STREAM INVENTORY REPORT

Bear Wallow Creek

INTRODUCTION

A stream inventory was conducted during the fall of 2002 on Bear Wallow Creek. The survey began at the confluence with Huckleberry Creek and extended upstream 2.1 miles.

The Bear Wallow Creek 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 Bear Wallow Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for 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.

WATERSHED OVERVIEW

Bear Wallow Creek is a tributary to Huckleberry Creek, a tributary to Hollow Tree Creek, a tributary to the South Fork Eel River, a tributary to the Eel River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Bear Wallow Creek's legal description at the confluence with Huckleberry is T22N R17W S26. Its location is 39.7315 degrees north latitude and 123.7240 degrees west longitude. Bear Wallow Creek is a first order stream and has approximately 1.5 miles of blue line stream according to the USGS Lincoln Ridge 7.5 minute quadrangle. Bear Wallow Creek drains a watershed of approximately 1.4 square miles. Elevations range from about 1,433 feet at the mouth of the creek to 1,729 feet in the headwater areas. Redwood forest, Douglas fir forest and hardwood forest dominate the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists through a locked gate via Hale's Grove Road off Highway 1.

METHODS

The habitat inventory conducted in Bear Wallow Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and 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). 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. 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, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are 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 Bear Wallow 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 a Marsh-McBirney Model 2000 flow meter.

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. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

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". Bear Wallow 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. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Bear Wallow 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) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate particle size, bedrock, 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 Bear Wallow 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. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Bear Wallow 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 Bear Wallow Creek, the dominant composition type and the dominant

vegetation type 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 (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Bear Wallow Creek. In addition, eleven sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

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. Graphics developed for Bear Wallow 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
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

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HABITAT INVENTORY RESULTS

The habitat inventory of September 12 through October 30, 2002 was conducted by Janelle Breton (WSP), and Matt Davis and Dan Resnik (CCC). The total length of the stream surveyed was 11,293 feet with an additional 37 feet of side channel.

Stream flow was estimated to be 0.1 cfs during the survey period.

Bear Wallow Creek is an F3 channel type for the first 630 feet surveyed (Reach 1), an F4 for the next 5,718 feet (Reach 2), and a G4 for the final 4,951 feet of the stream surveyed (Reach 3). F channels are entrenched meandering riffle/pool channels on low gradients with high width/depth ratio. F4 channels are gravel dominated and F3 channels are cobble dominated. G4 channels are entrenched "gully" step-pool and low width/depth ratio on moderate gradient with predominantly gravel channel.

Water temperatures taken during the survey period ranged from 44 to 56 degrees Fahrenheit. Air temperatures ranged from 40 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 36% pool units, 32% riffle units, and 29% flatwater units (Graph 1). Based on total length of Level II habitat types there were 38% flatwater units, 36% pool units, and 21% riffle units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 34%; low gradient riffles, 31%; and runs, 27% (Graph 3). Based on percent total length, runs made up 36%, mid-channel pools 34%, and low gradient riffles 20%.

A total of 129 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 98%, and comprised 99% 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. Fifty-four of the 129 pools (42%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 126 pool tail-outs measured, 36 had a value of 1 (29%); 46 had a value of 2 (37%); 33 had a value of 3 (26%); two had a value of 4 (2%); and four had a value of 5 (7%); (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. Riffle habitat types had a mean shelter rating of 4, flatwater habitat types had a mean shelter rating of 18, and pool habitats had a mean shelter rating of 46 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 67. Main channel pools had a mean shelter rating of 45 (Table 3).

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Table 5 summarizes mean percent cover by habitat type. Small woody debris and large woody debris are the dominant cover types in Bear Wallow Creek. Graph 7 describes the pool cover in Bear Wallow Creek. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 72% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 18%.

The mean percent canopy density for the surveyed length of Bear Wallow Creek was 96%. The mean percentages of deciduous and coniferous trees were 33% and 67%, respectively. Graph 9 describes the mean percent canopy in Bear Wallow Creek.

For the entire stream reach surveyed, the mean percent right bank vegetated was 89%. The mean percent left bank vegetated was 86%. The dominant elements composing the structure of the stream banks consisted of 57% sand/silt/clay, 29% cobble/gravel, 12% bedrock and 2% boulders (Graph 10). Deciduous trees were the dominant vegetation type observed in 53% of the units surveyed. Additionally, 40% had coniferous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Eleven sites were electrofished for species composition and distribution in Bear Wallow Creek on October 22, 2002. The water temperature taken during the electrofishing period was 48 degrees Fahrenheit. The air temperature taken was 47 degrees Fahrenheit. The sites were sampled by Paul Divine (DFG), Lori Schmitz (CCC) and Kevin Lucey (WSP/AmeriCorps).

The first site sampled included Habitat Unit #003, a mid-channel pool approximately 53 feet from the confluence with Huckleberry Creek. The site yielded 23 young-of-the-year coho salmon, one young-of-the-year steelhead/rainbow trout and one age one plus steelhead.

The second site sampled included Habitat Unit #022, a mid-channel pool located approximately 391 feet above the creek mouth. The site yielded 25 young-of-the-year coho salmon and one age one plus steelhead/rainbow trout.

The third site sampled included Habitat Unit #239, a mid-channel pool located approximately 6,468 feet above the creek mouth. The site yielded 15 young-of-the-year coho salmon.

The fourth site sampled included Habitat Unit #257, a mid-channel pool located approximately 6,888 feet above the creek mouth. The site yielded four young-of-the-year coho salmon.

The fifth site sampled included a habitat unit located between Habitat Units #257 and #299, a mid-channel pool located between 6,888 and 8,152 feet above the creek mouth. The site yielded four young-of-the-year coho salmon.

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The sixth site sampled included Habitat Unit #299, a mid-channel pool located approximately 8,152 feet above the creek mouth and approximately 152 feet above the last site surveyed in 1990. The site yielded seven young-of-the-year coho salmon.

The seventh site sampled included Habitat Unit #328, a step pool located approximately 9,345 feet above the creek mouth and approximately 1,345 feet above the last site surveyed in 1990. The site yielded six young-of-the-year coho salmon.

The eighth site sampled included a habitat unit located between Habitat Units #328 and #348, a mid-channel pool located between 9,345 and 10,613 feet above the creek mouth. The site yielded no fish.

The ninth site sampled included Habitat Unit #348, a mid-channel pool located approximately 10,613 feet above the creek mouth and approximately 2,613 feet above the last site surveyed in 1990. The site yielded one age one plus steelhead/rainbow trout.

The tenth site sampled included Habitat Unit #355, a mid-channel pool located approximately 10,937 feet above the creek mouth and approximately 2,937 feet above the last site surveyed in 1990. The site yielded four young-of-the-year coho salmon.

The eleventh site sampled included a habitat unit above the end of the habitat survey, a mid-channel pool located more than 11,293 feet above the creek mouth. The site yielded no fish.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Coho and Steelhead YOY, 1+, 2+ Co0+	Sh0+	Sh1+
10/21/02	1	53	003	4.2	1	F3	23	1	1
10/21/02	2	391	022	4.2	2	F4	25	1	0
10/21/02	3	6468	239	4.2	3	G4	15	0	0
10/22/02	4	6888	257	4.2	3	G4	4	0	0
10/22/02	5	unknown	unknown	4.2	3	G4	4	0	0
10/22/02	6	8152	299	4.2	3	G4	7	0	0
10/22/02	7	9345	328	4.4	3	G4	6	0	0
10/22/02	8	unknown	unknown	4.2	3	G4	0	0	0

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Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Coho and Steelhead YOY, 1+, 2+ Co0+ Sh0+ Sh1+		
10/22/02	9	10,613	348	4.4	3	G4	0	0	1
10/22/02	10	10,937	355	4.2	3	G4	4	0	0
10/22/02	11	above end of survey	above end of survey	4.2	3	G4	0	0	0

DISCUSSION

Bear Wallow Creek is an F3 channel type for first 630 feet of stream surveyed, an F4 for the next 5,718 feet, and a G4 for the final 4,951 feet. The suitability of F3 channel types for fish habitat improvement structures is as follows: good for bank placed boulders, single and opposing wing deflectors; and fair for plunge weirs, boulder clusters, channel constrictors, log cover. The suitability of F4 channels for fish habitat improvement structures is as follows: fair for single and opposing wing deflectors, plunge weirs, channel constrictors, and log cover; and poor for boulder clusters. The suitability of G4 channels for fish habitat improvement structures is as follows: good for bank placed boulders; fair for plunge weirs, opposing wing-deflectors and log cover; and poor for boulder clusters and single wing deflectors.

The water temperatures recorded on the survey days in September and October, 2002, ranged from 44 to 56 degrees Fahrenheit. Air temperatures ranged from 40 to 72 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 29% of the total length of this survey, riffles 32%, and pools 36%. The pools are relatively shallow, with 54 of the 129 (42%) pools having a maximum depth greater than two 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.

Eighty-two of the 126 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty-five of the pool tail-outs had embeddedness ratings of 3 or 4. Four of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Bear Wallow Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was 46. The shelter rating in the flatwater habitats was 18. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in all habitat types. Additionally, large woody debris and boulders contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 96%. Reach 1 had a canopy density of 99%, Reach 2 had a canopy density of 97%, and Reach 3 had a canopy density of 94%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 89% and 86%, respectively. In areas of stream bank erosion or where bank vegetation is at unacceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Bear Wallow Creek should be managed as an anadromous, natural production stream.

2) 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.

3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from small woody debris. Adding high quality complexity with woody cover is desirable.

4) 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.

5) 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.

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COMMENTS AND LANDMARKS

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

Position (ft):	Comments:
0'	Start of survey at confluence with Huckleberry Creek. Channel type is an F3.
53'	Electrofishing site #1.
67'	Out of the influence of Huckleberry Creek.
295'	Right bank erosion site measures 19' high x 12' long. Road on right bank.
348'	Right bank erosion site measures 6' high x 38' long.
391'	Electrofishing site #2.
522'	Young-of-the-year salmonids observed.
573'	Flag "X-SEC #3".
630'	Channel type changes from an F3 to an F4.
825'	Right bank erosion site measures 5' high x 50' long.
996'	Log debris accumulation (LDA) is composed of seven pieces of large woody debris (LWD) and measures 5' high x 12' wide x 5' long.
1,026'	Right bank erosion site measures 10' high x 20' long.
1,236'	Right bank erosion site measures 3' high x 12' long.
1,257'	Flag "5/2/02 CCC site 1245".
1,318'	Flag "5/2/02 CCC site 1315".
1,377'	LDA is composed of four pieces of LWD and measures 6' high x 16' wide x 7' long. Stored sediment measures 7' wide x 10' long x 2' high.
1,447'	Right bank erosion site measures 7' high x 14' long.
1,595'	Right bank erosion site measures 7' high x 6' long. LDA is composed of 14 pieces of LWD and measures 7' high x 22' wide x 25' long. Stored sediment measures 10' wide

x 30' long x 5' deep.

1,685' Left bank erosion site measures 8' high x 15' long x 3' deep.

1,900' LDA is composed of nine pieces of LWD and measures 4' high x 14' wide x 40' long. Stored sediment measures 10' wide x 40' long x 2' deep.

1,973' LDA is composed of five pieces of LWD and measures 5' high x 21' wide x 7' long. Stored sediment measures 10' wide x 15' long x 3' deep.

2,051' LDA is composed of four pieces of LWD and measures 9' high x 16' wide x 7' long. Stored sediment measures 10' wide x 60' long x 5' deep.

2,120' High gradient tributary enters channel on left bank. Dry at the time of the survey.

2,182' LDA is composed of nine pieces of LWD and measures 5' high x 24' wide x 12' long. Stored sediment measures 7' wide x 14' long x 4' deep.

2,208' Left bank erosion site measures 6' high x 12' long.

2,598' Flag "5/02/02 CCC site 2595".

2,680' LDA is composed of seven pieces of LWD and measures 5' high x 15' wide x 37' long. Stored sediment measures 12' wide x 12' long x 1' deep. Right bank erosion site measures 12' high x 18' long x 4' deep.

2,788' Right bank erosion site measures 4' high x 8' long.

3,350' Flag "3330 3/12/92 cover scour".

3,649' Flag "CCC habitat unit #136, 7-25-90".

3,710' LDA is composed of four pieces of LWD and measures 4' high x 12' wide x 17' long. Stored sediment measures 8' wide x 9' long x 2' deep.

3,814' LDA is composed of 13 pieces of LWD and measures 11' high x 32' wide x 23' long. Stored sediment measures 13' wide x 26' long x 4' deep.

3,983' Left bank erosion site measures 6' high x 50' long.

4,073' Low gradient tributary enters channel on right bank. Dry at the time of the survey.

4,101' LDA is composed of four pieces of LWD and measures 4' high x 16' wide x 7' long. Stored sediment measures 8' wide x 15' long x 2' deep.

4,365' LDA is composed of two pieces of LWD and one large root wad and measures 4' high

x 15' wide x 10' long. Stored sediment measures 8' wide x 8' long x 3' deep.

4,388' LDA is composed of one piece of LWD and many small pieces of woody debris and measures 4' high x 14' wide x 9' long. Stored sediment measures 5' wide x 15' long x 1' deep.

4,521' Left bank erosion site measures 15' high x 15' wide.

4,634' Flag "5-2-02 CCC site 4325".

4,821' Low gradient tributary enters channel on right bank. Dry at the time of the survey.

5,007' Left bank erosion site measures 5' high x 5' long.

5,079' Flag "CCC site 4635' 5-7-02".

5,206' LDA is composed of two pieces of LWD and measures 4' high x 15' wide x 5' long. It is not retaining sediment.

5,241' Right bank erosion site measures 5' high x 20' long.

5,371' LDA is composed of eight pieces of LWD and measures 7' high x 14' wide x 30' long. Stored sediment measures 6' wide x 25' long x 2' deep.

5,438' LDA is composed of five pieces of LWD and measures 6' high x 14' wide x 12' long. Stored sediment measures 4' wide x 15' long x 1' deep.

5,471' Left bank erosion site measures 5' high x 12' long.

5,600' Flag "CCC site 5140 5-7-02". Right bank erosion site measures 4' high x 26' long.

5,674' LDA is composed of seven pieces of LWD and measures 8' high x 22' wide x 10' long. Stored sediment measures 6' wide x 8' long x 5' deep. Left bank erosion site measures 5' high x 10' wide.

5,802' LDA is composed of approximately 25 pieces of LWD and measures 10' high x 25' wide x 75' long. Stored sediment measures 10' wide x 75' long x 3' deep.

6,116' LDA is composed of approximately 13 pieces of LWD and measures 7' high x 22' wide x 22' long. Stored sediment measures 13' wide x 50' long x 4' deep.

6,202' LDA is composed of six pieces of LWD and measures 4' high x 30' wide x 20' long. Stored sediment measures 15' wide x 15' long x 3' deep.

6,244' High gradient tributary enters channel on right bank. Dry at the time of the survey. Flag "CCC 7-26-90".

6,335' Flag “CCC 5-7-02 site 5875".

6,424' Channel type changes from an F4 to a G4.

6,498' Electrofishing site #3.

6,507' Left bank erosion site measures 4' high x 10' long.

6,567' LDA is composed of two pieces of LWD and measures 5' high x 10' wide x 5' long. Stored sediment measures 10' wide x 12' long x 3' deep. Left bank erosion site measures 6' high x 25' long.

6,616' Flag “CCC site 6155 5-7-02". Left bank erosion site measures 5' high x 30' long.

6,688' Left bank erosion site measures 10' high x 7' long.

6,723' Left bank erosion site measures 7' high x 30' long.

6,834' Right bank erosion site measures 6' high x 22' long.

6,888' Electrofishing site #4. LDA is composed of three pieces of LWD and measures 4' high x 11' wide x 20' long. Stored sediment measures 7' wide x 7' long x 1' deep. Left bank erosion site measures 6' high x 6' long.

6,938' LDA is composed of one piece of LWD and eight small (10” diameter) pieces and measures 5' high x 10' wide x 5' long. Stored sediment measures 10' wide x 12' long x 3' deep.

7,017' LDA is composed of seven pieces of LWD and measures 4' high x 20' wide x 5' long. Stored sediment measures 11' wide x 22' long x 1' deep. Left bank erosion site measures 6' high x 25'.

7,068' LDA is composed of 14 pieces of LWD and measures 6' high x 13' wide x 25' long. Stored sediment measures 8' wide x 18' long x 2' deep.

7,092' Right and left bank erosion sites measure 5' high x 20' long.

7,137' Right and left bank erosion site measures 5' high x 206' long.

7,309' LDA is composed of six pieces of LWD and measures 8' high x 12' wide x 17' long. Stored sediment measures 5' wide x 12' long x 1' deep. Juvenile salmonids observed.

7,732' LDA is composed of 16 pieces of LWD and measures 5' high x 13' wide x 50' long. Stored sediment measures 8' wide x 20' long x 2' deep.

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7,781' Juvenile salmonids observed. LDA is composed of four pieces of LWD and measures 6' high x 15' wide x 15' long. Stored sediment measures 8' wide x 10' long x 3' deep.

7,958' LDA is composed of five pieces of LWD and measures 8' high x 15' wide x 10' long. Stored sediment measures 10' wide x 12' long x 5' deep.

8,152' Electrofishing site #6.

8,187' LDA is composed of 17 pieces of LWD and measures 5' high x 15' wide x 23' long. Stored sediment measures 6' high x 25' long x 1.5' deep.

8,351' LDA is composed of six pieces of LWD and measures 5' high x 8' wide x 40' long. Stored sediment measures 8' wide x 16' long x 2' deep.

9,003' Orange algae present in large quantity throughout the remainder of the survey.

9,172' LDA is composed of three pieces of LWD and measures 4' high x 10' wide x 8' long. Stored gravel and clay sediment measures 5' wide x 10' long x 0.5' deep.

9,345' Electrofishing site #7.

9,367' Low gradient tributary enters on left bank. Dry at the time of the survey. Electrofishing site #8.

9,387' LDA measures 12' high x 12' wide x 27' long. Stored sediment measures 5' wide x 20' long x 10' deep.

9,827' Juvenile salmonids observed.

10,613' Electrofishing site #9.

10,915' LDA is composed of five pieces of LWD and measures 8' high x 15' wide x 20' long. It is not retaining sediment.

10,937' Electrofishing site #10. LDA is composed of eight pieces of LWD and measures 10' high x 12' wide x 25' long. Stored sediment measures 10' wide x 25' long x 6' deep. End of survey due to 400' of dry streambed upstream of LDA.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	