1989 Annual Report

Sorth Fork John Day Anadromous Fish Habitat Enhancement

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ABSTRACT

In 1989. the Umatilla National Forest constructed Fish habitat improvements on Clear Creek. Desolation Creek. Fivemile Creek. Bear Wallow Creek. Sorth Hidaway Creek. and Wilson Creek. Monitoring of all prior stream improvement projects was completed For the Sorth Fork of the John Day and Heppner Districts.

Project work continued on The Red Boy Mine project. A vegetative bog was created from the existing settling ponds and cattails were planted in an attempt to tie up heavy metals deposited From the mining effluent. The Forest Sex-vice Funded a project nearby at Blue Bird Wine that plugged the mine portal and piped the effluents into the existing settling ponds.

In Desolation Creek we created 19 rock weirs and six log weirs with their associated pools. One pool was designed as an adult holding pool. Hiding cover was created by placing 457 boulders in the stream and the construction of 23 deflectors. Areas of disturbance were seeded with 300 lbs. of riparian seed mix to increase stream bank stability and reduce surface erosion.

At Fivemile Creek 32 log and rock weirs were constructed. each with their own excavated pool. Each pool provided hiding and thermal cover For summer steelhead. with the addition of rootwads and boulders to each. Wood and rock deflectors were used to narrow the channel and provide instream catchments of spaawning gravel.

The North Hidaway Creek project produced 37 rock and log weirs with their associated pools. Maintenance of last year's structures was completed with all old and new structures secured by cabling weir rocks. Woody material and 180 boulders were placed in the stream to add diversity to the system and participate as hiding cover For Fish.

Work at Bear Wallow Creek began in reach two, north of Bear Wallow Campground with construction of 10 log and rock weirs. with their associated pools. Plans were made to have this project become an interpretive area For the public. In upper Bear Wallow Creek twenty-one log and rock weirs were built in a quarter mile section of stream.

Work continued in 1989 along 1.5 miles of Wilson Creek. Fifty-three new pool-forming structures were built. Logs with rootwads attached were placed in most pools to help create more in-stream diversity and hiding cover. Twenty log and rock deflectors were constructed in addition to the wings on the weirs to help stabilize eroding bank conditions. Some repair work was done on previously constructed structures.

Physical Structure Monitoring was completed on 10% of all the structures constructed For Fish habitat on Fivemile. Bear Wallow. Sorth Hidaway. Desolation, Clear. Little Wall and Wilson Creeks and the Sorth Fork of the John Cay River.

SUBPROJECT I - North Fork John Day Tributaries Fish Habitat Improvement

Subproject Ia- Clear and Granite Creeks Improvement

INTRODUCTION

Clear Creek and Granite Creek. tributaries to the North Fork John Day River. are located in T8S.. R35E., in the North Fork John Day Ranger District of the Umatilla National Forest.

Dredging operations For gold on Clear Creek and Granite Creek during 1920 - 1954 removed major portions of the spawning gravel and completely altered the natural hydrology of the streams. Hard rock mines created during this time period were left open, leaching high concentrations of mining effluents into Granite Creek. It was recognized by the Oregon Department of Fish and Wildlife that in order to bring back historical anadromous Fish MS. work was needed.

First. portions of Granite Creek and Clear Creek were withdraw From mineral entry in 1963 and 1968. In 1963. Oregon Department of Fish and Wildlife added 13.160 cubic yards of spawning gravel into the stream. It was successful as a high percentage (80%) of the spawning took place on these sites. The major work began in 1979 on Four miles of Clear Creek. The pool/riffle ratio at that time was 16:84. Far below optimum. From 1979 to 1982 eighty-two log weirs. 138 gravel beds using 6500 cubic yards of spawning gravel. and one adult holding pool were installed to improve the pool/riffle ratio to near optimum.

Reduction of heavy metal concentrations was also a major objective if additional spawning area was to be achieved. Three mines. Black Jack. Red Boy. and Blue Bird were contributing mining effluent that is toxic to Fish. The chemical analysis conducted in 1981 revealed that pH standards. iron. copper. zinc. and manganese exceeded the State of Oregon Water Quality Standards. The combination of low pH (3.00 - 4.00) and high iron content (5.40 - 28.00 mg/1) was lethal to Fish. Fish can tolerate a pH as low as 4.8. but will die at 5.5 if the iron content is 0.9 mg/l or above. Also, the high concentrations of copper (0.02 - 0.80 mg/l) and zinc (0.04 - 0.68 mg/1) have shown through toxicity tests to be lethal or reduce growth rates in Fish. An 83 day test on chinook salmon revealed a 50% mortality rate of juveniles with the surviving fry having a reduced growth rate.

Black Jack Mine was sealed with a concrete plug in 1981 and the discharge has been piped to an old closed channel adjacent to Clear Creek. In 1987 Red Boy Mine was plugged and the mining effluent Flows 900 Feet by pipeline to another closed channel where it can not contaminate the stream. In 1989 the Red Boy Mine settling ponds were enlarged and cattails were transplanted to speed the Formation of a vegetative bog. This project will be monitored over the next several years to determine its effectiveness to tie up heavy metals. This bog also holds effluent piped From the Blue Bird Wine pipeline, a U.S. Forest Service Funded project.

Clear Creek has tested last Fall For heavy metal concentrations. Testing will continue during the 1990 Field season. The visible heavy concentrations of iron in Clear Creek have been eliminated and the stream appears visually clean for the first time in many years.

In addition to creating a more optimum pool/riffle ratio and reducing the amount of mining effluents. other objectives have been achieved. These include: increasing the spawning area. bank stabilization and re-vegetation, increasing rearing habitat and retention of streamflow on the surface. Achievement has been through the addition of spawning gravel, hardwood plantings, boulder placement. restructuring of the stream channel. and placement of log and rock deflectors.

Prior to project work in Clear Creek and Granite Creek. spring chinook counts averaged 20.7 redds per mile For Clear Creek and 23.0 redds per mile For Granite Creek from 1957-1979. A 1989 survey completed by ODFW compiled data from 1973-1989 on average redd counts. The survey reported the average redd count For Clear Creek was 34 redds per mile and 67 redds per mile at Granite Creek. a 60% increase at Clear Creek and a 295% increase at Granite Creek.

OBJECTIVES

1. Reduce the possibility of mining effluent returning to Clear Creek through the creation of vegetative bogs For heavy metal retention.

PROJECT DESCRIPTION

The Red Roy Mine settling ponds were reexcavated to create shallow bogs where cattails were planted. These vegetative bogs act as Filters and settling ponds for sediment and heavy metals. The cattails were planted in an attempt to tie up heavy metals.

ACHIEVEMENTS

Reducing mine effluent will improve water quality and increase smolt survival For chinook salmon and steelhead.

1 Side channel that mining effluent from Black Jack and Blue Bird are diverted into.

2 The excavator and the loader are digging to enlarge the water course for the Blue Bird Mine settling ponds.

3 The excavator enlarged the settling ponds and also made them shallower in areas to increase aquadic vegetation (cattails) which "tie-up" heavy metals.

Subproject Ib - Desolation Creek

INTRODUCTION

The project area is located in the northern edge of Grant County in the North Fork John Day Ranger District, Umatilla National Forest in T.8S.. R.33E. and T.9S., R.33E. Desolation Creek is a tributary to the North Fork John Day River from the south, 0.5 miles upstream from the Highway 395 bridge.

Historically, Desolation Creek provided abundant chinook salmon and steelhead spawning and rearing habitat. Over the years, several barriers built up on the lower section of the creek blocking passage to migrating salmon. Louisiana-Pacific Corporation, landowner in the blockage area, removed the barriers in the 1970's.

In 1982 a prework stream inventory was conducted indicating that existing pool habitat for both adult holding and juvenile rearing was naturally limiting anadromous fish production. Presently the pool/riffle ratio averages 11% percent pool and 89 percent riffle (in unworked sections) as opposed to the 60:40 pool/riffle ratio which is considered optimum for rearing juvenile salmon and steelhead. The inventory for fish habitat conditions tallied only one spring chinook adult at stream mile 20.5. In September 1986 three spring chinook salmon redds and four live adult spring chinook were observed in the project area by CTUIR biologists during a cooperative spawning survey coordinated by ODFW. In July and August of 1987 five adult spring chinook were seen in or above the 1987 project area by Forest Service personnel. Spawning counts in 1988 revealed seven spring chinook adults and 10 redds, showing a tenfold increase since the project work began. A late spawning survey in 1989 gave inconclusive results.

We have improved rearing and spawning habitat for steelhead and chinook salmon along 4.5 miles of Desolation Creek. Pools have been created to provide the depth and size required for adult holding using rootwads and boulders as hiding cover. Downed logs used as deflectors have been placed in the stream to reduce stream width, prevent bank erosion, provide hiding cover and collect spawning gravel.

OBJECTIVE

1. Create and/or maintain at least one quality pool every six channel widths throughout each reach treated.

2. Construct at least one adult anadromous fish resting pool per mile.

3. Increase the amount of woody material in the stream to improve instream cover, diversity and complexity.

4. Increase the quantity and quality of anadromous fish spawning habitat by constructing rock weirs to retain bedload gravels.

5. Reduce bank erosion by installing bank deflectors and seeding.

PROJECT DESCRIPTION

The project began in late June. 1989 when rock for log and rock weirs was hauled to the construction site. Boulders were gathered by the excavator and hauled by dump trucks to the construction sites. Instream construction began July 20, 1989 and was completed September 1, 1989.

In 1989, the District constructed 19 rock weirs, six log weirs, 25 pools (one of which was designed as an adult holding pool), and 23 deflectors. Twenty-five boulders were placed in pools to improve quality, and an additional 457 boulders were placed within the stream to increase cover. In addition, 300 lbs of riparian seed mixture was planted to increase stream bank stability.

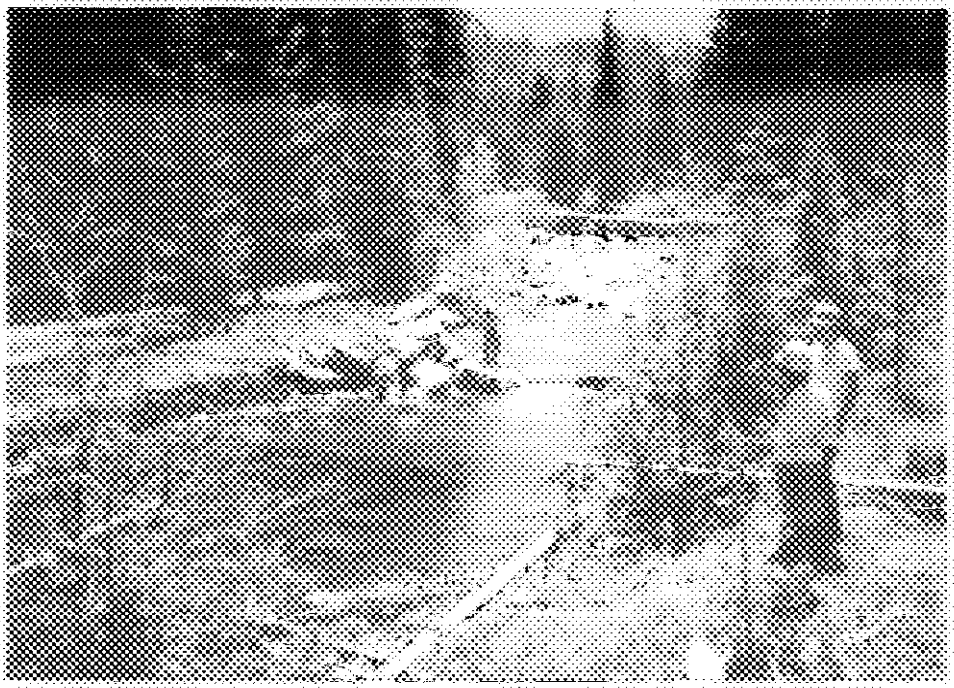
Work progressed downstream from river mile 11, just north of Battle Creek, to approximately river mile 13, downstream of Bruin Creek, the end of the Forest Service land Jurisdiction. Rock and log weirs were constructed to create pool forming structures. Woody debris and boulders were added to pools in the main channel to increase diversity and hiding cover. Chinook were observed in holding pools on several occasions during the construction process. All structures were secured in place by using a Hilti fastening technique to cable structure boulders together.

ACHIEVEMENTS

An increase in the number of pools in Desolation Creek has provided additional holding areas for chinook salmon and steelhead adults. The addition of woody material and boulders will provide additional summer and winter rearing habitat for chinook salmon and steelhead juveniles. New spawning areas have been provided at the pool tail-outs and upstream of the weirs.

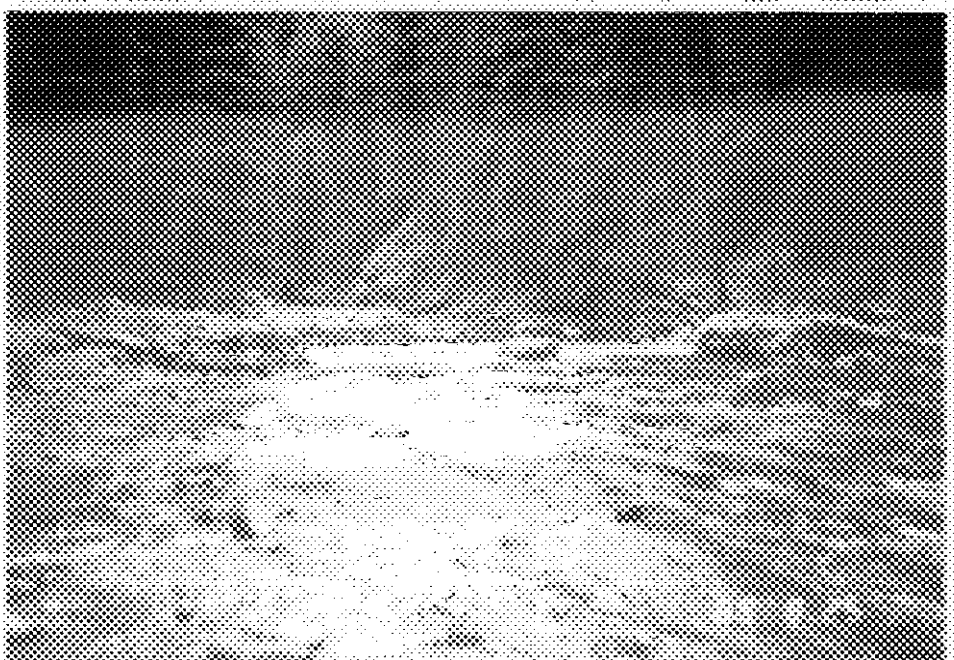
Desolation Creek Habitat Enhancement Work Summary

Structures	1985-86	1987	1988	1989	Total
Rock Weirs W/ Pools	120	50	31	19	220
Log Weirs W/ Pools	4	7	4	6	21
Sills	0	34	10	0	44
Deflectors (Log & Rock)	7	7	7	23	44
Instream Logs	51	91	3	0	145
Root Wads	n/a	n/a	n/a	21	21
In Pool Boulders	160	255	90	25	530
In Stream Boulders	120	250	48	457	875
Adult Holding Pools	5	2	2	1	10
Side Channels	5	1	0	0	6
Side Channel Lengths	4751	500	0	0	5251
Debris Jam Bypass	1	0	1	0	2
Cuttings Planted	86	0	0	50	136
Cubic Yds Spawning Gravel Placed	0	0	0	0	0
Mine Plug	O	O	0	0	O
Mine Diversion	O	O	0	0	O
Bogs Created	O	O	0	0	O



1 Reconstructed rock weir to maintain chinook holding pool.

2 Excavator moving boulders and log into place for log weir in Desolation Creek.



3 Same area as picture 2 showing completed log weir providing pool habitat.

Subproject Ic - Fivemile Creek System

INTRODUCTION

The Fivemile Creek System is located on the Umatilla National Forest in T4 & 5s. R29 & 30E and is tributary to Camas Creek which is tributary to the North Fork of the John Day River. Fivemile Creek and its tributaries have historically been used for spawning and rearing by summer steelhead. Within the last twenty years a falls formed one mile from the mouth of Fivemile Creek. This falls, which is on private land, became a partial barrier to steelhead adult migration. The Oregon Department of Fish and Wildlife improved passage in the fall of 1987.

In 1986 a physical stream survey was conducted for Fivemile Creek and its tributaries. An evaluation of survey data indicates that the quantity of pool sufficient to provide adequate rearing is very low - approximately 11 percent of the surface area. Spawning gravel and riparian vegetation were also limited along some reaches of the stream.

In 1988 the work started on Fivemile Creek at Gulliford Crossing. It was evident by the number of smolts present in the project area that passage had indeed been provided at the falls. We constructed twenty log and rock weirs as pool creating structures for rearing summer steelhead. This project was reviewed and analyzed for the success of the structure before the 1989 project was planned.

OBJECTIVES

1. Increase the pool frequency and the quality of pools for successful rearing and hiding cover for summer steelhead.

2. Provide adult hiding cover by building at least one large pool per mile of stream.

3. Increase stream bank stability with the addition of woody material and boulders to the stream banks.

4. Increase and protect vegetation in the riparian area by placing woody material near streambanks and building wings on weirs which catch sediments, promoting riparian recovery.

PROJECT DFSCRIPTION

The project started upstream from the 1988 project at the Silver Creek crossing. Thirty-two pool creating weirs were built in approximately two miles of stream. Root wads and boulders were placed in every pool. Woody material and downed logs were pulled into the riparian area and stream banks to promote riparian recovery.

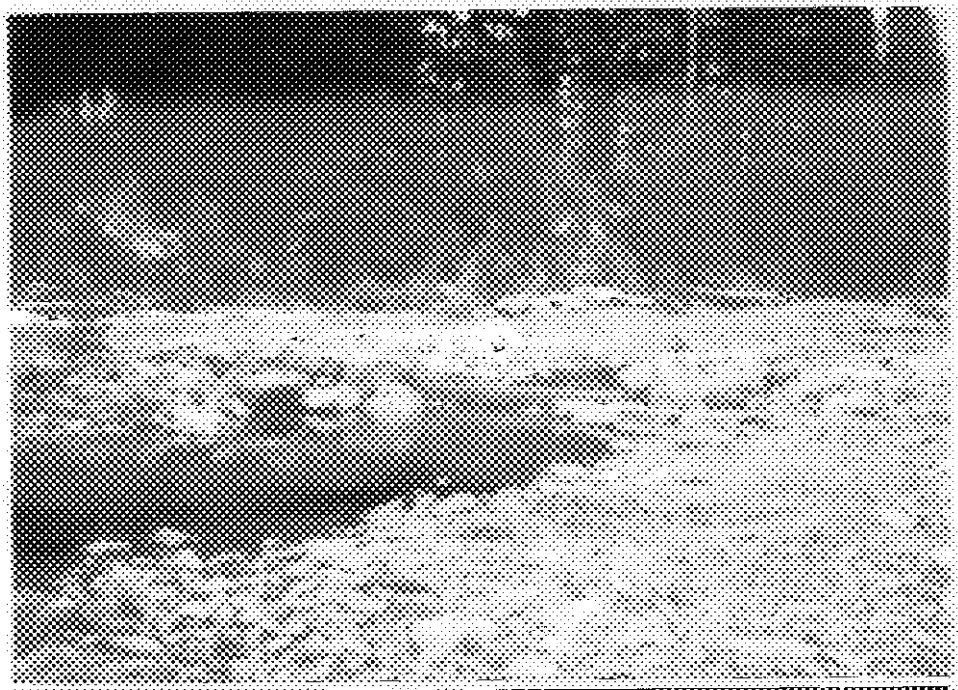
ACHIEVEMENTS

A total of two miles of stream was worked creating 32 weirs. Each weir was constructed with root wads and boulders placed in the associated pool. Boulders were placed in the stream for hiding cover and for bank stabilization.

The additional weirs will substantially improve the pool habitat quality and quantity in this section of the stream. The additional pools will provide substantial summer and winter rearing habitat. Overall, these habitat components are lacking in Fivemile Creek.

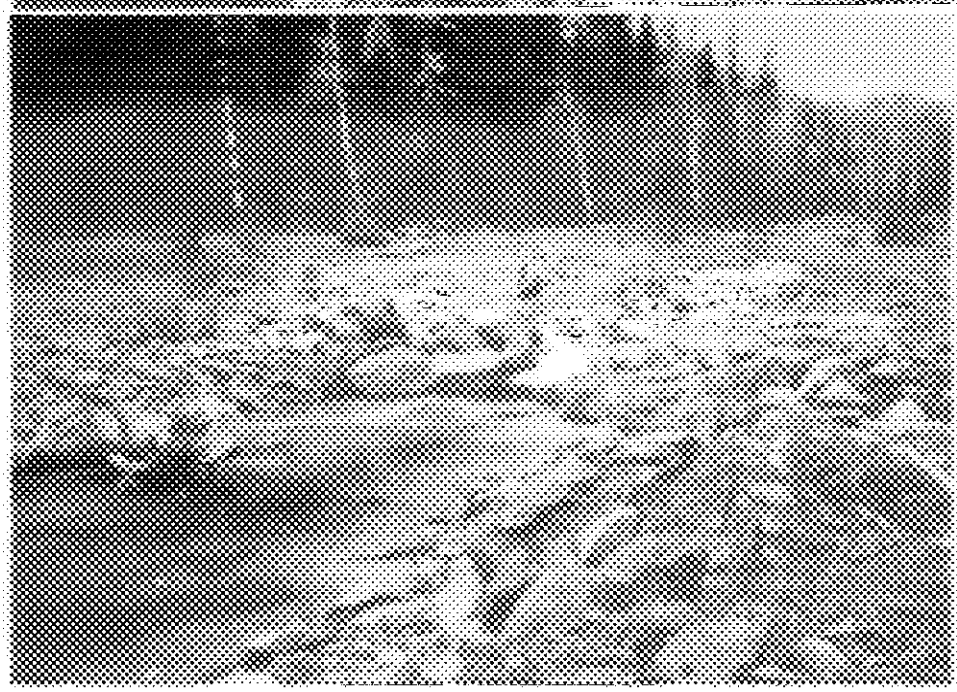
Fivemile Creek Habitat Enhancement Work Summary

Structures	1987	1988	1989	Total
Rock Weirs W/ Pools	6	15	16	37
Log Weirs W/ Pools	0	5	16	21
Sills	1	0	0	1
Deflectors (Log & Rock)	4	6	32	42
Instream Logs	a	a	0	16
Root Wads	n/a	12	30	42
In Pool Boulders	n/a	70	40	110
In Stream Boulders	n/a	80	150	230
Adult Holding Pools	1	0	0	1
Side Channels	0	0	0	0
Side Channel Lengths	0	0	0	0
Debris Jam Bypass	0	0	0	0
Cubic Yds Spawning Gravel Placed	0	0	0	0
Mine Plug	O	O	O	O
Mine Diversion	O	O	O	O
Bogs Created	O	O	O	O



1 Log weir with rock wings in Fivemile Creek.

2 Rock weir with associated pool at Fivemile Creek.



3 Hilti drilling being conducted on weir rocks.

Subproject Id - North Hidaway Creek

INTRODUCTION

North Hidaway Creek is a fourth order stream that flows west-northwest into Camas Creek. of the Umatilla National Forest. Although most of the stream flows through Forest Service managed land, several miles of stream does flow through private land. The stream enhancement project this year involved a two mile section of stream in T.5S., R.33 and 33 l/2 E., Sections 36, 25 and 26.

The initial pre-project stream survey was conducted in 1986 on North Hidaway Creek. The survey indicated that the quantity and quality of pool habitat was deficient throughout the system. There are potential barriers to migration scattered throughout the stream and a number of log jams that could become barriers in the future. The survey indicated steelhead and rainbow trout were seen in every reach. Due to proper riparian management, the timber and woody debris adjacent to the stream, have been left in place, inhibiting livestock grazing along streambanks.

Project work started in 1986 with the addition of 20 pool creating structures. The log and rock weirs were analyzed in the spring of 1987 end determined to be fully successful. During the next two summers, 66 additional log and rock weirs were completed in North Hidaway. Improvements on the construction of the weirs have occurred over the years, with the addition of rock wings, pools with boulders and woody material used as deflectors and the Hilting of each structure.

OBJECTIVES

1. Increase the pool frequency in treated reaches to attain quality pools by the construction of weirs.

2. Increase hiding cover by placing woody material or rootwads and boulders in pools.

3. Create a resting pool for steelhead moving upstream during spawning season.

4. Increase riparian protection and stream bank stabilization by placing woody material along the stream bank.

PROJECT DESCRIPTION

Thirty-seven new rock and log weirs, with their associated pools, were constructed this year. Rootwads and boulders were added to each pool to act as hiding cover. Logs and woody material made available by natural causes were secured to the stream bank to act as deflectors and hiding cover. Instream boulders were placed throughout the system to increase rearing habitat and diversity. Several structures constructed in the 1988 field season were repaired after a high spring runoff. Each of these structures, not cabled before, were secured by the Hilti method of cabling weir boulders, ensuring permanence over time. The Forest Service paid wages for this maintenance work.

ACHIEVEMENTS

Additional log and rock weirs will improve the pool frequency. Quality pools will increase the available habitat for rearing spawning and hiding cover. The addition of woody material and boulders will increase the habitat available for aquatic insects: making more food available to fish.

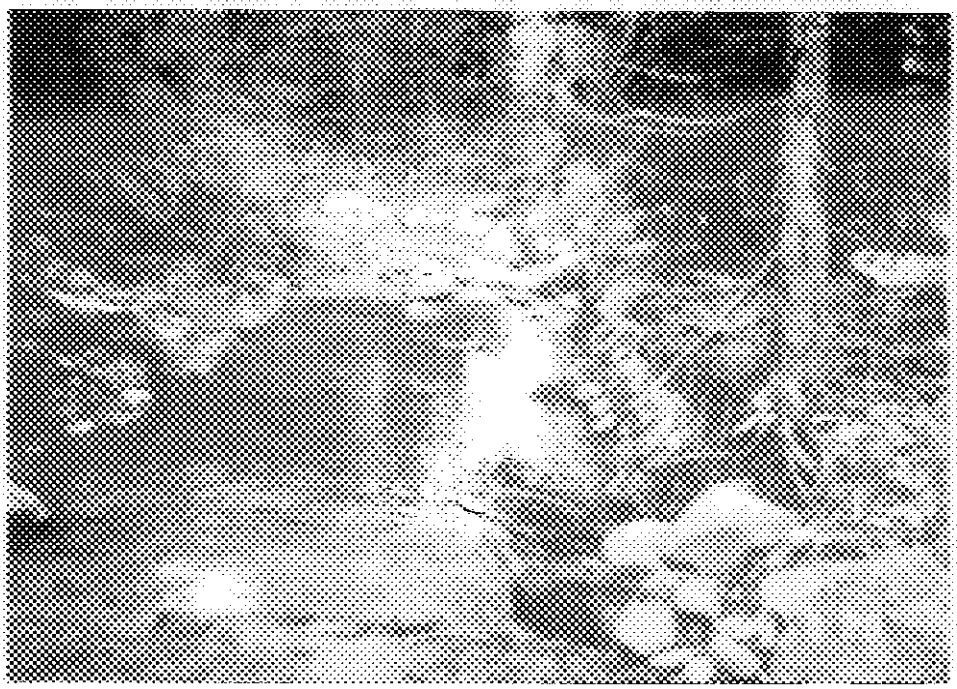
Hidaway Creek Habitat Enhancement Work Summary

Structures	1986	1987	1988	1989	Total
Rock Weirs W/ Pools	2	5	25	26	58
Log Weirs W/ Pools	18	12	20	11	61
Sills	0	0	0	9	9
Deflectors (Log & Rock)	0	0	0	76	42
Instream Logs	20	17	49	15	101
Root Wads	n/a	n/a	n/a	37	37
In Pool Boulders	n/a	n/a	n/a	240	240
In Stream Boulders	n/a	n/a	n/a	180	180
Adult Holding Pools	0	0	0	0	0
Side Channels	0	0	0	0	0
Side Channel Lengths	0	0	0	0	0
Debris Jam Bypass	0	0	1	0	1
Cubic Yds Spawning Gravel Placed	0	0	0	0	0
Mine Plug	0	0	0	0	0
Mine Diversion	0	0	0	0	0
Bogs Created	0	0	0	0	0

1 Log weir after root wad placed in excavated pool. Rocks constrain flow during spring runoff.

2 Rock weir with excavated pool; root wad placed in pool. Care was taken to make sure the stream vegetation was protected.

3 Log jams typical of many areas on the creek.



4 Constructed log weir-.

Subproject Ie- Bear Wallow Creek

INTRODUCTION

Bear Wallow Creek is a first order, class one (anadromous) stream that flows into Camas Creek near Bear wallow Campground on Highway 244. The entire drainage is under Forest Service management of the North Fork John Day Ranger District on the Umatilla National Forest. Project work was located north of the Bear Wallow Campground in T4S, R33E. Section 29 and in reach six located in section nine.

A Hankin and Reeves (1986) stream survey was conducted in 1988 which identified the physical stream habitat available for fish. The survey identified total number of pools, pool quality, shade, units with woody debris as limiting factors for steelhead rearing and spawning habitat. Cattle use of the riparian area was evident throughout Bear Wallow Creek, but, overgrazing was only evident in three reaches.

Bear Wallow Creek is an important anadromous stream with a limited fisheries at present. With improved land management and the addition of stream structures, the Oregon Department of Fish and Wildlife feels the number of smolts produced from Bear Wallow Creek drainage can be trippled.

A new allotment plan was drafted this year by the Umatilla National Forest that demands riparian protection by the allotment user. The allotment user end the Umatilla National Forest agreed on meeting the riparian management objectives to: increase shade to 80% of potential on reaches 2,4,6 and 8, reduce bank sloughing and siltation by 50%. reduce utilization of shrubs and herbaceous specied in riparian areas and improve livestock distribution by developing springs and ponds. The 10 year plan will be reviewed in five years to make sure plan objectives are being met. Yearly monitoring of permanent stations in riparian areas will give the land manager a good indication of grazing activity.

OBJECTIVE

1. Increase the number of pools and quality of pools by constructing log and rock weirs with their associated pools.

2. Increase the amount of vegetation available for stream shade by pulling in woody material to the stream bank and by changing the the grazing system used on the allotment.

3. Increase hiding cover available for steelhead by placing boulders and rootwads in pools.

PROJECT DESCRIPTION

The project started in September in reach two, north of the Bear Wallow Campground, by constructing 10 log and rock weirs and their associated pools. Root wads and boulders were placed in each pool with two rock deflectors and one area of bank armorment. The plan to initiate this portion of the project as an interpretive area for the general public was developed. An interpretive trail with signs at each site and one large project description sign, has been planned and cost estimated. Fencing the entire project area has been planned and will be completed in 1990 if funding becomes available.

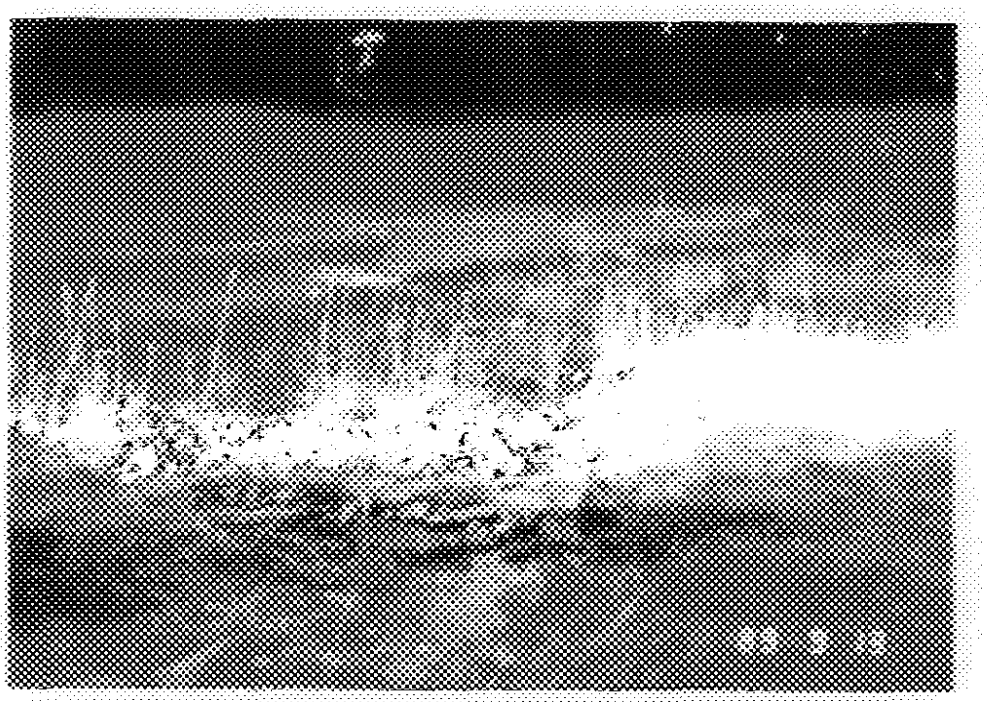
The project in upper Bear Wallow at reach six was designed to provide pool habitat and promote raising the water table. Twenty-one log and rock weirs with pools were constructed in a quarter mile section of stream. This project was fenced by the range department to monitor the vegetation growth, bank stability, channel narrowing and elk grazing over time. All structures in both project areas were secured by cabling weir boulders together with the Hilti system.

ACHIEVEMENTS

This project increased the pool density in reach two from two pools to 12 pools in the half mile long section of stream. The upper Bear Wallow project in reach six increased the density of pools from 13 to 34 pools in the 0.90 mile section. Quality pools in both project areas will provide summer and winter rearing habitat for steelhead smolts.

Bear Wallow Creek Habitat Enhancement Work Summary

Structures	1989	Total
Rock Weirs W/ Pools	12	12
Log Weirs W/ Pools	19	19
Sills	0	0
Deflectors (Log & Rock)	2	2
Instream Logs	2	2
Root Wads	13	13
In Pool Boulders	5	5
In Stream Boulders	3	3
Adult Holding Pools	0	0
Side Channels	0	0
Side Channel Lengths	0	0
Debris Jam Bypass	0	0
Cubic Yds Spawning Gravel Placed	0	0
Mine Plug	0	0
Mine Diversion	0	0
Bogs Created	0	0



1 Typical riffle habitat of lower Bear Wallow Creek before weir construction.

2 Constructed log weir with boulder wings and excavated pool.

3 Project work in upper Bear Wallow Creek showing log weir and gravel placement to bring up the water table and create pool habitat for fish.

Subproject If. - Wilson Creek

INTRODUCTION

The Wilson Creek project is located on the Umatilla National Forest in T6S, R27E (Grant Co.). Wilson Creek is a part of the Big Wall Creek system which is a tributary to the North Fork John Day River. The stream produces summer steelhead.

A stream survey was conducted on Wilson Creek in 1985. An analysis of the reach data revealed that both the quantity and quality of pool habitat was limiting production of juvenile summer steelhead. The pool:riffle ratio in Wilson Creek averaged 27:73. Average pool depth was less than a foot, which is far too shallow to be effective rearing habitat. Ten years ago, this lack of quality pool habitat must have been recognized as a factor which limited production because several pool forming gabions were installed in the stream. The stream survey crew noted that these structures were still providing some of the best pool habitat on the creek. These gabion structures and the recent enhancement work done in 1986, 1987, and 1988 have clearly demonstrated their value in improving steelhead rearing habitat. During the summer, these structures intercept underground flows and bring them to the surface. This increases the amount of water in the stream and provides thermal refuges to carry over the juvenile steelhead through the critical months of July and August.

In addition to a need to improve pool habitat, there were opportunities to increase the amount of spawning gravel by designing the structures to catch bedloads, to add more cover by placing rootwads and woody material in the stream, and to correct some unstable streambank conditions by using log and rock deflectors and riprap.

Some developing failures of earlier structures were detected, consisting mostly of rock movement during high flows. During the 1989 field season, additional Hilti work was done on these structures. There has been an increased emphasis on cabling this year's structures to avoid similar movement.

OBJECTIVES

1. Increase juvenile steelhead rearing habitat by constructing pool-creating structures to improve the current 27:73 pool:riffle ratio.

2. Increase both the size and quality of anadromous fish spawning areas by installing structures designed to retain bedload gravels.

3. Improve streambank stability by using deflectors and riprap to control bank erosion.

4. Increase the amount of woody material in the stream to improve instream cover and expand the diversity and complexity of the stream.

PROJECT DESCRIPTION

Project activities began in the spring of 1989 with scoping and analysis of the proposed work area. Restoration opportunities were identified and specific methods of correcting habitat deficiencies were proposed. Plans were finalized, structure design and layout were completed, and pre-work conditions were documented. Rock haul and rock dump sites were selected, and fueling sites and access roads were staked on the ground. The equipment rental contract was awarded in April and work started on July 17, 1989.

The first two weeks of contract work began with the construction of several structures. On July 26. the excavator pulled out of the stream and joined three dump trucks, a cat, and a crawler-loader to begin rock haul. Three dump trucks were utilized to move rock as close to the stream as possible. The dump trucks were released on July 28, and rock haul continued with the aid of the loader and excavator. The loader completed moving rock from dump sites to individual construction sites. The loader worked on construction of access roads, and moved rock and logs to selected locations. In addition to getting materials to sites on this year's project, rock was hauled to a few sites scheduled for work next year. Rock haul was completed in mid-August, and the excavator returned to construction of stream enhancement structures. Work continued until mid-October. Throughout the course of the contract, the excavator was also used to clean up work sites and close access roads as construction progressed down the stream. Grass seed was spread over all access roads and areas where equipment had been.

The primary objective on the Wilson Creek project was to increase the number and depth of pools. This year's project relied heavily on log and rock weir structures to increase pool habitat. The weir structures were mainly "K" weirs with two deflector wings. These structures are becoming the mainstay on Wilson Creek because of their ability to intercept subsurface water and concentrate flows in the dry summer months. They have been very successful over the years in maintaining high quality pools and retaining bedload gravels which increase spawning areas. To add habitat diversity, an equal number of rock and log weirs were built.

A second objective was to increase spawning habitat by retaining bedload gravels. Many of the structures were designed and placed in the stream in locations that would catch bedload gravels during high flows and eventually provide added spawning habitat. Side channels were closed to prevent juvenile stranding. Several types of bedload catchment structures were installed on the bedrock portions to initiate a streambed building process. The structures were designed to catch bedload material, including spawning gravels. This material will eventually cover the bedrock and allow vegetation to become established.

The project has progressed into the lower reaches of Wilson Creek. This area has increased amounts of exposed, raw streambanks. The eroding stream banks were stabilized with either log or rock deflectors or rip-rap, and an increased use of long wings on log weirs. Downed logs and other woody material were pulled into the riparian area where possible to help stabilize the ground, provide streamside cover, and deter cattle from heavily trampling the stream banks.

To increase instream cover a root wad was placed in most pools. Logs and boulder clusters were also placed in key places on the stream to prove habitat diversity.

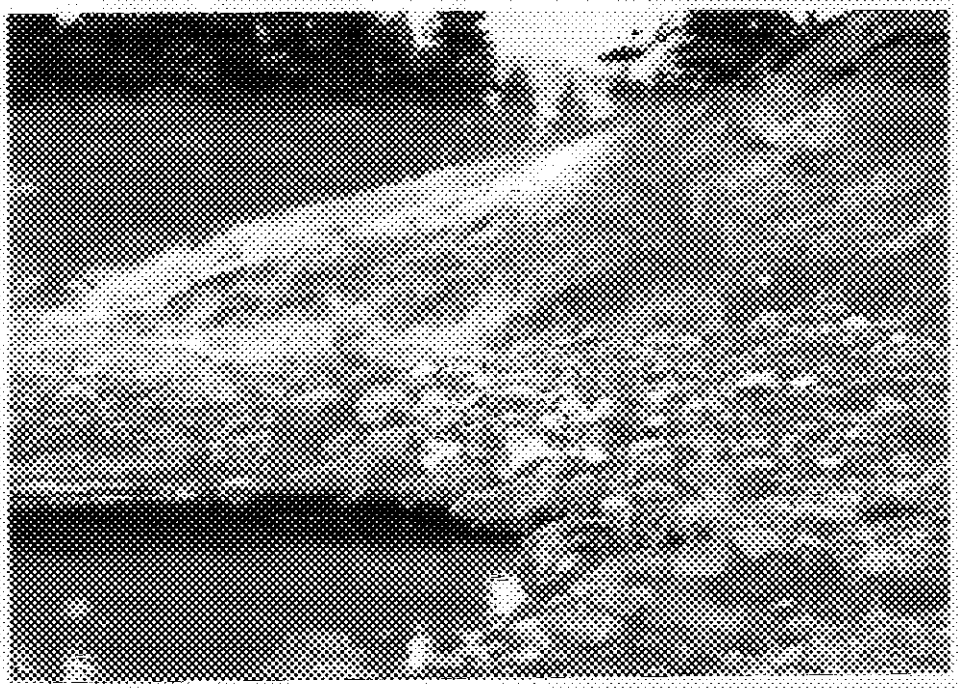
ACHIEVEMENTS

Stream enhancement work took place over a 1.5 mile section of Wilson Creek. A total of 53 pool-creating structures were constructed, which helps to bring the pool:riffle ratio closer to an optimum level in this section of the stream. These pools will provide hiding and thermal cover, and the addition of woody material and boulders will provide habitat diversity for steelhead juveniles. New spawning areas will be formed at the pool tail-outs as well as upstream of the weirs. Severely eroded streambanks have been reinforced and vegetative recovery will begin to occur.

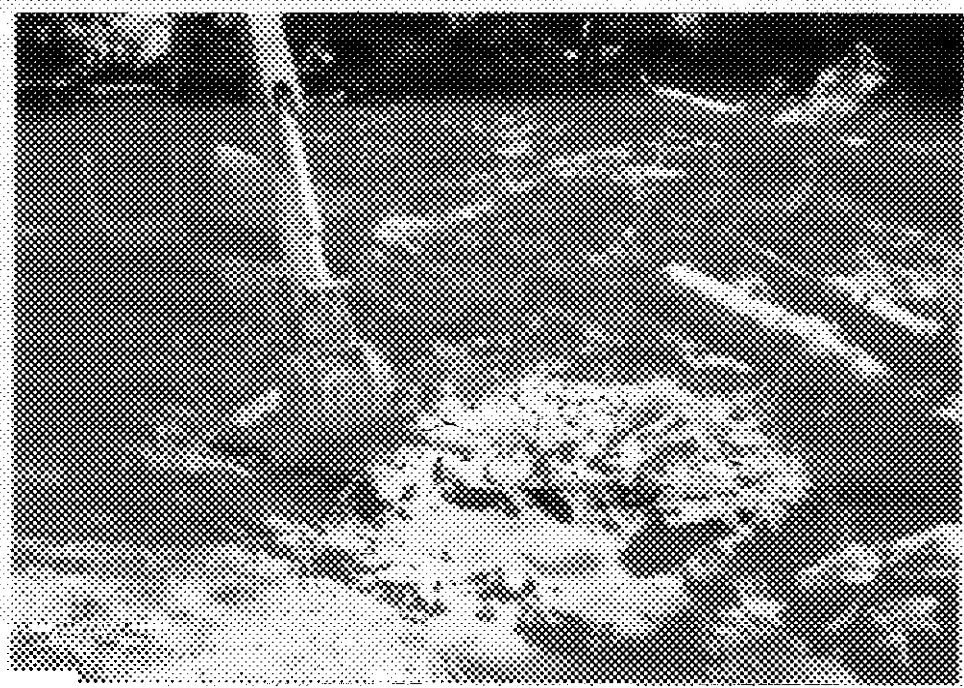
Table 1: Summary of the Wilson Creek Project to Date

Structure	1986	1987	1988	1989	Total
Rock Weirs W/ Pools	39	12	6	26	83
Log Weirs W/ Pools	9	13	16	27	65
Sills	63	0	0	3	66
Deflectors (Log & Rock)	24	339	251	40	654
Instream Logs	18	0	13	0	31
Root Wads	53	38	32	42	165
In Pool Boulders	12	13	8	0	33
In Stream Boulders	171	13	8	2	194
Adult Holding Pools	0	0	0	0	0
Side Channels	0	0	0	0	0
Side Channel Lengths	0	0	0	0	0
Debris Jam Bypass	1	0	0	0	1
Side Channels Closed	15	0	1	2	18
Vegetative Plantings	196	291	30	0	517

1. Pre-construction view of Wilson Creek streambed.

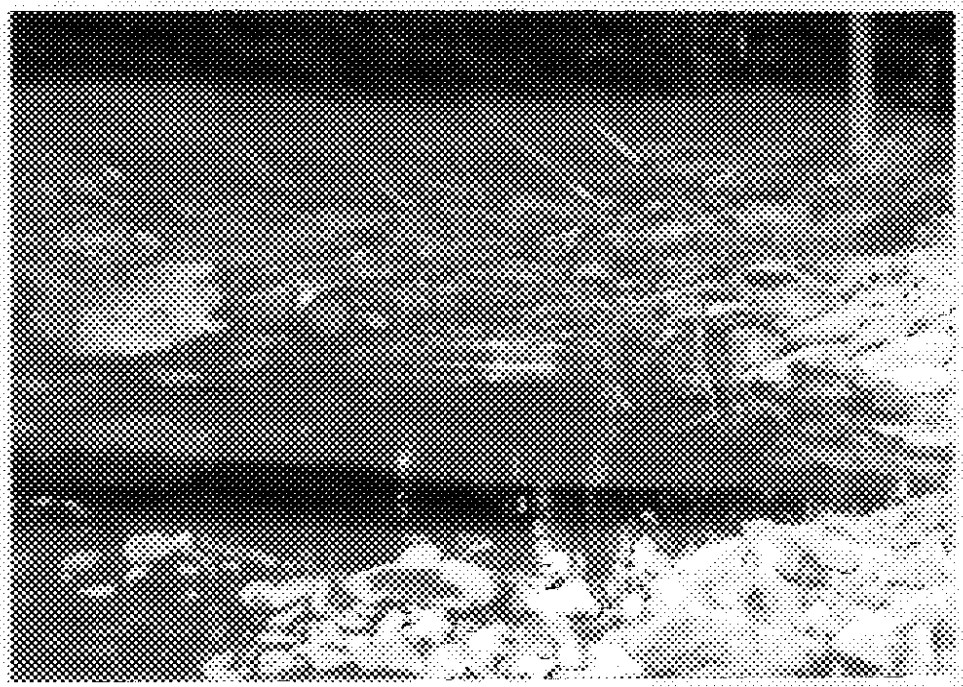


2. Post-construction view of the same area.



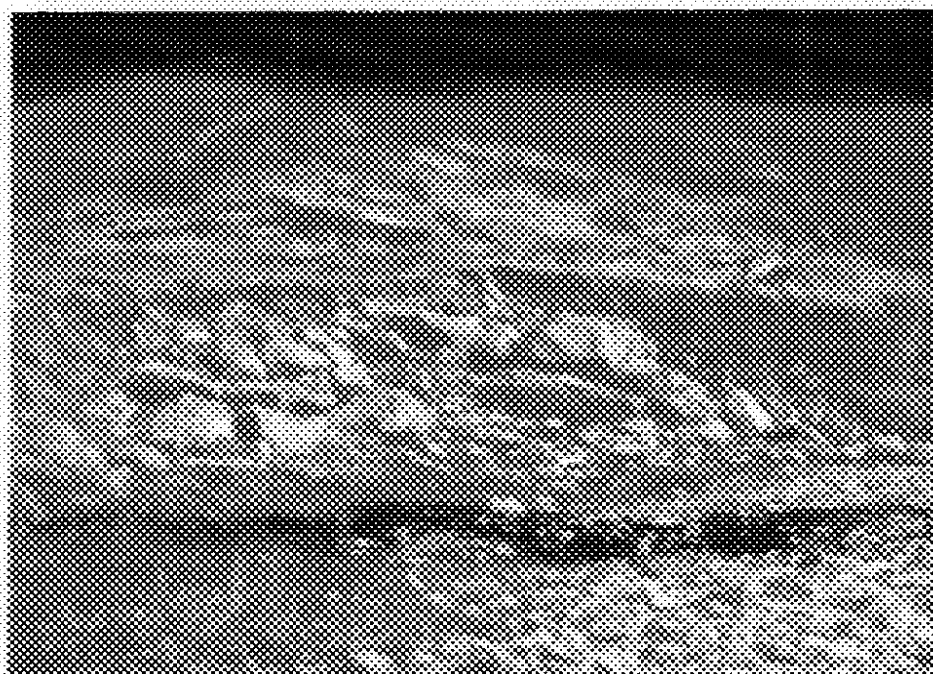
3. Excavator working in Wilson Creek.

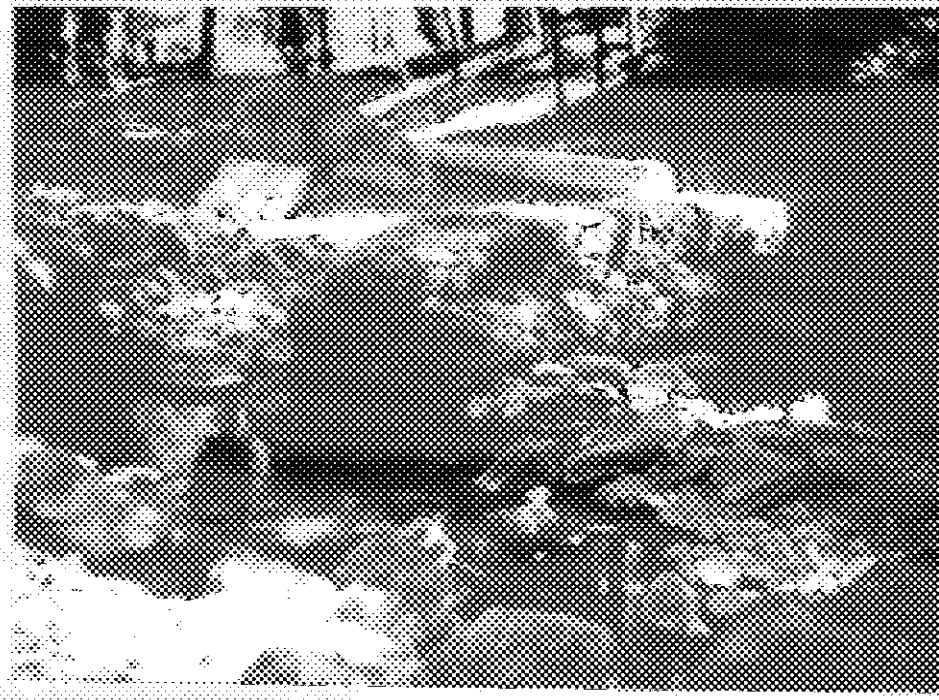
4. Log weir with rock wing and root wad.



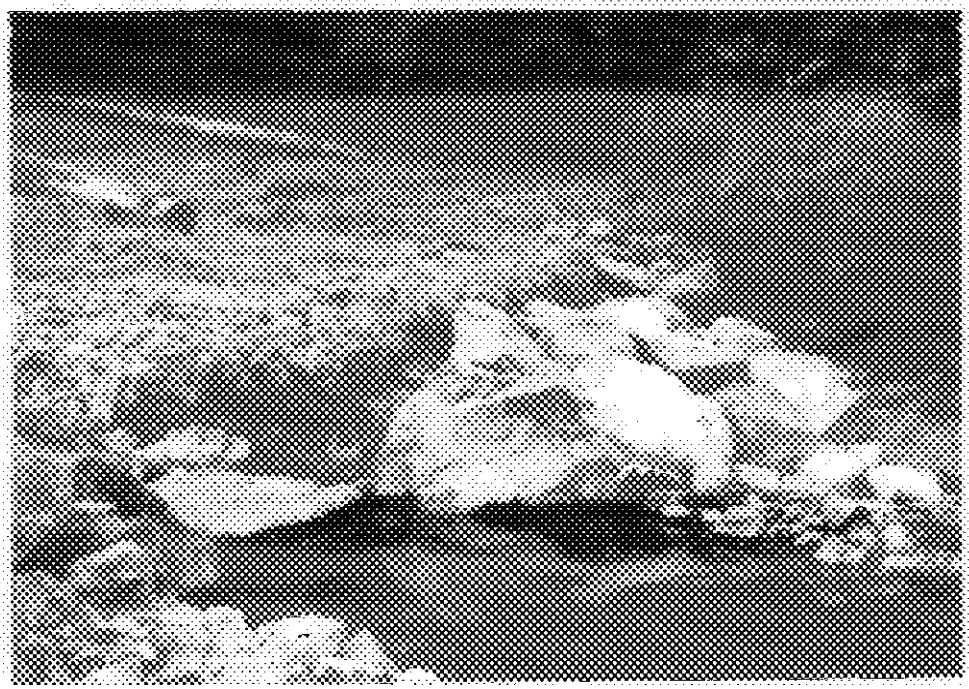
5. Log weir with one log wing and one rock wing tied into eroding bank.

6. Rock deflector protecting heavily eroded bank.





7. Pre-construction view of old gabion and pool.



8. Post-construction repairs on same gabion. Rocks placed between gabion and bank, and below gabion. Keystone placed and pool re-dug.

9. Boulder cluster placed in glide to provide cover for juvenile steelhead.

Subproject II. - Physical Structure Monitoring

INTRODUCTION

Physical project monitoring of structures began in 1889 to document changes of each project site through time. The method of monitoring structures was established to gather a representitive sample of function, type and size of structures at each project area. Monitoring was conducted on 10% of the structures already constructed with photo documentation, sketches of the structure and specific measurements being taken at each monitored structure. Each structure was monitored for the quality of fish habitat provided by each structure by snorkeling and shocking each pool for species composition and fish usage of the instream structure. Structures in need of maintenance were identified during the physical monitoring.

OBJECTIVES

1. Evaluate structural changes over time to identify changes necessary to create a more functable structure.

2. Monitoring structure effectiveness for fish by evaluating the pool habitat.

3. Collect a representative sample of each project to give collective information of the total project.

PROJECT DESCRIPTION

A two person monitoring team went to each project site on the North Fork John Day Ranger District and Heppner District that has been financed by Bonneville Power Administration and the U.S. Forest Service. Ten percent of the total number of structures of each project were monitored. Photo monitoring points were established at each of these structures. The team recorded specific data at each structure, including: structure number, structure type, length of pool, width, depth, depth at pool tail crest, temperature of water and air, and stream flows (cfs). A sketch of each structure was made showing photo points, measured area. identifying features and direction of flow with respect to the structure. A summary was written for each project and the data was bound in a notebook for future use.

ACHIEVEMENTS

Monitoring was completed on 10% of all the structures constructed for fish habitat on Fivemile Creek, Bear Wallow, North Hidaway, Desolation, North Fork of the John Day River, Clear Creek, Little Wall and Wilson Creek. The effectiveness of each of these structures is now known and changes can be made to create more effective structures. Maintenance needs have been identified through the monitoring method.

PROJECT COSTS

Table 1. Project Costs, April 1, 1989 to March 30, 1990

Bonneville Power Administration Funds:		
a. Salaries		$ 98,702
b. Transportation and travel		$ 1,671
c. Materials and supplies		$ 34,525
d. Equipment rental contracts		$171,584
e. Overhead @ 10.7%		$ 32,720
	Total	$339,202

REFERENCES

Hankin, D.D. Sampling designs for estimating the total number of fish in small streams. Res. Pap. PNW-360. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 1986. 33p.