# STREAM INVENTORY REPORT

## Bear Creek

### INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Bear 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 Bear Creek. The objective of the biological inventory was to document the salmonid species present and their distribution. 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 Bear Creek. The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout.

### WATERSHED OVERVIEW

Bear Creek is a tributary to Hollow Tree Creek, a tributary to the South Fork Eel River, a tributary to the Eel River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Figure 1). Bear Creek's legal description at the confluence with Hollow Tree Creek is T22N R17W S04. Its location is 39.7861 degrees north latitude and 123.7503 degrees west longitude. Bear Creek is a first order stream and has approximately 1.4 miles of blue line stream, according to the USGS Leggett 7.5 minute quadrangle. Bear Creek drains a watershed of approximately 1.0 square mile. Elevations range from about 1,160 feet at the mouth of the creek to 1,600 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned by the Louisiana-Pacific Corporation and is managed for timber production. Vehicle access exists from State Highway 1 at Hales Grove, via Westside Road, and is approximately 4.5 miles south of State Highway 1.

### METHODS

The habitat inventory conducted in Bear 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). Bear Creek personnel were trained in May and June, 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 Bear Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used, see the Hollow Tree Creek report.

## 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 Bear Creek to document the fish species composition and distribution. Three sites were electrofished in Bear Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. 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 Runtime, a dBASE 4.1 data entry program developed by the Department of Fish and Game. This program processes and summarizes the data.

The Runtime program produces the following summary 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 Bear 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

The habitat inventory of July 6 through July 7, 1992 was conducted by Erick Elliot and Jason Cleckler (CCC and contract seasonal). The total length of the stream surveyed was 2,042 feet, with an additional 101 feet of side channel.

Bear Creek is a C2 channel type for the entire 2,042 feet of stream reach surveyed. C2 channels are low gradient (0.3-1,0%), moderately confined streams, with stable stream banks.

Water temperatures ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 55 to 79 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent occurrence, pools made up 41%, flatwater 33%, and riffles 25% (Graph 1). Flatwater habitat types made up 44% of the total survey length, pools 33%, and riffles 23% (Graph 2).

Ten 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, 24%; mid-channel pools, 21%; and log enhanced lateral scour pools, 13% (Graph 3). By percent total length, low gradient riffles made up 22%, step runs 19%, and mid-channel pools 17% (Table 2).

Thirty-three pools were identified (Table 3). Main channel pools were most often encountered at 58%, and comprised 58% 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 of the 33 pools (61%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 31 pool tail-outs measured, eight had a value of 1 (26%); 11 had a value of 2 (36%); nine had a value of 3 (29%); and three had a value of 4 (10%). 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 74. Flatwater habitats followed with a rating of 55 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 79. Scour pools had a mean shelter rating of 67 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 13 of the 19 low gradient riffles (68%). Graph 8 describes the substrate composition in Bear Creek.

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Seventeen percent of the survey reach lacked shade canopy. Of the 83% of the stream that was covered with canopy, 58% was composed of deciduous trees, and 42% was composed of coniferous trees (Graph 9).

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 61%. The mean percent left bank vegetated was 63%. The dominant elements composing the structure of the stream banks consisted of 24% grass, 13% bedrock, 12% bare soil, 9% brush, and 2% cobble/gravel,. Additionally, 17% of the banks were covered with deciduous trees, and 24% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

## BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on Bear Creek. The objective was to identify fish species and distribution. The units were sampled on July 22, 1992 by Shea Monroe (CCC), and Jason Cleckler. Each unit was end-blocked with nets to contain the fish within the sample reach. One pass was conducted at each site, fork lengths were measured and recorded, and the fish were returned to the stream.

The first site sampled was Habitat Unit #003, a mid-channel pool, approximately 35 feet from the confluence with Hollow Tree Creek. This site had a surface area of 98 square feet, and a volume of 78 cubic feet. The unit yielded six steelhead/rainbow trout, ranging from 42 mm to 61 mm long and one coho salmon, 73 mm long.

The second site was Habitat Unit #009, a plunge pool, located approximately 175 feet from the confluence with Hollow Tree Creek. This site had a surface area of 240 square feet, and a volume of 240 cubic feet. The site yielded six steelhead/rainbow trout, ranging from 56 mm to 140 mm long.

The third site sampled was Habitat Unit #075, a mid-channel pool approximately 2,000 feet above the confluence with Hollow Tree Creek. The site had a surface area of 190 square feet, and a volume of 240 cubic feet. The site yielded six steelhead/rainbow trout ranging from 56 mm to 140 mm long.

## DISCUSSION

The C2 channel type has suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective cover for fish. Well placed and engineered structures that constrict the channel to form pool habitat or cover structures are usually appropriate and have a good chance of success in this channel type.

The water temperatures recorded on the survey days July 6 through July 7, 1992 ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 55 to 79 degrees Fahrenheit. This is a very good water temperature regime for salmonids. However, to make any further conclusions,

temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 23% of the total length of this survey, riffles 44%, and pools 33%. The pools are relatively deep with 20 of the 31 pools having a maximum depth of two feet or greater. 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 conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The LDA's in the system are retaining needed gravels. Any necessary modifications to them should be done with the intent of metering the gravels out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Twelve of the 31 pool tail-outs measured had embeddedness ratings of 3 or 4. Eight had embeddedness ratings of 1. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Bear 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 fairly high with a rating of 74. The shelter rating in the flatwater habitats was 55. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by large and small woody debris in all habitat types, which is desirable.

Fifteen of the 19 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 83%. This is a high percentage of canopy, since 80% 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) Bear Creek should be managed as an anadromous, natural production stream.

2) There are several log debris accumulations present on Bear Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully over time to avoid excessive sediment loading in downstream reaches.

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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.

| Position (ft): | Comments: |
|---|---|
| 0' | Start of survey at confluence with Hollow Tree Creek. Channel type is a C2 for the entire survey reach. |
| 111' | Young-of-the-year (YOY) observed. |
| 158' | Log debris accumulation (LDA) measures 25' long x 26' wide x 9' high and is retaining a volume of gravel measuring 12' long x 15' wide x 2' high. |
| 209' | Bedrock sheet measures 18' long and has a 4' high plunge, with a total gradient change of 8'. |
| 274' | LDA measures 4' long x 7' wide x 4' high. |
| 393' | Log bridge measures 30' long x 20' wide x 11' high. |
| 570' | LDA measures 5' long x 7' wide x 4' high. |
| 822' | LDA measures 15' long x 12' wide x 4' high. |
| 839' | 4' high bedrock plunge. |
| 1049' | LDA measures 30' long x 8' wide x 3' high. |
| 1128' | Dry tributary on the right bank. |
| 1202' | LDA measures 10' long x 9' wide x 4' high and is retaining a volume of gravel measuring 8' long x 9' wide x 4' high. |
| 1220' | Dry tributary on the left bank. LDA measures 10' long x 18' wide x 5' high and is retaining a volume of gravel measuring 20' long x 7' wide x 2' high. |
| 1526' | LDA measures 35' long x 10' wide x 4' high. |
| 1632' | LDA measures 25' long x 11' wide x 5' high. |
| 1658' | 7" long steelhead/rainbow trout observed. |
| 1683' | LDA measures 45' long x 12' wide x 5' high. |

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1817' Dry tributary on the left bank.

1992' LDA measures 20' long x 15' wide x 6' high.

2042' LDA measures 35' long x 15' wide x 7' high. End of survey.