STREAM INVENTORY REPORT

LITTLE SOUTH FORK ELK RIVER

INTRODUCTION

A stream inventory was conducted during the summer of 1994 on Little South Fork Elk River 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 Little South Fork Elk River. 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 spawning surveys having been conducted on Little South Fork Elk River. 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

Little South Fork Elk River is tributary to the South Fork Elk River, tributary to the Elk River, tributary to Humboldt Bay, located in Humboldt County, California. Little South Fork Elk River's legal description at the confluence with South Fork Elk River is T03N R01E S05. Its location is 40°40'24" North latitude and 124°05'46" West longitude. Little South Fork Elk River is a first order stream and has approximately 2.2 miles of blue line stream according to the USGS McWhinney Creek 7.5 minute quadrangle. Little South Fork Elk River drains a watershed of approximately 3.5 square miles. Summer base runoff is approximately 0.6 cubic feet per second (cfs) at the mouth. Elevations range from about 200 feet at the mouth of the creek to 1800 feet in the headwater areas. Redwood and fir forest dominates the watershed. The watershed is privately owned and is managed for timber production. Foot access is available from Elk River Road approximately 9 miles east from U.S. Highway 101 by crossing the South Fork Elk River to the mouth of Little South Fork Elk River.

METHODS

The habitat inventory conducted in Little South Fork Elk River follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991 rev. 1994). 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). Little South Fork Elk River personnel were trained in June, 1994, 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 Little South Fork Elk River 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". Little South Fork Elk River 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 Little South Fork Elk River, 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 Little South Fork Elk River, 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 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 Little South Fork Elk River, 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 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 Little South Fork Elk River, the dominant composition type and the dominant vegetation type of both the right and left banks 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, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

Biological inventory was conducted in Little South Fork Elk River to document the fish species composition and distribution. Five sites were electrofished in Little South Fork Elk River 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, 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 Little South Fork Elk River 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 July 1, 1994, was conducted by Chris Coyle and Charles Bartolotta

(CCC). The total length of the stream surveyed was 957 feet with an additional 87 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.62 cfs on July 1, 1994.

Little South Fork Elk River is an B3 channel type for the entire 957 feet of stream reach surveyed. B3 channels are moderately entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools; very stable plan and profile; stable banks; cobble channel.

Water temperature remained constant at 54 degrees Fahrenheit throughout the survey. Air temperatures ranged from 58 to 62 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 42%, pool types 31%, and flatwater 28% (Graph 1). Riffle habitat types made up 44% of the total survey **length**, pools 29%, and flatwater 27% (Graph 2).

Eight 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, 39%; step runs, 17%; and mid-channel pools, 14% (Graph 3). By percent total **length**, low gradient riffles made up 42%, step runs 21%, and lateral scour pools - bedrock, 14%.

Eleven pools were identified (Table 3). Main channel pools were most often encountered at 55% and comprised 42% 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. Four of the 11 pools (36%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 10 pool tail-outs measured, none had a value of 1 (0%); 9 had a value of 2 (90%); none had a value of 3 (0%); and 1 had a value of 4 (10%). 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 59. Riffle habitats followed with a rating of 39 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 65, and scour pools rated 52 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Little South Fork Elk River and are extensive. Graph 7 describes the pool cover in Little South Fork Elk River.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 5 of the 14 low gradient riffles (36%). Large cobble was the dominant substrate type observed in an additional 36% of the low gradient riffles (Graph 8).

Six percent of the survey reach lacked shade canopy. Of the 94% of the stream covered with canopy, 76% was composed of deciduous trees, and 24% was composed of coniferous trees. Graph 9 describes the canopy in Little South Fork Elk River.

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 81%. The mean percent left bank vegetated was 85%. The dominant elements composing the structure of the stream banks consisted of 41.7% bedrock, 8.3% boulder, 45.8% cobble/gravel, and 4.2% sand/silt/clay (Graph 10). Grass (including ferns) was the dominant vegetation type observed in 35% of the units surveyed. Additionally, 26% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Five sites were electrofished on July 5 and 6 and September 12, 1994, in Little South Fork Elk River. The units were sampled by Chris Coyle, Craig Mesman, and Kevan Schukraft (CCC). All measurements are fork lengths unless noted otherwise.

The first site sampled was habitat units 003-004, a step run / mid-channel pool combination approximately 58 feet from the confluence with South Fork Elk River. This site had an area of 511 sq ft and a volume of 358 cu ft. The unit yielded 25 steelhead between 33 and 126 mm, 16 coho between 44 and 70 mm, four frog tadpoles, one adult tailed frog, and three Pacific giant salamanders.

The second site was habitat units 029-031, a step run and two lateral scour pools - bedrock located approximately 817 feet above the creek mouth. This site had an area of 770 sq ft and a volume of 770 cu ft. The site yielded seven steelhead between 38 and 127 mm, two frog tadpoles, and four Pacific giant salamanders.

The third site sampled was a low gradient riffle / lateral scour pool - bedrock combination located approximately 980 feet above the creek mouth. The site had an area of 350 sq ft and a volume of 140 cu ft. The site yielded one 106 mm steelhead and one 47 mm coastal cutthroat trout.

The fourth site sampled was a pool / run / riffle / step run combination located approximately 2,014 feet above the creek mouth. The site had an area of 320 sq ft and a volume of 128 cu ft. The site yielded 14 steelhead between 47 and 210 mm.

The fifth site sampled was a 70' long series of pools and riffles located approximately 3,030 feet above the creek mouth. The site had an area of 630 sq ft and a volume of 315 cu ft. No fish were sampled, but numerous Pacific giant salamanders were observed.

DISCUSSION

Little South Fork Elk River is an B3 channel type for the entire 957 feet of stream reach surveyed. The B3 channel type is considered excellent for low-stage weirs, boulder clusters and bank placed boulders: single and opposing wing deflectors; and log cover structures; and good for medium-stage weirs.

The water temperature recorded on the survey day July 1, 1994, was 54° Fahrenheit. Air temperatures ranged from 58 to 62° Fahrenheit. This is a very 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.

Riffle habitat types comprised 44% of the total **length** of this survey, pools 29%, and flatwater 27%. The pools are relatively shallow, with only four of the eleven 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. 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.

One of the 10 pool tail-outs measured had an embeddedness rating of 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 Little South Fork Elk River, 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 59. The shelter rating in the flatwater habitats was lower at 22. A pool shelter rating of approximately 100 is desirable. The relatively moderate amount of 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.

Eight of the 14 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 94%. 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 81% and 85%, 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) Little South Fork Elk River should be managed as an anadromous, natural production stream.

2) 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.

3) 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.

4) Where feasible, design and engineer pool enhancement structures to increase the number of pools and deepen the existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

5) There are several log debris accumulations present on Little South Fork Elk River 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.

6) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored, and improved where possible.

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 Elk River. Channel type is F3.

548' Log and debris accumulation (LDA) 12' high x 25' wide x 15' long. Probable barrier.

731' LDA 7' high x 20' wide x 45' long. Retains gravel 2' high x 12' wide x 100' long. Flow partially diverted to right side. Passable.

957' Left bank calving siltstone rubble into channel. End of habitat survey due to bedrock cascade with 50% gradient, partially blocked by large wood. An additional 3,077 feet of stream were surveyed for problem sites. Eight LDA's were observed within that section, seven of which had significant gravel retention and four of which were probable barriers. At 2,792' above end of survey, the gradient increased to approximately 10% and varied from 5 to 20%.

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