STREAM INVENTORY REPORT

BOULDER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Boulder Creek to assess habitat conditions for anadromous salmonids. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Boulder Creek. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

There is no known record of adult spawning surveys having been conducted on Boulder Creek. The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Boulder Creek is a tributary to Larabee Creek, a tributary to the Eel River, located in Humboldt County, California (Figure 1). Boulder Creek's legal description at the confluence with Larabee Creek is T1S R3E S11. Its location is 40°23'39" N. latitude and 123°47'55" W. longitude. Boulder Creek is a first order stream and has approximately 1.9 miles of blue line stream, according to the USGS Bridgeville and Myers Flat 7.5 minute quadrangles. Boulder Creek drains a watershed of approximately 1.9 square miles. Elevations range from about 700 feet at the mouth of the creek to 2,600 feet in the headwater areas. Redwood and Douglas fir forest dominate the watershed. The watershed is privately owned and is managed for timber production. Vehicle access exists via State Highway 101 to the Pepperwood Exit, across the Eel River on the summer bridge to Larabee Valley, then along the private haul road that parallels Larabee Creek.

METHODS

The habitat inventory conducted in Boulder Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) and contract seasonal Technical

Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Boulder Creek personnel were trained in May, 1992, by Gary Flosi and Scott Downie. This inventory was conducted by a two person team.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This form was used in Boulder Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used see the Larabee Creek report.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Boulder Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Percent canopy
- Bank composition by composition type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of September 22, 1992, was conducted by

Chris Coyle and John Cleckler (CCC Technical Advisor and contract seasonal). The total length of the stream surveyed was 858 feet, with an additional 111 feet of side channel.

Flows were not measured on Boulder Creek.
Boulder Creek is an A2 channel type for the entire 869 feet of stream reach surveyed. A2 channels are steep (4-10% gradient), very well confined streams, with stable stream banks.

Water temperatures ranged from 55 to 56 degrees fahrenheit. Air temperatures ranged from 62 to 72 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 48.7%, pools 37.8%, and flatwater types 13.5% (Graph 1). Riffle habitat types made up 68.0% of the total survey **length**, pools 21.8%, and flatwater 10.2% (Graph 2).

Eight Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were cascades, 35.1% and plunge pools, 24.3% (Graph 3). By percent total **length**, cascades made up 47.5%, high gradient riffles 13.1%, and plunge pools 11.7%.

Fourteen pools were identified (Table 3). Scour pools were most often encountered at 64.3%, and comprised 53.7% of the total length of pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Two of the 14 pools (14%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 12 pool tail-outs measured, none had a value of 1 (0.0%); 7 had a value of 2 (58.3%); 5 had a value of 3 (41.7%); and none had a value of 4 (0.0%). On this scale, a value of one is the best for fisheries (Graph 6).

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had the highest shelter rating at 183.6. Pool habitats followed with a rating of 92.1 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 95.0, and main-channel pools rated 87.0 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Boulder Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Boulder Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble and gravel were equally represented in Boulder Creek. Of the two low gradient riffles surveyed, one was small cobble and one was gravel.
Thirteen percent of the survey reach lacked shade canopy. Of the 87% of the stream covered with canopy, 2.8% was composed of deciduous trees, and 83.3% was composed of coniferous trees. Graph 9 describes the canopy in Boulder Creek.

Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type. For the stream reach surveyed, the mean percent right bank vegetated was 86.5%. The mean percent left bank vegetated was 76.5%. The dominant elements composing the structure of the stream banks consisted of 2.7% bedrock, 36.5% boulder, 0.0% cobble/gravel, 2.7% bare soil, 0.0% grass, 17.6% brush. Additionally, 40.5% of the banks were covered with deciduous trees, including downed trees, logs, and root wads (Graph 10).

DISCUSSION

The A2 channel type is generally not suitable for fish habitat improvement structures. A2 channels are found in high energy, steep gradient stream reaches. They have channels dominated by boulders, do not retain gravel very well, but do have stable stream banks. Usually within the A2 channel there are zones of lower gradient where structures designed to trap gravels can be constructed. Any structure site must be selected with care because of the high stream energy which can create problems with stream bank erosion and structure stability.

The water temperatures recorded on the survey days September 22, 1992 ranged from 55° to 56° F. Air temperatures ranged from 62° to 72° F. This is a very good water temperature regime for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 10.2% of the total **length** of this survey, riffles 68.0%, and pools 21.8%. The pools are relatively shallow with only 2 of the 14 pools having a maximum depth greater than 2 feet. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. Therefore, installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

Five of the 12 pool tail-outs measured had embeddedness ratings of 3 or 4. None had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Boulder Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean shelter rating for pools was high with a rating of 92.1. The shelter rating in the flatwater habitats was slightly less at 85.0. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, white water contributes a small amount. Large and small woody debris as well as root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The two low gradient riffles had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 87%. This is a high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Boulder Creek should be managed as an anadromous, natural production stream.

2) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

3) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

4) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

5) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable and in some areas the material is at hand.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All the distances are approximate and taken from the beginning of the survey reach.

0'	Begin survey at confluence with Larabee Creek. Channel type is an A2.
255'	Left bank erosion 10' long x 20' high, contributing fines.
671'	Left bank slide 100' high x 150' long covering habitat units 30-33. Contributing gravel and fines.
869'	Rapid increase in gradient. Large boulder cascade. Possible barrier. No fish observed beyond this point. END OF SURVEY.