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.

An adult carcass survey was conducted on Fish Creek in January 1992. Neither live salmonids nor their carcasses were observed during this survey. However, in late February, 1992 one adult female steelhead was observed by Greg Moody, Pacific Lumber Company fishery biologist approximately 300 feet above the confluence with Lawrence Creek, and 100 feet above the recently constructed fishway at the Fish Creek's mouth. Additionally, local residents report historical use of this stream by chinook, coho, and steelhead. 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 Lawrence Creek, tributary to Yager Creek, tributary to the Van Duzen River, located in Humboldt County, Calif. (Figure 1). Fish Creek's legal description at the confluence with Lawrence Creek is T3N R2E S19. Its location is 40°37'55" N. latitude and 123° 59'29" W. longitude. Fish Creek is a first order stream. There is 1.0 mile of blue line stream, according to the USGS Iaqua Buttes and Maple Creek 7.5 minute quadrangles.

Fish Creek drains a watershed of approximately 1.9 square miles. Redwood forest dominates the watershed. The watershed is owned by the Pacific Lumber Company and is managed for timber production. Year round vehicle access exists from State Highway 36 near Carlotta, via Fisher Road, to Pacific Lumber Company's Yager Camp. The main Yager-Lawrence Haul Road leads to Road Six and Fish Creek, 10 miles from Yager Camp.

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 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 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.

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 cover by habitat types

Graphics are produced from the tables using Lotus 123. 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 June 4-7, and 10, 1991, was conducted by Shea Monroe, Jay Miller, Erick Elliot, and Brian Humphrey (CCC). The total length of the stream surveyed was 5,626 feet, with an additional 109 feet of side channel.

This section of Fish Creek has four channel types: from the mouth to 1,180 is a C1; next 2,023

feet a B6; next 1,124 feet a B4; and the upper 1299 feet an A2. C1 channels are gentle gradient (1.0-1.5%), slightly confined streams, with cobble/gravel stream beds. B6 streams are narrow and deep, moderate gradient (1.0-4.0%), meandering channels. B4 channels are moderate gradient, well confined streams, with unstable banks. A2 streams have steep (4-10% gradient), very well confined, boulder channels.

Water temperatures ranged from 50 to 52 degrees Fahrenheit. Air temperatures ranged from 60 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 28.7%, flatwater types were 22.3%, and pools 49.0% (Graph 1). Flatwater habitat types made up 35.8% of the total survey **length**, riffles were 30.9%, and pools 33.3% (Graph 2).

Eighteen 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, 25.5%; mid-channel pools, 17.2%; step runs, 13.4%; and step pools, 9.6% (Graph 3). By percent total **length**, low gradient riffles made up 28.1%, step runs made up 26.4%, mid-channel pools made up 10.6%, and step pools made up 10.6%.

Seventy-seven pools were identified (Table 3). Main channel pools were most often encountered at 57.1%, and comprised 65.7% 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. Fifty-two of the 77 pools (67.5%) had a depth of less than two feet (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 74 pool tail-outs measured, 20 had a value of 1 (27.0%); 29 had a value of 2 (39.2%); 25 had a value of 3 (33.8%); and zero had a value of 4 (0.0%). 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. Flatwater habitat types had the highest shelter rating at 83.5, followed by pool habitat types with a shelter rating of 78.9 (Table 1). For the pool types, the scour pools had the highest mean shelter rating at 88.9, backwater pools had a mean shelter rating of 74.0, and main-channel pools had a rating of 73.1 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large and small woody debris are the dominant cover types and are extensive. Graph 7 describes the pool cover in Fish Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 26 of the 40 low gradient riffles (65.0%). Small cobble and large cobble were the next most frequently observed dominant substrate types, and each occurred in 15.0% of the low gradient riffles (Graph 8).

Twenty-seven percent of the survey reach lacked shade canopy. Of the 73% of the stream

covered with canopy, 66% was composed of deciduous trees, and 34% 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 66.9%. The mean percent left bank vegetated was 58.8%. The dominant elements composing the structure of the stream banks consisted of 1.3% bedrock, 4.5% bare soil, 12.8% grass, 13.4% brush. Additionally, 29.2% of the banks were covered with deciduous trees, and 38.8% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three electrofishing sites were sampled on Fish Creek. The units were sampled on August 13, 1991 by Craig Mesman and Jay Miller (CCC). The results are as follows:

The first site sampled was habitat unit 041, a log enhanced lateral scour pool, approximately 946 feet from the confluence

with Lawrence Creek. The site had an area of 350 sq ft and a volume of 595 cu ft. Seventeen steelhead were sampled, ranging from 38 to 124 mm fork length.

The second site was habitat unit 127, a mid-channel pool, approximately 4,848 feet from the confluence with Lawrence Creek. The site had an area of 275 sq ft and a volume of 687.5 cu ft. Eight steelhead were sampled, ranging from 44 to 123 mm fork length.

The third site was a plunge pool, located approximately 5,676 feet from the confluence with Lawrence Creek, and 50 feet upstream from the end of the habitat inventory survey. No fish were found.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Fish Creek.

DISCUSSION

Fish Creek has four channel types: A2, B6, B4, and C1. The high energy and steep gradient of the A2 channel type is generally not suitable for instream enhancement structures. B4 and B6 channel types are unsuitable for instream enhancement structures due to their unstable stream banks. The lower 1,180 feet of Fish Creek is a C1 channel type. C1 channels have suitable gradients and moderately stable stream banks that are appropriate for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective cover for fish. Well placed and engineered structures that constrict the channel to form pool habitat or

cover structures are usually appropriate and have a good chance of success in this channel type.

The water temperatures recorded on the survey days June 4-10, 1991, ranged from 50° F to 52° F. Air temperatures ranged from 60° F to 80° F. This is a very good water temperature regime for salmonids. However, to make any further conclusions, temperatures should be monitored throughout the warm summer months, and more extensive biological sampling conducted.

Flatwater habitat types comprised 35.8% of the total **length** of this survey, riffles 30.9%, and pools 33.3%. The pools are relatively shallow with only 25 of the 77 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 interfere with the unstable stream banks.

Twenty-five of the 74 pool tail-outs measured had embeddedness ratings of 3 or 4. Twenty 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 relatively high with a rating of 78.9. The shelter rating in the flatwater habitats was slightly better at 83.5. A pool shelter rating of approximately 100 is optimum. The cover that now exists is being provided primarily by large and small woody debris, which is desirable.

Thirty-two of the 40 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 73%. 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) Fish Creek should be managed as an anadromous, natural production stream.

2) Where feasible, design and engineer pool enhancement structures to deepen the pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

3) There are several log debris accumulations present on Fish Creek that are retaining fine sediment. The modification of these debris accumulations is desirable over time.

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) Access to Fish Creek is limited due to the braided lower reach of the stream at its confluence with Lawrence Creek. Modification of the channel with a boulder fishway is recommended and is planned for late summer, 1992. (Note: the fishway is complete and passing adults in 1992).

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'	Confluence with Lawrence Creek. Channel is 130' wide, braided, with 8' high plunge. YOY observed. Reach #1 channel type is C1.
93'	Abundant algae for the next 130'.
767'	Left bank erosion 5' high x 33' long, contributing fines, gravel, and cobble into the channel.
821'	Left bank bare soil area 3' high x 33' long, contributing fines into the channel.
946'	Trestle bridge 10' above the channel.
981'	Log bridge 12' wide x 30' long x 4' high.
1014'	Left and right bank erosion, contributing fines and gravel into the channel
1136'	Log and debris accumulation 8' wide x 5' long x 5' high, retaining sand. YOY and 1+ salmonids observed.
1524'	YOY observed.
1180'	Undercut banks contribute to fines and gravel into the channel. Channel changes from a C1 to a B6 channel type (reach #2).
1837'	Left bank erosion 3' high x 20' long, contributing fines, boulder, and cobble into the channel.
1923'	Island of large woody debris and boulders 11' wide x 16' long x 5' high in the channel.
2018'	LDA 12' wide x 140' long x 5' high.

2571'	Left bank undercut 4' high x 25' long.
2800'	Left bank erosion 7' high x 16' long, contributing gravel and boulders into the channel. YOY observed.
2980'	LDA 22' wide x 4' long x 3' high.
3123'	Log bridge 4' wide x 24' long x 4' high.
3184'	Log bridge 4' wide x 40' long x 3' high.
3203'	Many fallen deciduous trees cover the channel. channel changes from a B6 to a B4 channel type (reach #3).
3433'	LDA 30' wide x 20' long x 6' high.
3503'	LDA 15' wide x 20' long x 5' high.
3640'	YOY and 1+ salmonids observed.
4012'	LDA 10' wide x 25' long x 8' high; possible barrier.
4162'	Creek forks. Left fork has LDA 50' upstream; probable end of anadromous fish. Continue to habitat type right fork.
4327'	Channel changes from a B4 to an A2 channel type (reach #4).
4328'	Abundant YOY observed for the next 205'.
4532'	Many fallen logs along the banks for the next 100'.
5095'	Left bank erosion 20' high x 25' long, contributing fines and gravel into the channel.
5143'	Creek forks.
5611'	LDA 30' wide x 23' long x 9' high, creating 9' high waterfall. Possible barrier to anadromous fish.
5626'	End of survey.