This document is intended to be dynamic, designed to change with new knowledge and changing conditions in a manner that will promote understanding and cooperation among all parties involved. All identified fish, mammals, reptiles, amphibians and birds in the County are addressed, including issues on both private and public lands. The document should not be interpreted as a regulatory instrument, law, or inflexible policy. Some of the proposals and actions in this document are based on recognized current scientific information and understanding. Other proposals are derived from the observations and experience of local land managers. As new information becomes available from research or monitoring activities, proposals and actions will be modified annually to reflect the new knowledge. Efficient use of limited resources is needed for the benefit of society and the environment.

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Appendixes

Tables

Maps and Figures

For additional guidelines or details of the
Wallowa County - Nez Perce Tribe Salmon Habitat Recovery Plan
may be obtained from:

OSU Extension Service 668 NW 1st, Enterprise, OR	541-426-3143
Wallowa County Soil & Water Conservation District 209 W North Street, Enterprise, OR	541-426-4588
Natural Resource Conservation District 209 W North Street, Enterprise, OR	541-426-4588
Oregon Department of Fish and Wildlife 654 Alder Slope Road, Enterprise, OR	541-426-3279
Wallowa County Planning Department 101 S River Street, Enterprise, OR	541-426-4543 ext25
Oregon Department of Forestry 802 W Hwy 82, Wallowa, Or	541-996-2881

Acronyms and Abbreviations

FSA	Farm Service Agency
BLM	Bureau of Land Management
BPA	Bonneville Power
cfs	cubic feet per second
CRMP	Coordinated Resource Management Planning
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DSL	Division of State Lands
ESA	Endangered Species Act
f/s	feet per second
mg	milligram
NPPC	Northwest Power Planning Council
ODA	Oregon Department of Agriculture
OEDD	Oregon Economic Development Department
ODEQ	Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OSU	Oregon State University
OWRD	Oregon Water Resources Department
NRCS	Natural Resources Conservation Service
SWCD	Soil and Water Conservation District
TDS	Total dissolved solids
USDA	U.S. Department of Agriculture
USBR	U.S. Bureau of Reclamation
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service

User Guide
for
Wallowa County - Nez Perce Tribe Salmon Habitat Recovery Plan with Multi-Species Management Strategy

To use Salmon Habitat Recovery Plan

- ID reach of stream
- Review watershed concerns and solutions related to reach
    - Refer to Appendix B, Problems and Solutions summary to identify potential solutions.
    - Relate Appendix B, (solutions 1 thru 130) to the watershed management approaches for implementing solutions (pp 117 to 130) to identify ways of solving watershed concerns.

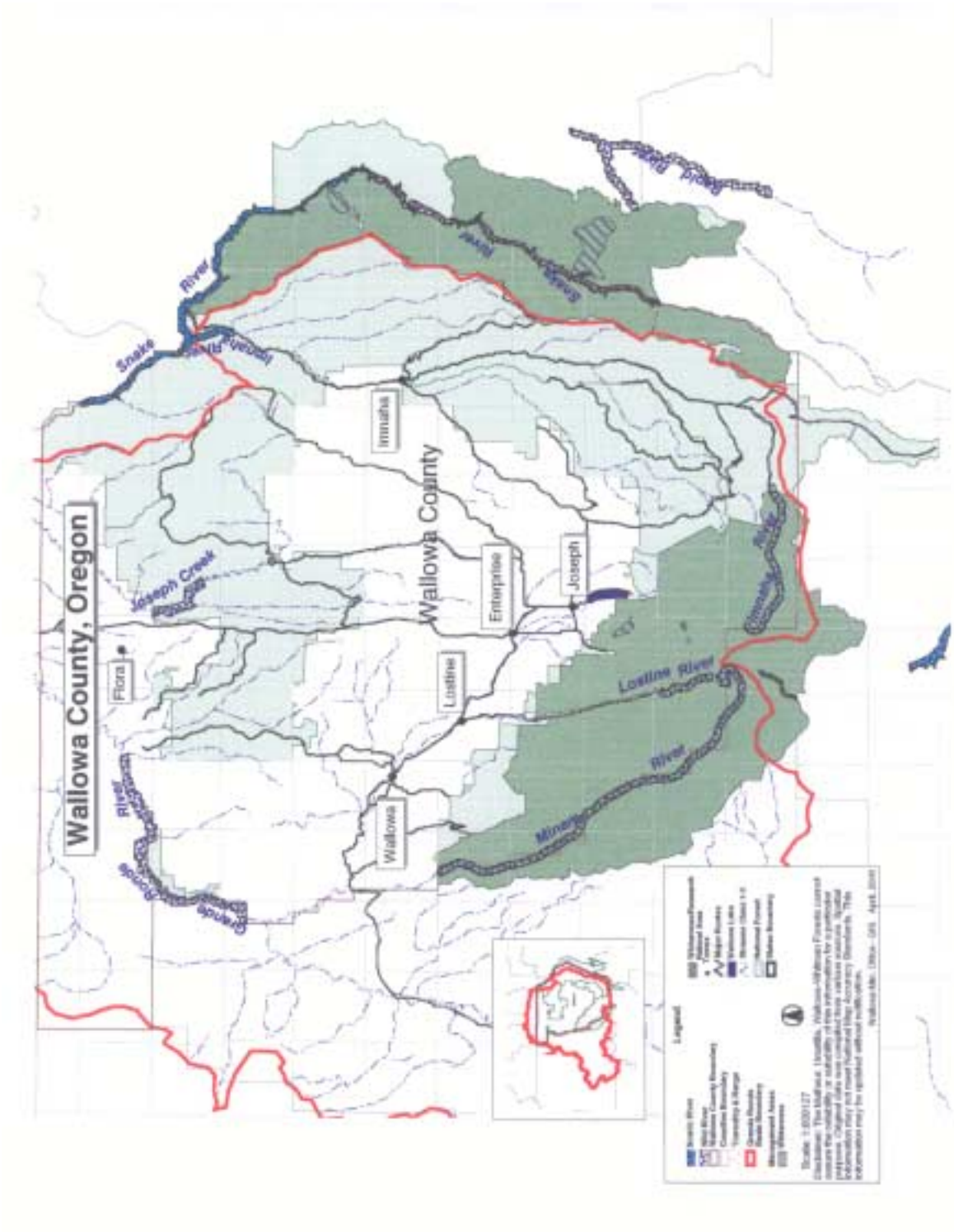
To use the multi-species management strategy (Appendix N)

- Identify cover type and stand structure of target land area.
- Review matrix (Appendix N) to determine potential species present of the current stand structure of your cover type.
- Identify potential activity
    - ♦ Use management alternatives for producing various stand structures matrix (Appendix O)
        - ∗ Find current cover type/stand structure and potential cover type/stand structure that the activity will create.
        - ∗ Numbers in appendix O identify alternatives for treatments to create potential stand structures.
            - ◊ Numbers refer to Appendix B (solutions 1 thru 130) and watershed management approaches (pp 117 to 130).

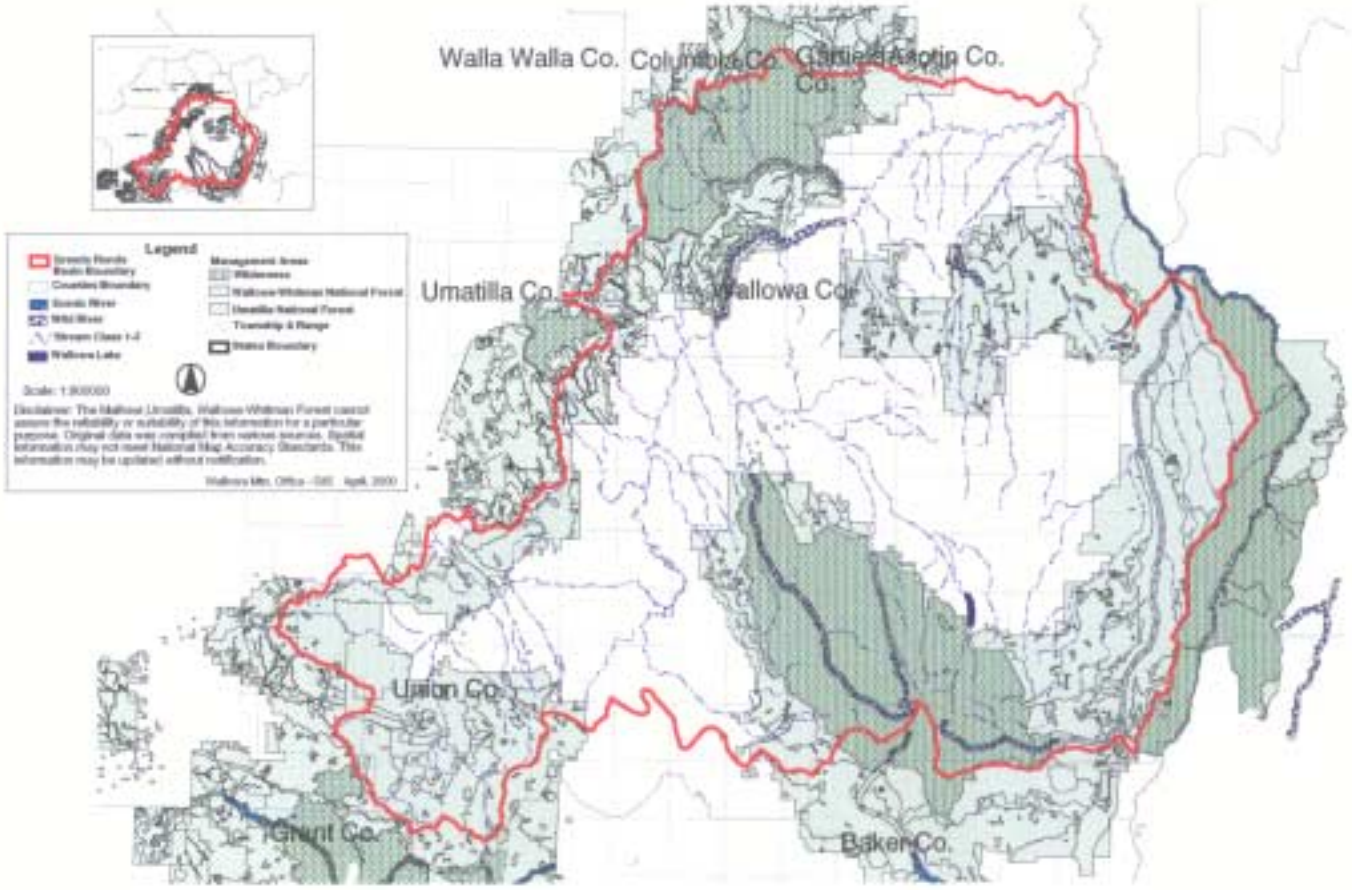
- Review matrix (Appendix N) for species present in new stand structure.
    - ♦ Identify variances between present stand structure and potential future stand structure.
- List any "species of concern" differences. (both plus and minus)
- Work with biologists to address differences list.
    - ♦ identify impact of the differences list of "species of concern" (plus and minus).

Additional Steps

- Review cover type/stand structures of current and potential structures against historic range of variability (if present)
- Review whether potential stand structure is closer to HRV than current stand structure.


Wallowa County, Oregon
Wallowa County
Snake River
Imnaha River
Grande Ronde River
Imnaha
Joseph Creek
Enterprise
Joseph
Flora
Lostine
Lostine River
Wallowa River
Minam River
Wallowa
Legend

Grande Ronde Basin



INTRODUCTION

BACKGROUND

This document sets forth a plan to restore and maintain habitat for chinook salmon (Oncorhynchus tshawytscha) and, potentially, other salmonid fish in Wallowa County, Oregon. The goals for salmon recovery are to provide spawning, rearing, and migration habitat within the County to assist in the recovery of Snake River salmonids.

The development of this plan was prompted by the May 22, 1992, listing of Snake River chinook salmon as threatened under the Endangered Species Act (ESA). Fish runs have dropped to 10 to 15 percent of historic numbers. Escapement of wild smolts downstream has declined dramatically.

A committee consisting of Wallowa County citizens, agency professionals, and the Nez Perce Tribe was established in 1992 to prepare a salmon recovery plan. Members of the Wallowa County Salmon Recovery Strategy Committee are listed in Appendix A. In 1998 Wallowa County received a Regional Strategy grant from Northeast Oregon Alliance to hire a technical writer to expand this plan to a multi-species plan.

MISSION

The mission of the Wallowa County Salmon Recovery Strategy Committee is:

> *To develop a management plan and a multi-species strategy to assure that watershed conditions in Wallowa County provide habitat necessary for salmonids and other vertebrate species occurring in Wallowa County by protecting and enhancing conditions as needed. The plan will provide the best watershed conditions available consistent with the needs of the people of Wallowa County, the Nez Perce Tribe, and the rest of the United States and is made an integral part of the Wallowa County comprehensive land use Plan*

SCOPE OF THE PLAN

Previous studies and past restoration strategies have generally concentrated on stream and riparian areas. However, Wallowa County recognizes that suitable instream habitat for salmon is dependent on conditions throughout the watershed, from the stream itself to the crests of ridges. For example, adequate crown density in forests contributes to the buildup of snowpack and the slower snowmelt needed to maintain streamflows beyond the spring runoff. Without healthy vegetation, soils can erode and fine sediment can flow into streams to suffocate fish eggs and small fry. The salmonid ecosystem includes the entire watershed, not just the instream habitat and, as such, this plan also incorporates all other vertebrate species that exist in the watershed.

This plan addresses two integrated aspects of salmonid habitat: (1) the in-channel water quantity and quality required for salmon perpetuation and (2) the general ecosystem requirements required to sustain those conditions. Conditions beyond human control including drought, earthquakes, etc. will always have the potential to adversely affect or destroy salmon habitat and will not be considered in this plan.

Successful recovery of chinook salmon requires establishment of a dynamically balanced, healthy ecosystem. The maintenance of a healthy ecosystem is a continuing responsibility. Economic and cultural practices may need to be modified. Solutions that are limited to only instream factors are unlikely to have long-term positive effects.

Generally, the concepts and activities to be implemented are beneficial to most native species. Management needs to promote enhancement as a whole and not rely on crisis management.

HISTORY OF THE PLAN

Development of the Wallowa County Salmon Recovery Plan began in June, 1992, with the County Court's appointment of a 16-person committee, including members from Federal and State agencies, private land owners, timber and grazing interests, environmental interests, and the Nez Perce Tribe. This committee met bimonthly to review major salmonid streams in the County, diagnose problem areas, and recommend solutions. Each major stream reach was discussed, concentrating on water quality, stream structure, flow timing, substrate conditions, shading, irrigation diversions, and other factors. Written records and the personal knowledge of the committee members were used to analyze the various factors. The committee defined problems and recommended solution based on consensus.

The writing of this plan took place over several months, with continuous review and revision. In addition to this process, the committee thought that a review by independent experts in the subject was appropriate. Appendix E contains the full texts of these independent reviewers' comments.

The strategy of this plan was later added in 1999, to assist in land resource management in Wallowa County, Oregon. The original plan was also revised. The same review process was used and the reviewers' comments are contained in Appendix E.

WALLOWA COUNTY ENVIRONMENT

PHYSICAL FEATURES

Wallowa County is located in the northeast corner of Oregon State. It is 3,153 square miles of topographic and biological diversity. North America's deepest gorge, Hells Canyon, bounds the east side; the Grande Ronde River, most of which is outside the County, fringes the west, and Washington State is the northern boundary. The southern boundary runs through the Eagle Cap Wilderness. The County is renowned for the Wallowa Mountains, a range with peaks rising to slightly more than 10,000 feet in the south of the County. The Wallowas are broadly considered part of the Blue Mountains and contain the highest peaks in the geologic crustal upwarp known as the Blue Mountains anticlinorium.

There are two major drainages in the County--the Grande Ronde which passes through the northwest corner of the County and the Imnaha which enters the Snake River on the east side of the County. Major tributaries of the Grande Ronde River include: the Wallowa River (including Prairie Creek, Hurricane Creek, the Lostine River, Bear Creek, and the Minam River), the Wenaha River, and Joseph Creek. The major tributary of the Imnaha River is Big Sheep Creek.

CLIMATE

Wallowa County is under the influence of Pacific winds but is within the rain shadow of the Cascade Mountains to the west. Because of the large elevation difference within the County, about 1,300 feet above mean sea level to more than 10,000 feet, average annual precipitation varies from about 8 to 60 inches. Annual variation in precipitation is also great, e.g. annual precipitation at Enterprise has varied from about 7.7 inches to over 19 inches. Low elevations are characterized by hot, dry summers while higher elevations are characterized by cold, wet winters.

POPULATION AND ECONOMY

The 1990 census indicates that 6,950 people live in Wallowa County. Over half of the population live in the communities of Enterprise, Joseph, Wallowa, and Lostine. The economy is based on natural resources. Most people make their living from ranching, farming, timber harvest, or trading with these interests. In 1991 total employment in the County was 3,580 with about 37 percent in agriculture, 23 percent in government, and 11 percent in lumber and wood manufacturing. The remaining 29 percent consists of infrastructure and associated services, arts, and tourism.

The Oregon State Employment Department statistics show that in March, 1999, total employment was 3,020, of which approximately 28 percent were in agriculture; 26 percent in government; 14 percent in wholesale and retail trade; 11 percent in services (primarily tourist related); and 10 percent in manufacturing, including lumber, wood, and other manufacturing. The remaining 11 percent were employed in construction, mining, transportation, communications, utilities, finance, insurance and real estate. While the

economic impact of tourism has accelerated in recent years, the rural culture and economy of the community continues to prevail.

Wallowa County includes portions of three Federally designated wilderness areas and large amounts of other publicly owned land. About 65 percent of the land is publicly owned and most of that is in Federal ownership, including National Forests managed by the U.S. Forest Service (USFS) and other lands managed by the Bureau of Land Management (BLM). The remaining land in the County is in private ownership. Timber and grazing are the largest land uses; about 48 percent of the total land base is forested.

DEFINITION OF THE PROBLEM

The Grande Ronde and Imnaha River subbasins were historically important producers of anadromous fish. The Wallowa County portion of the Grande Ronde subbasin produced spring, summer, and fall chinook, (Oncorhyncus tsawytscha), sockeye (O. Nerka), coho (O. Kisutch), and summer steelhead (O. Mykiss), whereas the Imnaha subbasin produced chinook, coho, and steelhead. Early-fall chinook (which spawned from mid-September through October), sockeye, and coho are now extinct. The remaining populations are at severely depressed levels when compared to historical levels. Several species of fish in Wallowa County have been listed under the Endangered Species Act as threatened. Spring, summer, and fall chinook were listed as threatened in 1992. Summer steelhead were listed as threatened in 1997. Bull Trout were listed as threatened in 1998.

The major causes of the loss of anadromous fish production in Wallowa County are: habitat destruction (both in-basin and out-of-basin); lower Columbia and ocean fishing pressure; imbalance of marine mammal/salmon predator/prey relationship; turn-of-the-century in-basin hatchery programs; dam construction on the Columbia and Snake rivers; and dredging and filling of the Columbia River estuary. Harvest practices in the ocean of particular concern are: drift gill nets, targeted salmon fisheries, and bottom trawling. While recognizing that factors in all phases of the salmon life cycle are important, this plan concentrates only on those factors within Wallowa County that affect the salmon life cycle.

Carmichael and Boyce (1986) summarized spring chinook production potentials for streams in the Wallowa River watershed and estimated the loss in production potential due to in-basin habitat degradation. The decline in production potential since the late 1950's was estimated to be 20 percent in the Lostine River and Bear Creek and 70 percent in the Wallowa River and Hurricane Creek. No estimates were made for Prairie Creek or the Imnaha and Minam Rivers, and the Wenaha River was felt to be unchanged. No estimates were made for steelhead streams.

STATUS OF THE STOCKS

The numbers of most anadromous species have fallen precipitously, if unevenly, in Wallowa County streams in the past. The trend is clearly illustrated in Figure 1, which depicts the decline of the spring chinook redd in the Imnaha River between 1964 and 1998. Figure 2 illustrates the decline during the same period for four additional rivers in Wallowa County. This general decline is the same for most other species. The following summaries of the status of the stocks are taken from a more detailed analysis found in Appendix D.

Figure 1 documents how the Imnaha spring chinook runs have declined since dams were constructed on the mainstem Columbia and Snake Rivers. Other dates of interest, such as droughts, termination of the commercial spring/summer chinook harvests in the Columbia basin, and termination of sport harvest in Wallowa County is also included. Figure 2 compares spawning ground counts for four different streams in the Wallowa County portion of the Grande Ronde subbasin, of which the Wenaha is almost totally within the Wenaha-Tucannon Wilderness.

Spawning ground counts for fall chinook and life history characteristics are also included in Appendix D. Spawning ground surveys were started in the Imnaha River in 1964 and discontinued in 1973 when the population disappeared. No surveys were conducted in the Grande Ronde subbasin during this time. Surveys were reinitiated in 1986 in both the Grande Ronde and Imanha subbasins as part of a larger effort in the Snake River.

Chinook declines can be attributed to factors outside the county, as well as habitat problems in some river reaches of Wallowa County. This is demonstrated by drops in adult salmon returning to wilderness rivers in the County where no human activities have adversely affected habitat during the period of redd count records. Downstream factors include habitat conditions in streams used for migration, effect of dams on migration, and ocean and Columbia River harvest. Dredging of bays and estuaries and bottom trawling have significant negative impacts.

Other fish species

Other anadromous species present in the Grande Ronde and Imnaha rivers are: summer steelhead, lamprey, and sturgeon. Population estimates, if known, and life history characteristics are included in Appendix D. Also included in Appendix D are life history characteristics of the non-anadromous species.

Figure 1. Spring Chinook Redd Counts per Mile in the Imnaha river Index Area for 1964-1998
(Selected events and construction of selected dams are noted in yellow)

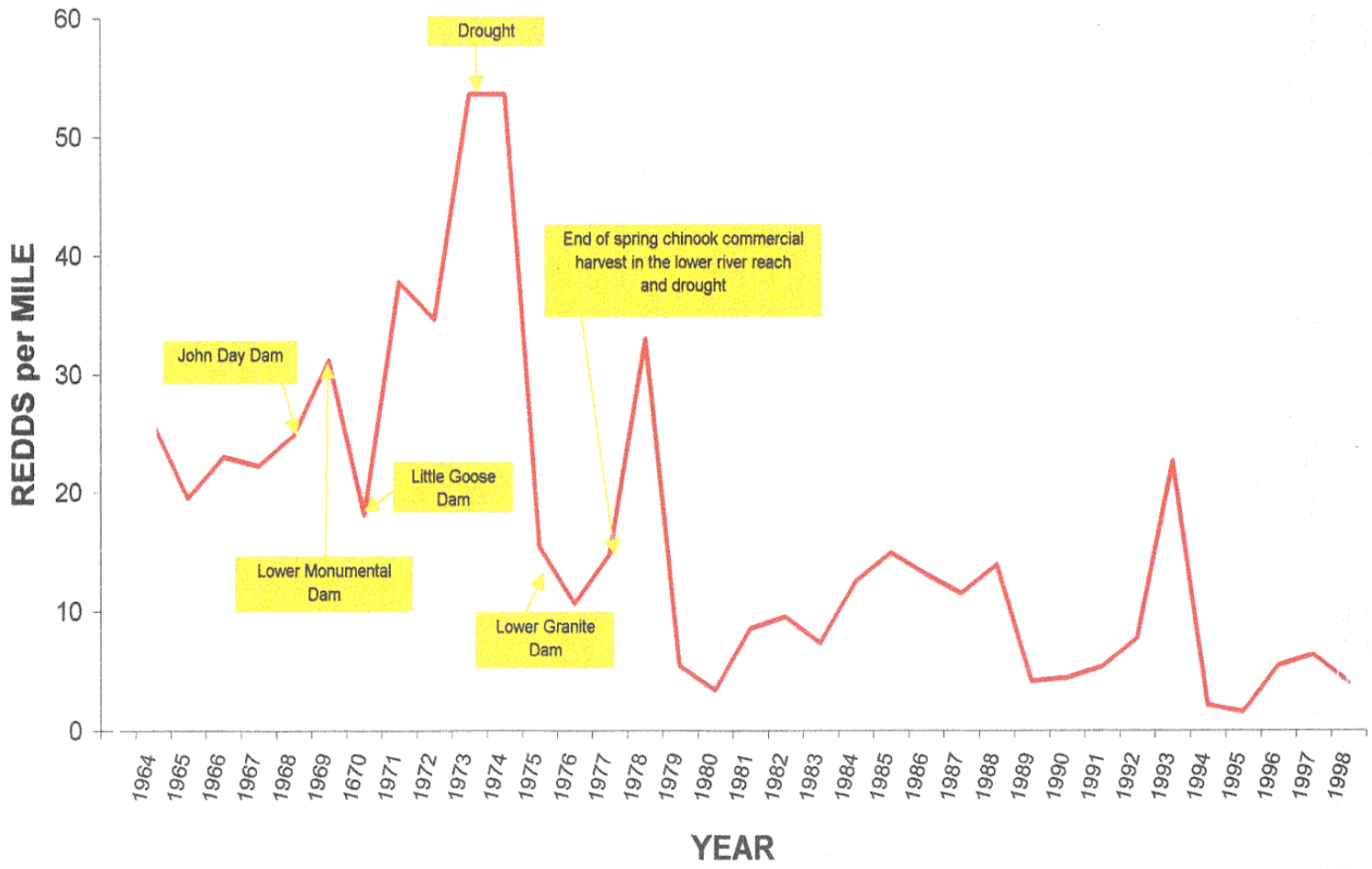
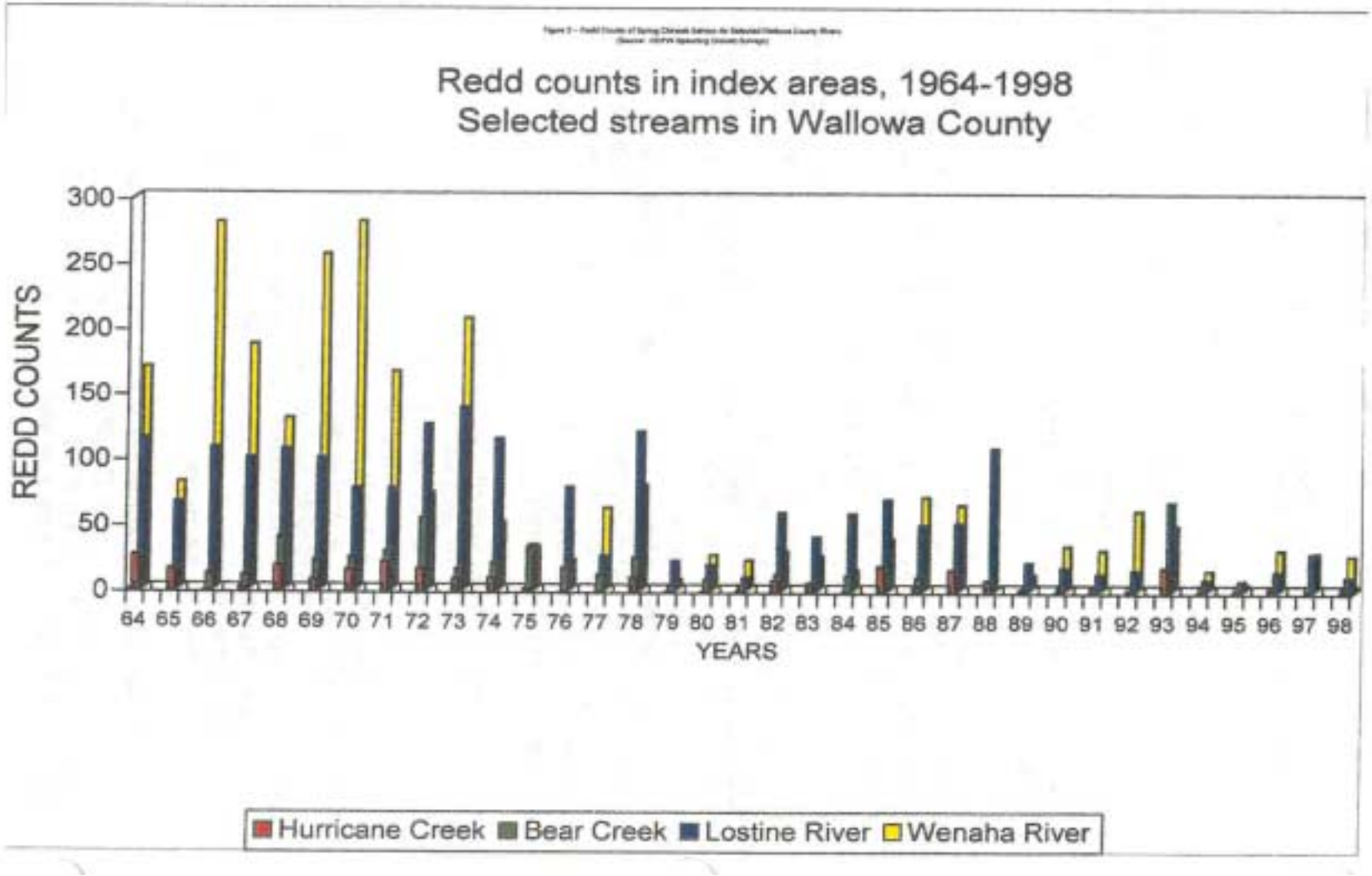


Figure 2.--Redd Counts of Spring Chinook Salmon for Selected Wallowa County Rivers
(Source: ODFW Spawning Ground Surveys)



IMPACTS OF LAND MANAGEMENT PRACTICES

Environmental conditions vary widely in Wallowa County streams, some of which fall 7,000 feet in elevation from headwaters to mouth. Native riparian vegetation varies greatly with elevation and moisture availability and may be narrowly constrained in canyons or spread broadly in valley floodplains. Direct human impacts on these streams include diversion of water for irrigation and other use, degradation of riparian zones, increased water temperature and decreased water quality.

Forest management and livestock grazing practices have a variety of impacts. Some effects include increased sedimentation due to logging, wildfires, road construction, and cattle grazing; compaction of soils due to roads, logging, or dense concentrations of livestock; and reduced winter snowpack development and increased soil moisture use in dense thickets of trees. (Satterlund 1972) In some areas, loss of stream shading through logging, insect infestation, wildfires, and grazing practices has increased stream temperatures. Excessive grazing by livestock, and by big game in some areas, has decreased vegetation. Native vegetation in some areas has been replaced with noxious weeds. In addition, extensive channelization has contributed to instream substrate and channel morphology problems which may include excessive fines, excessive cobble embeddedness, physical barriers to migration, loss of pools, changes in pool/riffle ratios, and modification of streambank form.

This plan addresses several management options for stand structure of forests and grasslands. Stand manipulation is a way of managing water yields, forest health, reducing the chance of catastrophic wildfire, and economic outputs. All stand manipulation methods will be made available on a site-specific basis considering constraints such as the Clean Air Act, Clean Water Act, and Forest Practices Act, Ownership Patterns. Emphasis will be given to those methods that balance the environmental outcomes and the social and economic needs of the communities involved.

The County is currently engaged in an effort to integrate watershed assessments and watershed analysis in the sub-basin. This effort is a collaborative effort including all agencies. Information will be gathered at the stand level on a site-specific basis then used in a watershed analysis.

DESIRED HABITAT CONDITIONS FOR CHINOOK SALMON

Desirable salmonid habitat includes an array of environmental conditions that relate to stream substrate and structure, water quality and quantity, plus factors needed for production of food organisms and protection from predation. In Wallowa County, salmon adults spawn, eggs incubate, alevins hatch, fry emerge from the gravel to feed, and the juvenile spring/summer chinook overwinter before migrating downstream to the ocean. Although certain factors are necessary for all stages of the life cycle, optimum habitat for one stage may not be optimum for another stage. As an example, food productivity of a stream is not important to spawning as the adults do not eat, but is critical to juvenile fish. As a result, habitat for salmon is often evaluated on the basis of a stage in the life cycle such as spawning, rearing, or migration.

Desired instream habitat for salmon and Oregon State water quality standards are listed in table 1. The desired instream habitat is based on the limits within which salmon can survive and function, and these limits, in general, provide good salmon habitat. Where the limits for a factor are significantly different for different salmon activities, these are noted. Also, the acceptable range of a factor has been divided in some cases to show an evaluation of poor, fair, and good within that range.

Many of the Oregon State water quality standards were adopted directly. Some of the State standards, however, are not directly correlated to fish requirements (e.g., chlorophyll a and fecal coliform levels) but are indicative of other factors (e.g., low dissolved oxygen levels) which are harmful to fish. State water quality standards do not address some factors important to fishery habitat such as percent of surface fines, pools per mile, and amount of large woody debris. In these cases, the desired conditions for these factors are considered goals for resource managers. (No new laws or ordinances were adopted; however, it should be understood that these or other goals may eventually be mandated by a government agency in the future).

The desired habitat conditions in Table 1 were used in evaluating stream reaches and in developing solutions and approaches resolving problems. The "Desired Habitat Condition for Salmon" column in Table 1 outlines chinook salmon habitat requirements. In some cases, required conditions exist and should be maintained; in other cases, improvements are needed to meet the salmon habitat requirements. Where State water quality standards and desired habitat goals are not being met, landowners and resource managers should work with the County's salmon restoration team to meet the goals (see "Implementation" chapter).

These instream habitat goals do not address riparian and upland conditions. However, the total watershed needs to be managed for contributions to maintaining desired instream habitat conditions. For example, a healthy riparian community is necessary to shade streams to avoid raising water temperatures above acceptable levels. Managing riparian areas, forests, upland areas, and other resources to achieve desired stream conditions is discussed in the "Watershed Management - Approaches to Implementing Solutions" chapter.

Table 1.-- General Habitat Requirements for Salmon and Related Oregon State Standards

Factor	Desired Habitat Condition for Salmon	Oregon State Water Quality Standards for the Grande Ronde River Basin
Temperature	[2]40-57^0 F for spawning and incubation, 38-68^0 F for adult migration, and 39-68^0 F is the optimum range for freshwater rearing (juvenile fish prefer 54-57^0 F)	No increase when water is 68^o F or greater, a maximum of 0.5^0 F increase from single source when temperature is 67.5^0 F or less, and 2.0^0 F increase when temperature is 66^0 F or less
Dissolved Oxygen (DO)	[2]Adult migration=greater than 7.0 mg/l Spawning and incubation=greater than 8.0 mg/l Rearing=greater than 7.0 mg/l	Minimum 75% saturation for season, allow minimum of 95% in spawning areas during spawning, incubation, hatching and fry stages
Chlorophyll a	Use State standard	Concentration greater than 0.015 mg/. Is indicator of nuisance algal growth.
Streamflow	Streamflow should provide access to adequate spawning gravel, and stream depth should be no less than 18 cm. [2]Spawning velocity of 1 to 2.2.5 f/s, maximum adult migration velocity of 8 f/s.	No standard for streamflow; however, there are instream water rights on many streams.
Turbidity	[2]Turbidity should be limited and not sustained.	No more than a 10% cumulative increase in natural stream turbidities is allowed.
Fecal coliform	Use State standard.	No more than 200 per 100 ml.
Total dissolved solids (TDS)	Not established	200 mg/l
Spawning gravel	[2]Generally 1/2-4 inches, larger fish (i.e fall chinook) can use larger size gravel	No state standard
Surface fines on stream bottom	[3]Good=less than 10 percent Fair=10-20 percent Poor=greater than 20 percent	No state standard
Cobble embeddedness	[3]Good=less than 20 percent Fair=20-35 percent Poor=greater than 35 percent	No state standard
pH	Use State standard	6.5 to 8.5
Pesticides	Depends on pesticide, many are highly toxic to fish. Use current State and Federal standards	Current State and Federal regulations
Pools per mile	[3]Good=greater than 10 Fair=5-10 Poor=less than 5	No standard
Large woody debris	[3]10-20 pieces of wood of at least 12 inches in diameter per 1000 lineal feet of stream.	No standard

[1]Oregon Administrative Rules, Chapter 340, Division 41 (OAR's 340-41-722 & 340-41-725)
[2]Bjornn, T.C., and D.W. Reiser, 1991, Habitat Requirements of Salmonids in Streams, **in** ed. W.R. Meehan, Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats, American Fisheries Society Special Publication 19, pp. 83-138
[3]Bureau of Land Management, 1993, Biological Evaluation ESA Section 7 Consultation, Baker Resource Area, Vale District, Oregon.

PROBLEMS AND OPPORTUNITIES

STREAM SEGMENTS CONSIDERED

The following major streams in Wallowa County were selected for analysis. Each stream was subdivided into segments for analysis based on channel characteristics such as slope, human impacts, inclusion in wilderness, and ownership. Each segment was analyzed for instream and watershed problems that contributed to stream and habitat degradation. Table 2 summarizes these streams.

Table 2.--Streams Selected for Analysis

Stream	Segments	Joins	Major Tributaries
Imnaha River	4	Snake River	Big Sheep Creek
Big Sheep Creek	3	Imnaha River	Lick Creek Little Sheep Creek
Lostine River	2	Wallowa River	None
Bear Creek	3	Wallowa River	None
Minam River	1	Wallowa River	None
Wenaha River	1	Grande Ronde River	None
Grande Ronde	2	Snake River	Wallowa River Wenaha River Joseph Creek
Hurricane Creek	3	Wallowa River	None
Prairie Creek	3	Wallowa River	None
Wallowa River	3	Grande Ronde River	Prairie Creek Lostine River Hurricane Creek Minam River Bear Creek
Joseph Creek	1	Grande Ronde River	Chesnimnus Creek Cottonwood Creek Swamp Creek Crow Creek

Problems were categorized and potential solutions to problems were identified. Problem resolution was analyzed, and each problem was placed in one of the following priority categories: (1) high priority, (2) low priority, (3) additional study needed. Measures that are relatively inexpensive and easy to implement or incorporate into existing programs should be initiated whether or not resolution is viewed as high or low priority. Fisheries biologists from the ODFW and the Nez Perce Tribes participated in these decisions, along with the Wallowa County Oregon State University (OSU) Agricultural Extension Agent, USFS professionals, geologists, and private timber managers, including a Wallowa County small woodlot owner who has won national and state awards for excellence in timber management practices. Altogether, 11 streams with a total of 26 segments were analyzed.

ANALYSIS FACTORS

General factors important to chinook salmon spawning, incubation, and rearing were identified, and subsets of watershed conditions that contribute to those factors were identified. These factors were used in the analysis of each stream segment. The factors used were:

- Water Quantity (Timing and quantity of streamflow)
- Tree density
    - Irrigation and water diversions
    - Compaction of soils by roads, trails, livestock, or wildlife
    - Low minimum flows
    - Need for flushing flow
    - Future demands

- Water quality

    - Water temperature
    - Excess fine sediments
    - Fuel density
    - Noxious weeds, erosion, and habitat destruction
    - Irrigation returns
    - Trash and human waste
    - Sewer/sanitary systems
    - Livestock feedlots
    - Herbicide/pesticide use
    - Other chemical contamination (municipal/industrial/incidental)
    - Excess nutrients

- Stream Structure

    - Woody debris
    - Pool/riffle ratio
    - Channelization
    - Bank form
    - Ice flows that scour spawning beds
    - Steep gradient

- Substrate

    - Cobble embeddedness
    - Excess fines
    - Physical barriers
    - Dredging, gravel mining

- Habitat Requirements

    - Riparian vegetation and hiding cover
    - Food
    - Harassment
    - Predators/competitors
    - Diversions screened

- Multi-species Strategy

    - Cover types
    - Stand Structure
    - Vertebrae Animal Species

SOLUTIONS

Potential solutions to problems (measures) were identified, and each solution was coded with a number for identification in charts and tables (see Appendix B). It is recognized that a solution to one problem may affect another. For example, relocating heavily-used campgrounds away from streambanks and riparian areas to help reduce harassment of spawning fish would also help reduce sedimentation of spawning beds and bank degradation. Planting riparian vegetation to provide shade to cool water would help preserve bank form and reduce sedimentation.

Management approaches have been developed to facilitate options for land managers in implementing the solutions (see "Watershed Management-Approaches to Implementing Solutions" chapter). These include:

- Water Management
- Forest Management
- Riparian Management
- Livestock Management
- Weed Management
- Road Management
- Filter Strip Management
- Campground Management

After identifying the problems and reviewing potential solutions, a mix of the various approaches would generally be utilized to achieve problem resolution.