STREAM INVENTORY REPORT

LITTLE SPROUL CREEK, 1991

INTRODUCTION

A stream inventory was conducted during the summer of 1991 on Little Sproul Creek to assess habitat conditions for anadromous salmonids. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Little Sproul Creek. After analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

A spawning survey was conducted on Little Sproul Creek on February 11, 1991. Four live steelhead and four redds were observed during the survey, which began at the creek mouth and ended at the forks, approximately two miles upstream. 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 Sproul Creek is tributary to Sproul Creek, a tributary to the South Fork of the Eel River, located in Humboldt County, California (Figure 1). Little Sproul Creek's legal description at the confluence with Sproul Creek is T04S R03E S34. Its location is 40°04'03" latitude and 123°50'06" longitude. Little Sproul Creek is a second order stream. The total length of blue line stream, according to the USGS Garberville and Briceland quadrangles is 1.9 miles. Little Sproul Creek drains a watershed of approximately 3.44 square miles. Elevations range from about 360 feet at the mouth of the creek to 1,200 feet in the headwater areas. Second growth redwood and Douglas fir forest dominates the watershed. The entire watershed is under private ownership and is managed for some limited logging. Vehicle access exists from U.S. Highway 101 at Garberville, via Sproul Creek Road.

METHODS

The habitat inventory conducted in Little Sproul 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). Little Sproul Creek personnel were trained in May and

June, 1991, 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 Little Sproul Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Discharge is measured in cubic feet per second using a current flow meter. Measurements are taken at the downstream end of the stream or reach being inventoried. Flows should also be measured at major tributary confluences. Flow was not measured in Little Sproul Creek.

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 operations 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 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". Little Sproul 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. Depth of the pool tail crest at each pool habitat unit was measured at 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 Sproul 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 Little Sproul 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 Little Sproul Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The percentage of the total canopy area was then further analyzed and recorded according to whether it was composed of either coniferous or deciduous trees.

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 Little Sproul 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.

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 Little Sproul 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 27, 28, and July 1-3, and 8, 1991, was conducted by Erick Elliot, Steve Liebhardt and Jay Miller (CCC). The total length of the stream surveyed was 10,193 feet, with an additional 433 feet of side channel.

Little Sproul Creek is a B2 channel type for the entire 10,988 feet of the survey. B2 channels are moderate (1-2.5%) gradient, moderately well confined streams, with stable stream banks. Water temperatures ranged from 56 to 76 degrees fahrenheit. Air temperatures ranged from 60 to 98 degrees fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 43.2%; flatwater types were 29.9%; and pools 26.9% (Graph 1). Riffle habitat types made up 51.3% of the total survey **length**, flatwater were 31.2%, and pools 17.5% (Graph 2).

Twelve 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, 43.2%, runs, 19.7%, and mid-channel pools, 16.3% (Graph 3). By percent total **length**, low gradient riffles made up 49.6%, step runs 15.2%, and runs 142.7% (Table 2).

Seventy-one pools were identified (Table 3). Main-channel pools were most often encountered at 62.0%, and comprised 62.4% 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. Thirty-one of the 71 pools (43.7%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 70 pool tail-outs measured, four had a value of 1 (5.7%); 33 had a value of 2 (47.1%); 33 had a value of 3 (47.1%); and 0 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 42.4. Flatwater habitats followed with a rating of 15.4 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 56.2, backwater pools had a rating of 40.0, and main channel pools rated 34.7 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Little Sproul Creek. Large and small woody debris are the next most prevalent cover types. Graph 7 describes the pool cover in Little Sproul Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 103 of the 114 low

gradient riffles (90.4%). Small cobble was the next most frequently observed dominant substrate type, and occurred in 8.8% of the low gradient riffles (Graph 8).

Sixty-nine percent of the survey reach lacked shade canopy. Of the 31% of the stream covered with canopy, 89% was composed of deciduous trees, and 11% was composed of coniferous trees. Graph 9 describes the canopy in Little Sproul 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 60.2%. The mean percent left bank vegetated was 66.6%. The dominant elements composing the structure of the stream banks consisted of 6.0% bedrock, 4.2% boulder, 18.5-% cobble/gravel, 4.2% bare soil, 26.4% grass, 3.8% brush. Additionally, 31.3% of the banks were covered with deciduous trees, and 5.7% with coniferous trees, including downed trees, logs, and root wads (Graph 10).

DISCUSSION

The B2 channel type is generally suitable for fish habitat improvement structures. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

The water temperatures recorded on the survey days ranged from 56° F to 76° F. Air temperatures ranged from 60° F to 98° F. These warmer temperatures, if sustained, are above the threshold stress level for salmonids. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

Riffle habitat types comprised 51.3% of the total **length** of this survey, flatwater 31.2%, and pools 17.5%. The pools are relatively shallow with only 31 of the 71 pools (43.7%) 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.

Thirty-three of the 70 pool tail-outs measured had embeddedness ratings of 3 or 4. Only four had a 1 rating. Embeddedness in excess of 26%, a rating of 2 or more, is considered poor quality for fish habitat. In Little Sproul 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 43.5. The shelter rating in the flatwater habitats was lower at 14.5. 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 moderate 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.

One hundred and three of the 114 low gradient riffles had gravel as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy for the stream was 31%. This is a low percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures could be reduced by increasing stream canopy. In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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

2) Temperatures in this section of Little Sproul 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) Increase the canopy on Little Sproul Creek by planting willow, alder, 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.

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) 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.

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 Sproul Creek. Channel type is a B2 for the entire survey reach.
76'	Bridge crossing.
200'	Small tributary on left bank.
266'	Discharge pipe from hatchery.
2887'	Dam constructed of 2 boards and cement.
3574'	Left bank erosion, 20' high x 40' long, some bedrock exposed.
3645'	Tributary enters on right bank at top of unit.
4130'	Tributary enters on left bank.
5250'	Right bank composed of shale and bedrock, 80' high x 60' long, open and lacking vegetation.
5545'	Right bank erosion, 5' long x 6' high, roots partially holding soil.
6780'	Tributary enters on right bank.
7426'	Left bank erosion, 30' long x 20' high, partially held by roots and bedrock.
8406'	Tributary enters on left bank.
10193'	End of survey.