STREAM INVENTORY REPORT

SHIVELY CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1992 on Shively 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 Shively 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 Shively Creek. 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

Shively Creek is tributary to the Eel River, located in Humboldt County, California. Shively Creek's legal description at the confluence with the Eel River is T1S R2E S29. Its location is 40° 26'36" N. latitude and 123°58'43" W. longitude. Shively Creek is a second order stream and has approximately 4.1 miles of blue line stream, according to the USGS Redcrest 7.5 minute quadrangle. Shively Creek drains a watershed of approximately 3.6 square miles. Elevations range from about 120 feet at the mouth of the creek to 1,200 feet in the headwater areas. Redwood forest dominates the watershed. The lower watershed is privately owned and is managed for residential use and agriculture. The upper watershed is owned by the Pacific Lumber Company and is managed for timber production. Vehicle access exists from U.S. Highway 101 via Shively Road.

METHODS

The habitat inventory conducted in Shively 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). Shively Creek personnel were trained in May, 1992, by Gary Flosi and Scott Downie. This inventory was conducted by two

person teams.

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 Shively 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". Shively 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 Shively 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 Shively 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 Shively 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 Shively 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.

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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 Shively Creek to document the fish species composition and distribution. Three sites were electrofished in Shively Creek using one Smith Root Model 12 electrofisher. Each site was end-blocked with nets to contain the fish within the sample reach. 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. 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 Shively 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

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HABITAT INVENTORY RESULTS

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

The habitat inventory of September 14, 23, 24, 27, 28, and 30, 1992, was conducted by Michelle Rose, Warren Mitchell, Russ Irvin, and John Cleckler (contract seasonals). The total length of the stream surveyed was 13,858 feet. The stream was not surveyed between 2,718 feet and 3,965 feet from the mouth due to excessive brush cover.

Flows were not measured on Shively Creek.

Shively Creek is a C1 channel type for the entire 13,858 feet of stream reach surveyed. C1 channels have a gentle gradient (1.0-1.5%), with cobble bed meandering channels and developed flood plains.

Water temperatures ranged from 55 to 67 degrees fahrenheit. Air temperatures ranged from 61 to 77 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, flatwater made up 39.6%, pools 36.9%, and riffles 20.9% (Graph 1). Flatwater habitat types made up 49.4% of the total survey **length**, pools 16.6%, and riffles 12.4%. The channel was dry for 21.6% of the survey length (Graph 2).

Sixteen Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were step runs, 24.1%; low gradient riffles, 20.9%; mid-channel pools, 16.6%; and runs, 14.4% (Graph 3). By percent total **length**, step runs made up 33.9%, runs 15.1%, low gradient riffles 12.4%, and mid-channel pools 8.1%.

Sixty-nine pools were identified (Table 3). Main channel pools were most often encountered at 47.8%, and comprised 52.1% 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 69 pools (46%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 56 pool tail-outs measured, zero had a value of 1 (0.0%); 13 had a value of 2 (23.2%); 35 had a value of 3 (62.5%); and 8 had a value of 4 (14.3%). 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 69.9. Flatwater habitats followed with a rating of 56.4 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 74.5, backwater pools had a rating of 68.8, and main channel pools rated 65.6 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Shively Creek and are extensive. Large and small woody debris are the next most common cover types. Graph 7 describes the pool cover in Shively Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 17 of the 39 low gradient riffles (43.6%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 23.1% of the low gradient riffles (Graph 8).

Thirty-four percent of the survey reach lacked shade canopy. Of the 66% of the stream covered with canopy, 69% was composed of deciduous trees, and 31% was composed of coniferous trees. Graph 9 describes the canopy in Shively 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 49.4%. The mean percent left bank vegetated was 47.8%. The dominant elements composing the structure of the stream banks consisted of 0.8% bedrock, 0.3% boulder, 26.5% cobble/gravel, 36.9% bare soil, 4.9% grass, 12.8% brush. Additionally, 8.5% of the banks were covered with deciduous trees, and 9.3% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on October 1, 1992 in Shively Creek. The units were sampled by Michelle Rose and John Cleckler (contract seasonals). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat unit 104, a run, located approximately 10,193 feet above the creek mouth. This site had an area of 662 sq ft, and a volume of 265 cu ft. Twelve steelhead were sampled. They ranged from 55 to 155mm FL.

The second site was habitat unit 167, a log enhanced lateral scour pool, approximately 13,443 feet from the confluence with the Eel River. This site had an area of 230 sq ft, and a volume of 161 cu ft. The unit yielded five steelhead, ranging from 47 to 70mm FL.

The third site sampled was a step run, located approximately 15,405 feet above the creek mouth. No fish were found.

DISCUSSION

The C1 channel type is generally suitable for fish habitat improvement structures. The stream banks are moderately stable, therefore structures such as bank placed boulders or opposing wing deflectors are most appropriate.

The water temperatures recorded on the survey days September 14-30, 1992 ranged from 55° F to 67° F. Air temperatures ranged from 61° F to 77° F. This is a fair water temperature regime for salmonids. However, 67° F, if sustained, is above 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 49.4% of the total **length** of this survey, riffles 12.4%, and pools 16.6%. The pools are relatively shallow with 32 of the 69 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 or deepen pool habitat is recommended.

Forty-three of the 46 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 Shively 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 69.9. The shelter rating in the flatwater habitats was lower at 56.4. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by undercut banks in all habitat types. Additionally, large and small woody debris contribute a moderate amount.

Twenty-six of the 39 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 66%. 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) Shively Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Shively Creek, as well as upstream, should be monitored to determine if they are having a deleterious effect upon juvenile salmonids. To achieve this, biological sampling is also required.

3) The culverts at 5855' and 6514' from the confluence may restrict fish passage during some flows. Fish passage into and through the culverts should be monitored to determine if modifications to the culverts are desirable.

4) 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.

5) There are at least two sections where the stream is being impacted from cattle trampling the riparian zone, and defecating in the water. Alternatives should be explored with the grazier, and developed if possible.

6) There are several log debris accumulations present on Shively 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 at confluence with the Eel River.

1803' Log and debris accumulation (LDA) 15' wide x 3' long x 4' high retaining silt.

2361' Old wire fence in the creek retaining small woody debris (SWD), sand, and gravel.

2591' Blackberry bushes are completely covering the creek, retaining abundant SWD. Creek is muddy; no fish observed.

2718' Channel was not habitat typed for the next 1247' due to heavy brush cover (blackberry bushes) within the channel. Stagnant, muddy pools were observed with no fish in them. Left bank pasture with 40 head of cattle which utilize the creek.

3043' Tributary enters from the right bank.

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3903' Panther Creek enters from the right bank.

3965' Habitat typing resumes.

5331' Railroad trestle bridge 25' high x 80' long x 20' wide.

5855' Creek flows through 60' long culvert, creating plunge 6' high.

6514' Culvert 7' diameter x 30' long. Both ends of the culvert are covered by blackberry bushes.

6770' Old cattle fence in the channel retaining SWD.

7107' Cattle fence crosses the channel.

7358' Bridge crossing 6' high x 7' wide x 16' long.

7502' Left bank retaining wall 20' long.

7899' Cattle fence crosses the channel.

8166' Railroad bridge 8' high x 12' wide x 45' long.

9993' Bridge crossing 8' high x 20' wide x 40' long.

10131' Concrete/steel bridge crosses the channel.

10851' First young-of-the-year (YOY) steelhead/rainbow trout observed.

10928' LDA consisting of approximately 10 large logs, retaining gravel 22' long x 11' wide x 2' high; not a barrier.

11360' LDA obstructing the channel and retaining gravel 17' wide x 60' long.

11826' LDA 5' high x 16' wide x 3' long.

11982' LDA retaining cobble and gravel.

13443' Electrofishing site.

13572' Old culvert material lying in the channel.

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13659' Stream flows through 6' diameter culvert.

14061' LDA 15' wide x 13' long x 7' high retaining gravel.

14531' LDA retaining silt/gravel, obstructing stream flow, and creating a braided channel.

14664' LDA 5' high x 17' wide x 20' long, retaining gravel 25' long, and creating sub-surface flow.

15105' LDA 15' high completely covers the channel, retaining silt/gravel 15' high. Stream channel has been sharply diverted to the right bank. 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