Draft

Boise-Payette-Weiser Subbasin Summary

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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 basinwide 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, wildlife, and habitat managers comprise the core members of subbasin teams. Core members of the Boise-Payette-Weiser subbasin team are 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 users. 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 Boise-Payette-Weiser subbasins total 8,800 square miles (mi^2) and are located in southwestern Idaho. Lands within these subbasins are under intensive land use practices, including cultivated agriculture, intensive range and timber management, and recreational use.

Fish and wildlife resources are abundant and include numerous federally listed threatened and endangered species.

Water resource development and operations is a primary factor limiting the abundance and distribution of native salmonids. Widespread losses of riparian-wetland vegetation communities have affected both aquatic and terrestrial species resulting in dramatic alterations to floodplains and river channels. Timber harvest and mining activities have significantly affected aquatic habitats throughout the three subbasins. The primary threats to existing wildlife habitat are the continuing increases in recreational and home development and the continuation of existing land management practices, including agricultural and forest management related activities in critical habitat areas. The cumulative impacts associated with the decline and loss of these habitats can be felt across the entire subbasin complex and is evident from the number of fish and wildlife species currently at risk.

Several agencies have conducted numerous biological assessments throughout the subbasin complex in recent years. Identified goals and objectives focus on rebuilding native salmonid populations and reducing or eliminating threats to native habitats, restoring fish and wildlife habitat connectivity, and habitat protection and enhancement.

Subbasin Description

The Boise-Payette-Weiser subbasins are comprised of three hydrological units located in southwestern and west central Idaho and total approximately 8,800 mi^2. The Boise River subbasin includes the North Fork Boise River, Middle Fork Boise River, Boise-Mores Creek, South Fork Boise River, North Fork Boise River, and Lower Boise River watersheds. The Payette River subbasin includes the South Fork Payette River, the Deadwood River, the Middle Fork Payette River, the mainstem Payette River, and the North Fork Payette River. The Weiser River subbasin includes the entire Weiser River watershed.

General Location

The Boise-Payette-Weiser subbasins are located in southwestern and west central Idaho. The subbasins encompass portions of the Idaho Batholith, Blue Mountains, and Owyhee Uplands ecoregional sections (McNab and Avers 1994). The subbasins extend north from the Snake River Plain. On the west, the subbasins encompass the Hitt and Cuddy mountains on the southern end of the Seven Devils Mountains. The subbasins encompass the West Side Mountains, which form the divide between the Weiser and North Fork Payette watersheds. On the eastern extent of the subbasins, the Boise and Salmon River mountains form the headwaters of the Boise and Payette Rivers.

Drainage Area

The Boise River subbasin is located in southwestern Idaho and is approximately 4,000 mi^2. This subbasin drains portions of Ada, Boise, Camas, Canyon, Elmore, Gem, and Payette Counties and includes the cities of Boise, Nampa, Caldwell, and the small settlements of Atlanta, Prairie, Pine, Featherville, Paradise Hot Springs, and Rocky Bar. Important streams in the subbasin include the mainstem Boise River, Indian Creek, Grimes Creek, South Fork Boise River, Big Smokey Creek, Little Smokey Creek, North Fork Boise River, Crooked Creek, and the Middle Fork Boise River. Approximately 215 named lakes and reservoirs occur within the subbasin. The larger reservoirs include Lake Lowell, Anderson Ranch, Lucky Peak, and Arrowrock reservoirs. Some of the large natural lakes include Azure Lake, Big Scenic Creek Lake, Big Trinity Lake, Browns Lake, Heart Lake, Lake Ingeborg, Little Spangle Lake, Plummer Lake, and Spangle Lake.

The Payette River subbasin is located in southwestern and west central Idaho and is approximately 3,300 mi^2. This subbasin drains portions of Adams, Boise, Valley, and Washington Counties. Major cities and towns include McCall and Cascade. Important streams include Big Willow Creek, Deadwood River, Fortynine Slough, Gold Fork River, Kennally Creek, Lake Fork, Little Willow Creek, North Fork Payette River, mainstem Payette River, South Fork Payette River, and Squaw Creek. Approximately 260 named lakes and reservoirs occur in the subbasin. The larger reservoirs include Cascade, Deadwood, and Paddock Valley reservoirs. Larger natural lakes include Box, Granite, Little Payette, Payette, and Upper Payette lakes.

The Weiser subbasin is located in southwestern Idaho and is approximately 1,500 mi^2. This subbasin drains portions of Adams and Washington Counties. Major cities and towns include Council and Cambridge. Important streams include Crane Creek, Hornet Creek, Keithly Creek, Little Weiser River, Monroe Creek, North Crane Creek, Pine Creek, South Fork Crane Creek, and the mainstem Weiser River. The subbasin contains ten reservoirs and one named lake. The largest reservoir is Crane Creek, and Rush Lake is the only natural lake in this subbasin.

Topography/geomorphology

Major geologic formations of the Boise-Payette-Weiser subbasins include the Cretaceous pluton of the Idaho Batholith, Miocene Columbia River basalt flow, and Quaternary alluvial surficial deposits (Table 1). The Idaho Batholith is predominant in the Boise-Mores Creek, Middle Fork Payette, North Fork Payette, North and Middle Fork Boise River, South Fork Boise River, and South Fork Payette River watersheds. The formation sets the context for a complex interplay of geologic diversity, especially in the Boise-Mores Creek, South Fork Boise River, and South Fork Payette River watersheds.

Columbia River basalts are prominent in the Weiser and Payette River subbasins. The southeastern extent of the massive Columbia River basalt flows occur within the Payette River watershed, extending well east of Horseshoe Bend, Idaho. Quaternary alluvial surficial deposits are extensive in the Lower Boise River, North Fork Payette River, and mainstem Payette River watersheds. The Lower Boise River, the Payette River, and to a lesser extent the South Fork Boise River watersheds extend south into geologic features that are more prominent on the Snake River Plain: Pliocene stream and lake deposits and Pleistocene to Pliocene basalts and associated tuffs and volcanic detritus.

The Cretaceous Idaho Batholith and younger Tertiary granitic intrusions dominate several watersheds of the Boise-Payette-Weiser subbasins. Parent rocks of the formation are composed of biotite granodiorite, a medium-grained intrusive igneous rock that disaggregates easily, especially on the steep slopes of the subbasins.

Topographical relief of the subbasins is reflective of a terrain that once attained a mature erosional level (by the Middle Tertiary) and subsequently uplifted thus re-initiating stream erosional processes. Quarternary glaciation occurred primarily on isolated high elevation peaks. Alpine glacier systems formed in the western Salmon River and Boise Mountains. Though large scale glacially derived physiographic features such as broad U-shaped valleys are mostly absent, localized evidence of alpine glaciation (pothole lake systems and glacial cirques) is common in the subbasins on upper slope and ridge top positions of higher elevation ridge systems. Stream erosion has played the predominant role in shaping the physiography of the subbasins. In the mountainous portions of the subbasins, stream erosion since the Middle Tertiary has given rise to topography characterized by relatively narrow, V-shaped valleys, steep valley side slopes, and relatively narrow ridge systems.

The combination of the physical characteristic of Idaho Batholith biotite granodiorite and the physiographic nature of the landforms within these subbasins give rise to high natural potential for erosion. The Boise-Mores Creek, Middle Fork Payette River, North Fork Payette River, North and Middle Fork Boise River, South Fork Boise River, and South Fork Payette River watersheds are particularly subject to rapid erosion and mass wasting. In areas with intense land management activities, erosion rates are even higher.

The coupling of high susceptibility to erosion and land management practices such as timber harvest activities, road construction, livestock grazing, and natural fire disturbance

events has given rise to recent extreme mass wasting within affected subbasin watersheds. For example, in 1994, a major wildfire occurred in Trapper Creek, a logged and heavily roaded tributary of the North Fork Boise River. In late summer 1995, Trapper Creek suffered a debris flow that removed most of the streambed, all vegetation, and aquatic biota from the creek. The debris torrent made up of predominantly fine sediment, coarse rock, and plant material was deposited into the North Fork Boise River.

Table 1. Geology of the Boise-Payette-Weiser subbasins. The percent occurrence of major geologic mapping units is summarized by watershed (adapted from Bond and Wood 1978; Jensen *et al.* 1997).

Geologic mapping unit	Boise-Mores	Lower Boise	Middle Fork Payette	North Fork Payette	North and Middle Fork Boise	Payette	South Fork Boise	South Fork Payette	Weiser
Cretaceous metamorphic intrusive and granitic rock				6.7		2.1	4.0		1.3
Cretaceous pluton of the Idaho Batholith	85.8	8.5	97.3	61.5	87.4	25.4	80.9	86.7	4.2
Eocene granite	7.8		0.1	0.3	10.3		1.0	8.9	
Eocene mixed silicic and basaltic ejecta, flows, and reworked debris	0.6	0.2				0.0	2.5	0.0	
Middle and Lower Triassic metabasalts and submarine volcanic									0.7
Miocene Columbia River basalt flow	0.0	0.2		2.8		32.4		0.1	70.9
Other minor rocks		0.4				2.4			11.4
Paleozoic mixed sedimentary rocks							0.9		
Pleistocene fluvial and unsorted glacial debris	4.1	0.1		1.1			0.1	0.6	
Pleistocene to Pliocene basalts and associated tuffs and volcanic detritus	0.0	12.9				0.0	5.9		
Pliocene silicic welded tuff, ash, and flow rocks							1.7		
Pliocene stream and lake deposits	0.0	19.8				15.5			1.4
Precambrian gneiss, amphibolite and other metamorphosed ignenious rocks								0.6	
Quaternary alluvial deposits	0.1	57.0	2.6	24.1	2.2	21.8	2.0	2.5	9.9
Water	1.7	1.0		3.5	0.0	0.4	0.9	0.7	0.2

Quaternary alluvial deposits and Pliocene stream and lake deposits prominent in the foothills regions of the Lower Boise River, North Fork Payette River, and mainstem Payette River watersheds are also naturally susceptible to erosion. The cumulative effects of intensive residential development, historic intensive livestock grazing, the replacement of indigenous perennial vegetation by exotic annual species, high levels of motorized recreational use, and altered fire disturbance regimes give rise to high potential for mass wasting events on these landscapes.

Climate

The Boise-Payette-Weiser subbasins are located on the western edge of the central mountain mass of the Salmon River and Boise Mountains. The forested watersheds of these subbasins drain southwesterly from elevations above 10,000 feet to 3,200 feet along the major rivers. Surrounding mountains rise about 4,000 feet above the valley floors. The subbasins encompass a strong climatic gradient from the hot, dry Continental climate of the Snake River Plain to the Pacific maritime climate of upland montane slopes and ridgecrests.

Pacific maritime-influenced climatic regimes, characterized by cool, moist winters and warm, dry summers, are prevalent in all but the Lower Boise River and Payette River watersheds. Extreme Continental climatic conditions are prominent in the low elevation valleys, of Lower Boise River and Payette River watersheds. Intermediate climatic regimes occur on the foothill slopes, and upper valleys of Boise-Mores Creek, Lower Boise River, mainstem Payette River, and Weiser River watersheds. The climate of the subbasins is summarized by watershed using the Koppen climatic classification system (Godfrey 1999) (Table 2).

Table 2. Climatic regimes of watersheds within the Boise-Payette-Weiser subbasins: the proportional representation of varying climatic regimes (using the Koppen climatic classification system, described by Godfrey 1999) within the subbasins is summarized by watershed.

Koppen climate class	Description	Boise-Mores	Lower Boise	Middle Fork Payette	North Fork Payette	North and Middle Fork Boise	Payette	South Fork Boise	South Fork Payette	Weiser
BSk	very dry Continental Climate; most precipitation occurs in summer		79.7				24.1			2.9
Dfb	warm summers, cold winters; precipitation is relatively evenly distributed between winter and summer				2.1					
Dfc	warm summers, cold winters; precipitation is relatively evenly distributed between winter and summer; summers are relatively short				2.7	6.8		2.7	2.7	
Dsa	warm summers, cold winters; extreme differences occur between summer versus winter precipitation (summers are much drier); summers are relatively long and hot	6.6	14.3				20.9			21.3
Dsb	warm summers, cold winters; extreme differences occur between summer versus winter precipitation (summers are much drier); summers are relatively warm	90.9	6.0	94.4	79.7	74.8	53.5	79.9	74.0	74.2
Dsc	warm summers, cold winters; extreme differences occur between summer versus winter precipitation (summers are much drier); summers are relatively short and cool	2.5		5.6	15.5	18.4	1.4	17.5	23.3	1.6

Major Land Uses

Ownership and Land Use Patterns

Land ownership patterns within the Boise-Payette-Weiser subbasins follow those often observed in the Intermountain West. Arable, highly productive lands are often privately held; the U.S. Bureau of Land Management (BLM) manages rangelands, and the U.S. Forest Service (USFS) manages public forestlands. Land ownership patterns within the subbasins are summarized in Table 3. Federally managed public lands are predominant in the Boise-Mores Creek, Middle Fork Payette River, North and Middle Fork Boise River, South Fork Boise River, and South Fork Payette River watersheds. The majority of lands in the Lower Boise and mainstem Payette River

watersheds are in State or private ownership. The distribution of federal versus state and private ownership is relatively even in the North Fork Payette River and Weiser River watersheds.

Table 3. Summary of land ownership patterns within the Boise-Payette-Weiser subbasins: the percent representation of land ownership class is listed for each watershed.

Agency	Boise-Mores	Lower Boise	Middle Fork Payette	North Fork Payette	North and Middle Fork Boise	Payette	South Fork Boise	South Fork Payette	Weiser
Military Reservation	0.2	0.0							
Private	20.9	75.7	7.0	38.8	0.4	58.2	13.5	1.5	50.2
State Lands	14.9	4.6	4.9	12.7		6.2	4.3	0.4	5.9
USFWS	0.0	0.1							
USFS	59.5	1.2	81.4	41.4	99.4	14.1	79.3	93.9	28.6
BLM	2.7	13.1	2.1	1.0		20.5	1.2	0.3	14.8
BOR	0.5	4.1	4.6	0.1	0.3	0.4	1.0	3.2	0.1
Water	1.2	1.1		6.0	0.0	0.5	0.8	0.8	0.3

Lands within these subbasins are under intensive land use practices, including cultivated agriculture, intensive range and timber management, and recreational use. Extensively modified ecological conditions are prevalent within the subbasins. Non-sustainable ecological conditions occur within the Lower Boise River and mainstem Payette River watersheds (Table 4). General land uses within the subbasins include urban development, dryland and irrigated agriculture, and forest and rangeland resource extraction, recreation, and wildlands. With few exceptions, urban development and dryland, irrigated-gravity flow, and irrigated-sprinkler agriculture land uses occur on private land.

Table 4. Land use patterns within the watersheds of the Boise-Payette-Weiser subbasins: the percent representation of levels of ecological modification is listed by watershed.

Land Use Class	Boise-Mores	Lower Boise	Middle Fork Payette	North Fork Payette	North and Middle Fork Boise	Payette	South Fork Boise	South Fork Payette	Weiser
1 - Natural, unmodified environments				2.1			1.5		
2 - Special natural areas				7.0	30.4		0.0	18.7	
3 - Essentially unmodified forested and grassland ecosystems	0.8	4.1	0.2	0.3	0.3	1.7	0.2	0.3	0.5
4 - Natural appearing, but modified for human use and occupancy	24.1	0.3	25.5	8.8	25.4	2.5	42.1	48.7	1.8
5 - Modified forest ecosystems	0.8	5.2		7.5		0.3	1.8	0.4	0.0
6 - Modified grassland ecosystems	32.1	0.0	60.0	22.2	44.0	13.1	24.4	26.9	29.1
7 - Areas modified by human occupation and activities	1.9	4.7	0.1	0.8	0.0	17.2	18.9	2.8	14.3
8 - Modified non-sustainable areas	40.4	85.6	14.2	51.3	0.0	65.1	11.1	2.2	54.3

Forest and range related uses are the principle land uses on federally managed public land within the subbasins. Private lands in forest related land uses are extensive, however, in the Boise-Mores Creek, Lower Boise River, North Fork Payette River, mainstem Payette River, and Weiser River watersheds. Rangeland related uses occur primarily on private lands in the North Fork Payette River and Weiser River watersheds and prominently on private lands in the Boise-Mores Creek, Lower Boise River, mainstem Payette River, and South Fork Payette River watersheds (Table 5).

Table 5. Distribution of forest and rangeland related land uses among land ownership classes within the Boise-Payette-Weiser subbasins.

Landowner	Boise-Mores	Lower Boise	Middle Fork Payette	North and Middle Fork Boise	North Fork Payette	Payette	South Fork Boise	South Fork Payette
Forest								
Military Reservation								
Private	21.0	43.3	4.2	0.4	26.7	24.2	5.6	1.0
State Lands	14.4	5.5	5.0		16.1	7.6	3.1	0.4
USFWS								
USFS	62.9	48.7	83.9	99.4	54.1	59.7	90.1	95.8
BLM	1.2	2.5	2.1		1.1	6.7	1.1	0.3
BOR	0.2		4.8	0.2	0.1	1.6	0.1	2.3
Water	0.3			0.0	1.8	0.1	0.1	0.3
Rangeland								
Military Reservation	0.6	0.0						
Private	21.4	51.4		70.0	58.9	22.0	4.0	64.8
State Lands	18.1	9.2		3.9	7.0	5.7		4.6
USFWS	0.0	0.2						
USFS	45.8	1.6	96.8	1.2	4.1	68.5	77.7	6.1
BLM	9.8	28.7		0.2	29.5	1.4	0.0	24.2
BOR	1.8	8.7	3.1		0.2	1.9	17.7	0.1
Water	2.4	0.2	0.2	24.8	0.3	0.5	0.5	0.2

The development of road systems on the public and private lands of the Boise-Payette-Weiser subbasins provides the transportation network that facilitates logging, mining, livestock grazing, other land management activities, and supports recreational access for the public. It is well documented that fish and wildlife habitat quality and availability are affected by the number and location of roads and the manner in which they are constructed and maintained (EPA *et al.* 1975). Sediments are produced from forestlands by surface erosion, mass soil movement, and channel erosion. Logging road activities may influence all of these and accelerate the surface erosion and mass soil movement (EPA *et al.* 1975). Unfortunately, when most road prisms were pioneered in these subbasins, little care or attention was given to potential environmental effects.

Road densities in portions of the subbasins are high. Historical mining within the Boise-Payette-Weiser subbasins has significantly affected fish and wildlife habitats, especially in the Boise-Mores Creek, North and Middle Fork Boise River, and South Fork Boise River watersheds. Dredge mining (commercial bucket) occurred on many sections of the Middle Fork Boise River, South Fork Boise River, and North Fork Boise River. Much of the floodplains in these areas have been overturned and remain as tall piles of cobbles, and dredge pools. Bucket dredge mining has not been performed in the last several decades and will probably never again occur in Idaho. Lode and other forms of placer mining have also occurred. On affected rivers there are typically few remaining areas of older river terrace.

The largest mining district currently within the subbasins is the Atlanta District. The Atlanta Lode consisted largely of quartz with arsenopyrite and gold, a common association, with pyrite. Arsenopyrite is an iron-arsenic-sulfide. Other old mines in the subbasin include an antimony mine near Swanholm Peak. There are also small gold and silver-base metal mines up Black Warrior Creek, Little Queens River, and several other tributaries. Commercial mining is still viable in these areas; the Atlanta Lode is the most likely to be re-activated.

Protected Areas

A diverse range of protected areas is present within the Boise-Payette-Weiser subbasins. These specially designated areas include vast roadless areas, relatively small ecological reference areas, wild and scenic rivers, national recreation areas, and fishing and hunting access areas. The IDFG Idaho Conservation Data Center maintains detailed information on these conservation sites and specially managed areas.

The Boise-Payette-Weiser subbasins encompass 40 USFS roadless areas (Table 6). These occur on the upper slopes and ridgecrests of the Boise Mountains, Salmon River Mountain, West Side Mountains, and Cuddy Mountains. One BLM wilderness study area, ID-110-91A, is located in the North Fork Payette River watershed.

Table 6. Summary of USFS inventoried roadless areas within the Boise-Payette-Weiser subbasins. Roadless areas are listed with X's indicating their distribution within subbasin watersheds.

Roadless Area Name	Boise-Mores	Lower Boise	Middle Fork Payette	North Fork Payette	North and Middle Fork Boise	Payette	South Fork Boise	South Fork Payette	Weiser
06-9X5 Hanson Lakes								X	
Bald Mtn.			X					X	
Bear Wallow			X						
Bernard								X	
Blackhorse Creek							X		
Breadwinner	X				X				
Buttercup Mountain							X		
Cathedral Rocks							X		
Council Mountain									X
Cow Creek	X						X		
Cuddy Mountain									X
Danskin		X					X		
Deadwood								X	
Elk Ridge							X		

Roadless Area Name	Boise-Mores	Lower Boise	Middle Fork Payette	North Fork Payette	North and Middle Fork Boise	Payette	South Fork Boise	South Fork Payette	Weiser
French Creek				X					
Grand Mtn.					X				
Grimes Pass	X							X	
Hanson Lakes								X	
Hawley Mtn.	X					X		X	
House Mtn.							X		
Liberal Mountain							X		
Lime Creek							X		
Lost Man Creek					X		X		
Mt. Heinen	X								
Needles				X					
Peace Rock			X	X				X	
Poison Creek				X					X
Rainbow					X		X		
Rapid River									X
Red Mtn.								X	
Secesh				X					
Sheep Creek	X				X		X		
Smokey Mountains					X		X		
Snowbank				X		X			X
Steel Mtn.					X		X		
Stony Meadows			X	X					
Ten Mile					X			X	
Whiskey Jack					X		X		
Whitehawk Mtn								X	
Wilson Peak	X								

Twenty-six relatively small, highly protected ecological reference areas are present within the subbasins. These include USFS Research Natural Areas and Special Interest Areas, BLM Management Research Natural Areas and Areas of Critical Environmental Concern, and The Nature Conservancy preserves. Research Natural Areas provide pristine, high quality, representative examples of the important ecosystems within the subbasins. These sites combine with the large tracts of undeveloped land within the subbasins to provide excellent opportunities for research regarding physical and biological ecosystem processes. Jankovsky-Jones *et al.* (1999) provide a guide to the wetland and riparian values of conservation sites within the subbasins. Rust (2000) provides an assessment of the representation of ecological components and identifies targets for selection of new conservation sites within the subbasins. The USFS Research Natural Areas and BLM Research Natural Areas and Areas of Critical Environmental Concern management guidelines are identified by site-specific establishment documents and decision notices.

Water Resources Development and Operations

Boise and Payette River Subbasins

The reservoir systems in the Boise and Payette rivers are operated primarily for irrigation water supply, power, and flood control. Hydroelectric power generation, recreation, and fish and

wildlife are secondary or incidental to project operations. Project operations release natural flows to meet earlier natural flow water rights. Operations of the projects in the Boise River and Payette River subbasins are complex.

While the Boise and Payette BOR projects are operated separately, the four reservoirs in the Boise River system and the two reservoirs of the Payette River system are operated as unified systems, respectively (Table 7, Table 8). There are three general operating seasons: 1) maintenance from November through March; 2) flood control and refill from April through July; and 3) drawdown from August through October. A detailed operational description is found in BOR (1996).

Spaceholder contracts and Idaho State law allow operation of rental pools. These pools permit spaceholders to offer water for rent to others that are in short supply. Water rental pools operate under Idaho law and at the direction and under the rules of the Idaho Water Resource Board (IWRB). Local water rental pool rules and leasing prices are determined by the local water rental pool organization and then reviewed by the IWRB. There are separate water rental pools in the Boise and Payette systems. Rules for purchase of rental water differ between the two rental pools. Both pools are operated primarily for irrigation; therefore, purchase for irrigation is the priority. Purchase of water for other beneficial uses has the lowest priority. Since 1991, Idaho State law requires that water for salmon flow augmentation must be administered through the water rental pools. The BOR consigns water to the rental pools, pays the administration charge, and then releases the water downstream for flow augmentation (BOR 1996).

Authorities for construction of storage facilities associated with the Boise Project do not include fish and wildlife enhancement except for Anderson Ranch Dam and Reservoir. Various agreements and administrative decisions recognize subsequent federal laws that deal with fish and wildlife protection and enhancement (BOR 1996). These include target flows and pools that are not absolute values but goals to be met within the capability of the systems and availability of water supply. These targets are not achieved under all conditions.

The National Marine Fisheries Service (NMFS) issued a 1995 Biological Opinion on the operations of the FCRPS. In the 1996 Record of Decision, the BOR accepted the Reasonable and Prudent Alternatives in the NMFS Biological Opinion. The BOR was asked to provide 427,000 acre-feet of water from the Snake River Basin for salmon flow augmentation in the lower Snake and Columbia Rivers. The BOR is obligated to ensure a high likelihood of providing this amount of water each year. The BOR has initiated a program to acquire reservoir storage space and natural flow rights throughout the drainage above Lower Granite Dam to attain the 427,000 acre-foot requirement.

Table 7. Summary of Boise Project operating activities. Adopted from BOR (1996).

Activity	Anderson Ranch Reservoir	Arrowrock Reservoir	Lucky Peak Reservoir	Lake Lowell
Refill target date	Late June	Late June	End of May	April 1
Flood control operation	Formal rule curve	Formal rule curve	Formal rule curve	Informal
Minimum flood control space[1]	None	None	50,000 AF Nov 1 - Mar 31	None
Avg. winter release(1961-1990)	627 cfs	815 cfs	848 cfs	None
Min. winter release target (official)	300 cfs	None	150-240 cfs[2]	None
Min. pool target (unofficial)	70,000 AF	28,700 AF	28,730 AF	None

[1] Nov 1 - Dec 31 total of 300,000 acre-feet in Anderson Ranch, Arrowrock, and Lucky Peak with 165,000 acre-feet in Arrowrock and Lucky Peak and a total of 150,000 acre-feet from Jan 1 - Feb 28.

[2] While the target minimum release at Lucky Peak Dam has historically been 150 cubic feet per second (cfs), the IDFG has targeted 240 cfs in recent history in cooperation with the BOR.

Table 8. Summary of Payette system reservoir operating activities. Adopted from BOR (1996).

Activity	Cascade Reservoir	Deadwood Reservoir
Refill target date	Late June	Late June
Flood control operation	Informal rule curve	Informal rule curve
Min. flood control space[1]	152,000 AF	38,000 AF
Avg. winter release (1961-1990)	674 cfs	2 cfs[2]
Min. winter release target	200 cfs	50 cfs[3]
Min. pool target (unofficial)	300,000 AF	50,000 AF

[1] Until spring forecasts are available.

[2] Average has been 63 cfs since gates were replaced in 1990.

[3] The target release since 1990. Prior to 1990, minimum flow control was not possible.

Leitzinger (2000) quantified changes in resident fish habitat in the Snake River Basin upstream of Brownlee Reservoir resulting from the release of salmon flow augmentation water. The flow augmentation releases in the Deadwood River appear to have detrimental effects to both bull trout and rainbow trout habitats. The quantity of useable habitat decreased with the additional water for most life stages. In the Payette River, the summer releases assisted with attaining minimum flows at both the Cascade and Letha gages, but the water was insufficient to achieve these minimums all the time (Leitzinger 2000). The winter releases from Cascade Dam

helped achieve minimum flows, but, like summer flows, were insufficient to meet the recommendations all the time. The resulting impacts to existing fish populations have never been quantified. The Boise River releases also helped achieve minimum recommendations some of the time. Generally, the recommendations were met without the flow augmentation releases. Leitzinger (2000) presented two flow scenarios describing the IDFG's recommendations on how the 427,000 acre-feet of flow augmentation water should be released in order to minimize adverse impacts and, in some instances, to benefit resident fish in the upper Snake River Basin.

In recent years, the BOR has modified water operations in the Snake River Basin above Brownlee Reservoir to assist in protecting and recovering aquatic species listed under the Endangered Species Act (ESA). By April 1992, Snake River sockeye salmon and spring/summer and fall chinook salmon stocks were federally listed. In January 1993, five species of aquatic snails that inhabit the middle Snake River were also listed. All the water is administered under the water rental pools as required by Idaho law. Table 9 summarizes information on the source and volume of storage that has been provided annually by the BOR from the Boise and Payette River subbasins for flow augmentation purposes.

Table 9. Summary of Boise and Payette River flow augmentation volume provided by BOR, 1991 - 2001. Adopted from Leitzinger (2000).

	Boise				Payette		
Year	**BOR Space (AF)**	**Rentals (AF)**	**BPA Purchase (AF)**	**Total (AF)**	**BOR Space (AF)**	**Rentals (AF)**	**Total (AF)**
1991	0	0	51,000	51,000	0	0	0
1992	90,000	0	51,000	141,000	0	0	0
1993	95,000	34,971	0	129,971	23,000	0	23,000
1994	61,883	0	0	61,883	35,950	0	35,950
1995	94,242	50,758	0	145,000	25,000	2,000	27,000
1996	95,000	56,000	0	151,300	38,000	0	38,000
1997	95,000	60,000	0	155,000	38,000	2,000	40,000
1998	95,000	50,043	0	145,043	40,932	0	40,932
1999	95,000	65,000	0	160,000	40,932	0	40,932
2000	95,000	50,000	0	145,000	40,932	0	40,932
2001	30,000	0	0	30,000	0	0	0

By the summer of 1865, most of the river bottomland in the Boise Valley was under irrigation (BOR 1996). By 1900, an estimated 465 miles of canals, ditches, and laterals had been constructed and about 100,000 acres were capable of being irrigated. A major problem with irrigation at the time was the low flow of the Boise River in the fall. In Idaho, public land was acquired largely under the Homestead Act (1862), the Desert Land Entry Act (1877), and the Carey Act (1884). The Carey Act was used extensively in developing lands for irrigated agriculture production in the Snake River system. Under the Carey Act, each state, where irrigation was feasible, could select up to one million acres of arid federal lands for reclamation (irrigation) by inducing private capital to construct the works necessary for irrigation (BOR 1996). While the Carey Act was somewhat effective in promoting irrigation development, the financial resources of the individual promoters and the state restricted it. Subsequently, the

federal government provided financial help to significantly increase water supplies through storage development.

The federal government approved the Boise Project in 1905. Following authorization of the Boise Project, additional irrigation facilities were constructed in the Boise River subbasin, and in the Payette River subbasin. Boise Project lands constructed and operated by the BOR include storage facilities at Anderson Ranch Dam and Reservoir, Arrowrock Dam and Reservoir, Deadwood Dam and Reservoir, Cascade Dam and Reservoir, and Deer Flat Dams and Lake Lowell. Additionally, there are two diversion dams, three power plants, seven pumping plants, more than 2,000 miles of canals and laterals, and several hundred miles of drains. The Lucky Peak Project, constructed and operated by the USACE, consists of Lucky Peak Dam and Reservoir. The following discussion provides a brief operational overview of the major federal dams in the Boise Project (Boise and Payette divisions) as well as significant private dams.

Arrowrock Dam

Arrowrock Dam was completed in 1915 on the Boise River upstream from Boise, Idaho. It has an active storage capacity of 280,526 acre-feet. Lands around the reservoir are withdrawn by the BOR and managed by the USFS. Most of the runoff during the winter and early spring is held initially in Arrowrock Reservoir, which is the first reservoir in the Boise system to be drafted to meet irrigation demand. Arrowrock is normally drafted to a pool of 28,000 acre-feet (below 10,000 acre-feet in drought years) before Lucky Peak is drafted.

Deer Flat Dams

The Deer Flat Dams are four earthen embankments that impound Lake Lowell in a natural depression southwest of Nampa, Idaho. This impoundment was created during the period 1906 to 1938. It has an active storage capacity of 159,400 acre-feet. Lands around Lake Lowell are part of the Deer Flat National Wildlife Refuge managed by the USFWS. Normal operation is to fill the reservoir between irrigation seasons and release water as needed for irrigation. Filling is accomplished by release of water from Anderson Ranch and Arrowrock. The water is passed through Lucky Peak Dam and diverted at the Boise River Diversion Dam to the New York Canal.

Anderson Ranch Dam

Anderson Ranch Dam was completed in 1951 and is located on the South Fork Boise River about 20 miles northeast of Mountain Home, Idaho. It has an active storage capacity of 423,200 acre-feet. Anderson Ranch Dam has two hydropower units. Lands around Anderson Ranch Reservoir were withdrawn by the BOR and are managed by the USFS. A minimum release of 300 cubic feet per second (cfs) is maintained below the dam from September 15 through the following March 31, and the minimum flow is increased to 600 cfs from April 1 through September 15 (releases are normally above 1,000 cfs during this period). Releases are managed conservatively to retain as much carryover as possible to meet the minimum streamflow requirements and to not exceed the power plant capacity of about 1,600 cfs.

Lucky Peak Dam

Lucky Peak Dam was completed in 1957 and is situated about eight miles southeast of Boise, Idaho on the Boise River. The reservoir has an active storage capacity of about 264,400 acre-

feet. The USACE dam is operated primarily for flood control purposes with storage for irrigation marketed by the BOR. In 1988, a three-unit power plant was constructed. Unless drought or flood control conditions are overriding, Lucky Peak Reservoir is generally filled by Memorial Day to provide recreation opportunities. In good water years, Lucky Peak is usually maintained nearly full until Labor Day. It is subsequently drafted to meet irrigation demand in September through October and is typically maintained at a low level during the winter for flood control purposes. In drought years, Lucky Peak is drafted when Arrowrock nears minimum pool level and releases from Arrowrock are insufficient to meet irrigation demand. This could be as early as late June. The BOR and IDFG jointly administer a combined 152,300 acre-feet of storage water in Lucky Peak Reservoir to provide a minimum streamflow for fish and wildlife during the winter in the Boise River. These storage water rights are junior to most existing irrigation storage rights in the Boise River system.

Black Canyon Dam

Black Canyon Dam was constructed on the Payette River near Emmett, Idaho in 1924. The diversion pool has a capacity of around 45,000 acre-feet. There is a hydropower facility with two units at the dam. Black Canyon pool is maintained at a steady level during the irrigation season by adjusting releases from Deadwood, Cascade, and Black Canyon dams.

Deadwood Dam

Deadwood Dam was constructed on the Deadwood River in 1931 and is located about 25 miles southeast of Cascade, Idaho. It has an active storage capacity of about 162,000 acre-feet. It was the first major storage structure completed in the Payette system, and the primary purpose was to provide water for generating electricity at Black Canyon. Lands around Deadwood Reservoir were withdrawn by the BOR and are managed by the USFS. In the Payette system, releases for irrigation demand are met first from Deadwood Dam, usually in July and August, to minimize the draft of Cascade Reservoir. After Labor Day, the draft of Deadwood Reservoir is reduced and late season irrigation demand is met by releases from Cascade Reservoir. A minimum 50 cfs is released from Deadwood Dam in the winter for fish and wildlife. A minimum pool of 50,000 acre-feet is a target established by administrative decision. Deadwood and Cascade Reservoirs are informally managed for flood control with a goal of limiting flows at Horseshoe Bend, Idaho to 12,000 cfs.

Cascade Dam

Cascade Dam was completed on the North Fork Payette River near Cascade, Idaho in 1948. It has an active storage capacity of 653,200 acre-feet. Idaho Power Company owns and operates a power plant at the dam. Lands around Cascade Reservoir were withdrawn and are managed by the BOR. The water surface of Cascade Reservoir is held as high as possible for recreation and water quality. Most late season irrigation releases in the Payette system are made from Cascade Reservoir. The target for winter release is a minimum 200 cfs, and a minimum pool of 300,000 acre-feet (250,000 acre-feet active storage) has been established by administrative decision.

Boise River Diversion Dam

This old facility is located on the Boise River about seven miles southeast of Boise, Idaho. The dam diverts water to the New York Canal. The hydropower plant is currently not operational; however, the BOR is considering bringing it back online in the near future.

Kirby Dam

The original Kirby Dam was a log crib structure built at the turn of the century near the town of Atlanta, Idaho on the Middle Fork Boise River. The structure failed in 1990 and was rebuilt using federal funds. Subsequently, the federal government assumed ownership of the dam. Atlanta Power Company operates a hydropower facility at the site.

Little Payette Lake

Little Payette Lake is an irrigation project located on Lake Fork Creek (tributary to Cascade Reservoir) several miles east of McCall, Idaho and operated by the Lake Irrigation District.

Horsethief Reservoir

Horsthief Reservoir is located on Horsethief Creek in the North Fork Payette River drainage east of Cascade, Idaho. It stores water for irrigation and is managed by the IDFG as a trout fishery.

Paddock Valley Reservoir

Paddock Valley Reservoir is located on Little Willow Creek (tributary to the Payette River) northeast of Payette, Idaho. It stores water for irrigation and is operated by the Little Willow Irrigation District.

Hubbard Reservoir

Hubbard Reservoir is a small offstream reservoir located about 12 miles southwest of Boise, Idaho. It is owned by the BOR. The primary purpose of the reservoir is for emergency short-term storage for dewatering the New York Canal in case of failure.

Payette Lakes

The Payette Lakes complex includes Upper Payette Lake, Granite Lake, and Payette Lake in the North Fork Payette River drainage, and all three are located in the vicinity of McCall, Idaho. Payette Lake is a large natural lake that was supplemented with a minor dam at its outlet to store about 35,000 acre-feet of irrigation water.

Little Camas Reservoir

Little Camas Reservoir is an irrigation storage reservoir that was constructed in 1912. The reservoir is about 1,455 acres in size at full pool and stores 22,500 acre-feet of water. While this facility is located in the South Fork Boise River drainage, water is diverted outside the Boise River drainage for irrigation.

Weiser River Subbasin

The Weiser River subbasin is essentially unregulated (BOR 1997 in BOR 1996). There are at least 15 significant irrigation reservoirs in the Weiser River subbasin (DuPont and Kennedy 2000). There are also many small reservoirs, most with a capacity of less than 100 acre-feet. e

Reservoirs include C. Ben Ross Reservoir (7,800 acre-feet), Mann Creek Reservoir (11,000 acre-feet), Crane Creek Reservoir (60,000 acre-feet), and Lost Valley Reservoir (10,300 acre-feet). There are no federal or non-federal hydropower facilities in the Weiser River subbasin.

Mann Creek Reservoir is the only federal project in the subbasin and is owned and operated by the BOR. At maximum capacity, Mann Creek Reservoir is 1.8 miles long and has a surface area of 282 acres. It provides supplemental irrigation water and is operated by the Mann Creek Irrigation District. Although the reservoir provides recreation and fish and wildlife benefits, it is not operated for those purposes. There is no minimum pool and the only minimum flow is 1.5 cfs for a downstream water right for stock watering.

Consumptive use of the Weiser River is primarily agricultural (BOR 1997 in BOR 1996). Numerous water diversions exist throughout the subbasin. It is not uncommon for streams to be completely dry during peak irrigation periods (DuPont and Kennedy 2000). In normal to above normal water years, it is common for flooding to occur along the Weiser River.

Hydrology

Instream Flows

A minimum streamflow, or instream flow, is the minimum flow necessary to preserve the biological, recreational, or aesthetic value of a water body. Water is not diverted and used, as is the case with most water rights in Idaho. Instead, the water remains in a given reach of river or in a lake to protect fish and wildlife habitat, aquatic life, water quality, navigation, transportation, recreation, or aesthetics. In 1978, the Idaho Legislature passed the Minimum Streamflow Law. Under Idaho Law (Chapter 15, Title 42, *Idaho Code*), non-diverted uses can become valid water rights, which the IWRB holds in trust for the citizens of Idaho.

In the Boise-Payette-Weiser subbasins, the IDFG recommended a number of instream flow regimes. Through its state water basin planning process, the Idaho Department of Water Resources also recommended instream flows in the Boise and Payette subbasins. To date, instream flows have been licensed in the Boise and Payette River subbasins (Table 10).

Table 10. Existing licensed instream flow water rights for the Boise and Payette River subbasins.

File Number	Reach (Length in miles)	Flow Regime (cfs)
	Boise River Subbasin	
63-12033	Middle Fk. Boise River (16.3)	200-1,000
63-12032	Yuba River (2.8)	44-200
63-12031	E. Fk. Montezuma Ck. (1.9)	0.11
63-12034	Elk Creek (15.4)	5
63-12031	Crooked River (10.1)	34-150
	Payette River Subbasin	
65-12733	S.Fk.Payette River-five reaches (54)	212-1,350
65-13060[a]	S.Fk.Payette River-one reach (1)	700-763
65-12822	N.Fk.Payette River (10)	106-1,400
65-12839[b]	N.Fk.Payette River (10)	100-294
65-12840	N.Fk.Payette River (17)	1,300-1,800
65-13059[c]	N.Fk.Payette River (17)	400
65-13894	N.Fk.Payette River (6.8)	35-60

[a] Supplemental flow to water right 65-12733
[b] Supplemental flow to water right 65-12822
[c] Supplemental flow to water right 65-12840

There are no licensed instream flow water rights in the Weiser River subbasin. The IDFG also recommended a number of instream flow regimes in the three subbasins that have never been acted upon by the IWRB (Table 11). These prior recommendations by the IDFG were intended as short-term minimum subsistence flows and were not meant to be long-term biologically based flows necessary to sustain aquatic resources.

Table 11. Existing recommended licensed instream flow water rights for the Boise and Payette River subbasins.

River	Reach	Flow Regime (cfs)	Reference
S.Fk. Boise River	Gage No. 13-1905	260-380	White & Cochnauer 1975
S.Fk. Boise River	Anderson Ranch Dam to Arrowrock Reservoir	279	Cochnauer 1977
S.Fk. Boise River	Anderson Ranch Dam to Arrowrock Reservoir	200-280	Pruitt & Nadeau 1978
Boise River	Barber Dam to Notus	240-5,000	Pruitt & Nadeau 1978
Boise River	Notus to Snake River	380-5,000	White & Cochnauer 1975
Boise River	Lucky Peak Dam to Star Diversion	240-4,500	Cochnauer 1977; Pruitt & Nadeau 1978
Payette River	Banks to Emmett	800-1,600	White & Cochnauer 1975
Payette River	Emmett to Payette	900-3,500	White & Cochnauer 1975

River	Reach	Flow Regime (cfs)	Reference
Payette River	Banks to Gardena	424	Cochnauer & Hoyt 1979
Payette River	Gardena to Letha	794	Cochnauer & Hoyt 1979
Payette River	Letha to Snake River	1,165-2,005	Cochnauer & Hoyt 1979
Payette River	Payette River below Black Canyon Dam	10,000	Cochnauer & Hoyt 1979
M.Fk. Payette River	Crouch to S.Fk.Payette River	70	Cochnauer & Hoyt 1979
Deadwood River	Deadwood Dam to S.Fk. Payette River	125	Pruitt & Nadeau 1978
Weiser River	Cambridge to mouth	190-240	Pruitt & Nadeau 1978
Little Weiser River	Grays Ck. to mouth	70	Pruitt & Nadeau 1978

The BOR developed a set of recommended reservoir pool elevations and flows for fisheries resources for the upper Snake River Basin as part of the needs assessment for the Snake River Resources Review (BOR 1998). The BOR used technical work groups comprised of experts from agencies, industry, tribes, and academic institutions to develop recommendations. Recommendations for the three subbasins are illustrated in Table 12. The Weiser River subbasin was not part of this review.

Table 12. Recommended pool elevations (KAF) and flows (cfs) for fisheries in the Boise and Payette River subbasins. Adapted from BOR (1998).

Site/Reach	Target Species	Pool (KAF)/Flow (cfs)	Reference
		Payette River Subbasin	
Cascade Reservoir	Kokanee, rainbow trout, yellow perch	425 KAF minimum 12/15-3/31	Reininger & Horner 1982
N.Fk. Payette River (Cascade Dam-Smith's Ferry)	Rainbow trout, yellow perch, mountain whitefish	400 cfs 10/13-3/15 600 cfs 3/16-6/17 1400 cfs 6/18-10/12	Cochnauer & Hoyt 1979; IDFG 1992
N.Fk. Payette River (Smith's Ferry-Banks)	Rainbow trout, mountain whitefish	400 cfs 9/2-4/18 1800 cfs 5/1-6/30 1300 cfs 7/1-7/31 1800 cfs 8/1-9/1	IDFG 1992
S.Fk. Payette River (Deadwood River-Oxbow Bend)	Rainbow trout, bull trout, mountain whitefish	337 cfs 9/1-4/18 1100 cfs 4/19-8/31	IDFG 1992
S.Fk. Payette River (Oxbow Bend)	Rainbow trout, bull trout, mountain whitefish	337 cfs 9/1-4/14 337-1100 cfs 4/15-8/31	IDFG 1992
S.Fk. Payette River (Oxbow Bend-Middle Fork)	Rainbow trout, bull trout, mountain whitefish	337 cfs 9/1-4/14 1100 cfs 4/15-8/31	IDFG 1992
S.Fk. Payette River	Rainbow trout, bull	407 cfs 9/1-4/14	IDFG 1992

Site/Reach	Target Species	Pool (KAF)/Flow (cfs)	Reference
(Middle Fk.-Banks)	trout, mountain whitefish	1350 4/15-8/31	
Deadwood Reservoir	Rainbow trout, mountain whitefish, bull trout	50 KAF year round	IDFG 1992
Deadwood River	Rainbow trout, mountain whitefish, bull trout, cutthroat trout	125 cfs year round 50 red flag minimum	Cochauer & Hoyt 1979
Payette River (Banks-Gardena)	Rainbow trout, mountain whitefish, smallmouth bass	424 cfs year round	Cochnauer & Hoyt 1979
Payette River (Banks-Emmett)	Rainbow trout, mountain whitefish, smallmouth bass	800 cfs 10/1-3/31 1600 cfs 4/1-9/30	White & Cochnauer 1975
Payette River (Emmett-Payette)	Rainbow trout, mountain whitefish, smallmouth bass	900 cfs 10/1-2/28 3500 cfs 3/1-5/30 1800 cfs 6/1-9/30	White & Cochnauer 1975
Payette River (Gardena-Letha)	Rainbow trout, mountain whitefish, smallmouth bass	794 cfs year round	Cochnauer & Hoyt 1979
Payette River (Letha Bridge-Snake River)	Smallmouth bass	1165 cfs 6/1-2/28 2005 cfs 3/1-5/30	Cochnauer & Hoyt 1979
	Boise River Subbasin		
S.Fk. Boise River (Anderson Ranch-Arrowrock Res.)	Rainbow trout, mountain whitefish, bull trout	300 cfs 9/16-3/31 600 cfs 4/1-9/15	IDFG 1992
S.Fk. Boise River (Anderson Ranch-Arrowrock Res.)	Rainbow trout, mountain whitefish, bull trout	380 cfs 10/1-12/31 260 cfs 1/1-3/31 280 cfs April 360 cfs 5/1-6/30 280 cfs 7/1-9/30	White & Cochnauer 1975
Anderson Ranch Reservoir	Rainbow trout, mountain whitefish, bull trout, kokanee	70 KAF min. pool year round	IDFG 1992
Arrowrock Reservoir	Rainbow trout, mountain whitefish, bull trout, yellow perch	28.7 KAF min. pool year round	Wolfin & Ray 1984
Lucky Peak Reservoir	Rainbow trout, kokanee, smallmouth bass	Stable pool elev. in summer for spawning	Wolfin & Ray 1984
Boise River (Lucky Peak-Snake River)	Rainbow trout, brown trout, mountain whitefish	225 cfs 10/1-11/30 & 4/1-6/30; 150 cfs 12/1-3/31 & 7/1-9/30	Pruitt & Nadeau 1978

Site/Reach	Target Species	Pool (KAF)/Flow (cfs)	Reference
Boise River (Lucky Peak-Star Bridge)	Rainbow trout, brown trout, mountain whitefish	240 cfs 7/1-2/28 1100 cfs 3/1-5/31 4500 cfs June	IDFG request to the IWRB; White & Cochnauer 1975

Boise River Subbasin

Stream hydrographs peak from late March to May because of snowmelt runoff. The runoff varies with south facing aspects at elevations less than 4,500 feet, warming early with resulting peak runoffs occurring as early as late March. High elevation lands with deeper snowpacks generate peak runoff beginning in late April and last until late May. Rain falling on snow in winter and spring cause rapid increases in stream flows. These rain-on-snow events usually occur in the elevation band between 4,500 and 5,000 feet. The peak runoff periods are followed by warm, dry summers, which greatly decrease stream flows. Seeps and springs provide perennial flows to streams in higher elevations, and smaller streams in the lower elevations tend to become dry before the end of summer. Periodic localized summer thunderstorms can result in flash floods within small drainages. The fall climate reduces transpiration in plants, and additional ground water results in slight increases in stream flows.

The stream flow regimes in the Upper Boise River watershed have been dramatically altered from historical conditions. Anderson Ranch Dam and Arrowrock Dam isolate migrant fish populations in the subbasin. Downstream dams on the Snake and Columbia River systems have blocked anadromous fish passage. Remaining migrant fish species have adapted from a fluvial existence to an adfluvial and fluvial lifestyle, wintering in reservoirs. Only the South Fork Boise River below Anderson Ranch Reservoir has had major stream flow alteration. In low water years the discharge from Anderson Ranch Dam is regulated for irrigation (1,700 cfs), intermediate (600 cfs), and base flow conditions (300 cfs).

The Payette River Subbasin

Nothing reported.

The Weiser River Subbasin

Nothing reported.

Water Quality

Idaho's 1998 303(d) list is required by the Federal Clean Water Act. States are required to submit this list to the Environmental Protection Agency (EPA) every two years. The list represents a comprehensive status of water quality in Idaho. Water bodies on the 303(d) list have been determined to be water quality limited because they do not support beneficial uses or they exceed water quality standards. The 303(d) list is organized by hydrologic unit code (HUC). Within each HUC, a unique number called a Water Quality Limited Segment Number (WQLSEG) further describes each water quality limited segment. Within the Boise-Payette-Weiser subbasins, there are 62 water quality limited water bodies (Table 13). In total, nearly 900 miles of rivers and streams, excluding reservoirs, are currently water quality limited in the Boise-Payette-Weiser subbasins.

In the three subbasins, as of February 2001, Total Maximum Daily Loads (TMDLs) have been submitted by the IDEQ and approved by the EPA for Cascade Reservoir (1996 and 1999), the Lower Boise River (2000), the Middle Fork Payette River (2000), and Lower Payette River (2000). The other TMDLs scheduled for the three subbasins should be completed by 2005-2006.

Boise River Subbasin

There are 26 water quality limited segments in the Boise River subbasin (Table 13). All segments in the upper subbasin are listed for sediment while segments in the lower subbasin are listed for sediment and other pollutants. Overall, water quality conditions in the Boise River subbasin above Arrowrock Dam are considered good. In a few areas, aquatic biota have been adversely affected by excess fine sediment. In other limited areas of the upper Boise River subbasin, elevated levels of heavy metals or historic mine talings containing heavy metals may threaten aquatic life.

Temperature data for the upper part of the Boise River subbasin are generally lacking. While there are thermograph data available from the Twin Springs Hydromet station on the Boise River since March 1998, there is no long-term data set. Stream temperatures are not thought to be a limiting factor for native fish species above 5,000 feet elevation. However, there is concern that elevated water temperatures may seasonally exist in nodal habitats like mainstem migration corridors.

The Idaho Division of Environmental Quality (IDEQ) completed a subbasin assessment and TMDL for water quality limited segments in the Lower Boise River (IDEQ 1999), and the EPA approved it in early 2000.

Payette River Subbasin

There are 24 water quality limited segments in the Payette River subbasin (Table 13). These segments are listed for a variety of pollutants. Considering the entire subbasin, the lower mainstem Payette River and the North Fork Payette River have the most segments included on Idaho's current 303(d) list.

In 1994, EPA placed five tributaries and the mainstem of the Middle Fork Payette River on Idaho's 303(d) list as water quality limited due to excess sediment. These segments were carried forward to the 1996 list. The listed segments included Anderson Creek, Lightning Creek, Scriver Creek, Bulldog Creek, Silver Creek, and the mainstem of the Middle Fork Payette River (Table 13). All of these segments are located within the Boise National Forest (BNF) and were determined to be water quality limited based on exceedences of the BNF Plan standards and guidelines (USDA 1990) and best professional judgement.

A subbasin assessment and TMDL have been prepared for the Middle Fork Payette River (IDEQ 1998) and subsequently approved by the EPA in 2000.

The Weiser River Subbasin

There are currently 12 water quality limited segments listed in the Weiser River subbasin (Table 13). These segments are listed for a variety of pollutants. A watershed advisory group has been established to assist the IDEQ with developing a subbasin assessment and TMDL. As of late summer 2001, water quality monitoring efforts were ongoing by several entities (R. Manwaring, West Central Highlands RCD, personal communication). The priority for TMDL

Table 13. Water quality limited segments found on Idaho's 1998 303(d) list in the Boise, Payette, and Weiser River subbasins.

HUC	WQLSEG	Water Body	Boundaries	Length (mi)	Pollutant(s)	TMDL Schedule
North & Middle Fork Boise						
17050111	5026	Browns Creek	Headwaters to MF Boise River	6.4	Sediment	2000
17050111	5028	Buck Creek	Headwaters to MF Boise River	7.2	Sediment	2000
Boise-Mores						
17050112	5117	Macks Creek	Headwaters to Grimes Creek	6.4	Sediment	2005
17050112	5126	Minneha Creek	Headwaters to Mores Creek	8.8	Sediment	2005
South Fork Boise						
17050113	5038	Cayuse Creek	Headwaters to SF Boise River	3.2	Sediment	2000
17050113	5060	Deer Creek	Headwaters to Anderson Ranch	1.3	Sediment	2000
17050113	5071	Elk Creek	Headwaters to Feather River	7.0	Sediment	2000
17050113	5639	Little Smoky Creek	Headwaters to Carrie Creek	11.3	Unknown	2000
17050113	2577	Rattlesnake Creek	Headwaters to SF Boise	16	Sediment	2000
17050113	2578	Smith Creek	Tiger Creek to SF Boise	14.5	Sediment	2000
17050113	2572	South Fk.Boise River	Anderson Ranch to Arrowrock	28.7	Sediment	2000
17050113	2575	Willow Creek	Headwaters to Arrowrock	14.9	Sediment	2000
Lower Boise						
17050114	2737	Blacks Creek	Headwaters to Blacks Creek Res.	13.2	Sediment	1998
17050114	2726	Boise River	Notus to Snake River	15.8	Sediment, Temperature	1998
17050114	2727	Boise River	Star to Notus	21.5	Bacteria, Nutrients, Sediment, Temperature	1998
17050114	2728	Boise River	Barber Diversion to Star	25.2	Sediment	1998
17050114	2729	Boise River	Lucky Peak to Barber Diversion	5.2	Flow Alteration	1998
17050114	5638	Cottonwood Creek	Headwaters to Freestone Creek	6.8	Unknown	2006
17050114	2734	Fivemile Creek	Headwaters to Fifteenmile Creek	28.9	DO, Nutrients, Sediment	1998
17050114	2731	Indian Creek	NY Canal to Boise River	16.6	DO, Nutrients, Oil/Gas, Sediment	1998
17050114	2732	Indian Creek	Headwaters to NY Canal	39.0	Nutrients Sediment	1998
17050114	5640	Lake Lowell			DO Nutrients	2006
17050114	2733	Mason Creek	Headwaters to Boise River	17.8	DO, Nutrients, Sediment	1998
17050114	2730	Sand Hollow Creek	Headwaters to Boise River	23.6	DO, Nutrients, Sediment	1998

HUC	WQLSEG	Water Body	Boundaries	Length (mi)	Pollutant(s)	TMDL Schedule
17050114	2736	Tenmile Creek	Headwaters to Fifteenmile Creek	27.2	DO, Nutrients, Sediment	1998
17050114	5637	Willow Creek	Headwaters to Boise River	51.4	Unknown	2006
South Fork Payette						
17050120	5186	SF Payette River	Wilderness Boundary to Payette River	59.4	Sediment	2002
Middle Fork Payette						
17050121	2703	MF Payette River	Big Bulldog Ck. to SF Payette River	13.0	Sediment	1998
Lower Payette						
17050122	5635	Big Willow Creek	Rock Creek to Payette River	23.4	Unknown	2006
17050122	2695	Bissel Creek	Headwaters to Payette River	17.0	Sediment	1999
17050122	2690	Black Canyon Res.			Nutrients, Oil/Gas, Sediment	1999
17050122	2689	Payette River	Black Canyon Dam to Snake River	39.2	Bacteria, Nutrients, Temperature	1999
17050122	2697	Soldier Creek	Headwaters to Squaw Creek	9.0	Sediment	1999
North Fork Payette						
17050123	2891	Big Creek	Horsethief Ck. to NF Payette R.	6.5	Sediment	2003
17050123	2895	Boulder Creek	Headwaters to Cascade Reservoir	20.4	DO, Flow Alteration, Nutrients, Sediment, Temperature	2003
17050123	6897	Browns Pond			Habitat	2003
17050123	5625	Brush Creek	Headwaters to NF Payette River	5.0	Unknown	2006
17050123	2884	Cascade Reservoir			DO, pH, Nutrients	2003
17050123	2890	Clear Creek	Headwaters to NF Payette River	17.8	Sediment	2003
17050123	5631	Duck Creek	Headwaters to Cascade Reservoir	2.0	Unknown	2006
17050123	5627	Elip Creek	Headwaters to Lemah Creek	3.0	Unknown	2006
17050123	2893	Gold Fork River	Flat Creek to Cascade Reservoir	5.4	Nutrients, Sediment	2003
17050123	5628	Lake Fork Creek	Headwaters to Cascade Reservoir	26.0	Unknown	2006
17050123	5626	Landing Creek	Headwaters to Deadhorse Creek	2.4	Unknown	2006
17050123	2898	Mud Creek	Headwaters to Cascade Reservoir	12.0	Bacteria, DO, NH_3,	2003

HUC	WQLSEG	Water Body	Boundaries	Length (mi)	Pollutant(s)	TMDL Schedule
17050123	6882	NF Payette River	Clear Ck. to Smiths Ferry	9.5	Nutrients, Sediment Flow alteration, Habitat, Nutrients, Sediment, Temperature	2003
17050123	2889	Round Valley Creek	Headwaters to NF Payette River	5.6	Sediment	2003
17050123	5633	Tripod Creek	Headwaters to NF Payette River	5.4	Unknown	2006
17050123	5632	Van Wyck Creek	Headwaters to Cascade Reservoir	2.5	Unknown	2006
17050123	5629	Willow Creek	Headwaters to Cascade Reservoir	8.2	Unknown	2006
Weiser						
17050124	2839	Cove Creek	Headwaters to Weiser River	14.0	Nutrients, Sediment	2003
17050124	2840	Crane Creek	Crane Creek Reservoir to Weiser River	12.6	Bacteria, Nutrients, Sediment	2003
17050124	2841	Crane Creek Res.			Nutrients, Sediment	2003
17050124	5636	Johnson Creek	Headwaters to Weiser River	13.6	Unknown	2006
17050124	2845	Little Weiser River	Indian Valley to Weiser River	17.2	Nutrients, Sediment	2003
17050124	2837	Mann Creek	Mann Ck. Res. to Weiser River	13.0	Sediment	2003
17050124	2842	North Crane Creek	Headwaters to Crane Ck. Res.	24.6	Bacteria, Flow, Nutrients, Sediment, Temperature	2003
17050124	5623	South Crane Creek	Headwaters to Crane Ck. Res.	9.2	Unknown	2006
17050124	2834	Weiser River	Galloway Dam to Snake River	12.4	Bacteria, Nutrients, Sediment, Temp, DO	2003
17050124	2835	Weiser River	WF Weiser R. to Little Weiser R.	20.8	Nutrients, Sediment	2003
17050124	6834	Weiser River	Little Weiser River to Galloway	32.0	Bacteria, Nutrients Sediment	2003
17050124	5624	WF Weiser River	Headwaters to Weiser River	15.9	Unknown	2006

development is completion of the process for the listed segments of the mainstem Weiser River (due in 2003), and completion of TMDLs for other listed segments by 2006.

Clark (1985) stated that the Weiser River annually contributed nearly 260,000 tons of suspended sediment load to the Snake River. The majority of the suspended sediment load is transported during spring runoff. Agricultural return flow accounts for less than one percent of the total suspended sediment in the lower Weiser River. However, it contributes to the chronic sediment problem in the river. Crane Creek, Mann Creek, and Monroe Creek are estimated to contribute about nine percent of the total suspended sediment input to the lower Weiser River (Clark 1985). Streambank erosion is a significant source of sediment to the river. Other pollutants generally follow the trend of suspended sediment.

Vegetation

Vegetation and Floristic Diversity

A range of different attributes may describe vegetation: species composition, structure, or seral status. Knowledge of vegetative cover provides information on the current dominant plant inhabitants and the associated species that may utilize these plant compositions and structures as habitat. Knowledge of potential plant growth, or potential natural vegetation (PNV), provides information on the basic physical environmental factors and ecological processes that function to structure species habitats. Coupled information on existing vegetative composition and potential natural composition provides insight regarding the current dynamic status of the vegetation in relation to how the vegetation might interact with, for example, disturbance processes or how the vegetation might function to provide specific species habitats.

Steele *et al.* (1981) and Johnson and Simon (1987) describe the forested vegetation of the Boise-Payette-Weiser subbasins. Mueggler and Harris (1969), Tisdale (1986), and Hironaka *et al.* (1983) provide descriptions of the composition and ecology of grassland and shrubland plant associations. Caicco (1983), Moseley (1985), Urbanczyk (1993), and Richardson (1996) conducted work on alpine vegetation within the vicinity of, and adjacent to, the subbasins (see Cooper and Lesica 1992). Crowe and Clausnitzer (1995) conducted work on wetland and riparian plant associations and community types in areas adjacent to the subbasins. Descriptive work by Tuhy (1981) and Tuhy and Jensen (1982) is relevant to the subbasins. Rust *et al*. (2000) conducted inventory and descriptive work in grassland and shrubland vegetation within these subbasins. Information on the distribution, composition, and ecology of vegetation within Idaho is available from the Idaho Conservation Data Center (2001). Many of these data are also available in NatureServe (Association for Biodiversity Information 2001).

Fourteen broad PNV plant association groups occur within the Boise-Payette-Weiser subbasins. The relative abundance of each is summarized by watershed in Table 14. The subbasins have considerable ecosystem diversity. Evergreen coniferous forest and evergreen shrubland ecosystems are most abundant. Dominant PNV varies widely among watersheds within these subbasins in relation to basic environmental factors of climate and elevation. Existing vegetative cover is grouped into 29 cover classes. The relative abundance of each class within each watershed is summarized in Table 15.

Table 14. Percent representation of 14 PNV plant association groups within the Boise-Payette-Weiser subbasins is listed by major watershed (adapted from Jensen *et al.* 1997).

Potential Natural Vegetation	Boise-Mores	Lower Boise	Middle Fork Payette	North Fork Payette	North and Middle Fork Boise	Payette	South Fork Boise	South Fork Payette	Weiser
Abies grandis Forest	14.5	0.1	34.9	60.0	27.0	7.2	6.4	23.8	15.2
Abies lasiocarpa Forest	3.0		4.8	6.8	17.5	0.6	7.3	21.5	1.1
Alnus rhombifolia Forest									0.0
Alpine Bunchgrass Meadow					0.0		0.1	0.3	
Artemisia tridentata vaseyana Shrubland	24.2	7.1	16.6	15.7	9.0	37.9	42.1	12.5	47.0
Artemisia tridentata wyomingensis Shrubland	0.4	62.0				16.4			4.4
Graminoid Wetland				0.1					
Juniperus occidentalis Woodland							0.0		
Pinus ponderosa Woodland	31.3	1.1	16.0	0.3	6.2	1.7	5.9	8.8	6.2
Populus trichocarpa Forest									0.0
Pseudotsuga menziesii Forest	25.6	1.0	27.6	11.9	40.2	20.9	37.3	32.5	23.2
Purshia tridentata Shrubland		0.1				0.2	0.1		0.1
Salix Deciduous Shrubland						0.0			0.0
Sarcobatus vermiculatus Shrubland		27.8				14.8			2.4
Water	0.9	0.8	0.1	5.2	0.0	0.5	0.7	0.7	0.4

Table 15. Percent representation of 29 land cover classes within the Boise-Payette-Weiser subbasins is listed by watershed (adapted from Landscape Dynamics Lab 1999).

Land Cover Class	Boise-Mores	Lower Boise	Middle Fork Payette	North Fork Payette	North and Middle Fork Boise	Payette	South Fork Boise	South Fork Payette	Weiser
Agriculture	0.1	37.3	0.9	9.6		14.3	1.0	0.2	6.2
Alpine Meadow				0.1	0.0		0.0	0.0	
Annual Grassland	0.1	13.9	0.0	0.0		11.0		0.0	3.9
Aspen	1.6		1.8		1.6		3.1	2.0	
Bitterbrush	4.8	2.1	1.2	0.1	5.0	11.0	6.4	3.2	13.9
Disturbed	0.3	0.1		0.1	0.0	0.0	0.1	0.0	0.0
Douglas-fir Forest	12.3	0.2	21.9	11.2	19.0	3.8	14.4	20.6	4.3
Exposed rock and mixed barren land	0.2		0.0	0.0	1.2	0.0	0.5	1.3	0.0
Grand Fir	0.4	0.0	2.2	2.7		0.7		0.1	1.3
Limber pine - whitebark pine	0.0		0.5	3.5	1.9	0.1	2.2	1.7	0.2
Lodgepole Pine	2.2	0.0	5.4	3.6	8.1	0.1	5.8	15.1	0.1
Low Sagebrush	0.3	0.7	0.2	0.0	1.6	3.5	0.9	1.3	6.5
Montane Parkland/Subalpine Meadow	0.1	0.0	0.6	2.8	1.4	0.5	0.9	0.7	1.3
Mountain Big Sagebrush	6.0	1.3	3.2	2.6	13.2	7.1	17.3	10.8	15.3
Perennial Grassland	11.0	14.0	1.2	8.6	8.5	25.0	11.0	2.8	16.7
Ponderosa Pine	16.5	0.4	19.0	12.1	0.6	7.2	0.5	3.3	10.4
Ponderosa pine - Douglas-fir forest	11.0	0.3	13.9	14.5	1.4	6.2	1.9	3.7	8.8
Rabbitbrush		2.7				0.1			
Riparian forest	0.9	0.5	0.9	0.4	0.7	0.4	0.6	0.9	0.8
Riparian grassland	0.1	0.3	0.0	2.3	0.1	0.2	0.4	0.1	0.1
Riparian shrubland	1.9	0.6	1.4	2.1	1.2	1.4	2.0	1.6	1.7
Salt-desert Shrub	0.0	1.0				0.2			
Subalpine Fir	1.0	0.0	5.4	9.5	3.4	1.1	2.1	4.2	2.7
Subalpine fir – Douglas-fir	0.9	0.0	4.6	6.8	6.1	0.7	5.0	7.5	1.0
Urban	0.1	14.3	0.1	0.6	0.1	0.5	0.0	0.0	0.1
Warm Mesic Shrubs	27.0	0.8	15.5	1.7	24.8	3.5	22.9	18.0	3.5
Water	0.9	0.8	0.1	5.2	0.0	0.5	0.7	0.7	0.4
Whitebark Pine	0.0				0.1		0.2	0.1	
Wyoming Big Sagebrush	0.2	8.7			0.0	0.7	0.0	0.0	0.8

Forest and Woodland Vegetation

Major groups of forest and woodland plant associations within the subbasin include ponderosa pine (*Pinus ponderosa*) woodland, Douglas-fir (*Pseudotsuga menziesii*) forest, grand fir (*Abies grandis*) forest, and subalpine fir (*Abies lasiocarpa*) forest (Table 15).

The ponderosa pine woodland plant association group typically occurs at lower treeline within the subbasins on ecotonal gradients between grassland or shrubland and more mesic coniferous forest. The plant association group is restricted to Pacific maritime-influenced climatic regions within the subbasins and occurs at 1,950 to 7,800 feet elevation on metamorphic intrusive and granitic rock associated with the Idaho Batholith within the northern and western watersheds. The plant association group is particularly prominent in the Boise-Mores Creek watershed and well represented in the Middle Fork Payette River, North and Middle Fork Boise River South Fork Boise River, and South Fork Payette River watersheds. Large diameter ponderosa pines are structurally dominant on these sites. Episodic understory establishment of ponderosa pine often occurs in dense, dispersed patches. Understory deciduous shrub species form a patchy mosaic with perennial bunchgrass and forb species.

Very frequent, low intensity fire is a key factor in maintaining the open canopies characteristic of these woodlands. Soil drought or infertility may be equally important in some areas. A very frequent, low intensity to infrequent, low intensity fire regime is characteristic of ponderosa pine woodland and Douglas-fir forest associations that form forest/grassland ecotonal woodlands. Fire disturbance in these low to moderately productive plant associations functions to reduce tree encroachment into grassland and thin understory tree regeneration, favoring the structural and compositional dominance of ponderosa pine or Douglas-fir, especially in the eastern portion of the subbasins, and reducing the development of pole-sized ladder fuels. On moderately productive sites, fire return intervals range from 10 to 18 years. On low productive sites the fire return interval in this group may be as long as 50 years as sufficient fuels are not present to carry fire or are broken by rock outcrop or bare soil (Agee 1993; Crane and Fischer 1986).

The Douglas-fir forest plant association group occurs in warm, dry to cool, very dry environments of both Pacific maritime-influenced and Continental climatic regions of the subbasins at 1,300 to 10,600 feet elevation. The group is abundant in all but the Lower Boise River watershed. Parent materials are highly varied. The group has the greatest affinity for intrusive granitic rock of the Idaho Batholith. These associations occur on low to moderately productive sites. Relatively frequent, low intensity fire, on these moderately productive sites, maintains open stands of large diameter ponderosa pine or Douglas-fir with patchy Douglas-fir understory regeneration and a patchy mosaic of understory shrub, grass, and herb cover. This fire disturbance regime functions to thin understory tree regeneration, favoring the structural and compositional dominance of ponderosa pine in the overstory and reducing the development of pole-sized ladder fuels (Fischer and Bradley 1987; Crane and Fischer 1986). As ground and ladder fuels accumulate during fire-free periods, these stands become increasingly susceptible to stand-replacing fire.

The grand fir forest plant association group occurs in cool to warm, relatively moist environments at 2,800 to 8,900 feet elevation on basalt (mafic volcanic flow), calc-alkaline intrusive rock of the Idaho Batholith, and meta-volcanic parent materials. The plant association group occurs within Pacific maritime climatic regions of the subbasins. It is well represented to abundant in all but the Boise-Mores Creek watershed. The plant association group is dominant in the North Fork Payette River watershed.

Grand fir plant associations within the subbasin represent a broad range of native fire disturbance regimes (Crane and Fischer 1986). The predominant pre-European settlement disturbance regime was frequent, low-intensity fire. Frequent ground fires maintained relatively open stands of large diameter fire-resistant tree species. These highly productive sites support fire-maintained, mid-seral old growth dominated by large diameter ponderosa pine.

Ponderosa pine is a long-lived seral species on grand fir and Douglas-fir forest sites within the subbasins. Historically, frequent, low intensity fire disturbance gave rise to the development of mid-seral old growth forest dominated by Ponderosa pine. Mid-seral Ponderosa pine-dominated old growth provides key cavity nesting and thermal cover habitats. The following species prefer Ponderosa pine-dominated old growth as breeding and feeding habitat: northern goshawk, white-headed woodpecker, pileated woodpecker, Williamson's sapsucker, white-breasted nuthatch, pygmy nuthatch, Townsend's warbler, silver-haired bat, California myotis, fisher, and flammulated owl (Hayward and Verner 1994; Warren 1989; Wisdom *et al.* 2000). Local studies regarding the flammulated owl that are relevant to these subbasins are documented by Hayward (1986), Hayward and Garton (1988), Powers *et al.* (1996), Groves *et al.* (1997), Atkinson and Atkinson (1990), Moore and Frederick (1991), Shepherd and Servheen (1992), and Shepherd (1996). Rust (1998) provides an indexed, annotated bibliography of literature related to Ponderosa pine-dominated old growth and species habitats relations.

Ponderosa pine is the currently dominant forest canopy species on most grand fir and Douglas-fir forest sites. However, several decades of fire exclusion in these old growth Ponderosa pine stands have resulted in significant alteration in the characteristics and placement of fuels (Barrett 1988; Sloan 1994). Fire suppression has resulted in the accumulation of surface and ladder fuels. These changes threaten the viability of Ponderosa pine-dominated old growth forest habitats as pre-settlement low- and moderate-severity fire regimes transition to present-day moderate- and high-severity fire regimes (Hann *et al.* 1997).

The consequences of fire exclusion in old growth Ponderosa pine-dominated stands are generally proportional to site productivity. On sites where Ponderosa-pine is seral, significant increases in the density of understory shade-tolerant tree regeneration have occurred giving rise to multi-layered stand structures that were relatively uncommon in pre-settlement times (Arno *et al.* 1995; Arno *et al.* 1997; Hamilton 1993; Johnson 1994; Sloan 1994; Steele *et al.* 1986). Exasperated by removal of Ponderosa pine through selective harvesting or increased understory regeneration resulting from livestock grazing, these conditions have occurred more rapidly and to a greater extent on more productive sites compared to less productive sites (Rust 1998). With the lengthening of fire return intervals, large, old Ponderosa pine are increasingly susceptible to mortality due to intensified competition for water and nutrients resulting from increased understory stem density of more competitive, shade-tolerant tree species (Everett *et al.* 1994; Morgan 1994; Agee 1996; O'Hara 1996).

Hann *et al.* (1997) characterize a general trend within these lower elevation forest ecosystems of the subbasins from predominantly frequent, non-lethal fire disturbance to less frequent, lethal fire disturbance (Table 16). This trend influences the viability of important components of terrestrial biological diversity: Ponderosa pine-dominated old growth and the plant and animal habitats these forests and woodlands represent. As forest stands have become increasingly susceptible to mortality from fire and competitive interactions, watershed stability has declined and aquatic habitats have become increasingly susceptible to alteration and loss.

Subalpine fir forest plant associations occur in relatively cool to cold, dry, high elevation valley and ridgetop environments within the subbasins. The plant association group is most

Table 16. Matrix of differences between current versus modeled historic fire disturbance regimes in the Boise-Payette-Weiser subbasins (adopted from Hann *et al.* 1997). Values appearing as "0.0" are less than 0.1 percent.

Historic fire disturbance regime	Current Fire Disturbance Regime										
	Lethal, extremely infrequent	Lethal, very frequent	Lethal, frequent	Lethal, infrequent	Lethal, very infrequent	Mixed, frequent	Mixed, infrequent	Nonlethal, very frequent	Nonlethal, frequent	Nonlethal, infrequent	Fire rarely occurs
Lethal, extremely infrequent		2.2		90.6		0.5	4.8				1.9
Lethal, frequent	0.0	12.3	6.9	42.9	3.2	2.8	13.4	1.5	1.7	14.6	0.7
Lethal, infrequent		22.0	11.8	47.1	0.4	3.9	5.1	3.6	0.2	4.5	1.3
Mixed, frequent		0.5	1.0	41.2	1.3	36.4	7.6	0.3	4.7	5.6	1.4
Mixed, infrequent		0.2	0.1	20.9	29.5	2.9	40.9	0.0	1.2	4.2	0.1
Nonlethal, frequent			1.7	37.7	10.5	16.7	20.1	2.7	1.0	9.3	0.3
Nonlethal, infrequent			0.4	27.5	6.3	6.0	34.2	0.2	0.5	24.6	0.3
Nonlethal, very frequent		0.7	3.0	28.5	0.7	8.3	26.0	2.2	4.3	26.1	0.1
Fire rarely occurs			0.7	19.2		4.0	6.6		0.7	1.3	67.5

abundant in the North and Middle Fork Boise River and South Fork Payette River watersheds and important in the North Fork Payette River and South Fork Boise River watersheds. Key concerns for biological diversity within these ecosystems are the placement and availability of different stand seral and structural conditions.

Subalpine fir forest plant associations provide key habitats for lynx. Critical habitat areas for lynx have been identified within the subbasins. The distribution of lynx habitat components (e.g., denning versus forage habitats) has not been determined. The stand dynamics and fire disturbance processes contributing to the distribution of lynx habitats have not been studied within these subbasins.

Shubland and Grassland Vegetation

Major shrubland plant association groups within the Boise-Payette-Weiser subbasins include greasewood (*Sarcobatus vermiculatus*) shrubland, Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) shrubland, mountain big sagebrush (*Artemisia tridentata vaseyana*) shrubland (Table 15). Bitterbrush (*Purshia tridentata*) shrubland plant association group is important and distinctive within the subbasins but occur over relatively little area. Alpine bunchgrass meadows are also present. Wetland and riparian shrubland and grassland vegetation is more abundant in the subbasin than depicted by Table 14 and Table 15 for the following reasons: riparian and wetland vegetation is poorly depicted by the modeled potential natural vegetation map product. Conversely, major wetland and riparian complexes are classified as agriculture by the covertype map product.

The greasewood shrubland plant association group occurs primarily in the Lower Boise River and mainstem Payette River watersheds in hot, moist to dry, valley bottom habitats. Shadscale (*Atriplex confertifolia*) plant associations are often also present in these habitats and on adjacent, drier habitats. Greasewood and shadscale shrublands may collectively be referred to as salt desert shrubland. Native salt desert shrublands within the subbasin have declined significantly in extent and quality. Approximately 95 percent of salt desert shrublands within the subbasin have been lost due to agriculture, urban development, or conversion to annual and perennial grassland. Wyoming big sagebrush habitats are predominant in the Lower Boise, Payette, and Weiser River watersheds (Table 15). The plant association group occurs on cool to warm, dry to very dry habitats on plateaus and canyon and lower foothill slopes of the Snake River Plain. The plant association group includes basin big sagebrush (*Artemisia tridentata tridentata*) communities on warm moist valley bottom habitats. Approximately 60 percent of the native extent of the plant association group has been lost due to conversion to agriculture, urban development, or annual grassland. An additional 19 percent of the extent within the subbasins is currently perennial grassland, primarily planted to crested wheatgrass (*Agropyron cristata*). Due to the ecological importance of native bunchgrasses, many of these stands must also be considered functionally lost. Wyoming big sagebrush plant associations provide key habitats for a number of wildlife species, notably the sage grouse. A number of rare and endemic plant species are associated with Wyoming big sagebrush plant communities.

Mountain big sagebrush plant associations are abundant to well represented in relatively cool, moist habitats of high valleys and mountain slopes of all the watersheds of the subbasins. Approximately 9 percent of the native extent of the plant association group has been converted to agriculture. An additional 23 percent of the plant association group is currently perennial grassland.

Native perennial bunchgrass species provide high quality and highly preferred forage for wildlife and domestic livestock in sagebrush steppe vegetation. Bluebunch wheatgrass (*Agropyron spicatum*) and Idaho fescue (*Festuca idahoensis*) are both seasonally sensitive to foliar loss by grazing or fire. Declines in the abundance of perennial bunchgrass species due to fire, domestic livestock grazing, and their combined cumulative effects have contributed to increase abundance and distribution of exotic annual grass species, particularly cheat grass (*Bromus tectorum*) and medusa wildrye (*Elymus caput-medusea*).
The early spring growth phenology of these exotic annual grass species confers a competitive advantage over native perennial bunchgrass (particularly bluebunch wheatgrass) species in seedling establishment. In spring the annual species are able to competitively capture soil surface moisture before initiation of significant root growth has occurred in bluebunch wheatgrass (Harris 1967). Increased subsequent reduction in abundance of bluebunch wheatgrass (Peters and Bunting 1994; Whisenant 1990). This spiraling decline related to the invasion of annual grass species has contributed to widespread loss of the quality and distribution of bluebunch wheatgrass plant associations.

Native perennial bunchgrass species provide important wildlife habitat and commercial resource values. The long lived, deep rooted perennial bunchgrass species native to the subbasin serve a keystone role in the maintenance of vegetative and watershed stability and resilience to disturbance events and environmental change. Lose of the abundance and vigor of bunchgrass triggers the decay of watershed integrity, and the capability of these sites to produce wildlife habitat and commercial resource values (Rust *et al.* 2000). In order to maintain and enhance quality terrestrial and aquatic habitats and commercial resource values in canyon grassland and sagebrush steppe vegetation within the subbasins, management should result in significant and prolonged gains in the distribution and abundance of native bunchgrasses.

Rare and Endemic Plants Species

Twenty-seven rare plant species occur in all of the nine Boise-Payette-Weiser subbasin watersheds in a combined total of 157 populations (Table 17). Eight of the twenty-seven species have ranks from G1 to G3 designating them rare and imperiled globally: Mulford's milkvetch (*Astragalus mulfordiae*), Indian Valley sedge (*Carex aboriuinum*), Cusick's false yarrow (*Chaenactis cusickii*), silverskin lichen (*Dermatocarpon lorencianum*), Idaho douglasia (*Douglasia idahoensis*), slick spot peppergrass (*Lepidium papilliferum*), pored lungwort (*Lobaria scobiculata*), and Douglas clover (*Trifolium douglasii*). Indian Valley sedge is considered both critically imperiled and especially vulnerable to extinction globally and statewide (rank G1S1). Indian Valley Sedge is known from two locations within the mainstem Weiser River watershed. Six rare plant species within the subbasins are considered critically imperiled. All occurrences of these species are located in the North Fork Payette River and mainstem Weiser River watersheds. One hundred and fourteen populations of imperiled plant species occur with relatively even distribution throughout the subbasin. Populations of Mulford's milkvetch and slick spot peppergrass occur with high frequency in the Lower Boise River watershed.

Noxious Weeds

Thirty-two noxious weed species are known to occur within the Boise-Payette-Weiser subbasins (Table 18). Current location data on species occurrences within the subbasin are limited, and

Table 17. Rare and endemic plant species (with global rank G1 through G3 or state rank S1 through S2) known to occur within the Boise-Payette-Weiser subbasins are listed by species with the number of population occurrences summarized by watershed.

Species	Common name	G Rank	S Rank	North and Middle Fork Boise	Boise-Mores	South Fork Boise	Lower Boise	South Fork Payette	Middle Fork Payette	Payette	North Fork Payette	Weiser	Total
Aster junciformis	rush aster	G5	S2								1		1
Astragalus cusickii var. *packardiae*	Packard's milkvetch	G5T1	S2							6			6
Astragalus mulfordiae	Mulford's milkvetch	G2	S2				22					2	24
Buxbaumia viridis	buxbaumia moss	G4	S2								1		1
Camassia cusickii	Cusick's camas	G4	S2							1		1	2
Carex aboriginum	Indian Valley sedge	G1	S1									2	2
Carex livida	pale sedge	G5	S2					1					1
Carex straminiformis	Mt. Shasta sedge	G4	S2					1					1
Catapyrenium congestum	earth lichen	G4	S2				1						1
Ceanothus protratus	mahala-mat ceanothus	G5	S1									2	2
Chaenactis cusickii	Cusick's false yarrow	G2G3	S2				1						1
Cyperus rivularis	shining flatsedge	G5	S2				4			3			7
Dermatocarpon lorencianum	silverskin lichen	G2	S1									1	1
Douglasia idahoensis	Idaho douglasia	G2	S2	7				7	3		2		19

Species	Common name	G Rank	S Rank	North and Middle Fork Boise	Boise-Mores	South Fork Boise	Lower Boise	South Fork Payette	Middle Fork Payette	Payette	North Fork Payette	Weiser	Total
Eriogonum ochrocephalum var. *calcareum*	calcareous buckwheat	G4T3	S2							6			6
Eriophorum viridicarinatum	green keeled cotton grass	G5	S2								1		1
Lepidium papiliferum	slick spot peppergrass	G2	S2				29			4			33
Lewisia kelloggii	Idaho bitterroot	G4	S2	1	1	6		3	1		2	1	15
Lobaria scrobiculata	Pored lungwort	G3G4	S1								1		1
Peraphyllum ramosissimum	squaw apple	G4	S2									8	8
Sanicula graveolens	sierra sanicle	G4	S1								2		2
Saxifraga bryophora var. *tobiasiae*	Tobias' saxifrage	G5T1	S1								5		5
Stylocline filaginea	stylocline	G4	S2			1	1						2
Teucrium canadense var. *occidentale*	American wood sage	G5T5	S2				1					1	2
Texosporium sancti-jacobi	wovenspore lichen	G2	S2				11						11
Trifolium douglasii	Douglas' clover	G3G4	S2									1	1
Trifolium plumosum var. *amplifolium*	plumed clover	G4T2	S2									1	1
													157.0

Table 18. Noxious weed species distributions within the Boise-Payette-Weiser subbasins are summarized by county. Data are taken from Morishita *et al.* (2001) with supplemental information from field contacts.

Species	Common name	Ada	Adams	Boise	Camas	Canyon	Elmore	Gem	Payette	Valley	Washington
Sorghum halepense	Johnsongrass					X					
Cytisus scoparius	Scotch broom					X					
Solanum elaeagnifolium	silverleaf nightshade					X					
Milium vernale	spring millet grass									X	
Senecio jacobaea	tansy ragwort									X	
Crupina vulgaris	common crupina		X							X	
Isatis tinctoria	dyer's woad		X								X
Sonchus arvensis	perennial sowthistle								X	X	
Hyoscyamus niger	black henbane				X	X	X				
Hieracium aurantiacum	orange hawkweed		X				X			X	
Solanum rostratum	buffalobur					X	X	X			X
Carduus nutans	musk thistle		X		X		X	X			
Euphorbia esula	leafy spurge		X	X	X		X			X	X
Lepidium latifolium	perennial pepperweed	X		X		X		X	X		X
Centaurea solstitialis	yellow starthistle	X	X	X		X	X	X			X
Aegilops cylindrica	jointed goatgrass	X	X	X		X	X	X		X	X
Centaurea repens	Russian knapweed	X			X	X	X	X	X	X	X
Linaria vulgaris	yellow toadflax		X	X	X	X		X	X	X	X
Centaurea diffusa	diffuse knapweed	X	X	X	X		X	X	X	X	X
Conium maculatum	poison hemlock	X	X	X		X	X	X	X	X	X
Tribulus terrestris	puncturevine	X	X	X	X	X	X	X	X		X
Lythrum salicaria	purple loosestrife	X	X	X	X	X	X	X	X		X
Centaurea maculosa	spotted knapweed	X	X	X	X		X	X	X	X	X
Cirsium arvense	Canada thistle	X	X	X	X	X	X	X	X	X	X
Linaria dalmatica	dalmatian toadflax	X	X	X	X	X	X	X	X	X	X
Convolvulus arvensis	field bindweed	X	X	X	X	X	X	X	X	X	X
Cardaria draba	hoary cress	X	X	X	X	X	X	X	X	X	X
Chondrilla juncea	rush skeletonweed	X	X	X	X	X	X	X	X	X	X
Onopordum acanthium	Scotch thistle	X	X	X	X	X	X	X	X	X	X

only allow identification to county. A number of species are relatively widespread within the subbasins, including: jointed goatgrass, Russian knapweed, yellow toadflax, diffuse knapweed, poison hemlock, puncturevine, purple loosestrife, spotted knapweed, Canada thistle, dalmatian toadflax, field bindweed, hoary cress, rush skeletonweed, and Scotch thistle. Noxious weed species of emerging concern include: Johnsongrass, Scotch broom, silverleaf nightshade, spring

millet grass, tansy ragwort, common crupina, dyer's woad, perennial sowthistle, black henbane, and orange hawkweed.

Fish and Wildlife Resources

Fish and Wildlife Status

Fisheries

Boise River Subbasin

Bull Trout

The Boise River subbasin is dynamic in nature. Natural and human-induced factors can limit and influence the well being of bull trout populations by affecting the short- and long-term habitat conditions of streams inhabited by fish. Floods, debris torrents, landslides, and wildfires are examples of disturbance factors that profoundly influence habitat conditions for bull trout in the basin. While bull trout are thought to be particularly sensitive to environmental change, their dispersal capabilities afford them the opportunity to potentially recolonize these disturbed streams once conditions stabilize. However, bull trout populations require high quality habitat. Bull trout have been reported in much of the Boise River subbasin and exhibit both the migratory and resident life history forms. Bull trout have had the capability to colonize all tributaries of the subbasin that do not contain impassable barriers.

In almost all situations, bull trout were sympatric with anadromous fish species and were the predominant species group. In the absence of anadromous fish, bull trout have adapted to a fluvial/adfluvial existence. Migratory forms have been documented in two complexes within the subbasin. The first complex consists of Arrowrock Reservoir and the North Fork Boise River, Middle Fork Boise River, and lower South Fork Boise River below Anderson Ranch Dam. The second complex consists of Anderson Ranch Reservoir and the upper South Fork Boise River watershed. It is notable that migratory forms were historically fluvial in nature but apparently have adapted to an adfluvial lifestyle following construction of both Arrowrock (1915) and Anderson Ranch (1950) dams.

Upstream migration of adult bull trout out of Arrowrock Reservoir begins in early April through early July. These fish enter spawning streams in the Middle and North Forks of the Boise River in late July or August. Spawning commences in September and October when water temperatures decrease below 50°F. Following spawning, adults reenter the mainstems and migrate downstream to winter in Arrowrock Reservoir. Arrowrock Reservoir in most years provides a suitable and very productive wintering environment for subbadult and adult bull trout.

Other Fish Populations

In the Boise River subbasin, headwater drainages tend to be populated by fish communities of low richness. These rather “simple” headwater fish communities generally consist of bull trout, rainbow/redband trout, and sculpin species. Downstream fish communities are more diverse and include native species such as mountain whitefish, northern pikeminnow, redside shiner, several sucker species, and daces. A total of 26 fish species have been documented in the Boise River subbasin, of which 12 are native (Table 19).

Table 19. Fish species documented to be present in the Boise-Payette-Weiser subbasins, Idaho.

Common Name	Scientific Name	Boise	Payette	Weiser
Bull trout (n)	*Salvelinus confluentus*	X	X	X
Redband trout (n)	*Oncorhynchus mykiss gairdneri*	X	X	X
Mountain whitefish (n)	*Prosopium williamsoni*	X	X	X
Brook trout (i)	*Salvelinus fontinalis*	X	X	X
Brown trout (i)	*Salmo trutta*	X		
Cutthroat trout (i)	*Oncorhychus clarkii*	X	X	
Chinook salmon (n.e.)	*Oncorhynchus tshawytscha*	X	X	
Kokanee salmon (i)	*Oncorhynchus nerka*	X	X	
Steelhead trout (n.e.)	*Oncorhynchus mykiss*	X	X	
Arctic grayling (i)	*Thymallus arcticus*	X		
Largescale sucker (n)	*Catostomus macrocheilus*	X	X	X
Bridgelip sucker (n)	*Catostomus columbianus*	X	X	X
Mountain sucker (n)	*Catostomus platyrhynchus*	X		
Mottled sculpin (n)	*Cottus bairdi*	X	X	X
Shorthead sculpin (n)	*Cottus confusus*	X		
Smallmouth bass (i)	*Micropterus dolomieui*	X	X	X
Largemouth bass (i)	*Micropterus salmoides*	X	X	X
Bluegill (i)	*Lepomis macrochirus*	X	X	X
Warmouth (i)	*Lepomis gulosus*		X	
Pumpkinseed (i)	*Lepomis gibbosus*		X	
Crappie species (i)	*Pomoxis nigromaculatus*		X	
Channel catfish (i)	*Ictaluras punctatus*	X	X	X
Brown bullhead (i)	*Ictaluras nebulosus*		X	
Common carp (i)	*Cyprinus carpio*	X	X	X
Northern pikeminnow (n)	*Ptychocheilus oregonensis*	X	X	X
Chiselmouth (n)	*Acrocheilus alutaceus*		X	X
Redside shiner (i)	*Richardsonius balteatus*	X	X	X
Longnose dace (n)	*Rhinichthys cataractae*	X	X	X
Speckled dace (n)	*Rhinichthys osculus*	X	X	X
Grass carp (i)	*Ctenopharyngodon idella*	X		
Oriental weatherfish (i)		X		

n=native species; i=introduced species; n.e.= native extinct

The distribution of bull trout and redband trout in the Boise River subbasin can be found in Figure 1and Figure 2, respectively. Kokanee migrate upstream from Anderson Ranch Reservoir to spawn in the river from late August into early October.

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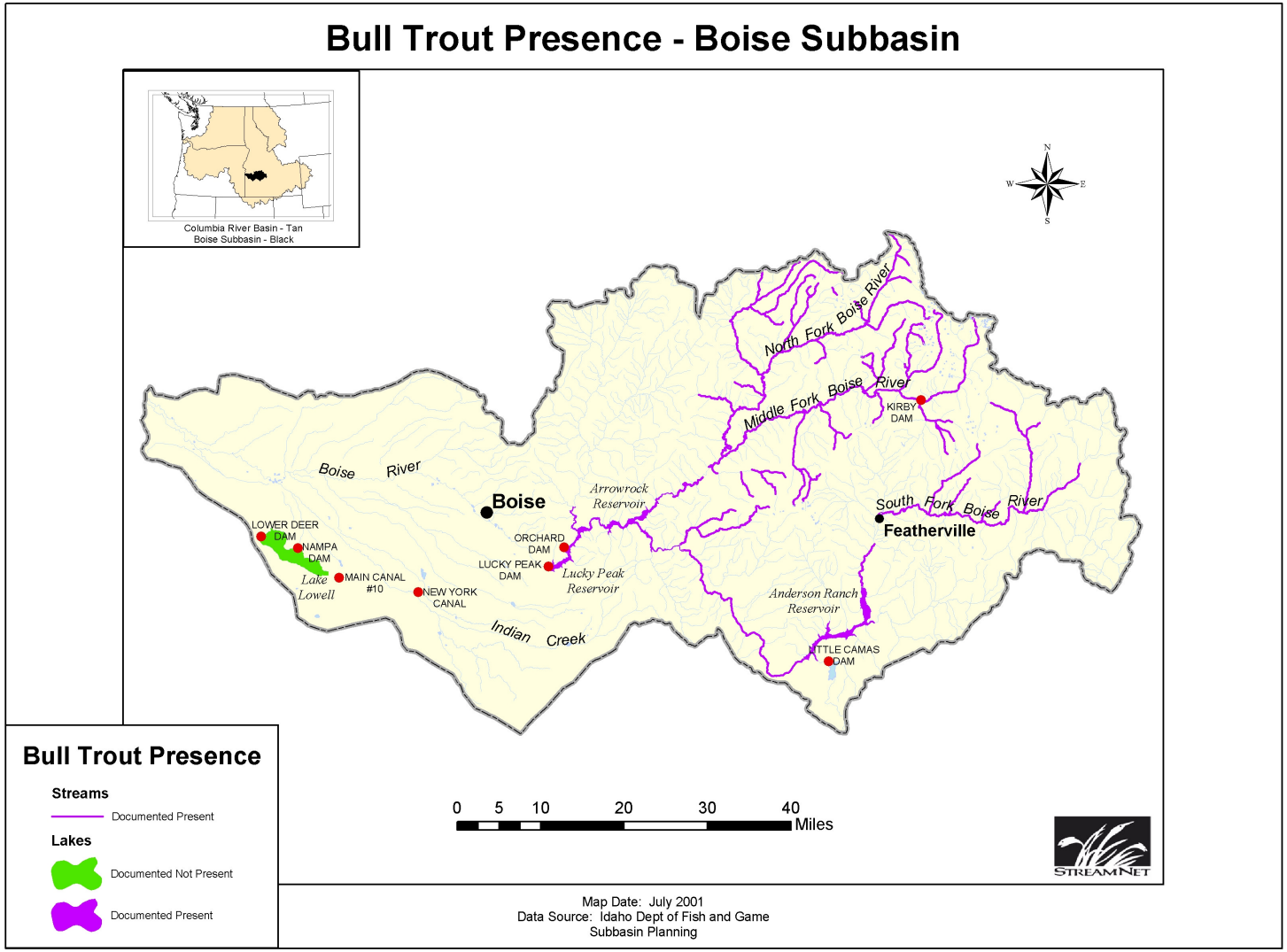

Figure 1. Bull trout distribution in the Boise River subbasin, Idaho.

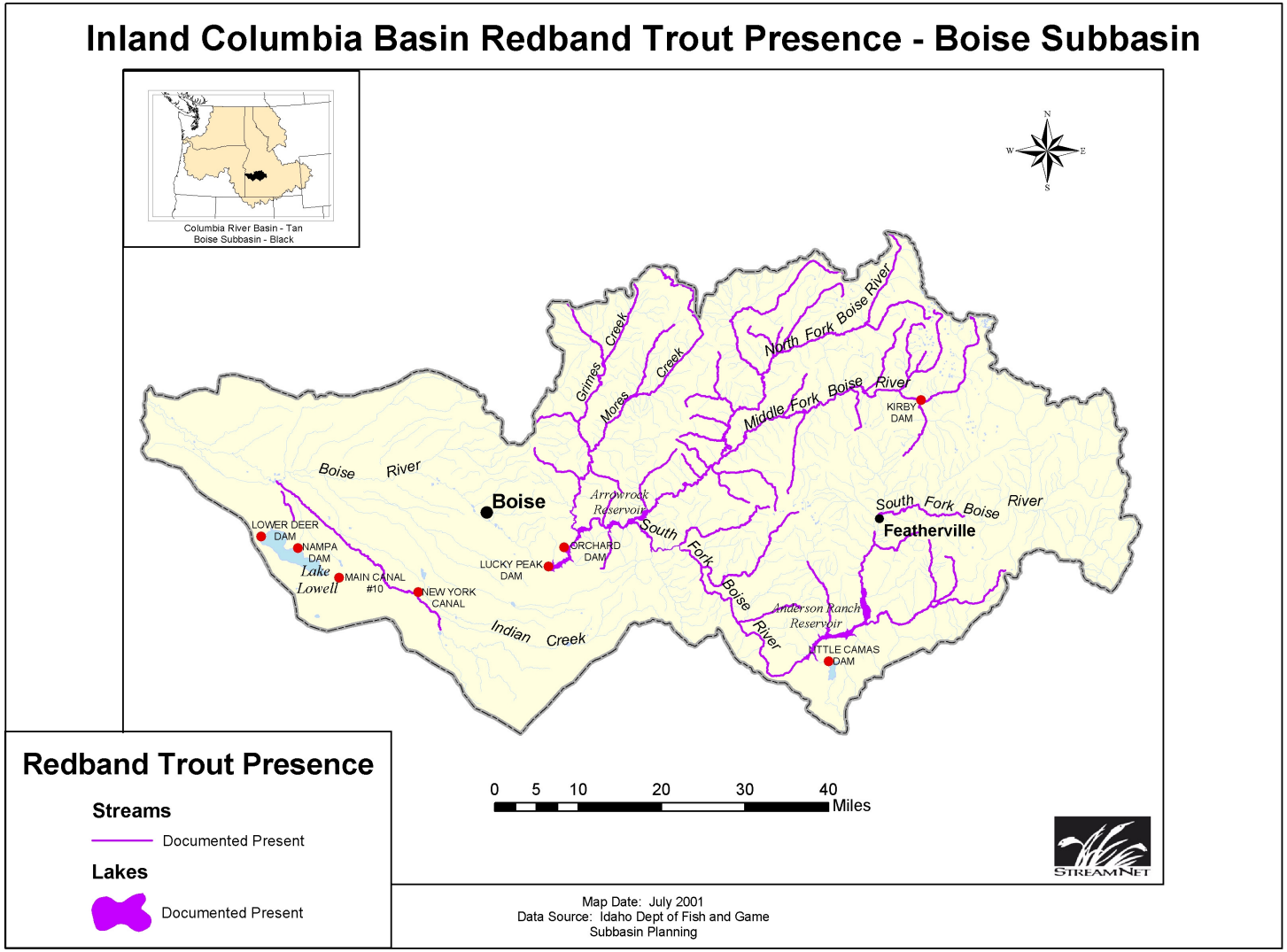

Figure 2. Redband trout distribution in the Boise River subbasin, Idaho.

In 1998, Partridge and Warren (in press) surveyed fish populations in a one-mile reach of the South Fork Boise River from Deadwood Creek upstream using two passes of electrofishing for adjusted Petersen mark-recapture population estimates (Ricker 1975). Previous estimates had been conducted in August 1991 (Partridge and Warren 1994) and 1994 (Warren and Partridge 1996). A habitat survey was included in the 1991 fisheries survey. Fish were surveyed again within the same reach in August 1998. Game fish sampled included bull trout, kokaneemountain whitefish and wild and hatchery rainbow trout. Population and density estimates for wild rainbow trout and mountain whitefish are presented in Table 20.

Table 20. Fish population and density estimates for wild rainbow trout and mountain whitefish in a one-mile reach of the South Fork Boise River upstream of Deadwood Creek. Data collected by the IDFG in 1991, 1994, and 1998.

Year of Survey	Population Estimate +/- 95% Confidence Interval	Density Estimate # fish/100 m^2 Surface Area
1991		
Rainbow Trout ≥ 100 mm	534 +/- 252	1.6
Mtn. Whitefish ≥ 100 mm	735 +/- 231	2.2
1994		
Rainbow Trout ≥ 100 mm	576 +/- 146	1.7
Mtn. Whitefish ≥ 100 mm	377 +/- 107	1.1
1998		
Rainbow Trout ≥ 100 mm	858 +/- 352	2.6
Mtn. Whitefish ≥ 100 mm	683 +/- 272	2.0

Due to the migratory nature of bull trout and the fact this species is not numerous, population estimates for this species could not be done.

Nongame fish sampled by IDFG staff while electrofishing included bridgelip sucker, largescale sucker, mountain sucker, longnose dace, mottled sculpin, and northern pikeminnow. Meyer (2000) documented only mottled sculpin at 48 percent of the sites sampled. In 1998, a number of tributaries to the South Fork Boise River were surveyed by electrofishing with a backpack shocker to determine the presence of bull trout and brook trout and to look for any potential barriers to upstream migrating fish. Numbers of fish collected by species in tributaries are presented in Table 21. In 1999, Meyer (2000) captured redband trout in 51 (76 percent) of the 67 sites sampled in the South Fork Boise River.

Historically the migratory bull trout population in the South Fork Boise River was a fluvial population with access down through the Boise River to the Snake River. Since the construction of Anderson Ranch Dam in the early 1940s, the population has been considered adfluvial. However, this bull trout population appears to retain fluvial characteristics with all juvenile and non-spawning adults returning to headwater streams each summer (F. Partridge, IDFG, personal communication).

The IDFG implanted radio tags in 57 bull trout during 1998 and 1999 (Partridge *et al.* 2000). Radio tagged fish were tracked by fixed-wing aircraft equipped with a radio receiver and wing mounted antennas. Thirty-seven of these fish were monitored moving out of the reservoir into the South Fork Boise River and tributaries. Most of the radios remaining in the reservoir were later recovered along the shoreline during low water periods. Although some of the recovered

radios had some indications of being angler induced mortalities, it is possible that bull trout shed the radios instead of the fish actually dying (Elle 1994). Monitoring of radio tagged bull trout found that fish begin moving upriver from the reservoir during May, with all fish being in the upper river or tributaries by the end of June.

Table 21. Fish species sampled using electrofishing gear in tributaries of the upper South Fork Boise River in 1998. Data collected by the IDFG (Partridge and Warren, in press).

Stream Name	Rainbow Trout	Bull Trout	Mtn. Whitefish	Mottled Sculpin	Other Fish
Barlow	28	0	0	0	0
Bear	6	9	0	30	0
Carrie lower	6	0	0	11	0
Carrie upper	11	0	0	0	0
Cayuse	33	0	0	0	0
Five Points	16	0	0	8	0
Grindstone 1	17	0	0	21	0
Grindstone 2	8	0	0	20	0
Grindstone 3	8	0	0	31	0
Grouse	10	0	0	0	0
MF Grouse	59	0	0	0	0
MF Grouse	10	0	0	0	0
Lick	21	0	0	28	8[a]
Little Smokey 1	12	0	2	5	17[b]
Little Smokey 2	17	0	5	8	13[b]
Little Smokey 3	11	0	0	0	21[c]
Little Smokey 4	8	0	0	21	0
Parks 1	23	0	0	0	0
Parks 2	24	0	0	0	0
Parks 3	3	0	0	0	0

[a] brook trout
[b] hatchery rainbow trout, bridgelip sucker, longnose dace
[c] hatchery rainbow trout, bridgelip sucker, longnose dace, redside shiner, speckled dace

Fluvial sized bull trout were also found in two additional tributaries while doing stream surveys (K. Meyer, IDFG, personal communication). Fish traveled a maximum distance of 58 miles from the reservoir in both the Big Smokey and Johnson Creek drainages. Radio tagged bull trout remained in headwater streams until late August to early September, at which time they began to move downstream. Of the individual samples of fish located during both August and September, 70 percent were at their highest point in the drainage during late August with the remaining fish being at the highest point during the September flights. Most bull trout had re-entered Anderson Ranch Reservoir by the end of November.

In 1999, Meyer (2000) captured bull trout in 16 (24 percent) of the 67 sites sampled in the South Fork Boise River. The BOR conducted presence/absence surveys in tributaries of the South Fork in 2001 (R. Rieber, BOR, personal communication).

Redband trout and bull trout are found in the Middle Fork Boise River drainage above Kirby Dam. Until recently, the abundance and distribution of bull trout above Kirby Dam was limited

to a small resident headwater population in the upper Yuba River, a tributary of the Middle Fork. In July 2000, 16 sites above Kirby Dam were snorkeled and electrofished. Fourteen sites contained redband trout, while bull trout were found at four sites. Observed bull trout densities were very low; multiple bull trout were only collected in upper Grouse Creek. Densities of redband trout documented while electrofishing and snorkeling are found in Table 22 and Table 23, respectively.

Table 22. Densities and population estimates of wild rainbow trout collected while electrofishing in the Yuba River drainage in July 2000.

Location / Section Name	UTM Location	Population Estimate (95% CI) [1]	Density (fish/100 m^2)[1]
Decker Cr. / D0.0	0649471/4847642	10 (10-13)	2.3
Decker Cr. / D0.1	0650977/4847542	19 (15-34)	5.9
Decker Cr. / D0.4	0653416/4847510	11 (11-14)	5.4
Grouse Cr. / G0.0	0651160/4847490	6 (6-7)	3.1
Grouse Cr. / G0.1	0652016/4846135	7 (7-8)	8.3
Grouse Cr. / G0.2	0651286/4847061	9 (9-11)	12.3
Grouse Cr. / G0.3	0651362/4846874	5 (5-7)	2.8
James Cr. / J0.2	0646855/4851071	8 (8-10)	7.1
James Cr. / J1.2	0646380/4850623	6 (6-7)	5.9
James Cr. / J2.0	0645655/4849214	no fish captured or observed	0
Sawmill Cr. / SM0.0	0651348/4846890	no fish captured or observed	0
Trail Cr. / T0.2	0649463/4846490	2 (2-15)	3
Trail Cr. / T0.5	0649661/4846270	5 (5-7)	4.1
Yuba River / Y0.2	0649379/4847272	12 (12-13)	4.2
Yuba River / Y4.2	0648965/4846215	8 (8-10)	2.6
Yuba River / Y4.7	0648598/4845545	14 (13-19)	3.9

[1] fish greater than or equal to 100 mm in total length

Table 23. Densities of redband trout observed while snorkeling in the Yuba River drainage on July 25, 2000. Data are from the IDFG.

	Redband trout density (fish/100 m^2) by size class				
Section	**0-101 mm**	**102-203 mm**	**204-304 mm**	**>304 mm**	**All Sizes**
YU-0	0.2	0.0	0.0	0.0	0.2
YU-1	0.3	0.3	0.0	0.0	0.6
YUB-2	5.2	2.6	1.0	0.0	8.8

The Middle Fork Boise River from Kirby Dam downstream to Arrowrock Reservoir is approximately 37 miles long, and contains widely distributed and abundant populations of redband trout. The Middle Fork Boise River is a migration corridor for subadult and adult bull trout (Flatter 2000). Flatter (1998, 1999, 2000) investigated bull trout in the Boise River

subbasin. Abundant wild redband trout, limited but targeted hatchery rainbow trout stockings, easy river access, and the close proximity to Boise, make the Middle Fork Boise River a popular sport fishery. Redband trout and bull trout use many of the tributaries to the Middle Fork Boise River for spawning and rearing. Rohrer (1991) conducted bull trout redd counts in Sheep Creek, Roaring River, and Queens River in 1990. Bull trout redds were found in each tributary surveyed. Snorkel surveys conducted in 1990 documented redband trout densities ranging from 2.0 to 12.6/100 m^2 in Sheep Creek and the Queens River, both large tributaries of the Middle Fork. Bull trout densities ranged from 0 to 0.3/100 m^2 in Sheep Creek, Roaring River, and the Queens River (Rohrer 1991).

Arrowrock Reservoir supports a population of wild redband trout, hatchery rainbow trout, and an adfluvial population of bull trout. A total of 14 species of native and introduced fish are found in Arrowrock Reservoir (Flatter 2000).

Lucky Peak Reservoir is managed as a "two story" fishery, including both warmwater and coldwater species. Important game fish include rainbow trout, kokanee salmon, smallmouth bass, and yellow perch. The trout and kokanee fisheries are reliant on hatchery supplementation, whereas bass and perch populations are self-supporting.

Fish populations in the mainstem Boise River below Lucky Peak Dam include rainbow trout, brown trout, mountain whitefish, sculpin, redside shiner, sucker, and chub. The fish are not evenly distributed throughout the river, and some species are more successful in sustaining their populations than others. The Boise River receives intense angling pressure. Currently, natural reproduction of both wild and hatchery trout stocks is insufficient to sustain populations. As a result, the IDFG stocks between 50 and 60 thousand hatchery, catchable sized rainbow trout, and thousands of brown trout fingerlings annually.

Brown and rainbow trout are limited to the portion of the Boise River upstream of Star diversion. Trout populations are sustained by stocking programs and limited natural reproduction. Rainbow trout observed at Middleton may be incidental or may be from Indian Creek, which had a significant natural trout population prior to a major fish kill in 1986. Mountain whitefish, a coldwater salmonid species, have been found in all reaches of the river from Lucky Peak Dam to its mouth at all sampling dates.

Coldwater biota use the Boise River from Lucky Peak Dam to the confluence with the Snake River. Fish sampling shows that mountain whitefish, a coldwater species, are present along the length of the river, during both the summer (1997) and winter (1996). Past studies by IDFG confirm the presence of coldwater species from Lucky Peak Dam to the Snake River. Salmonid spawning is also an existing use in all reaches of the river from Diversion Dam to the mouth. Trout and mountain whitefish are known to spawn to a limited extent in the river between Diversion Dam and Star. Trout are absent downstream of Star and salmonid spawning is limited to mountain whitefish. Multiple age classes of mountain whitefish, including young of year fish, were found downstream of Star, demonstrating that spawning is likely occurring.

Payette River Subbasin

Bull Trout

The distribution of bull trout appears to be limited to stream segments above 5,250 feet within the Deadwood River watershed. This key watershed is genetically isolated from adjacent key watersheds by the Deadwood Dam, reducing the potential for genetic interaction. The Deadwood River key watershed was historically connected to populations elsewhere in the Payette River

subbasin. It is not known whether the upper Deadwood River system retains enough genetic diversity to ensure long-term bull trout persistence.

The upper Middle Fork Payette River contains a strong local population of bull trout (at least 2,000 individuals and 500 adults). The Bull Creek local population watershed contains a weak bull trout population (less than 1,500 individuals and 50 adults). Adult bull trout have been found in the lower reaches of the Middle Fork Payette River historically, and in recent times, suggesting that a weak migratory component exists. The local population is almost genetically isolated. However, a weak migratory connection may exist with the South Fork Payette local populations (Jimenez 1998). Big Falls, located further up the South Fork Payette River, may restrict this connection. Dams restrict links to other subpopulations (Burton 1998b). Based on this connection, this key watershed may retain enough genetic diversity to ensure long-term bull trout persistence.

With only two known strong local populations, the South Fork Payette River key watershed is considered to be functioning at risk (Burton and Erickson 1998). No population trend data are available to assess changes in population strength over time within any of the local populations. Adult bull trout have been found in the lower portions of the South Fork Payette River historically and recently, identifying that a weak migratory component exists. Surveys in the summer of 1998 found no bull trout in the Deadwood River immediately below the dam (D. Allen, IDFG, personal communication). The connectivity of the key watershed to others is restricted due to Deadwood and Black Canyon Dams, which may adversely affect genetic diversity, inhibiting the long-term bull trout persistence.

The Gold Fork River and Squaw Creek drainages support the majority of the known remaining bull trout populations in the North Fork Payette River watershed. A total of three resident bull trout were captured in 1999 in the North Fork Lake Creek (Faurot 2001). Bull trout historically occupied both drainages; however, the current population status is thought to be poor and possibly extirpated in some areas (IDFG 1993; Gilbert and Everman 1894; Jacobson and Burns 1995).

Other Fish Populations

Fish species known to inhabit the Payette River subbasin can be found in Table 19. Distributions of bull trout and redband trout in the Payette River subbasin can be found in Figure 3 and Figure 4, respectively. The upper Payette River watershed is functionally the Cascade Reservoir watershed with major tributaries including the North Fork Payette River, Mud Creek, Lake Fork Creek, Boulder Creek, Gold Fork River, and Willow Creek. The North Fork Payette River, Lake Fork Creek, Gold Fork River, and Cascade Reservoir contain the only significant fisheries in the subbasin. The Cascade Reservoir watershed encompasses about 357,000 acres in a moderately high elevation valley between West Mountain and the Salmon River Mountains (IDEQ 2000).

The North Fork Payette River

The North Fork Payette River watershed contains three lakes that support fisheries: Payette Lake, Upper Payette Lake, and Granite Lake. These lakes and local streams are normally unproductive and support low densities of native salmonids. Redband trout and brook trout are found in major perennial streams. No bull trout have been documented in the watershed above Payette Lake and

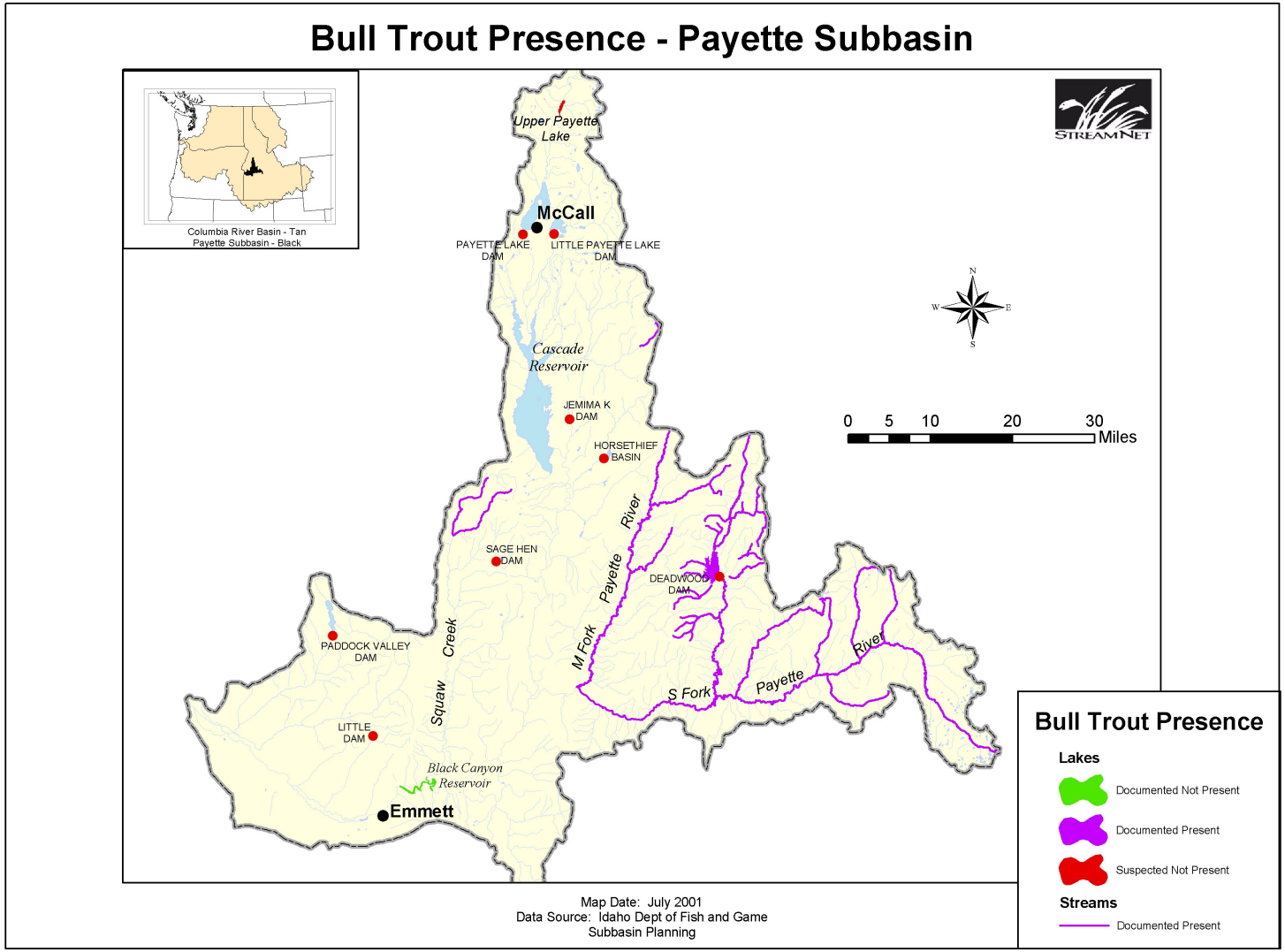

Figure 3. Bull trout distribution in the Payette River subbasin, Idaho.

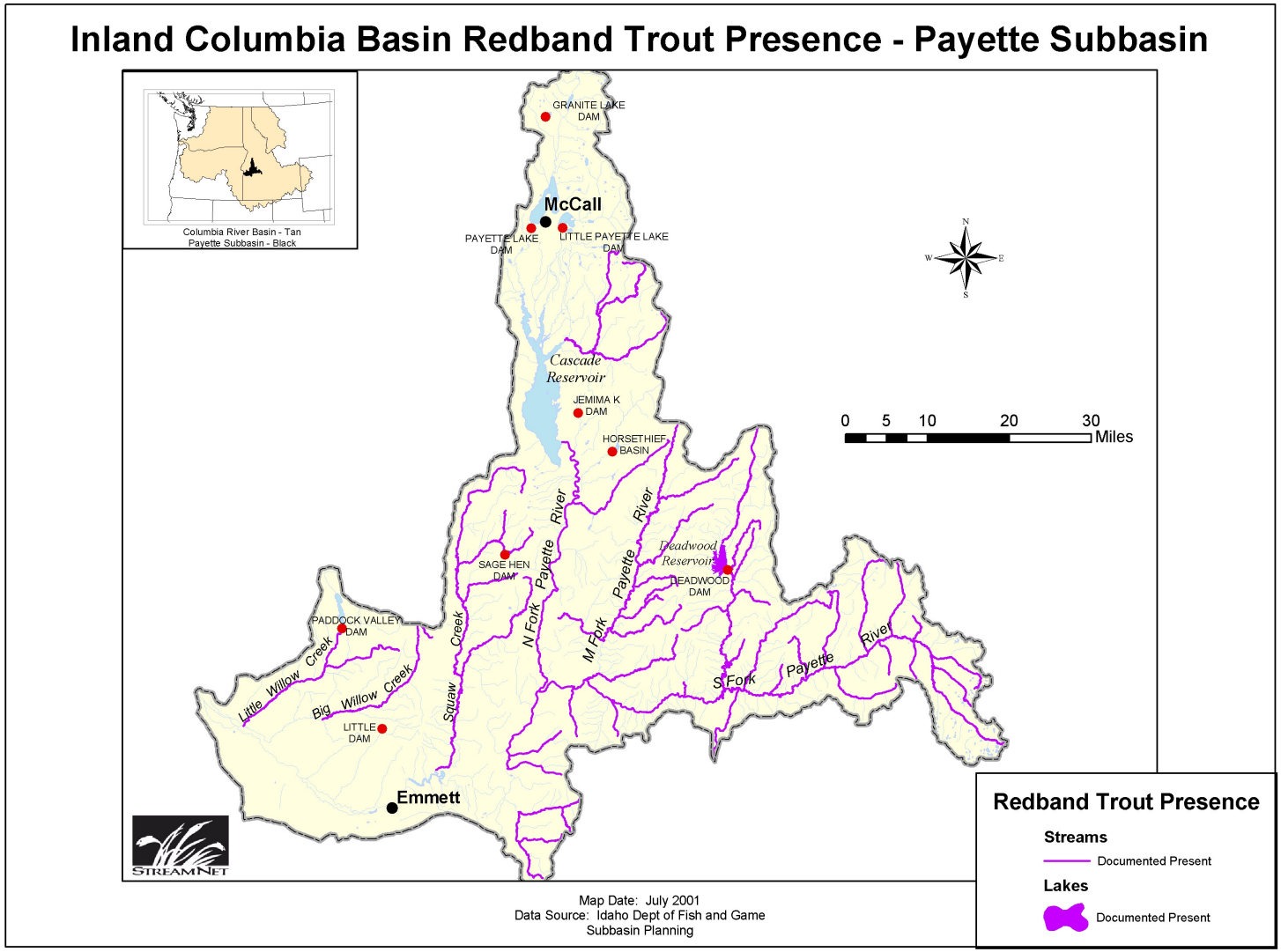

Figure 4. Redband trout distribution in the Payette River subbasin, Idaho.

there are no reliable historical accounts of bull trout above Payette Lake. However, based on criteria used by Rieman and McIntyre (1993), it is likely that Payette Lake and the upper North Fork Payette River watershed supported bull trout historically. The IDFG stocks sterile hatchery rainbow trout for sportfishing in the lakes and some limited stream reaches.

Payette Lake is oligotrophic with depths over 300 feet and supports a limited fishery. Fish biomass is primarily composed of kokanee salmon and northern pikeminnow. Lake trout were first introduced to Payette Lake in the 1950s and are the dominant predator. The IDFG manages lake trout as a trophy fishery. A small number of hatchery rainbow trout are released into the lake annually. The kokanee are likely a remnant of the sockeye salmon population, which was historically present in the system until Black Canyon Dam was constructed on the lower Payette River. Kokanee were stocked in Payette Lake during the 1800s and early 1900s but have been discontinued (Janssen *et al.* 2000). The early run kokanee utilize the North Fork Payette River above Payette Lake for spawning. Annual escapement of kokanee varies. In 1997 almost 65,000 kokanee were estimated in the spawning run (Janssen *et al.* 2000).

In 1998 and 1999, Meyer (1999 and 2000) captured redband trout in 34 (56 percent) of 61 sites sampled in the North Fork Payette River. In 1998 and 1999, Meyer (1999 and 2000) captured bull trout in 2 (3 percent) of the 61 sites sampled in the North Fork Payette River. In the North Fork Payette River, sculpin were the only non-game fish captured by Meyer (2000). The North Fork Payette River in the reach from Cascade Lake to Payette Lake supports a low density of redband trout, hatchery rainbow trout, and non-game species (Janssen *et al.* 2000).

Below Cascade Lake Dam, the North Fork Payette River fishery in the river from the dam to the confluence with the South Fork Payette River at Banks is primarily wild redband trout and some hatchery rainbow trout entrained through Cascade Dam.

Lake Fork Creek

Lake Fork Creek drainage generally drains southwest from the McCall area into Cascade Reservoir. The headwaters are generally steep and forested and fish densities are low. Brook trout and redband trout are the dominant salmonids in the drainage.

A total of three bull trout were identified in the North Fork Lake Fork Creek in 1999 (Faurot 2001). The bull trout population is isolated and likely a remnant population. Table 24 summarizes salmonid densities documented by snorkeling in tributaries of the North Fork Payette River (Faurot 2001; IDFG file data).

Little Payette Lake is managed as a trophy fishery for hatchery rainbow trout, smallmouth bass, and tiger muskie. The reservoir was renovated in 1987 to remove non-game species. The renovation was only successful for a short time; non-game species now dominate. One basis for the introductions of smallmouth bass and tiger muskie into Little Payette Lake was an attempt to biologically control non-game fish biomass (Janssen *et al.* 2000b). A rainbow trout fishery in Lake Fork Creek is largely dependent on migratory fish in the spring from Cascade Reservoir and Little Payette Lake (IDFG file data).

Surveys done during 1998 by the Payette National Forest in Kennally Creek (a large tributary of the Gold Fork River) did not document any bull trout. The North Fork of Kennally Creek and Rapid Creek are largely undisturbed roadless areas. The Payette National Forest (1998) found high densities of brook trout within the watershed making it unlikely that bull trout could be reestablished within this watershed without significant management intervention. No bull trout have been found in the lower reaches of the Gold Fork River in recent times. In the upper

reaches of the Gold Fork, only one or two large bull trout (>12 inches) have been observed suggesting that a migratory component may be weak or non-existent.

Table 24. Summary of snorkel surveys in select tributaries of the North Fork Payette River drainage (Faurot 2001).

Stream	Year of Survey	Rainbow Trout (# fish/100m^2)	Bull Trout (# fish/100m^2)	Westslope Cutthroat Trout (# fish/100m^2)	Brook Trout (# fish/100m^2)
Box Creek	1997 (5)	Not Sighted	Not Sighted	Not Sighted	Present
Fall Creek	1997 (19)	Present	Possible	Present	Not Sighted
Fisher Creek	1995 (2)	0.00 (0)	0.00 (0)	0.00 (0)	15.00 (183)
EF Fisher Creek	1997 (1)	2.89 (20)	0.00 (0)	0.00 (0)	2.46 (17)
Lake Cr	1997 (2)	0.00 (0)	0.00 (0)	0.00 (0)	45.95 (95)
Kennally Creek	1991	Present	Not Sighted	Not Sighted	Present
EF Kennally Creek	1991	Not Sighted	Not Sighted	Not Sighted	Present
SF Kennally Creek	1991	Not Sighted	Not Sighted	Not Sighted	Not Sighted
EF Lake Fork Creek	1994 (52)	1.13 (125)	0.00 (0)	0.00 (0)	1.17 (130)
NF Lake Fork Creek	1994 (32)	2.53 (116)	0.00 (0)	0.00 (0)	2.14 (98)
Lemah Creek	1997 (30)	0.26 (2)	0.00 (0)	0.77 (6) [6]	0.00 (0)
NF Payette River	1995 and 1996	1.71	Not Sighted	0.20 [5, 6]	Present
Rapid Creek	1994 (101)	0.38 (228)	0.00 (0)	0.00 (0)	1.26 (763)
Sloans Creek	1995	Not Sighted	Not Sighted	Not Sighted	Not Sighted
Trail Creek	1994 (43)	0.06 (2)	0.00 (0)	0.00 (0)	10.83 (357)
Twentymile Creek	1994 (49)	0.08 (8)	0.00 (0)	0.00 (0)	5.58 (527)

Gold Fork River

Anadromous species including chinook salmon and steelhead trout spawned and reared in the Gold Fork River system prior to the construction of dams. Historical accounts indicate the Gold Fork drainage was the primary producer of chinook salmon in the Long Valley area before the eventual construction of Black Canyon Dam. Subsequent construction of a water diversion dam on the Gold Fork River in the 1930s, and Cascade Dam in 1948 on the North Fork Payette River, further fragmented the system (Steed 1998).

Mountain whitefish, redband trout, and bull trout are the only native salmonids currently present in the drainage. Other salmonid species have been stocked, with evidence of stocking in the basin dating back to the turn of the century. The presence of brook trout is ubiquitous within the drainage (BCC 1996). Stocking of rainbow and Westslope cutthroat trout still occurs in alpine lakes (Steed 1998).

The State of Idaho's *Bull Trout Conservation Plan* identifies the Gold Fork River as a key watershed for bull trout. The documented bull trout focal habitat that supports an isolated and depressed population is located in tributaries of the upper Gold Fork watershed (Steed 1998).

Cascade Reservoir

Cascade Reservoir was completed in 1948 by the BOR on the North Fork Payette River, upstream of Cascade, Idaho. The reservoir is operated in conjunction with Deadwood and Black Canyon Reservoirs to provide irrigation, hydropower, flood control, recreation and wildlife habitat needs. Maximum storage is 703,200 acre-feet (IDEQ 1998). A hydropower facility is operated by Idaho Power Company.

The early fishery in Cascade was created with stocked rainbow trout and kokanee salmon. Northern pikeminnow soon became dominant and troublesome to the fishery. Spawning runs of northern pikeminnow were eradicated in Cascade Reservoir tributaries with rotenone and squoxin between 1958 and 1974 until their numbers were greatly reduced (Welsh 1975). After the non-game fish control measures the yellow perch population expanded and stocked salmonids were again creating a quality fishery (Welsh 1976). By 1982, yellow perch dominated the anglers catch (Reininger *et al.* 1982). Over 500,000 yellow perch were harvested in 1987 (Anderson *et al.* 1987).

The yellow perch population in Cascade Reservoir appeared to have become severely depressed since 1995. While no structured creel surveys were conducted recently, anglers reported generally poor to no yellow perch fishing success during all seasons of the year from 1996 through 1998. Angler counts made during the holidays in 1996 and 1997 indicated that angling pressure was the lowest recorded in the 1980s and 1990s (Janssen *et al.* in press a).

Northern pikeminnow predation, disease, or both, probably lowere yellow perch numbers in the early to mid-1990s. Reservoir water fluctuations, entrainment, water quality, food abundance, and disease were examined and excluded as the probable cause of the continued decline of yellow perch (Janssen *et al*., *i*n press a and b).

The recovery of the perch population is limited by predation by northern pikeminnow adults on young-of-the-year and age 1 yellow perch. In 2001, a yellow perch recovery program was started by the IDFG with financial support from the BOR. Efforts focused on removing northern pikeminnow adults during migratory spawning movements in the North Fork Payette River and Lake Fork Creek (D. Allen, IDFG, personal communication).

Deadwood River

Westslope cutthroat trout, redband trout, and bull trout are found in the Deadwood River above Deadwood Reservoir. Densities of all species are very low (Allen 1998). Above Deadwood Dam, westslope cutthroat, redband, and bull trout exhibit both resident and adfluvial life histories. Adfluvial fish migrate out of Deadwood Reservoir and use the Deadwood River and tributaries for spawning and rearing. A small population of resident bull trout is located in the upper

drainage (IDFG file data). This isolated bull trout population is estimated to contain less than 1,500 individuals (SBNFTG Problem Assessment 1998).

All tributaries to Deadwood Reservoir are managed under wild trout regulations, with a two fish bag limit and no size or gear restrictions. Bull trout are closed to harvest. Management of kokanee spawning runs up the river is intended to limit natural spawning escapement and provide 13-inch or larger kokanee in the reservoir fishery.

Snorkeling conducted in 1998 indicated that very few fish inhabit the Deadwood River below the confluence with the South Fork Payette River. Mountain whitefish, redband trout, native non-gamefish, and bull trout are known to inhabit the river (R23, IDFG file data). Scott Mountain Creek, a tributary to the Deadwood River, contains a resident population of bull trout. This reach is managed for wild trout with no hatchery supplementation. General regulations apply, and access is very limited.

Deadwood Reservoir

Deadwood Reservoir provides a diverse sport fishery for kokanee salmon, hatchery rainbow trout, native redband trout, westslope cutthroat, fall chinook salmon, and mountain whitefish. A small adfluvial population of bull trout also exists in Deadwood Reservoir (Allen 1998). Most of the fishery is provided by hatchery rainbow trout and kokanee. Rainbow trout are stocked annually. The kokanee fishery is managed by a combination of controlled natural recruitment and periodic hatchery supplementation. Fall chinook were introduced in the early 1990s to help control overabundant and small kokanee. Tributaries around the reservoir (Trail, Beaver, South Fork Beaver, Wild Buck, and Basin creeks, and the Deadwood River) provide spawning habitat and natural recruitment for salmonids.

Deadwood Reservoir is managed as a consumptive mixed-species fishery under general regulations. Kokanee limits are liberal (25 per day). Kokanee management focuses on controlling recruitment with tributary weirs, and providing 13-inch or larger kokanee in the fishery. Deadwood has traditionally been a source of kokanee eggs for rearing and stocking in other Idaho waters. Bull trout are closed to harvest.

Middle Fork Payette River

The upper Middle Fork Payette River watershed contains good densities of redband trout. Bull trout were observed in two locations in July of 1996. Silver Creek, a tributary to the MFBR, contains brook trout (R21). The lower Middle Fork Payette River watershed contains very low densities of redband trout. A popular trout fishery is maintained in the lower Middle Fork Payette by intensively stocking hatchery rainbow trout.

The entire Middle Fork Payette River is managed under general regulations, with bull trout closed to harvest. From the mouth upstream to and including Silver Creek, the fishery is supplemented with sterile hatchery rainbow trout. Above Silver Creek, the MFPR is managed for wild trout, with no hatchery stocking.

The South Fork Payette River

Headwaters to Lowman

In addition to non-game fish species, mountain whitefish, redband trout, cutthroat trout, brook trout, and bull trout can be found in the South Fork Payette River above Banks. Bull trout are also widely distributed in the South Fork Payette River (Figure 3), but strong populations are

present only in a few tributaries. Strong bull trout populations likely occur only in Whitehawk-Scott Creek, Canyon Creek, and the upper South Fork Payette River mainstem (SBNFTG Problem Assessment 1998), and there is does not appear to be a substantial migratory component in bull trout populations in the drainage. Redband trout are widely distributed and abundant (Figure 4). Growth rate for all salmonids is slow due to the low productivity of the drainage. As of 1996, whirling disease has not been detected in the South Fork Payette River.

As of 2000, the entire South Fork Payette River watershed is managed for wild trout, with no hatchery supplementation. Bull trout are closed to harvest and daily bag limit for other trout is two. Management activities include routine assessments of angler catch rates and harvest, and periodic snorkeling surveys to monitor trout abundance.

Prior to 2000, the mainstem South Fork Payette River was stocked with hatchery rainbow trout to provide consumptive fishing opportunity. Approximately 9,000 fish were stocked annually. Return-to-creel was poor however. In 1998, a pond complex was developed near Lowman on the upper South Fork Payette River to allow for a limited put-and-take fishery for anglers. These ponds receive hatchery catchable rainbow trout through the summer and fall.

Lowman to Banks

In addition to the non-game fish species mountain whitefish, redband trout, cutthroat trout, brook trout, and bull trout can be found in the South Fork Payette River drainage above Banks. Clear Creek, a large SFPR tributary near Lowman, contains resident and migratory bull trout. Redband trout are widely distributed. As of 1996 the presence of whirling disease was negative for the SFPR (R20).

As of 2000 the entire South Fork Payette River drainage is managed for wild trout, with no hatchery supplementation. Bull trout are closed to harvest and daily bag limit for other trout is two. Management activities include routine assessments of angler catch rates and harvest, and periodic snorkeling surveys to monitor trout abundance.

Banks to the Confluence with the Snake River

Fish populations in the mainstem Payette River from Banks to the mouth are dominated by native non-game and introduced game species. Salmonids are present throughout but decrease in abundance moving downstream. Squaw Creek, a tributary to the lower Payette River, contains good populations of redbands in the upper watershed, and is dominated by native nongame species in the lower reach. One tributary in the upper watershed, Poison Creek, contains a small population of resident bull trout (R19, R26 in press). Black Canyon Reservoir, near the town of Emmett, is dominated by native and introduced warmwater fish species (R21). The Payette River below Black Canyon Dam is dominated by non-native warmwater species. Smallmouth bass were the most abundant gamefish sampled in 1997 (R23), and 1999 (R24). General regulations throughout, mixed cold and warm water species.

The Weiser River Subbasin

Bull Trout

Within the Weiser River subbasin, bull trout are found in the headwaters of the Little Weiser River (Anderson Creek, Sheep Creek, and the upper Little Weiser River), the Middle Fork Weiser River, the Upper Weiser River (East Fork Weiser and Dewey Creek), and Hornet Creek (Olive Creek) (Adams 1994; unpublished Payette National Forest files, Council Ranger District; DuPont and Kennedy 1998).

Most of the adult fish are relatively small (4 to 8 inches) and are likely residents isolated most of the year by thermal barriers on the mainstem Weiser River (Adams 1994) or impassible stream crossings (culverts). Adams (1994) found bull trout up to 12 inches in size in the Little Weiser River drainage.

Based on criteria established by Rieman and McIntyre (1995), Williams and Veach (1999) estimated that the sub-watersheds that are likely to have spawning bull trout where they have not yet been identified, should include the Middle Fork Weiser River and Rush Creek watersheds.

Other Fish Populations

Fish species known to inhabit the Weiser River subbasin are found in Table 19. The distribution of bull trout and redband trout can be found in Figure 5 and Figure 6, respectively. In 1994, Hurley (1995a) reported a single adult bull trout in the mainstem Middle Fork Weiser River above the mouth of Warm Springs Creek. However, intensive surveys done throughout the Middle Fork Weiser River drainage in the summer of 1999 did not reveal any bull trout (Williams and Veach 1999). The IDFG believes that bull trout are at such a low density that they are difficult to detect. It is apparent this population is at a high risk of extirpation. Redband trout are prevalent in the lower reaches of the Middle Fork Weiser River and brook trout dominate the upper reaches. Some of the tributaries had no fish for much of their lengths (Hurley 1995a).

Bull trout are present within Dewey Creek and tributaries and in the East Fork Weiser River upstream of Dewey Creek. Hurley (1995b) found bull trout in both of these areas along with brook trout, and some redband trout in the lower reaches. Hurley (1995b) also found suspected brook trout x bull trout hybrids in the upper East Fork at and above the confluence of Dewey Creek and in the lower reaches of Dewey Creek. The IDFG confirmed the presence of bull trout in the upper East Fork in 1998 (Meyer 1998).

Bull trout were found in Olive Creek in 1999, above 5,250 feet elevation, in the upper Hornet Creek watershed. In August 2000, bull trout were found in upper Hornet Creek, below Hornet Creek Reservoir, in Placer Creek, and in North Creek (J. Dupont, IDL, personal communication). The upper Hornet Creek drainage contains 5,722 acres of contiguous habitat that is greater than 5,250 feet in elevation. Intensive surveys for bull trout have not been completed throughout the entire Hornet Creek drainage. Because bull trout occur in several of the streams within the drainage, the IDFG considers the remaining stream reaches greater than 5,250 feet in elevation as either occupied by bull trout or potential habitat for bull trout. This is based on the criteria from Rieman and Mclntyre (1993). A USFS electrofishing survey (1998) adjacent to the old Hornet Creek Guard Station site on Mill Creek documented only redband trout (Payette National Forest office files, McCall, Idaho). This site was below 5,250 feet in elevation.

A synopsis of fish species found in the Little Weiser River watershed is presented in USFS (2001). Bull trout occur in Sheep Creek, in the Little Weiser River around the mouth of Wolf Creek, and in Anderson Creek above and below a barrier culvert. Brook trout occur in the upper Little Weiser River as well as bull trout x brook trout hybrids (Adams 1994). Brook trout have not been found in any portion of Anderson Creek or its tributaries. Genetic analysis performed on samples collected in 1999 above and below a barrier culvert in Anderson Creek showed no evidence of hybridization (Spruell 2000). This is the only known population of bull trout in the Weiser River subbasin that has not been invaded by or hybridized with brook trout. In 1999, the IDFG found bull trout in the upper Little Weiser River at 5,950 feet in elevation and in Anderson

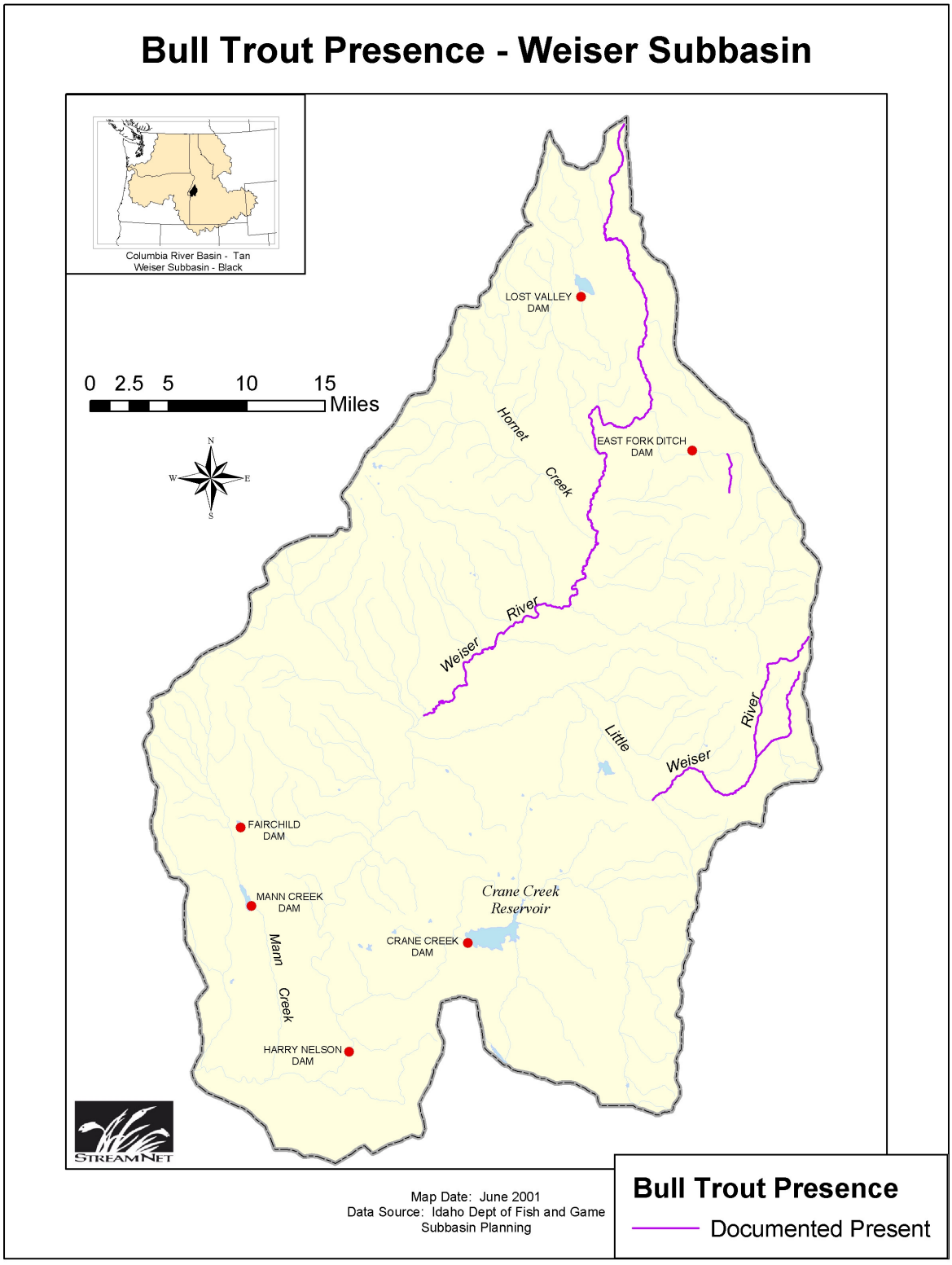

Figure 5. Bull trout presence in the Weiser River subbasin, Idaho.

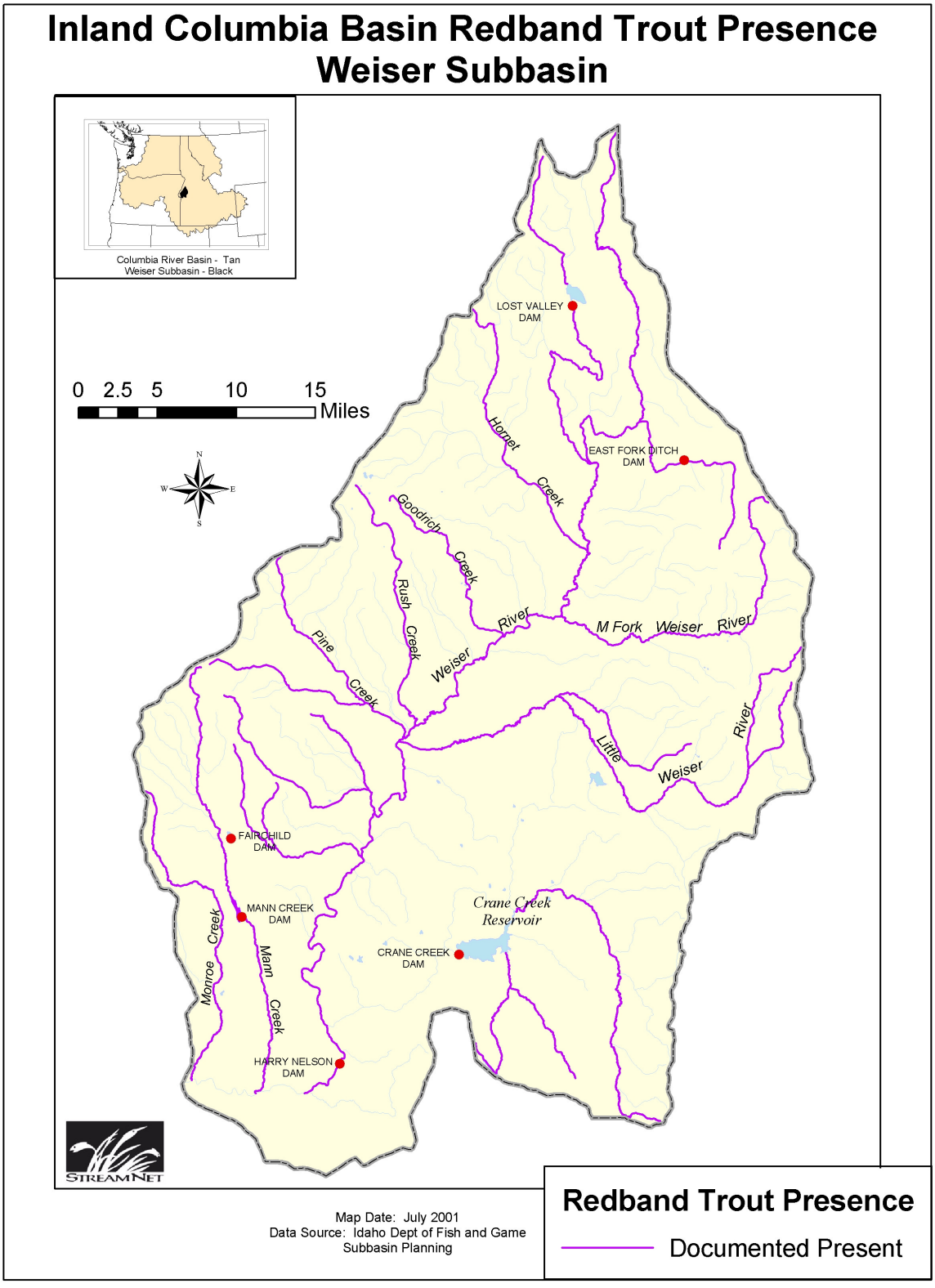

Figure 6. Redband trout presence in the Weiser River subbasin, Idaho.

Creek at two locations of 6,330 feet and 6,410 feet in elevation (Meyer 2001). The same researcher found brook trout in King Hill Creek at 4,710 feet and 5,740 feet in elevation, and redband trout in Grizzly Creek at 4,320 feet elevation.

In 1998 and 1999, Meyer (1999, 2000) captured bull trout in 5 (14 percent) of the 36 sites sampled in the Weiser River and captured redband trout in 26 (72 percent) of the 36 sites. In the Weiser River, mottled sculpin and shorthead sculpin were present, as were speckled dace and redside shiners (Meyer 2000).

C. Ben Ross Reservoir is situated in the lower reaches of the Little Weiser River. The reservoir is home to five species of fish, four of which are introduced warmwater species (Janssen *et al*., in press). The reservoir is operated for irrigation storage and affects the distribution of fish by being an upstream barrier and also contributing to warmer stream temperatures. The reservoir has become a popular largemouth bass fishery in part because of the special regulations imposed by the IDFG.

Historically, bull trout probably occurred throughout the Weiser River subbasin, but historic records are rare. Early records suggest chinook salmon and steelhead were common (Evermann 1894). In the 1930s and 1940s, these fish were noted in reduced numbers (Sedell and Mclntosh 1995). Neither of these documents mentions Dolly Varden or bull trout.

An electrofishing survey by the IDFG and the Payette National Forest in August 1998 found no bull trout in the Rush Creek watershed (USFS files, Payette National Forest). At this time, no bull trout are known to exist in the Main Weiser River watershed (McGee and Lund 2001).

Anadromous Fish in the Boise-Payette-Weiser Subbasins

Prior to widespread development of irrigation projects in the 1920s and 1930s, large runs of anadromous fish ascended the Snake River and its tributaries to spawn (Haas 1965). These runs included spring/summer and fall chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), steelhead trout (*O. mykiss*), and Pacific lamprey (*Entosphenus tridentatus*). The development of dams in the Middle Snake River subbasin resulted in the cumulative elimination of anadromous production areas in the mainstem Snake River and tributary streams. Swan Falls Dam, constructed in 1901 by the Trade Dollar Mining Company, eliminated access to much of the upper portion of the Middle Snake River Basin. Dam construction in the Boise River Basin soon followed. The first dam was the Barber Mill Dam, which was reported to pass fish. However, completion in 1911 of the New York Diversion Dam near Boise eliminated fish passage. Arrowrock Dam, located upstream of the New York Diversion Dam, was later constructed in 1915, which was a large high-head dam with no passage.

In 1924, Black Canyon Dam was constructed on the lower Payette River near Emmett, Idaho. This dam is significant because it not only blocked access to spring/summer chinook and steelhead production areas, but it eliminated the only sockeye salmon run in the Upper Snake River subbasin. The Owyhee Dam was constructed in 1935, which eliminated access to the entire Owyhee River subbasin. The Owyhee River subbasin accounted for approximately 25 percent of the Middle Snake River subbasin anadromous production area. Dam construction continued through the 1940s with additional dams constructed in the Malheur, Burnt, and Powder rivers.

Finally, the construction of the Hells Canyon Complex dams (Brownlee, Oxbow, Hells Canyon) by Idaho Power Company from the late 1950s through the late 1960s, resulted in the elimination of wild runs of spring chinook salmon and steelhead that spawned upstream from the dam complex in the habitats that remained available at the time (including the Weiser River). At

the time of construction of Brownlee Dam in the 1950s, only about 24 percent of the Middle Snake River anadromous production area remained above the present day Hells Canyon Dam site. In the present day, anadromous fish are extirpated from the Snake River drainage upstream of Hells Canyon Dam and the wild runs have been lost.

The IDFG has been collecting brood stock from spring chinook salmon and summer steelhead at the Hells Canyon Dam trap since the dam complex was completed. Spring chinook salmon are reared at Rapid River Fish Hatchery, located in the Little Salmon River drainage near Riggins, Idaho. The Rapid River adult trap has become the principal collection site for this translocated spring chinook salmon run. The steelhead trapped at the Hells Canyon Dam trap are incubated at Oxbow Hatchery and reared at Niagara Springs Hatchery in the Hagerman Valley, Idaho. The hatchery spring chinook are released in the Little Salmon River drainages, the mainstem Snake River, and in the Clearwater River drainage. The steelhead are released in the Snake River and Little Salmon River drainage. The hatchery program is funded by Idaho Power Company as mitigation for the construction of the Hells Canyon hydropower facilities as per a 1980 settlement agreement.

As part of the relicensing process of the Hells Canyon Complex, Idaho Power Company is preparing a comprehensive account of the historic distribution of anadromous fishes in the Middle Snake River Basin as well as reasons for their eventual extinction (J. Chandler, IPC, personal communication).

Corless (1990) mentioned that the Weiser Indians and Northern Paiute of eastern Oregon took salmon from the Boise, Payette, Weiser, and Snake Rivers, “all major runs.” Steelhead were taken in spring and chinook came in September. Sockeye salmon “ran in vast numbers” between August and late October and spawned in Big Payette Lake near McCall, Idaho.

While fall chinook salmon used the main Snake River, steelhead and spring/summer chinook salmon used the main river for access to and from tributaries. Evermann (1896) mentioned the presence of live chinook salmon in the Weiser River above Council about mid-September. He saw no fish on the Weiser River in a mile of examination upstream from Council Valley. Spring/summer chinook used the Powder, Payette, Weiser, Burnt, Malheur, Owyhee, and Boise Rivers.

In Idaho, anadromous fish are found in more than 30 percent of the state. These watersheds are all affected by the anadromous cycle of chinook salmon, steelhead, sockeye, and lamprey. Anadromous species are hatched and rear in Idaho streams, migrate to the ocean where they grow to adult size and mature, and return to their natal streams to spawn and die. All but lamprey are now federally listed and all are in decline.

Idaho once produced 39, 45, 5, and 55 percent of the total number of spring, summer, and fall chinook and summer steelhead, in the Columbia River Basin, respectively (Mallet 1974). Wild fish abundance is now approximately one percent of estimated historical predevelopment abundance (NRC 1996). Greater than 80 percent of all returning fish are now of hatchery origin (ISR 1999). In contrast to wild stocks, hatchery fish are incubated and raised in hatcheries and for the most part also return to hatcheries. In the Pacific Northwest, there are 20-40 percent fewer wild fish spawning in watersheds (Gresh *et al.* 2000).

These significant and continuing declines and the replacement of wild fish with hatchery fish has long-term ecological implications for Idaho's wildlife and wildlife habitats. The fact that salmon have played a key role in these systems and that they are now functionally missing can affect other terrestrial and avian species and ecosystems in Idaho.

There are an estimated 22 different species of wildlife that feed on salmon carcasses, salmon eggs, and salmon juveniles (Cederholm *et al.* 1989 and 1999; Wilson and Halupka 1995). Studies have also shown terrestrial and avian species to behaviorally respond to salmon carcass availability (Ben-David 1997) and for reproductive success to be positively correlated with the availability of spawning salmon (McClelland *et al.* 1982).

Riparian and aquatic associated species may also either directly or indirectly benefit from salmon as a direct food source, salmon as nutrients, and increases in salmon-derived productivity within the watershed. The presence of salmon carcasses increases aquatic macroinvertebrate biomass and taxonomic richness (Piorkowski 1995; Minakawa 1997; Wipfli *et al.* 1998). These increases can provide more food and indirect benefits to riparian dependent and insect feeding wildlife. The increased growth rates of juvenile resident and salmonid fish in watersheds with anadromous fish (Wood 1987) may also benefit avian and mammalian predators of these fish.

The availability and abundance of historic adult salmon and steelhead-derived nutrients has been estimated as high as 103 million kg of biomass for the Columbia River Basin. Currently, the estimated four million pounds of anadromous fish biomass being returned to Columbia River Basin headwaters (Gresh *et al.* 2000) is only 1.7 percent of historic levels. As an ecological process, marine-derived nitrogen, carbon and phosphorus delivered to headwater Idaho streams by adult salmon provide a nutrient cycle to upstream watersheds. Analysis of grizzly bears killed across the Columbia basin show 35-91 percent of the carbon and nitrogen in their skeletons was derived from marine-derived nutrients (Hilderbrand *et al.* 1996). Marine-derived nutrients also provides for fertilization of terrestrial vegetation (Ben-David *et al.* 1998).

The decline of salmon and steelhead has implications for many species in Idaho that directly or indirectly benefit from the ecological processes provided by anadromous fish runs. Recent research on salmon carcasses strongly emphasizes that salmon are a keystone species and that both aquatic and terrestrial organisms depend on them (Cederholm *et al.* 1999; Gross *et al.* 1998; Schmidt *et al.* 1998; Gresh *et al.* 2000). As the decline of these keystone species continues, productivity of associated freshwater and terrestrial ecosystems will diminish (Wilson and Halupka 1995). In the Boise-Weiser-Payette subbasins, the loss of significant runs of anadromous fish and carcass-derived nutrients potentially has adversely affected resident fish species by reducing overall watershed productivity.

Wildlife

The Boise-Payette-Weiser subbasins support diverse populations of wildlife, including species that have become uncommon or extirpated across large portions of their historic geographic ranges. For summary purposes, these species have been grouped into the following categories: threatened and endangered species; mammals (big game, forest carnivores, and small mammals); birds (raptors, upland birds, cavity nesters, and migratory birds); herpetofauna; and exotic species. A documented 303 vertebrate species are found across the three subbasins (Table 25). These species constitute all those known to be present in the subbasin complex on at least a seasonal basis.

Table 25. Wildlife species documented to occur within the Boise-Payette-Weiser subbasins, including current state and federal status for threatened, endangered, and special status species (Idaho Conservation Data Center, IDFG).

Common Name	Scientific Name	State Status[1]	Federal Status[2]
Long-toed salamander	Ambystoma macrodactylum		
Pacific giant salamander	Dicamptodon ensatus		
Tailed frog	Ascaphus truei		
Western toad	Bufo boreas	SC	W/SC
Woodhouse's toad	Bufo woodhousei		W
Striped chorus frog	Pseuacris triseriata		
Pacific treefrog	Hyla regilla		
Great Basin spadefoot	Scaphiopus intermontanus		
Northern leopard frog	Rana pipiens	SC	SC
Spotted frog	Rana pretiosa	SC	
Mojave black-collared lizard	Crotaphytus bicinctores	SC	W
Longnose leopard lizard	Gambelia wislizenii		
Short-horned lizard	Phrynosoma douglassii		
Desert horned lizard	Phrynosoma platyrhinos		
Sagebrush lizard	Sceloporus graciosus		
Western fence lizard	Sceloporus occidentalis		
Side-blotched lizard	Uta stansburiana		
Western skink	Eumeces skiltonianus		
Western whiptail	Cnemidophorus tigris		
Rubber boa	Charina bottae		
Racer	Coluber constrictor		
Ringneck snake	Diadophis punctatus	SC	W
Night snake	Hypsiglena torquata		
Striped whipsnake	Masticophis taeniatus		
Gopher snake	Pituophis melanoleucus		
Western terrestrial garter snake	Thamnophis elegans		
Common garter snake	Thamnophis sirtalis		
Western rattlesnake	Crotalus viridis		
Pied-billed grebe	Podilymbus podiceps	P	
Red-necked grebe	Podiceps grisegena	P	
Western grebe	Aechmophorus occidentalis	P	
American bittern	Botaurus lentiginosus	P	
Great blue heron	Ardea herodias	P	
Snowy egret	Egretta thula	P	
Black-crowned night heron	Nycticorax nycticorax	P	
Canada goose	Branta canadensis	G	
Wood duck	Aix sponsa	G	
Green-winged teal	Anas crecca	G	
Mallard	Anas platyrhynchos	G	
Northern pintail	Anas acuta	G	
Blue-winged teal	Anas discors	G	
Cinnamon teal	Anas cyanoptera	G	

Common Name	Scientific Name	State Status[1]	Federal Status[2]
Northern shoveler	Anas clypeata	G	
Gadwall	Anas strepera	G	
American wigeon	Anas americana	G	
Redhead	Aythya americana	G	
Barrow's goldeneye	Bucephala islandica	G	
Bufflehead	Bucephala albeola	G	
Common merganser	Mergus merganser	G	
Ruddy duck	Oxyura jamaicensis	G	
Turkey vulture	Cathartes aura	P	
Osprey	Pandion haliaetus	P	
Bald eagle	Haliaeetus leucocephalus	E	LT
Northern harrier	Circus cyaneus	P	
Sharp-shinned hawk	Accipiter striatus	P	
Cooper's hawk	Accipiter cooperii	P	
Northern goshawk	Accipiter gentilis	SC	W
Swainson's hawk	Buteo swainsoni	P	
Red-tailed hawk	Buteo jamaicensis	P	
Ferruginous hawk	Buteo regalis	P	W
Golden eagle	Aquila chrysaetos	P	
American kestrel	Falco sparverius	P	
Peregrine falcon	Falco peregrinus	E	
Prairie falcon	Falco mexicanus	P	
Gray partridge	Perdix perdix	G	
Chukar	Alectoris chukar	G	
Ring-necked pheasant	Phasianus colchicus	G	
Spruce grouse	Dendragapus canadensis	G	
Blue grouse	Dendragapus obscurus	G	
Ruffed grouse	Bonasa umbellus	G	
Sage grouse	Centrocercus urophasianus	G	
Columbian sharp-tailed grouse	Tympanuchus phasianellus columbianus	GSC	SC
Wild turkey	Meleagris gallopavo	G	
Northern bobwhite	Colinus virginianus		
California quail	Callipepla californica	G	
Mountain quail	Oreortyx pictus	P,SC	SC
Virginia rail	Rallus limicola	P	
Sora	Porzana carolina	P	
American coot	Fulica americana	G	
Sandhill crane	Grus canadensis	G	
Killdeer	Charadrius vociferus	P	
Black-necked stilt	Himantopus mexicanus	P	
American avocet	Recurvirostra americana	P	
Spotted sandpiper	Actitis macularia	P	
Upland sandpiper	Bartramia longicauda	P,SC	W
Long-billed curlew	Numenius americanus	P	SC
Common snipe	Gallinago gallinago	P	

Common Name	Scientific Name	State Status[1]	Federal Status[2]
Wilson's phalarope	Phalaropus tricolor	P	
California gull	Larus californicus	P	
Mourning dove	Zenaida macroura	G	
Common barn-owl	Tyto alba	P	
Flammulated owl	Otus flammeolus	P,SC	W
Western screech-owl	Otus kennicottii	P	
Great horned owl	Bubo virginianus	P	
Northern pygmy-owl	Glaucidium gnoma	SC	W
Western burrowing owl	Speotyto cunicularia hypugaea	P	SC
Barred owl	Strix varia	P	
Great gray owl	Strix nebulosa	SC	W
Long-eared owl	Asio otus	P	
Short-eared owl	Asio flammeus	P	
Boreal owl	Aegolius funereus	SC	W
Northern saw-whet owl	Aegolius acadicus	P	
Common nighthawk	Chordeiles minor	P	
Common poorwill	Phalaenoptilus nuttallii	P	
Vaux's swift	Chaetura vauxi	P	
White-throated swift	Aeronautes saxatalis	P	
Black-chinned hummingbird	Archilochus alexandri	P	
Calliope hummingbird	Stellula calliope	P	
Broad-tailed hummingbird	Selasphorus platycercus	P	
Rufous hummingbird	Selasphorus rufus	P	
Belted kingfisher	Ceryle alcyon	P	
Lewis' woodpecker	Melanerpes lewis	P	
Williamson's sapsucker	Sphyrapicus thyroideus	P	
Red-naped sapsucker	Sphyrapicus nuchalis	P	
Downy woodpecker	Picoides pubescens	P	
Hairy woodpecker	Picoides villosus	P	
White-headed woodpecker	Picoides albolarvatus	SC	W
Three-toed woodpecker	Picoides tridactylus	SC	W
Black-backed woodpecker	Picoides arcticus	SC	W
Northern flicker	Colaptes auratus	P	
Pileated woodpecker	Dryocopus pileatus	P	
Olive-sided flycatcher	Contopus borealis	P	
Western wood-pewee	Contopus sordidulus	P	
Willow flycatcher	Empidonax traillii	P	
Hammond's flycatcher	Empidonax hammondii	P	
Dusky flycatcher	Empidonax oberholseri	P	
Cordilleran flycatcher	Empidonax difficilis	P	
Say's phoebe	Sayornis saya	P	
Western kingbird	Tyrannus verticalis	P	
Eastern kingbird	Tyrannus tyrannus	P	
Horned lark	Eremophila alpestris	P	
Tree swallow	Tachycineta bicolor	P	
Violet-green swallow	Tachycineta thalassina	P	

Common Name	Scientific Name	State Status[1]	Federal Status[2]
Northern rough-winged swallow	Stelgidopteryx serripennis	P	
Bank swallow	Riparia riparia	P	
Cliff swallow	Hirundo pyrrhonota	P	
Barn swallow	Hirundo rustica	P	
Gray jay	Perisoreus canadensis	P	
Steller's jay	Cyanocitta stelleri	P	
Clark's nutcracker	Nucifraga columbiana	P	
Black-billed magpie	Pica pica	P	
American crow	Corvus brachyrhynchos	P	
Common raven	Corvus corax	P	
Black-capped chickadee	Parus atricapillus	P	
Mountain chickadee	Parus gambeli	P	
Red-breasted nuthatch	Sitta canadensis	P	
White-breasted nuthatch	Sitta carolinensis	P	
Pygmy nuthatch	Sitta pygmaea	P,SC	W
Brown creeper	Certhia americana	P	
Rock wren	Salpinctes obsoletus	P	
Canyon wren	Catherpes mexicanus	P	
House wren	Troglodytes aedon	P	
Winter wren	Troglodytes troglodytes	P	
Marsh wren	Cistothorus palustris	P	
American dipper	Cinclus mexicanus	P	
Golden-crowned kinglet	Regulus satrapa	P	
Ruby-crowned kinglet	Regulus calendula	P	
Western bluebird	Sialia mexicana	P	
Mountain bluebird	Sialia currucoides	P	
Townsend's solitaire	Myadestes townsendi	P	
Veery	Catharus fuscescens	P	
Swainson's thrush	Catharus ustulatus	P	
Hermit thrush	Catharus guttatus	P	
American robin	Turdus migratorius	P	
Varied thrush	Ixoreus naevius	P	
Gray catbird	Dumetella carolinensis	P	
Sage thrasher	Oreoscoptes montanus	P	
American pipit	Anthus spinoletta	P	
Cedar waxwing	Bombycilla cedrorum	P	
Loggerhead shrike	Lanius ludovicianus	SC	SC
Solitary vireo	Vireo solitarius	P	
Warbling vireo	Vireo gilvus	P	
Red-eyed vireo	Vireo olivaceus	P	
Orange-crowned warbler	Vermivora celata	P	
Nashville warbler	Vermivora ruficapilla	P	
Yellow warbler	Dendroica petechia	P	
Yellow-rumped warbler	Dendroica coronata	P	
Townsend's warbler	Dendroica townsendi	P	
American redstart	Setophaga ruticilla	P	

Common Name	Scientific Name	State Status[1]	Federal Status[2]
MacGillivray's warbler	Oporornis tolmiei	P	
Common yellowthroat	Geothlypis trichas	P	
Wilson's warbler	Wilsonia pusilla	P	
Yellow-breasted chat	Icteria virens	P	
Western tanager	Piranga ludoviciana	P	
Black-headed grosbeak	Pheucticus melanocephalus	P	
Lazuli bunting	Passerina amoena	P	
Green-tailed towhee	Pipilo chlorurus	P	
Rufous-sided towhee	Pipilo erythrophthalmus	P	
Chipping sparrow	Spizella passerina	P	
Brewer's sparrow	Spizella breweri	P	
Vesper sparrow	Pooecetes gramineus	P	
Lark sparrow	Chondestes grammacus	P	
Black-throated sparrow	Amphispiza bilineata	P	
Sage sparrow	Amphispiza belli	P	
Savannah sparrow	Passerculus sandwichensis	P	
Grasshopper sparrow	Ammodramus savannarum	P	
Fox sparrow	Passerella iliaca	P	
Song sparrow	Melospiza melodia	P	
Lincoln's sparrow	Melospiza lincolnii	P	
White-crowned sparrow	Zonotrichia leucophrys	P	
Dark-eyed junco	Junco hyemalis	P	
Bobolink	Dolichonyx oryzivorus	P	
Red-winged blackbird	Agelaius phoeniceus	P	
Western meadowlark	Sturnella neglecta	P	
Yellow-headed blackbird	Xanthocephalus xanthocephalus	P	
Brewer's blackbird	Euphagus cyanocephalus	P	
Brown-headed cowbird	Molothrus ater	P	
Scotts oriole	Icterus parisorum	P	
Rosy finch	Leucosticte arctoa	P	
Pine grosbeak	Pinicola enucleator	P	
Cassin's finch	Carpodacus cassinii	P	
House finch	Carpodacus mexicanus	P	
Red crossbill	Loxia curvirostra	P	
Pine siskin	Carduelis pinus	P	
American goldfinch	Carduelis tristis	P	
Evening grosbeak	Coccothraustes vespertinus	P	
Masked shrew	Sorex cinereus		
Vagrant shrew	Sorex vagrans		
Dusky shrew	Sorex monticolus		
Water shrew	Sorex palustris		
Merriam's shrew	Sorex merriami		
Coast mole	Scapanus orarius	SC	W
Little brown myotis	Myotis lucifugus		
Yuma myotis	Myotis yumanensis		W
Long-eared myotis	Myotis evotis		W

Common Name	Scientific Name	State Status[1]	Federal Status[2]
Fringed myotis	Myotis thysanodes	SC	W
Long-legged myotis	Myotis volans		W
California myotis	Myotis californicus		W
Western small-footed myotis	Myotis ciliolabrum		W
Silver-haired bat	Lasionycteris noctivagans		
Western pipistrelle	Pipistrellus hesperus	SC	W
Big brown bat	Eptesicus fuscus		
Hoary bat	Lasiurus cinereus		
Spotted bat	Euderma maculatum	SC	W
Townsend's big-eared bat	Plecotus townsendii	SC	W
Pallid bat	Antrozous pallidus		
Pika	Ochotona princeps	P	
Nutall's cottontail	Sylvilagus nuttallii		
Snowshoe hare	Lepus americanus		
White-tailed jackrabbit	Lepus townsendii		
Black-tailed jackrabbit	Lepus californicus		
Pygmy rabbit	Brachylagus idahoensis	GSC	W
Least chipmunk	Tamias minimus	P	
Yellow-pine chipmunk	Tamius amoenus	P	
Red-tailed chipmunk	Tamias ruficaudus	P	
Yellow-bellied marmot	Marmota flaviventris		
Hoary marmot	Marmota caligata		
Townsend's ground squirrel	Spermophilus townsendii		
Idaho ground squirrel	Spermophilus brunneus		
Columbian ground squirrel	Spermophilus columbianus		
Golden-mantled ground squirrel	Spermophilus lateralis	P	
Red squirrel	Tamiasciurus hudsonicus	P	
Northern flying squirrel	Glaucomys sabrinus	P	
Townsend's pocket gopher	Thomomys townsendii		
Northern pocket gopher	Thomomys talpoides		
Great Basin pocket mouse	Perognathus parvus		
Ord's kangaroo rat	Dipodomys ordii		
Chisel-toothed kangaroo rat	Dipodomys microps		
Beaver	Castor canadensis	G	
Western harvest mouse	Reithrodontomys megalotis		
Deer mouse	Peromyscus maniculatus		
Canyon mouse	Peromyscus crinitus		
Northern grasshopper mouse	Onychomys leucogaster		
Desert woodrat	Neotoma lepida		
Bushy-tailed woodrat	Neotoma cinerea		
Southern red-backed vole	Clethrionomys gapperi		
Heather vole	Phenacomys intermedius		
Meadow vole	Microtus pennsylvanicus		
Montane vole	Microtus montanus		
Long-tailed vole	Microtus longicaudus		
Water vole	Microtus richardsoni		

Common Name	Scientific Name	State Status[1]	Federal Status[2]
Sagebrush vole	Lemmiscus curtatus		
Muskrat	Ondatra zibethicus	G	
Western jumping mouse	Zapus princeps		
Porcupine	Erethizon dorsatum		
Coyote	Canis latrans		
Gray wolf	Canis lupis	E	LE/XN
Red fox	Vulpes vulpes	G	
Black bear	Ursus americanus	G	
Raccoon	Procyon lotor	G	
Marten	Martes americana	G	
Fisher	Martes pennanti	SC	W
Ermine	Mustela erminea	G	
Long-tailed weasel	Mustela frenata	G	
Mink	Mustela vison	G	
North American wolverine	Gulo gulo luscus	P,SC	W
Badger	Taxidea taxus	G	
Western spotted skunk	Spilogale gracilis		
Striped skunk	Mephitis mephitis		
River otter	Lutra canadensis	G	
Mountain lion	Felis concolor	G	
Lynx	Lynx canadensis	GSC	LT
Bobcat	Felis rufus	G	
Elk	Cervus elaphus	G	
Mule deer	Odocoileus hemionus	G	
White-tailed deer	Odocoileus virginianus	G	
Moose	Alces alces	G	
Pronghorn	Antilocapra americana	G	
Mountain goat	Oreamnos americana	G	
Southern Idaho ground squirrel	Spermophilus brunneus endemicus	SC	SC
Northern Idaho ground squirrel	Spermophilus brunneus brunneus	SC	LT
California bighorn sheep	Ovis canadensis californiana	G	SC
Rocky Mountain bighorn sheep	Ovis canadensis canadensis	G	

[1] State Status: SC=Species of Special Concern; G=Game Species or furbearers; T=Threatened; E=Endangered; P=Protected Nongame Species.

[2] Federal Status: LT=Listed Threatened; LE=Listed Endangered; PE=Proposed Endangered; PT=Proposed Threatened; C=Candidate Species; XN=Experimental, Nonessential Population; SC=Species of Concern; W=Watch Species

Data on the current status and distribution of many wildlife species in the subbasins is limited. Most information is related to big game management and includes winter-spring aerial surveys and harvest data for big game species elk, mule deer, pronghorn antelope, sheep, mountain goats, moose, black bears, cougars, and the furbearers such as bobcats. More limited and short-term information exists for such threatened and endangered species as the gray wolf, northern Idaho ground squirrel, bald eagle, and peregrine falcon. Data on other wildlife species are based on

occasional presence/absence surveys, predictive habitat relationship models, and incidental observations. The major source for threatened, endangered, rare, and sensitive species information is the Idaho Conservation Data Center.

Threatened and Endangered Species

In the three subbasins, there are 41 wildlife species of concern and 5 federally listed threatened or endangered species, including a population of wolves federally designated as "non-essential, experimental" under Section 10j of the ESA. Documented occurrences of rare animals within the subbasins are summarized in Table 26.

Table 26. Documented occurrences of threatened, endangered, or otherwise rare animal species within the Boise-Payette-Weiser subbasins, Idaho. Federally listed species are identified in bold. Information provided by the Idaho Conservation Data Center.

***Guild*/Species**	**Documented Presence (P) by 4th Order Watershed[1]**								
	NMB	BMO	SFB	LBO	SFP	MFP	PAY	NFP	WEI
Forest Carnivores									
North American wolverine	P	P	P		P	P	P	P	P
Lynx	P		P		P			P	
Fisher	P	P	P		P			P	
Gray Wolf					P	P		P	
Small Mammals									
California myotis									P
Fringed myotis		P							
Long-eared myotis								P	P
Long-legged myotis				P				P	
Yuma myotis	P								
Western small-footed myotis				P					
Townsend's big-eared bat				P					P
Pallid bat				P					
Northern Idaho ground squirrel								P	P
Southern Idaho ground squirrel							P		
Coast mole									P
Merriam's shrew			P	P					
Dwarf shrew			P						
Raptors									

Guild/Species	Documented Presence (P) by 4th Order Watershed[1]								
	NMB	BMO	SFB	LBO	SFP	MFP	PAY	NFP	WEI
Bald eagle	P	P	P	P	P		P	P	P
Northern goshawk			P		P		P	P	P
Peregrine falcon				P				P	
Ferruginous hawk				P			P		P
Northern pygmy owl					P				P
Western burrowing owl				P					
Barred owl								P	P
Great gray owl								P	P
Merlin				P					
Cavity Nesters									
Flammulated owl		P	P	P			P	P	P
Boreal owl								P	
White-headed woodpecker		P	P						P
Three-toed woodpecker								P	
Black-backed woodpecker								P	
Pygmy nuthatch		P						P	
Migratory Birds									
Common loon					P				
Red-necked grebe								P	
Western grebe				P				P	
Black-crowned night heron				P					
Bufflehead								P	
Upland sandpiper							P	P	
Long-billed curlew				P			P		P
Black-throated sparrow									P
Lesser goldfinch				P					
Upland Birds									
Columbian sharp-tailed grouse			P						P
Mountain quail	P	P	P	P	P	P	P	P	
Herptifauna									

Guild/Species	Documented Presence (P) by 4th Order Watershed[1]								
	NMB	BMO	SFB	LBO	SFP	MFP	PAY	NFP	WEI
Western toad	P		P	P	P			P	
Mojave black-collared lizard				P[1]					
Invertebrates									
Columbia pebblesnail							P[2]		

1 NMB=North and Middle Boise; BMO=Boise-Mores; SFB=South Fork Boise; LBO=Lower Boise; SFP=South Fork Payette; MFP=Middle Fork Payette; PAY=Payette; NFP=North Fork Payette; WEI=Weiser.
2 Probably extirpated from this watershed.
3 Extirpated from this watershed.

Gray Wolf

Gray wolf populations were extirpated from the subbasins in the early 1900s. In 1995 and 1996, 35 wolves from Alberta and British Columbia, Canada were reintroduced to central Idaho as a Nonessential, Experimental Population. These reintroduced wolves have successfully reproduced and expanded their ranges. In 2001 at least 2 wolf packs or reproductive pairs were known to reside within the subbasin complex. Several other packs have territories adjacent to the subbasins or may have portions of their territories that partially include the subbasin. Numerous unpaired, individual wolves have been documented in the subbasins, particularly in the North, Middle, and South Forks of the Payette River drainages.

The gray wolf Nonessential, Experimental Population Area covers all of the state of Idaho south of Interstate 90 in the Idaho Panhandle, and includes all of the Mid Snake River subbasin. The Nez Perce Tribe is currently conducting all monitoring of wolf populations in the state under contract with the USFWS. The effects of wolf reintroduction on big game and other prey populations are unknown. Wolf numbers are expected to expand within the subbasin until they are constrained by resource and/or human imposed limitations.

The Idaho Legislative Wolf Oversight Committee is working on development of an Idaho wolf management plan that will guide the IDFG's involvement in wolf management in the subbasin after wolves are delisted from the ESA.

Lynx

The USFWS listed the lynx as a threatened species on March 24, 2000. The status and distribution of lynx within the subbasin is largely unknown. Although their documented occurrences are widespread, they are rare. Field studies in similar habitats (Koehler *et al.* 1979; Smith 1984; Brainerd 1985; and Brittel *et al.* 1989) provide some information on lynx on the periphery of their range. Forage, denning, and travel habitats include lodgepole pine habitats and early successional habitat resulting from fire and other disturbances. Lynx are felids that prey upon small mammals with a preference for snowshoe hares. The different denning and foraging habitat needs result in the species requiring a mosaic of different-aged forest stands.

Conservation measures for this species include: habitat management to enhance early seral stages and potential prey populations; minimizing snow compaction to protect lynx habitat

integrity; providing interconnected foraging habitats; providing security habitats; reducing incidental harm or capture during regulated trapping activity; reducing lynx mortality and losses of habitat connectivity through improved highway and road management (Ruediger *et al.* 2000).

Northern Idaho Ground Squirrel

The Idaho ground squirrel is the state's only endemic mammal. The northern Idaho ground squirrel is a federally listed threatened species. It has the most restricted distribution of any North American ground squirrel and its range is one of the smallest among mainland North American mammals. It was originally found in two counties and now only occurs in Adams County. There are fewer than 400 individuals of this species remaining (Haak 2000). The northern Idaho ground squirrel occurs in meadows and adjacent forest clearings surrounded by ponderosa pine and Douglas-fir forests at 3,900 to 5,700 feet elevation. The inhabited meadows are isolated from each other due to habitat fragmentation as a result of conifer encroachment. The threats to northern Idaho ground squirrel recovery are, in order of priority: destruction and modification of habitat or range over-utilization, disease, or predation, and the inadequacy of existing regulatory mechanisms. A conservation agreement between the USFWS and the USFS for the protection of ground squirrel populations and habitats has been signed. The northern Idaho ground squirrel recovery plan is under development. A comprehensive survey of potential habitat for this species is needed.

Bald Eagle

Bald eagles in the subbasin are managed according to guidelines in the *Pacific Bald Eagle Recovery Plan* (USFWS 1986). The USFWS coordinates a nationwide survey of wintering bald eagles in select areas of the subbasin. Nesting bald eagles have increased in the subbasin. There are currently 27 known bald eagle nests in the subbasin complex, of which 25 were occupied in 2000 (Table 27). Most bald eagle nesting occurs in the North Fork Payette watershed influenced by the Cascade Reservoir ecosystem. Although some nest site management plans have been completed (Krol and Bechard 1989a; Krol and Bechard 1989b; Evans *et al.* 1990; Krol and Bechard 1990), plans are needed for many of the nests.

Table 27. Bald eagle nest territories within the Boise-Payette-Weiser subbasins, Idaho.

Nest Territory Name	Watershed	Occupied	Bald Eagle Management Plan Completed	Reference
Arrowrock	BMO	Yes		
Boulder Creek	NFP	Yes		
Buttercup	NFP	Yes		
Cabarton	NFP	Yes	Yes	Evans *et. al.* 1990
Camas Arm	SFB	Yes		
Deadwood	SFP	Yes		

Nest Territory Name	Watershed	Occupied	Bald Eagle Management Plan Completed	Reference
Donnelly	NFP	Yes	Yes	Krol and Bechard 1989a
Featherville	SFB	Yes		
French Creek	NFP	Yes	Yes	Krol and Bechard 1989b
Gold Fork	NFP	Yes	Yes	Krol and Bechard 1989a
Grouse Creek	BMO	Yes		
Hait Ranch	NFP	Yes		
High Valley	PAY	Yes		
Hurd Creek	NFP	Yes	Yes	Krol and Bechard 1990
Island	NFP	Yes		
Lake Lowell	LBO	Yes		
Lost Valley	WEI	Yes	Yes	Johnston 1995
McCall Airport	NFP	Yes		
Montour	PAY	No		
Poison Creek	NFP	Yes	Yes	Krol and Bechard 1990
Ponderosa	NFP	No		
Powerline	SFB	Yes		
Raspberry	NFP	Yes		
Smith's Ferry	NFP	Yes		
Sugarloaf	NFP	Yes		

Peregrine Falcon

One pair of nesting peregrine falcons has been documented within the subbasins in an artificial nest box (Levine *et al.* 2001). The IDFG monitors these nesting falcons. A large amount of suitable but unoccupied habitat occurs within the Boise-Payette-Weiser subbasins. The need for comprehensive peregrine nest surveys has been identified.

Mammals

Game

Big game, including furbearers, are widespread in the subbasins and highly valued for subsistence, cultural, recreational, and economic reasons.

Elk

Elk were prevalent in the subbasins prior to European settlement in the mid-1800s. As in other areas in Idaho, the proliferation of mining due to the gold rush in the late 1800s and early 1900s probably led to year-round hunting of these animals to supply meat and hides for mining camps. Subsequent intensive livestock grazing degraded habitat in much of the subbasin complex. Translocation of elk from the Yellowstone National Park area to places on the periphery of the subbasin complex such as New Meadows and Bear Valley, occurred in the late 1930s to bolster sagging elk populations. Regulated livestock grazing began during the same era. Transient elk from these populations probably repopulated the subbasins. Liberal either-sex hunting seasons kept population numbers of elk suppressed well into the 1970s. The implementation of bulls only hunting in the late 1970s spurred an increase in elk populations in the subbasins (IDFG 1999a). Elk herds currently exceed cow population objectives, but are below bull elk objectives in most of the subbasin complex (Table 28).

Table 28. Elk population status and IDFG objectives for game management units within the Boise-Payette-Weiser subbasins (Revised 8/21/01).

Big Game Unit[a]	Total Cows	Cow Objective	Status[b]	Total Bulls	Total Bulls Objective	Status[b]	Total Adult Bulls	Adult Bull Objective	Status[b]
22 (WEI)	1,480	1,100-1,700	M	224	250-350	N	91	125-200	N
24 (NFP)	**No Quantitative Objectives Set for this Unit**								
31 (WEI)	299	550-850	N	104	125-175	N	72	50-100	M
32 (PAY)	1,141	325-475	E	263	50-100	E	128	40-60	E
32A (WEI)	1,147	700-1,100	E	102	150-200	N	19	75-125	N
33 (MFP)	3,082	2,500-3,700	M	546	500-800	M	354	300-450	M
34 (SFP)	No Quantitative Objectives Set for this Unit								
35 (SFP)	480	300-500	M	61	50-75	M	37	25-75	M
39 (BMO/ NMB)	3,957	3,200-4,800	M	413	650-950	N	199	375-575	N
43 (SFB)	1,040	1,350-2,000	N	292	425-650	N	223	275-400	N
44 (SFB)	250	150-250	M	157	50-75	E	129	30-50	E
45 (SFB)	154	225-325	N	175	50-75	E	150	35-50	E

[a] Primary watershed in ( ).

[b] Status: M = meets objective; E = exceeds objective; N = below objective.

Deer

Before white man settled in Southwestern Idaho, deer populations wintered on the plains that are now Boise, Meridian, Nampa, and Caldwell. This development has cut off wintering areas for deer herds from Payette and Boise River subbasins. Today, the deer populations have to winter

on the limited winter range found in the foothills. This area is threatened from development. The deer populations in these subbasins are threatened by the loss of winter range from development in the Boise Foothills.

Most of the deer in the subbasins are mule deer, with white-tailed deer occurring in sporadic pockets of agricultural and riparian habitat. Deer populations are thought to have reached historic peak population levels in the 1960s. Habitat changes have probably altered the peak population capacity of the subbasins (IDFG 1999a). Deer herds currently exceed total population threshold, but are below buck : doe ratio objectives in most of the subbasin complex (Table 29).

Table 29. Deer population status and IDFG objectives for game management units within the Boise-Payette-Weiser subbasins (Revised 8/21/01).

Big Game Unit[a]	Total Deer	Total Deer Objective	Status[b]	Buck : 100 Does	Buck: 100 Does Objective	Status[b]	% 4 Points in Harvest	% 4 Points in Harvest Objective	Status[b]
22 (WEI)	4,091	3,700	E	7	15	N	23	30	N
24 (NFP)	No quantitative population objectives set for this unit						23	30	N
31 (WEI)	3,826	3,400	E	No quantitative herd composition objectives set for this unit			23	30	N
32 (PAY)	No quantitative population objectives set for this unit						23	30	N
32A (WEI)	No quantitative population objectives set for this unit			14	15	N	23	30	N
33 (MFP)	1,869	2,000	N	No quantitative herd composition objectives set for this unit			23	30	N
34 (SFP)	No quantitative population objectives set for this unit						23	30	N
35 (SFP)	No quantitative population objectives set for this unit						23	30	N
39 (BMO/ NMB)	21,300	20,000	E	19	15	E	23	30	N
43 (SFB)	No quantitative population objectives set for this unit						42	45	N
44 (SFB)	No quantitative population objectives set for this unit						42	45	N
45 (SFB)	8,198	5,000	E	30	20	E	42	45	N

[a] Primary watershed in ( ).
[b] Status: E = exceeds objective; N = below objective.

Pronghorn Antelope

A small number of pronghorn antelope inhabit the Lower Boise River, South Fork Boise River, Payette River, and Weiser River watersheds in the Boise-Payette-Weiser subbasins. No formal surveys have been conducted in recent years to estimate population numbers, but anecdotal observations suggest these small populations are static.

In 2000, 10 controlled hunt permits were offered in an area including portions of the Payette and Weiser River watersheds (Game Management Units 32 and 32A) and 8 pronghorn antelope were harvested. In addition, 20 permits were offered in an area that includes a portion of the Lower Boise River watershed (Game Management Unit 39). An estimated 17 pronghorn antelope were harvested in this hunt.

Mountain Goats

Mountain goat populations in the subbasin complex are poorly understood. Occupied and unoccupied goat habitat exists in the upper elevations of the North and South Fork Payette and South, Middle, and North Fork Boise watersheds. Mapping of goat habitat and population census is needed in the Boise-Payette-Weiser subbasins.

Moose

Because of dense cover, low densities, and solitary habits, formal population surveys and data on moose are not available for this area. Management is based on moose sighting reports, field observations of moose activity, and data from moose harvest and miscellaneous mortalities. Moose are thought to be pioneering into the subbasins from thriving adjacent populations, but populations are not thrifty enough to allow recreational hunting.

Black Bear

Although the black bear was classified as a game animal by IDFG in 1943, true big-game status and protection was not achieved until 1983 with the elimination of year-round hunting seasons and two bear bag limits. No economically practical methods are utilized to monitor the abundance of black bears in the subbasin. As a result, IDFG biologists have relied on harvest data to assess population trends. Harvest data from the mandatory check and report system are the primary source of information used to make management decisions. All data indicate that the subbasin is currently meeting or exceeding criteria for the subbasin. A reliable, cost effective method for monitoring bear populations is needed.

Mountain Lion

The management of mountain lions has changed dramatically during the past 30 years. Through 1971, the mountain lion was classified by the IDFG as a predator, with a continuous open season and no bag limit. In many years, a bounty was paid for dead lions. With reclassification as a game animal in 1972, management was initiated. In response to regulated harvest seasons and bag limits, concurrent increases in elk populations throughout much of the state, mountain lions increased in both number and distribution.

A three-fold increase in mountain lion harvest has been documented by IDFG mandatory check reports in game management units in the subbasin during the past 10 years. Hunters in these units harvested an estimated 27 mountain lions in 1990 vs. 81 during the 2000 hunting season. IDFG is currently in the process of revising its statewide mountain lion plan to readdress management philosophies, harvest objectives, and improvement of methodologies for monitoring mountain lion populations.

Forest Carnivores

Together, the fisher, marten, and wolverine are classified as forest carnivores. Each has been petitioned for listing under ESA. All are generally solitary, territorial, medium-sized carnivores that prey upon small or medium-sized mammals, some fruits and berries (wolverine), and birds. All were thought to be previously wide ranging across North America. Predicted distribution and habitats in Idaho for these species closely correspond to the forested habitats described previously. Priority habitats include grand fir, subalpine fir, and whitebark pine forests.

Fisher were nearly extirpated in Idaho as a result of large fires and over-trapping. Reintroduction of fishers beginning in the 1960s has successfully reestablished fishers in Idaho but it is unlikely that many occur south of the Salmon River (Jones 1991; Maj and Garton 1994). Fisher habitat is structurally complex with multiple canopy layers, diverse prey populations, and available dens and rest sites. Most preferred habitats in Idaho were closed canopy, later-seral, mesic forests close to water (Jones 1991). Marten habitats are similar (Koehler and Hornocker 1977; Spencer *et al.* 1983). In Idaho, wolverines prefer secluded subalpine talus sites for natal and kit rearing dens (Copeland and Harris 1993). The character of wolverine habitat most commonly described is its isolation from the presence and influence of humans.

Conservation strategies for these three species can be broadly grouped. They include protection from modification of species habitats through fragmentation, protection from human presence and disturbance, maintaining refugia, linkages and critical dispersal corridors, and maintaining habitat disturbance processes such as fire and disease. Basic biological knowledge of these species, especially as it varies by spatial scale, is an important need.

Small Mammals

Information on the distribution and status of small mammals within the subbasin is limited. There are 54 species of small mammals resident to the Boise-Payette-Weiser subbasins. These include 13 bat species, 5 shrew species, 1 mole species, 6 lagomorph species, 11 squirrel species, 2 gopher species, 2 pocket mouse species, 13 vole species, and 1 jumping mouse species. Those listed as sensitive or listed species include the coast mole, long-eared myotis, long-legged myotis, California myotis, spotted bat, Townsend's big-eared bat, and northern and southern Idaho ground squirrels.

The coast mole occurs in Idaho only in the counties of Adams and Washington. This species is associated with agricultural lands, grassy meadows, coniferous and deciduous forests and woodlands, and along streams. The coast mole is primarily a fossorial species with a diet of insects and other invertebrates.

The long-eared myotis is a widespread and not uncommon species, but very little is know about its habits. It is found mostly in forested areas, especially those with broken rock outcrops. In Idaho, all roosts were located near water.

The Idaho distribution of long-legged myotis is poorly known. This species used caves and mines as hibernacula, but apparently avoids them during the summer as roost sites. This species is suspected of changing preferred habitats seasonally.

Like the coast mole, the California myotis has only been documented in Adams and Washington County. It is suspected that this species has a broader distribution in Idaho. This species has a longer period of activity including forays during the winter months on warmer days.

The spotted bat is one of the few species that humans can hear echolocate. Its Idaho distribution is primarily confined to the southwestern corner of the state. A portion of its known range extends into the southern edge of the Boise-Payette-Weiser subbasins.

Although a fairly common species in the west, the Townsend's big-eared bat is classified as an endangered species in the eastern U.S., and a species of special concern in Idaho. This species is consistently found in areas with canyons or cliffs. This species may also be active during the winter months as it moves between hibernacula. This species is relatively sedentary and displays a high degree of site fidelity.

The northern Idaho ground squirrel is a threatened species inhabiting two counties in the subbasin complex. The species inhabits xeric montane meadows within coniferous forests. The current population estimate for this species is less than 400 individuals. The southern Idaho ground squirrel is a candidate species inhabiting three counties of the subbasin complex. The species inhabits lower elevation shrub/steppe habitats. The current population estimate for this species is less than 1,200 individuals.

Little is known about the remaining sensitive small mammals. Biological surveys for these species are needed. Habitat fragmentation, land management practices, and recreational development may be affecting the productivity of these species.

Birds

There are 243 species of birds believed to breed in Idaho. Of these, 119 are neo-tropical migrants, birds that breed in Idaho but migrate to winter in the neo-tropics of Mexico, Central America, the Caribbean, and South America (Idaho Partners in Flight 2000). In the Boise-Payette-Weiser subbasins, the following have been documented: 69 species that are yearlong residents, 96 that are summer residents, 7 that are winter visitors, and 63 that are transient. Despite the high numbers of species present both in the state and within the three subbasins, little attention has been given to identifying the distribution and status of most of these avian species. Additional information on the status, distribution, and trends of avian species that occur in the subbasin is needed. The lack of information regarding avian species contributes to the difficulties of developing sound management decisions for addressing the needs of these species. However, efforts will prove most effective when concentrated on habitat-based initiatives that protect and enhance habitats for key species guilds. The primary areas where habitat-based efforts would have the greatest beneficial effect on the most migratory bird species include riparian and ponderosa pine habitats protection and restoration.

Raptors

The Northern goshawk has a range that spreads through large parts of North America. In the subbasin complex, they are uncommon but widespread among the forested habitats. Goshawks prey upon small birds and mammals (Marshall 1996). Northern goshawks inhabit mature forests and require three kinds of habitats: nesting, post-fledgling family, and foraging areas. Nest sites are typically located in the most mature component of the timber stand. Post-fledgling family habitat should contain mid-seral forested stands, forest openings with a herbaceous layer and large trees, downed logs and snags. Foraging habitat is the prey species' habitat combined with areas that allow for goshawks to hunt and capture prey (Graham *et al.* 1994).

Upland Birds

Sage Grouse

The sage grouse is the largest North American grouse species, and it was once abundant throughout sagebrush (*Artemisia spp*.) habitats of the western U.S. and Canada, but breeding populations have experienced precipitous declines across their range and throughout Idaho (Connelly and Braun 1997). Sage grouse are sagebrush obligates that depend on large, contiguous expanses of sagebrush/grassland habitat. These areas provide critical winter habitats and breeding range. Meadows, riparian areas, and other moist areas provide important summer ranges. Sagebrush and understory grasses and forbs provide important components of nesting and brood-rearing habitat. Insects provide a high-protein diet to sage grouse chicks. Sagebrush height and canopy coverage are critical factors influencing all aspects of sage grouse ecology (Connelly *et al.* 2000).

The quality and quantity of sagebrush habitats have declined for at least 50 years (Connelly et al. 2000). The reasons for habitat loss vary from site to site but include wildfire, agricultural expansion, herbicide treatments, prescribed fire, abuse of livestock grazing, and rangeland seedings. The amount of historical shrub-steppe habitat has declined dramatically (ICBEMP 1997).

In the short-term, spring and early summer weather is often the primary factor influencing sage grouse populations. Late May and early June snows and cold rains can cause young chicks to die from hypothermia. Cool spring and dry summer weather can limit insect populations. Young chicks may then die from starvation, increased exposure, or predation while forced to travel longer distances to find food.

Management efforts directed at this native grouse are often fragmented between different agencies and landowners without common goals or direction. To rectify this, the 1997 *Idaho Sage Grouse Management Plan* identifies how the signatories including IDFG, BLM, USFS, the Natural Resources Conservation Service (NRCS), Idaho Department of Lands (IDL), and Pheasants Forever, will work together to recover sage grouse habitats and populations.

Sage grouse habitat quality and quantity has declined throughout the subbasin complex and coincided with declines in sage grouse numbers. Sage grouse populations in the Boise-Payette-Weiser subbasins are largely dependent on range conditions and spring weather during nesting and brood rearing. Recruitment of birds into the fall populations will be governed by uncontrollable weather factors until habitat quality and quantity is improved (IDFG 2001). IDFG personnel have worked closely with the BLM to reduce impacts of present and proposed land management practices on sage grouse habitat. Recommended conservation strategies include following the *Sage Grouse Habitat Management Guidelines*, increasing population information, improving riparian habitats, restoring brood habitats through work with water diversions, reducing mineral development impacts on sage grouse habitats, and identifying lek areas.

Sharp-tailed Grouse

Trends in sharp-tailed grouse populations are unknown in the subbasins. Washington County leks (located in Weiser subbasin) are monitored by BLM personnel and indicate a stable number of birds attending leks in recent years. Populations are far below long-term levels due to habitat losses (IDFG 2001).

Due to habitat loss, sharp-tailed grouse populations in the subbasins have been reduced to remnant flocks in Washington, Adams, and Payette Counties (IDFG 2001). The IDFG has encouraged land management agencies to protect sharp-tailed grouse habitat when planning land management activities. The IDFG has entered into a cooperative agreement with the BLM and The Nature Conservancy to manage sharp-tailed grouse populations and habitat in Washington County. An area of critical habitat for sharp-tailed grouse, comprised of approximately 7,000 acres of BLM and The Nature Conservancy lands, will be managed for sharp-tailed grouse by the cooperators. The IDFG will provide increased enforcement patrols, monitoring of leks, and survey other areas for possible inclusion into the monitoring program.

Forest Grouse

Forest grouse populations are dependent on good nesting and brood-rearing conditions in the three subbasins. There is concern that insect damage to evergreen species may have a negative impact on blue grouse population.

The IDFG has emphasized good forest grouse habitat management procedures to the BLM and the USFS when reviewing timber sales and livestock management plans (IDFG 2001). Fir habitats are important for wintering blue grouse; white aspen and spruce habitats are important for ruffed grouse and spruce grouse, especially during winter.

Chukar and Gray Partridge

Chukar and gray partridge populations are introduced species that are largely dependent upon spring weather conditions during nesting and brood rearing in the three subbasins. Recruitment of birds into the fall populations will be governed by uncontrollable weather factors until habitat quantity and quality is improved to moderate the effect of weather conditions.

The chukar and gray partridge populations are below historic highs, but good populations still exist. Habitat needs to be improved and the amount of high quality habitat needs to be increased (IDFG 2001).

California Quail

California quail populations have increased over time because of irrigated farming and more habitat along canals and drains. Populations have been fairly stable over the long-term, but experience short-term population fluctuations due to weather conditions during the nesting and brood-rearing seasons in the three subbasins. Populations are currently in good condition (IDFG 2001).

Mountain Quail

The mountain quail was historically common throughout western Idaho (Sands *et al*. 1998; IPC 1998; A. Ogden, IDFG, personal communication), including areas within the Boise-Payette-Weiser subbasins. Only 11 mountain quail populations are known to exist in Idaho (Sands *et al.* 1998). Habitat loss, degradation, and fragmentation are factors identified in the decline of mountain quail distribution and abundance. Existing and potential habitats in the Mid Snake River subbasin are threatened with development, changed fire frequencies, riparian habitats

degradation, grazing, noxious weeds, timber harvest, and domestic pets acting as mountain quail predators. There is a need for more population research and the mountain quail conservation strategy calls for the reestablishment of mountain quail populations through reintroduction.

Pheasant

Pheasants were introduced in the 1940s as game animals. Pheasant populations are largely dependent upon winter habitats, nesting habitats, and spring weather conditions during nesting and brood-rearing time within the subbasins. Weather conditions will have a larger influence on the pheasant population while the habitat remains low quality. Habitat quality and quantity needs to be improved to moderate the effect of weather conditions. Uncontrollable weather factors will be the major influence on recruitment of birds into the fall populations until habitat conditions improve. Pheasant populations continue to decline with loss of habitat (IDFG 2001).

Turkey

Wild turkeys were first introduced in the 1960s. More intensive introduction efforts took place in the early 1980s. The IDFG has supported enhancement of turkey habitat by plantings of food plots specifically for wild turkey on USFS lands; by input into land use plans on the importance of turkey habitat; and by habitat improvement projects on IDFG owned lands. Wild turkey numbers continue to increase in the Boise-Payette-Weiser subbasins (IDFG 2001).

Cavity Nesters

Flammulated Owl

The flammulated owl is a small, nocturnal, insectivorous owl. Common food sources during the breeding season are grasshoppers, beetles, and moths (Marshall 1996). The flammulated owl is a documented nesting species in Idaho. Population trends are not known the subbasins. Flammulated owl habitats include ponderosa pine and Douglas-fir woodlands. These stands have multiple canopy layers and tend to be open forests with grassland and dense forest patches. These habitats are threatened by fire exclusion.

Black-backed Woodpecker

Black-backed woodpeckers are widely distributed but rare in the Boise-Payette-Weiser subbasins. There are a limited number of element occurrences in the three subbasins. Because suitable habitat often shifts as a result of fire occurrence, trend and abundance data are limited on these species. Large severe fires have positive consequences for black-backed woodpeckers, so fire suppression and post-fire salvage logging may negatively affect the species (Dixon and Saab 2000).

White-headed Woodpecker

The white-headed woodpecker is considered uncommon throughout its range. The white-headed woodpecker has a close association with mature ponderosa pine forests. Preferred nest sites

include use of large (>21 inch dbh) dead trees most often excavated within 16 feet of the ground. White-headed woodpeckers display a distinct preference for broken-topped trees and rely heavily upon the seeds of conifers to supplement their diet of insects (Ligon 1973, Raphael and White 1984, Frederick and Moore 1991). Problems facing the species include the modification or elimination of mature ponderosa pine stands, loss of habitat through fire, motorized access and firewood cutting, and lack of biological information (IDFG 1995).

Waterfowl and Shorebirds

Although migratory waterfowl and shorebirds are affected by out-of-basin changes in wintering habitats, migration weather, and wintering conditions; those summer resident and breeding species that occur in the subbasin are dependent on habitats in the basin to maintain population viability. Important and sensitive breeding land birds in the three subbasins include the long-billed curlew and upland sandpiper.

With the development of farming in these subbasins, natural wetlands have been drained across the region. This has caused a loss of breeding and rearing areas for waterfowl. At the same time, the control of water and the use for agriculture has increased the food supplies from grain and grass crops that are raised in the area. As more development has occurred, there has been a significant increase in the number of farm and stock ponds. In the last twenty years, the increase in housing developments with water bodies has increased the security areas for gees and ducks. Today, there are more open water bodies and more are being developed.

Herpetofauna (Amphibians and Reptiles)

There are 8 species of amphibians and 9 species of reptiles known or predicted to occur in the three subbasins, but information on their distribution and status in the area is limited. Of those species, 3 amphibian (western toad, northern leopard frog, and Columbia spotted frog) and 1 reptile species (ringneck snake) have received IDFG species of special concern status. The Columbia spotted frog has received additional research effort in recent years; however, the research has been primarily focused on the Owyhee subpopulation, situated outside this subbasin complex.

Habitat Areas and Quality

Fisheries

Boise River Subbasin

Wildfire Effects on Native Fish

From 1986 to 1994, over 525,000 acres burned on the BNF. U.S. Forest Service (USFS) fishery biologists monitored fish abundance and stream habitat quality within watersheds associated with six major wildfires. These six fires were deemed uncharacteristically severe and large, and the largest of them (over 225,000 acres) occurred primarily in dry forest types of ponderosa pine and Douglas-fir. About 50 percent of the ponderosa pine-dominated forests on the BNF were burned during this period. However, on average, only about 18 percent of a typical watershed were burned at high intensity (Burton 2000). Most watersheds experienced predominantly low intensity burning and about one-third of a typical watershed did not burn at all.

Direct mortalities of native salmonids were documented in some instances where high intensity fires burned adjacent to streams. However, high intensity fires occurred only along relatively short stream segments, so many native fish survived in adjacent refuge areas. Post-fire floods and debris flows associated with these fires caused local, heterogeneous degradation of stream habitats for native fishes. Localized debris flows typically occurred in small order streams. Often, unburned landscapes and those that burned at lower intensity served as refuge habitat for fish.

Only about 25,000 acres of the total burn area experienced severe post-fire debris flooding and stream habitat alterations. Stream and riparian habitat conditions and salmonid densities declined dramatically following debris flows. However, in the most severely impacted streams, habitat conditions and salmonid populations rebounded dramatically, often within five years following a flood event (Burton 2000). In some cases, large numbers of young-of-the-year and juvenile fish were sampled several years after flood events, suggesting strong productivity following the dramatic changes observed from wildfires. Post-fire floods apparently rejuvenated habitats by transporting fine sediments, and by bringing in large amounts of large rock, woody debris, and nutrients that resulted in higher fish densities than prior to the fires (Burton 2000). Redband trout were particularly productive in some systems post-fire since optimal habitat typically includes high pool frequency and low substrate fine sediment.

Effects of these fires on threatened bull trout and spawning and early rearing habitats on the BNF have been neutral. These habitats are limited to colder streams located above 5,000 feet elevation, generally above the elevation range associated with severe post-fire debris floods. However, bull trout spawning habitats in Sheep Creek (Middle Fork Boise River watershed) and Rattlesnake Creek (South Fork Boise River watershed) experienced landslides and floods resulting in measurable declines in large woody debris, bank stability, increased sediment loading, and reduced pool frequency. High intensity burning caused localized fish mortality and temporarily extirpated fish from specific stream reaches. Bull trout may have sought refuge in more lightly burned reaches or unburned tributary streams due to the intense heat or habitat alterations during or immediately following the fires (Burton 2000). In Rattlesnake Creek, for example, which burned intensely in the 1992 Foothills Fire, large woody debris abundance had increased dramatically by the year 2000 as a result of felled trees killed by the fire. Width-to-depth ratios of pools were greatly improved as compared with the 1994 pre-flood measurements. Fish densities were higher, with bull trout abundance rebounding to pre-disturbance levels, and redband trout actually increasing to levels higher than pre-fire observations (Burton 2000). Large bull trout were documented in Rattlesnake Creek, suggesting that re-population was enhanced by mobility and fecundity of migratory bull trout (Burton 2000).

While fish populations can be significantly depressed by intense wildfires and post-fire debris floods, these events do not completely eliminate fish populations, or more importantly, cause the loss of the migratory component (Burton 2000). Large wildfires can have dramatic effects on fish and fish habitat, but such effects appear to be limited both spatially and temporally. Wildfire impacts on bull trout habitat are variable and difficult to predict due to varying site conditions, fire behavior, and prior history (Montana Bull Trout Scientific Group 1998). Fire effects on aquatic systems tend to be more pronounced in small watersheds (Minshall *et al.* 1989). Jones *et al.* (1993) monitored large (greater than fourth order) streams in Yellowstone National Park following the intense 1988 fires and found few definitive relationships between fire intensity and post-fire variation in hydrologic regime, stream habitat, and water chemistry. They concluded that the changes observed did not adversely affect fish

populations in monitored streams. Bowman *et al.* (1998) reported no significant adverse effects from wildfire on the chemical or physical habitat or biotic components of several tributary streams within the Middle Fork Salmon River drainage, Idaho.

Losses Resulting from Dam Construction

The IDFG quantified lotic habitat lost as a result of construction of Anderson Ranch Dam, Black Canyon Dam, Boise River Diversion Dam, and Deadwood Dam (IDFG, unpublished information). The IDFG also estimated the number of salmonids (bull trout, rainbow trout, and whitefish) that likely would have inhabited the lotic habitat lost following dam and reservoir construction. The following discussion of estimated habitat and fishery losses was derived from an internal IDFG unpublished report that has not received peer review.

Historically, Shoshone Falls near Twin Falls, Idaho on the Snake River blocked upstream fish migration. Upstream from Shoshone Falls, salmonid communities were dominated by Yellowstone cutthroat trout and whitefish. Other native species present included leatherside chub, longnose dace, Piute sculpin, redside shiner, speckled dace, Utah chub, and Utah sucker. Downstream from Shoshone Falls, salmonid communities were dominated by salmon and steelhead (CBIAC 1956; USFWS 1980). At least three anadromous salmonids utilized the Boise and Payette Rivers, including chinook, sockeye, and steelhead (Caldwell and Wells 1974). Because there was no accessible lake-rearing habitat for juveniles in the Boise River subbasin, sockeye salmon were likely strays from the Payette River. Pacific lamprey was also present.

Dam construction eliminated salmon and steelhead in areas upstream from dams. Following dam construction, native salmonid communities downstream from Shoshone Falls were dominated by redband trout, bull trout, and whitefish (Caldwell and Wells 1974; USFWS 1980). Other native species present included white sturgeon (*Acipenser transmontanus*), mountain whitefish, northern pikeminnow, sculpin, chiselmouth, long nose dace, peamouth (*Mylocheilus caurinus*), redside shiner, speckled dace, and several sucker species.

Historically, bull trout, cutthroat trout, and redband trout populations were comprised of resident and migratory forms (SBNFWAG 1998). Resident populations generally spend their entire lives in tributary and headwater streams. Migratory forms rear in tributary streams for several years and migrate to more productive downstream habitat in larger rivers (fluvial) or lakes (adfluvial).

The coexistence of migratory and resident forms of trout is important (Rieman and McIntyre 1995). Migratory trout link resident populations to the species' gene pool. Barriers to migration isolate resident populations, which cause isolated populations to become vulnerable to habitat degradation, loss of genetic diversity, and local extirpation (USFWS 1999).

Estimating native sport fish losses is exceptionally difficult, especially when pre-impoundment data are nonexistent or qualitative in nature. However, attempts have been made to estimate losses using post-impoundment fisheries information (Zubic and Fraley 1987; Marotz *et al.* 1998). In both studies, the authors estimated native fish losses by averaging population data from tributary and river reaches in the same geographical area, and then applied those values to the amount of inundated habitat. The IDFG used a similar approach to estimate the losses of bull trout, redband trout, and mountain whitefish resulting from the construction of Anderson Ranch, Black Canyon, Boise River Diversion, and Deadwood Dams.

South Fork Boise River

During 1997 through 1999, IDFG and IDEQ crews surveyed 105 individual road/stream crossings or related sites. Of the sites surveyed, 26 were considered to be barriers to bull trout passage under some flow conditions. The primary reason most of the structures were considered barriers was due to gradient and resulting high water velocities. Of the 26, only seven were in drainages considered potential bull trout habitat. The smaller drainages were generally intermittent streams or streams less than 2.0 cfs. The larger drainages were Big Water, Fall, Little Water, Steel, Trinity, Whiskey Jack, and the Feather River. It was also determined that not all of these structures were complete barriers to upstream movement. The culverts on the Feather River had surface velocities of almost 10 feet/second during spring runoff along with a cement base below the outlet, however radio tagged bull trout were found upstream of the culvert. Low water evaluation of the Feather River culverts found the joints in the bottom of the culvert folded up which created baffles reducing bottom velocities.

In addition to culverts and bridges, the natural waterfall on Fall Creek was also evaluated. This falls is located 2 miles upstream from the reservoir and has a drop exceeding 13 feet. In the geologic past, there was a high water channel, which flowed around the falls and reentered the stream approximately 660 feet downstream allowing upstream movement of fish during high water conditions. This channel flows along the base of the fill below the road and may have been blocked off several years ago by road maintenance crews to reduce problems of erosion along the fill.

Middle Fork Boise River

Overall habitat quality in the upper Middle Fork Boise River is very good. Historic dredge mining activity from the Atlanta area to Kirby Dam has left terraces of cobble and gravel above the current floodplain. Above Atlanta, in the vast majority of the watershed, habitat conditions improve. Burton (1998, 2000) noted that conditions in the upper Middle Fork meet criteria established for focal and adjunct bull trout habitat, meaning most of the drainage could provide suitable migration, spawning, and rearing habitat.

Instream habitat conditions in the upper Middle Fork Boise River do not appear to be a limitation to fish populations in general. Redband trout are present throughout the upper Middle Fork Boise River and, although bull trout distribution in this reach is restricted to one tributary drainage and the lower mainstem Boise River, the entire upper Middle Fork Boise River is considered good bull trout habitat (Burton 1998, 2000).

From the early 1900s to 1999, Kirby Dam acted as an upstream migration barrier to all fish and effectively isolated the upper Middle Fork Boise River from any migratory fish in the lower river (Grunder 1997). Current bull trout distribution is limited to a local resident population in the Yuba River drainage (Burton 1998). Redband trout are present throughout the upper drainage. A fish ladder was installed at Kirby Dam in 1999. Restoration of fish passage should allow reestablishment of adfluvial and fluvial migratory fish populations above the dam. Initial monitoring confirmed use of the ladder by bull and redband trout (IDFG, unpublished data). Continued monitoring at the ladder and in the upper watershed will be required to document and quantify bull trout recolonization.

Following a partial structural failure in June 1990, the original Kirby Dam log crib structure completely collapsed in May 1991, sending an estimated 200,000 yards^3 of accumulated sediment into the Middle Fork Boise River. The majority of material settled within 5 to 8 miles

of the dam with some fine materials carrying as far downstream as Arrowrock Reservoir. Biologists documented surface fine sediment levels in excess of 40 to 50 percent following the collapse of Kirby Dam (IDFG file records). Biologists also collected fish samples for the Idaho Department of Health and Welfare for testing for arsenic and mercury. Elevated levels of both heavy metals were found in fish tissue samples and a health alert was issued for the entire Middle Fork Boise River (R16). Fish populations did not appear to suffer any long-term effects from this event, however. Subsequent snorkeling evaluations in 1993 and 2000 indicated a general increasing population trend for redband trout, while bull trout numbers remained relatively unchanged Table 30.

There have been many other anthropogenic and natural events in the Middle Fork Boise River corridor. Recruitment of fine sediments to the mainstem river channel is chronic and is largely due to high road densities, fire, past logging and mining activities, and landslides. Rohrer (1990) reported that the percentage of sand in the substrate was higher in the upper Middle Fork Boise River watershed relative to similar B-channel types in the Salmon and Clearwater River subbasins.

Habitat conditions in important spawning and rearing tributaries of the Middle Fork Boise River such as Queens and Little Queens Rivers, Black Warrior Creek, and Roaring River are generally good and meet the established criteria for bull trout spawning and rearing habitat. The Sheep Creek drainage, used by spawning adfluvial bull trout in 1996 (R21), was extensively altered during a high intensity wildfire in 1992. Bull trout telemetry studies conducted in 1997 and 1998 failed to document any use of Sheep Creek by radio tagged adult bull trout (Flatter 1999).

Table 30. Densities of rainbow trout and bull trout observed using snorkeling techniques in the Middle Fork Boise River in 1988, 1993, and 2000.

Section	Year	Wild rainbow trout density (fish/100 m^2)				Bull Trout	Hatchery Rainbow Trout
		0-101 mm	102-203 mm	204-304 mm	>304 mm	All Sizes	
8	2000	0	0.07	0.21	0.07	0	0
11	1988	0	0.84	0.06	0	0	0.28
	1993	0.34	0.89	0.83	0.05	0	0.10
	2000	0.18	0.64	0.32	0.27	0	0.05
14	1988	0.14	0.79	0.07	0	0	0.14
	1993	0.59	0.93	0.66	0.20	0.07	0.13
	2000	0.12	0.30	0.24	0.12	0	0
18	1988	0.05	0.38	0.28	0.05	0	1.09
	1993	0.70	1.31	0.14	0.14	0.05	0.05
	2000	1.06	2.11	0.82	0.23	0	0
23	1988	0	0.06	0.93	0	0	0.81
	1993	0	0.03	0.08	0.08	0	0
	2000	0.05	0.05	0.30	0.05	0	0
26	1988	0.03	0.10	0.51	0	0.07	0.07
	1993	0.06	0.16	0.06	0.02	0	0.12
	2000	0.41	1.47	0.57	0.16	0.41	0.33
27	1988	0	0.31	0.87	0	0	6.53
	1993	0	0.25	0.10	0.05	0.05	0.25

Section	Year	Wild rainbow trout density (fish/100 m^2)				Bull Trout	Hatchery Rainbow Trout
		0-101 mm	102-203 mm	204-304 mm	>304 mm	All Sizes	
	2000	0.69	1.91	0.38	0	0.61	0
30	1988	0.18	0.55	1.28	0	0.09	0.27
	1993	0.08	0.08	0.16	0	0	0.08
	2000	1.76	2.11	0.56	0.42	0.14	0
34	2000	0.56	1.80	0.11	0	0	0.22
35	1988	0.05	1.03	0.89	0	0	2.48
	1993	0.32	0.58	0.21	0	0.05	3.56
	2000	1.56	1.95	0	0	0	1.47

Anderson Ranch Dam

Prior to the completion of Anderson Ranch Dam, the resident native fish community of the South Fork Boise River drainage was composed of bull trout, redband trout, mountain whitefish, northern pikeminnow, sculpin, and several sucker species (Caldwell and Wells 1974; USFWS 1980). Brook trout, cutthroat trout, kokanee, rainbow, redside shiner, smallmouth bass, and yellow perch have been introduced.

Fish responses to the inundation of the South Fork Boise River were varied. Gebhards (1963) reported that following impoundment, northern pikeminnow and sucker populations increased. Conversely, mountain whitefish, bull trout, and redband declined dramatically. It was assumed that the declines were caused from competition and predation by expanding pikeminnow and sucker populations, which flourished in the reservoir environment (CBIAC 1956; Gebhards 1963).

Anderson Ranch Reservoir inundated 15 miles of the South Fork Boise River and 5.3 miles of tributary streams. Total area inundated of 1st to fourth order streams, and the South Fork Boise River was 297 acres. Area inundated by of first to fourth streams and the South Fork Boise River was 276 acres.

Habitat for 266 bull trout and 5,748 redband trout was lost in tributaries inundated by Anderson Ranch Reservoir. Habitat for an additional 335 bull trout and 13,862 redband trout was lost by the inundation of 15 miles of the South Fork Boise River. Whitefish lost from river and tributary inundation totaled 16,347. Annual loss from inundation each year since 1950 includes 601 bull trout, 19,610 redband, and 16,347 whitefish.

The completion of Anderson Ranch Dam blocked fluvial bull trout and perhaps redband trout from reaching headwater populations. The dam blocked 75 percent of the South Fork and 24 percent of the entire Boise River drainage (BOR 1997). Estimating losses from the reservoir impacts are problematic without data from an unaltered system in the region. Surrounding watersheds have similar barriers to migrant fish populations. The IDFG did not attempt to quantify losses from construction attributable to migration barriers.

Black Canyon Dam

Historically, the resident native fish community of the Payette River supported migratory and resident forms of bull trout and redband trout (Jimenez and Zaroban 1998). Also present were

mountain whitefish, largescale and bridgelip suckers, northern pikeminnow, redside shiner, longnose and speckled dace, and sculpin.

Black Canyon Dam and Reservoir inundated 9 miles of the Payette River and 2.4 miles of tributary streams. Total area inundated of first to fourth order tributaries, and the Payette River was 296.5 acres. Area inundated by first to fourth streams and the Payette River was 288.6 acres.

Habitat for 473 redband trout was lost in tributaries inundated by Black Canyon Reservoir. An additional 140 bull trout and 11,681 redband trout were lost by the inundation of 9 miles of the Payette River. Whitefish lost from river and tributary inundation totaled 75,370. Annual loss from inundation each year year since 1924 includes 140 bull trout, 12,147 redband, and 75,370 whitefish.

The completion of Black Canyon Dam blocked fluvial bull trout and perhaps redband trout from reaching headwater populations. Estimating losses from the reservoir impacts are problematic without data from an unaltered system in the region. Surrounding watersheds have similar barriers to migrant fish populations. The IDFG did not attempt to quantify losses from construction attributable to migration barriers.

Boise River Diversion Dam

Historically, the Boise River supported migratory and resident forms of bull trout and redband trout (Steed *et al.* 1998). Also represented in the resident native fish community were mountain whitefish, northern pikeminnow, sculpin, and several sucker species (Caldwell and Wells 1974; USFWS 1980).

Fish loss in the Boise River resulting from construction of Diversion Dam is limited to 108.7 acres of the Boise River that was inundated. No fish bearing tributaries exist within the inundated reach. Mean width of the Boise River in the inundated reach was calculated using the ATM map tracing software.

The Boise River Diversion Dam and Reservoir inundated 4.9 km of the Boise River. No fish bearing tributaries were inundated by the construction of Boise River Diversion Dam. Total area of the Boise River inundated was 108.7.

Habitat for 1,827 redband trout and 26,709 whitefish was lost by inundation due to the Boise River Diversion Dam Reservoir (effects on migratory populations due to the migration barrier is unknown).

The completion of the Boise River Diversion Dam blocked fluvial bull trout and redband from reaching headwater populations. The dam blocked 65 percent of the Boise River drainage (BOR 1997). Estimating losses from the above impacts are problematic without data from an unaltered system in the region. Surrounding watersheds have similar barriers to migrant fish populations. The IDFG did not attempt to quantify losses from construction attributable to migration barriers.

The Boise Diversion Dam Project resulted in a total estimated loss of 42 target species Habitat Units (HUs) (Meuleman *et al.* 1986). The loss assessment did not include an evaluation of the impacts on fish or wildlife as a result of the Project blocking upstream fish migration and entraining fish into the New York canal.

Deadwood Dam

Historically, the resident native fish community of the South Fork Payette River drainage supported migratory and resident forms of bull trout and redband trout (Jimenez and Zaroban 1998). Also present were mountain whitefish, largescale and bridgelip suckers, northern pikeminnow, redside shiner, longnose and speckled dace, and sculpin.

Deadwood Reservoir inundated 7 km of the Deadwood River and 22.1 km of tributary streams. Within the reservoir, the Deadwood River is a 3rd and 4th order stream. Mean width of 1st to 4th order streams was 2.2, 3.3, 8.1, and 17.0 m, respectively. Total area inundated of 1st to 4th order streams was 23.18 ha. Area inundated by stream order (1st to 4th) was 0.6, 3.2, 17.6, and 1.8 ha, respectively.

Habitat for 347 bull trout, 13,551 redband trout, and 116 whitefish was lost in the Deadwood river and tributaries inundated by Deadwood Reservoir. Estimated annual loss from inundation each year since 1931 includes 347 bull trout, 13,551 redband trout, and 116 whitefish.

The completion of Deadwood Dam blocked fluvial bull trout and perhaps redband trout from reaching headwater populations. The dam blocked 50 percent of the South Fork Payette River and 12 percent of the entire Payette River Drainage (BOR 1997). Estimating losses from the reservoir impacts are problematic without data from an unaltered system in the region. Surrounding watersheds have similar barriers to migrant fish populations. The IDFG did not attempt to quantify losses from construction attributable to migration barriers.

Payette River Subbasin

North Fork Payette River

Numerous irrigation dams divide stream habitat in the North Fork Payette River watershed. Granite Lake, Upper Payette Lake and Payette Lake all have outlet structures that prohibit upstream movement of fish. Irrigation storage and diversion have altered the normal hydrograph of stream flows in the watershed.

The Payette Lake watershed has been extensively studied. Roads were identified as contributors to sediment input to Upper Payette Lake and Payette Lake (IDEQ 1997). Comparison of stream habitats of watershed streams to reference streams found greater amounts of fine sediments, somewhat higher water temperatures and higher than desirable width to depth ratios (IDEQ 1997).

Payette Lake is defined as oligotrophic but has substantial dissolved oxygen deficits in the near bottom waters of the southwest basin (Woods 1997). The southwest lake basin developing anoxia problem was related to lengthy water residence time and incomplete water column circulation and long-term build of organic matter (Woods 1997). Eurasian milfoil (*Myriophyllum spicatum*) an invasive aquatic macrophyte was identified in littoral areas of Payette Lake (IDEQ 1997). The *Big Payette Lake Management Plan* and *Plan Implementation Program* were accepted by the Idaho Legislature in December 1997.

The North Fork Payette River below Payette Lake was found to have limited potential for quality trout fishery because of lack of cover, low productivity and stream bank erosion (Janssen *et al.* 2000). The stream substrate changed noticeably from the Payette Lake outlet to the reservoir influence of Cascade Reservoir; the substrate changed from rubble and boulder to primarily sand at the lower end (Janssen *et al.* 2000).

Lake Fork Creek

Water diversions on both private and public lands are the largest limitation to a viable bull trout metapopulation (Faurot 2001). The Lake Fork watershed has several irrigation diversions that limit water flow and are fish migration barriers. Browns Pond, Little Payette Lake and several mainstem irrigation diversions completely block Lake Fork Creek (NRCE 1996). Faurot (2001) lists the majority of indicators for population and environmental baselines as functioning at risk or functioning at unacceptable risk for the Lake Fork subwatershed.

Gold Fork River

In focal habitat (those currently supporting bull trout spawning and rearing) within the Gold Fork River watershed, temperature, contaminants, large woody debris (LWD) and pool frequency are good and probably reflect the existing high-density stream cover and LWD in the watershed. Sediment and large pools are functioning at inappropriate risk and possibly indicate the effects of high road density. Conversely, adjunct habitat (those that do not, but could support spawning and rearing), reflect the effects of high densities of stream cover and shading, but are also suffering from road sedimentation, possible road culvert barriers, filled pools, and lack of refugia and off-channel habitat. Contaminants are functioning at risk due to high bedloads carrying excess nutrients (Steed 1998). High fine sediment is a problem. The fines cause problems by filling fish redds and creating small sized spawning gravels (Steed 1998). The Gold Fork River is blocked by the diversion structure of the Gold Fork Canal. The structure is a fish migration barrier and has prevented fish movement since the 1920s (BCC 1996). Several smaller fish migration barriers on the road system have been identified (BCC 1996).

Cascade Reservoir

Under section 303(d) of the Clean Water Act, Cascade Reservoir has been identified as water quality limited due to excessive phosphorus loading from the surrounding watershed. Nuisance algal growth resulting from nutrient loading has impaired beneficial uses of the reservoir, specifically, fishing, swimming, boating and agricultural water supply (IDEQ 1998). The reduction goal of 37 percent input of total phosphorus to the reservoir and a watershed management plan, which constitutes the functional equivalent of a TMDL was created (IDEQ 1998). An implementation plan for Cascade Reservoir based on subwatershed point and non-point source projects was developed (IDEQ 2000).

Cascade Reservoir has a 300,000 acre-foot minimum storage pool to over-winter the fishery (IDEQ 1998). The minimum pool was also supported within the TMDL with the discussion that a larger summer minimum pool might be needed (IDEQ 2000).

Habitat in small tributary streams on the west side of Cascade Reservoir is critical, especially when the reservoir water quality conditions become poor in late summer. Attempts at salmonids reproduction in the reservoir tributaries is evident, but success has been marginal due to water withdrawals, diversion structures for irrigation, warm summer temperatures, and lack of stream substrate due to sedimentation (USFS 1998).

A large fish kill just after ice out in 1997 resulted in dead yellow perch, largescale suckers, and northern pikeminnow. All dead yellow perch observed were very large specimens, 254 mm (10 inches) to 330 mm (13 inches) in length. There were very few yellow perch less than 254 mm (10 inches) observed, indicating that the 1995 and 1996 age class had failed. There was also

a significant yellow perch die off documented on July 26 when approximately 8 to 25 mm (0.31 to 0.98 inches) yellow perch per m^2 were found dead and floating northwest of Sugarloaf Island. The collection of sick, moribund and dead young-of-year and age 1 yellow perch in June, August and October of various years as well as significant fish kills documented in March, April, and July in various years suggests that environmental factors were playing a role in the demise of perch in Cascade Reservoir. Due to bottom dissolved oxygen levels of less than 3.0 ppm in late summer, it appeared that yellow perch were being forced out of specific areas. Areas where IDFG had collected yellow perch in May and then none in July were the same areas where dissolved oxygen levels were sufficient in May and not in July. Fish were either leaving these areas or being driven up in the water column (Janssen et al In press a).

Deadwood River

The substrate in the Deadwood River is dominated by sand in the lower reaches, with gravels and cobbles dominating the substrate in the upper drainage. Considerable mining activity took place in the upper drainage historically, but current conditions meet criteria for focal and adjunct bull trout habitat (SBNFTG Problem Assessment 1998).

Low productivity, very cold temperatures, and low densities of salmonids characterize the mainstem Deadwood River below the reservoir. The river is generally a high gradient run/riffle complex with little pool habitat available for fish, and is in a roadless area for approximately 25 miles.

Deadwood Reservoir

Deadwood Reservoir is subject to frequent drawdowns that increase in severity in drought years. Drawdown reduces productivity and available habitat for reservoir fish populations, including adfluvial bull trout that overwinter in the reservoir, and also impacts recreational access.

Stream habitat in the upper Deadwood River and tributaries is generally in good condition, although high sediment loading is evident in many reaches. Focal bull trout habitat is properly functioning for other criteria (SBNFTG Problem Assessment 1998).

The Middle Fork Payette River

The upper drainage contains excellent habitat for salmonid production and rearing. The cumulative effect of high road densities and land use practices throughout the watershed contribute a substantial sediment load to the lower river. Sand is the dominant river bottom substrate in a majority of the mainstem. Surface fine sediment levels averaged 40 percent when measured in 1990 (R15).

The South Fork Payette River

Headwaters to Lowman

Habitat quality in the upper sections of the South Fork Payette River is in good to excellent condition for wild redband trout. For bull trout, much of the upper drainage is also considered focal or nodal habitat (SBNFTG Problem Assessment 1998). Relatively low amounts of sand are found in the South Fork Payette River upstream of Lowman. Concentrations of sand ranged from

5.8 to 27.5 percent in the river bottom in 1988. Observations made in 1996 indicated habitat conditions were very similar to 1988.

Although the road densities found in the upper South Fork Payette River watershed are low, many are heavily traveled and discharge large quantities of sediment to the mainstem. The high gradient nature of this reach provides good conditions for flushing sediments to the lower drainage.

Lowman to Banks

The best salmonid habitat in this reach is found in the upper 20 miles located in the canyon. The river channel is very confined by steep canyon walls. Large cobbles, boulders, and bedrock dominate substrate in high gradient sections. Most pools contain large quantities of sand. Tributaries have good densities of redband trout.

Stream habitat in Clear Creek, a large tributary to the South Fork Payette River near Lowman, was intensively studied in 1977 (Corley and Burmeister). Biologists concluded that pools of sufficient size for salmonids were lacking and fine sediments were excessive. In 1998, the USFS improved the road, which was believed to be contributing a majority of the sediment to Clear Creek.

The lower eleven miles of the Lowman to Banks reach contains very little habitat suitable for salmonid production. Sand and large boulders dominate channel substrate. Most side channels are stagnant and sand-filled (IDFG file data, R22).

Banks to the Confluence of the Snake River

High levels of fine sediment are transported down the North Fork and South Fork of the Payette River. Irrigation withdrawals and returns flows dramatically affect water quantity and quality below Black Canyon Dam. High water temperatures and poor habitat quality cause a shift in fish community composition to non-game native fish and introduced species. Some redbands from the upper watershed winter in the lower reaches of the Payette River between Banks and Black Canyon Reservoir during the coldest winter months (IDFG file data).

The Squaw Creek drainage has a high load of fine particulates evidenced by the higher percentage of sand recorded in some sample sites. Livestock grazing, historical and current logging, and agricultural practices contribute to the instream habitat degradation (R19).

Livestock grazing and agricultural practices contribute substantially to the instream habitat degradation of the Payette River below Black Canyon Dam (R23). Allen *et al.* (1999) documented water surface temperatures that ranged from 20°C (68°F) in August to 13.5°C (56.3°F) in October (R24). Extreme water temperatures and poor water quality have eliminated native salmonid production from this reach.

Weiser River Subbasin

Most of the Weiser River subbasin has been altered by human activities. Agriculture, livestock grazing, human developments, and road construction have affected the lower portions of the watersheds. The upper reaches have been affected by road construction, livestock grazing, and timber harvest (DuPont and Kennedy 1998). Numerous barriers occur in the forms of stream crossings, irrigation diversions, dams, unsuitable water temperatures and degraded habitat. To help increase the probability of persistence of bull trout and other native species connectivity must be restored (DuPont and Kennedy 1998). Many reaches of the Weiser River drainage are listed on the Idaho 303(d) list for nutrients and sediment (USFS 2001).

Middle Fork Weiser River

Large areas of past timber harvest in the Middle Fork Weiser River watershed have caused periodic increases in water yield followed by increases in stream sediment, decreases in bank stability, and rapid transport of large woody debris through the system. The result has been increased width to depth ratios and decreased stream shade, which has led to increased stream temperatures in the watershed. Past timber harvest has decreased the quantity and quality of fish habitat and caused a decline in fish populations in the Middle Fork Weiser (USFS 2000). Because of these past actions the downward trend may be continuing (USFS 2000). Road construction within the watershed has probably had the greatest effect on fish habitat conditions (USFS 2000).

Little Weiser River

Road construction within the Little Weiser River watershed has probably had the greatest adverse effect on fish habitat conditions. Stream crossings may fragment fish populations by blocking fish passage and interrupt natural processes such as large woody debris transport (USFS 2001). Irrigation diversions, high stream temperatures, high nutrient levels, streamside roads, livestock grazing, stream channel alteration for flood control and C. Ben Ross Reservoir have reduced fish habitat conditions within the Little Weiser River watershed.

Wildlife

The Boise-Payette-Weiser subbasins have some areas of relatively pristine wildlife habitat in addition to other areas that are in an altered or heavily altered condition. Large tracts of high quality habitat occur within the core of wilderness and roadless areas in the subbasins. Wildlife habitats tend to be more modified or degraded in the major watersheds with broad valleys and easier human access.

Alterations in ecosystem processes have resulted in changes in the distribution, quality, and quantity of wildlife habitats within the subbasins. Adverse effects to wildlife habitats have occurred through historic timber harvest activities; the alteration of fire disturbance regimes in forested environments; human development and occupation of big game winter ranges; wetland alterations; modification of river drainage systems for flood control, irrigation, hydropower, and recreation; changes in sagebrush-steppe plant species composition resulting from livestock grazing; and the introduction of exotic species.

The subbasins have few areas of pristine wildlife habitat remaining. Most areas of the subbasin have been altered to some degree ranging from moderate to extreme as a result of resource extraction, land management practices, land use alteration, and development. Wildlife habitats tend to be significantly modified or degraded in the lower reaches of all watersheds in proportion to human access.

The quality, quantity, spatial distribution, and ecological function of wildlife habitats have changed throughout the subbasin as result of several mechanisms. Fire suppression and historic timber harvest management, as well as catastrophic wildfire and insect outbreaks have altered the plant community composition of some forest communities. Significant reductions in mean stand age leave limited quantities of large standing dead trees for cavity dependent species. Extensive road networks associated with timber management contribute to increased year-round disturbance of wildlife by recreationists.

The quality of shrub-steppe habitats within the subbasin has also been highly degraded. Land use conversion to irrigated agriculture and suburban development, as well as extensive wildfires, have had the greatest impact. Livestock grazing has contributed to changes in plant community composition and the dominance of exotic annual plant species that make much of the remaining shrub-steppe habitat extremely vulnerable. Encroachment by humans has increased disturbance effects to further reduce the effectiveness of ungulate winter range, and increases exposure to risk of fire and exotic plant introductions.

Riparian and wetland habitats have been adversely impacted due to reduced risk of annual flooding on the lower Boise River and introduction of nonnative wetland plants. Industrial, suburban, and recreational development has displaced floodplain wetlands and riparian areas. Livestock grazing, vegetation control, and drainage for agriculture have further reduced the quality and quantity of these habitats in all watersheds.

Wildlife habitat preservation and restoration efforts are being conducted on several areas within the subbasin on wildlife management areas or wildlife habitat areas, as listed in Table 31. The NRCS Conservation Reserve Program (CRP) provides wildlife habitat on 19,732 acres in the subbasins. Although it falls short of complete restoration of shrub-steppe habitats on croplands, this program improves the availability of cover to upland wildlife species and prevents further degradation of habitat by livestock.

Table 31. Wildlife habitat areas in the Boise-Payette-Weiser subbasins, Idaho.

Wildlife Habitat Area	Purpose	Acres
Fort Boise WMA	Upland bird and waterfowl production	1,600
Payette River WMA	Upland bird and waterfowl production	880
Boise River WMA	Big game winter range	29,700
Mountour WRA	Upland bird and waterfowl production	1,100
Mann's Creek WHA	Upland bird production	330
Roswell Marsh WHA	Waterfowl and Upland bird production	680
Deer Flat NWR	Waterfowl wintering habitat	11,400
BLM Isolated Tracts	Upland bird production	700
Hixon Sharptail Preserve	Upland bird production	27,740

Losses Resulting from Dam Construction

Anderson Ranch Dam

Martin *et al.* (1985) stated that Anderson Ranch Reservoir inundated considerable big game winter range along the South Fork Boise River. The loss of over 14 miles of free flowing river eliminated habitat for beaver, muskrat, otter, and mink. In total, the reservoir flooded over 4,800 acres of wildlife habitat (Meuleman *et al*. 1986).

Meuleman *et al.* (1986) used the Habitat Evaluation Procedure (HEP) to evaluate pre- and post-construction habitat conditions of the Anderson Ranch Project. Seven evaluation species were selected with losses expressed in number of Habitat Units (HUs). The project resulted in a total estimated loss of 9,619 target species HUs. An interagency work group developed a mitigation plan for the Anderson Ranch project (Meuleman *et al.* 1987). To date, no project mitigation has occurred.

Black Canyon Dam

Approximately nine miles of free flowing Payette River and the riparian and shrub-steppe vegetation communities are now flooded by the reservoir (Martin *et al*. 1984). Terrestrial wildlife associated with these communities were lost or displaced.

Meuleman *et al.* (1986) used the HEP to evaluate pre- and post-construction habitat conditions of the Black Canyon Project. Deadwood Dam is an integral part of the Black Canyon Project since it was authorized in 1928 exclusively for the purpose of storing water for power generation at Black Canyon. Seven evaluation species were selected for the Black Canyon area, and five evaluations species were selected for the Deadwood area. Black Canyon Dam resulted in a total estimated loss of 2,238 target species HUs. While impacts of Deadwood Reservoir on wildlife were evaluated and presented in the *Black Canyon Wildlife Impact Assessment* (Martin *et al*. 1986), the mitigation plan presented in Meuleman *et al.* (1987) only examined mitigation projects for Black Canyon Dam and Reservoir impacts. The authors state, "further analysis of wildlife impacts and/or mitigation actions at Deadwood and Cascade Reservoirs is planned in the future."

Deadwood Reservoir inundated at least 3,094 acres. Within the impact area were 4.8 miles of the Deadwood River and 11.1 miles of tributaries. There is an estimated total loss of 7,413 target species HUs associated with the Deadwood Dam (Meuleman *et al*. 1986). The Council's Program Appendix C: Wildlife Provisions, Table 11-4, is in error (NPPC 2000). It only lists 4,787 total target species HUs lost to the project. This figure does not include the estimated loss of 2,626 HUs identified for yellow-rumped warbler (Meuleman *et al.* 1986).

Boise Diversion Dam

At full pool, the reservoir is about 1.6 miles long and about 400 feet wide. The reservoir covered 66 acres and 1.6 miles of river channel. There were no wildlife mitigation measures identified in the *Mitigation Status Report* for this project (Martin *et al.* 1984).

Meuleman *et al.* (1986) used the HEP to evaluate the impacts of the project on wildlife habitats under pre- and post-construction conditions. Five target species were chosen either for their importance in regional management, or as species to represent other wildlife with similar habitat needs.

The Boise Diversion Dam resulted in a total estimated loss of 42 target species HUs (Meuleman *et al.* 1986). There has been no mitigation plan developed for this project.

Watershed Assessment

Regional-scale Assessments

Two regional-scale assessments of ecological or watershed conditions have been conducted recently in the Intermountain area that include the Salmon River subbasin. These include highly detailed ecological analyses by federal land managers (the USFS and BLM) during the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (ICBEMP 1997, 2000) and a smaller USFS effort called the Inland West Watershed Initiative (IWWI). The ICBEMP evaluated current ecological conditions and trends at multiple spatial scales across the entire Columbia River Basin east of the Cascade Mountains of Oregon and Washington. Information provided by ICBEMP is now being used in support of a new cycle of federal land management planning. The IWWI effort assessed watershed and fish status at the sub-watershed level to

construct spatial databases that could be used to examine patterns important to future conservation or restoration efforts.

The ICBEMP assessment concluded that historic development of the ICRB over the last 150 years has greatly altered ecological processes to the detriment of many native species of fish and wildlife (ICBEMP 2000). Land and water use practices contributing to these changes included unrestricted or little-restricted livestock grazing, road construction, timber harvest and fire management, certain intensive agricultural practices, placer and dredge mining, dam construction, and stream channelization. These watershed disturbances have caused risks to ecological integrity by reducing biodiversity and threatening riparian-associated species across broad geographic areas (ICBEMP 2000). Among many findings of relevance to the Boise-Payette-Weiser subbasins, the assessment concluded that:

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

Assessments within the Subbasins

Because of the high proportion of federal land within the Boise-Payette-Weiser subbasins, there have been a good number of large watershed, small watershed, subwatershed, and species-specific assessments conducted and written on conditions in the area.

Federal Agencies

U.S. Forest Service

- Biological Assessment of Ongoing Actions, South Fork Payette River Bull Trout Subpopulation Watershed, Boise National Forest (1998).
- Upper South Fork Boise River Key Watershed Assessment for Bull Trout, Boise National Forest (1997)
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- Biological Evaluation of the Effects of the Boise River Wildfire Recovery Project on Bull Trout, Boise National Forest (1994).
- Cascade Reservoir Watershed Analysis Report, Boise National Forest (1998)
- Biological Assessment for the Potential Effects of Managing the Payette National Forest in the Weiser River Section 7 Consultation Watershed on Columbia River Bull Trout and

Biological Evaluation for Westslope Cutthroat Trout Volume 3: Ongoing Actions. Payette National Forest (2001).

- Biological Assessment for the Potential Effects of Managing the Payette National Forest in the North Fork Payette River Section 7 Watershed on the Columbia River Bull Trout and Biological Evaluation for Westslope Cutthroat Trout. Volume 2: Ongoing Actions, Payette National Forest (2001).

U.S. Bureau of Reclamation

- Cascade Reservoir Resource Management Plan (1991)
- A Description of BOR System Operation of the Boise and Payette River (1997).

U.S. Army Corps of Engineers

- The Weiser River Basin Study (U.S. Army Corps of Engineers 1995), part of the Upper Snake River Basin Study, was a cooperative effort between the USACE and the Idaho Department of Water Resources. As part of the study, 49 reservoir storage sites in the basin were identified and reviewed. Five sites were selected for reconnaissance-level studies, including the Galloway, Goodrich, Vista, and Tamarack sites and enlargement of the existing Lost Valley project. Further study of all sites, except Galloway, was eventually discontinued due to lack of economic feasibility or federal interest.

U.S. Fish and Wildlife Service

- Biological Opinion on the Bureau of Reclamation Operations and Maintenance Activities in the Snake River Basin Upstream of Lower Granite Dam Reservoir (1999).

State Agencies

Idaho Department of Environmental Quality

- Idaho Agricultural Pollution Abatement Plan, Ag Plan (1993)
- Subbasin Assessment and TMDL for the Middle Fork Payette River (1998)
- Lower Boise River TMDL: Subbasin Assessment, Total Maximum Daily Loads (1998)
- Lower Payette River Subbasin Assessment and Total Maximum Daily Load (1999)
- Cascade Reservoir Phase I Watershed Management Plan (1996)
- Cascade Reservoir Phase II Watershed Management Plan (1998)

Idaho Department of Water Resources/Idaho Water Resource Board

- Idaho Comprehensive State Water Plan, Payette River Basin
- Idaho Comprehensive State Water Plan, South Fork Boise River Basin
- Idaho Comprehensive State Water Plan, Upper Boise River Basin
- Idaho Comprehensive State Water Plan, Lower Boise River Basin-in preparation

Watershed Groups

- Big Payette Lake Management Plan and Implementation Plan, Big Payette Lake Water Quality Council (1998)
- Boise River Bull Trout Key Watershed Problem Assessment, Native Fish WAG (1998)
- Gold Fork and Squaw Creek Key Watersheds Bull Trout Problem Assessment, Native Fish WAG (1999)
- Deadwood, Middle Fork and South Fork Payette Rivers Key Watersheds Bull Trout Problem Assessment, Native Fish WAG (1998)
- Weiser River Key Watershed Bull Trout Problem Assessment, Native Fish WAG (2000)

Private Entities

- Gold Fork River Watershed Analysis, Boise Cascade Corporation (1996)

Major Limiting Factors

Fisheries

Factors commonly listed as limiting the abundance and distribution of native salmonids include water resource development and operations; poor water quality due to non-point source pollution; anthropogenic disturbances to stream habitat due to timber harvest, grazing and road construction; mining; non-native species competion; habitat fragmentation (Rieman and McIntyre 1993; Gresswell 1995). In the Boise-Payette-Weiser subbasins, however, few formal investigations have been made to assess which factors are important in determining the patterns of distribution and abundance of native salmonids. However, since the above listed factors are pervasive in the subbasins, it is likely that they have contributed significantly to the decline of native fishes.

High-quality freshwater habitats are critical to the long-term strength and persistence of native resident and anadromous salmonid populations in these three subbasins and elsewhere within the Columbia River Basin. These fish have generally fared best in areas least disturbed by humans. High-quality habitats, especially those in wilderness or roadless areas, represent the only remaining strongholds for them and other sensitive aquatic species (Lee *et al.* 1997). Assuring a well distributed and connected network of high-quality habitats over the long term will be critical to maintaining or expanding the genetic and ecological diversity for salmonid populations in the Boise-Payette-Weiser subbasins.

Water Resource Development and Operations

Construction of dams in the Columbia River Basin has greatly reduced the accessible range of anadromous fishes and has interrupted migrating patterns of migratory forms of non-anadromous fishes (Lee *et al.* 1997 in Quigley and Arbelbide 1997). The National Research Council (1995) analyzed data from the state databases in Oregon, Washington, Idaho, and California and found that most small dams do not have fish passage facilities. The extent to which these dams impede migration or affect spawning and rearing habitats of fishes in unknown for the most part (Lee *et al.* 1997). Detrimental effects from dams may occur as a result of direct mortality of fish in turbines.

There has been significant development of water resources in the three subbasins. The adverse impacts to fish and wildlife resources are long-term, cumulative, and severe. There has been widespread loss of riparian-wetland vegetation communities, affecting both aquatic and terrestrial species and resulting in dramatic alterations of floodplains and river channels.

In southwestern Idaho, flows in many of the major rivers and tributaries are dictated by large water development projects. Many of these rivers have experienced a rapid and massive change in their hydrology. Most water is dedicated to and diverted for irrigated agriculture. During the irrigation season, which is generally April 15 to October 15 annually, river flows can be depleted in reaches of mainstems and tributaries in the Boise-Payette-Weiser subbasins. Depending on the water year, summer flows can be extremely low or non-existent in certain reaches, creating conditions unsuitable or unusable by native salmonids in most years. An additional adverse result of these water storage projects is that late fall and winter flows are also altered to store water for the following irrigation season. Conversely, due to summer irrigation releases below Boise River (Anderson Ranch, Lucky Peak) and Payette River projects (Deadwood, Cascade, Black Canyon), summertime flows can be significantly above natural conditions. However, this does not necessarily equate to improved habitat conditions for fish (Leitzinger 2000).

Reservoir operation has resulted in long-term changes in downstream water temperatures and the annual discharge of water and sediments. The pattern and timing of the annual hydrograph have been greatly altered in the Boise and Payette River subbasins. Dams have changed the subbasins in significant reaches from large river systems to isolated fluvial fragments between lakes. In parts of the subbasin complex, diversions have severely reduced flows.

Flow modification below the major dams has a significant effect on natural stream bedload movement. Along with silt, gravels needed to maintain trout and historically salmon spawning beds are collected in reservoirs where they are covered with silt/sand. Areas below the dams are then scoured of gravels during high water events resulting in loss of spawning areas and habitats for aquatic insects.

The cumulative effects of systems operation (hydropower, irrigation storage and release, flood control, etc.), urbanization, intensive agriculture, and poor water quality has generally depleted or extirpated native salmonids from significant reaches in these three subbasins. Mountain whitefish is typically the only native salmonid that has managed to survive to some degree in the altered mainstems; however, they are adversely affected as well. There are three federally owned power plants (one in ready reserve status), and four privately owned power plants within the Boise and Payette river subbasins. There are no federal or significant non-federal hydropower facilities in the Weiser River subbasin.

Adfluvial bull trout residing in Arrowrock Reservoir are subject to impacts from reservoir operations. Entrainment of bull trout through valves and over the spillway at Arrowrock Dam has been thoroughly documented (Flatter 1999; Flatter 2000). Fish entrained below Arrowrock Dam are prevented from reaching suitable spawning areas, and without significant management intervention, will not contribute to the Boise River subbasin metapopulation. Entrainment losses are significant to the population, and could have dramatic effects on abundance of adult spawners and reproductive potential. During normal BOR operations at Arrowrock Dam in the spring and fall of 1998, the IDFG conservatively estimated that 15.4 percent of the adult population (54 adults) passed from Arrowrock Reservoir into Lucky peak Reservoir (Flatter 1999). In 1997, Flatter (2000) documented 9.5 percent entrainment of adult bull trout radio-tagged in Arrowrock Reservoir. He further estimated that the loss in reproductive potential due to the 1997 entrainment was 22,540 bull trout. Entrainment occurs year-round, but is highest in

the early spring in years when the reservoir fills and the upper gates and spillway are opened (Flatter 1999). Entrainment also likely increases in drought years with substantial reservoir drawdown such as summer 2001 when the reservoir volume was drained to 11 percent of capacity.

A planned valve replacement project on Arrowrock Dam calls for near-complete reservoir evacuation in fall 2003 through spring 2004, down to 1,500 acre-feet or less than 1 percent of full pool volume (BOR 2000). This will result in a complete loss of wintering habitat for adfluvial bull and redband trout in winter 2003-2004, and entrainment of fish into Lucky Peak Reservoir. Proposed mitigation includes trapping and hauling entrained bull trout from Lucky Peak Reservoir to Arrowrock Reservoir or the Middle Fork Boise River during and after construction. It remains unclear how efficient or successful this program will be. There is the real potential for long-term adverse effects on the bull trout metapopulation due to this project.

Water Quality

Nonpoint source pollution is extensive in the three subbasins. Nearly 900 miles of waterways, and three reservoirs are recognized as water quality limited in the three subbasins. The most common pollution problems in the subbasins are elevated sedimentation, temperature, and nutrient enrichment. Sedimentation in the subbasins is largely a result of logging roads, agriculture, and urbanization. Eutrophication is a major problem at Cascade Reservoir and has resulted in fish kills. Nonpoint source pollution is often difficult to identify and control. Pollution abatement is going to be long-term in the subbasin complex.

Farming and Grazing

Agricultural practices have had considerable effects on aquatic resources in the three subbasins. Most agricultural lands are located on historic floodplains and valley bottoms. Primary effects include loss of native vegetation including riparian-wetlands, streambank degradation and instability, loss of floodplain function, removal of large woody debris sources, changes in sediment supply, changes in hydrology, increases in water temperature, changes in nutrient supply, chemical pollution, channel modification, and habitat simplification.

Domestic livestock grazing is common throughout the Boise-Payette-Weiser subbasins. Typically, livestock winter on private lands in the lower elevations and summer on federal lands between May and October. State school endowment rangelands are also grazed. Since the mid-1990s federal land management agencies have been implementing widespread changes in grazing practices on federal range allotments to improve the condition and function of riparian wetlands and stream channels, and improve water quality. Legacy effects of improper livestock grazing in the three subbasins mirror those reported in the scientific literature (Armour *et al*. 1994; Platts 1979; Chaney *et al.* 1990; Fleischner 1994).

Timber Harvest and Roads

Timber harvest activities are one of the major land management activities within the forested areas of the three subbasins. Ponderosa pine and Douglas-fir stands occur over a large portion of the three subbasins. Following World War II, the baby boom fueled a nationwide demand for affordable housing, which increased timber production throughout the western United States (USFS 2000). An extensive system of roads was developed on national forest lands to access timber stands on the Boise, Payette, and Sawtooth National Forests. Accelerated harvest and road

building continued well into the latter half of the twentieth century. Roads contribute more sediment to streams than any other land management activity (Meehan 1991 in Lee *et al.* 1997).

Based on available information, it appears that past road construction on timberlands of the Boise and Payette National Forests has adversely affected bull trout populations (Steed *et al.* 1998; Jimenez and Zaroban 1998; DuPont and Kennedy 2000). Generally, those watersheds with the highest road densities are areas where bull trout no longer exist. In bull trout key watersheds in the Boise River subbasin, substrate fine sediment was significantly higher in unoccupied habitats (average of 41 percent) than in occupied habitats (average of 26 percent) (Burton 1996). Past research involving the effects of substrate fine sediment on bull trout suggests that survival is generally unaffected up to measured levels of about 30 percent. Above 30 percent, embryo survival, and survival to emergence drops off sharply (Shepard et al. 1984; Weaver and White 1985; Weaver and Fraley 1991). While this may have contributed to the loss of bull trout in some watersheds, these same watersheds generally are well-roaded, thus migration barriers may also be common (Steed *et al.* 1998).

Similar stream channel and fish habitat conditions have been documented on forested lands in the Payette and Weiser River subbasins (Steed 1999; Jimenez and Zaroban 1998; DuPont and Kennedy 2000). On national forest system lands in the Weiser River subbasin with documented bull trout populations, the average Riparian Habitat Conservation Area road density is nearly 5.0 miles/mi^2 (DuPont and Kennedy 2000).

Mining

Historical mining has affected a significant portion of the Boise River subbasin (Steed *et al.* 1998). Dredge mining (commercial bucket) occurred on many sections of the Middle Fork Boise River, South Fork Boise River, and North Fork Boise River. Much of the floodplain in these areas have been over-turned and remain as tall piles of cobbles, and dredge pools. Lode and other forms of placer mining have also occurred. There are a few areas of older river gravels that form terraces high above the present river flood plain. Many of these high gravels, and the active river gravels, have been placer mined.

Recreational dredge mining was prevalent in the Boise River subbasin, particularly in the North, Middle, and South Fork Boise River. Some suction dredging activity still occurs on valid claims along the upper sections of the Middle Fork Boise River. Operators are regulated by permits and rules issued by the Idaho Department of Water Resources. Due to the federal listings of anadromous fish and bull trout, recreational dredge mining has been curtailed or limited throughout much of the state, including the Boise River subbasin. Restrictions in the Boise River subbasin were promulgated to eliminate impacts on bull trout spawning and rearing habitats. Recreational dredge mining can damage fish habitat, particularly in small tributaries. The enacted restrictions on dredge mining activities will probably significantly reduce effects on aquatic habitats.

Some limited recreational dredge mining still takes place in the Middle Fork Boise River as well as several tributaries. The lower mainstem is a migration corridor for both bull and redband trout. Dredge mining activity generally does not occur during spawning migration for redband trout, but does coincide with bull trout migration.

In the Payette River subbasin, placer and tunnel mining were historically active in the Deadwood River watershed (Jimenez and Zaroban 1998). Today, mining is very limited. The Deadwood Mine, located immediately off the Deadwood River above Deadwood Reservoir, is

draining directly into the river channel. It is unknown whether or not the Deadwood Mine is adversely impacting water quality and aquatic life.

Non-native Species Competition

The introduction of non-native species has had an important influence on aquatic communities and native fish communities in the three subbasins. Most introductions of non-native salmonids were done so with the intent of creating or expanding fishing opportunities. Mountain lakes in the Boise and Payette River subbasins have been stocked with hatchery reared cutthroat trout, rainbow trout, and brook trout. Cultured strains of rainbow trout have been widely stocked in rivers and lakes in southwestern Idaho where angler harvest or habitat degradation is high and natural reproduction is low or non-existent. Most reservoirs have been stocked with non-native sunfish, catfish, or salmonids.

Introductions of non-native fishes has in some instances, led to the elimination of some native populations, while fragmentation and isolation of other populations of native species have left them more vulnerable to future extirpation (Lee *et al.* 1997). In the Boise-Payette-Weiser subbasins, competition between native and non-native salmonids has resulted in displacement or further isolation of some populations of bull trout. Brook trout threaten bull trout through hybridization. Hybridization between the two species has been documented in the subbasin complex (Steed *et al.* 1998; DuPont and Kennedy 2000). Brook trout are the dominant salmonid in a number of the subbasins' watersheds occupied or formerly occupied by bull trout and redband trout. Data on brook trout abundance and potential spatial and temporal overlap with bull trout are lacking. Because brook trout can compete and hybridize with bull trout, they may represent a significant detriment to recovery efforts if brook trout are abundant or if substantial overlap occurs.

As a result of historical hatchery rainbow trout stockings, native salmonids have been exposed to diseases such as whirling disease (*Myxobolus cerebralis*). Mortality in wild fish is highly likely. As a result of whirling disease documentation and potential competition and hybridization between hatchery rainbow trout and wild redband trout, the IDFG has significantly altered its hatchery program.

Habitat Fragmentation

Aquatic habitat fragmentation and simplication is a critical problem in the Boise-Payette-Weiser subbasins. Fragmentation is caused by impassable obstructions (dams, irrigation structures), water temperature increases, pollution, and water diversions, while simplification is caused by channelization, snagging and clearing of riparian areas, removal of large woody debris from stream/river channels, and flow regulation.

Degradation of habitats in the three subbasins has not been uniform. Habitat loss and degradation has been greater in the lower reaches of the three subbasins. A multitude of dams and diversions has resulted in fragmented rivers and streams. The best remaining habitats in the three subbasins are not well dispersed throughout, but instead are restricted to the less productive headwater areas. The potential for dispersal of native fish species in the three subbasins has been significantly compromised.

While road culverts are less visible, they may be the most significant form of migration barrier for native fishes in the subbasins. Improperly placed or failing culverts can pose velocity barriers to adult and juvenile fish, while perched culverts are generally impassable barriers. A large number of road culverts have been documented to be or suspected to be migration barriers

for native fishes in the Boise-Payette-Weiser subbasins (Steed *et al*. 1998; Jimenez and Zaroban 1998; DuPont and Kennedy 2000; Steed 1999).

Excluding the Yuba River watershed, absence of bull trout in the Middle Fork River drainage above Kirby Dam may be due to natural barriers. Bull trout have been documented by IDFG personnel in the upper Middle Fork up to a possible barrier falls (Lynx Creek Falls) near Leggett Creek. No bull trout were observed in snorkel surveys above this falls. Other natural or man-made barriers in this reach could limit habitat available to migratory bull trout and redband trout. Undocumented natural barriers are likely to exist, but a complete inventory of barriers has not been done.

Kirby Dam isolated upriver stocks of redband and bull trout from downriver stocks for over 90 years. Although connectivity is now restored, it is unclear whether or how soon migratory fish will recolonize and use unoccupied habitat above the dam, or whether enhanced upriver production will improve overall abundance in the drainage.

The relative contribution of specific subbasin tributaries to bull trout and redband trout recruitment is unknown. Consequently, prioritizing management actions to protect or enhance habitat is difficult. Even with the heightened public and resource agency sensitivity to habitat disturbances following the ESA listing of bull trout, some proposed activities in the basin could have widespread impacts on fish populations. For example, previously proposed projects such as the Twin Springs Dam on the Middle Fork Boise River would completely block the migratory corridor for fluvial and adfluvial redband trout and bull trout seeking to access spawning and rearing areas in both the North and Middle Fork drainages. A dam at this location could prove problemmatic for native fishes in the Boise River Subbasin. The recent discussions on the nation's purported energy shortages could revive plans for many potentially environmentally damaging projects.

Loss of Anadromous Fish

The loss of anadromous fish runs and the significant marine derived nutrients that historically existed in the three subbasins had an unknown effect on populations of native resident fish. Healthy populations of bull trout may require abundant forage fish (Rieman and McIntyre 1993). In several river basins where bull trout evolved with large numbers of juvenile salmon, bull trout abundance declined when salmon declined (Ratliff and Howell (1992).

Wildlife

Habitat Loss

Land use activities have adversely affected habitat for native wildlife in the Boise-Payette-Weiser subbasins over the last 200 years. Agriculture, irrigation, livestock grazing, and urbanization account for significant wetland and native species losses but have provided benefits for other species. Past impacts to wildlife habitat within the subbasins, particularly to riparian, floodplain and wetland habitats within the Lower Boise, Boise-Mores Creek, Payette, and Weiser watersheds will prove difficult to overcome. Currently, the primary threats to existing wildlife habitat within the subbasins are the continuing increases in recreational and home development and the continuation of existing land management practices, including agricultural and forest management related activities in critical habitat areas. The cumulative impacts associated with the decline and loss of these habitats can be felt across the entire subbasin complex and is evident from the number of fish and wildlife species currently at risk.

The conversion and management of upland, forested, floodplain, riparian and wetland areas for agricultural and recreation purposes has greatly reduced the quantity and quality of habitat available to wildlife populations in the subbasins. Soil erosion has reduced the long-term productivity of the soils and their ability to support native plant and animal species. Rangeland wildfires have converted perennial shrub and grass communities to annual forb and non-native grass habitat components. Agricultural practices tend to create monoculture type food sources with limited seasonal availability. Although these croplands often provide high value food sources, they are only available for a portion of the year and use of these areas as feeding grounds tends to be discouraged because of the impacts to landowner profits. Tillage reduces the availability and quality of year-round food and security in wildlife habitats.

The alteration of forest types has reduced available habitats for those species that prosper in old growth conditions such as cavity nesting birds and woodpeckers, northern goshawk, fisher, several species of bats and other wildlife species. Alterations of low elevation areas, especially wetland, transitional forest and riparian corridors, have greatly reduced the availability and suitability of these areas for supporting wildlife species during critical times of the year. Riparian conversion has reduced the capabilities of these areas to provide critical breeding and rearing areas for multiple wildlife species.

Influencing Factors Outside the Subbasins

Wildlife species found in the Boise-Payette-Weiser subbasins are affected by habitat conditions outside the subbasins and by the availability of suitable migration corridors to critical habitats outside the subbasins. This is true of species with sizeable home ranges as well as migratory species that travel large distances to find suitable habitats on a seasonal basis. Wildlife in the subbasins also have been affected by reduced returns of anadromous fish. Historic large fish runs that have been reduced by past fisheries and development of the hydropower system provided an important component of the natural food web. The elimination of anadromous fish from the three subbasins continues to affect species that would otherwise benefit from the energy and nutrients these fish imported from the marine environment.

Artificial Production

Nothing reported.

Existing and Past Efforts

Fisheries

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

None reported.

Efforts Funded Outside of the Columbia Basin Fish and Wildlife Program

Idaho Department of Fish and Game

The IDFG has worked on a number of non-BPA sponsored projects and issues directed toward conserving fish and their habitat in the Boise-Payette-Weiser subbasins.

Technical Assistance. The IDFG provides technical review and comment on a wide variety of land and water management and development proposals in the Boise-Payette-Weiser subbasins. These include but are not limited to stream alterations, planning and zoning issues, timber harvest, livestock grazing allotments, mining, water right filings, hydroelectric project licensing and relicensing efforts, and watershed planning. The IDFG offers recommendations to regulatory entities to protect native fishes and their habitats.

Participation in State and Federal Recovery Efforts. The IDFG participates in state efforts to conserve and recover bull trout populations in the Boise-Payette-Weiser subbasins. The IDFG works with the Southwest Basin Native Fish Watershed Advisory Group and state, federal, and private stakeholders to implement the proposed strategies outlined in the State of Idaho's *Bull Trout Conservation Plan*.

Public Information Program on Bull Trout Identification and Status. The IDFG works with many entities to develop and distribute signs and bull trout educational pamphlets.

Brook Trout Suppression Effort in the Pikes Fork Watershed. Efforts include a cooperative, three-year (1998-2000) multi-disciplinary project designed to suppress brook trout in an almost five-mile reach of the Pikes Fork of the Crooked River, tributary to the North Fork Boise River. Multiple pass electrofishing was used to remove brook trout from the Pikes Fork to assess whether this technique holds any promise in suppressing an established non-native species from a bull trout key watershed.

Kirby Dam Fish Ladder and Penstock Screen. For over 90 years, the Kirby Dam on the Middle Fork Boise River had been an impassable barrier for migratory redband trout and bull trout. In 1998, the IDFG and Atlanta Power Company signed a fish passage agreement including a negotiated water flow regime for a proposed fish ladder. In 1998-1999, the IDFG constructed a fish ladder at Kirby Dam to reconnect approximately 57 miles of potential bull trout spawning and rearing habitat above Kirby Dam (Boise National Forest, unpublished information; Steed et al. 1998). Use of the ladder by redband trout and adult bull trout was documented in 1999, 2000, and 2001 through a combination methods including an underwater video camera and trapping within the ladder (DJ R24). Daily use of the ladder by migratory fish will be monitored in August for five years from 2001 through 2005. During this time, a trap in the ladder will be utilized to capture all fish traveling upstream. All bull trout will be measured and released above the ladder. If bull trout of suitable size are captured, a sample will be implanted with radio tags and telemetry will be used to identify spawning areas and movement patterns above Kirby Dam.

In the fall of 2001, the IDFG will place a removable screen on the penstock intake of the Kirby Dam hydroelectric project to prevent entrainment of native fish species through the turbine. Funds were provided to the IDFG by the Governor's Office.

Bull Trout Education Efforts and Creel Survey. Lamansky *et al*. (2001) completed creel surveys in the Boise River subbasin (Middle, North, and upper South Fork Rivers) and included estimates of illegal bull trout harvest in their results. Subsequently, Schill *et al.* (2001) implemented an angler education effort using a variety of signs and posters informing anglers of the presence of bull trout and of fishing regulations. Prior to the education efforts, estimated bull trout harvest totaled 149 fish. Angler awareness of regulations improved and bull trout harvest declined markedly after education efforts. Signing efforts have continued since these studies.

Extensive creel surveys were conducted on the Middle Fork Boise River in 1989 and 1990 (Rohrer 1990; Rohrer 1991) and in 1998 and 1999 (Schill, Lamansky). Both creel surveys focused closely on the harvest of bull trout and wild rainbow trout. The 1999 research also evaluated three education strategies intended to increase angler awareness of bull trout and how to differentiate their physical appearance from other fish species found in the basin. Angler effort and total catch in 1998 were nearly doubled in 1999. Estimated harvest, however, decreased from 1,462 rainbow trout and 149 illegal bull trout in 1998, to 1,055 rainbow and zero bull trout in 1999. The decline in bull trout harvest was likely a result of intense signing and educational efforts to help anglers better recognize bull trout. Large road signs illustrating bull trout identification were found to be, by far, the most effective method for improving angler knowledge of bull trout regulations and identification.

Radio telemetry was used in 1996 (R21), 1997 (Flatter 2000), and 1998 (Flatter 1999) to document spawning areas used by adfluvial bull trout migrating from Arrowrock Reservoir. A total of sixty-nine radio-tagged adult bull trout migrated upstream and out of Arrowrock Reservoir, of which, 32 percent migrated up Middle Fork tributaries to spawn. Tributaries of the Middle Fork used by radio tagged bull trout included Sheep Creek, Roaring River, Black Warrior Creek, Queens River, and the Little Queens River. Mark-recapture techniques were used in 1997 and 1998 to estimate the size of the bull trout population in Arrowrock Reservoir. A large population of adfluvial bull trout was documented (Flatter 1999).

Deadwood River. A velocity barrier was installed near the mouth of the Deadwood Reservoir in 1978 to limit kokanee spawning escapement from the reservoir. In 1999 and 2000, the velocity barrier was removed by the IDFG and the USFS to maximize bull trout spawning escapement to the upper Deadwood River watershed (R24, R25 in press, IDFG file data).

Allen (1998) electrofished eight sites in the Deadwood River between the mouth and the upper watershed. Bull trout were captured at only the upper two sites above the East Fork Deadwood River. The bull trout captured were generally small in size and were likely resident form. At the upper two sites only bull trout were present, whereas at the lower sites redband, westslope cutthroat, mountain whitefish, and dace were present. No bull trout were collected in the Deadwood River that would be considered large enough to be fluvial forms (Allen 1998).

Some fall chinook salmon stocked into Deadwood Reservoir also ascend the river to spawn. The reach from the mouth of Deer Creek to the reservoir was surveyed for fall chinook redds in October of 1998. Twelve redds were identified; ten adult fall chinook were observed, and two fall chinook carcasses were located (R23). Successful natural recruitment of fall chinook to the reservoir has not been documented.

The Deadwood River blow the confluence of the South Fork Payette River was snorkeled in 1998 as part of an IDFG bull trout investigation of Deadwood Reservoir. Biologists floated the Deadwood River in inflatable kayaks and snorkeled the large pools and tributary mouths. No bull trout were observed in the river or in tributary mouths (R23).

Deadwood Reservoir. Weirs are installed in main tributaries annually in August to facilitate kokanee egg take requests and to monitor kokanee spawning escapement (2000 Nampa Hatchery Annual Report).Extensive bull trout studies took place in 1997 (Allen 1998) and 1998 (R23) to document the presence of adfluvial bull trout in Deadwood Reservoir. Only one bull trout was successfully followed using radio telemetry. This fish ascended Trail Creek, a large tributary on the South end of the Reservoir (Allen 1998). Extensive reservoir fish sampling with trap nets and

gill nets has been conducted recently to monitor fish populations (R17, R18, R20, R21). Trail Creek, South Fork Beaver, and Beaver Creeks were rotenone in 1992 to control kokanee (IDFG file data). Deadwood Reservoir was drained and treated with rotenone+fintrol in 1973 to control kokanee populations.

South Fork Payette River. The size, distribution, and densities of redbands observed in 1996 were very similar to observations made 1988 (R13). Tributaries to the upper South Fork Payette River have extensive populations of redbands at densities very analogous to the main river (R13, R14). Canyon Creek, a tributary to the upper South Fork Payette River, contains a resident population of bull trout. Bull trout in excess of 12 inches are occasionally observed in the South Fork Payette River between Grandjean and Lowman. Brook trout, which have escaped upper watershed mountain lakes, are also found in this reach (IDFG file data). Extensive snorkeling was conducted in the South Fork Payette River between the Sawtooth Wilderness boundary and Lowman in 1996 (Allen *et al.* 2000 - R22). Wild redband trout were common, but no estimates of abundance or density were calculated. Three angler surveys have been conducted on the South Fork Payette River between 1980 and 1999.

In 1980, an angler survey was conducted between Grandjean and Alder Creek Bridge near Garden Valley. Anglers fished a total of 10,298 hours to harvest 4,398 redband trout, 3,979 hatchery rainbow trout, 411 brook trout and 27 whitefish (R5). In 1992, an angler survey was conducted between the Grandjean Campground and the mouth of the Deadwood River. Anglers fished a total of 8,142 hours, with an overall catch rate (all species) of 1.06 fish per hour (R24). In 1999, the 1992 angler survey was repeated between the Grandjean Campground and the mouth of the Deadwood River. Anglers fished a total of 16,010 hours, with an overall catch rate of 1.85 fish per hour (R24).

U.S. Forest Service

Culvert Modifications. Currently, some barriers are already being addressed such as the Feather River structure, which has been modified with an in-culvert fishway (Clancy and Reichmuth 1990). Further head cutting downstream of the culvert has been stopped and the height of the outlet plunge pool has been raised with drop structures. The USFS is also actively working on replacing problem culverts in the Trinity Creek drainage.

Results and Accomplishments

None reported.

Wildlife

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

Idaho Department of Fish and Game

Southern Idaho Wildlife Mitigation Implementation Project

The Southern Idaho Wildlife Mitigation Implementation Project (Project) (No. 00000386-00001) is implemented by IDFG and the 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. The following table provides an overview of Project implementation through calendar year 2000.

In the Boise-Payette-Weiser subbasins, the IDFG purchased 166 acres in 1999 and manages it as part of the 35,000-acre IDFG Boise River Wildlife Management Area (WMA). Fieldwork for the baseline Habitat Evaluation Procedure (HEP) was conducted in May 2000 resulting in a total of 57 baseline habitat units. Preparation of the management plan and final HEP report are in progress. A large wildfire on the WMA burned through part of the property in September 2000. Shrub stands riparian areas, native grass stands and perimeter fences were damaged by the fire, and firelines were bulldozed during suppression. Fire rehabilitation will be accomplished within a larger effort planned for the Boise River WMA.

Efforts Funded Outside of the Columbia Basin Fish and Wildlife Program

U.S. Fish and Wildlife Service

- Mack Safe Harbors Conservation Agreement. The USFWS entered into a conservation agreement to protect a northern Idaho ground squirrel population in the upper reaches of the Weiser River subbasin.
- Partners Projects for wetlands and riparian habitat on private lands in the Weiser River subbasin.
- Coordinating with the BLM and IDFG on annual greater sage grouse and Columbian sharp-tailed grouse lek and winter inventories and monitoring in the Weiser River subbasin.
- ESA consultation regarding listed species in the Weiser River subbasin including bull trout, bald eagles, northern Idaho ground squirrels, lynx, and Utes Ladies tresses.
- Annual review and pending actions on petitioned species status recommendations including sharp-tailed grouse, southern Idaho ground squirrel, mountain quail, and *Batrychium* in the Weiser River subbasin.
- Candidate conservation agreement for southern Idaho ground squirrels in progress in the Weiser River subbasin.
- Cooperative project between USFW, IDFG, and private parties in relocating a group of southern Idaho ground squirrels from the Weiser Golf Course to private lands.
- Starting in the fall of 2001, a master's student at Boise State University will be funded to assess the population and habitat conditions of southern Idaho ground squirrels in the Weiser River subbasin.
- Working cooperatively with Albertson's College of Idaho on the status report of southern Idaho ground squirrels, and in a study of nutrient and dietary analysis of southern and northern Idaho ground squirrels.
- A cooperative venture involving the USFWS, BLM, Cornell University, and Albertson's College in developing a Columbia Basin Field Guide map/brochure of ground squirrels.
- Funding IDFG Section 6 annual population monitoring of southern and northern Idaho ground squirrels.
- Working with the BLM, Idaho Power Company, and the IDFG on habitat restoration study site models for southern Idaho ground squirrels.
- Working with the USFS and IDFG on various habitat modification projects for northern Idaho ground squirrels.

- Habitat Improvement Program (HIP). The HIP is a program 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 that include portions of the three subbasins, many acres that have habitat for upland birds and waterfowl have been improved through the HIP program. Nesting cover, woody cover, food plots, ponds and nest structures were the main practices implemented.
- Critical Habitat Mapping. The IDFG is working with the University of Idaho Landscape Lab to map critical wildlife habitat and vertebrate species richness. This information can be used interested parties to identify which habitats are most critical to protect, and where conservation of soil, water and open space resources is most critical, and where and how restoration efforts might be most effective.
- Other Mapping Efforts. The IDFG has also worked with the Rocky Mountain Elk Foundation (RMEF) to develop a map delineating elk and deer winter range and other critical habitat in the subbasin.
- Conservation Data Center. The CDC maintains information on the occurrence of elements of biological diversity (plant and animal species and plant communities) and conservation sites and managed areas. The CDC has conducted inventory and monitoring projects within the subbasin related to rare and endemic plant species; the distribution and condition of old growth forest stands; the selection and establishment of ecological reference areas; vegetation and wildlife habitat mapping; and the conservation of high priority wetland and riparian sites. These studies produce recommendations for site-specific conservation action, assessments of conservation status, rankings of statewide or global rarity, and classifications and descriptions of plant communities.
- Payette River Bull Trout 1995. Using angling, the IDFG intensively surveyed the mainstems of the South Fork Payette River and Payette River to assess whether or not fluvial bull trout wintered in the larger river systems. No bull trout were collected during the effort (Allen *et al.* 1995).
- Deadwood Reservoir Bull Trout 1998-1999. The IDFG, under contract to the BOR, surveyed Deadwood Reservoir and Deadwood River in the spring of 1998 and 1999 to assess the exodus timing of adfluvial bull trout from the reservoir. No bull trout were captured in Deadwood River and very few were collected in the reservoir. The Deadwood River subpopulation is suppressed (Allen *et al.* 2001).

Results and Accomplishments

None reported.

Subbasin Management

Existing Plans, Policies, and Guidelines

Federal

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

- FCRPS BiOp. The BiOp was issued by NMFS in December 2000, and relates to operation of the federal hydropower system on the Columbia River by the USACE, BOR, and BPA. It fulfills consultation requirements with the USACE, the BOR, and BPA under Section 7 of the ESA. Significantly, the BiOp concluded that off-site mitigation in tributaries is necessary to continue to operate the hydropower system. The Reasonable and Prudent Alternative to prevent jeopardy to 12 stocks of anadromous fish considered in the BiOp includes quick actions to conduct off-site habitat improvements to correct all barrier, screen, and flow deficiencies on non-federal lands in certain tributary watersheds.

- Federal Caucus All-H Paper. This document is a framework for Columbia Basin-wide salmon recovery and identifies strategies for harvest management, hatchery reform, habitat restoration, and hydropower system operations.

- ICBEMP. This document is a framework for land management for federal lands over the interior Columbia Basin, and was produced by the primary federal land management agencies, including the USFS and the BLM. Significantly for this subbasin summary, this document will influence how these federal agencies prioritize actions and undertake and fund restoration activities.

By understanding the priorities outlined in these documents, significant opportunities for federally-funded restoration activities can be refined and identified for the Boise-Payette-Weiser subbasins.

Bonneville Power Administration

The BPA, a power-marketing agency of the U.S. Department of Energy, supplies roughly half of the electricity used in the Northwest. The marketed power comes primarily from 31 federal hydropower projects (FCRPS), as well as from one non-federal nuclear plant, wind facilities and other renewable resources, conservation efforts, and acquisition of power from traditional energy

sources. The BPA does not own or operate any of these dams. Such responsibilities belong to the USACE and the BOR. The BPA does own and operate about three-quarters of the region's high-voltage electric transmission grid. PA's fish and wildlife responsibilities have several sources, including the following:

- The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Act) extended BPA's responsibilities to include development of energy conservation resources and enhancement of the Northwest's fish and wildlife that have been affected by the construction and operation of federal hydropower plants in the Columbia River Basin. Under the Act, BPA has specific responsibilities:
    1) to protect, mitigate, and enhance fish and wildlife adversely affected by the construction and operation of the FCRPS, and
    2) to do so in a manner that provides equitable treatment for such fish and wildlife with the other purposes of the FCRPS.

- BPA also has specific duties regarding fish and wildlife under the ESA:
    1) BPA must avoid jeopardizing listed species, and
    2) BPA must use its authorities to conserve listed species.

National Marine Fisheries Service

The ESA was designed to protect and conserve endangered and threatened species and the ecosystems upon which they depend. As such, it requires federal agencies to protect and conserve threatened and endangered species. The goal of NMFS with respect to the Boise-Payette-Weiser subbasins is to use stored water from the Upper and Middle Snake River subbassins to provide enhanced flow regimes and improve passage conditions to achieve the recovery of Snake River spring/summer and fall chinook, sockeye and steelhead resources. This requires the development of watershed-wide properly functioning conditions at a population level that is viable according to standards and criteria identified by NMFS in two key documents: *Matrix of Pathways and Indicators* (1996) and *Viable Salmonid Populations* (2000). Actions that contribute to these objectives include development of riparian vegetation, restoration of streamflow and appropriate hydrologic peak flow conditions, passage improvements and screening, among other activities.

The Federal Basinwide strategy for salmon recovery identifies actions in the hydropower, hatchery, harvest, and habitat arena for short and long-term actions. The habitat goals of the Basinwide strategy are: the existence of high quality habitats that are protected, degraded habitats that are restored and connected to other functioning habitats, and a system where further degradation of tributary and estuary habitat and water quality is prevented. In its Section 7 consultations and in prioritizing restoration projects, NMFS relies upon its habitat model, watershed analyses, and the Federal Basinwide strategy.

U.S. Fish and Wildlife Service

- The USFWS administers the ESA of 1973 as amended. Due to the number of threatened, endangered, and sensitive species in the Boise-Payette-Weiser subbasins, the USFWS is an important presence in southwestern Idaho. The USFWS also administers the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). This plan was authorized by

the Water Resources Development Act of 1976, Public Law (P.L.) 94-587, to mitigate and compensate for fish and wildlife resource losses caused by the construction and operation of the four lower Snake River dams and navigation lock projects. The plan identified the need to replace adult salmon and steelhead and resident trout fishing opportunities, and the size of the anadromous program was based on estimates of salmon and steelhead adult returns to the Snake River basin prior to the construction of the four lower Snake River dams.

- The USFWS developed a Bull Trout Interim Conservation Guidance document in 1998 to assist in conducting ESA activities, including section 7 consultations, negotiating habitat conservation plans that culminate in the issuance of section 10(a)(1)(B)-incidental take permits, issuing recovery permits, and providing technical assistance in forest practice rule development and other interagency bull trout conservation and recovery efforts.
- The USFWS is currently attempting to develop a recovery plan for bull trout across the Columbia River Basin.

The U.S. Forest Service and Bureau of Land Management

The USFS is required to manage habitat to maintain viable populations of anadromous fish and other native and desirable non-native vertebrate species. Land and Resource Management Plans (Forest Plans) were developed for each of the national forests within the subbasin in the late 1980s or early 1990s. The Boise, Payette, and Sawtooth national forests are currently revising the Forest Plans. These Forest Plans guide all natural resource management activities, establish forest-wide multiple-use goals and objectives, and establish management standards and guidelines for the National Forests.

The BLM, in accordance with the Federal Land Policy and Management Act of 1976, is required to manage public lands to protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values. Both the USFS and BLM are required by the Clean Water Act to ensure that activities on administered lands comply with requirements concerning the discharge or run-off of pollutants.

In the Boise-Payette-Weiser subbasins, the USFS and the BLM manage salmonid habitat under the direction of the Interim Inland Native Fish Strategy (INFISH) (USFS 1995). This program provides interim management strategies that aim to protect areas that contribute to salmonid recovery and improve riparian habitat and water quality throughout the subbasin. The INFISH strategies have also facilitated the ability of the federal land managers to meet requirements of the ESA and avoid jeopardy. To meet recovery objectives, these strategies include:

- Establish watershed and riparian goals to maintain or restore all fish habitat.
- Establish aquatic and riparian habitat management objectives.
- Delineate riparian management areas.
- Provide specific standards and guidelines for timber harvest, grazing, fire suppression and mining in riparian areas.
- Provide a mechanism to delineate a system of key watersheds to protect and restore important fish habitats.
- Use watershed analyses and subbasin reviews to set priorities and provide guidance on priorities for watershed restoration.
- Provide general guidance on implementation and effectiveness monitoring.

- Emphasize habitat restoration through such activities as closing and rehabilitating roads, replacing culverts, changing grazing and logging practices, and replanting native vegetation along streams and rivers.

The ICBEMP is a regional scale land use plan that covers 63 million acres of federal lands in Oregon, Washington, Idaho, and Montana (www.icbemp.gov). The BLM and USFS released a *Supplemental Draft Environmental Impact Statement* for the ICBEMP Project in March 2000. The EIS focuses on the critical broad scale issues related to landscape health; aquatic and terrestrial habitats; human needs; and products and services. The ICBEMP will guide efforts to develop revised Forest Plans, which will then replace the interim management strategies. The intent is to provide for longer-term ecosystem management of federal lands in the Interior Columbia River Basin. As new strategies are implemented, subbasin and watershed assessments and plans will target further habitat work (NMFS 2000).

U.S. Environmental Protection Agency

The EPA administers the federal Clean Water Act. Section 303(d) of the Clean Water Act requires states to develop a list of water bodies that do not meet water quality standards. This section further requires TMDLs be prepared for listed waters. Both the list and the TMDLs are subject to EPA approval.

The federal Clean Water Act Section 319 grant program is an EPA funding program for water quality restoration work. The IDEQ is the lead agency for implementation of the Section 319 program. IDEQ administers the Idaho Nonpoint Source Management Program and insures the Section 319 requirements of the Clean Water Act are met. Local, regional, and statewide nonpoint source pollution control projects have received Section 319 funding.

Natural Resources Conservation Service

The NRCS provides technical support to the various Soil and Water Conservation districts, and agricultural landowners, and distributes federal cost-share monies to reduce soil erosion and provide streambank protection. The NRCS assists landowners to develop farm conservation plans and provides engineering and other support for habitat protection and restoration (PL 566). NRCS programs include the following: CRP, Continuous Conservation Reserve Program (CCRP), Wildlife Habitat Improvement Program (WHIP), Environmental Quality Incentives Program (EQIP), Public Law 566 Small Watersheds Program, River Basin Study Program, and the Wetlands Reserve Program. The NRCS works closely with the Farm Service Agency in conducting many of its programs.

U.S. Army Corps of Engineers

The USACE is the agency responsible for issuing the federal Clean Water Act Section 404 permit for the placement of dredged or fill material into waters of the United States, including wetlands. The USACE solicits comments from other federal and state agencies, and interested parties on applications for dredge or fill permits. Under Section 401 of this act, the IDEQ is required to issue a water quality certification for these permitted projects. The water quality certification sets conditions on the permit to assure that the activity will comply with state water quality standards.

U.S. Bureau of Reclamation

As a water management agency, the BOR manages a number of hydropower and irrigation projects in the Columbia River Basin. The BOR is a significant presence in the Boise and Payette subbasins operating hydropower and irrigation projects. The BOR also provides technical assistance to address water conservation and water quality issues in the subbasin complex.

The BOR developed a set of recommended reservoir pool elevations and flows for fisheries resources for the Upper Snake River subbasin as part of their needs assessment for the *Snake River Resources Review* (BOR 1998). The BOR used technical work groups comprised of technical experts from agencies, industry, tribes, and academic institutions to develop recommendations. Recommendations for the three subbasins are found in Table 32. The Weiser River subbasin was not part of this review.

Table 32. Recommended pool elevations (KAF) and flows (cfs) for fisheries in the Boise and Payette River subbasins. Adapted from BOR (1998).

Site/Reach	Target Species	Pool (KAF)/Flow (cfs)	Reference
		Payette River Subbasin	
Cascade Reservoir	Kokanee, rainbow trout, yellow perch	425 KAF minimum 12/15-3/31	Reininger & Horner 1982
N.Fk.Payette River (Cascade Dam-Smith's Ferry)	Rainbow trout, yellow perch, mountain whitefish	400 cfs 10/13-3/15 600 cfs 3/16-6/17 1400 cfs 6/18-10/12	Cochnauer & Hoyt 1979; IDFG 1992
N.Fk.Payette River (Smith's Ferry-Banks)	Rainbow trout, mountain whitefish	400 cfs 9/2-4/18 1800 cfs 5/1-6/30 1300 cfs 7/1-7/31 1800 cfs 8/1-9/1	IDFG 1992
S.Fk.Payette River (Deadwood River-Oxbow Bend)	Rainbow trout, bull trout, mountain whitefish	337 cfs 9/1-4/18 1100 cfs 4/19-8/31	IDFG 1992
S.Fk.Payette River (Oxbow Bend)	Rainbow trout, bull trout, mountain whitefish	337 cfs 9/1-4/14 337-1100 cfs 4/15-8/31	IDFG 1992
S.Fk.Payette River (Oxbow Bend-Middle Fork)	Rainbow trout, bull trout, mountain whitefish	337 cfs 9/1-4/14 1100 cfs 4/15-8/31	IDFG 1992
S.Fk.Payette River (Middle Fk.-Banks)	Rainbow trout, bull trout, mountain whitefish	407 cfs 9/1-4/14 1350 4/15-8/31	IDFG 1992
Deadwood Reservoir	Rainbow trout, mountain whitefish, bull trout	50 KAF year round	IDFG 1992
Deadwood River	Rainbow trout, mountain whitefish, bull trout, cutthroat trout	125 cfs year round 50 red flag minimum	Cochauer & Hoyt 1979

Site/Reach	Target Species	Pool (KAF)/Flow (cfs)	Reference
Payette River (Banks-Gardena)	Rainbow trout, mountain whitefish, smallmouth bass	424 cfs year round	Cochnauer & Hoyt 1979
Payette River (Banks-Emmett)	Rainbow trout, mountain whitefish, smallmouth bass	800 cfs 10/1-3/31 1600 cfs 4/1-9/30	White & Cochnauer 1975
Payette River (Emmett-Payette)	Rainbow trout, mountain whitefish, smallmouth bass	900 cfs 10/1-2/28 3500 cfs 3/1-5/30 1800 cfs 6/1-9/30	White & Cochnauer 1975
Payette River (Gardena-Letha)	Rainbow trout, mountain whitefish, smallmouth bass	794 cfs year round	Cochnauer & Hoyt 1979
Payette River (Letha Bridge-Snake River)	Smallmouth bass	1165 cfs 6/1-2/28 2005 cfs 3/1-5/30	Cochnauer & Hoyt 1979
	Boise River Subbasin		
S.Fk.Boise River (Anderson Ranch-Arrowrock Res.)	Rainbow trout, mountain whitefish, bull trout	300 cfs 9/16-3/31 600 cfs 4/1-9/15	IDFG 1992
S.Fk.Boise River (Anderson Ranch-Arrowrock Res.)	Rainbow trout, mountain whitefish, bull trout	380 cfs 10/1-12/31 260 cfs 1/1-3/31 280 cfs April 360 cfs 5/1-6/30 280 cfs 7/1-9/30	White & Cochnauer 1975
Anderson Ranch Reservoir	Rainbow trout, mountain whitefish, bull trout, kokanee	70 KAF min. pool year round	IDFG 1992
Arrowrock Reservoir	Rainbow trout, mountain whitefish, bull trout, yellow perch	28.7 KAF min. pool year round	Wolfin & Ray 1984
Lucky Peak Reservoir	Rainbow trout, kokanee, smallmouth bass	Stable pool elev. in summer for spawning	Wolfin & Ray 1984
Boise River (Lucky Peak-Snake River)	Rainbow trout, brown trout, mountain whitefish	225 cfs 10/1-11/30 & 4/1-6/30; 150 cfs 12/1-3/31 & 7/1-9/30	Pruitt & Nadeau 1978
Boise River (Lucky Peak-Star Bridge)	Rainbow trout, brown trout, mountain whitefish	240 cfs 7/1-2/28 1100 cfs 3/1-5/31 4500 cfs June	IDFG request to the IWRB; White & Cochnauer 1975

U.S. Department of Transportation Federal Highway Administration

The Federal Highway Administration (FHWA) through the Federal Aid Highway Program provides federal financial assistance to the states to construct and improve the national highway system, urban and rural roads, and bridges. The program provides funds for general improvments

and development of safe highways and roads. The FHWA administers the Federal Lands Highway Program that provides access to and within national forests, national parks, Indian reservations and other public lands by preparing plans, letting contracts, supervising construction facilities, and conducting bridge inspections and surveys. The FHWA also works cooperatively with state partners to ensure that the transportation system plans and improvements take full account of the impacts on the human and natural environment.

Tribal Government

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 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 approximate reservation population is 5,500 with the tribal resident membership approximately 3,600. Today, 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 a 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 key 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. Indeed, the tribal government has established environmental protection, land use, fish and game, cultural resources, and natural resources departments funded by the EPA, BPA, and the U.S. 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

The fish and game laws of the State of Idaho provide the authority for the IDFG to manage fish and wildlife. This authority is clearly stated in sections 36-103, 36-104, 36-201, and 36-202 of the Idaho Code. Idaho Code Section 36-103 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 only be captured or taken at such times or places, under such conditions, or by such means, or in such manner, as will preserve, protect, or perpetuate such wildlife, and provide for the citizens of this state, as by law permitted to others, continued supplies of such wildlife for hunting, fishing and trapping."

The IDFG has statutory responsibility for "preserving, protecting and perpetuating" Idaho's fish and wildlife for present and future generations, and is responsible for managing the fish and

wildlife populations in the Boise-Payette-Weiser subbasins. The Idaho Fish and Game Commission is the policy-making board for the IDFG. Idaho Department of Fish and Game management plans and policies relevant to fish and wildlife and their habitat in these subbasins include *A Vision for the Future: Idaho Department of Fish and Game Policy Plan, 1990-2005*; the *Idaho Department of Fish and Game Strategic Plan (IDFG 2001)*; the *Idaho Department of Fish and Game Fisheries Management Plan 2001-2006*; *White-tailed Deer, Mule Deer and Elk Management Plans (IDFG 1999)*; the *Black Bear Management Plan 2000-2010* (IDFG 1998); the *Nongame and Endangered Wildlife Plan 1991-1995*; the *Upland Game Plan 1991-1995*; the *Waterfowl Plan 1991-1995*; the *Moose, Sheep and Goat Plans 1991-1995*; the *Mountain Lion Plan 1991-1995*; the *Wildlife Depredation Plan 1988 – 1992*; the *Pronghorn Antelope Management Plan 1991-1995*; the *Idaho Sage Grouse Management Plan (1998)*; and the *Furbearer Plan 1991-1995*.

Fisheries Management Activities. Overall fisheries management direction for the Boise-Payette-Weiser subbasins is outlined in the *IDFG 2001-2006 Fisheries Management Plan* (IDFG 2001). The IDFG works cooperatively with the USFWS in conducting fish population sampling in waters containing the federally listed bull trout. These activities must be approved and reviewed by the USFWS through consultation under Sections 6 and 7 of the ESA. In an effort to protect the genetic integrity of redband trout, only sterile (triploid) put-and-take hatchery rainbows are used in watersheds containing wild populations. Prior to 2000, fertile hatchery fish from various sources were used. The IDFG carefully scrutinizes any proposed fish introductions and chemical treatments statewide by going through a rigorous internal review process.

Idaho Conservation Data Center (CDC). The Idaho Conservation Data Center, located within the IDFG, was initially established in 1984 (as Idaho Natural Heritage Program) through a cooperative effort involving the IDFG, Idaho Department of Parks and Recreation, and The Nature Conservancy. In 1987, the program merged with the IDFG. The name was changed to the Idaho Conservation Data Center in 1992. The Idaho CDC is part of an expanding international network of Natural Heritage Programs. Through the leadership of The Nature Conservancy, similar heritage programs have been established (primarily within state government) throughout North America. Programs within the natural heritage network collect and maintain information on the status of rare, threatened, and endangered plant and animal species; exemplary ecological reference and natural areas; and terrestrial and aquatic habitats and plant communities using standardized methods and protocols in the framework of an integrated, relational data management system (The Nature Conservancy 1982; The Nature Conservancy *et al.* 1996). The IDFG has also developed or cooperated in the development of sensitive species conservation strategies, including:

White-headed woodpecker

Blair, S. and G. Servheen. 1995. A species conservation assessment and strategy for white-headed woodpecker (Picoides albolarvatus). U.S. Forest Service, U.S. Fish and Wildlife Service, Idaho Department of Fish and Game.

Forest carnivores

Idaho Department of Fish and Game, Nez Perce Tribe, and Sawtooth National Forest. 1995. Saving All the Pieces. The Idaho State Conservation Effort. Forest Carnivores in Idaho. Habitat Conservation Assessments (HCAs) and Conservation Strategies (CSs).

Aase's onion

Mancuso, M. 1995. Conservation strategy for Allium aaseae Ownbey (Aase's Onion). Idaho Department of Fish and Game, Conservation Data Center, Boise, Idaho.

Northern goshawk

Patla, S., K.K. Bates, M. Bechard, E. Craig, M. Fuller, R. Howard, S. Jefferies, S. Robinson, R. Rodriguez, and B. Wall. 1995. Habitat Conservation Assessment and Strategy for the northern goshawk for the State of Idaho.

Columbian sharp-tailed grouse

Ullman, M.J., A. Sands, and T. Hemker. 1998. Conservation Plan for Columbian sharp-tailed grouse and its habitats in Idaho. Prepared for Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho.

Mountain quail

Sands, A., C.A. Vogel, and K.P. Reece. 1998. Idaho Mountain Quail Conservation Plan. Prepared for Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho.

Townsend's big-eared bat

Pierson, E.D., M.C. Wackenhut, J.S. Altenbach, P. Bradley, P. Call, D.L. Genter, C.E. Harris, B.L. Keller, B. Lengus, L. Lewis, B. Luce, K.W. Navo, J.M. Perkins, S. Smith, L. Welch. 1999. Species conservation assessment and strategy for Townsend's big-eared bat (Corynorhinus townsendii townsendii and Corynorhinus townsendii pallescens). Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho.

Idaho Department of Environmental Quality

The IDEQ is responsible for implementing the 1972 federal Clean Water Act and ensuring whether a person, entity, or discharge is in compliance with state Water Quality Standards and Waste Water Treatment Requirements for protection of aquatic life and other beneficial uses. Section 303(d) of the Clean Water Act requires states to develop a list of water bodies that do not meet water quality standards. The IDEQ conducts biological and physical habitat surveys of water bodies under the Beneficial Use Reconnaissance Project (BURP), the primary purpose of which is to determine the support status of designated and existing beneficial uses.

The IDEQ administers several programs designed to monitor, protect, and restore water quality and aquatic life uses. These include BURP monitoring; 305(b) water quality assessments; 303(d) reports of impaired waters and pollutants; TMDL assessments, pollutant reduction allocations, and implementation plans; Bull trout recovery planning; 319 nonpoint source pollution management; Antidegradation policy; Water quality certifications; Municipal wastewater grants and loans; nonpoint discharge elimination system (NPDES) inspections; Water quality standards promulgation and enforcement; General ground water monitoring and

protection; Source water assessments; and specific watershed management plans identified by the legislature. The Idaho Board of Environmental Quality oversees direction of the agency to meet responsibilities mandated through Idaho Code, Executive Orders, court orders, and agreements with other parties.

Governor's Office of Species Conservation

In 1999, the Idaho Legislature established the State of Idaho Office of Species Conservation (OSC). The OSC:

- coordinates input from state agencies to provide State of Idaho comments and positions on important natural resource issues;
- incorporates social and economic factors into development of state policy;
- assumes public communication of state policy; and
- pursues political and financial support, and encourages other state agencies actions, for implementation of state implementation of ESA recovery and protection efforts.

Idaho's *Bull Trout Conservation Plan* (State of Idaho 1996) identifies key watersheds for protecting and restoring bull trout populations. The plan has two phases:

1) development of problem assessments and conservation strategies by Technical Advisory Teams, and
2) implementation of conservation measures, monitoring, and progress evaluation, to be directed by citizen-led Basin and Watershed Advisory Groups (BAGs and WAGs). To date, problem assessments have been completed for all the key watersheds in southwest Idaho that includes the Boise-Payette-Weiser subbasins.

Idaho Department of Lands

The IDL manages Idaho's Trust and Endowment Lands within the Boise-Payette-Weiser subbasins, including both forest and rangeland areas, under the direction of the State Board of Land Commissioners. Endowment forestlands are managed following forestry best management practices pursuant to the Idaho Forest Practices Act, while the endowment rangelands are operated under coordinated resource management plans. The IDL assists private landowners in developing timber management plans that comply with site-specific best management practices, and local area offices develop independent annual and five-year timber management plans. The agency is also involved in assisting local groups in firefighting efforts. The IDL administers the Forest Improvement Program (FIP) and the Stewardship Program (SIP). The agency is also responsible for administering the state's surface mining laws, including the closure and rehabilitation of old mine sites.

The IDL also has responsibility for enforcing Idaho laws that require permits for work on or above the beds of navigable waterways, below the ordinary high water mark. This includes riprap, breakwaters, bridges, and aids to navigation such as docks, piers, pilings, buoys, and boat ramps. State agencies, including the IDEQ and IDFG, have the opportunity to review and comment on the potential environmental effects of the projects.

Idaho Department of Water Resources

The IDWR is responsible for administration of water rights, and enforcing the Stream Channel Protection Act, which requires permits for in-channel work or developments. State agencies, including the IDEQ and IDFG, have the opportunity to review and comment on the potential

environmental effects of the projects. IDWR is also responsible for developing comprehensive basin water plans across the state.

The eight-member IWRB is the policy making body for the IDWR, and is appointed by the Governor. Its responsibilities include developing comprehensive basin water plans and establishing water rights including instream flows. Under Idaho law (Chapter 15, Title 42, Idaho Code), instream uses can be protected under water rights held by the IWRB in trust for the people of the state of Idaho. The IWRB's financial program assists local governments, water and homeowners associations, non-profit water companies, canal companies and irrigation districts with funding for water system infrastructure projects. The IWRB also manages the operation of Idaho's Water Supply Bank (Bank). The purposes of the (Bank) are to encourage the highest beneficial use of water; provide a source of adequate water supplies to benefit new and supplemental water uses; and to provide a source of funding for improving water user facilities and efficiencies.

The IWRB is charged with developing the *Idaho Comprehensive State Water Plan* (Idaho Code Section 42-1734A). Included in the State Water Plan is the statewide water policy plan, and component basin and water body plans which cover specific geographic areas of the state. Consistent with the Board's responsibilities, a basin water plan has been drafted for the Payette River watershed, South Fork Boise River watershed, Upper Boise River watershed, and one for the Lower Boise River watershed is under development. The IWRB is also authorized by statute to designate select waterways as protected rivers. This authority has been incorporated in basin water plans.

A minimum streamflow, or instream flow, is the minimum flow necessary to preserve the biological, recreation, or aesthetic value of a water body. Water is not diverted and used, as is the case with most water rights in Idaho. Instead, the water remains in a given reach of a river or in a lake to protect fish and wildlife habitat, aquatic life, water quality, navigation, transportation, recreation, or aesthetics. In 1978, the Idaho Legislature passed the minimum streamflow law. Under Idaho Law (Chapter 15, Title 42, Idaho Code), non-diverted uses can become valid water rights, which the IWRB holds in trust for Idaho's citizens. In the Boise-Payette-Weiser subbasins, a number of instream flow regimes have been recommended by the IDFG. Through its state water basin planning process, the IDWR also has recommended instream flows in the Boise and Payette River subbasins. To date, instream flows have been licensed in the Boise and Payette River subbasins (Table 33).

Table 33. Existing licensed instream flow water rights for the Boise and Payette River subbasins.

File Number	Reach (Length in miles)	Flow Regime (cfs)
	Boise River Subbasin	
63-12033	Middle Fk. Boise River (16.3)	200-1,000
63-12032	Yuba River (2.8)	44-200
63-12031	E. Fk. Montezuma Ck. (1.9)	0.11
63-12034	Elk Creek (15.4)	5
63-12031	Crooked River (10.1)	34-150
	Payette River Subbasin	
65-12733	S.Fk.Payette River-five reaches (54)	212-1,350
65-13060[a]	S.Fk.Payette River-one reach (1)	700-763
65-12822	N.Fk.Payette River (10)	106-1,400
65-12839[b]	N.Fk.Payette River (10)	100-294
65-12840	N.Fk.Payette River (17)	1,300-1,800
65-13059[c]	N.Fk.Payette River (17)	400
65-13894	N.Fk.Payette River (6.8)	35-60

[a] Supplemental flow to water right 65-12733

[b] Supplemental flow to water right 65-12822

[c] Supplemental flow to water right 65-12840

There are no licensed instream flow water rights in the Weiser Rver subbasin. The IDFG has also recommended a number of instream flow regimes in the three subbasins that have never been acted upon by the IWRB (Table 34). It is important to note that these prior recommendations by the IDFG were intended as short-term minimum subsistence flows and were not meant to be the long-term biologically based flows necessary to sustain aquatic resources.

Table 34. Instream flow regimes recommended by the IDFG for the Boise-Payette-Weiser subbasins.

River	Reach	Flow Regime (cfs)	Reference
S.Fk. Boise River	Gage No. 13-1905	260-380	White & Cochnauer 1975
S.Fk. Boise River	Anderson Ranch Dam to Arrowrock Reservoir	279	Cochnauer 1977
S.Fk. Boise River	Anderson Ranch Dam to Arrowrock Reservoir	200-280	Pruitt & Nadeau 1978
Boise River	Barber Dam to Notus	240-5,000	Pruitt & Nadeau 1978
Boise River	Notus to Snake River	380-5,000	White & Cochnauer 1975
Boise River	Lucky Peak Dam to Star Diversion	240-4,500	Cochnauer 1977; Pruitt & Nadeau 1978
Payette River	Banks to Emmett	800-1,600	White & Cochnauer 1975
Payette River	Emmett to Payette	900-3,500	White & Cochnauer 1975
Payette River	Banks to Gardena	424	Cochnauer & Hoyt 1979
Payette River	Gardena to Letha	794	Cochnauer & Hoyt 1979
Payette River	Letha to Snake River	1,165-2,005	Cochnauer & Hoyt 1979
Payette River	Payette River below Black Canyon Dam	10,000	Cochnauer & Hoyt 1979
M.Fk. Payette River	Crouch to S.Fk.Payette River	70	Cochnauer & Hoyt 1979
Deadwood River	Deadwood Dam to S.Fk. Payette River	125	Pruitt & Nadeau 1978
Weiser River	Cambridge to mouth	190-240	Pruitt & Nadeau 1978
Little Weiser River	Grays Ck. to mouth	70	Pruitt & Nadeau 1978

Idaho Department of Transportation

In Idaho, the state and federal highway system is managed and maintained by the IDT through federal, state, and local funding. District 6 and a portion of Highway District 2 of the IDT include 405 miles of roadways that require maintenance and improvement activities. In coordination with the IDFG, the FHA, the USACE, the USFWS and the NMFS, ITD provides fish and wildlife species protection (with the mitigation sequence: avoidance, minimization, mitigation) "to the maximum extent practicable," to prevent impacts to threatened and endangered species or their habitat. For listed fish species, mitigation is generally focused on restoring habitat to maintain or improve water temperature and turbidity, maintaining or improving spawning habitats, and maintaining or improving fish migration or passage through culverts and bridges. Road maintenance by way of snow removal and road repair is also evaluated and required to meet the same environmental criteria and protection as new construction.

A statewide, focused campaign to improve or replace fish passage barriers caused by any IDT construction action is now being formulated. A determination of mitigation for highway construction should be considered a basinwide (or ecoregion) priority or it should be maintained as an on-site action.

IDT's program for the period from 2001 to 2005 comprises 34 projects. These include 8 pavement rehabilitations, 5 resurfacings, 4 sealcoat, 4 bridge replacements, 4 reconstructions, 1 major rewidening, and 8 other miscellaneous projects.

Idaho Association of Soil and Water Conservation Districts

The Idaho Association of Soil Conservation Districts (IASCD) is a voluntary, non-profit association of Idaho's 51 soil conservation districts cooperating in the management of Idaho's natural resources. In conjunction with districts from other states, they form a part of a national network, the National Association of Conservation Districts (NACD), comprising approximately 3,000 districts and over 15,000 individual directors.

The IASCD was organized in 1944 to provide a unified voice for conservation in Idaho. Its members work closely with the Idaho Soil Conservation Commisssion (ISCC) on problems of policy and natural resource concerns. The IASCD also provides a forum for discussion of common problems, including erosion and sediment control, water quality, forestry, research, conservation and environmental education, resource planning, wildlife and pasture and range. It informs the State Legislature and Congress of its views on these natural resource concerns.

Idaho Soil Conservation Commission

The ISCC was created by the Idaho Legislature in 1939 and consists of five members appointed to five-year terms by the Idaho Governor. Twenty-seven ISCC staff and four staff contracted through the IASCD provide technical and administrative support to the 51 soil conservation districts in Idaho. Technical support is provided for districts managing state funded (through the ISCC) Water Quality Program for Agriculture (WQPA) projects. The ISCC manages the Resource Conservation and Rangeland Development Program (grant and loan). ISCC is a designated agency for the Natural Resources Conservation Income Tax Credit (63-3024B Idaho Code).

Idaho Association of Counties

The Idaho Association of Counties (IAC) was founded in 1976 and is a non-partisan, non-profit service organization dedicated to the improvement of county government. The IAC serves as a spokesman for counties at the state and national levels and acts as a liaison between counties and other levels of government through research, training, and lobbying.

Local Government

Counties

The Idaho State Local Land Use Planning Act (Idaho Code Section 67-6502) sets forth guidelines for County Planning. Ada, Canyon, Washington, Payette, Adams, Valley, Elmore, Boise, and Gem Counties have developed comprehensive plans in accordance with those guidelines. Ada County, in particular, has a comprehensive plan and zoning ordinance with specific goals and objectives to protect fish and wildlife and native vegetation communities. Currently, all proposals for subdivisions within Ada County must be reviewed by the IDFG.

The Community Planning Association of Southwest Idaho is a regional planning organization for the Treasure Valley, Idaho. They have been involved in organizing and providing forums to address region-wide issues of importance to cities, counties, and

constituents. This has included assessing the potential impacts of urban development on natural resources.

Municipalities

The city of Boise has a Boise River System Ordinance and comprehensive plan. The comprehensive plan includes a Foothills Plan and Ordinance. These planning and zoning documents contain a number of goals, objectives, and rules designed to protect fish and wildlife and their habitats. Other cities and smaller communities in the subbasin complex have comprehensive plans that include some language to cooperate with other agencies in the protection of scenic and natural resources.

Local Collaborative Groups

There are a number of local, collaborative groups in the Boise-Payette-Weiser subbasins that take actions important to species conservation. These groups are both watershed-based and resource-based.

Basin and Watershed Advisory Groups

Basin advisory groups (BAG) were created by state water quality code (Idaho Code §39-3613). The duties of each BAG are specified by Idaho Code §39-3614. The BAGs were designated by the director of the Idaho Department of Health and Welfare to advise the director on water quality objectives for each river basin in the state. Basin advisory groups are generally composed of members representing industries and interests affected by the implementation of water quality programs within their area. The BAGs make recommendations to IDEQ concerning monitoring, designated beneficial use status revisions, prioritization of impaired waters, and solicitation of public input. The Southwest BAG is the sole basin advisory group in the Boise, Payette, and Weiser river subbasins.

Watershed advisory groups (WAGs) are created by state water quality code (Idaho Code §39-3615). WAGs were formed to provide advice to the Idaho Department of Heath and Welfare (via IDEQ) for specific actions needed to control point and nonpoint sources of pollution within watersheds where designated beneficial uses are not fully supported. WAG duties are specified in Idaho Code §39-3616. The code specifically calls for creation of WAGs for water bodies that were labeled as “high priority” on the TMDL schedule established for the state of Idaho. There are several existing WAGs in the Boise-Payette-Weiser subbasins. These include: the Lower Boise River WAG, the Lower Payette River WAG, the Weiser River WAG, and the Native Fish WAG.

Soil and Water Conservation Districts

Authorized under Title 22, Chapter 36 Idaho Code, soil and water conservation districts are non-regulatory subdivisions of Idaho State government. A board of five or seven supervisors, who are local residents, and who serve without pay, governs each. All supervisors are elected officials and must be landowners (including urban property owners located within district boundaries) or farm operators in the district to which they are elected. Soil and water conservation districts develop and implement programs to protect and conserve natural resources on nonfederal lands. Districts organize technical advisory groups for projects and call upon local, state, tribal, and federal agency specialists, industry representatives, and interested individuals.

Districts receive limited funds from local (county) and state (general fund) government, and may receive other funds for local project work through the Water Quality Program for Agriculture program (ISCC) and other funding agencies, institutions, or organizations. Working cooperatively with other entities, districts provide technical assistance to agriculturists and other private landowners based on long-standing agreements with the NRCS, ISCC, and other federal and state agencies.

Resource-based Groups

A number of resource-based groups are active in the Boise-Payette-Weiser subbasins. These include numerous irrigation districts in the Boise, Payette, and Weiser River watersheds.

Private Entities

A number of unaffiliated private entities are significant landholders and are active in the Boise-Payette-Weiser subbasins.

The Nature Conservancy

The mission of The Nature Conservancy is to preserve plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. The Nature Conservancy works collaboratively with a variety of public and private partners to accomplish its conservation goals and is instrumental in working with willing landowners to acquire private lands and conservation easements for habitat protection. The Nature Conservancy is actively involved in conservation efforts in the three subbasins.

Others

A number of other conservation organizations are active in the Boise-Payette-Weiser subbasins. These include the Idaho Watersheds Project, the Wilderness Society, the Idaho Conservation League, Foundation for North American Wild Sheep (FNAWS), Rocky Mountain Elk Foundation (RMEF), Trout Unlimited (TU), Ducks Unlimited (DU), Idaho Wildlife Federation, Idaho Rivers United (IRU), Gem State Flyfishers, the Boise Valley Flyfishers, and the Idaho Sporting Congress.

Professional Organizations

Members of a number of professional organizations are active within the Boise, Payette, and Weiser river subbasins. These include the Idaho Chapter of the American Fisheries Society, the Idaho Chapter of the Wildlife Society, the Native Plant Society, the Idaho Cattlemen's Association, the Idaho Woolgrower's Association, and the Idaho Farm Bureau.

Goals, Objectives, Strategies, and Recommended Actions

Fisheries

Idaho Department of Fish and Game

Goal 1. On a statewide basis beginning in 2001, all hatchery rainbow trout will be sterile to minimize risk of genetic impacts to native redband trout.

Goal 2. Protect and rebuild populations of native salmonids in the Mddle and Upper Snake River Provinces to self-sustaining, harvestable levels.

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

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 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 1 and 2.

State of Idaho Bull Trout Conservation Plan
Mission: Maintain and/or restore complex interacting groups of bull trout populations throughout their native range in Idaho.

Goal 1. Maintain the condition of those areas presently supporting critical bull trout habitat.

Goal 2. Institute recovery strategies that produce measurable improvement in the status, abundance, and habitats of bull trout. Concentrate resources and recovery efforts in areas which will produce maximum cost-effective, short-term returns and which will also contribute to long-term recovery.

Goal 3. Establish a secure, well-distributed set of subwatersheds within key watersheds to achieve a stable or increasing population and to maintain options for future recovery.

Goal 4. Achieve the above goals while continuing to provide for the economic viability of Idaho's industries.

Framework for Implementation of Bull Trout Key Watershed Plans:

1. The appropriate Basin Advisory Group recommend the formation of the required watershed advisory groups, including technical advisory teams.
2. Using technical advisory teams, compile existing technical bull trout information for the key watersheds and recommend appropriate bull trout and water quality protection measures.
3. Establish and evaluate key watershed goals and initiate collection of new data.
4. Develop prioritized recovery activities.
5. Develop and implement conservation plans.
6. Develop and implement monitoring plans and feedback mechanisms.

Four Bull Trout Problem Assessments have been developed by the Native Fish Watershed Advisory Group for bull trout key watersheds in the Boise-Payette-Weiser subbasins. These are for the Boise River key watershed (Steed *et al.* 1998), Gold Fork River and Squaw Creek key watersheds (Steed 1999), Deadwood, Middle Fork, and South Fork Payette River key watersheds (Jimenez and Zaroban 1998), and the Weiser River key watershed (DuPont and Kennedy 2000). Below is a list of the recommended actions from each of these problem assessments.

A. Boise River Key Watershed

- Barriers to Migration
    1. New culvert installations in migration routes must be designed and constructed so as not to be a migration barrier.
    2. Fish passage, including but not limited to bull trout, must be designed into replacement stream crossings (existing) when failures occur, design life has been exceeded or are known to be barriers. Culverts listed in the below watersheds, should be inventoried and should be planned for fish passage.

       Priority 1 and 2 subwatersheds (short term):
       - Feather River
       - Lower Trinity
       - Upper Trinity Creek
       - Beaver Creek

       Priority 3 and 4 subwatersheds (long term):
       - Deer Creek
       - Dog-Nichols
       - Big Owl-Wren
       - Trapper-Trail
       - Swanholm-Hot
       - Cottonwood Creek
       - Roaring River
    3. Provide for fish passage at Kirby (Atlanta) Dam.
       - Roads
           1. Reduce road sediment production in subwatersheds with high substrate fine sediment characteristics. The following subwatersheds that are adjunct habitat,

are priority 1 or 2, and have road densities in the Riparian Habitat Conservation Areas greater than or equal to one mile per square mile:

- Beaver-Edna
- Pikes Fork
- Upper Trinity Creek
- Feather River

2. Reconstruct existing roads with effective cross-drain spacing and drain dip location to turn water to slope filtration, rather than to existing first order streams.

Priority 1 & 2 Subwatersheds (short term):

- Lower Crooked River
- Beaver-Edna
- Pikes Fork
- Upper Crooked River
- Lower Fall
- Middle Fall
- Upper Fall Creek

The remaining subwatersheds are long-term.

- Mining
  1. Pursue restrictions on suction dredge mining in focal habitats (spawning and rearing) while investigating options to potentially open portions of nodal habitats (mainstem migration corridors).
  2. Continue enforcement on current mining regulations.

- Forest Practices
  1. Reduce the risk to catastrophic wildfire by encouragement of active forest management in priority 1 and 2 subwatersheds most at risk:
     - Lower Crooked River
     - Beaver-Edna
     - Pikes Fork
     - Upper Crooked River
     - Lower Fall
     - Middle Fall
     - Upper Fall Creek
  2. Continue enforcement on current forest practices regulations.

- Threats to Lake/Reservoir Habitats
  1. Establish conservation pools in Anderson Ranch Reservoir and Arrowrock Reservoir for overwintering bull trout subadults and adults.

- Fish Harvest
  1. Replace and increase number of fishing regulation and bull trout identification signs throughout Boise River key watersheds.

2. Continue enforcement of current fishing regulations and increase patrol in identified staging (June-August) and wintering areas (November-March).
3. Improve angler ability to identify bull trout and increase understanding of protective regulations.

- Agriculture/ Livestock
  1. Encourage improved management techniques that address cattle dispersal, timing of use, and herding.
  2. Evaluate livestock allotments, and if necessary, take actions that would reduce sediment production, increase streambank/channel stability, and contribute to riparian vegetation integrity.

- Exotic Species
  1. Reduce competition with brook trout where they overlap with bull trout in priority 1 subwatersheds:
     - Upper Crooked River
     - Lower Crooked River
     - Pikes Fork
     - Salt Creek
     - Upper Bear River
     - Lower Bear River

B. Gold Fork River and Squaw Creek Key Watersheds

- Angler Species Identification

  Conclusion: Angler species identification is very poor, and greatly affects the quantity of unintentional take of adult bull trout.

  Recommendation: Improve average angler's ability to correctly identify bull trout (and other species) in the field. The Southwest Basin NFWAG recommends the IDFG should take the lead.

- Stream Crossings

  Conclusion: Stream crossings can be barriers to upstream migrating adults.

  Recommendation: Land managers with bull trout habitat should investigate potential culvert barriers in all key watersheds.

  Conclusion: The large culvert in the Second Fork Squaw Creek is an obvious barrier to upstream migrating bull trout.

  Recommendation: Replace the culvert with a passable crossing.

- Sediment From Roads

  Conclusion: Sediment from roads is a factor that is limiting bull trout in these key watersheds.

  Recommendations: Squaw Creek: Reduce sedimentation from roads. Conduct road sedimentation survey and locate high priorities for road restoration and maintenance.
  Gold Fork: Reduce sedimentation from roads. Use the road sedimentation survey in the Boise Cascade Corporation Watershed

Analysis to help locate high priorities for road sediment reduction. Where roads deliver sediment to streams, redesign drainage to direct runoff to the forest floor rather than to stream channels. Gravel those roads that have high potential runoff.

- Intentional or Unintentional Removal of Bull Trout
  Conclusion: Each individual bull trout is critical to the entire population of the North Fork Payette.
  Recommendation: Until angler identification education is successful, the NFWAG requests that IDFG close all fishing from the confluence of North Fork and South Fork Gold Fork on main Gold Fork to Kennally Creek. Note: The IDFG declined to support this recommendation.

- Brook Trout Interactions
  Conclusion: The North Fork of Kennally Creek and Rapid Creek are located in largely undisturbed, roadless areas within the Gold Fork key watershed. Surveys indicate high densities of brook trout within these streams make it unlikely that bull trout could reestablish. Similarly, in the Squaw Creek key watershed, brook trout dominate Squaw Creek and Third Fork Squaw Creek.
  Recommendations: Reduce brook trout in the North Fork Kennally Creek, Rapid Creek, Squaw Creek, and Third Fork Squaw Creek.

- Additional Fisheries Data Needs
  Conclusion: There are no documented bull trout in the Second Fork Squaw Creek.
  Recommendation: Investigate and try to determine the factors behind the lack of bull trout in the Second Fork.

- Grazing
  Conclusion: Livestock grazing is impacting streams in the Gold Fork and Squaw Creek key watersheds.
  Recommendations: Encourage improved management techniques that address cattle dispersal, timing of use, and herding. Evaluate livestock allotments, and if necessary, take actions that would reduce sediment production, increase streambank/channel stability, and contribute to riparian vegetation integrity.

C. Deadwood, Middle Fork, and South Fork Payette Key Watersheds

- Angler Species Identification
  Conclusion: Angler species identification is very poor, and greatly affects the quantity of unintentional take of adult bull trout.
  Recommendation: Improve average angler's ability to correctly identify bull trout (and other species) in the field. The Southwest Basin NFWAG feels that Idaho Fish and Game ought to take the lead.

- Stream Crossings
  Conclusion: Stream crossings can be barriers to upstream migrating adults.
  Recommendation: Land management agencies with bull trout habitat should investigate potential culvert barriers in all key watersheds.

- Brook Trout Interactions
  Conclusion: Brook trout suppression is a restoration and recovery tool that needs further testing and refinement.
  Recommendation: Investigate approaches to reduce brook trout in "brook trout only" streams. These stream studies could allow more aggressive measures to be examined in parts or entire drainages of moderate size.
  Conclusion: Competition with brook trout is limiting the distribution and abundance of bull trout.
  Recommendation: Suppress brook trout numbers in streams such as Bull Creek in the Middle Fork Payette River watershed.

- Genetic Understanding
  Conclusion: The Southwest Basin is lacking genetic information on bull trout, which is needed to determine existing populations and to plan for strong metapopulations.
  Recommendations: Establish funding to acquire necessary equipment and to have genetic material analyzed. Establish/select common collection method and protocol.

- Deadwood Mine
  Conclusion: Bull trout are absent in Deadwood River downstream of the Deadwood Mine. Mine pollution effects to the river are unknown.
  Recommendation: Investigate sediment and mine waste drainage influences on the Deadwood River.

- Roads
  Conclusion: All three key watersheds appear to have excess fine sediment.
  Recommendation: Gather additional road-related sediment data to be used for sediment reduction treatments.

- Fish Distribution and Abundance Data Needs
  Conclusion: Data and information is lacking within the Middle Fork Payette River key watershed in relation to bull trout distribution and abundance, strength of the fluvial component and associated habitat conditions.
  Recommendation: Fish distribution and abundance surveys need to be performed including associated habitat condition surveys within this key watershed especially in Upper Middle Fork Payette River, Bull, Peace, Valley, Upper Silver, and Long Fork Silver Creeks.

Recommendation: Additional fluvial and adfluvial fish surveys need to be completed throughout the Deadwood, Middle Fork, and South Fork Payette Rivers to determine the status of the fluvial and adfluvial bull trout populations.

- Deadwood Dam
  Conclusion: The Deadwood Dam is potentially affecting fluvial bull trout population migration. Flows and temperatures are variable and limited at certain times of the year.
  Recommendation: BOR and Irrigation District 65 should study options of different releases that affect thermal and flow conditions downstream for bull trout.

- Non-Native Salmonids
  Conclusion: The recent introductions of non-native salmonids (Atlantic salmon, fall Chinook salmon) into Deadwood Reservoir may pose threats to the suppressed bull trout populations in the system.
  Recommendation: Management priority should be given to native inland fish species. The IDFG should perform thorough assessments on planned introductions and the potential effects on native fishes.

- Lower Middle Fork Payette nodal habitat
  Conclusion: Outside the key watershed boundaries, but within the lower Middle Fork Payette River watershed, excess sediment fills pools, alters width-to-depth ratios, and greatly simplifies habitat complexity resulting in a migration corridor, which is not functioning properly for bull trout.
  Recommendation: Investigate methods for restoring habitat conditions along the lower Middle Fork Payette River.

- Historical Information
  Conclusion: Information specific to historic presence, distribution, abundance, and status of bull trout within the South Fork Payette River drainage is minimal.
  Recommendation: Gather bull trout historic information on presence, distribution and abundance.

D. Weiser River Key Watershed

- Watershed Connectivity/Road Culverts
  Conclusion: Impacts from dams and diversions explain why resident populations comprise the majority of the bull trout spawning populations in the Weiser River key watershed. Some migratory populations of bull trout may exist, but the area available is much reduced from their historic distribution.

Recommendations: Currently, there are discussions considering maintaining suitable summer flows and water temperatures in the Weiser River. Land mangers with bull trout habitat should investigate how to reestablish connectivity in the Weiser River key watershed.

Conclusion: Stream crossings can be barriers to upstream migrating adults.

Recommendation: Land managers with bull trout habitat should investigate potential culvert barriers in the key watershed. Culverts found to be passage barriers on perennial streams should be replaced with an appropriate structure that ensures free fish passage. A culvert located in Anderson creek on FDR#326 is an obvious barrier to upstream migrating bull trout and should be replaced with a culvert or bridge that will allow fish passage.

- Sediment

  Conclusion: Sediment from roads is a factor that is limiting bull trout from the Weiser key water shed.

  Recommendations: Land managers with roads in bull trout habitat should gather additional road data to help locate priorities for road sediment reduction. Where roads deliver sediment to streams, redesign drainage to direct runoff to forest floor rather than to stream channels. Gravel roads that have high potential runoff. Develop a comprehensive transportation management plan.

- Angler Species Identification

  Conclusion: Angler species identification is very poor and could increase unintentional take of adult bull trout.

  Recommendation: Improve average angler's ability to correctly identify bull trout (and other species) in the field.

- Fish Distribution and Abundance Data Needs

  Conclusion: Brook trout overlap with bull trout populations in the upper Little Weiser River, Dewey Creek, and East Fork Weiser River. The impact brook trout are having on these bull trout populations is unknown.

  Recommendation: Fish distribution and abundance surveys should be done.

- Genetic Understanding

  Conclusion: The Southwest Basin is lacking in genetic information that is needed to determine the existing populations and to plan for strong metapopulations.

  Recommendations: Establish funding to acquire necessary equipment and to have genetic material analyzed. Establish/select common collection method and protocol.

- Catastrophic Wildfires

  Conclusion: Where important, isolated, small populations of bull trout persist in

landscapes at high risk of large wildfires, management should proceed only with the greatest possible care.

Recommendation: Silvicultural prescriptions that should be considered include those that do not require new or reconstructed road systems and should look at stabilization and obliteration of roads in those watersheds. These prescriptions should emphasize prescribe fire or "light on the land" logging and yarding systems.

- Livestock Management Strategies

  Conclusion: Monitoring of grazing forage and riparian habitat in the Weiser River key watershed has been limited.

  Recommendation: Annual monitoring of allotments is needed to assess the impacts of grazing on stream and riparian habitat. Land mangers should emphasize improved management techniques that address dispersal, timing of use and herding until more data becomes available.

Wildlife

Idaho Department of Fish and Game

General

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

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

Strategy 1.1.1. Protect, preserve, and perpetuate fish and wildlife resources for their intrinsic and ecological values, as well as their direct benefit to man.

Strategy 1.1.2. Actively support and participate in efforts to protect or enhance the quality of water in Idaho's lakes, rivers, and streams.

Strategy 1.1.3. Advocate land management practices that protect, restore and enhance fish and wildlife habitat, especially habitats such as wetlands and riparian areas that benefit a wide variety of fish and wildlife species.

Strategy 1.1.4. Be an advocate for wildlife and wildlife users in legislation, land and water use activities, policies, or programs that result in significant and unwarranted loss of fish and wildlife habitat or populations, and encourage project designs that eliminate or minimize such losses.

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

Objective 2. Emphasize recreational opportunities associated with fish and wildlife resources.

Strategy 2.1.1. Support hunting, fishing, and trapping as traditional and legitimate uses of Idaho's fish and wildlife resources.

Strategy 2.1.2. Manage fish and wildlife resources for recreational and other legitimate benefits that can be derived primarily by residents of Idaho.

Strategy 2.1.3. Manage fish and wildlife to provide a variety of consumptive and nonconsumptive recreational opportunities as well as scientific and educational uses.

Strategy 2.1.4. Manage wildlife at levels that provide for recreational opportunity but do not result in significant damage to private property.

Strategy 2.1.5. Use the best available biological and social information in making and influencing resource decisions.

Big Game Species

Deer

Objective 1. Protect and improve existing winter range.

Objective 2. Protect and preserve the limited deer winter range between Boise and Mountain Home through the use of conservation easements, acquisitions, cooperative agreements and other applicable methods.

Objective 3. Reduce the threat from weeds in the shrub-steppe ecosystem.

Elk

Objective 1. Reduce elk vulnerability by increasing escape cover and by reducing access.

Objective 2. Protect calving areas by maintaining understory vegetation on large areas to provide protection to newborn calves.

Forest Carnivores

Objective 1. Monitor marten populations and harvest opportunities.

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

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

Strategy 3.1. Conduct surveys for fishers within areas of unverified presence but having potential occupancy and in potential habitat linkage zones following (Zielinski and Kucera 1994).

Action 3.1.1. Develop methodologies for monitoring marten populations and harvest.

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

Strategy 4.1. Prioritize recolonization and augmentation areas.

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

Strategy 5.1. Restore fire as an ecological process.

Action 5.1.1. Evaluate historical conditions and landscape patterns to determine historical vegetation mosaics across landscapes through time.

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

Strategy 6.1. Protect integrity of forest carnivore habitats.

Action 6.1.1. Assess the effects of habitat fragmentation and mortality from roads and highways on lynx population viability.

Action 6.1.2. Determine the effects of open forest roads and associated human use on populations and habitat use.

Action 6.1.3. Determine the size and characteristics of refugia for forest carnivores.

Action 6.1.4. Determine to what extent lynx use shrub-steppe habitats.

Action 6.1.5. Provide a landscape of interconnected blocks of forging habitat.

Strategy 6.2. Delineate potential habitats.

Action 6.2.1. Map habitats using 1:250,000-1:1,000,000 scale maps with attributed coverages at the drainage, subdrainage, and stand scales.

Action 6.2.2. Identify connectivity and core habitats for priority protection and conservation.

Strategy 6.3. Identify habitat linkage zones connecting regional populations demographically and genetically.

Action 6.3.1. Manage linkage zones as primary conservation areas.

Action 6.3.2. Examine roading impacts to linkage habitats and populations.

Action 6.3.3. Identify core areas that possess high quality habitats and high-density populations.

Small Mammals

Objective 1. Survey and identify roost, foraging and hibernacula habitats, individuals and populations of fringed myotis, Townsend's Big-eared bat, and western Pipistrelle.

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

Strategy 2.1. Identify and record population and individual sitings of pygmy rabbits.

Migratory Birds

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

Objective 2. By 2025, restore at least 10% of the historical extent of each riparian system within each ecoregion subsection, to conditions that would support productive populations of designated focal species.

Strategy 2.1. Determine the potential bird communities within each riparian ecosystem.

Strategy 2.2. Determine the habitat requirements and habitat associations of focal and priority species and the effects of management activities and land use.

Action 2.2.1. Determine habitat requirements and population trends of focal and priority species using published and unpublished data.

Action 2.2.2. Initiate research and monitoring programs for focal and priority species (Barrow's Goldeneye, Hooded Merganser, Blue Grouse, Mountain Quail, Black-chinned, Calliope, and Rufous Hummingbirds, Willow Flycatcher, Dusky Flycatcher, American Dipper, Yellow Warbler, MacGillivray's Warbler).

Strategy 2.3. Accumulate information on the current and potential distributions of each riparian system.

Action 2.3.1. Develop a GIS data repository for riparian associated information.

Action 2.2.2. Complete the National Wetland Inventory mapping of riparian habitats for areas not yet completed.

Action 2.3.3. Identify areas of potential good quality riparian habitat and areas where restoration should occur.

Strategy 2.4. Restore riparian habitats based on feasibility, land ownership, size of existing patches, existing land matrix, quality, and habitat connectivity.

Action 2.4.1. Preliminarily protect or restore important riparian habitats in the subbasin complex.

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

Strategy 3.1. Write habitat management recommendations for wetland birds.

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

Strategy 4.1. Assess existing condition and extent of shrub-steppe habitat in Idaho at three levels: statewide, administrative unit, and management unit.

Action 4.1.1. Use remote sensing, existing information, and ground data to identify, map, assess, and prioritize shrub-steppe habitats.

Objective 5. In dry ponderosa pine/Douglas-fir/grand fir forests, restore as much as possible but at least 10 percent (100,000 acres) of the historical range of these forests meeting the conditions needed for White-headed woodpeckers.

Strategy 5.1. Identify stands of ponderosa pine that are in historical conditions and those that are at least 10 acres sizes with a large tree component.

Action 5.1.1. Define historical conditions of ponderosa pine stands and use remote sensing data and ground inventory information to map them.

Action 5.1.2. Prioritize potential restoration sites based on feasibility, land ownership, land management, and existing conditions.

Action 5.1.3. Work to develop conservation agreements, land or resource trades or other incentives to protect privately owned priority ponderosa pine stands.

Action 5.1.4. Develop a snag management strategy to optimize large ponderosa pine snags distributed across the landscape.

Action 5.1.5. Conduct studies on the effects of fire-management in ponderosa pine for focal and priority species.

Objective 6. Manage vegetation consistent with historical succession and disturbance regimes for Black-backed woodpeckers.

Strategy 6.1. Restore fire as an ecological process.

Action 6.1.1. Monitor nests and breeding and foraging behavior in logged and unlogged burned forests.

Action 6.1.2. Protect post-fire forests from salvage activities.

Action 6.1.3. Conserve selected burned forest stands >387 ha.

Owls

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

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

Strategy 2.1. Develop permanent monitoring sites.

Action 2.1.1. Establish and conduct owl survey transects and surveys.

Action 2.1.2. Erect and monitor nest boxes.

Strategy 2.2. Retain snags and primary cavity nesters.
Action 2.2.1. Protect or implement uneven-aged management practices in Ponderosa pine stands.
Action 2.2.2. Retain suitable boreal owl habitat in spruce-fir forests.
Action 2.2.3. Restore aspen forests.
Action 2.2.4. Retain large snags and habitat near and in riparian areas.

Northern Goshawk

Objective 1. Determine biology and ecology of northern goshawks.

Strategy 1.1. Use long-term studies to measure nest territory fidelity, home range, habitat use, and metapopulation dynamics.

Objective 2. Determine the abundance and distribution of goshawks.

Strategy 2.1. Use standardized survey protocols for surveying habitats.

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

Strategy 3.1. Develop conservation agreements with private landowners.
Action 3.1.1. Develop management guidelines that are standardized across regional boundaries for forest cover types, and climates.
Action 3.1.2. Manage riparian habitat in mature forest to include buffer zones to protect potential goshawk nesting and foraging habitat.

Mountain Quail

Objective 1. Identify and remove or lessen threats to mountain quail population recovery in the subbasin complex.
Strategy 1.1. Develop local management plans.

Objective 2. Identify, protect, and enhance habitats that link existing and future populations at the landscape level.

Strategy 2.1. Inventory mountain quail range.
Action 2.1.1. Use the habitat suitability model (Brennan *et al.* 1986) to assess and identify habitat quality, improvements needed, and monitor rehabilitation efforts.

Objective 3. Conduct experimental transplants and habitat management actions to more precisely determine habitat relationships.

Objective 4. Enhance degraded habitat and increase the distribution of mountain quail habitat.

Strategy 4.1. Rehabilitate riparian habitats.

Action 4.1.1. Manage grazing in riparian habitats to maintain dense overstory of mature shrubs and an open understory.

Action 4.1.2. Plant native and other desirable food-producing shrubs in riparian areas.

Sharp-tailed Grouse

Objective 1. Reestablish shrubs along riparian areas in the shrub-steppe ecosystem.

Sage Grouse

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

Strategy 1.1. Manage nesting and early brood habitats to provide 15-25 percent sagebrush canopy coverage and about 7 inches or more of grass and forb understory during the May nesting period.

Strategy 1.2. Manage for late summer brood habitat that includes a good variety of succulent vegetation adjacent to sagebrush escape and loafing cover.

Strategy 1.3. Manager for winter habitat that provides sagebrush exposed under all possible snow depths.

Strategy 1.4. Implement grazing management and big game regulations to achieve and maintain sagebrush and riparian/meadow habitats in good ecological condition.

Strategy 1.5. Do everything possible to protect remaining sage grouse habitats where natural fire frequency is 50-130 years and recent fire has greatly reduced sage grouse habitat.

Strategy 1.6. Establish priority areas for sage grouse habitat management.

Strategy 1.7. Monitor the condition and trend of sage grouse habitat.

Action 1.7.1. Prepare cover type maps and evaluate habitat conditions using standard methods for key seasonal habitats.

Action 1.7.2. Offer conservation easements or acquire critical habitats from willing sellers through land exchange, reserved interest deed, or direct purchase of mapped important sage grouse habitats.

Action 1.7.3. Develop strategically placed firebreaks using greenstripping, mechanical removal of fuel and/or special grazing that will slow or stop the spread of wildfires.

Action 1.7.4. Control noxious weeds along roads.
Action 1.7.5. Include forbs and native grasses in seeding mixtures on critical habitat areas.
Action 1.7.6. Rehabilitate gullied meadows to raise the water table and restore meadow characteristics.
Action 1.7.7. Improve grazing management in sage grouse nesting habitats.
Action 1.7.8. Restore riparian habitats through grazing and water diversion management.

Objective 2. Manage for Sage Grouse numbers as outlined in each Sage Grouse Management area in the Sage Grouse Management plan by 2007.

Strategy 2.1. Improve the base of knowledge on the status and distribution of Idaho sage grouse and their habitats.
Strategy 2.2. Monitor the abundance and distribution of sage grouse.
Action 2.2.1. Identify areas of strong sage grouse populations and protect them from habitat loss.
Action 2.2.2. Identify areas of good or declining populations of sage grouse an manage habitats to restore or protect them.
Action 2.2.3. Determine the population trends of shrub-steppe birds by establishing breeding bird surveys in each Sage Grouse management area.
Action 2.2.4. Establish lek route(s).

Amphibians, Reptiles, and Invertebrates

Objective 1. Determine genetic differences and relatedness of western toad populations.

Objective 2. Provide habitat protection of wetland and riparian areas until western toad populations, abundance and distribution, and genetics have been determined.

Research, Monitoring and Evaluation Activities

Fisheries

BPA-funded Research, Monitoring and Evaluation Activities

Idaho Department of Fish and Game

Snake River Native Salmonid Assessment (Project No. 980002)

This 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 inventorying phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the middle and upper Snake River provinces, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are also being collected to

assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. 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. This includes the Weiser, Owyhee, Payette, Boise, Goose, Raft, Rock, Bannock, Portneuf, Blackfoot, Willow, South Fork Snake, and Teton. Genetic samples of redband trout and Yellowstone cutthroat trout have been collected at a total of 155 sites, and results are available for 15 sites. Water temperature has been measured and/or obtained from other agencies at 97 stream sites across the Middle and Upper Snake River Provinces. A comprehensive database has been developed that includes data on native salmonid abundance and distribution, genetic samples, habitat summaries, and herpetofauna observations. This project also evaluates 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. This suggests 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

Entities within the three subbasins have collected, and continue to collect, diverse data directed toward answering multiple questions about fish and wildlife status, aquatic and riparian system health, and terrestrial conditions. Although there is no subbasin-scale program to coordinate the work conducted by all concerned, it is clear that many questions about aquatic and terrestrial conditions within the subbasins are being answered, and more might be answered through careful examination of exiting information or data now being collected. This is not to suggest that there is no need for additional monitoring, but better coordination of ongoing or future data collection would allow a more efficient effort across all subbasins.

Biologists were able to identify a number of recent research, environmental monitoring, and/or evaluation activities related to the Boise-Payette-Weiser subbasins that are funded by sources other than BPA. The BPA has not funded much work in these subbasins since the 1980s when loss assessments were contracted through the IDFG for federal hydropower facilities.

Rocky Mountain Research Station (RMRS, Boise, Idaho). The RMRS has a fish research team that is part of the Aquatic and Terrestrial Ecosystems Work Unit. Current research efforts are addressing the conservation biology of aquatic vertebrates, the influences of natural and human-caused disturbance, and the development of decision support tools for forest management. Although RMRS scientists and collaborators deal with multiple aspects of aquatic communities, considerable work has and will be focused on the salmonids including resident and anadromous species. Work occurs across a range of spatial scales but current efforts are focused largely on factors influencing or associated with the distribution and persistence of these fishes at scales ranging from stream reaches to whole river basins. Recent and ongoing research by the RMRS includes the following:

- Bull Trout Status, Distribution, and Persistence: Past work of the RMRS includes a variety of projects looking at the physical and biological processes influencing the distribution, dynamics, and persistence of bull trout populations. They have documented the broad scale distribution of bull trout and shown that climate or temperature, stream size, and human disruption of watersheds are important elements characterizing potential habitat, while the size of habitat patches, fragmentation (or isolation from other patches), and the level of human disruption are important factors influencing the occurrence and persistence of local populations. Habitat fragmentation and life history diversity may be key to the resilience of both bull trout and rainbow trout populations responding to major disturbances associated with wildfires and flood/debris flow events. Their work with bull trout in the Boise River subbasin was the foundation of work describing the status and distribution of bull trout across the species range within the Interior Columbia River basin in the U.S. (Rieman and McIntyre 1995; Dunham and Rieman 1999; Rieman, Lee, and others1997; Rieman and Clayton 1997; Adams 1994; Rieman and Dunham 2000; Rieman, Lee, and Thurow 1997; Rieman and Chandler 1999; Dunham and Chandler 2001).

- The RMRS continues to monitor a small number of populations of bull trout in the Boise River subbasin that were influenced by fire related disturbances in the last 10 years.

- Intraspecfic Diversity: The RMRS is currently engaged in research to describe the genetic population structure of bull trout across the entire Boise River basin. This work will compliment the work on distribution and occurrence of populations described above and will help resolve the role of dispersal and metapopulation structure in bull trout population dynamics.

- Sampling and Monitoring: With the growing recognition that large-scale processes may strongly influence fish population dynamics has come a need to sample and describe habitat and biological patterns over very large areas. Early work done by the RMRS with bull trout in the Boise River subbasin provided a protocol for sampling that attempts to maximize the probability of detecting bull trout while minimizing the sampling effort in any single stream or habitat patch. They are currently working on improved models of sampling efficiency for bull trout for a variety of gear types and habitat conditions that exist in the Boise River subbasin and other subbasins in the Columbia River Bbasin. The

sampling efficiency work is the foundation of an American Fisheries Society, Western Division bull trout sampling protocol that is currently in review (Peterson *et al.* 2001). The RMRS has also recently published work on sampling error in redd counts for bull trout (Dunham *et al.* 2001). Other work has focused on developing and validating measures of habitat, channel condition, and temperature that may reflect the influence of management and natural disturbance. (Rieman and McIntyre 1995; Peterson 1999; Peterson and Wollrab 1999; Rieman and Chandler 1999; Thompson 2000; Thompson 2001; Peterson *et al.* 2001).

- Physical Processes Structuring Habitat: Mass wasting processes following fire have been hypothesized to be a dominant mechanism in structuring stream habitat. In cooperation with the Payette National Forest, scientists at the RMRS are studying relationships between fire and landslides on basalt soils in the Weiser River subbasin. These studies include application of a GIS-based slope stability model to explore site-based risk. Similar studies are underway on granitic soils of the Idaho batholith in the Boise and Payette River subbasins. Post-fire water repellency spatial patterns and recovery over time are being studied in the Boise River subbasin. A study on the effectiveness of emergency post-fire rehabilitation treatments is coupled to the latter study.

- Over the past three decades, the RMRS has been conducting research in the Middle Fork Payette River watershed on effects of logging and roads on water quality and quantity. These are paired watershed studies in small (100-500-acre) basins, and field data collection is complete, although there are still some data analyses and manuscript preparation ongoing. Over 100 publications, many related to erosion and sedimentation effects under both natural and disturbed conditions, have resulted from these studies in Silver Creek.

- Over the last decade, the RMRS has evaluated the temporal dynamics of fine sediment intrusion in salmonid spawning habitat using artificial redds. These studies include measures of habitat quality including temperature, dissolved oxygen, and intragravel flow (Thurow and King 1991, 1994; Clayton, King and Thurow 1996).

- The RMRS has studied effects of water diversions on riparian habitat and near-stream ground water level response to diversions in the Payette and Boise River subbasins (Clayton, Luce and Barta 1998; King and Bohn 2000).

- Stream temperature has been identified as a fundamental control on the spatial distribution of fishes within river basins. Research has been conducted for several years on broadscale temperature patterns in the Boise River subbasin. A more detailed examination of stream temperatures, low flows, and driving microclimatology has been initiated in the Boise River subbasin. Objectives of the detailed study are to validate energy fluxes and balances estimated in stream temperature models. Existing physically based models address temperature changes in stream reaches and do not address conditions in headwater streams where the upstream boundary condition must also be modeled. The data set being collected will be critical in development of a model to fill this niche.

- Nonnative Species: A number of nonnative fishes have been introduced throughout the subbasin complex. Brook trout may be a threat of particular significance for native salmonids and amphibians. The RMRS provided support for a Master's degree project that evaluated the potential displacement of bull trout by brook trout (Adams 1994; Adams 1999). They are currently engaged in research extending that work to determine how much bull trout are likely to be displaced by brook trout invading from downstream. Other related work outside the basin has focused on the invasion process and suggests that invasions may not be inevitable in all systems that brook trout may access.

Boise National Forest

Bull Trout Related Monitoring

1. Bull Trout Spawning Survey on the Lowman Ranger District (Zurstadt 1998).
2. Bull Trout Observations from Dry and Wash Creeks, Lowman Ranger District (Zurstadt 1998).
3. Bull Trout Fisheries Monitoring Plan for the North Fork Boise River (Burton 1999).
4. Lowman Ranger District Bull Trout Study Progress Report 1996 (Zurstadt and Jimenez 1996).
5. Effects of uncharacteristically large and intense wildfires on native fish: 14 years of observations (Burton 2000).

U.S. Bureau of Reclamation

Currently, the BOR cooperates with the IDFG, BNF, and RMRS in sharing equipment and expertise on multiple projects in the Boise River subbasin. Work in the 2001 field season includes:

1. April 1 - June 30: The BOR, BNF, and the IDFG conduct a trap and haul effort in Lucky Peak Reservoir to capture bull trout which have been entrained through Arrowrock Dam. Field crews are experimenting with four different methods of capture to assess maximum capture rates by each method and time of year. Currently, crews use gill and fyke nets, and will begin using electrofishing boats and a Merwin trap in May. Results of this effort will be available in February 2002.

2. May 7 - August 1: BOR, BNF, and IDFG operate a rotary screw trap on the Crooked River, rivermile 9.5, to capture bull trout moving in the system. This trap was operated experimentally from May 30-August 1, 2000 and proved quite effective in capturing age class 2+ - 3+ juvenile bull trout migrating out of the system. A 2000-2001 summary for this trapping operation will be available in November 2001.

3. July 1 - August 28: BNF and BOR conduct habitat and abundance surveys for bull trout throughout the Mores Creek, and Middle and North Fork Boise River watersheds. This is the third year of a four year planned study in the North Fork system. The summary for the

four-year study will be available July 2004. A two-year progress report will be available for the North Fork watershed in October 2001.

4. August 20 - 24: South Fork habitat, abundance, and fin clip collection project. This is a largescale sampling effort with RMRS, the University of Montana Wild Trout and Salmon Genetics Laboratory, BOR, IDFG, BNF, Sawtooth National Forest, Boise Cascade Corporation and members of Trout Unlimited. The BOR currently is a cooperator with RMRS, Boise Cascade, and the University of Montana to complete microsatellite genetic analysis of multiple population scales of bull trout throughout the Boise River Basin. Final reports of this study are scheduled for June 2004.

5. August 28 - October 31: North Fork Boise River Weir trap operation. BNF and BOR operate a trap on the North Fork of the Boise River to capture post-spawning adult bull trout and juvenile migrants. Analysis has been conducted on multiple environmental and year class scales. This will be the third year of a four-year study. A two-year progress report will be available in October 2001 and final report in July 2004. Further operation of the North Fork weir may occur in conjunction with the valve replacement work in 2003 at Arrowrock Dam, and following in 2004 to continue to monitor the bull trout population.

6. August 28 - October 31: Juvenile bull trout movement telemetry study. BNF, BOR, IDFG, and Boise State University are cooperating to conduct tagging and tracking of juvenile size class (< 12 inches in total length) bull trout in the North Fork Boise River and Arrowrock Reservoir systems. The project is a two-year graduate program through Boise State University and is scheduled for completion in December 2003.

7. Mid-September: South Fork Boise River weir construction and telemetry study. The BOR and IDFG are cooperating to construct a weir trap and conduct radio tagging and tracking to determine entrainment and movement of adult bull trout in Anderson Ranch Reservoir. This is a continuation of work that has been conducted by IDFG in the South Fork Boise River in 1998.

The BOR is working on a third year of weir and tributary data collection. This work will continue through 2002. Fieldwork during 2002 will include all of the above listed projects with the exception of the South Fork Boise River sampling. The BOR anticipates analysis and discussion of results from that effort for the microsatellite project during 2002. Additional work planned for 2002 includes an archival and adult telemetry tagging project to monitor bull trout movement before, during, and after the Arrowrock Dam valve replacement project.

Idaho Department of Environmental Quality

Beneficial Use Reconnaissance Surveys. The IDEQ has conducted extensive surveys of stream habitat, water quality, and biotic conditions in streams in the Boise-Payette-Weiser subbasins using standardized protocols. Sample sites have been scattered across each major hydrologic unit with the subbasins, but tend to be somewhat biased towards sites of degraded water quality due to the purpose of identifying reaches that are not in compliance with state water quality laws.

Idaho Department of Fish and Game

The IDFG has conducted extensive work on bull trout and redband trout populations across the subbasin complex. Most work has focused on the Boise River subbasin (Flatter 1998; Flatter 1999; Flatter 2000; Partridge and Warren 2000). However, the IDFG has also surveyed bull trout key watersheds in the Payette River subbasin.

Since the Kirby Dam fish ladder was completed in 1999, the IDFG has been monitoring use of the ladder by fish using underwater video and trapping. The IDFG is committed to doing monitoring of the ladder through at least 2005. Biologists also plan to continue trend monitoring in pre-established snorkeling and electrofishing sites across the subbasin complex.

Orma J. Smith Museum of Natural History

Fish Collection Database. The fish collection database at the Orma J. Smith Museum of Natural History contains over 4,500 records representing over 5,000 lots of specimens collected from 1918 to the present. The collection is comprised of voucher specimens from Albertson's College of Idaho, IDEQ, U.S. Geological Survey (USGS), IDFG, BLM, U.S. National Forests, RMRS, and NMFS. The curator of the collection, Donald W. Zaroban (IDEQ) and Dr. Richard L. Wallace (Professor Emeritus of Zoology, University of Idaho), are collaborating on the production of a field guide to the native fishes of Idaho. This effort is resulting in a combined database of Idaho specimens from the University of Idaho, the Orma J. Smith Museum, and records of Idaho specimens housed at the U.S. Museum of Natural History and the University of Michigan Museum of Zoology.

University of Idaho, Moscow, Idaho

Adamas (1994) conducted a graduate research project on bull trout distribution in four streams in the Weiser River subbasin.

Wildlife

BPA-funded Research, Monitoring and Evaluation Activities

None reported.

Non BPA-funded Research, Monitoring and Evaluation Activities

Idaho Department of Fish and Game conducts research, monitoring, and evaluation activities related to sage grouse monitoring, vegetation mapping, big game surveys, and nongame and sensitive wildlife surveys.

Statement of Fish and Wildlife Needs

The following discussions and associated lists include specific immediate and/or critical needs within the Boise-Payette-Weiser subbasins. Needs have been defined to

1. address limiting factors to fish, wildlife, and plant communities;
2. ensure that gaps in current data or knowledge are addressed;

3. enable continuation of existing programs critical to successful management of fish and wildlife resources; and
4. guide development of new programs to facilitate or enhance fish and wildlife management.

Fisheries

General

- Fully inventory manmade and natural migration barriers for native fish. Develop methods to identify and prioritize barrier removal projects based on assessments of risk and benefit for basin-wide native fish populations.
- Develop and fund reservoir conservation pools to sustain aquatic and terrestrial resources.
- Complete fish and wildlife loss assessments for federal projects at Lucky Peak, Arrowrock, Cascade, and Deadwood.
- Describe relative importance of key tributaries to bull and redband trout production.
- Continue to inventory native salmonids in the Middle and Upper Snake River Provinces 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.
- Continue to gather and analyze genetic information on native salmonids throughout the Middle and Upper Snake River Provinces to determine the purity of populations and the degree of genetic variability between and among populations.
- 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 Middle and Upper Snake River Provinces.
- Sediment and nutrient control programs throughout the subbasin should include, but not be limited to: 1) improved road maintenance or road closures to reduce erosion of roadbed materials into streams, 2) incentives for landowners to provide riparian buffers in croplands and pastures, 3) development of settling ponds or wetland filters to treat agricultural return flows, and 4) purchase of grazing rights or reductions in grazing intensity on public lands along high priority stream reaches.
- Develop artificial wetlands program to treat return flows and provide wildlife habitat and waterfowl production.
- Install and maintain fish screens on all significant diversion structures; include flow monitoring at headgates to improve efficiency of irrigation systems.
- Provide fish passage at all flow stages around irrigation diversion structures.

Boise River Subbasin

- Develop and fund interagency team to evaluate effectiveness of the Kirby Dam fish ladder; expand monitoring to fully document bull trout escapement, timing, and spawning locations, establish trend sites for redd counts, and assess risks from brook trout.
- Enhance the minimum conservation pool in Arrowrock Reservoir to secure overwintering habitat for bull and redband trout.

- Monitor bull trout entrainment losses from Arrowrock Reservoir following the proposed valve replacements and installation of hydroelectric plant; work with BOR and hydro operators to develop and test avoidance technologies to minimize entrainment.
- Enhance fishing opportunity by developing fishing ponds in existing dredge ponds in the Middle Fork Boise and Mores Creek watersheds.
- Secure and increase minimum stream flows in the Boise River between Lucky Peak Dam and the mouth.
- Evaluate the distribution and potential impacts of brook trout hybridization with bull trout in the Fall Creek drainage. Assess habitat quality. If habitat is suitable and brook trout threat is negligible, consider developing passage around the falls.
- Replace or modify culverts that are potential barriers in the Trinity Creek and Spring Creek drainages.

Payette River Subbasin

- Purchase storage space in Cascade Reservoir to increase minimum pool storage to approximately 475,000 acre-feet; needed to increase survival of coldwater fishes currently limited by high nutrient loading and low dissolved oxygen.
- Install a fish ladder at the Gold Fork Canal diversion structure. Fish passage at this structure would open approximately 44 stream miles to migratory fish.
- Install fish screening on the Gold Fork Canal diversion.
- Install modern irrigation diversion structures within the Cascade Reservoir watershed to accomplish sediment and erosion control.
- Create and fund local fish screen construction programs to design and implement cost effective irrigation diversion fish screens.
- Create irrigation return filtration wetlands to remove nutrients and create waterfowl habitat.
- Build fish ladder on Brown's Pond to connect the upper Lake Fork Creek with Little Payette Lake. Construct fish ladders or other passage structures on all diversions that create passage problems.
- Purchase and retire grazing and agricultural easements on BOR lands around Cascade Reservoir to reduce direct input of nutrients to the reservoir and create upland wildlife habitat.
- Create grazing and riparian easements and riparian pastures along critical stream reaches to help reduce nutrient input and rebuild riparian plant communities.
- Determine status of fluvial migratory bull trout in the upper South Fork Payette River, including abundance, life history, and migratory patterns.
- Evaluate effects of Deadwood Mine tailings on water chemistry and aquatic biota in the upper Deadwood River; develop restoration or reclamation programs if required.
- Improve knowledge of status, life history, and habitat use for bull trout in the upper Deadwood River.
- Develop water management and release strategies for Deadwood and Cascade Reservoirs to optimize bull trout habitat in Deadwood and sportfish production in both reservoirs.
- Modify outlet structure for Deadwood Dam to allow mixing of warmer surface water with cold deepwater releases.

- Install and monitor several tributary weirs during the early spring to discover if bull trout follow spawning westslope cutthroat and redband trout into tributaries.
- Reduce sediment inputs to the Deadwood Reservoir. Investigate feasibility of adding a roadbed stabilizer to the road that parallels the Deadwood River.
- Determine whether Deadwood Reservoir drawdowns are inhibiting zooplankton production and the ability of bull trout populations to reach spawning tributaries.
- Investigate feasibility of water management changes in Deadwood Reservoir to begin irrigation water releases later in August to maximize zooplankton production.
- Flows into Deadwood River need to match inflows to the reservoir from mid-June until August. This change would rely on using Cascade Reservoir waters for irrigation earlier in the summer.
- Deadwood Dam needs to be modified to allow for mixing of warm lake surface water and deep released water.
- Fine sediment inputs to the South Fork Payette River exceed flushing capacity. Sediment sources of fines need to be identified and controlled.
- Modify land use practices to improve water quality; develop settling basins or wetland filters to improve water quality in irrigation return flows.
- Restore fish passage at Black Canyon Dam.

Weiser River Subbasin

- Complete the TMDL process for the basin; identify specific sources of nutrients and sediment.
- Use TMDL process to prioritize landscape scale management plans and secure funding to restore stream habitats and connectivity.
- Pursue water transfers and agricultural incentives to improve summer flows, decrease water temperatures, and restore riparian corridors.
- Expand storage capacity for Lost Valley reservoir to provide increased late summer stream flows and reduce temperatures in the mainstem Weiser River.
- Eradicate fish populations in Crane Creek Reservoir to remove introduced non-game species; manage for both introduced and native sportfish.

Wildlife

General

- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity and for mitigation of lost wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, and exchanges).
- Implement and (where applicable) continue Integrated Pest Management programs.
- Assist landowners with land holdings and easements.
- Continue long-term bird monitoring.
- Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.
- Acquire existing ecological data sets where possible and compile metadata according to national standards.

- Monitor use of existing reference areas to assure consistency with the maintenance of ecological values.
- Establish and maintain permanent baseline monitoring systems within ecological reference areas for priority ecosystems and species.
- Identify candidate sites for the establishment of ecological reference areas based on current needs assessments. Periodically update ecological reference area needs assessments.

Ponderosa Pine Forest and Woodlands

- Inventory and map the current and potential distribution of ponderosa pine-dominated plant communities in appropriate watersheds of the Boise-Payette-Weiser subbasins. Inventory, map, and gather population data for ponderosa pine associated wildlife and plant species.
- Acquire lands on breaklands when opportunities arise for improved habitat protection, restoration, and connectivity for ponderosa pine plant communities and for mitigation of lost wildlife habitat for ponderosa pine associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Restore mid-seral old growth ponderosa pine-dominated plant communities.
- Create and maintain large diameter snags in ponderosa pine plant communities.
- Develop an information and education stewardship program to foster ponderosa pine protection.

Canyon Grasslands and Sagebrush Steppe

- Inventory and map the distribution of canyon grasslands within the subbasin complex.
- Inventory and prepare conservation plans for high quality, representative stands of canyon grasslands within the subbasin complex.
- Inventory and map the distribution of sagebrush steppe within the Boise-Payette-Weiser subbasins.
- Inventory and prepare conservation plan for high quality, representative stands of sagebrush steppe.
- Inventory, map, and gather population data for canyon grassland and sagebrush steppe associated wildlife and plant species.
- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for canyon grasslands and sagebrush steppe and for mitigation of lost wildlife habitat for canyon grassland and sagebrush steppe associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Restore canyon grasslands and sagebrush steppe ecosystems.
- Investigate and develop appropriate and practical restoration techniques for canyon grasslands and sagebrush steppe ecosystems.
- Develop native plant nurseries for propagation and restoration.
- Seed-bank native canyon grassland and sagebrush steppe perennial bunchgrass species.
- Develop an information and education stewardship program to foster canyon grassland and sagebrush steppe protection.

- Complete inventories to better identify, protect, and enhance existing and potential critical sage grouse habitat areas in the upper portions of the subbasin.
- Increase public awareness of the status of sage grouse and their biology and support for their conservation.

Riparian Plant Communities

- Inventory and map the distribution of riparian plant communities.
- Inventory, map, and gather population data for riparian associated wildlife and plant species.
- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for riparian plant communities and for mitigation of lost wildlife habitat for riparian associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Protect, restore, and create wetland and riparian habitat in lower elevation riparian areas.
- Develop an information and education stewardship program to foster riparian community protection.
- Improve the trend and condition of the subbasin riparian plant communities located in critical sage grouse habitats.
- Reconnect historic streams to recover lost riparian plant communities and habitats.

Noxious Weeds

- Inventory and map the distribution of noxious weeds.
- Develop and use restoration techniques for noxious weed infested plant communities.
- Continue control programs for noxious weeds to restore natural habitat conditions and plant communities for wildlife species.
- Develop an information and education stewardship program for noxious weeds.
- Develop and maintain cooperative information management protocols for the occurrence of noxious weed populations.
- Complete inventories to better identify existing infestations and potential critical areas of spread in the subbasin complex.
- Improve the trend and condition of the subbasin riparian and upland communities located in the subbasin complex through the elimination of spotted knapweed and other noxious weeds.
- Increase public awareness of noxious weed problems and solicit their support for the conservation of native habitats.

Subalpine Forest and Woodland Stand Dynamics and Habitat Relations

- Inventory and map the distribution of subalpine forest and woodland (subalpine fir forest, subalpine fir forest and woodland, and whitebark pine-limber pine forest and woodland plant association groups) by seral status and structural condition, within the appropriate watersheds of the subbasin complex.
- In selected subalpine fir forest and woodland stands throughout the Boise-Payette-Weiser subbasins, determine pre-European settlement fire disturbance regimes.
- Investigate fire disturbance and stand dynamic processes in whitebark pine-dominated forest and woodlands in appropriate watersheds.

- Investigate techniques and methods to retain late successional habitats on state and private lands (land exchanges, conservation easements).
- Develop and implement management prescriptions to restore and promote late successional habitats.
- Develop an information and education stewardship program to foster late seral community protection.

Habitat Fragmentation and Disturbance

- Identify by county critical wildlife areas and plant communities.
- Acquire critical habitats threatened by development when opportunities arise for improved habitat protection, restoration, and connectivity (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Work with counties to support timely updates and resource inventories related to local land use plans to further prevent degradations of floodplains, wetlands, riparian, and other sensitive areas.
- Reduce road densities through closures, obliteration, and reduced construction.
- Need to support planned closures to motorized use on public roads, trails, and cross-country areas and encourage closure of other public motorized roads, trails, and cross-country areas when needed to protect fish, wildlife, or water quality.
- Improve enforcement of motorized access restrictions.
- Maintain riparian plant communities because of their connectivity value.

Combined Aquatic and Terrestrial Needs

- Continue ongoing, and establish new, monitoring and evaluation programs for fish supplementation, habitat restoration and improvement, habitat baseline conditions, water quality and water quantity improvements, conditions and trends. These monitoring and evaluation activities are critical to evaluating the effectiveness of projects at improving habitat, watershed health and enhancing production of target species.
- Coordinate monitoring and evaluation efforts at the subbasin and provincial scale to maximize effectiveness and minimize redundancy.
- Develop and implement improved practices for agricultural, mining, grazing, logging and development activities to protect, enhance, and/or restore fish and wildlife habitat, streambank stability, watershed hydrology, and floodplain function.
- Develop and maintain comprehensive and consistent subbasin databases related to both aquatic and terrestrial resources, and establish a centralized data repository. This will promote more effective resource management.
- Investigate effects of potential loss or lack of nutrients due to declines in anadromous salmonid populations, and coordinate and evaluate nutrient enhancement alternatives.
- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity, and for mitigation of lost fish and wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Protect existing pristine and key fish and wildlife habitats directly threatened by subdivision, recreation, or extractive resource uses.
- Support timely updates and resource inventories related to local land use plans to further prevent degradation of floodplains, wetlands, riparian, and other sensitive areas.

- Continue to develop watershed assessments at multiple scales to facilitate integrated resource management and planning efforts.
- Develop Federal Recovery Plans for threatened and endangered species to provide recovery guidance for state, tribal, and local entities as required by law.
- Complete road, trail, and cross-country motorized use area inventory and assess impacts to aquatic and terrestrial resources. Use information to facilitate transportation planning and to reduce densities of motorized roads and trails and reduce areas of cross-country motorized use. Support planned road closures on public land, and encourage closure of other roads.
- Support timely updates and resource inventories related to local land use plans to further prevent degradation of floodplains, wetlands, riparian, and other sensitive areas.
- Continue and enhance the cooperative/shared approach in research, monitoring, and evaluation between tribal, federal, state, local and private entities to facilitate restoration and enhancement measures. Protection and restoration of fish and wildlife populations and habitat will not be successful without the interest and commitment of all parties.

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

Boise/Weiser/Payette Subbasin Recommendations

Projects and Budgets

Continuation of Ongoing Projects

Project: 199505701 -- Southern Idaho Wildlife Mitigation - Middle Snake

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

Short Description:

Protect, enhance, restore and maintain wildlife habitats to mitigate for construction losses at Anderson Ranch, Black Canyon and Deadwood 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.

Southern Idaho Wildlife Mitigation – Middle Snake (SIWM-MS) is an ongoing programmatic project derived from the Southern Idaho Wildlife Mitigation (SIWM) project. The Southern Idaho Wildlife Mitigation – Middle Snake project will continue to implement SIWM wildlife mitigation actions in the Middle Snake Province. The Council's Fish and Wildlife Program currently includes the Anderson Ranch, Black Canyon, and Deadwood hydropower projects in the Middle Snake Province.

Relationship to Other Projects

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

Relationship to Existing Goals, Objectives and Strategies

The Southern Idaho Wildlife Mitigation Program is a collaborative effort between the SBT, IDFG, and the Shoshone-Paiute Tribes. Project objectives, including the protection and

enhancement of wildlife habitat, complement the efforts of numerous state, federal, and tribal agencies. Other cooperators include non-governmental organizations and private individual.

Review Comments

The proposed work provides the initiation of O&M. Project sponsors indicate credits will be applied to Anderson Ranch, Deadwood, or Black Canyon.

Budget

FY2003	FY2004	FY2005
$3,889,703 Category: High Priority Comments:	$4,146,844 Category: High Priority	$4,334,977 Category: High Priority

Project: 32004 – Effects of Culverts on Fish Population Persistence: Tools for Prioritizing Fish Passage Restoration Projects in the Middle Snake Province.

Sponsor: U.S. Forest Service-Rocky Mountain Research Station (RMRS)

Short Description:

This project seeks to develop quantitative tools to evaluate risks that stream culverts pose to fish populations. Products from the research would be used in prioritizing fish passage restoration projects to provide maximum benefits to fish populations.

Abbreviated Abstract

Isolation and fragmentation of habitats is believed to be one of the most important threats to the integrity of aquatic ecosystems in the Pacific Northwest (Lee et al. 1997; Rieman and Dunham 2000). Artificial barriers to the movements of fish and other aquatic organisms are an important cause of isolation and fragmentation. Road culverts are perhaps the most significant and widespread barriers or partial barriers to fishes throughout the Columbia River basin. A recent assessment by the U.S. General Accounting Office identified literally thousands of culverts in need of repair, replacement, or removal to facilitate fish passage in the region. Region-wide, the cost of these efforts will easily exceed several hundred million dollars, and likely require several decades to implement. The magnitude of the problem, coupled with limited time and funding suggests that prioritization of fish passage projects is an urgent need. Existing tools for monitoring and evaluation of culverts do a good job of identifying potential fish passage barriers, but the actual effects of these barriers on upstream fish populations are poorly understood. Fish populations and aquatic communities isolated upstream of culverts face a number of potential risks. Our objective in this proposed study is to develop quantitative models that 1) predict where culverts pose the biggest threats to existing populations, 2) predict where the most ecologically important habitats upstream of culverts are, and 3) identify key factors that affect persistence of fish populations above culverts for different species. The products from this work will provide immediately useful tools for evaluating the effects of culverts on fish populations and identifying high priority fish passage restoration opportunities.

Relationship to Other Projects

N/A

Relationship to Existing Goals, Objectives and Strategies

The Idaho Department of Fish and Game has a keen interest in this proposal, as it would potentially provide a valuable tool to collect quantitative evidence of the effects of stream culverts on fish populations. They are interested in providing land managers such as the U.S. Forest Service, Bureau of Land Management, and Idaho Department of Lands with a resource to assist in prioritizing the investment of limited financial resources. It is their professional opinion that stream road culverts are one of the primary limiting factors for native fish populations in the Middle Snake River Province. The IDFG has informed us that they have been involved in recent attempts to document the potential scale of culvert passage problems in the Boise, Payette, Weiser, and Salmon River drainages as part of the state's recovery efforts for bull trout. They have been frustrated by how logistically difficult it is to collect this information, and by the widespread scale of the potential problem (Scott Grunder, Idaho Department of Fish and Game, personal communication). With little funding currently available, the state must prioritize where its money is spent.

The U.S. Fish and Wildlife Service is in the process of drafting a recovery plan for bull trout, and has indicated a strong interest in the research questions we propose to address here (Contact Sam Lohr: 208-378-5264). We have played an active role in advising the recovery team on technical issues and providing new information for recovery planning. Examples include our recent collaborations with U.S. Fish and Wildlife Service in Washington State (Contact Paul Wilson: 360-696-7605) and related work on bull trout throughout the region (e.g., Rieman and Chandler 1999; Dunham and Chandler 2001; Peterson et al. 2001).

There are undoubtedly other projects that may be related to the studies proposed herein, but we are not aware of any work that would be in conflict or duplicate our efforts. To ensure strong collaboration and to minimize duplication of effort, we will host workshops to engage and inform biologists (e.g., state, tribal, federal, private) working within the province to the full extent possible. This will involve sharing of information and ideas to assist in study design and assimilation of additional data sets that may be useful for this study.

Review Comments

Reviewers question whether it is a BPA responsibility to pay for the removal of culverts. CBFWA found that the proposed work is potentially interesting: however, CBFWA questions whether it is needed. CBFWA found that the methods are more of a discussion and that specific methods for fieldwork and modeling are lacking. In addition, CBFWA is uncertain if this approach would provide additional information beyond the WDFW protocol manual (i.e., Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual).

Budget

FY2003	FY2004	FY2005
$23,600 Category: Recommended action Comments:	$121,540 Category: Recommended action	$121,540 Category: Recommended action

New Projects

Project: 32006 – Compare the Parr-smolt Transformation of Nonanadromous and Anadromous Populations of Oncorhynchus Mykiss

Sponsor: Idaho Department of Fish and Game (IDFG)

Short Description:

Determine if *O. mykiss* populations that were historically accessible to the ocean but are now blocked by dams can produce smolts.

Abbreviated Abstract

Idaho Department of Fish and Game (IDFG) proposes to investigate whether *O. mykiss* populations upstream of dams that block access to anadromous fish but were historically accessible to steelhead retain the ability to produce smolts. Personnel will trap migrating *O. mykiss* from streams during the fall and spring and compare their physiological response using gill Na+, K+-ATPase activity and other blood chemistry indices with a hatchery anadromous stock and a nonanadromous hatchery rainbow stock. In addition, we plan to tag migrating *O. mykiss* with Passive Integrated Transponder (PIT) tags, transport and release them downstream of the dam blocking access to the sea, and monitor for detections at Lower Snake and Columbia River dams equipped with PIT-tag detectors.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
199005500	Steelhead supplementation studies	share personnel and equipment
199107200	Redfish Lake sockeye salmon captive broodstock rearing and research	share personnel and equipment
199700100	Captive rearing initiative for Salmon River chinook salmon	share personnel and equipment
199800200	Snake River native salmonid assessment project	collect bull trout and other resident fish data that is valuable for this project

Relationship to Existing Goals, Objectives and Strategies

This project, if funded, would work closely with the Steelhead Supplementation Studies (BPA Project 199005500), the chinook and sockeye captive programs based in Eagle (BPA projects 199107200 and 199700100), Clearwater Anadromous Hatchery, Oxbow Hatchery, and the Snake River Native Salmonid Assessment Project (BPA Project 199800200).

Steelhead supplementation project personnel and equipment can assist with this project's trapping and PIT-tagging. The experience and knowledge of rearing wild fish that has been

gained from the chinook and sockeye captive programs will be valuable for this project to rear wild *O. mykiss* through the winter (see methods section) in circular tanks. IDFG personnel at the Oxbow and Clearwater Anadromous hatcheries will assist rearing fish for this study, thereby reducing costs.

This project will collect data on bull trout and other resident species at the traps we intend to operate. The data will complement the information being gathered by the Snake River Native Salmonid project.

Review Comments

No comments.

Budget

FY2003	FY2004	FY2005
$90,530 Category: Recommended action Comments:	$111,667 Category: Recommended action	$84,090 Category: Recommended action

Project: 32009 – Squaw Creek Cooperative Fisheries Restoration Project.

Sponsor: Central Highlands Resource Conservation and Development

Short Description:

Assess and ameliorate the significant factors that have resulted in a severely depressed bull trout metapopulation within the major streams of the Squaw Creek drainage.

Abbreviated Abstract

The Squaw Creek Cooperative Fisheries Restoration Project (SCCFRP) begins the process of restoring southwest Idaho bull trout population health by addressing the major factors negatively affecting one of the more isolated key watersheds, as identified in Idaho Governor Phil Batt's Bull Trout Conservation Plan (1996). The project will complement ongoing U.S. Forest Service and Idaho Department of Environmental Quality activities by refining the knowledge of the bull trout distribution, habitat use and potential for expansion within the Squaw Creek Drainage. It will further identify and ameliorate impacts of past human-induced watershed changes that are likely retarding the success of the migratory component of local native fishes. Interruptions to the upstream flow of gametes, primary nutrients and prey base will be corrected by providing upstream passage at irrigation diversion dams; increased reproductive productivity will be brought about by removing brook trout competition and hybridization in natal habitat; increased survival of advanced juveniles, seeking dispersal habitat, will occur by screening irrigation diversions and by facilitating access through culverts; and production potential will be increased by improving riparian zone health and improving water quality.

The SCCFRP will provide the opportunity to document the real rate of recovery of bull trout as exhibited by: Rate of re-founding into suitable reproductive habitats; rate of occupation of fluvial habitat; changes in biomass per unit area of natal (focal) habitat; and counts of migrants returning from adfluvial habitat. Information will ultimately prove valuable in deriving the sustainable population densities of fully recovered populations in southwest Idaho, which will guide decisions on ultimately de-listing the species.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
980002	Snake River Native Salmonid Assessment	The proposed project will provide additional data for the native salmonid assessment

Relationship to Existing Goals, Objectives and Strategies

The Squaw Creek Cooperative Fish Restoration Project utilizes information gained regarding species-selective fish passage and video surveillance from on-going bull trout monitoring (personal communication)1/, and behavior and movement of radio-tagged bull trout and brook trout in the nearby Malheur River System (personal communication)2/ to project probable bull trout responses to proposed actions. BPA funding supported the Malheur studies.

BPA Project 980002 has investigated native fish distribution, habitat condition and genetic characteristics in the Payette River watershed, but results are not yet available. It is expected that data collected in this project will become a part of the database for this broader and long-term search for information upon which province-level recovery actions will be focused.

This project parallels the Gold Fork project being submitted by Idaho Fish and Game. Information and experience gained from these two projects will undoubtedly be shared and there will be considerable synergy so each will be implemented more efficiently.

Review Comments

Due to the weakness of the proposed methods and the apparent lack of coordination with IDFG, CBFWA suggests that this project should be reclassified as a "Recommended Action" until the following comments are answered in a satisfactory manner. Are all culvert replacement activities occurring on private lands? Are bull trout present in Squaw Creek above the mouth of Poison Creek? What is the current population status of the Squaw Creek bull trout population compared to other populations within the Subbasin? How will the sponsor "characterize channel condition" during downstream migration of post-spawning adults? In addition, CBFWA expressed concern relative to the lack of information pertaining to the type of poison that would be used by the sponsors. CBFWA suggests that until the status of the bull trout population is identified, poisoning activities should not be implemented.

Budget

FY2003	FY2004	FY2005
$43,750 Category: Recommended action Comments:	$195,750 Category: Recommended action	$298,250 Category: Recommended action

Project: 32011 - Mitigation of Marine-derived Nutrient Loss in the Boise-Payette-Weiser Subbasin.

Sponsor: Idaho Department of Fish and Game (IDFG)
Washington State University (WSU)
University of Idaho (UI)
Pacific Northwest Research Station (PNRS)
Idaho Office of Species Conservation (IOSC)

Short Description:

The project replaces marine derived nutrients using salmon analogs and salmon carcasses in the Boise-Payetter-Weiser subbasin. Aquatic and terrestrial effects of nutrient treatments will be monitored using isotope and lipid analysis.

Abbreviated Abstract

This project mitigates marine-derived nutrient loss resulting from salmon extinction due to hydro project development in the Boise/Payette/Weiser subbasin. Salmon analogs and salmon carcasses will be applied to selected watersheds based on bull trout distribution, batholith geology, grazing, and historic anadromous fish spawning. Each treatment will be replicated in three watersheds. Positive controls (cattle grazing present) and negative controls (no cattle grazing present) will also be replicated three times. Aquatic, vegetative, and terrestrial food webs will be monitored using isotope and lipid analysis of sampled species. Three years of treatments will be used to model the relative effectiveness and effects of analog and carcass mitigation.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
199800200	Native Salmonid Assessment	Use survey data and sampling cooperatively
	Streamnet	Use Streamnet data for bull trout distribution

Relationship to Existing Goals, Objectives and Strategies

This project mitigates marine-derived nutrient loss resulting from salmon extinction due to hydro project development in the Boise/Payette/Weiser subbasin. Salmon analogs and salmon carcasses will be applied to selected watersheds based on bull trout distribution, batholith geology, grazing, and historic anadromous fish spawning. Each treatment will be replicated in three watersheds. Positive controls (cattle grazing present) and negative controls (no cattle grazing present) will also be replicated three times. Aquatic, vegetative, and terrestrial food webs will be monitored using isotope and lipid analysis of sampled species. Three years of treatments will be used to model the relative effectiveness and effects of analog and carcass mitigation.

Work will be done in conjunction with the IDFG annual instream fish surveys.

Salmon carcasses will be collected from IDFG fish hatcheries and screened to reduce fish health risks.

Bull trout distribution will be determined using StreamNet, Boise National Forest, and Rocky Mountain Experiment Station databases.

Aquatic sampling will follow IDFG stream survey protocols and species size, and abundance information will be transferred to IDFG research and management databases.

Based on the number of adult returns to the Snake River, steelhead and chinook salmon are released into the Boise River system to provide fishing opportunity to area fishermen. Experimental design will include background information on the effects of these transplanted fish. Transplanted fish numbers will be provided by IDFG.

Idaho Power Company has conducted an evaluation on the historical presence of anadromous fish above Hells Canyon dam as part of its efforts to re-license its projects on the Snake River. We will solicit and use this information as it affects our study design and recommended mitigation, in cooperation with Idaho Power Company.

Dr. Kavanagh has an ongoing research project funded by the U.S. Forest Service to study nutrient dynamics in riparian conifer forests along Squaw Creek (a tributary of the South Fork of the Payette). This study has both a similar focus, and the scheduling of treatments fit well with this project. By using this site in our proposed study, both baseline data and nutrient impacts relating to fertilization and fire will be available.

Review Comments

The loss of marine derived nutrients has been identified as a factor limiting the productivity of bull trout in Idaho and Oregon and is viewed as an issue that should be a region-wide concern/investigation. Reviewers believe that results from this study could likely be applied throughout the range of distribution for bull trout where anadromous fish have been removed. Reviewers suggested that the proposed work, as it relates to bull trout, should be implemented in a basin-wide approach; however, reviewers questioned whether the work should be initiated now or wait until results become available from some of the nutrient projects that were funded through the 2001 Innovative process. The reviewers suggested that pursuing this work is a high priority; however, review of data from the innovative projects may be useful before the implementation of this project thus coordination with ongoing projects is essential.

Budget

FY2003	FY2004	FY2005
$354,789 Category: High Priority Comments:	$356,702 Category: High Priority	$361,057 Category: High Priority

Project: 32013 - Fishery Restoration of the Gold Fork River, Idaho

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

Short Description:

Fish populations in the Gold Fork River can be recovered by reconnecting the habitat and expanding the range of bull trout and redband trout populations. By creating fish passage in the drainage we will reconnect 44 miles of resident fish habitat.

Abbreviated Abstract

The first objective of this proposed project is to establish new bull trout *Salvelinus confluentus* and native fish assemblages in suitable habitat throughout the North and South Forks of Gold Fork River over a three to six year period. Bull trout likely were distributed throughout the drainage, but have been impacted by water and habitat management and introductions of non-native species, especially brook trout *Salvelinus fontinalis*. We propose to identify and prioritize stream reaches that are physically isolated, chemically eradicate brook trout in select reaches, and re-stock with native fish assemblages including bull trout. This will require construction of temporary fish migration barriers, application of one or more approved fish toxicants, followed by structured monitoring to evaluate success of treatments. No stocking will occur until brook trout abundance is reduced to acceptable levels in treatment stream sections.

The existing Gold Fork watershed bull trout population currently resides in the upper North Fork Gold Fork River in an upper stream reach. We feel that there are many opportunities to experimentally increase the number of local bull trout populations due to the topography of the watershed. We propose to conduct a careful examination of abundance, life history behavior, and genetic characteristics of remaining bull trout populations in the Gold Fork River and in the larger Payette River Basin. After this examination, we will consider the appropriateness of using the remaining local Gold Fork River populations or populations in the Payette River Basin to supplement areas of suitable habitat within the North Fork Gold Fork River watershed that have been eradicated of brook trout. An experimental treatment design will be created that will shed light on the complex problem of brook trout/bull trout population interactions. Draft Recovery Plans for bull trout from the USFWS rely heavily upon the creation of new local populations of bull trout to reach recovery goals. Critical evaluation of watershed-scale efforts to enhance bull trout and other native fishes, as proposed herein, will help assess our ability to meet bull trout recovery criteria and may provide a template for native fish restoration efforts in other drainages.

A second and related objective is the reestablishing of connectivity between the upper Gold Fork drainage, the lower mainstem habitats, and potential over wintering habitats in Cascade Reservoir. Existing diversions on the lower mainstem act as upstream migration barriers, and lower river reaches are frequently dewatered to satisfy irrigation demands. The principal strategy is to provide fish passage at the Gold Fork Diversion and other minor water diversions on the Gold Fork River or main tributaries, and to maintain adequate stream flows so fish can use the lower river as a migration corridor. We propose to work with local irrigators and landowners to conduct feasibility studies, develop alternatives, design, fund and construct fish passage facilities. At the main Gold Fork Diversion site, this possibly could include removal and replacement of the existing structure. Other minor water diversions within the drainage create

seasonal fish passage barriers. These barriers will be identified, and fish-friendly alternatives will be designed and built. A guiding principle for all alternatives will be the protection of existing water rights and unimpeded water delivery from the Gold Fork River. Overall, we feel it will be feasible to create a fully connected river basin for the first time in approximately 80 years. The re-creation of a river flowing directly into Cascade Reservoir should improve the sport fishery in the reservoir. The combination of the river corridor improvements and expansion of bull trout local populations will help ensure survival of the currently isolated population of bull trout.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
980002	Snake River Salmonid Assessment	Sharing of primary data, possible use of field crew and equipment, restoration of native species.
199401500	Idaho Fish Screen Improvement	Construction engineering help, possible construction of screens
28007	Causes and Effects of Nonnative Trout Invasions in the Salmon River Basin	Sharing of data, experimental design assistance

Relationship to Existing Goals, Objectives and Strategies

Our proposal relates to several ongoing and proposed projects in the middle and upper Snake River provinces, several of which relate to BPA funding. IDFG is submitting a proposal to BPA titled: "An assessment of genetic risk to resident trout populations from hybridization and introgression with hatchery rainbow trout, and an analysis of genetic population structure of Yellowstone cutthroat trout and redband trout populations in the Middle and Upper Snake River Sub-Basins" (Matt Campbell; 208-939-4114). The goals are to assess current and future genetic risks, prioritize populations for conservation and management purposes, identify suitable populations for translocations, reintroductions, and broodstock development, understand genetic population structure, and address genetic concerns in future ESA petitions. Our project will provide non-lethally collected fin-tissue from redband trout populations in the Gold Fork River Watershed and the Payette River Basin to the previously described IDFG project.

Project 199800200 Snake River Native Salmonid Assessment has already provided some baseline fishery survey data in this drainage. All information collected from this proposed project would be shared among the projects. The objectives of this project are comparable to the ongoing project; namely the restoration of native salmonid species and development of management plans. The Snake River Native Salmonid Assessment field crews likely will be assisting the pilot study in 2002 to collect Payette River Basin bull trout DNA samples. We will coordinate with this project on field sampling procedures so all data is easily transferable between projects.

The Idaho Fish Screen Improvement Project Number 199401500 could provide a wealth of technical expertise to the engineering challenges that this project will face. Existing designs

from projects in the Salmon River will help speed results in this project. If possible, fabrication of fish screens could be accomplished out of the screen shop already funded by BPA.

The USFS Rocky Mountain Research Station; "Causes and Effects of Nonnative Trout Invasions in the Salmon River Basin" that deals with the base causes and mechanisms of brook trout invasion submitted a proposal in the Mountain Snake Province. Our proposal deals with developing methods to remove brook trout and hopefully expand bull trout populations on the local drainage watershed level.

Regarding projects not funded by BPA, IDFG has undertaken a research project on the population dynamics of redband trout in the Snake River desert (Dan Schill 208-465-8404). They will be surveying redband trout throughout much of the Bruneau River and other Snake River tributaries, studying growth, maturity, mortality, movement patterns, and effective population size.

The U.S. Bureau of Reclamation (BOR) has several ongoing and proposed projects in the Boise River basin (Tammy Salow 208-378-5330). In conjunction with the Boise National Forest, BOR is monitoring trends in bull trout migration and abundance with changes in habitat and environment using electrofishing, a screw trap, and a weir trap. Genetic population structure is also being determined. The genetic population structure aspect will allow us to compare and contrast the Payette and Boise Basin bull trout populations.

Review Comments

The CBFWA suggests that this anadromous substitution project will benefit bull trout if brook trout can be successfully removed; however, the proposed methodology to eradicate brook trout is vague. CBFWA suggests that Antimycin combined with selective electrofishing has the best track record for removing nuisance species from running water. Lakes can be successfully treated with rotenone during late fall, just prior to ice formation. The sequential strategy for removing brook trout in stages between temporary barriers has merit and should be funded and assessed for effectiveness before initiating Objective 2. The narrative states that bull trout will not be stocked until brook trout are reduced to acceptable levels. Unfortunately, because the stream habitat has been degraded by excessive sedimentation, CBFWA believes that brook trout are likely to rebound if not removed entirely. Instream habitat should be repaired to reduce the amount of fine sediments and protect riparian vegetation for thermal cover. Bull trout require cool water temperatures and clean substrates, whereas brook trout can tolerate degraded stream conditions. Barriers isolating the remnant population of bull trout should not be removed if brook trout can invade from elsewhere in the system. CBFWA questions the current population status of the Gold Fork population compared to other populations within the Subbasin. Funds are allocated in FY 2003 to relocate bull trout and native fish assemblages into renovated stream sections. After removing brook trout from selected stream reaches, what is the duration and sampling frequency that will conclude that all brook trout have been removed? It is mentioned in the abstract that "No stocking will occur until brook trout abundance is reduced to acceptable levels in treatment stream sections". Is this acceptable level zero? The proposal mentions that "lower river reaches are frequently dewatered to satisfy irrigation demands". Would the creation of passage facilities and more efficient water transfer to the irrigators guarantee water will be left instream? The CBFWA proposes that the project should be funded in stages. Objective 1 should be completed first with the initiation of Object 2 dependent on the RFC review/approval of the results from Objective 1.

Budget

FY2003	FY2004	FY2005
$344,500 Category: High Priority Comments:	$365,000 Category: High Priority	$1,250,000 Category: High Priority

Project: 32015 - Deadwood River and Clear Creek Drainages Roads Analysis and Repair

Sponsor: U.S. Forest Service (USFS)

Short Description:

Inventory, analyze, identify and repair road problems (road segments contributing sediment, culverts blocking fish passage, or culverts at high risk of failure) in the Deadwood River and Clear Creek drainages

Abbreviated Abstract

This project proposes to inventory, analyze and repair road locations that are impairing water quality and fish habitat in the Deadwood River and Clear Creek drainages. Both drainages support important bull trout habitat in the Upper South Fork Payette River. There are an estimated 300 miles of road with 233 number of road-stream crossings to inventory and analyze. A Forest Service "Roads Analysis" approach will be utilized to accomplish and organize the inventory. Survey methods will assess roads in term of sediment delivery to channels and will assess road-steam crossings in terms of risk of failure and fish passage.

Relationship to Other Projects

N/A

Relationship to Existing Goals, Objectives and Strategies

This project continues ongoing analysis and accomplishments regarding roads in the Payette River Subbasin. The Boise National Forest conducted stream habitat surveys and identified bull trout habitats in the late 1990s. Population monitoring continues on an annual basis on sites throughout the Upper South Fork Payette River drainage. This monitoring allows land managers to identify which stream reaches are being utilized by bull trout and where impacts to habitat may be occurring.

The Rocky Mountain Research Station (RMRS) has developed a protocol for road inventory and assessment in relation to sediment sources (Black and Luce 2001). This project will allow the utilization of the inventory methodology, adjusted for the Boise National Forest.

Forest Service personnel have worked cooperatively with DEQ in TMDL preparation in the Payette River basin. Hydrologists and soil scientists provided extensive support in the compilation of the Middle Fork Payette River (MFPR) TMDL, both in modeling and in collection of field data. The analysis performed for the MFPR TMDL identified through representative modeling that about 97% of the delivered sediment originated from the road system (IDEQ, 1999). This analysis indicated that identifying major sources of sediment is a key

component in delineating the difference between natural (background) sediment and management-induced sediment delivered to the impaired stream segments. As part of the TMDL Implementation Plan, a complete road inventory, utilizing the RMRS methodology described above, will be conducted. The road inventory and analysis for the Middle Fork Payette River will be completed before this proposed project begins. The Middle Fork Payette River TMDL has had extensive interagency involvement, including IDEQ, EPA, and IDFG. Lessons learned and improvements developed in the Middle Fork Payette River projects will be applied to this project. This proposal would provide important information to the Idaho Division of Environmental Quality (IDEQ) in support of developing an implementation plan for the South Fork Payette River TMDL due in 2004.

Based on the 1998 National Water Quality Inventory Report to Congress 40% of the nations water was deemed unable to support healthy fisheries and aquatic populations, and recreational uses. 100,000 acres of Wetlands per year are lost due to development, road construction or agricultural development. The emerging need to begin in earnest the task of restoring watersheds has led Student Conservation Association (SCA) to begin program development of the Watershed Restoration Corps.

The Forest Service will administer funds to the SCA Watershed Restoration Corps, who will act in a reconnaissance role to complete the roads inventory and develop a major source report identifying priority restoration needs. Teams of SCA interns will gather watershed information on the ground to meet roads analysis/inventory needs. Each team will be equipped with ESRI GIS information input computer packages and watershed entry programs that can be uploaded into a GIS data format. Interns will be trained before project initiation to collect pertinent information for the project. The use of these teams will not only educate the interns, but also provide information in the proper format coded and ready for analysis. SCA team leaders would be under direct supervision of the USDA Forest Service personnel. USDA Forest Service's input to the roads analysis/inventory process is important both in terms of aid to the state of Idaho as well as large interest due to proportion of land owned within the basin.

Review Comments

CBFWA believes that analyzing and correcting problems with roads, culverts and such seem to be reasonable approaches to improving conditions for bull trout; however, CBFWA believes that BPA funds should not be used for this work which is sponsored by the US Forest Service on Forest Service administered land to correct previous Forest Service sponsored actions.

The potential actions to address listed bull trout needs is extensive. The CBFWA questions where BPA's responsibility to mitigate for hydrosystem impacts end and the responsibilities of others begin.

Budget

FY2003	FY2004	FY2005
$105,800 Category: Recommended action Comments:	$44,000 Category: Recommended action	$313,000 Category: Recommended action

Project: 32020 -- Inventory and Assessment of Stream/Riparian Resources, Upper Boise and Upper Payette River Subbasins, Idaho

Sponsor: White Horse Associates, Inc. (WHA)

Short Description:

Apply a hierarchical classification to identify complexes of stream/riparian resources with distinctive ecological potential and divide the complexes into more discrete areas based on condition relative to a progression of states.

Abbreviated Abstract

An Ecological Classification that focuses on stream and riparian resources will be applied to the upper Boise River basin draining to Lucky Peak Reservoir in Idaho and the upper Payette River basin (consisting of the North Fork, Middle Fork and South Fork subbasins). Products will be an inventory and assessment of stream and riparian resources organized in a hierarchical landscape framework. Upper hierarchical levels will be used to identify stream/riparian resources with distinctive form, function and ecological potential. Lower hierarchical levels will be used to denote the condition of stream/riparian resources. Assessments will be based on a progression of states ranging from near natural to severely impacted.

The proposal addresses the need to "inventory and map the distribution of riparian plant communities" (Stovall 2001). Products will serve as basis for evaluating the effects of past, current and future management on stream and riparian resources and associated values to fish, wildlife and water quality. Products will also serve as a basis for identifying minimally impacted reference reaches, for refining TMDL assessments, as a basis for watershed analyses, for assessing priorities for enhancement and restoration, and as a basis for fish and wildlife interpretations.

Relationship to Other Projects

N/A

Relationship to Existing Goals, Objectives and Strategies

The Boise-Payette-Weiser subbasin summary (Stovall 2001) lists a single BPA-funded research project:

(Project No. 980002) – Snake River Native Salmonid Assessment (IDFG): Products of the proposed inventory and assessment are expected to be useful for interpreting results of this ongoing project to assess current status of native salmonids, identify factors limiting populations, and develop recovery plans.

The Forest Service Rocky Mountain Research Station (RMRS) is currently studying mass wasting following fire on granitic soils of the Idaho Batholith in the Boise and Payette River subbasins. Products of the RMRS study may provide useful background for the interpretation of states in the proposed study. The RMRS has also conducted extensive research regarding the effects of logging roads on water quality and quantity; measures of habitat, channel condition

and temperature that may reflect the influence of management and natural disturbance; evaluated the temporal dynamics of fine sediment intrusion in salmonid spawning habitat; the effects of water diversions on riparian habitat and near-stream ground water level response to diversions in the Boise and Payette River basins; and temperature patterns in the Boise River basin. The Boise NF has also studied the effects of large and intense wildfires on native fish. These studies will serve as background for the proposed inventory and assessment.

The IDEQ has conducted extensive surveys of stream habitat, water quality and biotic conditions in the Boise-Payette-Weiser subbasins as part of the Beneficial Use Reconnaissance Program (BURP). Sample sites are scattered across each major hydrologic unit within the subbasins, but tend to be biased towards listed 303d streams and tend to be near major confluences. Results of this monitoring will be useful for characterizing states in the immediate vicinity of the BURP stations. Given that BURP stations are used to characterize relative extensive areas (upstream from the station), proposed inventory and assessment products can also serve to refine interpretations of BURP monitoring and more specifically identify major non-point source impacts contributing to the water quality limitation.

We expect to identify additional ongoing relevant studies in the course of project implementation.

Review Comments

The CBFWA found that the proposed work is similar to the mapping effort submitted by the Northwest Habitat Institute in previous provinces. This may be useful when subbasin planning begins in this province and needs to be coordinated with EDT. CBFWA questions the specific need for this project and suggests the benefits to fish and wildlife are low. The proposal states the "proposed inventory and assessment can be used to enhance both completed and ongoing TMDL efforts, and as a basis for remediation to achieve TMDLs." CBFWA expressed concern regarding the appropriateness of funding TMDL's through the NWPPC Program.

Budget

FY2003	FY2004	FY2005
$176,000 Category: Recommended Action Comments:	$ Category: Recommended Action	$ Category: Recommended Action

Project: 32021 -- Lower Boise River Wetlands Restoration Project.

Sponsor: Pioneer Irrigation District

Short Description:

Restore wetlands in the Lower Boise River watershed in order to mitigate the inundation of wetland habitats caused by the construction of Anderson Ranch Dam. Improvements in water quality will be an integral part of restoration of the wetlands.

Abbreviated Abstract

The Boise-Payette-Weiser Subbasins total 8,800 square miles (mi^2) and are located in southwestern Idaho. Lands within these subbasins are under intensive land use practices, including cultivated agriculture, intensive range and timber management, and recreational use. Fish and wildlife resources are abundant and include numerous federally listed endangered species.

The Lower Boise River is a 64-mile stretch that flows from Lucky Peak Dam above Boise, Idaho, to the Snake River below Parma, Idaho. The river flows primarily through Ada and Canyon Counties, but also drains into portions of Elmore, Gem, Payette and Boise Counties.

Two regional-scale assessments of ecological or watershed conditions have been conducted recently in the Intermountain area that include the Boise-Payette-Weiser Subbasin. These include highly detailed ecological analyses by federal land managers (the USFS and BLM) during the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (ICBEMP 1997, 2000) and a smaller USFS effort called the Inland West Watershed Initiative (IWWI). The ICBEMP evaluated current ecological conditions and trends at multiple spatial scales across the entire Columbia River Basin east of the Cascade Mountains of Oregon and Washington. Information provided by ICBEMP is now being used in support of a new cycle of federal land management planning. The IWWI effort assessed watershed and fish status at the sub-watershed level to construct spatial databases that could be used to examine patterns important to future conservation or restoration efforts.

The ICBEMP assessment concluded that historic development of the ICRB over the last 150 years has greatly altered ecological processes to the detriment of many native species of fish and wildlife (ICBEMP 2000). Land and water use practices contributing to these changes included unrestricted or little-restricted livestock grazing, road construction, timber harvest and fire management, certain intensive agricultural practices, placer and dredge mining, dam construction, and stream channelization. These watershed disturbances have caused risks to ecological integrity by reducing biodiversity and threatening riparian-associated species across broad geographic areas (ICBEMP 2000). Among many findings of relevance to the Boise-Payette-Weiser Subbasins, the assessment concluded that:

- Aquatic diversity and resilience are dependent on the maintenance of complex habitats and networks of those habitats at multiple spatial scales;
- Conserving the remaining watersheds and habitats that have a high value for aquatic species is key to maintaining system integrity;
- Designated wilderness and roadless areas are important building blocks for aquatic restoration throughout the ICRB;
- Particularly important to conserving migratory salmonids because these corridors are essential to assuring habitat and population connectivity between areas of high integrity on federal lands.

There have been a good number of large watershed, small watershed, subwatershed and species specific assessments conducted and written on conditions in the Boise subbasin:

U.S. Forest Service

- Biological Evaluation of the Effects of the Boise River Wildfire Recovery Project on Bull Trout, Boise National Forest (1994)

U.S. Bureau of Reclamation

- A Description of BOR System Operation of the Boise and Payette River (1997)
- Lower Boise River Irrigation Waste Water Reuse Assessment (1994)

Idaho Department of Environmental Quality

- Idaho Agricultural Pollution Abatement Plan, Ag Plan (1993)
- Lower Boise River TMDL (1998)
- Lower Boise River TMDL: Subbasin Assessment (1998)

Idaho Department of Water Resources / Idaho Water Resource Board

- Idaho Comprehensive State Water Plan, Lower Boise River Basin-in preparation

Watershed Groups

- Boise River Bull Trout Key Watershed Problem Assessment, Native Fish WAG (1998)

Water quality investigations concluded that the Lower Boise River is a water quality impaired river, under guidelines from the Federal Clean Water Act. Section 303(d) of the Federal Clean Water Act requires states to develop a Total Maximum Daily Load (TMDL) allocation plan for water bodies determined to be water quality limited. Contact recreation uses are not fully supported in the Lower Boise River from Star to its mouth. Both salmonid spawning and cold water biota are not fully supported uses in any segment of the Lower Boise River. Sediment, temperature, flow, and habitat conditions contribute to the impairment of cold water biota. Fecal coliform bacteria impair contact recreation uses downstream of Star.

Between concerns for water quality improvements, and a desire for holistic restoration of the lower Boise watershed, this proposal has been developed to construct a wetlands restoration project to meet all of these needs.

Mason Creek, a tributary to the Lower Boise River, has been evaluated as a priority site for water quality and habitat improvement. This proposal will address the development, construction, and maintenance of seven wetlands (cells) to improve water quality, restore wetland habitat, and create new wildlife habitat.

Relationship to Other Projects

N/A

Relationship to Existing Goals, Objectives and Strategies

Riparian and wetland habitats have been adversely impacted due to reduced risk of annual flooding on the lower Boise River and introduction of nonnative wetland plants. Industrial, suburban, and recreational development has displaced floodplain wetlands and riparian areas. Livestock grazing, vegetation control, and drainage for agriculture have further reduced the quality and quantity of these habitats in all watersheds.

The Southern Idaho Wildlife Mitigation Implementation Project (No. 00000386-00001) is implemented by IDFG and the 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. The following table provides an overview of Project implementation through calendar year 2000.

In the Boise-Payette-Weiser subbasins, the IDFG purchased 166 acres in 1999 and manages it as part of the 35,000-acre IDFG Boise River Wildlife Management Area (WMA). Fieldwork for the baseline Habitat Evaluation Procedure (HEP) was conducted in May 2000, resulting in a total of 57 baseline habitat units. Preparation of the management plan and final HEP report are in progress. A large wildfire on the WMA burned through part of the property in September 2000. Shrub stands, riparian areas, native grass stands and perimeter fences were damaged by the fire, and firelines were bulldozed during suppression. Fire rehabilitation will be accomplished within a larger effort planned for the Boise River WMA.

Wildlife habitat preservation and restoration efforts are being conducted on several areas within the subbasin on wildlife management areas or wildlife habitat areas, as listed in the table below. The NRCS Conservation Reserve Program (CRP) provides wildlife habitat on 19,732 acres in the subbasins. Although it falls short of complete restoration of shrub-steppe habitats on croplands, this program improves the availability of cover to upland wildlife species and prevents further degradation of habitat by livestock.

Wildlife habitat areas in the Boise-Payette-Weiser subbasins, Idaho

Wildlife Habitat Area	Purpose	Acres
Fort Boise WMA	Upland bird and waterfowl production	1,600
Payette River WMA	Upland bird and waterfowl production	880
Boise River WMA	Big game winter range	29,700
Mountour WRA	Upland bird and waterfowl production	1,100
Mann's Creek WHA	Upland bird production	330
Roswell Marsh WHA	Waterfowl and Upland bird production	680
Deer Flat NWR	Waterfowl wintering habitat	11,400
BLM Isolated Tracts	Upland bird production	700
Hixon Sharptail Preserve	Upland bird production	27,740

Nonpoint source pollution is extensive in the Boise-Payette-Weiser Subbasins. Nearly 900 miles of waterways, and 3 reservoirs, are recognized as water quality limited in the three subbasins.

Mason Creek is listed as a water quality impaired stream on the State of Idaho's 1998 303(d) list. For purposes of designating beneficial uses the *Idaho Water Quality Standards in Wastewater Treatment Requirements* (IDAPA 58.01.02) delineate the lower Boise River by segments. From Rivermile 50 to Indian Creek the river is designated for cold water biota, salmonid spawning and primary contact recreation. Nutrients that originate in the lower Boise River watershed are thought to be contributing to the impairment of beneficial uses in the Snake River and Brownlee Reservoir. 40 CFR 131.10(b) provides that the State shall take into consideration the water quality and standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of water quality standards of downstream waters. For this reason, nutrient allocations driven by the Snake River – Hells Canyon TMDL may be necessary. The Snake River – Hells Canyon TMDL may allocate a total phosphorous load to the mouth of the Lower Boise River to help restore the impaired beneficial uses to full support. The phosphorous sources in the Lower Boise River watershed will then be allocated loads and waste loads to meet the load allocation for the lower Boise River. Upon

completion of the allocations, an implementation plan will be developed within 18 months by the Lower Boise River Watershed Advisory Group and supporting agencies.

Recent data collected by the USGS from the Boise River and selected tributaries is part of a multi-year monitoring plan jointly funded by DEQ, LBRWQP, and the USGS. The current monitoring project includes collection of water quality data from four Boise River sites and four tributaries, aquatic macroinvertebrates and periphyton data from five river sites and one watershed wide synoptic monitoring event that includes the river and 12 tributaries. The USGS currently monitors at the mouth of the following tributaries to the Boise River: Fivemile Creek, Tenmile Creek, Mason Creek and Indian Creek. The tributary monitoring events occur monthly. However, during the months of May, June and July for water year 2001, the tributaries will be monitored bi-monthly.

This project also compliments ongoing soil and water conservation activities of the Canyon County SCD and NRCS. Through their programs Best Management Practices (BMP) are utilized with cooperative landowners.

In 1994, a report prepared for the Lower Boise River Water Quality Plan was submitted by the U.S. Bureau of Reclamation titled "Lower Boise River Irrigation Waste Water Reuse Assessment." The report noted the need for a restored aquatic system to improve water quality and repair vegetative cover. One of the recommendations of the report is the development of passive treatment systems, which may include sediment ponds, overland flow, and marsh wetlands. From an original list of 50 sites identified as appropriate for such passive treatment systems, Mason Creek was one of ten that were selected by the report on consideration for implementation as demonstration projects.

The Ted Trueblood chapter of Trout Unlimited (TU) has several ongoing and prospective projects for the Middle and Lower Boise River. Upstream from this project proposal, TU has initiated rehabilitation of a side-channel of the Boise River for the purposes of restoring spawning, rearing, and over-wintering fish habitat. Restoring side-channels to the river is recommended because few remain. This project will be in cooperation with private landowners, the City of Boise, the U.S. Bureau of Reclamation, and the U.S. Army Corps of Engineers. Another project that TU is investigating would be to rehabilitate another side-channel in the Lower Boise River near the west-end of Eagle Island. Again, this will be a collaborative effort of many parties. TU is familiar with the Mason Creek project and this proposal, and agrees to assist with the effort.

Review Comments

This project will provide for the removal of phosphorous and sediment from the lower portion of the Boise River. The IDEQ has identified phosphorous and sediment as having negative effects on the white sturgeon population in the Hells Canyon reach of the Snake River. Although the sponsors suggested the project would provide for sensitive species, the reviewers question the benefits to sensitive species. Reviewers indicated that there are nine target species in this area and that the proposed work would provide habitat only for mink and waterfowl. CBFWA found that this proposal does not provide enough detail to determine if the construction phase should be funded and suggest that the proposal be reviewed after the design phase is completed. Wildlife would likely benefit from the wetland creation, but dredging and removal of vegetation to remove accumulated silts and nutrients would cause disturbances approximately every five years. It is unclear if fisheries benefits would result. In fact, CBFWA suggests that thermal heating in the settling cells and wetlands could lead to elevated water temperatures downstream. CBFWA

suggests that the proposed project is primarily a water quality project, with potential side benefits to wildlife.

The project would benefit from cost-share arrangements for funding from other sources. All listed cooperators are shown to contribute "in-kind" services or funds. Although the benefit of this project, combined with others throughout the basin, could have lasting benefits, impacts addressed are not entirely attributable to the Federal Columbia River Power System (FCRPS). CBFWA was unclear as to how this project qualifies as offsite mitigation for impacts caused by the FCRPS. Due to the relatively minor impacts associated with power operations, it seems the Corps of Engineers, Bureau of Reclamation, State of Idaho and the counties would have greater responsibilities to provide funding to mitigate for these impacts, rather than BPA.

The proposed conservation easements or land acquisitions appear to be very high cost at $5000/acre and $10,000/acre, respectively. The proposal does not describe how wildlife benefits will be calculated and credited.

CBFWA found that coordination with BPA and the fish and wildlife managers appears to have been inadequate.

Budget

FY2003	FY2004	FY2005
$164,500 Category: Recommended action Comments:	$1,949,250 Category: Recommended action	$1,612,250 Category: Recommended action

Research, Monitoring and Evaluation Activities

There is a variety of monitoring activities in this subbasin. Most research and monitoring have focused on water quality problems, and much fish monitoring is incorporated into water quality monitoring programs (USGS NAQWA, IDEQ BURP) and FERC hydropower relicensing efforts (IPC). Below is a list of monitoring activities within the subbasin.

A. Fisheries/Aquatic
   - IPC- molluscs
   - IPC-Fish (Malad River, other Snake R. FERC studies)
   - USGS: Upper Snake R. NAQWA and statewide monitoring.
   - IDFG- Annual fishery surveys.
   - IDFG- Snake River Native Salmonid Assessment (BPA project).
   - BLM- Stream Proper Functioning Condition (PFC), fishery surveys.

B. Surface Water Monitoring
   - IDEQ- BURP and 10 year TMDL effectiveness monitoring
   - USGS/DEQ Statewide
   - USGS NAQWA
   - IDA- Idaho Department of Agriculture
   - University of Idaho- contract for monitoring irrigation drains.
   - Groundwater Monitoring
   - IDWR, in cooperation with USGS- state wide well monitoring program.
   - IDA –Idaho Department of Agriculture
   - IDEQ

- USGS/NAQWA

C. Wildlife/Terrestrial
- IDFG- Game population surveys.

Fisheries R&M

IDFG

The IDFG maintains a database of information for fish sampling done throughout the Subbasin from data collected through Fish and Game studies and by holders of state fish collecting permits. Most of the data is from IDFG studies fulfilling reporting requirements for Sportfish Restoration funds.

Wildlife monitoring and studies within the Subbasin include annual surveys of big game and upland birds. Annual statewide big game reports include methods of survey, survey results for deer and elk, annual flight survey and population estimate results, hunter harvest estimates, and a listing of management objectives and habitat and biological issues, (IDFG 2001). Annual upland bird surveys include counts of sage grouse and sharptail grouse on strutting leks, mourning dove coo counts, and winter waterfowl counts.

Snake River Native Salmonid Assessment (BPA Project No. 980002)

This is an ongoing research project funded by BPA and implemented by IDFG. The project was 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 inventorying phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the middle and upper Snake River provinces, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are also being collected to assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. 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: Phase I research on redband trout in the subbasin has just begun in the fall of 2001, and will continue with more intensive sampling during the summer of 2002. No results are available.

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

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

Strategy 1. Coordinate with other ongoing projects and entities to avoid data duplication and to prioritize sampling efforts.

Strategy 2. Use electrofishing and snorkeling to estimate presence/absence and abundance of salmonids throughout the middle and upper Snake River provinces.

Strategy 3. Identify, describe, and measure stream habitat and landscape-level characteristics at the fish sampling sites.

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

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

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

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

USGS National Water Quality Assessment (NAQWA)

The USGS initiated a NAQWA monitoring program on the Upper Snake River in 1992-1995. The NAWQWA program is part of a nationwide comprehensive program that evaluates the extent of water quality, the effects of human and natural factors on water quality, and the change over time on a variety of basins. The Upper Snake River NAQWA program extends from King Hill to the Snake River headwaters in Wyoming. The NAQWA monitoring program collects a variety of biological and chemical data to assess water quality, aquatic health, and potential impacts. The Upper Snake River NAWQUA program includes many sites within this subbasin in the Main Snake River, Rock Creek, Wood River, and springs. The Upper Snake NAQWA study is an ongoing study and the intensive phase initiated in 1992-1995 will be revisited in 2004.

In the interim continuous trend monitoring occurs at King Hill. Fish and temperature data from this study are available on the USGS NAQWA web site http://idaho.usgs.gov/. In addition, numerous publications are available that summarize water quality, aquatic biology, pesticide concentrations in water and fish, are available on the web-site.

Table 35. NAQWA sites in the Upper Middle Snake River subbasin.

Data Collection Sites	**# Sites**
Stream Chemistry	**36 Total**
-Basic Site	3
-Basic & Intensive	2
-Synoptic Site	21
-Special Studies	10
Stream Ecology	**13 Total**
-Intensive Assessment-biology & contaminants	4
-Synoptic Assessment- least disturbed reference w/ contaminants	2
-Synoptic Assessments- least disturbed reference w/o contaminants	1
-Synoptic Assessments-contaminants only	1
-Special Studies- least disturbed springs	6
Ground Water Chemistry	**Many**

Groundwater/Surface Water

The level and importance of research and monitoring for groundwater and surface water quality and quantity in this subbasin has been substantive. The level of activity in the subbasin has increased recently, in part due to TMDL mandates, sensitive species issues, concerns for public and aquatic health and the realization of the importance of conjunctive management of groundwater and surface water. There are many state and federal agencies involved in cooperative integrated monitoring of surface and groundwater.

The Snake River segment above King Hill has had much activity historically regarding water quality because of the degree of water quality problems that occur between Milner Dam and King Hill. Much of this information is located at the Twin falls IDEQ field Office. Also, much information is available through the FERC relicensing process of the four IPC dams upstream of King Hill (Hill, 1988).

IDEQ

IDEQ is involved with two surface water quality monitoring projects, the statewide BURP monitoring process, and specific effectiveness monitoring for TMDL Best management practices (BMP) implementation.

IDEQ TMDL trend monitoring

IDEQ recently initiated a 10-year trend monitoring plan which covers the Snake River in this subbasin from Milner Dam to King Hill. The main objective of the monitoring plans is to support compliance of the TMDL's relative to the main stretches of the Snake River. IDEQ is utilizing

the water quality conditions of the Snake River as a "gauge" for determining beneficial support status over the next 10-years as implementation plans are being brought on-line by the various water user industries. Basic parameters being monitored include pH, temperature, dissolved oxygen, turbidity, total suspended solids, total phosphorus, nitrite + nitrate, total ammonia, total Kjeldahl nitrogen, chlorophyll-a, and flow. Additional monitoring needs for various tributaries are currently under discussion between the IDEQ and the watershed advisory groups.

IDEQ Beneficial Use Reconnaissance Program (BURP) Monitoring

In 1993, The IDEQ embarked on a pilot program aimed at integrating biological and chemical monitoring with physical habitat structure assessment to characterize stream integrity and the quality of water. This program was developed in order to meet the Clean Water Act requirements of monitoring and assessing biological assemblages as well as developing biocriteria. Because of the success of the 1993 pilot, IDEQ expanded the project statewide in 1994. Since 1994, the project has remained statewide. Objectives for Burp monitoring include:

Objective 1	Assess waters of unknown water quality and beneficial uses
Objective 2	Determine beneficial use support status
Objective 3	Water Quality Limited List (303d list)
Objective 4	Use reference (least impacted) streams to set the comparison standards for assessment.

The data collected by BURP is used to determine whether streams, creeks, rivers, lakes, and reservoirs are meeting their beneficial uses. These beneficial uses are identified in the Idaho water quality standards and include[1]:

- Aquatic life support – cold-water biota, seasonal cold-water biota, warm water biota, and salmonid spawning.
- Contact recreation – primary (swimming) and secondary (boating).
- Water supply – domestic, agricultural, and industrial.
- Wildlife habitat and aesthetics.

Information from BURP is used to support the following programs:

- Total Maximum Daily Load (TMDL)
- Bull Trout Conservation Plan
- Cumulative Watershed Effects
- Water Quality Standards Revisions (designations)

BURP Site Selection Process:

Site selection requires preplanning to insure that sites are representative and determine how many sites are needed to characterize the beneficial use status of the water body. Also, site selection documents land use stratum, stream order, and Rosgen Channel type. The minimum

[1] Water Body Assessment Guidance, Second Edition, December 2000.

site length should be 40 times the wetted width or 200 meters, whichever is greater. Sites are normally visited every 5 years, and some reference sites are sampled annually.
Site selection requires preplanning to insure that sites are representative and determine how many sites are needed to characterize the beneficial use status of the water body. Also, site selection documents land use stratum, stream order, and Rosgen Channel type. The minimum site length should be 40 times the wetted width or 200 meters, whichever is greater. Sites are normally visited every 5 years, and some reference sites are sampled annually.

BURP monitoring parameters

Physical / Chemical Variables Measured	Biological Variables Evaluated
• Temperature • Conductivity • Flow (Discharge, Q) • Width and Depth • Photo Documentation • Latitude/Longitude • Canopy Cover (Shade) • Substrate • Bank Stability • Habitat Typing • Habitat Assessment • Pool Complexity • Large Woody Debris	• Macroinvertebrates • Fish • Periphyton • Bacteria • Amphibians

Table 36. BURP monitoring sites and TMDL schedule in the Upper Mid Snake River Subbasin.

HUC Code	HUC Name	# BURP Sites	Date SBA Completed	Date TMDL Completed
17040212	Mid-Snake River	104	1996	1997
17040212	Upper Snake-Rock	104	1998	1999
17040213	Salmon Falls	56	2004	2005
17040219	Big Wood	162	2000	2001
17040220	Camas	39	2002	2003
17040221	Little Wood	32	2002	2003
17050101	C. J. Strike Reservoir	22	2003	2004

Note: All HUCs accept CJ Strike Reservoir, are under IDEQ Twin Falls Regional Office. CJ Strike Reservoir falls under IDEQ Boise Regional Office.

The IDEQ has assessed data using the BURP protocols for the years 1993, 1994, 1995, and 1996. The data collected using the BURP protocols for the years 1997, 1998, and 1999 are scheduled to be assessed in late 2001.

During the 2000 season the IDEQ focused on *E. coli* bacteria sampling on the 1997, 1998, and 1999 BURP sites to determine whether these waterbody segments were meeting their recreational beneficial uses. 427 bacteria samples were taken in 2000 that included waterbody segments in all of the HUCs listed above.

The Twin Falls Regional Office of the IDEQ has primarily focused on the Little Wood River and Camas Creek drainages during the field season of 2001. The BURP data collected in these HUCs will be used to support the Sub-basin Assessments and Total Maximum Daily Loads due in 2003 for these drainages. The Twin Falls Regional Office has compiled a large amount of data collected by other agencies. These agencies include the BLM, USFS, BOR, and the IDFG, University of Idaho, WRRI-Water Resources Research Institute. This data has been used and will be used to help determine whether a waterbody segment is meeting its beneficial uses.

USGS Surface water

USGS has a cooperative program with IDEQ to monitor trends in surface water quality at about 54 statewide sites. This trend network includes measures of water quantity, quality, fish and invertebrate communities collected on a rotating basis. A site at King Hill on the Snake River is monitored annually for trend data related to the ongoing NAQWA study in the subbasin. The USGS maintains these data for public access at their website http://idaho.usgs.gov/.

Groundwater Monitoring

IDA (Idaho Department of Agriculture)

The IDA conducts surface and groundwater water quality monitoring, partially in support of the coordinated TMDL monitoring effort.

IDWR-Statewide Ambient Ground Water Quality Monitoring Program

Since 1990, the Statewide Ambient Ground Water Quality Monitoring Program, a cooperative effort of the IDWR and the U.S. Geological Survey (USGS), has collected ground water samples from more than 1,500 sites throughout Idaho to better understand the health of the state's aquifers (Nealy, 1994). Each year, about 400 wells are sampled across Idaho for a variety of constituents. Currently, there are about 300 monitoring sites (wells and springs) located in the Upper Mid Snake River Basin. Numerous Statewide Program reports, technical summaries and site-specific data are available at the IDWR website: www.idwr.state.id.us

The Statewide Program has the following objectives:

Objective 1. Characterize the ground water quality in the state's major aquifers.
Objective 2. Determine if changes (trends) are occurring in ground water quality.
Objective 3. Identify areas where ground water quality problems exist or are emerging.

Parameters measured include:

- Nutrients.
- Pesticides.
- Bacteria.
- Volatile organic compounds.
- Common ions (calcium, magnesium, etc.).
- Trace elements (arsenic, copper, lead, etc.)

Fisheries

BPA-funded Research, Monitoring and Evaluation Activities

Idaho Department of Fish and Game

Snake River Native Salmonid Assessment (Project No. 980002)

This 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 inventorying phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the middle and upper Snake River provinces, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are also being collected to assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. 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. This includes the Weiser, Owyhee, Payette, Boise, Goose, Raft, Rock, Bannock, Portneuf, Blackfoot, Willow, South Fork Snake, and Teton. Genetic samples of redband trout and Yellowstone cutthroat trout have been collected at a total of 155 sites, and results are available for 15 sites. Water temperature has been measured and/or obtained from other agencies at 97 stream sites across the Middle and Upper Snake River Provinces. A comprehensive database has been developed that includes data on native salmonid abundance and distribution, genetic samples, habitat summaries, and herpetofauna observations. This project also evaluates 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. This suggests 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

Entities within the three subbasins have collected, and continue to collect, diverse data directed toward answering multiple questions about fish and wildlife status, aquatic and riparian system health, and terrestrial conditions. Although there is no subbasin-scale program to coordinate the work conducted by all concerned, it is clear that many questions about aquatic and terrestrial conditions within the subbasins are being answered, and more might be answered through careful

examination of exiting information or data now being collected. This is not to suggest that there is no need for additional monitoring, but better coordination of ongoing or future data collection would allow a more efficient effort across all subbasins.

Biologists were able to identify a number of recent research, environmental monitoring, and/or evaluation activities related to the Boise-Payette-Weiser subbasins that are funded by sources other than BPA. The BPA has not funded much work in these subbasins since the 1980s when loss assessments were contracted through the IDFG for federal hydropower facilities.

Rocky Mountain Research Station (USFS)

Rocky Mountain Research Station (RMRS, Boise, Idaho). The RMRS has a fish research team that is part of the Aquatic and Terrestrial Ecosystems Work Unit. Current research efforts are addressing the conservation biology of aquatic vertebrates, the influences of natural and human-caused disturbance, and the development of decision support tools for forest management. Although RMRS scientists and collaborators deal with multiple aspects of aquatic communities, considerable work has and will be focused on the salmonids including resident and anadromous species. Work occurs across a range of spatial scales but current efforts are focused largely on factors influencing or associated with the distribution and persistence of these fishes at scales ranging from stream reaches to whole river basins. Recent and ongoing research by the RMRS includes the following:

- Bull Trout Status, Distribution, and Persistence: Past work of the RMRS includes a variety of projects looking at the physical and biological processes influencing the distribution, dynamics, and persistence of bull trout populations. They have documented the broad scale distribution of bull trout and shown that climate or temperature, stream size, and human disruption of watersheds are important elements characterizing potential habitat, while the size of habitat patches, fragmentation (or isolation from other patches), and the level of human disruption are important factors influencing the occurrence and persistence of local populations. Habitat fragmentation and life history diversity may be key to the resilience of both bull trout and rainbow trout populations responding to major disturbances associated with wildfires and flood/debris flow events. Their work with bull trout in the Boise River subbasin was the foundation of work describing the status and distribution of bull trout across the species range within the Interior Columbia River basin in the U.S. (Rieman and McIntyre 1995; Dunham and Rieman 1999; Rieman, Lee, and others1997; Rieman and Clayton 1997; Adams 1994; Rieman and Dunham 2000; Rieman, Lee, and Thurow 1997; Rieman and Chandler 1999; Dunham and Chandler 2001).

- The RMRS continues to monitor a small number of populations of bull trout in the Boise River subbasin that were influenced by fire related disturbances in the last 10 years.

- Intraspecfic Diversity: The RMRS is currently engaged in research to describe the genetic population structure of bull trout across the entire Boise River basin. This work will compliment the work on distribution and occurrence of populations described above and will help resolve the role of dispersal and metapopulation structure in bull trout population dynamics.

- Sampling and Monitoring: With the growing recognition that large-scale processes may strongly influence fish population dynamics has come a need to sample and describe

habitat and biological patterns over very large areas. Early work done by the RMRS with bull trout in the Boise River subbasin provided a protocol for sampling that attempts to maximize the probability of detecting bull trout while minimizing the sampling effort in any single stream or habitat patch. They are currently working on improved models of sampling efficiency for bull trout for a variety of gear types and habitat conditions that exist in the Boise River subbasin and other subbasins in the Columbia River Basin. The sampling efficiency work is the foundation of an American Fisheries Society, Western Division bull trout sampling protocol that is currently in review (Peterson *et al.* 2001). The RMRS has also recently published work on sampling error in redd counts for bull trout (Dunham *et al.* 2001). Other work has focused on developing and validating measures of habitat, channel condition, and temperature that may reflect the influence of management and natural disturbance. (Rieman and McIntyre 1995; Peterson 1999; Peterson and Wollrab 1999; Rieman and Chandler 1999; Thompson 2000; Thompson 2001; Peterson *et al.* 2001).

Physical Processes Structuring Habitat: Mass wasting processes following fire have been hypothesized to be a dominant mechanism in structuring stream habitat. In cooperation with the Payette National Forest, scientists at the RMRS are studying relationships between fire and landslides on basalt soils in the Weiser River subbasin.

- These studies include application of a GIS-based slope stability model to explore site-based risk. Similar studies are underway on granitic soils of the Idaho batholith in the Boise and Payette River subbasins. Post-fire water repellency spatial patterns and recovery over time are being studied in the Boise River subbasin. A study on the effectiveness of emergency post-fire rehabilitation treatments is coupled to the latter study.

- Over the past three decades, the RMRS has been conducting research in the Middle Fork Payette River watershed on effects of logging and roads on water quality and quantity. These are paired watershed studies in small (100-500-acre) basins, and field data collection is complete, although there are still some data analyses and manuscript preparation ongoing. Over 100 publications, many related to erosion and sedimentation effects under both natural and disturbed conditions, have resulted from these studies in Silver Creek.

- Over the last decade, the RMRS has evaluated the temporal dynamics of fine sediment intrusion in salmonid spawning habitat using artificial redds. These studies include measures of habitat quality including temperature, dissolved oxygen, and intragravel flow (Thurow and King 1991, 1994; Clayton, King and Thurow 1996).

- The RMRS has studied effects of water diversions on riparian habitat and near-stream ground water level response to diversions in the Payette and Boise River subbasins (Clayton, Luce and Barta 1998; King and Bohn 2000).

- Stream temperature has been identified as a fundamental control on the spatial distribution of fishes within river basins. Research has been conducted for several years on broadscale temperature patterns in the Boise River subbasin. A more detailed

examination of stream temperatures, low flows, and driving microclimatology has been initiated in the Boise River subbasin. Objectives of the detailed study are to validate energy fluxes and balances estimated in stream temperature models. Existing physically based models address temperature changes in stream reaches and do not address conditions in headwater streams where the upstream boundary condition must also be modeled. The data set being collected will be critical in development of a model to fill this niche.

- Nonnative Species: A number of nonnative fishes have been introduced throughout the subbasin complex. Brook trout may be a threat of particular significance for native salmonids and amphibians. The RMRS provided support for a Master's degree project that evaluated the potential displacement of bull trout by brook trout (Adams 1994; Adams 1999). They are currently engaged in research extending that work to determine how much bull trout are likely to be displaced by brook trout invading from downstream. Other related work outside the basin has focused on the invasion process and suggests that invasions may not be inevitable in all systems that brook trout may access.

Boise National Forest

Bull Trout Related Monitoring

Bull Trout Spawning Survey on the Lowman Ranger District (Zurstadt 1998).

1. Bull Trout Observations from Dry and Wash Creeks, Lowman Ranger District (Zurstadt 1998).
2. Bull Trout Fisheries Monitoring Plan for the North Fork Boise River (Burton 1999).
3. Lowman Ranger District Bull Trout Study Progress Report 1996 (Zurstadt and Jimenez 1996).
4. Effects of uncharacteristically large and intense wildfires on native fish: 14 years of observations (Burton 2000).

U.S. Bureau of Reclamation

Currently, the BOR cooperates with the IDFG, BNF, and RMRS in sharing equipment and expertise on multiple projects in the Boise River subbasin. Work in the 2001 field season includes:

1. April 1 - June 30: The BOR, BNF, and the IDFG conduct a trap and haul effort in Lucky Peak Reservoir to capture bull trout which have been entrained through Arrowrock Dam. Field crews are experimenting with four different methods of capture to assess maximum capture rates by each method and time of year. Currently, crews use gill and fyke nets, and will begin using electrofishing boats and a Merwin trap in May. Results of this effort will be available in February 2002.

2. May 7 - August 1: BOR, BNF, and IDFG operate a rotary screw trap on the Crooked River, rivermile 9.5, to capture bull trout moving in the system. This trap was operated experimentally from May 30-August 1, 2000 and proved quite effective in capturing age class 2+ - 3+ juvenile bull trout migrating out of the system. A 2000-2001 summary for this trapping operation will be available in November 2001.

3. July 1 - August 28: BNF and BOR conduct habitat and abundance surveys for bull trout throughout the Mores Creek, and Middle and North Fork Boise River watersheds. This is the third year of a four year planned study in the North Fork system. The summary for the four-year study will be available July 2004. A two-year progress report will be available for the North Fork watershed in October 2001.

4. August 20 - 24: South Fork habitat, abundance, and fin clip collection project. This is a largescale sampling effort with RMRS, the University of Montana Wild Trout and Salmon Genetics Laboratory, BOR, IDFG, BNF, Sawtooth National Forest, Boise Cascade Corporation and members of Trout Unlimited. The BOR currently is a cooperator with RMRS, Boise Cascade, and the University of Montana to complete microsatellite genetic analysis of multiple population scales of bull trout throughout the Boise River Basin. Final reports of this study are scheduled for June 2004.

5. August 28 - October 31: North Fork Boise River Weir trap operation. BNF and BOR operate a trap on the North Fork of the Boise River to capture post-spawning adult bull trout and juvenile migrants. Analysis has been conducted on multiple environmental and year class scales. This will be the third year of a four-year study. A two-year progress report will be available in October 2001 and final report in July 2004. Further operation of the North Fork weir may occur in conjunction with the valve replacement work in 2003 at Arrowrock Dam, and following in 2004 to continue to monitor the bull trout population.

6. August 28 - October 31: Juvenile bull trout movement telemetry study. BNF, BOR, IDFG, and Boise State University are cooperating to conduct tagging and tracking of juvenile size class (< 12 inches in total length) bull trout in the North Fork Boise River and Arrowrock Reservoir systems. The project is a two-year graduate program through Boise State University and is scheduled for completion in December 2003.

7. Mid-September: South Fork Boise River weir construction and telemetry study. The BOR and IDFG are cooperating to construct a weir trap and conduct radio tagging and tracking to determine entrainment and movement of adult bull trout in Anderson Ranch Reservoir. This is a continuation of work that has been conducted by IDFG in the South Fork Boise River in 1998.

The BOR is working on a third year of weir and tributary data collection. This work will continue through 2002. Fieldwork during 2002 will include all of the above listed projects with the exception of the South Fork Boise River sampling. The BOR anticipates analysis and discussion of results from that effort for the microsatellite project during 2002. Additional work planned for 2002 includes an archival and adult telemetry tagging project to monitor bull trout movement before, during, and after the Arrowrock Dam valve replacement project.

Idaho Department of Environmental Quality

Beneficial Use Reconnaissance Surveys. The IDEQ has conducted extensive surveys of stream habitat, water quality, and biotic conditions in streams in the Boise-Payette-Weiser subbasins using standardized protocols. Sample sites have been scattered across each major hydrologic unit

with the subbasins, but tend to be somewhat biased towards sites of degraded water quality due to the purpose of identifying reaches that are not in compliance with state water quality laws.

Idaho Department of Fish and Game

The IDFG has conducted extensive work on bull trout and redband trout populations across the subbasin complex. Most work has focused on the Boise River subbasin (Flatter 1998; Flatter 1999; Flatter 2000; Partridge and Warren 2000). However, the IDFG has also surveyed bull trout key watersheds in the Payette River subbasin.

Since the Kirby Dam fish ladder was completed in 1999, the IDFG has been monitoring use of the ladder by fish using underwater video and trapping. The IDFG is committed to doing monitoring of the ladder through at least 2005. Biologists also plan to continue trend monitoring in pre-established snorkeling and electrofishing sites across the subbasin complex.

Orma J. Smith Museum of Natural History

Fish Collection Database. The fish collection database at the Orma J. Smith Museum of Natural History contains over 4,500 records representing over 5,000 lots of specimens collected from 1918 to the present. The collection is comprised of voucher specimens from Albertson's College of Idaho, IDEQ, U.S. Geological Survey (USGS), IDFG, BLM, U.S. National Forests, RMRS, and NMFS. The curator of the collection, Donald W. Zaroban (IDEQ) and Dr. Richard L. Wallace (Professor Emeritus of Zoology, University of Idaho), are collaborating on the production of a field guide to the native fishes of Idaho. This effort is resulting in a combined database of Idaho specimens from the University of Idaho, the Orma J. Smith Museum, and records of Idaho specimens housed at the U.S. Museum of Natural History and the University of Michigan Museum of Zoology.

University of Idaho, Moscow, Idaho

Adamas (1994) conducted a graduate research project on bull trout distribution in four streams in the Weiser River subbasin.

Wildlife

BPA-funded Research, Monitoring and Evaluation Activities

None reported.

Non BPA-funded Research, Monitoring and Evaluation Activities

Idaho Department of Fish and Game conducts research, monitoring, and evaluation activities related to sage grouse monitoring, vegetation mapping, big game surveys, and nongame and sensitive wildlife surveys.

Needed Future Actions

Fisheries/Aquatic

1. (USGS) A comprehensive monitoring program is needed for the middle Snake River including measures of pollutant loads and associated aquatic life as related to beneficial uses. Long-term monitoring sites are needed on the mainstem as well as major tributaries and springs. Information is needed to evaluate the progress of the middle snake TMDL and assess the status

and trends of federally listed snail species as part of the USFWS Snake River snail recovery efforts.

IDFG

2. Improved flow regime that resembles a more natural hydrograph for the Snake River and tributaries throughout the subbasin. The timing, quantity and quality of the water needs to mimic the natural, historic condition. Particular flow needs include:

- Spring spawning flow requirements for white sturgeon.
- Improved low flow conditions.
- Flushing flows for sediment (10,000 cfs identified)

Potential strategies include:

1) The purchase of water rights or land with water rights.
2) Changes in the state's water laws to allow the conversion of consumptive water rights into an instream beneficial use for fish and wildlife.
3) Elimination of load following activities at hydroelectric facilities.
4) Acquire storage space in subbasin reservoirs and large storage facilities upstream such as American Falls and Palisades reservoirs.
5) Initiate water conservation and enforce moratorium on new water rights throughout the basin. For example, water is currently over-allocated for irrigation and aesthetic uses in the upper Big Wood River system that has caused the Big Wood River to be essentially dried up downstream of Bellevue and upstream of the Hwy 20 bridge. The cumulative effect from the numerous water withdrawals from the Big Wood River channel has resulted in a change in channel capacity and riparian area that is adapted to smaller stream flows. When there are significant flows due to higher than normal snowpack, it becomes more of a catastrophic event because of this change in the riparian area.
6) Restore year-round flows to the Little Wood River downstream of Little Wood Reservoir and upstream of its confluence with Silver Creek.

Strategy*:* Install a mechanism to conserve reservoir water through a pressurized delivery system (e.g. pipes instead of open canals) with the savings used for a minimum instream flow.

7) Reduce high water temperatures in lowland streams.

Strategies may include

1) increase in flows or
2) riparian restoration and protection from development or grazing and
3) upland shrub plantings to reduce soil temperature.

8) Improve water quality in lower Rock Creek in Twin Falls County. Rock Creek currently receives large quantities of sediment and nutrients through agricultural runoff.
9) Restore riparian, streambank, channel, floodplain, and wetland conditions throughout the subbasin where habitat has been severely degraded.
10) Decrease water temperatures in the mainstem of the Snake River.

Strategy: Increasing summer time flows through this section of the river by increasing bypass flows through Milner Dam.

11) Improve water quality on the mainstem of the Snake River and tributaries throughout the subbasin, including reducing the build up of sediments and organic pollutants in the river.

Strategies:

1) Increasing summer time flows through this section of the river by increasing bypass flows through Milner Dam.
2) Constructing settling ponds and wetlands to filter sediment and other pollutants.
3) Implement various TMDL's and associated BMP's.

12) Reduce entrainment of white sturgeon between the Snake River dams.

Strategy: Provide safe and effective two-way fish passage on the Snake River Dams, including C.J. Strike Dam.

13) Development and implementation of biologically-based flow regimes for the Snake River and tributaries throughout the subbasin.
14) A detailed, quantitative assessment of the impacts of proposed and ongoing aquifer recharge projects on fish and wildlife habitat and populations.
15) Screening of irrigation canals throughout the subbasin to prevent the loss of fish through the canal system.
16) Reconnect tributaries to the Snake River and to other tributaries to allow free passage of fish to historic habitats.
17) Determine and establish minimum conservation pools in subbasin reservoirs to sustain aquatic and terrestrial resources.
18) Fish and wildlife loss assessments for the BOR owned Little Wood River Reservoir and other reservoirs throughout the subbasin.
19) Describe the relative importance of the Snake River and key tributaries to redband trout.
20) Provide fish passage around or remove manmade barriers to fish passage (e.g. irrigation diversion structures, dams).
21) Complete the TMDL for the CJ Strike reach (huc # 17050101).
22) Protect the remaining undeveloped springs along the Snake River.

Miscellaneous Aquatic.

Implement study of genetics, population viability and life history requirements of white sturgeon. Most life history studies have been conducted downstream in larger rivers and extrapolated to this population; however, major differences occur:

1) furthest upstream and most isolated population
2) habitat differs
    a) smaller river, habitat may be limiting for various life history stages
    b) major food source has disappeared or been reduced (salmon/steelhead, large freshwater molluscs)
    c) water quality impairment is severe.

There is a strong need in this subbasin to have a common method and geographic unit for collecting, collating and presenting data for comprehensive assessments of aquatic condition (stream/fish habitat, riparian, wetlands). There are no overall comprehensive assessments of aquatic habitat, wetland or riparian habitat for the subbasin. Each management agency and

landtype/landuse has different methods of assessment and geographic units and scales for reporting information. Furthermore, there are also different degrees of data and information synthesis and summaries. For example, The USFS (USFS 2000) has identified the need/desire to assess streams using Proper Functioning Condition (PFC) methods, which would be more similar to the methods employed by the BLM.

Needs identified in the Native Salmonid Assessment Research Program for the Mid and Upper Snake River provinces:

1. Continue to inventory native salmonids in the upper and middle Snake River provinces 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.
2. Use genetic markers to detect and quantify levels of hatchery produced O. mykiss introgression within native redband trout populations and to delineate genetic population structure of redband 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.
3. 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.
4. Continue coordinated collection of water temperature data (between USFS, DEQ and IDFG) throughout the middle and upper Snake River provinces.

Wildlife/Terrestrial

(BLM)

There is a need to improve vegetation habitat diversity and plant community structure on much of the mid-elevation and lower elevation range sites on lands north of the Snake River. There are extensive areas that are dominated by exotic annual and introduced perennial herbaceous plant communities. This has created narrow corridors of an intact sagebrush habitat that link sagebrush communities north and south of the Snake River. In addition, the plant communities which contain a shrub overstory are becoming increasingly separated by wildfires. Many of these lower elevation sagebrush communities also lack native perennial herbaceous species. The resulting plant communities do not contain either the desired multi-level habitat structure or the diversity of plant species, which is necessary to meet the life-cycle needs of a more diverse assemblage of wildlife species. The greatest opportunities for sustained changes in habitat values for wildlife occur primarily on lands administered by the BLM.

Efforts to improve wildlife habitat quality for a greater number of native resident and migratory wildlife species should include a variety of vegetation rehabilitation techniques. It is estimated that 444,000 acres (in Shoshone and Burley BLM FO only) in the subbasin would benefit by some type of habitat conversion or augmentation. The rehabilitation effort should result in a mosaic of plant communities with their attendant structural differences. This would

help restore suitable habitat conditions to meet the seasonal needs of a greater number of native wildlife species than exist with current plant communities.

Strategies*:*

1) Approximately two-thirds of the vegetation treatment area would benefit by increasing native shrub establishment in perennial herbaceous plant communities.
2) The remaining area would require the re-establishment of a perennial grass, forb and shrub plant community.

A partial listing of some of the habitat improvement techniques which would likely be used include:

- Prescribed burning followed by drill seeding;
- Plowing followed by drill seeding;
- Herbicide treatment followed by drill seeding;
- Herbicide treatment;
- Interseeding of missing perennial habitat structural components.

(IDFG)

1. Reduce mortality of big game on Interstate 84.
   Strateg*y:* Install fencing along the interstate in areas where deer are known to winter in large numbers and providing crossings where needed (under or overpasses).
2. Restore and protect sagebrush in areas where sagebrush obligate wildlife species need large contiguous blocks of sagebrush for survival.

Strategy: Purchase of land or conservation easements in areas where there is a need to restore or protect this habitat.

3. Improve the mechanism for restoring native vegetation after range fires. There needs to be a greater emphasis on restoring native vegetation after large fires by having a more dependable source of native seeds available. Historically, the BLM's policy was to reseed burnt rangeland with crested wheatgrass when other native vegetation is not available. Reduce the spread of noxious weeds in sagebrush steppe habitat.
3. Improve critical nesting and wintering habitat for sage grouse. Sage grouse require the presence of residual plant materials associated with sagebrush communities for successful nesting and brood rearing.
   Strategies*:* 1) Improvements in grazing management and better control of noxious weeds.
   2) Improved wintering habitat could be provided through the same mechanisms.
4. Expansion of the sharptail grouse range through habitat improvements and reintroductions.
   Strategy: Sharptail grouse have specific habitat requirements that could be provided with 1) changes in current rangeland management practices and by 2) reseeding or planting vegetation in upland areas suitable for sharptail grouse.

There is need to better understand the habitat requirements for mountain quail. This species was historically abundant but is now completely extirpated from the Subbasin.

Statement of Fish and Wildlife Needs

The following discussions and associated lists include specific immediate and/or critical needs within the Boise-Payette-Weiser subbasins. Needs have been defined to

5. address limiting factors to fish, wildlife, and plant communities;

6. ensure that gaps in current data or knowledge are addressed;
7. enable continuation of existing programs critical to successful management of fish and wildlife resources; and
8. guide development of new programs to facilitate or enhance fish and wildlife management.

Fisheries

General

- Fully inventory manmade and natural migration barriers for native fish. Develop methods to identify and prioritize barrier removal projects based on assessments of risk and benefit for basin-wide native fish populations.
- Develop and fund reservoir conservation pools to sustain aquatic and terrestrial resources.
- Complete fish and wildlife loss assessments for federal projects at Lucky Peak, Arrowrock, Cascade, and Deadwood.
- Describe relative importance of key tributaries to bull and redband trout production.
- Continue to inventory native salmonids in the Middle and Upper Snake River Provinces 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.
- Continue to gather and analyze genetic information on native salmonids throughout the Middle and Upper Snake River Provinces to determine the purity of populations and the degree of genetic variability between and among populations.
- 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 Middle and Upper Snake River Provinces.
- Sediment and nutrient control programs throughout the subbasin should include, but not be limited to: 1) improved road maintenance or road closures to reduce erosion of roadbed materials into streams, 2) incentives for landowners to provide riparian buffers in croplands and pastures, 3) development of settling ponds or wetland filters to treat agricultural return flows, and 4) purchase of grazing rights or reductions in grazing intensity on public lands along high priority stream reaches.
- Develop artificial wetlands program to treat return flows and provide wildlife habitat and waterfowl production.
- Install and maintain fish screens on all significant diversion structures; include flow monitoring at headgates to improve efficiency of irrigation systems.
- Provide fish passage at all flow stages around irrigation diversion structures.

Boise River Subbasin

- Develop and fund interagency team to evaluate effectiveness of the Kirby Dam fish ladder; expand monitoring to fully document bull trout escapement, timing, and spawning locations, establish trend sites for redd counts, and assess risks from brook trout.
- Enhance the minimum conservation pool in Arrowrock Reservoir to secure overwintering habitat for bull and redband trout.

- Monitor bull trout entrainment losses from Arrowrock Reservoir following the proposed valve replacements and installation of hydroelectric plant; work with BOR and hydro operators to develop and test avoidance technologies to minimize entrainment.
- Enhance fishing opportunity by developing fishing ponds in existing dredge ponds in the Middle Fork Boise and Mores Creek watersheds.
- Secure and increase minimum stream flows in the Boise River between Lucky Peak Dam and the mouth.
- Evaluate the distribution and potential impacts of brook trout hybridization with bull trout in the Fall Creek drainage. Assess habitat quality. If habitat is suitable and brook trout threat is negligible, consider developing passage around the falls.
- Replace or modify culverts that are potential barriers in the Trinity Creek and Spring Creek drainages.

Payette River Subbasin

- Purchase storage space in Cascade Reservoir to increase minimum pool storage to approximately 475,000 acre-feet; needed to increase survival of coldwater fishes currently limited by high nutrient loading and low dissolved oxygen.
- Install a fish ladder at the Gold Fork Canal diversion structure. Fish passage at this structure would open approximately 44 stream miles to migratory fish.
- Install fish screening on the Gold Fork Canal diversion.
- Install modern irrigation diversion structures within the Cascade Reservoir watershed to accomplish sediment and erosion control.
- Create and fund local fish screen construction programs to design and implement cost effective irrigation diversion fish screens.
- Create irrigation return filtration wetlands to remove nutrients and create waterfowl habitat.
- Build fish ladder on Brown's Pond to connect the upper Lake Fork Creek with Little Payette Lake. Construct fish ladders or other passage structures on all diversions that create passage problems.
- Purchase and retire grazing and agricultural easements on BOR lands around Cascade Reservoir to reduce direct input of nutrients to the reservoir and create upland wildlife habitat.
- Create grazing and riparian easements and riparian pastures along critical stream reaches to help reduce nutrient input and rebuild riparian plant communities.
- Determine status of fluvial migratory bull trout in the upper South Fork Payette River, including abundance, life history, and migratory patterns.
- Evaluate effects of Deadwood Mine tailings on water chemistry and aquatic biota in the upper Deadwood River; develop restoration or reclamation programs if required.
- Improve knowledge of status, life history, and habitat use for bull trout in the upper Deadwood River.
- Develop water management and release strategies for Deadwood and Cascade Reservoirs to optimize bull trout habitat in Deadwood and sportfish production in both reservoirs.
- Modify outlet structure for Deadwood Dam to allow mixing of warmer surface water with cold deepwater releases.

- Install and monitor several tributary weirs during the early spring to discover if bull trout follow spawning westslope cutthroat and redband trout into tributaries.
- Reduce sediment inputs to the Deadwood Reservoir. Investigate feasibility of adding a roadbed stabilizer to the road that parallels the Deadwood River.
- Determine whether Deadwood Reservoir drawdowns are inhibiting zooplankton production and the ability of bull trout populations to reach spawning tributaries.
- Investigate feasibility of water management changes in Deadwood Reservoir to begin irrigation water releases later in August to maximize zooplankton production.
- Flows into Deadwood River need to match inflows to the reservoir from mid-June until August. This change would rely on using Cascade Reservoir waters for irrigation earlier in the summer.
- Deadwood Dam needs to be modified to allow for mixing of warm lake surface water and deep released water.
- Fine sediment inputs to the South Fork Payette River exceed flushing capacity. Sediment sources of fines need to be identified and controlled.
- Modify land use practices to improve water quality; develop settling basins or wetland filters to improve water quality in irrigation return flows.
- Restore fish passage at Black Canyon Dam.

Weiser River Subbasin

- Complete the TMDL process for the basin; identify specific sources of nutrients and sediment.
- Use TMDL process to prioritize landscape scale management plans and secure funding to restore stream habitats and connectivity.
- Pursue water transfers and agricultural incentives to improve summer flows, decrease water temperatures, and restore riparian corridors.
- Expand storage capacity for Lost Valley reservoir to provide increased late summer stream flows and reduce temperatures in the mainstem Weiser River.
- Eradicate fish populations in Crane Creek Reservoir to remove introduced non-game species; manage for both introduced and native sportfish.

Wildlife

General

- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity and for mitigation of lost wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, and exchanges).
- Implement and (where applicable) continue Integrated Pest Management programs.
- Assist landowners with land holdings and easements.
- Continue long-term bird monitoring.
- Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.
- Acquire existing ecological data sets where possible and compile metadata according to national standards.

- Monitor use of existing reference areas to assure consistency with the maintenance of ecological values.
- Establish and maintain permanent baseline monitoring systems within ecological reference areas for priority ecosystems and species.
- Identify candidate sites for the establishment of ecological reference areas based on current needs assessments. Periodically update ecological reference area needs assessments.

Ponderosa Pine Forest and Woodlands

- Inventory and map the current and potential distribution of ponderosa pine-dominated plant communities in appropriate watersheds of the Boise-Payette-Weiser subbasins. Inventory, map, and gather population data for ponderosa pine associated wildlife and plant species.
- Acquire lands on breaklands when opportunities arise for improved habitat protection, restoration, and connectivity for ponderosa pine plant communities and for mitigation of lost wildlife habitat for ponderosa pine associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Restore mid-seral old growth ponderosa pine-dominated plant communities.
- Create and maintain large diameter snags in ponderosa pine plant communities.
- Develop an information and education stewardship program to foster ponderosa pine protection.

Canyon Grasslands and Sagebrush Steppe

- Inventory and map the distribution of canyon grasslands within the subbasin complex.
- Inventory and prepare conservation plans for high quality, representative stands of canyon grasslands within the subbasin complex.
- Inventory and map the distribution of sagebrush steppe within the Boise-Payette-Weiser subbasins.
- Inventory and prepare conservation plan for high quality, representative stands of sagebrush steppe.
- Inventory, map, and gather population data for canyon grassland and sagebrush steppe associated wildlife and plant species.
- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for canyon grasslands and sagebrush steppe and for mitigation of lost wildlife habitat for canyon grassland and sagebrush steppe associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Restore canyon grasslands and sagebrush steppe ecosystems.
- Investigate and develop appropriate and practical restoration techniques for canyon grasslands and sagebrush steppe ecosystems.
- Develop native plant nurseries for propagation and restoration.
- Seed-bank native canyon grassland and sagebrush steppe perennial bunchgrass species.
- Develop an information and education stewardship program to foster canyon grassland and sagebrush steppe protection.

- Complete inventories to better identify, protect, and enhance existing and potential critical sage grouse habitat areas in the upper portions of the subbasin.
- Increase public awareness of the status of sage grouse and their biology and support for their conservation.

Riparian Plant Communities

- Inventory and map the distribution of riparian plant communities.
- Inventory, map, and gather population data for riparian associated wildlife and plant species.
- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for riparian plant communities and for mitigation of lost wildlife habitat for riparian associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Protect, restore, and create wetland and riparian habitat in lower elevation riparian areas.
- Develop an information and education stewardship program to foster riparian community protection.
- Improve the trend and condition of the subbasin riparian plant communities located in critical sage grouse habitats.
- Reconnect historic streams to recover lost riparian plant communities and habitats.

Noxious Weeds

- Inventory and map the distribution of noxious weeds.
- Develop and use restoration techniques for noxious weed infested plant communities.
- Continue control programs for noxious weeds to restore natural habitat conditions and plant communities for wildlife species.
- Develop an information and education stewardship program for noxious weeds.
- Develop and maintain cooperative information management protocols for the occurrence of noxious weed populations.
- Complete inventories to better identify existing infestations and potential critical areas of spread in the subbasin complex.
- Improve the trend and condition of the subbasin riparian and upland communities located in the subbasin complex through the elimination of spotted knapweed and other noxious weeds.
- Increase public awareness of noxious weed problems and solicit their support for the conservation of native habitats.

Subalpine Forest and Woodland Stand Dynamics and Habitat Relations

- Inventory and map the distribution of subalpine forest and woodland (subalpine fir forest, subalpine fir forest and woodland, and whitebark pine-limber pine forest and woodland plant association groups) by seral status and structural condition, within the appropriate watersheds of the subbasin complex.
- In selected subalpine fir forest and woodland stands throughout the Boise-Payette-Weiser subbasins, determine pre-European settlement fire disturbance regimes.

- Investigate fire disturbance and stand dynamic processes in whitebark pine-dominated forest and woodlands in appropriate watersheds.
- Investigate techniques and methods to retain late successional habitats on state and private lands (land exchanges, conservation easements).
- Develop and implement management prescriptions to restore and promote late successional habitats.
- Develop an information and education stewardship program to foster late seral community protection.

Habitat Fragmentation and Disturbance

- Identify by county critical wildlife areas and plant communities.
- Acquire critical habitats threatened by development when opportunities arise for improved habitat protection, restoration, and connectivity (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Work with counties to support timely updates and resource inventories related to local land use plans to further prevent degradations of floodplains, wetlands, riparian, and other sensitive areas.
- Reduce road densities through closures, obliteration, and reduced construction.
- Need to support planned closures to motorized use on public roads, trails, and cross-country areas and encourage closure of other public motorized roads, trails, and cross-country areas when needed to protect fish, wildlife, or water quality.
- Improve enforcement of motorized access restrictions.
- Maintain riparian plant communities because of their connectivity value.

Combined Aquatic and Terrestrial Needs

- Continue ongoing, and establish new, monitoring and evaluation programs for fish supplementation, habitat restoration and improvement, habitat baseline conditions, water quality and water quantity improvements, conditions and trends. These monitoring and evaluation activities are critical to evaluating the effectiveness of projects at improving habitat, watershed health and enhancing production of target species.
- Coordinate monitoring and evaluation efforts at the subbasin and provincial scale to maximize effectiveness and minimize redundancy.
- Develop and implement improved practices for agricultural, mining, grazing, logging and development activities to protect, enhance, and/or restore fish and wildlife habitat, streambank stability, watershed hydrology, and floodplain function.
- Develop and maintain comprehensive and consistent subbasin databases related to both aquatic and terrestrial resources, and establish a centralized data repository. This will promote more effective resource management.
- Investigate effects of potential loss or lack of nutrients due to declines in anadromous salmonid populations, and coordinate and evaluate nutrient enhancement alternatives.
- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity, and for mitigation of lost fish and wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Protect existing pristine and key fish and wildlife habitats directly threatened by subdivision, recreation, or extractive resource uses.

- Support timely updates and resource inventories related to local land use plans to further prevent degradation of floodplains, wetlands, riparian, and other sensitive areas.
- Continue to develop watershed assessments at multiple scales to facilitate integrated resource management and planning efforts.
- Develop Federal Recovery Plans for threatened and endangered species to provide recovery guidance for state, tribal, and local entities as required by law.
- Complete road, trail, and cross-country motorized use area inventory and assess impacts to aquatic and terrestrial resources. Use information to facilitate transportation planning and to reduce densities of motorized roads and trails and reduce areas of cross-country motorized use. Support planned road closures on public land, and encourage closure of other roads.
- Support timely updates and resource inventories related to local land use plans to further prevent degradation of floodplains, wetlands, riparian, and other sensitive areas.
- Continue and enhance the cooperative/shared approach in research, monitoring, and evaluation between tribal, federal, state, local and private entities to facilitate restoration and enhancement measures. Protection and restoration of fish and wildlife populations and habitat will not be successful without the interest and commitment of all parties.

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

Actions by Others

Efforts Funded Outside of the Columbia Basin Fish and Wildlife Program

Idaho Department of Fish and Game

The IDFG has worked on a number of non-BPA sponsored projects and issues directed toward conserving fish and their habitat in the Boise-Payette-Weiser subbasins.

Technical Assistance. The IDFG provides technical review and comment on a wide variety of land and water management and development proposals in the Boise-Payette-Weiser subbasins. These include but are not limited to stream alterations, planning and zoning issues, timber harvest, livestock grazing allotments, mining, water right filings, hydroelectric project licensing and relicensing efforts, and watershed planning. The IDFG offers recommendations to regulatory entities to protect native fishes and their habitats.

Participation in State and Federal Recovery Efforts - The IDFG participates in state efforts to conserve and recover bull trout populations in the Boise-Payette-Weiser subbasins. The IDFG works with the Southwest Basin Native Fish Watershed Advisory Group and state, federal, and private stakeholders to implement the proposed strategies outlined in the State of Idaho's *Bull Trout Conservation Plan*.

Public Information Program on Bull Trout Identification and Status. The IDFG works with many entities to develop and distribute signs and bull trout educational pamphlets.

Brook Trout Suppression Effort in the Pikes Fork Watershed. Efforts include a cooperative, three-year (1998-2000) multi-disciplinary project designed to suppress brook trout in an almost

five-mile reach of the Pikes Fork of the Crooked River, tributary to the North Fork Boise River. Multiple pass electrofishing was used to remove brook trout from the Pikes Fork to assess whether this technique holds any promise in suppressing an established non-native species from a bull trout key watershed.

Kirby Dam Fish Ladder and Penstock Screen. For over 90 years, the Kirby Dam on the Middle Fork Boise River had been an impassable barrier for migratory redband trout and bull trout. In 1998, the IDFG and Atlanta Power Company signed a fish passage agreement including a negotiated water flow regime for a proposed fish ladder. In 1998-1999, the IDFG constructed a fish ladder at Kirby Dam to reconnect approximately 57 miles of potential bull trout spawning and rearing habitat above Kirby Dam (Boise National Forest, unpublished information; Steed et al. 1998). Use of the ladder by redband trout and adult bull trout was documented in 1999, 2000, and 2001 through a combination methods including an underwater video camera and trapping within the ladder (DJ R24). Daily use of the ladder by migratory fish will be monitored in August for five years from 2001 through 2005. During this time, a trap in the ladder will be utilized to capture all fish traveling upstream. All bull trout will be measured and released above the ladder. If bull trout of suitable size are captured, a sample will be implanted with radio tags and telemetry will be used to identify spawning areas and movement patterns above Kirby Dam.

In the fall of 2001, the IDFG will place a removable screen on the penstock intake of the Kirby Dam hydroelectric project to prevent entrainment of native fish species through the turbine. Funds were provided to the IDFG by the Governor's Office.

Bull Trout Education Efforts and Creel Survey. Lamansky *et al*. (2001) completed creel surveys in the Boise River subbasin (Middle, North, and upper South Fork Rivers) and included estimates of illegal bull trout harvest in their results. Subsequently, Schill *et al.* (2001) implemented an angler education effort using a variety of signs and posters informing anglers of the presence of bull trout and of fishing regulations. Prior to the education efforts, estimated bull trout harvest totaled 149 fish. Angler awareness of regulations improved and bull trout harvest declined markedly after education efforts. Signing efforts have continued since these studies.

Extensive creel surveys were conducted on the Middle Fork Boise River in 1989 and 1990 (Rohrer 1990; Rohrer 1991) and in 1998 and 1999 (Schill, Lamansky). Both creel surveys focused closely on the harvest of bull trout and wild rainbow trout. The 1999 research also evaluated three education strategies intended to increase angler awareness of bull trout and how to differentiate their physical appearance from other fish species found in the basin. Angler effort and total catch in 1998 were nearly doubled in 1999. Estimated harvest, however, decreased from 1,462 rainbow trout and 149 illegal bull trout in 1998, to 1,055 rainbow and zero bull trout in 1999. The decline in bull trout harvest was likely a result of intense signing and educational efforts to help anglers better recognize bull trout. Large road signs illustrating bull trout identification were found to be, by far, the most effective method for improving angler knowledge of bull trout regulations and identification.

Radio telemetry was used in 1996 (R21), 1997 (Flatter 2000), and 1998 (Flatter 1999) to document spawning areas used by adfluvial bull trout migrating from Arrowrock Reservoir. A total of sixty-nine radio-tagged adult bull trout migrated upstream and out of Arrowrock Reservoir, of which, 32 percent migrated up Middle Fork tributaries to spawn. Tributaries of the Middle Fork used by radio tagged bull trout included Sheep Creek, Roaring River, Black Warrior Creek, Queens River, and the Little Queens River. Mark-recapture techniques were used in 1997

and 1998 to estimate the size of the bull trout population in Arrowrock Reservoir. A large population of adfluvial bull trout was documented (Flatter 1999).

Deadwood River. A velocity barrier was installed near the mouth of the Deadwood Reservoir in 1978 to limit kokanee spawning escapement from the reservoir. In 1999 and 2000, the velocity barrier was removed by the IDFG and the USFS to maximize bull trout spawning escapement to the upper Deadwood River watershed (R24, R25 in press, IDFG file data).

Allen (1998) electrofished eight sites in the Deadwood River between the mouth and the upper watershed. Bull trout were captured at only the upper two sites above the East Fork Deadwood River. The bull trout captured were generally small in size and were likely resident form. At the upper two sites only bull trout were present, whereas at the lower sites redband, westslope cutthroat, mountain whitefish, and dace were present. No bull trout were collected in the Deadwood River that would be considered large enough to be fluvial forms (Allen 1998).

Some fall chinook salmon stocked into Deadwood Reservoir also ascend the river to spawn. The reach from the mouth of Deer Creek to the reservoir was surveyed for fall chinook redds in October of 1998. Twelve redds were identified; ten adult fall chinook were observed, and two fall chinook carcasses were located (R23). Successful natural recruitment of fall chinook to the reservoir has not been documented.

The Deadwood River blow the confluence of the South Fork Payette River was snorkeled in 1998 as part of an IDFG bull trout investigation of Deadwood Reservoir. Biologists floated the Deadwood River in inflatable kayaks and snorkeled the large pools and tributary mouths. No bull trout were observed in the river or in tributary mouths (R23).

Deadwood Reservoir. Weirs are installed in main tributaries annually in August to facilitate kokanee egg take requests and to monitor kokanee spawning escapement (2000 Nampa Hatchery Annual Report). Extensive bull trout studies took place in 1997 (Allen 1998) and 1998 (R23) to document the presence of adfluvial bull trout in Deadwood Reservoir. Only one bull trout was successfully followed using radio telemetry. This fish ascended Trail Creek, a large tributary on the South end of the Reservoir (Allen 1998). Extensive reservoir fish sampling with trap nets and gill nets has been conducted recently to monitor fish populations (R17, R18, R20, R21). Trail Creek, South Fork Beaver, and Beaver Creeks were rotenone in 1992 to control kokanee (IDFG file data). Deadwood Reservoir was drained and treated with rotenone+fintrol in 1973 to control kokanee populations.

South Fork Payette River. The size, distribution, and densities of redbands observed in 1996 were very similar to observations made 1988 (R13). Tributaries to the upper South Fork Payette River have extensive populations of redbands at densities very analogous to the main river (R13, R14). Canyon Creek, a tributary to the upper South Fork Payette River, contains a resident population of bull trout. Bull trout in excess of 12 inches are occasionally observed in the South Fork Payette River between Grandjean and Lowman. Brook trout, which have escaped upper watershed mountain lakes, are also found in this reach (IDFG file data). Extensive snorkeling was conducted in the South Fork Payette River between the Sawtooth Wilderness boundary and Lowman in 1996 (Allen *et al.* 2000 - R22). Wild redband trout were common, but no estimates of abundance or density were calculated. Three angler surveys have been conducted on the South Fork Payette River between 1980 and 1999.

In 1980, an angler survey was conducted between Grandjean and Alder Creek Bridge near Garden Valley. Anglers fished a total of 10,298 hours to harvest 4,398 redband trout, 3,979 hatchery rainbow trout, 411 brook trout and 27 whitefish (R5). In 1992, an angler survey was conducted between the Grandjean Campground and the mouth of the Deadwood River. Anglers fished a total of 8,142 hours, with an overall catch rate (all species) of 1.06 fish per hour (R24). In 1999, the 1992 angler survey was repeated between the Grandjean Campground and the mouth of the Deadwood River. Anglers fished a total of 16,010 hours, with an overall catch rate of 1.85 fish per hour (R24).

U.S. Forest Service

Culvert Modifications. Currently, some barriers are already being addressed such as the Feather River structure, which has been modified with an in-culvert fishway (Clancy and Reichmuth 1990). Further head cutting downstream of the culvert has been stopped and the height of the outlet plunge pool has been raised with drop structures. The USFS is also actively working on replacing problem culverts in the Trinity Creek drainage.

U.S. Fish and Wildlife Service

- Mack Safe Harbors Conservation Agreement. The USFWS entered into a conservation agreement to protect a northern Idaho ground squirrel population in the upper reaches of the Weiser River subbasin.
- Partners Projects for wetlands and riparian habitat on private lands in the Weiser River subbasin.
- Coordinating with the BLM and IDFG on annual greater sage grouse and Columbian sharp-tailed grouse lek and winter inventories and monitoring in the Weiser River subbasin.
- ESA consultation regarding listed species in the Weiser River subbasin including bull trout, bald eagles, northern Idaho ground squirrels, lynx, and Utes Ladies tresses.
- Annual review and pending actions on petitioned species status recommendations including sharp-tailed grouse, southern Idaho ground squirrel, mountain quail, and *Batrychium* in the Weiser River subbasin.
- Candidate conservation agreement for southern Idaho ground squirrels in progress in the Weiser River subbasin.
- Cooperative project between USFW, IDFG, and private parties in relocating a group of southern Idaho ground squirrels from the Weiser Golf Course to private lands.
- Starting in the fall of 2001, a master's student at Boise State University will be funded to assess the population and habitat conditions of southern Idaho ground squirrels in the Weiser River subbasin.
- Working cooperatively with Albertson's College of Idaho on the status report of southern Idaho ground squirrels, and in a study of nutrient and dietary analysis of southern and northern Idaho ground squirrels.
- A cooperative venture involving the USFWS, BLM, Cornell University, and Albertson's College in developing a Columbia Basin Field Guide map/brochure of ground squirrels.
- Funding IDFG Section 6 annual population monitoring of southern and northern Idaho ground squirrels.

- Working with the BLM, Idaho Power Company, and the IDFG on habitat restoration study site models for southern Idaho ground squirrels.
- Working with the USFS and IDFG on various habitat modification projects for northern Idaho ground squirrels.

Idaho Department of Fish and Game

- Habitat Improvement Program (HIP). The HIP is a program 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 that include portions of the three subbasins, many acres that have habitat for upland birds and waterfowl have been improved through the HIP program. Nesting cover, woody cover, food plots, ponds and nest structures were the main practices implemented.
- Critical Habitat Mapping. The IDFG is working with the University of Idaho Landscape Lab to map critical wildlife habitat and vertebrate species richness. This information can be used interested parties to identify which habitats are most critical to protect, and where conservation of soil, water and open space resources is most critical, and where and how restoration efforts might be most effective.
- Other Mapping Efforts. The IDFG has also worked with the Rocky Mountain Elk Foundation (RMEF) to develop a map delineating elk and deer winter range and other critical habitat in the subbasin.
- Conservation Data Center. The CDC maintains information on the occurrence of elements of biological diversity (plant and animal species and plant communities) and conservation sites and managed areas. The CDC has conducted inventory and monitoring projects within the subbasin related to rare and endemic plant species; the distribution and condition of old growth forest stands; the selection and establishment of ecological reference areas; vegetation and wildlife habitat mapping; and the conservation of high priority wetland and riparian sites. These studies produce recommendations for site-specific conservation action, assessments of conservation status, rankings of statewide or global rarity, and classifications and descriptions of plant communities.
- Payette River Bull Trout 1995. Using angling, the IDFG intensively surveyed the mainstems of the South Fork Payette River and Payette River to assess whether or not fluvial bull trout wintered in the larger river systems. No bull trout were collected during the effort (Allen *et al.* 1995).
- Deadwood Reservoir Bull Trout 1998-1999. The IDFG, under contract to the BOR, surveyed Deadwood Reservoir and Deadwood River in the spring of 1998 and 1999 to assess the exodus timing of adfluvial bull trout from the reservoir. No bull trout were captured in Deadwood River and very few were collected in the reservoir. The Deadwood River subpopulation is suppressed (Allen *et al.* 2001).

Table 37. Subbasin Summary FY 2003 - Funding Proposal Matrix

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	199505701
Provincial Team Funding Recommendation	**Recom. Action**	**Recom. Action**	**High Priority**	**High Priority**	**High Priority**	**Recom. Action**	**Recom. Action**	**Recom. Action**	**High Priority**
1. Fully inventory manmade and natural migration barriers for native fish. Develop methods to identify and prioritize barrier removal projects based on assessments of risk and benefit for basin-wide native fish populations.	+		+		+				
2. Develop and fund reservoir conservation pools to sustain aquatic and terrestrial resources.									
3. Complete fish and wildlife loss assessments for federal projects at Lucky Peak, Arrowrock, and Cascade reservoirs.									
4. Describe relative importance of key tributaries to bull and redband trout production.			+		+				
5. Continue to inventory native salmonids in the Middle and Upper Snake River Provinces 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.	+	+	+	+	+				
6. Continue to gather and analyze genetic information on native salmonids throughout the Middle and Upper Snake River Provinces to determine the purity of populations and the degree of genetic variability between and among populations.		+	+	+	+				
7. 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.		+	+						

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	199505701
8. Continue coordinated collection of water temperature data throughout the Middle and Upper Snake River Provinces.									
9. Implement sediment and nutrient control programs throughout the subbasin.									+
10. Develop artificial wetlands program to treat return flows and provide wildlife habitat and waterfowl production.								+	+
11. Install and maintain fish screens on all significant diversion structures; include flow monitoring at headgates to improve efficiency of irrigation systems.			+		+				
12. Provide fish passage at all flow stages around irrigation diversion structures.			+		+				
13. Develop and fund interagency team to evaluate effectiveness of the Kirby Dam fish ladder; expand monitoring to fully document bull trout escapement, timing, and spawning locations, establish trend sites for redd counts, and assess risks from brook trout.									
14. Enhance the minimum conservation pool in Arrowrock Reservoir to secure overwintering habitat for bull and redband trout.									
15. Monitor bull trout entrainment losses from Arrowrock Reservoir following the proposed valve replacements and installation of hydroelectric plant; work with BOR and hydro operators to develop and test avoidance technologies to minimize entrainment.									
16. Enhance fishing opportunity by developing fishing ponds in existing dredge ponds in the Middle Fork Boise and Mores Creek watersheds.									
17. Secure and increase minimum stream flows in the Boise River between Lucky Peak Dam and the mouth.									
18. Evaluate the distribution and potential impacts of brook trout hybridization with bull trout in the Fall Creek drainage. Assess habitat quality and if habitat is suitable and brook trout threat is negligible, consider developing passage around the falls.									

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	199505701
19. Replace or modify culverts that are potential barriers in the Trinity Creek and Spring Creek drainages.	+								
20. Purchase storage space in Cascade Reservoir to increase minimum pool storage to approximately 475,000 acre-feet; needed to increase survival of coldwater fishes currently limited by high nutrient loading and low dissolved oxygen.									
21. Install a fish ladder at the Gold Fork Canal diversion structure. Fish passage at this structure would open approximately 44 stream miles to migratory fish.					+				
22. Install fish screening on the Gold Fork Canal diversion.					+				
23. Install modern irrigation diversion structures within the Cascade Reservoir watershed to accomplish sediment and erosion control.					+				
24. Create and fund local fish screen construction programs to design and implement cost effective irrigation diversion fish screens.					+				
25. Build fish ladder on Brown's Pond to connect the upper Lake Fork Creek with Little Payette Lake. Construct fish ladders or other passage structures on all diversions that create passage.									
26. Purchase and retire grazing and agricultural easements on BOR lands around Cascade Reservoir to reduce direct input of nutrients to the reservoir and create upland wildlife habitat.									+
27. Create grazing and riparian easements and riparian pastures along critical stream reaches to help reduce nutrient input and rebuild riparian plant communities.					+				+
28. Determine status of fluvial migratory bull trout in the upper South Fork Payette River, including abundance, life history, and migratory patterns.									
29. Evaluate effects of Deadwood Mine tailings on water chemistry and aquatic biota in the upper Deadwood River; develop restoration or reclamation programs if required.									
30. Improve knowledge of status, life history, and habitat use for bull trout in the upper Deadwood River.						+			
31. Develop water management and release									

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	19950701
strategies for Deadwood and Cascade Reservoirs to optimize bull trout habitat in Deadwood and sportfish production in both reservoirs.									
32. Modify outlet structure for Deadwood Dam to allow mixing of warmer surface water with cold deepwater releases.									
33. Install and monitor several tributary weirs during the early spring to discover if bull trout follow spawning westslope cutthroat and redband trout into tributaries.									
34. Reduce sediment inputs to the Deadwood Reservoir. Investigate feasibility of adding a roadbed stabilizer to the road that parallels the Deadwood River.						+			
35. Determine whether Deadwood Reservoir drawdowns are inhibiting zooplankton production and the ability of bull trout populations to reach spawning tributaries.									
36. Investigate feasibility of water management changes in Deadwood Reservoir to begin irrigation water releases later in August to maximize zooplankton production.									
37. Fine sediment inputs to the South Fork Payette River exceed flushing capacity. Sediment sources of fines need to be identified and controlled.						+			
38. Restore fish passage at Black Canyon Dam.									
39. Complete the TMDL process for the basin; identify specific sources of nutrients and sediment.									
40. Use TMDL process to prioritize landscape scale management plans and secure funding to restore stream habitats and connectivity.									
41. Pursue water transfers and agricultural incentives to improve summer flows, decrease water temperatures, and restore riparian corridors.					+				
42. Eradicate fish populations in Crane Creek Reservoir to remove introduced non-game species; manage for both introduced and native sportfish.									

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	199505701
43. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity and for mitigation of lost wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, and exchanges).								+	+
44. Implement and (where applicable) continue Integrated Pest Management programs.					+				
45. Continue long-term bird monitoring.									+
46. Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.		+	+	+	+				+
47. Acquire existing ecological data sets where possible and compile metadata according to national standards.	+			+	+		+		+
48. Monitor use of existing reference areas to assure consistency with the maintenance of ecological values.	+		+	+	+		+		+
49. Establish and maintain permanent baseline monitoring systems within ecological reference areas for priority ecosystems and species.				+	+				+
50. Identify candidate sites for the establishment of ecological reference areas based on current needs assessments. Periodically update ecological reference area needs assessments.							+		+
51. Inventory and map the current and potential distribution of important plant communities in appropriate watersheds of the Boise-Payette-Weiser subbasins.							+		
52. Develop native plant nurseries for propagation and restoration.									
53. Seed-bank native canyon grassland and sagebrush steppe perennial bunchgrass species.									
54. Develop an information and education stewardship program to foster important plant community protection.									
55. Complete inventories to better identify, protect, and enhance existing and potential critical sage grouse habitat areas in the upper portions of the subbasin.									

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	199505701
56. Increase public awareness of the status of sage grouse and their biology and support for their conservation.									
57. Inventory and map the distribution of riparian plant communities.			+				+		+
58. Inventory, map, and gather population data for riparian associated wildlife and plant species.			+				+		+
59. Protect, restore, and create wetland and riparian habitat in lower elevation riparian areas.			+				+	+	+
60. Improve the trend and condition of the subbasin riparian plant communities located in critical sage grouse habitats.			+						+
61. Reconnect historic streams to recover lost riparian plant communities and habitats.			+		+				
62. Inventory and map the distribution of noxious weeds.							+		+
63. Develop and use restoration techniques for noxious weed infested plant communities.									+
64. Continue control programs for noxious weeds to restore natural habitat conditions and plant communities for wildlife species.									+
65. Develop an information and education stewardship program for noxious weeds.									+
66. Develop and maintain cooperative information management protocols for the occurrence of noxious weed populations.									+
67. Complete inventories to better identify existing infestations and potential critical areas of spread in the subbasin complex.									+
68. Inventory and map the distribution of subalpine forest and woodland (subalpine fir forest, subalpine fir forest and woodland, and whitebark pine-limber pine forest and woodland plant association groups) by seral status and structural condition, within the appropriate watersheds of the subbasin complex.									
69. In selected subalpine fir forest and woodland stands throughout the Boise-Payette-Weiser subbasins, determine pre-European settlement fire disturbance regimes.									

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	199505701
70. Investigate fire disturbance and stand dynamic processes in whitebark pine-dominated forest and woodlands in appropriate watersheds.									
71. Investigate techniques and methods to retain late successional habitats on state and private lands (land exchanges, conservation easements).									+
72. Develop and implement management prescriptions to restore and promote late successional habitats.									+
73. Identify by county critical wildlife areas and plant communities.									
74. Acquire critical habitats threatened by development when opportunities arise for improved habitat protection, restoration, and connectivity (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).									+
75. Work with counties to support timely updates and resource inventories related to local land use plans to further prevent degradations of floodplains, wetlands, riparian, and other sensitive areas.									
76. Reduce road densities through closures, obliteration, and reduced construction.									+
77. Need to support planned closures to motorized use on public roads, trails, and cross-country areas and encourage closure of other public motorized roads, trails, and cross-country areas when needed to protect fish, wildlife, or water quality.									+
78. Improve enforcement of motorized access restrictions.									
79. Continue ongoing, and establish new, monitoring and evaluation programs for fish supplementation, habitat restoration and improvement, habitat baseline conditions, water quality and water quantity improvements, conditions and trends. These monitoring and evaluation activities are critical to evaluating the effectiveness of projects at improving habitat, watershed health and enhancing production of target species.		+							+
80. Coordinate monitoring and evaluation efforts at the subbasin and provincial scale to maximize effectiveness and minimize redundancy.									+

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	19950701
81. Develop and implement improved practices for agricultural, mining, grazing, logging and development activities to protect, enhance, and/or restore fish and wildlife habitat, streambank stability, watershed hydrology, and floodplain function.	+		+		+	+		+	+
82. Develop and maintain comprehensive and consistent subbasin databases related to both aquatic and terrestrial resources, and establish a centralized data repository. This will promote more effective resource management.									+
83. Investigate effects of potential loss or lack of nutrients due to declines in anadromous salmonid populations, and coordinate and evaluate nutrient enhancement alternatives.				+					
84. Protect existing pristine and key fish and wildlife habitats directly threatened by subdivision, recreation, or extractive resource uses.									+
85. Support timely updates and resource inventories related to local land use plans to further prevent degradation of floodplains, wetlands, riparian, and other sensitive areas.									+
86. Continue to develop watershed assessments at multiple scales to facilitate integrated resource management and planning efforts.									
87. Develop Federal Recovery Plans for threatened and endangered species to provide recovery guidance for state, tribal, and local entities as required by law.									
88. Complete road, trail, and cross-country motorized use area inventory and assess impacts to aquatic and terrestrial resources. Use information to facilitate transportation planning and to reduce densities of motorized roads and trails and reduce areas of cross-country motorized use. Support planned road closures on public land and encourage closure of other roads.									

Project Proposal ID	32004	32006	32009	32011	32013	32015	32020	32021	199505701
89. Continue and enhance the cooperative/shared approach in research, monitoring, and evaluation between tribal, federal, state, local and private entities to facilitate restoration and enhancement measures. Protection and restoration of fish and wildlife populations and habitat will not be successful without the interest and commitment of all parties.									+
90. Better educate the public on issues and policies important to natural resource restoration, protection, and enhancement to encourage meaningful public participation.									

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

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