STREAM INVENTORY REPORT

STRONGS CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1993 on Strongs Creek to assess habitat conditions for anadromous salmonids. The survey began at the confluence with North Fork Strongs Creek. 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 Strongs 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 Strongs 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

Strongs Creek is tributary to the Eel River, located in Humboldt County, California. Strongs Creek's legal description at the confluence with the Eel River is T2N R1W S3. Its location is 40° 35'29" N. latitude and 124°09'39" W. longitude. Strongs Creek is a second order stream and has approximately 5.6 miles of blue line stream, according to the USGS Fortuna, Hydesville, and McWhinney Creek 7.5 minute quadrangles. Strongs Creek drains a watershed of approximately 10.0 square miles. Summer base runoff is approximately 0.41 cfs at the mouth. Elevations range from about 30 feet at the mouth of the creek to 1,400 feet in the headwater areas. Redwood forests dominate the watershed. The watershed is privately owned and is managed for rangeland and timber production. Vehicle access exists via Highway 101 to Sandy Prairie Road.

METHODS

The habitat inventory conducted in Strongs 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). Strongs Creek personnel were trained in June, 1993, 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 Strongs 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". Strongs 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 Strongs 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 Strongs 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 Strongs 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 Strongs 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 Strongs Creek to document the fish species composition and distribution. Two sites were electrofished in Strongs 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.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard 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 0.85mm).

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 Strongs 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 28 and 29, 1993, was conducted by Chris Coyle and Craig Mesman (CCC). The total length of the stream surveyed was 3,227 feet.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.41 cfs on July 15, 1993.

Strongs Creek is a B3 channel type for the entire 3,227 feet of stream reach surveyed. B3 channels are moderate gradient, (1.5-4.0%), moderately confined streams, with unstable rejuvenating slopes and cobble/ gravel channels.

Water temperatures ranged from 56 to 58 degrees Fahrenheit. Air temperatures ranged from 53 to 64 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, pools made up 46.3%, flatwater types 27.5%, and riffles 26.3% (Graph 1). Pool habitat types made up 44.5% of the total survey **length**, flatwater 31.8%, and rifles 23.7% (Graph 2).

Nine Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were mid-channel pools, 32.5%; low gradient riffles, 26.3%; and runs, 17.5% (Graph 3). By percent total **length**, mid-channel pools made up 29.4%, low gradient riffles, 23.7%, and runs, 16.0%.

Thirty-seven pools were identified (Table 3). Main-channel pools were most often encountered at 75.7 % and comprised 76.6% 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. Twenty-nine of the 37 pools (78%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 35 pool tail-outs measured, none had a value of 1 (0.0%); 5 had a value of 2 (14.0%); 9 had a value of 3 (26.0%); and 21 had a value of 4 (60.0%). 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 51.8. Riffle habitats followed with a rating of 47.6 (Table 1). Of the pool types, the main-channel pools had the highest mean shelter rating at 61.3, and backwater pools rated 35.0 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small and large woody debris are the dominant cover type in Strongs Creek. Boulders also contribute some. Graph 7 describes the pool cover in Strongs Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 6 of the 21 low gradient riffles (28.6%). Small cobble, large cobble,and silt were the next most frequently observed dominant substrate type. Each substrate material occurred in 23.8% of the low gradient riffles (Graph 8).

Ten percent of the survey reach lacked shade canopy. Of the 90% of the stream covered with canopy, 58.3% was composed of deciduous trees, and 41.8% was composed of coniferous trees. Graph 9 describes the canopy in Strongs 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 72.4%. The mean percent left bank vegetated was 71.0%. The dominant elements composing the structure of the stream banks consisted of 6.3% bedrock, 0.6% cobble/gravel, 6.3% bare soil, 6.3% grass, 33.8% brush. Additionally, 13.8% of the banks were covered with deciduous trees, and 33.1% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on July 15, 1993 in Strongs Creek.

The units were sampled by Chris Coyle and Craig Mesman (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled included habitat units 24, 25, 26, and 27, a corner pool, mid-channel pool, low gradient riffle, and mid-channel pool, approximately 871 feet from the confluence with the Eel River. This site had an area of 2,124 sq ft, and a volume of 1,834 cu ft. The unit yielded 3 steelhead, ranging from 78 to 94mm FL and 2 coastal cutthroat trout 152 and 190mm FL.

The second site was habitat unit 41, a run, locate approximately 100 feet upstream from three substantial log debris accumulations (LDA's) and 1,678 feet above the creek mouth. This site had an area of 136 sq ft, and a volume of 81.6 cu ft. One steelhead 85mm FL and one coastal cutthroat trout 160mm FL were sampled.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Strongs Creek.

DISCUSSION

The B3 channel type is generally not suitable for fish habitat improvement structures. B3 channels, although moderate gradient, are composed of unconsolidated cobble and gravel substrate that is prone to erosion and lateral migration.

The water temperatures recorded on the survey days June 28 and 29, 1993 ranged from 56° F to 58° F. Air temperatures ranged from 53° F to 64° F. This is a very good water temperature regime for salmonids. However, 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 31.8% of the total **length** of this survey, riffles 23.7%, and pools 44.5%. The pools are relatively deep with 29 of the 37 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. Therefore, installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not threaten unstable stream banks, 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 gravels. Any necessary modifications to them should be done with the intent of metering the gravels 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.

Thirty of the 35 pool tail-outs measured had embeddedness ratings of 3 or 4. None 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 Strongs 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 low with a rating of 51.8. The shelter rating in the flatwater habitats was lower at 33.6. However, a pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by small and large woody debris in all habitat types. Additionally, boulders and root wads 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.

Eleven of the 21 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 90%. This is a 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) Strongs Creek should be managed as an anadromous, natural production stream.

2) There are several log debris accumulations present on Strongs 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.

3) 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.

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) Inventory and map sources of stream bank erosion, and prioritize them according to present and potential sediment yield and then treated to reduce the amount of fine sediments entering the stream.

6) Spawning gravels on Strongs Creek are limited to relatively few reaches. Crowding and/or superimposition of redds have been observed during winter surveys. Projects should be designed at suitable sites to trap and sort spawning gravels in order to expand redd site distribution in the stream.

7) 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.

8) Increase the canopy on Strongs 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.

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 North Fork Strongs Creek. Mouth of creek is heavily silted and severely degraded from cattle. Channel type is a B3.
312'	Cattle crossing.
519'	Entering PALCO property.

790' Channel becomes very confined and clogged by large and small woody debris. Left bank erosion 5' high 30' long.

1414' Small log debris accumulation (LDA) in channel. Not a barrier.

1678' LDA 190' long x 30' wide x 13' high blocking channel.

1841' LDA 5' high x 20' wide x 15' long, retaining silt but no gravel.

1926' LDA 11' high x 30' wide x 80' long, retaining silt.

2182' LDA 10' high x 20' wide x 90' long, retaining 130' of silt and gravel. Right bank slide 70' long x 60' high, contributing fines and woody debris.

2558' LDA 5' high x 15' wide x 20' long. Tributary entering from left bank.

2643' LDA 8' high x 30' wide x 80' long, retaining fines.

3041' LDA 10' high x 30' wide x 50' long, retaining 3' high x 15' wide.

3227' Channel is 100% silted in. 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