STREAM INVENTORY REPORT

ELK CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1993 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.

There is no known record of adult spawning surveys having been conducted on Elk Creek. 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 Rattlesnake Creek, tributary to the South Fork Eel River, tributary to the Eel River, located in Mendocino County, California. Elk Creek's legal description at the confluence with Rattlesnake Creek is T23N R16W S23. Its location is 39°49'36" N. latitude and 123°35'32" W. longitude. Elk Creek is a first order stream and has approximately 2.2 miles of blue line stream, according to the USGS Tan Oak Park 7.5 minute quadrangle. Elk Creek drains a watershed of approximately 3.9 square miles. Summer base runoff is approximately 1 cubic foot per second (cfs) at the stream's mouth. Elevations range from about 1,280 feet at the mouth of the creek to 3,200 feet in the headwater areas. Douglas fir and hardwood forest dominates the watershed. The watershed is privately owned and is managed for timber production. Vehicle access exists from U.S. Highway 101, just east of Tan Oak Park.

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 California Conservation Corps (CCC) Technical Advisor and the contract seasonal 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, 1993, 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 Elk Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used see the Rattlesnake 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 Elk Creek to document the fish species composition and distribution. Two 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.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (25.4, 12.5, 4.7, 2.37, and 0.85mm).

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 28-30, and August 9, 1993, was conducted by Warren Mitchell and Ruth Goodfield (contract seasonal and CCC). The total length of the stream surveyed was 12,452 feet, with an additional 109 feet of side channel.

Flow was measured 50 feet above the confluence with Rattlesnake Creek using a Marsh-McBirney Model 2000 flowmeter. The flow was 0.97 cfs on July 30, 1993.

Elk Creek is a B1 channel type for the first 7,261 feet of stream reach surveyed, then it changes to an A3 channel type for the remaining 5,191 feet of the survey. B1 channels are moderate gradient (2.5-4.0%), moderately confined streams, with stable stream banks. A3 channels are steep (4-10% gradient), well confined streams, with unstable stream banks.

Water temperatures ranged from 56 to 72 degrees fahrenheit. Air temperatures ranged from 53 to 82 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 36.0%, pools 34.7%, and flatwater 29.3% (Graph 1). Flatwater habitat types made up 43.2% of the total survey **length**, riffles 29.5%, and pools 27.3% (Graph 2).

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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, 23.1%; step runs, 19.4%; and mid-channel pools, 17.4% (Graph 3). By percent total **length**, step runs made up 36.5%, low gradient riffles 20.4%, and step pools 13.6%.

Eight-four pools were identified (Table 3). Main channel pools were most often encountered at 77.4%, and comprised 87.5% 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-seven of the 84 pools (56%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 60 pool tail-outs measured, zero had a value of 1 (0.0%); 9 had a value of 2 (15.0%); 40 had a value of 3 (66.7%); and 11 had a value of 4 (18.3%). 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 12.4. Pool habitats followed with a rating of 10.8 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 11.9, backwater pools had a rating of 7.5, and scour pools rated 7.3 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Elk Creek. All other cover types are lacking. Graph 7 describes the pool cover in Elk Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 44 of the 56 low gradient riffles (78.6%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 17.9% of the low gradient riffles (Graph 8).

Thirty-eight percent of the survey reach lacked shade canopy. Of the 62% of the stream covered with canopy, 84% was composed of deciduous trees, and 16% 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 61.8%. The mean percent left bank vegetated was 63.3%. The

dominant elements composing the structure of the stream banks consisted of 2.1% bedrock, 0.2% boulder, 3.4% bare soil, 11.9% grass, 3.4% brush. Additionally, 75.0% of the banks were covered with deciduous trees, and 4.0% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on July 30, 1993 in Elk Creek. The units were sampled by Ruth Goodfield and Warren Mitchell (CCC and contract seasonal). All measurements are fork lengths (FL) unless noted otherwise.

The first site sampled was part of habitat unit 114, a step run, approximately 5713 feet from the confluence with Rattlesnake Creek. This site had an area of 225 sq ft, and a volume of 135 cu ft. The unit yielded 24 steelhead, ranging from 36 to 125mm FL. Three passes were performed, for a total effort of 436.

The second site was habitat unit 058, a step run, located approximately 3151 feet above the creek mouth. This site had an area of 330 sq ft, and a volume of 231 cu ft. Fifty steelhead were sampled. They ranged from 34 to 132mm FL. Three passes were performed, for a total effort of 700.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Elk Creek.

DISCUSSION

The surveyed reach of Elk Creek has two channel types: A3 and B1. The high energy and steep gradient of the A3 channel type is generally not suitable for instream enhancement structures. The B1 channel type is excellent for many types of low and medium stage instream enhancement structures. There are 7,261 feet of this type of channel in Elk Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and escape cover.

The water temperatures recorded on the survey days July 28-August 9, 1993 ranged from 56° F to 72° F. Air temperatures ranged from 53° F to 82° F. This is a poor water temperature regime for

salmonids. The warmer water temperatures, if sustained, are above 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 43.2% of the total **length** of this survey, riffles 29.5%, and pools 27.3%. The pools are relatively shallow with only 37 of the 84 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. In first and second order streams a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. 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 or cause stream bank erosion.

Fifty-one of the 60 pool tail-outs measured had embeddedness ratings of 3 or 4. Zero had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. 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 low with a rating of 10.8. The shelter rating in the flatwater habitats was slightly lower at 9.2. 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. All other cover types are lacking. 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.

Fifty-four of the 56 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 62%. This is a relatively 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) 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 bank 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 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)Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Fish passage should be monitored, and improved where possible.

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 Rattlesnake Creek. Reach #1 is a B1 channel type.

135'Highway 101 culvert 11' diameter with baffles.

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725'Right bank earth flow 50' high x 125' long, depositing silt and boulders into the channel at high flows.

739'Old left bank slide 60' high x 200' long; toe being eroded at high flows.

1381'Left bank earth flow 60' high x 80' long, partially revegetated.

1473'Log and debris accumulation (LDA) 40' long x 7' wide x 6' high.

1887'Right bank "blue goo" earth flow 30' high x 100' long.

3077'Left bank "blue goo" slump 10' high x 100' long.

3196'Railroad car bridge crosses the creek.

3256'Small tributary enters from the right bank.

4007'Large chunks of bedrock in the channel retaining gravel 4' high.

4210'Old left bank slide 40' high x 60' long.

5108'Right bank erosion 430' long.

5713'Right bank erosion scour 40' high x 80' long.

6302'Old railroad car bridge 5' above creek.

6672'Fallen madrone from the left bank is retaining woody debris, gravel, and small cobble.

7204'Small tributary (Dorothea Creek) enters from the right bank. Minimal flow, but numerous YOY observed.

7261'Channel type changes to an A3.

7639'Old revegetated earthflow 40' high x 60' long.

7764'Plunge 4' high.

9659'Small tributary enters from the left bank.

9947'Small tributary enters from the left bank.

10252'Right bank slump 15' high x 40' long, contributing fines and bay tree 16" diameter into the channel.

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10350'Right bank erosion 15' high x 30' long.

11873'Plunge 6' high over boulders.

12452'High gradient (35-40%) unit 161' long with massive boulder accumulations. Creek forks. End of anadromy; end of survey.

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