STREAM INVENTORY REPORT

ELDER CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Elder Creek to assess habitat conditions for anadromous salmonids. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Elder Creek. 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 Elder Creek. Researchers from the University of California, and elsewhere, have a long-running and extensive eletrofishing and direct observation record of fish in Elder Creek. Their samples indicate Elder Creek is utilized by steelhead trout. 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

Elder Creek is tributary to the South Fork Eel River, tributary to the Eel River, located in Humboldt County, California. Elder Creek's legal description at the confluence with South Fork Eel River is T22N R16W S29. Its location is 39°43'48" N. latitude and 123°38'51" W. longitude. Elder Creek is a second order stream and has approximately 5.0 miles of blue line stream, according to the USGS Lincoln Ridge and Cahto Peak 7.5 minute quadrangles. Elder Creek drains a watershed of approximately 5.7 square miles. Elevations range from about 1,440 feet at the mouth of the creek to 3,400 feet in the headwater areas. Douglas fir and oak forest dominate the watershed. The watershed is privately owned by the Nature Conservancy and is managed as wilderness sanctuary. It is one of the few undisturbed watersheds in the Eel River system. Vehicle access exists from U.S. Highway 101 at Laytonville via Branscomb Road to Wilderness Lodge Road.

METHODS

The habitat inventory conducted in Elder 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). Elder 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 Elder 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". Elder 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 Elder 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 Elder 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 Elder 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 Elder 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.

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 Elder Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length

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- 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 9, 16 and 17, 1992, was conducted by Warren Mitchell and Judah Sanders (contract seasonals). The total length of the stream surveyed was 8,601 feet, with an additional 249 feet of side channel.

Flows were not measured on Elder Creek.

Elder Creek is an B2 channel type for the entire 8,601 feet of stream reach surveyed. B2 channels are moderate gradient, moderately confined streams, with a predominantly cobble substrate and stable banks.

Water temperatures ranged from 57 to 65 degrees Fahrenheit. Air temperatures ranged from 58 to 88 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, Riffles made up 49.1%, flatwater types 33.6%, and pools 17.3% (Graph 1). Riffle habitat types made up 48.9% of the total survey **length**, flatwater 34.5%, and pools 16.6% (Graph 2).

Ten 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, 26.4%; high gradient riffles, 19.1%; and runs, 17.3% (Graph 3). By percent total **length**, low gradient riffles made up 30.8%, Step runs 23.2%, and high gradient riffles 15.6%.

Nineteen pools were identified (Table 3). Main-channel pools were most often encountered at 78.9%, and comprised 85.6% 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. All nineteen pools had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 16 pool tail-outs measured, none had a value of 1 (0.0%); 4 had a value of 2 (25.0%); 8 had a value of 3 (50.0%); and 4 had a value of 4 (25.0%). 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 49.2. Riffle habitats followed with a rating of 41.9 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 75.0, and main-channel pools rated 47.3 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Elder Creek and are extensive. Graph 7 describes the pool cover in Elder Creek.

Table 6 summarizes the dominant substrate by habitat type. Boulder was the dominant substrate observed in 20 of the 29 low gradient riffles (68.9%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 17.2% of the low gradient riffles (Graph 8).

Twenty-two percent of the survey reach lacked shade canopy. Of the 78% of the stream covered with canopy, 50% was composed of deciduous trees, and 50% was composed of coniferous trees. Graph 9 describes the canopy in Elder 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 17.1%. The mean percent left bank vegetated was 19.0%. The dominant elements composing the structure of the stream banks consisted of 18.2% bedrock, 27.7% boulder, 9.6% cobble/gravel, 12.3% bare soil, 24.5% grass, and 3.6% brush. Additionally, 0.5% of the banks were covered with deciduous trees, and 3.6% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Electrofishing was not necessary in Elder Creek due to the extensive level of research on the stream. Steelhead fry and juveniles were observed during the course of the survey.

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GRAVEL SAMPLING RESULTS

No gravel samples were taken on Elder Creek.

DISCUSSION

The B2 channel type is generally quite suitable for fish habitat

improvement structures. B2 channels are found in moderate gradient, riffle dominated stream reaches. They are of a predominantly boulder substrate, and have stable stream banks. B2 channel types are often suitable for instream structures such as low- and medium-stage plunge weirs and bank cover.

The water temperatures recorded on the survey days June 9-16, 1992 ranged from 57° F to 65° F. Air temperatures ranged from 58° F to 88° F. This is a good water temperature regime for salmonids. However, 65°F, if sustained, is near 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 34.6% of the total **length** of this survey, riffles 48.8%, and pools 16.6%. The pools are relatively deep with all of the 19 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 pool habitat is recommended for locations where their installation will not be threatened by high stream energy.

Twelve of the 16 pool tail-outs measured had embeddedness ratings of 3 or 4. None had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Elder 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 49.2. The shelter rating in the flatwater habitats was lower at 33.5. However, 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. Large and small woody debris contribute only 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.

Twenty of the 29 low gradient riffles had boulder as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean percent canopy for the stream was 78%. This is a relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

RECOMMENDATIONS

1) Elder 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) 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.

5) Spawning gravels on Elder 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.

6) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. 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.

Elder Creek

0'Begin survey at confluence with Eel River. Braided at the mouth. Young-of-the-Year (YOY) observed. Channel type is a B2 for entire length of stream surveyed.

135 Vehicle bridge overhead.

382'Department of Fish and Game temperature site.

564'Road crossing.

1589'Foot bridge overhead. YOY observed.

2857'Plastic manmade dam, water flowing over the tops. YOY observed.

3085' Bedrock sheet interrupted by series of plunge pools.

4163' Nine to ten 4" fish observed.

4687'Channel braided.

6822'9' vertical drop over cascading bedrock ledges. YOY observed.

7683'Few YOY observed since 9' falls.

8248'Small spring on right bank.

8601'End of survey. Few YOY observed due to steep gradient and decrease in YOY population.

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

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Dammed Pool	[DPL]	6.5