STREAM INVENTORY REPORT

ELK CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Elk 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 Elk 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.

Adult carcass surveys were conducted in Elk Creek from 1987 through 1990. In December 1987, 15 chinook carcasses, 10 males and 5 females, were found. One of the carcasses had a coded wire tag (CWT). In 1988 two surveys were conducted, one in February 1988 no fish were found. In December 1988 one chinook was recovered. On January 23, 1990 three females and three males were found. Of those six, two were fresh and one of the carcasses had a coded wire tag. On February 9, 1990 one fish was found. 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

Elk Creek is tributary to the South Fork Eel River, tributary to the Eel River, located in Humboldt County, California. Elk Creek's legal description at the confluence with the South Fork Eel River is T2S R3E S21. Its location is 40°16'41" N. latitude and 123°51'11" W. longitude. Elk Creek is a second order stream and has approximately 6.3 miles of blue line stream, according to the USGS Myers Flat 7.5 minute quadrangle. Elk Creek drains a watershed of approximately 6.7 square miles. Elevations range from about 160 feet at the mouth of the creek to 2,000 feet in the headwater areas. Redwood and Douglas fir forest dominate the watershed, with some oak grassland in the upper reaches of the watershed. The vast majority of the watershed is privately owned and is managed as a wilderness area. Vehicle access exists from U.S. Highway 101 to Myers Flat then south on Avenue of the Giants to Elk Creek Road.

METHODS

The habitat inventory conducted in Elk Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The contract seasonals that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Elk Creek personnel were trained in May 1992, by Gary Flosi and Scott Downie. This inventory was conducted by a two person teams.

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 Elk 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 measured 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". Elk 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 Elk 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 Elk 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 Elk 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 Elk 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 Elk Creek to document the fish species composition and distribution. Four sites were electrofished in Elk 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. 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 Elk 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 July 24, 27, 28, 29, 30 and August 4, 5, 6, and 7, 1992, was conducted by Russ Irvin, Judah Sanders, Ed Davis, Craig Mesman and Erick Elliot (CCC and contract seasonals). The total length of the stream surveyed was 18,615 feet, with an additional 449 feet of side channel.

Flows were not measured on Elk Creek.

Elk Creek is an B2 channel type for the entire 18,615 feet of stream reach surveyed. B2 channels have moderate gradients, are moderately confined with stable stream banks.

Water temperatures ranged from 60 to 71 degrees fahrenheit. Air temperatures ranged from 60 to 86 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 37.8%, flatwater types 31.2%, and pools 28.5% (Graph 1). Flatwater habitat types made up 36% of the total survey **length**, riffles 38.6%, and pools 19.5% (Graph 2).

Seventeen 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, 27.4%; step runs, 15.5%; and runs, 14.4% (Graph 3). By percent total **length**, low gradient riffles made up 29%, step runs 24%, and runs 10.8%.

One-hundred-thirty-four pools were identified (Table 3). Scour pools were most often encountered at 80.6%, and comprised 84% 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. Forty-two of the 134 pools (33%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 133 pool tail-outs measured, eight had a value of 1 (5.9%); 53 had a value of 2 (39%); 57 had a value of 3 (44.1%); and 15 had a value of 4 (11%). 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 82.6. Flatwater habitats followed with a rating of 65.8. (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 92.1, and scour pools rated 80.9 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Elk Creek and are extensive. Large and small woody debris are the next two most common cover types. Graph 7 describes the pool cover in Elk Creek.

Table 6 summarizes the dominant substrate by habitat type. Boulders were the dominant substrate observed in 47 of the 129 low gradient riffles (36.4%). Large cobble was the next most frequently observed dominant substrate type, and occurred in 27.1% of the low gradient riffles (Graph 8).

Sixteen percent of the survey reach lacked shade canopy. Of the 84% of the stream covered with canopy, 58.3% was composed of deciduous trees, and 41.2% was composed of coniferous trees. Graph 9 describes the canopy in Elk 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 39.4%. The mean percent left bank vegetated was 38.1%. The dominant elements composing the structure of the stream banks consisted of 1.0% bedrock, 12.0% boulder, 33.7% cobble/gravel, 7.6% bare soil, 24.2% grass, and 3.9% brush. Additionally, 11.4% of the banks were covered with deciduous trees, and 6.3% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Four sites were electrofished on August 27, 1992 in Elk Creek. The units were sampled by Chris Coyle and John Crittenden (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was between habitat units 157-161 approximately 6795 feet from the confluence with the Eel River. This site had an area of 751 sq ft, and a volume of 644 cu ft. The unit yielded 22 steelhead, ranging from 51 to 133 mm.

The second site was habitat unit 269, a corner pool, located below an instream road crossing approximately 10,595 feet above the creek mouth. This site had an area of 275 sq ft, and a volume of 412 cu ft. Eleven steelhead were sampled. They ranged from 50 to 195 mm.

The third site sampled was habitat unit 275, a step run, located approximately 10,834 feet above the creek mouth. The site had an area of 450 sq ft, and a volume of 180 cu ft. Seventeen steelhead were sampled, ranging from 43 to 74 mm.

The fourth site was habitat units 366 through 369, approximately 14,479 feet above the creek mouth. The habitat unit types were a mid-channel pool, a run, and a mid-channel pool respectively. The site had an area of 552 sq ft, and a volume of 471 cu ft. Fourteen steelhead were sampled. They ranged from 51 to 115 mm.

DISCUSSION

The B2 channel type is generally suitable for fish habitat improvement structures. B2 channels are found in moderate gradient streams with very stable banks. They have channels dominated by stable large cobble and coarse gravel. Structures suitable for B2 channels are in-channel and bank constrictors, overhead log covers, and submerged shelters.

The water temperatures recorded on the survey days July 24, 27-30 and August 4-7, 1992 ranged from 60° F to 71° F. Air temperatures ranged from 60° F to 86° F. These temperatures, if sustained, are boarding on the threshold stress level for salmonids. 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 36% of the total **length** of this survey, riffles 38.6%, and pools 19.5%. The pools are relatively shallow with 44 of the 134 pools 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.

Seventy-two of the 134 pool tail-outs measured had embeddedness ratings of 3 or 4. Only seven had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Elk 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 generally high with a rating of 82.6. The shelter rating in the flatwater habitats was substantially lower at 65.8. A pool shelter rating of approximately 100 is desirable. The relatively large amount of cover that now exists is being provided primarily by boulders in all habitat types. In addition, large and small woody debris, as well as root mass contributes a good deal of cover.

Eighty-two of the 129 low gradient riffles had boulders or large cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean percent canopy for the stream was 84.5%. This is a high percentage of canopy, since 80 percent 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) Elk Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Elk 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) 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) 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.

5) 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.

6) Spawning gravels on Elk Creek are limited to relatively few reaches. Crowding and/or superimposition of redds have been observed during winter surveys. Projects should be designed at suitable sites to trap and sort spawning gravels in order to expand redd site distribution in the stream.

7) 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.

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 Eel river. For the first 181' the channel is dry.
309'	Avenue of the Giants vehicle bridge 25' above unit. Dimensions of bridge are approximately 125' long by 35' wide.
1534'	Log debris accumulation (LDA) across channel, 35' long by 20' wide by 6' high.
1779'	Left bank erosion 35' long by 15' high. Slide extends into unit #29.
1874'	Exposed soil on left bank 100' long by 125' high contributing fines.
2074'	Large conifer log, retaining large and small woody debris in stream channel 30' long by 9' deep by 7' high.
2318'	Left bank erosion, 30' long by 15' high depositing gravel into stream. Young-of-the-year observed.
2926'	Right bank slope erosion, 30' long by 70' high contributing gravel and fines into channel.

3302'	LDA at the top of the unit, 24' wide by 8.5' high by 10' deep.
3693'	Small woody debris accumulation at top of unit.
3876'	Small vehicle bridge crosses unit. Dimensions of bridge are 20' long by 12' wide by 4' high. YOY observed.
5105'	Water pump on the right bank in the middle of unit. Right bank erosion at top of unit 25' long by 30' high.
5632'	Left bank erosion, 115' long by 38' high contributing gravel and fines. Many YOY observed.
5771'	LDA top of unit 53' wide by 12' deep by 6' high.
5849'	Unit #125 is dry. Gravel and sand retention 49' long by 28' wide by 6' high.
5951'	Right bank slide 75' high by 80' wide contributing gravel.
6141'	Active gravel deposition from right bank 40' long by 30' high. End of slide at the top of unit #137.
6936'	Wooden bridge, 35' long by 14' wide by 13' high, crosses creek between units 161 and 162.
7447'	LDA, 32' long by 5' high by 40' deep. Retaining gravel and cobble.
8823'	Intermittent tributary entering from right bank. Undercut left bank.
10,620'	Left bank erosion contributing gravel into channel.
10,834'	Road near the stream on the right bank.
11,565	Old skid trail on right bank. Left bank erosion 50' long by 25' high contributing boulders, gravel and debris into the stream.
11,892'	LDA on left bank, water flowing underneath.
12,304'	LDA, 25' long by 26' deep by 4' high covers entire unit and portion of next unit. YOY observed.

12,569' Bridge 18' long by 26' wide by 9' high crosses unit.

13,030' Water discharge from water tank on right bank.

14,064' Old cable and other metal debris dumped in creek on right bank.

15,017' Intermittent tributary, currently dry, enters creek from right bank.

15,623' Jeep trail crosses unit.

16,032' Trail crosses creek at top of unit.

16,286' Trail crosses bottom of unit.

17,411' LDA, 5' high by 30 wide by 30' deep retaining gravel upstream 20' long by 9' wide by 3' deep.

17,634' Dry tributary enters from left bank.

17,774' Right bank has active erosion contributing gravel and fines to channel.

18,096 Left bank scoured and contributing sand and larger debris, 80' long by 10' high. YOY observed.

18,615' End of survey due to lack of access permission. This unit was not flagged. This is not the end of the anadromous reach.

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