

**GRANDE RONDE RIVER SUBBASIN FISH HABITAT ENHANCEMENT PROJECT:
JOSEPH CREEK AND THE UPPER GRANDE RONDE RIVER DRAINAGES**

1991 ANNUAL REPORT,

by

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A B S T R A C T

On July 1, 1984 the Bonneville Power Administration and the Oregon Department of Fish and Wildlife entered into an agreement to initiate habitat enhancement work in the Joseph Creek drainage, a tributary of the Grande Ronde River in northeast Oregon. On July 1, 1985 the upper Grande Ronde River and 33 of its tributaries were added to the contract (Contract No. DE-AI79-84BP16614). Titled "The Grande Ronde Habitat Improvement Project: Joseph Creek and Upper Grande Ronde River Drainages, Project 84-25" this project's goal is to optimize spring/summer chinook and summer steelhead smolt production within the Grande Ronde River Basin using habitat enhancement measures. This project provides for implementation of Program Measure 703 (C)(I), Action Item 4.2 of the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Program and will be done as offsite mitigation for mainstem fishery losses caused by the Columbia River hydro-electric system. Accomplishing this goal will partially mitigate these losses.

All work being done by the Oregon Department of Fish and Wildlife is on private lands and therefore requires that considerable time be spent developing landowner rapport to insure their acceptance of, and cooperation with, the program.

Work undertaken during 1991 included: 1) construction of 14.5 miles of fence which protected 7.7 miles of stream and 132.7 acres of riparian area, 2) planting and/or seeding 8.6 stream miles of riparian area, 3) doing instream work on 6.0 miles of stream, 4) developing three off site water developments, 5) establishing new photopoints and retaking existing project photopoints, 6) monitoring stream temperatures with thermographs, and 7) doing maintenance on 45.6 miles of fence.

No new leases were signed in 1991 because there was sufficient project carryover for full implementation in 1992.

INTRODUCTION

The Joseph Creek and Upper Grande Ronde River drainages have been examined as part of a Grande Ronde basin study undertaken by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Oregon Department of Fish and Wildlife (ODFW). The study, funded by the Bonneville Power Administration (BPA), was designed to “compile, by major drainage, the basic information necessary to identify, evaluate, prioritize, and recommend site-specific solutions to major problems impacting the anadromous salmonid resource and fisheries”, and “prepare an integrated overall plan for the study area” (CTUIR, 1984). The identification, priority, and implementation of habitat work within these drainages represents a consensus among staff from ODFW, Tribal, and Federal entities (Tables 1 and 2).

The Joseph Creek drainage has historically been an excellent producer of summer steelhead, and the upper Grande Ronde River drainage an excellent producer of both summer steelhead and spring chinook. Unfortunately, summer steelhead redd counts from 1970 through 1984 indicated a severe reduction in numbers of spawning adults returning to these drainages. This downward trend began to show signs of improvement between 1985 through 1990. In 1991, however spawning counts were back down to the 1970 through 1984 levels. Escapement over Lower Granite Dam was significantly lower in 1990 which correlates to the low spawning escapement in 1991 (Tables 3 and 5). Spring chinook redd counts indicate that returns to the upper Grande Ronde River drainage remain well below those observed in the late 1960s and early 1970s (Table 4). Reasons for declines of anadromous fish during the mid-1970s and early 1980s include:

1. problems with passage at mainstem Columbia and Snake River dams,
2. user demands for the fishery resource,
3. degradation of spawning and rearing habitat, and
4. a major forest fire/flood event in the upper Grande Ronde headwaters during peak Chinook migration and spawning during August of 1989 resulting in decimation of the Chinook run (Boehne et.al, 1989).

Table 1. The estimated amount of riparian and instream habitat work needed within the Joseph Creek subbasin by stream, and in priority order.

Stream	Species Affected	Priority	Miles of Stream			Miles of Riparian Work				Instream Structures	
			USFS	Private	Total	Fencing		Planting		USFS	Private
						USFS	Private	USFS	Private		
Peavine Creek	Stld	1	8.0	0.0	8.0	4.5	0.0	4.5	0.0	43	0
Elk Creek	Stld	2	3.5	5.0	8.5	3.5	5.0	3.5	5.0	25	35
Chesnimnus Creek	Stld	3	12.0	8.0	20.0	12.0	8.0	8.0	4.0	60	40
Crow Creek	Stld	4	1.0	13.0	14.0	1.0	13.0	0.0	10.0	10	50
Swamp Creek	Stld	5	5.0	10.0	15.0	5.0	10.0	2.5	5.0	10	20
Pine Cr. System	Stld	6	2.0	20.0	22.0	2.0	18.0	2.0	18.0	10	40
Devil's Run Cr.	Stld	7	5.0	0.0	5.0	2.0	0.0	2.0	0.0	10	10
Davis Creek	Stld	8	7.0	3.0	10.0	7.0	3.0	4.0	3.0	10	0
Butte creek	Stld	9	0.0	4.0	4.0	0.0	4.0	0.0	3.0	0	10
INT Gulch	Stld	10	2.0	0.0	2.0	2.0	0.0	2.0	0.0	10	0
Joseph Creek	Stld	11	0.0	12.0	12.0	0.0	12.0	0.0	12.0	0	80
Subbasin Totals			45.5	75.0	120.5	39.0	73.0	28.5	60.0	188	285

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

Table 2. The estimated amount of riparian and instream habitat work needed within the Upper Grande Ronde River Subbasin by stream, and in priority order.

Stream	Species Affected	Priority	MILES OF Riparian Work								
			Miles of Stream			Fencing		Planting		Instream Structures	
			USFS	Private	Total	USFS	Private	USFS	Private	USFA	Private
Grande Ronde River	Ch,Stld	1	6.0	5.0	11.0	2.0	5.0	1.0	4.0	130	175
Sheep Creek	Ch,Stld	2	7.0	5.0	12.0	1.0	5.0	0.5	2.5	210	175
Fly Creek	Stld	3	6.0	6.0	12.0	1.0	5.0	0.5	3.0	180	180
Spring Creek	Stld	4	5.0	0.0	5.0	1.0	0.0	2.5	0.0	150	0
S.F. Spring Creek	Stld	5	3.0	0.0	3.0	1.0	0.0	1.5	0.0	90	0
N.F. Catherine Creek	Ch,Stld	6	3.0	0.0	3.0	0.0	0.0	0.0	0.0	90	0
McCoy Creek	Stld	7	4.0	7.0	11.0	1.0	7.0	3.0	4.0	120	210
Rock Creek	Stld	8	0.0	6.0	6.0	0.0	8.0	0.0	3.0	0	90
Dark Canyon Creek	Stld	9	1.0	2.5	3.5	0.0	2.5	0.0	0.0	15	38
Meadow Creek	Stld	10	7.0	7.0	14.0	1.0	7.0	0.5	0.5	210	210
Indian Creek	Ch,Stld	11	1.0	5.0	6.0	0.5	3.5	0.0	0.0	30	150
Chicken Creek	Ch,Stld	12	5.0	2.0	7.0	1.0	1.0	0.0	1.0	75	70
Catherine Creek	Ch,Stld	13	0.0	5.0	5.0	0.0	4.0	0.0	0.0	0	150
Beaver Creek	Stld	14	1.5	5.0	6.5	0.0	3.0	0.0	0.0	45	150
Five Points Creek	Stld	15	5.5	0.5	6.0	0.0	0.5	0.0	0.5	165	15
Clark creek	Ch,Stld	16	0.0	6.0	6.0	0.0	4.0	0.0	3.0	0	180
Little Catherine Cr.	Stld	17	1.0	4.0	5.0	0.0	2.0	0.0	1.5	15	60
Bear Creek	Stld	18	5.0	0.5	5.5	0.0	0.0	0.0	0.0	75	8
Limber Jim Creek	Ch,Stld	19	2.0	0.3	2.3	0.0	0.0	1.0	0.3	30	5
Pelican Creek	Stld	20	3.0	0.5	3.5	0.0	0.0	0.0	0.0	45	8
Peet Creek	Stld	21	2.0	1.0	3.0	0.0	0.0	1.0	0.5	60	30
Little Fly Creek	Stld	22	3.0	2.5	5.5	0.0	0.0	0.0	1.0	90	75
Whiskey Creek	Stld	23	1.0	8.0	9.0	0.0	4.0	0.0	2.0	15	120
Jordan Creek	Stld	24	2.0	8.0	10.0	0.0	4.0	0.0	2.0	30	120
N.F. Limber Jim Cr.	Stld	25	2.0	0.0	2.0	0.0	0.0	0.0	0.0	30	0
McIntyre Creek	Stld	26	2.5	5.0	7.5	1.0	3.0	1.0	5.0	75	150
Waucup Creek	Stld	27	5.0	0.0	5.0	0.0	0.0	1.0	0.0	150	0
Burnt Corral Cr.	Stld	28	6.0	0.2	6.2	0.0	0.0	0.0	0.0	90	4
Lookout Creek	Stld	29	3.5	0.8	4.3	0.0	0.0	0.0	0.0	53	24
Little Dark Canyon Cr.	Stld	30	2.0	0.0	2.0	0.0	0.0	0.0	0.0	60	0
Phillips Creek	Stld	31	0.0	6.0	6.0	0.0	2.0	0.0	0.0	0	180
Gordon Creek	Stld	32	0.0	7.0	7.0	0.0	4.0	0.0	2.0	0	210
Dry Creek	Stld	33	0.0	8.0	8.0	0.0	6.0	0.0	4.0	0	240
Cabin Creek	Stld	34	0.0	3.0	3.0	0.0	2.0	0.0	0.0	0	90
Subbasin Totals			95.0	116.8	211.8	10.5	82.5	13.5	39.8	2,328	3,117

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

TABLE 3. Average summer steelhead spawning ground counts in the Joseph Creek drainage, 1966 through 1991, (See footnotes 1-3 below.)

	AVERAGE 1966-69	AVERAGE 1970-74	AVERAGE 1975-79	AVERAGE 1980-84	AVERAGE 1985-89	1990	1991
REDDS OBSERVED	496	85	26	87	420	469	109
MILES SURVEYED	56	54	43	54	48	66	66
REDDS/MILE	8.9	1.6	0.6	1.6	8.9	7.1	1.6

- 1/ Streams included in the Joseph Creek subbasin summer steelhead spawning ground counts include: Butte, Chesnimus (mainstem, north, and south forks), Crow, Devil's Run, Elk, Peavine, Swamp, and TNT Gulch creeks. All of these creeks, however, may not be inventoried on any given year due to river conditions. This annual variation is reflected in the "Miles Surveyed" column.
- 2/ Since the Joseph Creek and Upper Grande Ronde River drainages are both within the Grande Ronde River basin, it is felt that spawning ground trends within the Joseph Creek drainage are also representative of those within the upper Grande Ronde River drainage.
- 3/ Summer steelhead spawning ground counts were obtained from Kenneth L. Witty, and Brad Smith, District Fish Biologists, Walla Walla District, Oregon Department of Fish and Wildlife.

TABLE 4, Average Spring Chinook spawning ground counts in the Grande Ronde River drainage, 1967 through 1991, (See footnotes 1-4 below.)

	AVERAGE 1967-69	AVERAGE 1970-74	AVERAGE 1975-79	AVERAGE 1980-84	AVERAGE 1985-89	1990	1991
REDDS OBSERVED	382	285	117	94	189	135	73
MILES SURVEYED	35	27	24	27	31	47	47
REDDS/MILE	10.9	10.6	4.9	3.5	5.9	2.9	1.6

- 1/ Late 1960's counts are three or four year averages, 1970-1989 are 5 year averages,
- 2/ Streams in the Upper Grande Ronde River drainage spring chinook spawning ground counts include North Fork, South Fork, and mainstem Catherine Creek; mainstem Grande Ronde River; Sheep Ck.; Lookingglass Creek; and Minam River,
- 3/ Spring chinook spawning ground counts were obtained from Duane C, West, District Fish Biologist, La Grande District, Oregon Department of Fish and Wildlife,
- 4/ The 1989 fish run was very low due to a flood/fire on Tanner Gulch, upstream on the Upper Grande Ronde drainage, Estimated 100% mortality.

TABLE 5. Counts of returning adult spring chinook and summer steelhead over Lower Granite Dam on the lower Snake River, 1975 through 1991. Spring chinook counts include adults and jacks. (See footnotes 1-3 below.)

YEAR	ANNUAL COUNTS	
	Summer Steelhead	Spring Chinook
1975	13,532	17,700
1976	20,020	20,500
1977	48,037	38,800
1978	23,565	41,000
1979	20,281	7,590
1980	32,677	6,800
1981	33,234	13,630
1982	63,070	12,780
1983	76,673	10,010
1984	86,538	7,900
1985	102,114	27,737
1986	116,622	33,074
1987	54,055	29,781
1988	72,884	30,419
1989	111,346	14,504
1990	50,628	17,559
1991	94189	7602

- 1/ Counts for 1975 through 1990 were taken from the Columbia River Fish Run and Fisheries Status Report, Oregon Department of Fish & Wildlife, Washington Department of Fisheries, 1991. Spring Chinook counts prior to 1985 were rounded off.
- 2/ The 1991 counts were obtained through personal communication with Curt Melcher, Oregon Department of Fish and Wildlife, Clackamas, OR.
- 3/ The 1975 through 1981 counts were prior to any fish passage improvements or smolt transport projects.

Considerable effort and money has already been put into trying to resolve mainstem dam passage problems and controlling ocean and river harvest of these stocks. Dam counts at Lower Granite Dam however, indicate that these efforts have not resulted in increased numbers of adult spring chinook returning to their native spawning grounds in lower Snake River tributaries (Table 4). Snake River Sockeye salmon have already been listed as an endangered species by NMFS under the Federal Threatened and Endangered Species Act, and a decision is expected in March 1992 on the possible listing of Spring, Summer, and Fall Chinook (Carmichael, personal communication, 1992).

Observations in the Joseph Creek and upper Grande Ronde River drainages however, indicate optimum rearing areas for summer steelhead and spring chinook are limited in large portions of these drainages by degradation of riparian and instream habitats (Noll, 1987). Several factors have contributed to this habitat degradation within project areas. Contributing factors include livestock grazing, farming practices, timber harvest practices, road construction, and stream channelization; livestock grazing and farming practices being the main factors on private lands. The result of this degradation has been loss of shade producing streamside vegetation, thereby causing high summer water temperatures, and destruction of natural pool/riffle ratios which are necessary for good smolt production. It has been estimated there is currently a 28 percent shade cover over most streams within project areas and, with proper habitat enhancement measures, this can be increased to 70 percent; a 250 percent increase over present shade cover. Installation of instream structures can restore pool/riffle ratios to an acceptable ratio. Therefore, through an aggressive habitat enhancement program, optimum habitats for returning adults and their progeny may be realized.

DESCRIPTION OF STUDY AREAS

JOSEPH CREEK DRAINAGE

The Joseph Creek drainage constitutes a major subbasin within the Grande Ronde River basin of northeast Oregon. It drains approximately 556 square miles of the 3,950 square mile Grande Ronde River basin and empties into the Grande Ronde River 4.3 miles above the confluence of the Grande Ronde and Snake rivers (Figure 1). Approximately 75 percent of the Joseph Creek drainage is within the project area. Not included in the project area is lower Joseph Creek in Washington state and the Cottonwood Creek drainage which enters Joseph Creek 4.4 miles above Joseph Creek's confluence with the Grande Ronde River (Figure 1).

Within the project area 120.5 miles of stream have been identified as in need of habitat enhancement; 75 miles on private land and 45.5 miles on National Forest lands (Table 1).

UPPER GRANDE RONDE RIVER DRAINAGE

The upper Grande Ronde River drainage constitutes approximately 1,622 square miles of the Grande Ronde River subbasin above the confluence of the Grande Ronde and Wallowa rivers at Rondowa; 81.4 miles upstream from the confluence of the Grande Ronde and Snake rivers (Figure 2). A major portion of the upper Grande Ronde River drainage, including the mainstem Grande Ronde River and 33 of its tributaries, are within the project area.

Within the project area 211.8 miles of stream have been identified as in need of habitat enhancement; 116.8 miles on private lands and 95.0 miles on National Forest lands (Table 2).

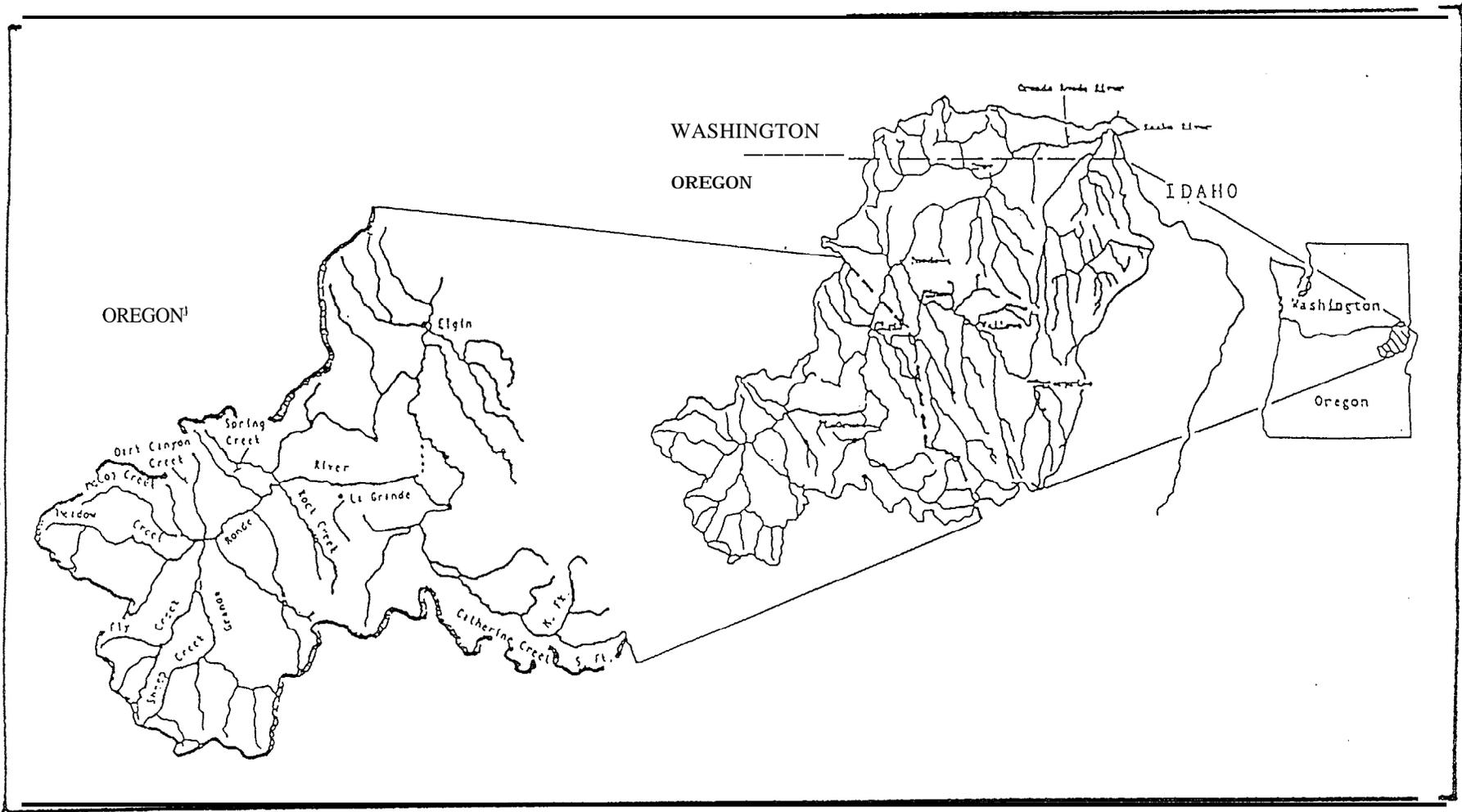


Figure 2. The Upper Grande Ronde River Drainage as it relates to the Grande Ronde River Basin of northeast Oregon.

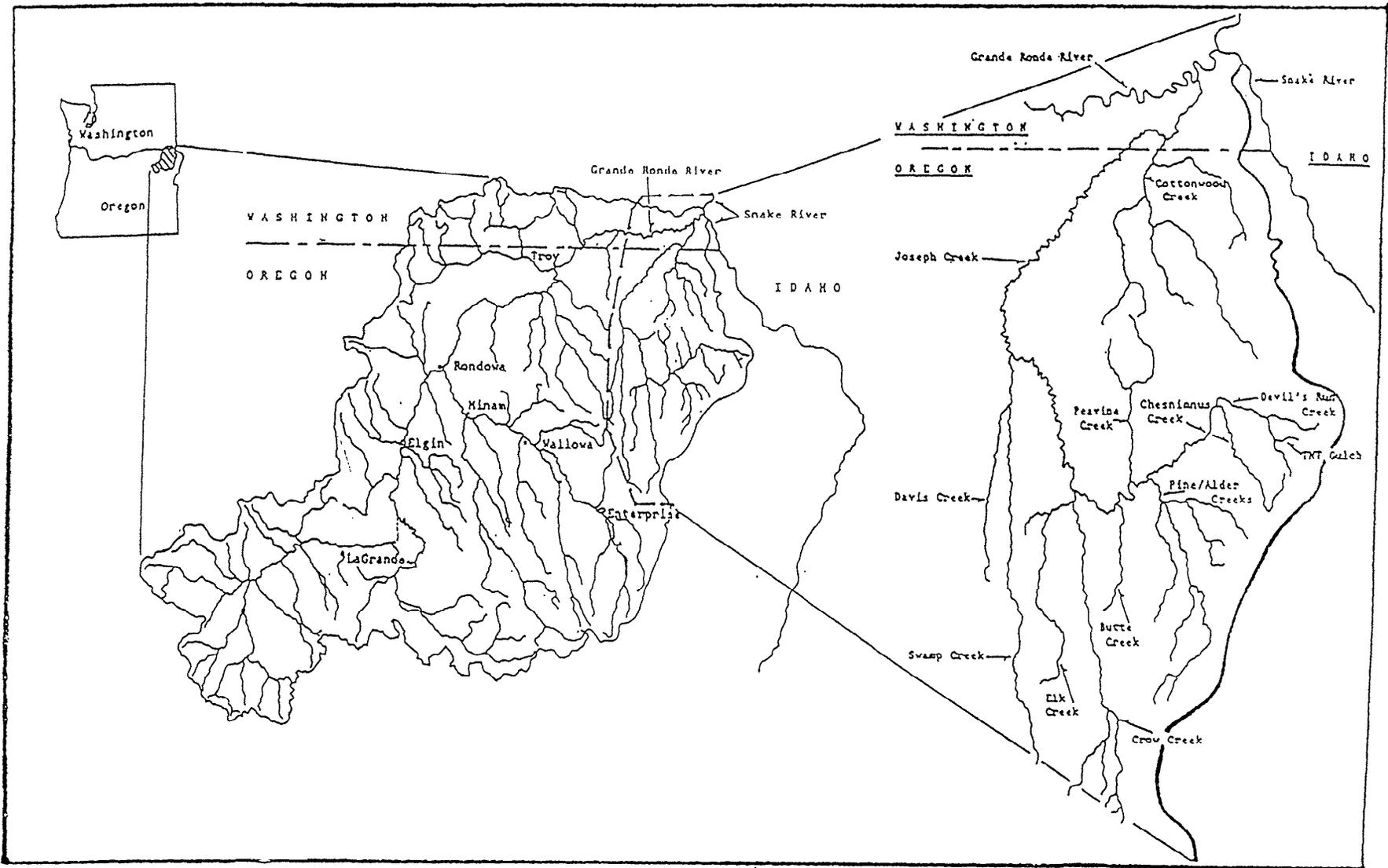


Figure 1. The Joseph Creek Drainage as it relates to the Grande Ronde River Basin of northeast Oregon and southeast Washington.

METHODS AND MATERIALS

The goal of this program is to optimize spring/summer chinook and summer steelhead smolt production within the Grande Ronde River Basin using habitat enhancement measures. To accomplish this goal, work will progress in three phases:

1. planning and preparation (prework),
2. implementation, and
3. maintenance and evaluation.

PREWORK

Prior to actual project implementation the following activities are to be conducted:

Project Planning

Project planning includes design and layout of all work to be done onsite, landowner coordination, development of contracts and contract specifications, and obtaining necessary work permits.

Project Preparation

Prior to signing leases or construction contracts, all lease boundaries and work sites must be identified, staked, and agreed upon by the landowner and/or contractor. Work sites may include easements or right-of-ways, fences, instream structures, offsite water developments, planting, and miscellaneous lease or construction related areas.

Riparian Lease Development and Procurement

Riparian lease development and procurement includes meeting with landowners and/or their legal representatives specifically for the purpose of developing an acceptable lease text, and/or signing lease documents.

IMPLEMENTATION

Implementation entails the actual on-the-ground work phase of the program and may include any or all of the following:

Instream Structures

During late summer and early fall when stream flows are lowest, structures will be installed in streams at locations preselected by fishery biologists and/or hydrologists. Structures of various types will be used to provide optimum pool/riffle ratios, raise riparian water tables, collect spawning gravels, and increase the amount of large woody debris, thereby increasing quantity and quality of rearing and spawning habitats. Rock jetties and deflectors will be the primary structures used to stabilize streambanks. Boulders will be used to create small rearing pools and hiding cover.

Planting

During the early spring, shrub and/or tree species may be planted at preselected locations along streams within project areas. Since high summer water temperature appears to be a major limiting factor, plantings will be made to provide stream shade, thereby reducing summer water temperatures and increasing salmonid utilization of streams. The maximum shade attainable for most streams in project areas is estimated at about 80 percent. The objective of this phase of the program is to reach a minimum of 70 percent shade and have water temperatures of no more than 68 degrees Fahrenheit within 20 years of project implementation.

During the fall, areas disturbed while doing implementation activities will be seeded to stabilize soils and discourage weed growth.

Fencing

Destruction of streamside vegetation by domestic livestock has been a major problem within project areas. To provide protection from livestock and thereby promote rapid recovery of existing and planted vegetation, fences will be constructed along riparian zones within project areas.

Photopoint Establishment

Photopoint establishment includes locating and placing permanent markers at sites from which photographs can be taken at regular intervals, thereby depicting riparian changes through time. Also associated with photopoint establishment is development of a photopoint notebook for each project area.

Offsite Water Developments

In an attempt to reduce the number of watering gaps in riparian fences (thereby reducing fence construction and maintenance costs) , and to encourage livestock utilization of vegetation away from riparian areas, offsite water sources will be developed.

Habitat Monitoring Transects

Within selected project areas permanent habitat monitoring transects will be established. Specific measurements will then be taken along each transect. These measurements will be repeated at regular intervals and compared with original measurements as a means of quantitatively measuring environmental changes through time.

Miscellaneous Field Activities

Cooperator sign boards denoting riparian enhancement projects as cooperative efforts between BPA, ODFW and private landowners will be installed at high visibility sites along completed riparian enhancement project areas.

MAINTENANCE AND EVALUATION

Postwork entails all maintenance and evaluation of work which has been done within project areas. This phase of the program will usually begin the year following completion of implementation and will continue for several years. Typical postwork activities may include:

Project Maintenance

Following completion of implementation a bi-annual inspection of all project areas will be made. Following these inspections all fence and instream structure maintenance will be done. Stream cross fences and/or watergap cross fences will be either put in or removed during these inspections or subsequent maintenance.

Photopoint Picture Taking

Standardized pictures will be taken from preselected photopoints prior to implementation on any project area and then during the spring and fall for two years immediately following completion of a project. Once these initial photos are obtained the frequency of photopoint picture taking may diminish to once every two to three years.

Habitat Monitoring Transect Data

Immediately after establishing habitat monitoring transects, baseline data will be collected. Data collection, following the establishment of baseline data, will be done on the first year following completion of implementation activities and then at approximately 3 to 5 year intervals.

Miscellaneous Field Activities

Thermographs have been installed within and/or adjacent to selected project areas. These thermographs will then be monitored on a regular basis to detect changes in water temperatures.

RESULTS AND DISCUSSION: I. FIELD ACTIVITIES

Pework

Project Planning

Design and Layout

Identification of property boundaries for privately owned lands along priority streams in the Joseph Creek and upper Grande Ronde drainages was the first step in preparation for doing habitat enhancement work. A majority of the mapping for the private lands was accomplished in 1988. Additional mapping has been done since then for ongoing and future project planning.

Landowner Coordination

Considerable time was spent during the year meeting with landowners in the Joseph Creek drainage and the Upper Grande Ronde River drainage located in the Grande Ronde River subbasin. Additional landowners were contacted in the Camas Creek drainage which is located in the John Day subbasin. Contacts were in the form of telephone conversations, on-the-ground inspection of proposed project sites, and letters. During these meetings emphasis was placed on meeting fishery needs while at the same time benefiting landowners.

During 1991 six landowners in the Joseph Creek drainage, five landowners in the upper Grande Ronde drainage, and twelve landowners in the Camas Creek drainage (John Day subbasin) were contacted regarding possible work on their properties.(Table 6,7,and 8).

Developing Contracts and Contract Specifications

Considerable time during 1991 was devoted to developing contracts and contract specifications for fence and instream structure contracts. The hi-tensile and barbed wire fence technical specifications and drawings were completely redone to reflect improvements made to them over the past several years. Ten contracts were needed to accomplish implementation activities in 1991. These contracts resulted in construction of 14.5 miles of fence and completion of 6.0 miles of instream work. All awarded contracts were prepared and administered by project personnel.

Obtaining Work Permits

Fill and Removal permits were applied for and received from the Oregon Division of State Lands. The permits applied for were Fish Habitat Waiver permits that allowed us to construct fish habitat structures and to do some bank stabilization work in and along Whiskey Creek (UGR), the Upper Grande Ronde River, and Chesnimnus Creek (LGR).

TABLE 6. Landowners contacted in the Joseph Creek drainage for the purpose of discussing riparian management programs and/or riparian lease development in 1991.

Joseph Creek Landowners	Stream Involved
McClaran	Adler, Pine Cks.
Yost	Butte Ck.
McDaniel	Butte Ck.
McDaniel	Pine, Chesnimnus Cks.
Fleshman	Crow Ck.
Birkmaier	Elk Ck.

TABLE 7. Landowners contacted in the Upper Grande Ronde drainage for the purpose of discussing riparian management programs and/or riparian lease development in 1991.

Upper Grande Ronde Landowners	Stream Involved
Shiller	Fly, Chicken, Sheep Cks.
Mosgrove	Bear Ck, Upper Grande Ronde R.
Sherman	Rock Ck.
Tsiatsos	Upper Grande Ronde R.
Able	Upper Grande Ronde R.

TABLE 8. Landowners contacted in the John Day River subbasin, Camas Creek drainage, for the purpose of discussing riparian management programs and/or riparian lease development in 1991.

John Day Landowners	Stream Involved
Christian	Camas Ck.
Fletcher	Camas Ck.
French	Camas, Owens Cks.
Hoeft	Camas Ck.
Hughes	Camas Ck.
Nelson	Camas Ck .
Owens	Camas Ck .
Palmer	Camas Ck.
Pendleton Ranches	Camas Ck.
Rhinehart	Camas Ck.
Cunningham Sheep	Camas, Owens Cks.
Markgraf	Camas Ck.

Project Preparation

In preparation for fencing prebid tours, 9.8 miles of new fenceline was staked along, Pine Creek (McDaniel), Whiskey Creek (Courtney), and the Upper Grande Ronde River (Delve). Most of this was restaked at least once prior to construction due to livestock. In addition approximately 8.4 miles of fenceline was restaked for ongoing fence projects left from 1990 on Butte Creek (McDaniel), Whiskey Creek (Hampton), and the Upper Grande Ronde River (Bowman/Hoeft).

In preparation for instream prebid tours all work sites were staked for Chesnimnus Creek (McDaniel), Whiskey Creek (Hampton), and the Upper Grande Ronde River (Delve).

Prebid inspection tours were conducted by ODFW personnel for all construction contracts.

Construction, preparation, and purchasing of all field equipment and materials needed for implementation activities were completed.

Riparian Lease Development and Procurement

No new riparian leases were signed with landowners in 1991 for projects to be implemented in 1992. In 1992 we will complete 13.1 miles of fencing projects and retro-fit fences and instream structures on other projects.

We now have 20.6 miles of stream and 387.5 acres of riparian habitat leased in the Joseph Creek drainage, and 18.4 miles of stream and 276.1 acres of riparian habitat leased in the Upper Grande Ronde drainage (Tables 9, 10, 11, and 12).

TABLE 9. Completed projects within the Joseph Creek drainage, 1985-1991.

Creek	Landowner	Acres	Stream Miles	Fence Miles
Chesnimnus Ck.	Yost	41.8	3.0	5.4
Elk Ck.	Birkmaier	7.7	0.6	1.4
Swamp Ck.	Olson	16.2	2.4	4.4
Swamp Ck.	Boise Cascade	48.6	2.6	4.9
Crow Ck.	Fleshman	10.5	1.2	2.4
Crow Ck.	Buhler	7.4	0.8	1.5
Salmon Ck.	McClaran	7.0	0.7	1.4
Salmon Ck.	McDaniel	45.5	1.6	3.2
Butte Ck.	McDaniel	29.2	2.7	5.3
Pine Ck.	McDaniel	43.5	1.5	3.2
Totals		257.4	17.1	33.1

TABLE 10. Ongoing & Proposed Projects within the Joseph Creek drainage, 1992.

Creek	Landowner	Acres	Stream Miles	Fence Miles	Fence Miles Completed
Chesnimnus Ck.	McDaniel	130.1	3.5	8.9	0.0
Totals		130.1	3.5	8.9	0.0

TABLE 11. Completed projects within the Upper Grande Ronde River drainage, 1986-1991.

Creek	Landowner	Acres	Stream Miles	Fence Miles
Fly Ck.	Smith	14.8	1.2	1.7
McCoy Ck.	Tipperman	19.6	1.6	3.1
Meadow Ck.	Waite	19.7	1.2	1.9
Meadow Ck.	Tipperman	56.8	2.7	5.3
Meadow Ck.	B.M.C.B.A.	6.6	0.4	0.6
Sheep Ck.	Vey	54.7	4.3	6.0
Sheep Ck.	BLM	12.8	0.7	0.8
U.G.R. River	Bowman/Hoeft	37.8	1.4	3.1
U.G.R. River	Delve	7.0	0.6	1.0
Whiskey Ck.	Hampton	15.2	1.5	3.0
Totals		245.0	15.6	-26.5

NOTE: Tipperman property formerly owned by Misener.

TABLE 12. Ongoing & Proposed Projects within the Grande Ronde River drainage, 1992:

Creek	Landowner	Acres	Stream Miles	Fence Miles	Fence Miles Completed
Whiskey Ck.	Courtney	31.1	2.8	5.6	0.0
Totals		31.1	2.8	5.6	0.0

IMPLEMENTATION

Instream Structures

Creating complex pools and the addition of large woody debris were some of the objectives for the instream work done in the Upper Grande Ronde River and Chesnimnus Creek in 1991. Approximately 70 percent of the large pool habitat in the Mainstem Upper Grande Ronde River and approximately 26 percent in Meadow Creek has been lost since 1941 (Sedell and Everest, 1990).

Upper Grande Ronde River Drainage

Whiskey Creek (Hampton) - The May 1991 flood created a potential fish passage problem by depositing a large volume of alluvial gravels at the mouth of Whiskey Creek. Approximately 100 yards of gravel was removed from this section of stream to provide fish passage. In addition, 5 boulders and 7 trees were placed in Whiskey Creek for additional instream habitat diversity.

Upper Grande Ronde River (Delve and Bowman-Hoeft) - Approximately 209 boulders were placed in a wide array of formations: upstream and downstream v-weirs, strings, clusters, scour rocks in weir pools, off of rock faces, and in conjunction with whole trees and root wads. Additionally 45 boulders were rearranged on the Bowman-Hoeft property to provide additional pool habitat. In conjunction with, and to enhance the complexity of the boulder placements, we attached 7 trees with root wads, 84 trees without root wads, and 42 root wads without trees to boulders or other hard points, (ie. rock walls) with cable.

Joseph Creek Drainage

Chesnimnus Creek (McDaniel) - Approximately 427 boulders were placed in the following configurations: Upstream U-weirs, boulder strings, clusters, scour rocks off jetty points, in pools; and in conjunction with large woody debris, trees, and root wads. A total of 63 jetties were constructed; 14 of these placed with cull logs protruding. Seventeen jetties were used as "hard points" to attach trees, root wads, and other large wood. A total of 27 whole trees, 15 root wads, and 44 cull logs and other large woody debris were added to the stream in a variety of configurations for additional habitat. All woody debris were attached to boulders or other hard points with cable.

Planting

McCoy and Sheep Creeks were planted with 920 willow and 280 red osier dogwood stakes for a total of 1200 cuttings. Meadow Creek (Camp Elkanah) was planted with 231 rooted shrubs/trees and the Upper Grande Ronde River (Bowman-Hoeft) was planted with 90 shrubs/trees for a total of 321 plants (Table 13). Whiskey Creek and the Upper Grande Ronde River were planted with 60 lbs. of a riparian grass seed mix after instream work was completed (Appendix A).

The Salmon Creek project (McClaran) was planted with 400 willow stakes. A total of 425 lbs. of grass seed mix was planted along Butte, Pine, and Chesnimnus creeks after completion of fences and instream work (Table 14).

Fencing

Joseph Creek Drainage.

The riparian corridor fence along Butte Creek that was started in 1990 was completed in 1991. A total of 5.3 miles of barbed wire fence was constructed of which 4.3 miles was completed in 1991. ODFW project personnel pounded posts for 2.3 miles of this fence to ensure that at least one side of the fence would be completed to exclude cattle from one side of the creek by June. The other side of the creek fence was completed in the fall of 1991.

The riparian corridor barbed-wire fence on the Pine Creek (McDaniel) property was completed totalling 3.2 miles of fence.

Upper Grande Ronde River Drainage.

Two hi-tensile smooth wire fence contracts totalling 6.6 miles (Whiskey Creek/Hampton and Upper Grande Ronde River/Bowman-Hoeft) were awarded in 1990 were completed in 1991.

The riparian corridor hi-tensile fence on the Upper Grande Ronde (Delve) property was completed totalling 1.0 miles of fence.

The hi-tensile riparian corridor fence on Whiskey Creek (Courtney) was awarded and approximately 1.5 miles was completed in 1991. This project was delayed because of a very wet spring and we could not access the property with materials until late July, 1991. When completed in 1992 this fence will total approximately 5.6 miles.

TABLE 13. Plantings performed on riparian areas in the Upper Grande Ronde River drainages, 1991.

Stream	Owner	Species	Number Planted	Lbs. of Seed
McCoy Ck	Tipperman	Willow	770	
McCoy Ck	Tipperman	Red Osier	130	
Sheep Ck.	Vey	Willow	150	
Sheep Ck.	Vey	Red Osier	150	
Meadow Ck.	B.M.C.B.A.	Aspen	15	
Meadow Ck.	B.M.C.B.A.	Currant	43	
Meadow Ck.	B.M.C.B.A.	Cottonwood	18	
Meadow Ck.	B.M.C.B.A.	Rose	35	
Meadow Ck.	B.M.C.B.A.	Serviceberry	5	
Meadow Ck.	B.M.C.B.A.	Chokecherry	30	
Meadow Ck.	B.M.C.B.A.	Red Osier	30	
Meadow Ck.	B.M.C.B.A.	Willow	50	
Meadow Ck.	B.M.C.B.A.	Mountain Ash	5	
Meadow Ck.	B.M.C.B.A.	Grass Mix		50
Upper Grande Ronde R.	Bowman/Hoeft	Aspen	5	
Upper Grande Ronde R.	Bowman/Hoeft	Cottonwood	10	
Upper Grande Ronde R.	Bowman/Hoeft	Serviceberry	35	
Upper Grande Ronde R.	Bowman/Hoeft	Chokecherry	20	
Upper Grande Ronde R.	Bowman/Hoeft	Rose	20	
Upper Grande Ronde R.	Bowman/Hoeft	Grass Mix		20
Upper Grande Ronde R.	Delve	Grass Mix		20
Whiskey Ck.	Hampton	Grass Mix		20
Totals			1521	110

NOTE: Grass Mixes consisted of three types based upon application. See Appendix A for descriptions.

TABLE 14. Plantings performed on riparian areas in the Joseph Creek drainage, 1991.

Stream	Owner	Species	Number Planted	Lbs. of Seed
Salmon Ck.	McClaran	Willow	400	
Butte Ck.	McDaniel	Grass Mix		100
Pine Ck.	McDaniel	Grass Mix		75
Chesnimnus Ck.	McDaniel	Grass Mix		250
Totals			400	425

NOTE: Grass Mixes consisted of three types based upon application. See Appendix A for descriptions.

Photopoint Establishment

Four preliminary photopoints were established on the Upper Grande Ronde (Delve) project. Additional photopoints will be established next spring. No photopoints were established on the Whiskey Creek (Courtney) project. These photopoints will be established in 1992.

Ten photopoints were established on the following Lower Grande Ronde/Joseph Creek Drainage project sites: 5 on Pine Creek (McDaniel), and 5 on Butte Creek (McDaniel). Several preliminary photopoints were taken on Chesnimnus Creek (McDaniel), which will be finalized in 1992. All photopoints were marked with a steel post and metal identification tag. All photopoints established in 1991 have been catalogued.

Miscellaneous Field Activities

Signs denoting riparian project areas as a cooperative effort between BPA, ODFW, and landowners were placed on the riparian fences on Whiskey Creek and the Upper Grande Ronde River in the Upper Grande Ronde drainage.

Several trees were cabled into an old bridge abutment near Red Bridge State Park (Upper Grande Ronde River). The Oregon Department of Transportation donated the use of a crane and personnel for this project.

MAINTENANCE AND EVALUATION

Project Maintenance

Inspection of 45.0 miles of project fence was done; 25.6 miles in the Joseph Creek drainage and 19.4 miles in the Upper Grande Ronde River drainage. Maintenance was completed in all project areas (Tables 15 and 16).

Winter ice flows and a May 1991 flood (estimated to be a 25 year event) damaged riparian fences, creek cross-fences, and water gap fencing units throughout the project. The majority of the damage occurred in the Upper Grande Ronde drainage. A major emphasis in the 1991 field season was to repair all existing fences and water gap fencing units before the grazing season began.

Maintenance of creek cross-fences and water gaps continued in the Joseph Creek drainage and should be completed in 1992. All maintenance was done using ODFW seasonal and permanent personnel.

Some of the early corner structures (ie. "pivot post w/angle braces") did not perform as desired, and continue to be replaced as needed. Another maintenance item was straightening stays and repounding all staples. Stay alignment is one of the biggest problems with hi-tensile smooth wire fences. We have tested several new ideas for the above problem, and are monitoring them for success.

Photopoint Picture Taking

Pictures were taken during the spring and fall at photopoints established prior to 1989 and in mid to late summer on new (1990 and beyond) projects. All photopoints were catalogued in project notebooks.

Thermograph Data Collection and Summarization

Data was collected from thermographs in Sheep and McCoy Creeks for the fourth year. The 1991 data sets were compared to earlier data sets (1988 - 1990). Though temperatures appear to be slightly lower in 1991 as compared to 1989 there is not enough data to make any conclusions at this time (Appendix B).

Thermographs were installed in Salmon Creek and data was collected for the first time.

TABLE 15. Summary of maintenance work performed on fences in the Upper Grande Ronde River drainage, 1991.

CREEK	OWNER	HOURS								
		Fence Type	Fence Miles	General Mainten.	Water Gap Mainten.	Flood Repairs	Spring Mainten.	Photo Points	Other	Total
Sheep Ck.	Vey	HT	6.8	68	3	8	0	7	11	97
Fly Ck.	Smith	HT	1.7	26	0	0	0	3	0	29
Meadow Ck.	Tipperman	HT	5.3	33	16	36	0	3	0	88
Meadow Ck.	Waite	HT	1.9	28	6	25	0	2	0	61
Meadow Ck.	B.M.C.B.A.	BLW	0.6	0	1	0	0	2	0	3
McCoy Ck.	Tipperman	HT	3.1	4	12	148	0	3	6	173
Whiskey Ck.	Hampton	HT	3.0	0	7	0	0	0	0	7
Whiskey Ck.	Courtney	HT	5.6	0	0	0	0	0	0	0
Upper G.Ronde	B/H	HT	3.1	6	4	0	0	0	0	10
Upper G.Ronde	Delve	HT	1.0	0	3	0	0	0	0	3
Totals			32.1	165	52	217	0	20	17	471

NOTES: "Other" column includes RTM maintenance and deployments, and placing pipe over Transect points.
 Tipperman property was formerly owned by Misener.

TABLE 16. Summary of maintenance work performed on fences in the Joseph Creek drainage, 1991.

CREEK	OWNER	Fence Type	Fence Miles	HOURS							Total
				General Mainten.	Water Gap Mainten.	Water Gap Refit	Spring Mainten.	Weed Control	Other		
Swamp Ck.	Boise Cascade	HT	4.9	14	0	0	0	0	0	14	
Swamp Ck.	Olson	BW	4.4	2	4	0	0	0	0	6	
Elk Ck.	Birkmaier	BW	1.4	4	66	18	0	0	0	88	
Crow Ck.	Buhler	HT	1.5	4	0	0	0	0	0	4	
Crow Ck.	Fleshman	HT	2.4	25	0	0	0	0	0	25	
Chesnimus Ck.	Yost	HT	5.4	17	7	20	0	0	0	44	
Salmon Ck.	McClaran	HT	1.4	0	7	0	0	0	0	7	
Salmon Ck.	McDaniels	BW	3.2	0	30	0	0	0	12	42	
Butte Ck.	McDaniels	BW	5.3	5	0	0	0	0	0	5	
Pine Ck.	McDaniels	BW	3.2	0	3	0	0	0	94	97	
Totals			33.1	71	117	38	0	0	106	332	

NOTES: "Other" column includes 1) Willow plantings on Salmon Ck.
and 2) New installations of water gaps on Pine Ck.

Miscellaneous Field Activities

A fish ladder was installed on Meadow Creek (Camp Elkanah) by a group of college students and the Biologist.

The flood of May 1991 was observed to provide insight into past and future planning of riparian restoration projects. Some photos were taken to record this event.

The annual bird count on Swamp Creek was not done in 1991.

Bird boxes along McCoy and Meadow Creeks were cleaned and data was collected on their use by species.

Table 17. Summary of avian species found in bird boxes along McCoy and Meadow Creek

<u>Bird Species</u>	<u>Nest Number</u>	<u>Percent Used</u>	<u>General Comments</u>
Bluebird	21	11.6%	several with unhatched eggs
Tree swallow	26	14.3%	used mallard feathers for lining
House wren	3	1.7%	all three with unhatched eggs
Unknown	83	45.5%	probably a mixture of the above species
Empty	49	26.9%	20% of these inhabited by wasps
Total	182	100.0%	

RESULTS AND DISCUSSION II. ADMINISTRATION

ADMINISTRATIVE

Administrative activities during 1991 included preparation of reports and data summaries, budgets and purchasing, program development, supervision of personnel, and contract administration.

Reports and Data Summaries

Monthly and annual progress reports for the Joseph Creek and upper Grande Ronde drainages were prepared and submitted to BPA.

Information pertinent to the 1992-1993 Work Statement and budgets were submitted to the Region for document preparation.

Daily contract inspection reports were completed for all project work done.

Project implementation summaries by drainage and stream were written and submitted to the region.

Budgets/Purchases

Considerable time was spent obtaining quotes for construction materials, and purchasing and receiving materials shipments. All capitol items were also purchased.

Program Development

Project maintenance hours were logged on "QUATTRO" to track current trends and help estimate future manpower needs. Comparisons of fence maintenance hours for hi-tensile and barbed wire fences is now available.

The respective District Fish Biologists, District Fish Habitat Biologists, and Regional Fish Habitat Biologist met to discuss past, current, and future goals of the BPA funded Fish Habitat Program.

Fish Habitat personnel from all projects met with BPA personnel to discuss current and future directions of fish habitat work in Northeast Oregon. Kirk Beiningen from ODFW Portland Fish Division also attended.

Personnel

Approximately three weeks were spent orienting new project personnel to the Upper Grande Ronde River and Joseph Creek drainages.

Mr. Steven Springston transferred from the Joseph Creek Habitat Technician II position to take a similar position with Central Region in May of 1991.

Mr. Vance McGowan transferred from Upper Grande Ronde Habitat Technician II to the Joseph Creek Habitat Technician II position in May of 1991.

Mr. Craig Soule was promoted from an EBA position in Central Region to the Upper Grande Ronde Habitat Technician II in May of 1991.

Mr. Dan Bartolomucci and Mr. Dale Hemerick were hired as seasonal employees for the Joseph Creek drainage. The seasonal employees spent approximately 25 percent of their time on fence maintenance, and 75 percent on project fence implementation.

Contract Administration

Ten contracts were administered by project personnel during 1991. Administering these contracts took considerable time for design, layout, construction, inspections, administration, and assisting contractors with materials handling.

INTER AGENCY COORDINATION/EDUCATION

INTERAGENCY COORDINATION

Union and Wallowa County SWCD monthly meetings were occasionally attended by ODFW personnel.

The annual Oregon Chapter of the American Fisheries Society (AFS) meeting was attended by project personnel.

The AFS Riparian Workshop was attended by project personnel.

All project personnel attended a Law Enforcement Training workshop which was presented by the Oregon State Police.

The Joseph Creek Technician coordinated with the ODFW District Fish Biologist, the Department of Environmental Quality, and Doug McDaniel regarding an oil spill into Butte Creek on the McDaniel property.

The Biologist met with personnel from the Water Resources Department, the USFS, Confederated Tribes of the Umatilla Indians, and a city councilperson from Ukiah, Oregon concerning the Camas Creek drainage.

The Biologist attended a Hydraulics and Hydrology short-course sponsored by the Idaho Chapter of AFS and taught by Mr. John Orsborn, P.E..

Woody debris for instream habitat enhancement work was obtained from the USFS (Wallow-Whitman N.F.) in Enterprise and La Grande.

Project personnel attended a field review of ODFW riparian projects in the Grande Ronde River and John Day River subbasins. This review was coordinated by BPA and conducted by Robert Beschta, Phd Hydraulologist; Boone Kaufmann, Phd Riparian Ecologist; and William Platts, Phd Fisheries Scientist.

EDUCATION

The following educational activities were undertaken with various groups during 1991:

- 1. An Imbler High School advanced biology class was instructed on physical and biological monitoring techniques and the value of riparian areas for watershed, and multiple resource uses. This was the fourth year that the students collected field data.**
- 2. School groups attending Camp Elkanah were instructed on riparian plant communities, the importance of riparian areas, and given field tours of the Meadow Creek fish habitat project. General information on instream fish habitat structures was discussed, and the children assisted in the planting of 261 shrubs and trees along Meadow Creek.**

LITERATURE

- Boehne, P. et al. 1989. Report on the Impacts to the Aquatic Environment of the Upper Grande Ronde River from the Tanner Gultch Fire, USDA Forest Service, Wallowa-Whitman N.F., LaGrande Ranger District.**
- Carmichael, Richard. 1992. ODFW Research Biologist. Personal Communication. E.S.A., Update on Grande Ronde River Anadromous Fish Stocks.**
- Confederated Tribes of the Umatilla Indian Reservation. 1984. Grande Ronde River Basin. Recommended Salmon and Steelhead Habitat Improvement Measures. 92 pp.**
- Noll, William T. et. al. 1987. Grande Ronde River Basin Fish Habitat Improvement Implementation Plan. 29 pp.**
- Sedell, James R. and Everest, Fred H. 1991. Historic Changes In Pool Habitat For Columbia River Basin Salmon Under Study For TES Listing. 7pp. (Draft).**

APPENDIX A

GRASS SEED MIXES

Three different grass seed mixes were used to seed disturbed ground in riparian areas, uplands, and access points to enhance recovery, repair access lanes, and minimize weed invasions onto disturbed ground. The following mixes were used in the Upper Grande Ronde River and Joseph Creek drainages in 1991:

1. **Roads** - This mix was designed primarily to seed disturbed access lanes.

Paiute Orchardgrass (40%)
Magnar Great Basin Wildrye (30%)
Durar Hard Fescue (10%)
Ladak Alfalfa (20%)

2. **Uplands** - This mix was designed primarily for upland sites and rock pit restoration.

Covar Sheep Fescue (67%)
Yellow Blossom Sweet Clover (33%)

3. **Riparian** - This mix was designed to be used in high water table areas, generally in the riparian enclosure. This mix was used to seed jetty sites and other disturbed sites.

Alkar Pubescent Wheatgrass (30%)
Luna Pubescent Wheatgrass (30%)
Magnar Great Basin Wildrye (15%)
Covar Sheep Fescue (10%)
Ladino White Clover (5%)
Ladak Alfalfa (5%)
Yellow Blossom Sweet Clover (5%)

APPENDIX B

THERMOGRAPHS

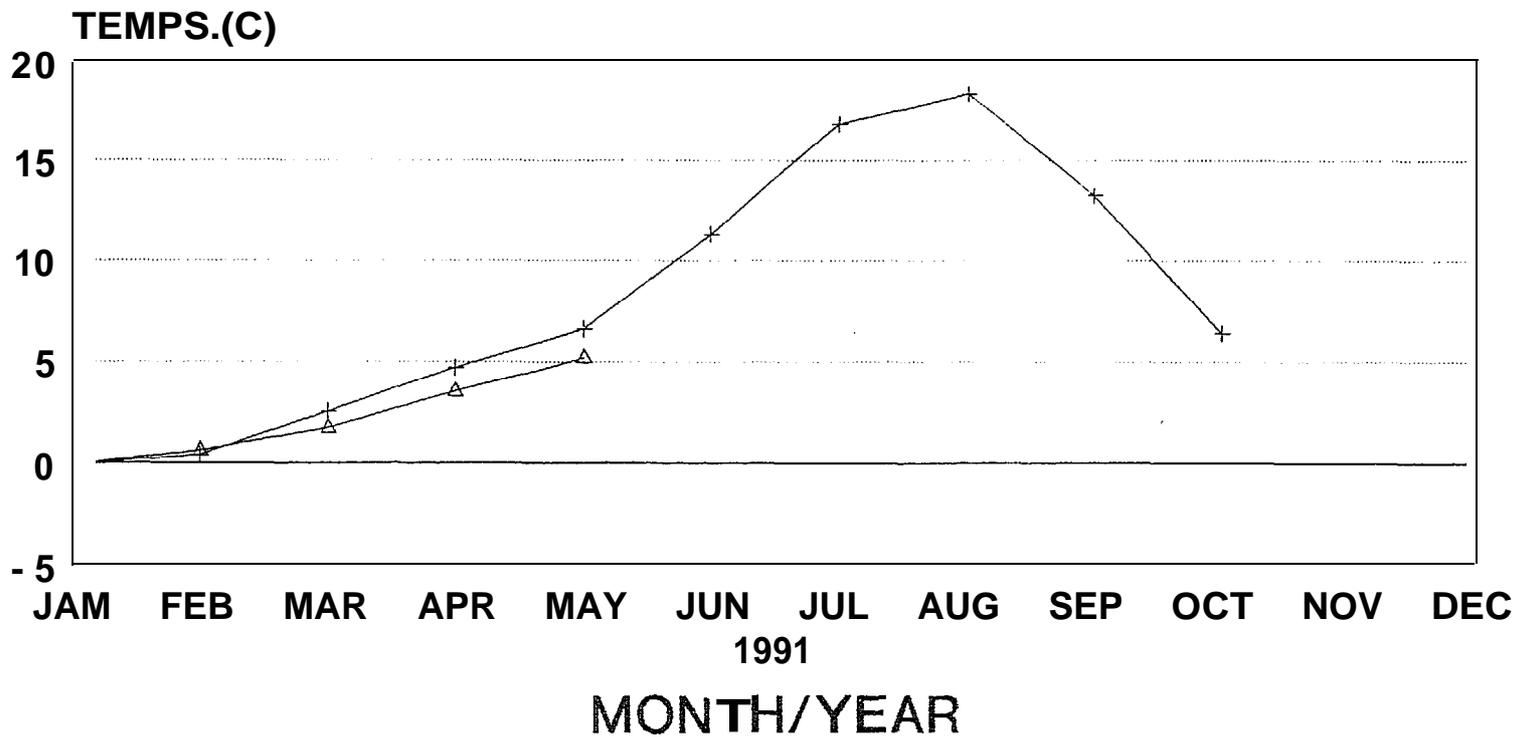
McCoy Creek and Sheep creek thermograph data has been gathered for four years. Data sets are inconclusive at this time. More years of data are needed to show instream temperature changes. As riparian vegetation recovers and provides shade and bank storage of water temperatures should be reduced. In addition we placed two thermographs on Salmon Creek in the Joseph Creek drainage in 1991.

Thermograph data was summarized using a program developed by the Confederated Tribe of the Umatilla- Indian Reservation (C.T.U.I.R.) on "PRODAS" software. Monthly means were tabled on "QUATTRO", and data was then graphed using "HARVARD GRAPHICS" software.

MONTHLY MEAN TEMPERATURES, McCOY AND SHEEP CREEKS

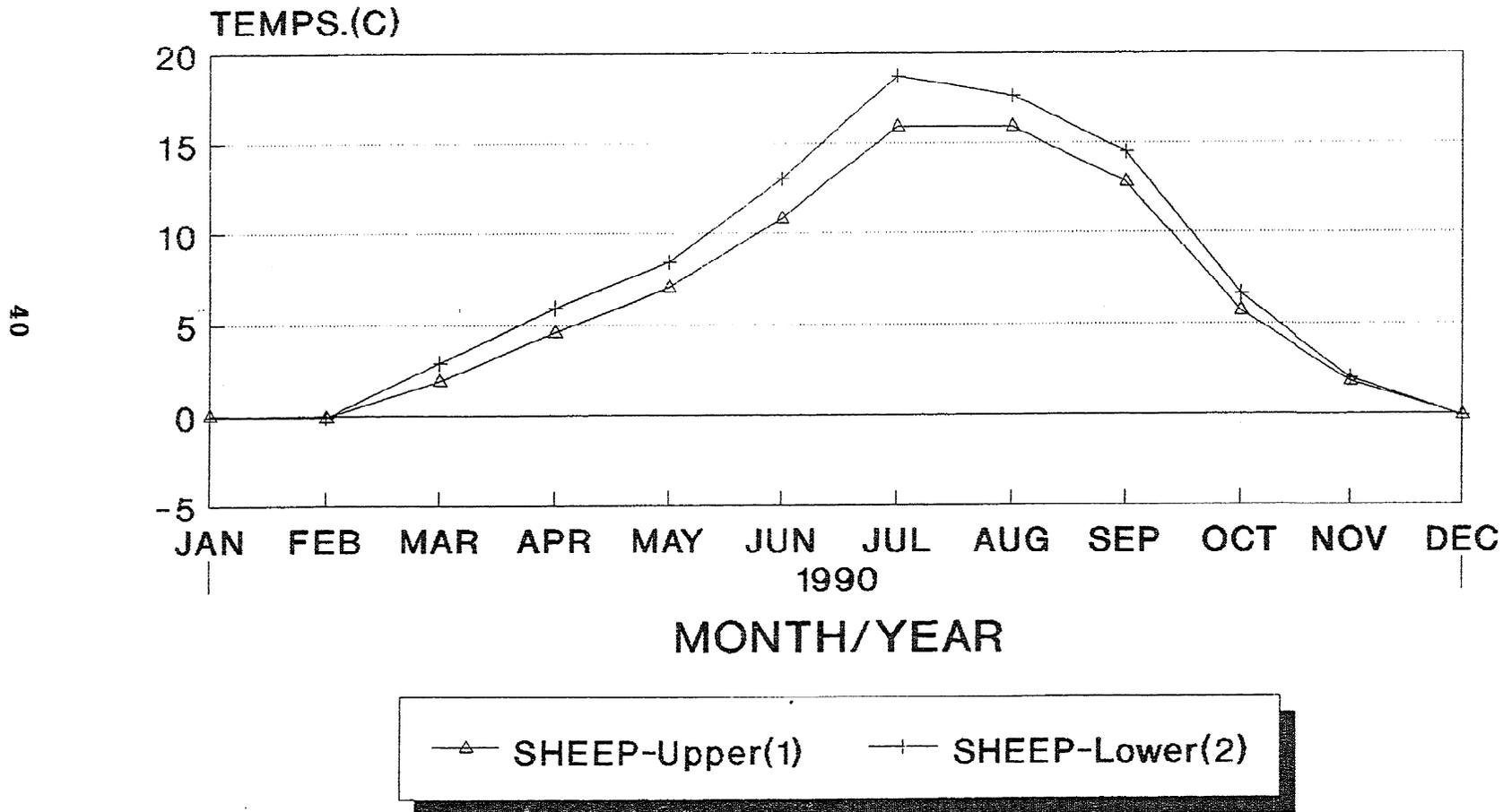
MONTH/YEAR	SHEEP(1) UPPER	SHEEP(2) LOWER	McCOY(2) UPPER	McCOY(3) LOWER	COMMENTS
May-88	8.8	10.9	13.7	13.9	Begin deployments
Jun-88	12.1	14.6	15.6	15.9	
Jul-88	16.5	18.9	18.3	18.7	
Aug-88	15.6	17.3	16.0	17.1	
Sep-88	11.2	12.4	11.2	12.9	
Oct-88	8.6	9.6	8.7	10.4	
Nov-88	1.9	2.1	2.2	3.4	
Dec-88	0.1	-0.1	0.3	0.3	
Jan-89	-0.1	-0.1	-0.1	0.0	
Feb-89	-0.1	-0.1	-0.1	0.1	
Mar-89	1.7	2.1	2.0	2.3	
Apr-89	4.3	5.9	6.2	6.3	
May-89	6.4	7.9	10.5	10.7	
Jun-89	12.3	14.8	16.6	16.7	
Jul-89	16.3	18.8	18.4	18.8	
Aug-89	14.5	16.4	16.0	16.8	
Sep-89	10.9	12.7	11.6	13.5	
Oct-89	5.8	6.8	6.0	8.0	
Nov-89	1.9	2.2	2.1	3.6	
Dec-89	0.2	0.1	0.0	0.6	
Jan-90	0.0	-0.1	-0.1	0.5	
Feb-90	-0.1	-0.1	0.0	0.5	
Mar-90	1.9	2.9	3.7	4.0	
Apr-90	4.6	5.9	9.2	9.4	
May-90	7.0	8.4	10.9	10.9	Sheep: May 7-31st only
Jun-90	10.8	13.0	14.7	15.2	
Jul-90	15.9	18.7	19.2	19.3	
Aug-90	15.9	17.6	17.1	18.0	
Sep-90	12.8	14.5	14.1	15.8	McCoy: Sept 1-20 only, redeployed Dec. 10.
Oct-90	5.7	6.6			
Nov-90	1.8	2			
Dec-90	-0.1	-0.1	0.0	0.2	
Jan-91	-0.1	-0.1	0.0	0.3	
Feb-91	0.6	0.4	1.3	1.6	
Mar-91	1.7	2.5	3.3	3.5	
Apr-91	3.5	4.7	5.7	5.9	
May-91	5.2	6.6	9.0	9.2	
Jun-91		11.3	12.9	14.1	Sheep Ck. Upper: no data June-Nov.
Jul-91		16.9	15.6	18.3	
Aug-91		18.4	15.5	18.1	
Sep-91		13.3	11.7	13.0	
Oct-91		6.4	8.0	7.2	
Nov-91			2.8	4.1	McCoy: Nov. 1-21 only.
Dec-91					
Jan-92					
Feb-92					
Mar-92					
Apr-92					
May-92					
Jun-92					

SHEEP CK.- Upper & Lower RTM Monthly Mean Water Temperatures



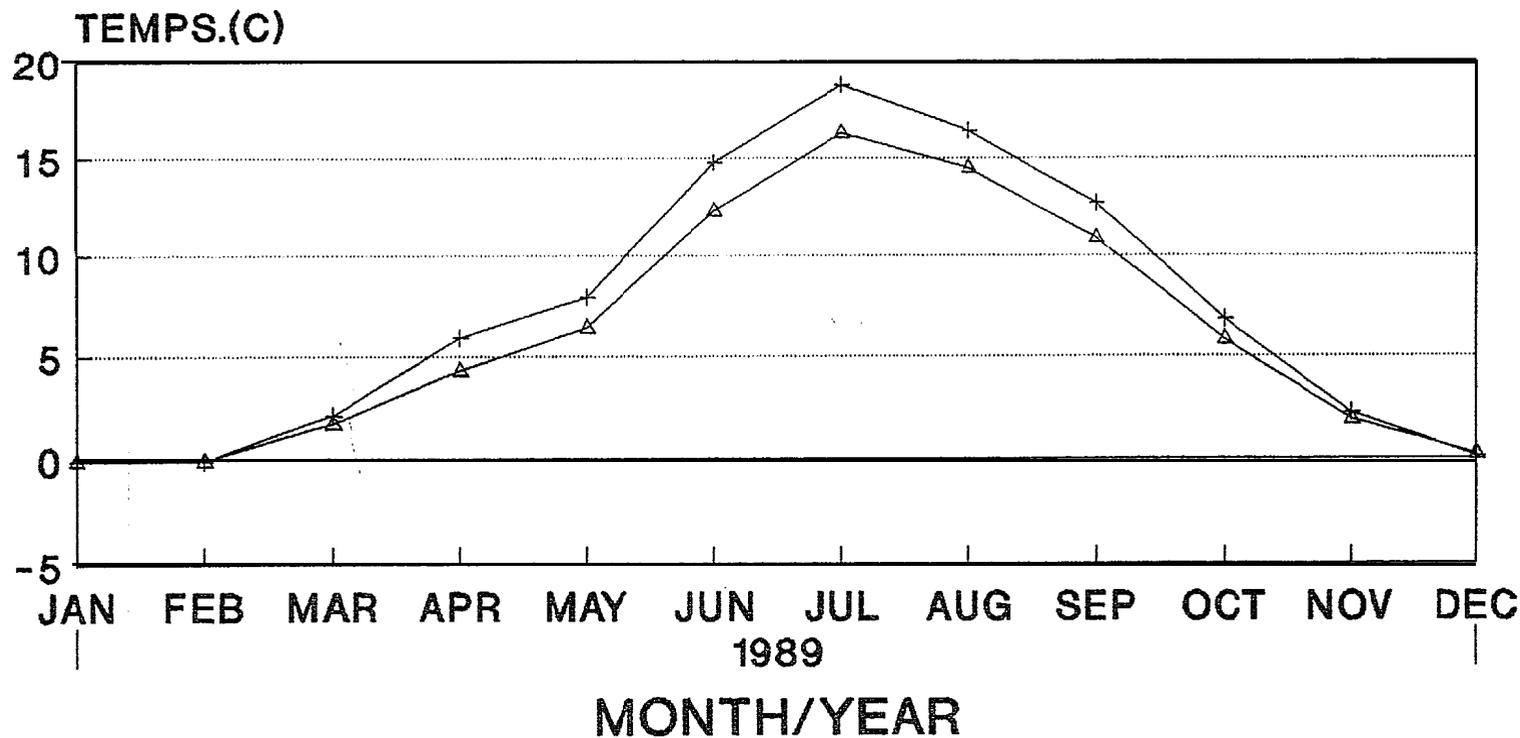
Deployment #006-8

SHEEP CK.- Upper & Lower RTM Monthly Mean Water Temperatures



Deployment #004-6

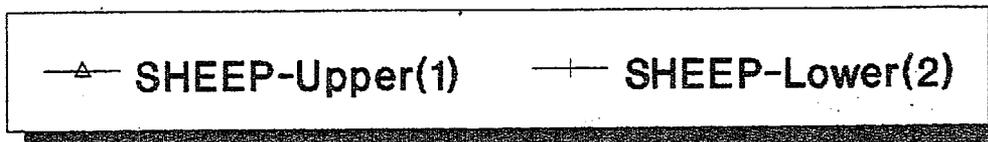
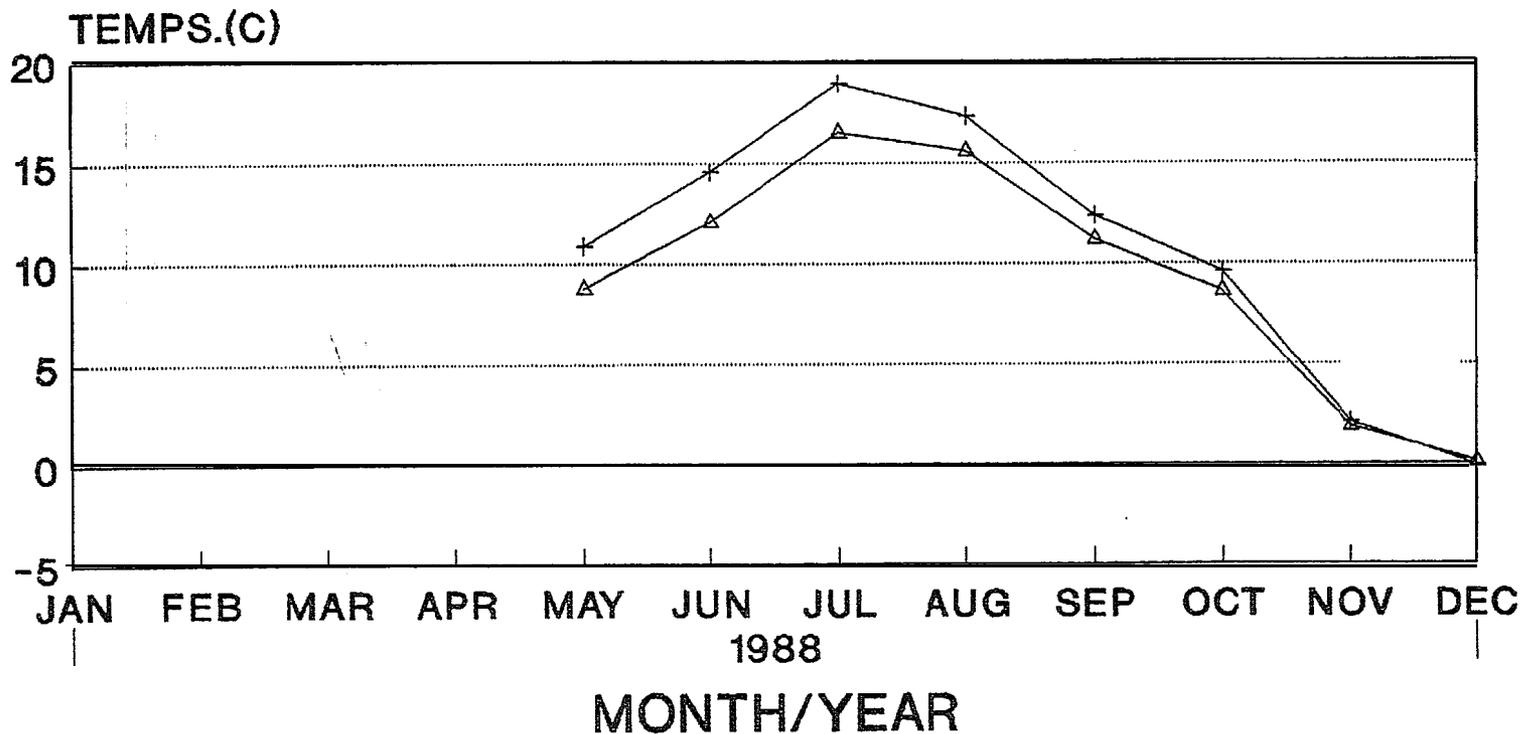
SHEEP CK.- Upper & Lower RTM Monthly Mean Water Temperatures



—△— SHEEP-Upper(1) —+— SHEEP-Lower(2)

Deployment #002-4

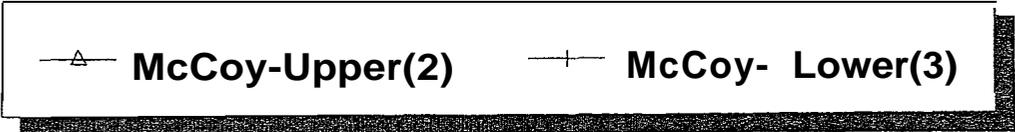
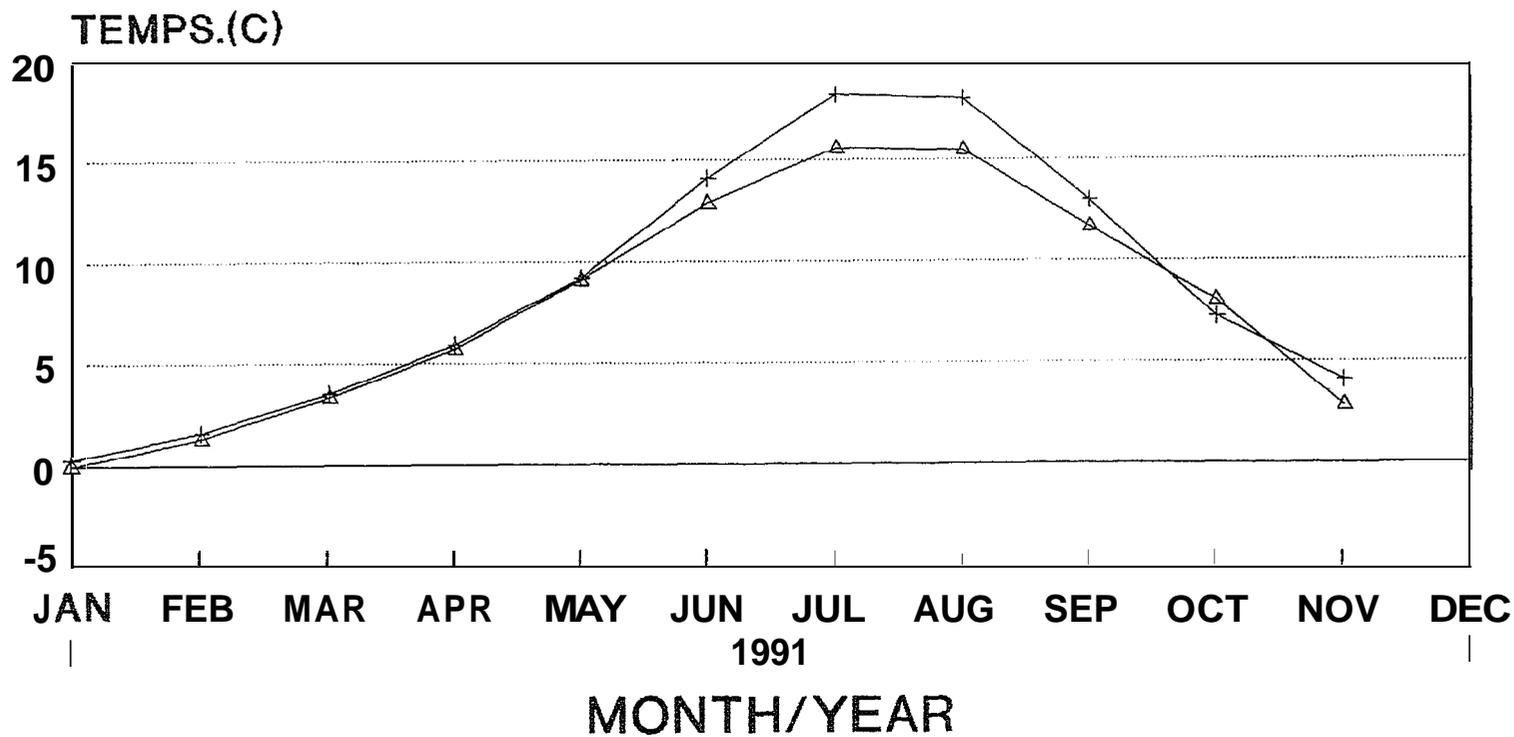
SHEEP CK.- Upper & Lower RTM Monthly Mean Water Temperatures



Deployment #001/2

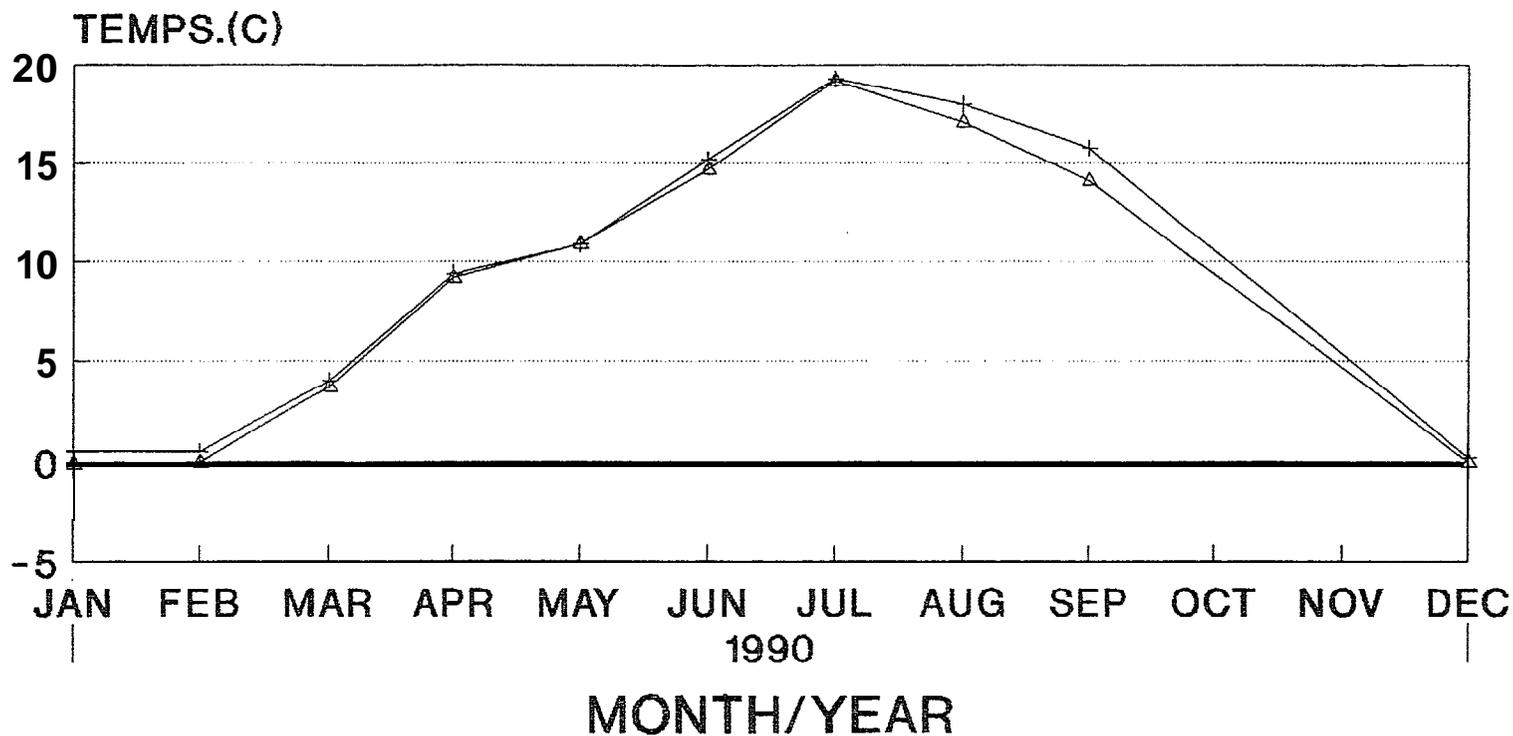
McCOY CK - Upper & Lower RTM Monthly Mean Water Temperatures

43



Deployment #004-8.

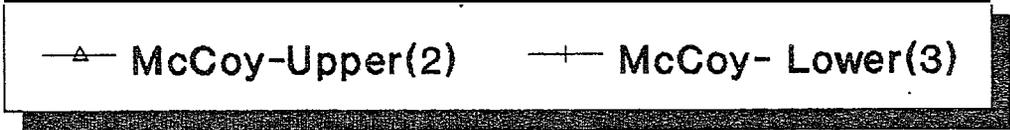
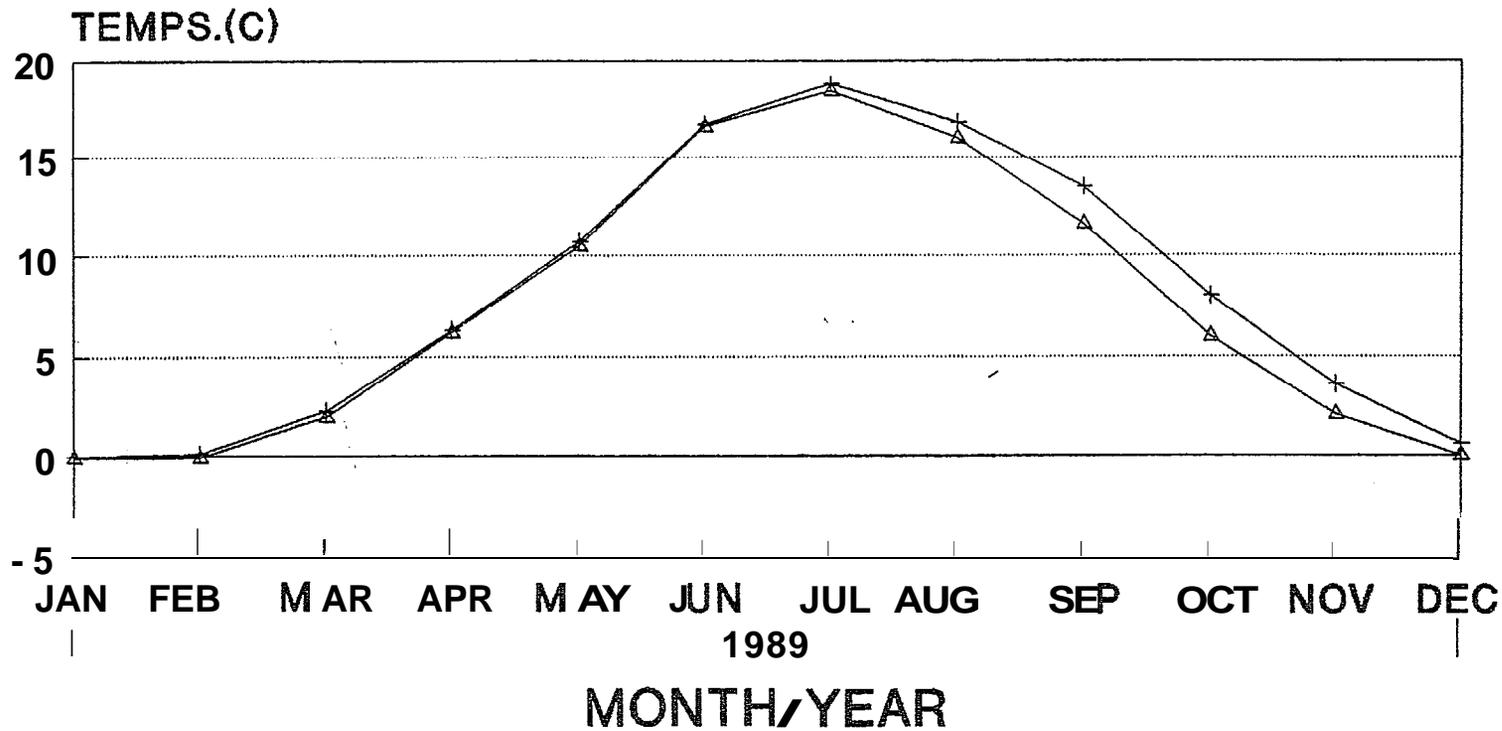
McCOY CK.- Upper & Lower RTM Monthly Mean Water Temperatures



—△— Mccoy-Upper(2) —+— McCoy- Lower(3)

Deployment #004/6, no data 9/20 to 12/10

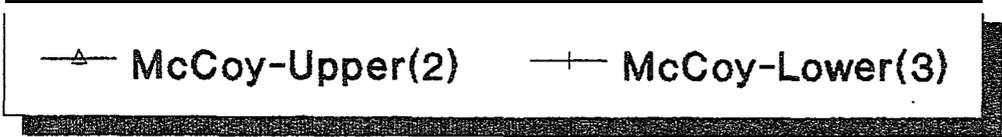
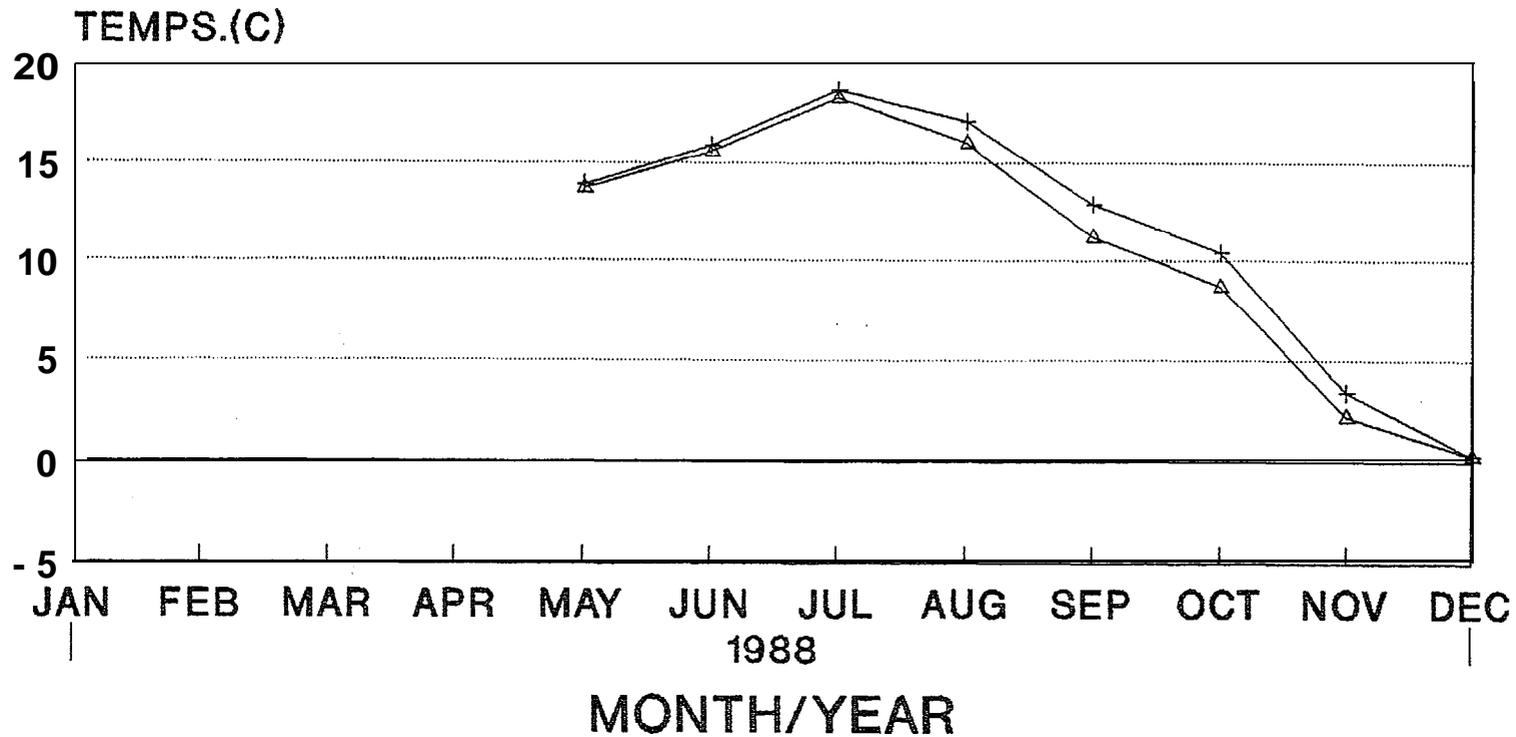
McCOY CK.- Upper & Lower RTM Monthly Mean Water Temperatures



Deployment #002-4

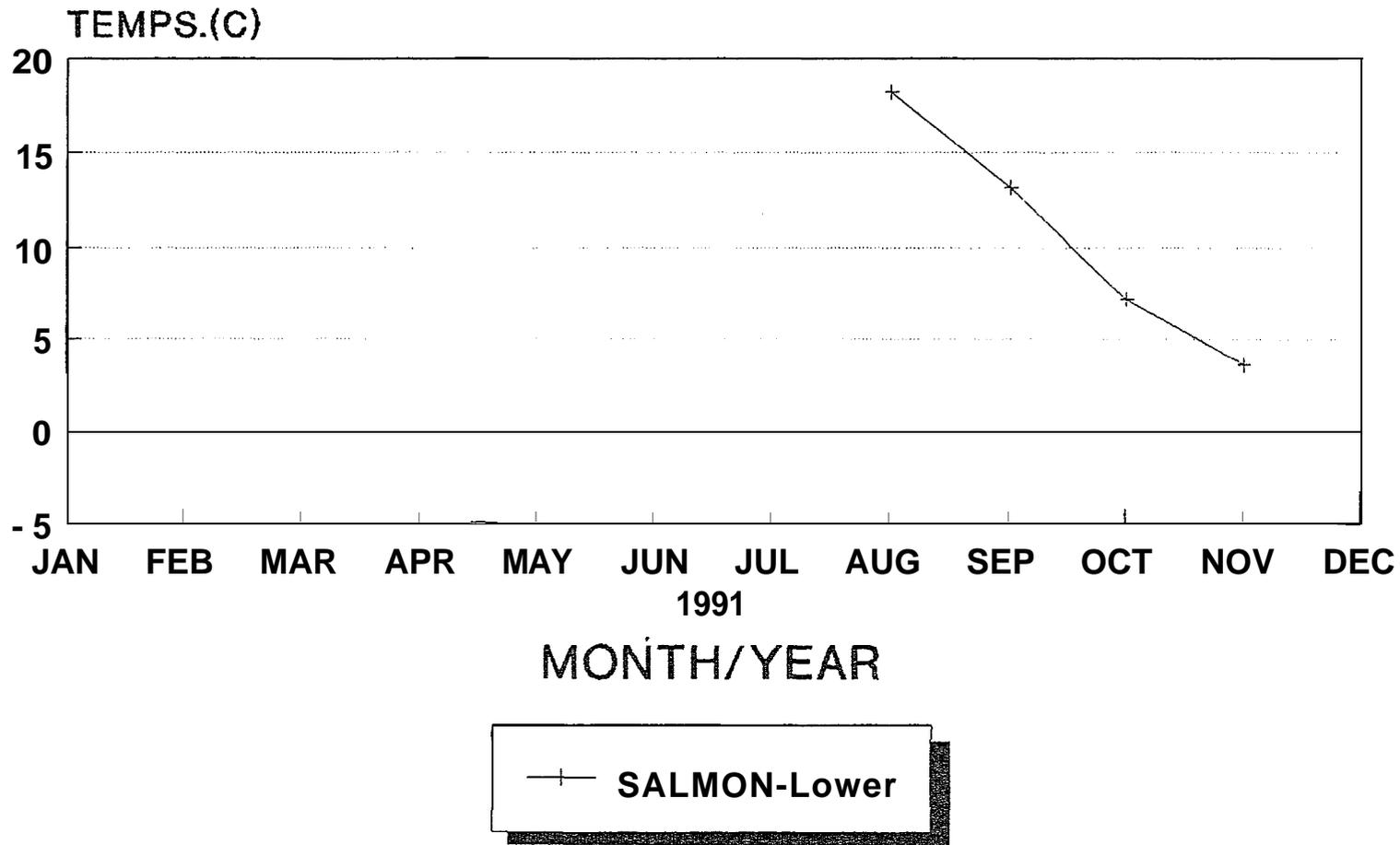
McCOY CK.- Upper & Lower RTM Monthly Mean Water Temperatures

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Deployment #001/2

SALMON CK.- Upper & Lower RTM Monthly Mean Water Temperatures



Deployment #001, no data for Upper

APPENDIX C

PHOTOGRAPHS

- Photo 1. UGR, root wad cabled to a boulder and associated tools
Photo 2. UGR, large tree w/root wad cabled to boulder
Photo 3. UGR, misc. woody debris and boulders
Photo 4. LGR, downstream log V w/woody debris cabled in pool
Photo 5. LGR, downstream mid channel boulder V w/woody debris
Photo 6. LGR, beaver dam
Photo 7. UGR, ice on bank after spring break-up
Photo 9. UGR, ice around watergap after spring break-up
UGR, photopoint 6 on Bowman/Hoeft property during (Jan., 90),, refer to photos 14, 15, and 16 for sequence
Photo 10. UGR, photopoint 4 (Aug., 90) on Bowman/Hoeft
Photo 11. UGR, photopoint 4 (May flood, 91) on Bowman/Hoeft note whitecaps in center of river - boulders w/root wads holding in high flows
Photo 12. UGR, Bowman/Hoeft, woody debris collected in May, 91
Photo 13. UGR, Bowman/Hoeft, same woody debris, note large pool
Photo 14. UGR, photopoint 6 (Aug., 90) on Bowman/Hoeft, taken immediately after jetty and whole tree placement
Photo 15. UGR, photopoint 6 (May flood, 91)
Photo 16. UGR, photopoint 6 (Aug., 91) note accumulation of woody debris
Photo 17. LGR, Chesnimnus Cr.-Yost, photopoint 7 (May, 87), note bare gravel bar
Photo 18. LGR, Chesnimnus Cr.-Yost, photopoint 7 (Sept., 87), note gravel bar
Photo 19. LGR, Chesnimnus Cr.-Yost, photopoint 7 (Sept., 91), note willow recruitment on gravel bar
Photo 20. LGR, Elk Cr.-Birkmeier, photopoint 3 (Sept, 85)
Photo 21. LGR, Elk Cr.-Birkmeier, photopoint 3 (Sept, 91)
Photo 22. UGR, Meadow Cr.-Tipperman, photopoint 4b (May, 87)
Photo 23. UGR, Meadow Cr.-Tipperman, photopoint 4b (Aug., 91)
Photo 24. UGR, Meadow Cr.-Tipperman, photopoint 6a (May, 87)
Photo 25. UGR, Meadow Cr.-Tipperman, photopoint 6a (Aug., 91)
Photo 26. UGR, Meadow Cr.-Tipperman, photopoint 7a (May, 87)
Photo 27. UGR, Meadow Cr.-Tipperman, photopoint 7a (Aug., 91)
Photo 28. UGR, photopoint 2 on Bowman/Hoeft after jetty const. (Aug., 90)
Photo 29. UGR, photopoint 2 on Bowman/Hoeft, (Aug., 91) note bedload deposited from (May flood, 91)

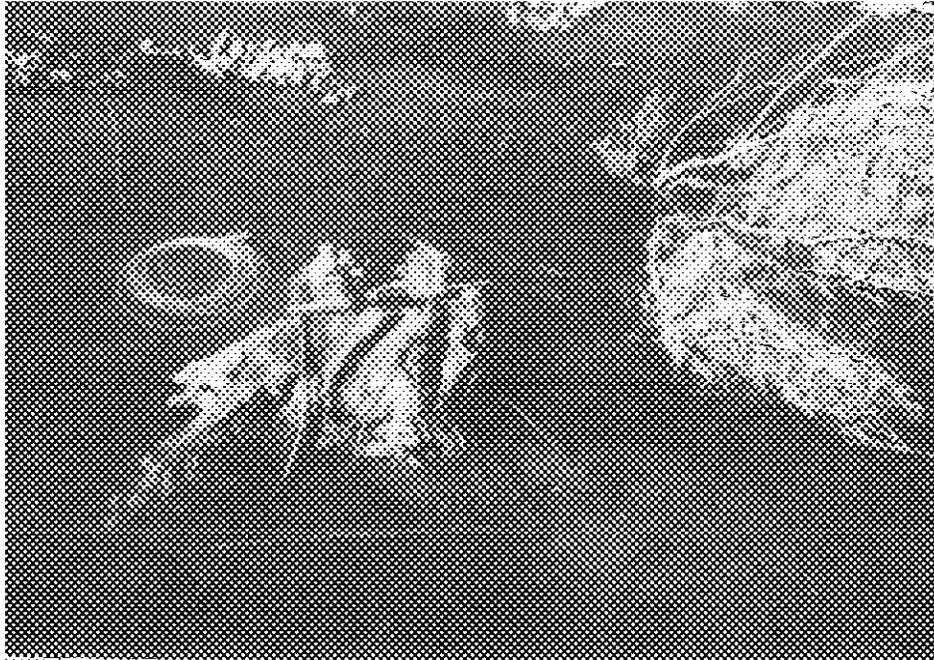


Photo 1. Upper Grande Ronde River, Bowman/Hoeft, 1991.
Root was cabled to a boulder and brush. Tools used were a Hilti drill, cable cutter, cable, and clamps.

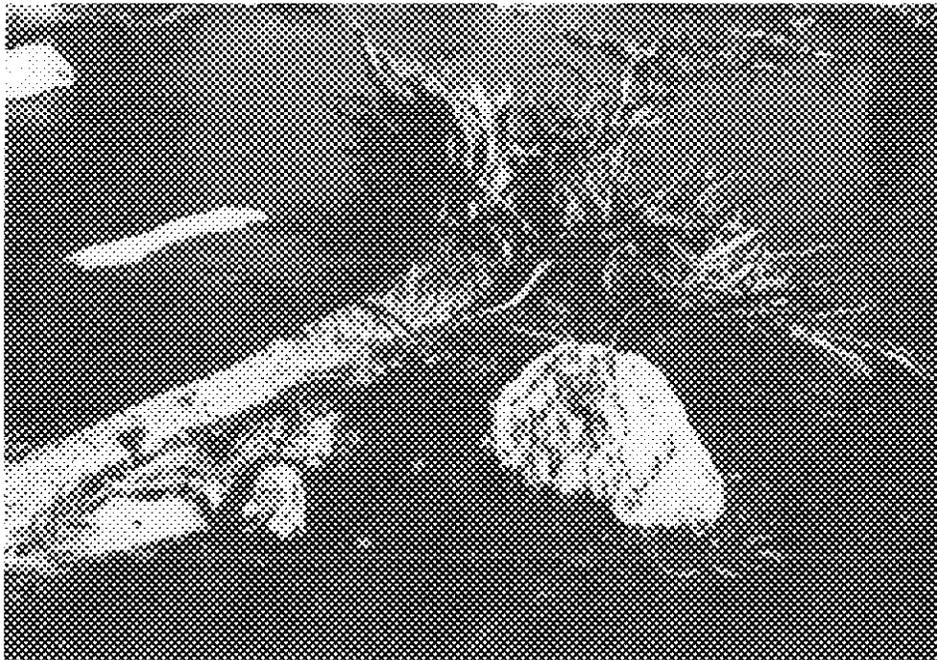


Photo 2. Upper Grande Ronde River, Bowman/Hoeft, 1991.
Large tree with root was cabled to boulders.

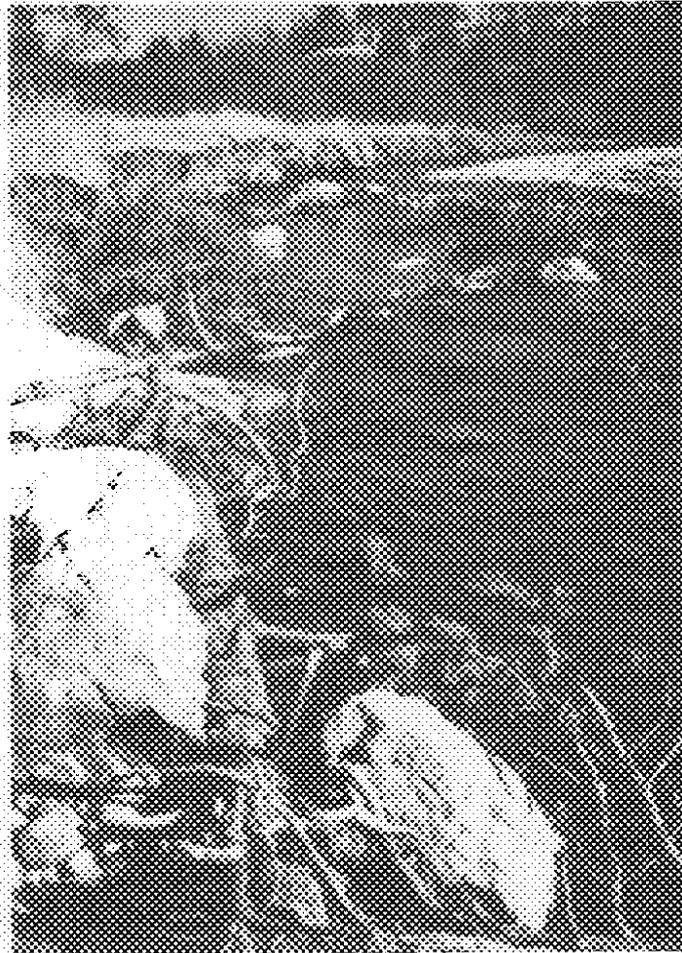


Photo 3. Upper Grande Ronde River, Bowman/Hoeft, 1991. Boulder placements in conjunction with small and large woody debris. Note large tree with root wad in upper right corner is the same tree as in Photo 2.

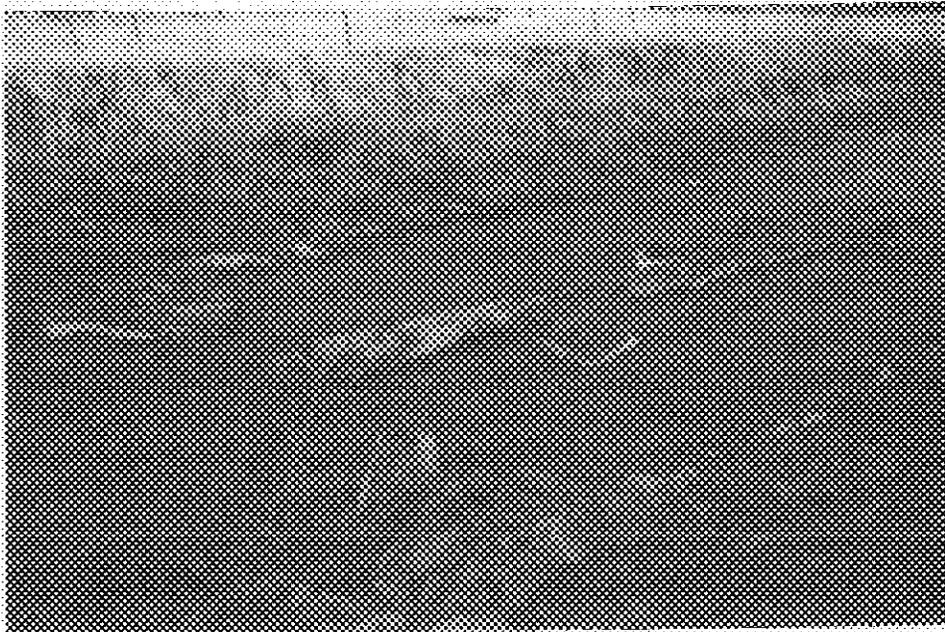


Photo 4. Lower Grande Ronde, Chesnimus Creek, McDaniel, 1991. Downstream V logs with large tree cabled to boulders in mid channel.

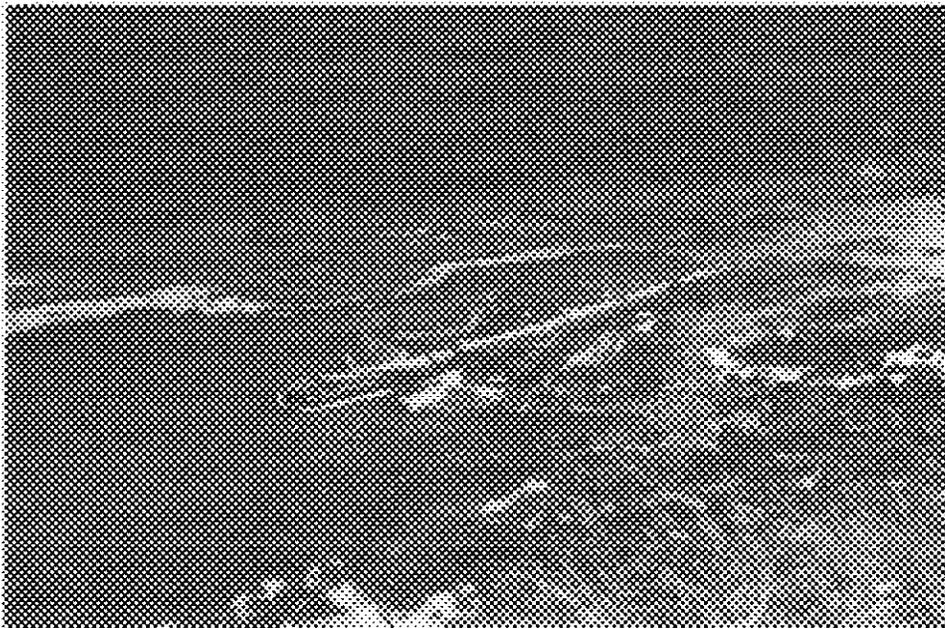


Photo 5. Lower Grande Ronde, Chesnimus Creek, McDaniel, 1991. Mid channel upstream U boulder weir with large woody debris and root wad cabled to boulders.

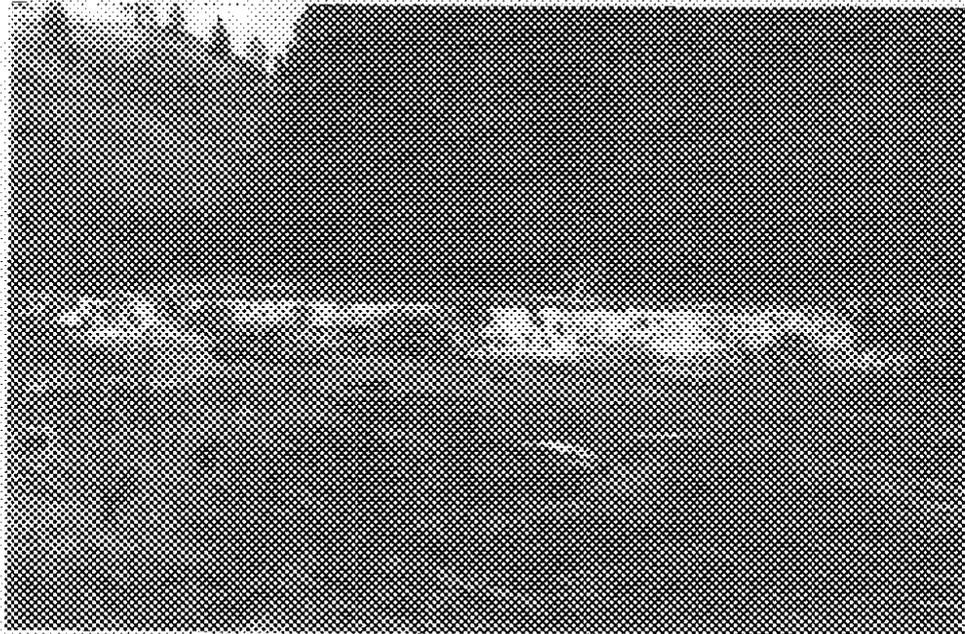


Photo 6. Lower Grande Ronde, Chesimnus Creek, McDaniel, 1991. Beaver dam creating large pool and backwater area.

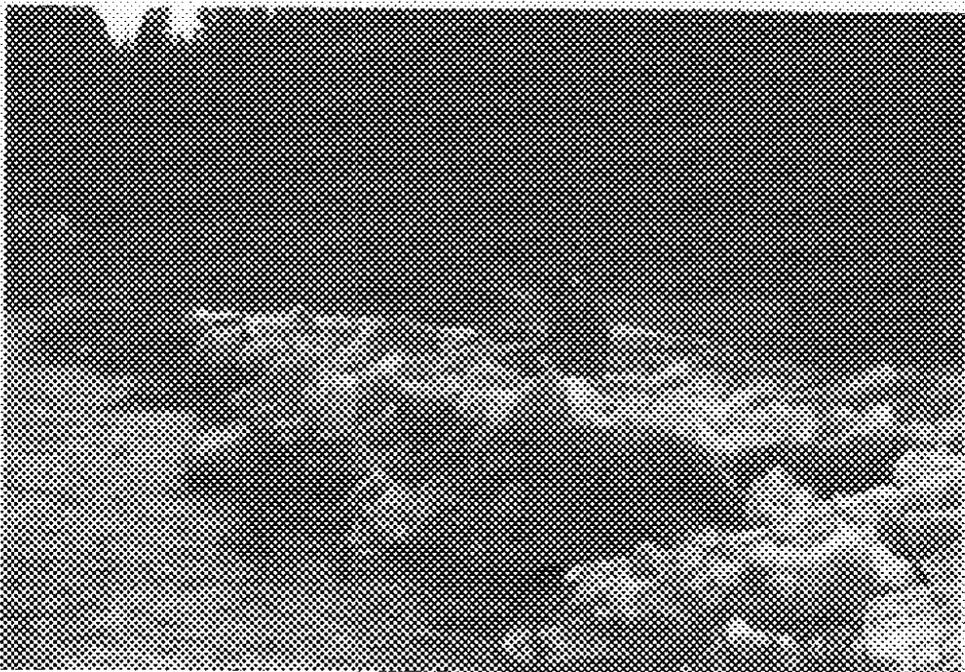


Photo 7. Upper Grande Ronde, Meadow Creek, Camp Elkahah, March 1991. An average year ice flow and break-up.

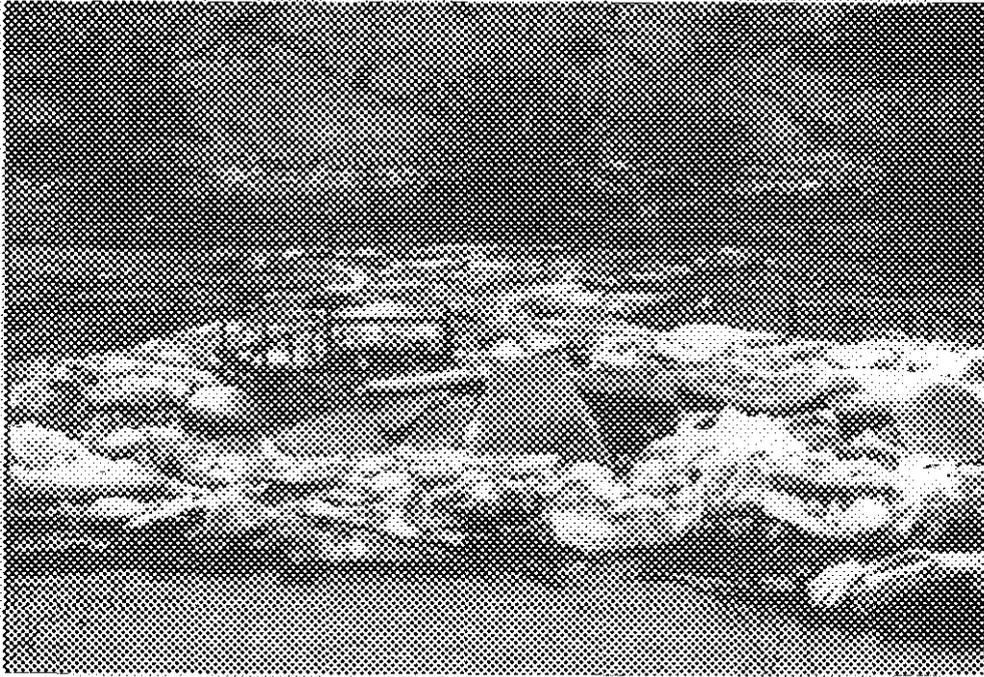


Photo 8. Upper Grande Ronde, Meadow Creek, Tipperman, March 1991. Ice flow at a water-gap that destroyed 400 yards of riparian corridor fence.



Photo 9. Upper Grande Ronde River, Bowman/Hoeft, January 1991. Refer to Photos 14, 15, and 16. Photopoint showing annual ice on the river.



Photo 10. Upper Grande Ronde River, Bowman/Hoeft, Fall 1990. Photopoint after the instream work was completed and prior to fence construction.



Photo 11. Upper Grande Ronde River, Bowman/Hoeft, May 1991. Same photopoint as in Photo 10. The May 19, 1991 flood.

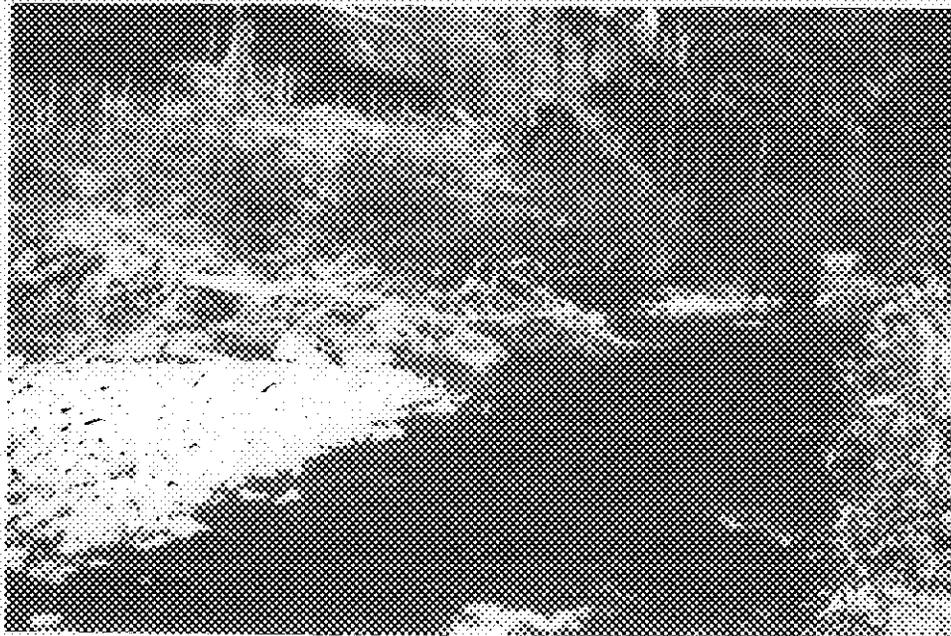


Photo 12. Upper Grande Ronde River, Bowman/Hoeft, Fall 1991. Initially we cabled three root wads to the rock bluff and three boulders which subsequently caught this debris in the May, 1991 flood.

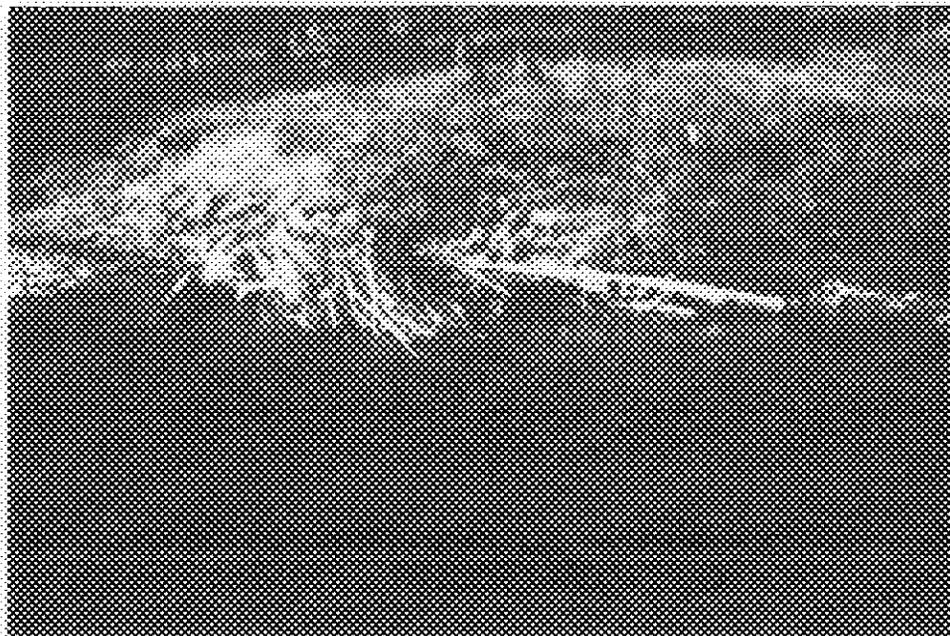


Photo 13. Upper Grande Ronde River, Bowman/Hoeft, Fall 1991. Same debris jam as in Photo 12. A large pool was scoured around and under the debris jam.



Photo 14. Upper Grande Ronde River, Bowman/Hoeft, August 1990. Photopoint taken after instream work. Three whole trees with root wads and one root wad were incorporated into the jetties and boulders.



Photo 15. Upper Grande Ronde River, Bowman/Hoeft, May 1991. Same photo as 14 except taken during the May 19, 1991 flood.



Photo 16. Upper Grande Ronde River, Bowman/Hoeft, August 1991. Same photo as 14 and 15. Notice large amount of woody debris that was collected during the May flood.

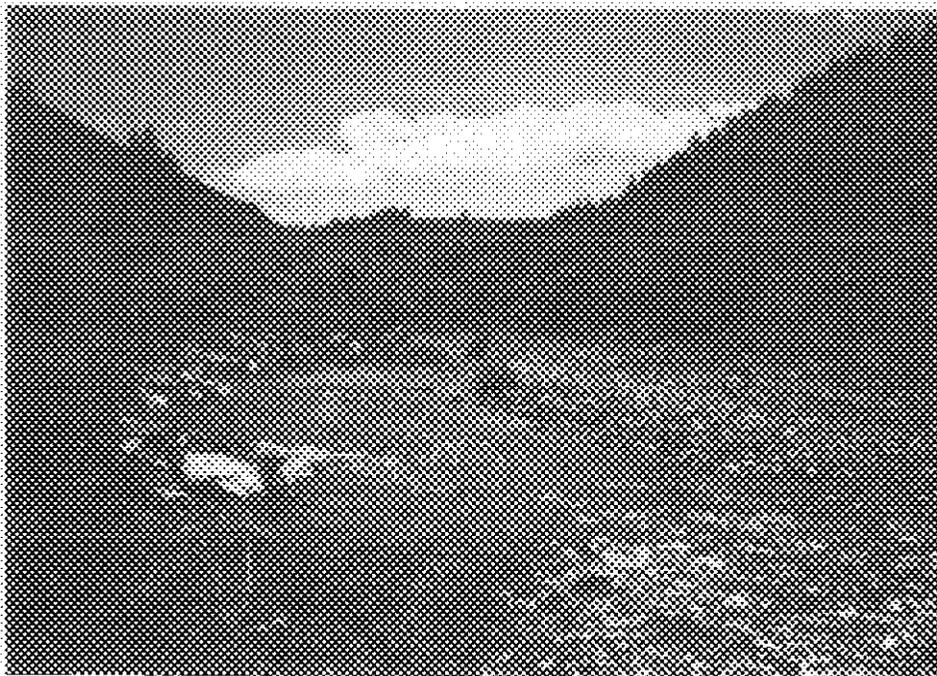


Photo 17. Lower Grande Ronde, Chesimous Creek, Yost, Summer 1987. Photopoint taken after implementation. Note gravel bar on right side of photo.

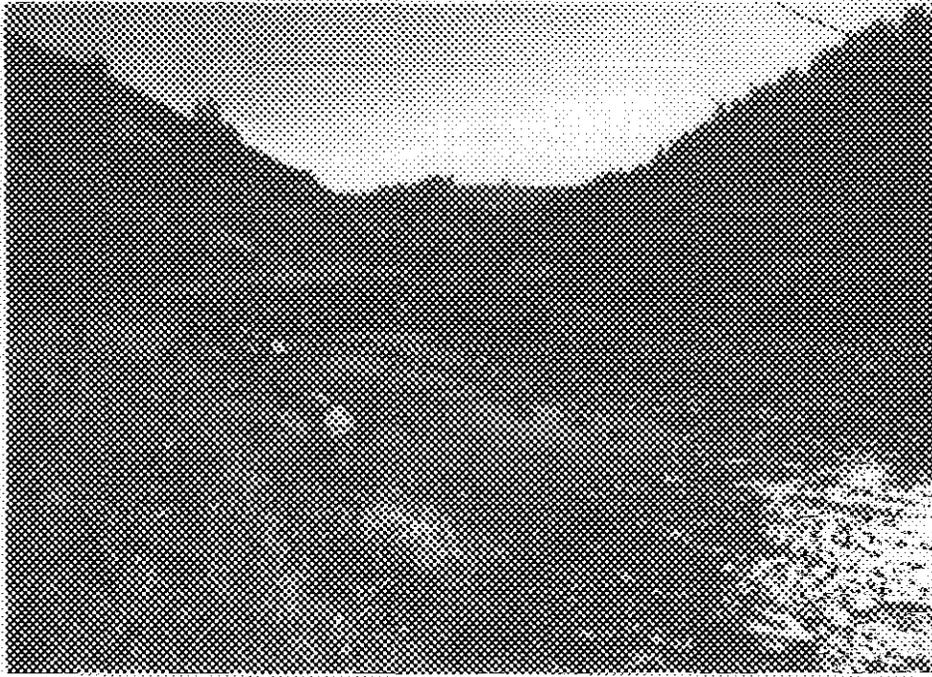


Photo 18. Lower Grande Ronde, Chesnimus Creek, Yost, Fall 1987. Same photo as 17.

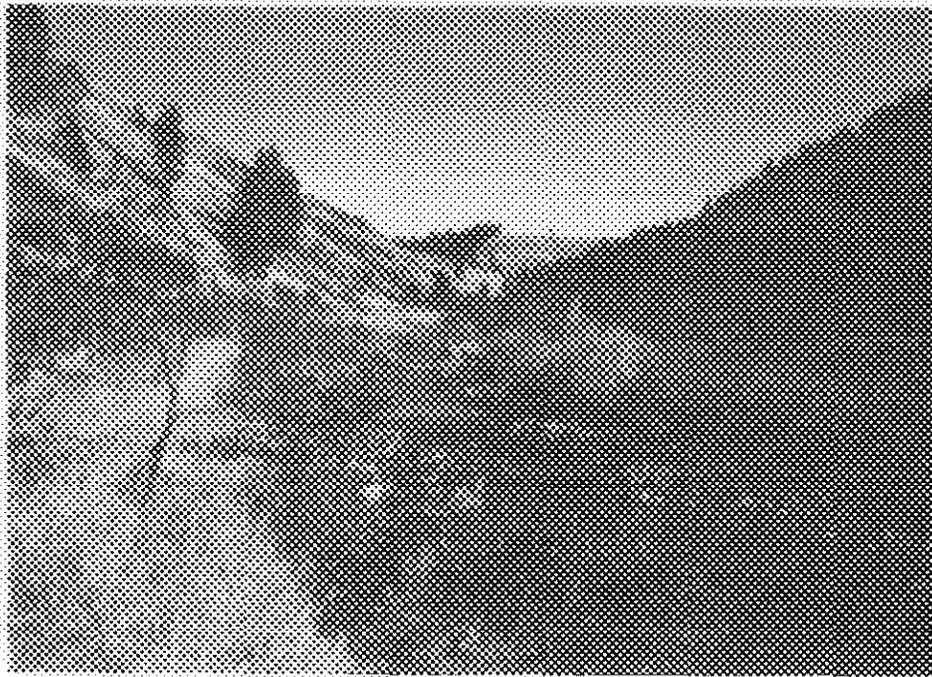


Photo 19. Lower Grande Ronde, Chesnimus Creek, Yost, Fall 1991. Same photo as 17 and 18. Note willow recruitment on the right bank.



Photo 20. Lower Grande Ronde, Elk Creek, Birkmeier, Fall 1985. Photopoint showing willow stakes recently planted.



Photopoint 21. Lower Grande Ronde, Elk Creek, Birkmeier, Summer 1991. Same photopoint as Photo 20 showing the willows growing.

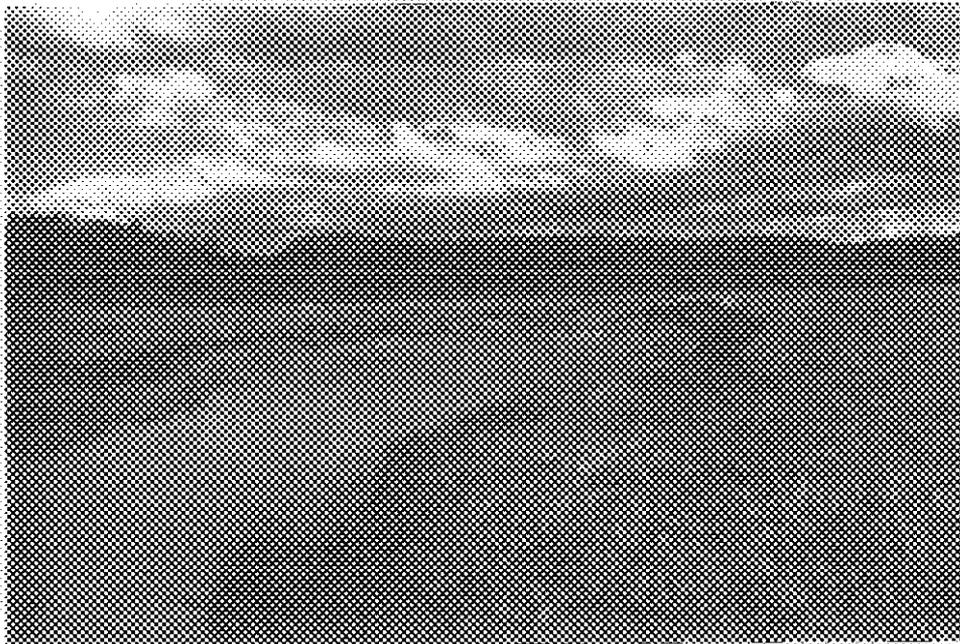


Photo 22. Upper Grande Ronde, Meadow Creek, Tipperman, Spring 1987. Pre-implementation photopoint. Note cut bank and wide shallow channel.



Photo 23. Upper Grande Ronde, Meadow Creek, Tipperman, Summer 1991. Same photopoint as Photo 22. Note grasses, sedges, and willows revegetating the cut bank. Also note narrowing and deepening of the channel.



Photo 24. Upper Grande Ronde, Meadow/McCoy Creek, Tipperman, Spring 1987. Pre-implementation photopoint shot from Meadow Creek looking upstream where McCoy Creek enters. Note cut banks, wide shallow bottom, and lack of vegetation.



Photo 25. Upper Grande Ronde, Meadow/McCoy Creek, Tipperman, Summer 1991. Note vegetative, bank, and channel changes.

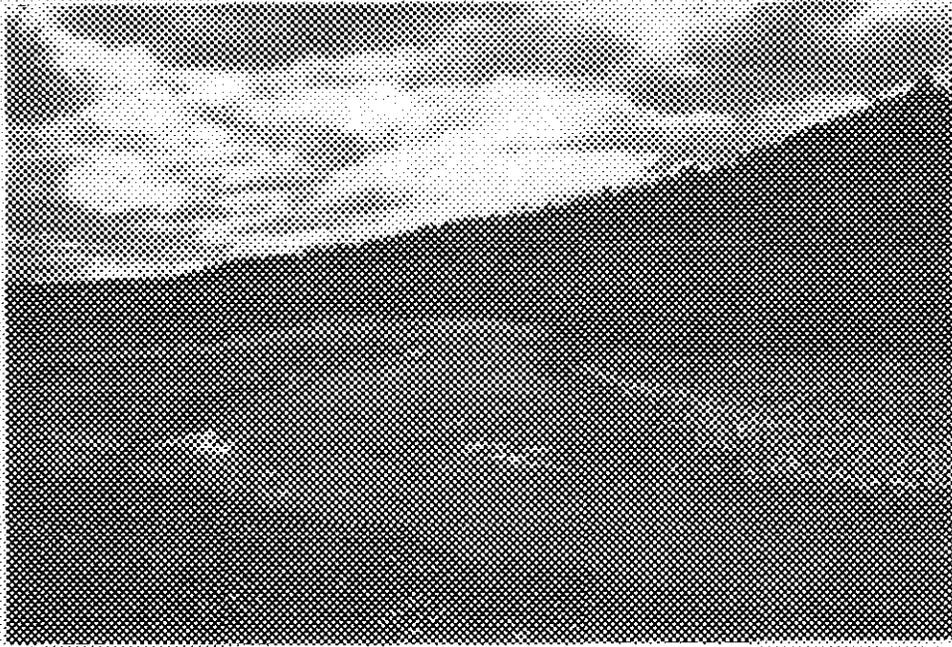


Photo 26. Upper Grande Ronde, Meadow Creek, Tipperman, Spring 1987. Note wide shallow channel and gravel island.

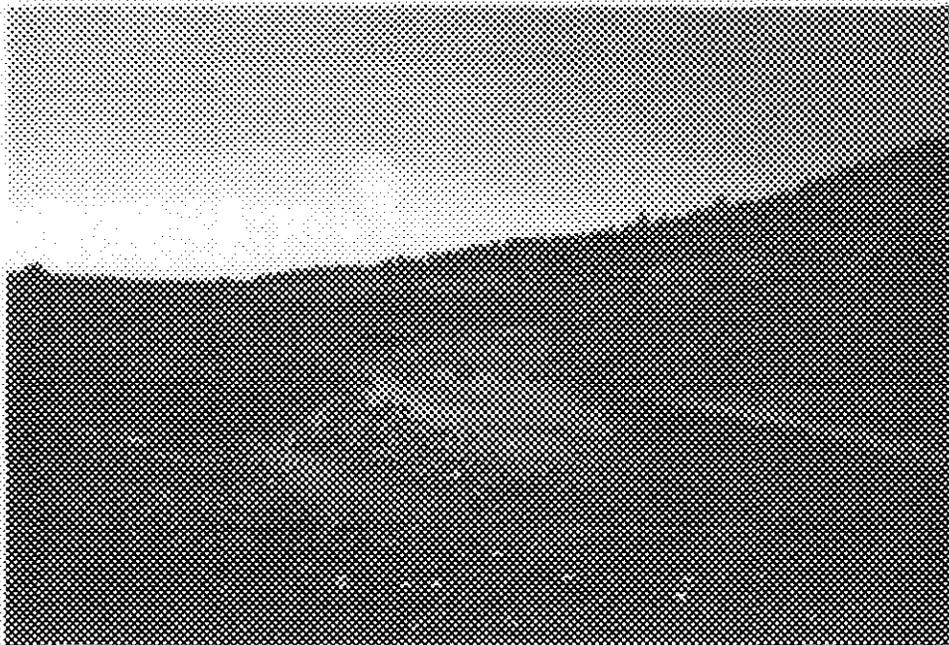


Photo 27. Upper Grande Ronde, Meadow Creek, Tipperman, Summer 1991. Same photo as 26. Note channel narrowing and vegetative recruitment on the gravel island.



Photo 28. Upper Grande Ronde River, Bowman/Hoeltz, Fall 1990. Photopoint on cut bank and a wide shallow channel. Jetties were installed to narrow and deepen the channel, and stabilize the bank.



Photo 29. Upper Grande Ronde River, Bowman/Hoeltz, Fall 1991. Same photo as 28. Shot after the May 1991 flood. Note that the jetties are not visible due to tremendous bed load movement in that event.