STREAM INVENTORY REPORT

GRIZZLY CREEK, 1991

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Grizzly 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 Grizzly 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 in Grizzly Creek from 1990 through 1992. The December 24, 1990 survey found no fish, carcasses, or redds, at least in part because of ice sheets on the pools. Another survey January 9, 1991, after the ice had melted, also failed to observe any fish. No surveys were conducted in early winter 1991 due to low flows. However, in March 1992, 10 redds were observed in the lower 13,705' of the stream. In a summer 1991 sample, the Department of Fish and Game electrofished steelhead fry in the creek (see Results below). 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

Grizzly Creek is tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California (Figure 1). Grizzly Creek's legal description at the confluence with the Van Duzen River is T01N R02E S12. Its location is 40°29'10" N. latitude and 123°54'18" W. longitude. Grizzly Creek is a third order stream. The total length of blue line stream, according to the USGS Bridgeville, Redcrest, Owl Creek and Yager Junction quadrangles, is 4.7 miles.

Grizzly Creek drains a watershed of approximately 18.4 square miles. Elevations range from about 360 feet at the mouth of the creek to 3,000 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned primarily by the Pacific Lumber Company and it is managed for timber production. Humboldt Redwoods State Park owns the lower section

of the basin and it is managed for recreation. Vehicle and foot access exist via a private road through Grizzly Creek State Park from State Highway 36, approximately seventeen miles east of Alton and the Highway 101 junction.

METHODS

The habitat inventory conducted in Grizzly 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). Grizzly Creek personnel were trained in May, 1991, 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 Grizzly 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 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 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". Grizzly 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 Grizzly 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 Grizzly 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 Grizzly 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 Grizzly 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 Grizzly Creek to document the fish species composition and distribution. Three sites were electrofished using one Smith Root Model 12 electrofisher. Each unit 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. All lengths are fork length unless otherwise noted.

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 Grizzly 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 June 11-14, and 17-18, 1991, was conducted by Shea Monroe and Steve Liebhardt (CCC). The total length of the stream surveyed was 12,962 feet, with an additional 614 feet of side channel.

Flows were not measured on Grizzly Creek.

Grizzly Creek is a C2 channel type for the first 2,022 feet from the confluence with the Van Duzen River, then it changes to a B2 channel type for the next 9,494 feet, then it changes to a B3 channel type for the remaining 1,446 feet of the stream reach surveyed. C2 channels are low gradient (< 1%), well confined streams, with stable stream banks. B2 channels are moderate gradient (1.0-2.5%), moderately confined streams, with stable banks. B3 channels are moderate gradient (1.5-4.0%), well confined, and have unstable banks.

Water temperatures ranged from 44 to 58 degrees Fahrenheit. Air temperatures ranged from 46 to 68 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 37.2%; flatwater types were 33.8%; and pools 29.1% (Graph 1). Flatwater habitat types made up 41.2% of the total survey **length**, riffles were 39.7%, and pools 19.1% (Graph 2).

Fifteen 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, 32.9%; runs, 18.0%; and step runs, 14.1% (Graph 3). By percent total **length**, low gradient riffles made up 37.2%, runs 16.0%, and step runs 22.4%.

Sixty-eight pools were identified (Table 3). Main-channel pools were most often encountered at 60.3%, and comprised 62.1% 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. Nineteen of the 68 pools (27.2%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 56 pool tail-outs measured, 2 had a value of 1 (3.6%); 24 had a value of 2 (42.9%); 29 had a value of 3 (51.8%); and 1 had a value of 4 (1.8%). 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 56. Flatwater habitats followed with a rating of 38.5 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 135.0, scour pools had a rating of 64, and main channel pools rated 47.2 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Grizzly Creek. Large woody debris is the next most prevalent habitat type. Graph 7 describes the pool cover in Grizzly Creek.

Table 6 summarizes the dominant substrate by habitat type. Boulders were the dominant substrate observed in 31 of the 77 low gradient riffles (40.3%). Gravel was the next most frequently observed dominant substrate type, and occurred in 35.1% of the low gradient riffles (Graph 8).

Fifty percent of the survey reach lacked shade canopy. Of the 50% of the stream covered with canopy, 79% was composed of deciduous trees, and 21% was composed of coniferous trees. Graph 9 describes the canopy in Grizzly 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 78.6%. The mean percent left bank vegetated was 69.7%. The dominant elements composing the structure of the stream banks

consisted of 15.0% bedrock, 7.3% boulder, 12.4% cobble/gravel, 0.9% bare soil, 5.1% grass, 6.4% brush. Additionally, 44.4% of the banks were covered with deciduous trees, and 8.5% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished Aug. 20-21, 1991 in Grizzly Creek. The units were sampled by Craig Mesman and Jay Miller (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 004, a mid-channel pool, approximately 493 feet from the confluence with the Van Duzen River. This site had an area of 684 sq ft, and a volume of 616 cubic feet. The sample included 103 steelhead, ranging from 31 to 159mm FL, and one Pacific lamprey ammocete, 61mm total length.

The second sample unit was habitat unit 031, a bedrock formed - lateral scour pool, located approximately 2,779 feet above the creek mouth. This site had an area of 1,120 sq ft, and a volume of 2,240 cu ft. The sample included 43 steelhead, ranging from 37 to 182mm FL; 2 sculpin, ranging from 101 to 109mm FL; and 6 Pacific lamprey ammocetes, ranging from 92 to 135mm total length.

The third unit sampled was habitat unit 082, a mid-channel pool, located approximately 5,736 feet above the creek mouth. The site had an area of 286 sq ft, and a volume of 257 cu ft. The sample included 38 steelhead, ranging from 40 to 143mm FL, and one
Pacific lamprey ammocete, 81mm total length.

DISCUSSION

Grizzly Creek has three channel types: C2, B2, and B3. The upper 1,446' of the survey reach is a B3 channel. B3 channels are moderate gradient, cobble/gravel streams with unstable stream banks. They are generally not suitable for instream enhancement structures. The lower 2,022 feet of Grizzly Creek is a C2 channel type. There is also a 9,494' reach of B2 channel in the middle section of Grizzly Creek. Both B2 and C2 channels have 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 these channel types.

The water temperatures recorded on the survey days June 11-18, 1991 ranged from 44° F to 58° F. Air temperatures ranged from 46° F to 68° 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.

Flatwater habitat types comprised 41.2% of the total **length** of this survey, riffles 39.7%, and pools 19.1%. The pools are relatively shallow with only 19 of the 68 pools (27.9%) having a maximum depth greater than 3 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 of the 56 pool tail-outs measured had embeddedness ratings of 3 or 4. Only two had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Grizzly 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 56. The shelter rating in the flatwater habitats was slightly lower at 43.6. However, 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, large and small woody debris contribute a small amount. Log and 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.

Thirty-one of the 77 low gradient riffles had boulders as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean percent canopy for the stream was 50%. This is a relatively low 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) Grizzly 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) There are several log debris accumulations present on Grizzly 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.

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 11,586', 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.

7) Increase the canopy on Grizzly Creek by planting willow, alder, redwood, 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.

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. Reach #1 is a C2 channel type.

455'	Highway 36 bridge.
1952'	Long step runs with short riffles 20 - 30' long.
1995'	Tributary enters from the right bank.
2022'	Channel type B2 begins (reach #2).
2656'	Stevens Creek enters Grizzly Creek from right bank.
4023'	Right bank (RB) bedrock 60' high x 150' long.
4688'	YOY, 1+ and larger 2+ salmonids observed.
5375'	CCC flag site # 5 (9-11-86), spring on LB.
6895'	LB Bedrock 20' high x 60' long.
7241'	Unstable broken slate on LB producing a 3 - 4 % gradient for 20 feet of the channel.
7379'	Log debris accumulation (LDA) on LB 10' high x 30' long.
7674'	CCC flag site # 8 (9-12-86), small spring on RB.
7702'	RB stabilization 10' high x 50' long.
8661'	Spring/tributary enters LB.
8816'	CCC flag site # 10 (11-9-86).
8952'	Small slide 15' x 20' on LB.
8983'	RB tree slide, old log crossing 30' above stream.
9041'	RB slide with old log crossing.
9301'	Tributary enters LB.
9564'	30' x 50' bridge 10' above stream.
10139'	LDA in channel.
10280'	Tributary enters RB.
11320'	LB slide 10' high x 30' long; LDA 6' high x 15' long, retaining gravel 3' deep x 15' long x 15' wide.
11370'	LB slide 100' long x 25' high, re-vegetated.

11516' Channel changes to a B3 channel type (reach #3).

11586' RB slide 120' long x 50' high.

11637' LB LDA 50' long x 10' high.

12151' RB slide 90' long x 70' high.

12173' Boulder enhanced LDA 50' long x 4' high and 4 - 5' triple plunges is retaining gravel. LB LDA is 20' wide x 10' high. RB has root wad plunge 4' high x 10' wide x 8' long.

12733' LDA plunge 8' high x 50' wide retaining gravel 2' deep x 15' wide x 15' long.

12962' Massive LDA 70' long x 20' high x 95' wide retaining gravel and sand. Probable barrier.

End of survey.