STREAM INVENTORY REPORT

Bear Canyon Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Bear Canyon Creek and 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. 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 Canyon 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 Canyon Creek is a tributary to the South Fork Eel River, a tributary to the Eel River, which drains to the Pacific Ocean. It is located in Humboldt County, California. Bear Canyon Creek's legal description at the confluence with the South Fork Eel River is T04S R03E S24. Its location is 40.1069 degrees north latitude and 123.7664 degrees west longitude. Bear Canyon Creek is a second order stream and has approximately 3.3 miles of blue line stream, according to the USGS Garberville 7.5 minute quadrangle. Bear Canyon Creek drains a watershed of approximately 3.4 square miles. Elevations range from about 300 feet at the mouth of the creek to 2,000 feet in the headwater areas. Grassland, oak woodland, and Douglas fir forest dominate the watershed. The watershed is privately owned and is subdivided for residential use and ranching. Vehicle access exists from U.S. Highway 101 at Garberville via Redwood Drive, to Bear Canyon Road.

METHODS

The habitat inventory conducted in Bear Canyon Creek and South Fork Bear Canyon 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 Canyon 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 Canyon Creek and South Fork Bear Canyon Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows should also be measured or estimated at major tributary confluences.

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 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 taken and recorded at 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". Bear Canyon Creek and South Fork Bear Canyon 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. Pool tail crest depth at each pool unit was measured in 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 Bear Canyon Creek and South Fork Bear Canyon 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 Bear Canyon Creek and South Fork Bear Canyon 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 Bear Canyon Creek and South Fork Bear Canyon Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

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 Bear Canyon Creek and South Fork Bear Canyon 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 Bear Canyon Creek to document the fish species composition and distribution. Four sites were electrofished in Bear Canyon 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 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 Bear Canyon Creek and South Fork Bear Canyon 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 FOR BEAR CANYON CREEK

The habitat inventory of July 14 through July 16, 1992 was conducted by Chris Coyle and Craig Mesman (CCC). The total length of the stream surveyed was 6,716 feet, with an additional 91 feet of side channel.

Flow was not measured on Bear Canyon Creek.

Bear Canyon Creek is a B4 channel type for the entire 6,716 feet of stream reach surveyed. B4 channels are moderate gradient (1.5- 4.0%), well confined streams, with gravel beds.

Water temperatures ranged from 62 to 81 degrees Fahrenheit. Air temperatures ranged from 65 to 92 degrees Fahrenheit.

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Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent occurrence, pools made up 36%, riffles 32%, and flatwater 31% (Graph 1). Flatwater habitat types made up 39% of the total survey length, riffles 30%, and pools 31% (Graph 2).

Fourteen 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, 32%; mid-channel pools, 22%; and step runs, 18% (Graph 3). By percent total length, low gradient riffles made up 30%, step runs 28%, and mid-channel pools 14%.

Seventy-five pools were identified (Table 3). Main channel pools were most often encountered at 64%, and comprised 64% 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. Sixty-eight of the 75 pools (91%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 73 pool tail-outs measured, one had a value of 1 (1%); six had a value of 2 (8%); 38 had a value of 3 (52%); and 28 had a value of 4 (38%). 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 22. Flatwater habitats followed with a rating of 18 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 47. Scour pools had a mean shelter rating of 21. Main channel pools had a mean shelter rating of 21 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Bear Canyon Creek and are extensive. All other cover types are lacking in nearly all habitat types. Graph 7 describes the pool cover in Bear Canyon Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 59 of the 68 low gradient riffles (87%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 12% of the low gradient riffles (Graph 8).

Thirty percent of the survey reach lacked shade canopy. Of the 70% of the stream covered with canopy, 92% was composed of deciduous trees, and 8% was composed of coniferous trees. Graph 9 describes the canopy in Bear Canyon 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 68%. The mean percent left bank vegetated was 71%. The dominant elements composing the structure of the stream banks consisted of 35% brush, 19% bedrock, 12% grass, 5% boulders, 5% bare soil, and 3% cobble/gravel,. Additionally, 21% of the banks were covered with deciduous trees, and 1% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

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BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished on July 17, 1992 in Bear Canyon Creek. The units were sampled by Chris Coyle and Craig Mesman (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was Habitat Unit #015, a bedrock formed lateral scour pool, approximately 617 feet from the confluence with the South Fork Eel River. This site had an area of 448 square feet, and a volume of 269 cubic feet. The unit yielded three steelhead/rainbow trout, ranging from 58mm to 76mm long, and six coho salmon, ranging from 59mm to 70mm long.

The second site was Habitat Units #018 and #019, a mid-channel pool and a step run, located immediately above the Highway 101 culvert, 1,222 feet upstream from the creek mouth. This site had an area of 3,491 square feet, and a volume of 1,746 cubic feet. Seven steelhead/rainbow were sampled. They ranged from 63mm to 143mm long.

The third site sampled was Habitat Unit #136, a mid-channel pool, located approximately 4,892 feet above the creek mouth. The site had an area of 406 square feet, and a volume of 5,287 cubic feet. The site yielded one steelhead/rainbow trout 150mm long, and eight coho salmon ranging from 64mm to 72mm long.

The fourth site sampled was Habitat Units #196 through #198, a combination low gradient riffle, run, and mid-channel pool. Located approximately 206 feet from the survey's end, this site had an area of 306 square feet and a volume of 68 cubic feet. No fish were found.

DISCUSSION

The B4 channel type is generally not suitable for fish habitat improvement structures. B4 channels are found in moderate energy, moderate gradient stream reaches. They have channels dominated by gravel and have very unstable stream banks.

The water temperatures recorded on the survey days July 14 through July 16, 1992 ranged from 62 to 81 degrees Fahrenheit. Air temperatures ranged from 65 to 92 degrees Fahrenheit. This is a poor water temperature regime for salmonids. If sustained, these temperatures are above the threshold stress level for salmonids. 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 39% of the total length of this survey, riffles 30%, and pools 31%. The pools are relatively shallow with only seven of the 75 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 conflict with the unstable stream banks of the B4 channel type.

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Sixty-six of the 73 pool tail-outs measured had embeddedness ratings of 3 or 4. Only one 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 Canyon 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 22. The shelter rating in the flatwater habitats was slightly lower at 18. 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. Large and small woody debris are lacking throughout the survey reach. 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.

Sixty-seven of the 68 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 70%. This is a relatively 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 Canyon Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Bear Canyon Creek, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) 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.

4) 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.

5) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, like the site at 6,037', should then be treated to reduce the amount of fine sediments entering the stream.

6) 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.

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 South Fork Eel River. From the mouth of the creek through unit two, a wide floodplain exists. Channel type is B4 for the entire survey reach.
122'	Culvert in stream channel, no dimensions were measured.
423'	Channel type done.
460'	Old Highway 101 bridge. Young-of-the-year salmonids (YOY) observed.
744'	Highway 101 culvert measures 13' wide x 11' high x 605'.
1222'	Broad, shallow series of pools/runs caused by baffles in culvert.
1343'	Portion of old culvert, 6' x 8', impinging water flow.
2476'	Ravine enters from left bank.
2583'	Terraced right bank measures 8' high and is contributing fine sediment to the channel.
2842'	High voltage lines crossing stream.
2935'	Left bank erosion site measures 20' high x 50' long and is contributing fine sediment to the channel.
3329'	Partially revegetated debris slide on right bank measures 50' high x 50' wide and is contributing some fine sediment to the channel.
3381'	Mid-channel log/boulder cluster causing left bank overflow through Habitat Units #080, #081, and #082. Small backwater pool on left bank.
3461'	Point bar measures 40' long x 15' wide in middle of unit.
3789'	Bear Canyon Creek forks, South Fork Bear Canyon Creek habitat typed separately.
4233'	Left bank scour measures 15' high x 30' wide and is eroding soft sandstone. YOY observed.

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4913' Boulders blocking channel and causing gravel retention: 2' x 10' at base.

5615' Right bank scour measures 15' high x 25' long and is contributing fine sediment to the channel.

5842' Large ravine entering from right bank.

6037' Log debris accumulation measures 8' high x 25' wide x 30' long and is retaining gravel measuring 6' x 15' at base. Left bank slide measures 50' long x 100' high and is contributing fine sediment to the channel. Debris slide is probably impassible as well as being the source of fine sediment encountered in downstream units.

6771' End of survey. No fish observed since large woody debris accumulation downstream.

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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