STREAM INVENTORY REPORT

Bear River

INTRODUCTION

A stream inventory was conducted during the summer of 2000 on Bear River. The survey began at the confluence with the Pacific Ocean and extended upstream 27.2 miles.

The Bear River 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 River. 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 River is a tributary to the Pacific Ocean, located in Humboldt County, California (Map 1). Bear River's legal description at the confluence with the Pacific Ocean is T01N R03W S10. Its location is 40.4769 degrees north latitude and 124.3931 degrees west longitude. Bear River is a fourth order stream and has approximately 25 miles of blue line stream according to the USGS Cape Mendocino 7.5 minute quadrangle. Bear River drains a watershed of approximately 83.2 square miles. Elevations range from sea level at the mouth of the creek to 3,600 feet in the headwater areas. Douglas fir forest, mixed hardwood forest and grasslands dominate the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via Mattole Road to Upper Bear River Road.

METHODS

The habitat inventory conducted in Bear River 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 Bear River 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". The Bear River 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 River, 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 River, 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 River, 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 River, 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 River. 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 Bear River 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 10 through October 7, 2000 was conducted by Karen Bromley (WSP/AmeriCorps), Rhonda Weidenbeck (WSP/AmeriCorps), Ethan Jankowski (WSP/AmeriCorps), Gordon Johnson (WSP/AmeriCorps), and Lars Bromley (CDFG Volunteer). The total length of the stream surveyed was 143,658 feet with an additional 10,608 feet of side

channel. 9,000 feet was not surveyed due to access constraints.

Stream flow was measured approximately three miles upstream from the confluence with the Pacific Ocean with a Marsh-McBirney Model 2000 flowmeter at 36.9 cfs on July 24, 2000; approximately 12.7 miles upstream from the confluence with the Pacific Ocean at 9.3 cfs on August 14, 2000; and approximately 25.3 miles upstream from the confluence with the Pacific Ocean at 0.24 cfs on October 12, 2000.

The 1,344 feet of Bear River estuary was not surveyed except for length. Bear River is a C4 channel type for the first 49,107 feet of the stream surveyed; an F3 channel type for next 37,080 feet, with 9,000 feet of unsurveyed section due to lack of access; a B2 channel type for 46,071 feet; and an F3 channel for the remaining 9,871 feet with 185 feet of unsurveyed marsh. C4 channels are low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplains with gravel dominated channel. F3 channels are entrenched meandering riffle/pool channels on low gradients with high width/depth ratio and cobble dominated channel. B2 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and boulder dominated channel.

Water temperatures taken during the survey period ranged from 51 to 76 degrees Fahrenheit. Air temperatures ranged from 54 to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 49% flatwater units, 31% pool units, and 20% riffle units (Graph 1). Based on total length of Level II habitat types there were 71% flatwater units, 15% pool units, and 14% riffle units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 36%; mid-channel pools, 23%; and low-gradient riffles, 19% (Graph 3). Based on percent total length, runs made up 52%, low-gradient riffles 13%, and mid-channel pools 10%.

A total of 306 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 77%, and comprised 78% 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. Two-hundred-sixteen of the 306 pools (71%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 306 pool tail-outs measured, 61 had a value of 1 (20%); 169 had a value of 2 (55%); 57 had a value of 3 (19%); five had a value of 4 (2%); and 14 had a value of 5 (5%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the 14 pool tail-outs that had an embeddedness value of 5 were as follows: 57% boulders, 21% large cobble, and 21% silt/clay/sand.

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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 32, flatwater habitat types had a mean shelter rating of 25, and pool habitats had a mean shelter rating of 35 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 140. Main channel pools had a mean shelter rating of 39 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Graph 7 describes the pool cover in Bear River. 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 51% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 38%. The mean percent canopy density for the surveyed length of Bear River was 38%. The mean percentages of deciduous and coniferous trees were 61% and 39%, respectively. Graph 9 describes the mean percent canopy in Bear River.

For the stream reach surveyed, the mean percent right bank vegetated was 49%. The mean percent left bank vegetated was 48%. The dominant elements composing the structure of the stream banks consisted of 61% cobble/gravel, 25% sand/silt/clay, 13% bedrock, and 1% boulders (Graph 10). Deciduous trees were the dominant vegetation type observed in 56% of the units surveyed. Additionally, 9% of the units surveyed had grass as the dominant vegetation type, 8% had coniferous trees as the dominant vegetation, and 24% had no vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Electrofishing was conducted at three sites within Bear River. These three sites are index reaches established in 1999.

September 11, 2000

The first index reach is located approximately 6.5 miles upstream of Bear River's confluence with the Pacific Ocean and one mile downstream of the Upper Bear River Road bridge. During the sample period of 1042 hours to 1319 hours, the water temperature increased from 67 degrees Fahrenheit to 73 degrees Fahrenheit and the air temperature increased from 63 degrees Fahrenheit to 68 degrees Fahrenheit. Stream flow was measured to be 9.68 cfs at the site. Water clarity was fair. A total distance of 143 feet was sampled and consisted of two runs, one boulder formed lateral pool, and two low gradient riffles. Two electrofishing passes resulted in a total catch of 304 young-of-the-year steelhead/rainbow trout, 34 one-plus age class steelhead/rainbow trout, 27 sculpin, nine three spine stickleback, seven suckers, and 23 lamprey ammocetes.

September 13, 2000

The second index reach is located approximately 10.5 miles upstream of Bear River's confluence with the Pacific Ocean and just upstream of the confluence of West Side Creek with Bear River. During the sample period of 1020 hours to 1400 hours, the water temperature increased from 65

degrees Fahrenheit to 67 degree Fahrenheit and the air temperature increased from 69 degrees Fahrenheit to 82 degrees Fahrenheit. Stream flow was measured to be 6.65 cfs at the site. Water clarity was fair. A total distance of 314 feet was sampled and consisted of one riffle, one run, one bedrock formed lateral scour pool, and one mid-channel pool. Two electrofishing passes resulted in a total catch of 246 young-of-the-year steelhead/rainbow trout, forty one-plus age class steelhead/rainbow trout, 38 sculpin, 155 three spine sticklebacks, two suckers, 15 lamprey ammocetes, and three pacific giant salamanders.

September 12, 2000

The third index reach is located approximately 16 miles upstream of Bear River's confluence with the Pacific Ocean and one mile upstream of Peaked Creek. During the sample period of 1028 hours to 1343 hours, the water temperature increased from 63 degrees Fahrenheit to 74 degrees Fahrenheit and the air temperature increased from 65 degrees Fahrenheit to 85 degrees Fahrenheit. Stream flow was measured to be 5.18 cfs at the site. Water clarity was fair. A total distance of 181 feet was sampled and consisted of one mid-channel pool, one low gradient riffle, and two runs. Two electrofishing passes resulted in a total catch of 276 young-of-the-year steelhead/rainbow trout, 52 one-plus age class steelhead/rainbow trout, two sculpin, six three spine sticklebacks, three suckers, 56 lamprey ammocetes, four frogs, and four pacific giant salamanders.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (mile)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+
9/11/2000	1	6.5	177-179	5.5, 3.3, 1.1	1	C4	304	34	0
9/13/2000	2	10.5	272-275	3.3, 1.1, 5.5	2	F3	246	40	0
9/12/2000	3	16	382-385	4.2, 1.1, 3.3	2	F3	276	52	0

DISCUSSION

The first 1,344 feet of the Bear River is estuary. Bear River is a C4 channel type for the next 49,107 feet of stream surveyed; an F3 channel type for the next 37,080 feet; a B2 channel type

for 46,071 feet; then an F3 channel for 10,056 feet. The suitability of C4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders and fair for plunge-weirs, single and opposing wing-deflectors, channel constrictors and log cover. The suitability of F3 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders, single and opposing wing-deflectors. Fair for plunge weirs, boulder clusters, channel constrictors and log cover. The suitability of B2 channel types for fish habitat improvement structures is as follows: excellent for plunge-weirs, single and opposing wing deflectors, and log cover.

The water temperatures recorded on the survey days July 10 through October 7, 2000 ranged from 51 to 76 degrees Fahrenheit. Air temperatures ranged from 54 to 82 degrees Fahrenheit. The upper range of these temperatures is near the threshold temperature range for steelhead. 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 71% of the total length of this survey, riffles 14%, and pools 15%. The pools are relatively deep, with 216 of the 306 (71%) pools having a maximum depth greater than three feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width.

Two-hundred-thirty of the 306 pool tail-outs measured had embeddedness ratings of 1 or 2. Sixty-two of the pool tail-outs had embeddedness ratings of 3 or 4. Fourteen of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Eight of the 14 were not suitable for spawning due to the dominant substrate being boulders. The remainder of pool tail-outs with embeddedness ratings of 5 were dominated by cobble or silt/sand/clay. 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 River should be mapped and rated according to their potential sediment yields and control measures should be taken.

Two-hundred-seventy-three of the 306 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 35. The shelter rating in the flatwater habitats was 25. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Additionally, large woody debris 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 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 38%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 49% and 48%, 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 River should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are nearing the threshold range for juvenile steelhead. 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) In reaches 3 and 4, design 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. Additional 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 treatable sites should then be addressed to reduce the amount of fine sediments entering the stream.

6) Identified active and potential sediment sources related to the road system need to be treated according to their potential for sediment yield to the stream and its tributaries.

7) Increase the canopy on Bear River by planting willow, and Douglas fir or other coniferous tree species along the stream. The riparian zones along the Bear River are dominated by deciduous trees. The coniferous component needs to be increased to provide bank stability and a future source of large wood to the stream channel. Tree planting will need to be included in bank stabilization or upslope erosion control projects.

8) There are sections where the stream is being impacted from cattle in the riparian zone. Alternatives should be explored with the grazier and developed if possible.

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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 Bear River estuary. The estuary was not flowing into the Pacific Ocean.
1,344'	End of estuary.
3,258'	Channel type is C4.
8,318'	Left bank erosion site measures 30' high and 390' long.
9,776'	Mattole Road Bridge crosses creek. It is approximately 30' wide.
12,193'	Dry tributary enters on right bank.
12,706'	Left bank erosion site measures approximately 30' high and 200' long.
13,946'	Dry tributary enters on right bank of side channel.
13,980'	Dry tributary enters on right bank.
14,073'	Large dry tributary enters on right bank.
14,611'	Road enters creek on right bank.
15,415'	Left bank erosion site measures approximately 30' high and 120' long.
15,703'	Flow measured with a Marsh-McBirney Model 2000 flow meter at 36.9cfs.
16,720'	Left bank erosion site measures approximately 30' high and 750' long.
19,026'	Dry tributary enters on right bank.
20,231'	Left bank erosion site measures approximately 60' high and 35' long.
23,107'	Johnson Gulch enters on right bank, it is dry.
25,946'	Dry tributary enters on left bank.
26,126'	Road crosses channel.

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26,439'	Right bank erosion site measures approximately 40' high and 150' long.
26,493'	Dry tributary enters on right bank.
26,657'	Logs cabled to right bank creating scour.
27,721'	End of cabled log structures.
29,041'	Red Rock Gulch enters on the left bank, it is dry.
29,379'	Road crosses channel.
29,790'	Road crosses channel.
30,947'	Small tributary enters on left bank. Water flow was minimal at the time of survey.
31,334'	Right bank erosion site measures approximately 100' high and 500' long.
34,950'	Electrofishing site #1.
35,187'	Left bank erosion site measures approximately 50' high and 150' long.
37,990'	Cabled log structure creating scour.
38,828'	South Fork Bear River enters on the left bank. Water temperature at time of survey was 75 degrees Fahrenheit.
39,832'	Dirt road enters channel on left bank.
40,230'	Upper Bear River Road Bridge crosses 17’ above channel and is 22' wide.
41,090'	Clark Creek enters on right bank. The mouth was dry at the time of the survey.
41,618'	Left bank erosion site measures approximately 40' high and 140' long.
41,727'	Cabled structures anchored to left bank, creating scour. Structures continue for approximately 115 feet.
41,841'	Small road crosses through channel.
42,301'	Small road crosses through channel.
44,539'	Small road crosses through side channel.
44,881'	Cabled structures anchored to right bank, creating scour.

45,003' Small road crosses through channel.

45,081' Cabled structure anchored to left bank, creating scour.

45,590' Cabled structures anchored to left bank, creating scour.

46,280' Small road crosses through channel.

48,123' Dry tributary enters on the right bank. Cabled structures on right bank, approximately 500' long.

49'637' Upper Bear River Road crosses 30' above channel and is 20' wide.

49,724' Channel type taken. Channel changes to F3 channel type.

51,390' Left bank erosion site measures approximately 100' high and 500' long.

52,269 Dry tributary enters on the left bank.

54'639' Road crosses channel.

55,172' Road crosses through side channel.

55,267' Road crosses channel.

55,642' Road crosses channel.

55,673' West Side Creek enters on right bank. Tributary was dry at the mouth at the time of survey. Electrofishing site #2.

56,641' Beginning of unsurveyed section. Survey stopped because access was denied. Survey resumed approximately 9,000' upstream.

65,641' Unnamed tributary G enters on right bank. Tributary was dry at the mouth at the time of survey.

65,692' Unnamed tributary F enters on left bank. Water temperature was 62 degrees Fahrenheit.

67,138' Flow measured with a Marsh-McBirney Model 2000 flow meter at 9.3 cfs.

68,593' Small tributary enters on left bank. Water temperature was 61 degrees Fahrenheit.

71,542' Dry tributary enters on right bank.

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72,176' Left bank erosion site measures approximately 75' high and 400' long.

74,509' Antone Creek enters on left bank. Water temperature was 61 degrees Fahrenheit.

76,379' Dry tributary enters on right bank.

77,014' Left bank erosion site measures approximately 50' high and 75' long.

77,303' Tributary enters on left bank. Water temperature was 58 degrees Fahrenheit.

78,061' Road crosses channel.

78,237' Peaked Creek enters on left bank. Water temperature was 64 degrees Fahrenheit at time of survey.

80,310' Right bank erosion site measures approximately 100' high and 200' long.

81,791' Dry tributary enters on right bank.

83,517' Electrofishing site #3.

83,788' Small dry tributary enters on left bank.

83,857' Road crosses channel.

84,643' Road crosses channel.

85,708' Road crosses channel.

86,034' Small dry tributary enters on right bank.

87,531' Channel type taken. Channel changes to B2.

89,512' Unnamed tributary E enters on right bank of side channel. Tributary was dry at mouth, surveyors walked upstream approximately 150' to where water was flowing. Water temperature was 61 degrees Fahrenheit.

90,711' Left bank erosion site measures approximately 100' high and 100' long.

90,829' Plunge pool with 1.5' plunge. Log debris accumulation on left bank measures approximately 40' wide x 20' high x 40' long.

92,083' Small dry tributary enters on right bank.

92,646' Small tributary enters on left bank. Water temperature was 60 degrees Fahrenheit.

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95,787' Small tributary enters on left bank. Water temperature was 57 degrees Fahrenheit.

96,830' Unnamed tributary D enters on left bank. Water temperature was 56 degrees Fahrenheit.

97,258' Right bank slumping, measures approximately 50' high x 200' long.

98,982' Tributary enters on left bank. Very high gradient. Water temperature was 58 degrees Fahrenheit.

99,470' Log debris accumulation measures approximately 30' wide x 40' high x 40' long. It is causing scour and not retaining sediment.

99,612' Left bank erosion site measures approximately 50' high x 100' long.

99,760' Small tributary enters on left bank. Water temperature was 56 degrees Fahrenheit.

101,470' Left bank erosion site measures approximately 300' high x 80' long. Contributing sediment to channel.

105,911' Bear River Bridge crosses 10' above channel and is 30' wide.

106,182' Log debris accumulation on left bank measures approximately 30' wide x 40' long x 20' high.

106,841' Beer Bottle Creek enters on left bank. Water temperature was 53 degrees Fahrenheit.

108,860' Small tributary enters on right bank. Water temperature was 65 degrees Fahrenheit.

112,679' Gorge Creek enters on left bank. Water temperature was 59 degrees Fahrenheit.

115,018' Tributary enters on left bank. Water temperature was 57 degrees Fahrenheit.

119,466' Right bank erosion site measures approximately 300' high x 230' long.

121,029' Dry tributary enters on left bank.

121,864' Left bank erosion site measures approximately 150' high x 223' long.

121,977' Dry tributary enters on left bank.

123,491' Log debris accumulation spans side channel and measures approximately 50' long x 30' wide x 10' high, retaining sediment.

123,514' Brushy Creek enters on right bank. Water temperature was 58 degrees Fahrenheit.

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127,127' Log debris accumulation is providing cover and measures approximately 30' long x 15' wide x 18' high, with associated right bank erosion measuring approximately 200' high x 70' long.

131,365' Nelson Creek enters on left bank. Water temperature was 55 degrees Fahrenheit.

131,704' Road crosses channel.

132,943' Right bank erosion site measures approximately 40' high x 137' long. Three Douglas Fir trees create a log debris accumulation measuring approximately 40' long x 15' wide x 10'high.

133,088' Pullen Creek enters on right bank. Water temperature was 55 degrees Fahrenheit.

133,170' Harmonica Creek) enters on left bank. Water temperature was 57 degrees Fahrenheit.

133,602' Channel type changes to a F3.

133,647' Flow measured with a Marsh-McBirney Model 2000 flow meter at 0.24 cfs.

133,965' Left bank erosion site measures approximately 8' high x 185' long.

134,542' Log debris accumulation measures approximately 10' high x 40' wide x 39' long. Log debris accumulation spans entire channel and is retaining 1.5' of gravel.

135,281' Tributary enters on right bank. Water temperature was 52 degrees Fahrenheit. Flow was low.

135,577' Log debris accumulation measures approximately 20' long x 10' high x 15' wide and retaining 1' of gravel and sediment, with associated left and right bank erosion sites, both measuring approximately 10' high x 65' long.

136,710' Right bank erosion site measures approximately 20' high x 61' long.

137,045' Log debris accumulation measures approximately 40' wide x 60' long x 10' high and is retaining 2' of gravel, with associated right bank erosion measuring approximately 20' high x 50' long.

137,630' Log debris accumulation measures approximately 30' long x 10' wide x 5' high.

138,002' Right bank erosion site measures approximately 30' high x 50' long.

138,426' Log debris accumulation measures approximately 80' wide x 20' long x 10' high.

138,978' Tributary enters on right bank. Water temperature was 53 degrees Fahrenheit.

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139,141' Log debris accumulation measures approximately 30' wide x 30' long x 10' high.

139,467' Log debris accumulation measures approximately 40' wide x 20' long x 10' high and is retaining approximately 2' of gravel and sediment.

140,022' Log debris accumulation measures approximately 15' long x 15' wide x 10' high and is retaining approximately 5' of gravel and sediment.

140,062' Log debris accumulation measures approximately 15' long x 20' wide x 10' high and is retaining 2.5' of gravel and sediment.

140,464' Log debris accumulation measures approximately 25' wide x 15' long x 10' high and is retaining 5' of gravel and sediment.

140,566' Log debris accumulation measures approximately 30' wide x 30' long x 15' high and is retaining 2' of gravel and sediment.

140,805' Log debris accumulation measures approximately 15' long x 10' wide x 5' high and is retaining 2' of gravel and sediment.

141,142' Log debris accumulation measures approximately 20' wide x 15' long x 10' high and is retaining 5' of gravel and sediment.

142,970' Tributary enters on left bank. Water temperature was 55 degrees Fahrenheit.

143,658' End of survey at beginning of marsh.

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]	