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.

Harvest 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.

REFERENCES

Alexander, C.W., P.R. Boucher, R.L. Moffatt, and M.L. Smith. 1988. Water Resources Data, Oregon, Water Year 1985, Part 1, Eastern Oregon. U.S. Geological Survey Water Data Report OR-85-1.

Bartlett, G. 1948. Once, in Wallowa Lake. Pacific Wilderness Journal. April/May.

Carmichael, Richard W., and R.T. Messmer. 1985. Evaluation of Snake River Compensation Plan Facilities in Oregon. Annual Progress Report. Oregon Department of Fish and Wildlife. Portland.

Carmichael, Richard W., B.A. Miller, and R.T Messmer. 1986. Evaluation of Lower Snake River Compensation Plan Facilities in Oregon. Annual Progress Report, U.S. v. Oregon. Oregon Department of Fish and Widlife. Portland.

Carmichael, Rich and R. Boyce. 1986. Grande Ronde River Spring Chinook Production Report, U.S. v. Oregon. Oregon Department of Fish and Wildlife. Portland.

1987. Grande Ronde River Steelhead Production Report, U.S. v. Oregon. Oregon Department of Fish and Wildlife. Portland.

Chaney, Ed and L.E. Perry. 1976. Columbia Basin Salmon and Steelhead Analysis. Summary Report. Pacific Northwest Regional Commission.

Clanton, R.E. 1911. Biennial Report of the Department of Fisheries of the State of Oregon to the Twenty-sixth Legislative Assembly (Regular Session) - for 1910. Salem.

Evermann, B.W. and S.E. Meek. 1897. A Report Upon Salmon Investigations in the Columbia River Basin and Elsewhere on the Pacific Coast in 1986. Bulletin of the United States Fish Commission. No 17.

James, Gary. 1984. Grande Ronde River Basin -- Recommended Salmon and Steelhead Habitat Improvement Measures. Working Report. Confederated Tribes of the Umatilla Indian Reservation.

Friday, John and Suzanne J. Miller. 1984. Statistical Summaries of Streamflow Data in Oregon. Volume 1. Eastern Oregon. U.S. Geological Survey. Open File Report 84-454.

Fulton, Leonard A. 1968. Spawning Areas and Abundance of Chinook Salmon (Oncochynchus tshauytsha) in The Columbia River Basin -- Past and Present. Special Scientific Report -- Fisheries No. 571. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries. Washington, D.C.

Horner, Ned and T.C. Bjornn. 1981a. Status of Upper Columbia and Snake River Spring Chinook Salmon in Relation to the Endangered Species Act. Idaho Cooperative Fishery Research Unit, University of Idaho at Moscow. Report prepared for U.S. Fish and Wildlife Service.

Horner, Ned and T.C. Bjornn. 1981b. Status of Upper Columbia and Snake River Coho Salmon in Relation to the Endangered Species Act. Idaho Cooperative Fishery Research Unit, University of Idaho at Moscow. Report prepared for U.S. Fish and Wildlife Service.

Hubbard, L.E., R.L. Moffatt, T.A. Herrett, R.L. Kraus, and G.P. Ruppert. 1989. Water Resources Data Oregon, Water Year 1989. U.S. Geological Survey Water-Data Report OR-89-1.

Hydrology Subcommittee. 1965. River Mile Index, Snake River Below Weiser, Idaho, Part 1. Columbia Basin Inter-Agency Committee.

Lavier, Dorien C. 1976. Investigative Reports of Columbia River Fisheries Project. Pacific Northwest Regional Commission.

McAllister, H.C. 1911. Biennial Report of the Department of Fisheries of the State of Oregon to the Twenty-sixth Legislative Assembly, Regular Session - for 1909. Salem, OR.

Mullan, James W. 1983. Overview of Natural and Artificial Propagation of Coho Salmon (Oncorhyncus kisutch) on the Mid-Columbia River. Report o. FRI/FAO - 84-4. Fisheries Assistance Office, U. S. Fish and Wildlife Service, Leavenworth, Washington.

Noll, William, S. Williams, and R. Boyce. 1987. Grande Ronde River Basin Fish Habitat Improvement Implementation Plan. Oregon Department of Fish & Wildlife. Portland.

Northwest Power Planning Council. 1984. Columbia River Basin Fish and Wildlife Program. Northwest Power Planning Council. Portland, Oregon.

Northwest Power Planning Council. 1990a. Grande Ronde River Subbasin Salmon and Steelhead Production Plan. Northwest Power Planning Council. Portland, Oregon.

Northwest Power Planning Council. 1990b. Salmon River Salmon and Steelhead Production Plan. Northwest Power Planning Council. Portland, Oregon.

Oregon Department of Transportation. 1984. Grande Ronde and Wallowa River Scenic Waterway Study, Union and Wallowa Counties. State Parks and Recreation Division, Scenic Waterways Program.

Parkhurst, Zell E. 1950. Survey of the Columbia River and its Tributaries -- Part VI. Special Scientific Report: Fisheries No. 39. U.S. Fish and Wildlife Service.

Ricker, W.E. 1959. Evidence for environmental and genetic influence on certain characteristics which distinguish stocks of the Pacific salmons and steelhead trout. J. Fish. Res. Bd. Can. Biological Station, Nanaimo, B.C.

Reed, F.C., E.P. Thompson, and R.C. Campbell. 1890. Fourth Annual Report of the State Board of Fish Commissioners for 1890. Oregon.

Sayer, Bob. 1964. 1964 Annual Report, La Grande District. ODFW.

Shuck, Mark and G. Mendel. 1987. Lyons Ferry Evaluation Study, Part II: 1985-86 Annual Report. Washington Department of Wildlife. Dayton.

Schwartzberg, Mathew and P.B. Roger. 1986. An Annotated Compendium of Spawning Ground Surveys in the Columbia River Basin Above Bonneville Dam, 1960-1984. Technical Report 86-1. Columbia River Intertribal Fish Commission. Portland.

Smith, Allan K. 1975. Fish and Wildlife Resources of the Grande Ronde Basin, Oregon, and Their Water Requirements. Federal Aid to Fish Restoration Completion Report, Project F-69-R-10, Job No. 5. Oregon Department of Fish and Wildlife. Portland.

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

Thompson, Robert M. and J.B. Haas. 1960. Environmental Survey Report Pertaining to Salmon and Steelhead in Certain Rivers of Eastern Oregon and the Willamette River and Its Tributaries. Fish Commission of Oregon. Clackamas.

Toner, Richard C. 1960. A Study of Some of the Factors Associated with the Reestablishment of Blueback Salmon (Oncorhynchus nerka) into the Upper Wallowa River System. Fish Commission of Oregon. Clackamas.

Uberuaga, Richard. 1988. Wallowa-Whitman National Forest Fish Habitat Improvement Implementation Plan. U.S. Forest Service, Wallowa Whitman National Forest.

Uberuaga, Richard. 1988. Wallowa-Whitman National Forest Fisheries Habitat Improvement Annual Report FY 1987. U.S. Forest Service. Wallowa-Whitman National Forest.

U.S. Army Corps of Engineers (USACE). 1975. Special Report, Lower Snake River Fish and Wildlife Compensation Plan. United States Army Engineer District, Walla Walla. (with Appendices).

U.S. Army Corps of Engineers (USACE). 1979. Lower Snake River Fish and Wildlife Compensation, Lookkingglass Creek, Oregon Fish Hatchery. Design Memorandum No. 5. Prepared by Oregon Department of Fish and Wildlife, Contract DACW68-79-C-0047.

U.S. Army Corps of Engineers (USACE). 1983. Lower Snake River Fish and Wildlife Compensation, Wallowa River Fish Hatchery Expansion. Design Memorandum No. 12. Prepared by Oregon Department of Fish and Wildlife.

U.S. Army Corps of Engineers (USACE). 1983 Lower Snake River Fish and Wildlife Compensation, Irrigon Fish Hatchery. Design Memorandum No. 11.

U.S. Army Corps of Engineers (USACE). 1984. Lower Snake River Fish and Wildlife Compensation, Big Canyon Fish Facilities. Design Memorandum No. 13.1.

U.S. Army Corps of Engineers (USACE). 1985. Lower Snake River Fish and Wildlife Compensation, Lyons Ferry Hatchery and Cottonwood Creek Facility. Design Memorandum No. 10.

U.S. Department of the Interior. 1981. Grande Ronde River Basin, Oregon. Appraisal Report. Bureau of Reclamation.

U.S. Geological Survey. 1956. Compilation of Records of Surface Waters of the United States through September 1950 Part 13. Snake River Basin. Geological Survey Water-Supply Paper 1317.

Van Dusen, H.G. 1903. Annual Reports of the Department of Fisheries of the State of Oregon to the Legislative Assembly, Twenty-second Regular Session. Salem, OR

Van Dusen, H.G. 1905. Annual Reports of the Department of Fisheries of the State of Oregon for the years 1903 and 1904 to the Twenty-third Legislative Assembly (Regular Session). Salem, OR

Van Dusen, H.G., Master Fish Warden. 1907. Annual Reports of the Department of Fisheries of the State of Oregon to the Legislative Assembly, Twenty-forth Regular Session. Salem, OR

Washington Department of Fisheries. 1974. Requirements of Hatcheries Under Lower Snake River Compensation Plan. Appendix I, USACE 1975.

Witty, Kenneth. 1968. Annual Fish Report, Wallowa Fish District. Oregon Department of Fish and Wildlife. Enterprise, OR

Witty, Kenneth. 1970. Annual Fish Report, Wallowa Fish District. Oregon Department of Fish and Wildlife. Enterprise, OR

Witty, Kenneth. 1985. Annual Fish Report, Wallowa Fish District. Oregon Department of Fish and Wildlife. Enterprise, OR

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

State of Oregon

Phone 503-426-4543
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, COMMISSIONER

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, 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

2

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

United States Department of Agriculture | Forest Service | Wallowa-Whitman National Forest

EAGLE CAP RANGER DISTRICT
OCT 20 1992
P. O. Box 907
Enterprise, OR 97828

Reply to: 2600

Date: October 18, 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

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)

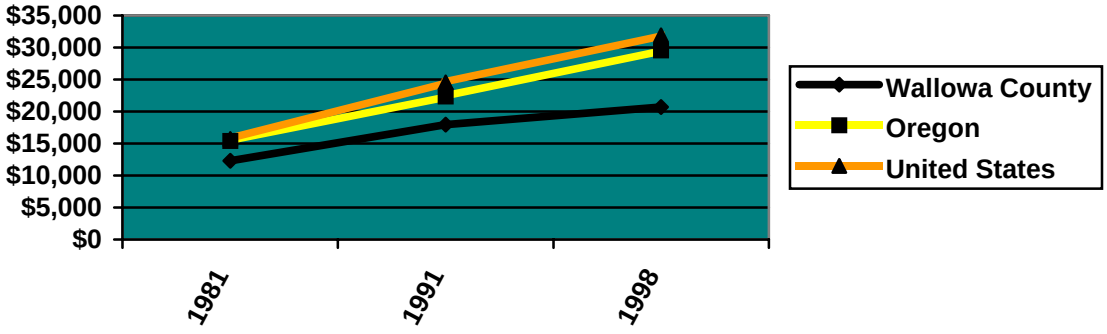
Shown below are 36 employment categories, firm count, average employment, gross payroll and average salary as documented by the Oregon State Employment Division. These figures reflect statistical information for 1991 (Table 20).

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.

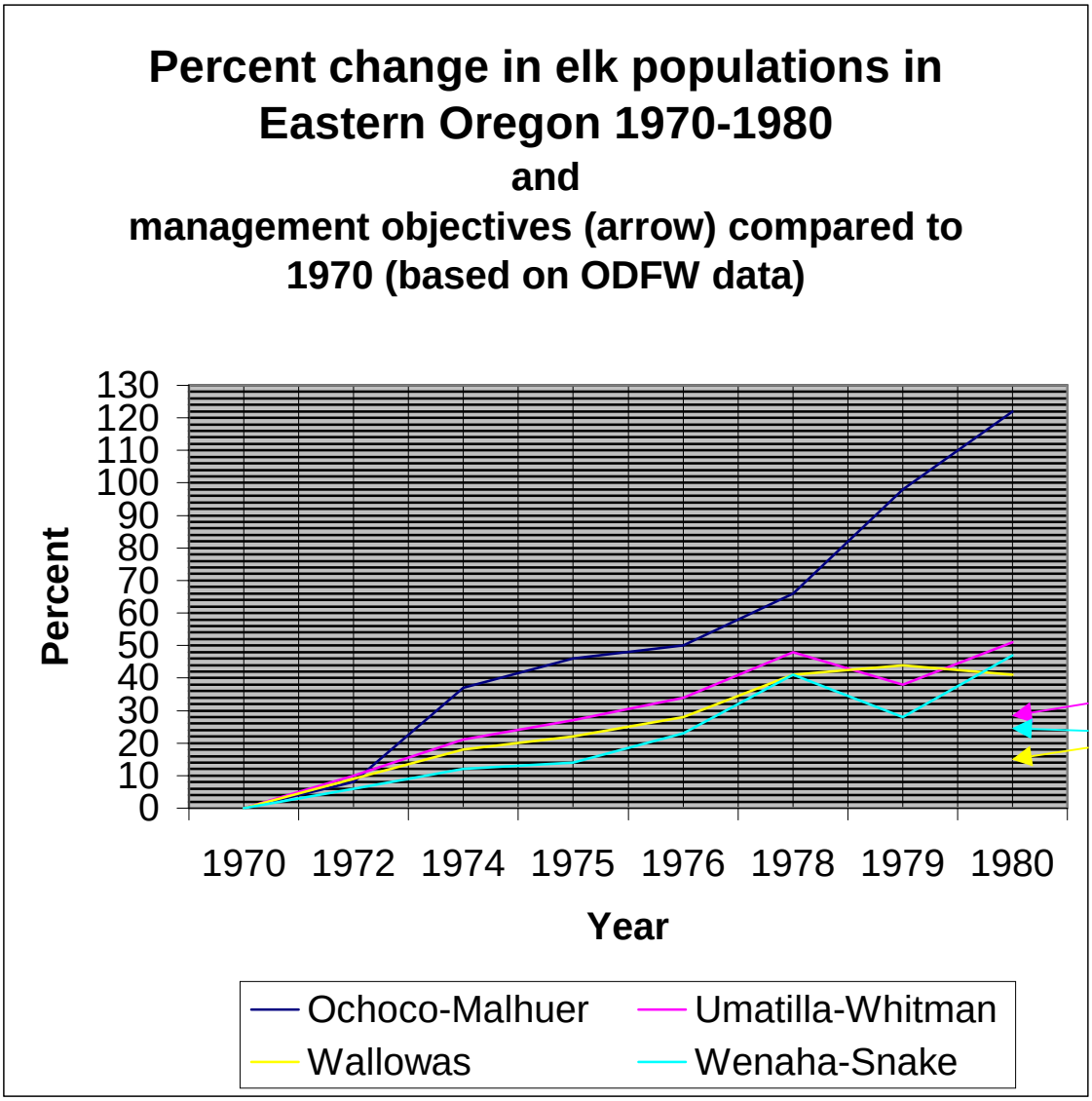
The soils, which form on a basalt substrate, contain little sand. Basalt rock weathers almost directly to clay. The older soils, generally the ones on flatter land, which have formed on the basalt rocks to the north and east of the Wallowa Valley, have had plenty of time to undergo this weathering process. 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.

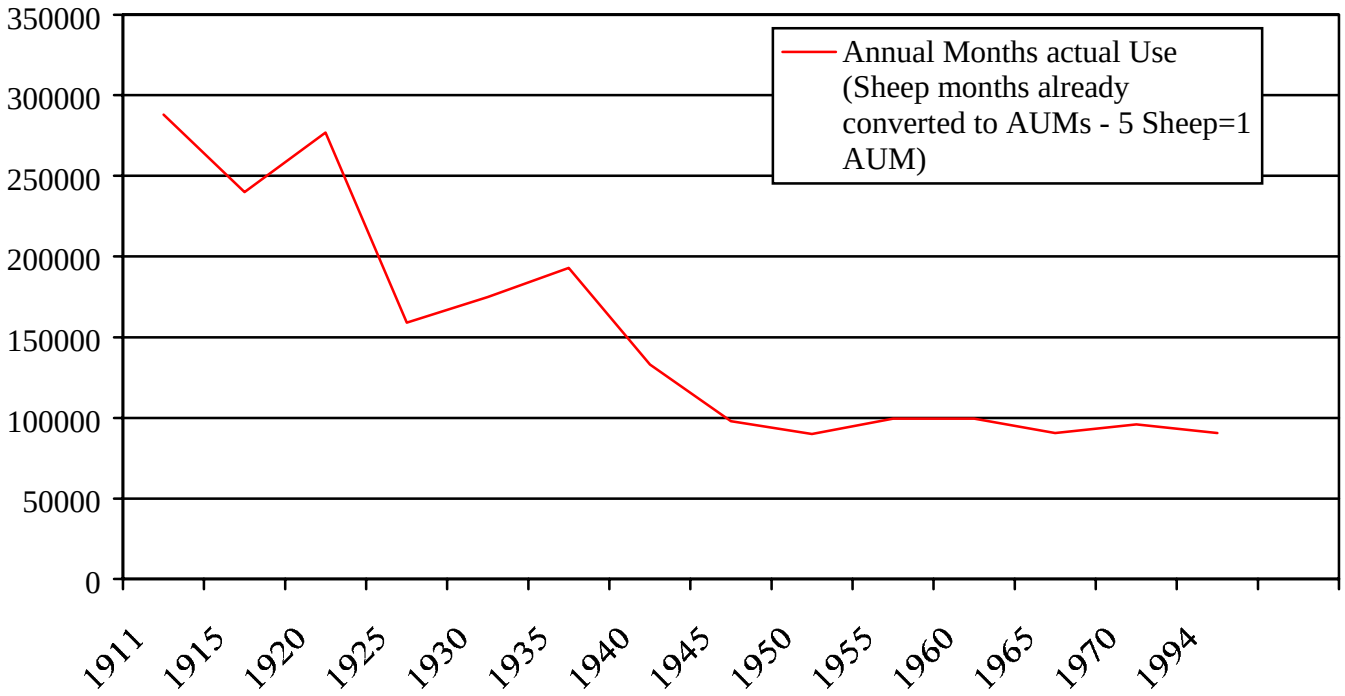
Overall, over 22,000 acres were no longer irrigated by the 1970's. However, because some farmers had converted to sprinkler systems, more acres were irrigated in or near the Wallowa and Prairie Creek valleys. Wells were drilled north and east of Enterprise for irrigation, but they have since been abandoned 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

---

[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.

---

[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

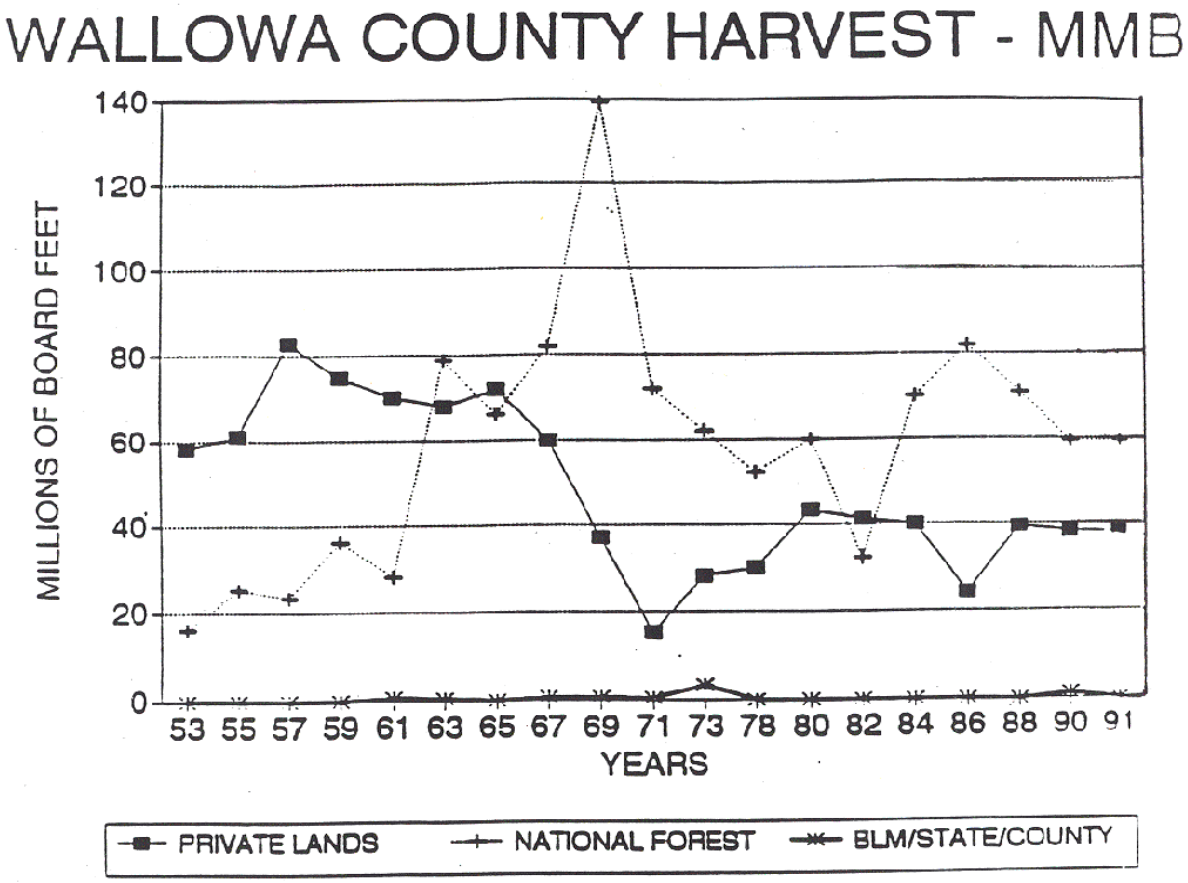
[8] Forestry Statistics for Eastern Oregon, 1977. USDA Forest Service. Resource Bulletin PNW-92, January 1982. Page 15; Timber Resource Statistics for All Forest Land, Except National Forests in Eastern Oregon. USDA Forest Service, Resource Bulletin PNW-RB-164, May 1989. Page 16.

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.