STREAM INVENTORY REPORT

FISH CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Fish 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 Fish 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 Fish Creek. General surveys were conducted in 1965, 1974, and 1988 by the Department of Fish and Game. Seventeen live steelhead adults and two redds were seen during the April, 1974 surveys. 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

Fish Creek is tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California (Figure 1). Fish Creek's legal description at the confluence with the Van Duzen River is T1N R3E S16. Its location is 40°27'36" latitude and 123°50'36" longitude. Fish Creek is a second order stream. The total length of blue line stream, according to the USGS Bridgeville 7.5 minute quadrangle is 2.1 miles.

Fish Creek drains a watershed of approximately 3.5 square miles. Douglas fir and redwood forest dominates the watershed. The watershed is owned by Simpson Timber Company and other private interests and is managed for timber production. Vehicle access exists from State Highway 36 near Bridgeville, via Golden Gate Drive.

METHODS

The habitat inventory conducted in Fish Creek follows the methodology as presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds). The California

Conservation Corps (CCC), Technical Advisors conducting the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Fish Creek personnel were trained in May and June, 1991, by Gary Flosi and Scott Downie.

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 Fish Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured at the beginning of the stream survey reach using standard flow measuring equipment. The flow is recorded in cubic feet per second of discharge.

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 measured and recorded 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". Fish 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. Depth of the pool tail crest at each pool habitat unit was measured at 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 Fish 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 Fish 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 Fish 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 Fish 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 Fish Creek to document the salmonid species composition and distribution. Three sites were electrofished in Fish 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.

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 Fish 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 August 19 and 20, 1991, was conducted by Shea Monroe and John Crittenden (CCC). The total length of the stream surveyed was 4,652 feet, with an additional 197 feet of side channel.

Fish Creek is an A3 channel type for the entire stream reach surveyed. A3 channels are steep (4-10% gradient), well confined streams, with small boulders, cobble, and gravel comprising the channel.

Water temperatures ranged from 55 to 58 degrees Fahrenheit. Air temperatures ranged from 62 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 10.3%, flatwater types were 41.0%, and pools 47.4% (Graph 1). Flatwater types made up 81.5% of the total survey **length**, riffles were 7.8%, and pools 10.2% (Graph 2).

Eight Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were step runs, 41.0%; and mid-channel pools, 24.4% (Graph 3). By percent total **length**, step runs made up 81.5%, and mid-channel pools made up 5.4%.

Thirty-seven pools were identified (Table 3). Main channel pools were most often encountered at 70.3%, and comprised 80.2% 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. The maximum

depth for 16 of the 37 pools (43.2%) was two feet or deeper (Graph 5).

The depth of cobble embeddedness was estimated at the pool tail-outs. Of the 32 pool tail-outs measured, zero had a value of 1; 10 had a value of 2 (31.3%); 12 had a value of 3 (37.5%); and 10 had a value of 4 (31.3%). 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. Flatwater types had the highest shelter rating at 46.9, and pool types had a rating of 36.0 (Table 1). For the pool types, the scour pools had the highest mean shelter rating at 43.2, and main channel pools had a rating of 32.9 (Table 3).

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

Table 6 (Graph 8) describes the dominant substrate by habitat type. Gravel was the dominant substrate observed in all five of the low gradient riffles (100%), and was dominant in 86% of the total habitat units.

Approximately 21% of Fish Creek lacked shade canopy. Of the 79% of the stream that was covered with canopy, 95.5% was composed of deciduous trees, and 4.5% was composed of coniferous trees. Graph 9 describes the canopy in Fish 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 82.6%. The mean percent left bank vegetated was 63.2%. The dominant elements composing the structure of the stream banks consisted of 12.8% bedrock, 1.3% boulder, 5.1% cobble/gravel, 7.7% bare soil, 14.1% grass, 6.4% brush. Additionally, 52.6% of the banks were covered with deciduous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on Fish Creek. The objective was to identify fish species and distribution. The units were sampled on September 17 and 19, 1991 by Brian Humphrey, Erick Elliot, and Shea Monroe (CCC). Each unit was end-blocked with nets to contain the fish within the sample reach. At each site, fork lengths (FL) were measured and recorded, and the fish returned to the stream.

The first unit sampled was habitat unit 003, a mid-channel pool, approximately 158 feet from the confluence with the Van Duzen River. The site had an area of 119.0 sq ft and a volume of 95.2 cu ft. Six steelhead were sampled. They ranged from 46 to 128 mm FL.

The second unit was habitat unit 032, a step pool, approximately 2297' from the confluence with the Van Duzen River. This site had an area of 256.0 sq ft and a volume of 281.6 cu ft. Eleven steelhead were sampled. They ranged from 49 to 140 mm FL.

The third unit was habitat unit 070, a mid-channel pool, approximately 4614' from the confluence with the Van Duzen River. The unit had an area of 84.0 sq ft and a volume of 117.6 cu ft. No fish were found.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Fish Creek.

DISCUSSION

The A3 channel type is generally not suitable for fish habitat improvement structures. A3 channels are found in high energy, steep gradient stream reaches. They have channels dominated by a coarse-grained substrate, do not retain gravels very well, and have unstable stream banks. Usually within the A3 channel there are zones of lower gradient where structures designed to trap gravels can be constructed. This seems to be the case in Fish Creek, but any structure sites must be selected with care because of the high stream energy which can create problems with stream bank erosion and structure stability.

The water temperatures recorded on the survey days ranged from 55° F to 58° F. Air temperatures ranged from 62° F to 70° 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 81.5% of the total **length** of this survey, riffles 7.8%, and pools 10.2%. The pools are relatively shallow with only 16 of the 37 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 interfere with the unstable stream banks of the A3 channel type.

Twenty-two of the 32 pool tail-outs measured had embeddedness ratings of 3 or 4. Zero had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Fish 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 36.0. The shelter rating in the flatwater habitats was slightly better at 46.9. 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. Additionally, large woody debris contributes 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.

All five of the low gradient riffles had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 79%. 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) Fish Creek should be managed as an anadromous, natural production stream.

2) 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. For example, the mouth is a barrier at summer flows to out migrant salmonids. There is another likely barrier to upstream migrants at 3,116 feet.

3) There are several log debris accumulations present on Fish Creek that are retaining fine sediment. The modification

of these debris accumulations is desirable.

4) 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.

5) 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.

6) 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 the confluence with the Van Duzen River. Channel is dry for the first 25'; probably no barrier at high flows. Channel is an A3 channel type for the entire survey reach.
311'	Bridge crossing with some erosion on the left bank side, depositing fines into the channel.
1008'	Plunge over log, 2' high.
1246'	Plunge over boulder, 2' high.
1262'	Log and debris accumulation (LDA) 15' wide x 8' long x 4' high; possible barrier.
1933'	Right bank erosion 100' high x 40' long, depositing boulders and fines into the channel.
2039'	Plunge over log, 3' high.
2206'	LDA 15' wide x 5' long x 5' high.
2404'	Plunge over two logs, 5' high.
2662'	Right bank erosion 100' high x 200' long.

2899' Tributary enters from the left bank.

3116' Right bank erosion, depositing fines and root wads into the channel. Double step plunge, 3-4' high, possible barrier. No YOY salmonids observed beyond this point.

3168' Steep slopes on the right bank, depositing fines and gravel into the channel.

3485' Left bank erosion 100' high x 200' long, depositing gravel into the channel.

3812' Left bank erosion 80' high x 80' long, depositing fines into the channel.

4091' Left and right bank erosion 100' high x 150' long, depositing fines into the channel.

4554' Plunge over boulder, 3' high.

4652' Channel forks. Gradient in excess of 20%. No fish observed in last 1,536 feet.

End of survey.