STREAM INVENTORY REPORT

SOMERVILLE CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 1993 on Somerville 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 Somerville Creek. The objective of the biological inventory was to document the salmonid species present and their distribution. After analysis of the information collected, stream restoration and enhancement recommendations are presented.

There is no known record of adult spawning surveys having been conducted on Somerville Creek. Although in December 1987 and January 1988, personnel from Eel River Salmon Restoration observed chinook salmon and steelhead spawners in the 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

Somerville Creek is tributary to the Redwood Creek, tributary to South Fork Eel River, located in Humboldt County, California. Somerville Creek's legal description at the confluence with Redwood Creek is T4S R3E S18. Its location is 40°06'30" N. latitude and 123°53'45" W. longitude. Somerville Creek is a second order stream and has approximately 2.2 miles of blue line stream, according to the USGS Briceland and Garberville 7.5 minute quadrangles. Somerville Creek drains a watershed of approximately 3.0 square miles. Elevations range from about 560 feet at the mouth of the creek to 1,600 feet in the headwater areas. Grass, oak and Douglas fir forest dominate the watershed. The watershed is privately owned and is managed for grazing and timber production. Vehicle access exists from State Highway 101 to Redway via Redwood Drive, then west on Briceland Road, to the town Briceland, where Somerville joins Redwood Creek.

METHODS

The habitat inventory conducted in Somerville Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The personnel that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). The two person Somerville Creek team was trained in June, 1993, by Gary Flosi and Scott Downie.

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 Somerville 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". Somerville 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 Somerville 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 Somerville 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 Somerville 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 Somerville 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.

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 Somerville 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 August 18, 19, and 23, 1993, was conducted by Warren Mitchell and Ruth Goodfield. The total length of the stream surveyed was 10,205 feet, with an additional 288 feet of side channel.

A flow of .26 cfs was measured 8-18-93 at the confluence of Redwood Creek with a Marsh-McBirney Model 2000 flowmeter.

This section of Somerville Creek has three channel types: from the mouth to 4,987' is a B1 channel, from 4,988' to 9,096' a B2 channel, and from 9,097' to the end of the survey an A2. B1 types are stable, moderately confined, moderate gradient, boulder/large cobble channels. B2 channels are moderate gradient, moderately confined, large cobble with small boulder channels. A2 channels are steep (4-10% gradient), very well confined streams, with stable stream banks.

Water temperatures ranged from 57 to 66 degrees Fahrenheit. Air temperatures ranged from 63 to 73 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, flatwater types made up 36.9%, riffles 32.4%, and pools 30.2% (Graph 1). Flatwater habitat types made up 51.4% of the total survey **length**, riffles 29.4%, and pools 18.0% (Graph 2).

Fourteen 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, 31.3%; step runs, 27.9%; and mid-channel pools, 13.4% (Graph 3). By percent total **length**, step runs made up 46.0%, low gradient riffles 27.1%, and mid-channel pools 7.1%.

Fifty-three pools were identified (Table 3). Main-channel pools were most often encountered at 51.9%, and comprised 56.1% 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. Nineteen of the 53 pools (35%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 50 pool tail-outs measured, none had a value of 1 (0.0%); 5 had a value of 2 (10.0%); 28 had a value of 3 (56.0%); and 17 had a value of 4 (34.0%). 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 20.5. Flatwater habitats followed with a rating of 10.5 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 22.8, and backwater pools rated 20.0 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Somerville Creek and are extensive. Large woody debris and root mass are lacking in nearly all habitat types. Graph 7 describes the pool cover in Somerville Creek.
Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 38 of the 57 low gradient riffles (67.9%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 23.2% of the low gradient riffles (Graph 8).

Twenty-two percent of the survey reach lacked shade canopy. Of the 78% of the stream covered with canopy, 76% was composed of deciduous trees, and 2% was composed of coniferous trees. Graph 9 describes the canopy in Somerville 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 67.5%. The mean percent left bank vegetated was 62.9%. The dominant elements composing the structure of the stream banks consisted of 1.1% bedrock, 0.6% cobble/gravel, 8.7% bare soil, 11.5% grass, 14.0% brush. Additionally, 63.9% of the banks were covered with deciduous trees, and 0.3% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

BIOLOGICAL INVENTORY RESULTS

One site was electrofished on September 1, 1993 in Somerville Creek. The units were sampled by Warren Mitchell and Ruth Goodfield. All measurements are fork lengths unless noted otherwise.

The site sampled was habitat unit 29, a mid-channel pool, located approximately 67 feet from the confluence with Redwood Creek. This site had an area of 1,005 sq ft, and a volume of 704 cu ft. The unit yielded 21 steelhead, ranging from 52 to 155mm FL.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Somerville Creek.

DISCUSSION

Somerville Creek has three channel types: B1, B2, and A2. The A2 channel type is generally not suitable for fish habitat improvement structures. A2 channels are found in high energy, steep gradient stream reaches. They have channels dominated by boulders, do not retain gravels very

well, but do have stable stream banks. There are 1,109 feet of this channel type.

The B2 channel type is excellent for many types of low stage instream enhancement structures such as plunge weirs, in-channel and bank boulder placement, single and double wing deflectors, channel constrictors and submerged shelters in straight reaches to name only a few. There are 4,109' of this channel type in Somerville Creek. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

B1 channel types are also ideal for many types of low and medium instream enhancement structures; single and double wing deflectors, bank cover, overhead log cover, and "V" and straight spawning weirs. Of the total length surveyed, 4,987 feet comprise this channel type.

The water temperatures recorded on the survey days August 18, 19, and 23, 1993 ranged from 57° F to 66° F. Air temperatures ranged from 63° F to 73° F. This is a very good water temperature regime for salmonids. However, 65° F, if sustained, is near the threshold stress level for salmonids. This does not seem to be the case here, and Somerville Creek seems to have temperatures favorable to 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 51.4% of the total **length** of this survey, riffles 29.4%, and pools 18.0%. The pools are relatively shallow with only 19 of the 53 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 be threatened by high stream energy, or where their installation will not conflict with the modification of the any 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.

Forty-five of the 50 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 Somerville 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 20.5. The shelter rating in the flatwater habitats was slightly lower at 10.5. 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 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.
Fifty-one of the 57 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 78%. 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) Somerville Creek should be managed as an anadromous, natural production stream.

2) 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.

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) 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) 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.

6) Increase the canopy on Somerville 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 Redwood Creek. Channel type is a B1 for the first 4,987' of survey.
91'	Flow measured at 0.26 cfs.
251'	Cement culvert crossing 7' high x 8' long, no baffles.
911'	Left bank (LB) and right bank(RB) have both been trampled by livestock. Creek is being used as watering hole. Cow excrement observed in and along creek.
2021'	Biological inventory site #1.
2057'	Cattle crossing. Bank erosion limited to single animal trail.
2519'	Pasture land on RB heavily worn from cattle. Cow excrement in channel and along RB.
2944'	Cattle crossing.
3955'	Small tributary entering from RB.
4082'	Collapsed wooden bridge across channel.
4987'	Channel type change from a B1 to a B2.
5418'	Small tributary entering RB.
5843'	Small log debris accumulation (LDA) 20' wide x 2' high, retaining gravel. Not a barrier.
6174'	Small spring on LB.

Somerville Creek

6778'	Dry tributary enters RB.
7368'	Dry tributary enters from RB.
7391'	Dry tributary enters from LB.
8138'	Large root wad collecting large and small woody debris.
8415'	LDA - 14' wide x 6' high x 13' long, retaining gravel and boulders. Not a barrier.
8480'	Small tributary entering from RB.
9096'	Channel type changes from a B2 to an A2.
9613'	Dry tributary enters from RB.
9756'	Dry tributary enters from LB.
10205'	Dry tributary enters from LB.
10205'	Dramatic decrease in flow and increase in gradient. No fish observed in last several units. 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