Draft

Henrys Fork of the Snake River Subbasin Summary

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Prepared for the
Northwest Power Planning Council

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

Henrys Fork Subbasin Summary

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Henrys Fork Subbasin Summary

Background

In 1980 Congress authorized the creation of the Northwest Power Planning Council (Council) to give the states of Idaho, Montana, Oregon and Washington a political voice in management of the federal hydropower system located in the Columbia Basin. Additionally, the Council was directed to develop a program (Program) to protect, mitigate, and enhance fish and wildlife communities and populations affected by the Columbia hydropower system.

In past years, the Council and the Columbia Basin Fish and Wildlife Authority (local managers of fish and wildlife resources) reviewed proposals submitted for on-the-ground projects and research. The Bonneville Power Administration then funded approved projects.

Recently, independent scientific panels recommended that subbasin plans be developed to better guide the review, selection, and funding of projects which implement the Council's Program. In an effort to refine the Program, a new review and selection process has begun. This process includes subbasin summaries (interim information) and subbasin plans, which provide a base of information and direction on conditions, limiting factors, and needs in the basin. Creation of these documents is followed by a rolling review of proposals by an Independent Scientific Review Panel, the Columbia Basin Fish and Wildlife Authority and the Council. Under the rolling provincial review, project proposals from a given subbasin will only be reviewed once every three years.

Subbasin summaries include a physical description of the area, fish and wildlife resources, current management and goals, and objectives and strategies for the subbasin. The Henrys Fork subbasin summary was created with the help of private individuals, tribes, state and federal government agencies interested in the fish and wildlife resources of the Henrys Fork subbasin.

Introduction

The Henrys Fork subbasin is located in the Upper Snake Province in eastern Idaho and western Wyoming (Figure 1). The subbasin boundary coincides roughly with that encompassing Fremont, Madison, and Teton counties in Idaho (Figure 2). Less than 20% of the Henrys Fork subbasin is located in Wyoming, and this portion consists of headwater streams that drain west into Idaho. Throughout this document, most of the maps generated using Geographic Information Systems data omit the Wyoming portion of the subbasin. This was not intentional but was due to lack of information available for these areas or the failure of agencies managing this area to submit information for inclusion in this summary.

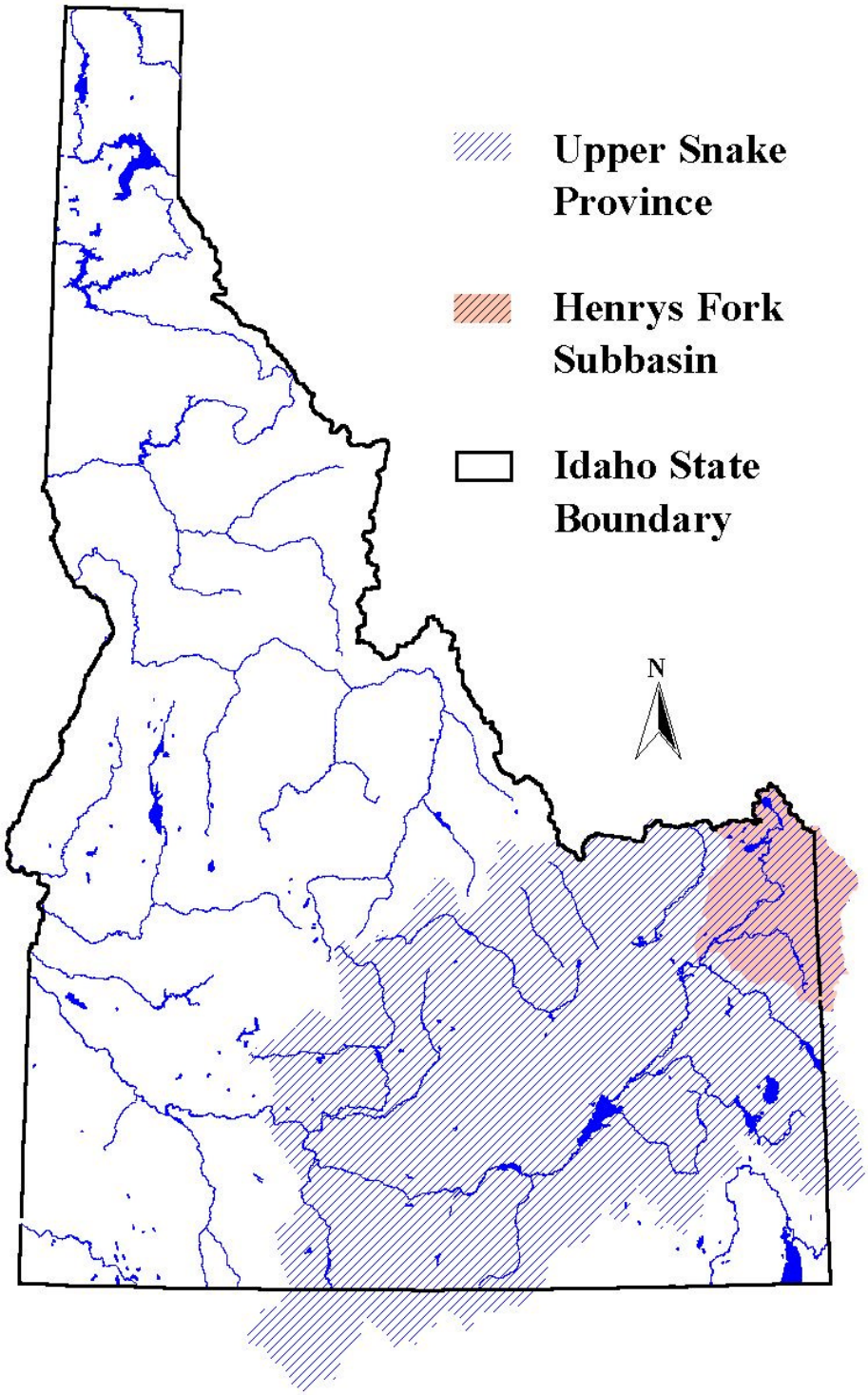
Upper Snake Province
Henrys Fork Subbasin
Idaho State Boundary
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Figure 1. General location of the Henrys Fork subbasin within the Upper Snake Province and Idaho

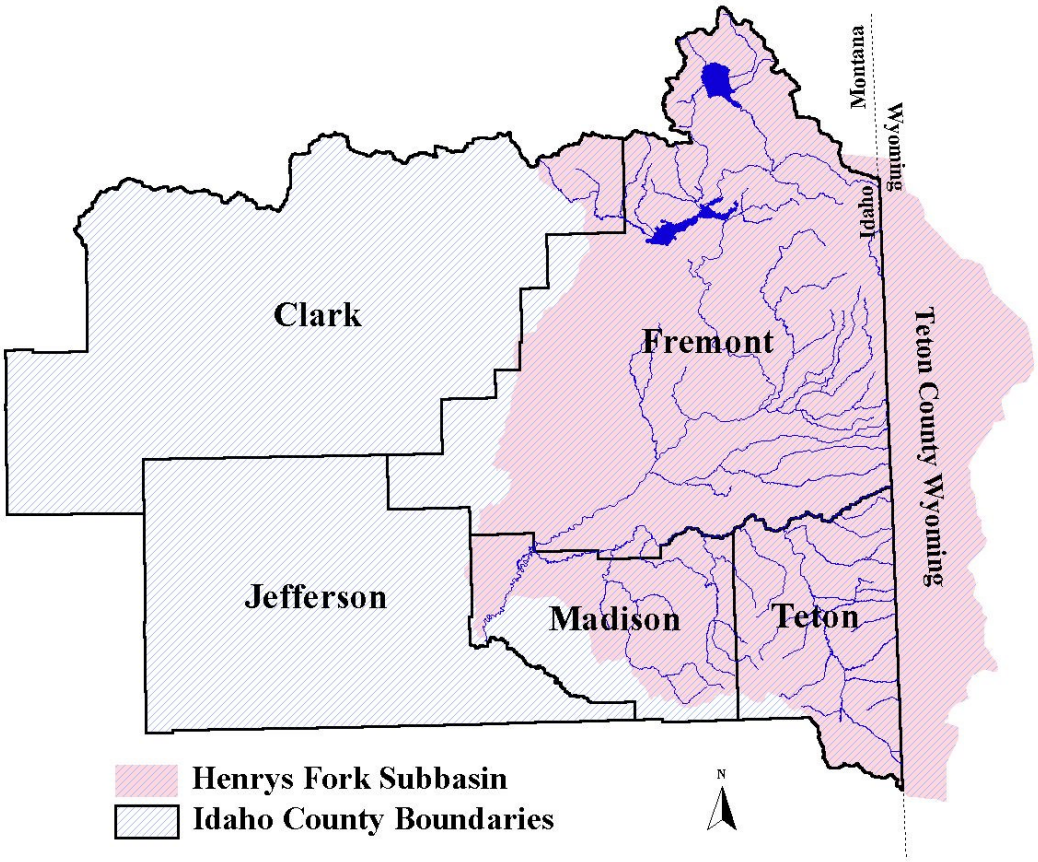

Figure 2. Boundaries of counties that are located within the Henrys Fork subbasin

Employment in the Henrys Fork subbasin is primarily in agriculture and other natural resource-related occupations, with additional employment in construction, service industries, and government. About 50 percent of the subbasin is publicly owned, and forest, range and agriculture account for about 95 percent of land use.

The Henrys Fork of the Snake River has been well known since the 1880s for its trout fishing and other recreational opportunities. The Henrys Fork subbasin provides one of the most important rainbow trout (*Oncorhynchus mykiss*) fisheries in the state in terms of habitat, fish populations and angler use (IDFG 2001). On the other hand, the rich agricultural land along the river's lower reaches is well known to the agricultural community as the world's largest seed-potato production area (Van Kirk and Griffin 1997). The cultural and economic significance of angling and irrigated agriculture have made the Henrys Fork subbasin a battleground for conflicts over water management issues (Van Kirk and Griffin 1997). Over the past two decades, water and other natural resource management issues in the subbasin have received national attention, both for the intensity

of conflicts over them and for the eventual success of collaborative subbasin research and management efforts. In natural resource management circles, the subbasin is now as famous for its successful watershed council as for fishing or potato production (Van Kirk and Griffin 1997, Weber 2000).

In 2000 the *Intermountain Journal of Sciences* devoted an entire issue to the Henrys Fork subbasin (Van Kirk and Zale 2000). Much of the information in this document comes from that journal.

Subbasin Description

General Description

Subbasin Location

The Henrys Fork subbasin is located in eastern Idaho and western Wyoming (Figure 1). It is bounded by the Continental Divide to the north, the Yellowstone Plateau and Teton Range to the east, the Big Hole Mountains to the south, and the Snake River Plain to the west (Figure 3). The subbasin's east side lies within the southwest corner of Yellowstone National Park and adjoins the northwest boundary of Grand Teton National Park. Elevations range from 1400 m at the southwest corner of the subbasin to over 3300 m along the Teton Range. Major mountain ranges include the Teton, Big Hole, Centennial, and Henrys Lake mountains (Figure 3). These mountain ranges are the oldest geologic features in the subbasin, which is otherwise dominated by volcanic formations of more recent origin. The Henrys Fork was named for Andrew Henry, who was a partner in the Missouri Fur Company. In 1810, Henry lead a party of eighty trappers from the Three Forks area of Montana south through the Henrys Fork basin. The party spent the winter near the current location of the town of St. Anthony, and left the region the following spring (Brooks 1986).

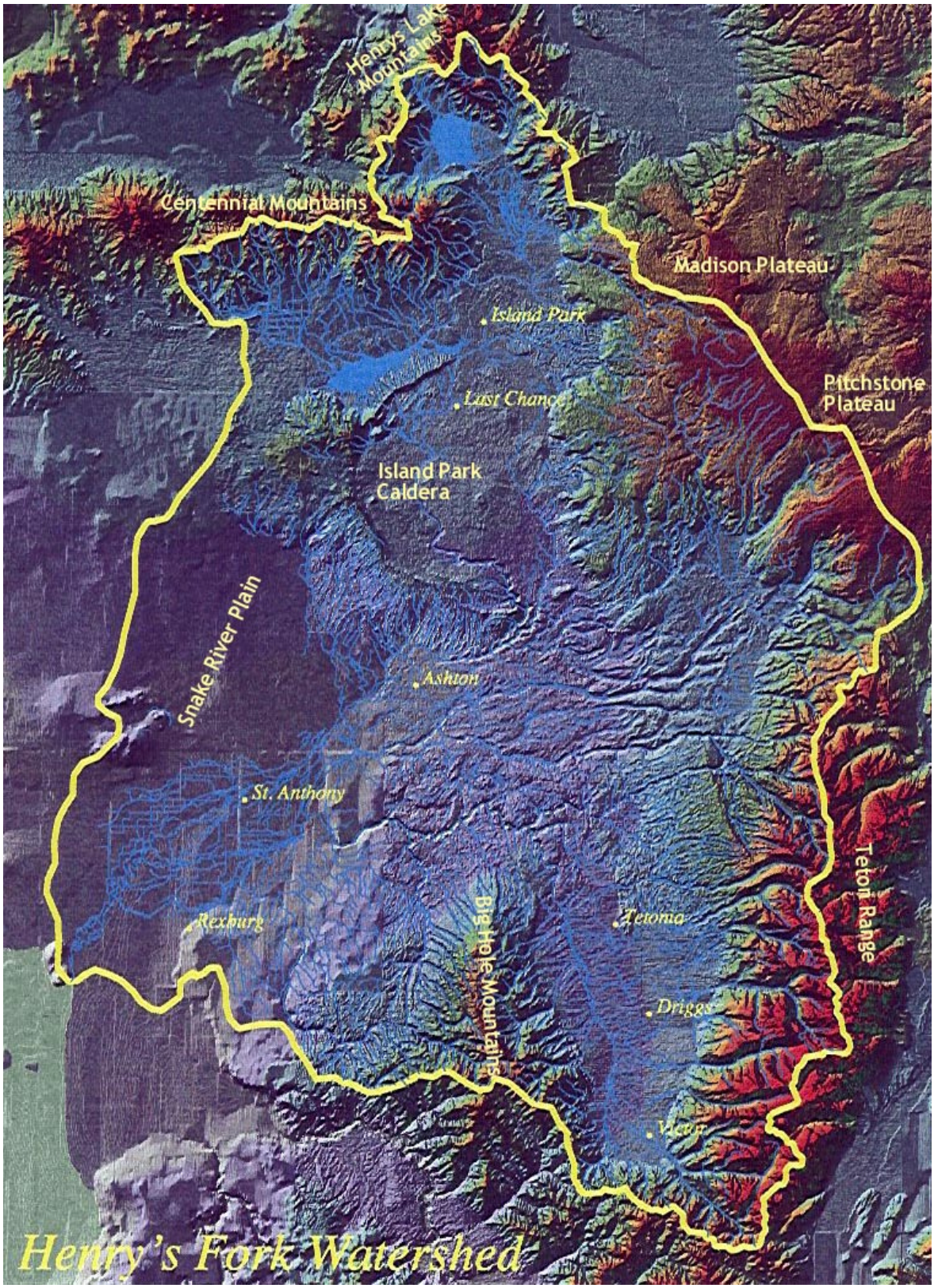

Figure 3. Physiographic features of the Henrys Fork subbasin

Drainage Area

The Henrys Fork subbasin drains an area of 8444 km². Major tributaries are Henrys Lake Outlet, Buffalo River, Warm River, Fall River, and Teton River. Our listing of Henrys Lake Outlet as a tributary follows the convention that the Henrys Fork begins at the confluence of Henrys Lake Outlet and Big Springs (see Van Kirk and Benjamin 2000). Most maps list the stream segment between Henrys Lake and Big Springs as the "Henrys Fork," but local usage refers this stream "Henrys Lake Outlet." In 2001, name of this stream segment was officially changed to "Henrys Lake Outlet" to be consistent with local usage and with the fact that in terms of total annual discharge, Big Springs, and not Henrys Lake, is the source of the Henrys Fork.

The Henrys Fork subbasin consists of three U.S. Geological Survey (USGS) hydrologic cataloging units, the Upper Henrys, Lower Henrys and Teton (Figure 4), each of which comprise about a third of the subbasin's area (Table 1). The Upper Henrys hydrologic unit consists of the Henrys Fork and its tributaries upstream of Ashton Reservoir. The Lower Henrys hydrologic unit contains the river and its tributaries from Ashton Reservoir downstream to its confluence with the Snake River, excluding the Teton River. This hydrologic unit primarily consists of the Fall River drainage. The third hydrologic unit contains the Teton River and its tributaries.

To minimize ambiguity, this document will use the term "subbasin" as it is defined by the NWPPC's designation of watershed units within the entire Columbia River basin. Thus, "subbasin" is used only to describe the entire area encompassed by the watershed of the Henrys Fork, that is, the combined area of the Upper Henrys, Lower Henrys and Teton hydrologic cataloging units, as defined by USGS. The terms "watershed," "subwatershed" and "drainage" will be used in a generic fashion to designate drainage areas that are subsets of the Henrys Fork subbasin as it is defined above. In many cases, these terms will be used as shorter and more easily readable synonyms for the official USGS "hydrologic cataloging unit" terminology. It should also be noted that although this document adopts the USGS convention of omitting apostrophes from possessive river names (e.g., Henrys Fork versus Henry's Fork), apostrophes are included in organization proper names that contain such river names (e.g., Henry's Fork Watershed Council).

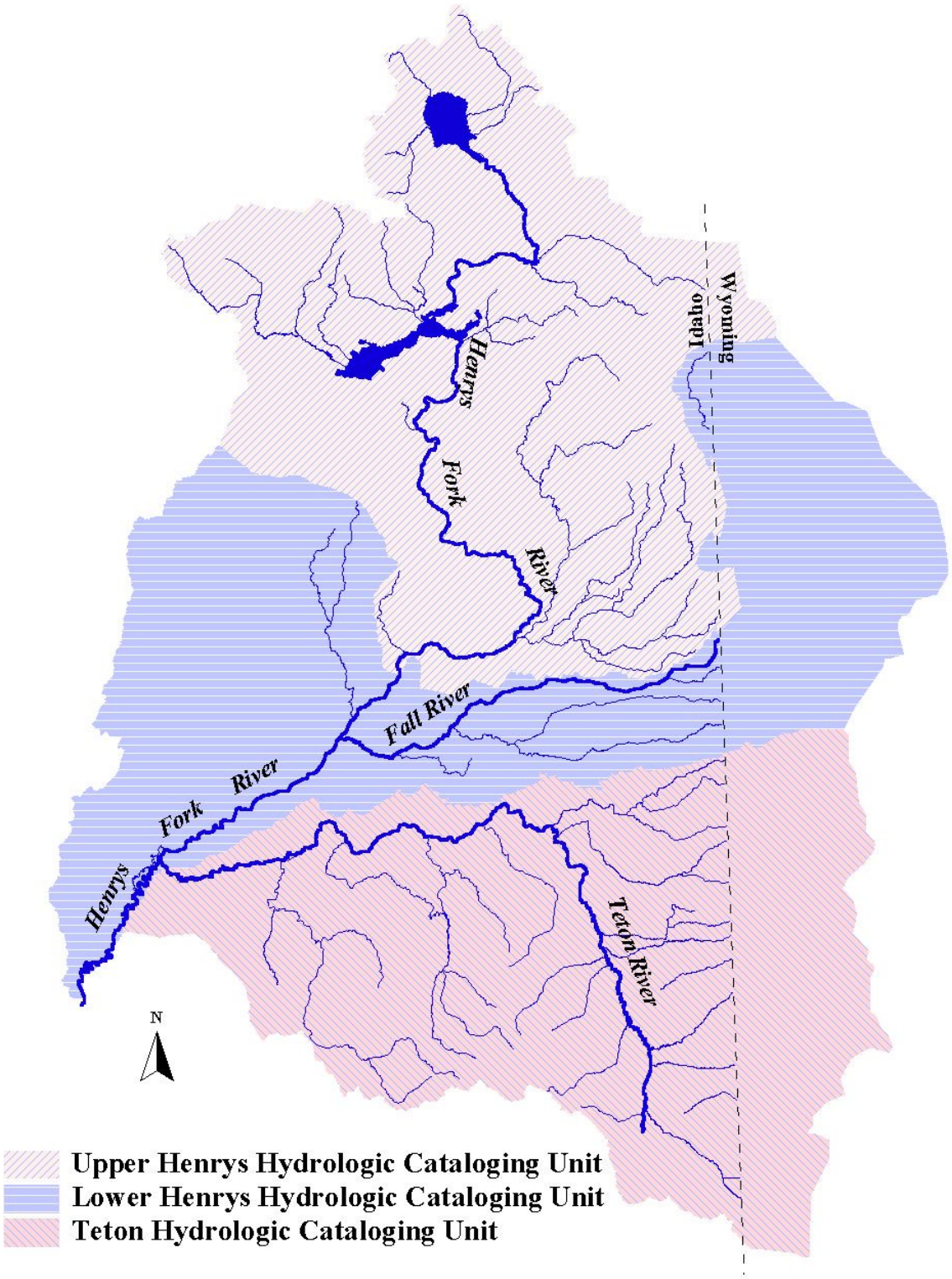

Figure 4. Hydrologic unit designations within the Henrys Fork subbasin

Table 1. Hydrologic characteristics of the Henrys Fork subbasin cataloging units. Data from U.S. Geological Survey, U.S. Environmental Protection Agency, and Van Kirk and Benjamin (2000)

	USGS hydrologic cataloging unit			Henrys Fork
	Upper Henrys	Lower Henrys	Teton	Subbasin Total
USGS cataloging number	17040202	17040203	17040204	
Area (km^2)	2,823	2,694	2,927	8,444
Number of lakes and reservoirs	77	102	37	216
Lake and reservoir surface area (ha)	6,268	936	140	7,344
Perennial stream length (km)	845	885	1,068	2,798
Intermittent stream length (km)	1,323	497	1,458	3,278
Total stream length (km)	2,168	1,382	2,526	6,076
Mean annual discharge (10^6 m^3)	1,360	1,875	748	1,875

The gradient of the Henrys Fork is quite low in the upper portion (averaging 0.1% between Henrys Lake Outlet and Osborne Butte). Between Osborne Butte and the mouth of Warm River, the Henrys Fork narrows and cuts through the floor of the Island Park Caldera, and the gradient averages 1% (Hill and Mebane 1998). Over a 10 km stretch, the Henrys Fork drops 11 m over Sheep Falls, 35 m over Upper Mesa Falls, and 20 m over Lower Mesa Falls (IWRB 1992). Below Lower Mesa Falls near Snake River Butte, the walls of the canyon reach more than 180 m above the surface of the river. As the river continues southwest at the base of Snake River Butte, the canyon walls become less rugged and the elevation loss moderates until the river reaches Ashton Dam at an elevation of 1,585 m (Hill and Mebane 1998).

Climate

The climate of the Henrys Fork subbasin is primarily arid to semi-arid and is characterized by subfreezing winters and cool summers. Mean annual temperature ranges from about 5.3 °C at the lowest elevations to less than 1 °C at the highest elevations. Mean annual precipitation ranges from 30 cm at low elevations to >100 cm at higher elevations (Van Kirk and Benjamin 2000). Precipitation is nearly uniformly distributed throughout the year at the lowest elevations but exhibits a large early-winter peak at the higher elevations. May and June are the wettest months at lower elevations, whereas November, December and January are the wettest months in the mountains (Figure 5). The vast majority of discharge in the subbasin's streams is derived from snowfall at elevations greater than 1900 m (Van Kirk and Benjamin 2000).

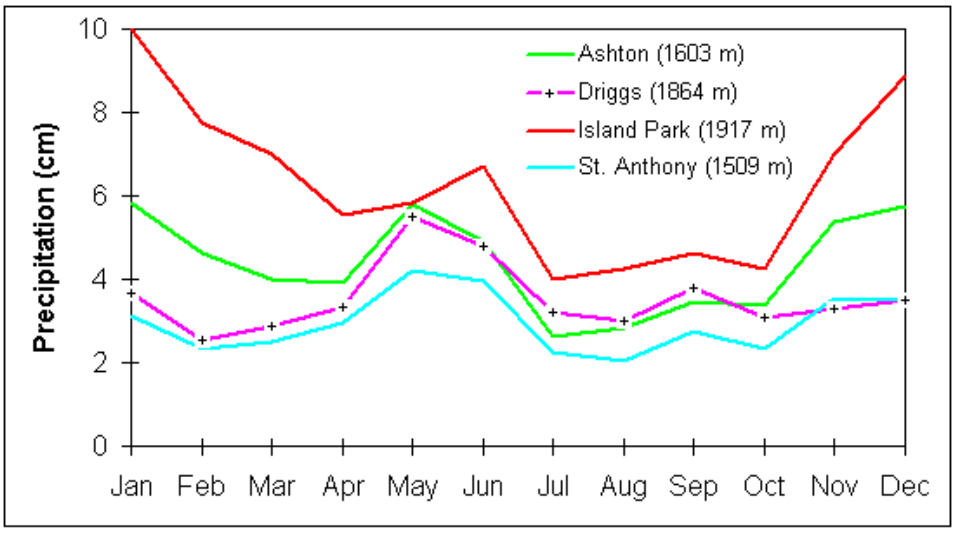

Figure 5. Mean monthly precipitation at various elevations in the Henrys Fork subbasin

Vegetation

The higher elevations of the Henrys Fork subbasin lie in the Middle Rockies ecoregion; the lower elevations lie in the Snake River Basin/High Desert ecoregion (Omernik 1987). Prior to the development of cultivated agriculture in the subbasin, elevations below 1800 m were primarily grassland and shrub steppes. Dominant species included wheatgrasses (*Agropyron* spp.), needlegrasses (*Stipa* spp.), Idaho fescue (*Festuca idahoensis*), big sagebrush (*Artemesia tridentata*), rabbit brushes (*Chrysothamnus* spp.), bitterbrush (*Purshia tridentata*) and serviceberry (*Amelanchier alnifolia*) (Marston and Anderson 1991). Most of these native grassland and steppe communities have been replaced by cultivated cropland. At higher elevations, the vegetation types consist of Rocky Mountain juniper (*Juniperus scopulroum*), lodgepole pine *(Pinus contorta*) and Douglas fir (*Pseudotsuga menziesii*); aspen (*Populus tremuloides*) groves often occur at the steppe-forest transition. Mixed forests of Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) occur at high elevations immediately below treeline. High alpine meadows occur in all of the subbasin's mountain ranges. Riparian vegetation assemblages are dominated by sedges (*Carex* spp.) along spring-fed streams, willows (*Salix* spp.) along most other higher-elevation streams, and cottonwoods (*Populus* spp.) along lower-elevation streams (Jankovsky-Jones and Bezzerides 2000).

Topography/Geology

The volcanic features present in the Henrys Fork subbasin were created between 4 million and about 600,000 years ago as a "hot spot" of volcanism moved northeastward through the region (Hackett and Bonnichsen 1994). This hot spot now lies under Yellowstone National Park. The oldest volcanic formations in the subbasin are those associated with the Snake River Plain, an 80- to 110-km wide crescent of lava covering most of southern Idaho. The Island Park region lies at the transition between the basalts of the Snake River Plain and the more recent rhyolite flows of the Yellowstone Plateau (Christiansen 1982,

Christiansen and Embree 1987). The Island Park Caldera (Figure 3) consists of three smaller calderas formed by cycles of volcanism occurring between 2 million and 600,000 years ago. The Madison and Pitchstone plateaus on the northeastern edge of the subbasin were formed by rhyolite flows that erupted from the Yellowstone hot spot about 600,000 years ago (Benjamin 2000).

Because of the young age and volcanic nature of the area's geology (Figure 6), the Henrys Fork subbasin is characterized by broad, flat plateaus and plains with a low drainage network density. Most streams draining the areas of volcanic origin have a large degree of groundwater influence and tend to have high width-to-depth ratios, low gradients and limited floodplain development (Anderson 1996, Benjamin 1997, Gregory 1997a, 1998a, 2000a, Gregory and Van Kirk 1998, Benjamin 2000). However, two small alluvial valleys occur in the northern part of the subbasin. The valley that contains Henrys Lake and its outlet lies in a narrow fold between the Centennial and Henrys Lake mountains, and Shotgun Valley lies along the southern flank of the Centennial Mountains (Figure 3). The only large mountain valley that occurs in the subbasin is the Teton Valley, which lies between the Teton Range and Big Hole Mountains (Figure 3). Tributaries to the Teton River are more typical of Rocky Mountain alluvial streams than those in the rest of the subbasin.

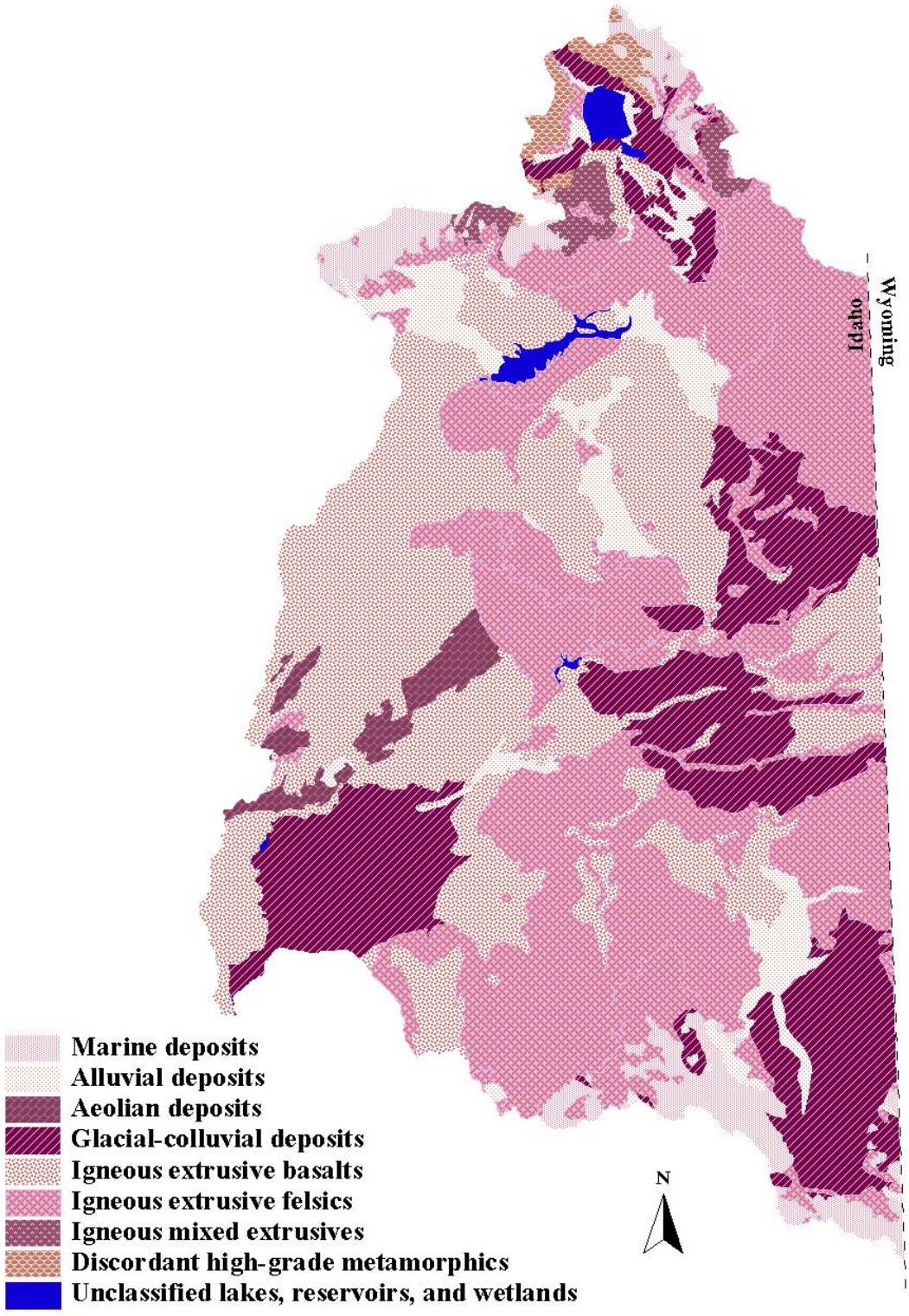

Figure 6. Geology of the Henrys Fork subbasin

Hydrology

Much of the upper Henrys Fork hydrologic unit discharge (75% of base flow at Island Park and 45% of base flow at Ashton) originates as springs on the eastern edge of the Island Park Caldera (Whitehead 1978). These springs are ecologically important during the winter, when they provide thermal refugia for fish and open-water areas for waterfowl (Table 2). During the summer, fish also find thermal refugia in the springs, which remain cooler than adjacent streams dominated by surface. Those springs located upstream from Island Park Dam, including Big Springs and Lucky Dog Springs, provide a constant dependable discharge that is used to fill Island Park Reservoir (Benjamin and Van Kirk 1999, Benjamin 2000).

Table 2. Temperatures and discharge rates of the Henrys Fork Springs (data from Benjamin 2000)

Spring	Temperature (°C)	Discharge (m^3/s)
Lucky Dog	12.6	0.8
Big Springs	12.5	5.4
Buffalo River	11.3	1.1
Chick Creek	11.0	0.4
Snow Creek	5.5	0.4
Warm River	12.0	5.6

Settlement History

The native inhabitants of the Henrys Fork subbasin were various branches of the Shoshone people, including the Northern, Western, and Eastern Shoshone, Bannock, Lemhi and Tukuarika (Sheepeater) Indians (David Moser, Shoshone Bannock Tribes, Personal Communication). These native people were largely nomadic, spending the winter in the lower elevations of the Snake River Plain and traveling to the higher elevations seasonally to hunt, fish, gather roots, berries, and materials used for medicinal purposes. In addition, obsidian was collected from sources in and around what is now Yellowstone National Park (Brooks 1986, Green 1990). Other native people, including the Crow, Flathead and Nez Perce traveled through the subbasin occasionally.

The first Euro-American to explore the Henrys Fork subbasin is believed to be John Colter, a member of the Lewis and Clark expedition who left the group on its way back to Missouri and spent the next several years in the Yellowstone region including at least one winter in the Teton Valley (Van Kirk and Benjamin 2000). The subbasin's first white resident was hunter, trapper, and guide Richard Leigh, who settled in Teton Valley in 1860. Gilman Sawtell, who settled at Henrys Lake in 1868 raised domestic cattle and by 1877, when General Howard passed through the region in pursuit of Chief Joseph, Sawtell was operating a commercial trout fishery on the lake (Brooks 1986, Green 1990). The first sportfishing club in the Henrys Fork subbasin was established on Henrys Lake in 1888 by a group of businessmen from Pittsburgh, PA, and by the 1900, the trout fishing of the Henrys Fork subbasin was known around the country (Brooks 1986, Green 1990).

Agriculture began in the subbasin in 1879 near the mouth of the Henrys Fork and subsequently spread up the valley from there. The first farmers were Mormon pioneers, who formed canal companies and irrigation districts as the need for irrigation infrastructure grew in the subbasin. Completion of a rail line from St. Anthony to the western entrance to Yellowstone National Park in 1908 facilitated further settlement of the subbasin and provided transportation for cattle ranchers in the upper subbasin and lumber companies harvesting timber from the Targhee National Forest, which was created in 1908 (Van Kirk and Griffin 1997).

Land Uses

Land use in the Henrys Fork subbasin is changing as the economy, once dominated by farming, ranching and logging, becomes more diverse. Tourist businesses based around fishing, skiing and snowmobiling are thriving in Island Park and Teton Valley. Construction is a major occupation in Teton County, reflective of a large building boom there and in nearby Jackson, Wyoming. Many Teton Valley residents commute to Jackson for work.

The majority of the land in the Henrys Fork subbasin is publicly owned and dominated by forest and range-land (Table 3). Although agriculture accounts for less than 30% of the land use in the Henrys Fork subbasin, it is concentrated at the lower elevations and therefore is the major land use in those areas (Figure 7). The primary agriculture crops are potatoes and grain, and the area around Ashton is known as the worlds largest seed potato production area.

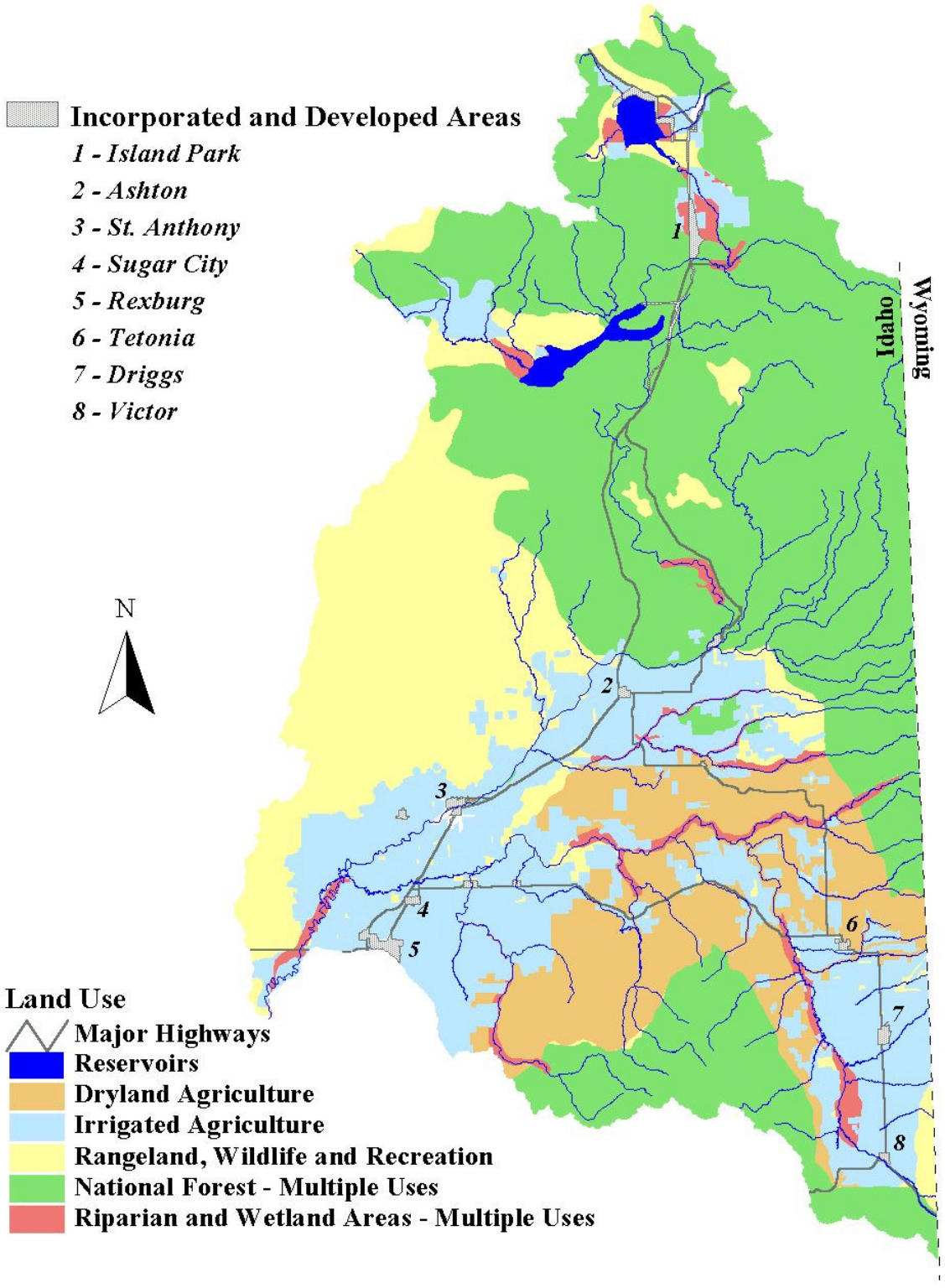

Figure 7. Land use within the Henrys Fork subbasin

Table 3. Land use and ownership in counties of the Henrys Fork subbasin. Data from U.S. Geological Survey and Idaho Department of Commerce

	Fremont	Madison	Teton (ID)	Total
Land Area (km^2)	4835	1221	1167	7223
Land use				
Forest	44.9%	17.3%	32.4%	38.2%
Range	32.6%	8.6%	21.1%	26.7%
Agriculture	17.2%	67.4%	40.9%	29.5%
Other	5.3%	6.7%	5.6%	5.6%
Land ownership				
Federal	59.5%	20.3%	33.0%	48.6%
State	9.6%	7.4%	0.6%	7.8%
City/county	0.0%	0.7%	0.1%	0.1%
Private	30.9%	71.7%	66.4%	43.5%

Impoundments and Irrigation Projects

The first major storage reservoir to be constructed in the subbasin was a dam on Henrys Lake, which was built by the North Fork Reservoir Company, an organization of farmers southwest of St. Anthony, in 1923. The dam raised the level of Henrys Lake about 5 meters and provided 111 million m^3 of storage (Table 4). In 1935, the Fremont-Madison Irrigation District was formed and entered into a contract with the U.S. Bureau of Reclamation to construct storage reservoirs in the subbasin. Grassy Lake Dam on Fall River and the much larger Island Park Dam on the Henrys Fork were completed in 1939. Both of these facilities are part of the Bureau of Reclamation's Minidoka Project, which provides irrigation water to lands throughout the Snake River basin upstream from the Twin Falls area. Island Park Reservoir holds 167 million m^3 of storage, and its construction had major effects on the hydrology and fisheries of the upper Henrys Fork watershed (Benjamin and Van Kirk 1999, Van Kirk and Gamblin 2000).

A third large storage reservoir was completed in 1975 on the Teton River near the mouth of Teton Canyon northeast of Rexburg. However, on 5 June 1976, the dam failed, and the contents of its nearly-full reservoir—three times the volume of Island Park—poured out onto the plains below, killing 11 people, completely destroying the towns of Wilford and Sugar City, and causing significant damage in Rexburg (Reisner 1993). Irrigation accounts for over 99 percent of the surface and ground water consumed in the Henrys Fork subbasin (Table 5).

Table 4. Major impoundments in the Henrys Fork subbasin (data from U.S. Bureau of Reclamation and Idaho Department of Water Resources)

Project	Year of Completion	Drainage	Storage Capacity (m^3)
Henrys Lake	1923	Henrys Lake	111,000,000
Island Park Reservoir	1939	Henrys Fork	167,000,000
Grassy Lake	1939	Fall River	19,000,000
Teton Reservoir	1975	Teton	356,000,000[a]
Ashton Reservoir	1913	Henrys Fork	12,000,000[b]

[a] - dam failed in 1976 and was not rebuilt.
[b] - reservoir is used for power production and does not store irrigation water

Table 5. Water use in the Henrys Fork subbasin and hydrologic units (figures are for 1995 and are from U.S. Geological Survey)

	USGS hydrologic cataloging unit			Henrys Fork
	Upper Henrys	Lower Henrys	Teton	Subbasin Total
Total groundwater withdrawals (m^3)	69,644	89,667	379,820	539,130
Total surface withdrawals (m^3)	486,360	673,690	879,520	1,742,570
Total consumptive use (m^3)	264,610	152,380	401,780	818,770
Irrigation conveyance loss (m^3)	379,370	199,660	466,160	1,045,190
Reservoir evaporation (m^3)	9,905,300	752,450	0	10,657,750
Irrigated land (ha)	20,555	18,685	53,327	92,567
Irrigated land (% of total)	7.3%	6.9%	18.2%	11.0%
Irrigation use (% of total consumptive use)	99.96%	99.53%	99.59%	99.70%

Protected Areas

Targhee-Caribou National Forest

Targhee-Caribou National Forest lands within the Henrys Fork subbasin contain two wilderness areas, the Jedediah Smith and the Winegar Hole (54,425 ha total), and four research natural areas: Thurmon Creek, Moose Creek Plateau, Willow Creek, and Targhee Creek (1,825 ha total). Additionally, 15,315 ha are listed as grizzly bear (*Ursus arctos horribilus*) habitat areas and are therefore protected from most uses (Figure 8)(Targhee National Forest 1997).

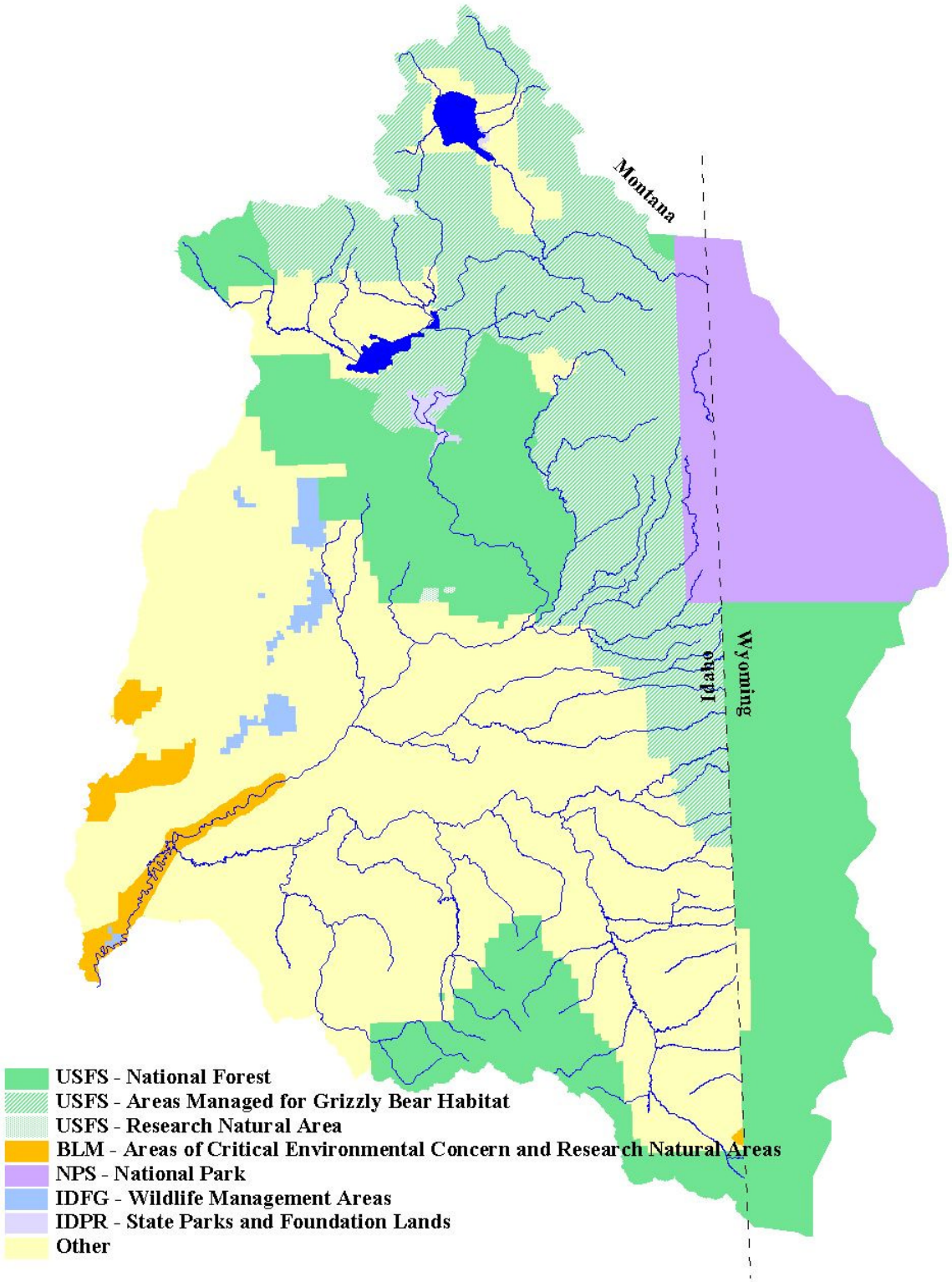

Figure 8. Areas granted special state or federal protection status

Harriman State Park

Harriman State Park is a 1,752-ha area that is owned and operated by the Idaho Department of Parks and Recreation. It includes 15 km of the Henrys Fork between the Island Park communities of Last Chance and Pinehaven and is part of a 6,475-ha wildlife reserve, the remainder of which lies on the Targhee-Caribou National Forest. In 1902, several officials of the Oregon Shortline Railroad and other investors purchased what is now Harriman State Park. The property, then called the Railroad Ranch, was the private retreat of the Harrimans of Union Pacific Railroad fame and the Guggenheims, then prominent in copper (www.idahoparks.org/parks/harriman.html). The rich wildlife habitat has been preserved since the turn of the century, when the owners established a private hunting reserve and working cattle ranch. For 75 years, the ranch has maintained game, waterfowl and fish populations. In 1977 it was gifted to the State if Idaho under the conditions that the historical aspects of the park be maintained, that fishing on Thurmon Creek and hunting be prohibited, and that the park be managed as a waterfowl sanctuary. Currently the park provides a winter home for one third of the Rocky Mountain Trumpeter Swan (*Cygnus buccinator*) population. Fishing and floating on the Henrys Fork, hiking, horseback riding, cattle grazing, mountain biking, and cross-country skiing are allowed in the park, but camping, hunting, fishing in Thurmon Creek and its two man-made lakes, and snowmobiling, are not allowed. Recently, Harriman State Park, Idaho Fish and Game, and the Henrys Fork Watershed Council completed a joint effort to remove exotic rainbow trout and brook trout (*Salvelinus fontinalis*) from the headwaters of Thurmon Creek and Golden Lake and replace them with genetically pure Yellowstone cutthroat trout (*O. clarki bouvieri*) from Henrys Lake (Jaeger et al. 2000). Monitoring of this project is ongoing.

The Nature Conservancy

In 1994, The Nature Conservancy of Idaho purchased the 650 ha Flat Ranch (formerly the Flying R Ranch), which is located in the Upper Henrys hydrologic unit and includes 7.2 km of Henry Lake Outlet. The ranch consists primarily of riverine influenced wet meadows embedded with spring creek aquatic systems and associated riparian wetlands. Long-billed Curlews (*Numenius americanus*) and approximately 200 pairs of Sandhill Cranes (*Grus Canadensis*) nest and stage on the Flat Ranch. Raptors found on the property include Bald Eagles (*Haliaeetus leucocephalus*), Osprey (*Pandion haliaetus*), Golden Eagles (*Aquila chrysaetos*), Redtail Hawks (*Buteo jamaicensis*), and Peregrine Falcons (*Falco mexicanus*). Extensive waterfowl nesting and brood rearing occurs on the ranch. Migratory songbirds utilize the willow complex associated with the riparian areas. Among other animals, moose (*Alces alces*), elk (*Cervus canadensis*), pronghorn (*Antilocapra americana*), and beaver (*Castor canadensis*), utilize the ranch for forage, travel cover, and rearing. The river through the ranch provides spawning habitat for an adfluvial population of Henrys Lake Yellowstone cutthroat trout. Unfortunately, fry survival seems to be limited (Gregory 2000b), and there is no fish ladder to allow fish passage back to the lake. There is a resident fishery consisting primarily of rainbow and brook trout. This fishery is somewhat transitory and is heavily influenced by irregular flow regimes and water temperatures. Although cattle grazing occurs on the Flat Ranch, a holistic rotational grazing plan has been implemented, and cattle are excluded from the riparian areas.

Teton Regional Land Trust
Henry's Fork watershed (excludes the Teton Drainage)

The Teton Regional Land Trust (TRLT) and partners have thus far protected 1,284 ha along the Henrys Fork and Fall River, and anticipate closing on protection of another 526 ha later in 2001. Most of the easements have been donated, although some easements and fee acquisitions have been made on the lower Henrys Fork with federal Land and Water Conservation Funds. The TRLT has recently been granted a Farmland Protection Program grant from the USDA Natural Resources Conservation Service (NRCS) to protect farmland along the Henrys Fork. This grant is to be matched by funds from the Doris Duke Charitable Foundation. These grants will lead to protection of approximately 283 ha along the river corridor.

Fremont County has experienced extreme growth rates in the past 10 years. Farmlands in the Ashton area are threatened by second-home residential development, as views of the Tetons are spectacular, and Yellowstone National Park and recreational activities are easily accessible.

Currently, Fremont County allows one home site on every 1 ha throughout most of the county. As such, there is potential for hundreds of new homes on private lands along the Henrys Fork. The new homes would result in additional septic systems, numerous dirt, gravel and paved roads, and increased recreational use of the river. More seriously, the properties could be subdivided down to half-acre lots if the residences convert to city sewer systems. Increased development would significantly degrade the river corridor's ecological values, the local farming economy, open space, and rural quality of life.

The area's private lands provide an essential link between upland, forested habitat and the riparian habitats found along the river. In the arid west, river corridors such as the Henrys Fork of the Snake River are hubs for wildlife activity. Although they comprise only a tiny percentage of the land area in the region, river corridors are vital to a disproportionate percentage of the area's wildlife. The Henrys Fork is internationally distinguished for its superior fishing and tremendous ecological importance to many wildlife species, but the land along the river (the river corridor) is recognized by the NRCS as prime farmland.

The Henrys Fork river corridor is an ecologically diverse focal point for fish and wildlife in Eastern Idaho. In addition to its notable native fish habitat, the river corridor supports healthy populations of many other wildlife species. Approximately 4,000 elk, 600 moose, and 3,000 mule deer (*Odocoileus hemionus*) winter west of the Henrys Fork near Ashton. These animals migrate along the river corridor from summer ranges to the east and north in Yellowstone National Park and the Island Park caldera. The uplands in this area also provide habitat for Sharp-tailed Grouse (*Tympanuchus phasianellus*) and Sage Grouse (*Centrocercus urophasianus*), sensitive species of concern. Riparian cottonwood forests, riverine habitats, and varied wetlands are also nesting sites for many species of waterfowl, birds of prey, and passerine birds. The river corridor and wetlands contain critical wintering habitat for 800 Trumpeter Swans in the Tri-state and Canada populations, and both nesting and wintering habitat for bald eagles.

Teton Drainage

The TRLT and partners have protected nearly 1,416 ha through conservation easements and fee title acquisitions within the upper Teton River basin since 1995. The TRLT anticipates protection of an additional 200 ha in this portion drainage in the remainder of calendar year 2001. Most of this acreage is protected through donated conservation easements, although some areas have been protected through bargain purchase of easements or fee title.

The total value of protected lands and the associated restoration projects provided by TRLT and partners is nearly 12 million dollars, including $1.7 million in federal wetland protection funds. The active project partners include numerous private donors, conservation oriented landowners, North American Wetlands Conservation Council Intermountain West Joint Venture, Teton Soil Conservation District, Natural Resources Conservation Service, Idaho Department of Fish and Game (IDFG), Idaho Conservation Data Center (CDC), TRLT Stewardship Committee (20 member team of ecologists, teachers, and farmers), Ducks Unlimited, Henry's Fork Watershed Council, Intermountain Aquatics, U.S. Fish and Wildlife Service, National Fish and Wildlife Foundation, The Trumpeter Swan Society, Friends of Teton River, and Teton Valley Chapter of Trout Unlimited.

Teton Basin is subject to tremendous development pressure. Teton County, Idaho is the fastest growing county per capita in Idaho and in the entire Greater Yellowstone Ecosystem over the past decade. The local population has grown at a rate of nearly 70% for the decade, and the development pressures appear to be accelerating. Much of the new development has occurred on ecologically sensitive lands because there are not effective local governmental mechanisms to channel the growth to less sensitive areas.

Wetlands are extensive throughout the Teton River Basin. These wetlands are among the most significant of Greater Yellowstone's ecological features, and are formally recognized by the U.S. Fish and Wildlife Service (USFWS), Natural Resources Conservation Service, IDFG, and other agencies as a priority for conservation. Conservation efforts are underway to protect and restore, through permanent conservation easements, emergent and shrub/scrub wetlands, cottonwood forests, riverine and spring creek habitats, and uplands that provide valuable nesting, migration, and wintering habitat for many wildlife species. These wetlands support numerous nesting waterfowl of some 20 species, and large numbers of wintering Trumpeter Swans. Teton Basin is the primary staging area for migratory Sandhill Cranes from throughout the Northern Rockies and is an important nesting area for cranes and shorebirds. Teton River and its tributaries are a notable stronghold for Yellowstone cutthroat trout, which were petitioned for federal Endangered Species Act listing (although the USFWS petition finding found that listing was not warranted at this time). Cottonwood corridors in the basin support the largest winter concentration of Great Gray Owls (*Strix nebulosa*) in the lower 48 states. The river and wetlands are also home to five rare bat species, neotropical passerines, Bald Eagles and many other raptors. The wetlands are the primary wintering area for large numbers of elk and other ungulates. An extensive peat land fen within these wetlands is home to seven rare plants.

Yellowstone National Park

The southwest corner of Yellowstone National Park contains 150 km^2 of the Henrys Fork subbasin (Hill and Mebane 1998), including the headwaters of Fall River, which begins at Beula and Hering Lakes on the Pitchstone Plateau. Fall River descends through the Birch Hills to join the Bechler River above Cave Falls. The Bechler River begins at Three Rivers Junction with the union of the Phillips, Ferris, and Greggs Forks and lies entirely within the park. Fall River is aptly named for the many falls and cascades along its tributaries occur as the streams drop off the Madison and Pitchstone Plateaus. With nearly 200 cm of annual precipitation, the Bechler-Falls River area is one of the wettest portions of Yellowstone (www.yellowstone-natl-park.com/bechler.htm). This area of the park is managed as Backcountry, and therefore human uses in this area are limited to packing (both backpacking and stock use), fishing, photography, and sightseeing (A. Varley, Yellowstone National Park, personal communication, 2000).

IDFG Management Areas

The Sand Creek Wildlife Management Area (SCWMA), owned and operated by IDFG, was originally created in 1947, when Federal Aid to Wildlife Restoration (Pittman-Robertson) funds were used to acquire the Chapman Ranch 27 km north of St. Anthony (Aslett 1998). This 1,928-ha parcel of private land was purchased to perpetuate the small herd of elk that wintered on the property. Since 1947, both the elk herd and the size of its winter range have expanded. Most of the present winter range is not owned by the IDFG but is a mixture of state, federal, and private lands. In 1998, the SCWMA consisted of 6,997 ha of IDFG owned land, 405 ha of land reserved by the U.S. Bureau of Land Management (BLM) for wildlife use, 4,656 ha of BLM land withdrawn from livestock grazing, 372 ha of Idaho Department of Lands property that were being leased by the Department for wildlife use, and approximately 10,118 ha in use through trade agreements with private landowners. The general topography of the area is rolling hills with broken lava reefs and moving sand dunes. The northern boundary of SCWMA lies on the southwest slope of Big Bend Ridge, at an elevation of 1,890 m. Although not a continuous tract of land, SCWMA extends 32 km to the southwest into semi-arid range land and includes several large sand dunes in the southern portion. The elevation drops to approximately 1,524 m at the southwestern corner of the area. The high desert range contained on the SCWMA is one of the most important shrub-grass wildlife ranges in Eastern Idaho.

The SCWMA plays a key role in the perpetuation of wildlife in the upper Snake River Plain. The SCWMA, adjacent public lands, specific private properties, and this cooperative management program are all critical to the continued existence of the Sand Creek elk, deer, and moose herds, as well as Sage and Sharp-tailed grouse and numerous other wildlife species. Additionally, in recent years, the Sand Creek Ponds, which were created from the 1950s through the 1970s, have supported a substantial percentage of the region's annual Trumpeter Swan production. There are about 170 bird species, 30 species of mammals, and 3 species of fish that reside on or use the SCWMA at various times. Several of these species are rare in Idaho and have special designations, including Species of Special Concern, Threatened, and Endangered. Current public use includes an estimated 2,500 hunter days, 8,000 angler days, and 5,500 wildlife appreciation visits annually. The

SCWMA plays a key role in IDFG's elk, moose, deer, upland game, fisheries, and nongame management plans.

In 2001 The Nature Conservancy purchased the Chester Wetlands, which was previously the Hooray Ranch. This property is located between Ashton and St. Anthony and includes 3 km of the Henrys Fork. Within 2 years, IDFG will purchase the property from The Nature Conservancy as an addition to the Sand Creek WMA. Some wetland restoration, noxious weed control, and water management issues need to be addressed on that property.

The Cartier Slough Wildlife Management Area (CSWMA) is located along the west side of the Henrys Fork of the Snake River west of Rexburg and south of Highway 33 (Wackenhut and Ragotzkie 1998). In 1976, the Army Corp of Engineers (COE) purchased 162 ha of what is today CSWMA as partial mitigation for wetland and waterfowl habitat losses associated with Ririe Dam and Reservoir. A 227-ha parcel was purchased in 1977 by the Bureau of Reclamation (BOR) as partial mitigation for wetland and waterfowl habitat losses associated with the construction of Teton Dam. Both segments are managed by IDFG as habitat for game and nongame wildlife and for wildlife-oriented recreation. Management is directed in part by agreements with the COE and BOR. Parcels of BLM owned lands along portions of the Henrys Fork have been included with management activities for CSWMA. The CSWMA contains Cartier Slough, a channel of the Henrys Fork, and other small channels and potholes that hold water for varying lengths of time in the spring and summer. There are approximately 4.5 km of riverbank and approximately 6.4 km of slough channels. The area is predominantly a grassland floodplain, but consists of a diversity of habitat types. The CSWMA contains habitat important to over 200 species of. Wildlife viewing and appreciation is an important use of CSWMA. The CSWMA is also a popular public hunting area for waterfowl and big game. Habitat development projects have included planting the agricultural fields to grass/forb cover and planting a windbreak on the east end of these fields. Nest structures have been installed for Canada Geese (*Branta canadensis*), Wood Duck (*Aix sponsa*), and Osprey.

Fish and Wildlife Resources

Fish and Wildlife Status

Fish

A relatively small number of fish species, primarily suckers, sculpin and dace, are native to the Henrys Fork subbasin (Table 6). A number of nonnative species, all salmonids, were introduced into the subbasin; most of these species are still present (Table 6). From 1996 to 2000 the Targhee-Caribou National Forest and the Henrys Fork Foundation conducted a joint habitat/fish species assessment in the Henrys Fork subbasin. Snorkeling, electrofishing, creel surveys, and hook-and-line sampling were used to assess game fish presence/absence in reaches of all fish bearing streams in the basin (Gregory 1997a, 1998a, 2000a, Gregory and Van Kirk 1998, Jaeger 1998, Jaeger et al. 2000). Although the primary intent of most of these studies was an assessment of habitat and an index of fish

species presence in the subbasin, they also served as an assessment of the status of Yellowstone cutthroat trout (Appendix A).

Table 6. Fish species occurring or known to have occurred in the Henrys Fork subbasin

Origin	Species	Scientific Name
Native		
	Yellowstone cutthroat trout	*Oncorhynchus clarki bouvieri*
	Mountain whitefish	*Prosopium williamsoni*
	Utah sucker	*Catostomus ardens*
	Bluehead (Colorado) sucker	*C. discobolus*
	Mountain sucker	*C. platyrhynchus*
	Mottled sculpin	*Cottus bairdi*
	Piute sculpin	*C. beldingi*
	Longnose dace	*Rhinichthys cataractae*
	Speckled dace	*R. osculus*
	Redside shiner	*Richardsonius balteatus*
	Utah chub	*Gila atraria*
Non-native		
	Rainbow trout	*O. mykiss*
	Brown trout	*Salmo trutta*
	Eastern brook trout	*Salvelinus fontinalis*
	Lake trout[a]	*S. namaycush*
	Brook x lake trout (splake)[a]	*S. namaycush x S. fontinalis*
	Coho salmon[a]	*O. kisutch*
	Kokanee salmon	*O. nerka*
	Montana grayling	*Thymallus arcticus montanus*
	Lahontan cutthroat trout[a]	*O. clarki henshawi*
	Rainbow x Yellowstone cutthroat trout	*O. mykiss x O. clarki bouvieri*

[a]no longer present

Cutthroat trout

The Yellowstone cutthroat is the only trout native to the Henrys Fork subbasin (Behnke 1992). Yellowstone cutthroat trout were likely historically present in all of the Teton and Henrys Fork watersheds with the possible exceptions of Split Creek (an Island Park Caldera stream that sinks without joining another stream), the Fall River watershed upstream of Cave Falls, and alpine streams throughout steep, mountainous parts the basin (Jaeger et al. 2000). Over the past 150 years, a drastic decline in distribution of Yellowstone cutthroat trout has occurred within the Henrys Fork subbasin (Appendix A). Commercial harvest and federal egg-taking programs at Henry's Lake may have reduced

Yellowstone cutthroat trout numbers prior to 1900 (Van Kirk and Gamblin 2000). Their decline in the small tributary streams of the subbasin was probably caused by hybridization with rainbow trout and competition with brook trout (Griffith 1988, Thurow et al. 1988, Gresswell 1995, Gregory and Griffith 2000). Recreational harvest of Yellowstone cutthroat trout early in the 20th century may also have played a role in the decline. Decline of cutthroat trout in the mainstem Henrys Fork upstream of Ashton was probably caused largely by the 1958 and 1966 chemical treatments of Island Park Reservoir, its tributaries, and the Henrys Fork above and below the reservoir, which were done to remove Utah chubs and other nongame fish (IDFG 1958, Jeppson 1966, IDFG 1968, Jeppson 1969, Van Kirk and Gamblin 2000). These treatments extended downstream to Mesa Falls in 1958 and to Ashton in 1966. Following both treatments, the reservoir and river were restocked with nonnative rainbow trout (Rohrer 1983).

Fisheries surveys, conducted between 1996 and 1999 and summarized by Jaeger et al. (2000), found that about 35 percent of the total fish-bearing habitat still contains Yellowstone cutthroat trout, and about 7 percent supports Yellowstone cutthroat trout populations that are isolated from nonnative salmonids (Figure 9). Although the range of Yellowstone cutthroat trout in the Henrys Fork subbasin has declined greatly over the past 150 years, more recent declines are also evident. Recent surveys (Jaeger et al. 2000) failed to detect Yellowstone cutthroat trout in seven streams where they were observed in the early 1980s (Spateholts and Moore 1985). Nonnative salmonids were observed in these streams by both the early 1980s surveys and those of the late 1990s. Jaeger et al. (2000) assumed that these populations of Yellowstone cutthroat trout became extinct during the intervening 15 years.

Ironically, many locations in the Henry's Fork subbasin where Yellowstone cutthroat trout currently exist may not lie within the historic range of the subspecies. Seven of the 16 Yellowstone cutthroat trout populations detected during recent surveys occurred in streams that were probably historically barren of salmonids and probably resulted from early introductions (Jordan 1889, Varley and Schullery 1998, Jaeger et al. 2000). These seven populations are located in Yellowstone National Park in upper Robinson Creek, Fall River above Terraced Falls, Calf Creek, and the Bechler River drainage above and below Colonnade Falls including Gregg's and Phillip's Forks (Appendix A). Excepting the Bechler River population below Colonnade Falls, these populations exist in allopatry and are isolated by downstream barriers. Therefore, six of the eight stream reaches where Yellowstone cutthroat trout were observed in isolation from nonnative salmonids likely originated from introductions. It is possible that the remaining two isolated populations (Tygee and Wyoming creeks) were also the result of early introductions, in which case no Yellowstone cutthroat trout exist in isolation from nonnative salmonids within their historic range in the Upper and Lower Henrys hydrologic units.

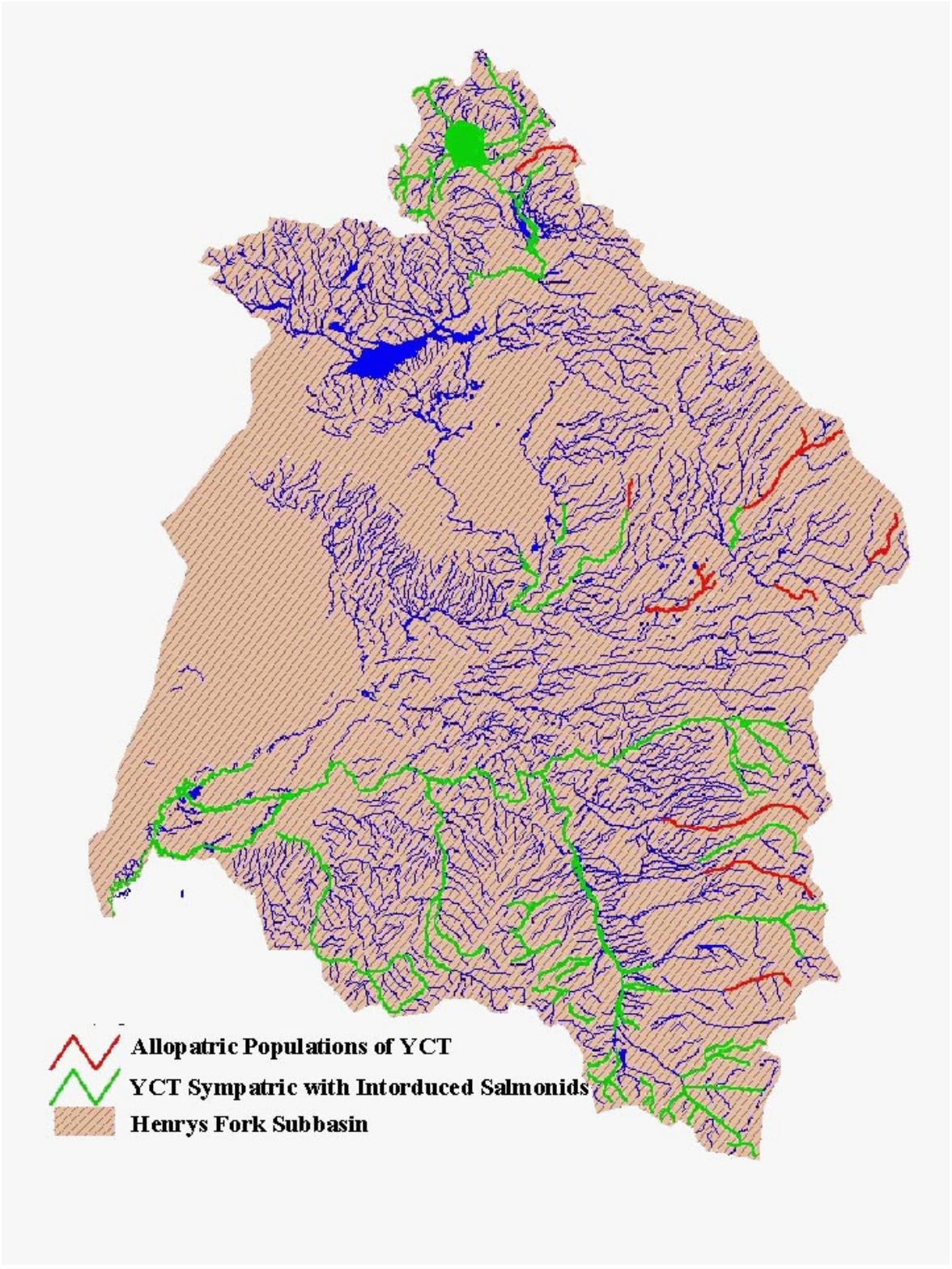

Figure 9. Streams containing Yellowstone cutthroat trout either in allopatry or sympatry with introduced salmonids (data from Jaeger et al. 2000, Meyer and Lamansky in review)

The status of Yellowstone cutthroat trout is more encouraging in the Teton drainage than in the remainder of the subbasin. In the Teton drainage, Yellowstone cutthroat trout were observed in 89 percent of the fish-bearing habitat surveyed by Jaeger et al. (2000) and were the only trout species observed in 19 percent of those areas. However, total amount of habitat occupied by cutthroat trout in allopatry in the Teton is still relatively small, as the Teton surveys covered only 291 km of stream while the surveys in the Upper and Lower Henrys Fork hydrologic units study covered 833 km of stream (Table 7). The observations of Meyer and Lamansky (in review) are similar to those of Jaeger (et al. 2000); they found Yellowstone cutthroat trout in 72 percent of the randomly selected fish-bearing habitat surveyed in the Teton drainage.

Table 7. Distribution of Yellowstone cutthroat trout in the Henrys Fork subbasin (data from Jaeger et al. 2000)

Drainage	Total	Within YCT historic range
Henrys Fork (excluding Teton) stream surveyed	833 km	793 km
YCT present	141 km (17%)	101 km (13%)
YCT present in allopatry	28 km (3%)	20 km (3%)
Teton stream surveyed	272 km	272 km
YCT present	241 km (89%)	241 km (89%)
YCT present in allopatry	51 km (19%)	51 km (19%)
Total - Henrys Fork subbasin stream surveyed	1105 km	1065 km
YCT present	382 km (35%)	342 km (32%)
YCT present in allopatry	79 km (7%)	72 km (7%)

These surveys provide an overview of the current distribution of resident Yellowstone cutthroat trout within the subbasin, but they likely represent a "best case" scenario. Detailed work on the genetics of these small-stream populations has yet to be performed. Only the Tygee Creek Yellowstone cutthroat trout population has been subjected to a genetic assessment that is significant at the population level. Evidence of rainbow trout introgression was absent in this isolated population (Jaeger et al. 2000). Preliminary genetic assessments of populations of Yellowstone cutthroat trout from Wyoming Creek suggest genetic purity; however, genetic integrity at the population level could not be determined because of a small sample size (Williams et al. 1998). In the Teton River drainage, cutthroat trout primarily occurred with brook trout rather than rainbow trout (Appendix A) and are therefore at a competitive risk (Griffith 1988) but not a genetic risk. Although rainbow trout x cutthroat trout hybrids are still stocked in Henrys Lake, to protect the genetic integrity of that cutthroat trout population the hybrid program is now supported entirely by the production of sterile hybrid trout (IDFG 2001). Recent

genetic surveys of the Henrys Lake cutthroat trout population have documented a modest level of rainbow trout introgression (14%), low level of back-crossing (10%) and an essentially genetically pure stock of cutthroat trout in the hatchery run. Future hatchery management will emphasize refinement of sterile hybrid production and development of genetically pure cutthroat production and supplementation.

Because many (27) Yellowstone cutthroat trout populations observed in recent stream surveys exist in sympatry with rainbow trout or cutthroat x rainbow hybrids, it is likely that these fish are not genetically pure (May 1996). If this proves to be true, Varley and Gresswell's (1988) estimate of 10 percent historical range occupancy by genetically pure stream-dwelling forms of the subspecies throughout its historic range might prove to be generous in the Henrys Fork subbasin. However, in the Teton drainage, Meyer and Lamansky (in review) found rainbow trout or hybrids in only 10 percent of the sites that contained Yellowstone cutthroat trout. Genetic samples were collected at these locations but to date have not been analyzed to verify genetic purity. In the mainstem Teton, introgression appears to be around 20 percent (W. Schrader, IDFG, personal communication). Recently, Harriman State Park, Idaho Fish and Game, and the Native Fish Subcommittee of the Henry's Fork Watershed Council completed a joint effort to remove exotic rainbow and brook trout from Golden Lake and the headwaters of Thurmon Creek and replace them with genetically pure Yellowstone cutthroat trout from Henrys Lake. In the spring of 2001, 19,000 genetically tested cutthroat fingerlings were released into Golden Lake. Monitoring of the success of this project is ongoing (see Existing and past efforts, subtitled Fish, Henrys Fork, Island Park Dam to Mesa Falls).

Rainbow trout

Private fish hatcheries were the first to introduce rainbow trout into the Henrys Fork subbasin. Although the earliest date of nonnative fish introduction is not known, Joe Sherwood established a commercial rainbow trout hatchery at Henry's Lake in 1891, and by 1893, George Rea was operating a hatchery in Shotgun Valley using brook and rainbow trout (Brooks 1986, Green 1990).

Rainbow trout were restocked in the Henrys Fork following the chemical treatments of Island Park Reservoir and the river downstream (including Box Canyon). In the Henrys Fork immediately downstream of Island Park Dam, rainbow trout density increased to a high in the late 1970's of nearly 18,000 fish in the 4.5-km Box Canyon section. Since that time no estimates have even approached this density (Figure 10). In fact, the rainbow trout population declined 80 percent in Box Canyon between 1978 and 1991 (Van Kirk and Gamblin 2000).

The highest fish population estimates occurred during a period of years when the reservoir was drawn down several times (Van Kirk and Gamblin 2000). Four of the 10 lowest drawdowns of Island Park Reservoir occurred between 1977 and 1984, when the trout population was high (Figure 10). Additionally, the jump in population abundance in 1993 followed a year in which the reservoir was drawn down. Van Kirk and Gamblin (2000) modeled the relationship between trout abundance in Box Canyon and years following the 1993 drawdown and found a statistically significant ($P < 0.05$) decreasing exponential relationship. The most plausible explanation for this relationship is that the

1993 population consisted primarily of reservoir fish introduced into the river during the drawdown. The addition of these fish caused the population to rise above the long-term carrying capacity of the river. As these fish died over the following years, their loss from the population was reflected in the exponential decline of the fish population (Van Kirk and Gamblin 2000).

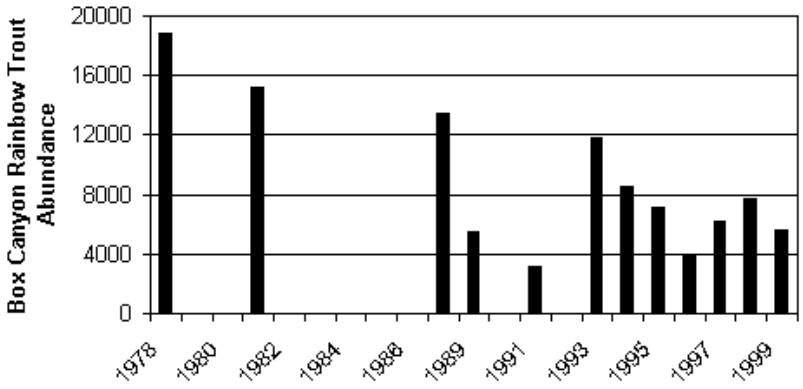

Figure 10. Rainbow trout abundance in the 4.5-km Box Canyon reach of the Henrys Fork

Currently, rainbow trout populations in Box Canyon fluctuate somewhat and, although they are lower than have been observed historically (historic highs were most likely a function of drawdowns and stocking), they are not exhibiting an overall increasing or decreasing trend (Figure 10). It appears that low summer flows and warm water might limit rainbow trout populations in the lower portions of the subbasin (IDFG 2001), while low winter flows (Mitro 1999) and lack of adequate winter habitat for juveniles seem to limit the population in the upper Henrys Fork (Gregory 2000c). Rainbow trout are currently present in many of the streams in the basin (Appendix A).

In 1999, IDFG conducted electrofishing surveys on the Henrys Fork between St. Anthony and Parker Bridge (IDFG 2000). Samples (n = 607 fish) consisted of 7.5% wild rainbow trout, 5.6% wild brown trout, 57.6% mountain whitefish, and 25.5% Utah suckers. Utah chubs, redside shiners, and dace comprised 3.5% of the total catch. Length frequencies suggest that little spawning occurs in this section of the Henry's Fork (IDFG 2000).

In 1997, IDFG conducted electrofishing surveys on the Henrys Fork between Stone Bridge (Warm River confluence) and the Highway 20 bridge upstream of Ashton Reservoir (IDFG 1998). The rainbow trout population was estimated at between 14,975 to 17,827 fish greater than 102 mm in length. Brown trout increased from 12% of the trout population in 1988 to 28% in 1997. In 1998, a total of 126 rainbow trout and 33 brown trout were sampled during electrofishing runs in the Stone Bridge section of the Henry's Fork (IDFG 1999). Despite the presence of the whirling disease parasite, and some fish showing clinical symptoms, there is no evidence of year class failure in this reach.

In 1997, IDFG conducted electrofishing surveys of the Ora Bridge to Seeley's section of the Henrys Fork. They collected a total of 636 wild rainbow trout, 79 mountain whitefish, and 19 brown trout (IDFG 1998). Species composition was similar to 1988 estimates (Elle and Corsi 1994). Size structure of wild rainbow trout suggests strong natural recruitment below Ashton Reservoir.

Brook Trout

Brook trout, as with rainbow trout, were first introduced to the Henrys Fork in the late 1800s, as they were raised in commercial fish hatcheries. Currently they inhabit nearly all of the small streams in the basin (Appendix A).

Brown Trout

Brown trout appear to have been introduced into the Henrys Fork subbasin relatively recently, most likely as the result of upstream migration from the South Fork and mainstem Snake and stocking in the lower part of the subbasin by IDFG during the 1980s. Brown trout are currently found in the streams of the Warm River watershed and throughout the Henrys Fork from Mesa Falls downstream to the main Snake River.

Mountain Whitefish

Mountain whitefish are present in most of the higher order streams in the subbasin. However, very little is known about mountain whitefish distribution and abundance in the Henrys Fork subbasin.

Utah Chub

The Utah chub is native to portions of Idaho including the Snake River and the Henrys Fork downstream from Mesa Falls (Simpson and Wallace 1982). Chemical treatments of Island Park Reservoir in 1958, 1966, 1979, and 1992 were done primarily to remove Utah chubs from the reservoir. In 1993 Utah chubs were discovered in Henrys Lake during annual gill net surveys (IDFG 2001). Utah chubs are considered by IDFG a serious nuisance species in regulated reservoir impoundments and pose a potential threat to the Henrys Lake fishery. Annual surveys since the 1993 discovery of Utah chubs indicate an increasing trend in chub numbers. The consequences of a dominant Utah chub population in Henrys Lake cannot be accurately predicted at this time. Intensive surveys of Utah chubs in Henrys Lake will continue for the next five years (IDFG 2001).

Wildlife

The Henrys Fork subbasin supports a variety of wildlife species including big game, upland game, waterfowl, and nongame species. Additionally, the subbasin provides an important nesting area for bald eagles and wintering habitat for trumpeter swans.

Trumpeter Swan

Slightly over half (53%) of the Trumpeter Swan population that exists in western Canada and the western United States (the Rocky Mountain Population, which consists of 3975 birds) winters in the Henrys Fork subbasin. The Rocky Mountain Population is considered to be highly vulnerable to winter mortality due to greatly reduced winter distribution and current concentration in the Henrys Fork subbasin and other parts of the Greater

Yellowstone Ecosystem. Wintering swans feed exclusively on submerged aquatic macrophytes and therefore depend on ice-free river habitat for winter food sources. Thus, winter food availability in the Henrys Fork is heavily influenced by dam management at Island Park (e.g., lower releases result in more extensive freezing and loss of winter food sources).

The segment of the population 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. Eleven of the 20 active nests observed in the state of Idaho during 2001 were located in the Henrys Fork subbasin. A petition to list this population of Trumpeter swans under the distinct population segment criteria of the Endangered Species Act (ESA) was filed in fall 2000 and is pending (R. Shea The Trumpeter Swan Society, Personal Communication).

Sage Grouse

In 1996, the number of Sage Grouse in Idaho reached a record low. Management efforts directed at this native grouse are often fragmented between different agencies and landowners without common goals or direction. In 1996, to provide improved cooperation among affected parties, the Idaho Fish and Game Commission sponsored development of a comprehensive, ecosystem-based plan for Idaho's sage grouse. Subsequently, the Idaho Sage Grouse Management Plan (Idaho Sage Grouse Task Force 1997) was developed by the Idaho Sage Grouse Task Force, a group comprised of representatives from natural resource agencies and agriculture, sportsman, and conservation organizations. The Plan was designed as a framework for interested parties to form local working groups for the purpose of developing 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, and it will be reviewed by the Task Force at least annually and updated and revised as new information becomes available. An important part of solving habitat management problems is cooperation 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 currently developing a plan that includes the Henrys Fork subbasin.

Sage grouse are dependent on large parcels (tens of thousands of hectares) of sagebrush/grassland habitats that have 15% to 25% sagebrush canopy cover and good grass and forb cover. Generally, grouse require these sagebrush habitats during the winter and for breeding, and loss of these habitats will cause loss of the Sage Grouse population. 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 reduction or elimination of sagebrush canopy cover, introduction of nonnative grass species, conversion to agricultural areas dominated by cropland or annual grasses (e.g., cheatgrass), or altered in any way that results in significant reduction of the native grass/forb understory.

Sage Grouse habitat quality and quantity has declined throughout southern Idaho, resulting in 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 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.

Two lek routes were counted in the Henrys Fork subbasin between 1991 and 2000 (Figure 11) by IDFG biologists (Compton 2001). The number of grouse counted on routes fluctuates from year to year due to previous year's production and other factors (such as weather conditions) relative to counting. The Jacoby route, which lost all the leks that existed in 1983, has had an increase of grouse since 1993 (Figure 11). This suggests that the sagebrush habitat in the area lost in the extensive 1982 Sheep Station wildfire is beginning to meet sage grouse nesting/brood rearing needs. Check station data since 1995 reflect the reduced bag/possession limits with fewer hunters in the field and fewer grouse harvested on opening weekend.

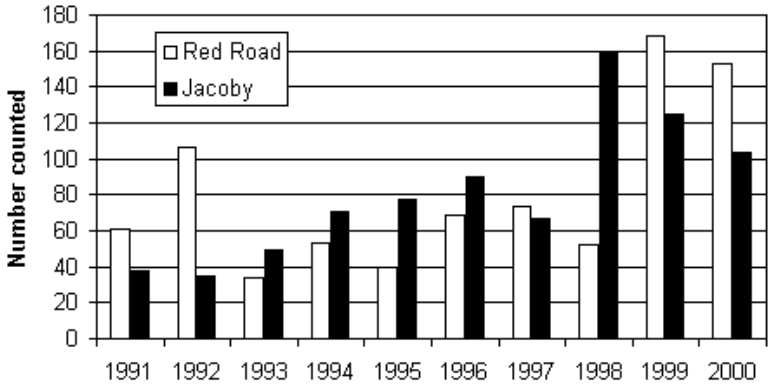

Figure 11. Male sage grouse counted on two lek routes within the Henrys Fork subbasin

Elk

The Henrys Fork subbasin is comprised of portions of two (Island Park and Teton) of IDFG's elk management zones (Figure 12). Management objectives vary between the two zones.

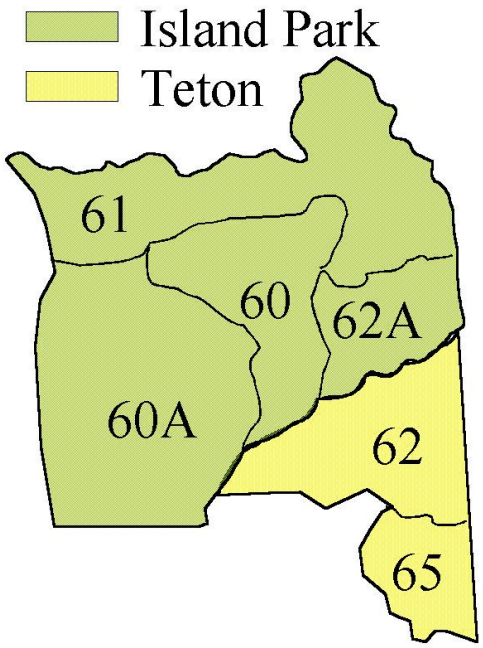

Figure 12. Big game (elk and deer) hunt units within the Henrys Fork subbasin

Island Park Zone

The management objective for the Island Park zone is to maintain a wintering elk population of approximately 1,500 cows and 475 bulls, including 300 adult bulls. Currently, the number of elk wintering on the Sand Creek winter range in Unit 60A exceeds these objectives. Obtaining adequate harvest on this population is difficult due to its migratory nature and the fact that substantial portions of the herd spend the fall in Yellowstone National Park and Harriman State Park, where they are immune to harvest. Reducing this population to below 3,000 animals postseason is a primary objective. Bull:cow ratios are difficult to measure for this population, again because of the number of animals that spend all or part of the hunting season in Yellowstone and Harriman. Sightability estimates in the Island Park zone are needed periodically to monitor progress toward achieving population objectives. In addition, the information is valuable to assess the results of the recently implemented travel management policy on the Targhee National Forest. The Island Park zone currently provides the widest array of hunting opportunity available, including archery, centerfire rifle, and muzzleloader seasons, early and late hunting, and controlled, any-bull, and either-sex hunts.

Elk have been present in varying numbers in at least portions of the Island Park zone throughout recorded history. There has been a general elk season in all or part of Fremont County since 1882. This undoubtedly is the longest running general hunting opportunity in the state. During much of the early 20th century, these hunts were based on elk populations summering in Yellowstone National Park. In the late 1940s, elk were first

observed wintering on the high desert habitats of Unit 60A, with 582 wintering elk recorded in 1952. These wintering populations varied from about 700 to1,200 elk until the mid 1970s, at which time the elimination of general either-sex elk hunting resulted in a rapidly increasing winter population. During the 1999-2000 winter, 4,134 elk were estimated to be present on the Sand Creek winter range (see Sand Creek Wildlife Management Area under General Description, Protected Areas). Cooperative use agreements have benefited the elk population in the vicinity of the Sand Creek Management Area. However, agricultural encroachment continues to threaten winter range in the Island Park zone.

Most of the elk summer range in the Island Park zone occurs on USFS lands and is dominated by lodgepole pine forest in areas with little topographic relief. Douglas fir stands are common on steeper sites. Timber management practices 1970-1990 substantially altered habitat in the Island Park zone. In the mid-1970s, approximately two-thirds to three-fourths of the merchantable lodgepole pine stands on the Targhee National Forest were classified as dead or dying due to a mountain pine beetle infestation. Consequently, the Forest dramatically accelerated timber harvest. The result was an extensive network of roads and clearcuts, which greatly increased elk vulnerability, ultimately resulting in low bull escapement and low bull:cow ratios. General bull hunting was restricted to spikes-only in 1991. Antlerless elk hunting has been managed through controlled hunts and, beginning in 1993, permits have been offered for any-bull hunting throughout the Island Park zone. Recent implementation of road and area closures in some should help offset some of these effects in the future.

Recruitment, measured through sightability surveys, indicates the moderately productive nature of the herd, with calf:cow ratios typically around 30-35 calves per 100 cows. Bull:cow ratios have rebounded markedly since the implementation of spike-only general hunting in 1991. Bull:cow ratios in the hunted portion of the population have ranged from 40 to 68 bulls per 100 cows. It should be noted, however, that these figures may not represent those of the population as a whole because of the number of animals that spend the summer and fall in Harriman State Park and Yellowstone National Park. These animals are largely unharvested, being subjected to hunting pressure only while migrating to winter range or during conservative winter range controlled hunts.

Unfortunately, little evidence exists to evaluate potential competitive relationships among elk, mule deer, and moose and other domestic and wild animals in the Island Park zone. White-tailed deer (*Odocoileus virginianus*) are scattered throughout the Island Park zone but are relatively uncommon. Heavy grazing/browsing by deer, elk, and moose may alter Sharp-tailed Grouse habitats. Domestic sheep and cattle grazing occurs throughout the Island Park zone and could pose some competitive concerns for elk, especially on winter range during drought years.

At present, predation on elk in the Island Park zone is probably minimal. Black bear (*Ursus americanus*) densities appear to be low and stable in the Island Park zone. Mountain lions (*Felis concolor*) are extremely rare. Coyotes (*Canis latrans*) are common, especially in the winter range portion of the Island Park zone, but are not known to have much impact on elk populations. Wolves (*Canis lupus*) recently introduced by the USFWS

in Yellowstone National Park may become established in the subbasin, which could affect other populations of other predators and elk in the future.

The IDFG does not sponsor feeding activities in the Island Park zone except under emergency situations. Agricultural encroachment on the Sand Creek winter range increases the risk of elk depredations on stored crops, especially under adverse winter conditions. Some feeding by private citizens has occurred on the Ashton hill in recent years, resulting in elk halting their migration short of winter range in the Sand Creek area. Educational efforts need to continue to give nonsanctioned feeders a better understanding of the problems associated with artificial feeding.

Teton Zone

The population management objective for the Teton zone is to maintain approximately 200 cows and 45 bulls, of which 25 should be adult bulls. This represents about a 17% reduction from 1996 levels and is designed to eliminate artificial feeding operations at Victor, Conant Creek, and Felt, as directed by the Wildlife Brucellosis Task Force Report and Recommendations to the Governor (Idaho Wildlife Brucellosis Task Force 1998). Following the elimination of feeding, the population will be allowed to recover to the extent it can be supported on natural forage. Population manipulation will be accomplished primarily through public hunting; however, trapping and transplanting may be used if hunting is unsuccessful in achieving objectives. Well over half of the elk in the Teton zone spend the spring, summer, and fall in Wyoming. They often do not enter Idaho until after the standard hunting seasons are over. This presents a difficult challenge for management. These migratory elk provide little opportunity for Idaho hunters, particularly in the eastern portion of Unit 65 where they cause depredation problems during the winter.

Reports of elk in the Teton zone from the 1800s and early 1900s are sketchy and inconclusive; however, it is likely that elk were present. General either-sex hunting was allowed until the mid l970s. At that time over-harvest 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. The elk population was relatively stable through the 1980s, with 50-60 animals wintering in the Game Creek/Moose Creek area, 30-40 animals wintering along the Teton River in the basin, 40-50 animals being fed at a ranch on Conant Creek, and approximately 100 elk wintering in and adjacent to the Teton River and its tributaries north of Highway 33. Elk populations have grown dramatically in the l990s. There are currently an estimated 700 elk wintering in this zone.

Although extensive logging and road building on national public lands over the last three decades has reduced elk habitat effectiveness and elk security, there remains ample summer range in the Teton zone. Winter range has always been limited in the zone due to high elevations and associated deep snows and severe temperatures. A large area of winter range in the western portion of Unit 62 has been converted to farming. Some of this land is now enrolled in the Conservation Reserve Program (CRP). Elk winter range was lost to the construction and subsequent failure of Teton Dam, although the greatest losses associated with that event were to deer habitat. Recently, urban sprawl, particularly in the east portion of Unit 65, has crept up the hillsides and reduced much of what limited winter range existed in that portion of the zone. Additionally, recent increases in winter recreation

(snowmobiling and skiing) will likely reduce suitable winter range further. Efforts are underway to inventory occupied and potential winter range in the zone as part of a strategy to end annual winter feeding of elk.

The most pressing biological issues in the Teton zone relate to the overall size of the wintering population in Unit 65 and winter distribution of elk in Unit 62. The Teton Basin population (Unit 65) has quadrupled over the past ten years and consists of two groups. One herd winters east and south of Victor and numbers about 200. It is estimated that the winter range in the area can support 50-60 animals. Addressing this overpopulation through harvest is difficult because many of the animals are in Wyoming until late winter. The other group winters along the Teton River in Teton Basin. They have increased to over 100 animals and they pose a major depredation threat in normal winters. There is an opportunity to control them with hunting. The Teton zone contains a moderate mule deer population, a significant and relatively new white-tailed deer population in Teton Basin, and a strong moose population. Grazing by domestic livestock in the area is extensive. Interspecific relationships among these species and elk are not monitored and are poorly understood. Examination of livestock impacts on elk winter range will be conducted as part of the effort to end annual winter feeding of elk in this zone.

Winter feeding occurs on a regular basis at three locations in the Teton zone. Continued annual feeding at these sites is in direct conflict with Fish and Game Commission policy and presents a brucellosis risk. It is believed that the Conant Creek and Teepee Creek feeding areas have short-stopped elk that previously migrated further to the west to winter. These elk summer in Wyoming and in the Bechler Meadows area of Yellowstone National Park. Feeding locations and descriptions are as follows.

- Victor - A herd of approximately 50 elk traditionally wintered in the foothills east and south of Victor. In about l990 a landowner began feeding this elk herd, which has grown each year and now numbers approximately 200 animals. The IDFG has rejected all requests to feed elk or establish a permanent feed ground at this site. However, IDFG provided hay to this operation during two winters that were deemed to be emergency cases. Permanent stack-yards, panels, and hazing have been employed to combat depredations at this site. A large damage payment was made to a nursery in the vicinity, which was then fenced at substantial expense.
- Conant Creek - In the late l950s a private landowner began feeding approximately 20 elk on upper Conant Creek in the Fall River drainage. Over the years, IDFG has provided this landowner hay to bait the elk away from stored hay and cattle. The numbers of elk increased, and in the interim, IDFG tried to work with the landowner to solve the problem with options other than feeding. All such efforts were rejected, and the landowner has successfully enlisted the support of politicians and sportsmen in continuing the feeding. Approximately 85 elk were fed at this site during the l999-2000 winter.
- Teepee Creek (Felt) - A landowner on Teepee Creek began feeding elk in the early l990s. There currently are approximately 150 habituated to this operation. The IDFG has provided panels to the landowner to protect haystacks but has not provided any feed.

A comprehensive inventory of winter range in the Teton zone is needed to accomplish the objective of ending annual winter feeding. As part of the inventory, an assessment of the location, quality, and remaining terms of enrollment of the area's CRP lands is key if the fed populations in this zone are to become self-sufficient. Additionally, information on snowmobile use of these lands is needed. If they are to be made available to elk, snowmobiles should be discouraged. The condition of some winter ranges may provide an opportunity for enhancement through burning or changes in livestock management.

Deer

The IDFG management objectives for the hunt units within the Henrys Fork subbasin are to maintain a minimum of 15 bucks per 100 does in post-season surveys and to maintain at least 30% 4+ points or larger bucks in the general season harvest.

Upper and Lower Henrys Fork hydrologic units

Mule deer summer range occurs in the lodgepole pine forest of the Island Park caldera and the moderate to steeply sloped lodgepole pine and Douglas fir forests of the Centennial Mountain Range. Most of this summer range occurs on lands administered by the U.S. Forest Service. The Sand Creek winter range supports a vegetative complex typical of high desert shrub steppe dominated by sagebrush. Bitterbrush and chokecherry are prominent on areas of stabilized sand. Rocky Mountain juniper is locally abundant. Land ownership consists of a checkerboard of state, BLM, and private property. Cooperative use trade agreements have benefited big game populations on this winter range.

Winter deer populations have been very high on the Sand Creek winter range. The current population of about 3000 deer is the highest level documented for this herd and is double the antlerless harvest threshold of 1500 total deer. The absence of a severe winter over the last decade has undoubtedly contributed to this increase. Both of IDFG's management goals are being met for this herd, as composition counts resulted in an estimate of 20 bucks per 100 does, and in 1998 – 2000, 37% of the bucks harvested were 4 points or larger. Recruitment data indicates the productive nature of this herd, with fawn:doe ratios typically around 80 - 90 fawns per 100 does. Little evidence exists to suggest that negative interactions are occurring among mule deer, elk, and moose in the Island Park area and the Sand Creek winter range. All three species presently occur at historical high population levels in this area. Grazing by domestic sheep and cattle could detrimentally affect deer, especially on winter range during drought years.

Teton River Hydrologic Unit

White-tailed deer have increased dramatically in Teton Basin over the past 10-15 years and have undoubtedly replaced mule deer in riverine habitats. Interspecific relationships are not monitored and are poorly understood. Winter range in Teton Valley is limited. The lowest areas in the valley exceed 1,830 km in elevation. The area has few

steep south and west facing slopes. Consequently, winters can be harsh on mule deer. Construction and subsequent failure of Teton Dam destroyed winter range in Teton Canyon, although some of this winter range has shown some slow recovery since the dam failure. Home sites and ranches occupy winter range throughout the Teton drainage, and private feeding of deer during the winter is common. Feeding, either intentional, or incidental to livestock operations, had produced a rapid growth in the area's white-tailed deer population. Discouraging winter feeding requires constant efforts by IDFG. Some mule deer that spend spring, summer and fall in Wyoming will winter in Idaho, which confounds management because the deer often do not enter Idaho until after normal hunting seasons. Cooperative management with Wyoming is necessary to keep this herd below a level where it does not cause depredation to ornamental shrubs in the Teton Valley communities and does not compel people to feed the deer.

Pronghorn

Pronghorn habitat is restricted to summer range on Henrys Lake Flat and adjacent clearcuts. These pronghorn winter in the Madison Valley of Montana. Summer range is predominantly privately owned. Some landowners have complained to IDFG about pronghorn foraging no their land, but they have also posted their land as not open to hunting. Montana experiences some winter depredation problems involving these pronghorn. Therefore, IDFG's goal is to manage this herd for nonconsumptive value and to use sport harvest to prevent it from increasing to a level that causes severe depredation.

Moose

Moose populations appear to have increased in the Henrys Fork subbasin prior to the severe winter of 1988-1989. That severe winter, combined with two previous years of drought, caused moose to shift their distribution to lower elevation agricultural and urban areas in some portions of the subbasin. Additionally, moose appeared to be in poor condition during the 1988-89 winter, and significant winter losses likely occurred. Moose populations have rebounded rapidly to levels above those present prior to the 1988-1989 winter. However, moose are only counted incidentally during elk surveys conducted in the subbasin. Therefore, numbers of moose counted are questionable indicators of the population, because not all moose habitat is searched during elk surveys.

The world's largest herd of desert-wintering moose (approximately 475 moose in winter 2000-01) occurs in the subbasin on the Sand Creek desert between St. Anthony and Ashton. An increase in desert-wintering moose could lead to increased depredations during unusually severe winters. Moose cause depredations by feeding on haystacks and ornamental shrubs, and they can act aggressively around rural residences or move into towns. These nuisance moose are usually darted and relocated.

Moose habitat in the basin consists of conifers with interspersed aspen and narrow riparian areas. Mountain mahogany stands on south-facing ridges provide important winter moose habitat, as do riparian willow/aspen/dogwood communities

Big Horn Sheep

A small population of bighorn sheep (*Ovis canadensis*) occurs on the Idaho-Montana border in the Lionhead area north of Henrys Lake. During the summer and fall months, 12 to 15 bighorn sheep can be seen in Idaho.

Bighorn sheep are occasionally observed during summer in the Bighole Mountains. There are no reports or observations of these sheep during the winter and few summer observations in consecutive years. Therefore, it is not considered an established herd in Idaho. These sheep are probably pioneering or migrant animals from Grand Teton National Park.

Miscellaneous Predators

Black bear densities appear to be low and stable, and mountain lions are extremely rare. Coyotes are common, especially on the Sand Creek Desert winter range.

Amphibians

Amphibians are among the most important nongame species found in the Henrys Fork subbasin because they are useful indicators of the ecological function of wetland and riparian areas. Existence of information on amphibian populations in the Henrys Fork subbasin is considered to be fair to good, when compared with that in other watersheds of the Greater Yellowstone Ecosystem (GYE; Van Kirk et al. 2000). Five species of amphibians are known to be native to the subbasin: tiger salamander (*Ambystoma tigrinum melanostictum*), boreal chorus frog (*Pseudacris maculata*), western (boreal) toad (*Bufo boreas boreas*), Columbia spotted frog (*Rana luteiventris*), and northern leopard frog (*Rana pipiens*) (Stebbins 1985). The Great Basin spadefoot (*Spea intermontana*) has been observed in lower portion of the Henrys Fork subbasin, but the subbasin lies on the fringe of the known range of this species, and it is not known whether spadefoots ever inhabited much of the subbasin. At least three observations of each of the five more common species have been recorded in the Henrys Fork subbasin over the past decade (Van Kirk et al. 2000). The Great Basin spadefoot has not been observed in the subbasin in over a decade.

Van Kirk et al. (2000) concluded that the tiger salamander, boreal chorus frog, and Columbia spotted frog are widespread and abundant in the GYE as a whole, and observation records indicate this to be the case in the Henrys Fork subbasin as well. However, observation records indicate that populations of the western toad and northern leopard have declined in the GYE from their historic distribution and abundance. Fewer than three observations of the western toad have been recorded in the lower Henrys and Teton hydrologic units since 1990. Fewer than three observations of the northern leopard frog have been recorded in the upper Henrys hydrologic unit since 1990. This species has never been recorded in the Teton hydrologic unit, even though the Teton drainage contains suitable habitat within the species' historic range. Primary causes of amphibian population decline throughout the western U.S. include introduction of nonnative fish and amphibian species, disease, chemical contaminants in air and water, and habitat loss, degradation and fragmentation. In the Henrys Fork subbasin, loss of riparian and wetland habitat and introduction of fish into historically fishless, high-elevation lakes and ponds are likely to be the most important causes of amphibian decline.

Federally listed threatened or endangered species

Gray Wolf

This species was once the most abundant large predator in North America. Nearly all of Idaho is thought to have supported gray wolves. Wolves were introduced to Central Idaho and Yellowstone National Park in 1995 and 1996. Human prosecution is the major threat to wolves. Prior to its introduction, the gray wolf was given "experimental, nonessential" status on November 22, 1994 (59 FR 60264; and 59 FR 60297p; November 22, 1994). Under section 10(j) of the ESA, a population of a listed species re-established outside its current range but within its probable historic range may be designated as "experimental" at the discretion of the Secretary of the Interior (Secretary). Reintroduction of the experimental population must further the conservation of the listed species. An experimental population must be separate geographically from non-experimental populations of the same species. Designation of a population as experimental and nonessential increases the management flexibility of the U.S. Fish and Wildlife Service. Experimental, nonessential populations located outside national wildlife refuge or national park lands are treated as if they are proposed for listing, which means that federal agencies are under an obligation to confer, as opposed to consult (required for a listed species under ESA section 7), on any actions authorized, funded, or carried out by them that are likely to jeopardize the continued existence of the species. Experimental, nonessential 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 ESA section 7 unless they are authorized, funded, or carried out by a federal agency. Individual animals used in establishing an experimental population can be removed from a source population if their removal is not likely to jeopardize the continued existence of the species and a permit has been issued in accordance with 50 CFR part 17.22.

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 present in 16 of the contiguous states. As of August 1999, Canada lynx occurred primarily in forested habitats in 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 deep snow habitats traditionally used only by lynx. On packed snow, bobcats and coyotes can out-compete the lynx for food and space.

The Canada lynx Northern Rocky Mountains Geographic Area encompasses the Upper Snake Province including the Henrys Fork subbasin. 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, 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 at between 8 and 800 km^2. Lynx are capable of moving extremely long distances in search of food or to establish new home ranges. Lynx populations rise and fall, following the cyclic highs and lows of snowshoe hare (*Lepus americanus*) populations. When hare populations are low, changes in the lynx's diet cause fecundity of adult female lynx and survival of young to drop to near zero.

The Canada lynx occurs predominantly on federal lands, especially in the western U.S. The USFWS concluded that lack of guidance to conserve the species in current federal land management plans threatens continued existence of lynx in the contiguous United States. The USFWS is working with other federal agencies to conserve lynx habitat, and the Forest Service, Bureau of Land Management and the National Park Service have all signed Lynx Conservation Agreements. The Forest Service is also undertaking several analysis processes to amend their forest plans to incorporate measures designed to conserve the lynx. These actions will provide immediate benefits for lynx.

Lynx risk factors specific to the Northern Rockies include timber management (including fire suppression and conversion or alteration of native vegetation), grazing use levels that affect lynx prey, changes in 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. Risk factors relating to direct mortality include trapping and hunting, predator control activities, and highways. Finally, risk factors affecting movement and dispersal include fragmentation of habitat and corridor areas by development, and existence of highways and other corridors (Ruediger et al. 2000).

Conservation measures are identified for Canada lynx on federal lands at four scales: range-wide, 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 such as fragmentation and degradation of refugia, lynx movement and dispersal across shrub-steppe habitats, and nonnative 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

In 1975, the U.S. Fish and Wildlife Service listed the grizzly bear as a threatened species. The Henrys Fork subbasin lies on the edge of the Yellowstone grizzly bear range. Periodically, grizzly bears are observed in the Teton River Valley and the upper Henrys Fork. In Idaho, an individual grizzly bear range averages 500 to 800 km^2. Grizzlies prefer open meadows and avalanche chutes in the spring and timberlands with berry bushes in late summer and fall. Hibernation occurs from November through April. They begin searching for their den in early fall, digging in north-facing slopes unlikely to be disturbed 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 is an estimated minimum of 400 to 600 grizzlies in the Yellowstone area. The number of adult breeding females has jumped from less than 30 in 1983, the first year this number 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 from which they had been absent for more than 40 years.

Habitat loss due to private land development and certain types of resource development that disturb grizzlies, loss of primary food sources, and human-caused mortality are the major threats to the grizzly bear in the Yellowstone area. Hunters who mistake them for black bears, which are legal game, accidentally kill some grizzly bears. Grizzlies become habituated to humans because of attractants, including 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 backcountry 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 disparate 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 Yellowstone grizzly bear primary conservation area, there is rapidly accelerating growth of human populations in grizzly bear habitat in western Montana, southeastern Idaho, and northwestern Wyoming. This growth results not only in increased visitor use but also increased residential development on important wildlife habitat adjacent to public 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 loss in valley bottoms and riparian areas is particularly harmful to grizzlies because they use these habitats as 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

The Bald Eagle was reclassified from endangered to threatened in the lower 48 States on July 12, 1995 and was proposed for de-listing 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.

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 southeastern Idaho portion of the GYE, making this area the most productive nesting area in Idaho. Of this total, 29 breeding areas are found within the Henrys Fork subbasin. Nineteen Bald Eagle breeding areas are located on the Henrys Fork at and upstream from Ashton Reservoir. In addition, five Bald Eagle breeding areas are located along the Teton River. One known territory is located on

the Fall River, and four breeding areas are found on the Henrys Fork below Ashton Reservoir.

This nesting population represents a dramatic increase in numbers since the 1950s, when Bald Eagle numbers were severely depressed. Bald Eagles were trapped and shot from much of their historic range, and eagle numbers plummeted further with the introduction of the pesticide DDT. Eagle prey contained DDT residues, which weakened eggshells and caused reproductive failure, nesting failure and direct mortality. Lead poisoning, often a result of feeding on waterfowl containing lead shot, also threatened the Bald Eagle. Habitat loss continues to be a threat to eagle recovery. Only one resident nesting pair was noted within the Henrys Fork subbasin 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 within the subbasin has been reoccupied over the past half century.

Within the Henrys Fork subbasin, young Bald Eagle pairs are occupying new nests. However, there is a 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 less productive habitat. 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. Nesting areas, both existing and potential, as well as wintering habitat and food sources, must continue to be protected for complete recovery to occur. Bald eagles represent an important element of river-dependent wildlife in the Henrys Fork subbasin. As predators at the top of the food chain, bald eagles are indicative of the overall health of the subbasin as habitat for many species.

Whooping Crane (*Grus americana*)

An Idaho population of whooping cranes was reestablished through introduction at Gray's Lake National Wildlife Refuge (GLNWR). The population was designated as experimental and nonessential July 21, 1997. One of the purposes of the experimental reintroduction was to investigate the possibility that sandhill cranes could raise whooping cranes. Whooping crane eggs were translocated into sandhill crane nests, and sandhill cranes successfully raised whooping crane young and taught them seasonal migration routes. However, the whooping cranes wrongly imprinted and never mated, and the experiment was discontinued. Only a few whooping cranes remain in this population. Occasionally one of these birds is observed migrating through the Teton Valley area of the Henrys Fork subbasin.

Utah valvata snail (*Valvata utahensis*).

This snail, which is currently listed as endangered, 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-boulder substrates. Free flowing, cold-water environments required by this species have been altered in the Snake River basin 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 their temperature, substrate, and flow requirements. Although the Utah valvata snail has not been observed in the Henrys Fork subbasin, it is possible that it occurs there.

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

- Ensure that water quality standards for cold-water biota are being met and that habitat conditions are such 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 five 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.

Ute ladies'-tresses (*Spiranthes diluvialis*)

This orchid was listed as a threatened species on February 18, 1992. It is endemic to moist soils in mesic or wet meadows near springs, lakes, or perennial streams at elevations of 550 to 2,100 m. 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 populations 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 79-km-long corridor in the Snake River floodplain downstream of Palisades Dam. However, it could be present in suitable habitat outside of this corridor, including areas in the Henrys Fork subbasin.

Urban development and subbasin 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 canary reedgrass. Recovery for this species will focus on improvement of watershed condition and function. The focus on watershed level planning and management 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 the following.

- Identify, protect, and manage populations in disjunct habitats.
- Inventory potential habitat.
- Conduct genetic, life history, ecology and habitat management studies.
- Reintroduce into appropriate habitat.
- Encourage public education on watershed and riparian ecosystem management.

Recovered Species

Peregrine Falcon (*Falco peregrinus anatum*)

The peregrine falcon was found to be recovered and was 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 ESA requires that the USFWS implement a system, in cooperation with the states, to monitor effectively for at least five 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 (USFWS 1984) established three objectives for delisting, including:

- Increasing the peregrine falcon population in the Rocky Mountain/Southwest region to a minimum of 183 breeding pairs with a minimum of 17 pairs in Idaho
- Sustaining a long-term average production of 1.25 young per pair without manipulation by 1995
- 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. Suitable peregrine habitat occurs in the Henrys Fork subbasin.

Candidate Species

Yellow-billed cuckoo (*Coccyzus americanus*)

On July 25, 2001, the USFWS announced a 12-month finding for a petition to list the yellow-billed cuckoo in the western continental United States under the ESA. The USFWS 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 USFWS. The USFWS found that declines in the distribution and abundance of yellow-billed cuckoos throughout the western states was primarily attributed to habitat loss, degradation and fragmentation from overgrazing, replacement of native riparian woodland species by tamarisk and other non-native plants, river regulation, including altered flow and sediment regimes, and flood control practices, such as channelization and bank stabilization. Much of the riparian habitat remaining in the western U.S. 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, which affects the birds' 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, Saab (1998) documented the presence of nesting yellow-billed cuckoos in the cottonwood galleries of the South Fork Snake River during the study period 1991-1994. There are also recent incidental reports of yellow-billed cuckoos from such areas as Camas National Wildlife Refuge and the Challis, ID area. Thus, although yellow-billed cuckoos have not been observed in the Henrys Fork subbasin, they have been observed in areas close to the subbasin within the past decade. Both riparian forest and riparian shrub habitats (primarily but not exclusively with cottonwoods and/or willows) are the primary breeding habitats for yellow-billed cuckoos. Although usually found in areas with a tree component, cuckoos can be found in areas dominated by shrubs (e.g., in fairly tall and/or dense willow stands).

Habitat Areas and Quality

Fish

Rivers and Streams

Streams in the Upper and Lower Henrys hydrologic units were assessed between 1996 and 1999 (Gregory 1997a, 1998a, 2000a, and Gregory and Van Kirk 1998). Stream reaches located on public property were generally in good to excellent condition. Stream reaches on private land for which permission was obtained to conduct habitat assessments were in poor to excellent condition, with conditions often changing dramatically at property boundaries. Seven stream reaches in the Fall River drainage were rated as pristine, as no evidence of human activities was observed (Gregory 1998a). Three of these reaches were located on the Targhee National Forest (Hominy Creek, South Fork of North Boone Creek, and the upper reach of Boone Creek), and the remaining four were located in Yellowstone Park (Upper Fall River, Little's Fork, Gregg's Fork, and Phillip's Fork).

The Henrys Fork from Big Springs to Island Park Reservoir contained an abundance of spawning habitat (Gregory 1997a) and supported a high density of redds (Gregory 1997b). Not surprisingly, density of juvenile trout was found to be high at the beginning of winter (Table 8). However, by the end of winter juvenile trout density decreased substantially (Gregory 1999), presumably due to reduction in cover provided by submerged macrophytes (Griffith and Smith 1995). Moose Creek, a tributary to the Henrys Fork in this reach, and Lucky Dog Creek, a tributary to Moose Creek, contained good fish habitat. Pools were abundant and most often formed by large woody debris (Gregory and Van Kirk 1998). Quality spawning gravel was also abundant. Streams tributary to Island Park Reservoir varied greatly in habitat condition, productivity, and degree of connectivity to the Reservoir. In general, those streams with good physical habitat features and a high degree of connectivity to the reservoir, Yale Creek and Hotel Creek for example, had the lowest inherent potential for productivity (Gregory 1997a). Low productivities in these streams result from excessively low water temperatures and lack of soluble nutrients.

Table 8. Estimates of the number of juvenile rainbow trout and brook trout present per kilometer in the Henrys Fork near Mack's Inn (Gregory 1999)

	Rainbow trout		Brook trout	
	Bank	Mid-channel	Bank	Mid-channel
10 Nov. 1998	800	15,200	700	7,300
31 March 1999	0	0	100	0

From Island Park Dam to Ashton reservoir, fish habitat in the Henrys Fork was in good to excellent condition (Gregory and Van Kirk 1998). From Pinehaven to Ashton Reservoir the Henrys Fork flows through deep, bedrock-lined canyons, and aside from four bridges (one of which has been removed) and an "unimproved boat launch" downstream from Lower Mesa Falls, the river in this area was probably in nearly the same condition as it was 100 years ago (Gregory and Van Kirk 1998). Warm River contains large sections of good spawning gravel and fairly constant temperatures, which make it ideal for trout spawning. Rainbow and brown trout migrate from the Henrys Fork to spawn in Warm River during spring and fall, respectively. Due to the lack of spawning habitat in Henrys Fork between Ashton Dam and Mesa Falls, Warm River is critical to the maintenance of wild rainbow and brown trout populations in this section of the Henrys Fork (IDFG 2001).

From the head of Ashton Reservoir to St. Anthony, the Henrys Fork has been impacted by Ashton Dam, Chester Dam (both of which block upstream migration of trout), and to a lesser degree by numerous smaller irrigation diversions. Private property borders the Henrys Fork through much of this area, and land uses and intensity of land use vary. However, because of the underlying basalt geology, which armors the banks, fish habitat has been minimally impacted by land use. Thus, the greatest impacts to trout habitat in this reach are related to dams and diversions. From St. Anthony to the mouth of the Henrys Fork, the combination of alluvial geology and land uses have caused banks to erode and have probably widened and therefore reduced the depth of the Henrys Fork in this section. However, due to the low gradient, this section is still very deep and fish habitat is in relatively good condition.

Water temperature varied widely among streams surveyed in the Upper and Lower Henrys hydrologic units due to large differences in elevation, the degree of groundwater influence, and condition of riparian areas. Water temperatures recorded in Snow Creek (Robinson Creek drainage) and in headwater streams in the Shotgun Valley were generally very cold (<10 °C), even during the hottest part of the summer, and no fish were observed in those areas (Gregory 1997a). Conversely, during 2000, water temperature exceeded Idaho Department of Environmental Quality standards for coldwater biota (average daily temperature ≤19 °C and maximum daily temperature ≤ 22 °C) at sites on the Henrys Fork in Harriman State Park, near St. Anthony, and near the mouth (Gregory 2001a). Water temperatures exceeding 20 °C were also recorded in Sheridan Creek, Icehouse Creek, Henrys Lake Outlet, the Buffalo River, Waterfall Creek (the small stream that enters the Henrys Fork on the west side of Box Canyon), and East Thurmon Creek (Gregory 1997a, Gregory and Van Kirk 1998). Additionally, water temperatures of 25 °C were recorded on

Ferris Fork, and Boundary Creek (Gregory 1998a). On some of these streams, Sheridan Creek for example, high water temperatures occur where riparian vegetation is lacking, resulting in little shading and high width-to-depth ratios. Trout densities were observed to be very low in these streams, although the low densities may have been due as much to limitations in physical habitat rather than water temperature per se. In many other streams, Buffalo River for example, trout densities remain very high despite high water temperatures.

Active beaver dams were surprisingly rare in the watershed upstream from Island Park Dam. In 1996, 13 active beaver dams were observed, and those dams occurred in 7 of 49 stream reaches. Many of the streams surveyed appeared to have adequate willows for beaver utilization but no active beaver dams were observed (Gregory 1997a). However, in tributaries between Island Park Dam and Chester Dam, active beaver dams were abundant in streams that appeared conducive to beaver habitation (Gregory 1998a, 2000a, Gregory and Van Kirk 1998).

Both natural and anthropogenic barriers to fish migration were observed throughout the watershed. Natural waterfall and cascade barriers to upstream fish migration were prevalent in the Fall River drainage (88 of these types of barriers were observed). Most of these features are a result of the recent volcanism in the area. A small number of barriers in the Fall River drainage were caused by road crossings or irrigation diversions and probably restricted fish passage only during low water conditions (Gregory 1998a). Man-made barriers to fish migration on the mainstem of the Henrys Fork include Henrys Lake Dam, Island Park Dam, Ashton Dam, and Chester Dam. Mesa Falls, a natural waterfall between Island Park and Ashton Dam, also blocks upstream fish passage.

Removal of water from the streams for irrigation purposes is one of the greatest threats to fish and fish habitat in the Upper and Lower Henrys hydrologic units. Low winter stream flows, to facilitate storage of irrigation water in Henrys Lake and Island Park Reservoir, reduce the quality of fish habitat in Henrys Lake Outlet (IDFG 2001) and the Henrys Fork downstream from Island Park Dam. Additionally, when flows are low during late winter, survival of juvenile trout is lower than when higher flows are present (Mitro 1999). Many of the streams in the Shotgun Valley are completely diverted for irrigation purposes. This precludes a surface connection between these streams and Island Park Reservoir, which prevents migrations of spawning fish and effectively prevents the streams from contributing fish to the reservoir. Water rights exist to divert over 38 cms of irrigation water from Fall River, which has a mean annual discharge of 30 cms at the mouth. The Henrys Fork below St. Anthony suffers from impacts of irrigation withdrawals and low flows, which limit salmonid populations.

Past and present land use practices related to agriculture impact streams throughout the Upper and Lower Henrys hydrologic units. Many of the privately owned reaches of small streams both on Henrys Lake Flat and in the Shotgun Valley have been channelized and/or have had riparian vegetation such as willows removed from their banks (Gregory 1997a). This has resulted in monotypic habitat and a large percentage of substrate materials. Excessive stream damage caused by cattle was observed on public land only on Lower Toms Creek and Lower Antelope Creek, the stream that originates in Antelope Park just west of Last Chance (Gregory and Van Kirk 1998). On privately owned lands, stream

damage by cattle was observed at various locations throughout the watershed (Gregory 1997a, 1998a, 2000a, Gregory and Van Kirk 1998). Sediment catchment basins have been constructed by landowners in many of the cultivated fields along Fall River and the lower Henrys Fork to trap soil mobilized by sheet erosion and prevent its transport to surface waters. However, sediment production is still occasionally a problem, particularly in the early spring before crop roots have developed sufficiently to stabilize the soil or when rainfall events exceed the capacities of the catchment basins. Both of these conditions occurred during 1998, and sediment was delivered to streams in the Fall River drainage (Gregory 1998a).

Thorough, systematic assessments of fish habitat similar to those conducted by Gregory (1997a, 1998a, 2000a) and Gregory and Van Kirk (1998) in the Upper and Lower Henrys hydrologic units have not been conducted in the Teton hydrologic unit. However, observations incidental to other survey efforts (e.g., Jaeger et al. 2000) suggest that patterns of habitat quality and degradation in the Teton watershed are similar to those of the Upper and Lower Henrys units. Not surprisingly, these patterns are closely associated with land ownership and land use. For example, habitat quality is generally very good in streams originating on the Targhee National Forest on the steep, relatively inaccessible slopes of the Teton Range, although fish production is limited by the low temperatures and nutrient-poor conditions typical of these high-elevation streams. Habitat quality is more variable in streams originating on national forest lands at more moderate elevations, such as in the Big Hole Mountains, because of greater accessibility by livestock and off-road motorized vehicles, recent and extensive timber harvests, and hydrologic changes due to loss of beaver (Blandford 2000). The habitat quality is most variable within stream channels and riparian areas located on private lands at the lowest elevations in the watershed because the streams are influenced by the cumulative effects of factors such as upstream conditions, reduced stream gradients, alluvial soils, and localized land use practices.

Assessments of beneficial use support, conducted by the Idaho Department of Environmental Quality (IDEQ), also indicate a relationship between land use and habitat quality in the Henrys Fork subbasin. According to Idaho's 1994 Clean Water Act § 303(d) list of water quality-impaired waterbodies, 14 waterbodies in the Henry's Fork subbasin were impaired because sediment, nutrients, or temperatures exceeded state water quality standards for the support of beneficial uses such as cold water biota (see Limiting Factors below, Hill and Mebane 1998; Hill 2000). Two of these waterbodies were located in the upper Henrys hydrologic unit, none were located in the lower Henrys hydrologic unit, and 13 were located in the Teton hydrologic unit. An assessment by IDEQ of data available as of 1998 for the upper Henrys hydrologic unit indicated that the waterbodies listed as impaired in 1994, i.e., Henrys Lake and the Henrys Fork from Island Park to Riverside, were in fact supporting beneficial uses to the extent possible given natural conditions (Hill and Mebane 1998). In contrast, IDEQ concluded that sediment and/or nutrient load allocations were warranted for 11 of the waterbodies listed as impaired in the Teton hydrologic unit (Hill 2000).

Lakes, Ponds, and Reservoirs

Systematic and comprehensive habitat assessment of the subbasin's lakes, ponds and reservoirs has not been undertaken. The two largest still-water habitats in the subbasin are

Island Park Reservoir and Henrys Lake, the fisheries of which are managed intensively by IDFG (Van Kirk and Gamblin 2000). Fisheries production in both of these reservoirs is closely tied to the condition and connectivity of tributary streams. The IDFG has worked with private landowners and conservation groups to improve tributary conditions at Henrys Lake, and tributary production has improved greatly over the past two decades. Fish production in Island Park Reservoir is limited by a number of factors, including lack of productive and connected spawning tributaries on the west end of the reservoir, frequent drawdowns of the reservoir for irrigation and other purposes, and presence of a prolific Utah chub population (Van Kirk and Gamblin 2000). Because of its small size and confinement within a narrow basalt canyon, Ashton Reservoir contains very little fish habitat, and thus its fishery is supported primarily by stocking (Maiolie 1987). Grassy Lake, a small irrigation storage reservoir located in Wyoming on a small tributary to Fall River, is stocked with a modest number of catchable trout (Wyoming Game and Fish Department 1995). Numerous small natural lakes and ponds are found at mid- to high-elevations throughout the Fall River and Teton River watersheds, mostly in Wyoming and Yellowstone National Park. Most of these were historically barren of fish, but trout have been introduced into some. These ponds and lakes provide habitat that is more important for non-fish wetland plant and animal species than for fish (see wetland/riparian/lake habitat description below), and in fact, introduction of trout poses a threat to amphibian populations in these historically fishless waters (see, e.g., Bradford et al. 1993). Small irrigation impoundments and gravel-pit ponds are scattered throughout the subbasin; on-stream impoundments provide deep-water habitat for fluvial fish populations, and many of the gravel-pit ponds are stocked to provide harvest-oriented, family fishing opportunities (IDFG 2001).

Wildlife

Conifer Forest

Almost all conifer forest in the subbasin lies on the Targhee National Forest or in Yellowstone National Park. Forested lands in the Park within the Henrys Fork subbasin are not actively managed for timber harvest and thus exist in a more-or-less pristine condition, the effects of historical fire suppression and the 1988 fires notwithstanding. With the exception of the wilderness and research natural areas listed under "Protected Areas" above, almost all Targhee National Forest land is managed to achieve multiple-use objectives including recreation, timber harvest, wildlife habitat and watershed protection (TARGHEE NATIONAL FOREST 1997). Thus, the quality wildlife habitat on any given parcel of National Forest land depends on the management objectives and timber harvest history of that particular parcel.

Wetland/riparian/lake

The abundance of springs in the Henrys Fork subbasin support instream and wetland communities of aquatic plants and animals that are relatively unique in the state (Hill and Mebane 1998). The Conservation Strategy for Henrys Fork Basin Wetlands (Jankovsky-Jones 1996) identifies 18 wetland areas that represent relatively intact systems where simple measures, such as livestock management, creation of buffers, and education, can

accomplish resource goals for a minimal amount of labor and material costs (Table 9). These wetlands are grouped by Jankovsky-Jones (1996) into four management categories based on the following criteria: 1) habitat diversity, 2) presence of state-designated rare plant communities, plant species, or animal species, 3) extent to which a site has been altered from natural conditions, and 4) likelihood of continued existence of biota within the site. Class I Sites are in near-pristine condition and often provide habitat for high concentrations of state-designated rare plant or animal species. Class II sites may provide habitat for state-designated rare plant or animal species, but human influences are apparent. Reference Sites represent high-quality assemblages of common community types where changes in management practices can be documented. Habitat Sites have moderate to outstanding wildlife values, but human influences are often present. These sites, along with their protection status and ownership, are listed in Table 9.

Table 9. Wetland sites in the Upper Henrys Fork subbasin that have been categorized by the Idaho Conservation Data Center (Jankovsky-Jones 1996, Hill and Mebane 1998, Hill 2001)

Site	**Category[1]**	**Protection[2] Status**	**Ownership[3]**
Big Springs- Henrys Fork Confluence	Class I	None	USFS
East Shore Henrys Fork	Class I	Partial	BLM, IPR, PVT
Ingals Creek Fen	Class I	None	PVT
Targhee Creek	Class I	Partial	USFS
Woods Creek Fen	Class I	None	PVT
Blue Spring Creek	Class II	None	IDL
Hatchery Butte	Class II	None	USFS
Henrys Lake White Spruce	Class II	None	PVT
Sheep Falls	Class II	None	USFS
Thurmon Creek	Class II	Full	USFS
Toms Creek/Buffalo River Wetlands	Class II	None	USFS, IDL
Fish Creek Springs	Reference	None	USFS
Flat Ranch	Reference	Full	TNC
Hotel Creek	Reference	None	USFS
Lucky Dog Ranch	Reference	Full	TNC
Willow Creek Headwaters	Reference	None	USFS

Site	Category[1]	Protection[2] Status	Ownership[3]
Boundary Pond	Habitat	None	USFS
Icehouse Creek	Habitat	Partial	IPR, PVT
Mesa Marsh	Habitat	None	USFS
Stamp Meadows	Habitat	None	USFS
Warm River Dams	Habitat	None	USFS
Trail Creek	Reference	None	USFS
Game Creek	Class II	Full	BLM
Fox Creek/Foster Slough	Habitat	Full	IDFG
Teton Creek/Bates Bridge	Habitat	Full	IDFG
Teton Creek Mitigation Site	Habitat	Full	CPT
Teton Creek Spring	Reference	None	PVT
Woods Creek Fen	Class I	None	PVT
Horseshoe Creek	Reference	None	USFS
Rainer Fish and Game Access	Habitat	None	IDFG
South Leigh Creek	Class II	None	PVT
Spring Creek Seeps	Reference	None	PVT
Canyon Creek	Reference	None	BLM, PVT
Lower Henrys Fork	Habitat	Partial	BLM, IDFG, PVT

[1]See text for explanation
[2]Refers only to the specific site surveyed, not to the entire stream corridor or area associated with the name
[3]Bureau of Land Management (BLM); Corporate (CPT); IDFG (IDFG); Private (PVT); U.S. Forest Service (USFS)

Wetland (including deepwater) habitat represents approximately 6% of the 0.6 million ha of land area in the Henrys Fork Basin (Jankovsky-Jones 1996). Nearly 66% of the wetlands in the basin are in private ownership. Open water makes up 7000 ha or 18% of the land area. The United States Forest Service is the largest public land manager of wetland habitats with lesser amounts being managed by the State of Idaho, Bureau of Land Management, and Bureau of Reclamation (Jankovsky-Jones 1996). Excluding Yellowstone National Park, approximately 1,400 ha of wetland and deepwater habitat are currently protected, representing less than 4% of the wetland and deepwater habitat in the

basin. This equates to approximately 0.2% of the total land area in the basin. More than 66% of the wetlands that are protected are in the plustrine emergent class (Table 10).

Table 10. Area of wetland and deepwater habitat by protected and unprotected status in the Henrys Fork subbasin (data from Jankovsky-Jones 1996)

System Subsystem	Protected (ha)	Unprotected (ha)	% of type protected
Palustrine			
Emergent	940	2,3199	3.89%
Scrub-schrub	265	4,828	5.20%
Forested	2	1,748	0.11%
Aquatic bed	33	1,616	2.00%
Open water	1	252	0.40%
Uncosolidated bottom	0	19	0.00%
Uncosolidated shore	0	5	0.00%
Total Palustrine	1,241	31,667	3.77%
Lacustrine			
Limnetic	76	4,263	1.75%
Litoral	6	568	1.05%
Total Lacustrine	82	4,831	1.67%
Riverine			
Upper perennial	56	2,341	2.34%
Lower perennial	0	36	0.00%
Intermittent	0	3	0.00%
Total Riverine	56	2,380	2.30%
Total all types	1,379	38,878	3.43%

Thirty-four rare plant species are known to occur in the Henrys Fork Basin and twenty of those species are considered wetland-associated species. The Henrys Fork also provides habitat for 20 wetland and riparian associated vertebrate species considered rare in the state of Idaho. Birds account for the majority of the rare species (Jankovsky-Jones 1996). Small lakes on the Targhee National Forest provide important nesting habitat for approximately 10 pairs of Trumpeter Swans and important summer habitat for non-breeding swans.

The Southeast Idaho Wetland Focus Area Working Group (2001) has summarized the extent and condition of wetlands in the Henrys Fork subbasin. Wetlands in the Henrys Fork are threatened by development pressure, water quality reductions, and water mismanagement. The upper Henrys Fork and Teton Valley are experiencing a boom in residential and second home construction. Many of these homes are being built in riparian

areas. This development creates significant "fractures" in what otherwise would be important contiguous riverine migratory zones. The associated influx of human activity causes the addition of a suite of predators that are not typically found in areas without this activity. Increased development also poses significant risks to water quality. With an increase in the density of homes that are utilizing sewage treatment systems designed for rural, low-density homesite development, excess nutrients can be introduced into ground and surface water systems. Improper agricultural practices can also have a negative impact on water quality. Mismanaged livestock grazing can result in excessive nutrient introduction, increased sediment loads and degradation of riparian and emergent wetland vegetation. Poor grazing practices can significantly decrease the density and complexity of understory communities associated with riparian areas. Riparian vegetation serves as a buffer or filter to sediment loading and nutrient runoff, but intensive row crop farming limits riparian area widths while adding potentially high nutrient and sediment loads. Water management that affects water levels in wetland areas can impact habitat quality, particularly for nesting birds. Artificially high water levels can flood nests, whereas excessive diversion can result in drying of ponds before fledging can occur. Additionally, excessive human disturbance to nesting waterfowl, especially Trumpeter Swans, can cause birds to abandon nesting efforts completely

Upper Henrys Fork Complex

The upper Henrys Fork wetland complex consists of Henrys Lake, Sheridan, Shotgun, and Island Park Reservoirs, wetlands in Harriman State Park, and the main river downstream to the base of the Island Park Caldera. Lacustrine wetlands occur in the larger and deeper reservoirs. Riverine habitats are found along the Henrys Fork and its tributaries. The slower flowing sections of the Henrys Fork are covered with dense submergent beds of vegetation that support wintering waterfowl. Palustrine habitats occur along the shallower portions of reservoirs and consist of emergent vegetation and submergent beds. Other palustrine wetlands occur on Henrys Lake Flat and consist of wet meadows and seasonally flooded wetlands. This area contains the only white spruce/aspen forest community in Idaho. This is a G1 globally rare wetland community type. Harriman State Park has been designated as an Important Bird Area.

Lower Henry's Fork Complex

The lower Henrys Fork complex includes those lands and waters associated with the Henrys Fork of the Snake River beginning at Ashton and terminating at the confluence with the South Fork of the Snake River at Menan Buttes. This unit is not a discrete hydrological unit, but is generally within 5 km of the centerline of the Henrys Fork River. Land ownership within this complex is primarily private, with parcels of BLM land found throughout. Also found in this areas are the Bonneville Power Association's Beaver Dick Management Area and IDFG's Cartier and Warm Slough Wildlife Management Areas (WMA). The Upper Snake River Land and Water Conservation Fund project area encompasses that portion of the river corridor downstream from St. Anthony. The Sand Creek WMA is contiguous to the lower Henrys Fork upstream of St. Anthony. Riparian areas associated with the mainstem of the river primarily characterize the wetlands of the

lower Henrys Fork. Riparian wetlands upstream of St. Anthony occur along reaches in which the river flows through basaltic substrate and has a limited floodplain. Shrub vegetative cover is predominant in this area. Below St. Anthony, the river's floodplain widens, and wetlands are associated with abandoned side channels and point bars. A cottonwood gallery forest becomes the dominant vegetative cover. Spring-fed wetlands are prominent as a result of groundwater springs. At the mouth of the Henrys Fork, at Menan Buttes, extensive willow-dominated communities are present, interspersed with cottonwood forests. Other wetlands of special concern include the singleton ponds north of St. Anthony. These ponds are a "naturalized" system that offers nesting and migratory habitat for waterfowl, including Trumpeter Swans.

Targhee Wetland Complex

The Targhee wetland complex includes a network of small ponds and wetlands in the extreme northern portion of the subbasin. Most of the ponds are on lands owned by the U.S. Forest Service, but a few are privately owned. These provide palustrine habitats with some emergent vegetation and submergent beds. Many of the ponds are filled with spatterdock (*Nuphar* sp.). A matrix of conifers, primarily lodgepole pine, surrounds nearly all of them.

Teton River Complex

The Teton River Complex includes all of Teton County. Approximately 10,800 ha of the Teton River basin (9% of the total area) are classified as wetlands (USDI et al. 1998). These wetlands are among the most significant of the region's ecological features and are a Priority Waterfowl Area for the NRCS. Wetland habitats in this complex consist primarily of riparian areas and wet meadows. Extensive cottonwood riparian forests, some classified by the Idaho Conservation Data Center (CDC) as globally rare, are found along Teton River tributaries and are important wildlife habitat for passerines as well as many raptor species and five regionally rare bat species. Riparian areas within the complex consist of dense willow thickets and aspen stands. Wet meadows are fairly extensive and are dominated by sedges, rushes, and native and tame grasses. Both of these wetland types experience seasonal periods of substantial flooding followed by relatively dry conditions. Woods Creek Fen was identified by the CDC as one of the most floristically unique and highest quality of rare peatlands found in Idaho. The fen contains seven rare plant species and provides excellent waterfowl and shorebird habitat.

Teton County was the sixth fastest growing (10.5% annually) county in the United States in 1996 (U.S. Census data). Residential development within Teton Valley has broken habitat into smaller fragments. Large blocks of wet meadow and riparian areas are being reduced by development of ranchettes and subdivisions. Water levels in many of the valley's wetlands and along the Teton River have declined on a basin-wide scale as both water use and irrigation practices have changed. Residential wells, combined with elimination of irrigation resulting from conversion of agricultural land to residential use, have caused seasonal changes in groundwater levels. The result has been reduced flows in spring-fed tributaries, altered surface water flood levels and duration, and decreased water

levels in Teton River, its tributaries, and associated sloughs. Riparian areas throughout the drainage have been altered significantly by livestock grazing.

Other Terrestrial Habitats

A variety of other plants that have received state protection have been observed at locations throughout the Henrys Fork subbasin (Figure 13).

Watershed Assessment

Fish and Fish habitat assessment: See Research, Monitoring and Evaluation Activities, Non-BPA funded – Subbasin Level.

Upper Henrys Fork Subbasin (hydrologic unit) Assessment: See Research, Monitoring and Evaluation Activities, Non-BPA funded – Subbasin Level.

Teton Subbasin (hydrologic unit) Assessment and Total Maximum Daily Load (TMDL): See Research, Monitoring and Evaluation Activities, Non-BPA funded – Subbasin Level.

Limiting Factors

Habitat

In general, habitat-related issues encompass the primary limiting factors for fish and wildlife in the Henrys Fork subbasin. These habitat issues fit into the following non-exclusive habitat categories: loss (including loss of specific habitat types such as winter range), degradation, fragmentation, quantity, and quality. Fish and wildlife habitat is often degraded in all of these areas as a result of development pressure.

Changes in wildlife habitat may limit some wildlife species and/or allow nonnative wildlife species to increase. Conversion of native habitats to agricultural fields, urban and rural human population areas, and extensive areas of nonnative vegetation (e.g., conversion of sagebrush range to nonnative grasses) decreases wildlife habitat quality and quantity. Roads, powerlines, residential development, agricultural development, and wildfires fragment or remove habitat. Forest habitats are changing due to alteration of natural fire regimes. Noxious weeds are displacing native plant species in all habitat types throughout the subbasin. Overgrazing by livestock grazing native species may be degrading native habitats.

Cropland in the subbasin can create food sources of high value to wildlife (e.g. grain), but these food sources are only available for a portion of the year. Tillage practices and installation of sprinkler systems for improved irrigation water management has reduced the availability of year-round food supply and security in some wildlife habitats. Noxious weeds often out-compete desirable vegetation and provide less nutrition and cover for wildlife than native species. The USDA Conservation Reserve Program has improved some habitat for upland game birds such as Sharp-tailed Grouse and other wildlife, but enrollment of additional lands in this program would provide more fish and wildlife habitat than is currently available in agricultural areas of the subbasin.

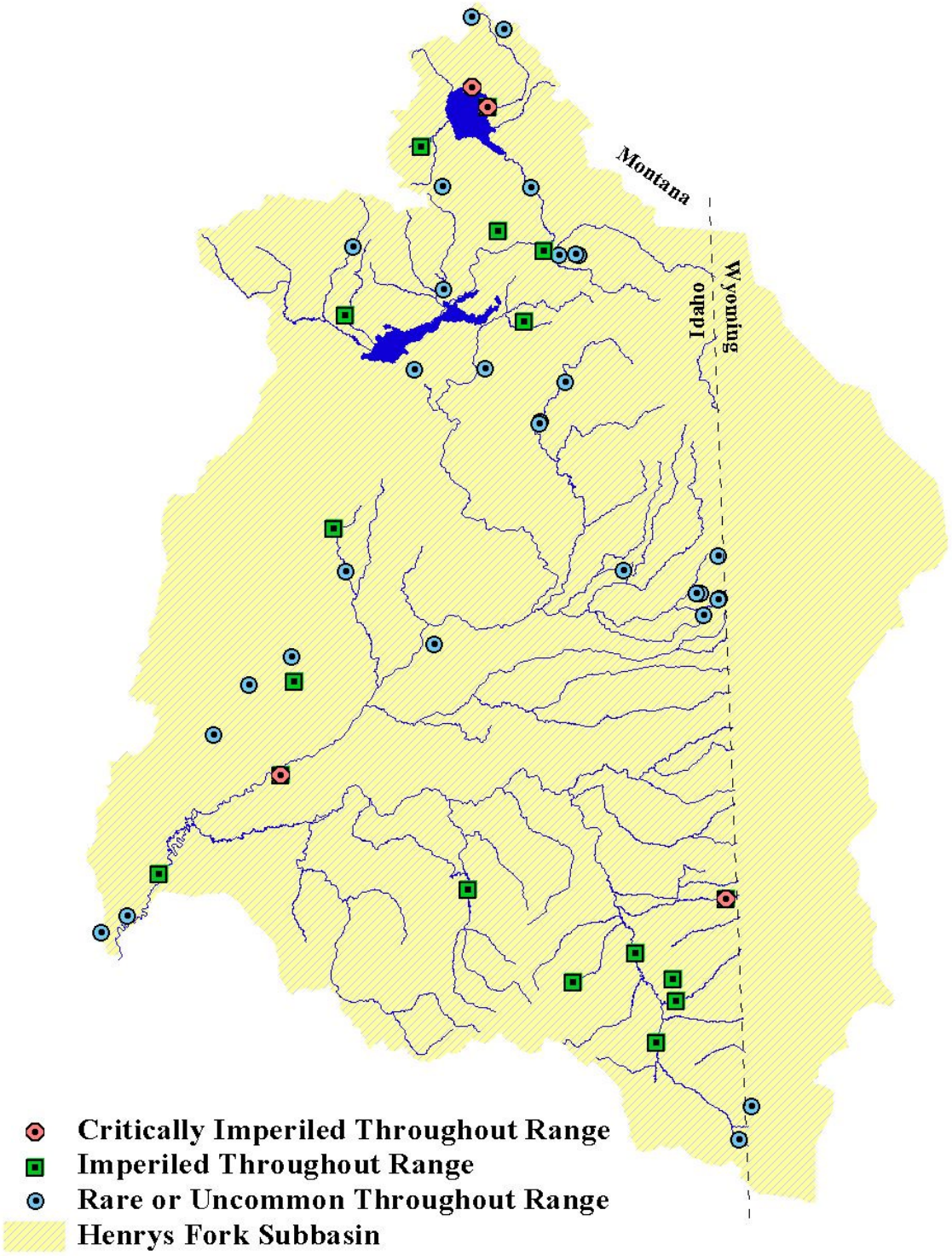

Figure 13. Locations of plants that have received state protection or watch designation

Fish populations and habitat are impacted throughout the subbasin by unscreened irrigation delivery systems, sedimentation, upland and instream habitat disturbances, loss and degradation of functional riparian areas and wetlands, elevated in-stream 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. Anthropogenic disturbances to stream habitat due to timber harvest, grazing, dam construction and operation, irrigation diversions, and road building often limit salmonid populations (Rieman and McIntyre 1993; Gresswell 1995).

Flow

Hydrologic regimes in the Henrys Fork subbasin are altered from very high in the watershed all the way downstream to mouth. The two largest irrigation storage reservoirs in the subbasin, Henrys Lake and Island Park Reservoir, are located in the upper portion of the subbasin. Storage of irrigation water in these impoundments results in lower-than-natural flows during the winter and spring (Benjamin and Van Kirk 1999). Release of this stored water to satisfy irrigation demand results in higher-than-natural flows during the summer upstream of the large diversions in the St. Anthony area. Irrigation withdrawals from the mainsteam and many of the tributaries in the basin cause reductions in flows and, in some cases, complete removal of all water from the streambed during irrigation season. Such diversions and dewatering of stream channels are especially detrimental in the Teton River drainage, where the attempts of fluvial Yellowstone cutthroat trout to spawn in tributary streams may be interrupted or even halted altogether. Low flow and dry streambeds can cause direct mortality, especially during critical periods when water temperatures are high, and can limit or prevent outmigration of juvenile cutthroat trout from these streams. It appears that low summer flows and warm water might limit rainbow trout populations in the lower portions of the subbasin (IDFG 2001), wheras low winter flows (Mitro 1999) and lack of adequate winter habitat for juveniles seem to limit the population in the upper Henrys Fork (Gregory 2000c). Regulated stream flows affect the functioning of riparian areas (Merigliano 1996), which provide important wildlife habitat in the lower portions of the subbasin.

Water Quality

Within the Henrys Fork subbasin, 14 stream segments on 13 different streams are listed as water quality impaired under Clean Water Act § 303(d) (Figure 14). Support of cold water aquatic life and salmonid spawning are the primary beneficial uses limited by impaired water quality in the Henrys Fork subbasin. The pollutants primarily responsible for impaired water quality are 1) sediment, 2) temperature, and 3) nutrients. degraded in all of these areas as a result of development pressure.

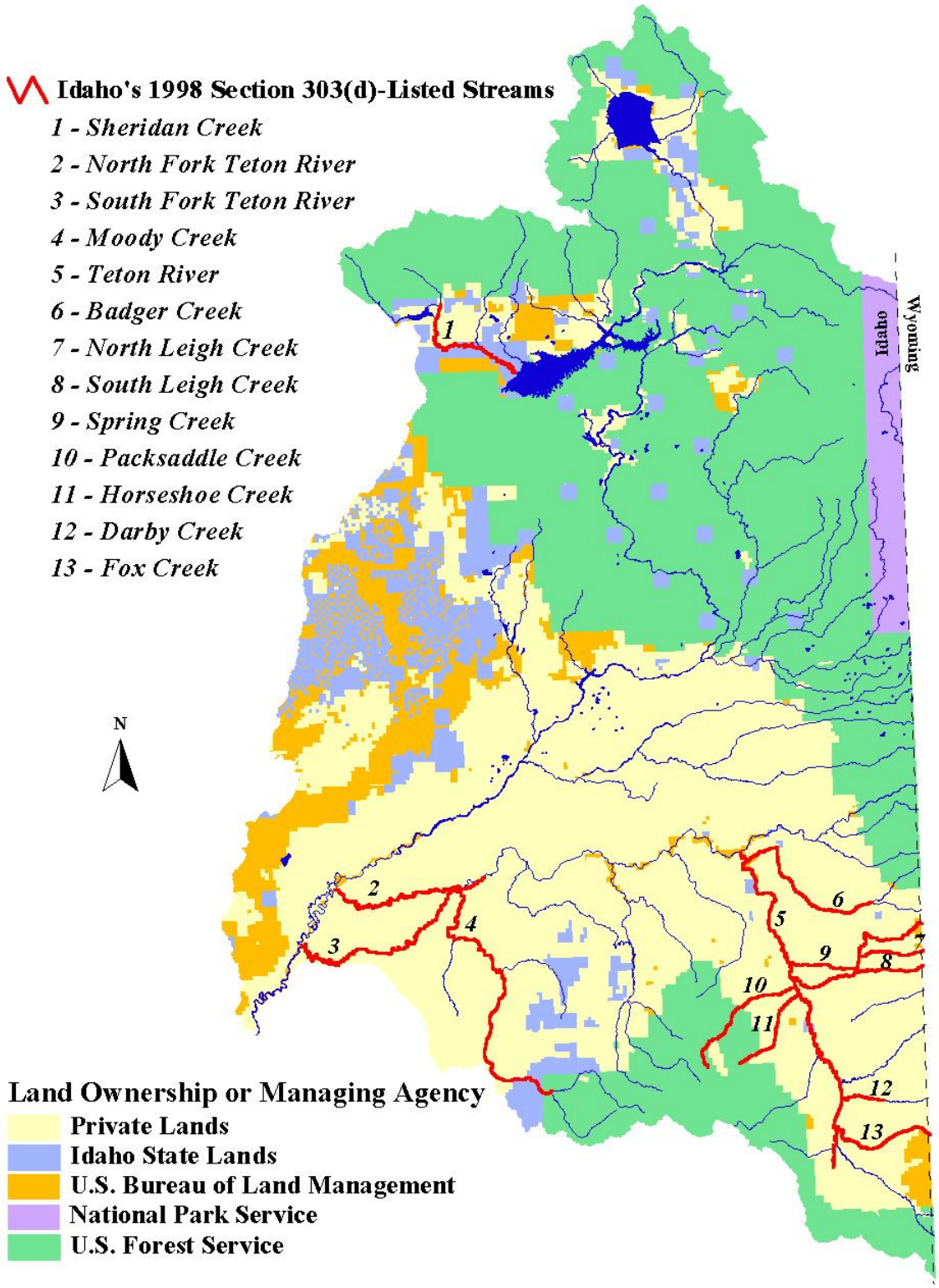

Figure 14. Land ownership and stream segments currently listed as impaired under § 303(d)

The production and transport of sediment to surface waters, and increases in water temperatures, are generally related to agricultural practices. Soil is mobilized from cultivated fields during runoff events through the processes of sheet and rill erosion. These processes are especially prevalent in the lower Henrys and Teton hydrologic units because large areas of these watersheds are used for cultivated agriculture. Soil is also mobilized from streambanks that have become unstable because of loss of natural floodplains due to channelization, extreme variations in seasonal flows due to natural runoff and irrigation diversion, trampling by livestock, and loss of stabilizing riparian vegetation through overgrazing or deliberate removal. Soil that is mobilized from fields by water or from streambanks by any physical force ultimately either remains suspended in the water column and is transported downstream, or is deposited in the stream substrate as sediment.

Most soils in the lower Henrys and Teton hydrologic units are classified by the U.S. Department of Agriculture as moderately to highly erodible. More than half of these soils are also classified as silty loams, which consist of more than 45% silt-sized particles. Because of the erodibility of these fine-sized soils, many of the surface substrates of streams in the Teton hydrologic unit consist of more than 50% fine-sized particles (Hill 2001). These particle sizes create a homogeneous substrate that limits the diversity of stream macroinvertebrate populations. These particles also interfere with salmonid spawning and reduce the survival of salmonid eggs and fry.

Streambank erosion indirectly limits the suitability of water for supporting diverse populations of fish and macroinvertebrates by contributing to increased water temperatures. As streambanks erode, the stream channel becomes wider and more shallow, and a larger proportion of the water surface and stream substrate is exposed to sunlight. The radiant energy absorbed by the water surface and substrate is transferred to the water column, increasing the water temperature. In addition, streambanks that are actively eroding often do so because of the absence or reduced quality of riparian vegetation, which normally shades the stream from incident sunlight. Secondary effects of increased water temperature include reduced concentrations of dissolved oxygen; conversion of ammonium to ammonia, the form which is toxic to fish; and increased primary production, which ultimately increases the biological oxygen demand and reduces concentrations of dissolved oxygen available to aquatic organisms.

The substrate of the Teton River downstream of the confluence of Badger Creek and of the Henrys Fork downstream of the confluence of the Teton River was dramatically altered by the collapse of the Teton Dam in 1976. Within a period of six hours following the collapse, 250,000 acre-feet of water and four million cubic yards of embankment material moved downstream. The canyon section of the Teton River, which had formed the reservoir behind the dam was converted into a series of large pools, and the North Fork of the Teton River filled with tons of sediment. The North Fork was rehabilitated within two years by dredging, channelization, and stabilization of the streambanks with rock armor. This has ultimately accelerated erosion of the streambank in the few areas where the channel was not armored. Currently, the only practical solution for mitigating movement of sediment from the North Fork to the Henrys Fork is complete armoring of the streambanks.

The U.S. Bureau of Reclamation recently completed a study of the geomorphology and river hydraulics of the portion of the Teton River that formed the reservoir behind the Teton Dam (Randle et al. 1999). Water temperatures were found to be elevated because of the changes in stream channel morphology related to collapse of the reservoir walls and the loss of native riparian vegetation. The BOR has requested funding to develop a Resource Management Plan for Teton Canyon, and to determine what, if any, steps can be taken to mitigate the effects of the former reservoir on the Teton River channel.

Nutrients have been identified as limiting factors in the upper Henrys and Teton hydrologic units. Henrys Lake is located in a drainage that is naturally enriched by high concentrations phosphorus. The lake is highly eutrophic, which contributes to the production of its world-class fishery. However, it also causes frequent violations of dissolved oxygen criteria in winter, which may in turn cause massive fish kills. This circumstance is natural, and the IIDFG has attempted to mitigate situations during which fish kills may occur by installing dissolved oxygen monitoring equipment and aerators. Relatively high concentrations of nitrogen have recently been detected in the upper Teton River, and concern has been expressed by researchers and the public that these concentrations are limiting the aquatic ecosystem of the upper Teton River. However, violations of the narrative water quality criteria that pertain to nutrients have not been exceeded, and the role of nitrogen as a limiting factor in the Teton River system requires additional study.

Cumulative Human Effects

Fish and wildlife are affected by human presence and land uses in many ways. Most land use effects are reflected in specific habitat limitations as discussed above. Direct impacts of human activities on fish and wildlife populations include recreational use disturbance and harvest. In general, fish and wildlife populations are managed by IDFG so that direct harvest through consumptive fishing and hunting are not limiting factors to populations. Modern fish and wildlife management uses stocking sparingly to support consumptive fishing and hunting, and uses it only in locations where habitat conditions prevent wild reproduction from maintaining populations. Wildlife populations can be directly impacted through disturbance resulting from recreational activities, including snowmobiling, skiing, and boating. Nesting waterfowl are particularly vulnerable to such disturbance. Of particular concern in the Henrys Fork subbasin are nesting Trumpeter Swans. Although the population as a whole is currently not limited by direct disturbance, Trumpeter Swans will not reproduce successfully in the presence of much human disturbance, and thus as recreational use in and around the Henrys Fork subbasin increases, the small Greater Yellowstone breeding flock may become limited by disturbance-related declines in reproductive success.

Altered Fire Regimes

Fire is a natural component of lodgepole pine forest, which is the most common forest type in the subbasin. Fire suppression has had a negative impact on the historic age class structure of the lodgepole pine forest and thus may limit its ability to function as wildlife habitat. Fire suppression is also a likely contributing factor in the current loss of mid-

elevation aspen stands in the subbasin. Other habitat types, such as sagebrush steppe, have probably also been altered by changes in fire regime. It is not known the degree to which these alterations directly limit wildlife populations in the Henrys Fork subbasin.

Disease

Disease can be an important factor in regulating fish and wildlife populations (Strange 1996). However, because diseased individuals are often removed from the population rapidly, the extent of this factor is largely unknown. An exception may be whirling disease in trout populations, which has been linked to severe declines in trout populations in other watersheds around the west.

Whirling disease was first detected in the Teton Valley in 1995. Additional research was initiated in 1997 to assess the potential impacts to wild salmonid populations. The investigation included sentinel exposures of hatchery and wild trout fry and trout population estimates in Teton and Fox Creeks. Results showed high infection rates for both hatchery and wild rainbow and cutthroat trout (IDFG 2001). Despite increased riparian habitat protection since 1988, restrictive harvest regulations since 1990, and above-average snowpack between 1994 and 1999, significant declines in all trout species have been documented in the river and its tributaries. The principal factor appears to be whirling disease (IDFG 2001). Yellowstone cutthroat trout appear to survive in the presence of whirling disease in natural conditions than rainbow or brook trout (Mark Gamblin, IDFG, Pers. Comm.), but whirling disease has the potential to limit populations of all three species in the Teton drainage.

Introduced species

Exotic and nonnative species of fish, wildlife, and plants have been introduced into the Henrys Fork subbasin both accidentally and intentionally. These introductions can have a profound influence on native species. Factors commonly listed as limiting the abundance and distribution of native salmonids, especially cutthroat trout, include hybridization and competition with nonnative salmonids (Griffith 1988). Various nonnative and exotic terrestrial species (e.g., starling, feral cat, red fox, raccoon) thrive in the subbasin. Exotic and nonnative species directly displace native species through predation and competition. Habitat alteration (e.g., conversion of native ranges to agriculture and urban areas) tends to favor survival of nonnative species over natives. Wildlife/livestock interactions create conflict through direct competition for resources, potential disease transmissions, and public perception. Game farms pose potential disease transmission to wild animals. All of the impacts of introduced species on native species are expected to increase in the Henrys Fork subbasin as its human population continues to increase.

Lack of Knowledge

Although a large amount of research has been completed in the Henrys Fork watershed (Van Kirk 2000), identifying specific limiting factors and fish and wildlife needs is a tremendous task. Nearly 15 years of research has been completed to identify limiting factors to rainbow trout on a short section of the mainstem Henrys Fork alone (Contor

1989, Smith 1992, Meyer 1995, Mitro 1999). This level of research is needed for many more species and locations in the basin.

Artificial Production

Historical Fisheries

Production and stocking

This summary of historical fish production and stocking comes from Van Kirk and Gamblin (2000). Some of the earliest artificial production activities in the Henrys Fork subbasin occurred on Henrys Lake, where the U.S. Commission of Fish and Fisheries (USCFF) collected wild Yellowstone cutthroat trout eggs for distribution to other parts of the country (USCFF 1899, 1901, 1905). The USCFF was at least indirectly responsible for bringing the first nonnative trout to the subbasin as they collected and distributed by train the eggs and fry of a variety of trout species to individuals, agencies and companies throughout the country (USCFF 1877, 1897, 1898, Wales 1939).

By 1900, there were 37 commercial fish operations in Fremont County (Arbuckle 1900). Although the fish species used in many of these hatchery operations remains unknown, records indicate that Joe Sherwood established a commercial rainbow trout hatchery at Henrys Lake in 1891, and by 1893, George Rea was operating a hatchery in Shotgun Valley using brook and rainbow trout (Brooks 1986, Green 1990). Idaho's first State Game Warden, Charles Arbuckle, reported that many commercial fish farms consisted of wild fish held in privately constructed impoundments on public waters. Arbuckle's successor, W. N. Stephens, reported that brook trout "seem to thrive and grow in our mountain streams...better than our native fish...[The brook trout] is considered the best of all the trout family and its propagation should be encouraged in every way possible (Stephens 1907)." The first state fish hatchery in the subbasin was located on Warm River and was first leased by the state in 1908 (Stephens 1909). The Warm River hatchery produced brook and cutthroat trout for stocking in waters within the subbasin. The following year Stevens stated that "the fish culture work of the past twelve months...will keep the streams well stocked with the finest species of fish and will insure an opportunity for all who come to catch a mess of trout" (Stevens 1909).

Later, Warm River hatchery was abandoned because of its remote location, and operations were moved to the Ashton hatchery, which was purchased from private owners in 1919 and remodeled in 1923 (Jones 1921, Thomas 1925). With the renovation of the Ashton hatchery, stocking programs in the Henrys Fork subbasin shifted from use of cutthroat and brook trout to use of primarily rainbow trout, a trend that continues today. The Ashton facility planted 40,000 brook and 262,000 rainbow trout into Fremont County waters during 1923 and 1924 (Thomas 1925).

In 1924, the state established a hatchery at Henrys Lake to mitigate the loss of spawning habitat in the lower reaches of tributaries caused by construction of the dam on Henrys Lake Outlet by the North Fork Reservoir Company (Thomas 1925, Green 1990). During the first year of hatchery operations on the lake, over 2 tons of Yellowstone cutthroat trout and cutthroat-rainbow hybrids averaging 2.3 kg each were collected (Thomas 1925). Stocking levels of 1,823,111 fish in Fremont County and 20,609,323

statewide in 1939 were representative of those during the 1930s and 1940s (Simpson 1948, IDFG 1940).

In 1948, it was "the intention of the department to operate all hatcheries at capacity...Throughout the state many streams are completely fished out soon after the opening of fishing season. Therefore, to as large an extent as is possible, these streams will be planted two or more times annually in an attempt to furnish catchable fish to the greatest number of fishermen" (Simpson 1948). Jeppson (1973) reported that during the 1973 season, 31,400 catchable-sized rainbow trout were stocked into the Henrys Fork between Island Park Dam and Riverside campground.

Current Fisheries

Production

Idaho Fish and Game currently operates a hatchery at Ashton and an egg-take station at Henrys Lake. In 2000, nearly 1.5 million cutthroat trout eggs were collected. Fry were transferred to Mackay Hatchery, where they were raised to fingerlings. Some of these fish were stocked in other areas of the state but in 2000; over 400,000 of these fingerlings were planted into Henrys Lake tributaries.

Stocking

Stocking of hatchery fish into the streams of the upper Henrys Fork subbasin has decreased significantly over the past 3 decades. Initially, reductions in stocking were caused by a shift in management emphasis to wild fisheries. More recently, budget cuts have forced IDFG to reduce stocking levels in all waters, including lakes and reservoirs (Van Kirk and Gamblin 2000). Currently, IDFG stocks about 2.5 million fish in the Henrys Fork subbasin (Table 11), and most of the fish are stocked as fingerlings (7 – 15 cm). For a complete breakdown of stocking in the Henrys Fork subbasin by species and size for 1998 – 2000 see Appendix B.

Table 11. Number of catchables (>15 cm), fingerlings (7 – 15 cm), and fry (< 7 cm) that were stocked in waters within the Henrys Fork subbasin

Species / **Water Body**	**Catchable**	**Fingerling**	**Fry**	**Total**
Cutthroat				
Blue Creek Reservoir		1,508		1,508
Duck Creek (Henrys Lake trib.)		116,440	138,600	255,040
Hatchery Creek (Henrys Lake trib.)		215,465	253,625	469,090
Targhee Creek (Henrys Lake trib.)		112,560		112,560
Cutthroat Total		445,973	392,225	838,198
Hybrids (cutthroat X rainbow)				
Hatchery Creek (Henrys Lake trib.)			141,750	141,750
Kokanee				
Moose Creek		579,128		579,128

Species Water Body	Catchable	Fingerling	Fry	Total
Rainbow				
Ashton Reservoir	27,504			27,504
Bannock Jim Slough		5,005		5,005
Blue Creek Reservoir	2,700	1,121		3,821
Buffalo River	2,985			2,985
Fish Pond	3,070	1,500		4,570
Henrys Fork	23,069			23,069
Horseshoe Lake	2,268			2,268
Island Park Reservoir	23,511	569,950		593,461
McCrea Pond	662			662
Rexburg City Pond	1,715			1,715
Sand Creek WMA #1	2,248	1,121		3,369
Sand Creek WMA #2	1,349	1,121		2,470
Sand Creek WMA #3	2,251	1,121		3,372
Sand Creek WMA #4	896	1,121		2,017
Snow Creek Pond	1,351			1,351
Spring Daniel Slough		4,004		4,004
Trail Creek Pond	3,406			3,406
Warm River	5,409			5,409
Warm Slough		4,004		4,004
Rainbow Total	104,394	590,068		694,462
Grand Total	104,394	1,615,169	533,975	2,253,538

Wildlife

During October and November of the 2000 pheasant season, 372 farm-raised rooster pheasants purchased from a private game farm were released on Cartier Slough WMA. The roosters were released to supplement pheasant hunting and it is unknown how many were harvested. This was the first time pheasant had been released at Cartier Slough WMA. However, similar releases will be continued in the future. Aside from this release, IDFG does not raise or release game farm wildlife in the Henrys Fork subbasin.

Existing and Past Efforts

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

None

Efforts funded outside the Columbia Basin Fish and Wildlife Program

One of the most notable past efforts in the Henrys Fork basin was the formation of the Henry's Fork Watershed Council. In 1992 agency personnel, hydroelectric developers, irrigators, and nonprofit organizations were completing a contentious three-year debate over recommendations to be incorporated into the Henrys Fork Basin Plan by the Idaho Water Resources Board (IWRB 1992). Three additional events in the basin that year

(failure of the Marysville canal, sedimentation of the Henrys Fork below Island Park dam due to reservoir drawdown, and drought) caused these individuals and groups to begin a new approach to reconciling conflicts over natural resource management in the Henrys Fork subbasin (Van Kirk and Griffin 1997). The Henry's Fork Watershed Council was founded as a grassroots, community forum that uses a non-adversarial, consensus-based approach to problem solving and conflict resolution among citizens, scientists, and agencies with varied perspectives. The Council is taking the initiative to better appreciate the complex watershed relationships in the Henrys Fork subbasin, to restore and enhance watershed resources where needed, and to maintain a sustainable watershed resource base for future generations. In addressing social, economic and environmental concerns in the basin, Council members respectfully cooperate and coordinate with one another and abide by federal, state and local laws and regulations (www.henrysfork.com/council2.htm). In 1994 the council was chartered by the Idaho Legislature (Hill and Mebane 1998) to:

- Cooperate in resource studies and planning that transcend jurisdictional boundaries, but still respect the mission, roles, water and other rights of each entity.
- Review and critique proposed subbasin projects and Basin Plan recommendations, suggesting priorities for their implementation by appropriate agencies.
- Identify and coordinate funding sources for research, planning and implementation and long-term monitoring programs, with financing derived from both public and private sectors.
- Serve as an educational resource to the Legislature and the general public.

The watershed council meets together six to ten times a year to discuss and evaluate projects that are being proposed in the subbasin. Projects are evaluated based on criteria under ten subject headings: watershed perspective, credibility, problem solution, water supply, project management, sustainability, social - cultural, economy, cooperation – coordination, and legality. The Council also receives reports on completed or ongoing projects in the subbasin at its annual State of the Watershed Conference.

Fish

Henrys Lake

- Between 1986 and 1996 IDFG, in cooperation with the Henry's Lake Foundation, BLM, The Nature Conservancy, and private ranchers in the area, completed a number of riparian exclosure and diversion enhancement projects. Exclosures eliminated cattle grazing from 10 km of stream bank and 10 km of lakeshore (Figure 15). Additionally, two fish screens and a fish ladder were installed on a diversion on Howard Creek, four fish screens were installed on diversions on Duck Creek, and three screens were installed on Targhee Creek diversions. In 1993 a lake aeration system and portable aeration equipment was installed and used to provide refuge for fish during winter oxygen stress (Tom Herron, Idaho Department of Environmental Quality, Idaho Falls, Personal Communication).
- In 1996 the Henrys Lake Clean Lakes Project (Montgomery Watson 1996) found that much of the phosphorus input to the Henrys Lake was attributable to natural processes in both the lake and its surrounding watershed. Sediment delivered to the lake is high in bound phosphorus. Low oxygen levels in the lake cause a release of

phosphorus from the sediments, promoting growth of algae and macrophytes in the lake. The decomposition of these materials, in turn, reduces oxygen levels in the lake. Effects of low oxygen levels in the lake are greatest during periods of drought.

- In 1993 the Yellowstone Soil Conservation District entered into a State Agricultural Water Quality Project (SAWQP) with Idaho Department of Environmental Quality to, among other things, identify major pollution sources in the Henrys Lake watershed. The report (YCD 1995) estimated that 7,015 tons of sediment (i.e., suspended solids and bedload material) were delivered to the lake per year under conditions existing in the watershed at the time. Approximately 40 percent of this sediment was produced by natural erosional processes on forest and range lands. The vegetative condition of these lands appeared good, and there was no evidence of accelerated sheet or rill erosion. The remaining 62 percent of sediment delivered to Henrys Lake was produced by accelerated erosion along tributary streambanks (26%) and associated irrigation channels (10%), along the lake shoreline (19%), and on pastureland (7%). The apparent cause of accelerated erosion along streambanks and irrigation channels was a combination of livestock activity and high-velocity spring flows acting on unstable streambanks, the cause of lake erosion was frequent severe windstorms acting on unstable shoreline, and the cause of pasture erosion was a combination of poor vegetative condition, mechanical impact from grazing, and irrigation practices (YSCD 1995).

Henrys Lake Outlet

- From 1994 – 2001 The Nature Conservancy has conducted research, monitoring, and evaluation activities that included identifying the status of wetland plant communities, in-stream habitat conditions, water temperature, streambank restoration projects, and fry survival (Gregory 2000b). Historic ditching and draining of the wetlands have had a negative impact on the hydrology of the Ranch and associated stream channel dynamics. Historic improper grazing practices have resulted in the extensive loss of willow communities, bank trampling and the associated loss of undercut banks, deep-water refugia, and vegetative thermal cover. Mismanaged flow regimes impact the health of the aquatic trophic system. The current flow regime, dictated by releases at Henrys Lake Dam, includes extremely low winter flows, high-intensity and long-duration flood events, and zero flow during conditions. The Outlet and associated wetlands have become a net source of sediment instead of a net sink as they were historically. To help reverse this trend, TNC has planted over 9,000 willows, and bioengineering has been utilized to stabilize streambanks. Off-site watering troughs, riparian fencing, and a holistic rotational grazing plan have also been have implemented. The lower portion of Jesse Creek has been restored by removing flows from the historic ditch system and returning them to the stream's natural channel. These projects have been accomplished in partnership with NRCS, Trout Unlimited, and the BLM.

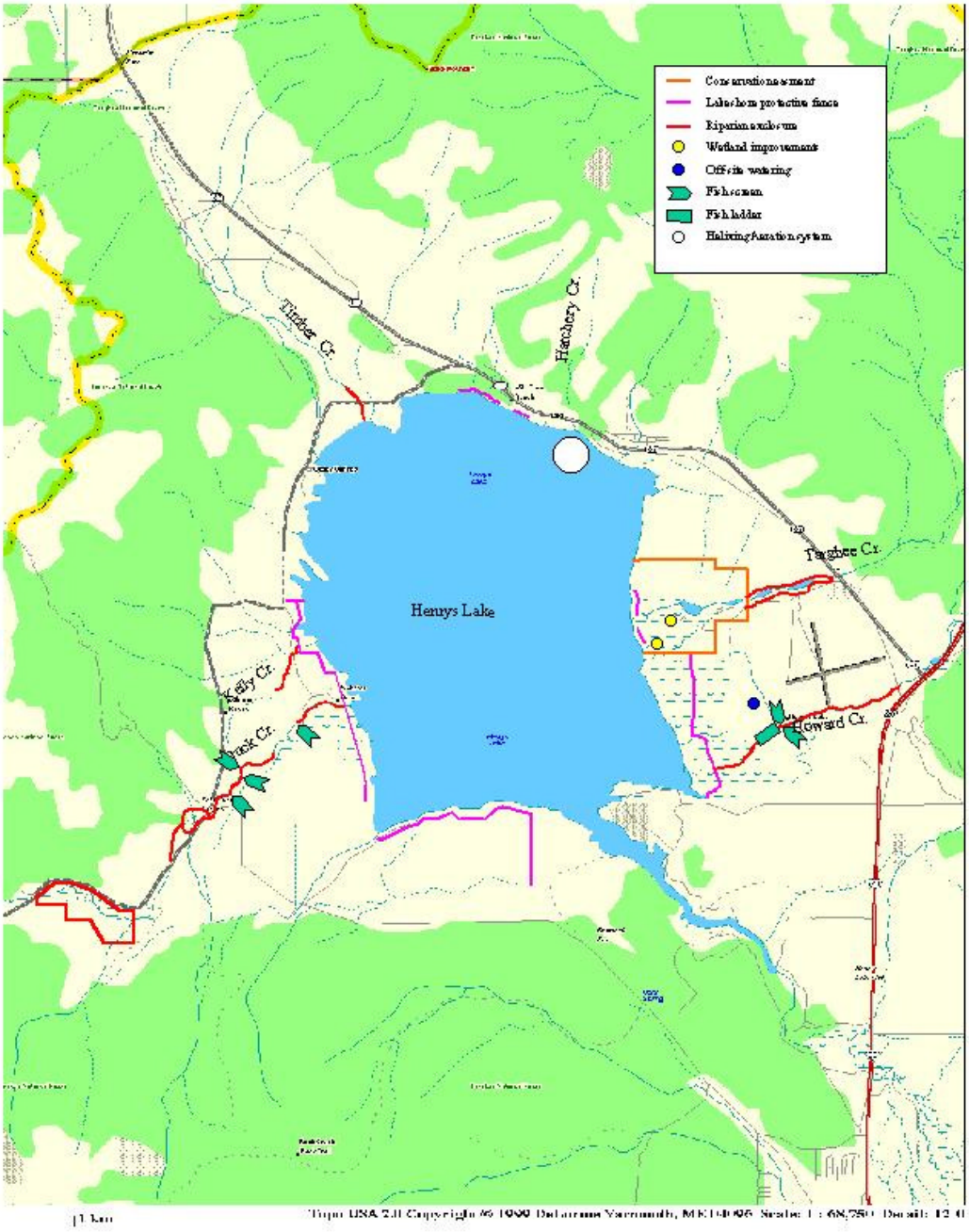

Figure 15. Henrys Lake stream and lakeshore protection projects conducted from 1986 through 1996

Henrys Fork

Big Springs to Island Park Dam (Upper River)

- Sheridan Creek has been identified by the Henrys Fork Watershed Council as its highest priority for restoration in the upper watershed. The Council formed the Sheridan Creek Restoration Committee to develop a restoration plan and to encourage private landowners, public land grazing permittees, and land management agencies to participate in its implementation. The goals and objectives of the Sheridan Creek restoration project were described in the proposal for a Clean Water Act § 319 grant awarded to the Watershed Council by the U.S. Environmental Protection Agency. These goals and objectives are to:

1. Restore stream hydrology, channel function and connectivity,
2. Improve riparian and aquatic habitat,
3. Restore resident and migratory fisheries in Sheridan Creek, and
4. Improve water quality in Island Park Reservoir.

The goals are being accomplished by implementing various programs and habitat improvement projects. Five irrigation diversion structures have been repaired and three more will be repaired in the near future (Figure 16). Improved riparian grazing management practices have been implement on 1,200 ha of range. Revegetation projects have been completed along 1,400 m of stream (2,800 m of stream bank), and 4000 m of stream will be revegetated in the future. Eight off-stream livestock watering facilities were installed. A riparian pasture that encloses 4.1 km of stream has been created on Sheridan Creek and a 400 m riparian exclosure will be completed soon. Additionally 3.6 km of Sheridan Creek will be removed from a canal, where it currently flows year-around, and returned to its natural channel (Pers. Comm. Lloyd Bradshaw, USDA Natural Resources Conservation Service, Rexburg, ID).

Island Park Dam to Mesa Falls (Caldera Section)

- From 1984 to 1989 the Henry's Fork Foundation constructed 34 km of solar powered riparian fence along the Henrys Fork on Forest Service and Harriman State Park lands between Box Canyon and Pinehaven. The fence is operated for total exclusion of cattle and is erected, monitored, maintained, and dismantled annually by the Henry's Fork Foundation.
- In 1988 the Targhee National Forest, Idaho State University, and the Henry's Fork Foundation completed a joint effort to place 30 cobble, boulder, and conifer trees complexes in a 6.4 km section of the Henrys Fork in Harriman East. The structures briefly provided habitat for a few juvenile trout and, during some seasons, for a few adult trout. However, sediment rapidly accumulated in the structures, and during low flow they were partially dewatered. Overall, the habitat they created was temporary (Griffith et al. 1990).

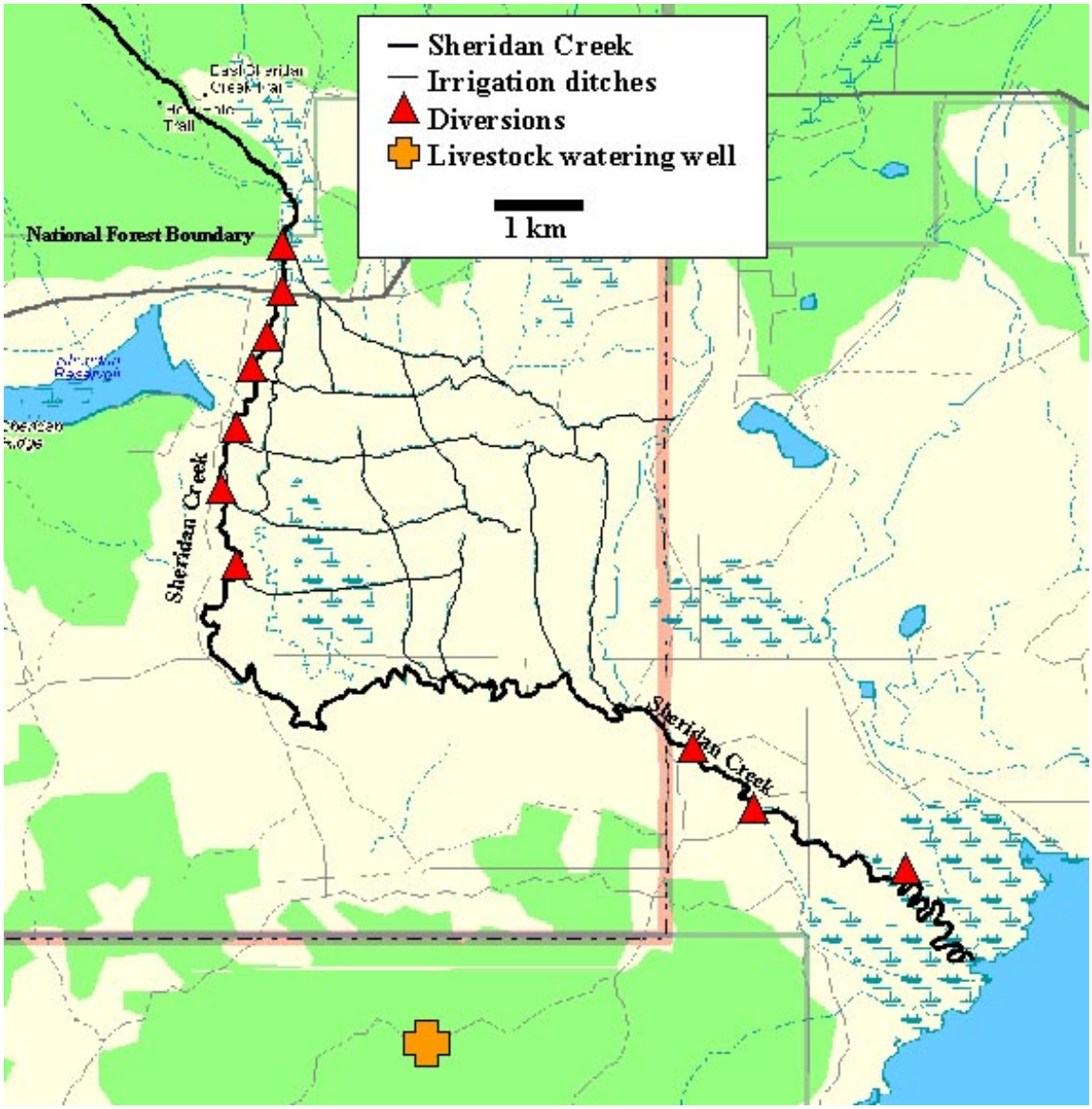

Figure 16. Location of off-channel stock-watering equipment and diversion structures repaired or scheduled for repair by the Sheridan Creek Restoration Committee

- In 1989, the Targhee National Forest placed a series of conifer complexes (approximately 50) along the banks of the Buffalo River. The objective was to provide summer and winter habitat for juvenile rainbow and brook trout. Electrofishing estimates during the winter of 1989-90 showed that combined rainbow and brook trout density in the structures (1.65 fish/m²) was 8 times higher than in control areas (0.19 fish/m²; Griffith et al. 1990). The following year, the trees had lost most of their needles and juvenile trout almost completely stopped using them for cover.
- In 1993 the Targhee National Forest put cobble and boulder clusters in the Last Chance reach of the Henry's Fork. In an effort to prevent siltation of the clusters,

they were centered 1 to 8 m from the bank where the higher water velocities would be expected to keep them sediment-free. K. Meyer (Idaho State University, unpublished data) monitored the use of the structures by juvenile rainbow trout in early, mid, and late winter (24 Oct 1993, 1 Dec 1993, and 28 March 1994, respectively). Overall, juvenile trout use of the clusters was minimal, with the total number of juvenile trout captured in all clusters decreasing through the winter from 34 to 17 to 11.

- In 1994, the Henry's Fork Foundation, Idaho State University, and Targhee National Forest implemented a demonstration project to enhance juvenile trout winter habitat along the bank in the Last Chance section of the Henrys Fork. A small water jet pump was used to flush silt from two 30-m sections, cobbles and boulders were added to two 30-m sections, and small conifers were anchored in two 30-m sections (Henry's Fork Foundation Newsletter, Fall 1994). By mid-winter, enough sediment had been transported into the test areas that most of the habitat was unusable. In early January, juvenile trout were observed in only one of the cobble/boulder treatment sections and one of the conifer treatment sections; four juvenile trout were captured by electrofishing at each of these sections. Shelf-ice prevented electrofishing in either of the areas that had been cleaned with the water pump. However, the amount of sediment that had been deposited in the other treatment sites suggested that these sites would no longer be sediment-free (Henry's Fork Foundation Newsletter, Winter 1995).
- Because of sedimentation problems with earlier attempts at providing winter habitat in the Henrys Fork at Last Chance, structures were needed that could easily be removed and cleaned during the winter. In 1997 the Henry's Fork Foundation sponsored a test project that used artificial structures made of PVC pipe to provide winter habitat for juvenile trout in the Last Chance section. Structures were made of 19.7 cm lengths of 51-mm diameter pipes glued together in arrangements ten pipes wide and three pipes high. Juvenile trout held in cages used similar structures during winter when no other habitat was provided (Gregory and Griffith 1996). Twenty of these structures were placed along each bank prior to winter. Areas with structures were electrofished monthly and compared to bare-bank (no cobble or boulders present) areas and areas that contained cobble and boulder substrate (Gregory 1998b). Although some juvenile trout did occupy the structures, there was no significant difference in density of fish in the structure areas and density of fish in the bare-bank areas; densities in cobble/boulder substrate areas were significantly higher during the early part of winter. However, juvenile trout abundance in even the cobble/boulder substrate areas decreased to 0 fish/100 m^2 by the end of April.
- In 1996, Buffalo Hydro Inc. installed a fish ladder on the Buffalo River dam (Mali 1998). The goal was to provide Henrys Fork rainbow trout of spawning age access to the Buffalo River under the hope that their offspring would spend their first winter in the warm spring-fed waters of the Buffalo River and Chick Creek. The juveniles would then migrate downstream into the Henrys Fork as age-1 fish, thereby circumventing the limiting factor of poor winter survival of age-0 fish in the Henrys Fork. Upstream migration of spawners (fish $\geq$ 406 mm in total length)

was monitored annually from 1997 to 2001 during late winter and spring with an underwater video camera at the fish ladder (Table 12) (Van Kirk and Beesley 1999, Gregory 2001b). When spring runoff begins in the Buffalo River, usually in late April, check boards are removed from the dam, and fish can migrate upstream over the dam without using the ladder. Because filming periods were dictated by funding and the timing of spring run-off, a standard period from 15 February to 4 April was selected as an index of fish movement (Table 13). Overall, counts of migrant spawners were high on the first year of ladder operation, dropped to a low in 1999 and then increased again. Monitoring continues to assess whether an adfluvial population has been established.

Table 12. Estimate of total number of rainbow trout and number of trout > 406 mm long that passed the Buffalo River fish ladder during the springs of 1997 – 2001 (Gregory 2001b)

Year	Dates Ladder Open	Check Boards Removed	Total # of Fish Estimate (95% CI))	# of Fish >16" Estimate (95% CI)
1997	1 Feb - 13 May	22 April	742 (actual count)	224 (actual count)
1998	28 Jan - 23 April	23 April	414 (268 - 560)	134 (76 - 192)
1999	1 Feb - 23 April[a]	23 April	56 (32 - 80)	26 (13 - 39)
2000	4 Feb - 15 May	15 May	1028 (722 - 1334)	87 (53 - 121)
2001	15 Feb - 29 April	Not removed	554 (354 - 788)	113 (74 - 321)

[a] Camera only ran from 1 Feb - 2 April; estimate is for that period.

Table 13. Total number of rainbow trout and number of trout > 40 cm long observed to pass the Buffalo River fish ladder between 15 February and 4 April during the springs of 1997 – 2001 (Gregory 2001b)

Year	Total # of Fish	# of Fish >16"
1997	313[a]	125[a]
1998	no data	no data
1999	93	13
2000	226	44
2001	314	62

[a] Data are from 15 February to 28 March.

A rotary screw trap was used during the summers of 1997 and 1998 to capture age-0 and age-1 trout migrating downstream in the Buffalo River (Van Kirk and Beesley 1999, Gregory 2000d). Due to the low recapture rate of marked trout

during both years, an estimate of total out-migration was not possible. However, estimates of trap efficiency based on other methods (discharge volume through the trap and capture rates of radishes released upstream of the trap) were less than 9% (Van Kirk and Beesley 1999). Most of the migrating trout exited the Buffalo River as age-0 fish instead of spending their first winter in the Buffalo River (Table 14). However, after high water receded, age-1 and older fish probably easily avoided the trap. Therefore, emigration of age-1 and older age classes was probably underestimated. In 1999, the rotary screw trap and a spillway trap were both used, and Gregory (2000d) estimated that about 2,883 (95% CI, 1,547 - 5,817) rainbow trout and 700 (95% CI, 134 - 14,078) brook trout spent their first winter in the Buffalo River and then emigrated to the Henrys Fork. All estimates were considered under-estimates, as fish not only avoided the screw trap but also avoided the spillway trap by emigrating through the power plant or holes in the dam. Buffalo Hydro Inc. is panning to screen the power plant intake and repair the holes in the dam as a condition of FERC relicensing. Following screening, outmigration of juvenile trout should again be evaluated.

Table 14. Number of fry, YOY, 1+, and 2+ fish emigrating downstream in the Buffalo River during 1997-1999 (size and age classes and 1997 and 1998 data are from Van Kirk and Beesley [1999] and are for comparison between years; the 1999 data is from Gregory 2000d)

		Size and Age Class				
Species	Operation	<=30	31-115	116-200	>200	Total
Year (Trap)	Dates	Fry	YOY	Age-I	Age-II	
Rainbow Trout						
1997 (river trap)	9 May - 9 Oct	189	504	6	0	699
1998 (river trap)	21 May - 30 Oct	NR[a]	144	34	7	185
1999 (river trap)	14 May - 30 Oct[b]	77	201	14	3	295
1999 (river trap)	14 May - 31 Jan	77	236	16	3	332
1999 (spillway trap)	21 June - 31 Jan	0	40	10	3	53
1999 (hydro trap)	8 - 26 July	1	5	9	2	17
Brook Trout						
1999 (river trap)	14 May - 31 Jan	0	59	46	0	105
1999 (spillway trap)	21 June - 31 Jan	0	146	77	3	226

[a] Not Recorded

[b] Portion of time trap was operated - for comparison with previous years

- From 1995 to 1999 Montana State University and the IDFG conducted research that demonstrated the importance of late winter flows in the Box Canyon reach of the Henrys Fork. Higher flows from January through March in this reach resulted in significantly higher over-winter survival of juvenile trout and subsequent recruitment to the fishery below Island Park Reservoir (Mitro 1999, IDFG 2001).
- In 1997 – 2000 the Henry's Fork Foundation attempted to provide another relatively large block of bank habitat by using the 2 km of the Harriman Canal (a 2 m wide by 20 - 50 cm deep irrigation ditch) as a side channel during winter (Gregory 2000e). This involved obtaining a non-consumptive water right to divert water into the canal through the winter. Additionally, headgate structures were installed 2 km downstream from the head of the canal that allowed winter closure of the lower canal and routed the water back to the river. During the first year fish use of the canal was relatively high (Table 15). However, in subsequent years, reduced macrophyte growth and removal of a beaver dam reduced the amount of habitat, and thus the number of fish using the canal. Discarded Christmas trees were placed in the canal during the winters of 1998-1999 and 1999 –2000, but they trapped enough silt that they provided little habitat by the end of the winter. The project is still operated during the winter, but studies and habitat improvement on the canal have been abandoned.

Table 15. Estimate of number of juvenile trout using the Harriman Canal at various times of the winter (Gregory 2000e)

Winter	Estimate early winter (95% CI)	Estimate late winter (95% CI)	Estimate prior to call for irrigation water (95% CI)
1997-1998	1750 (1584 - 2300)	246 (209 – 375)	107 (97 - 116)
1998-1999	33 (33 - 36)	97 (74 - 140)	45 (38 - 55)
1999-2000	177 (164 - 189)	89 (79 - 102)	6 (6 – 8)

- In 1999 – 2000 Harriman State Park, IDFG, and the Native Fish Committee of the watershed council implemented a cutthroat trout restoration project in Harriman State Park. In the autumn of 1999 and again in autumn 2000, Golden Lake and its tributaries, East, Middle, and West Thurmon creeks, were chemically treated to remove nonnative salmonids, and barriers to upstream migration from lower Thurmon Creek and the mainstem Henrys Fork were constructed (Jaeger et al. 2000). Genetically pure Yellowstone cutthroat trout were reintroduced to the lake in 2001.

Teton River

From 1987 to 2000 IDFG administered the Teton River Enhancement Program (TREP), which was funded by BOR as mitigation for the failure of Teton Dam in 1976. The majority of TREP efforts since 1987 have focused on livestock management along the river in Teton Valley, including riparian fencing, pasture rotation, and livestock non-use projects (Table 16). A number of willow plantings in riparian areas have also been accomplished

(Table 17). Additionally, tree revetments were installed in Teton Creek on the Kirk property in 1991, and instream structures were placed in Bear and Twin Forks creeks on the Wilson property in 1993. A fish ladder at the Trail Creek irrigation diversion was repaired in 1989, baffles were installed in the Moody Creek railroad culvert in 1990, and a fish ladder was constructed at the Rexburg City ditch diversion in 1994. Trail Creek fishing pond was also purchased in 1994 to provide additional harvest-oriented fishing opportunity in the Teton Valley without the threats to native cutthroat trout posed by stocking of catchable-sized rainbow trout into streams.

Table 16. Riparian fencing projects cooperatively funded and implemented by the Teton River Fisheries Enhancement Progrem (TREP), 1989 - 1995

Property Owner	Date	Fence type[a]	Stream km protected/ managed	Cost share %
Dunn	1989	NZ	2.60 Mainstem	80 TREP / 20 Landowner
Harrop	1989	NZ	0.84 Mainstem 0.81 Tribs	80 TREP / 10 HIP[c] / 10 Landowner
Hill	1989	NZ	5.40 Mainstem 0.15 Tribs	80 TREP / 20 ASCS
Drake	1990	NZ	4.16 Tribs	80 TREP / 20 ASCS
Horton/Kirk	1990	NZ	0.60 Mainstem 2.10 Tribs	100 TREP
Zohner	1990	NZ	0.84 Mainstem	100 TREP
Woolstenhulme	1991	NZ	0.80 Tribs	100 TREP
Wilson	1991	BW	1.65 Mainstem 1.10 Tribs	80 TREP / 20 Landowner
Gaudet	1992	BP	0.99 Mainstem 0.19 Tribs	80 TREP / 20 Landowner
Hokin	1993	BW/BP	0.35 Mainstem	80 TREP / 20 Landowner
Wilson	1993	BW	1.42 Tribs	80 TREP / 20 Landowner
Horton/Kirk	1993-1994	NU	---[b]	100 TREP
Wilson	1994	BW	1.30 Mainstem 0.50 Tribs	80 TREP / 20 Landowner
Lerwill	1994	WM/BW	0.50 S. Fork Teton	80 TREP / 20 Landowner
IDFG Fox Creek E	1994	BW	0.80 Mainstem	Material TREP / Labor HIP[c]
Moulton	1994	BW	2.90 Tribs	80 TREP / 20 Landowner
Mithune/Kirk	1995	BW	0.80 Tribs	80 TREP / 20 Landowner
TOTAL			30.80 (19.25 mi)	

[a] - BW = barbed wire; NZ = New Zealand electric; NU = livestock non-use; BP = buck and pole; WM = wire mesh

[b] - Livestock non-use lease.

[c] - HIP = IDFG Habitat Improvement Program.

Table 17. Riparian planting projects funded and implemented by the Teton River Fisheries Enhancement Program, 1989-95

Property	Date	Stream km planted	Riparian species	Volunteers
Hill	1990	0.8	Willows	Boy Scouts
Horton	1900	0.4	Willows	
Hill	1991	1.2	Willows	Boy Scouts
Wilson	1991	1.4	Willows	Boy Scouts, GreenwingsElementary School
Kirk/Horton	1992	1.4	Willows	AEC Sportsmen
Dunn	1993	0.06	Willows	Boy Scouts, Bressler Outfitters, SCS Personnel
Hokin	1993	0.75	Willows	Boy Scouts, Bressler Outfitters, SCS Personnel
Kirk	1994	0.1	Willows	TREP Personnel
Kirk	1995	1.0	Willows	TVLT Personnel
Mithune	1995	0.5	Willows	TVLT Personnel
Total		8.73 (5.5 mi.)		

Wildlife

IDFG has worked on a number of non-BPA projects to conserve wildlife and habitat in the Henrys Fork Subbasin. Many of these projects are identified below.

- *Habitat Improvement Program (HIP)*. The HIP is a program administered by IDFG to create and improve habitat for upland game and waterfowl on public and private land. Initiated in 1987, the program is designed primarily to help private landowners in their desire to use their property to the benefit of upland game birds and waterfowl. Funded by fees collected from upland bird and state waterfowl hunting validations, the program provides landowners with financial assistance for waterfowl nesting structures, wildlife ponds, irrigation systems, fence materials, food plots, and herbaceous, shrub and tree plantings to provide food, and nesting, brood-rearing and winter cover. Many hectares of land that contain habitat for upland birds and waterfowl have been improved through the HIP program. *Critical Habitat Mapping*. The IDFG is working with the University of Idaho Landscape Laboratory to map critical wildlife habitat and vertebrate species richness. This information can be used to identify which habitats are most critical to protect, where conservation of soil, water and open space resources is most critical, and where and how restoration efforts might be most effective.
- *Conservation Data Center*. The CDC maintains information on the occurrence of elements of biological diversity (plant and animal species and plant communities), conservation sites and managed areas. The CDC has conducted inventory and monitoring projects within the subbasin related to rare and endemic plant species, the distribution and condition of old growth forest stands, the selection and establishment of ecological reference areas, vegetation and wildlife habitat mapping, and the conservation of high priority wetland and riparian sites. These studies produce recommendations for site-specific conservation action, assessments of conservation status, rankings of statewide or global rarity, and classifications and descriptions of plant communities.

Present Subbasin Management

Existing Management

Various federal, state, and local government agencies along, with tribes, sportsman's clubs, irrigation districts, and nonprofit organizations are involved in the management of natural resources in the Henrys Fork subbasin. The success of these diverse groups at working together is apparent in the work of the Henry's Fork Watershed Council (see Existing and Past Efforts, Efforts funded outside the Columbia Basin Fish and Wildlife Program).

Federal Government

USDA Forest Service (USFS)

The Forest Service manages its land based on goals for desired future conditions. These conditions are outlined in the Revised Forest Plan for the Targhee National Forest (TARGHEE NATIONAL FOREST 1997).

Desired future condition for ecosystem processes and patterns. A mosaic of age classes and types of vegetation are sustained through time and exist across the landscape. Natural disturbances such as insects, disease, and fires continue their natural roles in ecosystem. The Forest functions as an integral part of the Greater Yellowstone Ecosystem as well as adjacent systems sustaining habitat and conditions necessary for free movement of wildlife.

Desired future condition for biological and physical resources. Riparian areas (aquatic influence zones) are healthy and productive. Aquatic systems are allowed to function naturally, and flows are delivered for downstream consumptive uses. Riparian area integrity contributes to productive fisheries and excellent water quality. Native plant and animal species are favored over undesirable nonnative species, and sustainable populations of all native and desirable species thrive. Habitat conditions contribute toward the recovery of threatened, endangered and sensitive species.

Desired future condition for forest use and occupation. Growing and diverse recreational, cultural, visual, historical, prehistorical, interpretive and spiritual needs are accommodated based on the capability of the ecosystem to sustain these uses. Recreation use is managed to minimize conflicts between incompatible uses and provide high levels of satisfaction. Year-round human access is managed to provide both motorized and non-motorized recreation opportunities. A system of trails and support facilities exist that is are compatible with resource capabilities. Roadless characteristics are preserved in proposed and existing wilderness areas.

Desired future condition for production of commodity resources. Commodities, including timber, firewood, minerals, livestock forage, and outfitting and guide services, are produced at sustainable levels that maintain the capability of the land to produce a constant output of a variety of goods and services for present and future generations. Timber harvest, prescribed fires and livestock grazing are used as tools used to achieve desired ecological vegetation conditions. Forest products are provided to sustain social and economic values and needs of the local communities within limits that allow maintenance of ecosystem health.

USDI Bureau of Land Management (BLM)

The BLM owns lands in the Henrys Fork subbasin primarily in lower elevation areas along the Henrys Fork and Sand Creek. Management directives for these areas are contained in the Snake River activity/operations plan (BLM and USFS 1991). All of the land along the Henrys Fork is classified as either SSM Class IIC or SSM Class IIIC. The SSM Class IIC designation is for areas where wildlife values are very low or non-existent due to high levels of human activity and applies to areas surrounding bridges across the Henrys Fork. The SSM Class IIIC designation applies to areas that are more isolated from human influences and applies to the remainder of BLM land along the Henrys Fork.

USDI Fish and Wildlife Service (USFWS)

The mission of the USFWS is, working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. This mission is carried out through a variety of activities, programs, and facilities, including law enforcement. The law enforcement activities of the USFWS focus on potentially devastating threats to wildlife resources including illegal trade, unlawful commercial exploitation, habitat destruction, and environmental contamination.

The Henrys Fork Subbasin 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. The USFWS compiles the information base to assess how each of these three hatchery facilities are meeting established mitigation goals. They also help design and implement studies to evaluate hatchery effectiveness and various management scenarios. The office also works with IDFG, Washington Department of Fish and Wildlife, Idaho Power Company, National Marine Fisheries Service, U.S. Geological Service-Biological Resource Division, and 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 in the southern Panhandle of Idaho between the 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 USFWS Ecological Services Office operates under a number of authorities and through a number of programs, including:

- Endangered species. The USFWS and the National Marine Fisheries Service share responsibility for administration of the Endangered Species Act. The ESA directs these agencies to identify species whose status warrants listing as endangered or threatened, develop and implement recovery programs for listed species, work with

state resource agencies and federal agencies to protect and recover listed species, and implement a program to permit certain activities with listed species.

- Migratory birds. The USFWS administers the Migratory Bird Treaty Act.
- Environmental contaminants. Contaminant 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 is not 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. This program offers technical and financial assistance to private landowners wishing to voluntarily restore wetlands and other fish and wildlife habitats on their land. The USFWS also provides biological technical assistance to U.S. Department of Agriculture agencies implementing key conservation programs of the Farm Bill.
- Federal projects. The USFWS evaluates the impacts of water resource development projects on fish and wildlife, makes recommendations to mitigate (avoid, reduce and compensate for) these impacts and enhance fish and wildlife, and provides technical assistance to private individuals, organizations and businesses regarding project impacts.

The USFWS is a primary participant in the North American Bird Conservation Initiative, which is an integrated bird conservation plan for Canada, Mexico, and the United States. This plan is coordinated by a coalition of government agencies, non-governmental organizations and other bird interest groups and integrates the following conservation plans.

North American Waterbird Conservation Plan. This 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, Audubon's Important Bird Areas Program, the U.S. Shorebird Plan, and the Canadian Shorebird Plan. Regional plans will contain information critical to waterbird conservation at smaller geographic scales. The Henrys Fork subbasin lies in the Intermountain West/Southwest Desert region of this planning effort.

U.S. Shorebird Conservation Plan. This 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 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 partners 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. This 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 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 been successfully organizing and building on the concept that broad partnerships can generate the financial resources necessary to restore thousands of hectares of wetland habitat for waterfowl, shorebirds, wading birds and songbirds.

Partners In Flight. The goal of Partners in Flight conservation planning is to ensure long-term maintenance of healthy populations of native land birds.

Columbia Plateau Bird Conservation Plan. Issues addressed by this plan include conversion of shrub/steppe areas and wetlands to agriculture, grazing and urban development, nonnative plant invasions, and changes in plant communities associated with fire suppression. The plan also addresses restoration of a dynamic sagebrush ecosystem, with objectives including no further net loss of healthy sagebrush habitat and restoration of fragmented and degraded areas. Protection of existing wetlands, riparian areas and hydrologic regimes are also addressed.

The Idaho Bird Conservation Plan (Idaho Partners in Flight 2000). This plan covers in detail four habitats considered the highest priority habitats for birds in Idaho: riparian areas, non-riverine wetlands, sagebrush shrublands, and dry Ponderosa pine/Douglas fir/grand fir forests. Objectives for management of each these habitats in Idaho include:

- Riparian habitat. 1) Maintain existing distribution and extent of each riparian system. 2) By 2025, restore at least 10% of the historical extent of each riparian system within each ecoregion subsection to conditions that would support productive populations of designated focal species.
- Non-riverine wetlands. Obtain a net increase in the number of hectares of wetlands in Idaho, focusing on the same types and amounts that historically occurred here.
- Sagebrush shrublands. 1) By end of 2009 breeding season, reverse declining population trends in species associated with sagebrush habitats in Idaho while maintaining current populations of other associated species. 2) Manage for Sage Grouse numbers as outlined in each Sage Grouse Management Area in the Sage Grouse Management Plan by 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 habitat conditions required for white-headed woodpeckers.

The plan also identifies priority bird species and their habitats (Table 18).

Table 18. Priority birds and habitat types identified by the Idaho Bird Conservation Plan (Idaho Partners in Flight 2000)

Priority Birds	Scientific Name	Priority Habitat Type
Swainson's Hawk	*Buteo swainsoni*	Shrub-steppe
Greater Sage-Grouse	*Centrocercus urophasianus*	Shrub-steppe
California Quail	*Lophortyx californicus*	Shrub-steppe
Long-billed Curlew	*Numenius americanus*	Shrub-steppe
Sage Sparrow	*Amphispiza billi*	Shrub-steppe
Brewer's Sparrow	*Spizella breweri*	Shrub-steppe
Gray Flycatcher	*Empidonax wrightii*	Shrub-steppe
Sage Thrasher	*Oreoscoptes montanus*	Shrub-steppe
Virginia's Warbler	*Vermivora virginiae*	Shrub-steppe
Black-chinned Hummingbird	*Archilochus alexandri*	Shrub-steppe
Prairie Falcon	*Falco mexicanus*	Shrub-steppe
Western Grebe	*Aechmophorus occidentalis*	Wetlands/grasslands
Trumpeter Swan	*Olor buccinator*	Wetlands/grasslands
Sandhill Crane	*Grus canadensis*	Wetlands/grasslands
Franklin's Gull	*Larus pipixcan*	Wetlands/grasslands
Tri-colored Blackbird	*Agelaius tricolor*	Wetlands/grasslands
Mountain Quail	*Oreortyx pictus*	Coniferous Forest
Flammulated Owl	*Otus flammeolus*	Coniferous Forest
Black Swift	*Cypseloides niger*	Coniferous Forest
Calliope Hummingbird	*Stellula calliope*	Coniferous Forest
Lewis's Woodpecker	*Melanerpes*	Coniferous Forest
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Coniferous Forest
White-headed Woodpecker	*Picoides albolarvatus*	Coniferous Forest
Black-backed Woodpecker	*Picoides arcticus*	Coniferous Forest
Hermit Warbler	*Dendroica occidentalis*	Coniferous Forest

Implementation Plan For Trumpeter Swans. The USFWS and the Pacific Flyway Commission are in the early stages of writing an Implementation Plan to address key problems in Trumpeter Swan management. This plan will prioritize needed management actions, habitat improvements, and research/monitoring needs. This document should be completed by July 2002 and is intended as a key reference for needed trumpeter work. Additionally, IDFG is in the process of writing a trumpeter swan management plan that will largely focus on the Henrys Fork subbasin.

Natural Resource Conservation Service (NRCS)

The NRCS is an agency of the U.S. Department of Agriculture with professionally staffed field offices in Madison, Fremont and Teton counties. The agency's major purpose is to provide consistent technical assistance to private land users, tribes, communities, government agencies, and conservation districts. The 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 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).

Tribes

Shoshone-Bannock

The Shoshone-Bannock Tribes will pursue, promote, and where necessary, initiate efforts to restore the Snake River system and affected unoccupied lands to a natural condition. This includes the restoration of component resources to conditions that most closely represent the ecological features associated with a natural riverine ecosystem. In addition, the Tribes will work to ensure the protection, preservation, and where appropriate, the enhancement of, rights reserved by the Tribes under the Fort Bridger Treaty of 1868 and any inherent aboriginal rights.

State

Idaho Fish and Game (IDFG)

In the Henrys Fork subbasin, IDFG manages fish and wildlife populations, two Wildlife Management Areas, and the Horray Ranch, which was recently purchased by the Nature Conservancy (See protected areas). The mission of IDFG is to "…preserve, protect, and … perpetuate … wildlife and provide … continued supplies of such wildlife for hunting, fishing, and trapping." Management directives for IDFG are contained in the management plans listed below.

- IDFG. 2001. Fisheries Management Plan 2001 – 2006.
- IDFG. 1990. A Vision for the Future: IDFG Policy Plan 1990 – 2005.
- IDFG. 1988. Wildlife Depredation Plan 1988 – 1992.
- IDFG. 1990. Furbearer Management Plan 1991 – 1995.
- IDFG. 1990. Waterfowl Management Plan 1991 – 1995.
- IDFG. 1990. Upland Game Management Plan 1991 – 1995.
- IDFG. 1997. Idaho Sage Grouse Management Plan.
- IDFG. 1990. Bighorn Sheep Management Plan 1991 – 1995.
- IDFG. 1990. Mountain Goat Management Plan 1991 – 1995.
- IDFG. 1999. Elk Management Plan.
- IDFG. 1999. Mule Deer Management Plan.
- IDFG. 1999. White-Tailed Deer Management Plan.
- IDFG. 1991. Mountain Lion Management Plan 1991 – 1995.
- IDFG. 1991. Nongame and Endangered Wildlife Plan 1991 – 1995.
- IDFG. 1998. Black Bear Management Plan.
- IDFG. 1990. Moose Management Plan 1991 – 1995.
- IDFG. 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, IDFG, 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). IDFG, USFWS, USFS.
- Cassirer, E.F., J.D. Reichel, R.L. Wallen, and E.C. Atkinson. 1996. Harlequin Duck (*Histrionicus histrionicus*) USFS/BLM Habitat Conservation Assessment and Conservation Strategy for the U.S. Rocky Mountains.
- IDFG, 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) and Conservation Strategies (CS).
- 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, IDFG, Boise, Idaho.
- Mancuso, M. 1995. Conservation strategy for *Allium aaseae* Ownbey (Aase's Onion). IDFG, 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, IDFG, Boise, Idaho.

Idaho Department of Parks and Recreation (IDPR)

The Department of Parks and Recreation manages 2,000 ha in the Henrys Fork subbasin, including Harriman State Park (1,752 ha) and Henrys Lake State Park (236 ha). These parks are managed as areas of scenic beauty, recreational utility, and historic, archaeological, or scientific interest. Additionally, part of IDPR's mission is to promote the health, happiness and recreational opportunities of park visitors.

Idaho Soil Conservation Commission (SCC)

The Idaho Soil Conservation Commission was created in 1939 by state legislation developed to deal with the soil erosion crisis of the Dust Bowl. Today, the SCC's purpose is to provide support and service to Idaho's 51 Soil or Soil and Water Conservation Districts (SCDs/SWCDs) for the wise use and enhancement of soil, water and related resources. The SCC consists of five members appointed to five-year terms by Idaho's governor. The SCC has a 25-member staff responsible for water quality program delivery and administrative programs. Most staff members work through one of the SWCDs, providing technical assistance directly to Idaho landowners and assisting with projects. The SCC manages the Water Quality Program for Agriculture (WQPA, formerly State Agriculture Water Quality Program), Resource Conservation and Rangeland Development

Loan and Grant Program (RCRDP), Agricultural Pollution Abatement Plan (APAP) and Grazing Lands Conservation Initiative (GLCI). The SCC is the designated agency for the Natural Resources Conservation Income Tax Credit (63-3024B Idaho Code) and for Idaho Water Quality Law for grazing activities and agricultural activities (39-3602 Idaho Code) (Idaho Soil Conservation Commission 2000).

Idaho Department of Water Resources (IDWR)

The IDWR is overseen by the Idaho Water Resource Board (IWRB) and is charged with administering water resources in accordance with state water law. One of the major directives governing water resource management in the Henrys Fork subbasin is the Henrys Fork Basin component of the Idaho State Water Plan, which was issued by the IWRB in 1992. The Henrys Fork Basin Plan designated approximately 314 km of streams in the Henrys Fork subbasin as state "recreational" or "natural" waters (Figure 17). A state recreational or natural waterway is defined by Idaho Code § 42-1731 as one that possesses outstanding fish and wildlife, recreation, geologic or aesthetic values. A recreational waterway may include human development in the stream or riparian area. Natural waterways must be free of substantial human development in the waterway, and its riparian area must be largely undeveloped. The following activities are prohibited within the stream channel or below the high water mark in designated natural waterways: construction or expansion of dams or impoundments, construction of hydropower projects, construction of water diversion works, dredge or placer mining, alterations of the stream bed, and mineral or sand and gravel extraction within the stream bed (IWRB 1992).

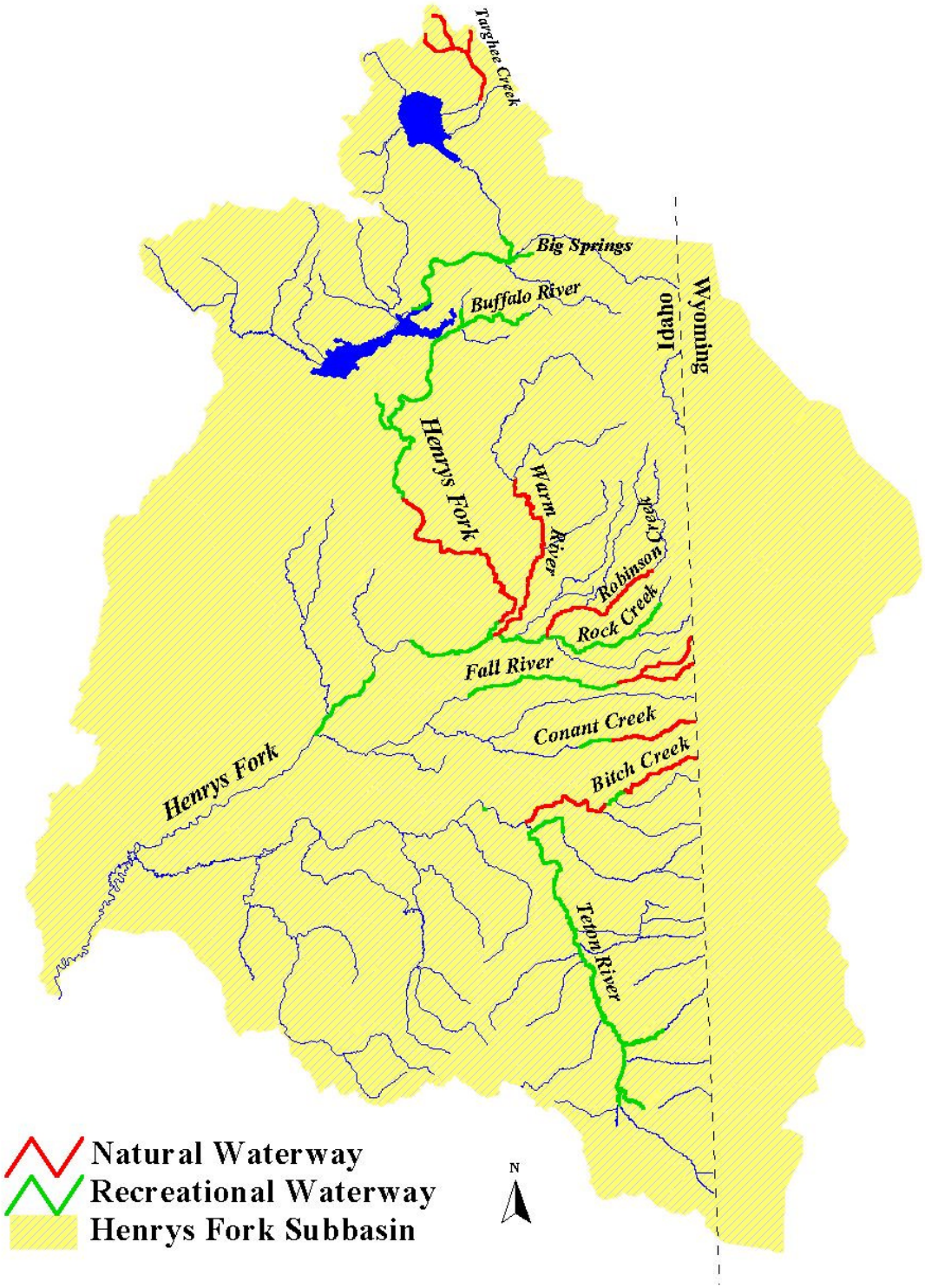

Figure 17. Rivers and streams protected in 1992 by the Idaho Water Resource Board through designation as Natural or Recreational Waterways (Hill and Mebane 1998)

Local Government

Soil and Soil and Water Conservation Districts (SCDs/SWCDs)

Soil and water conservation districts are non-regulatory subdivisions of Idaho State government authorized by Idaho Code Title 22, Chapter 36. A board of five or seven volunteer supervisors who are local residents govern each SCD. All supervisors are elected and must be landowners (including urban property owners located within district boundaries) or farm operators in the district to which they are elected. The SCDs develop and implement programs to protect and conserve natural resources primarily on privately owned lands. The SCDs organize technical advisory groups for projects and call upon local, state, tribal and federal agency specialists, industry representatives, and interested individuals for expertise. The SCDs in the Henrys Fork subbasin include Madison SWCD, Yellowstone SCD and Teton SCD. Districts receive limited funds from local (county) and state (general fund) government, and may receive other funds for local project work through the Idaho SCC's Water Quality Program for Agriculture program and other funding sources. Working cooperatively with other entities, SCDs provide technical assistance to agriculturists and other private landowners based on long-standing agreements with the NRCS, Idaho SCC and other federal and state agencies. Much of the Idaho portion of the Henrys Fork subbasin is admisistered by the Yellowstone Soil and Water Conservation District (Figure 18).

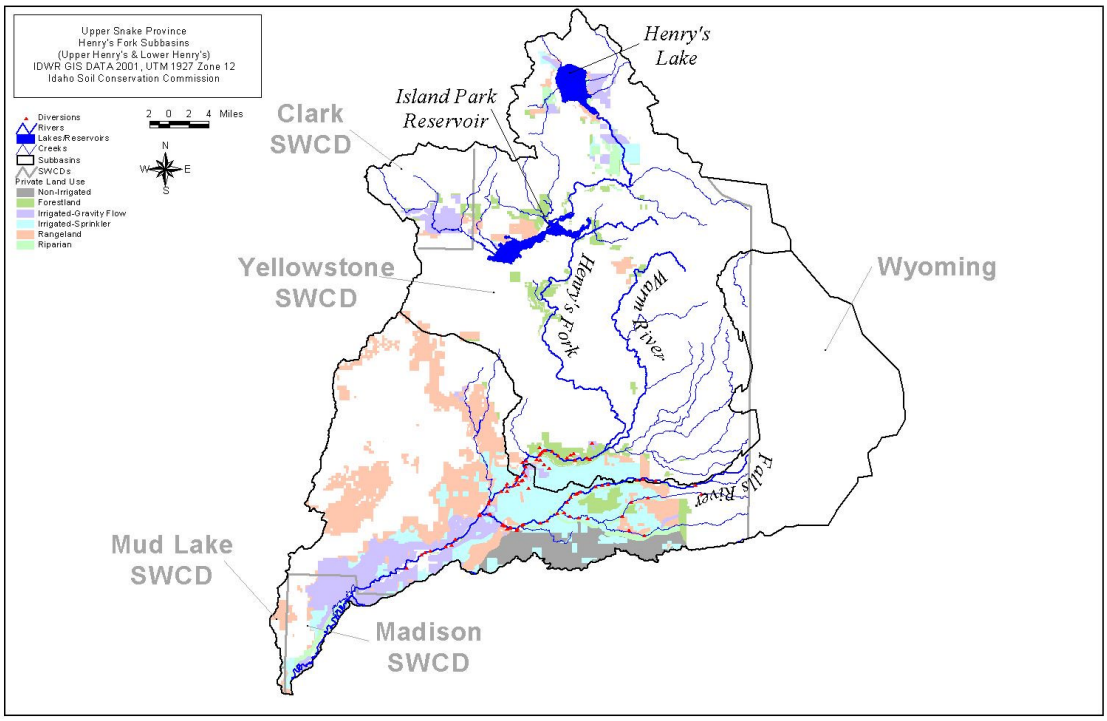

Figure 18. Land use and soil and water conservation district boundaries

Madison Soil and Water Conservation District

Madison SWCD programs focus on improved irrigation water management, control of agricultural nonpoint source pollution, and protection of wetlands and riparian areas.

The SWCD is involved with projects in the Teton River and the High Desert Wind Erosion areas. There are four major water bodies in the Madison SWCD, North (Henrys) and South Forks of the Snake River, the Teton River, and the Texas Slough, all of which provide habitat for fish and wildlife. The Madison SWCD encourages private landowners to protect habitat for fish and wildlife on agriculture and grazing lands. (Madison Soil and Water Conservation District 2001).

Yellowstone Soil Conservation District

The Yellowstone SCD's goal is to be a leader and encourage private landowners to exercise good stewardship of their natural resources while improving the economic vitality of Fremont County. Creating partnerships with conservation agencies and organizations to address natural resource, fish and wildlife issues are also primary goals of the Yellowstone Soil Conservation District. The Yellowstone SCD's goals are met through project coordination, technical assistance and educational outreach. Currently the District has four active Water Quality Projects for Agriculture, Squirrel Creek, Conant Creek, Bitch Creek North and Henry's Lake, which provide cost-share for the implementation of Best Management Practices (BMPs). Additionally, the Yellowstone SCD is sponsoring the Ashton Groundwater Protection Project to investigate high concentration of nitrates in drinking water (Yellowstone Soil Conservation District 2001).

Teton Soil Conservation District

The Teton SCD's current objectives are to assist landowners in conserving soil and water resources, improve water quality, and assist farmers with provisions of the federal Farm Bill. Recent planning and implementation efforts include Teton River and Bitch Creek South Water Quality Program for Agriculture and Teton Riparian Demonstration Project. Each project is designed to improve water quality, enhance fish and wildlife habitat and reduce non-point source pollution. Project goals are reached through cost-share funds to assist contractually obligated landowners in implementation of BMPs that will reduce sediment delivery to water bodies. The Teton SCD collaborates with NRCS, Idaho SCC, and Henry's Fork Watershed Council on natural resource issues (Teton Soil Conservation District).

County

Teton and Madison Counties

Goals for future growth and development in Idaho portion of the Henrys Fork subbasin are described in the Madison Comprehensive Plan, December 16, 1996, the Teton County, Idaho, Comprehensive Plan, Amended March 11, 1996, and the Fremont County Comprehensive Plan, 1997 Edition and Fremont County Development Code, 1997 Edition.

Existing Goals, Objectives, and Strategies

USDA Natural Resources Conservation Service (NRCS)

Goals, Objectives, and strategies are from the Natural Resources Conservation Service Strategic Plan 2000 – 2005.

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

Objective 1.1. Maintain, restore, and enhance cropland productivity.

NRCS will work with the conservation partnership to:

Strategy 1.1.1. Provide coordinated assistance in watersheds with pervasive soil health problems.

Strategy 1.1.2. Promote conservation planning and management approaches that improve multiple soil factors by focusing efforts on the most serious soil health problems.

Strategy 1.1.3. Help USDA program participants remain in compliance with requirements to protect highly erodible cropland and to take additional steps to improve the land.

Strategy 1.1.4. Help operators examine alternatives to crop production, such as enterprise diversification or conversion to hay or grazing.

Strategy 1.1.5. 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 1.1.6. Ensure that small, limited-resource and minority farmers and ranchers receive appropriate conservation planning and management assistance.

Strategy 1.1.7. Improve technical capacity and develop and implement a method to determine soil health and monitor changes.

Strategy 1.1.8. 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.

NRCS will work with the conservation partnership to:

Strategy 1.2.1. 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 1.2.2. Provide coordinated assistance in watersheds with substantial irrigated acreage.

Strategy 1.2.3. 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 1.2.4. Provide technical assistance to facilitate conversion to alternative crops or to dryland farming systems for those operators transitioning from irrigated agriculture.

Strategy 1.2.5. 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 1.2.6. 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.
NRCS will work with the conservation partnership to:

Strategy 1.3.1. 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 1.3.2. Promote grazing practices that provide multiple benefits for operators, including productivity, wildlife, and water quality.

Strategy 1.3.3. Promote cooperative, watershed or regional approaches to grazing lands conservation and reclamation.

Strategy 1.3.4. Strengthen inventory and assessment capabilities throughout NRCS to improve the ability to determine the status and condition of grazing land resources.

Strategy 1.3.5. Increase efforts to develop approaches for suppression of noxious and invasive species.

Strategy 1.3.6. Strengthen assistance to small, limited-resource and minority owned farms and ranches.

Strategy 1.3.7. 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.
NRCS will work with the conservation partnership to:

Strategy 1.4.1. Promote conservation planning and management approaches that prevent forestland damage and help ensure that resources can remain healthy and productive.

Strategy 1.4.2. 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 1.4.3. Promote cooperative, watershed, or regional approaches to forestland conservation.

Strategy 1.4.4. Strengthen inventory and assessment capabilities to improve the ability to determine the status and condition of forestland.

Strategy 1.4.5. Strengthen assistance to small, limited-resource and minority owners of private, non-industrial forestland.

Strategy 1.4.6. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about forestland productivity and water quality benefits of conservation practices.

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

Objective 2.1. Protect farmland from conversion to non-agricultural uses.
NRCS will work with the conservation partnership to:

Strategy 2.1.1. Provide technical assistance to units of government to assist them with development of policies and programs to protect farmland.

Strategy 2.1.2. 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 2.1.3. Provide training and support to relevant agencies to undertake site assessments in accordance with the Farmland Protection Policy Act requirements.

Strategy 2.1.4. Strengthen local partnerships and other mechanisms to increase the availability of technical assistance in rapidly developing areas.

Strategy 2.1.5. 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 2.1.6. 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 2.1.7. 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 2.1.8. 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.
NRCS will work with the conservation partnership to:

Strategy 2.2.1 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.

NRCS will work with the conservation partnership to:

Strategy 2.3.1. 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.

NRCS will work with the conservation partnership to:

Strategy 2.4.1. 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 2.4.2. Provide coordinated assistance in watersheds with AFO concentrations.

Strategy 2.4.3. Invest in development of technology and practice standards to support improved waste management.

Strategy 2.4.4. Foster greater private sector capacity to develop and implement animal waste management and riparian technology.

Strategy 2.4.5. Develop innovative partnerships to advance alternatives for animal waste management.

Strategy 2.4.6. Work with partners to encourage integrator-supported cooperative efforts for waste management and utilization where production is concentrated

Strategy 2.4.7. 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 2.4.8. Work with operators to increase adoption of waste management practices that address water and air quality concerns.

Strategy 2.4.9. Strengthen assistance to small, limited-resource and minority owned farms and ranches and develop and provide low cost alternatives that meet their needs.

Strategy 2.4.10. 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.

NRCS will work with the conservation partnership, state agencies, other federal agencies and private conservation organizations to:

Strategy 2.5.1. Identify priority wetlands that could benefit from application of conservation practices in the surrounding landscape to improve wetland 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 partnerships 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.

NRCS will work with the conservation partnership to:

Strategy 3.2.1. Promote watershed level planning to address water supply and drought mitigation, including land treatment as well as structural development or enhancement.

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

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

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

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

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

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

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

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

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

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

Objective 4.1. Deliver services fairly and equitably.
NRCS will work with the conservation partnership to:

Strategy 4.1.1. 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.
NRCS will work with the conservation partnership to:

Strategy 4.2.1. 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 changes.

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 and

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.
NRCS will work with the conservation partnership to:

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

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

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

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

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

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

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

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

Strategy 4.3.9. Use appropriate communications strategies to publicize new science and technology on natural resource conservation and ensure that new

information is widely disseminated within the agency and among the partnership.

Idaho Department of Parks and Recreation

Goal 1. Maintain and co-exist with a functional ecosystem.

Objective 1.1. Maintain and enhance fish and wildlife habitat and populations including the re-establishment of native populations where practicable.

Strategy 1.1.1. Maintain riparian fences for protection and rehabilitation of the river riparian area on Harriman and Harriman East.
Strategy 1.1.2. Continue weed inventory and mapping and control program.
Strategy 1.1.3. Continue experimentation with beaver management to coexist in appropriate areas.
Strategy 1.1.4. Plant seedling trees in designated areas of poor regeneration.
Strategy 1.1.5. Maintain a constant involvement in the winter swan management and relocation program representing the park and agency where required.
Strategy 1.1.6. Maintain a constant involvement in the fisheries and wildlife issues involving the park representing the park and agency where required.

Idaho Soil Conservation Commission

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. Sponsor and support NWPPC coordination work in the Upper Salmon Basin Watershed Project and the Clearwater Focus Program
Strategy 3. Facilitate Idaho Association of Soil Conservation District technical staff in priority areas
Strategy 4. Coordinate responsibilities with Idaho Department of Agriculture

Madison Soil and Water Conservation District

Goal 1. Reduce nonpoint source pollution on irrigated and dry cropland to tolerable limits
Goal 2. Improve irrigation water management
Goal 3. Continue efforts to improve fish and wildlife habitat
Goal 4. Identify and develop management systems to address animal waste as related to surface and ground water quality
Goal 5. 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 IDFG, 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

Teton Soil Conservation District

Goal 1. Meet the requirements of Idaho Water Quality Law and Federal Clean Water Act
Goal 2. Improve fish and wildlife habitat in Teton County
Goal 3. Coordinate technical and financial resources for the implementation of BMPs on private lands.
Goal 4. Lead the voluntary implementation of Best Management Practices on the Teton River and Bitch Creek South Water Quality Program for Agriculture Projects

Objective 1. Continue to support the development of the Teton Subbasin Assessment and TMDL process
Objective 2. Continue to administer projects to improve water quality concentrating on animal waste, sedimentation and streambank erosion.
Objective 3. Improve wetland and riparian areas
Objective 4. Assist and inform landowners of fish and wildlife issues

Strategy 1. Continue to participate and provide administrative assistance in developing the Upper Teton Subbasin TMDL implementation plan
Strategy 2. Continue to provide technical and financial assistance to landowners with critical properties in the Teton River and Bitch Creek South Water Quality Projects.
Strategy 3. Seek improvement of irrigation systems by providing technical assistance and seeking funds

Strategy 4. Promote Farm Bill Programs to enhance fish and wildlife habitat

Yellowstone Sol and Water Conservation District

Goal 1. Encourage and promote BMPs to reduce soil erosion and enhance water quality on prioritized agriculture and grazing lands
Goal 2. Improve water quality of 303 (d) listed water bodies
Goal 3. Accelerate completion of water quality projects on Upper Conant Creek, Squirrel Creek and Bitch Creek North
Goal 4. Lead Ashton Ground Water Project
Goal 5. Conserve irrigation water to minimize agricultural impacts to aquatic resources
Goal 6. Lead voluntary implementation of conservation programs for private landowners

Objective 1. Coordinate with NRCS and other state and federal agencies engaged in conservation
Objective 2. Provide environmental awareness through education outreach
Objective 3. Provide technical and administrative assistance for TMDLs
Objective 4. Support local efforts to protect and enhance fish and wildlife species in the Yellowstone ecosystem
Objective 5. Support local landowners in implementation of BMPs
Strategy 1. Continue to implement BMPs in water quality project areas
Strategy 2. Continue efforts to protect Henry's Lake shoreline
Strategy 3. Continue to improve the efficiency of irrigation delivery systems
Strategy 4. Seek and implement programs for enhancement of fish and wildlife programs

Idaho Department of Environmental Quality

Goal 1. Improve the quality of surface waters that do not support the beneficial uses of cold water aquatic life, salmonid spawning, or contact recreation.

Objective 1.1. Finalize the assessment document for the Teton hydrologic unit and develop load allocations for pollutants impairing the water quality of streams in the Teton River drainage.
Strategy 1.1.1. Complete a streambank erosion inventory for the North Fork of the Teton River.
Strategy 1.1.2. Monitor nutrient concentrations and other water quality parameters in Moody Creek, the North Fork of the Teton River, and the Teton River from the headwaters to Highway 33 to determine whether water quality standards are exceeded.
Strategy 1.1.3. Collect additional beneficial use reconnaissance data and reassess the support status of beneficial uses in segments of 303(d)-listed streams that do not become dry because of natural hydrologic conditions or legal water diversions.

Objective 1.2. Prepare an implementation plan for achieving the load allocations specified in the Teton River drainage TMDL within 18 months of approval of the TMDL by the US EPA.

Strategy 1.2.1. Coordinate development of the implementation plan with designated responsible agencies and interested parties by continued participation in the Henry's Fork Watershed Council Water Quality Subcommittee.

Objective 1.3. Assist private landowners, designated responsible agencies, and other interested parties in executing the water quality improvement practices and projects described in the TMDL implementation plan for the Teton River drainage.

Strategy 1.3.1. Obtain funding for projects identified in the implementation plan.

Strategy 1.3.2. Continue to cooperate and coordinate water quality improvement projects through participation in the Henry's Fork Watershed Council.

Goal 2. Protect and maintain surface water quality sufficient to support beneficial uses.

Objective 2.1. Implement IDEQ's ground water monitoring policy for small-community, exempt, municipal solid-waste landfills that pose a high risk for adversely impacting surface waters, including wetland ecosystems.

Strategy 2.1.1. Assist county governments in obtaining funding for ground water monitoring at the Teton County landfill near Driggs and the Fremont County landfills at St. Anthony and Island Park.

Objective 2.2. Refine monitoring methods, assessment methods and water quality criteria.

Strategy 2.2.1. Revise temperature criteria to protect fish.

Strategy 2.2.2. Designate the beneficial uses of undesignated waterbody units listed in *IDAPA 58.01.02 - Water Quality Standards and Wastewater Treatment Requirements.*

Strategy 2.2.3. Assess the status of the beneficial uses of water bodies for which beneficial use reconnaissance data were collected from 1997 to 2000.

Strategy 2.2.4. Continue to revise and refine the water body assessment guidance used to interpret beneficial use reconnaissance data.

Objective 2.3. Protect public health by maintaining or improving the quality of Idaho's drinking water.

Strategy 2.3.1. Conduct workshops to educate the public and local governments on the effects of storm water discharges on surface water quality.

Strategy 2.3.2. Conduct workshops to educate the public and local governments regarding protection of drinking water sources.

Strategy 2.3.3. Perform drinking water studies on ground water potentially under the direct influence of surface water.

Strategy 2.3.4. Assess sources of drinking water and identify potential contaminants and routes of contamination.
Strategy 2.3.5. Develop and implement a long-range ground water protection plan.

The Nature Conservancy of Idaho: Flat Ranch

Objective 1. Protect and restore important wildlife values.
Objective 2. Restore and enhance critical elements of stream and riparian habitat.
Objective 3. Work cooperatively with local irrigators to ensure minimal stream flows and encourage appropriate streamflow management.
Objective 4. Own and manage the Flat Ranch as a productive viable cattle operation and demonstrate that ranching and wildlife habitat protection are compatible for private landowners.
Objective 5. Provide public access, education and recreational opportunities to Visitors and members of the community.

Strategy 1. Stabilize banks to prevent erosion
Strategy 2. Provide riparian area fencing and off site watering systems
Strategy 3. Continue implementation of a holistic rotational grazing plan
Strategy 4. Return diverted sections of tributary streams to their original stream channels.
Strategy 5. Use water exchange agreements to provide flows meeting or exceeding a winter minimum in Henrys Lake Outlet.

Fisheries

USDA Forest Service

Goals, objectives and strategies are from the 1997 Revised Forest Plan, Targhee National Forest.

Goal 1. Maintain or improve water quality to meet water quality standards for the states of Idaho and Wyoming.

Goal 2. Water quality will improve on stream segments on the Forest identified by the states of Idaho and Wyoming as having water quality concerns, and they are removed from the Water Quality Limited list.

Goal 3. Maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems.

Goal 4. Maintain or restore stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems naturally developed.

Goal 5. Maintain or restore instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route discharges.

Goal 6. Maintain or restore the natural timing and variability of the water table elevation in meadows and wetlands.

Goal 7. Maintain or restore the diversity and productivity of native and desirable nonnative plant communities in riparian zones.

Goal 8. Maintain or restore riparian vegetation to:

1. Provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems;
2. Provide adequate summer and winter thermal regulation within the riparian and aquatic zones;
3. Help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed naturally.

Goal 9. Maintain or restore aquatic habitats necessary to support overall biodiversity, including unique genetic fish stocks such as native cutthroat trout that evolved within the specific geo-climatic regions.

Goal 10. Maintain or restore habitat to support populations of well-distributed native and desired nonnative plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

Goal 11. Wherever possible, secure water rights for maintenance of riparian and aquatic habitat, under state appropriative law, state reserved rights (in Wyoming), and federal reserved rights.

Goal 12. Focus maintenance and restoration efforts, where needed, within inventoried hydrologically disturbed watersheds.

Goal 13. Participate in cooperative river basin planning efforts. Coordinate management activities to be consistent with the results of these efforts including the Henry's Fork Basin Plan and the South Fork Snake Basin Plan.

Objective 1. By 2007, complete watershed improvement needs backlog in the Lemhi/Medicine Lodge, Big Hole Mountains, and Caribou Range Mountains Subsections. Verify watershed improvement needs identified in the Teton Basin Study. Inventory watershed improvement needs on the Centennial Mountains, Madison-Pitchstone Plateaus, and Teton Range Subsections.

Objective 2. Within two years after the ROD is signed, coordinate with the States of Idaho and Wyoming to: 1) reassess the health of native cutthroat trout populations within the Lemhi/Medicine Lodge, Centennial Mountains, Island Park, Madison-Pitchstone Plateaus, and Teton

Range Subsections; 2) use this information to further define species recovery needs and opportunities and to evaluate the effectiveness of the Native Trout Watersheds; and 3) determine which subwatersheds (drainages) within Native Trout Watersheds are vital to native cutthroat trout recovery. The designated Native Trout Watersheds on the Forest are: Elk Creek (003), Palisades Creek (004), Rainey Creek (005), Pine Creek (006), Heise (007), Henry's Fork Headwaters (008), Robinson Creek (013), Trail Creek (017), Mahogany Creek (022), Moody Creek (024), Bitch Creek (032), Burns-Pat Canyon (035), McCoy-Jensen Creeks (036), Elk-Bear Creeks (037), Fall Creek (038), Prichard Creek (039), and Brockman Creek (040).

Objective 3. Within four years after the ROD is signed, coordinate with the states of Idaho and Wyoming to: 1) reassess the health of native cutthroat trout populations within the Big Hole Mountains and Caribou Range Mountains Subsections; 2) use this information to further define species recovery needs and opportunities; and 3) determine which sub watersheds (drainages) within designated Native Trout Watersheds are nonessential to native cutthroat trout recovery.

Objective 4. Coordinate with sub-basin assessments for implementation of state water quality standards (Total Maximum Daily Loads, TMDLs).

Strategy 1. Not more than 30 percent of any of the principal watersheds and their subwatersheds should be in a hydrologically disturbed condition at any one time.

Strategy 2. New special use permits or new Forest Service projects involving instream facilities (exclusive of facilities retrofitted to existing dams) must maintain minimum instream flows as specified by the Forest or State and, on fish-bearing streams provide for fish passage and include screening devices to prevent accidental loss of fish.

Strategy 3. When reauthorizing existing special use permits or existing Forest Service projects involving instream facilities (exclusive of facilities retrofitted to existing dams), where feasible, provide for minimum instream flows as specified by the Forest or Stale and, on fish-bearing streams, where feasible, provide for fish passage and include screening devices to prevent accidental loss of fish.

Idaho Department of Fish and Game
General

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

Objective 1.1 Minimize the number of Idaho species identified as threatened or endangered under provisions of the Endangered Species Act of 1973, as amended.

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

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

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

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

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

Objective 2.1. Emphasize recreational opportunities associated with fish and wildlife resources.

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

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

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

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

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

Fisheries Bureau

Goal 1. Provide viable fish populations now and in the future for recreational, intrinsic, and aesthetic uses.

Objective 1.1. Provide the diversity of angling opportunities desired by the public, within guidelines for protection of existing fish populations.

Strategy 1.1.1. Develop and implement statewide fisheries programs.

Strategy 1.1.2. Operate fish hatcheries to provide eggs and fish for the angling public.

Strategy 1.1.3. Prepare and distribute information to the general public about fishing areas, rules, and techniques for angling.

Strategy 1.1.4. Maintain and enhance the quality of fish habitat so natural production of fish can be maintained.

Strategy 1.1.5. Provide access sites and related facilities for the boating and fishing public.

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

Objective 2.1. Maintain or restore wild populations of game fish in suitable waters.

Strategy 2.1.1. 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 2.1.2. Work closely with other regulatory agencies to provide adequate passage for anadromous fish to and from Idaho and the ocean environment.

Strategy 2.1.3. Assist in recovery of rare species through captive rearing projects, supplementation, and protection.

Strategy 2.1.4. Provide input to land management agencies on how fishery resources may be affected by various proposed activities.

Strategy 2.1.5. Conduct periodic surveys of Idaho anglers to determine their preferences and opinions.

Objective 2.2. Maintain and improve habitats, including water quantity and water quality, to preserve aquatic fauna.

Strategy 2.2.1. Provide technical guidance to land management agencies and private landowners to minimize impacts to aquatic habitats from their activities.

Strategy 2.2.2. 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

Goal 1. 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 1.1. Wild native populations of resident and anadromous fish species will receive priority consideration in management decisions.

Objective 1.2. Maintain or enhance the quality of fish habitat.

Strategy 1.2.1. Use spatial databases to assist in prioritization of habitat improvement projects.

Strategy 1.2.2. Coordinate with other agencies and landowners to develop comprehensive conservation and restoration plans.

Objective 1.3. 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

Goal 1. Native species are well distributed and represented in aquatic communities such that these species are not prone to extinction.

Goal 2. 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 2.1. Maintain or restore wild native populations Yellowstone cutthroat trout and resident rainbow trout to ensure species viability and sport fishing opportunity.

Objective 2.2. Increase sport-fishing opportunities and provide a diversity of angling opportunities desired by the public.

Strategy 2.2.1 Develop fishing ponds in areas where stream-fishing opportunity is limited by conservation efforts on native fishes

Strategy 2.2.2. Practice current public review process for developing management plans and regulations.

Objective 2.3. Where desirable and feasible, some lakes will be maintained as fishless. Fishless lakes will allow for maintenance of natural conditions for native fauna within alpine ecosystems.

Strategy 2.3.1. Coordinate with other agencies on data availability and identify additional data gaps.

Native Salmonid Assessment Research

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

Objective 1.1. Assess current stock status and population trends of native salmonids and their habitat.

Strategy 1.1.1. Coordinate with other ongoing projects and entities to avoid data duplication and to prioritize sampling efforts.

Strategy 1.1.2. Use electrofishing and snorkeling to estimate presence/absence and abundance of salmonids throughout the middle and upper Snake River provinces.

Strategy 1.1.3. Identify, describe, and measure stream habitat and landscape-level characteristics at the fish sampling sites.

Strategy 1.1.4. Collect genetic samples (fin clips) from native salmonids to determine (using microsatellite DNA markers) the purity of populations and the degree of genetic variability among and within populations.

Strategy 1.1.5. Develop models that explain the occurrence and abundance of native salmonids based on measurable characteristics of stream habitat and landscape features. Results will identify populations at risk and in need of recovery strategies, and will guide study design for Objective 2.

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

River provinces, especially for populations most at risk of extirpation.

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

The Friends of the Teton River

Friends of the Teton River was formed during the summer of 2000 by a group of local farmers, guides, outfitters, scientists, conservationists, and government agency representatives in response to observed changes in the Teton River. Over the past few years, Teton Valley residents, long-time fishing guides and wildlife experts have noticed adverse changes in the Teton River, including declines in aquatic plant life and insect hatches, increased siltation, and reduced trout populations. Additionally, springs on the east side of the Teton River appear to have lower flows, which has resulted in disappearing wetlands and sloughs. Unfortunately very few scientific studies of water resources in the Teton Basin have been undertaken so our understanding of these systems is quite limited.

Friends of the Teton River believes that a thorough scientific understanding is a necessary prerequisite for natural resource management and so has created a comprehensive research agenda based on the three areas of concern water quantity, water quality, and fisheries. We are committed to communicating all scientific results with members of the public and implementing on the ground projects, based on scientific findings that will improve the health of all water bodies in the Teton Basin.

Goal 1. Summarize the current status of the fishery in a historical context.

Strategy 1. Collect all existing fishery data and add it to the database. Areas of particular interest are population estimates, redd counts, spawning surveys, creel surveys, historical photos and historical anecdotes. The IDFG is currently working on a Performance Report for the Teton River that summarizes all of the useable data collected on the Teton form 1987 to 2000. Most of the existing fishery data will come from this report. The Targhee National Forest has also collected fishery data on the tributary streams that could be added to the database.

Recommended actions:

- Once this data is compiled a summary document should be written illustrating the historical changes in the fishery.
- The conclusions of the summary document should be circulated to the public to encourage both awareness and involvement in the Friends of the Teton River Organization.

Goal 2. Identify the limiting factors and potential threats to the fishery.

Strategy 1. Collect current fishery data to establish a comprehensive baseline of information.

Recommended Actions:

- Work with the IDFG to establish long-term comprehensive population surveys.
- Complete general habitat inventories of the main stem of the Teton River from its headwaters to the canyon section and the lower sections of the major tributaries.
- Conduct a spawning habitat survey of the spring creeks and tributaries west of Highway 33.
- Identify specific dates and locations where trout populations spawn.

Strategy 2. Use historical information and collected data to make conclusions about the status and management of the Upper Teton River Fishery.

Recommended Actions:

- Questions to be answered are: What is the current carrying capacity of the Teton River?
- Do the population numbers reflect that carrying capacity?
- What are the limiting factors to the fish population?
- Can these factors be addressed?
- If yes, where and how (*i.e.* spawning habitat projects in Spring Creeks, bank stabilization projects, dealing with sediment issues, dealing with macrophyte issues, creating specific limiting habitat types [cover, winter habitat, spawning habitat, feeding habitat] or try to enhance flows).
- Are there specific areas in the valley that are critical to the fishery?

<u>Goal 3. Identify areas where practical projects can be implemented to restore, maintain or enhance the fishery</u>.

Strategy 1. Use the conclusions about the status & management of the Upper Teton River Fishery to:

Recommended Actions:

- Gain funding to conduct community restoration and enhancement projects that address the limiting factors to the fish population.
- Provide guidance to landowners within the Teton River corridor on how to minimize impacts on the fishery.
- Provide suggestions for restoration and enhancements projects to private landowners that accurately address the limiting factors to the fish population within the context of the entire upper Teton River.
- Identify areas of special concern or importance to the fishery and notify the Teton Regional Land Trust and the Teton County Planning Commission.
- Provide recommendations to Teton County on how to plan growth around the Teton River in order to maintain the valuable resources within the river corridor.

<u>Goal 4. Understand water quality and quantity issues pertinent to the basin</u>.

Strategy 1. Assess water quantity and quality

Recommended Actions:

- Compile existing water quality data on the Teton Watershed.
- Understand, and address where necessary, sediment and nutrient inputs and transport.
- Model long-term water quality impacts of land-use changes in the Teton Basin.
- Implement a long-term surface and groundwater quality monitoring program.
- Assess minimum streamflows to support riparian and aquatic biota.
- Develop a model of surface and ground water hydrology of the Teton Basin.
- Improve understand hydrologic functioning of the springs that feed the Teton River and its adjacent wetlands.

Wildlife

USDA Forest Service

Goals, objectives and strategies are from the 1997 Revised Forest Plan, Targhee National Forest.

Wildlife

Goal 1. Wildlife biodiversity is maintained or enhanced by managing for a diverse array of habitats and distribution of plant communities.

Goal 2. Provide habitat to support the wildlife and hunting goals of the states of Idaho and Wyoming.

Strategy 1. Dead and Down Material. (Note: These requirements are interrelated with the woody residue requirements and are not cumulative to those requirements.)

1. On at least 60 percent of the forested hectares of each analysis area an average of 52 logs per ha should be left consisting of logs in decomposition classes 1, 2 and 3 where they exist (USDA FS, 1979). (Note: unmanaged stands or stands where management did not include the removal or piling of down material, meet forest-wide standards and guidelines for down woody material.)
2. When this amount of down material is not present on at least 60 percent of the forested hectares in an analysis area, an average of 42 logs per acre should be left in all activity areas (harvest units) consisting of logs in all decomposition classes where they exist. Fewer logs may be left if fuel loading would exceed 23 metric tons per acre.
3. Logs should be at least 18 cm in diameter at the small end, be at least 6 m long, and have a volume of at least 0.3 m^3 (e.g., a log averaging 24 cm in diameter and 2 m long).
    - Smaller size logs may only be used in meeting this volume criteria if the area is incapable of producing larger trees, or the stand is too young to produce these trees. In these cases, logs representing the largest tree diameter class present in

the stand should be retained and at least 5.6 m^3 (approximately 2 metric tons) per acre of down logs shall be retained.

- For every area two-acre area in an activity area, a minimum of two logs should be left, where they exist, to maintain distribution of down woody material.

Strategy 2. Winter Feeding of Big Game. Allow no new permanent feed grounds for wintering big game animals.

Strategy 3. Animal Damage management will be conducted in compliance with the 1996 "APHIS-ADC Predator Damage Management in Southern Idaho" Decision Notice and FONSI, selected alternative "Current Program with Livestock Protection Collar."

1. Annual ADC work plans will be prepared using the 1990 Targhee National Forest "Forest-Wide Predator Control Environmental Assessment" as a framework for conducting predator control activities on the Forest. Deviations from the direction in the 1990 EA will be considered when necessary to deal with particular problem animals.
2. Problem wolves will be managed according to the Nonessential Experimental Population for Gray Wolves Final Rule (USFWS, 1994b).
3. Problem grizzly beats will be addressed according to the Interagency Grizzly Bear Committee nuisance bear guidelines (IGBC, 1994).
4. Use of toxicants will not be allowed on the Forest.

Objective 1. Determine the biological potential for cavity nesting habitat on a watershed basis to enable management of some areas at higher levels of biological potential and some at lower levels of biological potential and meet the overall management prescription objectives.

Strategy 1. Retain snags within all management prescription areas allowing timber.

Strategy 2. In analysis areas where snag numbers are low (at or approaching management minimums), no dead standing trees should be harvested.

Strategy 3. Public workforce and contractor safety will be considered and provided for in selecting the arrangement of retained snags and trees.

Grizzly Bear Habitat

Goal 1. Habitat conditions will be sufficient to sustain a recovered population of grizzly bears.

Goal 2. Allow for unhindered movement of bears (continuity with Yellowstone National Park and adjacent bear management units).

Objective 1. Meet recovery criteria in the current Grizzly Bear Recovery Plan.

Objective 2. Implement guidelines developed by the Interagency Grizzly Bear Committee.

Objective 3. Provide safe, secure sites for nuisance bears as defines by Interagency Grizzly Bear Guidelines.

Objective 4. Achieve the road density standards in the Bear Management Units (BMUs) within three years of the implementation of the ROD in coordination with USFWS and State Wildlife agencies.

Objective 5. Develop fire management plans for each of the Bear Management Units (BMUs) to address wildfires and prescribed fires, as follows:

- Bechler-Teton BMU -- within two years of the Record of Decision (ROD) for the Revised Plan;
- Plateau BMU -- within four years of the ROD;
- Henrys Lake BMU -- by 2003.

Strategy 1. The grizzly bear education program will focus on residents in residential and summer home areas, developed recreation site users, wilderness users, hunters, outfitters and guides, and permittees.

Strategy 2. Those areas shown as Management Situation 3 (MS3) habitat on Map #5 of the 1985 Forest Plan will continue to be managed as MS3 habitat.

Bald Eagle Habitat

Goal 1. Habitat conditions will be sufficient to sustain a recovered bald eagle population.

Objective 1. Continue current nest location and productivity monitoring.

Objective 2. Identify bald eagle wintering and migration habitat and identify appropriate management needs.

- For the Henry's Fork watershed, within three years of the ROD for the Revision.
- For the South Fork of the Snake, by the year 2003.

Strategy 1. In Occupied Nesting Zones (Zone I) and Primary Use Areas (Zone II) apply the following:

- Minimize all human activities from February 1 to August 1.
- No new roads in Zone I. Avoid building new roads in Zone II.
- Manage human use on existing roads at levels which do not adversely affect use and productivity of the nest site.
- No new developed recreation sites or facilities in Zone I. Avoid building new recreation sites or facilities in Zone II.
- Manage existing recreation use at levels which do not adversely affect use and productivity of the nest site.
- Use the "No Surface Occupancy" stipulation for all minerals activities.
- If eagles choose to establish new nest sites and use areas in an area already receiving human use, the human activities may be restricted or modified. Expanded human activity, however, should be discouraged.
- Use silvicultural techniques which maintain or promote mature and old growth timber stand characteristics in both the short and long term, but reduce the risks of insects and disease epidemics.
- Vegetation management can only occur between September 1 and January 31.
- Use "control" as the appropriate suppression response for wildfires to minimize loss of habitat.

- Prohibit new structures that have the potential to cause direct mortality to bald eagles (e.g. power lines).
- Permit historic levels of livestock use as long as no adverse impacts (such as abandonment of Rest territory or reproduction failures) occur related to this activity. Manage livestock to allow successful reproduction of cottonwood where applicable.
- Prohibit wildlife management or predator control activity with the potential to cause mortality to bald eagles (such as exposed traps).

Strategy 2. Within Home Ranges (Zone III) follow existing site-specific management plans (when they exist) for each bald eagle territory, or Zone III management direction in the Bald Eagle Management Plan for the Greater Yellowstone Area when site-specific management plans do not exist.

Strategy 3. Within Zones I, II, and III, prohibit all use of herbicides and pesticides which cause egg shell thinning as determined by EPA labeling.

Strategy 4. Recreation activities and developments will be designed to minimize conflicts with bald eagle wintering and migration habitat.

Strategy 5. New roads and trails will be located to avoid bald eagle wintering and migration habitat. Where these areas cannot be avoided the roads and trails will be designed and located to minimize impacts to eagles.

Gray Wolf Habitat

Goal 1. All wolves found in the wild on the Forest will be considered nonessential experimental animals as defined in the FEIS for The Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho. (USFWS 1994)

Strategy 1. Restrict intrusive human disturbances (motorized access, vegetation management, livestock grazing, etc.) within 1.6 km around active den sites and rendezvous sites between April 1 and June 30, when there are five or fewer breeding pairs of wolves in the Yellowstone Nonessential Experimental Population Area (applies to the portion of the Forest east of Interstate 15) or the Central Idaho Nonessential Experimental Population Area (applies to the portion of the Forest west of Interstate 15). After six or more breeding pairs become established in each experimented population Area, land-use restrictions will not be needed. (USFWS 1994)

Strategy 2. The ability of individuals holding grazing permits on public land to harass adult wolves in an opportunistic, noninjurious manner will become part of their permit conditions so it is clearly understood exactly what can occur. There is a seven day reporting requirement. (USFWS 1994)

Strategy 3. The following conditions and criteria will apply in determining the problem status of wolves. (USFWS 1994)

- Wounded livestock or some remains of a livestock carcass must be present with clear evidence that wolves were responsible for the damage and there must be a reason to believe that additional losses would occur if the problem wolf or wolves

were not controlled. Such evidence is essential since wolves may simply feed on carrion they have found while not being responsible for the kill.

- Artificial or intentional feeding of wolves must not have occurred. Livestock carcasses not properly disposed of in an area where depredations have occurred will be considered attractants. Removal or resolution of such attractants must accompany any control action. Livestock carrion or carcasses not being used as bait in an authorized control action (by agencies) must be removed, burned, treated with an acceptable chemical repellent, or otherwise rendered such that the carcass(es) will not attract wolves using methods approved by the District Ranger.
- Animal husbandry practices previously identified in existing approved Allotment Management Plans and annual operating plans for allotments must have been followed.
- If additional livestock depredations are likely, proper animal husbandry practices are employed (proper disposal of livestock carcasses, etc.), artificial feeding does not take place, and AMPs are followed, the Forest may implement procedures to harass, capture, move, or kill wolves that attacked livestock (defined as cattle, sheep, horses, or mules only) on National Forest land. Prior to the establishment of six breeding pairs, depredating females and their pups will be captured and released at or near the site of capture, one time prior to October 1. If depredations continue, or if six packs are present, females and their pups will be removed. (USFWS 1994)

Goal - Peregrine Falcon Habitat
Goal 1. Plan project activities to avoid adverse impacts to falcons and their habitats.

Strategy 1. For proposed projects within 3 km of known falcon nests consider such items as: 1) human activities (aircraft, ground and water transportation, high noise levels, and permanent facilities) which could cause disturbance to nesting pairs and young during the nesting period March 15 to July 31 ; 2) activities or habitat alterations which could adversely affect prey availability.

Strategy 2. Within 24 km of all known nest sites, prohibit all use of herbicides and pesticides which cause egg shell thinning as determined by risk assessment (USFS, September 1992).

Strategy 3. Restrict climbing and other human disturbances from March 15 through July 31 to avoid adverse impacts at known falcon nest sites.

Wolverine Habitat
Goal 1. Within two years of the Record of Decision, complete a GIS inventory to identify potential wolverine natal den sites. Within 4 years of the Record of Decision, survey all potential wolverine natal den sites to document wolverine presence.

Goshawk Habitat
Goal 1. Provide suitable habitat conditions for known active and historic goshawk nesting territories

Flammulated Owl Habitat

Strategy 1. Do not allow timber or firewood harvest activities within a 30-acre area around all known flammulated owl active and historic nest sites.

Boreal Owl Habitat

Strategy 1. Do not allow timber or firewood harvest activities within a 30-acre area around all known boreal owl active and historic nest sites.

Strategy 2. Maintain over 40 percent of the forested hectares in late semi age classes within a 3,600-acre area around all known boreal owl nest sites.

Great Gray Owl Habitat

Strategy 1. Do not allow timber or firewood harvest activities within a 20-acre area around all known great gray owl active and historic nest sites. Vegetation manipulation does not include tree planting.

Strategy 2. Maintain over 40 percent of the forested hectares in late semi age classes within a 1,600-acre area around all known great gray owl nest sites.

Strategy 3. Restrict the use of strychnine poison to control pocket gophers within a 1 km buffer around all known active great gray owl nest sites.

Trumpeter Swan Habitat

Goal 1. Maintain habitat to support ten breeding pairs or more on the Forest.

Goal 2. Protect emergent vegetation along shorelines. Maintain riparian vegetation in desired vegetative condition.

Strategy 1. Maintain suitable trumpeter swan nesting habitat conditions including (but not limited to) the following lakes and ponds: Boundary Pond, Swan Lake, Lily Pond, Hatchery Butte, Railroad Pond, Mesa Marsh, Bear Lake, Upper Goose Lake, Long Meadows, Thompson Hole, Twin Lakes, Chain Lakes, Widgit Lake, Rock Lake, Indian Lake, Putney Meadows, Unnamed Pond (Sec. 19, T9N, R46E).

Strategy 2. Change livestock grazing through management or fencing when grazing is adversely affecting trumpeter swan use or productivity.

Strategy 3. No vegetation management will occur within 91 m of the lake or pond shoreline unless necessary to improve riparian habitat conditions favorable for trumpeter swans. Management may occur after the swans have left the lake or pond.

Strategy 4. Maintain constant water levels; allow no drawdowns from May 1 to September 30 when not in conflict with preexisting water rights.

Strategy 5. Do not take any recreation management actions that would encourage dispersed recreation activity at these lakes and ponds. Close these areas to recreation activity if this activity is adversely affecting trumpeter swan use or productivity.

Strategy 6. Implement habitat improvement projects at these lakes and ponds, such as dredging to maintain proper water depths and aquatic vegetation control.

Spotted Frog Habitat
Goal 1. Maintain riparian vegetation in desired vegetation condition.

Common Loon Habitat
Goal 1. Evaluate the potential to provide and maintain suitable breeding habitat for common loons at these sites: Indian Lake, Thompson Hole, Bergman Reservoir, Junco lake, Fish Lake, Loon Lake, Moose Lake, unnamed pond (Sec. 9, T47N, R118W).

Goal 2. Develop common loon management plans for the above sites if the evaluation indicates there is potential to provide and maintain suitable breeding habitat.

Harlequin Duck Habitat
Strategy 1. Avoid establishing new trails, new roads, or new recreation facilities within 91 m (on each side) of any stream reach with documented harlequin duck breeding activity.

Spotted Bat and Western Big-Eared Bat Habitat
Objective 1. Develop management plans for any caves, mine shafts, and other suitable habitats where these bat species are known to be present.

USDI Fish and Wildlife Service
Trumpeter Swan

The USFWS Rocky Mountain Population of Trumpeter Swan Working Group developed a draft concept plan for enhancing the Rocky Mountain Population (RMP) of trumpeter swans on units of the National Wildlife Refuge System (NWR). This draft is presently out for public review. The intent of the plan is to develop integrated management objectives on NWRs and help define roles for other FWS programs with the goal for restoring the Rocky Mountain Population of Trumpeter Swan. The draft document finds that a study of all the interrelated factors (swan, vegetation, fish, river flows, ice conditions, temperatures) on the Henrys Fork is needed. 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 subadults) 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 3. 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.

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.

IDFG

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.

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, 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 hectares of non-riverine wetlands in Idaho, focusing on the same types and amounts that historically occurred there.

Strategy 1. Write habitat management recommendations for wetland birds.

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

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

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

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

Owls

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

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

Strategy 1. Develop permanent monitoring sites.

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

Action 2. Erect and monitor nest boxes.

Strategy 2. Retain snags and primary cavity nesters.

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

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

Action 3. Restore aspen forests.

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

Northern Goshawk

Objective 1. Determine biology and ecology of northern goshawks.

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

Objective 2. Determine the abundance and distribution of goshawks.

Strategy 1. Use standardized survey protocols for surveying habitats.

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

Strategy 1. Develop conservation agreements with private landowners.

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

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

Sharp-tailed Grouse

Objective 1. Continue monitoring populations and conduct surveys of habitats that may support sharp-tailed grouse.

Objective 2. Implement sharp-tailed grouse conservation management plan.

Objective 3. Identify and map existing sharp-tailed grouse habitat and areas of potential sharp-tailed grouse habitat. Develop local management plans to protect and perpetuate sharp-tailed grouse habitat.

Sage Grouse

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

Strategy 1. Manage nesting and early brood habitats to provide 15-25% sagebrush canopy coverage and about 7 inches or more of grass and forb understory during the May nesting period.

Strategy 2. Manage for late summer brood habitat that includes a good variety of succulent vegetation adjacent to sagebrush escape and loafing cover.

Strategy 3. Manager for winter habitat that provides sagebrush exposed under all possible snow depths.

Strategy 4. Implement grazing management and big game regulations to achieve and maintain sagebrush and riparian/meadow habitats in good ecological condition.

Strategy 5. Do everything possible to protect remaining sage grouse habitats where natural fire frequency is 50-130 years and recent fire has greatly reduced sage grouse habitat.

Strategy 6. Establish priority areas for sage grouse habitat management.

Strategy 7. Implement Upper Snake local working group sage grouse management plan when plan is finalized.

Strategy 8. Monitor the condition and trend of sage grouse habitat.

Action 1. Prepare cover type maps and evaluate habitat conditions using standards methods for key seasonal habitats.

Action 2. Offer conservation easements or acquire critical habitats from willing sellers through land exchange, reserved interest deed, or direct purchase of mapped important sage grouse habitats.

Action 3. Develop strategically placed firebreaks using greenstripping or mechanical removal of fuel.

Action 4. Control noxious weeds along roads.

Action 5. Include forbs and native grasses in seeding mixtures on critical habitat areas.

Action 6. Rehabilitate gullied meadows to raise the water table and restore meadow characteristics.

Action 7. Improve grazing management in sage grouse nesting habitats.

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

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

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

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

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

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

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

Action 4. Establish lek route(s).

Amphibians, Reptiles, and Invertebrates

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

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

Plants and Habitats

Objective 1. Reduce habitat modification to conserve Alkali Primrose.

Objective 2. Monitor trend in populations of Alkali Primrose.

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

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

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

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

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

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

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

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

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

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

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

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

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

Strategy 1. Species and Population Status Surveys and Monitoring.

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

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

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

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

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

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

Action 7. Monitor populations of common species.

Strategy 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.

Idaho Conservation Data Center (CDC).

The CDC works with Federal, state, and private agencies and organizations to maintain high quality information on the conservation of biological diversity. CDC staff contribute to conservation planning efforts within the subbasin through dissemination and synthesis of information on the distribution and abundance of species populations and habitats. Availability of high quality information on biological diversity allows proactive conservation planning and reduces administrative delays related to fulfillment of regulatory procedural requirements.

Objective 1. Maintain high quality, accurate, and timely information on the occurrence of rare, threatened, and endangered plant and animal species.

Strategy 1. Conduct appropriate population inventory monitoring work for priority species.

Strategy 2. Maintain and develop sufficient funding to provide adequate facilities and staffing for the acquisition, maintenance, and dissemination of information on species populations.

Objective 2. Maintain high quality, accurate, and timely information on the distribution, abundance, and ecological status of plant and animal habitats, representative ecological reference areas, and plant communities.

Strategy 1. Conduct appropriate inventories of, and monitor, priority plant and animal habitats and plant communities.

Strategy 2. Serve as an information repository for ecological data regarding the distribution, composition, and structure of vegetation within the subbasin.

Action 1. Acquire existing data sets where possible and compile metadata information according to national standards.

Strategy 3. Develop and disseminate descriptive information on high quality reference stand structure, composition, and ecological functions.

Strategy 4. Maintain and develop sufficient funding to provide adequate facilities and staffing for the acquisition, maintenance, and dissemination of information on plant and animal habitats, representative ecological reference areas, and plant communities.

Objective 3. Assist with species and ecosystem conservation management action within the subbasin.

Strategy 1. Provide recommendations for conservation site selection and management. Protect high quality, representative stands of priority plant associations and habitats.

Strategy 2. Provide recommendations for the establishment and management of ecological reference areas.

Action 1. Monitor use of existing reference areas to assure consistency with the maintenance of ecological values.

Action 2. Identify candidate sites for the establishment of ecological reference areas based on current needs assessments. Periodically update ecological reference area needs assessments.

Action 3. Establish and maintain permanent baseline monitoring systems for priority ecosystems and species.

Strategy 3. Provide recommendations for species conservation and management. Prepare and update species conservation management plans.

Sand Creek Wildlife Management Area

Goals, objectives, and strategies were taken from the Sand Creek Wildlife Management Area management plan (Aslett 1998).

<u>Goal 1. Provide quality winter habitat for migratory big game on traditional winter ranges and secure year round habitat for resident and migratory wildlife</u>.

Objective 1.1. Provide winter habitat in sufficient quality and quantity to support the Sand Creek elk herd.

Strategy 1.1.1. Continue cooperative development of critical elk winter range with other agencies, organizations, and private landowners.

Strategy 1.1.2. Monitor and pursue all opportunities to protect critical portions of winter range, migration corridors, and transition range through use trades, easements, acquisition, or other appropriate means.

Strategy 1.1.3. Monitor, evaluate, and document existing use trade agreements annually and make revisions as necessary.

Strategy 1.1.4. Provide technical assistance and make appropriate recommendations on any proposed projects or plans by other agencies, organizations, or private landowners that may affect big game winter range, migration corridors, or transition range.

Strategy 1.1.5. Explore opportunities to improve forage quality or quantity on winter and transition ranges through habitat manipulations, crop plantings, livestock grazing modifications, or other appropriate means. All proposed projects will consider other wildlife uses and the potential effects on other species of wildlife.

Strategy 1.1.6. Provide assistance to the regional wildlife staff in monitoring migrations, winter elk numbers, herd composition, distribution, and movements through winter aerial or ground counts. Identify and map important areas of elk use annually and document results.

Strategy 1.1.7. Develop and implement a plan to monitor elk use of the Sand Creek WMA winter range. Methods may include pellet and vegetation transects, exclosures, photo points, or use of aerial count data.

Strategy 1.1.8. Monitor harvest strategies, elk movements, and harvest and make recommendations to improve use of transition and winter ranges.

Strategy 1.1.9. Recommend, establish, and maintain vehicle closures or restrictions to improve elk security.

Objective 1.2. Maintain quality winter habitat for the Sand Creek mule deer, white-tailed deer, and moose herds.

Strategy 1.2.1. Provide assistance to the wildlife staff in monitoring deer and moose numbers, herd composition, distribution, and movements on the winter range. Identify and map important areas of winter use annually.

Strategy 1.2.2. Identify opportunities to improve habitat quality through vegetation manipulation projects. Research, design, and implement appropriate projects in cooperation with BLM, IDL, other organizations, and private landowners. All proposed projects will consider the effects on other wildlife species and habitat components.

Strategy 1.2.3. Identify and map migration corridors and monitor migration timing. Document findings annually.

Strategy 1.2.4. Monitor hunting seasons and harvest strategies and make appropriate recommendations annually.

Objective 1.3. Provide quality and secure year around habitat on the SCWMA for resident and migratory wildlife.

Strategy 1.3.1. Maintain approximately 90 km of boundary and interior fences to control unauthorized livestock use of SCWMA.
Strategy 1.3.2. Manage vehicle access to provide big game security and habitat protection throughout the year.
Strategy 1.3.3. Provide appropriate food crops in the Sand Creek Pond area for year around use by big game and other wildlife and to delay fall migrations of big game to winter range.
Strategy 1.3.4. Provide a diversity of habitats throughout the SCWMA for a variety of wildlife and plant species.

Goal 2. Increase sage and sharp-tailed grouse production.

Objective 2.1. Improve and protect sage and sharp-tailed grouse nesting, brood rearing, and winter habitat.

Strategy 2.1.1. Coordinate management activities to comply with the Idaho Sage Grouse Management Plan (Idaho Sage Grouse Task Force 1997) and the 1998 Idaho Columbian Sharp-tailed Grouse Conservation Plan (Draft) when it is finalized and approved. In the interim, incorporate the draft habitat guidelines into management activities.
Strategy 2.1.2. Incorporate recommendations from the two recent sage grouse research projects on the Sand Creek sage grouse population into management plans: (Nelle et al. 2000, Leonard 1998). Incorporate information contained in two publications into management plans (Crowley and Connelly 1996, 1997).
Strategy 2.1.3. Explore opportunities to improve grouse habitat through habitat manipulations, crop plantings, grazing system modifications, or other means. All habitat projects must comply with grouse management plan guidelines.
Strategy 2.1.4. Monitor and pursue all opportunities to protect critical production and winter habitat through land acquisitions, easements, use trades, allotment management plans, or other appropriate means.
Strategy 2.1.5. Provide technical assistance and make recommendations on any proposed projects or plans submitted by other agencies, organizations, or private landowners that may affect grouse habitat.
Strategy 2.1.6. Review and modify existing use trades to comply with sage and sharp-tailed grouse management plans.
Strategy 2.1.7. Identify and map wintering areas and coordinate with other landowners and agencies to protect winter habitat. Obtain, record, and report

Global Positioning System (GPS) locations on all grouse seen on winter big game counts in the area.

Objective 2.2. Monitor sage and sharp-tailed grouse populations on and adjacent to the SCWMA.

Strategy 2.2.1. Conduct annual lek searches on the SCWMA and adjacent lands. Identify, map, and monitor major lek complexes annually.
Strategy 2.2.2. Conduct and monitor the Red Road and Sand Creek Road sage grouse routes and the Grassy and Sand Creek sharp-tailed grouse routes annually and document the results.
Strategy 2.2.3. Operate hunter check stations, hunter field checks, and provide wing barrels during hunting seasons to collect grouse harvest information. Document the results annually.

Goal 3. Maintain or increase use of SCWMA by nongame and species with special designations.

Objective 3.1. Provide secure habitat for wildlife with special designations and protect plant species listed as Threatened, Endangered, or Species of Special Concern.

Strategy 3.1.1. Inventory, map, and monitor locations or areas of use by wildlife species listed in special designations. Develop and implement plans to provide optimum protection and habitat security for listed species.
Strategy 3.1.2. Complete a Sensitive Plant survey on SCWMA by 2001. Provide adequate security for listed plant species and incorporate plant locations into weed control plans.
Strategy 3.1.3. Provide and protect nesting areas for trumpeter swans as necessary. Monitor and document nesting results for trumpeter swans.
Strategy 3.1.4. Provide educational opportunities for the public concerning special wildlife and plant species. Conduct tours, provide information, and give presentations to appropriate groups, organizations, and individuals.
Strategy 3.1.5. Provide a diversity of habitats for other nongame species.
Strategy 3.1.6. Design and implement a habitat mapping project to be completed by the year 2000. Coordinate with BLM, Forest Service, and IDL.
Strategy 3.1.7. Design and implement an amphibian and reptile inventory on SCWMA to be completed by 2001.
Strategy 3.1.8. Design and implement a bat survey on the SCWMA to be completed by 2000.

Goal 4. Increase waterfowl production at the Sand Creek Ponds.

Objective 4.1. Provide quality nesting cover at the Sand Creek Ponds.

Strategy 4.1.1. Research and document waterfowl nesting areas and nesting success at the Sand Creek Ponds as outlined in the Department's Statewide Waterfowl Management Plan.

Strategy 4.1.2. Research necessary habitat components and develop and implement plans to improve those areas that are presently not being used or receive little nesting use. Agricultural fields that are not used for crop production or elk forage areas will be planted into permanent cover using a seed mixture of native plant species or acceptable non-native species that provide optimum nesting cover for waterfowl.

Strategy 4.1.3. Where nesting success is low because of predation, develop high quality nesting cover, and implement predator control techniques.

Strategy 4.1.4. Provide artificial nesting structures where appropriate and maintain, monitor, and document annual use.

Strategy 4.1.5. Restrict public use of nesting areas during nesting periods. Sign and routinely patrol nesting areas to minimize disturbance.

Strategy 4.1.6. Census goose production annually and census duck production periodically as required in the Department's Statewide Waterfowl Management Plan.

Strategy 4.1.7. Exclude all livestock grazing in the waterfowl nesting areas around the ponds except when and where livestock grazing can be used to improve nesting cover.

Objective 4.2. Provide appropriate food crops adjacent to the Sand Creek Ponds for waterfowl use.

Strategy 4.2.1. Provide cereal grains, legumes, or other waterfowl food crops in the pond area.

Strategy 4.2.2. Wildlife use of crops will be evaluated and documented annually.

Goal 5. Maintain quality public recreational opportunities consistent with the SCWMA mission.

Objective 5.1. Provide hunter access and opportunity.

Strategy 5.1.1. Provide designated routes for motorized access on the WMA.

Strategy 5.1.2. Maintain major roads at a minimum level for vehicle use.

Strategy 5.1.3. Provide and maintain nonmotorized facilities including horse corrals, trails, and primitive camping areas.

Strategy 5.1.4. Maintain contact with neighboring landowners to provide public access on private lands for hunting activities.

Objective 5.2. Provide access and opportunity for anglers at the Sand Creek Ponds.

Strategy 5.2.1. Maintain the major roads in the pond area for vehicular use.

Strategy 5.2.2. Provide and maintain primitive camping and parking facilities in the pond area.
Strategy 5.2.3. Provide a variety of access developments to serve anglers with disabilities.

Objective 5.3. Provide opportunities for wildlife viewing, education, and nonconsumptive wildlife use.

Strategy 5.3.1. Construct and maintain a nature trail(s) in the pond area.
Strategy 5.3.2. Provide informational signs in appropriate areas to inform and educate SCWMA users.
Strategy 5.3.3. Consider construction of photo blinds for wildlife viewing and photography.
Strategy 5.3.4. Conduct tours, give presentations, and provide informational brochures about the SCWMA.
Strategy 5.3.5. Monitor SCWMA use by nonconsumptive wildlife user groups.
Strategy 5.3.6. Maintain contact with private landowners to provide access on private lands for wildlife related recreation.

Cartier Slough Wildlife Management Area

The goals, objectives, and strategies were taken from the Cartier Slough Wildlife Management Area (Wackenhut and Ragotzkie 1998).

Goal 1. Manage CSWMA for waterfowl production, for migrating waterfowl, and to provide waterfowl hunting.

Objective 1.1. Document waterfowl use on CSWMA.

Strategy 1.1.1. Identify important duck nesting areas and determine nesting success.
Strategy 1.1.2. Note waterfowl use on CSWMA from aerial waterfowl surveys (goose nest pair counts and mid-winter waterfowl survey).
Strategy 1.1.3. Monitor goose platform and wood duck nest box use.

Objective 1.2. Maintain or improve waterfowl nesting success. Maintain a 30% nesting success in accordance with the Department's Waterfowl Management Plan 1991-1995.

Strategy 1.2.1. Maintain goose nest platforms on CSWMA annually.
Strategy 1.2.2. Maintain wood duck boxes on CSWMA annually.
Strategy 1.2.3. Monitor use and condition of nest structures annually and relocate, replace, and add structures as needed.
Strategy 1.2.4. Manage habitat to encourage/improve duck nesting as needed. Noxious weed control, livestock grazing, mowing, or burning will be considered and used as needed.

Strategy 1.2.5. Maintain secure nesting habitat by continuing to limit vehicular access on CSWMA and by restricting some activities on CSWMA during the nesting season.

Strategy 1.2.6. Use passive predator management to limit predator habitat on CSWMA. This would include but not be limited to removing debris and burning brush piles (potential homes for mammalian predators).

Objective 1.3. Provide habitat for migrating waterfowl, particularly in the fall, to improve hunting opportunities.

Strategy 1.3.1. Repair the existing primary water level control structure to provide more open water.

Strategy 1.3.2. Investigate opportunities to install a water level control structure on an interior waterway to provide more open water in the summer and fall.

Strategy 1.3.3. Investigate opportunities to construct potholes or other open water habitat.

Strategy 1.3.4. Use livestock grazing, burning, or mechanical manipulation to provide short vegetation and limit willow expansion into some areas as needed.

Strategy 1.3.5. Pursue opportunities to expand waterfowl habitat and hunter access along the Henrys Fork River adjacent to CSWMA using conservation easements and acquisition.

Goal 2. Manage CSWMA to maintain a diversity of healthy plant communities and a diversity of native and desirable non-native wildlife species.

Objective 2.1. Maintain native plant communities.

Strategy 2.1.1. Control noxious weeds to the extent possible using a mix of chemical, mechanical, and biological control measures annually.

Strategy 2.1.2. Use only native plant materials on sites other than the irrigated agricultural field.

Strategy 2.1.3. Use vegetation manipulation only when necessary to meet other goals and in a manner which will not degrade the habitat.

Strategy 2.1.4. Maintain fences and gates to prevent trespass grazing and motorized vehicles.

Strategy 2.1.5. Monitor and manage recreational use to ensure it does not lead to habitat degradation.

Strategy 2.1.6. Document and monitor species composition and long term habitat changes in select habitats.

Strategy 2.1.7. Develop a plant species inventory.

Objective 2.2. Maintain the diversity of native and desirable non-native wildlife species on CSWMA.

Strategy 2.2.1. Develop and maintain a general inventory of animal species that use the CSWMA.
Strategy 2.2.2. Conduct surveys to document presence/absence information for amphibians, reptiles and small mammals.
Strategy 2.2.3. Conduct song bird survey.
Strategy 2.2.4. Maintain and provide habitat features for a variety of animals, including but not limited to maintaining snag trees, planting shrubs and food plants into portions of the agricultural field, and installing kestrel nest boxes, bat houses, and bluebird houses.

Objective 2.3. Provide suitable habitat for endangered, threatened, species of special concern, and other plants and wildlife with special designations which occur on the area.

Strategy 2.3.1. Monitor use of CSWMA by endangered, threatened, species of special concern, and plants and wildlife with other special designations.
Strategy 2.3.2. Assess the impact of management activities on endangered, threatened, species of special concern, and plants and wildlife with other special designations which are present on CSWMA.
Strategy 2.3.3. Do not conduct management activities or habitat manipulations in a manner which will impact endangered, threatened, species of special concern, or plants or wildlife with other special designations.
Strategy 2.3.4. Maintain secure habitat for nesting, perching, and roosting eagles by continuing to restrict vehicular access to CSWMA year around.

Objective 2.4. Assess impacts of management activities and natural events on the area's plants and animals.

Strategy 2.4.1. Collect baseline and trend data on vegetation and wildlife.
Strategy 2.4.2. Develop a plan for monitoring vegetation and wildlife. This plan will be completed by the Spring of 1997.

Goal 3. Increase the public's understanding and appreciation of CSWMA and the associated habitat types and wildlife species.

Objective 3.1. Assess the public use of and interest in CSWMA.

Strategy 3.1.1. Conduct informal surveys of CSWMA users to determine what types of activities they are participating in, where they are from, what their interests and needs are, etc.

Objective 3.2. Provide for a variety of wildlife related recreational and educational activities which do not lead to habitat degradation or impacts to wildlife populations nor conflict with CSWMA mission statement.

Strategy 3.2.1. Allow foot, boat, bike and horse access to CSWMA.
Strategy 3.2.2. Construct a photography/viewing blind near a wetland area for wildlife observation by year 2000.
Strategy 3.2.3. Construct a interpretive trail from Beaver Dick Park into CSWMA and through the cottonwood forested area. Develop a self-guided brochure for this trail by year 2000.
Strategy 3.2.4. Encourage elementary and high school classes to visit the area to learn more about wildlife, habitat, and the importance of Department owned/managed lands.
Strategy 3.2.5. Monitor and manage public uses on CSWMA to insure they do not result in habitat degradation or wildlife disturbance during critical times.
Strategy 3.2.6. Allow retriever trials and dog training within the Department's designated time frame. Vehicular access for these events will be restricted.

Objective 3.3. Provide information to the public about CSWMA.

Strategy 3.3.1. Develop a brochure and map of CSWMA for general public use by 1998.
Strategy 3.3.2. Develop a wildlife species list for CSWMA which can be used by the public while viewing wildlife by 1998.
Strategy 3.3.3. Write newspaper articles and news releases, conduct tours, etc., to promote CSWMA and its wildlife and recreational values as opportunity and need arise.

Objective 3.4. Maintain a positive working relationship with neighboring landowners, other management agencies, local officials, and wildlife conservation groups.

Strategy 3.4.1. Maintain clearly marked boundaries between CSWMA and private property.
Strategy 3.4.2. Cooperatively maintain fences and control noxious weeds where necessary and possible.
Strategy 3.4.3. Promote the "Ask First" philosophy to CSWMA users in all literature and information about CSWMA.
Strategy 3.4.4. Maintain a good working relationship with Egin Bench Canal Company and work to cooperatively control purple loosestrife along the canal upstream from CSWMA.
Strategy 3.4.5. Continue to work cooperatively with Madison County Parks and Recreation Department to maintain the shelterbelt on CSWMA property.
Strategy 3.4.6. Maintain a working relationship with Adopt-A-Wetland volunteers and expand the program on CSWMA as the need or interest arises.

Strategy 3.4.7. Develop a cooperative agreement with the BLM to formally allow its parcels which lie between CSWMA and the Henrys Fork River to be managed in conjunction with CSWMA. Obtain a signed agreement by 1999.

Goal 4. Maintain big game habitat and big game hunting on CSWMA.

Objective 4.1. Assess big game use of the CSWMA.

Strategy 4.1.1. Estimate population numbers, seasons of use, and important areas or features by direct observations and user surveys.
Strategy 4.1.2. If aerial big game surveys are conducted for unit 63A, obtain data specific to CSWMA and surrounding area.

Objective 4.2. Maintain habitat for big game.

Strategy 4.2.1. Control noxious weeds to the extent possible using chemical, mechanical, and biological control in order to maintain a quality forage base.]
Strategy 4.2.2. Maintain shrub and tree communities as thermal and security cover and as browse.
Strategy 4.2.3. Continue to limit vehicular access to minimize disturbance and provide security.
Strategy 4.2.4. Construct fences which allow easy and safe big game passage.

Objective 4.3. Provide quality public hunting opportunities.

Strategy 4.3.1. Allow nonmotorized access into the area.

Goal 5. Maintain huntable populations of upland game on CSWMA.

Objective 5.1. Manage and develop habitat for upland game where potential exists.

Strategy 5.1.1. Estimate the population levels of pheasant, gray partridge, and rabbits using direct observation and user surveys.
Strategy 5.1.2. Install a permanent diversion in the main canal to feed CSWMA irrigation ditch to make irrigation more efficient and effective for growing food plots, shrub/tree plantings, and perennial grass/forb cover planting.
Strategy 5.1.3. Plant perennial food plants in portions of the irrigated agricultural field.
Strategy 5.1.4. Plant shrubs in portions of the irrigated field.
Strategy 5.1.5. Use passive predator management to limit predator habitat on CSWMA. This would include but not be limited to removing debris and burning brush piles (potential homes for mammalian predators).

Strategy 5.1.6. Work with neighboring landowners using Habitat Improvement Program (HIP) funds to develop upland bird habitat where possible.

Research, Monitoring, and Evaluation Activities

Fisheries

BPA funded – Subbasin level

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 inventory phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the middle and upper Snake River provinces, and concurrent habitat measurements are being used to 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 three 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 Teton in the Henrys Fork subbasin. 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 in test streams, the brook trout population has not been reduced (Meyer 2000; Meyer and Lamansky in review). 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 inventory phase is still underway and not yet 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 in review). However, in a study of Yellowstone cutthroat trout in southeast Idaho, cutthroat trout densities have remained unchanged and size structure has 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).

Non-BPA funded - Subbasin level

Research efforts that involve aquatic resources in the Henrys Fork subbasin are extensive and have been compiled in a bibliography by Van Kirk (2000). Recent research, monitoring, and habitat improvement projects have been included in this section.

From 1996 to 1999 the Henry's Fork Foundation conducted a recognizance level fish and fish habitat assessment of all the fish-bearing streams in the upper and lower Henrys Fork hydrologic units (Gregory 1997a, 1998a, 2000a, and Gregory and Van Kirk 1998). This study, when combined with work conducted by the USFS (as reported in Jaeger et al. 2000) and IDEQ on Teton hydrologic unit streams (Hill 2001) provides a subbasin-wide assessment of trout distributions (Appendix A) and a nearly complete subbasin view of fish habitat.

The IDEQ has completed a water quality assessment for the Upper Henrys hydrologic unit (Hill and Mebane 1998) and a draft assessment and TMDL for the Teton hydrologic unit (Hill 2001). The Lower Henrys hydrologic unit, which is essentially the main river from Ashton Dam to the mouth and the Fall River drainage, contains no Water Quality Limited (Clean Water Act §303(d)) streams. Therefore, neither a water quality assessment nor a TMDL is required for the Lower Henrys hydrologic unit. The IDEQ's TMDL program is a three-step process that includes 1) preparation of a water quality assessment, 2) development of a TMDL or Watershed Management Plan, and 3) development of an Implementation Plan (Hill 2001). The purpose of the assessment is to:

- describe the physical, biological, and cultural attributes of the hydrologic unit, particularly in relation to surface water resources,
- summarize existing water quality information available for the hydrologic unit,
- describe applicable water quality standards,
- identify and evaluate pollution sources and disturbance activities that contribute to impairment of water quality,
- summarize past and present pollution control efforts, and
- outline water quality management needs including identification of those waterbodies that a) require development of a TMDL, b) may be removed from the § 303(d) list because they are not impaired, c) are not subject to TMDL development because the pollutant responsible for impairment is habitat modification or flow alteration, or d) are candidates for § 303(d) listing.

If the water quality assessment demonstrates that a waterbody identified on Idaho's § 303(d) list is not water quality-impaired and does not require development of a TMDL, IDEQ will develop a revised § 303(d) list that excludes that waterbody. If EPA approves the revised list, a TMDL will not be developed for the excluded waterbody. Conversely, if the subbasin assessment demonstrates that a waterbody is water quality-impaired, the waterbody will be included on the next § 303(d) list prepared for submission to EPA. Development of a TMDL or management and control plan for newly listed waterbodies will be delayed until at least 2006, following completion of the current TMDL schedule. During this time, it is possible that the waterbody will be restored to a condition that meets water quality standards, making development of a TMDL unnecessary. Currently, 14 stream segments in the subbasin are listed on the §303(d) list (Figure 14).

A whirling disease risk assessment has been conducted for the Henrys Fork subbasin (Gustafson 1998). This assessment is based on occurrence of *Tubifex tubifex,* the only known secondary host for the parasite *Mysobolus cerebralis*, which is the causative agent of whirling disease. Risk was considered high when *Tubifex* was present in the stream or when invertebrate biodiversity was low. Eight areas were identified as "high risk" areas based on these criteria (Figure 19). These areas were streams from Henrys Lake Flat downstream to Island Park Reservoir, the lower watershed of Sheridan Creek, Island Park Dam tailwater, Osborne Springs, Lower Warm River, Porcupine Creek, Lower Fall River and the entire lower elevation area of the Teton River drainage. All of the large springs of the Henrys Fork headwaters and most of the mountain forest streams were listed at low risk. Risk may be reduced in some areas by high summer temperatures and large numbers of non-host worm species.

BPA funded – Project level

None

Wildlife

BPA funded – Subbasin level

None

Non-BPA funded - Subbasin level

None

BPA funded – Project level

None

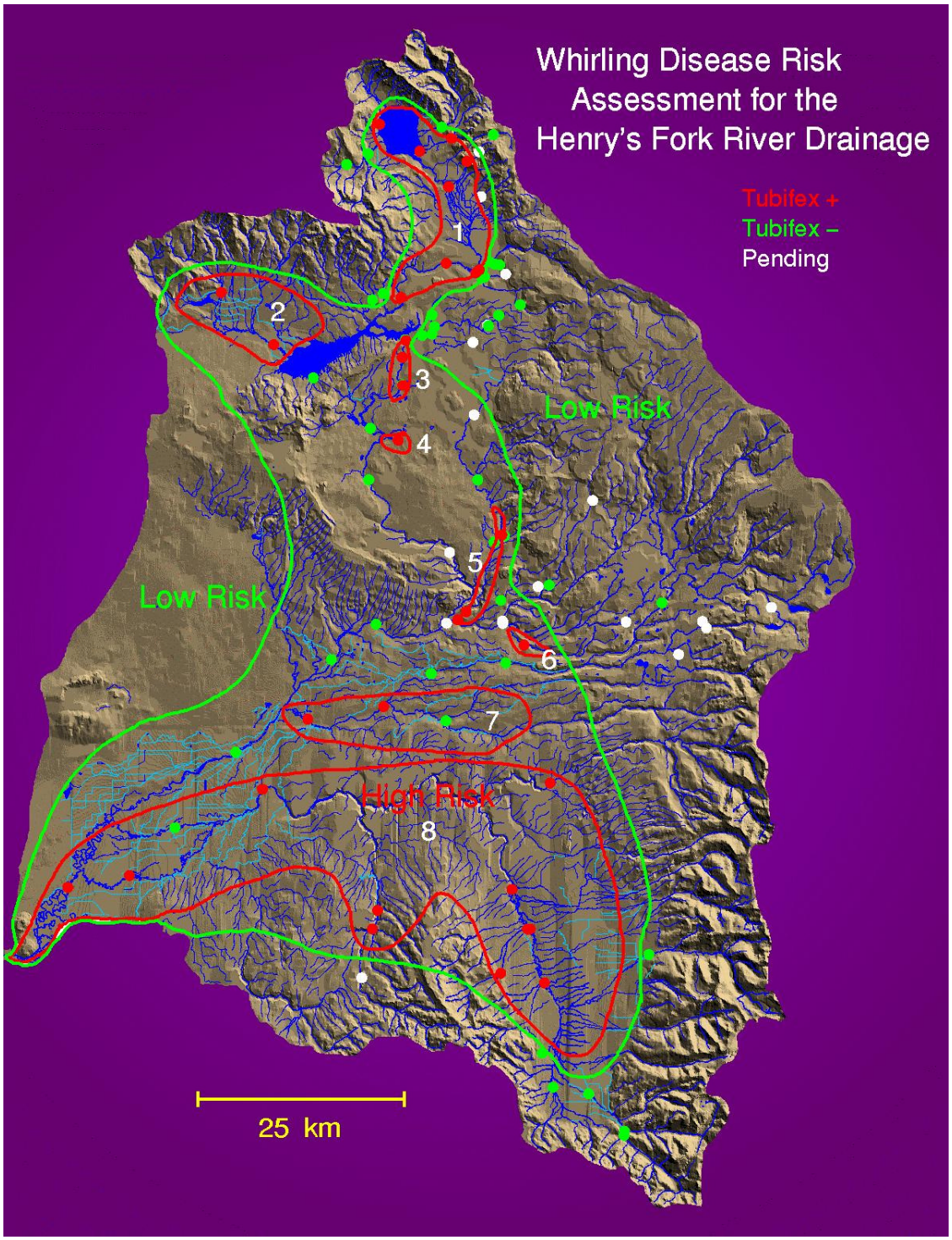

Figure 19. Areas of high and low risk for whirling disease (based on occurrence of Tubifex tubifex) in the Henrys Fork subbasin (D. Gustafson, Montana State University, Bozeman, MT)

Statement of Fish and Wildlife Needs

Protected Areas (Habitat)

Although land protection along the Henrys Fork, Teton, Fall, and other primary streams in the subbasin is well underway, development pressures in these areas are at unprecedented levels. The result of projected development could be substantial and permanent loss of vital fish and wildlife habitats and water quality and quantity. This threat gives rise to two prominent needs within the subbasin.

- There is a lack of proactive land protection planning in the Henrys Fork subbasin. A current effort to prioritize lands and resources for conservation is underway within the Henry's Fork Corridors Working Group, facilitated by the Teton Regional Land Trust and many other partners. However, long-term success of this project requires resources needed to compile and map data.
- Lands along the river corridors that feature the best habitats and the greatest development threats need to be protected as open space for the benefit of fish and wildlife and future generations of people to enjoy.

In addition, the following restoration, enhancement and management actions are needed to improve fish and wildlife habitat throughout the subbasin.

- Restore and enhance upland, riparian, wetland, and in-stream fish and wildlife habitat.
- Develop comprehensive land management programs and spatially linked databases identifying important fish and wildlife habitats, habitat quality, and habitat connectivity.
- Construct fencing along upland, riparian, wetland and stream habitat for protection from inappropriate livestock grazing, and/or degradation from human uses.
- Identify important fish and wildlife areas and fund programs for conservation easements, exchanges, supplemental payments, and/or fee title acquisition. Areas would include but not limited to native grouse habitats, winter range 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.
- Identify important fish and wildlife areas and fund programs for habitat improvements. Areas would include those mentioned above.
- 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.
- Develop and/or implement management plans for federal and state species of special concern and sensitive species.
- Develop and implement a 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.
- Mitigate for destroyed and altered fish and wildlife habitat due to the Teton Dam failure.
- Identify and protect big game migration corridors.

- Monitor angler and/or other recreational use of streams, rivers, lakes, and reservoirs. Develop and implement comprehensive management plans for recreational activities to minimize conflict with fish and wildlife and their habitats.

Fisheries

Native fish species

- Continue to inventory native salmonids 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 or where there is a need to enhance distribution and self sustaining viability of existing populations.
- Use genetic markers to detect and quantify levels of hatchery produced *O. mykiss* introgression within native Yellowstone cutthroat trout populations and to delineate genetic population structure of Yellowstone cutthroat trout throughout their historic range. This fundamental genetic information with regards to 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. 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.
- Evaluate potential impacts of private stocking of fish on Yellowstone cutthroat trout.

Fish populations in general

- Develop improved hatchery supplementation tools and products.
- Evaluate the Utah chub population and in Henrys Lake and methods for its control.
- Evaluate control methods, including predatory fish, for suckers and Utah chubs in Island Park reservoir.

Flow Management

- Identify impacts of flow regime to various fish and wildlife populations in all reaches of the Henrys Fork so that informed decisions can be made on utilization of available water for the benefit of the maximum number of species.
- 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.
- Acquire water rights for fish and wildlife benefits.

- Identify and address low flow and dewatering problems in lotic and lentic systems.
- Evaluate impacts of various ramping rates of flows from dams on fish and wildlife habitat and populations.
- Develop and implement plans for ramping rates, shape and timing of flow releases.
- Develop comprehensive water management plans to obtain appropriate maintenance flows, minimum pool levels, water temperatures, and nutrient and sediment levels for fish and wildlife.
- Identify and correct fish passage and entrainment problems.

Water Quality

- Restore, maintain, and protect spawning and rearing areas through implementation of sediment control measures specified in the TMDL implementation plan for the Teton hydrologic unit.
- Restore, maintain, and protect conditions suitable for cold water aquatic biota through implementation of temperature control measures specified in the TMDL implementation plan for the Teton hydrologic unit.
- Determine whether statewide temperature criteria are appropriate for the Henrys Fork subbasin for protecting various life stages of salmonid and non-salmonid fish and their macroinvertebrate food sources.
- Determine the origins of elevated concentrations of nitrogen in the Teton River upstream of Highway 33.
- Characterize of the biogeochemical cycle of nitrogen in the upper Teton River.
- Characterize of the effects of nitrogen concentrations on aquatic biota in the Teton River upstream of the confluence of Bitch Creek.
- Characterize the influence of ground water on the physical and chemical composition of surface water throughout the subbasin.
- Establish groundwater and stream sampling locations for long-term water quality monitoring.
- Update the streambank erosion inventories conducted by the US Department of Agriculture to prepare the Teton River Basin in 1999
- Determine how changes in land use from agriculture to residential development will alter sources of nonpoint-source pollutants and their transport to surface and ground waters

Wildlife

Trumpeter Swans

- Monitor winter distribution and abundance.
- Monitor 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 Henrys Fork.
- Correct habitat problems in specific nesting territories.
- Research seasonal movements and habitat use.
- Haze and translocate birds out of high-risk areas.

Elk

- Conduct sightability estimates in the Island Park zone periodically to monitor progress toward achieving population objectives. This information is also valuable to assess the results of the recently-implemented travel management policy on the Targhee National Forest.
- Conduct a comprehensive inventory of winter range in the Teton zone to accomplish the objective of ending annual winter-feeding. The condition of some winter ranges may provide an opportunity for enhancement for elk through burning or changes in livestock management.
- As part of the above assessment, an assessment of the location, quality, and remaining terms of enrollment of the area's CRP lands is key if winter-fed populations in this zone are to become self-sufficient.
- Obtain information on snowmobile use of these lands. If these lands are to be made available to elk, snowmobiles should be discouraged.

Canada Lynx

- Inventory and monitor lynx distribution, lynx habitat conditions, and effectiveness and validation of conservation measures.

Grizzly Bears

- Continue a coordinated, interagency grizzly bear management and monitoring program that crosses jurisdictional and geographic boundaries.

Henry's Fork Subbasin Recommendations

Henry's Fork is now part of Snake Upper Subbasin. Projects located in Henry's Fork are reviewed as part of Snake Upper.

References

Anderson, E. 1996. Stream geomorphology and hydrology of the upper Henry's Fork watershed. Project completion report for the Henry's Fork Foundation, Ashton, ID and the Targhee National Forest, St. Anthony, ID. Department of Earth Sciences, Idaho State University, Pocatello, ID.

Arbuckle, C. 1900. First biennial report of the state fish and game warden. IDFG, Boise, ID.

Aslett, D. 1998. Management Plan for Sand Creek Wildlife Management Area. IDFG, Idaho Falls, ID.

Behnke, R. 1992. Native trout of western North America. American Fisheries Society Monograph 6. American Fisheries Society, Betheseda, MD.

Benjamin, L. 1997. Hydrologic analysis of the upper Henrys Fork basin and probabilistic assessment of Island Park Reservoir fill. Master's Thesis, Utah State University, Logan, UT.

Benjamin, L. 2000. Groundwater hydrology of the Henry's Fork springs. Intermountain Journal of Sciences 6:119-142.

Benjamin, L., and R. Van Kirk. 1999. Assessing instream flows and reservoir operations on an eastern Idaho river. Journal of the American Water Resources Association 35:899-910.

Blandford, D. 2000. Teton Basin beaver Inventory. Prepared for the Caribou Targhee National Forest, Idaho Falls, ID.

BLM, and USFS 1991. Snake River Activity/Operations Plan Final. Bureau of Land Management, Idaho Falls District, Medicine Lodge Resource Area, and U.S. Forest Service, Targhee National Forest, Palisades Ranger District

Bradford, D., F. Tabatabai, and D. M. Graber. 1993. Isolation of remaining populations of the native frog, *Rana muscosa*, by introduced fishes in Sequoia and Kings Canyon National Parks, California. Conservation Biology 7:882-888.

Brooks, C. 1986. The Henry's Fork. Winchester Press, Piscataway, NJ.

Christiansen, R. 1982. Late Cenozoic volcanism of the Island Park area, eastern Idaho. Pp. 345-368 in: B. Bonnichsen and R. M. Breckenridge, eds., Cenozoic geology of Idaho. Idaho Bureau of Mines and Geology Bulletin 26. Boise, ID.

Christiansen, R., and G. Embree. 1987. Island Park, Idaho; transition from rhyolites of the Yellowstone Plateau to basalts of the Snake River Plain. Pp. 103-108 in: Geological Society of American Centennial Field Guide Rocky Mountain Section.

Compton, B. 2001. Upland Game Surveys and Inventories Progress Report. W-170-R-25. IDFG, Boise. 16pp.

Contor, C. 1989. Diurnal and nocturnal winter habitat utilization by juvenile rainbow trout in the Henry's Fork of the Snake River, Idaho. Master's thesis, Idaho State University, Pocatello, ID.

Coyner, J. 1989. Status check on reported historic populations of Spiranthes diluvialis. Memorandum, U.S. Fish and Wildlife Service, Salt Lake City, Utah. 9 pp.

Coyner, J. 1990. Report for population study Spiranthes diluvialis. Unpublished report. Bureau of Land Management and Red Butte Gardens, University of Utah, Salt Lake City. 29 pp.

Crowley, C. and J. Connelly. 1996. Sage Grouse Population and Habitat Trends in Southeastern Idaho and Southwestern Montana. IDFG, Pocatello. 204pp.

Crowley, C. and W. Connelly. 1997. Trends in Agricultural Lands in Sage Grouse Range in Southeast Idaho and Southwest Montana. IDFG, Pocatello. 56pp.

Elle, S., and C. Corsi. 1994. Regional fisheries management investigations, Project F-71-R-13, Job 6-c. IDFG, Idaho Falls, ID.

Fremont-Madison Irrigation District. 1992. Fremont-Madison Irrigation District management program scoping study. Report to USDI Bureau of Reclamation. Fremont-Madison Irrigation District, St. Anthony, ID.

Green, D. 1990. History of Island Park. Gateway Publishing, Ashton, ID.

Gregory, J. 1997a. Upper Henrys Fork habitat assessment headwaters to Island Park Dam summer 1996. Report to Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J. 1997b. Spring spawning on the Henrys Fork and tributaries upstream from Riverside Campground. Project completion report for the Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J. 1998a. Henrys Fork habitat assessment Fall River drainage summer 1998. Report to Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J. 1998b. Winter use of artificial structures and an off channel canal by juvenile rainbow trout in the Henrys Fork of the Snake River. Report of Gregory Aquatics, Mackay, ID, to the Henry's Fork Foundation, Island Park, ID.

Gregory, J. 1999. Preliminary study of trout and microhabitat in the upper Henrys Fork near the Flat Rock Club. Report to Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J. 2000a. Henrys Fork basin habitat assessment Henrys Fork (Island Park to mouth) and Bend Ridge summer 1999. Report to Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J. 2000b Abundance of Redds and Age-0 trout on The Nature Conservancy's Flat Ranch. Report of Gregory Aquatics, Mackay, ID, to The Nature Conservancy, Idaho Falls, ID.

Gregory, J. 2000c. Winter fisheries research and habitat improvements on the Henry's Fork of the Snake River. Intermountain Journal of Sciences 6:232-248

Gregory, J. 2000d. Downstream migration of rainbow and brook trout in the Buffalo River during 1999. Report to the Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J. 2000e. Winter Use of an Off Channel Canal by Juvenile Rainbow trout in the Henrys Fork of the Snake River, Idaho. Report to Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J. 2001a. Henrys Fork Long Term Monitoring. Report to Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J. 2001b. Use of the buffalo fish ladder by upstream migrating rainbow trout. Report to Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gregory, J., and J. Griffith. 1996. Winter concealment by subyearling rainbow trout: space size selection and reduced concealment under surface ice and in turbid water conditions. Canadian Journal of Zoology 74:451-455.

Gregory, J., and J. Griffith. 2000. First-winter survival of caged wild and hatchery cutthroat trout in allopatry and in sympatry with brook trout. Intermountain Journal of Sciences 6:217-222.

Gregory, J., and R. Van Kirk. 1998. Henrys Fork habitat assessment Island Park Dam to Warm River summer 1997. Report to Henry's Fork Foundation, Ashton, ID. Gregory Aquatics, Mackay, ID.

Gresswell, R. 1995. Yellowstone cutthroat trout. Pp. 36-54 in M. K. Young, ed., Conservation assessment for inland cutthroat trout. General Technical Report RM-GTR-256, USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Griffith, J. 1988. Review of competition between cutthroat trout and other salmonids. American Fisheries Society Symposium 4:134-140.

Griffith, J. and R. Smith. 1995. Failure of submersed macrophytes to provide cover for rainbow trout throughout their first winter in the Henry's Fork of the Snake River, Idaho. North American Journal of Fisheries Management 15:42-48.

Griffith, J., R. Smith, and C. Brand 1990. Evaluation of instream habitat structures in the Henry's Fork of the Snake River. Report from Department of Biological Science, Idaho State University, Pocatello, ID, to the Targhee National Forest, St. Anthony, Idaho.

Gustafson, D. 1998. Whirling disease and *Tubifex tubifex* risk assessment for the Henry's Fork River Drainage. Department of Biology, Montana State University, Bozeman, MT.

Hackett, B., and B. Bonnichsen. 1994. Volcanic Crescent. Pp. 24-61 in: T. Shallat, ed., Snake: the plain and its people. Boise State University, Boise, ID.

Hill, S. 2001. Teton subbasin assessment and total maximum daily load (TMDL), Idaho Department of Environmental Quality, Idaho Falls, ID.

Hill, S. and C. Mebane. 1998. Upper Henry's Fork Subbasin Assessment, Idaho Department of Health and Welfare, Division of Environmental Quality, Idaho Falls, ID.

Idaho Department of Fish and Game [IDFG]. 1940. Eighteenth biennial report, 1939-40. Boise, ID.

IDFG. 1958. Twenty-seventh biennial report, 1956-58. Boise, ID.

IDFG. 1968. Thirty-second biennial report, 1966-68. Boise, ID.

IDFG. 1998. Federal Aid in Sports Restoration 1997 Annual Performance Report, Upper Snake Regional Report. Idaho Fish and Game, Boise, Idaho. 50pp.

IDFG. 1999. Federal Aid in Sports Restoration 1998 Annual Performance Report, Upper Snake Regional Report. Idaho Fish and Game, Boise, Idaho. 50pp.

IDFG. 2000. Federal Aid in Sports Restoration 1999 Annual Performance Report, Upper Snake Regional Report. Idaho Fish and Game, Boise, Idaho. 50pp.

IDFG. 2001. Fisheries Management Plan 2001-2006. 307pp. Boise, ID.

Idaho Partners in Flight, 2000. Idaho Bird Conservation Plan. Version 1.0 January 2000. 166pp.

Idaho Sage Grouse Task Force. August 1997. Idaho Sage Grouse Management Plan. 34pp.

Idaho Water Resource Board [IWRB]. 1992. Comprehensive State Water Plan: Henrys Fork.

Idaho Wildlife Brucellosis Task Force. Wildlife Brucellosis Task Force Report and Recommendations. October 1998. 20pp.

Interagency Grizzly Bear Committee [IGBC]. 1994. Interagency grizzly bear committee taskforce report: Grizzly bear motorized access management.

Jaeger, M. 1998. Final report, Targhee trout restoration project #97-CCS-0401. Henry's Fork Foundation, Ashton, ID.

Jaeger, M., R. Van Kirk, and T. Kellogg. 2000. Status of Yellowstone cutthroat trout in the Henry's Fork watershed. Intermountain Journal of Sciences 6:197-216.

Jankovsky-Jones, M. 1996. Conservation stratagey for Henrys Fork basin wetlands. Report by Conservation Data Center, IDFG, Boise, ID 83707. DEQ Standard Contract # QCO17100

Jankovsky-Jones, M., and N. Bezzerides. 2000. Riparian ecology in the Henry's Fork watershed. Intermountain Journal of Sciences 6:159-177.

Jennings, W.F. 1989. Final report. Species studied: Eustoma grandiflorum, Spiranthes diluvialis, Malaxis brachypoda, Hypoxis hirsuta, Physaria bellii, Aletes humilis.Unpublished report prepared for the Nature Conservancy under the Colorado

Natural History Small Grants Program. The Nature Conservancy, Boulder, Colorado. 48 pp.

Jennings, W.F. 1990. Final report. Species studied: Spiranthes diluvialis, Sisyrinchium pallidum. Unpublished report prepared for The Nature Conservancy under the Colorado Natural History Small Grants Program. The Nature Conservancy, Boulder, Colorado. 29 pp.

Jeppson, P. 1966. Tests for increasing returns of hatchery trout. Project F-32-R-8, Job 1. IDFG, Boise, ID.

Jeppson, P. 1969. Tests for increasing the returns of hatchery trout. Project F-32-R-11, Job 8. IDFG, Boise, ID.

Jeppson, P. 1973. Snake River fisheries investigations. Project F-63-R-3, Job III-a. IDFG, Idaho Falls, ID.

Jones, O. 1921. Eighth biennial report of the state game warden, 1919-20. IDFG, Boise, ID.

Jordan, D. 1889. A reconnaissance of the streams and lakes in Yellowstone National Park, Wyoming, in the interest of the United States Fish Commission. Bulletin of the U.S. Fish Commission 9:41-63.

Leonard, K.M. 1998. Distribution, Movements, and Habitats of Sage Grouse on the Upper Snake River Plain: Changes From the 1950's to the 1990's. M.S. Thesis. University of Idaho, Moscow.

Madison Soil and Water Conservation District 2001. Madison SWCD Resource Conservation Plan 2001. Rexburg, ID.

Maiolie, M. 1987. Ashton Reservoir fishery enhancement evaluation. IDFG, Idaho Falls.

Mali, A. 1998. Buffalo River project: fish ladder and smolt trap. Henry's Fork Foundation, Ashton, ID.

Marston, R., and J. Anderson. 1991. Watersheds and vegetation of the Greater Yellowstone Ecosystem. Conservation Biology. 5:338-346.

May, B. 1996. Yellowstone cutthroat trout (Oncorhynchus clarki bouvieri). Pp. 11-34 in D. Duff, tech. ed., Conservation assessment for inland cutthroat trout status and distribution. U.S. Department of Agriculture, Forest Service, Intermountain Region, Ogden, UT.

Merigliano, M. F. 1996. Ecology and Management of the South Fork Snake River Cottonwood Forest. Idaho BLM Technical Bulletin 96-9. Bureau of Land Management, Boise, ID.

Meyer, K. 1995. Experimental evaluation of habitat use and survival of rainbow trout during their first winter in the Henrys Fork of the Snake River, Idaho. Master's thesis, Idaho State University, Pocatello, ID.

Meyer, K. 2000. Assessment of native salmonids above Hell's Canyon Dam, Idaho. IDFG annual report to Bonneville Power Administration, Report number 00-60.

Meyer, K. and J. Lamansky. In review. Assessment of native salmonids above Hell's Canyon Dam, Idaho. IDFG annual report to Bonneville Power Administration.

Meyer, K. A., D. J. Schill, F. S. Elle, and W. C. Schrader. In review. A comparison of Yellowstone cutthroat trout abundance and size structure from the 1980s to 1999-2000 across their historical range in Idaho. North American Journal of Fisheries Management.

Mitro, M. 1999. Sampling and analysis techniques and their application for estimating recruitment of juvenile rainbow trout in the Henrys Fork of the Snake River, Idaho. Ph.D. dissertation, Montana State University, Bozeman, MT 288 pp.

Montgomery Watson. 1996. Henry's Lake clean lakes project. Report to Idaho Department of Health and Welfare, Division of Environmental Quality, Idaho Falls, ID. Montgomery Watson Consultants, Boise, ID.

Nelle, P.J., K.P. Reese, and J.W. Connelly. 2000. Long-term effects of fire on sage grouse habitat. J. Range. Manage. 53:586-591.

Omernik, J. 1987. Ecoregions of the conterminous United States. Annals of the Association of American Geographers 77:118-125 plus map supplement.

Randle, T., J. Bountry, R. Klinger, and A. Lockhart. 2000. Geomorphology and river hydraulics of the Teton River upstream of Teton Dam, Teton River, Idaho. USDI Bureau of Reclamation, Denver, CO.

Reisner, M. 1993. Cadillac Desert. Penguin Books, New York, NY.

Rieman, B. E., and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. Gen. Tech. Rep. INT-302. U.S. Forest Service, Intermountain Research Station, Ogden, UT. 38 p.

Rohrer, R. 1983. Henrys Fork Fisheries Investigations. Project F-73-R-4, Subproject IV, Study XI. IDFG, Idaho Falls, ID.

Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger and A. Williamson. 2000. Canada Lynx Conservation Assessment and Strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management and USDI National Park Service. USFS Publication #R1-00-53, Missoula, MT. 142pp.

Saab, V.A. 1998. Effects of recreational activity and livestock grazing on habitat use by breeding birds in cottonwood forests along the South Fork Snake River. Idaho Bureau of Land Management Tech. Bull. No. 98-17. Boise, ID. 48 pp.

Simpson, J. 1948. Long-range fishing policy based on factual research. Idaho Wildlife Review 1(4):1-2.

Simpson, J. and R. Wallace. 1982. Fishes of Idaho. University of Idaho Press, Moscow, ID.

Smith, R. 1992. Effects of concealment cover availability and water temperature on overwinter survival and body condition of juvenile rainbow trout in the Henry's Fork of the Snake River, Idaho. Master's thesis, Idaho State University, Pocatello, ID.

Southeast Idaho Wetland Focus Area Working Group. 2001. Southeast Idaho Wetland Focus Area Wetland Conservation Plan: Intermountain West Joint Venture.

Spateholts, R., and V. Moore. 1985. Henrys Fork fisheries investigations. Project F-73-R-6, Subproject IV, Study III. IDFG, Idaho Falls, ID.

Stebbins, R.C. 1985. A field guide to western reptiles and amphibians. Houghton Mifflin Company, Boston, MA.

Stephens, W. 1907. Biennial report of the state game warden, 1905-06. IDFG, Boise, ID.

Stephens, W. 1909. Second biennial report of the state game warden, 1907-08. IDFG, Boise, ID.

Strange, R. 1996. Field examination of Fishes in Murphy, B. and R. Willis eds. Fisheries Techniques second edition. American Fisheries Society, Bethesda, MD.

Subcommittee on Rocky Mountain Trumpeter Swans. 1998. Pacific Flyway management plan for the Rocky Mountain Population of trumpeter swans. Pacific Flyway Study Committee, (C/O U.S. Fish and Wildlife Service), Portland, OR. Unpublished Report, i. + 74pp

Targhee National Forest 1997. 1997 Revised Forest Plan Targhee National Forest. Idaho Falls, ID.

Teton Conservation District 2001. Teton Conservation District Resource Conservation Plan 2001. Driggs, ID.

Thomas, R. 1925. Tenth biennial report of the state game warden, 1923-24. IDFG, Boise, ID.

Thurow, R., C. Corsi, and V. Moore. 1988. Status, ecology, and management of Yellowstone cutthroat trout in the upper Snake River drainage, Idaho. American Fisheries Society Symposium 4:25-36.

United States Commission on Fish and Fisheries [USCFF]. 1877. Report of the commissioner. Washington, DC.

USCFF. 1897. Report of the commissioner. Washington, DC.

USCFF. 1898. Report of the commissioner. Washington, DC.

USCFF. 1899. Report of the commissioner. Washington, DC.

USCFF. 1901. Report of the commissioner. Washington, DC.

USCFF. 1905. Report of the commissioner. Washington, DC.

U.S. Department of the Interior, Environment Canada, and Secretario De Desarrollo Social Mexico. 1998. The 1998 Update to the North American Waterfowl Management Plan: Expanding the Vision. Washington, D.C. 32pp.

United States Fish and Wildlife Service [USFWS]. 1984. American peregrine falcon recovery plan (Rocky Mountain/southwest population). USFWS, Denver, CO. 105 pp.

USFWS 1995. Snake River Aquatic Species Recovery Plan. Washington, D.C. 92 pp.

USFWS. 1994. Establishment of a Nonessential Experimental Population of Gray Wolves in Yellowstone National Park in Wyoming, Idaho, Montana; Central Idaho and Southwestern Montana; Final Rules. Federal Register, Vol. 59 No. 224 pp. 60252-60281.

United States Forest Service [USFS]. 1979. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. Agric. Handb. 533 Washington, D.C.: U.S. Department of Agriculture, Forest Service. (Agric. Handbook.; v. 533)

USFS 1992. Risk Assessment for Herbicide Use in Forest Service Regions 1, 2, 3, 4 and 10 and on Bonneville Power Administration Sites, Prepared for USDA Forest Service under contract number 53-3187-9-30.

Van Kirk, R. 2000. Henry's Fork aquatic resources bibliography. Intermountain Journal of Science 6:312-332.

Van Kirk, R. 1999. Status of fisheries and aquatic habitats in the Greater Yellowstone Ecosystem. Report to the Greater Yellowstone Coalition, Bozeman, MT. Department of Biological Sciences, Idaho State University, Pocatello, ID.

Van Kirk, R. and A. Zale, editors. 2000. Aquatic Resources of the Henry's Fork Watershed. Intermountain Journal of Sciences 6(3).

Van Kirk, R. and C. Griffin. 1997. Building a collaborative process for restoration: Henrys Fork of Idaho and Wyoming. Pp. 253-276 in J. E. Williams, C. A. Wood, and M. P. Dombeck, eds., Watershed restoration: principles and practices. American Fisheries Society, Bethesda, MD.

Van Kirk, R. and L. Benjamin. 2000. Physical and human geography of the Henry's Fork watershed. Intermountain Journal of Sciences 6:106-118.

Van Kirk, R. and S. Beesley. 1999. Downstream migration of rainbow trout in the Buffalo River during 1997 and 1998. Henrys Fork Foundation, Ashton, ID.

Van Kirk, R., and M. Gamblin. 2000. History of fisheries management in the upper Henry's Fork watershed. Intermountain Journal of Sciences 6:263-284.

Van Kirk, R., L. Benjamin, and D. Patla. 2000. Riparian area assessment and amphibian status in the Greater Yellowstone Ecosystem. Greater Yellowstone Coalition, February 2000.

Varley, J., and P. Schullery. 1998. Yellowstone fishes. Stackpole Books, Mechanicsburg, PA.

Varley, J., and R. Gresswell. 1988. Ecology, status, and management of the Yellowstone cutthroat trout. American Fisheries Society Symposium 4:13-24.

Wackenhut, M. and K. Ragotzkie. 1998. Management Plan for Cartier Slough Wildlife Management Area. IDFG, Idaho Falls, ID.

Wales, J. 1939. General report of investigations on the McCloud River drainage in 1938. California Fish Game 25:272-309.

Watson, M. 1996. Henry's Lake clean lakes project. Report to Idaho Department of Health and Welfare, Division of Environmental Quality, Idaho Falls, ID. Montgomery Watson, Boise, ID.

Weber. E. 2000. Cooperative watershed management and research: the case of the Henry's Fork Watershed Council. Intermountain Journal of Sciences 6:293-311.

Whitehead, R. 1978. Water resources of the upper Henry's Fork basin in eastern Idaho. Water Information Bulletin Number 46, Idaho Department of Water Resources. Boise, ID. 91 pp. plus maps.

Williams, R., M. Powell, R. Evans, and D. Shiozawa. 1998. Genetic analysis of putative Yellowstone cutthroat trout samples from the Henry's Fork Subbasin. Report to Henry's Fork Foundation, Ashton, ID. Hagerman Fish Culture Experiment Station, Hagerman, ID.

Wyoming Game and Fish Department. 1995. State Fisheries Management Plan, Snake River Subbasins. Wyoming Game and Fish Department, Jackson, WY.

Yellowstone Soil Conservation District [YCD]. 1995. Henry's Lake state agricultural water quality project final report/environmental assessment. Fremont County, ID.

YCD. 2001. Yellowstone Conservation District Resource Conservation Plan 2001. Saint Anthony, ID.

Young, M. K. 2001. Pheromonal attraction: the potential for selective removal of nonnative species. Page 28 *in* B. Shepard et al., editors. Practical approaches for conserving native inland fishes of the west: a symposium. American Fisheries Society, Montana Chapter, Bozeman, MT.