STREAM INVENTORY REPORT

Soda Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1993 on Soda 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 Soda 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 Soda Creek. Random pools electrofished in October of 1988 by the Department of Fish and Game found steelhead and coho salmon present. 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

Soda Creek is tributary to the Daugherty Creek, tributary to South Fork Big River, located in Mendocino County, California. Soda Creek's legal description at the confluence with Daugherty Creek is T16N R14W S29. Its location is 39°12'49" N. latitude and 123°26'29" W. longitude. Soda Creek is a first order stream and has approximately 1.8 miles of blue line stream, according to the USGS Baily Ridge 7.5 minute quadrangle. Soda Creek drains a watershed of approximately 1.8 square miles. Elevations range from about 550 feet at the mouth of the creek to 1,400 feet in the headwater areas. Mixed conifer forest dominate the watershed. The watershed is owned by the Louisiana-Pacific Corporation and is managed for timber production. Vehicle access exists via Masonite Road.

METHODS

The habitat inventory conducted in Soda Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Soda Creek personnel were trained in June, 1993, by Gary Flosi and Scott Downie. This inventory was conducted by a 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 Soda Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used see the Daugherty Creek Report.

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 Soda Creek to document the fish species composition and distribution. Three sites were electrofished in Soda 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 Soda 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

The habitat inventory of August 9-11, 1993, was conducted by Brian Humphrey, and Charlie Patton (CCC). The total length of the stream surveyed was 8,379 feet, with an additional 26 feet of side channel.

Flows were not measured on Soda Creek.

Soda Creek is a B1-1 channel type for the first 8,088 feet, then a B3 channel type for the remaining 291 feet of the stream survey. B1-1 types are moderate gradient (1.5-4.0%), bedrock controlled channels. B3 types, like the B1-1, are moderate gradient but have unstable stream banks that are highly prone to migration and erosion.

Water temperatures ranged from 62 to 65 degrees fahrenheit. Air temperatures ranged from 71 to 88 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 36.9%, flatwater types 31.5%, and pools 31.2% (Graph 1). Flatwater habitat types made up 43.9% of the total survey **length**, riffles 37.5%, and pools 18.5% (Graph 2).

Thirteen 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, 33.9%; step runs, 19.2%; and mid-channel pools, 11.9% (Graph 3). By percent total **length**, low gradient riffles made up 35.2%, step runs 33.9%, and mid-channel pools 6.6%.

Eighty-one pools were identified (Table 3). Main channel pools were most often encountered at 45.7%, and comprised 47.2% 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. Sixteen of the 81 pools (20%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 75 pool tail-outs measured, four had a value of 1 (5.4%); 16 had a value of 2 (21.6%); 31 had a value of 3 (40.6%); and 24 had a value of 4 (32.4%). 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 21.4. Flatwater habitats followed with a rating of 13.35 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 24.7, and scour pools rated 18.6 (Table 3).

Soda Creek

Table 5 summarizes mean percent cover by habitat type. Boulders and undercut banks are the dominant cover type in Soda Creek. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Soda Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 50 of the 88 low gradient riffles (57%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 38.6% of the low gradient riffles (Graph 8).

Twenty-one percent of the survey reach lacked shade canopy. Of the 79% of the stream covered with canopy, 14.5% was composed of deciduous trees, and 85.5% was composed of coniferous trees. Graph 9 describes the canopy in Soda 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 66.8%. The mean percent left bank vegetated was 69.7%. The dominant elements composing the structure of the stream banks consisted of 6.7% bedrock, 9.8% bare soil, 10.8% grass, and 12.9% brush. Additionally, 2.3% of the banks were covered with deciduous trees, and 57.5% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished on August 25, 1993 in Soda Creek. The units were sampled by Craig Mesman and Charles Patton (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat units 6 and 7, a low gradient riffle and mid-channel pool, approximately 150 feet from the confluence with Daugherty Creek. This site had an area of 1580 sq ft, and a volume of 652 cu ft. The unit yielded 10 steelhead, ranging from 48 to 84mm; six coho ranging from 63 to 77mm; 12 sculpin and two stickleback.

The second site was habitat units 171 and 172, a low gradient riffle and mid-channel pool, located approximately 5520 feet above the creek mouth. This site had an area of 300 sq ft, and a volume of 142 cu ft. Thirteen steelhead were sampled. They ranged from 46 to 127mm.

The third site sampled was habitat unit 174 and 175, a low gradient riffle and mid-channel pool, located approximately 5655 feet above the creek mouth. The site had an area of 474 sq ft, and a volume of 316 cu ft. Seven steelhead were sampled, ranging from 49 to 127mm.

DISCUSSION

The surveyed reach of Soda Creek has two channel types; B1-1 and B3. B3 channels are generally not suitable for instream enhancement structures due to their unstable stream banks. B1-1 channels are excellent for many instream structures, including log and/or root wad cover structures, boulder placement, and opposing deflectors in straight reaches.

The water temperatures recorded on the survey days August 9-11, 1993 ranged from 62° F to 65° F. Air temperatures ranged from 71° F to 88° F. This water temperature regime, 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.

Flatwater habitat types comprised 43.9% of the total **length** of this survey, riffles 37.5%, and pools 18.5%. The pools are relatively shallow with only 16 of the 81 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. 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. 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 where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The 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.

Fifty-five of the 75 pool tail-outs measured had embeddedness ratings of 3 or 4. 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. In Soda 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 low with a rating of 21.4. The shelter rating in the flatwater habitats was 13.4. 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 and undercut banks in all habitat types. Additionally, large and small woody debris 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.

Eighty-four of the 88 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 79%. 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.

Soda Creek

RECOMMENDATIONS

1) Soda Creek should be managed as an anadromous, natural production stream.

2) Temperatures in this section of Soda 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) 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.

4) 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.

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 and undercut banks. Adding high quality complexity with woody cover is desirable and in some areas the material is at hand.

7) There are several log debris accumulations present on Soda 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.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Comments:
0'	Begin survey at confluence with Daugherty Creek. Channel type is B1.
209'	Cascade through a bedrock gorge approximately 20% gradient.
293'	Bridge crossing, 20' long x 11' high x 20' wide.
468'	Right bank erosion 20' high x 40' long.
558'	Left bank erosion 20' high x 40' long.

Soda Creek

921'	Right bank erosion 20' high x 50' long.
994'	Log debris accumulation (LDA) 25' long x 15' wide x 6' high.
1284'	Tributary enters from the right bank. Not accessible to anadromous fish.
2191'	Left bank erosion contributing fines into the channel.
2264'	LDA, 6' high x 10' long x 20' wide.
2319'	LDA, 15' high x 15' long x 15' wide.
2775'	LDA, 20' wide x 7' high x 20' long retaining gravel 3.5' high.
3157'	LDA, 30' wide x 20' long x 8' high.
3917'	Left bank erosion 50' high x 60' wide, contributing fines into the channel.
4128'	Dry tributary entering from the right bank.
4272'	LDA, 30' long x 20' wide x 6' high.
4307'	Left bank erosion 30' long x 30' high, contributing fines into the channel.
4875'	Road crossing.
4927'	Tributary entering from the right bank. Not accessible to anadromous fish.
5655'	LDA, 30' wide x 10' long x 6' high, possible barrier.
6080'	LDA, 18' wide x 8' long x 6' high, retaining gravel 4' high.
7010'	LDA, 16' long x 6' high x 10' wide, retaining gravel.
7551'	Right bank erosion 8' high x 30' long.
7830'	Tributary enters from the right bank.
8088'	Channel type changes from a B1-1 to a B3.
8236'	Right bank erosion 50' high x 35' long contributing fines into the channel.
8302'	Erosion on both banks with trees and debris in the channel.
8379'	End of habitat typing survey. No fish were observed past LDA 5655'. An informal survey of Soda Creek was conducted for additional 1/4 mile upstream;

surveyors noted a rapid increase in gradient, several large LDA's, and a dewatered stream channel above road crossing.

Soda Creek

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