STREAM INVENTORY REPORT

Minor Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Minor Creek. The survey began at the confluence with Redwood Creek and extended upstream 2.7 miles.

The Minor 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 Minor 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 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.

WATERSHED OVERVIEW

Minor Creek is a tributary to Redwood Creek, a tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Minor Creek's legal description at the confluence with Redwood Creek is T07N R03E S28. Its location is 40°57′38″ north latitude and 123°50′03″ west longitude. Minor Creek is a second order stream and has approximately 6.5 miles of blue line stream according to the USGS Lord-Ellis Summit 7.5 minute quadrangle. Minor Creek drains a watershed of approximately 11.6 square miles. Elevations range from about 730 feet at the mouth of the creek to 2,800 feet in the headwater areas. Redwood/Douglas fir and mixed hardwood forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via Highway 299 to Redwood Valley Road.

METHODS

The habitat inventory conducted in Minor Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). 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). 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 Minor 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 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". Minor 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 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 Minor 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, 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 Minor 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 Minor 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 Minor 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 Minor Creek. In addition, twenty-six 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 Minor 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

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

The habitat inventory of June 11 through June 20, 2001, was conducted by T. Saunders and D. Resnik (WSP/AmeriCorps). The total length of the stream surveyed was 14,418 feet with an additional 333 feet of side channel.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.3 cfs on June 22, 2001.

Minor Creek is an F4 channel type for the first 3,316 feet of the stream surveyed, an F2 for 1,725 feet, a B3 for 8,139 feet, and a B2 for the last 1,238 feet. Channel types classified "F" are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios. F4 channels are dominated by gravel and F2 channels are dominated by boulder. Channel types classified as "B" are moderately entrenched, moderate gradient, riffle-dominated channel with infrequently spaced pools; very stable plan and profile and stable banks. B3 channels are dominated by cobble and B2 channels are dominated by boulder.

Water temperatures taken during the survey period ranged from 52° to 57° Fahrenheit. Air temperatures ranged from 55° to 74° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 39% riffle units, 33% flatwater units, and 28% pool units (Graph 1). Based on total **length** of Level II habitat types there were 44% riffle units, 38% flatwater units, and 17% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were low gradient riffles, 33%; runs, 16%; and step runs, 16% (Graph 3). Based on percent total **length**, low gradient riffles made up 40%, step runs 27%, and runs 12%. A total of 35 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 63%, and comprised 81% 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. Thirty-four of the 35 pools (97%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 35 pool tail-outs measured, 13 had a value of 1 (37%); 12 had a value of 2 (34%); 3 had a value of 3 (9%); none had a value of 4; and 7 had a value of 5 (20%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The dominant substrate composition for the 7 pool tail-outs that had a embeddedness value of 5 was boulder.

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 30, flatwater habitat types had a mean shelter rating of 26, and pool habitats had a mean shelter rating of 41 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 105. Main channel pools had a mean shelter rating of 42 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Minor Creek. Graph 7 describes the pool cover in Minor Creek. Boulders are the dominant pool cover type followed by bedrock ledges.

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 71% of pool tail-outs while boulders were the next most frequently observed substrate type, at 23%.

The mean percent canopy density for the surveyed length of Minor Creek was 88%. The mean percentages of deciduous and coniferous trees were 92% and 8%, respectively. Graph 9 describes the mean percent canopy in Minor Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 91.1%. The mean percent left bank vegetated was 89.4%. The dominant elements composing the structure of the stream banks consisted of 61.4% cobble/gravel, 18.2% sand/silt/clay, 11.4% boulder and 9.1% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 81.8% of the units surveyed. Additionally, 5.7% of the units surveyed had grass as the dominant vegetation type, and 3.4% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Twenty six sites were electrofished for species composition and distribution in Minor Creek on August 8, 9, 13 and 15, 2001. Water temperatures taken during the electrofishing period ranged from 64° to 69° degrees Fahrenheit. The sites were sampled by P. Divine (DFG) and D. Resnik and T. Saunders (WSP/AmeriCorps).

The first site sampled was habitat unit 006, a run located approximately 322 feet from the confluence with Redwood Creek. The site yielded 9 young-of-the-year steelhead and 4 age one-plus steelhead.

The second site sampled was habitat unit 007, a low gradient riffle located approximately 354 feet above the creek mouth. The site yielded 3 young-of-the-year steelhead and 1 age one-plus steelhead.

The third site sampled was habitat unit 008, a mid-channel pool located approximately 381 feet above the creek mouth. The site yielded 12 young-of-the-year steelhead, 2 age one-plus steelhead and 1 age-two plus steelhead.

The fourth site sampled was habitat unit 012, a mid-hannel pool located approximately 612 feet above the creek mouth. The site yielded 5 young-of-the-year steelhead and 1 age one-plus

steelhead.

The fifth site sampled was habitat unit 014, a lateral scour pool - boulder located approximately 921 feet above the creek mouth. The site yielded 7 young-of-the-year steelhead, 3 age one-plus steelhead and 1 age two-plus steelhead.

The sixth site sampled was habitat unit 019, a step pool located approximately 1,280 feet above the creek mouth. The site yielded 6 young-of-the-year steelhead, 3 age one-plus steelhead and 1 age two-plus steelhead.

The seventh site sampled was habitat unit 023, a step run located approximately 1,649 feet above the creek mouth. The site yielded 5 young-of-the-year steelhead.

The eighth site sampled was habitat unit 024, a backwater pool, rootwad formed located approximately 1,947 feet above the creek mouth. The site yielded 4 young-of-the-year steelhead, 4 age one-plus steelhead and 1 age two-plus steelhead.

The ninth site sampled was habitat unit 028, a low gradient riffle located approximately 2,331 feet above the creek mouth. The site yielded 16 young-of-the-year steelhead.

The tenth site sampled was habitat unit 029, a mid-channel pool located approximately 2,418 feet above the creek mouth. The site yielded 6 young-of-the-year steelhead and 2 age one-plus steelhead.

The eleventh site sampled was habitat unit 031, a step pool located approximately 2,620 feet above the creek mouth. The site yielded 9 young-of-the-year steelhead, 3 age one-plus steelhead and 1 age two-plus steelhead.

The twelfth site sampled was habitat unit 035, a plunge pool located approximately 3,162 feet above the creek mouth. The site yielded 3 young-of-the-year steelhead.

The thirteenth site sampled was habitat unit 037, a lateral scour pool -boulder formed, located approximately 3,293 feet above the creek mouth. The site yielded 7 young-of-the-year steelhead and 1 age two-plus steelhead.

The fourteenth site sampled was habitat unit 041, a step pool located approximately 3,673 feet above the creek mouth. The site yielded 10 young-of-the-year steelhead.

The fifteenth site sampled was habitat unit 045, a plunge pool located approximately 4,075 feet above the creek mouth. The site yielded 2 young-of-the-year steelhead, 1 age one-plus steelhead and 1 age three-plus steelhead.

The sixteenth site sampled was habitat unit 048, a step pool located approximately 4,247 feet above the creek mouth. The site yielded 3 young-of-the-year steelhead, 1 age one-plus steelhead, 1 age two-plus steelhead and 1 age three-plus steelhead.

The seventeenth site sampled was habitat unit 053, a step pool located approximately 4,555 feet above the creek mouth. The site yielded 7 young-of-the-year steelhead and 2 age one-plus steelhead.

The eighteenth site sampled was habitat unit 056, a low gradient riffle located approximately 5,041 feet above the creek mouth. The site yielded 4 young-of-the-year steelhead.

The nineteenth site sampled was habitat unit 057, a run located approximately 5,132 feet above the creek mouth. The site yielded 5 young-of-the-year steelhead and 1 age two-plus steelhead.

The twentieth site sampled was habitat unit 058, a plunge pool located approximately 5,216 feet above the creek mouth. The site yielded 1 age one-plus steelhead, 1 age two-plus steelhead and 1 age three-plus steelhead.

The twenty-first site sampled was habitat unit 109, a plunge pool located approximately 13,180 feet above the creek mouth. The site yielded 4 young-of-the-year steelhead, 1 age two-plus steelhead and 1 age three-plus steelhead.

The twenty-second site sampled was habitat unit 111, a lateral scour pool - boulder formed located approximately 13,400 feet above the creek mouth. The site yielded 5 young-of-the-year steelhead, 1 age one-plus steelhead and 1 age two-plus steelhead.

The twenty-third site sampled was habitat unit 112, a low gradient riffle located approximately 13,458 feet above the creek mouth. The site yielded 2 young-of-the-year steelhead.

The twenty-fourth site sampled was habitat unit 113, a step run located approximately 13,521 feet above the creek mouth. The site yielded 1 young-of-the-year steelhead.

The twenty-fifth site sampled was habitat unit 117, a step pool located approximately 13,623 feet above the creek mouth. The site yielded 1 young-of-the-year steelhead, 2 age one-plus steelhead, 1 age two-plus steelhead and 1 age three-plus steelhead.

The twenty-sixth site sampled was habitat unit 119, a cascade located approximately 14,242 feet above the creek mouth. The site did not yield fish.

An additional five pools were sampled above the end of survey and yielded 2 young-of-the-year steelhead and 1 age three-plus steelhead.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+	3+
8/8/01	1	322	006	RUN	1	F4	9	4	0	0
8/8/01	2	354	007	LGR	1	F4	3	1	0	0
8/8/01	3	381	008	MCP	1	F4	12	2	1	0
8/8/01	4	612	012	MCP	1	F4	5	1	0	0
8/8/01	5	921	014	LSBo	1	F4	7	3	1	0
8/9/01	6	1,280	019	STP	2	F2	6	3	1	0
8/9/01	7	1,649	023	STR	2	F2	5	0	0	0
8/9/01	8	1,947	024	BPR	2	F2	4	4	1	0
8/9/01	9	2,331	028	LGR	2	F2	16	0	0	0
8/9/01	10	2,418	029	MCP	2	F2	6	2	0	0
8/9/01	11	2,620	031	STP	2	F2	9	3	1	0
8/9/01	12	3,162	035	PLP	2	F2	3	0	0	0
8/9/01	13	3,293	037	LSBo	2	F2	7	0	1	0
8/9/01	14	3,673	041	STP	2	F2	10	0	0	0
8/9/01	15	4,075	045	PLP	2	F2	2	1	0	1
8/9/01	16	4,247	048	STP	2	F2	3	1	1	1
8/9/01	17	4,555	053	STP	2	F2	7	2	0	0
8/13/01	18	5,041	056	LGR	3	B3	4	0	0	0
8/13/01	19	5,132	057	RUN	3	B3	5	0	1	0
8/13/01	20	5,216	058	PLP	3	B3	0	1	1	1
8/15/01	21	13,180	109	PLP	4	B2	4	0	1	1
8/15/01	22	13,400	111	LSBo	4	B2	5	1	1	0
8/15/01	23	13,458	112	LGR	4	B2	2	0	0	0
8/15/01	24	13,521	113	SRN	4	B2	1	0	0	0

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+	3+
8/15/01	25	13,623	117	STP	4	B2	1	2	1	1
8/15/01	25	14,242	119	CAS	4	B2	0	0	0	0

DISCUSSION

Minor Creek is an F4 channel type for the first 3,316 feet of stream surveyed, an F2 channel type for 1,725 feet, a B3 for 8,139 feet, and a B2 for 1,238 feet. The suitability of F4 channel types for fish habitat improvement structures are as follows: good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors and log cover; poor for boulder clusters. The suitability of F2 channel types for fish habitat improvement structures are as follows: fair for plunge weirs, single and opposing wing-deflectors and log cover. The suitability of B3 channel types for fish habitat improvement structures are as follows: excellent for plunge weirs, boulder clusters, bank placed boulders, log cover and single and opposing wing deflectors. The suitability of B2 channel types for fish habitat improvement structures are as follows: excellent for plunge weirs, single and opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days June 11 to June 20, 2001, ranged from 52° to 57° Fahrenheit. Air temperatures ranged from 55° to 74° Fahrenheit. The water temperatures taken during the biological sampling in August ranged from 64° to 69° Fahrenheit. The water temperatures recorded in August are nearing 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 38% of the total **length** of this survey, riffles 44%, and pools 17%. The pools are relatively deep, with 34 of the 35 (97%) 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.

Twenty-five of the 35 pool tail-outs measured had embeddedness ratings of 1 or 2. Three of the pool tail-outs had embeddedness ratings of 3 or 4. Seven of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. All of the seven were unsuitable for spawning due to the dominant substrate being boulders. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Twenty-six of the 35 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 41. The shelter rating in the flatwater habitats was 26. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, small woody debris contributes 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 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 86%. Reach 1 had a canopy density of 84% while Reaches 2, 3 and 4 had canopy densities of 72%, 92% and 93%, respectively. In general, revegetation projects are considered when canopy density is less than 80% or the canopy composition is dominated by deciduous trees.

The percentage of right and left bank covered with vegetation was 91.1% and 89.4%, 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) Minor Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are nearing the threshold stress level 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 boulders. 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) Increase the canopy on Minor Creek by planting redwood, and Douglas fir or other native conifers within the riparian zone. The tributaries to Minor Creek and the reaches above this survey section should be inventoried and treated as well, since the water flowing here is effected from upstream.

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.

0'	Begin survey at confluence with Redwood Creek. Channel type is B4.
255'	Concrete bridge 10' above creek.
322'	Electrofishing site #1. Erosion on left bank approximately, 10' high x 40' long.
354'	Electrofishing site #2.
381'	Electrofishing site #3.
612'	Electrofishing site #4.
921'	Electrofishing site #5.
1,040'	Steel bridge 11' above creek.
1,164'	Road crosses through creek. Channel type changes from F4 to F2.
1,280'	Electrofishing site #6.
1,361'	Gully on right bank approximately 20' wide.
1,523'	Slide on right bank approximately, 125' long x 100' high, actively contributing sediment and debris to creek.
1,649'	Electrofishing site #7.
1,947'	Electrofishing site #8.
2,076'	Slide on left bank approximately, 20' high x 50' long, partially vegetated with grass.
2,331'	Electrofishing site #9.
2,418'	Electrofishing site #10.
2,620'	Electrofishing site #11.

3,162'	Electrofishing site #12.
3,293'	Electrofishing site #13.
3,673'	Electrofishing site #14.
3,846'	Bank erosion approximately, 75' high x 138' long, actively contributing sediment and debris to creek.
4,075'	Electrofishing site #15.
4,247'	Electrofishing site #16.
4,555'	Electrofishing site #17. Series of plunge pools with 3'-10' plunges.
4,856'	Erosion on left bank approximately, 40' high x 300' long, actively contributing sediment and debris to creek.
4,996'	Channel type changes from F2 to B3.
5,041'	Electrofishing site #18.
5,132'	Electrofishing site #19.
5,216'	Electrofishing site #20.
6,879'	Tributary enters on left bank with a water temperature of 52°F.
9,928'	Tributary enters on left bank with a water temperature of 50°F.
10,723'	Old road crossing through creek.
11,480'	Tributary enters on right bank with a water temperature of 57°F.
13,142'	Channel type changes from B3 to B2.
13,180'	Electrofishing site #21.
13,400'	Electrofishing site #22.
13,458'	Electrofishing site #23. Erosion on right bank approximately, 40' high x 100' long, actively contributing sediment and debris to creek.
13,521'	Electrofishing site #24.

13,623' Electrofishing site #25.

14,060' Erosion on right bank approximately, 30' high x 50' long, actively contributing sediment and debris to creek.

14,162' Tributary enters on right bank with a water temperature of 53°F.

14,242' Electrofishing site #26. End of survey due to approximately 500' of high gradient section with boulder cascades and plunges of 3'-10'. Possible end of anadromy.

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]	