STREAM INVENTORY REPORT

STANDLEY CREEK

INTRODUCTION

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

Adult carcass surveys were conducted in Standley Creek in January 1988, and January 1990. The two surveys yielded a total of one live chinook, 15 fresh chinook carcasses, and 13 non-fresh chinook carcasses. 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

Standley Creek is tributary to the South Fork Eel River, tributary to the Eel River, located in Mendocino County, California. Standley Creek's legal description at the confluence with the South Fork Eel River is T24N R18W S01. Its location is 39°57'37" N. latitude and 123°47'37" W. longitude. Standley Creek is a first order stream and has approximately 4.1 miles of blue line stream, according to the USGS Piercy 7.5 minute quadrangle. Standley Creek drains a watershed of approximately 7.2 square miles. Elevations range from about 560 feet at the mouth of the creek to 1,200 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is owned by the Georgia-Pacific Corporation and is managed for timber production. Vehicle access exists from U.S. Highway 101 at Piercy, via Highway 271, and then by crossing the South Fork Eel River on foot at the mouth of Standley Creek.

METHODS

The habitat inventory conducted in Standley Creek follows the methodology presented in the California Salmonid Stream Habitat

Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) Technical Advisors and contract seasonals that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Standley Creek personnel were trained in May, 1992, by Gary Flosi and Scott Downie. This inventory was conducted by a two person team.

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 Standley 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 taken 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". Standley 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 Standley 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 Standley 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 Standley 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 Standley 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 Standley Creek to document the fish species composition and distribution. Three sites were electrofished in Standley 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 (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 Standley 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
- Fish species by fork lengths

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 28, 29, and August 5, 6, 10, and 11, 1992 was conducted by Shea Monroe, Jason Cleckler, Erick Elliot, and Russ Irvin (CCC and contract seasonals). The data for Standley Creek and North Fork Standley Creek were combined for the data analysis. The total length of the stream surveyed was 16,389 feet of Standley Creek and 296 feet of the North Fork Standley Creek, with an additional 415 feet of side channel.

Flows were not measured on Standley Creek.

Standley Creek is a B2 channel type for the first 1,429 feet of stream reach surveyed, then it changes to a B1 channel type for the next 477 feet, then it changes back to a B2 channel type for the remaining 14,779 feet of stream reach surveyed. B1 channels are moderate gradient (2.5-4.0%), moderately confined boulder/cobble streams. B2 channels are moderate gradient (1.0-2.5%), moderately confined, cobble/gravel channels.

Water temperatures ranged from 61 to 68 degrees fahrenheit. Air temperatures ranged from 65 to 91 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 35.3%, riffles 32.1%, and flatwater 30.8% (Graph 1). Riffle habitat types made up 38.3% of the total survey **length**, flatwater 37.3%, and pools 23.1% (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 low gradient riffles, 29.9%; mid-channel pools, 15.6%; and step runs, 14.7% (Graph 3). By percent total **length**, low gradient riffles made up 36.3%, step runs 24.4%, and mid-channel pools 10.0%.

Seventy-nine pools were identified (Table 3). Scour pools were

most often encountered at 52.2%, and comprised 50.1% 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. Seventy of the 79 pools (89%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 74 pool tail-outs measured, 9 had a value of 1 (12.2%); 39 had a value of 2 (52.7%); 26 had a value of 3 (35.1%); 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. Pool habitat types had the highest shelter rating at 46.5. Flatwater habitats followed with a rating of 22.8 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 67.5, scour pools had a rating of 47.8, and main channel pools rated 44.1 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Small cobble was the dominant substrate observed in 34 of the 67 low gradient riffles (50.7%). Gravel was the next most frequently observed dominant substrate type, and occurred in 26.9% of the low gradient riffles (Graph 8).

Thirty-seven percent of the survey reach lacked shade canopy. Of the 63% 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 Standley 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 42.4%. The mean percent left bank vegetated was 37.5%. The dominant elements composing the structure of the stream banks consisted of 27.9% bedrock, 9.8% boulder, 14.3% cobble/gravel, 8.5% bare soil, 3.8% grass, 3.8% brush. Additionally, 23.4% of the banks were covered with deciduous trees, and 8.5% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on July 30, and August 7, 1992 in Standley Creek. The units were sampled by Erick Elliot, Shea Monroe, and Jason Cleckler, (CCC and contract seasonal). All measurements are fork lengths unless noted otherwise.

The first site sampled was a combination lateral scour pool/low gradient riffle/run. The site was approximately 50 feet long, and was located in the headwaters of the creek. The unit yielded 2 steelhead/rainbow trout, 137 and 163 mm FL.

The second site was a step pool/run, approximately 50 feet long. The unit yielded 29 steelhead, 43 to 116 mm FL.

The third site sampled was habitat unit 007, a mid-channel pool, located approximately 775 feet above the creek mouth. The site had an area of 336 sq ft, and a volume of 403 cu ft. The site yielded 6 steelhead, ranging from 58 to 135 mm FL, and 14 coho salmon, ranging from 59 to 76 mm FL.

DISCUSSION

The surveyed reach of Standley Creek has two channel types: B1 and B2. Both of these channel types are excellent for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within these channel types, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days July 28-August 11, 1992 ranged from 61° F to 68° F. Air temperatures ranged from 65° F to 91° F. This is a good water temperature regime for salmonids. However, 68° F, if sustained, is near 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.

Riffle habitat types comprised 38.3% of the total **length** of this survey, flatwater 37.3%, and pools 23.1%. The pools are relatively deep with 70 of the 79 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 for locations where their installation will not conflict with the modification of the numerous log debris

accumulations (LDA's) in the stream.

Twenty-six of the 74 pool tail-outs measured had embeddedness ratings of 3 or 4. Nine had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Standley 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 46.5. The shelter rating in the flatwater habitats was lower at 22.8. However, a pool shelter rating of approximately 100 is desirable. The 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.

Fifty-two of the 67 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 63%. 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) Standley 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 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.

4) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield. Identified sites, like the one at 14,454', should

then be treated to reduce the amount of fine sediments entering the stream.

5) Increase the canopy on Standley Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

7) There are several log debris accumulations present on Standley 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 South Fork Eel River. Reach #1 is a B2 channel type.
1429'	Channel type changes from a B2 to a B1 (reach #2).
1721'	Young-of-the-year (YOY) and three 1+ coho observed.
1906'	Channel type changes from a B1 to a B2 (reach #3).
3757'	Tributary enters from the left bank.
8666'	Large root wad and log retaining gravel 20' long x 10' wide x 3' high.
8835'	Log and debris accumulation (LDA) 70' wide x 70' long x 20' high, retaining gravel 60' wide x 500' long x 12' high. LDA is being caused by a narrow canyon, and is a possible barrier to anadromous fish.
9454'	Tributary enters from the right bank. YOY observed in

this tributary up to the first LDA.

10522' Tributary enters from the left bank.

10708' LDA 34' wide x 38' long x 11' high.

11393' LDA 44' wide x 32' long x 7' high, diverting flow into the left bank and retaining gravel 220' long.

12429' Tributary enters from the left bank.

12973' Left bank erosion 45' high x 35' long, contributing fines into the channel.

13263' Tributary enters from the right bank.

13283' Tributary enters from the right bank at a high gradient. No fish observed in this tributary.

14044' Left bank erosion 65' high x 50' long, contributing fines into the channel.

14274' LDA 19' wide x 15' long x 6' high; no apparent barrier.

14353' Right bank erosion 120' high x 45' long, contributing silt and gravel into the channel.

14411' YOY and 1+ salmonids observed.

14454' Right bank erosion 300' high x 125' long, contributing large amounts of silt and gravel into the channel. LDA 20' wide x 45' long x 9' high; no apparent barrier.

15232' Left bank erosion 35' high x 20' long.

15481' LDA 31' wide x 28' long x 6' high; possible low flow barrier.

16243' LDA 45' wide x 10' long x 9' high.

16389' End formal survey of Standley Creek. North Fork Standley Creek enters from the left bank, and survey is continued on this fork. Main stem Standley Creek was walked for an additional 1/4 to 1/2 mile upstream. Fish were observed until a series of LDAs at the end of this informal survey.

0' Begin survey of North Fork Standley Creek at the confluence with Standley Creek.

23' Left bank cut 8' high x 60' long, contributing silt at high flows. YOY observed.

223' Right bank erosion 3' high x 50' long.

296' End of formal habitat survey due to lack of time. However, survey crew walked the creek for an additional 2594' and observed the following landmarks.

320' LDA 30' wide x 15' long x 6' high.

447' LDA 22' wide x 25' long x 6' high, retaining gravel 18' wide x 33' long x 3' high. No apparent barrier.

580' Small LDA 13' wide x 10' long x 4' high, retaining gravel 25' long. No apparent barrier.

1032' LDA 30' wide x 25' long x 9' high, retaining gravel 8' wide x 50' long x 3' high. Possible barrier at low flows. Right bank erosion 25' high x 30' long, contributing gravel and silt into the channel.

1219' Left bank erosion 15' high x 30' long, contributing fines into the channel. Right bank erosion 20' high x 25' long.

1315' Right bank slide 25' high x 45' long, contributing abundant silt and gravel into the channel.

1375' LDA 20' wide x 28' long x 5' high, retaining gravel 20' long x 2' high.

1505' Log bridge crossing.

2890' Multiple LDAs 15' wide x 80' long x 5' high, with gravel retention. Not a barrier, but could use some modification to ease fish passage. Fish observed above this point. 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