STREAM INVENTORY REPORT

Long Valley Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1995 on Long Valley 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 Long Valley 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. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

Adult carcass surveys were conducted on Long Valley Creek by the California Department of Fish and Game (DFG) from 1987 through 1996. The table below describes the results of those surveys:

Long Valley Creek Carcass Surveys 1987 1996

	Chinook Salmon					Other	
Year	# of Surveys	Live Fish	# of Carcass	Adipose ClipCWT	Redds seen	Coho seen	SH/RT seen
1987	1	156	397	4	9	2	
1988	2	77	85	3	14	5	
1989	1	2	1				
1995	1	36	8		5	4	2
1996	2	7	4		3		

Four adipose clipped carcasses were found on winter surveys of 1987-88. Two of the clipped carcasses did not have a CWT, but one four year old chinook bore CWT #065012 and had originated from and been planted into Hollow Tree Creek, South Fork Eel. Another carcass was recovered in 1987 with CWT #H60701 which was a two year old chinook salmon of Outlet Creek origin, reared at Silverado Hatchery and planted into Outlet Creek. The objective of this report is to document the current habitat conditions in Long Valley Creek, and recommend options for the enhancement of

habitat for chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Long Valley Creek is tributary to the Outlet Creek, tributary to the Mainstem Eel River, located in Mendocino County, California. Long Valley Creek's legal description at the confluence with Outlet Creek is T20N R14W S28. Its location is 39°33'07" N. latitude and 123°25'25" W. longitude. Long Valley Creek is a second order stream and has approximately 9.5 miles of blue line stream according to the USGS Longvale, Sherwood Peak, and Laytonville 7.5 minute quadrangles. Long Valley Creek drains a watershed of approximately 26.5 square miles and has a summer base flow of about 2 cfs. Elevations range from about 1,270 feet at the mouth of the creek to 2,720 feet in the headwater areas. Grassland and mixed conifer forest dominate the watershed. The watershed is privately owned and is managed for timber production and rangeland. Vehicle access exists via Highway 101 approximately ten miles south of Laytonville.

METHODS

The habitat inventory conducted in Long Valley Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The two Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods in May 1995, by Ruth Goodfield of the California Department of Fish and Game (DFG).

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 Long Valley 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 beginning 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". Long Valley 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 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 Long Valley 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 Long Valley 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 Long Valley 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 Long Valley 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 Long Valley 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 Quattro Pro 4. Graphics developed for Long Valley 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 20-22, 26-29, and July 5, 6, and 11, 1995, was conducted by Jeffrey Jahn and Kyra Short (WSP/Americorps). The total length of the stream surveyed was 45,940 feet with an additional 971 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.9 cfs on July 10, 1995.

Long Valley Creek is an F3 channel type for the first 29,455 feet, a B2 for 3,903 feet, and an F4 for the remaining 12,582 feet of stream reach surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble dominated substrates. B2 channels are moderately entrenched, on moderate gradients, with a boulder dominant substrates. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 57 to 80 degrees Fahrenheit. Air temperatures ranged from 64 to 91 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 36% pool units, 34% flatwater units, and 30% riffle units (Graph 1). Based on total **length** of Level II habitat types there were 50% pool units, 32% flatwater units, and 18% riffle units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were mid-channel pools, 35%; runs, 30%; and low gradient riffles, 33% (Graph 3). Based on percent total **length**, mid-channel pools made up 49%, runs 27%, and low gradient riffles 17%.

A total of 373 pools were identified (Table 3). Main pools were most frequently encountered at 97% and comprised 98% 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. One hundred and ninety-three of the 373 pools (52%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 373 pool tail-outs measured, none had a value of 1 (0%); 90 had a value of 2 (24%); 171 had a value of 3 (46%); and 113 had a value of 4 (30%) (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 habitat types had a mean shelter rating of 56, and riffle habitats had a mean shelter rating of 47 (Table 1). Of the pool types, the main pools had the highest mean shelter rating at 58. Scour pools had a mean shelter rating of 30 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 19 of the 33 low gradient riffles measured (58%). Small cobble was the next most frequently observed dominant substrate type and occurred in 27% of the low gradient riffles (Graph 8).

The mean percent canopy density for the stream reach surveyed was 65%. The mean percentages of deciduous and coniferous trees were 59% and 6%, respectively. Graph 9 describes the canopy in Long Valley Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 47%. The mean percent left bank vegetated was 43%. The dominant elements composing the structure of the stream banks consisted of 8.8% bedrock, 26.2% boulder, 25.9% cobble/gravel, and 39.1% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 54.8% of the units surveyed. Additionally, 7.4% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished on July 10, 1995, in Long Valley Creek. The sites were sampled by Ruth Goodfield (DFG), Jeffrey Jahn, and Kyra Short (both WSP/AmeriCorps).

The first site sampled included habitat unit 002, a low gradient riffle approximately 200 feet from the confluence with Outlet Creek. This site had an area of 2,436 sq ft and a volume of 974.4 cu ft. The site yielded 9 young-of-the-year (YOY) steelhead, 8 YOY sacramento squawfish, 3 YOY roach.

The second site included habitat unit 387, a mid-channel pool located approximately 26,849 feet above the creek mouth. This site had an area of 252 sq ft and a volume of 201.6 cu ft. The site yielded 10 YOY steelhead rainbow trout.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on Long Valley Creek.

DISCUSSION

Long Valley Creek is an F3 channel type for the first 29,455 feet of stream surveyed, a B2 for 3,903 feet, and an F4 for the remaining 12,582 feet. The suitability of F3, B2, and F4 channel types for fish habitat improvement structures is as follows: F3 channels are good for bank-placed boulders, single and opposing wing deflectors; fair for low-stage weirs, boulder clusters, channel constrictors, and log cover; and poor for medium-stage weirs. B2 channels are excellent for low- and medium-stage weirs, single and opposing wing deflectors, and bank cover. F4 channels are good for bank-placed boulders; fair for low-stage weir, single and opposing wing-deflectors, channel constrictors, and log cover; and poor for medium-stage weirs and boulder clusters.

The water temperatures recorded on the survey days June 20-22, 26-29, July 5, 6, and 11, 1995, ranged from 57 to 80 degrees Fahrenheit. Air temperatures ranged from 64 to 91 degrees Fahrenheit. This is a poor water temperature range for salmonids. Eighty degrees, if sustained, is above the threshold stress level 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.

Flatwater habitat types comprised 32% of the total **length** of this survey, riffles 18%, and pools 50%. The pools are relatively deep, with 193 of the 373 (52%) 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.

Two hundred and eighty-four of the 373 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 to indicate good quality spawning substrate for salmon and steelhead. In Long Valley 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 56. The shelter rating in the flatwater habitats was slightly lower at 39. 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, undercut banks 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.

Twenty-eight of the 33 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 65%. This is a relatively low 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 low at 47% and 43%, 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) Long Valley Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are above 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.

7) Increase the canopy on Long Valley 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.

4) 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.

10) There is at least one section 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.

6) 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.

PROBLEM SITES AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

0'	Begin survey at confluence with Outlet Creek. Channel type is an F3.
341'	School of Sacramento squawfish observed.
1068'	Begin fractional sampling.
2053'	Highway 162 bridge.
3107'	Spring enters from the right bank (RB).
3471'	A spring enters from the RB.
4784'	A small tributary is present.
5459'	Highway 101 bridge.
6006'	Dutch Henry Creek enters from the RB.
9241'	A small spring enters from the RB.
11863'	Ten to 20 young-of-the-year steelhead (YOY). Sacramento squawfish also present.
13000'	Round culvert, 18.5' in diameter. The bottom is rusted. The total length of the culvert is 436'.
13342'	A small tributary enters from the RB.
13387'	YOY present.
15211'	Highway 101 bridge, the freeway is now on the RB. YOY present.
15239'	Irvine Rest Area is on the RB.
16348'	A small tributary enters through a small culvert on the left bank (LB).
16595'	4 YOYs present, very lethargic. Water temperature is 73°.
17669'	A small tributary enters through a small culvert on the RB. Rest area bridge crosses here.
18040'	A tributary enters from the RB. School of fish present, possibly squawfish.
20383'	A tributary enters from the RB through a culvert.

20647' Old concrete road bridge, no longer in use.

21470' A small tributary enters from the RB through a culvert.

22005' A spring is present on the LB.

22604' A tributary enters from the RB through a square cement tunnel.

23900' There is a culvert on the RB.

26294' A spring enters from the LB.

26333' A spring enters from the LB.

26372' A spring enters from the LB.

26585' The RB is armored with concrete for the next 200'.

26730' Highway 101 bridge for the next 130'. Both banks and the streambed are concrete.

26777' There are a total of six baffles 2.6' high with alternate side openings. It is a barrier for summer upstream migration, but does not appear to be a barrier for downstream migration.

26876' Concrete banks are no longer present. YOYs, a 1+, and a 2+ are present.

27795' A culvert enters from the LB.

28590' A culvert enters from the LB.

28908' A spring enters from the LB.

29076' Three culverts enter from the LB.

29455' Channel type changes from an F3 to a B2 (reach 2).

30109' There is a 4' waterfall at the beginning of the unit.

30329' A dry tributary enters from the LB.

30450' There is a 5' waterfall at the beginning of the unit.

31099' Seven to ten steelhead YOYs present.

31528' There is a 4' waterfall at the beginning of the unit.

32339' A tributary enters from the RB.

33034' There is a 4' waterfall at the end of the unit.

33358' Channel type changes from a B2 to an F4 (reach 3).

34067' Ten plus steelhead YOYs.

34169' Old Highway 101 bridge, now in private use.

34403' Highway 101 bridge.

34974' A tributary enters from the left bank.

35383' Cattle impacting the stream.

35503' Erosion on LB and RB due to cattle.

35559' Erosion on the LB.

35997' Cattle impacting the stream.

36099' Cattle impacting the stream.

36433' Steelhead YOY observed.

36601' Cattle impacting the stream.

36799' Cattle impacts on both banks and in the stream for the next 230'.

38845' Cattle impacts in the stream for the next 300'.

38971' Old railroad car bridge.

38994' Ford across the stream.

39059' A tributary enters from the RB.

39755' Cattle impacts in the stream.

40055' Cattle crossing.

40616' Cattle impacts in the stream.

41210' Old cement dam.

41217' 20+ steelhead YOYs.

44382' Cattle crossing.

44976' A spring enters from the LB.

54081' 30+ steelhead YOYs.

54940' End of Survey. A tributary enters from the RB; it has 2/3 of the flow.

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