STREAM INVENTORY REPORT

Redwood Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2000 on Redwood Creek and one unnamed tributary. The survey began at the confluence with the Noyo River and extended upstream 4.3 miles.

The Redwood 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 Redwood 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

Redwood Creek is a tributary to the Noyo River, a tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Redwood Creek's legal description at the confluence with the Noyo River is T18N R15W S12. Its location is 39°25′52″ north latitude and 123°29′34″ west longitude. Redwood Creek is a second order stream and has approximately 4.5 miles of blue line stream according to the USGS Burbeck 7.5 minute quadrangle. Redwood Creek drains a watershed of approximately 5.2 square miles. Elevations range from about 700 feet at the mouth of the creek to 2,100 feet in the headwater areas. Redwood/Douglas fir forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Irmulco Road off of Highway 20.

METHODS

The habitat inventory conducted in Redwood 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 Redwood 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". Redwood 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 were in feet to the nearest tenth. Habitat characteristics were

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 Redwood 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 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 Redwood 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 Redwood 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 Redwood 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 Redwood Creek. In addition, three 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 Redwood 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

HABITAT INVENTORY RESULTS

The habitat inventory of July 12, 13, 26-28, 31 and August 1-3, 8-10, 2000, was conducted by Kasey Sirkin, Ethan Jankowski, and Jacob Newell (WSP). The total length of the stream surveyed was 28,200 feet with an additional 419 feet of side channel.

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Redwood Creek is an F4 channel type for 12,886 feet of the stream surveyed and a B4 channel type for 15,314 feet of the stream surveyed. F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools; very stable plan and profile; stable banks and a gravel channel.

Water temperatures taken during the survey period ranged from 60 to 69 degrees Fahrenheit. Air temperatures ranged from 56 to 88 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 14% riffle units, 46% flatwater units, and 38% pool units (Graph 1). Based on total **length** of Level II habitat types there were 11% riffle units, 70% flatwater units, and 18% pool units (Graph 2).

Fourteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were runs, 34%; mid-channel pools, 15%; and low gradient riffles, 14% (Graph 3). Based on percent total **length**, runs made up 46%, step runs 24%, and low gradient riffles 10%.

A total of 196 pools were identified (Table 3). Scour pools were the most frequently encountered, at 54%, and comprised 56% 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 thirty-three of the 196 pools (68%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 188 pool tail-outs measured, sixteen had a value of 1 (9%); 61 had a value of 2 (32%); 82 had a value of 3 (44%); 14 had a value of 4 (7%); and 15 had a value of 5 (8%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the 15 pool tail-outs that had an embeddedness value of 5 were as follows: 47% bedrock, 27% silt/clay/sand or small gravel, and 27% large cobble.

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 23, and pool habitats had a mean shelter rating of 38 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 50. Scour pools had a mean shelter rating of 36 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover types in Redwood Creek. Graph 7 describes the pool cover in Redwood Creek. Undercut banks are the dominant pool cover type followed by root mass.

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 58% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 26%. The mean percent canopy density for the surveyed length of Redwood Creek was 88%. The

mean percentages of deciduous and coniferous trees were 41.4% and 46.6%, respectively. Graph 9 describes the mean percent canopy in Redwood Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 64.4%. The mean percent left bank vegetated was 60.3%. The dominant elements composing the structure of the stream banks consisted of 62.2% sand/silt/clay, 32.4% cobble/gravel, and 5.4% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 48% of the units surveyed. Additionally, 27% of the units surveyed had grass as the dominant vegetation type, and 25% had coniferous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished for species composition and distribution in Redwood Creek on July 19, 2000. The sites were sampled by the Mendocino Redwood Company.

The first site sampled included habitat units 008-011, approximately 450 feet from the confluence with Noyo River. The site yielded two young-of-the-year steelhead.

The second site included habitat units 0183-0185, located approximately 9,180 feet above the creek mouth. The site yielded one young-of-the-year steelhead, one three-spined stickleback, and one Pacific giant salamander.

The third site sampled included habitat units 0211-0215, located approximately 11,088 feet above the creek mouth. The site yielded one young-of-the-year steelhead, and one three-spined stickleback.

The following chart displays the information yielded from these sites:

*The site numbers are according to the Mendocino Redwood Company data and correspond approximately to the habitat unit numbers listed below.

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead		
							YOY	1+	2+
7-19-2000	70-42*	450	008-0011	1.1, 3.3, 5.4, 3.3	1	F4	2	0	0
7-12-2000	70-43*	9,081'	0183-0185	5.1, 3.3, 5.4	1	F4	1	0	0
7-12-2000	70-44*	11,088'	0211-0215	3.3, 5.3, 1.1, 3.3, 5.4	1	F4	1	0	0

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DISCUSSION

Redwood Creek is an F4 channel type for the first 12,886 feet of stream surveyed and a B4 channel type for the remaining 15,314 feet. The suitability of F4 channel types for fish habitat improvement structures is as follows: F4 channels are good for bank placed boulders, single and opposing wing deflectors, channel constrictors and log cover. B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days of July 12, 13, 26-28, 31 and August 1-3, 8-10, 2000, ranged from 60 to 69 degrees Fahrenheit. Air temperatures ranged from 56 to 88 degrees Fahrenheit. This is a suitable water temperature range 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 70% of the total **length** of this survey, riffles 11%, and pools 18%. The pools are relatively deep, with 133 of the 196 (67.9%) pools measured 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 pool habitat is recommended.

Seventy-seven of the 188 pool tail-outs measured had embeddedness ratings of 1 or 2. Ninety-six of the pool tail-outs had embeddedness ratings of 3 or 4. Fifteen of the pool tail-outs had a rating of 5 which is considered unsuitable for spawning. Four of the15 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or small gravel. The remainder of pool tail outs valued at 5 were dominated by bedrock and large cobble. 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 Redwood Creek should be mapped and rated according to their potential sediment yields and control measures should be taken.

One hundred fifty-seven of the 188 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 38. The shelter rating in the flatwater habitats was 23. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by undercut banks in all habitat types. Additionally, root mass contributes a small amount. Log and root wad cover structure in the pool and flatwater habitats would enhance 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.

The mean percent canopy density for the stream was 88%. Reach 1 had a canopy density of 89% while Reach 2 had canopy density of 87%. In general, revegetation projects are considered when canopy density is less than 80%.
The percentage of right and left bank covered with vegetation was moderate at 64.4% and

60.3%, 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) Redwood 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) 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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from undercut banks. Adding high quality complexity with woody cover is desirable.

5) 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.

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.

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'	Begin survey at confluence with the Noyo River. Channel type is F4.
403'	Culvert with downstream migrant trap at end. Culvert dimensions are 9' high x 9' wide x 82' long.
645'	One piece of large woody debris (LWD) on right bank causing scour.
681'	Flagging “Electrofishing 100m”.

788'	Bridge crosses 9' above channel.
822'	Timber harvest flagging.
1,361'	One piece of large woody debris spanning channel.
1,466'	One piece of large woody debris, 15' long x 35" diameter, retaining a small amount of small woody debris.
1,780'	Three pieces of large woody debris (60' long x 15" diameter; 7' long x 13" diameter; 10' long x 15" diameter) on right bank, parallel with channel and causing scour.
1,817'	Channel type taken.
2,430'	Flagging on left bank, “1 Steelhead, DFG, 3/20/00"
2,751'	Road on right bank runs parallel with creek.
2,771'	Flagging, “ 3/20/00 - 3 lamprey redds, DFG, 1 steelhead”.
2,897'	Log debris accumulation (LDA) consists of 4 pieces of large wood, 10' long x 45' wide x 6' high; retaining small amount of sediment.
3,604'	Flagging, “DFG - Redd - 3/20/00".
4,291'	LDA, consists of 3 pieces of large wood, 10' long x 18' wide x 5' high; retaining 2" sediment.
4,838'	Erosion on right bank.
5,022'	LDA on right bank consists of 6 pieces of large wood, 76' long x 13' wide x 5' high; not retaining sediment.
5,049'	Erosion on right bank.
5,083'	Erosion on left bank.
5,130'	Erosion on left bank. Plunge pool with less than 1 foot plunge.
5,244'	Erosion on right bank.
5,556'	Flagging, “ Lamprey redds 5/03/00 - DFG”.
5,575'	LDA consists of 2 pieces of large wood, 7' long x 8' wide x 4' high; not retaining sediment.

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5,607'	LDA, 10' long x 3' wide x 3.5' high: not retaining sediment.
5,706'	LDA consists of 4 pieces of large wood,11' long x 8' wide x 3' high; not retaining sediment.
5,964'	Road crosses channel.
5,975'	LDA consists of 2 pieces of large wood,15' long x 6' wide x 5' high; not retaining sediment.
6,041'	LDA, 4' long x 20' wide x 5' high; not retaining gravel.
6,532'	Flagging, " DFG - 2 lamprey redds - 5/30/00".
6,656'	Erosion on left bank.
6,767'	LDA consists of 5 pieces of large wood, 9' long x 20' wide x 4' high; not retaining sediment.
8,226'	Tributary enters on right bank, dry at time of survey.
8,469'	Erosion on right bank.
8,632'	Flagging, "Lamprey redd - DFG - 5/3/00".
8,900'	Flagging, "2 redds - 3/20/00".
9,107'	Tributary enters right bank, dry at time of survey.
9,364'	Erosion on right bank.
9,448'	Erosion on left bank.
9,543'	Flagging, "3 redds - DFG".
9,973'	Erosion on left bank.
10,110'	LDA consists of 2 pieces of large wood, 7' long x 6' wide x 5' high; not retaining sediment.
10,275'	LDA consists of 4 pieces of large wood, 21' long x 7' wide x 4' high; not retaining sediment.
10,452'	Flagging, "Lamprey redd - 5/30/00 - CDFG".
10,477'	LDA, 3' long x 5' wide x 4' high; not retaining sediment.

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11,037'	Erosion on left bank.
11,177'	Erosion on left bank.
11,373'	Flagging, “DFG - 5/3/00 -Redd”.
11,561'	Erosion on left bank.
11,577'	Erosion on left bank.
11,672'	Erosion on left bank.
11, 747'	Erosion on left bank.
11,930'	Erosion on right bank.
12,342'	Flagging, “DFG 96 Flag”.
12,347'	Flagging, “2 Redds - 3/20/00 - DFG”.
12,355'	Erosion on left bank.
12,471'	Flagging, “DFG - Lamprey Redd - 5/3/00".
12,577'	LDA, 30' long x 3' wide x 3' high; not retaining sediment.
12,692'	LDA consists of 2 pieces of large wood, 6' long x 10' wide x 2' high; not retaining sediment.
12,806	Channel type taken. Channel type changes to B4. Flagging, “Lamprey Redd - 5/3/00 - DFG”.
13,155'	Erosion on right bank.
13,202'	Flagging, “1 Redd, 3/20/00 - DFG”.
13,517'	LDA consists of 3 pieces of large wood, 7' long x 18' wide x 4' high; not retaining sediment.
13,678'	Flagging, “2 Redds - 3/20/00 - DFG”.
13,981'	Erosion on left bank.
14,145'	Bridge crosses 8' above channel; 23' long x 9' wide.
14,305'	Road crosses channel.

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14,382' Road crosses channel.

14,544' Flagging, “2 lamprey redds - DFG”.

14,591' Erosion on left bank.

14,609' Road crosses channel.

14,989' LDA consists of 1 piece of large wood, 1.5' long x 8' wide x 2' high. Erosion on right bank.

15,141' LDA consists of 2 pieces of large wood, 25' long x 15' wide x 5' high; not retaining sediment.

15,255' Flagging, “DFG - 2 Redds - 3/20/00".

15,494' Erosion on right bank.

15,623' Erosion on right bank.

15,657' Erosion on left bank.

15,728' Erosion on left bank.

15,760' Flagging, “DFG - 70-44 - Fish 2000".

15,787' Plunge pool with 1.5' plunge.

16,224' LDA consists of 3 pieces of large wood, 3' long x 15' wide x 3' high; not retaining gravel.

16,258' Flagging, “DFG - 1 coho redd - 4/5/00".

17,027' Bridge crosses 9' above channel; 35' long x 12' wide.

18,190' Flagging, “1 Redd - 3/20/00 -DFG”.

18,329' Flagging, “1 Redd - 3/20/00 -DFG”.

18,674' LDA consists of 7 pieces of large wood, 40' long x 20' wide x 9' high; retaining a small amount of sediment.

18,789' Tributary enters on right bank, water temperature was 65° Fahrenheit. Habitat inventoried on 8/17/00; see subsection report.

18,828' Flagging, “1 Redd - 3/20/00 -DFG”.

18,859' Erosion on right bank.

18,919' Erosion on right bank.

19,520' Bridge crosses 7' above channel; 25' long x 12' wide.

19,875' LDA consists of 1 piece of large wood, 8' long x 13' wide x 5' high; not retaining sediment.

20,062' LDA consists of 2 pieces of large wood, 5' long x 10' wide x 4' high; not retaining sediment.

20,911' LDA consists of 4 pieces of large wood, 15' long x 15' wide x 5' high; not retaining sediment.

20,934' Tributary enters on left bank, was dry at time of survey.

20,962' LDA, 12' long x 10' wide x 4' high; not retaining sediment.

20,986' LDA consists of 8 pieces of large wood, 15' long x 20' wide x 6' high; not retaining sediment.

21,423' Plunge pool with one foot plunge.

21,933' LDA consists of 3 pieces of large wood,18' long x 20' wide x 5' high; not retaining sediment.

22,140' Bridge crosses 8' above channel; 45' long x 13' wide.

22,624' Erosion on left bank.

23,564' LDA, 8' long x 6' wide x 3' high; not retaining sediment.

24,490' Tributary enters on right bank and was dry at time of survey.

25,489' LDA, 30’ long x 25' wide x 8' high; not retaining sediment.

26,461' Plunge pool with 1.6' plunge.

26,650' LDA, 12’ long x 15' wide x 8' high; retaining sediment.

26,591' LDA consists of 6 pieces of large wood,12' long x 15' wide x 7' high; not retaining sediment.

27,218' LDA consists of 4 pieces of large wood, 9' long x 6' wide x 6' high; not retaining sediment.

27,684' LDA consists of 3 pieces of large wood,11' long x 13' wide x 7' high; retaining

some sediment.

27,933' Series of plunges 2-3'.

28,200' LDA, 13' long x 13' wide x 5.5' high; retaining sediment. End of survey due to LDA approximately 250' upstream of this LDA which is retaining significant amounts of sediment and reducing the flow to a trickle.

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]	