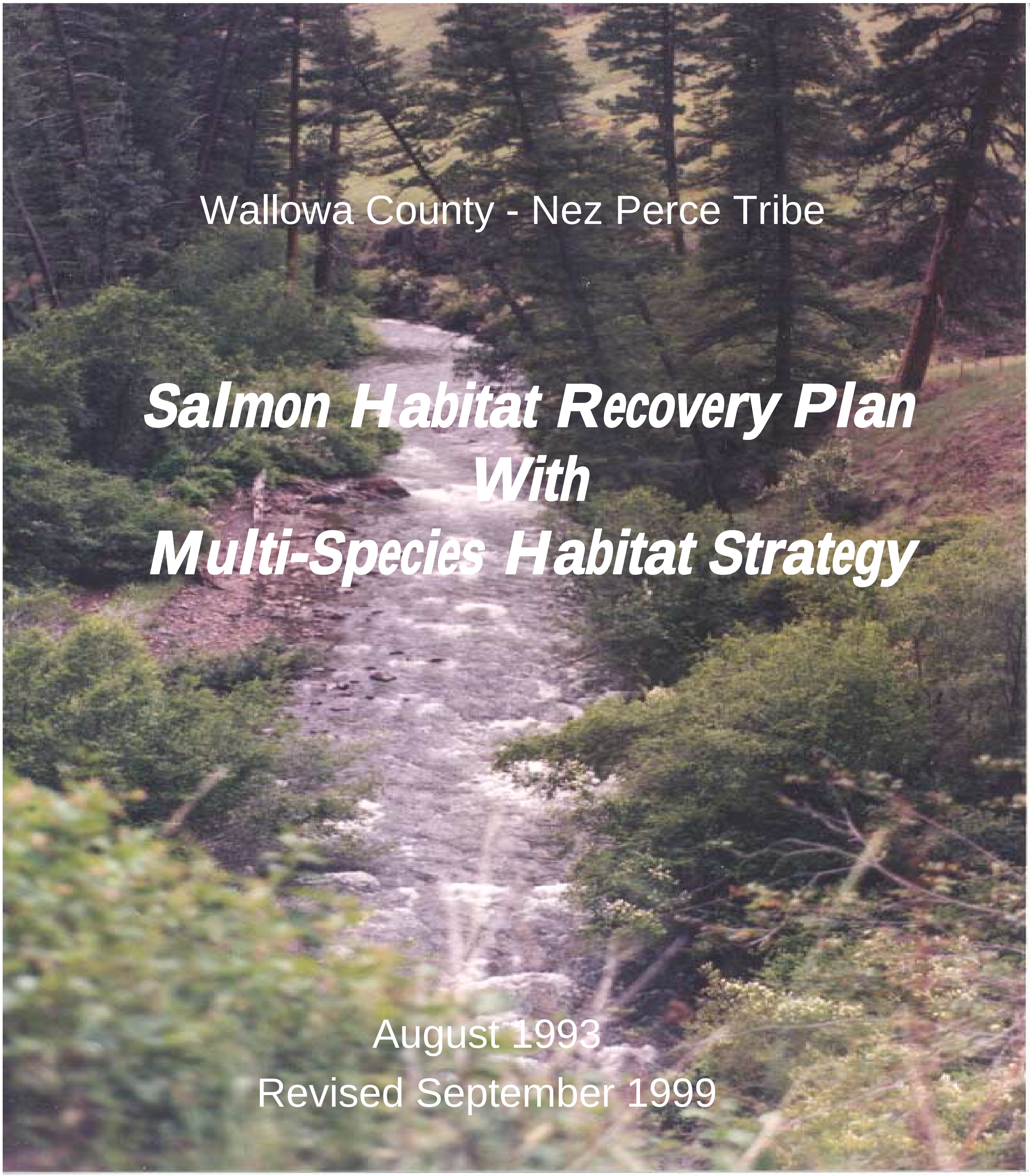


Wallowa County - Nez Perce Tribe

Salmon Habitat Recovery Plan
With
Multi-Species Habitat Strategy

August 1993

Revised September 1999

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.

Table of Contents

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.

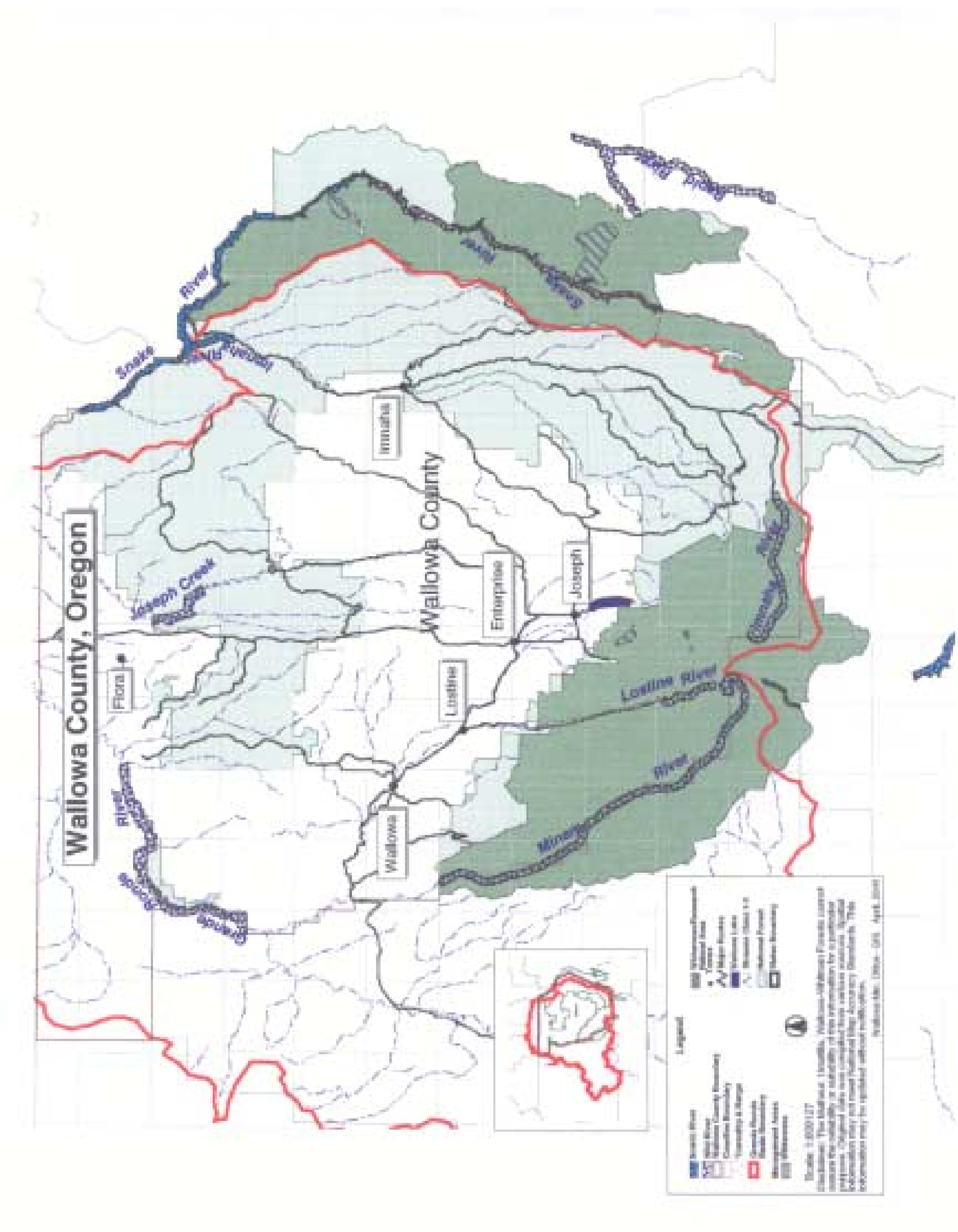
To use the multi-species management strategy (Appendix N)

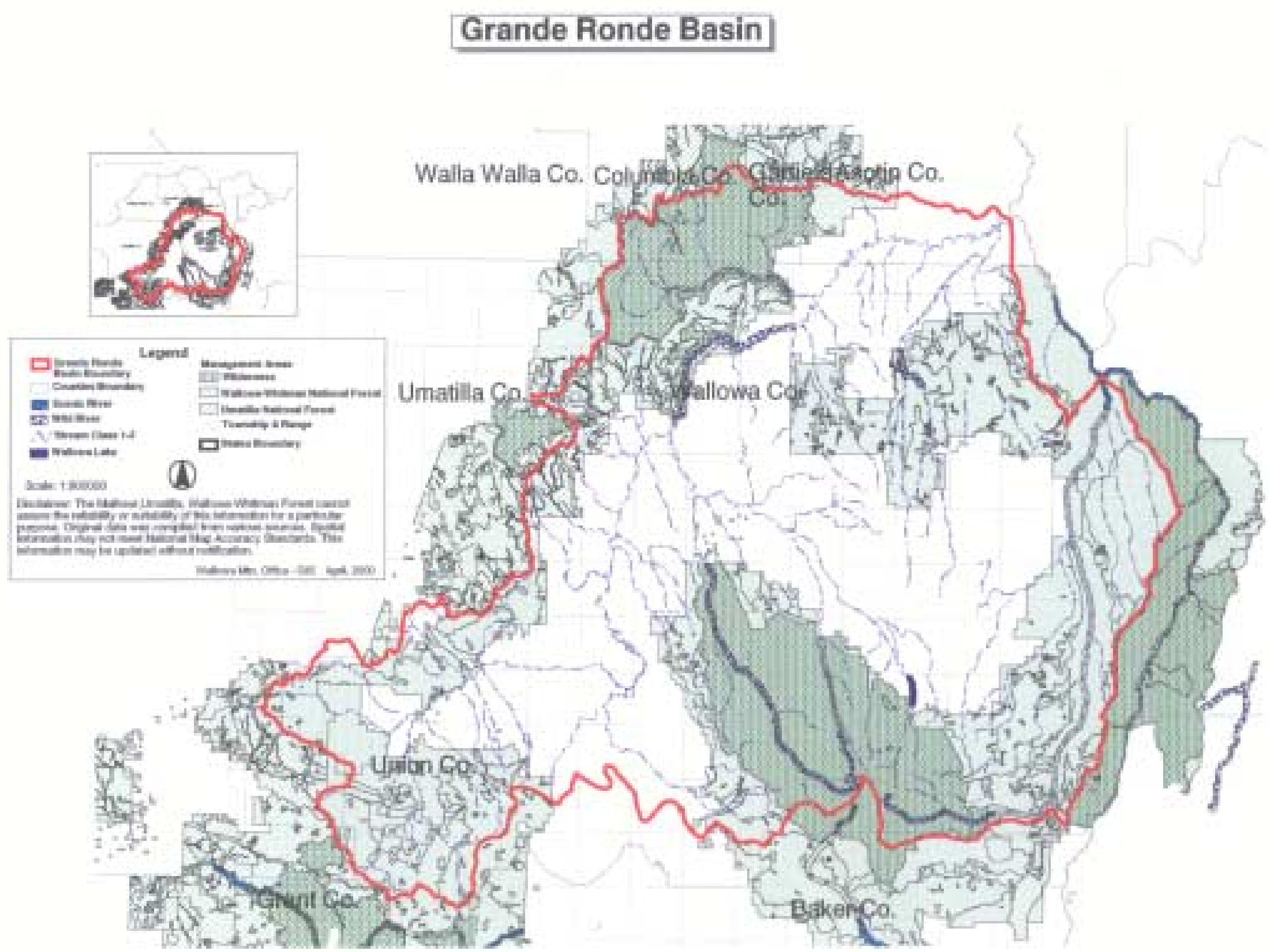
- Identify cover type and stand structure of target land area.
- Review matrix (Appendix N) to determine potential species present of the current stand structure of your cover type.
- Identify potential activity
    - ♦ Use management alternatives for producing various stand structures matrix (Appendix 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
Flora
Joseph Creek
Imnaha
Enterprise
Joseph
Lostine
Wallowa
Lostine River
Minam River
Grande Ronde River
Snake River
Legend


Grande Ronde Basin
Walla Walla Co.
Columbia Co.
Garfield Co.
Asotin Co.
Umatilla Co.
Wallowa Co.
Union Co.
Grant Co.
Baker Co.
Legend
Scale: 1:900000

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)

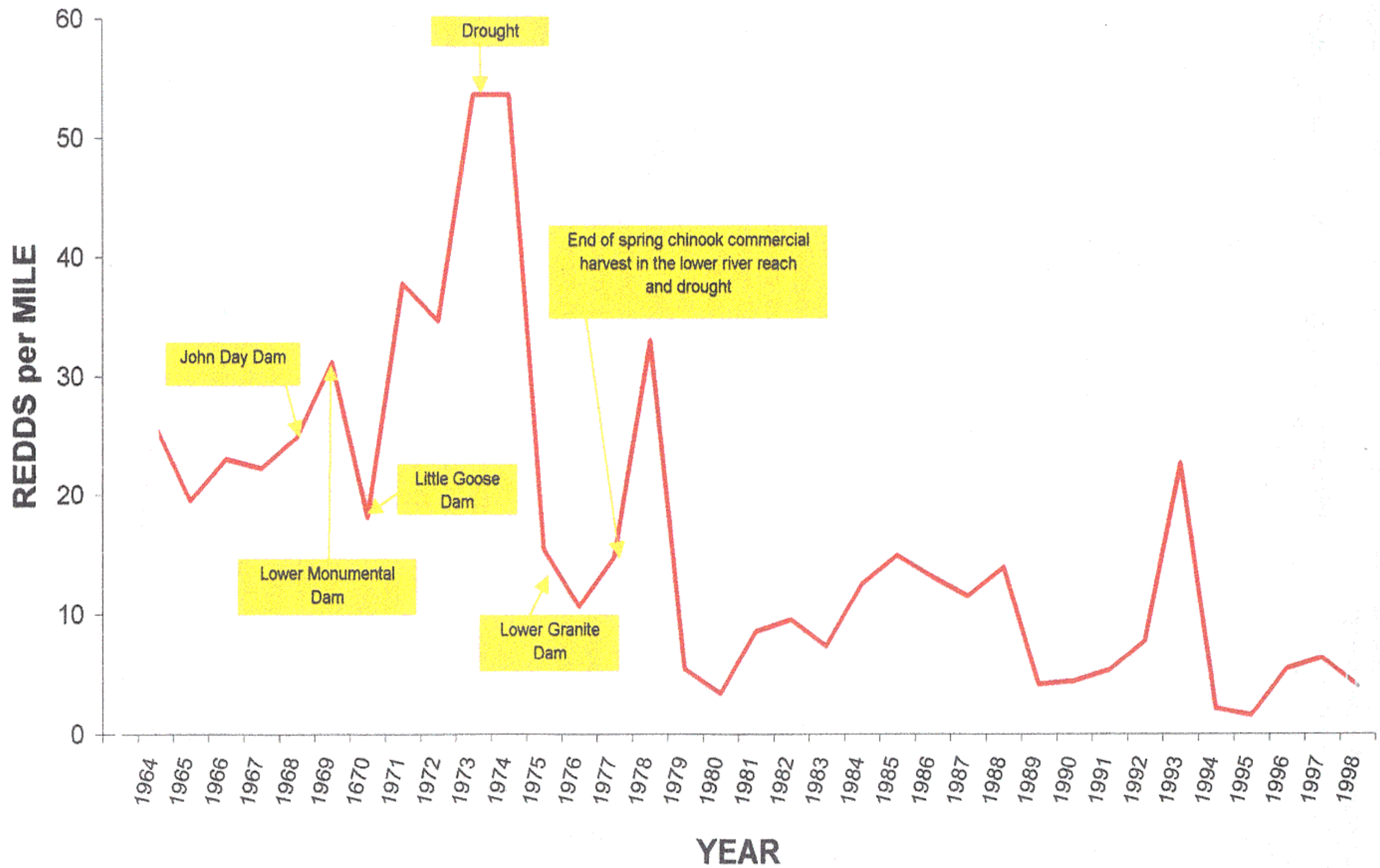
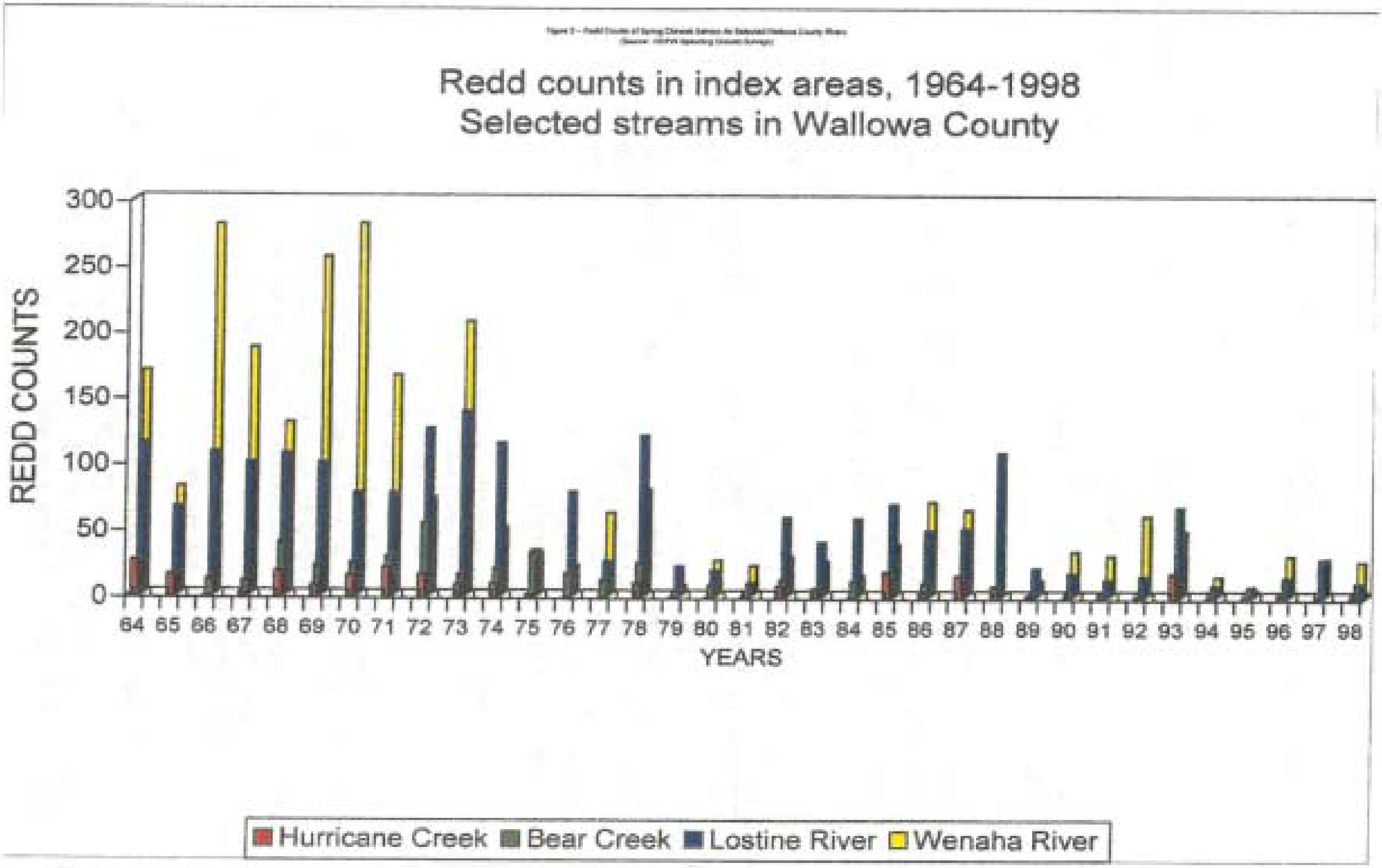


Figure 2.--Redd Counts of Spring Chinook Salmon for Selected Wallowa County Rivers
(Source: ODFW Spawning Ground Surveys)



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.

STREAM ANALYSIS

BY

STREAM AND REACH

STREAM ANALYSIS BY STREAM AND REACH

This section provides a short description of each stream and reach analyzed. Problems and proposed solutions are listed for each stream reach. Problems are in *italics*, solutions are indented and in normal typeface.
Since this section was originally written in 1993, some solutions have been implemented. Descriptions of these subsequent solutions are appended as NOTE:

COUNTYWIDE ISSUES[1]

There are several aspects of habitat protection and restoration that are not limited to specific stream reaches. These aspects need to be addressed for all streams. One of the most important aspects of stream restoration is education. The educational process is vital to the protection and restoration of salmon habitat.
Introduction of non-native species in Wallowa County is subject to County Ordinance 93-001. Release of any non-native species is concurrence with County Commissioners.

Water Quantity

> Water quantity problems are specific to reaches and listed under those reaches.
> Tree density – In many areas the peak flows are a month earlier then historic USGS data.
> There are more trees in some areas, and there are fewer trees in other areas.

Water Quality

Weeds/Erosion (Study, High Priority).--*Noxious, non-native weeds are present and scattered throughout the County. These weeds are highly competitive and can completely displace native plant populations. Many of these weeds have shallow root systems which do not provide soil stability. This can result in increased sedimentation. Invasive noxious weeds limit habitat biodiversity.*

> Identify, map, and monitor noxious weeds on an ongoing basis. Use whatever combination of herbicides, biological, and mechanical controls as necessary to control or eradicate weeds.

Herbicides/Pesticides (High Priority).--*Herbicides and pesticides are necessary to control agricultural and forest weeds (as noted above) and pests. These agents can be harmful to fish and, in the case of pesticides, harmful to the fish food supply.*

> Current regulations on herbicide and pesticide use should be followed (e.g., stream setbacks). Appropriate combinations of hand-sprayed application (as opposed to aerial spraying), biological control, and mechanical control should be used near riparian areas to keep the chemicals out of the water and surface runoff.

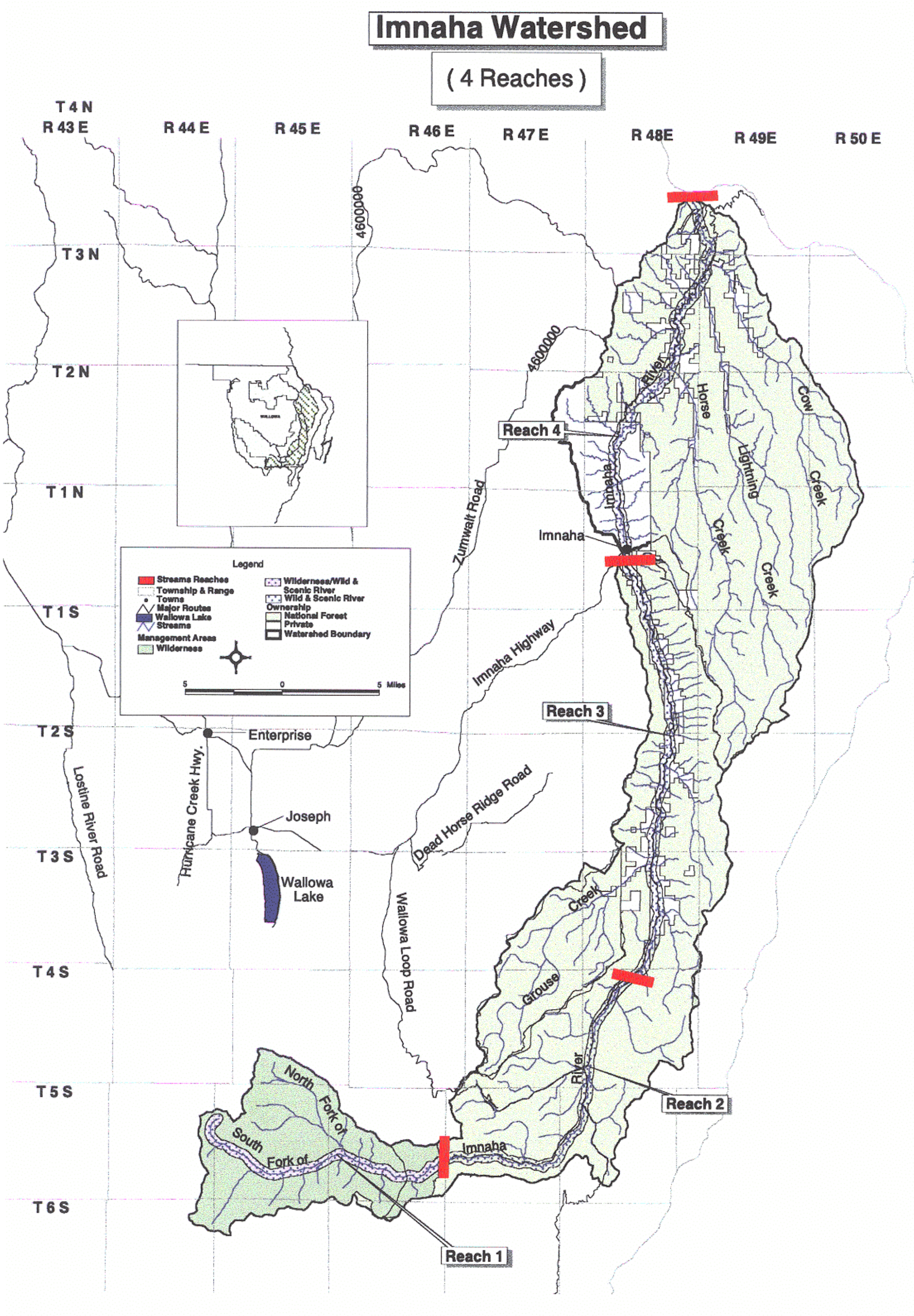
[1] See also Watershed Management - Approaches to Implementing Solutions

Stream Structure
Stream structure problems are specific to reaches and listed under those reaches.

Substrate
Substrate problems are specific to reaches and listed under those reaches.

Habitat Requirements
Resource users (agriculture, forestry, and recreation) are not aware of how they can effect (enhance or degrade) salmon habitat.

> Education of resource users about how to protect and enhance salmon habitat is vital to the successful implementation of any restoration plan. Education can be a two-way process. Agency planners may find that long-term local resource users have much knowledge that can be useful in planning restoration projects and avoiding unforeseen adverse effects (e.g., habitat degradation caused by large-scale removal of woody debris from stream).


Imnaha Watershed
(4 Reaches)
T 4 N
R 43 E
R 44 E
R 45 E
R 46 E
R 47 E
R 48E
R 49E
R 50 E
T 3 N
T 2 N
T 1 N
T 1 S
T 2 S
T 3 S
T 4 S
T 5 S
T 6 S
4600000
4600000
Reach 4
Reach 3
Reach 2
Reach 1
Imnaha
Imnaha River
Horse Creek
Lightning Creek
Cow Creek
Grouse Creek
North Fork of
South Fork of
Zumwalt Road
Imnaha Highway
Dead Horse Ridge Road
Wallowa Loop Road
Lostine River Road
Hurricane Creek Hwy.
Enterprise
Joseph
Wallowa Lake
Legend
Streams Reaches
Township & Range
Towns
Major Routes
Wallowa Lake
Streams
Management Areas
Wilderness
Wilderness/Wild & Scenic River
Wild & Scenic River
Ownership
National Forest
Private
Watershed Boundary
5
0
5 Miles

IMNAHA RIVER[2]

The Imnaha River was analyzed in four reaches:

1. Headwaters to boundary of Eagle Cap Wilderness
2. Wilderness boundary to private lands
3. Private lands to Imnaha store, and
4. Imnaha store to confluence with the Snake River

The Imnaha River is nearly 80 miles long. A maximum discharge of 20,000 cubic feet per second (cfs) was recorded on January 1, 1997. The previous 60-year recorded high was 10,100 cubic feet per second recorded on January 17, 1974. A minimum discharge of 25 cfs was recorded on November 22 and 23, 1931. These were measured at the gauging station near the town of Imnaha, about 19.3 miles from the confluence with the Snake River. The headwaters of the Imnaha are in the Eagle Cap Wilderness below Cusick Mountain and Sentinel Peak. The Imnaha River is part of the National Wild and Scenic Rivers system. It is classified as (1) a Wild River for a 15-mile reach from the headwaters to Indian Crossing, (2) a Recreational River for the 58-mile reach from Indian Crossing to the Cow Creek Bridge and (3) a Scenic River for the lower 4 miles through the Hells Canyon National Recreation Area.

Resource uses along the Imnaha River include recreational use of trails and backcountry in the wilderness area at the head of the river and in the Hells Canyon National Recreation area at the bottom, sheep grazing in the wilderness area, timber harvest on private and National Forest lands, cattle grazing on private lands and National Forest lands along all reaches below the wilderness boundary, and limited feedlot, haying, and orchards in the next to lowest reach. Cattle graze the high country above the Imnaha Canyon in the summer, move down into the canyon area in the fall and winter, and move out again in the spring. Most Feedlots are a year-round operation.

The Imhaha River (together with the Wenaha and Lostine Rivers) historically had the largest runs of spring chinook in Wallowa County. The Imnaha River spring chinook salmon are distinctive in northeast Oregon due to their elongated anal fin and parr marks which are similar to coho. These fish also exhibit spring and summer run timing characteristics when they pass Bonneville Dam and Lower Granite Dam and also spring and summer chinook spawning time characteristics. However, there is no break in the spawning from start to finish, and the fish are managed as one population. Spring chinook spawn from Freezeout Creek to a mile up the South Fork, a distance of 35.2 miles. The run size has declined significantly since the mid-1960's as measured in the index area from the Blue Hole downstream to Mac's Mine, a distance of 9.7 miles. The average redd count in this area from 1964 to 1973 was 281.8 redds. The average redd count from 1979 to 1988 was 97.0 redds. The average redd count from 1989 to 1998 was 61.5 redds.

Fall chinook historically spawned in the lower Imnaha River, possibly as far upstream as

[2] See also Watershed Management - Approaches to Implementing Solutions

the town of Imnaha. The first spawning ground surveys were conducted in 1964 when 9 redds were counted. By 1968, 0 redds were counted. The survey in 1973 again showed no redds. Surveys were reinitiated in 1987, and counts went from 0 in 1987 to 4 in 1991 and 13 in 1998. This increase corresponds to an overall increase in fall chinook returns to the Snake River. Most of the redds have been observed in the lower ten miles.

An active ODFW hatchery program captures migrating chinook adults at the Imnaha River fish weir 30 miles upstream from the town of Imnaha. Some of the fish are used for hatchery egg take while others are released to spawn in the wild. Fertilized eggs are hatched and reared at the Lookingglass Hatchery on Lookingglass Creek, near the Grande Ronde in Union County. Smolts from the hatchery are returned to the Imnaha fish weir for about 4 weeks of acclimation prior to release into the Imnaha River.

Wild fish in the Imnaha have decreased dramatically since the mid-1970's, even though the habitat has remained relatively stable, and subbasin harvest rates have been near zero according to a draft report[3] on the Imnaha River.

In general, the Imnaha watershed is in good condition. However, there are some significant problems with water quality and overall habitat, especially in the lower two reaches. Feedlots are one of the factors that contribute to water quality and habitat problems in the lower 2 reaches. Temperatures recorded at the mouth of Fence Creek reached 74 degrees F. A landslide in the wilderness area headwaters contributes fine sediment to the stream. This excess fine sediment adversely affects gravels for anadromous spawning and has resulted in salmonid kills (possibly due to gill abrasion, which was noted on some of the recovered carcasses). A USFS geotechnical engineer and other employees determined that the landslide that contributed sediment was a natural phenomena not related to human or livestock use (see Appendix F).

Imnaha River--Headwaters to the Wilderness Boundary

Water Quantity

There are no major problems with water quantity on the Imnaha River, but the committee discussed two possible ways to augment water quantity on this reach.

Tree Density (Low Priority)[4.]--*Dense thickets of trees resulting from past fire suppression can prevent much of the rain and snow from reaching the ground, and consequently the moisture is lost to the drainage through evaporation or sublimation.*

> Maintenance of healthy watershed conditions, by reducing tree density will provide an optimal, sustainable supply of water. Healthy watershed and forest

[3]Columbia Basin Fish and Wildlife Authority, 1989, Imnaha River Subbasin Salmon and Steelhead Plan, Public Review Draft

[4]This salmon recovery analysis does not advocate increasing water with large-size clearcuts, seed cuts or seed tree cuts**.** For further discussion of tree density see the forest management approaches in the chapter "Watershed Management - Approaches to Implementing Solutions."

conditions will also supply the water at the optimal times for salmon through snowpack and groundwater recharge and release.

Compaction (Low Priority).--*Compaction from livestock and recreational trails, especially in riparian areas, may result in increased surface runoff and decreased groundwater recharge (i.e. poor timing of streamflow for salmon).*

Manage the recreational and livestock trail systems to maintain and enhance fisheries habitat by reducing compaction and devegetation in the riparian and upland areas which cause surface runoff and prevent infiltration and groundwater recharge.
NOTE: Since the original plan was completed in 1993, the grazing permit that allowed domestic sheep to graze this area has been cancelled.

Water Quality
Excess Fine Sediment (High Priority and Study).--*This problem results from landslides in the headwaters that were caused by heavy rain, soil saturation, and slope failure. Injury to migrating salmon (fish with abraded gills) has been noted.*

Nothing could have prevented the landslides, but there are several possible mitigation measures. One measure would be to stabilize the toes of the slides by planting native and desirable non-native vegetation (the plant mix should include species that can rapidly establish on newly exposed soil and that can form root systems that will stabilize the soil). A supply of seeds for native and desirable non-native vegetation should be kept on hand for planting to stabilize any future slides in the wilderness areas. Other measures include study and management of recreational, livestock, and wildlife trail systems (and their overall use) to ensure that they do not result in further excess sedimentation.

Fuel Density (High Priority)-- *Parts of this reach have high levels of fuels and pose a risk of catastrophic fire and consequent salmon habitat destruction. These levels are in part a natural occurrence and in part due to past fire suppression practices in the wilderness. It is a high priority for treatment but a low probability for accomplishment.*

Prescribed burning in the wilderness, done judiciously, can help reduce the fuel levels and provide fire breaks to prevent large uncontrollable fires. Riparian areas and fuel rearrangement (piling or putting the fuels near the ground to facilitate rotting, judiciously placing fuels to protect streambanks, or placing large woody debris in stream to add to stream structure) may be preferable to burning. Such methods would also keep the organic material as part of the ecosystem, help improve fish habitat, and help prevent sedimentation. Well managed grazing may also help to reduce light "flash" fuels. A prescribed burning plan has been prepared by a local fire control manager for the Wallowa/Whitman National Forest.
NOTE: Since the original plan was completed in 1993, a Wildland Fire Use Program has been completed for the Eagle Cap Wilderness. Several wildfires have been managed for resource benefits under this program.

Herbicides/Pesticides (High Priority).—See County Issues, above.

Other Chemicals (High Priority Study).--*High levels of mercury have been recorded near the gauging station located downstream from this section. This source may be from a naturally occurring cinnabar.*
(See Studies Appendix P)

Sample the water again to test for mercury, and if it reappears do systematic sampling to identify and mitigate the source if possible.

Stream Structure
No problems were identified.

Substrate
Excess Fines (High Priority)

See the solutions for excess fine sediment in the Water Quality Section.

Habitat Requirements
Harassment (Low Priority).--*The only problem the committee has identified for this reach is possible harassment of spawning salmon by recreational users.*

The solutions include education of recreational users and seasonal sport fishery closures.
NOTE: Since the original plan was completed in 1993, an educational program has been conducted through the campground hosts and through the school system.

Imnaha River--Wilderness Boundary to Private Lands

Water Quantity
Tree Density (Possible future problem, Low Priority).--*Dense thickets of trees resulting from past fire suppression can prevent much of the rain and snow from reaching the ground, and consequently moisture is lost to the drainage through evaporation or sublimation.*

Maintenance of healthy watershed conditions by managing fuel loads will provide an optimal, sustainable supply of water. Healthy watershed and forest conditions will also supply the water at the optimal times for salmon through snowpack and groundwater release and recharge.

Compaction (Low Priority).--*Compaction (and devegetation) from livestock trails and grazing, recreational trails, campgrounds, skid trails, and roads (especially in riparian areas) may result in increased surface runoff and decreased groundwater recharge and release (i.e. poor timing of streamflow for salmon).*

Manage trail, campground, and road use to maintain and enhance fisheries

habitat by avoiding compaction and devegetation in riparian and upland areas which cause surface runoff and prevent infiltration and groundwater recharge.
NOTE: Since the original plan was completed in 1993, several campsites in the riparian area have been moved away from the river. Riparian vegetation has been planted, and an educational program has been useful in educating campground users.

Minimum flow (Low Priority).--*Minimum flow is not a problem in this reach at this time, but the committee discussed it because of possible future downstream demands.*

Preserve adequate snowpack shading (tree cover) to maintain flows later into the summer. This will help promote infiltration and groundwater recharge instead of surface runoff.

Water Quality

Temperature (Study, Low Priority).--*There is a concern about temperature on this reach because many of the riparian spruce trees have died due to the spruce bark beetle (Dendroctonus rufipennis).*

Study temperatures and make it a high priority if there is a problem. Preserve existing riparian shading and plant if necessary. Move campgrounds away from river so that dead trees are left to provide shade and large woody debris instead of being removed as hazard trees.
See Compaction.

Excess Fine Sediment (High Priority).--*This problem results from landslides in the headwaters that were caused by heavy rain, soil saturation, and slope failure (see Appendix F on analysis of slides by Forest Service Personnel). Injury to migrating salmon (fish with abraded gills) has been noted.*

Address the landslides as noted above. The committee discussed additional ways to reduce sediment input to the river. One way would be to limit dust from the roads with lignosulfonate, water, chip seal, or asphalt. Roads should be designed and maintained to prevent direct runoff from the road to the river. Use of some roads could be limited (seasonal use and closure). Roads could be revegetated (with limited use) or be closed if necessary. Skid trails should be water barred and revegetated. Lighter skidding equipment or off-ground skidding/decking equipment could also be used to limit erosion. Livestock use should be managed to reduce sediment input. The number of visitors to riparian campgrounds could be limited (by initiating a permit system) to limit sediment input from streamside activities. Campground design could be improved to limit sediment input, and campers and fishermen could be educated to limit riparian compaction, devegetation, and erosion.
NOTE: Since the original plan was completed in 1993, several campsites in the riparian area have been moved away from the river.

Fuel Density (Low Priority).--*Parts of this reach have high levels of fuels and pose a risk of catastrophic fire and consequent salmon habitat destruction. These levels are in part a natural occurrence and in part due to past fire suppression practices in the wilderness.*

Precommercial and commercial thinning could be used to remove fuels as saw logs or chip material. In some cases, especially in riparian areas, fuel rearrangement (piling or putting the fuels near the ground to facilitate rotting, judiciously placing fuels to protect the streambank, or placing large woody debris in stream to add to stream structure) may be used in order to keep the organic material as part of the ecosystem, preserve shade, and prevent sedimentation. Well managed grazing may also help to reduce light "flash" fuels.
NOTE: Since the original plan was completed in 1993, prescribed fire has been introduced into the area to control fuel densities.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure
Woody Debris (Low Priority).--*Lack of large woody debris has been a problem in this reach.*

Add or preserve existing large woody debris in the river. Protect and/or plant trees in the riparian area to supply future large woody debris.

Pool/Riffle Ratio (Low Priority).--*Could be improved in this reach.*

Add large woody debris, as mentioned above.

Bank Form (High Priority).--*Bank form has deteriorated along some portions of this reach.*

Move campgrounds away from river, and restrict vehicle access to river in campgrounds. Manage grazing and livestock use to protect the bank form. Educate campers and fishermen about how their actions can create problems with the bank form and overall salmon habitat. Manage recreational use of roads, trails, and campgrounds to protect the bank form.
Reduce compaction as described previously.
NOTE: Since the original plan was completed in 1993, several campsites in the riparian area have been moved away from the river. Riparian vegetation has been planted, and an educational program has been useful in educating campground users.

Substrate
Excess Fine Sediment (High Priority).--*Excess fine sediment in the substrate from the upstream landslides appears to be a problem in this reach.*

The solution to this problem is described in water Quality, above.

Habitat Requirements

Harassment (High Priority).--*Harassment of spawning salmon is a problem in this reach.*

> Move campgrounds back from spawning areas. Close sport fishing during spawning season. Plant thorn bushes such as Hawthorn (*Crategus columbiana*), which is native to most elevations in the County, in riparian areas to keep people and livestock away from spawning areas. Educate river users about effects of harassment on spawning fish.

Imnaha River--Private Lands to Town of Imnaha

Water Quantity

Tree Density (Possible future problem, Low Priority).--*Dense thickets of trees resulting from past fire suppression can prevent much of the rain and snow from reaching the ground, and consequently moisture is lost to the drainage through evaporation or sublimation.*

> Maintenance of healthy watershed conditions, by managing tree density will provide an optimal, sustainable supply of water. Healthy watershed and forest conditions will also supply the water at the optimal times for salmon through snowpack and groundwater release and recharge.

Irrigation withdrawals (Possible Future Problem, Low Priority).--*There is a possibility of increased irrigation requirements for row crops. This possibility is slight because of the limited area of tillable lands.*

> Use efficient methods of irrigation. ODFW has filed instream water rights to maintain optimum flow for salmon habitat (ODFW's instream water rights are junior to most irrigation rights and may not be effective in providing water during low flow periods).

Compaction (Low Priority).--*May result in some habitat problems in this reach.*

> Limit bank erosion and destruction by livestock by using physical or electric fencing. Use water corridors or supply alternative water source for livestock. Make sure compaction and devegetation in the riparian (and upland) areas do not cause surface runoff and prevent infiltration and groundwater recharge.

Future demand (Possible future problem, Low Priority).--*Future demands for water may impact water quantity needed for salmon habitat.*

> Use efficient methods of irrigation. File instream water rights on the water necessary to maintain optimum flow for salmon habitat. Use zoning and the land use planning process to limit future demands on water, for agricultural or domestic purposes, which would adversely affect salmon habitat.

Water Quality

Temperature (Possible Future Problem, Low Priority).--*There is a concern about temperature on this reach.*

> Study temperature and make it a high priority if there is a problem. Preserve existing riparian shading and plant if necessary. Plant or protect conifers in the riparian area to provide thermal cover in the winter.

Excess Fine Sediment (High Priority).--*This problem results from landslides in the headwaters that were caused by heavy rain, soil saturation, and slope failure. Injury to migrating salmon (fish with abraded gills) has been noted. Grazing, logging, road building, and runoff from cropland also contribute some sediment to this reach.*

> See "Feedlots" in this section. Manage grazing, logging, road building, and croplands to minimize sediment input.

Fuel Density (Possible Future Problem, Low Priority).--*Fires may destroy vegetative cover and consequently result in sediment input to the river.*

> Well managed grazing may help to reduce light "flash" fuels.

Septic (Study).--*Study effects of leakage from septic systems on water quality and salmon habitat.*

> If there is a problem with septic systems, limit future development in the County's comprehensive land use plan and improve current systems (ODEQ approved septic systems are required prior to building in Wallowa County).
> NOTE: Since the original plan was completed in 1993, septic systems are being moved away from the river on a case by case basis as reviewed by the NRAC Technical Committee.

Feedlots (High Priority).--*Feedlots and other areas of heavy livestock concentration contribute to water quality problems by adding contaminants (sediment, turbidity, nitrates, etc.) to the river. The input from feedlots also decreases dissolved oxygen in the water which stresses or even kills fish.*

> Prevent bank erosion and destruction by livestock by fencing livestock away from river and providing water corridor or alternate stock water. Provide filter strip, settling ponds, and/or wetlands to improve quality of feedlot runoff. Monitor wildlife and herd them away from domestic feedlots if they became a problem.
> NOTE: Since the original plan was completed in 1993, many feedlots have been moved away from the river and/or at least 35 feet buffer strips have been fenced off. Many improvements were damaged in the January 1, 1997, flood.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure

Bank Form (High Priority).--*Heavy livestock use and road fords result in river bank destruction.*

Prevent bank erosion and destruction by livestock through physical or electric fencing. Provide a water corridor or alternate water for livestock. Protect bank in livestock water corridor or road ford with rock of appropriate size.

Ice Flows (Low Priority).--*Ice jams in the river scour the streambed, removing woody debris, etc.*

Preserving or somehow establishing large trees on the bank could possibly help slow the ice flow, and the banks would be somewhat resistant to being wiped out by an ice flow. Dynamiting small ice jams before they get larger and more destructive might be possible.

Substrate

Excess Fine Sediment (High Priority).--*Excess fine sediment in the substrate from the upstream landslides appears to be a problem in this reach.*

See "Imnaha River--Wilderness Boundary to Private Lands" and "Feedlots" in this section.

Habitat Requirements

Harassment (Low Priority).--*Harassment of spawning salmon could be a problem in this reach.*

Close sport fishing during spawning season. Avoid using road fords and engaging in other instream activities during spawning and incubation (August 15-June 1).

Imnaha River--Town of Imnaha to Snake River

Water Quantity

Flushing Flow (Possible Future Problem, Low Priority).--*Increased demand for irrigation upstream may reduce available flushing flow.*

Do not impound or divert needed flushing flow. See "Imnaha River--Wilderness Boundary to Private Lands" and "Feedlots" in this section.

Water Quality

Temperature (Possible Future Problem, Low Priority).--*This reach is at lower elevations, and the climate is hotter than the upper reaches. Lack of shade may allow warming of the water.*

Preserve riparian shading. Plant trees or bushes to create shade where temperature problems are found.

Excess Fine Sediment (Low Priority).--*This problem results from landslides in the* *headwaters that were caused by heavy rain, soil saturation, and slope failure (see Appendix F). Injury to migrating salmon (fish washed up with abraded gills) has been noted. Grazing, logging, road building and runoff from plowed cropland also contribute some sediment to this reach.*

> See "Imnaha River--Wilderness Boundary to Private Lands" and "Feedlots" in this section. Manage grazing, logging, road building, and croplands to minimize sediment input.

Septic (Study).--*Study effects of leakage from septic systems on water quality and salmon habitat.*

> If there is a problem with septic systems, limit future development in the county's comprehensive land use plan, and improve current systems (the Oregon Department of Environmental Quality [ODEQ] has information on improving septic systems).
> NOTE: Since the original plan was completed in 1993, septic systems are being moved away from the river on a case by case basis as reviewed by the NRAC Technical Committee.

Feedlots (High Priority).--*Feedlots contribute to water quality problems by adding contaminants (sediment, turbidity, nitrates, etc.) to the river. The input from feedlots can also decrease dissolved oxygen in the water and stress (or even kill) fish.*

> Prevent bank erosion and destruction by livestock through fencing livestock away from river and providing water corridor or alternate stock water. Provide filter strips, settling ponds, and/or wetlands to improve quality of feedlot runoff. Monitor wildlife and herd them away from domestic feedlots if they became a problem.
> NOTE: Since the original plan was completed in 1993, many feedlots have been moved away from the river and/or at least 35 feet buffer strips have been fenced off. Some of the improvements were damaged by the January 1, 1997, flood.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure
Ice Flows (Low Priority).--*Ice flows through the river scour the streambed, removing woody debris, etc.*

> Dynamiting small ice jams before they get larger and more destructive might be possible.

Substrate
Excess Fine Sediment (High Priority).--*Excess fine sediment in the substrate from the upstream landslides appears to be a problem in this reach.*

> See "Imnaha River--Wilderness Boundary to Private Lands" and "Feedlots" in

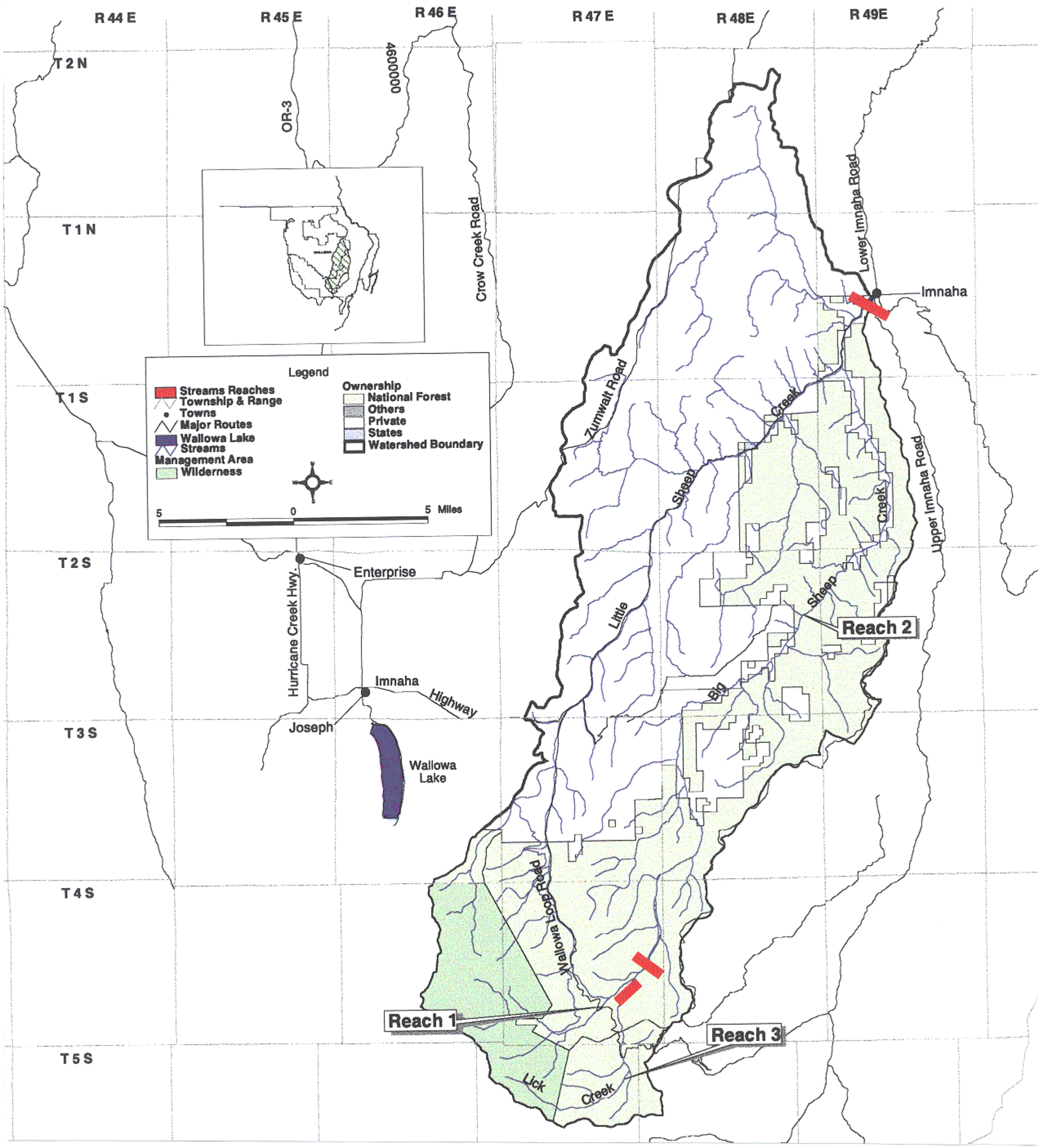
this section.

Habitat Requirements

No problems were identified.

Big Sheep Creek Watershed

(3 Reaches)



BIG SHEEP CREEK[5]

Big Sheep Creek was analyzed in three reaches:

1. Big Sheep Creek from headwaters to Lick Creek
2. Big Sheep Creek from Lick Creek to Imnaha River (including Little Sheep Creek)
3. Lick Creek, a tributary of Big Sheep Creek

Big Sheep Creek, the major tributary of the Imnaha River, rises in the Eagle Cap Wilderness and flows 7 miles before being joined by Lick Creek and then flows 31.6 miles to join the Imnaha River near the town of Imnaha. Lick Creek rises in the Eagle Cap Wilderness. The major tributary of Big Sheep Creek is Little Sheep Creek, which joins Big Sheep Creek 3.2 miles above the town of Imnaha.

A large portion of the watershed of Big Sheep Creek above Lick Creek burned in the 22,370-acre Canal Fire of 1989 causing increased sedimentation, turbidity, and nutrient levels in the stream. Loss of tree cover has resulted in increased surface runoffs. Higher peak flows will potentially increase bank erosion and sedimentation. Excess algal growth has been noted in reaches below the fire and is attributed, by some fish biologists, to nutrient runoff from the burned area.

Water is diverted from the drainage via the Wallowa Valley Improvement Canal which contributes to low flow problems in low water years. A biologist doing an index area count of redds in 1992 noted that more of the spawning gravel was above the water than in previous years.

Resource uses include grazing and logging below the wilderness boundary.

Spring Chinook spawn in Big Sheep Creek from at least Muley Creek to the USFS 140 road bridge, a distance of 23.5 miles. The run size has declined significantly since the mid-1960's when index surveys were standardized as to length, location, and time of year. Index areas were chosen because the majority of spawning occurs in the index reach. The index area is from the USFS 140 road bridge downstream to Echo Canyon, a distance of 4 miles. The average redd count from 1964 to 1973 was 39.4 redds. The average redd count from 1979 to 1988 was 6.7 redds. The average redd count in the index area from 1989 to 1998 was 1.3 redds. In 1997, "surplus" adults from the Imnaha River spring chinook hatchery program were outplanted in Lick Creek, and some of them may have strayed downstream into Big Sheep Creek. In 1998, "surplus" hatchery fish were outplanted into Big Sheep Creek.

Spring Chinook spawn in Lick Creek from at least one-third mile above the USFS 39 road bridge to the confluence with Big Sheep Creek, a distance of 4.3 miles. The run size has declined significantly since the mid-1960's when index surveys were standardized as to length, location, and time of year. Index areas were chosen

[5] See also Watershed Management - Approaches to Implementing Solutions

because the majority of spawning occurs in the index reach. The index area is from the USFS 39 road bridge downstream to the confluence with Big Sheep Creek, a distance of 4 miles. The average redd count from 1964 to 1973 was 26.0 redds. The average redd count in the index area from 1979 to 1988 was 1.7 redds. The average redd count from 1989 to 1998 was 3.4 redds. In 1993, “surplus” adults from the Imnaha River spring chinook hatchery program were outplanted in Lick Creek after the index survey and are not included in the 1989-1998 counts. In 1997 and 1998, “surplus” adults from the Imnaha River spring chinook hatchery program were again outplanted in Lick Creek and are included in the 1989-1998 counts.

Big Sheep Creek--Headwaters to Lick Creek

Water Quantity

Tree Density (High Priority).--*Large numbers (2000-3000 per acre) of lodgepole pine have been naturally reseeded in areas of this drainage following the Canal Fire of 1989 (22,370 acres).*

> Early precommercial thinning of the lodgepole will avoid future fire hazard, reduce precipitation interception and transpiration, and avoid overall forest health problems. The first thinning should be followed by later precommercial and commercial thinning. Individual thinnings should not be drastic. Thinning, as opposed to prescribed burning, is suggested for this reach because of the current stocking level. Prescribed burning would probably reestablish dense lodgepole pine stands and perpetuate the current situation.

Irrigation Withdrawals (Study).--*Irrigation diversions out of the basin to the Wallowa Valley Improvement District remove water from the drainage which could help supplement flushing flows and minimum flows.*

> Snowpack shading should be preserved through appropriate tree density to release the water as late as possible in the season. This benefits both fish and irrigators. If minimum flow is a problem during spawning season, water could be leased from the irrigators and small hydropower projects for instream use. Providing more efficient methods of irrigation might help keep water in the creek. Study building upstream impoundment(s) to supply late season irrigation water and keep the natural, cooler water in the creek. Study canal leakage and find ways to mitigate it if there is a problem.

Minimum Flow (Study).--*Low flow can decrease spawning habitat and allow higher temperatures.*

> See mitigation/enhancement measures discussed under "Irrigation Withdrawals." The watershed vegetation should be protected to avoid quick surface runoff and promote infiltration to recharge the groundwater system. Groundwater release into springs provides most of the flow during low flow times.

Flushing Flow (Study).--*Lack of high flows to trigger migration instinct in smolt and flush* *fine sediment from the spawning gravel could be a problem.*

> See mitigation/enhancement measures under "Irrigation Withdrawals." In some areas, tree spacing could be used to limit precipitation intercept. This could reduce evaporation/sublimation and increase snowpack and water flows. Flushing flow could be released from an upstream impoundment if one were constructed.

Water Quality
Temperature (Possible Future Problem).--*Temperature on this reach is a concern.*

> Study temperature and make it a high priority if there is a problem. Preserve existing riparian shading and plant if necessary. Plant or protect conifers in the riparian area to provide thermal cover in the winter.
> NOTE: Since the original plan was completed in 1993, this issue was addressed in the CRMP and USFS watershed analysis.

Excess Fine Sediment (Low Priority).--*Excess fine sediment is detrimental to water quality and can cause problems with the stream substrate.*

> There are several possible ways to reduce sediment input into the stream. One way would be to limit sediment input from roads. Grazing and logging should be managed to avoid excess sediment input to the stream. Use of roads, trails, and campgrounds should be managed to avoid sediment input, and overall maintain and enhance salmon habitat. Bank erosion and destruction by livestock could be reduced by physical or electric fencing of the creek and providing a water corridor or alternate water source.
> NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis

Fuel Density (Low Priority).--*Fires may destroy vegetative cover and consequently result in sediment input to the river.*

> Precommercial and commercial thinning and prescribed burning (in the Eagle Cap Wilderness) can be used to reduce the potential for catastrophic fire. Fuel rearrangement and/or piling could also be used to reduce the risk of uncontrollable fire. Well managed grazing may help to reduce light and medium "flash" fuels.
> NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure
Woody Debris (Low Priority).--*There is a continuing input of skeletal trees from the Canal Fire. After those trees are rotted away, there will be no replacements for a few years.*

There may be an excess of trees blown into the creek; if these become a problem, some could be removed. Preserve woody debris and add woody debris in the future if necessary.

Bank Form (Low Priority).--*Heavy livestock use and road fords can result in river bank destruction. High peak flows (freshets) can cause bank unraveling/erosion.*

Prevent bank erosion and destruction by livestock through physical or electric fencing. Provide a water corridor or alternate water for livestock. Protect bank in livestock water corridor or road ford with rock of appropriate size. Avoid excess peak flows by keeping enough watershed vegetation to slow the runoff (and let some of it recharge the groundwater system). Good vegetation cover in riparian areas will also stabilize banks and reduce erosion.
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Substrate
Excess Fine Sediment (High Priority).--*Sediment from a fire was washed into this drainage, and the last several drought years have not produced sufficient flushing flow.*

This problem is mainly related to the fire and should resolve itself. Other ways to reduce sediment input are listed above in the "Water Quality" section under "Excess Fine Sediment."
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Physical Barriers (Low Priority).--*There is a possibility that skeletal trees left by the fire will create log jams, physical barriers.*

The creek should be monitored, and if log jams actually become impassable, portions (not necessarily all of the jam) could be removed to allow fish passage.

Habitat Requirements
Predation and Competition (Low Priority).--*Predation and competition may adversely affect salmon in this reach.*

Trout that will prey on juvenile salmon or compete for food should not be stocked. Bull trout in this stretch prey on juvenile salmon, but since the bull trout is listed as threatened under ESA, no action is suggested.

Diversion Screening (Study):.--*Diversion(s) should be screened to prevent loss of fish.*

Make sure that diversions and irrigation returns are screened, monitored, and maintained (this is currently done by the ODFW).
All diversions that are accessible to anadromous fish have been screened.

Big Sheep Creek--Lick Creek to Imnaha River

Water Quantity

Tree Density (Medium Priority).--*Too few trees will result in increased, earlier surface runoff. Too many trees will result in forest health problems, increased risk of fire, and loss of moisture (that never reaches the ground because of interception, evaporation, and sublimation) to the drainage.*

> See the "Tree Density" in the Forest Management section of the "Watershed Management" chapter.

Irrigation Withdrawals (Study).--*Irrigation diversions out of the basin to the Wallowa Valley Improvement District remove water from the drainage which could help supplement flushing flows and minimum flows.*

> See "Big Sheep Creek--Headwaters to Lick Creek."

Flushing Flow (Low Priority).--*Lack of high flows to trigger migration instinct in smolt and flushing fine sediment from the spawning gravel could be a problem.*

> See "Big Sheep Creek--Headwaters to Lick Creek."

Water Quality

Temperature (Study).--*There are reports of warm springs in this area which affect temperatures. Lack of riparian vegetation and shade allows temperature to increase.*

> Provide riparian shading by planting new shrubs and trees, as well as protecting existing shade. Protect (and possibly increase) flow from springs by enhancing groundwater recharge (limit surface runoff from roads, etc). The temperature of springs is generally ground temperature (around 45-50^{0}F). Plant and/or protect conifers in riparian area to provide thermal cover in winter. (See suggestions under "Feedlots.")
> NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Septic (Study).--*Study effects of leakage from septic systems on water quality and salmon habitat.*

> If there is a problem with septic systems, limit future development in the County comprehensive land use plan and improve current systems (ODEQ has information on improving septic systems).

Feedlots (Study).--*Runoff from feedlots on this reach may affect water quality.*

> Prevent bank erosion and destruction (as well as loss of shade vegetation) by livestock though fencing and supplying water corridors or alternate water sources. Protect water corridors and road fords with rock of appropriate size. Provide wetlands, settling ponds, and/or filter strips for feedlot runoff.

NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Excess Nutrients.--*Excess nutrient runoff from the Canal Fire has resulted in excessive algal growth which is indicative of poor water quality. Feedlots also contribute to excess nutrients in the lower 3 miles of Big Sheep Creek.*

See "Feedlots" above. Excess nutrient runoff from the fire is dissipating naturally as revegetation occurs.

Stream Structure
Channelization (Low Priority).--*Channelization limits diversity of stream structure.*
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Do not permit any channelization and restore natural stream structure where possible.

Bank Form (Low Priority).--*Heavy livestock use (e.g. feedlots) and road fords can result in river bank destruction. High peak flows can cause bank unravelling/erosion. Recreational use of roads, trails, and campgrounds may also lead to bank stability problems.*

See "Big Sheep Creek--Headwaters to Lick Creek," also "Channelization" in this section.
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Steep Gradient (Low Priority).--*Stream structure in this reach is limited by a steep gradient.*

Work with the inherent possibilities of the stream. Anchoring large woody debris or providing other structures (e.g., rock) could provide pools with slower water for the fish.

Substrate
Cobble embeddedness (Study).--*There may be a problem with cobble embeddedness in this reach (sediment input from the fire, etc.).*

See "Big Sheep Creek--Headwaters to Lick Creek." Work on reducing sediment input from roads, skid trails, grazing, and recreational use (see "Watershed Management" chapter).

Habitat Requirements
Riparian Vegetation (Low Priority).--*Riparian vegetation on this reach could be improved.*

Preserve existing riparian vegetation and restore riparian vegetation where needed to preserve cooler water temperatures. Plant and/or protect conifers in the riparian area to provide shade in summer and thermal cover in winter (allow for diversity and do not plant/favor conifers exclusively).
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Harassment (Low Priority).--*Activities on this reach may result in harassment of spawning salmon.*

Manage recreational use of roads, trails, and campgrounds to avoid harassment. Planting thorn bushes in riparian areas of spawning beds could discourage harassment. Alternate places could be provided for sport fishing. There could be seasonal sport fishery closures during spawning season.
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Predation and Competition (Low Priority).--*Predation and competition adversely affect salmon in this reach.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Diversion Screening (Study).--*Diversion(s) should be screened to prevent loss of fish.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Big Sheep Creek--Lick Creek

Water Quantity
Tree Density (Medium Priority).--*Too few trees will result in increased, earlier surface runoff. Too many trees will result in forest health problems, increased risk of fire, and loss of moisture (that never reaches the ground because of interception, evaporation, and sublimation) to the drainage.*

See the "Density" in "Watershed Management" chapter.

Water Quality
Temperature (Possible Future Problem).--*There is a concern about temperature on this reach.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Fuel Density (Medium Priority).--*Catastrophic fires may destroy vegetative cover and consequently result in sediment input to the river.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure

Woody Debris (Low Priority).—*There is a continual input of skeletal trees from the Canal Fire in last mile of stream. After those trees are rotted away, there will be no replacements for a few years.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Bank Form (in meadow) (Study).—*Allow the improving condition of the bank to continue.*

Study the cause. Recreational and livestock trails on the bank should be managed to maintain and enhance fisheries habitat. If bank erosion is being caused by livestock, fence riparian areas and provide water corridors or alternate water source.

Substrate

Excess Fine Sediment (Low Priority).--*The last several drought years have not produced sufficient flushing flow.*

See "Big Sheep Creek--Headwaters to Lick Creek." Work on reducing sediment input from roads, logging, and grazing.

Physical Barriers (Low Priority).--*There is a possibility of log jams, from the skeletal trees left by the fire, creating physical barriers. Rock dams have been built near the campgrounds to provide swimming holes. Some of these dams create fish passage problems.*

See "Big Sheep Creek--Headwaters to Lick Creek." Campers should be educated about the effects of their dams on fish and how to provide passage for fish through their dams.

Habitat Requirements

Harassment (Low Priority).--*Activities on this reach result in harassment of spawning salmon.*

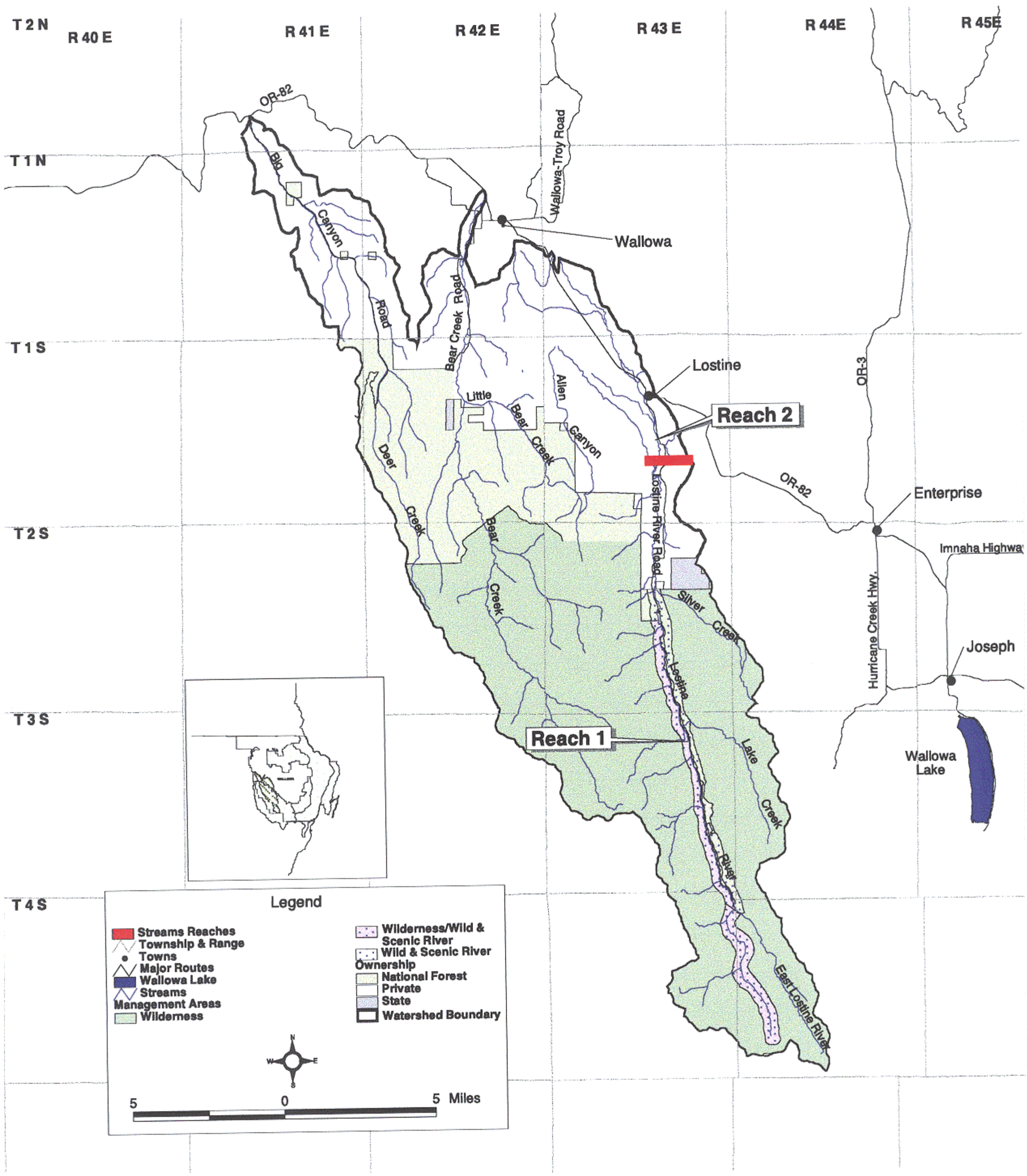
See "Big Sheep Creek--Headwaters to Lick Creek."

Predation and Competition (Low Priority).--*Predation and competition adversely affect salmon in this reach.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Lostine Watershed

(2 Reaches)



LOSTINE RIVER[6]

The Lostine River was analyzed in two reaches:

1. Headwaters to Strathearn's Pond
2. Strathearn's Pond to Wallowa River

The Lostine River rises in the Eagle Cap Wilderness and flows north to join the Wallowa River near the town of Wallowa. This tributary of the Wallowa River is about 30 miles long. An existing dam at Minam Lake stores some water that is released for irrigation purposes.

The main resource uses along the upper reach of the Lostine River (to Strathearn's Pond) include recreation (fishing, hiking, camping) in the wilderness area and some logging in addition to recreation in the reach outside of the wilderness but within the National Forest. There are a number of small land ownerships in the lower portion of this reach where logging, grazing, and other agricultural activities are ongoing.

Lands adjacent to the River in the reach downstream from Strathearn's Pond are privately owned. Resource activities include grazing and irrigated agriculture. Some reaches of the river are left with very low flows and dry at times when water is diverted for irrigation and stock water during low flow times. Irrigation return flows from the Cross Country Ditch diversion increase water quantity but contribute to water quality problems.

The Lostine River (together with the Imnaha and Wenaha rivers) historically had the largest runs of spring chinook in Wallowa County. Spring Chinook spawn from Lapover Meadows to the confluence with the Wallowa River, a distance of 21 miles. The run size has declined significantly since the mid-1960's when index surveys were standardized as to length, location, and time of year. Index areas were chosen because the majority of spawning occurs in the index reach. The index area is from the Six-mile Bridge downstream to the OC Ranch Bridge, a distance of 3 miles. The average redd count in the index area from 1964 to 1973 was 200.5 redds. The average redd count from 1979 to 1988 was 47.3 redds. The average redd count from 1989 to 1998 was 18.9 redds.

The Nez Perce Tribe and ODFW initiated a spring chinook captive broodstock hatchery program on the Lostine River in 1995 by collecting native juvenile chinook. This is a continuing program. The juveniles are split between Bonneville Hatchery on the Columbia River (fresh water rearing) and the Manchester Fish Hatchery located near Seattle, Wa. (salt water rearing). A captive brood program is generally initiated when a population has dropped to a level where extinction is imminent. The increased survival gained in the hatchery provides more smolts per juvenile collected than would be expected under natural conditions. The juveniles are reared to adults and spawned, and the offspring are returned to the Lostine River as smolts, then acclimated, and

[6]See also Watershed Management - Approaches to Implementing Solutions

released.

The Nez Perce Tribe initiated a conventional hatchery program on the Lostine River in 1997. Adults are trapped at a weir located approximately ¾ miles above the confluence with the Wallowa River. A portion of the adults are passed above the weir, and the balance are transported to Lookingglass Hatchery where they are spawned and reared to the smolt stage. They are then transported back to the Lostine River where they are acclimated and released. An acclimation site located approximately 13.5 miles above the confluence with the Wallowa River was established in 1999 by the Nez Perce Tribe to acclimate the first smolt release from the conventional program. The first release from the captive brood program will occur in 2000.

Lostine River--Headwater to Strathearn's Pond

Water Quantity
Tree Density (Medium Priority).--*Tree densities in portions of this drainage keep much of the precipitation (rain and snow) from reaching the ground, and this moisture is lost to the drainage.*

> A long term policy of fire depression is the primary cause of tree density. Prescribed burning of small portions in the wilderness can create areas with less fuel that would allow control of wildfires and prevent catastrophic consequences. Precommercial and commercial thinning should be used to reduce excess densities in non-wilderness areas.
> NOTE: Since the original plan was completed in 1993, a Wildland Fire Use Program has been completed for the Eagle Cap Wilderness. Several wildfires have been managed for resource benefits under this program.

Water Quality
Fuel Density (Medium Priority).--*Fires may destroy vegetative cover and consequently result in sediment input to the river.*

> See "Water Quantity" in this section. Fuel rearrangement and/or piling, especially in riparian areas, could be used to reduce the risk of uncontrollable, catastrophic fire.

Stream Structure
Channelization (Low Priority).--*Channelization occurs on lower portions of this reach and limits diversity of stream structure.*

> Do not permit any more channelization.

Bank Form (Low Priority).--*A variety of factors can contribute to bank erosion on this reach. The upper portions of the reach (National Forest and Eagle Cap Wilderness) are subject to fairly heavy recreational use including roads, trails, and campgrounds.*

Lower portions of this reach have some bank form problems relating to livestock use and channelization. High peak flows also contribute to bank erosion.

Recreational activities including road, campground, and trail use should be managed to avoid bank degradation. Logging activities should meet or exceed the requirements of the Oregon Forest Practices Act. Prevent excessive bank erosion and destruction by livestock through physical or electric fencing. Provide a water corridor or alternate water for livestock. Protect bank in livestock water corridor or road ford with rock of appropriate size. Avoid excess peak flows by keeping enough watershed vegetation to slow the runoff (and let some of it recharge the groundwater system). Good vegetation cover in riparian area will also stabilize banks and reduce erosion. Also see "Channelization" in this section.

Substrate

<u>Physical Barriers (Low Priority)</u>.--*Log jams have, in the past, created actual physical barriers to fish passage.*

The river should be monitored, and if log jams actually become impassable, portions (not necessarily all of the jam) could be removed to allow fish passage.
NOTE: Since the original plan was completed in 1993, a log has been removed.

<u>Dredging (Low Priority)</u>.--*Gravel is removed from this reach for concrete mix.*

Gravel dredging operations should be, and already are, limited to the time when there are not likely to be anadromous fish spawning (July 1 - August 15) or eggs in the gravel. Gravel operations should be confined to bars above the water level.
NOTE: Since the original plan was completed in 1993, this is not being continued unless ODFW approves.

Habitat Requirements

<u>Harassment (Medium Priority)</u>.--*Recreational and resource use of the area, including trails and campgrounds, may contribute to harassment of spawning salmon.*

Recreational use of roads, trails, and campgrounds should be managed to avoid harassment of salmon, as well as to help maintain and enhance overall fisheries habitat. Thorn bushes could be planted along the streambanks to discourage use by potential harassers. Campgrounds could be moved away from the stream to discourage harassment. The river could be closed to sport fishing for other species, or have seasonal sport fishery closures. Education of recreational and resource users should help reduce harassment.
NOTE: Since the original plan was completed in 1993, housing density has been increased, and an educational program has been conducted through the campground hosts and through the school system.

Predation and Competition (Study).--*Predation and competition adversely affect salmon in this reach.*

> Trout should not be stocked since they will prey on juvenile salmon, compete for food, and fishing should not be encouraged on these stocks. Bull trout in this stretch prey on juvenile salmon, but since they are listed as threatened, no action is recommended at this time.
> NOTE: Since the original plan was completed in 1993, ODFW no long stocks trout in response to this plan.

Lostine River--Strathearn's Pond to Wallowa River

Water Quantity
Irrigation Withdrawals (High Priority).--*Irrigation diversions create instream flow problems, especially in some portions of this reach (potential alternative solutions are listed below).*

> Conditions in the upper watershed, snowpack shading, etc. should be maintained in a healthy condition to provide late snowpack release and good ground water recharge. Diversions from one watershed to another should be avoided where possible. Water could possibly be leased during low flow times (i.e. after second cutting of hay) to supplement low flows. Work on increasing irrigation efficiency to leave conserved water in reaches with low flow problems. Study adding impoundments upstream to supplement irrigation water and keep natural flow in the river. Look into drilling wells to supplement flow where needed during low flow times.
> NOTE: Since the original plan was completed in 1993, numerous landowners have installed more efficient irrigation systems such as sprinklers and gated pipe. Every irrigation ditch has been gauged with the irrigators' cooperation.

Minimum Flow (High Priority).--*There are minimum flow problems on portions of this reach.*

> See "Irrigation Withdrawals" above. Make use of land use planning to limit possible future demands for agricultural and domestic purposes that would be detrimental to salmon habitat.

Flushing Flow (Medium Priority).--*Lack of high flows to trigger migration instinct in smolt, and flushing fine sediment from the spawning gravel could be a problem.*

> Avoid impounding or diverting needed flushing flow. Other solutions include releasing impounded water for flushing flows and limiting tree density and vegetative cover to increase peak flows.

Water Quality
Temperature (High Priority).--*Lack of riparian vegetation and shade, as well as low flow*

levels, contributes to rises in water temperature.

Provide riparian shading by planting new shrubs and trees, as well as protecting existing trees. Protect (and possibly increase) flow from springs by enhancing groundwater recharge (limit surface runoff from roads, etc). The temperature of springs is generally ground temperature (45-50^{o}F). Plant and/or protect conifers in riparian area to provide thermal cover in winter. Look at increasing irrigation efficiency and limiting amounts of warm irrigation return flows.

Excess Fine Sediment (High Priority).--*There is excess fine sediment in this reach which creates water quality and other problems for the salmon.*

See "Road Management" section in "Watershed Management" chapter. Prevent bank erosion and destruction through livestock by fencing riparian area and providing water corridors or alternate water sources. Protect water corridors with rock of appropriate size. Avoid devegetation in the upper watershed to the extent that it would result in extreme peak flows and cause bank erosion. Provide wetlands, filter strips, or settling ponds for feedlot runoff and irrigation return flows. Limit sediment-laden irrigation return flows. Limit overland return flows/sheet erosion off fields.

Irrigation Return Flows (High Priority).--*Irrigation return flows can contribute to excess sediment and temperature problems.*

See "Excess Fine Sediment" and "Temperature" in this section.
NOTE: Since the original plan was completed in 1993, two landowners installed settling pond in return irrigation ditches to reduce sediment.

Septic (Study).--*Study effects of leakage from septic systems on water quality and salmon habitat.*

If there is a problem with septic systems, possibly limit future development using the County comprehensive land use plan and improve current systems (ODEQ has information on improving septic systems).

Feedlots (Study).--*Runoff from feedlots on this reach may affect water quality.*

Prevent bank erosion and destruction (as well as loss of shade vegetation) by livestock though fencing and supplying water corridors or alternate water sources. Protect water corridors and road fords with rock of appropriate size. Provide filter strips, settling ponds, and/or wetlands for feedlot runoff.
NOTE: Since the original plan was completed in 1993, one major feedlot was moved away from the river.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Excess Nutrient Loading (High Priority).--*Excess nutrient load results in a variety of water quality problems (including excess algae growth, loss of dissolved oxygen, etc).*

See "Feedlots," Excess Fine Sediment," and "Temperature" in this section. Avoid runoff from farmlands (fertilizer) and pastures.

Stream Structure

Woody Debris (High Priority).--*Lack of large woody debris limits stream structure and habitat.*

Add woody debris and preserve current woody debris. Do not permit additional channelization. Preserve and restore riparian vegetation to provide future source of woody debris.
NOTE: Since the original plan was completed in 1993, woody debris has increased.

Channelization (Low Priority).--*Channelization limits diversity of stream structure.*

Avoid permitting additional channelization and restore the channel where possible. Protect and restore riparian vegetation to stabilize banks, and assure that devegetation in upper watershed does not contribute to extreme peak flows. Use comprehensive plan to deter developments on floodplain which could need channelization to protect them. Develop mitigation strategies for necessary channelization and/or bank protection.
NOTE: Since the original plan was complete in 1993, pool habitat has improved by many landowners allowing the river to return to natural river condition by reducing channelization, improving stream structure and substrate condition.

Bank Form (Low Priority).--*Heavy livestock use and channelization lead to bank erosion and degradation.*

See "Excess Fine Sediment," Riparian Vegetation," and "Channelization" in this section.
NOTE: Since the original plan was completed in 1993, fences have been installed to exclude livestock along the river.

Substrate

Cobble Embeddedness (High Priority).--*Cobble embeddedness in this reach is a problem.*

See "Flushing Flow" and "Excess Fine Sediment" in this section.

Excess Fine Sediment (High Priority).--*Excess fine sediment limits fish habitat by creating water quality and substrate problems. This is due to high deposits from the Cross Country Ditch.*

Protect upland watershed vegetative cover to avoid quick surface runoff, high peak flows, and bank erosion. In some areas, space trees so that snow can reach the ground (instead of evaporating and sublimating) and build up snowpack to provide flushing flow. Release impounded water from new impoundments if they are built to provide flushing flow. Increase flow quantity (see "Minimum Flow" and "Water Quality" in this section.

Physical Barriers (High Priority).--*Low flows combined with one diversion structure sometimes provide physical barriers to fish passage.*

Provide adequate minimum flow levels (see "Minimum Flow" in this section). Modify diversion barriers to better provide fish passage. Provide passage through swimming hole dams.
NOTE: Since the original plan was completed in 1993, four major ditch diversions have been installed in the Lostine River with fish passages.

Dredging (Low Priority).--*Gravel is removed from this reach for concrete mix.*

Gravel dredging operations should be, and already are, limited to the time when there are not likely to be anadromous fish spawning (July 1 - August 15) or eggs in the gravel.
NOTE: Since the original plan was completed in 1993, this is continuing however plant is in the process of moving location.

Habitat Requirements

Riparian Vegetation (Low Priority).--*Riparian vegetation on this reach could be improved.*

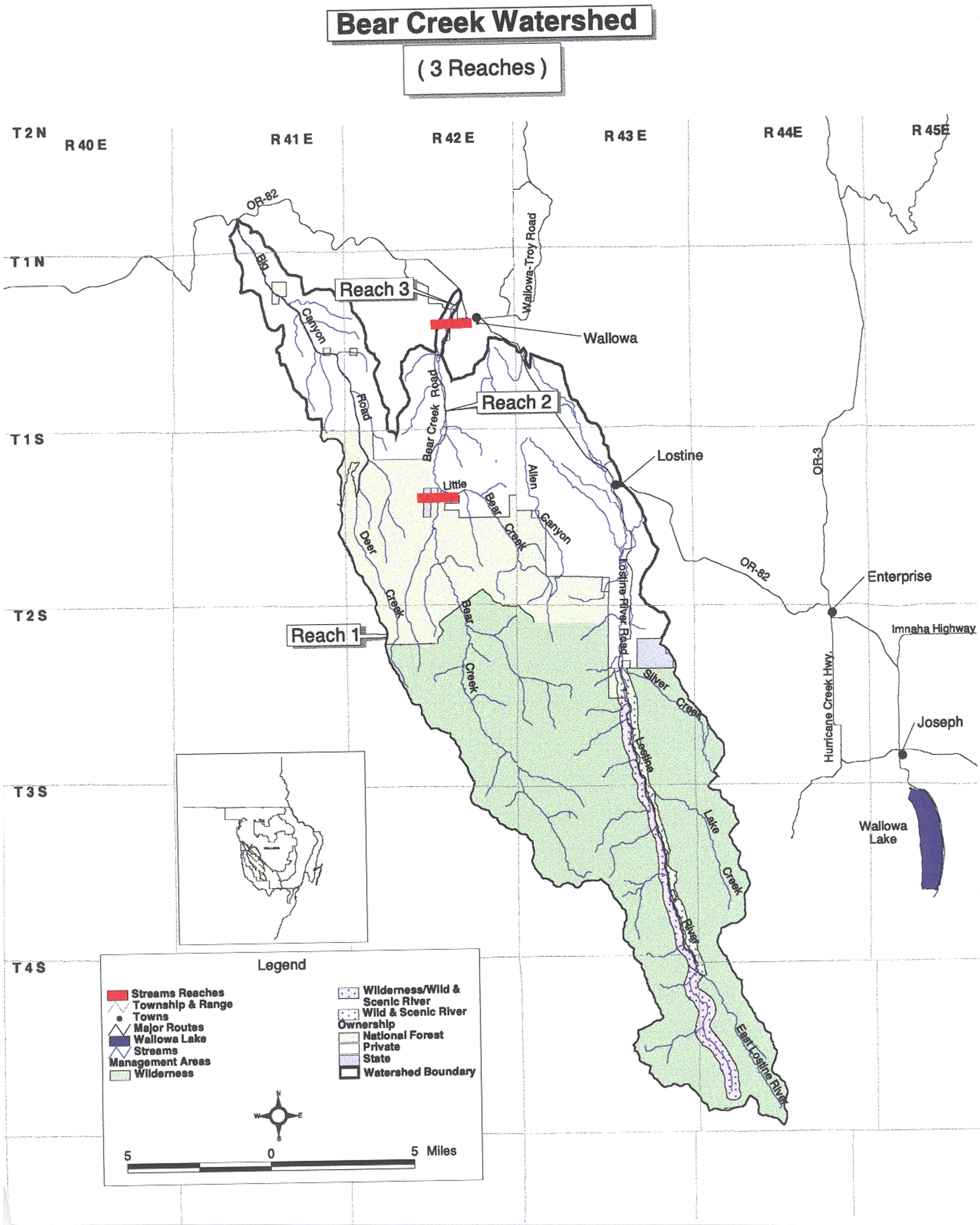
Preserve existing riparian vegetation and restore riparian vegetation where needed to preserve cooler water temperatures. Plant and/or protect woody vegetation in riparian areas to provide shade in summer and thermal cover in winter (allow for diversity and do not plant/favor conifers exclusively).
NOTE: Since the original plan was completed in 1993, numerous landowners have planted vegetation along the river to help improve shade.

Predation and Competition (Study).--*Predation and competition may adversely affect salmon in this reach.*

Trout should not be stocked that will prey on juvenile salmon or compete for food. Bull trout in this stretch prey on juvenile salmon, but since they are likely to be listed as threatened, no action is suggested. Provide alternate location for sport fishing.

Diversion Screening (Low Priority).—*All Irrigation diversions and return flows assessable to fish have been screened since the original plan was completed in 1993.*

Diversions and returns should be screened, monitored, and maintained.


Bear Creek Watershed
(3 Reaches)
T 2 N
R 40 E
R 41 E
R 42 E
R 43 E
R 44E
R 45E
T 1 N
T 1 S
T 2 S
T 3 S
T 4 S
OR-82
Big
Canyon
Road
Reach 3
Wallowa-Troy Road
Wallowa
Bear Creek Road
Reach 2
Lostine
Little
Bear
Creek
Allen
Canyon
Deer
Creek
OR-82
Enterprise
OR-3
Reach 1
Bear
Creek
Lostine River Road
Silver
Creek
Imnaha Highway
Hurricane Creek Hwy.
Joseph
Lostine
Lake
Creek
Wallowa
Lake
River
East Lostine River
Legend
Streams Reaches
Township & Range
Towns
Major Routes
Wallowa Lake
Streams
Management Areas
Wilderness
Wilderness/Wild & Scenic River
Wild & Scenic River
Ownership
National Forest
Private
State
Watershed Boundary
5
0
5
Miles

BEAR CREEK[7]

Bear Creek was analyzed in three reaches:

1. Headwaters to Little Bear Creek
2. Little Bear Creek to Chamberlain Ditch diversion
3. Chamberlain Ditch diversion to Wallowa River.

Bear Creek rises in the Eagle Cap Wilderness and flows 24 miles north to join the Wallowa River near the town of Wallowa. The uppermost reach (to Little Bear Creek) is primarily in the Eagle Cap Wilderness and a roadless area. Sheep grazed in the wilderness area in the past, but no grazing has been done in recent years. Recreational facilities along the uppermost reach include a USFS campground at the wilderness trailhead.

The reach from Little Bear Creek to Chamberlain Ditch, including Little Bear Creek, is partly within the National Forest and but is bordered primarily by a few large landowners. Private lands are grazed. Resource activities include logging and grazing.

The lower reach (from Chamberlain Ditch diversion downstream) is bordered by a number of smaller private ownerships. Streamflows are low or non-existent below the irrigation diversions during base flow periods. Resource activities include logging of the forested uplands, grazing, and irrigated agriculture.

Maximum recorded streamflow at the U.S. Geological Survey (USGS) gauging station on Bear Creek upstream from the irrigation diversions was 1,730 cfs on June 15, 1974. Minimum recorded discharge is 3 cfs for February 1, 1937.

Spring chinook spawn in Bear Creek from two miles above the guard station (in the wilderness) to the first bridge downstream where the Bear Creek road crosses Bear Creek, a distance of 8.5 miles. The run size has declined significantly since the mid-1960's when index surveys were standardized as to length, location, and time of year. Index areas were chosen because the majority of spawning occurs in the index reach. The index area is from the Guard Station to the first bridge downstream where the Bear Creek road crosses Bear Creek, a distance of 6.5 miles. The average redd count in the index area from 1964 to 1973 was 25.1 redds. The average redd count from 1979 to 1988 was 7.6 redds. The average redd count from 1989 to 1998 was 1.6 redds.

NOTE: Since the original plan was completed in 1993, a Bear Creek Action Plan was written and is being implemented.

[7]See also Watershed Management - Approaches to Implementing Solutions

Bear Creek--Headwaters To Little Bear Creek

Water Quantity
Tree Density (Medium Priority).--*Tree densities in portions of this drainage keep much of the precipitation (rain and snow) from reaching the ground, and this moisture is lost to the drainage.*

> A long term policy of fire depression is the primary cause of tree density. Prescribed burning of small portions in the wilderness can create areas with less fuel that would allow control of wildfires and prevent catastrophic consequences. Precommercial and commercial thinning should be used to reduce excess densities of non-wilderness areas.
> NOTE: Since the original plan was completed in 1993, a Wildland Fire Use Program has been completed for the Eagle Cap Wilderness. Several wildfires have been managed for resource benefits under this program.

Minimum Flow (High Priority).--*Although there are no flow problems in this reach, irrigation withdrawals in the lowest reach of the creek remove essentially all of the water during low flow times. The committee looked at ways to possibly supplement water on this reach to supply late summer flows for salmon in the lowest reach.*

> Study the possibility of adding impoundments at Getchell Meadows, Bear Lake, etc. to supply irrigation and keep the natural flow in stream during low flow times. It is suggested that the natural flow could provide water for the salmon that is not heated by being held in an impoundment at lower elevations. Above all diversions, in August of 1988, low water flow was not sufficient for fish passage.

Water Quality
Excess Fine Sediments (Low Priority).--*There is little human caused sedimentation on this reach because much of it is in the Eagle Cap Wilderness. There is a road which ends about 4 miles below the wilderness boundary which could be a source of sedimentation.*

> Road design and maintenance should be planned to avoid quick runoff and sediment entrainment.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure

> No problems were identified.

Substrate

> No problems were identified.

Habitat Requirements

Harassment (Study).--*Sport fishing and related recreational use may cause harassment of spawning salmon.*

If there is a problem, mitigation measures include not stocking trout, closing stream to sport fishing for non-salmon species, and/or seasonal sport fishery closures.

Bear Creek--Little Bear Creek to Chamberlain Ditch Diversion

Water Quantity

No problems were identified.

Water Quality

Weeds/Erosion (Study) –See Countywide Issues

Excess Fine Sediments (High Priority).--*Sediment is contributed to the river from roads, logging, and grazing.*

Road design and maintenance should be planned to avoid quick runoff and sediment entrainment. Limit dust from road that will settle into the creek with lignosulfonate, water, chip seal, or asphalt. If it is necessary to reduce sediment, the road or portions of the road could be relocated to a better site. If there is a sediment problem that could not be mitigated by road design, maintenance, or relocation, the road could be revegetated, use could be limited, or the road closed. Roads and ground skidding should be avoided when the soil is wet. Limiting use to times when roads are dry or frozen will minimize soil and vegetation disturbance. Skid trails should be water barred and revegetated. Manage recreational use of roads, trails, and campgrounds to reduce sediment input. Education of fishermen and campers about the effects of riparian erosion and compaction could reduce sediment input from their activities. Although an impoundment may help supplement minimum flows, it should not impound or divert necessary flushing flows.

Prevent bank erosion and degradation by livestock through physical or electric fencing, and use watering corridors or supply alternative water source. Avoid excessively high peak flows, and resultant bank erosion by keeping enough watershed vegetation to slow runoff. Wetlands and/or filter strips could be developed to filter runoff from roads and campgrounds.
NOTE: Since the original plan was completed in 1993 county road was rocked and culverts installed to reduce sediment in the creek. All the landowners in this reach have performed major erosion control measures on the roads on their property. Bear Creek and Little Bear Creek have been fenced to control livestock access. The pool ratio has improved on this reach.

Fuel Density (low Priority).--*Fuel densities have been controlled in this reach.*

Precommercial and commercial thinning has been used to reduce excess densities and fire hazard.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Other Chemicals (Low Priority).--*Oil was noticed in section of water on this reach during redd counts.*

Find source of oil if it still present and mitigate the problem.
NOTE: Since the original plan was completed in 1993, no oil has been noted on this reach.

Stream Structure
Pool/Riffle Ratio (High Priority).--*Loss of large woody debris and channelization have led to decreased diversity of stream habitat and loss of a good pool/riffle ratio.*

Add and/or preserve large woody debris. Provide good riparian vegetation, including trees for future large woody debris recruitment. Avoid additional channelization.
NOTE: Since the original plan was completed in 1993, logs and some root wads were installed along the streambanks in the low flow channel project to provide cover and shade for fish.

Habitat Requirements

No problems were identified.

Bear Creek--Chamberlain Ditch Diversion to Wallowa River

Water Quantity
Irrigation Withdrawal (High Priority).--*Natural flows are low during late summer (after mid-July) and the ditch takes essentially all of the flow. This creates a physical barrier to fish migration and a decrease in available habitat.*

Preserving (and possibly increasing through tree density management) upper watershed snowpack will help snowpack melt as late as possible. Limit irrigation diversions from one watershed to another. (There is an out-of-basin diversion in the upper reaches of Little Bear Creek, but apparently it is dry by late summer.) Leasing water from water right holders during low flow time (after second cutting) may be a viable way to supplement late summer flows. Irrigation efficiency may allow diverters to keep additional water instream. Impoundments (as discussed above) may be used to supply irrigation needs and keep the natural flow instream.
NOTE: Since the original plan was completed in 1993, all irrigation ditches are gauged with cooperation of irrigators.

Minimum Flow (High Priority).--*Low minimum flows in this reach during late summer result in the loss of salmon habitat.*

See discussion under "Irrigation Withdrawal" in this section. Vegetative cover in the drainage should be kept in a healthy condition to avoid quick runoff and promote recharge of aquifer. Good recharge of the aquifer will protect, and possibly, increase spring flows, which supply water during minimum flow times. Limiting compaction from roads, logging, grazing, campgrounds, and trails will also promote infiltration and recharge the aquifer.
NOTE: Since the original plan was completed in 1993, landowners began in 1997 to shut off all irrigation withdrawal for a 24-hour period to aid fish passage. It was determined by ODFW when this would be beneficial. A low flow channel project was completed in 1998 on this whole stretch that consists of numerous rock vortex weirs that concentrate the water to aid fish passage and provide pools for fish.

Water Quality

Excess Fine Sediments (High Priority).--*Excess fine sediment creates a variety of habitat problems; activities in this reach have the potential to add sediment to the river.*

See "Bear Creek--Little Bear Creek to Chamberlain Ditch Diversion."
NOTE: Since the original plan was completed in 1993, numerous landowners have constructed livestock exclusion fences along both sides of Bear Creek.

Septic (Study).--*Study effects of leakage from septic systems on water quality and salmon habitat.*

If leakage from septic systems causes water quality problems, there are several options to mitigate the effects. The county's comprehensive land use plan could be used to limit future development. Current septic systems could be improved (with technical assistance from the ODEQ). Municipality sewer treatment could be provided at the town of Wallowa.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Feedlots (High Priority).--*Nutrient runoff from feedlots can result in excess algal growth and excessive fine sediments. Feedlots (or other heavy livestock use) on the edge of streams result in devegetation of the riparian area and streambank erosion.*

Prevent bank erosion and degradation by livestock through physical or electric fencing of the riparian area. Use watering corridors or supply alternative sources of stock water. Provide wetlands and/or filter strips for feedlot runoff.

Other Chemicals (Low Priority).--*Farmland fertilizer runoff contributes nutrients that can result in excessive algal growth.*

Avoid farmland fertilizer runoff.

Stream Structure

Pool/Riffle Ratio (High Priority).--*Loss of large woody debris and channelization have led to decreased diversity of stream habitat and loss of a good pool/riffle ratio.*

> Add and/or preserve large woody debris. Provide good riparian vegetation, including trees, for future large woody debris recruitment. Avoid additional channelization.
> NOTE: Since the original plan was completed in 1993, logs and some root wads were installed along the streambanks in the low flow channel project to provide cover and shade for fish.

Channelization (Low Priority).--*Channelization limits diversity of stream structure and habitat.*

> Preserve riparian vegetation (and plant where necessary) to provide streambank stability and avoid the need for channelization. Avoid excess peak flows and bank erosion that result from excessive upland devegetation. Avoid channelization and building structures on the floodplain.

Substrate

Physical Barriers (Study).--*Lack of water below irrigation diversions creates a physical barrier to fish passage.*

> Water could be leased from water-right holders during low flow times to supplement flow. Irrigation efficiency could allow more water to be left in the creek. The diversion barrier could be modified to better provide passage. Study the feasibility of using well water supplementation to improve instream flows. See minimum flow – low flow channel

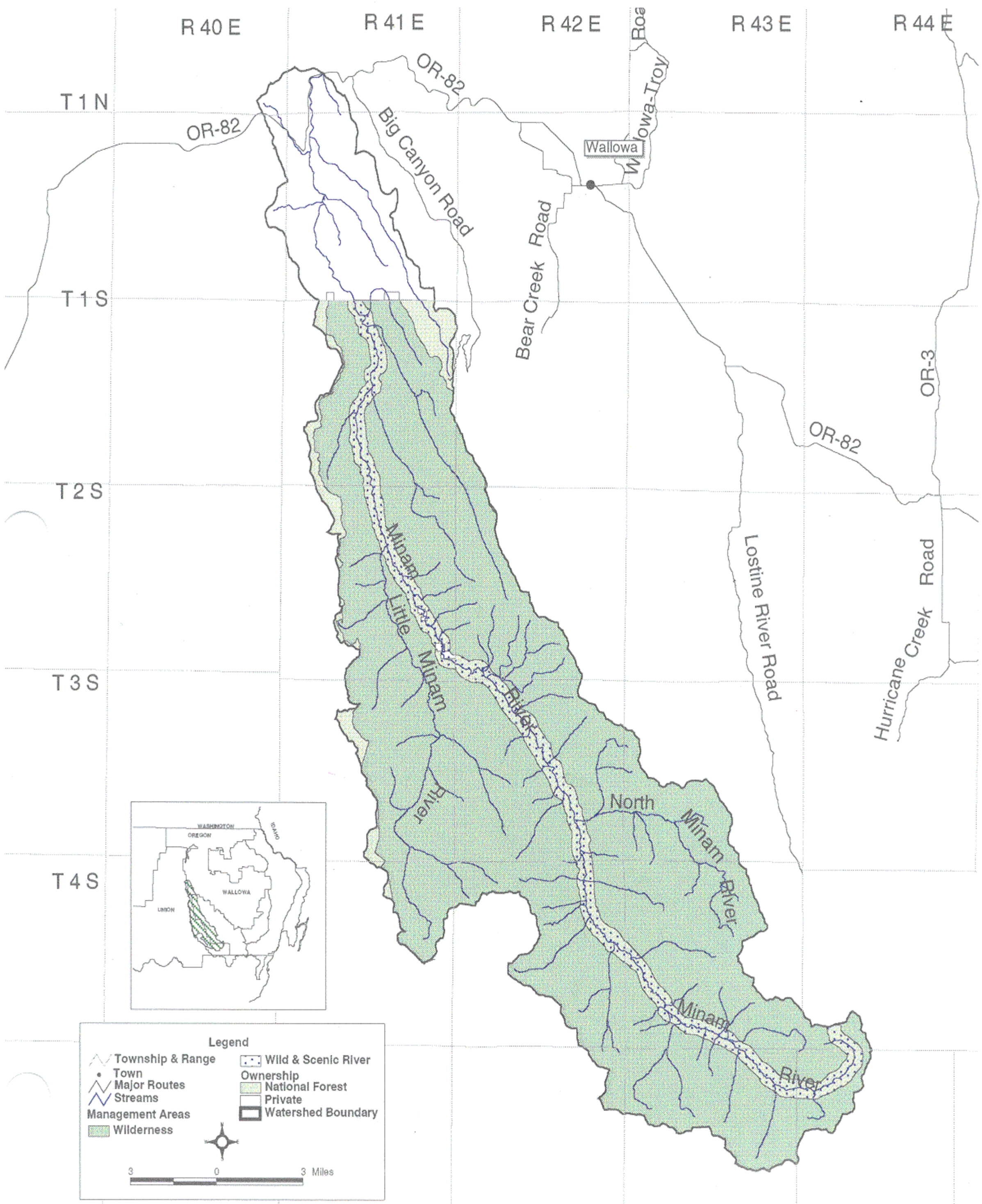
Habitat Requirements

Diversion Screening (Low).—*All irrigation diversions and return flows have been screened Since the original plan was completed in 1993.*

> Diversions and returns should be screened, monitored, and maintained.

Minam Watershed

(1 Reach)



MINAM RIVER[8]

The Minam River was analyzed in one reach since most of its length is within the Eagle Cap Wilderness; some private lands are adjacent to the stream near the mouth of the Minam River. The Minam River rises in the Eagle Cap Wilderness and flows about 42 miles to join the Wallowa River near the town of Minam. It crosses the border between Union and Wallowa Counties several times.

For the most part, the Minam is not currently impacted by resource use. Historically, splash dams were used for a couple of years in the 1920's. Recreational uses of the Minam drainage include a recreational trail, which crosses the river several times, Minam Lodge, Red's Horse Ranch, and airplane landing strips on private ground in the middle of the wilderness.

The maximum streamflow measured at the USGS gauging station was 6,260 cfs on June 16, 1974. Minimum discharge was measured at 10 cfs on December 6, 1972, during a freeze. Extensive water quality sampling has been made at the gauging site.

Redds are counted in three separate index areas totaling 15 miles on the Little Minam River, the Lower Minam River, and the upper Minam River. A total of 176 spring/summer chinook redds were counted on the Minam in 1964, but only 19 were counted in 1992.

Although fall chinook have been observed spawning in the Minam River, the numbers have been low. The most recent observation was in 1988.

Water Quantity

Tree Density (Medium Priority).--*Dense thickets of trees resulting from past fire suppression prevent much of the rain and snow from reaching the ground, and consequently the moisture is lost to the drainage through evaporation or sublimation.*

> Tree density is increasing due to Douglas-fir bark beetle and fir engraver beetle along with the eastside screen prohibiting the removal of trees greater then 21 inches in diameter on national forest land. Maintenance of healthy watershed conditions, by reducing fuel loads as mentioned below under fuel density, will provide an optimal, sustainable supply of water. Healthy watershed and forest conditions will also supply the water at the optimal times for salmon through snowpack melt and groundwater recharge and release.
> NOTE: Since the original plan was completed in 1993, a Wildland Fire Use Program has been completed for the Eagle Cap Wilderness. Several wildfires have been managed for resource benefits under this program. Also, prescribed fire has been introduced into the area to control fuel densities.

[8]See also Watershed Management - Approaches to Implementing Solutions

Water Quality

Temperature (Low Priority).--*High temperatures (above 70^{O}F) have been recorded at the USGS stream gauging/water quality site near the Minam's confluence with the Wallowa. Stream width, shallow water, and lack of shade contribute to the problem.*

Provide riparian shading by preserving and/or planting riparian vegetation to preserve cool water temperatures. Redevelop width depth ratios that fit this channel type.

Excess Fine Sediments (High Priority).--*Logging roads and recreational use of these roads on the lowest reaches of the Minam contribute sediment to the river.*

Work on road design and maintenance to avoid quick runoff that entrains sediment. Limit dust on roads with lignosulfonate, water, chip seal or asphalt. Relocate roads to better sites if necessary to limit sediment.

Do not use roads or ground skidding when wet. Use of roads and skid trails when dry or frozen minimizes soil disturbance, vegetation disturbance, and compaction of clay rich soils. Skid trails should be water barred and/or revegetated. Recreational use of roads, trails, and campgrounds should be managed to avoid sediment input. Prevent bank erosion and degradation by livestock through physical or electric fencing of the riparian area. Use watering corridors or alternative water source to supply stock water. Avoid excess peak flows by keeping enough watershed vegetation to slow runoff and promote groundwater recharge.

Fuel Density (Low Priority).--*Excessive fuel density in this watershed is presently a high risk for a catastrophic fire, such as the Tanner Gulch Fire, that would probably result in severe water quality problems. Past fire suppression practices have contributed to the risk of fire.*

Prescribed burning in the wilderness, done judiciously, can help reduce the fuel levels and provide fire breaks to prevent large uncontrollable fires. In some cases, especially in riparian areas, fuel rearrangement (piling or putting the fuels near the ground to facilitate rotting, judiciously placing fuels to protect streambank, or placing large woody debris in stream to add to stream structure) may be preferable to burning in order to keep the organic material as part of the ecosystem, preserve shade, and prevent sedimentation. Well managed grazing also helps to reduce light "flash" fuels.
NOTE: Since the original plan was completed in 1993, a Wildland Fire Use Program has been completed for the Eagle Cap Wilderness. Several wildfires have been managed for resource benefits under this program. Also, prescribed fire has been introduced into the area to control fuel densities.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure

Ice Flows (Low Priority).--*Ice flows occur during many winters. Ice flows scour the streambed and destroy stream structure.*

Preserve riparian conifers to provide thermal cover and preserve larger trees on the bank which may break up or slow ice flows. Look into dynamiting smaller ice flows before they get bad.

Substrate

Physical Barriers (Low Priority).--*Large log jams can provide a physical barrier to fish.*

Fish can get through many log jams, but jams should be monitored and if they are actually providing a barrier, enough material should be removed to provide passage.

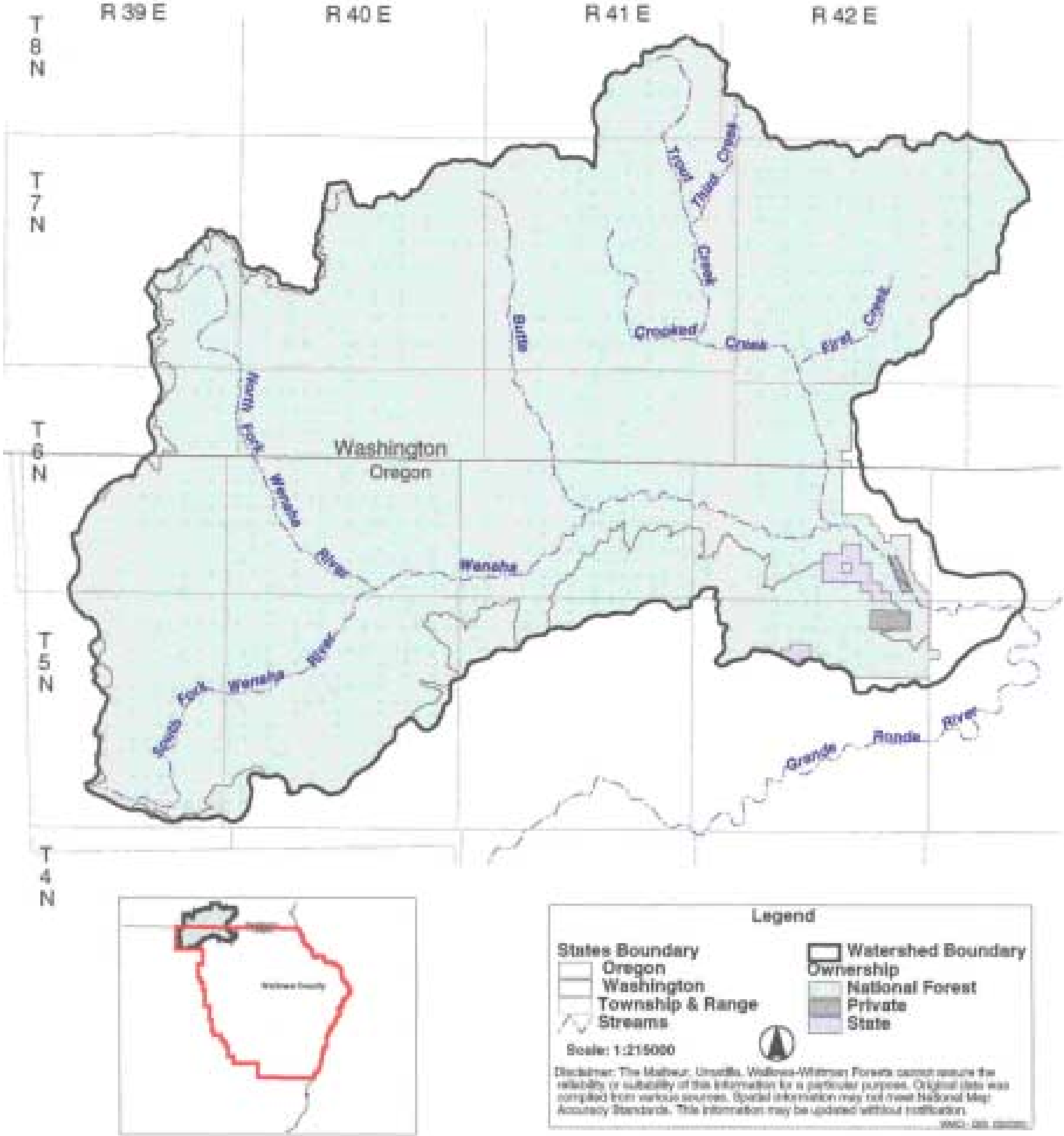
Dredging/Mining (Low Priority).--*Spawning gravel is limited on most of the Minam because of steep gradients. Some gravel has been removed from the spawning area to gravel one of the air strips.*

Stop the removal of needed spawning gravel. Allow permitted gravel removal (and gold panning) from July 1 to August 15 when there are no anadromous fish spawning or eggs in the gravel.

Habitat Requirements

No problems or enhancement measures were identified.

Wenaha River
(1 Reach)



WENAHA RIVER[9]

The Wenaha River was analyzed in one reach since it is located primarily within the Wenaha-Tucannon Wilderness. The Wenaha River, located in the extreme northwest corner of Wallowa County, rises in the Wenaha-Tucannon Wilderness and flows about 22 miles to join the Grande Ronde near the town of Troy.

The Wenaha River (together with the Imnaha and Lostine Rivers) historically had the largest runs of spring chinook in Wallowa County. Spring chinook spawn from three miles above Milk Creek (a South Fork Wenaha tributary) downstream to Crooked Creek, a distance of 18.6 miles, in Milk Creek upstream one-third mile above the mouth, and in Butte Creek upstream approximately 1.5 miles (ending in Washington State). The run size has declined significantly since the mid-1960's when index surveys were standardized as to length, location, and time of year. Index areas were chosen because the majority of spawning occurs in the index reach. The index area is in the South Fork from Milk Creek downstream to the forks, a distance of 5.5 miles. The average redd count in the index area from 1964 to 1973 was 181.0 redds. The average redd count from 1979 to 1988 was 37.5 redds. The average redd count from 1989 to 1998 was 26.4 redds.

Grande Ronde and Snake River stocks of fall chinook may use or have used the lower portions of the Wenaha for spawning; however, documentation is limited.

Water Quantity
Tree Density (Medium Priority).--*Dense thickets of trees resulting from past fire suppression prevent much of the rain and snow from reaching the ground, and consequently the moisture is lost to the drainage through evaporation or sublimation.*

> A long term policy of fire depression is the primary cause of tree density. Maintenance of healthy watershed conditions, by reducing fuel loads as mentioned below under fuel density, will provide an optimal, sustainable supply of water. Healthy watershed and forest conditions will also supply the water at the optimal times for salmon through snowpack melt and groundwater recharge and release.

Water Quality
Excess Fine Sediments (High Priority).--*Catastrophic fire would probably put high sediment loads into the river. At the present time this is not a problem.*

> Avoid excess peak flows and related bank erosion by keeping enough watershed vegetation to slow runoff and promote groundwater recharge. (See "Fuel Density" in this section).

Fuel Density (High Priority).--*Excessive fuel density in this watershed is presently a high risk for a catastrophic fire, such as the Tanner Gulch Fire, that would probably result in*

[9]See also Watershed Management - Approaches to Implementing Solutions

severe water quality problems. Past fire suppression practices have contributed to the risk of fire.

Prescribed burning in the wilderness, done judiciously, can help reduce the fuel levels and provide fire breaks to prevent large uncontrollable fires. In some cases, especially in riparian areas, fuel rearrangement (piling or putting the fuels near the ground to facilitate rotting, judiciously placing fuels to protect streambank, or placing large woody debris in stream to add to stream structure) may be preferable to burning in order to keep the organic material as part of the ecosystem, preserve shade, and prevent sedimentation. Well managed grazing also helps to reduce light "flash" fuels.

Stream Structure

Ice Flows (Low Priority).--*Ice flows occur during many winters. Ice flows can scour the streambed and destroy stream structure.*

Preserve riparian conifers to provide thermal cover, and preserve larger trees on the bank which may break up or slow ice flows. Look into dynamiting smaller ice jams before they result in habitat destruction.

Substrate

Physical Barriers (Low Priority).--*Large log jams can provide a physical barrier to fish.*

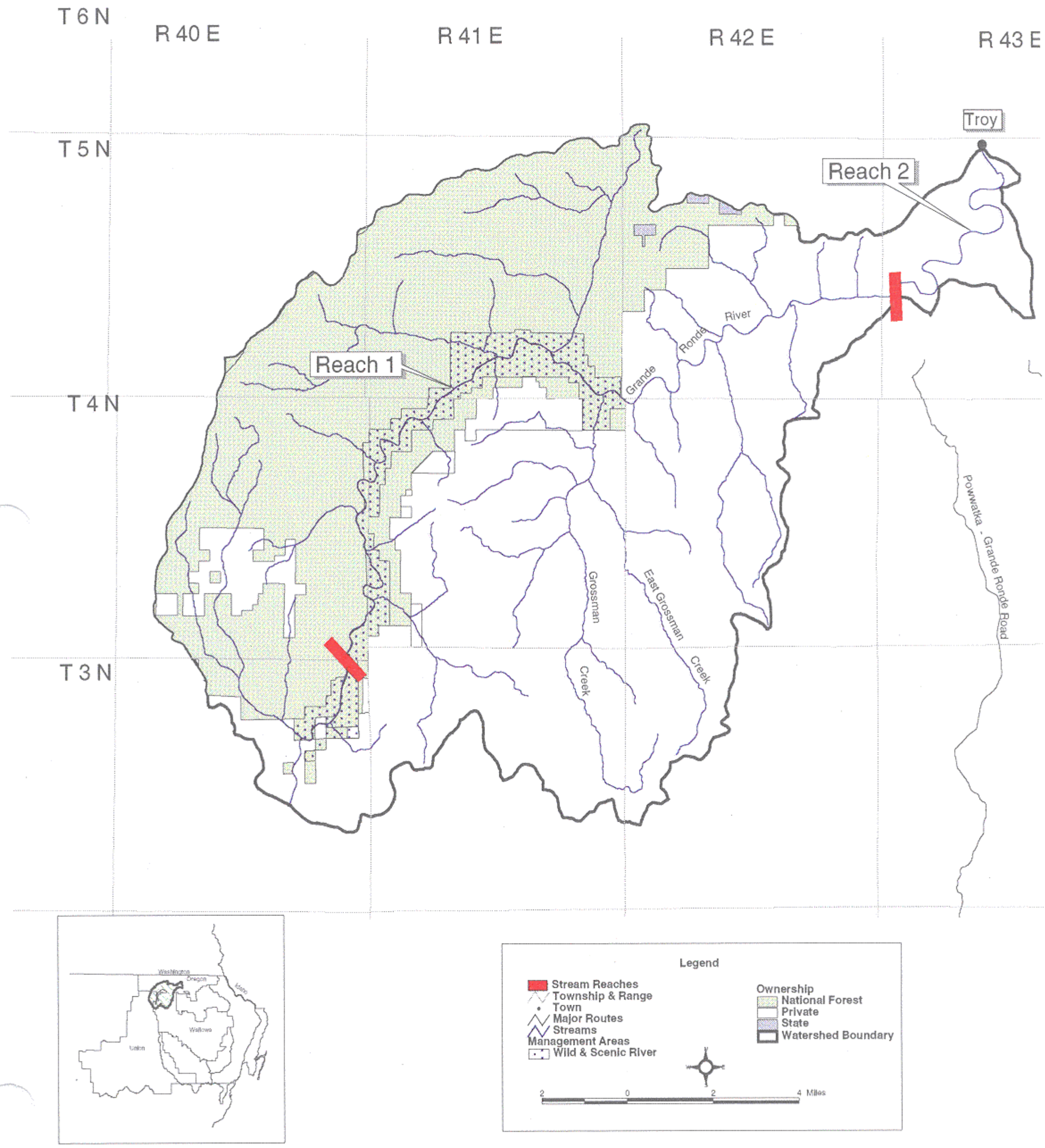
Fish can get through many log jams, but jams should be monitored and if they are actually providing a barrier, enough material should be removed to provide passage.

Habitat Requirements

No problems were identified.

Grande Ronde Watershed

(2 Reaches)



GRANDE RONDE RIVER[10]

The Grande Ronde River was analyzed in two reaches:

1. Rondowa to Wildcat Creek
2. Wildcat Creek to State line

The Grande Ronde River rises to the west and south of Wallowa County and enters the northwest part of the County at Rondowa near the confluence of the Wallowa River (Grande Ronde River rivermile 81.4). The river flows about 43 miles northeast to exit the northern boundary of the County. After exiting the County and entering Washington State, the river flows easterly to join the Snake River.

The Grande Ronde River from the Wallowa River confluence to the Snake River is classed under the National Wild and Scenic Rivers system as wild, scenic, or recreation and classed as a scenic river under the Oregon State system. Resource use of the watershed includes grazing, logging, and recreation; a small amount of irrigated agriculture is located along the reach from Wildcat Creek to the State line.

Water quality and flow problems in the Wallowa County reach of the Grande Ronde River are the result of upstream watershed use. There are two USGS stream gauging stations. The gauging station at Rondowa (500 feet downstream from the confluence with the Wallowa River and active since 1926) recorded a maximum flow of 24,700 cfs on January 30, 1965; a minimum flow of 179 cfs was recorded on August 24, 1977. The gauging station at Troy recorded a maximum flow of 42,200 cfs on December 23, 1964, and a minimum flow of 344 cfs on August 19-21 and 23, 1977.

There are no records of spring chinook spawning in the Wallowa County portion of the Grande Ronde River mainstem. Fall Chinook enter the Grande Ronde in late October and November and spawn in November and December. Spawning ground surveys have been conducted since 1986 from the mouth of the Wenaha River downstream to the confluence with the Snake River. Fall chinook redd counts have increased from 0 in 1986 to 49 in 1993, 55 in 1997, and 24 in 1998.

Grande Ronde River--Rondowa to Wildcat Creek

Water Quantity

No problems were identified.

Water Quality

Temperature (High Priority).--*Lack of riparian vegetation and shade, as well as low flow levels, contribute to rises in water temperature. Temperature problems will need to be addressed upstream (in the Grande Ronde Valley in Union County) and in the local tributaries.*

[10]See also Watershed Management - Approaches to Implementing Solutions

Provide riparian shading by planting new shrubs and trees, as well as protecting existing shade. Protect (and possibly increase) flow from springs by enhancing groundwater recharge (limit surface runoff from roads, etc). The temperature of springs is generally ground temperature (around 45-50^{0}F). Plant and/or protect conifers in riparian area to provide thermal cover in winter, although allow for biodiversity with deciduous vegetation. Limit amounts of warm irrigation return flows.

Excess Fine Sediments (High Priority).--*There is excess fine sediment in this reach, which creates water quality and other problems for the salmon. Excess fine sediment can smother eggs of fall chinook.*

Work on road design and maintenance to avoid quick surface runoff. Limit dust from roads with lignosulfonate, water, chip seal, or asphalt. Relocate roads to better sites if sediment input to river cannot be mitigated by road maintenance. Avoid using roads or ground skidding when the soil is wet. Use of roads when dry or frozen avoids soil and vegetation disturbance. Water bar and/or revegetate skid trails. Educate fishermen and campers about effects of riparian erosion and compaction. Limit recreational use of roads and trails which results in sediment input to river. Prevent bank erosion and destruction by livestock by fencing riparian area and providing water corridors or alternate water sources. Protect water corridors with rock of appropriate size. Avoid devegetation in the upper watershed to the extent that it would result in extreme peak flows and cause bank erosion.

Excess nutrient loading (Study).--*Excess nutrient loading can result in excessive algal growth and related water quality problems.*

If there is a problem with nutrient loading, it needs to be addressed at upstream sources.

Stream Structure

Ice Flows (Low Priority).--*Ice flows occur during many winters. Ice flows scour the streambed and destroy stream structure.*

Substrate

Excess Fine Sediment (High Priority).--*Excess fine sediment in the substrate smothers eggs and fills intergravel hiding places (cover) for juvenile fish.*

See "Water Quality" in this reach.

Physical Barriers: --

NOTE: Since the original plan was completed in 1993, a bottomless arched culvert has been placed at the mouth of Grouse Creek to facilitate fish passage.

Habitat Requirements

No problems were identified.

Grande Ronde River--Wildcat Creek to State Line

Water Quantity

Compaction (Low Priority).--*Soils on this reach generally have higher clay content, and are more compactable than younger soils formed on more silicic bedrock (such as that in the high Wallowas). Soil compaction results in greater surface runoff and less groundwater recharge.*

> Work on road design and maintenance to avoid quick runoff and let precipitation and snowmelt recharge aquifer. Limit compaction from roads, campgrounds, and trails (human and livestock). Site various uses on less compactable soils to promote infiltration and recharge aquifer.

Flushing Flows (Low Priority).--*Flushing flows (high peak flows or freshets) are needed to wash fine sediments from the gravel and to trigger the migration instinct in juvenile salmon.*

> Do not impound or divert needed flushing flow. In some cases it may be possible to release impounded water for flushing flow. Limiting tree density and vegetative cover can increase peak flows, but this should be balanced against bank erosion caused by excess peak flow (and done within the framework of a productive, healthy watershed ecosystem).

Water Quality

Temperature (High Priority).--*Lack of riparian vegetation and shade, as well as low flow levels, contribute to rises in water temperature. Temperature problems will need to be addressed upstream (in the Grande Ronde Valley) and in the local tributaries.*

> See "Grande Ronde--Rondowa to Wildcat Creek."

Excess Fine Sediment (High Priority).--*There is excess fine sediment in this reach, which creates water quality and other problems for the salmon. Excess fine sediment smothers eggs of fall chinook.*

> See "Grande Ronde--Rondowa to Wildcat Creek."

Weeds/Erosion (Low) – See Countywide Issues.

Septic (Study).--*Study effects of leakage from septic systems on water quality and salmon habitat.*

> If there is a problem with septic systems, limit future development using the county's comprehensive land use plan, and improve current septic system (the ODEQ has information on improving septic systems).

Feedlots (Low Priority).--*Nutrient runoff, sedimentation, and riparian devegetation from* *feedlots are detrimental to water quality.*

Prevent bank erosion and degradation by livestock through physical or electric fencing of the riparian area. Use watering corridors or supply alternative water source for livestock. Wetlands and/or filter strips should be provided for feedlot runoff. Monitor elk and herd away from "feedlots" if they are a problem.

Herbicides/Pesticides (Low Priority).—See Countywide Issues

Excess Nutrient Loading (Study).--*Excess nutrient loading can result in excessive algal growth and related water quality problems.*

If there is a problem with nutrient loading it needs to be addressed at upstream sources.

Stream Structure

Woody Debris (High Priority).--*This reach is lacking large woody debris to provide diversity of stream structure.*

Add and preserve large woody debris. Establish a good riparian plant community to provide a source of future large woody debris.

Bank Form (Low Priority).--*Deterioration of the streambank results in excess sedimentation.*

Prevent bank erosion and destruction by livestock by physical or electric fencing of watering corridors or supply alternative water sources for livestock. Avoid excessively high peak flows and resultant bank erosion by keeping enough watershed vegetation to slow runoff and allow infiltration to groundwater. Provide large trees and other vegetation on the banks whose root systems provide stability.

Ice Flows (Low Priority).--*Ice flows occur during many winters. Ice flows scour the streambed and destroy stream structure.*

See "Grande Ronde--Rondowa to Wildcat Creek."

Substrate

Excess Fines (High Priority).--*Excess fine sediment in the substrate smothers eggs and fills intergravel hiding places (cover) for juvenile fish.*

See "Grande Ronde--Rondowa to Wildcat Creek."

Habitat Requirements

Riparian Vegetation (Low Priority).--*Riparian vegetation is lacking on this reach.*

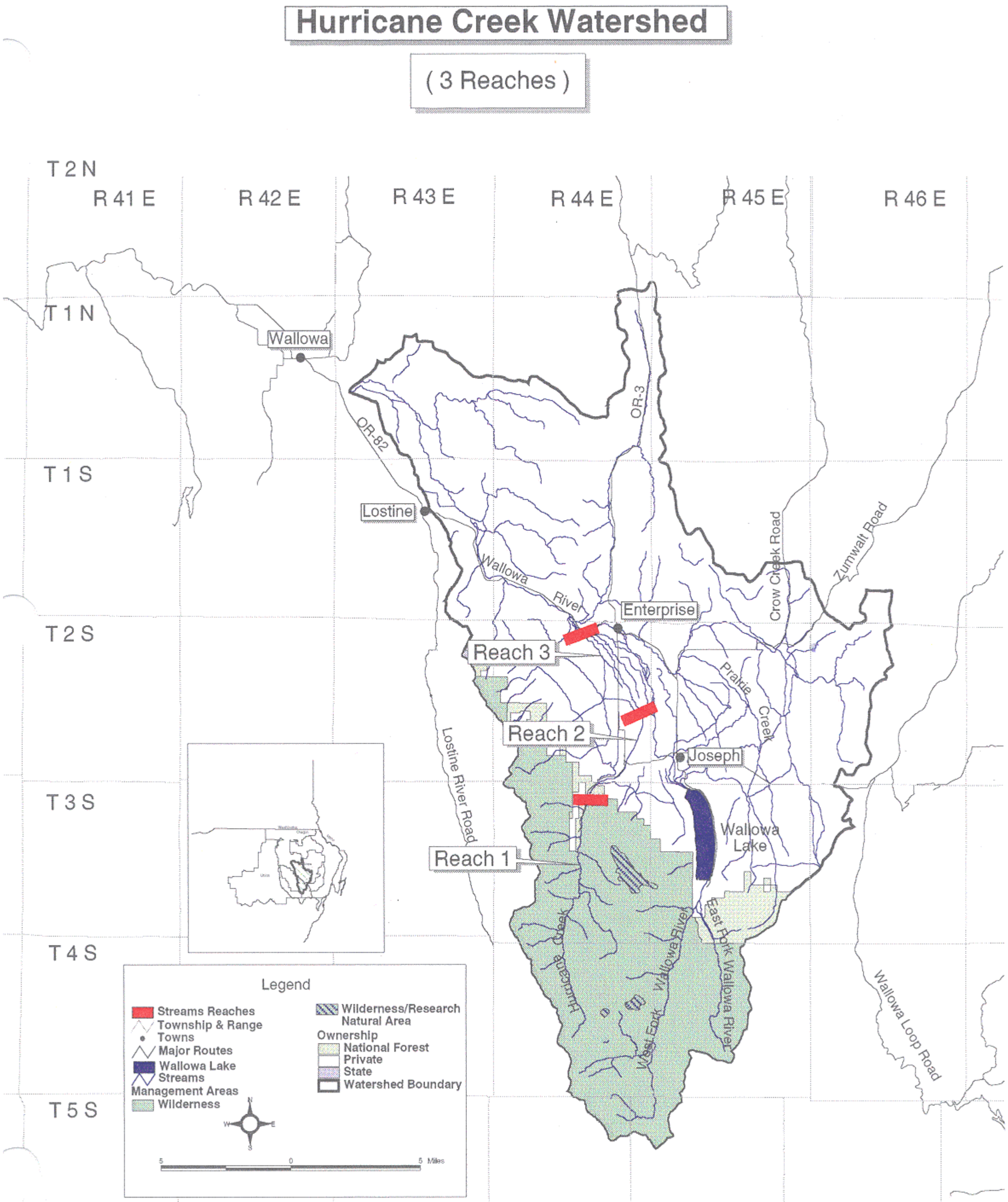
Plant/protect conifers in riparian area to keep thermal cover in winter and deciduous trees and shrubs to provide habitat diversity. Preserve and restore riparian vegetation.

<u>Harassment (Low Priority)</u>.--*Recreational use of this reach results in harassment of spawning fall chinook.*

Relocate campgrounds away from spawning areas (improve campground design). Limit recreational use of roads, trails, and campgrounds in spawning season. Seasonal sport fishery closures may reduce harassment potential. Educate recreational users about salmon harassment.

<u>Diversion Screens (Study)</u>.--*Irrigation diversions and return flows should be screened to prevent the loss of fish.*

Make sure diversions and irrigation returns are screened, monitored, and maintained.



Hurricane Creek Watershed
(3 Reaches)
T 2 N
R 41 E
R 42 E
R 43 E
R 44 E
R 45 E
R 46 E
T 1 N
T 1 S
T 2 S
T 3 S
T 4 S
T 5 S
Wallowa
OR-82
OR-3
Lostine
Wallowa River
Enterprise
Crow Creek Road
Zumwalt Road
Reach 3
Reach 2
Reach 1
Prairie Creek
Joseph
Lostine River Road
Wallowa Lake
Hurricane Creek
West Fork Wallowa River
East Fork Wallowa River
Wallowa Loop Road
Legend
Streams Reaches
Township & Range
Towns
Major Routes
Wallowa Lake
Streams
Management Areas
Wilderness
Wilderness/Research Natural Area
Ownership
National Forest
Private
State
Watershed Boundary

HURRICANE CREEK[11]

Hurricane Creek was analyzed in three reaches:

1. Headwaters to upper diversions (Moonshine and Alder Slope Ditches)
2. Upper diversions to third bridge
3. Third bridge to Wallowa River

Hurricane Creek rises in the Eagle Cap Wilderness and flows north to join the Wallowa River near Enterprise. The USGS operated a gauging station above the diversions on Hurricane Creek from 1924 until the late 1970's. The maximum measured flow was 1,110 cfs on June 4, 1948. A much greater flow occurred July 5, 1975 when the gauge height reached 6.02 feet as opposed to 3.55 feet on June 4, 1948, but the amount of flow is not known. A minimum flow of 6 cfs was measured on January 6 and April 13, 1945.

The main resource use on the uppermost reach of Hurricane Creek is recreational camping, fishing, and hiking. Some logging is done in the lower portion of the uppermost reach and the upper portion of the middle reach. Irrigated agriculture and grazing is common on lands adjacent to the middle and lower reaches.

Spring chinook presently spawn in Hurricane Creek from the old gravel pit downstream to the confluence with the Wallowa River, a distance of 3.2 miles. Flows above the gravel pit are presently insufficient to provide passage for adult chinook although historically they would have migrated approximately an additional 4 miles upstream to the cascades, just inside the National Forest boundary. The run size has declined significantly since the mid-1960’s when index surveys were standardized as to length, location, and time of year. Index areas were chosen because the majority of spawning occurs in the index reach. The index area is from the gravel pit downstream to the confluence with the Wallowa River, a distance of 3.2 miles. The average redd count in the index area from 1964 to 1973 was 14.6 redds. The average redd count from 1979 to 1988 was 6.8 redds. The average redd count from 1989 to 1998 was 3.2 redds.

Hurricane Creek--Headwaters to Upper Diversions

Water Quantity

Tree Density (Medium Priority).--*Dense thickets of trees, resulting in part from past fire suppression, prevent rain and snow from reaching the ground, and consequently the moisture is lost to the drainage through evaporation or sublimation.*

> Tree density is increasing due to Douglas-fir bark beetle and fir engraver beetle along with the eastside screen prohibiting the removal of trees greater then 21 inches in diameter on national forest land.
>
> Maintenance of healthy watershed conditions, by reducing fuel loads as

[11] See also Watershed Management - Approaches to Implementing Solutions

mentioned below under fuel density, will provide an optimal, sustainable supply of water. Healthy watershed and forest conditions will also supply the water at the optimal times for salmon through snowpack melt and groundwater recharge and release.

Compaction (Low Priority).--*Soil compaction can result in greater surface runoff and less infiltration and groundwater recharge.*

Work on road design and maintenance to avoid quick runoff and let precipitation and snowmelt recharge aquifer. Study relocating road, or portions of road, to a better site out of riparian area. Limit human trail use in riparian area when it results in compaction and devegetation. Educate fishermen and campers about adverse effects of riparian erosion and compaction.

Water Quality

Excess Fine Sediments (Low Priority).--*Excess fine sediment in the lowest portion of this reach creates some water quality problems.*

Work on road design and maintenance to avoid quick surface runoff.

Fuel Density (Medium Priority).--*Excessive fuel density in this watershed is presently a high risk for a catastrophic fire, such as the Tanner Gulch Fire, that would probably result in severe water quality problems. Past fire suppression practices have contributed to the risk of fire.*

Prescribed burning in the wilderness, done judiciously, can help reduce the fuel levels, and provide fire breaks to prevent large uncontrollable fires. In some cases, especially in riparian areas, fuel rearrangement (piling or putting the fuels near the ground to facilitate rotting, judiciously placing fuels to protect streambank, or placing large woody debris in stream to add to stream structure) may be preferable to burning in order to keep the organic material as part of the ecosystem, preserve shade, and prevent sedimentation. Well managed grazing also helps to reduce light "flash" fuels.
Since the original plan was completed in 1993, a Wildland Fire Use Program has been completed for the Eagle Cap Wilderness. Several wildfires have been managed for resource benefits under this program.

Septic (Study).--*Study effects of leakage from septic systems on water quality and salmon habitat.*

If there is a problem with septic systems, limit future development using the county's comprehensive land use plan, and improve current septic system (the ODEQ has information on improving septic systems).

Herbicides/Pesticides (Low Priority).—See Countywide Issues

Stream Structure

No problems were identified.

Substrate

Excess Fine Sediment (Low Priority).--*Excess fine sediment in the substrate from the upstream landslides appears to be a problem in this reach.*

Habitat Requirements

No problems were identified.

Hurricane Creek--Upper Diversions to Third Bridge

Water Quantity

Irrigation Withdrawals (High Priority).--*Most of this reach is dry during irrigation season (after the runoff from the snowpack melt).*

Irrigation efficiency may allow water to be left in the stream (it should be noted that some amounts of conserved water might sink in the river bed and not necessarily flow on the surface). Lease water from water-right holders during critical periods to supplement minimum (no) flow. Study the possibility of adding impoundments to supply irrigation and keep the natural flow in stream.

Minimum Flow (High Priority).--*As noted above, most of this reach is dry during irrigation season.*

See "Irrigation Withdrawals" above. Preserve vegetative cover to provide snowpack shading, later snowmelt, infiltration, and groundwater recharge. In extremely dense tree cover, thinning can allow more precipitation to reach the ground and provide additional rain/snowpack moisture to the drainage.

Future Demand (Study).--*Future development in this area may place increased demands on water.*

Use zoning and land use planning to limit possible future demands for water which would adversely impact the salmon.

Water Quality

Temperature (Study).--*Study to see if there are temperature problems on this reach.*

Use zoning/land use planning to limit possible future demand for agricultural or domestic uses along the stream, which could result in the loss of riparian vegetation. Provide riparian shading to preserve cool temperatures.

Plant and/or protect conifers, along with deciduous trees and shrubs, in riparian area to provide thermal cover in winter. Increased flow quantities could limit temperature increases.

Excess Fine Sediments (High Priority).--*Excess fine sediment in this reach creates water quality and other problems for the salmon.*

Work on road design and maintenance to avoid quick surface runoff. Limit dust from roads with lignosulfonate, water, chip seal, or asphalt. Relocate roads to better sites if sediment input to river cannot be mitigated by road maintenance. Avoid using roads or ground skidding when the soil is wet. Use of roads when dry or frozen avoids soil and vegetation disturbance. Water bar and/or revegetate skid trails. Educate fishermen and campers about effects of riparian erosion and compaction. Limit recreational use of roads and trails which results in sediment input to river. Prevent bank erosion and destruction by livestock by fencing riparian area and providing water corridors or alternate water sources. Protect water corridors with rock of appropriate size. Avoid devegetation in the upper watershed to the extent that it would result in extreme peak flows and cause bank erosion. Provide filter strips, settling ponds, and or wetlands for feedlot and pasture runoff.

Septic (Study).--*There is a subdivision sited along this reach; leakage from the septic systems may contribute nitrates (excess nutrients) to the stream.*

If a problem is found, install pump or self-composting toilets. Limit future development and associated septic systems with the County comprehensive land use plan. Improve the current septic systems (the ODEQ has information available on system design).

Herbicides/Pesticides (High Priority).—See Countywide Issues

Other Chemicals (Low Priority).--*The Joseph airport is near this reach of Hurricane Creek, and aviation fuels are stored there. There are fertilizers used on fields near this reach.*

Monitor storage of the aviation fuels to prevent discharge of hazardous material to the stream. Avoid farmland fertilizer runoff to prevent a problem with excess nutrient loading in the creek.
NOTE: Since the original plan was completed in 1993, the Joseph airport has been improved, and fuels are not stored there at this time. In the future, containment of possible fuel storage will meet DEQ/EPA standards.

Stream Structure

Woody Debris (High Priority).--*This reach is lacking large woody debris to provide diversity of stream structure.*

Add and preserve large woody debris. Preserve the riparian plant community to provide a source of future large woody debris.

Channelization (Low Priority).--*Channelization limits diversity of stream structure and habitat.*

Preserve riparian vegetation (and plant where necessary) to provide streambank stability and avoid the need for channelization. Avoid excess peak flows and bank erosion that result from excessive upland devegetation. Fence riparian area to prevent bank erosion and devegetation by livestock. Do not permit more channelization, but if channelization is necessary, develop mitigation strategies. Avoid building structures on floodplain that eventually require channelization for protection.

Substrate

Excess Fine Sediment (High Priority).--*Excess fine sediment in this reach smothers eggs and fills intergravel hiding places.*

See "Water Quality" discussion. Provide filter strips, settling ponds, and/or wetlands for feedlot and pasture runoff.
NOTE: Since the original plan was completed in 1993, some landowners in this stretch have completed streambank stabilization work to prevent bank erosion and reduce sediment.

Physical Barriers (High Priority).--*Lack of water below irrigation diversions creates a physical barrier to fish passage.*

Water could be leased from water-right holders during low flow times to supplement flow. Irrigation efficiency could allow more water to be left in the creek. The diversion barrier could be modified to better provide passage.

Dredging (Low Priority).--*Gravel is removed from this reach for concrete mix.*

Gravel dredging operations should be limited to the times when there are not likely to be anadromous fish spawning (July 1 - August 15) or eggs in the gravel.

Habitat Requirements

Riparian Vegetation (High Priority).--*Riparian vegetation is lacking on portions of this reach.*

Plant and/or protect conifers in riparian area to keep thermal cover in winter and deciduous trees and shrubs to provide habitat diversity. Work on preserving and restoring overall riparian vegetation to provide shade.

Predators and Competitors (Low Priority).--*Predators prey on juvenile salmon, and other fish may compete for food.*

Trout that would compete with salmon for food should not be stocked. Bull trout, which are listed as threatened under ESA, are present in this reach, so no action is warranted at this time. There is a great blue heron rookery nearby, which results in predation of juvenile fish.

Diversion Screens (Study).--*Irrigation diversions and return flows should be screened to prevent the loss of fish.*

Make sure diversions and irrigation returns are screened, monitored, and maintained.

Hurricane Creek--Third Bridge to Wallowa River

Water Quantity
Irrigation Withdrawals (High Priority).--*Multiple, small irrigation withdrawals limit streamflow which is supplemented by irrigation return flows and springs.*

See "Hurricane Creek--Upper Diversion to Third Bridge."

Minimum Flow (High Priority).--*As noted, multiple, small irrigation withdrawals limit streamflow which is supplemented by irrigation return flows and springs.*

See "Hurricane Creek--Upper Diversion to Third Bridge." Preserve vegetative cover to provide snowpack shading, slower snowmelt, infiltration, and groundwater recharge. In extremely dense tree cover, thinning the trees can allow more precipitation to reach the ground and provide additional rain/snowpack moisture to the drainage.

Water Quality
Temperature (Study).--*Study to see if there are temperature problems on this reach.*

Use zoning/land use planning to limit possible future demand for agricultural or domestic uses along the stream, which could result in the loss of riparian vegetation. Provide riparian shading to preserve cool temperatures.

Plant and/or protect conifers, along with deciduous trees and shrubs, in riparian area to provide thermal cover in winter. Increased flow quantities could limit temperature increases.

Excess Fine Sediments (High Priority).--*Excess fine sediment in this reach creates water quality and other problems for salmon.*

See "Hurricane Creek--Upper Diversion to Third Bridge." Provide filter strips, settling ponds and/or wetlands for feedlot and farmland runoff. If an impoundment is added to supply late season flow, impoundment of water should be managed to allow necessary flushing flows. Some of the fine sediment input on this reach apparently comes from springs located in peat soils of the riparian area and is a natural occurrence.

Irrigation Return Flows (High Priority).--*Irrigation return flows present water quality problems. Among these problems are potentially harmful increases in temperature, sediment, and nutrients.*

> Irrigation return flows, especially those with increased water temperatures, should be limited. Wetlands and filter strips could be used to improve water quality of irrigation return flows before they enter the creek. Overland return flows of poor quality water (sediment from plowed cropland, nutrients from fertilized cropland, etc.) to the ditch or stream should be limited.

Septic (Study).--*Input from septic systems to the groundwater system, and through spring flow to the creek, could add to water quality problems. Among these potential problems is the addition of nitrates to the river, which could contribute to excessive algal growth and problems with dissolved oxygen in the creek.*

> If there is a problem with leakage it may be possible to improve the current septic systems, possibly with help from the ODEQ. Future development of the area and associated septic systems could also be limited by the county's comprehensive land use plan to reduce nitrate input, etc.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Feedlots (High Priority).--*Runoff from feedlots can contribute to sediment and nutrient problems in the creek. Feedlots in the riparian area also cause the loss of riparian vegetation and shade, as well as streambank erosion.*

> There are several possible ways to mitigate the effects of feedlots on the stream. Thorn bushes could be established in the riparian area to discourage use by livestock. Bank erosion and destruction could be curtailed by physical or electric fencing of the riparian area and providing a watering corridor for livestock. Wetlands and/or filter strips could be added to improve the quality of feedlot runoff. Feedlots should be relocated away from the creek by developing alternate water sources.

Excess Nutrients (High Priority).--*Excess nutrients contribute to poor water quality, primarily by feeding excessive algal growth which cause dissolved oxygen problems.*

> See "Irrigation Return Flows", "Septic", and "Feedlots" in this section.

Stream Structure

Woody Debris (High Priority).--*This reach is lacking large woody debris to provide diversity of stream structure.*

> Add and preserve large woody debris. Preserve the riparian plant community to provide a source of future large woody debris.

Pool/Riffle Ratio (Low Priority).--*A good pool/riffle ratio is necessary for good holding, spawning, and rearing habitat. The pool/riffle ratio on this reach has been impacted by human activities.*

The pool/riffle could be improved with the addition of large woody debris. Riparian vegetation should be maintained and/or restored to provide a source of future large woody debris.

Channelization (Low Priority).--*Channelization limits diversity of stream structure and habitat.*

Preserve riparian vegetation (and plant where necessary) to provide streambank stability and avoid the need for channelization. Avoid excess peak flows and bank erosion that result from excessive upland devegetation. Fence riparian area to prevent bank erosion and devegetation by livestock. Avoid channelization and building structures on floodplain.

Substrate

Cobble Embeddedness (High Priority).--*Cobble embeddedness that results from excess fine sediments being added to the substrate makes it difficult for salmon to spawn. It also results in loss of intergravel cover for juvenile salmon.*

See "Water Quality" in this section.

Excess Fines (High Priority).--*Excess fine sediment in the substrate smothers salmon eggs and leads to cobble embeddedness.*

See "Water Quality" in this section.

Habitat Requirements

Riparian Vegetation (High Priority).--*Riparian vegetation is lacking on portions of this reach.*

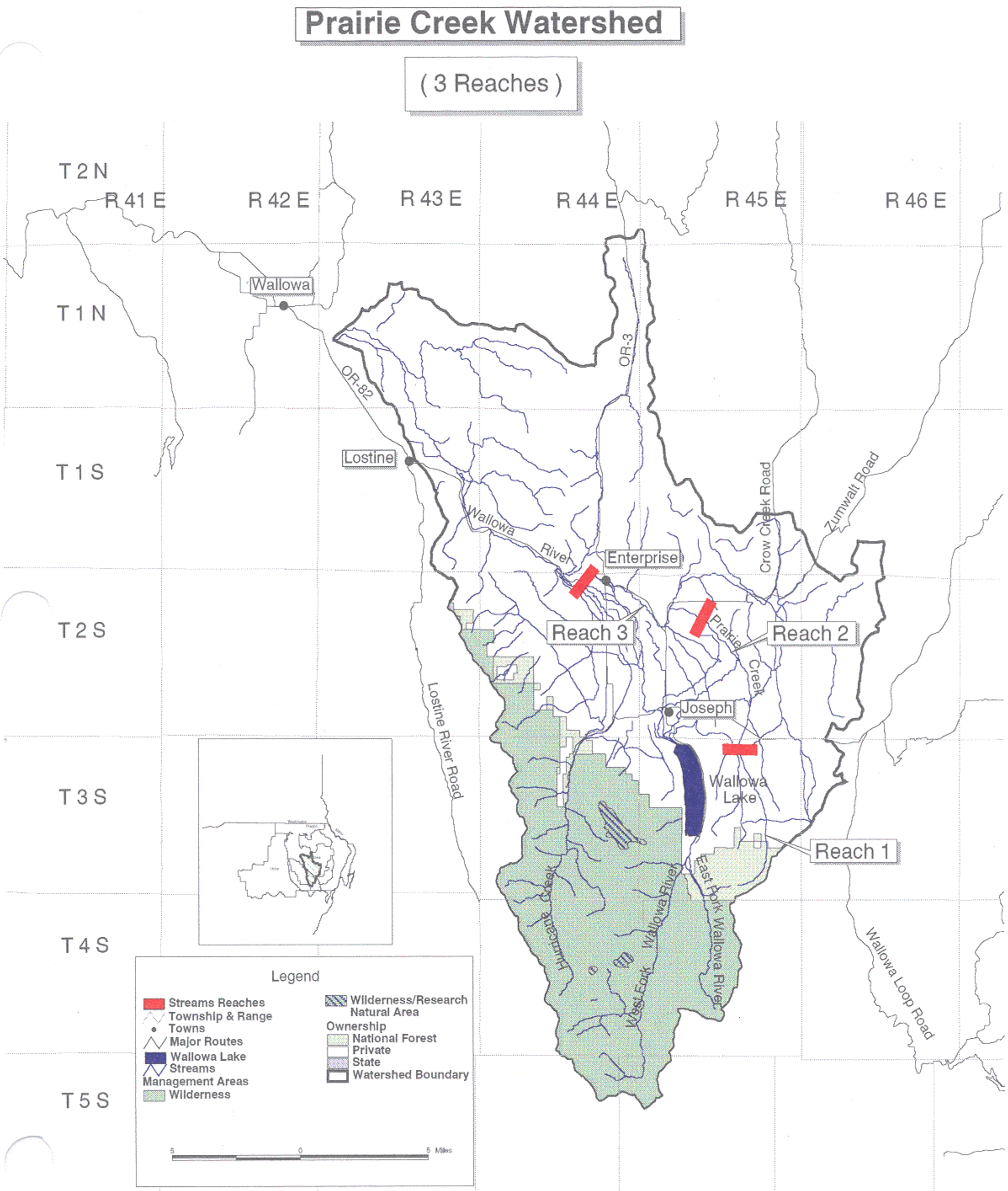
Work on preserving and restoring overall riparian vegetation to provide shade and large woody debris.

Predators and Competitors (Low Priority).--*Predators prey on juvenile salmon, and other fish may compete for food.*

See "Hurricane Creek--Upper Diversions to Third Bridge."

Diversion Screens (Study).--*Irrigation diversions and return flows should be screened to prevent the loss of fish.*

Make sure diversions and irrigation returns are screened, monitored, and maintained.


Prairie Creek Watershed
(3 Reaches)
T 2 N
R 41 E
R 42 E
R 43 E
R 44 E
R 45 E
R 46 E
T 1 N
T 1 S
T 2 S
T 3 S
T 4 S
T 5 S
Wallowa
OR-82
OR-3
Lostine
Wallowa River
Enterprise
Crow Creek Road
Zumwalt Road
Reach 3
Reach 2
Prairie Creek
Joseph
Lostine River Road
Wallowa Lake
Reach 1
Hurricane Creek
West Fork Wallowa River
East Fork Wallowa River
Wallowa Loop Road
Legend
Streams Reaches
Township & Range
Towns
Major Routes
Wallowa Lake
Streams
Management Areas
Wilderness
Wilderness/Research Natural Area
Ownership
National Forest
Private
State
Watershed Boundary
5
0
5 Miles

PRAIRIE CREEK[12]

Prairie Creek was analyzed in three reaches:

1. Headwaters to elk fence
2. Elk fence to Hays Fork
3. Hays Fork to Wallowa River

Prairie Creek rises in the Eagle Cap Wilderness and flows north and west to join the Wallowa River near Enterprise. There has been no long term flow monitoring on Prairie Creek. A fairly extensive flow study that measured diversions into the watershed and irrigation return flows was made in the summer of 1992 by the SCS and Reclamation. Water quality, including levels of turbidity and coliform bacteria, was monitored at 10 locations in the drainage. It should be noted that there has been a significant visual increase in turbidity since the 1989 Canal Fire.

Resource use in the uppermost reach includes logging and grazing. Agriculture and grazing are resource uses in the middle reach. Irrigation diversions from other basins (Big Sheep Creek and the Wallowa River) into the Prairie Creek drainage are a concern as they reduce flows needed for fishery habitat in the other drainages. Return flows from stock water and irrigation result in season-long flows that are higher than normal and in many cases contribute to water quality problems. Water quality measurements taken on the lower reaches of Prairie Creek often do not meet state water quality guidelines for fecal coliform bacteria and other factors.

Spring/summer chinook spawn in the lowest reach, but long term data on redd counts is not available.

Prairie Creek--Headwaters to Elk Fence

Water Quantity

Tree Density (Medium Priority).--*Dense thickets of trees resulting, in part, from past fire suppression prevents much of the rain and snow from reaching the ground, and consequently the moisture is lost to the drainage through evaporation or sublimation.*

> Tree density is increasing due to Douglas-fir bark beetle and fir engraver beetle along with the eastside screen prohibiting the removal of trees greater then 21 inches in diameter on national forest land.
> Maintenance of healthy watershed conditions, by reducing fuel loads as mentioned below under fuel density, will provide an optimal, sustainable supply of water. Healthy watershed and forest conditions will also supply the water at the optimal times for salmon through snowpack and groundwater release and recharge.

[12]See also Watershed Management - Approaches to Implementing Solutions

Future Demand (Study).--*Future development in this area may place increased demands on water.*

Use zoning and land use planning to limit possible future demands for water which would adversely impact the salmon.

Water Quality

Excess Fine Sediment (High Priority).--*Excess fine sediment in this reach creates water quality and other problems for the salmon.*

Work on road design and maintenance to avoid quick surface runoff. Limit dust from roads with lignosulfonate, water, chip seal, or asphalt. Relocate roads to better sites if sediment input to river cannot be mitigated by road maintenance. Avoid using roads or ground skidding when the soil is wet. Use of roads when dry or frozen avoids soil and vegetation disturbance. Water bar and/or revegetate skid trails. Educate fishermen and campers about effects of riparian erosion and compaction. Limit recreational use of roads and trails which results in sediment input to river. Prevent bank erosion and destruction by livestock by fencing riparian area and providing water corridors or alternate water sources. Protect water corridors with rock of appropriate size. Avoid devegetation in the upper watershed to the extent that it would result in extreme peak flows and cause bank erosion.

Fuel Density (High Priority).--*Excessive fuel density in this watershed is presently a high risk for a catastrophic fire, such as the Tanner Gulch Fire, that would probably result in severe water quality problems. Past fire suppression practices have contributed to the risk of catastrophic fire.*

Thinning trees, both pre-commercially and commercially, can improve watershed health and reduce the risk of catastrophic fire. In some cases, especially in riparian areas, fuel rearrangement (piling or putting the fuels near the ground to facilitate rotting, judiciously placing fuels to protect streambank, or placing large woody debris in stream to add to stream structure) may be preferable to burning (as slash or in a wildfire) in order to keep the organic material as part of the ecosystem, preserve shade, and prevent sedimentation. Well managed grazing may also help to reduce light "flash" fuels.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Excess Nutrients (Study).--*Excess nutrients can contribute to poor water quality, primarily by feeding excessive algal growth and resulting in dissolved oxygen problems.*

Fence (physical or electric) livestock from riparian area and provide watering corridor or alternate water source. Provide wetlands and/or filter strips to improve quality of feedlot runoff. Limit overland return flows, especially from fertilized fields. Improve septic systems if they are contributing to excess nutrient loading in the creek (check with the ODEQ for ways to improve the systems).

Stream Structure

No problems were identified.

Substrate

No problems were identified.

Habitat Requirements

No problems were identified.

Prairie Creek--Elk Fence to Hays Fork

Water Quantity

Irrigation Diversions (Low Priority).--*Irrigation diversions from the Imnaha (Big Sheep and Little Sheep) and Wallowa River drainages add large quantities of water to the Prairie Creek drainage. Most of this water is used for irrigation, but irrigation and stock water return flows into Prairie Creek provide higher than natural flows year round.*

Work on limiting excess diversions from other watersheds which result in irrigation return flows. Protect watershed vegetative cover to avoid quick runoff and promote infiltration and aquifer recharge. In dense areas of the watershed, limit precipitation intercept and evaporation by increasing tree spacing to allow more precipitation to reach the ground. Do not remove enough trees to decrease shade from snowpack. Since the problem is too much water, use any additional water produced by tree spacing to help replace diversions brought in from outside the basin. Improve irrigation efficiency. Study adding impoundments to supply irrigation needs and keep the natural flows in the stream.

Future Demands (Study).--*Future development in this area may place increased demands on water.*

Utilize zoning and land use planning to limit possible future demands for water which would adversely impact the salmon.

Water Quality

Temperature (Study).--*Study to see if there are temperature problems on this reach. Most of this reach is lacking riparian shade, and there are irrigation return flows which could contribute to increased temperatures.*

Use zoning/land use planning to limit possible future demand for agricultural or domestic uses along the stream which could result in the loss of riparian vegetation. Provide riparian shading to preserve cool temperatures.

Plant and/or protect conifers, along with deciduous trees and shrubs, in riparian area to provide thermal cover in winter. Increased flow quantities in the upper portions of the reach could limit temperature increases. Protect and/or increase spring flow, keeping enough watershed vegetation to reduce rapid surface runoff and promote infiltration and aquifer recharge.

Excess Fine Sediments (High Priority).--*Excess fine sediment in this reach creates water quality and other problems for the salmon.*

Work on road design and maintenance to avoid quick surface runoff. Limit dust from roads with lignosulfonate, water, chip seal, or asphalt. Relocate roads to better sites if sediment input to river cannot be mitigated by road maintenance. Educate fishermen about effects of riparian erosion and compaction. Prevent bank erosion and destruction by livestock by fencing riparian area and providing water corridors or alternate water sources. Protect water corridors with rock of appropriate size. Avoid devegetation in the upper watershed to the extent that it would result in extreme peak flows and cause bank erosion. Do not over divert water from other watersheds into this one that results in excess irrigation return flows and bank erosion. Provide wetlands and/or filter strips to improve quality of feedlot runoff. Relocate feedlots and develop alternate water sources to improve water quality. Do not impound or divert needed flushing flow.

Irrigation Return Flows (High Priority Study).--*Water returned to the creek through irrigation return flows creates water quality problems by contributing to excess sediment, nutrients, and temperature.*

Irrigation return flows could be mitigated by diverting less water and improving irrigation efficiency. Evaluate and analyze return flows relative to temperature and overall quality (seasonal impacts). Wetlands and/or filter strips could be used to improve water quality before it is returned to the creek. Overland return flows from fields should be minimized to avoid input of excess nutrients and possible input of agricultural chemicals (fertilizer, herbicides, etc.). Irrigation returns of water from Big Sheep Creek and the Wallowa River contribute to sustained high water levels in Prairie Creek and possibly bank erosion throughout the irrigation season.

Septic (Study).--*Leakage from septic systems may contribute to excess nutrient loading in Prairie Creek.*

Study to see if there is a problem. Improve current systems if there is a problem with nutrient loading (work with ODEQ). Install pump or self composting toilets. Limit future development and installation of septic systems using the county's comprehensive land use plan.

Feedlots (High Priority).--*Runoff from feedlots contributes to poor water quality. Feedlots in riparian areas lead to loss of riparian vegetation.*

Fence riparian areas, physical or electric, to prevent bank erosion and sedimentation and provide water corridor. Relocate feedlots and provide alternate water source. Plant thorn bushes in riparian areas. Provide wetlands and/or filter strips for feedlot runoff.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Excess Nutrients (High Priority).--*Excess nutrients contribute to poor water quality, primarily by feeding excessive algal growth which cause dissolved oxygen problems.*

Fence, physical or electric, livestock from riparian area and provide watering corridor. Relocate feedlots away from riparian area and provide an alternate water source. Provide wetlands and/or filter strips to improve quality of feedlot runoff. Limit overland return flows (especially over fertilized fields). Improve septic systems if they are contributing to excess nutrient loading in the creek (check with the ODEQ for ways to improve the systems).

Stream Structure

Woody Debris (High Priority).--*This reach lacks large woody debris to provide the diversity of habitat (pools and riffles) necessary for the different life stages of the salmon.*

Add large woody debris. Provide healthy riparian vegetation community to supply future large woody debris.

Pool/Riffle Ratio (Low Priority).--*The pool/riffle ratio on this reach should be improved to enhance salmon habitat.*

See "Woody Debris" above. Look at providing other permanent structures such as boulders or concrete to form pools.

Channelization (Low Priority).--*Channelization limits diversity of stream structure and salmon habitat.*

Preserve riparian vegetation (and plant where necessary) to provide streambank stability and avoid the need for channelization. Avoid excess peak flows and bank erosion that result from excessive upland devegetation. Fence riparian area and provide watering corridor or alternate water source to prevent bank erosion and devegetation by livestock. Do not permit more channelization, but if channelization is necessary, develop mitigation strategies for necessary channelization. Utilize land use planning to avoid building structures on the floodplain that will eventually require channelization for protection.

Bank Form (Low Priority).--*Bank form of the creek has deteriorated over much of this reach due to devegetation, excess flows, channelization, and livestock use.*

See "Excess Fine Sediment" and "Channelization" above.

Ice Flows (Low Priority).--*Ice jams in irrigation systems cause bank and streambed erosion.*

Provide thermal cover in winter by planting conifers, in addition to other riparian vegetation. Establishing large trees on the bank may help to break up ice flows and prevent major ice jams that back up water and lead to erosion when they give way.

Substrate

Cobble Embeddedness (High Priority).--*The Nez Perce Tribe did freeze core sampling on this reach in 1992 and found that about the top 4 inches of the substrate were highly embedde, with cleaner unembedded gravel below that. Cobble embeddedness makes it difficult or impossible for the salmon to build their redd and also reduces hiding places (cover) for juvenile salmon.*

See "Water Quality" in this section. Work on providing flushing flow, possibly through the release of impounded water.

Excess Fine Sediment (High Priority).--*Excessive fine sediment in the substrate or on the surface of the streambed contributes to cobble embeddedness.*

See "Water Quality and Substrate" in this section.

Physical Barriers (Study).--*Diversion structures can provide physical barriers to fish passage.*

Modify diversion structures that are barriers to provide for fish passage.

Habitat Requirements

Riparian Vegetation (High Priority).--*Riparian vegetation on much of this reach should be improved to contribute to fish habitat.*

Riparian shading should be provided to preserve cooler water temperatures, contribute to habitat diversity, and provide a supply of future large woody debris.

Predation and competition (Low Priority).--*Predators and competitors may eat juvenile salmon or deprive them of their food source.*

Do not stock trout, as they may eat juvenile salmon and compete with them for food sources. Blue Heron fish on this reach; look into providing them with an alternate food source, but no other action is warranted at this time. Seasonally close sport fishing.

Diversion Screening (Study).--*Irrigation diversions may result in the loss of fish.*

Make sure diversions and irrigation returns are screened, monitored, and maintained.

Prairie Creek--Hays Fork to Wallowa River

Water Quantity

Irrigation Diversions (Low Priority).--*Irrigation diversions from the Imnaha (Big Sheep and Little Sheep) and Wallowa River drainages add large quantities of water to the Prairie Creek drainage. Most of this water is used for irrigation, but irrigation and stock water return flows into Prairie Creek provide higher than natural flows year round.*

See "Prairie Creek--Elk Fence to Hays Fork."

Future Development (Study).--*Future development in this area may place increased demands on water.*

Utilize zoning and land use planning to limit possible future demands for water which would adversely impact the salmon. Utilize land use planning to avoid building on floodplains.

Water Quality

Temperature (High Priority Study).--*Study to see if there are temperature problems on this reach. Most of this reach is lacking riparian shade, and there are irrigation return flows which could contribute to increased temperatures.*

Provide riparian shading to preserve cool temperatures. Plant and/or protect conifers, along with deciduous trees and shrubs, in riparian area to provide thermal cover in winter. Protect and/or increase spring flow by keeping enough watershed vegetation to reduce rapid surface runoff and promote infiltration and aquifer recharge.
NOTE: Since the original plan was completed in 1993, several landowners have planted various types of vegetation next to Prairie Creek.

Excess Fine Sediment (High Priority).--*Excess fine sediment in this reach creates water quality and other problems for the salmon.*

See "Prairie Creek--Elk Fence to Hays Fork."
NOTE: Since the original plan was completed in 1993, several landowners in this reach have installed exclosure fences along Prairie Creek.

Irrigation Return Flows (High Priority).--*Water returned to the creek through irrigation return flows creates water quality problems by contributing to excess sediment, nutrients, and temperature.*

See "Prairie Creek--Elk Fence to Hays Fork."

Septic (Study).--*Leakage from septic systems may contribute to excess nutrient loading in Prairie Creek.*

See "Prairie Creek--Elk Fence to Hays Fork."

Feedlots (High Priority).--*Runoff from feedlots can contribute to poor water quality. Feedlots in riparian areas lead to loss of riparian vegetation.*

> See "Prairie Creek--Elk Fence to Hays Fork."

Other Chemicals (Low Priority).--*A variety of chemicals are used and/or stored along this reach, including in the town of Enterprise.*

> Storage of industrial chemicals and fuels should be monitored for safety from spillage. Possible contamination from backyard chemicals in urban areas should be monitored, and educational programs provided to help avoid accidental contamination that would be harmful to the salmon or their food sources. Avoid farmland fertilizer runoff.

Excess Nutrients (High Priority).--*Excess nutrients contribute to poor water quality, primarily by feeding excessive algal growth which cause dissolved oxygen problems.*

> See "Prairie Creek--Elk Fence to Hays Fork."

Stream Structure

Woody Debris (High Priority).--*This reach lacks large woody debris to provide the diversity of habitat (pools and riffles) necessary for the different life stages of the salmon.*

> Add/preserve large woody debris. Provide healthy riparian vegetation community to supply future large woody debris. Utilize local land use planning to prohibit future development in the riparian area which would result in the loss of riparian vegetation.

Pool/Riffle Ratio (Low Priority).--*The pool/riffle ratio on this reach should be improved to provide additional and better salmon habitat.*

> See "Woody Debris" above. Look at providing other permanent structures such as boulders or concrete to form pools.

Channelization (Low Priority).--*Channelization limits diversity of stream structure and habitat.*

> See "Prairie Creek--Elk Fence to Hays Fork."

Bank Form (Low Priority).--*Bank form of the creek has deteriorated over much of this reach.*

> See "Prairie Creek--Elk Fence to Hays Fork."

Substrate

Cobble Embeddedness (High Priority).--*Cobble embeddedness makes it difficult or impossible for the salmon to build their redd and also reduces hiding places (cover) for juvenile salmon.*

See "Prairie Creek--Elk Fence to Hays Fork."

Excess Fine Sediment (High Priority).--*Excessive fine sediment in the substrate or on the surface of the streambed contributes to cobble embeddedness.*

See "Prairie Creek--Elk Fence to Hays Fork."

Dredging (Low Priority).--*Portions of this creek were dredged and channelized due to flooding in the late 1980's.*

Develop mitigation strategies for necessary channelization. Limit dredging to times when there is no spawning or eggs in the gravel (July 1 - August 15).

Habitat Requirements

Riparian Vegetation (High Priority).--*Riparian vegetation on much of this reach should be improved to contribute to fish habitat.*

Riparian shading should be provided to preserve cooler water temperatures, contribute to habitat diversity, and provide a supply of future large woody debris.

Harassment (Low Priority).--*Harassment of holding and spawning adults adds to their stress level and may result in failure to spawn.*

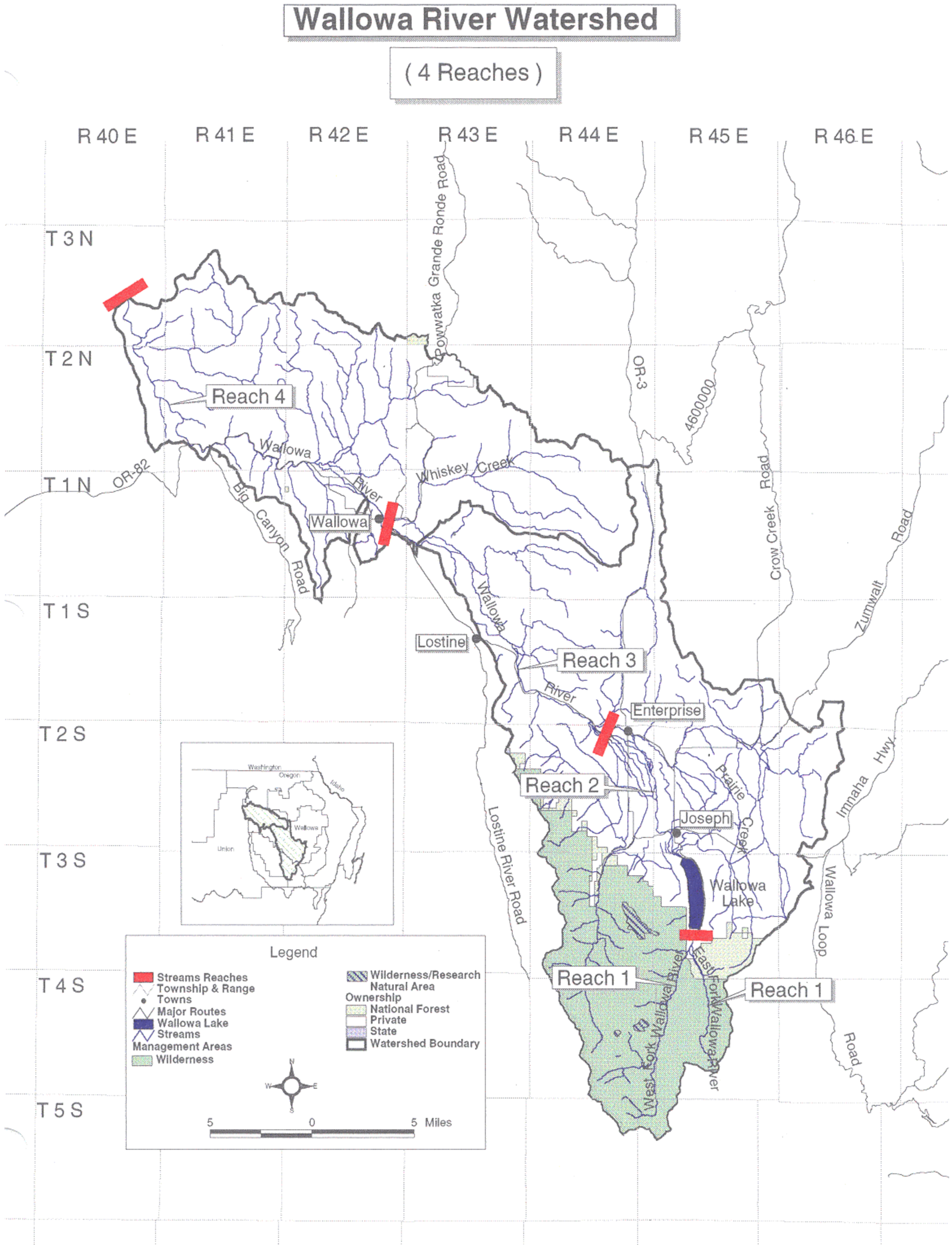
Discourage recreational fishery by discontinuing trout stocking. Seasonal closure of sport fishery during holding and spawning times may offer further protection.

Predation and competition (Low Priority).--*Predators and competitors eat juvenile salmon or deprive them of their food source.*

Do not stock trout, as they may eat juvenile salmon and compete with them for food sources. Blue Heron fish are on this reach. Look into providing them with an alternate food source, but no other action is warranted at this time. Seasonally close sport fishing.

Diversion Screens (Study).--*Irrigation diversions may result in the loss of fish.*

Make sure diversions and irrigation returns are screened, monitored, and maintained.


Wallowa River Watershed
(4 Reaches)
R 40 E
R 41 E
R 42 E
R 43 E
R 44 E
R 45 E
R 46 E
T 3 N
T 2 N
T 1 N
T 1 S
T 2 S
T 3 S
T 4 S
T 5 S
Reach 4
Reach 3
Reach 2
Reach 1
Reach 1
Wallowa
Lostine
Enterprise
Joseph
Wallowa Lake
Wallowa River
Whiskey Creek
OR-82
OR-3
Big Canyon Road
Powwatka Grande Ronde Road
Lostine River Road
Crow Creek Road
Zumwalt Road
Imnaha Hwy
Wallowa Loop Road
Prairie Creek
4600000
West Fork Wallowa River
East Fork Wallowa River
Legend
Streams Reaches
Township & Range
Towns
Major Routes
Wallowa Lake
Streams
Management Areas
Wilderness
Wilderness/Research Natural Area
Ownership
National Forest
Private
State
Watershed Boundary
5
0
5 Miles

WALLOWA RIVER[13]

The Wallowa River was analyzed in four reaches:

1. Headwaters to Wallowa Lake
2. Wallowa Lake to Spring Creek
3. Spring Creek to head of Wallowa Canyon
4. Head of Wallowa Canyon to Grande Ronde River

The Wallowa River rises in the Eagle Cap Wilderness, flows north to Wallowa Lake and then northwest to join with the Grande Ronde near Rondowa. The Wallowa is the largest tributary of the Grande Ronde. Major tributaries of the Grande Ronde include Hurricane Creek, the Lostine River, Bear Creek, and the Minam River. The river flows about 30 miles through agricultural lands in the Wallowa Valley.

Resource use on the reach above Wallowa Lake is primarily recreation. Resource use on the middle two reaches is primarily irrigated agriculture and grazing. Resource use on the lowest reach includes recreation, grazing, and timber harvest.

The EPA has classified the lower Wallowa River as "severely polluted" due to runoff from agricultural lands. Much of the suspended solids in the Wallowa River are organic materials originating from winter feeding grounds and feedlots for livestock. Study to determine source of pollution. At the confluence with the Minam River, human contact sports in the river are not possible due to E coli levels.

The storage dam at Wallowa Lake blocks salmon from the reach above Wallowa Lake. Sockeye salmon used Wallowa Lake and supported a cannery early in the century but have been extinct since then. Kokanee, the land locked cousins of the sockeye, are present and support a recreational fishery in the lake, but current stocks may be primarily non-native stocks from Washington, Montana, and British Columbia. The non-native stocks were introduced because the native stocks collapsed in 1957-1963 as a result of channelization of their spawning area and the introduction of lake trout, which prey on kokanee. Kokanee have not been stocked since 1982, and the population is self-sustaining. Small numbers of marked kokanee have been stocked since 1990 for evaluation purposes.

Low flows are common in the reach immediately downstream of Wallowa Lake because of irrigation impoundments and diversions to the Prairie Creek area. This reach has not had a flushing flow in several years, and fine sediment has built up. Fish biologists note that previously good holding pools are now filled with sediment.

Spring chinook presently spawn in the Wallowa River from the McClaran Road bridge downstream to at least Spring Branch (located approximately one mile below the Lostine River confluence), a distance of 20.2 miles. In the late 1800's, spring chinook spawned upstream as far as Wallowa Lake. The run size has declined significantly

[13] See also Watershed Management - Approaches to Implementing Solutions

since the mid-1960's when index surveys were standardized as to length, location, and time of year. Index areas were chosen because the majority of spawning occurs in the index reach. The index area is from McClaran Lane to the Wallowa Fish Hatchery, a distance of 4.5 miles. The average redd count in the index area from 1964 to 1973 was 16.6 redds. The average redd count from 1979 to 1988 was 4.0 redds. The average redd count from 1989 to 1998 was 0.4 redds (some years having zero counts).

Wallowa River--Headwaters to Wallowa Lake

Water Quantity

Tree Density (Medium Priority).--*Dense thickets of trees, resulting in part from past fire suppression, prevent much of the rain and snow from reaching the ground, and consequently the moisture is lost to the drainage through evaporation and/or sublimation.*

> Prescribed burning can be used in the wilderness to reduce tree densities, although burning is not as selective as thinning. Commercial and precommercial thinning can be used in the non-wilderness areas to provide optimum tree densities.
>
> Since the original plan was completed in 1993, a Wildland Fire Use Program has been completed for the Eagle Cap Wilderness. Several wildfires have been managed for resource benefits under this program.

Water Quality

Fuel Density (Medium Priority).--*Fuel densities in this reach are high, with relatively large numbers of dead tree. In particular, most of the spruce trees in this area have been killed by the spruce bark beetle. The current large fuel loads are a relatively high risk for catastrophic fire.*

> Prescribed burns in the wilderness could provide corridors with low fuel levels to serve as fire breaks in the event of wildfires. Prescribed burning may best be done in January through February to reduce the risk of a controlled burn getting away. With current fuel levels it should be possible to burn it at these times. Commercial and precommercial thinning could be used to lower fuel loads and wildfire risk on non-wilderness lands. In many cases, particularly in riparian areas, fuel rearrangement is preferable to burning, to return the organic material to the soil and provide many other ancillary benefits.
>
> NOTE: Since the original plan was completed in 1993, a Wildland Fire Use Program has been completed for the Eagle Cap Wilderness. Several wildfires have been managed for resource benefits under this program.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure

Channelization (Low Priority).--*Channelization done to protect the state park has* *adversely affected kokanee spawning beds in the past.*

Develop a coordinated (State Park, landowner, DSL, ODFW, and Wallowa County) plan to address property protection needs while maintaining spawning areas in the Wallowa River.

Substrate
<u>Dredging (Low Priority)</u>.--*Dredging, related to the channelization addressed above, can adversely effect spawning beds.*

See "Channelization" above. If dredging (gravel removal) is absolutely necessary, permit it only between July 1 and August 15.

Habitat Requirements

No problems were identified.

Wallowa River--Wallowa Lake to Spring Creek

Water Quantity
<u>Irrigation/Water Withdrawals (High Priority)</u>.--*Irrigation and stock water diversions remove essentially all of the water from portions of this reach during irrigation season. Water held in storage behind the dam also contributes periodically to low water problems on this reach. Springs and irrigation return flows between Joseph and Enterprise return some water to this reach upstream of the confluence with Spring Creek.*

Protect upland vegetative cover to avoid quick runoff and promote recharge of the aquifer. Aquifer recharge needs to be protected to sustain the spring flows. Work with water right holders to limit irrigation diversions that result in return flows to Prairie Creek and possibly allow conserved water to be used for instream purposes. Improve irrigation efficiency and allow conserved water to be used for instream purposes. Lease water from water-right holders during minimum flow times to maintain instream flows.

Study additional impoundments in the Prairie Creek area to supply irrigation needs and keep natural flow in the stream. Instream water rights have been filed by ODFW for this reach.

<u>Minimum Flow (High Priority)</u>.--*Adequate minimum, or base flows, do not currently exist and are needed for salmon spawning on this reach.*

See "Irrigation" above.

<u>Flushing Flow (High Priority)</u>.--*Excess fine sediment in the stream substrate is building*

up in this reach because the natural flushing flows have been impounded over the last several drought years.

> Work with water-right holders to manage releases from the dam to provide flushing flows when water is available.

Future Demand (Study).--*Future demands by agricultural and domestic users may adversely affect flow quantities.*

> Utilize zoning and land use planning to limit possible future demands for development of domestic or agricultural uses. Utilize land use planning to avoid building on the floodplain.

Water Quality

Temperature (Study).--*Excessive temperatures are stressful and potentially lethal to salmon in all life stages.*

> Provide riparian shading to preserve cool temperatures. Protect and possibly increase spring flow by protecting (and promoting) aquifer recharge. Increase flow quantities to provide additional cooler water and dilute warm water. Limit irrigation return flows of warm water. Plant and/or protect conifers, in addition to deciduous vegetation, to provide thermal cover in the winter. Thermal cover may help avoid freezing temperatures, which are lethal to eggs and rearing salmon.

Excess Fine Sediments (High Priority).--*Excess fine sediment has built up in this reach over the last several years because there have been no high flows to flush the sediment away. All of the flows that would normally have flushed excess sediment have been impounded for irrigation because of the drought. Fine sediment in this reach has filled in at least one good holding pool. Fine sediment can smother eggs.*

> Limit sediment input to the river. Limit human and livestock trail use in the riparian area that leads to compaction, devegetation, and erosion. Fence the riparian area and use watering corridors for livestock. Relocate feedlots and develop alternate water sources. Work on road design and maintenance to avoid quick, sediment-laden runoff into stream, and allow precipitation and snowmelt to recharge the aquifer instead. Relocate road to better site if it is adding sediment and maintenance or redesign cannot stop sediment input. Close roads, limit road use, vegetate road if necessary to stop sediment input. Do not over-divert water to another watershed and preserve flow in this reach. Keep enough watershed vegetation to slow runoff and avoid bank erosion. Provide wetlands and/or filter strips for feedlot runoff.

Irrigation Return Flows (High Priority).--*Irrigation return flows supply excessively warm, sediment, and nutrient laden water to the river.*

> Study the possibility of adding impoundments to supply irrigation and keep more of the natural flow in the river. Limit irrigation return flows of warm water. Provide wetlands and/or filter strips for return flows to improve their water quality.

Limit overland return flows.

Septic (Study).--*Leakage of nitrates from septic systems may add to excess nutrient problems in the river.*

If there is a problem, install pump or self-composting toilets. Improve current systems if necessary (and possible) with design assistance from the ODEQ. Limit future development which may result in problems by using the county's comprehensive land use plan.

Feedlots (High Priority).--*Feedlots in the riparian area result in devegetation, shade loss, bank erosion, and sedimentation. Runoff from feedlots also provide excess nutrients to the river.*

Prevent bank erosion and destruction by livestock through physical or electric fencing and using watering corridors. Relocate feedlots and supply alternate water source if necessary to protect water quality. Provide wetlands and/or filter strips for feedlot runoff.
NOTE: Since the original plan was completed in 1993, one landowner moved the feeders away from the river and fenced off the river leaving a buffer strip between feedlot and river.

Other Chemicals (Low Priority).--*There is potential for hazardous chemicals accidentally being put into to the river in this reach. One site, the old Joseph Forest Products site, on this reach is a CERCLA "superfund" clean up site. Studies have shown that no contaminants from this site have reached the Wallowa River.*

Monitor storage of industrial chemicals and fuels at the sawmills, airport, grain growers, fertilizer facilities, etc. Monitor possible contaminants (fuel storage, backyard chemicals, etc.) from urban areas for safety. Educate city inhabitants about chemical use, disposal, and possible effects on anadromous fish. Avoid farmland fertilizer runoff.
NOTE: Since the original plan was completed in 1993, clean-up has been accomplished at the old Joseph Forest Products and also at the Boise Cascade log yard.

Excess Nutrients (High Priority).--*Excess nutrients in the water contribute to water quality problems. One result of excess nutrients is excess growth of algae. The excess algae growth can result in large diurnal swings in dissolved oxygen (extreme swings from 37% saturation to 232% saturation of DO were measured at Catherine Creek in Union County in 1992). The diurnal swings are a consequence of oxygen production from photosynthesis during the day and oxygen use for respiration and decomposition of algae at night.*

See "Septic" and "Feedlots" in this section. Avoid farmland fertilizer runoff.

Stream Structure

Woody Debris (High Priority).--*Large woody debris provides diversity of stream structure. Some portions of this reach are lacking adequate large woody debris.*

Add large woody debris, preserve existing large woody debris. Provide healthy riparian vegetation as a source of future large woody debris.

Pool/Riffle Ratio (High Priority).--*A good pool/riffle ratio is vital to salmon habitat. Some portions of this reach are lacking a good pool/riffle ratio. The salmon use various portions of the stream at different life stages. For example, pools are vital for spring/summer chinook to hold in over the summer after they have migrated upstream and are waiting to spawn, and the pool/riffle interface is the preferred salmon spawning area.*

See "Woody Debris" above. Possibly provide other permanent structures such as boulders or concrete to form pools. Avoid building on floodplains which could lead to devegetation (landscaping) and channelization (for protection) by using land use planning. Develop mitigation strategies for necessary channelization and bank protection.

Channelization (Low Priority).--*Channelization limits diversity of stream habitat.*

See "Pool/Riffle Ratio" above. Preserve riparian vegetation that provides bank stability by physical or electric fencing of riparian areas and supplying watering corridors or alternate water source.

Bank Form (Low Priority).--*Good bank form provides bank stability and, in some cases, cover for the fish.*

See "Feedlots" above. Prevent bank erosion and degradation by livestock through physical or electric fencing of the riparian area and use watering corridors or supply alternative water source. Do not over-divert water from this reach into other watersheds. Avoid excess high/peak flows and consequent bank erosion and unraveling by keeping enough watershed vegetation to slow runoff.

Substrate

Cobble Embeddedness (Medium).--*Cobble embeddedness can make it difficult for salmon to build their redds. It is also an indication that the eggs may be smothered by sediment.*

Do not impound or divert the flushing flow needed to flush fine sediment from the gravel. Reduce impounded water to flush. Possibly increase flow quantity by limiting tree density/vegetative cover.

Excess Fine Sediment (High Priority).--*Excess fine sediment in the substrate smothers eggs and leads to cobble embeddedness.*

See "Water Quality" and "Cobble Embeddedness" in this section.

<u>Physical Barriers (Study)</u>.--*Physical barriers can stop salmon migration.*

Modify diversion barriers to better provide passage.

Habitat Requirements
<u>Predators/competitors (Study, Low Priority)</u>.--*There is a Blue Heron rookery near this reach.*

Live with the Blue Heron, possibly provide alternate food source for Blue Heron.

<u>Diversion Screens (Study)</u>.--*Diversions should be screened to prevent loss of fish.*

Make sure diversions and irrigation returns are screened, monitored, and maintained.

Wallowa River--Spring Creek to Head of Wallowa Canyon

Water Quantity
<u>Irrigation/Water Withdrawal (Low Priority)</u>.--*Irrigation and stock water diversions remove most of the water from portions of this reach.*

Protect upland vegetative cover to avoid quick runoff and promote recharge of the aquifer. Aquifer recharge needs to be protected to sustain the spring flows. Work on reducing diversions/return flows from the Wallowa to the Lostine. Improve irrigation efficiency and allow conserved water to be used for instream purposes. Lease water from water-right holders during minimum flow times to maintain instream flows. Study additional impoundments to supply irrigation needs and keep the natural flow in the stream. Instream water rights have been filed by ODFW for this reach.
NOTE: Since the original plan was completed in 1993, several landowners have installed more efficient irrigation systems.

<u>Compaction (Low Priority)</u>.--*Compaction causes increased surface runoff and decreased aquifer recharge.*

Limit human and livestock use that leads to compaction and devegetation in the riparian area.

<u>Flushing Flow (High Priority)</u>.--*Excess fine sediment in the stream substrate is building up in this reach because the natural flushing flows have been impounded over the last several drought years.*

Work with water-right holders to avoid impounding or diverting needed flushing flows. Possibly release impounded water to flush the streambed.

Future Development (Study).--*Future development could lead to additional demands of water for agricultural and domestic uses.*

Limit development that would lead to excess water demands for agricultural and domestic uses by using zoning and land use planning to limit possible future demand. Use land use planning to avoid building on floodplains that would result in additional channelization and loss of floodplain groundwater recharge to feed spring flows.

Water Quality

Temperature (High Priority).--*Excessive temperatures are stressful and potentially lethal to salmon in all life stages.*

See "Wallowa River--Wallowa Lake to Spring Creek."

Excess Fine Sediment (High Priority).--*Excess fine sediment is added to this reach through a variety of activities and processes. In the upstream portion of this reach much of the water during base flow time comes from sources such as Prairie Creek, Spring Creek, and Trout Creek. Water from some of these creeks contains excess fine sediment which stresses fish and smothers eggs.*

See "Wallowa River--Wallowa Lake to Spring Creek."
NOTE: Since the original plan was completed in 1993, several landowners have constructed fences along the river and planted vegetation to improve bank stabilization and reduce erosion. Other landowners have placed rip rap along the banks to reduce erosion.

Irrigation Return Flows (High Priority).--*Irrigation return flows can supply excessively warm, sediment, and nutrient laden water to the river.*

See "Wallowa River--Wallowa Lake to Spring Creek."

Septic (Study).--*Leakage of nitrates from septic systems may add to excess nutrient problems in the river.*

See "Wallowa River--Wallowa Lake to Spring Creek." Make sure that municipality sewer treatment for Lostine and Wallowa is provided.

Feedlots (High Priority).--*Feedlots in the riparian area result in devegetation, shade loss, bank erosion, and sedimentation. Runoff from feedlots also carries excess nutrients to the river.*

See "Wallowa River--Wallowa Lake to Spring Creek."

Other Chemicals (Low Priority).--*Use and storage of hazardous chemicals in this reach potentially affect water quality.*

See "Wallowa River--Wallowa Lake to Spring Creek."

Stream Structure
Woody Debris (High Priority).--*Large woody debris provides diversity of stream structure. This reach is lacking adequate large woody debris.*

Add large woody debris, preserve existing large woody debris. Provide healthy riparian vegetation as a source of future large woody debris.

Pool/Riffle Ratio (High Priority).--*A good pool/riffle ratio is vital to salmon habitat. This reach is lacking a good pool/riffle ratio.*

See "Wallowa River--Wallowa Lake to Spring Creek."

Channelization (Low Priority).--*Channelization limits diversity of stream habitat.*

See "Wallowa River--Wallowa Lake to Spring Creek."

Bank Form (Low Priority).--*Good bank form provides bank stability, and in some cases, cover for the fish.*

See "Wallowa River--Wallowa Lake to Spring Creek."

Substrate
Excess Fine Sediment (High Priority).--*Excess fine sediment in the substrate smothers eggs and leads to cobble embeddedness.*

See "Wallowa River--Wallowa Lake to Spring Creek."

Physical Barriers (Study).--*Physical barriers in the stream substrate can halt migration of juvenile and adult salmon.*

Modify diversion barriers to better provide passage.
Since the original plan was completed in 1993 one cement diversion structure was installed eliminating three push-up dams and aiding fish passage.

Habitat Requirements
Predators/competitors (Study, Low Priority).--*There are Blue Heron rookeries near this reach. The Blue Heron feed on fish, including juvenile salmon.*

Exist with the Blue Heron and look into the potential for providing an alternate food source.

Diversion Screening (Medium).—All irrigation diversions have been screened since the original plan was completed in 1993.

Make sure irrigation diversions and returns are screened, monitored, and maintained

Wallowa River--Head of Wallowa Canyon to Grande Ronde River

Water Quantity
Compaction (Low Priority).--*Compaction along the riparian area leads to loss of vegetation and reduces the amount of aquifer recharge. In riparian upland areas, compaction causes increased surface runoff, higher peak flows, and bank erosion. Some of the older soils formed on a basalt substrate, with relatively high amounts of clay, are the ones in the county most likely to compact.*

Limit recreational trail use in the riparian area that leads to compaction. Do not use roads and ground skidding on clay rich soils when wet because the soils are subject to compaction. Limit use of roads and ground skidding to when the soil is dry or frozen because it does not compact at these times. Use lighter skidding equipment or off-ground equipment. Educate fishermen and campers about riparian erosion and compaction.

Water Quality
Temperature (Low Priority).--*There is the potential for temperatures on this reach to be high enough to adversely affect the salmon. The upper portion of this reach, from the head of the canyon to Minam, has limited potential for riparian shade (other than the canyon itself) because of the presence of the road on one bank and the railroad on the other.*

Provide riparian shading, where possible, to preserve cool temperatures. Protect and/or possibly increase spring flow to provide cool, high quality water. Plant and/or protect conifers in the riparian area to provide thermal cover in the winter. Increase flow quantity to dilute the effects of heating.

Excess Fine Sediment (High Priority).--*Excess fine sediment stresses salmon, smothers eggs, and reduces aquatic insect production.*

Work on road design and/or maintenance to avoid quick runoff (with lots of sediment) and promote groundwater recharge. Limit human and livestock trail use in riparian area to avoid compaction and devegetation. Limit dust that drifts from road to river with lignosulfonate, water, chip seal, or asphalt.

Relocate road to a better site where necessary and possible. Vegetate road, limit road use, or close road where necessary. Do not use roads or ground skidding when wet to avoid surface compaction and runoff. Use lighter skidding equipment or off-ground equipment such as helicopters. Educate fishermen and campers about riparian erosion and compaction.

Weeds/Erosion (Study, Medium Priority).-- See Countywide Issues

Herbicides/Pesticides (Low Priority).—See Countywide Issues

Stream Structure

No problems were identified.

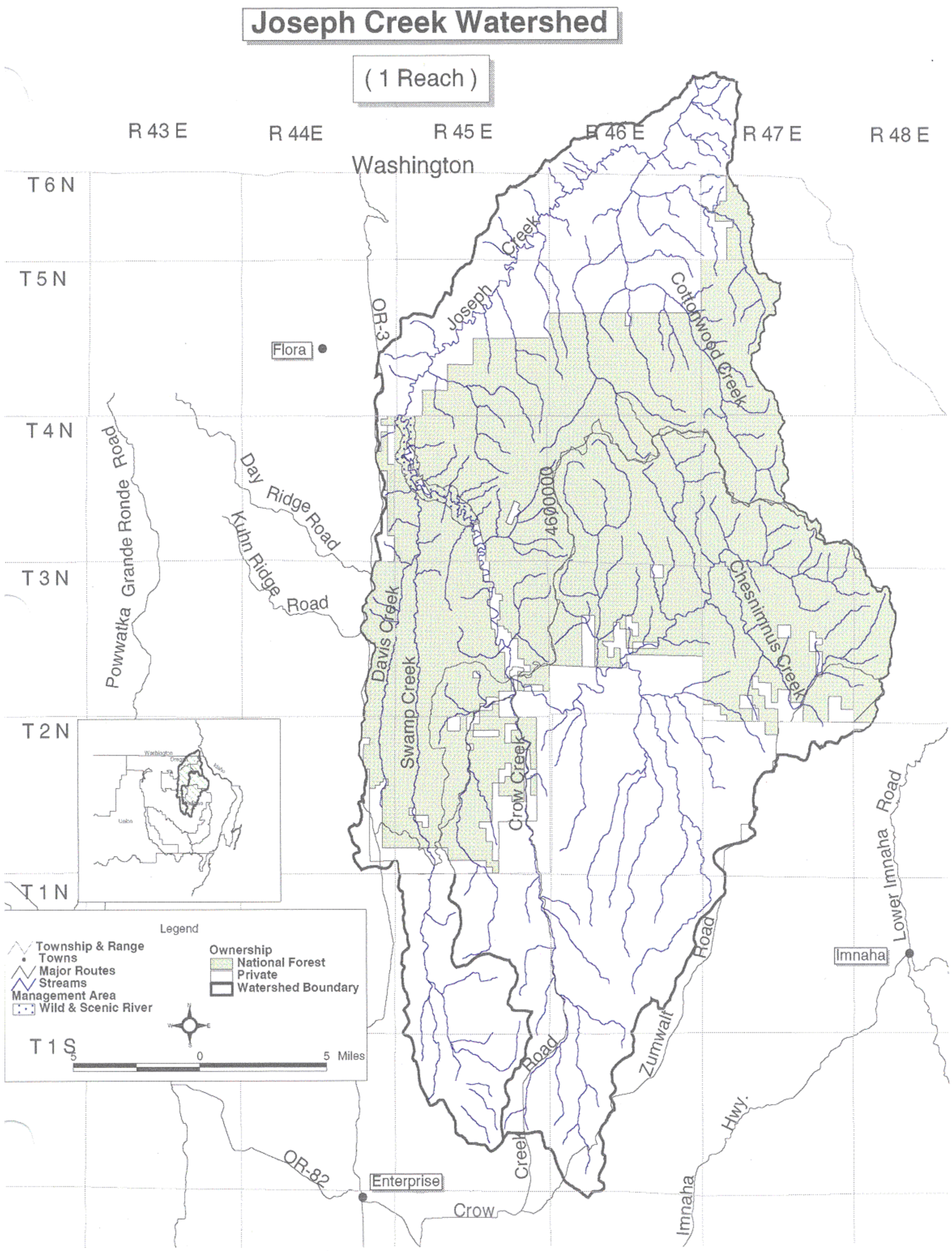
Substrate

No problems were identified.

Habitat Requirements

Harassment (Low Priority).--*Recreational use by float boaters or fishermen can result in harassment of salmon.*

Educate recreational users about the potential adverse effects of their activities on migrating, holding, and spawning activities.



Joseph Creek Watershed
(1 Reach)
R 43 E
R 44E
R 45 E
R 46 E
R 47 E
R 48 E
Washington
T 6 N
T 5 N
T 4 N
T 3 N
T 2 N
T 1 N
T 1 S
Flora
OR-3
Joseph Creek
Cottonwood Creek
Powwatka Grande Ronde Road
Day Ridge Road
Kuhn Ridge Road
4600000
Chesnimnus Creek
Davis Creek
Swamp Creek
Crow Creek
Road
Zumwalt Road
Lower Imnaha Road
Imnaha
Imnaha Hwy.
OR-82
Enterprise
Crow Creek
Legend
Township & Range
Towns
Major Routes
Streams
Management Area
Wild & Scenic River
Ownership
National Forest
Private
Watershed Boundary
5
0
5 Miles

JOSEPH CREEK (AND TRIBUTARIES)

Joseph Creek and its tributaries, including Cottonwood Creek, Crow Creek, Swamp Creek, and Chesnimnus Creek, were considered in one reach. The tributaries that give rise to Joseph Creek arise north of Enterprise and flow north. Chesnimnus Creek drains eastern slopes. Joseph Creek proper is formed at the confluence of Chesnimnus and Crow Creeks and flows northeast to join the Grande Ronde at rivermile 4.3 miles in Washington State.

Through conversations with local inhabitants, the historical presence of spring and fall chinook in the system was documented by Stout[14] in the 1950's, although none were still present at that time. In the 1940's, Chapman[15] documented the presence of fall chinook being in Joseph Creek through conversations with local inhabitants, but could find no evidence of spring chinook still being present. There may have been some confusion during these interviews because a common name for steelhead was salmon trout (which are present in the system), and some of the residents may have used the terms interchangeably. Two fall chinook were observed spawning in the Washington portion of Joseph Creek in 1997.

Resource use on Joseph Creek includes grazing, logging, and a relatively small amount of irrigated agriculture. The largest single ownership in the Joseph Creek subbasin watershed is the Federal Government (Wallowa Whitman National Forest). Resource uses may contribute to water quality problems.

Warm water temperature is a problem on Joseph Creek and is due, in part, to the low elevation, high air temperatures, and early snowmelt, and is compounded by a lack of riparian vegetation and shade in some areas. An ODFW thermograph at mile 44 on Joseph Creek (about 3 miles below the confluence of Chesnimnus and Crow Creeks) recorded summer temperatures above 80 degrees Fahrenheit every year since it was installed in 1988. Temperatures that high can be lethal to salmonid fish. Long term base temperature data is not available; however, it is felt that high stream temperatures probably existed in the past and accounts for the lack of chinook in Joseph Creek.

The USFS has exclosures on Elk, Swamp, Davis, Peavine, Devils Run, and Chesnimnus Creeks. There are also exclosures on private land on Elk, Butte, Crow, and Chesnimnus Creeks. All of these are tributaries of Joseph Creek. Thermographs at the upstream and downstream ends of these exclosures are installed to monitor effects of increased shade in these reaches. Some of these thermographs have shown a recovery (lowering) of over 5^0 degrees Fahrenheit in water temperature.

Water Quantity

<u>Tree Density (Low Priority)</u>.--*Some areas are too thick, others too thin.*

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[14]Stout, Wendell H., 1957, Stream Surveys and Fish Relocation Feasibility Studies, Mountain Sheep and Pleasant Valley Dams. Oregon State Game Commission.

[15] Chapman, Wilber M., 1940, Report of a Field Trip to the Snake River Drainage in Idaho and Eastern Oregon (unpublished).

Provide optimum tree densities for building and retaining snowpack by planting and preserving trees where they are too thin, and thinning trees to allow precipitation to reach the ground where they are too thick. Provide for aquifer recharge, which in turn feeds spring flows that provide most of the water in the summer.

<u>Compaction (Low Priority)</u>.--*Compaction along the riparian area contributes to the loss of vegetation and reduces the amount of aquifer recharge. In riparian upland areas, compaction causes increased surface runoff, higher peak flows, and bank erosion. Some of the older soils formed on a basalt substrate with relatively high amounts of clay are the ones in the county most likely to compact. Road and skid trail surfaces can increase rapid runoff and limit groundwater recharge.*

Limit recreational and livestock trail use in the riparian area that leads to compaction. Work on road design and/or maintenance to avoid quick runoff and promote aquifer recharge. Use dips or outslopes to limit surface water transfer along roads. Revegetate roads where appropriate and limit access by closing the road with a gate, but keep access for fire protection. Relocate roads if necessary to reduce compaction and facilitate groundwater recharge. Limit use of roads and ground skidding to times when the soil is dry or frozen because it does not compact at those times. Use lighter skidding equipment or off-ground equipment. Educate fishermen and campers about riparian erosion and compaction.
NOTE: Since the original plan was completed in 1993, there has been construction of low rinsing dips on both Forest Service and private roads, and low-impact logging equipment has been used during thinning timber stands.

Water Quality
<u>Temperature (High Priority)</u>.--*Temperature is a high priority on Joseph Creek. Stream temperature recorders consistently show reading of over* 80^0 *F over the last several summers. The area's headwaters are at lower elevations than the other major streams in Wallowa County and naturally more prone to high temperatures. Loss of riparian vegetation and shade has also allowed heating of water on some reaches of Joseph Creek and its tributaries.*

Provide riparian shading to preserve cool temperatures. Protect and possibly increase spring flow by promoting aquifer recharge. Increased flow quantity from cool spring water would help dilute high temperatures. Plant and/or protect conifers in riparian area to provide thermal cover in the winter. Prevent bank erosion, destruction, and devegetation by livestock through physical or electric fencing of the riparian area, and use watering corridors or supply alternative water source.
NOTE: Since the original plan was completed in 1993, riparian vegetation has been enhanced through fencing and planting.

Excess Fine Sediment (High Priority).--*Excess sediment is supplied to portions of Joseph Creek through road use, logging, recreational activities, and livestock activities.*

Limit recreational and livestock trail use in the riparian area that leads to compaction. Prevent bank erosion and destruction by livestock through physical or electric fencing of the riparian area. Use watering corridors or supply alternative water source for livestock. Provide wetlands and/or filter strips for feedlot runoff. Work on road design and/or maintenance to avoid quick runoff and promote aquifer recharge. Limit dust floating from roads to streams with lignosulfonate, water, chip seal, or asphalt. Use dips or outslopes to limit surface water transfer along roads. Revegetate roads where appropriate and limit access by closing the road with a gate, but keep access for fire protection. Relocate roads if necessary to reduce excess sedimentation, to decrease compaction, and to facilitate groundwater recharge. Limit use of roads and ground skidding to when the soil is dry or frozen because it does not compact at these times, and less vegetation is disturbed. Use lighter skidding equipment or off-ground equipment such as helicopters. Educate fishermen and campers about riparian erosion and compaction. Avoid excessively high peak flows and consequent bank erosion by preserving enough watershed vegetation to slow runoff, and enough riparian vegetation to stabilize streambanks.
NOTE: Since the original plan was completed in 1993, in the various tributaries, numerous landowners have constructed fences along the smaller waterways and planted various vegetation to help improve bank stability and reduce erosion. One landowner installed rip rap on the Joseph Creek streambanks to reduce erosion.

Fuel Density (Low Priority).--*Some areas of this watershed have high fuel levels. There is a risk of forest fire and consequent sedimentation.*

Prescribed burns, commercial thinning, or precommercial thinning should be used to reduce fuel levels in some areas. Fuel rearrangement and/or piling can reduce fire risk while preserving the organic material and nutrients for the health and productivity of the forest. In some areas controlled and/or seasonal grazing helps to reduce the "flash" fuels.
NOTE: Since the original plan was completed in 1993, thinning has occurred on both Forest Service and private lands.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure
Channelization (Low Priority).--*Channelization limits stream habitat for anadromous fish.*

Avoid building on the floodplains. Develop mitigation strategies for necessary channelization and bank protection.

Substrate

No problems were identified.

Habitat Requirements

Riparian Vegetation (High Priority)

Protect existing riparian vegetation and the benefits it provides such as shade and streambank stabilization. Plant conifers in riparian area to provide thermal cover in winter. Plant deciduous shrubs and trees to restore riparian vegetation and to provide shade in the summer (and provide habitat for other species as well as salmon). Prevent bank erosion, bank degradation, and riparian devegetation by livestock with physical or electric fencing. Use watering corridors or supply alternate stock water source. Add and/or preserve large woody debris.

WATERSHED MANAGEMENT
APPROACHES TO IMPLEMENTING SOLUTION

Long-term and short-term management for sustainable resources will restore and maintain a healthy ecosystem for vertebrae species and all other Wallowa County residents. However, to restore this ecosystem, we must understand the parameters of its components and practices that are compatible with it. To develop a successful plan, cumulative effects of practices must be considered, as well as long-term goals and short-term requirements.

The resource-based aspects of Wallowa County's economy, ranching, timber harvest, farming, and recreation, all have much to gain by modifying some practices or establishing new parameters so that sustainable timber harvest, grazing, and irrigated crop production can continue in Wallowa County for future generations. Sustainable practices are already utilized by a substantial portion of Wallowa County resource managers.

GENERAL APPROACH

Overall Action

The general public should be educated about overall vertebrae species habitat requirements and reasons for the actions taken and then be allowed to comment.

The effectiveness of all actions taken to benefit vertebrae species should be monitored and modified or terminated if not necessary or effective.

Privately Held Lands

Landowners should be educated about beneficial and detrimental effects of land use on vertebrae species.

Information about governmental and private funding sources to help correct habitat problems and implement solutions suggested in the recovery plan should be provided to landowners.

If funding is limited, funds should be directed first toward correcting high priority problems.

Cost share (and possibly other) incentives for landowners should be provided to those who maintain and enhance watershed conditions and overall environmental quality. See appendix C for cost-share funding sources.

Publicly Held Lands

A coordinated and cooperative effort among agencies should be the focus to make sure efforts at implementing solutions are not duplicated or left out.

Adequate funding for implementation of solutions necessary for watershed enhancement needs to be assured.

Public agencies need to work with adjoining private landowners and other agencies to provide continuity between ownerships in management and monitoring.

Management Tables

The tables in this discussion show general approaches for the management of specific resources or activities. A single management approach can potentially address several interrelated habitat problems. For example, a livestock management approach that encourages buffer strips adjacent to streams would in effect help to (1) manage livestock to enhance fisheries habitat, (2) protect vegetative cover, (3) maintain healthy riparian plant communities, (4) increase riparian shading to preserve cool water temperatures, etc. Solutions to specific problems have been categorized and are listed by identifying number in Appendix B.

Each table consists of a list of management approaches in the first column and the solutions that would be addressed by that approach in the second column. Numbers in the second column identify the solutions listed in Appendix B.

WATER

The availability of clean, high quality water is a key component of good salmon habitat. Salmon have evolved and adapted to the natural flow conditions of the area which are generally (1) high flows in March through July (depending on elevation) due to melting snowpack and (2) moderate to low flows at other times. The lower natural flows are good for salmon spawning, incubation, and rearing. Higher flows are needed to assist migration and remove fine sediment buildup from streams.

On some reaches of streams in the County, irrigation and stock water diversions during low flow times remove enough water to eliminate rearing habitat and make passage impossible for migrating salmon.

The goal for water management is to cooperate with water-right holders and governmental water conservation/management agencies (e.g. Natural Resources Conservation Service (NRCS), Soil and Water Conservation Districts (SWCDs), Oregon Water Resources Division (OWRD), and the Bureau of Reclamation (BOR)) to find ways to supply water needed for salmon habitat. Some ways of potentially finding water to supplement low flows include irrigation conservation measures, adding irrigation impoundments to replace stream diversions during low flow, and leasing water rights during late season flow (i.e., after the second cutting of hay). Additional water during low flow times may be made available through improved forest management and control of tree densities.

Table 3 summarizes the suggested approaches for water management and the solutions that would be addressed.

Table 3.--Water Management

Approach	Solutions Addressed[1]
• Inventory all water withdrawals and irrigation return flows.	16, 32, 20
• Support OWRD monitoring of water withdrawals to ensure that users remain within their legal water appropriations. (This may also benefit junior water-right holders during times their water rights are curtailed due to lack of water.)	16
• Within existing law, purchase water during low flow times. (Private water right-holders are allowed to sell, lease, or donate water rights to be converted into instream purposes. The Endangered Species Act also allows purchase of water.)	15, 22
• Water may be obtained through water that is "conserved" by development projects upstream, e.g.; impoundments, sprinkler systems, and pipelines	16, 17
• Preserve shaded, iced snowpack (no large clearcut or overcutting) to avoid early melt and runoff (control tree densities and study to determine which tree densities provide the largest quantity and longest duration of snowpack)	12, 13, 31
• Promote the installation of more efficient irrigation systems.	16, 17

[1]See Appendix B

FORESTS

The forest canopy intercepts precipitation. As much as 15 to 40 percent of precipitation remains in the forest canopy for some period of time. Precipitation intercepted by trees is subject to evaporation and transpiration, and this is recycled back into atmospheric water and possible future precipitation, rather than contributing immediately to ground water and streamflow.

Small forest openings may be beneficial to stream hydrology and salmonid ecology because they store more snowpack, increase groundwater supply, and release more groundwater to streams. Large clearcuts (greater than 40 acres) have detrimental effects which include early melting and release of water to streams which may result in higher peak or floodflows in the spring and lower flows later in the year. Lower flows can create high temperatures and other stress problems for fish, and less water for irrigation. Flow and environmental problems resulting from large clearcuts persist for 25 to 50 years.

Forest practices that produce roads and compaction may have negative impacts on salmonid ecology. On a healthy forest floor there is almost no overland flow. However, in roads and skid trails that have been devegetated and/or compacted, water does not penetrate the ground as easily. The result is overland flow that may carry significant fine sediment and occasionally coarser sediment into streams.

Compaction from roads can also intercept movement of water through soil creating bogs and increasing pore pressure up-slope from the compacted strip. Where slopes are steep, and where fills are present and culverts small or plugged, failure of the road, fill, or slope, and the sudden, major input of sediments to a stream may occur. Subsoilers and rippers may eliminate the compaction problem but generally create additional sedimentation. The roadway can be seeded to grass with a range drill. This seeds and stabilizes the road, allowing road use for fire management or timber harvest.

Table 4 summarizes the forest management approaches related to tree density and fuel loads. Some of the approaches listed in tables of other management categories, e.g., roads, livestock, and campgrounds, also apply to forest management.

Table 4.--Forest Management

Approach	Solutions Addressed
Tree Density	
• Maintain appropriate average density of trees, e.g., 50-110 square feet basal area on south facing slopes and ridges 90-160 square feet basal area on north facing slopes	2, 3, 10, 12, 13, 24
• Promote early precommercial thinning.	1, 2, 24
• Emphasize selective logging practices where appropriate.	10, 12, 13, 24
• Encourage the orientation of created openings according to aspect, slope, alignment, and shape, to maximize shaded snow pack.	10, 12, 13, 24, 2b, 2d
• Encourage 40-50 percent shading (winter sun) at noon on 50 percent of the forested watershed outside riparian areas.	10, 11, 13, 24, 2a, 2b, 2d.
• Encourage species diversity.	10, 24, 2d
• Encourage development of management plans for private landowners, e.g., Assistance from Oregon State Forestry Department Assistance from forestry consultants. Assistance from Oregon State Extension/Master Woodland Managers.	Can address many solutions in plan
• Shelter wood seed cut, shelter wood removal cut, irregular shelter wood, single tree selection, group selection, and clearcut.	2a, 2c, 2d, 2e
• Mechanical under thinning.	1a

Table 4.--Forest Management (Cont.)	
Approach	**Solutions Addressed**
Fuel Loads	
• Encourage land managers to maintain riparian fuel loads at not more than 35 tons/acre average. Some acres may have higher loads, and some may have lower loads depending on the intensity of fuel management.	1, 2, 39, 42, 43, 58, 85, 87, 94, 97, 130
• Encourage land managers to maintain upland fuel loads at an average of 25 tons/acre or less. Some acres may have higher or lower loads, depending on the intensity of fuel management.	1, 2, 39, 130
• Encourage land managers to harvest salvage as rapidly as possible while meeting environmental concerns such as adequate woody material recruitment for stream and riparian needs.	1, 2, 39, 42, 43, 58
• Encourage land managers to analyze fuels and fire potential ladder. Fuels and dense crowns contribute to crown fires.	1, 2, 39
• Encourage land managers to develop fire control corridors if time and resources are not available to treat the entire area.	1, 2, 39, 59
• Encourage land managers to select and place appropriate woody Material in upland areas, riparian area, and streams to benefit stream structure, replenish soil inventories, reduce soil movement, and reduce fire risks.	58, 85, 86, 87, 108

RIPARIAN AREAS

Riparian areas, about 5 percent of Wallowa County's forested areas, are the most fragile and yet the most productive parts of a watershed. About 70 percent of the wildlife in a watershed either lives in or frequents the riparian zone. The intent of timber harvest in riparian zones should be to enhance watershed conditions.

A healthy stream is a stream with little bank exposed. Even during high water, the effect of riparian vegetation is to protect streambanks from erosion by floods and ice and to slow floodwaters and allow fine sediments to settle out, building soil fertility and thickness. The fine soils of the floodplain store water.

Establishment and preservation of woody vegetation along floodplains and in riparian zones is essential to a healthy stream system. Woody debris in the stream provides hiding cover for small fish and nutrients for invertebrates that fish eat. Past practices removed woody debris from the streams. Approaches for riparian management are summarized in table 5.

Table 5.--Riparian Management	
Approach	**Solutions Addressed**
• Encourage the design of riparian management to be site specific	10, 20A, 20B, 28, 68, 89, 91, 108
• Encourage relocation design of roads, trails, and campgrounds whenever possible. -Revegetate roads and trails with native grass species and/or non-native desirables.	6, 7, 8, 11, 25, 36, 37, 38, 45, 47, 68, 115
• Encourage hardened fords and bridges for crossing and watering points for livestock.	25, 51, 92
• Encourage fencing, electronic tagging, and creation of natural barriers to large animal use of critical spawning and rearing reaches. e.g., Develop and encourage alternatives to instream watering.	8, 10, 25, 49, 50, 54, 68, 108
• Provide shade for riparian areas to maintain optimum water temperature for salmon on a site specific basis: Good=60 percent and above Fair=40 percent to 60 percent Poor=40 percent and below	10, 20A, 20B, 25, 28, 30, 85, 94, 108, 130
• Encourage retention of snags and trees for future large woody debris.	28, 94
• Encourage revegetation and protection of existing vegetation on non-forested riparian areas with woody material. e.g., Educate land owners on value of streamside woody plants.	10, 20A, 28, 30, 38, 49, 68, 85, 94, 108
• Establish carrying capacities for campgrounds and trails.	77, 25, 44, 46
• Education by signing and brochures to fishermen and campers about use of riparian zone.	48, 71, 130
• Encourage design, implementation, and evaluation of grazing management systems. e.g., Manage late summer/fall use in riparian pastures.	8, 10, 25, 28, 50, 68, 108
• Limit future development in riparian zones, e.g., Avoid building on floodplains.	26, 74, 90
• Utilize Oregon Forest Practices Act for minimum protection standards. (The current FPA is in the process of being updated.)	10, 28, 30, 39, 68, 94, 108
• Encourage minimal impact methods for noxious weed control in riparian zone. e.g., Spot-spraying, pull by hand, biological control. Revegetate with thrifty competitive native species	63, 64, 65
• Use filter strips as appropriate.	38, 54

LIVESTOCK

Properly managed, livestock grazing may be of benefit in riparian management. However, livestock near streams can cause a variety of habitat problems. Major problems are loss of riparian vegetation and water quality degradation.

Riparian vegetation provides shade for streams and protects banks. It is to the long term benefit of the landowner to maintain healthy riparian vegetation because the root systems of the shrubs and forbs in meadow areas and trees in other areas are a protection against bank erosion during high water. In some cases, several acres of ground have been lost to erosion during high water.

Livestock use can reduce water quality by increasing temperature through loss of shade, adding sediment, and adding fecal coliform bacteria. Improving water quality in some stream reaches is important for several reasons in addition to improving salmon habitat. Maintaining water quality is important in avoiding potential health problems for children and adults who use the water downstream for recreation.

The season, timing, frequency, duration and intensity of grazing use should be based on the physical and biological characteristics of the site. This should offer adequate cover (live plants, plant litter, and residue), vigorous plants, and proper root growth to promote infiltration, conserve soil moisture and maintain soil stability.

Approaches to livestock management are listed in table 6. Many of these approaches, while requiring a change in management practices, should benefit landowners over the long term by providing for the continued health and productivity of the land.

Table 6.--Livestock Management

Approach	Solutions Addressed
General	
• Provide alternate water sources in both upland and riparian areas.	8, 10, 11, 20A, 28, 50
• Use upland salting.	8, 10, 11, 20A, 28, 50
• Study and monitor the use of seasonal grazing to enhance riparian conditions.	8, 10, 11, 20A, 28, 50, 108
• Use well planned riparian fencing in spawning areas, e.g., -Let down type fencing. -Temporary electric. -Permanent fencing.	8, 10, 11, 20A, 28, 50, 108

Table 6.--Livestock Management (cont.)	
Approach	**Solutions Addressed**
• Use approved educational processes through whatever means available, e.g., NRCS, OSU Department of Forestry and Extension Service.	130
• Keep abreast of and use new technology such as electronic ear tags as it becomes available.	50, 130
• Where beneficial, look at reorganization of pasture rotation as well as resource allocation between livestock and wildlife.	20A
• Document early spring use by wildlife that occurs prior to turnout.	9
• Use temporary fencing along rivers to prevent riparian damage during winter feeding periods.	50
• Use BLM, USFS, SCS, ASCS, OSU Extension, and ODFW to provide coordinated monitoring.	130
• Encourage rangeland revegetation.	10, 57
• Monitor and control noxious weeds.	63, 64, 65, 77
• Develop CRMP with USFS, BLM, NRCS, FSA, SWCD and ODFW.	
• Use filter strips as appropriate.	
• Use appropriate timing frequency, duration and intensity of livestock grazing.	
Feedlots	
• Graze or feed livestock in or near riparian areas during the dormant season or early spring particularly at lower elevations.	8, 9, 10, 20A, 28, 54, 55, 108
• Encourage buffer strips, and in some instances, earth berms adjacent to streams.	8, 9, 10, 20A, 28, 54, 55, 108
• Encourage the planting of vegetation in filter strips, along streambanks and berms. Species selected for these plantings must be appropriate for the purpose or objective chosen.	30, 108
• Encourage locating feedlots away from riparian areas whenever practical.	8, 9, 10, 20A, 28, 50, 55, 108
• Encourage feeding in such a manner that the most decomposed material will be near the stream and the newest material will be farthest from the stream.	8, 9, 10, 20A, 108
• Encourage the planting of shelter belts and the development of water away from streams and riparian areas.	8, 9, 10, 20A, 28, 50
• Encourage livestock producers to consider visual aspects and public perceptions as they design feedlots and livestock handling facilities.	130
• Encourage livestock producers to consider odor control, dust, and noise in relation to neighbors or the public's perceptions.	130

• Encourage cooperation with State and Federal agencies through incentive programs designed to improve habitat conditions and research projects that will turn problems into economic benefits.	130

WEEDS

A number of noxious, invasive, non-native weeds are spread throughout the county. These weeds can replace native vegetation and destroy ecological diversity. Root systems of many weeds do not provide the soil stability of native vegetation. As a result, an increase of weeds may increase soil erosion in riparian and upland areas.

One way that weeds spread is by seeds entering streams or ditches. Areas where the soil is exposed through logging, fires, and agricultural activities are conducive to infestation by noxious weeds. Reseeding after the Teepee Butte Fire introduced yellowstar thistle (Centaurea solstitialis) into that area because of a contaminated seed source. Other problem weeds include Russian knapweed (Centaurea repens), diffuse knapweed (Centaurea diffusa), spotted knapweed (Centaurea maculosa), and leafy spurge (Euphoria esula), among a host of other nonnative plant species in the County.

The noxious weeds need to be aggressively controlled and eradicated if possible. Approaches to weed management are summarized in table 7.

Table 7.--Weed Management

Approach	Solutions Addressed
• Identify, map, and manage species on an ongoing basis with Wallowa County Weed Control Supervisor, BLM, USFS, and ODFW.	66
• Apply proper herbicides using licensed applicator.	63
• Use biological control or hand-pulling in areas where herbicides are inappropriate.	64, 65
• Monitoring should be ongoing.	66
• Work with Wallowa County weed control officer and committee.	66
• Use aggressive educational programs.	130
• Use new technology as it becomes available.	66, 130
• Replant native and/or desirable non-native vegetation.	66

ROADS

Roads are an integral part of resource management and have many roles. They are particularly important in forest management where they play a key role as fire breaks and as means of quickly bringing firefighters and equipment to the fire.

Poorly designed, located, and maintained roads are a major source of sedimentation to streams. Other impacts can include loss of riparian shade and channelization due to drawbottom roads, increased surface runoff, decreased groundwater recharge, and potential chemical contamination.

The adverse impacts of roads in Wallowa County are not necessarily as severe as those in areas that have heavier rainfall such as western Oregon. Even so, Wallowa County roads need to be evaluated, designed, and maintained to handle the heaviest expected rainfall and runoff without excessive sedimentation.

The approaches outlined in table 8 are to be implemented to mitigate the adverse effects of roads on salmon habitat.

Table 8.--Road Management

Approach	Solutions Addressed
• Develop a comprehensive County transportation plan. - Identify and map all existing roads in the County. - Identify non-essential roads and make decision to leave open, close with very limited use or obliterate. - Develop condition index for all existing roads, and bring substandard roads up to "use" standards or close.	5, 6, 11, 34, 35, 36, 37, 38, 39, 40, 46, 51, 92, 108
• Evaluate draw bottom roads. -Identify draw bottom roads on County transportation map. -Determine total mileage and percent of total riparian area occupied by draw bottom roads. - Close draw bottom road wherever appropriate.	5, 6, 11, 34, 35, 36, 37, 38, 39, 46, 52, 92, 108
• Temporary road/skid trail construction and maintenance. -Build to suit use; do not over build. -In small stream crossings it might cause less damage to the stream if hard ended fords were used instead of installing, then removing culverts. -Cover with slash if the road/trail will be used within 2 years. -Reseed with grass if the road/trail will be used within 2-20 years. - Plant trees or other suitable plant species if the road/trail will be closed for more than 20 years. -Ripping should be avoided unless no other option is available.	5, 11, 34, 36, 39, 40, 46, 51, 92, 108

Table 8.--Road Management (cont.)	
Approach	**Solutions Addressed**
• Criteria for maintenance of closed road. -Develop a County-wide definition of a "closed road." -Pull all culverts if a road is closed and not maintained. -Pull all culverts on obliterated roads. -Maintain all seasonally closed roads. -Use structures sufficient to effectively close road.	38
• Road surface criteria - Permanent main-haul roads should be paved whenever practical. -Dust should be minimized through application of lignosulfonate, water, etc. -Surface material needed (i.e., pavement, gravel, or soil) would depend on the expected use, length of use, and, if temporary, the length of closure. Pavement would be preferred for high traffic permanent roads. Gravel would be preferred for medium traffic, permanent roads and for temporary roads that would have shorter closure times and would, therefore, not be replanted. Soil would be acceptable for minimum traffic roads that would have longer closure times, and would, therefore, be replanted. Local conditions will necessarily play an important role in choosing a suitable surfacing material.	35
• Criteria for road placement. -Wet areas should be avoided. -Minimize erosion during construction. -Do not construct roads during the rainy season where overland flow (perennial or intermittent) is present. -Construct the road to the standard needed for the projected use.	5, 6, 11, 34, 36, 37, 39, 46, 92, 108
• Criteria for road maintenance. -A maintenance plan and schedule should be developed for all roads. -Use of gravel and dirt roads would be minimized during the spring thaw, and the use of dirt roads would be minimized during the rainy season. -Draw bottom roads should not be graded toward the stream. -Culverts, water bars, and dips would be regularly inspected and immediately repaired as needed.	34, 36
• Criteria for determining appropriate road grades. -Assess associated environmental effects to determine whether a steeper, shorter road might be more appropriate than a longer, lower gradient one. -Take into account slope, aspect, substrate, length, and type of use.	5, 6, 11, 34, 36, 37, 46, 108

Table 8.--Road Management (cont.)	
Approach	**Solutions Addressed**
• Road drainage requirements. -Use an adequate number of relief culverts, water bars, or dips to prevent active erosional features from appearing on the road, and direct the outlet onto a suitable substrate (and/or filter strip) to minimize erosion down slope of the road. -Relief structures are generally needed for every five feet of elevation gain. -Out-sloping of the road may minimize the need for relief structures.	5, 34, 36
• Use filter strips where appropriate	34

FILTER STRIPS

Filter strips are managed areas of firmly rooted vegetation designed to slow sheet movement of water and intercept the sediment contained in the water. They can improve water quality by reducing movement of excess nutrients and other pollutants as well as sediment into streams. Filter strips can also help recharge the groundwater by intercepting water from roads, allowing the water to percolate into the ground.

Filter strips are effective in stopping or reducing sedimentation from a variety of sources including feedlots, agricultural fields, and roads. They are effective as field borders in reducing sheet erosion from bare, plowed fields. Located below relief culverts and dips on the downhill side of roads, they can be especially effective in reducing sediment movement.

Filter strips, as outlined in table 9, are a management tool that can be applied in resource management.

<table>
<tr><th colspan="2">Table 9.—Filter Strip Management</th></tr>
<tr><th>Approach</th><th>Solutions Addressed</th></tr>
<tr><td>• Suggested minimum filter strip widths (NRCS). Considerations for designing a filter strip include type and quantity of pollutant, slope, soil type, drainage, vegetative species, etc. The chart below shows the width of filter strip in feet, based on slope (vertical drop in feet per 100 feet) and the length of the slope in feet.
<table>
<tr><th>Slope</th><th colspan="10">Length of Slope (feet)</th></tr>
<tr><th></th><th>100</th><th>110</th><th>120</th><th>130</th><th>140</th><th>150</th><th>160</th><th>180</th><th>200</th><th>300</th></tr>
<tr><td>10</td><td>14</td><td>14</td><td>14</td><td>14</td><td>14</td><td>14</td><td>14</td><td>14</td><td>14</td><td>17</td></tr>
<tr><td>12</td><td>14</td><td>14.5</td><td>17</td><td>17</td><td>17</td><td>18</td><td>18</td><td>19</td><td>20</td><td>22</td></tr>
<tr><td>14</td><td>14</td><td>20</td><td>20</td><td>21</td><td>21</td><td>22</td><td>22</td><td>23</td><td>24</td><td>27</td></tr>
<tr><td>16</td><td>14</td><td>23</td><td>24</td><td>25</td><td>25</td><td>26</td><td>26</td><td>27</td><td>28</td><td>32</td></tr>
<tr><td>18</td><td>14</td><td>27</td><td>28</td><td>29</td><td>30</td><td>30</td><td>31</td><td>32</td><td>33</td><td>37</td></tr>
<tr><td>20</td><td>14</td><td>32</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>43</td></tr>
<tr><td>23</td><td>14</td><td>42</td><td>43</td><td>44</td><td>46</td><td>47</td><td>48</td><td>49</td><td>51</td><td>57</td></tr>
<tr><td>30</td><td>14</td><td>54</td><td>55</td><td>57</td><td>58</td><td>59</td><td>60</td><td>62</td><td>64</td><td>73</td></tr>
<tr><td>40</td><td>14</td><td>78</td><td>80</td><td>82</td><td>84</td><td>86</td><td>88</td><td>91</td><td>94</td><td>106</td></tr>
<tr><td>50</td><td>14</td><td>105</td><td>108</td><td>110</td><td>113</td><td>115</td><td>117</td><td>122</td><td>125</td><td>142</td></tr>
<tr><td>60</td><td>14</td><td>133</td><td>136</td><td>140</td><td>143</td><td>146</td><td>149</td><td>154</td><td>160</td><td>180</td></tr>
</table></td><td>34, 50, 54</td></tr>
<tr><td>• Discourage intensive activities in areas which might need a filter strip that have over 5 percent slope.</td><td>34, 50, 54</td></tr>
<tr><td>• Design and install settling basins between waste source and filter strip when more than 100-1,000 pound animal units are confined. Clean basin as needed.</td><td>34, 50, 54</td></tr>
<tr><td>• Grass area filter strips shall be generally on contour and sufficiently wide to pass peak flow at a depth of 0.5 inches or less and provide a minimum of 15 minutes flow-through time.</td><td>34, 50, 54</td></tr>
<tr><td>• Grass channel filter strips shall be designed to carry the peak flow at a depth of 0.5 feet or less and provide at least 30 minutes of flow-through time.</td><td>34, 50, 54</td></tr>
<tr><td>• Filter strips on forest land should be at least 25 feet on slopes of less than 1 percent and proportionately up to 65 feet for 30 percent slopes and at least 150 feet for 70 percent slopes. Longer flow lengths should be used as contributing drainage areas increase.</td><td>34, 50, 54</td></tr>
<tr><td>• Monitor performance and condition of filter strips. Rills and small channels should be minimized to maintain sheet flow through filter area.</td><td>34, 50, 54</td></tr>
<tr><td>• Grazing in filter strip should be controlled to maintain vegetation in a vigorous condition.</td><td>34, 50 54</td></tr>
<tr><td>• Installation of filter strips in riparian areas should avoid ground disturbance and removal of trees, stumps, brush, rocks, etc., and consequently may need to be larger than the minimum dimensions.</td><td>34, 54, 108</td></tr>
</table>

CAMPGROUNDS

Campgrounds can be areas of high impact to the adjoining lands and streams. Potential impacts include compaction of soils, devegetation of areas, removal of woody material, and removal of shade trees. Severity of impact is often directly related to intensity of use.

Campgrounds immediately adjoining streams are not compatible with the management of healthy riparian areas and are especially incompatible near salmon spawning areas where harassment of salmon can occur. The removal of "hazard" trees in campgrounds reduces stream shading and the availability of large woody debris for stream structure. Approaches to campground management are outlined in table 10.

Table 10.--Campground Management

Approach	Solutions Addressed
• Move all recreational improvements at least 100 feet from streambanks.	45, 47
• Set barriers to restrict vehicles from the streambank.	36, 46, 47
• Educate through signing, news releases, and visitor contact.	48, 130
• Inventory campground/day use areas, identify problems and solutions.	46, 47
• Seasonal closures of campgrounds where necessary to protect holding and spawning reaches, e.g., dispersed areas, old fire rings.	44
• Develop in land-use plans the location and design of future campgrounds.	45, 46, 47
• Close (with order) dispersed sites within 100 feet of streambank.	45, 47
• Provide dust abatement throughout campground.	35, 36, 46
• Provide noxious weed control.	63, 64, 65
• Restore riparian vegetation.	11, 46, 49
• Establish carrying capacity for recreational areas.	7, 25, 44, 46

IMPLEMENTATION OF THE WALLOWA COUNTY/ NEZ PERCE TRIBE SALMON HABITAT RECOVERY AND MULTI-SPECIES STRATEGY (WC/NPS&MS)

Wallowa County will be managed on a watershed basis. The management will be coordinated by the Wallowa County Natural Resource Advisory Committee (NRAC) and its technical committee. The Wallowa County Court appointed this committee in the spring of 1996. The committee is comprised of twenty members representing the following interests: Tribal, Federal, Landowner, Business, Industry, Professional, State, Environmental, County and Community. The Advisory Committee is supported in its endeavors by a Technical Committee that provides natural resource expertise.

The delineation of the watershed units has not been completed. The U.S. Forest Service (USFS) and the Natural Resource Conservation Service (NRCS) are currently debating a system to delineate watershed boundaries. This agreement is necessary for the incorporation of the data into various GIS systems. Once the hydrologic boundaries have been agreed to, NRAC will recommend the various watershed planning units.

A Watershed unit analysis will provide current baseline data and should be compared to the historic range of variability. Monitoring and flexibility will be incorporated in the analysis so that implementation of the WC/NPS&MS moves ahead in a positive, pro-active manner. Analysis is currently being accomplished in several ways. Coordinated Resource Management Plans (CRMP's) and/or Watershed Action Plans have been developed or are being developed on Bear Creek, Lostine River, Big Sheep Creek, Little Sheep Creek, and Upper Joseph Creek. These Coordinated Resource Management Plans and/or Watershed Action Plans, and the projects identified in them, are based on the Plan.

The use of the WC/NPS&MS reach-by-reach information and the on-the-ground cover type/stand structure analysis of the watershed will provide a basis to design projects to enhance, maintain or create habitat in each management area. Should the landowners choose to implement changes, the management approaches suggested in the WC/NPS&MS may be used. Landowners will be offered encouragement and assistance in project implementation. It is intended that the implementation of projects be adaptive and that projects be monitored.

Participation in WC/NPS&MS implementation includes private landowners, Nez Perce Tribe, USFS, Soil & Water Conservation District (SWCD), NRCS, Oregon Department of Fish Wildlife, Grande Ronde Model Watershed Program (GRMWP), Oregon Department of Forestry (ODF), and Oregon State University (OSU). Because the WC/NPS&MS is incorporated into the Wallowa County Land Use Plan and Zoning Ordinances, requests for County Permits or County sign-off through the Wallowa County Planning Department require review by the Technical Committee in all Land Use Zones. These reviews sometimes include the creation of developmental or resource management plans for a land ownership.

Recommendations of the technical committee based on the WC/NPS&MS are incorporated into the projects. The effectiveness of the projects is reviewed annually on a project-by-project basis and on an overall watershed basis. This monitoring also provides the opportunity to adapt that which is learned into future projects.

Baseline and project monitoring data is currently being collected by a coalition of entities in Wallowa County including:

Wallowa Soil and Water Conservation District (SWCD)
Oregon Department of Fish and Wildlife (ODFW)
USDA Forest Service (USFS)
Nez Perce Tribe (NPT)
Natural Resources Conservation Service (NRCS)
Grande Ronde Model Watershed (GRMWP)
Oregon Department of Agriculture (ODA)
Wallowa County Road Department
Bureau of Land Management (BLM)
Oregon Department of Forestry (ODF)
Oregon State University Extension Service (OSU)
Oregon Watershed Enhancement Board (OWEB)
Oregon Department of Environmental Quality (DEQ)
Bureau of Reclamation (BOR)
Oregon Division of State Lands (DSL)

This coalition of entities has agreed to the use of the DEQ protocols for water quality monitoring. Field training was done in the spring of 1999 taught by DEQ on the monitoring techniques and protocols for over 20 individuals. The coordination of the water quality monitoring in the watershed has been established so that duplication of efforts is minimized. A software package to allow for the sharing of temperature data with attached meta-data included. It has been agreed that any data that is shared will be collected by the appropriate protocols.

Activities addressing the many biological conditions in our County must be accomplished in a timely manner to be efficient and successful. Injunctions and appeals can be counterproductive to restoration/enhancement activities. Endorsement of the WC/NPS&MS by the various regulatory agencies (National Marine Fisheries Service (NMFS), United States Fish &Wildlife (USF&W), and Department of Environmental Quality (DEQ) will form a basis with which to avoid some of the blanket appeals that are currently filed.

Wallowa County is a "demonstration area" under the State of Oregon and is being considered for designation as a Reinvention Laboratory under the Federal Government for watershed enhancement activities. The intent of this designation is to show that active management can produce a variety of healthy conditions for endangered species, forest health, clean water, and a stable socio-economic structure.

Any plan that does not have local ownership and support as well as the cooperation of governmental agencies will not succeed. Wallowa County views the consensus effort that produced the Wallowa County/Nez Perce Tribe Salmon Habitat Recovery and Multi-species strategy as the best solution to providing healthy ecosystems that balance the needs of animals and humans.

Appendix A

Wallowa County Salmon Recovery Strategy Committee Members and Alternates

APPENDIX A
WALLOWA COUNTY SALMON RECOVERY STRATEGY COMMITTEE MEMBERS AND ALTERNATES
Who Developed the Plan in 1992

Agriculture/Grazing:

Jack McClaran:

- President and CEO, McClaran Ranch, Inc.
- U.S. Army 45th Armored Division Platoon Sgt.--Tank Commander
- University of Idaho B.S. (Business Ad.) Extractive Industries
- Graduated from High School in Lewiston, Idaho
- Committees and memberships:
  - Chair of Federal Grand Jury.
  - Member and chair of Imnaha School Board.
  - Member of Enterprise City Council.
  - Vice President of Oregon Cattleman's Association.
  - Committee Chair, Oregon Cattleman's Association- Public Lands & Legislative
  - President, Wallowa County Stockgrowers.
  - Wallowa County Cattleman of the Year
  - Wallowa County Grassman of the Year
  - Oregon Governor Atiyeh's representative - Hell's Canyon Management Team
  - Wallowa County JC's "Outstanding Young Farmer."

Mack Birkmaier:

- Responsible for management of cattle operation with 5000 deeded acres and two U.S.F.S. allotments with permits for approximately 400 head of cattle, 42 years. The allotments are on Swamp Creek and Cougar Creek.
- Lifetime experience working with Forest Service Personnel and other permittees running cattle in the Joseph Creek drainage and cooperating in all areas with the USDA Forest Service in regard to range management and resource conservation.
- U.S. Navy.
- Oregon State University.
- Born in Wallowa County but attended elementary and secondary schools in Portland; John Day; Denver; Arlington, VA (his father was assistant to the USDA Forest Service Chief in Washington D.C.); and Enterprise, OR.
- Committees and Memberships:
  - Alpha Gamma Rho Fraternity.
  - Lewis School District, former Board Chairman.
  - Enterprise School District, former Board Chairman.
  - Wallowa County Soil and Water Conservation District, former member.
  - A.S.C.S. Committee, former member.
  - Wallowa County Stockgrowers Association, member and past president.

Oregon Cattlemen's Association; former chair of Wildlife Commission; former 2nd Vice President; President elect and chair of Endangered Species Committee.

Upper Grande Ronde conservation strategy for salmon restoration.

Grande Ronde Model Watershed.

Numerous other committees on ditches and water.

Awards:

Wallowa County Stockgrowers: Grass Man of the Year, 1966; Cattleman of the Year, 1992.

Wallowa County Soil and Water Conservation District, State award for outstanding accomplishment in resource conservation, 1988 and 1989.

Wallowa County Chamber of Commerce, agricultural leader of the year award, 1992.

Arleigh Isley:

Wallowa County Judge, January 1992-1994

Oregon State Extension Service Natural Resources, Agriculture, and Community Development, 1969-1992.

U.S.F.S. Range Conservationist, 1965-1969.

Professor Emeritus OSU.

M.S., Agricultural and Resource Economics, Oregon State University, 1977.

B.S., Range Management and Ecology, Oregon State University, 1965.

Committees and Memberships:

Private land coordinator for Oregon Range and Related Evaluations, 1979-1984.

Project leader, Oregon Forest Intensive Research Project, Southern Oregon, 1977-1979.

Southeastern Oregon Community Development and Natural Resource Council, 1972-1977.

Charter member of American Society of Range Management, Wallowa County Chapter.

Project leader, Survey of Oregon Owned Rangelands, 1964-1969.

Owned and operated various cattle ranches from 80 to 350,000 acres with 25 to 2000 head of cattle.

Published "Horse Packing in Back Country", "Oregon Rangeland Resources", "Pre-settlement Vegetation of the High Desert", and numerous fact sheet newsletters and short technical articles.

Technical Advisor and Editor for USFS film "Land of Many Users".

Slide Tape Programs:

"Comprehensive Resource Management"

"The Water Cycle"

"Birth of a Calf"

"Reducing Risk from Natural Phenomena"

"Optimizing your Forest Resources"

"Resources for All"

Presentations:

International Stockman's School, El Paso Texas-Horse Pack in Back Country.

Society of Range Management Annual Conference, "Comprehensive Resource

Management"

Oregon State Water Conference, "Water Cycle-How Do We Enhance It?"

Bureau of Land Management:

Jack Albright:

Area Manager, Baker Resource Area, Vale District, BLM.

Has worked for BLM for 25 years including working as Range Conservationist at the Las Cruces, Boise, and Canyon City Districts and as Area Manger at the Royal Gorge Resource Area, Canyon City District.

B.S., Agronomy, Oklahoma State University.

Business/Community:

Larry Snook:

Owns and operates a clothing/outdoor store in Wallowa County since 1976.

Worked in retail in Lebanon, Oregon from 1962 to 1976.

Eastern Oregon State College.

Worked on summer survey crew for USDA Forest Service.

Graduated from Baker High School, 1960.

Has been active as a hunter and fisherman who tries to leave an area in better condition than it was when he got there and is very environmentally conscious.

Committees and memberships:

Former Scout Master for several years.

Former member--Planning Commission.

Former member--Hospital Board.

Chamber of Commerce.

Former member and co-chair of Wallowa Lake County Service District.

Airport Committee.

Awards:

Lebanon Chamber of Commerce--Jr. First Citizen.

Environmental Interests:

Duncan Lagoe:

Mechanical/Optical Engineer for IBM, 25 years, retired in 1988.

Has lived in Wallowa County 4 1/2 years.

Committees and Memberships:

Wallowa Valley Resource Council, 1988 to present.

Wallowa Wild and Scenic River Study Ad Hoc Committee, 1989 to 1992.

Labor:

Paul Morehead:

Oiler/relief man for Boise Cascade, 1960-1993.

Rachet setter to Mt. Emily Lumber Company, 1955-1960.

Worked for J. Herbert Bate Company, Wallowa, OR, 1950-1955

U.S. Army, 1947-1950.
Fire fighter for Oregon State Department of Forestry, 1945-1946.
Camp cook for Oregon State Department of Forestry, summer job at age 15.
LaGrande High School.
Life long resident of Union and Wallowa Counties.
Committees and Memberships:
43-year member of Western Council of Industrial Workers, United Brotherhood of Carpenters and Joiners of America, held offices of Financial Secretary, Warden, and Trustee.
Member, Easter Oregon Labor Council, AFL-CIO.
30-year member of National Rifle Association.
5-year member of NW Timber Workers Resource Council.
2-year Wild and Scenic River Team for Grande Ronde and Wallowa Rivers.

John Roberts:
Plantsite Handyman for the Boise Cascade sawmill in Joseph, has worked for Boise Cascade 1972-present.
Timber faller for J.I. Morgan 1970-1972.
United States Marine Corps, 1966-1970, Viet Nam veteran.
John is a fourth generation Wallowa County resident. His grandfather, Samuel Roberts, homesteaded in the Leap area of Wallowa County in 1887. Agricultural background includes having been reared on a farm west of Wallowa.
Committees and Memberships:
President of Union Local 2798, Joseph, for 18 years.
President of Blue Mountain Area Caucus, Western Council of Industrial Workers, 8 years.
School Board Member, Joseph School District, 1988 to present.
Chair of School Board, 1989.
High School Track Coach, 1993.
Middle School Track Coach, 1990 to 1993.
Intermediate Soccer Coach for 3 years.
Umpire Little League Baseball 4 years.
Assisted with Eagle Cap 4-H Livestock Club for 7 years.
Member of Veterans of Foreign Wars since 1970.

Large Landowners:

Bob Weinberger:
Chief forester for Boise Cascade's northeast Oregon region (300,000 acres of B.C.'s land), has worked for B.C. 1974-present.
BLM forest and range management, 1969-1974.
Graduate courses in land management.
B.S. in Forest Management, Colorado State University.
Retired Captain U.S. navy reserve.
Committees and Memberships:
Society of American Foresters (former chair of the Oregon State Society of this

organization).

Blue Mountain Private Land Forest Tree Seed/Seedling network, chair.

Wallowa Wild and Scenic Study River working group for the U.S.F.S.

Grande Ronde Wild and Scenic River working group for the B.L.M.

Union County Overall Economic Development Plan Committee (past chair).

Eastern Oregon State College Agri-Business Advisory Council.

Union County Weed Control Board (past chair).

Vice-Chairman of the Eastern Oregon Forest Protection Association.

Chair of budget committee for Northeast Oregon Fire Patrol District.

Public advisory committee for the ODF&W Grande Ronde River Basin Fish Management Plan.

Blue Mountain Natural Resources Institute technical advisory committee.

Cassandra Botts:

Currently Boise Cascade's timber resource coordinator for Northeast Oregon, has worked for B.C. 1983-present.

U.S.F.S. Office Services Supervisor and Timber Resource Specialist, 1974-1983.

Committees and Memberships:

Precinct Committeewoman.

County Court appointed representative to Regional Strategies Rounds I, II, III.

Grande Ronde Model Watershed Committee alternate.

Oregon Business Week Committee for 5 years, including 3 years as Wallowa County Coordinator.

Wallowa County Chamber of Commerce, president 2 years, director 2 years.

Blue Mountain Natural Resources Institute Technology Transfer Committee.

Citizens Resource Group.

NW Timber Workers Resource Council.

NW Environmental Council.

People for the West.

Oregon Lands Coalition.

Joseph Chamber of Commerce.

Oregon Women in Timber.

Awards:

Wallowa County Timber Leader of the Year, 1988 and 1992.

Wallowa County Civic Leader of the Year, 1991.

Logging Industry:

Bruce Dunn:

RY Timber, private timber industry, 15 years to present.

USDA Forest Service, forester, Boise, Payette, and Targhee National Forests, 10 years.

Graduate Work in Forest Economics, Michigan State University, 1967.

B.S., Forest Management, Michigan Technological University, 1966.

Silviculture Certification,USDA Forest Service, Utah State University, 1980

Forest Engineering Institute (Logging Systems) USDA Forest Service, Oregon State University, 1978

Committees, Commissions, and Memberships:

Wallowa County Planning Commission, 7 years (including 2 as chair).
Wallowa County Economic Development Committee.
Wallowa County Winter Recreation Committee.
Wallowa County Airport Committee.
Wallowa County Natural Resource Group.
Wallowa County Small Woodlands.
Forest Service Fire Overhead Citizens Group.

Nez Perce Tribe:

Don Bryson:

Works as fisheries biologist, NE Oregon, for the Nez Perce Tribe.

Has 18 years experience, 12 in Columbia Basin, 6 of which have been in Northeast Oregon.

B.S., Biological Oceanography, University of Washington

B.S., Fisheries.

B.S., Zoology.

Other information:

Is writing N.E. Oregon hatchery master plan for the Grande Ronde River.

Wrote the Imnaha sub-basin plan.

Has served on four public ad hoc committees dealing with Wild and Scenic River management plans: for the Imnaha River, Wallowa River, Grande Ronde River (Oregon), Grande Ronde River (Washington).

Si Whitman:

Oregon Department of Fish and Wildlife:

Brad Smith:

District Fish Biologist, Wallowa District, Oregon Department of Fish and Wildlife.

B.S. Fisheries Science, Oregon State University, 1976.

10 years experience in fisheries management and research in northeast Oregon.

Bill Knox:

Assistant District Fish Biologist, Wallowa District, Oregon Department of Fish and Wildlife.

B.S., Fisheries and Wildlife Biology, Iowa State University, 1978.

M.S., Fishery Resources, University of Idaho, 1982

14 years experience in fisheries management and research in Oregon, Washington, and Idaho.

Member of American Fisheries Society since 1979.

Small Woodlands:

Leo Goebel:

Owner and operator of logging business, 1970-present.

Joseph High School math, earth science, and forestry teacher, 1964-1978.

Veteran of Korean Conflict.

M.S., Geology, University of Oregon, 1963.

B.S., Geology, University of Oregon, 1957.

Elementary and secondary school at Wallowa, Oregon.

O.S.U. Master Woodland Manager.

Leo's grandparents and great grandfather homesteaded at Bear Creek near Wallowa in the late 1800's.

Awards:

American Forest Council's Western Region (of 4 regions nationwide) Tree Farmer of the Year, 1992.

Oregon State Tree Farmer, 1984, 1991.

Wallowa County Tree Farmer, 1977, 1984, 1991.

Committees and Memberships:

Advisory committee for the Wallowa Lake County Service District, chair.

Blue Mountain Natural Resources Institute: Technology Transfer, Education, and Extension Committee.

Blue Mountain Natural Resources Institute: Standing Committee for the Learning Center.

Hurricane Creek Grange.

Wallowa County Small Woodlands Association (local American Forest Council organization), current president.

Patti Goebel:

Oregon Water Resources Department, Watershed Planner, March 1993-present.

Logger and forest management assistant to family logging company, seasonally and/or occasionally, 1974-present.

U.S. Department of the Interior, Bureau of Reclamation, Hydrologic Technician, 1992-1993.

Selectcare (HMO Insurance), Finance Assistant, 1990-1991.

Held various work-study positions through college years including: geology department assistant, lab assistant, teaching assistant, and dishwasher.

M.S., Geology, University of Oregon, 1990.

B.A., Geology and English, Mount Holyoke College, 1984.

Attended elementary and secondary school at Joseph, Oregon.

Patti's great grandparents and great great grandfather homesteaded on Bear Creek near Wallowa in the late 1800's.

Committees and Memberships:

Assistant to Wallowa County Salmon Recovery Strategy Committee.

Technical Assistant to Grande Ronde Model Watershed.

Wallowa County Small Woodlands.

USDA Forest Service:

Pat O'Connor:

Worked for USDA Forest service, has worked in Forest Service land management for 30 years.

B.S., Forest Management, University of Idaho.

Advanced Studies in Wilderness Philosophy and Ethic Development, Colorado State University.

Lloyd Swanger:

District Ranger of the Eagle Cap Wilderness for the USDA Forest Service, has worked with Forest Service for 36 years, as District Ranger for 25 years.

B.S., Forest Management, Washington State College.

Advanced studies in Wilderness Stewardship.

Wallowa County Court:

Pat Wortman:

Wallowa County Commissioner, 1989 to 1998

Rancher and Logger, 1957 to present.

Elementary and secondary school at Imnaha and Enterprise, Oregon.

Committees, Commissions, and Memberships.

Grande Ronde Model Watershed, Board of Directors, 1992-present.

Blue Mountain Natural Resources Institute, Board of Directors, 1991-present.

Blue Mountain Natural Resources Institute Foundation, Board of Directors, 1991-present.

Oregon Water Resources Department, Conservation Committee, 1991-1992.

Blue Mountain Elk Initiative, Board 1991-1992.

Associated Oregon Counties; Public Lands and Natural Resource Committee, 1989-present; District 1 Vice President, 1991 to present; Board of Directors, 1992 to present.

North East Oregon, Fire Review Team, 1989.

Wallowa River Wild and Scenic Study, Ad Hoc Committee, 1989-1992 alternate.

Imnaha River Wild and Scenic Study, Ad Hoc Committee, 1989-1992.

School District #21, Board Member, 1974-1981, Chair, 1976-1977.

Wallowa Valley Marketing Association, President, 1969-1973.

4-H Leader, 10 years, President of Leaders Association, 1968-1969.

Oregon Cattlemen's Association, 1966-present, Board of Directors 1982-1984, Resolution Committee 1981-1984, Chair 1983-1984.

Wallowa County Stockgrowers Association, 1965 to present, Vice President 1980-1982, President 1982-1984, Legislative Chair 1988-present.

Appendix B

Problems/Solutions Summary

APPENDIX B--PROBLEMS/SOLUTIONS SUMMARY

SOLUTIONS

QUANTITY

- **Tree Density-Transpiration**
  - 1 Implement prescribed burns where stands are too dense.
  - 1a. Mechanical under thinning.
  - 2 Commercial/precommercial thinning.
  - 2a Shelterwood seed cut*
  - 2b Small clearcut*
  - 2c Shelter wood removal cut*
  - 2d Irregular shelter wood*
  - 2e Single tree selection*
  - 2f Group selection*
  - 3 Plant/preserve where trees are too sparse

. ***** definitions are included in glossary (Appendix N)

- **Irrigation Withdrawals/Other Withdrawals**
  (see Minimum Flow, 10-20b)

- **Compaction Road/Logging - & Lack of Vegetation**
  - 5 Design/maintain roads to avoid quick runoff/to improve infiltration
  - 6 Relocate roads outside riparian area and to less compactable soils.
  - 7 Manage recreational trail systems to enhance fisheries habitat.
  - 8 Manage livestock trail system to enhance fisheries habitat.
  - 9 Study wildlife (predominantly elk and deer) and domestic livestock use, identify problems, and develop mitigation strategies.

- **Minimum Flow**
  - 10 Plant/protect vegetative cover.
  - 11 Limit compaction from roads, campgrounds, trails by siting on less compactable soil.
  - 12 Limit Precipitation Intercept-Evaporation (tree spacing for shaded snowpack) (1, 2).
  - 13 Preserve snow pack shading(2, 3).
  - 14 Limit irrigation diversions/return flows from one watershed to another.
  - 15 Purchase/negotiate water from water-right holders during low flow times.
  - 16 Improve irrigation efficiency.
  - 17 Study impoundments to supply irrigation/keep natural flow in stream.
  - 18 File instream water right.
  - 19 Develop wells.
  - 20 Study canal/ditch leakage and solutions.
  - 20a Maintain healthy riparian plant communities.

20b Evaluate creation of wetlands to store water for later use.

- **Flushing Flow – (to remove excess fine sediment and aid smolts in spring)**
  - 21 Avoid impounding or diverting needed flushing flow.
  - 22 Release impounded water to flush.
  - 24 Limit tree density/vegetative cover to manipulate high peak flow (1, 3).
  - 25 Decrease sediment input.

- **Limit Demand for Agricultural and Domestic Water**
  - 26 Implement zoning/land use planning to limit future demand for agricultural and domestic water.

QUALITY

- **Temperature**
  - 28 Increase riparian shading to preserve cool temperatures.
  - 29 Protect/increase spring flows to moderate streamflows.
  - 30 Plant/protect conifers in riparian area to keep thermal cover in winter.
  - 31 Increase flow quantity (see Minimum Flow, 10-20b).
  - 32 Limit return of water irrigation flows.

- **Excess Fine Sediment/Turbidity (organic matter)**
  - 34 Provide filter strips along roads to help catch sediment
  - 35 Limit dust with lignosulfonate, water, chip seal, asphalt.
  - 36 Design/maintain roads to prevent direct runoff from road into streams. (5)
  - 37 Relocate roads to better sites. (6)
  - 38 Vegetate road/limit road use/close road.
  - 39 Avoid road use and ground skidding when wet/limit use to dry or frozen conditions.
  - 40 Water bar/revegetate skid trails.
  - 41 Use designated skid trails.
  - 42 Use lighter skidding equipment or off-ground (i.e., helicopters).
  - 43 Study ways to reward conscientious skidders/penalize unconscientious ones.
  - 44 Implement permit system for campground use.
  - 45 Relocate campgrounds. (46)
  - 46 Manage recreational use of roads, trails, and campgrounds to maintain and enhance fisheries habitat. (7)
  - 47 Improve campground design. (46)
  - 48 Educate fishermen/campers about riparian erosion/compaction.
  - 49 Plant thorn bushes in riparian area.
  - 50 Fence watering corridors/supply alternative water source for livestock.

51 Protect water corridors/road fords with rock of appropriate size.
52 Avoid excess flows in irrigation canals.
53 Avoid excess high flows/bank erosion unraveling/keep enough watershed vegetation to slow runoff.
54 Implement wetlands/filter strips for feedlot runoff.
55 Manage feedlots and develop alternate water sources as necessary to maintain and enhance fisheries habitat.
56 Monitor wildlife and herd away from domestic feedlots if they are a problem.
57 Develop and maintain available supply of native seeds and non-native desirable seeds

❖ **Fuel Density**

(see also Tree Density, 1-3)

58 Rearrange/re-pile dry debris.
59 Reduce fuels through controlled and/or seasonal grazing management.

❖ **Noxious Weeds/Erosion/Habitat Destruction**

63 Use hand sprayer and/or aerial application for herbicide application.
64 Implement biological control of weeds.
65 Control weeds with mechanical means (pull up/cut off).
66 Identify, monitor, and correct noxious weed problems. (63, 64, 65)

❖ **Irrigation Returns**

(See also Excess Fine Sediment/Turbidity, 34-57 and Temperature, 28-32)

68 Develop wetland/filter strips.
69 Limit overland return flows.
70 Limit return flows.

❖ **Trash/Human Waste**

71 Implement pack in/pack out policy.
72 Install pump or self-composting toilets.
73 Provide trash collection facilities at high use sites along roads and waterways.

❖ **Sewer Systems**

74 Limit future development through Land Use Plan. (26)
75 Improve current systems if problem/ODEQ.
76 Develop municipal sewer treatment.

❖ **Feedlots**

(See Excess Fine Sediments/Turbidity, 34-57)

❖ **Herbicide/Pesticide**

77 Follow current use regulations, water quality studies.

- **Other Chemicals - Municipal/Industrial/Incidental**
  - 80 Monitor storage of industrial chemicals/fuels.
  - 81 Investigate source of mercury in Imnaha and oil in Bear Creek.
  - 82 Monitor possible contaminants from urban areas.
  - 82a Prevent fuel leaks from equipment or vehicles accessing or using waterways.

- **Excess nutrients**

  (See also Excess Sediment/Turbidity, 34-57)
  - 83 Avoid farmland fertilizer runoff. (69, 70)
  - 84 Wait for nutrient runoff from fire to dissipate.

STREAM STRUCTURE

- **Woody Debris**
  - 85 Add/preserve large woody debris in streams.
  - 86 Other permanent structures such as boulders or concrete (e.g. in Enterprise).
  - 87 Place woody debris or large boulders to direct water to spawning gravel.

- **Pool/Riffle Ratio**

  (See Woody Debris, 85-87, Channelization, 89-91, and Excess Fine Sediment/Turbidity, 34-57)

- **Channelization**
  - 89 Prohibit further channelization.
  - 90 Avoid building on floodplain.
  - 91 Develop mitigation strategies for necessary channelization/bank protection.

- **Bank Form**

  (See also Excess Fine Sediment/Turbidity, 34-37, and Temperature, 28-32)
  - 92 Develop hardened fords for machinery and livestock use. (51)
  - 93 Avoid excess flow/peak flow and bank erosion.

- **Ice Flows**

  (See also Temperature, 28-34, and Minimum Flow, 10-20b)
  - 94 Retain large trees on bank to slow/break up ice flows.
  - 95 Dynamite small flows before they get bad.

- **Steep Gradient**
  - 96 Inherently limits some habitat possibilities/work with what is there.

97 Anchor large woody debris/provide other structures to form pools.

SUBSTRATE

- **Cobble Embeddedness**
  (See Excess Fine Sediment/Turbidity, 34-57 and Flushing Flow, 21-45)

- **Excess Fines**
  (See Excess Fine Sediment and Flushing Flow) [see above]

- **Physical Barriers**
  99 Monitor and remove log jams/excess woody debris.
  100 Modify diversion barriers to improve passage.
  101 Educate users, provide passage through swimming hole dams.

- **Dredging/Gravel Mining**
  104 Prohibit dredging streams.
  105 Permit mining only from July 1 through August 15.

HABITAT REQUIREMENTS

- **Riparian Vegetation/Cover**
  (See also Woody Debris, 85-87, and Temperature, 28-32)
  108 Preserve/restore riparian vegetation by planting a diversity of shrub species. (28, 30)

- **Food Organisms**
  110 Reduce shade where a temperature problem would not be created.
  111 Avoid pesticide use.
  112 Avoid planting competing fish species.

- **Harassment**
  115 Move campgrounds. (45, 46)
  116 Do not stock trout. (112)
  117 Close stream to fishing for other species.
  118 Provide alternate place for sport fishing.
  119 Implement seasonal sport fishery closures.
  119A Do not use fords in salmon spawning areas during spawning season.

- **Predators/Competitors**
  120 Do not stock trout. (112, 116)
  121 Blue Heron- Live with and/or provide alternate food source.
  122 Live with Bull Trout.

- **Diversions Screened**

  125 Install, monitor, and maintain screens at all irrigation diversions and returns.

- **General**

  130 Implement education program.

PROBLEMS/SOLUTIONS SUMMARY TABLES

Priority designation F = Possible future problem H = High priority for salmon
L= Low priority for salmon M = Medium priority for salmon
S = Study needed * = requires further discussion by committee
Numbers are from the solutions listed on pages B-1 though B-7

Table 1 - IMNAHA RIVER

Factor	Reach1 Headwaters to the Wilderness Boundary	Reach 2 Wilderness Boundary to Private Lands	Reach 3 Private Lands to Town of Imanha	Reach 4 Town of Imnaha to Snake River
Water Quantity				
Tree Density	L:1	F, L:1, 2	F, L:1, 2	
Irrigation/water diversion			F, L:16, 18	
Compaction	L:7, 8	L:7, 8, 11, 115, 130	L:50, 130	
Minimum Flow		L:13		
Flushing Flow				F, L:21, 25
Future Demand			F, L:16, 18, 26	
Water Quality				
Temperature		S, L:28, 45	F, L:28, 30	F, L:28
Excess Fine Sediment	S, H:7, 8, 9, 46, 57, 130	H:35, 44, 45, 47, 48, 51	L:35, 44, 45, 47, 48, 51, 55	L:35, 44, 45, 47, 48, 51, 55
Fuel Density	L:1, 58, 59	L:2, 58, 59	F, L:59	
Weeds/erosion				
Irrigation returns				
Trash/human waste	L:73	L:73	L:73	L:73
Sewer Systems			S:74, 75	S:74, 75
Feedlots			H:50, 54, 130	H:50, 54, 130
Herbicides/pesticides	H:63, 64, 65, 77	H:63, 64, 65, 77	H:63, 64, 65, 77	H:63, 64, 65, 77
Other Chemicals	S, H:81			
Excess Nutrients				
Stream Structure				
Woody debris	L:30, 85, 108	L:30, 85, 108		
Pool/riffle ratio		L:108		
Channelization				
Bank Form		H:45, 46, 48, 130	H:50, 51	
Ice Flows			L:94, 95	L:95
Steep gradient				
Substrate				
Cobble embeddedness				
Excess Fines	H:57, 130	H:35, 36, 38, 39, 40, 41, 42	H:35, 36, 38, 39, 40, 41, 42	H:35, 36, 38, 39, 40, 41, 42
Physical barrier				
Dredge/mining				
Habitat Requirements				
Riparian vegetation				
Food				
Harassment	L:119, 130	H:49, 115, 119, 130	L:119, 130	
Predators/competitors				
Diversion screens				

Table 2 - Big Sheep Creek			
Factor	**Reach 1 Headwaters to Lick Creek**	**Reach 2 Lick Creek to Imnaha River**	**Reach 3 Lick Creek**
Water Quantity			
Tree Density	F, H:2	M:2	M:2
Irrigation/water diversion	S:13, 15, 16, 17, 20	S:13, 15, 16, 17, 20	S:12, 13, 14, 15, 16, 17, 19
Compaction			
Minimum Flow	S:10, 13, 15, 16, 17		
Flushing Flow	S:12, 21, 22, 24, 26	L:12, 21, 22, 24, 26	
Future Demand			
Water Quality			
Temperature	F:28, 29, 30, 31	S:28, 29, 30, 31	F:28, 29, 30, 36, 50
Excess Fine Sediment	L:5, 35, 36, 37, 38, 39, 40, 46, 50		
Fuel Density	L:1, 2, 58, 59	M:2,58,59	M:2, 58, 59
Weeds/erosion			
Irrigation returns			
Trash/human waste	L:73	L:73	L:73
Septic		S:74, 75	
Feedlots		S:50, 51, 52, 53, 54, 130	
Herbicides/pesticides	H:63, 64, 65, 77	H:63, 64, 65, 77	H:63, 64, 65, 77
Other Chemicals			
Excess Nutrients		S:84, 58	
Stream Structure			
Woody debris	L:53, 85, 86		L:53, 85, 86, 108
Pool/riffle ratio			
Channelization		L:89	
Bank Form	L:50, 52, 53	L:30, 46, 50, 52, 53, 89	L:7, 8, 50 (meadow)
Ice Flows			
Steep gradient		L:96, 97	L:96, 97
Substrate			
Cobble embeddedness		S:21, 22, 24, 31, 36, 38, 40, 50	
Excess Fines	H:35, 36, 38, 39, 40, 41, 42, 50		L:35, 36, 38, 39, 40, 41, 42, 50
Physical barrier	L:99		L:99, 101, 115
Dredge/mining			
Habitat Requirements			
Riparian vegetation		L:28, 30, 108	
Food			
Harassment		L: 46, 49, 115, 117, 118, 119, 130	L: 46, 49, 115, 117, 118, 119, 130
Predators/competitors	L:120, 122	L:120, 122	L:120, 122
Diversion screens	S:125	S:125	

Table 3 - Lostine River		
Factor	**Reach 1 Headwater to Strathern's Pond**	**Reach 2 Strathern's Pond to Wallowa River**
Water Quantity		
Tree Density	L:1, 2	
Irrigation/water diversion		H:13, 14, 15, 16, 17, 19
Compaction		
Minimum Flow		H:14, 15, 16, 22, 26
Flushing Flow		M:21, 22, 24
Future Demand		
Water Quality		
Temperature		H:16, 28, 29, 31, 32
Excess Fine Sediment		H:5, 21, 35, 36, 37, 38, 39, 40, 46, 48, 50, 52, 53, 54, 68, 69, 70
Fuel Density		
Weeds/erosion		
Irrigation returns		L:68, 69
Trash/human waste	L:73	L:73
Septic		S:
Feedlots		S:50, 54, 130
Herbicides/pesticides		H:63, 64, 65, 77
Other Chemicals		
Excess Nutrients		H:50, 54, 68, 69, 83, 130
Stream Structure		
Woody debris		H:85, 89, 108
Pool/riffle ratio		H:15, 16, 85, 86, 89, 108, 130
Channelization	L:30, 52, 89, 90, 91	L:30, 52, 89, 90, 91
Bank Form	L:30, 46, 50, 52, 53, 89, 130	L:50, 89,90
Ice Flows		
Steep gradient		
Substrate		
Cobble embeddedness		H:10, 12, 22, 24, 31, 35, 39, 50, 69
Excess Fines		H:10, 12, 22, 24, 31, 35, 39, 50, 69
Physical barrier	L:99	H:15, 16, 31, 99, 100, 101, 130
Dredge/mining	L:105	L:105, 130
Habitat Requirements		
Riparian vegetation		L:
Food		
Harassment	M:46, 49, 115, 117, 118, 119, 130	
Predators/competitors	S:120, 122	S:118, 119, 120, 122, 130
Diversion screens		L:25

Table 4 - Bear Creek			
Factor	**Reach 1 Headwaters to Little Bear Creek**	**Reach 2 Little Bear to Chamberlain Ditch Diversion**	**Reach 3 Chamberlain Ditch Diversion to Wallowa River**
Water Quantity			
Tree Density	M:1		
Irrigation/water diversion			H:13, 14, 15, 16, 17
Compaction			
Minimum Flow	H:17		H:10, 11, 12, 13, 14, 15, 16, 17, 19
Flushing Flow			
Future Demand			
Water Quality			
Temperature			
Excess Fine Sediment	L:5, 21, 35, 36, 37, 38, 39, 40, 46, 48, 50, 52, 53, 68	H:5, 21, 35, 36, 37, 38, 39, 40, 46, 48, 50, 52, 53, 68	H:5, 21, 35, 36, 37, 38, 39, 40, 46, 48, 50, 52, 53, 68, 69
Fuel Density			
Weeds/erosion		S:63, 64, 65, 77	
Irrigation returns			
Trash/human waste	L:73	L:73	L:73
Septic			S:74, 75
Feedlots			H:50, 54, 130
Herbicides/pesticides	H:63, 64, 65, 77	H:63, 64, 65, 77	H:64, 64, 65, 77, 130
Other Chemicals		L:81	L:83
Excess Nutrients			
Stream Structure			
Woody debris		H:85, 87, 89, 108	
Pool/riffle ratio		H:108	H:15, 16, 85, 89, 108
Channelization			L:30, 52, 89, 90
Bank Form			
Ice Flows			
Steep gradient			
Substrate			
Cobble embeddedness			
Excess Fines			
Physical barrier			S:15, 16, 100
Dredge/mining			
Habitat Requirements			
Riparian vegetation			
Food			
Harassment	S:116, 117, 119		
Predators/competitors			
Diversion screens			L:125

Table 5 - Minam, Wenaha, Grande Ronde River & Joseph Creek

Factor	Minam & Wenaha Rivers	Grande Ronde Reach 1 Rondowa to Wildcat Creek	Grande Ronde Reach 2 Wildcat Creek to State Line	Joseph Creek
Water Quantity				
Tree Density	M:1, 2			L:2, 3
Irrigation/water diversion				
Compaction			L:5, 7, 8, 11, 21	L:5, 6, 7, 8
Minimum Flow				
Flushing Flow			L:21, 22, 24	
Future Demand				
Water Quality				
Temperature	L:28, 30, 31 (Minam only)	H:15, 16, 28, 29, 30, 31, 32 upstream and tributaries	H:15, 16, 28, 30, 32 upstream and tributaries	H:28, 29, 30, 31, 50
Excess Fine Sediment	H:53(5, 35, 36, 37, 39, 40, 46, 50, 53 for lower Minam &Wenaha	H:5, 35, 36, 37, 39, 40, 46, 50, 53	H:5, 35, 36, 37, 39, 40, 46, 50, 53	H:5, 6, 7, 35, 36, 37, 38, 39, 42, 43, 48, 50, 53, 54
Fuel Density	H:1, 58, 59 for Wenaha L: for the Minam			L:1, 2, 58, 59
Weeds/erosion		L:63, 64, 65, 77, 130	L:63, 64, 65, 77, 130	
Irrigation returns				
Trash/human waste	L:73	L:71, 72, 73, 130	L:71, 72, 73, 130	L:73
Septic			S:72, 74, 75	
Feedlots			L:50, 54, 56	
Herbicides/pesticides	H:63, 64, 65, 77	H:63, 64, 65, 77	L:5, 63, 64, 65, 77, 130	L:63, 64, 65, 77
Other Chemicals				
Excess Nutrients		S: If there is a nutrient problem it needs to be addressed upstream.		
Stream Structure				
Woody debris			H:85, 108	
Pool/riffle ratio				
Channelization				L:90, 91
Bank Form			L:50, 52, 53, 94	
Ice Flows	L:94, 95	L:94, 95	L:94, 95	
Steep gradient				
Substrate				
Cobble embeddedness				
Excess Fines		H:35, 36, 37, 38, 39, 40, 46, 48, 50, 54	H:35, 36, 37, 38, 39, 40, 46, 48, 50, 54	
Physical barrier	L:99, 101, 130			
Dredge/mining	L:104, 105, 130 for Minam on.y			
Habitat Requirements				
Riparian vegetation			L:108	H:30, 50, 85, 108
Food				
Harassment			L:45, 46, 47, 115, 119, 130	
Predators/competitors				
Diversion screens			S:125	

Table 6 - Hurricane Creek			
Factor	**Reach 1** **Headwaters to Upper Diversions**	**Reach 2** **Upper Diversions to Third Bridge**	**Reach 3** **Third Bridge to Wallowa River**
Water Quantity			
Tree Density	M:1, 2		
Irrigation/water diversion		H:14, 15, 16, 17	H:14, 15, 16, 17
Compaction	L:5, 6, 7, 8, 37, 48		
Minimum Flow		H:12, 13, 15, 16	H:12, 13, 15, 16, 17
Flushing Flow			
Future Demand		S:26, 90	
Water Quality			
Temperature		S:28, 29, 30, 31, 32, 90	S:30, 31
Excess Fine Sediment	L:5, 35, 36, 37, 39, 40, 46, 50, 53	H:5, 8, 35, 36, 37, 38, 50, 52, 53, 54	H:5, 8, 21, 35, 36, 37, 38, 50, 52, 53, 54
Fuel Density	M:1, 2, 58, 59		
Weeds/erosion			
Irrigation returns			H:32, 68, 69
Trash/human waste	L:73	L:73	L:73
Septic	S:26, 74, 75	S:74, 75	S:74, 75
Feedlots			H:49, 50, 54, 55, 130
Herbicides/pesticides	L:63, 64, 65, 77	H:63, 64, 65, 77	H:63, 64, 65, 77
Other Chemicals		L:80,83,130	
Excess Nutrients			H: 54, 55, 75
Stream Structure			
Woody debris		H:85	H:85, 108
Pool/riffle ratio			H:85, 86, 89, 90, 108
Channelization		L:50, 89, 90, 91	L:50, 89, 90, 91
Bank Form			
Ice Flows			
Steep gradient			
Substrate			
Cobble embeddedness			H:50, 52, 53, 55
Excess Fines	L:35, 36, 37, 38, 40, 46, 48, 50	H:5, 8, 35, 36, 37, 38, 48, 50, 52, 53, 54, 55	H:5, 8, 21, 35, 36, 37, 38, 48, 50, 52, 53, 54, 55
Physical barrier		H:15, 16, 100, 130	
Dredge/mining		L:105, 130	
Habitat Requirements			
Riparian vegetation		H:108	H:108
Food			
Harassment			
Predators/competitors		L:119, 120, 121, 122	L: 119, 120, 121, 122
Diversion screens		S:125	S:125

Table 7 - Prairie Creek			
Factor	**Reach 1 Headwaters to Elk Fence**	**Reach 2 Elk Fence to Hays Fork**	**Reach 3 Hays Fork to Wallowa River**
Water Quantity			
Tree Density	M:2		
Irrigation/water diversion		L:10, 12, 14, 16, 17, 120, 130	L:10, 12, 14, 16, 17
Compaction			
Minimum Flow			
Flushing Flow			
Future Demand	S:26	S:26	S:26, 90
Water Quality			
Temperature		S:28, 29, 30, (31 on upper portion)	H:28, 29, 30, 32
Excess Fine Sediment	H:5, 8, 21, 35, 36, 37, 38, 40, 42, 46, 48, 50, 52, 53, 54	H:, 8, 21, 35, 36, 37, 38, 40, 42, 46, 48, 50, 52, 53, 54, 55	H:5, 8, 36, 37, 38, 48, 50, 52, 53, 54, 55
Fuel Density	H:2, 58, 59		
Weeds/erosion			
Irrigation returns		H:32, 68, 69	H:17, 32, 68, 69
Trash/human waste	L:73	L:73	L:73
Septic		S:72, 74, 75	S:72, 74, 75, 76
Feedlots		H:49, 50, 54, 55, 130	H:50, 54, 55, 130
Herbicides/pesticides	H:63, 64, 65, 77	H:63, 64, 65, 77	L:5, 63, 64, 65, 77, 130
Other Chemicals			L:80, 82, 83, 130
Excess Nutrients	S:54, 69, 75	H:54, 55, 69, 75	H:54, 55, 75, 83
Stream Structure			
Woody debris		H:85, 108	H:85, 108 (26, removal by development)
Pool/riffle ratio		L:85, 86, 108	L:85, 86, 108
Channelization		L:50, 89, 90, 91	L:50, 89, 90, 91
Bank Form		L:50, 52, 53, 89, 108	L:50, 52, 53, 55, 108
Ice Flows		L:94	
Steep gradient			
Substrate			
Cobble embeddedness		H; 22, 50, 52, 53, 55	H:50, 52, 53, 55
Excess Fines		H:5, 8, 21, 35, 36, 37, 38, 48, 50, 52, 53, 54, 55	H:5, 7, 36, 37, 38, 48, 50, 52, 53, 54, 55
Physical barrier		S:100, 130	
Dredge/mining			L: 91, 105
Habitat Requirements			
Riparian vegetation		H:108	H:28, 108
Food			
Harassment			L:118, 119, 130
Predators/competitors		L:119, 120, 121	L:120, 119, 130
Diversion screens		S:125	S:125

Table 8 - WALLOWA RIVER				
Factor	**Reach 1 Headwaters to Wallowa Lake**	**Reach 2 Wallowa Lake to Spring Creek**	**Reach 3 Spring Creek to Head of Wallowa Canyon**	**Reach 4 Head of Wallowa Canyon to Grande Ronde River**
Water Quantity				
Tree Density	M:1,2			
Irrigation/water diversion		H:10, 14, 15, 16, 17, 18	L:10, 14, 15, 16, 17, 18	
Compaction			L:7, 21	L:7, 39, 42, 48
Minimum Flow		H:15, 16, 18		
Flushing Flow		H:21, 22	H: 21, 22	
Future Demand		S:26, 90	S:26, 90	
Water Quality				
Temperature		S:28, 29, 30, 31, 32	H:28, 29, 30, 31, 32	L:28, 29, 30, 31, 32
Excess Fine Sediment		H:5, 8, 36, 37, 38, 48, 50, 52, 53, 54, 55	H:5, 8, 36, 37, 38, 48, 50, 52, 53, 54, 55	H:5, 7, 8, 35, 36, 37, 38, 39, 42, 48
Fuel Density	M:1, 2, 58			
Weeds/erosion				M:66
Irrigation returns		H:17, 32, 68, 69	H:17, 32, 68, 69	
Trash/human waste	L:73	L:73	L:73	L:71, 72, 73
Septic		S: 72, 74, 75	S: 72, 74, 75, 76	
Feedlots		H:50, 51, 54, 55, 130	H:50, 54, 55, 130	
Herbicides/pestidcides	L:63, 64, 65, 77	L:5, 63, 64, 65, 77, 130	L:5, 63, 64, 65, 77, 130	L:5, 63, 64, 65, 77,. 130
Other Chemicals		L:80, 82, 83, 130	L:80, 82, 83, 130	
Excess Nutrients		H:54, 55, 75, 83		
Stream Structure				
Woody debris		H:85, 108	H:85, 108	
Pool/riffle ratio		H:85, 86, 90, 91, 108	H:85, 86, 90, 91, 108	
Channelization	L:89, 91	L:50, 89, 90,91	L:50, 89, 90, 91	
Bank Form		L:50, 52, 53, 55, 108	L:50, 52, 55, 108	
Ice Flows				
Steep gradient				
Substrate				
Cobble embeddedness		M:21, 22, 24, 31		
Excess Fines		H:5, 7, 36, 37, 38, 48, 50, 52, 54, 55	H:5, 7, 36, 37, 38, 48, 50, 52, 54, 55	
Physical barrier		S:100, 130	S:100, 130	
Dredge/mining	L:91, 105			
Habitat Requirements				
Riparian vegetation				
Food				
Harassment				L:130
Predators/competitors		S, L:212	S, L:212	
Diversion screens		M:125	S:125	

Appendix C

POTENTIAL FUNDING SOURCES

APPENDIX C – POTENTIAL FUNDING SOURCES

Agency	Program	Assistance	Recipients	Purpose	Comments
Federal					
FSA	Emergency Loan Assistance	Loan	For an established farmer/rancher who suffered a qualifying physical loss, or a production loss of at least 30% in any essential farm or ranch enterprise.	To restore or replace essential property, production costs, living expenses.	
FSA	Conservation Reserve Program (CRP)	Grant up to 50% total cost for seeding ground. An annual rental payment is made as an incentive to keep the land in permanent cover. Contracts are for 10 years.	Landowner must own the land at least 1 year prior to enrollment, and agree to limit certain land uses during the contract period. Land must meet certain criteria in order to qualify.	Encourages farmers to voluntarily plant permanent areas of grass and trees on land that needs protection from erosion, to act as windbreaks, or where vegetation can improve water quality or provide food and habitat of wildlife.	Contact your local NRCS or FSA office. Applications accepted during announced sign up periods.
FSA	Environmental Quality Incentives Program (EQIP)	Grant of up to 75% ($10,000.00 maximum per owner per year, $50,000.00 per contract period) total cost.	Landowner must be actively engaged in livestock or agricultural production and complete a 5-10 year conservation plan addressing soil & water conservation problems.	This program offers financial, educational and technical help to install or implement structural, vegetative and management practices.	Contact your local NRCS or Farm Service Agency (FSA). Applications accepted yearlong, with funding priority given for maximum and sustainable environmental benefit per cost.
NRCS	Forestry Incentives Program (FIP)	Grant up to 65% ($10,000.00 maximum per owner per year) total cost, with landowner or other partners costsharing remainder.	Landowner must own 10 to 1000 acres of commercially productive nonindustrial forest suited for afforestation, reforestation, or improved management, and jointly develop a forest management plan.	This program offers site preparation, tree planting, control of competing vegetation or animal damage, tree thinning or pruning, and erosion control.	Contact your local NRCS or Oregon Department of Forestry. Applications accepted during announced sign up periods

Agency	Program	Assistance	Recipients	Purpose	Comments
USFWS	Wildlife Habitat Incentive Program (WHIP)	Grant up to 50% total cost ($10,000.00 maximum per owner) , with landowner or other partners costsharing remainder.	Landowner agrees to prepare and implement a habitat development plan, to maintain implemented practices for the 10+ year contract period, and to allow administrative access for effectiveness monitoring.	Establishes and improves fish & wildlife habitat on private lands not used for mitigation or other specified exceptions, and not currently enrolled in similar programs.	Contact your local NRCS or FSA office. Applications accepted during announced sign up periods.
USFWS	Partners for Wildlife	Cost-share and advice on biological matters.	Landowner can improve fish and wildlife populations through habitat restroration and management programs.	Restores and protects fish & wildlife habitat on private lands through alliances between USFWS and other entities	Contact the USFWS that works with your state.
STATE					
OEDD	Regional Strategies Program	Grant – lottery Funds	Counties	Economic Development	
OWEB	Conservation Project Grant	Cost-shares for conservation projects	Landowners, Watershed Councils, SWCDs		Contact regional representative or local SWCD office.
OWRD	Water Development Loan Program	Loans	Municipalities under 30,000 population	Irrigation or drainage of agricultural lands, or municipal water.	Importance to have secondary benefits of recreation, flood control, or hydropower.
ODA	Small Grant Program	Grant	To SWCDs. $5000.00 available bi-annually	For small conservation projects.	Contact local SWCD
ODFW	Green Forage Program	Cost-share for planting and seeding ground.	Landowners	Used for planting/seeding (i.e., abandoned roads)	Contact local ODFW office
ODFW	Fence Program	Supply fence material.	Landowners	Supply fence material to fence off rivers/creeks from livestock.	Contact local ODFW office
DEQ	Clean Water Act Section 319	Grants	State or Federal governmental entities	Improvement of natural watershed and quality of surface and ground water.	Basin must be in State's Clean Water Strategy. 40% non-Federal cost share required.
ODF	Forestry Incentives Program	Technical Assistance	Private, Non-industrial Landowners	Assist in planting forest trees and improve production of timber & related forest resources.	Ownership of 10-1000 acres. Can obtain cost share of 50-75%.
ODF	Stewardship Incentive Program	Grants	Woodland Owners with 5-1000 acres of forest land	Improved land management	Ownership of 5-1000 acres. Cost-share is 50-75% and up $10,000/yr/owner.

Agency	Program	Assistance	Recipients	Purpose	Comments
Regional					
NPPD (BPA)	Fish & Wildlife Program	50-75% cost-share grants	State and Federal agencies, Tribes, Watershed Councils, Landowners	Conservation projects to improve watershed and fish habitat.	Contact local SWCD, Watershed Council or tribe.
Private					
Nature Conservancy		Direct Payment	State or local entities	Planning, construction, and O&M of watershed enhancement projects. Land and water purchase/lease.	
Water Heritage Trust		Direct Payment	State or local entities	Planning, construction, and O&M of watershed enhancement projects. Land and water purchase/lease.	
Oregon Trout		Direct Payment, Volunteer Assistance			
Rocky Mnt Elk Foundation					Potential source of funding for land purchase
Trout Unlimited		Volunteer Assistance			

Appendix D

Fishery

APPENDIX D--FISHERY

STATUS OF THE STOCKS - GRANDE RONDE RIVER SUBBASIN

Excerpted from: Bryson, Don. Nez Perce Tribe Evaluation of the LSRCP Hatchery Production in the Grande Ronde River Subbasin, Working Paper. Draft and updated to 1992. Note: The figures referred to are not included in this excerpt.

The Grande Ronde River subbasin was historically an important producer of chinook, coho, sockeye and steelhead. The current depressed status of the stocks is the result of inbasin and lower Snake and Columbia Rivers habitat degradation, lower Columbia and ocean fishing pressure, early hatchery procedures, and the construction of eight dams on the Columbia and Snake Rivers.

Inbasin habitat degradation is responsible for a reduction in spawning and rearing potential and out-migration success. High summer water temperatures, low flows, lack of cover, and increased sedimentation rates have all acted to limit usable spawning and rearing areas, thereby limiting the number of adults and smolts the system can effectively support. Pollution and temperature problems in the lower Columbia and Snake Rivers and poor estuarine conditions reduce survival for emigrating smolts and immigrating adults.

Intense commercial fishing began in the lower Columbia River in 1866 with the development of salmon canning (Horner and Bjornn 1981a). Production reached a peak of nearly 43 million lb. in 1883. The harvest, however, had already declined to 18 million lb. by 1889. Between 1890 and 1920, catches fluctuated between 17 and 37 million lb. and then gradually declined to about 5 million lb. in 1966 (Fulton 1968). In way of contrast, the historical Indian catch prior to settlement by non-Indians has been estimated at an average of 18 million lb. (Horner and Bjornn, 1981a). Spring and summer chinook were the primary target of the inriver commercial cannery and cold storage fishery but other species were targeted as these runs declined.

An open ocean troll fishery developed from a few boats in the early 1900's to several thousand by the 1950's. The ocean sport fishery developed more slowly but had developed into a major industry by the 1960's. Relatively few spring and summer chinook are caught in the ocean fisheries compared to fall chinook (Chaney and Perry 1976). Coho, sockeye, pinks, and chums are also targeted. A very preliminary estimate has been made for the percent of Grande Ronde fish which are harvested in the lower river fisheries. The Lookingglass Hatchery spring chinook smolt tagging program, initiated in 1985, provided a harvest rate estimate of 44 percent for five-year-olds (1983 brood) and a lower percent for four-year-olds in 1988 (NPPC 1989).

A hatchery station was established in 1901 near the mouth of the Wenaha River. The purpose of the Grande Ronde Hatchery Station was to trap and spawn all salmon species passing or entering the Wenaha River. Racks were constructed across the Grande Ronde River just upstream from the Wenaha River and also across the

Wenaha River in 1901 and 1902. The collected eggs were fertilized and then either planted in "suitable" gravel bars downstream from the Wenaha River or hatched, fed, and the fry were outplanted in the same general areas. Fry were frequently released in late December or early January when the hatchery water supply froze up. Sockeye were treated the same as chinook and coho. Tons of moss came down the Grande Ronde River in 1902, killing many of the fish trapped between the racks, and this portion of the Hatchery Station was closed at the end of the season. The entire station ceased operation after the 1903 season during which only the Wenaha River was racked (Van Dusen 1903, 1905).

Racks were also placed across the Wallowa River in 1903 just downstream from the mouth of the Minam River. The purpose was again to trap all salmon species and spawn them. The Wallowa Hatchery Station was constructed in 1904 and became operational in 1905. Eggs were again planted in "suitable" gravel bars near the hatchery or were hatched and the fry were outplanted in the same general area, usally the result of freeze-up. Sockeye were again treated the same as the other salmon species (Van Dusen 1905, 1907).

A new concept in hatchery production found reality in the construction of the Bonneville Central Hatchery at Bonneville, OR (on Tanner Creek near present day Bonneville Dam). The concept was to eye the eggs at the outlying hatchery stations (such as The Wallowa Station) and then to transport the eyed eggs to the Central Hatchery for hatching and rearing. All juveniles were then to be released in the general area of the Central Hatchery. The idea was that by releasing the juveniles here they would be below the sawmills, irrigation ditches, and power wheels and, consequently, mortalities would be reduced (Mc Allister 1911). In 1910, 1,790,000 eyed chinook eggs and 83,000 eyed steelhead eggs were transported from the Wallowa Station to the Bonneville Central Hatchery (Clanton 1911).

It is quite apparent that the early hatchery personnel did not understand salmonid life histories. Sockeye need a lake to rear in. The sockeye outplanted near the Minam and Wenaha Rivers suffered a probable 100 percent mortality. The embryo mortalities suffered by the other species can not be estimated but was probably substantial. The biological oxygen demand (BOD) probably exceeded the supply where large numbers of eggs were planted in relatively small areas. As for the central hatchery concept, salmon return to spawn in the streams where they were reared as juveniles, not where their parents returned to spawn. The eyed eggs removed from the Grande Ronde subbasin and hatched, reared, and released at the Central Hatchery produced adults which returned to the Central Hatchery and not to the Grande Ronde subbasin.

With the advent of powerdam construction on the Columbia River in the 1930's and the resultant large scale commercial development of the river, the next phase of salmonid population reductions began. Spawning and rearing areas were inundated, and tributaries were blocked. More critical to the Grande Ronde populations were the losses of smolts passing downstream and the prespawning mortalities of adults migrating upstream. There is an estimated fifteen percent loss of smolts (USACE 1975) and adults (Chaney and Perry 1976) passing each project. Grande Ronde fish pass eight dams between the subbasin and the ocean (Figure 1). This equates to a potential loss of 73 percent of the smolts migrating downriver and 73 percent of the adults migrating upriver. Smolt survival has since been ameliorated with the development of smolt transportation systems (eg. smolt bypass systems at some dams and trap and haul capabilites at Lower Granite, Little Goose, and McNary Dams), but are still a small fraction of pre-dam survivals (0.4 percent smolt-to-adult survival now compared to an estimated 1.6 percent pre-dam).

The construction of the powerdams, however, provided the first opportunity to actually count the number of fish migrating upstream. Each fish ladder was equipped with a fish counting station, and counts were collected for each species, generally throughout the migration. When counts were started at Ice Harbor Dam in 1962, it became possible to calculate the percent of the population (for each species) which turned off into the Snake River. When estimates of the Grande Ronde component of the Snake River runs were developed by state and federal agencies for LSRCP, it became possible to estimate the loss to the Grande Ronde system due to the construction of the four lower Snake River dams.

Spring Chinook

Spring and summer chinook are presently found in the Grande Ronde River and most of the larger tributaries (Figure 7). The historical distribution is not fully known. Parkhurst (1950) mentioned that Meadow Creek formerly supported a sizeable run but that it was nearly extinct. Stout (1957) stated that Joseph Creek was reported to have once had a good run of spring chinook, whereas Chapman (1940) was unable to document their presence. Evermann and Meek (1899) stated for the Wallowa River that the chinook apparently enters both the west, now known as the Lostine River, and the main forks, the majority running into the west fork; those which keep in the main fork enter Prairie Creek where they have their principal spawning beds, although they have been seen spawning up near the outlet to the lake itself". Summer chinook are known to be present because some of the summer chinook tagged on the lower Columbia River from 1947 to 1965 were recovered in the Grande Ronde subbasin (Galbreath 1966 as cited in CBWFA 1989). ODFW, however, does not differentiate between spring and summer chinook in the subbasin and, for management decisions, the two stocks are considered to be one. In acuality, there are no clear-cut behavioral differences between the two stocks once they enter the subbasin, and they will be referred to in this report as spring chinook.

Adults begin entering the river in May and spawning occurs from mid August to mid September. Juveniles trapped at irrigation diversions in the Wallowa River drainage indicate that the peak out-migration from the tributaries generally occurs from May through July (Thompson and Haas 1960). The fingerlings rear for one year in freshwater before migrating out as smolts in April and May during the spring freshet. Most adults return as four-year-old fish (Bennett 1975 as cited in CBFWA 1989).

There are no historical estimates of the escapement to the subbasin. The turn-of-the-century hatchery reports do not provide a good estimate of escapement. The majority of the run would have passed the hatchery sites prior to the yearly installation of the racks across the river and by the time the Wallowa Hatchery and its associated dam at Minam were constructed, the runs were already depressed. The estimated escapement in 1967 was 12,200 adults (USACE 1975). This number forms the basis for mitigating the effects of the dams. Smith (1975) estimated that the escapement to the subbasin in the early 70's was 8,400 fish. The estimated escapement from 1977-92 has varied from 309 fish in 1979 to 2175 in fish 1988 (CBFWA 1989 and subsequent spawning ground survey data). The average return for the last four years (1989-1992) has been 578 fish.

Annual spawning surveys have been conducted since 1964 on all streams that support significant spawning populations (Carmichael and Boyce 1986). Table 3 presents the spring chinook redd counts and redds/mile in index areas for the years 1964-1992. Redds/mile averaged 9.6 from 1964-1973, peaking at 16.0 in 1969. The counts dropped to an average of 5.4 redds/mile from 1974-1978. The count in 1979 plunged to 1.3 redds/mile, the lowest on record, and then leveled out to an average of 2.6 redds/mile from 1980-1984. The escapement began to rebound in 1985 and by 1988 had risen to 8.7 redds/mile but, in 1989, they had again dropped to 1.6 redds/mile and averaged 2.3 from 1989-1992. The drop in 1974 could be the result of construction of Lower Granite Dam on the lower Snake River, whereas the 1979 and 1989 decreases may correspond to the two ocean fish returning from the smolt outmigrations during the 1977 and 1987 low flow years, respectively. The effects of the last several low flow years will be expressed in low adult returns for several years to come. Some numbers in Table 3 differ from those presented in recent ODFW reports (eg. Carmichael and Boyce 1986) because previous reporting errors have been corrected.

Several different stocks have been imported into the subbasin during various attempts to rebuild the runs. Table 4 shows the ODFW outplanting schedule from 1980-1992. Spring chinook smolts from the Rapid River Hatchery were released into Lookingglass Creek in 1980 to develop a broodstock for the Lookingglass Hatchery. The Rapid River stock is a Snake River stock which was developed from fish trapped at Oxbow Dam (probably stock from Eagle Creek). Disease problems caused a shift to Carson stock which were first introduced into Lookingglass and Catherine Creeks in 1982. Catherine Creek was stocked in 1982 and 1983 with 100,000 fingerlings each year in an attempt to redevelop a CTUIR fishery (CTUIR 1984). Survival of Carson stock releases have been poor, however (percent smolt to adult survivals around 0.2), and Rapid River stocks are again being utilized. Carson stock were replaced in the hatchery program by 1989. Carson stock originated from a broodstock trapping program in the Bonneville Dam fish ladders and consisted of upriver bright fish.

<u>Harvest</u> Sport harvest has been closed since 1974. The largest recorded harvest occurred in 1966 when 1,175 fish were caught. The average harvest from 1959 - 1969 was 539 fish. The average harvest from 1970 - 1973 dropped to 166 fish (Carmichael and Boyce 1986).

Fall Chinook

There was an early and late fall run into the subbasin at the turn of the century. The early hatchery records show that spawning at the hatchery stations generally commenced in mid September and continued until late October for the years 1902 and 1903 and from early September until late October for the years 1905 and 1906 ((Van Dusen 1903 (for 1902), 1905 (for 1903), and 1907(for 1905,1906)). The indication is that the hatchery station on the Wallowa River also spawned a portion of the spring run. Thompson and Haas (1960) reported that a remnant of this early fall spawning race was still present in the Lostine River in 1960. No spawning surveys are presently being conducted for this stock nor was any attempt made to determine the presence of this stock prior to the construction of the four lower Snake River dams. Fishermen reported observing spawning activity above Troy in late October, 1988. This could indicate that a remnant of the run may still exist.

Table 11. Annual spring chinook redd counts within index areas in the Grande Ronde River subbasin, 1964-1977

Stream	Miles	YEARS													
		64	65	66	67	68	69	70	71	72	73	74	75	76	77
South Fork Wenaha River	6.0	167	79	278	185	128	254	279	164	71	205	49	30	20	60
Wallowa River	4.5	35	32	14	15	11	17	14	12	5	11	7	1	15	2
Little Minam River	1.5	25	27	25	7	10	7	8	11	19	9	22	13		
Lower Minam River	7.5	83	48	44	18	77	75	93	60	72	70	15	25	28	14
Upper Minam River	6.0	68	78	77	32	30	106	82	49	66	48	36	25	24	
Bear Creek	6.5	24	15	12	11	40	23	25	30	55	16	21	33	17	12
Lostine River	3.0	114	65	107	99	106	99	76	76	125	138	114	33	77	25
Hurricane Creek	3.0	28	17	1	3	20	9	17	23	18	10	11	2	0	0
Spring Creek	1.0	20	6	6	4	1	1	0	0	4	2	0	0		
Lookingglass	6.2	141	101	210	92	92	165	188	149	63	101	27	28	40	32
Indian Creek	3.0					10	2	10	0	19	7	1	0	9	
Catherine Creek (a)	7.5	41	47	15	27	51	85	51	121	85	116	70	21	78	6
S.F. Catherine Creek	2.0				17	7	43	3	86	21	33	19	12	21	
N.F. Catherine Creek	3.0				31	15	19	19	28	38	73	17	9	13	4
Sheep Creek	6.0		4		24	13	106	74	58	69	21	19	22	18	
Grande Ronde River (b)	8.5	172	128	143	216	304	194	51	129	110	52	61	42	75	92
Total	75.2	918	647	932	781	715	1205	990	996	840	912	489	296	435	247
Redds/mile		6.9	8.6	7.9	5.8	6.5	16.0	13	8.1	11.2	12	6.5	3.9	5.8	3.3

(a) 10 miles surveyed in 1964

(b) 14.0 miles surveyed in 1964, 7.5 miles surveyed in 1966, 18.0 miles surveyed in 1967, 21.0 miles surveyed in 1968, and 10.0 miles surveyed in 1971

Source: Carmichael and Boyce 1986, with corrections, and recent spawning ground counts

Table 12. Annual spring chinook redd counts within index areas in the Grande Ronde River subbasin, 1978-1992

Stream	Miles	YEARS														
		78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
South Fork Wenaha River	6.0	77	5	24	20	27	23	12	36	68	62	98	7	31	28	58
Wallowa River	4.5	18	0	1	0	1	5	12	3	7	15	7	0	0	1	0
Little Minam River	1.5															3
Lower Minam River	7.5	65	3	3	2	9	8	6	62	36	64	50	23	36	17	2
Upper Minam River	6.0	72	6	7	12	13	13	17	54	27	26	37	10	17	20	14
Bear Creek	6.5	25	4	8	4	12	6	11	6	10	10	5	2	2	2	0
Lostine River	3.0	120	21	18	8	58	39	57	68	48	49	107	20	16	11	14
Hurricane Creek	3.0	11	0	0	1	9	7	0	20	5	17	9	2	0	4	1
Spring Creek	1.0															
Lookingglass	6.2	25	13	29	7	26	7		12	0	18	53	18	19	7	21
Indian Creek	3.0	11														
Catherine Creek (a)	7.5	47	36	66	16	42	43	23	22	47	103	99	31	19	15	36
S.F. Catherine Creek	2.0	26	5	0	3	7	4	4	7	21	35	39	1	7	1	0
N.F. Catherine Creek	3.0	7	0	3	3	14	11	1	3	8	14	38	6	6	3	5
Sheep Creek	6.0		0	8	8	18	5	18			7	15	0	0	0	5
Grande Ronde River (b)	8.5	42	7	32	38	29	49	26	70	37	112	99	0	31	10	97
Total	75.2	546	100	199	122	265	220	187	363	314	532	656	122	184	119	256
Redds/mile		7.3	1.3	2.6	1.6	3.5	2.9	2.5	4.8	4.2	7.1	8.7	1.6	2.4	1.6	3.4

(a) 10 miles surveyed in 1964

(b) 14.0 miles surveyed in 1964, 7.5 miles surveyed in 1966, 18.0 miles surveyed in 1967, 21.0 miles surveyed in 1968, and 10.0 miles surveyed in 1971

Source: Carmichael and Boyce 1986, with corrections, and recent spawning ground counts

Table 13. ODFW spring chinook releases in the Grande Ronde subbasin (1980-1992).					
Stock/ Brood year	Hatchery	Number Released	Size (fish lb.)	Date of release	Location of release
Rapid River					
1978	Oxbow	418,488	8.4	3-11-80	Lookingglass Creek
Carson					
1980	Carson	100,000	20.0	4-8-82	Catherine Creek
1980	Oxbow	460,744	9.4	4-3-82	Lookingglass Creek
1981	Lookingglass	434,640	20.0	4-3-83	Lookingglass Creek
1982	Lookingglass	710,000	31.0	12-22-83	Lookingglass Creek
1982	Lookingglass	68,940	25.0	12-22-83	Lookingglass Creek
1982	Carson	101,870	16.7	4-17-84	Catherine Creek
Lookingglass					
1982	Lookingglass	9,955	31.0	12-22-83	Lookingglass Creek
1982	Lookingglass	29,650	31.0	4-5-84	Lookingglass Creek
Carson					
1983	Lookingglass	502,642	8.5-148.0	5-16-84	Upper Grande Ronde
1983	Lookingglass	382,500	187.5	6-13-84	Catherine Creek
1983	Lookingglass	243,565	76.7-79.1	7-23-84	Lookingglass Creek
1983	Lookingglass	171,612	13.9-16.3	9-11-84	Deer Creek (Big Canyon)
1983	Lookingglass	261,931	21.5-32.8	9-16-84	Lookingglass Creek
1983	Oxbow	148,544	23.5	9-29-84	Lookingglass Creek
1983	Lookingglass	261,221	17.0-28.3	11-01-84	Lookingglass Creek
1983	Lookingglass	920,528	15.5-23.5	4-4-85	Lookingglass Creek
1983	Carson	100,448	18.2-20.2	4-16-85	Catherine Creek
1984	Lookingglass	104,800	32.0	7-19-85	Lookingglass Creek
1984	Lookingglass	373,454	18.0-29.5	9-18-85	Lookingglass Creek
1984	Lookingglass	277,997	16.4-23.3	11-1-85	Lookingglass Creek
1984	Lookingglass	90,233	8.5-9.6	11-23-85	Lookingglass Creek
1984	Lookingglass	315,613	8.8-15.7	4-1-86	Lookingglass Creek
1984	Lookingglass	100,072	10.4-10.8	4-1-86	Deer Creek (Big Canyon)

Table 13. ODFW spring chinook releases in the Grande Ronde subbasin (1980-1992).

Stock/ Brood year	Hatchery	Number Released	Size (fish lb.)	Date of release	Location of release
1984	Lookingglass	100,150	10.0-11.0	4-3-86	Catherine Creek
Lookingglass					
	Lookingglass	47,190	15.6	4-1-86	Lookingglass Creek
Lookingglass – Carson					
1985	Lookingglass	88,543	53.5	7-17-86	Lookingglass Creek
1985	Lookingglass	37,760	52.1	7-29-86	Catherine Creek
1985	Lookingglass	163,275	23.6-25.3	9-24-86	Lookingglass Creek
1985	Lookingglass	164,886	23.8	11-1-86	Lookingglass Creek
1985	Lookingglass	164,518	18.3	4-1-87	Lookingglass Creek
1985	Lookingglass	111,711	17.1	4-6-87	Upper Grande Ronde
Rapid River					
1985	Irrigon/ Lookingglass	393,639	24.0-25.0	4-1-87	Lookingglass Creek
1986	Irrigon/ Lookingglass	173,974	35.6	5-20-87	Lookingglass Creek
Carson					
1985	Irrigon	379,450	24.0-25.0	6-11-86	Grande Ronde River
1985	Bonneville/ Lookingglass	88,667	10.1-11.7	2-24-87	Catherine Creek
1985	Bonneville/ Lookingglass	84,295	11.5	3-30-87	Deer Creek (Big Canyon)
Imnaha (a)					
1985	Lookingglass			4-20-87	Lookingglass Creek
Lookingglass-Carson					
1986	Lookingglass			7-20-87	Lookingglass Creek
1986	Lookingglass			3-30-88	Deer Creek (Big Canyon)
1986	Lookingglass			3-31-88	Catherine Creek

Table 13. ODFW spring chinook releases in the Grande Ronde subbasin (1980-1992).

Stock/ Brood year	Hatchery	Number Released	Size (fish lb.)	Date of release	Location of release
Rapid River					
1986	Lookingglass	81,902	22.6	9-18-87	Lookingglass Creek
1986	Lookingglass	82,445	22.8	11-3-87	Lookingglass Creek
1986	Lookingglass	345,943	7.0-20.1	4/1/88	Lookingglass Creek
1987	Irrigon/ Lookingglass	141,080	29.3	5-13-88	Lookingglass Creek
1987	Lookingglass	85,564	21.7	9-23-88	Lookingglass Creek
1987	Lookingglass	86,310	20.9	11-1-88	Lookingglass Creek
1987	Lookingglass	417,354	14.3-19.5	4-3-89	Lookingglass Creek
Lookingglass - Carson					
1987	Lookingglass	83,160	13.2	4-4-89	Catherine Creek
1987	Lookingglass	89,102	14.9	4-4-89	Deer Creek (Big Canyon)
Rapid River					
1988	Lookingglass	126,714	36.2	5-5-89	Lookingglass Creek
1988	Lookingglass	91,433	16.7	3-31-90	Deer Creek (Big
1988	Lookingglass	619,630	12.6-18.9	4-2-90	Lookingglass Creek
1988	Lookingglass	70,002	19.9	4-9-90	Catherine Creek
1988	Lookingglass	80,073	19.5	4-9-90	Upper Grande Ronde
1988	Lookingglass	26,445	20.7	4-10-90	Hurricane Creek
1988	Lookingglass	26,445	20.7	4-10-90	Wallowa River
Lookingglass – Carson					
1989	Lookingglass	504,668	18.6	4-2-91	Lookingglass Creek
Rapid River					
1989	Lookingglass	331,636	13.8-20.6	4-1-91	Lookingglass Creek
1990	Lookingglass	950,868	9.6-18.8	4-1-92	Lookingglass Creek

(a) 1985 brood Imnaha spring chinook were released into Lookingglass Creek because the fish were infected with erythrocytic inclusion body syndrome (EIBS)

The distribution of the early run is not fully known but the early hatchery records indicate that it was present in the Wenaha and Wallowa Rivers and Thompson and Hass (1960) found it in the lower Lostine River and felt that it also spawned in the mainstem Grande Ronde River. There is no reason not to assume that they also spawned in the lower Minam River. It is presently unknown whether they extended above Rondowa, Oregon, on the mainstem. It was the opinion of Thompson and Hass (1960) that the Wenatchee stock has a similar life history and that the early fall run was probably an o-age migrant.

Van Dusen (1903, for 1901) indicated that the run had passed the Wenaha River by the end of August. Accurate population estimates are not available. In 1902, 709 females were trapped at the Grande Ronde Hatchery Station with an unknown number dying when the racks were impacted with moss (Van Dusen 1903). In 1905, 690 females were taken at the Wallowa Hatchery Station (Van Dusen 1907). Fecundities were 4,528 and 3,338 eggs per female, respectively for the two years.

Fall chinook are presently limited in their distribution to the lower river, although the exact extent of their range is unknown. Lavier (1976) prepared maps showing the distribution in 1850 as being in Joseph Creek, the Grande Ronde River as far as Rondowa, the Wallowa River as far as the mouth of the Lostine River and in the Minam and Lostine Rivers. His information came from conversations with local biologists and is probably somewhat speculative (personal communication, Dorien Lavier, 1988). Stout (1957) reported that local inhabitants remembered good runs once being present in Joseph Creek and according to Chapman (1940) "There are said to be good runs of steelhead and fall chinook in it yet..." Figure 8 shows the presumed range in 1975. Van Dusen (1903), however, stated in his 1901 annual report that no fall chinook were moving past the Wenaha River. They had racks across the Grande Ronde River from August 29th through December 8th but only caught a few chinook at the end of August. If fall chinook had ever been present above the Wenaha River, that portion of the run had already been eliminated by 1901. It is unlikely that fall chinook were present up as far as Minam in 1975, especially considering the remnant population entering the Snake River at that time (19,500 crossing Ice Harbor Dam in 1968 versus 1,900 in 1975). It is very likely that people have confused the early fall chinook with fall chinook when looking at the early hatchery records and even when reading Thompson and Hass (1960). Information on the distribution of fall chinook seems to be contradictory. However, there is documentation from residents as far back as 1870 that no chinook salmon were in Joseph Creek.

Adult fall chinook enter the river in early November and spawn in the mainstem during the same month. No research has been done on the outmigration timing for this stock. Most Snake River fall chinook are o-age migrants, migrate out in August and September, and spend two to four years in salt water.

There are no long-term historical estimates of the escapement to the subbasin. Spawning surveys have been conducted from the mouth of the Wenaha to the confluence with the Snake from 1986 to the present. No mitigation was negotiated by the federal and state agencies for losses caused by the four lower Snake River dams because no fall chinook had been observed in the river just prior to construction (personal communication, James Haas, ODFW, retired, 1989).

Washington Department of Wildlife (WDW) counted seven redds, two live fish and two carcasses on November 24, 1987, during a flyby while tracking radio tagged steelhead. The observations were made approximately three miles below Schumaker Creek and between Cottonwood Creek and the river's mouth (Personal communication, Glen Mendel, WDW, 1988). No surveys were made in Oregon. An aerial survey in 1989 from the mouth to the town of Troy found no redds. Visibility during the aerial survey, however, was poor and the redds observed above Troy by fishermen were reported to be rapidly silting over which would make aerial observations difficult.

Summer Steelhead

Summer steelhead are presently distributed throughout the accessible portions of the Grande Ronde River subbasin (Figure 9). The historical distribution is not known but probably approximates today's distribution with the exception of the area above Wallowa Lake which is currently blocked by a dam.

Adult steelhead enter the lower river as early as July but most fish enter from September through April, and peak spawning occurs from late April through early June. Trapping at irrigation diversions indicates that the fingerling outmigration from the tributaries occurs from April through October (Thompson and Haas 1960). The actual timing for individual tributaries is probably dependent on temperature and flow regimes. The peak migration period for the Lostine River is May, August, and September, whereas for Catherine Creek it is during May and June (Thompson and Haas 1960). The fish generally spend two years in fresh water and then migrate out as smolts from April to mid May during the spring freshet. They then spend one to three years in the ocean before migrating back to their natal stream.

There are no historical estimates of the escapement to the subbasin. The estimated escapement in 1967 was 15,900 adults (USACE 1975). This number forms the basis for mitigating the effects of the lower Snake River dams. The current run size estimate is 11,000 adults (Columbia Basin Fish and Wildlife Authority 1989).

Table 5 gives the results of spawning surveys conducted by ODFW from 1964 to the present. No surveys have been conducted in the Washington portion of the river. A high point was reached in 1966 and 1967 when redds/mile were 8.8 and 8.7 respectively. Counts declined sharply in 1968 and then continued to decline until 1979 when a low point of 0.3 redds/mile was reached. Counts rebounded to an average of 3.2 redds/mile from 1980-1984 and then jumped to 8.7 in 1985 and averaged 8.0 through 1988. The count in 1987 for the Wallowa District was 13.6 redds/mile. From 1989-1992, redds/mile have averaged 3.9 with a low of 1.5 in 1991. The poor runs of the last few years are probably the result of the recent drought and resultant poor smolt outmigations.

Table 14. Grande Ronde River summer steelhead redd counts from 1964-1992.			
Year	**Miles Surveyed**	**Redds**	**Redds/mile**
1964	113	331	2.9
1965	175	636	3.6
1966	247	2168	8.8
1967	161	1404	8.7
1968	155	543	3.5
1969	158	610	3.9
1970	151	533	3.5
1971	146	388	2.7
1972	131	490	3.7
1973	148	463	3.1
1974	112	265	2.4
1975	86	147	1.7
1976	84	66	.8
1977	83	210	2.5
1978	110	173	1.6
1979	109	31	0.3
1980	117	275	2.4
1981	100	183	1.8
1982	89	169	1.9
1983	99	157	1.6
1984	63	138	2.2
1985	91	792	8.7
1986	92	680	7.4
1987	88	666	7.6
1988	87	702	8.1
1989	84.5	417	4.9
1990	82.5	438	5.3
1991	61	89	1.5
1992	80.5	300	3.7

Various stocks of fish have been outplanted in the Grande Ronde River subbasin. Table 6 shows the outplanting schedule since 1970 for WDW of non-indigenous stocks. The Skamania stock was derived by crossing Washougal River fish with Klickitat River fish. The

Chelan stock was derived initially from upriver fish trapped at Priest Rapids Dam. Trapping now occurs at Wells Dam. The Dworshak B-strain is an indigenous Clearwater River fish from Idaho. The Wallowa stock was developed by trapping late run fish, probably a mixture of A and B-strains, at Ice Harbor Dam in 1976 and at Little Goose Dam in 1977 and 1978. All fish were outplanted at Cottonwood Creek and near Schumaker Creek (except for the B- Strain planted in Joseph Creek) until 1983 when some Wallowa stock fingerlings were sent to the Wallowa Hatchery from Lyons Ferry Hatchery. This was a cooperative effort by WDW and ODFW to build up the Wallowa Hatchery stocks as rapidly as possible and ran through 1985. Table 7 shows the outplanting schedule for summer steelhead by ODFW during the years 1976-1992.

Table 15. A summary of Washington Department of Wildlife steelhead smolt releases in the Grande Ronde River (1970 – 1987)

Year	Hatchery	Stock	Number
1970	Ringold	Skamania	75,010
1973	Ringold	Skamania	57,235
1974	Ringold	Skamania	50,046
1974	Tucannon	Chelan	53,634
1975	Ringold	Skamania	30,000
1975	Tucannon	Chelan	88,064
1976	Tucannon	Chelan	79,721
1978	Tucannon	Chelan	59,682
1978	Dworshak	B Srain	207,630
1980	Tucannon	Chelan	20,800
1981	Tucannon	Chelan	113,700
1982	Tucannon	Wallowa	35,155
1983	Tucannon	Wallowa	183,782
1984	Tucannon	Wallowa	685,234
1985	Lyons Ferry	Wallowa	528,761
1986	Lyons Ferry	Wallowa	124,200
1987	Lyons Ferry	Wallowa	253,345

1970-81 hatchery and number data taken from Witty 1985, stock data taken from personal communication, Bill Hubbard, Wahington Department of wildlife, Tucannon fish hatchery 1988.

1982-87 data from Shuck and Mendel 1987 and personal communication, Mark Shuck, Washington Department of Wildlife 1988.

Harvest Sport harvest was closed in 1974. A catch and release fishery was reestablished in 1983, and in 1986 the harvest of marked hatchery fish was opened in the lower Grande Ronde River and in the Wallowa River. The average catch from 1959 - 1970 was 1,573 fish. The average dropped to only 684 fish from 1971 -1973. The catch in 1986 was 54 fish, of which two were marked hatchery fish (Carmichael and Boyce 1987).

Coho

Coho are presently extinct in the Grande Ronde subbasin. The historical distribution is not fully known. Figure 8 shows the presumed distribution in 1975. Parkhurst (1950) found a few coho spawning in the lower river during an October 9-17, 1940, survey. He also noted that a small run was reported to be still ascending the Wenaha River. The Grande Ronde Hatchery Station trapped and spawned 438 female coho from the Wenaha River in 1903 (Van Dusen 1903). These fish were incorrectly labeled sockeye in the report but the time of spawning corresponds to coho. Van Dusen (1901) stated that the "Silverside" variety spawn principally in the lower Wallowa River. According to a map prepared by Lavier (1976), the 1850 distribution was in the Wenaha River, the Grande Ronde River up to Rondowa, the Wallowa River to above the lake, the Minam and Lostine Rivers and Hurricane Creek. His information came from conversations with local biologists and is probably somewhat speculative.

Adults began arriving off the Wenaha River in mid September, and spawning at the Grande Ronde Hatchery Station occurred from mid October through December 8th (Van Dusen 1903). Juvenile trapping at irrigation diversions in the Wallowa Valley indicate that the peak outmigration from the tributaries generally occurred from May through July (Thompson and Haas 1960). Coho generally spend about 18 months in freshwater before migrating to the ocean as smolts in May during the spring freshet. Most adults usually spend about 18 months in salt water.

The best historical estimate of escapement to the subbasin is from the 1901 Annual Report of the Master Fish Warden. The Hatchery Station took 7.5 million eggs from 2,511 females. Assuming a 50:50 ratio of males to females, over 5,000 coho were entering the Grande Ronde River at the turn or the century. Only a remnant of this population remained by the early 1960's.

An effort to rebuild the runs was initiated in the mid- 1960's. Adults and eyed eggs from the Bonneville Hatchery or nearby hatcheries were outplanted into the Wallowa River from 1964-1967. These were early run fish from the lower Columbia. Nine hundred adults were released into the Wallowa River in 1964 at three locations: 300 near Minam, 300 near Lostine, and 300 below Enterprise (Witty 1970). Approximately 1,156,260 eyed eggs were planted from 1965-1967 in a spawning channel constructed on Spring Creek above the Wallowa Hatchery (Witty 1968).

One thousand one hundred thirty coho adults from the Bonneville Hatchery were also outplanted in 1964 in the upper Grande Ronde River in four locations: 300 at RM 101.25, 300 at RM 173.00, 126 at Rm 195.00, 404 at RM 199.00 (Sayre 1964). No surveys were attempted in the upper Grande Ronde, and the effectiveness of the outplants is unknown. No subsequent adult or egg outplanting was attempted in the subbasin.

Table 8 shows the redd counts from spawning surveys conducted in the Wallowa River drainage from 1968-1983. The peak count occurred in 1971 when 117 redds were observed. The period prior to the adult and eyed egg plants in the Wallowa River cannot, unfortunately, be compared to the post planting period, but it is probable that the high count in 1971 was the result of the 1967 eyed egg plant. The egg plants were discontinued in 1967 and the count dropped to 51 in 1972. By 1977 only 5 redds were observed. Counts averaged 60.8 redds

(3.1 redds/km) from 1968-1976 and then dropped to an average of 3.8 redds from 1977-1983 (0.2 redds/km). No survey was conducted in 1982, and no surveys were conducted after 1983.

A second attempt to rebuild the stocks occurred in 1983-1984. The program was discontinued, however, when adults trapped at Ice Harbor Dam proved to be insufficient in numbers to support a hatchery program (Schwartzberg and Roger 1986).

During the rebuilding attempts, the coho harvest was being managed at an 80 percent rate in the lower Columbia River. According to the subbasin planning model, naturally reproducing populations located above eight dams cannot survive at that level of harvest. The coho run in the Snake River was officially declared extinct in 1987 by the Northwest Power Planning Council (NPPC) during their June, 1987, council meeting.

No attempt was made under LSRCP to mitigate for losses of coho due to the lower Snake River dams. According to Horner and Bjornn (1983b), an average of 40 percent of the upper Columbia River run turned in at the Snake River between 1962 and 1979. The majority of native coho were produced in the Wallowa River drainage. The average count over Ice Harbor Dam between 1968-1981 was 1,300 fish. This should have equated to a Snake River mitigation goal of 620 adults (1300 x 0.48).

Sockeye

Sockeye were limited in distribution to the Wallowa River, mostly spawning in the gravel bars at the inlet to Wallowa Lake (Van Dusen 1901). The dam at the outlet to the lake was raised to 40 feet in 1916 and blocked off access to the lake for anadromous fish. Kokanee are still present.

Run timing for the lower Grande Ronde River can be found in Van Dusen (1903). Sockeye were reported to be passing the Wenaha River from June 20-July 20. Van Dusen's 1905 annual report indicated that the fish moved into the Wallowa River in September and October. Spawning occurred from mid October through mid November.

The 1902 season produced 3.6 million eggs from 1,173 females which were reared at the Grande Ronde Hatchery Station and an additional 5 million eggs from 1605 females which were "carefully planted in a spawning bar below the racks" (Van Dusen 1903). The 1903 season produced 3.9 million eggs from 1,342 females at the Wallowa Hatchery Station (Van Dusen 1905). In both cases, eggs were planted in gravel bars or fingerlings were released near the rack locations. This meant a probable 100 percent loss of fish since no lakes were close enough for rearing. Assuming a 50:50 ratio of males and females and an average fecundity of 3069 in 1902, there were at least 5,500 sockeye ascending the Wallowa River at the turn of the century. In 1881 and 1882, two canneries on the lake took 60,000 pounds, approximately12,000sockeyeeachyear(Bartlett1975).

Table 16. Annual Coho redd counts within index areas in the Wallowa River drainage, 1968-1983.

Stream	Miles	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1980	1982	1983
Wallowa	5.0	51	35	76	107	43	70	27	12	64	4	3	7	4	0	n.s.	4
Prairie Creek	2.0	2	0	6	0	2	1	0	0	0	1	0	0	0	0	n.s.	n.s.
Spring Creek	2.0	6	4	3	3	2	6	3	n.s.	7	0	0	0	0	0	n.s.	n.s.
Lostine River	3.0	0	3	3	7	4	0	0	0	0	0	0	0	0	0	n.s.	n.s.
Total	12.0	59	42	88	117	51	77	30	12	71	5	3	7	4	0	n.s.	4
Redds/mile		4.9	3.5	7.3	9.8	4.3	6.4	2.5	1.2	5.9	0.4	0.3	0.6	0.3	0.0	n.s.	0.3

n.s. – no survey

Source: Schwartzberg, M. et al, 1986

The sockeye runs had already been greatly reduced by 1905 when a dam was constructed across the Wallowa River near Minam for the Wallowa Fish Hatchery. Between irrigation diversions, dams, hatchery procedures, and overfishing, it is not surprising that in the 1905 report of the Master Fish Warden it was noted that "No eggs of the Sockeye variety of salmon were secured this season which was quite a disappointment, inasmuch as we had always been assured of quite a number of this variety of salmon coming along during the months of September and October" (Van Dusen 1907). The last few adults were observed around 1917 (Toner 1960) and may have been returns from searun kokanee.

HATCHERY FACILITIES

Chinook losses of 5,856 and steelhead losses of 7,632 became the mitigation goals for the Grande Ronde subbasin under LSRCP. Sometime between 1975 and the 1985 ODFW Progress Report (Carmichael et al. 1985), the Oregon mitigation goal for summer steelhead was increased to 9,184 adults and for spring chinook was reduced to 5,813 adults. Washington State expects a summer steelhead return of 1,550 adults from their outplanting efforts for a total return of 10,734 steelhead to the subbasin.

Smolt releases required to meet the adult mitigation goals were based on a smolt-to-adult survival rate of 0.65 percent for chinook and 0.68 percent for steelhead. The number of chinook smolts needed to produce 5,813 returning adults is 900,000 and the number of steelhead smolts needed to produce 9,184 returning adults is 1.8 million (USACE 1983, 1984). Washington needs to release approximately 240,000 steelhead smolts to meet their goal of 1,550 returning adults. Actual smolt-to-adult survivals were closer to 0.2 percent for chinook and 1.0 percent for steelhead.

LSRCP Hatcheries

Two hatcheries and two satellite facilities have been constructed in Oregon to mitigate for losses of chinook and steelhead in the Grande Ronde River subbasin. Lookingglass Hatchery and its satellite facility, Big Canyon Facilities, produce spring chinook. Irrigon Hatchery (located outside of the subbasin) and its satellite facilities, Wallowa Hatchery and Big Canyon Facilities, produce summer steelhead.

One hatchery and one satellite facility have been constructed in Washington. Lyons Ferry Hatchery and its satellite facility located at Cottonwood Creek produce summer steelhead.

Big Canyon Fish Facilities

The Big Canyon Fish Facilities are located on Deer Creek (which flows through Big Canyon) approximately 200 feet from the confluence with the Wallowa River and 1.25 miles east of Minam. Access is provided by a Forest Service road and bridge which connects with State Highway 82. The facility became operational in 1987.

The purpose of these facilities is to act as a backup adult trapping site for both chinook and steelhead and also as an acclimation area for smolts brought in from Lookingglass and Irrigon Hatcheries. Chinook will be trapped from June 1 to September 1 and held for supplemental egg needs at Lookingglass Hatchery or for adult outplanting. This run is presently composed of Carson stock. Chinook smolts are returned from Lookingglass Hatchery in March, allowed to acclimate, and then forced out of the holding pond. Steelhead will be trapped in the spring and then either be passed above the wier or held until ripe and then spawned. The eggs will then be transported to Wallowa Hatchery. Steelhead smolts will be returned from Wallowa Hatchery and held from March 1 to May 1, at which time they will be forced out of ponds.

The facilities consist of one adult holding pond, a covered spawning area, three acclimation ponds, water intake structure and a weir. The concrete adult holding pond is 30 feet x 9.8 feet x 7 feet. There are two inline steelhead acclimation ponds constructed of concrete with dimensions of 150 feet x 30 feet x 5.6 feet. The single chinook acclimation pond is also constructed of concrete with dimensions of 70 feet x 30 feet x 5.6 feet. A diversion dam at the upstream edge of the project provides 12.4 cfs of creek water to the ponds. A fish ladder provides access above the dam for bypassed fish. The weir is located at the downstream edge of the project and consists of a permanent structure and removable racks.

Big Canyon Fish Facilities are designed to handle approximately 10 percent of the LSRCP estimated losses to the Grande Ronde River Subbasin. Approximately 225,000 steelhead smolts are scheduled to be returned to the acclimation ponds from Irrigon Hatchery at 6 fish per pound (37,500 pounds). The return size may be increased to 4 fish per pound for better expected survivals. The chinook acclimation pond is designed to handle the expected return from Lookingglass Hatchery of 125,000 smolts at 20 fish per pound (6250 pounds), (USACE 1984).

Lookingglass Hatchery

Lookingglass Hatchery is located on Lookingglass Creek, 2.3 miles upstream from the confluence with the Grande Ronde River at Palmer Junction, Oregon, and 16 miles north of Elgin, Oregon. Access is provided by a logging road from Palmer Junction. The facility became operational in 1982.

The hatchery is designed to serve the chinook mitigation needs for both the Grande Ronde and Imnaha River systems. Green eggs are brought in from the Big Canyon Facilities as well as being collected at the hatchery. Imnaha stock are kept separate from Grande Ronde stock throughout incubation and rearing. The smolts are then outplanted into their respective river systems.

The facilities consist of adult holding ponds, a spawning/sorting area, egg trays, indoor starter tanks, outdoor rearing ponds, a water intake structure, and a weir. The two concrete holding ponds are 80 feet x 20 feet x 6 feet. The spawning/sorting area is an outdoor covered table where green fish can be returned to the holding ponds and ripe fish can be spawned. There are 36 Heath tray units with 8 trays per unit and a combined capacity for 2.9 million green eggs at 10,000 per tray. The 32 concrete starter tanks are 21 feet x 2.6 feet x 2 feet and have a combined capacity of 1270 pounds at 1244 fish/pound. The 18 concrete rearing ponds are 100 feet x 10 feet x 4.6-5.3 feet and have a combined capacity of 69,500 pounds at 20 fish/pound. The water intake structure is located above Lookingglass Falls, providing gravity flow to the hatchery. A weir directs fish into a trap located just below the intake while a 1 on 5 slope Denil-Type fishway, combined with a convential ladder, leads fish directly into the holding ponds at the facility. There are plans for eventually installing a wier to direct fish into the Denil.

Adult spring and summer chinook are trapped from mid-June until mid-September. Spawning occurs as the fish become ripe, usually from mid August to mid-September. Swim-up occurs from mid January for 12 fish/pound to early March for 20 fish/pound. Fry are reared indoors from July to mid-April or May and then are moved to the outside ponds. At approximately 20 fish/pound, the fish are outplanted to selected streams within the Grande Ronde system. Outplanting occurs in March and April. The entire process from spawning to outplanting lasts 21 to 22 months (USACE 1979).

Wallowa Hatchery

Wallowa Hatchery is located on Spring Creek, one mile from its confluence with the Wallowa River and one mile west of Enterprise, Oregon. Access is provided by Fish Hatchery Road which leads out of Enterprise. The facility became fully operational in 1986.

The original hatchery was expanded to meet mitigation goals for steelhead in the Grande Ronde and Imnaha River systems. Adult steelhead are trapped at Wallowa Hatchery and Big Canyon Fish Facilities for the Grande Ronde system and Little Sheep Creek Facilities for the Imnaha system. Eggs taken at all three sites are incubated to the eyed stage at Wallowa Hatchery and then transported in egg shipping crates to Irrigon Hatchery. Smolts are returned from Irrigon Hatchery to all three sites for acclimation and release. Wallowa Hatchery is the major adult steelhead trapping facility and steelhead smolt acclimation facility for the Grande Ronde system.

The facility consists of an adult holding pond, spawning area, egg incubation trays, two acclimation ponds, water intake facilities, and a weir. Only the Grande Ronde portion of the facilities will be described. The concrete holding pond is 80 feet x 20 feet x 6 feet. The Grande Ronde and Imnaha incubation rooms are isolated from each other. The Grande Ronde section contains 60 four-tray units capable of handling 4.3 million green eggs at 18,000 eggs/tray. The two concrete acclimation ponds are 300 feet x 42 feet x 5 feet and will be in use from 1 February to 15 May. The acclimation ponds have a combined capacity of 100,000 pounds. This is sufficient capacity to acclimate 600,000 smolts at 6 fish/pound. Water is provided from Clear Creek, Spring Creek, two springs, and two deep wells. Well water is the primary source for incubation while Clear Creek is the primary source for the holding and acclimation ponds. The weir consists of a permanent structure on Spring Creek with removable gates. Wallowa Hatchery is considered to be a satellite of Irrigon Hatchery because of its inability to rear fish from eggs to smolts due to water quantity, quality, and temperature problems (USACE 1983).

Irrigon Hatchery

Irrigon Hatchery is located on the Columbia River at approximately rm 279, 3 miles west of Irrigon, Oregon. Access is provided by U.S. Highway 730 to Irrigon and then a connecting road to the hatchery. The facility became fully operational in 1986.

The hatchery is designed to handle steelhead mitigation for both the Grande Ronde and Imnaha River subbasins by raising eyed eggs received from Wallowa Hatchery to the smolt stage. A portion of the hatchery is allocated for each subbasin.

The facilities consist of egg trays, indoor starter tanks, and outdoor rearing ponds. Only the Grande Ronde portion of these facilities will be described. Egg trays are located in 60 units of four trays per unit, providing sufficient capacity for 2.32 million green eggs. The 56 circular indoor starter tanks are fiberglass construction, 6 feet in diameter and 3 feet deep. The combined capacity for the tanks is 3430 pounds (500 fish/pound). The 26 concrete ponds are 11.5 feet x 20 feet x 5 feet and have a combined capacity of 225,042 pounds (6 fish/pound).

Incubation of the eyed eggs received from Wallowa Hatchery occurs from April into May. Indoor rearing of the fry is planned to occur from 1 May through 7 July. Outdoor rearing is scheduled to run from mid-June to the end of March of the following year at which time the smolts will be outplanted (USACE 1983).

Lyons Ferry Hatchery

Lyons Ferry Hatchery is located in Washington State, approximately 10 miles north of Starbuck, WA, on the north side of the Snake River. Access is provided by State Highway 261. A portion of this hatchery's production will be used for steelhead mitigation in the Washington portion of the Grande Ronde River.

The facilities consist of trough type incubators, concrete raceways, and earthen rearing ponds. The trough type incubators are 9.8 feet x 15 feet x 8 inches. Only a portion of the 120 trough-type incubators are designated for the Grande Ronde. The raceways are 9.8 feet x 100 feet x 3.6 feet. There are currently 19 raceways with a possible expansion to 34. Again, only a portion of these are designated for the Grande Ronde. The rearing ponds are 80 feet x 1100 feet x 4 feet to 11 feet. One of the three ponds is assigned to the Grande Ronde.

Wallowa Hatchery provides approximately 500,000 Wallowa stock eyed eggs to the hatchery (only 425,000 were provided in 1989). Fish will be raised to the size of 7/pound prior to outplanting (USACE 1985).

Cottonwood Creek Facility

The Cottonwood Creek Facility is located 2 miles upstream from where Washington State Highway 129 crosses the Grande Ronde River and is situated at the mouth of Cottonwood Creek. A county road provides access from Highway 129 to the site.
The facilities consist of an intake structure located on Cottonwood Creek and an acclimation pond. A concrete diversion dam located 680 feet up Cottonwood Creek will provide water through a 12 inch diameter conduit. The pond covers 58,782 square feet and holds 357,196 cubic feet of water. An impervious pond liner was used to seal the bottom.

The facility is designed for smolt acclimation only. An adult trap has recently been installed on Cottonwood Creek. In the past several years, 208,000 to 221,000 smolts have been released at the facility. The capacity is 250,000 smolts.

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Appendix E

Comments of Independent Reviewers

Comments of independent reviewers from the writing of the original plan in 1992 and update and expansion in 1999 are available in a separate document. For information on these documents, contact the Wallowa County Board of Commissioners or the Wallowa County Office of the OSU Extension Service.

Appendix F

County Resolution – Implementing the Salmon Habitat Plan
&
USFS Memoranda on Imnaha River

WALLOWA COUNTY COURT

Phone 503-426-4543

State of Oregon 101 South River Street, Room 202 Enterprise, Oregon 97828

IN THE COUNTY OF THE STATE OF OREGON

IN AND FOR THE COUNTY OF WALLOWA

IN THE MATTER OF IMPLEMENTING THE WALLOWA COUNTY/NEZ PERCE TRIBE SALMON HABITAT PLAN	)))	RESOLUTION 95-014

WHEREAS, Representatives of the Wallowa County Court, Nez Perce Tribe, Wallowa-Whitman National Forest, Oregon Department of Fish and Wildlife, Oregon Department of Forestry, Baker Resource Area of the Vale District of Bureau of Land Management and other Special Interest Groups have designed a Salmon Habitat Restoration Plan for all Anadromous Fish Streams in Wallowa County **AND;**

WHEREAS, The Plan has undergone extensive peer review by agency and Tribal scientists from participating agencies in Northeast Oregon Hatchery Planning, Sub Basin Planning, Snake River Recovery and Tribal Recovery Plans, this peer review has validated the Wallowa County Plan as technically sound and addresses Salmon critical habitat needs; **AND**

WHEREAS, Implementation of this Plan has been considered by participating Federal, State, Tribal and local Governments and found that implementation will result in enhancing the Anadromous Fisheries Habitat as well as the habitat of other aquatic and terrestrial species; **AND**

WHEREAS, Between the involved entities; the Wallowa County Court, The Wallowa-Whitman National Forest, and the Nez Perce Tribe, there have been working agreements signed; **NOW,**

THEREFORE, BE IT RESOLVED, the Wallowa County Court will join with the Nez Perce Tribe, the Wallowa-Whitman National Forest and other affected entities and agencies to implement the Wallowa County/Nez Perce Salmon Habitat Restoration Plan on all lands within Wallowa County.

SAVED: resolut\95-014

WALLOWA COUNTY COURT

ARLEIGH G. ISLEY, JUDGE

Pat Wortman

PAT WORTMAN, COMMISSIONER

Ben Boswell

BEN BOSWELL, COMMISSIONER

The Wallowa-Whitman National Forest acknowledges the need and encourages this implementation of the Wallowa County/Nez Perce Salmon Plan which is consistent with the Wallowa-Whitman Land and Resource Management Plan including the PACFISH and Interim Management Guideline amendments.

WALLOWA-WHITMAN NATIONAL FOREST

Bob Richmond

BOB RICHMOND, FOREST SUPERVISOR

The Nez Perce Tribes strongly urge the Wallowa County Court, the Wallowa-Whitman National Forest and Oregon Department of Fish and Wildlife and the Oregon Department of Forestry to implement the Salmon Plan as rapidly as possible.

THE NEZ PERCE TRIBE

SI WHITMAN, DIRECTOR OF FISHERIES

SAMUAL N. PENNEY, NPTEC-CHAIRMAN

SAVED: resolut\95-014

States Department of Agriculture | Forest Service | Eagle Cap Ranger District
88401 Hwy. 82
Enterprise, OR 97828

Caring for the Land and Serving People

Reply to: 2210 July 23, 1992

Subject: Mud-Duck Inspection

To: Lloyd Swanger, District Ranger

On July 22, 1992 I met Marty Gardner and Robin Rose at the forks of the Imnaha River. We were to look at the river to assess any damage done by the sheep. We rode up the river about 3/4 miles above the mouth of Cliff Creek.

We did not find any place that we could see any sign of problems from the sheep using the river bottom between the trail and the river. This was a would be expected as the majority is either swamps or downed timber, which would not be conducive to sheep grazing at all.

We did look at several camp sites that are used by recreational users. The sites were the at the mouth of the North Fork, mouth of Blue Creek, Upper Imnaha Meadows, Steens Drop Camp and one area below the Boner Flat Trail across the river. Robin felt that the camps looked better than in the early 1980's when she first visited them. We saw a sheep camp area but could find no problems with it. It looked like there had been some heavy rains as there were several small slides and mud that has washed into areas.

Charles D. Anderson

CHARLES D. ANDERSON
Range Technician

EAGLE CAP RANGER DISTRICT

OCT 20 1992

United States Department of Agriculture | Forest Service | Wallowa-Whitman National Forest | P. O. Box 907 Baker City, OR 97814

Reply to: 2600

Date: October 16, 1992

Subject: Eagle Cap Field Inspection

To: Forest Supervisor

From September 1 through 3, 1992, I assisted the Eagle Cap Ranger District on a field inspection. Those attending the trip were Lloyd Swanger, Larry Brandvold, Kevin Martin, Chuck Anderson, Howard Lyman, Rod Childers, Brad Smith, and myself. Our purpose was to review: (1) the recent massive slide erosion in the Imnaha River area, and (2) the heavy elk use reported in Norway Basin.

Our group witnessed extensive slide erosion in the Imnaha River in almost every drainage, small or large, north of the main Imnaha River. These were on the North, Middle, and South Forks of the Imnaha River. On some of the main creeks, mass erosion extended 30 feet wide and 3 feet deep. Only pictures (I will send later to the District) can accurately show the extent of mass soil movement. Clearly, this was at least a once every 50-year event.

The reason for the massive slide erosion, in my opinion, was due to continued high intensity thunder showers for several days in the last of ~~June and the first of July~~ on top of granitic soils. This was a natural event that probably happens once every 50-100 years.

The area, being in wilderness, is pristine. No timber harvest or road construction exists. The area is part of the Mud Duck sheep allotment. We inspected the drainages and uplands for domestic sheep use. I saw no areas of over-grazing throughout the allotment. We did have the pleasure of observing several elk, lots of elk sign, and some bulls bulging. Vegetation condition and percent ground cover were excellent in almost all areas. We were able to find the band of sheep on the upper portions of North Fork. It appears the sheep permittee is doing a fine job of maintaining light grazing use (about 20-25%) by moving his sheep and camp on a frequent basis. I would not in any way contribute the cause of slide erosion to the current domestic sheep or elk grazing.

Our second purpose of the trip was to inspect elk use in Norway Basin. We observed a 10-15 acre bench (which has cluster transects) which had very heavy use by elk in June and July. It appeared the majority of elk left the area in late July because the vegetation regrew substantially. I would estimate grazing utilization on this bench to be about 60-65 percent. The remainder of Norway Basin had little or no use and excellent vegetation condition and ground cover. Domestic sheep did not graze in Norway Basin in 1992.

Timothy J. Schommer

TIM SCHOMMER
Forest Wildlife Biologist

cc: Lloyd Swanger - Eagle Cap RD
Kevin Martin - Wallowa Valley RD
Howard Lyman - HCNRA, Enterprise
Chuck Quimby
Chuck Ernst
Charlie Johnson

United States Department of Agriculture

Forest Service

Eagle Cap Ranger District
88401 Hwy. 82
Enterprise, OR 97828

Caring for the Land and Serving People

Reply to: 4300

January 20, 1993

Subject: North Fork of the Imnaha Debris Flows

To: Lloyd Swanger, District Ranger

Heavy precipitation triggered a debris flow in a tributary to the North Fork of the Imnaha River in late June 1992.

The geologic history of the area is that tributaries to the North Fork have been downcutting since the last ice age. The base level of the side drainages has been lowered by glacial ice leaving the main North Fork valley. Undercutting of canyon slopes continues and debris are deposited forming fans at the mouth of the draws. This is a natural process.

On July 4th, 1992, Larry Brandvold and Linda Brandvold visited the site of mud flow deposition in the North Fork of the Imnaha. The debris avalanche occurred in a side drainage approximately one mile up the North Fork. Extremely heavy precipitation came down during the last part of June 1992. This water saturated the drainage walls and increased flow of the creek which undercut the side slopes. Consequently, an area of the drainage failed and slid down into the creek. The debris liquefied and avalanched down the drainage until it was deposited in a fan at the bottom of the draw.

The side drainage which failed is young, geologically, and is naturally downcutting to its new base level. Heavy precipitation saturated the walls of the drainage, an area slide out, and deposited in the fan below. The process is entirely natural.

Linda D. Brandvold

LINDA D. BRANDVOLD
Geotechnical Engineer

Caring for the Land and Serving People

FS-6200-28b(3/92)

Appendix G

Letters on Chinook Salmon in Joseph Creek

Letters on chinook salmon in Joseph Creek from the writing of the original plan in 1992 are available in a separate document. For information on these documents, contact the Wallowa County Board of Commissioners or the Wallowa County Office of the OSU Extension Service.

Appendix H

Social and Economic Infrastructure of Wallowa County

This overview was written in 1993 and updated in April, 2000, by Cassandra Botts, Timberlands Communications Manager, Boise Cascade Corporation.

Appendix H

The Social and Economic Infrastructure of Wallowa County

Overview

Wallowa County was the home of Native American people for thousands of years. Archaeological sites and artifacts spanning this period have been documented throughout the county. Major highways now follow the ancient routes. Trails into the high mountains and deep canyons follow prehistoric pathways. The towns of Imnaha, Joseph, Enterprise, Lostine, and Wallowa are located near significant Indian camps. County maps are filled with names such as Chesnimnus, Minam, and Powwatka – words of Native American origin.

Historic records show the Wallowa County area was acquired by treaty, signed with the Nez Perce tribe in 1855. The first permanent settler was William McCormack in 1872. The first white family, the A. B. Findley's, soon joined McCormack. By the end of 1873 about 20 families had arrived in the Wallowa Valley, and in 1874 the federal government recognized homestead rights for the area.[1] The first post office was established at the town of Wallowa in 1874, with F. C. Bramlet as postmaster. In 1876 the first school was held in a log cabin near the confluence of the Wallowa River and Bear Creek.

Settlers first accessed Wallowa County from the Grande Ronde Valley. Captain A. C. Smith built the first toll road over the hill from the area now known as Cricket Flat. He also built a toll bridge about one-quarter mile below the confluence of the Minam and Wallowa Rivers. Smith operated these toll facilities from 1875 to 1878.[2]

Wallowa County's land base (2,033,920 acres) is approximately 65% publicly owned. Therefore, the local economy is influenced greatly by public land management decisions. Recreation and tourist related businesses, timbering, and livestock grazing are particularly affected by public land edicts.

Wallowa County is rural in nature. The population has varied little since homesteading began in the 1870's. The 1900 census shows about 5,600 Wallowa County residents. The population peaked in 1920 with about 9,800 citizens, gradually declined to 6,247 in 1970, and by 1990 had increased slightly to 6,911. The largest community is Enterprise, the County seat, with 1,905 citizens (1990). Joseph follows with 1,073, Wallowa with 748, and Lostine with

[1] The History of Wallowa County, Published by the Wallowa County Museum Board, Wallowa County, Oregon, 1983.

[2] Ibid.

321. The remaining 2,954 citizens reside in the towns of Imnaha or Troy or on farms and ranches outside of the communities.

Government

Wallowa County is governed locally by three elected officials, a Commission Chairperson, and two County Commissioners. The County Commission is housed in the Wallowa County Court House in Enterprise. County roads and schools are heavily dependent on federal timber receipts, which have fallen commensurate with reduced timber harvest the past few years. In fiscal year 1989, Wallowa County timber receipts were $2,297,601; in 1990, $2,328,158; in 1991, $1,046,441, in 1992, $420,623. From a low of $163,000 in 1995, receipts in 1999 were approximately $458,000. (Source: U.S. Forest Service, Wallowa-Whitman National Forest.)

Economy

Historically and currently, Wallowa County's economy is based on natural resource extraction, production, and manufacturing. Timbering, agriculture, and recreational tourism dominate the established economic structure. Art manufacturing, wholesaling and retailing entities have added some economic diversification and stability within the past 20 years.

In 1993 at the time of the original writing of Appendix H, 80 percent of manufacturing jobs were found in lumber and wood products. Since that time, federal decisions regarding commodity outputs from U. S. Forest Service lands have drastically reduced the amount of Forest Service timber sold, which has resulted in the loss of the Boise Cascade sawmill in Joseph (66 full-time jobs). Therefore, in April 2000, approximately 57 percent of manufacturing jobs are within the lumber and wood products sector. The remaining 43 percent are primarily in the manufacturing of fine art bronzes.[3]

The average income has risen, but has not kept pace with the rest of Oregon or the nation. Wallowa County's average income continues well below that of northeastern Oregon and the nation as a whole. Shown below are the average incomes (Table 17, all employment sectors) for Wallowa County, neighboring counties, Oregon, and the United States.

[3] Eastern Oregon Labor Trends, Oregon Employment Department, April, 2000.

	1981	1991	1998
Wallowa County	$12310	$17933	$20711
Union County	$13688	$18790	$22870
Baker County	$12961	$17575	$21949
Oregon	$15376	$22353	$29548
United States	$15689	$24575	$31908

(Source: Oregon Economic Development Division, Oregon Employment Division, and Wallowa County Land Use Plan)

Transportation

Wallowa County is accessed by Oregon State Highway 82 (west) and Oregon Highway 3 (north). Both are paved, two lane highways. An U. S. Forest Service Road, No. 39, connects Wallowa County with Halfway, Oregon, and area to the south. Although paved, this road is narrow and best utilized by those with time to enjoy the mountainous scenery. Since the terrain is high in elevation, Road 39 is open only during the warm summer and fall months.

There are no freight companies based in Wallowa County, but several include this area in their regular routes. Idaho Northern and Pacific now own the rail line, formerly owned by Union Pacific Railroad. Idaho Northern has petitioned for abandonment and is not operating trains at this time. Grain, lumber, and wood chips produced in the County are transported by truck.

The two airports within the County are located near Joseph and Enterprise. The Joseph airport was expanded and improved during 1998 and is capable of handling larger airplanes. There is no fuel or other services available at the Joseph airport.

Infrastructure/Utilities

The infrastructure is supported by Pacific Power, which is owned by Scottish Power, and Clearwater Power Company. Propane is available from various local sources. All of the major municipalities have local water systems, and all major communities except Lostine have sewage treatment plants. The Wallowa Lake State Park and surrounding privately owned area is served by the City of Joseph's sewage system. A County landfill is located northeast of Enterprise, and drop boxes are strategically located throughout the area.

Employment

The labor force in Wallowa County has changed, commensurate with the population and the reduction in timber sold by the federal government. The major industries continue to be those originating from natural resources. The chart below shows the historic labor picture (Table 18).

YEAR	1962	1972	1983	1991	1992	1999
Labor Force	2930	2630	3970	3880	3910	3470
Employment	2600	2310	3550	3580	3550	3080
Percent Unemployment	10.6	8.7	10.6	7.7	9.2	11.2

(Source: Oregon State Employment Division)

A comparison of numbers of employed by major employment sectors, other than agriculture, in 1962, 1972, and 1991 shows a marked increase in Government and gradual increases in other categories. However, by 1999, employment in the Government sector has decreased along with lumber and wood manufacturing. Employment in the other sectors has increased or remained relatively static (Table 19).

Sector	1962	1972	1991	1999
Government	560	560	820	740
Trade	230	350	440	410
Lumber & Wood Manufacturing	430	180	410	190
Services	150	160	230	330
Other Manufacturing	400	190	100	140
Transportation/Utilities	50	60	100	100
Finance/Insurance/Real Estate	70	50	90	120
Construction	50	70	80	120

(Sources: Oregon Economic Development Department, Oregon Employment Division, and Wallowa County Land Use Plan)

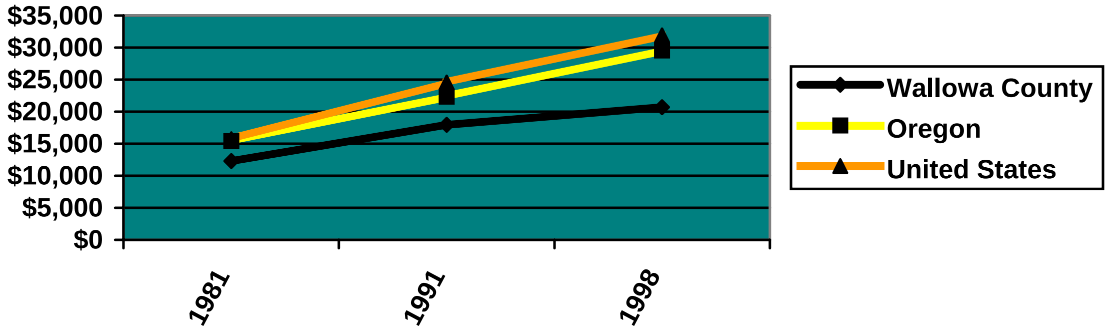
Shown below are 36 employment categories, firm count, average employment, gross payroll and average salary as documented by the Oregon State Employment Division. These figures reflect statistical information for 1991 (Table 20).

Employment Sector	Firm Count	Average Employment	Gross Payroll	Average Salary
Total all Wallowa County Industries	6	2251	$40,366,847	$17,933
Livestock Production	4	41	$541,310	$13,203
Other Ag/Forestry/Fishing	6	24	$372,931	$15,539
General Building Contractors	5	22	$343,608	$15,619
Heavy Construction Contractors	7	36	$1,094,030	$30,390
Special Grade Contractors	12	35	$788,684	$22,534
Lumber & Wood Products	27	399	$9,371,020	$23,486
Other Manufacturing	8	100	$1,790,928	$17,909
Trucking & Warehousing	12	26	$652,643	$25,102
Utilities	4	20	$677,344	$33,800
Other Transportation & Communications	4	42	$577,506	$13,750
Wholesale Nondurable Goods	7	77	$1,233,616	$16,021
Retail Hardware/Garden	6	24	$329,325	$13,722
Food Stores	6	84	$1,202,025	$14,310
Auto Dealers/Service Stations	11	65	$1,296,065	$19,939
Apparel & Accessory Stores	5	13	$145,395	$11,338
Eating & Drinking Places	23	145	$917,288	$6,326
Misc. Retail	13	35	$266,897	$7,626
Other Retail trade	3	14	$193,455	$13,818
Depository Institutions	4	47	$738,988	$15,723
Insurance Agents & Brokers	4	18	$268,222	$14,901
Real Estate	4	6	$59,696	$9,949
Lodging Places	6	23	$167,491	$7,282
Personal Services	5	8	$55,468	$6,934
Business Services	4	8	$48,692	$6,087
Auto Repair Services	4	6	$97,539	$16,257
Amusement/Recreation Services	8	15	$140,328	$9,355
Health Services	9	49	$905,031	$18,470
Legal Services	4	6	$51,491	$8,582
Social Services	6	32	$244,031	$7,626
Membership Organizations	5	17	$75,390	$4,435
Private Households	4	9	$85,859	$9,540
Other Services	6	25	$378,981	$15,159
Nonclassifiable	5	12	$246,678	$20,500
Federal Government	14	224	$5,181,291	$23,100
State Government	14	80	$1,817,276	$22,716
Local Government	19	464	$8,008,326	$17,259

Source: Oregon State Employment division.

For comparison, shown below is Wallowa County's employment picture(Table 21) for 1998. The average annual pay for all industries in Wallowa County has changed little from the 1991 average annual pay, even though the average annual pay for Oregon state-wide has risen from $22,353 in 1991 to $29,548 in 1998 and for the United States from $24,575 to $31,908 in 1998. Wallowa County's average annual pay has risen from $17,933 in 1991 to $20,711 in 1998.

Average Annual Earnings



Industry	Employing Units	Job Count	Total Payroll	Average Annual Pay
Livestock Production	11	39	$615,061	$15,771
Agriculture Services	5	17	$264,431	$15,555
Forestry	9	17	$288,356	$16,962
General Building Contractors	16	39	$682,963	$17,512
Heavy Construction	3	3	$51,630	$17,210
Special Trade Contractors	24	55	$1,185,921	$21,562
Lumber & Wood Products	21	191	$5,172,365	$27,080
Primary Metals	3	110	$2,377,319	$21,612
Other Manufacturing	7	28	$948,284	$27,.391
Trucking & Warehousing	12	34	$948,284	$27,891
Utilities	3	17	$774,726	$45,572
Other Transportation & Utilities	7	54	$995,882	$18,442
Wholesale Durable Goods	3	9	$429,501	$47,722
Wholesale Non-durable Goods	4	57	$1,460,515	$25,623
Building Material Stores	4	16	$223,063	$13,941
General Merchandise Stores	3	10	$101,753	$10,175
Food Stores	6	38	$1,492,318	$16,958
Auto Dealers & Gas Stations	14	77	$1,696,145	$22,028
Apparel & Accessory Stores	6	11	$170,635	$15,512
Eating & Drinking Places	28	139	$975,557	$7,018
Misc. Retail	16	47	$330,158	$7,025
Depository Institutions	3	80	$2,078,709	$25,984
Insurance Agents/Brokers	3	14	$277,167	$19,798
Real Estate	11	12	$209,222	$17,435
Lodging Places	15	83	$611,425	$7,367
Personal Services	4	5	$56,205	$11,241
Business Services	3	2	$30,371	$15,186

Auto Repair Services	7	20	$392,211	$19,611
Amusement/Recreation Services	8	25	$309,895	$12,396
Health Services	15	79	$1,487,171	$18,825
Legal Services	5	12	$157,089	$13,091
Social Services	12	49	$615,491	$12,561
Membership Organizations	13	33	$472,835	$14,328
Engineering/Management Services	7	16	$392,545	$24,534
Private Households	5	9	$98,341	$10,927
Other Services	8	31	$380,833	$12,285
Nonclassifiable	7	17	$399,265	$23,486
Federal Government	10	139	$4,899,017	$35,245
State Government	13	87	$11,109,501	$22,175
Local Government	18	501	$11,109,501	$22,175
Total all Industries	373	2,267	$46,941,894	$20,711

Source: Oregon State Employment Department: Jason Yohannon

As of April 2000, Wallowa County's unemployment rate stands at 11.2 percent; the Oregon average unemployment rate is 5.7 percent and the United States average unemployment is at 4.2 percent.

Education

Wallowa County has three public school districts serving the major communities and respective surrounding rural areas. Kindergarten through 12th grade facilities are located in Joseph, Enterprise, and Wallowa. Kindergartens through eighth grade schools are also located in Imnaha and Troy.

The nearest four-year college is Eastern Oregon University located in La Grande, Oregon. Eastern Oregon University is located about 65 miles from Wallowa County and serves approximately 2,000 students. The Blue Mountain Community College, located in Pendleton, is about 115 miles distant. Both Eastern Oregon University and Blue Mountain Community College provide "satellite" offices in Enterprise to serve off-campus students. Additionally, many classes are offered via the internet for those with computers "on-line."

Communications

Radio KWVR, located in Enterprise, provides both AM and FM broadcasting. Three radio stations are rebroadcast from the Spokane, Washington, area via translator, including one public FM station. The Wallowa Valley Translator Association provides public access to three Spokane television stations and two Portland, Oregon, television stations. Newspapers that serve the area include the weekly Wallowa County Chieftain with 4,032 circulation; The Observer, a daily paper (except Sunday) from La Grande with 7,899 circulation; and The Oregonian, a daily paper from Portland with a circulation of 335,162.

GTE Northwest, and the Union-Wallowa Telephone supply telephone service. Two internet servers provide access to the World Wide Web: Eastern Oregon Net, Inc., and Oregon Trail Internet.

Medical

Wallowa County residents are supported with medical facilities in every major community. The Wallowa Memorial Hospital and Nursing Home is a 33-bed hospital located in Enterprise. In 1999, four family practice physicians, four dentists, two optometrists, two nurse practitioners, and two chiropractors live and work in the County.

In addition to the Wallowa Memorial Hospital and Nursing Home, extended care is offered at the Alpine House in Joseph and several "adult foster" homes throughout the County.

Churches

Most major Christian denominations are represented in Wallowa County. Many churches have organized activities throughout the week. Some have formalized youth-oriented activities.

Recreation

Recreational opportunities abound in Wallowa County. Outdoor spring, summer, and fall activities include hiking and camping, white water rafting, hunting, fishing, boating, water skiing, and photography. Outdoor winter activities include downhill skiing, cross country skiing, snowmobiling, and other snow-oriented ventures.

Recreational facilities include baseball fields, a nine-hole golf course, a golf driving range, a public outdoor swimming pool, indoor swimming pools at various resorts, Wallowa Valley Bowling Lanes, the Wallowa Lake State Park, federal campgrounds, and the Ferguson Ridge ski area. Numerous tourist-related facilities are located at Wallowa Lake, including a swimming area and marina. The Eagle Cap Wilderness and Hells Canyon National Recreation Area provide about 1,000,000 acres for primitive outdoor non-motorized experiences.

Cultural Activities

Cultural activities and opportunities include the many fine art galleries located in Joseph and Enterprise. These galleries feature arts and crafts with world renown and local artists' work represented. The Missoula Children's Theater performs twice yearly. The Fishtrap and Winter Fishtrap multi-day writers' conferences gather authors and publishers from the Pacific Northwest.

The Festival of Arts and the Youth Art Festival are held annually. A local drama group, the Wallowa Players, presents several productions yearly, including the summer-long outdoor melodrama. The Wallowa County Museum in Joseph offers many displays pertinent to Wallowa County's history.

Other major celebrations and activities include the Wallowa County 4-H and FFA Fair, the Nez Perce Pow Wow event, Chief Joseph Days Rodeo, and the Mule Days Show and Rodeo. The Lostine Flea Market is a three-day event that draws thousands. The Alpenfest held at Wallowa Lake in late September is also well attended.

Summary

Wallowa County is home to pioneer families and newcomers alike. It encompasses about 3.3 percent of Oregon's total land base, yet is inhabited by only .2 percent of Oregon's 2,842,321 residents. It is a place of unsurpassed scenic beauty with spectacular mountains, plateaus, and canyons. It is home to cowboys, farmers, artists, ranchers, loggers, saw-millers, retailers, educators, and telecommuters. Many are independent thinkers; most are fiercely defensive of their lifestyles and occupations who intend to continue to live and work in Wallowa County.

Appendix I

Geology

APPENDIX I – GEOLOGY

Bedrock Geology:

Beginning about 15 million years ago, all of the land surface in what is now Wallowa County was covered by the flood basalt flows now known as the Columbia River basalt group. These basalt flows were extruded from vents in eastern Oregon and Washington. Some of the vents were in Wallowa County. These basalt flows inundated more that 15,000 square miles, covering the older rocks with basalt layers in excess of 4000 feet thick.

In the time since the extrusion of the basalt flows, faulting has uplifted the Wallowa Mountains and erosional processes have exposed the older rocks that had been buried by the massive basalt flows. The Wallowa fault, which borders the southwest edge of the Wallowa Valley, has an offset which reaches more than 7000 feet. Remnants of the Columbia River basalt flows are found at the tops of some of the peaks in the Wallowa Mountains. The uplift of the Wallowa Mountains is related to larger scale tectonic processes, which resulted in the formation of the Blue Mountains.

Erosion of the overlying basalt revealed a rock package which is known as the "Wallowa Terrane". These rocks include volcanic greenstones, gabbros, diorites, volcaniclastic rocks, sandstones, shales, and limestones. The terrane rocks were formed 300 to 140 million years ago as part of a volcanic island arc system. Granitic rocks intruded the Wallowa terrane during its accretion to North America 130 to 100 million years age. These older rocks are exposed by both the uplift of the Wallowa Mountains and the downcutting of the Snake River.

Mining:

Many prospectors explored Wallowa County during the later half of the last century and the early portion of this century. Hundreds, if not thousands, of small prospect holes were dug, but few deposits of economic value were found in the northern portion of the mountains (many more economically profitable deposits were found in the southern part of the Wallowa Mountains). Prospecting in the County included panning for gold as well as bedrock mining. Small deposits of gold, silver, copper, lead, etc. were found.

In the last 50 or more years the only mining to speak of in the county has been assessment work on the few claims which were not abandoned.

Landforms:

Some of the mountain peaks reach nearly 10,000 feet above sea level, while the elevation at McDuff Rapids on the Snake River is only 1,300 feet. Many of the landforms in the mountains are related to glacial activity. The most recent period of glacial activity was in the time from about 100,000 to 15,000 years ago. In a climate with lower temperatures than currently found, the snow pack built up in the high mountains and did not melt year round. When the weight of this pack became heavy enough, rivers of ice began to flow. These rivers of ice, or glaciers, scoured rock from the mountains to form the U-shaped valleys down which most of the modern day rivers now flow. This rock was deposited along the leading edges and sides of the glacier. The zone of ablation, the elevation or area in which the glacial ice melts, would stay constant for many years, and the rock material carried by the glacier would be deposited in one spot to form a moraine. The deposits of morainal material, or till, are usually found where the glaciers exited the high mountains.

The Wallowa Valley has been infilled with alluvium. Sediment (from boulder to clay size) derived from the relatively rapid erosional processes in the high mountains is deposited by the streams in the Wallowa Valley. This occurs when the energy of the stream lessens as the stream gradient decreases. Over time the rivers and streams have migrated across the valley floor to build up the alluvial deposits. The boulders, gravel, and sand which are “in transit” from the high mountains to the valley floor form much of the spawning habitat in the county.

The areas to the north and east of the Wallowa Valley include relatively flat areas which grade into rolling hills and the steeper canyons of rivers which feed the Grande Ronde and Snake River drainages. Smaller offsets along faults in these areas have also played a role in shaping the landscape, and in fact, are still shaping the landscape. In 1992, a small earthquake (Richter magnitude of 3.6) shook the Flora area.

Soils:

The soils which form on the terrane rocks are as diverse as their parent material. Some commonalties are that they are generally younger soils and have relatively little clay.

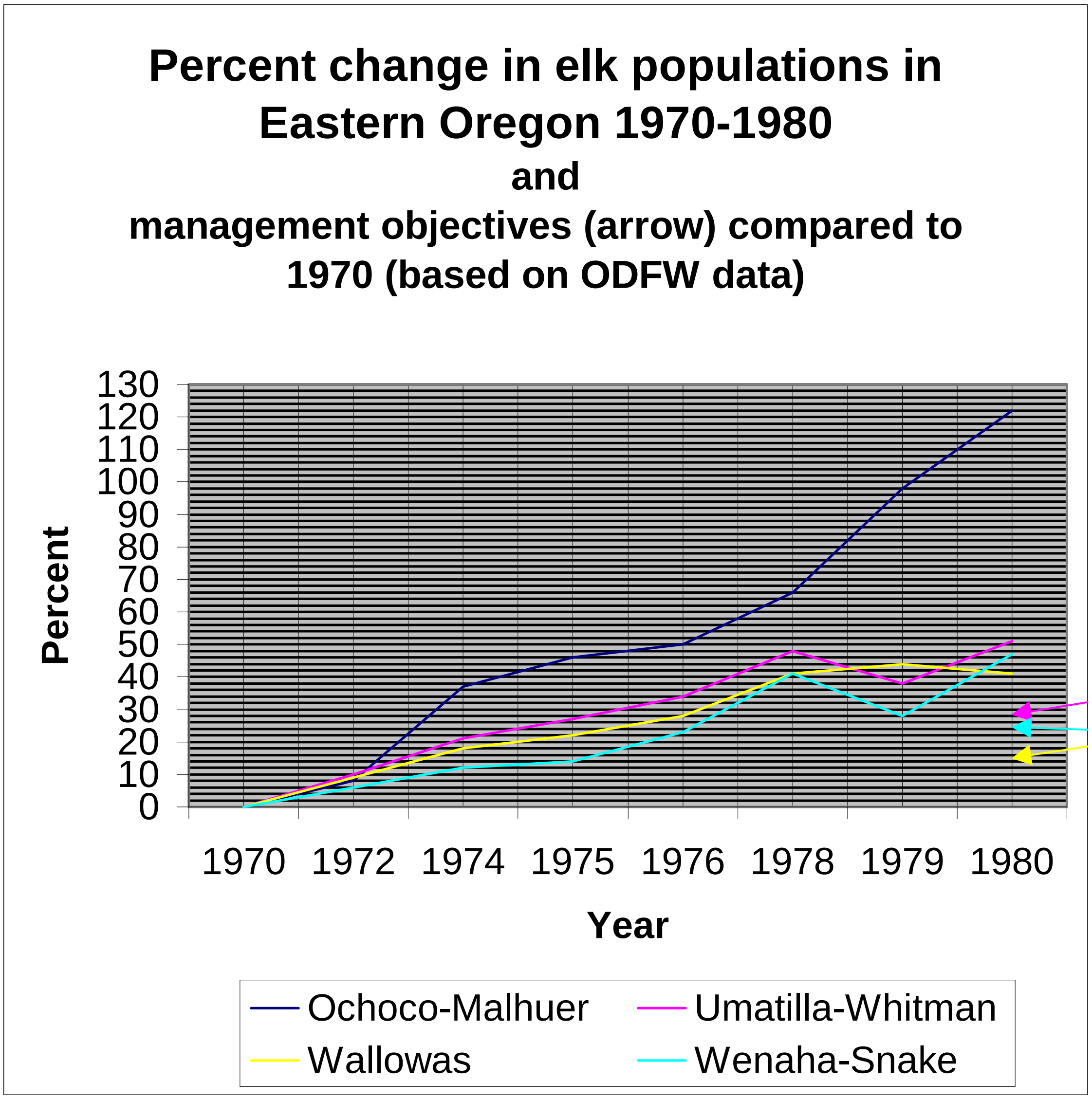
The soils, which form on a basalt substrate, contain little sand. Basalt rock weathers almost directly to clay. The older soils, generally the ones on flatter land, which have formed on the basalt rocks to the north and east of the Wallowa Valley, have had plenty of time to undergo this weathering process. These deeper clay rich soils are subject to compaction if heavy machinery operates on them while they are wet. If the soils are dry or frozen, this excessive compaction does not take place.

Soils on north slopes are generally deeper and more productive of vegetation. This is in part because these slopes do not get as much sun and retain more water. The water is key to formation of clays during the weathering process, as well as to the growth of vegetation. The vegetation also contributes shade and organic matter to further retain water on the north slopes. The existence of vegetation on the north slopes has also helped retain the nutrients from deposits of volcanic ash such as the ones from Mount Mazama about 6000 years ago. The Mazama ash washed off of the generally more barren south slopes.

Appendix J

Agricultural Overviews

Table 22.



F. William Anderson

Executive Assistant

Oregon Coordinated Resource Management

HISTORY OF RANGELAND GRAZING IN WALLOWA COUNTY

Wallowa County contains 1,027,261 acres of land, a large portion of which is usable for grazing and has been used that way for some time.

The Nez Perce Indians grazed horses in Wallowa County as early as the 1730's. They maintained large numbers of horses, as the horse played a significant role in their mobility and lifestyle. Horse numbers among the Nez Perce were as low as 5,000 head in 1892 and as high as 17,000 head in 1880.

The Nez Perce obtained cattle sometime after 1840, maintaining a viable herd. Their cattle numbers were as low as 600 head in 1872 and as high as 7,000 head in 1890.

White settlers began grazing domestic livestock in the 1800's and have continued up to the present day.

Recorded numbers for 1906 indicate there were 18,700 head of cattle and 251,000 head of sheep grazing on the Wallowa Forest Reserve. Uses of grazing allotments were being considered about this time to help gain control of livestock use on the National Reserve. Early observation and surveys of the condition of the forage resource led to a similar concern about the numbers of grazing livestock.

Cattle and sheep grazing peaked about 1920 with approximately 29,000 cattle and 60,000 sheep after which numbers began to drop, and in 1961, were recorded to be approximately 11,200 head of cattle and 11,400 head of sheep. The trend in numbers since then began slowly downward with a reduction in numbers continuing in recent years.

Currently (1993) there are 79 grazing allotments on National Forest land in Wallowa County, 7 of which are vacant. Cattle currently occupy 69 allotments with sheep being on 3 allotments for a total of 72 allotments being used by domestic livestock.

Recorded numbers of domestic livestock on National Forest land in Wallowa County as of 1990 totaled approximately 12,300 head of cattle and 4,300 head of sheep.

[1] "Horses As Fat As Seals" The Geoloqy and Economy of Nez Perce Herding in the Nineteenth Century by Kennety C. Reid, WSU

[2] Dr. Charles Grier Johnson, Jr. An Interpretation of Synecologic Relationships in the Billy Meadows Area of the Wallowa-Whitman National Forest

[3] U.S.F.S. Grazing Statistical Report for 1990

WATER AND IRRIGATION HISTORY

As Wallowa County was settled, people found much of the area was without water for domestic use or livestock. They followed the custom of grazing livestock and homesteading near streams or springs that could be developed. After the choice areas had been taken, the new settler had to develop his water supply by either developing a spring or digging a well. Many springs were developed but relatively few wells were dug. Digging a well before drilling equipment became available was hard, tedious labor and the deeper the well, the more difficult digging became.

Some of the first settlers soon began irrigating by diverting water from streams. First small acreages adjacent to streams were irrigated. Usually these areas were used to produce perennial forage crops, vegetables or to start orchards.

The Wallowa River Valley was the last area settled because it was mostly dry, lacked both wood and water except close to the river, and the technology to produce crops on alkaline soils was not well understood. Thusly, Alder Slope, the hilly lands, and valley fringe areas were settled first.

People who traveled through other sagebrush areas of the west saw the benefits of irrigating these lands and how much they could produce. In addition, the Government became aware of how much could be produced by irrigating these western lands that were relatively level, had fewer stones than the uplands, and were generally adapted to large irrigation projects. Settlers were encouraged to “take up” these lands, form irrigation districts or companies and to develop large projects.

The first diversions from larger streams were relatively small and irrigated from five to 160 acres. But in 1916 a group of farmers organized and designed a plan to dam the Wallowa Lake and irrigate much of the valley. The Mitchell brothers had already demonstrated the benefits as they had farms near Joseph where irrigation had greatly increased production, and people realized the same benefits were possible for much of the Wallowa Valley.

Soon several irrigation canals were constructed, and much of the Prairie Creek Valley became irrigated. Diversions below Joseph had already been installed, and soon the entire Wallowa Valley and most of the Prairie Creek Valley were under irrigation. In addition, many diversions along Big Sheep, Little Sheep, Imnaha, Snake River, the Grande Ronde and their tributaries were utilized to irrigate practically all the cultivated land along streams and in the valley bottoms.

Two more ambitious and difficult projects were completed by 1915. One was the Silver Lake project where Minam Lake was dammed and water diverted for irrigation. The other project was the Wallowa Valley Improvement Project that brought water in a canal from Big Sheep to upper Prairie Creek.

In total, over 67,000 acres were irrigated by the height of irrigation development. This period did not last long. World War II came and with it two other factors: people left the farms to join the war effort; labor became scarce and was replaced with machinery.

Small isolated acreages where the owner could devote time and labor to irrigate were abandoned. Large machines were not adapted to farming small acreages and without someone close by, it was not feasible to irrigate. Thus, most irrigation along Big Sheep, Lower Imnaha, Joseph Creek, Chesnimus and its tributaries, Little Sheep, and many other small tracts were abandoned.

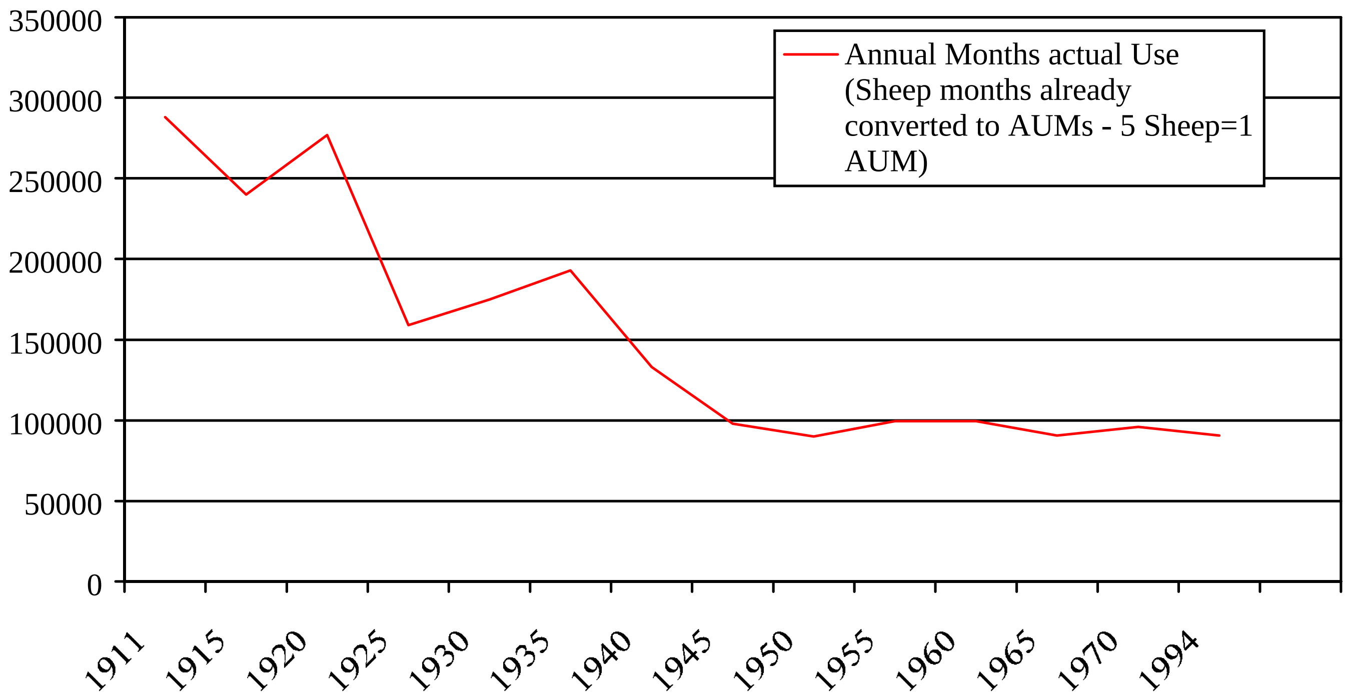
Overall, over 22,000 acres were no longer irrigated by the 1970's. However, because some farmers had converted to sprinkler systems, more acres were irrigated in or near the Wallowa and Prairie Creek valleys. Wells were drilled north and east of Enterprise for irrigation, but they have since been abandoned due to the high cost of labor and energy, plus a short growing season that limits crop production.

Due to the installation of sprinkler systems over a large area (approximately 70 percent of the area) and the change from flooding, substantially less water is used for agricultural purposes. However, at the same time, industrial and domestic uses have increased and, from all indications, will continue to increase.

AGI:kn 3.24.93

Historical Use Summary for Wallowa N.F. (Domestic Livestock)

(Table 23)



The old Wallowa N.F. includes the Sled Springs, Chesnimnus, Snake River, Imnaha, Minam

ODFW Mgmt Units.

AGRICULTURE BACKGROUND
WALLOWA COUNTY

Livestock producers first came to Wallowa County after many areas in Oregon and the west had already been settled. Wallowa County was off the path and separated by geographic features such as deep canyons and high mountains that caused most early travelers to bypass the area.

As livestock herds grew and the demand for grass increased, producers from the Grande Ronde Valley who had been told of abundant grass to the east explored the Wallowa Valley and consequently brought cattle and horses to graze here. As both the government and railroad companies sought to get more homesteaders in the west, Wallowa County, along with many areas, soon had more people than could be supported with the conditions that existed at that time. Homesteads soon lined the streams and all other areas near water that seemed capable of supporting agriculture. Areas were plowed in hopes of producing grain, hay or vegetables. Most meadows near streams were plowed, some were irrigated and livestock were present most of the year.

Barnyards were generally located near or adjacent to the stream. Thus milk cows, pigs, sheep, horses and chickens had ready access to water.

In the early nineteen hundreds 45,000 fat hogs were shipped in one year; 34,000 cattle, 8,700 sheep and 4,500 horses. Many livestock producers were city folks who came to settle the west, and they had little knowledge of the land’s carrying capacity.

Open range laws prevailed, and competition for grass was the driving force behind much over grazing. Soon all of the best or most accessible ranges and pastures were overgrazed. Areas nearest the homesteads received the hardest use as the animals necessary for food and to provide power and transportation were kept near home. Hogs and plows turned meadows upside down while milk cows, sheep and horses confined to smaller areas with limited fencing ate the grass into the ground.

By 1930, most riparian areas had lost the native grasses and most woody vegetation. Many ridge tops, upland meadows and side hills next to homesteads had lost the native vegetation. In the spring and after storms, streams ran brown with mud. Homesteaders starved out and abandoned their farms or sold to neighbors.

Livestock producers who had seen the land in its prime became concerned. They formed associations, and with the assistance of the USFS, began to gain control of livestock grazing. At that time, feral horses were abundant and people could locate them by dust clouds as they traveled long distances between feed and water.

As livestock numbers were reduced, the land began to come back. By 1959 few people had hogs and most milk cows were gone. Riparian areas were first to improve as sod formed and trees and willows increased; range seedings and new management systems replaced much of the excessive grazing. Miles of fence has been built to control where and when livestock graze. The draft horses and many saddle horses have been replaced with machinery.

As people settled, they developed irrigation in the Wallowa Valley and on many small streams. All land was flood irrigated. Over 14,000 acres were irrigated by flooding for nearly forty years. Then sprinkler technology was developed, and today over 70% of the irrigated land in Wallowa County is sprinkler irrigated. Water consumption has been reduced, and the erosion and pollutants associated with flood irrigation is mostly gone.

Today over 24,000 acres of cropland is in the Conservation Reserve program. Another 13,000 acres of cropland has been seeded to permanent pasture. Over 3000 livestock ponds and 3600 watering troughs provide water away from riparian areas. Livestock grazing public ranges have been reduced to 15% of the highest number grazed. Only the people present during the years of fierce competition for rangeland can appreciate the improvements that have occurred since the early thirties. This does not mean there is no conservation work left to be done. We still have the challenge of restoring some areas, teaching new agriculturists proper management and ensuring progress already made is not lost.

Appendix K

Forestry Overviews

AN OVERVIEW OF WALLOWA COUNTY FORESTS

Since the first white family, the A. B. Findley's settled near the present town of Lostine in 1872, the extent of the forested areas in Wallowa County have changed little.

As the area settlers arrived, the need for lumber and other building materials increased. According to historians, the earliest logging activities took place near Wallowa. Since horses were the main source of transportation, most logging of that time was accomplished during the winter months when snow covered the earth.

"The usual procedure, ...was to fell the trees and buck them into lengths usually of 16 feet six inches, skid or drag them with a team of horses to a sled road, then load them on to a sled pulled with one or more teams of horses."[1] In many logging operations, log chutes were used to move logs downward, closer to the sawmills. Two remembered log chutes were located in Allen and Water Canyons. By the early 1900's Wallowa County had many small, and a few large sawmills. By 1908, sawmilling was a lucrative business in Wallowa County. The Nibley-Mimnaugh Lumber Company constructed a large mill near Wallowa. This was the first major sawmilling, and timber harvesting company in the County. The operation included 18 miles of logging railway, located northwest of the present town of Wallowa. About a year after the death of founder James Mimnaugh in 1922, the company was sold to the Kansas City based Bowman-Hicks Lumber Company.

The George Palmer Lumber Company, based in La Grande, Oregon began milling Wallowa County timber about 1907. By 1913, the company had begun construction of a logging railway up Howard Creek. This railroad opened the Grossman area (north of Wallowa) for timber harvest. The George Palmer Lumber Company was purchased by the Bowman-Hicks Lumber Company in 1922. Also, in

[1] The History of Wallowa County, Wallowa County Museum Board, 1983. Page 71

1922, Bowman Hicks purchased the timber holdings of the Grand Ronde Lumber Company, bringing their forest land holdings to 125,000 acres.

Another historical sawmill was the East Oregon Lumber Company, located in Enterprise. Anxious to have a new lumber company, "the citizens of Enterprise gave 80 acres in the heart of the city to the company to secure its location".[2] The land was deeded with the understanding that the East Oregon Lumber would construct and operate a two-band sawmill with 100 thousand board feet (MBF) daily production capacity. The first log was cut on November 22, 1915, but it was not until February, 1916, that the mill was fully operational.[3]

In 1919 the East Oregon Lumber mill in Enterprise was totally destroyed by fire. A new mill was built and became operational about mid-1920. The mill employed about 500, included a lumber planer and extensive railway log transportation system. In 1923 the wages were $3.60 per day.[4] This mill was lost to the Great Depression in 1929.

The J. Herbert Bate mill, located in Wallowa, was purchased from Bowman-Hicks in 1944. At it's peak, the mill employed about 200. The operation included a 12-track dry kiln and a planer.[5] The mill was closed in 1963, and the timberland holdings were purchased by Boise Cascade Corporation.

Other major sawmilling companies operated in Wallowa County. Mt. Emily Lumber Company, Valsetz Lumber Company, Miller Mills and Manufacturing, Mt. View Lumber Company, and Chief Joseph Lumber Company are a few that are better-remembered.

Three major mills remain active in Wallowa County at the

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[2]Enterprise Record Chieftain, July 16, 1914, Page 1

[3]Enterprise Record Chieftain November 23, 1916, Page 1

[4]The History of Wallowa County. Wallowa County Museum Board, Wallowa County, Oregon. 1983.

[5]Id. Page 68

present time. Rogge Lumber, located in Wallowa, R-Y Timber and Boise Cascade, both located in Joseph, process about 85 million board feet of timber annually. The mills employ about 75, 72, and 55 respectively. The Lumber and Wood Products industry in Wallowa County currently totals 27 firms, with about 400 persons employed. In 1991, the annual gross payroll for this industry was about $9,400,000, with the average salary per year being $23,486.[6]

The Boise Cascade plant, located in Joseph was built in 1947 by Mose Miller and Ernest Cloud. Company records show that Valsetz Lumber Company purchased the mill from Miller Mills and Manufacturing in 1958. A studmill owned by Chief Joseph Lumber Company, located north of the present mill was sold to Boise Cascade in 1968.

Rogge Wood Products, Inc. was built in 1974 near the confluence of Rock Creek and the Wallowa River, about three miles northwest of Wallowa. The mill was built by Warren Brewster, and owned and operated by the Rogge family.

The R-Y Timber mill in Joseph was built in 1976 and was owned by Hurricane Creek Lumber Company through 1978. The Hitchcock family purchased the mill in 1978 and operated it through 1985 as Wallowa Lake Forest Industries. In 1985, Ron Yanke from Boise, Idaho purchased the mill and has operated it until the present time -- first as Sequoia Industries and more recently as R-Y Timber, Inc.

About 974,000 acres of Wallowa County are forested. This comprises about 48 percent of the total land base. Of the forested area, the U. S. Forest Service controls about 418,000 acres.[7] Approximately 65% of the 2,017,920 acres within Wallowa County are publicly owned.

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[6] Oregon State Employment Division, Wallowa County 1991 Covered Employment and Payroll Statistics.

[7] Wallowa County Land Use Plan, Adopted by the Planning Commission 5/31/77. Revised and Amended 1988.

Two inventory reports, prepared by the USDA Pacific Northwest Research Station in 1977 and 1989, show a marked increase in growing stock and sawtimber in Wallowa County. The table below is exclusive of national forest land. Volumes are shown in millions of board feet, Scribner Rule.[8]

YEAR	OTHER PUBLIC	FOREST INDUSTRY	OTHER PRIVATE	TOTAL
1978	22	570	290	882
1988	97	691	633	1421

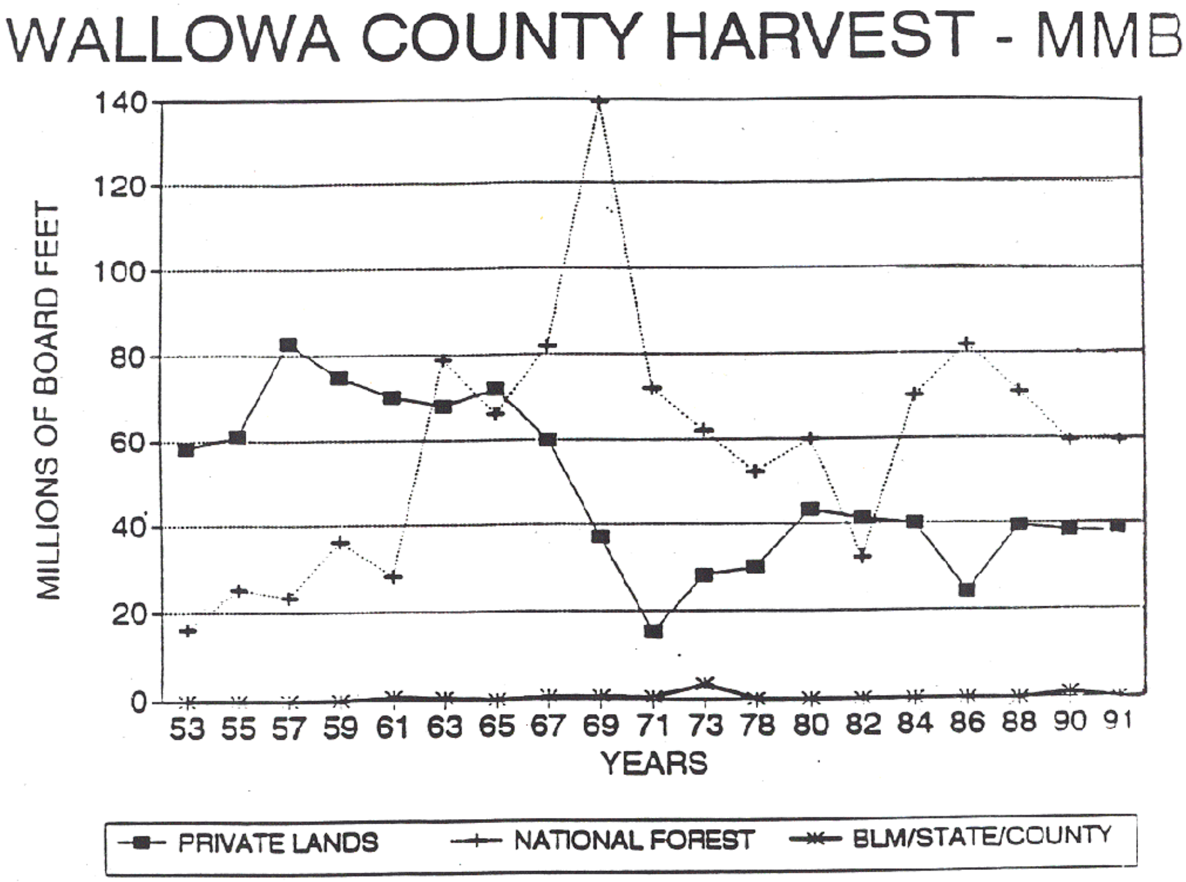
[8] Forestry Statistics for Eastern Oregon, 1977. USDA Forest Service. Resource Bulletin PNW-92, January 1982. Page 15; Timber Resource Statistics for All Forest Land, Except National Forests in Eastern Oregon. USDA Forest Service, Resource Bulletin PNW-RB-164, May 1989. Page 16.

Following is a brief iteration describing the volume in million board feet (MMBF) removed from Wallowa County forests (Table 24):

YEAR	PRIVATE	NATIONAL FOREST	BLM/STATE/COUNTY	TOTAL
1953	58	16		73
1955	61	25		86
1957	83	23		106
1959	75	36		11
1961	70	28	.3	98
1963	68	79	.2	147
1965	72	66		138
1967	60	82	.3	142
1969	37	139	.3	176
1971	15	72	.2	86
1973	28	62	3.1	93
1978	30	52		82
1979	28	77		105
1980	43	60		103
1981	32	61		93
1982	41	32		73
1983	45	62	.7	107
1984	40	70		110
1985	30	73		103
1986	24	82		107
1987	39	95	1.3	135
1988	39	71		110
1989	57	87	1	145
1990	47	53	1	101
1991	38	59		97

Source: Wallowa County Land Use Plan and State of Oregon Timber Harvest Report

Table 25



Source: Wallowa County Land Use Plan and State of Oregon Timber Harvest Report

LOGGING IN WALLOWA COUNTY

The first homesteaders in Wallowa County during the late 1800's and up until about 1910 has a few small sawmills to cut lumber for themselves and their neighbors. The railroad came to Wallowa in 1908 and on to Enterprise in 1909. This provided a market for the large tracts of virgin timber present in the County. Previous to this time, there were no trucks and roads as we see now, only horses and wagon roads. Sleds were used in the winter

Between 1910 and 1929, mills were built at Minam, Wallowa, and Enterprise. Railroad tracks were built into the forests to haul logs to the mills. The mill at Minam used the Minam River and splash dams to float logs to the mill for a few years. The railroads lasted about 15 years, and the total cut during this period was probably about 300 million board feet.

In the early 1930's, during the Depression, the steel was removed from the lines out in the woods. Bulldozers were becoming available for road building, and trucks were now available to haul logs. In 1940, there were about 20 small mills (2 to 5 men) cutting special orders.

In the late 1940's and 1950's, there was massive road building, and the mills began cutting timber other than the big smooth pine. The annual cut in Wallowa County was about 90 million board feet per year, and there were some logs shipped out on the railroad. In the 1970's two mills were built in the county which had the capability to cut the smaller, mixed species logs. The market for mixed species and small logs has continued until the present. This heavy logging of the mixed fir and small pine logs has led to some bad logging practices during the last 20 to 30 years.

The practice of clear cutting and burning has led to erosion and siltation in some drainages. Many roads were built along the streams and, in some cases, this has resulted in excessive silt in the stream.

AN OVERVIEW OF THE ROLE OF FIRE IN WALLOWA COUNTY'S FORESTS

Studies of old fire scars, patterns of vegetation, and soil charcoal yield a fairly clear picture of the fire history of the forests of Wallowa County. Based on this evidence the following scenario for the period prior to settlement by Caucasians emerges:

The lower elevation and dry ridge top forests received light ground fires about every 15-20 years. Many of these fires were the result of lightning, but many may have been spread or set by Native Americans for a variety of reasons including: improving forage for horses, revitalizing berry patches, aiding in the collection of Pandora Moth grubs, and improving hunting conditions. These frequent but low intensity fires tended to maintain these areas as open park-like stands of large fire tolerant Ponderosa Pine trees.

The wetter and higher elevation sites had fire frequency intervals of from between 60-400 years. Because these wetter sites are more productive, they typically built up very heavy fuel loads between the periods when conditions were right for a fire to start and carry through the stands. When fires occurred on these sites, they tended to be high intensity stand-replacement fires. The fire area would then revegetate with Western Larch or Lodgepole pine, and to a lesser extent, Ponderosa Pine. If the period between fires was long enough, Douglas-fir and/or Grand Fir, which are the climax species for these sites, would take over and occupy the site until the next fire.

Starting in the early 1900's, an aggressive program of fire suppression was instituted. This, together with the type harvest practices that were followed until the 1960's and an unusually wet weather cycle lasting from about 1900 to the mid-1980's, has led to the encroachment of Douglas-fir and Grand Fir onto sites that previously supported primarily Ponderosa Pine. During dry cycles such as the County has experienced for the last 7 to 8 years, these species are under heavy stress on these sites. They are therefore extremely vulnerable to insects, disease, and catastrophic fire, and these have resulted in the forest health problems we are currently experiencing.

TIMBER MANAGEMENT IN WALLOWA COUNTY
FROM THE PERSPECTIVE
OF
A LARGE INDUSTRIAL TIMBERLAND OWNER

With the acquisition of Chief Joseph Lumber Company and J. Herbert Bate Lumber Company in the early 1960's, Boise Cascade Corporation became the largest private timberland owner in Wallowa County. Since that time we have acquired other property and consolidated our holdings so that we now own and manage approximately 150,000 acres in the county, of which approximately 121,000 acres is classed as commercial timberland. We mange the land on a long-term sustained yield basis with an annual harvest in the County averaging 20-25 million board feet.

Our predecessors started logging this land in the early part of this century, and virtually all of our land had been logged over at least once – much of it as many as three times – prior to our gaining ownership. Additionally, a significant part of the ownership had been cleared for homesteads, which later had been allowed to revert to timber. Most of the stands on these reverted homesteads date to the 1920 – 1940 era.

The early logging selectively removed essentially all of the mature and high grade Ponderosa Pine and much of the larger mature Douglas-fir and Western Larch. Grand Fir, Lodgepole pine, Subalpine Fir, and Englemann Spruce had little or no economic value in those days, so were largely untouched. As a result, the timberlands we acquired were stocked with a mixture of second growth Ponderosa Pine, somewhat mixed age classes of Douglas-fir and Western Larch (tough heavy to second growth), even-aged stands of Lodgepole pine, and Grand Fir and Englemann Spruce ranging from old growth to very young stands to multi-aged stands. The past management, along with vigorous fire protection, resulted in many of these stands being over-stocked. Additionally, Grand Fire and Douglas-fir now occupy many sites that had historically consisted primarily of Ponderosa Pine and/or Western Larch.

For a variety of reasons, not the least of which are the stresses placed on the trees by the extremely wide swings in periodic weather patterns in the County, our forests are very vulnerable to and unusually heavily plagued by tree-killing agents such as insects and disease. Many of these agents tend to be species and/or age class selective. A prudent approach to management, therefore, dictates that we maintain a good mix of species and age classes well distributed across our ownership.

This approach is further dictated by the stands we have to work with.

We follow the precepts below in carrying out our management:

1. Although an overall operation may cover a large area, tailor specific treatments on a site-specific basis at the smallest possible size area (may be as small as 1/10 ac. in some instances), taking into account the species best adapted to the site and what already exists there.
2. Retain a good mix of species and age classes at the management unit level (200-2000 ac.) e.g., try to keep contiguous areas of single species and/or age class as small as operationally or biologically possible and try to have several species/age classes well represented in each management unit.
3. Maintain stand vigor through good stocking control and selecting individual trees, groups of trees, or stands for harvest based on vigor rather than on tree size class.
4. Use silvicultural regimes that favor regeneration of species that are seral for the specific site.
5. Minimize ground disturbance by appropriately matching equipment to conditions, use of specified skid trails, leaving as much slash in place as practical to protect both regeneration and the soil as well as for retention of large woody debris, and properly timing operations to soil conditions.
6. Meet or exceed all Oregon Forest Practices Act requirements, with special emphasis on riparian zone protection.
7. Try to emulate the patterns that result from natural processes such as fire by laying out treatments whenever operationally feasible.

Following these principles results in stands that tend to be even-aged at the micro level (1/10 acre +) but which have an uneven-aged appearance at the viewshed level. In other words, most of our stands (defined as a fairly homogeneous area with regard to site productivity class, land form, species mix, and age class mix) really consist of mosaics of numerous sub-stands which are too small to map and track separately. As a result, although most of our trees are not ready for harvest until they are 60-100 years old, most of our stands have a re-entry cycle of about 20 years. Additionally, we may have several harvests in a stand or sub-stand to maintain stocking control before we have a regeneration harvest, and even when the regeneration harvest occurs, elements of the older age classes are often retained for one or more entry cycles.

This report prepared by:

Bruce Dunn, Forester, R-Y Timber
Robert Weinberger, Chief Forester, Boise Cascade
Cassandra Botts, Timber Resource Coordinator, Boise Cascade

NATIONAL FOREST SYSTEM LAND

Most of the National Forest land in Wallowa County is part of the old Wallowa National Forest that is currently administered as part of the Wallowa-Whitman National Forest with headquarters in Baker City, Oregon. There are 1,027,261 acres of the Wallowa-Whitman National Forest in Wallowa County. The three administrative units managing these lands are located in Enterprise, Oregon. They are the Eagle Cap Ranger District, Wallowa Valley Ranger District, and the Hells Canyon National Recreation Area. Included in this acreage is the Eagle Cap Wilderness, 218,432 acres in Wallowa County, and Hells Canyon Wilderness,129,781 acres in Wallowa County.

Since these Wilderness's are congressionally designated areas and part of the National Wilderness Preservation System, they are managed under regulations established by the Wilderness Act of 1964. There is approximately 580 miles of streams considered salmon habitat on the Wallowa-Whitman National Forest within Wallowa County.

In the extreme Northwest corner of the county, there is 123,510 acres of National Forest System land on the Umatilla National Forest with headquarters in Pendleton, Oregon. The majority of these acres is within the Wenaha-Tucanon Wilderness.

Most of the National Forest System lands in Wallowa County are managed under the multiple-use management concept. However, there are some special emphasis areas such as the congressionally designated areas that are designed for particular use. Examples are lands in the Hell's Canyon National Recreation Area where recreation is the main emphasis item and the rivers in the Wild and Scenic River system where the river corridors are managed for their outstanding remarkable values.

National Forests are available for a great variety of uses. These include most forms of outdoor recreation, timber production, timber harvest, mining, grazing, and watershed management. They also provide habitat for fish and wildlife, and threatened and endangered plants and animals, etc.

All projects on National Forest System Lands are thoroughly analyzed by the National Environment Policy Act (NEPA) process prior to approval and implementation to assure protection of the entire environment. The Salmon Recovery Plan should mesh nicely with this procedure. In order for any project to proceed, management practices and mitigation measures are required to protect, enhance, and maintain the environment. Among other considerations, clean air and water are primary issues.

Currently, all projects, both ongoing and proposed, on all National Forests in the entire Snake River System are being compiled and submitted to the National Marine Fisheries Service (NMFS) for consultation to determine the effect on the salmon habitat. This process and this Salmon Recovery Plan would compliment each other and result in acceptable habitat should the salmon ever return

Prepared by: Pat O'Connor, USFS, Eagle Ranger District

TIMBER MANAGEMENT IN WALLOWA COUNTY FROM R-Y TIMBER'S PERSPECTIVE

Since 1989, R-Y Timber, Inc., has been purchasing timbered lands in Wallowa County. We have acquired approximately 22,000 acres. We anticipate that this 22,000 acres will supply annually seven million board feet of timber to supply its mill in Joseph, Oregon. As with Boise Cascade's timbered lands, virtually all of our acquisitions have been cut over more than once.

The removal in past entries of the higher value/higher quality species has left the majority of our timbered lands in a second-growth situation. We are endeavoring to use the following guidelines in the management of our timbered lands.

1. We are striving to maintain a more feasible irregular sheltered system. This system requires three or four even-aged stands occupying the same site at the same time. This provides the look of an uneven-aged stand with the flexibility of even-age stand management. Ideally, this system will have five to fifteen large over-story trees, forty to seventy intermediate-story and the remainder of the stand will have up to one hundred trees per acre of seedling and sapling size trees.

2. We are trying to maximize growth on our stands, aiming for three to four rings per year grown, which equates to four to six inches of diameter grown in ten years. These kinds of growth rates require the stand to be progressively thinned to allow growing room for the residual stand.

3. In some instances, because of insect and/or disease, group selections would be required. We favor limiting those selections to quarter acre size or less. Establishment or regeneration of the new serial groups will hopefully be by natural regeneration, not by planting.

4. We plan to make entries on each stand at an average of ten years or less.

Appendix L

Vegetation and Vegetation History

APPENDIX L—VEGETATION AND VEGETATION HISTORY

Some of the factors affecting vegetation in Wallowa County include elevation, precipitation, soils, slope, and aspect. Elevation-precipitation zonation results in whitebark, limber, lodgepole pine and alpine fir above approximately 8000 feet. Fir, spruce, and lodgepole grow above approximately 5,500 feet, depending upon slope aspect, and a variety of plant communities persist at lower elevations. In Wallowa County, approximately 50 percent of the land is in forest, with about 40 percent of that in ponderosa pine-larch forests, 30 percent in Douglas fir-grand fir communities, and 20 percent in Western spruce-fir forests. About half of the County is bunchgrass steppe or bunchgrass-shrub communities. Much of this is in the northern part of the county, in the steep-sloped breaks and canyons of the Grande Ronde River. Native plant communities exhibit substantial biodiversity as well as adaption to slope and moisture conditions.

Native plant communities have been altered by forest harvest and replanting practices, grazing practices, fire suppression, and farming. Bunchgrass-dominated plant communities have been significantly affected by overgrazing that occurred in the late 1800's and early 1900's. Overgrazing has significantly impacted the grass community in some places; planting non-native perennial bunchgrass, beginning in the 1930's, has helped in some overgrazed areas, but not significantly improved other areas. The invasion by non-native plants such as cheat grass (Bromus tectorum) began in the mid- to late 1800's due to overgrazing. Cheat grass, which is endemic throughout the West, replaced bunchgrasses in much of the bunchgrass steppe area. Other non-native plants, including diffuse, spotted, and Russian knapweed, yellow starthistle, and leafy spurge are classified as noxious weeds. These are established in Wallowa County.

Perennial noxious weeds that displace native grasses and shrubs decrease wildlife habitat and biodiversity. Because these plants have solitary, deep taproots rather than a spreading, near-surface network of roots, their domination of slopes results in greater erosion and stream sedimentation than the native bunchgrass and bunchgrass-shrub communities they displace.

Riparian areas are critical to wildlife and fisheries. They occupy relatively small areas (less than 5 percent of Wallowa County's forested area) and are defined by "the presence of vegetation that requires free or unbound water or conditions that are more moist than 'normal'." Native plant communities in riparian areas vary with elevation, aspect, and other factors. These productive areas can contain well-defined habitat zones and vegetative "edges" critical to wildlife. They serve as water storage and cooling areas. From the salmonid perspective, riparian areas along springs, bogs, and alpine meadows are important for water quality, temperature, and quantity considerations. Riparian zones along fish spawning and rearing habitat are important for similar reasons.

Riparian areas are highly productive and have been the sites of heavy use and over-use by humans and livestock. In some areas of Wallowa County, livestock were permitted unlimited access to streams for water and forage, meadowlands were changed to hayfields, and upland springs and ponds were used as stock water. Dwellings and stockyards have been placed near some streams, contributing to a decline in water quality. In some places, trees, especially conifers, have been harvested from riparian zones, eliminating shading and increasing streambank erosion. Harvest of trees and degradation of other vegetation in riparian zones have often severely reduced the amount of decaying leaves, needles and woody debris in streams, removing an important component of stream ecology.

Conifers common in Wal1owa County riparian zones include Douglas fir, Engelmann spruce, and ponderosa pine. Cottonwoods and willows were the dominant native deciduous trees. In the canyons leading from the Wallowa Mountains, riparian vegetation includes cottonwoods and a variety of shrubs and forbs. Lower elevation stream riparian vegetation was dominated by willows and willow thickets.

Appendix M

Mining

Appendix M – Mining

Mining ventures in Wallowa County have been largely confined to the Imnaha River, the Snake River, and small mines in the Wallowa Mountains. Most ventures were copper mines, but some gold was mined. All mining ventures have been small and short-lived. They included the Mountain Chief Mine near the mouth of the Imnaha River and mines on Deep Creek and Copper Creek. Small mining ventures were also tried high in the Wallowas without much commercial success. The ongoing active metal ore mining in Wallowa County is limited to small "hobby mines". Placer mining is limited, but occurs as a "hobby mine" in the Imnaha River. Although small "pockets" of copper and gold probably persist in the pre-Tertiary rocks of the Wallowa, Snake and lower Imnaha River canyons, there is little potential for a commercially rewarding ore deposit.

Appendix N

Multi-species Strategy

TABLE OF CONTENTS

INTRODUCTION

This document is put together to provide a framework or a strategy to assist in land resource management for Wallowa County. One of the goals of this update is to make the document readable, usable, and accessible by the general public. Therefore, we have used common names, non-technical terms, and an extensive use of synonyms that are easily understood. A critical component of this update is the matrix (page N-101). The matrix provides a large amount of information and makes the rest of the document easier to understand. The graphs are a pictorial representation of the matrix and are intended to enhance understanding of the matrix (graphs on page N-7 as an example). Italicized words are defined in the glossary on page N-159.

The largest contributing data source for this document was ICBEMP (Interior Columbia Basin Ecosystem Management Project). This entity provided all baseline data concerning animal species, cover types, and species placement in habitats. However, the prevalent idea in Wallowa County among the scientific professionals is that ICBEMP data is too broad in scope to apply in an acceptable manner. For this reason the local scientists reviewed and edited the data so that it is specific to Wallowa County. The edited data was then used to build the matrix that serves as the core of this document. A rating system was devised to give the data in the matrix levels of credibility. The rating system indicates the reviewing groups' levels of confidence in the data and the contributing entity. With the final, peer reviewed and accepted matrix, summations were performed for the individual habitats, and from these summations, graphs were made to show animal distributions in the various habitats. The text in this document concerning cover types locations, descriptions, uses, and historic range of variability was compiled from research of several land management agencies and private publications.

EXECUTIVE SUMMARY

Wallowa County contains 368 vertebrate animal species, 28 vegetative cover types, and 17 stand structures. "Cover type" is a term used to describe the dominant or climax plant in a community. For example, in the cover type mountain hemlock, this species is the dominant plant in the community and is used to represent all of the associated plant species included in this particular cover type. "Stand structure" is our method of breaking down cover types into different age classes. The mountain hemlock cover type has seven different stand structures, all of which define an age succession or *seral* stage in the cover type. All 28-cover types with their associated stand structures produce 103 individual habitats in Wallowa County.

Graphs #29 and #30 (pages N-7 and N-48 respectively) provide a quantitative summary of all the data used in this document. Graph #29 shows how animal species occur in the stand structures of the cold, dry and moist forests of the tree cover types. Graph #30 shows how animal species occur in the stand structures of the shrub, grass, and other cover types in the non-tree areas. These two graphs provide an example of how to compare stand structures across cover types.

Each description in this document is intended to give the reader a general knowledge of the plant community, related animal species, historical and current uses, geographic locations, and a comparison with other vegetative communities found in Wallowa County. With a general background in a particular site, the user can consult the matrix to determine which animal species could, do, or may exist in a particular site. With a general site description, the matrix as a tool, and, if needed, professional consultation, a landowner can predict the consequences of their management activities.

All quantitative information concerning animal species occurrences, distribution, and habitat preferences is derived from the matrix. The X-axis (left to right) of the matrix contains all cover type and stand structure combinations that occur in Wallowa County while the Y-axis (top to bottom) is a list of vertebrate animal species occurring in Wallowa County. Each box in the matrix defines a species presence or non-presence in individual cover type stand structure combinations. Presence is denoted by characters that pertain to the rating system that describes the degree of confidence in the information and the entity that confirmed its existence. The rating system and contributing entities are defined in the footer of the matrix. Animal species that are highlighted across the matrix are those of concern as stated by ICBEMP. Data in the matrix that has some other character than X has been contributed by another data source.

SPECIAL/UNIQUE HABITATS

Special or unique habitats are areas utilized by wildlife that are not necessarily defined by vegetative cover type or stand structure. The presence of many animal species in a cover type is often a function of the existence of another habitat need that can be masked by the vegetative characteristics. For example, many amphibians and reptiles show weak correlation to vegetation type while soil, presence of water, and types of cover available are much better predictors. Similarly, the presence of the yellow-bellied marmot is more dependent on talus slope existence than vegetation type. Special or unique habitats in Wallowa County are edges, snags, dead and down woody material, cliffs, talus, and caves. Extensive information concerning special and unique habitats can be found in “Wildlife Habitats in Managed Forests in the Blue Mountains of Oregon and Washington” edited by Jack Ward Thomas.

EDGES

An edge is a place where two successional stages or two different plant communities overlap each other, a place where two separate habitats meet and produce a third habitat with characteristics of both parent habitats. The area of overlap is called an *ecotone*, which can be very rich in plant and animal diversity. *Ecotones* can be areas that provide both feed and cover and are consequently used in greater proportions than surrounding habitats. Inherent edges tend to be long standing and occur between plant communities. Soil, topography, geomorphology, and microclimate changes dictate these edges. Induced edges are the meeting of successional stages, different aged stands in a plant community bordering each other. Management practices or short-term natural events such as grazing, vegetation manipulation, fire, disease, insects, logging, or floods can create these edges. Inherent edges tend to form a mosaic pattern of islands and peninsulas that resemble a natural progression while induced edges may be more linear and less random.

SNAGS/DEAD AND DOWN WOODY MATERIAL

A snag is defined as a standing dead tree that is at least 6 feet tall with a minimum 4-inch diameter at breast height. In Wallowa County, 63 vertebrate animal species, 39 birds, and 23 mammals use snags for nesting, shelter, or as a food source. Snags provide a growth substrate for fungus, cover and food for insects, and cavities, roosts, and perches for birds. Standing dead trees contain many insects that are a large food source for many birds and mammals. Snags support birds and bats, and these two lifeforms eat insects which contributes to the suppression of insect epidemics. Large standing dead trees have been removed for safety reasons, to reduce fuel loads, and cut down to produce lumber. Currently many forest managers are leaving snags in place or fabricating new ones from existing live trees to maintain this important habitat. Snags are necessary as habitat for many species, but their type, location and number need to be carefully managed.

Dead and down woody material consists of downed logs, root wads, limb piles, and logging slash. This slowly decomposing matter affects mineral cycling, nutrient immobilization, fire, and provides wildlife habitat. In Wallowa County, 179 animal species, 5 amphibians, 9 reptiles, 116 birds, and 49 mammals use dead and down woody material. Birds use this habitat for lookouts, feeding, as a food source, and for nesting cavities. Small mammals utilize the thermal cover, hiding cover, and the food source provided by this habitat. Some small animals such as squirrels will store food in hollow downed logs while others will live, hibernate, and reproduce in them. The decaying organic matter of this habitat contributes rich nutrients to growing plants. In the event of catastrophic fire, most nutrients are redistributed, and long lasting damage is imposed on this resource.

CLIFF/TALUS/CAVE

Cliffs, talus slopes, and caves are defined as unique habitats because they are difficult or impossible to humanly produce, and they have at least one animal species that depends on them for survival. The best habitat of this type is found on volcanic rock terranes. Igneous rocks do not crumble or disintegrate like sedimentary or metamorphic rocks so cliffs, talus slopes, and caves have better longevity in volcanic terranes. Cliffs provide fissures, ledges, and small openings that are habitat for a variety of reptiles, birds, and mammals. Cliff features are used for roosting, reproduction, hibernation, perching, and shelter. Thermal updrafts common on cliff faces are important for soaring birds to take flight. Talus slopes are the accumulation of angular multisized rocks deposited by erosional forces at the base of steep slopes. Many voids and openings that provide habitat for reptiles, amphibians, birds, and small mammals characterize talus slopes. Herbaceous vegetation often times will border talus, providing a food source for herbivorous animals. Caves provide shelter, protective cover, darkness, solitude, and a stable temperature while maintaining humidity. These features make caves good areas for bats to roost, hibernate, and reproduce. Several other animals use caves for temporary shelter or as places to raise their young. Unused railway/road tunnels, and mine shafts are often used as animal habitat since they resemble caves.

COLD FOREST

COVER TYPE: WHITEBARK PINE (Pinus albicaulis). S208.

Photo by Brother Alfred Brousseau (Calphotos)

LOCATION

Whitebark pine is a subalpine conifer occurring above 6,000 feet in the inland Pacific Northwest. It grows on dry and rocky exposures high in the mountains. It lies in the highest and coldest zones. At timberline, trees may be prostrate due to snow loading, wind, and ice shearing. Whitebark pine is often found in shrublike thickets with subalpine fir and may be found as a *seral* stage species in subalpine fir and mountain hemlock plant associations. After episodes of burning, whitebark pine is a pioneering species on exposed mineral soils and survives fire better due to the severe site location and its scattered nature.

DESCRIPTION/USES

Tree structure is often stunted and between 15 and 50 feet tall. The bark is thin, with whitish scales, and a red brown inner bark. Needles are in bundles of five, 1-3 inches long, and are green to yellow-green with needles occurring at the end of branches. *Ovulate* cones are 2-4 inches long with thick scales and upturned points. *Staminate* cones are red and *ovulate* cones are deep red to purple. Cones disintegrate on the tree rather than fall to the ground intact. Seed dispersal is dependent on the Clark's Nutcracker. The greatest value of the species is as habitat and as a watershed protector through soil stabilization. Whitebark pine has little commercial value for timber products.

STAND STRUCTURE

Seven stand structures are found in the whitebark pine cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

HISTORIC RANGE OF VARIABILITY

Historic range of variability per stand structure.

- Old forest single story:........................1%-10%. Tends to be multistory.
- Old forest multistory:..........................1%-10% with an average of 10%.
- Young forest multistory:.....................50%-70% with an average of 60%.
- Understory reinitiation:.......................5%-25% with an average of 15%.
- Stem exclusion closed canopy: ....5%-25% with an average of 10%.
- Stem exclusion open canopy:............0%.
- Stand initiation:..................................1%-10% with an average of 5%.

ANIMAL SPECIES

Many animal species use the whitebark pine cover type. Woodpeckers, chickadees, nuthatches, finches, crossbills, grosbeaks, and blue grouse use the seeds as a food source. Blue grouse feed on needles and buds. Squirrels, chipmunks, and bears use whitebark pine as caches. The full suite of animal species utilizing the whitebark pine cover type, as it pertains to Wallowa County, can be found in the matrix (page N-101).

GRAPH ANALYSIS

An analysis of the graphs (#1 and #29), concerning the cover type whitebark pine, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #1 shows the number of animal species using each stand structure in the whitebark pine cover type.

Table #1

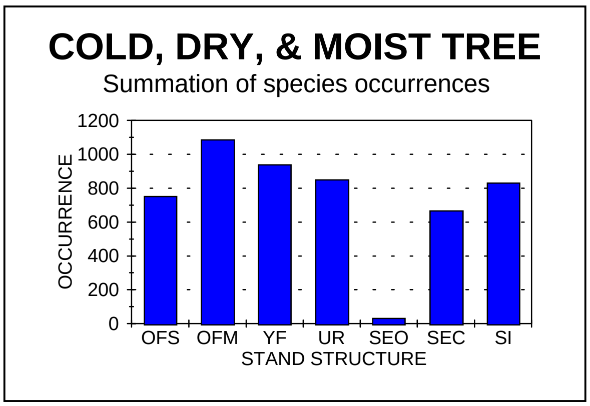
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #1. Number of species by stand structure for whitebark pine. (%)	Whitebark pine use compared to the summation of tree cover types. % comparison.	Number of species of concern using whitebark pine by stand structure. (See note 1)
Old forest single story.	751 (15%)	63 (22%)	More	12
Old forest multistory.	1084 (21%)	61 (21%)	Similar	11
Young forest multistory.	938 (18%)	53 (19%)	Similar	8
Understory reinitiation.	849 (16%)	47 (17%)	Similar	7
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	15 (5%)	Less	4
Stand initiation.	829 (16%)	46 (16%)	Similar	7

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

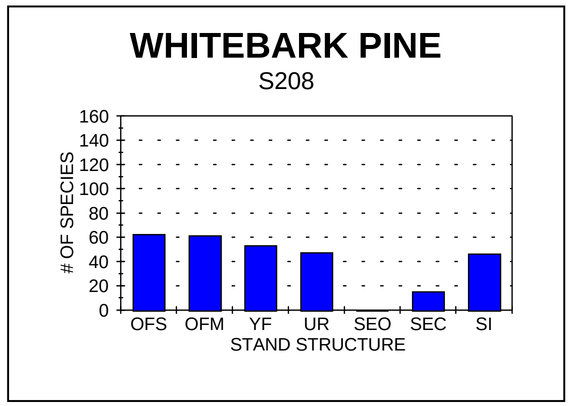
When these two graphs are compared we see that the whitebark pine cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The words “more”, “less”, and “similar” imply how animal species use the whitebark pine stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- More means there is a higher species use of a stand structure in whitebark pine than that stand structure in the summation of tree cover types (difference > 5%).
- Similar means there is close to the same species use of a stand structure in whitebark pine when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.
- Less means there is a lower species use of a stand structure in whitebark pine than that stand structure in the summation of tree cover types (difference > 5%).

Graph #29



Graph #1



Old forest single story and old forest multistory are the most heavily used stand structures in the whitebark pine cover type. When compared to the summation of tree cover types, old forest single story contributes 8% and old forest multistory contributes 6% of all occurrences in those stand structures. Young forest multistory, understory reinitiation, and stand initiation are slightly lower with each contributing 6%. Stem exclusion closed canopy and stem exclusion open canopy are significantly lower with stem exclusion closed canopy contributing 2% and stem exclusion open canopy not contributing. It is seen in this analysis that old forest single story is the most diverse in animal species use and stem exclusion open canopy is the least used habitat.

COVER TYPE: ENGELMANN SPRUCE/SUBALPINE FIR (Picea engelmannii/Abies lasiocarpa). S206.

ENGELMANN SPRUCE.

Photo by Brother Alfred Brousseau (Calphotos)

LOCATION

Engelmann Spruce is a conifer found in many regions in the western United States, Alaska, and western Canada and is a consistent associate with the subalpine fir plant associations. Engelmann Spruce is found in the Cascades of Washington and Oregon, northern California, the northern mountains of Arizona and New Mexico, the mountains of northeast Oregon, and is rarely found west of the Cascades in Washington and Oregon. Preferred site locations are cold, moist, wet frost pockets in forests often dominated by true firs. Preferred site locations are areas of well-drained soils, meadow margins, streams, and lakes. Stands will occur at mid elevations with sufficient cold airflow. Mid elevation stands are on *alluvial* terraces, wet benches, river bottoms, wet slopes, and northern aspects. Engelmann Spruce at timberline is found on all aspects.

DESCRIPTION

Engelmann Spruce can grow up to 180 feet tall, has a narrow pyramidal crown, and has whorled branches that may extend to the ground in unhindered conditions. The bark is thin, loose, scaly, and reddish to purple brown. Needles are 1-2 inches long, sharply pointed, stiff, bluish green, and whorled. The needle has 4 angles and 2 *stomatal* bands on the top and bottom. Small knobs remain on the branch when the needle is shed. *Staminate* cones are 10-15 millimeters long and *ovulate* cones are 1-2 inches long. They are light brown with papery thin scales and serrated margins. Cones hang below branches, flower from June to July, and shed seeds from September to October. Root rot, spruce bark beetle, blow down and fire are the principal reasons for death. Engelmann Spruce is very sensitive to fire and is often killed by low intensity fire due to its shallow roots and thin resin-filled bark. Extensive information concerning Engelmann spruce and its associated plant species, as they occur in Wallowa County, can be found in “Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests” by Elizabeth A. Crow.

USES

Engelmann Spruce is used as lumber, pulp, made into plywood, as an ornamental landscape tree, and was once used to build airplanes due to its lightweight, straight grain, and ease of working. The Native Americans used the bark for canoes and baskets, roots for rope making, and the needles for incense and tea.

HISTORIC RANGE OF VARIABILITY

- *Historic range of variability* data concerning Engelmann spruce is not available for Wallowa County at this time.

SUBALPINE FIR

Photo by John Williams.

LOCATION

Subalpine fir is the most widely distributed fir in North America. It exists in the Yukon, Alberta and British Columbia, Canada, Alaska, the Cascades, the Siskiyous, the Blue and Wallowa Mountains, in the mountains of north and central Idaho, western Montana, Wyoming, Colorado, New Mexico, and Arizona. Subalpine fir occupies subalpine slopes and ridges between 5,000 and 8,000 feet in elevation. In the lower elevations, it is found along streams where there is a presence of cold airflows. At the higher elevations, subalpine fir lives on north and east aspects and on all aspects at timberline. This species occupies cooler sites than grand fir, Douglas fir, and ponderosa pine and is present in cold moist areas with hemlock, Engelmann spruce, whitebark pine and lodgepole pine.

DESCRIPTION

Subalpine fir is a coniferous tree that grows up to 100 feet tall with a spire like crown. The upper branches are short and stiff while the lower branches tend to droop towards the ground. At or near timberline, it can be severely dwarfed and stunted due to cold temperatures, wind, snow, and ice shearing. The bark is thin, ash-gray, and smooth with resin blisters. Older trees have fissured bark at the base. Needles are 1-1.5 inches long, bluish-green, have rounded tips, have *stomatal* bands on both surfaces, and turn upward from spiral arrangements on the branches. *Staminate* cones are bluish and up to 10 millimeters long while *ovulate* cones are deep purple and 2-4 inches long. Cones are cylindrical, upright on the branch, with *bracts* being shorter than the scales. Cones flower in June-early July, shed seeds in September, and disintegrate on the tree. Western spruce budworm, tussock moth, wood rots, fire and snow slides are all contributors to subalpine fir mortality. It is very susceptible to fire due to thin, resin-filled bark, shallow roots, and dense lower branches. Extensive information concerning subalpine fir and its associated plant species, as they occur in Wallowa County, can be found in “Plant Association of the Wallowa-Snake Province” by Charles G. Johnson, Jr.

USES

Subalpine Fir can be harvested for lumber and is an excellent pulpwood. The Native Americans used the needles as an ingredient in hair tonics and in healing salves, and burning boughs were used to fumigate dwellings.

HISTORIC RANGE OF VARIABILITY

Historic range of variability per stand structure.

- Old forest single story:.......................1%-10% Tends to be multistory.
- Old forest multistory:..........................5%-25% with an average of 10%.
- Young forest multistory:.....................50%-70% with an average of 60%.
- Understory reinitiation:.......................5%-25% with an average of 15%.
- Stem exclusion closed canopy: ....5%-25% with an average of 10%.
- Stem exclusion open canopy:............0%.
- Stand initiation:..................................1%-10% with an average of 5%.

ENGELMANN SPRUCE/SUBALPINE FIR

STAND STRUCTURE

Seven stand structures are found in the Engelmann spruce/subalpine fir cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

ANIMAL SPECIES

The Engelmann spruce cover type provides hiding and thermal cover for bear, elk, and deer, and is used by chickadees, nuthatches, owls, and woodpeckers. Spruce, blue and ruffed grouse feed on buds and needles. Squirrels clip buds and young shoots. The seeds are eaten by squirrels, chipmunks, mice, voles, chickadees, nuthatches, crossbills, and siskins.

Subalpine fir stands are used as summer range by mule deer, elk, and bear. Squirrels, mice, woodpeckers, nuthatches, juncos, chickadees, crossbills, siskins, grouse, and owls all use subalpine fir stands. Buds and needles are utilized as a food source by blue grouse year round.

The full suite of animal species utilizing the Engelmann spruce/subalpine fir cover type, as it pertains to Wallowa County, can be found in the matrix (page N-101).

GRAPH ANALYSIS

An analysis of the graphs (#2 and #29), concerning the cover type Engelmann spruce/subalpine fir, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #2 shows the number of animal species using each stand structure in the Engelmann spruce/subalpine fir cover type.

Table #2

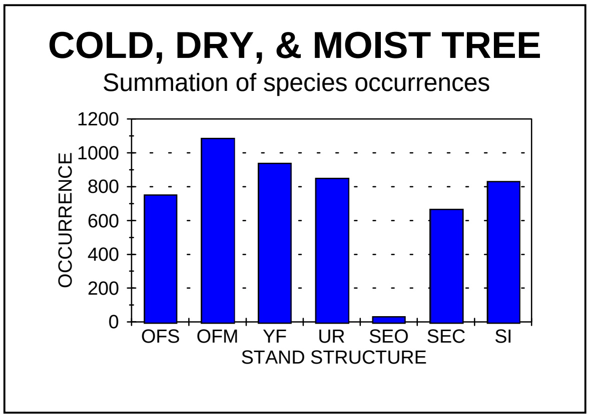
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #2. Number of species by stand structure for Engelmann spruce/ subalpine fir. (%)	Engelmann spruce/sub-alpine fir use compared to the summation of tree cover types. % comparison.	Number of species of concern using Engelmann spruce/sub-alpine fir by stand structure. (See note 1)
Old forest single story.	751 (15%)	0 (0%)	Less	0
Old forest multistory.	1084 (21%)	88 (26%)	Similar	24
Young forest multistory.	938 (18%)	70 (21%)	Similar	10
Understory reinitiation.	849 (16%)	70 (21%)	Similar	15
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	48 (14%)	Similar	7
Stand initiation.	829 (16%)	64 (19%)	Similar	12

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

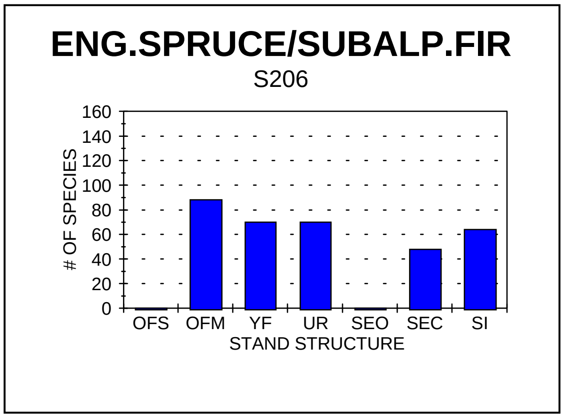
When these two graphs are compared we see that the Engelmann spruce/subalpine fir cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The words “less” and “similar” imply how animal species use the Engelmann spruce/subalpine fir stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- Similar means there is close to the same species use of a stand structure in Engelmann spruce/subalpine fir when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.
- Less means there is a lower species use of a stand structure in Engelmann spruce/subalpine fir than that stand structure in the summation of tree cover types (difference > 5%).

Graph #29



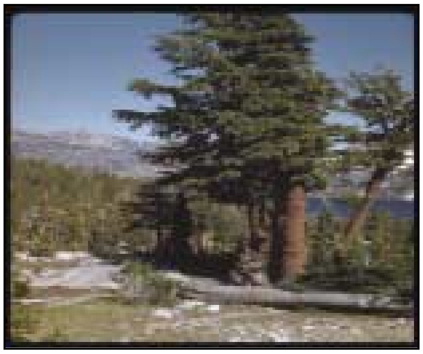
Graph #2



Old forest multistory is the most heavily used stand structure in the Engelmann spruce/subalpine fir cover type. When compared to the summation of tree cover types, old forest multistory contributes 8% of all occurrences in this stand structure. Somewhat lower are young forest multistory, understory reinitiation, and stand initiation with young forest multistory contributing 7%, understory reinitiation contributing 8%, and stand initiation contributing 8% of all occurrences to these stand structures. Stem exclusion closed canopy is a moderately used habitat contributing 7% of the total species using this habitat. The least used stand structures are old forest single story and stem exclusion open canopy with no animal species using these habitats.

<u>COVER TYPE: MOUNTAIN HEMLOCK (Tsuga mertensiana). S205.</u>

Photo by Charles Webber (Calphotos).



<u>LOCATION</u>

Mountain hemlock is a conifer often found with subalpine fir and Engelmann spruce and ranges from Alaska to California. It is found in the high mountains of northern Washington, northern Idaho, western Montana, northeast Oregon, and north central Nevada. Mountain hemlock is found at timberline, in alpine forests, and in subalpine forests. Preferred sites are on *alluvial* and *colluvial* deposits that are moist and well drained. These preferred sites are on moisture retaining north and east slopes and in cornice areas where snowpacks linger into the late summer.

DESCRIPTION

Mountain hemlock often forms pure stands where the successional time frame is slow, and *silviculture* practices are hindered due to cold soil, frost, short growing season, and deep snowpacks. This species is slow growing, frost tolerant, and very important for watershed protection. Mountain hemlock grows up to 130 feet tall with a shallow root system and a drooping leader. The bark is dark purple to reddish brown with deep furrows, rounded ridges, and is 1-1.5 inches thick. Needles have a thick center, are 4 sided, 1/2-1 inch long, dark green on shaded branches, bluish green on branches exposed to the sun, have *stomatal* blooms on the surfaces, blunt tips, and even length needles arranged in a star-like fashion around the twigs. *Staminate* cones are blue and 1/8 inch long. *Ovulate* cones are brownish purple to deep purple and turn brown at maturity. *Ovulate* cones are cylindrical, thin scaled, 1-3 inches long, and are as broad as they are long. Buds are conical, sharp pointed, red brown, and 1/8 inch long. Mountain hemlock flowers in June-July and sheds seeds in August-October. Agents of mortality are laminated root rot, blow down due to shallow roots, and fire. This species is easily killed by fire. Extensive information concerning mountain hemlock and its associated plant species, as they occur in Wallowa County, can be found in "Plant Association of the Wallowa-Snake Province" by Charles G. Johnson, Jr.

STAND STRUCTURE

Seven stand structures are found in the mountain hemlock cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

HISTORIC RANGE OF VARIABILITY

Historic range of variability per stand structure.

- Old forest single story:........................1%-10% with an average of 5%.
- Old forest multistory:..........................1%-10% but tends to be single story.
- Young forest multistory:.....................50%-70% with an average of 60%.
- Understory reinitiation:.......................5%-25% with an average of 15%.
- Stem exclusion closed canopy: ....5%-25% with an average of 15%.
- Stem exclusion open canopy:............0%.
- Stand initiation:..................................1%-10% with an average of 5%.

ANIMAL SPECIES

The mountain hemlock cover type provides excellent thermal and hiding cover for many animal species. The buds are used by blue grouse, seeds are eaten by siskins and chickadees, and mountain goats eat the twigs and needles. The full suite of animal species utilizing the mountain hemlock cover type, as it pertains to Wallowa County, can be found in the matrix (page N-101).

GRAPH ANALYSIS

An analysis of the graphs (#3 and #29), concerning the cover type mountain hemlock, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #3 shows the number of animal species using each stand structure in the mountain hemlock cover type.

Table #3

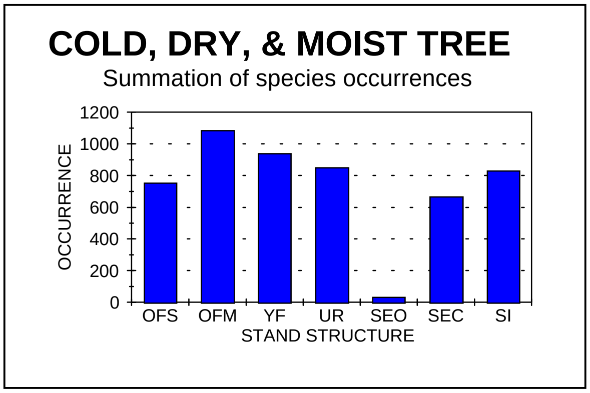
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #3. Number of species by stand structure for mountain hemlock. (%)	Mountain hemlock use compared to the summation of tree cover types. % comparison.	Number of species of concern using mountain hemlock by stand structure. (See note 1)
Old forest single story.	751 (15%)	84 (20%)	Similar	17
Old forest multistory.	1084 (21%)	85 (20%)	Similar	18
Young forest multistory.	938 (18%)	74 (18%)	Similar	10
Understory reinitiation.	849 (16%)	68 (16%)	Similar	11
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	51 (12%)	Similar	6
Stand initiation.	829 (16%)	58 (14%)	Similar	7

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

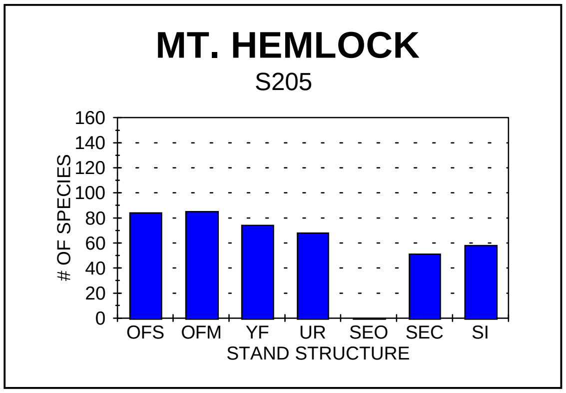
When these two graphs are compared we see that the mountain hemlock cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The word “similar” implies how animal species use the mountain hemlock stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- Similar means there is close to the same species use of a stand structure in mountain hemlock when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.

Graph #29



Graph #3



In the mountain hemlock cover type, old forest single story and old forest multistory are the most heavily used stand structures. When compared to the summation of tree cover types, old forest single story contributes 11% and old forest multistory contributes 8% of all occurrences in those stand structures. Following closely behind are young forest multistory and understory reinitiation, each contributing 8%. Significantly lower are stand initiation and stem exclusion closed canopy with stand initiation contributing 7% and stem exclusion closed canopy contributing 8% to their respective stand structures. Stem exclusion open canopy is the least diverse animal species habitat in the mountain hemlock cover type adding no species to this stand structure.

DRY FOREST

COVER TYPE: INTERIOR DOUGLAS FIR (Pseudotsuga menziesii (var. glauca)). S210.

Photo by Charles Webber (Calphotos)

LOCATION

Interior Douglas fir is a widely occurring coniferous tree in the Western United Stated and Canada. It is found from southeast British Columbia to Alberta Canada. In the United States it is found in Montana, Idaho, eastern Washington, eastern Oregon, Nevada, Utah, Wyoming, Colorado, New Mexico, and Arizona. This species lives in mid *montane* zones that range from moist to dry and is most abundant in low to mid elevations where it forms climax communities. Douglas fir is found on warmer drier sites than true firs and in colder areas than ponderosa pine. In subalpine fir zones at high elevation, Douglas fir occupies dry cool sites.

DESCRIPTION

Douglas fir has a compact pyramidal crown, drooping and ascending branches, an upright leader, and is up to 150 feet tall. The bark on young trees is thin, smooth, and has resin blisters. On older trees the bark is 3-10 inches thick, reddish brown, with irregular deep furrows, and has grayish to reddish brown layered plates with a cork-like texture. Buds are shiny, sharp pointed, conical, and brown to reddish brown. Needles are 3/4-1 inch long, blue-green, yellow-green, or gray-green, have blunt ends, two white *stomatal* bands on the upper surface, and are spirally arranged on twigs. Cones hang from branches in a pendent fashion. *Staminate* cones are orange to red while *ovulate* cones are yellowish green to purple green and become reddish-brown. *Ovulate* cones are 2-4 inches long and have a three lobed bract with the middle lobe extending beyond scales. Douglas fir flowers from April to May and sheds seeds from August to September. In dry sites, dwarf mistletoe attacks foliage. Other agents of mortality are western spruce budworm, tussock moth, and fire. Young trees are very susceptible to fire while older trees with their thick bark are more fire resistant. In moist habitats, crown fires often destroy stands while on dry sites underburns are more common. Extensive information concerning interior Douglas fir and its associated plant species, as they occur in Wallowa County, can be found in “Plant Association of the Wallowa-Snake Province” by Charles G. Johnson, Jr.

USES

Douglas fir is an important wood with many uses. Trees are harvested to produce lumber, plywood, railroad ties, and firewood. Its conical shape and evenly spaced branches make Douglas fir an ideal species for Christmas and landscape trees. The Native Americans used split Douglas fir for construction, the roots for basket weaving, and the needles for tea.

STAND STRUCTURE

Seven stand structures are found in the Douglas fir cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

HISTORIC RANGE OF VARIABILITY

Historic range of variability per stand structure.

- Old forest single story:............. 15%-55% with an average of 25% in warm moist areas.
  .... 15%-55% with an average of 40% in warm dry areas.
- Old forest multistory:.................10%-30% with an average of 20% in warm moist areas.
  ....5%-25% with an average of 15% in warm dry areas.
- Young forest multistory: ....10%-30% with an average of 20% in warm moist areas.
  ....5%-25% with an average of 15% in warm dry areas.
- Understory reinitiation: ....1%-10% with an average of 5% in all areas.
- Stem ex. closed canopy: ....1%-10% with an average of 10% in warm moist areas.
  ....1%-10% with an average of 5% in warm dry areas.
- Stem ex. open canopy:............. 5%-20% with an average of 10% in all areas.
- Stand initiation:........................1%-15% with an average of 10% in all areas.

ANIMAL SPECIES

The Douglas fir cover type provides habitat for many animal species. Deer and elk use Douglas fir for cover and forage while squirrels eat the seeds and use the trees as caches. Clark's nutcracker, nuthatches, crossbills, juncos, and siskins eat Douglas fir seeds. The full suite of animal species utilizing the Douglas fir cover type, as it pertains to Wallowa County, can be found in the matrix (page N-112).

GRAPH ANALYSIS

An analysis of the graphs (#4 and #29), concerning the cover type Douglas fir, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #4 shows the number of animal species using each stand structure in the Douglas fir cover type.

Table #4

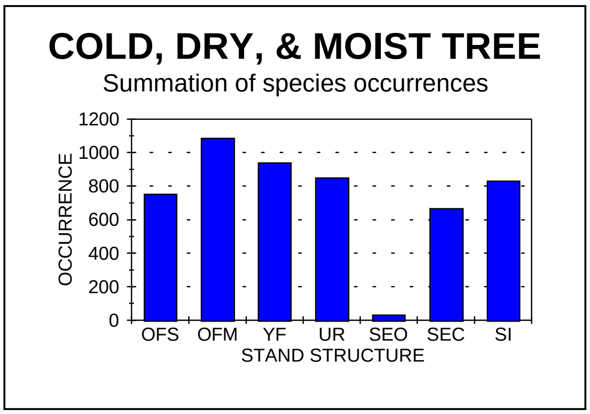
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #4. Number of species by stand structure for Douglas fir. (%)	Douglas fir use compared to the summation of tree cover types. % comparison.	Number of species of concern using Douglas fir by stand structure. (See note 1)
Old forest single story.	751 (15%)	139 (21%)	More	38
Old forest multistory.	1084 (21%)	137 (20%)	Similar	41
Young forest multistory.	938 (18%)	112 (17%)	Similar	20
Understory reinitiation.	849 (16%)	112 (17%)	Similar	23
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	77 (11%)	Similar	6
Stand initiation.	829 (16%)	97 (14%)	Similar	17

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

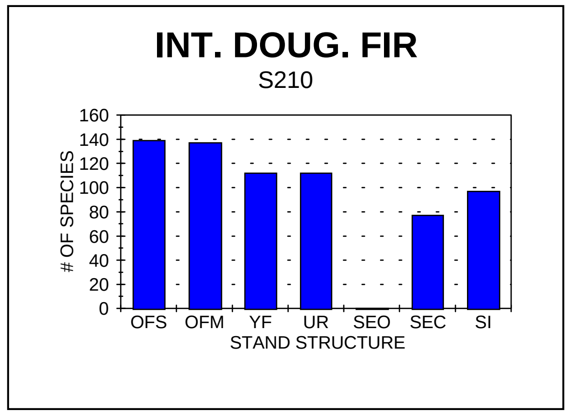
When these two graphs are compared we see that the Douglas fir cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The words “more” and “similar” imply how animal species use the Douglas fir stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- More means there is a higher species use of a stand structure in Douglas fir than that stand structure in the summation of tree cover types (difference > 5%).
- Similar means there is close to the same species use of a stand structure in Douglas fir when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.

Graph #29



Graph #4



Old forest single story and old forest multistory are the most heavily used habitats in the interior Douglas fir cover type. When compared to the summation of tree cover types, old forest single story contributes 19% and old forest multistory contributes 13% of all occurrences in those stand structures. Somewhat lower, but still heavily used, are young forest multistory and understory reinitiation with each contributing 12% and 13% respectively. Significantly lower are stand initiation and stem exclusion closed canopy with each contributing 12% to their respective stand structures. Stem exclusion open canopy is the least diverse habitat in the interior Douglas fir cover type with no animal species contribution.

COVER TYPE: WESTERN LARCH (Larix occidentalis). S212.

Photo from http://osu.orst.edu/instruct/for241/con/1chgen.html

LOCATION

Western larch is a widely occurring mid *montane* coniferous tree in the Pacific Northwest and southwestern Canada. It is found on the south and east sides of the Cascades, central Oregon, northeast Oregon, northern Washington, and Northern Idaho to northeast Montana. Western larch grows on moist deep soils, dryer gravels, and is prominent on ash influenced soils. This species lives on northeast exposures in the lower limits of its environmental range where it is associated with moist and cool Douglas fir plant associations. At mid and upper elevations western larch is found on all aspects.

DESCRIPTION

Western larch grows up to 180 feet tall, has a long clear trunk, has a short crown, and has horizontal radiating branches. The bark on young trees is thin, scaly, and grayish brown. On older and mature trees, the bark is up to 6 inches thick, has flattened plates between deep furrows, is yellowish brown, and resembles ponderosa pine bark. The buds are small at 1/8th inch long, rounded, and brown in color. The needles on western larch are very unique, as it is our only conifer with *deciduous* needles. Needles are bunched on spurs in groups of 15-30, are pale green that turn bright yellow before shedding, and are 1-2 inches long. *Staminate* cones are yellow and 1/2 inch long. *Ovulate* cones are oblong, one inch long, have *reflexed* reddish brown scales, and have *bracts* with a prominent central spine that is longer than the scales. This tree flowers from May to June and sheds seeds from September to October. With its thick bark, western larch is the most fire resistant tree in the inland Pacific Northwest. Western larch establishes quickly after episodes of burning, grows rapidly, and dominates as a fire pioneer.

USES

Western larch is a valuable wood with many uses. With its high strength, it is used for lumber, utility poles, plywood, veneer, shakes, and is cut for firewood. The Native Americans made a sweet syrup and gum from the resin, made tea out of the bark for colds, coughs, and sore throats, and fashioned bowls out of the wood.

STAND STRUCTURE

Seven stand structures are found in the western larch cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

HISTORIC RANGE OF VARIABILITY

Historic range of variability per stand structure.

- Old forest single story:............. 0% in cool areas.
  .... 15%-55% with an average of 40% in warm areas.
- Old forest multistory: .... 30%-60% with an average of 40% in cool areas.
  .... 5%-25% with an average of 15% in warm areas.
- Young forest multistory:............ 20%-50% with an average of 30% in cool areas.
  .... 5%-25% with an average of 15% in warm areas.
- Understory reinitiation:.............. 5%-25% with an average of 20% in cool areas.
  .... 1%-10% with an average of 5% in warm areas.
- Stem ex. closed canopy:.......... 1%-10% with an average of 5% in cool areas.
  .... 1%-10% with an average of 5% in warm areas.
- Stem ex. open canopy:............. 0% in cool areas.
  .... 5%-20% with an average of 10% in warm areas.
- Stand initiation:............................ 1%-10% with an average of 5% in cool areas.
  .... 1%-15% with an average of 10 % in warm areas.

ANIMAL SPECIES

The western larch cover type provides habitat for many animal species. Deer, elk, and bear use the stands for cover, while crossbills eat the seeds. Blue grouse and spruce grouse use the needles. The full suite of animal species utilizing the western larch cover type, as it pertains to Wallowa County, can be found in the matrix (page N-112).

GRAPH ANALYSIS

An analysis of the graphs (#5 and #29), concerning the cover type western larch, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #5 shows the number of animal species using each stand structure in the western larch cover type.

Table #5

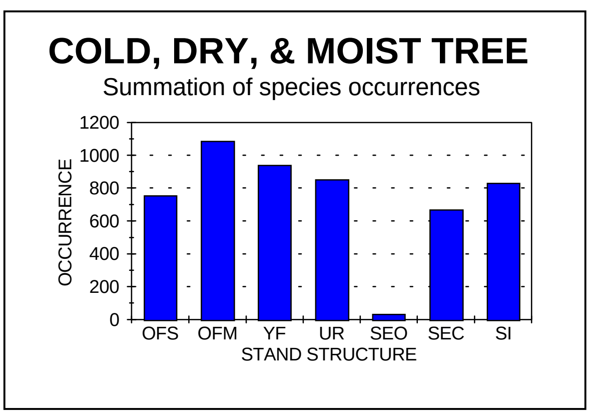
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #5. Number of species by stand structure for western larch. (%)	Western larch use compared to the summation of tree cover types. % comparison.	Number of species of concern using western larch by stand structure. (See note 1)
Old forest single story.	751 (15%)	118 (21%)	More	29
Old forest multistory.	1084 (21%)	114 (21%)	Similar	32
Young forest multistory.	938 (18%)	91 (17%)	Similar	10
Understory reinitiation.	849 (16%)	87 (16%)	Similar	16
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	64 (12%)	Similar	5
Stand initiation.	829 (16%)	76 (14%)	Similar	12

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

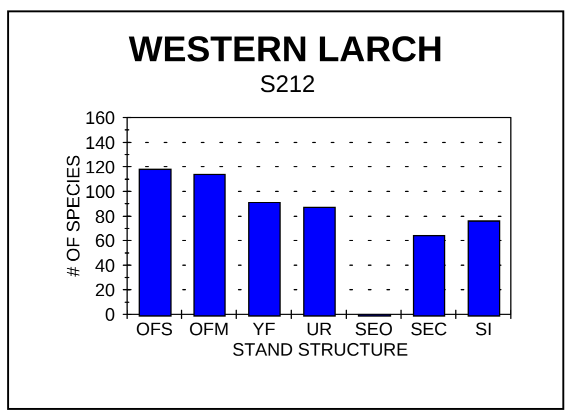
When these two graphs are compared we see that the western larch cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The words "more" and "similar" imply how animal species use the western larch stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- More means there is a higher species use of a stand structure in western larch than that stand structure in the summation of tree cover types (difference > 5%).
- Similar means there is close to the same species use of a stand structure in western larch when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.

Graph #29



Graph #5



Old forest single story and old forest multistory are the most heavily used stand structures in the western larch cover type. When compared to the summation of tree cover types, old forest single story contributes 16% and old forest multistory contributes 11% of all occurrences in those stand structures. Young forest multistory and understory reinitiation are somewhat lower with each contributing

10%. Significantly lower in species use are stand initiation and stem exclusion closed canopy each contributing 9% and 10% respectively. Stem exclusion open canopy is the least diverse habitat in the western larch cover type with no animal species contribution.

COVER TYPE: LODGEPOLE PINE (Pinus contorta (var. latifolia)). S218.

Photo by Neva Snell (Calphotos)

LOCATION

In North America lodgepole pine is one of the most widely distributed trees and is the conifer with the greatest range in altitude and latitude. Lodgepole pine is found in Alaska, the Yukon to Alberta and Saskatchewan, in the Rocky Mountains to southern Colorado, in the Blue and Wallowa Mountains of Oregon, Idaho, northern Utah, and western Nevada. Habitat sites are in mountain forests from mid to high elevations where it forms extensive pure stands following stand-replacing fires. This tree grows across a wide range of environments, low elevations where it is warm and dry to high elevations where it is cool and moist.

DESCRIPTION

Lodgepole pine is a small conifer that grows up to 100 feet tall, has a long slender trunk, and has a short crown. This species often forms dense stands that have pioneered after episodes of burning. The bark is less than one inch thick, flaky, and gray to dark gray. Buds are ovoid, 1/4 inch long, resinous, and chestnut-brown. Lodgepole pine needles are in bundles of two, 1-3 inches long, stiff, commonly twisted, and are green to yellow green. *Staminate* cones are reddish green, clustered, and up to 0.4 inches long. *Ovulate* cones are 1-2 inches long, ovoid, purplish brown, have knoblike base scales, have a long *prickle*, and hang below branches. Some cones will open after their second year while others will stay on the tree for years and only open to seeding after fire. Cones flower from April to June and shed seeds from September to October. Ground fire will easily kill lodgepole pine due to its thin bark. Ground fires also tend to thin stands while higher intensity fires will tend to destroy a stand by crown burning. Other agents of mortality are mountain pine beetle, dwarf mistletoe, and western gall rust. Extensive information concerning lodgepole pine and its associated plant species, as they occur in Wallowa County, can be found in “Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests” by Elizabeth A. Crow.

USES

Lodgepole pine is a valuable wood with many uses. It is used to make small dimension lumber, plywood, posts, paper, and house logs. Native Americans used small trees for teepee poles, pitch and resin for gum, and the inner cambium layer to counter tuberculosis.

STAND STRUCTURE

Seven stand structures are found in the lodgepole pine cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

HISTORIC RANGE OF VARIABILITY

- *Historic range of variability* data concerning lodgepole pine is not available for Wallowa County at this time.

ANIMAL SPECIES

The lodgepole pine cover type provides habitat for many animal species. It provides critical summer range for deer and elk, seeds are used by squirrels and chipmunks, and the needles are eaten by blue and spruce grouse. The full suite of animal species utilizing the lodgepole pine cover type, as it pertains to Wallowa County, can be found in the matrix (page N-112).

GRAPH ANALYSIS

An analysis of the graphs (#6 and #29), concerning the cover type lodgepole pine, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #6 shows the number of animal species using each stand structure in the lodgepole pine cover type.

Table #6

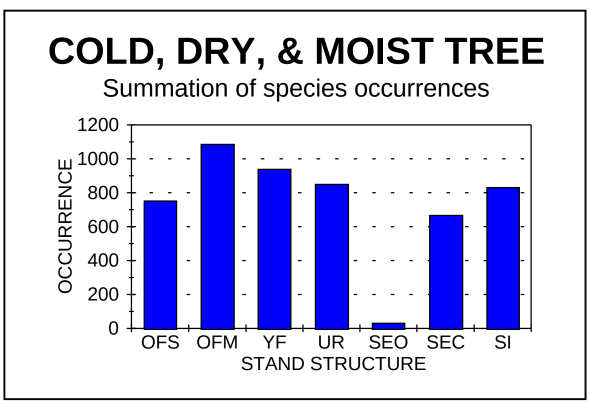
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #6. Number of species by stand structure for lodgepole pine. (%)	Lodgepole pine use compared to the summation of tree cover types. % comparison.	Number of species of concern using lodgepole pine by stand structure. (See note 1)
Old forest single story.	751 (15%)	96 (20%)	Similar	23
Old forest multistory.	1084 (21%)	92 (19%)	Similar	21
Young forest multistory.	938 (18%)	83 (17%)	Similar	14
Understory reinitiation.	849 (16%)	79 (16%)	Similar	14
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	62 (13%)	Similar	8
Stand initiation.	829 (16%)	74 (15%)	Similar	12

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

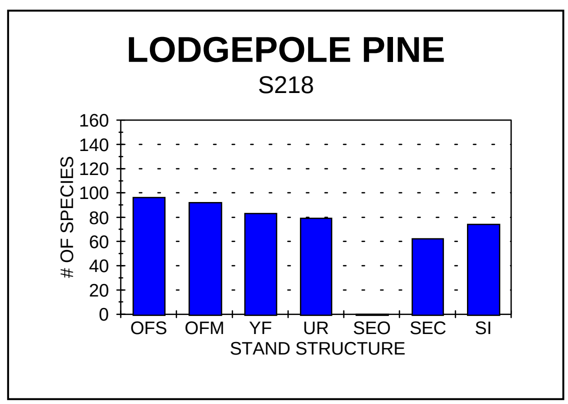
When these two graphs are compared we see that the lodgepole pine cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The word "similar" implies how animal species use the lodgepole pine stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- Similar means there is close to the same species use of a stand structure in lodgepole pine when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.

Graph #29



Graph #6



Old forest single story and old forest multistory are the most heavily used habitats in the lodgepole pine cover type. When compared to the summation of tree cover types, old forest single story contributes 13% and old forest multistory contributes 8% of all occurrences in those stand structures. Slightly lower are young forest multistory and understory reinitiation with each contributing 9% to their respective stand structures. Slightly lower again are stand initiation and stem exclusion closed canopy with each contributing 9% respectively. The least diverse habitat is stem exclusion open canopy with no animal species contribution.

COVER TYPE: ASPEN (Populus tremuloides). S217.

Photo by Charles Webber (Calphotos)

LOCATION

Aspen is a *deciduous* tree widely occurring in North America. It is found in the Western, upper midwest and the northeast United States and occurs in more states than any other tree. Aspen is found in every province in Canada. In Oregon this species is found in the eastern Cascades, in the mountainous regions of eastern Oregon, and is scarce in western Oregon. Mountain streams, mountain lake edges, meadows, and openings in the woods are all habitats for aspen. This species will grow anywhere but prefers silt or silt loams.

DESCRIPTION

Aspen is a *deciduous* perennial that grows up to 75 feet tall, has a long slender trunk, and a rounded crown. Basal and root sprouts are the most common forms of propagation while reproduction by seed is uncommon. The bark is greenish-white on young trees and may turn dark and furrowed on older trees. Leaves are arranged in an alternating pattern on branches, are ovate to round, 2-3 inches in diameter, have green tops and pale green bottoms, smooth edges with rounded teeth, and turn bright yellow to yellowish orange in the fall before shedding. Fruits are a series of cone shaped capsules attached to a *catkin* that grows up to five inches long. Capsules are up to ¼ inch long, light green to brown, thin walled, and have 3-6 cottony seeds. *Catkin*s droop and hang below branches. Aspen flowers from April to June and fruits ripen from May to July. Aspens are short-lived and sprout profusely from their roots when they are injured. For this reason fire plays an important role in the maintenance of aspen. If fire is free to burn, this species is damaged and sends up vigorous new shoots; if fire is limited, more shade tolerant trees soon replace aspens. Bronze birch bore is the primary insect that destroys aspen. Extensive information concerning aspen and its associated plant species, as they occur in Wallowa County, can be found in “Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests” by Elizabeth A. Crow.

USES

In the timber products industry, aspen is used for pulp and for lumber. Aspen bark contains salicin, which is similar to the active ingredients in aspirin. For this reason, the Native Americans and the pioneers used aspen as a fever remedy and to help fight scurvy. A substance similar to turpentine was extracted and used as an expectorant and a counterirritant.

STAND STRUCTURE

Seven stand structures are found in the aspen cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

HISTORIC RANGE OF VARIABILITY

- *Historic range of variability* data concerning aspen is not available for Wallowa County at this time.

ANIMAL SPECIES

The aspen cover type provides habitat for many animal species. The twigs, bark, and buds are browsed by wildlife, and numerous birds eat the seeds. Beavers store cuttings of aspen and feed on the inner bark during the winter. Aspen bark, buds, and, shoots are considered good forage for sheep and fair forage for cattle. The full suite of animal species utilizing the aspen cover type, as it pertains to Wallowa County, can be found in the matrix (page N-123).

GRAPH ANALYSIS

An analysis of the graphs (#7 and #29), concerning the cover type aspen, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #7 shows the number of animal species using each stand structure in the aspen cover type.

Table #7

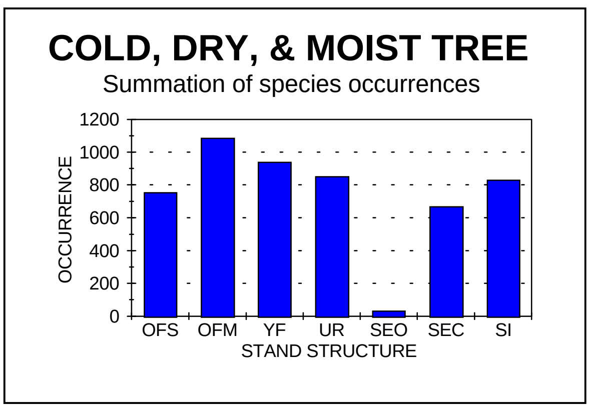
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #7. Number of species by stand structure for aspen. (%)	Aspen use compared to the summation of tree cover types. % comparison.	Number of species of concern using aspen by stand structure. (See note 1)
Old forest single story.	751 (15%)	0 (0%)	Less	0
Old forest multistory.	1084 (21%)	115 (23%)	Similar	24
Young forest multistory.	938 (18%)	99 (20%)	Similar	8
Understory reinitiation.	849 (16%)	101 (21%)	Similar	15
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	80 (16%)	Similar	7
Stand initiation.	829 (16%)	95 (19%)	Similar	15

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

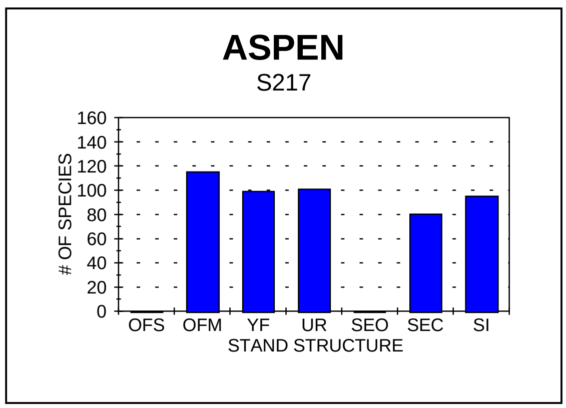
When these two graphs are compared, we see that the aspen cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The words "less" and "similar" imply how animal species use the aspen stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- Similar means there is close to the same species use of a stand structure in aspen when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.
- Less means there is a lower species use of a stand structure in aspen than that stand structure in the summation of tree cover types (difference > 5 %).

Graph #29



Graph #7



Old forest multistory is the most heavily used habitat in the aspen cover type. When compared to the summation of tree cover types, old forest multistory contributes 11% of all occurrences in this stand structure. Slightly lower are understory reinitiation, young forest multistory, and stand initiation with each contributing 12%, 11%, and 11% respectively. Stem exclusion closed canopy is significantly lower with a contribution of 12% of all animal species using this stand structure. Old forest single story and stem exclusion open canopy are the least diverse habitats in the aspen cover type with no animal species contributions.

COVER TYPE: INTERIOR PONDEROSA PINE (Pinus ponderosa (var. ponderosa)). S237

Photo by J.E. McClellan (Calphotos)

LOCATION

Ponderosa pine is the most widely distributed pine in North America. It is found from the Pacific coast to South Dakota and from Canada to Mexico. Nearly half of the trees east of the Cascades summit are ponderosa pine. This species occurs on warm dry sites at lower mountain elevations, on intermountain valley and plateau locations, and on a broad spectrum of soils with best development in deep sandy gravels and loams. Warm sunny sites are preferred and severe cold winters are tolerated. Productive forests will grow with as little as 15 inches of annual precipitation. Ponderosa pine forms climax communities on warmer dryer sites than does Douglas fir and true firs, on moister sites than juniper, and is a *seral* species in *mesic* Douglas and grand fir plant associations.

DESCRIPTION

Ponderosa pine is a large conifer that grows up to 180 feet tall, has a clear symmetrical trunk, and has an open pyramidal to flat topped crown. This species can exceed 500 years in age. The bark is dark brown to black on young trees and yellow brown to cinnamon red on mature trees. Large, flat, puzzle-shaped plates occur between deep furrows on older trees. Younger trees have puzzle shaped bark but do not have furrows. Ponderosa pine is the only 3 needled pine. Needles occur in bundles of three and rarely two, are 5-8 inches long, green to yellow-green, flexible, tufted near the ends of branches, and have a 1/4-3/4 inch long basal sheath. *Staminate* cones are yellow to purplish and clustered. *Ovulate* cones are deep reddish-purple and maturing reddish-brown to brown, are 3-6 inches long, egg shaped, and have a *prickle* at the end of a thickened tip. Ponderosa pine flowers from May to June and sheds seed in September. Agents of mortality are fire, western pine beetle, and dwarf mistletoe. Extensive information concerning interior ponderosa pine and its associated plant species, as they occur in Wallowa County, can be found in "Plant Association of the Wallowa-Snake Province" by Charles G. Johnson, Jr.

Ponderosa pine is well adapted to fire with its thick bark, open stands, smooth trunks that are free of lower limbs, deep roots, and ability to readily seed on mineral soils. Fire is essential for this species to become dominant over Douglas fir and grand fir, which are discouraged by fire. Frequent fires promote thinning of stands and act as a cleaning agent and lead to healthy stands, free of insects and disease. The yellow trunks seen on ponderosa pine are the result of frequent cleansing ground fires. If fire is suppressed, stands can become dense and stagnate so when a fire does occur, many trees could be killed.

USES

Ponderosa pine is one of the most versatile woods in North America. It is very important as it is made into lumber, furniture, window frames, doors, stairs, molding, cabinets, toys, fence pickets, and novelties. The Native Americans ate the cambium for its sweet flavor and nourishment. Captain Lewis of Lewis and Clark used the resin to make a salve for abscesses. Its by-products have been used to make ointments for rheumatism, backaches, and to control dandruff.

STAND STRUCTURE

Seven stand structures are found in the ponderosa pine cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

HISTORIC RANGE OF VARIABILITY

Historic range of variability per stand structure.

- Old forest single story:........15%-55% with an average of 40% in warm dry areas.
  ....20%-70% with an average of 55% in hot dry/hot moist areas.
- Old forest multistory: ....5%-25% with an average of 15% in warm dry areas.
  ....2%-15% with an average of 10% in hot dry/ hot moist areas.
- Young forest multistory:......5%-25% with an average of 15% in warm dry areas.
  ....5%-10% with an average of 5% in hot dry/hot moist areas.
- Understory reinitiation:........1%-10% with an average of 5% in warm dry areas.
- Stem ex. closed canopy:....1%-10% with an average of 5% in warm dry areas.
- Stem ex. open canopy:.......5%-20% with an average 10% in warm dry areas.
  ....5%-25% with an average of 15% in hot dry/hot moist areas.
- Stand initiation:.....................1%-15% with an average of 10% in warm dry areas.
  ....1%-15% with an average of 15% in hot dry/hot moist areas.

ANIMAL SPECIES

The ponderosa pine cover type provides habitat for many animal species. Elk, deer, porcupines, and rabbits browse on the needles; mice, chipmunks, and ground squirrels use the roots and stems. The seeds are an important food source for juncos, finches, siskins, grosbeaks, sparrows, and chickadees. Deer and elk use this cover type for hiding cover and cavity nesters use snags. Eagles, turkeys, and hawks use the trees for roosts and nests. All stand structures are utilized by animal species. The full suite of animal species utilizing the ponderosa pine cover type, as it pertains to Wallowa County, can be found in the matrix (page N-123).

GRAPH ANALYSIS

An analysis of the graphs (#8 and #29), concerning the cover type ponderosa pine, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #8 shows the number of animal species using each stand structure in the ponderosa pine cover type.

Table #8

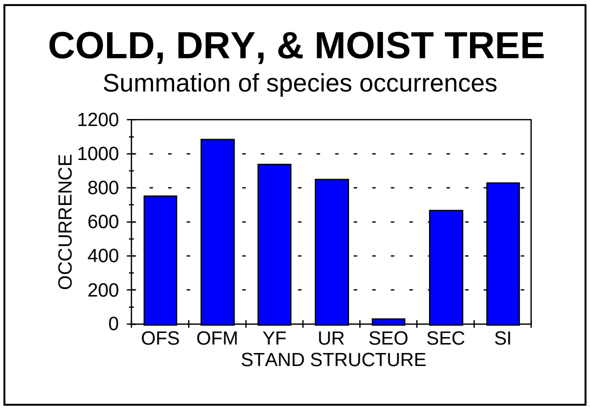
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #8. Number of species by stand structure for ponderosa pine. (%)	Ponderosa pine use compared to the summation of tree cover types. % comparison.	Number of species of concern using ponderosa pine by stand structure. (See note 1)
Old forest single story.	751 (15%)	129 (20%)	Similar	32
Old forest multistory.	1084 (21%)	119 (18%)	Similar	30
Young forest multistory.	938 (18%)	102 (16%)	Similar	15
Understory reinitiation.	849 (16%)	101 (15%)	Similar	19
Stem exclusion open canopy.	30 (1%)	30 (5%)	Similar	9
Stem exclusion closed canopy.	666 (13%)	76 (12%)	Similar	9
Stand initiation.	829 (16%)	100 (15%)	Similar	18

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

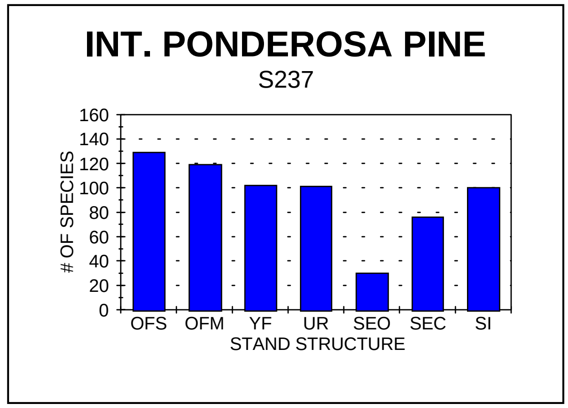
When these two graphs are compared we see that the ponderosa pine cover type resembles the trend set by the summation of tree cover types as shown incolumn 4 in the table above. The word “similar” implies how animal species use the ponderosa pine stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- Similar means there is close to the same species use of a stand structure in ponderosa pine when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.

Graph #29



Graph #8

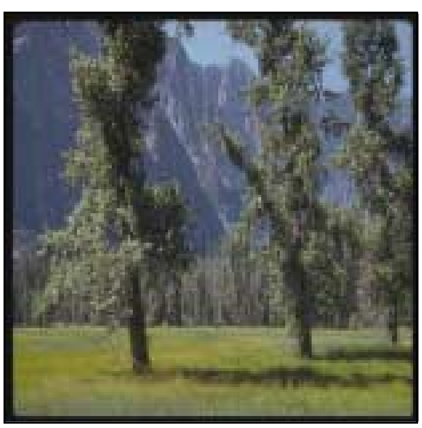


Old forest single story and old forest multistory are the most heavily used stand structures in the interior ponderosa pine cover type. When compared to the summation of tree cover types, old forest single story contributes 17% and old forest multistory contributes 11% of all occurrences in those stand structures. Significantly lower are young forest multistory, understory reinitiation, and stand initiation contributing 11%, 12%, and 12% respectively. Stem exclusion closed canopy is a moderately used habitat contributing 11% while stem exclusion open canopy contributes 100% and is the least diverse site in the interior ponderosa pine cover type.

<u>COVER TYPE: COTTONWOOD/WILLOW (Populus trichocarpa/Salix species). S235</u>

<u>COTTONWOOD</u>

Photo by Charles Webber (Calphotos)



<u>LOCATION</u>

Cottonwood is a widely occurring tree in the western United states, Canada, Alaska, and Baja California. The eastern extent of cottonwood is to the Dakotas. This species has a large but winding range, as it tends to follow stream courses and avoid hot and dry areas. East of the Cascades cottonwood occur from sea level up to 5000 feet.

<u>DESCRIPTION</u>

Cottonwood is a close relative of poplars and aspens, and they occupy the populus genus. Cottonwood is the tallest and the broadest broadleaf tree in the western United States. It can grow up to 200 feet tall and 6 feet in diameter. This species is a fast growing tree that turns bright yellow in the fall and sprouts easily from root suckers and cut branches. The female trees shed the familiar cottony fruit that litters the landscape in the early spring. Cottonwood leaves are *deciduous*, simple, and alternating along branches. Spear-shaped leaves occur on sprouts rising from roots at the base of the tree while triangle-shaped leaves occupy the crown of the tree. Leaf margins can be smooth or have small rounded teeth. Lengths are from 3-6 inches and can sometimes be much longer. They have green tops and white bottoms with frequent rusty markings. The bi-color of the leaves is what makes cottonwood seem to shimmer in the wind. The fruits are a series of rounded capsules attached to a string-like twig. Each capsule contains numerous tiny seeds shrouded in cotton. The buds are cigar shaped, perfume the air when open, and sticky due to a resin commonly called balsam. Young trees have a smooth gray bark that becomes furrowed and ridged as the tree matures. Extensive information concerning cottonwood and its associated plant species, as they occur in Wallowa County, can be found in "Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests" by Elizabeth A. Crow.

USES

Cottonwood is a tree that can be easily hybridized to form a tree that far outgrows its parent trees. For this reason, it has been hybridized and propagated for plantations to provide wood fiber for the paper products industry. Cottonwood was the earliest planted tree in the region to supply pulp to a paper mill near Oregon City in 1901. This tree has little use as a lumber producer but was used to make packing material before Styrofoam was invented. Other uses are stream bank stabilization, urban landscapes, and shade. Cottonwood was very important to the pioneers along the Oregon Trail as it provided the only shade for nearly 1000 miles along the way.

HISTORIC RANGE OF VARIABILITY

- *Historic range of variability* data concerning cottonwood is not available for Wallowa County at this time.

WILLOW

Photo by John Williams and Bruce Dunn

LOCATION

Willow is a widely occurring plant at all elevations in the western United States, Canada, and Alaska. This plant will grow almost anywhere but is most common along streams and wet ground; if found at treeline it is a prostrate shrub. Willow withstands abundance of water very well and will grow on poorly drained soils.

DESCRIPTION

North America has about 90 different types of willow, and many species will interbreed having the characteristics of both parent plants. All species grow as a shrub and 12 of those species will grow to tree form. All species have multiple stems and indistinct crowns. The leaves are narrow and pointed, have a yellow-green top and white bottom, short leaf stalks, and leafy ears where the stalk joins the twig. Male and female flowers occur on separate plants. The female flower has tear-shaped fruits filled with tiny cottony seeds that are distributed by wind and water. Seeds need to land on moist soil for germination soon after falling, or they will quickly dry out and die. Male flowers simply wilt and fall off the plant. Willow buds are a narrow winter bud that hugs the twig and a cap-like scale covers each. Terminal buds are non existent in favor of laterals where twigs die back to a lateral bud in the winter. Twigs are yellowish-green and will sometimes have tinges of purple or red. Extensive information concerning willow and its associated plant species, as they occur in Wallowa County, can be found in "Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests" by Elizabeth A. Crow.

USES

Willow in our region does not reach a commercial size and has no value for lumber products. Willow branches are fashioned into lawn furniture, and thicker stems are made into cricket bats and croquet balls due to its hard springy nature. Willow grows and is often planted along stream banks as a bank protector due to its clinging roots, tangled branches, fast growth, and ability to sprout vigorously. Baskets made from willow twigs were probably among the earliest manufactured products. This tree is often planted as an ornamental and shade tree. Campers and hunters benefit from the slow even burning nature of willow in their campfires and stoves.

HISTORIC RANGE OF VARIABILITY

- *Historic range of variability* data concerning willow is not available for Wallowa County at this time.

COTTONWOOD/WILLOW

STAND STRUCTURE

Seven stand structures are found in the cottonwood/willow cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.

- Understory reinitiation.
- Stem exclusion open canopy.
- Stem exclusion closed canopy.
- Stand initiation.

ANIMAL SPECIES

Many animal species utilize the cottonwood/willow cover type. Twigs and flowers of willow provide a food source for many wildlife species. Grouse, rabbits, mice, beaver, and many other species eat the bark, while deer and livestock browse on the stems. The full suite of animal species utilizing the cottonwood/willow cover type, as it pertains to Wallowa County, can be found in the matrix (page N-123).

GRAPH ANALYSIS

An analysis of the graphs (#9 and #29), concerning the cover type cottonwood/willow, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #9 shows the number of animal species using each stand structure in the cottonwood/willow cover type.

Table #9

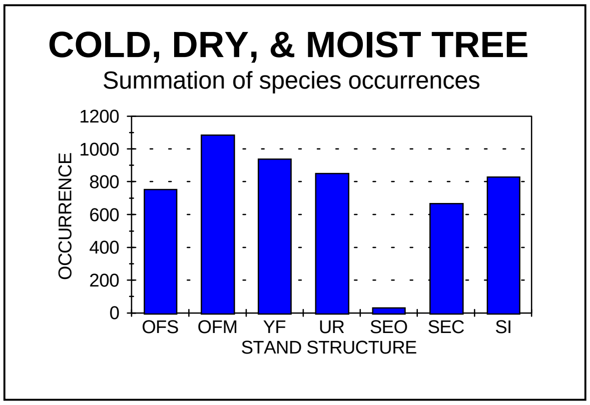
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #9. Number of species by stand structure for cottonwood/ willow. (%)	Cottonwood/ willow use compared to the summation of tree cover types. % comparison.	Number of species of concern using cottonwood/ willow by stand structure. (See note 1)
Old forest single story.	751 (15%)	0 (0%)	Less	0
Old forest multistory.	1084 (21%)	137 (26%)	Similar	22
Young forest multistory.	938 (18%)	128 (24%)	More	14
Understory reinitiation.	849 (16%)	68 (13%)	Similar	8
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	94 (18%)	Similar	5
Stand initiation.	829 (16%)	107 (20%)	Similar	9

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.
When these two graphs are compared we see that the cottonwood/willow cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The words “more”, “less”, and “similar” imply how animal species use the cottonwood/willow stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

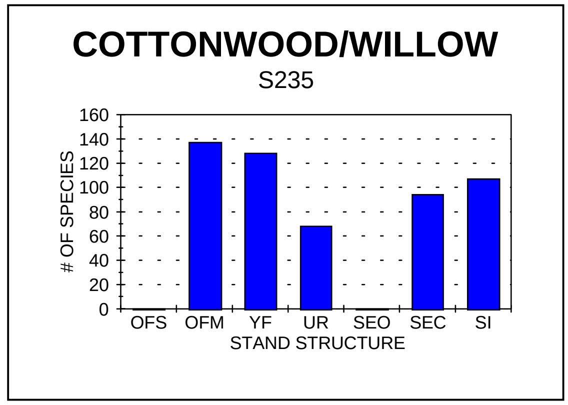
- More means there is a higher species use of a stand structure in cottonwood/willow than that stand structure in the summation of tree cover types (difference > 5 %).

- Similar means there is close to the same species use of a stand structure in cottonwood/willow when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.
- Less means there is a lower species use of a stand structure in cottonwood/willow than that stand structure in the summation of tree cover types (difference > 5%).

Graph #29



Graph #9



Old forest multistory and young forest multistory are the most heavily used habitats in the cottonwood/willow cover type. When compared to the range of forest cover types, old forest multistory contributes 13% and young forest multistory contributes 14% of all occurrences in those stand structures. Significantly lower are stand initiation and stem exclusion closed canopy with each contributing 13% and 14% respectively. Understory reinitiation is a moderately used habitat accounting for 8% of the total animal species using this stand structure. Old forest single story and stem exclusion open canopy are the least diverse habitats in the cottonwood/willow cover type with no animal species contribution.

COVER TYPE: JUNIPER WOODLANDS (Juniperus occidentalis). CS01.

Photo by Brother Alfred Brousseau (Calphotos).

LOCATION

Juniper is a tree that grows in many arid regions of the western United States. It is found in southeast Washington, eastern Oregon, in the Sierra Nevada Mountains, southwest Idaho, and northwest Nevada. This species occupies dry sites at the lower limits of tree growth and zones between non-forest lands and principal tree growing locations. Juniper has the ability to grow on sites that require the least amount of moisture needed to grow trees. Moist canyon sites are preferred but this species has spread to dry, sandy, and gravely areas.

DESCRIPTION

Juniper is a small rounded coniferous tree that grows up to 30 feet tall and will reach heights of 20 feet in shrub form. This is a long-lived species that can live for several hundred years. In both tree and shrub form branches usually extend to the ground. Juniper bark in fibrous, furrowed, thin, and grayish-brown with a reddish inner bark. Needles are scale-like, opposite or in groups of three, 1/8 inch long, gray-green, and have a prominent gland on the upper surface that is usually covered by a resin drop. The resin drop is in place to seal a breathing pore and acts as a water conservation device. Needles are scratchy to the touch and have a strong distinctive fragrance that many of us associate with the high desert. Juniper cones resemble a berry more than the typical cone that most of us associate with coniferous evergreen trees. Cones are round, bluish-black, 1/4 inch long, berry shaped, have soft scales that seldom open, are covered with a bluish-white coating called bloom that can be rubbed off, and take two years to mature. This species is easily killed by fire, and young trees are especially susceptible due to their thin bark. Extensive information concerning juniper and its associated plant species, as they occur in Wallowa County, can be found in "Plant Association of the Wallowa-Snake Province" by Charles G. Johnson, Jr.

USES

Juniper has a variety of uses. Poles are cut for fence posts and planters due to their superior longevity and resistance to rot. Boards are milled to produce novelties, clocks, and signs as juniper has very attractive coloration. This species is an important source of firewood in the high desert regions and boughs are used as decoration during the Christmas season. Juniper is also a very common ornamental landscape tree in both tree and shrub form. Dried berries (cones) are edible, and cone oil extracts are used to scent and flavor beverages, seasonings, soaps, and cosmetics.

STAND STRUCTURE

In this document, stand structure for the cover type juniper is defined as woodland. The stand structure woodland includes all growth stages that may occur in this cover type, and they are described further in the following paragraph concerning historic range of variability.

HISTORIC RANGE OF VARIABILITY

Historic range of variability per stand structure.

- Old forest single story: .... 20%-70% with an average of 40%.
- Old forest multistory: .... 2%-20% with an average of 15%.
- Young forest multistory: .... 5%-20% with an average of 10%.
- Understory reinitiation: .... 0%.

- Stem ex. closed canopy:.......... 0%.
- Stem ex. open canopy:............. 5%-35% with an average of 25%.
- Stand initiation:........................... 5%-15% with an average of 10%.

ANIMAL SPECIES

One hundred and eighteen animal species utilize the juniper cover type in Wallowa County. Many mammals use the berries (cones) as an important food source; coyotes, chipmunks, ground squirrels, and mice are a few examples. Birds such as grosbeaks, jays, and robins eat the berries, while blue birds and chickadees nest in the natural cavities that juniper provide. Mule deer and cattle will browse the foliage in cases of extreme conditions. The full suite of animal species utilizing the juniper cover type, as it pertains to Wallowa County, can be found in the matrix (page N-134).

GRAPH ANALYSIS

Table #10

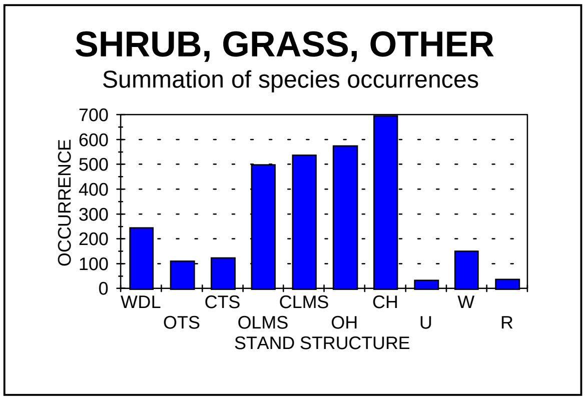
Stand Structure	Graph #30 Summation of species occurrences for woodland in all cover types. (%)	Graph #10 Number of species by stand structure for juniper woodlands. (%)	Juniper woodlands use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using juniper woodlands by stand structure. (See note 2.)
Woodland	244 (100%)	119 (100%)	Similar	21

Note 1. Similar means there is close to the same species use of a stand structure in juniper woodlands when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%.

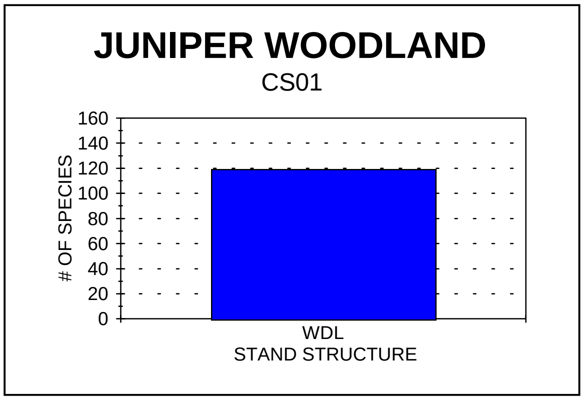
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #10 shows the number of animal species using each stand structure in the juniper woodland cover type.

Graph #30



Graph #10



- See WDL for juniper woodlands (page 156).

In the summation of non-cover types (graph #30) concerning woodland, there are 244 animal species occurrences. This means that all cover types that have the stand structure woodland have a summation of 244 occurrences. *Of those 244 occurrences, 119 (49%) are contributed by the juniper woodland cover type.*

<u>COVER TYPE: MIXED CONIFER WOODLANDS. CS02.</u>

Photo by John Williams and Bruce Dunn

<u>DESCRIPTION</u>

“Mixed conifer woodlands” pertains to dry forest areas in Wallowa County, where conifers live with several other vegetative types. Mixed conifer woodland is divided into several sub-classifications: conifer/exotic herbs, conifer encroachment/exotic grass, conifer/perennial grass, and conifer encroachment/sagebrush/perennial grass.

<u>Conifer:</u> Dry forest conifer species include interior Douglas fir, western larch, lodgepole pine, interior ponderosa pine, and juniper. All of these species are described in this document and can be extensively researched in “Plant Associations of the Wallowa-Snake Province by Charles G. Johnson, Jr.

<u>Exotic herbs:</u> Non native, non woody plants, dying back each year or dying back to the crown.

<u>Exotic grass:</u> Non native grasses.

<u>Sagebrush:</u> Low sagebrush, stiff sagebrush, and mountain big sagebrush.

<u>Perennial grasses:</u> Grasses that live more than two years.

STAND STRUCTURE

In this document, stand structure for the cover type mixed conifer woodland is defined as woodland. The stand structure woodland includes all growth stages for each species that occur in this cover type as they are found in Wallowa County.

HISTORIC RANGE OF VARIABILITY

- For the mixed conifer woodland cover type *historic range of variability* is not available.

ANIMAL SPECIES

Mixed conifer woodland provides key habitat for many animal species. One hundred and twenty four animals use this habitat: 5 amphibians, 73 birds, 37 mammals, and 9 reptiles. Due to vegetative diversity in this cover type, habitats tend to be site specific within the cover type. Mixed conifer woodland provides thermal and hiding cover, seeds and grasses as a food source, and cavities for cavity nesting birds to name only a few. The full suite of animal species utilizing the mixed conifer woodlands cover type as it pertains to Wallowa County can be found in the matrix (page N-134).

GRAPH ANALYSIS

Table #11

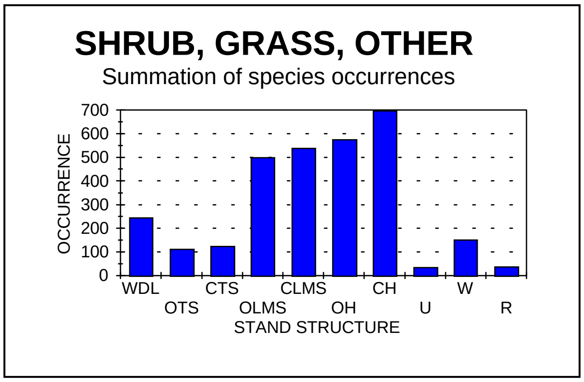
Stand Structure	Graph #30 Summation of species occurrences for woodland in all cover types. (%)	Graph #11. Number of species by stand structure for mixed conifer woodland. (%)	Mixed conifer woodland use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using mixed conifer woodland by stand structure. (See note 2.)
Woodland.	244 (100%)	125 (100%)	Similar	20

Note 1. Similar means there is close to the same species use of a stand structure in mixed conifer woodlands when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%.

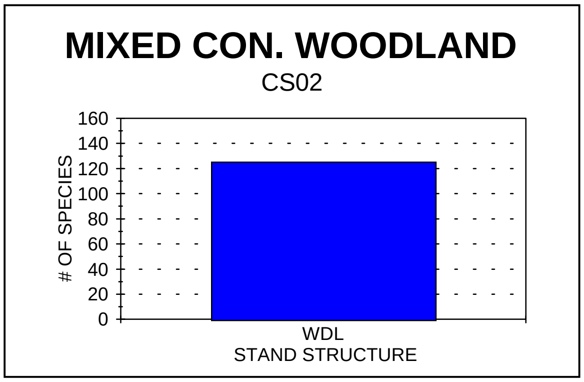
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #11 shows the number of animal species using each stand structure in the mixed conifer woodlands cover type.

Graph #30



Graph #11



- See WDL for mixed conifer woodlands.

In the summation of non-tree cover types (graph #30) concerning woodland, there are 244 animal species occurrences. This means that all cover types that have the stand structure woodland have a summation of 244 occurrences. *Of those 244 occurrences, 125 (51%) are contributed by the mixed conifer woodland cover type.*

MOIST FOREST

COVER TYPE: GRAND FIR (Abies grandis). CS09.

Photo by Brother Alfred Brousseau (Calphoto).

LOCATION

Grand fir is a far ranging western conifer that will occupy sites from sea level to elevations of 5000 feet. East of the Cascades it is found from southeast British Columbia to the Rocky Mountains in central Idaho. It is also found in southeast Washington, northeast Oregon, and western Montana. Grand fir is a principal *montane* coniferous forest dweller that tends to mingle in mixed forest cover types and represents about 2% of Oregon's conifers. In mixed forest stands east of the Cascades, grand fir is generally found at mid elevations, near streams, in valleys, and on lower slopes. This species occupies cooler and moister sites than climax ponderosa pine and Douglas fir and warmer sites than climax subalpine fir. In these limits it prefers moist mountain slopes, north and east slopes at lower sites, and all aspects at upper sites.

DESCRIPTION

Grand fir will grow up to 250 feet tall, 6 feet in diameter, and has a narrow, open, and usually rounded crown. This tree is the most moisture tolerant conifer of the intermountain species and represents warm to cool and moist environments. These sites are very productive in species' richness and biomass. Grand fir is a very shade tolerant tree so it will form climax forests throughout much of its range. The bark on young trees is smooth, gray to light brown, and has resin blisters. Older trees have bark that is ashy brown, 2-3 inches thick, and furrowed. Inner bark is purplish red. Buds are rounded, yellow brown, covered with resin, and occur in groups of three at the end of stems. Needles are 1-1.5 inches long, have notched ends, are dark green, and are double ranked in a "V" shaped fashion. Lower needle surfaces have *stomatal* bands while upper surfaces do not have a bloom and resin ducts occur near margins. *Ovulate* cones are yellow-green to green, 2-4 inches long, cylindrical, upright on the branch, have *bracts* shorter than scales, and disintegrate on the tree. Flowering occurs from May-June and seeds shed in early September. Grand fir is moderately susceptible to fire depending on site and stand structure. Fire in dry sites tends to underburn with less mortality, while fires in moist sites tend to result in stand replacing burns. Indian paint fungus is the primary wood rotting agent, as grand fir does not exude pitch to seal wounds. Spruce budworm and tussock moth reduce stock on dry and overstocked sites. Extensive information concerning grand fir and its associated plant species as they occur in Wallowa County can be found in "Plant Association of the Wallowa-Snake Province" by Charles G. Johnson, Jr.

USES

Grand fir represents about 10% of Oregon's commercial timber harvest. In some regions, grand fir is a preferred species due to its rapid growth. Wood products include lumber, pulp, and plywood and are shipped to Asia where they are desired for their light color. This species is commercially grown as Christmas trees due to its even conical form, fragrance, and rich green color. The Native Americans used the resin to make a tea to help fight whooping cough and ointments for colds. Needles were boiled to make eyewash and were dried and pulverized to make baby powder.

STAND STRUCTURE

Seven stand structures are found in the grand fir cover type. The stand structures are defined in the stand structure key included in this document (page N-156).

- Old forest single story.
- Old forest multistory.
- Young forest multistory.
- Understory reinitiation.
- Stem exclusion open canopy.

- Stem exclusion closed canopy.
- Stand initiation.

HISTORIC RANGE OF VARIABILITY

Historic range of variability per stand structure.

- Old forest single story:........0% in cold areas.
  ....0% in cool areas.
  ....15%-55% with an average of 40% in warm areas.
- Old forest multistory: ....30%-60% with an average of 40% in cold areas.
  ....30%-60% with an average of 40% in cool areas.
  ....5%-25% with an average of 15% in warm areas.
- Young forest multistory:......20%-50% with an average of 35% in cold areas.
  ....20%-50% with an average of 30% in cool areas.
  ....5%-25% with an average of 15% in warm areas.
- Understory reinitiation:........5%-25% with an average of 15 % in cold areas.
  ....5%-25% with an average of 20% in cool areas.
  ....1%-10% with an average of 5% in warm areas.
- Stem ex. closed canopy:....1%-10% with an average of 5% in cold areas.
  .....1%-10% with an average of 5% in cool areas.
  .....1%-10% with an average of 5% in warm areas.
- Stem ex. open canopy:.......0% in cold areas.
  ....0% in cool areas.
  ....5%-20% with an average of 10% in warm areas.
- Stand initiation:......................1%-5% with an average of 5% in cold areas.
  ....1%-10% with an average of 5% in cool areas.
  ....1%-15% with an average of 10% in warm areas.

ANIMAL SPECIES

The grand fir cover type provides excellent habitat for many animal species. It provides thermal and hiding cover, snags for cavity nesters, hollow logs for dens, and feed for browsing animals. The full suite of animal species utilizing the grand fir cover type, as it pertains to Wallowa County, can be found in the matrix (page N-134).

GRAPH ANALYSIS

An analysis of the graphs (#12 and #29), concerning the cover type grand fir, show that this cover type generally follows the trend set by the summation of tree cover types. Graph #29 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once); graph #12 shows the number of animal species using each stand structure in the grand fir cover type.

Table #12

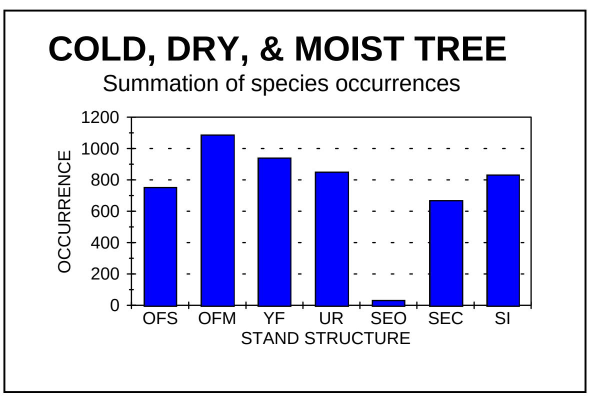
Stand structure	Graph #29. Summation of species occurrences by stand structure for all tree cover types. (%)	Graph #12. Number of species by stand structure for grand fir. (%)	Grand fir use compared to the summation of tree cover types. % comparison.	Number of species of concern using grand fir by stand structure. (See note 1)
Old forest single story.	751 (15%)	123 (17%)	Similar	35
Old forest multistory.	1084 (21%)	136 (19%)	Similar	38
Young forest multistory.	938 (18%)	126 (18%)	Similar	26
Understory reinitiation.	849 (16%)	116 (16%)	Similar	26
Stem exclusion open canopy.	30 (1%)	0 (0%)	Similar	0
Stem exclusion closed canopy.	666 (13%)	99 (14%)	Similar	13
Stand initiation.	829 (16%)	112 (16%)	Similar	21

Note 1. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

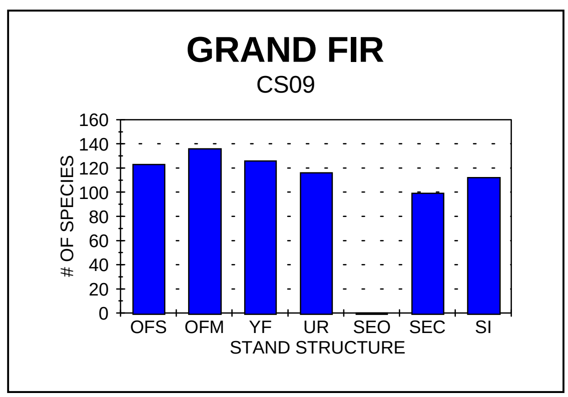
When these two graphs are compared, we see that the grand fir cover type resembles the trend set by the summation of tree cover types as shown in column 4 in the table above. The word "similar" implies how animal species use the grand fir stand structures compared to the number of animal species occurrences for stand structures in the summation of tree cover types.

- Similar means there is close to the same species use of a stand structure in grand fir when compared to the summation of tree cover types (same %). Considered similar when percent differs by up to 5%.

Graph #29



Graph #12



In the grand fir cover type all stand structures are heavily used with the exception of stem exclusion open canopy. When compared to the summation of tree cover types, old forest single story contributes 16%, old forest multistory contributes 13%, young forest multistory contributes 13%, understory reinitiation contributes 14%, stand initiation contributes 14%, and stem exclusion closed canopy contributes 15% of all animal species that use these habitats. Old forest multistory defines the high use end and is the most diverse while stem exclusion open canopy bounds the low end with no animal species contribution.

COOL SHRUB

COVER TYPE: SHRUB OR HERB/TREE REGEN. COO3.

Photo by John Williams and Bruce Dunn

LOCATION/DESCRIPTION

The shrub or herb/tree regen. cover type is an area consisting of shrubs, forbs, grasses, and young trees in the process of re-establishing. The cover type is divided into five groups: general shrub, grass/forb, mountain shrub, ceanothus species, and shrub/regen. This habitat is found in upland areas that have been altered due to fire, logging, or other landscape changing events. The shrub or herb/tree regen. cover type is usually in an early successional stage of development lacking large concentrations of big mature trees and climax vegetative species. Remnant large trees may exist in sparse or small groups. Common shrubs are snowberry, rose, mountain mahogany, and sagebrush while redstem and snowbrush ceanothus are characterizing species of the cover type. Bluebunch wheatgrass and Idaho fescue, a variety of forbs, seedling conifers, and shrubs varying in age are common is this area.

STAND STRUCTURE

Four stand structures are found in the shrub or herb/tree regen. cover type. They are defined in the stand structure key (page N-156).

- Open canopy tall shrub.
- Open canopy low-medium shrub.
- Closed canopy low-medium shrub.
- Closed herb.

ANIMAL SPECIES

The shrub or herb/tree regen cover type is a moderately used habitat by animal species. This cover type is often adjacent to more mature or climax plant communities, and the edge areas between the two provide valuable overlap or areas called *ecotones*. *Ecotones* are areas of diverse animal species use where two separate habitats join and provide additional benefits over one single habitat. The shrub or herb/tree regen cover type provides feed for grazing animals, seeds for birds and rodents, and prey for predatory animals while an adjacent habitat may provide hiding and thermal cover, nesting habitat, or additional food sources. The full suite of animal species utilizing the shrub or herb/tree regen. cover type, as it pertains to Wallowa County, can be found in the matrix (page N-134).

GRAPH ANALYSIS

Table #13

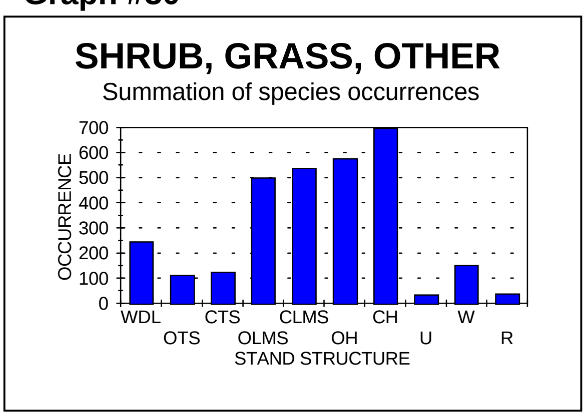
Stand Structure	Graph #30 Summation of species occurrences by stand structure for ots, olms, clms and ch. (%)	Graph #13. Number of species by stand structure for shrub or herb/tree regen. (%)	Shrub or herb/tree regen. use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using shrub or herb/tree regen. by stand structure. (See note 2.)
Open canopy tall shrub	123 (7%)	52 (25%)	More	4
Open canopy low-medium shrub	498 (27%)	54 (26%)	Similar	5
Closed canopy low-medium shrub.	537 (29%)	51 (25%)	Similar	5
Closed herb.	696 (38%)	50 (24%)	Less	5

Note 1. More means there is a higher species use of a stand structure in shrub or herb/tree regen. than that stand structure in the summation of non-tree cover types. Similar means there is close to the same species use of a stand structure in shrub or herb/tree regen. when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%. Less means there is a lower species use of a stand structure in shrub or herb/tree regen. than that stand structure in the summation of non-tree cover types.

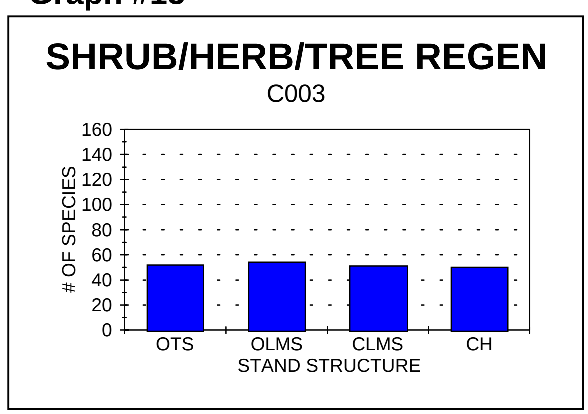
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #13 shows the number of animal species using each stand structure in the shrub or herb/tree regen. cover type.

Graph #30



Graph #13



- See OTS, OLMS, CLMS, and CH for the shrub or herb/tree regen. cover type (page N-156).

In the summation of non-tree cover types (graph #30) concerning open canopy tall shrub, there are 110 animal species occurrences. This means that all cover types that have the stand structure open canopy tall shrub have a summation of 110 occurrences. *Of those 110 occurrences 52 (47%) are contributed by the shrub or herb/tree regen. cover type.*

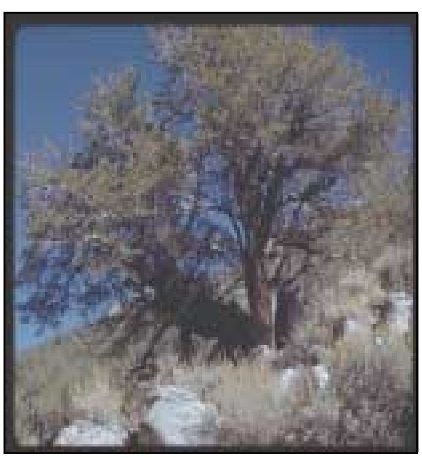
In the summation of non-tree cover types (graph #30) concerning open canopy low-medium shrub, there are 498 animal species occurrences. This means that all cover types that have the stand structure open canopy low-medium shrub have a summation of 498 occurrences. *Of those 498 occurrences 54 (11%) are contributed by the shrub or herb/tree regen. cover type.*

In the summation of non-tree cover types (graph #30) concerning closed canopy low-medium shrub, there are 537 animal species occurrences. This means that all cover types that have the stand structure closed canopy low-medium shrub have a summation of 537 occurrences. *Of those 537 occurrences 51 (9%) are contributed by the shrub or herb/tree regen. cover type.*

In the summation of non-tree cover types (graph #30) concerning closed herb, there are 696 animal species occurrences. This means that all cover types that have the stand structure closed herb have a summation of 696 occurrences. *Of those 696 occurrences 50 (7%) are contributed by the shrub or herb/tree regen. cover type.*

COVER TYPE: MOUNTAIN MAHOGANY (Cercocarpus ledifolius). R322.

Photo by Charles Webber (Calphotos).



LOCATION

Mountain mahogany is found in many regions of the western United States. It is found in southern and eastern Oregon, southeast Washington, and into the Rocky Mountains. This species prefers warm, dry, rocky ridges and rim outcroppings. It can be found in pine forest openings, scattered across sagebrush flats, in canyons, and at 3,000 to 9,000 feet in elevation. Mountain mahogany is often found on forest edges where sites are too dry and severe to support forests, on shallow rocky soils, and is associated with ponderosa pine and juniper. The highest concentrations of mountain mahogany are found in areas between higher conifer forests and lower desert steppes, plains, or plateaus where it is a climax species.

DESCRIPTION

Mountain mahogany is a very distinctive shrub that often grows in short, dense, and tangled thickets. This species is easily identified by its curled leaves and silky streamers attached to the seeds. Individuals are usually twisted and unshapely due to browsing animals and the severe climate at site locations. Mountain mahogany is an evergreen, usually about 15 feet tall, and if allowed to grow to tree form, will reach heights of 40 feet with a trunk diameter of two feet. Leaves are simple, alternating or clustered on spurs, elliptical, 1/2-1 inch long, thick, leathery, and emit an aromatic resin. Upper surfaces are dark green, lower sides are pale green, and edges have a distinctive under curling. The bark has furrows and ridges that break into plate-like scales, is red on younger trees, and turns gray-brown on older trees. Flowers are greenish-white, inconspicuous, occur in clusters, and are out from April to June. The fruit is a single 1/2-inch long, hard, narrow, sharp pointed seed that has a very distinctive 3 inch long feathery tail.

Mountain mahogany occasionally occurs in pure stands but usually is found with ponderosa pine, juniper, scrub oak, aspen, and in spruce-fir communities. Common associated shrubs include snowberry, big sagebrush, bitterbrush, rabbitbrush, and Oregon grape. Many grasses are found with mountain mahogany including bluebunch wheatgrass, Idaho fescue, bluegrass, cheatgrass, and a variety of sedges. Extensive information concerning mountain mahogany and its associated plant species as they occur in Wallowa County can be found in “Plant Association of the Wallowa-Snake Province” by Charles G. Johnson, Jr.

USES

Mountain mahogany had many uses in the Native American culture. The wood was used for fire and for smoking meats, leaves were used as a laxative, inner bark for pulmonary problems, and due to their hardness and strength, branches were made into arrow shafts and digging tools.

STAND STRUCTURE

In this document, stand structure for the cover type mountain mahogany has two classifications: open canopy low medium shrub and closed canopy low medium shrub. They are defined in the stand structure key (page N-161).

ANIMAL SPECIES

Many animal species utilize the mountain mahogany cover type. Deer and elk use mountain mahogany as an important fall range. Many animal species use this shrub for protection against the weather and predators. The full suite of animal species utilizing the mountain mahogany cover type, as it pertains to Wallowa County, can be found in the matrix (page N-134).

GRAPH ANALYSIS

Table #14

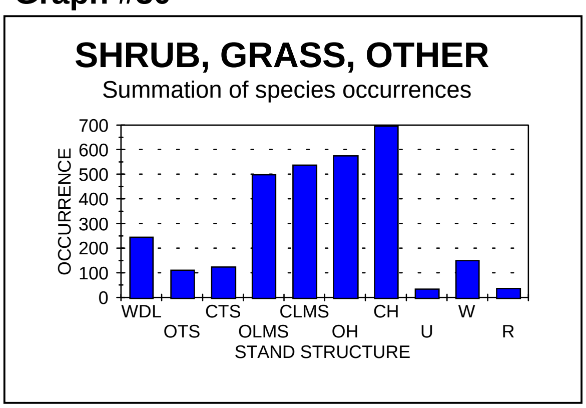
Stand Structure	Graph #30 Summation of species occurrences by stand structure for olms and clms. (%)	Graph #14. Number of species by stand structure for mountain mahogany. (%)	Mountain mahogany use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using mountain mahogany by stand structure. (See note 2.)
Open canopy low-medium shrub.	498 (48%)	81 (55%)	More	14
Closed canopy low-medium shrub.	537 (52%)	67 (45%)	Less	8

Note 1. More means there is a higher species use of a stand structure in mountain mahogany than that stand structure in the summation of non-tree cover types. Less means there is a lower species use of a stand structure in mountain mahogany than that stand structure in the summation of non-tree cover types.

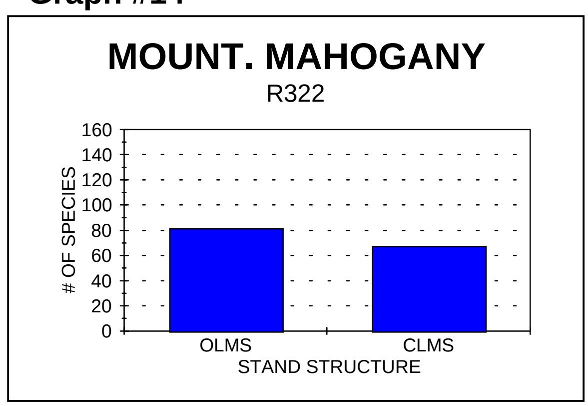
Note 2. Species of concern are highlighted in the **matrix**. Pages N-106-N-160.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #14 shows the number of animal species using each stand structure in the mountain mahogany cover type.

Graph #30



Graph #14



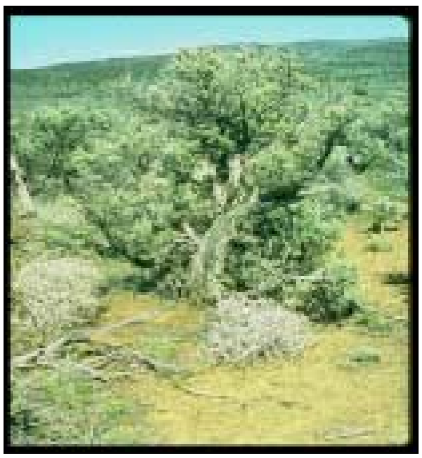
- See OLMS and CLMS for mountain mahogany (page N-156).

In the summation of non-tree cover types (graph #30) concerning open canopy low medium shrub, there are 498 animal species occurrences. This means that all cover types that have the stand structure open canopy low medium shrub have a summation of 498 occurrences. *Of those 498 occurrences, 81 (16%) are contributed by the mountain mahogany cover type.*

In the summation of non-tree cover types (graph #30) concerning closed canopy low medium shrub there are 537 animal species occurrences. This means that all cover types that have the stand structure closed canopy low medium shrub have a summation of 537 occurrences. *Of those 537 occurrences, 67 (12%) are contributed by the mountain mahogany cover type.*

<u>COVER TYPE: MOUNTAIN BIG SAGEBRUSH (Artemisia tridentata (ssp. vaseyana)). R402.</u>

Photo by Brother Alfred Brousseau (Calphotos).



<u>LOCATION</u>

Mountain big sagebrush is a widespread shrub found east of the Cascades and at higher *montane* elevations. Site locations are in valleys, plains, basins, and mountain slopes. This species is found on rocky basaltic soils and is most abundant on dry, well drained gravely soil types. Upland elevation occurrences of mountain big sagebrush are generally unsuitable for silvicultural practices and have severe tree regeneration difficulties.

<u>DESCRIPTION</u>

Mountain big sagebrush is a medium sized shrub that grows from 2-6 feet tall and has a strong aromatic fragrance. This is a multi-stemmed species where young stems are silver-gray and then turn grayish brown with age. The bark sheds on older stems and branches touching the ground will root. Mountain big sagebrush has both *deciduous* leaves and winter persistent leaves. Leaves are alternating, 1/2-1 1/2 inches long, triangular, silvery green, and have a three lobed apex. Flowers are small, yellow, tubular, and bloom from August to September. The fruits are a dry one seeded nodule called an *achene* surrounded by a husk called a *pericarp*.

Mountain big sagebrush is the dominant species in this cover type. Several other lifeforms commonly occur with mountain big sagebrush. Shrubs that are found co-existing with this species are antelope bitterbrush, green rabbitbrush, gray horsebrush, and in moister areas, mountain snowberry. Associated grasses include Idaho fescue, bluebunch wheatgrass, Sandbag bluegrass, mountain brome, slender wheatgrass, junegrass, onion grass, western needlegrass, and several varieties of sedge. Extensive information concerning mountain big sage and its associated plant species, as they occur in Wallowa County, can be found in "Plant Association of the Wallowa-Snake Province" by Charles G. Johnson, Jr.

USES

The Native Americans used mountain big sagebrush as thatching, cordage, firewood, and in making baskets. Fruits can be used fresh, dried, or pounded into a meal. Some Native Americans used sage as a laxative. Due to high protein content, this species is considered good winter range for sheep and fair for cattle.

STAND STRUCTURE

In this document, stand structure for the cover type mountain big sagebrush has two classifications: open canopy low medium shrub and closed canopy low medium shrub. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

Many animal species utilize the mountain big sagebrush cover type. This shrub is lightly used by deer and provides a food source and cover for many kinds of wildlife. The full suite of animal species utilizing the mountain big sagebrush cover type, as it pertains to Wallowa County, can be found in the matrix (page N-134).

GRAPH ANALYSIS

Table #15

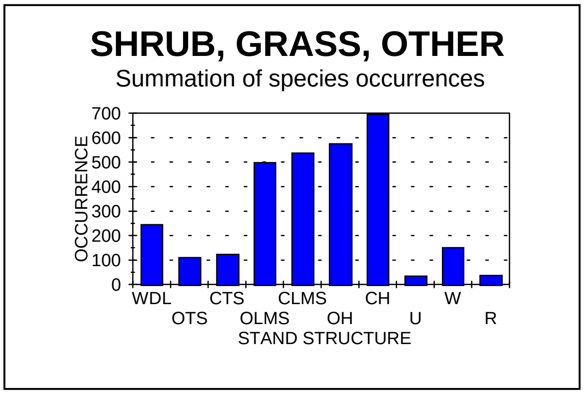
Stand Structure	Graph #30 Summation of species occurrences by stand structure for olms and clms. (%)	Graph #15. Number of species by stand structure for mountain big sagebrush. (%)	Mountain big sagebrush use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using mountain big sagebrush by stand structure. (See note 2.)
Open canopy low-medium shrub.	498 (48%)	122 (54%)	More	25
Closed canopy low-medium shrub.	537 (52%)	106 (46%)	Less	21

Note 1. More means there is a higher species use of a stand structure in mountain big sagebrush than that stand structure in the summation of non-tree cover types. Less means there is a lower species use of a stand structure in mountain big sagebrush than that stand structure in the summation of non-tree cover types.

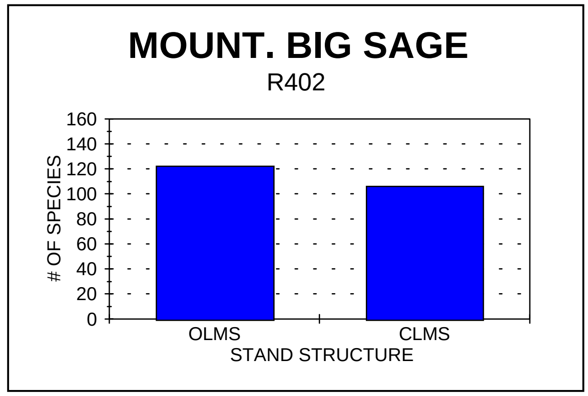
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #15 shows the number of animal species using each stand structure in the mountain big sagebrush cover type.

Graph #30



Graph #15



- See OLMS and CLMS for mountain big sagebrush (page N-156).

In the summation of non-tree cover types (graph #30) concerning open canopy low medium shrub, there are 498 animal species occurrences. This means that all cover types that have the stand structure open canopy low medium shrub have a summation of 498 occurrences. *Of those 498 occurrences 122 (24%) are contributed by the mountain big sagebrush cover type.*

In the summation of non-tree cover types (graph #30) concerning closed canopy low medium shrub, there are 537 animal species occurrences. This means that all cover types that have the stand structure closed canopy low medium shrub have a summation of 537 occurrences. *Of those 537 occurrences, 106 (20%) are contributed by the mountain big sagebrush cover type.*

COVER TYPE: CHOKECHERRY/SERVICE BERRY/ROSE (Prunus virginiana(var. melanocarpa)/Amelanchier alnifolia(old-florida)/Rosa species). R421.

CHOKECHERRY

Photo by Brother Alfred Brousseau

LOCATION

Chokecherry is found across Canada, the northern United States, and is very common in the Pacific Northwest. This species occurs around seepy outcrops, in cold desert sage locations, grasslands, and lower elevation forests. Chokecherry usually grows in a scattered fashion but thickets can form on canyon rim seepage sites. Moist soils are preferred but not essential as chokecherry is adapted to a broad range of soil types and will grow along fence rows, roadsides, and in canyons.

DESCRIPTION

Chokecherry is a tall perennial shrub that grows from 3-15 feet tall and at times will reach heights of 30 feet and resemble a small tree. Growth form is upright with horizontal branches and rounded crowns. Reproduction is from seed, *rhizomes*, and basal sprouts. Stems have purplish-gray bark, reddish brown twigs, are long, and slender. Leaves are *deciduous*, alternate, oblong to ovate, 2-4 inches long, and 1/2-2 inches wide. Leaf margins are finely serrated, tops are dark green and lustrous, bottoms are pale green, have an acute apex, round base, and turn bright yellow to orange in the fall. Flowers are white, 5 lobed, short, have obtuse ends, fragrant, and bloom from May to July. Flowers are clustered on an elongated drooping *raceme* up to 6 inches long. Chokecherry fruit is dark red to black, lustrous, thick skinned, 3/8 inch in diameter, and oblong to ovoid. Flesh is juicy, astringent, acidulous, and fruits occur in clusters.

USES

Chokecherry fruits are made into jellies, syrups, and wines, and bark extracts can be used to flavor cough syrups. Forage is fair to poor for livestock and can be poisonous if cyanide levels are high due to drought and freezing. Chokecherry is planted in the urban landscape as an ornamental shrub. The Nez Perce used fresh or dried berries as an ingredient in pemmican, the bark to make a tea to relieve diarrhea and stomach ailments, and the wood to make bows, arrows, and pipe stems. Cyanide levels are reduced if berries are either cooked or dried.

SERVICEBERRY

Photo by Charles Webber (Calphotos).

LOCATION

Serviceberry is widespread throughout the Pacific Northwest and extends into Canada, the Rocky Mountain states, and the upper Midwest. Site locations are canyon slopes, open forest savanna, brushy hillsides, canyons, and creek banks. This species is an early *seral* component of the ponderosa pine-dominated woodlands. Serviceberry is usually found on well-drained soils and will occasionally occur around bogs.

DESCRIPTION

Serviceberry is a tall perennial shrub or small tree that will grow up to 20 feet tall. This species reproduces from seed or *stolons* and tends to form colonies. Stems are reddish brown to gray with alternating branches, and single or clustered trunks will occur. Leaves are *deciduous*, alternating, have parallel veins, oval shaped to oblong, 1-3 inches long, and 1-2 inches wide. Leaf margins have course dentations above the mid point and flattened or truncated bases while the top surface is dark green and bottoms are yellow. Flowers have five long white petals, are in bunches of 3 to 20 on upright ovate clusters, and are out from March to July. The fruit is berry-like, dry, mealy, and not very palatable. They are globe shaped, dark purple, fleshy, and have 3 to 6 seeds.

USES

Serviceberries are made into jams, jellies, wine, and pies. Young growth is fair to good as livestock forage. The Native Americans dried the berries for later use in soups and stews and made arrow shafts and teepee stakes out of the stems.

BALDHIP ROSE

Photo by John Williams and Bruce Dunn

LOCATION/DESCRIPTION/USES

Baldhip rose is widespread in the Pacific Northwest. This species prefers cool moist sites in grand fir plant associations and moist areas in Douglas fir communities. Baldhip rose is an upright, slender, finely branched, low shrub that grows up to three feet tall. Stems are armed with many fine *prickles* resembling raspberry and have reddish stems. Leaves are *deciduous*, alternating, odd-pinnately compound with 5 to 7 leaflets per stem, serrated edges, and are medium to dark green. Flowers are pleasant to the taste and can be used as an edible decoration in salads. They are small (1/2 inch diameter), pink to rose color, occur singly, and bloom from June to July. The fruit is a hip that is high in vitamin C and is often used in teas. Hips are small at 1/2 inch wide, ovoid, and start green then turn to red. Flowers fall from the hip as it matures and leaves a round bald fruit, hence the name baldhip rose.

NOOTKA ROSE

Photo by Brother Alfred Brousseau (Calphotos).

LOCATION/DESCRIPTION/USES

Nootka rose can be found from the Cascades in the Pacific Northwest to the Rocky Mountains. At its lower limits on warmer drier sites this species is often mixed with pearhip rose where these two species often hybridize. Site locations are usually warmer and drier than suitable for baldhip rose and is often found in Douglas fir and ponderosa pine forestlands. This species is an upright, low to mid-sized shrub that grows from 2 to 6 feet tall. The stems are armed with pairs of straight to slightly curved spines. Leaves are dark green, alternating, *deciduous*, and odd-pinnately compound with 5 to 7 leaflets. Leaf edges are serrated with gland tipped teeth. Nootka rose has large, pink, 2 to 3-inch diameter flowers occurring singly at branch ends that are out from May to July. The fruits are a large purplish-red hip with sepals remaining on the hip at fruiting time. Hips are a good source of vitamin C and are used in jellies and teas.

PEARHIP ROSE

Photo by John Williams and Bruce Dunn

LOCATION/DESCRIPTION/USES

Pearhip rose is widespread east of the Cascades where it is commonly found with ninebark and snowberry. On warm dry sites this species is typically mixed with nootka rose where the two roses may hybridize. On moist site locations, pearhip rose is often found with ponderosa pine and Douglas fir. This is an upright, low to mid-sized shrub that grows from 3 to 7 feet tall. The stems are armed with stout slightly curved spines. Leaves are alternating, *deciduous*, odd-pinnately compound with 5 to 9 leaflets, and have serrated margins. Flowers are 1 to 2 inches in diameter, in bunches of 3 to 5 in *terminal cymes*, pink, and out from May to July. The fruit is a round to ovoid red hip that resembles a pear; hence the name pearhip rose. Hips are rich in vitamin C and used to make jellies and teas.

CHOKECHERRY/SERVICEBERRY/ROSE

Chokecherry, serviceberry, and the rose varieties in this cover type are the dominant species found in this community. Each species may occur as a pure stand but it is more common to find them growing together in mixed stands representing most any combination of the species. Site locations are generally more moist than sage communities and drier than aspen communities. At lower elevation sites, stands occur on protected northern exposures or in snow accumulating depressions. Upper elevation locations are on southern exposures or rocky ridges where quaking aspen or conifer communities can co-exist. Associated shrubs include green rabbitbrush, bitterbrush, horsebrush, Oregon grape, and wild currants. On dry sites this cover type will merge with sage, oak, and other mountain brushes, and on more moist sites it is found with aspen and conifer communities.

STAND STRUCTURE

In this document, stand structure for the cover type chokecherry/serviceberry/rose has three classifications: open canopy tall shrub, open canopy low medium shrub, and closed canopy low medium shrub. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

Many animal species utilize the chokecherry/serviceberry/rose cover type. Chokecherry provides key browse for mule deer and grouse, magpies, rabbits, and bears eat the fruits. Deer, elk, sheep, and goats browse serviceberry. Grouse use serviceberries in summer and buds in winter. Nootka rose hips are an important winter food for grouse and quail while bear, grouse, and quail eat pearhip rose hips. Roses are intensely browsed by deer, elk, and cattle. The full suite of animal species utilizing the chokecherry/serviceberry/rose cover type, as it pertains to Wallowa County, can be found in the matrix (page N-134).

GRAPH ANALYSIS

Table 16

Stand Structure	Graph #30 Summation of species occurrences by stand structure for ots, olms and clms. (%)	Graph #16. Number of species by stand structure for chokecherry/ serviceberry/ rose. (%)	Chokecherry/ serviceberry/ rose use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using chokecherry/ serviceberry/ rose by stand structure. (See note 2.)
Open canopy tall shrub	110 (10%)	58 (32%)	More	11
Open canopy low-medium shrub.	498 (43%)	66 (37%)	Less	12
Closed canopy low-medium shrub.	537 (47%)	55 (31%)	Less	11

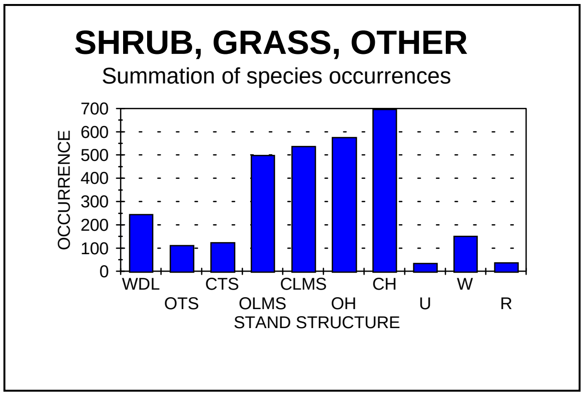
Note 1. More means there is a higher species use of a stand structure in chokecherry/serviceberry/rose than that stand structure in the summation of non-tree cover types. Less means there is a lower

species use of a stand structure in chokecherry/serviceberry/rose than that stand structure in the summation of non-tree cover types.

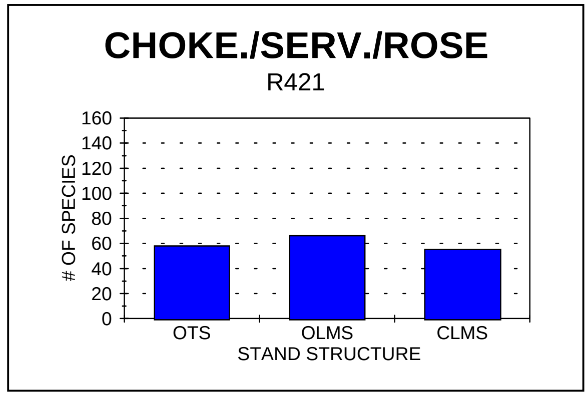
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #16 shows the number of animal species using each stand structure in the chokecherry/serviceberry/rose cover type.

Graph #30



Graph #16



- See CTS, OLMS, and CLMS for chokecherry/serviceberry/rose.

In the summation of non-tree cover types (graph #30) concerning open canopy tall shrub, there are 110 animal species occurrences. This means that all cover types that have the stand structure open canopy tall shrub have a summation of 110 occurrences. *Of those 110 occurrences, 58 (53%) are contributed by the chokecherry/serviceberry/rose cover type.*

In the summation of non-tree cover types (graph #30) concerning open canopy low medium shrub, there are 498 animal species occurrences. This means that all cover types that have the stand structure open canopy low medium shrub have a summation of 498 occurrences. *Of those 498 occurrences, 66 (13%) are contributed by the chokecherry/serviceberry/rose cover type.*

In the summation of non-tree cover types (graph #30) concerning closed canopy low medium shrub, there are 537 animal species occurrences. This means that all cover types that have the stand structure closed canopy low medium shrub have a summation of 537 occurrences. *Of those 537 occurrences, 55 (10%) are contributed by the chokecherry/serviceberry/rose cover type.*

DRY SHRUB

COVER TYPE: ANTELOPE BITTERBRUSH/BLUEBUNCH WHEATGRASS (Purshia tridentata/Agropyron spicatum). R104.

ANTELOPE BITTERBRUSH

Photo by Charles Webber (Calphotos).

LOCATION

Antelope bitterbrush is found east of the Cascades in Oregon, Washington and northern California and in the western parts of Montana, Wyoming, and Colorado. Habitats are plains, foothills, mountain slopes, mesas, and open woodlands. Preferred sites have well drained sand, gravel, or rocky soils. Colder sites tend to be desert shrublands, and warmer sites are commonly beneath ponderosa pine at the forest fringes.

DESCRIPTION

Antelope bitterbrush is an upright, stiff, evergreen, perennial that will grow up to 8 feet tall but is more commonly less than 5 feet tall. This species is abundantly branched with crowns tending to be round and compact due to heavy wildlife and livestock use. This shrub is very tolerant to drought, withstands heavy grazing, reproduces from seed, and will sprout from branches if they are in contact with the ground. Stems and branches are reddish-brown becoming grayish with age, have many spur shoots or branchlets, and have small scaly buds. Leaves alternate along branches, are 3/4 inch long, wedge shaped, have a 3 lobed apex, and are clustered on spur shoots. Margins are rolled under, tops are green to gray-green, and bottoms are white to gray. Flowers are pale yellow, 5 petaled, and are out from April to June. The flower has a stout, beak-like, persistent *style* and 20 to 25 exposed *stamens*. The fruit is a tear-shaped *achene* up to ½ inch long with a tapered beak. Antelope bitterbrush is sensitive to fire and will have regeneration problems unless soils are moist soon after fire episodes. Extensive information concerning antelope bitterbrush and its associated plant species as they occur in Wallowa County can be found in “Plant Association of the Wallowa-Snake Province” by Charles G. Johnson, Jr.

USES

Antelope bitterbrush provides good forage for cattle, sheep, and goats. The value of this feed is in the late fall and winter when the ground is covered with snow and grasses are not easily obtained. The Native Americans used antelope bitterbrush for firewood, and it is now used as an ornamental landscape shrub.

BLUEBUNCH WHEATGRASS

Photo by John Williams and Bruce Dunn

LOCATION

Bluebunch wheatgrass is found from Alaska to California and east to the Dakotas and New Mexico. This grass is widespread east of the Cascades and very abundant in the Blue and Wallowa Mountains. Bluebunch wheatgrass will occupy plains, mountain slopes, canyons, open woods, and stream banks, from hot dry slopes in grasslands to warm dry forest fringes. On shallow soil scablands, roots penetrate rock fissures to tap moisture at depth. Optimal growth is obtained on deep soils that are dry but moist soils are tolerated.

DESCRIPTION/USES

Bluebunch wheatgrass is a native, perennial, drought resistant grass that forms in bunches or tufts. At higher elevations with moist sites, *rhizomes* may form. Growth begins in April and will stay green well into summer. After late summer dormancy regrowth begins after fall rains. Reproduction is from seed, *tillers*, and *rhizomes*. Of all native grasses, bluebunch wheatgrass produces the most dry weight per acre. Leaves are flat, long, narrow, and have slightly rolled blades up to 16 inches long. Blades have a prominently veined upper surface, bluish appearance, and a reddish to purple base where it connects to the stem. Flowers are an upright spike that is 3 to 6 inches long and contain 6 to 8 individual spikelets. Each spikelet contains 6-8 individual florets that have tails called awns that are up to 3/4 inches long. Associated native grasses include sand dropseed, Kentucky bluegrass, Idaho fescue, and red top. Bluebunch wheatgrass has high palatability and nutritional values and is fed on extensively by cattle, horses, elk, and sheep. Extensive information concerning bluebunch wheatgrass and its associates can be found in “Plant Association of the Wallowa-Snake Province” by Charles G. Johnson, Jr.

ANTELOPE BITTERBRUSH/BLUEBUNCH WHEATGRASS

Bluebunch wheatgrass is the dominant species in this cover type in Wallowa County. Bluebunch wheatgrass and antelope bitterbrush are often found with several other species of shrubs, forbs, and grasses while species cover percentages vary from site to site. Common shrub associates are gray rabbitbrush, green rabbitbrush, and sagebrush species. Sandbergs bluegrass, prairie junegrass and cheatgrass are common grass associates, while arrowleaf balsamroot, western yarrow, lupine, milkvetch, and nine-leaf lomatium are common forb associates. Soils where this cover type occurs are basaltic, sedimentary, or granitic, with shallow depths of 10-20 inches, and usually over fractured bedrock. The climate that produces the antelope bitterbrush/bluebunch wheatgrass cover type has 10-15 inches of annual precipitation, cold moist winters, and hot dry summers. Temperatures are too hot and sites are too dry to produce Idaho fescue; this cover type defines transition between low elevation sage/grass communities and high elevation fescue communities.

STAND STRUCTURE

In this document, stand structure for the cover type antelope bitterbrush/bluebunch wheatgrass has one classification: closed canopy low medium shrub. This stand structure is described in the stand structure key (page N-156).

ANIMAL SPECIES

The antelope bitterbrush/bluebunch wheatgrass cover type provides key habitat for several animal species. With its high palatability, antelope bitterbrush provides very important winter range browse for deer, antelope, and elk. Pica, squirrels, and chipmunks eat and cache bitterbrush seeds in great quantity. Bluebunch wheatgrass has high palatability and nutritional values in the fall and winter months. This grass is used extensively by cattle, horses, elk, and sheep as winter-feed. The full suite of animal species utilizing the antelope bitterbrush/bluebunch wheatgrass cover type, as it pertains to Wallowa County, can be found in the matrix (page N-134).

GRAPH ANALYSIS

Table #17

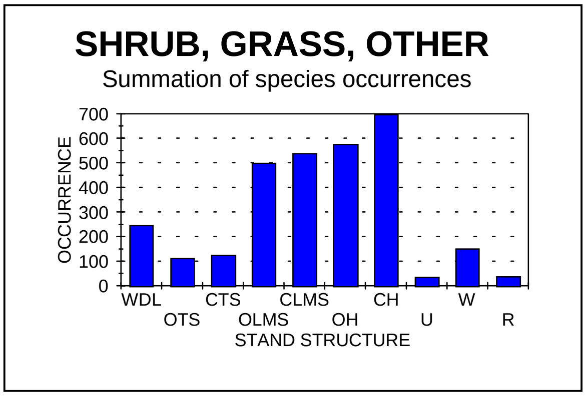
Stand Structure	Graph #30 Summation of species occurrences by stand structure for clms. (%)	Graph #17. Number of species by stand structure for antelope bitterbrush/blue bunch wheatgrass. (%)	Antelope bitterbrush/blue bunch wheatgrass use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using antelope bitterbrush/ bluebunch wheatgrass by stand structure. (See note 2.)
Closed canopy low-medium shrub.	537 (100%)	92 (100%)	Similar	15

Note 1. Similar means there is close to the same species use of a stand structure in antelope bitterbrush/bluebunch wheatgrass when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%.

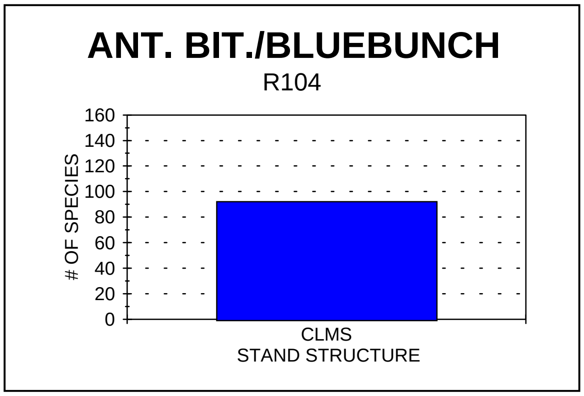
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #17 shows the number of animal species using each stand structure in the antelope bitterbrush/bluebunch wheatgrass cover type.

Graph #30



Graph #17



- See CLMS for mountain mahogany.

In the summation of non-tree cover types (graph #12) concerning closed canopy low medium shrub, there are 537 animal species occurrences. This means that all cover types that have the stand structure closed canopy low medium shrub have a summation of 537 occurrences. *Of those 537 occurrences, 92 (17%) are contributed by the antelope bitterbrush/bluebunch wheatgrass cover type*.

DRY GRASS

COVER TYPE: AGROPYON BUNCHGRASS (Agropyron spicatum): CS06

BLUEBUNCH WHEATGRASS

Photo by John Williams and Bruce Dunn

LOCATION

Bluebunch wheatgrass is found from Alaska to California and east to the Dakotas and New Mexico. This grass is widespread east of the Cascades and very abundant in the Blue and Wallowa Mountains. Bluebunch wheatgrass will occupy plains, mountain slopes, canyons, open woods, and stream banks; from hot dry slopes in grasslands to warm dry forest fringes. On shallow soil scablands roots penetrate rock fissures to tap moisture at depth. Optimal growth is obtained on deep soils that are dry but moist soils are tolerated.

DESCRIPTION/USES

Bluebunch wheatgrass is a native, perennial, drought resistant grass that forms in bunches or tufts. At higher elevations with moist sites, *rhizomes* may form.

Growth begins in April and will stay green well into summer. After late summer dormancy regrowth begins after fall rains. Reproduction is from seed, *tillers*, and *rhizomes*. Of all native grasses, bluebunch wheatgrass produces the most dry weight per acre. Leaves are flat, long, narrow, and have slightly rolled blades up to 16 inches long. Blades have a prominently veined upper surface, bluish appearance, and a reddish to purple base where it connects to the stem. Flowers are an upright spike that is 3 to 6 inches long and contain 6 to 8 individual spikelets. Each spikelet contains 6-8 individual florets that have tails called awns that are up to 3/4 inches long.

In the agropyon bunchgrass cover type, bluebunch wheatgrass is the dominant and most common grass. Sandbergs bluegrass and junegrass are consistent associates but accounts for a very small percentage of the cover types' annual production. No other perennial grass occurs commonly throughout this cover type but several grasses are found site specifically. Sand dropseed, red threeawn, and cheatgrass are examples of grasses found site specifically. While few forbs are common throughout the cover type, many are found in the cover type. Yarrow, milkvetch, balsamroot, fleabane, biscuitroot, lupine, and phlox are examples of perennial forbs found in this cover type. Common annual forbs are spring whitlow wort, Indian wheat, and shining chickweed. In this cover type, grasses account for up to 90% of the annual production while forbs can yield up to 20%. Forb production is lowest on dry sites. Agropyon bunchgrass occupies the driest bunchgrass sites in the Pacific Northwest where annual precipitation is from 8-20 inches. Bluebunch wheatgrass has high palatability and nutritional values and is fed on extensively by cattle, horses, elk, and sheep. Extensive information concerning bluebunch wheatgrass and its associates can be found in "Plant Association of the Wallowa-Snake Province" by Charles G. Johnson, Jr.

STAND STRUCTURE

In this document, stand structure for the cover type agropyon bunchgrass has two classifications: closed herb and open herb. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

The agropyon bunchgrass cover type provides key habitat for many animal species. Bluebunch wheatgrass retains high palatability and nutritional values in the fall and winter months after curing. This grass is used extensively by cattle, horses, elk, and sheep as winter-feed. Bearded wheatgrass provides good forage for sheep, elk, and cattle, and ground squirrels use the seeds. Forage values are excellent when green, poor in summer and good in the fall and winter. The full suite of animal species utilizing the agropyon bunchgrass cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #18

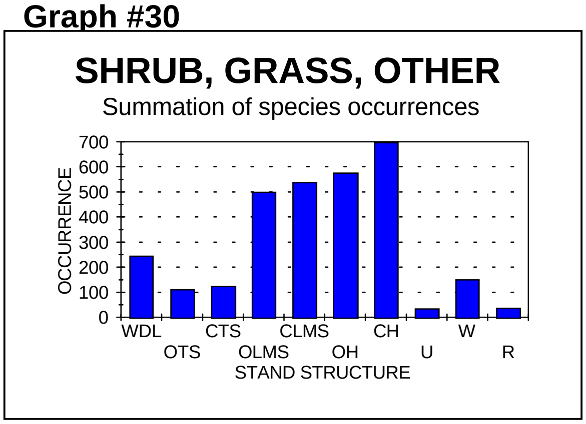
Stand Structure	Graph #30 Summation of species occurrences by stand structure for ch and oh. (%)	Graph #18. Number of species by stand structure for agropyon bunchgrass. (%)	Agropyon bunchgrass use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using agropyon bunchgrass by stand structure. (See note 2.)
Closed herb	696 (55%)	108 (48%)	Less	12
Open herb	575 (45%)	117 (52%)	More	14

Note 1. More means there is a higher species use of a stand structure in agropyon bunchgrass than that stand structure in the summation of non-tree cover types. Less means there is a lower species use of a stand structure in agropyon bunchgrass than that stand structure in the summation of non-tree cover types.

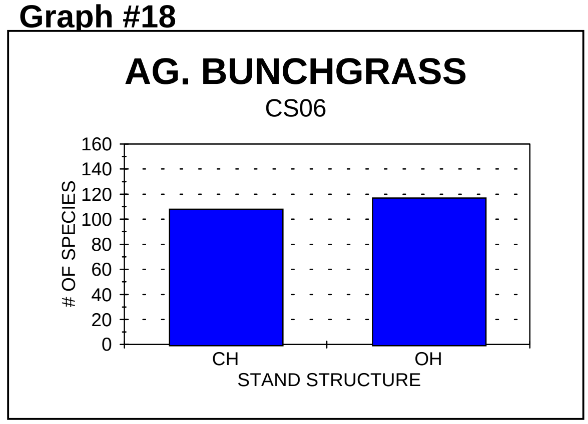
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #18 shows the number of animal species using each stand structure in the agropyon bunchgrass cover type.

Graph #30



Graph #18



- See CH and OH for agropyon bunchgrass.

In the summation of non-tree cover types (graph #30) concerning closed herb, there are 696 animal species occurrences. This means that all cover types that have the stand structure closed herb have a summation of 696 occurrences. *Of those 696 occurrences 10,8 (16%) are contributed by the agropyon bunchgrass cover type.*

In the summation of non-tree cover types (graph #30) concerning open herb, there are 575 animal species occurrences. This means that all cover types that have the stand structure open herb have a summation of 575 occurrences. *Of these 575 occurrences, 117 (20%) are contributed by the agropyon bunchgrass cover type.*

COVER TYPE: FESCUE-BUNCHGRASS (Festuca idahoensis-Agropyron spicatum). CS13.

IDAHO FESCUE

Photo by John Williams and Bruce Dunn

LOCATION

Idaho fescue is a widespread grass found in the western United States and Canada from the Cascades to the Sierras and east to the Rocky Mountains. Site locations are warm, dry to warm, and moist grasslands where it is often associated with bluebunch wheatgrass and prairie junegrass. This species occupies the moist zones of the bunchgrass regions where annual precipitation is from 14-22 inches. Idaho fescue is found in foothill rangelands, open woods and rocky slopes where it grows on all exposures and in many soil types. This species is most abundant on well-drained loams that are neutral to slightly alkaline while elevation range is from 900 to 12,000 feet.

DESCRIPTION/USES

Idaho fescue is a native perennial that is the second most common and important grass, behind bluebunch wheatgrass, in the Blue and Wallowa Mountains. Growth starts in early spring with seeds maturing in the mid summer months. This species reproduces from seeds and *tillers* and will withstand some excessive grazing pressure. Stems are up to 2 1/2 feet tall, smooth, and have a bluish waxy coating. Leaves are fine, 2-5 inches long, green with a bluish cast, tightly inrolled, and occur at the base of the plant. Flowers (inflorescence) are a 3-6 inch long narrow *panicle* with upright ascending spikelets. Each spikelet contains 5-7 florets that have a stout, straight, short tail called an awn.

In the fescue-bunchgrass cover type, Idaho fescue is usually dominant and always present while bluebunch wheatgrass can be co-dominant and is usually present. Foliage cover is about 60% greater than in the agropyon bunchgrass cover type with several grasses, forbs, and annuals commonly associated. Grass to forb ratios vary greatly with forbs contributing up to 65% of total annual production. Grasses found in this cover type include Sandberg’s bluegrass, prairie junegrass, slender wheatgrass, intermediate oatgrass, western needlegrass, mountain brome, and Wheeler’s bluegrass, in addition to a variety of sedges. Forbs include yarrow balsamroot, bessaya, prairie smoke aven, lupine, cinquefoil, phlox, salsify, wild hyacinth, Indian paintbrush, western hawkweed, and fringecup. Annuals found in this cover type are rattlesnake brome, Japanese brome, cheatgrass, spring whitlow wort, and shining chickweed. The palatability of Idaho fescue varies with season and location in Wallowa County. Elk, sheep, and cattle feed heavily on this grass during the spring and as palatability decreases in the summer, it is fed upon lightly. Extensive information concerning Idaho fescue and its associates can be found in "Plant Association of the Wallowa-Snake Province" by Charles G. Johnson, Jr.

BLUEBUNCH WHEATGRASS

Photo by John Williams and Bruce Dunn

LOCATION

Bluebunch wheatgrass is found from Alaska to California and east to the Dakotas and New Mexico. This grass is widespread east of the Cascades and very abundant in the Blue and Wallowa Mountains. Bluebunch wheatgrass will occupy plains, mountain slopes, canyons, open woods, and stream banks; from hot dry slopes in grasslands to warm dry forest fringes. On shallow soil scablands roots penetrate rock fissures to tap moisture at depth. Optimal growth is obtained on deep soils that are dry but moist soils are tolerated.

DESCRIPTION/USES

Bluebunch wheatgrass is a native, perennial, drought resistant grass that forms in bunches or tufts. At higher elevations on moist sites, *rhizomes* may form. Growth begins in April and will stay green well into summer. After late summer dormancy regrowth begins after fall rains. Reproduction is from seed, *tillers*, and *rhizomes*. Of all native grasses, bluebunch wheatgrass produces the most dry weight per acre. Leaves are flat, long, narrow, and have slightly rolled blades up to 16 inches long. Blades have a prominently veined upper surface, bluish appearance, and a reddish to purple base where it connects to the stem. Flowers are an upright spike that is 3 to 6 inches long and contain 6 to 8 individual spikelets. Each spikelet contains 6-8 individual florets that have tails called awns that are up to 3/4 inches long. Bluebunch wheatgrass has high palatability and nutritional values and is fed on extensively by cattle, horses, elk, and sheep. Extensive information concerning bluebunch wheatgrass and its associates can be found in "Plant Association of the Wallowa-Snake Province" by Charles G. Johnson, Jr.

STAND STRUCTURE

In this document, stand structure for the cover type fescue-bunchgrass has two classifications: closed herb and open herb. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

Idaho fescue is excellent forage for livestock and wildlife. This species is an important feed late in the growing season, as it remains green longer than other grasses. Although an important feed for grazing animals, Idaho fescue is often by-passed in favor of other rangeland feeds. Elk, cattle, and sheep feed heavily on Idaho fescue in the lowlands during the spring, and at higher elevations during the summer this grass is lightly used. Bluebunch wheatgrass provides key habitat for many animal species as well as retaining high palatability and nutritional values in the fall and winter months after curing. This grass is used extensively by cattle, horses, elk, and sheep as winter-feed. The full suite of animal species utilizing the fescue-bunchgrass cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #19

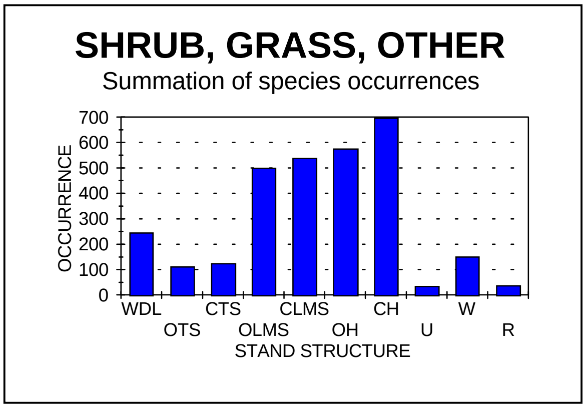
Stand Structure	Graph #30 Summation of species occurrences by stand structure for ch and oh. (%)	Graph #19. Number of species by stand structure for fescue bunchgrass. (%)	Fescue bunchgrass use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using fescue bunchgrass by stand structure. (See note 2.)
Closed herb.	696 (55%)	107 (48%)	Less	16
Open herb.	575 (45%)	117 (52%)	More	16

Note 1. More means there is a higher species use of a stand structure in fescue-bunchgrass than that stand structure in the summation of non-tree cover types. Less means there is a lower species use of a stand structure in fescue-bunchgrass than that stand structure in the summation of non-tree cover types.

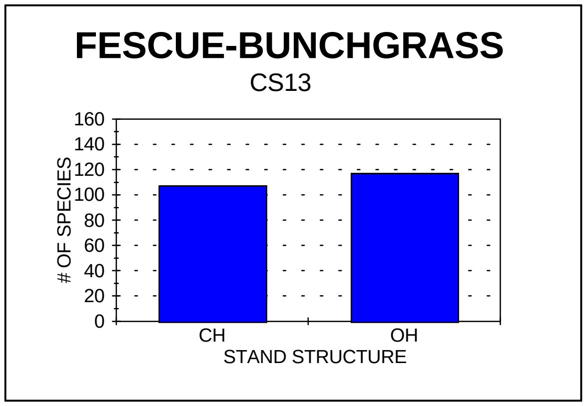
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #19 shows the number of animal species using each stand structure in the fescue-bunchgrass cover type.

Graph #30



Graph #19



- See CH and OH for fescue-bunchgrass (page N-156).

In the summation of non-tree cover types (graph #30) concerning closed herb, there are 696 animal species occurrences. This means that all cover types that have the stand structure closed herb have a summation of 696 occurrences. *Of those 696 occurrences, 107 (15%) are contributed by the fescue-bunchgrass cover type.*

In the summation of non-tree cover types (graph #30) concerning open herb, there are 575 animal species occurrences. This means that all cover types that have the stand structure open herb have a summation of 575 occurrences. *Of those 575 occurrences, 117 (20%) are contributed by the fescue-bunchgrass cover type.*

<u>COVER TYPE: NATIVE FORB. CS07.</u>

Photo by John Williams and Bruce Dunn

<u>LOCATION/DESCRIPTION</u>

Native forbs are herbaceous plants other than grasses and grass-like plants that occurred in North America prior to the settlement of European peoples. Native forbs are found in all areas and elevations of Wallowa County: forestlands, steppe, alpine, riparian, and wetlands. These plants are associated with many plant communities and can account for a large percentage of cover in a stand. In this document the native forb cover type has five sub-classifications: deschampsia/calamagrostis species, exotic moist herbs, exotic riparian herbs, native forbs, and pioneer forbs. Common native forbs include strawberry, yarrow, lupine, and phlox. For further information concerning forbs consult the forb section of “Common Plants of the Inland Pacific Northwest” by Charles G. Johnson, Jr.

USES

Plants in the native forb cover type provide humans with many beneficial products. Several of these forbs have medicinal uses to relieve a variety of ailments. Native Americans used arnica flowers in a salve to help heal wounds or cuts. Avens tea can be ingested to improve digestion. Yarrow taken in tea form relieves fever while maintaining strength as it has stimulative properties, is used to suppress colds, and can prevent hair loss. Many forbs are used for esthetic reasons in our landscapes and as wildflower arrangements. Some forbs such as prickly pear can be eaten, and arrowleaf balsamroot can be put into salads.

STAND STRUCTURE

In this document, stand structure for the cover type native forb has two classifications: closed herb and open herb. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

The native forb cover type provides habitat for many animal species. This cover type provides forage for livestock and wildlife, seeds for birds, and food for rodents. Grouse and rodents eat fruits found on many forbs. While some forbs are poisonous, most are not, and almost all forbs are used by animals in some form or another. The full suite of animal species utilizing the native forb cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #20

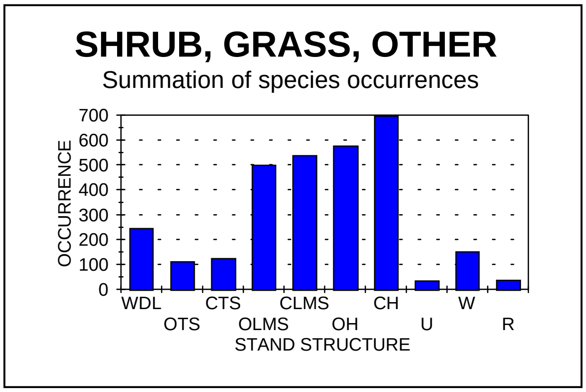
Stand Structure	Graph #30 Summation of species occurrences by stand structure for ch and oh. (%)	Graph #20. Number of species by stand structure for native forb. (%)	Native forb use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using native forb by stand structure. (See note 2.)
Closed herb.	696 (55%)	121 (49%)	Less	15
Open herb.	575 (45%)	127 (51%)	More	13

Note 1. More means there is a higher species use of a stand structure in native forb than that stand structure in the summation of non-tree cover types. Less means there is a lower species use of a stand structure in native forb than that stand structure in the summation of non-tree cover types.

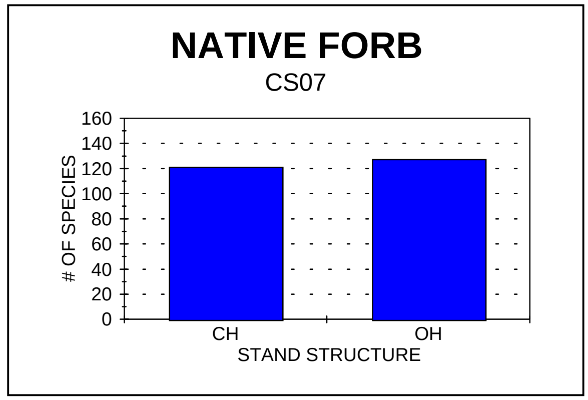
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #20 shows the number of animal species using each stand structure in the native forb cover type.

Graph #30



Graph #20



- See CH and OH for native forb.

In the summation of non-tree cover types (graph #30) concerning closed herb, there are 696 animal species occurrences. This means that all cover types that have the stand structure closed herb have a summation of 696 occurrences. *Of those 696 occurrences, 121 (17%) are contributed by the native forb cover type.*

In the summation of non-tree cover types (graph #30) concerning open herb, there are 575 animal species occurrences. This means that all cover types that have the stand structure open herb have a summation of 575 occurrences. *Of those 575 occurrences, 127 (22%) are contributed by the native forb cover type.*

COVER TYPE: EXOTIC FORBS/ANNUAL GRASS. CS08.

Photo by John Williams and Bruce Dunn

DESCRIPTION/USES

The exotic forb/annual grass cover type consists of forbs and annual grasses that are not indigenous to Wallowa County. Exotic forbs are herbaceous plants other than grasses or grass-like plants that have been introduced from another area. Annual grasses are grasses that complete their life cycle in one growing season. A few exotic forbs are prickly lettuce, goatweed, and yellow salsify, while soft chess, Japanese brome, and cheatgrass are examples of annual grasses. Many of these exotic plants are considered noxious and therefore undesirable, while others are invaders that will follow a successional sequence and be replaced by more desirable plants. Several of the plants in this cover type have human uses. Yellow salsify juice was used by the Native Americans to help cure indigestion, and prickly lettuce greens can be cooked or put into salads. This cover type is divided into five sub-classifications; exotic forb, exotic grass, exotic herbaceous, exotic herbs, and exotic perennial grass. For further information concerning exotic forbs and annual grasses consult the forb and grass sections of "Common Plants of the Inland Pacific Northwest" by Charles G. Johnson, Jr.

LOCATION

The plants of this cover type exist in a variety of locations. They are found in canyons, ridgetops, forest communities, and rangelands. Many of the species in this group tend to grow in disturbed areas. Many of the plants in this cover type have naturalized themselves to the western landscape and co-exist with native plants yet others tend to crowd out native plants and take over an area. This cover type contains several desirable and undesirable plants.

STAND STRUCTURE

In this document, stand structure for the cover type exotic forbs/annual grass has two classifications: closed herb and open herb. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

The exotic forbs/annual grass cover type provides habitat for many animal species. This cover type provides forage for livestock and wildlife, seeds for birds, and food for rodents. Grouse and rodents eat fruits found on many forbs. While some forbs are poisonous, most are not, and almost all forbs are used by animals in some form or another. The full suite of animal species utilizing the exotic forb/annual grass cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #21

Stand Structure	Graph #30 Summation of species occurrences by stand structure for ch and oh. (%)	Graph #21. Number of species by stand structure for exotic forbs/annual grass. (%)	Exotic forbs/annual grass use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using exotic forbs/annual grass by stand structure. (See note 2.)
Closed herb.	696 (55%)	103 (49%)	Less	9
Open herb.	575 (45%)	106 (51%)	More	8

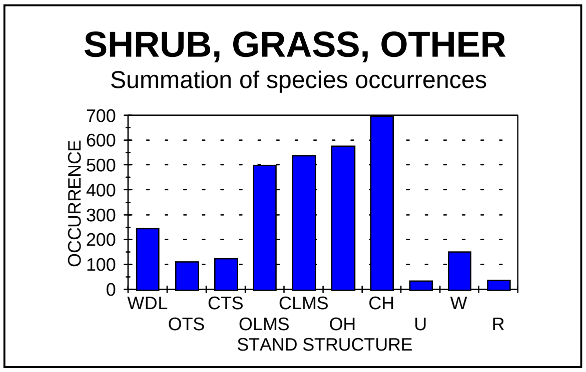
Note 1. More means there is a higher species use of a stand structure in exotic forb/annual grass than that stand structure in the summation of non-tree cover types. Less means there is a lower species use of a stand

structure in exotic forb/annual grass than that stand structure in the summation of non-tree cover types.

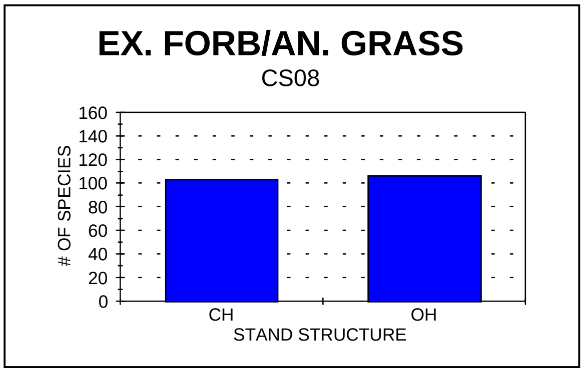
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #21shows the number of animal species using each stand structure in the exotic forb/annual grass cover type.

Graph #30



Graph #21



- See CH and OH for exotic forb/annual grass (page N-156).

In the summation of non-tree cover types (graph #30) concerning closed herb, there are 696 animal species occurrences. This means that all cover types that have the stand structure closed herb have a summation of 696 occurrences. *Of those 696 occurrences, 103 (15%) are contributed by the exotic forbs/annual grass cover type.*

In the summation of non-tree cover types (graph #30) concerning open herb, there are 575 animal species occurrences. This means that all cover types that have the stand structure open herb have a summation of 575 occurrences. *Of those 575 occurrences 10,6 (18%) are contributed by the exotic forbs/annual grass cover type.*

COVER TYPE: CROP/HAY/PASTURE. CS12.

Photo by John Williams and Bruce Dunn

LOCATION

In Wallowa County on private lands, agriculture and grazing lands are extensive. Irrigated crops are grown in the moist areas, and dryland crops are cultivated on they dry upland sites. Crops and hay are grown below the forest communities on the mountain slopes, in the river valleys, on the rolling hills, and out into the dry regions of the County. Summer livestock grazing is extensive including upland timber sites, fenced pasture throughout the valleys, dry rangeland, and in the canyons. In the winter, livestock are kept in feedlots in the warmer canyons, moved to the valleys and fed hay, or in some cases moved out of the county to warmer climates. Wilderness areas on the national forests are not exempt from grazing pressures, as recreational grazing can be quite extensive during the summer and fall months.

DESCRIPTION

The crop/hay/pasture cover type includes all agricultural grounds both irrigated and non-irrigated where crops and hay are grown, where livestock graze, and areas set aside in *CRP*. Examples of crop species include wheat, barley, oats, canola, rape, and winter peas. Most hay grounds consist of alfalfa, smooth brome, orchard grass, timothy, and clover. Pasture grasses are generally made up of Kentucky bluegrass, orchard grass, smooth brome, and clover. In Wallowa County, there are 27,700 crop acres, 40,700 hay acres, and 12,600 acres currently in *CRP*. There are 81,000 total acres harvested and *CRP* acres in Wallowa County. Extensive information concerning crop, hay, and pasture vegetative types can be obtained at the OSU Extension Service or the NRCS (Natural Resources Conservation Service).

STAND STRUCTURE

In this document, stand structure for the cover type crop/hay/pasture has one classification: closed herb. Closed herb is defined in the stand structure key (page N-156).

ANIMAL SPECIES

The crop/hay/pasture cover type provides important habitat for many animal species. Deer, elk, rodents, and birds use this area as an important food source. Large game animals feed on crops and hay grounds, predators feed on rodents, and migrating/resident geese feed on the grain crops. Irrigation ditch banks provide habitat for muskrats and weasels, and fence lines give game birds valuable cover. The full suite of animal species utilizing the cropland/hay/pasture cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #22

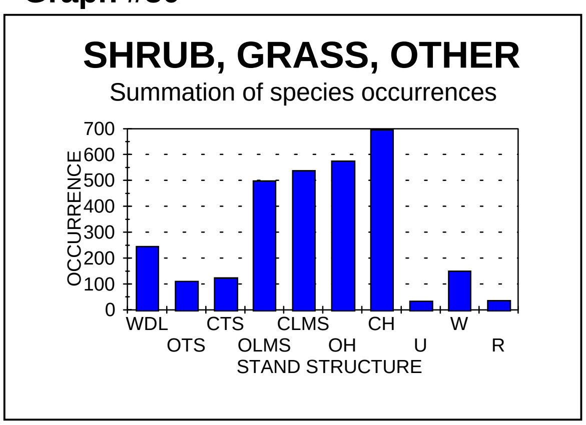
Stand Structure	Graph #30 Summation of species occurrences in all cover types for the stand structure ch. (%)	Graph #22. Number of species by stand structure for crop/hay/ pasture. (%)	Crop/hay/ pasture use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using crop/hay/pasture by stand structure. (See note 2.)
Closed herb.	696 (100%)	108 (100%)	Similar	9

Note 1. Similar means there is close to the same species use of a stand structure in crop/hay/pasture when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%.

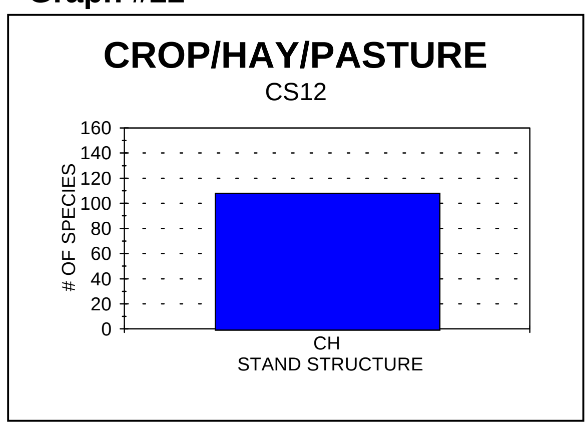
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #22 shows the number of animal species using each stand structure in the crop/hay/pasture cover type.

Graph #30



Graph #22



- See CH for crop/hay/pasture (page N-156).

In the summation of non-tree cover types (graph #30) concerning closed herb, there are 696 animal species occurrences. This means that all cover types that have the stand structure closed herb have a summation of 696 occurrences. *Of those 696 occurrences, 108 (16%) are contributed by the crop/hay/pasture cover type.*

OTHER

COVER TYPE: ALPINE TUNDRA. C005.

Photo by Coby Menton

DESCRIPTION

"Tundra is a word that describes an area, a kind of vegetation, and a specific ecosystem. The land beyond tree limit, whether it be marshy grasslands or with permanently frozen soils, or high alpine reaches" (Mason, 1975). It is the zone between upper tree limits and perpetual snow line of high mountains. Alpine is a word, relating to the biogeographic zone including the elevated slopes above timberline. The northern hemisphere contains 9 million square miles of tundra and 40% is classified as alpine. In Wallowa County, alpine tundra pertains to the areas above timberline supporting a specific ecosystem including plants, animals and soils, and is dictated by severe weather conditions. Strong winds, large lingering snowpacks, and extreme cold conditions characterize climate in the alpine tundra. Tundra vegetation is more uniform in aspect and composition throughout its extent than any other vegetation type. Tundra in Wallowa County closely resembles tundra found in other parts of the world. Surface features found in tundra include frost heaving, *patterned ground*, and *needle ice,* all of which are the result of severe weather conditions.

Timberline in Wallowa County varies in elevation from 7,100-9,000 feet and averages at 8,000 feet. If trees do occur above this line, they form small groups that are dwarfed, twisted, and one-sided due to wind, avalanches, and deep snow. Trees above timberline are few in number and are whitebark pine or alpine fir. Tundra vegetation consists of low growing plant communities that are adapted to extreme cold mountain conditions. Plants with short stems, a sprawling nature, and hairy stems and foliage characterize high elevation plant communities. Communities tend to be sparse, and individuals take advantage of depressions, cracks, and crevices for shelter. In Wallowa County, the pink mountain heather is a plant that characterizes the alpine tundra while many grasses, sedges, forbs, and shrubs can be found in this region. Extensive information concerning plants found in the alpine tundra cover type can be found in "Guide to the Plants of the Wallowa Mountains of Northeastern Oregon" by Georgia Mason.

STAND STRUCTURE

In this document, stand structure for the cover type alpine tundra has two classifications: open canopy low-medium shrub and closed canopy low-medium shrub. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

Several large mammals are found in the alpine tundra regions: elk, deer, mountain goats, bighorn sheep, coyote, and mountain lions. Rodents found include marmots, pica, pocket gophers, voles, mice, and shrews. The horned lark, cliff swallow, and mountain bluebird are examples of birds found in the tundra. Many of these animals are seasonal residents, living on the tundra during the summer months then moving to more tolerable climates during the winter. Many of the rodents are adapted to live in this area year round by hibernating or storing food for the winter months. The pocket gopher stays active year round as it lives under ground most of its life and feeds on the root systems of tundra plants. The full suite of animal species utilizing the alpine tundra cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #23

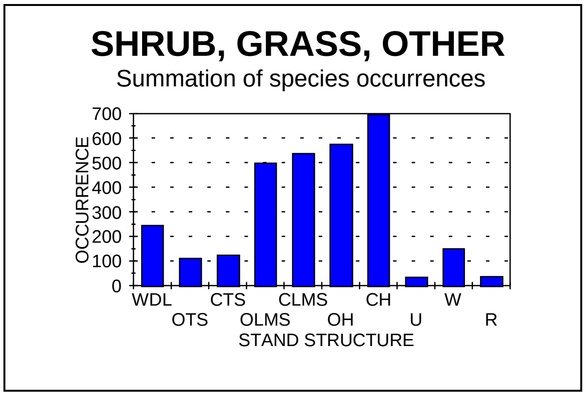
Stand Structure	Graph #30 Summation of species occurrences by stand structure for olms and clms. (%)	Graph #23. Number of species by stand structure for alpine tundra. (%)	Alpine tundra use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using alpine tundra by stand structure. (See note 2.)
Open canopy low-medium shrub.	498 (48%)	34 (51%)	Similar	7
Closed canopy low-medium shrub.	537 (52%)	33 (49%)	Similar	7

Note 1. Similar means there is close to the same species use of a stand structure in alpine tundra when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%.

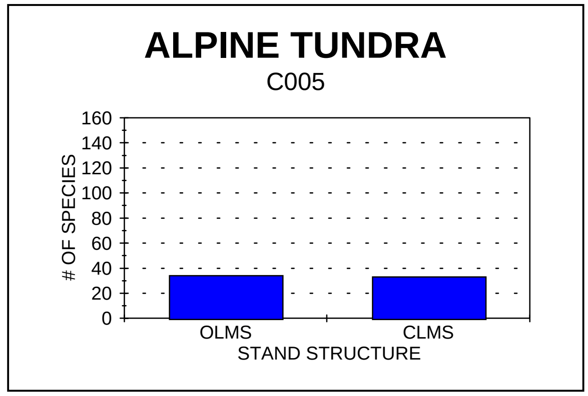
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #23 shows the number of animal species using each stand structure in the alpine tundra cover type.

Graph #30



Graph #23



- See OLMS and CLMS for alpine tundra (page N-156).

In the summation of non-tree cover types (graph #30) concerning open canopy low-medium shrub, there are 498 animal species occurrences. This means that all cover types that have the stand structure open canopy low-medium shrub have a summation of 498 occurrences. *Of those 498 occurrences, 34 (7%) are contributed by the alpine tundra cover type.*

In the summation of non-tree cover types (graph #30) concerning closed canopy low-medium shrub, there are 537 animal species occurrences. This means that all cover types that have the stand structure closed canopy low-medium shrub have a summation of 537 occurrences. *Of those 537 occurrences, 33 (6%) are contributed by the alpine tundra cover type.*

COVER TYPE: SHRUB WETLANDS. CS05.

Photo by Mike Straw.

DESCRIPTION

Wetlands are a very important component in the overall health of a landscape. They provide extensive habitat for a large number of animal and plant species. Wetlands account for a small part of the total landmass but have proportionately high productivity for plants and animals. Alders, willows, sedges, and grasses are all characteristic plants found in wetland communities. A wetland is defined as an "Area that is between terrestrial and aquatic systems and is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Federal Interagency Committee for Wetland Delineation 1989). Wetland vegetation is defined as a "term used to describe vegetation within or adjacent to, and hydrologically influenced by, streams, rivers, lakes, meadows, and seeps" (USFWS, Cowardin and others 1979). Extensive information concerning shrub wetlands can be found in “Mid-Montane Wetland Plant Associations of the Malheur, Umatilla, and Wallowa-Whitman National Forests” by Elizabeth A. Crow.

USES

The shrub wetland cover type has many human uses agriculturally, ecologically, esthetically, and monetarily. Wetlands provide and store water and act as filters. Under certain conditions water that passes through a wetland filter strip can leave cleaner than when it entered and can therefore benefit instream water quality. Wetlands can be very attractive features in the landscape with their lush vegetative growth and abundance of bird species. These features aid in flood controls, which keep our cities and transportation networks intact, while at the same time providing excellent habitat for game birds and animals.

STAND STRUCTURE

In this document, stand structure for the cover type shrub wetlands has three classifications: closed canopy tall shrub, open canopy low-medium shrub, and closed canopy low-medium shrub. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

The shrub wetland cover type is one of the most heavily used by animal species in Wallowa County. Amphibians, birds, mammals, and reptiles are all found in abundance in this habitat. The vegetative characteristics of this cover type provide hiding cover, nesting habitat, and feed for a variety of animals. The presence of water allows the residence of many water-dependent animals while providing a water source for many non-resident species. The presence of water also provides an abundance of insects for many birds, bats, and insect-eating animals to feed on. Predators such as hawks, eagles, and coyotes prosper in this habitat due to the large number of prey animals. The full suite of animal species utilizing the shrub wetlands cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #24

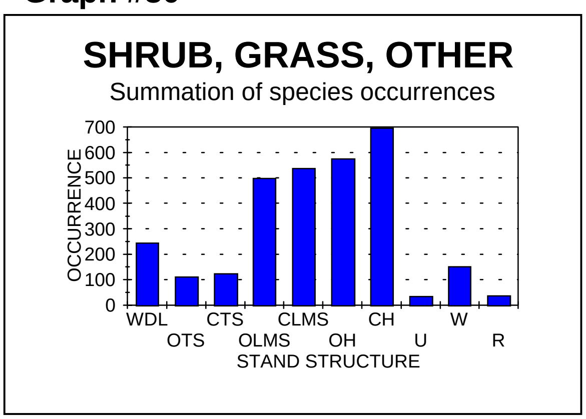
Stand Structure	Graph #30 Summation of species occurrences by stand structure for cts, olms and clms. (%)	Graph #24. Number of species by stand structure for shrub wetlands. (%)	Shrub wetlands use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using shrub wetlands by stand structure. (See note 2.)
Closed canopy tall shrub.	123 (11%)	123 (31%)	More	10
Open canopy low-medium shrub.	498 (43%)	141 (36%)	Less	12
Closed canopy low-medium shrub.	537 (46%)	133 (34%)	Less	12

Note 1. More means there is a higher species use of a stand structure in shrub wetland than that stand structure in the summation of non-tree cover types. Less means there is a lower species use of a stand structure in shrub wetland than that stand structure in the summation of non-tree cover types.

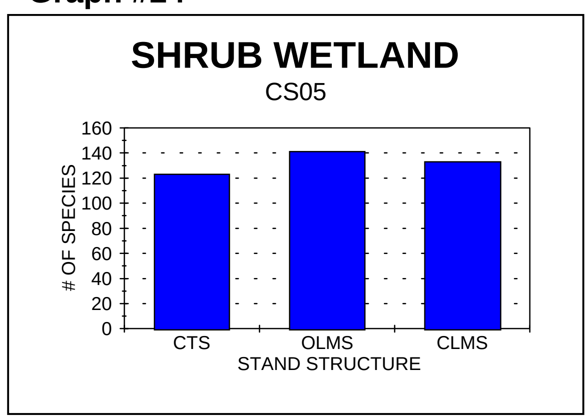
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #24 shows the number of animal species using each stand structure in the shrub wetlands cover type.

Graph #30



Graph #24



- See CTS, OLMS and CLMS for shrub wetland (page N-156).

In the summation of non-tree cover types (graph #30) concerning closed canopy tall shrub, there are 123 animal species occurrences. This means that all cover types that have the stand structure closed canopy tall shrub have a summation of 123 occurrences. *Of those 123 occurrences, 123 (100%) are contributed by the shrub wetlands cover type.*

In the summation of non-tree cover types (graph #30) concerning open canopy low-medium shrub, there are 498 animal species occurrences. This means that all cover types that have the stand structure open canopy low-medium shrub have a summation of 498 occurrences. *Of those 498 occurrences, 141 (28%) are contributed by the shrub wetlands cover type.*

In the summation of non-tree cover types (graph #30) concerning closed canopy low-medium shrub, there are 537 animal species occurrences. This means that all cover types that have the stand structure closed canopy low-medium shrub have a summation of 537 occurrences*. Of those 537 occurrences, 133 (25%) are contributed by the shrub wetlands cover type.*

COVER TYPE: HERBACEOUS WETLANDS. C007.

Photo by Mike Straw.

DESCRIPTION

Wetlands are a very important component in the overall health of a landscape. They provide extensive habitat for a large number of animal and plant species. Wetlands account for a small part of the total landmass but have proportionately high productivity for plants and animals. Cattails, sedges, and grasses are all characteristic plants found in herbaceous wetland communities. A wetland is defined as an "Area that is between terrestrial and aquatic systems and is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (Federal Interagency Committee for Wetland Delineation 1989). Wetland vegetation is defined as a "term used to describe vegetation within or adjacent to, and hydrologically influenced by, streams, rivers, lakes, meadows, and seeps" (USFWS, Cowardin and others 1979). Extensive information concerning herbaceous wetlands can be found in "Mid-Montane Wetland Plant Associations of the Malheur, Umatilla, and Wallowa-Whitman National Forests" by Elizabeth A. Crow.

USES

The herbaceous wetland cover type has many human uses agriculturally, ecologically, esthetically, and monetarily. Wetlands provide and store water and act as filters. Under certain conditions water that passes through a wetland filter strip can leave cleaner than it entered and can therefore benefit instream water quality. Wetlands can be very attractive features in the landscape with their lush vegetative growth and abundance of bird species. These features aid in flood controls, which keep our cities and transportation networks intact while at the same time providing excellent habitat for game birds and animals.

STAND STRUCTURE

In this document, stand structure for the cover type herbaceous wetlands has two classifications: closed herb and open herb. They are defined in the stand structure key (page N-156).

ANIMAL SPECIES

The herbaceous wetland cover type is one of the most heavily used by animal species in Wallowa County. Amphibians, birds, mammals, and reptiles are all found in abundance in this habitat. The vegetative characteristics of this cover type provide hiding cover, nesting habitat, and feed for a variety of animals. The presence of water allows the residence of many water-dependent animals and provides a water source for many non-resident species. The presence of water also provides an abundance of insects for many birds and insect-eating animals. Predators such as hawks, eagles, and coyotes can prosper in this habitat due to the large number of prey animals. The full suite of animal species utilizing the herbaceous wetlands cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table 25

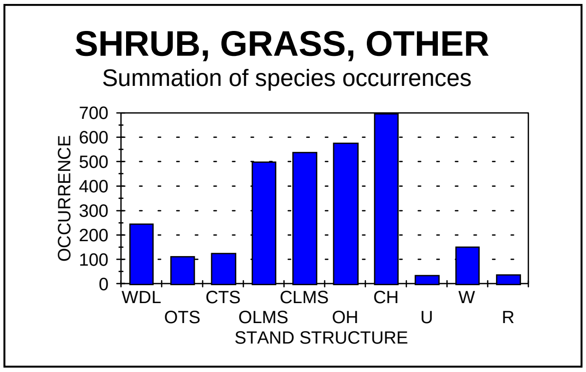
Stand Structure	Graph #30 Summation of species occurrences by stand structure for ch and oh. (%)	Graph #25. Number of species by stand structure for herbaceous wetlands. (%)	Herbaceous wetlands use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using herbaceous wetlands by stand structure. (See note 2.)
Closed herb.	696 (55%)	99 (48%)	Less	7
Open herb.	575 (45%)	108 (52%)	More	9

Note 1. More means there is a higher species use of a stand structure in herbaceous wetland than that stand structure in the summation of non-tree cover types. Less means there is a lower species use of a stand structure in herbaceous wetland than that stand structure in the summation of non-tree cover types.

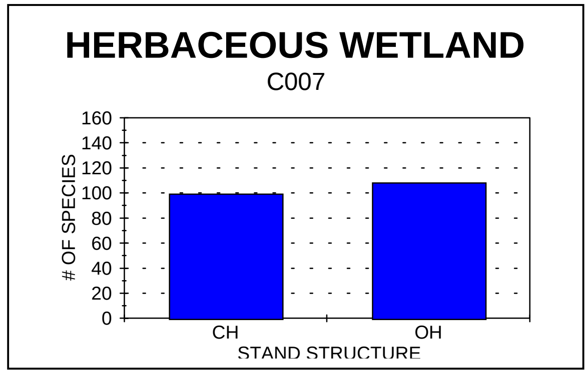
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #25 shows the number of animal species using each stand structure in the herbaceous wetlands cover type.

Graph #30



Graph #25



- See CH and OH for herbaceous wetlands.

In the summation of non-tree cover types (graph #30) concerning closed herb, there are 696 animal species occurrences. This means that all cover types that have the stand structure closed herb have a summation of 696 occurrences. *Of those 696 occurrences, 99 (14%) are contributed by herbaceous wetlands cover type.*

In the summation of non-tree cover types (graph #30) concerning open herb, there are 575 animal species occurrences. This means that all cover types that have the stand structure open herb have a summation of 575 occurrences. *Of those 575 occurrences, 108 (19%) are contributed by the herbaceous wetlands cover type.*

COVER TYPES: BARREN: C006, URBAN: CS19, and WATER: CS20.

DESCRIPTION

BARREN: Rock or barrenlands. Lands without vegetation including gravel pits, quarries, rock outcrops or talus slopes. The lack of vegetation in this cover type results in no stand structure classification; the cover type is therefore the structure.

URBAN: Urbanland. Lands including cities and towns. Lands dominated by buildings, transportation networks, and neighborhoods.

WATER: Aquatic communities including lakes, ponds, rivers, and creeks. Aquatic environments have several classifications to determine quality and health of the environment. These classifications are extensively described by drainage and reach in the original Wallowa County Salmon Plan.

ANIMAL SPECIES

BARREN

Photo By John Williams

The barren cover type provides habitat for 36 animal species in Wallowa County. The number of animals found in this cover type is few but the lifeforms are diverse. Amphibians, reptiles, birds, and mammals all use this habitat. Food for predators, dens for rodents, nesting habitat for birds, and cover for reptiles and amphibians are provided in this cover type. In the summation of non-tree cover types (graph #30), the barren cover type contributes all animal species (100%) represented in this graph. The full suite of animal species found in the barren cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #26

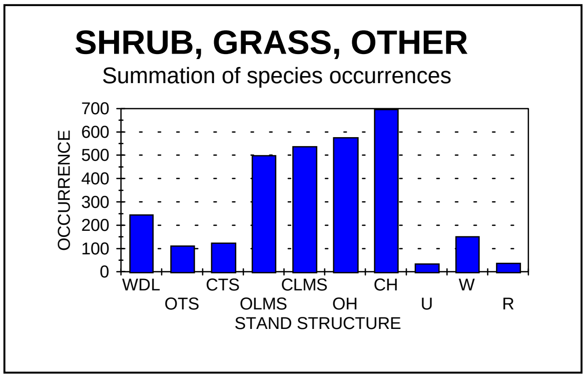
Stand Structure	Graph #30 Summation of species occurrences for R by stand structure. (%)	Graph #26. Number of species by stand structure for barren. (%)	Barren use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using barren by stand structure. (See note 2.)
Rock/barren.	36 (100%)	36 (100%)	Similar	11

Note 1. Similar means there is close to the same species use of a stand structure in barren when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%.

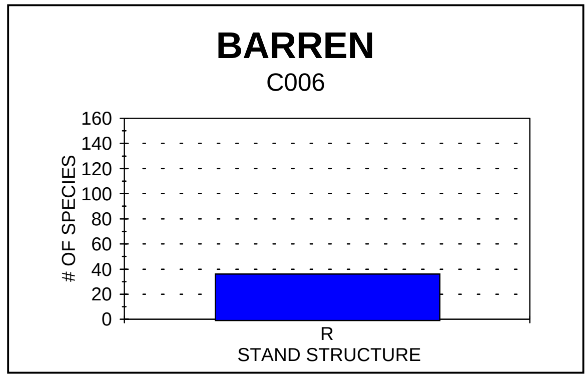
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #26 shows the number of animal species using each stand structure in the barren cover type.

Graph #30



Graph #26



- See R for barren (page N-156).

URBAN

Photo by John Williams.

The urban cover type provides habitat for 33 animal species in Wallowa County. This habitat is not extensively used when compared to the other habitats found in Wallowa County. The animals found in urban areas are those that have adapted to or found benefits from human development. Birds, mammals, reptiles, and amphibians can be found in areas of urban development. In the summation of non-tree cover types (graph #30), the urban cover type contributes all animal species (100%) represented in this graph. The full suite of animal species found in the urban cover type, as it pertains to Wallowa County, can be found in the matrix (page N-145).

GRAPH ANALYSIS

Table #27

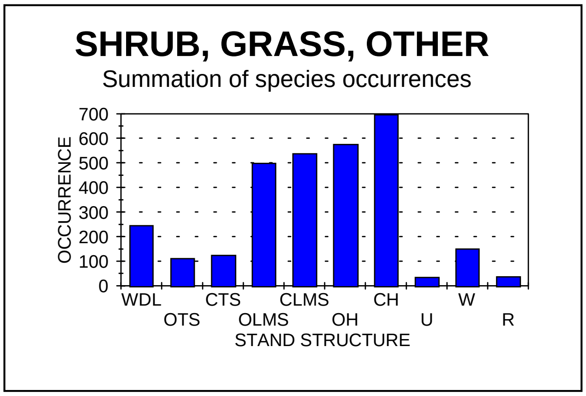
Stand Structure	Graph #30 Summation of species occurrences for U by stand structure. (%)	Graph #27. Number of species by stand structure for urban. (%)	Urban use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using urban by stand structure. (See note 2.)
Urban.	33 (100%)	33 (100%)	Similar	7

Note 1. Similar means there is close to the same species use of a stand structure in urban when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%.

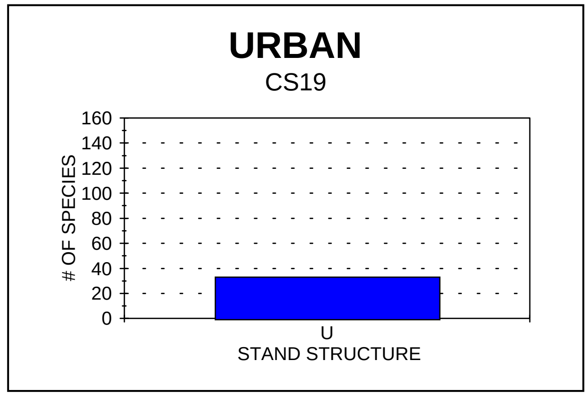
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #27 shows the number of animal species using each stand structure in the urban cover type.

Graph #30



Graph #27



- See U for urban (page N-156).

<u>WATER</u>

Photo by John Williams.

The water cover type is the most diverse in vertebrate animal species occurrences and lifeform diversity in Wallowa County. Fish, amphibians, mammals, birds, and reptiles are all found in this habitat. Fish are the dominant lifeform and the heaviest users in this cover type. Of the 368 vertebrate species found in Wallowa County, 150 use this habitat at some time in their life cycle. In the summation of non-tree cover types (graph #30), the water cover type contributes all animal species (100%) represented in this graph. The full suite of animal species found in the water cover type, as it pertains to Wallowa County, can be found in the matrix.

GRAPH ANALYSIS

Table #28

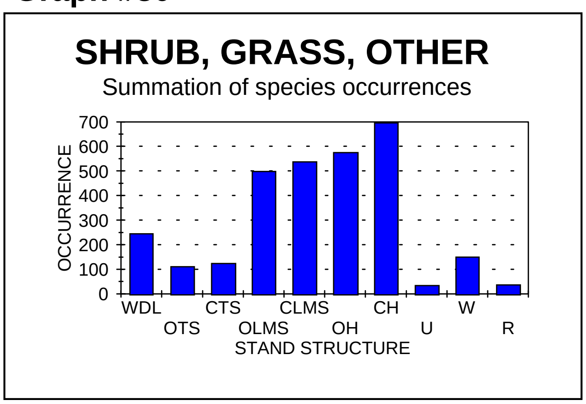
Stand Structure	Graph #30 Summation of species occurrences for W by stand structure. (%)	Graph #28. Number of species by stand structure for water. (%)	Water use compared to summation of non-tree cover types. % comparison. (See note 1.)	Number of species of concern using water by stand structure. (See note 2.)
Water.	150 (100%)	150 (100%)	Similar	17

Note 1. Similar means there is close to the same species use of a stand structure in water when compared to the summation of non-tree cover types (Same %). Considered similar when percent differs by up to 5%.

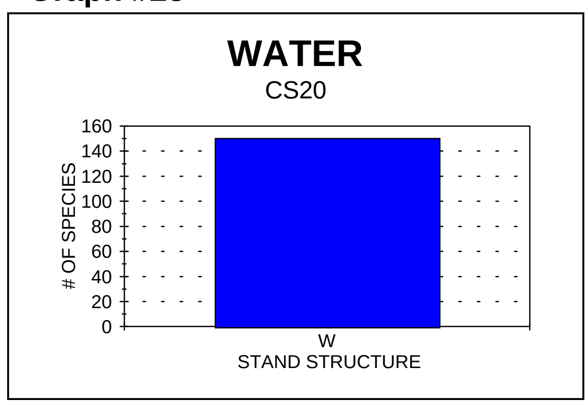
Note 2. Species of concern are highlighted in the **matrix**. Pages N-101-N-155.

Graph #30 shows how many times each species occurs in each stand structure (if a species occurs in more than one cover type then it is counted more than once). Graph #28 shows the number of animal species using each stand structure in the water cover type.

Graph #30



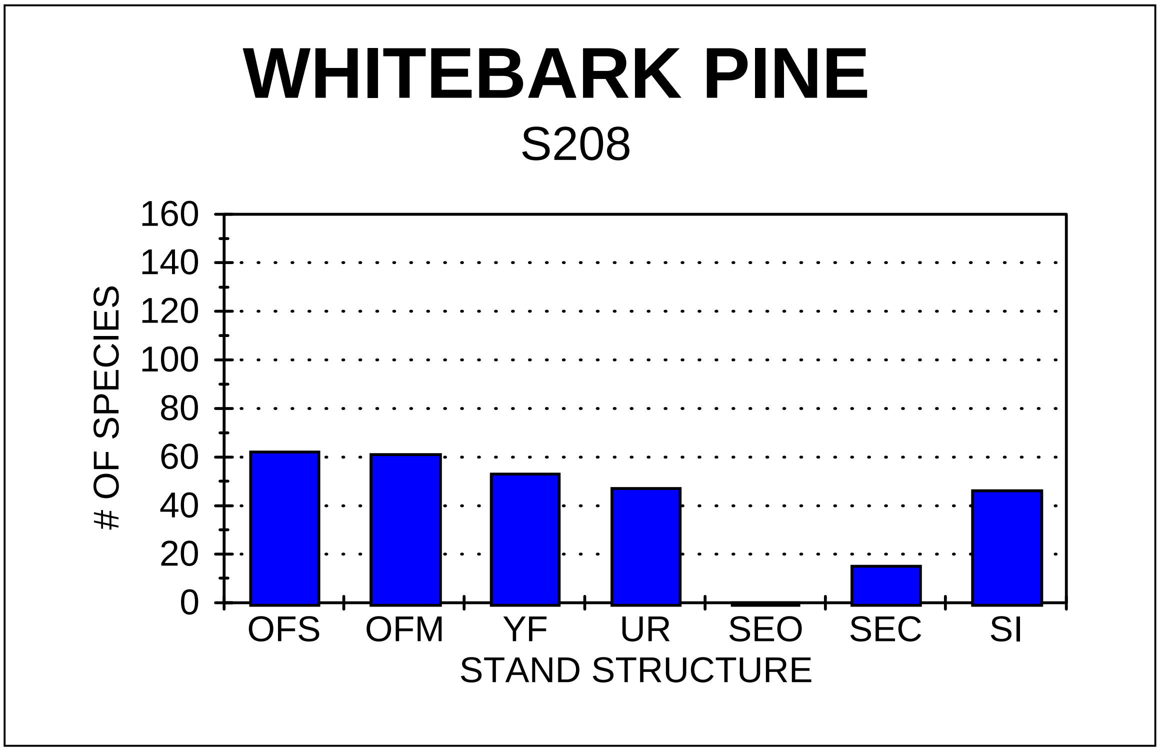
Graph #28



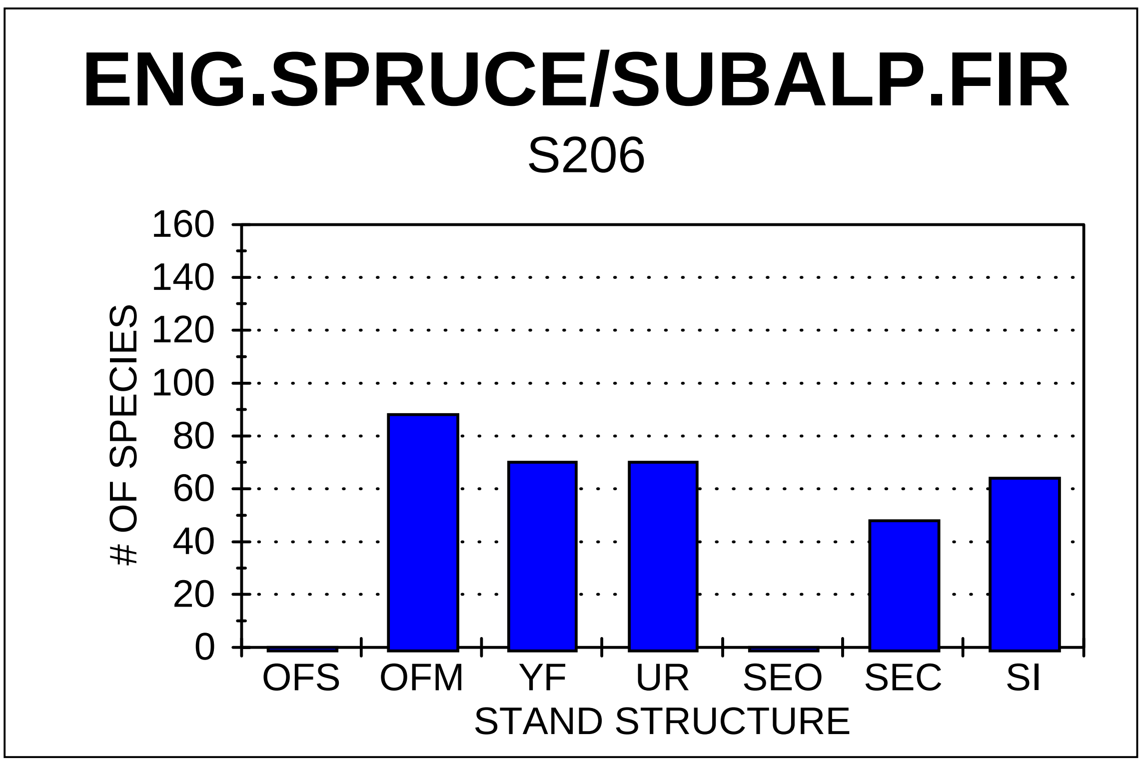
- See W for water (page N-156).

GRAPHS

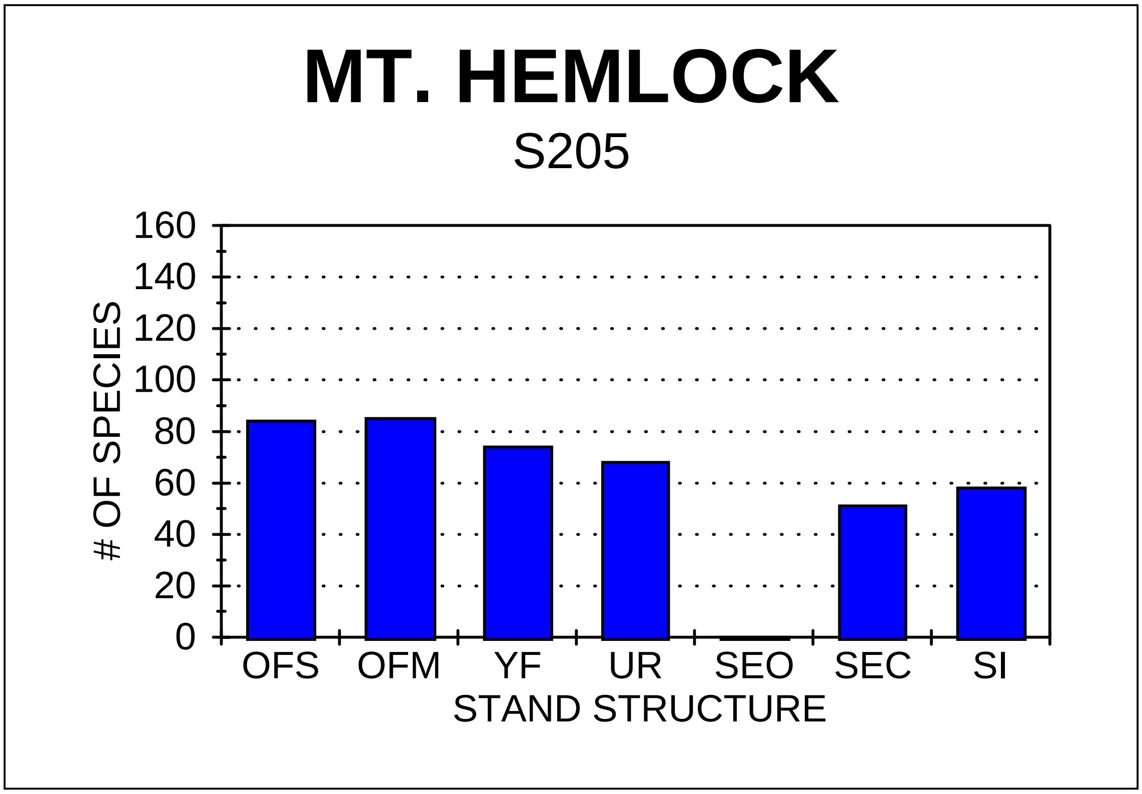
Graph #1



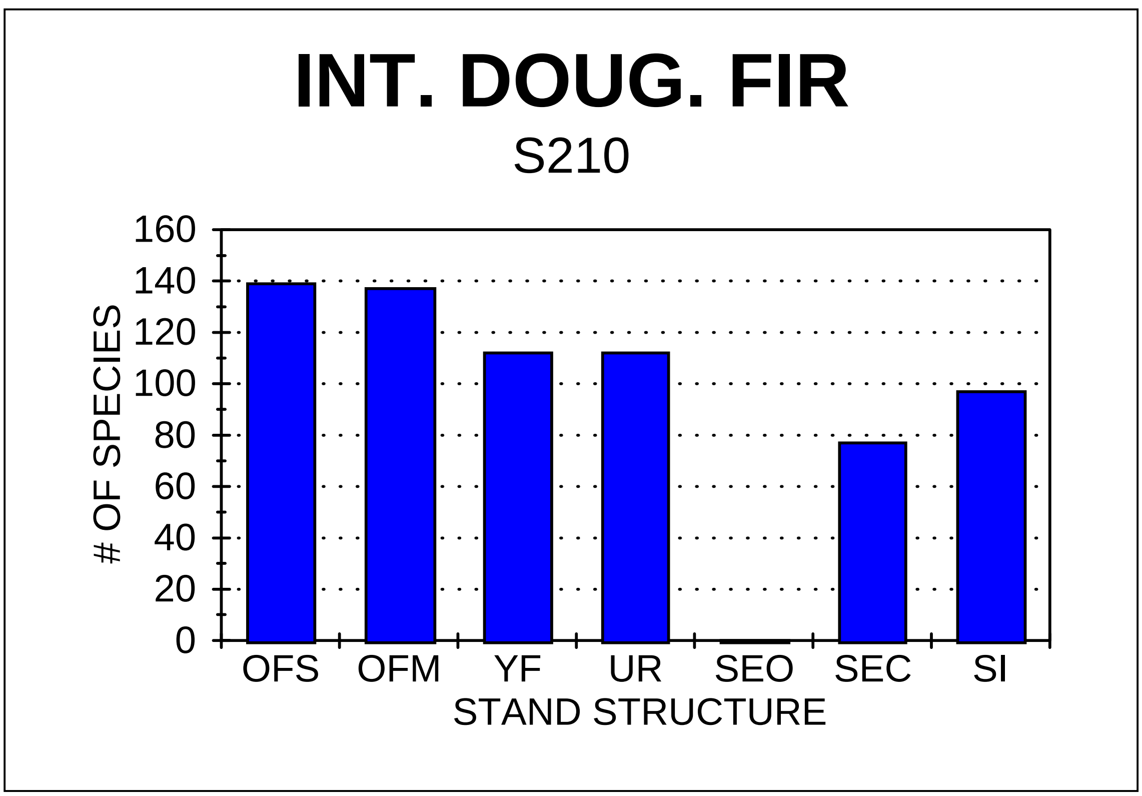
Graph #2



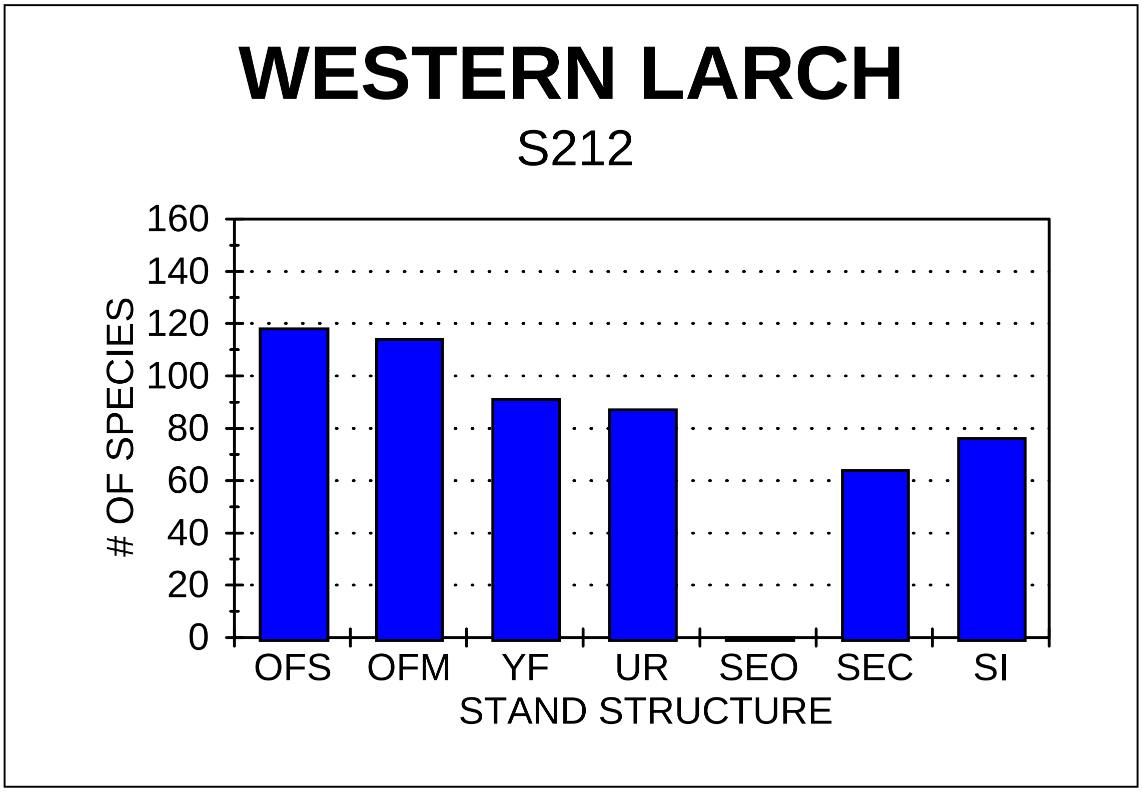
Graph #3



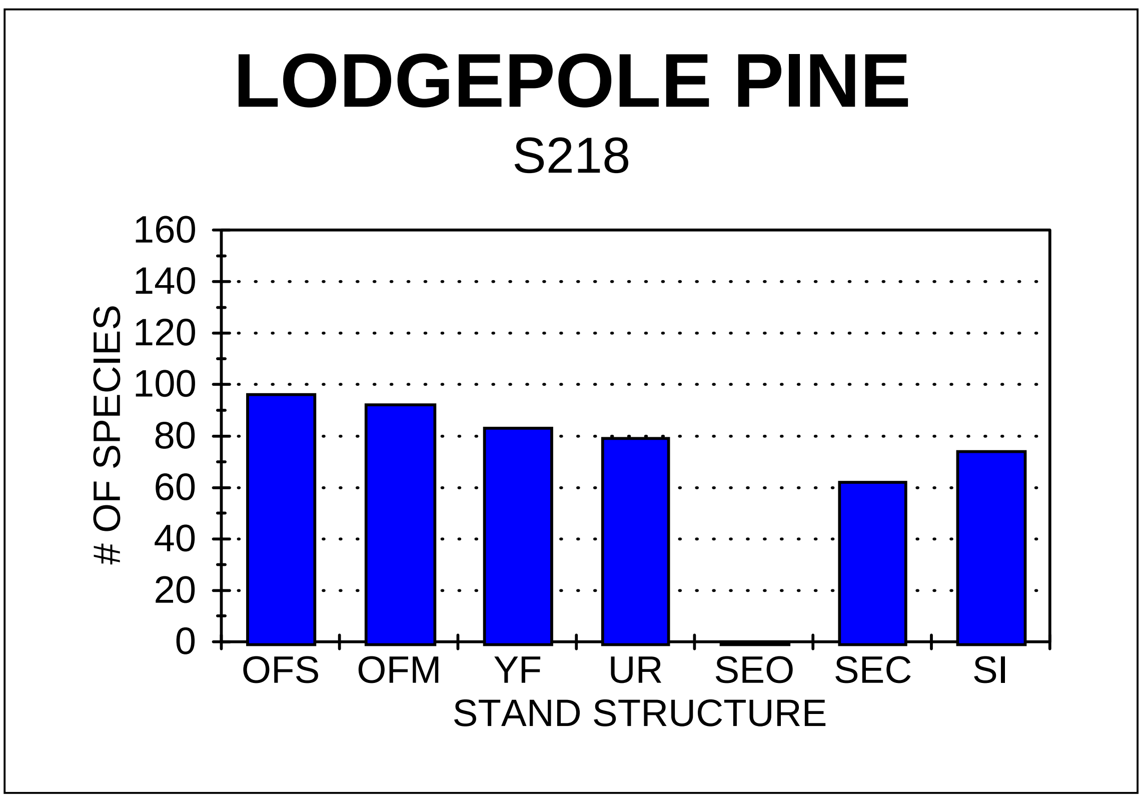
Graph #4



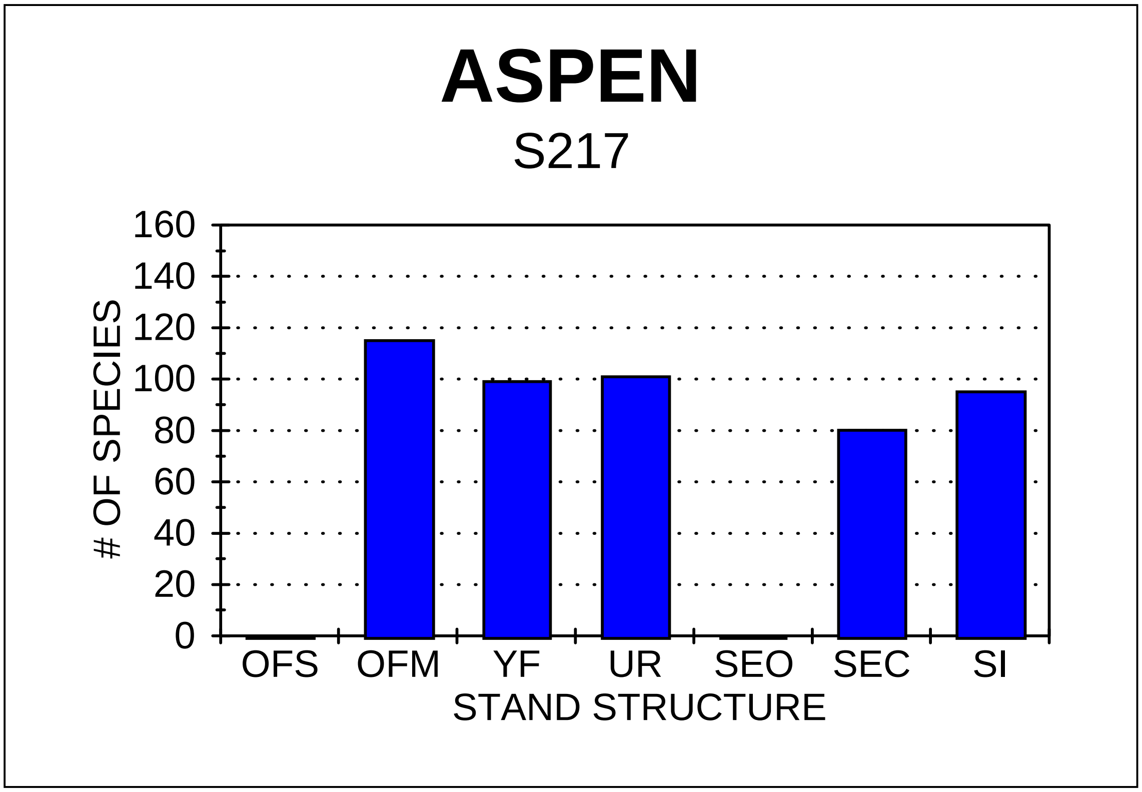
Graph #5



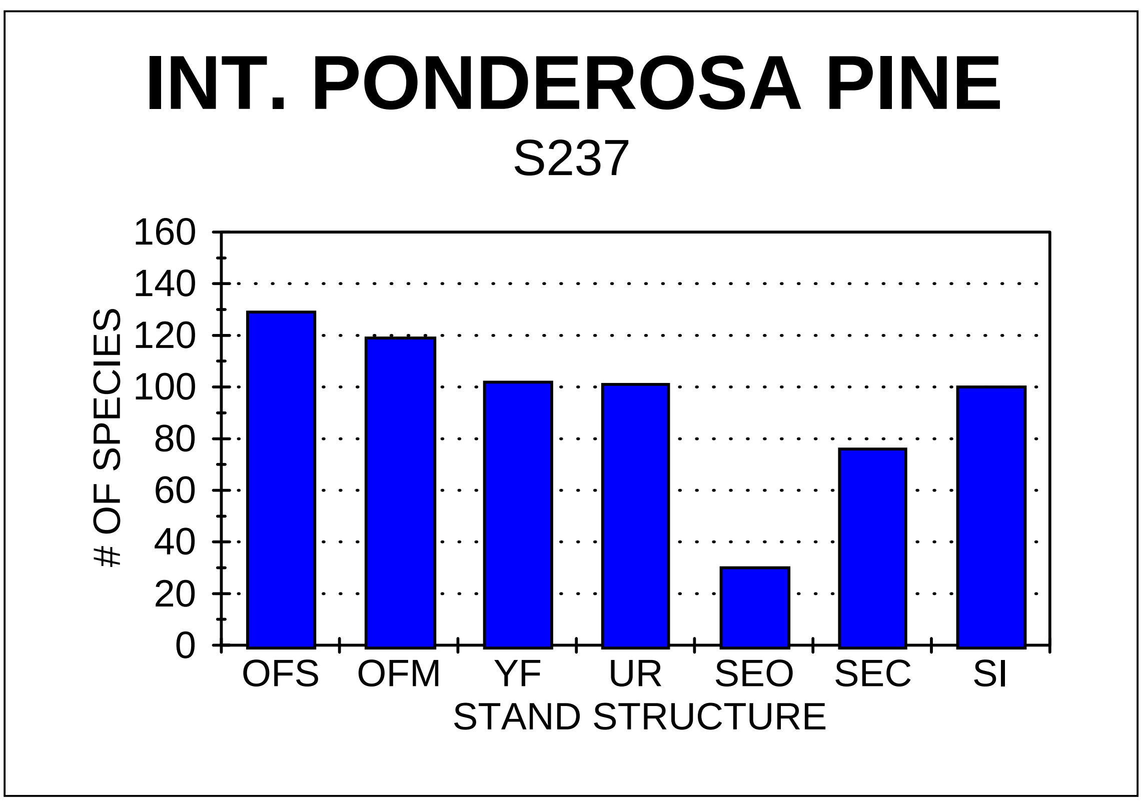
Graph #6



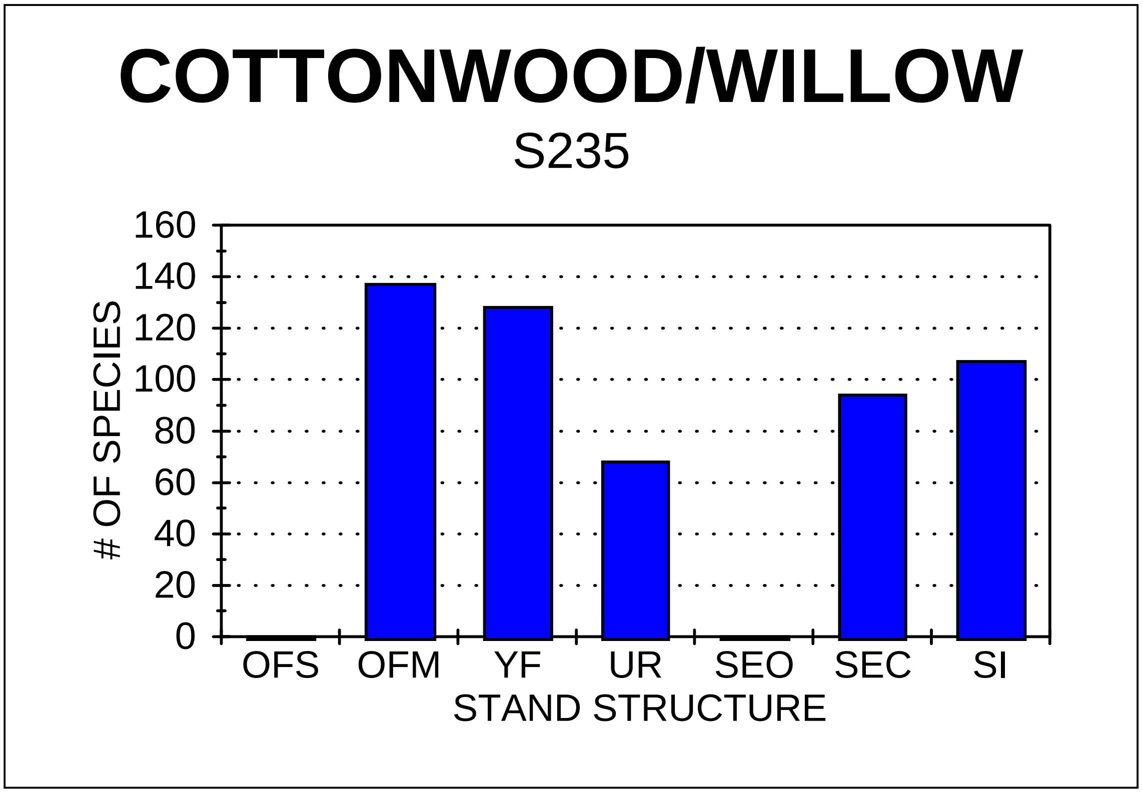
Graph #7



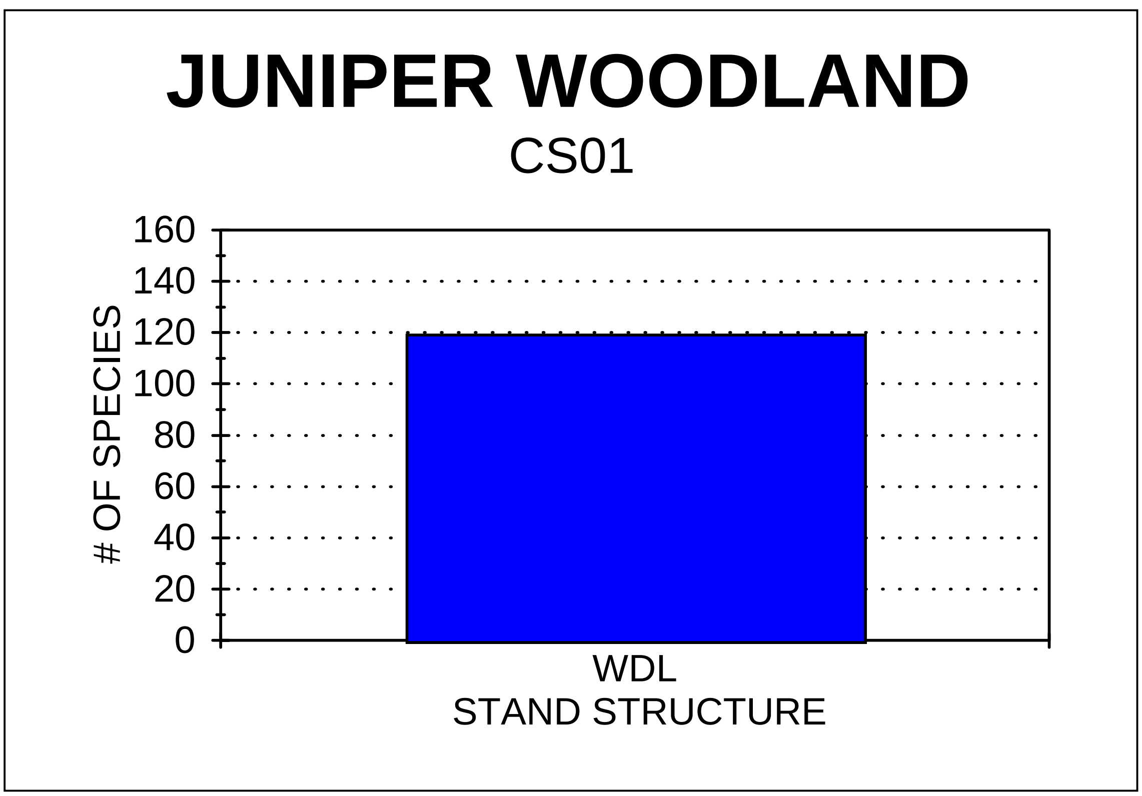
Graph #8



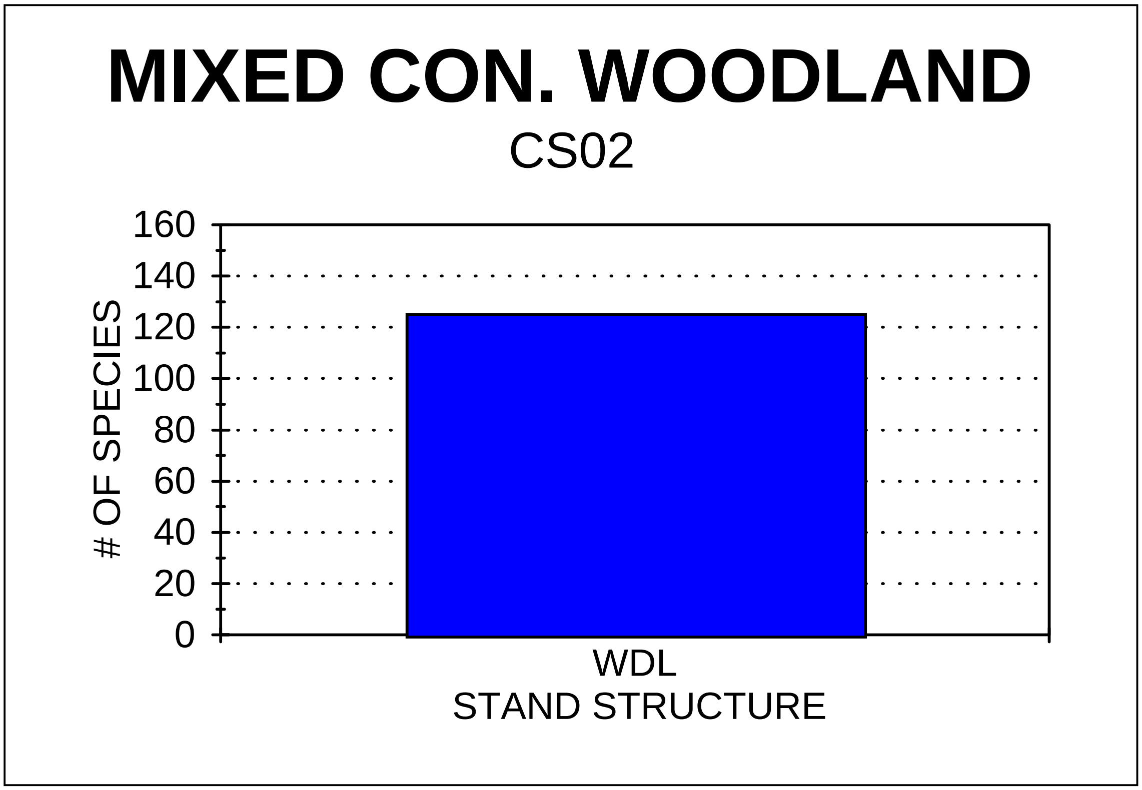
Graph #9



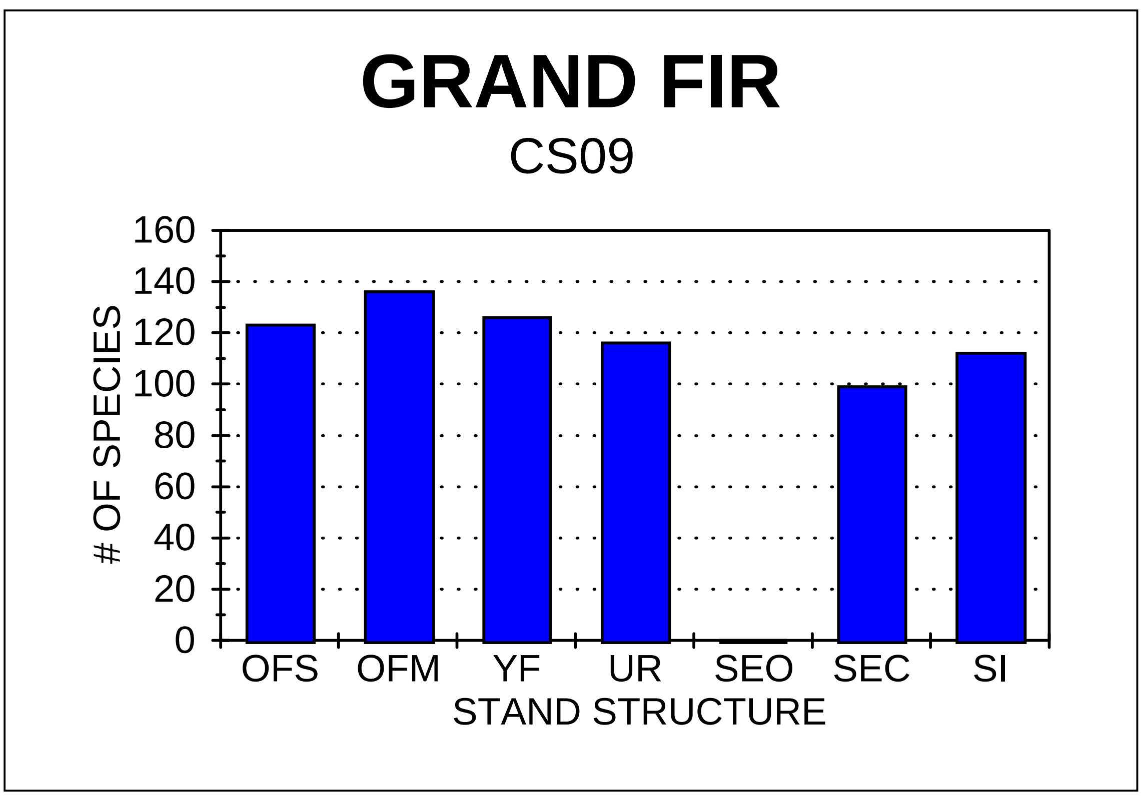
Graph #10



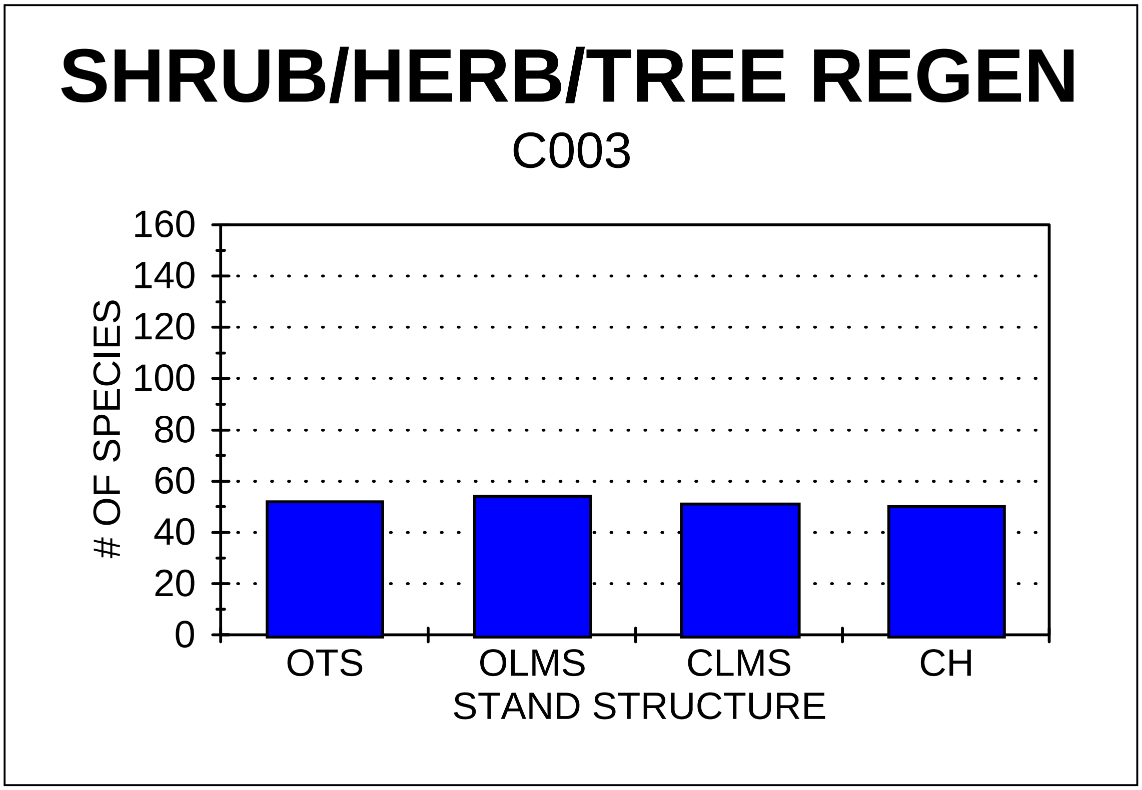
Graph #11



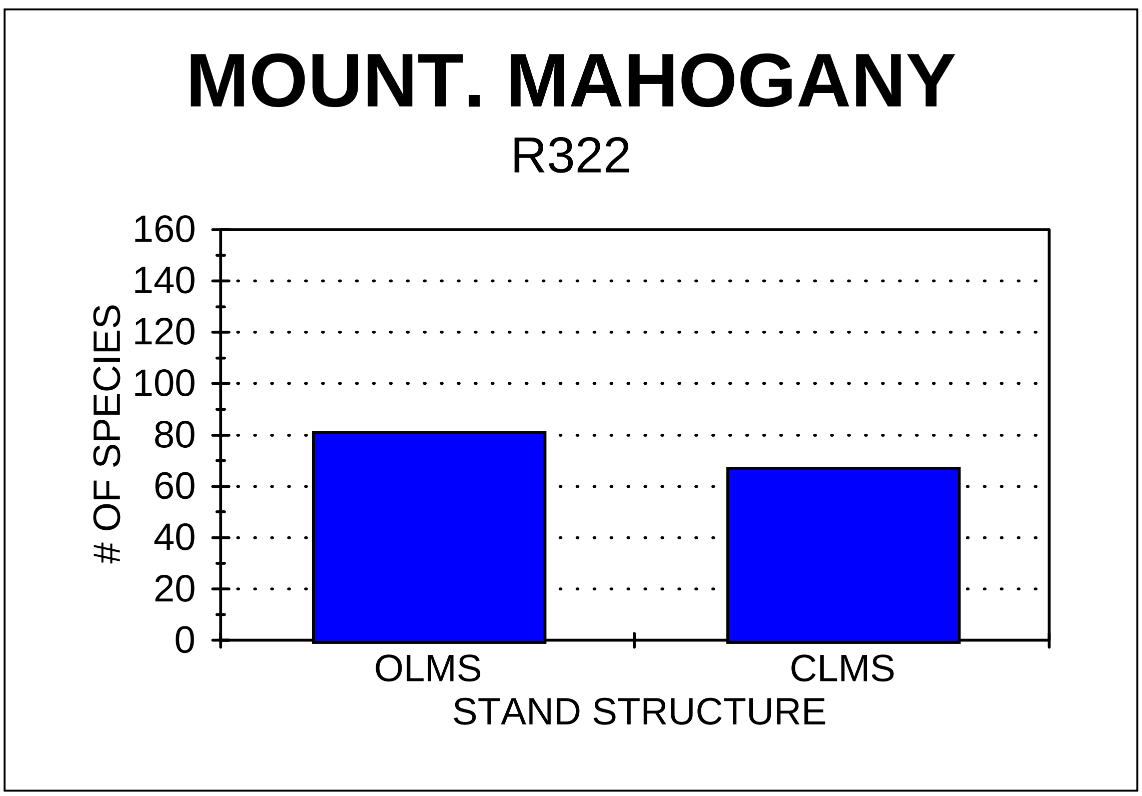
Graph #12



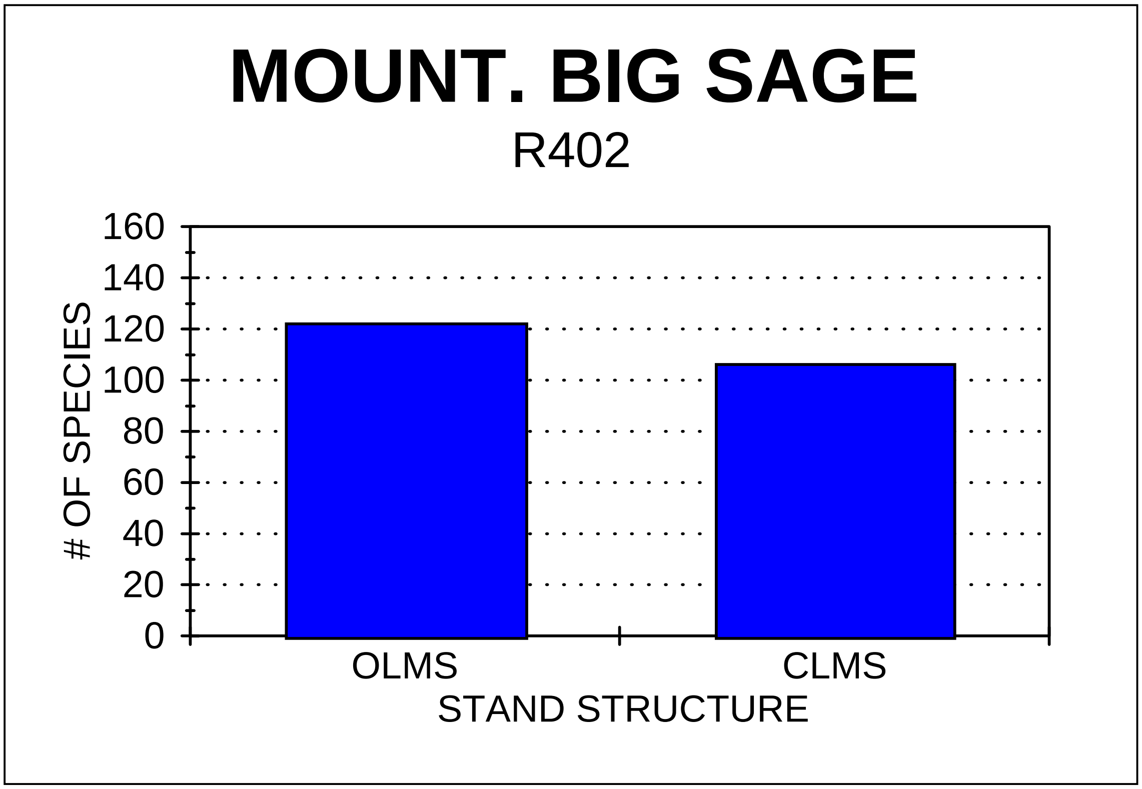
Graph #13



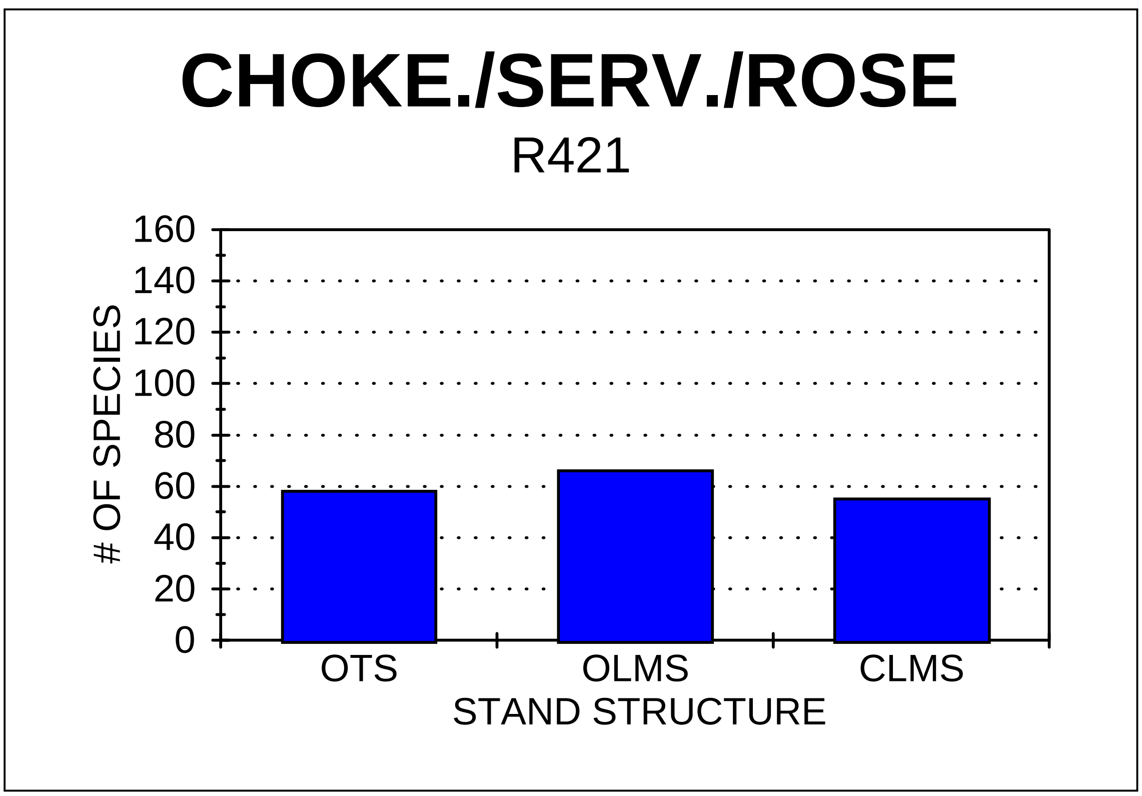
Graph #14



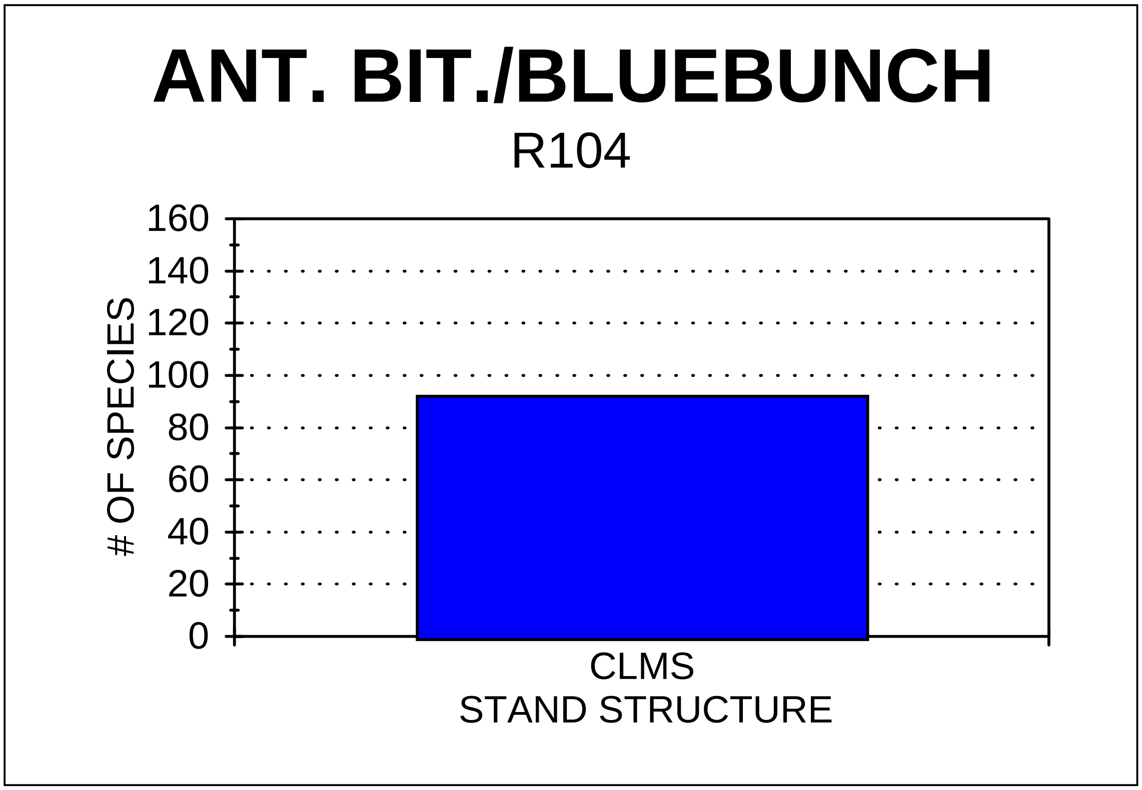
Graph #15



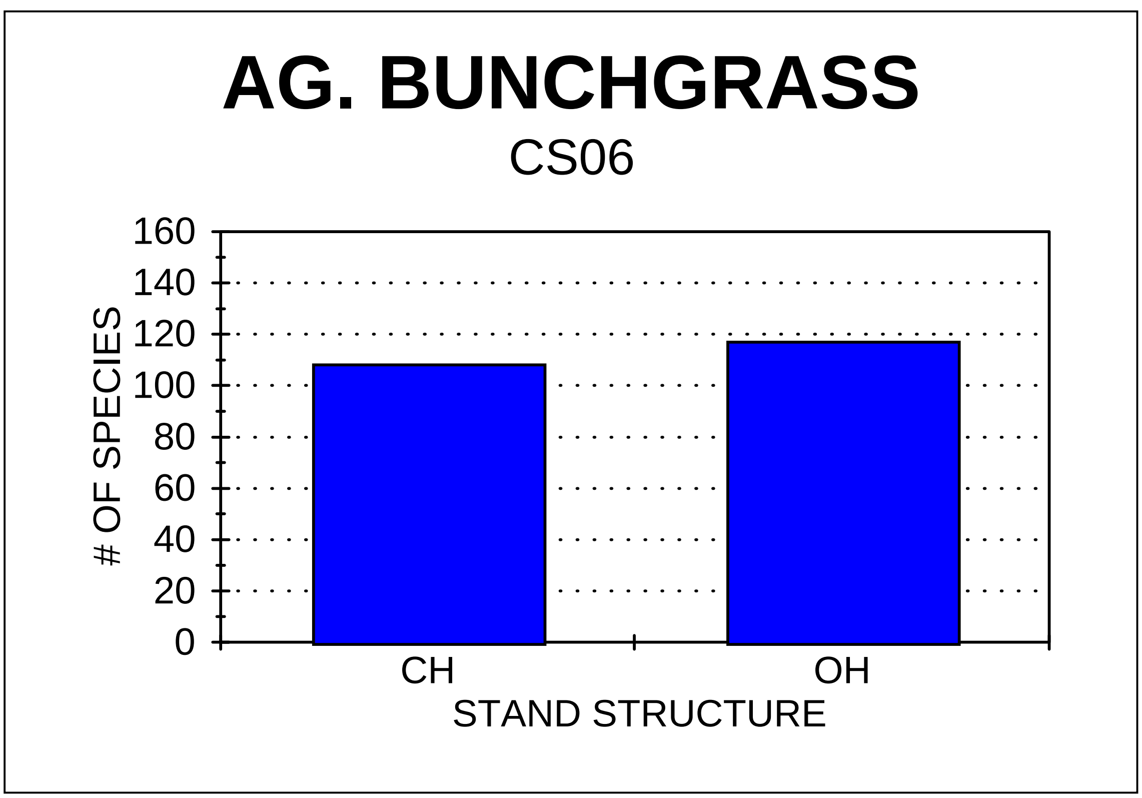
Graph #16



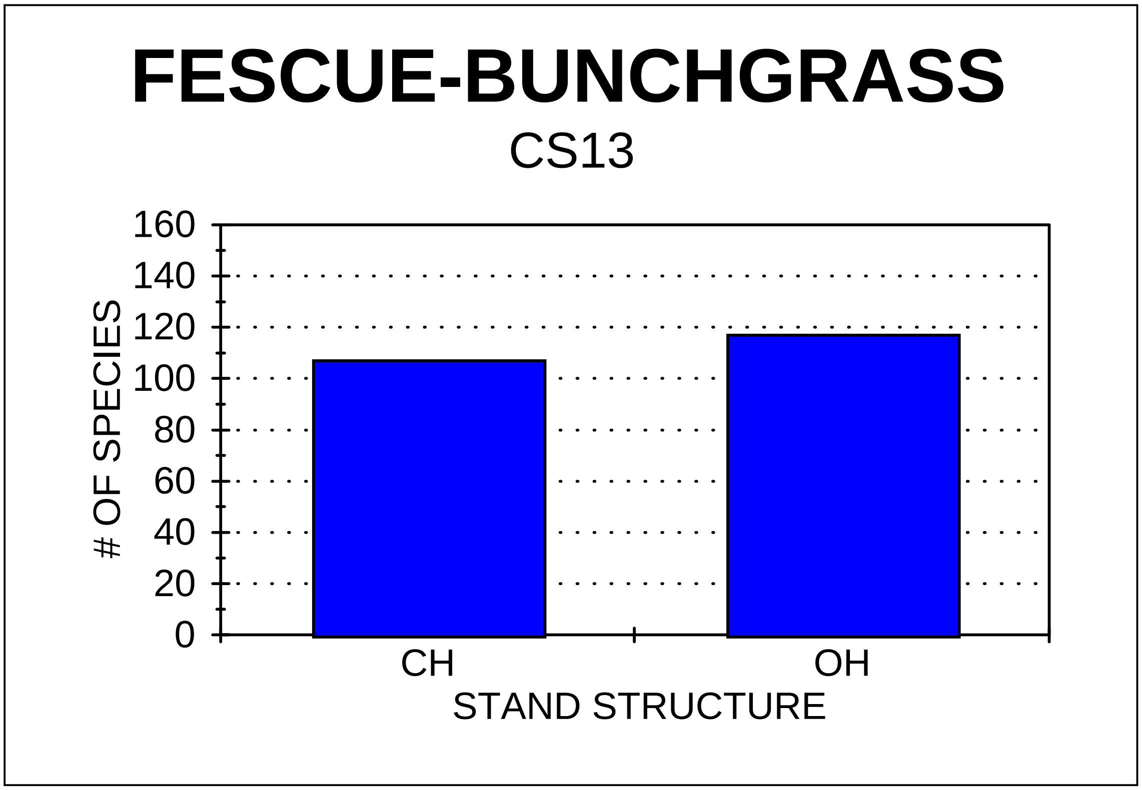
Graph #17



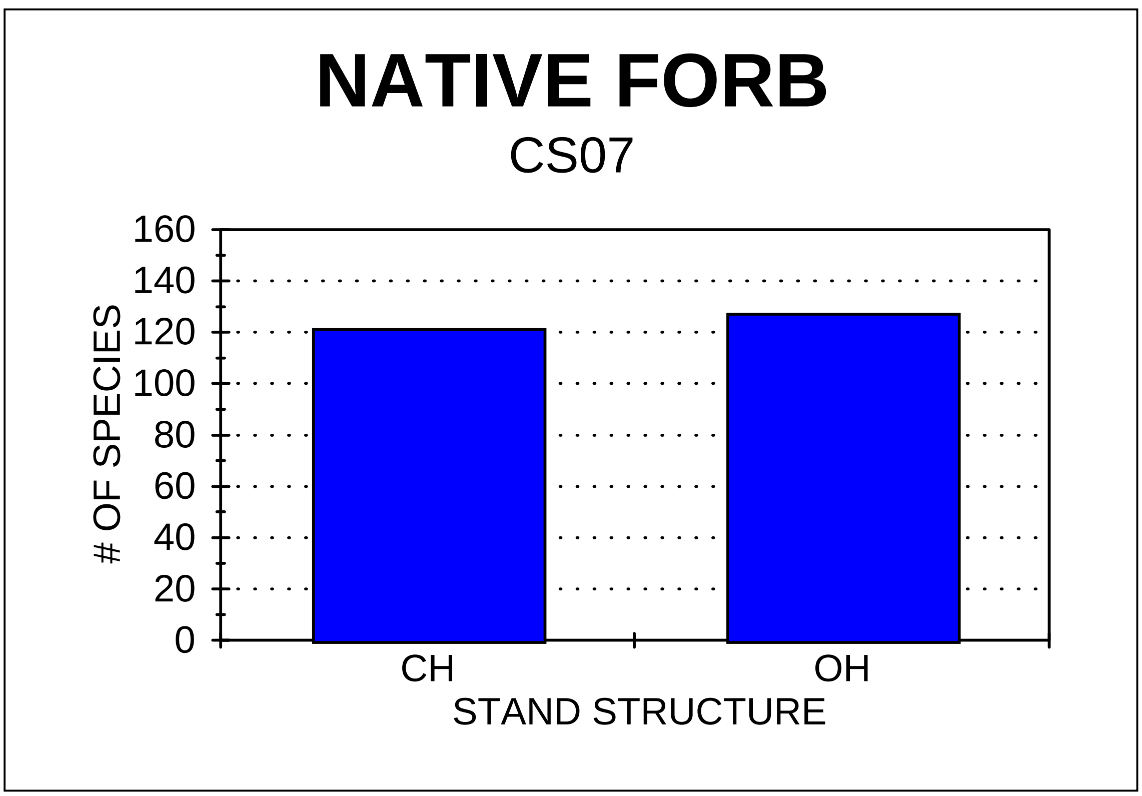
Graph #18



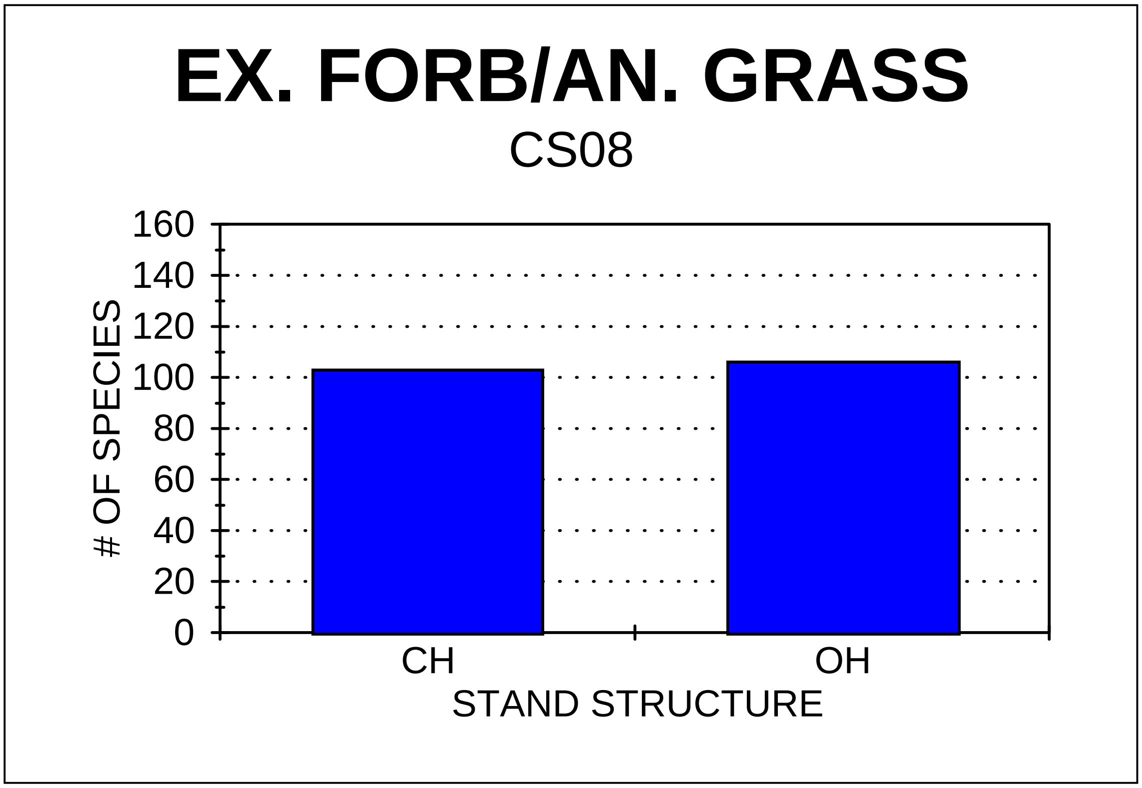
Graph #19



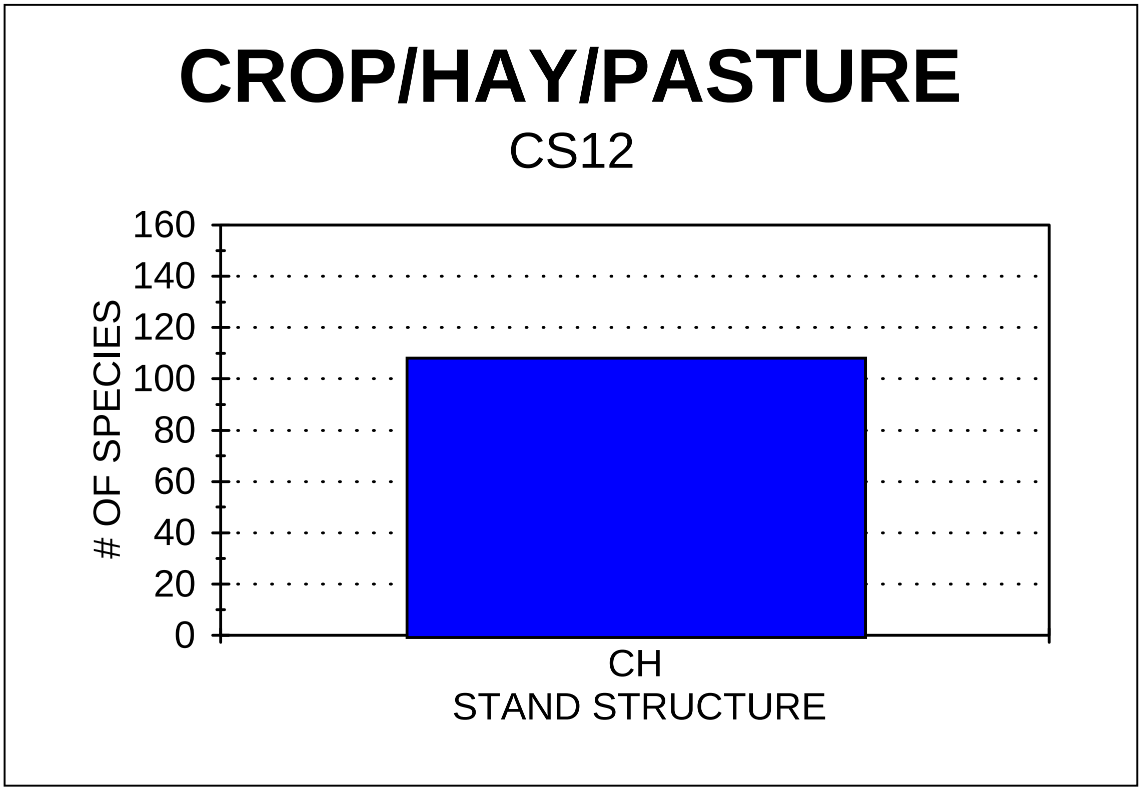
Graph #20



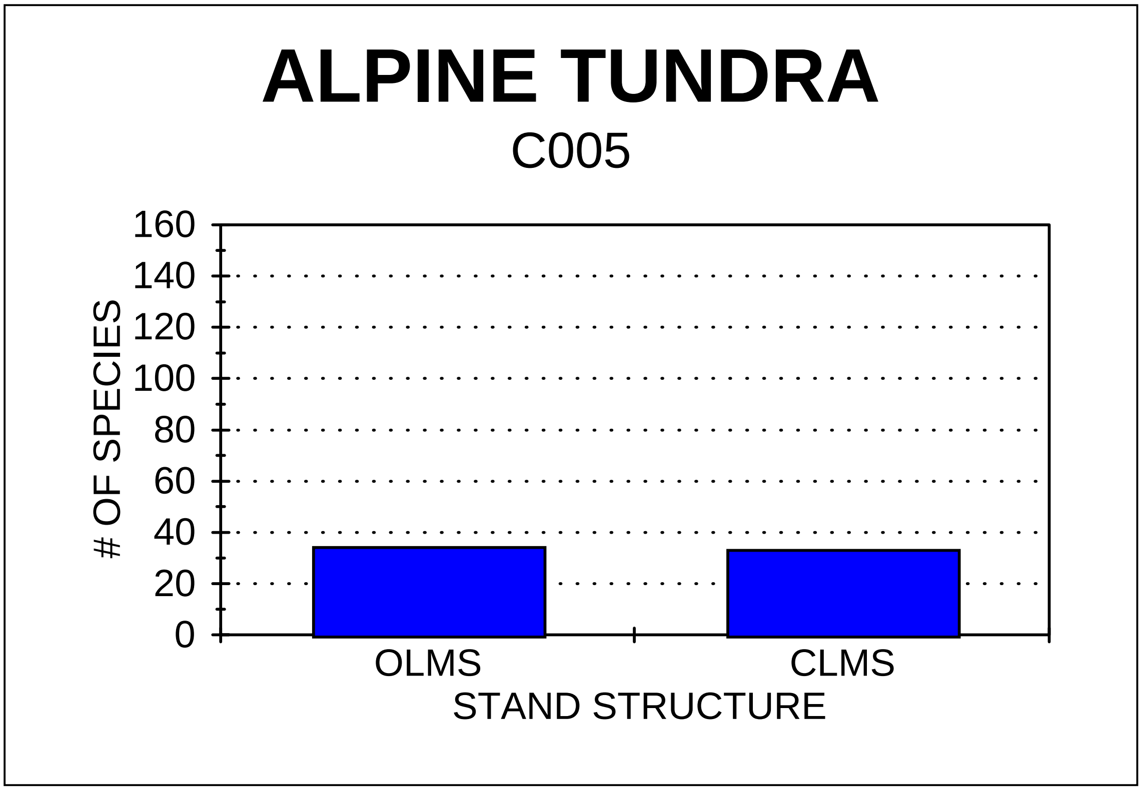
Graph #21



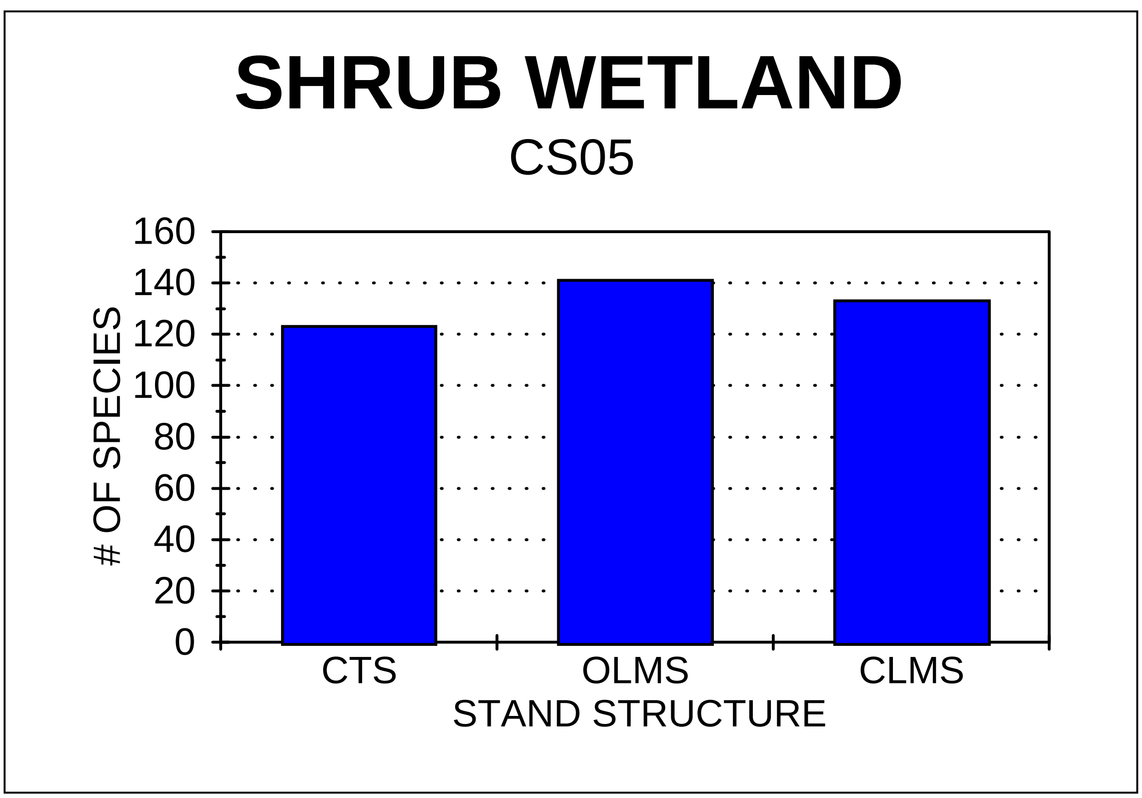
Graph #22



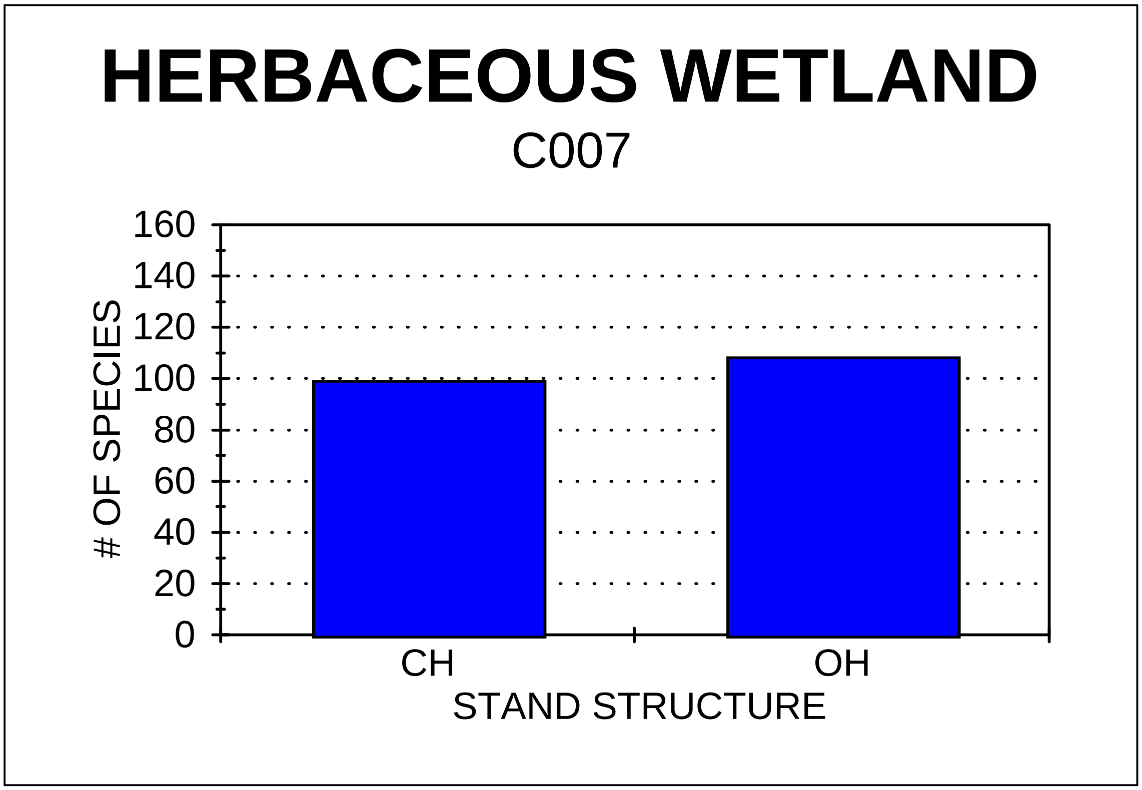
Graph #23



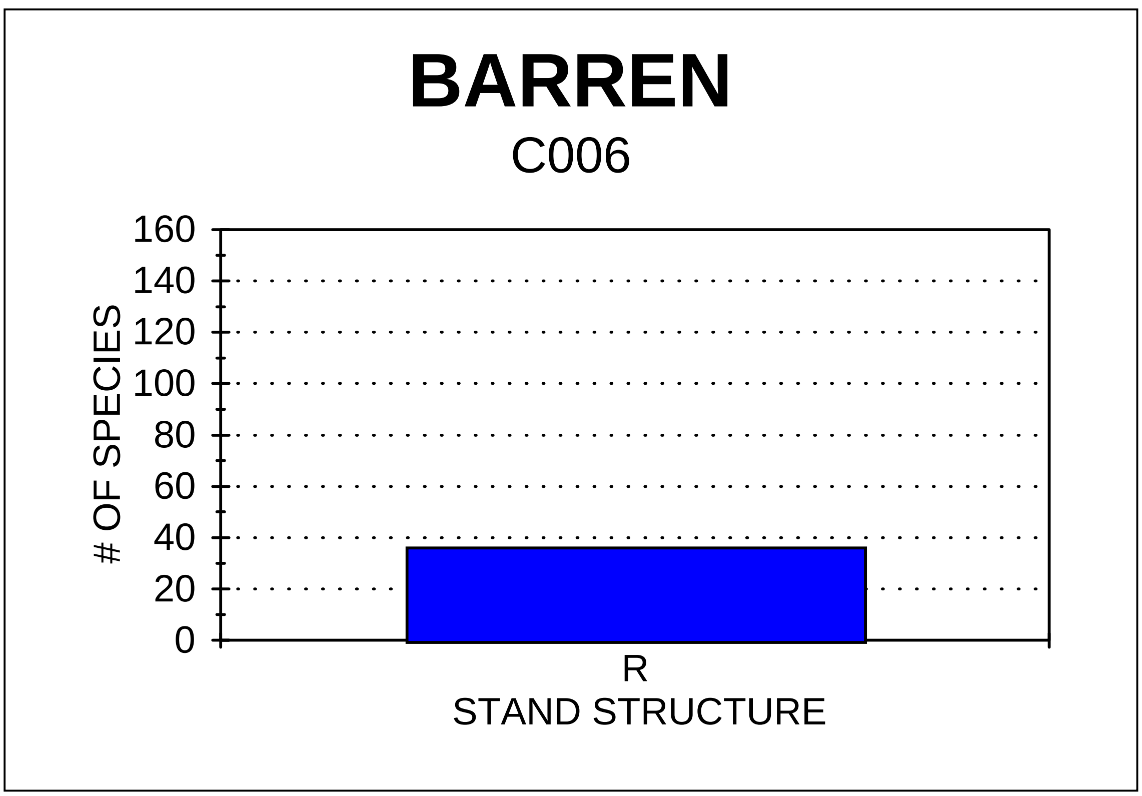
Graph #24



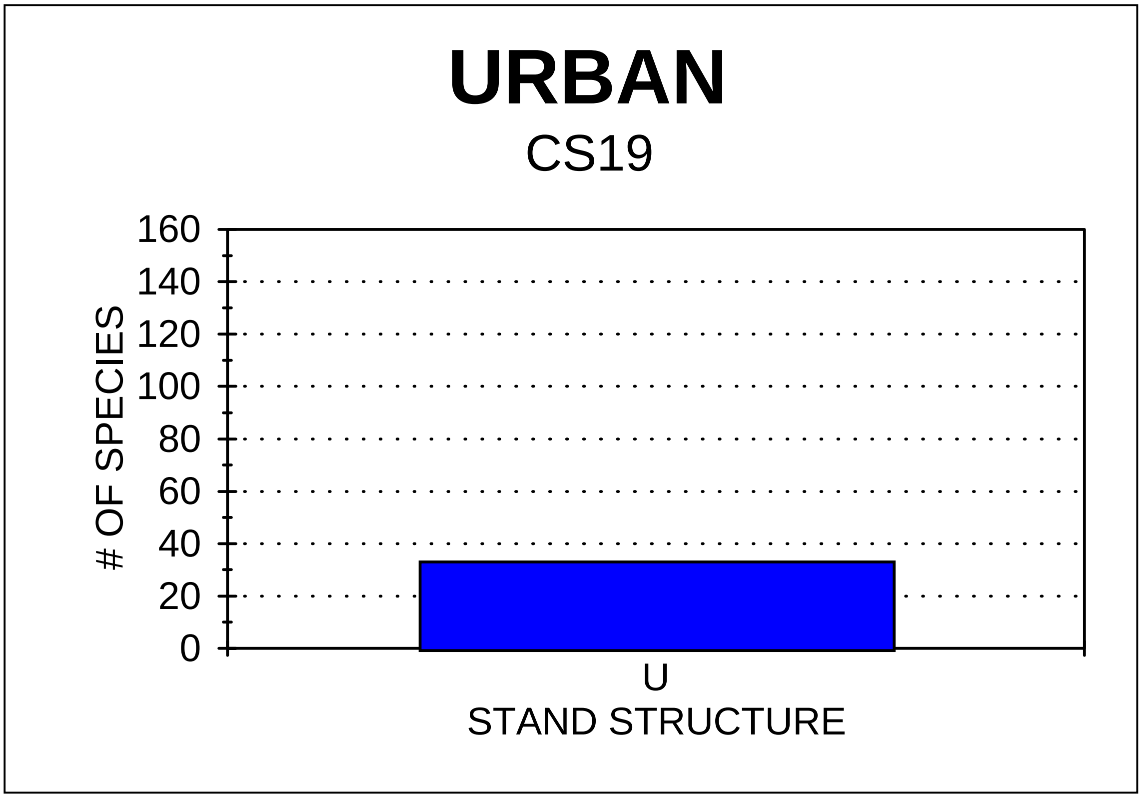
Graph #25



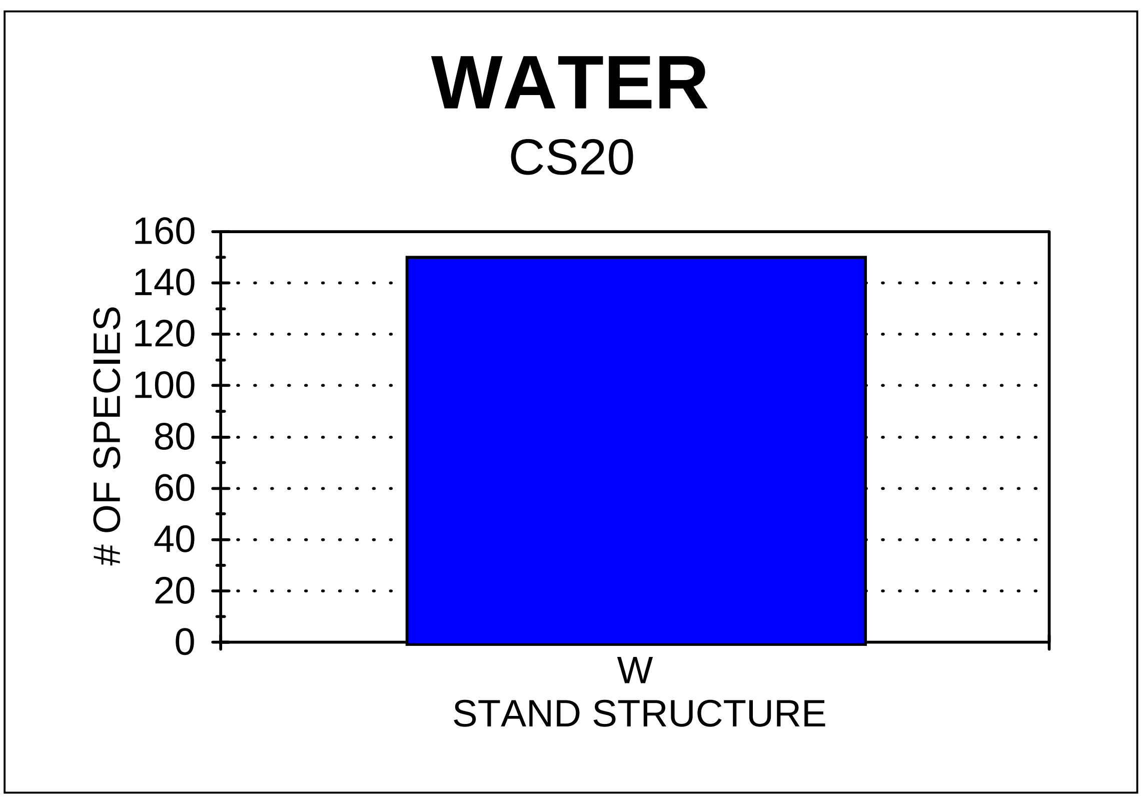
Graph #26



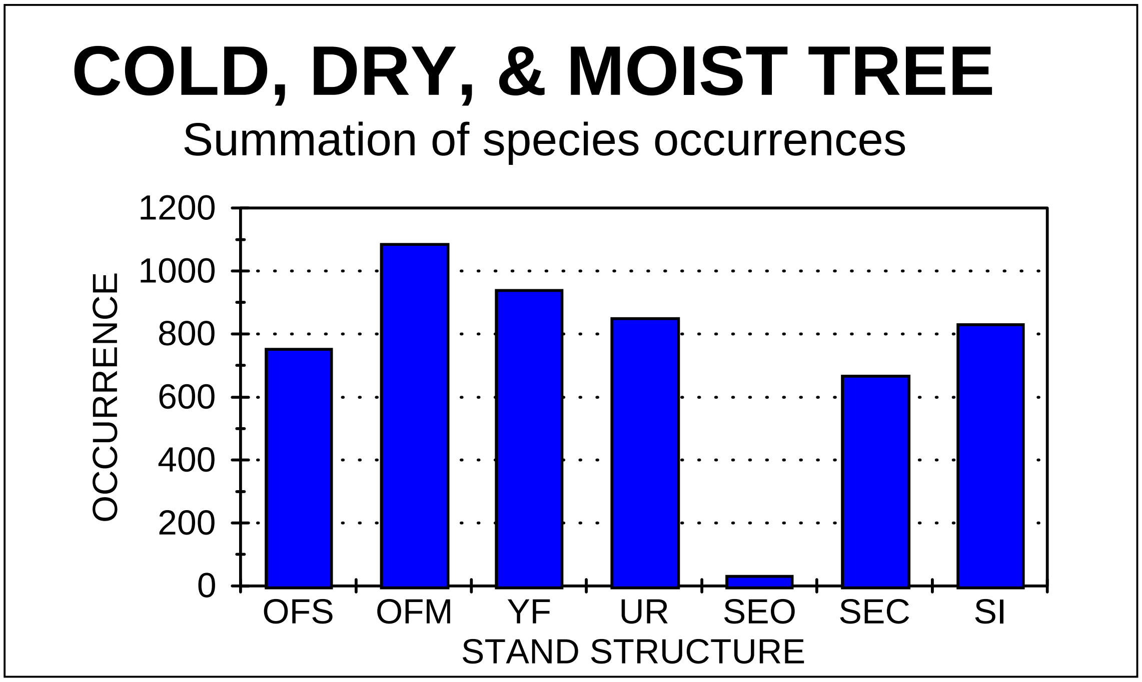
Graph #27



Graph #28

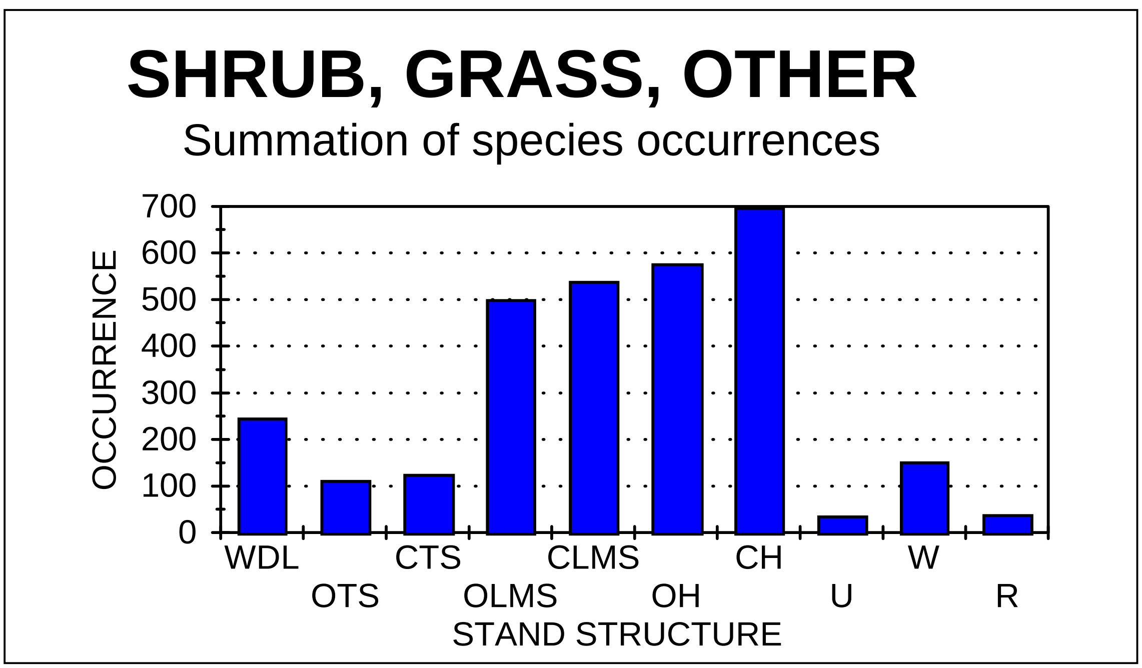


Graph #29



The bars in the graph represent how many animal species occurrences there are by stand structure in all of the cold, dry and moist forest tree cover types. The Y-axis is labeled occurrence because a species may be counted more than once as it may occur in several of the included cover types.

Graph #30



The bars in the graph represent how many animal species occurrences there are by stand structure in all of the shrub, grass and other cover types. The Y-axis is labeled occurrence because a species may be counted more than once as it may occur in several of the included cover types.

MATRIX

The format of this matrix is designed to provide the reader with a simple way to find out what animal species can, may or do exist in specific habitats in Wallowa County. The left column of the matrix is a full vertebrate animal species roster that repeats every eleven pages and the page headings are specific cover type and stand structure combinations that are found in Wallowa County. Characters or the lack of characters in the matrix boxes denote animal species existence or non-existence in a specific habitat (characters denote existence). All codes and abbreviations in the page headings are defined in the cover type and stand structure keys.

Matching an animal across a row with a cover type stand structure combination down a column denotes a species existence or non-existence in that habitat. If a character is found in that particular box of the matrix, then that animal lives in that habitat at some point in their life cycle. If the reader wants to know what animals can be found in a particular habitat then find that habitat in the matrix headings, follow that column down the matrix, and match characters with animal species in the left column.

Baseline data for the building of this matrix was provided by ICBEMP (Interior Columbia Basin Ecosystem Management Project). All data in the matrix provided by ICBEMP is denoted by an "X". Species of concern are highlighted in the matrix, were also provided by ICBEMP and are denoted by an "X". Extensive songbird information in Grand Fir stands was provided by Rex Sallabanks, a songbird biologist contracted by Boise Cascade. The fish species were verified by ODFW (Oregon Department of Fish and Wildlife). All data, cover types, stand structures and animal species have been verified by scientists working in Wallowa County.

A rating system for the data in this matrix has been developed to define levels of confidence in the contributor or the source. A "1" means that the lowest confidence has been assigned to that data, a "2" denotes moderate confidence, and a "3" defines a high degree of confidence. A "1" has been assigned to all ICBEMP data because it has not been intensively peer-reviewed for Wallowa County applications. All species of concern are given a "2" because these species are more intensively studied, and the data concerning these species has been intensively peer reviewed. Data that has a "3" rating has been contributed by a local scientist who can replicate field observations and has agreement among local peers.

The matrix has been reviewed by several government, academic and private entities. Government entities include the United States Forest Service, Oregon Department of Forestry, Oregon Department of Fish and Wildlife and the Nez Perce Tribe. Academic reviewers are Oregon State University and the University of Idaho. Private reviewers include Boise Cascade, RY Timber and several local people with extensive natural resource backgrounds.

	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Amphibian																					
Bullfrog																					
Columbia Spotted Frog	2x	2x	2x	2x		2x	2x		2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Long-toed Salamander	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Pacific Treefrog																					
Tailed Frog	2x	2x	2x	2x		2x	2x		2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Western Toad	2x	2x	2x	2x		2x	2x		2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Leopard Frog																					
Bird																					
American Avocet																					
American Bittern																					
American Coot																					
American Crow																					
American Dipper	1x	1x	1x						1x	1x					1x	1x	1x				
American Goldfinch				1x			1x				1x			1x							
American Kestrel							1x							1x							1x
American Redstart																					
American Robin	1x	1x	1x	1x		1x	1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
American Tree Sparrow																					
American White Pelican																					
American Widgeon																					
Ash-throated Flycatcher																					
Baird's Sandpiper																					
Bald Eagle															2x	2x					
Bank Swallow																					
Barn Owl																					
Barrows Goldeneye																					
Belted Kingfisher															1x	1x	1x	1x		1x	1x
Black Rosy Finch																					
Black Tern																					
Black Swift																					
Black-backed Woodpecker									2x												
Black-billed Magpie																					
Black-cappedChickadee							1x							1x	1x		1x	1x		1x	1x
Black-chinned Hummingbird																					

1=no local data
2=regional data or local knowledge
3=replicable data and local agreement
X=ICBEMP
O=ODFW
S=Sallabanks

Highlight=species of concern

	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Black-crowned Night-heron																					
Black-headed Grosbeak										1x	1x		1x				1x	1x		1x	
Black-throated Gray Warbler																					
Black-necked Stilt																					
Blue Grouse																					
Blue-winged Teal																					
Bobolink																					
Bohemian Waxwing																					
Bonaparte's Gull																					
Boreal Owl									2x		2x										
Brewer's Blackbird																					
Brewer's Sparrow																					
Broad-tailed hummingbird									2x		2x		2x	2x							
Brown Creeper									2x						2x	2x					
Brown-headed Cowbird																					
Bufflehead																					
Burrowing Owl																					
California Gull																					
Calliope Hummingbird	1x					1x	1x						1x	1x	1x					1x	1x
Canada Goose																					
Canvasback																					
Canyon Wren																					
Cassin's Finch	1x	1x	1x	1x					1x	1x	1x				1x	1x	1x	1x			
Cassin's Vireo																					
Cedar Waxwing																					1x
Chestnut-backed Chickadee									2x						2x	2x					
Chipping Sparrow	1x	1x	1x	1x		1x	1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Chukar																					
Cinnamon Teal																					
Clark's Nutcracker	1x	1x	1x	1x					1x	1x	1x				1x	1x	1x	1x			
Cliff Swallow																					
Columbian sharp-tailed Grouse																					
Common Goldeneye																					
Common Loon																					
Common Merganser																					
Common Nighthawk													1x	1x						1x	1x

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	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Common Poorwill																					
Common Raven	1x	1x							1x						1x	1x					
Common Redpoll																					
Common Snipe	2x	2x	2x	2x		2x	2x		2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Common Tern																					
Common Yellowthroat																					
Cooper's Hawk		1x	1x						1x	1x						1x	1x				
Dark-eyed Junco	1x	1x	1x	1x			1x		1x	1x	1x			1x	1x	1x	1x	1x			1x
Double-crested Cormorant																					
Downy Woodpecker																					
Dusky Flycatcher		1x	1x	1x			1x		1x	1x	1x			1x		1x	1x	1x			1x
Eared Grebe																					
Eastern Kingbird																					
European Starling																					
Evening Grosbeak	1x	1x	1x						1x	1x					1x	1x	1x				
Ferruginous Hawk																					
Flammulated Owl																					
Forster's Tern																					
Fox Sparrow														2x							2x
Franklin's Gull																					
Gadwall																					
Golden-crowned Kinglet	2x	2x							2x						2x	2x					
Golden-crowned Sparrow																					
Golden Eagle																					
Grasshopper Sparrow																					
Gray Catbird																					
Cray-crowned Rosy Finch																					
Gray Jay									1x	1x	1x		1x		1x	1x	1x				
Gray Partridge																					
Great Egret																					
Great Blue Heron																					
Great Gray Owl									2x		2x			2x							
Great Horned Owl	1x	1x							1x						1x	1x					
Greater Sandhill Crane																					
Greater Scaup																					
Greater Yellowlegs																					

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	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Green-winged Teal																					
Gyrfalcon																					
Hairy Woodpecker	1x	1x	1x	1x					1x	1x	1x				1x	1x	1x	1x			
Hammond's Flycatcher									2x												
Harlequin Duck									2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Harris' Sparrow																					
Hermit Thrush	1x	1x	1x	1x					1x	1x	1x				1x	1x	1x	1x			
Hooded Merganser																					
Horned Grebe																					
Horned Lark																					
House Finch																					
House Sparrow																					
House Wren	1x	1x	1x	1x		1x	1x		1x		1x		1x	1x	1x	1x	1x	1x		1x	1x
Killdeer																					
Lark Sparrow																					
Lazuli bunting														2x							
Least Sandpiper																					
Lesser Scaup																					
Lesser Yellowlegs																					
Lewis' Woodpecker																					
Lincoln's Sparrow										1x	1x		1x	1x			1x	1x		1x	1x
Loggerhead Shrike																					
Long-billed Curlew																					
Long-billed Dowitcher																					
Long-eared Owl																					
Macgillivray's Warbler									1x	1x	1x			1x	1x	1x	1x	1x			1x
Mallard																					
Marbled Godwit																					
Marsh Wren																					
Merlin																					
Mountain Bluebird							1x							1x							1x
Mountain Chickadee									1x	1x	1x		1x		1x	1x	1x	1x		1x	
Mountain Quail																					
Mourning Dove																					
Nashville Warbler																					
Northern Flicker															1x	1x	1x	1x		1x	1x

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	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Northern Goshawk		2x																			
Northern Harrier																					
Northern Oriole																					
Northern Pintail																					
Northern Pygmy Owl																1x					
Northern Rough-winged Swallow																					
Northern Saw-whet Owl																					
Northern Shoveler																					
Northern Shrike																					
Olive-sided Flycatcher									2x												
Orange-crowned Warbler															1x		1x			1x	
Osprey	1x	1x	1x	1x					1x	1x	1x				1x	1x	1x	1x			
Peregrine Falcon	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Pied-billed Grebe																					
Pileated Woodpecker									2x												
Pine Grosbeak	1x	1x	1x						1x	1x					1x	1x	1x				
Pine Siskin									2x	2x	2x				2x	2x	2x	2x			
Prairie Falcon																					
Purple Finch																					
Pygmy Nuthatch																					
Red Crossbill									1x	1x					1x	1x	1x				
Red-breasted Nuthatch	1x	1x	1x						1x	1x					1x	1x	1x				
Red-breasted Sapsucker																					
Red-eyed Vireo																					
Red-naped Sapsucker																					
Red-necked Grebe									2x	2x	2x		2x	2x							
Red-necked Phalarope																					
Red-tailed Hawk	1x	1x	1x	1x					1x	1x	1x			1x		1x	1x	1x			1x
Red-winged blackbird																					
Redhead																					
Ring-billed Gull																					
Ring-necked Duck													2x	2x							
Ring-necked Pheasant																					
Rock Dove																					
Rock Wren																					
Ross' Goose																					

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	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Rough-legged Hawk																					
Ruby-crowned Kinglet	1x	1x	1x						1x	1x	1x				1x	1x	1x	1x			
Ruddy Duck																					
Ruffed Grouse									1x	1x	1x		1x			1x	1x	1x		1x	
Rufous Hummingbird									2x		2x			2x	2x	2x		2x			2x
Sage Sparrow																					
Sage Thrasher																					
Savannah Sparrow																					
Say's Phoebe																					
Semipalmated Plover																					
Sharp-shinned Hawk			1x	1x		1x				1x	1x		1x				1x	1x		1x	
Short-eared Owl																					
Snow Bunting																					
Snow Goose																					
Snowy Owl																					
Solitary Sandpiper																					
Sora									2x	2x	2x		2x	2x							
Spotted Sandpiper	2x	2x	2x	2x		2x	2x		2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Spotted Towhee																					
Spruce Grouse									1x	1x	1x										
Steller's Jay	1x	1x	1x	1x					1x	1x	1x				1x	1x	1x	1x			
Swainson's Hawk																					
Swainson's Thrush									1x	1x	1x				1x	1x	1x	1x			
Three-toed Woodpecker	2x	2x							2x						2x	2x					
Townsend's Solitaire	1x	1x	1x				1x		1x	1x				1x	1x	1x	1x				1x
Townsend's Warbler																					
Tree Swallow							1x							1x							1x
Trumpeter Swan																					
Tundra Swan																					
Turkey Vulture	1x	1x	1x	1x		1x	1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Upland Sandpiper									2x												
Varied Thrush															2x	2x					
Vaux's Swift																					
Veery																					
Vesper Sparrow																					
Violet-green Swallow	1x	1x	1x	1x		1x			1x	1x	1x		1x		1x	1x	1x	1x		1x	

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S=Sallabanks

Highlight=species of concern

	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Virginia Rail																					
Warbling Vireo																					
Western Bluebird																					
Western Grebe																					
Western Kingbird																					
Western Meadowlark																					
Western Screech Owl																					
Western Tanager	1x	1x							1x						1x	1x					
Western Wood-Pewee	1x	1x	1x	1x					1x	1x					1x	1x	1x	1x			
White-breasted Nuthatch																					
White-crowned Sparrow																		1x			1x
White-faced Ibis																					
White-headed Woodpecker																					
White-throated Sparrow																					
White-throated Swift																					
White-winged Crossbill									2x		2x										
Wild Turkey																					
Willet																					
Williamson's Sapsucker																					
Willow Flycatcher																					
Wilson's Phalarope																					
Wilson's Warbler																					
Winter Wren																2x					
Wood Duck																					
Yellow Warbler																					
Yellow-bellied Sapsucker																					
Yellow-billed Cuckoo																					
Yellow-breasted Chat																					
Yellow-headed Blackbird																					
Yellow-rumped Warbler	2x	2x	2x	2x					2x	2x	2x		2x		2x	2x	2x	2x		2x	
Mammal																					
American Badger																					
American Beaver				1x			1x				1x			1x				1x		1x	1x
American Marten	2x	2x	2x						2x	2x					2x	2x	2x				
American Pika																					

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	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Belding's Ground Squirrel																					
Big Brown Bat	1x	1x	1x	1x			1x								1x	1x	1x	1x		1x	1x
Black Bear	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Bobcat	1x	1x	1x	1x			1x		1x	1x	1x			1x	1x	1x	1x	1x		1x	1x
California Myotis															1x	1x	1x	1x		1x	1x
Columbian Ground Squirrel														1x							1x
Common Muskrat																					
Common Porcupine		1x	1x	1x			1x		1x	1x	1x		1x	1x							
Common Raccoon																					
Coyote	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Deer Mouse	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Dusky Shrew																					
Eastern Fox Squirrel																					
Ermine	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Fisher																					
Fringed Myotis																					
Gapper Red-backed Vole																					
Great Basin Pocket Mouse																					
Golden-mantled Ground Squirrel	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Heather Vole	1x	1x					1x		1x					1x	1x	1x					
Hoary Bat	2x	2x							2x					2x	2x	2x					
House Cat(feral)																					
House Mouse																					
Little Brown Myotis									1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Long-eared Myotis			2x	2x			2x				2x		2x	2x				2x		2x	2x
Long-legged Myotis											2x		2x		2x	2x	2x	2x		2x	
Long-tailed Myotis																					
Long-tailed Vole	1x	1x	1x				1x		1x	1x				1x	1x	1x	1x				1x
Long-tailed Weasel	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Lynx									1x	1x	1x		1x	1x						1x	
Merriam's Shrew																					
Mink	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Mountain vole	1x														1x						
Moose									1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Mountain Cottontail																					
Mountain Goat	2x	2x	2x	2x		2x	2x		2x	2x	2x			2x							

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	COLD FOREST																					
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK							
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Mountain Lion	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Mule Deer	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Northern Flying Squirrel	2x	2x	2x	2x					2x	2x	2x				2x	2x	2x	2x			
Northern Pocket Gopher	1x	1x							1x						1x	1x					
Northern River Otter	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Pale Western Big-eared Bat																					
Pallid Bat																					
Preble's Shrew																					
Red Fox(native)	1x						1x							1x							
Red Squirrel	1x	1x	1x						1x	1x					1x	1x	1x				
Rocky Mountain(Bighorn)Sheep	2x						2x														
Sagebrush Vole																					
Silver-haired Bat	2x																				
Snowshoe Hare				1x			1x				1x		1x	1x				1x		1x	1x
Spotted Bat																					
Striped Skunk																					
Townsend's Big-eared Bat																					
Townsend's Ground Squirrel																					
Vagrant Shrew															1x	1x	1x	1x		1x	1x
Wapiti(elk)	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Water Shrew									2x	2x	2x		2x		2x	2x	2x	2x		2x	
Water Vole									2x						2x	2x					
Western Harvest Mouse																					
Western Jumping Mouse													1x	1x							
Western Pipistrelle																					
Western Small-footed Myotis																					
Western Spotted Skunk																					
White-tailed Deer									1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
White-tailed Jackrabbit																					
Wolf		1x				1x	1x		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Wolverine	2x	2x	2x	2x		2x	2x		2x	2x	2x			2x	2x	2x	2x	2x			2x
Yellow-bellied Marmot																					
Yellow-pine Chipmunk	1x	1x	1x	1x			1x		1x	1x	1x			1x	1x	1x	1x	1x			1x
Yuma Myotis										2x					2x	2x	2x	2x			
Reptiles																					

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	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Common Garter Snake															2x	2x	2x	2x		2x	2x
Gopher Snake																					
Painted Turtle																					
Racer																					
Rubber Boa																					
Western Fence Lizard																					
Western Rattlesnake																					
Western Skink																					
Western Terrestrial Garter Snake	1x			1x			1x				1x			1x	1x			1x			1x
Fish																					
Black Bullhead																					
Black Crappie																					
Bluegill																					
Bridgelip Sucker																					
Brook Trout																					
Brown Bullhead																					
Bulltrout																					
Channel Catfish																					
Chinook Salmon																					
Chiselmouth																					
Common Carp																					
Cutthroat Trout																					
Flathead Catfish																					
Golden Trout																					
Goldfish																					
Largemouth Bass																					
Lake Trout																					
Largescale Sucker																					
Longnose Dace																					
Mountain Sucker																					
Mountain Whitefish																					
Northern Squawfish																					
Pacific Lamprey																					
Paiute Sculpin																					
Peamouth																					

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	COLD FOREST																				
	WHITEBARK PINE							ENGELMANN SPRUCE/SUBALPINE FIR							MT. HEMLOCK						
COVER TYPES	S208	S208	S208	S208	S208	S208	S208	S206	S206	S206	S206	S206	S206	S206	S205	S205	S205	S205	S205	S205	S205
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Pumpkinseed																					
Redband Trout																					
Rainbow Trout																					
Redside Shiner																					
American Shad																					
Shorthead Sculpin																					
Smallmouth Bass																					
Sockeye(incl. Kokanee)Salmon																					
Speckled Dace																					
Steelhead Trout																					
Tadpole Madtom																					
Torrent Sculpin																					
White Crappie																					
White Sturgeon																					
Yellow Bullhead																					
Yellow Perch																					

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	DRY FOREST																					
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Amphibian																					
Bullfrog	1x	1x	1x	1x		1x	1x	1x	1x	1x			1x	1x							
Columbia Spotted Frog	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Long-toed Salamander	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Pacific Treefrog																					
Tailed Frog	2x	2x	2x	2x		2x	2x		2x	2x	2x		2x	2x	2x		2x	2x		2x	2x
Western Toad	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Leopard Frog																					
Bird																					
American Avocet																					
American Bittern																					
American Coot																					
American Crow																					
American Dipper	1x	1x	1x					1x	1x	1x					1x	1x	1x				
American Goldfinch				1x			1x														
American Kestrel							1x							1x							1x
American Redstart	2x	2x						2x													
American Robin	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
American Tree Sparrow																					
American White Pelican																					
American Widgeon																					
Ash-throated Flycatcher																					
Baird's Sandpiper																					
Bald Eagle	2x	2x						2x	2x												
Bank Swallow																					
Barn Owl																					
Barrows Goldeneye	2x	2x	2x	2x		2x		2x							2x	2x	2x	2x		2x	2x
Belted Kingfisher	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Black Rosy Finch																					
Black Tern	2x	2x	2x	2x		2x	2x	2x		2x	2x				2x	2x	2x	2x		2x	2x
Black Swift																					
Black-backed Woodpecker	2x	2x						2x	2x						2x	2x	2x				
Black-billed Magpie																					
Black-cappedChickadee	1x		1x	1x		1x	1x	1x		1x			1x	1x							
Black-chinned Hummingbird	2x	2x	2x	2x			2x	2x													

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	DRY FOREST																					
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Black-crowned Night-heron																					
Black-headed Grosbeak			1x	1x		1x		1x		1x			1x								
Black-throated Gray Warbler																					
Black-necked Stilt																					
Blue Grouse	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x							
Blue-winged Teal																					
Bobolink																					
Bohemian Waxwing																					
Bonaparte's Gull																					
Boreal Owl	2x	2x		2x				2x	2x		2x				2x	2x		2x			
Brewer's Blackbird																					
Brewer's Sparrow																					
Broad-tailed hummingbird	2x	2x		2x				2x	2x												
Brown Creeper	2x	2x						2x	2x												
Brown-headed Cowbird																					
Bufflehead	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Burrowing Owl																					
California Gull																					
Calliope Hummingbird	1x					1x	1x	1x					1x	1x	1x					1x	1x
Canada Goose																					
Canvasback																					
Canyon Wren																					
Cassin's Finch	1x	1x	1x	1x				1x	1x	1x	1x				1x	1x	1x	1x			
Cassin's Vireo	1x	1x	1x	1x		1x		1x	1x	1x	1x		1x								
Cedar Waxwing							1x							1x							
Chestnut-backed Chickadee	2x	2x						2x	2x												
Chipping Sparrow	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x		1x		1x	1x
Chukar																					
Cinnamon Teal																					
Clark's Nutcracker	1x	1x	1x	1x				1x	1x	1x											
Cliff Swallow																					
Columbian sharp-tailed Grouse																					
Common Goldeneye	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Common Loon	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Common Merganser	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Common Nighthawk						1x	1x						1x	1x							

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	DRY FOREST																				
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Common Poorwill																					
Common Raven	1x	1x						1x	1x												
Common Redpoll																					
Common Snipe	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Common Tern																					
Common Yellowthroat																					
Cooper's Hawk		1x	1x						1x	1x						1x	1x				
Dark-eyed Junco	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x
Double-crested Cormorant																					
Downy Woodpecker																					
Dusky Flycatcher		1x	1x	1x			1x		1x	1x	1x			1x		1x	1x	1x			1x
Eared Grebe																					
Eastern Kingbird			1x	1x		1x	1x														
European Starling																					
Evening Grosbeak	1x	1x	1x					1x	1x	1x					1x	1x	1x				
Ferruginous Hawk																					
Flammulated Owl	2x	2x	2x	2x				2x	2x		2x										
Forster's Tern															2x	2x	2x	2x		2x	2x
Fox Sparrow																					
Franklin's Gull																					
Gadwall																					
Golden-crowned Kinglet	2x	2x						2x	2x						2x	2x					
Golden-crowned Sparrow																					
Golden Eagle																					
Grasshopper Sparrow																					
Gray Catbird																					
Cray-crowned Rosy Finch																					
Gray Jay	1x	1x	1x	1x				1x	1x	1x	1x				1x	1x	1x	1x			
Gray Partridge																					
Great Egret																					
Great Blue Heron	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Great Gray Owl	2x	2x		2x			2x	2x	2x		2x			2x	2x	2x		2x			2x
Great Horned Owl	1x	1x						1x	1x												
Greater Sandhill Crane	2x	2x	2x				2x								2x	2x	2x			2x	2x
Greater Scaup																					
Greater Yellowlegs																					

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	DRY FOREST																					
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE							
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Green-winged Teal																					
Gyrfalcon																					
Hairy Woodpecker	1x	1x	1x	1x				1x	1x	1x	1x										
Hammond's Flycatcher	2x	2x						2x	2x						2x	2x					
Harlequin Duck	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Harris' Sparrow																					
Hermit Thrush	1x	1x	1x	1x				1x	1x	1x	1x										
Hooded Merganser	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Horned Grebe																					
Horned Lark																					
House Finch																					
House Sparrow																					
House Wren	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Killdeer																					
Lark Sparrow																					
Lazuli bunting							2x							2x							2x
Least Sandpiper																					
Lesser Scaup	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Lesser Yellowlegs																					
Lewis' Woodpecker		2x							2x												
Lincoln's Sparrow			1x	1x		1x	1x			1x	1x		1x	1x							
Loggerhead Shrike																					
Long-billed Curlew																					
Long-billed Dowitcher																					
Long-eared Owl	2x	2x		2x			2x	2x	2x		2x			2x							
Macgillivray's Warbler	1x	1x	1x	1x			1x								1x	1x	1x	1x			1x
Mallard	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Marbled Godwit																					
Marsh Wren																					
Merlin																					
Mountain Bluebird							1x							1x							1x
Mountain Chickadee	1x	1x	1x	1x		1x		1x	1x	1x	1x		1x		1x	1x	1x	1x		1x	
Mountain Quail		2x	2x	2x			2x														
Mourning Dove																					
Nashville Warbler			1x	1x		1x															
Northern Flicker	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x							

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Highlight=species of concern

	DRY FOREST																				
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Northern Goshawk	2x	2x		2x				2x	2x		2x				2x	2x		2x			
Northern Harrier																					
Northern Oriole																					
Northern Pintail																					
Northern Pygmy Owl		1x																			
Northern Rough-winged Swallow																					
Northern Saw-whet Owl	1x	1x																			
Northern Shoveler																					
Northern Shrike																					
Olive-sided Flycatcher	2x	2x																			
Orange-crowned Warbler	1x		1x			1x									1x		1x			1x	
Osprey	1x	1x	1x	1x				1x	1x	1x	1x				1x	1x	1x	1x			
Peregrine Falcon	1x	1x	1x	1x		1x	1x								1x	1x	1x	1x		1x	1x
Pied-billed Grebe																					
Pileated Woodpecker	2x	2x						2x	2x												
Pine Grosbeak	1x	1x	1x					1x	1x	1x					1x	1x	1x				
Pine Siskin	2x	2x	2x	2x				2x	2x	2x	2x				2x	2x	2x	2x			
Prairie Falcon	1x	1x																			
Purple Finch																					
Pygmy Nuthatch																					
Red Crossbill	1x	1x	1x					1x	1x	1x											
Red-breasted Nuthatch	1x	1x	1x					1x	1x	1x											
Red-breasted Sapsucker		1x	1x																		
Red-eyed Vireo																					
Red-naped Sapsucker	1x	1x						1x	1x												
Red-necked Grebe	2x	2x	2x	2x		2x		2x	2x	2x	2x		2x		2x	2x	2x	2x		2x	
Red-necked Phalarope																					
Red-tailed Hawk	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x
Red-winged blackbird																					
Redhead																					
Ring-billed Gull																					
Ring-necked Duck	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Ring-necked Pheasant																					
Rock Dove																					
Rock Wren																					
Ross' Goose																					

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	DRY FOREST																				
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Rough-legged Hawk																					
Ruby-crowned Kinglet	1x	1x	1x	1x				1x	1x	1x	1x				1x						
Ruddy Duck																					
Ruffed Grouse		1x	1x	1x		1x			1x	1x	1x		1x			1x	1x	1x		1x	
Rufous Hummingbird	2x	2x		2x			2x		2x		2x			2x							
Sage Sparrow																					
Sage Thrasher																					
Savannah Sparrow																					
Say's Phoebe																					
Semipalmated Plover																					
Sharp-shinned Hawk			1x	1x		1x				1x	1x		1x				1x	1x		1x	
Short-eared Owl																					
Snow Bunting																					
Snow Goose																					
Snowy Owl																					
Solitary Sandpiper																					
Sora	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Spotted Sandpiper	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Spotted Towhee																					
Spruce Grouse	1x	1x		1x				1x	1x		1x				1x	1x	1x	1x			
Steller's Jay	1x	1x	1x	1x				1x	1x	1x	1x										
Swainson's Hawk																					
Swainson's Thrush	1x	1x	1x	1x				1x	1x	1x	1x										
Three-toed Woodpecker															2x	2x					
Townsend's Solitaire	1x	1x	1x				1x		1x	1x				1x	1x	1x	1x				1x
Townsend's Warbler																					
Tree Swallow							1x	1x						1x							1x
Trumpeter Swan	2x	2x	2x			2x	2x								2x	2x	2x	2x		2x	2x
Tundra Swan																					
Turkey Vulture	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Upland Sandpiper																					
Varied Thrush	2x	2x						2x	2x												
Vaux's Swift	2x	2x						2x	2x												
Veery																					
Vesper Sparrow																					
Violet-green Swallow	1x	1x	1x	1x		1x		1x	1x	1x	1x		1x		1x	1x	1x	1x		1x	

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	DRY FOREST																				
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Virginia Rail																					
Warbling Vireo																					
Western Bluebird							2x							2x							
Western Grebe																					
Western Kingbird																					
Western Meadowlark																					
Western Screech Owl																					
Western Tanager	1x	1x						1x	1x						1x	1x					
Western Wood-Pewee	1x	1x	1x	1x				1x	1x	1x	1x				1x	1x	1x	1x			
White-breasted Nuthatch																					
White-crowned Sparrow				1x			1x											1x			1x
White-faced Ibis																					
White-headed Woodpecker																					
White-throated Sparrow																					
White-throated Swift																					
White-winged Crossbill								2x	2x		2x				2x	2x		2x			
Wild Turkey	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x							
Willet																					
Williamson's Sapsucker	2x	2x						2x	2x												
Willow Flycatcher																					
Wilson's Phalarope																					
Wilson's Warbler																					
Winter Wren		2x							2x												
Wood Duck	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Yellow Warbler																					
Yellow-bellied Sapsucker																					
Yellow-billed Cuckoo																					
Yellow-breasted Chat																					
Yellow-headed Blackbird																					
Yellow-rumped Warbler	2x	2x	2x	2x		2x		2x	2x	2x	2x		2x		2x	2x	2x	2x		2x	
Mammal																					
American Badger																					
American Beaver				1x			1x				1x		1x	1x	1x	1x		1x		1x	1x
American Marten	2x	2x	2x					2x	2x	2x					2x	2x	2x				
American Pika																					

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	DRY FOREST																					
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Belding's Ground Squirrel																					
Big Brown Bat	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Black Bear	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Bobcat	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
California Myotis	1x	1x	1x	1x		1x	1x														
Columbian Ground Squirrel							1x														1x
Common Muskrat	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Common Porcupine	1x		1x	1x		1x	1x	1x		1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Common Raccoon	1x	1x	1x	1x		1x	1x								1x	1x	1x	1x		1x	1x
Coyote	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Deer Mouse	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Dusky Shrew																					
Eastern Fox Squirrel																					
Ermine	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Fisher	2x	2x	2x					2x	2x	2x					2x		2x				
Fringed Myotis	2x	2x		2x																	
Gapper Red-backed Vole																					
Great Basin Pocket Mouse																					
Golden-mantled Ground Squirrel	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Heather Vole																					
Hoary Bat	2x	2x					2x	2x	2x						2x	2x					2x
House Cat(feral)																					
House Mouse																					
Little Brown Myotis	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x							
Long-eared Myotis	2x	2x	2x	2x		2x	2x	2x	2x		2x		2x	2x	2x	2x	2x	2x		2x	2x
Long-legged Myotis	2x	2x	2x	2x		2x		2x	2x		2x		2x							2x	
Long-tailed Myotis																					
Long-tailed Vole	1x	1x	1x				1x	1x	1x	1x				1x	1x	1x	1x				
Long-tailed Weasel	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Lynx		1x	1x	1x		1x	1x		1x	1x	1x			1x		1x	1x	1x			1x
Merriam's Shrew																					
Mink	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Mountain vole	1x							1x													
Moose	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x						1x
Mountain Cottontail																					
Mountain Goat	2x	2x	2x	2x			2x								2x	2x	2x	2x			2x

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	DRY FOREST																				
	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Mountain Lion	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Mule Deer	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Northern Flying Squirrel	2x	2x	2x	2x				2x	2x	2x	2x				2x	2x	2x	2x			
Northern Pocket Gopher	1x	1x						1x	1x						1x	1x					
Northern River Otter	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x							
Pale Western Big-eared Bat	2x	2x	2x																		
Pallid Bat																					
Preble's Shrew																					
Red Fox(native)	1x						1x	1x						1x	1x						1x
Red Squirrel	1x	1x	1x					1x	1x	1x					1x	1x	1x				
Rocky Mountain(Bighorn)Sheep							2x							2x							2x
Sagebrush Vole																					
Silver-haired Bat	2x	2x						2x	2x						2x	2x					
Snowshoe Hare				1x		1x	1x											1x		1x	1x
Spotted Bat	2x	2x	2x																		
Striped Skunk																					
Townsend's Big-eared Bat																					
Townsend's Ground Squirrel																					
Vagrant Shrew	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x							
Wapiti(elk)	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
Water Shrew	2x	2x	2x	2x		2x		2x	2x	2x	2x		2x		2x	2x	2x	2x		2x	
Water Vole	2x	2x																			
Western Harvest Mouse																					
Western Jumping Mouse	1x					1x	1x	1x					1x	1x							
Western Pipistrelle																					
Western Small-footed Myotis	2x	2x	2x	2x											2x	2x	2x	2x		2x	2x
Western Spotted Skunk	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
White-tailed Deer	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x
White-tailed Jackrabbit																					
Wolf	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x
Wolverine	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x	2x	2x	2x	2x		2x	2x
Yellow-bellied Marmot																					
Yellow-pine Chipmunk	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x
Yuma Myotis	2x	2x	2x	2x						2x					2x	2x	2x				
Reptiles																					

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	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Common Garter Snake	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x
Gopher Snake	1x			1x			1x														
Painted Turtle																					
Racer	1x	1x	1x	1x		1x	1x														
Rubber Boa	2x			2x		2x	2x														
Western Fence Lizard	1x			1x			1x														
Western Rattlesnake				1x			1x														
Western Skink																					
Western Terrestrial Garter Snake	1x			1x			1x	1x			1x			1x	1x			1x			1x
Fish																					
Black Bullhead																					
Black Crappie																					
Bluegill																					
Bridgelip Sucker																					
Brook Trout																					
Brown Bullhead																					
Bulltrout																					
Channel Catfish																					
Chinook Salmon																					
Chiselmouth																					
Common Carp																					
Cutthroat Trout																					
Flathead Catfish																					
Golden Trout																					
Goldfish																					
Largemouth Bass																					
Lake Trout																					
Largescale Sucker																					
Longnose Dace																					
Mountain Sucker																					
Mountain Whitefish																					
Northern Squawfish																					
Pacific Lamprey																					
Paiute Sculpin																					
Peamouth																					

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	INTERIOR DOUGLAS FIR							WESTERN LARCH							LODGEPOLE PINE						
COVER TYPES	S210	S210	S210	S210	S210	S210	S210	S212	S212	S212	S212	S212	S212	S212	S218	S218	S218	S218	S218	S218	S218
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Pumpkinseed																					
Redband Trout																					
Rainbow Trout																					
Redside Shiner																					
American Shad																					
Shorthead Sculpin																					
Smallmouth Bass																					
Sockeye(incl. Kokanee)Salmon																					
Speckled Dace																					
Steelhead Trout																					
Tadpole Madtom																					
Torrent Sculpin																					
White Crappie																					
White Sturgeon																					
Yellow Bullhead																					
Yellow Perch																					

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	DRY FOREST																				
	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Amphibian																					
Bullfrog		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Columbia Spotted Frog		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Long-toed Salamander		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Pacific Treefrog																1x	1x	1x		1x	1x
Tailed Frog		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Western Toad		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x							
Leopard Frog																					
Bird																					
American Avocet																					
American Bittern																					
American Coot																					
American Crow		1x					1x			1x	1x			1x		1x	1x			1x	1x
American Dipper		1x	1x					1x	1x	1x						1x					
American Goldfinch				1x			1x				1x			1x				1x			1x
American Kestrel							1x							1x							1x
American Redstart								2x	2x												
American Robin		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
American Tree Sparrow																					
American White Pelican																					2x
American Widgeon																					
Ash-throated Flycatcher																2x					
Baird's Sandpiper																					
Bald Eagle								2x	2x												
Bank Swallow																1x	1x	1x		1x	1x
Barn Owl																	1x			1x	1x
Barrows Goldeneye		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Belted Kingfisher		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Black Rosy Finch																					
Black Tern		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Black Swift		1x	1x	1x		1x	1x									1x	1x	1x		1x	1x
Black-backed Woodpecker		2x						2x	2x												
Black-billed Magpie														1x		1x	1x			1x	1x
Black-cappedChickadee			1x	1x		1x	1x	1x								1x	1x			1x	1x
Black-chinned Hummingbird		2x						2x	2x	2x		2x		2x		2x	2x				2x

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	DRY FOREST																				
	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Black-crowned Night-heron																2x	2x	2x		2x	
Black-headed Grosbeak			1x	1x		1x		1x		1x	1x		1x				1x			1x	
Black-throated Gray Warbler																1x	1x	1x		1x	1x
Black-necked Stilt																					
Blue Grouse		2x	2x	2x		2x	2x	2x	2x		2x			2x							
Blue-winged Teal																					
Bobolink																					
Bohemian Waxwing																					
Bonaparte's Gull																					
Boreal Owl		2x		2x																	
Brewer's Blackbird																2x	2x	2x			2x
Brewer's Sparrow																					
Broad-tailed hummingbird		2x		2x			2x	2x	2x		2x			2x							
Brown Creeper								2x	2x												
Brown-headed Cowbird																					
Bufflehead		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Burrowing Owl																					
California Gull																					
Calliope Hummingbird						1x	1x	1x					1x	1x		1x	1x			1x	1x
Canada Goose																1x					
Canvasback																					
Canyon Wren																					
Cassin's Finch		1x	1x	1x				1x	1x	1x	1x					1x	1x				
Cassin's Vireo		1x	1x	1x		1x		1x	1x	1x	1x		1x			1x	1x			1x	
Cedar Waxwing						1x	1x							1x			1x			1x	1x
Chestnut-backed Chickadee		2x																			
Chipping Sparrow		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x	1x		1x	1x
Chukar																					
Cinnamon Teal																					
Clark's Nutcracker																					
Cliff Swallow																1x	1x				
Columbian sharp-tailed Grouse																					
Common Goldeneye		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Common Loon		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Common Merganser		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Common Nighthawk						1x	1x						1x	1x		1x	1x	1x		1x	1x

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	DRY FOREST																				
	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Common Poorwill																					
Common Raven		1x						1x	1x							1x					
Common Redpoll																					
Common Snipe		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Common Tern																					
Common Yellowthroat																				1x	1x
Cooper's Hawk		1x	1x						1x	1x						1x	1x				
Dark-eyed Junco		1x	1x	1x			1x	1x	1x	1x	1x			1x		1x	1x	1x			1x
Double-crested Cormorant																1x					1x
Downy Woodpecker		1x	1x	1x		1x										1x	1x	1x		1x	
Dusky Flycatcher		1x	1x	1x			1x		1x	1x	1x			1x		1x	1x				1x
Eared Grebe																					
Eastern Kingbird										1x	1x		1x	1x			1x			1x	1x
European Starling																					
Evening Grosbeak		1x	1x					1x	1x	1x						1x	1x				
Ferruginous Hawk																					
Flammulated Owl		2x		2x				2x	2x		2x										
Forster's Tern		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Fox Sparrow						2x	2x									2x	2x	2x		2x	2x
Franklin's Gull																					
Gadwall																					
Golden-crowned Kinglet																					
Golden-crowned Sparrow																					
Golden Eagle																					
Grasshopper Sparrow																					
Gray Catbird		1x	1x	1x		1x	1x									1x	1x			1x	1x
Cray-crowned Rosy Finch																					
Gray Jay								1x	1x	1x											
Gray Partridge																					
Great Egret																2x	2x	2x		2x	
Great Blue Heron		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Great Gray Owl		2x		2x			2x														
Great Horned Owl		1x						1x	1x							1x					
Greater Sandhill Crane		2x	2x			2x	2x		2x	2x			2x	2x		2x	2x	2x		2x	2x
Greater Scaup																					
Greater Yellowlegs																					

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	DRY FOREST																				
	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Green-winged Teal																					
Gyrfalcon																					
Hairy Woodpecker		1x	1x	1x				1x	1x	1x	1x					1x	1x				
Hammond's Flycatcher		2x						2x	2x												
Harlequin Duck		2x	2x	2x		2x	2x	2x	2x	2x	2x		2x	2x							
Harris' Sparrow																	1x			1x	1x
Hermit Thrush		1x	1x	1x				1x	1x	1x	1x										
Hooded Merganser		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Horned Grebe																					
Horned Lark																					
House Finch																					
House Sparrow																					
House Wren		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Killdeer																					
Lark Sparrow																					
Lazuli bunting				2x			2x				2x			2x		2x	2x	2x			2x
Least Sandpiper																					
Lesser Scaup		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Lesser Yellowlegs																					
Lewis' Woodpecker								2x								2x					
Lincoln's Sparrow			1x	1x		1x	1x										1x	1x		1x	1x
Loggerhead Shrike																					
Long-billed Curlew													2x	2x							
Long-billed Dowitcher																					
Long-eared Owl		2x		2x			2x									2x	2x	2x			2x
Macgillivray's Warbler		1x	1x	1x			1x									1x	1x	1x			1x
Mallard		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Marbled Godwit																					
Marsh Wren																					
Merlin			1x	1x				1x	1x	1x							1x	1x			
Mountain Bluebird							1x							1x							
Mountain Chickadee		1x	1x					1x	1x	1x	1x		1x								
Mountain Quail																					
Mourning Dove																1x	1x	1x		1x	1x
Nashville Warbler			1x	1x		1x	1x			1x	1x		1x	1x							
Northern Flicker		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x

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	DRY FOREST																				
	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Northern Goshawk		2x		2x				2x	2x	2x	2x	2x	2x	2x		2x		2x			
Northern Harrier																					
Northern Oriole		1x		1x			1x									1x	1x			1x	1x
Northern Pintail																					
Northern Pygmy Owl		1x						1x	1x	1x											
Northern Rough-winged Swallow																1x	1x	1x		1x	1x
Northern Saw-whet Owl								1x	1x							1x					
Northern Shoveler																					
Northern Shrike																					
Olive-sided Flycatcher																					
Orange-crowned Warbler			1x			1x		1x		1x			1x				1x			1x	
Osprey								1x	1x	1x	1x					1x	1x	1x			
Peregrine Falcon		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Pied-billed Grebe																					
Pileated Woodpecker																					
Pine Grosbeak		1x	1x					1x	1x	1x						1x	1x				
Pine Siskin								2x	2x	2x	2x					2x	2x	2x			
Prairie Falcon								1x	1x												
Purple Finch																					
Pygmy Nuthatch								2x	2x												
Red Crossbill																					
Red-breasted Nuthatch		1x	1x	1x				1x	1x	1x						1x	1x				
Red-breasted Sapsucker		1x	1x	1x					1x	1x						1x	1x	1x			
Red-eyed Vireo		2x														2x					
Red-naped Sapsucker		1x	1x	1x		1x										1x	1x	1x		1x	
Red-necked Grebe		2x	2x	2x		2x		2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Red-necked Phalarope																					
Red-tailed Hawk		1x	1x	1x			1x	1x	1x	1x	1x			1x		1x	1x	1x			1x
Red-winged blackbird			1x				1x									1x	1x			1x	1x
Redhead																					
Ring-billed Gull																					
Ring-necked Duck		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Ring-necked Pheasant																					
Rock Dove																					
Rock Wren																					
Ross' Goose																					

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	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Rough-legged Hawk																					
Ruby-crowned Kinglet		1x						1x	1x	1x	1x					1x	1x				
Ruddy Duck																					
Ruffed Grouse		1x	1x	1x		1x										1x	1x	1x		1x	
Rufous Hummingbird		2x		2x			2x	2x	2x		2x			2x		2x	2x	2x			2x
Sage Sparrow																					
Sage Thrasher																					
Savannah Sparrow																					
Say's Phoebe																					
Semipalmated Plover																					
Sharp-shinned Hawk			1x	1x		1x				1x	1x		1x				1x	1x		1x	
Short-eared Owl																					
Snow Bunting																					
Snow Goose																					
Snowy Owl																					
Solitary Sandpiper																					
Sora		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Spotted Sandpiper		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Spotted Towhee																					
Spruce Grouse																					
Steller's Jay		1x		1x				1x	1x	1x	1x					1x	1x	1x			
Swainson's Hawk																					
Swainson's Thrush		1x	1x	1x				1x	1x	1x	1x					1x	1x	1x			
Three-toed Woodpecker																					
Townsend's Solitaire		1x	1x				1x	1x	1x	1x				1x							
Townsend's Warbler																					
Tree Swallow							1x							1x							1x
Trumpeter Swan		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Tundra Swan																					
Turkey Vulture		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x	1x		1x	1x
Upland Sandpiper													2x	2x							
Varied Thrush																					
Vaux's Swift																					
Veery																2x	2x	2x			
Vesper Sparrow																					
Violet-green Swallow		1x	1x	1x		1x		1x	1x		1x		1x			1x	1x	1x		1x	

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	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Virginia Rail																2x	2x	2x		2x	2x
Warbling Vireo		1x	1x	1x		1x										1x	1x			1x	
Western Bluebird		2x					2x	2x						2x							
Western Grebe																					
Western Kingbird																					
Western Meadowlark																					
Western Screech Owl		1x	1x	1x												1x	1x	1x			
Western Tanager		1x						1x	1x		1x		1x			1x					
Western Wood-Pewee		1x	1x	1x				1x	1x	1x	1x					1x	1x				
White-breasted Nuthatch		2x						2x	2x	2x						2x	2x				
White-crowned Sparrow		1x	1x	1x		1x	1x									1x	1x	1x		1x	1x
White-faced Ibis																					
White-headed Woodpecker								2x	2x												
White-throated Sparrow																					
White-throated Swift		1x	1x	1x		1x	1x									1x	1x	1x		1x	1x
White-winged Crossbill																					
Wild Turkey		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x	1x		1x	1x
Willet																					
Williamson's Sapsucker		2x						2x	2x							2x					
Willow Flycatcher																	2x				2x
Wilson's Phalarope																					
Wilson's Warbler																					
Winter Wren																					
Wood Duck		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Yellow Warbler																1x	1x	1x			1x
Yellow-bellied Sapsucker		1x	1x													1x	1x				
Yellow-billed Cuckoo																2x	2x	2x			
Yellow-breasted Chat																2x	2x				2x
Yellow-headed Blackbird																					
Yellow-rumped Warbler								2x	2x	2x	2x		2x			2x	2x			2x	
Mammal																					
American Badger																					
American Beaver		1x	1x	1x		1x	1x				1x		1x	1x		1x	1x			1x	1x
American Marten		2x	2x																		
American Pika																					

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	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Belding's Ground Squirrel																					
Big Brown Bat		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Black Bear		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Bobcat		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
California Myotis								1x	1x	1x	1x		1x	1x							
Columbian Ground Squirrel							1x							1x							
Common Muskrat		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Common Porcupine		1x	1x	1x		1x	1x		1x	1x	1x		1x	1x		1x	1x			1x	1x
Common Raccoon		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Coyote			1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Deer Mouse		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Dusky Shrew																					
Eastern Fox Squirrel																1x	1x	1x		1x	1x
Ermine								1x	1x	1x	1x		1x	1x							
Fisher																2x	2x				
Fringed Myotis								2x	2x	2x	2x										
Gapper Red-backed Vole																					
Great Basin Pocket Mouse																					
Golden-mantled Ground Squirrel								1x	1x	1x	1x		1x	1x							
Heather Vole																					
Hoary Bat							2x	2x	2x			2x		2x		2x					2x
House Cat(feral)																					
House Mouse																					
Little Brown Myotis								1x	1x	1x	1x		1x	1x							
Long-eared Myotis		2x				2x	2x	2x	2x	2x	2x	2x	2x	2x		2x				2x	2x
Long-legged Myotis		2x		2x		2x		2x	2x	2x	2x		2x			2x	2x			2x	
Long-tailed Myotis																					
Long-tailed Vole		1x	1x				1x	1x	1x	1x				1x		1x	1x				1x
Long-tailed Weasel		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Lynx		1x	1x	1x			1x									1x		1x			1x
Merriam's Shrew																					
Mink		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Mountain vole																					
Moose		1x	1x	1x		1x	1x									1x	1x			1x	1x
Mountain Cottontail																					
Mountain Goat								2x	2x	2x	2x	2x		2x							

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	DRY FOREST																				
	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Mountain Lion		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Mule Deer		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Northern Flying Squirrel		2x	2x	2x				2x	2x	2x						2x					
Northern Pocket Gopher		1x						1x								1x					
Northern River Otter		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Pale Western Big-eared Bat								2x	2x		2x					2x					
Pallid Bat								2x	2x												
Preble's Shrew																					
Red Fox(native)							1x	1x						1x							1x
Red Squirrel								1x	1x	1x											
Rocky Mountain(Bighorn)Sheep							2x							2x							
Sagebrush Vole																					
Silver-haired Bat		2x						2x	2x			2x				2x					
Snowshoe Hare				1x		1x	1x														
Spotted Bat								2x	2x		2x			2x							
Striped Skunk																1x	1x			1x	1x
Townsend's Big-eared Bat																					
Townsend's Ground Squirrel																					
Vagrant Shrew		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Wapiti(elk)		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
Water Shrew		2x	2x	2x		2x		2x								2x	2x			2x	
Water Vole																					
Western Harvest Mouse								1x						1x		1x					1x
Western Jumping Mouse			1x	1x		1x	1x	1x						1x							1x
Western Pipistrelle																					
Western Small-footed Myotis								2x	2x	2x	2x					2x	2x				
Western Spotted Skunk		1x	1x	1x		1x	1x	1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
White-tailed Deer								1x	1x	1x	1x		1x	1x		1x	1x			1x	1x
White-tailed Jackrabbit																					
Wolf		1x	1x	1x		1x	1x	1x	1x	1x	1x			1x		1x	1x	1x		1x	1x
Wolverine							2x														
Yellow-bellied Marmot																					
Yellow-pine Chipmunk								1x	1x	1x	1x			1x							
Yuma Myotis			2x					2x	2x	2x	2x	2x					2x				
Reptiles																					

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	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW							
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Common Garter Snake		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Gopher Snake											1x			1x							1x
Painted Turtle		2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x		2x	2x
Racer								1x	1x	1x	1x		1x	1x							
Rubber Boa								2x			2x		2x	2x							
Western Fence Lizard								1x			1x			1x							1x
Western Rattlesnake				1x			1x	1x			1x			1x				1x			1x
Western Skink														1x							
Western Terrestrial Garter Snake				1x			1x	1x			1x			1x							1x
Fish																					
Black Bullhead																					
Black Crappie																					
Bluegill																					
Bridgelip Sucker																					
Brook Trout																					
Brown Bullhead																					
Bulltrout																					
Channel Catfish																					
Chinook Salmon																					
Chiselmouth																					
Common Carp																					
Cutthroat Trout																					
Flathead Catfish																					
Golden Trout																					
Goldfish																					
Largemouth Bass																					
Lake Trout																					
Largescale Sucker																					
Longnose Dace																					
Mountain Sucker																					
Mountain Whitefish																					
Northern Squawfish																					
Pacific Lamprey																					
Paiute Sculpin																					
Peamouth																					

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	DRY FOREST																				
	ASPEN							INTERIOR PONDEROSA PINE							COTTONWOOD/WILLOW						
COVER TYPES	S217	S217	S217	S217	S217	S217	S217	S237	S237	S237	S237	S237	S237	S237	S235	S235	S235	S235	S235	S235	S235
STAND STRUCTURE	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ofs	Ofm	Yf	Ur	Seo	Sec	Si
SPECIES / RESIDENCE * ASSESS																					
Pumpkinseed																					
Redband Trout																					
Rainbow Trout																					
Redside Shiner																					
American Shad																					
Shorthead Sculpin																					
Smallmouth Bass																					
Sockeye(incl. Kokanee)Salmon																					
Speckled Dace																					
Steelhead Trout																					
Tadpole Madtom																					
Torrent Sculpin																					
White Crappie																					
White Sturgeon																					
Yellow Bullhead																					
Yellow Perch																					

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			MOIST FOREST							COOL SHRUB												DRY
	JUNIP	MCW	GRAND FIR							SHRB HERB/TREE REGEN				MT. MAHOG.		BIG SAGE		CHOK/SERV/ROS				SHR
COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421		R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms		Clms
SPECIES / RESIDENCE * ASSESS																						
Amphibian																						
Bullfrog			1x	1x	1x	1x		1x	1x													
Columbia Spotted Frog	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x		2x
Long-toed Salamander	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x		1x
Pacific Treefrog		1x								1x	1x	1x	1x	1x	1x							1x
Tailed Frog	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x		2x
Western Toad			2x	2x	2x	2x		2x	2x													
Leopard Frog																						
Bird																						
American Avocet														2x		2x						
American Bittern																2x	2x					
American Coot																						
American Crow	1x	1x																				
American Dipper			1x	1x	1x																	
American Goldfinch	1x	1x								1x	1x	1x	1x									
American Kestrel	1x	1x			3s				3s	1x	1x		1x	1x		1x		1x	1x			
American Redstart			2x	2x																		
American Robin	1x	1x	1x	3s	3s	3s		3s	3s	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x		1x
American Tree Sparrow																						
American White Pelican																						
American Widgeon																2x	2x					2x
Ash-throated Flycatcher	2x	2x												2x	2x							
Baird's Sandpiper																						
Bald Eagle	2x	2x	2x	2x										2x	2x	2x	2x					2x
Bank Swallow														1x	1x	1x	1x					1x
Barn Owl																1x						
Barrows Goldeneye	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x					2x
Belted Kingfisher	1x	1x	1x	1x	1x	1x		1x	1x									1x	1x	1x		
Black Rosy Finch																						
Black Tern	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x		2x
Black Swift						1x																
Black-backed Woodpecker			2x	2x	3s			3s														
Black-billed Magpie	1x	1x								1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x		
Black-cappedChickadee				3s	3s																	
Black-chinned Hummingbird	2x	2x												2x	2x			2x	2x	2x		

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	JUNIP	MCW	GRAND FIR							SHRB HERB/TREE REGEN				MT. MAHOG.		BIG SAGE		CHOK/SERV/ROS			SHR
COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Black-crowned Night-heron											2x	2x	2x			2x	2x	2x	2x	2x	2x
Black-headed Grosbeak				3s	3s	1x		3s						1x	1x			1x	1x	1x	
Black-throated Gray Warbler																					
Black-necked Stilt														2x							
Blue Grouse		2x														2x	2x	2x	2x	2x	2x
Blue-winged Teal																2x	2x				2x
Bobolink																					
Bohemian Waxwing																					
Bonaparte's Gull																					
Boreal Owl			2x																		
Brewer's Blackbird														2x	2x	2x	2x		2x	2x	2x
Brewer's Sparrow														2x	2x	2x	2x				2x
Broad-tailed hummingbird		2x	2x	2x		2x			2x												
Brown Creeper			2x	2x	3s	3s		3s													
Brown-headed Cowbird				3s	3s	3s		3s	3s												
Bufflehead	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				2x
Burrowing Owl																2x	2x				
California Gull																					
Calliope Hummingbird			1x					1x	1x	1x	1x	1x	1x					1x	1x	1x	
Canada Goose																					
Canvasback																2x	2x				2x
Canyon Wren	1x	1x																			
Cassin's Finch	1x	1x	1x	3s	3s	3s		3s	3s												
Cassin's Vireo				3s	3s	3s		3s	3s												
Cedar Waxwing	1x	1x							3s					1x	1x			1x	1x	1x	
Chestnut-backed Chickadee			2x	3s	3s	3s															
Chipping Sparrow	1x	1x	1x	3s	3s	3s		3s	3s												
Chukar	1x	1x												1x	1x	1x			1x		1x
Cinnamon Teal																2x	2x				2x
Clark's Nutcracker					3s																
Cliff Swallow														1x	1x	1x	1x				1x
Columbian sharp-tailed Grouse														2x	2x			2x	2x	2x	2x
Common Goldeneye	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				2x
Common Loon			2x	2x	2x	2x		2x	2x												
Common Merganser	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				2x
Common Nighthawk	1x	1x						1x	1x					1x	1x	1x	1x				1x

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	JUNIP	MCW	GRAND FIR							SHRB HERB/TREE REGEN				MT. MAHOG.		BIG SAGE		CHOK/SERV/ROS			SHR
COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Common Poorwill																					
Common Raven	1x	1x	1x	3s	3s			3s	3s												
Common Redpoll																					
Common Snipe	2x	2x	2x	2x	3s	2x		2x	3s	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x
Common Tern																					
Common Yellowthroat																					
Cooper's Hawk	1x	1x		1x	3s			3s													
Dark-eyed Junco	1x	1x	1x	3s	3s	3s		3s	3s	1x	1x	1x	1x	1x	1x	1x	1x		1x		1x
Double-crested Cormorant																					
Downy Woodpecker					3s				3s												
Dusky Flycatcher				3s	3s	3s		3s	3s	1x	1x	1x	1x					1x	1x	1x	
Eared Grebe																					
Eastern Kingbird	1x	1x												1x	1x		1x	1x	1x	1x	1x
European Starling																					
Evening Grosbeak	1x	1x	1x	3s	3s	3s		3s													
Ferruginous Hawk	2x																2x				
Flammulated Owl		2x	2x	2x		2x															
Forster's Tern	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				2x
Fox Sparrow				3s		3s			3s					2x	2x			2x	2x	2x	
Franklin's Gull																					
Gadwall																2x	2x				2x
Golden-crowned Kinglet			2x	3s	3s	3s		3s													
Golden-crowned Sparrow																					
Golden Eagle	1x	1x								1x	1x	1x	1x	1x	1x	1x		1x	1x		1x
Grasshopper Sparrow																2x					
Gray Catbird																					
Cray-crowned Rosy Finch																					
Gray Jay			1x	3s	3s	3s		3s	3s												
Gray Partridge	1x	1x												1x	1x				1x	1x	1x
Great Egret										2x	2x	2x	2x				2x		2x		2x
Great Blue Heron	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				2x
Great Gray Owl			2x	2x		2x			2x		2x	2x	2x								
Great Horned Owl	1x	1x	1x	1x																	
Greater Sandhill Crane	2x	2x														2x	2x				2x
Greater Scaup																					
Greater Yellowlegs																					

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	JUNIP	MCW	GRAND FIR							SHRB HERB/TREE REGEN				MT. MAHOG.		BIG SAGE		CHOK/SERV/ROS			SHR
COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Green-winged Teal																2x	2x				2x
Gyrfalcon																					
Hairy Woodpecker			1x	3s	3s	3s		3s	3s												
Hammond's Flycatcher			2x	3s	3s	3s		3s	3s												
Harlequin Duck			2x	2x	2x	2x		2x	2x												
Harris' Sparrow	1x	1x												1x	1x	1x	1x	1x	1x	1x	
Hermit Thrush				3s	3s	3s		3s	3s												
Hooded Merganser	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				2x
Horned Grebe																					
Horned Lark																1x	1x				
House Finch																					
House Sparrow																					
House Wren	1x	1x			3s	3s			3s	1x	1x	1x	1x								
Killdeer																					
Lark Sparrow																					2x
Lazuli bunting				3s					3s									2x	2x	2x	
Least Sandpiper																					
Lesser Scaup	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x			2x	2x	2x			2x
Lesser Yellowlegs																					
Lewis' Woodpecker																					
Lincoln's Sparrow					3s	1x		1x	1x												
Loggerhead Shrike	2x	2x												2x				2x	2x	2x	2x
Long-billed Curlew	2x	2x														2x	2x				2x
Long-billed Dowitcher																					
Long-eared Owl	2x	2x	2x	2x		2x			2x	2x	2x	2x	2x			2x	2x	2x	2x	2x	
Macgillivray's Warbler			1x	3s	3s	3s		3s	3s					1x	1x			1x	1x	1x	
Mallard	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x
Marbled Godwit														1x	1x						1x
Marsh Wren														1x	1x	1x	1x				1x
Merlin		1x								1x						1x	1x		1x	1x	
Mountain Bluebird	1x	1x							3s	1x	1x	1x	1x	1x	1x	1x	1x				1x
Mountain Chickadee	1x	1x	1x	3s	3s	3s		3s	3s												
Mountain Quail																		2x	2x	2x	
Mourning Dove	1x	1x			3s					1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Nashville Warbler	1x	1x		3s	3s	3s		1x		1x	1x	1x	1x								
Northern Flicker	1x	1x	1x	3s	3s	3s		3s	3s	1x	1x	1x	1x								

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			MOIST FOREST							COOL SHRUB											DRY
	JUNIP	MCW	GRAND FIR							SHRB HERB/TREE REGEN				MT. MAHOG.		BIG SAGE		CHOK/SERV/ROS			SHR
COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Northern Goshawk	2x	2x	2x	3s		2x												2x	2x	2x	
Northern Harrier																1x	1x				
Northern Oriole	1x													1x	1x	1x	1x				1x
Northern Pintail																2x	2x				2x
Northern Pygmy Owl				1x	3s																
Northern Rough-winged Swallow														1x	1x	1x	1x				1x
Northern Saw-whet Owl			1x	3s																	
Northern Shoveler																2x	2x				2x
Northern Shrike	1x	1x														1x	1x	1x	1x	1x	
Olive-sided Flycatcher			2x	3s	3s				3s												
Orange-crowned Warbler	1x	1x	1x	3s	3s	3s		3s	3s									1x	1x	1x	
Osprey			1x	1x	1x	1x															
Peregrine Falcon	1x	1x	1x	1x	1x	1x		1x	1x					1x	1x	1x	1x				1x
Pied-billed Grebe																					
Pileated Woodpecker			2x	3s	3s	3s															
Pine Grosbeak	1x	1x	1x	1x	1x																
Pine Siskin	2x	2x	2x	3s	3s	3s		3s	3s												
Prairie Falcon	1x																				
Purple Finch																					
Pygmy Nuthatch																					
Red Crossbill			1x	3s	3s	3s															
Red-breasted Nuthatch			1x	3s	3s	3s		3s	3s												
Red-breasted Sapsucker																					
Red-eyed Vireo																					
Red-naped Sapsucker			1x	3s	3s	3s		3s	3s												
Red-necked Grebe			2x	2x	2x	2x		2x	2x												
Red-necked Phalarope																					
Red-tailed Hawk	1x	1x	1x	3s	3s	3s			3s	1x	1x	1x	1x	1x	1x	1x		1x	1x		1x
Red-winged blackbird														1x	1x	1x	1x		1x	1x	1x
Redhead																2x	2x				2x
Ring-billed Gull																					
Ring-necked Duck			2x	2x	2x	2x		2x	2x												
Ring-necked Pheasant																					
Rock Dove																					
Rock Wren	1x	1x												1x	1x						1x
Ross' Goose																					

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	JUNIP	MCW	GRAND FIR							SHRB HERB/TREE REGEN				MT. MAHOG.		BIG SAGE		CHOK/SERV/ROS			SHR
COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Rough-legged Hawk	1x	1x												1x	1x	1x	1x				1x
Ruby-crowned Kinglet	1x	1x	1x	3s	3s	3s		3s	3s												
Ruddy Duck																2x	2x				2x
Ruffed Grouse				1x	3s	3s		1x		1x	1x	1x									
Rufous Hummingbird			2x	3s		2x			2x									2x	2x	2x	
Sage Sparrow																2x	2x				
Sage Thrasher																2x	2x				
Savannah Sparrow																					
Say's Phoebe																					
Semipalmated Plover																					
Sharp-shinned Hawk					3s	1x		1x													
Short-eared Owl																					
Snow Bunting																					
Snow Goose																					
Snowy Owl																					
Solitary Sandpiper																					
Sora	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				2x
Spotted Sandpiper	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x	2x		2x		2x
Spotted Towhee				3s	3s													1x	1x	1x	
Spruce Grouse																					
Steller's Jay		1x	1x	3s	3s	3s		3s	3s												
Swainson's Hawk																1x	1x				
Swainson's Thrush			1x	3s	3s	3s		3s													
Three-toed Woodpecker			2x	2x																	
Townsend's Solitaire	1x	1x	1x	3s	3s			3s	1x	1x	1x	1x	1x								
Townsend's Warbler				3s	3s	3s		3s													
Tree Swallow		1x							1x												
Trumpeter Swan	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x	2x
Tundra Swan																					
Turkey Vulture	1x	1x	1x	1x	1x	1x		1x	1x					1x	1x	1x	1x	1x	1x	1x	1x
Upland Sandpiper																					
Varied Thrush			2x	2x																	
Vaux's Swift			2x	2x	3s																
Veery																					
Vesper Sparrow	2x													2x		2x					
Violet-green Swallow	1x	1x	1x	1x	1x	1x		1x													

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COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Virginia Rail	2x	2x														2x	2x				2x
Warbling Vireo				3s	3s	3s			3s												
Western Bluebird	2x	2x		3s	3s									2x		2x			2x		
Western Grebe																					
Western Kingbird														1x	1x	1x	1x				1x
Western Meadowlark																2x	2x				2x
Western Screech Owl	1x																				
Western Tanager	1x	1x	1x	3s	3s	3s		3s	3s												
Western Wood-Pewee			1x	3s	3s	3s		3s	3s												
White-breasted Nuthatch				3s	3s				3s												
White-crowned Sparrow						1x			1x												
White-faced Ibis																					
White-headed Woodpecker																					
White-throated Sparrow																					
White-throated Swift	1x	1x												1x	1x	1x	1x				
White-winged Crossbill			2x	2x		2x															
Wild Turkey	1x	1x			3s																
Willet	2x	2x														2x	2x				2x
Williamson's Sapsucker			2x	2x	3s				3s												
Willow Flycatcher					3s																
Wilson's Phalarope																2x	2x				2x
Wilson's Warbler				3s		3s		3s													
Winter Wren				3s	3s	3s		3s													
Wood Duck	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				
Yellow Warbler																					
Yellow-bellied Sapsucker																					
Yellow-billed Cuckoo																					
Yellow-breasted Chat																		2x		2x	
Yellow-headed Blackbird																					
Yellow-rumped Warbler			2x	3s	3s	3s		3s	3s												
Mammal																					
American Badger																					
American Beaver		1x				1x		1x	1x	1x	1x		1x								
American Marten			2x	2x	2x																
American Pika																					

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STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Belding's Ground Squirrel	1x	1x										1x		1x	1x	1x	1x	1x	1x	1x	
Big Brown Bat	1x	1x	1x	1x	1x	1x		1x	1x												
Black Bear	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	
Bobcat	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
California Myotis			1x	1x	1x	1x		1x	1x												
Columbian Ground Squirrel	1x	1x							1x	1x	1x	1x	1x	1x	1x	1x	1x				
Common Muskrat	1x	1x	1x	1x	1x	1x		1x	1x					1x	1x	1x					1x
Common Porcupine	1x	1x	1x		1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Common Raccoon			1x	1x	1x	1x		1x	1x												
Coyote	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Deer Mouse	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Dusky Shrew																					
Eastern Fox Squirrel																					
Ermine		1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x								
Fisher			2x	2x	2x																
Fringed Myotis																2x	2x				
Gapper Red-backed Vole																					
Great Basin Pocket Mouse	1x	1x														1x	1x				
Golden-mantled Ground Squirrel	1x	1x	1x	1x	1x	1x		1x	1x												
Heather Vole																					
Hoary Bat		2x	2x	2x					2x												
House Cat(feral)																					
House Mouse																					
Little Brown Myotis		1x	1x	1x	1x	1x		1x	1x												
Long-eared Myotis	2x	2x	2x	2x	2x	2x		2x	2x							2x	2x				
Long-legged Myotis	2x		2x	2x	2x	2x		2x													
Long-tailed Myotis																					
Long-tailed Vole			1x	1x	1x				1x	1x	1x	1x	1x								
Long-tailed Weasel	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Lynx				1x	1x	1x			1x	1x	1x	1x	1x								
Merriam's Shrew		1x												1x	1x	1x	1x				1x
Mink	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Mountain vole																					
Moose			1x	1x	1x	1x		1x	1x												
Mountain Cottontail	1x	1x												1x	1x	1x	1x				1x
Mountain Goat			2x		2x	2x			2x	2x	2x	2x	2x	2x		2x	2x				

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COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Mountain Lion	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Mule Deer	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Northern Flying Squirrel			2x	2x	2x	2x															
Northern Pocket Gopher	1x	1x	1x	1x						1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Northern River Otter		1x	1x	1x	1x	1x		1x	1x							1x	1x				
Pale Western Big-eared Bat	2x	2x												2x		2x	2x				2x
Pallid Bat	2x																				2x
Preble's Shrew																2x	2x				
Red Fox(native)	1x	1x	1x						1x												
Red Squirrel			1x	1x	1x																
Rocky Mountain(Bighorn)Sheep									2x					2x	2x	2x					2x
Sagebrush Vole																2x	2x				
Silver-haired Bat	2x	2x	2x	2x												2x	2x				2x
Snowshoe Hare						1x		1x	1x	1x	1x	1x	1x								
Spotted Bat	2x	2x												2x		2x	2x				2x
Striped Skunk																					
Townsend's Big-eared Bat																					
Townsend's Ground Squirrel	1x	1x												1x	1x	1x	1x				1x
Vagrant Shrew	1x	1x	1x	1x	1x	1x		1x	1x					1x	1x	1x	1x				1x
Wapiti(elk)	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Water Shrew			2x	2x	2x	2x		2x													
Water Vole			2x	2x																	
Western Harvest Mouse	1x	1x												1x	1x	1x	1x	1x	1x		1x
Western Jumping Mouse		1x	1x					1x	1x									1x	1x	1x	
Western Pipistrelle																1x	1x				
Western Small-footed Myotis	2x	2x	2x	2x		2x			2x							2x					
Western Spotted Skunk			1x	1x	1x	1x		1x	1x							1x	1x				
White-tailed Deer	1x	1x	1x	1x	1x	1x		1x	1x					1x	1x	1x	1x				1x
White-tailed Jackrabbit	1x													1x	1x	1x	1x				1x
Wolf	1x	1x	1x	1x	1x	1x		1x	1x		1x	1x	1x	1x	1x	1x	1x		1x	1x	1x
Wolverine			2x	2x	2x	2x			2x												
Yellow-bellied Marmot	1x	1x								1x	1x	1x	1x	1x	1x	1x		1x	1x		1x
Yellow-pine Chipmunk	1x	1x	1x	1x	1x	1x			1x												
Yuma Myotis	2x		2x	2x	2x	2x										2x	2x				
Reptiles																					

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COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Common Garter Snake	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x
Gopher Snake	1x	1x								1x	1x	1x		1x		1x					
Painted Turtle	2x	2x														2x	2x	2x	2x	2x	2x
Racer	1x	1x								1x	1x			1x		1x		1x	1x	1x	
Rubber Boa	2x	2x														2x	2x				
Western Fence Lizard	1x	1x														1x					
Western Rattlesnake	1x	1x												1x		1x		1x	1x		
Western Skink	1x	1x												1x		1x					
Western Terrestrial Garter Snake		1x	1x			1x			1x	1x	1x			1x		1x		1x	1x		
Fish																					
Black Bullhead																					
Black Crappie																					
Bluegill																					
Bridgelip Sucker																					
Brook Trout																					
Brown Bullhead																					
Bulltrout																					
Channel Catfish																					
Chinook Salmon																					
Chiselmouth																					
Common Carp																					
Cutthroat Trout																					
Flathead Catfish																					
Golden Trout																					
Goldfish																					
Largemouth Bass																					
Lake Trout																					
Largescale Sucker																					
Longnose Dace																					
Mountain Sucker																					
Mountain Whitefish																					
Northern Squawfish																					
Pacific Lamprey																					
Paiute Sculpin																					
Peamouth																					

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COVER TYPES	CS01	CS02	CS09	CS09	CS09	CS09	CS09	CS09	CS09	C003	C003	C003	C003	R322	R322	R402	R402	R421	R421	R421	R104
STAND STRUCTURE	Wdl	Wdl	Ofs	Ofm	Yf	Ur	Seo	Sec	Si	Ots	Olms	Clms	Ch	Olms	Clms	Olms	Clms	Ots	Olms	Clms	Clms
SPECIES / RESIDENCE * ASSESS																					
Pumpkinseed																					
Redband Trout																					
Rainbow Trout																					
Redside Shiner																					
American Shad																					
Shorthead Sculpin																					
Smallmouth Bass																					
Sockeye(incl. Kokanee)Salmon																					
Speckled Dace																					
Steelhead Trout																					
Tadpole Madtom																					
Torrent Sculpin																					
White Crappie																					
White Sturgeon																					
Yellow Bullhead																					
Yellow Perch																					

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	DRY GRASS									OTHER									
	AG. BUNCH		FES-BUNCH		NAT. FORB		EXFRB/ANGR		CROP	ALPINE TUNDRA		SHRUB WETLAND			HERB WET		BARR.	URBN	WAT.
COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Amphibian																			
Bullfrog												1x	1x	1x					1x
Columbia Spotted Frog	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x		2x
Long-toed Salamander	1x	1x	1x	1x	1x	1x				1x	1x	1x	1x	1x	1x	1x	1x		1x
Pacific Treefrog												1x	1x	1x					
Tailed Frog										2x	2x	2x	2x	2x	2x	2x			2x
Western Toad	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x	2x			2x
Leopard Frog																			
Bird																			
American Avocet	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x		2x	2x	2x		2x
American Bittern	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
American Coot																			1x
American Crow							1x	1x	1x			1x	1x	1x					
American Dipper																			1x
American Goldfinch			1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			
American Kestrel		1x		1x		1x		1x					1x			1x			
American Redstart												2x							
American Robin	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x		1x	
American Tree Sparrow																			
American White Pelican												2x	2x		2x	2x	2x		2x
American Widgeon	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Ash-throated Flycatcher																			
Baird's Sandpiper				1x	1x	1x	1x	1x	1x							1x	1x	1x	
Bald Eagle	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x					2x
Bank Swallow	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x
Barn Owl	1x	1x			1x	1x	1x	1x	1x			1x	1x	1x					
Barrows Goldeneye	2x	2x	2x	2x	2x	2x	2x	2x	2x					2x	2x	2x			2x
Belted Kingfisher												1x	1x	1x					1x
Black Rosy Finch																	1x		
Black Tern	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Black Swift												1x	1x	1x					1x
Black-backed Woodpecker																			
Black-billed Magpie							1x	1x	1x			1x	1x	1x					
Black-cappedChickadee												1x	1x	1x				1x	
Black-chinned Hummingbird												2x	2x	2x					

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	DRY GRASS									OTHER									
	AG. BUNCH		FES-BUNCH		NAT. FORB		EXFRB/ANGR		CROP	ALPINE TUNDRA		SHRUB WETLAND			HERB WET		BARR.	URBN	WAT.
COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Black-crowned Night-heron	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Black-headed Grosbeak												1x	1x	1x				1x	
Black-throated Gray Warbler																			
Black-necked Stilt	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x		2x	2x			2x
Blue Grouse	2x	2x																	
Blue-winged Teal	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Bobolink															2x	2x			
Bohemian Waxwing																			
Bonaparte's Gull															1x	1x			1x
Boreal Owl																			
Brewer's Blackbird									2x			2x	2x	2x	2x	2x		2x	
Brewer's Sparrow																			
Broad-tailed hummingbird												2x	2x	2x					
Brown Creeper																			
Brown-headed Cowbird									2x										
Bufflehead	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x	2x	2x	2x			2x
Burrowing Owl	2x	2x	2x	2x			2x	2x	2x										
California Gull				1x													1x	1x	
Calliope Hummingbird					1x	1x				1x	1x	1x	1x	1x	1x	1x			
Canada Goose									1x			1x	1x	1x	1x	1x			1x
Canvasback	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x	2x	2x	2x			2x
Canyon Wren	1x	1x			1x	1x													
Cassin's Finch																			
Cassin's Vireo												1x	1x	1x					
Cedar Waxwing									1x									1x	
Chestnut-backed Chickadee																			
Chipping Sparrow										1x	1x							1x	
Chukar		1x		1x		1x	1x	1x											
Cinnamon Teal	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Clark's Nutcracker																			
Cliff Swallow	1x		1x		1x		1x	1x	1x	1x	1x	1x	1x	1x	1x	1x		1x	1x
Columbian sharp-tailed Grouse		2x	2x	2x											2x	2x			
Common Goldeneye	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x	2x	2x	2x			2x
Common Loon																			2x
Common Merganser	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x		2x			2x
Common Nighthawk	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			

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COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Common Poorwill																			
Common Raven																			
Common Redpoll																			
Common Snipe	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x
Common Tern																			1x
Common Yellowthroat					1x	1x						1x	1x	1x	1x	1x			1x
Cooper's Hawk																			
Dark-eyed Junco	1x	1x	1x	1x	1x	1x	1x	1x		1x	1x	1x	1x	1x					
Double-crested Cormorant												1x	1x	1x			1x		1x
Downy Woodpecker																			
Dusky Flycatcher										1x	1x								
Eared Grebe																			1x
Eastern Kingbird	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x					
European Starling																			
Evening Grosbeak																			
Ferruginous Hawk	2x	2x	2x	2x	2x	2x	2x	2x	2x										
Flammulated Owl																			
Forster's Tern	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Fox Sparrow												2x	2x	2x					
Franklin's Gull									1x						1x	1x			1x
Gadwall	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Golden-crowned Kinglet																			
Golden-crowned Sparrow																			
Golden Eagle	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x					
Grasshopper Sparrow			2x	2x															
Gray Catbird												1x	1x	1x					
Cray-crowned Rosy Finch										2x	2x						2x		
Gray Jay																			
Gray Partridge	1x	1x	1x	1x	1x	1x	1x	1x	1x										
Great Egret	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Great Blue Heron	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Great Gray Owl													2x	2x	2x	2x			
Great Horned Owl																			
Greater Sandhill Crane	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x	2x	2x	2x			2x
Greater Scaup																			
Greater Yellowlegs	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x	1x		1x

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	AG. BUNCH		FES-BUNCH		NAT. FORB		EXFRB/ANGR		CROP	ALPINE TUNDRA		SHRUB WETLAND			HERB WET		BARR.	URBN	WAT.
COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Green-winged Teal	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Gyrfalcon							1x	1x	1x										1x
Hairy Woodpecker																			
Hammond's Flycatcher																			
Harlequin Duck																			2x
Harris' Sparrow												1x	1x	1x					
Hermit Thrush																			
Hooded Merganser	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x		2x			2x
Horned Grebe																			1x
Horned Lark	1x	1x	1x	1x	1x	1x	1x	1x	1x										
House Finch																			
House Sparrow							1x	1x	1x									1x	
House Wren									1x									1x	
Killdeer	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x
Lark Sparrow		2x	2x	2x	2x	2x	2x	2x											
Lazuli bunting												2x	2x	2x					
Least Sandpiper	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x	1x		1x
Lesser Scaup	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Lesser Yellowlegs	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x	1x		1x
Lewis' Woodpecker																			
Lincoln's Sparrow																			1x
Loggerhead Shrike																			
Long-billed Curlew	2x	2x	2x	2x	2x	2x	2x	2x	2x					2x		2x			2x
Long-billed Dowitcher	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x	1x		1x
Long-eared Owl					2x	2x						2x	2x	2x					
Macgillivray's Warbler												1x	1x	1x					
Mallard	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x		2x	2x
Marbled Godwit	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x			1x
Marsh Wren	1x	1x			1x	1x				1x	1x	1x	1x	1x	1x	1x			1x
Merlin	1x			1x	1x	1x	1x	1x	1x				1x	1x		1x	1x	1x	
Mountain Bluebird	1x	1x	1x	1x	1x	1x	1x	1x		1x	1x								
Mountain Chickadee																			1x
Mountain Quail																			
Mourning Dove	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x				1x	
Nashville Warbler																			1x
Northern Flicker												1x	1x	1x	1x	1x		1x	

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COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Northern Goshawk																			
Northern Harrier	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			
Northern Oriole												1x	1x	1x				1x	
Northern Pintail	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Northern Pygmy Owl																			
Northern Rough-winged Swallow	1x	1x			1x	1x	1x	1x				1x	1x	1x	1x	1x			1x
Northern Saw-whet Owl																			
Northern Shoveler	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Northern Shrike	1x	1x	1x	1x	1x	1x	1x	1x	1x										
Olive-sided Flycatcher																			
Orange-crowned Warbler												1x	1x	1x					
Osprey													1x	1x	1x	1x			1x
Peregrine Falcon	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x
Pied-billed Grebe																			1x
Pileated Woodpecker																			
Pine Grosbeak																			
Pine Siskin																			
Prairie Falcon	1x	1x	1x	1x	1x	1x							1x	1x			1x		1x
Purple Finch																			
Pygmy Nuthatch																			
Red Crossbill																			
Red-breasted Nuthatch																			
Red-breasted Sapsucker																			
Red-eyed Vireo																			
Red-naped Sapsucker																			
Red-necked Grebe															2x	2x			2x
Red-necked Phalarope	1x	1x			1x	1x						1x	1x	1x	1x	1x			1x
Red-tailed Hawk	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x		1x			1x	1x			
Red-winged blackbird	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x		1x	1x
Redhead	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x	2x	2x	2x			2x
Ring-billed Gull				1x													1x	1x	
Ring-necked Duck															2x	2x			2x
Ring-necked Pheasant									1x										
Rock Dove							1x	1x	1x									1x	
Rock Wren	1x	1x	1x	1x	1x	1x	1x	1x											
Ross' Goose									1x										1x

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COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Rough-legged Hawk	1x	1x	1x	1x	1x	1x	1x	1x	1x										
Ruby-crowned Kinglet																			
Ruddy Duck	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x	2x	2x	2x			2x
Ruffed Grouse																			
Rufous Hummingbird												2x	2x	2x					
Sage Sparrow																			
Sage Thrasher																			
Savannah Sparrow	1x	1x	1x	1x	1x	1x	1x	1x							1x	1x			
Say's Phoebe							1x	1x	1x										
Semipalmated Plover		1x		1x		1x			1x								1x		1x
Sharp-shinned Hawk																			
Short-eared Owl	2x	2x	2x	2x	2x	2x	2x	2x	2x						2x	2x			
Snow Bunting																			
Snow Goose									1x										1x
Snowy Owl					1x	1x	1x	1x	1x	1x	1x				1x	1x			1x
Solitary Sandpiper	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x	1x		1x
Sora	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Spotted Sandpiper	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x	2x		2x	2x	2x	2x			2x
Spotted Towhee												1x	1x	1x	1x	1x			
Spruce Grouse																			
Steller's Jay																			
Swainson's Hawk	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x					1x
Swainson's Thrush																			
Three-toed Woodpecker																			
Townsend's Solitaire																			
Townsend's Warbler																			
Tree Swallow	1x	1x											1x					1x	
Trumpeter Swan	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Tundra Swan									1x			1x	1x	1x	1x	1x			1x
Turkey Vulture	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x					
Upland Sandpiper	2x	2x	2x	2x	2x	2x	2x									2x			2x
Varied Thrush																			
Vaux's Swift																			
Veery												2x		2x					
Vesper Sparrow			2x	2x	2x	2x													
Violet-green Swallow																		1x	1x

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COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Virginia Rail	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Warbling Vireo												1x	1x	1x					
Western Bluebird	2x	2x	2x	2x	2x	2x			2x										
Western Grebe															2x	2x			2x
Western Kingbird	1x	1x	1x	1x			1x	1x	1x										
Western Meadowlark			2x	2x															
Western Screech Owl																		1x	
Western Tanager																			
Western Wood-Pewee									1x			1x	1x	1x				1x	
White-breasted Nuthatch																			
White-crowned Sparrow																			
White-faced Ibis																			
White-headed Woodpecker																			
White-throated Sparrow																			
White-throated Swift	1x	1x	1x	1x			1x	1x				1x	1x	1x					
White-winged Crossbill																			
Wild Turkey																			
Willet	2x	2x	2x	2x	2x	2x	2x	2x	2x				2x	2x	2x	2x			2x
Williamson's Sapsucker																			
Willow Flycatcher												2x	2x	2x					
Wilson's Phalarope	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x	2x		2x
Wilson's Warbler												2x	2x	2x					
Winter Wren																			
Wood Duck												2x	2x	2x	2x	2x			2x
Yellow Warbler												1x	1x	1x					
Yellow-bellied Sapsucker																			
Yellow-billed Cuckoo												2x							
Yellow-breasted Chat												2x	2x	2x					
Yellow-headed Blackbird			1x	1x	1x	1x			1x			1x	1x	1x	1x	1x			1x
Yellow-rumped Warbler																			
Mammal																			
American Badger																			
American Beaver							1x	1x	1x			1x	1x	1x					1x
American Marten																			
American Pika					1x	1x				1x	1x						1x		

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COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Belding's Ground Squirrel	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x				1x	1x			
Big Brown Bat																			1x
Black Bear					1x	1x				1x	1x	1x	1x	1x	1x	1x			
Bobcat	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x	1x		
California Myotis																			
Columbian Ground Squirrel	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x				1x	1x			
Common Muskrat	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x			1x
Common Porcupine												1x	1x	1x					
Common Raccoon							1x	1x	1x			1x	1x	1x					1x
Coyote	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x		
Deer Mouse	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x			
Dusky Shrew																			
Eastern Fox Squirrel									1x									1x	
Ermine					1x	1x				1x	1x				1x	1x			
Fisher																			
Fringed Myotis																	2x		
Gapper Red-backed Vole																			
Great Basin Pocket Mouse	1x	1x			1x	1x	1x	1x									1x		
Golden-mantled Ground Squirrel										1x	1x								
Heather Vole					1x	1x				1x	1x				1x	1x			
Hoary Bat																		2x	2x
House Cat(feral)																			
House Mouse									1x										
Little Brown Myotis																			
Long-eared Myotis													2x					2x	2x
Long-legged Myotis																	2x	2x	2x
Long-tailed Myotis																			
Long-tailed Vole					1x	1x				1x	1x	1x	1x	1x	1x	1x			
Long-tailed Weasel	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x		
Lynx												1x	1x	1x					
Merriam's Shrew	1x	1x	1x	1x	1x	1x													
Mink	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			1x
Mountain vole																			
Moose												1x	1x	1x					
Mountain Cottontail	1x	1x	1x	1x	1x	1x													
Mountain Goat					2x	2x				2x	2x						2x		

1=no local data
2=regional data or local knowledge
3=replicable data and local agreement
X=ICBEMP
O=ODFW
S=Sallabanks

Highlight=species of concern

	DRY GRASS									OTHER									
	AG. BUNCH		FES-BUNCH		NAT. FORB		EXFRB/ANGR		CROP	ALPINE TUNDRA		SHRUB WETLAND			HERB WET		BARR.	URBN	WAT.
COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Mountain Lion	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x			
Mule Deer	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x	1x			
Northern Flying Squirrel																			
Northern Pocket Gopher	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			
Northern River Otter												1x	1x	1x					1x
Pale Western Big-eared Bat													2x				2x		2x
Pallid Bat		2x	2x	2x	2x	2x	2x	2x	2x								2x		2x
Preble's Shrew	2x	2x	2x	2x	2x	2x													
Red Fox(native)					1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			
Red Squirrel																			
Rocky Mountain(Bighorn)Sheep	2x	2x	2x	2x	2x					2x	2x						2x		
Sagebrush Vole																			
Silver-haired Bat														2x				2x	2x
Snowshoe Hare																			
Spotted Bat													2x	2x			2x	2x	2x
Striped Skunk									1x			1x	1x					1x	
Townsend's Big-eared Bat																			
Townsend's Ground Squirrel	1x	1x	1x	1x	1x	1x	1x	1x	1x								1x		
Vagrant Shrew	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x			
Wapiti(elk)	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x	1x	1x			
Water Shrew												2x	2x	2x					2x
Water Vole										2x	2x				2x	2x			2x
Western Harvest Mouse							1x	1x	1x			1x	1x	1x					1x
Western Jumping Mouse					1x	1x	1x	1x				1x	1x	1x	1x	1x			
Western Pipistrelle																			1x
Western Small-footed Myotis	2x				2x							2x							
Western Spotted Skunk							1x	1x	1x			1x	1x	1x					
White-tailed Deer	1x	1x	1x	1x	1x	1x	1x	1x	1x			1x	1x	1x					
White-tailed Jackrabbit	1x	1x	1x	1x	1x	1x													
Wolf	1x	1x	1x	1x	1x	1x						1x	1x	1x	1x	1x			
Wolverine										2x	2x						2x		
Yellow-bellied Marmot	1x	1x	1x	1x	1x	1x	1x	1x	1x										
Yellow-pine Chipmunk																			
Yuma Myotis																		2x	2x
Reptiles																			

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	DRY GRASS									OTHER									
	AG. BUNCH		FES-BUNCH		NAT. FORB		EXFRB/ANGR		CROP	ALPINE TUNDRA		SHRUB WETLAND			HERB WET		BARR.	URBN	WAT.
COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Common Garter Snake	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x			2x
Gopher Snake		1x		1x		1x		1x					1x			1x	1x		
Painted Turtle	2x	2x	2x	2x	2x	2x	2x	2x	2x			2x	2x	2x	2x	2x		2x	2x
Racer		1x		1x		1x		1x											
Rubber Boa							2x	2x											
Western Fence Lizard		1x				1x	1x	1x	1x				1x						
Western Rattlesnake		1x		1x		1x							1x				1x		
Western Skink		1x		1x		1x													
Western Terrestrial Garter Snake		1x	1x	1x		1x		1x					1x			1x			
Fish																			
Black Bullhead																			3o
Black Crappie																			3o
Bluegill																			3o
Bridgelip Sucker																			3o
Brook Trout																			3o
Brown Bullhead																			3o
Bulltrout																			3o
Channel Catfish																			3o
Chinook Salmon																			3o
Chiselmouth																			3o
Common Carp																			3o
Cutthroat Trout																			3o
Flathead Catfish																			3o
Golden Trout																			3o
Goldfish																			3o
Largemouth Bass																			3o
Lake Trout																			3o
Largescale Sucker																			3o
Longnose Dace																			3o
Mountain Sucker																			3o
Mountain Whitefish																			3o
Northern Squawfish																			3o
Pacific Lamprey																			3o
Paiute Sculpin																			3o
Peamouth																			3o

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Highlight=species of concern

	DRY GRASS									OTHER										
	AG. BUNCH		FES-BUNCH		NAT. FORB		EXFRB/ANGR		CROP	ALPINE TUNDRA		SHRUB WETLAND			HERB WET		BARR.	URBN	WAT.
COVER TYPES	CS06	CS06	CS13	CS13	CS07	CS07	CS08	CS08	CS12	C005	C005	CS05	CS05	CS05	C007	C007	C006	CS19	CS20
STAND STRUCTURE	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Oh	Ch	Olms	Clms	Cts	Olms	Clms	Ch	Oh	R	U	W
SPECIES / RESIDENCE * ASSESS																			
Pumpkinseed																			3o
Redband Trout																			3o
Rainbow Trout																			3o
Redside Shiner																			3o
American Shad																			3o
Shorthead Sculpin																			3o
Smallmouth Bass																			3o
Sockeye(incl. Kokanee)Salmon																			3o
Speckled Dace																			3o
Steelhead Trout																			3o
Tadpole Madtom																			3o
Torrent Sculpin																			3o
White Crappie																			3o
White Sturgeon																			3o
Yellow Bullhead																			3o
Yellow Perch																			3o

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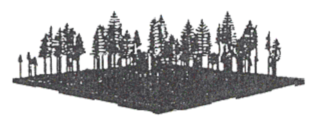
Structure Based Management

Structural Stage Definitions

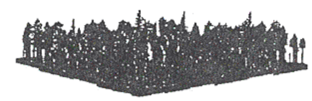
Stand Initiation (SI)

Forest growing space is reoccupied by young trees following a stand-replacing disturbance (e.g., fire).



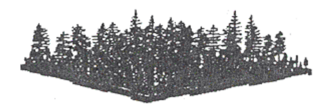
Stem Exclusion, Open Canopy (SEOC)

Occurrence of new trees is excluded (moisture-limited situation); the forest canopy is broken and tree crowns are open-growing.



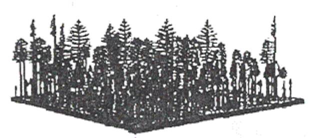
Stem Exclusion, Closed Canopy (SECC)

Occurrence of new trees is excluded (light-limited situation); the forest canopy is closed and tree crowns are abrading.



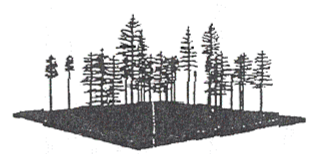
Understory Reinitiation (UR)

A new age group of trees establishes under the mortality-induced openings of the older overstory.



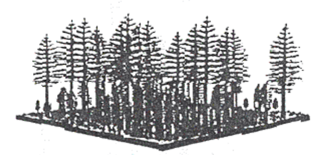
Young Forest, MultiStory (YFMS)

Several age groups are established; large trees are generally absent.



Old Forest, Single Story (OFSS)

Understory trees generally are absent; large trees are present and significant in the overstory.



Old Forest, MultiStory (OFMS)

Diverse horizontal and vertical distributions of tree sizes occur; with large trees also present and significant in the overstory.

Adapted from: *Hessburg, Paul F., and Bradley G. Smith. 1995. Assessing Change in Vegetation Structure and Composition at Midscale in the Interior Columbia River Basin Assessment: Analysis Plan. USDA Forest Service. (Draft Report)*

Ofs: Old forest single story.
Understory trees generally are absent; large trees are present and significant in the overstory. See footnotes 1 and 2.

Ofm: Old forest multistory.
Diverse horizontal and vertical distributions of tree sizes occur; with large trees also present and significant in the overstory. See footnotes 1 and 2.

Yf: Young forest multistory.
Several age groups are established; large trees are generally absent. See footnotes 1 and 3.

Ur: Understory reinitiation.
A new age group of trees establishes under the mortality-induced openings of the older overstory.

Seo: Stem exclusion open canopy.
Occurrence of new trees is excluded (moisture-limited situation); the forest canopy is broken and tree crowns are open-growing.

Sec: Stem exclusion closed canopy.
Occurrence of new trees is excluded (light-limited situation); the forest canopy is closed and tree crowns are abrading.

Si: Stand initiation.
Forest growing space is reoccupied by young trees following a stand-replacing disturbance (e.g. fire).

Wdl: Woodland.
Ots: Open canopy tall shrub. See notes 4, 6 and 7.
Cts: Closed canopy tall shrub. See notes 5, 6 and 7.
Olms: Open canopy low-medium shrub. See notes 4, 6 and 7.
Clms: Closed canopy low-medium shrub. See notes 5, 6 and 7.
Oh: Open herb. See notes 4 and 7.
Ch: Closed herb. See notes 5 and 7.
U: Urban.
W: Water.
R: Rock/barren.

Footnotes

1. Stand structure is based on size not age. Large diameter at breast height is not always equal to old age.
2. Diameter at breast height for “old” classification.
   - Whitebark pine = 12 inches.
   - Engelmann spruce/subalpine fir = 13 inches.
   - Mountain hemlock = 12 inches.
   - Interior Douglas fir = 21 inches.
   - Western larch = 21 inches.
   - Lodgepole pine = 12 inches.
   - Interior ponderosa pine = 21 inches.
   - Juniper = 21 inches.
   - Grand fir = 21 inches.
3. Trees with diameters at breast height smaller than stated in footnote #2 are considered young trees.
4. Open implies that the stands are not dense enough for crowns to intermingle.
5. Closed implies that crowns grow in high enough density for crowns to overlap.
6. Tall and low-medium describe stature.
7. Shrub and herb describe the vegetative type.

COVER TYPES

COLD FOREST

S208 Whitebark Pine
S206 Engelmann Spruce/Subalpine fir
S205 Mt. Hemlock

DRY FOREST

S210 Interior Douglas-fir
S212 Western Larch
S218 Lodgepole Pine
S217 Aspen
S237 Interior Ponderosa Pine
S235 Cottonwood/Willow
CS01 Juniper Woodlands
CS02 Mixed Conifer Woodlands

MOIST FOREST

CS09 Grand fir

COOL SHRUB

C003 Shrub or Herb/Tree Regen
R322 Mountain Mahogany
R402 Mountain Big Sagebrush
R421 Chokecherry/Serviceberry/Rose

DRY SHRUB

R104 Antelope Bitterbrush/Bluebunch Wheatgrass

DRY GRASS

CS06 Agropyon Bunchgrass
CS13 Fescue-Bunchgrass
CS07 Native Forb
CS08 Exotic Forbs/Annual Grass
CS12 Cropland/Hay/Pasture

OTHER

C005 Alpine Tundra
CS05 Shrub Wetlands
C007 Herbaceous Wetlands
C006 Barren
CS19 Urban
CS20 Water

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GLOSSARY

Achene. A small, dry, one-celled, one-seeded indehiscent fruit, the seed attached to the pericarp at one place.

Alluvial. Pertaining to or composed of alluvium, or deposited by a stream or running water.

Bracts. A more or less modified leaf situated near a flower or infloresncense.

Catkin. A spike or spike-like, usually pendulous, inflorescence of unisexual flowers.

Clearcut * Any type of cutting in which all the merchantable timber is cut, and all the trees that cannot be utilized profitably are left – two acres and larger in size – evenage management.

Colluvial. A general term applied to loose or incoherent deposits, usually at the foot of a slope or cliff brought there by gravity. Talus and cliff and cliff debris are included in such deposits.

CRP. A USDA program designed to seed highly erodable land to native vegetation for a period of 10 years to reduce erosion.

Deciduous. Falling away, not persistent or evergreen.

Ecotone. A place where two successional stages or two different plant communities overlap each other; a place where two separate habitats meet and produce a third habitat with characteristics of both parent habitats.

Group Selection* ¼ to 2 acre group removal – groups of maximum size resemble small clearcuts – able to maintain some intolerant species (able to withstand sunlight) – unevenage management.

Historic range of variability. Historic range of variability is a way of expressing how much of each stand structure in each cover type existed under natural conditions in Wallowa County. HRV data was assembled by scientists from the Wallowa-Whitman, Umatilla, and Malheur national forests to be used for and specific to northeast Oregon forests.

Irregular Shelterwood* The maintenance of 2 to 4 evenage classes in the stand- intermediate position between evenage and unevenage management (manage easy of evenage with appearance of unevenage).

Mesic. Characterized by, relating to, or requiring a moderate amount of moisture.

Montane. Of, relating to or growing in the biogeographic zone of relatively cool moist upland slopes below timberline dominated by evergreen trees.

Needle ice. Needle shaped ice formations found in tundra soils.

Ovulate. Bearing an ovule. The ovule is the structure that turns into a seed.

Panicle. A compound inflorescence with the younger flowers at the apex or center.

Patterned ground. Features found in tundra environments resulting from frost heaving.

Pericarp. The wall of the ripened ovary and therefore the wall of the fruit.

Prickle. A small, usually slender outgrowth of the young bark, coming off with it.

Raceme. An inflorescence with pedicelled flowers borne along a more or less elongated axis with the younger flowers nearest the apex.

Reflexed. Abruptly bent or turned downward or backward.

Rhizomes. Any prostrate more or less elongated stem growing partly or completely beneath the ground.

Seed Cut of Shelterwood* To open up enough growing space in a single operation to allow the establishment of regeneration – the number of reserve trees depends on size and species (usually 15-30 trees per acre) – evenage management.

Seral. A series of ecological communities formed in ecological succession.

Shelterwood Removal Cut* Objective of gradually uncovering the new crop of trees and of making best use of the potentialities of the remnants of the old crop to increase in value – can be one or more entries for removal – evenage management.

Silviculture. A branch of forestry dealing with the development and care of forests.

Single-tree Selection* Removal of individual trees rather than groups of trees – species are tolerant (able to withstand shade) – unevenage management

Stamen. One of the pollen-bearing organs of a flower.

Staminate. Bearing stamens only.

Stolon. A trailing root above ground rooting at the nodes. Runner.

Stomatal. Constituting plant stomata. A small opening on the surface of a leaf through which gaseous exchange takes place.

Style. The stalk-like part of a pistil connecting the ovary to the stigma.

Terminal cymes. A flower cluster, often convex or flat-topped, in which the central or terminal flower blooms earliest.

Tiller. A stalk or sprout growing from the base of a plant.

* From The Practice of Silviculture by David Martyn Smith (1962)

APPENDIX N BIO

This addendum to the Wallowa County/Nez Perce Tribe Salmon Recovery Plan was funded with a grant from the Oregon State Lottery through the Regional Strategies fund administered by State of Oregon Economic Development Department. The grant was awarded by the Northeast Oregon Alliance made up of a board of volunteers who chose the project and were appointed by Union, Baker, and Wallowa Counties. The Wallowa County court with the NRAC (Natural Resources Advisory Committee) coordinated the effort, received the funding, and hired the contractor. Wallowa Resources wrote the grant.

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Jim Dawson
Bruce Dunn
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Mack Huff
Howard Johnson
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Rick Lusk
Tom Macy
Mike Mahon
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Dan Sherwin
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Appendix O

Matrix – Alternatives
for
Producing Various Stand Structures

Appendix O

Management Alternatives for Producing Various Stand Structures

To

From

		ofs	ofm	yf	ur	seo	sec	si	wdl	ots	cts	olms
Old Forest Single	ofs	2e	2d, 2e, 2f, 3, 10, 24, 30	1, 1a, 2a, 2b, 24	1, 1a, 2, 2b, 3	1, 1a, 2, 24	3,10	2b, 3	1, 1a, 2a	1, 1a, 12b	1, 1a, 12b	1, 1a, 12b
Old forest Multi	ofm	1, 1a, 2,24	2d, 2e, 2f	1, 2c, 2d	2a, 2b, 3	1, 1a, 24	1, 1a, 2	1, 1a, 2a, 2b, 3	1, 1a, 2a	1, 1a, 12b	1, 1a, 12b	1, 1a, 12b
Young Forest	yf	1, 1a, 2	2, 2d, 2e	2d	2	2	1, 1a	2	1, 1a, 2a	1, 1a, 12b	1, 1a, 12b	1, 1a, 12b
Understory Reinitiation	ur	2	2	2	X	--	--	--	2	1, 1a	1, 1a	1, 1a
Stem Exclusion Open Story	seo	1, 1a	3	3	1, 1a	X	--	1, 1a, 2a, 3	1, 1a, 2a, 3	1, 1a, 12b	1, 1a, 12b	1, 1a, 12b
Stem Exclusion Close Story	sec	--	2, 2a	2, 2a, 3	1, 1a, 2a, 2b	1, 1a, 2, 2a	X	1, 2b, 3	3	1, 2b	1, 2b	1, 2b
Stand Initiation	si	1a, 2	1a, 2	1a, 2	--	1, 1a, 2	--	X	1, 1a, 2	1, 1a	1, 1a	1, 1a
Woodland	wdl	1	3	2, 3	2a, 3	1	1, 3	2a, 3	x	2c	2c	2c
Open Canopy Tall Shrub	ots	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	x	6, 10, 20a, 28, 34, 49, 50, 108	10, 20a,59
Closed Canopy Tall Shrub	cts	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	10, 20a, 59	x	10, 20a,59
Open Canopy Low-Med Shrub	olms	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	10, 20a, 28, 34, 49, 50, 108	10, 20a, 28, 34, 49, 50, 108	x

		ofs	ofm	yf	ur	seo	sec	si	wdl	ots	cts	olms
Closed Canopy Low-med Shrub	**clms**	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	10, 20a, 28, 34, 49, 50, 108	10, 20a, 28, 34, 49, 50, 108	10, 20a,59
Open Herb	**oh**	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	1 ,2, 3	6, 10, 20a, 28, 34, 49, 50, 108	6, 10, 20a, 28, 34, 49, 50, 108	6, 10, 20a, 28, 34, 49, 50, 108
Closed Herb	**ch**	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3	0, 20a, 28, 34, 49, 50, 59, 10	10, 20a, 28, 34, 49, 50, 108	10, 20a, 28, 34, 49, 50, 108
Urban	u	X	X	X	X	X	X	X	x	6, 10, 20a	6, 10, 20a	6, 10, 20a, 50
Water	**W**	X	X	X	X	X	X	X	x	10, 20a	10, 20a	10, 20a
Rock/Barren	**r**	X	X	X	X	X	X	X	x	10, 20a	10, 20a	10, 20a

Footnote: Numbers in boxes are from “Appendix B – Problems/Solutions Summary.”

Appendix P

Studies Identified

Appendix P – Studies

The following are studies identified in the reach by reach portion that need to be done.

Areas Needing Studied	**Reach**
Temperature	Imnaha River – Wilderness Boundary to Private Lands (Imnaha 2) Big Sheep Creek – Lick Creek to Imnaha River (2) Prairie Creek – Elk Fence to Hays Fork Wallowa River – Wallowa Lake to Spring Creek
Septic	Imnaha River – Private Lands to Town of Imnaha (Imnaha 3) Imnaha River – Town of Imnaha to Snake River (Imnaha 4) Big Sheep Creek – Lick Creek to Imnaha River (2) Lostine River – Stratheran's Pond to Wallowa River (2) Bear Creek – Chamberlain Ditch Diversion to Wallowa River (2) Grande Ronde River - Wildcat Creek to State Line (3) Hurricane Creek – Upper Diversions to Third Bridge Hurricane Creek – Third Bridge to Wallowa River Prairie Creek – Elk Fence to Hays Fork Prairie Creek –Hays Fork to Wallowa River Wallowa River – Wallowa Lake to Spring Creek Wallowa River – Spring Creek to Head of Wallowa Canyon
Feedlots	Big Sheep Creek – Lick Creek to Imnaha River (2) Lostine River – Stratheran's Pond to Wallowa River (2)
Irrigation Withdrawals	Big Sheep Creek – Headwaters to Lick Creek (Big Sheep Creek 1)
Minimum Flow	Big Sheep Creek – Headwaters to Lick Creek (Big Sheep Creek 1)
Flushing Flow	Big Sheep Creek – Headwaters to Lick Creek (Big Sheep Creek 1)
Diversion Screening	Big Sheep Creek – Headwaters to Lick Creek (Big Sheep Creek 1) Grande Ronde River – Wildcat Creek to State Line Hurricane Creek – Upper Diversions to Third Bridge Prairie Creek – Elk Fence to Hays Fork Wallowa River – Wallowa Lake to Spring Creek
Cobble Embeddedness	Big Sheep Creek – Lick Creek to Imnaha River (2)
Predation & Competition	Lostine River – Headwaters to Strathearn's Pond Lostine River – Stratheran's Pond to Wallowa River (2) Wallowa River – Wallowa Lake to Spring Creek (Blue Heron) Wallowa River – Spring Creek to Head of Wallowa Canyon
Physical Barriers	Bear Creek – Chamberlain Ditch Diversion to Wallowa River Prairie Creek – Elk Fence to Hays Fork Wallowa River – Wallowa Lake to Spring Creek Wallowa River – Spring Creek to Head of Wallowa Canyon
Harassment	Bear Creek – Headwaters to Little Bear Creek

Excess Nutrient Loading	Grande Ronde River – Rondowa to Wildcat Creek Prairie Creek – Headwaters to Elk Fence
Future Demands	Hurricane Creek – Upper Diversions to Third Bridge Prairie Creek – Headwaters to Elk Fence Prairie Creek –Hays Fork to Wallowa River Wallowa River – Wallowa Lake to Spring Creek Wallowa River – Spring Creek to Head of Wallowa Canyon

The following are studies that have been done or are currently being done:

Flow measurement	Wallowa and Lostine River, Bear Creek	Available from USGS
Ditch Flow Measurement	Wallowa Lower Valley	Available from Ditch Companies
Water Samples	Various locations in Lower Valley	Available from SWCD
Temperature Data	Various locations in the County	Beginning the summer of 1999, all agencies doing water monitoring are coordinating to reduce duplication and cover a larger area. All data will be kept by the Wallowa County Water Quality Coordinator.