

# **Ah Pah Creek Fish Passage and Habitat Improvement Project**

## **Final Report**

### **Funding Organization:**

**U.S. Fish and Wildlife Service, Klamath River FWO  
USFWS Agreement #: 14-48-11333-8-J113**

**Terms of Agreement: July 1, 1998 through September 1, 1999**

### **Cooperating Organization:**

**California Conservation Corps, Klamath Service District**

### **Written By:**

**Scott Bauer, Fish Habitat Assistant**

**Ah Pah Creek Fish Passage and Habitat Improvement Project**  
**USFWS Agreement #14-48-11333-8-J113**  
**Project #98-HR-07**

**Abstract**

The California Conservation Corps (CCC), Klamath Service District was funded in July 1998 by the Klamath River Basin Conservation Area Restoration Program to implement instream enhancement and fish passage measures on Ah Pah Creek, a small tributary to the lower Klamath River. The Ah Pah Creek Fish Passage and Habitat Improvement Project was a cooperative effort undertaken by the CCC, California Department of Fish and Game (DFG), and U.S. Fish and Wildlife Service (USFWS). Restoration efforts took place on lands owned and operated by the Simpson Timber Company. Intensive land use practices, interstate highway road construction, flood events, and stream clearance projects had left much of Ah Pah Creek nearly devoid of instream fish habitat. This restoration project, as well as past projects on this creek, was implemented in order to improve spawning and rearing habitat for depressed populations of salmon and steelhead.

Restoration efforts on Ah Pah Creek were implemented by CCC crews using hand labor and power tools. A crew of up to fifteen young men and women logged a total of 3,200 hours on the stream. In the end, eight log cover structures were constructed or enhanced, four boulder structures were placed instream, and two large woody debris accumulations were modified. Approximately 2.5 miles of Ah Pah Creek were enhanced by this project. The restoration of Ah Pah Creek has directly benefitted Coho and Chinook salmon, Steelhead, and Coastal Cutthroat Trout.

**Introduction**

Both human and natural disturbances have had a tremendous impact on anadromous fish populations along the Klamath River. Human influence on the natural environment has been significant. Logging, road building, grazing, irrigation, fishing, and many other activities have had detrimental effects on fish and their habitat. Massive floods in 1955, 1964, and 1997 further harmed already beleaguered stocks of salmon and steelhead by wiping out riparian vegetation, mobilizing unstable hillslopes, and burying pools and spawning areas under layers of silt. Native fish populations, an important food resource for people and wildlife, have been greatly diminished. With the extinction of many local populations of fish so close at hand, efforts to restore their habitat began in earnest.

The economic, social, and political importance of recovering and maintaining healthy salmon and steelhead populations brought together a diversity of groups to take on the effort. Federal and state agencies involved in the effort include the U.S. Fish and Wildlife Service, U.S. Forest Service, California Conservation Corps, California Department of Fish and Game, and the

Wildlife Conservation Board. The Yurok Tribe, private landowners and nonprofit groups have also been instrumental in this recovery mission. Although these groups often act independently of one another, cooperative efforts have brought about the most success during restoration efforts.

Since the late 1980's the CCC, in cooperation with DFG and Simpson Timber Company, have performed restoration and enhancement work in the Ah Pah Creek watershed. Restoration activities included instream structure placement, barrier modifications, riparian plantings, and stream channel modifications. While much has been done to improve habitat for anadromous fish, some reaches of the creek were still found in need of instream enhancement measures. Considering that populations of salmon and steelhead have yet to rebound from dangerously low levels, it was deemed important to continue restoration efforts on this lower Klamath tributary.

In 1997, the California Conservation Corps, Klamath Service District, submitted a proposal to the USFWS for the Ah Pah Creek Fish Passage and Habitat Improvement Project. The goals of the project were to improve fish spawning and rearing habitat by enhancing instream cover, and restoring fish passage to more than a mile of habitat. The original proposal called for the repair and reconstruction of three Hewitt Ramp fish passage structures, removal of a log and boulder weir, stabilization of a failing stream bank, construction of three multiple log structures, and placement of three boulder clusters. Before actually receiving funding from USFWS, a grant from the Federal Emergency Management Agency (FEMA) allowed the CCC to repair and reconstruct the Hewitt Ramp structures and the failing streambank. These two enhancement measures were of immediate concern due to a lack of fish passage at the sites.

To offset these completed enhancement measures and allow for the maximum benefit of the USFWS grant funds to be obtained, a restoration plan modification was submitted. With the blessing of the USFWS Yreka office, the grant was kept intact with provisions to modify the project to include two barrier modifications, one boulder deflector, three single digger log structures, one additional multiple log structure, and maintenance of a log wing deflector. These enhancement measures were deemed to provide excellent benefits comparable to those initially proposed. Approximately 1.5 miles of stream were proposed for restoration. The proposal was approved for funding in fiscal year 1998. The following report summarizes the outcomes and achievements of this project.

### **Description of Project Area**

Ah Pah Creek is a third order tributary of the lower Klamath River. Located southeast of Klamath, California in Humboldt County, this creek enters the Klamath approximately seventeen river miles from the Pacific Ocean. The Ah Pah Creek watershed encompasses 26 square miles of forested terrain. The watershed is predominately owned by Simpson Timber Company and has been logged extensively beginning in the early 1960's. The watershed has successive age classes of first and second growth redwood and Douglas fir forest with red alder, willow, California Bay laurel, and big leaf maple in the riparian corridor. Ah Pah Creek supports habitat for Chinook and Coho Salmon, Steelhead and Coastal Cutthroat Trout. Mainstem Ah Pah Creek

remains wetted year around above the confluence with the south fork of Ah Pah Creek.

The Ah Pah Creek Fish Passage and Habitat Improvement Project begins 175 feet from the mainstem's confluence with the South Fork, and ends approximately 13,000 feet upstream (see map). The project reach lies entirely within the anadromous portion of the creek. Instream habitat conditions are fair to poor throughout Ah Pah Creek. Most of the stream is shallow and wide due to excessive sedimentation. Pool depths average one to two feet, and channel width averages roughly twenty feet. Besides the lack of deep pools, adequate rearing cover is next to nonexistent. Large woody debris is conspicuously absent from the system, except for instream structures placed by CCC crews in the late 1980's and early 90's.

Excessive sedimentation is another problem effecting Ah Pah Creek fish habitat. Road and landslide related sediment has filled in pools and tailouts with gravel and sand, reduced spawning success rates, and increased duration of high turbidity levels. Canopy cover along the creek course is not a limiting factor to anadromous fish production. Although dominated by alder, riparian cover averages 90%, providing adequate shade and temperature control for salmonids.

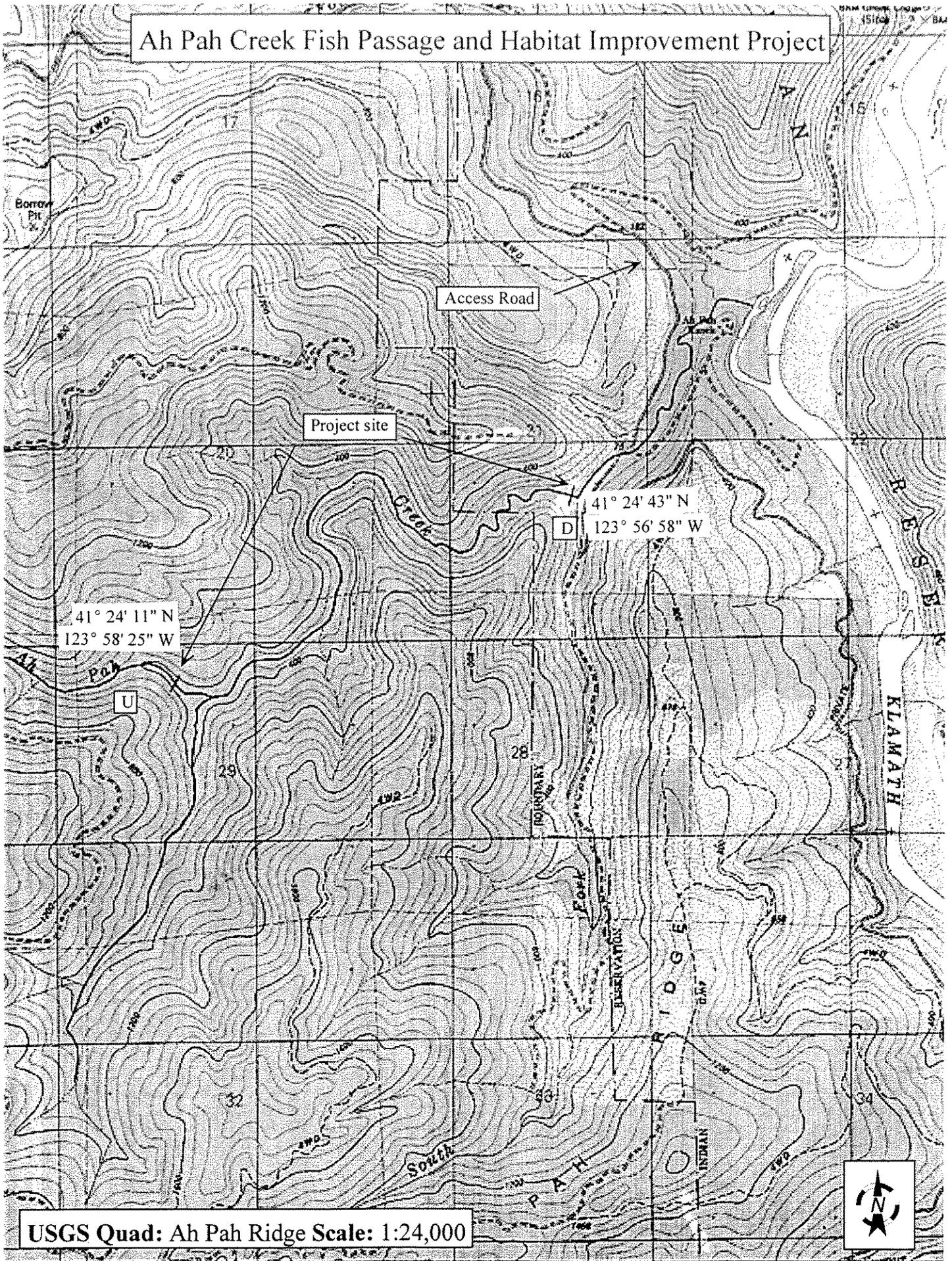
Habitat conditions on Ah Pah Creek have been showing signs of improvement. Restoration efforts by the CCC and the Yurok Tribe are helping to reduce several factors capable of stressing fish populations. The CCC has completed maintenance work on instream structures throughout the creek. Fish passage structures were reconstructed, providing access to salmonids for more than 1.5 miles of habitat. The lower portion of Ah Pah Creek was reconstructed and revegetated to benefit Chinook Salmon. The Yurok Tribe recently completed a road decommissioning project along the uppermost portion of the stream, which will reduce current and future sediment delivery to the creek. This particular project set out to work on some of the remaining factors affecting salmonid recovery.

## **Methods and Materials**

An instream structure evaluation survey conducted in 1997 using California Department of Fish and Game protocol discovered a lack of instream cover habitat throughout Ah Pah Creek. The survey, conducted by CCC personnel and Americorps Watershed Stewards Project, also identified several log debris barriers that may be limiting anadromous fish access to upstream spawning grounds. A subsequent habitat inventory revealed that these two factors appear to be negatively impacting salmonid production. With this information in hand the CCC, in cooperation with the DFG, set out to improve habitat conditions on Ah Pah Creek.

Several different instream restoration techniques were utilized during the project. Boulder clusters and deflectors, single and multiple log cover structures, and barrier modifications made up the full compliment of enhancement measures. Fisheries department personnel from the CCC and DFG developed site prescriptions for the project utilizing protocol found in the *California Salmonid Stream Habitat Restoration Manual*. Pre-project photos were taken, pool depths were noted, and site designs were drawn before implementation. CCC crews would later provide the labor to complete the stream enhancements.

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USGS Quad: Ah Pah Ridge Scale: 1:24,000



Boulder cluster and deflector work took place in the bottom 400 feet of the project area. Boulders utilized for these sites were left over from a channel reconstruction project located immediately downstream. Boulder clusters were placed in a straight and featureless reach of Ah Pah Creek (see site 175' photo). Each cluster consisted of three boulders spaced approximately two feet apart, in a triangular formation. The sets of clusters were placed mid channel, fifty feet from one another and slightly off set. Boulders used weighed approximately one to two tons each, and were roughly three to five feet in diameter. The boulder deflector placed instream was located just above the boulder cluster reach (see site 350' photo). The deflector was designed to concentrate flow against a bedrock wall and thus increase pool depth. Approximately fifteen boulders were put into this structure. All boulders were placed by hand crews using griphoists. Many of these boulders had to be moved more than two hundred yards to their current locations.

The next phase of the project involved log structure placement, enhancement and maintenance. Instream fish habitat structure work occurred on more than 6,000 feet of Ah Pah Creek. Logs placed within the creek were found on the hillsides, in close proximity to individual sites. Newly created structures were designed to provide cover to existing pools, help enhance depth, and collect woody debris. Several existing structures had logs added to them to increase site complexity. Other log structures placed in years past were in dire need of maintenance to prevent the sites from being lost during high flow events. Logs used in site formation and enhancement were at least twenty feet long and 16 to 36 inches in diameter. All sites were anchored with either one inch rebar, 3/4 inch cable, or both.

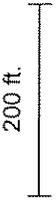
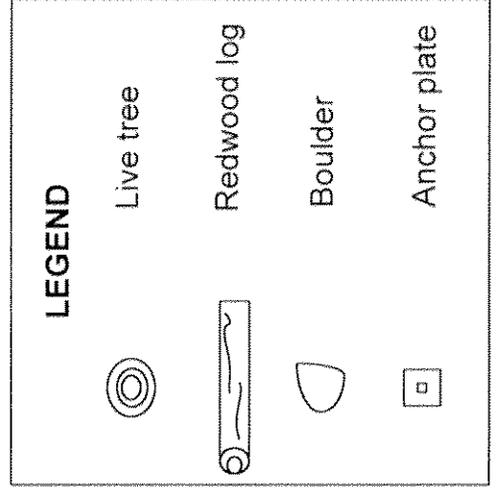
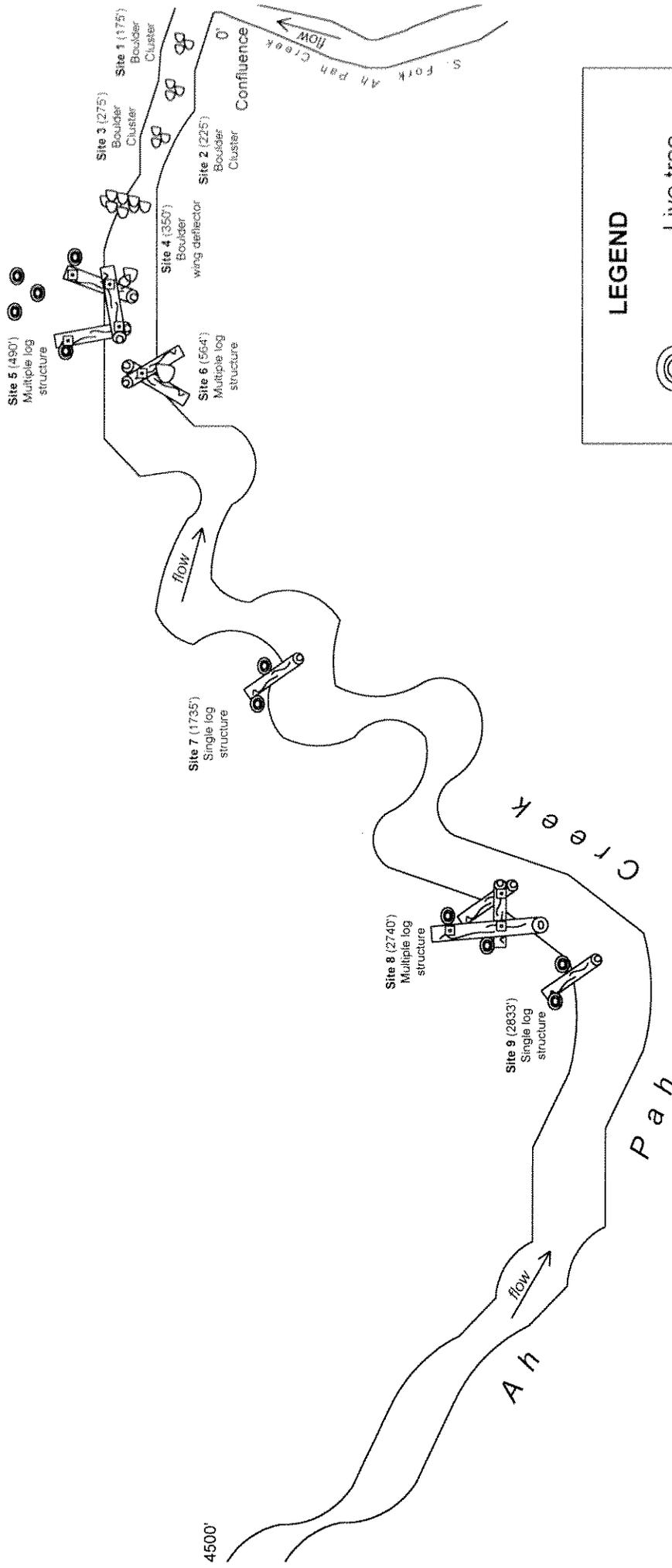
The third and final phase of the project involved the modification of several log debris accumulations considered barriers to upstream anadromous fish migration. Two sites on Ah Pah Creek were determined by DFG and CCC personnel to possibly hinder spawning fish from accessing quality habitat. In order to improve access for salmon and steelhead, selected logs and debris were removed from these sites and placed on streamside terraces. Only enough wood was removed to allow for fish passage. Most of the wood accumulation was left intact to maintain high quality fish habitat. Crews using chainsaws and griphoists implemented these fish passage enhancement measures.

## **Results**

A great deal of time and effort was expended developing, designing, and implementing the Ah Pah Creek Fish Passage and Habitat Improvement Project. Development and design of the project were conducted by a team of CCC and DFG personnel. Several different CCC crews of up to fifteen individuals contributed to the implementation of the enhancement measures. Work was done in the summer during low flow conditions and outside of endangered species restrictions. A total of fifteen enhancement sites were completed in the summer of 1998 (see site diagram).

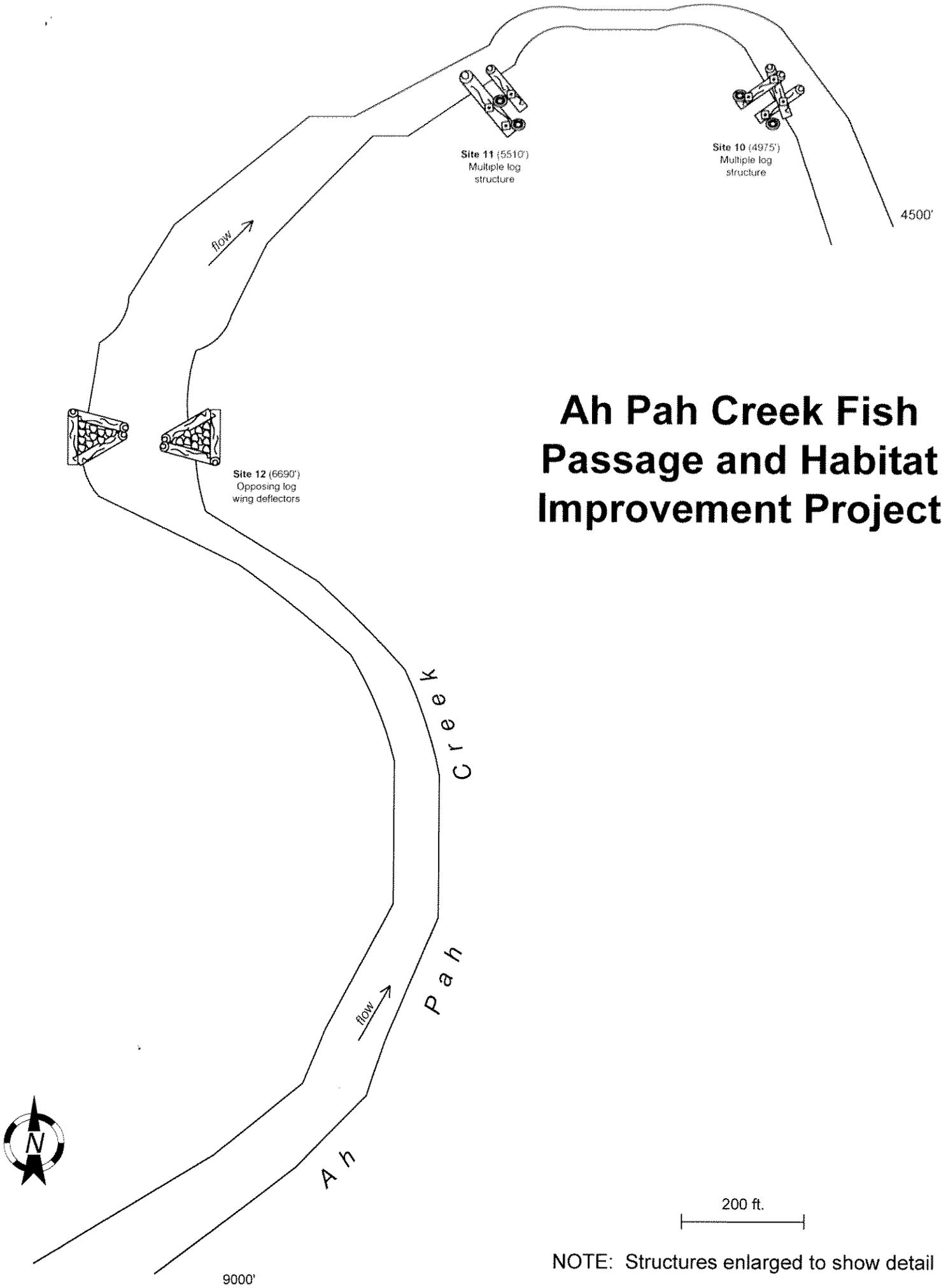
In the first phase of the project, approximately three boulder clusters and one boulder deflector were placed in lower Ah Pah Creek. Boulders were pulled long distances to the sites by hand crews using griphoists. A total of thirty boulders were placed instream at these four sites. Phase

# Ah Pah Creek Fish Passage and Habitat Improvement Project



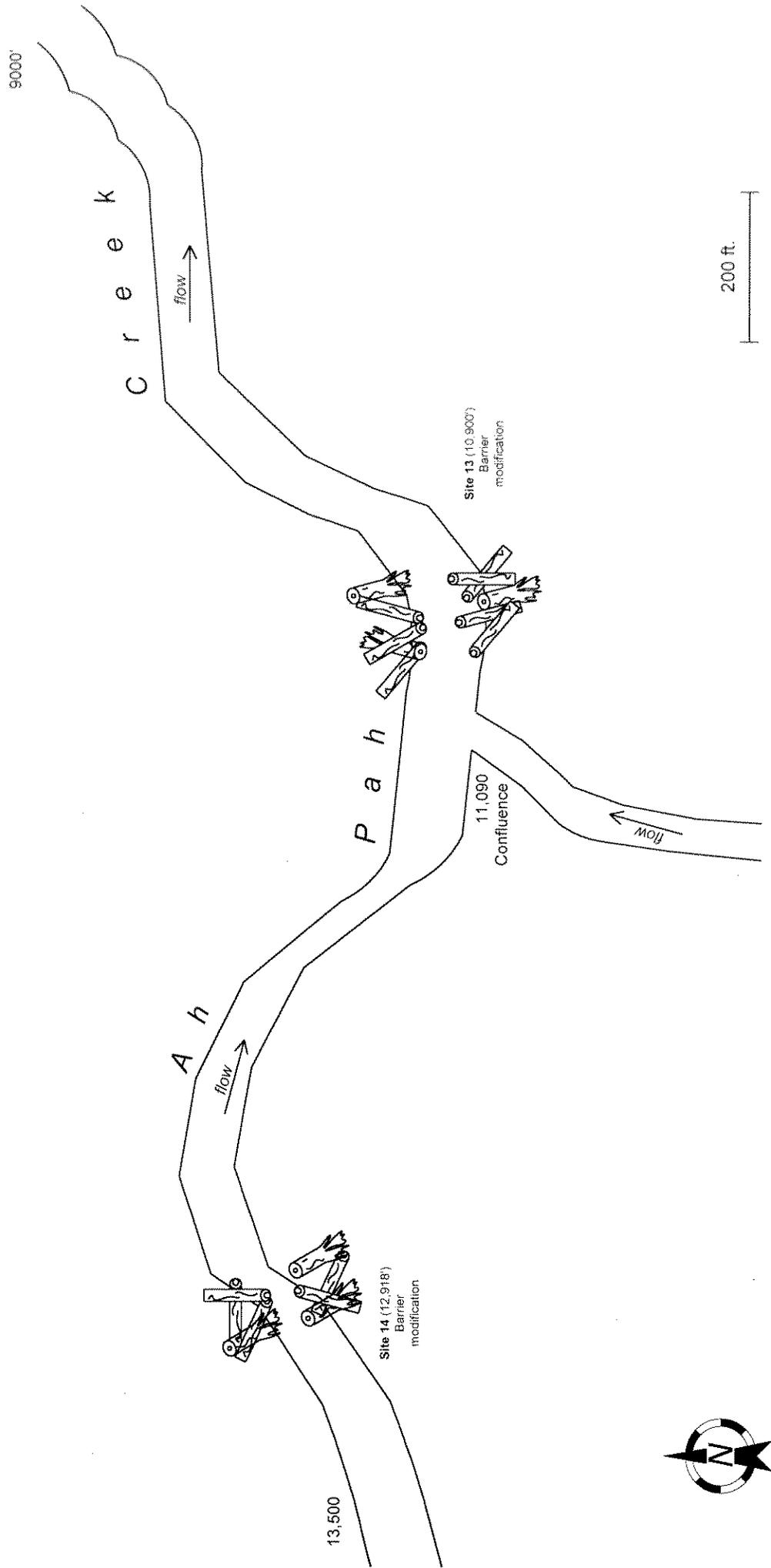
NOTE: Structures enlarged to show detail

# Ah Pah Creek Fish Passage and Habitat Improvement Project



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NOTE: Structures enlarged to show detail

two of the project involved the creation, enhancement, and modification of log cover structures. Three single digger log structures, four multiple log cover structures, and one log wing deflector were worked on by CCC crews. A total of ten logs were added at eight sites along Ah Pah Creek's mid to upper anadromous fish reaches. The third and final phase of this restoration project involved barrier modifications at two sites. Crews moved approximately seven to ten logs and several cords of small woody debris from sizable log jams. Just enough wood was removed to facilitate fish passage through these sites.

## **Discussion**

The Ah Pah Creek Fish Passage and Habitat Improvement Project has been completed for almost two years now, and every enhancement site has survived intact through two winters of above average precipitation. Although projects such as this one are designed with long term benefits in mind, some improvements can occur quite rapidly. The first immediate benefit occurred at pools where log and boulder structures were located. The boulder deflector and several multiple log structures placed in the lower reach of the creek helped deepen and expand existing pools considerably. One particular pool enhanced with a multiple log cover structure went from two feet to almost four feet deep over one winter season (see site 490' photo). Pool volume also improved, almost doubling in size. Recruitment of woody debris was another immediate benefit gained due to log structure placement. Some of the structures collected massive amounts of debris, thereby increasing habitat complexity and rearing cover.

Anadromous fish appear to be benefitting from the restoration work implemented on Ah Pah Creek. Observations from the streambank seem to indicate heavy usage of log structures by juvenile fish for rearing habitat. More than fifteen juvenile steelhead were observed on one instream structure alone. Spawning adult salmon and steelhead appear to be utilizing these same structures also. One pair of adult Sea-run Cutthroat Trout, and one Coho Salmon were seen spawning in tailouts created by digger log structures. Fish migration to spawning grounds is now unimpeded due to barrier modifications performed during this project (see site 10,900' photo). Both modification sites are still open, and providing fish access to spawning and rearing habitat. While benefits are steadily accruing on Ah Pah Creek, several issues and problems did arise during and after this project.

Enhancement work conducted on Ah Pah Creek was a demanding proposition. Rough terrain, long hikes, and heavy materials are just a few of the issues that affected crew work performance and timely implementation. Slopes along the work area are steep and unstable. Retrieving logs for structure sites was not only dangerous, but took many hours of labor to move. Material size and distance to site were also issues affecting productivity. The size of boulders utilized for the clusters and deflectors, and the distance to the placement sites meant long griphoist pulls, days of labor, and lots of broken equipment. Long hikes to several sites also hampered productivity. Barrier modification sites and several structure locations required more than a mile of hiking in the creek itself. Work difficulties may have reduced the pace of construction and increased costs, but nature and man teamed up to reduce the effectiveness of the completed enhancements.

In November of 1998, a storm struck the north coast of California, dumping more than ten inches of rain in 24 hours. This one event unleashed large amounts of sediment stored in channel, and it also reactivated landslides at several sites. Sediment filled the channel along lower Ah Pah Creek, burying all three boulder clusters and vastly reducing pool sizes at structure locations. Since that time though, the boulder clusters have reappeared, and sediment is being routed out of the system. Pools have been reestablished and turbidity levels have greatly improved.

## Summary

The following is a brief synopsis of enhancement measures implemented on the Ah Pah Creek Fish Passage and Habitat Improvement Project. This summary, by all means does not include the long hours, hard work, and tremendous effort put out by all those involved on the project.

### *Accomplishments*

<u>Type of Fish Habitat Enhancement Implemented</u>	<u>Number of Sites</u>
Boulder Cluster	3
Boulder Deflector	1
Single digger log structure	3
Multiple log cover structure	4
Log Wing Deflector	1
Barrier Modification	2
Total Number of Sites:	14

Total Number of Corpsmember hours logged: 3,200 hours

Total Project Cost: \$49,093.00

## Conclusions

The Ah Pah Creek Fish Passage and Habitat Improvement Project was conceived with the idea that restoring instream habitat conditions in an impaired watershed would help speed up the recovery of depressed salmon and steelhead stocks. With the help of a grant from the USFWS, the cooperation of the California Department of Fish and Game, and a willing landowner, the CCC set out to enhance critical fish habitat. Through instream habitat enhancement and barrier modifications, benefits have already begun to accrue.

Immediate benefits of this enhancement work developed within a year of project completion. Instream log structures scoured deep pools, collected woody debris, and improved spawning gravel accumulations. Barrier modifications remain open and provide access to more than a mile of quality spawning habitat. Juvenile and adult salmonids have been observed year around utilizing these restoration sites. The response of fish to the project bodes well for long-term recovery of the habitat and the species that depend on healthy and complex stream ecosystems.

Although the project has been successful, there are still issues of concern for the Ah Pah Creek

watershed. First, the Highway 101 Bypass cuts through the upper part of the creek, and has in the past contributed large amounts of sediment to the stream. Second, a large and old logging road system still exists throughout the watershed. Both have potential to deliver large amounts of sediment to an already degraded stream. Recent road decommissioning projects undertaken by the Yurok Tribe and erosion control measures implemented on the Bypass by Caltrans should prevent further large releases of sediment into the creek.

### **Summary of Expenditures**

Final Budget - see Appendix A

**APPENDIX A: Ah Pah Creek Fish Passage and Habitat Improvement Project  
FINAL BUDGET**

Category			Funding Requested	Non-Federal Cost Share	
				Other Federal Funds	Cash
<b>1) Personnel:</b>	<b># Hours</b>	<b>Hourly Rate</b>			
a. Wages					
General Labor	3200	\$ 12.00	\$ 38,400.00		
Technical Assistant	336	\$ 8.00	\$ 2,688.00		
Fish Habitat Assistant	168	\$ 16.00			\$ 2,688.00
<b>Subtotal Personnel:</b>			<b>\$ 41,088.00</b>		<b>\$ 2,688.00</b>
<b>2) Materials and Supplies</b>	<b># Units</b>	<b>Cost/Unit</b>			
Materials (total)			\$ 2,921.00		
Polyester Adhesive Resin*	15 tubes	\$26.75/tube			
3/4" Rock Drill Bits*	6	\$135.00/unit			
Film and Developing*	4 units	\$20.00/unit			
5/8" Cable Clamps*	40	\$5.00/each			
5/8" Cable*	300	\$1.35/ft.			
1" Rebar Nuts and Plates	40	\$20.00/set			
Cutoff Saw Blades	10	\$7.50/each			
Cable Ratchets	5	\$30.00/each			
Misc. Materials			\$ 1,209.00		
<b>Subtotal Materials and Supplies:</b>			<b>\$ 4,130.00</b>		<b>\$ 0.00</b>
<b>3) Operating Expenses</b>	<b># Units</b>	<b>Cost/Unit</b>			
Office Supplies		-----	\$ 200.00		
Other (tool repairs)			\$ 800.00		
Equipment lease/rental			\$ 645.00		
<b>Subtotal Operating Expenses:</b>			<b>\$ 1,645.00</b>		
<b>4) Travel</b>	<b>Miles</b>	<b>Cost/Mile</b>			
Vehicle Maint. and fuel	1,920	\$0.40/mi.	\$ 768.00		
Vehicle Operations			\$ 1,462.00		
<b>Subtotal Travel:</b>			<b>\$ 2,230.00</b>		
<b>Total Direct Costs</b>					
<b>5) Indirect Costs (Overhead): 5%</b>					\$ 2,455.00
<b>Totals</b>			<b>\$ 49,093.00</b>		<b>\$ 5,143.00</b>
<b>Total Project Cost (Including In-Kind Contributions): \$ 54,236.00</b>					

\* Indicates in-kind contribution from California Conservation Corps, Klamath Service District.



**Before:** Boulder Cluster site (175', 225', and 275'). Shallow and featureless riffle along lower Ah Pah Creek lacks any sort of instream cover, pool depth, or habitat complexity.



**After:** Boulder cluster sites placed in riffle to break up a monotypic reach of creek. Two winters later, the sites have helped enhance stream depth and habitat.



**Before:** Boulder Cluster site (175', 225', and 275'). Shallow and featureless riffle along lower Ah Pah Creek lacks any sort of instream cover, pool depth, or habitat complexity.



**After:** Boulder cluster sites placed in riffle to break up a monotypic reach of creek. Two winters later, the sites have helped enhance stream depth and habitat.



**Before:** Multiple Log Cover Structure site (490'). A shallow pool and associated rootwad provided the perfect opportunity for instream enhancement. Overhead canopy cover was adequate, but instream habitat was non-existent.



**After:** Three logs and two boulders added to the pool increased depth by two feet, expanded pool volume by at least 50%, and helped collect woody debris. At least twenty juvenile salmonids were observed utilizing the log enhanced pool. Prior to enhancement, no more than five fish would be seen at the site at any one time.



**Before:** Digger Log enhancement site (564'). Large downed log helped scour a shallow pool, but little instream cover exists.



**After:** Log structure collected a large amount of woody debris after one winter season. Not only did cover improve dramatically, but pool depth was greatly enhanced.



**Before:** Multiple Log Structure site (2,740'). Enhancement site lacked any instream fish habitat prior to log placement.



**After:** Recently completed log cover structure. Redwood logs will provide escape cover for juvenile fish and help deepen this rootwad formed pool.



**Before:** Barrier modification site (10,900'). Accumulation of large and small woody debris was determined to be a partial barrier to adult fish migration during low flows.



**After:** Barrier modification after winter flows. A small six foot hole was cut out of the debris jam to allow fish access to high quality habitat upstream of site. The majority of the LWD was left in place to provide excellent rearing cover for salmon and steelhead.