STREAM INVENTORY REPORT

Little Larabee Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Little Larabee 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 Little Larabee Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species. After the analysis of the information and data gathered, stream restoration and enhancement recommendations are presented.

Adult spawning surveys in December 1987, January 1988 and December 1993 found no adults nor redds. However, steelhead fry were sampled during 1996 summer electrofishing (DFG file data). The objective of this report is to document the current habitat conditions and to recommend options for the potential enhancement of habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Little Larabee Creek is tributary to the Van Duzen River, tributary to the Eel River, located in Humboldt County, California. Little Larabee Creek's legal description at the confluence with Van Duzen River is T01N R03E S12. Its location is 40°28'42" North and 123°46'53" West. Little Larabee Creek is a second order stream and has approximately 5.0 miles of blue line stream according to the USGS Bridgeville and Larabee Valley 7.5 minute quadrangles.

Little Larabee Creek drains a watershed of approximately 13.4 square miles. Summer base flow is approximately 3.0 cubic feet per second (cfs) at the mouth of the stream. Elevations range from about 520 feet at the mouth of the creek to 2400 feet in the headwater areas. Grass, oak and Douglas fir forest dominates the watershed. The watershed is privately owned and is managed for timber production and rangeland. Vehicle access exists via State Highway 36, which crosses Little Larabee Creek near its mouth, one and 1/4 miles northeast of Bridgeville.

METHODS

The habitat inventory conducted in Little Larabee Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1994). The Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Little Larabee Creek personnel were trained in May, 1996, by Scott Downie and Ruth Goodfield. This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth. Habitat unit types encountered for the first time are further measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

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 Larabee 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.

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 every tenth habitat unit. 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 Larabee 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. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form (Hopelain, 1995). 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 Larabee 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). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

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 fully-described 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 Larabee 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 fully-described 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 density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Little Larabee Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or deciduous trees.

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 Larabee Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) of both the right and left banks for each fully-described unit 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. In Little Larabee Creek fish presence was observed from the stream banks, and two sites were electrofished using one Smith-Root Model 12 electrofisher. 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 0.85 mm (Valentine, 1995).

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 Larabee 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
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of June 20, 24, 25 and 26, 1996, was conducted by Dale Melton and Paul Ouradnik (AmeriCorps/WSP). The total length of the stream surveyed was 15,319 feet with an additional 665 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.97 cfs on June 20, 1996.

Little Larabee Creek is a B4 channel type for the first 6,200 feet from the confluence with the Van Duzen River, then it changes to an A2 for the remaining 9,119 feet of stream reach surveyed. B4 channels are moderately entrenched, moderate gradient, riffle dominated channels with stable banks and gravel-dominant substrates. A2 channels are steep, cascading, step-pool streams with high energy/debris transport associated with depositional soils, and boulder channel.

Water temperatures taken during the survey period ranged from 54 to 61 degrees Fahrenheit. Air temperatures ranged from 54 to 65 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, pool and dry habitat types. Based on frequency of **occurrence**, flatwater units

made up 39%, pools 34%, riffles 27% and dry units 1% of the total habitat units (Graph 1). Flatwater units made up 59% of the total survey **length**, pools 20%, riffles 20% and dry units 1% (Graph 2).

Eighteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were step runs, 27%; mid-channel pools, 21%; and high gradient riffles, 12% (Graph 3). Based on percent total **length**, step runs made up 50%, mid-channel pools 13%, and cascades 8%.

A total of eighty-six pools were identified (Table 3). Main channel pools were most frequently encountered at 73% and comprised 79% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Eighty-one of the 86 pools (94%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 86 pool tail-outs measured, seven had a value of 1 (8%); 20 had a value of 2 (23%); 23 had a value of 3 (27%); two had a value of 4 (2%); and 34 had a value of 5 (40%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 and flatwater habitat types had a mean shelter rating of 19, and riffle habitats had a mean shelter rating of 11 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 45. Scour pools had a mean shelter rating of 25 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Large cobble was the dominant substrate observed in half of the low

gradient riffles measured (50%). Gravel was also the most frequently observed dominant substrate type and occurred in 50% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 60%. The mean percentages of deciduous and coniferous trees were 85% and 15%, respectively. Graph 9 describes the canopy in Little Larabee Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 40%. The mean percent left bank vegetated was 35%. The dominant elements composing the structure of the stream banks consisted of 0.9% bedrock, 34.5% boulder, 53.6% cobble/gravel, and 10.9% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 9% of the units surveyed. Additionally, 66.4% of the units surveyed had deciduous trees as the dominant vegetation type, and 1.8% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on June 27, 1996, in Little Larabee Creek. The sites were sampled by Dale Melton, Paul Ouradnik (WSP/AmeriCorps), and Craig Mesman (CCC).

The first site sampled included habitat units 0011-0012, a run/pool sequence approximately 1,206 feet from the confluence with the Van Duzen River. This site had an area of 1,680 sq ft and a volume of 1,512 cu ft. The site yielded thirty-three young-of-the-year (YOY) steelhead rainbow trout, and three one-year+ steelhead rainbow trout.

The second site included habitat units 0232-0234, a run/riffle/pool sequence located approximately 15,027 feet above the creek mouth. This site had an area of 2,080 sq ft and a volume of 1,664 cu ft. The site yielded one YOY steelhead rainbow trout, and four one-year+ steelhead rainbow trout.

GRAVEL SAMPLING RESULTS

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No gravel samples were taken on Little Larabee Creek.

DISCUSSION

Little Larabee Creek is a B4 channel type for the first 6,200 feet of stream surveyed and an A2 for the remaining 9,119 feet. The suitability of B4 channel types for fish habitat improvement structures is excellent for low-stage plunge weirs, boulder clusters, bank-placed boulders, single and opposing wing-deflectors, and log cover; and good for medium-stage plunge weirs. Because they are steep, high energy streams, A2 channel types are considered generally not suitable for instream fish habitat improvement structures.

The water temperatures recorded on the survey days June 20 to 26, 1996, ranged from 54 to 57 degrees Fahrenheit. Air temperatures ranged from 54 to 65 degrees Fahrenheit. This is a good water temperature range for salmonids. However, 67° F, if sustained, is near the threshold stress level for salmonids. This does not seem to be the case here, and Little Larabee 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 would need to be conducted.

Flatwater habitat types comprised 59% of the total **length** of this survey, riffles 27%, and pools 34%. The pools are relatively deep, with 81 of the 86 (94%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream 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.

Twenty-five of the 86 pool tail-outs measured had embeddedness ratings of 3 or 4. Only seven had a 1 rating. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In Little Larabee Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 19. The shelter rating in the riffle habitats was slightly lower at 11. 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, rootmass 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.

Half of the low gradient riffles measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 60%. This is a relatively moderate percentage of canopy. In general, re-vegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 35% and 40%, 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 Larabee Creek 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 locally available.

3) 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.

4) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites, like the site at 5736', should then be treated to reduce the amount of fine sediments entering the stream.

5) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

6) Increase the canopy on Little Larabee 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 distances are approximate and measured from the beginning of the survey reach.

0' Begin survey at confluence with the Van Duzen River. Channel type is a B4 for the first 6200' of stream surveyed.

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649' Highway 36 bridge crosses over stream.

674' Young-of-the-year (YOY) salmonids observed from the streambanks by surveyors.

722' Small slope failure on the right bank (RB); 100' long X 80' high.

1206' Bioinventory site #1.

2754' Failure on RB; 70' long X 20' high.

3311' Old failure on RB; 70' long X 30' high. Appears to be about 50% re-vegetated.

3677' Large debris accumulation (LDA) in stream channel; 80' long X 20' wide X 10' high. Not a barrier to migrating salmonids.

4095' Tributary enters from RB.

4095' Lateral erosion on RB; 80' long X 15' high.
4667' YOY salmonids observed from the streambanks.

5736' Failure on the left bank (LB); 100' long X 30' high.

6090' Failure on LB; 150' long X 50' high. Contributing fines and gravels directly to the stream channel.

6201' Channel type change from a B4 to an A2 for the remaining 9119' of stream surveyed.

6891' Tributary enters from LB; 54°F.

7252' Failure on LB; 200' long X 50' high.

7353' Stream gradient begins to steepens to greater than 4%.

7930' Failure on LB; 150' long x 30' high.

8187' YOY salmonids observed from the streambanks.

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8348' Small tributary enters from RB.

9092' Failure on LB; 100' long X 30' high.

9523' YOY salmonids observed from the streambanks.

10556' Tributary enters from LB; 52°F. Several YOY salmonids were observed in this tributary.

10714' LDA in stream channel; 10' long X 50' wide X 10' high. Not a fish barrier.

12841' Waterfall with 8' vertical drop at beginning of unit. Possible barrier to migrating salmonids.

12926' YOY salmonids observed from the streambanks.

15027' Tributary enters from LB; 52°F.

15027' Tributary enters from RB; 53°F.

15027' Bioinventory site #2.

15319' Waterfall at beginning of unit with a 20' vertical drop in elevation. Probable fish barrier. End of survey.

References

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript. California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing, and analysis, unpublished manuscript. California Department of Forestry and Fire Protection, Santa Rosa, California.

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