



**CCC-USFS Cooperative Lower and Mid Klamath Sub-basin  
Steelhead and Coho Salmon Habitat Restoration Projects on  
Bluff, China, Indian, Clear, and Grider Creeks**

**Final Report**

**Funding Organization:  
U.S. Fish and Wildlife Service, Yreka FWO  
USFWS Agreement #1448-11333-97-J074  
Project #97-HR-01**

**Terms of Agreement: October 1, 1996 through September 30, 2002**

**Cooperating Organization:  
California Conservation Corps, Klamath Service District**

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### **Abstract**

The California Conservation Corps (CCC), Klamath Service District was funded on October 1, 1996 by the U.S. Fish and Wildlife Service Klamath River Basin Fisheries Task Force to improve fish habitat along four creeks in the Klamath River watershed. The original name of the funded project was the CCC-USFS Cooperative Lower and Mid Klamath Sub-basin Steelhead and Coho Salmon Habitat Restoration Project on Bluff, China, Indian, and Clear Creeks. The CCC Klamath Service District was commissioned to plant approximately 6,000 trees on Indian and Clear Creek, revegetate 20 acres of landslides on Bluff Creek, and place 25 rootwads in a one mile section of China Creek. In the winter of 1997 tree planting occurred on Indian Creek and Clear Creek. However, due to the New Years Storm of 1997, stream conditions changed dramatically from the time the proposal was written, making Clear Creek unsuitable for rootwad placement, and the Bluff Creek revegetation sites inaccessible.

In order to compensate for the loss of restoration project sites, the US Forest Service (USFS) and the CCC developed a project to prevent erosion on abandoned roads in the Grider Creek watershed. The Grider Creek Watershed Protection by Hand Crews was created as a replacement project that would benefit salmonids in the mid-Klamath watershed. This project was collaboratively designed by the CCC and USFS personnel. Restoration efforts took place on public lands managed by the Happy Camp Ranger District.

The Grider Creek Watershed Protection by Hand Crews project was initiated to restore watershed function and processes in the Grider Creek watershed to the greatest extent possible. Road treatments were identified by USFS in the Road Sediment Source Inventory and Risk Analysis for Grider Watershed (Westside II Project- KNF 2002). The CCC provided the crew time necessary to hydrologically decommission two non system roads and stormproof a segment of Pacific Crest Trail that is located on a section of non-system road. A total of 57 erosion prevention structures were installed among the three sites; six diversion prevention ditches (DPD) and two waterbars on road 46N66.1, fourteen DPD's and four waterbars on 46N66.3, and 31 waterbars on a portion of the Pacific Crest Trail (road 45N78A.1) Erosion prevention sites were designed to prevent catastrophic failure of the road prism, thus decreasing the amount of sediment that could potentially be delivered into Grider Creek. Enclosed maps show the location of roads in the watershed and GPS coordinates of road and trail segments (except Salt Creek because of dense tree canopy).

## Introduction

Indian Creek, tributary to the Klamath River near Happy Camp, has been the focus of multi-agency cooperative restoration efforts for almost two decades. Stream habitat inventories were conducted on the lower 17 miles of Indian Creek during the months of June and July of the years 1980 and 1997. Adult Chinook salmon spawner utilization of available habitat has been monitored through fall and spring redd surveys conducted annually since 1988. Results of these investigations (West et al. 1990) indicate that “shade conditions are locally fair to poor.” Existing shade is composed primarily of White Alder, which does not survive larger flood events. Consequently, the riparian areas along Indian Creek suffered severe damage from the 1997 flood. Mature, deep-rooted tree species such as Douglas Fir and Ponderosa Pine no longer exist in the riparian area, and thus bank erosion and creek sedimentation was severe.

Reestablishment of the riparian areas along flood terraces will provide channel stabilization in a post flood situation when shallower rooted alders will have been uprooted. Willows planted along stream edges encourage bank stabilization, sort bedload, trap fines and provide riparian cover for the creek. Riparian planting slows winter/spring stream velocity along channel margins, backwaters, and secondary channel pools, providing winter habitat for juvenile coho and steelhead. Conifers provide large woody material for future recruitment, and assist in bedload movement in highly aggraded areas. Furthermore, the reestablishment of the riparian areas will provide channel stabilization, reduce stream temperatures, increase in-stream nutrients, and provide future large woody debris recruitment.

In order to improve rearing habitat within China Creek, 25 rootwads were scheduled to be added to pools and deep runs. Unfortunately, several unforeseen factors inhibited restoration work on this creek. First, the New Years Flood of 1997 caused heavy erosion in the China Creek watershed, delivering large amounts of sediment into the stream. The pools intended to be enhanced by the placement of 25 rootwads had been filled in and were no longer suitable for such treatment. Also, the rootwads selected for stream cover enhancement purposes were too small for the size of the creek, and would most likely not withstand large volumes of water during flood events. In order to compensate for the loss of the instream structure aspect of the project, the CCC worked with the US FS and the U.S. Fish and Wildlife Service (USFWS) to develop an alternate project. After extensive research, it was determined that the instream structure project would be replaced with a project designed to decommission/storm proof sections of roads on Grider Creek, another important salmon and steelhead stream located in the mid Klamath watershed.

Grider Creek, is a 3<sup>rd</sup> order tributary to the Klamath River. Considered a key watershed by USFS fisheries biologists, Grider Creek supports runs of coho and chinook salmon and steelhead trout. Lack of habitat and lowered water quality due to excessive silt and sediment impair these fish populations. Deteriorating roads in the Grider Creek watershed have been found to contribute large amounts of sediment into Grider Creek and its tributaries, and are considered the number one factor limiting salmonid productivity.

The Klamath National Forest has recently completed (1) a Watershed Analysis for the Grider Creek (Key) watershed that considered costs and benefits of roads (Tomsider WA, KNF 2000), (2) completed a Road Sediment Source Inventory and Risk Analysis of all system and non-system roads within the Grider Creek Watershed (Westside II Project-KNF, March 2002) and, (3) conducted a roads Analysis Process for the roads within the Grider Creek watershed. Based on agency and public needs, environmental impact of the roads, and project cost for road maintenance and repair, these analyses established the desired future condition for the transportation system in the Grider Creek watershed and determined which roads would be permanently kept and which roads should be decommissioned. Roads that are no longer needed and/or are too costly from an economic and/or an ecological standpoint will be decommissioned. Roads that are needed will be stormproofed as necessary to protect the road and minimize impacts to watershed and aquatic values.

Most road decommissioning and stormproofing identified in the Grider Creek watershed will be conducted with heavy equipment because this is the most efficient and cost-effective method of accomplishing the work. A proposal to use heavy equipment to decommission and stormproof roads in Grider Creek watershed is currently under development in the Grider Creek Watershed Restoration Environmental Analysis (KNF-Happy Camp Ranger District) but is not part of this project.

There are however areas where it was determined that hand crews can more effectively decommission roads or stormproof trails with less watershed disturbance than if heavy equipment was employed (i.e. such as removal of a small shallow culvert or outsloping a small section of road prism that is a long distance down an otherwise well vegetated benign non-system road). Three main areas that were identified as needing to be decommissioned, roads 45N78A.1, 46N66.1 and 46N66.3, are unaccessible to heavy equipment due to the roads deteriorated state. It was determined that CCC hand crews would be utilized to restore natural drainage patterns across old road prisms to reduce erosion and sedimentation. This would be accomplished through installment of diversion prevention ditches, waterbars, and road berm removal.

### **Description of Study Area**

The Indian Creek watershed is a tributary to the Klamath River on the west side of the Klamath National Forest, near Happy Camp. The legal locations of the work areas on Indian Creek are; T18N, R6E, Section 25. The project lies entirely on public lands administered by the United States Forest Service.

Clear Creek is a relatively pristine Klamath River tributary located below the town of Happy Camp. This waterbody is located in a key watershed with much of the land base designated as wilderness. A fire swept through the watershed in 1987 and burned riparian areas located adjacent to overstocked even-aged management areas. Erosion from fire damaged areas has continued to be a problem in this important salmon and steelhead stream. Conifers were planted in areas that contained significant damage from

fires.

The Grider Creek watershed is located in the Klamath National Forest, and flows into the Klamath River near the town of Seiad in Siskiyou County, California. This watershed is in fairly good condition, with a limited road network. Fish populations are some of the highest in the mid Klamath watershed. In order to protect this population of salmonids, erosion prevention is a high priority. CCC hand crews were used to decommission two non-system roads and stormproof a section of the Pacific Crest Trail that is aligned on a non-system road. See map(s) for specific site locations.

The following is a description of each Grider Creek watershed restoration area. Road 45N78A.1 is a 4100-foot section of the Pacific Crest Trail that was formerly a road. This trail/road was assessed in 2000 during the RSS Inventory and Risk Analysis. This trail/road was found to have extensive and severe gulying occurring from poor drainage down the saucer-shaped former road prism.

Road 46N66.1 is a very old road that was not constructed to any standards and is now in an advanced state of disrepair. Drainage structures were never installed, except for a few Humboldt log crossings across mainstem Salt Creek. Gulying from diverted tributaries on road sections that were insloped and have outer berms had been identified as the road's top priority problem.

Road 46N66.3 is also an old antiquated road that was not constructed to any present day standards, and is now in danger of failing. The road was not built with drainage structures and some sections have decommissioned themselves due to road cut slumping and failure of road fill, although several short flat and/or bermed road sections had been found gulying. Also, road sections contributed concentrated runoff to large landslides associated with this road, which could cause the landslides to reactivate.

### **Methods and Materials**

Approximately 3,276 trees including Douglas Fir, White Alder, Willow, and Maple were planted along Indian and Clear Creek. All trees were planted in accordance with the Department of Fish and Game protocol outlined in the [California Salmonid Stream Habitat Restoration Manual](#). A four to five-foot square area was scalped down to mineral soil at each tree planting locale. Trees were planted by CCC corpsmembers with power augers and hand tools.

The Grider Creek Watershed Protection by Hand Crews component of this restoration project was designed to restore natural hydrological processes in this key watershed at various points along two non-system roads (46N66.1 and 46N66.3), and to stormproof a segment of the Pacific Crest Trail that is located on a section of non-system road (45N78A.1.) Eight sites along road 46N66.1 (Salt Creek) were restored through Diversion Prevention Ditch (DPD) and waterbar construction. Eighteen sites along 46N66.3 were implemented. Fourteen DPD's and four waterbars were constructed. One site involved

the removal of a berm to improve drainage along a 100-foot section of the road. Work on road 45N78A.1, the Pacific Crest Trail consisted primarily of enhancement of pre-existing waterbars that were in great need of repair. Approximately 31 sites were completed along the Pacific Coastal Trail.

In each case, water flowing through an intermittent stream course entered the road surface and flowed down hill creating gullies and trenches. Diversion Prevention Ditches were built to capture and direct diverted water to a natural drainage as quickly and efficiently as possible. Ditches were constructed according to techniques outlined in the USFS *Diversion Potential at Road-Stream Crossings* manual (see Diagram 1). Ditches were constructed down hill of each watercourse at a 30° angle to the hillslope. Ditches are a minimum of 12" deep at the upper end and are gradually graded down to a minimum of 24" deep on the downslope side. All ditches were constructed to be a minimum of 3 feet wide at the base. Soil removed from the ditch was piled on the downhill side of the ditch and packed into a berm. The uphill sides of the ditches are gently sloping to promote collection of water draining off the road surface. Rock and wood was placed at the end of the ditch to dissipate and disperse the energy of the water as it returns to its original drainage area. CCC corpsmembers performed all work using hand tools including picks, shovels, rock bars, hoedads, and polaski's.

Waterbars on the Pacific Crest Trail were enhanced by removing soil from the bar and regrading to meet the needs of the site, and building/enhancing berms on the downhill side of the waterbar based on the sites need. Ditches and waterbars were installed by CCC Klamath Service District corpsmembers. Hand tools such as shovels, pixmatics, mc clouds, and palaskies were used. Chainsaws were utilized to clear debris from the work sites.

\*Photos of erosion prevention techniques are included at the end of this report.

### **Results and Discussion of Accomplishments During the Project**

A great deal of time and effort was expended developing, designing, and implementing both the original CCC -USFS Cooperative Lower and Mid-Klamath Sub-basin Steelhead and Coho Salmon Habitat Restoration Projects and the newly developed Grider Creek Watershed Protection by Hand Crews. Tree planting on Indian Creek and Clear Creek was developed and implemented by CCC staff, U.S. Forest Service personnel, and Department of Fish and Game personnel. Approximately 3,276 trees were planted along Indian Creek and Clear Creek. Tree survival was good, with success rates close to 80%.

The next phase in this restoration project involved the development and design of road drainage improvement sites by a team of CCC and U.S. Forest Service personnel. The project used several hand crews of up to fifteen crew members from the Del Norte Center CCC to restore natural hydrological processes that were being altered due to road disturbance at various points along two non-system roads (46N66.1 and 46N66.3), and to

stormproof a segment of the Pacific Crest Trail that is located on a section of non-system road (45N78A.1). Eight Diversion prevention ditch structures were placed at strategic points along road 46N66.1. Eighteen diversion prevention ditches and waterbars were constructed along decommissioned road 46N66.3 and 31 waterbars were improved along the Pacific Crest Trail built on road 45N78A.1 to improve storm water drainage.

All sites were completed on schedule and at or above design specifications. Several suggestions/issues do need to be considered before implementing a project like this in the future. First, weather conditions need more serious consideration. Similar future projects need to be implemented either in spring or early fall to prevent corpsmembers from working in the often unbearable heat conditions, and to reduce the risk of potential wildfires. The last suggestion involves the implementation of erosion prevention sites. After careful post project review, we believe that diversion prevention ditches could use better rock armor (if available) along ditch bottoms. This would slow the incision of the ditch through the road fill, and thus meter out sediment from the site over a longer period of time. The true test of this project will be in the winter rainy months when the water begins to drain off the hillside. Forest Service employees with the assistance of CCC watershed restoration department staff, will be responsible for monitoring all sites for drainage effectiveness.

Another positive outcome of the Grider Creek Watershed Protection by Hand Crews Project were the learning opportunities provided to CCC corpsmembers. Approximately 25 young men and women took part in college level learning opportunities and job skill development while implementing this project. This work/learn project increased their knowledge of the natural environment, all the while working to conserve it.

## Summary

The following is a brief synopsis of enhancement measures implemented on the CCC-USFS Cooperative Lower and Mid Klamath Sub-basin Steelhead and Coho Salmon Habitat Restoration Project. This summary, by all means does not include the long hours, hard work, and tremendous efforts put out by all those involved on the project.

### *Summary of Accomplishments*

<u>Name of Stream</u>	<u>Number of Trees</u>
Indian and Clear Creeks	3,276
Total acres planted:	<b>20 acres</b>

<u>Name of Road</u>	<u>Number of Sites</u>
45N78A.1	31 waterbars
46N66.1	8 sites; 6 DPD's, 2 waterbars
46N66.3	18 sites; 14 DPD's, 4 waterbars
Total number of sites:	<b>57</b>

Total road miles decommissioned:	<b>3.47 miles</b>
Total # of Corpsmembers hours logged:	<b>2,591 hrs.</b>
Total Project Cost (including in-kind):	<b>\$44,705.00</b>

### **Summary of Expenditures**

Final Budget- see Appendix A

### **Conclusions**

The CCC-USFS Cooperative Lower and Mid Klamath Sub-basin Steelhead and Coho Salmon Habitat Restoration Project on Bluff, China, Indian, and Clear Creeks project was conceived with the idea that improving instream habitat and enhancing the riparian areas of Mid-Klamath tributaries would help improve conditions for anadromous fish. Due to changing conditions caused by the New Years flood of 1997, the project was altered. Trees were still planted along Indian Creek and Clear Creek; however, the instream enhancement aspect of the project was eliminated. The Grider Creek Watershed Protection by Hand Crews project was developed in order to make up for the lost portion of the project.

The Grider Creek component of this restoration project was developed with the idea that restoring watershed function and processes in the Grider Creek watershed will prevent future erosion, landslides, and excessive sediment from entering Grider Creek and its tributaries. With the help of a grant from USFWS, the cooperation of the California Department of Fish and Game and the U.S. Forest Service, the CCC set out to decommission two antiquated roads and storm proof a section of the Pacific Crest Trail. The success of this project will be measurable after the rainy winter months of the year have tested the erosion prevention sites. The U.S. Forest Service will be responsible for monitoring all DPD sites. The many benefits of road decommissioning bode well for long-term recovery of the habitat and the species that depend on healthy and complex stream ecosystems.

The California Conservation Corps, Klamath Service District would like to thank the USFWS (Yreka Office), DFG, and USFS for all of their support on this endeavor. The collaborative efforts of this group will provide a host of long term benefits to native salmon and steelhead populations. A diverse riparian canopy and less stream sedimentation should vastly improve watershed health.