CAMAS CREEK (MEYERS COVE) ANADROMOUS SPECIES HABITAT IMPROVEMENT

1990 Annual Report

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ABSTRACT

Populations of wild salmon and steelhead in the Middle Fork of the Salmon River are at historical lows. Until passage and flow problems associated with Columbia River dams are corrected to reduce mortalities of migrating smolts, continuance of habitat enhancements that decrease sediment loads, increase vegetative cover, remove passage barriers, and provide habitat diversity is imperative to maintain surviving populations of these specially adapted fish.

Historical agricultural practices and natural events contributed to severe degradation of riparian zones and instream fish habitat in the Meyers Cove area of Camas Creek. Natural recovery of anadromous fish habitat is expected to take considerable time due to climate, elevation, and extent of degraded conditions. In 1984, Salmon National Forest personnel began implementing specific management activities in riparian areas and the stream channel to accelerate habitat recovery. The goal of these activities is to enhance the quality and quantity of spring and summer chinook salmon and summer steelhead with an emphasis on long-term survival of stocks indigenous to the Middle Fork drainage.

In 1987-88, 4.3 miles of fence was constructed establishing a riparian livestock exclosure in the Meyers Cove area of Camas Creek. One end-gap and two water-crossing corridors were constructed in 1989 to complete the fence system. Areas within the riparian exclosure have been fertilized with phosphorous-rich fertilizer to promote tree and shrub root growth and meadow recovery. A stream crossing ford was stabilized with angular cobble. Streambank stabilization/habitat cover work was completed at three sites and three additional habitat structures were placed. Extensive habitat inventories were completed to identify quality/quantity of habitat available to anadromous fish.

The work accomplished was designed to promote natural revegetation of the riparian area to improve rearing habitat cover and streambank stability. Streambank stabilization work was limited to extremely unstable banks, minimizing radical alterations to an active stream channel. Enhancement activities will improve spawning, incubation, and rearing habitat for wild populations of steelhead trout and chinook salmon. Anadromous species population increases resulting from these enhancement activities will provide partial compensation for downstream losses resulting from hydroelectric developments on the Columbia River system.

INTRODUCTION

Camas Creek is a tributary to the Middle Fork of the Salmon River (Figure 1). Present fishery resources in Camas Creek include populations of wild chinook salmon (Oncorhynchus tshawytscha) and steelhead trout (Oncorhynchus mykiss) which are part of the last remaining pure inland runs of anadromous fish in Idaho. The Idaho Department of Fish and Game has laid groundwork to systematically restore and enhance the anadromous fish resources by developing a 5-year (1985-1990) management plan. The 1985-1990 Idaho Anadromous Fisheries Management Plan (IDFG, 1985) states "The Salmon River is the most important tributary in the Snake and Columbia River drainages for anadromous fish production. The Middle Fork is the largest tributary of the Salmon River and is the most important producer of anadromous fish. The drainage flows through the Frank Church-River of No Return Wilderness, leaving the aquatic habitat conditions mostly undisturbed.... Both chinook and steelhead of the Middle Fork are uniquely adapted to the habitat conditions and long migrations distances. Preservation of the indigenous gene pools is a high priority." The primary component of this plan is protection and enhancement of wild anadromous fish populations.

Present land management and resource coordination outlined in the Salmon National Forest Management Plan provides administrative direction to reduce and eliminate negative influences on fish habitat. The Camas Creek (Meyers Cove) Anadromous Species Habitat Improvement Plan (May and Rose, 1986) defines habitat deficiencies and describes suitable options for increasing channel stability and improving riparian conditions. The Camas Creek Anadromous Species Habitat Improvement Project is the product of that plan. The project goal is to increase the quantity and vigor of wild populations of chinook salmon and steelhead trout through improvement of spawning, incubation, and rearing habitat.

The Camas Creek Anadromous Species Habitat Improvement Project conforms with the Columbia River Basin Fish and Wildlife Program measures found in Section 703 (NPPC 1987a). This project is funded by Bonneville Power Administration which has the responsibility to protect, mitigate, and enhance fish and wildlife affected by hydroelectric developments on the Columbia River and its tributaries.

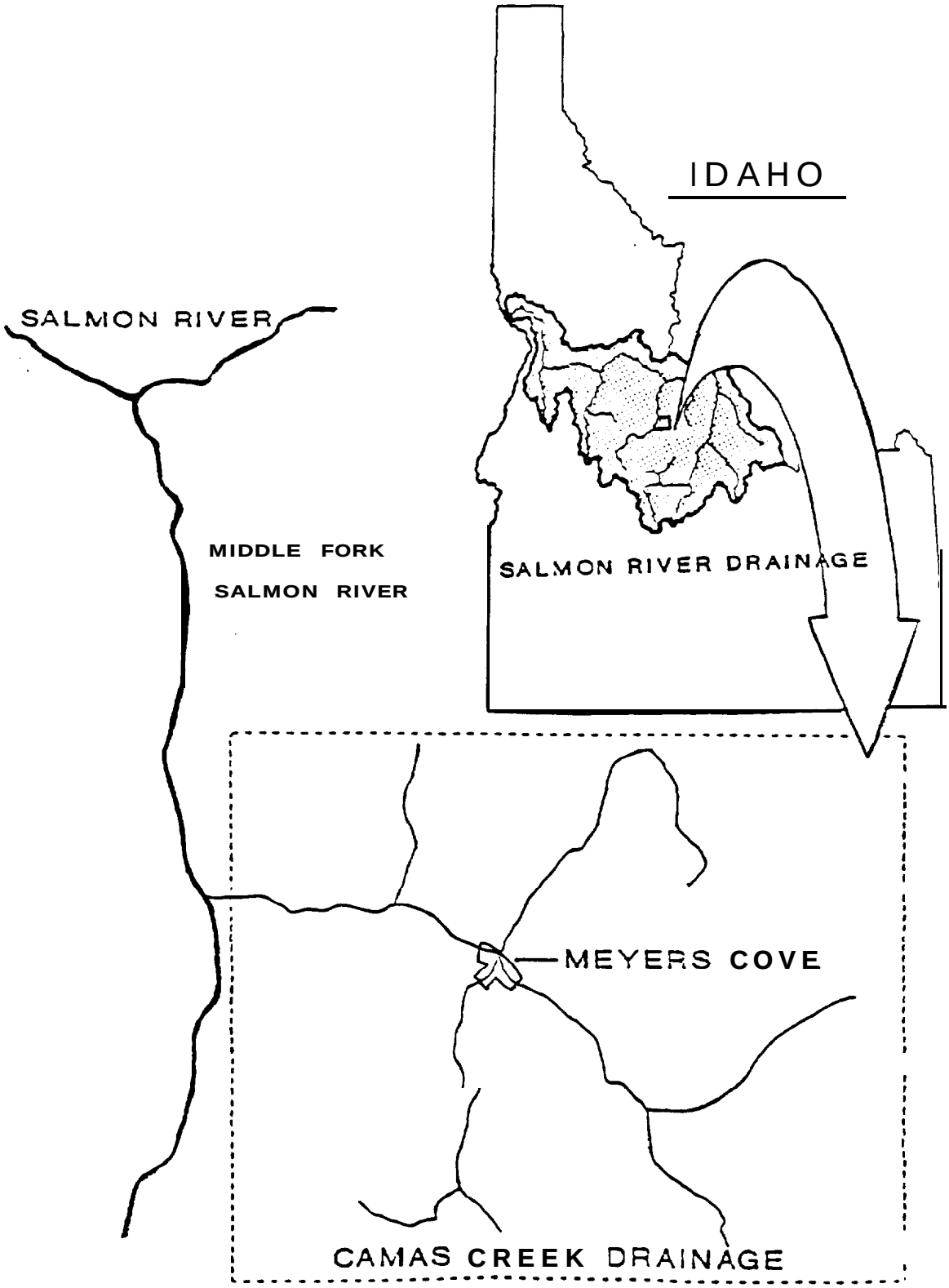
Agency and Tribal Coordination

The Camas Creek Anadromous Species Habitat Improvement Project is a cooperative effort involving the U.S. Forest Service, the Idaho Department of Fish and Game, the Shoshone-Bannock Tribes, the Meyers Cove Grazing Allotment permittee and the Bonneville Power Administration, Copies of the Camas Creek (Meyers Cove) Anadromous Species Habitat Improvement Plan, annual reports, and work statements are submitted to respective agencies for comment.

NEPA Compliance

The project proposal was reviewed by a Salmon National Forest Interdisciplinary Team (ID Team). The ID Team completed a draft Environmental Assessment in 1986. A Categorical Exclusion/Decision Notice was signed in March 1987 (Anon. 1987).

Figure 1. Project location map. Relationship of Meyers Cove to the Salmon River drainage and the State of Idaho.



HISTORY

Project Area

Camas Creek, from Meyers Cove downstream to the Middle Fork-Salmon River, delineates the boundary between the Challis and Salmon National Forests (Figure 2). Because of improved access, administrative responsibilities for Meyers Cove, including the lower reach of the West Fork-Camas Creek, have been assignee to the Cobalt Ranger District, Salmon National Forest. The project area legal description is: sections 5, 6, and 7 of Township 17N, Range 17E, Boise Meridian. Elevation is approximately 5,100 feet.

The Meyers Cove reach of Camas Creek lies in a wide, low-gradient, flat-floored valley bordered by steep volcanic and quartzite canyonlands rising to over 9,000 feet. Located in the central Idaho mountains, the steep rugged topography is a mixture of cretaceous granitics and tertiary intrusive and extrusive igneous rocks, geologically termed the Idaho Batholith.

Average annual precipitation is 36 inches, mostly in the form of snow. Peak discharge occurs during a 2-6 week period from early May to mid-June, followed by decreasing flows through summer and winter (Anon. 1987). Dominant riparian vegetation species include Wolf's willow (Salix wolfii) and lance-leaf cottonwood (Populus acuminata), both with a grass/forb understory. Stands of Douglas-fir (Pseudotsuga menziesii) and lodgepole pine (Pinus contorta) are present in suitable riparian sites and on upper-elevation sideslopes.

Fishery Resource

The potential smolt capacity of the project in 1986 was estimated at 2,231 summer steelhead and 18,779 spring or summer chinook. This is expected to increase to a potential smolt production of approximately 3,161 summer steelhead and 28,633 spring or summer chinook when the riparian area is restored (Table 1).

Grazing Management

Meyers Cove was essentially pristine and undeveloped prior to 1900. From 1901 to 1969, 464 acres of the Meyers Cove area were in private ownership, grazed and irrigated for hay production. Three Forest Service grazing allotments adjoined the private inholding throughout this time period. In 1970, the United States Government purchased the private land under the authority of the Land and Water Conservation Fund Act of 1964 which provided management control for protection of anadromous fishery resources. The Camas Creek allotment now includes the formerly private land.

The Camas Creek Allotment Management Plan is currently being revised. Preferred grazing areas along the bottomland and riparian zones of Camas Creek, West Fork-Camas Creek, and Silver Creek (Figure 2), is the better producing land from the original homestead ranch. Since government purchase, irrigation has been discontinued and the meadow communities have reverted back to annuals and other less productive grasses. This area has been utilized in excess of its potential while the remainder of the allotment, typically upland areas, is in good range condition.

Figure 2. Camas Creek grazing allotment (T17N, R17E, Sec. 5.6.7). Outlined area represents the formerly private land that is no longer irrigated. This bottomland and adjacent riparian zone is heavily impacted by over-grazing.

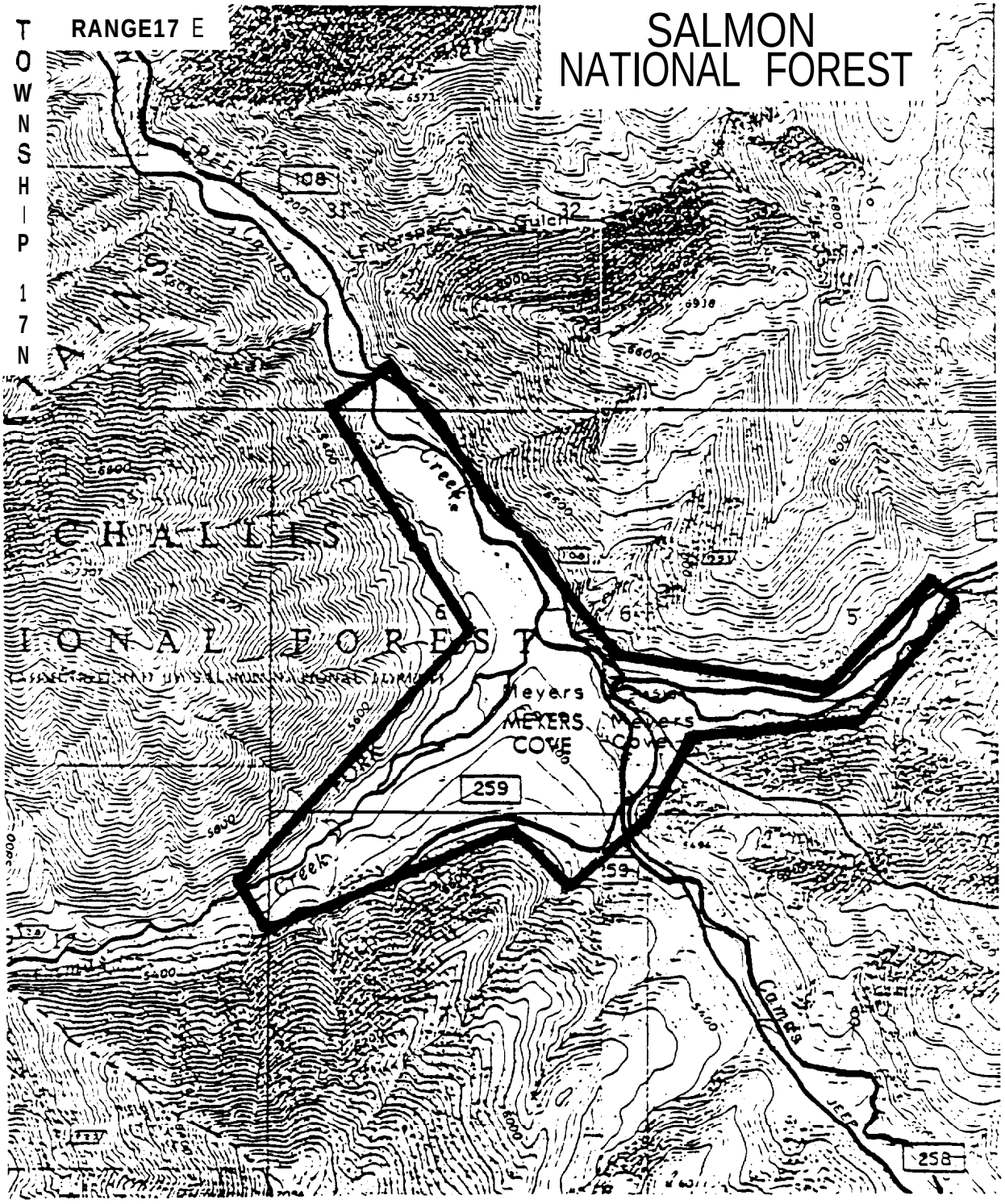


Table 1. Estimated annual spring or summer chinook and summer steelhead smolt production potential as a result of habitat improvements in the Meyers Cove reach of Camas Creek.

SPECIES	REARING AREA (M^2) 1/	REARING QUALITY 2/	PRESENT DENSITY (SMOLTS PER M^2) 3/	PRESENT POTENTIAL REARING CAPACITY 4/	ESTIMATED POTENTIAL REARING WITH IMPROVEMENTS 5/	ESTIMATED SMOLT INCREASE 6/
Chinook	37,187	fair/good	0.505	18,779	28,633	9,854
Steelhead	37,187	fair/good	0.060	2,231	3,161	930

1/ Based on low flow rearing area. Calculation involved comparing the stream area data in the Anadromous Species Presence/Absence Files for the Salmon Basin, (NPPC, 1987) and data collected through the extensive habitat evaluation completed by Forest Service personnel in October, 1989.

2/ The current situation in Meyers Cove reach of Camas Creek. Limiting factors included lack of riparian vegetation (over-hanging shrubs, shade and cover), high sedimentation, and poor habitat diversity.

3/ Standard smolt density estimates taken from Columbia Basin System Planning Data Standardization Report, System Planning Group, 1987.

4/ Rearing Capacity = Rearing Area x Smolt Density

5/ Improving rearing quality to excellent/good, and multiplying rearing area by increased standard smolt density estimates of 0.770 for chinook and 0.85 for steelhead.

6/ Potential increase in smolt production as a result of habitat improvements.

LIMITING FACTOR ANALYSIS

The 1985-1990 Idaho Anadromous Fisheries Management Plan (IDFG, 1985) states "Anadromous salmon and steelhead produced in Idaho are exposed to a complex array of natural and man-made conditions which limit return of adult fish to Idaho and which must be mitigated in order to achieve the long-term spawning and harvest objectives proposed in this plan. The Camas Creek (Meyers Cove) Anadromous Species Habitat Improvement Project addresses site-specific factors limiting production from returning adult to migrating smolt.

In 1979, Salmon National Forest personnel collected aquatic habitat and riparian vegetation data for preparation of a management plan for the Camas Creek C&H grazing allotment. A 1981 study conducted by the U.S. Fish & Wildlife Service assessed anadromous fish habitat quality in Camas Creek and associated tributaries. Both assessments reflected conflicts resulting from livestock use of riparian areas.

The combination of historic land-use activities that occurred prior to government purchase in 1970, natural runoff events, and the recent land-use management associated with the current grazing allotment are responsible for degraded habitat conditions of streams and riparian zones.

Existing downstream passage and flow problems have been limiting the survival of migrating smolts and returning adults. In addition, the following criteria were also identified as limiting for anadromous fish spawning and rearing success in the Meyers Cove reach of Camas Creek:

Riparian Vegetation

Past agricultural activity encroached upon the riparian zone and resulted in removal of much of the larger woody vegetation (cottonwood, alder, and willow). Heavy livestock use has compounded the problem by reducing vegetative vigor, ground cover, and woody shrub and tree recruitment. Lack of adequate riparian vegetation has therefore significantly reduced stream-side shade, hiding cover, food supply, streambank stability and long term sources of large woody material.

Sediment Loading

Removal of riparian grasses and tree and shrub recruitment from adjacent bottomlands initiated influences to stream channels. Natural revetment and channel control provided by large woody vegetation was reduced. This has led to substantial changes in the stream channel as water energies began exerting influences on the streambed and non-vegetated streambanks. May and Rose (1986) rated the area's streambanks as generally unstable and sparsely vegetated with erodible materials being deposited within the stream channel. Substrate conditions were less than optimum as a result of moderate to high levels of fine material being deposited in the desirable spawning gravels.

Habitat Diversity

The study completed by the U.S. Fish & Wildlife Service revealed very low ratings for instream cover, streambank stability, preferred water velocity, and stream width. Aggradation and channel instability had caused Camas Creek to widen, velocities to increase, and instream cover to decrease, resulting in reduced pool depths and decreased pool quality.

GOAL AND OBJECTIVES

The primary goal of this project is to increase the quality and quantity of spring and summer chinook salmon and summer steelhead with an emphasis on survival of stocks indigenous to the Middle Fork drainage. This goal will be achieved by protecting and improving the habitat of wild stocks in the Meyers Cove reach of Camas Creek, which will in turn increase fish production. Continued efforts to increase survival and production of existing stocks is imperative until mortalities of migrating smolts over Columbia River dams is reduced.

The project objectives to attain this goal are: reduce sediment loading, improve riparian vegetation, and increase habitat diversity for anadromous fish. Accomplishing these objectives will improve the quality and quantity of juvenile rearing habitat. This will result in increased juvenile rearing densities and smolt production of spring and summer chinook salmon and steelhead trout.

Objective 1. Provide Optimum Riparian Vegetation

Optimum riparian vegetation is essential for prime fish habitat, but also maintains year-round micro-climate temperatures essential for migration, spawning, incubation, and rearing. During hot summer months, over-story and stream canopy prevents water temperatures from increasing and concentrations of dissolved oxygen from decreasing (Bergstrom 1987). Overhanging shrubs and trees provide shade, hiding cover, and a food source. Fertilization and willow transplants will accelerate revegetation in areas where re-establishment is slow.

Objective 2. Reduce Sediment Loading

Stabilizing streambanks is necessary to minimize sediment delivery to the stream channel. The clean gravels, essential for spawning, incubation, and food production during juvenile rearing, deteriorate as levels of silt increase. Reduction of silt laden gravel will be the measurable coefficient. Embeddedness ratings collected from anadromous habitat inventories and photopoints will be used to interpret effects of streambank stabilization work. Meeting the already mentioned objective of providing optimum riparian vegetation will also contribute to reducing sediment delivery.

Objective 3. Increase Habitat Diversity

Lack of protective instream rearing cover is considered the primary habitat problem in the Meyers Cove reach of Camas Creek. Habitat diversity in the form of channel complexity (riffle/pool sequences) and in-stream cover is vital for optimum fish production. Overhead cover and shade near stream margins will be provided by overhanging riparian vegetation, turbulent water, and undercut banks. Aquatic vegetation and partially submerged rocks, logs, and root wads for in-stream cover will be provided by installing structures for treatment of unstable streambanks.

Achieving the above goal and objectives will provide partial off-site mitigation under mandate of the Pacific Northwest Electric Power Planning and Conservation Act of 1980.

ACCOMPLISHMENTS

Implementation of the Camas Creek Habitat Improvement Project was divided into two separate but interrelated phases. Phase I inventoried the current fisheries and stream conditions, identified land use activities that were adversely affecting aquatic habitat, and located site-specific channel instabilities in a two-mile reach of Camas Creek. The Camas Creek (Meyers Cove) Anadromous Species Improvement Plan was published in 1986 as a result of this inventory. The improvement plan includes enhancement and land-use management recommendations, a schedule of work, and estimated costs for enhancement activities.

Phase II outlined: 1) environmental assessment of enhancement activities as required by the NEPA process; 2) implementation of habitat enhancement activities; 3) maintenance, monitoring, and evaluation of project structures, changes in physical habitat, and resulting biological responses.

Riparian Revegetation

In 1987, the Salmon National Forest made a management decision to restrict livestock grazing in riparian areas of Meyers Cove. To ensure livetock were excluded from the riparian area, 2.8 miles of four strand, barbed-wire fence and 1.5 miles of buck and pole fence was constructed enclosing 23 acres of riparian area (Figure 3; Appendix D, Photographs 1 and 2). Riparian area width ranges from 120 to 290 feet (each side of stream, from streambank to fence). The mean width is 220 feet. In October and November 1988, one-half mile of fence (two water crossing corridors and one end closure), a cattle guard and six steel gates were installed. Six sections of "over water" suspension fence were constructed during the 1989 season and modified during the 1990 season thereby completing the riparian exclosure system.

A Cobalt Ranger District management decision not to seed the riparian area was made in June, 1988. This decision was based on the concept that without grazing impacts, natural revegetation could be encouraged with fertilization. In August 1988, 1500 pounds of 16-20-o-14 fertilizer was spread over the seven acres of the riparian area enclosure. Two test plots were staked and photopoints were set up to monitor results. Forest Service personnel fertilized approximately five acres of upper pasture with a phosphorous-base fertilizer. A similar fertilizer application was applied in December 1989.

Streambank Stabilization

Bank stabilization work was completed at three critical locations within the riparian enclosure (Figure 4). (See Appendix D for photographs of stabilization work.) Stabilization work will serve a "dual purpose", as it will reduce sedimentation and also provide protective cover:

Site l-88:

Site l-88 (Figure 4) required 120 yards of rock to stabilize 180 feet (linear) of streambank (completed November, 1988). Logs and woody material from an existing debris jam were anchored in place, providing additional rearing habitat and water deflecting structures (Appendix D, Photographs 3 and 4).

Figure 3. Schematic of riparian fence.

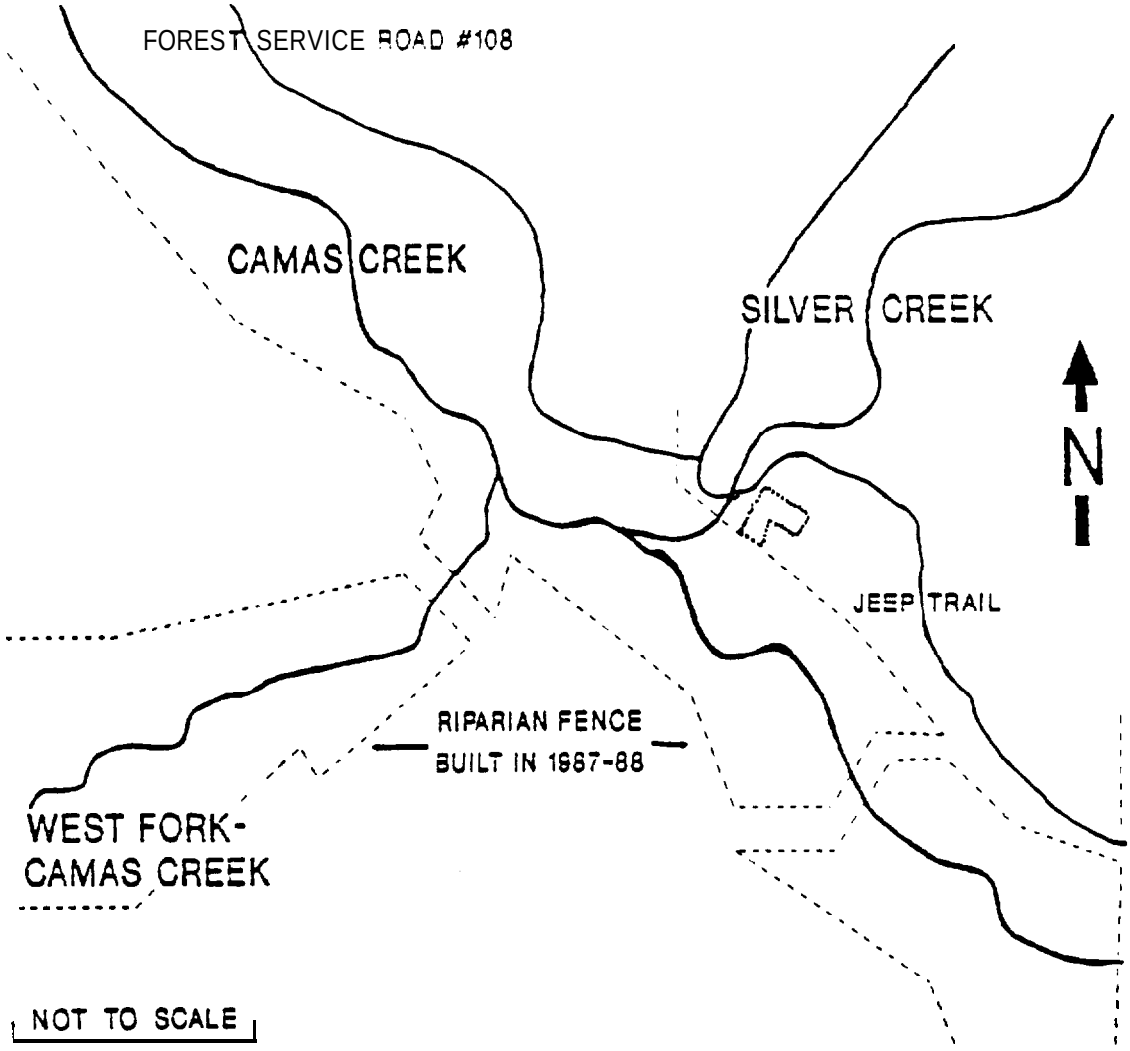


Figure 4. Upper reach of Camas Creek, Meyers Cove area with habitat improvement projects and August/September 1990 chinook salmon redd locations.

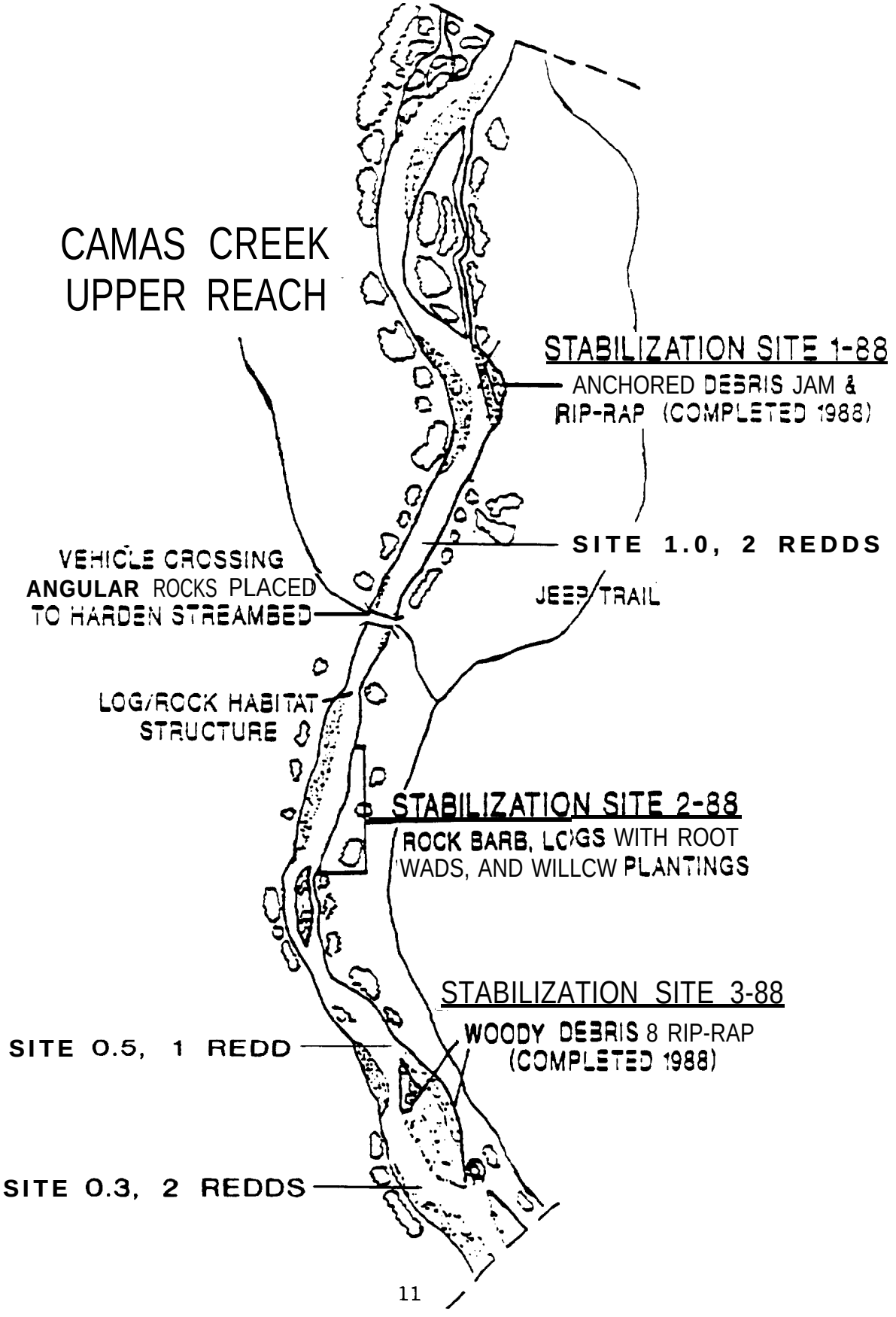


Figure 5. Middle reach of Camas Creek, Meyers Cove area with habitat improvement projects and August 1990 chinook salmon redd locations.

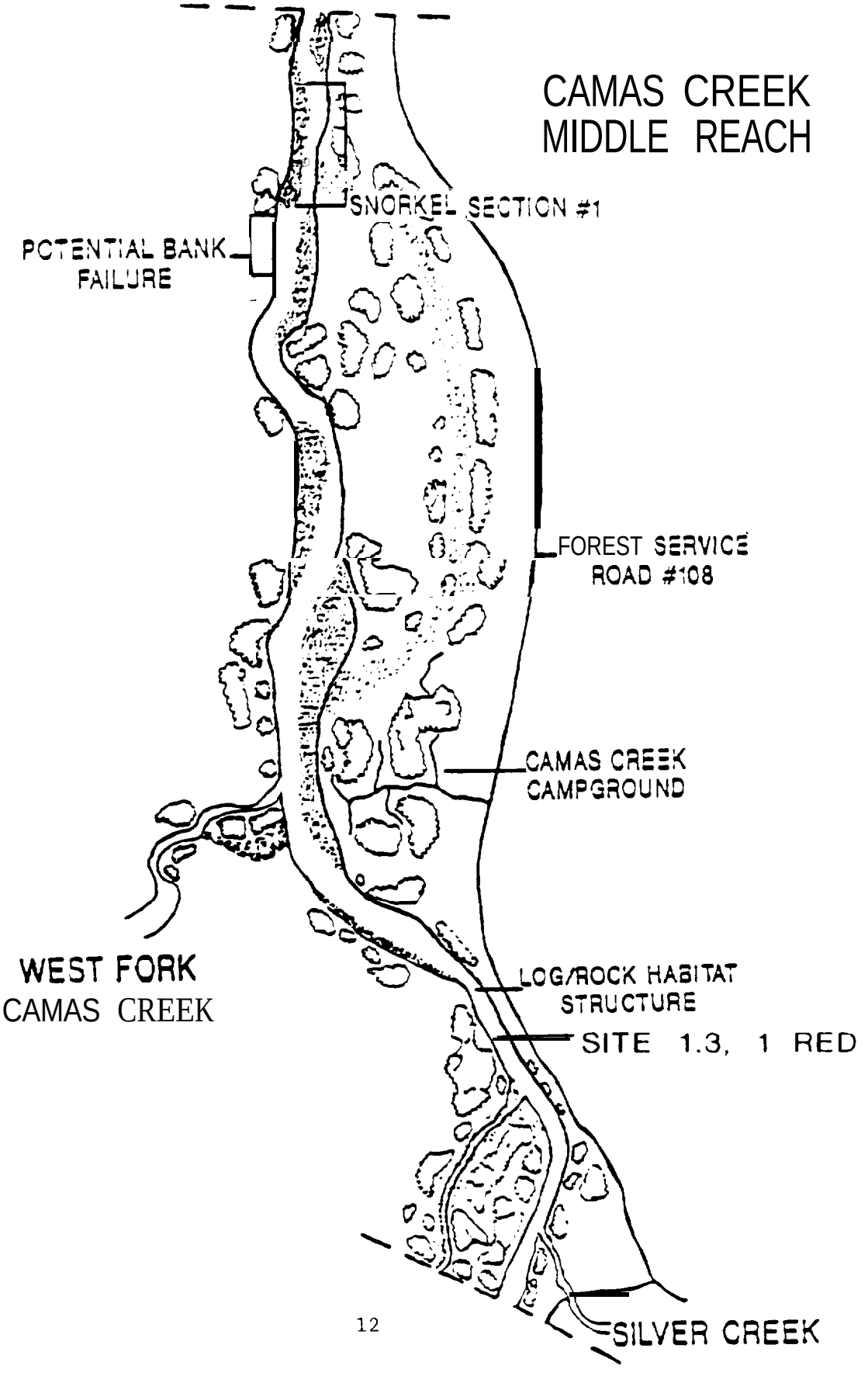
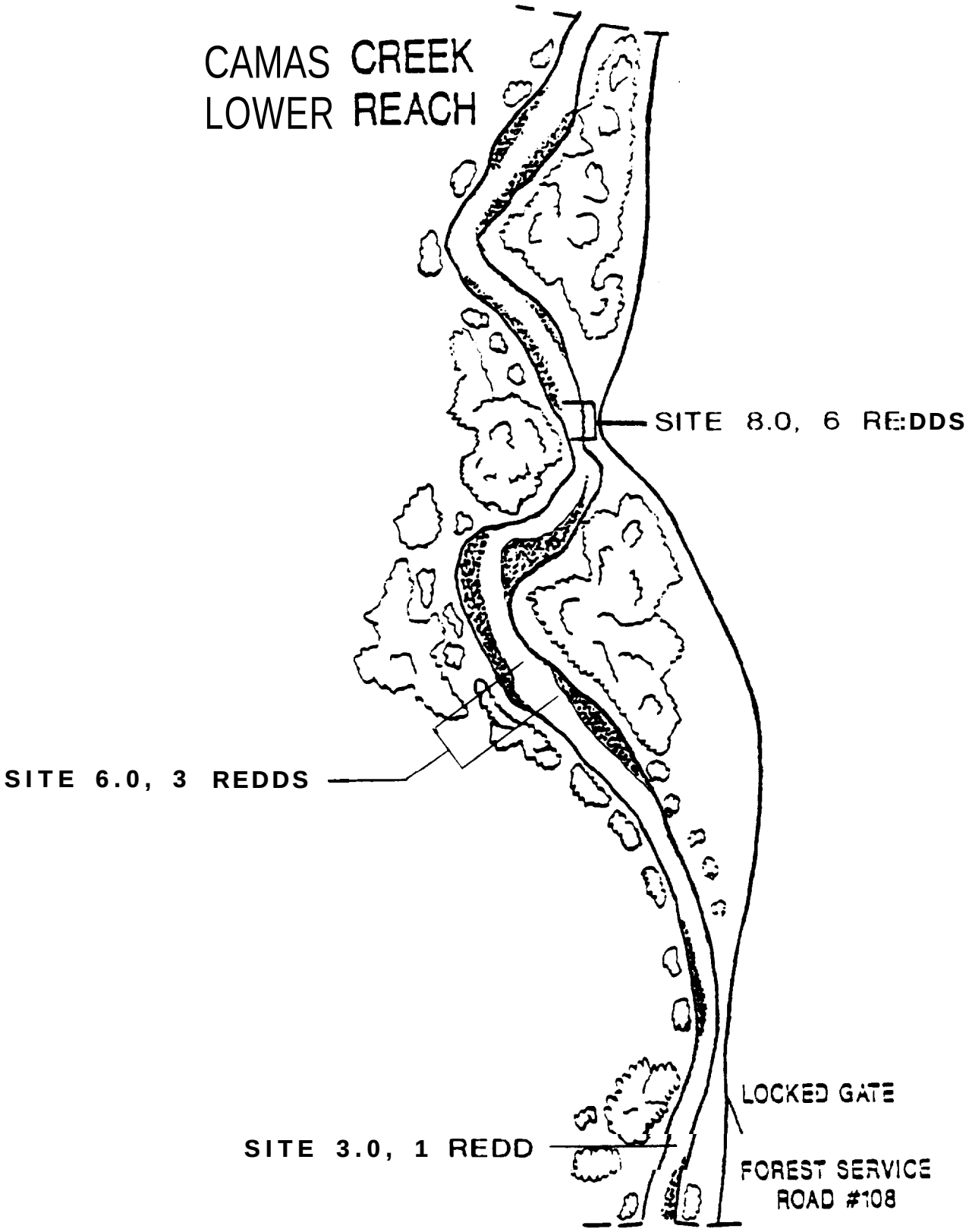


Figure 6. Lower reach of Camas Creek, Meyers Cove area with habitat improvement projects and August 1990 chinook salmon redd locations.



Site 2-88:

Work accomplished in October, 1989 at site 2-88 included bank stabilization and placing habitat structures (Figure 4; Appendix D, Photograph 5). Woody debris was anchored parallel along an eroding bank. Logs (with root wads attached) were placed to provide in-stream cover. Twenty cubic yards of rock were hauled and placed for construction of one water-deflection structure and streambank stabilization. Seven willow plugs were transplanted among the anchored woody debris. Additionally, over 40 willow cuttings were planted and the disturbed area reseeded with native grasses to accelerate revegetation (Appendix D, Photograph 6).

Site 3-88:

Work at site 3-88 was completed in 1988, and involved bank stabilization and armoring a vegetated island (Figure 4). This site is the upper end-closure of the riparian area and encompasses 120 feet of buck-and-pole fence. The bank armoring was necessary to protect this upstream section of riparian fence and cable suspended cross-fence.

Twenty cubic yards of clean, angular cobble was worked into the vehicle crossing on Camas Creek. Rounded cobbles and boulders were removed from the crossing prior to rebuilding this section. The aprons/approaches to the crossing were also armored to reduce potential sedimentation.

Habitat Diversity

Two log/rock structures were placed in Camas Creek in 1989 (Figures 4 and 5). Logs were cabled then epoxy-anchored to large boulders and placed in a location that was lacking in-stream cover.

DISCUSSION

Riparian Fencing

The fence structure defining a riparian exclosure has been in-place since November 1987. Additional fences have been constructed at water-gaps and in at least one upland area to make this exclosure cattle-tight. The Camas Creek allotment is grazed with cow/calf pairs -when small calves walk under the bottom poles of the buck-and-pole fence system they usually cannot find their way out. The cows become nervous and eventually find the weak link to the calves-the suspended fence located at the main Camas Creek crossing. This suspended fence was replaced with four-strand barbed wire fence in July of 1990.

Streambank Stabilization

Camas Creek is a very active channel. Stream channel diagrams drawn for this report do not compare to diagrams in the 1986 improvement plan or 1983 aerial photos used to prepare that plan. Stream channel movement was considerable from August 1988 to August 1989. Stabilization work was completed only at critical sites where structures were necessary to deflect the stream away from non-vegetated streambanks, or where armoring was necessary to prevent the stream channel from scouring a failing, unstable streambank. Stabilization could be accomplished at one additional site (Figure 5). This unstable site is lacking streamside woody vegetation and has a high rate of bank failure. The stream course in this reach of Camas Creek deviates annually. The benefits of encouraging natural revegetation by eliminating grazing of the riparian area, outweigh the expense and results of other enhancement alternatives, should the stream channel maintain its rate of movement.

Riparian Vegetation Regeneration

Not all enhancement activities listed in the Camas Creek (Meyers Cove) Anadromous Species Habitat Improvement Plan were implemented. The cost/benefit of reseeding the riparian area and upper pasture was not feasible. The fencing and fertilizer applications will promote natural revegetation, a preferred alternative. Woody species regeneration and riparian greenline surveys are showing a dramatic increase in the number of young cottonwood and willow species within the exclosure (Figures 7 and 8; Appendix D, Photographs 9 and 10).

In 1990, grazing within the riparian exclosure occurred in isolated areas prior to the completion of a wing fence and the water-gaps. These areas were cobble-dominated streambanks with woody vegetation community types. Riparian pasture sites were lightly impacted as a result of a few cattle being inside the exclosure for short durations of time.

Grazing Allotment Management

The Cobalt Ranger District personnel have rewritten the management plan for the Camas Creek Grazing Allotment. Guidelines for grazing utilization outside the project area have been limited to a 45% use-level of riparian vegetation. This level of use will reduce the period of use and improve vegetative vigor, allowing stressed plants to regenerate. The construction of the riparian exclosures has produced a focal point, from which all three of the grazing pastures it adjoins can be managed. This, along with an existing unit in Upper Silver Creek, has facilitated the creation of a four pasture deferred system which will allow for maximum flexibility in livestock management.

During the summer of 1990, a new partner has supported the efforts on Camas Creek Project. Jack Witworth of Witworth Ranches (the grazing permittee of the Camas Creek Allotment), became the on-the-ground livestock manger for this allotment and put forth a remarkable effort to achieve proper utilization with his cattle. He was also quite helpful in suggestion for changes in project design that would achieve project objectives, as well as livestock management needs.

Fish Habitat and Beavers

Beavers activity has been improving the quality and quantity of fish habitat, especially in the West Fork-Camas Creek and Silver Creek. Preferred beaver management is to maintain a manageable resident population as builders of instream rearing habitat and cover. Although low flows and dams might possibly be migration barriers to adult chinook salmon, the beaver ponds provide excellent areas of rearing habitat for juveniles. (Sufficient spawning gravels exist in Camas Creek drainage to support the chinook salmon, however, the amount of rearing habitat is limited.)

In addition to increasing fish habitat, beaver ponds perform sediment control for tributary containment and will accelerate natural regeneration of riparian woody vegetation. The ponds also will raise surrounding water tables, increasing water availability for riparian development in adjacent low-lying areas.

Figure 7. Cottonwood regeneration within the Meyers Cove exclosure.

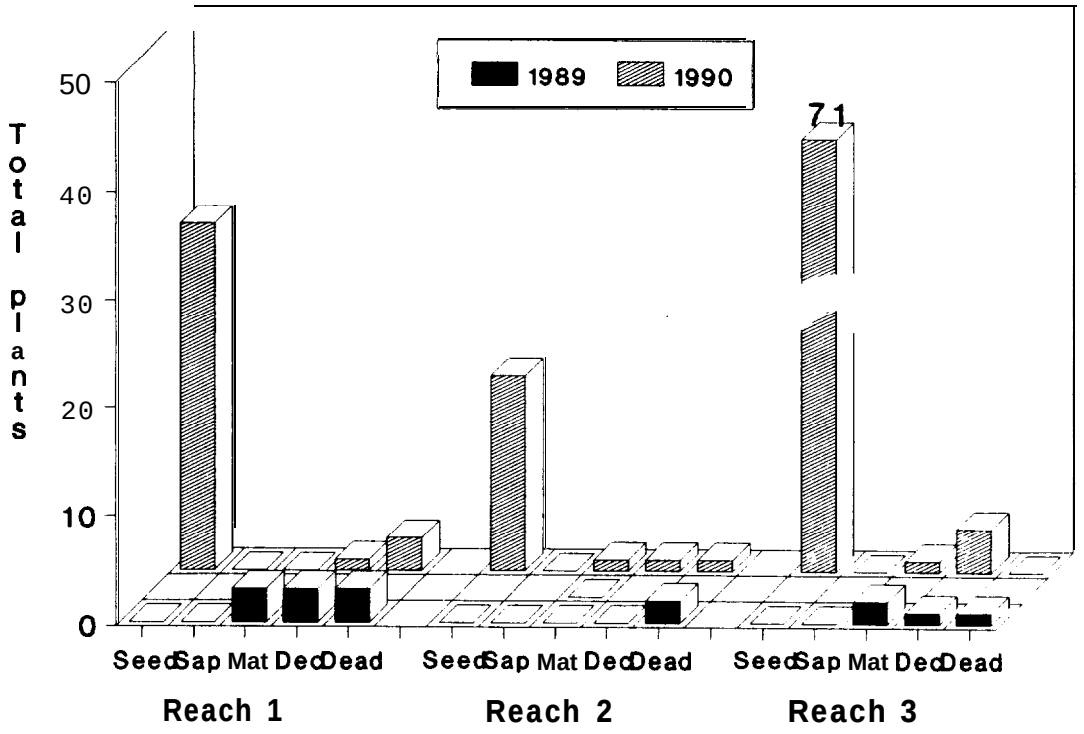
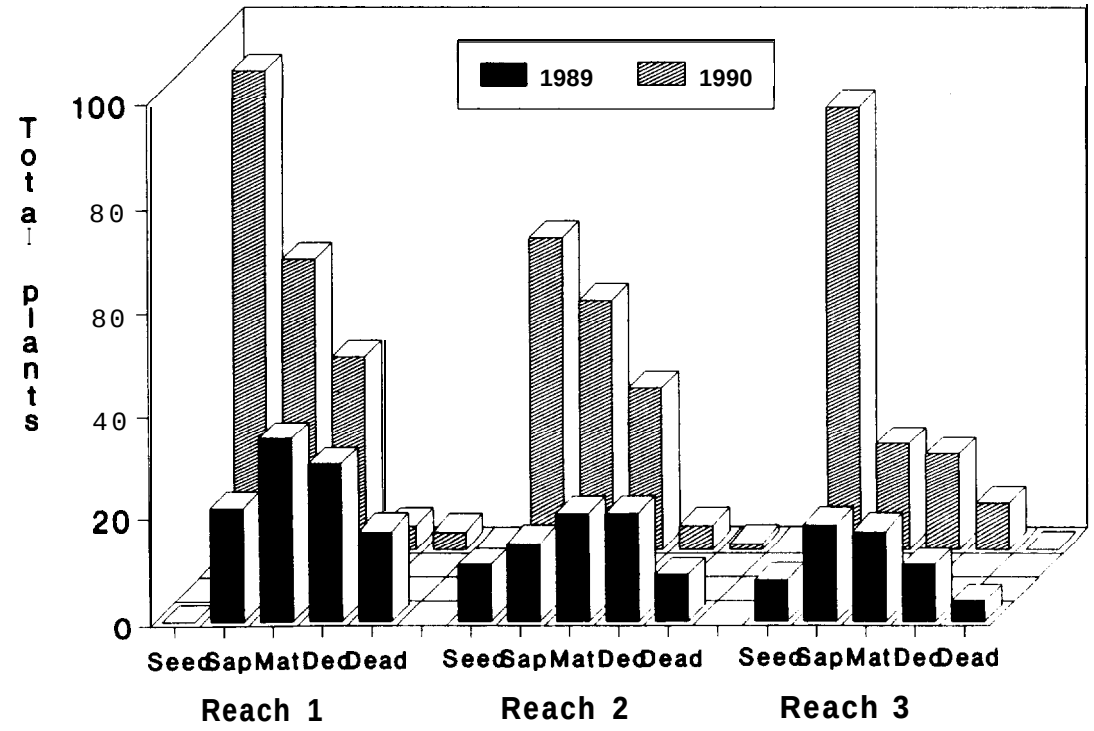


Figure 8. Willow regeneration within the Meyers Cove exclosure.



MONITORING AND EVALUATION

Monitoring was completed in accordance with the plan design for the Camas Creek Anadromous Species Habitat Enhancement Project (Appendix B). The recovery of riparian areas is progressing slowly (as mentioned in Discussion-Riparian Vegetation Regeneration). Photographs, taken in 1990, show the current status of riparian vegetation. Before and after photographs were taken of work completed at bank stabilization sites (Appendix D, Photographs 3,4,5,6). The photographs included in this report identify streambank instability sites and provide a general overview of the project area and work accomplished. Now that construction work is complete, permanent photopoints should be established to monitoring revegetation and response to treatments (Appendix D, Photographs 7 and 8).

Redd Counts

On-the-ground chinook salmon redds and adult populations were counted as outlined in the monitoring plan. In 1990 a total of 22 live adult salmon were observed on 16 redds at 7 sites in the two-mile project reach (Table 2 and Figures 4,5,6). This count was approximately 76% of the redds identified in 1989 (Figure 9). The overall data was consistent with Idaho Fish and Game estimates of declining chinook salmon escapements thoughout the Salmon River drainage.

Annual chinook salmon redd (aerial) counts have been completed by the Idaho Department of Fish and Game since 1960 (Figure 10). The present flight pattern covers Camas Creek from Hammer Creek upstream to Castle Creek. Redd counts prior to 1960 began at the mouth of Duck Creek and continued up Camas Creek to the Furnace and White Goat tributaries.

Habitat Inventories

Portions of the intensive habitat evaluation conducted through Meyers Cove in 1989 were repeated in September 1990. The riparian regeneration and green line surveys indicate a dramatic increase in the numbers of seedling and sapling willows and cottonwoods species (Figures 7 and 8). In 1990, seedlings and saplings increased 660.3% over 1989. These young plants need several more years before they can provide the shade, cover and bank stabilization needed to improve rearing and spawning habitat within Meyers Cove.

An intensive habitat evaluation of Silver Creek also was completed in September 1990. The data was summarized and indicates less than optimum conditions. Spawning gravels are very limited in quality and quantity. A large beaver complex provides the majority of rearing habitat for juvenile salmonids, but navigation around and through this area by adults can only be achieved during periods of high water. A summary of stream inventory data is included as Appendix C.

Population Densities

Juvenile population densities for age 0+ chinook, age l+ steelhead, and ages l+ & 2+ steelhead have been collected by the Idaho Department of Fish and Game and are described in Table 3 and Figure 11. The density values listed are

Table 2. Weekly chinook salmon redd counts in Camas Creek (Meyers Cove), August 1990. These on-the-ground counts were completed once per week for three weeks. Values listed are cumulative to identify changes over the three week period. 1/

DATE	8/13/90		8/21/90		8/28/90 2/	
REDDS/STAGE	INCOMPLETE/COMPLETE		INCOMPLETE/COMPLETE		INCOMPLETE/COMPLETE	
SITE						
0.3				2		2
0.5					1	1
1.0				2		2
1.3				1		1
3.0						1
4.0						
5.0						
6.0					2	3
7.0						
8.0				2		6
9.0						
TOTALS	0	0	0	7	3	16
CHANGE			0	+7	+3	+9

11 Counts conducted by Borum, Smith and Hill.

2/ Upper reach data (sites 0.3 · 1.0) is from re-survey on 9/04/90 due to an incomplete count for that reach on 8/28/90.

Figure 9. Comparison of completed chinook salmon redd counts in Meyers Cove reach of Camas Creek between 1988, 1989 and 1990.

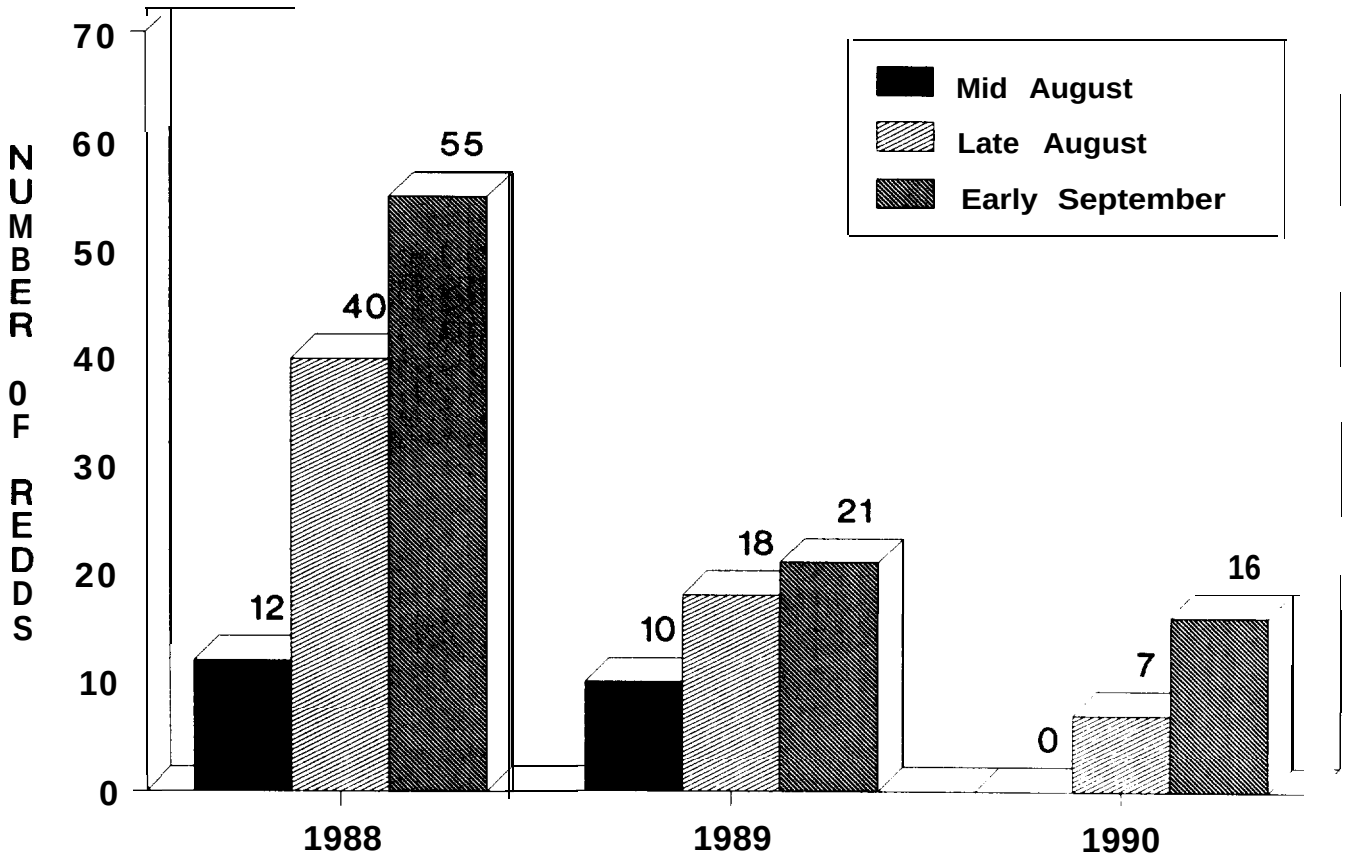


Figure 10. Annual chinook salmon redd counts in Camas Creek for the period 1960 to 1990. These numbers were obtained from the Idaho Department of Fish and Game (IDFG) and are aerial counts in the Camas Creek reach from Castle Creek to Hammer Creek.

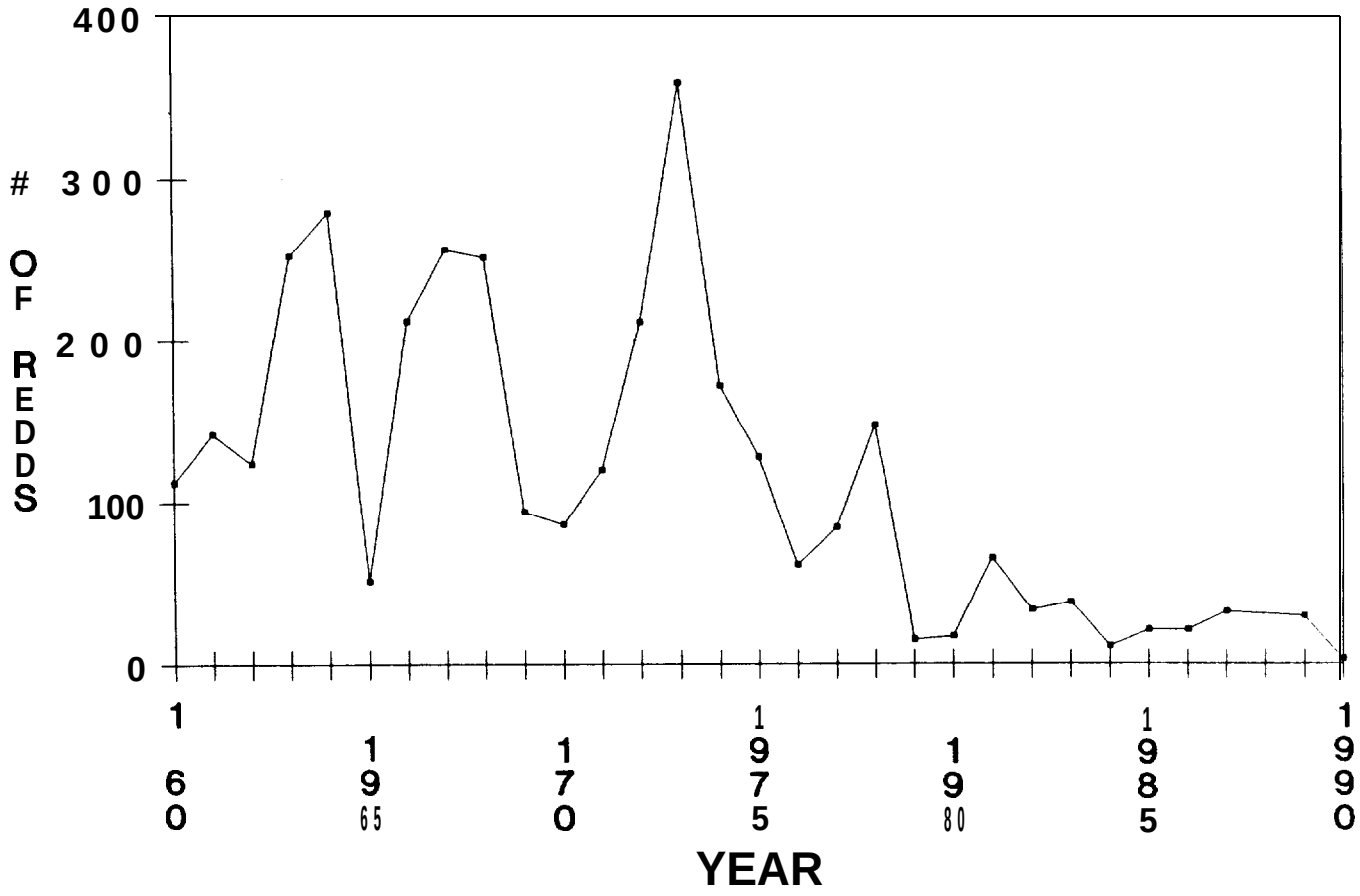


Table 3. Juvenile densities of chinook salmon and steelhead trout in the Meyers Cove reach of Camas Creek from 1984 to 1990. 1/

DATE SNORKELED	SECTION 2/	CHIN 0+ ($100M^2$) 3/	STHD 1+ ($100M^2$) 4/	STHD 1-2+ ($100M^2$) 5/
08/16/84	1	0.79	0.21	0.84
	2	1.27	1.35	1.61
08/28/85	1	3.01	1.65	1.95
	2	3.61	0.89	0.89
08/28/86	1	10.00	4.34	4.67
	2	5.25	0.43	0.43
1987	NO DATA	--	--	--
08/25/88	2	2.13	0.69	0.69
08/23/89	1	4.15	0.68	0.68
	2	0.42	0.00	0.07
08/14/90	1	2.15	0.55	0.58
	2	11.07	0.33	0.33

ANNUAL AVERAGES OF
SNORKEL SECTIONS 1 AND 2

YEAR	CHIN 0+	STHD 1+	STHD 1-2+
1984	1.03	0.78	1.23
1985	3.31	1.27	1.42
1986	7.62	2.38	2.55
1987	0.00	0.00	0.00 6/
1988	2.13	0.69	0.69 7/
1989	2.29	0.34	0.38
1990	6.61	0.44	0.46

1/ Data was included in personal letter received from Idaho Department of Fish and Game, Fishery Research Laboratory, Eagle, ID.

2/ Section 1 is near locked gate on Forest Service Road #108. Section 2 is at the trail head sign, 1 mile downstream from the locked gate. Both sections are "C" type channels and data will be directly related to adult escapement, embyo survival, and fry emergence.

3/ CHIN 0+ = age 0+ chinook salmon juveniles.

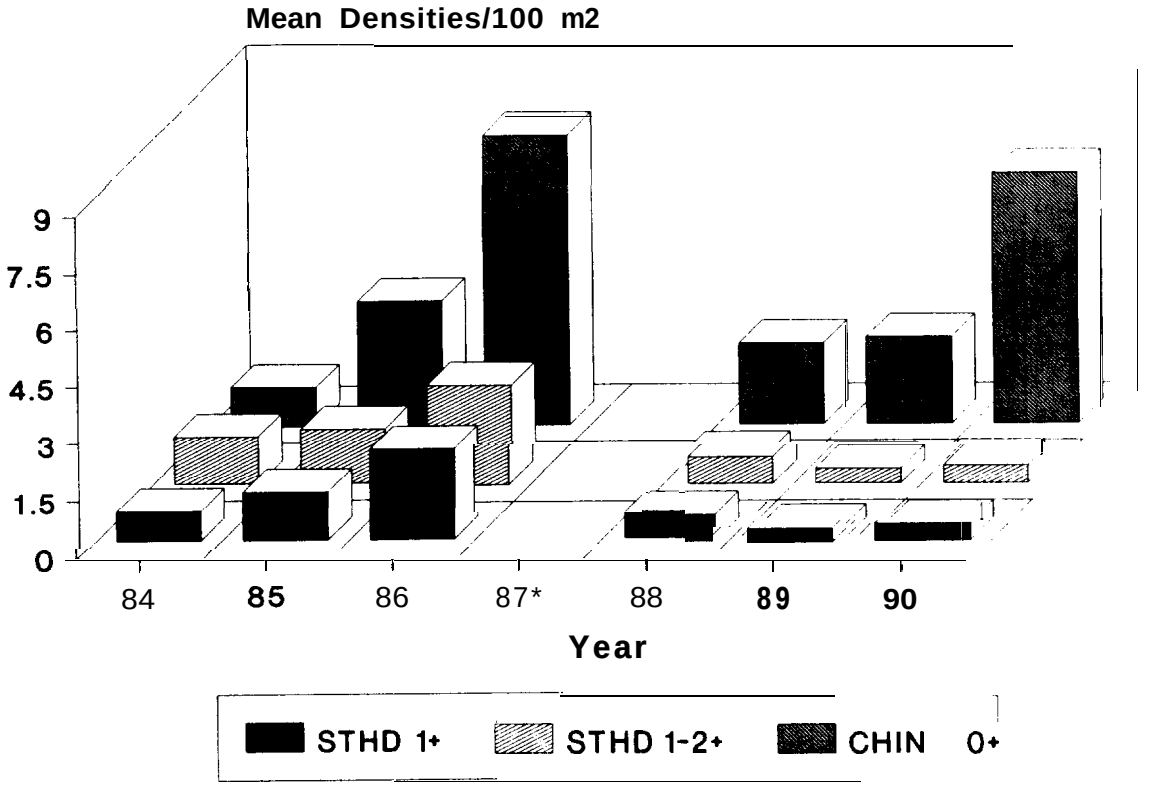
4/ STHD 1+ = age 1+ steelhead trout juveniles.

5/ STHD 1-2+ = ages 1+ and 2+ steelhead trout juveniles.

6/ Survey crew arrived too late in 1987 and parr had moved out of summer habitat.

7/ Section 1 was ommitted in 1988 snorkeling schedule.

Figure 11. Chinook salmon and steelhead parr densities in Camas Creek (Meyers Cove) from 1984-1990.



• **No density data available**

Table 4. Juvenile densities of chinook salmon and steelhead **trout in the** Meyers Cove reach of Camas **Creek and West Fork of** Camas Creek 1990.1/

STREAM	SITE	N	CHIN 0+ (100M^2)	STHD 1+ (100M^2)	STHD 1-2+ (100M^2)
Camas Creek	Below exclosure	4	0.60	1.68	1.94
Camas Creek	Within exclosure	8	0.39	1.42	1.58
Camas Creek	Above exclosure	4	0.38	0.39	0.51
WFk Camas Cr.	Below crossing	4	0.00	5.31	6.08
WFk Camas Cr.	Above crossing	4	0.02	3.68	4.23

1/ Data was included in personal letter received from Idaho Department of Fish and Game, Fishery Research Laboratory, Eagle, ID.
2/ CHIN 0+ = age 0+ chinook salmon juveniles.
3/ STHD l+ - age 1+ steelhead trout juveniles.
4/ STHD l-2+ - age 1+ and 2+ steelhead trout juveniles.

significantly lower than the standards used to calculate smolt production potentials in Table 1 and can be the result of unfortunate scheduling. Camas Creek is snorkeled in mid August prior to the late-summer storms which precipitate the downstream migration of parr. Snorkeling too late in the year often results in low or zero parr densities. Snorkel Section 1 is located within the exclosure (Figure 5), and Section 2 is located just downstream outside the exclosure. Juvenile densities collected from these sites are directly related to chinook adult escapement, embryo survival, and fry emergence.

In a further attempt to enumerate juvenile chinook and steelhead parr before their late August outmigration, Idaho Department of Fish and Game personnel snorkeled new sections of the Meyers Cove area in mid July 1990. Snorkel sites were established approximately every 500 meters. Four sites were snorkeled below the exclosure, eight sites within the exclosure, and four sites above the exclosure. In addition, IDFG snorkeled four sites below and four sites above the ford crossing on West Fork of Camas Creek. The mean densities for juvenile chinook and steelhead at these new sites are listed in Table 4.

In order to fully document the project benefits, these new snorkel sites should be repeated annually. As habitat conditions change within the exclosure, IDFG should document changes in juvenile densities as well.

MAINTENANCE

Maintenance and design changes on the fence was heavy in 1990. The following work was completed: The cable suspended fences for the Camas Creek and West Fork-Camas Creek crossing corridor were replaced with four-strand barbed-wire "swing" fences. Reconstruction and repair of 14 breaks in the barbed wire exclosure. Reconstructed 25 feet of buck-and-pole fence. Installed an interpretive sign. Repaired the upper West Fork stream crossing exclosure fence. Reconstructed the upper Camas stream crossing exclosure fence. Constructed 450 feet of four-strand barbed wire fence to complete the exclosure on upper Camas creek. Additional maintenance included tear-down of 280 feet of old non-functional barbed-wire fence, within the riparian area. Most of this work was not completed until mid-July, and it is doubtful that the exclosures were functional until this time.

WORK REMAINING

Major construction work planned for the Camas Creek Anadromous Species Habitat Improvement Project is now complete. A Cobalt District employee should have the monitoring and maintenance of the fence and instream structures as a major part of their responsibilities. Remaining monitoring and maintenance tasks are:

- Continue to include Witworth Ranches as a partner in the success of the project. Include Witworth Ranches in annual coordination meeting and encourage participation in other meetings and tours that concern the project.

- Continue removal of old non-fuctional riparian fences.

- Establish permanent photopoints to monitor revegetation of the riparian area. Photographs already on file can be used for the baseline

photographs and will assist in determining the location of the photopoints.

- Continue monitoring riparian vegetation respnse and conducting the spring chinook redd counts in late August to early September. Conduct visual observations to document steelhead trout spawning in Camas Creek, Silver Creek, and West Fork-Camas Creek from late April to early June.

- Prepare a five year maintenance plan for: monitoring riparian revegetation, fertilizer applications, fence repair, and fish response to habitat improvements.

- Along with coordinating agencies, develop a beaver management plan to maintain population levels for achieving desired conditions of rearing habitat and riparian vegetation.

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APPENDIX

APPENDIX A: Budget Summary

Table 5. Budget summary for Camas Creek (Meyers Cove) Anadromous Species Habitat Improvement Project, Fiscal Years 1989 and 1990.

Revised Agreement Amount	$97,474.00
Net Amount Paid As of End of FY88	$32,582.86
Balance Unliquidated As of Start of N89	$64,891.14

Fiscal Year 1989	Oct - Dec 1st QTR	Jan - Mar 2nd QTR	Apr - Jun 3rd QTR	Jul - Sep 4th QTR	Total
Personnel	12,108.93	2,948.44	4,000.27	6,810.80	25,868.44
Travel	841.10	1,647.93	1,951.65	1,770.87	6,211.55
Expendable Equip	160.45	47.88	1,225.70	1,659.94	3,093.97
General Services	34.68	7.59	28.56	536.30	607.13
G&A 12.9%					
Total	$13,145.16	$4,651.84	$7,206.18	$10,777.91	$35,781.09
Declining Balance	$64,891.14	$51,745.98	$47,094.14	$39,887.96	$29,110.05	$29,110.05

Net Amount Paid As of End of N89	$68,363.95
Balance Unliquidated As of Start of FY90	$29,110.05

Fiscal Year 1990	Oct - Dec 1st QTR	Jan - Mar 2nd QTR	Apr - Jun 3rd QTR	Jul - Sep 4th QTR	Total
Personnel	5,116.71	$183.40			5,300.11
Travel	81.84				81.84
Expendable Equip		1,413.30	27.70		1,441.00
General Services		185.40			185.40
G&A 12.9%	670.61	229.89	3.57		904.08
Total	$5,869.16	$2,011.99	$31.27	$0.00	$7,912.43
Declining Balance	$29,110.05	$23,240.89	$21,228.90	$21,197.62	$21,197.62	$21,197.62

APPENDIX B: Monitoring Plan

MONITORING PLAN
CAMAS CREEK ANADROMOUS SPECIES IMPROVEMENT PROJECT

The monitoring program consists of periodic visual inspections of the project area, maintaining established photopoints, monitoring chinook salmon and steelhead trout spawning, and an annual comprehensive habitat inventory. This program is designed to ensure that habitat enhancements identified for Camas Creek and Meyers Cove are accomplished and result in attaining the goal of increasing the quantity of migrating spring and summer chinook salmon and summer steelhead trout.

VISUAL INSPECTIONS

Observations of project structures:

- in-stream structures should be viewed during and after high water to determine maintenance needs
- annual pre-season inspection of riparian fences and, if necessary, repairs
- weekly inspection of riparian exclosure for trespass cattle

PHOTOPOINTS

Monitor response, over time, of:

- revegetation of riparian area, effects of fencing, fertilizing, and non-grazing
- streambank stabilization structures, photographs should be taken during and after high water

REDD COUNTS

"On-the-ground" count and map chinook salmon redds, once per week for a minimum of three weeks, in the two-mile reach of the Camas Creek-BPA Project. Begin counts the third week of August and continue through the first week of September. Staggering counts over a three-week period will show changes over time in numbers of redds, pinpoint peak spawning activity, and identify multiple redds. Count and map redds beginning at upstream vehicle crossing and continue downstream to swinging fence/wire gate below the locked gate. Note sex, plus live and dead spawners. Collect mortality statistics for Idaho Department of Fish and Game: measure total length (TL), fork length (FL), and hypural length (HL); and scrape scales for age determination.

Most often steelhead redd counts in Camas Creek are not feasible due to turbidities during spring runoff. Visual ground counts of adult steelhead and redds can be successful in West Fork-Camas Creek and Silver Creek. Populations and spawning activities should be monitored and numbers recorded for documenting in reports.

HABITAT INVENTORIES

This extensive inventory will collect data on existing or potential habitat for use by steelhead trout and chinook salmon. The data collection will be consistent with other Bonneville Power Administration funded anadromous fish habitat surveys being completed on National Forest System Lands in Region 4. Physical habitat monitoring will be coordinated with Project 83-7, Idaho Department of Fish and Game who conducts fish population monitoring. The inventory data and population densities are formulated to produce smolt estimates listed in Table 1, Camas Creek Anadromous Species Habitat Improvement Project, 1990 Annual Report.

APPENDIX C: Silver Creek Inventory Summary

Silver Creek Summary Data

Silver Creek

Summary Table

Length	(m)	Width	(m)	Area	(m^2)	Miscellaneous	
Riffle	604.7	Riffle	4.0	Riffle	2414.8	Avg depth (m)	0.33
Pool	272.6	Pool	3.9	Pool	1067.9	Avg pool quality	3.7
Glide	1155.9	Glide	3.5	Glide	4050.4	R:P ratio	32:68
PW	0.0	PW	0.0	PW	0.0	Avg velocity (m/s)	0.19
BW	492.4	BW	20.8	BW	10221.6	Spawning area (m2)	15.0
Total	2525.6	Total	7.0	Total	17754.6	% Surface fines	73.2
SC	395.8	SC	0.9	SC	371.3		

Reach 1

Length	(m)	Width	(m)	Area	(m^2)	Miscellaneous	
Riffle	54.7	Riffle	4.7	Riffle	258.7	Avg depth (m)	0.18
Pool	0.0	Pool	0.0	Pool	0.0	Avg pool quality	0.0
Glide	8.7	Glide	4.6	Glide	40.3	R:P ratio	87:13
PW	0.0	PW	0.0	PW	0.0	Avg velocity (m/s)	0.48
BW	0.0	BW	0.0	BW	0.0	Spawning area (m2)	0.0
Total	63.4	Total	4.7	Total	299.0	% Surface fines	32.0
SC	0.0	SC	0.0	SC	0.0		

Reach 2

Length	(m)	Width	(m)	Area	(m^2)	Miscellaneous	
Riffle	90.1	Riffle	3.9	Riffle	349.5	Avg depth (m)	0.21
Pool	63.8	Pool	4.0	Pool	257.8	Avg pool quality	3.3
Glide	500.8	Glide	4.0	Glide	1983.7	R:P ratio	13:87
PW	0.0	PW	0.0	PW	0.0	Avg velocity (m/s)	0.31
BW	0.0	BW	0.0	BW	0.0	Spawning area (m2)	15.0
Total	654.7	Total	4.0	Total	2591.0	% Surface fines	40.6
SC	76.0	SC	1.2	SC	94.3		

Reach 3

Length	(m)	Width	(m)	Area	(m^2)	Miscellaneous	
Riffle	459.9	Riffle	3.9	Riffle	1806.6	Avg depth (m)	0.35
Pool	208.8	Pool	3.9	Pool	810.2	Avg pool quality	3.9
Glide	646.4	Glide	3.1	Glide	2026.4	R:P ratio	39:61
PW	0.0	PW	0.0	PW	0.0	Avg velocity (m/s)	0.16
BW	492.4	BW	20.8	BW	10221.6	Spawning area (m2)	0.0
Total	1807.5	Total	8.2	Total	14864.6	% Surface fines	79.7
SC	319.8	SC	0.9	SC	277.0		

Silver Creek Summary

It seems as if this stream, as a whole, lacks spawning gravel quality and quantity. The high levels of surface fines can be in part due to the cattle grazing along Silver Creek. A series of large beaver dams collect the majority of suspended fines, but the low gradient and slow velocities associated with this stream seem to be unable to completely flush the system. There is very little quality spawning habitat below these beaver dams. Navigation around or thru the dam complex would be possible only at high stream flows. Steelhead may be able to pass the dams; however, the number of dams, the shallow jump pools and the large amounts of woody debris all combine to create a barrier which prevents passage of spring chinook salmon. Rearing habitat is very limited outside the beaver complex itself. The large backwater pools behind the beaver dams provide excellent instream cover and rearing habitat for juvenile fish.

Reach 1

Very short reach, mostly riffle and not much for rearing or spawning. Substrate OK though.

Reach 2

This reach starts out with good cover along the banks, but that changes quickly. The majority of this reach is extremely overgrazed. Banks are failing everywhere, very little streamside cover and surface fines are starting to increase. A small pocket of measurable spawning habitat exists spell Reach ends at the start of the massive beaver complex.

Reach 3

This reach begins at a major barrier to spring chinook salmon. Steelhead can probably pass provided the spring runoff is normal or better. Deep backwaters, vast quantities of aquatic vegetation and submerged willows all provide excellent habitat for rearing juveniles. Several juvenile trout were noted. Not much in the form of spawning habitat exists here. A quick reconnaissance of habitat type composition was made further upstream and it appears that spawning gravels are limited there as well.

APPENDIX D: Photographs

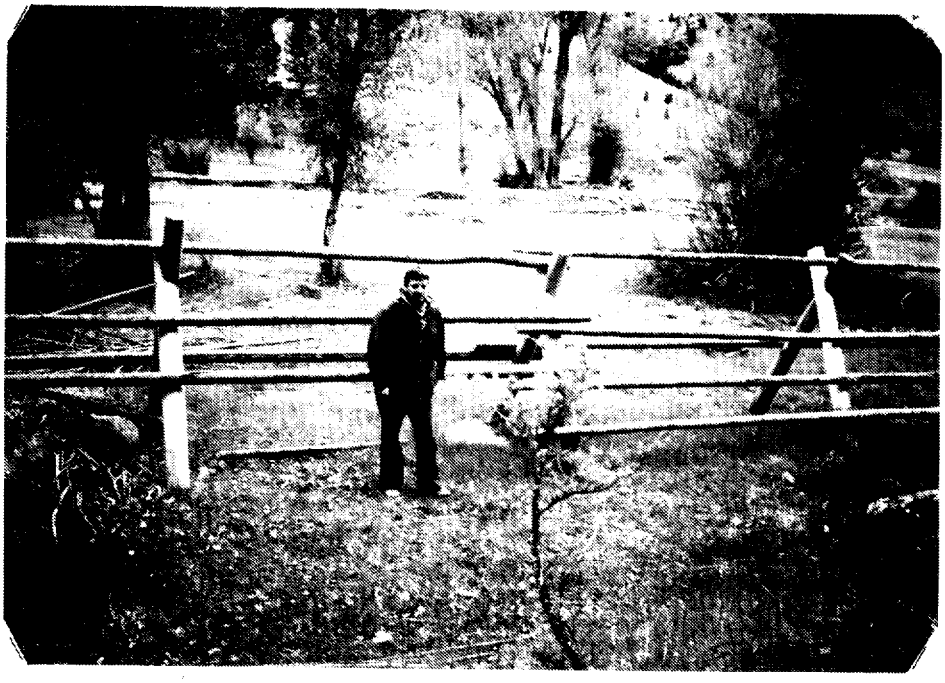

Photo 1: Upper **Camas** Riparian Exclosure (June 1988) just after completion of fence.

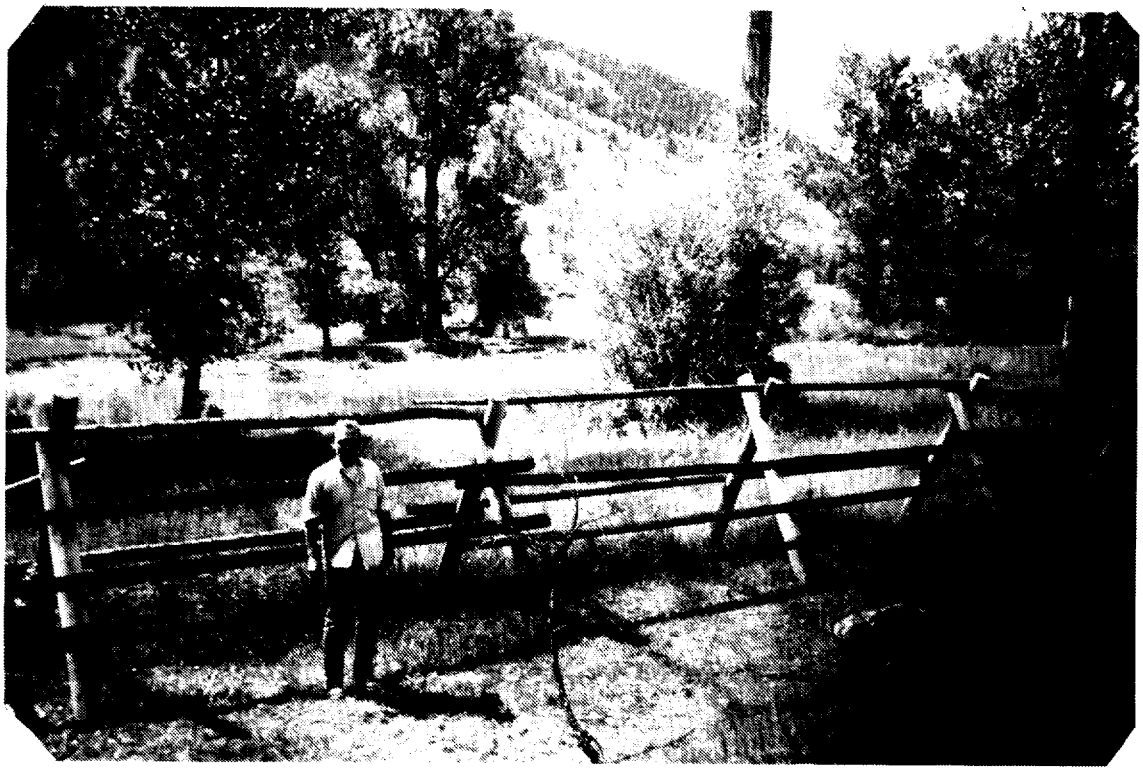

Photo 2: Upper Camas Riparian Exclosure (June 1990) note increased vigor of Woody Riparian and Herbaceous vegetation.

Photo 3: Watershed Stabilization Site 1 (May 1988) just after rock was placed to armor stream bank.

Photo 4: Watershed Stabilization Site 1 (October 1990) Note willow recruitment and increase in herbaceous vegetation.

Photo 5: Watershed Stabilization Site 2 (November 1989) Prior to placement of logs at streams edge.

Photo 6: Watershed Stabilization Site 2 (October 1990) 11 months after treatment. Note stabilization of bank with grasses and willow recruitment.

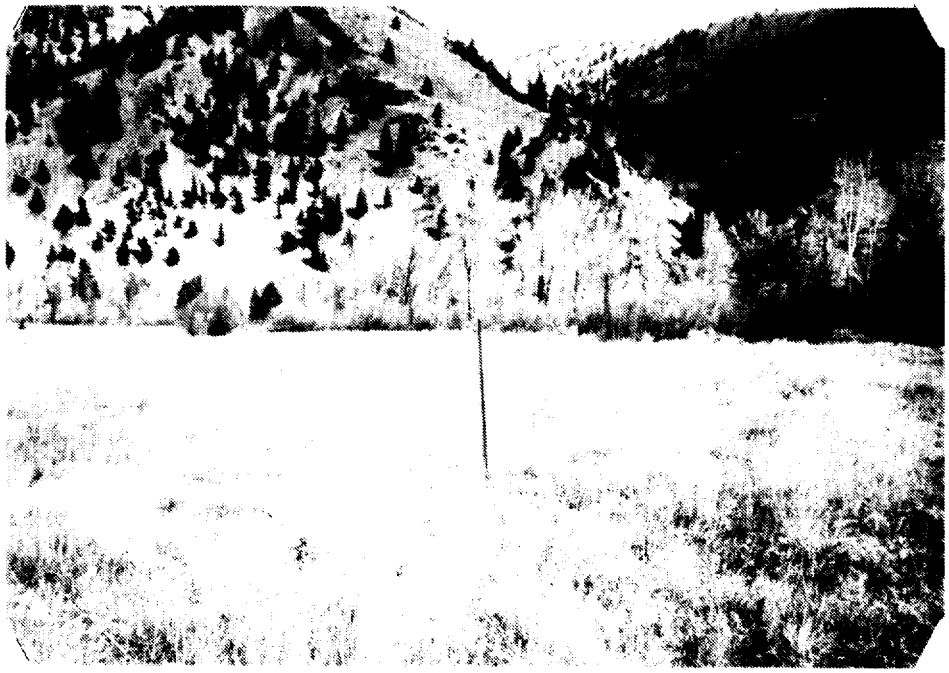

Photo 7: Herbaceous Photo Point No. 1 · West Fork
Established October 1990 to monitor herbaceous vegetation.

Photo 8: Herbaceous Photo Point No. 2 · Camas Creek
Established October 1990 to monitor herbaceous vegetation.

Photo 9: Cottonwood Regeneration West Fork (September 199$_{0}$). Note vigor of young cottonwoods.

Photo 10: Cottonwood Regeneration along West Fork (September 1990). Note young cottonwoods next to stream.