WALLOWA-WHITMAN NATIONAL FOREST

FISH HABITAT IMPROVEMENT

IMPLEMENTATION PLAN

United States Forest Service

Bonneville Power Administration

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WALLOWA-WHITMAN NATIONAL FOREST

FISH HABITAT IMPROVEMENT IMPLEMENTATION PLAN

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GRANDE RONDE RIVER SUBBASIN

UPPER NORTH FORK JOHN DAY RIVER SUBBASIN

FISH HABITAT IMPROVEMENT IMPLEMENTATION PLAN

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ABSTRACT

A Forest wide fisheries habitat improvement program designed to optimize anadromous fish production on National Forest lands is being implemented by the U.S. Forest Service (USFS), with cooperation and support from the Oregon Department of Fish and Wildlife (ODFW) and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). This USFS action plan describes agency improvement efforts and identifies a clear course of action for the interim period April 1, 1988 - March 31, 1992. This plan describes the Grande Ronde and John Day River subbasins' project areas and their associated fisheries characteristics. Program goals, priorities, implementation schedules, and costs are presented along with discussion of the improvement measures for implementation. This program will treat approximately 53.15 miles of instream and riparian habitat by March 31, 1992.

The primary factor limiting chinook and steelhead production is rearing habitat. Five primary factors have been identified which affect the quality and/or quantity of rearing habitat. These factors are: 1) high summer water temperatures, 2) low summer flows, 3) lack of riparian vegetation, 4) lack of habitat diversity, and 5) poor channel stability. Most limiting factors are inter-related. Treatment techniques to be implemented to mitigate these limiting factors are: a) construction of approximately 18.2 miles of riparian pasture fence, b) planting 50.15 miles of stream bank, c) placing instream structures in 50.55 miles of stream.

INTRODUCTION

The Grande Ronde and John Day River Basins Implementation Plan represents a five-year (April 1, 1988 - March 31, 1992) habitat improvement effort by the U.S. Forest Service (USFS) on National Forest lands in Northeast Oregon. This multi-year, multi-phase fish habitat improvement program was initiated in Columbia River basin streams in 1984 funded under the amended (1987) Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program, Measure 703(c)(l), Action Item 4.2. Specific project description and work statements are found in Appendix 1. Principal program funding is being provided by the Bonneville Power Administration (BPA). Complementary anadromous improvement work is also funded through Forest Service fisheries program monies and funds available from timber sale receipts.

USDA FS expenditures on Forest lands since 1984 total approximately $140,000.

The overall Forest fisheries program goal is to optimize anadromous spawning and rearing habitat conditions for juvenile and adult chinook salmon and steelhead trout, thereby maximizing smolt production as a mitigation measure of fishery losses due to Columbia River hydroelectric system.

Achieving optimum fisheries habitat conditions is facilitated through comprehensive and systematic planning efforts such as this implementation plan. This approach provides for long-range budgeting and implementation requirements and establishes a clear course of future action. The work identified in this plan are those highest priority projects which can be completed by March 31, 1992. The current NPPC's subbasin planning process will set subbasin priorities for future habitat improvement projects.

The specific objectives of this plan are:

1. Identify the major limiting factors to salmon and steelhead smolt production in the Grande Ronde and John Day River basins and present the USFS's approach to the analysis of limiting factors.

2. Present prioritized implementation measures necessary to reduce factors limiting chinook and steelhead smolt production.

3. Provide an interim implementation schedule and justification of improvement measures.

4. Estimate outyear implementation costs.

5. Describe potential fisheries benefits from habitat improvements.

The Columbia River Basin Fish and Wildlife Program's goal of doubling anadromous runs in the near future will be achieved through actions in three broad areas; passage, harvest, and production. l/ While passage and harvest issues are outside the scope of management control on National Forest lands, efforts to increase production through optimizing spawning and rearing habitats will play a critical role in achieving long range program objectives.

SUBBASIN DESCRIPTIONS AND FISHERIES RESOURCES

Wallowa-Whitman National Forest (NF) improvement projects within the two subbasins are located on the Baker, Unity, La Grande, and Wallowa Valley Ranger Districts.

The Baker and Unity Ranger Districts administer the upper headwater portions of the North Fork of the John Day River, while the La Grande and Wallowa Valley Ranger Districts administer streams within the Grande Ronde River subbasin; the La Grande District being responsible for the upper Grande Ronde and the Wallowa Valley District the lower Grande Ronde and tributaries.

Following is a brief discussion of each subbasin's physical characteristics:

Grande Ronde River Subbasin

The Grande Ronde River Subbasin is comprised of a drainage area of approximately 4,070 square miles in northeastern Oregon. 2/ The river's headwaters originate from several principal drainages, all located on NF lands. Those streams are the Joseph and Catherine creeks, the Upper Grande Ronde, Wenaha, Wallowa, Lostine, and Minam rivers and a few smaller tributaries. The Upper Grande Ronde drainage, approximately 1622 square miles above the confluence of the Grande Ronde and Wallowa rivers, currently contains three ongoing improvement projects on Forest lands (Figure 1). The Joseph Creek drainage, the major river drainage within the lower Grande Ronde River, drains approximately 556 square miles and contains four major ongoing projects on National Forest lands (Figure 2).

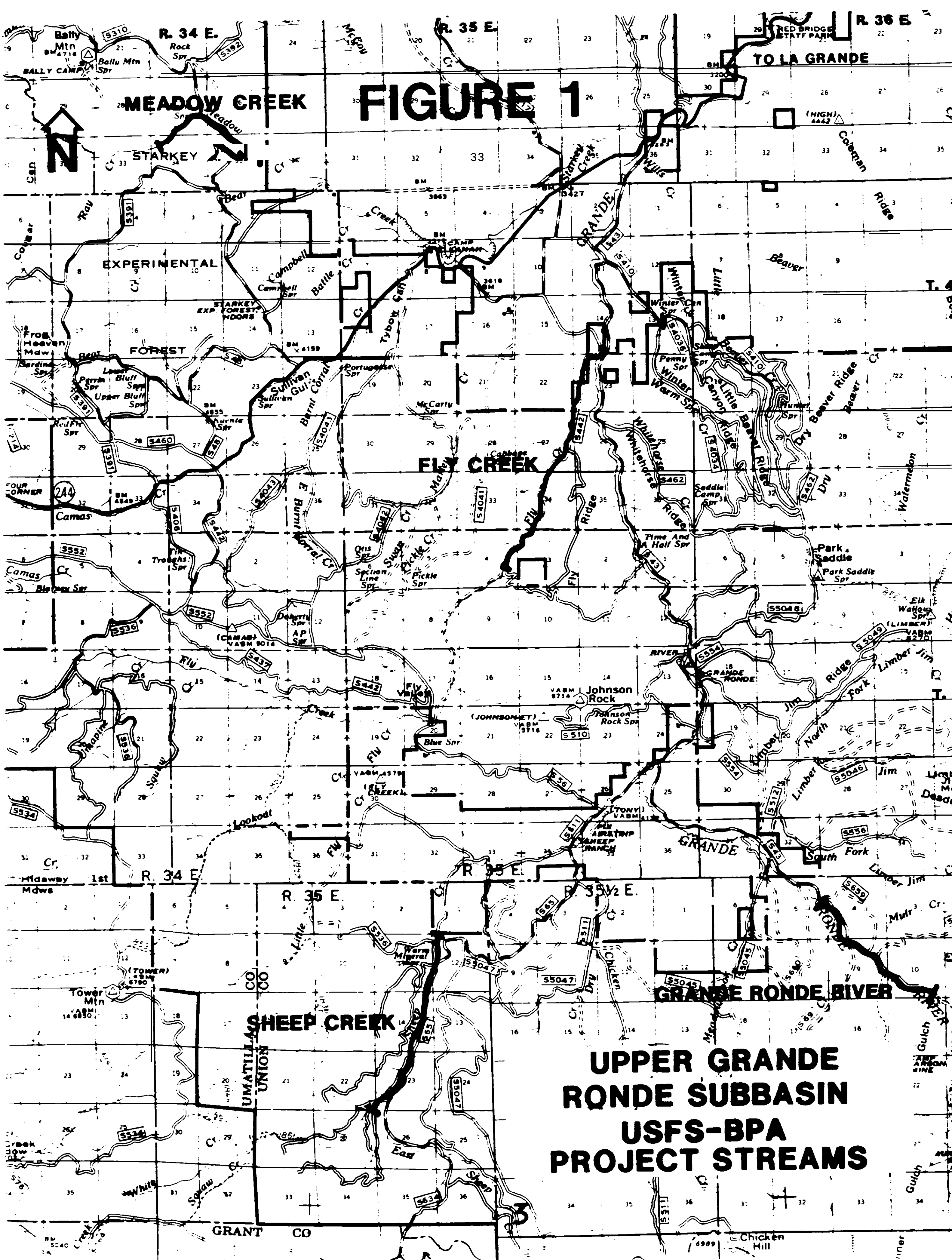
FIGURE 1
UPPER GRANDE RONDE SUBBASIN
USFS-BPA
PROJECT STREAMS
MEADOW CREEK
FLY CREEK
SHEEP CREEK
GRANDE RONDE RIVER
TO LA GRANDE
R. 34 E.
R. 35 E.
R. 36 E.
R. 35½ E.
N
STARKEY
EXPERIMENTAL
FOREST
UMATILLA CO
UNION CO
GRANT CO
Johnson Rock
Tower Mtn
Bally Mtn

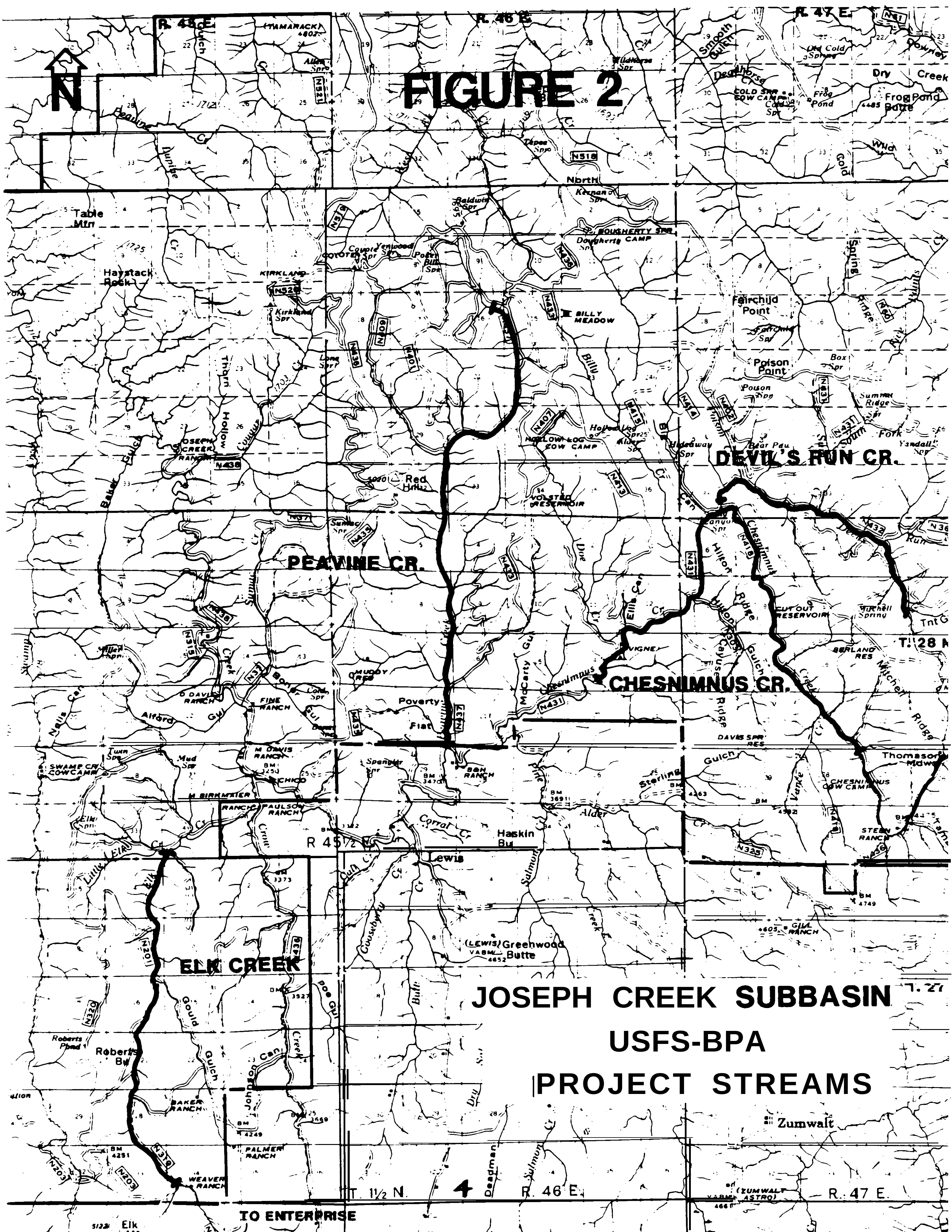

FIGURE 2
N
R. 45 E.
R. 46 E.
R. 47 E.
PEAVINE CR.
DEVIL'S RUN CR.
CHESNIMNUS CR.
ELK CREEK
JOSEPH CREEK SUBBASIN
USFS-BPA
PROJECT STREAMS
Table Mtn
Haystack Rock
Fairchild Point
Poison Point
Red Hill
Poverty Flat
Haskin Bu
Lewis
Greenwood Butte
Roberts Bu
Zumwalt
Thomason Mdw
BILLY MEADOW
VOLSTED RESERVOIR
CUT OUT RESERVOIR
JOSEPH CREEK RANCH
FINE RANCH
PAULSON RANCH
B&H RANCH
STEEN RANCH
BAKER RANCH
PALMER RANCH
WEAVER RANCH
CHESNIMNUS COW CAMP
HOLLOW LOG COW CAMP
Dougherty CAMP
R 45 1/2 E
T. 1 1/2 N.
R. 46 E.
R. 47 E.
TO ENTERPRISE

While these upstream areas are all on National Forest lands, those lands below the headwaters lie primarily in private ownership. Streamflow patterns in the Grande Ronde exhibit typical spring floods common to northeast Oregon streams with minimum flows usually occurring in August or September. Average annual discharge in the lower Grande Ronde is 3,107 cfs. 3/

John Day Subbasin

The North Fork of the John Day River originates on the northeast slopes of Columbia Hill, a peak of the Elkhorn Mountain Range within the North Fork John Day wilderness. After three miles the stream leaves wilderness at Peavy Cabin, a local landmark, and reenters the wilderness near the North Fork John Day Campground, approximately seven miles of non-wilderness stream. The North Fork of the John Day River is under consideration for addition to the National Wild and Scenic Rivers System. The river and its tributaries provide over 40 stream miles of salmon and steelhead habitat. Anadromous fish contend with the lower three Columbia River dams with regard to upstream and downstream passage.4/ Figure 3 identifies proposed John Day subbasin fisheries improvement projects on NF lands.

Within the Grande Ronde Basin 140.5 miles of stream on National Forest lands have been identified as requiring habitat improvement (Table 1 and 2). Approximately 198.1 miles of stream on private lands also require rehabilitation. Within the John Day Basin, an estimated 45 stream miles require improvement. 5/

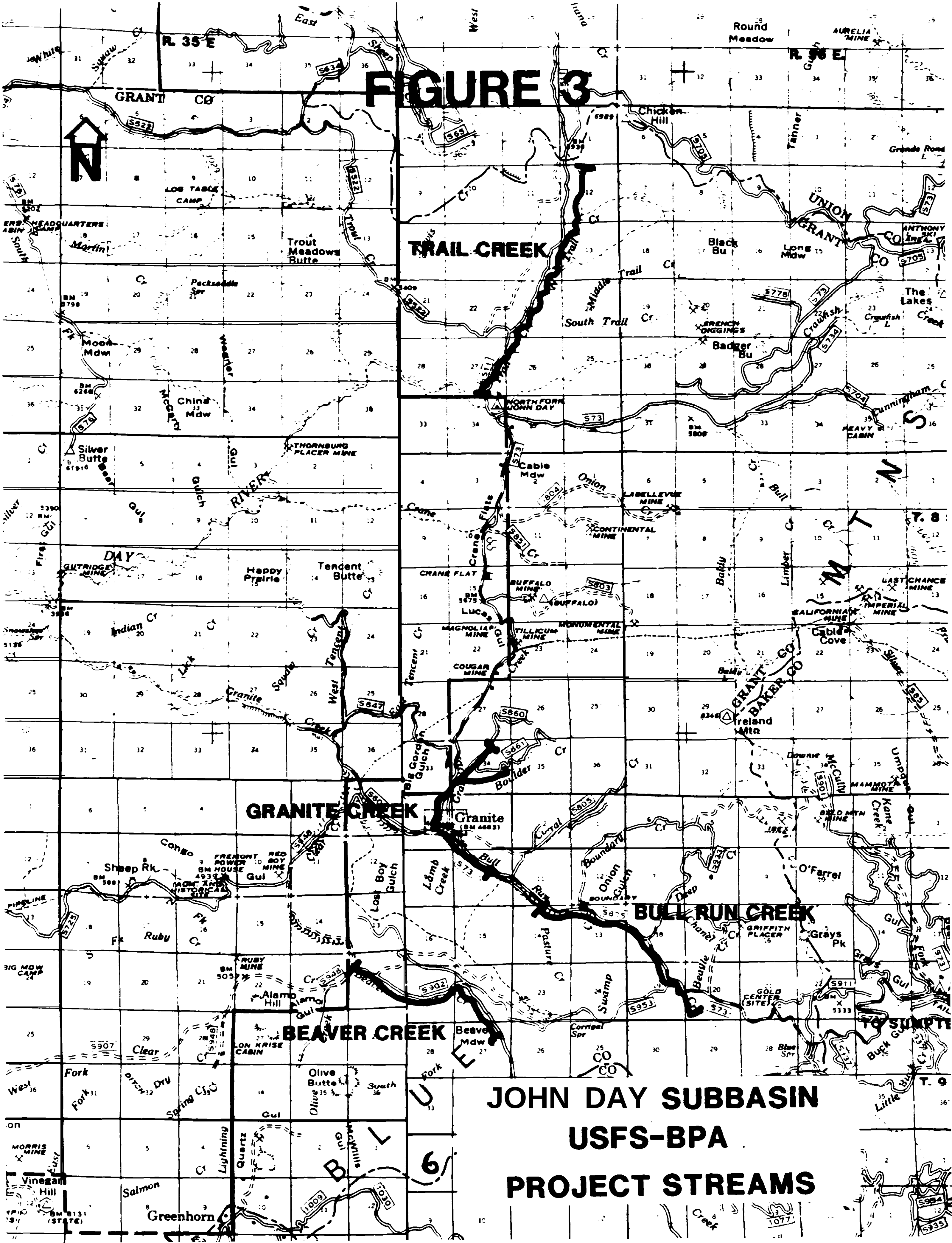
FIGURE 3
TRAIL CREEK
GRANITE CREEK
BULL RUN CREEK
BEAVER CREEK
JOHN DAY SUBBASIN
USFS-BPA
PROJECT STREAMS

Table 1. The estimated amount of riparian and instream habitat work needed within the Joseph Creek drainage by stream on NF lands.

Joseph Creek Drainage	Species Affected	Miles of Stream	Miles of Riparian Work: Fencing	Miles of Riparian Work: Planting	Instream Structures
Peavine Creek	Stld	8.0	4.5	4.5	43
Elk Creek	Stld	3.5	3.5	3.5	25
Chesnimnus Creek	Stld	12.0	12.0	8.0	60
Crow Creek	Stld	1.0	1.0	0.0	10
Swamp Creek	Stld	5.0	5.0	2.5	10
Pine Cr. System	Stld	2.0	2.0	2.0	10
Devil's Run Cr.	Stld	5.0	2.0	2.0	10
Davis Creek	Stld	7.0	7.0	4.0	0
TNT Gulch	Stld	2.0	2.0	2.0	10
Joseph Creek	Stld	0.0	0.0	0.0	0
Drainage Totals		45.5	39.0	28.5	188

Adapted from: Confederated Tribes of the Umatilla Indian Reservation. 1984. Grande Ronde River Basin. Recommended Salmon and Steelhead Habitat Improvement Measures. 92 pp.

Table 2. The estimated amount of riparian and instream habitat work needed within the Upper Grande Ronde River drainage by stream on NF lands.

Upper Grande Ronde River Drainage	Species Affected	Miles of Stream	Miles of Riparian Work Fencing	Miles of Riparian Work Planting	Instream Structures
Grande Ronde River	Ch, Sthd	6.0	2.0	1.0	130
Sheep Creek	Ch, Sthd	7.0	1.0	0.5	210
Fly Creek	Sthd	6.0	1.0	0.5	180
Spring Creek	Stld	5.0	1.0	2.5	150
S. F. Spring Cr.	Sthd	3.0	1.0	1.5	90
N. F. Catherine Cr.	Ch, Sthd	3.0	0.0	0.0	90
McCoy Creek	Sthd	4.0	1.0	3.0	120
Dark Canyon Creek	Sthd	1.0	0.0	0.0	15
Meadow Creek	Sthd	7.0	1.0	0.5	210
Indian Creek	Ch, Sthd	1.0	1.0	0.0	30
Chicken Creek	Sthd	5.0	1.0	0.0	75
Beaver Creek	Sthd	1.5	0.0	0.0	45
Five Points Creek	Sthd	5.5	0.0	0.0	165
Little Catherine Cr	Sthd	1.0	0.0	0.0	15
Bear Creek	Sthd	5.0	0.0	0.0	75
Limber Jim Creek	Ch, Sthd	2.0	0.0	1.0	30
Pelican Creek	Sthd	3.0	0.0	0.0	45
Peet Creek	Sthd	2.0	0.0	1.0	60
Little Fly Creek	Sthd	3.0	0.0	0.0	90
Whiskey Creek	Sthd	1.0	0.0	0.0	15
Jordan Creek	Sthd	2.0	0.0	0.0	30
N. F. Limber Jim Cr	Sthd	2.0	0.0	0.0	30
McIntyre Creek	Sthd	2.5	1.0	1.0	75
Waucup Creek	Sthd	5.0	0.0	1.0	150
Burnt Corral Cr.	Sthd	6.0	0.0	0.0	90
Lookout Creek	Sthd	3.5	0.0	0.0	53
Little Dark Canyon	Sthd	2.0	0.0	0.0	60
Drainage Totals		95.0	10.5	13.5	2328

Adapted from: Confederated Tribes of the Umatilla Indian Reservation. 1984. Grande Ronde River Basin. Recommended Salmon and Steelhead Habitat Improvement Measures. 92 pp.

Fisheries Characteristics

The Grande Ronde River subbasin supports both natural and hatchery runs of spring chinook salmon and steelhead trout. Natural rainbow trout are also produced along with a remnant coho salmon run. (Figures 4, 5, 6) Chinook salmon juveniles used for hatchery supplementation of natural stocks, are currently being produced at Looking Glass Hatchery. A new chinook and steelhead adult trapping and juvenile outplanting facility was recently constructed (1987) at Big Canyon Creek's confluence with the Wallowa River. The Joseph Creek subbasin is managed strictly for wild steelhead production.

Current steelhead production potential for the Grande Ronde Basin is estimated at 16,566 adults and 322,895 smolts while chinook production capacity is estimated at 8,789 adults and 432,844 smolts. 6/ However, actual production is estimated to be near 10-20% of potential due to mainstem passage problems for juveniles and adults.

The John Day River subbasin supports the largest remaining exclusively wild runs of spring chinook and summer steelhead in Northeast Oregon, the North Fork of the John Day River being the most important anadromous producers in the subbasin. Table 3 provides an estimate of fish runs status in both subbasins with less than full escapement (1984), the estimated situation at full escapement, and an estimate of full escapement with full habitat improvements.

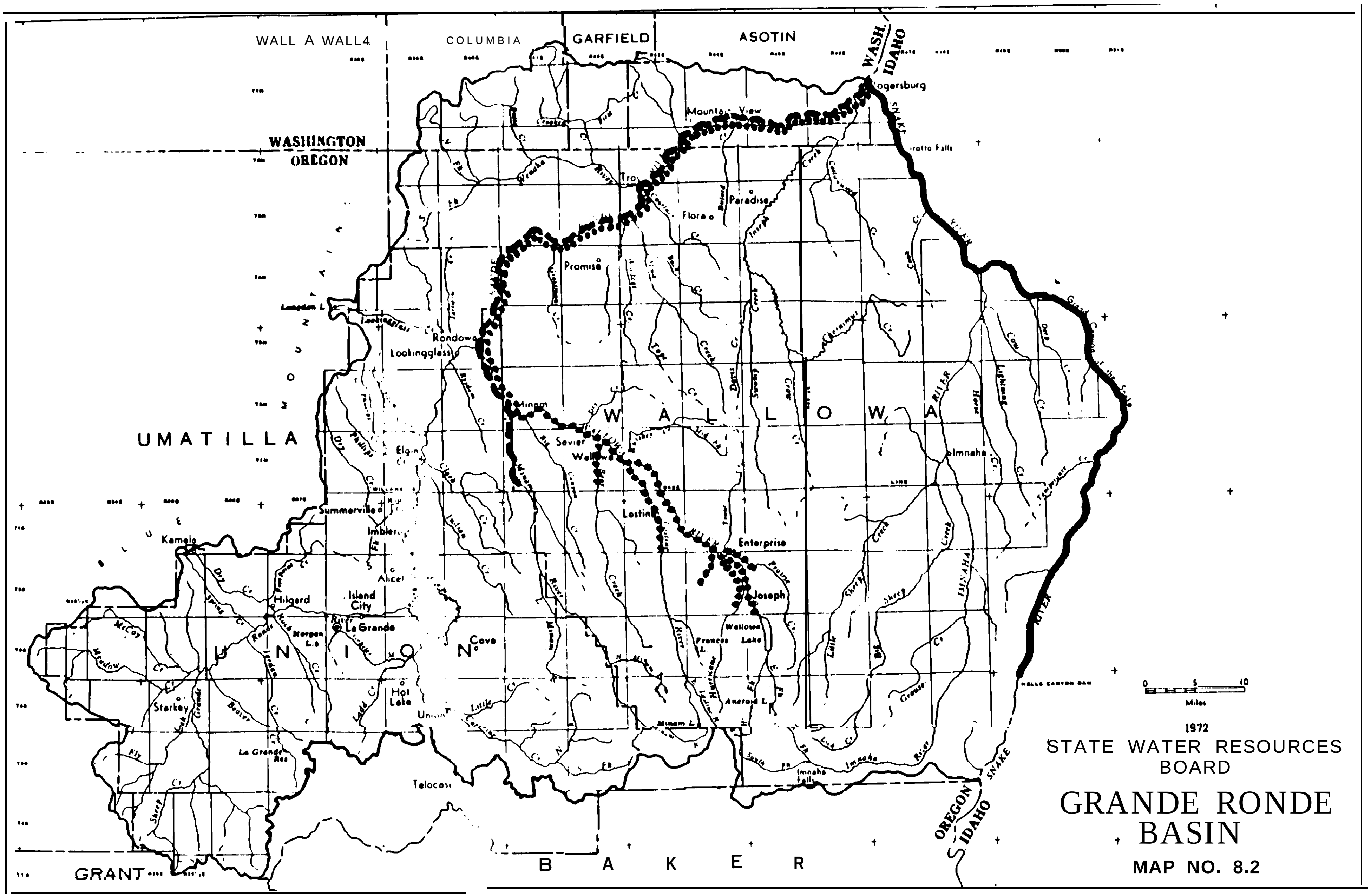

Figure 4. Fall chinook and coho salmon distribution, Grande Ronde Basin.

Fall chinook - known

Fall chinook - presumed

Coho

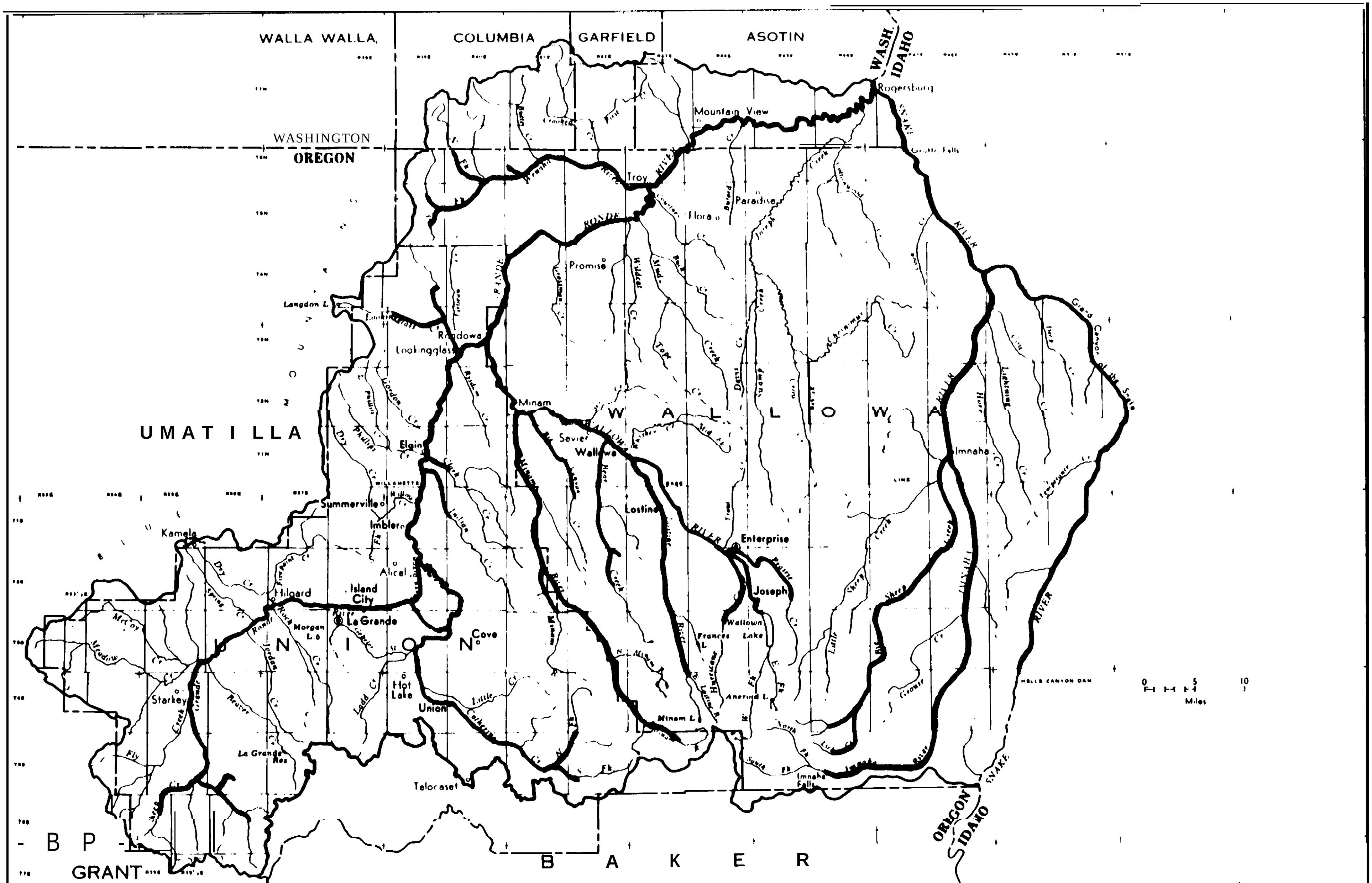

Figure 5. Spring and summer chinook salmon distribution, Grande Ronde Basin.

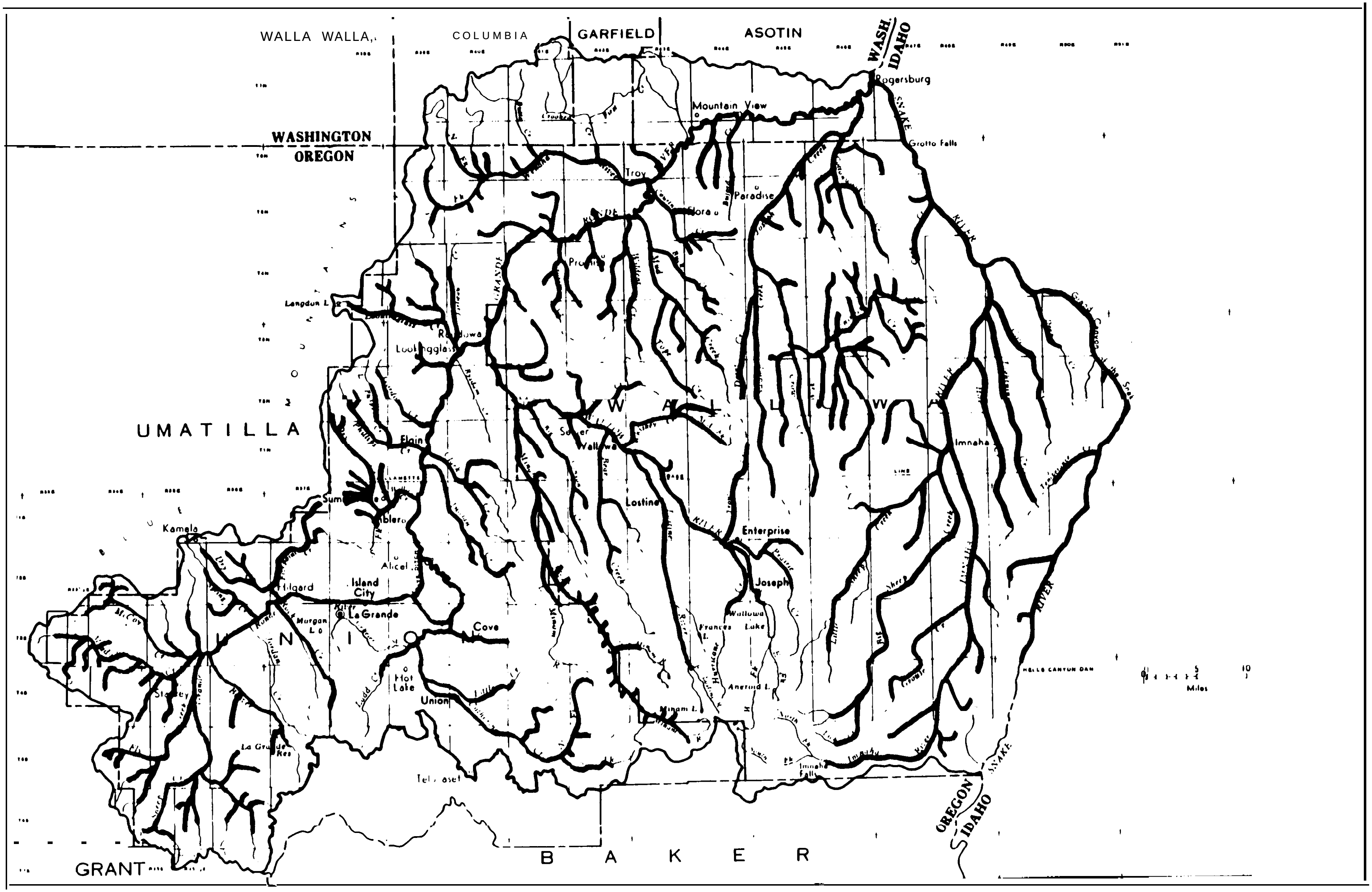

Figure 6. Summer steelhead distribution, Grande Ronde Basin.

Table 3
ANADROMOUS FISH SPAWNING PRODUCTION

Fish Species and Stream System	Miles of Natinal Forest Spawning & Rearing Streams	Estimated 1984 Situation: No. of Spawning Adults	Smolt to Ocean Survival		Catch of Fish		Estimated Situation With Full Escapement: No. of Spawning Adults	Smolt to Ocean Survival		Catch of Fish		Estimated Situation with Full Escapement & Habitat Enhancement: No. of Spawning Adults	Smolt to Ocean Survival		Catch of Fish	
			%	Fish	Fish	Lbs.		%	Fish	Fish	Lbs		%	Fish	Fish	Lbs.
Spring Chinook																
North Fork John Day	10	300	2.5	1,200	900	13,500	426	4.0	2,726	2,045	30,672	852	4.0	5,453	4,090	61,346
Upper Grande Ronde & above Rondowa	74	395	.4	340	226	3,390	1,897	4.0	16,314	10,767	161,505	2,617	4.0	22,506	14,854	222,810
Imnaha	95	300	.4	258	170	2,550	3,000	4.0	25,800	17,028	255,420	3,000	4.0	25,800	17,028	255,420
Fall Chinook																
Snake River	71	500	.4	430	284	5,680	-------- U N K N O W N -------					-------------U N K N O W N ------------				
Summer Steelhead																
North Fork John Day	46.2	600	2.0	1,800	1,200	9,600	900	6.0	8,100	5,346	42,768	2,394	6.0	21,546	14,220	113,763
Imnaha River	206.9	1,000	1.0	1,800	900	7,200	5,680	4.0	40,896	20,448	163,584	5,680	4.0	40,896	20,448	163,584
Snake River	91.4	3,000	1.0	5,400	2,700	21,600	17,040	4.0	122,688	61,344	490,752	17,040	4.0	122,688	61,344	490,752
Grande Ronde	(434.0)															
Joseph Creek	135.0	418	1.0	752	334	2,672	2,708	4.0	19,497	8,657	69,255	4,077	4.0	29,354	12,916	103,328
Lower Grande Ronde below Rondowa	47.0	145	1.0	261	116	928	943	410	6,790	2,988	23,900	990	4.0	7,128	3,136	25,090
Wallowa	31.0	120	1.0	216	96	767	622	4.0	4,478	1,988	15,907	622	4.0	4,478	1,988	15,907
Minam	61.0	230	1.0	414	184	1,472	1,224	4.0	8,813	3,913	31,303	1,224	4.0	8,813	3,913	31,303
Upper Grande Ronde above Rondowa	160.0	500	1.0	900	400	3,197	3,763	4.0	27,094	11,921	95,369	4,666	4.0	33,595	14,782	118,256
Totals	778.5 (steelhead only)				7,510	72,556				146,445	1,380,435				168,719	1,101,559

Source: Oregon Department of Fish and Wildlife.

LIMITING FACTORS

Historic patterns of land use in northeast Oregon have left most riparian areas in a far less productive state than their natural potential. Placer mining in the late 1800’s left many streams with little or no shade, large sediment loads, and radically disturbed channels.

Inadequate control of past activities such as logging, roading, and grazing over the ensuing century left managers with degraded and sub-optiumal habitats in most cases. Sympomatic of these conditions are wide and shallow streams with low summer flows and high water temperatures; channels typically without adequate amounts of instream debris; and low in diversity.

Limiting factors associated with instream and riparian habitat degradation were identified by the ODFW, USFS, and CTUIR. 7/ These factors are:

1. High summer water temperature - Loss of riparian vegetation combined with low summer flows result in water temperatures in excess of 80 degrees fahrenheit during summer months. 8/ These high temperatures limit available summer habitat and make the cooler upstream tributaries relatively more important to salmonid production.

2. Low summer flows - Irrigation withdrawals result in extremely low flows in the Grande Ronde river during summer months. Poor watershed management practices further aggravate flow conditions, resulting in many intermittent streams which were once perennial.

3. Lack of riparian vegetation - Riparian vegetation loss, principally from ungulate overgrazing, results in many undesireable conditions. Essential habitat for fish and other aquatic organisms is lost along with the riparian areas abilities to alternate flood peaks and increase groundwater recharge. Many perennial streams no longer flow in late summer. Channels become unstable and readily erode, concentrating flows and accelerating downcutting.

4. Lack of habitat diversity - Low habitat diversity, common to all project streams, is caused principally from the absence of large, woody debris in and along stream channels. Wood plays a critical role in maintaining stream structure and fisheries production. Man's activities over the past century, often well-intentioned, such as in the case of instream debris cleaning programs, have left many streams without this critical component.

5. Lack of channel stability - Low channel stability results from many causes; overgrazing, improper timber harvest methods, instream timber salvage, mining operations, etc. Streams, once narrow and deep, widen out and become shallower, becoming more prone to creating new channels and downcutting.

FISHERIES HABITAT IMPROVEMENT COALS AND OBJECTIVES

The overriding goal of the Forest's fisheries improvement program is to optimize habitat conditions in and along streams, thereby maximizing smolt production from Forest lands.

Current Forest direction calls for all management activities to meet state water quality guidelines. This direction also places an emphasis on maintained or enhanced riparian habitat through more stringent livestock management requirements. 9/

Riparian areas are managed to achieve optimum conditions for fish and wildlife. Management objectives for stream shading, streambank stability, stream sedimentation, grass-forb cover, shrub and tree cover, are described in Managing Riparian Ecosystem Zones for Fish and Wildlife in Eastern Oregon and Eastern Washington (Appendix A). lO/

There is increasing professional awareness that improvement objectives are met most quickly and effectively by using a combination of treatment measures. The single, most critical factor in rehabilitation of aquatic habitats is to control riparian revegetation.

Installing permanent instream structures in rangeland riparian areas without changing vegetation management will be counter productive over the long haul. ll/ Thus, the primary limiting factors for juvenile and adult chinook and steelhead will first be addressed from a vegetation suitability standpoint, followed by improvements in habitat diversity. The newly created limiting factor analysis procedure within the USFS in Region 6 will not only identify physical and biological constraints to production, but also provide for clear, individual project specific objectives. 12/ All future improvement projects on NF lands will undergo a limiting factor analysis before implementation begins.

Program objectives are identified below as they relate to primary limiting factors:

1. <u>High summer water temperatures</u> - Riparian vegetation recovery through riparian pasture fencing, supplemental plantings, and increased grazing administration will lower summer water temperatures and improve instream habitat.

2. <u>Low summer flows</u> - Controlling domestic livestock use within riparian areas will stimulate vegetative recovery and improve flow regimes drainage wide.

3. <u>Lack of riparian vegetation</u> - Riparian vegetation will exhibit a dramatic response to riparian pasture fencing and increased administration, timing, and control of livestock. Vegetation plantings will also supplement this recovery.

4. <u>Lack of habitat diversity</u> - Habitat diversity will be created through additions of rock or wood. Examples are log weirs in a variety of configurations, whole tree additions with and without rootwads, rock berms, clusters, and deflectors, riprap, rock and log sills.

Currently, both designed, expensive "hard" structures such as K-dams and elaborate log sills and "soft" structures such as whole tree additions or boulder clusters are used. Large, woody debris additions such as whole trees may be directly added through falling with chainsaws, or by pushing trees over into the stream channel with heavy equipment or explosives.

However, managers must carefully weigh the costs of improving instream diversity with structure additions against the cost of providing wood to the stream through long-term riparian management strategies such extended timber rotations and development of large, woody debris guidelines. Managing streamside vegetation is managing fish habitat. 13/

5. Lack of channel stability - Improvements in channel stability will occur over time through implementation of all three treatment measures. Stabilization of problem channels with large amounts of riprap however, is an expensive task, and often creates additional problems downstream. Extreme care must be used to recognize causes of instability and treat these, rather than only the symptoms.

IMPLEMENTATION STRATEGIES AND PRIORITIES

Implementation activities addressing identified limited factors to fish production primarily use a combination of available treatment techniques. The following two common techniques (Table 4) mitigate most identified limiting factors:

a) Riparian Vegetation Restoration (RVR) includes all activities which, either directly or indirectly, influence restoration and/or enhancement of riparian vegetation. This may include such things as control and regulation of livestock grazing through riparian pasture fencing or offsite water developments, increased administration and control of livestock, planting trees and shrubs, seeding disturbed riparian areas or fertilizing riparian areas to encourage growth of native plant species. Riparian vegetation restoration is an attractive solution because of its relative low cost and long-term benefit characteristics.

b) Habitat Diversity Improvement (HDI) includes all activities which, either directly or indirectly, influence restoration and/or enhancement of instream habitat, and usually entail addition of structure to the stream channel. Instream structures (including log or rock weirs, jetties, boulders, cabled large woody debris, vegetative rip rap, etc.) can successfully be used to concentrate low summer flows, increase pool habitat and effective cover, and stabilize stream channels.

Fencing to control ungulate use along riparian zones has been one of the primary management approaches used by fisheries biologists to protect and rehabilitate habitats. 14/

The two methods most commonly used today are riparian pasture fencing and the riparian exclosure fencing. Riparian pasture fencing usually encloses a wide section of riparian zone, allowing grazing once riparian recovery objectives have been met (Appendix A). Future grazing within the riparian pasture will be in accordance with utilization standards (Appendix B). Riparian exclosure fencing results in permanent, narrow exclosures along riparian zones with no future grazing opportunities available.

Habitat improvement techniques available to managers today are most effective when used in combination where applicable. However, these techniques are not a panacea or solution to poor management. Protection and maintenance of fisheries habitat is a primary management goal within the Forest Service today. 15/

Table 4. Limiting factors with associated treatment strategies designed for mitigation purposes

Limiting Factor(s)	Treatment Strategy
High summer water temperatures	RVR
Low summer flows	RVR
Lack of riparian vegegation	RVR
Lack of habitat diversity	RVR/HDI
Channel instability	RVR/HDI
Winter icing	RVR/HDI

Priorities

Improvement projects on National Forest lands were prioritized using the following factors and rationale:

a. Project value to adaptive management: Ongoing and planned FS funded efforts for project evaluation were considered in setting project priorities. The existence of long-term, pre-project implementation data bases for some projects and their feedback loop value assisted in prioritization.

b. Species of interest. Though all fish species will be taken into account when planning habitat enhancement projects, primary consideration within the Grande Ronde River Basin will be given to anadromous salmonids. Summer steelhead and spring/summer chinook habitats will be targeted for enhancement activities. On streams utilized by both chinook and steelhead, care will be taken to consider habitat requirements of both species when planning habitat enhancement activities.

c. Benefits to fish. The greatest benefit(s) to fish will be realized when enhancement work is done in areas utilized by the greatest number and species of salmonids. Therefore streams with the greatest number and species of salmonids and the greatest diversity of habitat utilization (spawning, rearing, overwintering, etc.) will receive the highest prioritization.

d. Project orientation. Resolution of limiting factors should begin in the headwaters of the basin and on the uppermost reaches of individual streams. Habitat work should then proceed downstream to meet habitat objectives, and protect improvement investments and private lands. This will provide positive, cumulative downstream effects in terms of stream flows, water temperatures, and channel stability. Another factor affecting the project location will be the location of ongoing riparian projects (by ODFW and other agencies) within the basin or on a specific stream. As maximum benefits will be realized when large reaches of stream are treated (e.g. the longer the continuous section of stream that is treated the greater and longer lasting the benefits), efforts will be made to coordinate with other agencies to implement projects in close proximity to their ongoing projects.

e. <u>Cost effectiveness</u>: The program strategy is to implement activities that provide for the most immediate and long lasting benefits to fish production capability, and to do so in the most cost effective manner possible.

f. <u>Logistic constraints</u>: Logistic constraints may include equipment access, timing as it relates to landuse practices, chinook and/or steelhead spawning and incubation periods, and technical feasibility.

g. <u>Species management plans</u>: Priorities were established with consideration of objectives and goals of individual species management plans. Existing adopted policies give protection and enhancement of wild stock first and highest priority.

Once these rationale were established, highest priority streams were identified and prioritized (Table 5).

Table 5. Prioritized anadromous fish streams on NF lands within the Grande Ronde and John Day subbasins requiring riparian or instream habitat improvement.

Stream	Species	Priority	Miles of Work	Pasture Fencing 3/	Plantings	Instream Structures	Total cost l/
Meadow Creek	Sthd	1	4.25	0.0	4.25	4.25	254,600 2/
Chesnimnus Creek	Sthd	2	10.9	9.0	10.9	10.9	99,800
Elk Creek	Sthd	2	7.4	0.0	7.4	7.4	32,500
UGR River	Sthd, Ch	3	2.0	0.0	0.5	2.0	130,200
Fly Creek	Sthd	3	6.0	2.0	2.0	3.0	68,000
Devil's Run Cr	Sthd	4	7-3	4.0	7.3	7.3	88,200
Sheep Creek	Sthd, Ch	5	3.4	0.0	3.4	3.4	21,900
Peavine Creek	Sthd	5	4.1	0.0	4.1	4.1	54,800
Trail Creek	Sthd, Ch	6	2.9	0.0	2.9	2.9	80,000
Bull Run Creek	Sthd, Ch	6	3.2	0.0	3.2	3.2	80,000
Granite Creek	Sthd, Ch	6	2.2	0.0	2.2	2.2	40,000
Beaver Creek	Sthd, Ch	6	1.6	2.0	1.6	0.0	15,000
			55.25	17.0	49.75	50.65	965,000

l/ Includes preproject, implementation, monitoring, and maintenance costs.
2/ Includes preproject and implementation costs only.
3/ Miles of fence to build.

Grande Ronde Subbasin

The Grande Ronde subbasin provides habitat for both wild and hatchery supplemented runs of steelhead and chinook. The Joseph Creek drainage has wild fish runs of steelhead only. Streams within the Grande Ronde subbasin were prioritized as follows:

1. Meadow Creek provides the best opportunity in Eastern Oregon to quantify the effectiveness of habitat improvement measures on National Forest lands, thus its number one priority rating. Besides an existing data base collected over a period of ten years, this project has had two years of intensive pre-project data collection necessary to tie smolt production with habitat improvement measures. All project evaluation work for Meadow Creek is being conducted by the Pacific Northwest Research Experiment Station and funded by the USFS.

2 Chesnimnus and Elk creeks all provide spawning, rearing and/or overwintering habitat for wild summer steelhead in varying degrees. Additionally, Chesnimnus Creek provides access to all of the steelhead producing tributaries in the upper Joseph Creek subbasin.

3 Upper Grande Ronde River and Fly Creek are two current projects, both scheduled for completion in FY 1989.

   The UGR project contains current runs of spring chinook. Fly Creek historically also produced spring chinook according to tribal records.

4 Devil's Run Creek within the Joseph Creek drainage received this priority status due to no implementation work having yet occurred.

5 Sheep Creek and Peavine Creeks, in the upper and lower Grande Ronde subbasin respectively, have had considerable habitat improvements and are demonstrating positive responses to limiting factors.

John Day Subbasin

The John Day subbasin contains exclusively wild runs of spring chinook salmon and steelhead trout. All proposed projects within this subbasin are new projects, thus their priority standing. Those projects within this subbasin will complement extensive downstream restoration efforts by the Umatilla National Forest. Three of the four identified projects deal with reclamation of past instream mining activities, necessitation instream channel work along with streamside plantings.

the fourth, Beaver Creek, will address riparian recovery from overgrazing. These projects final site selection is scheduled by this plan and will occur cooperatively with the John Day Office of ODFW and the Confederated tribes of the Umatilla Indian reservation.

Priority listings among the four proposed projects have not been established. An important consideration in prioritizing projects forest wide is that the John Day subbasin juvenile fish migrations experience a significantly higher survival rate with passage problems at three major dams, versus eight for the Grande Ronde subbasin.

IMPLEMENTATION SCHEDULE AND COSTS

An implementation schedule of prioritized improvement projects on NF lands is displayed in Table 6 for both subbasins. Proposed miles of stream to be treated, by year, and the proposed treatment and implementation costs are shown. This schedule provides for treatment of 43.5 and 9.8 miles of stream habitat in the Grande Ronde and John Day subbasins, respectively. Approximatley 18.2 miles of riparian pasture fence construction, 50.15 miles of streamside vegetation planting, and 50.55 miles of instream structure treatment will occur by March 31, 1992. Outyear cost estimates are subject to modification from continuing improvements in implementation efficiency.

Table 6. Implementation schedule, with associated costs proposed for the Grande Ronde River subbasin for fiscal years 1988-1991. 1/

Streams	Fiscal Year	Stream Miles to Treat	Fencing	Planting	Instream Structures	Program costs
UGR River		1.0	0.0	0.5	1.0	70,200
Fly Creek		3.0	0.0	0.0	3.0	41,000
Sheep Creek	1988	3.4	0.0	3.4	3.4	18,900
Chesnimnus Creek		5.4	0.0	5.4	10.9	44,800
Elk Creek		7.4	0.0	7.4	7.4	17,500
Meadow Creek		2.1	0.0	2.1	2.1	125,000
UGR River		1.0	0.0	0.5	1.0	50,000
Fly Creek	1989	1.0	2.0	2.0	0.0	15,000
Chesnimnus Cr		5.5		5.5	0.0	45,000
Devil's Run Cr		7.3	4.0	7.3	7.3	65,000
Trail Creek		1.5	0.0	1.5	1.5	40,000
Meadow Creek		2.15	0.0	2.15	2.15	125,000
Peavine Creek		4.1	0.0	4.1	4.1	45,000
Trail Creek	1990	1.4	0.0	1.4	1.4	40,000
Bull Run Creek		1.6	0.0	1.6	1.6	40,000
Bull Run Creek		1.5	0.0	1.5	1.5	40,000
Beaver Creek	1991	1.6	3.2	1.6	0.0	15,000
Granite Creek		2.2	0.0	2.2	2.2	40,000
Totals		53.15	18.2	50.15	50.55	877,400

1/ Implementation costs only. See Table 5 for monitoring and maintenance costs.

FISHERIES BENEFITS

Implementation of habitat improvement projects in the Grande Ronde subbasin is estimated to increase spring chinook smolt production capacity by 38,298 to 43,086 smolts annually. Steelhead smolt production is estimated to increase by 22,221 to 31,742 smolts annually. The increase in smolt production should result in an increased adult return of 333 adult steelhead and 153 adult chinook.

Implementation of improvement measures in the John Day subbasin is estimated to increase spring chinook smolt production capacity by 42,378 to 47,676 smolts annually. Steelhead smolt production is estimated to increase by 3,708 to 5,298 smolts annually. The increase in smolt production should result in an increased adult return of 148 adult steelhead and 636 adult chinook (Tables 7 and 8).

Rearing densities and smolt to adult survival rates for salmon and steelhead were obtained from the Columbia River Basin data standardization report prepared by the System Planning Group and Monitoring and Evaluation Group of the Columbia Basin Fish and Wildlife Authority.

Table 7. Estimated Steelhead Production Increases Resulting from Implementation of the Grande Ronde and John Day Subbasins Habitat Improvement Projects.

		Smolt Production Capability (#/square meter)*			
	Low Flow Rearing Area M^2	Current (0.03)	Post Project Good Habitat (0.07)	Post Project Excellent Habitat (0.10)	Increase
Meadow Creek (+2,918)	41,693	1,251	2,918	4,169	
Upper Grande Ronde (+1,718)	24,525	735	1,717	2,453	
Fly Creek (+3,091)	44,146	1,324	3,090	4,415	
Sheep Creek (+1,635)	23,348	700	1.634	2,335	
Chesnimnus Creek (+5,614)	80.198	2,406	5,614	8,020	
Elk Creek (+3,049)	43,557	1,307	3,049	4,356	
Devil's Run Creek (+2,507)	35,807	1,074	2,506	3,581	
Peavine (+1,689)	24,133	724	1,689	2,413	
Trail Creek (+1,195)	17,069	512	1,195	1,707	
Bull Run Creek (*1,099)	15,696	471	1,099	1,570	
Granite Creek (+755)	10,791	324	755	1,079	
Beaver Creek (-+659)	9,418	283	659	942	
Totals	11,111	25,925	37,040	25,929	

Estimated Increase in Adults to Grande Ronde Subbasin**
22,221 smolts x .015 to adult survival = 33 adults

Estimated Increase In Adults to John Day Subbasin
3,708 smolts x .04 smolt to adult survival = 148 adults

*Density figures are from the Columbia River Basin data standardization report.
***Smolt-adult survival figures are from the Columbia River Basin data standardization report.

Table 8. Estimated spring chinook production increases resulting from implementation of the Grande Ronde and John Day rivers subbasins habitat improvement projects.

	Low Flow Rearing Area	Smolt Production Capability (#/square meter)* Current	Post Project Good Habitat	Post Project Excellent Habitat	Increase
	M^2	(0.10)	(0.40)	(0.90)	
U. Grande Ronde	24,525	2,453	9,810	22,073	(+19,620)
Sheep Creek	23,348	2,335	9,339	21,013	(+18,678)
Trail Creek	17,069	1,707	6,828	15,362	(+13,655)
Bull Run Creek	15,696	1,570	6,278	14,126	(+12,556)
Granite Creek	10,791	1,079	4,316	9,712	(+ 8,633)
Beaver Creek	9,418	942	3,767	8,476	(+ 7,534)
Totals	100,847	10,086	40,338	90,762	(+80,676)

Estimated Increase in Adults to Grande Ronde Subbasin**
38,298 smolts x .004 smolt to adult survival = 153 adults

Estimated Increase in Adults to John Day Subbasin
42,378 smolts x .015 smolt to adult survival = 636 adults

*Density figures are from the Columbia River Basin data standardization report.
**Smolt-adult survival figures are from the Columbia River Basin data standardization report.

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APPENDIX A

Riparian Habitat:

Management Objectives, Standards and Guidelines

Source: "Managing Riparian Ecosystem Zones for Fish and Wildlife in Eastern Oregon and Eastern Washington." Riparian Habitat Subcommittee of the Oregon/Washington Interagency Wildlife Committee. March 1979

The importance and relationships of riparian vegetation to fish and wildlife habitat, water quality and quantity, and erosion control have been known for years. Studies have more recently documented the significance of riparian habitat to all types of wildlife (Winegar 1977; Thomas, Maser and Rodiek 1977; Oliver and Barnett 1966). About 80% of the terrestrial wildlife species found in northeastern Oregon are either directly dependent on riparian habitat or utilize it proportionately more than any other habitat type (Thomas et al 1977).

OBJECTIVE 1: DESCRIBE OPTIMUM HABITAT CONDITIONS FOR FISH AND WILDLIFE IN RIPARIAN ZONES

Rationale - Optimum habitat conditions are defined as the most desirable habitats for fish and wildlife. These conditions may not be possible to achieve in all riparian ecosystems uue to site potential and vegetative response.

In describing "optimum riparian habitat" for fish and wildlife it was recognized that what is optimum for a mallard as nesting cover is totally unacceptable to a killdeer. To describe "optimum riparian habitat" it is necessary to break the riparian habitat into several components and evaluate each separately.

Evaluation parameters - The following six parameters were selected; the first three were used to evaluate fish habitat (Haugen 1977) and the last three relate to wildlife (Thomas 1978).

1. Stream surface shaded
2. Stream bank stability
3. Streambed sedimentation
4. Grass-forb cover
5. Shrub cover
6. Tree cover

Optimum Habitat Conditions:

For each parameter an "optimum" physical habitat condition for fish and wildlife is described, followed by a short rationale explaining derivation of the optimum level for that parameter.

Parameters 1 through 3 are used to describe general relationships between trout production and riparian habitat conditions in eastern Oregon and eastern Washington streams. The curves in figures 1-3 were developed by the subcommittee and are not based on site specific studies. While the data were developed for trout, they apply equally to salmon and steelhead rearing in fresh water.
uations may require management of riparian habitat which will benefit species other than salmonid fishes.

1. <u>STREAM SURFACE SHADED.</u> BETWEEN 60% AND 100% OF THE STREAM SURFACE SHOULD BE SHADED FROM JUNE TO SEPTEMBER DURING THE HOURS OF 10 A.M. TO 4 P.M. (FIG. 1).

Solar radiation is highest during this time of day and season. Streamside vegetation is important in maintaining good salmon and trout habitat. Streamside vegetation is essential in providing shade to keep water temperatures from becoming lethal during the hot summer months. Vegetation may consist of trees, shrubs, grasses, sedges, or other plants. Stream bank vegetation also acts as important habitat for terrestrial insects, an important food source for fish, and is a primary nutrient source for in-stream aquatic populations. In some situations topography (rocks and rims) can provide some of this needed shade. Shade is more important on small streams (less than 50 feet wide). On larger streams, vegetative height may not be sufficient to provide enough shade to meet optimum conditions; however, water depth and turbulence help compensate for this deficiency.

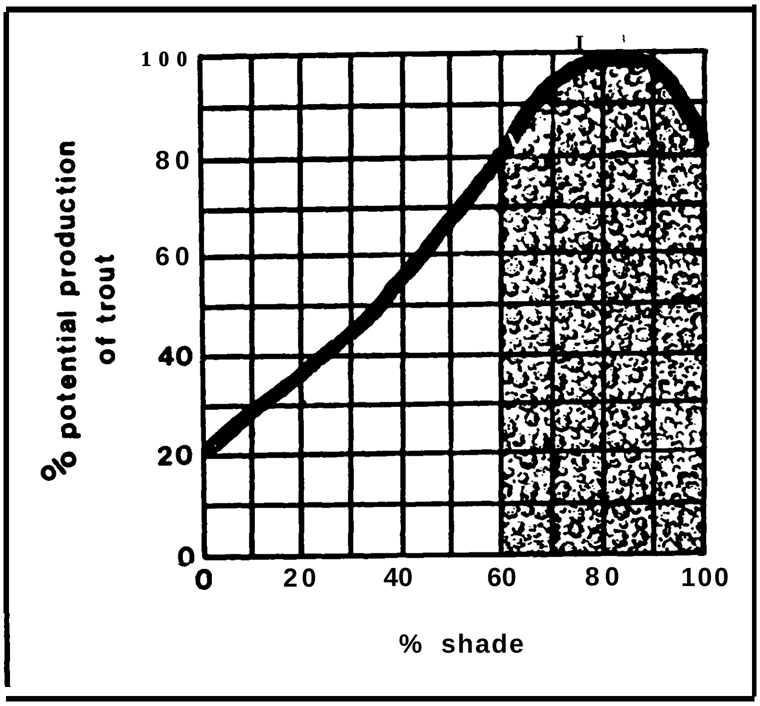

Fig. 1. Trout production in relation to percent of stream water surface shaded.

2. STREAM BANK STABILITY. STREAM BANKS SHOULD HAVE 80% OR MORE OF THEIR TOTAL LINEAL DISTANCE IN A STABLE CONDITION (FIG. 2).

Naturally occurring stable, well vegetated stream banks help maintain stream channel integrity. They provide cover for fish and reduce exposure of water surface to solar radiation (cooler water). Equally important is the reduction of sediment originating from stream banks thereby protecting the quality of the entire aquatic environment. Generally, where banks are not eroding, channel widths are narrower and stream depths greater than where banks are not stable.

Vegetative cover (grasses, shrubs and trees) reduces stream bank erosion during high water periods. Plant roots help hold soil in place. Shrubs and grasses reduce scouring in the riparian zone, trapping sediment before it moves into the stream channel and settles on spawning and food-producing gravels. Mature grasses and forbs also tend to stabilize stream banks by helping form a stronger sod.

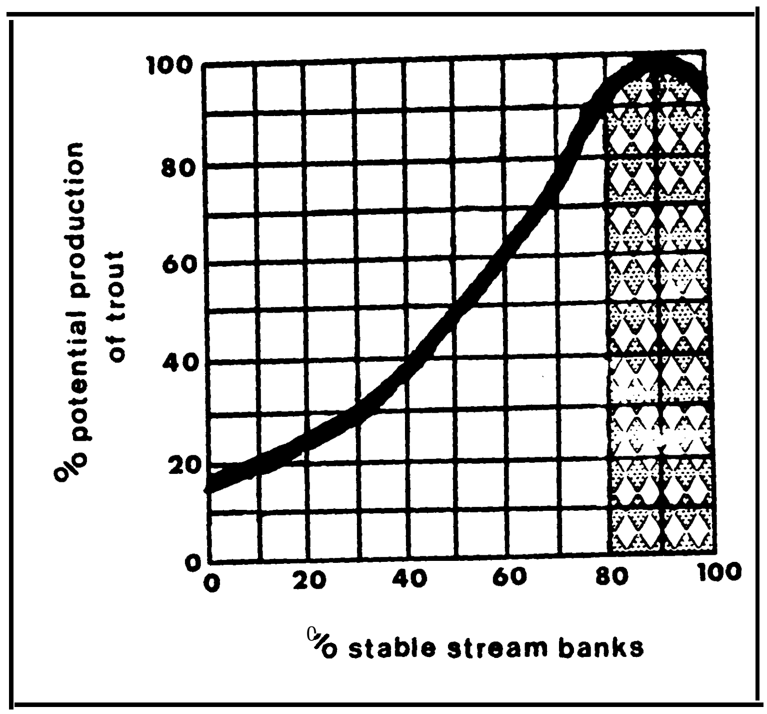

Fig. 2. Trout production in relation to percent of stable stream banks.

3. <u>STREAMBED SEDIMENTATION.</u> NO MORE THAN 15% OF STREAM SUBSTRATE SHOULD BE COVERED BY INORGANIC SEDIMENT (FIG. 3).

The gravel/rubble substrate of streams is important for spawning and food production. Aquatic insects, developing trout eggs, and recently hatched fry still in the gravel depend on a continuous supply of oxygen-rich water for survival. Fine sediments (sand and silty material less than 3.3 mm in size) in large amounts clog the spaces between gravels. This prevents water from percolating through the gravel/rubble substrate causing fish and insect mortalities. Trout populations can be further reduced if pools become filled with sediments thus eliminating rearing or hiding habitat.

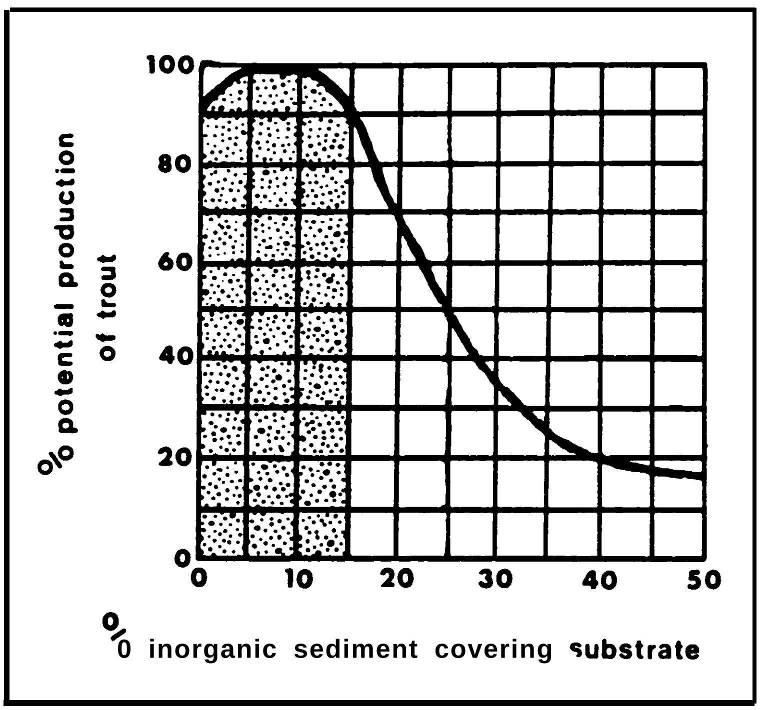

Fig. 3. Trout production in relation to percent of substrate covered by inorganic sediment.

Parameters 4 through 6 are used to describe general relationships between wildlife production and native riparian vegetation conditions in eastern Oregon and eastern Washington.

4. GRASS-FORB COVER. RIPARIAN ZONES SHOULD PROVIDE AT LEAST 80% OF THE SITE ENHANCEMENT POTENTIAL.

5. SHRUB COVER. RIPARIAN ZONES SHOULD PROVIDE AT LEAST 80% OF THE SITE ENHANCEMENT POTENTIAL.

6. TREE COVER. RIPARIAN ZONES SHOULD PROVIDE AT LEAST 80% OF THE SITE ENHANCEMENT POTENTIAL CROWN COVER FOR SITES THAT WOULD NATURALLY BE DOMINATED BY TREES. FOR RIPARIAN ZONES THAT NATURALLY CONTAIN ONLY A FEW TREES PER ACRE (20 OR LESS), OPTIMUM TREE COVER FOR WILDLIFE IS CONSIDERED TO BE 100% OF POTENTIAL.

Site enhancement potential is defined as the subjective estimate of the potential vegetative production, natural or introduced, as determined by the evaluating team.

OBJECTIVE 2: DEVELOP AN INVENTORY PROCEDURE WHICH EVALUATES THE PRESENT CONDITION OF RIPARIAN HABITAT, ITS POTENTIAL FOR IMPROVEMENT, AND PROVIDES A BASIS FOR ESTABLISHMENT OF RIPARIAN ZONE HABITAT MANAGEMENT OBJECTIVES FOR FISH AND WILDLIFE.

Procedures for Evaluation of Riparian Zones:

Evaluation of present and potential habitat conditions and development of management prescriptions will be done by an interdisciplinary team whose members are familiar with soil and vegetative potentials as well as fish and wildlife requirements of the riparian zone being evaluated. The team will:

1. Identify and prioritize riparian zones where high value fish and wildlife habitat potentials exist.

2. Evaluate riparian zones identified as having high fish and wildlife values using the analysis procedure presented on the Riparian Habitat Analysis Form. Separate evaluations will be made for each distinctly different riparian zone within the drainage being evaluated.

a. Mapping. Sketches drawn to scale will illustrate the overall drainage area by reach being evaluated and cross sectional profile of each reach.

b. Present Habitat Condition. Indicate physical and vegetative conditions of the riparian zone adjacent to and within the stream channel that exists at the time the field survey is conducted.

c. Potential Habitat Condition. Indicate optimum physical and vegetative habitat conditions that would exist if present land uses were terminated and replaced with a management scheme that prescribed protection and/or enhancement for the riparian zone. The following evaluation parameters will be used:

(1) Percent Stream Surface Shaded is that percentage of the stream surface that is shaded by vegetation between 10 a.m. and 4 p.m. during months of June through September.

(2) Percent Stream Bank Stability is that percentage of the stream bank in a stable condition.

(3) Percent Streambed Sedimentation is that percentage of the substrate covered with fine sediments (sand and silty material less than 3.3 MM in size) during low flow periods.

(4) Percent Grass-Forb Cover is the percentage of the riparian zone covered by grasses and forbs.

(5) Percent Shrub Cover is the percentage of the riparian zone covered by shrubs.

(6) Percent Tree Cover is the percentage of crown cover in the riparian zone.

The following parameters (7-10) are optional and should only be used when more specific documentation of present condition and future potential is needed (see Appendix C).

(7) Mass Wasting (Critical Soil Erosion) - optimum condition is when there is no evidence of past or any potential for future mass wasting into stream channels.

(8) Bank Vegetation - optimum condition is when plant density of upper bank vegetation is at least 90%.

(9) Bank Rock Content - optimum condition is when at least 65% of the lower bank zone is rock, with many angular boulders larger than 12 inches in diameter.

(10) Bank Cutting - optimum condition is when the lower stream bank area has only infrequent raw banks less than 6 inches in height.

d. Recommended Habitat Objectives. The team, after determining the present and potential habitat conditions, will establish recommended habitat objectives for each of the parameters. In assigning objectives, the team must keep in mind the site potential of each reach for vegetative response, the time frame required to attain the desired response, and management prescriptions under which the objectives can be attained.

RIPARIAN HABITAT ANALYSIS FORM

Location (T.R.S.) ______________________________ Date ____________

Stream ______________________ Reach ______________________

Species of Fish Present ______________________________

Team Members ______________________________

Flow at date evaluated ____________ CFS

$\bar{X}$ _____ CFS Low _____ CFS Peak _____ CFS Flow (if available)

Sketch of Riparian Zones Being Evaluated

Typical Cross Section of Reach Evaluate

	Habitat Conditions		
	Present %	Potential %	Recommended % by (Year)
1. Stream Surface Shaded			
2. Stream Bank Stability.			
3. Streambed Sedimentation			
4. Grass-Forb Ground Cover			
5. Shrub Ground Cover			
6. Tree Crown Cover			

Optional Procedure - See Appendix C

		Present Habitat Conditions (Score)	Potential Habitat Conditions (Score)	Habitat Goals (Score)
Upper Bank	7. Mass Wasting			
	8. Vegetation			
Lower Bank	9. Bank Rock Content			
	10. Bank Cutting			
	Total 7-10			

APPENDIXB

Riparian Habitat:

Grazing Utilization Standards

Source: Forest Service Manual 2209.1. Range Analysis and Management Handbook.

511.2 -Establishing Allowable Use.

Application: These standards reflect proper we percent converted to stubble height on average sites. They should be adjusted for sites above or below average productivity.

1. For Grassland Vegetation

Plant proper, use standards reflect the maximum utilization by ungulates (livestock and wildlife) that can be tolerated and still maintain the plant in a moderately productive condition. When other considerations, such as fishery habitat, water quality, aesthetic or wildlife are involved, these utilization standards must be adjusted to allowable use, on the basis of resource allocation.

These utilization standards will be applied on key areas.

On continuous grazing systems, when the allowable use stubble height is reached, the key area is closed to grazing for the remainder of the grazing season.1/

On the other systems (rotation,deferred or deferred-rotation, and rest rotation) the stubble height stated is the minimum allowed; these stubble heights can be maintained, but when the stated stubble height goes below these minimums, the key area is closed to grazing for the remainder of the grazing season.

2. For Riparian Vegetation (Everything in the Flood Plain)

The following utilization standards are the maximum utilization by ungulates (livestock and wildlife) that can be tolerated and still maintain the plant in a moderately productive condition considering water quality, fish, and wildlife habitat.

These utilization standards will be applied on key areas on streams that are classified as Class I and II.

For shrubs on continuous, deferred and deferred-rotation grazing systems, ungulates (livestock and wildlife) are allowed to take 2/3's of the seasonal tips during the livestock grazing period. When 2/3's of the shrub tips are grazed,the key area is closed to grazing for the remainder of the grazing season.

For grasses on continuous, deferred,and deferred-rotation grazing systems, add 1/3 of the stated stubble height and round to the nearest half inch. When this added stubble height has been reached, the key area is closed to grazing for the remainder of the grazing season.

Rest rotation grazing systems are exempt from this standard until the system has fully operated for three complete cycles.

1/ NOTE: Should grazing occur on closed key areas, the livestock shall be moved from the unit or the allotment.

UTILIZATION STANDARDS

Each cell gives stb. ht : % Use.

Species (Ungrazed plant heights)	Continuous Grazing	Rotation Early	Rotation Mid Season	Rotation Late	Deferred or Deferred Rotation Early	Deferred or Deferred Rotation Mid Season	Deferred or Deferred Rotation Late	Rest Rotation Early	Rest Rotation Mid Season	Rest Rotation Late	Condition Class
Redtop (30" plant w/seed stalks)	3.0: 40	3.0: 40	3.0: 40	3.0: 40	3.0: 40	3.0: 40	2.0: 50	3.0: 40	2.0: 50	2.0: 50	GOOD AND EXCELLENT CONDITION
Bluebunch wheatgrass (20" plant w/seed stalks)	5.0: 45	5.0: 45	4.5: 50	4.5: 50	4.5: 50	4.5: 50	4.0: 55	3.5: 60	3.5: 60	3.0: 65	
Carex (dry) (8" plant w/seed stalks)	2.0: 35	2.0: 35	2.0: 35	2.0: 35	2.0: 35	2.0: 35	1.5: 40	1.5: 40	1.5: 40	1.5: 40	
Carex (wet) (18" plant w/seed stalks)	3.5: 45	3.5: 45	3.5: 45	3.5: 45	3.5: 45	3.5: 45	3.0: 50	2.5: 55	2.5: 55	2.5: 55	
Tufted hairgrass (30" plant w/seed stalks)	3.0: 40	2.5: 45	2.5: 45	2.5: 45	2.5: 45	2.5: 45	2.0: 55	2.0: 55	2.0: 55	2.0: 55	
Idaho fescue (16" plant w/seed stalks)	1.5: 45	1.5: 45	1.5: 45	1.5: 45	1.5: 45	1.5: 45	1.0: 55	1.0: 55	1.0: 55	1.0: 55	
Green fescue (24" plant w/seed stalks)	4.0: 35	4.0: 35	3.5: 40	3.5: 40	3.5: 40	3.0: 45	3.0: 45	2.5: 50	2.5: 50	2.5: 50	
Kentucky bluegrass (20" plant w/seed stalks)	2.0: 55	1.5: 65	1.0: 70	1.0: 70	1.5: 65	1.0: 70	1.0: 70	1.0: 70	1.0: 70	1.0: 70	
Sandburg's bluegrass (14" plant w/seed stalks)	3.0: 25	2.5: 30	2.5: 30	2.5: 30	2.5: 30	2.5: 30	2.0: 35	2.0: 35	2.0: 35	2.0: 35	
Redtop (30" plant w/seed stalks)	3.0: 40	3.0: 40	3.0: 40	3.0: 40	3.0: 40	3.0: 40	2.0: 50	3.0: 40	2.0: 50	2.0: 50	FAIR CONDITION
Bluebunch wheatgrass (20" plant w/seed stalks)	6.0: 35	6 0: 35	5 5: 40	5.5: 40	5 5: 40	5 5: 40	5 0: 45	3.5: 60	3 5: 60	3 0: 65	
Carex (dry) (8" plant w/seed stalks)	2.5: 25	2.5: 25	2.0: 35	1.5: 40	2.0: 35	2.0: 35	1.5: 40	1.5: 40	1.5: 40	1.5: 40	
Carex (wet) (18" plant w/seed stalks)	4.5: 35	4.0: 40	4.0: 40	4.0: 40	4.0: 40	4.0: 40	3.0: 50	2.5: 55	2.5: 55	2.5: 55	
Tufted hairgrass (30" plant w/seed stalks)	3.5: 35	3.0: 40	2.5: 45	2.5: 45	3.0: 40	3.0: 40	2.5: 45	2.0: 55	2.0: 55	2.0: 55	
Idaho fescue (16" plant w/seed stalks)	2.0: 35	2.0: 35	2.0: 35	2.0: 35	2.0: 35	2.0: 35	1.5: 45	1.0: 55	1.0: 55	1.0: 55	
Green fescue (24" plant w/seed stalks)	5.0: 30	4.0: 35	4.0: 35	4.0: 35	4.0: 35	3.5: 40	3.5: 40	2.5: 50	2.5: 50	2.5: 50	
Kentucky bluegrass (20" plant w/seed stalks)	2.0: 55	1.5: 65	1.0: 70	1.0: 70	1.5: 65	1.0: 70	1.0: 70	1.0: 70	1.0: 70	1.0: 70	
Sandburg's bluegrass (14" plant w/seed stalks)	3.5: 20	3.0: 25	3.0: 25	3.0: 25	3.0: 25	3.0: 25	2.5: 30	2.5: 30	2.5: 30	2.5: 30	
Redtop (30" plant w/seed stalks)	4.0: 30	3.5: 35	3.5: 35	3.5: 35	3.5: 35	3.0: 40	3.0: 40	3.0: 40	3.0: 40	3.0: 40	POOR CONDITION
Bluebunch wheatgrass (20" plant w/seed stalks)	6.0: 35	6.0: 35	5.5: 40	5.5: 40	5.5: 40	5.5: 40	5.0: 45	3.5: 60	3.5: 60	3.0 65	
Carex (dry) (8" plant w/seed stalks)	3.0: 15	3.0: 15	3.0: 15	3.0: 15	3.0: 15	3.0: 15	2.5: 25	2.0: 35	2.0: 35	2.0: 35	
Carex (wet) (18" plant w/seed stalks)	5.0: 30	5.0: 30	5.0: 30	5.0: 30	5.0: 30	5.0: 30	5.0: 30	3.5: 45	3.5: 45	3.5: 45	
Tufted hairgrass (30" plant w/seed stalks)	4.0: 30	3.5: 35	3.5: 35	3.5: 35	3.5: 35	3.5: 35	3.0: 40	2.5: 45	2.5: 45	2.5: 45	
Idaho fescue (16" plant w/seed stalks)	2.5: 25	2.5: 25	2.5: 25	2.5: 25	2.0: 35	2.0: 35	1.5: 45	1.0: 55	1.0: 55	1.0: 55	
Green fescue (24" plant w/seed stalks)	5.0: 30	3.5: 40	3.5: 40	3.5: 40	3.5: 40	3.0: 45	3.0: 45	3.0: 45	3.0: 45	3.0: 45	
Kentucky bluegrass (20" plant w/seed stalks)	3.0: 50	2.0: 55	2.0: 55	1.5: 65	2.0: 55	2.0: 55	1.5: 65	1.0: 70	1.0: 70	1.0: 70	
Sandburg's bluegrass (14" plant w/seed stalks)	4.0: 15	3.5: 20	3.5: 20	3.5: 20	3.5: 20	3.5: 20	3.0: 25	2.5: 30	2.5: 30	2.5: 30	