STREAM INVENTORY REPORT

Fish Creek

INTRODUCTION

Adult carcass surveys were conducted on Fish Creek by the California Department of Fish and Game (DFG) from 1992 through 1994. The table below describes the results of those surveys:

Fish Creek Carcass Surveys 1992-1994

	Chinook Salmon					Other	
Year	# of Surveys	Live Fish	# of Carcass	Adipose ClipCWT	Redds seen	Coho seen	SH/RT seen
1992	2	2	0	0	1	0	0
1993	1	3	0	0	2	0	0
1994	2	3	0	0	9	0	0

The objective of this report is to document the current habitat conditions in Fish Creek, 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, tributary to the Eel River, located in Humboldt County, California. Fish Creek's legal description at the confluence with Lawrence Creek is T03N R02E S19. Its location is 40°37'55" N. latitude and 123°59'29" W. longitude. Fish Creek is a first order stream and has approximately 1.0 miles of blue line stream according to the USGS Iaqua Buttes 7.5 minute quadrangle. Fish Creek drains a watershed of approximately 1.9 square miles. Summer base flow is approximately 0.5 cubic feet per second (cfs) at the mouth, but over 15 cfs is not unusual during winter storms. Elevations range from about 630 feet at the mouth of the creek to 1,800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned 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 presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps members that conducted 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, 1996, by Scott Downie and Ruth Goodfield. A two-person team conducted this inventory.

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 is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). 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 five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

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 degrees 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". 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 dimensions were measured using hip chains, range finders, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were measured for mean width, mean depth, and maximum depth (*Sampling Levels for Fish Habitat Inventory*, Hopelain, 1995). 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 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). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

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 fully-described 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 fully-described habitat units, dominant and sub-dominant substrate elements were ocularly
estimated using a list of seven size classes and recorded as a one and two respectively.

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 approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results were recorded.

9. Bank Composition and Vegetation:

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 (options 1-4) and the dominant vegetation type (options 5-9) of both the right and left banks for each fully-described unit were selected from 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, or 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 fish species composition and distribution. One site was electrofished in Fish Creek using one Smith-Root Model 12 electrofisher. A single electrofishing pass was made at this site. Fish from the site were counted by species and age class and returned to the stream.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter 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 (*Stream Substrate Quality for Salmonids: Guidelines for Sampling, Processing, and Analysis*, Valentine, 1995).

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat7.2, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, 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 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
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of May 28 to June 6, 1996, was conducted by Kelley Garrett and Paul Oradnik (WSP/AmeriCorps). The total length of the stream surveyed was 8,239 feet with an additional 250 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.8 cfs on June 6, 1996.

Fish Creek is a B4 channel type for the entire 8,239 feet of stream reach surveyed. B4 channels are moderately entrenched, moderate gradient, riffle dominated channels with stable banks and gravel-dominant substrates.

Water temperatures ranged from 48 to 57° Fahrenheit. Air temperatures ranged from 50 to 77° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 45%, flatwater types 30%, and riffles 25% (Graph 1). Flatwater habitat types made up 53% of the total survey **length**, pools 28%, and riffles 19% (Graph 2).

Thirteen Level IV habitat types were identified. These data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 24%; runs, 23%; and main channel pools, 23% (Graph 3). By percent total **length**, runs made up 43%, low gradient riffles 18%, and mid-channel pools 16%.

One hundred twenty-four pools were identified (Table 3). Main channel pools were most often encountered at 52% and comprised 58% 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. Thirty-two of the 124 pools (26%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 124 pool tail-outs measured, 44 had a value of 1 (35%); 39 had a value of 2 (31%); 11 had a value of 3 (9%); and one had a value of 4 (1%). On this scale, a value of 1 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. Riffle habitats followed with a rating of 25 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 77, and scour pools rated 49 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Fish Creek. Small woody debris is also found in nearly all habitat types. 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 47 of the 67 low gradient riffles measured (70%). Small cobble was the next most

frequently observed dominant substrate type and occurred in 25% of the low gradient riffles (Graph 8).

The mean percent canopy for the stream reach surveyed was 89%. The mean percentages of deciduous and coniferous trees were 52% and 48%, respectively. Graph 9 describes the canopy in Fish Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 95%. The mean percent left bank vegetated was 93%. The dominant elements composing the structure of the stream banks consisted of 0.1% bedrock, 3.8% boulder, 43.7% cobble/gravel, and 52.0% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 12% of the units surveyed. Additionally, 34.6% of the units surveyed had deciduous trees as the dominant vegetation type, and 52.5% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on June 28, 1996, in Fish Creek. The units were sampled by Craig Mesman and Andrew MacMillan (CCC).

The site sampled was habitat unit 0035-0037, a riffle/run/pool sequence approximately 1,319 feet from the confluence with Lawrence Creek. This site had an area of 760 sq ft and a volume of 580 cu ft. The unit yielded 18 young-of-the-year (YOY) steelhead rainbow trout and four pacific giant salamanders.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Fish Creek.

DISCUSSION

Fish Creek is a B4 channel type for the entire 8,239 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is excellent for low-stage plunge weirs, boulder clusters, and bank-placed boulders; and good for medium-stage plunge weirs.

The water temperatures recorded on the survey days May 28 to June 6, 1996, ranged from 48 to 57° Fahrenheit. Air temperatures ranged from 50 to 77° Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 53% of the total **length** of this survey, riffles 19%, and pools 28.%. The pools are relatively shallow, with only 32 of the 124 pools having a maximum depth greater than 2 feet. 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. 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.

LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

Twelve of the 124 pool tail-outs measured had embeddedness ratings of 3 or 4. Forty-four 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.

The mean shelter rating for pools was low with a rating of 49. The shelter rating in the flatwater habitats was slightly lower at 24. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by large and small woody debris in all habitat types. Additionally, undercut banks contribute 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.

Sixty-four of the 67 low gradient riffles measured 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 89%. This is a relatively high percentage of canopy, since 80 percent is generally considered optimum in these north coast streams.

The percentage of right and left bank covered with vegetation was high at 95% and 93%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, 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 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) There are several log debris accumulations present on Fish 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 distances are approximate and measured from the beginning of the survey reach.

0'	Begin survey at confluence with Lawrence Creek. Channel type is a B4 for the entire 8239' of stream surveyed.
32'	Fish-way in stream channel. Appears to be in working condition.
107'	Young-of-the-year (YOY) salmonids observed from the streambanks by the surveyors.
1013'	Old wooden bridge spans the stream.
1087'	Another old wooden bridges spans stream.

1319' Bioinventory site of June 28, 1996. Eighteen YOY steelhead rainbow trout were identified.

1370' CCC flag #1370.

1420' V-shaped log weir in channel.

1643' CCC bank protection project.

1993' Tributary enters from left bank (LB).

3365' Large debris accumulation (LDA) in stream channel, approximately 8' long x 6' wide x 8' high. Does not appear to be a barrier to migrating salmonids.

3608' LDA in stream channel; 25' long x 15' wide x 7' high. Not a barrier to salmonids.

3924' LDA in stream channel; 30' long x 20' wide x 6' high. Not a barrier to salmonids.

4401' Small failure (20' long x 20' high), contributing material directly into the stream channel.

4544' Small tributary enters from right bank (RB).

4601' Dry tributary enters from RB.

5148' Slope failure on LB; approximately 30' long x 50' high. Contributing material to the stream.

5498' Slope failure on LB; 30' long x 30' high. Contributing gravel and fines to the stream.

5525' Tributary enters from RB.

5944' LDA in channel; 40' long x 30' wide x 6' high. Not a fish barrier.

6140' LDA in channel; 25' long x 20' wide x 12' high. Not a barrier to fish.

6256' Failure on LB; 30' long x 25' high. Contributing fines to the stream.

6837' YOY salmonids observed from the streambanks by surveyors.

8239' Stream forks into two much smaller channels. Right bank tributary has a corrugated metal pipe (CMP); 30'

long by 2' diameter in channel. 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