Draft

Snake Headwaters Subbasin Summary

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Northwest Power Planning Council

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

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Background & Introduction

In 1980 Congress passed the Northwest Power Act, establishing the Northwest Power Planning Council (Council) and articulating the legal mandate to develop a program to protect, mitigate, and enhance fish and wildlife in the Columbia River Basin. The Council developed its first Fish and Wildlife Program in 1982 and has revised it every few years, most recently in November, 2000. The program includes support of management and research projects to mitigate and benefit fish and wildlife resources, and is reviewed by an Independent Scientific Review Panel (ISRP). The Council is developing a set of subbasin plans for each of the 62 subbasins that lie within the 11 provinces of the Columbia River Basin (Figure 1). An interim step in developing subbasin plans is summarizing the existing information on fish and wildlife resources, habitats, programs, limiting factors, and needs into documents called subbasin summaries.

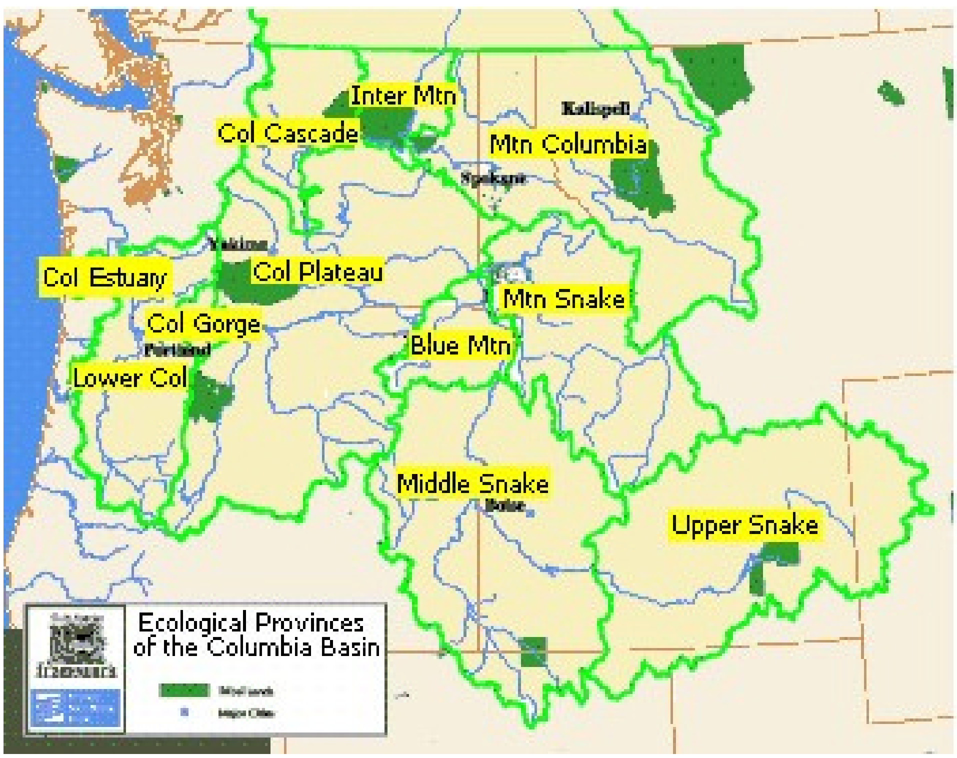


Figure 1. Columbia River Basin with major provinces

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

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

Subbasin Description

General

The Upper Snake Headwaters Subbasin is one of the largest subbasins in the Columbia River Basin system and encompasses some of the most pristine terrestrial and aquatic temperate montane ecosystems. It lies within the heart of the northern Rocky Mountain Region straddling the border between Southeastern Idaho and Western Wyoming. The habitat ranges from forest-riparian to agricultural/urban to riparian, and encompasses six key drainage areas (the Snake Headwaters, Gros Ventre, Greys-Hoback, Salt, Palisades, and Willow drainages) and the Snake River to below Idaho Falls, Idaho (a part of the Idaho Falls drainage.)

The major rivers that are a part of the Headwaters Subbasin, or feed into it, include the Snake River, the Greys River, the Salt River, the Hoback River, and the Gros Ventre River. Some of the most important cottonwood gallery forests in the intermountain west exist within this river parkway. Lakes and reservoirs within the drainages include Jackson Lake, Palisades Reservoir, and Ririe Reservoir. The Snake River itself harbors one of the few fluvial populations of Yellowstone cutthroat trout in Idaho.

The Headwaters Subbasin forested areas are home to a diversity of mammalian and avian species including the largest population of nesting bald eagles in the Greater Yellowstone Ecosystem (a broad-reaching expanse of environmental and ecological oversight that includes the Headwaters Subbasin). National forests include the Targhee-Caribou National Forest and the Bridger-Teton National Forest. It also includes such resources as the Grand Teton National Park, Jackson Hole Elk Refuge, Jackson National Fish Hatchery, and Gros Ventre Wilderness area.

The Snake River Corridor

The Headwaters are characterized by the Snake River Corridor, a term describing all fish and wildlife habitats, demographics, and recreational opportunities within the influenced geographic region. The Corridor is comprised of rugged mountains and rolling hills surrounding the flat-bottomed valleys, reservoirs, and steep canyons. Eminating north of Jackson Lake, major tributaries include the Buffalo Fork at the north end of the valley and the Gros Ventre River near the middle of the valley, both entering from the east. At the south end of the valley, the Teton and Absaroka ranges meet to form a narrow canyon near the mouth of the Hoback River.

From Jackson Lake, the river drops from 6,800 feet to about 5,900 feet at the southern end of the valley. The river displays a predominantly braided pattern in its current floodplain, characterized by multiple, winding channels separated by transient islands, which migrate due to continual erosion by the fast-flowing water

At Hoback Junction at the southern end of the Jackson Hole valley, the river floodplain changes abruptly from the flat surface of the valley to a steep-sided, high-gradient canyon. The river also changes from broad and braided to a dominantly single-channel character. In the Canyon, the river drops from 5,900 feet at its head to 5,600 feet at the entrance to Palisades Reservoir. (The Snake drops especially rapidly in the final section of the Canyon, renowned for its abundant whitewater.)

The Snake River creates a water-rich 'ribbon of life', which extends through the high altitude grasslands, past the pine and aspen forests, and through riparian and wetland vegetative zones. This 'ribbon of life' provides essential habitat for a wide variety of terrestrial species and birds. Moose, deer, and bald eagle are especially noteable species which flourish along the Corridor and rely on the water of the Snake.

The Snake is catagorized as a blue-ribbon trout stream, and many game and non-game fish species are present in its braided channels. The Snake River fine-spotted Cutthroat Trout is one of the most important species for the large sport-fishing industry along the river. The trout spawn along the many spring creeks, which enter the main channel of the Snake, and are limited by the availability of such gravel-bottomed habitat away from the fast currents and erosional force of the main river.

There are numerous rare and endangered species along the Snake River Corridor, including the cutthroat trout and bald eagle. The eagle nests along various portions of the river and utilize the Corridor for all stages of its life process.

Location

The Snake Headwaters Subbasin of the Upper Snake Province lies within the northern Rocky Mountains straddling the border between southeastern Idaho and western Wyoming. The Headwaters contain one of the tributaries, the Snake River, that contributes to the Columbia River Basin and the Columbia River (Figure 2 and Figure 3).

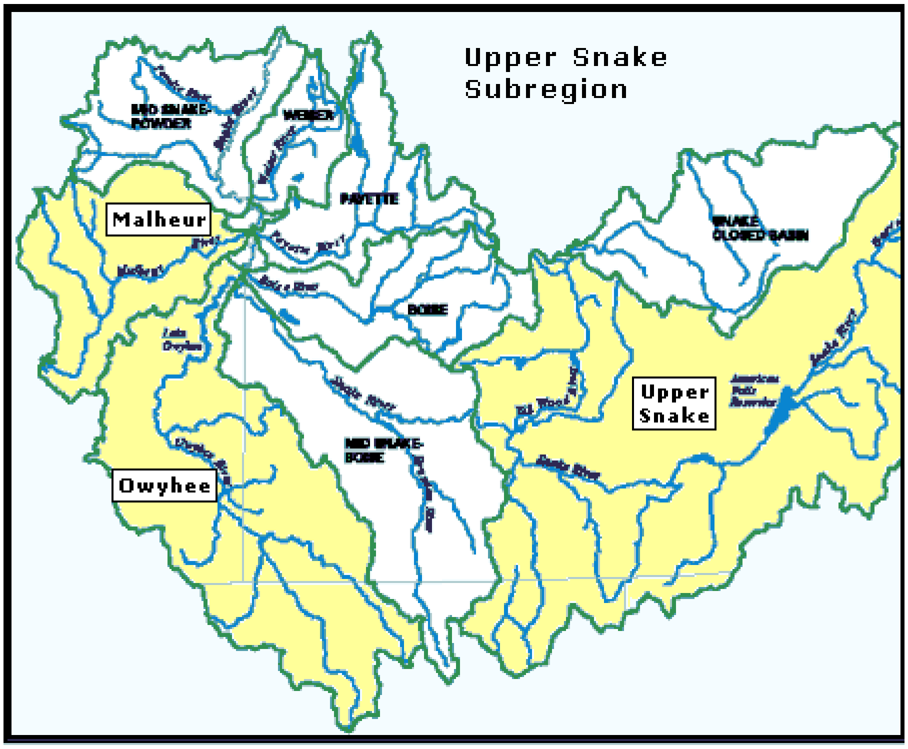


Figure 2. Upper Snake Subregion including the Upper Snake Subbasin.

The Snake River originates on the Continental Divide, about 1/4 mile north of the south boundary of Yellowstone National Park and about 3.5 mi west of the Yellowstone River (UTM 12 564937E 4886960N; 44º 08' 06" N, 110º 11' 18" W), nearly the most northern point of Grand Teton National Park (Figure 3). The Snake River Headwaters also include Heart Lake, Shoshone Lake, and their associated tributaries in Yellowstone National Park. The Snake Headwaters Subbasin then extends southwest to Gem Lake Dam located below Idaho Falls, Idaho. It also includes the area that extends from Grey's Lake from the east flowing west through the Willow Creek drainage towards Idaho Falls (Figure 3).

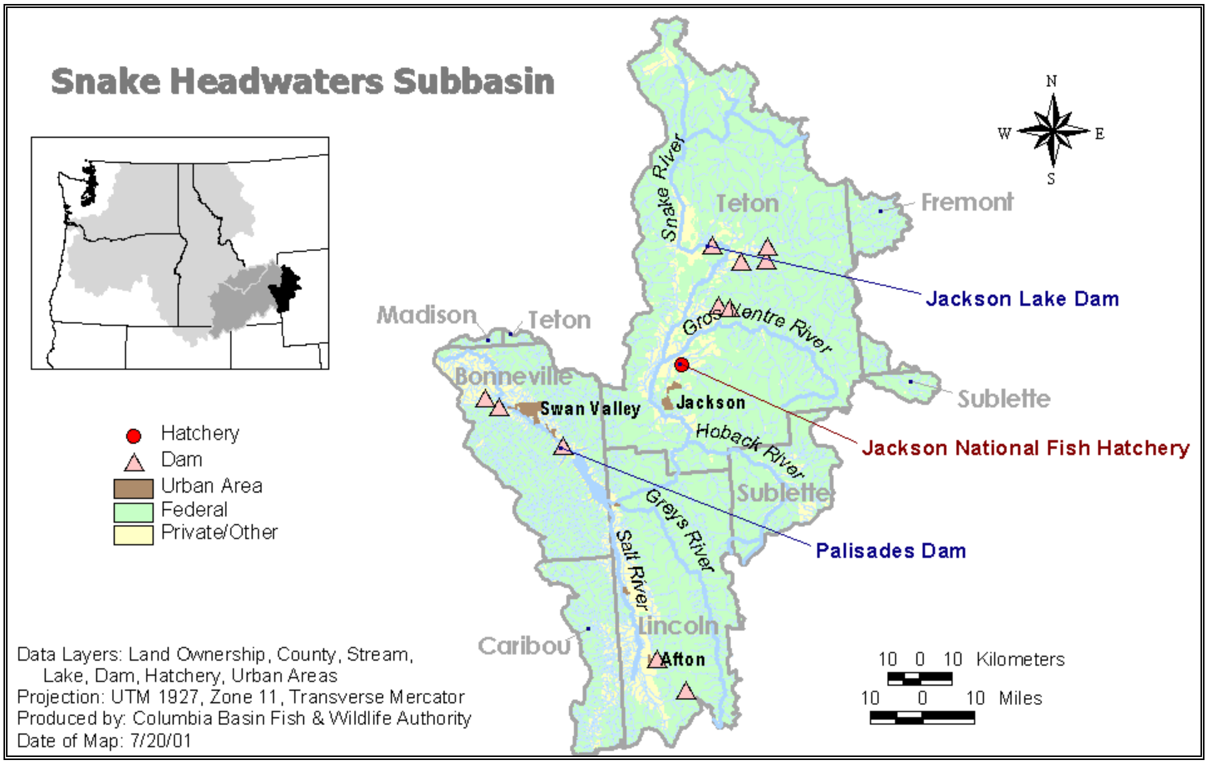


Figure 3. Snake Headwaters Subbasin originates in Grand Teton National Park, WY.

Drainage Area

The Snake Headwaters South Fork Snake River/Willow Creek Subbasin is located in southeastern Idaho and northwestern Wyoming. The subbasin occurs within portions of Northwest Basin and Range, Snake River Basalts, Yellowstone Highlands, and Overthrust Mountains ecoregional sections (McNab and Avers 1994). The 452,000-acre subbasin encompasses seven watersheds (Table 1): Greys-Hoback, Gros Ventre, Idaho Falls, Palisades, Salt, Snake Headwaters, and Willow Creek. The subbasin occurs within portions of Bingham, Bonneville, Caribou, Clark, Fremont, Jefferson, Madison, and Teton counties within Idaho, and Teton, Lincoln, Sublette and Fremont counties within Wyoming. Important cities and towns include: Ririe, Rigby, Idaho Falls, and Roberts in Idaho, and Jackson, Alpine, and Afton in Wyoming.

Table 1. Summary of watersheds present in Headwaters Subbasin.

HUC	Watershed	Size (acres)
17040101	Snake Headwaters	101,526
17040102	Gros Ventre	38,064
17040103	Greys-Hoback	93,828
17040104	Palisades	69,154

HUC	Watershed	Size (acres)
17040105	Salt	51,854
17040205	Willow	44,282
17040201	Idaho Falls	52,926

Note: Watersheds are listed by hydrologic unit code (HUC) with size in acres

Snake Headwaters

The Snake Headwaters subbasin is located in the northeastern most section of the Upper Snake Headwaters Subbasin in Wyoming. The subbasin contains a total area of 1,696.88

square miles and is where the Snake River originates. The Snake Headwaters subbasin is comprised of the drainage and tributaries of the Snake River that originate at the southern end of Yellowstone National Park and above Jackson Lake Reservoir at the northeast corner of the watershed. The Snake Headwaters include the small communities of Moran, Kelly, and Moose. It encompasses Grand Teton National Park, John D. Rockfeller Memorial Parkway, and abuts the Bridger-Teton National Forest and Gros Ventre Wilderness Area in Wyoming, and the Targhee National Forest to the west. The Snake Headwaters subbasin contains some of the most spectacular landscapes in the Rocky Mountain region with the Teton Range bordering the west side and Absoraka Range to the south. Elevations in the subbasin range from an estimated minimum of 5,900 to the Grand Teton Mountain with an elevation of 13,772 feet. Affected counties include Teton County, Park County, and Fremont County, and there are no metropolitan areas. The Snake Headwaters subbasin is designated as the United States Geological Survey (USGS) cataloging unit HUC number 17040101.

Greater Teton National Park Floodplain and Wetlands Management

Floodplain and wetlands management at Jackson Lake are mandated by Executive Orders 11988 for floodplains and 11990 for wetlands (both signed May 24, 1977), and Service floodplain management and wetland protection guidelines (45 F.R. 35916). These implement the Executive Order, which requires that no facilities or structures be located in 100 year floodplains or other hazard areas and that any development in known or designated wetlands be controlled.

Gros Ventre

The Gros Ventre subbasin is located in the mideastern section of the Upper Snake Snake Headwaters Subbasin in Wyoming. The subbasin contains a total area of 642.93 square miles. The subbasin is also comprised of the drainage and tributaries of the Snake River from Jackson Lake Reservoir and of the Gros Ventre River. It encompasses the Gros Ventre Wilderness Area and abuts the Bridger-Teton National Forest and Grand Teton National Park. The Gros Ventre subbasin contains some of the most spectacular landscapes in the Rocky Mountain region with a view of the Teton Range to the west. Elevations in the subbasin range from an estimated 6,000 feet at the valley floor to a height of 8,000 feet. Affected counties include Teton County, Sublette County, and Fremont County, and there are no metropolitan areas. The Gros Ventre subbasin is designated as the USGS cataloging unit HUC number 17040102.

Greys-Hoback

The Greys-Hoback subbasin is located in the southeastern section of the Upper Snake Snake Headwaters Subbasin in Wyoming. The subbasin contains a total area of 1,585.39 square miles. The Greys-Hoback subbasin is also comprised of the drainage and tributaries of the Snake River from Jackson Lake Reservoir and of the Hoback River that flows from the east and joins the Snake River at Hoback Junction, Wyoming, and of waters that originate in the Bridger-Teton National Forest. The Snake River then continues its journey south to Palisades Reservoir. Communities in the subbasin include the town of Jackson (formerly called Jackson Hole), Wilson, and Alpine, the junction of the Greys-Hoback subbasin and the Palisades subbasin. It includes the Jackson National Elk Refuge and some of the Bridger-Teton National Forest, and abuts the Gros Ventre Wilderness Area. It too contains some of the most spectacular landscapes in the Rocky Mountain region with a view of the Teton Range to the northwest and the Snake River canyon area from Hoback Junction to Palisades Reservoir. Elevations in the subbasin range from an estimated range of 6,000 feet at the valley floor to a height of 8,000 feet. Affected counties include Teton County, Sublette County, and Lincoln County, and there are no metropolitan areas. The Gros Ventre subbasin is designated as the USGS cataloging unit HUC number 17040103.

National Elk Refuge

The National Elk Refuge occupies about 24,700 acres at elevations between 6,200 and 7,200 feet in the mountain valley of western Wyoming known as Jackson Hole. The Jackson Hole valley is bordered by the Teton Mountain Range to the west. The Gros Ventre Range to the east and southeast, and the Snake River Range to the south and southwest. The town of Jackson borders the NER on the south, and the town of Kelly is situated near its northern boundary. Lands to the south and west of the Refuge are mostly privately owned. East of the National Elk Refuge are lands administered by Bridger-Teton National Forest including the nearby Gros Ventre Wilderness. To the north and northwest of the Refuge are lands within Grand Teton National Park.

Bridger-Teton National Forest

The Bridger-Teton National Forest represents an administrative combination of two National Forests, the Bridger and the Teton. Geographical features divide the Bridger National Forest into an eastern and western division. The eastern division is composed of the Wind River Mountains, which contain the Bridger Wilderness. Within the western division are the Greys River corridor and the surrounding mountain ranges, the Wyoming and Salt River Ranges. Established in 1911, the Bridger National Forest was named after famous mountain man and explorer Jim Bridger. The Teton National Forest, along Yellowstone National Park's southern boundary, surrounds Grand Teton National Park and Jackson Hole, on three sides. Teton National Forest was established in 1908, in part from the original National Forest reservation, the Yellowstone Park Timber Land Reserve.

Salt

The Salt subbasin is located in the southwestern section of the Upper Snake Snake Headwaters Subbasin in an area of Wyoming known as Star Valley, and in Idaho. The subbasin contains a total area of 925.84 square miles and is comprised of the drainage and tributaries of the Salt River that originate in the Bridger-Teton National Forest and eventually meander through Star Valley to join the Greys River near Alpine, WY. Its waters originate in the Bridger-Teton National Forest. The Snake River then continues its journey south to Palisades Reservoir. It includes the town of Thayne and Afton, WY. It includes some of the Bridger-Teton National Forest to the north and east, and some of the Caribou National Forest to the west. It too contains spectacular landscapes with a view of the Teton Range to the northwest and the Snake River canyon area from Hoback Junction to Palisades Reservoir. Elevations in the subbasin range from an estimated valley floor at 5,000 feet to a height exceeding 8,000 feet. Affected counties include Bear Lake County, Bonneville County, Caribou County, and Lincoln County, and there are no metropolitan areas. The Salt subbasin is designated as the USGS cataloging unit HUC number 17040105.

Palisades

The Palisades subbasin is located midway along the Idaho-Wyoming border. Approximately ten percent of the subbasin is in Wyoming. The subbasin contains a total area of 927.4 square miles, with 839.7 square miles in Idaho and 87.7 square miles in Wyoming. This area incorporates 1368 stream miles in Idaho and 110 stream miles in Wyoming. The Palisades subbasin is comprised of the drainage and tributaries of the South Fork Snake River from Palisades Reservoir at the southeast corner of the watershed, through the small communities of Irwin and Swan Valley, to the USGS Heise gaging station. The Palisades subbasin is bounded to the south by the Caribou Range, culminating with Caribou Mountain at 9,803 feet. The northern boundary extends to the Big Hole Mountains in the Snake River Range. The northeast boundary runs along the Teton County-Bonneville County border. Elevations in the subbasin range from a minimum of 5,276 feet in Swan Valley, to a maximum elevation of 10,026 feet at Mount Baird (USGS 1996). Affected counties include Bonneville County, Jefferson County, Madison County, Teton County (in Wyoming and Idaho), and Lincoln County, WY, and there are no metropolitan areas. The Palisades subbasin is designated as the USGS cataloging unit HUC number 17040104.

Willow

The Willow subbasin is located in the southwestern section of the Upper Snake Snake Headwaters Subbasin in southeastern Idaho. The Willow subbasin is in the Middle Rocky Mountain Province (USDA, 1984). In Idaho, this province extends from the Utah border to within a few miles of Montana, bordered on the east by Wyoming. The subbasin contains a total area of 651.45 square miles and is comprised of the drainage and tributaries some of which originate near Grays Lake National Wildlife Refuge in the Caribou National Forest and eventually meander through the Willow Creek drainage Ririe Reservoir. There are no towns but there are inhabited locations such as Bone and Wayan, Idaho. It includes some of the Carbou National Forest to the east. Elevations in the subbasin range from an estimated valley floor at 4,000 feet to a height exceeding 7,000 feet. Affected counties include Bingham County, Bonneville County, and Caribou County, and there are no metropolitan areas. The Willow subbasin is designated as the USGS cataloging unit HUC number 17040205.

Willow Creek Drainage

The 20 miles of Willow Creek below Ririe Dam is controlled for irrigation and flood control. This segment of Willow Creek is annually dewatered to keep ice buildup from causing floods near Idaho Falls. Some trout from irrigation ditches that flow into Willow Creek via the South Fork Snake River provide a seasonal fishery. The 95 miles of streams in the drainage of Willow Creek above Ririe Reservoir are mainly in narrow canyons and contain important wild cutthroat trout populations. Most tributaries in this area contain wild populations of cutthroat, brown and brook trout. The main management objective in this area is to restore native fluvial cutthroat trout populations. The Soil Conservation Service has identified the Willow Creek drainage as one of the most serious (ten worst) soil erosion areas in the United States. Bull Trout are not known to inhabit this area. (http://www.academic.uidaho.edu/fishwild/bt/btdist39.htm)

Major tributaries to Willow Creek are Grays Lake Outlet and Cranes, Meadow and Tex creeks. Since 1924, up to 20,000 acre-feet of water a year has been diverted from the

Willow Creek drainage to Blackfoot Reservoir through Clark's Cut Canal. The Corp of Engineers completed the construction of Ririe Dam, a rock-face, earth-filled structure, in 1976. The reservoir has a total capacity of 80,540 acre-feet and a surface area of 1,470 and is managed for priorities of flood control and irrigation water storage. The reservoir is drawn down to 35,000 acre-feet annually by November 1 to provide winter flow storage (flood control).

Idaho Falls

The Idaho Falls subbasin is located in the southwestern section of the Upper Snake Snake Headwaters Subbasin in southeastern Idaho. The subbasin contains a total area of 1,151.98 square miles. But the affected area, about one-fifth of the Idaho Falls Subbasin or 230.40 miles square, is inclusive within the Headwaters Subbasin following the Snake River from the Palisades Subbasin, nearly includes the town of Ririe, then extends south through Idaho Falls to just south of the Gem Lake Dam. The major town is Idaho Falls, considered a semi-metropolitan area. Elevations in the subbasin range from an estimated valley floor at 4,000 feet to a height exceeding 7,000 feet. Affected counties include Bingham County, Bonneville County, Clark County, Fremont County, Jefferson County, and Madison County. The Idaho Falls subbasin is designated as the USGS cataloging unit HUC number 17040201.

The following (Table 2) briefly describes each of the drainages within the Headwaters Subbasin.

Table 2 General Heawaters Subbasin Characteristics

Subbasin; Cataloging Unit	Codes	Rivers/ streams in watershed	Lakes in watershed	Total # Watershed Acres	Land Area Miles ^{2}; Perimeter	Habitat
Snake Headwaters 17040101	SHW	24	225	46494.3	1696.88 mi ^{2}; 241.19 mi	- Forest Riparian Habitat - Agricultural/Urban Riparian habitat
Gros Ventre 17040102	GVT	9	92	1790.2	642.93 mi ^{2}; 170.73 mi	- Forest Riparian Habitat - Agricultural/Urban Riparian habitat
Greys-Hoback 17040103	GHB	25	79	1151.6	1585.39 mi ^{2}; 256.36 mi	- Forest Riparian Habitat - Agricultural/Urban Riparian habitat
Salt 17040105	SLT	12	31	769.5	925.84 mi ^{2}; 161.36 mi	- Forest Riparian Habitat - Agricultural/Urban Riparian habitat
Palisades 17040104	PAL	15	12	15334.7	930.4 mi ^{2} 145.89 mi	- Forest Riparian Habitat - Agricultural/Urban Riparian habitat
Willow 17040205	WIL	12	0	0	651.45 mi ^{2} 148.1 mi	- Forest Riparian Habitat - Agricultural/Urban Riparian habitat
Idaho Falls 17040201	IF	5	0	0	1151.98 mi ^{2} 210.72 mi	- Forest Riparian Habitat - Agricultural/Urban Riparian habitat

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

Topography/ Geomorphology

Anticlinal and synclinal structures of the Headwaters Subbasin in combination with fault thrust zones give rise to an intricate system of linear valleys and ridges. The mountains are characterized by tight-to-open folded Paleozoic and Mesozoic sedimentary rocks (Ross and Savage 1967). Table 3 summarizes the percent occurrence of eighteen geologic mapping units in the watersheds of the Snake Headwaters South Fork Snake River/ Willow Creek Subbasin (adapted from Bond and Wood 1978; Jensen et al. 1997). The largest continual coverage of any one geological unit occurs in the Idaho Falls watershed where 72 percent of the land is Pleistocene to Pliocene basalts and associated tuffs and volcanic detritus.

Table 3. Geology of the Headwaters Subbasin (in percent occurence)

Geologic mapping unit	SHW	GVT	GHB	SLT	PAL	WIL	IF
Cretaceous metamorphic intrusive and granitic rock	0.7	0.9	0.8	0.1	0.0	0.6	
Eocene granite	1.6	0.1	0.5				
Eocene mixed silicic and basaltic ejecta, flows, and reworked debris	3.3		0.0		10.1	13.0	1.8
Mesozoic shale, siltstone, and limestone	2.5	11.2	20.4	28.1	12.7	8.3	0.4
Other minor rocks	24.0	6.6	16.1	9.0	12.8	1.7	0.0
Paleozoic and Mesozoic mixed sedimentary rocks	5.1	11.5	13.9	21.2	21.1	27.7	0.0
Paleozoic mixed sedimentary rocks		6.8	4.5	2.7	6.0	2.3	0.0
Pleistocene fluvial and unsorted glacial debris	11.2	14.0	6.6	0.4		0.2	0.0
Pleistocene silicic volcanic units	10.8						
Pleistocene to Pliocene basalts and associated tuffs and volcanic detritus	0.1	0.1			7.3	13.6	71.5
Pliocene stream and lake deposits	5.6	27.1	13.6	13.9	7.2	1.7	0.7
Pliocene volcanic units of air-fall or pyroclastic origin				0.9			
Precambrian gneiss, amphibolite and other metamorphosed igneous rocks	2.8		1.0				
Quaternary alluvial deposits	17.7	9.5	15.1	23.5	20.7	19.6	17.0
Quaternary colluvial deposits (landslides)	10.0	11.7	6.3	0.2	0.1		
Quaternary wind-blown deposits; loess						6.8	5.9
Quaternary wind-blown deposits; recent sand dunes							2.6
Water	3.8	0.3	0.1	0.0	2.1	4.5	

Adapted from Bond and Wood 1978; Jensen et al. 1997

There are 13 major geological formations in the Headwaters Subbasin (IDFG 2001; Figure 4). (Note: Geologic terms may not correlate exactly between Figure 4 and Table 3 due to different sources.)

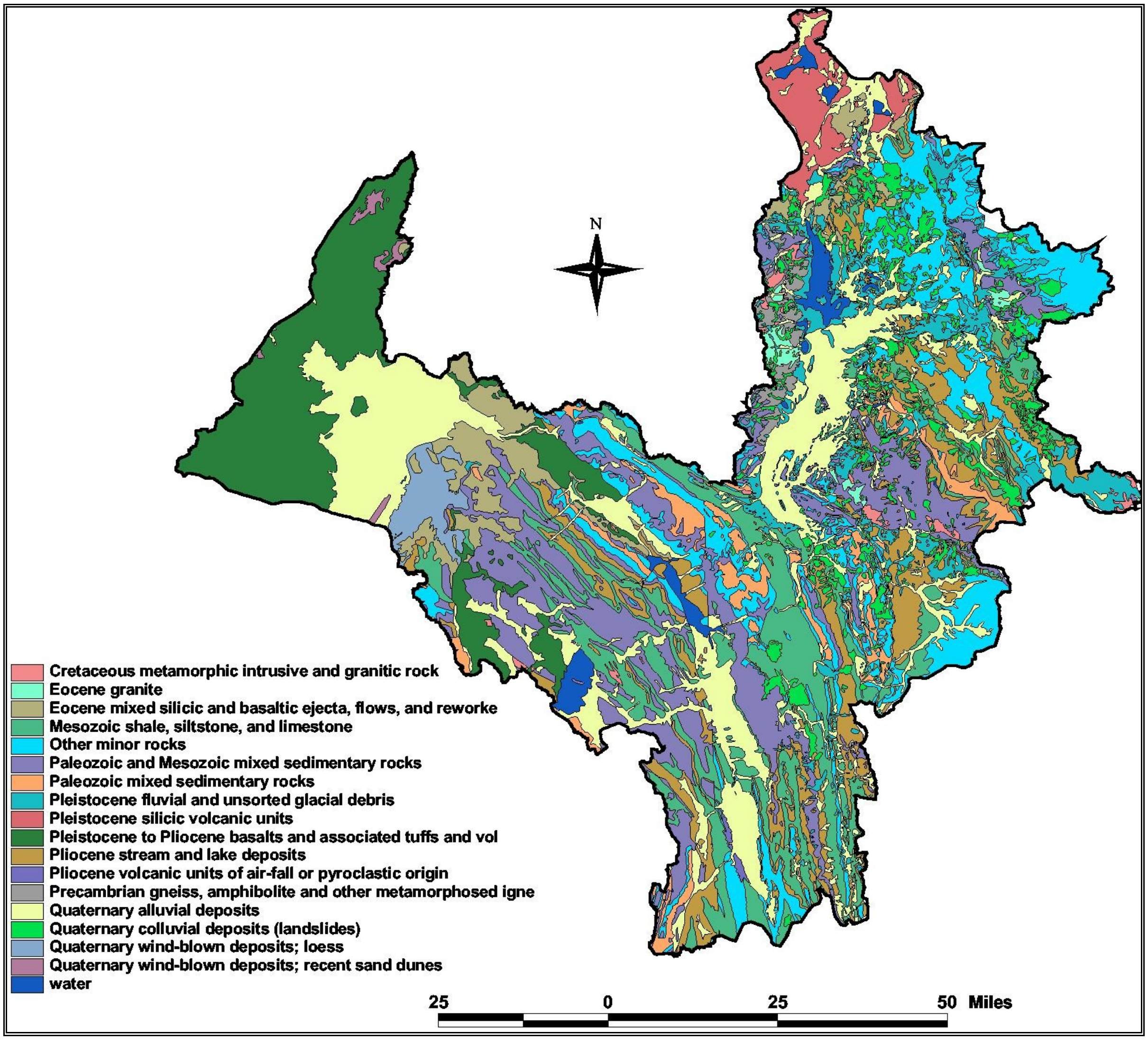


Figure 4. Geology of the Headwaters Subbasin.

Peaks within the Snake Headwaters watershed exceed 11,000 feet due to the faulting and tilting of the blocks resulting in a very steep escarpment along the east face of the Teton Range and a gentler slope of the west side. Deep, glacier-carved canyons cleave the mountains, and several canyons have large, morainal lakes at their mouths. Alpine lakes and tarns are numerous. The core of the Teton Range is metamorphic gneisses and schists and igneous rocks (granite and pegmatite.

The extent of mineral resources in Grand Teton National Park is poorly known. The two eastern most townships may have coal deposits of some value. Half of the Park may have oil and/or gas deposits. Other mineral possibilities include phosphate, bentonite, asbestos, gold, lead, and silver (Austin et al. 1976). The U.S. Soil Conservation Service has classified and mapped 44 soil series in Grand Teton National Park (Young 1982). A recent project to map and classify soils in John D. Rockfeller Parkway is nearing completion.

On the National Elk Refuge, over 20 different soil types are found within its boundaries (Young, 1982), while the U. S. Conservation Service has classified and mapped 44 soil series in Grand Teton National Park. Soils on the Refuge at the lower elevations are alluvial, generally sandy loam or loam, and are shallow and permeable. The soils at the higher elevations are also loamy but there are considerable areas of gravelly soils and cobblestone on the south slopes and ridges. The northern half of the Refuge consists of steep rolling hills. The southern half is glacial out slopes and ridges. The northern half of the refuge consists of steep rolling hills. The southern half is glacial out wash material, with one resistant formation (Miller Butte) rising approximately 500 feet above the valley floor.

Geological forces created a distinctive topographic trend along a northwest to southeast axis (USGS 1992), with mountain ranges to southwest and northeast of the South Fork Snake River and valley flats between the ranges. An overthrust belt that was active during formation of the Rocky Mountains pushed from the southwest through layers of sedimentary bedrock to form the Caribou Range. High angle block-faulting events cut into this overthrust belt to create typical Basin and Range topography. These characteristics place the Palisades subbasin in the Middle Rocky Mountains Physiographic Province with block-faulting influence from the Basin and Range Province to the south (Alt and Hyndman 1989).

Other parts of the geomorphology of the Palisades Watershed is composed of igneous rocks from volcanic flows (where rhyolite and rhyolitic tuff are the dominant igneous rocks associated with extrusive flows and dissected shields); overthrust structures of sandstone, shale, limestone and dolomite; glacial depositional/erosional cycles and deposits of alluvium at the base of block faults (Merigliano 1996); and hard Mesozoic sedimentary bedrock, mostly limestone.

The Ridgeline Mountains exhibit higher relief than those in the Caribou Range, rising 4000 to 6000 feet above the adjacent landscape. Even the foothills and lower mountains rise 500 to 4000 feet above the surrounding terrain. Evidence of repeated glacial episodes is shown in the drainages northeast of the South Fork. Drainage patterns are very complex throughout the Big Hole and Snake River Ranges due to the variable bedrock materials. Springs and creeks are common on the sedimentary substrates and rare on the igneous substrates (TNF 1997a).

The valley flats between the ranges consist predominately of Tertiary valley-fill sediments in Swan Valley and Snake River plain basalt flows downstream through the Antelope Flat region. Swan Valley is a high, narrow valley between steep mountain ranges and was formed by a large fault block with an east-west trending fault line that is parallel to the valley. Volcanic rocks cover the sides of the valley, while gravelly glacial outwash covers the valley floor. Windblown loess soils have been deposited throughout Swan Valley, especially on the north side (SCS 1994). Downstream from Swan Valley, the course of the South Fork narrows into the steep cliffs of Conant Valley where the south bank shows distinctively warped exposed sedimentary rock. Further downstream, Antelope Flat is a broad, flat floodplain where the river takes a more meandering pattern, continuing to deposit glacial sediments. Interbedded with unconsolidated sediments, the basalt flows generally covering this region are broken and full of cavities, making the rock very permeable to water (TNF 1997b). Although more angular gravel is found in the tributaries, the type of soils that are mostly transported as sediments in the South Fork are rounded cobble from glacial deposits (Merigliano 1996).

Soils are dominated by very deep, well-drained soils with rapid permeability below the surface. Most of the soils are derived from either coarse gravel-cobble glacial outwash or windblown loess deposits. From the small community of Irwin through Swan Valley and all along the South Fork floodplain, the soil types belong in the "Hobacker-Badgerton Variant". These very deep soils exist on floodplains from nearly level to moderately steep slopes from 5,000 to 5,500 feet in elevation. The Hobacker soils comprise the majority of this soil series and have a surface layer of gravelly loam and very gravelly loam, with extremely gravelly sandy loam found at a depth of 30 inches. The loamy sand of Badgerton soils are also common in this complex. Irrigated crops are grown on these floodplain soils. Native vegetation typically includes various sagebrush (*Artemisia* spp.) or antelope bitterbrush (*Purshia tridentata*) communities (SCS 1981).

The "Tetonia-Rin-Ririe" soil series is found in higher elevations, from 5,200 to 7,000 feet, in the drainages of Antelope Creek, Pine Creek and Rainey Creek. Tetonia-Rin-Ririe soils are very deep silt loams and occur on level to very steep slopes. They are well-drained soils found on loess foothills, plateaus and mountainsides. Non-irrigated crops are most productive in these soils, and irrigated crops are common. Depending upon slope, these soils are highly erodible. Native vegetation includes sagebrush communities interspersed with grasses (SCS 1981).

Soils in the Caribou Range and Snake River Range are sloping to very steep, deep and well-drained soils with frequent rock outcropping, in elevations from 5,500 to 9,900 feet. The rangelands and forestlands occurring on these soils support livestock grazing as well as wildlife habitat. Native vegetation ranges from sagebrush community types to Douglas-fir (*Pseudotsuga menziesii)*, Englemann's spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*) and quaking aspen (*Populus tremuloides*) forests (SCS 1981).

Palisades Reservoir covers about 16,000 acres on the floor of the Grand Valley, the northern portion of Lower Star Valley. The floor of the reservoir is a relatively flat plain underlain by a veneer of silt and fine sand and layers of sands and gravels. The total thickness of the overburden throughout the valley ranges from 5 to about 60 feet. The sand and gravel portion of the overburden is quite pervious. The overburden along the valley walls consists mostly of talus, which has accumulated along the base of the steeper slopes, and of outwash deposits from the side canyons. The talus deposits are accumulated rock debris and clayey silt soil, which appears to be semimpervious materials. The overburden on the main valley floor is underlain by a series of highly compact, uncemented, clays, silts sands and gravels. Surface exposures are found only at a few cuts along the riverbanks. In general the beds are rather lenticular; their strike is parallel with the north-southwest trend of the valley and very compressed. The left wall is underlain by steeply inclined, consolidated sediments which are much older than the clay-silt beds. The right wall of the valley rises as a very steep slope from the dam upstream for about 500 feet, then as a cliff for several hundred feet to the rim of the valley.

Ririe Reservoir is located in the Willow Creek Drainage on the western flank of the Caribou Range of the Middle Rocky Mountains. The stream flows from the southeast to the northwest and enters the adjoining Snake River Plain about three miles below Ririe Dam. The upper watershed is an area underlain by Paleozoic and Mesozoic age rocks, mainly of sedimentary origin. The lower watershed near the damsite is an erosion-dissected plateau surface, which is slightly tilted toward the northeast. The plateau into which Willow Creek is entrenched is comprised of Pleistocene volcanic flows and intercalated sediments which, in turn rest with angular unconformity on the regional widespread Salt Lake Formation. This formation, identified locally as "basalt sediments", is a Pliocene age unit of continental origin with highly variable lithology. The surface of the volcanic rocks is often overlain by a variable thickness of unconsolidated, windblown silt deposits. At the damsite Willow Creek has entrenched itself 250 feet below the surrounding plateau surface. The floor of the river valley under normal conditions is about 550 feet wide and nearly level at elevation 4,960 feet, with the meandering stream channel incised about 5 to 10 feet into alluvial deposits. The valley alluvium is about 70 to 90 feet deep and is underlain by the canyon wall basalt sequence, except where erosion and faulting have exposed the underlying basalt sediment formation.

Climate

The Snake Headwaters Subbasin occurs largely within the Middle Rocky Mountain Province. The climate is influenced by interactions between prevailing southwesterly winds and the typically north-south orientation of mountain ranges (McNab and Avers 1994). Pacific maritime-influenced climatic conditions prevail in high elevation regions of the Caribou, Wyoming, Gros Ventre, and Wind River ranges of the Willow Creek, Salt, Greys-Hoback, Gros Ventre, and Snake Headwaters watersheds. In these regions of the subbasin precipitation occurs primarily as snow during winter; summers are relatively short, cool, and dry. Continental climatic conditions, in contrast, are prevalent on low elevation broad valleys and plains of the subbasin. Precipitation is relatively evenly distributed between the cold winters and warm summers. Continental climatic conditions are particularly pronounced within the Idaho Falls, Palisades, Salt, and Willow Creek watersheds. Coarse pattern representation of the distribution of climatic regimes is summarized by watershed in Table 4 and Figure 5 using the Koppen climate classification system (Godfrey and Molnau 1999).

Table 4. Climatic regimes of the Snake Headwaters Subbasin

Koppen Class	Description	SHW	GVT	GHB	SAL	PAL	WIL	IF
BSk	Very dry Continental climate; most precipitation occurs in summer							0.3
Dfb	Warm summers, cold winters; precipitation is relatively evenly distributed between winter and summer	1.0	2.1	19.2	70.2	88.5	84.6	99.7
Dfc	Warm summers, cold winters; precipitation is relatively evenly distributed between winter and summer; summers are relatively short	73.2	46.1	48.8	17.2	8.7		
Dsb	Warm summers, cold winters; extreme differences occur between summer versus winter precipitation (summers are much drier); summers are relatively warm			0.8	6.2	1.7	15.4	
Dsc	Warm summers, cold winters; extreme differences occur between summer versus winter precipitation (summers are much drier); summers are relatively short and cool	12.4	26.4	25.8	6.4	1.0		
H	Due to high elevation the mean temperature of the warmest month is less than 50 F	13.4	25.5	5.4				

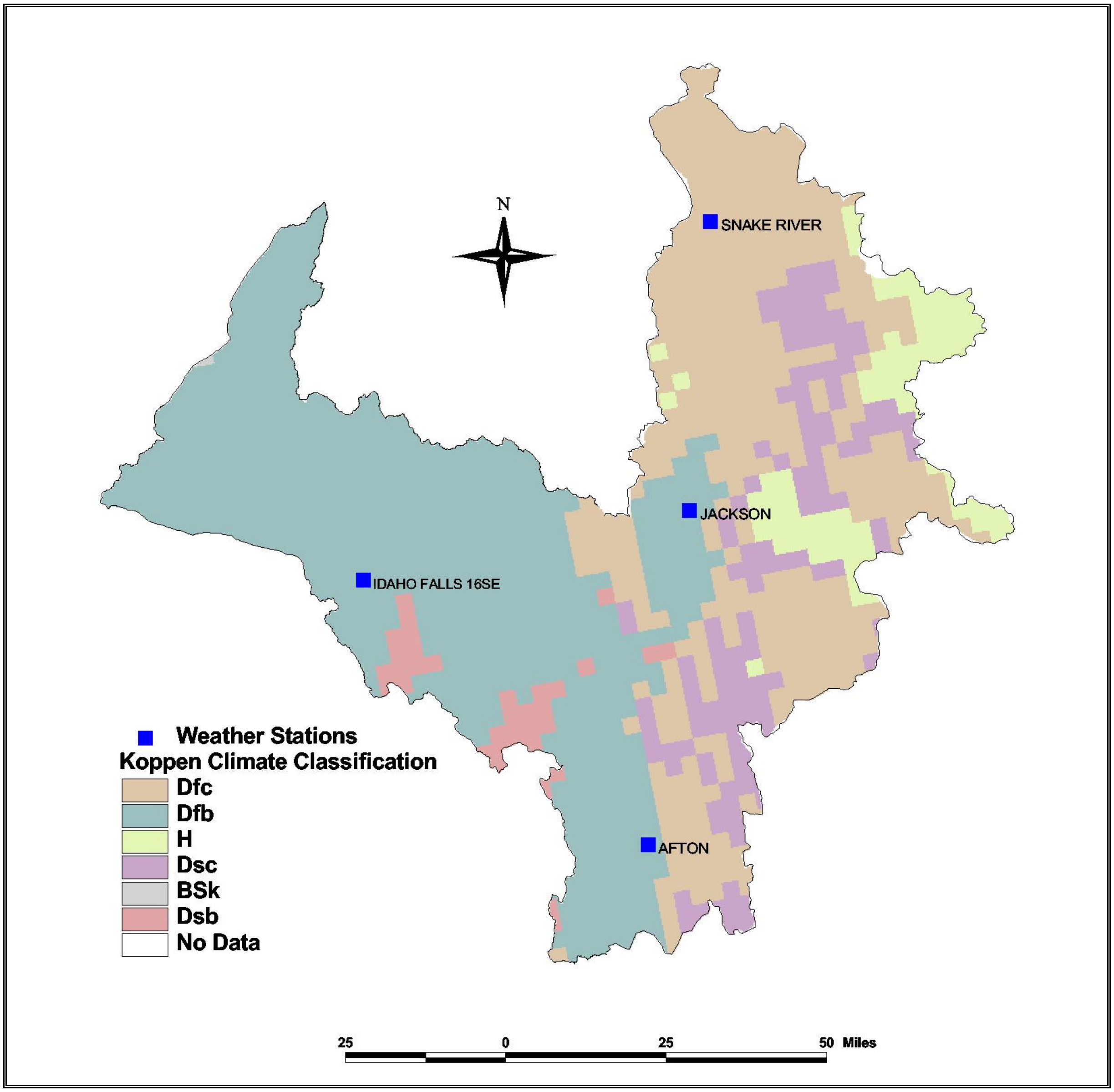


Figure 5. Koppen Climate Classification throughout the Headwaters Subbasin.

The climate of the upper Snake River basin above Palisades Dam is very much dependent upon topography. The region is mountainous for the most part except for the valley of the Salt River called Star Valley and Jackson Hole. The entire basin is above 6,000 feet except for a small part of the lower Star Valley and immediately around Palisades Reservoir. Because of this scheme, the Palisades Subbasin experiences long, cold winters and pleasantly mild summers. Freezing temperature has occurred in all months of the year and most areas have a freeze free season of less that 30 days duration. Typical summer (July and August) afternoon temperatures vary from the middle 70's to the lower 80's across the basin. At night, temperatures are typically in the 30's and low 40's. Afternoon temperatures exceed 90 degrees on the average 1 to 5 days and nighttime temperatures have dropped into the teens and low 20's at all valley stations during July and August. Average daily temperatures begin to fall rather rapidly by mid-September. Typical afternoon temperatures are in the 50's in October falling to the upper 20's by mid by December. At night, temperatures average between 20 and 25 in October falling to near zero by December. Every climatological station in the basin has been recorded below zero temperatures in October, below -30 degrees Fahrenheit in November, and near or below -50 degrees Fahrenheit in December. Some of the lowest temperatures observed in the in the United States have been recorded in this region. The temperature at Moran, in Jackson Hole, reach -63 degrees Fahrenheit on February 9, 1933, the lowest temperature ever recorded in months of February, March, July, September, October, and December were recorded in or near the basin. Below zero temperatures have been recorded as late as May in many portions of the basin.

Precipitation varies widely depending on elevation. From Palisades Dam upstream to both Afton and the Star Valley and Jackson in Jackson Hole, annual amounts are between 15 and 20 inches. Most precipitation in valleys occurs as snow from November through March with some snowfalls occurring as early as August or as late as June. In the high country annual precipitation varies from about 20 inches on lower slopes to over 70 inches on the Pitchstone Plateau in Yellowstone Nation Park and other mountain areas over 9,000 feet. Snow can occur anytime throughout the year, although the period of significant snow accumulation extends from late October through April. Annual snowfall can vary from about 55 inches in the vicinity of Palisades Dam, 80 inches at Afton and Jackson, to about 120 inches at Moran. Above Jackson Lake, snowfall increases significantly with increasing elevation, especially in the northern part of the basin. More than 500 inches of snow falls annually over the Pitchstone Plateau in Yellowstone Park, and in mountains north and east of Jackson Lake. Lower elevation mountains can receive between 200 and 400 inches per year. The greatest flood potential is when heavy spring rains occur during the snowmelt season from late May through July.

Precipitation during the warm season falls mostly from showers and thunderstorms. Thunderstorms are frequent from June through August, occurring on about half the afternoons on the average. Precipitation amounts from individual storms are relatively small, the greatest daily precipitations recorded during the summer at any of the stations in the basin was 2.56 inches at Snake River Range Station on July 24, 1913.

Hydrology

There are nine Bureau of Reclamation gaging stations in the Headwaters Subbasin (including Willow Creek), starting with the Flagg Ranch above Jackson Lake and ending near Heise, Id (Figure 6). Figure 7, Figure 8, Figure 9, Figure 10, Figure 11, Figure 12, Figure 13, Figure 14, and Figure 15 illustrate, in sequence, the current year (2001), previous year (2000) and the average streamflow at each BOR gaging station.

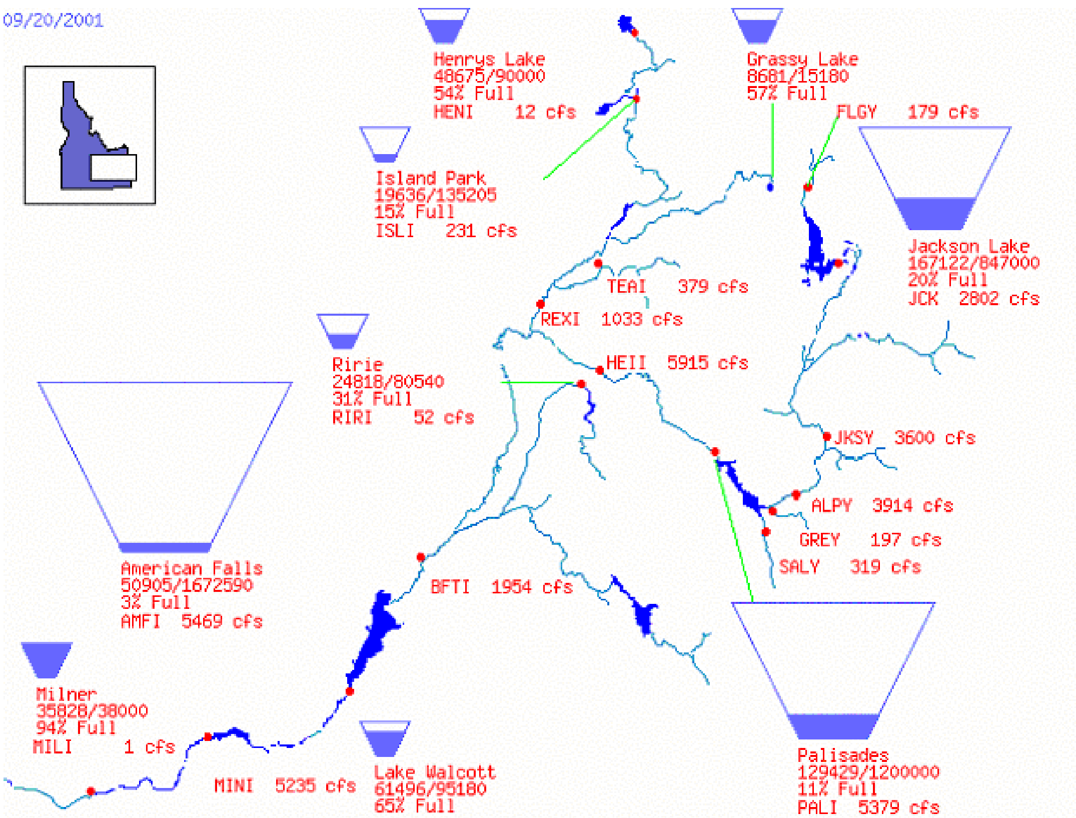


Figure 6. Dams and BOR gaging stations in the Upper Snake River Basin (Idaho and Wyoming) as of 9/20/2001.

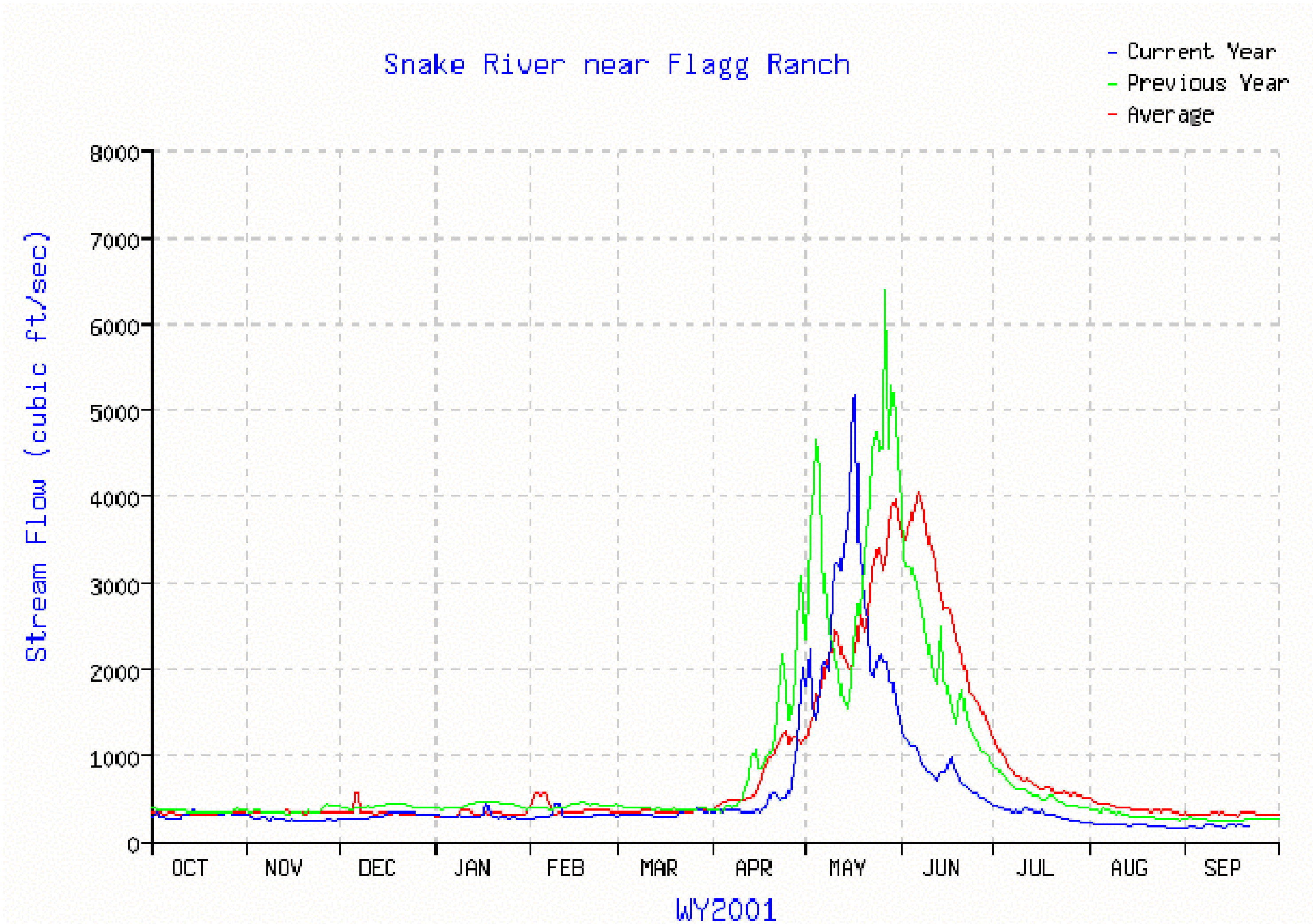


Figure 7. Current year (2001), previous year (2000) and average monthly streamflow at the BOR Flagg Ranch Gage Station above Jackson Reservoir.

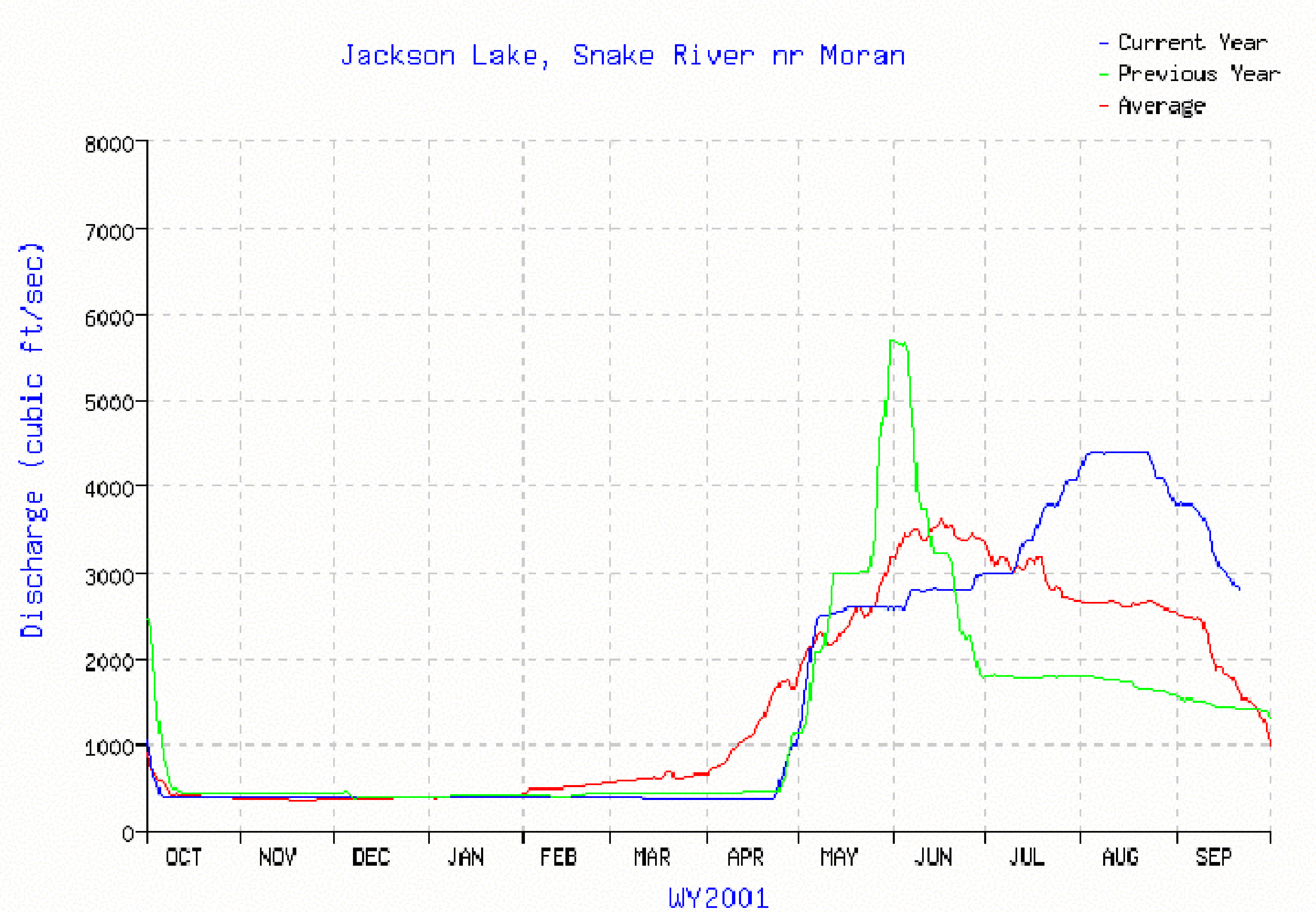


Figure 8. Current year (2001), previous year (2000) and average monthly streamflow at the BOR Snake River Gage Station below Jackson Lake near Moran Junction, WY.

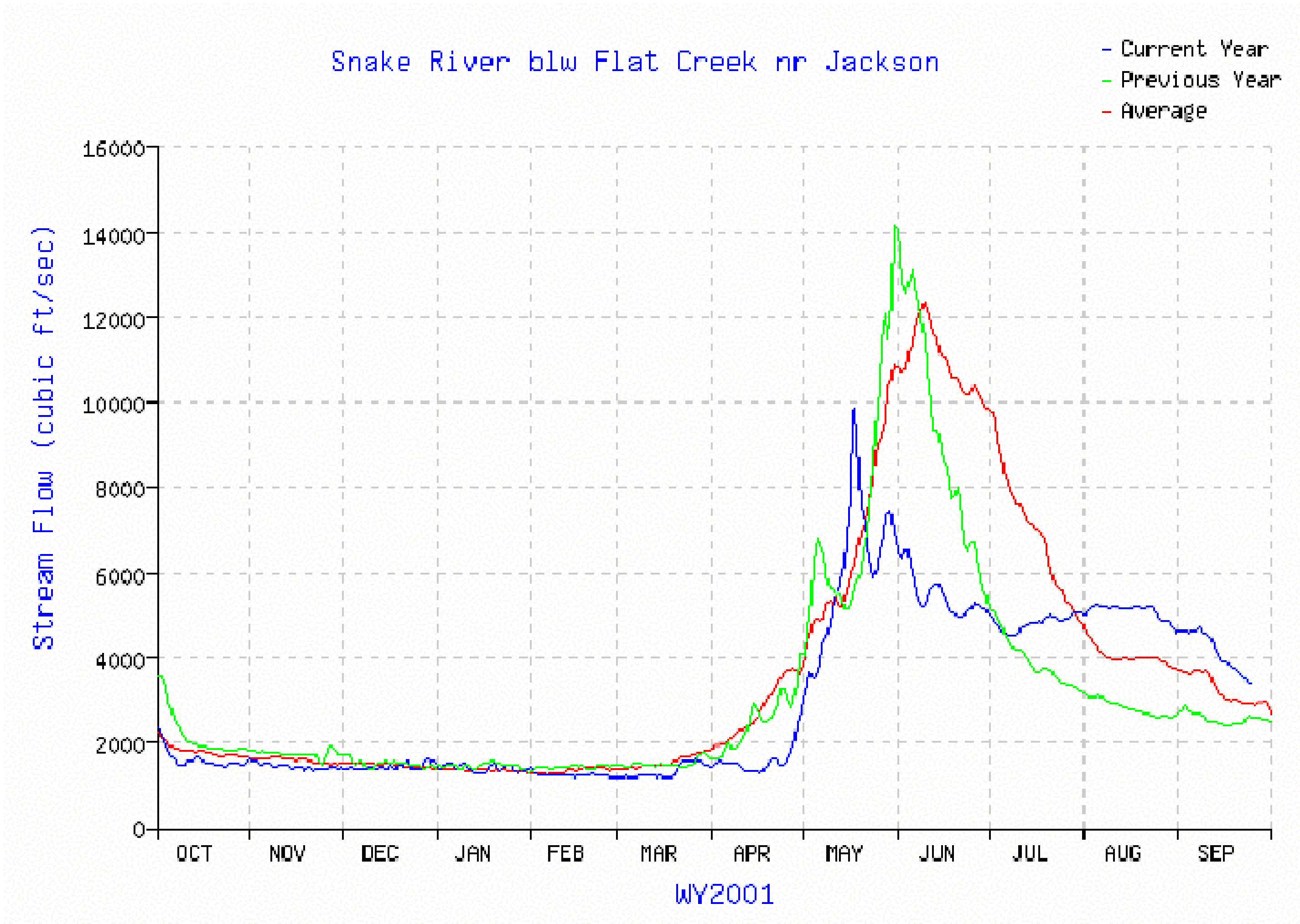


Figure 9. Current year (2001), previous year (2000) and average monthly streamflow at the BOR Snake River Gage Station below the confluence of Flat Creek near Jackson, WY.

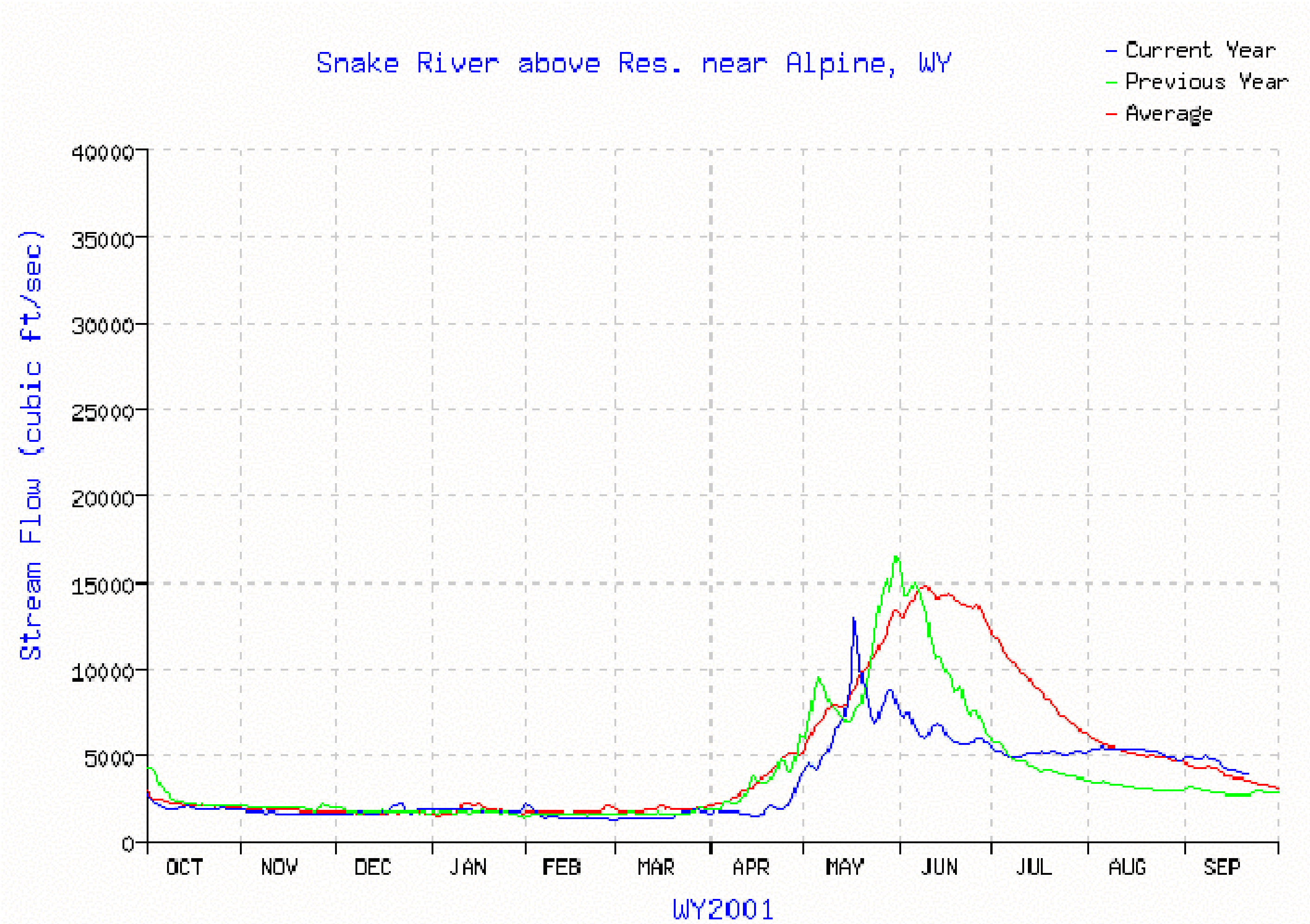


Figure 10. Current year (2001), previous year (2000) and average monthly streamflow at the BOR Snake River Gage Station above the Palisades Reservoir near Alpine, WY.

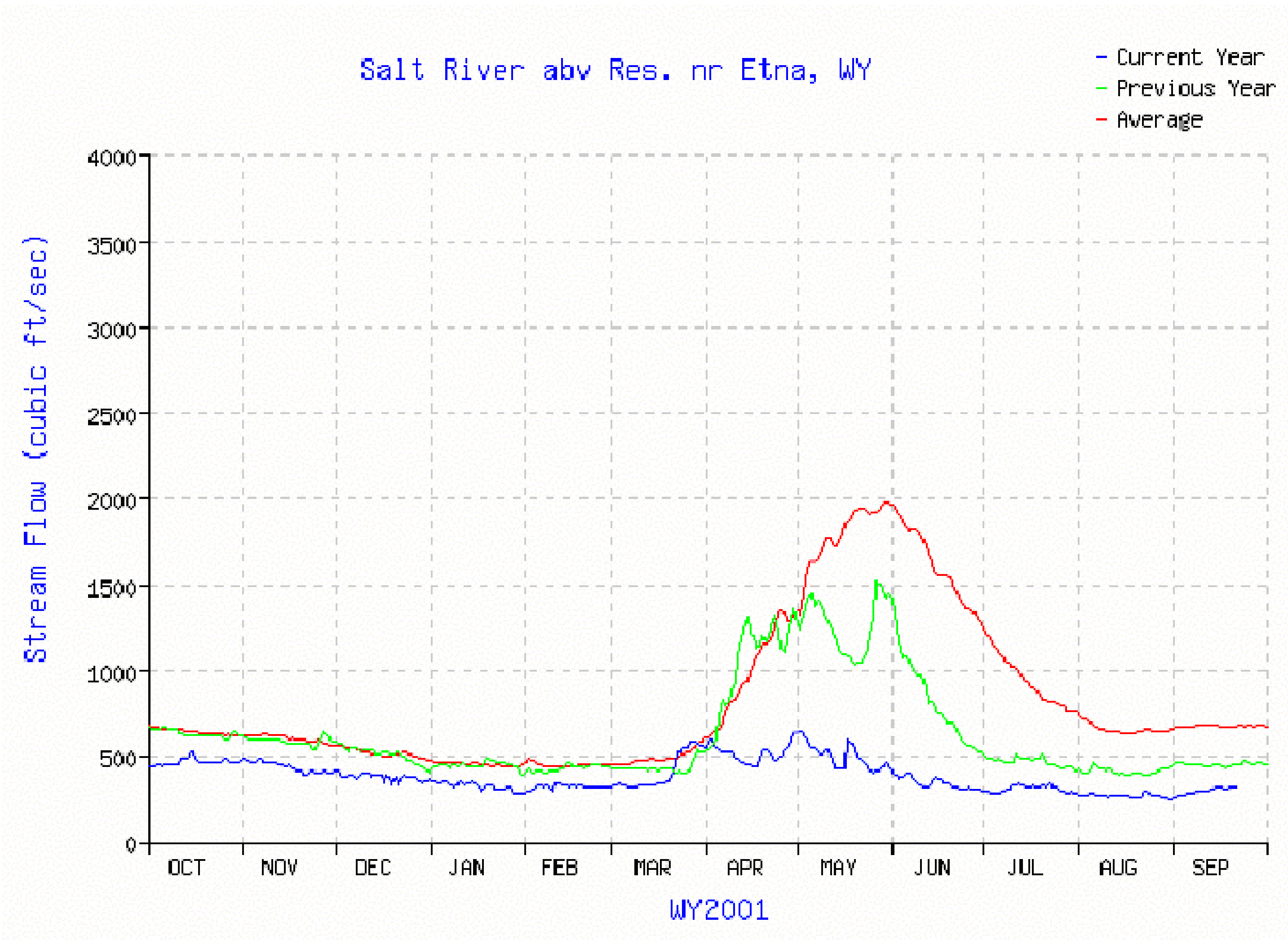


Figure 11. Current year (2001), previous year (2000) and average streamflow at the BOR Gage Station in the Salt River near Etna, WY.

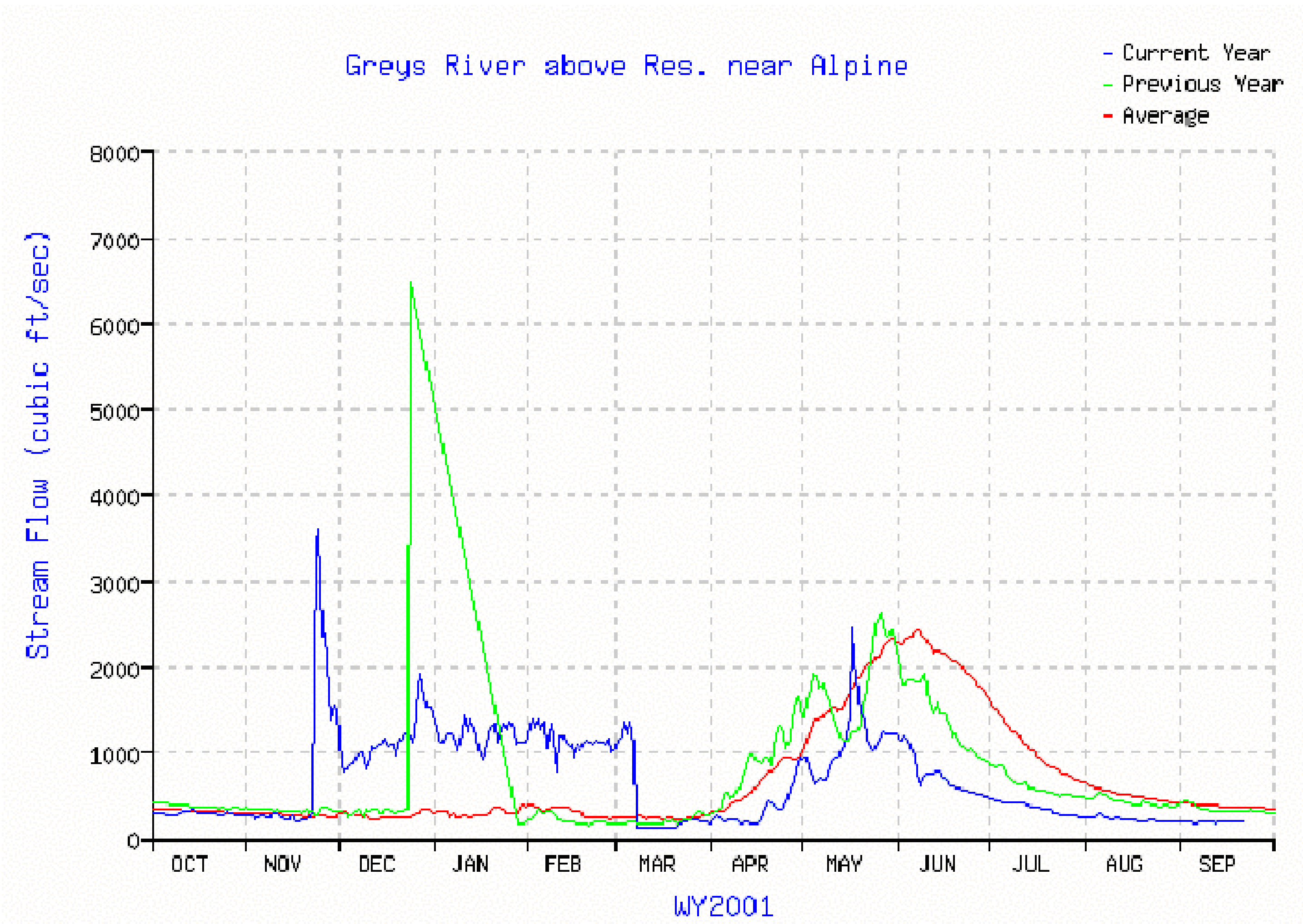


Figure 12. Current year (2001), previous year (2000), and average monthly streamflow at the BOR Gage Station in the Greys River above Palisades Reservoir near Alpine, WY.

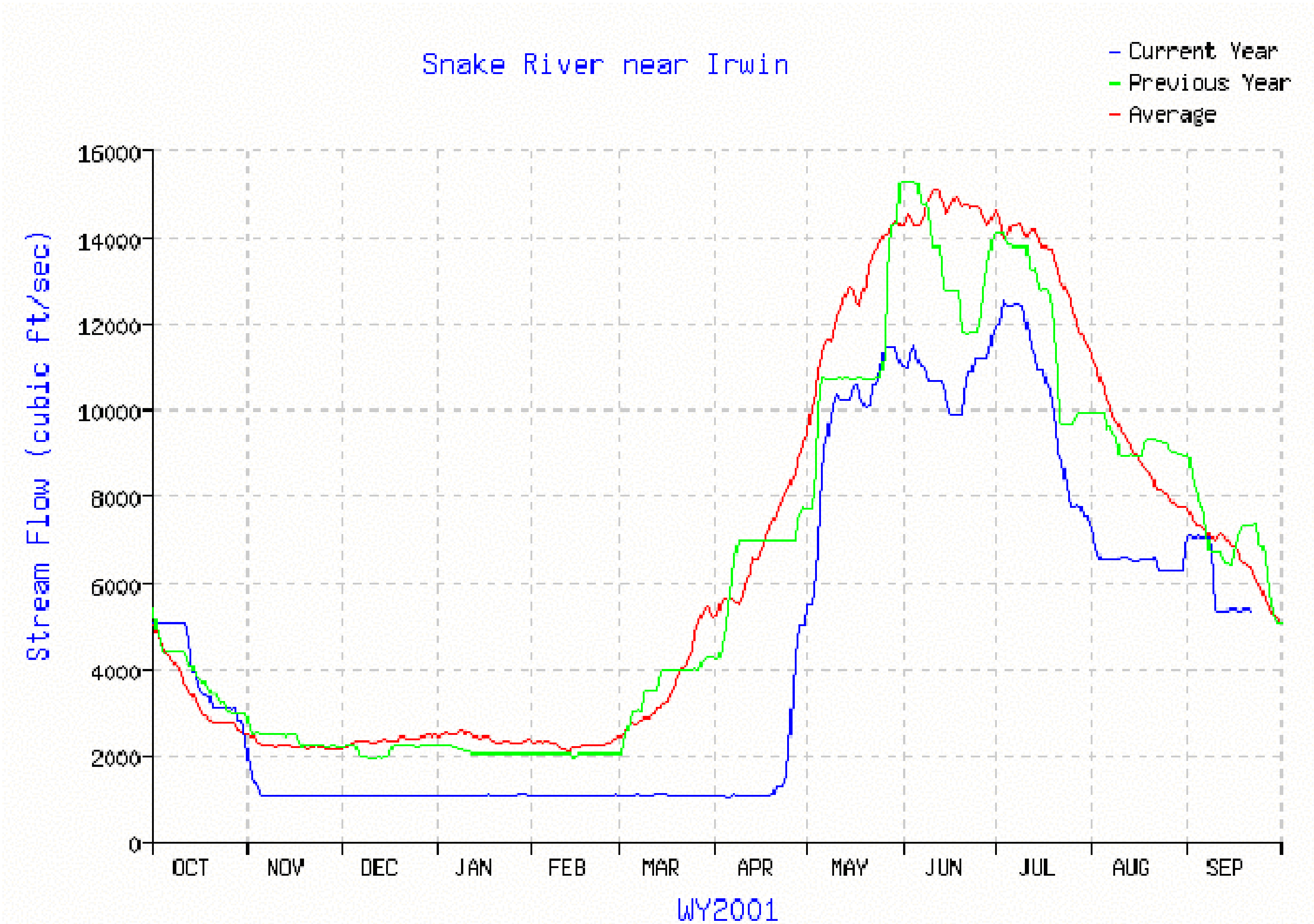


Figure 13. Current year (2001), previous year (2000) and average monthly streamflow at the BOR South Fork Gage Station near Irwin, ID, below Palisades Reservoir.

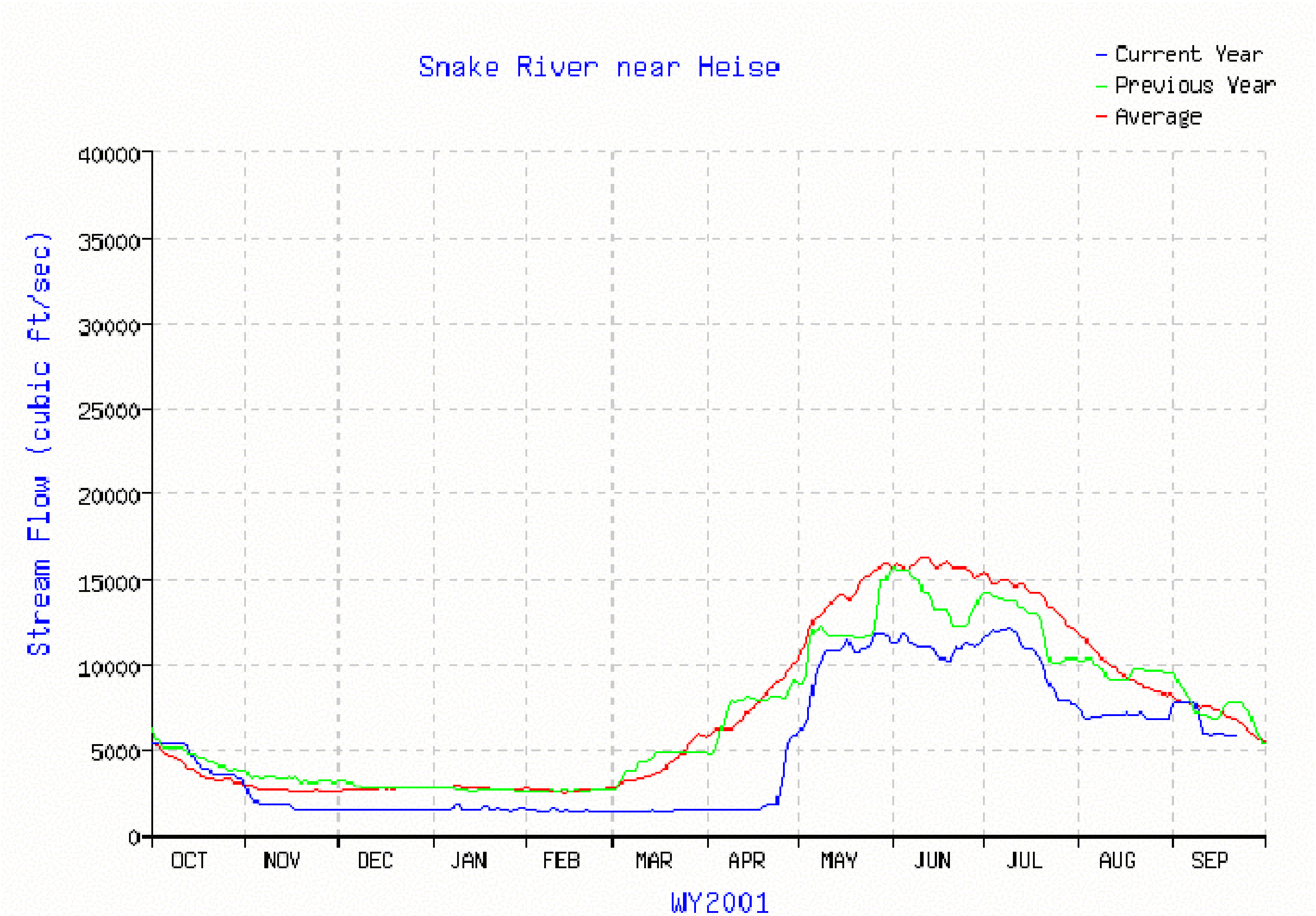


Figure 14. Current year (2001), previous year (2000), and average monthly streamflow at the BOR South Fork Gage Station near Heise, ID, below Palisades Reservoir.

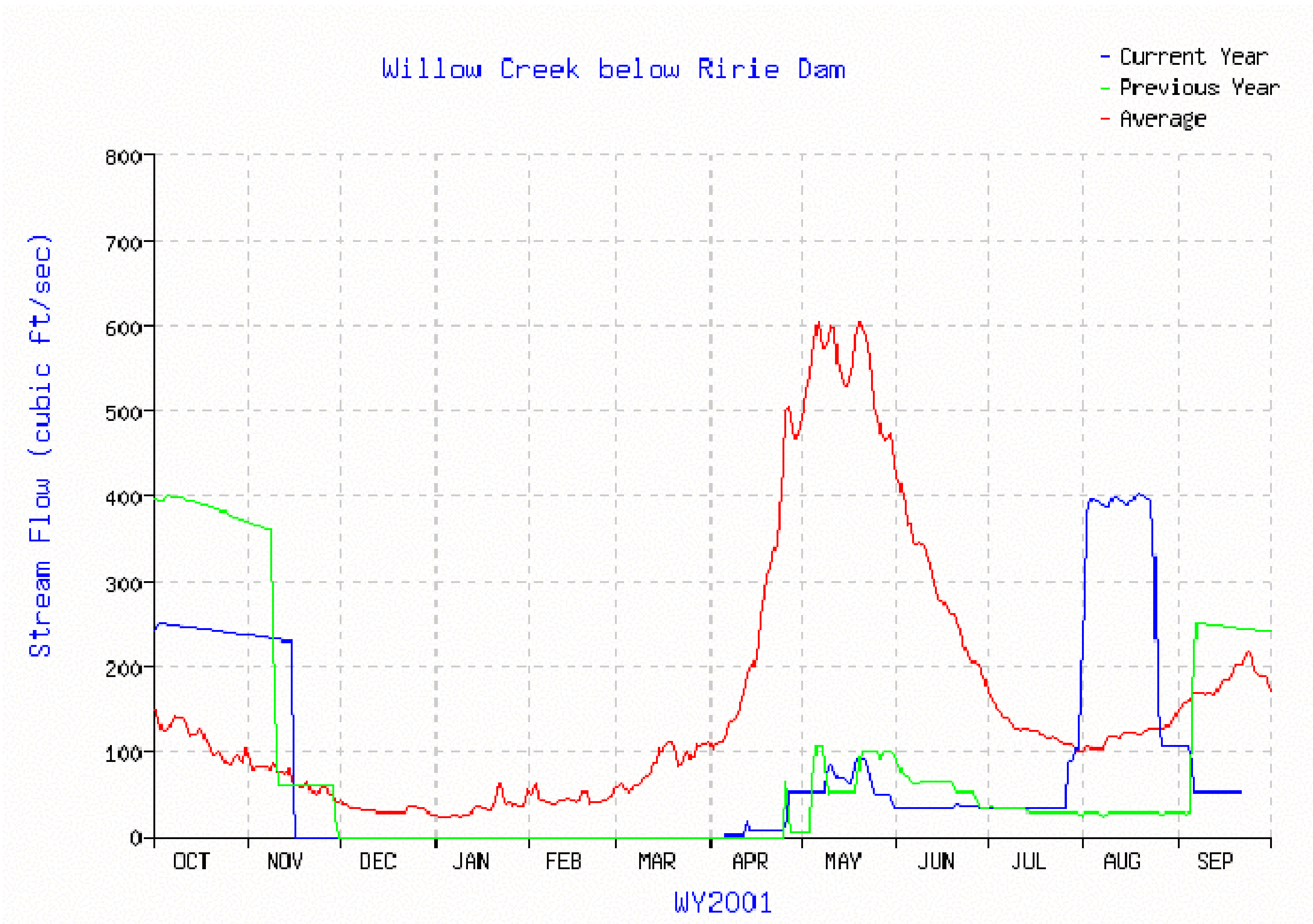


Figure 15. Current year (2001), previous year (2000), and average monthly streamflow at the BOR Gage Station in Willow Creek below Ririe Reservoir.

Snake Headwaters

Grand Teton National Park

Approximately 10% (31,000 acres) of the Park is covered by surface water, most of which is in six piedmont lakes along the eastern front of the Teton Range, with Jackson Lake being the largest (25,540 acres at full pool). About 100 alpine lakes (varying from 1 to 60 acres) are within the Teton Range, mostly above 9,000 feet elevation. Seven streams originating in the Teton Range drain eastward into Jackson Lake, six others drain into Cottonwood Creek and the Snake River near Moose, and three drain the southern portion of the Teton Range into Lake and Fish Creeks, which flow into the Snake River south of the Park. Eight major streams drain highlands in the Bridger-Teton National Forest north and east of the Park and flow into Jackson Lake or the Snake River within the Park. Approximately 75 pothole ponds of less than 0.5 to more than 35 acres occur in the glacial drift area south and east of Jackson Lake. Two large lakes (Two Ocean and Emma Matilda) in the northeast portion of the Park were not glaciated during the last advance of ice, and the origin of their basins is not known.

All surface and ground water in the Park drains into the Snake River, which originates in highlands of the Teton Wilderness Area, flows north and west through part of Yellowstone National Park, south through the John D. Rockefeller, Jr. Memorial Parkway and into Jackson Lake in the Park. From Jackson Lake, the Snake River flows east and then south for about 25 miles before crossing the Park's south boundary.

Much of the eastern and central portions of the Park (particularly areas covered by glacial outwash) also have extensive ground water resources (McGreevy and Gordon 1964; Cox 1974). Water tables vary from near the surface on floodplains to 30 to 60 feet below the surface on outwash flats and deeper on most upland areas. Flow is toward the Snake River, and many springs emerge along the Snake River floodplain south of the Buffalo Fork confluence. Numerous springs also emerge from limestone areas in the northwest and southwest portions of the Park. Other springs are along the Park's east boundary, including several thermal springs near Kelly and East Gros Ventre Butte. Another series of thermal springs are on the west side of Jackson Lake and may be associated with the Teton fault.

Approximately 1.98 million acre feet of water (average daily flow = 2,740 cubic feet/second (cfs) flows out of the Park annually by way of the Snake River. Annual flow of the Gros Ventre River is about 345,000 acre feet (average daily flow = 475 cfs).

Stream flow is measured at three stations within the Park: the Snake River below the Jackson Lake Dam, Pacific Creek, and Buffalo Fork. The Pacific Creek and Buffalo Fork stations are under special use permit (U.S. Geological Survey). The Snake River station is on Bureau of Reclamation withdrawn lands. Occasional stream flow measurements have been made for other streams in the Park, but systematically only for 15 years on the Gros Ventre River. Stream flow data are recorded in U.S. Geological Survey annual reports of water resources data.

Gros Ventre Subbasin

National Elk Refuge

Riverine Resources. Naturally occurring surface hydrologic features found on or influencing the Refuge include the Gros Ventre River, Flat Creek, Cache Creek, Nowlin Creek, and several other small creeks and springs. There are two major streams flowing through the refuge. The Gros Ventre River forms much of the northern boundary and Flat Creek, flowing east to west, nearly bisects the refuge. As Flat Creek approaches the western boundary, it turns south and leaves the refuge in the southwest corner.

Wetlands. The Refuge contains approximately 1,641 acres of wetlands consisting primarily of palustrine emergent and, to a lesser degree, scrub-shrub and aquatic bed wetlands. NER wetlands are some of the most diverse and important in the valley due to their multi-functional character, visual qualities, and importance to a wide variety of wildlife, especially resident and migratory birds. The majority of NER wetlands are located within the Nowlin Management Unit, which contains approximately 1,300 acres of the emergent variety. The remaining 300 acres can be found scattered throughout the Refuge, often in the form of linear palustrine emergent or scrub-shrub wetlands along the banks of watercourses, or in the form of unconsolidated bottom wetlands associated with seasonal watercourses.

Palisades Subbasin

The primary drainage for streams and groundwater in the Palisades subbasin is the South Fork Snake River. The US Bureau of Land Management (BLM) and Targhee National Forest (TNF) describe three general sections that characterize the stream corridor of the South Fork in this watershed (BLM and TNF 1991). From Palisades Dam downstream to Squaw Creek, the river follows a single channel through a narrow mountain valley cut into surrounding terraces and rising steeply with an abrupt transition to the uplands. Downstream from Squaw Creek, the river begins showing complex floodplain features with side channels and islands, but the river bottom is narrow, flowing through a rugged canyon. No road or foot traffic is possible along this stretch. The final stretch of the South Fork in this subbasin flows through a narrow canyon, but the river has several large river bars and numerous islands (BLM and TNF 1991).

Management of Palisades Reservoir currently regulates the water level and volume of the South Fork Snake River. Building of Palisades Dam was authorized primarily to store irrigation water, and the reservoir currently maintains an active storage capacity of 1,200,000 acre-feet. Upon completion of the dam in 1956, the upper portion of Swan Valley was inundated and the flow rate of the river has been directed by irrigation needs since reservoir management began in 1957. Palisades Reservoir is also managed for flood control, power generation, recreation and wildlife conservation. Water supply and demand is affected not only by weather, but also by storage holdover and water rights, so analysis of average annual streamflow will not indicate natural hydrological trends for the South Fork (BLM and TNF 1990).

Tributary flows are not regulated. The mountainous character of most of the drainage contributes to the natural stream discharge. The runoff pattern is dominated by snowmelt, which contributes to daily as well as seasonal variations in stream flow measurements. Flows are usually highest during spring runoff. Occasional summer thunderstorms sometimes increase tributary stream flow, but generally the lowest flows are in summer, fall, and winter (Drewes 1991).

Composite hydrographs of mean daily discharge of the South Fork at the Heise gaging station in Merigliano (1996) compare pre-Palisades Dam years to post-dam years to demonstrate altered flow patterns. After the dam began controlling water discharge in 1957, three significant flow alteration trends appear on the comparative hydrographs. First, comparatively more water is released earlier in the spring prior to snowmelt runoff in post-dam years. Throughout the late spring and summer months, larger peak flows that could lead to flooding are reduced. Finally, flows lower than pre-Palisades Dam conditions generally occur during fall and winter months while the reservoir is filling. Although the frequency of moderate flows has remained similar to pre-dam data, the timing of these flows has changed. Moderate flows are the most efficient at transporting sediments over time, and the frequency of moderate flows has not changed significantly with operation of the dam.

Eighteen USGS gages are located in the Palisades subbasin (Figure 16). The two USGS gages for the longest period of record and the capability for reporting Real Time data are both below the dam on the South Fork Snake River near Irwin and Heise (Figure 17, adapted from Figure 2.1 of the U.S. Bureau of Reclamation's Snake River Resources Review (SR3)). As shown in Table 5, the average annual discharge for the South Fork near Irwin is 6,578 cfs for the period from 1935 to 1999, while the average annual discharge near Heise is 7,037 cfs for data years 1911-1999. Since Palisades Reservoir is managed primarily for irrigation needs (BLM and TNF 1990), the minor decrease in the lowest annual streamflows at the downstream Heise gage may be due to irrigation withdrawals.

Table 5. Flow Statistics for Data of Record for USGS stations near Heise and Irwin.

Station Name	Station #	Data Years	Average Annual (cfs)	Highest Annual (cfs)	Lowest Annual (cfs)
Snake River near Irwin, ID	13032500	1935-1999	6,578	10,710	4,394
Snake River near Heise, ID	13037500	1911-1999	7,037	11,590	4,117

Source: USGS surface water data at http://idaho.usgs.gov

Drainage patterns are complex, but most of the major streams within Palisades's subbasin exhibit dendritic, or branching, drainage patterns (USGS 1996), with some parallel drainage patterns in the Fall Creek region.

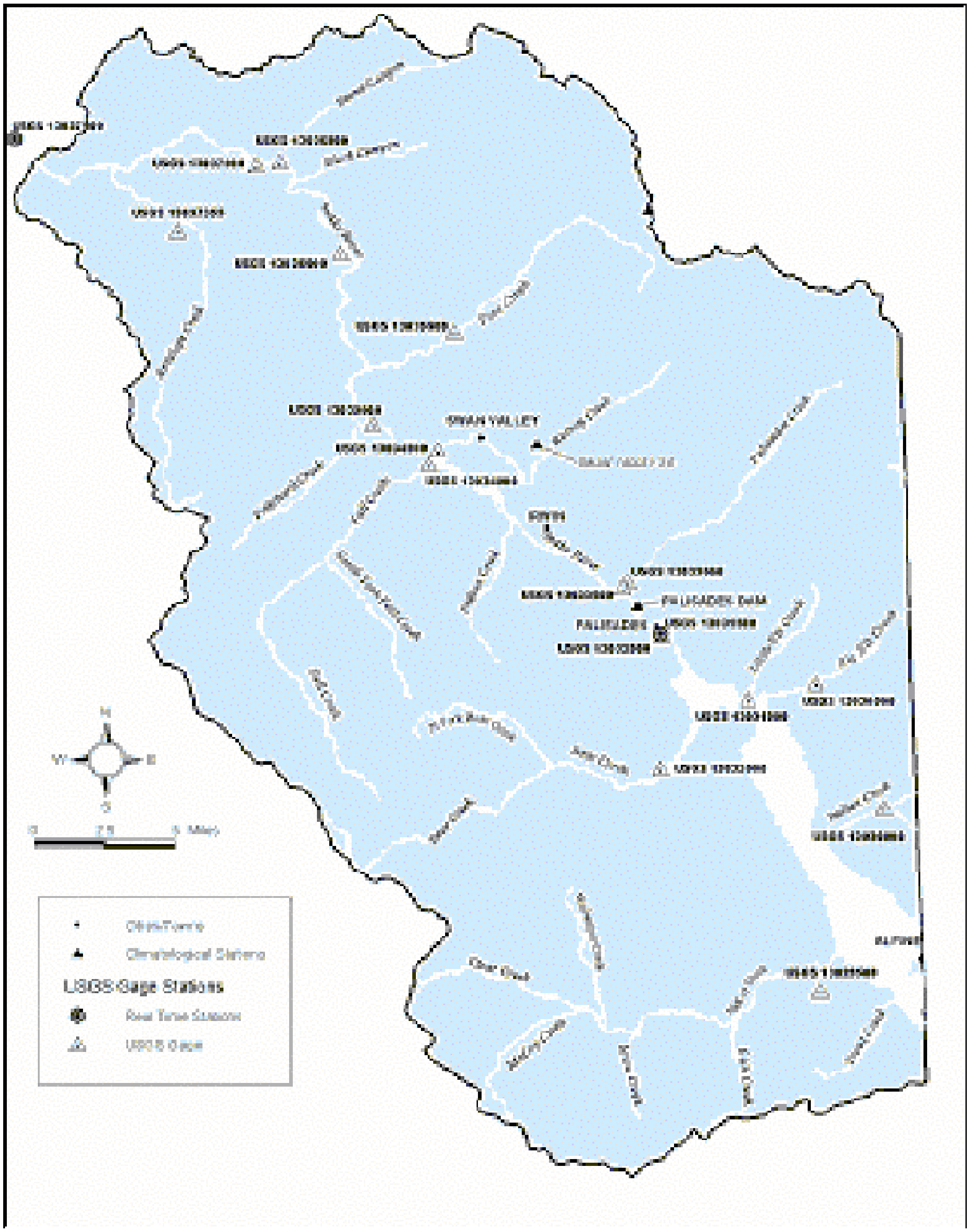


Figure 16. USGS surface water gage stations and climatogogical stations in the Palisades subbasin.

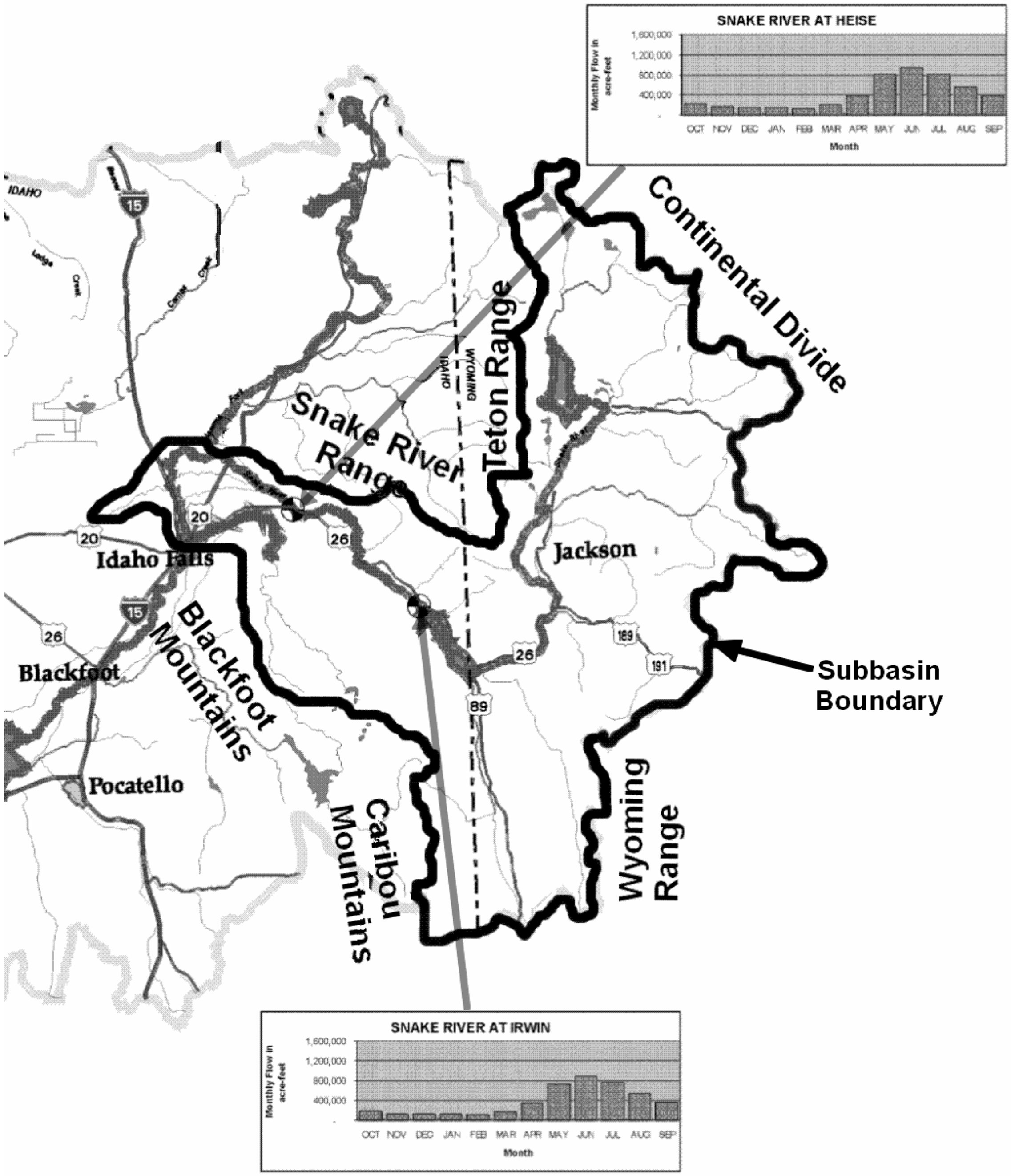


Figure 17. Geographic boundaries of the Upper Snake Headwaters Subbasin showing monthly flow at the Heise and Irwin USGS gaging stations.

Water Quality

Surface Water Quality and 303(d) Streams

Both Idaho and Wyoming Departments of Environmental Quality have been working to develop a schedule for assessment, mitigation, and management of streams and rivers of concern within the two states. Figure 18 is a map of the watersheds, streams, rivers and 303(d) streams in the Snake Headwaters Subbasin in Idaho and Wyoming. Figures 17 through 22 show each watershed and its streams with the exception of the Gros Ventre watershed; the Gros Ventre has not been reviewed for 303(d) listing inclusion.

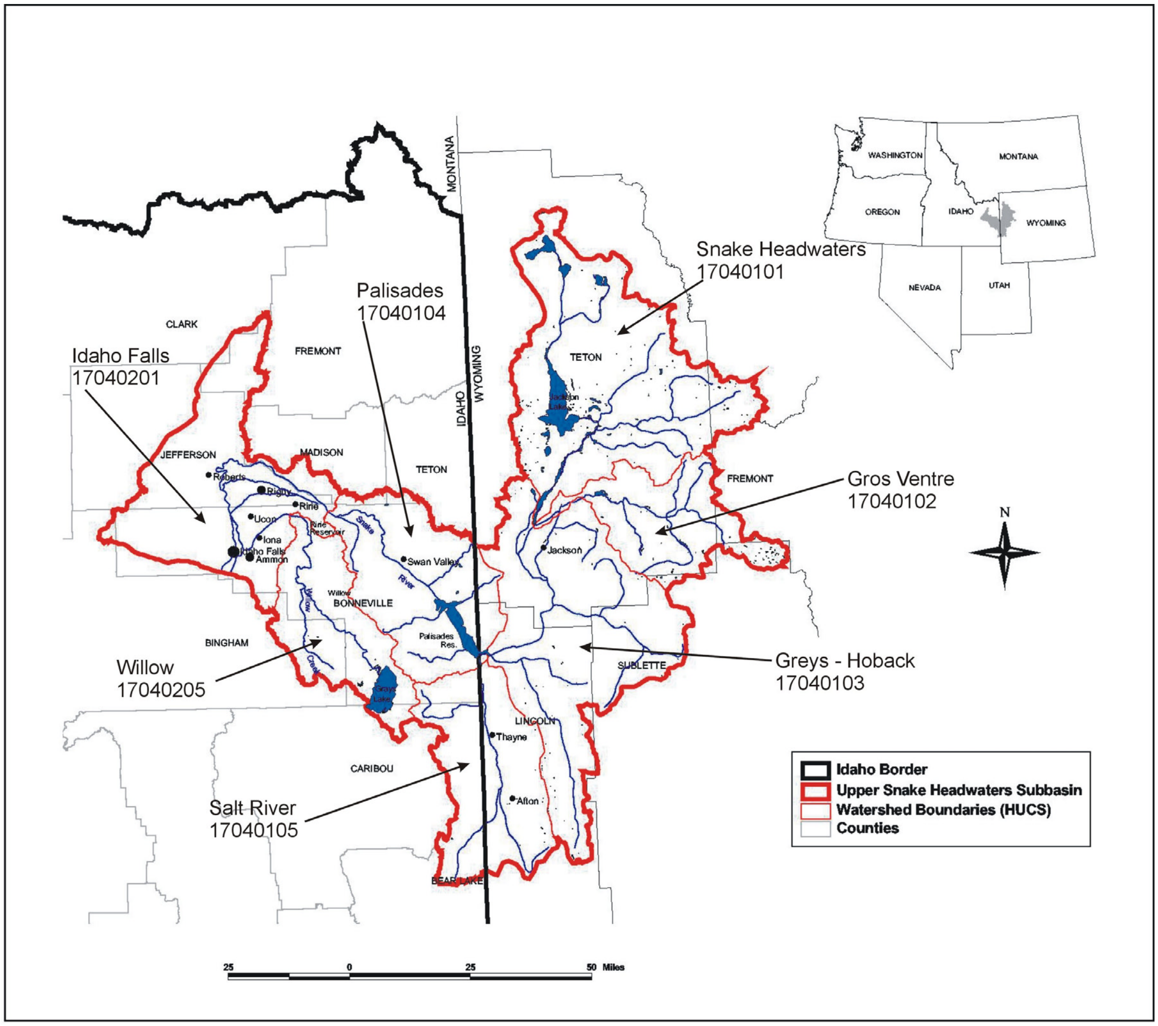


Figure 18. Idaho and Wyoming HUC Map of the Upper Snake Headwaters

From Northeast beginning of the Headwaters Subbasin of the Upper Snake above Grand Teton National Park to the lower Southwest end below Idaho Falls, Idaho, at Gem Lake Dam, each watershed is shown with its 303(d) impaired waters and RF3 hydrology in Figures 17 - 22:

• Snake Headwaters Watershed (SHW)	HUC 17040101	(Figure 19)
• Gros Ventre Watershed (GVT)	HUC 17040102	Not available
• Greys-Hoback (GHB)	HUC 17040103	(Figure 20)
• Salt River (SLT)	HUC 17040105	(Figure 21)
• Palisades (PAL)	HUC 17040104	(Figure 22)
• Willow (WIL)	HUC 17040205	(Figure 23)
• Idaho Falls (IF)	HUC 17040201	(Figure 24)

Idaho reports that 33% of river and stream miles fully support uses, while 67% are impaired for one or more uses. Based on the state's proposed Section 303(d) list, the major causes of impairment in Idaho's rivers and streams include siltation, nutrients, thermal modifications, bacteria, habitat alterations, and oxygen-depleting substances. The state has not yet determined the sources of impairment to rivers and streams.

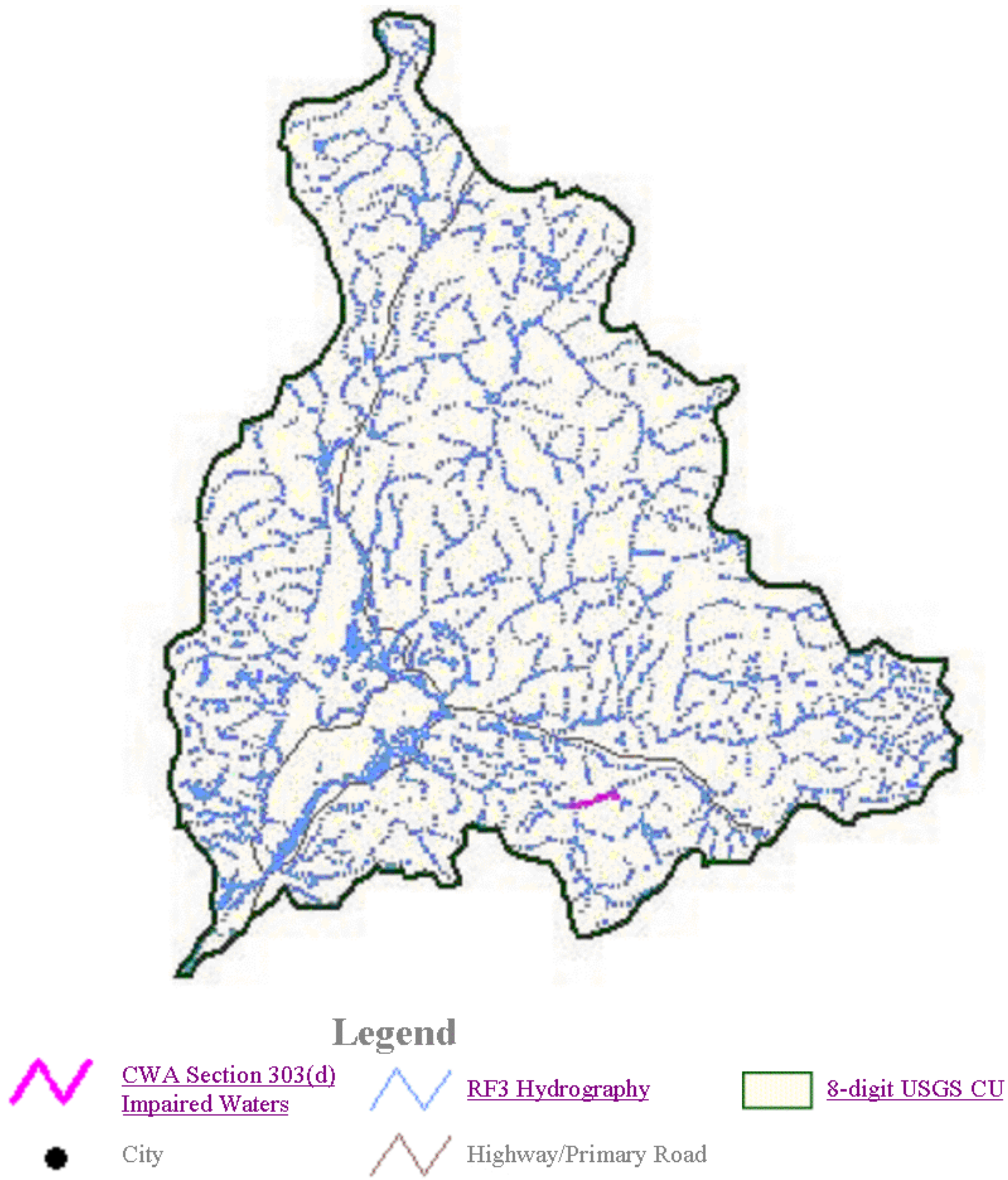


Figure 19. 303(d) listed stream segments in the Snake Headwaters Watershed, HUC 17040101

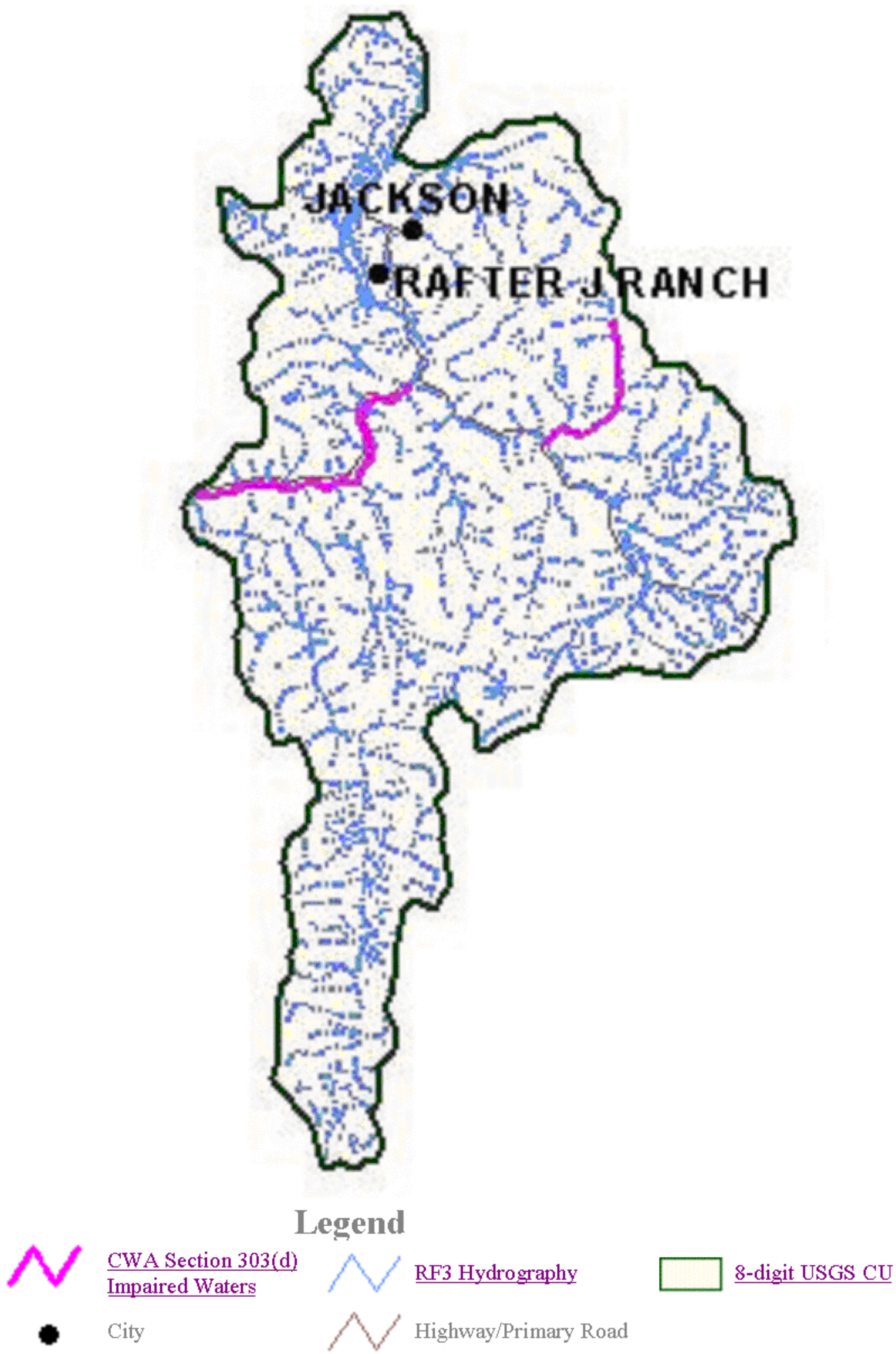


Figure 20. 303(d) listed stream segments in the Greys-Hoback Watershed, HUC 17040103

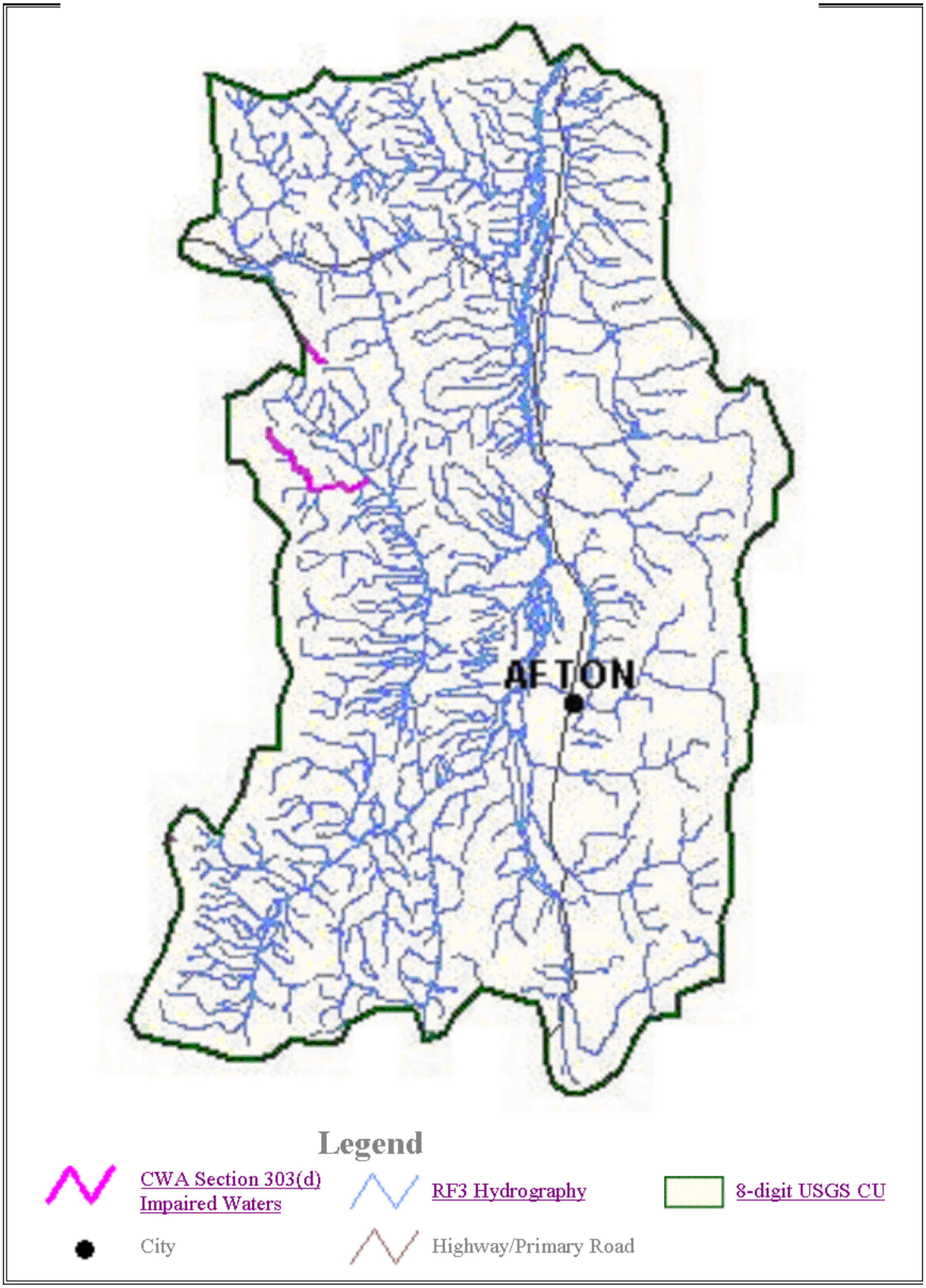


Figure 21. 303(d) listed stream segments in the Salt River Watershed, HUC 17040105.

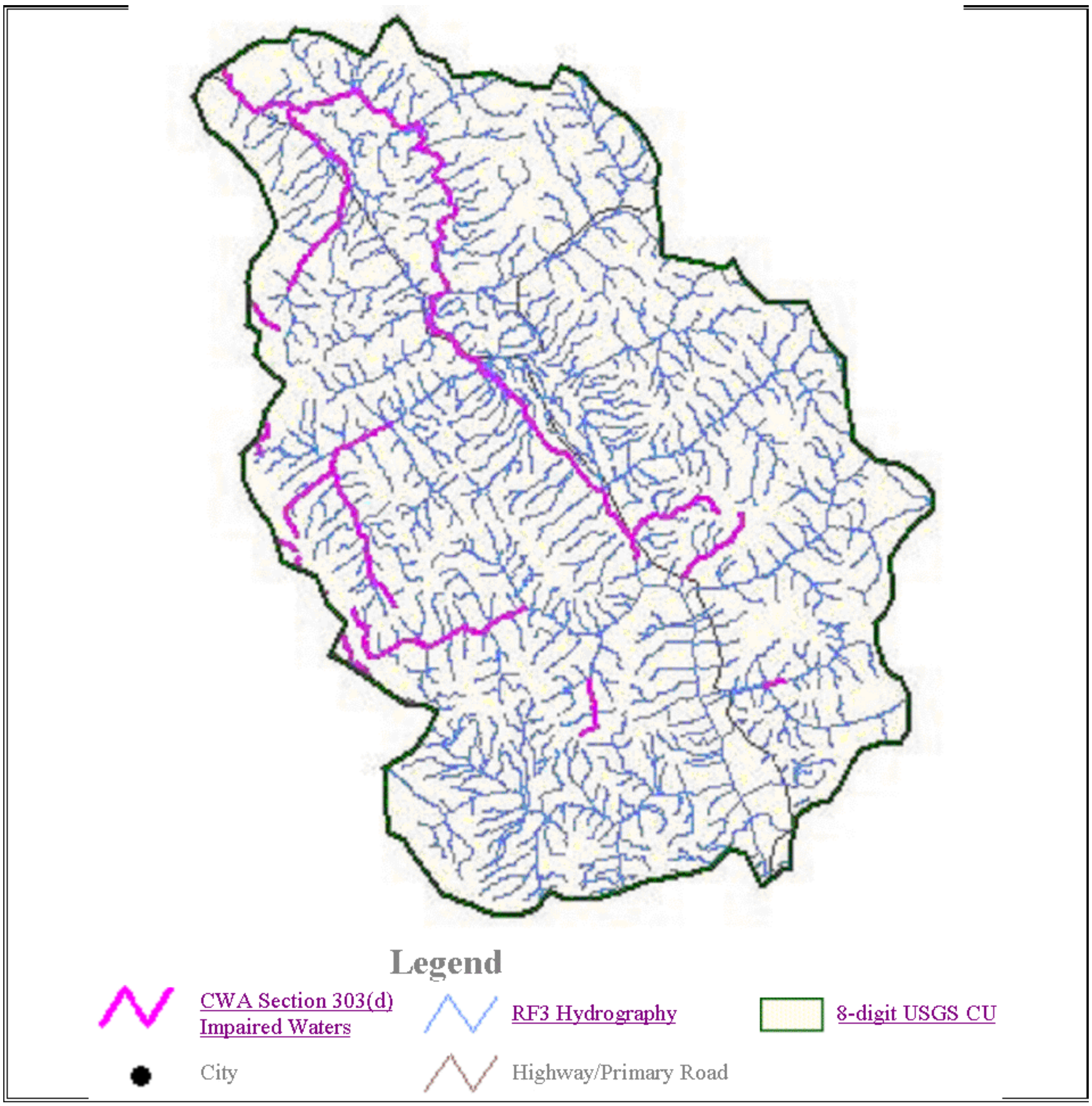


Figure 22. 303(d) listed stream segments in the Palisades Watershed, HUC 17040104

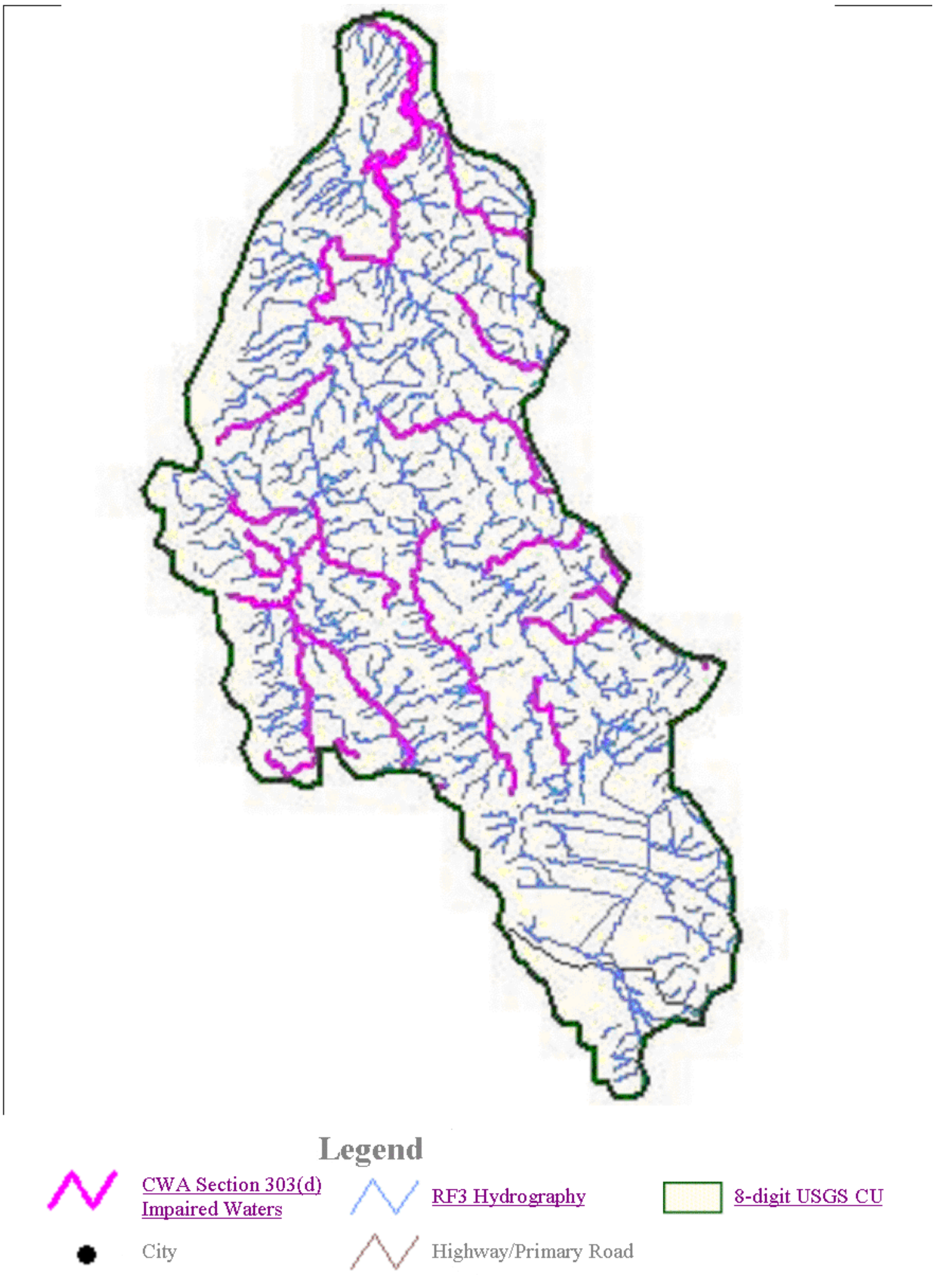


Figure 23. 303(d) listed stream segments in the Willow Watershed, HUC 17040205.

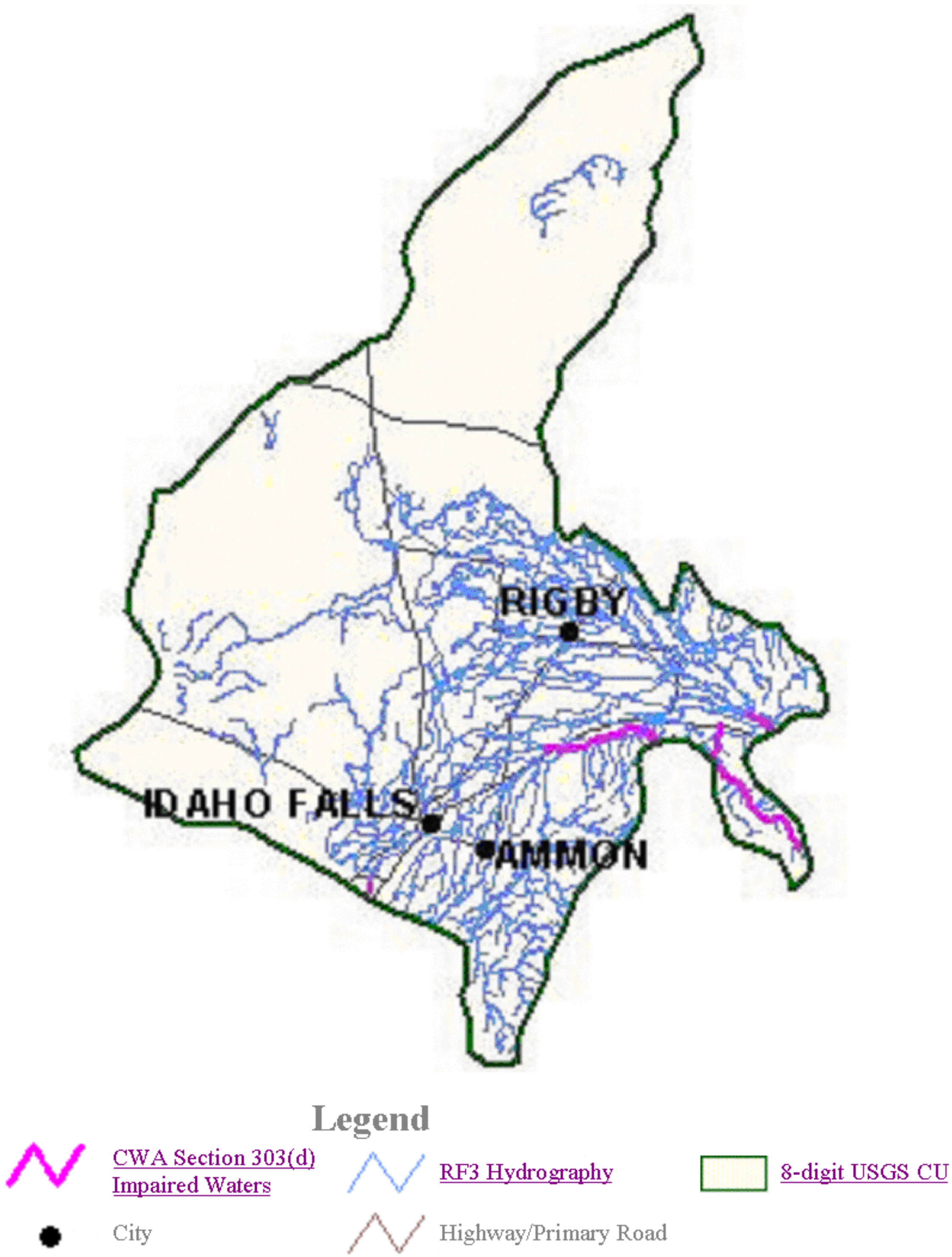


Figure 24. 303(d) listed stream segments in the Idaho Falls Watershed, HUC 17040201.

Table 6 identifies the watersheds of the Headwaters Subbasin, the 303(d) code, waterbodies either assessed or to be assessed, the parameters of concern, and the scheduled completion year for Total Maximum Daily Loads (TMDL) assessment pertaining to that waterbody.

Table 6. Headwaters Subbasin Total Maximum Daily Load 303(d) Listed Stream Segments

Watershed	303(d) Code	Water Body	Parameter[4]	Year for TMDL[5] Completion
Snake Headwaters (HUC 17040101)	WYSR17040101-256-1-1998	Spread Creek, North Fork	S	
Gros Ventre (HUC 17040102)	There is no 303(d) information for this HUC			
Greys-Hoback (HUC 17040103)	WYSR17040103-002-5-1998	Snake River	TRC	2000 [1]
	WYSR17040103-031-2-1998	Granite Creek	TRC	2000 [1]
Salt River (HUC 17040105)	ID2276-1998	Dry Creek	N, S	2000 [1]
	ID2312-1998	Slug Creek	S	2000 [1]
	ID2315-1998	Diamond Creek	S	2000 [1]
	ID2320-1998	Lanes Creek	S	2000 [1]
	ID5266-1998	Boulder Creek	UC	
Palisades (HUC 17040104)	ID2003-1998	Snake River	FA	2000 [2]
	ID2004-1998	Snake River	FA	2000 [1]
	ID2006-1998	Antelope Creek	S	2000 [1]
	ID2040-1998	Meadow Creek	S	2000 [2]
	ID2041-1998	Tex Creek	S	2000 [2]
	ID2045-1998	Hell Creek	N, S	2000 [2]
	ID2046-1998	Lava Creek	S, T	2000 [2]
	ID2047-1998	Brockman Creek	N, S	2000 [2]
	ID2048-1998	Corral Creek	S, T	2000 [2]
	ID2049-1998	Sawmill Creek	S, T	2000 [2]
	ID5241-1998	Camp Creek	UC	2006 [3]
	ID5242-1998	Little Elk Creek	UC	2006 [3]
	ID5244-1998	North Fork Indian Creek	UC	2006 [3]
	ID5245-1998	Bear Creek	UC	2006 [3]
	ID5246-1998	Elk Creek	UC	2006 [3]
	ID5247-1998	Fall Creek	UC	2006 [3]
	ID5645-1998	Snake River	FA	2000 [1]
	ID5653-1998	Sheep Creek	UC	2006 [3]
Idaho Falls (HUC 17040201)	ID2003-1998	Snake River	FA	
	ID2035-1998	Willow Creek	S	2002 [2]
	ID5250-1998	Birch Creek	UC	2002 [2]

Watershed	303(d) Code	Water Body	Parameter[4]	Year for TMDL[5] Completion
	ID5655-1998	South Fork Willow Creek	S	2002 [2]
	ID6363-1998	Snake River	S	2000 [1]
Willow (HUC 17040205)	ID2035-1998	Willow Creek	S	2002 [2]
	ID2036-1998	Ririe Lake	S	2002 [2]
	ID2037-1998	Willow Creek	S	2000 [2]
	ID2039-1998	Willow Creek	S	2000 [2]
	ID2040-1998	Meadow Creek	S	2000 [2]
	ID2041-1998	Tex Creek	S	2000 [2]
	ID2042-1998	Birch Creek	S	2000 [2]
	ID2044-1998	Grays Lake Outlet	N, S	2000 [2]
	ID2045-1998	Hell Creek	N, S	2002 [2]
	ID2046-1998	Lava Creek	S, T	2002 [2]
	ID2047-1998	Brockman Creek	N, S	2002 [2]
	ID2048-1998	Corral Creek	S, T	2000 [2]
	ID2049-1998	Sawmill Creek	S, T	2002 [2]
	ID2050-1998	Homer Creek	S	2002 [2]
	ID2051-1998	Sellars Creek	FA, S, T	2002 [2]
	ID2053-1998	Long Valley Creek	S, T	2000 [2]
	ID2054-1998	Mill Creek	S, T	2002 [2]
	ID2056-1998	Crane Creek	S	2002 [2]
	ID2057-1998	Seventy Creek	FA, S, T	2002 [2]
	ID2310-1998	Meadow Creek	S	2000 [1]
	ID5232-1998	Buck Creek	UC	2002 [2]

[1] http://www.epa.gov/iwi/303d/hucnumberhere_303d.html
[2] http://www2.state.id.us/deq/water/tmdlschd_exp.htm
[3] Palisades Subbasin Assessment and Total maximum Daily Load Allocation, January 2001
[4] DO = Dissolved Oxygen; S = Sediment; UC = Unknown Cause; N = Nutrients; T = Temperature; B = Bacteria; F = Flow; HA = Habitat Alteration; TRC = Total Residual Chlorine; FA = Flow Alteration
[5] Total Maximum Daily Load is the sum of wasteload allocations for point sources and load allocations for non point sources plus a margin of safety:
TMDL = Loading capacity (LC) = WLA + LA + MOS
WLA = waste load allocation for point sources LA = load allocations for nonpoint souces
MOS = margin of safety

Palisades Subbasin Sub-Watershed Descriptions are further described below and included in approximately 537,407.6 acres or 839.7 square miles in Idaho. This area provides approximately 16.5 inches of runoff per year for the drainage, which equals roughly 5,054,578 acre feet per year (Merigliano 1996). The USGS has divided the subbasin into 11 sub-watersheds (Figure 25) at the fifth field HUC level. The subbasin is roughly divided by Palisades Reservoir and the South Fork Snake River that runs in a northwesterly direction. Pine Creek sub-watershed is located entirely in the northern part of Palisades's subbasin, while McCoy Creek, Bear Creek, and Fall Creek sub-watersheds are located entirely in the southern portion. Therefore, these sub-watersheds are true watersheds. Antelope Creek, Dry Canyon, Swan Valley, Rainey Creek, Palisades Creek, Big Elk Creek and Indian Creek sub-watersheds have a portion of their drainage both north and south of the reservoir and river. Therefore, these sub-watersheds are composite watersheds.

Palisades Dam has a fish screen that has been constructed on Palisades Creek, which joins the South Fork approximately 3 miles downstream from the dam. The YMCA camp located on Big Elk Creek has operated a hydroelectric facility since 1987. With a capacity of 7.4 kilowatts, the power is utilized only for the camp. Fish passage is insured via a minimum 25 percent streamflow (Idaho Water Resource Board 1996).

The following are descriptions of the eleven sub-watersheds. Unless otherwise stated, the description of each sub-watershed was compiled from 1996 BURP data (IDEQ 1996), the 1980 TNF stream inventory, the 1999 cutthroat distribution survey reports (TNF 1999a) and the 2000 cutthroat distribution survey reports (TNF 2000). All stream type classifications are based on the system proposed by Dave Rosgen (1996). The sub-watershed area (Idaho Department of Water Resource 1994-1997) and stream mileage (Idaho Department of Water Resources 1994-1996) are provided by Geographic Information System (GIS) calculations.

The Palisades subbasin sub-watersheds are graphically described in Figure 25. Figure 26 depicts the 1998 303(d) listed stream segments for the Palisades subbasin. (Both figures are from Palisades Subbasin Assessment and Total Maximum Daily Load Allocations, January 2001.)

- **Antelope Creek**— (11.49 Miles in length) For sediment, the upper boundary is extended to Forest Service road culvert and runs to the private dam. From private dam to South Fork Snake River, pollutant is flow alteration. No load allocation will be calculated for flow alteration. A load allocation is calculated for sediment.
- **Bear Creek**— (12.02 Miles in length) Bear Creek had been listed from its headwaters to North Fork Bear Creek for an unknown pollutant. The lower boundary is extended to South Fork Snake River. The pollutant has been identified as sediment and a load allocation is calculated.
- **Camp Creek**-- (4.57 Miles in length) Camp Creek is listed from its headwaters to Fall Creek for an unknown pollutant. The Camp Creek TMDL will be deferred until the year 2006.
- **Elk Creek**-- (3.28 Miles in length) Elk Creek had been listed from its headwaters to West Fork Elk Creek for an unknown pollutant. There are no known human activities impacting the drainage. With no management issues in the riparian areas, Elk Creek will be removed from the 303(d) list.
- **Fall Creek**-- (12.18 Miles in length) Fall Creek had been listed from its headwaters to South Fork Fall Creek for an unknown pollutant. Water quality and fish habitat along the unlisted segment of Fall Creek is impacted by grazing and recreational land use. The entire length of Fall Creek will be listed and a TMDL will be calculated in 2006.
- **Little Elk Creek**-- (4.52 Miles in length) Little Elk Creek had been listed from its headwaters to Palisades Reservoir for an unknown pollutant. Little Elk Creek cannot support salmonid spawning since the creek is only 2-3” deep with no fish passage. The upper portion is intermittent. Historic high water erosion events have scoured the channel and left the streambed entirely composed of boulder substrate. With a naturally erosive hydrologic condition without observed human impacts, Little Elk

Creek will be removed from the 303(d) list.

- **North Fork Indian Creek**-- (1.08 Miles in length) North Fork Indian Creek had been listed from the Wyoming State line to Indian Creek. There are no observable human impacts to the riparian area, and no visible fish habitat. Historic high water events have scoured the channel down to bedrock. The stream is subterranean in the lower reach. North Fork Indian Creek will be removed from the 303(d) list.
- **Snake River** – (Palisades Dam to Irwin 7.28 Miles in length and Irwin to HUC Boundary 32.41 Miles in Length)
- **Sheep Creek**--(5.37 Miles in length) Sheep Creek had been listed from its headwaters to South Fork Snake River for an unknown pollutant. Streamflow does not reach one cubic feet per second even in May during spring runoff, so water quality standards do not apply. The Sheep Creek drainage cannot support salmonid spawning since the creek is 4” wide with no fish passage. Sheep Creek will be removed from the 303(d) list.

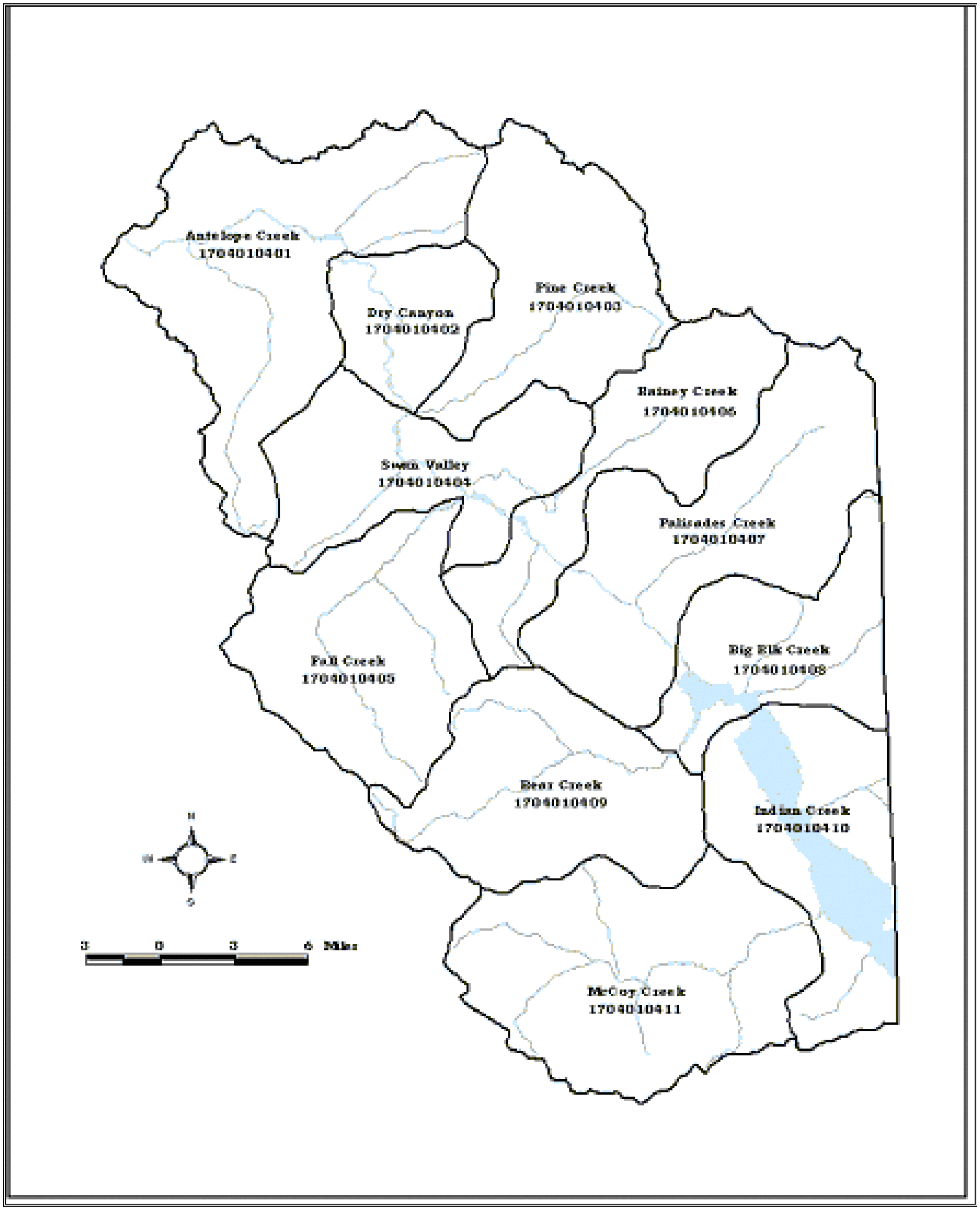


Figure 25. Names and HUCs of sub-watersheds within the Palisades subbasin.

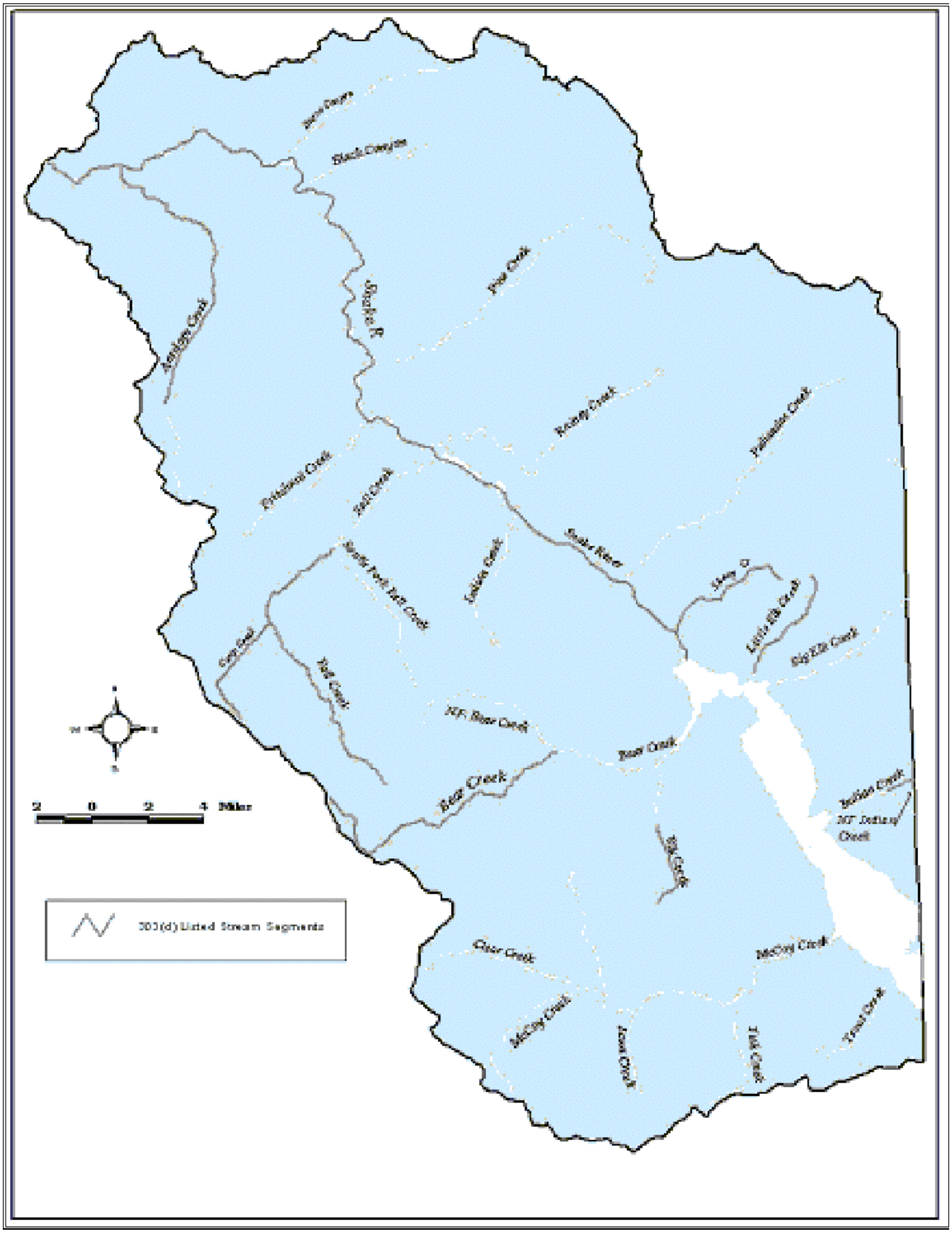


Figure 26. 1998 303(d) listed stream segments for the Palisades subbasin.

Palisades and Willow

Ten limited water quality samples were taken from Palisades and Ririe Reservoirs as part of a BPA sponsored water quality pilot project in 1998 (Table 7) (Streamnet, 2001). Tests were conducted for chlorophyll A in micrograms per liter, pH, Secchi depth[a] in meters, and total phosphorous in milligrams per liter. By comparing the two sets of samples taken on three different days, Palisades Reservoir indicators demonstrate that Palisades had the better water quality for that time.

Table 7. Results of limited BPA Water Quality Pilot Project in the Headwaters Subbasin.

WaterBodyName	Date	Value	ParameterDescription
Palisades Reservoir	8/13/1998	0.2	Chlorophyll A in micrograms per liter
Palisades Reservoir	8/13/1998	2.9	Chlorophyll A in micrograms per liter
Palisades Reservoir	8/13/1998	8.45	ph in standard units
Palisades Reservoir	8/13/1998	8.1	ph in standard units
Palisades Reservoir	8/13/1998	5.5	Secchi Depth in meters
Palisades Reservoir	8/13/1998	2	Secchi Depth in meters
Palisades Reservoir	8/13/1998	0.025	Total Phosphorus (mg/L)
Palisades Reservoir	8/13/1998	0.025	Total Phosphorus (mg/L)
Palisades Reservoir	8/13/1998	0.025	Total Phosphorus (mg/L)
Palisades Reservoir	8/13/1998	0.025	Total Phosphorus (mg/L)

WaterBodyName	Date	Value	ParameterDescription
Ririe Reservoir	8/10/1997	2.8	Chlorophyll A in micrograms per liter
Ririe Reservoir	8/10/1997	8.44	ph in standard units
Ririe Reservoir	8/10/1997	3	Secchi Depth in meters
Ririe Reservoir	8/10/1997	0.13	Total Phosphorus (mg/L)
Ririe Reservoir	8/10/1997	0.019	Total Phosphorus (mg/L)
Ririe Reservoir	8/9/1998	7.5	Chlorophyll A in micrograms per liter
Ririe Reservoir	8/9/1998	8.29	ph in standard units
Ririe Reservoir	8/9/1998	2	Secchi Depth in meters
Ririe Reservoir	8/9/1998	0.08	Total Phosphorus (mg/L)
Ririe Reservoir	8/9/1998	0.13	Total Phosphorus (mg/L)

[a] The Secchi disk measures the transparency of the water. A Secchi disk is lowered into a body of water until it can be no longer seen by the observer. This depth of disappearance, called the Secchi depth, is a measure of the transparency of the water.

Table 8 describes the current vulnerability of the watersheds within the Upper Snake Headwaters Subbasin. Table 9 describes the current conditions of the watersheds within the Upper Snake Headwaters Subbasin.

Table 8 Snake Headwaters Subbasin Watershed: Vulnerability Indicators

Vulnerability Indicators [h] -	**SHW[a]**	**GVT[b]**	**GHB[c]**	**SLT[d]**	**PAL[e]**	**WIL[f]**	**IF[g]**
Aquatic Species at Risk [i]	M [2]	ID [4]	M	M	M	M	L [3]
Toxic Loads Over Permitted Limits j	ID	ID	L	L	ID	ID	L
Conventional Loads over Permitted Limits [k]	ID	ID	L	H [1]	ID	ID	L
Urban Runoff Potential [l]	L	L	L	L	L	L	M
Index of Agricultural Runoff Potential [m]	L	L	L	M	M	M	M
Population Change [n]	L	L	L	M	L	L	H
Hydrologic Modification [o]	H	ID	L	L	H	M	L
Estuarine Pollution Susceptibility Index [p]	ID	ID	ID	ID	ID	ID	ID
Air Deposition [q]	L	L	L	L	L	L	L

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

[1] H - High
[2] M – Moderate
[3] L – Low
[4] ID - Insufficient Data

[a] Snake Headwaters
[b] Gros Ventre
[c] Greys-Hoback
[d] Salt

[e] Palisades
[f] Willow
[g] Idaho Falls

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

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

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

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

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

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

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

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

[p] EP For coastal waters only.

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

Table 9. Snake Headwaters Subbasin Watershed: Condition Indicators.

Condition Indicators [h]	**SHW**[a]	**GVT**[b]	**GHB**[c]	**SLT**[d]	**PAL**[e]	**WIL**[f]	**IF**[g]
Designated Use Attainment [i]	B [3]	ID [4]	ID	B	B	LS [2]	MS [1]
Fish & Wildlife Consumption Advisories [j]	ID	ID	ID	ID	ID	ID	ID
Source Water Condition [k]	B	B	B	B	B	B	ID
Contaminated Sediments [l]	ID	ID	B	ID	ID	ID	B
Ambient Water Quality Data – Four Toxic Pollutants [m]	ID	ID	ID	ID	ID	ID	ID
Ambient Water Quality Data - Four Conventional Pollutants [n]	B	ID	B	LS	B	MS	ID
Wetland Loss Index [o]	LS	LS	LS	LS	LS	LS	LS

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

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

[a] Snake Headwaters
[b] Gros Ventre
[c] Greys-Hoback
[d] Salt

[e] Palisades
[f] Willow
[g] Idaho Falls

[h] Designed to show existing watershed health. These indicators include such thins as waters meeting state or tribal designated uses, contaminated sediments, ambient water quality, and wetland loss.

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

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

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

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

[m] AWQD – 4TP The Exceedance Criteria over 6 yr period (1990-1996) are based on the hardness of the water.

For freshwater (hardness <= 1000 mg/l) the exceedance criteria are:
Copper (ug/l) = 2.9
Nickel (ug/l) = 8.29
Zinc (ug/l) = 86.1
Chromium +6 (ug/l) = 17.5
For marine water (hardness > 1000 mg/l) the exceedance criteria are:
Copper (ug/l) = exp(0.85451*log(hardness - 1.465))
Nickel (ug/l) = exp(0.84601*log(hardness + 1.1645))
Zinc (ug/l) = exp(0.8473*log(hardness + 0.7614))
Chromium +6 (ug/l) = 0.29

[n] AWQD – 4CP The Exceedance Criteria over 6 yr period (1990-1996) are:
DO: < 5.0 mg/l
ph: < 6 or > 9
Phosphorus: > 0.1 mg/l
Ammonia: recommended chronic levels for ammonia were taken from Ambient Water Quality Criteria for ammonia, EPA 440/5-85-001, p. 97 and reflect temperature and pH adjustments.

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

Snake Headwaters

Grand Teton National Park

Water quality within Grand Teton National Park abides by the following acts and actions:

- The Federal Water Pollution Control Act of 1972, as amended in 1977 (33 U.S.C. 1251 et. seq.), establishes the national policy to prevent, control, and abate water pollution and defines the responsibility of Federal agencies to cooperate with the Federal Water Pollution Control Administration and the states to prevent or control water pollution from Federal properties.
- Executive Order 11752 (38 F.R. 34793-34797) obligates Federal agencies to comply with Federal, State, interstate, and local standards and limitations regarding the quality of air, water and land resources.
- The U.S. Army Corps of Engineers must approve any project that might affect the flow or sediment load of streams in the Park (33 U.S.C. 1251).
- The Service holds 281 water rights within the Park (262 adjudicated, 19 unadjudicated). Most were acquired as appurtenances to lands purchased by or donated to the Park. There have been no adjudicated water rights in the Parkway.
- A 1972 Memorandum of Agreement between the Park and the Teton County Conservation District provides for consultation and coordination for the construction and maintenance of irrigation works in the Park that are related to valid water rights.
- Structures appurtenant to valid water rights that existed when the Park was enlarged in 1950, including ditches and canals and other irrigation structures on Federal land, are protected by enabling legislation for the Park (64 Stat. 849).
- Irrigation in the Park, which is required to fulfill terms of valid leases or grazing commitments, will continue until the leases expire or are relinquished by the lessee or grazing rights are terminated (Appendix A, *Grand Teton National Park and John D. Rockefeller, Jr., Memorial Parkway Surface Water Plan, Draft Executive Summary, 2001).*

Gros Ventre Subbasin

National Elk Refuge

Groundwater resources on the Refuge as a whole are considered high and are not subject to septic-related pollution concerns except perhaps in the vicinity of the Twin Creek Ranch development and other inholdings.

A possible non-point source of pollution affecting surface water quality at the Refuge involves large amounts of fecal material produced by concentrations of wintering elk and flowing into Flat Creek and Nowlin Creek. Although no data presently exist which document this as a problem, anecdotal information provided by TCNRD suggest that high concentrations of fecal material has the potential to negatively affect Refuge water quality (R. Gay, pers. comm.). The high concentration of waterfowl in the Nowlin marsh area is also suspected of contributing to decreased water quality in the lower Refuge section of Flat Creek (R. Gay, pers. comm.).

Teton County (Snake Headwaters, Gros Ventre, Greys-Hoback)

Surface water quality in Teton County is also believed to be high but can be negatively affected by both point source (e.g., a gasoline station along Flat Creek) and non-point source (e.g., overland runoff of fecal matter from winter concentrations of livestock discharges). Existing or future urban development has little or no potential of influencing water quality in Refuge surface water features. Lower Cache Creek, however, is an exception since this watercourse flows through Jackson and a diversion from this watercourse (i.e., the Cache Creek pipeline) enters the Refuge and is used for irrigation. This section of creek has the potential to be heavily impacted by urban runoff and this could have as yet undetermined effects on downstream water quality (Jackson-Teton County Coop. Plan 1994). Stormwater flows directly from Jackson streets into this creek. No data presently exist regarding Cache Creek water quality in the vicinity of the Refuge. However, water quality data have been and continue to be collected on sections of Cache Creek flowing through Jackson closer to its confluence with Flat Creek. Two ongoing studies have determined that petroleum hydrocarbons and sodium (salt), both of which represent possible threats to aquatic life, are entering Flat Creek along with stormwater originating from Jackson streets and a similar situation may be occurring on Cache Creek. Hydrocarbons are unavoidable artifacts of the number of automobiles and other motorized vehicles concentrated in Jackson. The occurrence of sodium is probably linked to materials used by the Town and County Road Departments and the Wyoming Department of Transportation during the winter to keep road sand piles from freezing. Zinc, the only heavy metal found in stormwater samples, is also flowing into Flat Creek from the town but its source is unknown (B. Norton, Nelson Engineering, Pers. comm.). It may be possible to reduce the levels of hydrocarbon input through the use of stormwater retention cisterns, which would collect these pollutants during normal stormwater drainage. The Town of Jackson is presently studying several systems but, to date, no large-scale plans have been finalized (S. Buckstaff, Town of Jackson, Pers. comm.).

Vegetation

A range of different attributes may describe vegetation: species composition, stand structure, or seral status (to name a few). 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.

Sixteen broad potential natural vegetation (PNV) plant association groups are identified as occurring within the Snake Headwaters Subbasin. The relative abundance of each is summarized by watershed in Table 10. The subbasin has considerable ecosystem diversity. Evergreen coniferous forest and evergreen shrubland ecosystems are most abundant. Dominant potential natural vegetation varies widely among watersheds within the subbasin in relation to basic environmental factors of climate and elevation. Existing vegetative cover within the subbasin is grouped into 29 cover classes. The relative abundance of each class within each watershed within the subbasin is summarized in Table 11. Figure 27 briefly summarizes a graphic depiction of the vegetative dispersion throughout the Snake Headwaters Subbasin.

Steele et al. (1983), Mauk and Henderson (1984), and Mueggler (1988) describe the forested vegetation of the Snake Headwaters Subbasin. Mueggler and Harris (1969) and Hironaka et al. (1983) provide descriptions of the composition and ecology of grassland and shrubland plant associations. Bowerman et al. (1996), Mutz and Queiroz (1983), Youngblood et al. (1985), and Padgett et al. (1989) conducted early work on wetland and riparian plant associations and community types within the subbasin. Descriptive work by Manning and Padgett (1995) is relevant to the subbasin. Jankovsky-Jones (1997) conducted wetland and riparian inventories within the subbasin. Information on the distribution, composition, and ecology of vegetation with Idaho is available from Idaho Conservation Data Center (2001). Many of these data are also available in NatureServe (Association for Biodiversity Information 2001).

Table 10. Percent representation of 11 PNV plant association groups within Snake Headwaters Subbasin is listed by major watershed (adapted from Hann et al. 1997).

Potential Natural Vegetation	SHW	GVT	GHB	SAL	PAL	WIL	IF
Abies lasiocarpa Forest	35.6	46.4	42.2	20.6	5.3	0.0	
Abies lasiocarpa-Picea engelmannii Forest	0.7	0.3	2.0				
Alpine Bunchgrass Meadow	3.0						
Artemisia tridentata vaseyana Shrubland	7.7	3.8	12.2	41.4	45.1	31.9	1.5
Artemisia tridentata wyomingensis Shrubland			3.5	7.7	18.3	41.1	97.9
Juniperus osteosperma Woodland			0.4		2.4		
Montane and Subalpine Wet Meadow				0.5		19.1	
Pinus albicaulis Woodland	9.2		4.2	0.8			
Pinus ponderosa Woodland						0.1	
Populus tremuloides Forest	9.5	4.5	1.8	3.1	11.5	3.4	0.1
Populus trichocarpa Forest	3.2				0.4		
Pseudotsuga menziesii Forest	5.9	31.8	15.7	21.2	9.8	2.9	
Pseudotsuga menziesii-Pinus flexilis Forest	18.1	6.0	11.7	4.7	4.6	0.8	
Rock	0.3						
Salix-Alnus Deciduous Shrubland	2.5	7.1	6.3		0.2	0.0	
Water	4.4				2.4	0.6	0.4

Table 11. Percent representation of 30 land cover classes within Snake Headwaters Subbasin is listed by watershed (adapted from Landscape Dynamics Lab 1999).

Covertype	SHW	GVT	GHB	SAL	PAL	WIL	IF
Agriculture	0.0	0.2	0.3	0.1	25.4	30.3	44.1
Alpine Meadow	5.4		0.3		0.0	0.0	
Annual Grassland	1.5	1.7	0.1				
Aspen	11.2	1.9	37.9	26.5	23.9	21.1	0.4
Bitterbrush					0.3	0.7	3.1
Curlleaf Mountain Mahogany					0.0	0.0	
Disturbed					0.0	0.0	0.1
Douglas-fir Forest	28.5	40.7	33.6	64.3	11.4	0.3	0.0
Engelmann Spruce-Subalpine Fir	21.0	40.0	17.8	4.4	0.1		
Exposed rock and mixed barren land	0.3				1.0	0.0	4.3
Juniper woodland			0.0		0.1	0.1	0.0
Limber pine - whitebark pine					0.0	0.0	
Lodgepole Pine	15.8	0.2	2.0	0.8	2.4	0.6	0.0
Low Sagebrush					0.2	1.6	5.5
Montane Parkland/Subalpine Meadow					2.4	0.4	0.0
Mountain Big Sagebrush	0.3	0.2	0.1		9.3	18.4	0.8
Perennial Grassland	7.2	11.3	6.5	3.6	0.7	2.7	12.4
Rabbitbrush							1.2
Riparian forest					1.8	0.8	0.5
Riparian grassland		0.2	0.4	0.0	0.0	6.5	0.2
Riparian shrubland	0.7	0.2	0.2		1.0	2.5	0.1
Sand Dune							1.4
Subalpine Fir					0.6	0.0	
Subalpine fir - Douglas fir					8.1	0.9	0.0
Urban			0.0		0.5	1.2	2.0
Warm Mesic Shrubs					7.4	5.4	0.9
Water	4.4				2.4	0.6	0.4
Whitebark Pine	3.8	3.3	0.7	0.3	0.0		
Wyoming Big Sagebrush					0.8	6.0	22.6

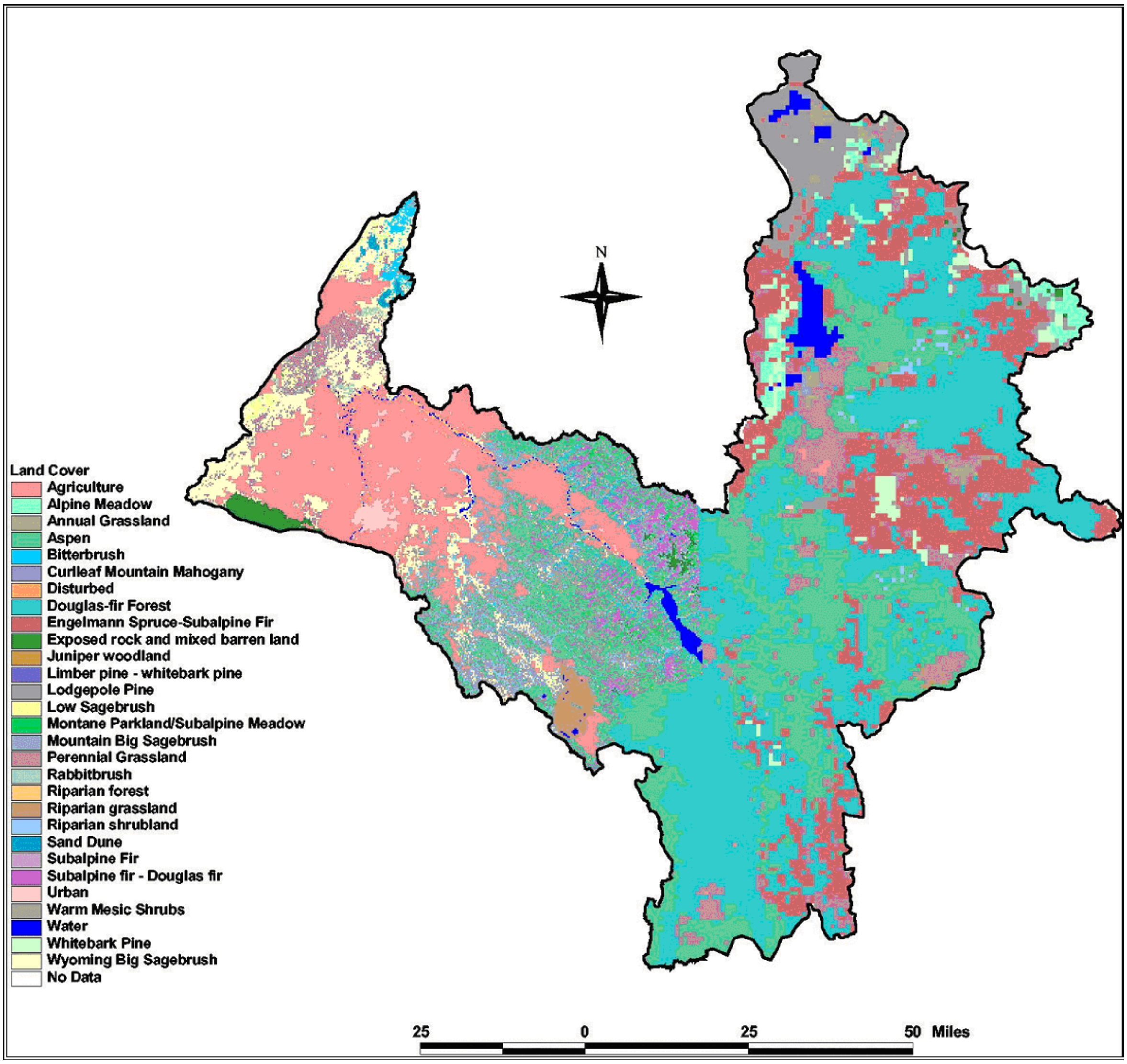


Figure 27. Landcover within the Headwaters Subbasin.

Snake Headwaters

Grand Teton National Park and John D. Rockefeller, Jr.,Parkway

Over 1000 species of vascular plants (Shaw 1992) and over 200 species of fungi (McKnight 1980) occur in Grand Teton National Park or nearby Teton County, Wyoming. This includes 117 alien species of vascular plants; i.e. plants that have migrated directly into the Park or county within the last 75-100 years, or those plants remaining from previous cultivation around abandoned places of habitation (Shaw 1992). A number of different studies have developed maps of vegetation types found throughout the Park. The vegetation of the original, 96,000 acre Park (largely just the Teton Range) was mapped into 19 types and 329 subtypes in 1935 and 1936 (National Park Service 1935-1936 and 1935-1936a). A rough map of major vegetation types (upland forest and forest park, sagebrush grassland, bunchgrass-shrub, and floodplain forest and willow) in valley portions of the Park is in Houston (1968). These major types are further broken down into 19 categories and their characteristic plants are listed. Cole (1969) maps major vegetation types in the Park, classifies the vegetation into nine types, lists characteristic plants and associated plants for each type, and includes photographs of some types. Martinka (1965) quantitatively described and mapped eleven plant communities in parts of valley areas in the Park. Loope and Gruell (1973), and Gruell (1980, 1980a) discuss the important role of fire in determining the vegetation of the Park region. From 1986 to 1988 the vegetation of Grand Teton National Park and John D. Rockefeller, Jr., Parkway was classified and mapped by vegetative cover types as part of a data gathering process to develop a grizzly bear cumulative effects model. All of this information is currently digitized and has been utilized for a variety of data analyses with the Geographic Information System (GIS) (Appendix B).

Forest and Woodland Vegetation

Important forest plant associations groups within the subbasin are Douglas-fir (*Pseudotsuga menziesii*) forest, Douglas-fir-limber pine (*Pinus flexilis*) forest, aspen (*Populus tremuloides*) forest, subalpine fir (*Abies lasiocarpa*) forest, and whitebark pine (*Pinus albicaulis*) woodland. Black cottonwood (*Populus trichocarpa*) forest and Utah juniper (*Juniperus osteosperma*) woodlands are also present but occur with more limited distributions. Steele et al. (1983), Mauk and Henderson (1984), and Mueggler (1988) summarize species composition of forested plant associations present within the subbasin.

The Douglas fir forest and Douglas-fir-limber pine forest plant association groups occur in warm to cool, dry to very dry environments of the subbasin on mid- to upper-slope positions and ridge-spurs. The plant association groups are prominent primarily in the Greys-Hoback, Gros Ventre, and Salt watersheds. A mix of early-seral stands dominated by aspen and mid- to late-seral stands dominated by Douglas fir is present. These associations typically occur on low to moderately productive sites. Relatively frequent, low intensity fire, on moderately productive sites, maintains open stands of large diameter Douglas fir with patchy Douglas-fir understory regeneration and a patchy mosaic of understory shrub, grass, and herb cover. This fire disturbance regime functions to thin understory tree regeneration, favoring the structural and compositional dominance of large diameter Douglas-fir in the overstory and reducing the development of pole-sized ladder fuels (Fischer and Bradley 1987; Crane and Fischer 1986). As ground and ladder fuels accumulate during fire-free periods, these stands become increasingly susceptible to stand-replacing fire.

Aspen and black cottonwood plant associations appear most abundant in the relatively warm, wet to moist environments of the Palisades and Snake Headwaters watersheds. Seral stands of aspen are abundant in the Greys-Hoback, Salt, and Willow watersheds.

Subalpine fir forest plant associations occur in relatively cool to cold, moist to dry, montane and subalpine valley and ridgetop environments within the subbasin. These plant associations are well represented to abundant in the Greys-Hoback, Gros Ventre, Salt, and Snake Headwaters watersheds. The plant association group displays a range of disturbance regimes, predominantly by fire. Fire disturbance regimes range from frequent, low to medium intensity surface fire in dry environments to infrequent, high intensity fire disturbance on moist environments. On many dry subalpine fir sites within the Rocky Mountain region fire disturbance regimes of frequent, repeated stand replacing fire maintain persistent dominance by lodgepole pine (*Pinus contorta*). Within the Snake Headwaters Subbasin, however, Douglas fir or aspen are the primarily seral species, though lodgepole pine stands are present. Key concerns for wildlife habitat and biological diversity within these ecosystems are the placement and availability of different stand structures. Table 12 briefly describes timberland distribution within Bonneville County.

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

Table 12. Area in acres of timberland by forest type and ownership in Bonneville County.

Forest Type	All Owners	National Forest	Other Public	Private
Spruce/Fir	69,400	64,000	5,300	0
Douglas-fir	111,200	111,200	0	0
Lodgepole Pine	24,000	24,000	0	0
Conifer Total	204,500	199,200	5,300	0
Elm/Ash/Cottonwood	5,300	0	5,300	0
Aspen/Birch	61,700	15,500	5,300	40,900
Hardwood Total	67,000	15,500	10,700	40,900
Nontyped	4,900	4,900	0	0
All Types Total	276,400	219,500	16,000	40,900

Source: FIA Database Retrieval System (www.srsfia.usfs.msstate.edu/scripts/twig); results are rounded

Shrub and Grassland Vegetation

Sites that potentially support Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) or mountain big sagebrush (*Artemisia tridentata vaseyana*) shrubland are abundant on the Idaho Falls, Palisades, Salt, and Willow Creek watersheds. Approximately 48 percent of the Wyoming big sagebrush habitats within the subbasin, however, have been converted to agriculture. An additional 8 percent of the land area potentially supporting stands of Wyoming big sagebrush is currently perennial grassland.

Species of rare plants known to occur in the Snake Headwaters Subbasin are listed in Table 13. All the rare species known to occur within the subbasin are considered vulnerable to extinction within Idaho. Thirty-four occurrences representing five species are known from the Palisades watershed. Twenty-six noxious weed species are known to occur within the subbasin (Table 14). Current location data on species occurrences within the subbasin are limited, and only allow identification to county. A number of species are relatively widespread within the subbasin. Noxious weed species of emerging concern include: meadow knapweed, Syrian beancaper, yellow starthistle, buffalobur, purple loosestrife, silverleaf nightshade, spring millet grass, Johnsongrass, and perennial pepperweed.

Table 13. Rare and endemic plant species known to occur within the Snake Headwaters Subbasin.

Common name	Global Rank	State Rank	SHW	GVT	GHB	SAL	PAL	WIL	IF	Total
green spleenwort	G4	S1					1			1
Payson's bladderpod	G4	S2					8			8
gray willow	G4	S2					2			2
Ute ladies' tresses	G2	S1					22			22
Payson's milkvetch	G3	S3					1			1
red glasswort	G4	S2				2				2

Note: With global rank G1 through G3 or state rank S1 through S2, and listed by species with the number of population occurrences summarized by watershed.

Table 14. County summary of noxious weed species distributions within the Snake Headwaters Subbasin.

Species	Common name	BINGHAM	BONNEVILLE	CARIBOU	CLARK	FREMONT	JEFFERSON	MADISON	TETON
Hyoscyamus niger	black henbane	X	X	X	X	X	X	X	X
Solanum rostratum	buffalobur				X			X	
Cirsium arvense	Canada thistle	X	**X** [a]	**X**	X	X	X	X	X
Linaria dalmatica	dalmatian toadflax	X	X	X	X	X		X	
Centaurea diffusa	diffuse knapweed	X	X		X	X	X	X	
Isatis tinctoria	dyer's woad	X	X	**X**	X	X			X
Convolvulus arvensis	field bindweed	X	X	X	X	X	X	X	X
Cardaria draba	hoary cress	X	X	X	X	X	X	X	
Sorghum halepense	Johnsongrass	X	X					X	
Aegilops cylindrica	jointed goatgrass	X	X	X	X				
Euphorbia esula	leafy spurge	X	**X**	**X**	X	X	X	**X**	X
Centaurea pratensis	meadow knapweed				X				
Carduus nutans	musk thistle	X	**X**	**X**	X	X	X	X	X
Lepidium latifolium	perennial pepperweed	X			X		X		
Sonchus arvensis	perennial sowthistle	X	X	X		X		X	
Conium maculatum	poison hemlock	X	X	X	X	X	X	X	X
Tribulus terrestris	puncturevine	X	X	X	X	X	X	X	

Species	Common name	BINGHAM	BONNEVILLE	CARIBOU	CLARK	FREMONT	JEFFERSON	MADISON	TETON
Lythrum salicaria	purple loosestrife					X		**X**	
Centaurea repens	Russian knapweed	X	X	X	X	X		X	
Onopordum acanthium	Scotch thistle	X		X	X	X		X	X
Solanum elaeagnifolium	silverleaf nightshade		X					X	
Centaurea maculosa	spotted knapweed	X	X	X	X	X	X		X
Milium vernale	spring millet grass				X			X	
Zygophyllum fabago	Syrian beancaper	X							
Centaurea solstitialis	yellow starthistle					X			
Linaria vulgaris	yellow toadflax	X	X	**X**	X	X			X

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

Gros Ventre

National Elk Refuge

Thirty-three plant community types have been identified on the National Elk Refuge. Twenty-three of these are primarily indigenous plants or plant communities naturally occurring on the Refuge under current conditions and ten are classified as "cultivated species" indicating their introduction and/or perpetuation as a result of agricultural activities. Although some have adapted to natural conditions on the Refuge, most of the cultivated species are supported by continued irrigation.

Much of the refuge consists of grassy meadows and marshes on the valley floor with sedges, bluegrass, and brome grass being important components of the communities. The flood plain forest along the Gros Ventre River contains blue spruce, narrowleaf cottonwood, red osier dogwood and willow as major species. There are extensive areas of big sagebrush and rock outcroppings. The forested areas of lodgepole pine, Douglas fir, and aspen are mostly on the northern slopes of the Gros Ventre hills.

Refuge plant communities are classified under 5 general categories: marshland, native grassland, shrubland, woodland, and cultivated grasslands (Table 15). Areas vegetated predominantly in sedges (*Carex* spp.), rushes (*Juncus* spp.), cattails (*Typha latifolia*), and bulrushes (*Scripus* spp.) are classified as marshland and encompass about 1,263 acres. Native grasslands, including some bluegrasses (*Poa* spp.), wheatgrasses (*Agropyron* spp), and needlegrasses (*Stipa* spp.), cover approximately 7,962 acres. The most abundant vegetative grouping is shrubland, which covers approximately 37% (9,394 acres) of the Refuge. The primary species found in these shrublands are *sagebrush (Artemisia tridentata* and *A. tripartita*) and willow (*Salix* spp.), although stands of snowberry (*Synphoricarpos oreophilus*), wild rose (*Rosa* spp.), and cinquefoil (*Potentilla floribunda*) are also present. Douglas rabbitbrush (*Chrysothamnus viscidiflorus*) is found throughout the Refuge but occurs as a subdominant. Forested areas cover 12.1% (3,091 acres) of the Refuge and include stands of quaking aspen (*Populas tremuloides*), narrowleaf cottonwood (*Populus angustifolia*), Douglas fir (*Pseudotsuga menziesii*) with lodgepole pine (*Pinus contorta*), and juniper (*Juniperus scopulorum*). Of these, aspen stands are most abundant, occurring in 4 varieties with willow, Douglas fir, pinegrass (*Calamagrostis rubescens*), and snowberry as subdominants. Engelmann spruce (*Picea engelmannii*) trees are also found scattered throughout the dominant woodland stands. Cultivated grassland fields occur in ten varieties (2,519 acres) on the Refuge with smooth brome (*Bromus inermis*) fields being most common.

Table 15. Types of Habitat and acreages within the National Elk Refuge

Habitat	Acres
Open-water (ponds and streams)	326
Marsh lands	1,260
Grasslands	8,144
Shrublands	9,416
Woodlands	3,097
Cultivated fields	2,457
TOTAL	**24,700**

Willow

Vegetation within the Willow Subbasin varies from indian ricegrass, aspen and big sagebrush which is used primarily for rangeland and wildlife habitat to hills and semi-mountainous areas that have aspen, bluebunch wheatgrass, snowberry, blue wildrye, and antelope bitterbrush which supports grazeable woodland, rangeland, and wildlife (Table 16). In many areas there is an opportunity for erosion hazard, whether by airborne or by effluent runoff. Bench areas used for dryland winter wheat and spring barley also support native vegetation including bluebunch wheatgrass, slender wheatgrass, mountain brome big sagebrush and mountain big sagebrush. Minor uses include rangeland and some sprinkle irrigated agriculture.

There are two major delineations of this association in the Willow subbasin, one south of Bone, ID, broadly following Willow, Cranes, and Meadow Creeks southward, and the other broadly following Grays Lake Outlet, roughly from the confluence of Lava Creek southward to Grays Lake. Vegetation in upland areas of this association includes Idaho fescue, streambank wheatgrass, and Colombia needlegrass. Vegetation in lowland areas of this association includes Kentucky bluegrass, timothy, and tufted hairgrass support summer grazing and dryland small grain farming. Woody species include aspen; Douglas fir, subapine fir and lodgepole pine also support summer grazing, timber production, and dryland farming. North facing slopes appear to maintain the densest vegetative growth for Douglas fir, aspen and pinegrass on north slopes, and big sagerush, snowberry, and western wheatgrass on south slopes.

Table 16. Common and Scientific Names for the Willow Subbasin Vegetation

Common Name	Scientific Name	Common Name	Scientific Name
Antelope bitterbrush	*Purshia tridentate*	Lodgepole pine	*Pinus contorta*
Aspen	*Populus tremuloides*	Mountain big sagebrush	*Artemesia tridentata Nutt ssp. (vaseyana)*
Big Sagebrush	*Artemesia tridentata*	Mountain brome	*Bromus marginatus*
Bluebunch wheatgrass	*Pseudoroegneria spicata*	Pinegrass	*Calarnagrostis rubescens*
Blue wildrye	*Elymus glaucus*	Slender wheatgrass	*Elymus trachycaulus*
Columbia needlegrass	*Achnatherum nelsonii*	Snowberry	*Symphoricarpos albus*
Douglas-Fir	*Pseudotsuga menziesii*	Streambank Wheatgrass	*Elymus lanceolatus*
Idaho Fescue	*Festuca idahoensis*	Subalpine fir	*Abies lasiocarpa*
Indian ricegrass	*Achnatherum hymenoides*	Timothy	*Phleum pratense*
Kentucky bluegrass	*Poa pratensis*	Tufted hairgrass	*Deschampsia caespitosa*
		Western wheatgrass	*Pascopyrum smithii*

Riparian

The floodplain along the Snake River and its tributaries includes mixed deciduous/coniferous forests and wetlands. Floodplain forest consists of narrow-leaf cottonwood and willow intermixed with Englemann and blue spruce. Wetlands occur where the water table is high enough to support hydrophytic plants, *i.e.*, plant species that grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. The wetland areas include three major types:

- Palustrine shrub-scrub - found primarily on stable gravel bars and dikes, and are dominated by willow and mountain alder.
- Palustrine emergent - sedges, cattails, and bulrush are the primary species.
- Aquatic bed - dominant species in aquatic bed wetlands depend on bottom substrate. Aquatic beds along shorelines tend to support watercress. Pondweed is common in streams or ponds with silt bottoms and ballhead waterleaf occurs in rocky substrates.

The riparian cottonwoods are closely linked with the natural flow regimes of rivers and streams. These flow regimes consist of wooded islands, transitioning to riparian and wetland communities, a vital component of the highly productive braided-channel riverine environment. They are also important as a cornerstone of biodiversity that maintains the ecological health of large alluvial river basins. Cottonwood stands and wetlands require periodic flooding to sustain them. The rushing water also helps create a diverse river channel with braids, pools, riffles, islands and gravel beds. Strong stream flows also flush out sediment that can build up and choke streams.

There are many benefits of riparian cottonwoods in providing the structure and function of riverine and floodplain habitats. Quigley and Arbelbide (1997), Rood and Heinze-Milne (1989), Rood and Mahoney (1990) among others have noted that riparian cottonwoods:

- dissipate stream energy associated with peakflows, stabilize riverbanks, reduce erosion and improve water quality (Merritt and Cooper 2000, Friedman et al. 1998, Debano and Schmidt 1990, Scott et al. 1996, Bradley and Smith 1986, Strahler and Strahler 1973)

- filter sediment, capture bedload and promote floodplain development; (Tooth and Nanson 2000; Johnson 2000)
- improve flood water retention and groundwater recharge, (Benke et al., 2000, Naiman et. al 2000)
- provide shade, large woody debris and reduce water temperatures which benefit a wide range of resident and anadromous fish (Debano and Schmidt 1990, Hauer et al. 1999,)
- promote a diverse mosaic of river channel habitats and off channel ponds that are necessary for fish production, waterfowl breeding and other wildlife uses, and (Whited et al. 2001, Pitlick and Van Streeter, 1998)
- support significantly higher levels of biodiversity than streamside conifers (Thompson et al. 2001, Naiman et al. 1992 & 2000, Whitham et al. 1996).

Rare & Endemics

Willow Creek Subbasin Vegetation – Special Status Species

Both the Conservation Data Center (CDC) of Idaho Department of Fish and Game and the US Fish and Wildlife Service (USFWS) maintain lists of special status plants by county. Their lists are potentially slightly different from each other. The CDC Special Status Plants list includes plants identified on a variety of other lists including, that which has been created, by the Idaho Native Plant Society, the USFWS, the Forest Service, and the Bureau of Land Management (http://www2.state.id.us/fishgame/info/cdc.htm). The USFWS list is only those species identified by that agency as listed under the Endangered Species Act, proposed for listing, candidates for listing, and those species of concern and watch species identified by the USFWS (Burch, 2001). Ute ladies'-tresses (*Spiranthes diluvialis*) is the only plant species in this subbasin listed under the Endangered Species Act; it is listed as "threatened." (IDEQ, Draft, September 2001)

Plant species of concern identified by CDC and USFWS for these counties are listed in Table 17, Table 18, and Table 19 for Bingham, Bonneville, and Caribou, respectively.

Table 17. Bingham County Species of Concern

CDC	USFWS
Iodine bush (*Allenrolfea occidentalis)*	Ute ladies'-tresses (*Spiranthes diluvialis*) – listed threatened
Meadow milkvetch *(Astragalus diversifolius*)	Slender moonwort (*Botrychium lineare*)
Red glasswort (*Salicornia rubra*)	

Table 18. Bonneville County Species of Concern

CDC	USFWS
Green spleenwort (*Asplenium trichomanes-ramosum*)	Ute ladies'-tresses (*Spiranthes diluvialis*) – listed threatened
Payson's milkvetch (*Astragalus paysonii*)	Payson's milkvetch (*Astragalus paysonii*)
Payson's bladderpod (*Lesquerella paysonii*)	Payson's bladderpod (*Lesquerella paysonii*)
Western sedge (*Carex occidentalis*)	Slender moonwort (*Botrychium lineare*)
Gray willow (*Salix glauca*)	Mountain twin bladderpod (*Physaria integrifolia* var. *monticola*)
Ute ladies'-tresses (*Spiranthes diluvialis*)	

Table 19. Caribou County Species of Concern

CDC	USFWS
Idaho sedge (*Carex parryana* ssp. *idahoa*)	Ute ladies'-tresses (*Spiranthes diluvialis*) – listed threatened
Green muhly (*Muhlenbergia racemosa*)	Slender moonwort (*Botrychium lineare*)
Red glasswort (*Salicornia rubra*)	
Hoary willow (*Salix candida*)	
Green neddlegrass (*Stipa viridula*)	

Noxious Weeds

Throughout the Headwaters Subbasin, there is a continuing threat of invasive or noxious weeds showing up in any of the counties. Bonneville County includes all or part of the Willow, Palisades, and Idaho Falls subbasins. Geographically the watersheds are expansive and vulnerable to invasion by processes including recreational activities (such as hikers, animals, and tourists), airborne dynamics, or transport by birds. Table 20, Table 21, Table 22, Table 23, and Table 24 lists vegetative species, invasive, noxious and non-noxious (obnoxious) that are of concern in or around Bonneville County, their priority, and ability to manage.

Table 20. Invasive or Noxious Weeds that are not currently found in Bonneville County.

Common Name	Scientific Name	Common Name	Scientific Name
1 Buffalo bur	*Solanum rostratum*	8 St. Johnswort	*Hypericum Perforatun L* (put on county noxious weel list as of July 2000)
2 Common crupina	*Cirsium arvense* L. Scop.	9 Syrian bean caper	*Zygophyllum fabago* L
3 Purple Loosestrife	*Lythrum salicaria L.*	10 Tansy ragwort	*Senecio jacobea*
4 Orange hawkweed	*Hieracium urantiacum*	11 Toothed spurge	*Eughorbia dentate*
5 Rush Skeleton	*Chondrilla juncea*	12 Yellow hawkweed	*Hieracium pratense*
6 Scotch Broom	*Cytisus scoparius*	13 Yellow starthisle	*Centaurea solstitialis* L.
7 Squarrose Knapweed	*Centaurea virgata* (Lam. ssp. squarrosa Gugl.)	14 Eurasian Watermilfoil	*Myriophyllum spicatum*

Note: But are found in neighboring counties or states.

Table 21. Invasive or Noxious Weeds that have a minimal presense in Bonneville County.

Common Name	Scientific Name	Common Name	Scientific Name
1 Dyers woad	*Isatis tinctoria* L.	6 Puncturevine	*Tribulus terrestris* L
2 Black henbane	*Hyoscyarrius niger* L.	7 Scotch Thistle	*Onopordum acanthium* L.
3 Diffuse knapweed	*Centaurea diffusa* Lam	8 Yellow Toadflax	*Linaria vulgaris* Hill.
4 Jointed goat grass	*Anglos cylindrical*	9 Chickory	*Cichoium intybus* L. (non-noxious)
5 Perennial pepperweed	*Lepidium latifolium* L.		

Note: Such that it is believed these weeds can be eradicated within the first year and monitored thereafter.

Table 22. Noxious weeds that pose the greatest threat to property.

Common Name	Scientific Name	Common Name	Scientific Name
1 Dalmatian toadflax	*Linara dalmatica* L. Mill.	6 Russian knapweed.	*Centaurea repens* L
2 Houndstongue	*Cynoglossum officinale* L. (As of July 2000, listed on county noxious weed list)	7 Silverleaf nightshade	*Solanum elaeagnifolium* Cav.
3 Leafy spurge	*Euphorbia esula* L.	8 Spotted Knapweed	*Centaurea maculosa* Lam.
4 Musk thistle	*Carduus nutans* L.	9 Hoary cress	*Cardaria draba* L. Desv
5 Poison hemlock	*Conium maculatum*		

Table 23. Non-Noxious (obnoxious) weeds that pose the greatest threat to property.

Common Name	Scientific Name	Common Name	Scientific Name
1 Kochia	*Kochia scoparia* L. Scrad.	4 Prickly lettuce	*Lactuca serriola* L.
2 Russian thistle	*Salsola iberica* Sennen	5 Bull thistle	*Cirsium vulgare* (Savi) Tenore
3 Curlycup gumweed	*Grindelia squarrosa* (Pursh) Dunal		

Table 24. Noxious weeds that have a high presence in Bonneville County but cannot be economically controlled at present time.

Common Name	Scientific Name
1 Canada thistle	*Cirsium arvense* L. Scop.
2 Field Bindweed	*Convolvulus arvensis* L.
3 Johnsongrass	*Sorghum halepense*

Note: These weeds will be monitored and controlled as to keep there numbers at a minimum.

Major Land Uses

Land use within the subbasin is largely reflective of coarse patterns of geography and physiography and the distribution of arable soils (Table 25). The Idaho Falls, Salt, and Willow Creek watersheds are primarily under intensive land use practices: cultivated agriculture, intensive range and timber management, and recreational use. The Palisades watershed shows the highest diversity of uses. Greys-Hoback, Gros Ventre, and Snake Headwaters watershed are largely in a pristine, unmodified condition.

Table 25. Summarized land use patterns within the watersheds of the Headwaters Subbasin (in percentages).

Landuse Class	SHW	GVT	GHB	SAL	PAL	WIL	IF
1 - Natural, unmodified environments	83.9	36.2	25.9		6.8		5.8
2 - Special natural areas	2.3	3.1	3.4	10.2	3.1		2.5
3 - Essentially unmodified forested and grassland ecosystems	6.9	31.2	34.5	17.0	46.7	3.7	
4 - Natural appearing, but modified for human use and occupancy	0.0		2.3	0.0	2.7		0.1
5 - Modified forest ecosystems	6.5	28.3	30.4	21.5	1.5	0.5	0.1
6 - Modified grassland ecosystems				40.8	8.3	7.1	25.5
7 - Areas modified by human occupation and activities	0.4	1.3	3.5	10.5	31.0	88.8	66.1
8 - Modified non-sustainable areas					0.0	0.0	

Ownership

Land ownership patterns throughout the watersheds are summarized (in percentages of 100) in Table 26. The Idaho Falls and Willow Creek watersheds are predominantly State and private lands. The high elevation, rugged lands within the Greys-Hoback, Gros Ventre, and Snake Headwaters watersheds are largely managed by Federal agencies including USDA Forest Service and USDI National Park Service. Lands managed by USDI Bureau of Land Management are typically intermingled with State and private lands within the lower Idaho Falls watershed. Figure 28 depicts the graphic dispersion of state and federal agency ownership within the Headwaters Subbasin

Of the three major water impoundments within the Headwaters Subbasin, the Bureau of Reclamation owns both Jackson Lake and Palisades Reservoir while Ririe Reservoir is corporate owned. But the BOR is responsible for the operations and management of all three impoundments while taking into account that Palisades Reservoir is a power generating plant for portions of the subbasin (Table 27)(SR3, 2001).

Table 26. Summarized land ownership patterns within the watersheds of the Headwaters Subbasin (in percentages).

Agency	SHW	GVT	GHB	SAL	PAL	WIL	IF
Department of Energy							1.6
Military Reservation						0.1	0.2
National Park Service	42.6	0.2	1.9				
Private	4.0	4.5	7.4	28.9	30.8	70.3	58.6
State Lands	0.1	0.0	0.5	1.3	0.8	15.2	4.9
US Fish and Wildlife Service		0.6	0.3			2.5	
USDA Forest Service	49.1	94.4	87.7	68.1	62.7	7.8	0.0
USDI Bureau of Land Management		0.0	1.9	1.7	1.6	3.6	34.1
USDI Bureau of Reclamation				0.0	1.6	0.1	
Water	4.2	0.3	0.3	0.0	2.6	0.5	0.5

Table 27 Owner and Operator of Storage Facilities (with an active capacity greater than 20,000 acre-feet in the Headwaters Subbasin).

Reservoir	Stream	River Mile	Storage Capacity (Acre feet)	Power Plant	Owner	Operator
Jackson Lake	Snake R.	988.9	847,000	No	BOR	BOR
Palisades	Snake R.	901.6	1,200,000	Yes	BOR	BOR
Ririe	Willow Ck.	20.5	90,540	No	CORP	BOR

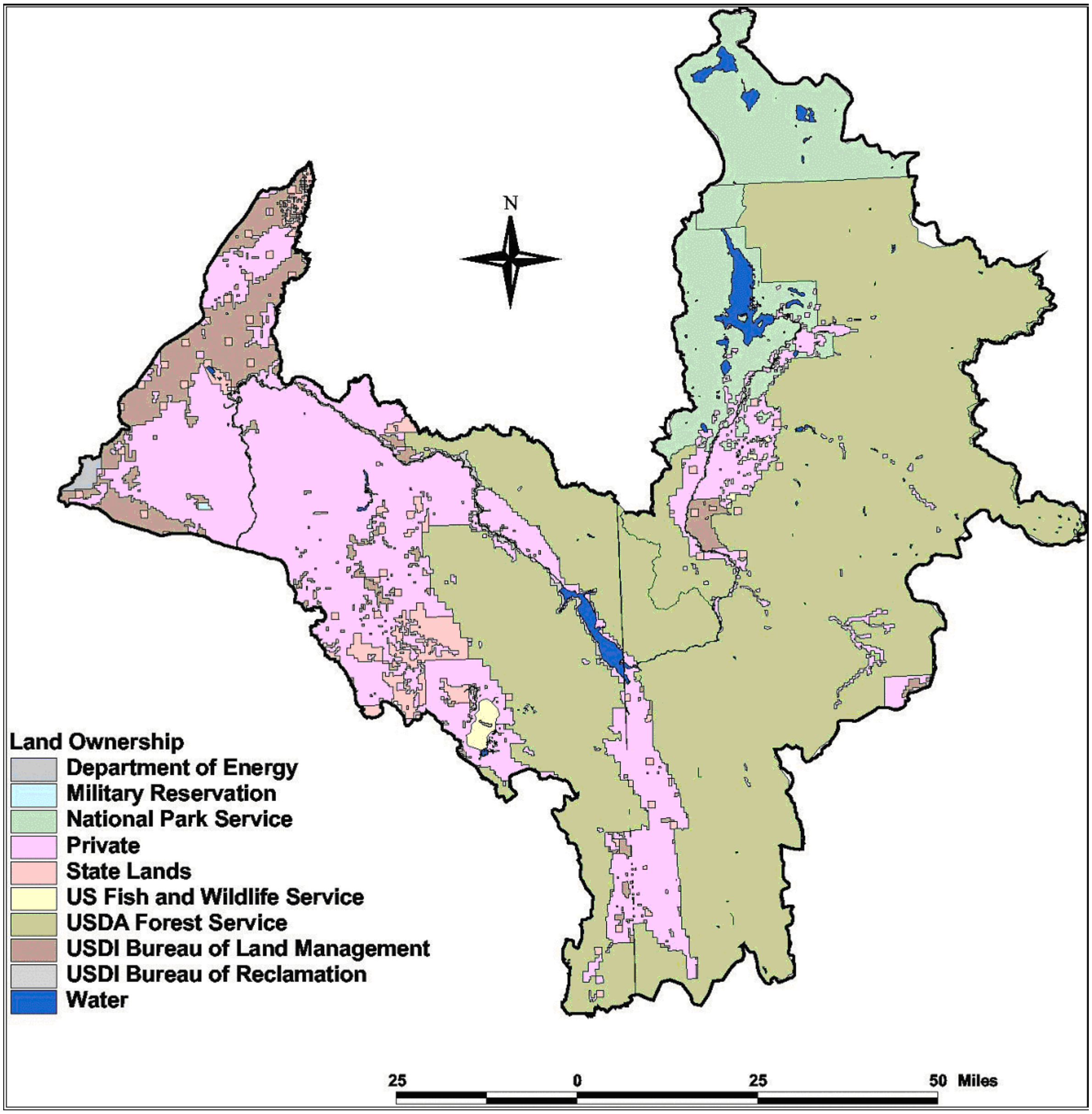


Figure 28. Land Ownership within the Headwaters Subbasin.

Bridger-Teton National Forest.

With its 3.4 million acres, the Bridger-Teton National Forest in western Wyoming is the second largest National Forest outside Alaska. Included are more than 1.2 million acres of wilderness in the Bridger, Gros Ventre, and Teton Wildernesses. The Bridger-Teton National Forest is part of the Greater Yellowstone Ecosystem, the largest remaining area of undeveloped lands in the continental United States. In addition to offering a multitude of recreational opportunities, National Forests are managed for a variety of other uses including livestock grazing, logging, or hunting.

Palisades Watershed

Public lands cover over two-thirds of the land area in the Palisades subbasin (Figure 29) (Idaho Water Resource Board 1992). Targhee National Forest has historically managed forestlands north of the river and Caribou National Forest is south of the river. During the year 2000, these forests combined into the Caribou-Targhee National Forest. The BLM and the US Bureau of Reclamation are the other federal agencies that control land in this watershed. Only a small proportion of the land is under state endowment (Idaho Department of Commerce 2000).

The US Bureau of Reclamation manages operation of the dam and one boat launch campground, but Targhee National Forest administers most of the developed recreational facilities around the reservoir. Private residential lands are on the north side tributaries to the reservoir. From the dam downstream to Conant Valley, the south side of the river is mainly national forest land with associated recreational facilities. Some BLM parcels are north of the river, but private land with farms and pastures becomes increasingly common in this vicinity. From Conant Valley to Heise, the canyonlands bordering the river are still mainly Forest Service and BLM lands, but there are a few private parcels. In the flats above the canyon, most of the land is privately owned (Idaho Water Resource Board 1996). There are 39 islands totaling 770 acres in the South Fork between the towns of Swan Valley and Heise. The larger islands are covered with cottonwood stands and the smaller islands have more shrubby trees and other dense riparian vegetation. All of them are public lands in federal ownership, but 25 of them are under special management by the Bureau of Reclamation for power sites and reclamation projects (BLM 1988).

Land use is highly correlated with ownership (Figure 30) (Idaho Water Resource Board 1990). Forests and rangelands are mainly used for livestock grazing and wildlife habitat. Near the reservoir and along the river, private lands are mainly used for residential purposes, especially for recreational cabins. Further downstream, private land is used more often for crop and pasture production. Irrigated croplands are found throughout Swan Valley and Conant Valley. Beginning at parts of Pine Creek Bench and further downstream to Antelope Flat, dryland agriculture is practiced (TNF 1997a).

In addition to agricultural activities, recreation drives the character of the area due to the large proportion of forestland, the presence of Palisades Dam, and the high quality fishing in the South Fork Snake River. The forests make provision for a range of recreational opportunities from roads and trails for motorized use to primitive backcountry experiences. Some of the steep mountain ranges are inventoried roadless areas, including Bear Creek, Garns Mountain and Palisades Roadless Areas. A portion of the Palisades Roadless Area has been recommended for wilderness designation. Winter sports are also increasing in forest areas such as Kelly Canyon Nordic Ski trails (TNF 1997a). Water sports are a primary attraction at Palisades Reservoir. With about 70 miles of shoreline, six access roads, and multiple campgrounds, picnic areas and boat ramps, the reservoir is a big draw to tourism. The river corridor from Palisades Dam to the Heise gaging station shows heaviest recreational use from May to November, which correlates with the fishing season on this stretch. The South Fork has a national reputation for its native cutthroat trout fishery (Idaho Water Resource Board 1996).

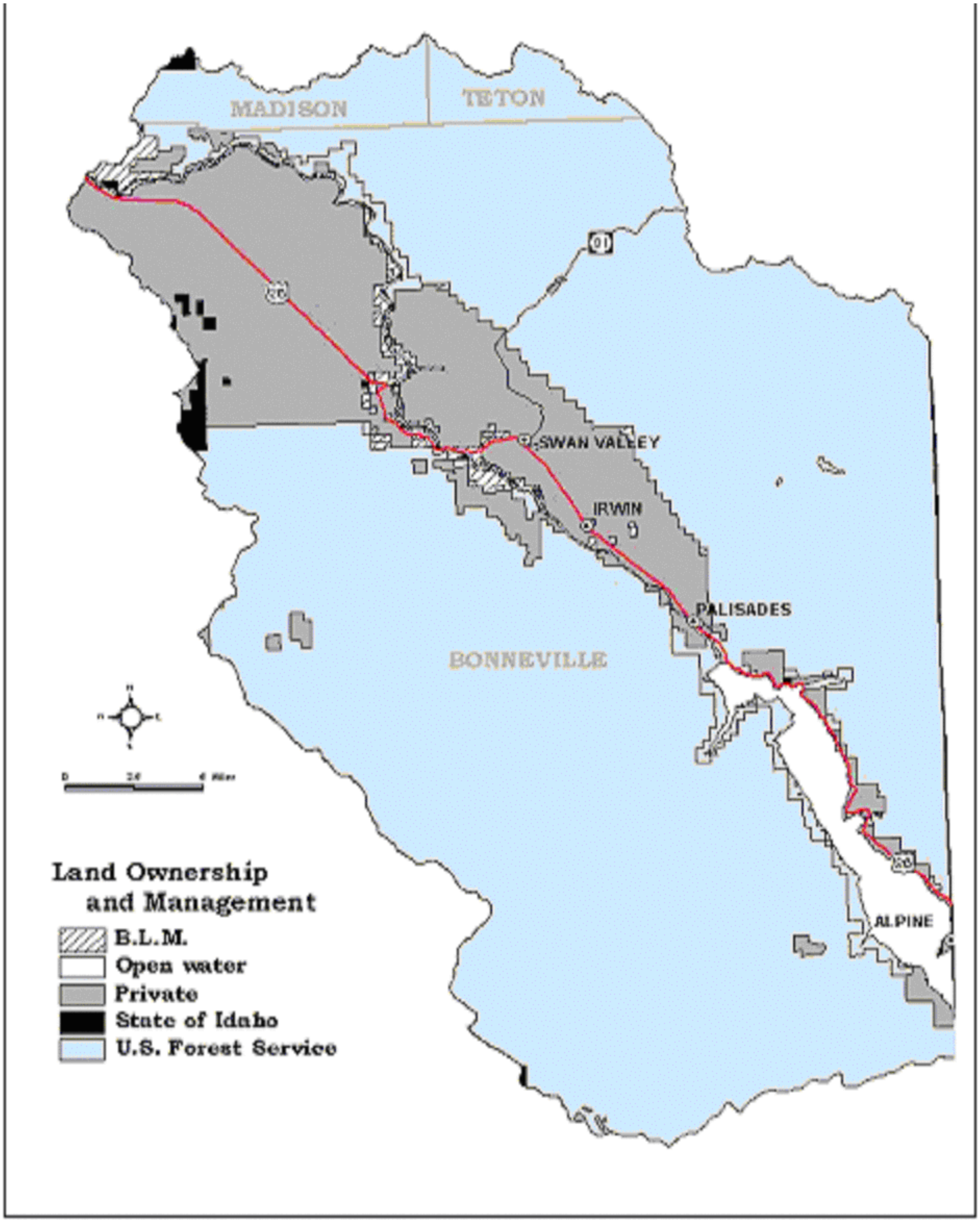


Figure 29. Land Ownership and management in the Palisades subbasin.

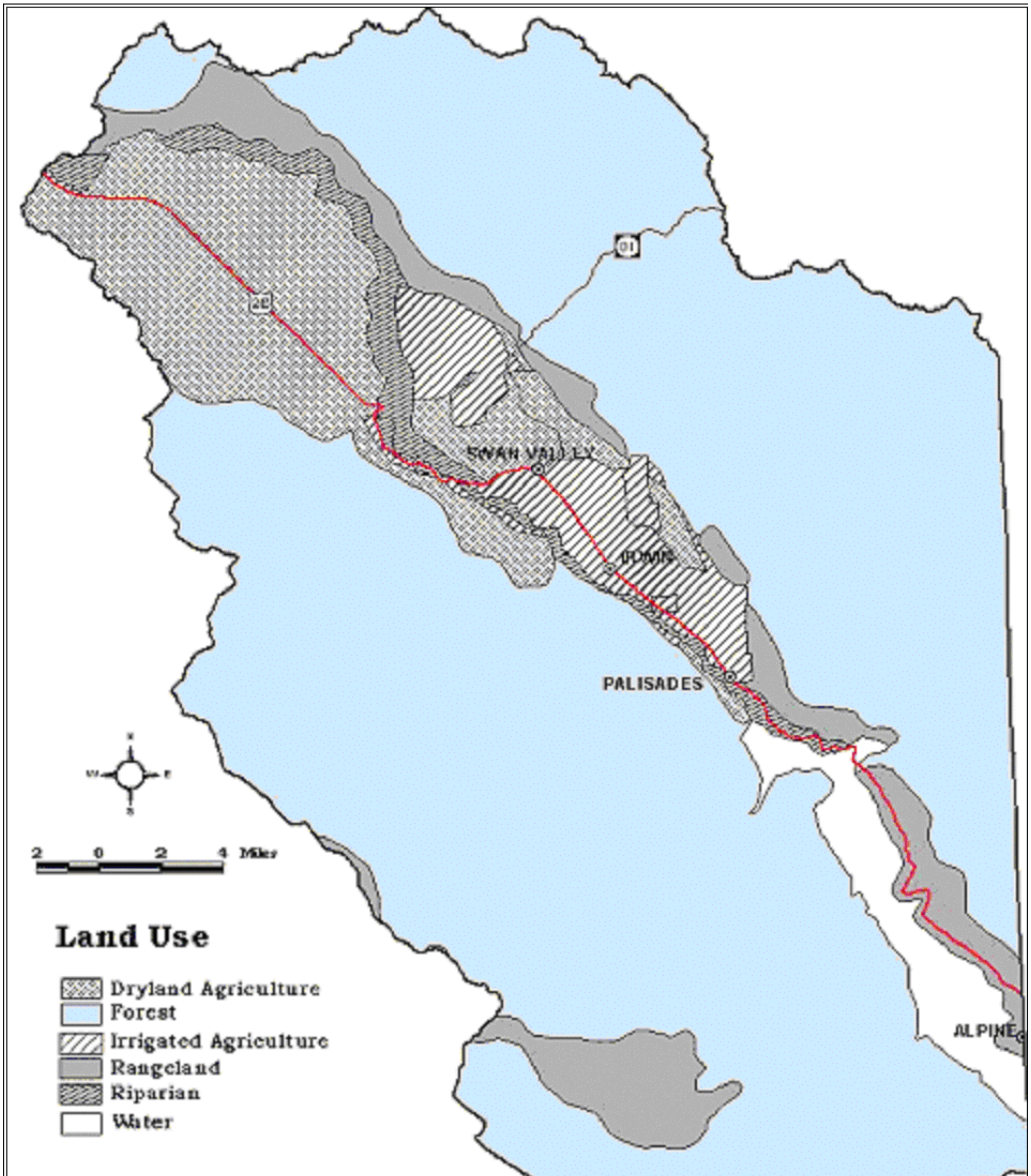


Figure 30. Land use in the Palisades subbasin.

Almost the entire Palisades subbasin is located in Bonneville County, with small portions of Madison and Teton counties included to the north. Irwin (population 125) and Swan Valley (population 155) are the only two incorporated towns in the subbasin. Demographics describing population distribution and trends for Bonneville County are not applicable since Palisades subbasin is so sparsely populated. Most of the private land is rural and unincorporated, some owned by people living in Idaho Falls and Ririe. Many residences on private land are secondary residences used for recreation instead of year-round occupation. Some commercial activity occurs in Swan Valley and Irwin along Highway 26, which is a popular travel route to Jackson Hole and Yellowstone National practiced (TNF 1997a).

Snake-Salt/Henrys Fork River Basin

The Wyoming Snake River Basin, originating from southern Yellowstone National Park, includes approximately 5,139 square miles of land area. Over 92 percent of the land in the basin is federally owned (http://dataweb.usbr.gov/dams/id00344.htm).

Willow Creek Watershed/Ririe Reservoir

Four recreation areas have been developed to meet projected initial demands. Juniper Park, adjacent to the project headquarters visitor center, is the major recreation site. Both overnight camping and day-use facilities are available, including a floating fishing dock and a boat-launching ramp. Blacktail Park, on the lake, includes a swimming area and other day-use facilities. Benchland Park is also on the lake, but is accessible only by boat and has limited day-use facilities. Creekside Park has day-use facilities and access to Willow Creek just downstream from the dam. Ririe Lake is stocked annually with rainbow trout and the minimum reservoir pool provides winter habitat for fish survival and growth. A minimum flow of 25 cubic feet per second is maintained downstream in Willow Creek to provide stream fishing habitat. Deer and elk use the area as winter range, so a large area around the south half of Ririe Lake is developed as rangeland for support of these animals during the critical winter months.

The loss of wildlife habitat associated with the construction of Ririe Dam and Teton Dam led to the establishment of the Tex Creek Wildlife Management Area. In 1976 and 1977, the U.S. Army Corps of Engineers and the Bureau of Reclamation purchased 11,000 acres of critical big game winter range in the Tex Creek area just east of Idaho Falls, Idaho. The Idaho Department of Fish and Game eventually acquireded additional critical acres. Also, a cooperative agreement with the Bureau of Land Management resulted in the inclusion of 9,600 acres of land, and today, the Tex Creek Wildlife Management Area encompasses more than 28,700 acres. The entire area is managed for wildlife, with emphasis on big game.

Grays Lake National Wildlife Refuge (taken from IDEQ, Septeber 2001, Willow Creek Subbasin Assessment, DRAFT)

In 1965 the USFWS established the Gray's Lake National Wildlife Refuge on 13,000 acres of bulrush/tule marsh near Wayan, Idaho. The USFWS allowed usage of lands between the meander line and the refuge boundary (known as "No-Man's Land") by landowners, and maintained water levels within the refuge through the construction of levees and the controlled release of water.

In 1972, the refuge boundary was expanded to 32,825 acres (USFWS, 1982). Of these 32,825 acres, 18,330 acres are controlled by the USFWS: 12,500 acres are in use agreements; 3,110 acres are fee title owned; 2,650 acres of "No-Man's Land" are claimed by virtue of riparian upland ownership; 27 acres are under easement from private landowners; and 46 acres are a headquarters site obtained through land withdrawal (USFWS, 1982). The remaining 14,495 acres not controlled by the FWS within the 32,825 acre boundary. A portion is under private ownership (4,609 acres); other acreage is controlled by public agencies (3,536 acres); or lies within the "No-Man's Land" with control rights claimed by riparian upland owners (6,350 acres) (USFWS, 1982).

Impoundments and Irrigation

Various impoundments, ranging from small, private ponds to large federal projects, are present in the Headwaters Subbasin (Figure 31). Dams and impoundments in the subbasin are for hydroelectric generation, water storage for irrigation and other agricultural uses, wildlife habitat, and recreation. Table 28 lists those impoundments, the owners, and the owner types (Streamnet, 2001).

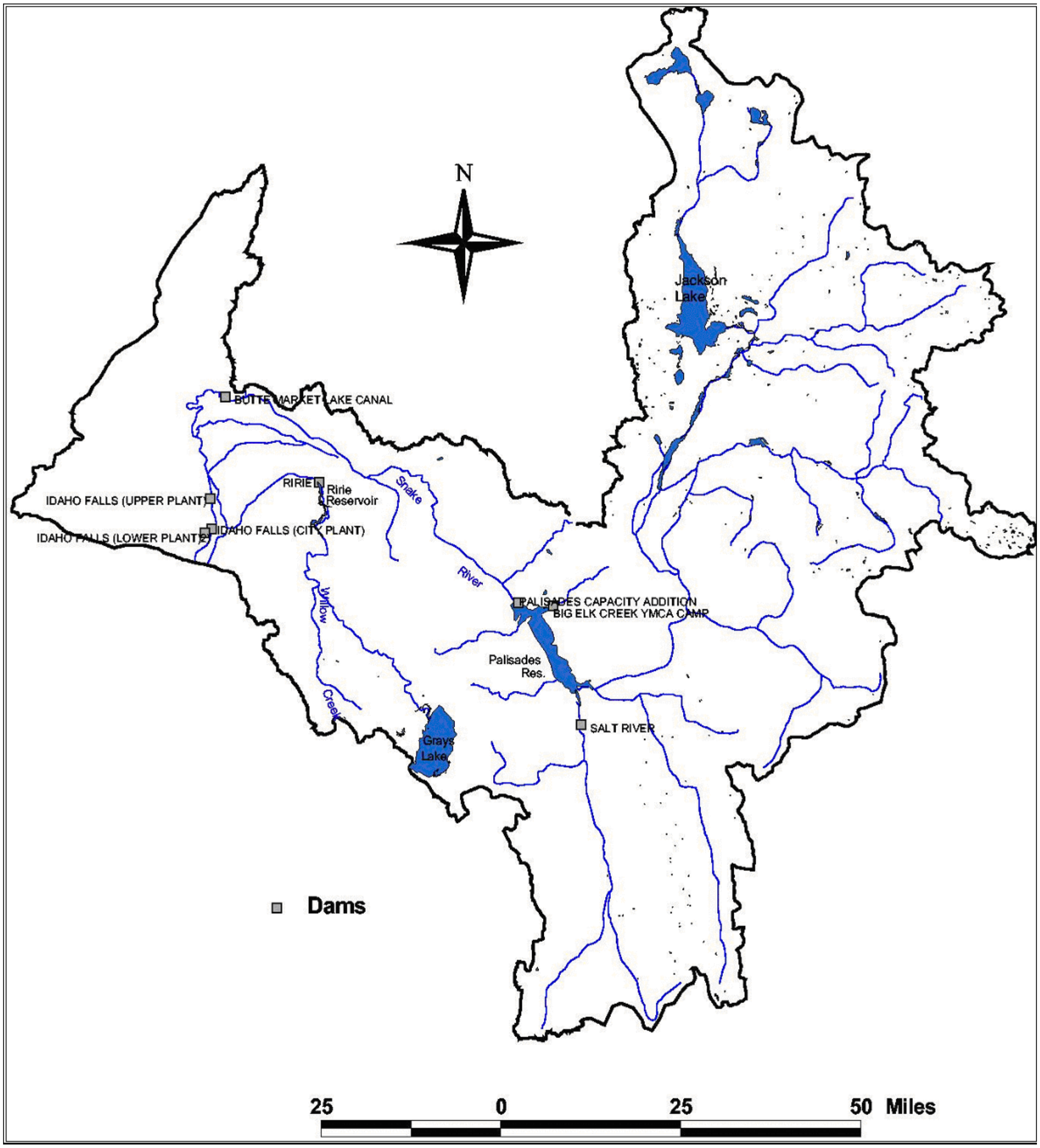


Figure 31. Dams and impoundments within the Headwaters Subbasin.

Table 28. Dams located in the Headwaters Subbasin

Stream Name	RRN	Dam_Name	Owner	DamOwnerType
Salt R & Tribs	17040105	Stewart Ranch	Stewart Bros Crow Creek Ranch	PRIVATE
Snake R	1704010401200	Palisades	DOI BR	FEDERAL
Snake R, Upper Sub Region	1704	Smoky Canyon	J R Simplot Co	PRIVATE
Tygee Cr	1704010501200	Smoky Canyon No 2	J R Simplot Co	PRIVATE
Idaho Falls R & Tribs	17040201	Ririe	DOI BR	FEDERAL
Palisades R & Tribs	17040104	Gem State	City Of Idaho Falls	LOCAL GOVERNMENT
Palisades R & Tribs	17040104	Power Dam No 1 Upper	City Of Idaho Falls	LOCAL GOVERNMENT
Palisades R & Tribs	17040104	Power Dam No 3	City Of Idaho Falls	LOCAL GOVERNMENT
Palisades R & Tribs	17040104	Upper Plant Dam #2	Idaho Falls, City Of	PUBLIC UTILITY
Snake R	1704020100100	City Plant	Idaho Falls City Of	PUBLIC UTILITY
Snake R	1704020604300	Gem State	Idaho Falls City Of	PUBLIC UTILITY
Snake R	1704020100100	Lower Plant	Idaho Falls City Of	PUBLIC UTILITY
Snake R	1704020100300	Upper Plant	Idaho Falls City Of	PUBLIC UTILITY
Snake R, Upper & Tribs	170402	Dog Creek	Idaho Fish And Game Department	STATE
Snake R, Upper & Tribs	170402	Egbert	Kevin Egbert	PRIVATE
Snake R, Upper & Tribs	170402	Mikesell Lower	Glen Moon And Lynn Bowman	PRIVATE
Snake R, Upper & Tribs	170402	Mikesell Upper	Glen Moon & Lynn Bowman	PRIVATE
Snake R, Upper & Tribs	170402	Ravencroft Diversion	Vernon F. Ravenscroft	PRIVATE
Snake R, Upper & Tribs	170402	Twin Buttes No 1	Idaho Department Of Lands	STATE
Snake R, Upper Sub Region	1704	Enders	Olive Enders	PRIVATE
Snake R, Upper-Rock R & Tribs	17040212	Star Falls	B & C Energy Inc	PRIVATE
Willow R & Tribs	17040205	Grays Lake - North End	DOI BR	FEDERAL

Snake-Salt River Basin

Recreation is a major use of the Snake River in Wyoming as the local economy has a tourism base. Fishing, wildlife viewing and white water recreation are popular uses of the river. Flood controls in areas downstream of Jackson Lake are of local concern. Levees must be constantly maintained to control spring flood flows. Growth in the Jackson area is also of concern as new development has converted former agricultural lands. The Salt River area in the southern basin is generally more agricultural in nature. However, southern communities are experiencing spillover growth from the Jackson area. Alluvial groundwater resources are adequate in the Snake River floodplain while deeper aquifers also exist. Salmon species management in the larger Snake River system are a concern for future river management.

Relevant Compacts and Decrees

The Snake River Compact between Wyoming and Idaho was signed in 1949. Water flows at the stateline are allocated 4% to Wyoming and 96% to Idaho. Wyoming must provide replacement storage for a portion of its allocation. The state entered into a contract with the Bureau of Reclamation in 1990 to purchase 33,000 acre-ft of storage in Jackson Lake for this purpose. The contract also outlines the management of flows below Jackson dam for trout fisheries.

National Elk Refuge

In addition to natural watercourses throughout the Jackson Hole Valley, many miles of constructed irrigation ditches are also present on the Elk Refuge, as are three wells and an enclosed water storage reservoir used by the Town of Jackson as a water supply.

Jackson Lake

Jackson Lake Reservoir Legislation

On June 3, 1948, Congressional consent was given to Idaho and Wyoming to enter into a compact to equitably divide and apportion the waters of the Snake River and its tributaries, but " ... nothing in this Act shall apply to any waters within ... Grand Teton National Park or shall establish any right or interest in or to any lands within the boundaries thereof or in subsequent additions thereto". (62 Stat. 294). In 1950, Congress approved the compact entered into by Idaho and Wyoming (64 Stat. 29, 34).

Legislation establishing the Park in 1950 (64 Stat. 849) and a Memorandum of Understanding of November 23, 1956 between the Service and the Bureau of Reclamation provide for operation of Jackson Lake Reservoir in the Park. Congress clearly intended that expansion of the Park would not conflict with Bureau of Reclamation operations or the rights of spaceholders in the reservoir. The Bureau retains complete and exclusive control of the flow and utilization of water in the reservoir, including the right to raise and lower the water level at will; however, the Bureau will fully consider maintaining a constant level from June through September. Any permits or licenses issued by the Service for use of lands covered by the memorandum (within the reclamation withdrawal) or that might affect the operation zone must have bureau concurrence. The Bureau will consult with the Service before developing anything in the operation zone that might affect recreational facilities or use. The Service must authorize occupancy or use of Federal lands other than in the operation zone for the reservoir. But the Bureau has access rights over all such lands. The Bureau, its contractors, lessees, and water users cannot be held liable for damage to lands covered by this agreement or structures thereon due to operation of the reservoir. Approximately 100 acres of the Parkway have been withdrawn by the Bureau of Reclamation to insure the operation and protection of the reservoir.

Jackson Lake Drawdown Management

Jackson Lake provides important habitat for Snake River cutthroat and lake trout, and is a popular recreations fishery. Lake trout spawn on rocky shoals in shallower water during the fall season. Lake levels need to be held stable during four months in the winter to maintain spawning habitat for lake trout. In most years, this means that the lake has been drawn down only to elevation 6,761 feet, and inflow is passed to maintain the surface elevation. In years when substantial releases from storage are required to meet irrigation demands, the lake is at a much lower elevation on October 1. Under current operations, Jackson Lake is drawn down before spawning begins and no further drafting occurs after October 1. This maintenance of a winter minimum pool prevents lake trout redds from being de-watered.

There are rare occasions when meeting the storage rights in Jackson Lake requires releases as low as 100 cfs for extended periods. The State of Wyoming owns rights to 33,000 acre feet of water in Palisades Reservoir which can be shifted to Jackson Lake to maintain lake levels or be release for maintain minimum flows below Jackson Lake in the winter (Snake River Resources Review: Aquatic Resources Parameters Manual, March 2001). Figure 32 graphically depicts the water storage capacity that has occurred currently (2001), during the previous year (2000), and the average for Jackson Lake Reservoir.

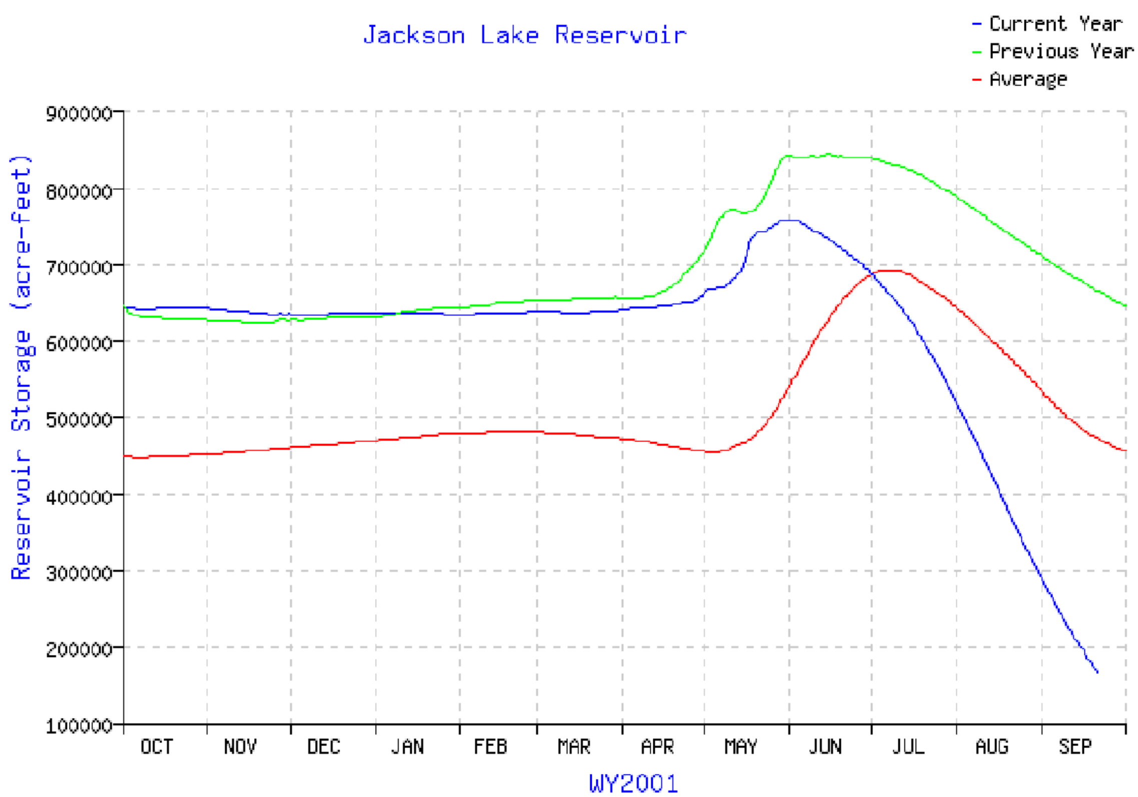


Figure 32. Current year (2001), previous year (2000), and average storage in Jackson Lake Reservoir, WY.

Jackson Lake Dam

Jackson Lake is a large natural lake located in a deep glacial and structural depression. Jackson Lake Dam was built at the outlet of Jackson Lake which raised the lake level 40 feet. The Dam, (Table 29) consists of a combined concrete gravity and zoned earthfill structure. The dam has a combined crest length of 4,920 feet at crest elevation 6780.5 feet. The dam is located on the South Fork Snake River in northwestern Wyoming, 30 miles north of Jackson, and impounds a reservoir containing 624,400 acre feet at elevation 6,760 feet. Principal benefits of the reservoir include irrigation storage, flood control, recreation, and fish and wildlife benefits. The dam was constructed at the mouth of a natural lake by the Bureau of Reclamation in 1910 - 1911, and enlarged in 1916. Completion of modifications in 1991 corrected the dam safety deficiency of inadequate seismic stability of the north embankment. The modification included strengthening the foundation of the north dike by dynamic consolidation and installing compaction piles, replacement of the embankment materials, widening and strengthening of the bridge deck on top of the concrete dam, widening of the south dike roadway, placement of an upstream parapet wall and downstream retaining wall for the south dike, and replacement of the outlet works gates, stems, and hoists.

Release facilities of the dam include a spillway and outlet works within the concrete gravity section, which is 65 feet high and 222 feet long. The spillway contains 19 radial gates above the crest at elevation 6762.5, 17 of which are 8-foot by 7-foot radial gates, and 2 of which are 10-foot by 7-foot, 10-inch radial gates. The radial gates are manually operated from the crest of the concrete section. The discharge capacity of the spillway is 8,700 ft^3/s at a reservoir water surface elevation of 6,769 feet.

The outlet works originally consisted of 20 conduit sections, each 6-feet, 6-inches-high and 8-feet-wide, within the concrete gravity section at invert elevation 6,728 feet, with flow controlled by manual controls on the dam crest. In 1977, five of the 20 conduits were backfilled with concrete to provide increased seismic stability. The remaining 15 conduits are controlled by 6- by 8-foot slide gates at the upstream face of the gravity section, which were replaced during recent modifications. The current discharge capacity of the outlet works is 23,600 ft3/s at a reservoir water surface elevation of 6,769 feet.

Jackson Lake Dam is located within a seismically active region. The most significant tectonic feature in the area is the Teton fault, located at the western edge of Jackson Hole along the base of the Teton Range. The Teton fault extends 50 to 60 miles in a north-south direction.

Table 29. General Statistics on Jackson Lake Dam.

General

- Vicinity Map
- Region (Map) .... Pacific Northwest
- State (Map) .... Wyoming
- County .... Teton
- Project .... Minidoka
- Dam type .... Concrete gravity with embankment wings
- Location .... Near Moran, WY
- Watercourse .... Snake River
- Reservoir .... Jackson Lake
- Original construction 1910-1911
- Latitude .... 43 51′ 36" N
- Longitude .... 110 35′ 24" W
- National ID Number WY01385
- Hydrologic Unit Code ....

Hydraulics

- Active storage to El. 6760 .... 624,000 acre-ft
- Service spillway Capacity at El. 6769................. 8,690 cfs
- Outlet works Capacity at El. 6769.5 .... 24,000 cfs

Dimensions

- Crest Elevation .... 6777.0 ft
- Structural Height .... 65.5 ft
- Hydraulic Height .... 42 ft
- Crest Length .... 4,920 ft
- Crest Width .... 24 ft
- Base Width .... 72 ft

Hydrology

- Drainage area .... 1,824 sq mi
- Hydrometeorological Report .... NA
- PMF .... Thunderstorm
- Volume .... 105,000 acre-ft
- Peak inflow .... 177,800 cfs
- Maximum water surface .... 6770.3 ft

Dynamic Loads

- Natural frequency ....
- MCE ....
- Peak acceleration ....

Geology

- Foundation: Rock ledge about 30 feet thick underlain by a 10 foot layer of stiff, blue clay overlying second rock formation. (Source: http://dataweb.usbr.gov/dams/wy01385.htm)

Palisades Dam

The Palisades Project (Table 30) is a multiple-purpose development involving irrigation, power, flood control, recreation, and fish and wildlife conservation. Palisades Dam is on the South Fork of the Snake River at Calamity Point in eastern Idaho about 11 miles west of the Idaho-Wyoming boundary. The project provides a supplemental water supply to about 670,000 acres of irrigated land in the Minidoka and Michaud Flats Projects. The 176,600 kilowatt hydroelectric powerplant furnishes energy needed in the upper valley to serve irrigation pumping units, municipalities, rural cooperatives, and other power users. The principal features of the project are Palisades Dam, Reservoir, and Powerplant.

Table 30. General Statistics on Palisades Dam.

General

- Region (Map) : .... Pacific Northwest
- State: .... Idaho
- County .... Bonneville
- Project: .... Palisades
- Dam type: .... Earthfill
- Location: .... 7 mi SE of Irwin
- Watercourse: .... SF of Snake River
- Reservoir: .... Palisades
- Construction Date: 1951-1957
- Latitude:..................... .... 43 19' 48"N
- Longitude:...................... ... 111 12' 18"W

Dimensions

- Crest Elevation of Dam: .... 5630.00 ft
- Structural Height of Dam: .... 270.00 ft
- Crest Length: .... 2100.00 ft
- Top of Joint Use: ....5620.00 ft
- Top of Active Conservation: .... 5497.90 ft
- Top of Inactive Conservation: ......5497.90 ft
- Spillway Crest: ....5570.00 ft
- Top of Dead Storage: .... 5452.43 ft
- Streambed at Dam Axis : .. .. 5372.00 ft

Hydraulics

- Normal Water Surface Elev: .... 5497.9 ft
  Hydraulic Height: .... 249.0 ft
- Service Spillway Type:
- Uncontrolled Crest .... No
- Morning-Glory .... No
- Crest Length .... 2x50 ft
- Gated .... Yes
- Capacity at Elev: 5621.0 ft, 48,500 cfs
- Auxiliary Spillway .... No
- Capacity at Elev. .... NA
- Outlet Works Capacity at
- Elevation 5621.0 ft., ...33,000 cfs

Hydrology

- Drainage Area: .... 5150.0 sq mi
- Hydrometeorological Report(HMR) HMR 43
- Flood Type: .... June General
- Storm Duration: .... 72 hrs
- Probable Maximum Flood (PMF) Report:
- Peak Inflow: .... 172,400 cfs
- Inflow Volume: .... 2,837,000 acre-ft
- Flow Duration: .... 30 days
- PMF Routing MWS Elev.: .... NA
- Initial Routing Elev: .... 5620.0 ft
- Study Date: .... December 1982

Source: http://dataweb.usbr.gov/dams/id00273.htm

Palisades Dam Plan

The project, in addition to providing needed holdover storage, helps control floods, develops a substantial block of power, and permits the annual storage of about 135,000 acre-feet of water saved by shutting off canals in the upper valley during the winter. This water is stored to the credit of and delivered to the water users who make the savings possible. Releases from Palisades Reservoir are diverted and carried to the land by previously constructed facilities.

Principal facilities of the Palisades Project include:

- one storage dam with a total active capacity of 1,200,000 acre-feet (Table 31) (Water storage for the current year (2001), previous year (2000) and average storage are depicted in Figure 33.)
- one powerplant with a capacity of 176,564 kilowatts,
- one substation, and
- 0.44 miles of transmission lines.

Table 31. Monthly average storage (1000 acre feet) in Palisades Reservoir.

Time Span	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
45 yrs 1956-2000	884	936	969	983	990	934	893	1023	1250	1116	971	886
30 yrs 1961-1990	970	1016	1036	1044	1063	1013	950	1055	1303	1182	1045	965

Ref: http://idsnow.id.nrcs.usda.gov/snow/data/basin_reports/resv/resvtab.txt

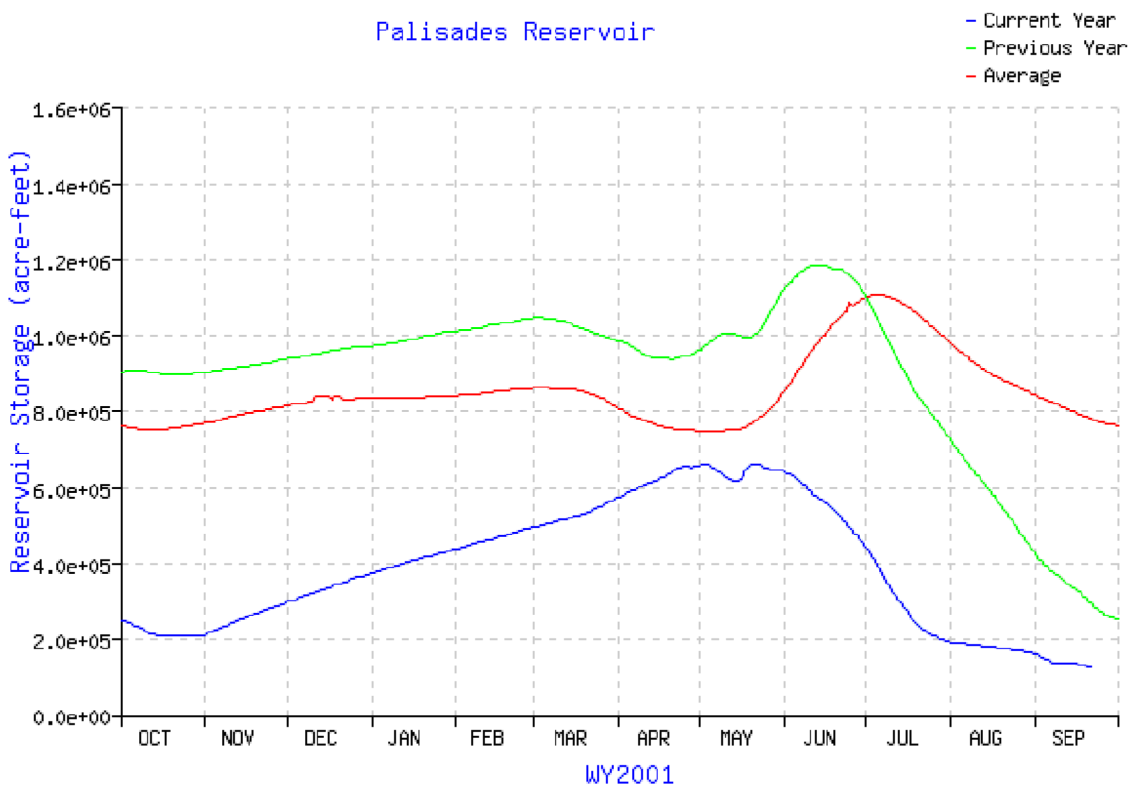


Figure 33. Current (2001) and previous (2000) year water storage at Palisades Reservoir.

Diversion Dams

There are no diversion dams within the Palisades drainage basin.

Palisades Drainage Basin

Palisades Dam is located in the NE 1/4 of sec. 17, T. 1S., R. 45E., about 7 miles southeast of Irwin, Idaho, and 25 miles out-southwest of Jackson, Wyoming. Elevations across the basin range from 5,639 feet at Palisades Dam to 13,762 feet at Grand Teton. The total basin area is 5,090 square miles.

Palisades Dam and Powerplant

Palisades Dam and Reservoir is located in Bonneville County, Idaho, on the South Fork of the Snake River, seven miles upstream from Irwin, Idaho, and 55 miles southeast of Idaho Falls, Idaho.

The dam and Reservoir provides supplemental water to 650,000 acres, thus providing crop insurance for about 60 irrigation districts and canal companies located in southeaster Idaho. About 28,200 acres of new irrigation development also benefit from the stored water. The hydroelectric powerplant is equipped with four 28,500-kilowatt generators, which supply power for irrigation pumping plants and commercial loads. After a recent upgrade, it operates four generators, each with a capacity of 44.1 megawatts for a total of 176.6 megawatts. About two million acre-feet of water are used annually for power.

Located on the Snake River about 55 miles southeast of Idaho Falls, Idaho, Palisades Dam is a large zoned earthfill structure 270 feet high, has a crest length of 2,100 feet, and contains 13,571,000 cubic yards of material. At the time of construction, this was the largest volume of material placed in a dam by the Bureau of Reclamation.

The spillway at Palisades Dam is controlled by two 20-foot by 50-foot radial gates. Spillway inflows are directed into a 28-foot-diameter tunnel through the left abutment, with a capacity of 48,500 cubic feet per second. The outlet works and power inlet structures are controlled by a fixed-wheel gate at the entrances of the inclined shafts leading to 26-foot-diameter tunnels.

The outlet works consist of one main tunnel branching into six separate outlets numbered 1 through 6. Regulation of flow through 1, 2, 5 and 6 is accomplished by 7-foot 6-inch by 9-foot outlet gates. Flow through outlets 3 and 4 is regulated by 96-inch diameter hollow jet values. The outlet tunnel conveys the water to the steel manifold transition section, where it is released to the stilling basin by regulating gates. At the lower end of the power tunnel, the water may be released to the stilling basin or to four penstocks and conveyed to the turbines for power generation. The capacity of the outlet works is 33,000 cubic feet per second. The dam creates a reservoir of 1,401,000 acre-feet capacity (active 1,200,000 acre-feet).

The powerplant is on the downstream toe of the dam on the west side of the river and initially had a total capacity of 118,750 kilowatts. The powerplant was uprated in 1994 and all four units were rewound increasing the nameplate capacity to a total of 176,600 kilowatts; 44,150 kilowatts each. As part of the mitigation for the powerplant uprate, a fish screen was constructed on Palisades Creek, a small tributary which joins the Snake River approximately three miles downstream from the dam.

Investigations

Following the drought period of the early 1930's, a need was recognized for additional storage for lands already under irrigation in the Minidoka Project and in private developments, and investigations of various reservoir sites were made upstream from American Falls Dam. The Palisades site was selected for the construction of the dam and reservoir to provide holdover storage to supplement the water supply for existing irrigated lands, to develop a limited acreage of new lands, to provide flood control, and to generate electrical power. The Bureau of Reclamation started intensive investigations at the location as now developed in 1934.

Authorization

The project was initially authorized by the Secretary of the Interior on December 9, 1941, under the provisions of Section 9 of the Reclamation Project Act of 1939 (53 Stat. 1187). Reauthorization of the project by the Congress was granted on September 30, 1950 (Public Law 864, 81st Cong.), substantially in accordance with a supplemental report approved by the Secretary of the Interior on July 1, 1949. The authorized purposes of the Palisades Project are irrigation, power, flood control, and fish and wildlife.

Construction

The preconstruction phase of the project was started early in 1945. Construction was delayed until the close of World War II and until local interests gave satisfactory assurance to the Bureau of Reclamation that they would agree to important practices in the efficient water use of the entire Upper Snake River Basin through the workings of winter water savings and exchange agreements that were entered into by some 57 water entities as a part of the Palisades Project. Actual construction of the project was initiated in 1951 and completed in 1957. All generating units of the powerplant were in operation by May 1958.

Irrigation

Palisades Dam provides holdover storage during years of average or above average precipitation for release in ensuing dry years to lands of the Upper Snake River Valley, the area served by diversions from the river above Milner Dam. This holdover storage assures an adequate supply of supplemental water for over 670,000 acres of irrigated lands in the valley. Principal crops are grain, alfalfa, pasture, dry beans, potatoes, sugar beets, other vegetables, and seeds.

Recreation

Palisades Reservoir is in a scenic river valley with forested hillsides rising from the water to the towering snowcapped mountains, which form the background. Since U.S. Highway 26 parallels the reservoir; much of the recreational use is by tourists. The reservoir has about 70 miles of shoreline and six access roads have been built. The Targhee National Forest headquartered in St. Anthony, Idaho administers recreation at Palisades Reservoir. Public use facilities include six campgrounds, five picnic areas, and six boat ramps. Two boat clubs have facilities on the reservoir and 74 private cabins have been constructed under lease from the Forest Service. The Bureau of Reclamation has developed a day-use area and campground below the dam to provide fishing and boat launching on the Snake River.

Water Contract

In 1991, the State of Wyoming entered into a contract with the Bureau of Reclamation for the purchase of 33,000 acre-feet of "joint use" space in Palisades Reservoir. All Palisades Reservoir spaceholder contracts provide for use of a proportionate share of the water accruing to the Palisades Reservoir water rights, the ability to keep unused stored water for use in subsequent years, and the option of participating in the Water District 1 Rental Pool. Additionally, Wyoming has the option of making exchanges to allow the use of their Palisades Reservoir space to retain water in Jackson Lake or to increase winter flows in the Snake River cutthroat trout. The Palisades space also insures Wyoming's ability to fulfill Snake River Compact obligations.

Hydroelectric Power

The Palisades Powerplant serves large irrigation pumping power requirements on and near the Minidoka Project in southern Idaho. Power not needed for Bureau of Reclamation project purposes is marketed in the Federal Southern Idaho Power System administered by the Bonneville Power Administration.

Flood Control

The project also provides substantial flood control benefits. A flood control-operating plan has been established with the Corps of Engineers and several local interests. The plan provides for the joint use of storage capacity during flood seasons for irrigation and flood control on the basis of periodic runoff forecasts. Flood control space is held in Jackson Lake and Palisades Reservoir on a forecast basis to control the Snake River near Heise, about 48 miles below Palisades Dam, to no more than 20,000 cubic feet per second.

Ririe Reservoir

Ririe Reservoir is drawn down to 35,000 acre-feet by November 1 annually to provide for winter flood control storage (USBR 1997). Drafting to this elevation does not begin until after Labor Day. (Ref: Snake River Resources Review: Aquatic Resources Parameters Manual, March 2001) (http://dataweb.usbr.gov/dams/id00344.htm)

The Ririe Project (Table 32) was constructed to impound and control the waters of Willow Creek, a Snake River tributary in eastern Idaho, for flood control, irrigation, and recreation. Significant fish and wildlife protection measures also are included. Major features of the project include Ririe Dam and Lake, and a floodway bypass outlet channel.

Table 32. General Statistics for Ririe Reservoir.

General

- Region (Map) : .... Pacific Northwest
- State: .... Idaho
- County .... Bonneville
- Project: .... Ririe
- Dam type: .... Earthfill
- Location: .... 6 mi SE of Ririe
- Watercourse: .... Willow Creek
- Reservoir: .... Ririe
- Construction Date: 1970-1977
- Latitude:...................... .... 43 35' 00"N
- Longitude:................ .... 111 44' 33"W

Hydraulics

- Normal Water Surface Elev: .. ... 5112.8 ft
- Hydraulic Height: .... 174.0 ft
- Service Spillway Type:
- Uncontrolled Cres.t .... No
- Morning-Glory .... No
- Crest Length .... NA
- Gated .Yes Capacity at Elev: 5118.6 ft 40,000 cfs
- Auxiliary Spillway .... No
- Capacity at Elev. .... NA
- Outlet Works Capacity at Elevation 5119.0 ft. .... 4,250 cfs

Source: http://dataweb.usbr.gov/dams/id00344.htm

Dimensions

- Crest Elevation of Dam: .... 5128.0 ft
- Structural Height of Dam: .. .. 253.0 ft
- Crest Length: .... 1070.0 ft
- Top of Joint Use: .... 5112.8 ft
- Top of Active Conservation: .... 5112.8 ft
- Top of Inactive Conservation: ....5023.0 ft
- Spillway Crest: .... 5093.0 ft
- Top of Dead Storage: .... 4997.0 ft
- Streambed at Dam Axis : .. .. 4950.0 ft

Hydrology

- Drainage Area: .... 487.0 sq mi
- Hydrometeorological Report(HMR): HMR 43
- Flood Type: .... Winter General
- Storm Duration: .... 72 hrs
- Probable Maximum Flood (PMF) Report:
- Peak Inflow: .... 47,000 cfs
- Inflow Volume: .... 178,000 acre-ft
- Flow Duration: .... 7 days
- PMF Routing MWS Elev.: .... 5118.6 ft
- Initial Routing Elev: .... 5090.4 ft
- Study Date: .... February 1966

Ririe Reservoir Plan

Ririe Lake, formed by the construction of Ririe Dam, serves a principal purpose of flood control on the lower reaches of Willow and Sand Creeks. Out of a total reservoir capacity of 100,500 acre-feet, 10,000 acre-feet is dead and inactive space, 80,500 acre-feet serves both flood control and irrigation, and the top 10,000 acre-feet is held exclusively for emergency flood control operations.

Principal facilities of the Ririe Project include one storage dam with a total active capacity of 90,500 acre-feet and one floodway or outlet channel. The following table (Table 33) shows the monthly average storage of the dam since its construction.

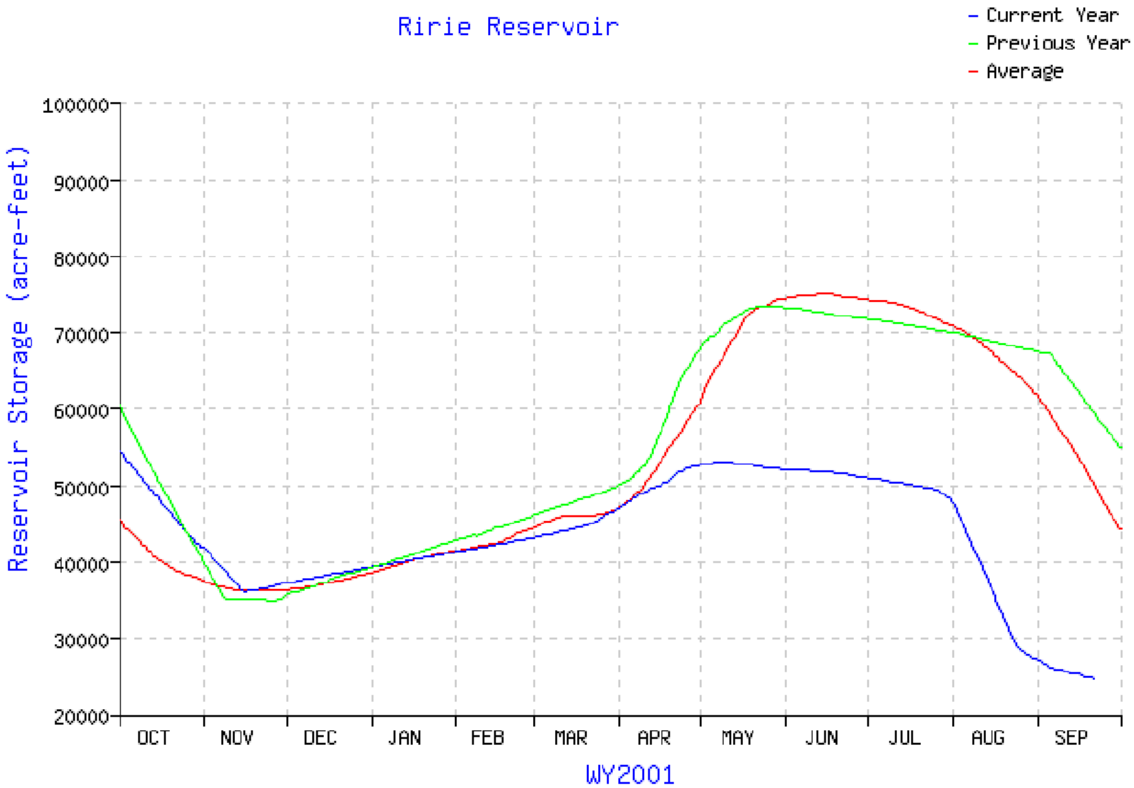


Figure 34 shows the storage for current year (2001), previous year (2000) and the average of the two years.

Table 33. Monthly average storage (1000 acre feet) in Ririe Reservoir.

Time Span	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
25 yr Avg 1976-2000	33.6[a]	32.5[a]	34.5[a]	35.8	38.5	41.6	56.2	70.3	70.0	67.1	58.2	43.5
15 yr Avg 1976-1990	33.0[b]	31.8[b]	33.8[b]	34.1	36.7	39.5	53.5	68.3	68.5	64.6	55.2	39.8

[a] Based on 24 yr average [b] Based on 14 yr average
Ref: http://idsnow.id.nrcs.usda.gov/snow/data/basin_reports/resv/resvtab.txt

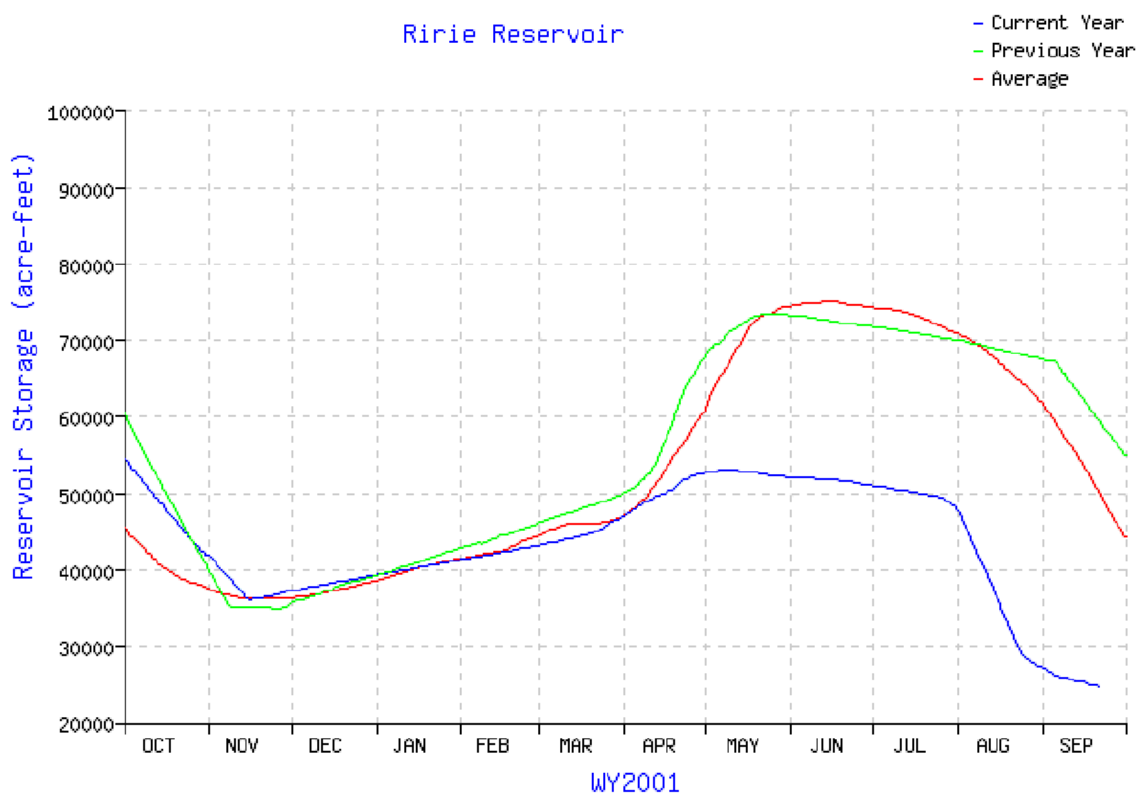


Figure 34. Current (2001), previous (2000), and average water storage in Ririe Reservoir.

Diversion Dams

There are no diversion dams within the Ririe Reservoir drainage.

Ririe Dam and Lake

Ririe Dam is located on Willow Creek, a minor tributary of the Snake River, in Bonneville County of eastern Idaho about 15 miles northeast of the city of Idaho Falls and about 4 miles southeast of the town of Ririe. The Corps of Engineers constructed the dam during the period 1970-1977. The dam is a zoned earth and rockfill structure with a structural height of 253 feet, a hydraulic height of 169 feet, and a crest length of 1,076 feet. The reservoir impounded by the dam has a total capacity of 100,500 acre-feet (active 90,500 acre-feet).

The outlet works consists of an intake structure, gate controlled outlet conduit, stilling basin, and service bridge. The water from the intake structure is discharged into a reinforced concrete conduit, and the conduit carries the water through the main dam to the stilling basin on the downstream side of the dam.

The spillway is a gated two-bay concrete gravity structure. Each bay contains a 40.5-foot wide by 27.32-foot high radial (tainter) gate with no provisions for stoplogs. The spillway contains an ogee crest at elevation 5,093 feet. The ogee crest is located immediately downstream from the bottom of the radial gates. The spillway is divided into three monoliths with construction joints at the centerline of the ogee crest.

The Ririe Dam Project is a multiple-purpose development involving irrigation, flood control, and recreation. Significant fish and wildlife protection measures are also included. Major features include Ririe Dam, Ririe Reservoir, and an outlet channel which serves as a flood way to control project flood releases.

Floodway or Outlet Channel

The floodway or outlet channel is a structure to control the water flow in Willow Creek below the dam, especially that section flowing through Idaho Falls and the area northeast of the city. Also controlled is Sand Creek as it flows east and southeast of Idaho Falls. Required releases of 1,900 cubic feet per second from Ririe Lake can be carried adequately in the natural channel to the point where the stream divides into Willow and Sand Creeks. The floodway bypass begins on Willow Creek just downstream from the point where Sand Creek branches from Willow Creek and extends directly west 7.8 miles to enter the larger natural channel of the Snake River 4.5 miles north of Idaho Falls. The bypass is gated at the Willow Creek intake to control initial inflow. The north bank of the channel was constructed at ground level to permit surface inflow of floodwaters along its course. Sand Creek can adequately carry 1,000 cubic feet per second and the floodway bypass channel was designed to carry 900 cubic feet per second, thereby providing the required additional capacity to control water flows.

Early History

Since 1911, at least eight spring floods and nine winter floods have caused considerable damage in the area of Ririe and Idaho Falls. The largest known floods were those of 1917 and 1962. The 1917 flood was a spring snowmelt flood augmented by rainfall peaking at 4,200 cubic feet per second in Willow Creek near Ririe. Some 3,000 acres of land were inundated for 2 to 3 weeks. The 1962 flood was a winter rain flood augmented by frozen ground and snowmelt, peaking at 5,080 cubic feet per second in Willow Creek above its confluence with Sand Creek. About 54,000 acres were inundated for 2 to 3 days. Flows above 2,000 cubic feet per second that occur about 3.5 miles below the present damsite cause flooding conditions

Investigations

The review report on "Columbia River and Tributaries," dated June 1949, prepared by the Corps of Engineers and printed as House Document 531, 81st Congress, 2nd session, summarized field studies for storage and channel works on Willow Creek and indicated that flood control works were not economically feasible at that time. The Upper Snake River Basin report of 1961, prepared jointly by the Corps of Engineers and the Bureau of Reclamation, indicated that Ririe Dam and Reservoir warranted early construction. Interim Report No. 3, dated March 1962 and prepared by the Corps, presented additional information on structures and costs, economic analysis, and operating procedures. This report included a brief summary of the February 1962 flood, with comments on the control of such a flood by storage at the Ririe site.

Authorization

Construction of Ririe Dam and Reservoir was authorized by the Flood Control Act of October 23, 1962 (76 Stat. 1193, Public Law 87-874). House Document No. 562 served as the basis for that authorization. Project purposes are irrigation, flood control, and recreation.

Construction

Project construction was performed under the jurisdiction of the Corps of Engineers. Construction of the dam began in January 1970 and was completed in November 1977. Floodway channel work began in June 1975, and was completed in February 1978. Recreation area work was started in May 1977, and was completed in June 1979.

Flood Control

Coordinated operation of Ririe Dam and the floodway bypass channel will control the flows in Willow and Sand Creeks to help alleviate flood damages such as those previously experienced in the city of Idaho Falls and on surrounding farmlands. The devastating floods of 1917 and 1962 were created by flows more than double the 2,000-cubic-foot-per-second capacity of Willow Creek. With the present control structures, Willow Creek can be contained at 1,900 cubic feet per second.

Idaho Falls Power

Idaho Falls Power is a municipal electric utility serving the corporate city limits of Idaho Falls, Idaho. The City has operated the utility continuously since its establishment in 1900 and serves approximately 19,750 residential and 3,035 commercial customers. The service area encompasses approximately 17 square miles and is served by 370 miles of transmission and distribution lines.

Idaho Falls Power owns and operates hydropower facilities located in the Snake River Subbasin. Current operations include the Upper Power Plant, City Plant, Lower Plant, Old Lower Plant, and the Gem State Plant. The Upper Plant and the City Plants are low head "bulb-turbine" plants which operate with approximately 18 feet of net head. The 16 foot diameter runner blades turn at approximately 94.7 rpm. Both plants are classified as "run-of-the-river" plants and require approximately 6,000 cfs for peak output of approximately 7.4 MWatts each. In an average year the Upper and City Plants generate 5.6 and 5.2 MWatts annually. The reservoir surface acres for the Upper plant is 100 and for the City plant, 50 acres. The Upper plant is constructed with two separate dams which creates an island between the two waterways. This island provides significant riparian habitat as well as wetlands. The City plant does not expressly provide wetland type habitat but is almost always home to hundreds of both wintering and nesting ducks and geese. Migratory birds frequently stop off in the City plant forebay to rest along their journey.

Both the Upper and City plants were originally designed with fish ladders incorporated into the water passage way, however, through the permitting and licensing process were removed from the design prior to construction. The ruling resource agencies specifically required Idaho Falls to not install the fish ladders to limit the upstream migration of Utah chubs, suckers, and whitefish into the two "blue-ribbon" trout fisheries upstream, the North (Henrys) fork and the South fork of the Snake River. This stretch of the Snake River does not have any anadromous fish species due to Shoshone Falls.

The lower plant is basically the same as the City Plant with some differences as follows: The reservoir surface is approximately 100 acres, the same as the upper plant. The lower plant generates at an annual average of 5.6 MWatts with a peak of 7.5 MWatts. During certain times of the year there will be enough water flow in the river to operate the old lower power plant units which are installed adjacent to the bulb turbine. These two lower units can produce around 3.6 MWatts when operating by themselves, however, more like 2 MWatts when the bulb turbine is operating. The plants both have approximately 18 feet of net head and all together need around 8,000 cfs to generate maximum output.

The Gem State power plant is a much larger development including large amounts of both on-site mitigation as well as off-site mitigation. The power plant is rated at 24 MWatts and operates on 45 feet of net head. The reservoir is approximately 300 acres and runs approximately 7,000 cfs for maximum generation. This plant includes a large spillway capable of passing 140,000 cfs if necessary. On-site mitigation includes a 4.5 acre riparian parcel located upstream of the power plant, various islands in Gem Lake, a long island with substantial nesting and vegetation located between the main river channel and the tailrace channel. Idaho Falls Power has also developed a 5.5 acre children's fishing pond which is constructed with approximately 2/3 of the area as shallow water wetland habitat. The mitigation pond is typically covered with various water birds including egrets, geese, ducks, herons, terns, seagulls, among others. During construction of Gem State, the City also purchased and developed a 55 acre off-site mitigation area near the Menan area north of Idaho Falls. This area provides significant riparian, wetland, and scrub type habitats. The area is heavily used by moose, deer, eagles, osprey, and smaller birds and animals. This area is open to the public via foot traffic only and is managed by the Idaho Department of Fish & Game in cooperation with the BLM and Idaho Falls Power. (personal e-mail communication, McBride, S., October 2001)

Utah Power

Utah Power, founded in 1912, is part of PacifiCorp, an energy company with diverse holdings and 1.6 million customers in its six-western state service area. Utah Power serves about 650,000 customers in Utah and Idaho. PacifiCorp recognizes that many of its business activities have an impact on the environment locally and globally, but is committed to providing energy in a responsible manner. The company has programs that promote environmental stewardship, protect fish and wildlife, conserve energy, prevent pollution, recycle materials and reduce waste. The company is noted for innovative customer service, high environmental standards and programs recognized with national awards and spirited participation in the communities it serves.

A portion of PacifiCorp's electrical generation is from hydro resources, so PacifiCorp is involved in extensive studies of fish and habitat, recreation, land use, cultural resources and water quality. These studies are conducted at each of the company's projects as part of the mandatory hydroelectric relicensing process. Results of these studies can serve as the base for future decisions concerning habitat enhancement or preservation, modifications in stream flows, recreation and land uses or fish screens and fish ladders.

Habitat preserved for wildlife is also habitat preserved for people. Adjacent to thermal and hydro-generating projects, PacifiCorp has developed 53 recreational areas open to the public. The sites offer outdoor activities such as camping, picnicking, fishing and birdwatching.

Eagles, raptors and other large birds interact with power lines causing outages and injury to the birds. PacifiCorp's nationally recognized bird power line program proactively manages its activities to reduce bird-related outages and raptor mortalities. The company has installed hundreds of nesting platforms or perches for osprey and other raptors (including eagle nesting platforms on transmission towers from Oregon to Idaho). New lines are constructed to raptor-safe standards and existing problem lines can be modified or protective devices installed to protect birds and improve service.

Protected Areas

A diverse range of protected areas is present within the Snake Headwaters Subbasin. These specially designated areas include vast wilderness and roadless areas, relatively small ecological reference areas, wild and scenic rivers, national recreation areas, and fishing and hunting access areas (Figure 35). Idaho Conservation Data Center, Idaho Department of Fish and Game maintain detailed information on these conservation sites and specially managed areas.

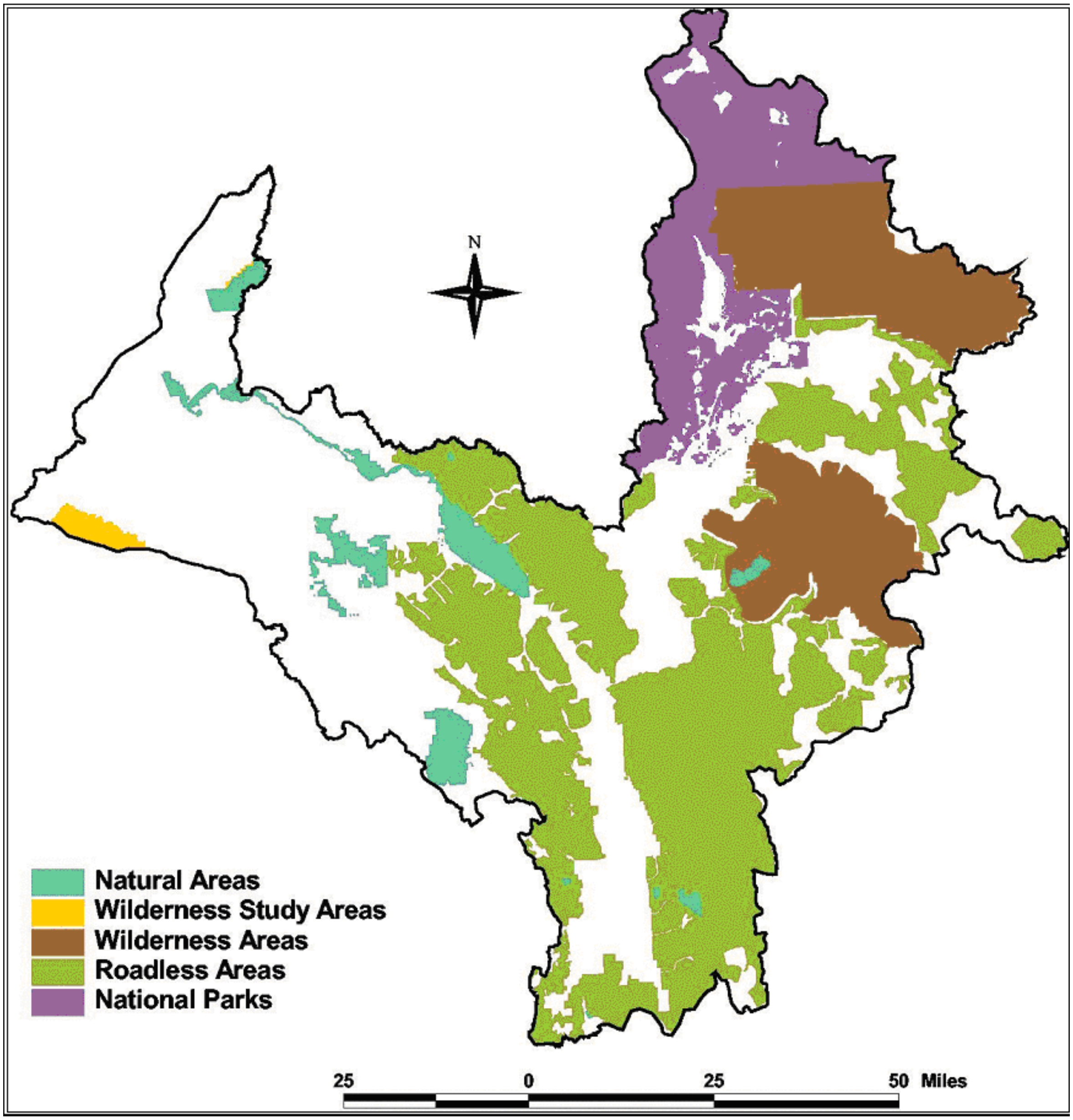


Figure 35 Protected areas within the Headwaters Subbasin.

The Snake Headwaters Subbasin encompasses portions of two major Wilderness Areas, Gros Ventre and Teton, and two National Parks, Yellowstone and Grand Teton. Forty-three USDA National Forest System roadless areas are identified in the subbasin (Table 34). These occur in the ridgecrests and peaks of the Caribou, Wyoming, and Gros Ventre ranges. Three USDI Bureau of Land Management wilderness study areas are present within the Idaho Falls and Palisades watersheds. The wilderness study areas are named: ID-33-015, SANDS WSA, and ID-34-002.

Table 34. Summary of USDA National Forest System Inventoried Roadless Areas within Snake Headwaters Subbasin.

Roadless Area Name	SHW	GVT	GHB	SAL	PAL	WIL	IF
Bald Mountain					X	X	
Bear Creek					X	X	
Caribou City				X	X	X	
Dry Ridge				X			
Dunoir Special Management Unit	X						
Gannett Hills - Spring Creek				X			
Gannett Spr				X			
Garns Mountain					X		
Grayback Ridge			X		X		
Gros Ventre Mountains			X				
Lake Alice - Commissary Ridge				X			
Meade Pk				X			
Monument Ridge			X				
Mosquito Lake - Seven Lakes		X					
Munger Mountain			X				
Pacific Creek - Blackrock Creek	X						
Palisades			X		X		
Phillips Ridge			X				
Poker Peak					X		
Pole Creek					X	X	
Red Mtn.				X			
Sage Creek				X			
Salt River Range			X	X			
Sheridan Pass		X					
South Wyoming Range			X				
Spread Creek - Gros Ventre River	X	X					
Stump Creek				X			
Teton Corridor Trailheads	X						
Togwotee Pass	X						
Warm Spring Creek		X					
West Slope Tetons	X		X				
Wilderness Study Area			X		X		

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

Fourteen relatively small, highly protected ecological reference areas are present within the subbasin. These include USDA Forest Service Research Natural Areas and Special Interest Areas, USDI Bureau of Land Management Research Natural Areas and

Areas of Critical Environmental Concern, and The Nature Conservancy preserves. Research Natural Areas provide pristine, high quality, representative examples of the important ecosystems within the subbasin. These sites combine with the large tracts of undeveloped land within the subbasin to provide excellent opportunities for research 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 subbasin. Rust (2000) provides an assessment of the representation of ecological components and identifies targets for selection of new conservation sites within the subbasin. USDA Forest Service Research Natural Areas and USDI Bureau of Land Management Research Natural Areas and Areas of Critical Environmental Concern management guidelines are identified by site-specific establishment documents and decision notices.

Starting in 1983, the Northwest Power Planning Council (Council) directed studies of existing habitat throughout the Columbia Basin. These studies (1) identified fish and wildlife resources of critical importance to the region, and (2) concluded mitigation techniques alone cannot reverse all adverse impacts of hydroelectric development on these resources. The Council, relying on these studies, designated certain reaches in the basin as "protected areas", where the council believes hydroelectric development would cause an unacceptable risk of loss to fish and wildlife resources of concern, their productive capacity, or their habitat. Protected Reaches in the Headwaters Subbasin are listed in Table 35 (Streamnet, 2001).

The Gros Ventre Wildnerness, a 300,000 acre parcel of land that rises from an elevation of 6,000 to a height of 8,000 feet, became a part of the 1964 National Wilderness Preservation System. The National Wilderness Preservation System was created from the law known as the Wilderness Act. It grew from the recognition that the heritage of wildlands was in danger of being lost to expanding population and settlement. The purpose of the law was, therefore, to "secure for the American people of present and future generations the benefits of an enduring resource of wilderness." The Wilderness Act gives the American people the world's only National Wilderness Preservation System. Designated to remain forever wild are some lands within National Forests, National Parks and Monuments, National Wildlife Refuges, and public lands managed by the Bureau of Land Management. Only Congress can designate a Wilderness. Section 2 of the Act gives the U.S. Forest Service a mandate to manage these acres so they are "an enduring resource," one that remains "unimpaired for future use and enjoyment as wilderness."

Table 35. Stream segments “protected” from hydroelectric development in the Headwaters Subbasin.

Stream	Tributary To	Reach Starts At	Reach Ends At	RRN	Reach Length [a]	Protected Category	Institutional Constraints
Birch Cr	Willow Cr	Mouth	Squaw Cr	1704020500700.00	1.1	Unprotected	None
Birch Cr	Willow Cr	Squaw Cr	Headwaters	1704020503200.00	6	Unprotected	None
Brockman Cr	Grays Lake Outlet	Mouth	Sawmill Cr	1704020502500.00	5.7	Resident Fish and Wildlife	None
Brockman Cr	Grays Lake Outlet	Sawmill Cr	Corral Cr	1704020502501.00	1.3	Resident Fish and Wildlife	None
Brockman Cr	Grays Lake Outlet	Corral Cr	Headwaters	1704020502502.00	3.3	Resident Fish and Wildlife	None
Burgess Cr	Dry Bed	Mouth	Headwaters	1704020101300.00	16.2	Unprotected	None
Conant Cr	Falls R	Mouth	Squirrel Cr	1704020301000.00	5.9	Wildlife Only	None
Conant Cr	Falls R	Squirrel Cr	Headwaters	1704020301100.00	25.5	Wildlife Only	None
Conner Cr	Cassia Cr	Mouth	Headwaters	1704021005300.00	6.4	Unprotected	None
Corral Cr	Brockman Cr	Mouth	Headwaters	1704020503800.00	4.3	Resident Fish and Wildlife	None
Corral Cr	Camas Cr	Mouth	Corral Cr, E Fk	1704022002300.00	10.5	Unprotected	None
Corral Cr	Trail Cr	Mouth	Headwaters	1704021902700.00	4.6	Wildlife Only	None
Corral Cr, E Fk	Corral Cr	Mouth	Headwaters	1704022002400.00	5.2	Unprotected	None
Corral Cr, W Fk	Corral Cr	Mouth	Headwaters	1704022002500.00	5.8	Unprotected	None
Cow Cr	Camas Cr	Mouth	Headwaters	1704022003100.00	7.8	Unprotected	None
Cow Cr	Camas Cr	Mouth	Headwaters	1704022003300.00	5.9	Unprotected	None
Cranes Cr	Willow Cr	Mouth	Headwaters	1704020501000.00	11.3	Resident Fish Only	None
Dry Bed	Snake R	Mouth	Burgess Cr	1704020101100.00	4.8	Unprotected	None
Dry Bed	Snake R	Burgess Cr	Headwaters	1704020101101.00	24.5	Unprotected	None
Fall Cr	Lake Fk	Mouth	Headwaters	1704021005900.00	2.2	Resident Fish Only	None
Fall Cr	Snake R	Mouth	Headwaters	1704020900900.00	8.5	Unprotected	None
Grays Lake Outlet	Willow Cr	Mouth	Hell Cr	1704020501100.00	3.9	Resident Fish and Wildlife	None
Grays Lake Outlet	Willow Cr	Hell Cr	Homer Cr	1704020501200.00	7	Resident Fish and Wildlife	None
Grays Lake Outlet	Willow Cr	Homer Cr	Lava Cr	1704020501400.00	4.2	Resident Fish and Wildlife	None
Grays Lake Outlet	Willow Cr	Lava Cr	Brockman Cr	1704020501500.00	4.1	Resident Fish and Wildlife	None
Grays Lake Outlet	Willow Cr	Brockman Cr	Grays L	1704020501600.00	11.7	Wildlife Only	None

Stream	Tributary To	Reach Starts At	Reach Ends At	RRN	Reach Length [a]	Protected Category	Institutional Constraints
Grays Lake Outlet	Willow Cr	Grays L	Lake Interior Reach	1704020501700.00	2.9	Unprotected	None
Great Western Canal	Snake R	Mouth	Headwaters	1704020100900.00	30.8	Unprotected	None
Lava Cr	Grays Lake Outlet	Mouth	Headwaters	1704020502600.00	7.2	Resident Fish Only	None
Long Valley	Willow Cr	Mouth	Headwaters	1704020503700.00	7.1	Unprotected	None
Meadow Cr	Willow Cr	Ririe Res	Headwaters	1704020503100.00	11	Unprotected	None
Meadow Cr	Willow Cr	Ririe Res	Lake Interior Reach	1704020504000.00	0	Unprotected	None
Mill Cr	Willow Cr	Mouth	Headwaters	1704020503600.00	6	Resident Fish and Wildlife	None
Sawmill Cr	Brockman Cr	Mouth	Headwaters	1704020503900.00	3.6	Resident Fish and Wildlife	None
Squaw Cr	Birch Cr	Mouth	Headwaters	1704020500701.00	6.1	Resident Fish Only	None
Squaw Cr	Trapper Cr	Mouth	Headwaters	1704021100800.00	4.2	Resident Fish Only	None
Squirrel Cr	Conant Cr	Mouth	Headwaters	1704020301200.00	21.5	Resident Fish and Wildlife	None
Thompson Cr	Corral Cr	Mouth	Grizzly Cr	1704020701200.00	2.8	Unprotected	None
Thompson Cr	Corral Cr	Grizzly Cr	Headwaters	1704020701400.00	4.5	Unprotected	None
Thompson Cr	Warm Springs Cr	Mouth	Headwaters	1704021905300.00	5	Unprotected	None
Unnamed	Grays Lake Outlet	Grays L	Lake Interior Reach	1704020502100.00	6.7	Unprotected	None
Unnamed	Grays Lake Outlet	Grays L	Headwaters	1704020502200.00	5.1	Unprotected	None
Unnamed	Willow Cr	Mouth	Headwaters	1704020500300.00	5.3	Unprotected	None
Willow Cr	Snake R	Mouth	Across Drainage	1704020100200.00	16	Unprotected	None
Willow Cr	Snake R	Gauge Sta	Ririe Res	1704020500100.00	4.4	Unprotected	None
Willow Cr	Snake R	Ririe Res	Lake Interior Reach	1704020500101.00	3.8	Unprotected	None
Willow Cr	Snake R	Ririe Res	Lake Interior Reach	1704020500200.00	3.9	Unprotected	None
Willow Cr	Snake R	Ririe Res	Unnamed	1704020500201.00	0	Resident Fish and Wildlife	None
Willow Cr	Snake R	Ririe Res	Willow Cr, Bulls Fk	1704020500400.00	5.6	Resident Fish and Wildlife	None
Willow Cr	Snake R	Willow Cr, Bulls Fk	Grays Lake Outlet	1704020500500.00	11.6	Resident Fish and Wildlife	None
Willow Cr	Snake R	Grays Lake Outlet	Birch Cr	1704020500600.00	2.3	Resident Fish Only	None

Stream	Tributary To	Reach Starts At	Reach Ends At	RRN	Reach Length [a]	Protected Category	Institutional Constraints
Willow Cr	Snake R	Birch Cr	Mud Cr	1704020500800.00	7.2	Resident Fish Only	None
Willow Cr	Snake R	Mud Cr	Long Valley	1704020500801.00	1.2	Resident Fish Only	None
Willow Cr	Snake R	Long Valley	Mill Cr	1704020500802.00	0.5	Resident Fish Only	None
Willow Cr	Snake R	Mill Cr	Cranes Cr	1704020500803.00	6.5	Resident Fish Only	None
Willow Cr	Snake R	Cranes Cr	Headwaters	1704020500900.00	7.7	Resident Fish Only	None
Willow Cr, Bulls Fk	Willow Cr	Mouth	Tex Cr	1704020502800.00	0.8	Resident Fish and Wildlife	None
Willow Cr, Bulls Fk	Willow Cr	Tex Cr	Headwaters	1704020502900.00	6.7	Resident Fish and Wildlife	None

[a] in miles

Demographics

Population

State of Idaho

Idaho has 44 counties with a population of 1,293,953 and 82,747 square miles (averge density: 15.6 people per square mile [ppsm] with a population change of 28.5% between 1990 and 2000). The Headwaters Subbasin is semi-densely populated in clustered areas that are either tourist economy related or semi-industrial/urban. The agricultural areas are sparsely populated with some suburban support regions. The average population density for the Headwaters counties within Idaho is 40.1 ppsm. Note this average includes data from all Idaho communities within each of the counties represented in the Headwaters even though no county is entirely with the Headwaters Subbasin. The following counties fall within the Headwaters of the Upper Snake Subbasin (unless otherwise stated, all population information is from the US Census Bureau http://quickfacts.census.gov/qfd/states/16000.html):

Bonneville County, Idaho

Bonneville County has 1,897 square miles and is not part of a Metropolitan Area. Its 1999 population of 81,536 ranked 4th in the State. Population density is 44.2 ppsm and the population increased 14.3 percent between 1990 and 2000. Idaho Falls constitutes the county seat and is the third largest city in the state behind Boise, the state capital, and Pocatello.

Jefferson County, Idaho

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

Madison County, Idaho

Madison County has 473 square miles and is not part of a Metropolitan Area. Its 1999 population of 24,806 ranked 12th in the State. Population density is 44.2 ppsm and the population increased 14.3 percent between 1990 and 2000. Because Madison County is geographically a smaller county, its 15.2 ppsm appears higher than surrounding counties. Its population increase was 16 percent between 1990 and 2000. Rexburg constitutes the county seat.

State of Wyoming

Wyoming has 23 counties with a population of 493,782 and 97,100 square miles (averge density: 5.1 ppsm with a population change of 8.9% between 1990 and 2000). The Wyoming portion of the Headwaters Subbasin is sparsely populated with few concentrated urban areas such as Jackson, mostly supported by a tourist economy. The average population density for the Headwaters counties within Wyoming is 3.1 ppsm. Note this average includes data from all Wyoming communities within each of the counties represented in the Headwaters even though no county is entirely with the Headwaters Subbasin. The following Wyoming counties fall within the Headwaters of the Upper Snake Subbasin (unless otherwise stated, all population information is from the US Census Bureau http://quickfacts.census.gov/qfd/states/56000.html):

Lincoln County, Wyoming

Lincoln County has 4,069 square miles and is not part of a Metropolitan Area. Its 1999 population of 14,573 ranked 12th in the State. Population density is 3.6 ppsm and the population increased 15.4 percent between 1990 and 2000. Kemmerer constitutes the county seat.

Sublette County, Wyoming

Sublette County has 4,883 square miles and is not part of a Metropolitan Area. Its 1999 population of 5,920 ranked 20th in the State. Population density is 1.2 ppsm and the population increased 22.2 percent between 1990 and 2000. Pinedale constitutes the county seat.

Teton County, Wyoming

Teton County has 4,008 square miles and is not part of a Metropolitan Area. Its 1999 population of 18,251 ranked 11th in the State. Population density is 4.6 ppsm and the population increased 63.3 percent between 1990 and 2000. Jackson Hole constitutes the county seat.

Economy and Employment

State of Idaho

Bonneville County, Idaho

Per Capita Personal Income In 1999, Bonneville County had a per capita personal income (PCPI) of $22,408. This PCPI ranked 9th in the State, and was 98 percent of the State average, $22,871, and 78 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 3.5 percent from 1998. The 1998-99 State change was 4.3 percent and the national change was 4.5 percent.

Total Personal Income In 1999, Bonneville County had a total personal income (TPI) of $1,827,084*. This TPI ranked 4th in the State and accounted for 6.4 percent of the State total. The 1999 TPI reflected an increase of 4.6 percent from 1998. The 1998-99 State change was 6.1 percent and the national change was 5.4 percent.

Earnings By Industry Earnings by persons employed in Bonneville County increased from $1,245,282* in 1998 to $1,326,733* in 1999, an increase of 6.5 percent. The largest industries in 1999 were services, 39.3 percent of earnings; retail trade, 11.6 percent; and state and local government, 10.2 percent. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to 1999 was state and local government, which increased 4.8 percent; the fastest was retail trade, which increased 7.5 percent.

Jefferson County, Idaho

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

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

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

Madison County, Idaho

Per Capita Personal Income In 1999, Madison County had a per capita personal income (PCPI) of $14,861. This PCPI ranked 44th in the State, and was 65 percent of the State average, $22,871, and 52 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 9.8 percent from 1998. The 1998-99 State change was 4.3 percent and the national change was 4.5 percent.

Total Personal Income In 1999, Madison County had a total personal income (TPI) of $368,652*. This TPI ranked 16th in the State and accounted for 1.3 percent of the State total. The 1999 TPI reflected an increase of 8.4 percent from 1998. The 1998-99 State change was 6.1 percent and the national change was 5.4 percent.

Earnings By Industry Earnings by persons employed in Madison County increased from $270,264* in 1998 to $293,205* in 1999, an increase of 8.5 percent. The largest industries in 1999 were services, 36.1 percent of earnings; state and local government, 13.4 percent; and retail trade, 9.6 percent. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to 1999 were nondurable goods manufacturing (7.2 percent of earnings in 1999), which decreased 2.3 percent; the fastest was farm (6.4 percent of earnings in 1999), which increased 21.6 percent.

State of Wyoming

Lincoln County, Wyoming

Per Capita Personal Income In 1999, Lincoln County had a per capita personal income (PCPI) of $20,870. This PCPI ranked 20th in the State, and was 79 percent of the State average, $26,363, and 73 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 6.3 percent from 1998. The 1998-99 State change was 5.8 percent and the national change was 4.5 percent.

Total Personal Income In 1999, Lincoln County had a total personal income (TPI) of $292,145*. This TPI ranked 12th in the State and accounted for 2.3 percent of the State total. The 1999 TPI reflected an increase of 7.8 percent from 1998. The 1998-99 State change was 5.7 percent and the national change was 5.4 percent.

Earnings By Industry Earnings by persons employed in Lincoln County increased from $163,332* in 1998 to $180,983* in 1999, an increase of 10.8 percent. The largest industries in 1999 were state and local government, 18.4 percent of earnings; construction, 16.2 percent; and transportation and public utilities, 15.5 percent. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to

1999 was durable goods manufacturing (6.3 percent of earnings in 1999), which decreased 4.8 percent; the fastest was construction, which increased 57.1 percent.

Sublette County, Wyoming

Per Capita Personal Income In 1999, Sublette County had a per capita personal income (PCPI) of $24,992. This PCPI ranked 8th in the State, and was 95 percent of the State average, $26,363, and 88 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 6.3 percent from 1998. The 1998-99 State change was 5.8 percent and the national change was 4.5 percent.

Total Personal Income In 1999, Sublette County had a total personal income (TPI) of $145,227*. This TPI ranked 20th in the State and accounted for 1.1 percent of the State total. The 1999 TPI reflected an increase of 7.5 percent from 1998. The 1998-99 State change was 5.7 percent and the national change was 5.4 percent.

Earnings By Industry Earnings by persons employed in Sublette County increased from $71,632* in 1998 to $77,308* in 1999, an increase of 7.9 percent. The largest industries in 1999 were services, 20.0 percent of earnings; state and local government, 16.8 percent; and mining, 16.1 percent. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to 1999 was mining, which decreased 9.1 percent; the fastest was farm (5.8 percent of earnings in 1999), which increased 60.7 percent.

Teton County, Wyoming

Per Capita Personal Income In 1999, Teton County had a per capita personal income (PCPI) of $59,632. This PCPI ranked 1st in the State, and was 226 percent of the State average, $26,363, and 209 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 9.7 percent from 1998. The 1998-99 State change was 5.8 percent and the national change was 4.5 percent.

Total Personal Income In 1999, Teton County had a total personal income (TPI) of $866,568*. This TPI ranked 4th in the State and accounted for 6.9 percent of the State total. The 1999 TPI reflected an increase of 12.3 percent from 1998. The 1998-99 State change was 5.7 percent and the national change was 5.4 percent.

Earnings By Industry Earnings by persons employed in Teton County increased from $504,645* in 1998 to $602,639* in 1999, an increase of 19.4 percent. The largest industries in 1999 were services, 34.0 percent of earnings; construction, 17.3 percent; and finance, insurance, and real estate, 15.7 percent. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to 1999 was retail trade (13.4 percent of earnings in 1999), which increased 6.9 percent; the fastest was finance, insurance, and real estate, which increased 77.1 percent.

* All income estimates, with the exception of PCPI, are in thousands of dollars. (Unless otherwise stated all economic information is from the Regional Economic Information System, Bureau of Economic Analysis, Based on the county estimates published in the May 2001 *Survey of Current Business*.)

Fish and Wildlife Resources

Fish and Wildlife Status

Fish

Unless otherwise referenced, the information in the following section for Idaho is from IDFG 2001.

South Fork of the Snake River, Idaho.

The South Fork Snake River drainage in Idaho includes the mainstem and tributaries from its confluence with the Henrys Fork upstream to the Idaho-Wyoming State boundary. This management drainage area includes Palisades Reservoir and its tributaries and Salt River tributaries, which originate in Idaho (including Jacknife, Tincup, Stump and Crow creeks). Major tributaries to the South Fork are Palisades Creek, Burns Creek, Rainey Creek, Pine Creek, and Fall Creek. The first four contribute to the Southfork fishery as major spawning streams for many mainstem fish. A significant waterfall prohibits fish migration from the mainstem into Fall Creek. The South Fork Snake River has been called Idaho's most unique riparian ecosystem containing the largest continuous cottonwood ecosystem in the state.

In the South Fork Snake River and tributaries below Palisades Dam, wild native cutthroat trout supported 71% of the catch in 1986. Jackson National Hatchery cutthroat are stocked in Palisades Reservoir as catchables and sub-catchables and are flushed into the South Fork during reservoir drawdowns. The reservoir recruitment affects only the first 2 to 3 miles of river below Palisades Dam. Brown trout provided only a small portion of the catch (12%) but offer the opportunity to catch a trophy fish. The brown trout catch has remained almost identical since 1979. The present state record brown trout weighing 26.4 lbs was caught from this river.

Special regulations restricting harvest of cutthroat trout were enacted upstream of the Heise Measuring Cable to Irwin in 1984 and to Palisades Dam in 1988. Increased cutthroat numbers and fish size in these areas resulted in an estimated 300% increase in fishing effort by 1989. Based on this success, the Upper Snake restricted cutthroat harvest regulation was implemented in 1990 and included the lower South Fork (below Heise) and all tributaries. The 2-fish, 8 to 16 inch slot limit was extended to all trout species in the main-stem in 1992. In 1996 a comprehensive creel survey was conducted to measure changes in the fishery since the last survey in 1982. Total angling effort increased by 318%, the total catch increased by 396% and the total harvest decreased by 84%. In 2000 the special regulation was modified to a 2-fish, none under 16 inch rule. Rainbow and rainbow-cutthroat hybrid trout were also placed under general harvest rules for cutthroat conservation.

Although exotic wild rainbow trout and their hybrids provide a significant component of the catch throughout the South Fork drainage, they pose a threat to the genetic integrity and long-term viability of wild cutthroat populations. Stocking of rainbow trout in the main-stem and tributaries was discontinued in the early 1980s. A research initiative was begun in 1996 to determine the status of the rainbow and rainbow-cutthroat hybrid trout populations and describe where and when rainbow, hybrid and cutthroat trout are spawning. Rainbow and hybrid trout use main-stem side channel habitat almost exclusively for spawning while cutthroat trout use both main-stem side channel and tributary habitat extensively (Henderson et al. 2000). Following these results, an intensive tributary management program is being implemented to reserve Burns Creek, Pine Creek, Rainey Creek and Palisades Creek exclusively for cutthroat spawning and production. Permanent tributary weir and trapping facilities will allow Idaho Fish and Game personnel to block escapement of rainbow and hybrid spawners and allow passage of genetically pure cutthroat spawners. Genetic research has confirmed low levels of introgression in the South Fork population and have documented near 100% accuracy in field identification of genetically pure cutthroat.

Mountain whitefish are the most abundant game fish in the drainage but are not extensively utilized by fishermen. Through the adoption of fishing contest regulations in 1989, the Department of Fish and Game and sportsman groups has sponsored whitefish derbies to enhance angler awareness and utilization of whitefish.

Habitat in the South Fork main-stem is generally in good condition. Winter flow releases, regulated to manage Palisades Reservoir storage, have resulted in significant de-watering of secondary channels of the South Fork. The de-watering causes major losses of juvenile salmonids during winter. De-watering during the late 1980s resulted in reduction of the cutthroat population, which temporarily offset gains made through harvest regulation. A multi-agency study completed in 1992 defined a minimum winter flow release of 1,500 cfs at Palisades Dam (Schader and Griswold 1994). Implementation of this minimum stream flow will enhance long-term population stability.

The lower 20 miles of the river is impacted by low water during late fall and winter due to irrigation diversions and reduced flows from Palisades Reservoir. Loss of fish from the river to these irrigation diversions often creates good seasonal fisheries. One such canal, an old side channel of the river called the Great Feeder or Dry Bed, utilized as a feeder canal, is 20 miles in length and provides adequate habitat to support a fishery. De-watering of the Dry Bed annually in the spring for head-gate maintenance results in a loss of fish and a salvage season is in effect.

Palisades Reservoir provides fishing opportunity for bank, boat and ice fishermen. Fishing effort was 22,500 angler hours during 1993. Lake trout and kokanee have been introduced, but only small natural populations have developed. Large fluctuation in water levels (up to 80 vertical ft) may affect these open water species.

Size, brood source and location of stocking hatchery cutthroat are being fine- tuned in cooperation with Wyoming Game and Fish and the U.S. Fish and Wildlife Service to produce higher catch rates on the reservoir. Presence of mysis shrimp was documented for the first time in 1994 while trawling for kokanee. Mysis density was low and will be monitored concurrent with future trawling efforts for kokanee. The Big Elk Creek kokanee spawning run will be monitored, but no further kokanee introductions will be made under agreement with Wyoming Game and Fish.

Tributary streams to the South Fork and Salt River can benefit from habitat restoration and modified grazing management for riparian restoration. Fish screening was implemented in 1994 on Palisades Creek. The Idaho Department of Fish and Game constructed improved irrigation diversion structures incorporating fish passage and fish trapping capabilities on Rainey Creek in 1997, Palisades Creek in 1999 and Burns Creek in 2000.

Salt River (Wyoming) tributaries which originate in Idaho include Jacknife, Tincup, Stump and Crow creeks. These tributaries will be managed for restricted cutthroat harvest to restore populations. Fisheries interaction between the Salt River and its tributaries and Palisades Reservoir is not clearly understood. Idaho is cooperating with Wyoming to define fish movements to better manage this system.

South Fork Snake River Trout Population (Gabmlin et al., 1999)

Wild trout populations in the main stem South Fork Snake River are monitored annually by Idaho Department of Fish and Game using electrofishing. Mountain whitefish and non-game fish species are not monitored. Four river sections have been electrofished in various years since 1986 (Figure 36): Palisades (5.0 km), Conant (4.9 km), Twin Bridges (2.9 km), and Lorenzo (4.8 km). However, only the Conant section has been sampled every year. A portion of the Conant section was also sampled in 1982.

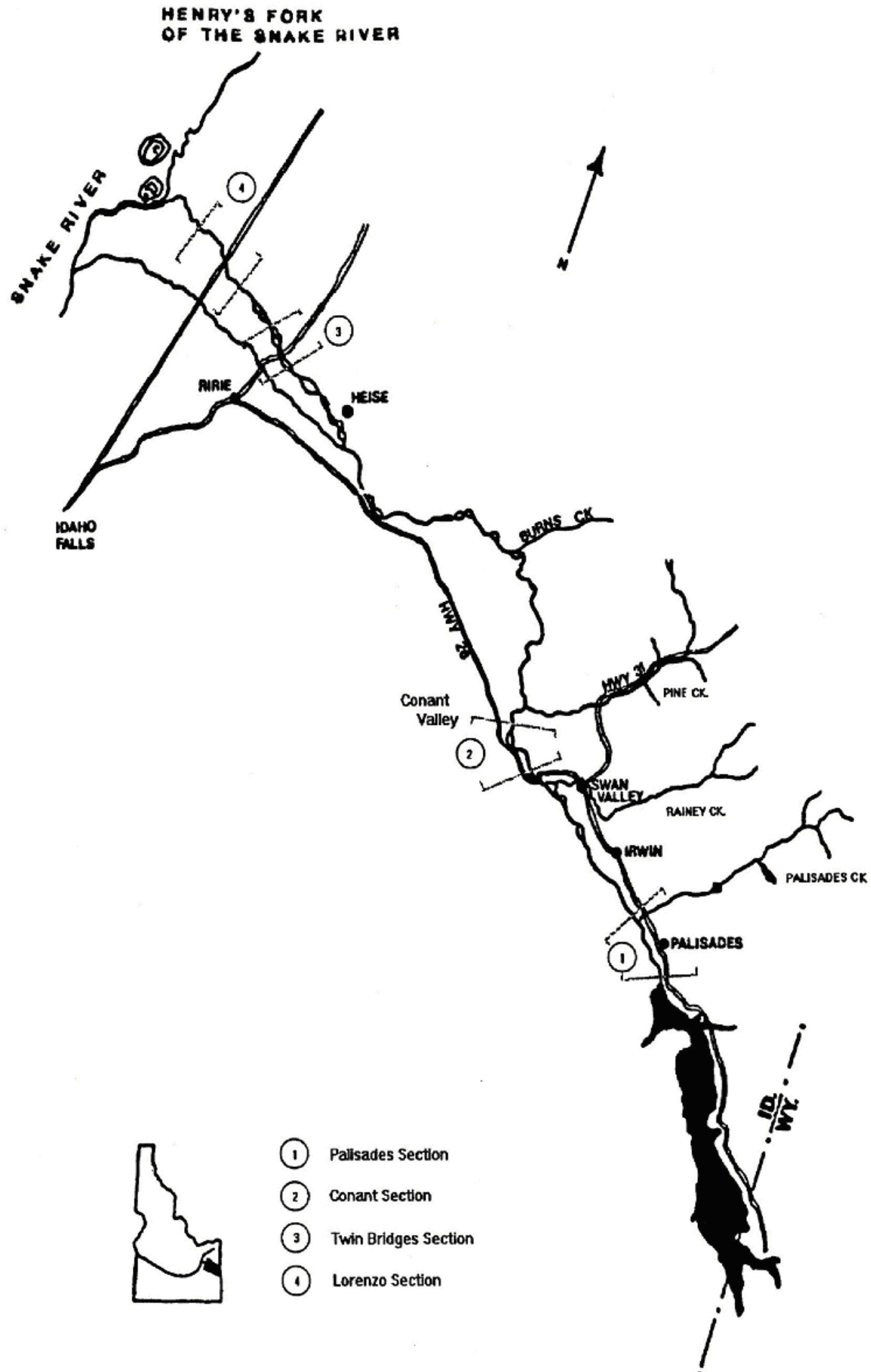


Figure 36. Annual fish electro-shocking sites along the South Fork of the Snake River.

For the Conant section, the proportion of brown trout captured by electrofishing has varied from 7 to 21% since 1982 (Table 36). There is no apparent trend. The proportion of wild and hatchery cutthroat trout captured by electrofishing is nine percentage points higher than in 1997, the all time low. The proportion of rainbow and hybrid trout is eight points lower than in 1997, the all time high. Idaho Fish and Game views the 1982, 1986 and 1987 data with caution as sampling was conducted in November rather than October. Further, the Conant section was shortened in 1982 and 1987, and trout sample sizes were small (n=229 and n=348, respectively).

Table 36. Trout species composition and relative abundance (%) at the Conant electrofishing section, South Fork Snake River, October 1982-1999.

Year	WCT & HCT[a,b]	WRB & HYB[a]	BRN[a]	LKT[a,b]	KOK[a,b]	Total
1982[c,d,e]	79 (181)	1 (2)	19 (44)	1 (2)	0 (0)	100 (229)
1986[d]	83 (1647)	2 (47)	14 (285)	<1 (4)	0 (0)	99 (1983)
1987[d,f,g]	86 (299)	2 (6)	12 (43)	0 (0)	0 (0)	100 (348)
1988	88 (1570)	3 (58)	9 (159)	<1 (1)	0 (0)	100 (1788)
1989	89 (2291)	4 (103)	7 (175)	0 (0)	0 (0)	100 (2569)
1990	84 (2978)	6 (216)	9 (335)	<1 (4)	0 (0)	99 (3533)
1991	80 (1646)	7 (150)	13 (259)	0 (0)	0 (0)	100 (2055)
1992[f]	83 (598)	5 (34)	12 (87)	0 (0)	0 (0)	100 (719)
1993	85 (1528)	6 (113)	9 (166)	0 (0)	0 (0)	100 (1807)
1994[f]	79 (867)	9 (100)	12 (136)	0 (0)	<1 (1)	100 (1104)
1995	69 (1121)	16 (256)	16 (258)	0 (0)	0 (0)	101 (1635)
1996	66 (1190)	15 (274)	18 (325)	<1 (1)	<1 (1)	99 (1791)
1997[h]	54 (1676)	27 (840)	18 (567)	<1 (1)	<1 (2)	99 (3086)
1998	59 (1312)	20 (454)	21 (469)	<1 (1)	0 (0)	100 (2236)
1999	63 (1803)	19 (560)	18 (513)	0 (0)	0 (0)	100 (2876)
Note: Total individual fish captured during mark and recapture runs is in parentheses. Results are from MR5 database for all sizes of fish						

[a] WCT = wild cutthroat trout; HCT = hatchery cutthroat trout; WRB = wild rainbow trout; HYB = wild rainbow x cutthroat hybrid; BRN = wild brown trout; LKT = lake trout; KOK = kokanee salmon.
[b] HCT, LKT, and KOK are believed to emigrate from Palisades Reservoir and numbers are directly related to extent of drawdown.
[c] Only 1.9 km of larger 4.9 km section was electrofished.
[d] Electrofishing conducted in early November.
[e] From Moore and Schill (1984), not MR5 database.
[f] No recapture runs due to low flows.
[g] Only 3.2 km of larger 4.9 km section was electrofished with drift boat.
[h] Major habitat changes with spring runoff.

Willow Creek Drainage

The 20 miles of Willow Creek below Ririe Dam is controlled for irrigation and flood control. This segment of Willow Creek is annually dewatered to keep ice buildup from causing floods near Idaho Falls. Maintaining a wild fishery in this area is only feasible with minimum yearlong releases below Ririe Reservoir although numerous trout from irrigation ditches which flow into Willow Creek via the South Fork Snake River provide a seasonal fishery. Prior to dewatering lower Willow Creek in 1976, the catch rate was 0.44 trout/hour with 10,500 hours (5,600 angler days) of effort expended annually. Catch rates declined to 0.33 trout/hour and 3,000 hours of effort in 1980. Game fish found in this area are primarily cutthroat and brown trout. Lesser numbers of rainbow trout and whitefish are also present.

Ririe Reservoir has developed into a popular fishery only 20 miles from Idaho Falls. It supports one of the most intensive salmonid reservoir fisheries in Idaho. Angler use was approximately 60,000 hours with a catch rate of 0.20 trout/hour in 1993. This fishery is supported primarily through hatchery releases of rainbow trout and kokanee salmon. Minor catches of cutthroat and brown trout are also made. Steep banks and limited access restrict bank fishermen to 35% of the effort. Kokanee have been stocked since 1990. Smallmouth bass were introduced into Ririe Reservoir from 1984 to 1986. A self-reproducing population has developed from the original introductions. The smallmouth bass fishery in Ririe Reservoir is limited by the short growing season at this latitude. Smallmouth bass growth will not approach growth rates in western Idaho impoundments. Without restrictive harvest regulations, angling exploitation will keep the upper size distrubution of this population at less than 12 inches, the minimum harvest length allowed.

The 95 miles of streams in the drainage of Willow Creek above Ririe Reservoir are mainly in narrow canyons and contain important wild cutthroat populations. Water flows vary from extremes of several thousand second-feet during runoff to a few second-feet in late summer and winter in Willow Creek. Intense agricultural practices have contributed to poor riparian habitat conditions in the upper watershed. Water quantity and quality has suffered as a result. The Natural Resource Conservation Service (NRCS) has identified the Willow Creek drainage as one of the ten worst soil erosion areas in the United States. A water quality program has been initiated to reduce loss of top soils and improve the water quality of Willow Creek above Ririe Dam. Riparian habitat improvement through improved grazing management is a high priority on both state and private lands. The Idaho Department of Fish and Game is also working with the NRCS, the Eastern Idaho Grazing Association and other local groups to facilitate improvements in resource management practices.

Cutthroat in the mainstem areas of Willow Creek and Grays Lake Outlet are dependent on downstream movement from tributary spawning and nursery areas. Most tributaries of Willow Creek contain wild populations of cutthroat, brown and/or brook trout. Native cutthroat trout populations are presently depressed in the drainage but remain viable. Overharvest of cutthroat once contributed to the decline of this species but restrictive harvest regulations have eliminated angling exploitation as a threat. Cutthroat and brown trout presently dominate the catch in tributaries. Hatchery catchable rainbow and brown trout fingerlings are no longer stocked in the Willow Creek drainage above

Ririe Reservoir. No wild rainbow have been found in the Willow Creek drainage and genetic surveys in 1999 and 2000 have documented that Willow Creek cutthroat trout are free of rainbow trout introgression. Beginning in 1990, the Department of Fish and Game restricted harvest regulation was enacted for cutthroat in rivers and streams. The limit is 2 cutthroat or cutthroat hybrids, all fish less than 16 inches must be released. This regulation has contributed to the restoration of cutthroat populations in the Willow Creek system above Ririe Reservoir. Severe drought conditions in the late 1980's through 1994 caused the fish habitat quality and trout populations in this system to at best maintain status quo. By 1995, increased numbers and size of cutthroat were documented.

Fish populations in the Willow Creek drainage have not been assessed on a broad scale since the early 1980's. Moore et al. (1983) and Corsi (1986) surveyed over 30 individual stream sections in 12 tributaries, the mainstem Willow Creek and the mainstem Grays Lake outlet. In 19 sites, they used multiple-pass depletion methods to estimate abundance and density of Yellowstone cutthroat, and also characterized species composition and habitat conditions at some sites.

In 1998 and 1999, Idaho Fish and Game began re-surveying these established sample sites throughout the drainage. Surveys were completed on five tributary sites in 1998 and three tributaries (Homer Creek, Sawmill Creek, and Grays Lake Outlet) and one mainstem Willow Creek site (below High Bridge) in 1999. At each site backpack electrofishing gear was used to complete three-pass depletion estimates of fish abundance and species composition, and compared results to previous estimates (Moore et al. 1983; Corsi 1986).

Of the four 1999 sample sites, only one (Willow Creek below High Bridge) had sufficient catch rates for Yellowstone cutthroat to complete a depletion estimate of abundance (Table 37). Eight of nine stream sections sampled in 1998-99 had fewer Yellowstone cutthroat than in the early 1980’s. In six of the nine, too few Yellowstone cutthroat were captured to allow depletion estimates. The Cellars Creek site below the Long Valley road had the highest density of Yellowstone cutthroat (36/100m2) of the nine sites. With the exception of this site, fish communities were dominated by cyprinids and catostomids including redside shiners Richardsonius balteatus, dace Rhinichthys spp., and Utah suckers Catostomus ardens (Table 37). One ripe female hatchery rainbow trout (LV clip – stocked in Ririe Reservoir) was captured in Hell Creek. Splake were present in lower Cellars Creek (1998) and middle sections of Homer Creek (1999), and were abundant at the High Bridge site on Willow Creek (1999). The splake had been stocked in Ririe Reservoir and had traveled up to 40 km upstream.

Table 37. Yellowstone cutthroat density estimates, species composition, and comparisons to previous data for five sites in four Willow Creek tributaries, August 1998.

Location	1998-99				1980's
	Transect length	Total YCT captured	YCT density (fish/100m^2)	Species composition (sample size)	YCT density (fish/100m^2)
Brockman Cr. below FS road 282	77 m	1 fry	NE[a]	redside shiner 54% dace 28% sculpin 18% (n=57)	3.6[b]
Lava Cr. above Brockman Rd	180 m	34	6.3	Yellowstone cutthroat 21% redside shiner 45% dace spp. 29% sucker spp. 5% (n=164)	17.1[b]
Cellars Cr. below Bone Rd	60 m	1	NE[a]	Yellowstone cutthroat 6% redside shiner 50% sucker spp. 37% sculpin 6% (n=16)	42-58[c]
Cellars Cr. below Long Valley Rd	141 m	132	35.9	Yellowstone cutthroat 56% dace spp. 24% sculpin 9% sucker spp. 8% redside shiner 2% brook, brown, splake 2% (n=237)	22-34[b]
Hell Cr. above Dan Cr. Rd	200 m	1	NE[a]	Yellowstone cutthroat 4% sucker spp. 75% dace spp. 18% hatchery rainbow 4% (n=28)	5.0[b] 13.0[c]
Lower Homer Cr.	400 m	3	NE[a]	Yellowstone cutthroat 25% brown trout 75% (n=12)	1.4[b]
Sawmill Cr.	~200 m	0	NE[a]	salmonids 0% dace, shiners, suckers present	38.4[b]
Willow Cr. below High Bridge	256 m	68	3.0	Yellowstone cutthroat 59% splake 26% brown trout 15% (n=115)	7.6[b]
Grays Lake Outlet above Dan Cr. Rd	~500 m	6	NE[a]	Yellowstone cutthroat 43% brown trout 50% brook trout 7% (n=14)	2.5[b]

[a] YCT capture rates insufficient to estimate density
[b] Corsi (1986)
[c] Moore et al. (1983)

Willow Creek

Yellowstone cutthroat trout

Although surveys by Meyer and Lamansky (2001, In progress) in the Willow Creek watershed are ongoing and not completed, to date Yellowstone cutthroat trout have been found at 6 (60%) of the 10 sites surveyed (Table 38) (Meyer 1999, 2000, Meyer & Lamansky 2001, in prep.) Non-native brook trout were captured at 1 (10%) of the sites sampled.

Non-game fish species

Mottled sculpin, speckled dace, redside shiners, Utah sucker, and mountain sucker are present in the Willow Creek watershed.

South Fork Snake River

Yellowstone cutthroat trout

Although surveys by Meyer and Lamansky (2001, In progress) in the South Fork of the Snake River are ongoing and not completed, to date Yellowstone cutthroat trout have been found at 17 (19%) of the 90 sites surveyed (Table 38) (Meyer 1999, 2000, Meyer & Lamansky 2001, in prep.) Non-native salmonids, such as brook trout, rainbow trout, and brown trout, were captured at 18 (20%) 11 (12%), and 1 (1%) of the sites sampled, respectively. Mountain whitefish were found in 8 (16%) of the sites surveyed.

Non-game fish species

Mottled sculpin are common throughout the watershed, as are speckled dace and longnose dace. Utah sucker, mountain sucker, bluehead sucker, and redside shiners are also present.

Table 38. Number of sites at which various fish species were sampled 1999-2001.

Fish Species	Willow Creek	S. Fork Snake R.
Cutthroat Trout	6	43
Rainbow/Redband Trout		13
Rainbow/Cutthroat Hybrid		8
Brown Trout		9
Brook Trout	1	
Hatchery Rainbow Trout		
Bull Trout		
Mountain Whitefish		8
Utah Sucker	2	4
Mountain Sucker	1	4
Bluehead Sucker		2
Bridgelip Sucker		
Mottled Sculpin	4	29
Paiute Sculpin		
Shorthead Sculpin		
Unspecified Sculpin		
Longnose Dace		12
Speckled Dace	4	15
Redside Shiner	4	8

Fish Species	Willow Creek	S. Fork Snake R.
Utah Chub		
Leatherside Chub		
Northern Pikeminnow		
Smallmouth Bass		
Brown Bullhead		
Chisel Mouth		
No of Sites Sampled	10	49

South Fork of Snake River Creel Census (Schrader et al., 1997)

Idaho Fish and Game conducted 1,750 angler interviews with 1,750 anglers during the summer fishing season (25 May to 13 September) in the upper South Fork Snake River (Dam to Heise cable) in 1996 (Table 39). Moore and Schill (1984) conducted 1518 interviews with 2,758 anglers during the summer season (29 May to 17 September) and early season (1 April to 28 May in section 1) in the same stretch in 1982. From these interviews in 1996, 21% of anglers were non-resident (11% in 1982) and 9% of all anglers were guided (2% in 1982). The proportion of hours fished by gear type was: 38% using bait (64% in 1982), 10% using lures (16% in 1982), and 52% using flies (20% in 1982). Average time spent fishing was 3.3 hours (3.6 hours in 1982).

Table 39. Summary of creel census statistics, upper South Fork Snake River, opener to mid September, 1982.

Metric	Year	
	1982	1996
% Non-resident	11	21
% Guided	2	9
% Power Boat Fishing	22	15
% Bank Fishing	60	19
% Float Boat Fishing	18	66
% Bait Fishing	64	38
% Lure Fishing	16	10
% Fly Fishing	20	52
Total Effort (hrs)	53,170	169,142
Average Effort/Episode (hrs)	3.6	3.3
% Weekday Episodes	47	54
Catch Rate (fish/hr)	0.9	1.12
Total Catch	47,730	188,989
Harvest Rate (fish/hr)	0.53	0.03
Total Harvest	27,937	4,568
% Released	41	98
Catch Composition (%)		
Yellowstone Cutthroat Trout	67	71
Mountain White Fish	20	10
Brown Trout	9	12

Metric	Year 1982	1996
Rainbow Trout	1	7
Other	2	1
Harvest Composition (%)		
Yellowstone Cutthroat Trout	63	54
Mountain White Fish	20	0
Brown Trout	12	25
Rainbow Trout	2	20
Other	2	3
Catch Composition (%)		
Power Boat	27	26
Bank	56	25
Float Boat	16	49
Harvest Composition (%)		
Power Boat	23	36
Bank	68	54
Float Boat	10	10
Catch Composition (%)		
Bait	47	32
Lures	17	7
Flies	36	61
Harvest Composition (%)		
Bait	63	70
Lures	16	9
Flies	21	21
Total Interviews	2758	1750
Total Anglers Interviewed	1518	1750

Note: Moore and Schill 1984, but entered and analyzed using IDFG Creel Census System computer program and 1996 (present study)

Raw data from the 1982 (Moore and Schill 1984) and 1996 creel census were entered into the IDFG Creel Census System computer program (McArthur 1993) so comparative analyses could be made for similar time periods (opener to mid-September). Total angler effort in the upper South Fork in 1996 was estimated at 169,142 hr (53,170 hr in 1982; Table 39). More than half (54%) of the total effort occurred during weekdays (47% in 1982). The estimated proportion of total effort by angler type was: 15% power boat (22% in 1982), 19% bank (60% in 1982), and 66% float boat (18% in 1982).

Estimated catch rate in 1996 was 1.12 fish/hr (0.90 fish/hr in 1982), and estimated total catch (including harvested and released fish) was 188,989 fish (47,730 fish in 1982; Table 39). Catch composition (from opener to mid-September angler interviews) was: 71% wild and hatchery cutthroat trout (67% in 1982), 10% mountain whitefish (20% in 1982), 12% brown trout (9% in 1982), 7% rainbow/hybrid trout (1% in 1982), and 1% other species (2% in 1982). Some of the 1982 catch was hatchery rainbow trout.

Estimated harvest rate was 0.03 fish/hr (0.53 fish/hr in 1982), and estimated total harvest was 4,568 fish (27,937 fish in 1982; Table 39). It is estimated 98% of the fish caught were released (41% in 1982). Estimated harvest composition was:54% wild and hatchery cutthroat trout (63% in 1982), 0% mountain whitefish (20% in 1982), 25% brown trout (12% in 1982), 20% rainbow/hybrid trout (2% in 1982), and 3% other species (2% in 1982). Hooking mortality was not taken into account. Some of the 1982 harvest was hatchery rainbow trout.

Of 81 harvested fish independently identified by the angler and the creel clerk, 43 agreed as to being a cutthroat trout, 12 agreed as rainbow/hybrid trout, 23 agreed as brown trout, and 3 agreed as other species. There was no disagreement. It was concluded that anglers on the South Fork are able to accurately identify most trout they catch.

Comparative creel census statistics going back to 1966 suggest improved catch rates, a doubling of effort, and a tripling of catch since special regulations were implemented on the South Fork in 1984 (Table 40). Of concern, however, are decreasing proportions of cutthroat trout, and increasing proportions of brown and rainbow/hybrid trout, in the catch. Cutthroat trout comprised 97% of the catch in 1966. Brown trout were not a significant proportion (>5%) of the catch until the early 1970's, rainbow/hybrid until the early 1990's. Note that these data are for various sections and intervals. Trends in angler catch composition suggest a potential threat to the genetic integrity and long-term viability of wild cutthroat trout populations in the South Fork.

Table 40. Comparative Creel-Census Statistics, South Fork Snake River, 1966 – 1996.

						Catch Composition (%)				a			
Year	**Effort (hours)**		**Catch Rate (fish/hour)**	**Total Catch**		**YCT**	**MWF**	**BRN**	**RBT**		**LKT**	**Area & Time**	**Reference**
1966	77,000		0.05	38,500		97	3	<1			<1	Dam - Heise June 1 - Oct. 31	U.S. Fish and Wildlife Service (unpub.)
1969	16,809		0.42	7,060		75	24	1				Black Can - Heise Cable May 30 – Nov 1	Jeppson (1970)
1970	17,377	b	0.56	9,731		85	8	6	1		<1	Dam - Black Canyon May 1 - Nov. 30	Jeppson (unpublished data)
1972	33,390		0.51	17,029		75	20	2	3		<1	Dam - Heise July 1 - Sept. 30	U.S. Fish and Wildlife Service (unpub.hed data)
1973	NE	c	0.32	NE	c	56	37	6	<1			Dam - Henry's Fork January 1 - Dec. 31	Jeppson (1973)
1979	88,830		0.43	38,197		72	15	9	4		<1	Dam - Henry's Fork March 3 - February 29	Moore (1980)
1982	64,355		0.80	51,604		66	23	9	<1		2	Dam - Heise Cable April 1-Sept. 17	Moore and Schill (1984)
1996	169,142		1.12	188,989		71	10	12	7		<1	Dam - Heise Cable May 25 - Sept.13	Present Study

[a] YCT = Yellowstone Cutthroat Trout, MWF = Mountain Whitefish, BRN = Brown Trout, RBT = Rainbow Trout, LKT = Lake Trout
[b] Under-estimate due to techniques used (Moorw 1908)
[c] No Estimate

Anadramous

Because of a the significant natural barrier to upstream migration at Shoshone Falls, Idaho,on the Middle Snake River, there is no sea-run anadromous fishey in the Headwaters Subbasin.

Native Resident

Fisheries biologists from the Caribou-Targhee National Forest conducted fish surveys on ten headwaters tributaries to the South Fork of the Snake River in 2000 (Appendix C). The objective was to measure various stream parameters and document fish distribution within the watershed. Data were collected in such a way that population estimates and other summary data could be calculated at a later date. Primary fisheries results were:

Antelope Creek: Cutthroat trout were the only species of fish captured. Although high numbers of fish were not captured, the stream seemed well populated for its size. All age classes were either captured or observed during the study, which leads us to believe that this resident population of cutthroat is reproducing in Antelope Creek. It is a good estimation that these populations of cutthroat were derived from the South Fork of the Snake before man intervened and intercepted flow to the main river. All specimens captured seem to be healthy with no deformities and no signs of external parasites.

Bear Creek: Six species of fish were observed during the survey (cutthroat trout, dace, sculpin, shiners, suckers and mountain whitefish). Sculpin were the most frequent of the species captured. High numbers of cutthroat trout were captured, all age classes were either captured or observed during the survey. It is likely both resident and adfluvial (fish from the reservoir) life history patterns of Yellowstone cutthroat trout exist in Bear Creek as no upstream migration barrier was observed during the survey. All specimens captured seem to be health with no deformities and no signs of external parasites.

Big Springs Creek: Three species of fish were observed during our sampling (cutthroat trout, dace, and sculpin). Cutthroat trout were the dominant species captured. One large deceased fish (380mm) was observed in Unit 1. It was believed to have been a adfluvial cutthroat trout from the reservoir. Big Springs Creek provides spawning habitat for reservoir fish and also supports a resident fish population. Fish population density decreases as the survey progressed upstream.

Burns Creek: Two species of fish were captured during our sampling (cutthroat trout and sculpin). Sculpin dominated each unit and only a few cutthroat were captured. Cutthroat were captured in two of the four units in Reach 2. All specimens' captured seem to be healthy with no deformities and no signs of external parasites.

Garden Canyon Creek: No fish were captured during the survey. Habitat suggests there is suitable habitat for Yellowstone cutthroat trout. It is apparent that the brook trout introduction into the system has eliminated any cutthroat that once occupied this watershed. According to Wyoming Game and Fish, there was only one plant of approximately 400 brook trout in the 1940's within the North Fork Indian Creek Drainage. That was enough to eventually displace the cutthroat trout in the drainage.

Flat Creek: The Wyoming Game and Fish Department classifies Flat Creek as a Class 3 fishery. Although historically important as a spawning stream to Snake River cutthroat trout, this importance appears to have diminished in recent years. The meadow reach of this watercourse provides significant recreational opportunities to a large number of anglers between August 1 and October 31 for large, native cutthroat trout

Landslide Creek: Three species of fish were observed during our sampling (cutthroat trout, apparent cutthroat/rainbow trout hybrids, and sculpin). A total of nine cutthroat trout were captured during our sampling and all seemed to be adults. The hybrid trout was captured at the mouth of the stream and could have been produced elsewhere as no other hybrids or rainbow trout were captured. All species captured seem to be in good health with no deformities and no signs of external parasites.

Sulphur Bar Creek: Three species of fish were observed during our sampling (Cutthroat Trout, Dace, and Sculpin). One larger fish (420) was observed which was believed to have been a fluvial cutthroat trout from the reservoir. Also noted was a right ventral fin clip on this fish. All species captured seemed to be in good health with no deformities and no signs of external parasites.

Trout Creek: Two species of fish were captured during our sampling (cutthroat trout and sculpin). Cutthroat trout dominated the first three units, however numerous fish were not found. As gradient increased cutthroat populations decreased. Although cutthroats were captured in the second unit of Reach 2, sculpin dominated the upper units of the survey. Fluvial fish were observed staging below and above a culvert on Forest Service Road 087.

Van Creek: Van Creek was not sampled during the 2000 survey. Due to extremely low flow and the 100% silt stream bottom, it was determined that Van Creek is not likely fish bearing. Beaver dams and activity were frequent along the short length of stream.

Wolverine Creek: Cutthroat trout were the only species of fish captured during our sampling. Wolverine Creek had a good population of cutthroat trout for its size. All age class of cutthroat were observed. Cutthroat trout were the only species captured during the survey. It is likely cutthroat trout in most of Wolverine Creek have a resident life history pattern. Upstream migration of fluvial fish from the South Fork into Wolverine Creek appears to be blocked by a bedrock falls in the canyon area. All specimens captured seem to be healthy with no deformities and no signs of external parasites.

The number and variety of fish species in the Palisades subbasin are influenced naturally by Shoshone Falls near Twin Falls, Idaho (IDEQ 2001). Representatives of the sucker family (Catostomidae), sculpin family (Cottidae), minnow family (Cyprinidae), as well as the trout and salmon family (Salmonidae) are known to occur. Suckers reported in the subbasin include the bluehead sucker (*Catostomus discobolus*), mountain sucker (*C. platyrhynchus*), and Utah sucker (*C. ardens*). Sculpins in the subbasin include the mottled sculpin (*Cottus bairdi*) and the Paiute sculpin (*C. beldingi*). Minnows reported in the subbasin include the longnose dace (*Rhinichthys cataractae*), redside shiner (*Richardsonius balteatus*), speckled dace (*Rhinichthys osculus*), and Utah chub (*Gila atraria*). The leatherside chub (Gila copei) is reported from Jackknife Creek, at tributary of the Salt River, which flows into Palisades Reservoir. Leatherside chub could easily occur in the Palisades subbasin as well. Species of the family Salmonidae reported in the subbasin include brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), cutthroat trout (*Oncorhynchus clarki* sp.), mountain whitefish (*Prosopium williamsoni*), rainbow trout (*O. mykiss* sp.), and cutthroat trout-rainbow trout hybrids. These occurrence reports are taken from Lee and others (1980), Simpson and Wallace (1982), Baxter and Stone (1995), Maret (1997), and the data sources listed in Table 41. No bull trout (*Salvelinus confluentus*) are known to occur in the Palisades subbasin (IDEQ 2001).

Yellowstone cutthroat trout (*O. c. bouvieri*) is the species of greatest concern in the Palisades subbasin. May (1996) reports that in Idaho only ten percent of the populations of Yellowstone cutthroat trout are secure and stable. In its historic range, the Yellowstone cutthroat trout is estimated to occupy 41 percent of the riverine environments (May 1996). A primary objective of the Idaho Department of Fish and Game (IDFG) is to preserve the genetic integrity and population viability of wild native cutthroat trout in the South Fork Snake River drainage (IDFG 1996). Stocking of rainbow and brown trout was discontinued in the early 1980s to reduce competition with Yellowstone cutthroat trout.

The IDFG and the U. S. Fish and Wildlife Service (FWS) have rated the fishery resources for a number of water bodies in the Palisades subbasin. The South Fork Snake River below Palisades Dam is rated as a highest-valued fishery resource. Bear Creek, Big Elk Creek, Burns Creek, Fall Creek, Palisades Creek, Pine Creek, and Rainey Creek are rated as "high priority" fishery resources. McCoy Creek and Pritchard Creek are rated as substantial fishery resources (IDFG and FWS 1978). Fishing effort on the South Fork Snake River below Palisades Dam was estimated to be 25,000 angler days in 1981 and 22,500 angler hours on Palisades Reservoir in 1993 (IDFG 1996). Streams in the Palisades subbasin known to contain cutthroat trout are shown in Figure 37.

Table 41. Occurrence of fish and number of salmonid age classes in the Palisades cataloging unit (17040104).

Water body (WBID #[1])	**CTT[2]**	**BRK[3]**	**BRN[4]**	**KOK[5]**	**LKT[6]**	**MWF[7]**	**RBT[8]**	**Non-salmonids**	**Comments**	**Data source**
Antelope Creek (2)	2/J									Moore 1981
Antelope Creek (2)	3/J	X							visual estimate	Zaroban and Herron 2000
Antelope Creek (2)	X									TNF 2000
Bear Creek (11)	1							mottled sculpin, Paiute sculpin, speckled dace		IDEQ 1996
Bear Creek (11)	X					X		dace, sculpin, shiners, suckers		TNF 2000
Big Elk Creek (25)	3+/J			X				sculpins, suckers		TNF 1999a
Big Elk Creek (25)	4+			2/J						Moore and

Water body (WBID #[1])	CTT[2]	BRK[3]	BRN[4]	KOK[5]	LKT[6]	MWF[7]	RBT[8]	Non-salmonids	Comments	Data source
										others 1981
Big Spring Creek (10)	X							dace, sculpin		TNF 2000
Black Canyon Creek (30)	3/J									Moore 1981
Burns Creek (31)	X								stocked CTT	Moore 1980
Burns Creek (31)	5+/ J					X		sculpins		Moore 1981
Burns Creek (31)	4+/ J					X		longnose dace, sculpins	stocked CTT	Moore and Schill 1984
Burns Creek (31)	3+/ J		1					sculpins	hybrids	TNF 1999a
Burns Creek (31)	X							sculpins		TNF 2000
Clear Creek (18)	X							dace, sculpins, sucker		TNF 2000
Deer Creek (8)									no fish observed	TNF 1999a
Elk Creek (11)	3+/ J							Paiute sculpin		IDEQ 1996
Fall Creek (6)	X								stocked RBT	Moore 1980
Fall Creek (6)									stocked RBT	Moore and Schill 1984
Fall Creek (6)	2+/ J							dace, sculpins, shiners		Elle and Corsi 1994
Fall Creek (6)	3	3+/ J						sculpins, longnose dace, speckled dace		TNF 1999a
Fish Creek (21)	X							sculpins		TNF 2000
Garden Creek (3)	3+/ J									TNF 1999

Water body (WBID #[1])	CTT[2]	BRK[3]	BRN[4]	KOK[5]	LKT[6]	MWF[7]	RBT[8]	Non-salmonids	Comments	Data source
Garden Creek (3)	X									TNF 2000
Gibson Creek (6)	1/J	3								IDEQ 1996
Hawley Gulch Creek (1)									no fish observed	IDEQ 1997
Hawley Gulch Creek (1)									no fish observed	TNF 2000
Indian Creek (9)	3+/ J									Moore 1980
Indian Creek (9)	4+/ J									Moore 1981
Indian Creek (9)	4+/ J									Moore and Schill 1984
Indian Creek (9)	2/J									IDEQ 1996
Indian Creek (9)	4+/ J						1/J			TNF 1999a
Indian Creek (24)									no fish observed	Moore and others 1981
Indian Creek (24)									no fish observed	TNF 1999a
Landslide Creek (10)	X							Sculpin, hybrids		TNF 2000
McCoy Creek (14)	4+/ J		2			3+/ J	1	sculpins, mountain sucker, redside shiner	hybrids	TNF 1999a
McCoy Creek (14, 15, 16, 19)	5+									Elle and Corsi 1994
McCoy Creek (15, 19)	X							dace, sculpin, shiners		TNF 2000
Nelson Creek (2)	X									TNF 2000

Water body (WBID #[1])	CTT[2]	BRK[3]	BRN[4]	KOK[5]	LKT[6]	MWF[7]	RBT[8]	Non-salmonids	Comments	Data source
North Fork Indian Creek (24)		X								TNF 2000
North Fork Pine Creek (29)	3/J							Paiute sculpin		IDEQ 1996
Palisades Creek (27)	X/J									Moore 1980
Palisades Creek (27)	5+/ J		X			X	X	longnose dace, sculpin	hybrids	Moore and Schill 1984
Palisades Creek (27)	3+					1+	2	sculpins	hybrids	TNF 1999a
Palisades Reservoir (10)	X				X				stocked CTT, LKT	Moore 1980
Palisades Reservoir (10)	3+		3+	X	3+	X	X			Moore and others 1981
Palisades Reservoir (10)									stocked CTT, LKT	Moore and Schill 1984
Palisades Reservoir (10)	X		X	X	X	X	X		Utah sucker, chubs	Corsi and Elle 1986a
Papoose Creek (8)									no fish observed	TNF 1999a
Pine Creek (29)	2+/ J						X		stocked RBT	Moore 1980
Pine Creek (29)	3+/ J		1/J			3+	X	longnose dace, speckled dace, bluehead sucker, Utah sucker, mottled sculpin, Paiute sculpin		Moore 1981
Pine Creek (29)	5+/ J						X	bluehead sucker, longnose dace, speckled dace, sculpin	stocked RBT	Moore and Schill 1984

Water body (WBID #[1])	CTT[2]	BRK[3]	BRN[4]	KOK[5]	LKT[6]	MWF[7]	RBT[8]	Non-salmonids	Comments	Data source
Pine Creek (29)	3/J							Paiute sculpin		IDEQ 1996
Pine Creek (29)	4/J						3+/ J	sculpins, Utah sucker	hybrids	TNF 1999a
Pritchard Creek (4)	X									Moore 1980
Pritchard Creek (4)	4+/ J		2+/ J			X				Corsi and Elle 1986b
Pritchard Creek (4)	3+/ J									TNF 1999a
Rainey Creek (28)	3+/ J								stocked CTT, RBT	Moore 1980
Rainey Creek (28)	4+/ J					2+/ J		suckers, longnose dace, speckled dace, sculpin, redside shiner		Moore 1981
Rainey Creek (28)	4+/ J		X					longnose dace, speckled dace, suckers, sculpin, redside shiner	stocked BRN, CTT, RBT	Moore and Schill 1984
Rainey Creek (28)	3/J	2/J						mottled sculpin, Paiute sculpin		IDEQ 1996, 1998
Rainey Creek (28)	4+/ J							sculpins		TNF 1999a
Snake River, SF (1)	X		X		X	X	X			Moore 1980
Snake River, SF (1)	X		X		X	X	X		stocked BRN	Moore and Schill 1984
Snake River, SF (1)	5/J		4			4+/ J	2	Utah sucker, mottled sculpin, longnose dace, speckled dace	hybrids	Maret 1999
Snake River, SF (3)	X		X		X	X	X			Moore 1980

Water body (WBID #[1])	CTT[2]	BRK[3]	BRN[4]	KOK[5]	LKT[6]	MWF[7]	RBT[8]	Non-salmonids	Comments	Data source
Snake River, SF (3)	X		X		X	X	X		stocked BRN	Moore and Schill 1984
Snake River, SF (3)	4+/ J		4+/ J						hybrids	Elle and Gamblin 1993
Snake River, SF (3)	5+/ J		X			3+			hybrids	Elle and Corsi 1994
Snake River, SF (8)	X		X		X	X	X			Moore 1980
Snake River, SF (8)	X		X		X	X	X		stocked BRN	Moore and Schill 1984
Squaw Creek (8)	1									TNF 1999a
Sulphur Bar Creek (10)	X							dace, sculpin		TNF 2000
Table Rock Creek (1)									no fish observed	Moore 1980
Table Rock Creek (1)	3									Moore 1981
Table Rock Creek (1)	X									TNF 2000
Tie Canyon Creek (29)	2							Paiute sculpin		IDEQ 1996
Trout Creek (22)	4+/ J	1/J	1/J				1/J			Moore and others 1981
West Pine Creek (29)	1							Paiute sculpin	hybrids	IDEQ 1996
Williams Creek (10)	X		X							TNF 2000
Wolverine Creek (1)	2+/ J									Moore 1981
Wolverine Creek (1)	X									TNF 2000

Water body (WBID #[1])	CTT[2]	BRK[3]	BRN[4]	KOK[5]	LKT[6]	MWF[7]	RBT[8]	Non-salmonids	Comments	Data source
Yeaman Creek (8)									stocked RBT	Moore 1980
Yeaman Creek (8)									stocked RBT	Moore and Schill 1984
Yeaman Creek (8)									no fish observed	TNF 1999a

[1]WBID#: Idaho Department of Environmental Quality water body index number as listed in IDAPA 58.01.02.150.01.
[2]CTT: cutthroat trout
[3]BRK: brook trout
[4]BRN: brown trout
[5]KOK: kokanee
[6]LKT: lake trout
[7]MWF: mountain whitefish
[8]RBT: rainbow trout
J: age classes present include juveniles
X: species reported present, no indication of number of age classes observed
+: number provided in table is a conservative estimate of age classes present

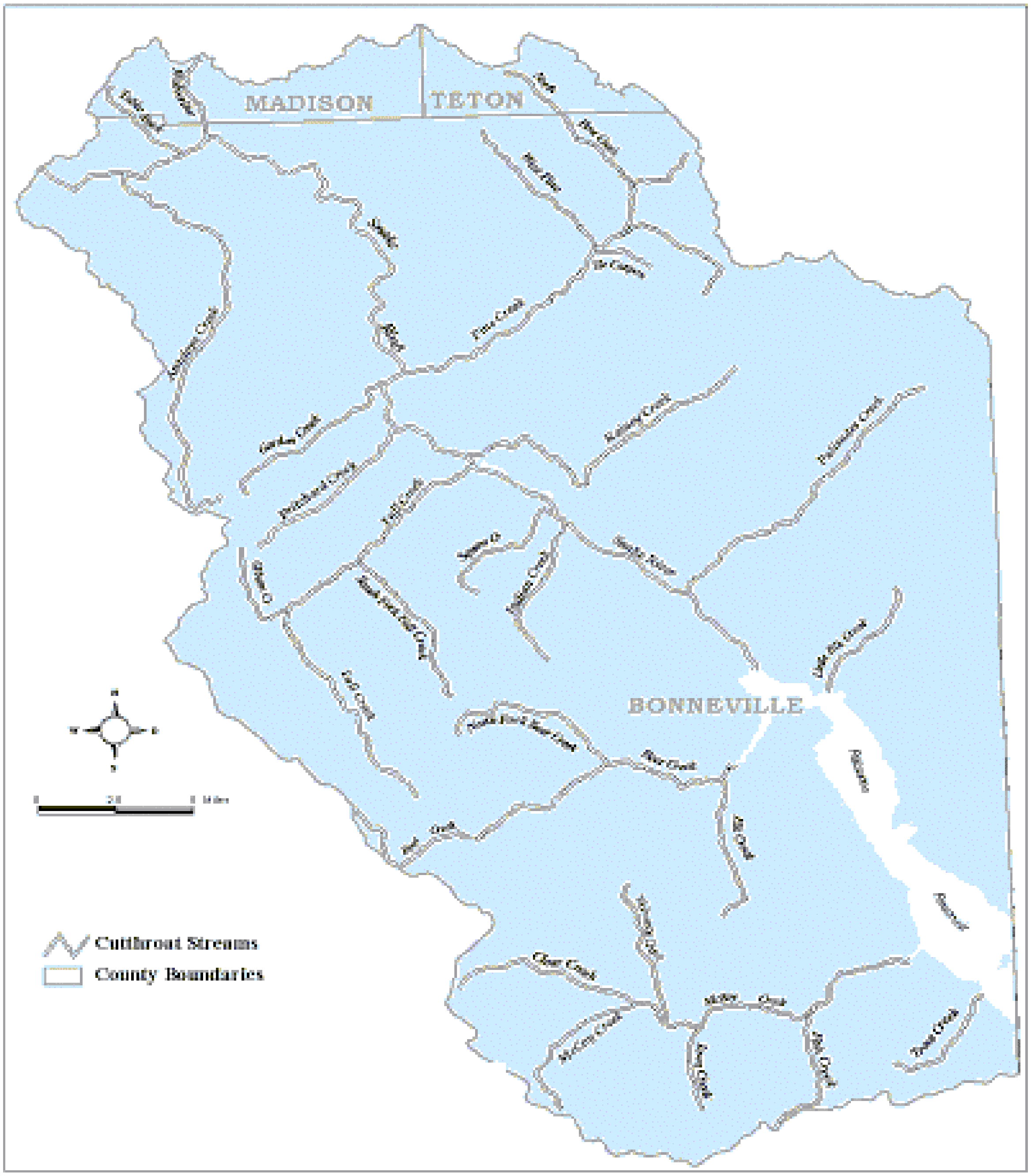


Figure 37. Streams in the Palisades subbasin in which cutthroat trout are known to occur.

Ririe Reservoir

Ririe Reservoir, located within the Willow Watershed and fed by Willow Creek, is located about 20 miles from Idaho Falls, and generates significant angler interest throughout out the year. The primary fishery is composed of hatchery rainbow trout and kokanee (IDFG 1996). An introduced smallmouth bass population, which has developed into a self-sustaining fishery, provides angling diversity. Yellow perch were illegally introduced prior to 1989 and are also part of angler catch. Minor catches of cutthroat and brown trout are also made.

Ririe Dam to Snake River

Willow Creek below Ririe Dam flows about 20 miles until reaching the Snake River. This reach is annually dewatered after November 1 to prevent ice buildup and flooding near Idaho Falls, subsequently preventing the fishery from establishing itself. Game fish found in this area are primarily cutthroat and brown trout. Maintaining a wild fishery in this reach is only feasible with minimum year-long releases below Ririe Reservoir.

Wildlife

Threatened and Endangered and Rare Species

(Bureau of Reclamation -- 1998 Baseline Conditions (BOR, 1998)

Peregrine Falcon

Snake River in Wyoming

In Wyoming, there are at least seven occupied territories that make use of the Snake River from Jackson Lake downstream to the Idaho State line. These eyries are regularly occupied and are some of the highest producing eyries in Wyoming (Oakleaf, 1997). There are two to three peregrine nesting territories near Jackson Lake. Falcons from these territories forage at Jackson Lake and surrounding area. Little is known about winter use by peregrine falcons. In Teton National Park, breeding falcons begin to occupy nesting territories as early as April and leave sometime in October.

Snake River (Wyoming State Line to Confluence with Henrys Fork)

Three nesting territories have been documented along this reach of the Snake River. Surveys, although not always complete, have documented the production of more than 28 young from these sites since 1990. Two of the sites, both located on the river, have each produced a total of four young since 1990. The third site, located on Palisades Reservoir just north of Alpine, Wyoming, has produced over 20 young.

Snake River (Henrys Fork to American Falls Reservoir)

Peregrine falcons are found as occasional visitors and winter migrants in the American Falls area and up stream to the confluence with the Henry Fork. While nesting has not been documented in the area, suitable habitat and food supply are present (Howard, 1997) and adequate to support a nesting site (USFWS, 1993).

Although not closely associated with the Snake River, a nesting tower at Market Lake, located about 20 miles north of Idaho Falls, has been periodically active since 1992, but has not successfully produced any young.

Bald Eagle (BOR, 1998)

Snake River in Wyoming

Bald eagle populations are increasing along the Snake River in Wyoming. Nesting surveys conducted between 1978 and 1991 by Wyoming Game and Fish Department (WGFD) and others, show that populations have more than doubled. Occupied nesting territories increased from an estimated 9 in 1978 to 21 in 1991 (Harmata and Oakleaf, 1992). It is not known whether additional nesting territories are available. Harmata and Oakleaf

(1992) anticipated that increased human populations and recreational use will, in fact, reduce bald eagle nesting habitat in the near future.

There is at least one bald eagle nesting territory at Jackson Lake and at least two nesting territories downstream. Eagles from these territories most likely forage at the lake as well as in the surrounding area. There are no production data available for these nesting territories. In Wyoming, there are no organized counts for wintering bald eagles on the Snake River. However, it is known that most of the nesting adults are residents and stay associated with their territories throughout the year (Oakleaf, personal communication, 1997). Transient eagles from other areas also winter along the Snake River.

Snake River (Wyoming State line to Henrys Fork)

The main stem, with its extensive cottonwood forest, provides excellent wintering and breeding habitat. The number of eagles using the area for both wintering and nesting has steadily increased over the last 20 years. Based on mid-winter counts, use of the main stem has ranged from as few as a dozen eagles to as many as 70. As the population of eagles in the Greater Yellowstone Ecosystem (GYE) has increased, winter use on the main stem has also steadily increased. The cottonwood forest along the river provides virtually unlimited hunting perches and roosting opportunities immediately adjacent to the river, and the excellent fishery provides an abundant source of food. A total of 19 nesting territories were monitored along the main stem (including Ririe Reservoir) in 1996. (Ririe Reservoir is included in this section because of close proximity to this reach of the main stem.) There were three new nesting territories discovered, two on the South Fork and one on Ririe Reservoir. All 19 territories were occupied and at least 11 were successful in producing young. It is not known whether the nest at Ririe Reservoir was successful. Five of the 19 nests were located on Palisades Reservoir and 2 of those were successful. It should also be noted that studies show that eagles from a nesting territory near Alpine, Wyoming make extensive use of Palisades Reservoir (Harmata and Oakleaf, 1992).

The following segment on Bald Eagles along the South Fork is from Whitified (in litt, 2001). Bald eagles represent an important element of the river dependent wildlife in the Snake River Watershed. As top of the food chain predators, bald eagles are also indicative of the overall health of the watershed for many species.

The breeding bald eagle population of the Greater Yellowstone Ecosystem (GYE) is the most important nesting population in the Intermountain West. There are currently 53 known bald eagle breeding areas within the Southeast Idaho portion of the Greater Yellowstone Ecosystem, making this area the most productive bald eagle nesting area in Idaho. Of this total, 29 breeding areas are found in the Upper Snake River Headwaters along the South Fork of the Snake River in Idaho.

The South Fork provides habitat for nesting bald eagle pairs and up to 100 wintering eagles. The U.S. Fish and Wildlife Service considers this river section to be the most important fish and wildlife habitat in the state of Idaho.

The most productive river segment is the river canyon between Palisades and Heise, where 12 bald eagle breeding areas are located. In addition, 7 bald eagle breeding areas are located near the Palisades Reservoir, and 6 territories on the lower river below Heise.

This nesting population represents a dramatic increase in numbers since the middle of the past century when bald eagle numbers were severely depressed. Bald eagles were trapped and shot from much of their historic range, and finally DDT eliminated bald eagles from much of the country, including most of Idaho. No resident nesting bald eagle breeding pairs were noted on the South Fork in the 1950s. However, since the banning of DDT and regulations that protect eagles from shooting and other mortality factors, the nesting population has recovered dramatically. Much of the former bald eagle habitat has been reoccupied.

Along the Snake River corridor, young bald eagle pairs are occupying new nests. However, there is a witnessing to the gradual loss of historically productive bald eagle nesting areas, primarily on private lands now being developed. This is particularly troubling because the newer territories are generally in the less productive habitat. Ironically, several of the nesting areas at greatest threat have historically been the most productive breeding areas. This loss of preferred bald eagle nesting habitat highlights the importance of protected areas.

Market Lake

A single Bald Eagle nest has been active at Market Lake for several years.

Grizzly Bear -(BOR, 1998)

Snake River in Wyoming

Within this portion of the Snake River basin, grizzly bears are known to use the area around Jackson Lake and the Snake River corridor downstream to the southern boundary of Grand Teton National Park. This area is within the Buffalo/Spread Creek and Two Ocean Lake BMU's. While most grizzly bear use of the Jackson Lake area is north of the lake (Two Ocean Lake BMU), it is expected that three or four individual bears occasionally use the Snake River corridor downstream of the dam within Grand Teton National Park (Cain, 1997). Sightings of grizzly bear further south are rare. It is unlikely that grizzly bears use the Snake River corridor, and its associated habitats, downstream of Grand Teton National Park on a regular basis.

Ute Ladies' Tresses – (BOR, 1998)

Snake River Basin from Wyoming State Line to Henrys Fork

Previously known from central Colorado, northern and eastern Utah, eastern Wyoming, western Nebraska, and west-central Montana, Ute ladies' tresses were found in Idaho in September 1996 (Moseley, 1996). Extensive surveys in 1996 covered a wide area of eastern Idaho to assess the distribution of potential habitat. These surveys documented the existence of four separate occurrences of the plant in the floodplain along the main stem of the Snake River between Heise and Swan Valley. One population consisted of 12 individuals scattered over an area of about 1 acre while another population consisted of 15 individuals within an area of about 1 acre. The largest population was 173 plants within a one acre area, while the smallest population was one plant at another site.

The IDFG Conservation Data Center, BLM, USFS, and USFWS conducted more intensive surveys in 1997. Preliminary analysis of data indicates the existence of 20 occurrences along the Snake River between Swan Valley and the confluence with the Henrys Fork (Moseley, 1997). A total of 1,171 (mostly flowering/fruiting plants) individuals were counted. Non-flowering plants were not counted due to the difficulty of species identification.

Grazing and recreational use appear to be the most likely activities affecting the plant. However adequate data is not available to determine what, if any, activities are affecting this species along the main stem Snake River. It is generally believed that any activity that degrades floodplain riparian or wetland habitats will also affect Ute ladies' tresses (USFWS, 1995).

Reclamation is currently cooperating with BLM and other agencies in a study to document river morphology changes of the Snake River that may have resulted from 1997 floodflows downstream from Palisades Reservoir. This study is expected to provide some understanding of the effects of periodic flood events on the habitat of the Ute ladies' tresses.

Snake River Basin Downstream of the Henrys Fork

Ute ladies' tresses have not been found in this part of the Snake River basin.

Federally Listed Endangered and Threatened Species
(U.S. Fish and Wildlife Services – Idaho)

Gray Wolf (*Canis lupus*)

(Experimental, nonessential population; 59 FR 60264; November 22, 1994 and 59 FR 60297p; November 22, 1994).

> *(Note: Under section 10(j), a population of a listed species re- established outside its current range but within its probable historic range may be designated as ``experimental'' at the discretion of the Secretary of the Interior (Secretary). Reintroduction of the experimental population must further the conservation of the listed species. An experimental population must be separate geographically from nonexperimental populations of the same species. Designation of a population as experimental nonessential increases the Service's management flexibility. For purposes of section 7 [except section 7(a)(1), which requires Federal agencies to use their authorities to conserve listed species], nonessential experimental populations located outside national wildlife refuge or national park lands are treated as if they are proposed for listing. This means that Federal agencies are under an obligation to confer, as opposed to consult (required for a listed species), on any actions authorized, funded, or carried out by them that are likely to jeopardize the continued existence of the species. Nonessential experimental populations located on national wildlife refuge or national park lands are treated as threatened, and formal consultation may be required. Activities undertaken on private or tribal lands are not affected by section 7 of the Act unless they are authorized, funded, or carried out by a Federal agency. Individual animals used in establishing an experimental population can be removed from a source population if their removal is not likely to jeopardize the continued (12.9 km2) existence of the species and a permit has been issued in accordance with 50 CFR part 17.22.)*

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

Canada lynx (Lynx canadensis)

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

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

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

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

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

Grizzly bear (*Ursus arctos*)

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

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

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

Outside the Primary Conservation Area, there is rapidly accelerating growth of human populations in some areas in grizzly bear habitat in western Montana, southeast Idaho, and northwest Wyoming. This growth results not only in increased visitor use but also increased residential development on important wildlife habitat adjacent to publish lands. This increased human use, primarily residential development, results in the loss of wildlife habitat and permanent increases in human bear conflict resulting in higher bear mortality rates.

Habitat destruction in valleys bottoms and riparian areas is particularly harmful to grizzlies because they use these "corridors" to travel from one area to another when they are searching for food. Some private landowners and companies are trying to help grizzlies by voluntarily protecting grizzly corridors.

Bald Eagle (Haliaeetus leucocephalus)

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

Eagle numbers plummeted with the introduction of the pesticide DDT. Eagles prey contained DDT residues, which weakened eggshells and caused reproductive failures, nesting failures and direct bird mortality. Lead poisoning, often a result of feeding on waterfowl containing lead shot also threatened the eagle. Habitat loss continues to be a threat to the recovery of the eagle.

Nesting areas (both existing and potential), as well as wintering habitat and food sources, must continue to be protected for complete recovery to occur.

Whooping Crane (Grus americana)

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

Utah valvata snail (*Valvata utahensis*).

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

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

- Ensure water quality standards for cold-water biota and habitat conditions so that viable, self-reproducing snail colonies are established in free-flowing mainstem and cold-water spring habitats within specified geographic ranges, or recovery areas, for each of the 5 species.
- Develop and implement habitat management plans that include conservation

measures to protect cold-water spring habitats occupied by Utah valvata snail from further habitat degradation.

- Stabilize the Snake River Plain aquifer to protect discharge at levels necessary to conserve the listed species cold-water spring habitats.
- Evaluate the effects of non-native flora and fauna on listed species in the Snake River from C.J. Strike Dam to American Falls Dam.

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

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

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

The Big Wood River site had a poor benthic community with many *Gyraulus parvus* and *Physella gyrina* (Dan Gustafson, pers. com. 2001). There were many small *Valvata*, but fewer large ones and the total number was too numerous to count. Gustafson (pers. com., 2001) suspects that this river may not have been suitable for Valvata before regulation and the site may therefore may not be a good one for recovery. However, it may serve as an important population for the recovery period. The habitat is large and the density is apparently quite high.

Ute ladies'-tresses (*Spiranthes diluvialis*)

(Listed as a threatened species on February 18, 1992.)
Spiranthes diluvialis is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams at elevations of 1,800 -7000 feet. The species occurs primarily in areas where the vegetation is relatively open and not overly dense, overgrown, or overgrazed (Coyner 1989, 1990; Jennings 1989, 1990).

Populations of this orchid were discovered in 1996 along the South Fork of the Snake River, downstream of Palisades Dam. Some of the groups are on federal lands administered by the U.S. Forest Service and the Bureau of Land Management. In Idaho, the species has not been discovered outside of a 49-mile-long corridor downstream of Palisades Dam in the Snake River floodplain. However, it could be present in suitable habitat outside of this area.

Urban development and watershed alterations in riparian and wetland habitat adversely affect this plant. *S. diluvialis* may also be impacted by the invasion of exotic plant species such as purple loosestrife, whitetop and reed canarygrass.

Recovery for this species will focus on improvement of watershed condition and function. The focus on watershed level planning and mangaement is necessary because it is watershed conditions and processes that create and maintain orchid habitat and thus assure perpetuation of orchid populations. Other actions that are necessary to recover the species include: 1) identify, protect, and manage populations in disjunct habitats; 2) inventory potential habitat; 3) conduct genetic, life history, ecology and habitat management studies; 4) reintroduce into appropriate habitat; and, 5) public education on watershed and riparian ecosystem management.

Recovered Species

Peregrine Falcon (Falco peregrinus anatum)

The peregrine falcon was found to be recovered and subsequently removed from the list of threatened and endangered species on August 25, 1999 (64 FR 46542). This determination is based on available data indicating that this subspecies has recovered following restrictions on organochlorine pesticides in the United States and Canada, and following the implementation of successful management activities. The Endangered Species Act requires that the Service implement a system, in cooperation with the States, to monitor effectively for at least 5 years, the status of all species that have been recovered and no longer need protection of the ESA. A proposed monitoring plan for the American peregrine Falcon was provided for public review and comment on July 31, 2001.

The American Peregrine Falcon Rocky Mountain/Southwest Population Recovery Plan (U.S. Fish and Wildlife Service 1984) established three objectives for delisting, including (1) increasing the Falco peregrinus anatum population in the Rocky Mountain/Southwest region to a minimum of 183 breeding pairs with a minimum of 17 pairs in Idaho; (2) sustaining a long-term average production of 1.25 yg/pr without manipulation by 1995; and (3) observing eggshell thinning of no more than 10 percent from the pre-DDT era for a 5-year span. The Rocky Mountain/Southwest population of the American peregrine falcon has made a profound comeback since the late 1970s when surveys showed no occupied nest sites in Idaho. As of 1999, the minimum known number of peregrine falcon pairs for Idaho was 17 breeding pairs.

Candidate Species

Yellow-billed cuckoo (*Coccyzus americanus*)

On July 25, 2001, the Service announced a 12-month finding for a petition to list the yellow-billed cuckoo (*Coccyzus americanus*) in the western continental United States under the Endangered Species Act of 1973, as amended. The Service found that the petitioned action is warranted, (i.e., the status of the species is such that listing as endangered or threatened is warranted), but precluded by higher priority listing actions. By publication of this finding, the species is now considered as a “candidate species” by the Service. The Service finds that declines in the distribution and abundance of yellow-billed cuckoos throughout the western states is primarily attributed to habitat loss, degradation and fragmentation from: overgrazing; replacement of native riparian woodland species by tamarisk and other non-native plants; river management, including altered flow and sediment regimes; and flood control practices, such as channelization and bank protection. Much of the remaining riparian habitat is in poor condition and heavily affected by human use. Fragmentation effects include the loss of patches large enough to sustain local populations, leading to local extinctions, and potential loss of migratory corridors, affecting the ability to recolonize habitat patches.

Information provided in the 12-month finding indicates that there have only been four records of yellow-billed cuckoo over the last century in Idaho with the most recent record from the South Fork of the Snake River in 1992. Additionally, the 1998 Forest Service publication titled "Effects of Recreational Activity and Livestock Grazing on Habitat Use by Breeding Birds in Cottonwood Forests along the South Fork Snake River" documents the presence of nesting yellow-billed cuckoos in the cottonwood galleries of the South Fork Snake River during the study period 1991-1994.

Greater Yellowstone Ecosystem

Gray Wolf

An experimental population of gray wolves was introduced into Yellowstone National Park and the central-Idaho Mountains in 1994. As of January 19, 2001, it appears that the estimated number of confirmed wolf breeding pairs in 2000 (25 plus) will fall just shy of the 30 breeding pair goal. Wolf packs/groups not counted as breeding pairs either did not produce 2 pups that survived until December 31 or had adult breeding pack members killed after pups were born. These estimates are just that, estimates, and as is typical with most wildlife population estimates, the confidence intervals are often at best plus or minus 20%, depending on terrain, vegetation, and monitoring intensity.

In the Greater Yellowstone area there are 164 wolves in 16 groups (mean pack size was 9) and at least 11packs with breeding pairs: Absaroka, Beartooth [#9], Chief Joseph, Druid Peak, Gros Ventre, Leopold, Nez Perce, Rose Creek, Sunlight, Swan Lake (152 group), Taylor's Peak, and Yellowstone Delta [formerly Soda Butte]. Packs/groups without pups include: Mollie's Pack [formerly Crystal Creek], Sheep Mountain, Teton, and Washakie.

Other Species of Concern

Although only three listed threatened species (Bald Eagle, Grizzly Bear, and Lynx) and two experimental populations of endangered species (Gray w\Wolf and Whooping Crane) have been recorded in the Wyoming drainages of the Headwaters Subbasin, nearly 25 species of animals and 50 species of plants classified a species of concern have been recorded (Wyoming Natural Diversity Database, in litt. 2001; Appendix D). Species in the Idaho portion of the Headwaters Subbasin recognized as Species of Concern by the The Idaho Conservation Data Center are listed in Table 42 (CDC in Litt, 2001).

The Endangered Species Act of 1973 (16 U.S.C. 1531 et. seq., particularly Section 7), Federal regulations (50 CFR 402) that implement provisions of Section 7, and Fish and Wildlife Service policy require that the Service consider the potential impact on threatened and endangered species of all projects and programs in Grand Teton National Park and Parkway and that management actions for protection and perpetuation of endangered or threatened species be incorporated into the resources management plan.

The most recent publication of 50 CFR does not identify, as listed or proposed, any threatened or endangered plant species found in GRTE or JODR. However, the Shultz's milkvetch *(Astragalus shultziorum*) is identified as a category 2 candidate species, indicating that conclusive data on biological vulnerability and threat are not currently available to support listing.

As of October 1, 1990 the gray wolf (*Canis lupus*), American peregrine falcon (*Falco pereginus*), bald eagle (*Haliacetus leucocephalus*), and whooping crane (*Grus americana*), all of which either formerly occurred or presently occur in the Park, are federally listed as endangered, and the grizzly bear (*Ursus arctos horribilis*), which presently occurs in the north end of the Park, is listed as threatened (50 CFR 17.11 and 17.12) (See Appendix B).

The Jackson Lake snail (*Helisoma [= Carinifex] jacksonense* Henderson, 1932) and the Elk Island snail (*Fontelicella robusta* Walker, 1908), which occur only in Jackson Lake in close proximity to Elk Island, are considered category 2 candidate species (49 F.R. 21664, 21673, 21674). Other category 2 wildlife species include the Prebles's shrew (*Sorex preblei*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Plecotus townsendii*), wolverine (*Gulo gulo*), lynx (*Felis lynx*), trumpeter swan (*Cygnus bucinnator*), loggerhead shrike (*Lanius ludovicianus*), western boreal toad, spotted frog, leatherside chub and fine spotted Snake River cutthroat trout (Clark et al 1989, Davis 1993).

Table 42. Threatened, Endangered, and Species of Special Concern in the Idaho Watersheds of the Headwaters Subbasin.

Species	Common Name	Global Rank	State Rank	Federal Status	IF	PALs	SLT	WIL
ACCIPITER GENTILIS	NORTHERN GOSHAWK	G5	S4	W		2	1	
BUFO BOREAS	WESTERN TOAD	G4	S4	W/SC		1		
BUTEO REGALIS	FERRUGINOUS HAWK	G4	S3B,SZN	W	12			
CICINDELA ARENICOLA	IDAHO DUNES TIGER BEETLE	G2	S1	SC	1			
COCCYZUS AMERICANUS	YELLOW-BILLED CUCKOO	G5	S1B,SZN	W		3		
CORYNORHINUS TOWNSENDII	TOWNSEND'S BIG-EARED BAT	G4	S2?	SC	3			
CYGNUS BUCCINATOR	TRUMPETER SWAN	G4	S1B,S2N	SC	2			1
GRUS AMERICANA	WHOOPING CRANE	G1	SE	XN				1
GULO GULO LUSCUS	NORTH AMERICAN WOLVERINE	G4T4	S2	W		1		1
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G4	S3B,S4N	LT	2	19	1	2
LYNX CANADENSIS	LYNX	G5	S1	LT		2	2	
MYOTIS CILIOLABRUM	WESTERN SMALL-FOOTED MYOTIS	G5	S4?	W	1	1		1
MYOTIS EVOTIS	LONG-EARED MYOTIS	G5	S3?	W		2		
MYOTIS VOLANS	LONG-LEGGED MYOTIS	G5	S3?	W		1		
MYOTIS YUMANENSIS	YUMA MYOTIS	G5	S3?	W		1		
NUMENIUS AMERICANUS	LONG-BILLED CURLEW	G5	S3B,SZN	SC				2
OTUS FLAMMEOLUS	FLAMMULATED OWL	G4	S3B,SZN	W		2		
PLEGADIS CHIHI	WHITE-FACED IBIS	G5	S2B,SZN	SC	1			1
STRIX NEBULOSA	GREAT GRAY OWL	G5	S3	W		3	1	
TAMIAS UMBRINUS	UINTA CHIPMUNK	G5	S1	W		1		
TYMPANUCHUS PHASIANELLUS COLUMBIANUS	COLUMBIAN SHARP-TAILED GROUSE	G4T3	S3	SC	9			13

Mammals: Game, Forest Carnivores, Small Mammals

Wyoming

Because of the two National Parks, a National Fish Hatchery, and the National Elk Refuge in the Headwaters Subbasin in Wyoming, there are several unique legislations governing wildlife. Public Law 81-787 (64 Stat. 849, Section 6) provides for a joint program between the U.S. Department of Interior and the State of Wyoming " ... to ensure the permanent conservation of the elk" within the Park [Teton National Park]. This includes the controlled reduction of elk by qualified hunters on part of the Federal land that was added to the Park in 1950. Reductions will be made " ... when it is found necessary for the purpose of proper management and protection of the elk". Hunting and fishing are currently permitted in the Parkway in accordance with Federal and Wyoming laws. Trapping has been prohibited in the Parkway since January 15, 1985.

A Memorandum of Understanding of March 31, 1959 (amended in 1984) between the Wyoming Game and Fish Commission, U.S. Forest Service, Bureau of Sport Fisheries and Wildlife, and the Service established the Jackson Hole Cooperative Elk Studies Group to coordinate studies of the Jackson Hole elk herd. The studies group initiated its activities on July 1, 1958 and remains active.

In a Memorandum of Agreement of July 3, 1973 between the Service and the Wyoming Game and Fish Commission, the Service agreed to: (1) manage areas administered by the Service in Wyoming to benefit fish and wildlife consistent with Service management policies for national parks, monuments, and recreation areas; (2) consult with the Commission before initiating research or any program or regulation that may affect distribution, numbers, species, or public use of fish and wildlife populations found within or adjacent to Service-administered areas; (3) regulate public uses of wildlife resources in accordance with State laws and regulations (except in Yellowstone National Park) and in a manner compatible with Service management objectives. The Service may prohibit or restrict, after consultation with the Commission, such uses as are reasonably necessary to comply with management objectives; and (4) cooperate in joint enforcement of applicable State laws pertaining to hunting, fishing, and boating.

Gros Ventre Subbasin: National Elk Refuge

Over 175 species of birds and 45 species of mammals have been recorded on the Refuge. Most noteworthy among the mammals are moose, bighorn sheep, mule deer, pronghorn antelope, bison, and of course, elk. Several species of large carnivores also annually or seasonally inhabit the refuge. These include coyotes, mountain lions, black bear, bobcat, and gray wolves.

The refuge provides winter habitat for about 60% of the Jackson elk herd. Numbers of elk on the refuge have varied from 5,000-10,700 since 1975, and winter feeding to sustain the herd has been required during all but 2 of those winters. Joining this large concentration of elk is a growing herd of bison that compete with the elk for refuge forage and space. Bison too utilize supplemental feed provided to elk in winter. Although hunting controls the size of the elk herd, ongoing litigation has prevented state and federal agencies from limiting the size of the bison herd, which has increased from 11 animals in 1969 to approximately 650 currently.

Impacts to palatable deciduous woody vegetation by winter concentrations of ungulates have degraded shrubland and woodland communities of the refuge particularly along Flat Creek. Several ongoing studies, generated by the Jackson Elk and Bison EIS, seek to quantify habitat impacts.

Most noteworthy among bird species that use the refuge is the trumpeter swan. Swans were apparently native to northwest Wyoming but extirpated from the refuge early in the 20th century. Reintroductions of trumpeters to the refuge occurred in the late 1930s. In recent years, 1-4 pairs of swans have nested on the refuge. They are among the most productive pairs in Wyoming, and part of the tristate trumpeter swan population. The refuge has conducted habitat improvement projects in the Flat Creek marsh and several ponds were constructed in the 1980s on the north half of the refuge to provide additional nesting habitat. Thus far, increased nesting by swans has not occurred. Figure 38 charts the productivity of refuge trumpeter swans since 1938; Figure 39 charts the nesting pairs of refuge trumpeter swans since 1938.

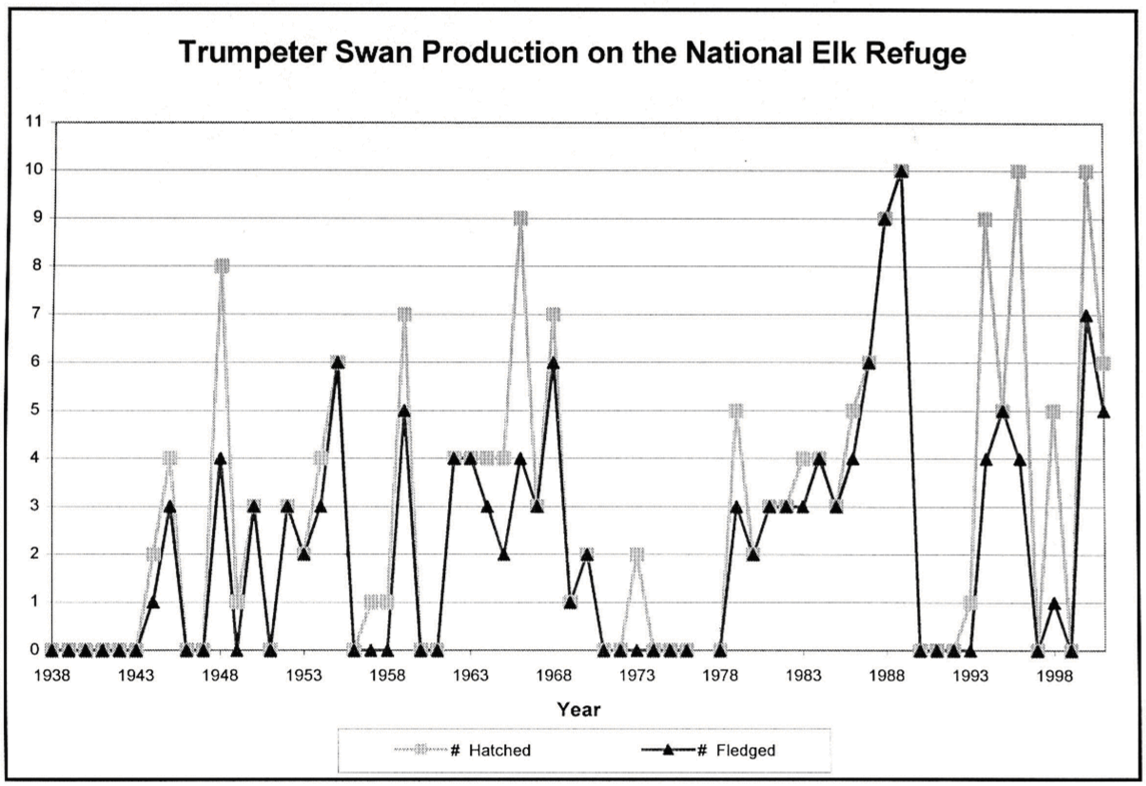


Figure 38. Productivity of the Trumpeter Swan.

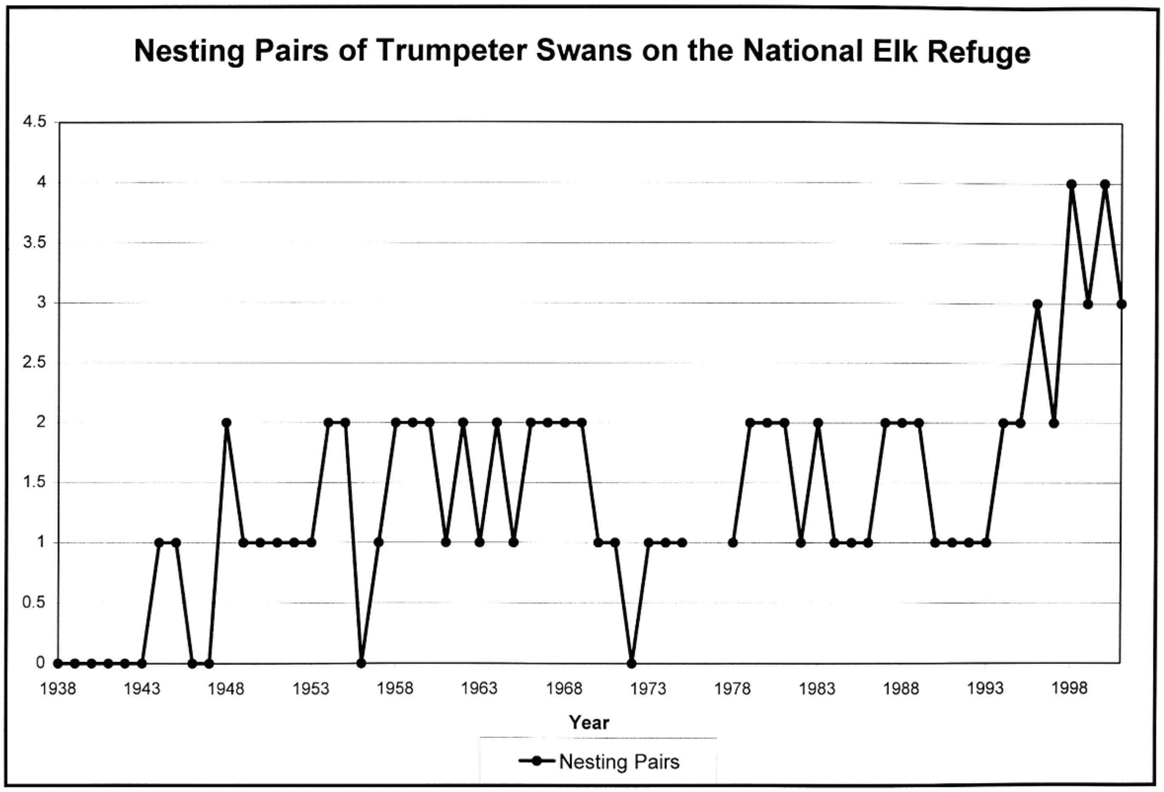


Figure 39. Nesting Pairs of Trumpeter Swans.

Moose

A significant population of moose exists in the Headwaters subbasin, although population surveys are not conducted specifically for moose. However moose are counted incidentally in the winter during deer and elk sightability surveys in portions of the sub-basin. Number of moose counted were; 147, 98, 200, 293, 228, and 317, respectively during 1992, 1994, 1995, 1997, 1999, and 2000. These surveys covered approximately 50% of the sub-basin.

Moose utilize a diversity of habitats in the sub-basin. The riparian corridor of cottonwood, willow/dogwood, conifers, and aspen/sagebrush along the South Forks of the Snake River, Willow creek, main stem of the Snake River, and their tributaries provide summer and winter habitat. Moose also use the residential and agricultural lands adjacent to the riparian corridors. Mountain mahogany on south-facing ridges provides important winter habitat in some areas.

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

Idaho Fish and Game offered 181 permits for moose in Headwaters hunt areas in 2000. Hunters harvested 160 moose (117 males and 43 females) for a 88% success rate.

Mountain Goats

The Snake River Mountain Range within the Headwaters subbasin is outside the historical range of mountain goats. However, twelve mountain goats were introduced into the subbasin (Table 43) during 1969 and 1970 (Hayden 1989). The mountain goat population in the Snake River Range grew rapidly in the 1970s and 1980s (Table 44, Table 45). Populations have declined since the mid 1990's.

The Snake River Range mountain goat habitat is productive, with a good complex of alpine meadows, mountain mahogany, and conifers. In summer the mountain goats use lush, alpine meadows and cirque basins. Examination of harvested mountain goats from this area indicates they are in extremely good body condition going into winter.

Domestic sheep graze the Mt. Baird area and may be impacting mountain goat summer range. This area is heavily used by mountain goats prior to sheep use, but they leave and move onto winter range when domestic sheep intrude. It is not known if this mountain goat movement is due to forage or spatial competition, or disturbance created by herders and dogs. The Targhee National Forest, who administers the area, continues to evaluate the conflict.

Productivity and survival have historically been high in this introduced population. In 1982 and 1983, the percent of adult females producing young was 71% and 83%, respectively, and twinning rates were 25% and 33%, respectively. Annual survival from 1982 to 1983 was calculated to be 88% among kids, 95% among yearlings, and 93% among adult/subadults (Hayden 1989).

A total of 90 mountain goats with a kid:adult ratio of 48:100 was counted in the Mt. Baird area (Hunt Area 67-1; Table 44). The next most recent count in this area was a helicopter count conducted in 1998 that accounted for 163 mountain goats. This population has shown a steady decline from 217 (the historical high count) down to 90 since 1996. Reasons for this decline are largely unknown.

The 2000 population survey of the Mt. Baldy area resulted in a total count of only 14 goats with a kid:adult ratio of 56:100 (Table 45). This total of 14 mountain goats represents the lowest total for this population and a continuation of a significant downward trend over the past 10 years. The total of 14 mountain goats is just 11% of the historical high count of 126 for this area that was observed in 1986.

Hunts were initiated in 1983. Seasons were restructured in 1991 due to decreasing population trends and plans to continue trapping mountain goats from the Mt. Baldy and Mt. Baird populations for statewide transplants. Total permits were reduced from 24 to 13. The continuation of a downward population (Table 45) trend resulted in the closure of Hunt Area 67-2 beginning in 1999 and a decrease in permits in Hunt Area 67-1 from 20 to 10. In 2000, 9 mountain goats (5 males and 4 females) were harvested on the 10 permits (90% success rate) available.

Table 43. Summary of Mountain Goat Transplants in the Snake River Range, Idaho.

Date	Capture Site	Release Site	Adult M	Adult F	Kid M	Kid F	Total
7/1969	9-Snow Peak,	67-Palisades Creek	1	2	0	0	3
7/1969	9A-Black Mtn.	67-Palisades Creek	1	1	0	0	2
7/1970	9A-Black Mtn.	67-Black Canyon	3	0	0	0	3
7/1970	9A-Black Mtn.	67-Black Canyon	1	2	1	0	4
8/1989	67-Baldy Mtn.	28-Williams Creek	1	1	0	0	2
7/1990	67-Baldy Mtn.	28-Panther Creek	2	3	0	2	7
7/1991	67-Baldy Mtn.	28-Panther Creek	1	4	0	1	6
7/1992	67-Baldy Mtn.	28-Panther Creek	2	9	0	0	11
8/1994	67-Baird Mtn.	21-Square Top	4	6	0	0	10
8/1997	67-Baird Mtn.	21-Corn Lakes	4	6	0	0	10

Table 44. Summary of Mountain Goat Surveys south of Palisades Creek, 1982-Present (Mt. Baird area).

Year	Hunt Area	Inclusive Location	Adults	Kids	Unknown	Total	Ratio Kid:100 Adult
1982[a]	67-1	South of Palisades Creek, Idaho	33	13	0	46	39
1985[a]			35	16	0	51	46
1986[b]			0	0	104	104	--
1986[a]			37	15	0	52	41
1988[b]			71	21	0	92	30
1990[b]			45	18	0	63	40
1993[b]			104	33	16	153	34
1994[a]			73	42	0	115	58
1996[a]			151	66	0	217	44
1998[a]			118	45	0	163	38
2000[a]			61	29	0	90	48

[a] Helicopter survey.
[b] Ground count.

Table 45. Summary of Mountain Goat Surveys north of Palisades Creek, 1982-Present (Mt. Baldy area).

Year	Hunt Area	Inclusive Location	Adults	Kids	Unknown	Total	**Ratio** Kid:100 Adult
1982[a]	67-2	North of Palisades Creek, Idaho	45	12	0	57	27
1985[a]			31	8	0	39	26
1986[b]			0	0	126	126	--
1986[a]			38	19	49	106	50
1987[b]			72	28	0	100	39
1988[b]			91	31	0	122	34
1989[b]			35	12	0	47	34
1990[b]			73	22	0	95	30
1994[a]			41	20	0	61	49
1996[a]			47	17	0	64	36
1998[a]			26	7	0	33	27
2000[a]			9	5	0	14	56

[a] Helicopter survey.
[b] Ground count.

Black Bear

IDFG Management Objectives

The Idaho Department of Fish and Game's 2000-2010 Black Bear Management Plan set management objectives to maintain harvest (Table 46) levels consistent with the moderate harvest targets of 25-35% age 5+ black bears in the male harvest and 30-40% females in the total harvest over a three year running average.

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

A bait station survey was conducted from Junes 24 - 29, 1999. A total of 138 bait stations were established on 23 transects in Units 66, 66A, 67, and 76. No visits by black bears were recorded at the bait stations.

Table 46. Idaho Department of Fish and Game Black Bear Harvest for Years 1998 & 1999 by Hunting Unit.

Spring 99

UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
64	6/4/99	M	0	BOW	NO	BAIT
64	5/19/99	M	4	RIFLE	NO	BAIT
64	5/22/99	M	3	RIFLE	NO	BAIT
66	5/27/99	F	2	RIFLE	YES	BAIT
67	5/19/99	F	0	RIFLE	NO	STALK
67	5/19/99	M	0	RIFLE	NO	INC
67	5/23/99	M	2	BOW	NO	BAIT
67	5/14/99	M	3	RIFLE	NO	BAIT
67	5/8/99	M	3	BOW	NO	HOUND
67	5/15/99	M	7	RIFLE	NO	BAIT
67	6/3/99	M	4	PISTOL	NO	BAIT
67	6/6/99	M	6	RIFLE	NO	HOUND
67	6/7/99	F	4	PISTOL	NO	HOUND
69	5/25/99	M	1	RIFLE	NO	STALK

Fall 99

UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
64	10/6/99	M		RIFLE	NO	BAIT
66	9/18/99	M		BOW	NO	INC
66	9/17/99	F		RIFLE	NO	BAIT
66	9/25/99	F		RIFLE	NO	HOUND
66	9/26/99	M		BOW	NO	HOUND
66	10/31/99	M		RIFLE	NO	INC
66	10/8/99	F		RIFLE	NO	BAIT
66	10 3/99	M		RIFLE	NO	INC
66	10/30/99	M		RIFLE	NO	STALK
67	10/5/99	F		RIFLE	NO	INC
67	9/25/99	F		RIFLE	NO	BAIT
67	9/28/99	F		RIFLE	NO	STALK
67	9/20/99	M		BOW	NO	BAIT
67	10/30/99	M		RIFLE	NO	INC
69	9/18/99	M		BOW	NO	BAIT

Spring 98

UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
64	5/16/98	M	5	RIFLE	NO	HOUND
64	7/13/98	M	4	OTHER?	NO	OTHER?
66	5/2/98	M	7	BOW	NO	HOUND
66	5/24/98	M	2	RIFLE	NO	BAIT
66	6/7/98	M	3	BOW	NO	BAIT
66	5/31/98	M	1	RIFLE	NO	STALK
66	6/1/98	M	2	RIFLE	NO	BAIT
66	5/29/98	M	2	RIFLE	NO	HOUND
66	5/30/98	F	6	RIFLE	NO	HOUND
66	6/5/98	F	4	RIFLE	NO	HOUND
66	6/7/98	M	2	BOW	NO	HOUND

Fall 98

UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
66	10/11/98	F	2	RIFLE	NO	INC
67	10/1/98	F	9	RIFLE	NO	INC
67	10/6/98	U?	3	OTHER?	NO	STALK
67	9/26/98	M	7	BOW	NO	INC
69	9/19/98	M	3	PISTOL	NO	HOUND

Spring 98						
UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
67	4/30/98	M	4	RIFLE	NO	BAIT
67	6/5/98	M	3	BOW	NO	HOUND
67	5/7/98	M	5	RIFLE	NO	BAIT
67	6/3/98	F	3	MZLDR	NO	PRED CL
67	6/3/98	M	2	RIFLE	NO	BAIT
67	5/17/98	M	12	RIFLE	NO	HOUND
67	5/27/98	M	7	RIFLE	NO	BAIT

Fall 98						
UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD

Mountain Lion

Historically, there were few mountain lions in the sub-basin. Suitable mountain lion habitat is relatively limited to the Snake River Mountain Range, with isolated areas separated by agricultural lands and urban areas.

Idaho Department of Fish and Game manages the harvest (Table 47) of mountain lions in the sub-basin under a general *either sex take season* between August 30 and December 31st. The take season is closed once 7 female mountain lions are harvested in Units 64, 65, 66, 67, and 69 combined, then the season becomes a pursuit only season. There is no dog training season in the sub-basin. (Idaho Department of Fish and Game, Surveys and Inventories, Mountain Lion, Annual Progress Report W-170-R-25, Boise, Idaho)

Table 47. Idaho Department of Fish and Game Mountain Lion Harvest for Years 1973 – 2001 by Hunting Unit.

Year	Unit				TOTAL	SEASON FRAMEWORK
	64	66	67	69		
73/74	0	0	0	0	0	GH
74/75	0	0	0	0	0	GH
75/76	0	0	0	0	0	GH
76/77	0	0	0	0	0	GH
77/78	0	0	0	0	0	GH
78/79	0	0	0	0	3	GH
79/80	0	0	0	0	1	GH
80/81	0	0	0	0	1	GH
81/82	0	0	0	0	5	GH
82/83	0	0	0	0	0	GH
83/84	0	0	0	0	1	GH
84/85	0	0	0	0	5	GH
85/86	0	0	0	0	2	GH
86/87	0	0	0	0	7	GH
87/88	0	0	0	0	8	GH
88/89	0	0	0	0	3	GH
89/90	0	0	0	0	11	GH
90/91	0	0	0	0	9	GH, Quota (3)
91/92	0	0	0	0	9	GH, Quota (3)
92/93	0	0	0	0	8	GH, Quota (3)
93/94	0	0	0	0	4	GH, Quota (3)
94/95	1	0	3	0	11	Quota (7)
95/96	1	0	4	0	15	Quota (7)
96/97	1	2	1	0	14	Quota (8)
97/98	2	5	3	0	22	Quota (9)
98/99	1	2	6	0	15	Quota (11)
99/00	0	3	2	1	18	Quota (20)
00/01	1	4	5	4	24	Quota (20)
Unit Total	7	16	24	5	192	

(yellow) = No Take Season Offered

Elk and Deer

Harvest Numbers for the Year 2000

The Idaho Fish and Game Department provided numbers for harvestable ungulates, elk and deer, noted below in Table 48 for elk and Table 49 for deer. Comparative numbers for previous years were not available due to the collection method being different than the collection method for year 2000.

Table 48. Year 2000 Elk Harvest Numbers for Idaho Headwaters Subbasin.

Unit	Total Harvest	# Hunters	Total Days Hunted	Avg Days/ Hunter	% Success (1)	# Bulls	% Spikes	% 6+ Pts.
63A	13	212	1,941	9.2	6.3	0	0	0
64	32	209	1,341	6.4	15.2	19	0	67
66	191	941	4,589	4.9	20.2	111	53	23
67	32	247	1,613	6.5	12.8	25	25	75
69	132	684	3,250	4.8	19.2	72	73	0

(1) % Successs = Total Harvest/#Hunters
Source: IDFG, Sept 2001, DKemner

Table 49. Year 2000 Deer Harvest Numbers for Idaho Headwaters Subbasin.

Unit	Estimated # Harvest	Male	Female	%4+ Pts	%5+ Pts	Rifle	Muzzle	Archery	% Whitetails
63A	91	74	15	30	8	37	6	41	69
64	71	69	2	25	8	63	0	7	18
66	139	134	4	33	6	129	0	5	2
67	108	106	1	37	7	104	0	4	5
69	246	238	4	26	6	235	0	5	6

Elk

The subbasin is comprised of all (Tex Creek) or a portion (Palisades) of two of Idaho Fish and Game's elk management zones (Figure 40). Management objectives vary according to zone.

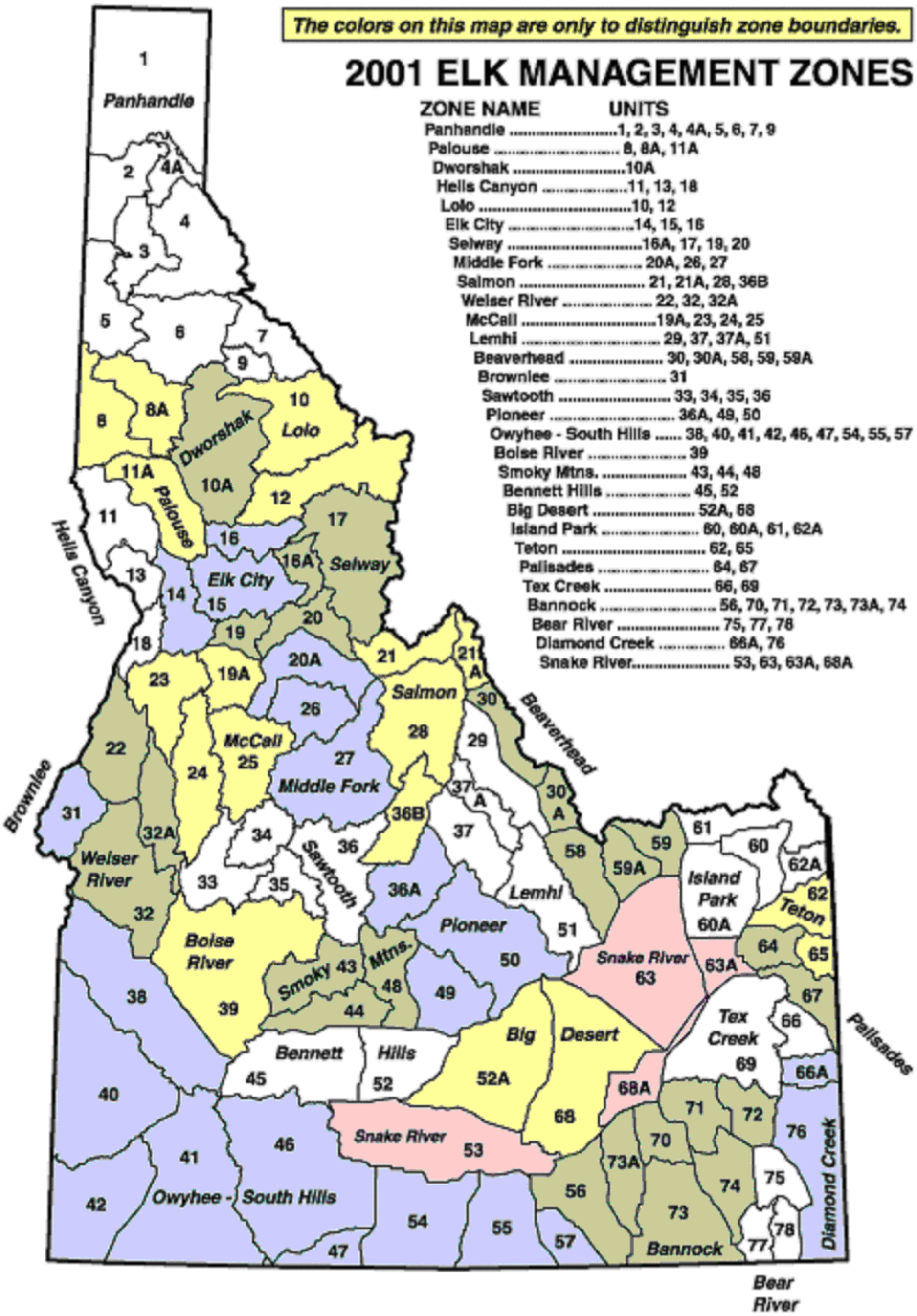


Figure 40. Idaho Hunting Units and Elk Hunt Zones, 2001.

The population management objective for the Palisades Zone is to maintain approximately 500 cows and 160 bulls, of which 100 should be mature bulls. This represents a slight reduction from current levels and is designed to eliminate the artificial feeding operation existing at Rainey Creek, as directed by the Wildlife Brucellosis Task Force Report and Recommendations to the Governor (September 1998). Following the elimination of annual feeding, the population will be allowed to recover to the extent it can be supported on natural forage, particularly on winter ranges northwest of Dry Canyon. Population manipulation will be accomplished primarily through public hunting; however, trapping and transplanting will also be employed. This zone offers most of what little backcountry hunting opportunity remains in southeast Idaho.

The population management objective for the Tex Creek Zone is to winter approximately 2,500 cows and 525 bulls, of which 300 should be adult bulls. Population manipulation will be accomplished primarily through regulated public hunting. Management will be coordinated with management of Unit 66A of the Diamond Creek Zone where a major portion of the wintering Tex Creek elk are in summer and fall. Claims resulting from crop damage will be eliminated and depredation problems will be solved using hunting as a first option.

Reports of elk in the 1800s and early 1900s are sketchy and inconclusive for the Palisades area; however, it is likely elk were present. General either-sex hunting was allowed until the mid-l970s. At that time overharvest became a concern and the format was changed to allow five days of general hunting for bulls only. Hunting for antlerless elk was restricted to permits. Elk damage to haystacks in Swan Valley dates back to the mid-1950s, corresponding with a loss of winter range to inundation by Palisades Reservoir on the South Fork of the Snake River. In the mid-l970s the Department began feeding elk in Rainey Creek to bait them away from livestock feeding operations. This activity has continued to the present and involves approximately 300 animals. The elk population wintering in this zone has increased gradually over the last three decades and is currently as high as it has been in modern times.

Elk were present in the Tex Creek Zone during the late 1840s, as reported by Osborne Russell in *Journal of a Trapper*. During the early 20th century, elk were rarely seen according to residents of the area. The elk population increased during the l940s. By the mid-l950s depredation complaints on winter wheat were common. The first modern hunt was implemented in l952 and consisted of 50 permits. Beginning in 1955 general hunting was allowed and has continued in some form to the present.

Elk Habitat Issues

Abundant spring, summer, and fall habitat exists in the Palisades zone. Winter range is limited and is more characteristic of mule deer habitat than elk habitat. Winter range has been lost to agriculture and inundation by Palisades Reservoir, and is currently threatened by proposed housing developments. Efforts are underway to inventory both occupied and potential elk winter range in the zone as part of a strategy to end winter feeding. Opportunities to preserve or enhance winter range will be pursued. Potentially important winter ranges in the northern portion of the zone (Grandview Point) are now nearly vacant, in all probability due to displacement of elk by snowmobile activity. Winter range on slopes in the vicinity of the mouth of Rainey Creek appears to have suffered from years of overgrazing by elk and mule deer. Mature mountain mahogany stands throughout the zone may be providing only limited forage, in addition to precluding all but a sparse understory of other species.

Habitat throughout the Tex Creek Zone is or has the potential to be highly productive. The fertile, mineral rich soils of the area produce diverse plant communities including sagebrush-grasslands, extensive aspen patches, and cool moist conifer stands primarily on north and east-facing slopes. Terrain is generally mild and much of the private land of the area is dry farmed with cereal grains. Nearly half of the zone is private land with the balance of public lands administered by the USFS, BLM, IDL, and the Department. A significant portion of the private land is CRP enrolled and is contributing substantially to the area's carrying capacity during all seasons. The Tex Creek Wildlife Management Area, partially owned and totally managed by the Department, provides 30,000 acres of prime winter habitat for elk, mule deer, and moose in the zone. This land was purchased to mitigate for habitat inundated or destroyed by Ririe, Palisades, and Teton dams and reservoirs.

The most pressing biological issues in the Palisades zone relate to the fed elk herd at Rainey Creek. This group of about 300 animals has a documented exposure rate to brucellosis exceeding 25% based on testing of >100 individuals. Late hunts have been unsuccessful in reducing this population. Plans have been implemented to trap and remove all positive testing female animals and transplant negative testing animals to winter ranges northwest of Dry Canyon. This process is expected to take three years to complete. The elk are being transplanted in an experimental effort to determine if they will return to their birthing summer ranges and then migrate back near their transplant site the following winter. Radio tracking will monitor this test.

A projected overharvest of bull elk in this zone was occurring under the prior management scheme of 5 days of any-bull hunting. This condition was not evident on winter surveys because the elk from Unit 66A in the Diamond Creek Zone winter in this zone. These elk should be managed as one population in the same zone from a biological perspective. Implementation of zone management resulted in a dramatic drop in the number of any-bull hunters the first 2 years and could bring the male segment of the population to objective rapidly. The Tex Creek elk are productive and future management of them will be heavily influenced by the need to control this population. Placing all of the seasonal ranges of these elk in the same zone would be appropriate to accomplish this objective.

In addition to elk, the sub-basin is home to an important mule deer population, a strong moose population, and is grazed extensively by domestic livestock. Interspecific relationships among these species and elk are not well monitored and are poorly understood. Competition between elk and mule deer probably is occurring in the immediate vicinity of Rainey Creek where both species have been fed most winters since the mid-l970s. Mule deer and elk appear to be spatially separated on winter range in the Tex Creek zone and there are no known conflicts between elk and moose.

There are no known unique or unusual predator issues affecting elk populations in this zone.

Elk Winter Feeding Issues

In the late l970s, a rancher near Irwin began feeding cattle near the mouth of Rainey Creek and along the Forest boundary. Concurrently large areas of browse in the area were being converted to cultivation. The combination of these factors resulted in elk damaging stored hay and taking advantage of the livestock feedlines. The Department resolved these conflicts by baiting the elk up into Rainey Creek where they have been fed ever since. It is the Idaho Fish and Game's intent to eliminate all but emergency feeding of elk in this zone by the 2001-2002 winter. This should also eliminate any brucellosis-related concerns. Elk are not fed in the Tex Creek zone except on an emergency basis, which has occurred twice recently– winters of l988-1989 and l991-1992. Because of the zone's proximity to known brucellosis-infected herds in Wyoming and Idaho, it is extremely critical that feeding on anything less than a genuine emergency basis should be avoided. Large round bales of grass-alfalfa hay have been left in the field on Tex Creek WMA periodically to attract elk to the area and hold them on that winter range.

Elk Information Requirements

A comprehensive inventory of winter range in this zone is needed to accomplish the objective of ending annual winter feeding. The condition of some winter ranges may provide opportunities for enhancement for elk, perhaps through prescribed burning or changes in livestock management. As part of this, an assessment of the location, quality, and remaining terms of enrollment of the area's CRP lands will be determined.

In l978, 1979, and 1980 Idaho Fish and Game conducted radio telemetry studies of elk wintering on Tex Creek WMA, the results of which indicated these elk summered primarily in Units 66 and 66A with some going to Units 69 and 76. This work was duplicated in l998-1999 with results showing the same trends in distribution and movement. Of concern, however, is the low proportion of marked animals remaining in the zone during the summer and fall. Information from this work may result in new harvest strategies designed to favor the zone's resident animals.

Mule Deer –IDFG Management Objectives

The Idaho Department of Fish and Game's management objectives for mule deer in the Headwaters subbasin is to maintain a minimum of 15 bucks per 100 does in post season surveys, and to maintain a minimum of 30% 4 point and larger bucks in the general season harvest. Additionally, general antlerless harvest will be encouraged when trend area sightability estimates exceed 3000 deer in certain Fish and Game analysis areas. Maintaining population in the Palisade Mountains at a level where it does not cause chronic depredations and require winter feeding, particularly in Swan Valley, is also a priority.

Mule Deer –Habitat Issues

Habitat is or has the potential to be highly productive. The fertile, mineral rich soils of the area produce diverse plant communities including sagebrush-grasslands, extensive aspen patches and cool moist conifer stands primarily on north and east facing slopes. Approximately half of the area south of the South Fork of the Snake River is private land. The United States Forest Service, Bureau of Land Management, Idaho Department of Lands and the Idaho Department of Fish and Game manage land in the sub-basin. Approximately 250 square miles of the southwest corner of the area is Fort Hall Indian Reservation land. A significant portion of the private land is CRP enrolled and is contributing substantially to the area's carrying capacity during all seasons. The Tex Creek Wildlife Management Area, partially owned and totally managed by the Idaho Department of Fish and Game, provides 30,000 acres of prime winter habitat for mule deer, elk, and moose. This land was purchased to mitigate for habitat inundated or destroyed by Ririe, Palisades and Teton Dams and Reservoirs. Winter range is limited and is more characteristic of mule deer habitat than elk habitat. Winter range in Swan Valley has been lost to agriculture, and is currently threatened by proposed home sites. Efforts are underway to inventory both occupied and potential winter range as part of a strategy to reduce the need to feed deer in the winter. Opportunities to preserve or enhance winter range will be pursued.

Mule Deer Biological Issues

Both of the management objectives for this area (minimum of 15 bucks per 100 does post-season and at least 30 percent of the buck harvest being $\geq$ 4 points) are being met. Composition counts resulted in an estimate of 21-25 bucks per 100 does and 36-41 percent $\geq$ 4 points in the buck harvest for 1998-00.

Idaho Fish and Game conducted an aerial trend count in late March, 2001 for their hunting units 66, 66A, and 69. This survey resulted in an estimate of 2331 total deer, which is below the 3508 estimated on the previous survey (1999) and the antlerless harvest threshold of 3000. It is believed that the 2001 estimate is not an accurate reflection of the status of this population. It is likely that the mild winter/early spring conditions resulted in either deer not coming all the way to the surveyed winter range or leaving early, prior to the trend survey in late March.

Mule deer populations were at a historical high in this analysis area when surveyed in February l991. The winter of l992-93 was severe and significant mortality occurred, especially to fawns. The population rebounded rapidly to long term average levels, but has not approached the extreme highs of the late l980s and early l990s. If the current series of mild winters continues this highly productive population will respond positively.

Mule Deer Interspecific Issues

In addition to mule deer, the area supports a large elk population and numerous moose. Domestic livestock grazing occurs in the sub-basin. Interspecific relationships are not monitored and are poorly understood. If the elk population is not kept in check, conflicts with deer on winter range could develop. Currently agricultural practices, particularly management of CRP lands, are of greater concern than are potential interspecific conflicts.

Mule Deer Predation Issues

There are no known unique or unusual predator issues affecting mule deer populations in the Headwaters Subasin. Wolves reintroduced in Yellowstone National Park could become established in the sub-basin. Presence of wolves may affect other predators and deer.

Mule Deer Winter Feeding Issues

Mule deer have been fed during severe winters on an emergency basis below the Palisades Bench, near Heise, and in Canyon Creek. They have been fed on a regular basis at the mouth of Rainey Creek along with elk. Plans to eliminate feeding of elk at that site will remove the site's strong attraction to deer and should result in the end of deer feeding as well. With the new and planned home site developments occurring in Swan Valley, will come new residents tempted to bait or feed deer and elk. All such efforts will be discouraged.

Birds

US Fish and Wildlife Services - Idaho

The U.S. Fish and Wildlife Service has provided a bird population list and varied habitats throughout the Headwaters regions (Table 50).

Table 50. Priority Bird Populations and Habitats in Idaho.

Shrubsteppe	Wetlands/grasslands
Swainson's Hawk	Western Grebe
Greater Sage Grouse	Trumpeter Swan
Black-chinned Hummingbird	Sandhill Crane
Long-billed Curlew	Franklin's Gull
Sage Sparrow	
Brewer's Sparrow	
Gray Flycatcher	
Sage Thrasher	
Virginia's Warbler	
Prairie Falcon - *Highest percent population of any physiographic area.*	

Coniferous Forest
Flammulated Owl
Calliope Hummingbird
Lewis's Woodpecker
Williamson's Sapsucker
Hermit Warbler

Raptors

There is documented use of the Upper Snake by some 23 species of raptors (Table 51, Whitfield et al. 1995). The diverse vegetative habitats found along the river coupled with varied topography contribute to this wildlife diversity.

Table 51. Raptors recorded along the South Fork of the Snake River.

Bald Eagle	*Haliaeetus leucocephalus*	Turkey Vulture	*Cathartes aura*
Golden Eagle	*Aquila chrysaetos*	N. Saw-Whet Owl	*Aegolius acadicus*
Osprey	*Pandion haliaetus*	Northern Pigmy Owl	*Glaucidium gnoma*
Northern Goshawk	*Accipiter gentilis*	Western Screech Owl	*Otus kennicottii*
Cooper's Hawk	*Accipiter cooperii*	Flammulated Owl	*Otus flammeolus*
Sharp-shinned Hawk	*Accipiter striatus*	Short-eared Owl	*Asio flammeus*
Red-tailed Hawk	*Buteo jamaicensis*	Long-eared Owl	*Asio otus*
Swainson's Hawk	*Buteo swainsoni*	Great Horned Owl	*Bubo virginianus*
Northern Harrier	*Circus cyaneus*	Great Gray Owl	*Strix nebulosa*
Peregrine Falcon	*Falco peregrinus*	Boreal Owl	*Aegolius funereus*
Prairie Falcon	*Falco mexicanus*		
American Kestrel	*Falco sparverius*		

Sage Grouse (Idaho Sage Grouse Task Force, 1997)

In 1996, the number of sage grouse in Idaho was at a record low. Management efforts directed at this native grouse are often fragmented between different agencies and landowners without common goals or direction. To provide improved cooperation among affected parties, in 1996 the Idaho Fish and Game Commission sponsored development of a comprehensive, ecosystem-based plan for Idaho's sage grouse.

The Idaho Sage Grouse Task Force developed the Idaho Sage Grouse Management Plan. The task force was comprised of representatives from natural resource agencies and agricultural, sportsman, and conservation organizations. The Plan is designed as a framework for local working groups (LWGs) to develop site-specific programs to improve local sage grouse populations. This plan is expected to be in place until population goals are met in all Management Areas. It will be reviewed by the Statewide Sage Grouse Task Force at least annually and updated and revised as new information becomes available. Connelly (2001) recently summarized the past decade of sage grouse research in Idaho (Appendix E).

Sage Grouse Habitat

Sage grouse are dependent on large acreages (i.e., hundreds of thousands of acres) of sagebrush/grassland habitats that have a 15 to 25% sagebrush canopy cover and good grass and forb (flowering herbaceous plants) cover. Generally, sagebrush habitats provide critical winter range for sage grouse (i.e., grouse depend on these habitats exclusively during the winter and loss of these habitats will cause a loss of the sage grouse population). Similarly, sagebrush/grassland habitats provide critical breeding range for sage grouse and their loss will result in a loss of sage grouse. Meadows, riparian areas, alfalfa fields and other moist areas provide important summer range for sage grouse, but grouse will use a variety of habitats at that time of year. Sage grouse populations decline when sagebrush/grassland habitat is altered or fragmented by reducing or eliminating sagebrush canopy cover, seeded to introduced grass species, converted to agriculture dominated by annual grasses (e.g., cheatgrass), or altered in any way that results in significant reduction of the native grass/forb understory. Quality sage grouse habitat has not been widespread in the Idaho Portion of the Headwaters Subbasin for manyl decades.

Sage Grouse Habitat Trends

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

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

A local working group is developing a plan that covers the Closed Basins sub-basin, the Henry's Fork sub-basin, and that portion of the Headwaters sub-basin north and west of the South Fork of the Snake River and main Snake River in Idaho. Currently, there is not a local working group plan being developed for the Willow Creek drainage. Very few sage grouse occur in the Headwater's subbasin of Idaho.

Sage Grouse Population Trend (Compton, 2001).

Seventeen lek routes were counted in 2000 in the Idaho Department of Fish and Game's Upper Snake region. Only one route (Market Lake) is in the Headwaters Subbasin. This lek has not has a significant change in numbers since its inception (Table 52).

Table 52. Sage Grouse lek counts in the Headwaters Subbasin of Idaho.

Route	1997	1998	1999	2000	Average
Market Lake	26	31	30	19	27

Sage Grouse Harvest Characteristics

Starting in 1996, sage grouse hunting season has been divided into three areas to study the affects hunting may have on populations. Lek route counts elsewhere indicate that populations have increased slightly over the past 5 years. Check station data since 1995 reflects the reduced bag/possession limits with fewer hunters and fewer grouse harvested on opening weekend (Table 53).

Table 53. Check Station counts and telephone survey results for sage grouse, 1991 – 2000.

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

Year	Check Station					Telephone Survey		
	Bag and Possession Limit	Hunters	Birds	Birds Per Hunter Day	Hours Per Bird	Hunters	Birds	Birds Per Hunter Day
1998 [c]	1-2 & 2-4	524	336	0.64	6.53	[d]		
1999 [c]	1-2 & 2-4	526	424	0.81	4.54	[d]		
2000 [c]	1-2 & 2-4	573	387	0.68	5.58			
10 Year Average		1,065	717	0.67	7.07			

[a] Season extended from 16 to 30 days.
[b] A toxic chemical spill on I-15 on opening day 1992 resulting in some hunters being missed at the Sage Junction check station.
[c] Season closed area 1; 7-day season area 2, bag-possession limits 1-2, 23- day season area 3, bag-possesssion limits 2-4.
[d] Telephone Survey data were not collected on the 1997, 1998, 1999 or 2000 seasons.

Trumpeter Swans

Grays Lake is the single most important swan nesting area in Idaho, but has severe habitat problems due to the Department of the Interior and Bureau of Indian Affairs water withdrawals (U.S. Fish and Wildlife Service 1982). Currently (as of 2001), nine of the 20 active swan nests known in Idaho are located at Grays Lake.

Winter use by trumpeter swans in the headwaters is significant, and increased along the South Fork and Salt River drainages during the 1990s (U.S. Fish and Wildlife Service 1935-1997, U.S. Fish and Wildlife Service 1972-1998). The USFWS conducted an aerial survey in February 2001: 643 trumpeter swans were counted on the South Fork and 98 on the Salt River (U.S. Fish and Wildlife Service 1972-1998). One current nesting pair exists along the Salt River as of August 2001 (pers. com. R. Shea, August 2001). The segment of the Rocky Mountain Population of Trumpeter Swans (Gale et al., 1987) that nests in eastern Idaho and elsewhere in Greater Yellowstone (the Greater Yellowstone nesting population) is the only nesting population in the lower 48 states that was not extirpated by 1900. A petition to list it under the distinct population segment criteria of the ESA was filed in fall 2000 and is pending

There are key trumpeter swans habitats threatened by subdivision and incoming human activity in the Salt River and Swan Valley drainages. Grays Lake consistently experiences inadequate water, leading to problems for the resident nesting population. Correction of the habitat problems (introduced by DOI/BIA water draw down and incoming human activity) in Grays Lake basin are key to long-term viability of resident nesting population, which currently has been petitioned for listing.

Currently, USFWS and the Pacific Flyway (with other western state F&G departments) are in the early stages of writing an Implementation Plan to address key problems (Pacific Flyway Subcommittee on Rocky Mountain Trumpeter Swans 1998). This plan will prioritize needed management actions, habitat improvements, and research/monitoring needs. Its goal will be as a key reference for needed trumpeter swan work scheduled for completion by July 2002.

Additionally, IDFG is just beginning to write its own stand-alone plan for trumpeter swans to be completed by 2002.

Priority Waterfowl (Southeast Idaho Wetland Focus Area Working Group, 2001)
North America has 43 species of ducks, geese, and swans that typically use habitats in at least two or more countries during their annual life cycle. During the 1900s waterfowl population numbers have fluctuated, sometimes significantly, throughout North America. In the early 1930s the public began to take notice of changing waterfowl numbers. Waterfowl numbers reached their peak last century in the 1970s. This peak is the basis for the population goals outlined in the North American Waterfowl Management Plan (NAWMP). The North American Plan calls for a sustainable population level for ducks, geese, and swans. For ducks, the goals are for a breeding population of at least 62 million and a fall flight of at least a 100 million. For geese and swans, the total combined winter population goal is approximately 6 million birds. Several goose populations are considered too high; however, others are in steady decline and are facing possible listing as a threatened or endangered species. Swan populations goals include a slight reduction in tundra swan numbers and a doubling of current trumpeter swan numbers continent wide.

The Priority Waterfowl species identified for the Southeast Idaho Wetland Focus Area are in many cases similar to those identified in the NAWMP. The following species were selected Southeast Idaho WFA priority species for several reasons including being common breeders, common wintering birds, declining breeding numbers, substantial reliance on WFA habitats for migration, rarity, recreational importance, and/or overall declining numbers in the WFA because of habitat loss.

Trumpeter swan: Trumpeter swan population goals outlined in the NAWMP call for a doubling of the continent's numbers. The Southeast Idaho WFA hosts trumpeters migrating from several areas in the Rocky Mountains. However, the Rocky Mountain Population, considered by many as a separate population, are the birds of concern for the WFA. These birds nest in the Greater Yellowstone Ecosystem and will typically winter only short distances from their breeding grounds. Wintering habitat quality and quantity, as well as disturbances during nesting, are the major concerns for this species in the southeast Idaho.

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

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

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

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

The Market Lake Wetland Complex is host to a significant number of colonial and other nesting water birds (Table 54) (Trost and Gerstell, 1994).

Table 54. Estimation of nests and numbers of the colonial nesting waterbirds at Market Lake WMA in 1993.

Species	Nests	Number of Birds
White-faced ibis	500-1,000	3,200+
Franklin's gull	800-1,200	?
Black tern	8-12	12-13
Ring-billed gull	20-25	40
Cattle egret	1-2	?
Great egret	2-3	?
Snowy egret	10-20	26
Black crowned night heron	10-15	11

Comprehensive Bird Lists have been assembled in the Headwaters Subbasin for Grand Teton National Park (Appendix B), Grays Lake (Appendix F), the National Elk Refuge (Appendix G), Jackson Hole, WY (Appendix H), and the Upper Snake River BLM District (Appendix I). In all, well over 300 species of birds have been recorded in the Headwaters Subbasin. An effort by Grand Teton National Park to develop a list of species considered rare and sensitive to human activities was recently completed (Park files)

3.1.2d Amphibians and Reptiles

The number of reptile and amphibian species (nine) in Grand Teton National Park is limited because of the Park's high altitude and its associated cool climate. Common (*Thamnophis sirtalis*) and wandering (*T. elegans*) garter snakes; rubber boas (*Charina bottae*); western toads (*Bufo boreas*); spotted (*Rana pretiosa*), leopard (*Rana pipiens*), and chorus (*Pseudacris triseriata*) frogs; and tiger salamanders (*Ambystoma tigrinum*) are observed throughout the valley floor and foothill regions of the Park, mostly below 8,000 feet elevation, and especially along the Snake River, Buffalo Fork, and Gros Ventre River floodplains. One non-native frog species (*Rana catesbeiana*) can be found in the Kelly warm springs area. Baxter and Stone (1980) do not list any lizards for Teton Co., however a few scattered reports indicate that the northern sagebrush lizard (*Sceloporus graciosus*) within the Park.

The National Elk Refuge and Gros Ventre/Flat Creek drainages provide important habitat for amphibian species including the Blotched Tiger Salamander, Boreal Toad, Boreal Chorus Frog, and the Columbia Spotted Frog. Of these, Boreal Chorus Frogs are highly vulnerable due to a small number of breeding sites and a new disease outbreak. Chytrid fungus disease was discovered on the Refuge in Boreal Toads in 2000 and is the first documented case of this disease in northwest Wyoming (Patla 2000). The parasitic chytrid fungus is a newly recognized organism that has caused mass die-offs and declines of amphibians in many areas. USGS pathologist D.E. Green reports that the finding "has potentially dire implications for all species of frogs and toads in NER and possibly western Wyoming".

The Bridger-Teton National Forest

The Bridger-Teton National Forest supports six species of amphibians, six species of reptiles, 74 species of mammals, 355 species of birds, and 25 species of fish.

Habitat Areas and Quality

Fisheries

Van Kirk (2001) developed a scheme for assigning conservation priorities and strategies for waters within the Greater Yellowstone Ecosystem (Table 55) (Van Kirk, 2001).

Table 55. Criteria for assigning conservation priority and strategy to waters in the Greater Yellowstone Ecosystem.

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

[a] Watersheds within the Headwaters Subbasin with a priority status of 1(p) and a strategy to *Preserve and Protect*, are Snake Headwaters, Gros Ventre, Greys-Hoback, Palisades, and Salt River watersheds.

[b] The Idaho Falls watershed and Willow Creek have a priority of 1(r) and a strategy to *Rehabilitate and Restore Ecological Processes*.

Wildlife

There are several significant wetland habitat complexes in the Idaho portion of the Headwaters subasin (Southeast Idaho Wetland Focus Area Working Group, 2001).

Market Lake Complex -- This area includes the historic Market Lake basin and watershed as well as the Roberts slough area. The Market Lake basin includes Market Lake Wildlife Management Area (WMA), which is owned and managed by the Idaho Department of Fish and Game (IDFG). The Bureau of Land Management and Idaho Department of State Lands own small portions of the watershed. Most of the Market Lake basin and watershed, as well as Roberts slough, are privately owned.

The watershed is dominated by agricultural fields and sagebrush desert. Nevertheless, there are several important wetland habitats in Roberts slough and the Market Lake basin including ephemeral wetlands, cattail/bulrush emergent marshes, and large wet meadow areas. Many waterfowl and other wetland dependent wildlife species use the Complex throughout the year. Trumpeter and tundra swans rest and feed within the complex for 3-4 weeks during spring migration. Trumpeter swans nested at the Market Lake WMA in 1980-82. A pair of trumpeter swans was seen on the WMA in June 2000, but no evidence of nesting or successful broods was found. Several hundred Canada geese use the focus area as a migration stop during the spring. Approximately 86 pairs of Canada geese nest on the WMA. Several thousand snow geese use the area during spring migration. Tens of thousands of mallards, pintails, and other duck species, including redheads, use the focus area during spring migration. Several hundred duck pairs nest within the focus area. Several colonial waterbird species nest at the Market Lake WMA (Table 54) and other wetlands within the focus area. Wetlands, pastures, and agricultural fields in the focus area are used as feeding grounds by the waterbird species. Several other species nest within the focus area, including eared grebe, Clark's grebe, western grebe, pied-billed grebe, double-crested cormorant, American bittern, greater sandhill crane, sora rail, American coot, common snipe, long-billed curlew, willet, American avocet, black-necked stilt, Wilson's phalarope, and California gull. Other wetland dependent bird species using the focus area include Foster's tern, caspian tern, horned grebe, white pelican, great blue heron, green heron, and several shorebird species. Wetlands in the Complex also provide habitat for moose, white-tailed deer, elk (winter habitat), bald eagles, peregrine falcons, osprey, northern harriers, and many songbird species.

South Fork of the Snake Complex – This includes the South Fork of the Snake River from Wyoming to the confluence with the Henry's Fork of the Snake River. It includes many small tributary streams and associated wetland areas. The Complex has mixed ownership including many private landowners, the Bureau of Land Management, the Bureau of Reclamation, the U.S. Forest Service, Idaho Department of Lands, and the Idaho Department of Fish and Game.

The South Fork Wetland Complex habitats are primarily riverine with associated springs, sloughs, groundwater fed ponds, and wet meadows. The riparian areas within the Snake River corridor consist of narrow-leaf cottonwood with sagebrush and juniper on drier areas and Douglas fir and aspen in cooler, wetter areas. Riparian understories are typically comprised of a shrub layer with dogwood, willows, wild rose, and serviceberry. The portion of the South Fork from Palisades Dam to the Henry's Fork confluence is considered eligible for designation as a Wild and Scenic River. A 1980 U.S. Fish and Wildlife Service report said:

> *"The South Fork of the Snake River is perhaps the most extensive and highest quality cottonwood riparian forest in Idaho. It supports a very large volume of wildlife and a great diversity of species. It provides habitat for a large number of species of concern and is a very high quality example of a habitat type which has been drastically reduced throughout the state."*

Wildlife using this Complex includes all five priority waterfowl species as well as many other species. Many other wetland dependent bird species also inhabit this Complex including sandhill crane, white-face ibis, white pelican, and long-billed curlew.

Willow Creek Complex--The Willow Creek Complex includes the Willow Creek watershed, Grays Lake National Wildlife Refuge (NWR), Tex Creek Wildlife Management Area (WMA), and Ririe Reservoir. Ownership in the Complex is a mix between private landowners, federally owned lands managed by the Bureau of Land Management, the Bureau of Reclamation, and the U.S. Forest Service, and state owned lands managed by the Idaho Department of Lands and the Idaho Department of Fish and Game.

Wetland habitats in the Complex include a wide variety of types. Ririe Reservoir has open water habitats, whereas the extensive stream network in the Complex has riparian areas dominated by dense willow thickets. These areas are important for many neo-tropical migratory songbirds. The Grays Lake NWR has the largest continuous bulrush/tule marsh west of the Mississippi and is over 22,000 acres. The marsh area is surrounded by extensive wet meadows containing a wide variety of emergent vegetation. Grays Lake NWR contains the best sandhill crane breeding grounds in the world. During migration, Grays Lake may host over 3,000 sandhill cranes. Grays Lake NWR is also home to occasional whooping cranes, as well as nesting Franklin gulls, trumpeter swans, mallards, Canada geese, and many other species of waterfowl. The Tex Creek WMA is managed primarily for its extensive upland habitats. However, the WMA does have many small emergent wetland and riparian areas as well.

Wetland dependent wildlife found in this Complex include 19 species of waterfowl, 6 species of shorebirds, several colonial nesting birds, bald eagles, Yellowstone cutthroat trout, moose, and many others.

Watershed & Related Assessment

Regional

Greater Yellowstone Coalition Regional Assessments

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

- Noss, Reed; Wuerthner, George; Vance-Borland, Ken; Carroll, Carlos. 2001. *A Biological Assessment for the Greater Yellowstone Ecosystem: Report to the Greater Yellowstone Coalition*. Bozeman, MT. This report will not be available until Fall, 2001.

- Van Kirk, Rob. 1999. *Status of Fisheries and Aquatic Habitats in the Greater Yellowstone Ecosystem*. Project Completion Report for the Greater Yellowstone Coalition, Bozeman, MT. The executive summary for this report follows:

  EXECUTIVE SUMMARY -- Status of Fisheries and Aquatic Habitats in the Greater Yellowstone Ecosystem.

  The Greater Yellowstone Ecosystem (GYE) contains the headwaters of the Missouri, Snake and Green Rivers. Average annual discharge from the GYE into these rivers totals 16.2 million acre- feet (5,280,000,000,000 gallons). Furthermore, the rivers and lakes of the GYE are internationally famous for their recreational and scenic values. However, trends in aquatic species status and watershed condition in the GYE have not been quantified. The purpose of this study is to compile and analyze existing ecosystem-scale data on the condition of aquatic and riparian habitats and salmonid fishes. The specific objectives are to:

  1. *Define the specific watershed units that comprise the GYE,*
  2. *Develop an ecosystem-wide database of watershed and aquatic resource information,*
  3. *Quantify the relative amount of existing information on watersheds in the GYE,*

4. *Quantify the current status of native and nonnative salmonid populations in the GYE,*
5. *Quantify the current status of aquatic habitat and watershed integrity in the GYE, and*
6. *Develop strategies and priorities for conserving and restoring watersheds in the GYE.*

Watersheds of the GYE. U.S. Geological Survey (USGS) eight-digit hydrologic units were chosen as the basic watershed units for this study. The GYE was defined to be the area centered around Yellowstone National Park that is bounded on the east by western edge of the Wyoming Basin ecoregion, on the south and west by the 4,900-foot elevation contour and the boundary of the Middle Rockies ecoregion, and on the north by an approximate east-west line running from the Jefferson-Madison-Gallatin confluence to the Yellowstone River confluence with Clarks Fork. The study area included all watersheds that lie partially or wholly within this area. This resulted in inclusion of 41 eight-digit hydrologic units in the Missouri, Green, Bear and Snake River drainages. These 41 watersheds have a combined area of 62,347 square miles, which is substantially larger than the GYE itself. However, because the condition of stream biota and habitats reflects the condition of the entire watershed upstream, inclusion of lowland watersheds lying only partially within the GYE is necessary to gain an understanding of the condition of watersheds in higher elevation areas.

Methods. Data from existing sources were compiled into a database in Microsoft Excel workbook format. A percentile-ranked quantitative scale assessed the amount of information generated by seven different regional and national data collection projects in each of the study watersheds. The status of native and nonnative salmonid populations was evaluated with an index of biotic integrity quantifying distribution and abundance of trout and grayling in the GYE. Aquatic habitat and watershed status was evaluated with a percentile-ranked aquatic and riparian habitat index. Finally, conservation strategy and priority were determined based on the concepts that existing native species should be protected where they already exist in viable populations, that restoration be undertaken first in areas where it is possible to return species assemblages to historical condition without unreasonable efforts, that large high-integrity watersheds can act as sources of native species to recolonize adjacent second-tier watersheds as they are restored, and that some watersheds will never be restored to historical condition with any reasonable amount of and declines with distance east or west away from the core.

Conclusions.

1. More information on aquatic resources is available for the watersheds on the west side of the GYE than for watersheds on the east side.

2. The status of native trout and grayling populations in the GYE is generally poor except in a core of watersheds running from the Upper Yellowstone southward through Yellowstone and Teton national parks to the Central Bear and Bear Lake watersheds at the southern end of the ecosystem. Yellowstone cutthroat are native to all of these watersheds except the two in the Bear River drainage, where Bonneville cutthroat are native. (Note: the Bear River cutthroat are *genetically more closely related to the Yellowstone subspecies than to other Bonnevilles and may actually be Yellowstone cutthroat.)*

3. The status of Montana grayling, Westslope cutthroat trout and Colorado River cutthroat trout is poor throughout their respective historic ranges in the GYE.

4. Decline of native-species is due primarily to interactions with introduced fish species, but where natives remain, their status is highly correlated with habitat quality.

5. Aquatic habitat quality is highest in a core of watersheds extending from the Shields in the north southward to the Greys River drainage and declines with distance east or west away from the core.

6. Habitat quality is negatively correlated with percentage of the watershed comprised of cropland.

7. Composite watershed integrity is highest in the core watersheds and decreases with distance east or west away from the core.

8. The highest conservation priority for aquatic resources in the GYE is preservation and restoration of the core watersheds.

9. Significant restoration opportunities exist for Yellowstone and Bear River cutthroat populations in the Upper Yellowstone, Salt, Teton, Idaho Falls, Willow Creek, Central Bear and Bear Lake watersheds.

Recommendations.

1. Conduct a more thorough ecosystem-scale study of the watersheds of GYE that includes large-scale assessment of riparian areas, an expanded invertebrate community inventory, an amphibian inventory, assessment of nonsalmonid fishes, quantification of hydrologic alteration, and analysis of correlation among ecological integrity and land and water use.

2. Develop an ecosystem-scale plan for preservation and restoration of native trout in the GYE. 3. Work with agencies and other conservation organizations preserve and restore the core watersheds of the GYE.

4. Provide assistance to state and federal agencies in the GYE in the form of financial resources and facilitation of landowner involvement and interagency collaboration to implement on- the-ground restoration projects.

5. Work with state and local governmental entities and community groups to develop and implement cost-effective conservation and restoration projects to benefit ecologically and economically important nonnative fisheries, low-elevation riparian habitats, and recreational, scenic and water quality resources near urban centers.

Bureau of Reclamation Regional Assessments

The Bureau of Reclamation has conducted two significant regional assessments: The Snake River Resource Review (SR^3; http://mac1.pn.usbr.gov/SR3/index.html) and the Biological Assessment – Operations and Maintenance in the Snake River above Lower Granite Dam (BOR 1998).

The goal of SR^3 is to develop the best set of tools available to analyze the operation of the river and reservoir system for traditional uses such as irrigation and flood control, and to identify the possible tradeoffs to these uses when considering other demands on the system for water related resources such as threatened and endangered species, fish, wildlife, cultural resources, Indian Trust Assets and recreation, as well as water quality and economics. SR^3 covers the Snake River from Jackson Lake in the Grand Teton National Park, Wyoming, to Brownlee Dam on the Idaho/Oregon border. The river flows for more than 700 miles in this reach and drains 72,590 square miles that includes lands and tributaries in Wyoming, Idaho, Nevada, and Oregon. The Fort Hall Indian Reservation in Idaho and the Duck Valley Indian Reservation on the Idaho & Nevada border are located in the basin. Regarding fish and wildlife resource, SR3 concludes: Vegetation and wildlife resources are closely related to other resource categories. Relationships among aquatic resources, vegetation, and wildlife are often closely interdependent. For example, bald eagle and colonial water birds rely on a healthy fish population as their primary food source. Any change in fish populations will have a corresponding affect on these wildlife species. Similarly, riparian and wetland vegetation/habitats are critical to maintaining fish populations. Water quality directly affects the health of riparian and aquatic habitats and wildlife species that rely on these habitats. Groundwater levels and flows from spring flows directly affect aquatic, wetland, and riparian habitats. Recreation often involves consumptive and nonconsumptive use of vegetation, wildlife, and aquatic resources. Wildlife viewing and hunting, as well as riparian vegetation environments are important dimensions of outdoor recreation. Enhancement of these resources enhances recreation. In contrast, factors which support and expand recreation access and/or intensity may have adverse effects on wildlife and vegetation through direct or indirect disturbance of habitat. Wildlife and vegetation resources also have economic effects either directly or related to recreation, and provides benefits to local and regional economies. One significant objective of SR3 was to to develop a suite of wildlife resource parameters: that is, a relationship between various flow regimes and target wildlife populations. Unfortunately, this effort was "dropped from further consideration." Regardless, a wealth of information on the natural resources within the Headwaters Subbasin and elsewhere, including populations and needs, is summarized in: http://mac1.pn.usbr.gov/SR3/rna/intro.pdf.

Bureau of Reclamation 1998

Detailed assessments of life histories, habitat requirements, status, and potential impacts (effects analyses; summarized below) to several listed species from Operations and Maintenance in the Snake River above Lower Granite Dam (BOR 1998), limited to Headwaters Subbasin concerns, follow.

Peregrine Falcon – Effects Analysis

Snake River in Wyoming

Peregrine falcons, which occupy the two to three nesting territories near Jackson Lake, hunt for ducks, shorebirds, and passerine birds that inhabit the surrounding area. The falcons occupy nesting territories (at least seven) along the Snake River corridor from Jackson Lake downstream to the Idaho State line. These rely on waterfowl, shorebirds, and passerine birds as their major food sources. There is an extensive amount of wetland and riparian habitat suitable for waterfowl, shorebirds, passerines, and other peregrine falcon prey species in the Jackson Lake and upper Snake River area. Although seasonal operations at Jackson Lake affect reservoir levels and Snake River flows, habitats away from the immediate shoreline or river edge are not affected.

Even during drought cycles when the reservoir is drawn further down and riverflows fluctuate more dramatically, habitat conditions are generally suitable to support an adequate prey base for the nesting falcon population. Although operation of Jackson Lake may influence seasonal and annual distributions of prey species, it is not likely to adversely affect the nesting peregrine falcon population.

Snake River (Wyoming State Line to Henrys Fork)

The three known nesting territories within this portion of the project area (two downstream of Palisades Dam and one on the east shore of Palisades Reservoir) are all located closely enough to the Snake River that ducks are most likely a major food source during the nesting season. Operation of Palisades Reservoir may affect peregrine falcons only if those operations affect use of the reservoir and river by ducks, shorebirds, or riparian dependant prey species. It is not clear whether operation of this river segment has a measurable impact on the presence or production of ducks or passerine birds. It could be speculated that some duck nests could be lost due to increased flow releases that inundate early nests. However, a decrease in duck production may, or may not, occur since re-nesting efforts by ducks may negate any losses from the increased flows. Ducks and other prey species appear to be abundant along this reach of the Snake River throughout the year in most years and appear to be numerous enough to provide an adequate food supply for the nesting peregrine falcon population. While operations may have an effect on duck numbers and other prey species during flood releases and during low flow seasons, there are generally adequate reservoir levels and streamflows to support a good population of waterfowl and shorebirds during the peregrine nesting season. Operations at Palisades Reservoir are not likely to adversely affect the nesting peregrine falcon population.

General Conclusion -- Operations of Jackson Lake and Palisades Reservoir on the Snake River and reservoirs on the Henrys Fork may affect habitats and distribution of waterfowl and other prey populations but are not likely to adversely affect nesting peregrine populations. Operation and maintenance of project facilities would have little or no effect on peregrine falcons because there are abundant or adequate prey populations to support migrant or wandering falcon.

Bald Eagle -- Effects Analysis

Operation and maintenance of Reclamation dams and reservoirs may affect bald eagles in two ways: (1) affect primary prey base of fish and, to a lesser extent, waterfowl, and the eagles' ability to exploit prey and (2) affect cottonwood trees used for nesting, perching, and roosting habitat.

Upper Snake River in Wyoming --Jackson Lake

At Jackson Lake, any impacts to bald eagles would be the result of fluctuations in reservoir surface elevation. During winter months, when the lake is iced over, it is unlikely that the proposed action would have any effect on bald eagle habitat or food supply. Resident bald eagles that nest in the vicinity of the lake typically rely on the river and/or nearby big game winter ranges as foraging areas. During the breeding season through fall, surface levels fluctuate while eagles are using the prey base associated with the reservoir, primarily the fishery and waterfowl resources. Early in the spring, ice begins to recede on the lake leaving small areas of open water, typically at stream inlets. Waterfowl concentrate at these open water areas creating a ready source of food for the eagles. During this time, the proposed action has little effect on foraging opportunities. Later, during late spring and early summer, lake elevations generally start to recede to make storage space for spring runoff. Subjective observations (Harmata and Oakleaf 1992) indicate that receding lake elevations tend to make fish more available as prey for the eagles.

Snake River Below Jackson Lake

Any effect of the proposed action on bald eagles would be due primarily to Snake River fishery or waterfowl populations' changes. Most of the breeding pairs on the Snake River are year-long residents and depend on the Snake River fish and waterfowl population as a main source of food. During the bald eagle nesting season river levels are adequate to maintain sufficient habitat for fish and waterfowl prey. The riverine environment plus surrounding prey habitat provide an abundant prey base for nesting eagles. Based on the increasing bald eagle nesting populations and an adequate prey base during the nesting season project, operations have no effect on nesting eagles. An agreement with the State of Wyoming allows for reservoir releases, which benefit the downstream fishery during winter months, when conditions are the most critical. During low winter flows, this agreement provides for the release of flows necessary to maintain the fishery.

In some years, large winter releases may be necessary for flood control and these releases caused high downstream velocities that reduce winter habitat for fish. While these conditions may negatively impact the fishery, it is not known whether these impacts are sufficient to reduce the availability of fish as a food source for wintering eagles. If fish were less available it is probable that bald eagles in the area would switch to adjacent wintering sites and/or alternative prey sources with no adverse effect on wintering bald eagles.

Snake River (Wyoming State Line to Henrys Fork)

The approximately 17 known nesting territories along this reach are all located closely enough to the Snake River, or the reservoirs, that fish and waterfowl are most likely the major food source during the nesting season.

Palisades Reservoir and Main Stem to Henrys Fork

Operation of Palisades Reservoir may affect bald eagles only in those years when operations affect the fishery or the use of the reservoir and river by waterfowl. Downstream of Palisades Dam, the proposed action may affect the fishery when fall and winter releases from the reservoir drop below 1,500 cfs. Flows have dropped significantly below this level in 2 of the last 5 years resulting in dewatering of side channels which strand fish. The stranded fish die as a result of the dewatering and are lost to the population. Continued strandings could cause long-term negative impacts to the fishery as a food source for eagles. In the short term, fish strandings create an abundant food source of fish for wintering bald eagles. However, when flows drop below 1,200 cfs (low water years) and temperatures are low, the shallow water in the side channels containing stranded fish can ice over, making the fish unavailable to foraging eagles. The loss of this food source may require eagles to forage in adjacent areas and to use alternative sources of food such as big game carrion, but is not expected to adversely affect wintering eagle populations.

Depending on the timing of high spring flows, waterfowl nesting habitat can be inundated. It is not clear whether operation of this river segment has a measurable impact on the presence or overall production of waterfowl. Waterfowl appear to be abundant along this reach of the Snake River throughout the year in most years and appear to be numerous enough to provide a substantial portion of diet of nesting bald eagles. While operations may have an effect on waterfowl during flood releases and during low flow seasons; there are generally adequate reservoir levels and streamflows to support a good population of waterfowl during the bald eagle nesting season. Operation of the reach of the river is not likely to adversely affect the nesting bald eagle population.

Flood control operations at Palisades Reservoir may have an effect over the long term on the availability of large black cottonwood trees used by bald eagles for perching and nesting. Although mature trees are currently available, the lack of seasonal flooding and building of new alluvial seed beds reduces germination of new trees. Although conifers and rock outcrops are present along much of the South Fork, the eventual loss of mature cottonwoods may have a longterm adverse effect on availability of streamside nesting trees for bald eagles, as well as, fewer perching trees for wintering bald eagles. These effects are not likely to become apparent over the short term.

Ririe Reservoir

Ririe Reservoir has limited winter use by bald eagles. Winter operations of this reservoir have little effect on bald eagles. As is the case on Palisades Reservoir, there is an adequate waterfowl population and fishery to support the one active nesting territory near Ririe Reservoir. In addition, winter mortality of big game from an adjacent winter range provides carrion as an additional food source for nesting bald eagles early in the spring.

General Conclusion -- Operation and maintenance of project facilities would have little or no adverse effect on bald eagles at most locations because there are abundant or adequate prey populations to support current nesting and winter use. Operations of Palisades Reservoir on the South Fork Snake River may affect habitats for the local fish and/or waterfowl prey base but are not likely to adversely affect nesting and wintering eagle populations. Continued flood control operations may limit cottonwood regeneration on the Snake River downstream from Palisades Dam.

<u>Grizzly Bear</u> – Effects Analysis

Snake River in Wyoming

Most grizzly bear use of the Snake River in Wyoming occurs north, or upstream, of Jackson Lake and is outside of the influence of Reclamation project operations. Any grizzly bear use made of the Snake River and its associated habitat downstream of Jackson Lake Dam is mostly likely that of wandering individuals that do not normally use the area and do not depend on fish or other potential prey species that may be affected by reservoir or river operations. It is unlikely that the proposed action would have an effect on grizzly bears in Wyoming.

<u>Ute Ladies' Tresses</u> -- Effects Analysis

Short term and long-term scenarios must differentiate potential effects of the proposed action on the Ute ladies' tresses. In the short-term, project operations on the upper Snake River may affect, but are not likely to adversely affect, known populations of Ute ladies' tresses along the South Fork of the Snake River. The main factor in making this determination is the fact that inundation of the known habitat of the Ute ladies' tresses is a normal occurrence along the South Fork. Spring inundation is considered a normal occurrence within the habitat of this orchid and is most likely needed for the existence of the plant (Moseley, 1997) and the maintenance of appropriate habitat conditions. Once the higher flow releases associated with spring runoff recede, the orchids again become exposed and can begin the normal growth cycle. When spring flows in the South Fork reach or exceed 20,000 cfs, most of the known populations of Ute ladies' tresses are inundated for a period ranging from several days to several weeks. This condition is reached in at least 50 percent of the years. The exception is during drought years when little or no spring runoff is released. Another factor, in support of a determination to "not likely to adversely affect" during the short-term, is the fact that peak flows in the Snake River have been regulated for more than 87 years and Palisades Reservoir has been in operation for more than 40 years, yet there are viable populations of the orchid along the Snake River.

The long-term effect of project operations on the Ute ladies' tresses is somewhat more speculative. This orchid is a floodplain species that is suspected to require mid-seral riparian habitats created by streams and rivers with actively changing channels (USFWS, 1995). Project operations have significantly reduced the high, annual scouring flows associated with uncontrolled spring runoff. Over the last 87 years, the average unregulated (without operation of the project) peak flow for the Snake River at Heise would have been 32,081 cfs. However, the actual average regulated peak flow for the same period has been 22,872 cfs, and, since Palisades Dam was completed in 1956, the average regulated peak flow has been 21,000 cfs.

The demonstrated reduction in peak flow may alter seral development of some affected plant communities and reduce the amount, or development, of new mid-seral riparian habitat. Over time, the affected mid-seral communities would progress to later seral stages that would not be suitable as habitat for Ute ladies' tresses. It is assumed that a mid-seral community may remain in a suitable condition as habitat for Ute ladies' tresses for 10 to 15 years (CUWCD, 1995) in the absence of flows sufficient to frequently inundate the site or to alter stream morphology and create new suitable habitat. However, it could also be argued that a less active river would destroy less acreage of existing mid-seral habitat and would result in stabilization of point bars, thereby prolonging the time that Ute ladies' tresses are able to exist at a given site and/or providing new habitat for colonization on point bars (CUWCD, 1995).

However, high flows still occasionally occur in the river reach from Palisades Dam to Heise. Flood stage at Heise is considered to be 24,500 cfs and is defined as the point when flows begin to damage manmade structures outside the normal high water mark. As of 1998, flows have exceed flood stage at Heise seven times during years following construction of Palisades Dam in 1956 (Table 56).

Table 56. Years since 1956 that Flows Have Exceeded Flood Stage at Heise, Idaho.

Year	CFS
1956	31,000
1963	25,100
1970	25,000
1974	26,000
1981	24,600
1986	26,700
1997	42,900

The frequency of exceeding flood stage is about one year out of six and may be sufficient to inundate Ute ladies' tresses communities and limit the establishment of shrubs sufficiently enough to maintain the suitability of the sites as habitat for the orchid over an extended period of time. The existing effort to study the river morphology changes resulting from the 1997 flood flows will provide more information that can be used to help answer questions about long-term viability of flood plain riparian communities and effects of extreme flow events on these communities.

General Conclusion -- Continued project operation is not likely to adversely affect the populations of Ute ladies' tresses along the Snake River over the short-term. Peak flows have been sufficient to maintain habitats for this species for more than 40 years since Palisades Dam began operation. In addition, it is expected that since flows have exceeded flood stage in 7 of the last 41 years, the existing Ute ladies' tresses habitat will likely be maintained for many more years, if not indefinitely, and point bar habitat will continue to be available for maintenance or establishment of suitable habitat for the species. Reclamation's inability to completely control the river, as demonstrated in 1997, provides evidence that channel altering flows are still likely to occur periodically. Reclamation concludes that long-term operation of the river system could provide suitable conditions for the maintenance and creation of habitat for the Ute ladies tresses that may equal or exceed any adverse effects of reduced peak flows. Subsequently, the net result of the proposed action is not likely to adversely affect Ute ladies' tresses.

USGS National Water Quality Assessment Program

In 1991, the U.S. Geological Survey (USGS) began a full-scale National Water-Quality Assessment (NAWQA) Program. The long-term goals of the NAWQA Program are to describe the status and trends in the water quality of a large part of the Nation's rivers and aquifers and to improve understanding of the primary natural and human factors that affect water-quality conditions. In meeting these goals, the program will produce water-quality, ecological, and geographic information that will be useful to policy makers and managers at the national, State, and local levels.

A major component of the program is study-unit investigations, upon which national-level assessment activities are based. The program's 60 study-unit investigations are associated with principal river basins and aquifer systems throughout the Nation. Study units encompass areas from 1,200 to more than 65,000 mi^2 (square miles) and incorporate about 60 to 70 percent of the Nation's water use and population served by public water supply. In 1991, the upper Snake River Basin was among the first 20 NAWQA study units selected for implementation. From 1991 to 1995, a high-intensity data-collection phase of the upper Snake River Basin study unit (Figure 41) was implemented and completed. Components of this phase are described in a report by Gilliom and others (1995).

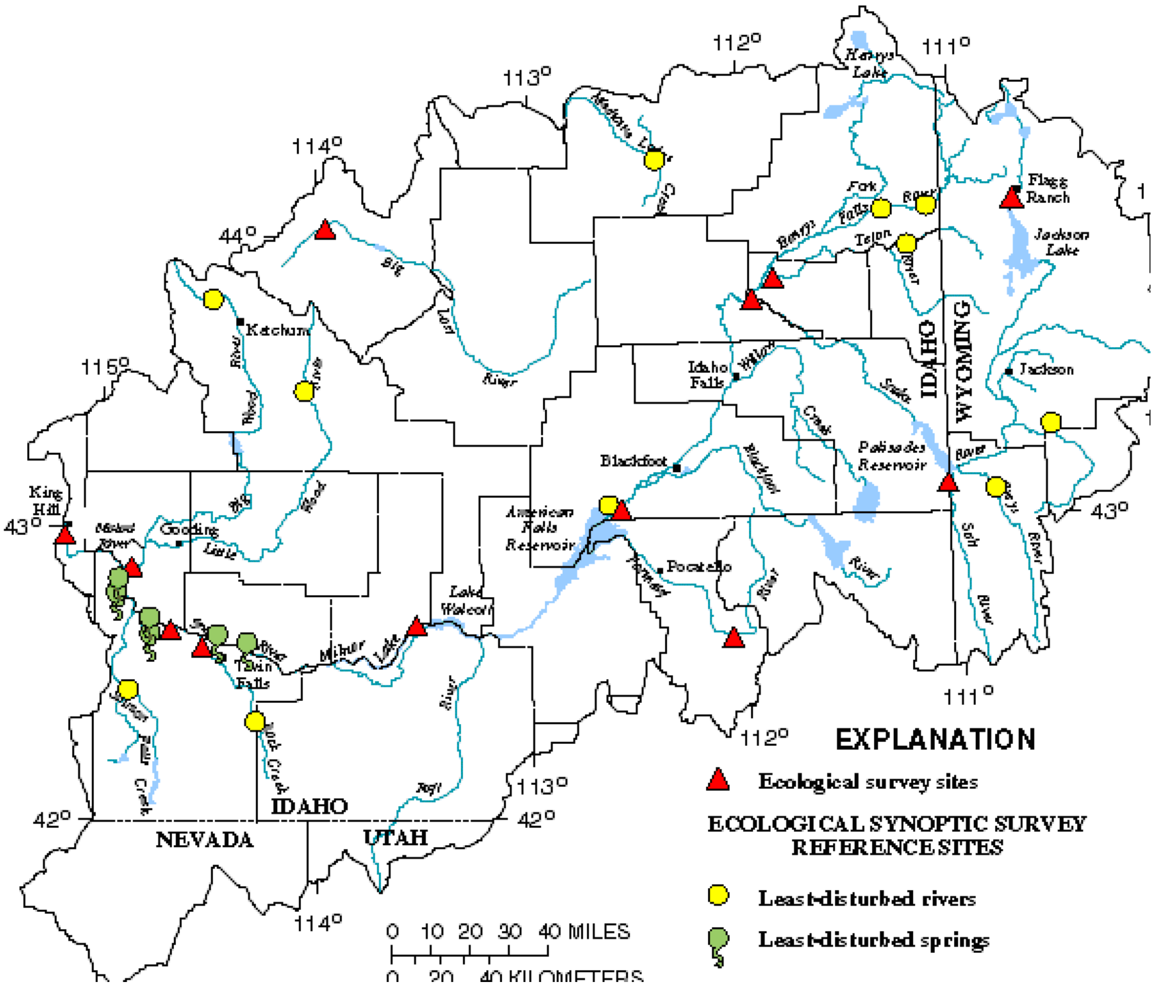


Figure 41. USGS NAWQA sampling sites in the Upper Snake River Basin.

In 1997, a low-intensity phase of data collection began, and work continued on data analysis, report writing, and data documentation and archiving activities that began in 1996. Principal data-collection activities during the low-intensity phase will include monitoring of surface-water and ground-water quality, assessment of aquatic biological conditions, and continued compilation of environmental setting information.

Completed Surface Water Activities, 1991-1995

About 300 monthly and extreme-flow samples were collected at 12 sites (Table 57) during the high-intensity phase from April 1993 to June 1995. Also, weekly pesticide samples were collected at Teton River and Rock Creek sites from April 1993 to August 1993. Sites were selected to represent reference sites with relatively undisturbed land, indicator sites with a single predominant land use, or integrator sites with multiple land uses.

Table 57. USGS NAWQA high-intensity sampling site descriptors.

Site No.	Site name	Intervening Basin Area (sq miles)	Type	Site Land Use
13010065	Snake River at Flagg Ranch, WY	511	Reference	Forested
13027500	Salt River near Etna, WY	829	Indicator	Agriculture
13055000	Teton River near St. Anthony, ID	890	Indicator	Agriculture
13056500	Henrys Fork near Rexburg, ID	2,920	Indicator	Agriculture
13069500	Snake River near Blackfoot, ID	11,310	Integrator	Mixed
13073000	Portneuf River at Topaz, ID	570	Indicator	Agriculture
13081500	Snake River near Minidoka, ID	15,700	Integrator	Mixed
13092747	Rock Creek at Twin Falls, ID	277	Indicator	Agriculture
13094000	Snake River near Buhl, ID	17,139	Indicator	Mixed
13120500	Big Lost River near Chilly, ID	450	Indicator	Rangeland
13152500	Malad River near Gooding, ID	2,990	Indicator	Agriculture
13154500	Snake River at King Hill, ID	6,650	Integrator	Mixed

Sample collection followed established NAWQA protocols designed to minimize sample contamination. Runoff conditions during the sampling period included extreme drought and average and above-average snowmelt runoff. Quality assurance samples were collected and analyzed at all sites.

Three synoptic surveys for nutrients, suspended sediment, and pesticides were conducted in 1994 and 1995 to provide greater spatial resolution for sources of contaminants in water discharging to the Snake River. A high-flux/high-use synoptic survey was conducted at 35 sites on the Snake River and major tributaries in 1994. A second high-flux/high-use synoptic survey was conducted at 10 sites on Rock Creek, agricultural tunnel drains, and agricultural drains in 1994. A third synoptic survey was conducted at selected sites on the State-declared water-quality-limited reach of the Snake River between Milner Dam and King Hill during the late irrigation season in 1995. High-flux/high-use refers to the period of the irrigation season during which land application of chemicals, contaminant discharge, and water use are intensive.

Planned Surface Water Activites, 1997-2001

Two low-intensity phase surface-water quality sites, one on the Snake River and one on Rock Creek were selected from sites sampled during 1993 to 1995. To complement the two low-intensity phase sites, water samples from eight additional sites will be analyzed for major ion, nutrient, and suspended sediment concentrations. These samples will be collected as part of the Idaho Surface-Water Quality Monitoring Network, a cooperative USGS and Idaho Division of Environmental Quality (formerly Idaho Department of Health and Welfare, Division of Environmental Quality) program.

Beginning in May 1997, 12 samples per year at each low-intensity phase site will be collected and analyzed for major ions, nutrients, and suspended sediment.

Completed Ecological Activities, 1992-1995

Ecological surveys, including ecological synoptic surveys and intensive ecological assessments, were conducted at 30 river and spring sites in the upper Snake River Basin during 1993-95. These surveys were completed during summer and fall low-flow conditions at the 12 water-quality sites and 12 least-disturbed reference river sites and 6 least-disturbed spring sites (Figure 41). Least-disturbed reference sites are sites that showed little evidence of human disturbance. Fish, macroinvertebrate, and algae samples were collected for taxonomic identification and enumeration, and associated habitats were assessed. Voucher samples of aquatic species were preserved and archived. Continuous water temperature also was recorded at the 12 water-quality and 6 spring sites.

Planned Ecological Activities, 1997-2001

Selected aquatic communities and habitat will be assessed annually at two low-intensity phase sites. Fish, macroinvertebrate, and algae taxonomy and enumeration and selected habitat assessments will be conducted annually. Bed sediment and tissue samples for contaminant analyses will be collected at each site triennially beginning in 1997.

The low-intensity phase aquatic biological sampling sites were selected in accordance with established guidelines similar to the surface-water quality site guidelines. To complement the two low-intensity phase sites, selected biological data will be collected at six high-intensity phase sites and two high-intensity phase synoptic sites as part of the Idaho Surface-Water Quality Monitoring Network. Data will be compiled, reviewed, and published in the USGS annual Water-Resources Data report for Idaho.

Completed Ground-Water Activities, 1991-1995

As part of the study-unit survey to assess current ground-water quality conditions, samples from 50 wells in the Snake River Plain in 1994 and 40 wells in the northern and southern tributary valleys to the Snake River Plain in 1995 were analyzed for targeted pesticides and semivolatile organic compounds. These samples supplemented other samples collected and analyzed as part of the Idaho Statewide Ground-Water Quality Monitoring Network, a cooperative USGS/Idaho Department of Water Resources program. Samples from 20 wells in the eastern tributary valley (Jackson, Wyoming) area also were analyzed in 1995 for major ions, nutrients, semivolatile organic compounds, and pesticides.

Planned Ecological Activities, 1997-2001

Ground-water quality monitoring for the study-unit survey is closely coordinated with the Idaho Statewide Ground-Water Quality Monitoring Network, for which 400 wells are sampled annually. Land-use study monitoring also will be closely coordinated with the regional component of this program. Data collected for the statewide program will be used for the study-unit survey.

Completed Data Base and GIS Activities, 1991-1995

Data were documented and archived using a geographic information system (GIS) library and data base and USGS national and local data bases. Also, all water-quality and ecological data were aggregated regularly into the national data base. Study-unit personnel reviewed and assured that incoming field and analytical water-quality, aquatic biological, and habitat data were compiled into the established data bases. Updated environmental setting information was compiled, re-viewed, and aggregated regularly into established data bases.

Surface-water quality site locations, intensive ecological assessment site locations, ecological synoptic survey site locations, and land-use study area boundaries and sampling site locations were stored in a GIS library. Surficial geology, land use, precipitation quantity and quality, and other geographic data also were stored in the GIS library.

Planned Data Base and GIS Activities, 1997-2001

Planned activities include three major tasks. The first task will be to classify current thematic map scenes into land use and land cover and create GIS coverages of the classification for selected areas. The 1970's land-use data for the NAWQA Program are being updated using 1991 93 LANDSAT Thematic Map satellite scenes. Guidelines were established to produce a consistent national classification of land cover, which was further refined into land-use classifications that are relevant to the upper Snake River Basin. The second task will be to compile, review, and store incoming geographic, water-quality, and ecological data collected during the low-intensity phase. The third task will be to assure that incoming data are aggregated into the USGS national data base.

USDA Forest Service

The Bridger-Teton National Forest has prepared a Draft Environmental Impact Statement for Oil and Gas Leasing Draft in four management areas: Hoback Basin, Moccasin Basin, Union Pass, and Upper Green River MAs. (Bridger-Teton National Forest, United States Department of Agriculture, United States Forest Service, DEC 2000).

> ***Introduction*** *--The environmental analysis documented in this Draft Environmental Impact Statement (DEIS) is tiered to the 1990 Land and Resource Management Plan (Forest Plan) and the associated Final Environmental Impact Statement (FEIS). This analysis is being conducted in cooperation with the Bureau of Land Management (BLM) in response to interest by the energy industry, and in accordance with the National Environmental Policy Act of 1969 (NEPA). This analysis will determine whether or not to authorize the BLM to lease these lands for oil and gas exploration and development, and if so where. The Bridger-Teton National Forest will consider and analyze the environmental effects of leasing and will also consider amending the 1990 Forest Plan to remove all or portions of these management areas from availability. Additionally the analysis will consider additional restrictions (stipulations), or changing current stipulations in the Forest Plan requiring a Forest Plan amendment. This DEIS is not a decision document. It discloses environmental consequences of implementing the proposed action and alternatives to that action. The Forest Supervisor will document her decision in a separate document called a Record of Decision (ROD).*

***Purpose of and Need for Action** -- The purpose of and need for action is to implement the 1990 Bridger-Teton Land and Resource Management Plan (Forest Plan) and comply with national policy by determining whether or not to authorize the BLM to offer leasing opportunities for oil and gas exploration and development of leasable minerals and to consider and analyze the environmental effects of leasing and of amending the 1990 Forest Plan to remove all or portions of these management areas from availability.*

***Proposed Action** -- The Bridger-Teton National Forest is proposing to authorize the BLM to offer leasing opportunities in MAs 21, 45, 71 and 72, consisting of approximately 369,900 acres of National Forest System lands. Alternatives to the proposed action are also considered. The Bridger-Teton National Forest proposes to authorize the BLM to offer these lands for oil and gas leasing, with accompanying mitigating stipulations identified in the Forest Plan. Once leased, the lessee has the right to explore, develop and produce oil and gas under the terms of the lease.*

***Relationship between short-term uses and long-term productivity** -- Short-term uses include the removal of forest vegetation and disturbance of land surface for temporary roads during the exploratory and conformation phase. These areas would be returned to vegetation cover and not reduce long-term productivity. There would be some land area used for permanent roads and well pads, if development occurs, that would reduce the long-term productivity for vegetation.*

***Irreversible and irretrievable commitment of resources** -- Construction and operation of drill sites could result in either irreversible or irretrievable commitment of certain resources. Irreversible is a term that describes the loss of future options. It applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those resources, such as soil productivity, that are renewable only after a long period of time. Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources. For example, forage production from an area is lost irretrievably while the area is serving as a drill site. The forage production lost is irretrievable, but the action is not irreversible. If the use changes and the drill sites are reclaimed, it is possible to resume forage production. Site-specific commitment of resources includes the removal of vegetation and commitment of land surface to roads and well pads. The land area used for permanent roads would be an irretrievable commitment of land available to produce forage.*

Assessments Within the Headwaters Subbasin

Idaho Department of Environmental Quality (IDEQ)

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

The purpose of the BURP program is to consistently provide the physical, chemical, and biological data necessary to assess the integrity and quality of waters. It relies heavily on macroinvertebrate sampling, habitat evaluation and measurement, bacterial sampling, and fish sampling. The BURP protocol closely follows EPA's *Rapid Bioassessment Protocols for Use in Streams and Rivers* (Plafkin et al. 1989). BURP data also documents existing uses, which must then be designated and protected under Idaho's water quality standards. It is the goal of the state to re-monitor water bodies on a rolling five year schedule.

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

Wyoming Department of Environmental Quality (WYDEQ)
(Water Quality Division Assessments within the Subbasin)

Upper Snake River Watershed
The Wyoming DEQ/WQD Reference Stream Condition Program involved the collection of biological (benthic macroinvertebrates), water chemisty, and streambed and riparian area physical habitat measurements at individual river and stream sites. The upper Snake River watersheds (Snake/Gros Ventre Rivers, Falls River, Hoback River, and Salt/Greys Rivers) are all contained in the Middle Rockies Ecoregion. A total of 21 stations were established in these watersheds as part of this program (Table 58). These include:

Table 58. WYDEQ Water Quality Stations within the Upper Snake River Watersheds

Stream Segment	Section/Town/Range
Snake/Gros Ventre Watersheds	
Snake R. - Yellowstone Park	S.09, T48N, R115W
Snake R. - Flagg Ranch	S.28, T48N, R115W
Buffalo Fork River	S.23, T45N, R112W
North Fork Spread Creek - Lower	S.14, T44N, R112W

Stream Segment	Section/Town/Range
North Fork Spread Creek - Middle	S.13, T44N, R112W
North Fork Spread Creek - Upper	S.13, T44N, R112W
Crystal Creek	S.34, T42N, R113W
Fish Creek - No. 1	S.27, T41N, R117W
Fish Creek - No. 2	S.15, T41N, R117W
Fish Creek - No. 3	S.02, T41N, R117W
Fish Creek - No. 4	S.24, T42N, R117W
Cache Creek - Upper	S.01, T40N, R116W
Cache Creek - Lower	S.01, T40N, R116W
Snake River - Alpine	S.01, T37N, R117W
Salt/ Greys Watersheds	
Salt River	S.04, T29N, R118W
Strawberry Creek	S.26, T34N, R118W
Willow Creek	S.14, T33N, R118W
Greys River	S.34, T37N, R118W
Hoback Watershed	
Little Granite Creek	S.34, T39N, R114W
Willow Creek	S.05, T38N, R115W
Falls River Watershed	
Falls River	S.07, T48N, R116W

Beneficial Use Reconnaissance Monitoring Program

Wyoming DEQ/WQD initiated a 5-year comprehensive monitoring program in July, 1998. A total of nine waterbody segments in the Snake River watershed were scheduled for assessment monitoring during the five-year period (Table 59).

Table 59. WY DEQ Monitoring Schedule for the Snake River Watershed.

Waterbody	Segment	Schedule
Pacific Creek	Confluence with Snake R. upstream to Gravel Cr.	2002
Gros Ventre River	Confluence with Fish Cr. upstream to Clear Cr.	2002
Greys River	Confluence with Palisades Resv. upstream to L. Greys R.	2000
Flat Creek	Confluence with Snake River upstream to Nowlin Cr.	2002
Horse Creek	Confluence with Snake River upstream to North Fork	2002
Willow Creek	Confluence with Hoback River upstream to Mumford Cr.	2002
Cache Creek	Confluence with Flat Creek upstream to headwaters	2002
Little Granite Cr.	Confluence with Granite Creek upstream to headwaters	2002
Grassy Cr.	Confluence with Falls River upstream to Grassy Lake Resv.	2002

Watershed Improvement Projects

There currently are two watershed improvement projects in the Snake River Watershed.

- North Fork Spread Creek. This project was conducted to rehabilitate the stream channel to improve the stream's ability to support aquatic life. Most of project has been completed and riparian vegetation is becoming better established. The Project is under the direction of Bridger-Teton National Forest.
- Flat Creek Watershed improvement project to reduce sediment to the stream from urban runoff and other sources. The Project is under the direction of the Teton County Conservation District.

Jackson Hole, Wyoming Environmental Restoration Feasibility Report (2000)

The Jackson Hole Environmental Restoration Feasibility Study (Feasibility Study) was conducted to investigate of the feasibility of restoring fish and wildlife habitat that was lost as a result of construction, operation, and maintenance of levees of the Jackson Hole Flood Control Project, including levees constructed by non-Federal interests. The study area was located along the Snake River, near Jackson, Wyoming, in Teton County. (The Jackson Hole Flood Control Project was authorized in the Flood Control Act of 1950, and provided flood protection by levees and revetment along the Snake River in Jackson Hole, Wyoming. The Jackson Hole Flood Control Project was completed in the fall of 1964, and the sponsor was Teton County. Additional levees were added to the system by other agencies and by emergency flood fight operations of the U.S. Army Corps of Engineers (Corps) and Teton County through 1986.)

While the levees have contributed significantly toward reducing flood damage potential along the river corridor, over time the levees have significantly changed the physical character of the river system and contributed to the loss of environmental resources. The environmental restoration project supported by this Feasibility Study was needed to prevent further degradation and destruction of environmental resources within the study area and to facilitate recovery of lost aquatic and terrestrial habitat. A restoration project has high potential for restoring fish and wildlife habitat through enhancement and restoration of the aquatic and riparian environment, including wetland and riparian vegetation and in-stream fisheries habitat.

The original study area defined in the reconnaissance report encompassed 25,000 acres of the 500-year floodplain of the Snake River and its tributaries in the vicinity of Jackson Hole, Wyoming. The study area was limited to the reach between the town of Moose (near the southern boundary of Grand Teton National Park), and the U.S. Highway 26 Bridge over the Snake River about 7 miles south of Jackson. The Progressive National Ecosystem Restoration (NER) Plan involves restoration of the entire 22-mile reach of the Snake River starting approximately 2 miles downstream of Moose, Wyoming, to Flat Creek at South Park National Elk Feedgrounds. The Progressive Plan provides the greatest opportunity for environmental restoration of all impacted areas of the Snake River below Grand Teton National Park and above the canyon section of the river managed by the U.S. Forest Service (USFS).

Habitat analyses conducted as part of this Feasibility Study showed a future continued trend of riparian habitat destruction within the levees further promoting the shift from a highly diverse and productive ecological system to one where nearly all out-of-channel habitat is primarily gravel from levee to levee. The degradation in riparian habitats has pronounced impacts on both aquatic and terrestrial species. Aquatic habitat analyses conducted in the Feasibility Study showed that without intervention there would be a trend of continued significant habitat degradation, including the reduction of vital rearing and overwintering habitats. Figure 42 & Figure 43 display the trend of continued aquatic and riparian habitat degradation that was identified by the study's environmental modeling.

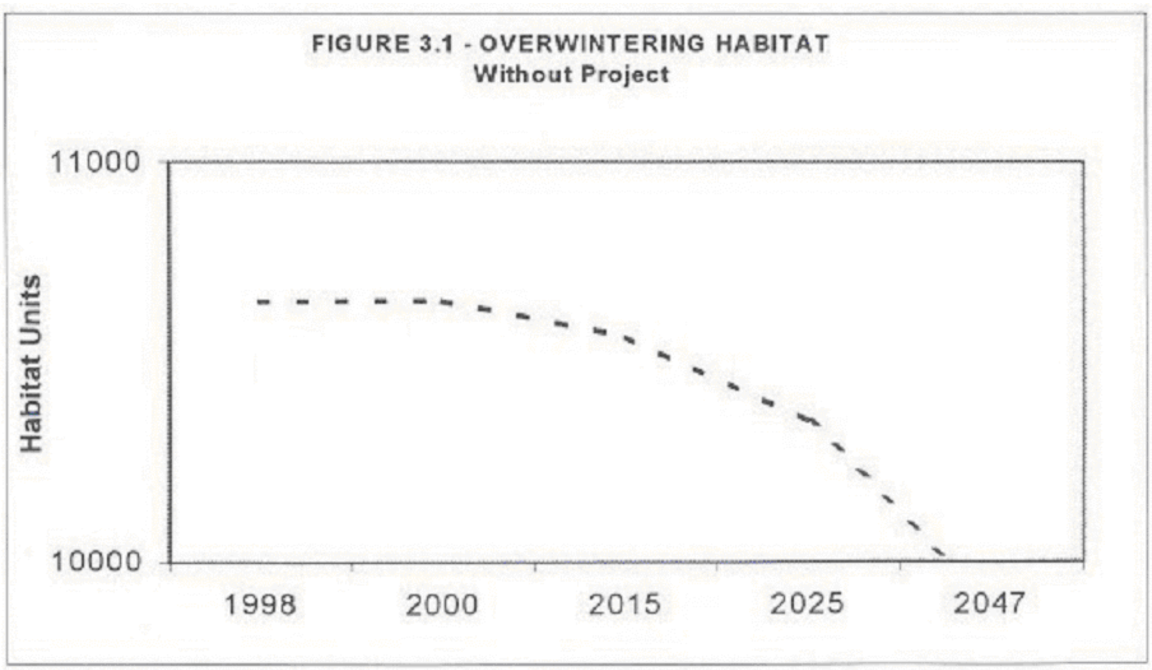


Figure 42. Overwintering Habitat without Restoration Project.

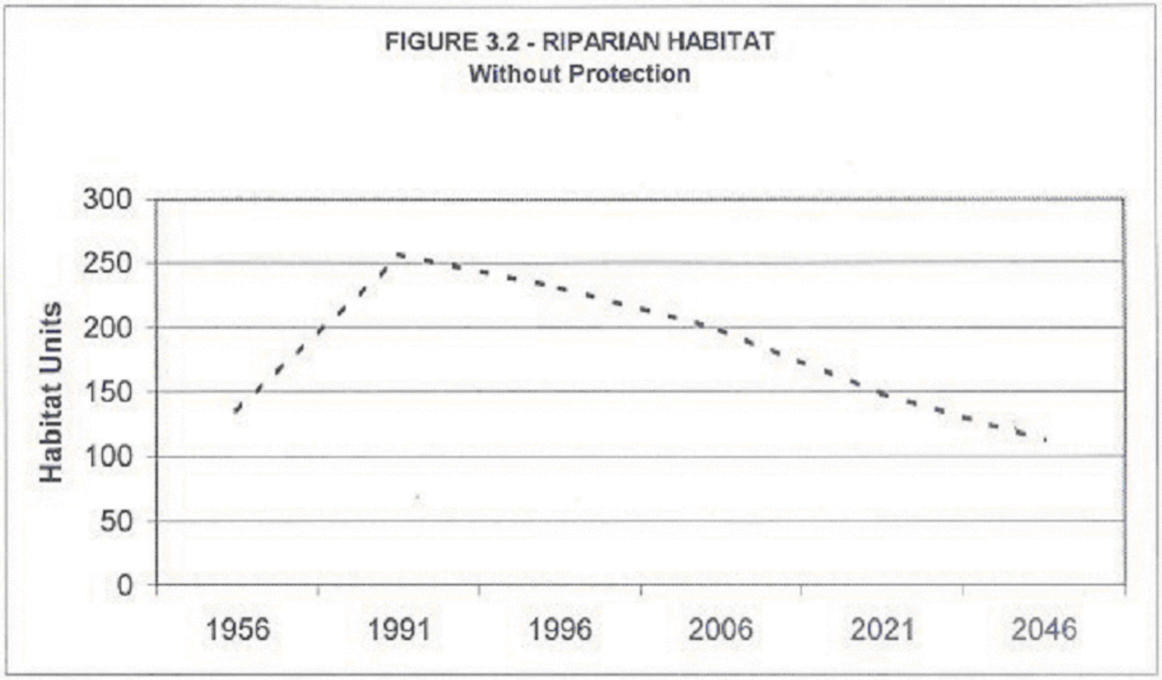


Figure 43. Riparian Habitat without Protection.
(Source: U.S. Army Corps of Engineers, Walla Walla District, 2000, Jackson Hole, Wyoming Environmental Restoration Feasibility Report) (http://www.nww.usace.army.mil/reports/jackson/report.htm)

Idaho Department of Fish and Game (IDFG)

IDFG has sponsored many species specific and habitat assessments in the Headwaters Subbasin. Examples include:

- 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 ad Strategy for the northern goshawk for the State of Idaho.
- Dolan, P.M. Saving all the pieces. Idaho Interagency Conservation/Prelisting Effort. Common Loon, *Gavia immer*, Habitat Conservation Assessment (HCA) and Conservation Strategy (CS). Idaho Department of Fish and Game, U. S. Fish and Wildlife Service, U.S. Forest Service.
- Cassirer, E.F., J.D. Reichel, R.L. Wallen, and E.C. Atkinson. 1996. Harlequin Duck (*Histrionicus histrionicus*) United States Forest Service/Bureau of Land Management Habitat Conservation Assessment and Conservation Strategy for the U.S. Rocky Mountains.
- 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 (HCA's) and Conservation Strategies (CS's).
- 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.

Wyoming Department of Game and Fish

With the growth within the Jackson Hole valley ecosystem, traditional land use consisting of homesteads, ranch headquartering, grazing, and other long term residences has changed. Rising land values in the 1980's and 1990's have lead to accelerated conversion of the Snake River floodplain from agricultural to residential uses, currently the primary land use. Levees built along approximately 25 miles of the Snake River in the 1950's and 1960's have had significant additions to accommodate new growth and protect from frequent flooding. The construction of these levees has created many impacts on the ecology of the Snake River floodplain in Jackson Hole. Direct impacts include blocking of access to traditional cutthroat trout spawning sites in tributaries, displacement of wildlife, loss of channel braiding (and associated bird nesting sites and trout habitat), loss of riparian (stream bank) vegetation, and dessication of floodplain habitats. Lack of periodic flooding outside the levees has resulted in siltation of streambed gravels in the spring creek tributaries, and curtailment of cottonwood and willow regeneration.

Snake River Compact Allocations

The Snake River Compact between Wyoming and Idaho was enacted into law in 1949. All permitted uses of water prior to June 30, 1949 were recognized. For future use, the flow of water at the Wyoming-Idaho state line is allocated 4% to Wyoming and 96% to Idaho. After the first 2% is put to beneficial use by Wyoming, replacement storage for one-third of the next 2% must be provided by Wyoming for Idaho use. When calculating these amounts based on the average state line flow, the storage replacement equals approximately 33,000 acre-feet. Wyoming believes its present use is well below the first 2%. A study underway at the Wyoming Water Resources Center is directed towards quantifying what additional consumptive uses have been established since 1949.

National Park Service

Recent assessments in Grand Teton National Park and the John D. Rockefeller, Jr., Parkway focus on a wide array of physical and natural resource topics.

- Endangered raptors have received a substantial amount of research effort in the past decade. Information gathered by these projects has generated management changes that increase the protection of these species.

- Large mammals also generate management oriented research. A very intensive study of elk calf mortality and dispersal has been undertaken to evaluate whether density dependent population regulation is occurring in Jackson Hole.

- Carnivores such as the grizzly bear and gray wolf will probably require an increased amount of monitoring and management effort in the future. Many locations within Grand Teton National Park and the John D. Rockefeller Parkway offer ideal habitat for expanding populations of both species.

Wyoming State Engineer's Office's West Bank Study

The Wyoming State Engineer's Office's West Bank Study, funded by the Water Development Commission, is completing an assessment of the groundwater-surface water interactions in the area between Teton Village and Wilson. As subdivisions continued to expand, new residents began to complain of excess water around their foundations and septic systems. The study is attempting to quantify the relationship between surface irrigation, river releases, and off-channel pond development in the area and resulting impacts to the housing areas.

Major Limiting Factors

Within the Subbasin

Fish

Idaho Department of Fish and Game -- Factors commonly listed as limiting the abundance and distribution of native salmonids in the Snake River include hybridization and competition with non-native salmonids, and anthropogenic disturbances to stream habitat due to timber harvest, grazing, dam construction, irrigation diversions, and road building (Rieman and McIntyre 1993; Gresswell 1995). In the middle and upper Snake River provinces, however, few investigations have been made to elucidate which factors are important in determining the patterns of distribution and abundance of native salmonids (IDFG 2001).

Wyoming Game and Fish Department -- Limiting factors which impact the historical river channels along the Headwaters Snake River in Wyoming (Wyoming Game & Fish, Coordination Act Report on the 1135 Project Modification, early 1990s) include:

- additional residential development on lands currently irrigated for hay production;
- reduction in agricultural irrigation that results in less groundwater recharge.

Local Sportsmen -- Limiting factors (concerns) expressed by sportsman likely to have a profound effect on fish (and wildlife) resources in the Palisades Watershed, including the Palisades reservoir (Post Register, July 19, 2001) include:

- Inconsistent releases from Palisades dam (vagaries of weather causing more or less irrigation drawdown)
- Significant changes in river temperature
- River dewatered
- Siltation
- Storage pool diminished to zero (where actually 201,000 acre feet of water is reserved; 44,000 acre feet for turbine intake and 157,000 acre feet in accordance with Bureau of Reclamation)
- Poor communications between water managers and irrigators
- Lack of water storage/retention mechanisms.

Fish and Wildlife

Idaho Department of Fish and Game -- Construction of the levee system through most of the Upper Snake River Basin reach has resulted in erosion, degradation, and in many cases destruction of the island cottonwood stand habitats. With the damming of rivers and subsequent alteration of flow regimes, the structure and function of riparian cottonwood ecosystems have been significantly altered. The regulated flows have promoted the invasion of floodplain habitats by exotic woody species, such as silver maple, ash, elm, Russian olive and European willow as well as significantly alter basic fluvial geomorphic processes, such as cut and fill alluviation. Results suggest that a flow regulation scheme that limits the reproductive success of cottonwoods sets in motion a spiral of ecological degradation for all organisms that depend on complex geomorphic river systems and multi-age stands of native cottonwoods and willows.

Studies have also shown that declines in riparian cottonwoods are related to the suppression of seedling recruitment. Since cottonwoods are a relatively short-lived tree (100-200 years), declines in seedling recruitment over the past century have lead to the widespread loss of riparian cottonwood ecosystems.

<u>The Nature Conservancy</u> – TNC has identified several threats to the South Fork of the Snake River. The scenic value of the river has attracted significant second home development that has fractured the otherwise continuous riverine corridor. Flood regimes on this river have been altered in a manner that minimizes the potential for large flood events that are required for the regeneration of the cottonwood gallery forest. There is also concern that low flow releases from Palisades Reservoir significantly limit the amount of juvenile rearing habitat for native fish. The introduction and proliferation of non-native trout threaten the genetic integrity of the Yellowstone cutthroat trout population. The agricultural conversion of native grasslands and aspen forests on the canyon rim significantly limits habitat availability and travel cover for grassland species and large mammals.

<u>Teton Regional Land Trust</u> -- The U.S. Fish & Wildlife Service has identified the South Fork of the Snake River as the most significant and highest quality riparian corridor remaining in the state of Idaho. Here thrives a unique forest including one of the last remaining intact communities of globally-threatened narrowleaf cottonwood and red-osier dogwood left in the western U.S. as well as habitat for the rare orchid, Ute ladies' tresses. The South Fork also supports the highest concentration of nesting bald eagles in the U. S. and the waters of this area nourish an endemic fish subspecies, the Snake River fine-spotted cutthroat trout. The South Fork is currently generating substantial development interest from parties who would like to develop subdivisions and recreational housing within the river corridor. Most of the river corridor in Swan Valley has already been platted into subdivisions, with subsequent loss of fish and wildlife habitats and threats to the future integrity of the South Fork as a free flowing river. Many new homes are being built within the floodplain, with the threat that the owners will press hard to harness the river within a levy system.

<u>Natural Resource Conservation Service</u> – NRCS has identified agriculture and grazing limiting factors affecting fish and wildlife throughout the Headwaters Subbasin. The NRCS has encountered many limiting factors despite efforts to preserve and improve habitat through various programs. Agriculture practices tend to create monoculture type food sources with limited seasonal availability. Although these croplands often provide high value food sources to wildlife, they are only available for a portion of the year. Tillage practices and installation of sprinkler systems for improved irrigation water management has reduced the availability of year-round food supply and secure cover in some wildlife habitats.

Habitat limitations includes

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

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

In years of low snowpack, flows in water bodies and reservoir storage can be drafted to fulfill irrigation water rights impacting the quality and quantity of water. Drought conditions affect bank stability and habitat quality. The invasion of noxious weeds often out competes desirable vegetation and provides less nutrition and cover for wildlife.

National Elk Refuge Based on historic photographs and field observations, the age structure and possibly distribution of certain deciduous shrubs and trees, including willow, serviceberry, chokecherry, cottonwood and aspen have declined over the past 50-100 years on the Refuge. Mountain mahogany, which Olaus Murie reported present in the 1940's, is absent from the Refuge today. Many Refuge aspen communities show signs of deterioration, poor regeneration of new stems, and heavy hedging of those stems by ungulates. An inventory and evaluation of the Flat Creek riparian corridor by a team of U.S. Forest Service biologists found that shrub species were severely repressed and cottonwood trees were likely to disappear from the corridor within the next 50-100 years (Galbraith et al. 1997). Experiments using exclosures on Flat Creek riparian areas and in aspen stands suggest that ungulate browsing is the cause of this decline. Impacts to streamside woody vegetation have potential water quality impacts including degradation of stream bank stability and resulting sedimentation, and potential increase in water temperature. An ongoing graduate student project is investigating passerine bird abundance and diversity in willow and aspen communities as a function of various ungulate densities. Other studies in Jackson Hole and other locations show adverse effects on avian diversity from high levels of herbivory on shrubland and woodland community structure.

In summary, high ungulate densities have the potential to impact water quality and affect breeding habitat for the Snake River cutthroat trout, amphibian species, and certain avian species. These are among the issues to be considered in an EIS being prepared to address management of the Jackson elk and bison herds. Data gaps remain in our knowledge about short-term and long-term consequences to plant communities, and particularly riparian communities, of artificially concentrating ungulates. As elk populations continue to increase to 100+ year high levels in the Rockies, and winter ranges are fragmented by subdivision, recreational development, and other human uses, similar concerns are arising elsewhere in the Columbia River basin. A coordinated effort to assess the impacts to biotic resources needs attention.

Wildlife

Idaho Department of Fish and Game (Merigliano, 1996)

- Habitat Loss, Degradation, and Fragmentation -- Changes in wildlife habitat may limit some wildlife species and/or allows non-native wildlife species to increase. Conversion of native habitats to agricultural fields, urban and rural human population areas, non-native vegetation (i.e. converting sagebrush range to non-native grasses) decrease or eliminate wildlife habitat in quality and quantity. Roads, powerlines, residential development, agricultural development, and wildfires fragment or remove habitat. Forest habitats are changing due to lack of natural fire regimes. Noxious weeds are displacing native plant species. In some areas, non-native plantings (i.e. conservation reserve program fields) do provide habitat for some wildlife species (sharp-tailed grouse). Studies are necessary to determine if native habitats are declining in productivity. Over abundance of livestock grazing and grazing by native species may be degrading native habitats.

- Species Competition, and Exotic/Non-native Species -- Various exotic species (e.g., starling, feral cat, red fox, and raccoon) thrive in the sub-basin. Exotic species directly displace native species by predation, and competing for nesting sites. Change in habitats (conversion of native ranges to agriculture and urban areas) support non-native species (e.g., red fox and raccoon). Wildlife and livestock interactions create conflict by direct competition for resources, potential disease transmissions, and through public perception. Game farms pose potential disease transmission to wild animals.
- Water Quality, Stream Flows, and Ground Water -- Water quality can be a limiting factor for amphibians. Regulated stream flows affect riparian corridors (Merigliano 1996) that provide wildlife habitat. Shape of flows released from dams may increase sediment movement and streambank erosion. Pumping of water from the aquifer may be diminishing ground water levels and impacting spring flows. Development of springs, piping of small streams, and development of hydropower on small streams have decreased or eliminated riparian habitat.
- Recreation -- The number of people, type of use, and amount of time, using wildlife habitat for recreational purposes are increasing in the sub-basin. Disturbance by recreational activities may displace wildlife. Recreational disturbance may include but not limited to, motorized and non-motorized use, winter recreation, and water related recreation.

<u>Market Lake Wetland Complex</u> (Southeast Idaho Wetland Focus Area Working Group, 2001) Three main issues that face conservation of wetland habitats in this complex include water management, land use, and noxious weeds. Water management within Market Lake basin is an issue facing many existing and historic wetlands. Irrigation practices on Egin bench and groundwater pumping in the Hamer area have reduced flows from springs and seeps at Market Lake WMA. Flows in the Snake River can hinder disposal of excess runoff and groundwater flows during winter to early summer by closing off drainage from the Van Leuven slough to the river. Drain water can back up and can cause flooding on the WMA and private property in the basin. Excess runoff or lack thereof from rain and snow in the watershed influences water levels in the marshes of the WMA, Roberts Slough, ephemeral and seasonal wetlands in the basin, and flooding in the basin. A few thousand acres of the lowest elevation portion of the basin are farmed. This private property is prone to flooding and it is common for this area to produce low yield crops and hay. The agricultural land use influences water management and disposal on the WMA. High water on the WMA increases groundwater subbing in the historic lake basin. An extensive drain canal and pump system removes water from the basin back to the river. This complex also has an extensive noxious weed problem. Weedy species such as Canada thistle, Russian knapweed, and leafy spruge are invading wet meadow areas.

Purple loosestrife was recently found in a marsh of the WMA and has been seen in several places nearby along the Snake River.

Southfork Wetland Complex (Southeast Idaho Wetland Focus Area Working Group, 2001). The major issues facing the conservation of wetland habitats in the South Fork Wetland Complex include residential development, livestock grazing, and noxious weed spread. The South Fork of the Snake River is becoming a highly desirable building location for both primary and secondary homes. People are interested in being close to the natural habitats found along this section of the river. However, many of these small "ranchettes" end up fragmenting important riparian and associated upland habitats. These areas are important breeding ground for many bird species as well as are important for wintering wildlife. The majority of the uplands in the Complex are utilized for livestock grazing. Reduced vegetation regeneration and stream bank degradation from livestock grazing has made riparian areas the most stressed wetland habitat in this Complex. Noxious weeds spread is a common issue for eastern Idaho wetlands and associated upland habitats. Leafy spurge and purple loosestrife (among others) threaten the foraging, cover, and nesting habitats of many wetland dependent wildlife species.

Willow Creek Wetland Complex (Southeast Idaho Wetland Focus Area Working Group, 2001). The major issues facing the conservation of wetland habitats in the Willow Creek Complex include livestock grazing, water management, noxious weed spread, and recreational development. The majority of the Complex is utilized for livestock grazing. Riparian areas are the most stressed wetland habitat from grazing due to reduced vegetation regeneration and stream bank degradation. Some of the most productive pasture areas are the extensive wet meadows surrounding Grays Lake. However, since early last century these areas have been grazed in coordination with water management activities in the Grays Lake basin. Water has been managed in the Grays Lake basin since 1906 and the construction of Clark's Cut. Clark's Cut essentially moves water to a different watershed for irrigation purposes. The result is lower water levels in Grays Lake sooner than historic natural drawdowns. In poor water years, Grays Lake is without open water before many young birds, notably trumpeter swans, have fledged. These birds are then subjected to predation pressures and breeding attempts for the year often are unsuccessful.

Subbasin wide -- Noxious weeds spread is a common issue for eastern Idaho wetlands and associated upland habitats. Leafy spurge and purple loosetrife (among others) threaten the foraging, cover, and nesting habitats of many wetland dependent wildlife species. Recreational development is another common issue for eastern Idaho landscapes. Increased utilization of public lands for a variety of recreational activities has the potential for disrupting easily disturbed wildlife (e.g., trumpeter swans).

Other Concerns

Wyoming is also concerned about Bureau delivery of water from the upper Snake River system to meet obligations in the salmon recovery efforts downstream in the Snake/Columbia River Basin. During dry years, these downstream deliveries are likely to impact carryover levels in Jackson Lake.

Artificial Fish Production

Anadromous Production & Stocking

The Idaho Department of Fish and Game has nearly two dozen fish hatchery operations throughout the state (Figure 44). No hatcheries are located in the Headwaters Subbasin of Idaho. No artificial production or stocking of anadromous species occurs in this subbasin.

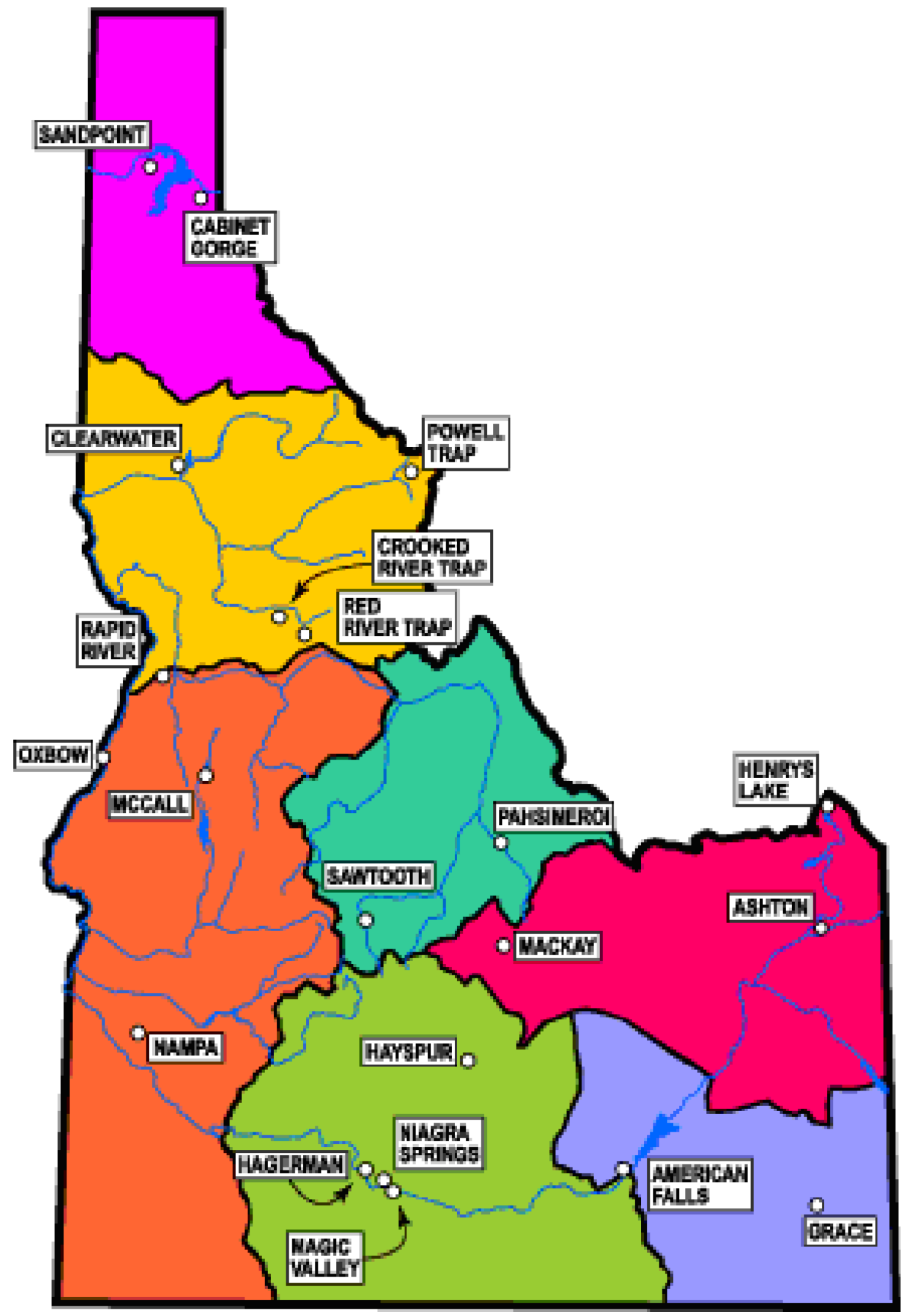


Figure 44. Fish Hatcheries in Idaho.

Non-anadromous Production and Stocking.

Although no hatcheries are located in the Headwaters Subbasin of Idaho, fish stocks from elsewhere are regularly stocked in subbasin streams (Table 60; Appendix J) (IDFG 2001).

Table 60. Summary of Fish Planted in Idaho Stream Segments of the Headwaters Subbasin, 1968 – 2000.

STREAM	CATCHABLE (6+ in.)	Fingerling (3-6 in.)	FRY (O-3 in.)	Grand Total
ANNIS SLOUGH		20229		20229
S F SNAKE R (DRY BED)		37622		37622
SNAKE R	67978	180850		248828
TINCUP CR	5757			5757
WILLOW CR	223130	714376	1660023	2597529
YEAMAN CR	2918			2918
Grand Total	299783	953077	1660023	2912883

Jackson National Fish Hatchery Stocking Program (C.Grant, In litt.)

Legislative authority for the establishment of Jackson National Fish Hatchery (NFH) was included in the Palisades Dam Act, 64 Stat. 1083, dated September 30, 1950. The Act authorized the construction of facilities for the improvement of fish and wildlife along the headwaters of the Snake River. Construction began in the spring of 1957 and was completed in December of that year. The station was officially accepted on January 10, 1958, and dedicated July 30, 1960. The first fish were stocked in September of 1958. The hatchery rears wild Snake River cutthroat trout. Presently, the fish stocking or distribution area includes three Bureau of Reclamation projects in the upper Snake River watershed: Jackson Lake; Grassy Lake; and Palisades Reservoir. Other waters for which stocking is included in each management plan occur in the upper Snake River drainage basin in the Targhee and Bridger-Teton National Forests and on the Fort Hall Reservation in Idaho. The distribution area covers 18,000 square miles and contains an estimated 100,000 acres of lakes and 4,000 miles of streams. Funding for the production and stocking programs comes from the U.S.Fish and wildlife Service.

Annual Hatchery Production of Snake River cutthroat Trout for Bureau of Reclamation Projects:

- 315,000 sub-catchables (5-7 inches) averaging 55,000 pounds
- 36,000 catchables (10 inch) averaging 9000 pounds

Other Snake River Headwater Stocking:

- 55,000 sub-catchables (5-7 inch) averaging 7900 pounds.

Existing and Past Conservation Efforts

BPA Sponsored Actions, Activities, and Programs

Salmon Flow Augmentation (Source -- US Bureau of Reclamation, 1998).

Flow augmentation for migrating juvenile salmon was identified as a key element in regional efforts to protect ESA listed salmon runs. The Bureau of Reclamation began a program of providing flows in 1991. Seasonal targets are 85,000 to 100,000 cfs for spring flows (April 10 to June 20) and 50,000 to 55,000 cfs for summer (June 21 to August 31) (BOR 1998). The primary purpose of flow augmentation is to provide flows for juvenile salmon migration from April 20 through August 31. Reclamation generally assumes the 427 KAF will most likely be needed in the latter part of the migration, July and August. This coincides with recession of natural flows and the beginning of storage draft for irrigation. Storage releases for irrigation generally begin by early July, but may begin as early as April or May in a low water year. The strategy for release depends on the magnitude and timing of the natural runoff and the timing and numbers of migrating fish. Typically, augmentation water has not been released as long as the natural flows are sufficient to meet the target flows.

Reclamation complies with state law in the effort to provide water for salmon flow augmentation. Legislation was enacted by the State of Idaho (Idaho Code, Chapter 17, Section 42-1763B) that provides interim approval for Reclamation to rent water through the water bank operated by rental pools in Idaho. Key provisions of that legislation state that:

- Water is to be obtained only from willing lessors
- Water must be obtained from storage
- Water releases must be used for power production in Idaho

The maximum amount is 427,000 acre-feet, which is to be reduced by any Snake River amounts acquired by Reclamation outside the rental pools

During the last several years, a varying amount of water has been available from the upper Snake River reservoirs for salmon flow augmentation (Table 61). Contributions from Headwaters Subbasin for flow augmentation are given in Table 62.

Table 61. Upper Snake River Water (acre-feet) available from BOR for salmon flow agumentation.

Type	1991	1992	1993	1994	1995	1996	1997
Reclamation space	15,000		206,617	285,954	22,396	22,396	22,396
Rentals	84,000		65,000	44,325	232,839	194,667	202,104
Subtotal	99,000		271,617	330,279	255,235	217,063	224,500

Table 62. Bureau of Reclamation Headwaters Subbasin Reservoir Space Used for Salmon Flow Augmentation (acre-feet).

Source	1993	1994	1995	1996	1997
Jackson Lake			3,923	3,923	3,923
Palisades Res.	13,615	15,754	9,522	9,522	9,522
Palisades Powerhead	18,794	153,530			
Ririe Res.	78,633	17,430			
Headwaters Total	111,042	186,714	13,445	13,445	13,445

More than 330,000 acre-feet were released in 1994 when more than 250,000 acre-feet were taken from powerhead space. Reclamation schedules the releases of the upper Snake River water and typically begins releases at the time storage releases for irrigations begin, normally in June or early July. In very low or consecutive low water years, storage releases for irrigation may begin earlier. The USFWS is also party to the agreement between Reclamation and Idaho Power for the upper Snake flow augmentation. Through this agreement (and separate ESA consultations) Reclamation tries to operate to reduce flows (ramp down) in a manner that will reduce the possibility of stranding ESA listed snail species. A maximum reduction rate of 100 cfs per day is currently used.

Other BPA Funded projects (Source -- US Bureau of Reclamation, 1998).

Few BPA sponsored conservation efforts have been conducted in the Upper Snake Province (Table 63) (Streamnet 2001). Of those, most in the Headwaters have been mitigation and acquisition.

Dams built to generate power, as well as to control flooding and to provide navigation, irrigation, and recreation services, have altered the network of rivers that feeds into the Pacific Northwest's Columbia River Basin. Twenty-nine Federal hydroelectric dams, including the Palisades Project and numerous other dams now regulate the flows of many of these rivers. The Northwest Power Act of 1980 recognized that development and operation of the Federal hydroelectric dams of the Columbia River and its tributaries have affected fish and wildlife resources (Pacific Northwest Electric Power Planning and Conservation Act [Northwest Power Act], 16 U.S.C. 839 et seq., Section 4. [h][10][A]). The act created the Northwest Power Planning Council (Council), in part, to develop a program to protect, mitigate and enhance fish and wildlife, including related habitat, within the Columbia River Basin (section 4[h][1][A]).

Table 63. Upper Snake Subbasin Projects Funded by BPA.

Location	State	Target Spp.	Project Type	Project Description	Agency Name	Project Title
COLUMBIA RIVER BASIN	NY	Anadromous Fish	Research / Evaluation	Smolt Mainstem Passage	ENVIRONMENTAL DEFENSE FUND	EDF WATER ACQUISITION PILOT PROJECT
NONE	ZZ	Program	Coordination	Mainstem Flow Regulation	CONTRACTOR UNKNOWN TO EMIS	COST SHARE 500 KAF UPPER SNAKE
SNAKE RIVER BASIN	ID	Wildlife	Research / Evaluation	Mitigation / Recovery	IDAHO DEPARTMENT FISH & GAME	BLACK CANYON / ANDERSON RANCH WILDLIFE LOSS STUDY
SNAKE RIVER BASIN	OR	Resident Fish	Monitoring / Baseline	Baseline / Feasibility Efforts	CH2M HILL - PORTLAND	FEASIBILITY STUDY - HATCH DES ABOVE HELLS CANYON
SNAKE RIVER BASIN	ID	Anadromous Fish	Coordination	Mainstem Flow Regulation	IDAHO POWER COMPANY	IDAHO WATER RENTAL - FLOWS
SNAKE RIVER BASIN	ZZ	Wildlife	Research / Evaluation	Mitigation / Recovery	CONTRACTOR UNKNOWN TO EMIS	SOUTHERN IDAHO WILDLIFE MITIGATION - SHOBAN TRIBES
SNAKE RIVER BASIN	ID	Wildlife	Research / Evaluation	Mitigation / Recovery	IDAHO DEPARTMENT FISH & GAME	UPPER SNAKE PROJS WILDLIFE MITIGTION PLAN
UPPER SNAKE SUBBASIN	ID	Wildlife	Aquisition / Enhancement	Enhance / Maintain	IDAHO DEPARTMENT FISH & GAME	CAMAS PRAIRIE - PHASE I
UPPER SNAKE SUBBASIN	ID	Resident Fish	Habitat / Watershed	Implementation	SHOSHONE-BANNOCK TRIBES	HABITAT IMPRVMNT/ENHNMNT - FORT HALL BOTTOMS
UPPER SNAKE SUBBASIN	ID	Wildlife	Research / Evaluation	Mitigation / Recovery	IDAHO DEPARTMENT FISH & GAME	MINIDOKA DAM WILDLIFE MITIGATION PLAN
UPPER SNAKE SUBBASIN	ID	Wildlife	Research / Evaluation	Mitigation / Recovery	IDAHO DEPARTMENT FISH & GAME	MINIDOKA WILDLIFE LOSS STUDY & MITIGATION PLAN
UPPER SNAKE SUBBASIN	ID	Wildlife	Aquisition / Enhancement	Enhance / Maintain	IDAHO DEPARTMENT FISH & GAME	SOUTH FORK SNAKE - PHASE I
UPPER SNAKE SUBBASIN	ID	Wildlife	Aquisition / Enhancement	Enhance / Maintain	IDAHO DEPARTMENT FISH & GAME	SOUTH FORK SNAKE/SAND CREEK WILDLIFE MITIGATION
UPPER SNAKE SUBBASIN	ID	Wildlife	Aquisition / Enhancement	Land Purchase / Enhancement	IDAHO DEPARTMENT FISH & GAME	SOUTHERN IDAHO WILDLIFE MITIGATION - (IDFG)
UPPER SNAKE SUBBASIN	OR	Wildlife	Research / Evaluation	Mitigation / Recovery	USFWS - PORTLAND REGION	WILDLIFE LOSS ASSESSMENT PALISADES IDAHO

The Palisades Project, located on the South Fork Snake River in Bonneville County, Idaho and Lincoln County, Wyoming, was completed in 1959 for irrigation, flood control, and electric power production. The dam created a reservoir with over a million acre-feet of water storage capacity. Approximately 16,000 acres of floodplain and riparian habitats important to wildlife were inundated when the reservoir filled. The natural flow regime in the Snake River downstream from the dam has been changed by operation of the project resulting in continuing alteration or elimination of wildlife habitat.

Conservation Easements Habitat for wildlife impacted by construction of Palisades Dam has been protected by the purchase of two easements on Pine Creek Bench near Swan Valley, Idaho. The easements were funded through the BPA wildlife mitigation program. Both easements involved purchase of development rights on working farms that are located in an area with high potential for recreational and second home development.

Winterfeld Conservation Easement The Winterfeld easement was granted to the Idaho Department of Fish and Game in 1997. This easement covers a total of 422 acres in two non-contiguous parcels adjacent to Pine Creek, a tributary of the South Fork Snake River. A baseline HEP was completed in 1996 and as a result BPA was credited with 383 habitat units for target species associated with Palisades Dam. The primary emphasis of management on the easement is protection of riparian, forested and sagebrush-grassland wildlife habitats. Two active bald eagle nesting territories are within 1 mile of this property. The farm is managed using a Conservation Plan prepared by NRCS in 1996. The owner is currently producing about 10 different agricultural products on the property including grain, hay and native and non-native grass and forb seed. Easement monitoring is done by IDFG.

Kruse Conservation Easement The Kruse easement was granted to the Teton Regional Land Trust in 1997. This easement covers a total of 800 acres adjacent to Pine Creek and the Winterfeld easement. A baseline HEP was completed in 1996 and as a result BPA was credited with 813 habitat units for target species associated with Palisades Dam. The primary emphasis of management on the easement is protection of riparian, forested and sagebrush-grassland wildlife habitats. Two active bald eagle nesting territories are within 1 mile of this property. The farm is operated under a Conservation Plan prepared by NRCS in 1996 and is used to raise alfalfa hay and small grains using no-till practices. Teton Regional Land Trust does easement monitoring.

Idaho Department of Fish and Game

The Idaho Department of Fish and Game (IDFG) have received BPA funding to inact mitigation projects since 1997 (Table 64). Some of these projects have been in partnership with the Shoshone-Bannock Tribes and Teton Regional land Trust.

Table 64. Upper Snake Subbasin BPA-funded Wildlife Mitigation Projects

Project Name	Year Implemented	Manager(s)	Acres	Habitat Units
Winterfeld easement	1997	IDFG&SBT	422	383
Kruse easement	1997	Teton Regional Land Trust	800	813
Menan acquisition	1997	IDFG&SBT	140	317
Noxious Weed Project	1997	IDFG&SBT	Up to 10,000	499
Beaver Dick acquisition	1997	IDFG&SBT	310	901
Quarter Circle "O" acquisition	1997	IDFG	1/3 of 2,135	1,254
Deer Parks	1999	IDFG&SBT	2,556	6,918

Mitigation Acquisition The properties that comprise the Deer Parks Complex were acquired for the purpose of partial mitigation for the loss of wildlife habitat caused by construction of the Palisades Project dam and reservoir. Using Bonneville Power Administration (BPA) funding, the wildlife mitigation units were acquired from willing sellers by U.S.D.I. Bureau of Land Management (BLM), with the agreement that the Idaho Department of Fish and Game (IDFG) and The Shoshone-Bannock Tribes (SBT) would cooperatively manage them.

The Deer Parks Complex (Figure 45) is located along and near the Snake River and Henry's Fork Snake River about 20 miles north of Idaho Falls, Idaho in Jefferson and Madison counties. The mitigation units lie in the Snake River Plain at an elevation of 4,790 feet on the Snake River. Most of the terrain has gentle relief and slopes gradually away from the river, rising to about 4,830 feet. An exception to the otherwise gentle topography is the North Menan Butte, which rises nearly 800 feet above the surrounding landscape and is partially within the Deer Parks mitigation unit.

The Deer Parks Complex includes three Wildlife Mitigation Units. The Menan and Beaver Dick properties were acquired in 1997 and the Deer Parks (Boyle Ranch) property was acquired in 1999. The Bonneville Power Administration provided funds to BLM to purchase the lands. The Deer Parks Complex is managed cooperatively by BLM, IDFG, and SBT.

The Deer Parks Wildlife Mitigation Unit is located along the mainstem Snake River in Jefferson County about three miles north of Menan, Idaho. The 2,556-acre property includes about two miles of river frontage, wetlands, shrub-steppe uplands, pasture and cropland. It abuts BLM land on three sides. A paved county road is adjacent to the property. There is no levee system along the river in this reach and the low-lying portions of the property flood most years.

The Menan Wildlife Mitigation Unit is located along the mainstem Snake River in Jefferson County adjacent to the Deer Parks unit. The 142-acre property includes river frontage, wetlands, former pasture and former cropland and floods most years.

The Beaver Dick Wildlife Mitigation Unit is located along the Henry's Fork Snake River in Madison County about 5 miles west of Rexburg, Idaho. The 310-acre property includes one mile of river frontage, wetlands and former pasture. It also floods most years.

The Quarter Circle O (QCO) acquisition added 2,135 acres fee-title plus a 640 acre Idaho Department of Lands (IDL) lease to the existing 28,750 acre Tex Creek Wildlife Management Area (TCWMA). The three QCO parcels include approximately 3.75 miles of perennial stream in the Willow Creek, Tex Creek and Deer Creek drainages. The QCO parcels are located approximately 15 miles east of Idaho Falls, Idaho and 10 miles south of the South Fork Snake River.

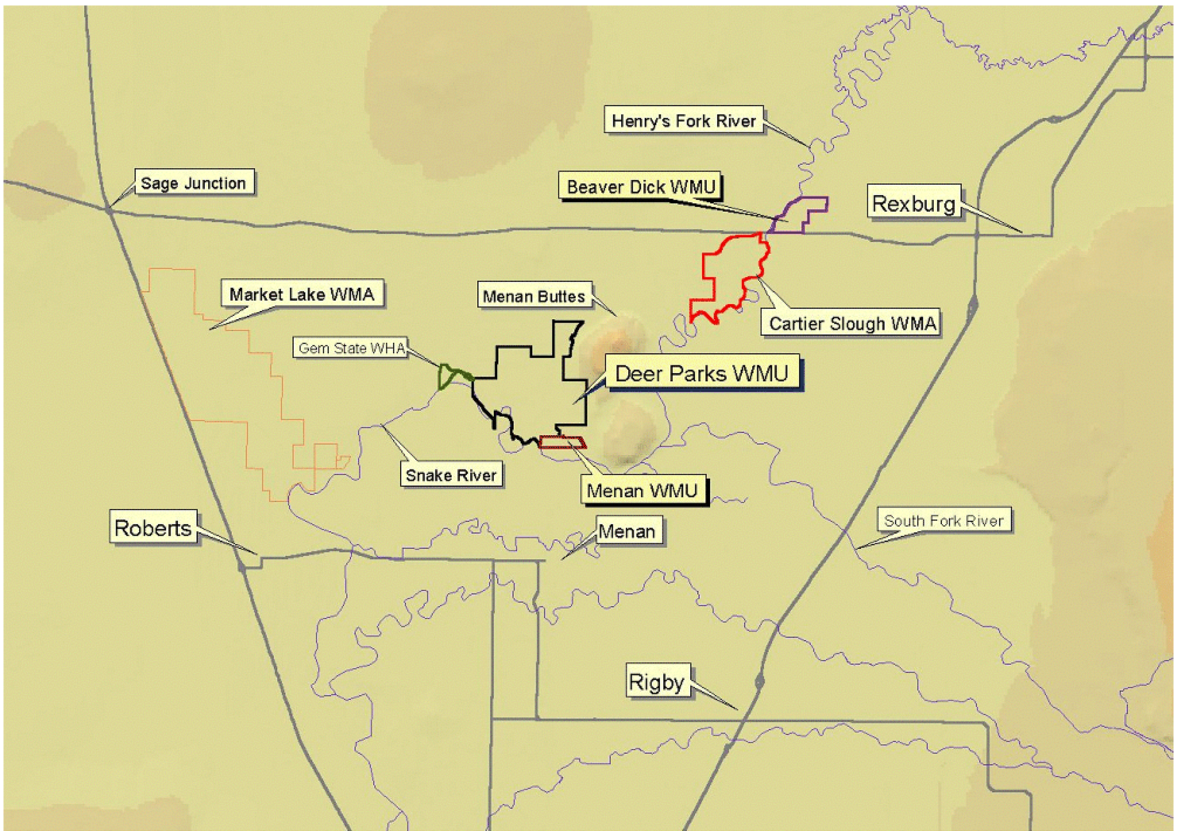


Figure 45. Deer Parks Complex.

Palisades Mitigation Noxious Weed Control Project The Palisades Mitigation Noxious Weed Control Project was funded in 1997 to facilitate use of biological methods to control noxious weeds in the Palisades project area to improve wildlife habitat. Over 500 individual releases of biological control agents (insects) have been made and monitoring has shown the project to be very successful. Insectories have become established at some of the release sites and are now being used as sources of control agents for other areas. All projects require at least a 50:50 match of BPA funds.

During June 1998 data was collected at permanent monitoring sites in Pine Creek and Dry Creek Canyon. Aphthona nigriscutus (Black Dot Flea Beetle) were previously released on Leafy Spurge at these sites during 1994. Both release sites are in the South

Fork of the Snake River Canyon where the native plant community is a mixture of grasses, forbs, and shrubs including sagebrush and bitterbrush, and trees including juniper and cottonwoods. At each monitoring station leafy spurge is present in large patches which are expanding. The locations are remote sites most readily accessible by boat. Accessibility, slopes, and the proximity to live water make weed control methods using herbicides impractical and undesirable. This area is one of many seed weed seed sources adversely affecting habitats down stream. Aphthona nigriscutis is *host specific* to leafy spurge, making it ideal for biological weed control. Adult insects feed on the plant foliage interrupting photosynthesis and reducing seed production. However, the larva does the most significant damage, as they mine the root system and crown.

Permanent monitoring stations were established at Pine Creek and Dry Creek in 1995. At that time base line data were collected about the leafy spurge stand. Leafy spurge density was measured by counting the number of plants found within a 9.6 sq. ft. (3-½ ft. diameter) range hoop at permanently established points centered 25 feet from the release point. The frequency of occurrence and plant vigor of plants was measured at 25 points (one foot intervals) along four permanently established transect lines. Frequency was the number of times a leafy spurge plant "intersected" the transect line point. Vigor was measured by the height of plants at each point. Each site was photographed to log changes and trends in the future.

Non-BPA Funded Actions, Activities, and Programs

Grays Lake

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

National Wildlife Refuge System is national network of lands and waters established for the conservation and management of fish, wildlife and plant resources and their habitats. There is one refuge unit located within the Headwaters Subbasin: the Grays Lake National Wildlife Refuge.

Grays Lake is located 27 miles north of Soda Springs, in a high mountain valley at an elevation of 6400 feet. The refuge currently controls 18,500 acres. Additions are proposed to protect more important wildlife habitat, which will eventually increase the refuge to 32,800 acres. While Grays Lake is a natural lake, its water level is regulated according to agreements that balance the needs of wildlife with various off-refuge interests. The "lake" is actually a large shallow marsh. It has little open water and is covered with dense vegetation, primarily bulrush and cattail. Wet meadows and grasslands surround the marsh (Figure 46). Habitat management focuses on measures to benefit cranes and waterfowl. The refuge hosts the largest nesting population of greater sandhill cranes in the world; during the staging period in late September and early October, as many as 3,000 have been found in the valley at one time. There have been up to 199 species noted on Grays Lake NWR or within the Grays Lake watershed (Appendix F).

Grays Lake National Wildlife Refuge was established for use as an inviolate sanctuary, or for any other management purpose, for migratory birds (16 U.S.C. 715d (Migratory Bird Conservation Act). It was also identified as suitable for

(1) incidental fish and wildlife-oriented recreational development,

(2) the protection of natural resources, and

(3) the conservation of endangered species or threatened species

(16 U.S.C. 460k-1 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ...16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended). AND ... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 16 U.S.C. 742f(a)(4) ...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ...16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

Management Programs -- Grays Lake NWR is the largest hardstem bulrush marsh in North America. This marsh attracts large numbers of ducks, sandhill cranes, Canada geese and trumpeter swans. Water levels cannot be manipulated because of agreements with local land owners and the Fort Hall Irrigation District. Surrounding the marsh are large wet meadows. These meadows are used by feeding geese and cranes and their broods. These fields are managed with grazing, haying and prescribed burning to provide short foraging habitat. These practices are currently being investigated with a large research project. Some small grain crops are grown to provide supplemental feed for geese and cranes and to keep them on the refuge, rather than in private croplands. Integrated pest management is practiced to prevent noxious weeds from degrading native habitats. Waterfowl banding is done each year at Grays Lake, in a cooperative effort with the Idaho Department of Fish and Game. Grays Lake NWR was the site of the discontinued whooping crane cross-fostering experiment. This experiment used sandhill crane foster parents to hatch and raise whooping cranes. The sandhill cranes were successful in raising the whooping crane chicks and teaching them the migration route to the New Mexican wintering sites. However, the whooping cranes imprinted on the sandhills and never paired successfully with each other. This experiment has been discontinued and it is no longer possible to see whooping cranes on the refuge.

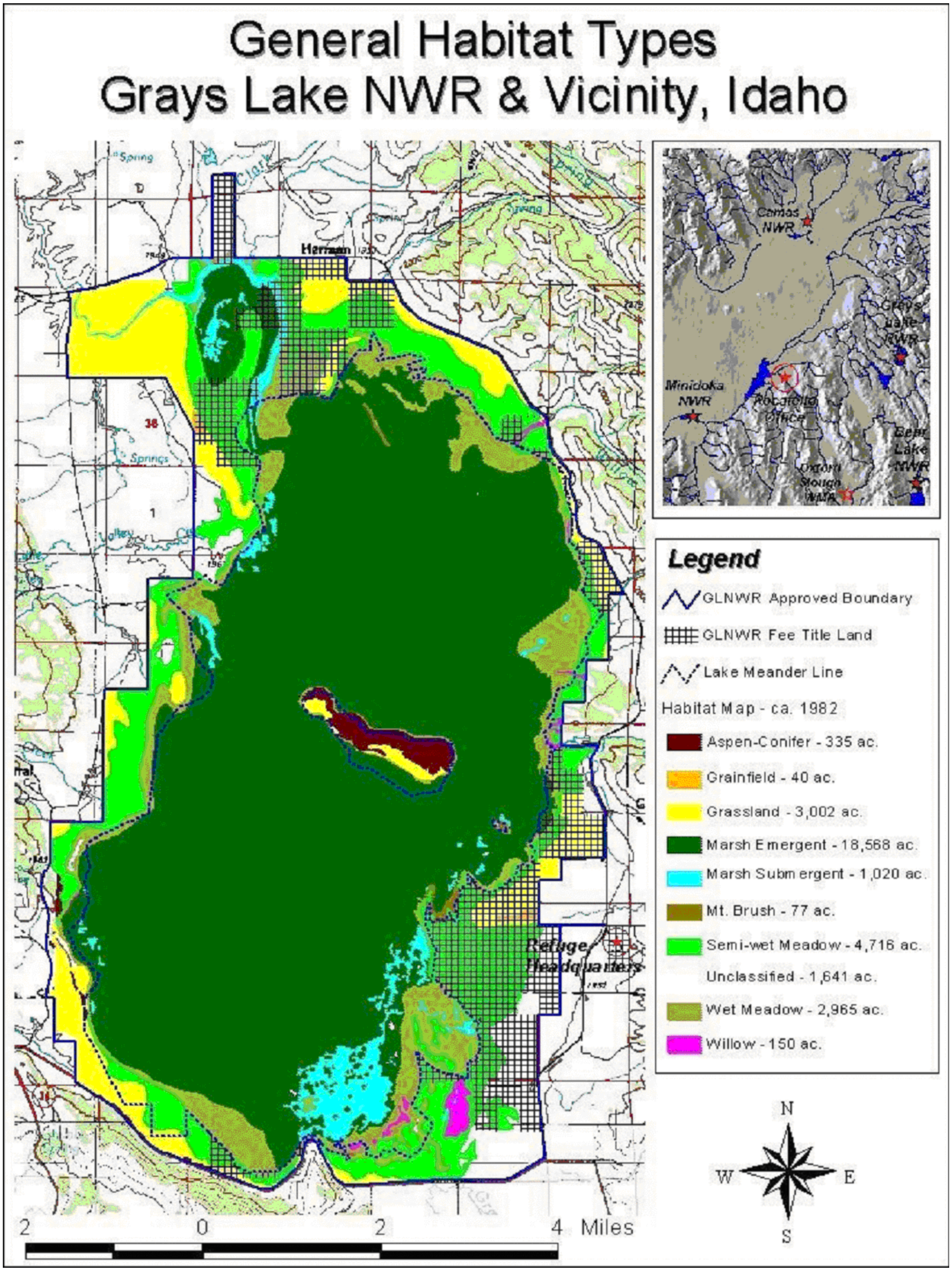


Figure 46. Grays Lake and Vicinity – General Habitat Types.

Gem State Wildlife Habitat Area

The Gem State Wildlife Habitat Area (GSWHA) is made up of 71 acres of riparian habitat, most of which is the offsite mitigation area for losses resulting from the development of the Gem State Hydroelectric facility by the City of Idaho Falls. It is managed by the Idaho Department of Fish and Game. The parcel is located on the Snake River below the confluence of the Henry's Fork and the South Fork of the Snake River (Figure 45). The Gem State offsite mitigation area was purchased by the City of Idaho Falls and transferred to the Idaho Department of Fish and Game for management. GSWHA is managed primarily as wildlife habitat. GSWHA is also managed to provide public access for hunting fishing, trapping, and wildlife viewing (IDFG, 1998).

The parcel has 63.7 acres of forested riparian habitat, including some mature cottonwoods. There are approximately 7 acres of palustrine emergent wetland on the BLM owned lands. Common flora includes: Cottonwood, red-osier dogwood, willow spp., snowberry, rose, Kentucky bluegrass. As part of the mitigation the city was required to provide new habitat on about 21 acres by clearing two areas and replanting them to a grass/forb mix in 1988 and to trees and shrubs in 1989. This project failed to provide the enhancements anticipated and the clearings became invaded largely by noxious weeds, particularly leafy spurge.

The area is located on river terraces and consists of only one soil type, Annis silty clay loam. The elevation is about 4,780 feet above sea level. No water rights are associated with the area and there has been no agricultural development. However, past use did included livestock grazing. Grazing was removed to enhance wildlife habitat when the City acquired the property.

The GSWHA provides habitat for a variety or songbirds, waterfowl, and raptors, including roost and perch sites for bald eagles. Small mammals, furbearers, deer, elk, and moose also use the area. The removal of grazing from the property and a project to reopen a remnant river channel to allow waterflows to raise the water table are expected to improve habitat for wildlife. Trees, including cottonwoods, shrubs and understory vegetation are expected to improve because of the elimination of grazing and because of an increase in available water provided by a raised water table.

Market Lake Wildlife Management Area

The 5,071 acre Market Lake Wildlife Management Area (MLWMA), in Jefferson County is located 2 miles north of the city of Roberts, and 17 miles north of Idaho Falls. The MLWMA was established in 1956 to restore a portion of the historic Market Lake basin for migrating and nesting waterfowl, and to provide an area for waterfowl hunting. It is managed by the Idaho Department of Fish and Game.

The original Market Lake was a 12 square mile flood plain of the adjacent Snake River. The vast flocks of waterfowl that visited Market Lake during the spring and fall migrations attracted "market" hunters who harvested the birds and gave the area its name. In 1956 when the MLWMA was established, only 30 acres of the original wetlands remained. Federal Aid per the Pittman-Robertson Act was used in acquiring property to create the MLWMA and also is used to manage the MLWMA.

The MLWMA has four major habitat types; marsh/wetland meadow, desert uplands, Snake River riparian, and cropland. The wetland complexes are surrounded by low rises of sand to sandy loam soils and igneous rock ledges. The 1,700 acres of wetlands receive the majority of their water from springs located throughout the MLWMA.

The MLWMA is used by 250 wildlife species and is an important migration and staging area for waterfowl species in the Pacific Flyway. Approximately 50,000 snow geese, 4,000 tundra swans, 100 trumpeter swans, 2,000 Canada geese and 250,000 ducks feed, rest, and stage at the wetland complex made up of the MLWMA, Mud Lake WMA, and Camas National Wildlife Refuge, during spring migration. The largest concentration of waterfowl occur in March and April.

In 1998, the MLWMA was given Globally Important Bird Area status in the American Bird Conservancy’s United States Important Bird Areas program. Specifically, the MLWMA provides habitat for greater than 1% of the biogeographic population of snow geese during spring migration, and greater than 1% of the world’s breeding population of white-faced ibis. It also provides habitat for nationally significant population of tundra swans in the spring.

Species with special status designations and species for which there is concern for their long term well being, which use the MLWMA include the bald eagle, peregrine falcon, sage grouse, sharp-tailed grouse, and white pelican.

The mission for the MLWMA is to protect and provide habitat at the Market Lake Wildlife Management Area for the propagation of waterfowl and other wildlife species so as to maintain abundant populations, and for public hunting, trapping, wildlife viewing, nature viewing and education (IDFG 1998).

Tex Creek Wildlife Management Area

The properties chosen for acquisition for the Tex Creek Wildlife Management Area had a long history of big game winter use. At the time of acquisition, the Indian Fork and Pipe Creek areas wintered 1,400 elk. Wintering deer were so numerous in Willow Creek Canyon that biologists had named one area Deer Heaven. The acquisition and cooperative management of these properties has ensured that these herds of big game animals would continue to have winter range.

Tex Creek Wildlife Management Area is comprised of land owned by several government agencies and one private organization. The Ririe Segment (2,255 acres managed under a 100 year agreement signed in 1976), was purchased by the Corps of Engineers to mitigate big game habitat losses due to the construction of Ririe Dam. The Teton Segment (9,113 acres managed under a 25 year renewable agreement signed in 1981) was purchased by the Bureau of Reclamation (BOR) as mitigation for Teton Dam. The Idaho Department of Fish and Game (IDFG) holds title to 9,215 acres and the Rocky Mountain Elk Foundation (RMEF) owns 705 acres. The remaining 9,600 acres is owned by the Bureau of Land Management (BLM) land and is managed under a three-way cooperative agreement between the BLM, BOR and IDFG. Primary management responsibility rests with IDFG. The entire project area encompasses 84,000 acres and includes 6,160 acres of state lands leased to private individuals and 53,665 acres of privately owned land.

Elevations at TCWMA range from 5,119 feet at the Ririe Reservoir pool level to 7,287 feet near the east boundary. Soils are highly varied and range from deep well-drained loess formed silt loams to shallow stony soils. Significant amounts of heavy clay soils are also present. Rock outcrop and lava rock rims predominate in canyon areas. Soil erosion can be severe during spring runoff and summer storm events.

Temperatures range from -35 F to 100 F. The mean annual temperature is about 43EF at the lower elevations. The growing season is generally less than 90 days and light frosts are common during the summer months. Mean annual precipitation ranges from about 12 to 18 inches, moving west to east across the area. Most precipitation falls as snow and spring rains. The area is prone to severe summer thunderstorms.

Normal snow depths are moderate over most of the area. Willow Creek canyon may have a month or less of snow cover in some years with 8-to-10 inches being the normal maximum depth. The eastern portions of the area will normally accumulate 2 to 3 feet of snow.

The area has predominantly south and west aspects. This, combined with a prevailing southwest wind tends to minimize snow depths and keep travel routes and foraging areas available for wintering elk, deer and moose.

Vegetation on the area is diverse with good interspersion of different habitat classes. Bitterbrush shrub steppe is the largest single natural habitat class (about 3,500 acres). Tall sagebrush, low sagebrush, juniper, and service berry shrub fields are common. Aspen is the most predominant tall cover type. Douglas Fir occupies about 250 acres. Of the nearly 5,500 acres of historical cropland, about 4,700 acres has been converted back into permanent herbaceous cover, generally a mix of perennial forbs such as alfalfa, Lewis blue flax and small burnett and bunch grasses such as Sherman bluebunch wheatgrass. About 800 acres remain in winter wheat rotation to serve as an attractant and high quality winter/spring forage for mule deer.

Many developments have occurred over the past 20 years. Fences have been removed, new fencing has been constructed, old farmsteads have been cleaned up and buildings removed. A headquarters facility has been developed. Over 170,000 shrubs have been hand and machine planted. Springs have been developed to facilitate the livestock grazing use trade and benefit wildlife. Terracing and water and sediment basins have been constructed on Ritter Bench, in the Pipe Creek drainage, Indian Fork drainage and in Bull's Fork. The purpose of this work is to control erosion, hasten recovery of eroded areas and to attempt to increase the water table and sub-irrigation of developed fields.

A recent wildlife development was the construction of three ponds on Pipe Creek in the fall of 1996. These ponds were constructed with funds acquired from a BOR grant with matching funds from Ducks Unlimited and the IDFG Habitat Improvement Program. The purpose of these ponds is to increase waterfowl production on the area and increase area diversity.

Pastures were created in several areas in order to facilitate a use trade agreement which removes grazing pressure from formerly privately held critical winter range. This resulted in increased winter range for elk and deer and is helping in restore areas where combined elk and livestock use created a situation of forage over-utilization.

Noxious weeds continue to be controlled by a variety of methods. This protects wildlife habitat from invasion by undesirable plant species.

TCWMA is home to a variety of migratory and resident mammals, birds, reptiles amphibians and fish. The mission of TCWMA is to Protect and manage the wildlife resources of the Tex Creek Wildlife Management Area, as mititagion for habitat losses elsewhere in the region, to insure sufficient quantities of high quality and secure habitat for wintering big game and for a wide variety of other game and nongame species. Provide high quality wildlife-based recreational opportunities and nature viewing compatible with this primary mission for the benefit of the public (IDFG 1998).

Jackson National Fish Hatchery

Wild Trout Program -- The Snake River Cutthroat trout the hatchery produces each year, is the native gamefish of this area. The cutthroat trout program is designed to produce a wild fish which has been in the hatchery system for less than 3 years. This requires an infusion of "wild" genes into the captive population every three to five years or a complete replacement of the broodstock depending upon the genetic testing results.

Lower Valley Energy, Inc.

Osprey Nesting Box Program -- The most frequent bird management problem of the Lower Valley Energy (LVE) system is osprey nesting on transmission and three phase distribution lines. Wherever overhead power lines and support poles exist, there is avion interaction. The birds can create a short circuit between the lines causing a power outage. And often the nest will catch on fire or the birds are electrocuted. LVE’s method of managing this problem is to install a nesting box higher on the transmission structure, or to plant a pole near the distribution pole and install a nesting box on it. The nest is then relocated to the box. This practice has been so successful that LVE linemen are complaining that LVE is increasing the osprey population, thus increasing problems. It does add to the expense of operating the LVE system. The expense does not end with the installation of the nesting box; overload and snow loading will create the need for maintenance or replacement in time. Power lines do not directly affect fish but the increase in the Osprey population has some impact on fish populations as well.

Bald Eagle Nesting Platform Program -- A request for a Boy Scouts of America (BSA) Eagle project was made to BPA; this was passed on to LVE. As an Eagle rank project, the local BSA helped LVE by building nesting boxes, whereas LVE covered the expenses of the BSA materials, etc. It is estimated, without a field survey, there are twelve nests on distribution lines and fourteen on transmission lines. Of these, eight are along Palisades Reservoir and in Swan Valley, three are in the Alpine area, ten are in the Grand Canyon of the Snake River at, and below, Hoback Junction and five are in Swan Valley.

Trumpeter Swan Program -- Another conflict with birds has been the danger of swans colliding with the lines. LVE has added marker balls to spans where such collisions are a possibility, when it has been possible to do so. At present there are two places, one in Star Valley and one in Jackson Hole, where the Wyoming Fish and Game would like LVE to install marker balls, but the bucket truck does not reach high enough. LVE currently plans to arrange with BPA for the rental of a larger bucket truck.

Peregrine Falcon hack-back program -- When falcons were being reintroduced into the Jackson Hole and Grays Lake areas, LVE provided and installed used power poles for the construction of brood hutches. This seems to assist in the population stability of peregrine falcons which seem to have fewer conflicts with power lines.

Trout Unlimited

South Fork of the Snake River Home Rivers Project –Description: Phase one of a multi-year "Home Rivers" project to conserve the native Yellowstone Cutthroat trout fishery on Idaho's South Fork of the Snake River. The project will combine research and assessment, habitat restoration, and long-term conservation planning. First year activities will include assisting state and federal managers to erect and operate fish weirs on four tributaries to manually remove non-native rainbow trout from cutthroat spawning habitat; identifying mainstem and tributary habitat restoration projects; as well as a review of current research and recomendations for future research needs. First year costs are projected at $150,000.

The current trust of this project can be divided into five catagories---

- Reducing hybridization and displacement of native Yellowstone cutthroat trout with introduced rainbow trout
- Understanding and recommending modifications that effect geomorphic impacts to mainstem river habitats due to flow alterations from Palisades Dam
- Reducing and eliminating damage to the spawning tributaries due to dewatering, grazing, road development, and other impacts
- Reducing or mitigating recreational impacts, including boat traffic from jet and drift boats
- Assessing and reducing or eliminating impacts from development, with associated bank armoring, along the South Fork.

This project is scheduled to last at least three years with associated funding on an annual basis.

Protected Areas

The South Fork Snake River corridor is one of the Upper Snake's most outstanding fish and wildlife resources. The U.S. Fish and Wildlife Service ranked the cottonwood gallery forest along this reach of the river the number one wildlife resource in Idaho. The multi-layered cottonwood forest is home to the greatest avian diversity in all of the Greater Yellowstone Ecosystem (GYE). The South Fork corridor is the most productive bald eagle nesting habitat in the GYE, and supports 25 other species of nesting birds of prey. The South Fork is widely regarded as the finest large native cutthroat trout river in the country.

Extensive cottonwood riparian forests and the surrounding canyons and cliffs along the South Fork provide vital habitat for a diversity of neo-tropical migrant passerine birds as well as many other species, including many raptors. Within the South Fork corridor there are 14 bald eagle breeding territories, 3 peregrine falcon eyres, mountain lion dens, as well as abundant habitat for black bears and large game such as elk, moose, and mule deer. With many of these species listed as sensitive, threatened or declining, habitat protection is critical. Native populations of Yellowstone cutthroat trout are abundant, making the South Fork one of the best large native cutthroat rivers in the world.

In addition, this reach of the South Fork is an important trumpeter swan wintering area. The South Fork and Rainey Creek near Swan Valley have supported up to 300 wintering trumpeters. The South Fork is of critical importance to swans, geese and many other waterfowl during migration, nesting, and wintering.

Partnerships have leveraged a substantial investment of federal funds towards the South Fork Snake River. Partners include private parties, conservation oriented landowners; U.S. Bureau of Land Management (Land and Water Conservation Funds); Teton Regional Land Trust, The Conservation Fund; The Nature Conservancy of Idaho; Idaho Department of Fish & Game; Natural Resources Conservation Service; Idaho Conservation Data Center; U.S. Fish and Wildlife Service; Bonneville Power Administration (mitigation funds); and The Trumpeter Swan Society. In combination, The Nature Conservancy, The Conservation Fund, Teton Regional Land Trust, and the Bureau of Land Management have protected a total of 2,620 acres along the South Fork of the Snake River in Idaho from the Palisades Reservoir to Roberts. Acquired conservation easements include 696 acres, fee acquisition includes 1,810 acres, and donated easements include 114 acres.

Teton Regional Land Trust (TRLT)

As of January 2001, the total value of protected lands and the associated restoration projects provided by the Bureau of Land Management and partners including landowners, TRLT, the Conservation Fund, and Idaho Nature Conservancy exceeds 13.2 million dollars, including 7.8 million in appropriated Land and Water Conservation Fund (LWCF) funds**.** Of this total, TRLT has protected 1,269 acres of river corridor along the South Fork of the Snake River through conservation easements. An 800-acre farm/high value wildlife landscape was protected through hydroelectric mitigation funding, and 458 acres of river bottom and upland winter range through LWCF funds. An easement was donated on 11 acres in Swan Valley. TRLT is currently working to close two other approved LWCF projects on 269 acres.

The Nature Conservancy of Idaho (TNC)

The U.S. Fish & Wildlife Service has identified the South Fork of the Snake River as the most significant and highest quality riparian corridor remaining in the state of Idaho. Here thrives a unique forest including one of the last remaining intact communities of globally-threatened narrowleaf cottonwood and red-osier dogwood left in the western U.S. as well as habitat for the rare orchid, Ute ladies' tresses. The South Fork also supports the highest concentration of nesting bald eagles in the U. S. and the waters of this area nourish an endemic fish subspecies, the Snake River fine-spotted cutthroat trout. TNC and its partners have protected almost 5,000 acres here.

Bonneville County Weed Control Program

The spotted knapweed program was implemented in the fall of 2000 and will continue as long as participation with the State Department of Agriculture and local landowners continues. Spotted knapweed is very prolific in Bonneville County and one or two years of aggressive attention should greatly suppress the weed, but the area will need to be monitored for expanding weed populations. With the proper cooperation and education the Landowners can then control the weed on their own and have the security of the county to work with.

Safari Club International

<u>Tex Creek Habitat Partner</u> The Idaho Chapter of Safari Club International became a Tex Creek Habitat Partner with the Rocky Mountain Elk Foundation's (RMEF's) purchase of the Quarter Circle O Ranch and subsequent transfer of land management responsibilities to the Idaho Department of Fish and Game (IDF&G). Tex Creek is located in the Upper

Snake Headwater subbasin. The Idaho Chapter made a $2,500.00 commitment to the project in August 1998. In an area increasingly affected by development, the Tex Creek Wildlife Management Area (WMA) constitutes critical habitat for numerous wildlife species. The Quarter Circle O Ranch along the boundaries of the WMA became IDF&G's 1997 top acquisition priority and a RMEF Idaho conservation project. Purchase of the ranch and the transfer of land management responsibilities to the IDF&G protected three parcels totaling 4,300 acres.

1997 Mountain Goat Transplant -- The Idaho Chapter of SCI partnered with the Idaho Department of Fish and Game (IDF&G) for this effort. Mountain goats were transplanted from Game Management Unit 67 in the Upper Snake Headwater subbasin to the Frank Church Wilderness Area in the Salmon subbasin and was conducted in August 1997. The Idaho Chapter and a Safari Club International matching grant supplied $5000.00 to cover the helicopter costs associated with the goat capture. Chapter members worked on the ground crew assisting in the transport crate assembly, ear tagging, blood, fecal and nasal swab samples, and preparing the goats for transport. The IDF&G goat management plan called for transplant operations from a prolific introduced herd in southeast Idaho to other suitable habitats in the state. Aerial surveys of the capture area revealed a population of more than 200 animals. This project successfully transplanted 10 goats of the correct age class of 1.5 to 3.5 years old from the Palisades goat herd to an area of release on the edge of the Frank Church River of No Return Wilderness area.

Intermountain West Joint Venture:

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

Natural Resource Conservation Service (NRCS)/ Idaho Soil Conservation Commission (ISCC)

The NRCS/ISCC have a wide range of completed and ongoing conservation efforts within the soil and water conservation districts of the Willow Creek and Palisades drainages (Table 65).

Table 65. Existing and Past Efforts of Soil and Water Conservation Districts (SWCD)

Responsible District	Project Duration	Project Title	Description and Results
East Side SWCD	1983-1993	Badger Creek SAWQP	Idaho Ag Water Quality Program, Ag BMP implementation, 3500 acres treated
East Side SWCD	1984 - 1993	Meadow Creek SAWQP	Idaho Ag Water Quality Program, Ag BMP implementation, 4700 acres treated
East Side SWCD	1985 - 2000	Tex Creek	Idaho Ag Water Quality Program, Ag BMP implementation, 6800 acres treated
East Side SWCD	1990 - 2002	Antelope Creek	Idaho Ag Water Quality Program, Ag BMP implementation, 13,500 acres treated
East Side SWCD	1996 - 2005	Granite Creek	Idaho Ag Water Quality Program, Ag BMP implementation, 9000 acres treated
East Side SWCD & USDA NRCS	1980's	Upper Sand Creek Small Watershed Project (P.L. 566 Program)	Flood control & implementation of ag BMPs. Project completed.
East Side SWCD & USDA NRCS	1980'2	Lower Sand Creek Small Watershed Project (P.L. 566 Program)	Flood control & implementation of ag BMPs. Project completed.
Jefferson SWCD	annually	Conservation Tree Sales Program	Establishment of conservation windbreaks for wind erosion control and wildlife habitat
Madison SWCD	annually	Conservation Tree Sales Program	Establishment of conservation windbreaks for wind erosion control and wildlife habitat
West Side SWCD		Northwest Flood Control Project	Protect croplands from spring run off
West Side SWCD	annually	Adopt-A-Canal Program	Canals cleaned or debris to reduce water pollution and protect irrigation pumps & delivery systems

Subbasin Management

Existing Plans, Polices and Guidelines

Cooperative responsibility

Draft Deer Parks Management Plan

The mission of the Deer Parks Complex is to sustain an ecosystem that supports an abundant, productive and diverse community of naturally reproducing fish and wildlife by protecting and restoring natural ecological functions, habitats and biological diversity. Wildlife mitigation units are developed and managed within the framework of the Northwest Power Planning Council's Fish and Wildlife Program. Funding for wildlife mitigation units is provided by BPA. Several specific agreements also provide direction about how mitigation units are managed including the following:

- Memorandum of Agreement between the State of Idaho and the Shoshone-Bannock Tribes, 1996.
- South Fork Snake/Palisades Wildlife Mitigation Agreement between BPA and IDFG, 1997.
- Southern Idaho Wildlife Mitigation Agreement between BPA and Shoshone-Bannock Tribes of the Fort Hall Indian Reservation, 1997.
- Memorandum of Agreement (ID-030-97-01) between BLM and BPA, 1997.
- Cooperative Management Agreement between BLM and IDFG, 1998.

BLM is obligated by the 1997 Memorandum of Agreement with BPA to manage properties for the primary benefit of wildlife and wildlife habitat in perpetuity, following the prescriptions and proscriptions in the South Fork Snake River/Palisades Wildlife Mitigation Project Final Environmental Assessment (BPA 1995) to ensure the properties retain at least their baseline HEP values. The Agreement also obligates BLM to provide public and tribal access when access does not adversely affect the purpose of the mitigation project. Public access to wildlife mitigation units and use compatible with protection and enhancement of wildlife and wildlife habitat is encouraged, but is not required. All of the Deer Parks Complex mitigation units are within the area covered by the Snake River Activity/Operations Plan (February 1991) which directs management activities on all BLM and U.S. Forest Service lands along the river corridor.

Target species were identified and species-specific Habitat Evaluations Procedures (USFWS 1980) were conducted for Deer Parks.

Menan Unit -- A baseline HEP was completed for the Menan Unit in September 1996 (Table 66). Cover types found on the unit include: emergent wetland (45 acres), scrub-shrub wetland (25 acres), forested wetland (5 acres), agricultural (cropland, 65 acres).

Beaver Dick Unit -- A baseline HEP was completed for the Beaver Dick Unit in 1997 (Table 67). Cover types found on the unit include: emergent wetland (245 acres), scrub-shrub wetland (50 acres), and forested wetland (15 acres).

Table 66. Target species, habitat suitability, and habitat units on the Menan Unit of the Deer Parks Complex.

Target Species	Cover Types	Habitat Suitability Index	Acres	Habitat Units
Breeding bald eagle	All	0.93	140	130
Wintering bald eagle	All	0.97	140	136
Mule deer	FW, SSW	0.17	30	5
Ruffed grouse	Not used			0
Mink	All w/in 100m of water and slough	0.55	17	9
Canada goose	All w/in 100m of water	0.50	10	6
Mallard	All w/in 100m of water	0.70	17	12
Yellow warbler	SSW	0.66	25	16
Black-capped chickadee	FW	0.50	5	3
TOTAL				317

Table 67. Target species, habitat suitability, and habitat units on the Beaver Dick Unit of the Deer Parks Complex.

Target Species	Cover Types	Habitat Suitability Index	Acres	Habitat Units
Breeding bald eagle	All	0.91	310	282
Wintering bald eagle	All	0.97	310	301
Mule deer	FW, SSW	0.40	65	26
Ruffed grouse	FW	0.60	15	9
Mink	All w/in 100m of water and slough	0.66	160	106
Canada goose	All w/in 100m of water	0.60	45	27
Mallard	All w/in 100m of water	0.70	160	112
Yellow warbler	SSW	0.45	50	23
Black-capped chickadee	FW	1.0	15	15
TOTAL				901

Deer Parks Unit -- A preliminary baseline HEP was completed for the Deer Parks Unit in 1998 (Table 68). The final baseline HEP is in progress. Cover types found on the unit include: open water/riverine (100 acres), emergent wetland (150 acres), scrub-shrub wetland (89 acres), forested wetland (425 acres), sagebrush-grassland (1097 acres), agricultural (pasture and cropland, 668 acres), and built up areas (27 acres).

Table 68. Target species, habitat suitability, and habitat units on the Deer Parks Unit of the Deer Parks Complex

Target Species	Cover Types	Habitat Suitability Index	Acres	Habitat Units
Breeding bald eagle	All	0.90	2,564	2,308
Wintering bald eagle	All	1.0	2,564	2,564
Mule deer	FW, SSW, S-G	0.30	1,611	483
Ruffed grouse	FW	0.40	425	170
Mink	All w/in 100m of water and slough	0.70	568	398
Canada goose	All w/in 100m of water	0.55	474	261
Mallard	All w/in 100m of water	0.70	474	332
Yellow warbler	SSW	0.70	89	62
Black-capped chickadee	FW	0.8	425	340
TOTAL				6,918

Federal

Natural Resource Conservation Service (NRCS)

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

Bureau of Land Management (BLM)

Management actions on lands under BLM stewardshiop in the Headwaters Subbasin are governed by the *Snake River Activity/Operations Plan (1991).*

National Park Service

Policy regarding natural resources in the park service is summed up as:

> *It is the policy of the National Park Service to assemble baseline inventory data describing the natural resources under its stewardship, and to monitor those resources forever - to detect or predict changes that may require intervention, and to provide reference points to which comparisons with other, more altered parts of the home of mankind may be made.* (NPS 1987)

Grand Teton National Park -- The purpose of Grand Teton National Park as stated in its 1976 Master Plan is as follows:

> *Grand Teton was established as a unit of the National Park System to protect the scenic and geological values of the Teton Range and Jackson Hole, and to perpetuate the Park's indigenous plant and animal life. The Park will interpret these natural and scenic values, in association with the historical significance of the region, in a manner that preserves these resources for the benefit and pleasure of present and future generations.*

Section 1 of Public Law 81-787 (64 Stat. 849) guarantees all valid grazing, occupancy leases and mineral activities and rights that existed when the Park was established. Section 4(a) provides for the designation of rights-of-way, and livestock driveways can be provided across Park land to State and private land within or adjacent to the Park. Federally issued leases, permits, and licenses that were in effect when the Park was enlarged in 1950 were to be continued until terminated in accordance with provisions therein. Domestic livestock grazing, occupancy of Federal lands within the Park, and other uses that were permitted when the Park was enlarged in 1950 were to be continued subject to specific conditions. Grazing privileges appurtenant to privately owned lands within the Park are not to be withdrawn until these lands are acquired by the United States. These provisions for continuing use do not apply to mining, public accommodations and services, or to any occupancy or use of Federal land for temporary purposes (64 Stat. 849, Section 4(a), (b), (c)). The Park and Parkway have been withdrawn from mining and mineral leasing.

On May 1, 1984, non-Federal inholdings within the Greater Teton National Park consisted of 2,272.53 acres of private land in 140 tracts, 1,366.32 acres owned by the State of Wyoming, and 12.68 acres owned by Teton County and School District 2. The constraints that non-Federal inholdings impose on natural resources management in the Park and on fulfillment of the Park's purpose are discussed in the environmental assessment for the Park's land protection plan. There is no private land in the Parkway.

Eight permittees graze domestic livestock on about 27,755 acres of the Park. Stock driveways have been designated for permittees grazing domestic livestock on Park and national forest land. Six special use permits provide rights-of-way to non-Federal land within and adjacent to the Park, primarily via roads that existed prior to enlargement of the Park in 1950.

The owners of several parcels of undeveloped private lands within the Park have not yet requested designated rights-of-way to these parcels.

U.SFish and Wildlife Service - Idaho

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

Law Enforcement - Service law enforcement activities focus on potentially devastating threats to wildlife resources -- illegal trade, unlawful commercial exploitation, habitat destruction, and environmental contaminants.

Fisheries. The Province is included in the area of responsibility for the Idaho Fisheries Resources Office and the Idaho Fish Health Center.

The Idaho Fisheries Resources Office provides assistance to the State of Idaho, Native American Tribes, and other interested entities to encourage cooperative conservation, restoration, and management of the fishery resources of the State of Idaho. A primary area of work includes evaluation and fish management planning for the three federal hatcheries in Idaho: Dworshak, Kooskia, and Hagerman National Fish Hatcheries. Fisheries data has been compiled to assess how each of these three hatchery facilities are meeting their established mitigation goals. The office also helps set up and design studies to evaluate hatchery effectiveness and various management scenarios. The office also works with the Idaho Department of Fish and Game, Washington Department of Fish and Wildlife, Idaho Power Company, National Marine Fisheries Service, United States Geological Service-Biological Resource Division, the Nez Perce and Shoshone-Bannock Tribes in evaluation of various fish management programs in the Snake River Basin.

The Idaho Fish Health Center is co-located with Dworshak National Fish Hatchery and is located in the southern Panhandle of Idaho between the historic communities of Ahsahka and Orofino. Originally built in 1969 as part of the Dworshak National Fish Hatchery, the center provides fish health services within Idaho, eastern Washington, and eastern Oregon. Federally funded national fish hatcheries within Idaho receive health diagnostic and inspection services from the center. In addition, the center works in cooperation with other federal, state, private and Tribal agencies to survey, sample, and analyze hatchery and wild fish populations.

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

- Endangered Species: The Service, and the National Marine Fisheries Service, share responsibility for administration of the Endangered Species Act. The Act directs these agencies to identify species whose status warrants listing as endangered or threatened, develop and implement recovery programs for listed species, work with state resource agencies and federal agencies to protect and recover listed species, and to implement a program to permit certain activities with listed species.
- Migratory Birds: administration of the Migratory Bird Treaty Act.
- Environmental Contaminants: Contaminants specialists focus on detecting

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

- Partners for Fish and Wildlife: Offers technical and financial assistance to private (non-federal) landowners to voluntarily restore wetlands and other fish and wildlife habitats on their land. The Service also provides biological technical assistance to U.S. Department of Agriculture agencies implementing key conservation programs of the Farm Bill.
- Federal Projects: The Service evaluates the impacts of water resource development projects on fish and wildlife; makes recommendations to mitigate (avoid, reduce and compensate for) these impacts and enhance fish and wildlife; and provides technical assistance to private individuals, organizations and businesses regarding project impacts.

Idaho Bird Conservation Plan

The Idaho Bird Conservation Plan (Idaho Partners in Flight, 2000) covers in detail four habitats they consider the highest priority habitats for birds in Idaho: Riparian; Non-riverine Wetlands; Sagebrush Shrublands; and Dry Ponderosa Pine/Douglas-fir/Grand Fir Forests. Objectives for these habitats in Idaho include:

- Riparian habitat:
  - maintain existing distribution and extent of each riparian system;
  - by 2025, restore at least 10% of the historical extent of each riparian system within each ecoregions subsection to conditions that would support productive populations of designated focal species;
- Non-riverine Wetlands:
  - obtain a net increase in the number of acres of wetlands in Idaho, focusing on the same types and amounts that historically occurred here.
- Sagebrush Shrublands:
  - by end of 2009 breeding season, reverse declining trends of species associated with sagebrush habitats in Idaho. While maintaining current populations of other associated species and
  - manage for Sage Grouse numbers as outlined in each Sage Grouse Management Area in the Sage Grouse Management Plan b 2007.
- Dry Ponderosa Pine/Douglas-fir/Grand Fir Forests:
  - restore by 2025 as much as possible but at least 10% of the historical range of these forest meeting the conditions needed for white-headed woodpeckers.

U.S. Fish and Wildlife Service, Jackson Fish Hatchery

Propagation and Genetic Management Plan Authority -- USFWS, Fisheries, Region 6, Denver, CO Jackson National Fish Hatchery.

The vision for the development of a wild, native hatchery stock was derived through a cooperative effort by three separate agencies: Idaho Department of Fish and Game; Wyoming Game and Fish Department; and the US Fish and Wildlife Service. The overall goal for this stock is to maintain the wildness of this strain through planned, periodic infusions of wild trout gametes at a rate far more frequent than is described in the Inland Salmonid Broodstock Management Handbook for a wild strain. Frequent testing of mitochondrial dNA provides the background information necessary to maintain the variability of this population.

State Entities

Idaho Department of Environmental Quality (DEQ)

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

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

Idaho Department of Fish and Game.

The Idaho Department of Fish and Game has developed the following fish and game management plans and conservation strategies:

- Idaho Department of Fish and Game. 2001. Fisheries Management Plan 2001 – 2006.
- Idaho Department of Fish and Game. 1990. A Vision for the Future: Idaho Department of Fish and Game Policy Plan 1990 – 2005.
- Idaho Department of Fish and Game and Shoshone-Bannock Tribes. 2001. Draft Management Plan: Deer Parks Complex Wildlife Management Untis.
- Idaho Department of Fish and Game. 1998. Management Plan for Market Lake Wildlife Management Area.
- Idaho Department of Fish and Game. 1998. Management Plan for Gem State Wildlife Habitat Area.
- Idaho Department of Fish and Game. 1998. Management Plan for Tex Creek Wildlife Management Area.
- Idaho Department of Fish and Game. 1988. Wildlife Depredation Plan 1988 – 1992.
- Idaho Department of Fish and Game. 1990. Furbearer Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1990. Waterfowl Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1990. Upland Game Management Plan 1991 – 1995.

- Idaho Department of Fish and Game. 1997. Idaho Sage Grouse Management Plan.
- Idaho Department of Fish and Game. 1990. Bighorn Sheep Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1990. Mountain Goat Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1999. Elk Management Plan.
- Idaho Department of Fish and Game. 1999. Mule Deer Management Plan.
- Idaho Department of Fish and Game. 1999. White-Tailed Deer Management Plan.
- Idaho Department of Fish and Game. 1991. Mountain Lion Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1991. Nongame and Endangered Wildlife Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1998. Black Bear Management Plan.
- Idaho Department of Fish and Game. 1990. Moose Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1991. Pronghorn Antelope Management Plan 1991 – 1995.
- Ullman, M.J., A. Sands, and T. Hemker. 1998. Conservation Plan for Columbian sharp-tailed grouse and its habitats in Idaho. Prepared for Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho.
- Patla, S., K.K. Bates, M. Bechard, E. Craig, M. Fuller, R. Howard, S. Jefferies, S. Robinson, R. Rodriguez, and B. Wall. 1995. Habitat Conservation Assessment and Strategy for the northern goshawk for the State of Idaho.
- Dolan, P.M. Saving all the pieces. Idaho Interagency Conservation/Prelisting Effort. Common Loon, *Gavia immer*, Habitat Conservation Assessment (HCA) and Conservation Strategy (CS). Idaho Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Forest Service.
- Cassirer, E.F., J.D. Reichel, R.L. Wallen, and E.C. Atkinson. 1996. Harlequin Duck (*Histrionicus histrionicus*) United States Forest Service/Bureau of Land Management Habitat Conservation Assessment and Conservation Strategy for the U.S. Rocky Mountains.
- 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 (HCA's) and Conservation Strategies (CS's).
- 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.
- Mancuso, M. 1995. Conservation strategy for *Allium aaseae* Ownbey (Aase's Onion). Idaho Department of Fish and Game, Conservation Data Center, Boise, Idaho.
- Elzinga, C. 1997. Habitat conservation assessment and strategy for the Alkaline Primrose (*Primula alcalina*). Draft unpublished report. Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho.

Idaho Department of Water Resources (In Cooperation with: U.S. Bureau of Reclamation Navigant Consulting, Inc., December 1999 http://www.idwr.state.id.us/recharge/**)**

Managed recharge program for the Eastern Snake Plain Aquifer (ESPA): Recharge Assessment and Management

Declines in ground water levels in the eastern Snake River Plain aquifer (ESPA) and reductions in spring discharges to the Snake River have heightened concerns for the long-term sustainability of water resources in the eastern Snake River Plain. Since the early 1970s, the increased efficiency of irrigation practices has resulted in a decrease in incidental recharge of ESPA. At the same time, ground water withdrawals for irrigation have increased substantially. About 800,000 acres of ground water irrigated land have been brought into production since the 1950s.

Since the mid-1960s irrigation sources have continued to shift from surface water to ground water. Between 1975 and 1995 it was estimated that total ground-water storage declined on average about 350,000 acre-feet per year, a cumulative decrease of 7 million acre-feet (Johnson, Cosgrove, 1997). The locus of ground-water level declines during the last twenty years has been in the central part of the plain, in a roughly 1,300 square miles area that includes much of Minidoka County, and parts of Jerome, Lincoln, and Blaine counties (Figure 47. ESPA Ground-water level declines, 1980-1998.). The A & B Irrigation District, and the Magic Valley Ground Water District have a total of 754 wells in this area of the plain, and together pump about 460,000 acre-feet of water per year (IDWR, 1998). As much as 12 feet of ground-water decline has occurred within this area, and the average has been about 8 feet.

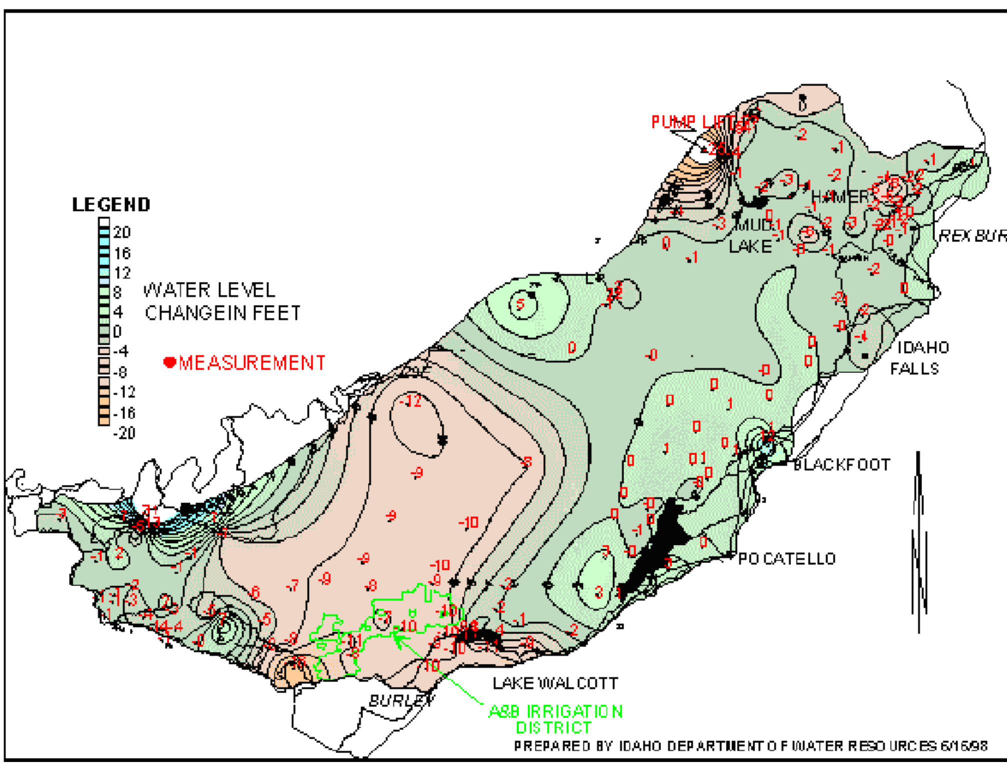


Figure 47. ESPA Ground-water level declines, 1980-1998.

The purpose of a managed recharge program for the Eastern Snake Plain Aquifer (ESPA) is to sustain or increase ground-water levels and the outflow from springs discharging to the Snake River. The general design calls for the aquifer system to be used as a storage reservoir that would capture excess flows in the Snake River during high-flow periods, mainly winter and spring, and release the stored water back to the river throughout the remainder of the year. Water would be diverted from the river only when streamflow exceeds irrigation demand, hydropower rights, and instream flow requirements. The excess water would be conveyed to recharge basins, via existing canals, where it would infiltrate the subsurface and enter the regional aquifer system, raising ground-water levels. The subsequent release of stored water as spring discharge would raise the base flow rate in the river during low-flow periods.

There is a strong motivation to conduct managed aquifer recharge mainly during winter months (December through February). The motivation stems from a combination of factors, including greater availability of surplus flows, greater excess canal capacity during these months, and lower instream flow requirements of resident fisheries. Equally important, winter time recharge affords the opportunity to demonstrate a net positive impact on Snake River flows during critical summer months (May through September). Timing of recharge activity to provide for increased net river response from the upper Snake during late summer months could make a significant contribution (as much as 150,000 acre feet) toward meeting endangered species and water quality targets.

Recharge Management

Seven sites were chosen as managed recharge sites (Table 69) whereby management would be in accordance with prescribed construction requirements with the goal to hopefully improve recharge levels.

Palisades Contracts

When the USBR constructed Palisades Reservoir in the 1950s, contracts were amended with the participants in the Minidoka Project regarding storage of winter stream flow. Prior to the construction of Palisades Reservoir, water users diverted river water during the winter for stock ponds. Although the amounts of stock water consumed were low, high seepage losses in the canal required significant diversions. Under the contracts, the water users agreed to forego winter diversions during a 150-day period in exchange for an earlier storage priority in Palisades or American Falls Reservoir. The Palisades contracts are thus the basis for the Winter Water Savings Program (USBR, 1996), but may need to be amended to address managed recharge.

The article, entitled "Saving of Winter Water; Special Storage Right,", provides that specific spaceholders, in exchange for preferred space, agree ". . . for a period of 150 consecutive days during the period from November 1 through April 30 of each storage season, [to] make no diversion of water from the Snake River or any of its tributaries by means of its existing diversion works or by any other means. (emphasis added)"

The above contract provision is contained in each Palisades spaceholder contract. Table 70 identifies the entities which agreed to curtail winter diversions and hold preferred space.

Table 69. Recharge Sites and Characteristics of the eastern Snake River Plain.

	Recharge Site	Capacity Characteristics			Property Owner	New Construction Requirements[3]
		Recharge Rate	Pond Area[1]	Perme-ability[2]		
A	Fremont - Madison Irr. Dist.					
1	Recharge Canal	40 cfs			District	none
2	Egin Lakes Recreation Area		70 ac	H	Private	increase canal capacity
3	Nine Mile Knoll		250 ac	H	B L M	control structure
4	Quayles Lake		70 ac	M/H	BLM & Private	control structure & 1,000-ft dike
5	Beaver Dick State Park		480 ac	M/H	B L M	increase canal capacity
B	Burgess Canal Company					
1	Gravel Pits	500 cfs			Private	none
C	Harrison Canal Company					
1	Sink Holes	15 cfs			Unknown	none
D	New Sweden Irrigation District					
1	New Sweden Reservoir	50 cfs			District	none
2	State Highway Gravel Pit		15 ac	H	State	headgate control structure
3	Gravel Pit New Swed Sch Rd		60 ac	H	Private	headgate control structure
4	Martin Canal Sinkholes		6 ac	H	Private	headgate control structure
5	Sinkhole Canal		Med.	M/H	District	headgate control structure
6	Lava Flows West Of Dist		Lg.	H	B L M	pump stations
E	Butte Market Lake Canals					
1	Lava Flows West of Canals		Lg.	H	Private & BLM	pump stations
2	Depressions Robinson Canal		460 ac	L/M	Private	headgate control structure
F	People's Canal Company					
1	Gravelly Farm		160 ac	M/H	Private	headgate control structure
2	Sink Holes along Lavas		Med.	H	Private	headgate control structures
3	People's Canal Spillway Pond	6 cfs			Canal Co.	none
4	Moreland Gravel Pit[4]		10 ac	H	Private	expand canal & control structure
G	Aberdeen Springfield Canal Co.					
1	Upper Reaches Main Canal		Lg.	H	Canal Co.	none
2	Rose Spill		Med.	H	Canal Co.	none
3	Gravel Pits at Mile 12.5		60 ac	H	Private	headgate control structure
4	Gravel Pits at Mile 13.5[4]		10 ac	H	Private	headgate control structure
5	Hilton Spill	150 cfs			Canal Co.	none
6	Depression at Mile 29.0		20 ac	H	Private	headgate control structure
7	Depression at Mile 31.0		10 ac	H	B L M	headgate control structure
8	Depression at Mile 31.5		80 ac	H	B L M	headgate control structure
9	Depression at Mile 32.5		60 ac	H	B L M	headgate control structure
10	Big Fill Reservoir		60 ac	M	Canal Co.	small dike

Table 70. Entities which agreed to curtail winter diversions and hold preferred space for Snake River waters.

Upper Valley	
Aberdeen Springfield Canal Co.	North Rigby Irrigation & Canal Co.
Blackfoot Irrigating Co.	Parks & Lewisville Irrigation Co.
Burgess Canal & Irrigating Co.	Peoples Canal & Irrigation Co.
Butler Island Canal Co.	Poplar Irrigation District
Butte & Market Lake Canal Co., Ltd.	Progressive Irrigation District
Clark & Edwards Canal or Irrigating Co., Ltd.	Reid Canal Co.
Corbett Slough Ditch Co.	Rigby Canal & Irrigation Co.
Danskin Ditch Co.	Riverside Ditch Co.
Dilts Irrigation Co., Ltd.	Rudy Irrigation Canal Co.
Enterprise Canal Co., Ltd.	Shattuck Irrigation Co. (in Palisades W.U.I.)
Farmers Friend Irrigation Co., Ltd.	Snake River Valley Irrigation District
Harrison Canal & Irrigation Co.	Sunnydell Irrigation District
Idaho Irrigation District	Texas Slough Irrigation Canal Co.
Island Irrigation Co.	Trego Ditch Co.
Labelle Irrigating Co.	U&I Inc. (now Osgood Canal Co.)
Lenroot Canal Co.	Watson Slough Ditch Co., Ltd.
Liberty Park Irrigation Co.	Watson Slough Irrigation Co., Ltd.
Lowder Slough Canal Co., Ltd.	Wearyrick Ditch Co.
Martin Canal Co. (in AFRD)	West Side Mutual Canal Co.
New Lava Side Ditch Co.	Woodville Canal Co. (in AFRD)
New Sweden Irrigation District	
Lower Valley	
Burley Irrigation District	Minidoka Irrigation District

Diversions for managed recharge have the potential to affect two recreational uses of the river: (1) sport fishing would be affected by any impacts to fish habitat that decrease fish populations; and (2) float boating in rafts and kayaks depends on high stream velocities that may be reduced if the diversions are made during spring and summer.

Present Condition

Much of the mainstem Snake River has been designated as "water quality limited" by the Environmental Protection Agency (EPA). The primary pollutants are nutrients, increased sediment levels, and increased water temperature. The sources of these pollutants are agriculture, municipalities, and the aquaculture industry. Lower flows in the river exacerbate the pollution problems by reducing the ability of the river to assimilate and flush the pollutants through the system as well as by reducing the dilution of the pollutants. Lower flows during the summer result in increased warming of the river.

Status

Managed recharge is still under study and has not been implemented.

Soil and Water Conservation Districts

Soil and water conservation districts (SCDs) are non-regulatory subdivisions of Idaho State government authorized (Title 22, Chapter 36 Idaho Code). A board of five or seven supervisors, who are local residents, and who serve without pay, governs each. All supervisors are elected officials and must be landowners (including urban property owners located with district boundaries) or farm operators in the district to which they are elected.

Soil and water conservation districts develop and implement programs to protect and conserve natural resources primarily on privately owned lands. Districts organize technical advisory groups for projects and call upon local, state, tribal and federal agency specialists, industry representatives, and interested individuals. Districts in the Upper Snake, Headwaters Subbasin include East Side SWCD, Madison SWCD, Jefferson SWCD and West Side SWCD. Districts receive limited funds from local (county) and state (general fund) government, and may receive other funds for local project work through the Water Quality Program for Agriculture program (ISCC) and other funding agencies, institutions or organizations. Working cooperatively with other entities, SCDs provide technical assistance to agriculturists and other private landowners based on long-standing agreements with the USDA Natural Resources Conservation Service, Idaho Soil Conservation Commission and other federal and state agencies. (Idaho Soil Conservation Commission 2001)

There are four districts in the Upper Snake Closed Subbasin: East Side SWCD, Jefferson SWCD, Madison SWCD, and West Side SWCD.

East Side Soil and Water Conservation District

The East Side SWCD board of supervisors develops a district 5-year Resource Conservation Plan to prioritize and manage conservation efforts throughout the district updating the plan annually. The East Side SWCD office is located in the federal service center in Idaho Falls. The district works with the USDA Natural Resources Conservation Service and the Idaho Soil Conservation Commission. In addition to these agencies, the district works closely with private landowners, and other local, state and federal agencies on conservation issues and projects. The East Side SWCD has sponsored five watershed projects, primarily on dryland acres, using the Idaho State Water Quality Program for Agriculture (WQPA) funding, sponsored two P.L .566 (NRCS small watershed program) project, and is participating in Idaho’s TMDL process. The district maintains an active information and education program.

Jefferson Soil and Water Conservation District

The Jefferson SWCD develops a district 5-Year Resource Conservation plan to prioritize resource issues and manage conservation efforts throughout the district. The plan is updated every year. The district promotes conservation actions and available programs (local, state, and federal) to private landowners and agricultural operators. The district conducts an annual conservation tree program, participates in local integrated weed management programs, and Idaho’s TMDL process on the South Fork of the Snake River. The district maintains and activity information and education program.

Madison Soil and Water Conservation District

The Madison Soil and Water Conservation District programs focus on improved irrigation water management, control of agricultural nonpoint source pollution, protecting wetlands and riparian areas. The District is involved with EQIP projects in the Teton River and the High Desert Wind Erosion areas. There are four water bodies in the District, North and South Forks of the Snake River, the Teton River, and the Texas Slough, all of which provide habitat for fish and wildlife. The District encourages private landowners to protect habitat for fish and wildlife on agriculture and grazing lands.

West Side Soil and Water Conservation District

The West Side SWCD coordinates resource conservation on private lands on the west side of the Snake River in Bonneville County and the Roberts area in Jefferson County. The West Side SWCD has worked on irrigation water management systems, annually sponsors a highly successful Adopt-A-Canal Program, is a participant in integrated weed management and programs, sponsored weed control training sessions and is active in the Idaho TMDL process on Willow Creek. The District is involved with EQIP efforts in the High Desert Wind Erosion areas. The West Side SWCD's strong partnership with private landowners allows for the implementation of conservation programs on private land. The district maintains an active information and education program including sponsorship of youth conservation activities.

Local Government

Bonneville County Weed Control Program

The goal of the program is to conduct a coordinated effort to implement County and State weed ordinances to manage the land and its 900 miles of roads, of which 480 are gravel assisting the opportunity for weed/seed translocation. The program will be achieved using the most effective Vegetation Management program for the preservation of Bonneville County's valuable property by utilizing Education, Mechanical, Biological, Cultural, and Chemical control efforts for the benefit of Bonneville County and its neighbors. Prioritized weed management efforts for the invasiveness of the weed include:

Priority Number 1: Noxious weeds that are not currently found in Bonneville County, but are in neighboring counties. These weeds are to be eradicated immediately including any seed sources.

Priority Number 2: Noxious weeds that have a minimal presence in Bonneville County. These have such a minimal presence in the county that it is believed that the can be eradicated with the first couple of years and monitored thereafter.g

Priority Number 3: Weeds that pose the greatest economical threat to property. These weeds have a strong presence in the county and will be given the greatest amount of attention during the day-to-day activities of the Bonneville County Weed Department

Watershed-based groups

Snake / Salt Basin Advisory Group

The River Basin Planning Process was initiated in 1999. In March of 2001 the State Legislature authorized funding for the continuation of the Statewide Water Planning Process. Based on this authorization, the Wyoming State Water Planning Team has started the planning process in the Snake/Salt River Basin. The Snake/Salt River Basin is scheduled for completion on December 31, 2002. The Wyoming Water Development Commission (WWDC) has contracted with Sunrise Engineering, Inc. of Afton, Wyoming to complete the Snake/Salt River Basin Plan.

The Snake/Salt River Basin Plan will incorporate public participation from the *Snake/Salt Basin Advisory Group*. In the May 2001 inaugural meeting, the Basin Advisory Group was formed, representing a broad range of interests from agriculture to local government. This group, through regularly scheduled meetings, will provide input on important water planning issues, review planning products, and assist with the water planning process. The meetings are open to the public, and all interested individuals are encouraged to attend.

Resource-based groups

Southeast Idaho Wetland Focus Area Wetland Conservation Plan.

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

Private Entities

Lower Valley Energy

Lower Valley Energy, Inc. (LVE) has a rather large geographical service area considering that it serves only about 20,000 electrical customers and about 2,000 natural gas customers. The service area includes parts of Caribou and Bonneville Counties in Idaho; and Teton, North Lincoln, and part of Sublette County in Wyoming. It extends from the South Gate of Yellowstone Park on the north to the southern extent of Star Valley, and from Henry on Blackfoot Reservoir in the southwest to Gypsum Creek in the upper Green River drainage in the northeast.

Nearly all of the electrical power for the system is purchased from Bonneville Power Administration. There is one small hydro plant, but in high water it is only capable of producing 1.5 megawatts. This plant is located in Strawberry Canyon near Bedford, Wyoming. Strawberry Creek is a tributary to the Salt River. The Strawberry Project went into operation about 1950. It includes a small dam and reservoir, about two miles of penstock, a power plant, an operator's house, and a small substation. It is a run-of-the-river operation because the size of the reservoir does not allow otherwise. The license on this project was renewed almost one year ago with one of the stipulations being that Lower Valley Energy would sponsor a trout habitat improvement project not to exceed $55,000. LVE has worked with the Forest Service, Wyoming Game and Fish Department, U S Fish and Wildlife and the Salt River Coordinated Resource Management Steering Committee to formulate a plan, but, to this date, the plan is not completed.

U.S. Fish and Wildlife Service - Idaho

The North American Bird Conservation Program in the United States
A coalition of government agencies, non-governmental organizations, and other bird interest groups are coordinating efforts to develop an integrated bird conservation plan for Canada, Mexico, and the United States. The integrated plan will take into consideration the below-listed plans.

<u>North American Waterbird Conservation Plan</u> The North American Waterbird Conservation Plan is being developed in concert with other bird conservation initiatives. These initiatives include the North American Waterfowl Management Plan, Partners in Flight Bird Conservation Strategy, Audubons Important Bird Areas Program, the US

Shorebird Plan, and the Canadian Shorebird Plan. Regional plans will contain information critical to waterbird conservation at smaller geographic scales. Regions have been delineated - for the subbasin area; the region is defined as Intermountain West/Southwest Desert.

U.S. Shorebird Conservation Plan The U.S. Shorebird Conservation Plan is a partnership effort being undertaken throughout the United States to ensure that stable and self-sustaining populations of all shorebird species are restored and protected. The plan includes recommendations for both regional and national programs that are outlined in detailed reports available at the link below. The plan was developed by a wide range of agencies, organizations, and shorebird experts who helped set conservation goals for each region of the country, identified critical habitat conservation needs and key research needs, and proposed education and outreach programs to increase awareness of shorebirds and the threats they face. The partnerships responsible for development of the plan are remaining active and are working to improve and implement the plan''s many recommendations.

North American Waterfowl Management Plan The North American Waterfowl Management Plan established an international committee with six representatives each from each of the three countries. Its purpose is to provide a forum for discussion of major, long-term international waterfowl issues and to make recommendations to directors of the three countries' national wildlife agencies. It approves the formation of joint venture partnerships and reviews and approves joint venture implementation and evaluation plans. The Committee is responsible for updating the Plan, considering new scientific information and national and international policy developments, and for identifying the need to expand or diminish activities carried out on behalf of the Plan.

Intermountain West Joint Venture –

One of the largest of the joint ventures, the Intermountain West Joint Venture, stretches from Canada to Mexico with focus areas in eleven western states. Each state has designated locations where wetland and/or riparian areas are of prime importance. This joint venture has successfully been organizing and building on the concept that broad partnerships can generate the financial resources necessary to restore thousands of acres of wetland habitat for waterfowl, shorebirds, wading birds and song birds.

Partners in Flight –

The goal of Partners in Flight landbird conservation planning and the Bird Conservation Plans is to ensure long-term maintenance of healthy populations of native landbirds. These documents were prepared to facilitate that goal by stimulating a proactive approach to landbird conservation.

Goals, Objectives, Strategies and Recommended Actions

Federal Government

Trumpeter Swans: The U.S. Fish and Wildlife Service's Rocky Mountain Population of Trumpeter Swan Working Group developed a draft concept plan for enhancing the Rocky Mountain Population of trumpeter swans on units of the National Wildlife Refuge System. This draft is presently out for public review. The intent of the plan is to develop integrated management objectives on NWRs and help define roles for other FWS programs with the goal for restoring the Rocky Mountain Population of Trumpeter Swan. The draft document finds that a study of all the interrelated factors (swan, vegetation, fish, river flows, ice conditions, temperatures) on the Henry's Fork is needed. Swan genetics need to be analyzed across all populations, including the Pacific Coast populations, so that restoration can continue smoothly.

Goals and objectives, as outlined in the Pacific Flyway Management Plan for the Rocky Mountain Population (Subcommittee on Rocky Mountain Trumpeter Swans 1998) include, but are not limited to:

GOAL 1. Population Management, including:

Objective 1: Redistribute wintering swans to wintering areas outside of the core Tri-State Area, reducing the number of wintering swans in the core Tri-State Area to a maximum of 1,500.
Objective 2: Rebuild U.S. breeding flocks by the year 2002 to at least 131 nesting pairs (594 adults and sub-adults) that use natural, diverse habitats and winter predominately outside of the core Tri-State Area.
Objective 3. Encourage growth of Canadian flocks.
Objective 4. Increase the abundance of most desirable submerged macrophytes in the Henry's Fork of the Snake River in and near Harriman State Park.
Objective 5: Monitor the population

GOAL 2. Research needs, including:

Objective 1: Ascertain the seasonal movements of Canadian and Tri-State trumpeter swans using satellite tracking of transmitter.
Objective 2: Continue evaluation of potential habitat range wide).
Objective 3: If university interest exists, obtain graduate student help to investigate movements, habitat use, behavior and factors affecting success of recent translocation.
Objective 4. Develop methods to routinely monitor vegetation trends at key wintering sites.

Additionally, the draft Trumpeter Swan Refuge Implementation Plan developed strategies and tasks to address the above goals and objectives. These include, but are not limited to:

Strategy 1: Restore trumpeter swans to unoccupied breeding habitat with the RMP's historic range;
Strategy 2: Encourage broader winter distribution;
Strategy 3: Conduct appropriate research;
Strategy 5: Reduce swan mortality.

Jackson Hole, Wyoming Environmental Restoration Feasibility Report

Specific study objectives from the *Jackson Hole, Wyoming Environmental Restoration Feasiblilty Report* (U.S. Army Corps of Engineers, 2000) include investigating the feasibility of:

- Restoring channel stability and in-stream habitat values.
- Protecting remaining diverse (wetland/riparian/terrestrial) island habitats.
- Restoring diversity and sustainability to degraded island habitats.
- Restoring degraded habitats for threatened and endangered species.

USFWS Jackson Fish Hatchery

The goal of the hatchery is to produce the size or numbers of native fish needed for each of the stocked waters depending upon the management plan for that particular body of water. Revisions of the numbers or sizes of stocked fish is dependent upon the amount of use, habitat, water and other factors which are conveyed by the biologists to the hatchery at annual program planning meetings. The habitat goal is the responsibility of the respective land use management agencies, specifically, the Wyoming Game and Fish Department; the Idaho Fish and Game Department; and the Fort Hall Reservation.

National Park Service

Management objectives Grand Teton National Park are detailed in the Park's Statement for Management (1989). These include

- Manage all park natural resources under ecosystem concepts that are aimed at perpetuating natural systems rather than individual species or features.
- Establish ecologically sound limits and manage all activities and uses to ensure compatibility with the preservation of park resources and a positive visitor experience.
- Manage wildlife under conditions that are natural and unrestrained.
- Cooperatively develop a management program that diminishes the need for elk reduction within the park.
- Cooperatively manage the Snake River drainage to ensure perpetuation of the native cutthroat trout as a wild population.
- Cooperatively agree to maintain Jackson Lake at a level that enhances a lake appearance and balances ecosystem needs with protection of downstream resources.
- Manage the Snake River as a natural environment by limiting development and use levels.
- Maintain all service waters in Class I condition.
- Establish and maintain sufficient test wells and sampling to ensure that such waters are not degraded by any polluting discharge or maintenance work in stream beds.
- Maintain and/or restore air quality characteristics in the park and surrounding area so visitors can enjoy panoramic views of the Teton Range and Jackson Hole from within and outside the Park.
- Develop a workable plan, policies and regulations to maintain an acceptable level of quiet throughout the park.
- Preserve, manage, and display sites, buildings, and objects that are significant and represent the broad sweep of western history and prehistory.
- Provide future generations opportunities to enjoy, comprehend, and appreciate these tangible resources and their historical significance.
- Carry out a study of historic and archeological sites, bringing the park inventory and planning for management of cultural resources up to standard.
- Perform maintenance on identified National Register sites to minimize deterioration, and, where possible, bring to LCS standard.
- Prepare a park administrative history.
- Enhance and maintain a viable, working relationship with appropriate cultural resource organizations.

Essentially identical objectives are listed in the 1989 Statement for Management for the John D. Rockefeller, Jr., Memorial Parkway.

NPS has established a drawdown goal for Jackson Lake (Snake River Resources Review: Aquatic Resources Parameters Manual, March 2001). The minimum flow of 280 cfs, or use of the preferred flow of 600 cfs from October through February (released from Jackson Dam), would hopefully maintain Jackson Lake at its preferred drawdown level of the preferred 0.5 foot to the maximum drawdown not to exceed 5 feet from December 1 through March 31.

A wilderness review and recommendation has been completed for NTNP. In 1972, 115,807 acres of the Park were recommended for inclusion in the National Wilderness Preservation System. An additional 20,850 acres were identified as potential wilderness (National Park Service 1972 and 1973). Recommended wilderness was increased to 122,604 acres in 1978 and 20,850 acres of potential wilderness were retained. Congress has not yet acted on the recommendation. In 1984 the Park recommended increasing wilderness and potential wilderness to 135,680 and 20,320 acres, respectively. There is no current proposal for a wilderness study of the Parkway.

USDA Natural Resources Conservation Service (NRCS)

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

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

Objective 1.1. Maintain, restore, and enhance cropland productivity.

Strategy 1.1.1. NRCS will work with the conservation partnership to:

Strategy 1.1.2. Provide coordinated assistance in watersheds with pervasive soil health problems.

Strategy 1.1.3. Promote conservation planning and management approaches that improve multiple soil factors by focusing efforts on the most serious soil health problems.

Strategy 1.1.4. Help USDA program participants remain in compliance with requirements to protect highly erodible cropland and to take additional steps to improve the land.

Strategy 1.1.5. Help operators examine alternatives to crop production, such as enterprise diversification or conversion to hay or grazing.

Strategy 1.1.6. Provide assistance to landowners and land managers who are removing land from CRP to plan and apply systems with suitable plant materials that adequately control erosion and address other soil health issues.

Strategy 1.1.7. Ensure that small, limited-resource minority farmers and ranchers receive appropriate conservation planning and management assistance.

Strategy 1.1.8. Improve technical capacity and develop and implement a method to determine soil health and monitor changes.

Strategy 1.1.9. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about the production benefits of conservation practices.

Objective 1.2. Maintain, restore, and enhance irrigated land.

Strategy 1.2.1. NRCS will work with the conservation partnership to:

Strategy 1.2.2. Encourage long-range water management planning to help communities develop strategies to address future water needs for irrigation and municipal and rural water use.

Strategy 1.2.3. Provide coordinated assistance in watersheds with substantial irrigated acreage.

Strategy 1.2.4. Promote comprehensive irrigation and water management systems that increase irrigation efficiency, address nutrient and pest management, and, otherwise, manage irrigation return flow to reduce potential adverse effects.

Strategy 1.2.5. Provide technical assistance to facilitate conversion to alternative crops or to dryland farming systems for those operators transitioning from irrigated agriculture.

Strategy 1.2.6. Provide training to help irrigation equipment suppliers and contractors plan equipment installation and provide services to help operators increase efficiencies in irrigation water delivery and application systems.

Strategy 1.2.7. Use appropriate, targeted communication strategies to educate irrigators, farmers, and others about the importance of water management and the availability of assistance

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

Strategy 1.3.1. NRCS will work with the conservation partnership to:

Strategy 1.3.2. Promote conservation planning and management approaches that prevent grazing land damage, reduce the impact of drought, and help ensure that resources can remain healthy and productive.

Strategy 1.3.3. Promote grazing practices that provide multiple benefits for operators, including productivity, wildlife, and water quality.

Strategy 1.3.4. Promote cooperative, watershed or regional approaches to grazing lands conservation and reclamation.

Strategy 1.3.5. Strengthen inventory and assessment capabilities throughout NRCS to improve the ability to determine the status and condition of grazing land resources.

Strategy 1.3.6. Increase efforts to develop approaches for suppression of noxious and invasive species.

Strategy 1.3.7. Strengthen assistance to small, limited-resource and minority owned farms and ranches.

Strategy 1.3.8. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about grazing land productivity and water quality benefits of conservation practices

Objective 1.4. Maintain, restore, and enhance forestland productivity.

Strategy 1.4.1. NRCS will work with the conservation partnership to:

Strategy 1.4.2. Promote conservation planning and management approaches that prevent forestland damage and help ensure that resources can remain healthy and productive.

Strategy 1.4.3. Promote forest management that maintains yield of forest products with protection of watersheds for clean water, wildlife habitat, fiber production, and mixed land uses.
Strategy 1.4.4. Promote cooperative, watershed, or regional approaches to forestland conservation.
Strategy 1.4.5. Strengthen inventory and assessment capabilities to improve the ability to determine the status and condition of forestland.
Strategy 1.4.6. Strengthen assistance to small, limited-resource and minority owners of private, non-industrial forestland.
Strategy 1.4.7. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about forestland productivity and water quality benefits of conservation practices.

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

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

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

Objective 2.2. Promote sound urban and rural community development.

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

Strategy 2.2.2. Develop specialized training, guidance, and practices for employees and partners.

Strategy 2.2.3. Extend coverage of RC&D areas.

Strategy 2.2.4. Enhance efforts in urban and suburban areas, particularly newly developing areas, to undertake comprehensive watershed planning that addresses the potential offsite impacts of development.

Strategy 2.2.5. Work with long-standing and new partners to promote technologies and improved practice standards for reducing runoff of nutrients, pesticides, and sediment from rural and urban residential and community facility sites.

Strategy 2.2.6. Promote conservation activities that can help address air quality problems in non-attainment areas.

Strategy 2.2.7. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about the benefits of conservation for urban and suburban areas.

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

Strategy 2.3.1. NRCS will work with the conservation partnership to provide area-wide planning and coordinated assistance in watersheds with non-point source pollution problems on all non-Federal and Tribal lands.

Strategy 2.3.2. Promote innovative watershed level approaches in areas where the rural-urban interface may constitute unique challenges and offer different opportunities for mixed solutions to locally identified problems.

Strategy 2.3.3. Intensify efforts to protect rivers and streams from the effects of excess nutrient loading and siltation.

Strategy 2.3.4. Intensify efforts to protect rivers and streams from the effects of hydrologic alterations and structural changes to natural geomorphic characteristics, including loss of streamside vegetation, that affect the quality of aquatic habitat.

Strategy 2.3.5. Evaluate the potential to abate sources of air quality impairment and greenhouse gas emissions and increase carbon sequestration on U.S. forest, range, and croplands (e.g., emissions from AFOs, fugitive dust from erosion, agricultural burning).

Strategy 2.3.6. Develop accurate, scientifically validated soil carbon measurement models.

Strategy 2.3.7. Develop economical methods/practices to control erosion and mitigate greenhouse gas emissions on a wide variety of parcel sizes and for landowners and land managers with limited financial resources.

Strategy 2.3.8. Promote streambank restoration and riparian area establishment in locally important watersheds.

Strategy 2.3.9. Support the National Conservation Buffer Initiative to help reduce movement of eroded soil and attached chemicals into waterways.

Strategy 2.3.10. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about the role of conservation practices and programs in protecting water and air quality.

Objective 2.4. Enhance animal feeding operations to protect the environment.

Strategy 2.4.1. NRCS will work with the conservation partnership to:

Strategy 2.4.2. Promote innovative watershed level approaches in areas where animal waste is a key concern to consider centralized nutrient accounting, storage and distribution of manure nutrients, and other approaches that can link nutrient-rich and nutrient-poor areas.

Strategy 2.4.3. Provide coordinated assistance in watersheds with AFO concentrations.

Strategy 2.4.4. Invest in development of technology and practice standards to support improved waste management.

Strategy 2.4.5. Foster greater private sector capacity to develop and implement animal waste management and riparian technology.

Strategy 2.4.6. Develop innovative partnerships to advance alternatives for animal waste management.

Strategy 2.4.7. Work with partners to encourage integrator-supported cooperative efforts for waste management and utilization where production is concentrated.

Strategy 2.4.8. Coordinate with EPA, partners, Tribes, individuals, and communities to identify TMDL program requirements and integrate these with NRCS watershed level planning and technical assistance activities.

Strategy 2.4.9. Work with operators to increase adoption of waste management practices that address water and air quality concerns.

Strategy 2.4.10. Strengthen assistance to small, limited-resource and minority owned farms and ranches, and develop and provide low cost alternatives that meet their needs.

Strategy 2.4.11. Use appropriate communication strategies to publicize traditional and alternative solutions for managing animal waste.

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

Strategy 2.5.1. NRCS will work with the conservation partnership, State agencies, other Federal agencies, and private conservation organizations to identify priority wetlands that habitat and wetland-landscape habitat linkages.

Strategy 2.5.2. Work through the locally led process to identify community goals for fish and wildlife and wetland conservation.

Strategy 2.5.3. Conduct functional assessments on wetlands before and after conservation treatment to validate conservation practice effects in support of outcome measurement.

Strategy 2.5.4. Focus efforts on "no-net loss of wetlands" and on the most highly vulnerable areas of the Southeast, South Central, Midwest, and Northeast regions.

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

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

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

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

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

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

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

Objective 3.1. Protect upstream watersheds from flood risks.

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

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

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

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

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

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

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

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

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

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

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

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

<u>GOAL 4</u>. Deliver high quality services to the public to enable natural resource stewardship.

Objective 4.1. Deliver services fairly and equitably.

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

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

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

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

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

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

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

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

Objective 4.2. Strengthen the conservation delivery system.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

State Government

Idaho Department of Environmental Quality

Included in the mission of Idaho DEQ are (1) restoration, protection, and maintenance of spawning and rearing areas of salmonid fishes through implementation of sediment control measures in TMDL Implementation Plans; and (2) refinement of aquatic life beneficial use monitoring and assessment methods to better focus restoration efforts. These mission items are subsumed as a single goal:

GOAL Restore Cold Water Biota and Salmonid Spawning beneficial uses to Full Support.

Objective 1. Complete TMDL Sub-basin Assessments, pollutant reduction allocations, and Implementation Plans for impaired water bodies.

Strategies: Maintain current schedule for TMDL development.

Complete development of TMDL implementation plans within 18 months of TMDL approval through coordination with appropriate agencies, advisory groups, and interested parties.

Objective 2. Effectuate actions identified in TMDL Implementation Plans to restore aquatic life beneficial uses.

Strategies: Seek funding for projects identified in TMDL Implementation Plan.

Idaho Department of Fish and Game

The Idaho Department of Fish and Game has several overarching goals and objectives, plus species-specific and area-specific plans and objectives. Overarching objectives include:

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

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

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

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

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

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

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

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

Strategy 1. Support hunting, fishing, and trapping as traditional and legitimate uses of Idaho's fish and wildlife resources.
Strategy 2. Manage fish and wildlife resources for recreational and other legitimate benefits that can be derived primarily by residents of Idaho.
Strategy 3. Manage fish and wildlife to provide a variety of consumptive and nonconsumptive recreational opportunities as well as scientific and educational uses.
Strategy 4. Manage wildlife at levels that provide for recreational opportunity but do not result in significant damage to private property.
Strategy 5. Use the best available biological and social information in making and influencing resource decisions.

Fisheries Bureau

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

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

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

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

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

Strategy 1. Provide technical expertise to the Executive and Legislative branches, Idaho Northwest Power Planning Council representatives, Idaho Fish and Game Commission and to the citizens of Idaho.
Strategy 2. Work closely with other regulatory agencies to provide adequate passage for anadromous fish to and from Idaho and the ocean environment.
Strategy 3. Assist in recovery of rare species through captive rearing projects, supplementation, and protection.
Strategy 4. Provide input to land management agencies on how fishery resources may be affected by various proposed activities.
Strategy 5. Conduct periodic surveys of Idaho anglers to determine their preferences and opinions.

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

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

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

Statewide Fisheries Management

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

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

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

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

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

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

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

Resident Fish Management

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

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

Strategy 1. Utilize anglers to exploit rainbow trout populations and reduce introgression.

Action 1. Develop materials and program to educate anglers on the threat of introgression.

Action 2. Continue to utilize restrictive Yellowstone cutthroat trout regulations in conjunction with liberal rainbow trout regulations.

Strategy 2. Continue to monitor and ascertain the genetic purity status of wild Yellowstone cutthroat trout stocks in the subbasin to aid in the prioritization of fishery management decisions.

Action 1. Conduct DNA-based genetic inventories of Yellowstone cutthroat stocks.

Action 2. Evaluate introgression rates between rainbow trout and Yellowstone cutthroat stocks in the subbasin.

Strategy 3. Continue management programs designed to decrease populations of rainbow trout and minimize introgression with Yellowstone cutthroat trout.

Action 1. Use Biologically Based Systems Management model to improve understanding of temporal and spatial habitat overlaps between the two species.

Action 2. Operate fish weir and trapping facilities on tributaries to the South Fork to restrict rainbow trout spawning migrations and ensure escapement is limited to Yellowstone cutthroat trout.

Strategy 4. Protect, improve and restore degraded habitat.

Action 1. Utilize fish screens on major irrigation diversions to minimize entrainment.

Action 2. Work with private landowners in Willow Creek drainage to protect riparian areas from cattle grazing and restore productive Yellowstone cutthroat trout spawning and rearing habitat.

Strategy 5. Obtain sufficient normative river flows and river processes to minimize survival bottlenecks of Yellowstone cutthroat trout.

Action 1. Use Biologically Based Systems Management model to improve understanding of links between flows and biological systems.

Action 2. Work to develop instream flow agreement for Dry Bed portion of lower South Fork Snake River or alternatively install fish avoidance device to minimize entrainment.

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

Strategy 1. Improve fishery in Palisades Reservoir.

Action 1. Evaluate the use of behavioral avoidance devices to minimize entrainment through Palisades Dam.

Action 2. Improve efficiency of stocking program to maximize benefits.

Action 3. Provide habitat and stream flow protection/enhancement to improve natural reproduction of reservoir populations of kokanee, brown trout, andYellowstone cutthroat trout.

Strategy 2. Develop fishing ponds in areas where stream-fishing opportunity is limited by conservation efforts on native fishes or inefficient use of hatchery fish.

Action 1. Develop one or two catchable trout ponds in the Willow Creek drainage.

Terrestrial Habitats and Wildlife

Forest Carnivores

Objective 1. Monitor marten populations and harvest opportunities.

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

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

- Strategy 1. Conduct surveys for fishers within areas of unverified presence but having potential occupancy and in potential habitat linkage zones following (Zielinski and Kucera 1994).
  - Action 1. Develop methodologies for monitoring marten populations and harvest.

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

- Strategy 1. Prioritize recolonization and augmentation areas.

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

- Strategy 1. Restore fire as an ecological process.
  - Action 1. Evaluate historical conditions and landscape patterns to determine historical vegetation mosaics across landscapes through time.

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

- Strategy 1. Protect integrity of forest carnivore habitats.
  - Action 1. Assess the effects of habitat fragmentation and mortality from roads and highways on lynx population viability.
  - Action 2. Determine the effects of open forest roads and associated human use on populations and habitat use.
  - Action 3. Determine the size and characteristics of refugia for forest carnivores.
  - Action 4. Determine to what extent lynx use shrub-steppe habitats.
  - Action 5. Provide a landscape of interconnected blocks of forging habitat.
- Strategy 2. Delineate potential habitats.
  - Action 1. Map habitats using 1:250,000-1:1,000,000 scale maps with attributed coverages at the drainage, subdrainage, and stand scales.
  - Action 2. Identify connectivity and core habitats for priority protection and conservation.
- Strategy 3. Identify habitat linkage zones connecting regional populations demographically and genetically.
  - Action 1. Manage linkage zones as primary conservation areas.
  - Action 2. Examine roading impacts to linkage habitats and populations.
  - Action 3. Identify core areas that possess high quality habitats and high-density populations.

Small Mammals

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

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

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

Migratory and Resident Birds

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

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

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

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

Strategy 1. Determine the potential bird communities within each riparian ecosystem.

Strategy 2. Determine the habitat requirements and habitat associations of focal and priority species and the effects of management activities and land use.

- Action 1. Determine habitat requirements and population trends of focal and priority species using published and unpublished data.
- Action 2. Initiate research and monitoring programs for focal and priority species

Strategy 3. Accumulate information on the current and potential distributions of each riparian system.

- Action 1. Develop a GIS data repository for riparian associated information.
- Action 2. Complete the National Wetland Inventory mapping of riparian habitats for areas not yet completed.
- Action 3. Identify areas of potential good quality riparian habitat and areas where restoration should occur.

Strategy 4. Restore riparian habitats based on feasibility, land ownership, size of existing patches, existing land matrix, quality, and habitat connectivity.

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

Strategy 1. Write habitat management recommendations for wetland birds.

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

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

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

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

Owls

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

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

Strategy 1. Develop permanent monitoring sites.

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

Action 2. Erect and monitor nest boxes.

Strategy 2. Retain snags and primary cavity nesters.

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

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

Action 3. Restore aspen forests.

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

Northern Goshawk

Objective 1. Determine biology and ecology of northern goshawks.

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

Objective 2. Determine the abundance and distribution of goshawks.

Strategy 1. Use standardized survey protocols for surveying habitats.

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

Strategy 1. Develop conservation agreements with private landowners.

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

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

Sharp-tailed Grouse

Objective 1. Continue monitoring populations and conduct surveys of habitats that may support sharp-tailed grouse.

Objective 2. Implement sharp-tailed grouse conservation management plan.

Objective 3. Identify and map existing sharp-tailed grouse habitat and areas of potential sharp-tailed grouse habitat. Develop local management plans to protect and perpetuate sharp-tailed grouse habitat.

Sage Grouse

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

Strategy 1. Manage nesting and early brood habitats to provide 15-25% sagebrush canopy coverage and about 7 inches or more of grass and forb understory during the May nesting period.

Strategy 2. Manage for late summer brood habitat that includes a good variety of succulent vegetation adjacent to sagebrush escape and loafing cover.

Strategy 3. Manager for winter habitat that provides sagebrush exposed under all possible snow depths.

Strategy 4. Implement grazing management and big game regulations to achieve and maintain sagebrush and riparian/meadow habitats in good ecological condition.

Strategy 5. Do everything possible to protect remaining sage grouse habitats where natural fire frequency is 50-130 years and recent fire has greatly reduced sage grouse habitat.

Strategy 6. Establish priority areas for sage grouse habitat management.

Strategy 7. Implement Upper Snake local working group sage grouse management plan when plan is finalized.

Strategy 8. Monitor the condition and trend of sage grouse habitat.

- Action 1. Prepare cover type maps and evaluate habitat conditions using standards methods for key seasonal habitats.
- Action 2. Offer conservation easements or acquire critical habitats from willing sellers through land exchange, reserved interest deed, or direct purchase of mapped important sage grouse habitats.
- Action 3. Develop strategically placed firebreaks using greenstripping or mechanical removal of fuel.
- Action 4. Control noxious weeds along roads.
- Action 5. Include forbs and native grasses in seeding mixtures on critical habitat areas.
- Action 6. Rehabilitate gullied meadows to raise the water table and restore meadow characteristics.
- Action 7. Improve grazing management in sage grouse nesting habitats.
- Action 8. Restore riparian habitats through grazing and water diversion management.

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

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

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

- Action 1. Identify areas of strong sage grouse populations and protect them from habitat loss.
- Action 2. Identify areas of good or declining populations of sage grouse and manage habitats to restore or protect them.
- Action 3. Determine the population trends of shrub-steppe birds by establishing breeding bird surveys in each Sage Grouse management area.
- Action 4. Establish lek route(s).

Amphibians, Reptiles, and Invertebrates

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

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

Plants and Habitats

Objective 1. Assess, conserve, and enhance wildlife habitats.

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

- Action 1. Determine quantity, distribution, and condition of dominant plant communities and major habitat elements on a basin, physiographic area, and statewide basis.
- Action 2. Identify priority habitats of concern and their ecological relationships to native species.
- Action 3. Monitor changes and trends in habitats on a basin, physiographic province (ecoregional), and statewide basis, with emphasis on priority habitats.

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

- Action 1. Identify conservation, restoration, and management needs and opportunities for priority habitats.
- Action 2. Take actions to conserve, restore, enhance, or acquire important habitat areas.
- Action 3. Promote land use patterns and management practices that conserve, restore, and enhance habitats needed to maintain wildlife diversity.
- Action 4. Provide technical information and support to landowners, land managers, and local governmental agencies regarding habitat protection, restoration, and enhancement.
- Action 5. Develop incentive and recognition programs to assist in the conservation, restoration, and enhancement of habitats on private lands.

Objective 2. Assess, conserve, and enhance populations of native species at self-sustaining levels throughout their natural geographic ranges.

Strategy 1. Species and Population Status Surveys and Monitoring.

- Action 1. Maintain listings of species, populations, and distinct smaller groups that are, or could be, facing extinction or extirpation in Idaho using such categories as: endangered, threatened, and species of special concern.
- Action 2. Determine the status of poorly known species and populations.
- Action 3. Conduct research to address incomplete information on the taxonomic status of species.
- Action 4. Maintain listings of species, populations, groups of species, or distinct smaller groups requiring special attention.

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

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

Action 7. Monitor populations of common species.

Strategy 2. Continue monitoring game species populations and harvest.

Strategy 3. Provide hunting opportunity for game species without a loss of days available for hunting each species.

Action 1. Record verified unusual sightings of rare or unusual wildlife occurrences.

Strategy 4. Identify, establish, and implement management measures to restore threatened and endangered species; preventing species of special concern from qualifying as threatened or endangered; and maintaining or enhancing other species requiring special attention.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Improvements for hydro-power and/or irrigation facilities

Objective 1. Identify and correct fish passage and entrainment problems.

Objective 2. Develop and implement plans for ramping rates, shape and timing of flow releases.

Objective 3. Develop comprehensive water management plans to obtain appropriate maintenance flows, minimum pool levels, water temperatures, nutrient and sediment levels for fish and wildlife.

Research for Fish and Wildlife

Objective 1. Evaluate potential impacts of private stocking of fish on Yellowstone cutthroat trout.

Objective 2. Evaluate impacts of various ramping rates of flows from dams on fish and wildlife habitat and populations.

Strategy 1. Evaluate effects of flow regimes that may minimize rainbow trout and rainbow/cutthroat hybrid reproduction on the South Fork of the Snake River.

Objective 3. Evaluate control methods, including predatory fish, for Utah chubs and suckers in Ririe reservoir.

Objective 4. Develop improved hatchery supplementation tools and products.

Objective 5. Evaluate relationships between moose densities and twinning rates.

Objective 6. Quantify relationships between sage brush steppe habitats and associated species that are showing long term declines in productivity, abundance, and distribution.

Strategy 1. Study micro-site habitats of shrub-steppe animal species.

Strategy 2. Study nutritional condition of browse, forb, and grass species.

Strategy 3. Study animal population dynamics related to habitat condition.

Strategy 4. Study cause specific mortality of shrub steppe animal species.

Strategy 5. Study current versus historical faunal and floral composition changes.

Objective 7. Continue sage grouse chick (less than 10 weeks of age) mortality study.

Strategy 1. Begin assessment of microhabitat characteristics and predator populations associated with chick mortality.

Strategy 2. Complete the analysis of juvenile survival and dispersal data.

Acquisition

Objective 1. Continue to implement wildlife mitigation projects along and near the South Fork Snake and Snake River corridors to achieve full mitigation for the construction and operation of Palisades Dam.

Objective 2. Acquire 44 acres between the Deer Parks Wildlife Mitigation Unit (DPWMU) and the Twin Buttes county road. This area is at risk due to the potential for subdivision development. This acquisition would maintain a buffer between the housing developments to the east of DPWMU and the wetlands associated with the Butte Slough.

Objective 3. A number of BLM isolated tracts along the South Fork of the Snake River, and main stem of the Snake River are currently in degraded condition due to trespass livestock grazing, unregulated motorized access, and noxious weed infestations. These tracts provide important habitat for many wildlife species and valuable public access to these river corridors. The purchase of public access

easements is necessary in some areas to allow the public access to BLM tracts and allow for tract management.

Objective 4. Acquire property along Tex creek up to the Forest Service boundary. The area is a major migration corridor for mule deer, elk, and moose.

Objective 5. Property adjacent to or near the Tex Creek WMA.

Objective 6. Property adjacent to main stem of the Snake river between Deer Parks WMU and Market Lake WMA for bald eagle nesting and winter habitat.

Fisheries -- The Idaho Department of Fish and Game has the following fisheries management objectives and programs for the South Fork of the Snake River (Table 71) (IDFG 2001).

Objectives and Programs

Objective 1: Preserve genetic integrity and population viability of wild native cutthroat trout.

Program: Do not stock or allow stocking of streams, rivers, reservoirs or ponds with other species of fish that will interbreed or compete with cutthroat trout.

Program: Complete construction and operate fish trapping weirs on Burns, Pine, Rainey, and Palisades's creeks to manage those tributaries strictly for cutthroat trout spawning and production.

Program: Continue to monitor genetic status of wild cutthroat trout populations.

Program: Work to obtain special consideration, protection, and improvement of critical cutthroat trout habitat in land use decisions.

Program: Protect cutthroat trout through at least one spawning season by late openers on important tributaries, minimum size limits, and reduced bag limits.

Objective 2: Obtain adequate winter stream flows to reduce juvenile fish mortality.

Program: Work with Bureau of Reclamation to maintain at least 1500 cfs release from Palisades Dam during winter. Establish ramping rates to minimize water level fluctuations.

Objective 3: Monitor incidence of fish disease and minimize its threat to wild trout populations.

Program: Continue to monitor for presence of whirling disease.

Program: Educate private pond owners on the threat of whirling disease and strictly enforce fish transport regulations.

Program: Educate the public on the threat of whirling disease and methods to control its spread.

Objective 4: Minimize loss of juvenile fish to irrigation diversions and stream dewatering.

Program: Operate and maintain the Palisades Creek and Burns Creek screens in cooperation with local irrigators.

Program: Negotiate with local irrigators for maintenance flows when possible.

Objective 5: Minimize impacts of land use and development on fish habitat and water quality.

Program: Work with government agencies, private landowners, developers, and interested conservation groups to make protection and enhancement of fish habitat and water quality a primary concern in land use decisions.

Program: Ensure restoration of habitat or mitigation of habitat loss whenever possible.

Objective 6: Improve angler compliance with special regulations.

Program: Develop informational programs to encourage compliance. Educate anglers on the need for regulations, the kinds and location of regulations, and alternative fishing opportunities.

Program: Focus available enforcement to reduce poaching losses.

Objective 7: Maintain a satisfactory salmonid fishery in Palisades Reservoir.

Program: Continue stocking hatchery cutthroat trout from Jackson National Fish Hatchery of a variety and size and on a schedule, which provides high quality fishing with economic efficiency.

Objective 8: Maintain adfluvial cutthroat trout populations in Palisades Reservoir.

Program: Maintain restrictive harvest rules for cutthroat trout and consider late season openers in principal spawning tributaries if monitoring and/or public desires indicates need for doing so.

Program: Evaluate agency and private stockings of fish in the drainage for possible negative effects on native cutthroat trout, restrict and or comment on accordingly.

Program: Provide habitat and stream flow protection and enhancement.

Table 71. Idaho Department of Fish and Game fisheries management objectives for stream segments within the Headwaters Subbasin: South Fork Snake River Drainage.

Water	Miles/ acres	Fishery Type	Species present	Management	Management Direction
Mouth to Heise	23/	Coldwater	Cutthroat trout Brown trout Rainbow trout Whitefish	Quality General	Upper Snake cutthroat trout with restricted harvest regulation. Maintain overall catch rates at 0.7 fish/hr. Emphasize rainbow trout and whitefish harvest.
Heise to Palisades Dam	40/	Coldwater	Cutthroat trout Brown trout Rainbow trout Whitefish	Quality General	Upper Snake cutthroat trout with restricted harvest regulation Maintain overall catch rates at 1.0 fish/hr with 10% larger than 16 inches in population. Emphasize rainbow trout and whitefish harvest.
Dry Bed Canal	32/	Coldwater	Cutthroat trout Rainbow trout Brown trout Whitefish	General (not protected in canals)	Put-and-grow fishery with rainbow trout below Lewisville. April salvage season Lewisville to Ririe. Minimize de-watering through agreements with irrigation districts.
Burns, Pine, Rainey, and Palisades creeks	38/	Coldwater	Cutthroat trout Rainbow trout	Quality General	Upper Snake cutthroat trout restricted harvest regulation. Conserve resident cutthroat trout populations. Manage exclusively for cutthroat trout production. Enhance stream habitat and cutthroat trout recruitment with riparian livestock management and diversion screening.

Water	Miles/ acres	Fishery Type	Species present	Management	Management Direction
McCoy Creek and tributaries	35/	Coldwater	Cutthroat trout Brown trout	Quality General	Delayed opener to protect cutthroat trout spawning. Habitat protection from mine impacts.
Tincup Creek from Idaho line to Highway 34 Bridge	12/	Coldwater	Cutthroat trout Brown trout	Quality General	Stock fall spawning hatchery rainbow trout in segment heavily altered by road construction. Evaluate returns.
Tincup Creek from Highway 34 Bridge to Headwater	8/	Coldwater	Cutthroat trout Brown trout	Quality General	Maintain "semi-primitive" access to the fishery. Develop hatchery rainbow trout management zone and evaluate returns.
Stump Creek and tributaries	12/	Coldwater	Cutthroat trout Brown trout Brook trout	Quality General	Work with federal agencies on habitat rehabilitation. Develop hatchery rainbow trout management zone and evaluate returns.
Crow Creek and tributaries	25/	Coldwater	Cutthroat trout Brown trout	Quality General	Investigate development of quality brown trout fishery in Sage Creek in conjunction with habitat improvement. Develop hatchery rainbow trout management zone and evaluate returns.
Jacknife Creek and tributaries	12/	Coldwater	Cutthroat trout Brown trout	Quality General	Assess needs for habitat improvement program.

Deer Parks Complex

The mission of the Deer Parks Complex is to sustain an ecosystem that supports an abundant, productive and diverse community of naturally reproducing fish and wildlife by protecting and restoring natural ecological functions, habitats and biological diversity (IDFG & SBT 2001). To achieve the mission, the Idaho Department of Fish and Game has developed the following identified management goals, objectives and strategies.

GOAL 1: Protect, maintain and enhance wildlife habitat consistent with the Deer Parks Complex mission.

Objective 1: Maintain or increase baseline habitat units for wildlife mitigation target species.

Strategy 1: Favor passive methods of restoration and rehabilitation of wildlife habitat over active methods.

Action1: Allow restoration to occur through successional habitat recovery as opposed to active intervention.

Action 2: Promote the restoration of natural ecological processes.

Strategy 2: Focus management on actions that will benefit habitat for wildlife mitigation target species. Target wildlife species and species with similar habitat needs would benefit most from wildlife mitigation management activities.

Action 1: Implement management actions which, as much as possible, result in permanent, self-maintaining vegetation communities that provide habitat for wildlife mitigation target species and other wildlife.

Action 2: Maintain or improve high-quality native or other habitat for wildlife mitigation target species.

Action 3: Manage habitats for a biologically diverse mix of fish and wildlife species including TES species.

Strategy 3: Prevent or control wildfires.

Action 1: Follow established BLM fire management plan for the area.

Action 2: Mow roadways and parking areas.

Action 3: Prohibit camping, campfires and fireworks.

Objective 2: Monitor and evaluate wildlife habitat and species populations to determine effects of management actions.

Strategy 1: Develop and implement a monitoring plan to evaluate habitat.

Action 1: Conduct a HEP every five years to monitor changes in vegetation and habitat quality, and to provide updated crediting to BPA.

Action 2: Establish a series of permanent photo points to monitor changes in plant communities over time.

Action 3: Use monitoring information to guide annual management priorities and activity planning.

Strategy 2: Develop and implement a monitoring plan to assess wildlife populations.

Objective 3: Prevent, control or eradicate noxious weeds and other undesirable vegetation.

Strategy 1: Develop and implement a noxious weed control plan.

Action 1: Use chemical, biological, mechanical and cultural methods to prevent, control or eradicate weed infestations.

Action 2: Map current weed infestations and prepare an annual report of weed control activities including recommendations for improving control.

Action 3: Continue participation in the Upper Snake Cooperative Weed Management Area.

Action 4: Train staff in noxious weed identification and control.

Strategy 2: Develop and implement a plan to control undesirable vegetation.

Objective 4: Manage for native plant communities where appropriate.

Strategy 1: Permanent habitat restoration or enhancement shall be composed primarily of native plant species.

Strategy 2: Prohibit the harvest or removal of plants, rocks, and minerals by the public on the Deer Parks Complex.

Objective 5: Provide wildlife habitat and implement wildlife habitat enhancements by using sharecropping, livestock grazing agreements, or other techniques.

Strategy 1: Provide for the use of share cropping to create wildlife habitat in croplands and facilitate permanent wildlife habitat enhancements.

Strategy 2: Provide for the use of livestock grazing agreements on an occasional basis as a vegetation management tool.

Strategy 3: Remove all non-essential fences.

GOAL 2: Provide for a diversity of public recreational opportunities on the Deer Parks Complex consistent with the mission.

Objective 1: Develop and implement an access management plan.

Strategy 1: Allow foot access only.

Strategy 2: Provide a brochure and map for the public about access to the Deer Parks Complex.

Strategy 3: Provide designated access sites.

Strategy 4: Provide a handicapped access with toilet at the Deer Parks Complex headquarters.

Strategy 5: Allow for boat-in access from the Snake River and Henry's Fork without developing boating facilities on the Deer Parks Complex.

Strategy 6: Maintain tribal treaty rights and protection of cultural resources.

Strategy 7: Apply consistent access restrictions to all groups.

Objective 2: Provide for diverse public recreational activities which do not harm wildlife or reduce the value of wildlife habitat.

Strategy 1: Protect bald eagles and their habitat.

Action 1: Post signs indicating that it is unlawful to approach within ¼ mile of the bald eagle nest between February1 – July 31.

Action 2: Prohibit harvest of wood and wood products on the Deer Parks Complex to protect bald eagle perch and nest trees and other wildlife trees.

Strategy 2: Prohibit camping, campfires and fireworks on the Deer Parks Complex to protect wildlife and wildlife habitat and to prevent wildfires.

Strategy 3: Manage Butte Slough to maintain or increase habitat units for wildlife mitigation target species.

Action 1: Prohibit open water fishing in Butte Slough to protect nesting and brood rearing waterfowl and other wildlife between February 1 and August 15.

Action 2: Evaluate the potential to allow fishing on Butte Slough.

Action 3: On Butte Slough allow non-motorized watercraft only. Use is allowed from August 15 through freeze up only.

Strategy 4: Require all trappers to register at the IDFG Regional office at 1515 Lincoln Road, Idaho Falls, Idaho.

Strategy 5: Consider requests and require permits for special use activities.

Action 1: Permits will be approved only with the consensus of the IDFG Regional Habitat Manager and the SBT Wildlife Mitigation Program Manager.

Objective 3: Inform and educate Deer Parks Complex visitors.

Strategy 1: Install and maintain informational signs.

Action 1: Promote general public awareness of the BPA wildlife mitigation program.

Action 2: Promote general public awareness of the importance of protecting and managing wildlife habitat.

Action 3: Develop a brochure with map of the Deer Parks Complex.

Objective 4: Monitor and evaluate the affects of public use on the Deer Parks Complex.

Strategy 1: Conduct annual incidental and stratified public use surveys.

Strategy 2: Solicit voluntary comments from public visitors using various means.

Strategy 3: Modify the Deer Parks Complex plan to reflect impacts of public use where appropriate.

<u>GOAL 3</u>: Strive to maintain good working relationships with neighbors.

Objective 1: Manage the Deer Parks Complex to be a responsible neighbor.

Strategy 1: Clearly mark Deer Parks Complex boundaries.

Strategy 2: Cooperatively maintain common fences to regulate livestock.

Strategy 3: Actively promote the IDFG "Ask First" campaign to encourage hunters, anglers, trappers and other visitors to obtain permission before entering private land.

Strategy 4: Attend and participate in local meetings where appropriate.

Strategy 5: Coordinate with adjacent private landowners to control noxious weeds.

Objective 2: Minimize wildlife depredation damage on nearby privately owned land.

Strategy 1: Monitor and evaluate local wildlife depredations on private land near the Deer Parks Complex.

Strategy 2: IDFG will address complaints of wildlife depredations on private land near the Deer Parks Complex in a timely manner consistent with IDFG policy.

Strategy 3: Manage cropland on the Deer Parks Complex with consideration for the impacts it may have on adjacent private land and crops.

Gem State Wildlife Habitat Area

The Idaho Department of Fish and Game has identified five significant management issues for the GSWHA (IDFG 1998):

- Create and maintain enhanced wildlife habitat for a diversity of wildlife species meet the terms of the agreement made between the City and IDFG
- Noxious Weed Control
- Public Use
- Trespass Livestock Grazing

They have developed an independent comprehensive weed control plan and a management plan with the following goals, objectives and strategies:

GOAL 1: Maintain high quality wetland/riparian habitat.

OBJECTIVE 1: Decrease the acres of habitat impacted by noxious weeds.

Strategy 1. Continue to control noxious weeds by chemical and biological measures.

Strategy 2. Monitor the impacts and effectiveness of control measures.

OBJECTIVE 2: Eliminate impacts from habitat degrading activities.

Strategy 1. Manage public access by restricting motorized vehicles.

Strategy 2. Prevent trespass livestock grazing by maintaining and monitoring fences and gates.

Strategy 3. Avoid permitting livestock grazing

GOAL 2: Maintain a diversity of wildlife species.

OBJECTIVE 1: Determine wildlife use of the area.

Strategy 1. Inventory wildlife using the area, including presence/absence of big game, waterfowl, amphibians, reptiles, birds and small mammals.

Strategy 2. Conduct an annual breeding bird census to monitor bird use of the area.

Strategy 3. Monitor and document use of the area by species, which have special designations.

OBJECTIVE 2: Maintain or increase habitat for selected wildlife species.

Strategy1. Provide and maintain goose nest structures.

Strategy 2. Provide and maintain wood duck nest boxes.

Strategy 3. Provide and maintain kestrel nest boxes, bluebird nest boxes, and bat roost boxes.

Strategy 4. Protect the area from livestock grazing to promote healthy and diverse vegetation for wildlife food and cover.

Strategy 5. Allow only non-motorized travel, except for administrative use, to reduce disturbance to roosting bald eagles and other species sensitive to disturbance.

GOAL 3: Provide public access for wildlife related recreational activities and nature viewing.

OBJECTIVE 1: Maintain public access to the area in a manner which will not impact wildlife or wildlife habitat.

Strategy 1. Permit non-motorized access on the area for hunting, fishing, trapping, and wildlife and nature viewing.

Strategy 2. Monitor and manage use of the area to insure that habitat degradation and disturbance are not occurring and negatively impacting wildlife or wildlife habitat.

Strategy 3. Avoid further development of the area as a recreational access area to insure that the primary goal of providing wildlife habitat is not jeopardized.

GOAL 4: Fulfill our agreement with the City of Idaho Falls to assist them in meeting their obligation to mitigate for wetland/riparian losses.

OBJECTIVE 1: Maintain a positive working relationship with the City by keeping them informed of Department activities and management actions so the City can insure the area is being managed to mitigate for losses.

Strategy 1. Provide Annual Reports to the City to inform them of management activities such as improvements, maintenance, weed control, etc.

Strategy 2. Provide reports of the results obtained from monitoring activities conducted by the Department.

Market Lake Wildlife Management Area –

The Market Lake Wildlife Area Management Plan addresses 24 issues:

1. Continued cooperation and coordination with adjacent landowners, the City of Roberts, Jefferson County Sheriff's Office, Roberts Fire Department and other County, State and Federal agencies, and volunteers is important to the management of the MLWMA.
2. The continuation of state listed noxious weed control efforts is essential to achieving the habitat goals for the MLWMA and is required by state law.
3. There is a need to improve marsh access for hunting.
4. Spring Canada goose pair counts need to be maintained at or above the minimum level established in the Department's Statewide Five Year Waterfowl Plan.
5. Avian botulism and avian cholera have killed waterfowl and other water birds on the MLWMA and pose future threats to resident and migratory waterfowl.
6. Trumpeter swans, a species of special concern, have not nested on the MLWMA since 1982 and could be reintroduced to the MLWMA.
7. Public boating, wading and hiking in the marshes may negatively impact waterfowl, shorebirds and other wildlife species during certain times of the year.
8. Waterfowl hunting on the MLWMA often results in fewer ducks and geese returning to the area and a potential reduction in waterfowl to hunt.
9. A variety of food crops are needed on the MLWMA to lure depredating waterfowl to the MLWMA, provide food for upland birds and big game, and to feed spring migrating waterfowl.
10. Duck nesting success in the uplands is below the minimum acceptable level set by the Department's Statewide Five Year Waterfowl Plan.
11. Hunter congestion may be a problem on the MLWMA and needs to be investigated.
12. There is a need for a designated area for year round hunting dog training.
13. The public desires larger upland bird populations on the MLWMA.
14. Sage grouse use the MLWMA but little is known about the local population.

15. Activities and management at MLWMA must reflect the needs of wintering and spring migrating bald eagles (listed as an endangered species).
16. The cause(s) for the non-use of the Peregrine falcon hack tower since 1992 is unknown. Activities and management at MLWMA must reflect the needs of Peregrine falcons.
17. The MLWMA should be managed for a broad diversity of wildlife species (game and nongame species).
18. Programs held at the MLWMA such as the pheasant hunts for youths, waterfowl day workshop, and International Migratory Bird Day are educational and sought by the public.
19. All MLWMA users need to be informed of the effects that permitted and prohibited recreation has on wildlife production on the area.
20. Activities and facilities on MLWMA should ensure to the extent possible, safety for the public and Department personnel.
21. The Department has received several comments related to livestock grazing on the MLWMA. These suggestions are: 1) The Department should use livestock grazing to control noxious weeds, 2) The Department should limit livestock grazing on the MLWMA, and 3) The Department should not graze livestock during the nesting season or in the fall to leave winter cover for pheasants.
22. There should be a vehicle access to the MLWMA from the north boundary.
23. Consider developing a fishery on the MLWMA.
24. Water needs to be managed on the MLWMA to meet needs of wildlife, hunting, and in accordance with agreements with other entities.

The following MLWMA Management Plan goals, objectives and strategies are intended to match the issues:

GOAL 1: Provide wildlife habitat that produces viable waterfowl and other wildlife populations.

Objective 1: Provide resting and feeding habitat for spring migratory waterfowl

Strategy 1: Provide deep water and shallow water feeding marshes during the spring waterfowl migration for swans, geese, and dabbling and diving ducks.

Strategy 2: Provide a minimum of 10 acres of grain crops during the spring waterfowl migration.

Strategy 3: Provide a minimum of 50 acres of grazing fields for spring migrating Canada geese.

Strategy 4: Survey the waterfowl food producing plants available in the marshes. Develop management strategies for waterfowl food plants.

Strategy 5: Investigate potential to grow additional food crops in the North Agricultural fields (Appendix C).

Strategy 6: Determine feasibility of flooding some food plots to attract spring migrating waterfowl.

Strategy 7: Continue closure of marshes to public use during spring migration.

Objective 2: Increase the current average nesting success of upland nesting ducks from 20% to a minimum of 30% in accordance with the Department's Waterfowl Management Plan 1991-95

Strategy 1: Convert 50 cropland acres of the North Agricultural Fields to nesting cover.

Strategy 2: Convert 30 cropland acres of the South Agricultural Fields to nesting cover.
Strategy 3: Monitor and manage nesting cover to produce high quality nesting habitat. Establish vegetation height-density transacts to determine nesting habitat quality.
Strategy 4: Investigate and implement rejuvenation methods to enhance deteriorated nesting cover as determined by height-density transects.
Strategy 5: Implement passive predator control methods (i.e. removing potential predator denning and nesting sites and increasing the quantity and quality of duck nesting habitat) during 1998-2001 in accordance with the Department's Statewide Five Year Waterfowl Plan.
Strategy 6: Conduct upland duck nesting success surveys.
Strategy 7: Implement active predator control methods if duck nesting success does not meet 30% minimum nesting success level after passive predator control methods have been implemented for three years as prescribed in the Department's Waterfowl Management Plan 1991-95.
Strategy 8: Consider using herbicide, biological agents, mowing, grazing and/or burning to control, decrease and/or eliminate state listed noxious weeds, as well as, undesirable weeds to increase the quality and quantity of nesting cover.
Strategy 9: Post closure of upland nesting areas to public use during duck nesting season (April 1st-July 15th).

Objective 3: Maintain the three year average spring goose pair count for the MLWMA to at least the minimum level in accordance with the Department's Waterfowl Management Plan 1991-95

Strategy 1: Evaluate the nesting use of existing goose nesting platforms and islands to determine if changes in management are necessary.
Strategy 2: Conduct aerial spring goose pair counts as funding from the Wildlife Bureau allows.
Strategy 3: Maintain, repair, and/or replace existing goose nesting platforms with labor provided by Adopt-a-Wetland groups, volunteers, Department reservists, and Department staff.
Strategy 4: Mow roads, dikes and other areas to provide pasture for geese.
Strategy 5: Add small forbs to grass mix plantings to provide additional forage for geese.
Strategy 6: Continue closure of marshes to public use during the goose nesting season (March 1- July15). (However, these dates may change according to seasonal variances.)

Objective 4: Provide pair, nesting and brood rearing habitat for over water nesting waterfowl (i.e. redhead duck, canvasback, ruddy duck, mallards and trumpeter swans)

Strategy 1: Stabilize water levels in the Main marsh by April 15th to prevent flooding of over water nests.
Strategy 2: Conduct over water nesting surveys in at least one cell of the Main marsh per year during 1999-2001 to determine species use and nesting success. Conduct over water nest surveys in Sandy marsh and East Springs marsh at least once each during 1999-2001 and 2004-07.

Strategy 3: Implement methods to open up marshes with a greater than 60:40 ratio of emergent vegetation to open water as indicated by vegetation monitoring.

Strategy 4: Survey the food producing plants available in the marsh system. Manage for plants producing waterfowl foods.

Strategy 5: Monitor annually for nesting trumpeter swans.

Strategy 6: Use biological agents, herbicides consistent with use in or near wetlands, prescribed fire and/or mechanical methods to control, decrease, and/or eliminate state listed noxious weeds in or near wetlands to increase the quality and quantity of nesting, brood rearing and feeding habitat.

Strategy 7: Extend the nesting season marsh closure to public activities from July 15th to August 15th to allow broods to fledge without public disturbances in the marshes.

Strategy 8: Manage water levels in marshes in accordance with agreements with adjacent landowners. Use sinkwells, pumping stations, and disposal to the Snake River to meet management goals for wildlife, recreational users, and terms of agreements.

Objective 5: Control avian botulism and cholera outbreaks on the MLWMA. Monitor for other die-offs.

Strategy 1: Use prescribed fire in marshes to remove the build up of decaying aquatic vegetation that may cause conditions that could trigger avian botulism outbreaks.

Strategy 2: Store irrigation water in the marshes if conditions indicate a botulism outbreak could occur. (Fresh water decreases the marsh water temperature and decreases the likelihood of botulism.)

Strategy 3: Monitor water conditions in the marshes, during July, August and early September as warning indicators of conditions leading to botulism.

Strategy 4: Monitor marshes during spring migration, especially snow goose migration, for sick, dying and dead birds as signs of avian cholera.

Strategy 5: Investigate and implement methods (i.e. draining a marsh) to control disease outbreaks. Methods may vary dependent upon existing circumstances.

Strategy 6: Ship samples of dead birds to the Wildlife Health Laboratory in Caldwell, Idaho and/or the National Wildlife Health Laboratory in Madison, Wisconsin to determine cause of death.

Strategy 7: Provide annual report of bird die-offs to the National Wildlife Health Laboratory for inclusion in the national database.

Strategy 8: Replace or add water control structures as needed to provide for optimal water level control in the marshes.

Strategy 9: Investigate and implement, if feasible, new methods (wells, storage bank water, others) to acquire more water for the marshes during the summer and fall months.

Objective 6: Provide secure habitat, thermal cover, and natural forage for 300 wintering elk and 20 resident deer on the MLWMA

Strategy 1: Use "let-down" fence along north and east boundary of the MLWMA when appropriate to avoid entanglement by migrating big game animals.

Strategy 2: Remove all non-essential fences, and adjust wire height on necessary fences, by 2001 to make fences easier for deer to cross.
Strategy 3: Provide 10 acres of food crops in the north agricultural fields.
Strategy 4: Include grass and forb species which are nutritious foods for big game in 50% of the permanent cover plantings to be seeded in the north agricultural fields.
Strategy 5: Provide a minimum of 500 acres of cattail/bulrush marshes and shelter belts for big game thermal cover.
Strategy 6: Plant 10 acres of shelter belts for thermal cover in the north and south agricultural fields by 2010.
Strategy 7: Provide hay as bait on the MLWMA during heavy snow winters to encourage big game to stay on the MLWMA and avoid depredation situations on private property.
Strategy 8: Provide secure thermal cover and wintering grounds by maintaining an over snow vehicle closure on marshes, agricultural fields and sagebrush/grasslands, and secondary roads on the MLWMA.
Strategy 9: Consider using biological agents, herbicides, mowing, prescribed fire, grazing and/or mechanical methods to control, decrease, and/or eliminate state listed noxious weeds and to improve forage and thermal cover for big game.
Strategy 10: Continue existing road closures on the MLWMA that provide secure winter and summer areas for big game.

Objective 7: Provide nesting, brood rearing and winter habitat for upland game (sage grouse, pheasant, gray partridge, mourning dove and cottontail rabbits).

Strategy 1: Provide sagebrush with a tall grass understory as nesting cover for sage grouse.
Strategy 2: Convert 50 acres of crop fields in the north agricultural fields to permanent nesting cover by 2005.
Strategy 3: Convert 30 acres of crop fields in the south agricultural fields to permanent nesting cover by 2004.
Strategy 4: Include palatable forb species in seed mixtures to be planted for nesting cover in agricultural fields.
Strategy 5: Plant grain crops as winter food for pheasants and partridge.
Strategy 6: Provide secure winter cover for sage grouse, pheasants, partridge and rabbits by maintaining an over snow vehicle closure on sagebrush/grasslands, agricultural fields, marshes and secondary roads on the MLWMA.
Strategy 7: Plant 10 acres of shelter belts in the north and south agricultural fields as nesting cover for mourning doves and winter cover for pheasants, partridge and rabbits by 2010.
Strategy 8: Continue monitoring the local sage grouse population by conducting a lek route on the MLWMA and adjacent public land.
Strategy 9: Continue monitoring the local pheasant population by conducting crow and/or brood surveys a minimum of every other year through 2004 on the MLWMA.

Objective 8: Provide migratory, breeding and/or winter habitat for species with special designations such as threatened and endangered species, and species of special concern

Strategy 1: Maintain existing Peregrine falcon hack tower and report sightings of Peregrine falcons to the Department's State Nongame coordinator.

Strategy 2: Maintain existing cottonwood, willow and poplar trees on MLWMA as perch sites for wintering and migrating bald eagles.

Strategy 3: Stabilize Main marsh water levels by April 15th to encourage nesting by trumpeter swans.

Strategy 4: Monitor annually for nesting trumpeter swans.

Strategy 5: Provide 500 acres of flooded marshes for white pelicans.

Strategy 6: Develop and implement strategies for future listed threatened and endangered species, and species of special concern, if and when listing occurs.

Objective 9: Provide migratory, breeding and winter habitat for nongame species

Strategy 1: Plant 10 acres of shelter belts of conifers and fruit bearing trees and shrubs in the north and south agricultural fields as migratory, nesting and winter cover for songbirds by 2010.

Strategy 2: Install 50 nest boxes for swallows and house wrens by 2005. Boxes will be constructed, installed, monitored and maintained by volunteers.

Strategy 3: Install 20 nesting boxes for American kestrel and saw whet owls by 2005. Boxes will be constructed, installed, monitored and maintained by volunteers.

Strategy 4: Maintain snag trees on the MLWMA portion along the Snake River for cavity nesting species.

Strategy 5: Encourage Idaho State University's Department of Biological Sciences to continue conducting surveys of colonial nesting waterbird species every five years.

Strategy 6: Install 10 bat boxes by 2005. Boxes will be constructed, installed, monitored and maintained by volunteers.

Strategy 7: Install one artificial nesting canopy for cliff swallows by 2005. Canopy will be constructed, monitored and maintained by volunteers.

Strategy 8: Maintain a minimum of one section, in two of the four Main marsh cells, in bulrush and cattails for colony nesting water birds.

Strategy 9: Survey the MLWMA for breeding raptors, songbirds and corvids.

Strategy 10: Investigate potential and install one osprey nesting platform on the MLWMA along the Snake river by 2007.

Strategy 11: Stabilize water levels in the Main marsh by April 15th to prevent flooding of over water nests.

Strategy 12: Maintain closure of marshes to public activities during spring migration.

Strategy 13: Extend the closure of marshes to public use from July 15th to August 15th to allow all water birds to fledge.

Strategy 14: Post closures for public notification.

<u>GOAL 2:</u> Provide a diversity of high quality recreational opportunities on the MLWMA consistent with the MLWMA mission statement.

Objective 1: Provide boat and foot access to the Main marsh cells by September 1999 to increase access to the marsh for MLWMA personnel use and public use.

Strategy 1: Install one walkway across the drainage channel to each marsh cell that does not have foot access.

Strategy 2: Install boat ramps in cells M-3 and M-4 of the Main marsh.

Strategy 3: Install one vehicle access across the channel to allow boat launching to either M-3 or M-4 of the Main marsh.

Objective 2: Provide flooded marshes for waterfowl hunting

Strategy 1: Have a minimum of 3 of the 4 main marsh cells flooded annually for waterfowl hunting or as water supplies allow. (Main marsh cells are filled during the winter and spring but can go practically dry during hot, dry summers).

Strategy 2: Investigate the feasibility of purchasing water from the storage bank system, by September 2000, for use in the Main marsh, Sandy marsh and East Springs marsh.

Strategy 3: Determine watershed of the marshes to be able to determine potential runoff and water available for the marshes.

Strategy 4: Use prescribed fire, herbicides, and/or mechanical methods to open up marshes with greater than 60:40 ratio of emergent cover to open water as indicated by monitoring methods.

Objective 3: Monitor harvest and hunter satisfaction during waterfowl and upland bird seasons

Strategy 1: Operate check stations to survey the number of hunters, harvest, and hunter satisfaction.

Strategy 2: Conduct public use surveys during waterfowl and upland bird seasons to survey the number of hunters, harvest, and hunter satisfaction. Surveys may be conducted by Department personnel, Department reservists and volunteers.

Strategy 3: Conduct a survey of pheasant hunters to determine if hunter congestion is a concern. Develop and implement methods to alleviate congestion if congestion is occurring.

Objective 4: Promote hunting and wildlife appreciation through education, information and workshops

Strategy 1: Conduct a waterfowl hunting workshop on the MLWMA at least once every three years with the cooperation and support from local Ducks Unlimited chapters, gun clubs, hunting clubs, local businesses, local communities and volunteers.

Strategy 2: Conduct an International Migratory Bird Day event at least once every three years with the cooperation and support of the local Audubon Club, state and federal agencies, local businesses and communities, and volunteers.

Strategy 3: Continue pheasant youth hunt if and as approved by the Idaho Fish and Game Commission. Organize event with the cooperation and support of the local Pheasants Forever chapter, local businesses, local communities and volunteers.

Strategy 4: Construct and install an information kiosk or self guided tour on the MLWMA by 1999 as funding allows. Solicit volunteer help and donated resources.

Strategy 5: Work with the local retriever dog club to investigate and develop, if feasible, a public use area on the MLWMA for training retriever and pointing hunting dogs.

Strategy 6: Continue giving tours of the MLWMA to scout, school, church and civic groups, as available labor allows without interfering with higher ranked management priorities.

Strategy 7: Continue to use Department reservists, volunteers, Adopt-a-Wetland groups, scouts, and community service personnel to accomplish work on the MLWMA. Work may include but is not necessarily restricted to biological surveys and manual labor.

Strategy 8: Maintain wildlife viewing opportunities along roadways in the MLWMA.

Strategy 9: Consider construction of handicap accessible waterfowl hunting and wildlife viewing blind.

Strategy 10: Monitor use on the MLWMA by non-consumptive wildlife users, develop and implement strategies, if necessary, to maintain non-consumptive use within the mission of the MLWMA.

Objective 5: Continue to provide furbearer trapping opportunity on the MLWMA.

Strategy 1: Continue required registration by trappers interested in trapping on the MLWMA as a way of monitoring trapping activities and harvest.

Strategy 2: Use trapping as one method to control muskrat damage on dikes. Investigate and implement other methods if trapping does not control muskrat damage.

Objective 6: Maintain existing fishing opportunity on the MLWMA.

Strategy 1: Continue to allow fishing along the Snake River bordering the MLWMA.

Strategy 2: Monitor fishing activities along the Snake River and MLWMA border to determine if activities conflict with other MLWMA priorities. Develop and implement methods to alleviate conflicts, if and when conflicts occur.

Strategy 3: Maintain existing nonfishery in marshes to deter conflict with waterfowl production goals on the MLWMA (see explanation given under MLWMA issue 23).

GOAL 3: Promote MLWMA activities that can have benefits to local communities. (Addressing Issue 1).

Objective 1: Invite local businesses to participate in planned public activity events on the MLWMA.

Objective 2: Continue to purchase materials and supplies from local businesses when economically possible, and as state purchasing code allows.

Objective 3: Continue to inform adjacent landowners of management activities on the MLWMA.

Objective 4: Maintain working relationship with the local fire department, Sheriff's office and emergency medical services.

GOAL 4: Maintain MLWMA facilities for the propagation of wildlife, and enjoyment and safety of the public and working personnel.

Objective 1: Maintain roads for seasonal use by public vehicles

Strategy 1: Maintain the paved and gravel road (old highway) along main marsh as unimproved status for non-winter use.

Strategy 2: Maintain as primitive status, the North Agriculture road to Jones Well road loop, Twin Wells road, and East Springs road for dry season use.

Strategy 3: Close roads as needed to maintain the integrity of roads, protect MLWMA equipment from vandalism and theft, protect wildlife and their habitat, prevent wild fires, control hunter congestion, and as deemed necessary by MLWMA management staff.

Strategy 4: Do not maintain the MLWMA roads during the winter months.

Strategy 5: Post closures, identified above, for public notification.

Objective 2: Maintain parking areas as day use only areas

Strategy 1: Mow designated parking areas.

Strategy 2: Sign areas where parking is permitted.

Strategy 3: Prohibit camping.

Objective 3: Minimize littering and vandalism on the MLWMA

Strategy 1: Encourage volunteers to continue trash cleanup.

Strategy 2: Do not allow camping on the MLWMA.

Strategy 3: Do not allow campfires.

Strategy 4: Conduct periodic night time enforcement patrols on the MLWMA.

Strategy 5: Cooperate with the Jefferson County Sheriff's Office on MLWMA patrols.

Strategy 6: Encourage MLWMA users to report violations of Department regulations.

Objective 4: Maintain and/or construct wildlife and user friendly fences where fences are necessary.

Strategy 1: Maintain "let down" fence along north and east boundary of the MLWMA for easy passage of migrating big game animals.

Strategy 2: Remove all non-essential fences by 2001.

Strategy 3: Develop cooperative fence maintenance agreements with adjacent landowners and agencies.

Strategy 4: Convert necessary fences to allow passage of big game.

Strategy 5: Install fence styles and gates at appropriate locations to provide public access to some fenced portions of the MLWMA.

Objective 5: Maintain the MLWMA residences, office, shops, out buildings, and compound in a safe and professional manner for the public and MLWMA staff.

Strategy 1: District habitat biologist and/or regional habitat manager will conduct an annual inspection of residences, buildings and compound area.

Strategy 2: MLWMA staff will continue to cooperate with the annual State safety inspection and annual fire extinguisher inspection as required.

Strategy 3: Establish and mark a public closure around the MLWMA headquarters compound when safety hazards warrant.

Strategy 4: Continue to post and enforce a no hunting safety zone around the headquarters compound, buildings and residences.

Strategy 5: Secure all hazardous materials at the MLWMA headquarters. Post safety signs regarding chemical use and storage as per state laws. Maintain appropriate records of potentially hazardous materials stored and used on the MLWMA as required by state or federal law.

Objective 6: Control the spread of noxious and undesirable weeds

Strategy 1: Continue to prepare and implement an annual weed control plan.

Strategy 2: Consider chemical, biological, and mechanical methods, as well as prescribed fire and grazing to control, decrease, eradicate, or prevent infestations of state listed noxious weeds and undesirable weeds on the MLWMA.

Strategy 3: Train MLWMA staff in the identification of noxious weeds and their control. Encourage attendance at local and regional weed control association meetings, interagency training opportunities, and herbicide seminars.

Strategy 4: Evaluate hay produced on the MLWMA to determine if the hay meets weed free certification standards. Monitor MLWMA users to determine and encourage the use of weed free hay on the MLWMA.

Strategy 5: Monitor weed control efforts by mapping weed infestations using global positioning system (GPS) techniques.

Strategy 6: Monitor weed control efforts and document results.

Strategy 7: Maintain herbicide spraying records in accordance with state laws.

Strategy 8: Prepare an annual summary of noxious weed control efforts on the MLWMA including recommendations for improving noxious weed control.

Objective 7: Prevent the spread of wildfire.

Strategy 1: Mow roadways and parking areas.

Strategy 2: Prohibit camping and campfires on the MLWMA.

Strategy 3: Maintain green stripping and fire breaks around Headquarters.

Strategy 4: Use prescribed fire for habitat improvement and to decrease the likelihood of wildfires.

Tex Creek Wildlife Management Area

The Management Plan for TCWMA has the following priorities, listed in order of importance:

- Big game winter range for elk and deer
- Upland game habitat for sharp-tailed grouse
- Public hunting
- Other game and nongame habitat
- Wildlife based recreation, nature viewing and education
- Maintain and improve habitat for Yellowstone cutthroat trout
- Public fishing opportunity

The Management Plan goals and objectives reflects these priorities, and includes:

Winter Habitat

GOAL 1: Provide high quality secure winter range habitat for migratory big game and high quality secure year round habitat for resident big game herds and other wildlife species on TCWMA.

OBJECTIVE 1: Continue implementing vegetation enhancements that benefit wintering (and resident) big game by providing high quality forage and browse, improving distribution and increasing security.

FIELD MANAGEMENT

Objective 1: Manage fields to provide high quality habitat, reduce depredations and improve distributions of elk and deer on TCWMA via a variety of techniques.

Strategy 1: Manage the Teton segment and the Bulls Fork segment to emphasize elk. This will help to reduce any natural competition between elk and deer by creating a spatial separation.

Strategy 2: Hay (through sharecropping) or mulch up to 400 acres a year in the core winter range to provide a more palatable, nutritious and attractive second growth.

Strategy 3: Fertilize up to 400 acres per year to improve the vigor of the fields and to make them more palatable to big game.

Strategy 4: Burn fields to improve field vigor and palatability to elk.

Strategy 5: Use domestic livestock grazing when appropriate to hasten spring green up and help with reseeding efforts by trampling seed into the ground.

Strategy 6: Pursue livestock grazing and other use trades consistent with the mission of TCWMA to secure critical wildlife habitat on adjacent or nearby private lands.

Strategy 7: Rejuvenate field stands every 8-15 years to provide a variety of fields with differing maturity classes.

Strategy 8: Consider adding strips of small grains to existing fields of permanent cover to attract big game onto the management area. This may become an important option as the Conservation Reserve Program matures and surrounding private lands revert back into grain production.

Strategy 9: Continue to sharecrop small grains on Ritter Bench until a suitable replacement for this highly attractive forage can be found. These grain fields provide deer with an excellent source of winter and spring forage and help to reduce potential depredations across the Willow Creek canyon on private property.

Strategy 10: Divide fields into smaller blocks by planting shrub blocks and shrub travel lanes. This will add diversity, winter cover and an alternate forage base. Deer in particular will benefit from additional browse availability and visual barriers may help reduce any competition that may exist between elk and deer. This may also encourage better distribution of big game animals, discourage large group sizes, reduce energy losses and reduce disturbances to wintering animals.

Strategy 11: Develop additional soil erosion control structures (long terraces or sediment basins for example) when and where they are deemed necessary to recover eroded areas and to collect moisture.

Strategy 12: Control noxious weeds chemically or mechanically along roadways. Use biological control methods for noxious weeds in all other areas if such means are available.

RANGELAND MANAGEMENT

Objective 1: Conduct rangeland management techniques when and where necessary and practical to enhance native big game winter and summer range:

Strategy 1: Manage aspen stands in a healthy and productive state.

Strategy 2: Manipulate bitterbrush/sagebrush stands to improve native forage for wintering big game, particularly deer.

Strategy 3: Use foliar fertilization where appropriate after testing and evaluation for efficacy.

Strategy 4: Implement soil microbe enhancement where appropriate after testing and evaluation.

Strategy 5: Plant native shrub seedlings where feasible on an ongoing basis.

Strategy 6: Collect shrub seeds from on or near TCWMA to be used in shrub establishment efforts whenever possible.

Strategy 7: Plant shrub seeds using a bulldozer with a track dribbler in some areas to evaluate this technique. If the technique proves valuable, expand the program especially on the Ririe segment.

Strategy 8: Encourage beaver activity to restore riparian areas which can provide important big game habitat.

Strategy 9: Establish sediment basins in rangelands to control erosion as appropriate pending evaluation of trial project implemented in 1996.

Strategy 10: Continue to seek opportunities to develop ponds to improve habitat diversity.

Strategy 11: Use livestock grazing when and where appropriate to improve forage and help establish wildlife plantings. Graze domestic livestock only when there are clear and measurable benefits to wildlife habitat and populations.

Strategy 12: Place large hay bales when and where appropriate into rangelands to help attract and disperse elk groups. This will reduce pressure on the core winter range for a longer period, and promote better utilization of existing forage in less traditional areas.

Strategy 13: Control noxious weeds chemically and mechanically along roadways. Use biological control (if available) in rangelands off of roads.

OBJECTIVE 2: Implement emergency winter feeding of elk and deer only when conditions combine to seriously threaten the herd or create serious depredations and as Department policy allows. Recognize that emergency feeding may cause as many problems as it solves. The concentration of animals and the potential for habitat destruction and disease transmission dictate that feeding occur only when necessary.

Strategy 1: Feed (when necessary) with hay produced on TCWMA to reduce costs and weed infestation.

Strategy 2: Use volunteers as much as possible to assist with feeding.

Strategy 3: Implement a variety of methods to obtain a wide distribution of feeding areas to keep the group sizes as small as possible. This will be dependent on snow conditions and elk movements.

OBJECTIVE 3: Ensure optimum wildlife populations for hunting and viewing for generations to come by creating secure habitat to protect wintering big game from unnecessary disturbance and limit depredations.

ACCESS MANAGEMENT

Strategy 1: Pursue an agreement with Bonneville County to maintain winter road closures through important winter range areas from December 1 through April 15.

Strategy 2: Sign roads that are open to motorized travel. Close unsigned roads to motorized travel.

Strategy 3: Close any new roads created for administrative purposes to motorized travel.

Strategy 4: Consider restricting all human entry (except administrative use) into TCWMA from December 1 through March 15 as conditions warrant.

Strategy 5: Strictly enforce the antler hunting closure from January 1 to May 1.

Public Use

GOAL 2: Provide recreational hunting opportunity, non-consumptive wildlife based recreation and public educational opportunities consistent with the mission of TCWMA.

OBJECTIVE 1: Provide hunting access and opportunity on TCWMA.

Strategy 1: Maintain motorized access on established and open roads for hunters while maintaining a quality hunting experience. Maintain current situation until future conditions warrant change.

Strategy 2: Maintain TCWMA roads in a low maintenance or unimproved status. (These roads may be impassable during inclement weather. Maintenance of roads owned by Bonneville County, which run through TCWMA, is the responsibility of the county.)

Strategy 3: Maintain some roads and trails as non-motorized use only to provide quality hunting experiences and to protect wildlife security, soils and vegetation.

Strategy 4: Maintain and improve working relationships between TCWMA and neighboring landowners to encourage landowners to allow recreational access to private property.

Strategy 5: Periodically reevaluate the demand for and levels of hunter access to TCWMA. Implement management changes accordingly with input from user groups. (As the demand for hunting opportunity increases, a permitting system may need to be implemented at peak demand periods in order to maintain the quality of the hunting experience, protect species from over exploitation and maintain a safe hunting environment.)

Strategy 6: Plan and implement big game hunting seminars on TCWMA to improve hunter skills and ethics and aid hunters in realizing the value of TCWMA.

Action 1: Coordinate this activity with local sportsmen and conservation groups.

Action 2: Obtain sponsors from sportsmen and conservation groups and local vendors.

Action 3: Prepare the initial seminar for late summer of 1998.
Action 4: Refine the program based on experience from 1998 and begin an annual or bi-annual event.

OBJECTIVE 2: Improve public access and opportunity for non-consumptive wildlife appreciation (non-consumptive uses of TCWMA will increase dramatically over the next 20 years. Birdwatching, wildlife viewing and photography, wildflower viewing, hiking, horseback riding and related activities are all expected and legitimate uses of TCWMA).

Strategy 1: Develop a non-motorized trail system to improve access to unroaded portions of TCWMA and provide wildlife based recreational opportunity.
Action 1: Develop interpretive signs on a portion of these trails to aid the public in understanding the area and its resources.
Action 2: Solicit cost-sharing partners to help fund the development of a trail system.
Action 3: Enlist volunteer organizations to adopt trails once they are established.
Strategy 2: Develop, by 1999, an interpretive sign at the Pipe Creek entrance to TCWMA to describe the area and some of the opportunities available.
Strategy 3: Develop interpretive signs for some of the roads and trails.
Strategy 4: Develop, by 1999, a wildlife viewing platform on the Indian Fork pond.
Strategy 5: Develop one to three photography blinds when and where appropriate as funding allows.
Strategy 6: Pursue the development of a variety of outdoor educational programs to be conducted on TCWMA as funding and manpower allows.
Strategy 7: Improve designated campsites by planting native trees for shade and providing a designated fire ring by 1998.
Strategy 8: Increase the number of designated campsites from six to as many as nine when and where appropriate as funding allows.
Strategy 19: Consider the addition of portable toilets as needed.
Strategy 10: Update the bird list for TCWMA by 1999.

Acquisitions

GOAL3: Expand TCWMA to accommodate the increased numbers of big game wintering on TCWMA and provide sufficient quantities of secure habitat.

OBJECTIVE 1: Acquire additional winter range for the increased number of elk and deer now supported by TCWMA, a buffer zone around the core winter range to protect it from developmental encroachment and a migration corridor connecting TCWMA with public lands to the south.

Strategy 1: Evaluate properties adjacent to TCWMA if and when they are for sale for their role in the wildlife management objectives of TCWMA. Attempt to acquire properties that have exceptional value to wildlife or to protect values currently managed by TCWMA.
Strategy 2: Seek cost-share partners to help purchase critical properties.

Sharp-tailed Grouse Management

<u>GOAL 4:</u> Improve sharp-tailed grouse habitat and populations on TCWMA.

OBJECTIVE 1: Increase the amount of sharp-tailed grouse winter habitat on TCWMA.

Strategy 1: Ensure that in shrub and thicket plantings for elk and deer, berry and bud producing species utilized by wintering grouse are included.

Strategy 2: Ensure that major activities to improve habitat for elk are coordinated with sharp-tailed grouse habitat management.

Strategy 3: Test leaving standing grain in strategic locations. Coordinate these efforts to avoid conflict with management objectives for big game. (Elk and deer are likely to key in on grain stands as well and this action may affect big game distributions.)

Strategy 4: Coordinate management activities to comply with Sharp-tailed Grouse Conservation Plan when finalized and approved.

OBJECTIVE 2: Maintain and improve nesting cover and brood rearing habitat for sharp-tailed grouse.

Strategy 1: Establish shrubs on field borders to provide additional nesting habitat for sharp-tailed grouse.

Strategy 2: Manage fields within one kilometer of known leks to leave at least 60% residual cover for fall.

Strategy 3: Continue to improve and restore riparian areas on TCWMA.

Action 1: Encourage beaver activity where possible.

Action 2: Continue to build small check dams where possible to rehabilitate wet sites.

Action 3: Plant riparian vegetation where appropriate.

Action 4: Minimize the use of pesticides on TCWMA. Follow Department and BOR policy for all pesticide use. Develop supplemental pesticide policies for pesticide use specific to TCWMA as necessary.

OBJECTIVE 3: Improve the Departments database on sharp-tailed grouse on TCWMA and surrounding lands.

Strategy 1: Continue to search for new leks on TCWMA.

Strategy 2: Search to monitor existing and mapped leks.

Strategy 3: Continue to search for new leks on lands surrounding TCWMA.

Strategy 4: Develop and implement a plan to monitor broods and habitat use on and in the vicinity of TCWMA.

Other game and nongame species

<u>GOAL 5:</u> Insure that management activities contribute to or at least do not seriously impact other species on TCWMA.

OBJECTIVE 1: Provide diverse habitats in sufficient quantities to fulfill the needs of all native species on TCWMA.

Strategy 1: Evaluate and implement habitat improvements for a diverse list of wildlife species using TCWMA. (Many projects previously mentioned may help to add diversity to TCWMA including: aspen treatments, shrub plantings, field management through grain production, haying, grazing or mulching, riparian restoration, erosion control, fire management, noxious weed control, fertilization, motorized trail restrictions and limiting the use of pesticides. These projects will enhance habitat for such diverse species as ruffed and blue grouse, gray partridge, waterfowl, neotropical songbirds, bats, amphibians and reptiles, beaver, rodents, raptors, bluebirds and more.)

OBJECTIVE 2: Seek opportunities to enhance nongame habitat.

Strategy 1: Continue to provide habitat structures for selected nongame species including bluebirds, American kestrels, and other species.

OBJECTIVE 3: Seek opportunities to enhance gamebird populations.

Strategy 1: Develop ponds and brood rearing habitat for waterfowl on Pipe Creek and Cove Creek.

Strategy 2: Evaluate impacts to gray partridge and adjust management techniques for projects potentially affecting gray partridge.

Strategy 3: Evaluate transplanting chukar partridge back onto TCWMA.Investigate ways to improve chukar survivability prior to transplants.

Strategy 4: Do not transplant pheasants on TCWMA. (Most winters conditions preclude pheasant survival.)

Strategy 5: Locate sage grouse leks on and in the vicinity of TCWMA.

Strategy 6: Protect habitat associated with all sage grouse leks found on TCWMA.

Strategy 7: Manage sage grouse habitat on TCWMA in accordance with the Departments Sage Grouse Management Guidelines when finalized and approved.

Strategy 8: Incorporate recommendations from current sage grouse research projects into management plans and projects.

Strategy 9: Identify and protect sage grouse wintering areas on the WMA.

Strategy 10: Cooperate with other agencies and landowners to protect wintering areas adjacent to the WMA.

OBJECTIVE 4: Maintain and enhance Yellowstone cutthroat trout spawning and rearing habitat.

Strategy 1: Manage use trade grazing to improve riparian habitat in Willow Creek, Tex Creek and Bulls Fork.

Strategy 2: Work with neighboring landowners to eliminate trespass cattle grazing in Meadow Creek and Indian Fork.

Strategy 3: Improve riparian zone condition on all portions of TCWMA through an ongoing program of planting riparian vegetation where appropriate.

Strategy 4: Encourage beaver activity in all tributaries to create habitat, store water to maintain downstream flows and reduce sediment loading in spawning areas.

IDF&G Predator Policy

On August 24, 2000, the Idaho Department of Fish and Game adopted a Policy for Avian and Mammalian Predation Management. The purpose of this policy is to provide the Department direction in managing predator populations consistent with meeting management objectives for prey species populations.

The Department recognizes predator management to be a viable and legitimate wildlife management tool that must be available to wildlife managers when needed.

Because the Department has a responsibility to preserve, protect, perpetuate and manage all wildlife in the state and to provide continued supplies of such wildlife for hunting, fishing and trapping, the Department must efficiently and effectively manage populations of predators as well as populations of prey species to meet management objectives.

Predator populations will be managed to assure their future recreational, ecological, intrinsic, scientific, and educational values, and to limit conflicts with human enterprise and values. Where there is evidence that predation is a significant factor inhibiting the ability of a prey species to attain Department population management objectives and the Department decides to implement predation management actions, the management actions will ordinarily be directed by a predation management plan.

Predator populations will be managed through habitat manipulation and/or predator removal as appropriate.

Idaho Code provides that predatory wildlife (i.e., coyotes, jack rabbits, skunks, starlings, and weasels) may be taken by any legal means at any time.

The Department will cooperate with the Animal and Plant Health Inspection Service (APHIS) Wildlife Services Program to address specific areas and species, particularly on private lands, in a manner consistent with the approved interagency Memorandum of Understanding.

Predator management may occur but is not limited to the following circumstances:

1. In localized areas where prey populations are fragmented or isolated, or where introductions or transplants of potentially vulnerable wildlife species (e.g., bighorn sheep, wild turkeys, sharp-tailed grouse, and others) has occurred or is imminent. Control may be intensive and of sufficient duration to allow transplanted animals and their progeny to become established and to become self-sustaining, or selective with removal efforts directed at specific offending animals.

2. In specific areas where managers are unable to meet management goals and objectives for prey populations due to predation. For example, in areas where survival or recruitment of game animal populations is chronically low and management plan objectives have not been or cannot be met and where there is evidence that predation is a significant factor, predator control may be initiated.

3. On wildlife management areas, especially those which are managed primarily to provide for production of specific species (e.g., waterfowl), provision of critical winter range, and those acquired and managed to provide specific mitigation for wildlife losses elsewhere.

Predation management plans will be prepared using the following outline:

- Definition of the problem. This definition must include a rationale for the proposed action. Such a rationale may include:
    - a proposed management action (such a the introduction of a small number of animals into suitable but unoccupied habitat) that may be adversely affected by the presence and predictable actions of predators,
    - a finding that approved wildlife management objectives are not being met due in large part to the actions of predators, or

- evidence that wildlife recruitment or populations has been or will be adversely impacted by the presence of predators.

- Risk Assessment. A discussion of the ramifications of the program, including potential effects on:
    - predator populations (i.e., will removal of avian roosting trees near a waterfowl production area affect non-targeted species, such as bald eagles? Will removal of specific individual animals result in vacant home ranges that will be especially attractive to transient predators of the same species?)
    - prey or benefiting species,
    - sportsmen and wildlife-associated recreational opportunity,
    - landowners in or near the impacted area, and
    - groups that will strongly favor or oppose the proposed action.
- Program. A discussion of the specific proposed treatment, including:
    - clearly-defined boundaries,
    - the species of predator(s) affected,
    - the prey or other species to benefit from any proposed action,
    - the method or techniques identified to address identified concerns, including habitat manipulation where appropriate and the method(s) of predator removal (if removal is a component of the program),
    - the objective and measure of success used to determine whether that objective has been achieved,
    - date of initiation of actions,
    - measurable objectives and monitoring plans to access program effectiveness, and
    - budget.

The chief of the Bureau of Wildlife and regional supervisor will review all predator management plans. The director must approve predator management plans. Predator management plans will be reviewed and evaluated annually.

Idaho Soil Conservation Commission

The general goals for ISCC are:

GOAL 1: Assist 51 soil conservation districts to deliver natural resource conservation programs.
GOAL 2: Coordinate work with participants of the Idaho Conservation Partnership
GOAL 3: Provide the Idaho State executive and legislative branches with information and education on commission goals and objectives
GOAL 4: Fulfill responsibilities under Idaho water quality law as the state designated agency for agriculture and grazing
GOAL 5: Function as state-level entity to implement Idaho's Agricultural Pollution Abatement Plan

Objective 1: Provide technical and programmatic assistance to soil conservation districts for conservation implementation delivery

Objective 2: Manage and coordinate Water Quality Program for Agriculture

Objective 3: Participate in the implementation of the Idaho Conservation Partnership Strategic Plan

Objective 4: Coordinate with the Office of Species Conservation, Bonneville Power Administration and Northwest Power Planning Council.

Strategy 1: Place and support SCC technical staff throughout Idaho in priority areas as funding allows

Strategy 2: Facilitate Idaho Association of Soil Conservation District technical staff in priority areas

Strategy 3: Coordinate responsibilities with Idaho Department of Agriculture

The State of Idaho provides cost-share money to private landowners through a state cost-share program, which is administrated by the Idaho Soil Conservation Commission (ISCC). The cost-share program was called State Agricultural Water Quality Program (SAWQP) but has been changed to Water Quality Program for Agriculture (WQPA). The East Side Soil & Water Conservation District (SWCD) has sponsored 5 of these water quality projects including Badger Creek, Meadow Creek, Tex Creek which are in the Willow Creek HUC 17040205 and Antelope Creek, Granite Creek which are in the Palisades HUC 17040104. The project goals are to reduce soil erosion and nutrients off private agriculture land by installing Best Management Practices (BMPs). The BMPs were installed by developing individual contracts with landowners and then cost sharing with them 50 to 75 percent depending on the BMP installed. In each project area there is a goal to get 75% of the critical acres under contract. The BMPs that are used are outlined in the Idaho Agricultural Pollution Abatement Plan 1991.

ISCC provides the following goals for the Palisades Reservoir and watershed. The Palisades Reservoir should never be drawn down to "empty". To run the dam's power turbines, the Bureau of Reclamation leaves 157,000 acre feet of water in the reservoir at all times. (One acre-foot is a football field covered by a foot of water.) This water, called a powerhead, is not reserved for irrigators and the reservoir should never drop below this level. Additionally, there is also 44,000 acre-feet of water below the turbine intake valves. This is called the dead pool, which will not be drained. So, when water officials discuss the reservoir is at a certain percentage or at zero irrigation storage, that percentage is above and beyond the required 201,000 acre feet of water (the water required for the powerhead and dead pool).

GOAL 1: Assure the 201,000 acre feet remain in the reservoir
GOAL 2: Improved technologies that monitor water releases
GOAL 3: Better communications between canal companies and Idaho Department of Water Resources (IDWR)
GOAL 4: Improved storage mechanisms for the irrigators
GOAL 5: Palisades Dam (from dam) to Heise flows: (SR3, March 2001)

Minimum flow	1500 cfs	October - March
Preferred flow	2200 cfs	October - March

Minimum episodic flow (occurs once every 10-15 yrs with a duration of up to 2 weeks) 38,000cfs or more Spring)

GOAL 6: From the dam at Ririe Reservoir to the Snake River, a minimum flows of 49 cfs from January through September, and 58 cfs from October through December for fishery maintenance. (SR3, March 2001)

Objective 1: Enough water for fish and irrigators

Objective 2: Sustain natural flora and fauna, and recreational activities at the Palisades Reservoir

Strategy 1: Use Jackson Lake water, the highest irrigation reservoir on the river

Less water could be taken out of Palisades at the same time more water is shipped from Jackson, slowing the decline in the Palisades pool.

Strategy 2: Begin conserving water for next year

Strategy 3: Encourage the farmers to plant less water intensive crops (like potatoes and corn); instead plant smaller grains.

Local Colloborative Groups

East Side Soil and Water Conservation District

GOAL 1: Protect the integrity of Idaho's waters as stated in the Clean Water Act, its amendments, the Idaho Agriculture Pollution Abatement Plan, and Idaho Code 39-3601 et.seq.

GOAL 2: Reduce water and wind erosion on cropland

GOAL 3: Improve conditions and trends of range, pasture and hayland

GOAL 4: Expand environmental awareness of the values and concepts of resource conservation

GOAL 5: Improve and enhance fish and wildlife habitats on riparian and wetland areas

Objective 1: Reduce nonpoint source pollution in streams and watershed of priority in the District

Objective 2: Apply resource management systems to reduce erosion

Objective 3: Improve forage conditions on 10,000 acres of range, pasture and hayland

Objective 4: Develop meetings, events, workshops, presentations, and demonstrations to promote resource conservation

Objective 5: Collaborate on conservation projects to improve fish and wildlife habitat with landowners, local, state and federal agencies

Jefferson Soil and Water Conservation District

GOAL 1: Reduce weed infestations in the district

GOAL 2: Improve irrigation water management

GOAL 3: Reduce wind erosion

GOAL 4: Promote improved water quality by complying with Idaho Water Quality Law and Federal Clean Water Act

GOAL 5: Improve awareness of conservation

Objective 1: Support South Fork Mitigation Weed Control Program

Objective 2: Improved irrigation water management

Objective 3: Assist producers with dairy and animal feed operations waste management

Objective 4: Provide administrative support to the South Fork Watershed WAG

Objective 5: Continue environmental education program

Strategy 1: Support high priority areas for weed control, wind erosion control and improved irrigation management with technical and financial assistance

Strategy 2: Provide technical assistance to landowners with Confined Animal Feeding Operations (CAFOs) and Animal Feeding Operations (AFOs)

Strategy 3: Provide conservation programs: conservation tree sale program, conservation windbreaks, workshops, presentations and environmental education in schools

Madison Soil and Water Conservation District

<u>GOAL 1</u>: Reduce nonpoint source pollution on irrigated and dry cropland to tolerable limits

<u>GOAL 2</u>: Improve irrigation water management

<u>GOAL 3</u>: Continue efforts to improve fish and wildlife habitat

<u>GOAL 4</u>: Identify and develop management systems to address animal waste as related to surface and ground water quality

<u>GOAL 5</u>: Promote control of the noxious weeds

Objective 1: Continue to support the use of USDA Farm Programs for conservation

Objective 2: Seek program and financial assistance to implement BMPs

Objective 3: Improve irrigation water management

Objective 4: Promote CRP, EQIP, and WHIP with cooperators for wildlife habitat improvement

Objective 5: Coordinate planning and implementation of animal waste management systems

Objective 6: Participate in Upper Snake Coordinated Weed Management Area program

Strategy 1: Continue to work the Idaho Department of Fish and Game, Idaho Wildlife Council and Sage Grouse Local Working group on habitat issues.

Strategy 2: Coordinate water quality programs in 303(d) listed areas; lead BMP implementation

Strategy 3: Encourage and provide assistance for improve irrigation water management

West Side Soil and Water Conservation District

<u>GOAL 1</u>: Reduce wind and water erosion on highly erodible irrigated cropland

<u>GOAL 2</u>: Protect the integrity of Idaho's waters as stated in the Clean Water Act, its amendments, the Idaho Agriculture Pollution Abatement Plan, and Idaho Code 39-3601 et.seq.

<u>GOAL 3</u>: Improve water management on irrigated cropland

<u>GOAL 4</u>: Expand environmental awareness of rural and urban adults and youth

<u>GOAL 5</u>: Improve and protect fish and wildlife habitats

Objective 1: Reduce wind and water erosion to tolerable level, "T."

Objective 2: Promote agricultural BMPs in accordance with Idaho's Agriculture Pollution Abatement Plan

Objective 3: Increase overall irrigation efficiencies on irrigated lands

Objective 4: Reduce potential risk of contamination to gourd and surface water by pesticides and fertilizers

Objective 5: Inform landowners about the costs of resource problems and the benefits of conservation

Objective 6: Improve and increase wildlife habitats

Strategy 1: Promote and implement state and federal incentive based programs for water and wind erosion control

Strategy 2: Consult in TMDL and implementation plans for 303(d) water quality limited streams

Strategy 3: Provide technical assistance for irrigation system maintenance and improved efficiency

Strategy 4: Implement environmental education outreach programs

Strategy 5: Promote protection and development of fish and wildlife habitat areas on private lands

Research, Monitoring and Evaluation Activities

BPA-funded

Snake River Native Salmonid Assessment Research (Project No. 980002)

This project is conducted by the Idaho Department of Fish and Game. 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.

Project Description: 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, including the Weiser, Owyhee, Payette, Boise, Goose, Raft, Rock, Bannock, Portneuf, Blackfoot, Willow, South Fork Snake, and Teton. Genetic samples of redband trout and Yellowstone cutthroat trout have been collected at a total of 155 sites, and results are available for 15 sites. Water temperature has been measured and/or obtained from other agencies at 97 stream sites across the middle and upper Snake River provinces. A comprehensive database has been developed that includes data on native salmonid abundance and distribution, genetic samples, habitat summaries, and herpetofauna observations. This project is also evaluating the effectiveness of electrofishing to remove non-native brook trout as a means of reducing threats to native salmonids; after three years of removal, the brook trout population has not been reduced (Meyer 2000; Meyer and Lamansky 2001, in progress). Other removal techniques (e.g., Young 2001) may be evaluated in subsequent years in an attempt to find a more viable method of removing non-native salmonids where the long-term persistence of native salmonids is being threatened by the presence of exotic species.

Because the inventorying phase is ongoing and not completed for any one species (Yellowstone cutthroat trout will be completed in 2002), analysis to date for the most part has been preliminary and cursory (Meyer 2000; Meyer and Lamansky 2001). However, in a study of Yellowstone cutthroat trout densities across southeast Idaho, densities remained unchanged and fish size structure improved over the last 20 years, suggesting that at least at some locations in the middle and upper Snake River provinces, native salmonid populations may be relatively stable (Meyer et al. in review). Maturity of Yellowstone cutthroat trout has been determined for a number of locations across southeast Idaho to assess effective population size for extinction risk analysis in Idaho.

Southern Idaho Wildlife Mitigation (Project 1995-057-01)

This project is conducted by IDFG and the Shoshone-Bannock Tribes to implement projects to achieve full mitigation for construction and inundation losses in southern Idaho from development of the federal hydropower system. Monitoring and evaluation actions take place on all acquisitions and easements administered by project managers. The Habitat Evaluation Procedure (HEP) is used to estimate habitat value for protection and/or enhancement credit to BPA. Photopoints and transects are used to monitor changes in vegetation and habitat. Neotropical birds are monitored using established protocols.

Non BPA funded

National Park Service, Grand Teton National Park

Sensitive, threatened and endangered species inventory and monitoring. -- The requirement for the National Park Service to conserve rare species is specifically stated in

NPS Management Policies: "Consistent with the purposes of the Endangered Species Act, the National Park Service will identify and promote the conservation of all federally listed threatened, endangered, or candidate species within park boundaries and their critical habitats...Active management programs will be conducted as necessary to perpetuate the natural distribution and abundance of threatened or endangered species...The National Park Service also will identify all state and locally listed threatened, endangered, rare, declining, sensitive, or candidate species that are native to and present in the parks, and their critical habitats...(p. 4:11).

Furthermore, *NPS-77 Natural Resources Management Guideline*, states as the first major program objective: "Inventory and monitor sensitive, candidate, and listed species. This includes mapping species' distribution in the park, identifying critical habitats (if any), and determining numbers of individuals, threats to the species, and population trends" (p. 270).

Currently, the Park contains small breeding populations of one endangered (peregrine falcon) and two threatened species (grizzly bear and bald eagle). One species listed as experimental (gray wolf) uses the Park on occasion, but is not a resident at this time. Two additional resident species, the lynx and northern goshawk, are under review for listing by the U.S. Fish and Wildlife Service. The Park lists 33 avian species and 9 mammals as "Species of Special Concern". The Wyoming Natural Diversity Database lists 66 "Plant Species of Concern" as occurring in the Park.

Threatened and Endangered (T & E) Species

As a rare species, the bald eagle has the longest history of monitoring within Grand Teton National Park, with efforts beginning in 1968 (detailed histories of all species addressed can be found in the Resources Management Plan). Studies were conducted on the population by various researchers until 1989. Since that time, Park biologists have maintained a monitoring and banding program in coordination with the U.S. Fish and Wildlife Service and the Wyoming Game and Fish Department (WGFD). Bald eagle territories increased from 3-4 in the Park in 1968 to 10 in 1997.

The Park was active in a peregrine falcon reintroduction program from 1980 to 1986, with 52 birds released during a hacking program. The first documented nesting attempt was observed in 1987. That territory has been active every year since that time. In 1990 and 1991, extensive surveys for peregrines were performed, funded by a regional NRPP initiative. No additional eyries were found. A new territory was located in the Park in 1995, and a third in 1996.

Grizzly bear research and monitoring within the Park has been conducted primarily by WGFD through the Interagency Grizzly Bear Committee (IGBC). In 1994, the first grizzly bear mauling in the Park occurred, when a runner was attacked injured in the Two Ocean Lake area. In 1995, grizzly bears were responsible for several domestic cattle depredations within Park boundaries in the Elk Ranch grazing allotment. The following year (1996), depredations continued, and the offending grizzly bear was caught and killed by WGF in accordance with IGBC guidelines. Three additional grizzly bears were caught by Park biologists, one for human habituation, and two for habituation to human attractants. In 1997, grizzly bears again preyed upon domestic cattle in the Elk Ranch allotment, however losses were acceptable and no action was taken. During this situation, WGFD personnel verbally stated that they were relinquishing all responsibility for grizzly bear management within Park boundaries due to staffing constraints. A second grizzly bear mauling occurred in the fall of 1997 in the Parkway during the moose archery season.

Gray wolves have been documented within the Park prior to the 1994 reintroduction effort in Yellowstone National Park, however they did not become established. In 1996, a pair reintroduced in Yellowstone began using areas immediately adjacent to the Park in Buffalo Valley, but finally settled down north of Dubois. In 1997, an entire pack from the Heart Lake area traveled south and began using areas within Park boundaries in the Two Ocean Lake area. They have since returned to Yellowstone, but are expected to use Park lands on a more frequent basis now that they are familiar with the area. Wolf biologists expect pack establishment within Park boundaries in the unspecified future.

Sensitive Species

Monitoring of a variety of sensitive species has occurred in the Park since the early 1960's when the monitoring of trumpeter swan nests began. Surveys of great blue heron rookeries began in 1968, and the monitoring of osprey nests began in 1972, and both continue on an annual basis. A monitoring program for amphibians was begun in 1991 by an outside researcher, but has since been maintained by Park biologists. Annual harlequin duck surveys began in 1984 but ceased in 1995 due to staffing constraints. Annual sage grouse counts have occurred since the late 1980's. A radiotelemetry research project on bighorn sheep was initiated in 1994 and is maintained by Park biologists, along with helicopter and ground surveys.

Sensitive Species Processes

Aside from formal surveys, additional information on sensitive species is collected through the Park Natural History Field Observation reporting process whereby visitors and staff report observations of sensitive species. Significant observations are followed up with verbal or written interviews and/or site visits to better assess to accuracy and importance of the report.

The current Inventory and Monitoring (I & M) program is the primary responsibility of the Project Biologist, with direction from the Senior Wildlife Biologist. Since 1995, a Resource Management Biologist has not been availed to the park. These duties (both I & M related and otherwise) have been reapportioned upon existing staff, reducing the effectiveness of the current I & M program.

Further Park status changes include an increase in:

a) the number of T & E species (the addition of the gray wolf, possible additional listing of the lynx and the northern goshawk)
b) the population of all resident T & E species (grizzly bear, bald eagle, peregrine falcon)
c) the complexity of management of T & E species (grizzly bear depredations, maulings, human habituation)
d) the complexity of non-T & E wildlife related issues (brucellosis, bison management, black bear management)

Due to decreased staffing and funding levels, some I & M projects had to be eliminated, while the information gained in other projects was severely reduced, resulting in inadequate information in some instances. For example, following the periodic changes in nest trees, the locations of two of the ten bald eagle nests in the Park are currently unknown due to insufficient resources to locate the nests. Although peregrine falcons are expanding in the Park, thorough surveys to search for new sites have not been instituted since 1991.

Idaho Department of Environmental Quality

Programs to assess water quality -- Monitoring activities in Idaho have focused on beneficial uses and ambient water quality trends. Data from Idaho DEQ's monitoring are used to document the existence of uses, the degree of use support, and reference conditions. This monitoring is made up of primarily the collection of biological and physical data. The ambient trend monitoring network is designed to document water quality trends at the river basin and watershed scales through the collection of mainly water column constituent data. Biological parameters are being added to this network as well. Fifty-six monitoring stations are currently sampled on a rotating basis to provide data for water quality trend assessment.

The Idaho Department of Environmental Quality is engaged in ongoing research to obtain the most recent and site specific scientific knowledge available for the purposes of refining water quality criteria. DEQ also monitors chemical, physical and biological components of the aquatic environment through the Beneficial Use Reconnaissance Project. DEQ continues to refine the water body assessment guidance for evaluating BURP data. The primary assessments are designed to determine the support status of the two main aquatic life beneficial uses, Cold Water Biota and Salmonid Spawning.

Jackson Fish Hatchery

Currently, evaluations for individual stocking programs are underfunded and are accomplished only if incorporated into a larger, overall study of the habitat or watershed. This information would determine if the wild trout program has benefits over and above the annual production costs or, if the extra costs of this program exceed the benefits derived.

Safari Club International

Mule Deer Recruitment in Southern Idaho -- The SE Idaho Chapter of Safari Club International partnered with the Idaho Department of Fish and Game (IDF&G) for this project. The study area is in Game Management Units 54, 55, 56, 57, 70, and 73A located in the Upper Snake subbasin, with additional studies in Game Management Unit 67 in the Upper Snake Headwaters subbasin and Game Management Units 59 and 59A in the Upper Snake Closed basin. The study period is from 1998 through 2003. The Idaho Chapter of Safari Club International, to date, has donated $10,000.00 and has supplied hundreds of man hours trapping deer for the study. $125,000.00 has been leveraged towards this study through the U.S. Forest Service, the Bureau of Land Management, National Shooting Sports Foundation, National Fish and Wildlife Foundation and Safari Club International. This research has 2 major emphases that will identify factors that influence deer populations in Southern Idaho. The first will determine the effect of predation on mule deer population characteristics such as population growth, recruitment, and mortality. This will include an evaluation of the effectiveness of coyote control as a means to increase deer populations. The second emphasis will identify habitat factors influencing population levels of mule deer in southern Idaho. Without a thorough understanding of how deer and predator populations interact on a large scale, management of deer populations on the typical big game unit level is difficult.

Sharp-tailed Grouse Lek Inventory -- This project is a partnership between the SE Idaho Chapter of Safari Club International and the Idaho Department of Fish and Game (IDF&G), and the Southeast Idaho, Jefferson County and Upper Snake River Chapters of Pheasants Forever. The study area is in portions of Bingham, Bonneville, Fremont, Jefferson, Madison and Teton counties located in the Upper Snake Headwaters subbasin and the Upper Snake Closed Basin. The study period is scheduled for March and May 2002. The Idaho Chapter of Safari Club International with matching grants and private contributions has donated $6,500.00 towards this study. An additional $6,250.00 has been pledged by the study partners. Biological aides will be hired by the IDF&G to systematically ground search suitable habitat in the identified study area. Additional survey personnel will include Idaho Chapter volunteers. Columbian sharp-tail grouse (*Tympanuchus phasianellus columnianus)* leks will be located and mapped, and the number of birds occupying will be recorded. This project will provide scientifically collected information on distribution and relative abundance of sharp-tailed grouse in a portion of eastern Idaho where only limited data currently exists. This data will be used to develop population management recommendations and prioritize habitat conservation areas.

United States Geological Survey

Interior Columbia Basin Ecosystem --The USGS provides earth science information to the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) project staff, which is completing a scientific assessment of all land in a seven-State region of the Columbia River Basin east of the Cascade Mountains. Goals of the scientific assessment are to understand the development and current state of land, water, plants, animals, and society within the basin and to model future conditions that could result from different management alternatives and disturbances. In coordination with the scientific assessment, the USFS and BLM staff also is developing regional management strategies for Federal lands in the Basin. Goals of the management strategies are to maintain and improve ecological integrity by promoting the natural processes that operate in healthy aquatic, terrestrial, and landscape ecosystems and to provide sustainable flows of resources from Federal lands. Mineral-resource potential of the Interior Columbia Basin is a partial indicator of the potential for economic development, land use, and environmental hazards. USGS scientists have provided detailed digital geologic, hydrologic, and mineral-resource information to USFS and BLM staff biologists, botanists, forest ecologists, sociologists, and economists; participated in systems modeling; provided data to be used by the agencies in the development of management alternatives; and contributed to several reports.

Hydrologic and Water-Quality Data-- Idaho has seven major river basins--the Kootenai, the Pend Oreille, the Spokane, the Clearwater, the Salmon, the Snake, and the Bear. Rivers in these basins supply surface water for agriculture, industry, hydroelectric-power generation, recreation, fish and wildlife habitat, and other uses within Idaho and in adjacent States. Aquifers supply ground water for these same uses in many parts of the State. Water from geothermal aquifers also is used for space heating. Hydrologic and water-quality data are critical for the day-to-day administration and management of water resources; for determining the extent and severity of droughts; for characterizing and predicting conditions during floods; and for monitoring the effects of people's activities on streamflow, ground-water supply, and water quality. The data also are essential to plan development activities and to carry out interpretive studies that provide information for making decisions about water issues that affect millions of people.

The USGS, in cooperation with the Idaho Department of Water Resources, the Bureau of Reclamation, and more than 20 other local, State, and Federal agencies, collects surface- and ground-water and water-quality data at numerous sites throughout the State. For example, streamflow discharge was measured at 279 gaging stations (Figure 48); water-quality data were collected at 124 of those stations in 1996 (Figure 49).

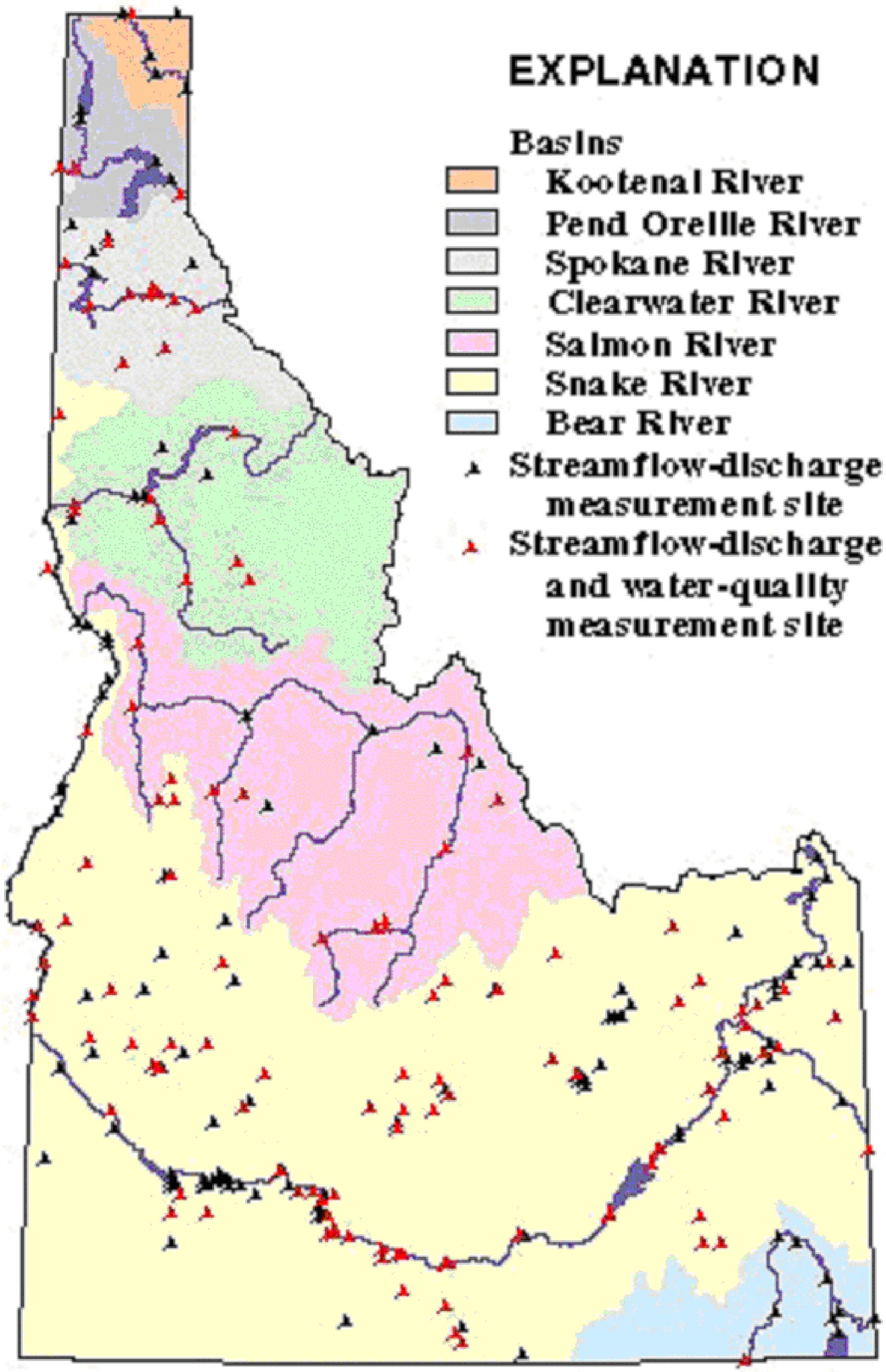
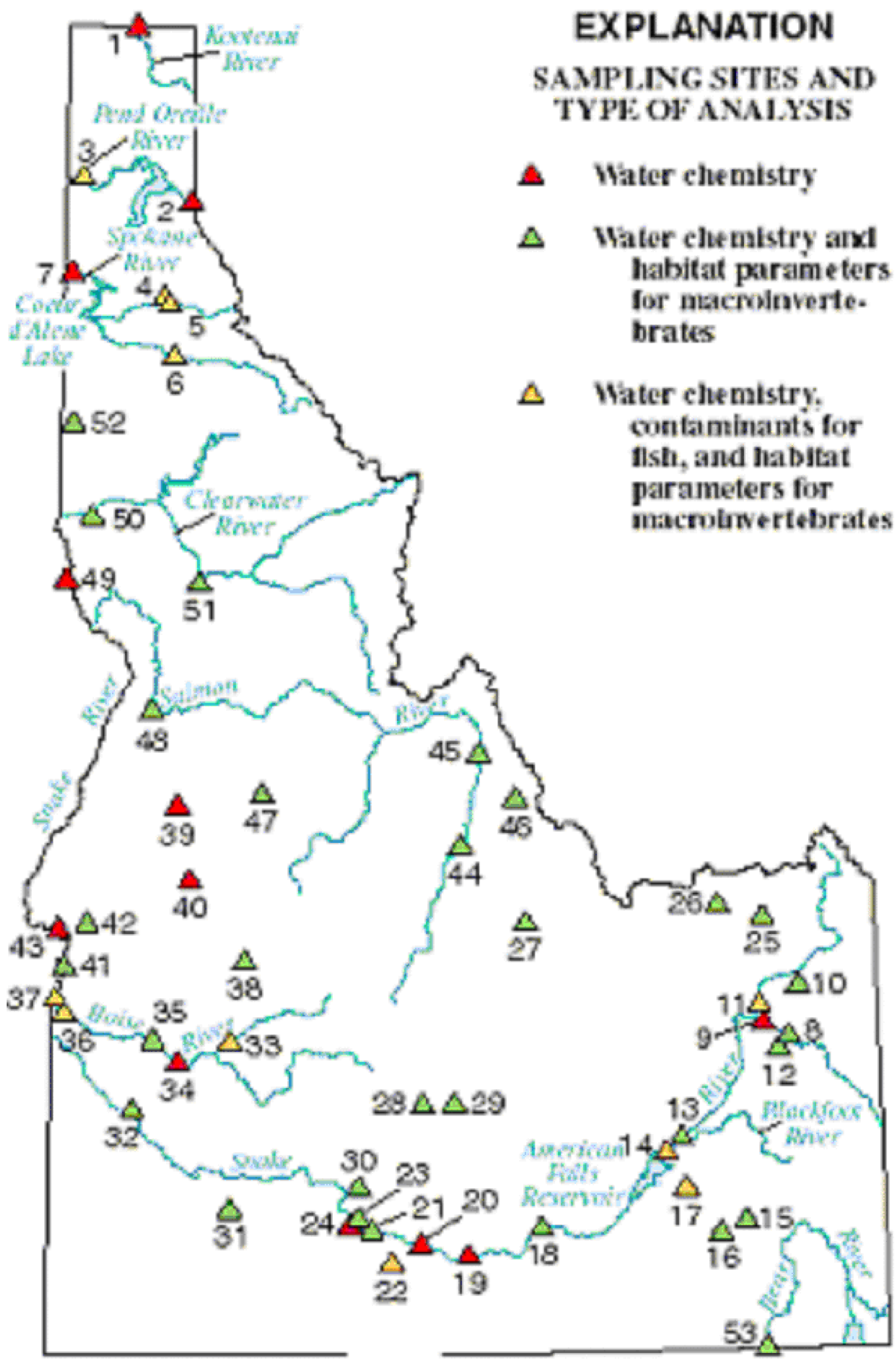


Figure 48. River Basins and sites in Idaho where streamflow and water quality were measured by USGS in 1996.



Legend

8 Snake River near Heise
9 Snake River at Lorenza
12 Willow Creek near Ririe
25 Camas Creek at Red Road
26 Beaver Creek at Spencer
27 Big Lost River near Chilly

Figure 49. USGS Water Quality Sampling in Idaho, 1996.

Selected Ongoing or Recently Completed Research Projects

An investigation of coyote (*Canis latrans*) habitat use-movement patterns, and mortality in developed and undeveloped land in Jackson Hole, Wyoming -- A study of coyote (*Canis latrans*) habitat use-movement patterns, and mortality in Grand Teton National Park and the suburban-agricultural areas surrounding Jackson, WY was conducted between 15 August 1999 and 15 August 2000. This research focused on the influence of human development, habitat type, topography, and simulated wolf presence on fine scale coyote habitat use and movement (travel paths). This project also investigated the causes of mortality for marked coyotes, and compares the spatial habitat use, gender, social status, and activity cycles of coyotes that died vs. coyotes that survived. Eight coyotes were captured and fitted with radio collars equipped with activity and mortality sensors to add to the twenty-one surviving coyotes collared by Nate McClennen and Rachel Wigglesworth in 1998. There were a total of fifteen collared coyotes in the suburban-agricultural area and fourteen collared coyotes in Grand Teton National Park and adjacent areas of Bridger Teton National Forest. Marked coyotes were located twice a week by radio telemetry to determine habitat use patterns, response to wolf urine scent grids, and mortalities. Marked coyote movements were tracked weekly using short interval (5-15 minute) relocations to determine patterns of travel paths. During the winter track transects were skied weekly and coyote trails were backtracked and mapped using hand held GPS units to determine travel path patterns. Data analyses on coyote travel paths suggest that coyotes use travel paths mainly in sagebrush-grasslands or forest shrub-grass edge areas. Coyotes frequently used trails and roads, south facing slopes, and ridges when moving long distances. We also observed frequent use of riparian corridors to move between open meadows mainly in the suburban-agricultural area. There is some evidence that suggests coyotes selectively travel fences and irrigation ditches for long distances in agricultural areas. The data on coyote locations suggests some avoidance of wolf urine scent grids in the National Park area, but not in the suburban agricultural area. We have recorded 9 mortalities (31%) of 29 marked animals. Human caused mortalities made up 88% of the overall mortalities. The influence of spatial habitat use, gender, social status, and activity on mortality is currently being assessed. Radio telemetry locations and travel paths, as well as snow tracking will continue at least through spring of 2001. The goal of this project is to provide information on the baseline parameters of the coyote population in Jackson Hole that can be used in the future to determine what if any impacts wolves, and human developments may have on coyotes in Jackson Hole.

An investigation of wild ungulate impacts on landbirds and their upland aspen habitat in Jackson Hole, Wyoming. --The purpose of this study is to compare the consequences of varying densities of elk (*Cervus elaphus*) and other wild ungulates on:

1) landbirds (i.e., smaller, upland-nesting, nongame species) in upland aspen communities and
2) habitat parameters within these aspen communities across Jackson Hole, WY.

Recent studies indicate

1) wild ungulate browse-induced impacts on landbirds in this and other regions and
2) a decline in the condition of woody vegetation on the USFWS National Elk Refuge (NER). Fieldwork seasons include the summers of 2000 and 2001.

We selected 34 upland aspen stands satisfying a suite of biotic and abiotic criteria, and their location across a broad spatial scale should permit inference into the consequences of browsing over a range of ungulate densities and management jurisdictions. The unique challenge of this study lies in establishing a link between ungulates and birds that may or may not share spatial scale, yet generally do not share temporal scale. To this end, in addition to comparisons of avian and habitat parameters among all stands (e.g. habitat use analyses) and among categories defined by management jurisdictions, comparisons will be made at multiple spatial scales and among categories of aspen stands defined by differential proximate evidence of ungulate use (e.g. twig-browsing and bark-stripping). Analyses underway include comparisons among these categories of, for instance, avian diversity and abundance by nesting guild, understory vegetation parameters, and rates of aspen regeneration and recruitment to overstory. We designed methodologies to provide insight into the cause of hypothesized aspen stand area decay and its incremental consequences on landbird species. Landscape-scale analyses will consider the role of aspen stand size, adjacent landscape composition and stand proximity to feed sites in structuring avian communities. Findings of this study will contribute to an EIS documenting the broader effects of the NER supplemental feeding program, as well as to the NER Comprehensive Conservation Plan required by the USFWS National Wildlife Refuge Improvement Act of 1997. The longevity, mobility and diversity of responses to environmental change characteristic of bird species provide motivation for the study of bird communities as early indicators of habitat decline impacting entire faunas.

<u>Diet and habitat use of coyotes in developed and undeveloped areas of Jackson Hole, Wyoming</u>.-- Coyotes (Canis latrans) are ubiquitous. They adapt extremely well to most environments, including areas dominated by people. Coyotes have been moving into urban and suburban areas in increasing numbers as human development encroaches upon open space. The purpose of this study was to examine the differences in diet and habitat use in coyotes that live in suburban and agricultural areas of Jackson Hole, Wyoming with coyotes that live in undisturbed areas of Grand Teton National Park. Coyote scat was collected and washed and will be dissected to determine prey use. Additionally, small mammal live traps were used to determine if prey availability was different between the two areas. Habitat use was measured by using radio telemetry to determine which habitat types coyotes were located in most frequently. Blood was drawn from the coyotes that were captured. Serological tests found that coyotes had been exposed to tularemia, leptospirosis, plague, canine distemper, and brucellosis. The data collected during this study may also be used as baseline data from which to compare how coyote populations might change as wolves (Canis lupis) continue to move into Jackson Hole.

<u>Effects of suburban development on the home range and activity of the coyote (*Canis latrans*) in Jackson Hole, Wyoming</u>.--Despite substantial research on coyotes, few studies have compared coyote ecology in protected areas such as national parks with adjacent areas of suburban and agricultural development. Research in this area could potentially aid in the understanding and management of wildlife found at the interface between developed and undeveloped areas. Twenty-seven coyotes were captured and radio-collared in Jackson Hole, Wyoming during the spring and fall of 1998. Eleven coyotes resided in the suburban/agricultural areas in the south end of the valley and 17 coyotes were located in Grand Teton National Park. Home ranges were calculated from

1,966 relocations collected from July 1998 through August 1999. Resident coyote home ranges were significantly smaller in the developed areas as compared to the national park during pair formation/gestation and pup rearing seasons. Predictive models indicated that core home range size decreased as suburban development increased and transient coyotes tolerated or were relegated to more developed areas during all biological seasons. Activity of coyotes in the suburban/agricultural areas was significantly lower during the diurnal hours as compared to the coyotes in undeveloped areas. As development continues in Jackson, open space will be reduced, forcing coyotes and other adaptable species closer to human activity. This data suggested that coyotes in suburban/agricultural lands of Jackson Hole adapted to increased human presence by reducing core area size, relegating transient coyotes to higher density developments, and reducing diurnal activity.

The Jackson Hole pronghorn and Sublette mule deer studies -- Western Wyoming is home to the largest, most diverse ungulate populations in the western states. Maintenance of these populations and protection of their habitats is a primary concern among public and private sectors. The objective of this cooperative research effort is to gather baseline movement and distribution data to assist agencies with management decisions and minimize potential negative effects of natural gas development on big game winter ranges and migration corridors. The pronghorn study focuses on a small (~300) herd that summers in the Jackson Hole area and annually migrates ~150 miles to winter in the Green River Basin. We captured and radio-collared 35 pronghorn in Grand Teton National Park and the Gros Ventre River drainage. Telemetry work identified the unusually long migration route and seasonal ranges this unique pronghorn population depend upon. The mule deer project centers around the Mesa and other winter ranges near Pinedale, where 160+ radio-collars were distributed. Subsequent monitoring has documented extremely long (>85 miles) north by northwest movements into 5 different mountain ranges.

Sage grouse seasonal habitat use in Grand Teton National Park **--** The Jackson Hole sage grouse population has experienced a 63% decline since 1995, based on maximum rooster counts on known leks. The current population is 400% below its peak in 1950, and is estimated at less than 175 individuals. The current population needs to increase by 133% to reach viable population levels. It is imperative that potential causative factors be investigated before this population is extirpated. A 3-year project funded by the Wyoming Game and Fish Department and the National Park Service examining seasonal habitat selection and survival of sage grouse in Grand Teton National Park was initiated in 1999. The project is concerned with identifying seasonal habitat inadequacies, important seasonal ranges, and seasonal survival throughout the park. PI: Stanley Anderson RS(s): Matt Holloran, Alison Lyon MFA(s): WY Game & Fish Dept., National Park Service

Determination of factors affecting natural recruitment of Snake River cutthroat trout in spring streams tributary to the Salt River. Four spring streams were studied to provide information on the value of spring streams and habitat improvements on reproduction of the Snake River cutthroat trout in the Salt River Valley, Wyoming. Two of the streams (Christensen and Perk) have had a number of habitat improvements and the other two (Andersen and Bee) have had minimal habitat improvements. Christensen and

Andersen creeks were studied intensively and Perk and Big creeks were studied in less detail to determine if similar trends were occurring among streams.

Project objectives were to:
(1) determine if spawning adults migrate from the mainstem of the Salt River into spring streams and the proportion of adults comprised of migrants;
(2) describe the habitat used for spawning;
(3) determine if rainbow trout are successfully spawning and if hybridization is occurring between Snake River cutthroat trout and rainbow trout;
(4) describe the habitat being used by age-0 fish; and
(5) determine the impact of whirling disease on survival of age-0 fish during the summer.

Preliminary results suggest that:
(1) a larger number of fish migrate into the streams with habitat improvements than into streams without improvements, but the migrants make up less than half the spawning population in both types of streams;
(2) more spawning occurs in the improved streams and there is more spawning habitat available in the improved streams;
(3) adult rainbow trout were observed in Perk Creek and may be hybridizing with Snake River cutthroat trout;
(4) abundance of age-0 fish in unimproved streams was too low to make inferences about habitat use, but in the improved streams where the abundance was greater there seemed to be ontogenetic changes in habitat use by age-0 fish over the summer and fall;
(5) none of the age-0 fish captured in Perk Creek by electrofishing in 1999 showed clinical signs of whirling disease (blacktail and spinal deformities), but greater than 25% of the age-0 fish captured by electrofishing in Christensen Creek had clinical signs of whirling disease, and
(6) of 200 fish from Christensen Creek out for histological analysis, 80% were infected by Myxobolus cerebralis the causative agent of whirling disease.
(PI: Wayne Hubert G: Mike Joyce (MS) MFA: WY Game & Fish Dept.)

Sport fish and habitat in the Salt River drainage -- There is a need for information on the status of fish and habitat because a variety of land and water uses are having cumulative effects. This is part of a larger study by the WGFD. The Unit's component is to determine the distribution patterns of fishes and habitat over the watershed; describe the features influencing sport fish; and suggest management activities that may enhance sport fisheries. The study encompasses the entire Salt River and 18 of its tributaries. Studies during 1996 and 1997 have shown that fragmentation of the stream system due to irrigation practices and variation in water temperature due to the geomorphology of the surrounding ranges are having substantial effects in fish distribution patterns.

The effects of landscape features on the distribution of *Myxobolus cerebralis* and occurrence of whirling disease among age-0 salmonids in the Salt River drainage, Wyoming-Idaho -- The purpose of this study is to evaluate possible relationships between spatial variation in channel slope, summer water temperatures, seasonal variation in stream flow, and fine sediment deposition among mainstem river reaches and tributaries to the

Salt River and the spatial distribution patterns of age-0 trout and whitefish infected with M. cerebralis and exhibiting clinical and histological signs of whirling disease. The objectives of this study are to:

(1) determine to what extent spatial variation in stream habitat features contribute to infection by *M. cerebralis* and signs of whirling disease,

(2) develop a risk assessment tool that will determine where impacts from M. cerebralis may occur, and

(3) identify possible management interventions that my circumvent outbreaks of whirling disease within the Salt River watershed.

Age-0 salmonids and associated habitat data were collected from 110 locations representing the variety of spatial characteristics within the watershed during summer 2000. Polymerase chain reaction (PCR) analysis is being conducted at the WGFD laboratory to determine *M. cerebralis* infection in individual fish. Histological analysis will be conducted on fish testing positive for *M. cerebralis* to determine the extent of whirling disease. Spatial analyses will be conducted using multivariate statistics and a GIS.

Breeding Ecology of Sandhill Cranes at Grays Lake National Wildlife Refuge -- Historically, Grays Lake supported the largest breeding concentration of greater sandhill cranes (*Grus canadensis tabida*) in the Rocky Mountain Population. The purpose of this study is to collect current information on population numbers and breeding success to compare with data collected in the 1950's and 1969-1971. The 4 main objectives of this project are to 1) determine the number of breeding and non-breeding sandhill cranes; 2) determine nest success and evaluate the factors that affect nest success; 3) describe habitat use by breeding sandhill cranes; and 4) determine how many pairs successfully raise chicks and how many migrating cranes use the Grays Lake valley. Data was collected during 1997-2000.

In 1997-2000, sandhill crane nests throughout much of the Grays Lake basin were located by using a spotting scope and binoculars. Nests in tall vegetation or areas not easily viewed were located either on foot or by canoe. For each nest, information was collected on nest height and width, nest site vegetation, water depth, number of eggs, incubation stage, and nest fate (successful, destroyed, abandoned, or other). Data used in this study include those collected on cranes nesting in experimental units (12 Fish and Wildlife Service units where the Habitat Management is conducted), as well as on other public and private lands (non-experimental units) in the valley. A total of 129 nests were monitored in 1997 (60 on experimental units and 69 on non-experimental units); 131 in 1998 (66 and 65), 143 in 1999 (54 and 89), and 173 in 2000 (53 and 120). Apparent nest success rates of all nests averaged 43% in 1997, 66% in 1998, 55% in 1999, and 59% in 2000. Rates in experimental and non-experimental units differed by <7% in 1997 and 1998; larger differences in 1999 (44% vs. 61%) and 2000 (45% vs. 65%) were likely due to very high (>90%) nest success in areas searched only in those 2 years. Rate of renesting seems to vary among years with lower rates corresponding to years of higher nest success (4.6-9.2% of nests in 1997, 1.5-4.5% in 1998, and approximately 10% in 1999 and 2000).

Greater than 57% of monitored crane nests were located in Baltic rush/spikerush and wet meadow plant communities, in water depths averaging <10 cm. Nest success seems to be higher when the nests are more isolated by deep (>40 cm) water.

Spring population surveys were conducted from 17 April to 11 May, 1998-2000, to determine number and distribution of breeding and non-breeding sandhill cranes in the Grays Lake basin. All cranes seen in the marsh and in adjoining pastures and uplands in the valley were counted during surveys. Mean population counts for 1998-2000 was 728 (n =14, range 613 to 831). Population counts were usually highest at the end of April then counts gradually declined as nesting began in early May and visibility began to deteriorate with rapid growth of vegetation. Each year the number of actual pairs was consistent among counts at 230-250.

Fall population counts were conducted from mid-August through the end of September, 1998-2000. Counts in mid-August include primarily resident sandhill cranes and their young. Juvenile cranes are distinguished from adult cranes by plumage characteristics in order to determine the proportion of pairs at Grays Lake that successfully raised chicks. Counts during mid-August averaged 729 (n =5, range 628-847) for 1998-2000; 4.9% (1998), 4.4% (1999), and 2.0% (2000) of identifiable cranes were juveniles. Crane numbers started to increase after 20 August as cranes moved into the valley from other areas. Peak numbers (1,203-1,217 in 1998 and 1,485-1,574 in 1999) were counted during mid-September. In 2000, peak numbers (1,579-1,674) occurred in early September. Most cranes departed soon after 23 September, similar to records for earlier years.

Data is currently being analyzed; reports and final manuscripts will be completed by early summer 2001. Proposals are currently being submitted for continued ecological and management related research of sandhill cranes. (Austin, J., J. Ball, and A. Henry, September 2000, Breeding Ecology of Sandhill Cranes at Grays Lake National Wildlife Refuge, Idaho USGS, Northern Prairie Research Center, SE, Jamestown, ND [http://www.npwrc.usgs.gov/grayslk])

<u>Biologically Based System Management</u> --The declines of native plants and animals associated with, and dependant upon, the integrity of river/floodplain structure and function requires an examination of the management approaches that have been employed to either protect these resources and/or efforts for the restoration of rivers. This 3-phase Upper Snake River Biologically Based System Management Project is examining the river/floodplain structure and function to improve aquatic resource conditions between Palisades Dam and Heise. Phase 1 synthesized the significant scientific literature of the focal study. Phase 2 evaluated the hydrogeomorphic structure and function of the Snake River reaches in the focal area and will provide the detailed site-specific understanding of geomorphic and hydrologic processes and form the information platform for building Phase 3. Phase 3, will use hyperspectral imagery to extend the utility and application of on-site field work conducted in Phase 2, and will allow a landscape scale analysis of the entire focal study area resulting is restoration prescriptions this key river reach. One of the primary goals of this project is to accurately predict, and scientifically defend, flow rates requisite for conserving the fishery.

Statement of Fish and Wildlife Needs

Multi-scaled Ecological Research and Development on New Analytical Tools

Biologically Based System Management

The present Biologically Based System Management Project funded by BOR (see Assessments Within the Subbasin, and Research, Monitoring, and Evaluation Activities, above) extends only from Palisades Dam to Heise on the South Fork of the Snake River. Because this stretch of the river is significantly different geologically and hydrologically from the stretch from Heise downstream to the confluence with Henry's Fork, similar data (particularly field measurements and hyperspectral imagery) need to be obtained from this lower stretch to make the BBSM fully worthful, and maximize the predictive power and utility of the resulting model.

4.4.2 Fish/Aquatic Needs

General

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.

- Use genetic markers to detect and quantify levels of hatchery produced *O. mykiss* introgression within Yellowstone cutthroat trout populations and to delineate genetic population structure of Yellowstone cutthroat trout throughout their historic range. This fundamental genetic information with regards to introgressive hybridization and genetic population structure is needed to identify remaining pure populations, preserve existing genetic variability, and identify population segments for the development of management plans and the designation of conservation units/management units.
- Compare rates of hybridization and introgression between hatchery produced *O. mykiss* and native populations of Yellowstone cutthroat, redband trout, and westslope cutthroat trout. A greater understanding of the phenomenon of hybridization and introgression observed within *Oncorynchus* populations throughout the middle and upper Snake River provinces should allow a better assessment of the impacts of past hatchery produced *O. mykiss* introductions and allow a better evaluation of the possible future genetic risks native *Oncorynchus* populations face with regards to hybridization and introgression.
- Continue coordinated collection of water temperature data throughout the middle and upper Snake River provinces.

Jackson National Fish Hatchery

- <u>Irrigation Diversions</u> -- Irrigation diversions on Federal and private land in the upper Snake River Basin may or may not have direct impacts on the native and non-native fish stocks. Many of the irrigation diversions do not have screens or other devices which would reduce or eliminate the potential impacts on the fish populations. A study proposal has long been identified in Jackson NFH's Fisheries Operational Needs System (FONS) to determine the effects on aquatic populations on Federal land but has not been funded.
- <u>Isolation / Quarantine Facility</u> -- Jackson NFH's involvement with wild and native trout is entering its second decade. Other species, including species of concern and to a lesser degree, amphibians, cannot be reared and propagated at this facility because it lacks an isolation / quarantine unit which is necessary according to Wyoming Game and Fish Department Policy. Currently, replacement broodstock from the wild are brought in to the facility as fingerlings from iso-quarantine units in the state system. Multi-species propagation and broodstock development

dictates that a unit is necessary at Jackson. It has been identified in the Maintenance Management System (MMS) for the station but has not been funded.

- Peterson Springs Waterline -- The availability of cold, clean, and abundant pure water located on the National Elk Refuge was the primary reason for the site location of the hatchery today. The water delivery system from Peterson Springs is a ductile iron pipe which is now approximately 50 years old. The pipeline has failed twice in previous years and is in need of replacement. The project is in the MMS system but has not been funded. Without this source of water for the facility, many of the existing propagation programs could not be attempted, nor could other species be considered as a refugia population.

Palisades Reservoir Need

- No studies have been conducted to identify a conservation minimum pool in Palisades Reservoir (BPA1991). Palisades has a minimum operational pool of 201,000 acre feet for power head. According to IDFG, increased outmigrations of fish occur at levels below 500,000 acre feet. Large fluctuations in water levels (up to 80 feet) may affect open water species such as lake trout and kokanee (IDFG 1991). (ref: Snake River Resources Review: Aquatic Resources Parameters Manual, March 2001.)

4.4.3 Wildlife/Terrestrial Needs

Comprehensive Monitoring Program for Neo-tropical Migrant and Other Non-game Birds. Bird populations have long been recognized as a good indicator of environmental health. Although various bird surveys are conducted in the region (e.g. limited USF&WS Breeding Breeding Bird Surveys, various raptor counts, etc.), there is no coordinated, rigorous bird monitoring program. Moreover, the limited efforts that do exist are wanting; the general bird surveys only record bird presence and abundance, rather than the more telling metrics of productivity and survivorship. There is a scientific need to establish a comprehensive network across the subbasin of MAPS (Monitoring Avian Productivity and Survivorship; DeSante and Burton, 1997) stations to provide coordinated and uniform information on bird populations and, as an extension, an evaluation of environmental health.

Grand Teton National Park and John D. Rockefellar, Jr., Parkway

A primary need is to develop an adequate natural resource database with which to (1) protect natural resources from degradation by an expanding visitor population and (2) assist management in developing project priorities. Toward this end, specific needs are:

- Funding for an additional seasonal biologist position, devoted to the I & M program.
- Additional helicopter hours, particularly for locating two “missing” bald eagles.
- Neotropical migratory bird monitoring program development and implementation.
- Vegetation specialist to develop and implement a program to manage grazing, rare plants, noxious weeks and rehabilitation of disturbed sites and abandoned homesteads.
- Permanent funding for Geographic Information System (GIS) technology to assist resource management and research programs within the Park.

Management and Research Needs for Trumpeter Swans

Management and research needs for the protection and population enhancement of the trumpeter swans include (Pacific Flyway Subcommittee on Rocky Mountain Trumpeter Swans 1998):

- monitoring of winter distribution and abundance,
- monitoring of nesting effort and success and abundance of breeding segment,
- monitor/research aquatic macrophyte communities and impacts of winter flow, regimes, particularly in the Harriman State Park vicinity of the Henry's Fork (as it influences breeding populations in Grays Lake such that they are both of the Rocky Mountain Population),
- habitat improvement to correct problems at specific nesting territories,
- research into seasonal movements and habitat use, and
  hazing and capture/translocations out of high risk areas.

Bonneville County Weed Control Program Need

- Develop a program for the Swan Valley area on control of Spotted Knapweed. This will include participation with land owners, agencies including the Idaho Department of Agriculture, and Bonneville County. A program may include an agreement whereby:
  -the county applies the herbicide\bugs,
  -the land owner pays for product, and
  -the state or other agencies cost share the total expense, or pays for the application and a percentage of the product.

This would be a long term program implemented and monitored for many years.

Combined Aquatic & Terrestrial Needs

U.S. Fish and Wildlife Service - Idaho

The Columbia Plateau is an arid sagebrush steppe and grassland surrounded on the north, west, and east by moister, predominantly forested, mountainous ecological regions. It consists of arid tablelands, intermountain basins, dissected lava plains, and widely scattered low mountains. There is a more subtle transition to the Basin and Range to the south in which hotter lowlands are dissected by isolated mountain ranges. (Taken from the *Columbia Plateau Bird Conservation Plan Executive Summary*)

Issues in this area include conversion of shrubsteppe and wetlands to agriculture, grazing, and some urban development. To return the area to its near natural status would require:

- Careful management and removal of non-native plant invasions. These have been particularly damaging, led by aggressive species such as cheatgrass and crested wheatgrass.
- Management of wild lands for fire suppression and other practices which have greatly reduced the extent and health of open ponderosa pine habitat.
- Restore the dry, open, multi-aged ponderosa pine system. This will require careful silviculture and a regimen of prescribed fire.
- Maintain and restore a dynamic sagebrush ecosystem within the shrubsteppe including no further net loss of healthy sagebrush, and restoration of fragmented and degraded areas.
- Protect existing wetlands, and restore water regimes.

- Manage livestock grazing and restore levels of water tables. The health and complexity of riparian shrub and forest vegetation has been extensively degraded due in part to over grazing and lowering of water tables. However, restoration activities have been shown to produce relatively good results.

Idaho Department of Fish and Game - Muledeer Information Requirements

A comprehensive inventory of winter range quality and quantity including the status and terms of enrollment of CRP lands would be valuable for long range planning and management. CRP is particularly important because such a large percentage of the analysis area is privately owned. A large scale conversion from CRP back to cultivated crops could result in significant depredations problems by both mule deer and elk under current population objectives for both species.

Idaho Department of Fish and Game (IDFG)

Sagebrush steppe habitats throughout the Columbia River Basin have been degraded by human activities including conversion to agriculture, livestock grazing, non-native plant invasions and altered fire regimes. Restoration of these habitats demands a reliable source of plant materials (seed and seedlings) for use in reestablishing ecosystem function to accomplish restoration and enhancement goals. Often, managers are unable to find an adequate supply of site adapted native plant materials that will survive and prosper in local climates and soils.

Idaho Soil Conservation Commission (ISCC)

In order to support both aquatic and terrestrial needs, the Idaho Soil Conservation Commission (ISCC) proposes the following for the East Side Soil and Water Conservation District:

- Educating landowners in benefits of Best Management Practices (BMPs) such as no-till, sub-soiling, water and sediment basins, etc. (These BMPs would reduce soil runoff which should reduce the amount of suspended solids in streams.)
- Subsidizing installation of BMPs and cost sharing
- Water monitoring to reassure beneficial uses are attained

Lower Valley Energy, Inc

- Growing osprey population is an increasing problem for LVE and LVE's customers. Assistance in planning and achieving long-term mitigation of the problem through expert advice and funding for both the ospreys and our customers would be a benefit.
- Tools such as longer-reaching bucket trucks for installation of marker balls, etc., to assist in the prevention of swans colliding with high expanse power lines.

Market Lake Wetland Complex (Southeast Idaho Wetland Focus Area Working Group, 2001)

Several strategies exist for conserving existing and historic wetland areas in this complex, however

- Acquisition of property or capital may be the best option.
- The purchase of water rights within the Snake River system and using them on the WMA may be able to supplement decreasing water levels in the marshes during the summer.

- Purchasing and installing a pumping system that will take water from the Van Leuven slough to the Snake River is one alternative. Pumping would occur when the slough backs up during times of high flows in the river so as to prevent flooding on the WMA and private property in the basin.
- An evaluation of erosion and flooding problems in the basin may be warranted.
- Installation of check dams could reduce excessive runoff and reduce or eliminate flooding problems within the basin.
- Conservation actions (acquisition and restoration) within the historic Market Lake basin would allow for extensive restoration of these converted wetlands.
- Control of noxious weeds needs to increase throughout this complex. This effort should continue to be coordinated with local agencies, landowners, and other conservation organizations to control and/or eliminate purple loosestrife.

South Fork of the Snake Wetlands Complex (Southeast Idaho Wetland Focus Area Working Group, 2001)

Protecting wildlife and habitat value in existing wetlands should be the main thrust of wetland conservation in the South Fork Wetland Complex.

- Conservation partnerships focusing wetland protection especially on lands with high wildlife and habitat values should be a priority. Such land partnerships would be able to protect existing wetland habitat functions and values, as well as restore degraded areas to historic conditions.
- Livestock management should be addressed using several Natural Resources Conservation Service (NRCS) programs that are directed at improving grazing methods and protecting water quality. Additionally, the NRCS can work with landowners to develop conservation plans that would recommend strategies for continuing the farming and/or cattle operations and still protect the wetland resources.
- The Idaho Department of Fish and Game and U.S. Fish and Wildlife Service also have some cost share funds to assist with fencing along riparian zones.
- Due to the private ownership of important wetland and riparian areas in, landowner participation in wetland conservation efforts will be essential. Landowners interested in conservation should be informed about the economic and ecological advantages of participation in the various land stewardship programs that can include grazing management, waterway buffering, best management practices, water quality improvement projects, wetland restoration, and riparian fencing and re-establishment.

Willow Creek Wetland Complex (Southeast Idaho Wetland Focus Area Working Group, 2001)

Conservation partnerships should be developed to focus wetland protection and restoration efforts especially on private and public lands with high wildlife and habitat values.

- Due to the private ownership of important wetland and riparian areas in the Willow Creek Complex, landowner participation in wetland conservation efforts will be essential. Interested and willing landowners should be informed about the economic and ecological advantages of participation in land stewardship programs that can include grazing management, stream and wetland restoration, and riparian fencing and re-establishment.

- Government land managers of mountainous areas should be encouraged to incorporate wetland habitat maintenance and restoration techniques in land management projects.
- This should include establishing wide stream protection zones, and facilitating growth of riparian and forested wetland vegetation near rivers, streams, and wetlands.
- Road construction across or near streams and other wetlands should be avoided or minimized and natural drainage patterns should be maintained.
- Restoration of historic wetland functions and values should be a long-term goal.
- Re-establishment of natural hydrologic regimes may be one of the few ways to benefit declining wildlife populations as well as wetland vegetation communities.

Baseline Winter Moose Surveys in the Headwaters of the Upper Snake

The North American Moose Foundation (NAMF) and the Idaho Department of Fish and Game (IDFG) are currently planning to partner together to develop science-based surveys for moose and habitat. There have been no specific Moose surveys conducted in the Headwaters of the Upper Snake. Accurate winter surveys, and seasonal as required, of Moose are needed to: 1) set permit levels; 2) observe the health of the herds; and 3) identify conservation areas by determining where the Moose are located. Previous survey reports were random and incidental from deer and elk surveys. Additionally, the survey process will become a resource tool to educate the public about Moose and their habitat. (http://www.moosefoundation.org)

Wyoming Game & Fish

Wyoming Game & Fish combined aquatic and terrestrial needs include

- Installation of a water intake structure in the levee near Tucker pit
- Channel water into historical river channels that are currently either dry or hold only small amounts of water for a portion of the year. Improved flows will increase cutthroat trout spawning, and provide habitat for a wide diversity of amphibians, mammals and birds. Project benefits include significant benefits to the spawning substrates.

Jackson Lake Ecology as Affected by Severe Drawdowns

During severe drought years as occurred in summer of 2000 and 2001 Jackson Lake is drawn down to natural lake levels which could be 40 feet below full pool level as maintained by the Jackson Dam. During these periods vast stretches of shoreline and mud flats are exposed.

- Acquire data related to the impacts of these severe drawdowns on:
  - Waterfowl, bald eagles, herons, and other water dependent bird species.
  - Beaver, muskrats, otters and other mammals dependent upon lake levels.
  - Aquatic vegetation including floating and emergent plant communities.
  - Cultural resource sites that are normally submerged.
  - Aquatic invertebrates.
  - Hyporehic communities.
  - Fish species.

- Exotic species such as the New Zealand Mud Snail (known to occur upstream of Jackson Lake) or the encouragement of invading exotics such as tamarisk and purple loostrife.
    - Aquatic born diseases such as Whirling Diseases.
- A panel of experts should be established who will be charged with the responsibility of :
    - Evaluation of the significance of the impact on the above resources and/or concerns.
    - Establish a priority of investigation and evaluation
    - Develop protocols for appropriate inventory, monitoring, and research projects as required
    - Develop mitigation procedures following inventory, monitoring, and research efforts if applicable and practical
    - Define potential contractors and partners for funding and investigative efforts
    - Provide oversight of inventory, monitoring, and research

Land protection Needs.

Although substantial lands have been protected along the South Fork of the Snake River, many rich fish and wildlife habitats found near the river are still at threat to development.

- The best of these lands should be conserved through conservation easements and fee acquisition to insure that they continue to function as habitat.
- Reasonable forward-looking developments plan, based on good science and impacts to resources, needs to be developed.

Upper Snake Headwaters Subbasin Recommendations

Projects and Budgets

Continuation of Ongoing Projects

Project: 33009 Improve Yellowstone cutthroat trout recruitment and survival in the South Fork of the Snake River

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Sponsor: Idaho Department of Fish and Wildlife (IDFG)

Short Description:

Increase juvenile cutthroat trout recruitment and survival in the South Fork of the Snake River by minimizing entrainment losses and side channel stranding mortality, and by restoring tributary habitat.

Abbreviated Abstract

The South Fork of the Snake River, from Palisades Dam to the confluence with the Henry's Fork of the Snake River, supports a popular and productive fishery, comprised primarily of native Yellowstone cutthroat trout. Palisades Dam, a U.S. Bureau of Reclamation project, regulates flows in this reach of the river. Flows vary considerably based on the need for irrigation water, power production and flood control. Life history strategies of cutthroat trout include both tributary and mainstem spawning and rearing. Rainbow trout, a non-native species, are now well established in the mainstem and are considered a significant threat to the genetic integrity and population viability of Yellowstone cutthroat trout. Management actions have been taken to control or reduce the rainbow trout population; however, the long term success of Yellowstone cutthroat trout management in the South Fork will depend on not only maintaining rainbow trout control efforts, but also on enhancing recruitment and survival of Yellowstone cutthroat trout.

Several factors related to habitat pose serious threats to the cutthroat trout population by limiting juvenile survival and recruitment to the population. The first is unscreened irrigation diversions in tributaries and in the mainstem. The second is degraded habitat in tributaries, due largely to cattle grazing and dewatering. The third is the dewatering of mainstem side channels and stranding of juvenile and adult fish due to reduced flows from Palisades Dam. Previous research has demonstrated that entrainment in diversions and side channel dewatering can result in high mortality of juvenile trout in both the South Fork of the Snake River and in other similar systems. This project seeks to increase survival and recruitment of Yellowstone cutthroat trout by minimizing entrainment of juvenile cutthroat trout in irrigation diversions, improving habitat in South Fork tributaries, and by developing a better understanding of the relationship between regulated flows and juvenile cutthroat trout survival so that optimal flows can be identified. This project is proposed by IDFG in cooperation with the Office of Species Conservation (OCS) as partial mitigation for the construction and operation of Palisades Dam.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
199800200	Snake River Native Salmonid Assessment	Inventory/evaluation of current distribution of native salmonids

Relationship to Existing Goals, Objectives and Strategies

This project will complement several ongoing projects and recently developed projects and programs. In each case, projects have been developed to protect and enhance Yellowstone cutthroat trout populations and the related fishery.

South Fork Cutthroat Conservation Project -- In an intensive Yellowstone cutthroat conservation project, IDFG has worked in cooperation with U.S. Forest Service (USFS), the Jackson One-Fly Foundation, Trout Unlimited, and the National Fish and Wildlife Foundation since 1996 to design, construct and operate permanent fish trapping facilities on Palisades, Burns, Rainey, and Pine creeks, the four most important cutthroat spawning tributaries to South Fork. These traps are being used to prevent upstream migration and spawning of rainbow trout. This program will not only help minimize introgression in the South Fork cutthroat population, but it will also create refuges of pure Yellowstone cutthroat trout in these important tributaries. Additionally, irrigation diversions on Palisades, Burns, and Rainey creeks were screened to minimize entrainment losses of juvenile Yellowstone cutthroat trout outmigrants.

Snake River Native Salmonid Assessment Research Project --The Idaho Department of Fish and Game began this fisheries inventory and research project (Project No. 980002) in August 1998. This ongoing project is designed to assess the current status of native salmonids in the middle and upper Snake River provinces in Idaho. 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. The project, which consists of three phases, will (Phase I) assess current stock status and population trends of native salmonids and their habitat (Phase II), identify factors limiting populations of native salmonids, and (Phase III) develop and implement recovery strategies and plans. The inventorying phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the middle and upper Snake River provinces, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are also being collected to assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. 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.

Trout Unlimited Home Rivers Initiative -- Recently, Trout Unlimited identified the South Fork of the Snake River for the national Home Rivers Initiative, thereby commencing a multi-year project designed to conserve the native Yellowstone Cutthroat trout fishery on Idaho's South Fork of the Snake River. The project, beginning in the fall, 2001, will combine research and assessment, habitat restoration, and long-term conservation planning and is scheduled to last at least three years with associated funding on an annual basis. The current thrust of this project can be divided into the following five categories:

1) reducing hybridization and displacement of native Yellowstone cutthroat trout with introduced rainbow trout
2) 2) understanding and recommending modifications that effect geomorphic impacts to mainstem river habitats due to flow alterations from Palisades Dam
3) 3) reducing and eliminating damage to the spawning tributaries due to dewatering, grazing, road development, and other impacts
4) 4) reducing or mitigating recreational impacts, including boat traffic from jet and drift boats
5) 5) assessing and reducing or eliminating impacts from development, with associated bank armoring, along the South Fork.

<u>Biologically Based System Management</u> –The Bureau of Reclamation and the Flathead Research Station are currently developing a Biologically Based System Management model. The goal of this model is, in part, to accurately predict, and scientifically defend, flow rates requisite for conserving the South Fork fishery. This 3-phase project is examining the river/floodplain structure and function to improve aquatic resource conditions between Palisades Dam and Heise. Phase 1 was synthesis of the significant scientific literature of the focal study. Phase 2 involves evaluation of the hydrogeomorphic structure and function of the Snake River reaches in the focal area and will provide the detailed site-specific understanding of geomorphic and hydrologic processes and form the information platform for building Phase 3. Phase 3 will use hyperspectral imagery to extend the utility and application of on-site field work conducted in Phase 2, and will allow a landscape scale analysis of the entire focal study area resulting is restoration prescriptions to this key river reach.

<u>Idaho State University Flow Evaluation</u> – Idaho State University is currently developing a proposal to compile and analyze hydrologic data for the gages at Irwin, Heise and Lorenzo. Researchers plan to analyze post-Palisades flows, reconstruct unregulated flows, and statistically compare the regulated and unregulated hydrologic regimes. This will form the hydrologic basis on which to investigate relationships between flows and various biological indices such as rainbow introgression and winter survival.

To our knowledge, there have been no other BPA funded fishery projects for mitigation of Palisades Dam and no other BPA funded projects in this reach of the river.

Review Comments

Budget

FY2003	FY2004	FY2005
$264,700 Category:High Priority Comments: None	$600,000 Category: High Priority	$620,000 Category: High Priority

Project: 199505700 -- Southern Idaho Wildlife Mitigation - Upper Snake

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

Short Description:

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

Abbreviated Abstract

Upper Snake Wildlife Mitigation (USWM) is an ongoing programmatic project derived from the 1996 Memorandum of Agreement between the Shoshone-Bannock Tribes (SBT) and the Idaho Department of Fish and Game implementing the Southern Idaho Wildlife Mitigation (SIWM) project. The USWM project will continue to implement SIWM wildlife mitigation actions in the Upper Snake Province. USWM is a habitat protection, enhancement and restoration project. As such, the project addresses the Council's primary wildlife strategy to complete the current mitigation program for construction and inundation losses as described in the Council's Fish and Wildlife Program (NWPPC 1995 and NWPPC 2000). The Northwest Power Planning Council's (Council's) Fish and Wildlife Program currently includes the Minidoka and Palisades hydropower projects in the Upper Snake Province.

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

Potential mitigation sites in Southern Idaho were initially prioritized by interagency teams of biologists in the mid 1980s. The original site-selection process has been supplemented with contemporary conservation site planning in Idaho, including wetland conservation strategies (Jankovsky-Jones 1997a, b), GAP (Scott et al. 1993) cover types as coarse filter targets, and Ecoregional Planning by The Nature Conservancy. Interagency Work Groups, led by SBT and IDFG, develop site-specific project proposals based on regional criteria (Sect. 11.2D.1, NWPPC 1995 FWP) to ensure program consistency.

A fundamental assumption is that protecting and enhancing habitat will result in increased populations of wildlife, increased "health" of wildlife populations, and increased biodiversity. We monitor programmatic progress by measuring standardized target species habitat variables from Habitat Evaluation Procedure models (USFWS 1980). To monitor biological progress, the SBT and IDFG monitor wildlife populations on mitigation areas. USWM staff is working with members of the Albeni Falls Interagency Work Group and other CBFWA members to develop a monitoring and evaluation program that will inform the adaptive management process and provide useful information to others in the province and Columbia Basin (AFIWG 2001).

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. Throughout the mid/upper Snake River, protecting, enhancing, and maintaining existing fish and wildlife habitat has become a priority for numerous state, federal, and tribal agencies.

In 2001, the BOR completed its Final Environmental Assessment and Finding of No Significant Impact for the Ririe Reservoir Resource Management Plan. The intent of the plan is to serve as a blueprint for the future use, management, and site development of BOR lands at the reservoir and the associated Wildlife Management Areas (WMA) for the next 10 years (2001,BOR). The Tex Creek WMA, which includes the Ririe Reservoir, consists of 34,269 acres with joint ownership belonging to the BLM, Idaho Department of Lands, IDFG, BOR, and the Rocky Mountain Elk Foundation. The Bonneville Power Administration recently bought and added to the Tex Creek WMA, the 2,100 acre Circle Quarter O Ranch for wildlife mitigation. The WMA is considered wintering grounds for up to 3,000 elk, and is a prime example of federal, state, and tribal co-management. Furthermore, the BOR is currently working with the SBT, Bureau of Indian Affairs, and the Natural Resource Conservation Service to develop a model related to flows and flood plain usage on roughly 14 km of the Snake River from Tilden Bridge, at Ferry Butte, to the top of American Falls Reservoir. The model will inform planning efforts to protect, enhance, and maintain the Snake River and its component resources for the benefit of fish and wildlife.

Other related projects would include the Comprehensive State Water Plan South Fork Snake River Basin developed by the Idaho Water Resources Board in1996. This plan recognizes the NWPPC's Fish and Wildlife Program and its focus on habitat protection and enhancement measures to protect riparian habitat along the South Fork Snake, lower Henrys Fork, and Snake River upstream of Idaho Falls to mitigate for the loss of nearly 16,000 acres of wildlife habitat, including cottonwood forests, wetlands, agricultural lands and shrub-steppe (1996, Idaho Water Resource Board).

Review Comments

The proposed work provides for ongoing O&M activities. Project sponsors indicate credits will be applied to Palisades and Minidoka.

Budget

FY2003	FY2004	FY2005
$4,068,153 Category: High Priority Comments: None	$4,331,361 Category: High Priority	$4,525,768 Category: High Priority

Research, Monitoring and Evaluation Activities

BPA-funded

Snake River Native Salmonid Assessment Research (Project No. 980002)

This project is conducted by the Idaho Department of Fish and Game. 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.

Project Description:

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, including the Weiser, Owyhee, Payette, Boise, Goose, Raft, Rock, Bannock, Portneuf, Blackfoot, Willow, South Fork Snake, and Teton. Genetic samples of redband trout and Yellowstone cutthroat trout have been collected at a total of 155 sites, and results are available for 15 sites. Water temperature has been measured and/or obtained from other agencies at 97 stream sites across the middle and upper Snake River provinces. A comprehensive database has been developed that includes data on native salmonid abundance and distribution, genetic samples, habitat summaries, and herpetofauna observations. This project is also evaluating the effectiveness of electrofishing to remove non-native brook trout as a means of reducing threats to native salmonids; after three years of removal, the brook trout population has not been reduced (Meyer 2000; Meyer and Lamansky 2001, in progress). Other removal techniques (e.g., Young 2001) may be evaluated in subsequent years in an attempt to find a more viable method of removing non-native salmonids where the long-term persistence of native salmonids is being threatened by the presence of exotic species.

Because the inventorying phase is ongoing and not completed for any one species (Yellowstone cutthroat trout will be completed in 2002), analysis to date for the most part has been preliminary and cursory (Meyer 2000; Meyer and Lamansky 2001). However, in a study of Yellowstone cutthroat trout densities across southeast Idaho, densities remained unchanged and fish size structure improved over the last 20 years, suggesting that at least at some locations in the middle and upper Snake River provinces, native salmonid populations may be relatively stable (Meyer et al. in review). Maturity of Yellowstone cutthroat trout has been determined for a number of locations across southeast Idaho to assess effective population size for extinction risk analysis in Idaho.

Southern Idaho Wildlife Mitigation (Project 1995-057-01)

This project is conducted by IDFG and the Shoshone-Bannock Tribes to implement projects to achieve full mitigation for construction and inundation losses in southern Idaho from development of the federal hydropower system. Monitoring and evaluation actions take place on all acquisitions and easements administered by project managers. The Habitat Evaluation Procedure (HEP) is used to estimate habitat value for protection and/or enhancement credit to BPA. Photopoints and transects are used to monitor changes in vegetation and habitat. Neotropical birds are monitored using established protocols.

Non BPA funded

National Park Service, Grand Teton National Park

Sensitive, threatened and endangered species inventory and monitoring. – The requirement for the National Park Service to conserve rare species is specifically stated in Headwaters Subbasin Summary 275 DRAFT October 26, 2001 NPS Management Policies: “Consistent with the purposes of the Endangered Species Act, the National Park Service will identify and promote the conservation of all federally listed threatened, endangered, or candidate species within park boundaries and their critical habitats...Active management programs will be conducted as necessary to perpetuate the natural distribution and abundance of threatened or endangered species...The National Park Service also will identify all state and locally listed threatened, endangered, rare, declining, sensitive, or candidate species that are native to and present in the parks, and their critical habitats...(p. 4:11). Furthermore, NPS-77 Natural Resources Management Guideline, states as the first major program objective: “Inventory and monitor sensitive, candidate, and listed species.

This includes mapping species’ distribution in the park, identifying critical habitats (if any), and determining numbers of individuals, threats to the species, and population trends” (p. 270).

Currently, the Park contains small breeding populations of one endangered (peregrine falcon) and two threatened species (grizzly bear and bald eagle). One species listed as experimental (gray wolf) uses the Park on occasion, but is not a resident at this time. Two additional resident species, the lynx and northern goshawk, are under review for listing by the U.S. Fish and Wildlife Service. The Park lists 33 avian species and 9 mammals as “Species of Special Concern”. The Wyoming Natural Diversity Database lists 66 “Plant Species of Concern” as occurring in the Park.

Threatened and Endangered (T & E) Species

As a rare species, the bald eagle has the longest history of monitoring within Grand Teton National Park, with efforts beginning in 1968 (detailed histories of all species addressed can be found in the Resources Management Plan). Studies were conducted on the population by various researchers until 1989. Since that time, Park biologists have maintained a monitoring and banding program in coordination with the U.S. Fish and Wildlife Service and the Wyoming Game and Fish Department (WGFD). Bald eagle territories increased from 3-4 in the Park in 1968 to 10 in 1997.

The Park was active in a peregrine falcon reintroduction program from 1980 to 1986, with 52 birds released during a hacking program. The first documented nesting attempt was observed in 1987. That territory has been active every year since that time. In 1990 and 1991, extensive surveys for peregrines were performed, funded by a regional NRPP initiative. No additional eyries were found. A new territory was located in the Park in 1995, and a third in 1996.

Grizzly bear research and monitoring within the Park has been conducted primarily by WGFD through the Interagency Grizzly Bear Committee (IGBC). In 1994, the first grizzly bear mauling in the Park occurred, when a runner was attacked injured in the Two Ocean Lake area. In 1995, grizzly bears were responsible for several domestic cattle depredations within Park boundaries in the Elk Ranch grazing allotment. The following year (1996), depredations continued, and the offending grizzly bear was caught and killed by WGF in accordance with IGBC guidelines. Three additional grizzly bears were caught by Park biologists, one for human habituation, and two for habituation to human attractants. In 1997, grizzly bears again preyed upon domestic cattle in the Elk Ranch allotment, however losses were acceptable and no action was taken. During this situation, Headwaters Subbasin Summary 276 DRAFT October 26, 2001 WGFD personnel verbally stated that they were relinquishing all responsibility for grizzly bear management within Park boundaries due to staffing constraints. A second grizzly bear mauling occurred in the fall of 1997 in the Parkway during the moose archery season. Gray wolves have been documented within the Park prior to the 1994 reintroduction effort in Yellowstone National Park; however, they did not become established. In 1996, a pair reintroduced in Yellowstone began using areas immediately adjacent to the Park in Buffalo Valley, but finally settled down north of Dubois. In 1997, an entire pack from the Heart Lake area traveled south and began using areas within Park boundaries in the Two Ocean Lake area. They have since returned to Yellowstone, but are expected to use Park lands on a more frequent basis now that they are familiar with the area. Wolf biologists expect pack establishment within Park boundaries in the unspecified future.

Sensitive Species

Monitoring of a variety of sensitive species has occurred in the Park since the early 1960's when the monitoring of trumpeter swan nests began. Surveys of great blue heron rookeries began in 1968, and the monitoring of osprey nests began in 1972, and both continue on an annual basis. A monitoring program for amphibians was begun in 1991 by an outside researcher, but has since been maintained by Park biologists. Annual harlequin duck surveys began in 1984 but ceased in 1995 due to staffing constraints. Annual sage grouse counts have occurred since the late 1980's. A radiotelemetry research project on bighorn sheep was initiated in 1994 and is maintained by Park biologists, along with helicopter and ground surveys.

Sensitive Species Processes

Aside from formal surveys, additional information on sensitive species is collected through the Park Natural History Field Observation reporting process whereby visitors and staff report observations of sensitive species. Significant observations are followed up with verbal or written interviews and/or site visits to better assess to accuracy and importance of the report.

The current Inventory and Monitoring (I & M) program is the primary responsibility of the Project Biologist, with direction from the Senior Wildlife Biologist.

Since 1995, a Resource Management Biologist has not been availed to the park. These duties (both I & M related and otherwise) have been reapportioned upon existing staff, reducing the effectiveness of the current I & M program.

Further Park status changes include an increase in:

- the number of T & E species (the addition of the gray wolf, possible
- additional listing of the lynx and the northern goshawk)
- the population of all resident T & E species (grizzly bear, bald eagle,
- peregrine falcon)
- the complexity of management of T & E species (grizzly bear depredations,
- maulings, human habituation)

- the complexity of non-T & E wildlife related issues (brucellosis, bison management, black bear management)

Due to decreased staffing and funding levels, some I & M projects had to be eliminated, while the information gained in other projects was severely reduced, resulting in inadequate information in some instances. For example, following the periodic changes in nest trees, the locations of two of the ten bald eagle nests in the Park are currently unknown due to insufficient resources to locate the nests. Although peregrine falcons are expanding in the Park, thorough surveys to search for new sites have not been instituted since 1991.

Idaho Department of Environmental Quality

Programs to assess water quality -- Monitoring activities in Idaho have focused on beneficial uses and ambient water quality trends. Data from Idaho DEQ's monitoring are used to document the existence of uses, the degree of use support, and reference conditions. This monitoring is made up of primarily the collection of biological and physical data. The ambient trend monitoring network is designed to document water quality trends at the river basin and watershed scales through the collection of mainly water column constituent data. Biological parameters are being added to this network as well. Fifty-six monitoring stations are currently sampled on a rotating basis to provide data for water quality trend assessment.

The Idaho Department of Environmental Quality is engaged in ongoing research to obtain the most recent and site specific scientific knowledge available for the purposes of refining water quality criteria. DEQ also monitors chemical, physical and biological components of the aquatic environment through the Beneficial Use Reconnaissance Project. DEQ continues to refine the water body assessment guidance for evaluating BURP data. The primary assessments are designed to determine the support status of the two main aquatic life beneficial uses, Cold Water Biota and Salmonid Spawning.

Jackson Fish Hatchery

Currently, evaluations for individual stocking programs are underfunded and are accomplished only if incorporated into a larger, overall study of the habitat or watershed.

This information would determine if the wild trout program has benefits over and above the annual production costs or, if the extra costs of this program exceed the benefits derived.

Safari Club International

Mule Deer Recruitment in Southern Idaho -- The SE Idaho Chapter of Safari Club International partnered with the Idaho Department of Fish and Game (IDF&G) for this project. The study area is in Game Management Units 54, 55, 56, 57, 70, and 73A located in the Upper Snake subbasin, with additional studies in Game Management Unit 67 in the Upper Snake Headwaters subbasin and Game Management Units 59 and 59A in the Upper Snake Closed basin. The study period is from 1998 through 2003. The Idaho Chapter of Safari Club International, to date, has donated $10,000.00 and has supplied hundreds of man-hours trapping deer for the study. $125,000.00 has been leveraged towards this study through the U.S. Forest Service, the Bureau of Land Management, National Shooting Sports Foundation, National Fish and Wildlife Foundation and Safari Club International.

This research has 2 major emphases that will identify factors that influence deer populations in Southern Idaho. The first will determine the effect of predation on mule deer population characteristics such as population growth, recruitment, and mortality. This will include an evaluation of the effectiveness of coyote control as a means to increase deer populations. The second emphasis will identify habitat factors influencing population levels of mule deer in southern Idaho. Without a thorough understanding of how deer and predator populations interact on a large scale, management of deer populations on the typical big game unit level is difficult.

Sharp-tailed Grouse Lek Inventory -- This project is a partnership between the SE Idaho Chapter of Safari Club International and the Idaho Department of Fish and Game (IDF&G), and the Southeast Idaho, Jefferson County and Upper Snake River Chapters of Pheasants Forever. The study area is in portions of Bingham, Bonneville, Fremont, Jefferson, Madison and Teton counties located in the Upper Snake Headwaters subbasin and the Upper Snake Closed Basin. The study period is scheduled for March and May 2002. The Idaho Chapter of Safari Club International with matching grants and private contributions has donated $6,500.00 towards this study. An additional $6,250.00 has been pledged by the study partners. Biological aides will be hired by the IDF&G to systematically ground search suitable habitat in the identified study area. Additional survey personnel will include Idaho Chapter volunteers. Columbian sharp-tail *grouse (Tympanuchus phasianellus columnianus*) leks will be located and mapped, and the number of birds occupying will be recorded. This project will provide scientifically collected information on distribution and relative abundance of sharp-tailed grouse in a portion of eastern Idaho where only limited data currently exists. This data will be used to develop population management recommendations and prioritize habitat conservation areas.

United States Geological Survey

Interior Columbia Basin Ecosystem --The USGS provides earth science information to the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) project staff, which is completing a scientific assessment of all land in a seven-State region of the Columbia River Basin east of the Cascade Mountains. Goals of the scientific assessment are to understand the development and current state of land, water, plants, animals, and society within the basin and to model future conditions that could result from different management alternatives and disturbances. In coordination with the scientific assessment, the USFS and BLM staff also is developing regional management strategies for Federal lands in the Basin. Goals of the management strategies are to maintain and improve ecological integrity by promoting the natural processes that operate in healthy aquatic, terrestrial, and landscape ecosystems and to provide sustainable flows of resources from Federal lands. Mineral-resource potential of the Interior Columbia Basin is a partial indicator of the potential for economic development, land use, and environmental hazards.

USGS scientists have provided detailed digital geologic, hydrologic, and mineral-resource information to USFS and BLM staff biologists, botanists, forest ecologists, sociologists, and economists; participated in systems modeling; provided data to be used by the agencies in the development of management alternatives; and contributed to several reports.

Hydrologic and Water-Quality Data-- Idaho has seven major river basins—the Kootenai, the Pend Oreille, the Spokane, the Clearwater, the Salmon, the Snake, and the Bear. Rivers in these basins supply surface water for agriculture, industry, hydroelectric-power generation, recreation, fish and wildlife habitat, and other uses within Idaho and in adjacent States. Aquifers supply ground water for these same uses in many parts of the State. Water from geothermal aquifers also is used for space heating. Hydrologic and water-quality data are critical for the day-to-day administration and management of waterHeadwaters Subbasin Summary 279 DRAFT October 26, 2001 resources; for determining the extent and severity of droughts; for characterizing and predicting conditions during floods; and for monitoring the effects of people's activities on streamflow, ground-water supply, and water quality. The data also are essential to plan development activities and to carry out interpretive studies that provide information for making decisions about water issues that affect millions of people.

The USGS, in cooperation with the Idaho Department of Water Resources, the Bureau of Reclamation, and more than 20 other local, State, and Federal agencies, collects surface- and ground-water and water quality data at numerous sites throughout the State. For example, streamflow discharge was measured at 279 gaging stations (Figure 48); water-quality data were collected at 124 of those stations in 1996 (Figure 49).

BPA-funded

Idaho Department of Fish and Game

The Snake River Native Salmonid Assessment (Project No. 980002) is an ongoing IDFG research project initiated in August 1998 to: 1) assess the current status of native salmonids in the middle and upper Snake River provinces in Idaho, 2) identify factors limiting populations of native salmonids, and 3) develop and implement recovery strategies and plans. The inventorying phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the middle and upper Snake River provinces, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are also being collected to assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. In the third phase, recovery strategies for individual or groups of subbasins will be developed to address the factors most important in limiting the patterns of distribution and abundance of native salmonids.

In the first 3+ years of the project, fish and habitat surveys have been made at a total of 757 sites on private and public lands across southern Idaho in nearly all major watersheds, including the Weiser, Owyhee, Payette, Boise, Goose, Raft, Rock, Bannock, Portneuf, Blackfoot, Willow, South Fork Snake, and Teton. Genetic samples of redband trout and Yellowstone cutthroat trout have been collected at a total of 155 sites, and results Closed Basin Subbasin Summary 150 Draft October 26, 2001 are available for 15 sites. Water temperature has been measured and/or obtained from other agencies at 97 stream sites across the middle and upper Snake River provinces. A comprehensive database has been developed that includes data on native salmonid abundance and distribution, genetic samples, habitat summaries, and herpetofauna observations. This project is also evaluating the effectiveness of electrofishing to remove non-native brook trout as a means of reducing threats to native salmonids; after three years of removal, the brook trout population has not been reduced (Meyer 2000; Meyer and Lamansky 2001, In progress). Other removal techniques (e.g., Young 2001) may be evaluated in subsequent years in an attempt to find a more viable method of removing non-native salmonids where the long-term persistence of native salmonids is being threatened by the presence of exotic species.

Because the inventorying phase is ongoing and not completed for any one species (Yellowstone cutthroat trout will be completed in 2002), analysis to date for the most part has been preliminary and cursory (Meyer 2000; Meyer and Lamansky 2001, In progress). However, in a study of Yellowstone cutthroat trout densities across southeast Idaho, densities remained unchanged and fish size structure improved over the last 20 years, suggesting that at least at some locations in the middle and upper Snake River provinces, native salmonid populations may currently be relatively stable (Meyer et al. in review).

Maturity of Yellowstone cutthroat trout has been determined for a number of locations across southeast Idaho to assess effective population size for extinction risk analysis in Idaho.

Non BPA funded

USDS Forest Service

The Challis Ranger District of the USDA Forest Service is conducting or participating in the following research/assessment activities in the Little Lost River basin:

- A study assessing the relationship between summer stream temperature and bull trout distribution and abundance.
- A study assessing the relationship between groundwater temperature and juvenile bull trout distribution in small stream basins.
- A study assessing the feasibility of electrofishing to remove exotic brook trout from small streams.
- A study assessing the relationship between water temperature and brook trout
- distribution to determine the influence of water temperature on brook trout
- invading bull trout streams.
- A study to identify which species of fish were native to the Sinks Drainages and the manner in which they were established.
- A study to determine the temporal nature of bull trout spawning.
- An assessment of fish entrainment through water diversions.
- An assessment of fish passage barriers (culverts and bridges) associated with roads and trails.
- A study to determine sculpin species occurrence and distribution.

The Forest Service monitors the following fish and fish habitat parameters in the Little Lost River: Closed Basin Subbasin Summary 151 Draft October 26, 2001

- Fish populations
- Fish habitat

- Riparian vegetation
- Depth fines
- Stream temperatures

The Challis Ranger District of the USDA Forest Service is conducting or participating in the following research/assessment activities in the Big Lost River basin:

- A study assessing the relationship between water temperature and brook trout distribution to determine the influence of water temperature on brook trout invading bull trout streams.
- A study to identify which species of fish was native to the Sinks Drainages and the manner in which they were established.
- An assessment of fish entrainment through water diversions.
- A study to determine sculpin species occurrence and distribution.

The Forest Service monitors the following fish and fish habitat parameters in the Big Lost River:

- Riparian vegetation
- Depth fines
- Stream temperatures

Idaho Department of Environmental Quality

The Idaho Department of Environmental Quality is engaged in ongoing research to obtain the most recent and site specific scientific knowledge available for the purposes of refining water quality criteria. Monitoring activities in Idaho have focused on beneficial uses and ambient water quality trends. Data from DEQ's monitoring are used to document the existence of uses, the degree of use support, and reference conditions. This monitoring is made up of primarily the collection of biological and physical data. The ambient trend monitoring network is designed to document water quality trends at the river basin and watershed scales through the collection of mainly water column constituent data.

Biological parameters are being added to this network as well. Fifty-six monitoring stations are currently sampled on a rotating basis to provide data for water quality trend assessment. DEQ also monitors chemical, physical and biological components of the aquatic environment through the Beneficial Use Reconnaissance Project. DEQ continues to refine the water body assessment guidance for evaluating BURP data. The primary assessments are designed to determine the support status of the two main aquatic life beneficial uses, Cold Water Biota and Salmonid Spawning.

United States Geological Survey

Interior Columbia Basin Ecosystem --The USGS provides earth science information to the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) project staff, which is completing a scientific assessment of all land in a seven-State region of the Columbia River Basin east of the Cascade Mountains. Goals of the scientific assessment are to understand the development and current state of land, water, plants, animals, and society within the basin and to model future conditions that could result from different management alternatives and disturbances. In coordination with the scientific assessment, Closed Basin Subbasin Summary 152 Draft October 26, 2001 the USFS and BLM staff also is developing regional management strategies for Federal lands in the Basin. Goals of the management strategies are to maintain and improve ecological integrity by promoting the natural processes that operate in healthy aquatic, terrestrial, and landscape ecosystems and to provide sustainable flows of resources from Federal lands. Mineral-resource potential of the Interior Columbia Basin is a partial indicator of the potential for economic development, land use, and environmental hazards.

USGS scientists have provided detailed digital geologic, hydrologic, and mineral-resource information to USFS and BLM staff biologists, botanists, forest ecologists, sociologists, and economists; participated in systems modeling; provided data to be used by the agencies in the development of management alternatives; and contributed to several reports.

Idaho National Engineering and Environmental Laboratory -- The Idaho National Engineering and Environmental Laboratory (INEEL) which is operated by the U.S. Department of Energy, is located on the eastern Snake River Plain in southeastern Idaho.

The USGS has monitored hydrologic conditions in the Snake River Plain aquifer at the INEEL since the early 1950's. A multiphase project began in 1987 to characterize the fate and transport of radioactive and chemical constituents in the aquifer. In the first phase of this project, stratigraphic, geochemical, and hydraulic studies are being incorporated to define the ground-water flow system at the INEEL. Complementary studies include the use of environmental tracers to provide information about the rate of ground-water flow and geochemical-reaction experiments to evaluate the chemical processes that affect the transport of waste constituents in the subsurface. In the second phase, numerical flow models are developed to simulate the occurrence and movement of water in the aquifer system. These models integrate data obtained from the first-phase studies and are used to evaluate the conceptual model of the flow system. In the third phase, a solute-transport model is developed to test hypotheses about the movement of radiochemical constituents in the aquifer. In addition to the large-scale characterization study, the USGS began a flood-plain study in 1994 to delineate the possible extent, volume, and velocity of floods in relation to INEEL processing and storage facilities. Other USGS activities at the INEEL include regional and local surface geologic mapping and subsurface stratigraphic, isotopic, and paleomagnetic studies to help develop hazard assessments for potential threats from earthquakes and volcanic eruptions for the INEEL and for specific reactor and radioactive-waste storage facilities.

Hydrologic and Water-Quality Data --Idaho has seven major river basins—the Kootenai, the Pend Oreille, the Spokane, the Clearwater, the Salmon, the Snake, and the Bear. Rivers in these basins supply surface water for agriculture, industry, hydroelectric-power generation, recreation, fish and wildlife habitat, and other uses within Idaho and in adjacent States. Aquifers supply ground water for these same uses in many parts of the State. Water from geothermal aquifers also is used for space heating. Hydrologic and water-quality data are critical for the day-to-day administration and management of water resources; for determining the extent and severity of droughts; for characterizing and predicting conditions during floods; and for monitoring the effects of people's activities on streamflow, ground-water supply, and water quality. The data also are essential to plan development activities and to carry out interpretive studies that provide information for making decisions about water issues that affect millions of people.

The USGS, in cooperation with the Idaho Department of Water Resources, the Bureau of Reclamation, and more than 20 other local, State, and Federal agencies, collects surface- and ground-water and water-quality data at numerous sites throughout the State. For example, streamflow discharge was measured at 279 gaging stations; water-quality data were collected at 124 of those stations in 1996.

Needed Future Actions

Multi-scaled Ecological Research and Development on New Analytical Tools

Biologically Based System Management

The present Biologically Based System Management Project funded by BOR (see Assessments within the Subbasin, and Research, Monitoring, and Evaluation Activities, above) extends only from Palisades Dam to Heise on the South Fork of the Snake River. Because this stretch of the river is significantly different geologically and hydrologically from the stretch from Heise downstream to the confluence with Henry's Fork, similar data (particularly field measurements and hyperspectral imagery) need to be obtained from this lower stretch to make the BBSM fully worthy and maximize the predictive power and utility of the resulting model.

Fish/Aquatic Needs

General

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.

- Use genetic markers to detect and quantify levels of hatchery produced *O. mykiss* introgression within Yellowstone cutthroat trout populations and to delineate genetic population structure of Yellowstone cutthroat trout throughout their historic range. This fundamental genetic information with regards to introgressive hybridization and genetic population structure is needed to identify remaining pure populations, preserve existing genetic variability, and identify population segments for the development of management plans and the designation of conservation units/management units.
- Compare rates of hybridization and introgression between hatchery produced *O. mykiss* and native populations of Yellowstone cutthroat, redband trout, and westslope cutthroat trout. A greater understanding of the phenomenon of hybridization and introgression observed within *Oncorynchus* populations throughout the middle and upper Snake River provinces should allow a better assessment of the impacts of past hatchery produced *O. mykiss* introductions and allow a better evaluation of the possible future genetic risks native *Oncorynchus* populations face with regards to hybridization and introgression.
- Continue coordinated collection of water temperature data throughout the middle and upper Snake River provinces.

Jackson National Fish Hatchery

- Irrigation Diversions -- Irrigation diversions on Federal and private land in the upper Snake River Basin may or may not have direct impacts on the native and non-native fish stocks. Many of the irrigation diversions do not have screens or other devices thatwould reduce or eliminate the potential impacts on the fish populations. A study proposal has long been identified in Jackson NFH's Fisheries Operational Needs System (FONS) to determine the effects on aquatic populations on Federal land but has not been funded.
- Isolation / Quarantine Facility -- Jackson NFH's involvement with wild and native trout is entering its second decade. Other species, including species of concern and to a lesser degree, amphibians, cannot be reared and propagated at this facility because it lacks an isolation / quarantine unit which is necessary according to Wyoming Game and Fish Department Policy. Currently, replacement broodstock from the wild are brought in to the facility as fingerlings from iso-quarantine units in the state system. Multi-species propagation and broodstock development dictates that a unit is necessary at Jackson. It has been identified in the Maintenance Management System (MMS) for the station but has not been funded.
- Peterson Springs Waterline -- The availability of cold, clean, and abundant pure water located on the National Elk Refuge was the primary reason for the site location of the hatchery today. The water delivery system from Peterson Springs is a ductile iron pipe, which is now approximately 50 years old. The pipeline has failed twice in previous years and is in need of replacement. The project is in the MMS system but has not been funded. Without this source of water for the facility, many of the existing propagation programs could not be attempted, nor could other species be considered as a refugia population.

Palisades Reservoir Need

- No studies have been conducted to identify a conservation minimum pool in Palisades Reservoir (BPA1991). Palisades has a minimum operational pool of 201,000 acre feet for power head. According to IDFG, increased outmigrations of fish occur at levels below 500,000 acre feet. Large fluctuations in water levels (up to 80 feet) may affect open water species such as lake trout and kokanee (IDFG 1991). (ref: Snake River Resources Review: Aquatic Resources Parameters Manual, March 2001.)

Wildlife/Terrestrial Needs

Comprehensive Monitoring Program for Neo-tropical Migrant and Other Non-game Birds. Bird populations have long been recognized as a good indicator of environmental health. Although various bird surveys are conducted in the region (e.g. limited USF&WS Breeding Breeding Bird Surveys, various raptor counts, etc.), there is no coordinated, rigorous bird monitoring program. Moreover, the limited efforts that do exist are wanting; the general bird surveys only record bird presence and abundance, rather than the more telling metrics of productivity and survivorship. There is a scientific need to establish a comprehensive network across the subbasin of MAPS (Monitoring Avian Productivity and Survivorship; DeSante and Burton, 1997) stations to provide coordinated and uniform information on bird populations and, as an extension, an evaluation of environmental health.

Grand Teton National Park and John D. Rockefeller, Jr., Parkway

A primary need is to develop an adequate natural resource database with which to (1) protect natural resources from degradation by an expanding visitor population and (2) assist management in developing project priorities. Toward this end, specific needs are:

- Funding for an additional seasonal biologist position, devoted to the I & M program.
- Additional helicopter hours, particularly for locating two "missing" bald eagles.
- Neotropical migratory bird monitoring program development and implementation.
- Vegetation specialist to develop and implement a program to manage grazing, rare plants, noxious weeks and rehabilitation of disturbed sites and abandoned homesteads.
- Permanent funding for Geographic Information System (GIS) technology to assist resource management and research programs within the Park.

Management and Research Needs for Trumpeter Swans

Management and research needs for the protection and population enhancement of the trumpeter swans include (Pacific Flyway Subcommittee on Rocky Mountain Trumpeter Swans 1998):

- monitoring of winter distribution and abundance,
- monitoring of nesting effort and success and abundance of breeding segment,
- monitor/research aquatic macrophyte communities and impacts of winter flow, regimes, particularly in the Harriman State Park vicinity of the Henry's Fork (as it influences breeding populations in Grays Lake such that they are both of the Rocky Mountain Population),
- habitat improvement to correct problems at specific nesting territories,
- research into seasonal movements and habitat use, and
  hazing and capture/translocations out of high risk areas.

Bonneville County Weed Control Program Need

- Develop a program for the Swan Valley area on control of spotted knapweed. This will include participation with land owners, agencies including the Idaho Department of Agriculture, and Bonneville County. A program may include an agreement whereby:
  - -the county applies the herbicide\bugs,
  - -the land owner pays for product, and
  - -the state or other agencies cost share the total expense, or pays for the application and a percentage of the product.

This would be a long term program implemented and monitored for many years.

Combined Aquatic & Terrestrial Needs

U.S. Fish and Wildlife Service - Idaho

The Columbia Plateau is an arid sagebrush steppe and grassland surrounded on the north, west, and east by moister, predominantly forested, mountainous ecological regions. It consists of arid tablelands, intermountain basins, dissected lava plains, and widely scattered low mountains. There is a more subtle transition to the Basin and Range to the

south in which hotter lowlands are dissected by isolated mountain ranges. (Taken from the *Columbia Plateau Bird Conservation Plan Executive Summary*)
Issues in this area include conversion of shrubsteppe and wetlands to agriculture, grazing, and some urban development. To return the area to its near natural status would require:

- Careful management and removal of non-native plant invasions. These have been particularly damaging, led by aggressive species such as cheatgrass and crested wheatgrass.
- Management of wild lands for fire suppression and other practices, which have greatly reduced the extent and health of open ponderosa pine habitat.
- Restore the dry, open, multi-aged ponderosa pine system. This will require careful silviculture and a regimen of prescribed fire.
- Maintain and restore a dynamic sagebrush ecosystem within the shrubsteppe including no further net loss of healthy sagebrush, and restoration of fragmented and degraded areas.
- Protect existing wetlands, and restore water regimes.
- Manage livestock grazing and restore levels of water tables. The health and complexity of riparian shrub and forest vegetation has been extensively degraded due in part to over grazing and lowering of water tables. However, restoration activities have been shown to produce relatively good results.

Idaho Department of Fish and Game - Muledeer Information Requirements

A comprehensive inventory of winter range quality and quantity including the status and terms of enrollment of CRP lands would be valuable for long range planning and management. CRP is particularly important because such a large percentage of the analysis area is privately owned. A large scale conversion from CRP back to cultivated crops could result in significant depredations problems by both mule deer and elk under current population objectives for both species.

Idaho Department of Fish and Game (IDFG)

Sagebrush steppe habitats throughout the Columbia River Basin have been degraded by human activities including conversion to agriculture, livestock grazing, non-native plant invasions and altered fire regimes. Restoration of these habitats demands a reliable source of plant materials (seed and seedlings) for use in reestablishing ecosystem function to accomplish restoration and enhancement goals. Often, managers are unable to find an adequate supply of site adapted native plant materials that will survive and prosper in local climates and soils.

Idaho Soil Conservation Commission (ISCC)

In order to support both aquatic and terrestrial needs, the Idaho Soil Conservation Commission (ISCC) proposes the following for the East Side Soil and Water Conservation District:

- Educating landowners in benefits of Best Management Practices (BMPs) such as no-till, sub-soiling, water and sediment basins, etc. (These BMPs would reduce soil runoff which should reduce the amount of suspended solids in streams.)
- Subsidizing installation of BMPs and cost sharing

- Water monitoring to reassure beneficial uses are attained

Lower Valley Energy, Inc

- Growing osprey population is an increasing problem for LVE and LVE's customers. Assistance in planning and achieving long-term mitigation of the problem through expert advice and funding for both the ospreys and our customers would be a benefit.
- Tools such as longer-reaching bucket trucks for installation of marker balls, etc., to assist in the prevention of swans colliding with high expanse power lines.

Market Lake Wetland Complex (Southeast Idaho Wetland Focus Area Working Group, 2001)

Several strategies exist for conserving existing and historic wetland areas in this complex, however

- Acquisition of property or capital may be the best option.
- The purchase of water rights within the Snake River system and using them on the WMA may be able to supplement decreasing water levels in the marshes during the summer.
- Purchasing and installing a pumping system that will take water from the Van Leuven slough to the Snake River is one alternative. Pumping would occur when the slough backs up during times of high flows in the river so as to prevent flooding on the WMA and private property in the basin.
- An evaluation of erosion and flooding problems in the basin may be warranted.
- Installation of check dams could reduce excessive runoff and reduce or eliminate flooding problems within the basin.
- Conservation actions (acquisition and restoration) within the historic Market Lake basin would allow for extensive restoration of these converted wetlands.
- Control of noxious weeds needs to increase throughout this complex. This effort should continue to be coordinated with local agencies, landowners, and other conservation organizations to control and/or eliminate purple loosestrife.

South Fork of the Snake Wetlands Complex (Southeast Idaho Wetland Focus Area Working Group, 2001)

Protecting wildlife and habitat value in existing wetlands should be the main thrust of wetland conservation in the South Fork Wetland Complex.

- Conservation partnerships focusing wetland protection especially on lands with high wildlife and habitat values should be a priority. Such land partnerships would be able to protect existing wetland habitat functions and values, as well as restore degraded areas to historic conditions.
- Livestock management should be addressed using several Natural Resources Conservation Service (NRCS) programs that are directed at improving grazing methods and protecting water quality. Additionally, the NRCS can work with landowners to develop conservation plans that would recommend strategies for continuing the farming and/or cattle operations and still protect the wetland resources.

- The Idaho Department of Fish and Game and U.S. Fish and Wildlife Service also have some cost share funds to assist with fencing along riparian zones.
- Due to the private ownership of important wetland and riparian areas in, landowner participation in wetland conservation efforts will be essential. Landowners interested in conservation should be informed about the economic and ecological advantages of participation in the various land stewardship programs that can include grazing management, waterway buffering, best management practices, water quality improvement projects, wetland restoration, and riparian fencing and re-establishment.

Willow Creek Wetland Complex (Southeast Idaho Wetland Focus Area Working Group, 2001)

Conservation partnerships should be developed to focus wetland protection and restoration efforts especially on private and public lands with high wildlife and habitat values.

- Due to the private ownership of important wetland and riparian areas in the Willow Creek Complex, landowner participation in wetland conservation efforts will be essential. Interested and willing landowners should be informed about the economic and ecological advantages of participation in land stewardship programs that can include grazing management, stream and wetland restoration, and riparian fencing and re-establishment.
- Government land managers of mountainous areas should be encouraged to incorporate wetland habitat maintenance and restoration techniques in land management projects.
- This should include establishing wide stream protection zones, and facilitating growth of riparian and forested wetland vegetation near rivers, streams, and wetlands.
- Road construction across or near streams and other wetlands should be avoided or minimized and natural drainage patterns should be maintained.
- Restoration of historic wetland functions and values should be a long-term goal.
- Re-establishment of natural hydrologic regimes may be one of the few ways to benefit declining wildlife populations as well as wetland vegetation communities.

Baseline Winter Moose Surveys in the Headwaters of the Upper Snake

The North American Moose Foundation (NAMF) and the Idaho Department of Fish and Game (IDFG) are currently planning to partner together to develop science-based surveys for moose and habitat. There have been no specific Moose surveys conducted in the Headwaters of the Upper Snake. Accurate winter surveys, and seasonal as required, of Moose are needed to: 1) set permit levels; 2) observe the health of the herds; and 3) identify conservation areas by determining where the Moose are located. Previous survey reports were random and incidental from deer and elk surveys. Additionally, the survey process will become a resource tool to educate the public about Moose and their habitat. (http://www.moosefoundation.org)

Wyoming Game & Fish

Wyoming Game & Fish combined aquatic and terrestrial needs include

- Installation of a water intake structure in the levee near Tucker pit

- Channel water into historical river channels that are currently either dry or hold only small amounts of water for a portion of the year. Improved flows will increase cutthroat trout spawning, and provide habitat for a wide diversity of amphibians, mammals and birds. Project benefits include significant benefits to the spawning substrates.

Jackson Lake Ecology as Affected by Severe Drawdowns

During severe drought years as occurred in summer of 2000 and 2001 Jackson Lake is drawn down to natural lake levels, which could be 40 feet below full pool level as maintained by the Jackson Dam. During these periods vast stretches of shoreline and mud flats are exposed.

Acquire data related to the impacts of these severe drawdowns on:

- Waterfowl, bald eagles, herons, and other water dependent bird species.
- Beaver, muskrats, otters and other mammals dependent upon lake levels.
- Aquatic vegetation including floating and emergent plant communities.
- Cultural resource sites that are normally submerged.
- Aquatic invertebrates.
- Hyporehic communities.
- Fish species.
- Exotic species such as the New Zealand Mud Snail (known to occur upstream of Jackson Lake) or the encouragement of invading exotics such as tamarisk and purple loostrife.
- Aquatic born diseases such as Whirling Diseases.

A panel of experts should be established who will be charged with the responsibility to:

- Evaluate the significance of the impact on the above resources and/or concerns.
- Establish a priority of investigation and evaluation
- Develop protocols for appropriate inventory, monitoring, and research projects as required
- Develop mitigation procedures following inventory, monitoring, and research efforts if applicable and practical
- Define potential contractors and partners for funding and investigative efforts
- Provide oversight of inventory, monitoring, and research

Land protection Needs.

Although substantial lands have been protected along the South Fork of the Snake River, many rich fish and wildlife habitats found near the river are still at threat to development.

- The best of these lands should be conserved through conservation easements and fee acquisition to insure that they continue to function as habitat.
- Reasonable forward-looking developments plan, based on good science and impacts to resources, needs to be developed.

Actions by Others

Non-BPA Funded Actions, Activities, and Programs

Grays Lake

Within the Upper Snake River sub-basin, several branches of the U.S. Fish and Wildlife Service are active: Law Enforcement, Ecological Services Office, Fisheries, and National Wildlife Refuges. The mission statement of the Service: "The U.S. Fish and Wildlife Service's mission is, working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people." National Wildlife Refuge System is national network of lands and waters established for the conservation and management of fish, wildlife and plant resources and their habitats. There is one refuge unit located within the Headwaters Subbasin: the Grays Lake National Wildlife Refuge.

Grays Lake is located 27 miles north of Soda Springs, in a high mountain valley at an elevation of 6400 feet. The refuge currently controls 18,500 acres. Additions are proposed to protect more important wildlife habitat, which will eventually increase the refuge to 32,800 acres. While Grays Lake is a natural lake, its water level is regulated according to agreements that balance the needs of wildlife with various off-refuge interests. The "lake" is actually a large shallow marsh. It has little open water and is covered with dense vegetation, primarily bulrush and cattail. Wet meadows and grasslands surround the marsh. Habitat management focuses on measures to benefit cranes and waterfowl. The refuge hosts the largest nesting population of greater sandhill cranes in the world; during the staging period in late September and early October, as many as 3,000 have been found in the valley at one time. There have been up to 199 species noted on Grays Lake NWR or within the Grays Lake watershed.

Grays Lake National Wildlife Refuge was established for use as an inviolate sanctuary, or for any other management purpose, for migratory birds (16 U.S.C. 715d (Migratory Bird Conservation Act). It was also identified as suitable for

(1) incidental fish and wildlife-oriented recreational development,
(2) the protection of natural resources, and
(3) the conservation of endangered species or threatened species

(16 U.S.C. 460k-1 ... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ...16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended). AND ... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 16 U.S.C. 742f(a)(4) ...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ...16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

Management Programs -- Grays Lake NWR is the largest hardstem bulrush marsh in North America. This marsh attracts large numbers of ducks, sandhill cranes, Canada geese and trumpeter swans. Water levels cannot be manipulated because of agreements with local land owners and the Fort Hall Irrigation District. Surrounding the marsh are large wet meadows. These meadows are used by feeding geese and cranes and their broods. These fields are managed with grazing, haying and prescribed burning to provide short foraging habitat. These practices are currently being investigated with a large research project. Some small grain crops are grown to provide supplemental feed for geese and cranes and to keep them on the refuge, rather than in private croplands. Integrated pest management is practiced to prevent noxious weeds from degrading native habitats. Waterfowl banding is done each year at Grays Lake, in a cooperative effort with the Idaho Department of Fish and Game. Grays Lake NWR was the site of the discontinued whooping crane cross-fostering experiment. This experiment used sandhill crane foster parents to hatch and raise whooping cranes. The sandhill cranes were successful in raising the whooping crane chicks and teaching them the migration route to the New Mexican wintering sites. However, the whooping cranes imprinted on the sandhills and never paired successfully with each other. This experiment has been discontinued and it is no longer possible to see whooping cranes on the refuge.

Gem State Wildlife Habitat Area

The Gem State Wildlife Habitat Area (GSWHA) is made up of 71 acres of riparian habitat, most of which is the offsite mitigation area for losses resulting from the development of the Gem State Hydroelectric facility by the City of Idaho Falls. It is managed by the Idaho Department of Fish and Game. The parcel is located on the Snake River below the confluence of the Henry's Fork and the South Fork of the Snake River. The Gem State offsite mitigation area was purchased by the City of Idaho Falls and transferred to the Idaho Department of Fish and Game for management. GSWHA is managed primarily as wildlife habitat. GSWHA is also managed to provide public access for hunting fishing, trapping, and wildlife viewing (IDFG, 1998).

The parcel has 63.7 acres of forested riparian habitat, including some mature cottonwoods. There are approximately 7 acres of palustrine emergent wetland on the BLM owned lands. Common flora includes: cottonwood, red-osier dogwood, willow spp., snowberry, rose, and Kentucky bluegrass. As part of the mitigation the city was required to provide new habitat on about 21 acres by clearing two areas and replanting them to a grass/forb mix in 1988 and to trees and shrubs in 1989. This project failed to provide the enhancements anticipated and the clearings became invaded largely by noxious weeds, particularly leafy spurge.

The area is located on river terraces and consists of only one soil type, Annis silty clay loam. The elevation is about 4,780 feet above sea level. No water rights are associated with the area and there has been no agricultural development. However, past use did included livestock grazing. Grazing was removed to enhance wildlife habitat when the City acquired the property.

The GSWHA provides habitat for a variety or songbirds, waterfowl, and raptors, including roost and perch sites for bald eagles. Small mammals, furbearers, deer, elk, and moose also use the area. The removal of grazing from the property and a project to reopen a remnant river channel to allow waterflows to raise the water table are expected to improve habitat for wildlife. Trees, including cottonwoods, shrubs and understory vegetation are expected to improve because of the elimination of grazing and because of an increase in available water provided by a raised water table.

Market Lake Wildlife Management Area

The 5,071 acre Market Lake Wildlife Management Area (MLWMA), in Jefferson County is located 2 miles north of the city of Roberts, and 17 miles north of Idaho Falls. The MLWMA was established in 1956 to restore a portion of the historic Market Lake basin for migrating and nesting waterfowl, and to provide an area for waterfowl hunting. It is managed by the Idaho Department of Fish and Game.

The original Market Lake was a 12 square mile flood plain of the adjacent Snake River. The vast flocks of waterfowl that visited Market Lake during the spring and fall migrations attracted "market" hunters who harvested the birds and gave the area its name. In 1956 when the MLWMA was established, only 30 acres of the original wetlands remained. Federal Aid per the Pittman-Robertson Act was used in acquiring property to create the MLWMA and also is used to manage the MLWMA.

The MLWMA has four major habitat types; marsh/wetland meadow, desert uplands, Snake River riparian, and cropland. The wetland complexes are surrounded by low rises of sand to sandy loam soils and igneous rock ledges. The 1,700 acres of wetlands receive the majority of their water from springs located throughout the MLWMA.

The MLWMA is used by 250 wildlife species and is an important migration and staging area for waterfowl species in the Pacific Flyway. Approximately 50,000 snow geese, 4,000 tundra swans, 100 trumpeter swans, 2,000 Canada geese and 250,000 ducks feed, rest, and stage at the wetland complex made up of the MLWMA, Mud Lake WMA, and Camas National Wildlife Refuge, during spring migration. The largest concentration of waterfowl occur in March and April.

In 1998, the MLWMA was given Globally Important Bird Area status in the American Bird Conservancy's United States Important Bird Areas program. Specifically, the MLWMA provides habitat for greater than 1% of the biogeographic population of snow geese during spring migration, and greater than 1% of the world's breeding population of white-faced ibis. It also provides habitat for nationally significant population of tundra swans in the spring.

Species with special status designations and species for which there is concern for their long term well being, which use the MLWMA include the bald eagle, peregrine falcon, sage grouse, sharp-tailed grouse, and white pelican.

The mission for the MLWMA is to protect and provide habitat at the Market Lake Wildlife Management Area for the propagation of waterfowl and other wildlife species so as to maintain abundant populations, and for public hunting, trapping, wildlife viewing, nature viewing and education (IDFG 1998).

Tex Creek Wildlife Management Area

The properties chosen for acquisition for the Tex Creek Wildlife Management Area had a long history of big game winter use. At the time of acquisition, the Indian Fork and Pipe Creek areas wintered 1,400 elk. Wintering deer were so numerous in Willow Creek Canyon that biologists had named one area Deer Heaven. The acquisition and cooperative management of these properties has ensured that these herds of big game animals would continue to have winter range.

Tex Creek Wildlife Management Area is comprised of land owned by several government agencies and one private organization. The Ririe Segment (2,255 acres managed under a 100 year agreement signed in 1976), was purchased by the Corps of Engineers to mitigate big game habitat losses due to the construction of Ririe Dam. The Teton Segment (9,113 acres managed under a 25 year renewable agreement signed in 1981) was purchased by the Bureau of Reclamation (BOR) as mitigation for Teton Dam. The Idaho Department of Fish and Game (IDFG) holds title to 9,215 acres and the Rocky Mountain Elk Foundation (RMEF) owns 705 acres. The remaining 9,600 acres is owned by the Bureau of Land Management (BLM) land and is managed under a three-way cooperative agreement between the BLM, BOR and IDFG. Primary management responsibility rests with IDFG. The entire project area encompasses 84,000 acres and includes 6,160 acres of state lands leased to private individuals and 53,665 acres of privately owned land.

Elevations at TCWMA range from 5,119 feet at the Ririe Reservoir pool level to 7,287 feet near the east boundary. Soils are highly varied and range from deep well-drained loess formed silt loams to shallow stony soils. Significant amounts of heavy clay soils are also present. Rock outcrop and lava rock rims predominate in canyon areas. Soil erosion can be severe during spring runoff and summer storm events.

Temperatures range from -35 F to 100 F. The mean annual temperature is about 43EF at the lower elevations. The growing season is generally less than 90 days and light frosts are common during the summer months. Mean annual precipitation ranges from about 12 to 18 inches, moving west to east across the area. Most precipitation falls as snow and spring rains. The area is prone to severe summer thunderstorms.

Normal snow depths are moderate over most of the area. Willow Creek canyon may have a month or less of snow cover in some years with 8-to-10 inches being the normal maximum depth. The eastern portions of the area will normally accumulate 2 to 3 feet of snow.

The area has predominantly south and west aspects. This, combined with a prevailing southwest wind tends to minimize snow depths and keep travel routes and foraging areas available for wintering elk, deer and moose.

Vegetation on the area is diverse with good interspersion of different habitat classes. Bitterbrush shrub steppe is the largest single natural habitat class (about 3,500 acres). Tall sagebrush, low sagebrush, juniper, and service berry shrub fields are common. Aspen is the most predominant tall cover type. Douglas Fir occupies about 250 acres. Of the nearly 5,500 acres of historical cropland, about 4,700 acres has been converted back into permanent herbaceous cover, generally a mix of perennial forbs such as alfalfa, Lewis blue flax and small burnett and bunch grasses such as Sherman bluebunch wheatgrass. About 800 acres remain in winter wheat rotation to serve as an attractant and high quality winter/spring forage for mule deer.

Many developments have occurred over the past 20 years. Fences have been removed, new fencing has been constructed, old farmsteads have been cleaned up and buildings removed. A headquarters facility has been developed. Over 170,000 shrubs have been hand and machine planted. Springs have been developed to facilitate the livestock grazing use trade and benefit wildlife. Terracing and water and sediment basins have been constructed on Ritter Bench, in the Pipe Creek drainage, Indian Fork drainage and in Bull's Fork. The purpose of this work is to control erosion, hasten recovery of eroded areas and to attempt to increase the water table and sub-irrigation of developed fields.

A recent wildlife development was the construction of three ponds on Pipe Creek in the fall of 1996. These ponds were constructed with funds acquired from a BOR grant with matching funds from Ducks Unlimited and the IDFG Habitat Improvement Program. The purpose of these ponds is to increase waterfowl production on the area and increase area diversity.

Pastures were created in several areas in order to facilitate a use trade agreement which removes grazing pressure from formerly privately held critical winter range. This resulted in increased winter range for elk and deer and is helping in restore areas where combined elk and livestock use created a situation of forage over-utilization.

Noxious weeds continue to be controlled by a variety of methods. This protects wildlife habitat from invasion by undesirable plant species.

TCWMA is home to a variety of migratory and resident mammals, birds, reptiles amphibians and fish. The mission of TCWMA is to Protect and manage the wildlife resources of the Tex Creek Wildlife Management Area, as mititagion for habitat losses elsewhere in the region, to insure sufficient quantities of high quality and secure habitat for wintering big game and for a wide variety of other game and nongame species. Provide high quality wildlife-based recreational opportunities and nature viewing compatible with this primary mission for the benefit of the public (IDFG 1998).

Jackson National Fish Hatchery

Wild Trout Program -- The Snake River Cutthroat trout the hatchery produces each year, is the native gamefish of this area. The cutthroat trout program is designed to produce a wild fish, which has been in the hatchery system for less than 3 years. This requires an infusion of "wild" genes into the captive population every three to five years or a complete replacement of the broodstock depending upon the genetic testing results.

Lower Valley Energy, Inc.

Osprey Nesting Box Program -- The most frequent bird management problem of the Lower Valley Energy (LVE) system is osprey nesting on transmission and three phase distribution lines. Wherever overhead power lines and support poles exist, there is avion interaction. The birds can create a short circuit between the lines causing a power outage. And often the nest will catch on fire or the birds are electrocuted. LVE's method of managing this problem is to install a nesting box higher on the transmission structure, or to plant a pole near the distribution pole and install a nesting box on it. The nest is then relocated to the box. This practice has been so successful that LVE linemen are complaining that LVE is increasing the osprey population, thus increasing problems. It does add to the expense of operating the LVE system. The expense does not end with the installation of the nesting box; overload and snow loading will create the need for maintenance or replacement in time. Power lines do not directly affect fish but the increase in the Osprey population has some impact on fish populations as well.

Bald Eagle Nesting Platform Program -- A request for a Boy Scouts of America (BSA) Eagle project was made to BPA; this was passed on to LVE. As an Eagle rank project, the local BSA helped LVE by building nesting boxes, whereas LVE covered the expenses of the BSA materials, etc. It is estimated, without a field survey, there are twelve nests on distribution lines and fourteen on transmission lines. Of these, eight are along Palisades Reservoir and in Swan Valley, three are in the Alpine area, ten are in the Grand Canyon of the Snake River at, and below, Hoback Junction and five are in Swan Valley.

Trumpeter Swan Program -- Another conflict with birds has been the danger of swans colliding with the lines. LVE has added marker balls to spans where such collisions are a possibility, when it has been possible to do so. At present there are two places, one in Star Valley and one in Jackson Hole, where the Wyoming Fish and Game would like LVE to install marker balls, but the bucket truck does not reach high enough. LVE currently plans to arrange with BPA for the rental of a larger bucket truck.

Peregrine Falcon hack-back program -- When falcons were being reintroduced into the Jackson Hole and Grays Lake areas, LVE provided and installed used power poles for the construction of brood hutches. This seems to assist in the population stability of peregrine falcons which seem to have fewer conflicts with power lines.

Trout Unlimited

South Fork of the Snake River Home Rivers Project –Description: Phase one of a multi-year "Home Rivers" project to conserve the native Yellowstone Cutthroat trout fishery on Idaho's South Fork of the Snake River. The project will combine research and assessment, habitat restoration, and long-term conservation planning. First year activities will include assisting state and federal managers to erect and operate fish weirs on four tributaries to manually remove non-native rainbow trout from cutthroat spawning habitat; identifying mainstem and tributary habitat restoration projects; as well as a review of current research and recommendations for future research needs. First year costs are projected at $150,000.

The current trust of this project can be divided into five categories---

- Reducing hybridization and displacement of native Yellowstone cutthroat trout with introduced rainbow trout
- Understanding and recommending modifications that effect geomorphic impacts to mainstem river habitats due to flow alterations from Palisades Dam
- Reducing and eliminating damage to the spawning tributaries due to dewatering, grazing, road development, and other impacts
- Reducing or mitigating recreational impacts, including boat traffic from jet and drift boats
- Assessing and reducing or eliminating impacts from development, with associated bank armoring, along the South Fork.

This project is scheduled to last at least three years with associated funding on an annual basis.

Protected Areas

The South Fork Snake River corridor is one of the Upper Snake's most outstanding fish and wildlife resources. The U.S. Fish and Wildlife Service ranked the cottonwood gallery forest along this reach of the river the number one wildlife resource in Idaho. The multi-layered cottonwood forest is home to the greatest avian diversity in all of the Greater Yellowstone Ecosystem (GYE). The South Fork corridor is the most productive bald eagle nesting habitat in the GYE, and supports 25 other species of nesting birds of prey. The South Fork is widely regarded as the finest large native cutthroat trout river in the country. Extensive cottonwood riparian forests and the surrounding canyons and cliffs along the South Fork provide vital habitat for a diversity of neo-tropical migrant passerine birds as well as many other species, including many raptors. Within the South Fork corridor there are 14 bald eagle breeding territories, 3 peregrine falcon eyres, mountain lion dens, as well as abundant habitat for black bears and large game such as elk, moose, and mule deer. With many of these species listed as sensitive, threatened or declining, habitat protection is critical. Native populations of Yellowstone cutthroat trout are abundant, making the South Fork one of the best large native cutthroat rivers in the world.

In addition, this reach of the South Fork is an important trumpeter swan wintering area. The South Fork and Rainey Creek near Swan Valley have supported up to 300 wintering trumpeters. The South Fork is of critical importance to swans, geese and many other waterfowl during migration, nesting, and wintering.

Partnerships have leveraged a substantial investment of federal funds towards the South Fork Snake River. Partners include private parties, conservation oriented landowners; U.S. Bureau of Land Management (Land and Water Conservation Funds); Teton Regional Land Trust, The Conservation Fund; The Nature Conservancy of Idaho; Idaho Department of Fish & Game; Natural Resources Conservation Service; Idaho Conservation Data Center; U.S. Fish and Wildlife Service; Bonneville Power Administration (mitigation funds); and The Trumpeter Swan Society. In combination, The Nature Conservancy, The Conservation Fund, Teton Regional Land Trust, and the Bureau of Land Management have protected a total of 2,620 acres along the South Fork of the Snake River in Idaho from the Palisades Reservoir to Roberts. Acquired conservation easements include 696 acres, fee acquisition includes 1,810 acres, and donated easements include 114 acres.

Teton Regional Land Trust (TRLT)

As of January 2001, the total value of protected lands and the associated restoration projects provided by the Bureau of Land Management and partners including landowners, TRLT, the Conservation Fund, and Idaho Nature Conservancy exceeds 13.2 million dollars, including 7.8 million in appropriated Land and Water Conservation Fund (LWCF) funds**.** Of this total, TRLT has protected 1,269 acres of river corridor along the South Fork of the Snake River through conservation easements. An 800-acre farm/high value wildlife landscape was protected through hydroelectric mitigation funding, and 458 acres of river bottom and upland winter range through LWCF funds. An easement was donated on 11 acres in Swan Valley. TRLT is currently working to close two other approved LWCF projects on 269 acres.

The Nature Conservancy of Idaho (TNC)

The U.S. Fish & Wildlife Service has identified the South Fork of the Snake River as the most significant and highest quality riparian corridor remaining in the state of Idaho. Here thrives a unique forest including one of the last remaining intact communities of globally-threatened narrowleaf cottonwood and red-osier dogwood left in the western U.S., as well as habitat for the rare orchid, Ute ladies' tresses. The South Fork also supports the highest concentration of nesting bald eagles in the U. S. and the waters of this area nourish an endemic fish subspecies, the Snake River fine-spotted cutthroat trout. TNC and its partners have protected almost 5,000 acres here.

Bonneville County Weed Control Program

The spotted knapweed program was implemented in the fall of 2000 and will continue as long as participation with the State Department of Agriculture and local landowners continues. Spotted knapweed is very prolific in Bonneville County and one or two years of aggressive attention should greatly suppress the weed, but the area will need to be monitored for expanding weed populations. With the proper cooperation and education the Landowners can then control the weed on their own and have the security of the county to work with.

Safari Club International

Tex Creek Habitat Partner The Idaho Chapter of Safari Club International became a Tex Creek Habitat Partner with the Rocky Mountain Elk Foundation’s (RMEF’s) purchase of the Quarter Circle O Ranch and subsequent transfer of land management responsibilities to the Idaho Department of Fish and Game (IDF&G). Tex Creek is located in the Upper Snake Headwater subbasin. The Idaho Chapter made a $2,500.00 commitment to the project in August 1998. In an area increasingly affected by development, the Tex Creek Wildlife Management Area (WMA) constitutes critical habitat for numerous wildlife species. The Quarter Circle O Ranch along the boundaries of the WMA became IDF&G’s 1997 top acquisition priority and a RMEF Idaho conservation project. Purchase of the ranch and the transfer of land management responsibilities to the IDF&G protected three parcels totaling 4,300 acres.

1997 Mountain Goat Transplant -- The Idaho Chapter of SCI partnered with the Idaho Department of Fish and Game (IDF&G) for this effort. Mountain goats were transplanted from Game Management Unit 67 in the Upper Snake Headwater subbasin to the Frank Church Wilderness Area in the Salmon subbasin and was conducted in August 1997. The Idaho Chapter and a Safari Club International matching grant supplied $5000.00 to cover the helicopter costs associated with the goat capture. Chapter members worked on the ground crew assisting in the transport crate assembly, ear tagging, blood, fecal and nasal swab samples, and preparing the goats for transport. The IDF&G goat management plan called for transplant operations from a prolific introduced herd in southeast Idaho to other suitable habitats in the state. Aerial surveys of the capture area revealed a population of more than 200 animals. This project successfully transplanted 10 goats of the correct age class of 1.5 to 3.5 years old from the Palisades goat herd to an area of release on the edge of the Frank Church River of No Return Wilderness area.

Intermountain West Joint Venture:

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

Natural Resource Conservation Service (NRCS)/ Idaho Soil Conservation Commission (ISCC)

The NRCS/ISCC have a wide range of completed and ongoing conservation efforts within the soil and water conservation districts of the Willow Creek and Palisades drainages

Table 72. Existing and Past Efforts of Soil and Water Conservation Districts (SWCD)

Responsible District	Project Duration	Project Title	Description and Results
East Side SWCD	1983-1993	Badger Creek SAWQP	Idaho Ag Water Quality Program, Ag BMP implementation, 3500 acres treated
East Side SWCD	1984 - 1993	Meadow Creek SAWQP	Idaho Ag Water Quality Program, Ag BMP implementation, 4700 acres treated
East Side SWCD	1985 - 2000	Tex Creek	Idaho Ag Water Quality Program, Ag BMP implementation, 6800 acres treated
East Side SWCD	1990 - 2002	Antelope Creek	Idaho Ag Water Quality Program, Ag BMP implementation, 13,500 acres treated
East Side SWCD	1996 - 2005	Granite Creek	Idaho Ag Water Quality Program, Ag BMP implementation, 9000 acres treated
East Side SWCD & USDA NRCS	1980's	Upper Sand Creek Small Watershed Project (P.L. 566 Program)	Flood control & implementation of ag BMPs. Project completed.
East Side SWCD & USDA NRCS	1980'2	Lower Sand Creek Small Watershed Project (P.L. 566 Program)	Flood control & implementation of ag BMPs. Project completed.
Jefferson SWCD	annually	Conservation Tree Sales Program	Establishment of conservation windbreaks for wind erosion control and wildlife habitat
Madison SWCD	annually	Conservation Tree Sales Program	Establishment of conservation windbreaks for wind erosion control and wildlife habitat
West Side SWCD		Northwest Flood Control Project	Protect croplands from spring run off
West Side SWCD	annually	Adopt-A-Canal Program	Canals cleaned or debris to reduce water pollution and protect irrigation pumps & delivery systems

Table 73. Subbasin Summary FY 2003 - Funding Proposal Matrix

Project Proposal ID	33009	199505700
Provincial Team Funding Recommendation	**High Priority**	**High Priority**
1. Extend the geographical scope of the present Biologically Based System Management Project (funded by BOR) to include the reach of the South Fork Snake River below Heise diversion to maximize the predictive power and utility of the resulting model.		
2. Continue to inventory native salmonids in the Middle and Upper Snake 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.	+	
3. Determine the effects on aquatic populations of unscreened irrigation diversions or other devices.	+	
4. Develop an isolation/quarantine unit for the Jackson National Fish Hatchery's multi-species propagation and broodstock development program.		
5. Replace the Petersen Springs waterline at the Jackson National Fish Hatchery.		
6. Conduct a study to identify a conservation minimum pool in Palisades Reservoir.		
7. Conduct a comprehensive monitoring program for neo-tropical migrant and other non-game birds.		+
8. Develop an adequate natural resource database for Grand Teton National Park and John D. Rockefellar Parkway.		
9. Assess research needs for the protection and population enhancement of trumpeter swans.		
10. Implement habitat improvement to correct problems at specific trumpeter swan nesting territories.		
11. Develop a program for the Swan Valley area to control spotted knapweed.		
12. Maintain and restore a dynamic sagebrush ecosystem within the shrub steppe including no further net loss of healthy sagebrush, and restoration of fragmented and degraded areas.		+
13. Protect existing wetlands, and restore water regimes.		+
14. Manage livestock grazing and restore levels of water tables.		+
15. Educate landowners in benefits of Best Management Practices (BMPs) such as no-till, sub-soiling, water and sediment basins, etcetera and subsidize installation of BMPs and cost sharing.		+

Project Proposal ID	33009	199505700
16. Assistance in planning and achieving long-term mitigation of osprey problem at Lower Valley Energy Corporation facilities.		
17. Conserve existing and historic wetland areas in the Market Lake Wetland Complex.		+
18. Conserve existing and historic wetland areas in the South Fork Snake Wetland Complex.		+
19. Conserve existing and historic wetland areas in the Willow Creek Wetland Complex.		+
20. Assess need for surveys of moose and habitat.		
21. Install a water intake structure in the levee near Tucker pit (Wyoming).		
22. Channel water into historical river channels that are currently either dry or hold only small amounts of water for a portion of the year (Wyoming).		
23. Acquire data related to the impacts of severe drawdowns of Jackson Lake on waterfowl, bald eagles, herons, and other water dependent bird species, beaver, muskrats, otters and other mammals dependent upon lake levels, aquatic vegetation including floating and emergent plant communities, cultural resource sites that are normally submerged, aquatic invertebrates, hyporehic communities, fish species, exotic species such as the New Zealand mud snail (known to occur upstream of Jackson Lake) or the encouragement of invading exotics such as tamarisk and purple loosetrife, aquatic born diseases such as whirling diseases.		+
24. Protect valuable fish and wildlife habitats along the South Fork of the Snake River through conservation easements and fee acquisition to insure that they continue to function as habitat.		+

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

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Acronyms and Abbreviations

A	
ACOE	Army Corp of Engineers
B	
B	Bacteria
BIA	Bureau of Indian Affairs
BLM	US Bureau of Land Management
BMP	Best Management Practices
BMU	Basin Management Unit
BOR	US Bureau of Reclamation
BPA	Bonneville Power Authority
BRK	Brook Trout
BRN	Brown Trout
BSA	Boy Scouts of America
BURP	Beneficial Use Reconnaissance Project
C	
CDC	Conservation Data Center
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
COUNCIL	Northwest Power Planning Council
CRP	Conservation Preserve Program
CTT	Cutthroat Trout
D	
DDT	Dichloro-diphenyl-trichloro-ethane
DEIS	Draft EIS
DO	Dissolved Oxygen
E	
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ESA	Endangered Species Act
ERU	Ecological Reporting Unit
F	
F	Flow
FA	Flow Alteration
FEIS	Final Environmental Impact Statement
FIP	Forestry Incentive Program
F&G	Fish and Game

G

GHB	Grays – Hoback (Drainage)
GIS	Geographic Information System
GLNWR	Grays Lake National Wildlife Refuge
GRTE	Grand Teton National Park
GSWHA	Gem State Wildlife Habitat Area
GTNP	Grand Teton National Park
GVT	Gros Ventre (Drainage)
GYE	Greater Yellowstone Ecosystem

H

H	High
HA	Habitat Alteration
HCA	Habitat Conservation Assessment
HCT	Hatchery trout
HEP	Habitat Evaluation Procedures
HUC	Hydrologic Unit Code
HYB	Wild Rainbow + Cutthroat Hybrid

I

ICEMP	Interior Columbia Ecosystem Management Project
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
IF	Idaho Falls (Drainage)
ISCC	Idaho Soil Conservation Commission
ISRP	Independent Scientific Review Panel
IWJV	Intermountain West Joint Venture

K

KOK	Kokanee Salmon

L

L	Low
LKT	Lake Trout
LVE	Lower Valley Energy
LWCF	Land and Water Conservation Funds

M

M	Middle
MA	Management Area
MLWMA	Market Lake Wildlife Management Area
MMS	Maintenance Management System
MOS	Margin of Safety

MWF	Mountain White Fish

N

N	Nutrient
NAWMP	N. American Waterfowl Management Plan
NAWQA	National Water Quality Assessment (Program)
NER	National Elk Refuge
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NWR	National Wildlife Refuge

P

PAL	Palisades (Drainage)
PCPI	Per Capital Personal Income
PL	Public Land
PNV	Potential Natural Vegetation

Q

QCO	Quarter Circle O

R

RBT	Rainbow Trout
RMEF	Rocky Mountain Elk Foundation
ROD	Record of Decision

S

S	Sediment
SLT	Salt (Drainage)
SAWQP	State Agricultural Water Quality Program
SBT	Shoshone Bannock Tribes
SCDS	Soil and Water Conservation Districts
SCI	Safari Club International
SCS	Soil Conservation Service
SHW	Snake Headwater (Drainage)
SR3	Snake River Resources Review
SWCD	South West Conservation District

T

T	Temperature
TCWMA	Tex Creek Wildlife Management Area
TMDL	Total Maximum Daily Limit
TNC	The National Conservancy
TNF	Targhee Natural Forest
TPI	Total Personal Income
TRC	Total Resident Chlorine
TRLT	Teton Regional Land Trust

U

UC	Unknown Cause
USC	United States Code
USDA	US Department of Agriculture
USDI	US Department of Interior
USFS	US Forest Service
USFWS/FWS	U S Fish and Wildlife Service
USGS	US Geological Survey

W

WBAG	Water Body Assessment Guidance
WBID#	IDEQ Water Body Index Number
WCT	Wild Cutthroat
WGFD	Wyoming Game and Fish Department
WHIP	Wildlife Habitat Improvement Project
WIL	Willow (Drainage)
WLA	Waste Load Allocation
WNDD	Wyoming Natural Diversity Database
WMA	Wildlife Management Area
WQD	Wyoming Quality Department
WQPA	Water Quality Program for Agricultural
WRB	Wild Rainbow Trout
WRP	Wetlands Reserve Program

Y

YCT	Yellowstone Cutthroat Trout