STREAM INVENTORY REPORT

CUMMINGS CREEK, 1991

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Cummings Creek to assess habitat conditions for anadromous salmonids. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Cummings Creek. The objective of the biological inventory was to document the salmonid species present and their distribution in the stream. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

Adult carcass surveys were conducted on Cummings Creek from 1987 through 1992. Chinook salmon were documented during surveys in December 1987 and December 1988. One unidentified live fish was observed in the January 1990 survey and three redds were observed during the January 1992 survey. The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of salmonid habitat.

WATERSHED OVERVIEW

Cummings Creek is tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California (Figure 1). The legal description at the confluence with the Van Duzen River is T02N R01E S26. Its location is 40°31'25" N. latitude and 124°01'50" W. longitude. Cummings Creek is a first order stream. The total length of blue line stream, according to the USGS Hydesville and Owl Creek quadrangles is 2.7 miles.

Cummings Creek drains a watershed of approximately 5.03 square miles. Redwood and Douglas fir forest dominates the watershed. The watershed is owned by the Pacific Lumber Company, Eel River Sawmill and other private interests, and is managed for timber production. Vehicle access exists from State Highway 36 via Cummings Creek Road, approximately seven miles east of Carlotta.

METHODS

The habitat inventory conducted in Cummings Creek follows the methodology presented in the California Salmonid Stream Habitat

Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Cummings Creek personnel were trained in May and June, 1991, by Gary Flosi and Scott Downie.

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 Cummings Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Discharge is measured in cubic feet per second using a current flow meter. Measurements are taken at the downstream end of the stream or reach being inventoried. Flows should also be measured at major tributary confluences. Flow was not measured in Cummings Creek.

2. Channel Type:

Channel typing is conducted according to the classification system developed by David Rosgen (1985). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted simultaneously with habitat typing operations and follows a standard form to record measurements and observations. There are four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Both water and air temperatures are measured and recorded each tenth unit typed. The time of the measurement is also recorded. Both temperatures are taken in fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Cummings Creek habitat typing used standard basin level measurement criteria. These parameters require that

the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Depth of the pool tail crest at each pool habitat unit was measured at the thalweg. All measurements were taken in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Cummings Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4).

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Cummings Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Cummings Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentage of the total canopy area was then further analyzed and recorded according to whether it was composed of either coniferous or deciduous trees.

9. Bank Composition:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Cummings Creek, the dominant composition type in both the right and left banks was selected from a list of eight options on the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY:

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

Biological inventory was conducted in Cummings Creek to document the salmonid species composition and distribution. Three sites were electrofished using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, measured, and returned to the stream.

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
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Cummings 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
- Dominant substrate in low gradient riffles
- 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 August 21, 22, 23, and 26, 1991, was conducted by Shea Monroe, Steve Liebhardt, Jerry Suissa and John Crittenden (CCC). The total length of the stream surveyed was 17,823 feet, with an additional 170 feet of side channel.

Cummings Creek is a C3 channel type for the first 5,536 feet, B1 for the middle 5,847 feet, and A3 for the remaining 6,440 feet of stream reach surveyed. C3 channels are low gradient (0.5-1.0%), slightly confined streams with meandering, unstable stream banks. B1 channels are moderate gradient (2.5-4.0%), moderately confined streams with stable stream banks. A3 channels are steep gradient (4-10%), very well confined, and have stable stream banks.

Water temperatures ranged from 55 to 60 degrees fahrenheit. Air temperatures ranged from 57 to 70 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 41.4%; pools were 33.8%; and flatwater types 24.3% (Graph 1). Riffles made up 36.4% of the total survey **length**, flatwater habitat types were 25.5%, and pools 11.4% (Graph 2).

Eleven Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 40.5%; mid-channel pools, 19.5%; and step runs, 9.1% (Graph 3). By percent total **length**, low gradient riffles made up 35.6%, step runs made up 17.6%, and mid-channel pools 6.1% (Table 2).

Seventy-one pools were identified (Table 3). Main-channel pools were most often encountered at 59.2%, and comprised 54.7% 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. Twenty-six of the 71 pools (36.6%) had a depth of two feet or greater (Graph

5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 67 pool tail-outs measured, zero had a value of 1 (0.0%); 34 had a value of 2 (50.7%); 31 had a value of 3 (46.2%); and 2 had a value of 4 (3.0%). 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. Pool habitat types had the highest shelter rating at 65.8. Flatwater habitats followed with a rating of 36.7 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 66.2, and scour pools rated 65.2 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Cummings Creek. Graph 7 describes the pool cover in Cummings Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 67 of the 85 low gradient riffles (78.8%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 18.8% of the low gradient riffles (Graph 8).

Approximately 30 percent of the survey reach lacked shade canopy. Of the 70% of the stream covered with canopy, 80% was composed of deciduous trees, and 20% was composed of coniferous trees. Graph 9 describes the canopy in Cummings 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 87.6%. The mean percent left bank vegetated was 88.7%. The dominant elements composing the structure of the stream banks consisted of 0.0% bedrock, 1.0% boulder, 1.4% cobble/gravel, 1.9% bare soil, 9.5% grass, 31.9% brush. Additionally, 41.0% of the banks were covered with deciduous trees, and 13.3% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on Cummings Creek. The objective was to identify fish species and distribution. The units were sampled on September 3 and 6, 1991 by Erick Elliot, and Brian Humphrey (CCC). Each unit was end-blocked with nets to contain the fish within the sample reach. Three passes were

conducted at each site, fork lengths measured and recorded, and the fish returned to the stream.

The first unit sampled was habitat unit 003, a log enhanced - lateral scour pool, approximately 4,826 feet from the confluence with the Van Duzen River. This site had an area of 198 sq ft, and a volume of 79.2 cubic feet. The unit yielded 50 steelhead, ranging from 42 to 126 mm FL.

The second sample unit was habitat unit 024, a mid-channel pool, located above a logging road crossing approximately 5,975 feet above the creek mouth. This site had an area of 165 sq ft, and a volume of 182 cu ft. Twenty-three steelhead were sampled. They ranged from 49 to 170 mm FL.

The third unit sampled was habitat unit 151, a mid-channel pool, located approximately 12,166 feet above the creek mouth. The site had an area of 224 sq ft, and a volume of 179 cu ft. Twenty-six steelhead were sampled, ranging from 36 to 150 mm FL.

DISCUSSION

Cummings Creek has three channel types: A3, B1, and C3. The high energy and unstable stream banks of the A3 channel type is generally not suitable for instream enhancement structures. The B1 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 5,847 feet of this type of channel in Cummings Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The lower 5,536' of the survey reach is a C3 channel. C3 channels are meandering steam types on noncohesive gravel beds which have poorly consolidated and unstable stream banks. They are generally not suitable for instream enhancement structures. However, bank placed boulders, bank cover, overhead log cover and shelter structures in straight reaches are often appropriate. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks.

The water temperatures recorded on the survey days ranged from 55° F to 60° F. Air temperatures ranged from 57° F to 70° F. This is a very good water temperature regime for salmonids. However, to make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Riffle habitat types comprised 36.4% of the total **length** of this

survey, dry 26.7%, flatwater 25.5%, and pools 11.4%. The pools are relatively shallow with only 26 of the 71 pools (36.6%) 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.

Thirty-three of the 67 pool tail-outs measured had embeddedness ratings of 3 or 4. Zero had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Cummings 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 moderate with a rating of 65.8. The shelter rating in the flatwater habitats was lower at 36.7. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, small woody debris and root mass contribute a small amount. Log and root wad cover structures in the 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.

Sixty-seven of the 85 low gradient riffles had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 84.1%. This is a high percentage of canopy, since 80 percent is generally considered desirable. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) 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.

3) 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.

4) 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 system.

5) Increase woody cover in the flatwater habitat units. Most of the existing cover is from large woody debris, which is desirable. Increasing complexity with woody cover is desirable and in some areas the material is at hand.

6) There are several log debris accumulations present on Cummings Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done in a manner that will not release an overabundance of fine sediment into the system.

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 Van Duzen River. Approximately 4800' of dry channel to Highway 36. Cattle crossing approx. 1400' below bridge causing erosion to both stream banks.
4955'	CCC flag site # 2 (4-19-89).
5387'	Left bank (LB) erosion, 60' long x 6' high, contributing gravel.
5536'	Channel type changes from C3 to B1.
5553'	Small debris accumulation (SDA) along LB. Stream flowing under bank causing erosion and small jam, retaining silt.
5621'	Log debris accumulation (LDA) inter-mixed with 30-40 tires, 20' wide x 6' high x 35' long, causing massive jam and retaining sand and gravel.
5964'	Logging road crosses stream.
6057'	Small LDA, 15' wide x 3' long x 2' high, retaining silt. Man made rock dam.

6460' CCC flag site # 5 (4-19-89). Deflector on LB.

6597' Side channel has been covered with logging slash.

6705' SDA retaining fines at LB and right bank (RB) deflectors.

6806' LDA retaining gravel.

6846' RB erosion under large root wad.

7125' Large root wad retaining fines, 20' wide x 8' high x 5' long.

7948' Water flowing under log along RB causing erosion, 15' long x 5' high.

8003' LDA, 30' wide x 20' long x 5' high, retaining gravel, 40' long x 3' high. RB erosion, 50' long x 8' high.

8107' RB erosion undercutting redwood tree and stump, 60' long x 8' high.

8448' CCC flag site # 11 (5-2-89).

8469' LDA, 25' wide x 10' long x 5' high, retaining silt and gravel.

8899' Low gradient riffle undercutting redwood weirs on both banks.

9475' Road above RB.

9640' Humboldt log crossing, 27' long x 4' high x 30' wide.

10359' RB erosion, 40' long x 20' high.

10595' Fallen logs creating a bottle-neck, causing small blockage.

11019' RB erosion, 40' long x 40' high, contributing fines and gravel.

11513' Bridge crossing, 17' long x 25' wide x 8' high. Channel type changes from B1 to A3.

11737' Bridge crossing, 10' long x 18' wide x 15' high.

11831' RB erosion threatening adjacent road.

12567' CCC flag site # 6 (2-25-88).

13298' RB erosion, 50' long x 10' high, contributing fines and boulders.

13467' LDA, 15' wide x 5' high x 8' long.

13525' LB erosion, 30' long x 10' high.

13900' Dry tributary enters on RB.

14314' Small tributary enters on RB.

14425' DFG flag site # 4 (2-7-85).

14477' CCC flag site # 14 (4-22-89). Large LDA, 50' wide x 40' long x 5' high, retaining fines and gravel, 30' long x 5' high.

14786' CCC flag site # 15 (4-24-89).

14797' LDA, 25' wide x 5' long x 8' high, retaining gravel, 15' long x 4' high.

15371' LDA, 25' wide x 28' long x 5' high, retaining SWD and fines. LB erosion, 70' long x 60' high.

16034' RB slide and erosion, 50' long x 50' high,contributing fines. LDA causing gravel and cobble retention, 20' long x 20' wide x 3' high.

16444' LDA, 40' long x 40' wide x 8' high, and massive blue goo slide, 200' long x 100' high, contributing trees and fines.

16472' LDA, 50' long x 40' wide, retaining gravels, 40' long x 40' wide x 4' high. Large, well vegetated island in center on channel.

17719' RB erosion, 45' long x 20' high.

17823' One LDA after another beyond this point. No YOY observed after 16472'.
End of survey.