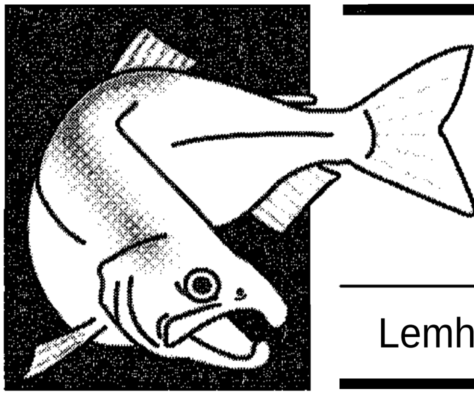

Model Watershed Plan

Lemhi, Pahsimeroi, and East Fork of the Salmon River

Prepared by:

Idaho Soil Conservation Commission

With Support of:

Custer Soil and Water Conservation District
Lemhi Irrigation District
Lemhi Soil and Water Conservation District
Model Watershed Advisory Committee
Model Watershed Technical Advisory Committee

In Cooperation with:

Bonneville Power Administration
Bureau of Land Management
Idaho Department of Fish and Game
Natural Resources Conservation Service
Northwest Power Planning Council
Shoshone-Bannock Tribe
U.S. Forest Service

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Preface

Idaho's Model Watershed Project was established as part of the Northwest Power Planning Council's plan for salmon recovery in the Columbia River Basin. The Council's charge was simply stated and came without strings. The tasks were to (1) identify actions within the watershed that are planned or needed for salmon habitat, and (2) establish a procedure for implementing habitat-improvement measures. The Council gave the responsibility of developing this project to the Idaho Soil Conservation Commission.

This Model Watershed Plan is intended to be a dynamic plan that helps address these two tasks. It is not intended to be the final say on either. It is also not meant to establish laws, policies, or regulations for the agencies, groups, or individuals who participated in the plan development.

This plan and its implementation strategy will change as more is learned about the watershed and watershed processes. This is true for both the biological and social sciences. These two are intertwined and cannot be separated when it comes to actual implementation of salmon habitat projects.

It is possible to achieve long-term gains toward a more sustainable environment for fish and wildlife and the local economies supported by the watershed. This will occur when the local watershed residents support and manage the changes necessary to achieve these gains.

Ralph Swift
Model Watershed Coordinator

Acknowledgments

Development of this plan has been underway for over two years and could not have been accomplished without the assistance of many individuals, groups and agencies. It would be difficult to individually acknowledge all who helped in this process. Also, it is likely that there would be an oversight of an individual whose effort was important. Therefore, this acknowledgment focuses on groups and agencies.

The landowners in the three watersheds must be acknowledged first and foremost. This includes large landowners, as well those individuals who own smaller parcels of land. Without their cooperation, which allowed access for inventory and project development, there would be no model watershed project or plan.

The local leadership groups should be acknowledged next. These include the Custer and Lemhi Soil Conservation Districts, Lemhi Irrigation District, Water District 74, Lemhi County Land Use Planning Committee, East Fork Land Owners Association, and the Pahsimeroi Irrigators. These groups served as an important contact and sounding board for the watershed committees. Group members also spent countless hours at meetings, tours, and workshops related to this planning effort.

Many groups were also involved early in the process when the model watershed concept was being developed by the Northwest Power Planning Council. These groups included the Idaho Salmon and Steelhead Unlimited, Trout Unlimited, Idaho Conservation League, Idaho Rivers United, Idaho Farm Bureau, Shoshone-Bannock Tribe, and Nez Perce Tribe. These groups, along with others, nominated and supported the inclusion of the Lemhi, Pahsimeroi, and East Fork in the model watershed process.

These groups allowed local watershed residents to set their own direction in the planning process. This gave local residents an opportunity to set priorities and present these priorities to agencies for funding. This process has also moved beyond planning to include implementation where there has been consensus that the action was beneficial to fish or fish habitat.

Numerous agencies, such as the Idaho Soil Conservation Commission, Natural Resources Conservation Service, Bureau of Reclamation, Bureau of Land Management, Forest Service, Idaho Department of Fish and Game, Bonneville Power Administration, Idaho Department of Water Resources, Consolidated Farm Service

Agency, County Extension Service, and Shoshone-Bannock Tribe have provided invaluable technical assistance.

Agency representatives have worked together in both their traditional and non-traditional roles to assist with landowner coordination and resource inventories. They have also helped develop innovative ways to reduce resource conflicts. This could not have been accomplished without support of agency management from the top down. These agencies must be commended for cutting the red tape and helping landowners make improvements on the land where it counts.

Summary

Model Watershed Plan
Lemhi, Pahsimeroi, and East Fork of the Salmon River

Overview

Idaho's Model Watershed Project was established in 1992 as part of the regional effort to rebuild Columbia Basin salmon runs. It is one of several model watershed projects in the Pacific Northwest specifically designed to protect and restore important salmon habitat.

Three watersheds are included in Idaho's Model Watershed Project-the Lemhi, Pahsimeroi, and East Fork of the Salmon. These Salmon River tributaries once produced large numbers of salmon and steelhead. Today, populations are so low that some runs are protected under the federal Endangered Species Act.

Many factors contributed to the decline of these fish runs, including hydropower development, hatcheries, overharvest, and habitat degradation. Therefore, these runs can only be rebuilt by using a comprehensive strategy that addresses all of these factors.

The model watershed approach is just one part of this comprehensive strategy, It is designed to ensure that all human activities affecting salmon production within each subbasin are coordinated on a comprehensive watershed basis. It also is designed so that the goals of all interested parties are considered in developing watershed management strategies.

This *Model Watershed Plan* is an important part of this overall process. This plan documents the key habitat-limiting factors in each watershed. It also identifies and prioritizes goals for solving these problems.

Plan Scope and Process

The model watershed strategy is to first assess resource conditions within each watershed, then implement coordinated actions that will help rebuild salmon runs.

Approximately 90 percent of the occupied salmon habitat in these three watersheds is found on private lands. Therefore, this watershed plan focuses on the habitat problems and opportunities in these areas. Salmon habitat on public lands is being addressed through other coordinated planning efforts in the area.

Planning activities are guided by a local watershed coordinator and a 15-member advisory committee. The advisory committee is a diverse group that includes local landowners, personnel from resource management agencies, and various interested parties.

Project Objective and Goals

The advisory committee members and other interested parties developed the following objective and goals:

Project Objective: To maintain, enhance and restore anadromous and resident fish habitat, while also achieving and maintaining a balance between resource protection and resource use on a holistic watershed management basis.

Goals

- Provide for the safe and timely passage of migrating fish through critical reaches of the watershed.
- Protect spawning areas by ensuring that spawning gravels are managed to prevent habitat losses.
- Protect and manage juvenile fish rearing areas.
- Protect and enhance water quality to ensure maximum survival of juvenile fish.
- Protect and enhance instream and riparian environments to maximize fish production and escapement.
- Minimize losses of migrating fish caused by irrigation diversions.
- Ensure that any resources invested achieve maximum returns in terms of multiple-use benefits.
- Coordinate all salmon recovery activities to minimize duplication of efforts and maximize use of limited resources.
- Achieve measurable progress towards a holistic resource management approach that addresses water management, water conservation, fish habitat protection, and fish migration.
- Develop an effective and responsive resource management program (i.e., agriculture, timber, mining, fish, wildlife) for the watershed.
- Develop or adapt a holistic watershed management approach for fish habitat protection, enhancement, and restoration.

Action Plan

Resource inventories were conducted in each watershed to identify factors limiting salmon production. These inventories identified the following major problems:

- inadequate water flows
- high water temperatures
- lack of streamside vegetation
- high sediment levels
- physical barriers

To solve these problems, habitat goals were established for each watershed. These goals were then prioritized to show their relative importance in rebuilding fish runs (see accompanying table).

For each goal, the action plan also identifies one or more actions. These actions are individual projects or measures designed to help achieve that goal.

Some of the highest priority actions for each watershed are listed in the section that follows. Together, the prioritized goals and actions serve as an important blueprint that will help guide future activities within these watersheds.

Habitat Goals and Priorities within each Watershed-Lemhi River, Pahsimeroi River, and East Fork of the Salmon River

	Lemhi River Watershed					Pahsimeroi River Watershed		East Fork of the Salmon River Watershed		
Goals	River Mouth to Agency Creek	Agency Creek to Hayden Creek	Hayden Creek to Leadore	Big Springs Creek	Hayden Creek	River Mouth to Hooper Lane	Patterson-Big Springs Creek	River Mouth to Herd Creek	Herd Creek to Germania Creek	Herd Creek
Increase instream flows during critical fish migration periods	Highest	Lowest	Lowest	Lowest	Highest [1]	Highest [2]	Lowest	Lowest	Lowest	Lowest
Reduce the number of physical barriers hindering fish migrations	Highest	Lowest	Lowest	Lowest	Highest	Highest [3]	Medium [4]	Medium	Medium	Medium
Develop new rearing and resting pools	Lowest	Medium	Lowest	Medium	Lowest	Lowest	Lowest	Lowest	Medium	Lowest
Establish riparian vegetation along critical areas to provide cover & reduce temps	Medium	Medium	Highest	Highest	Lowest	Highest	Highest	Lowest	Medium	Highest
Reduce the sediment levels within spawning gravels	Lowest	Lowest	Highest	Highest	Medium	Lowest	Highest	Lowest	Lowest	Highest

● Highest priority

◍ Medium priority

○ Lowest priority

Footnotes

1 Passage is a problem in low flow years as most water goes through gravel diversion weirs, instead of over the top.

2 Additional 6-10 cfs of flow is needed directly below the Ellis ditch diversion.

3 Ellis diversion needs a fish ladder to aid fish passage during low flow periods.

4 Diversion weirs at PBSC-1, PBSC-2, and PBSC-3 lack sufficient flow for passage.

Highest Priority Actions

Lemhi River Watershed

- Implement the Bureau of Reclamation Water Conservation Project.
- Improve irrigation efficiency below diversion L-7.
- Maintain and enhance the riparian corridor along the upper 10 miles of the Hayden Creek-to-Leadore reach.
- Construct a fish ladder on the L-3 spillway
- Improve irrigation diversions that currently pose migration problems in the lower Lemhi.
- Screen the 7 diversions above currently occupied habitat in Hayden Creek.
- Stabilize streambanks in the 10-mile section from the bridge near Leadore to the Eightmile Creek confluence.

Pahsimeroi River Watershed

- Substitute water diverted from Patterson-Big Springs Creek by pumping water from the Salmon River.
- Develop water conservation agreements to reduce levels of stream diversion.
- Maintain and enhance the riparian corridor along 17 miles of critical fish habitat in the reach from the river's mouth to Hooper Lane.
- Enhance 10 miles of riparian corridor in the Patterson-Big Springs reach through selective planting of trees and shrubs.
- Improve 12 irrigation diversions to provide stable diversion points and reduce erosion (Pahsimeroi mouth to Hooper Lane).

East Fork of the Salmon River Watershed

- Enhance and protect the riparian corridor along 3 miles of Herd Creek.
- Stabilize 10,000 feet of streambank in Herd Creek where the stream has widened.
- Improve irrigation diversions to allow water management and fish protection for all diversions in the East Fork drainage.

Chapter 1

Introduction

Background

Idaho's Salmon River once produced some of the largest salmon and steelhead runs in the Columbia River Basin. Each year, thousands of adult salmon would return to this subbasin to spawn, and begin the cycle anew. Salmon were so plentiful, according to local rumor, you could cross the Salmon River on their backs.

The Lemhi, Pahsimeroi and East Fork are three Salmon River tributaries where salmon once returned in great numbers. These fish have always been an important part of the region's history, culture and economy. Salmon were originally a primary source of food and commerce for Native Americans and early white settlers. Later, as the region continued to develop, salmon and steelhead provided recreational fishing and helped support local economies.

Over the last century, salmon runs throughout the Columbia River Basin have declined dramatically. Today, only a fraction of the once-plentiful salmon runs still return to the Salmon River tributaries.

Fish runs became so low that in 1992, Snake River spring/summer chinook salmon were listed as a "threatened" species under the federal Endangered Species Act (ESA). In 1994, these chinook returns were the lowest in history and the species was reclassified as an "endangered" species.

Many factors have contributed to the decline of the region's salmon and steelhead runs. These factors generally fall into one of four categories: hatcheries, hydropower facilities, harvest, and habitat. For more than a decade, significant efforts have been underway to protect and rebuild the region's fish runs. During this time there has also been disagreement regarding which factors have contributed most to the decline and how to solve these problems.

There is agreement, however, that fish runs can only be rebuilt by using a comprehensive strategy that addresses all of the factors. Implementing this type of strategy will require the cooperation and action by all who use the Columbia Basin's waterways.

Because Idaho's watersheds once produced some of the greatest fish runs, the issue of fisheries habitat is of special importance. Previous studies have indicated that Idaho has sufficient quantity of habitat to bring about recovery of the fish runs, if other factors could be overcome (IDFG 1992). There have been declines in the habitat quality, even in areas still accessible to anadromous fish.

Although use of existing fish habitat is at low levels, some habitat improvements are needed to increase productivity for fish stocks. This will lead to more offspring, and ultimately to more returning adult fish.

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The Model Watershed Program

The importance of habitat quality has gained attention over the years. Today, it is considered a key element to ensure the long-term productivity of fish stocks.

In 1992, the Northwest Power Planning Council (Council) completed its Strategy for Salmon, a comprehensive plan for rebuilding salmon runs in the Columbia River Basin (NPPC 1992). The Council's plan is based on four major elements:

- Enhance salmon survival in the rivers
- Improve harvest management
- Improve hatcheries and production practices
- Protect and restore habitat

In developing this strategy, the Council recognized that maintaining and improving habitat productivity is a complex task. To be successful, it requires coordination of virtually all activities that occur in the subbasin. This coordination is especially important because most fish spawning and rearing habitat is on private land.

To help facilitate watershed planning efforts, the Council called for creation of model watershed projects in Idaho, Oregon, and Washington. In Idaho, the Soil Conservation Commission was named the lead agency for developing the model watershed project. Through these model watersheds, the Council hopes to encourage planning partnerships that involve local landowners, government agencies, tribal governments, and other interested parties.

The model watershed approach is designed to ensure that all human activities affecting salmon and steelhead production in each subbasin are coordinated on a comprehensive watershed management basis. It also is designed to ensure that the goals and objectives of all interested parties are considered in the watershed management strategies.

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In 1993, Idaho's Lemhi River, Pahsimeroi River, and East Fork of the Salmon River were selected to participate in the model watershed program. Although the Lemhi was initially selected for this program, it was decided by local watershed residents that the project should be expanded to include the Pahsimeroi and East Fork of the Salmon drainages. These two watersheds are similar to the Lemhi in terms of land use, agricultural operations, community interest, and fishery problems. All three drainages are also similar in their potential for increasing chinook salmon production.

Plan Scope and Objectives

The model watershed strategy is to first assess resource conditions within each drainage basin, then implement coordinated actions that will help rebuild salmon runs. This watershed plan is a critical element of this planning process.

Approximately 90 percent of the occupied salmon habitat in these watersheds is located on private lands. Therefore, this watershed plan focuses on the habitat problems and opportunities in these areas, Salmon habitat on public lands is being addressed through other coordinated planning efforts in the area.

Approximately 90 percent of the occupied salmon habitat in these watersheds is found on private lands. Therefore, this watershed plan focuses on the habitat problems and opportunities in these areas.

The objectives of this plan are to:

- Provide a brief overview of the project setting.
- Describe current planning activities, goals and objectives.
- Document existing habitat conditions and the key factors limiting salmon production within each drainage.
- Identify and prioritize goals for resolving habitat-related problems.
- Present an action plan for implementing on-the-ground actions.
- Establish a framework for monitoring and evaluating the project's success.

This watershed plan is intended to be a dynamic document that will change over time. Changes are likely to occur as more is learned about the watershed and its processes. Changes may also occur as projects are implemented and evaluated according to the plan guidelines. This concept of learning by doing is called *adaptive management.*

This plan is not intended to set law, policy, or regulations for the agencies, groups, or individuals who participated in the plan's development. Nor does it address the many other factors (i.e., mainstem passage, harvest, hatcheries) that affect salmon production outside the target watersheds.

The remainder of this plan document is divided into the following major chapters:

Chapter 2-Project Setting provides a general overview of project area by describing the geography, history, current land use, and socioeconomic conditions.

Chapter 3-Model Watershed Planning Process provides a summary of the model watershed process and outlines the project's objectives and goals.

Chapters *4,5,* and 6 present detailed descriptions of the three drainages-Lemhi, Pahsimeroi, and East Fork. Each chapter describes past and present fisheries use within each watershed, and existing habitat conditions.

Chapter 7-Action Plan outlines a series of goals and proposed actions designed to protect, enhance, and restore fish habitat. Actions are presented for each watershed reach and include some cost estimates when known.

Chapter &-Monitoring and Evaluation presents a proposed monitoring program designed to evaluate the plan's success.

Chapter 9-Coordination, Consultation, and Public Participation summarizes public involvement activities and identifies groups and agencies that have participated in the plan's development.

This plan is not intended to set law, policy, or regulations for the agencies, groups, or individuals who participated in the plan's development. Nor does it address the many other factors (i.e., mainstem passage, harvest, hatcheries) that affect salmon production outside the target watersheds.

Chapter 2

Project Setting

This chapter describes existing conditions within the model watershed project area. This information is important in helping to understand the resource-related issues and opportunities within the watersheds. It also helps establish some baseline conditions that can be used for future evaluations and comparisons.

Physical Geography

Idaho's Model Watershed Project is located in the southeast portion of central Idaho (Figure 2-l). The project area includes drainages from three Salmon River tributaries-the Lemhi, Pahsimeroi, and the East Fork of the Salmon. Together, these three rivers have a drainage area of approximately 1,698,870 acres.

The area is mountainous with elevations that range from 4,000 feet in the valleys to over 10,000 feet in the mountains. Soils in this area are formed from four dominant parent materials: limestone, quartzite, Challis volcanics, and lacustrine sediments. There are also smaller areas formed from granitic rock, sandstone and shales, and areas influenced by volcanic ash.

The climate is characterized by cold winters and warm summers. Air temperatures during the summer can exceed 100°F in the Salmon and Challis areas. Temperatures below 0°F are common in the winter.

Precipitation is sparse and generally ranges from 9 inches in the valleys to about 40 inches in the mountains. Nearly 70 percent of the total precipitation falls during the five-month period from November through April. All three rivers are very dependent on winter snowpacks to sustain water flows throughout the spring and summer.

History

Members of the Shoshone Tribe are considered the first inhabitants of the upper Salmon River, arriving approximately 8,000 years ago. Over time, various cultures evolved as a result of glacial activity and climatic change. One such culture, the Mountain Shoshone, resided in the Salmon River mountains. They became recognized for their skill in hunting mountain sheep. These bands eventually became known to white men as Sheepeaters. This tribe later emerged as the Lemhi Shoshone around 1250-1850 A.D.

The Shoshone people shared their Salmon River fishing grounds with their neighbors. The Bannock Tribe often came to this area for fishing and to trade with the Shoshone. It is estimated that as many as

30,000-60,000 salmon were caught during a single season.

When Lewis and Clark entered the Lemhi Valley in August 1805, they found approximately 400 Shoshone in the area. Within the next two decades, numerous British and American fur traders came to the region. In 1855, Mormon missionaries from Utah established Ft. Lemhi on a tributary of the Lemhi River. The mission station was active for three years until the Shoshone and Bannocks drove them out.

When gold was discovered at Grasshopper Creek and Alder Gulch in S.W. Montana in 1862, an influx of people moved into the region and established permanent settlements. Gold was also found shortly thereafter in Napias Creek, a tributary of the Salmon River.

The livestock industry followed the region's gold rush. At first, longhorn cattle were trailed to mining camps and butchered as needed. By the early 1870s, the livestock industry was well established. Cattle herds imported from Oregon, Utah, and Montana were grazed in the mountains in the summer and in the lower meadows during the winter. The severe winter of 1889 brought an end to this practice and ranchers began raising and storing hay for winter feeding.

Current Land Ownership and Management

Approximately 95 percent of the land is currently owned and managed by the federal government (Table 2-l). However, private landowners control management on approximately 90 percent of the river bottoms and the remaining occupied salmon habitat.

Forestland and rangeland comprise the two largest land-use categories within the project area (Table 2-2). Agricultural activities are primarily focused on beef production. Extensive irrigation systems allow farmers to produce hay and pasture forage in the valleys.

Table 2-1. Land Ownership within the Model Watershed Area (Acres)

	Subwatersheds			
Ownership	Lemhi	Pahsimeroi	E. Fork	Totals
Private	145,100	46,570	6,600	198,270
Forest Service	**316,460**	**244,030**	**215,870**	**776,360**
BLM	316,050	233,700	120,260	670,010
State	25,780	14,070	10,050	49,900
Other	3,740	30	560	4,330
Totals	807,130	538,400	353,340	1,698,870

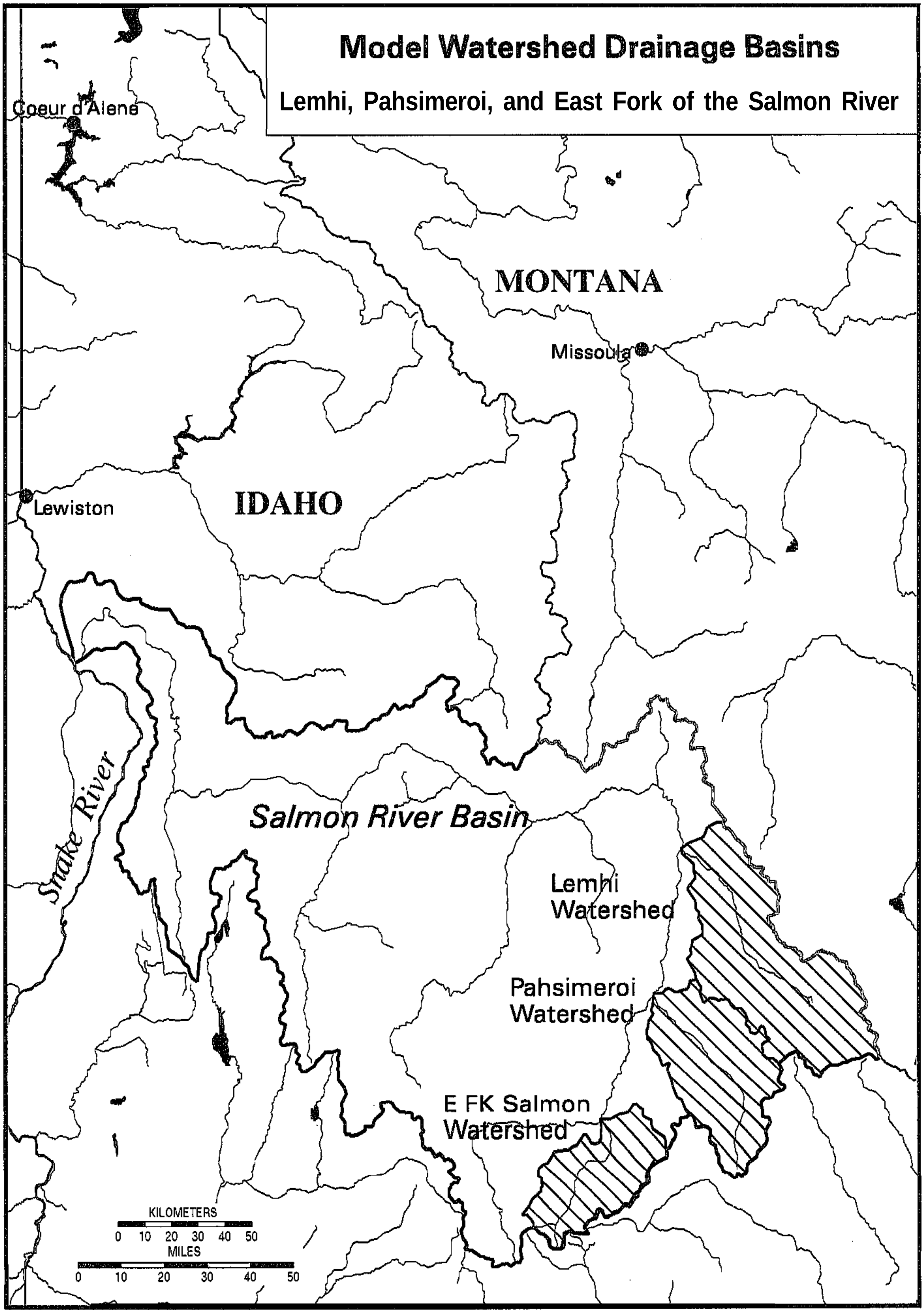
Model Watershed Drainage Basins
Lemhi, Pahsimeroi, and East Fork of the Salmon River
Coeur d'Alene
MONTANA
Missoula
IDAHO
Lewiston
Snake River
Salmon River Basin
Lemhi Watershed
Pahsimeroi Watershed
E FK Salmon Watershed
KILOMETERS
0 10 20 30 40 50
MILES
0 10 20 30 40 50

Table 2-2. Land Use within the Model Watershed Area (Acres)

Land Use	Subwatersheds Lemhi	Pahsimeroi	E. Fork	Totals
Irrigated Land (hay, pasture, and crop)	37,000	30,000	2,600	69,600
Rangeland	447,580	263,430	136,250	847,260
Forestland (timber & range)	321,370	244,120	213,820	779,310
Urban	**170**	**0**	**0**	**170**
Other	**1,010**	**850**	**670**	**2,530**
Totals	807,130	**538,400**	**353,340**	1,698,870

Most livestock operations rely upon federal grazing allotments to sustain their operations through the summer months. Bureau of Land Management (BLM) and U.S. Forest Service (USFS) grazing lands provide about 28.5 percent of the total feed base and represent approximately 47 percent of the available pastureland.

Cattle are usually pastured from May 1 to December 15. Hay is then fed to supplement grazing during the rest of the year.

The project area has approximately 69,600 acres of pasture and hayland. Typically, pastureland occurs in areas too wet to hay, or at elevations above 6,300 feet. Approximately one-third of these acres are in pasture located along the valley floor. The remaining acres are in hayland production on higher stream terraces and benches above the valley floor.

Nearly every acre of pasture and hayland is pastured at some time during the year. This may be early in the year before plants are actively growing, during the growing season, or late in the year after the hay has been harvested.

Field crops suited to the area include alfalfa, grass hay, and some small grains. Cropped areas can be classified into three units: (1) pastureland, (2) well-drained soils suitable for alfalfa production, and (3) moderate-to-poorly drained soils suitable for grass/hay or pasture.

Areas along lower stream terraces are suited to grass production for pasture or hay and are usually wet from spring runoff and flood irrigation. Moderate-to-poorly drained soils contribute to these conditions. The soil surface is sufficiently dry in mid-to-late summer to allow harvesting of a hay crop.

Most of the irrigation water is diverted from the rivers or their tributaries. A shortage of irrigation water develops early each spring before snowmelt, and again in the late summer months. Sprinkler irrigation is common on the benches and bars that support hay production. Sprinkling reduces the amount of water required by increasing the application efficiency.

Crop rotations of alfalfa typically consist of 8-10 years in alfalfa and 2 years of oats. Minimum tillage practices have increased in recent years which has eliminated excessive tillage practices and the need for using grain in the rotation. Minimum tillage also helps to maintain soil fertility and tilth.

Surface or flood irrigation is commonly used for the grass hayland and pastureland. Flood irrigation methods include the border dike, contour ditch, and wild flooding (a form of irrigation that utilizes a main center ditch and lateral ditches to flood water over the fields). Although flood irrigation is very inefficient in terms of water delivery, the excess water supports many acres of wetland wildlife habitat and also recharges the rivers through subsurface flows.

Livestock operations are similar within all three drainages. Cow-calf operations are the dominant type of livestock enterprise. There are approximately 100 cow-calf operations in the Lemhi watershed, 40 in the Pahsimeroi, and 8 in the East Fork. A number of smaller operations are also present in similar proportions.

The Lemhi drainage has a small number of dairies (approximately five at any one time). These dairies average about 20 cows.

Most cattle are not confined, except during calving time when cows are placed in holding pens. Most holding pens have a live stream running through them. There is no inventory on the number of operations with this situation, nor is there any specific information regarding what impact these operations have on water quality.

Sheep production was once a major enterprise in these watersheds. Now only one band is located in the headwaters of the Pahsimeroi.

Almost all livestock operations use streams for livestock watering. Many places have open access, while others have a water gap that is used to limit livestock access to the stream. Although these water gaps can reduce the impacts on the streambank and riparian areas, they concentrate animal wastes when large numbers of livestock are watering.

Socioeconomic Conditions and Outlook

The Lemhi, Pahsimeroi, and East Fork watersheds are located in Custer and Lemhi counties. A summary of economic conditions follows.

Custer County

The Custer County population has generally increased over the years, from approximately 3,000 residents in 1970 to over 4,100 residents in 1990. The county's economic base is largely driven by the natural resources sector. Total personal income for 1991 was estimated at $51.0 million. Approximately 60 percent of this income was from mining, agriculture, and timber.

The town of Challis dominates the local economic activity with $35.2 million in personal income and 1,199 jobs. Approximately 95 percent of the households had income based on the mining industry. This represents almost 70 percent of total earnings and over 55 percent of the employment in the Challis area.

Lemhi County

Similar to Custer County, the economic base of Lemhi County is also driven by the natural resources sector. Total personal income for 1991 was estimated at $73.1 million. Approximately 50 percent is from agriculture, mining, and timber.

The Lemhi County population has shown some variations over the past 20 years. In 1970, the population was estimated at 5,566. The population increased to 7,460 in 1980 and declined slightly to 6,899 in 1990.

The city of Salmon is the county's primary trade center and has the largest and most diverse economy with $58.4 million in personal income and 2,304 jobs. Nearly 89 percent of the households have wage or salary income.

Salmon's leading economic sector is tourism, followed closely by timber and agriculture. Together, these three sectors comprise almost 53 percent of the total earnings. Mining, state and local government, and federal government sectors add an additional 37 percent to the total earnings. Salmon has developed sufficient infrastructure in the form of motels, restaurants, and retail stores, that it can capture significant amounts of tourism income.

Fisheries-Related Activities

Salmon fishing has historically been an important part of local recreational activities. From 1970-1974, an average of 5,955 days were spent fishing for salmon on the main stem Salmon River each year (Table 2-3). Angler days during the 1960s were probably twice as high, considering that there were more fish returning during that period. Because of the diminished salmon runs, however, there has been no recreational salmon fishery since 1978.

Table 2-3. Angler Survey Data as Recorded at the Salmon River Harvest Check Stations (North Fork to Stanley), 1970-1974

Year	Number of Anglers	Chinook Salmon Caught	Angler Days per Fish	Angler Days
1970	3,512	1,198	7.1	8,506
1971	1,137	706	5.5	3,883
1972	1,913	809	5.8	4,692
1973	4,917	1,550	6.6	10,230
1974	949	316	7.8	2,465
Average	2,486	916	6.6	5,955

Source: Idaho Department of Fish and Game

The loss of the salmon fishery has been a significant recreational loss and has also had a negative impact on the local economy. No detailed study was conducted as part of this plan; however, it is possible to estimate the economic value associated ‘with this fishery, For example, check station interviews on the Little Salmon River found that anglers spent approximately $125 per day during a nine-day season in 1992. Indexed to 1995 dollars, the daily amount would be $136. If angler expenditures were similar for fishing on the main stem Salmon River ($136/day), then 5,955 angler days (1970-1974 average) would have generated $809,880 in direct expenditures each year.

For every dollar spent as a direct expenditure, the actual economic impact in the local community is multiplied. This multiplier effect is not easily measured. However, smaller communities generally have lower multipliers. The Idaho Department of Fish and Game has used a multiplier of 3 (i.e., every $1 in direct expenditures results in $3 in economic activity) for estimating recreation-related impacts. A study by the University of Idaho indicates that agricultural-based multiplier would be in the range from 1.5 to 1.8 (Harp and Pauley).

Assuming that fishing-related expenditures in this area had a multiplier of 2.5, then the $809,880 directly spent by anglers would have generated over $2 million in local business activity each year. Again, this is based on fishing levels during the early 1970s. Assuming angler days would double if fish numbers were near the 1960s level, then the loss of this fishery would represent a loss of over $4 million in local business activity

Fish

Both native and non-native fish species can be found within the project area (Table 2-4). Although the primary focus of this watershed plan is on spring/summer chinook salmon, habitat improvements will likely benefit other fish species.

Anadromous fish use within the three watersheds is quite extensive, both in terms of when fish are present and where they are located. Historically, most attention has focused on the habitat needs of returning adult salmon since this is when fish are most visible. However, young salmon are actually present in these watersheds throughout the year. These young fish occupy different areas during different stages of their life. When evaluating fish habitat, life history requirements at all ages must be considered, not just the requirements of the adult fish.

Salmon within these watersheds are spring/summer chinook. The later-arriving salmon (arriving and migrating in August) were summer chinook. Table 2-5 outlines the general life history (cycle) requirements of spring/summer chinook salmon within the target watersheds.

Adult chinook usually arrive in May and move up the main stem reaches to holding and staging areas in June and July. Staging areas are usually deep holes or undercut banks with brush cover and cool water temperatures below 68°F. If water is warmer than that, the fish usually seek cooler temperatures, but can become stressed. This stress can reduce egg viability or even cause death before the fish has spawned.

Adults move to the spawning grounds in mid- to late August when days become

Table 2-4. Fish Species Present in the Model Watershed Project Area

Common Name	Scientific Name
NativeSpecies	
Chinook Salmon	*Oncorhynchus tshawytscha*
Rainbow/Steelhead	*Oncorhynchus mykiss*
Bull Trout	*Salvelinus confluentus*
Cutthrout Trout	*Oncorhynchus clarki*
Mountain Whitefish	*Prosopium williamsoni*
Northern Squawfish	*Plychocheilus oregonensis*
Dace	*Rhinichtys sp.*
Redside shiner	*Richardsonius balteatus*
Sucker	*Catostomus sp.*
Sculpin	*Cottus sp.*
Chiselmouth	*Acrocheilus alutaces*
Non-Native Species	
Brook Trout	*Salvelinus fontinalis*
Golden Trout	*Oncorhynchus aquabonita*
Artic Grayling	*Thymallus articus*

Source: Technical Advisory Committee

Table 2-5. General Habitat Requirements for Spring/Summer Chinook Salmon

Life History Stage	Habitat Requirements
Adult Migration	Passage free of temperature, chemical and physical barriers
Adult Holding	Pools greater than 3' deep with good cover provided by undercut banks, overhanging vegetation or large woody debris
Spawning	Clean, cool water (55°F or less is optimal) Gravels of suitable size and type that have less than 20% fines (sand grain size or smaller) Spawning habitat close to escape cover (i.e., pools with good cover)
Egg Incubation	Clean, cool water Absence of surface sediments
Early Rearing (through the first summer)	Clean, cool water (<64°F or a maximum daily temperature of 68°F with no more than a 10°F fluctuation between day and night temperatures) Low velocity areas with cover provided by clean cobble and boulder substrates, and to a lesser extent, large woody debris, and riparian vegetation
Over-wintering	Low velocity areas with cover provided by clean cobble and boulder substrates, and to a lesser extent by large woody debris and riparian vegetation Deep pools and springs may be important to avoid freezing effects of ice. Streamside vegetation can help provide thermal insulation in smaller streams.
Late Rearing (through second summer)	Cool, clean water Center-channel pools with cover provided by coarse substrates, water depth, and/or large woody debris
Juvenile Outmigration	Passage free of temperature, chemical, and physical barriers

shorter and water temperatures are cooler. At the spawning grounds, the female fish digs a redd (nest) and deposits eggs in the gravels. These eggs are then fertilized by the male fish. Most spawning occurs from the end of August through late September.

Fertilized eggs remain in the gravels until they hatch in February or March. The young fish, known as *sac fry,* remain in the gravel until their yolk sac is absorbed. They then emerge from the gravel as fry in the early spring.

The young fry move throughout the watershed to find suitable rearing areas. Young fry prefer areas with slow water, such as small side channels or adjacent sloughs. Living in these slow-water areas reduces the required energy and helps optimize growth.

Fry grow throughout the summer months. Once they reach 3 to 5 inches in length, they are called *parr* (another life history stage). Parr begin to migrate out of the rearing habitat towards the main stem river. When water temperatures reach 40°F, the parr begin to seek winter refuge areas. This can either be back in the gravels, under root wads, or in slow water where ice caps have formed.
Winter water temperatures within the three drainages can reach sub-freezing conditions; therefore, finding quality winter habitat is very important for the young fish. For the most part, parr do not feed much during this period.

In February, once water temperatures begin to warm and days become longer, the parr enter their smolting stage (a period of physiological change that will allow the fish to survive in the ocean environment). The young fish begin to colonize in late March for their downstream migration to the ocean. The fish will spend the next 2-3 years in the ocean and then return as adults to reproduce and start the cycle again.

Steelhead adults return to the Salmon River in early fall and remain in the Salmon River through the winter. Fish hold in the Salmon River until water temperatures in the Lemhi, Pahsimeroi, and East Fork warm to 40-43°F. They then swim into these tributaries and spawn, usually from late March until late April.

Steelhead fry emerge from the gravels about 45 days later and have rearing characteristics similar to spring/summer chinook. Young steelhead also colonize a year later in late March or early April and begin their downstream journey

Wildlife

The project area contains a wide variety of wildlife species. Many of these animals also depend upon the area's rivers and riparian areas for their survival.

There are some local wildlife species, such as herons and otters, that prey on young salmon. Predation by squawfish in the main Salmon River could also be a problem for the young migrating smolts.
Other than these few examples, however, the local wildlife probably has little impact on the salmon resource. Therefore, no detailed wildlife inventory or analysis was conducted as part of this planning effort.

Vegetation

Native vegetation is similar for all three watersheds and the plant communities generally reflect the moisture regime. In areas influenced by high water tables, the vegetation is dominated by willows and sedges. Areas inundated with water are often dominated by cattails. Native grasses in the wet areas include tufted hairgrass. In salty areas where the water table fluctuates, alkali Sacaton is the primary native grass.

On bench areas where annual precipitation is between 8 and 12 inches, the predominate vegetation is Wyoming sagebrush, blue-bunch wheatgrass, and forbs such as buckwheat, tapertip hawksbeard or Hood's phlox. Where precipitation is 12 to 16 inches, the native vegetation is mountain sage, Idaho fescue, arrowleaf balsamroot, milkvetch, and lupine.

Vegetation in areas with precipitation between 16 and 20 inches varies with slope and aspect. South-facing slopes have mountain sagebrush, Idaho fescue, and a scattering of Douglas fir. North-facing slopes have Douglas fir with open areas of mountain sage and Idaho fescue.

Trees dominate the landscape in areas where annual precipitation is greater than 20 inches. The dominant tree types are lodgepole pine or limber pine, with some spruce along the stream bottoms.

Threatened & Endangered Species

Snake River spring/summer chinook salmon are currently protected as an "endangered" species under the federal Endangered Species Act. All three drainages within the project area have been listed as part of the critical habitat for this species.

Bull trout are also found in the project area. This species is being considered for listing in the State of Idaho as a threatened species. Should bull trout be listed, the federal land management agencies would increase resource management emphasis on the smaller side tributaries.

The Lemhi County Board of Commissioners initiated a conservation agreement with the U.S. Fish and Wildlife Service and other federal and state agencies for maintaining, enhancing, and restoring riparian habitats. When implemented, this agreement should address bull trout concerns within Lemhi County. This agreement could eventually become part of the Model Watershed Project for implementing riparian measures beyond those streams occupied by salmon.

Several other federally protected plant and animal species occur within the project area (Table 2-6). Any actions taken as part of this watershed plan will need to take these species into consideration.

Cultural Resources

All three watersheds have both prehistoric and historic resources. Native Americans have occupied all three drainages for thousands of years and have many religious and cultural sites in the area. These sites need to be taken into consideration when implementing any actions as part of this watershed plan.

Local tribes are expected to play an important role in the implementation process. Tribal representatives will be asked to identify cultural resources that could be impacted by any of the proposed plan activities. Other historic resources (e.g., homesteads) will also need to be protected as projects are planned and implemented.

Recreation

Outdoor recreation is a key part of the local culture and customs. In fact, the importance of fishing to the local culture is one of the driving forces behind this model watershed project.

Some forms of outdoor recreation can adversely affect the salmon resource. For example, water-based activities that occur near spawning redds can damage the fragile eggs. Public information and education should be used to help minimize any adverse impacts to the salmon resource and the recovery efforts.

Water Quality

State water quality standards require streams to support appropriate or designated beneficial uses. The Lemhi, Pahsimeroi, and East Fork of the Salmon River are protected for the designated beneficial

Table 2-6. Threatened, Endangered and Candidate Species-Custer and Lemhi Counties (August 1995)

Common Name	Scientific Name	Federal Status
Mammals		
Gray Wolf	*Canis lupus*	Endangered
Lynx	*Felix lynx*	Candidate
Wolverine	Gulo gulo	Candidate
Grizzly Bear	*Ursus arctos*	Threatened
Pygmy Rabbit	*Brachylagus idahoensis*	Candidate
Birds		
Peregrine Falcon	*Falcc peregrinus*	Endangered
Bald Eagle	*Haliaeetus leucocephalus*	Threatened
Long-Billed Curlew	*Mumenius americanus*	Candidate
Fish		
Snake River Sockeye Salmon	*Oncorhynchus nerka*	Endangered
Snake River Spring/Summer Chinook Salmon	*Oncorhynchus tschawytcha*	Endangered
Bull Trout	*Salvelinus confluentus*	Candidate
Invertebrates		
Idaho Point-Headed Grasshopper	*Acrolophitus pulchellus*	Candidate
Plants		
Douglass' Wavewing	*Cymopterus douglassii*	Candidate
Ibapah Wavewing	*Cymopterus ibapensis*	Candidate
Salmon River Fleabane	*Erigeron salmonensis*	Candidate
Davis' Stickseed	*Hackelia davisii*	Candidate
Puzzling Halimolobos	*Halimolobos perplexa var. perplexa*	Candidate
Lemhi Penstemon	*Penstemon lemhiensis*	Candidate
Salmon Twin Bladderpod	*Physaria didymocarpa var. lyrata*	Candidate
Lost River Milkvetch	*Astragalus amnis amissi*	Candidate
Payson's Milkvetch	*Astragalus paysonii*	Candidate
White Clouds Milkvetch	*Astragalus vexilliflexus var. nubilus*	Candidate
Silvery Draba	*Draba argyraea*	Candidate
Stanley Whitlow-Grass	*Draba trichocarpa*	Candidate
Idaho Goldenweed	*Haplopappus aberrans*	Candidate
Vivid Green Aster	*Machaeranthera lastevirens*	Candidate
Kruckberg's Sword-Fern	*Polystichum kruckebergii*	Candidate
Wavy-Leaf Thelypody	*Theiypodium repandum*	Candidate
Alkali Primrose	*Primula alcalina*	Candidate
Purpus' Sullivanta	*Sullivantia purpusii*	Candidate

uses of domestic water supply, agricultural water supply, cold water biota, salmonid spawning, primary contact recreation, and secondary contact recreation.

The beneficial uses of cold water biota and salmonid spawning are water quality indicators for cold water fisheries. Although the 1994 Idaho Water Quality Status Report indicates that the water quality of the Lemhi and Pahsimeroi watersheds is generally good, the 1992 Status Report lists these beneficial uses as partially supported for the Lemhi, Pahsimeroi, and East Fork of the Salmon rivers.

In 1994, the Environmental Protection Agency (through Section 303(d) of the Clean Water Act) established a list of streams in the Salmon River Basin for which pollution controls or requirements are inadequate to provide for attainment and maintenance of beneficial uses. This list includes several streams within the target watersheds that are not occupied by salmon. It also includes the main stem Pahsimeroi. Sediment and nutrients are the pollutants of concern in these stream segments.

In 1994, the Lemhi Soil Conservation District initiated a water quality study for the Lemhi River. When completed, this study will help identify potential water quality problems in this area.

Chapter 3

Mode! Watershed Planning Process

Previous Planning Efforts

Cooperative planning efforts in the project area began several years before it was selected for the model watershed program. For example, Lemhi irrigators had already initiated a process to help resolve habitat issues. This effort was formally recognized in 1990 during the development of the Lemhi Soil and Water Conservation District (SWCD) Long Range Plan. This plan included an action item to initiate dialogue between District cooperators and interested parties for purposes of increasing fish returns to the Lemhi.

In 1991, the Lemhi SWCD and the Lemhi Irrigation District asked the Soil Conservation Service (now the Natural Resources Conservation Service) to review the current situation and recommend possible strategies for eliminating conflicts between agriculture and fisheries. This request resulted in a report that outlined possible planning partnerships and programs to overcome some of the habitat-related conflicts (High Country RC&D 1991).

In 1992, the Bureau of Reclamation (BOR) following directions from the Northwest Power Planning Council made contact with the two districts to initiate a water conservation demonstration project. The Lemhi was selected because of its fish production potential and the apparent willingness of local people to participate in the process.

On June 12, 1992 the Districts, joined by Water District 74 (the group responsible for delivery of irrigation water from the Lemhi), adopted the *Irrigators Plan to Improve Fish Passage on Lemhi River* (Lemhi Irrigation District and Water District 74, 1992). The Irrigators Plan calls for addressing migration habitat problems first, then spawning and rearing habitat. The rationale was that if migration problems are not solved, there is little reason to worry about spawning and rearing habitat.

The Irrigators Plan is designed to solve migration problems through a critical reach of the Lemhi (between diversions L-7 and L-3a). This reach is dewatered by irrigation withdrawals during the low water periods of below-average water years. The plan calls for installing permanent diversions and fish ladders at L-7,6, 5, 4 and 3A. It also involves establishing "flushing flows" to help fish migrations through this reach. Flushing flows are provided by the voluntary release of water (35-50 cfs) by irrigators for a 12-hour period.

This 12-hour water-release period can be adjusted, as needed, to meet the needs of migrating fish. Flushes can be requested based on sightings of fish above or below the dewatered reach. An operating procedure for making releases is included as part of the Irrigators Plan.

The Bureau of Reclamation's Water Conservation Demonstration Project (U.S. Bureau of Reclamation 1993) addresses some of the needs of the five diversions mentioned above. The original plan has been altered to eliminate diversions L-4 and L-5. Land currently irrigated out of diversion L-4 will be sprinkled using L-6. Land irrigated out of L-5 will now be irrigated out of L-SA. These measures reduce the water diverted from the river by about 50 cfs. (Additional information regarding the Irrigators Plan can be found in the BOR project report cited above.)

In late 1992, the Idaho Soil Conservation Commission was given the lead to develop a model watershed program in Idaho. The Lemhi was initially selected because of prior activity of the Lemhi community The Commission, with support of the Custer Soil and Water Conservation District, later decided to expand the watershed effort to include the Pahsimeroi and East Fork.

In 1992, the Idaho Department of Fish and Game was also gearing up to expand and expedite its fish screening program. A technical work group was formed and began meeting in Salmon. This group was to review the screen program and bring about a transition to conform to the new screening standards established by the National Marine Fisheries Service.

The many agencies represented in the technical work group decided early on that business as usual would not improve the plight of the salmon. While screening alone would protect fish from being diverted into fields, it would only slow the decline of the fish. The group decided to become part of the model watershed project to help look at other alternatives and solutions.

The Model Watershed

In January 1993, the model watershed project became the umbrella for salmon recovery activities for the Lemhi, Pahsimeroi and East Fork of the Salmon River. Under this umbrella, planning activities are primarily guided by a local watershed coordinator and a 15-member Model Watershed Advisory Committee.

The advisory committee is a diverse group that includes local landowners, personnel from resource management agencies, and various interested parties (see Chapter 9).

Advisory Committee's Vision Statement

"To provide as basis of coordination and cooperation between local, private, state, tribal, and federal fish and land managers, land users, land owners, and other affected entities to manage the biological, social, and economic resources to protect, restore, and enhance anadromous and resident fish habitat."

In order to make the process manageable, the advisory committee decided that the project should only address fish habitat issues. It was also decided that the short-term evaluation of the project's success should be based on habitat improvements, not on the numbers of returning fish.

As part of the planning process, the advisory committee held several meetings to discuss natural resource-related problems and opportunities. Although the discussions covered a wide range of issues, the main focus was on anadromous fish, primarily chinook salmon. From these meetings, the committee identified three major fishery concerns that need to be addressed in the watershed plan. These concerns, listed in order of importance, are:

- Migration habitat
- Rearing habitat
- Spawning habitat

Project Objective and Goals

The issues and concerns identified by the advisory committee members and other interested parties were used to develop the following objective and goals.

Project Objective: To maintain, enhance and restore anadromous and resident fish habitat, while also achieving and maintaining a balance between resource protection and resource **use** on a holistic watershed management basis.

Goals

- Provide for the safe and timely passage of migrating fish through critical reaches of the watershed.
- Protect spawning areas by ensuring that spawning gravels are managed to prevent habitat losses.
- Protect and manage juvenile fish rearing areas.
- Protect and enhance water quality to ensure maximum survival of juvenile fish.
- Protect and enhance instream and riparian environments to maximize fish production and escapement.
- Minimize losses of migrating fish caused by irrigation diversions.
- Ensure that any resources invested achieve maximum returns in terms of multiple-use benefits.
- Coordinate all salmon recovery activities to minimize duplication of efforts and maximize use of limited resources.
- Achieve measurable progress towards a holistic resource management approach that addresses water management, water conservation, fish habitat protection, and fish migration.
- Develop an effective and responsive resource management program (i.e., agriculture, timber, mining, fish, wildlife) for the watershed.
- Develop or adapt a holistic watershed management approach for fish habitat protection, enhancement, and restoration.

To help guide project activities, the advisory committee decided that efforts should focus on restoring habitat to levels that would support salmon numbers present in the 1960s. Fish redds during this period are as follows:

	1960-1965 Average
Lemhi	1,200 redds
Pahsimeroi	700 redds
East Fork	775 redds

Resource Inventories and Studies

Several studies were conducted as part of this planning effort. These include a riparian inventory, fisheries habitat inventory, water quality investigation and analysis, and an erosion and sedimentation analysis. *(Note: These reports are not included us* part of this *plan document, but are in a Technical Appendix available from the Lemhi and Custer SWCDs.)* Many of the recommendations presented in this plan are based on these studies.

Chapter 4

Lemhi River Watershed

Overview

The Lemhi drainage basin is the largest of the three watersheds addressed in this plan, encompassing over 800,000 acres. Approximately 80 percent of this area is managed by the U.S. Forest Service or the Bureau of Land Management (Figure 4-l).

Watershed hydrology in this basin is both highly complex and fragmented. It is complex in terms of where the stream flows originate. It is fragmented in terms of how water moves throughout the watershed.

Within the Lemhi drainage there are 26 major tributaries, as well as many side draws and gulches, small springs, sloughs, and two spring-fed creeks (Figure 4-2). The watershed has one small irrigation reservoir (approximately 500 acre-feet of storage) located in Yearian Creek. However, the natural outlets on five high-mountain lakes have been altered to provide additional water storage for irrigation purposes.

Water rights in the Lemhi were adjudicated in 1978. There are several reports that provide detailed descriptions of the basin's hydrology (Haws et al. 1977; Chapman 1976). A report by Ott Water Engineers (1985) also discusses the basin's hydrology as it relates to fishery needs.

Hayden Creek is the largest tributary and may contribute as much as 50 percent of the Lemhi's water flows during high water periods and 20 percent during low flow periods (Chapman 1976). Many of the tributaries contribute only minor surface flows to the Lemhi because water is usually diverted for irrigation or it sinks into the alluvial gravels. Consequently, any tributary flows to the Lemhi River are limited to extreme high water periods, winter time, and underground flows.

Weather data is collected at the National Weather Station in Salmon, Idaho. This station has a period of record from 1917 to present. The Lemhi also has two U.S. Geological Survey (USGS) river flow gauging stations. One station is located near irrigation diversion L-31, approximately 2 miles above Tendoy. This station has operated since 1955, except from 1963-1967 when it was not used.

The other USGS station is located near diversion L-5, approximately 5 miles above the Lemhi's confluence with the Salmon River. The station was established in 1993 as part of the Bureau of Reclamation's Water Conservation Development Project. The Lemhi Irrigation District and Bureau of Reclamation also operate gauging stations at the Barrack Lane Bridge and the Clark Steel Bridge. These stations are used to monitor water flows as part of the "Fish Flush" operating procedures (see pages 3-l and 3-2).

Six snow survey data stations are located within the Lemhi watershed. Most are used only during the winter to measure snow water accumulations. One station, Meadow Lake, is automated and records moisture levels throughout the year.

Irrigation and Water Supplies

Water quantity and irrigation are almost inseparable in the Lemhi River watershed. Much of the instream water flow is used at least once, and in some cases, as many as three times for irrigation purposes.

Haws et al. (1977) estimated that the annual water yield is 1,055,000 acre-feet from the 1,270 square mile drainage. An additional 56,000 acre-feet are produced from the Texas Creek subbasin. This basin is located in the headwaters of the Lemhi, but surface flows go underground without ever reaching the Lemhi. According to Haws, the Lemhi's average annual flow at Salmon is 180,000 acre-feet. The remaining 875,000 acre-feet are lost to evaporation, transpiration from vegetation, and underground flows.

The relationship between deep groundwater, shallow groundwater, and surface water is complex and not well understood. There are seven deep, groundwater wells used for irrigation. Six of these wells are in the headwaters area. These wells are approximately 200 feet deep and have static water levels between 70 and 90 feet deep. Some of these are supplemental wells used only when stream flows decrease to the point below the irrigation pump requirements.

The oldest irrigation well is located at the mouth of McDevitt Creek. This well is about 970 feet deep and has a static water level of approximately 90 feet. Water levels are drawn down to about 160 feet during pumping. This well has not been used since 1989 because of high pumping costs.

There are approximately 37,000 acres of irrigated land in this watershed. Of this total, approximately 20 percent is sprinkled and the remainder is flood irrigated. Flood irrigation methods range from wild flooding using ridge ditches to border irrigation. Irrigation efficiency (the percentage of irrigation water actually used by plants) averages approximately 25-30 percent, and ranges from 10 to 60 percent.

The Lemhi Irrigation District measures the water delivered to all irrigation diversions in the district. Water deliveries are measured at least once a year, sometimes more often. Measurements have been taken since the District's inception in 1972, and these records are kept in the District's office in Salmon.

The relationship between stream flows and irrigation return flows is of critical importance in the Lemhi watershed. The importance of this relationship was recognized in the water right adjudication process as well as in the detailed hydrologic studies (Chapmanl976; Haws 1977; Ott Water Engineers 1985).

Water from irrigation returns as springs directly to the river, as overland flow from sloughs, and from irrigation ditches. Many of the these return flow irrigation ditches are old stream channels. Ott Water Engineers (1985) estimated that irrigation return flows provide 8 to 14 cfs per mile to the Lemhi.

Irrigation practices and water usage adversely impact fish production within this watershed. Of the 110 water diversions in the Lemhi River and Hayden Creek, nine have severe fish passage problems during low water years. Low water flows created by diversions also contribute to high water temperatures.

Fish migration delays and mortality occurs for out-migrating juvenile fish as they pass through the numerous diversion points. This is due to old screening facilities which have a large screen mesh, high approach velocities, inadequate bypass pipes, and plugged screens.

Understanding the important relationship between irrigation, stream flows, and fish cannot be understated. All three variables must be addressed concurrently when trying to solve water-related issues. For example, although improving irrigation efficiency may save water in the spring, it may actually cause reduced stream flows in the late summer. This could result in higher water temperatures and more fish passage problems caused by the diversions. This situation applies to the tributaries and the main stem Lemhi River.

The large amount of groundwater that lies beneath the irrigated land represents a significant resource. New management strategies utilizing this resource could be developed that would improve stream flows.

Grazing, Logging, and Mining

Most grazing, logging, and mining occurs on public land managed by either the Forest Service or the Bureau of Land Management. These two agencies have spent the last two years conducting an intensive review of the impacts that these land uses have on salmon. These reviews are listed in the Section 7 consultation review reports to the National Marine Fisheries Service.

Grazing is currently the only on-going activity that occurs on both private and public lands. It ties the two land ownerships together.

Grazing on federal lands provides nearly 30 percent of the feed base for cattle in the Lemhi watershed. A typical cattle operation grazes livestock on federal lands from May 15 to October 15. Most of the private land is adjacent to the streams and rivers. Thus, moving cattle to federal grazing lands allows streamside areas to rest during the growing season. This helps maintain salmon habitat conditions. There are exceptions to this situation for the few ranches that do not have federal grazing allotments.

Coordinating federal grazing allotments with private land use is critical for maintaining and improving salmon habitat. This is a time-consuming effort because public and private lands do not always have the same management objectives.

There are 10 federal grazing allotments that are of critical importance to the Lemhi's salmon habitat. These allotments are located in the upper watershed in the Hayden Creek subbasin. The allotments are under strict management guidelines and are monitored by the public land agencies.

Grazing activities on other areas were reviewed as part of this watershed planning effort. Grazing can lead to unstable streambanks, trampled redds, increased water temperatures, loss of vegetative cover, and water quality problems. However, most tributaries on federal allotments have water flows that never reach the Lemhi except during high water or for a short period during the winter.

Logging in the watershed is primarily small scale, generally for posts and poles. There is some saw timber on BLM and Forest Service lands in Agency Creek, Hayden Creek, Mill Creek, Eightmile Creek, and Timber Creek drainages. Most timber sales are small. Timber sales were not estimated for the Lemhi watershed.

Most mining in this watershed occurred during the late 1800s and early 1900s. During this period there were several gold dredge mining operations in side tributaries, such as Geertson Creek, Bohannan Creek, and Kirtley Creek. Copper and lead were also mined during the 1920s and 1930s. The Leadore area has many old mining remnants, such as the townsite of Gilmore where some prospecting still takes place. Other current mines include the Harmony copper mine at the head of Withington Creek.

There are still active claims in the watershed, but no active mines. New mining activities must comply with the federal Endangered Species Act and the National Environmental Policy Act.

Past and Present Fisheries Use

The Lemhi is well documented as a salmon and steelhead river. Early records from Lewis and Clark's 1805 journal describe the Lemhi Shoshone Tribe fishing for salmon.

Until recent times, there has been no accurate count of how many fish returned to this watershed. Walker (1993) estimated that as many as 60,000 adult salmon were harvested from the Lemhi each year by tribal fishermen.

In recent history, fish populations have declined dramatically. The lower Lemhi River was blocked by a power dam from the 1920s through the 1930s. This dam eliminated most of the salmon run, except the portion that peaked during the high water period when water by-passed the dam. Local citizens also captured and moved fish over the dam during this period.

In addition to the migration problems caused by the dam, fish were also trapped at the dam for commercial and hatchery use. Together, these factors contributed to the collapse of the salmon fisheries by the late 1930s when as few as 200 salmon returned to the Lemhi River.

The power dam was removed in 1938 and fish runs began to rebuild up to the 1960s. Redd counts conducted by Idaho Department of Fish and Game found an average of 1200 redds in the Lemhi watershed from 1960 to 1965. This was approximately 23 percent of all redds counted in the Salmon River drainage. Assuming there were 2.3 adult fish per redd, then the annual escapement (i.e., the number of returning fish that reach the spawning grounds) was approximately 2,990 fish during this period.

Tribal and sport fisheries were both present in the basin when these redd counts were taken. Assuming that 500 salmon were harvested in these fisheries, the total adult returns to the Lemhi would be approximately 3,500 fish.

Over the next three decades, redd counts slowly declined. In 1994, an aerial survey conducted by Idaho Fish and Game found only seven redds in the Lemhi watershed.

In 1994, an aerial survey conducted by Idaho Fish and Game found only seven redds in the Lemhi watershed.

During the 1800s, the Lemhi had approximately 100 miles of good salmon habitat. Today, only 15 miles of good habitat is present. A life history analysis conducted on the Lemhi indicates that fish production has been lost from Texas Creek, Agency Creek, Wimpey Creek, limber Creek, Big Eightmile Creek, Withington Creek, Sandy Creek, Little Eightmile Creek, Pattee Creek, Kenny Creek, and possibly others.

The loss of anadromous fish production from the tributaries has primarily been caused by the dewatering of these streams for irrigation. This has isolated these streams from the Lemhi, except during runoff events. There has also been some habitat losses caused by the land management activities; however, these problems could be corrected if the water problems were solved.

Only the main stem Lemhi, Hayden Creek, and Big Springs Creek still produce any salmon. Other tributaries are thought to support some small steelhead populations.

Irrigation development and associated water rights began in these tributaries around 1880 and continued through 1920. Only a small amount of land has been developed for new water right acquisition since then.

Idaho water law is based on a first-in-time first-in-right basis. This means that land developed in 1880 has a priority over the land developed in 1920. Some have suggested that water rights be purchased from irrigators as a means of increasing instream flows. Under current Idaho law, acquiring water rights would require purchasing the land that the water is used to irrigate.

It is unlikely that this strategy would have any significant effect unless large blocks of land were purchased or water laws were changed to allow water rights to be purchased and designated for instream flows. This is not economically or socially acceptable at this time, and is doubtful that this would have a major effect on fish recovery. This is not to discount the importance of working to increase instream flows during the early spring when tributaries can be dewatered for short periods of time. Improving stream flows for protecting other fish and wildlife values is also an important consideration.

The Lemhi River watershed once had numerous resident fish, including cutthroat, rainbow, and bull trout. Cutthroat and bull trout are still present in some of the tributaries, but populations have declined. Rainbow trout populations are healthy above Hayden Creek.

Fish Habitat Conditions

Fisheries habitat within the Lemhi watershed can be described using five primary stream segments (Figure 4-3). Three segments are part of the main stem Lemhi and involve the following stream reaches: Lemhi Mouth to Agency Creek, Agency Creek to Hayden Creek, and Hayden Creek to Leadore. There are also two Lemhi tributaries-Hayden Creek and Big

Springs Creek-that have anadromous fish populations.

Habitat conditions within these reaches are summarized in tables 4-l to 4-5. This information is based on results of the resource inventories conducted for this project.

In summary, the inventories indicate there is sufficient quantity of spawning and rearing habitat within the Lemhi watershed to support the desired level of salmon recovery. However, there are opportunities to improve the quality of this habitat which would help increase production levels.

The quality of habitat could be improved by implementing voluntary ranch plans which include water developments, fencing, seedings, and planned grazing systems. This would help re-establish needed riparian corridors and increase stability of stream banks. It would also help reduce water temperatures, which often exceed the threshold for cold-water fish during the mid-to-late summer months.

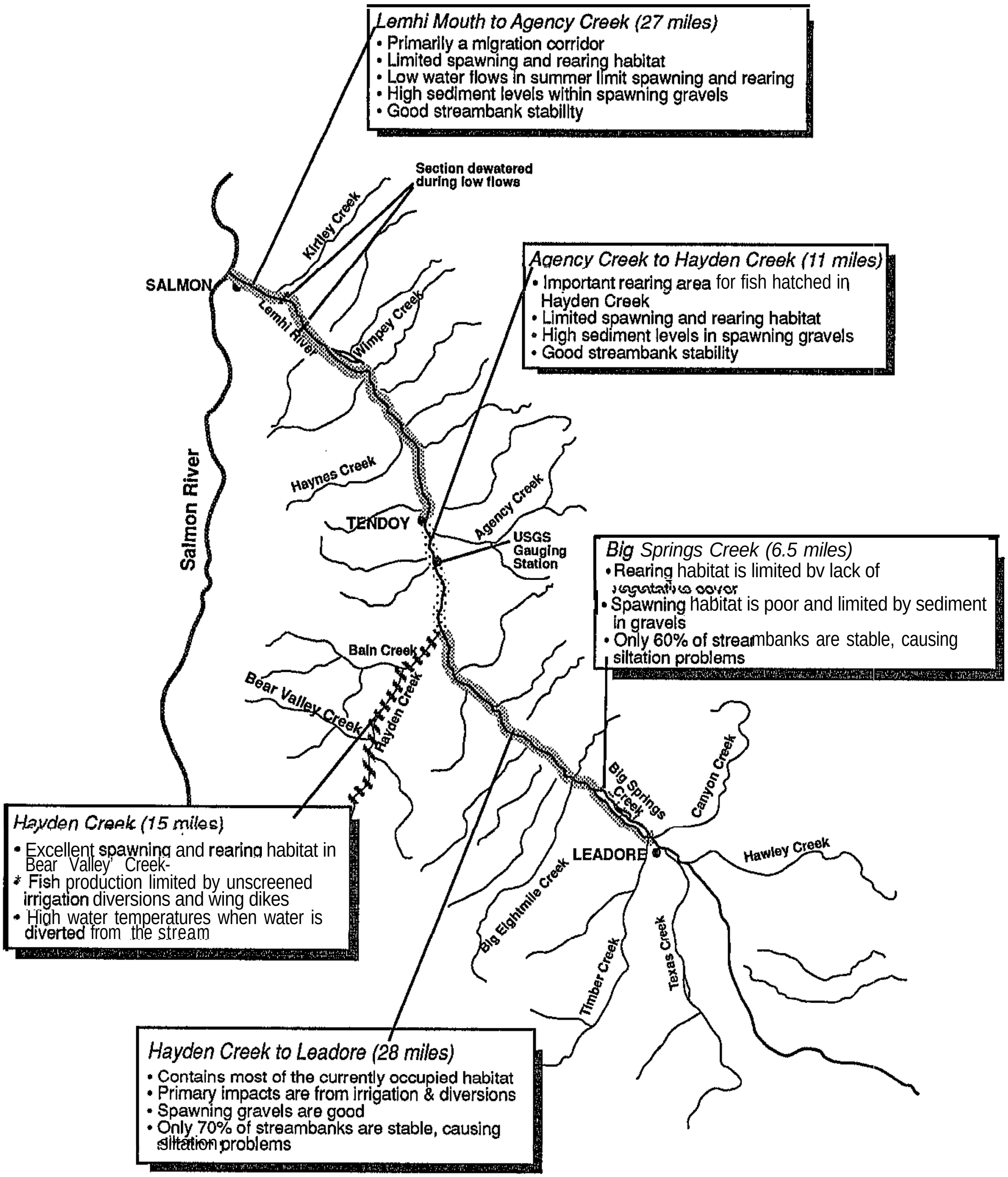

Figure 4-3. Fisheries Habitat Conditions—Lemhi River Watershed

Table 4-1. Habitat Conditions in the Lemhi River Watershed-Lemhi Mouth to Agency Creek

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	●	Lower Lemhi has 3-mile stretch dewatered during low flow periods. This usually occurs during years that have low snow pack and insufficient June rain.
Barrier-free passage for adult migration	◍	Diversion L-3 spillway blocks fish migration during extremely low flow periods. This was identified during the irrigators' 'fish flush" in 1994.
Cool water temperatures	◍	Additional data collection and analysis is ongoing.
Good water quality (chemical)	?	A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	◍	Lower Lemhi to diversion L-7 is primarily a migration corridor. There is insufficient rearing habitat from L-7 to Agency Creek.
Streamside vegetative cover	◍	Need additional cover *to* reduce water temperatures and stabilize stream banks.
Spawning/Incubation areas	0	Lower Lemhi to diversion L-7 is primarily a migration corridor. There is insufficient spawning habitat from L-7 to Agency Creek. Sedimentation from unstable stream banks and diversions may be affecting spawning in the Salmon River.
Water flows for juvenile outmigration	◍	Diversions L-3 to L-7 A are sometimes dewatered during the outmigration period.
Barrier-free passage for juvenile outmigration	◍	Diversions can pose a problem if there are high water diversion rates prior to the spring snow melt.

● Major limiting factor
◍ Needs improvement
○ Adequate
? Insufficient information

Table 4-2. Habitat Conditions in the Lemhi River Watershed-Agency Creek to Hayden Creek

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	○	
Barrier-free passage for adult migration	○	
Cool water temperatures	◍	Additional data collection is underway.
Good water quality (chemical)	?	A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	◍	Currently supports rearing and spawning, but is primarily an adult salmon staging area. Important rearing area for fish hatched in Hayden Creek. Currently lacks resting and rearing areas.
Streamside vegetative cover	◍	Additional vegetation is needed to facilitate natural formation of pools and provide shade and cover.
Spawning/Incubation areas	◍	Quality of spawning habitat is limited by naturally occurring silica in the streambed. Sedimentation from unstable stream banks may also be affecting production.
Water flows for juvenile outmigration	○	
Barrier-free passage for juvenile outmigration	◍	Some screens are inadequate to quickly pass fish.

● Major limiting factor
◍ Needs improvement
○ Adequate
? insufficient information

Table 4-3. Habitat Conditions in the Lemhi River Watershed--Hayden Creek to Leadore

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	Adequate	
Barrier-free passage for adult migration	Adequate	
Cool water temperatures	Needs improvement	Limited information indicates wide fluctuations and high temperatures. Additional data collection and analysis is underway.
Good water quality (chemical)	?	A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	Needs improvement	This is the currently occupied habitat for chinook salmon and steelhead. This reach is critical to recovery of salmon in this watershed.
Streamside vegetative cover	Needs improvement	Enhanced streamside vegetation is needed to help reduce water temperatures, stabilize stream banks. and improve stream cover.
Spawning/Incubation areas	Needs improvement	Sedimentation from unstable stream banks and diversions is reducing habitat quality.
Water flows for juvenile outmigration	Adequate	
Barrier-free passage for juvenile outmigration	Needs improvement	

- ● Major limiting factor
- ◍ Needs improvement
- ○ Adequate
- ? Insufficient information

Table 4-4. Habitat Conditions in the Lemhi River Watershed--Big Springs Creek

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	○	
Barrier-free passage for adult migration	○	
Cool water temperatures	●	Limited information indicates wide fluctuations and high temperatures. Additional data collection is underway.
Good water quality (chemical)	?	A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	●	Insufficient pool diversity and depth. Depth:width ratio needs improvement. Frequency and quality of pools are also limiting production.
Streamside vegetative cover	●	Enhanced streamside vegetation is needed to help reduce water temperatures, stabilize stream banks, and improve stream cover.
Spawning/Incubation areas	●	Spawning habitat is severely limited by sedimentation from unstable stream banks and diversions.
Water flows for juvenile outmigration	○	
Barrier-free passage for juvenile outmigration	○	

● Major limiting factor
◍ Needs improvement
○ Adequate
? Insufficient information

Table 4-5. Habitat Conditions in the Lemhi River Watershed-Hayden Creek

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	◍	Insufficient water flows in late August during years that have low snow pack.
Barrier-free passage for adult migration	◍	Some irrigation diversions block fish migration during low water years.
Cool water temperatures	?	Limited information indicates high water temperatures during low flow periods. Additional data collection is underway.
Good water quality (chemical)	○	Condition is based on 1994 water quality data. Monitoring is ongoing and will identify any potential problems.
Pools for adult holding and juvenile rearing	●	Insufficient pool diversity and depth.
Streamside vegetative cover	◍	Need additional cover to reduce water temperatures and stabilize stream banks.
Spawning/Incubation areas	●	Primary limiting factor is lack of spawning gravels. Most productive spawning habitat is on USFS land in Bear Valley Creek.
Water flows for juvenile outmigration	◍	Can be a problem in early spring when water is diverted for irrigation prior to the snow melt.
Barrier-free passage for juvenile outmigration	●	Seven irrigation diversions are unscreened.

● Major limiting factor
◍ Needs improvement
○ Adequate
? Insufficient information

Chapter 5

Pahsimeroi River Watershed

Overview

The Pahsimeroi watershed encompasses about 845 square miles. Approximately 90 percent of this area is federally managed by the Forest Service and the Bureau of Land Management (Figure 5-l).

The basin has unique hydrologic characteristics that include a close relationship between groundwater and surface water flows. Information regarding the basin's hydrologic conditions are detailed in several existing technical reports (Meinzer 1924; Young and Harenberg 1973).

The watershed contains many tributaries both small and large (Figure 5-2). Big Creek is the only tributary that provides significant surface water flows to the Pahsimeroi River, and flows only occur during extremely high water years. Water from the other tributaries moves underground as they cross the large, foothill alluvial deposits. Water then reappears through numerous springs along the valley floor.

The main stem Pahsimeroi also flows beneath the streambed for a 5-mile section near Hooper Lane. These subsurface water flows in the Pahsimeroi and its tributaries likely occurred in the summer months even before irrigation development in the basin. Fish populations were thus isolated by low water flows prior to irrigation development and have adapted to these conditions.

Spring/summer chinook and steelhead are known to seek out spring-fed areas in upper watersheds where they can spawn in the summer. As long as fish have adequate flows in the spring to migrate upstream, they can successfully utilize habitat isolated later in the year.

The USGS historically measured water flows at several locations within the basin. Today, the USGS gauge near Ellis is the only station still operating.

The basin does not have any water storage reservoirs, but does have extensive groundwater resources. In 1971, six irrigation wells pumping 8.5 cfs were present in the basin (Young and Harenberg 1973). A few more irrigation wells have been added since that time.

Irrigation and Water Supplies

Irrigation is the major consumptive water use in the Pahsimeroi watershed. Irrigation water rights involve approximately 900 cfs of water for 30,000 acres of land. Below Hooper Lane there are about 7,400 acres of hay and pasture irrigated from the main stem Pahsimeroi and Big Springs Creek. Idaho Power has rights to 50 cfs for its fish hatchery.

Irrigation is accomplished using both flood and sprinkler systems. The average irrigation efficiency is approximately 40 percent, slightly higher than for the Lemhi. Much of the water lost by inefficient flood irrigation systems infiltrates the ground and returns to the stream through springs. Many irrigation ditches actually accumulate water from subsurface sources and increase flows from the diversion point to the first field outlet.

The basin has extensive ground water resources and additional water could be pumped from the aquifer to replace surface water withdrawals. As long as the amount of irrigated acreage does not change, stream flows should remain unchanged.

Grazing, Logging, and Mining

Because of the Pahsimeroi's unique hydrology, activities on federal lands in the upper watershed have little effect on the lower river habitat. Tributary streams generally infiltrate into the streambed, become subsurface flows, and then reappear as springs. These waters are filtered through the gravels so downstream sedimentation problems are minimized.

Grazing on federal lands is an important part of the livestock operations. Most ranchers in the lower Pahsimeroi with salmon habitat also have grazing allotments on public land, some located outside the basin. Cattle are usually grazed on public land May through September. Federal grazing allotments do play a key role in efforts to maintain and improve salmon habitat on private lands. For example, loss of federal grazing privileges would lead to intensive development of the private land to make up for the lost feed. Riparian vegetation would be removed and more land cultivated in an attempt to make up for the lost forage.

Because most salmon habitat is on private lands, grazing on these lands has a greater effect on salmon than grazing on the federal lands. Establishing managed grazing systems could yield benefits for salmon habitat and the livestock producer.

Mining in this watershed is mostly historical, although there are still a few active claims. The tungsten mine in Patterson Creek is the most notable mine, but has not been worked for many years. Although Patterson Creek drains this mine area, most of the creek is diverted for irrigation and remaining flows infiltrate the large gravel fan above the lower Pahsimeroi.

There are no significant timber resources in the Pahsimeroi watershed because it is a high desert drainage. There are few post and pole sales, but no active saw timber sales at this time.

Past and Present Fisheries Use

Redd counts were not taken in this watershed until 1994. Therefore, there is no historical record of salmon numbers. A life history analysis conducted for this watershed plan indicates that salmon probably occupied the main stem Pahsimeroi, Big Springs Creek, and a number of smaller springs. These areas were occupied by salmon up to Hooper Lane.

Although there are no records, it is possible to estimate historic fish runs based on available habitat. It is estimated that this watershed once had approximately 30 miles of instream salmonid habitat. Assuming that fish production was similar to the Lemhi River watershed (i.e., 241 returning adult salmon per mile of habitat), then annual runs would have been approximately 7,230 fish. This is probably a low estimate because many springs also provided additional habitat. Today, the Pahsimeroi has about 10 miles of adequate instream habitat.

The hatchery on the Pahsimeroi River has produced salmon and steelhead for the past 20 years. The Pahsimeroi was chosen as a hatchery site because of the spring flows.

Fish Habitat Conditions

Fisheries habitat within the Pahsimeroi watershed is restricted to two primary stream segments: (1) river mouth to Hooper Lane, and (2) Patterson-Big Springs Creek (Figure 5-3). Both sections have high fish-producing potential. The existing fish habitat conditions within these two reaches are summarized in Table 5-1 and Table 5-2.

The quality of habitat could be improved by implementing voluntary ranch plans which include water developments, fencing, seedings, and planned grazing systems. This would help re-establish needed riparian corridors and increase stability of streambanks. It would also help reduce water temperatures, which often exceed the threshold for cold-water fish during the mid-to-late summer months.

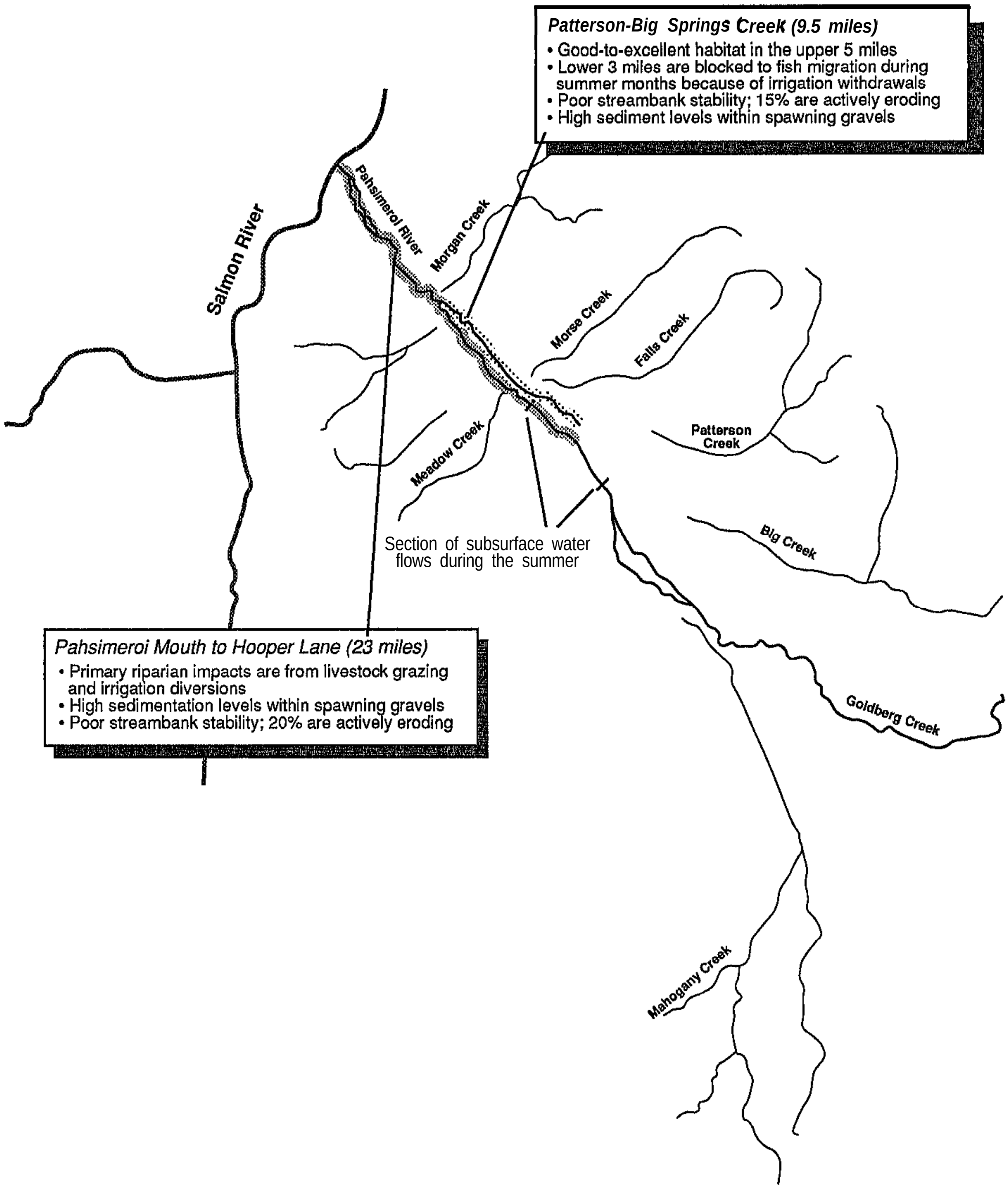

Figure 5-3. Fisheries Habitat Conditions—Pahsimeroi River Watershed

Table 5-1. Habitat Conditions in the Pahsimeroi River Watershed-Pahsimeroi Mouth to Hooper Lane

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	●	Insufficient flows directly below the Ellis diversion block fish passage after irrigation begins.
Barrier-free passage for adult migration	◍	Three diversions hinder fish passage.
Cool water temperatures	?	Existing data show wide fluctuations. Additional data collection is underway.
Good water quality (chemical)	?	A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	○	Fish rearing habitat is fair to good. Areas with good riparian cover have highest numbers of fish.
Streamside vegetative cover	◍	Some areas need additional cover to reduce water temperatures and stabilize streambanks.
Spawning/Incubation areas	●	High sediment levels in spawning gravels caused by (1) poor streambank stability, (2) head cut where Sulfur Creek enters the Pahsimeroi, and (3) twelve diversions that need improvements. Cobble embeddedness is approximately 50 percent.
Water flows for juvenile outmigration	○	
Barrier-free passage for juvenile outmigration	◍	Twelve irrigation diversions have inadequate screens.

● Major limiting factor
◍ Needs improvement
○ Adequate
? Insufficient information

Table 5-2. Habitat Conditions in the Pahsimeroi River Watershed-Patterson-Big Springs Creek

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	●	Low water flows caused by irrigation withdrawals block the lower 3 miles during the summer. Fish cannot get back to Patterson - Big Springs Creek because they are blocked by diversion #2. Water flows are a problem only for short periods of time and usually for short sections due to the number of springs in this watershed. Reach segments with passage problems are usually less than 400 feet in length.
Barrier-free passage for adult migration	●	Three diversions require weirs to help fish passage.
Cool water temperatures	?	Existing data show wide fluctuations. Additional data collection is underway.
Good water quality (chemical)	?	A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	○	Adequate pool habitat. Pool:fast water ratio is 40:60.
Streamside vegetative cover	◍	Need additional cover to reduce water temperatures and stabilize streambanks.
Spawning/Incubation areas	●	High sediment levels in spawning gravels from unstable streambanks and nine diversions that need improvement.
Water flows for juvenile outmigration	○	Good spring flows for outmigrating juveniles.
Barrier-free passage for juvenile outmigration	◍	Nine irrigation diversions have inadequate screens.

● Major limiting factor
◍ Needs improvement
○ Adequate
? Insufficient information

Chapter 6

East Fork of the Salmon River Watershed

Overview

The East Fork of the Salmon River watershed covers 353,340 acres and is the smallest watershed addressed in this plan. Although 85 percent of the land is federally managed by the Forest Service or BLM, approximately 80 percent of occupied salmon habitat is on private land (Figure 6-l).

The drainage area is very steep and has a valley floor less than 1 mile wide. The slopes next to the valley floor are steep, gravelly, and for the most part, are not suited for cultivation,

The East Fork has several large tributaries that provide year-round water flows—Herd Creek, Big and Little Boulder creeks, Germania Creek, and Bowery Creek. Lake Creek and Road Creek contribute minor amounts of flow, but are often dewatered during the summer irrigation periods. These streams may have been dry during low-water years even prior to irrigation development.

The East Fork also has many small tributaries, such as Fox Creek, that provide some water for irrigation use. It is doubtful that any of these small creeks ever provided year-round flows to the main stem.

The upper end of the East Fork watershed drains the White Cloud Mountains. These high peaks gain most of their moisture from snow. Because they are primarily north-facing mountains, they hold snow until very late spring creating extreme variations in water flows. Unlike the Pahsimeroi and upper Lemhi, the East Fork channel is very unstable and often moves during high water events.

Irrigation and Water Supplies

Only 2,600 acres are irrigated in the East Fork watershed, less than 1 percent of the total land base (Figure 6-2). Flood irrigation is the most common irrigation method because water supply exceeds the demand. The total water decree in this drainage is 80 cfs.

Irrigation efficiency is about 25 percent. The East Fork watershed is very similar to the Lemhi and Pahsimeroi in terms of the porosity of the substrate. Irrigation water not used by crops eventually returns to the river. The speed at which this occurs is faster than in the other two river systems. In addition, the late summer stream flows are not as dependent on the irrigation return flows because of the shallow, gravelly soils and the short distance between the fields and the river.

Several high-elevation, naturally occurring lakes, such as Herd Lake and Jimmy Smith Lake, provide some water storage. However, no man-made storage reservoirs are present in the drainage. The USGS does not maintain gauging stations in this watershed, nor are there any irrigation wells. Water supply exceeds the demand, even in the driest years.

Grazing, Logging, and Mining

Cattle operations in the East Fork drainage depend upon both private and public grazing lands. In fact, ranches would not be economically viable without the federal grazing allotments. Any loss of federal grazing allotments would intensify the use of private lands to make up for lost forage. This could lead to degradation of the salmon habitat.

There are six ranches in this watershed that are of key importance to the salmon habitat. Managed grazing systems that involve both private and public lands will play an important role in maintaining and enhancing fisheries habitat.

Mining activities are still underway in the East Fork watershed. The Livingston gold mine in Big Boulder Creek is still active, and there are gold mining reserves in the White Clouds. The effects of these activities were not addressed in this plan.

Logging other than for posts and poles is limited. Except for the primitive area, there is little saw timber in the watershed and no future timber sales are anticipated.

Past and Present Fisheries Use

The East Fork has a long history of anadromous fish runs-spring/summer chinook and steelhead. No attempt was made to estimate the historical run sizes as part of this plan. However, redd counts conducted from 1957 to 1962 found an average of 1,385 redds per year within this watershed. These redds comprised 34 percent of all redds counted in the upper Salmon River drainage during this period.

From 1977 to 1981, the East Fork had 19 percent of all redds counted in the upper Salmon drainage. This percentage has dropped to 10 percent since 1981.

The East Fork has approximately 31 miles of salmon habitat. Most of this has not changed much since the 1960s. In terms of fish growth, this river is not as productive as the Lemhi and Pahsimeroi because of its higher elevation, colder waters, and higher gradient.

The stream has about 11 miles of adequate spawning habitat. This area should be capable of producing approximately 720,000 smolts (based on 200 adult fish per mile and an egg-to-smolt survival rate of 15 percent). A life history analysis shows that all streams, except for Big Boulder Creek, still have occupied habitat.

Fish Habitat Conditions

Fisheries habitat within the East Fork watershed can be divided into three primary stream segments: (1) river mouth to Herd Creek, (2) Herd Creek to Little Boulder Campground, and (3) Herd Creek (Figure 6-3). Fish habitat conditions within these reaches are summarized in Tables 6-1, 6-2, and 6-3.

Overall, the quality and quantity of salmon habitat in the East Fork watershed is good and conditions have changed very little in the past 50 years. The major problem is simply a lack of returning adult fish.

There are opportunities to increase habitat quality in some areas by implementing voluntary ranch plans which include water developments, fencing, seedings, and planned grazing systems. This would help m-establish needed riparian corridors and increase stability of streambanks. It would also help reduce water temperatures, which often exceed the threshold for cold-water fish during the mid-to-late summer months.

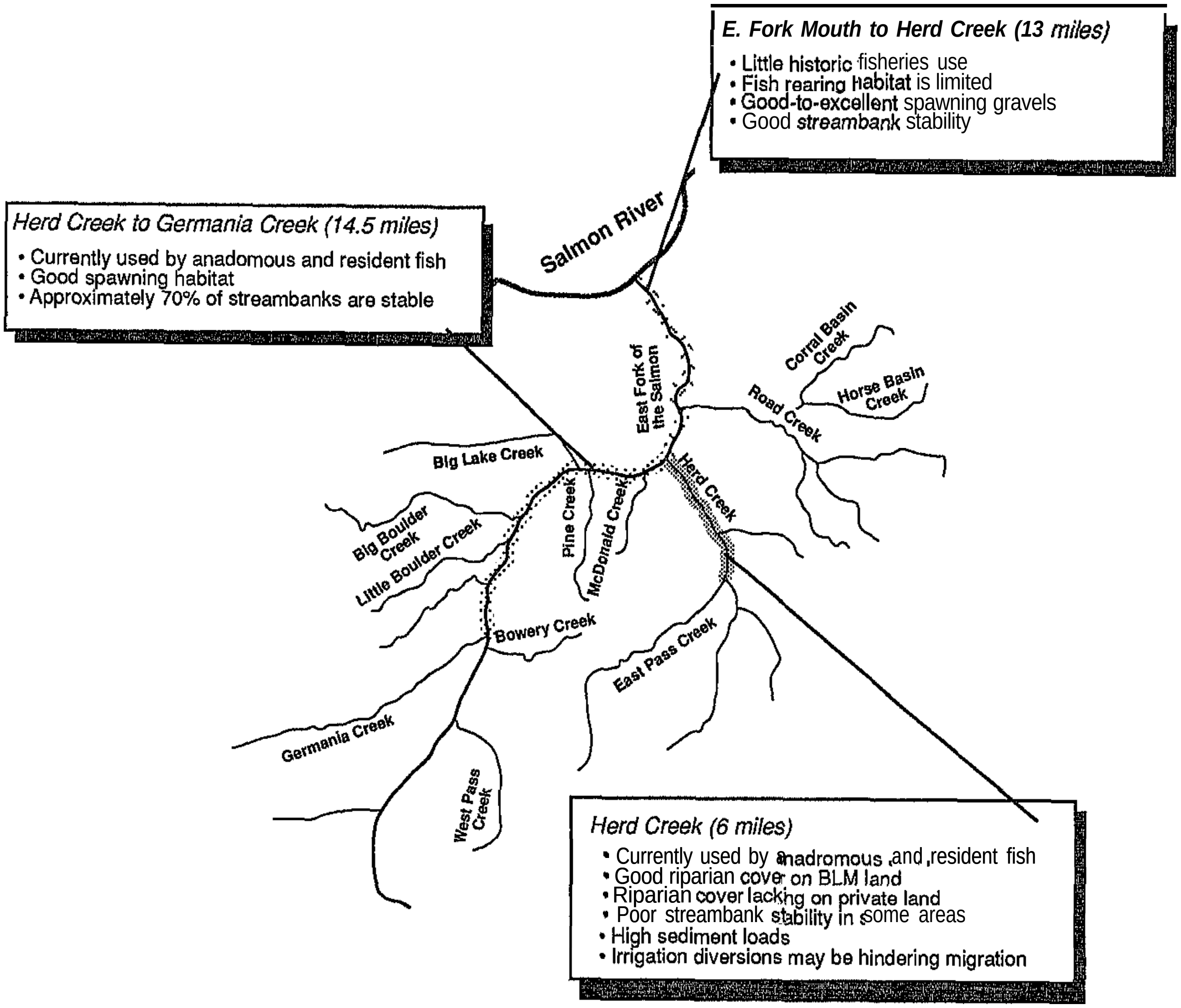

Figure 6-3. Fisheries Habitat Conditions-East Fork of the Salmon River Watershed

Table 6-1. Habitat Conditions in the East Fork of the Salmon River Watershed—East Fork Mouth to Herd Creek

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	○	Inadequate flows are not a limiting factor in this reach, but improving flows could help downstream.
Barrier-free passage for adult migration	○	
Cool water temperatures	?	Temperature meters have been installed to collect additional information. This will help identify potential problems.
Good water quality (chemical)	?	A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	○	Rearing habitat is limited to small pools behind rocks and back-water areas, but is sufficient for expected levels of fish.
Streamside vegetative cover	Needs improvement	Good riparian cover of cottonwood, birch and willow. Some areas need additional cover.
Spawning/Incubation areas	Needs improvement	Need additional island bars and off-channel spawning areas.
Water flows for juvenile outmigration	○	
Barrier-free passage for juvenile outmigration	Needs improvement	Eight irrigation diversions have inadequate fish screens.

● Major limiting factor
◍ Needs improvement
○ Adequate
? Insufficient information

Table 6-2. **Habitat Conditions in the East Fork of the Salmon River Watershed—Herd Creek to Germania Creek**

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	○	
Barrier-free passage for adult migration	○	
Cool water temperatures	?	Additional temperature data need to be collected and analyzed.
Good water quality (chemical)	?	A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	◍	Rearing habitat limited to small pools behind rocks and back-water areas. There is a lack of island bars and large woody debris. Off-channel rearing areas need to be maintained andenhanced
Streamside vegetative cover	◍	Additional streamside vegetation is needed along critical habitat sections.
Spawning/Incubation areas	◍	Provides majority of spawning habitat in this watershed. Spawning habitat is good; cobble embeddedness is 10-25%. Some sedimentation occurs from unstable streambanks and operation of the adult fish trap.
Water flows for juvenile outmigration	○	
Barrier-free passage for juvenile outmigration	◍	Fourteen irrigation diversions have inadequate fish screens to protect fish during all life histories.

● Major limiting factor
◍ Needs improvement
○ Adequate
? Insufficient information

Table 6-3. Habitat Conditions in the East Fork of the Salmon River Watershed—Herd Creek

Spring/Summer Chinook Habitat Requirements (see Table 2-5)	Habitat Condition	Comments
Water flows for adult migration	○	
Barrier-free passage for adult migration	◍	Herd Creek diversions 1 & 2 do not completely block passage, but could be improved.
Cool water temperatures	?	Additional temperature data are being collected and analyzed.
Good water quality (chemical)	○	Appears to be adequate based on current land use. A water quality study is currently underway that will help identify any problems.
Pools for adult holding and juvenile rearing	◍	Pools on lower BLM section are filling with sediment from upstream sources. Pool frequency and quality are limiting production.
Streamside vegetative cover	◍	BLM sections have good riparian vegetation. Streamside vegetation is sparse through the 2-mile section of private land. Streambanks are unstable through this section.
Spawning/Incubation areas	◍	Spawning/incubation limited by fines in the gravel (220 percent).
Water flows for juvenile outmigration	○	
Barrier-free passage for juvenile outmigration	◍	Three irrigation diversions have inadequate fish screens.

● Major limiting factor
◍ Needs improvement
○ Adequate
? Insufficient information

Chapter 7

Action Plan

Overview

The primary objective of this watershed program is to protect, enhance, and restore salmon habitat, while maintaining a balance between resource protection and use. This chapter presents an action plan designed to achieve that objective.

Chapters 4, 5 and 6 identify the habitat problems currently limiting salmon production within each watershed. These problems include inadequate water flows, high water temperatures, lack of streamside vegetation, high sediment levels, and physical barriers that hinder adult and juvenile fish migrations.

Although each watershed is different, the habitat problems and solutions are often very similar. One important distinction, however, is that all problems are not equal in terms of their impact on fisheries production. This is true for problems in the same watershed, and when problems and opportunities are compared between the three watersheds.

Given these considerations, this action plan contains a series of prioritized goals and actions. The following goals have been developed to address each of the major habitat problems outlined above:

- Increase instream flows during critical fish migration periods.
- Reduce the number of physical barriers hindering fish migrations.
- Develop new rearing and resting pools.
- Establish riparian vegetation along critical habitat areas to provide cover and reduce water temperatures.
- Reduce sediment levels within spawning gravels.

Table 7-l presents a prioritized listing of these goals for each watershed. It is designed to show the priorities for solving habitat-related problems within each watershed. It does not indicate the overall priorities between the three watersheds.

Table 7-2 indicates priorities when all three watersheds are evaluated together. For example, the highest priority for the model watershed project area is to increase the water flows in the lower Lemhi during the critical fish migration period. Other high priority goals are to enhance and protect the riparian vegetation along the critical habitat areas in all three watersheds, and to reduce the num-

Table 7-1. Habitat Goals and Priorities within each Watershed—Lemhi River, Pahsimeroi River, and East Fork of the Salmon River

	Lemhi River Watershed					Pahsimeroi River Watershed		East Fork of the Salmon River Watershed		
Goals	River Mouth to Agency Creek	Agency Creek to Hayden Creek	Hayden Creek to Leadore	Big Springs Creek	Hayden Creek	River Mouth to Hooper Lane	Patterson-Big Springs Creek	River Mouth to Herd Creek	Herd Creek to Germania Creek	Herd Creek
Increase instream flows during critical fish migration periods	●	○	○	○	● [1]	● [2]	○	○	○	○
Reduce the number of physical barriers hindering fish migrations	●	○	○	○	●	● [3]	◍ [4]	◍	◍	◍
Develop new rearing and resting pools	○	◍	○	◍	○	○	○	○	◍	○
Establish riparian vegetation along critical areas to provide cover & reduce temps	◍	◍	●	●	○	●	●	○	◍	●
Reduce the sediment levels within spawning gravels	○	○	●	●	◍	○	●	○	○	●

● Highest priority

◍ Medium priority

○ Lowest priority

Footnotes

[1] Passage is a problem in low flow years as most water goes through gravel diversion weirs, instead of over the top.

[2] Additional 6-10 cfs of flow is needed directly below the Ellis ditch diversion.

[3] Ellis diversion needs a fish ladder to aid fish passage during low flow periods.

[4] Diversion weirs at PBSC-1, PBSCQ, and PBSC-3 lack sufficient flow for passage.

Table 7-2. Habitat Goals and Priorities Between the Model Watershed Project Areas

Goals	Lemhi River Watershed					Pahsimeroi River Watershed		East Fork of the Salmon River Watershed		
	River Mouth to Agency Creek	Agency Creek to Hayden Creek	Hayden Creek to Leadore	Big Springs Creek	Hayden Creek	River Mouth to Hooper Lane	Patterson-Big Springs Creek	River Mouth to Herd Creek	Herd Creek to Germania Creek	Herd Creek
Increase instream flows during critical fish migration periods	● [1]	○	○	○	◍	●	○	○	○	○
Reduce the number of physical barriers hindering fish migrations	◍	○	○	○	◍	●	○	○	○	○
Develop new rearing and resting pools	○	○	○	○	○	○	○	○	○	○
Establish riparian vegetation along critical areas to provide cover & reduce temps	○	○	●	●	○	●	◍	○	○	●
Reduce the sediment levels within spawning gravels	○	○	◍	◍	○	○	◍	○	○	◍

● **Highest priority**

◍ **Medium priority**

○ **Low priority until other problems are solved**

Footnote

[1] This **priority need is currently** being addressed by the Bureau of Reclamation in cooperation with the Lemhi Water Users under the Lemhi Model Water Conservation Project.

ber of physical barriers within the Pahsimeroi watershed.

For each goal, this plan identifies one or more proposed actions. These actions are individual projects or measures designed to help achieve the stated goal. Actions are also prioritized (i.e., high, medium, or low) to indicate their relative importance.

The prioritized goals and actions for each watershed are listed in tables 7-3, 7-4, and 7-5. High priority actions are also shown in Figures 7-1, 7-2, and 7-3.

[Note: The BLM and Forest Service lands that comprise most of the land base in these watersheds are important to salmon production, and many actions are proposed for these lands as part of the salmon recovery plan. While actions specific to these lands are not included in this action plan, they are integral to overall recovery goals.

The federal lands contain a number of resources important to the recovery formula. They produce most of the water and also provide grass that helps support the area's livestock industry. The relationship between healthy uplands and riparian lands will become more important as coordinated resource management plans are developed for individual ranches. These plans will require a close partnership between the private and public land managers.]

Treatment Levels

The actions identified in this plan represent a wide range of potential projects that could be implemented in the model watersheds. As noted earlier, some actions are considered high priority, while others are medium or low priority Future implementation strategies could range from taking no action to implementing all of the actions.

To help compare different options, three levels of treatment were identified and evaluated as part of this plan. The three treatments are:

- No Planned Action- This scenario represents existing resource conditions if no new actions are taken.
- Level I -Under this treatment only the high priority actions would be implemented.
- Level II-This treatment would implement the high priority and medium priority actions.

Table 7-6 provides a comparison of these three treatment levels. If all high priority actions were implemented (i.e., Level I treatment), they would provide sufficient water flows during critical fish migration period. These actions would also reduce sediment and phosphorus delivery to the Salmon River by 63 percent and create approximately 30 miles of adequate spawning and rearing habitat. The Level I treatment would cost approximately $5 million.

The Level II treatment would provide the same benefits as the Level I treatment. It would also increase flows in the East Fork River, provide additional pool habitat, and add approximately 10 miles of rearing and spawning habitat. This treatment level would cost approximately $5.4 million.

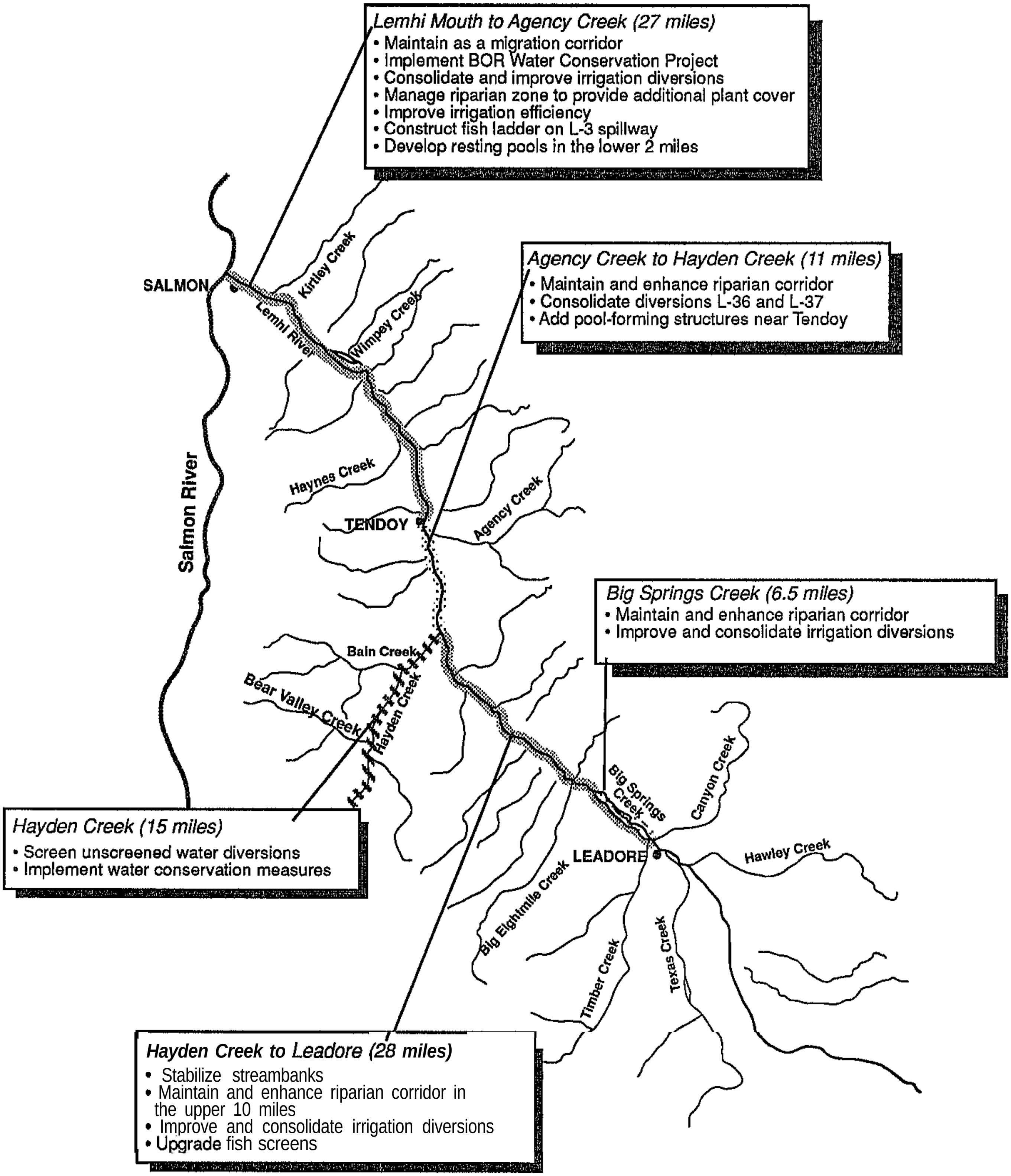

Figure 7-1. High Priority Actions for the Lernhi River Watershed

Table 7-3. Prioritized Goals and Actions for the Lemhi River Watershed

Lemhi Goal #1: Increase water flows so there is a minimum 35 cfs flow between diversions L-3a and L7 during the critical adult migration period (July and August). Maintain a 100 cfs flow past the L-5 flow gauge in April.

Action Number	Action	Priority	Cost ($)
1-L	Implement BOR Water Conservation Project (see page 3-2). This project and the Lemhi Irrigators Plan are the key elements in addressing the main migration problem in the Lemhi. This project includes construction of variable-crest diversion weirs with fish ladders and fish screens that meet current screen standards. Weirs will be built at diversions L-3A, L-6 and L-7 (L-7A is consolidated with L-7). The L-5 diversion has been eliminated with a land purchase and water transfer. L-4 will be eliminated by sprinkling the land currently irrigated out of L-4 and L-6.	High	$2,000,000
2-L	Improve irrigation efficiency below diversion L-7. This includes changing the point of diversion for 510 acres currently irrigated out of the Lemhi to being irrigated out of the Salmon River. This would reduce the Lemhi call by 13 cfs.	High	$500,000
3-L	Develop small reservoir storage in the upper Lemhi. Approximately 2,100 acre-feet of storage would be needed to provide 35 cfs in the lower river over a 30-day period.	Medium	$200,000 to $300,000 per site
4-L	Store runoff in the upper watershed by diverting water from a side tributary onto sagebrush land during the winter. This would create an ice build-up and provide some ground-water recharge.	Medium	$20,000 to $50,000

Table 7-3 (continued). Prioritized Goals and Actions for the Lemhi River Watershed

Lemhi Goal #2: Establish riparian vegetation (60 percent cover) along critical habitat areas to provide cover and reduce water temperatures.

Action Number	Action	Priority	Cost ($)
5-L	Maintain and enhance the riparian corridor along the upper 10 miles of the Hayden Creek-to-Leadore reach. This section contains the most important rearing and spawning habitat. This action also covers Big Springs Creek. It is recommended that this riparian corridor be 200-300 feet wide and have a minimum buffer of 30 feet (see Riparian Management Strategy on page 7-16).	High	$300,000 to $600,000
6-L	Implement a program to maintain and enhance riparian vegetation (Lemhi mouth to Hayden Creek). This program should include reviewing riparian conditions near existing pools and establishing priorities for maintaining and improving these areas.	High	$50,000
7-L	Expand temperature monitoring, including sites that monitor ambient air temperatures.	Medium	$25,000

Lemhi Goal #3: Reduce the number of physical barriers hindering fish migrations.

Item	Action	Priority	Cost ($)
8-L	Construct a fish ladder on the L-3 spillway.	High	$5,000
9-L	Make physical improvements to irrigation diversions that currently pose migration problems. Diversions should be consolidated whenever feasible. The following diversions have been identified for possible consolidation: L-2 and L-2b ($25,000) L-7 and L-7a (under construction) L-17 and L-16 ($15,000) L-22a and L-23 (under construction) L-24 and L-25 ($5,000) L-36 and L-37 (currently in the design phase - $30,000) L-43a, L-43b, and L-43c ($20,000) L-46 and L-47 ($15,000) L-48 and L-49 (under construction) LBSC-4 and LBSC-4a ($5,000) Diversions that cannot be consolidated should be improved to provide stable diversion points and provide adequate fish passage.	High	$115,000
10-L	Upgrade fish screen on 24 diversions in the Hayden Creek-to-Leadore reach. This will help prevent loss of fry in this important spawning and rearing area.	High	$360,000
11-L	Screen the 7 diversions above the currently occupied habitat in Hayden Creek.	High	$140,000

Table 7-3 **(continued). Prioritized Goals and Actions for the Lemhi River Watershed**

Lemhi Goal #4: Increase spawning success and fish productivity by reducing sediment levels in spawning gravels.

Item	Action	Priority	Cost ($)
12-L	Stabilize streambanks in areas where the stream has widened. Stabilization should not be used to constrain the stream channel or align the stream into a straight channel. Stabilization should include a combination of bio-engineering measures as well as additional riparian cover. Highest priority is the IO-mile section from the bridae near Leadore to the Eiahtmile Creek confluence.	High	$100,000
13-L	Install cattle crossings to minimize streambed disturbances (Hayden Creek to Leadore).	Medium	$750 per crossing
14-L	Stabilize streambanks in areas where bank erosion is threatening physical structures (e.g., bridges, roads, homes) using bio-engineering measures (Lemhi mouth to Leadore).	LOW	$17.50/Ft
15-L	Mechanically work spawning gravels just prior to spawning (Hayden Creek to Leadore). This should be conducted as an experiment to see if it would be effective in improving fish production. The long-term solution is to enhance and protect the riparian corridor throuah the actions outlined above.	Low	$10/Ft

Lemhi Goal #5: Increase the number and quality of rearing and resting pools.

Item	Action	Priority	Cost ($)
16-L	Provide additional pool habitat near Tendoy.	High	$100,000
17-L	Develop resting pools in the lower 2 miles of the Lemhi.	High	$34,000
18-L	Maintain any new pools that develop following high water events. This may require paying landowners for land lost as a result of stream meandering (Lemhi mouth to Aoencv Creek).	Medium	$5,000 per pool
19-L	Evaluate the possibility of creating new rearing habitat using existing irrigation canals or old slough channels. (Lemhi mouth to Hay den Creek). The possibility of creating new pools should also be considered.	Medium	?

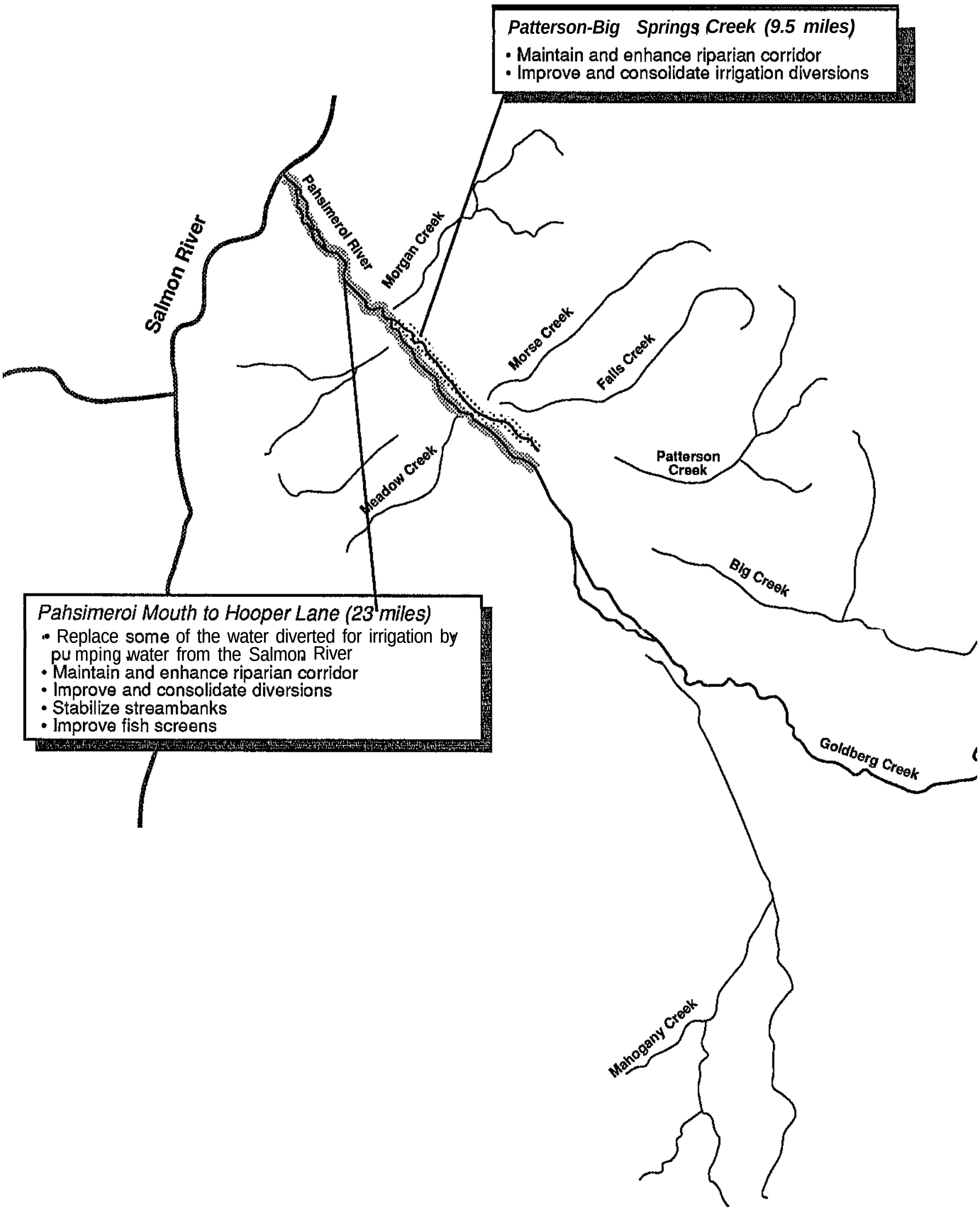

Figure 7-2. High Priority Actions for the Pahsimeroi River Watershed

Table 7-4. Prioritized Goals and Actions for the Pahsimeroi River Watershed

Pahsimeroi Goal #1: Increase water flows so there is a minimum 6 cfs flow passing the Ellis Ditch Diversion at all times.

Action Number	Action	Priority	Cost (5)
1-P	Substitute water diverted from Patterson-Big Springs Creek by pumping water from the Salmon River to the old Amar farm. This would keep 6-10 cfs of flow in Patterson-Big Springs Creek and the Pahsimeroi.	High	$105,000
2-P	Develop water conservation agreements to reduce levels of stream diversion.	High	?

Pahsimeroi Goal #2: Establish riparian vegetation (60 percent cover) along critical habitat areas to provide cover and reduce water temperatures.

Action Number	Action	Priority	Cost (5)
3-P	Maintain and enhance the riparian corridor along 17 miles of critical fish habitat. It is recommended that this riparian corridor be 200-300 feet wide and have a minimum buffer of 30 feet from the streambank (see Riparian Management Strategy on page 7-16). This action will cover Patterson-Big Springs Creek as well as the main stem Pahsimeroi.	High	$500,000 to $1,020,000
4-P	Enhance 10 miles of riparian corridor through selective planting of trees and shrubs (Patterson-Big Springs Creek).	High	$10,000
5-P	Expand temperature monitoring.	Low	?

Table 7-4 (continued). Prioritized Goals and Actions for the Pahsimeroi River Watershed

Pahsimeroi Goal #3: Increase spawning success and fish productivity by reducing sediment /eve/s in spawning gravels.

Action Number	Action	Priority	Cost ($)
6-P	Stabilize 76,755 feet of streambank in areas where the stream has widened (Pahsimeroi mouth to Hooper Lane). Stabilization should not be used to constrain the stream channel or align the stream into a straight channel. Stabilization should involve a combination of bio-engineering measures as well as restoring vegetative cover.	High	$300,000
7-P	Stabilize head cut where Sulfur Creek enters the Pahsimeroi River. Possibly construct a sediment basin as a means to reduce sediment.	High	$5,000
8-P	Mechanically work spawning gravels to remove sediment. This action should not be taken until rioarian actions are implemented.	Low	?

Pahsimeroi Goal #4: Increase the quality of rearing and resting pools.

Action Number	Action	Priorlty	Cost ($)
	Pool habitat quality can be improved by establishing protected riparian corridor and reducing sedimentation (see actions above.)	High	

Pahsimeroi Goal #5: Reduce the number of physical barriers hindering fish migrations.

Action Number	Action	Priority	Cost ($)
9-P	Improve 12 irrigation diversions (Pahsimeroi mouth to Hooper Lane) to provide stable diversion points and reduce erosion.	High	$72,000
1 0-P	Improve 9 irrigation diversions (Patterson-Big Springs Creek) to provide stable diversions points and reduce erosion.	High	$27,000
11-P	Improve fish screens at the12 diversions (Pahsimeroi mouth to Hooper Lane) so they meet the new fish screen standards.	High	$360,000
12-P	Improve fish screens at the 9 diversions (Patterson-Big Springs Creek) so they meet the new fish screen standards.	High	$180,000
13-P	Improve fish passage on 6 diversions (Pahsimeroi mouth to Hooper Lane).	Medium	$10,000

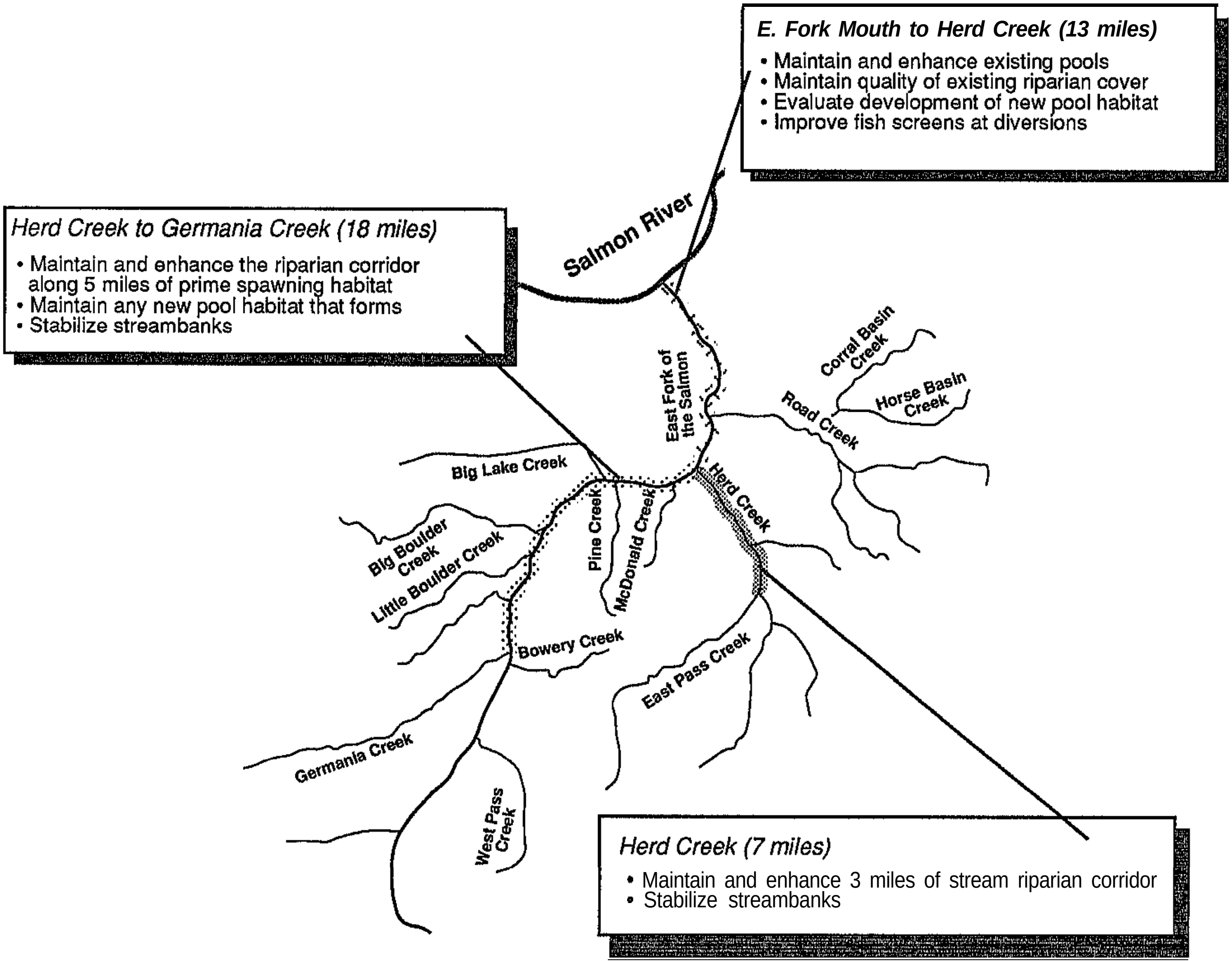

Figure 7-3. High Priority Actions for the East Fork of the Salmon River Watershed

Table 7-5. Prioritized Goals and Actions for the East Fork of the Salmon River Watershed

East Fork Goal #1: Establish riparian vegetation (60 percent density) along critical habitat areas to provide cover and reduce high water temperatures.

Action Number	Action	Priority	Cost ($)
1-EF	Enhance and protect the riparian corridor along 3 miles of Herd Creek. This will involve selective plantings of trees and shrubs as well as new management strategies to increase riparian cover (see Riparian Management Strategy on page 7-16).	High	$15,000
2-EF	Enhance and protect the riparian corridor along 5 miles of prime spawning habitat between Pine Creek and Little Boulder Creek. A 10 foot-wide buffer of cottonwood and willows should be established along each bank (see Riparian Management Strategy on page 7-16). This will involve selective plantings of trees and shrubs as well as new management strategies to increase riparian cover.	High	$75,000 to $100,000
3-EF	Maintain quality of existing riparian cover through conservation planning efforts (East Fork mouth to Herd Creek).	High	?
4-EF	Expand temperature monitoring throughout the watershed.	Medium	?

East Fork Goal #2: Increase spawning success and fish productivity by reducing sediment levels in spawning gravels.

Action Number	Action	Priority	Cost ($)
5-EF	Stabilize 23,000 feet of streambank (Herd Creek to Germania Creek) in areas where the stream has widened. Stabilization should not be used to constrain the stream channel or align the stream into a straight channel. Stabilization should involve a combination of bio-engineering measures as well as restoring vegetative cover.	High	$92,000
6-EF	Stabilize 10,000 feet of streambank (Herd Creek) in areas where the stream has widened (see discussion in Action 5-EF above).	High	$40,000
7-EF	Mechanically work spawning gravels in Herd Creek to remove existing sediment.	Medium	?
8-EF	Review operations of the adult fish trap to see if they are causing sedimentation problems.	Medium	?

Table 7-5 (continued). Prioritized Goals and Actions for the East Fork of the Salmon River Watershed

East Fork Goal #3: Increase the number and quality of rearing and resting pools.

Action Number	Action	Priority	Cost ($)
9-EF	Maintain and enhance the existing pool habitat. Maintain any new pool habitat that forms following high water events. This may require an incentive program to compensate landowners for any losses caused by pool formation. Allow debris to accumulate in the channel to provide pool habitat. (East Fork mouth to Germania Creek)	High	$5,000 per pool
IO-EF	Evaluate development of new habitat using existing irrigation canals, old meanders and slough channels (East Fork mouth to Germania Creek). The possibility of creating new pools should also be considered. These actions need to be part of individual ranch plans developed on a voluntary basis. These plans could include incentives for enhancement.	Medium	?

East Fork Goal #4: Reduce the number of physical barriers hindering fish migrations.

Action Number	Action	Priority	Cost ($)
11-EF	Evaluate alternatives for eliminating some of the irrigation diversions in this watershed. Some diversions could be eliminated by consolidating diversions or by switching to another irrigation method (e.g., using wells and a pressurized system). Diversions EF-7 and EF-8 have already been identified for possible consolidation. If diversions cannot be eliminated, they should be improved so there is a stable instream structure and adequate fish passage.	High	?

East Fork Goal #5: Increase instream flows (Note: Inadequate flows are not a limiting factor in this watershed, but increasing flows would help meet need for additional flows in the Salmon River and would also help reduce water temperatures.)

Action Number	Action	Priority	Cost ($)
12-EF	Evaluate whether land smoothing could be used to improve flood irrigation efficiency (East Fork mouth to Herd Creek).	Medium	?
13-EF	Implement water conservation practices on the irrigated benches above the river. Install sprinkler irrigation systems on 500 acres of irrigated ground below Herd Creek.	Medium	$200,000

Table 7-6. Comparison of Watershed Treatment Levels

AFFECTED ENVIRONMENT	NO ACTION (Present Levels)	LEVEL I (High Priority Actions)	LEVEL II (High + Medium Priority)
Stream Flows	Some dewatering at various location5 in Lemhi and Pahsimeroi rivers	Provide outmigration flows for juvenile fish in April & May. Provide flushing flows for adults in the Lemhi during critical periods.	Increase flows in Lemhi to a minimum stream flow. Increase flows in the East Fork River.
Sediment Delivery to Salmon River	5,479 Tons/Year	2,022 Tons/Year	2.022 Tons/Year
Sediment Reduction (%)	0	63%	63%
Phosphorus Delivery to Salmon River	15,341 Pounds/Year	5,662 Pounds/Year	5,662 Pounds/Year
Phosphorus Reduction (%)	0	63%	63%
Stream Bank Stabilization (miles of streambank with severe-to-moderate problems)	2 miles stabilized	25 miles stabilized	30 miles stabilized
Water Temperatures	Temperatures occasionally exceed desired levels for spawning and rearing	Reduces water temperatures so that the maximum allowable temperatures would be exceeded only in worst years and only in the longest reaches	Reduces water temperatures and increases the #of pools that have proper width:depth ratios for refuge sites
Spawning and Rearing Habitat (Miles)	20 miles of good habitat	50 miles of good habitat	80 miles of good-to-excellent habitat
Costs ($)	0	$5,000,000	$5,400,000
Wildlife Habitat	No Change	Increased Benefit	Increased Benefit
Threatened & Endangered Species	No Change	Increased Benefit	Increased Benefit
Wetlands	No Change	Increased Quality	Increased Quality
Recreation	No Change	Increased Benefit & Quality	Increased Benefit & Quality
Visual & Aesthetic Values	No Change	Riparian Enhancement	Riparian Enhancement
Cultural Resources	No Change	No Change	No Change
Cropland, Hayland, and Pasture	No Change	Increased productivity, herd quality, levels of management, and crop quality (grain, hay & pasture)	Same as Level I

Riparian Management Strategy

Several high priority actions call for voluntarily establishing protected riparian corridors along critical fish habitat areas. These corridors can help solve several habitat problems within watersheds. Establishing a corridor with good vegetative cover can provide cover for rearing fish, help reduce water temperatures, stabilize streambanks, and reduce cobble embeddedness.

Riparian corridors should be 200-300 feet wide and have a minimum buffer of 30 feet from the streambank as shown below. This buffer recommendation is for wide valley streams with a low gradient. The recommendation is based on two reference sites in the Lemhi River above the town of Lemhi. Actual buffer widths would be site-specific and would be determined with the landowners.

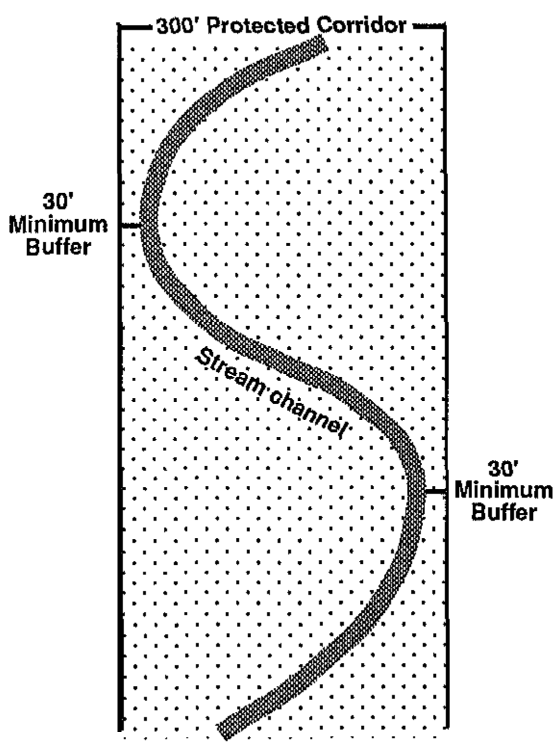

Figure 7-4. Example Riparian Corridor Showing Recommended Buffer Widths

The following strategies could be used to achieve a protected riparian corridor:

- Corridor fencing and land easements
- Grazing systems which include riparian pastures
- Set-aside or conservation reserves of whole pastures that include the stream corridor

The first strategy could cost as much as $60,000 per mile for fencing (both sides) and $1,650 per year in easements. This is based on 33 acres per mile and a $50 per acre annual lease. Limited costs would also be associated with the monitoring and evaluation. This strategy would make rapid progress towards achieving the goals; however, the landowner acceptance would likely be mixed.

The cost of establishing grazing systems would be approximately $30 to $50 per acre. This would be the average cost to develop the pasture rotation using cross fencing, seedings, and water developments. Progress towards the goals would be slower under this strategy, and monitoring and evaluation costs would be higher. Most expenses would be a one-time cost, although there may be some on-going maintenance costs that need to be considered.

Costs associated with the third strategy-establishing conservation reserves-would be approximately equal to the value of forage foregone by not grazing the bottom pastures. This strategy would be similar to the Conservation Reserve Program or Wetland Reserve Program. Estimated annual rental fees for a lo-year contract would be about 536 to $45 per acre. Implementing any of these strategies would also require some technical staff assistance. Approximately one full staff year would be required at an estimated cost of $50,000.

All strategies will require voluntary participation by private landowners. Therefore, it will be necessary to tailor a plan for each individual landowner's operation. Each plan must mold the riparian objectives into the overall ranch objectives. Compatibility of the objectives will be necessary for these strategies to succeed.

Implementation and Funding

Implementation of this plan will require financial and technical assistance from a variety of entities. It will also require the cooperation of landowners, resource management agencies, and other interested parties.

Potential sources of technical and financial assistance are presented in Appendix A. Because assistance would likely come from several different sources, an implementation schedule has not been developed as part of this action plan. However, information presented in this plan will guide future efforts to secure funding and technical assistance.

Cost estimates shown in tables 7-3 to 7-5 represent the basic implementation costs associated with each action. The estimates do not include the technical assistance needed for planning, designing, implementing, and monitoring the actions.

The estimated staffing level needed to implement and monitor the high priority actions is shown in Figure 7-7. Assuming that each staff year would cost $53,000 (including salaries, benefits, equipment, and office space), then the required technical assistance would cost $1,404,500. It is anticipated that these costs would be spread over a five-year period.

Funding for technical assistance could come from almost any of the funding agencies outlined in Appendix A. Staffing could be accomplished through the development of interagency, interdisciplinary teams. These teams could then help private landowners implement the proposed actions.

Table 7-7. Estimated Staffing Level Required to Implement and Monitor the High Priority Actions

Staffing Element	Position	Staff Year
Overall Watershed Coordination	Coordinator/Monitoring Leader	5.0
	Administrative Assistant	2.5
Lemhi River Watershed	Civil Engineer	3.0
	Range Conservationist/ Contract Writer	3.0
	Soil Conservationist/ Engineering Technician	3.0
	Biologist	2.0
	Geomorphologist/Geologist	0.5
	Archeologist	0.5
Pahsimeroi River Watershed	Civil Engineer	1.0
	Range Conservationist/ Contract Writer	2.0
	Biologist	1.0
	Archeologist	0.25
East Fork of the Salmon River Watershed	Civil Engineer	1.0
	Range Conservationist/ Contract Writer	1.0
	Geomorphologist/Geologist	0.5
	Archeologist	0.25
	TOTAL	*26.5* **Staff Years**

Chapter 8

Monitoring and Evaluation

Overview

This watershed plan outlines a series of actions designed to improve fish habitat conditions within the target drainages. The ultimate goal is to help restore fish numbers to levels that were present in the 1960s.

To meet the needs of this plan, a monitoring and evaluation framework has been developed based on the following key elements:

1. Monitoring must be directly linked to the factors limiting fish production within the target watersheds.

2. Several levels of monitoring are needed to help evaluate the project's success.

3. Monitoring must be designed so that it has scientific credibility.

4. Monitoring should be used to help improve future decisions through an adaptive management process.

Monitoring Framework

The complex nature of these watersheds makes plan monitoring and evaluation a key but difficult task. Ideally, the simplest form of monitoring would be to measure the number of returning adult fish or number of redds. This approach would work if all factors affecting the fish populations were within the watershed. However, since most factors are outside the watershed, a different monitoring and evaluation approach is needed.

This plan proposes that monitoring be conducted on three different levels. The first level of monitoring and evaluation will be very basic, focusing on projects which have been implemented, and whether projects were implemented as planned.

The second level will measure the effects on specific habitat parameters, such as:

- Sediment in the spawning gravels
- Water temperatures in relation to ambient air temperature
- Stream flows in critical sections
- Streambank stability
- Water quality
- Riparian cover

The second monitoring approach will help evaluate individual actions, as well as cumulative effects of different actions. To measure changes in these habitat parameters, reference sites will be established in key watershed reaches. Detailed habitat inventories will then be conducted at these sites to establish baseline data and monitor future changes.

Individual actions designed to meet a spe cific watershed need will be monitored to assess effectiveness. For example, if an action proposes a pasture management system to enhance riparian vegetation, then changes in plant cover will be moni-tored to evaluate this action.

Existing guidelines such as *Monitoring Protocols* to Evaluate Water *Quality Effects of Grazing* Management *on Western* Rangeland *Streams* and *Idaho* Water *Quality Monitoring Protocols* will be used to identify monitor-ing parameters and strategies. All actions will include an individual monitoring and evaluation plan that identifies specific monitoring parameters and the responsi-ble monitoring entity.

The third level of monitoring will focus on in-basin changes in fish productivity. This can be accomplished by monitoring sur-vival rates between different life history stages that occur within the watershed (e.g., egg-to-fry, egg-to-parr, egg-to-smolt, etc.).

The egg-to-parr survival rate is an impor-tant indicator of fish productivity, It is also relatively easy to measure within these watersheds. Egg numbers can be esti-mated by using redd counts. Parr num-bers can then be monitored using population density counts.

A weir for counting juvenile fish will be installed on the Lemhi River (near diver-sion L-7) as part of the BOR project. This will help with monitoring efforts. Else-where, parr counts can be made by snor-keling or by electrofishing. These will only be rough estimates, however, because of fish movements and the difficulty of snor-keling the river during different flows.

Chapter 9

Coordination, Consultation, and Public Participation

Public participation has been the cornerstone of this model watershed planning effort. The public has been invited to participate and provide solutions from the beginning.

The initial organization of the model watershed included a public meeting in Salmon for residents of the Upper Salmon Basin. At this meeting, residents were asked to express their opinions on (1) whether they wanted to participate, and (2) how best to implement the program.

Since 90 percent of the occupied salmon habitat occurs on private land, the private landowners were asked from the beginning to help shape the planning process. From this came a decision to appoint a ***Model Watershed Adviso y Committee*** representing a range of interests. The committee is currently comprised of the following members:

Allan Anderson	Bob Loucks
Betty Baker	Bruce Mulkey
Ron Bloxam	Dallas Olson
Lionel Boyer	V. Don Olson
Tom Curet	Don O'Neal
Jim Dowton	Scott Turner
Gini Gilliam	Dick Ward
Bob Heidemann	

A ***Technical Advisory Committee*** was also formed to assist with the planning effort. Groups, agencies, and interests represented on this committee are:

- Bonneville Power Administration
- Bureau of Reclamation
- Challis Bureau of Land Management
- Challis National Forest
- District 74 Water Master
- East Fork Irrigators
- Forest Service
- Idaho Department of Fish and Game
- Idaho Department of Health &Welfare - Divison of Environmental Quality
- Idaho Department of Water Resources
- Lemhi Bureau of Land Management
- Lemhi County Extension Agent
- Lemhi Irrigation District
- National Marine Fisheries Service
- Natural Resources Conservation Service
- Pahsimeroi Irrigators
- Shoshone-Bannock Tribes

The advisory committee meets formally twice a year. The technical committee met more often at the beginning, then branched into smaller technical groups to handle more specific topics. Smaller sub-basin meetings have also been held to review progress and solicit input. These meetings are led by landowners and are open to the public.

One key event in each watershed was a public tour that brought landowners and interested citizens together to view and discuss habitat issues in the field. The actions outlined in this plan are largely a result of these meetings and tours.

The Model Watershed Coordinator has used a variety of methods to provide additional public information about this project. The project was featured on "Outdoor Idaho," a television show produced by Idaho Department of Fish and Game. It is also part of a video entitled "A Place to Come Home To" produced by the Natural Resources Conservation Service. More recently, the Sawtooth Wildlife Council produced a video on the project for release to major news networks.

Additional public information has been provided through a quarterly newsletter mailed to all households in the upper Salmon River Basin. Newsletter articles have featured project progress while also soliciting additional public comments.

The Model Watershed Coordinator has also given numerous presentations at local and regional meetings. A slide show and display board have also been developed and used at some of these presentations.

Chapter 10

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Appendix A
Potential Funding Sources

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Potential Funding Sources

Implementation of the plan actions will require funding for the technical assistance needed to plan and design projects. Funding will also be needed to provide incentives for individuals or groups to install projects.

The two local Soil and Water Conservation Districts could leverage project implementation funds from Bonneville Power Administration (or other state, federal, or private organizations) to secure funding from the Natural Resources Conservation Service (NRCS). Funding for technical assistance is being sought through the NRCS Small Watershed Program (PL-566). The Conservation Districts could also seek cost-sharing for project implementation through this same watershed program.

Potential sources of technical and financial assistance are outlined below. Some of these programs provide assistance to individuals, while others are more directed towards group projects.

Natural Resources Conservation Service

Assistance to Conservation Districts—Public Law 46
The Natural Resources Conservation Service, through the local Soil Conservation Districts (SCD), helps plan and implement soil and water conservation practices on private land. Assistance is available to individuals and groups. The level and timing of technical assistance is determined and prioritized by the local NRCS field office and the SCD.

Watershed Protection and Flood Prevention Act - Public Law 83-566—This program administered by the NRCS provides technical and financial assistance for the protection of watershed areas. Assistance is available to qualified sponsors for the following purposes: fiood prevention, agricultural water management, public fish and wildlife development, public recreation development, groundwater recharge, water quality management, conservation and proper utilization of land, and municipal and industrial water supply.

Resource Conservation and Development Program—This NRCS program provides assistance to groups for developing and implementing conservation measures. Cost-sharing assistance is available for land conservation, water management, community development, and other environmental elements.

Consolidated Farm Services Agency Cost-Sharing Programs

Agricultural Conservation Program—This program provides cost-sharing to individuals and groups for the installation of conservation practices. Technical responsibility for most practices is assigned to NRCS.

Lone-Term Agreements—Operators within the project area could install conservation practices by entering into Long Term Agreements. Agreements for the entire farm or ranch may be for a 3 to 10 year period, depending on the required treatment. Agreements which cover only part of an operating unit have a contract period of 3 to 5 years

Pooling Agreements-These agreements are used to join farmers or ranchers in a combined effort to perform conservation practices that will solve a mutual problem. Producers are encouraged to solve community conservation problems using this approach.

Water Qualitv Incentive Program—This program is designed to enhance and protect water quality by providing incentive payments for reduction of agricultural pollutants. Only management-type practices are eligible under this program.

Loan Program—Two basic loan programs, previously administered by the Farmers Home Administration, are available for implementing land and water development measures. Irrigation and drainage loans are available to legal entities (e.g., irrigation companies, nonprofit corporations) to finance system improvements. Individual landowners can obtain soil and water conservation loans to implement their on-farm conservation practices.

Department of the Army-Corps of Engineers Programs

Section 14—This program provides funding for protection of public facilities, including school, bridges, and water treatment facilities. Funds can be used for treatment alternatives, such as streambank erosion control measures.

Section 205—This program provides financial and technical assistance to qualified sponsors for purposes of flood control, power, water supply, recreation, and water quality control.

Section 1135—This program provides funding for environmental restoration projects. The program's primary purpose is for fish and wildlife restoration.

Bureau of Reclamation Small Reclamation Projects Act

The Bureau of Reclamation is authorized to make loans to legal entities for developing or rehabilitating irrigation and/or drainage systems. This type of loan could be utilized for financing structural improvement measures.

Water Wise irrigation Conservation Program

Bonneville Power Administration, through the local utility, provides funding for system analysis, design assistance, and irrigation incentives for hardware retrofit activities. Incentive payments are made for installing eligible measures.

Clean Water Act (Section 319)

Section 319 funding is used to help implement EPA-approved state nonpoint source management programs. Funding is intended to prevent or solve specific water quality problems on a comprehensive watershed basis. Funding may also be used to protect or restore riparian areas, wellhead protection areas, wetlands, and coastal areas.

Partners for Wildlife

This program administered by the U.S. Fish and Wildlife Service offers both financial and technical assistance. The goal is to restore and protect fish and wildlife habitat on private lands while leaving the land in private ownership.

Habitat Improvement Program

Administered by the Idaho Department of Fish and Game, this program provides cost-sharing to private landowners for developing and improving wildlife habitat for upland game birds and waterfowl.

Idaho State Agricultural Water Quality Program

This program provides assistance to private landowners and operators who control lands designated as either critical areas or sources of nonpoint-source pollution in an approved project area. Assistance may be technical, financial, or both. The program is administered by the Idaho Department of Health and Welfare-Division of Environmental Quality and the Idaho Soil Conservation Commission. Grants made to selected Soil Conservation Districts provide funding for technical assistance, informational activities, project administration, and cost-sharing for installing Best Management Practices.

Idaho Department of Water Resources Loan and Grant Programs

With approval of the Idaho Water Resources Board, the State is authorized to make loans and/or grants to legal government entities for water resource projects. Funding is available from three sources: (1) Water Management Account (loans and/or grants), (2) Revolving Development Account (loans), and (3) bonding programs.

Resource Conservation and Rangeland Development Program

Loan Program-Administered by the Idaho Soil Conservation Commission, this program provides long-term low-interest loans to farmers and ranchers for conservation improvements. Eligible projects include the installation of permanent conservation practices for treating all land uses, riparian protection, and water quality improvements.

Grant Program—This program finances demonstration projects designed to improve rangeland and riparian areas. Grants are available to individuals, partnerships, associations, trusts, private corporations, and other private legal entities. The program is administered by the Idaho Soil Conservation Commission. Grants cannot exceed $10,000 and must be matched by local funds, materials, labor, or equipment use.

Stewardship Incentive Program

Administered by the Idaho Department of Fish and Game, this program provides cost-sharing to non-industrial private forest landowners and operators. Benefits may include habitat for fish and wildlife, aesthetics, recreational opportunities, increased timber supplies and other products, and erosion control measures.

Bonneville Power Administration

Under its fish and wildlife authority granted by the Pacific Northwest Electric Power and Conservation Act, Bonneville can fund habitat improvement projects. Funding directives come through the Northwest Power Planning Council. Assistance may be given to groups, units of government, *or* individuals.

Conventional Bank Loans

Private lending institutions can provide loans for conservation improvements.

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