STREAM INVENTORY REPORT

Gates Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Gates Creek. The survey began at the confluence with Daugherty Creek and extended upstream 2.8 miles.

The Gates 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 Gates 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

Gates Creek is a tributary to Daugherty Creek, which is a tributary to South Fork Big River, a tributary to the Big River, which is located in Mendocino County, California (Map 1). Gates Creek's legal description at the confluence with Daugherty Creek is T16N R14W S32. Its location is 39° 12′ 21″ north latitude and 123° 26′ 03″ west longitude. Gates Creek is a second order stream and has approximately 2.7 miles of blue line stream according to the USGS Baily Ridge and Orrs Springs 7.5 minute quadrangles. Gates Creek drains a watershed of approximately 5.3 square miles. Elevations range from about 680 feet at the mouth of the creek to 2,000 feet in the headwater areas. Redwood/Douglas fir forest dominate the watershed. About 20% of the watershed surveyed is owned by Mendocino Redwood Company and is managed for timber production. The rest of the 80% surveyed is owned by 5 separate landowners. Vehicle access exists via Masonite Road.

METHODS

The habitat inventory conducted in Gates 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 Gates 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 top 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". Gates Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Gates 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 Gates 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 Gates 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 Gates 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.

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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 Gates Creek. In addition, two sites were electrofished using a Smith-Root Model 12 electrofisher and one site was snorkel surveyed. 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 Gates 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 May 21 through 31, and June 24 and 25 was conducted by Bob Pagliuco (WSP) and Lori Schmitz (WSP). The total length of the stream surveyed was -13,931 feet with an additional 61 feet of side channel.

Stream flow was measured 161 feet upstream from the confluence with Daugherty Creek with a Marsh-McBirney Model 2000 flowmeter. On May 20th after a recent rainfall the creek was

calculated to be flowing at 1.71 cfs. On May 30th it was found to be flowing at .54 cfs.

Gates Creek is F4 channel type for 853 feet of the survey. F4 channels are entrenched, meandering, riffle/pool channels with low gradient, high width/depth ratios, and gravel-dominant substrate.

Gates Creek is B4 channel type for 11,662 feet of the survey. B4 channels are moderately entrenched, with moderate gradient, and are riffle dominated with infrequently spaced pools. They have very stable banks and a gravel channel bed.

Gates Creek is A4 channel type for 1,416 feet of the survey. A4 channels are steep, narrow, cascading streams, with step-pools, high energy debris transport, and a gravel channel.

Water temperatures taken during the survey period ranged from 50 to 66 degrees Fahrenheit. Air temperatures ranged from 50 to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% riffle units, 20% flatwater units, and 38% pool units (Graph 1). Based on total length of Level II habitat types there were –43% riffle units, 17% flatwater units, and 40% pool units (Graph 2).

Nine IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle, 41%; Mid-channel Pool, 33%; and run, 18% (Graph 3). Based on percent total length, low gradient riffles made up 42%, mid-channel pools make up, 33%, and runs make up 15%.

A total of 139 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 98% , and comprised 99% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Fifty-five of the 139 pools (40%) had a depth of two feet or greater (Graph 5).

The depth of substrate embeddedness was estimated at pool tail-outs. Of the 137 pool tail-outs measured, 44 had a value of 1 (32.1%); 43 had a value of 2 (31.1%); 42 had a value of 3 (30.7%); 1 had a value of 4 (0.7%); and 7 had a value of 5 (5.1%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the 137 pool tail-outs that had a embeddedness value of 5 were as follows: bedrock 28.6%, large cobble 28.6%, gravel 28.6%, and silt/sand 14.3% .

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 65, flatwater habitat types had a mean shelter rating of 39, and pool habitats had a mean shelter rating of 78 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 80. Scour pools had a mean shelter rating of 45 (Table 3).

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Table 5 summarizes mean percent cover by habitat type. Boulders and white water are the dominant cover types in Gates Creek. Large and small woody debris are lacking in some habitat types. Graph 7 describes the pool cover in Gates Creek. Large woody debris is 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 60 % of pool tail-outs while small cobble was the next most frequently observed substrate type, at 35%.

The mean percent canopy density for the surveyed length of Gates Creek was 87%. The mean percentages of deciduous and coniferous trees were 24% and 77%, respectively. Graph 9 describes the mean percent canopy in Gates Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 91.9%. The mean percent left bank vegetated was 92.6%. The dominant elements composing the structure of the stream banks consisted of cobble/gravel 53.1%, bedrock 23.5%, sand/silt/clay 21.4%, and boulder 2.1%.

Additionally, 14.3% of the units surveyed had deciduous trees as the dominant vegetation type, and 63.3% had coniferous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished for species composition and distribution in Gates Creek on July 22 and 23, 2002. Water temperatures taken during the electrofishing and snorkeling period ranged from 60 to 67 degrees Fahrenheit. Air temperatures ranged from 59 to 77 degrees Fahrenheit. The sites were sampled by Allan Renger (DFG), Chris Ramsey (DFG), Hillary Kleeb (WSP), Bob Pagliuco(WSP), and Lori Schmitz (WSP).

The first site sampled included habitat unit 0009, a mid channel pool approximately 266 feet from the confluence with Daugherty Creek. The site yielded 5 O+steelhead, 3 chinook, and 1 stickleback.

The second site included habitat units sampled between 0037-0326, mid channel pools, located between 1,118-12,516 feet above the confluence. The site yielded 46 0+steelhead, 4 1+ steelhead, 2 2+ steelhead, and 3 sculpin.

The third site sampled included habitat units sampled between 0334- 0360, mid channel and step pools, located between 12,699-13,509 feet above the creek mouth. The site yielded 2 1+ steelhead, and 2 sculpin.

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The following chart displays the steelhead information yielded from these sites:

Date	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead		
						YOY	1+	2+
07/22/02	266	0009	4.2	1	F4	5	0	0
07/22/02	1,119	0037	4.2	2	B4	0	0	0
07/23/02	11,513	0300	4.2	2	B4	11	1	1
07/23/02	11,598	0303	4.2	2	B4	7	1	0
07/23/02	11,755	0306	4.2	2	B4	3	0	0
07/23/02	11,781	0308	4.2	2	B4	10	1	0
07/23/02	11,868	0310	4.2	2	B4	1	0	0
07/23/02	12,079	0316	4.2	2	B4	3	1	0
07/23/02	12,515	0326	4.2	2	B4	1	0	0
07/23/02	12,700	0334	4.2	3	A4	0	1	0
07/23/02	12,884	0342	4.2	3	A4	0	1	0
07/23/02	13,083	0348	4.4	3	A4	0	0	0
07/23/02	13,265	0354	4.2	3	A4	0	0	0
07/23/02	13,508	0360	4.4	3	A4	0	0	0

DISCUSSION

Gates Creek is a F4 channel type for 853 feet of stream surveyed. F4 channel types for fish habitat improvement structures are good for bank-placed boulders; fair for plunge weirs; single and opposing wing-deflectors, channel constrictors, log cover; and poor for boulder clusters.

Gates Creek is a B4 channel type for the 11,662 feet of stream surveyed. B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

Gates Creek is a A4 channel for 1,416 feet of the stream surveyed. A4 channels are good for bank-placed boulders; fair for plunge weirs, opposing wing-deflectors, and log cover; poor for boulder clusters and single wing deflectors.

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The water temperatures recorded between May 21-23, 28-29,31, and June 24-25, ranged from 50 to 66 degrees Fahrenheit. Air temperatures ranged from 50 to 82 degrees Fahrenheit. Over 68 degrees is poor for salmonids.

Flatwater habitat types comprised 17% of the total length of this survey, riffles 43%, and pools 40%.

The pools are relatively shallow, with 55 of the 139 pools (40%) having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream. The LDA's in the system are retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

The depth of substrate embeddedness was estimated at pool tail-outs. Of the 137 pool tail-outs measured, 44 had a value of 1 (32.1%); 43 had a value of 2 (31.1%); 42 had a value of 3 (30.7%); 1 had a value of 4 (0.7%); and 7 had a value of 5 (5.1%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The breakdown of dominant substrate composition for the 137 pool tail-outs that had a embeddedness value of 5 were as follows: bedrock 28.6%, large cobble 28.6%, gravel 28.6%, and silt/sand 14.3% .

Eighty-seven of the 137 pool tail-outs measured had embeddedness ratings of 1 or 2. 43 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. Three of the 7 were unsuitable for spawning due to the dominant substrate being silt/sand/clay or small gravel. The remainder of pool tails valued at 5 were dominated by large cobble and bedrock. 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 Gates Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

130 of the 137 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 low with a rating of 78. The shelter rating in the flatwater habitats was lower at 39. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by boulders and white water in most habitat types. Additionally, bedrock ledges contribute the least amount. Large woody debris is the dominant pool cover type followed by root mass. More 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.

Reach 1, 2, and 3 all had canopy densities of 87%, causing the mean percent canopy density to be 87%. This is a relatively moderate percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The mean percent canopy density for the surveyed length of Gates Creek was 87%. The mean percentages of deciduous and coniferous trees were 24% and 77%, respectively. Graph 9 describes the mean percent canopy in Gates Creek.

The percentage of right and left bank covered with vegetation was high/moderate/low at 91.9% and 92.6%, 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) Gates 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) 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.

4. 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.

6) There are several log debris accumulations present on Gates Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

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.

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Position (ft):	Comment:
0'	Begin survey at confluence with Daugherty Creek. Channel type is F4.
100'	CCC Log Habitat Improvement Structure
132'	Out of the influence of Daugherty Creek
214'	Flow taken, 1.7 cfs May 20, 2002. Flow taken, 0.54 cfs May 30, 2002.
266'	Channel Type Taken, F4, start/end of electrofishing site #1
358'	CCC log habitat improvement structure
549'	8'H x 20'W x 15'L large woody debris accumulation, seven pieces of wood, with water flowing through and visible gaps.
686'	CCC log habitat improvement structure
853'	CCC log habitat improvement structure
1119'	CCC log habitat improvement structure, start of electrofishing site #2
1250'	CCC log habitat improvement structure
1391'	CCC log habitat improvement structure
1250'	CCC log habitat improvement structure
1391'	CCC log habitat improvement structure
1498'	CCC log habitat improvement structure
1558'	CCC log habitat improvement structure
1719'	Two CCC log habitat improvement structures
2115'	CCC log habitat improvement structure
2244'	CCC log habitat improvement structure
2820'	CCC log habitat improvement structure
3022'	CCC log habitat improvement structure
3158'	Six coho and 10 young of the year steelhead observed in pool.

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3204'	Left bank 150'H x 160'L x 15'D landslide contributing many trees, 12'H x 35'W x 50'L Large Woody Debris Accumulation, 14 pieces of wood, with water flowing through and visible gaps, 250'H x 10'W x 3'D small cobble and silt-sediment retained, possible barrier to juveniles, 13 trees less than 12'' diameter downed by landslide
3336'	Two CCC log habitat improvement structures
3550'	CCC log habitat improvement structure, salmonids observed in pool
3635'	CCC log habitat improvement structure
3787'	CCC log habitat improvement structure
3862'	4'H x 12'W x 8'L large woody debris accumulation, 4 more than 12'' diameter logs, minimal small woody debris accumulation, water flows through with visible gaps.
4062'	CCC log habitat improvement structure
4251'	8'H x 20'W' x 7'L large debris accumulation, channel wide, 3 pieces of wood, water flowing through, with visible gaps, 55'L x 5'W x 1.5'D sediment retention, possible barrier to juvenile salmonids.
4294'	CCC log habitat improvement structure
4438'	Tributary enters right bank, 7% estimated slope, .1 cfs estimated flow, contributing 2% to downstream flow of receiving stream, water temperatures 54 degrees upstream, downstream and in tributary, accessible to fish, but none observed
4533'	Undercut bank caused large woody debris to topple shoreward
4640'	Juvenile salmonids observed in pool
4772'	CCC log habitat improvement structure
4871'	CCC log habitat improvement structure, 6'H x 30'W x 14'L large woody debris accumulation, 5 logs, water flows through with visible gaps
4964'	CCC log habitat improvement structure
4990'	CCC log and rock weir habitat improvement structure
5142'	Observed many young of the year and two first year salmonids in pool

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5197'	CCC log habitat improvement structure
5250'	Old skid road crosses creek, little vegetation growing
5323'	CCC habitat log and rock weir improvement structure
5438'	Young of the year and 1+ salmonids observed in pool
5535'	CCC log habitat improvement structure
5685'	CCC log and rock weir habitat improvement structure
5745'	CCC log and rock weir habitat improvement structure
5848'	Channel type taken, B4
5943'	CCC log habitat improvement structure
6267'	Side channel
6279'	CCC log and rock weir habitat improvement structure
6297'	CCC log habitat improvement structure
6390'	Juvenile salmonids observed
6538'	CCC log habitat improvement structure
6775'	CCC log habitat improvement structure
7071'	CCC log habitat improvement structure, 5'H x 27'W x 15'L large debris accumulation, five pieces of wood, water flows through, with visible gaps.
7134'	80' of the left bank is slumping into the creek, undercut bank 6'-8', with redwoods leaning landward, small spring enters on left bank, CCC log habitat improvement structure, 8'H x 16'W x 60'L large woody debris accumulation, nine pieces of wood, water flows through with visible gaps
7385'	CCC log habitat improvement structure, 8'H x 34'W x 6'L large woody debris accumulation, five pieces of wood, water flowing through, with visible gaps
7537'	Juvenile salmonids observed in pool
7604'	Two redds observed, 12''-15'' diameter, perfectly round, possible lamprey, in pool tailcrest, CCC log habitat improvement structure

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7884'	CCC rock habitat improvement structure
7979'	CCC rock and log improvement structure, juvenile salmonids observed in pool
8130'	Juvenile and 1+ salmonids observed in pool, CCC log habitat improvement structure
8182'	Steel and wood vehicle bridge, 10'W x 30'L, 5' from waters surface
8248'	Open area, with algae growing on rocks that is greater than 70% of the wetted width
8382'	CCC habitat rock improvement structure
8417'	Observed many juvenile and 1+ salmonids
8790'	Johnson Creek enters right bank, flow 0.36 cfs, contributing 20% to downstream flow, 64 degrees in tributary, upstream, and downstream. Salmonids and stickleback were observed, 1.2% estimated slope
8850'	Old skid road crosses creek, little vegetation growing back
8858'	Stickleback species and salmonids observed in pool
9152'	Young of the year salmonids observed in stream
9376'	Stream has cut a 90 degree angle in right bank 12 feet down, vegetation is leaning toward the stream
9481'	3'H x 32'W x 8'L log debris accumulation, water flows through, with visible gaps
9974'	Tributary enters right bank, flow 0.2 cfs, contributing 10% to downstream flow, tributary temperature 59 degrees, downstream 61 degrees, upstream 60 degrees, not accessible to fish
10163'	Juvenile salmonids observed in pool
10394'	Juvenile salmonids observed in pool
10564'	Five large conifers fell across the channel from right bank, not in wetted width during the summer
10918'	60'H x 50'L left bank landslide, adding large woody debris, small woody debris, sand and clay. Large debris accumulation

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11,114’	Juvenile salmonids observed in pool
11,275’	Juvenile salmonids observed in pool
11,513’	60'L x 14'W x 8'H Steel and wood vehicle bridge above pool in good condition, no scour visible
11598’	Juvenile salmonids observed in pool
11,942’	44'L x 21'W x 10'H large debris accumulation, seven pieces, water flows through with visible gaps, 30'L x 20'W x 0.5'D Gravel sediment retention, fish seen above large debris accumulation, possible barrier to juvenile salmonids, 50'L x 70'H right bank landslide, contributing gravels, small cobbles, clay, small woody debris, large woody debris. Tops of trees delivered into the stream were missing
12079'	Juvenile salmonids observed in pool
12,515’	Channel type taken, A4, end of electrofishing site #2
12624’	15'L x 22'W x 9'H large debris accumulation, 10 pieces of wood, water flows through with visible gaps, 30'L x 20'W x 0.5'D gravel sediment rentention, fish observed above large debris accumulation, possible barrier to juvenile salmonids
12,700’	Start of electrofishing site #3
12761’	Right bank landslide delivering small woody debris, large woody debris, cobble, gravel, and silt, small large debris accumulation, possible barrier to juvenile salmonids
12884’	Six inch fish observed in pool, possible 1+ year salmonid
13283’	17'H x 35W x 112'L large debris accumulation, 54 pieces of wood, water flows through, no visible gaps, 115'L x 35'W x 17'D cobble, gravel, sand sediment retention. No fish seen above large debris accumulation, possible barrier to juvenile and adult salmonids, possible end of anadromy
13,508’	End of electrofishing site #3
13931’	Tributary enters left bank, end of survey due to lack of access. Stream continues upstream and anadromous fish habitat possibly located upstream.

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.

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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]	