# 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 the Little Van Duzen River, a tributary to the Van Duzen River, a tributary to the Eel River, which drains to the Pacific Ocean. It is located in Humboldt County, California. Bear Creek's legal description at the confluence with the Little Van Duzen River is T01S R05E S27. Its location is 40.3511 degrees north latitude and 123.6000 degrees west longitude. Bear Creek is a first order stream and has approximately 1.7 miles of blue line stream, according to the USGS Black Lassic 7.5 minute quadrangle. Bear Creek drains a watershed of approximately 1.7 square miles. Elevations range from about 1,600 feet at the mouth of the creek to 4,400 feet in the headwater areas. Grassland, oak woodland, and Douglas fir forest dominate the watershed. The watershed is primarily owned by Six Rivers National Forest, Mad River Ranger District, and is managed for multiple uses. Vehicle access exists from State Highway 36 to the Mad River Ranger District. From here, take Forest Service Road 511 to Black Lassic, then take jeep road 1S07 to the Little Van Duzen River along Blanket Creek.

## 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) 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, 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 Little Van Duzen River 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. One site was electrofished in Bear Creek using a Smith Root Model 12 electrofisher. The site was end-blocked with nets to contain the fish within the sample reach. Fish from the 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. This program processes and summarizes the data, and produces the following six 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 October 26, 1992 was conducted by John Crittenden and Shea Monroe (CCC). The total length of the stream surveyed was 5,671 feet.

Flow was not measured on Bear Creek.

Bear Creek is a B1 channel type for the first 1,820 feet of stream reach surveyed (Reach 1), then it changes to an A2 channel for the remaining 3,851 feet of the survey (Reach 2). B1 channels are moderate gradient (2.5-4.0%), moderately confined streams, with stable stream banks. A2 channels are steep (4-10% gradient), very well confined streams, with stable stream banks.

Water temperatures ranged from 51 to 55 degrees Fahrenheit. Air temperatures ranged from 56 to 60 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent occurrence, riffles made up 42%, pools 34%, and flatwater 18% (Graph 1). Riffle habitat types made up 37% of the total survey length, flatwater 16%, and pools 5%. At the time of the survey, 42% of the length of the channel was dry (Graph 2).

Seven Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent occurrence were mid-channel pools, 26%; low gradient riffles, 24%; and high gradient riffles, 18% (Graph 3). By percent total length, low gradient riffles made up 26%, step runs 13%, and high gradient riffles 11%.

Thirteen pools were identified (Table 3). Main channel pools were most often encountered at 77%, and comprised 80% 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. Ten of the 13 pools (77%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 13 pool tail-outs measured, six had a value of 2 (46%); five had a value of 3 (39%); and two had a value of 4 (15%). 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 37. Flatwater habitats followed with a rating of 31, and pools rated 16 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 27. Main channel pools had a mean shelter rating of 13 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Bear Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. 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 eight of the nine low gradient riffles (89%). Large cobble was the next most frequently observed dominant substrate type, and occurred in 11% of the low gradient riffles (Graph 8).

Fifty-seven percent of the survey reach lacked shade canopy. Of the 43% of the stream covered with canopy, 27% was composed of deciduous trees, and 73% was composed of coniferous trees. Graph 9 describes the canopy in Bear 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 19%. The mean percent left bank vegetated was 19%. The dominant elements composing the structure of the stream banks consisted of 65% cobble/gravel, 31% boulders, and 3% bedrock. Additionally, 1% of the banks were covered with deciduous trees, including downed trees, logs, and root wads (Graph 10).

## BIOLOGICAL INVENTORY RESULTS

One site was electrofished on October 27, 1992 in Bear Creek. The unit was sampled by John Crittenden and Shea Monroe (CCC). All measurements are fork lengths unless noted otherwise.

The site sampled included Habitat Units #004 through #008, a riffle/pool sequence, approximately 498 feet from the confluence with the Little Van Duzen River. This site had an area of 2,572 square feet, and a volume of 1,215 cubic feet. The unit yielded 22 steelhead/rainbow trout, ranging from 55mm to 123mm long.

## DISCUSSION

A2 channel types are 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 gravels 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. This seems to be the case in Bear Creek, but any structure sites must be selected with care because of the high stream energy which can create problems with stream bank erosion and structure stability.

The B1 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 1,820 feet of this type of channel in Bear Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume

and pool cover.

The water temperatures recorded on the survey day October 26, 1992 ranged from 51 to 55 degrees Fahrenheit. Air temperatures ranged from 56 to 60 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 need to be conducted.

Riffle habitat types comprised 37% of the total length of this survey, flatwater 16%, and pools 5%. The pools are relatively shallow with only three of the 13 pools having a maximum depth greater than two 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.

Seven of the 13 pool tail-outs measured had embeddedness ratings of 3 or 4. None had an embeddedness rating 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 low with a rating of 16. The shelter rating in the flatwater habitats was better at 31. However, a pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders in all habitat types. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

Eight of the nine low gradient riffles had gravel as the dominant substrate. This is considered good for spawning salmonids.

The mean percent canopy for the stream was 43%. This is a relatively low 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) 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) 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.

4) 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.

5) Increase the canopy on Bear Creek by planting willow, alder, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

6) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Fish passage should be monitored, and improved if needed.

## 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 the Little Van Duzen River. Reach 1 is a B1 channel type. |
| 666' | The next 70' length of channel has a series of small log debris accumulations (LDAs). |
| 1820' | Channel type changes from a B1 to an A2 (Reach 2). |
| 2109' | Young-of-the-year (YOY) and 1+ steelhead observed. |
| 2226' | 3' high plunge. |
| 2786' | LDA measures 50' wide x 20' long x 5' high. |
| 3232' | LDA measures 35' wide x 5' long x 4' high and is retaining gravel. |
| 5671' | Channel narrows and gradient increases to 15% or greater. No YOY, but one large steelhead/rainbow trout observed. End of survey reach. |

**Bear Creek**

LEVEL III and LEVEL IV HABITAT TYPE KEY:

| HABITAT TYPE | LETTER | NUMBER |
|---|---|---|
| **RIFFLE** | | |
| Low Gradient Riffle | [LGR] | 1.1 |
| High Gradient Riffle | [HGR] | 1.2 |
| **CASCADE** | | |
| Cascade | [CAS] | 2.1 |
| Bedrock Sheet | [BRS] | 2.2 |
| **FLATWATER** | | |
| Pocket Water | [POW] | 3.1 |
| Glide | [GLD] | 3.2 |
| Run | [RUN] | 3.3 |
| Step Run | [SRN] | 3.4 |
| Edgewater | [EDW] | 3.5 |
| **MAIN CHANNEL POOLS** | | |
| Trench Pool | [TRP] | 4.1 |
| Mid-Channel Pool | [MCP] | 4.2 |
| Channel Confluence Pool | [CCP] | 4.3 |
| Step Pool | [STP] | 4.4 |
| **SCOUR POOLS** | | |
| Corner Pool | [CRP] | 5.1 |
| Lateral Scour Pool - Log Enhanced | [LSL] | 5.2 |
| Lateral Scour Pool - Root Wad Enhanced | [LSR] | 5.3 |
| Lateral Scour Pool - Bedrock Formed | [LSBk] | 5.4 |
| Lateral Scour Pool - Boulder Formed | [LSBo] | 5.5 |
| Plunge Pool | [PLP] | 5.6 |
| **BACKWATER POOLS** | | |
| Secondary Channel Pool | [SCP] | 6.1 |
| Backwater Pool - Boulder Formed | [BPB] | 6.2 |
| Backwater Pool - Root Wad Formed | [BPR] | 6.3 |
| Backwater Pool - Log Formed | [BPL] | 6.4 |
| Dammed Pool | [DPL] | 6.5 |