STREAM INVENTORY REPORT

STEVENS CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Stevens 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 Stevens 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 Stevens Creek. The objective of this report is to document the current habitat conditions, and recommend options for the enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Stevens Creek is tributary to Grizzly Creek, tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California (Figure 1). Stevens Creek's legal description at the confluence with Grizzly Creek is T1N R2E S01. Its location is 40°29'31" N. latitude and 123 °54'19" W. longitude. Stevens Creek is a first order stream. The total length of blue line stream, according to the USGS Owl Creek, Redcrest, and Yager Junction quadrangles is 2.4 miles.

Stevens Creek drains a watershed of approximately 5.5 square miles. Elevations range from about 500 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 Simpson Timber Company and is managed for timber production. Vehicle access exists from State Highway 36, approximately 17 miles east of Alton and Highway 101, via a private road through Grizzly Creek Redwoods State Park.

METHODS

The habitat inventory conducted in Stevens Creek follows the methodology as presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds). 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). Stevens Creek personnel were trained in May, 1991, by Gary Flosi and Scott Downie. This survey was conducted by a two person crew.

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 Stevens 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 was 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. 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 used 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". Stevens 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 measurements were accomplished 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 Stevens 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 Stevens 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 Stevens Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentages 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 Stevens 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 Stevens Creek to document the salmonid species composition and distribution. Three sites were electrofished in Stevens Creek using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, measured, and returned to the stream.

SUBSTRATE SAMPLING

Gravel sampling is conducted using either a 6 or 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 0.85 mm). During field analysis, fine sediment suspended in the liquid portion of the sample is settled in Imhoff cones for one hour, measured, and recorded on a standard field form. The remainder of the sample is sealed in plastic bags with an identification and information ribbon, then taken to the laboratory for final processing.

In the laboratory the samples are wet sieved using standard Tyler screens. All particles greater than 0.85 mm diameter are measured by displacement in graduated cylinders. The volume of fine sediment less than 0.85 mm is measured following one hour of settling in graduated cylinders or Imhoff cones. The fines measured in the field are added to these results.

Gravel sampling is conducted to determine the percentage of fine sediment present in probable fish spawning areas. These areas are generally found in low gradient riffles, at the tail-out of a pool, in the thalweg. The higher the percent of fine sediment, the lower the probability for eggs to survive to hatch. This is due to the reduced quantity of oxygenated water able to be percolated through the gravel, or because of the fine sediment capping the redd and preventing successful fry emergence.

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 Stevens 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 RESULTS *

The habitat inventory of June 11-14, 1991, was conducted by Erick Elliot and Jay Miller (CCC). The length of stream surveyed was 5,063 feet, with an additional 467 feet of side channel.

No flow measurements were taken on Stevens Creek.
This section of Stevens Creek has three channel types: from the mouth to 3,737 feet a B3; next 932 feet a B2; and the upper 394 feet an A3. B3 channels are moderate gradient (1.5-4.0%), well confined, with unstable slopes and cobble beds. B2 channels are moderate gradient (1.0-2.5%), moderately confined, with stable stream banks. A3 channels are steep (4.0-10% gradient), well confined streams with unstable banks.

Water temperatures ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 55 to 78 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 26.5%, flatwater types were 21.4%, and pools 47.9% (Graph 1). Riffles made up 32.8% of the total **length**, flatwater habitats were 36.6%, and pools 25.9% (Graph 2).

Nineteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were mid-channel pools, 23.9%; low gradient riffles, 22.2%; and step runs, 13.7% (Graph 3). By percent total **length**, step runs made up 31.2%, low gradient riffles were 29.9%, and mid-channel pools 14.1%.

Table 3 summarizes the pool habitat types. Of these pools, 57.1% were main channel pools (Graph 4). These main channel pool types comprised 65.4% of the total length for all pools.

Table 4 (Graph 5) is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. The maximum depth for 32 of the 56 pools (57%) was two feet or deeper. This level indicates a fair quality of pool habitat in Stevens Creek.

The depth of cobble embeddedness was estimated at the pool tail-outs. Of the 53 pool tail-outs, 33 had a value of 1 (62.3%); 10 had a value of 2 (18.9%); 9 had a value of 3 (17.0%); and 1 had a value of 4 (1.9%). On this scale, a one is the best for fisheries. Graph 6 describes embeddedness.

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 types had the highest shelter rating at 69.1 (Table 1). For the pool types, the scour pools had the highest mean shelter rating at 79.2, main channel pools had a mean shelter rating of 64.1, and backwater pools had a rating of 63.0 (Table 3).

Table 5 summarizes percent cover by habitat type. Large woody debris was the dominant cover type in Stevens Creek and comprised 47.4% of the pool cover. Boulders were the next most common cover type and comprised 18.6% of the pool cover (Graph 7).

Table 6 (Graph 8) describes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 57.7% of the low gradient riffles. Large cobble was the next most frequently observed dominant substrate type, and occurred in 26.9% of the 26 low gradient riffles.

Nearly 33% of Stevens Creek lacked shade canopy. Of the 67% of the stream that was covered with canopy, 71% was composed of deciduous trees, and 29% was composed of coniferous trees. Graph 9 describes the canopy in Stevens Creek.

Table 2 summarizes the mean percent of the right and left stream banks covered with vegetation by habitat unit type. For the stream reach surveyed, the mean percent right bank vegetated was 63.3%. The mean percent left bank vegetated was 66.3%. The elements composing the structure of the stream banks consisted of 13.7% bedrock, 2.6% boulder, 6.0% cobble/gravel, 0.9% bare soil, 5.1% grass, and 8.5% brush. Additionally, 41.0% of the banks were composed of deciduous trees, and 22.2% of coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished Aug. 21-22, 1991 on Stevens Creek. The units were sampled by Craig Mesman and Jay Miller (CCC).

The first site sampled was composed of habitat units 011 and 012, a mid-channel pool and a step

pool, approximately 543 feet from the confluence with Grizzly Creek. Habitat units 011 and 012 had a total area of 890.4 sq ft and a total volume of 1148.2 cubic feet. The unit yielded 50 steelhead, ranging from 37 to 135 mm fork length, two coho salmon, 70 and 74 mm fork length, and one roach, 83 mm fork length.

The second site was habitat unit 069, a root wad enhanced lateral scour pool, approximately 3,131 feet from the confluence. Habitat unit 069 had an area of 390 sq ft and a volume of 390 cubic feet. Forty-four steelhead were sampled, ranging from 32 to 153 mm fork length.

The third site was a plunge pool at the base of a 20' high waterfall, approximately 5,263 feet from the confluence and 100' above habitat unit 106. The unit had an area of 130 sq ft and a volume of 260 cubic feet. No fish were found.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Stevens Creek.

DISCUSSION

Stevens Creek has three channel types: A3, B2, and B3. The high energy and steep gradient of the A3 channel type is generally not suitable for instream enhancement structures. B3 channel types are also not suitable for enhancement structures due to their cobble/gravel channels and unstable stream banks.

The B2 channel type is good for many types of low and medium stage instream enhancement structures. There are 932 feet of this channel type in Stevens Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days June 11-14, 1991 ranged from 52° F to 54° F. Air temperatures ranged from 55° F to 78° 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 36.6% of the total **length** of this survey, riffles 32.8%, and pools 25.9%. The pools are relatively deep with 32 of the 56 pools having a maximum depth of two feet or greater. 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, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Ten of the 53 pool tail-outs measured had embeddedness ratings of 3 or 4. Thirty-three had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish

habitat.

The mean shelter rating for flatwater habitats was low with a rating of 24.4. The shelter rating for the pools was better at 69.1. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, boulders contribute a small amount. Log and root wad cover structures in the 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.

Seventeen of the 26 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 67%. This is a relatively high 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) Stevens 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 flatwater habitat units. Most of the existing cover is from large woody debris and boulders. Increasing high quality complexity with additional woody cover is desirable.

4) There are several log debris accumulations present on Stevens 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.

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. The mouth of Stevens Creek is 13' wide and accessible to anadromous fish. Reach #1 is a B3 channel type.

33'	Many steelhead/rainbow trout (SHRB) YOYs observed for the next 300'.
438'	Left bank composed of bedrock 10' high x 40' long.
649'	Log and debris accumulation (LDA) 25' wide x 6' long x 4' high.
663'	Right bank erosion 90' high x 40' long, contributing gravel/cobble into the channel.
726'	LDA 18' wide x 10' long x 8' wide; no barrier.
748'	Old bridge (unusable) 30' high crosses the channel.
810'	2' high plunge.
862'	Right bank erosion 5' high x 20' long, contributing gravel and fines into the channel.
1073'	Many SHRB YOYs observed for the next 210'.
1205'	LDA 12' wide x 16' long x 6' high, retaining gravel and sand.
1283'	Right bank erosion 20' high x 10' long, contributing gravel and fines into the channel.
1477'	Log weir; one foot high plunge.
2152'	LDA 20' wide x 5' long; no barrier.
2195'	Many SHRB YOYs observed for the next 332'.
2386'	LDA 15' wide x 10' high; no barrier.
2706'	Log weir; 2' high plunge.
2756'	Log weir.
2799'	LDA 8' wide x 25' long x 4' high; possible barrier.
2856'	LDA 30' wide x 6' long x 5' high.
3197'	LDA 50' wide x 15' long x 7' high; possible barrier.
3520'	Log weir; 7' high plunge.
3725'	LDA 30' wide x 40' long x 15' high on the side channel.

3737'	Channel type changes from a B3 to a B2 (reach #2). LDA 90' wide x 15' long x 15' high, retaining cobble, gravel, sand, and causing a side channel.
4132'	SHRB YOYs observed for the next 486'.
4238'	Two log weirs form two deep (2.3' mean depth) pools.
4669'	Channel type changes from a B2 to an A3 (reach #3).
4993'	LDA 60' wide x 80' long x 8' high.
5025'	Plunge over bedrock, 3' high. Eight inch fish observed.
5081'	Thirty foot high cascade, with extremely high gradient. Possible end of anadromous fish passage.
5135'	LDA 140' wide x 11' high; possible barrier.
5063'	End of survey. Approximately 100' past this point is a 20' high waterfall.