STREAM INVENTORY REPORT

Salmon Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1997 on Salmon Creek. The 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 Salmon Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Salmon Creek is a tributary to Hookton Slough, a tributary to Humboldt Bay, which drains to the Pacific Ocean. It is located in Humboldt County, California (Map 1). Salmon Creek's legal description at the confluence with Humboldt Bay is T04N R01W S31. Its location is 40.6831 degrees north latitude and 124.2219 degrees west longitude. Salmon Creek is a third order stream and has approximately 13.3 miles of blue line stream according to the USGS Fields Landing 7.5 minute quadrangle. Salmon Creek drains a watershed of approximately 23.5 square miles. Elevations range from sea level at the mouth of the creek to 1,500 feet in the headwater areas. Redwood forest and Douglas fir forest dominate the watershed. The watershed is primarily privately owned and is managed for timber production and rangeland. The lower 5,000 feet run through the Humboldt Bay National Wildlife Refuge, which is managed for recreation. Vehicle access exists via Highway 101 to Loleta Road.

METHODS

The habitat inventory conducted in Salmon Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1995). 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, dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are further 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 Salmon 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 standard flow measuring equipment, if available. In some cases flows are estimated.

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.

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". Salmon 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. Channel dimensions were measured using hip chains, tape measures, and stadia rods. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the sampling form. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Salmon Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Salmon 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 Salmon 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 Salmon 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 was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In Salmon Creek fish presence was observed from the stream banks, and twenty 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 Salmon 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 the pool tail-outs
- 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 August 5 through August 30, 1997 was conducted by Sandra Miles and Lisa Campbell (WSP\AmeriCorps). The total length of the stream surveyed was 53,851 feet with an additional 3,129 feet of side channel.

Flow was measured at seven locations on Salmon Creek with a Marsh-McBirney Model 2000 flowmeter. The flows measured on August 12, 1997 were: 0.88 cfs 4,394 feet upstream from the mouth; 0.22 cfs 4,804' upstream from the mouth; 0.28 cfs 10,908' upstream from the mouth; 0.25 cfs 17,418' upstream from the mouth; 0.26 cfs 27,900' upstream from the mouth. The flows measured on August 15, 1997 were: 0.18 cfs 38,133' upstream from the mouth; and 0.24 at the end of the survey.

Salmon Creek is a DA5 channel type for the first 4,394 feet of stream reach surveyed, an F5 for the next 8,330, a C4 for the next 11,045 feet, an F4 for the next 7,819 feet, an F2 for the next 5,716 feet, a B3 for the next 9,736 feet, and an F2 for the last 6,811 feet. DA5 channel types are multiple channels, narrow and deep with an expansive well vegetated floodplain and associated wetlands, very gentle relief with highly variable sinuosities, stable banks, and a sand channel. F channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios. F5 channels have sand as the dominant substrate, F4 channels have gravel as the dominant substrate and F2 channel have boulder as the dominant substrate. C4 channels are low gradient, meandering, point-bar, riffle/pool, alluvial channels with a broad, well defined floodplain and a gravel dominant channel. B3 channels are moderately entrenched, moderate gradient, riffle dominated channels, with infrequently spaced pools, very stable plan and profile, stable banks, and a cobble dominant channel.

Water temperatures taken during the survey period ranged from 59 to 76 degrees Fahrenheit. Air temperatures ranged from 62 to 77 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% flatwater units, 32% pool units, and 31% riffle units (Graph 1). Based on total length of Level II habitat types there were 57% flatwater units, 30% pool units, and 13% riffle units (Graph 2).

Sixteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools and low gradient riffles, each at 30%; runs, 19%; and step runs, 17% (Graph 3). Based on percent total length, step runs made up 31%, mid-channel pools, 26%, and runs, 24%.

A total of 286 pools were identified (Table 3). Main channel pools were most frequently encountered at 93% and comprised 87% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. One-hundred-twenty of the 286 pools (42%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 286 pool tail-outs measured, 28 had a value of 2 (10%); 36 had a value of 3 (13%); 74 had a value of 4 (26%); and 148 had a value of 5 (52%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning. In Salmon

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Creek, 79 of the 148 pool tail-outs which were valued at 5 had silt/clay/sand or gravel too small to be suitable for spawning as the substrate. Eighty-one of tail-outs were unsuitable for spawning due to the tail-outs being comprised of boulder, bedrock or wood.

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 19, flatwater habitat types had a mean shelter rating of 27, and pool habitats had a mean shelter rating of 47 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 56. Scour pools had a mean shelter rating of 34 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Salmon Creek. Graph 7 describes the pool cover in Salmon Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate in 10 of the 34 low gradient riffles fully measured. Small cobble was the dominant substrate observed in 75 of the 286 pool tail-outs measured (26%). Boulders were the next most frequently observed dominant substrate type and occurred in 25% of the pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 70%. The mean percentages of deciduous and coniferous trees were 79% and 21%, respectively. Graph 9 describes the canopy in Salmon Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 81%. The mean percent left bank vegetated was 84%. The dominant elements composing the structure of the stream banks consisted of 35% cobble/gravel, 30% sand/silt/clay, 20% bedrock, and 15% boulders (Graph 10). Deciduous trees were the dominant vegetation type observed in 66% of the units surveyed. Additionally, 17% of the units surveyed had coniferous trees as the dominant vegetation type, and 10% had grass as the dominant vegetation, (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Twenty sites were electrofished from September 2 through September 5, 1997 in Salmon Creek. The sites were sampled by Sandra Miles and Lisa Campbell. The results are displayed in the table below.

Site #	Habitat unit #	Habitat type	Distance from conf.	Length of site	Yield STB = stickleback SH = steelhead/rainbow trout
1	14	MCP	3,377'	41'	8 STB
2	16	CRP	3,516'	24'	6 STB
3	28	MCP	4,790'	25'	3 STB

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4	71	MCP	7,693'	35'	5 STB
5	87	MCP	10,343'	35'	14 STB 1 SH
6	204	MCP	17,171'	131'	13 STB 2 SH
7	264	MCP	21,441'	71'	3 STB 3 SH
8	269,270	MCP,LGR	21,819'	76'	12 STB 8 SH
9	343-346	MCP, RUN,BRS	27,584'	339'	18 STB 10 SH
10	367,368	LSR,LGR	29,579'	83'	5 STB 17 SH
11	394,395	MCP,LGR	31,283'	98'	18 STB 6 SH
12	405	MCP	31,863'	54'	11 STB 9 SH
13	413	MCP	32,230'	59'	6 STB 1 SH
14	420	MCP	32,542'	72'	24 STB 14 SH
15	532-534	MCP,LGR SRN	37,874'	107'	2 STB 15 SH
16	536	MCP	38,133'	24'	10 SH
17	833	MCP	52,287'	38'	6 SH
18	855	MCP	53,165'	19'	1 SH
19	875	MCP	53,823'	28'	0
20		MCP,RUN	53,974'	60'	1 SH

DISCUSSION

Salmon Creek has six channel types: DA5, F5, C4, F4, F2, and B3. The suitability of these channel types for fish habitat improvement structures is as follows: DA5 channel types are generally not suitable for fish habitat improvement projects. F5 channel types are good for bank-placed boulders, fair for plunge weirs, single and opposing wing deflectors, channel constrictors, and log cover, and poor for boulder clusters. C4 channel types are good for bank-placed boulders, and fair for plunge weirs, single and opposing wing deflectors, channel constrictors, and log cover. F4 channel types are good for bank-placed boulders, fair for plunge weirs, single and opposing wing deflectors, channel constrictors, and log cover, and poor for boulder clusters.

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F2 channel types are fair for plunge weirs, single and opposing wing deflectors, and log cover. B3 channel types are excellent for plunge weirs, boulder clusters and bank-placed boulder; single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days August 5 through August 30, 1997 ranged from 59 to 76 degrees Fahrenheit. Air temperatures ranged from 62 to 77 degrees Fahrenheit. The highest water temperatures were recorded in the first three stream reaches where the water temperatures ranged from 61 to 76 degrees Fahrenheit. The water temperature range in the first three stream reaches, if sustained, is near the threshold stress level for salmonids. The water temperatures recorded in the upper three stream reaches ranged from 62 to 66 degrees Fahrenheit, a more suitable temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 37% of the total length of this survey, riffles 31%, and pools 32%. The pools are relatively deep, with 120 of the 286 (42%) 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 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.

None of the 286 pool tail-outs measured had an embeddedness rating of 1. One-hundred-ten of the pool tail-outs had embeddedness ratings of 3 or 4. There were 148 pool tail-outs that had a rating of 5 or were considered not suitable for spawning. Seventy-nine (28%) of all of the pool tail-outs were not suitable for spawning due to the dominant substrate being silt/sand/clay or gravel being too small to be suitable. Twenty eight percent of the pool tail-outs were unsuitable for spawning due to the dominant substrate being boulders/bedrock/wood. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In Salmon Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was 47. The shelter rating in the flatwater habitats was 27. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by boulders in all habitat types. Log and root wad cover structures in the pool and flatwater habitats are needed to improve 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.

One hundred forty-four of the 286 pool tail-outs measured had gravel or small cobble as the dominant substrate. One hundred thirty-nine of the 286 low pool tail-outs had silt, sand, or boulders as the dominant substrate. In some reaches of Salmon Creek, suitable sized spawning gravel is limited.

The mean percent canopy density for the stream was 70%. In general, revegetation projects are considered when canopy density is less than 80%.

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The percentages of right and left banks covered with vegetation were 81% and 84%, 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) Salmon Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are near or above the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

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

4) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Treatable sites should then be deal with to reduce the amount of fine sediments entering the stream.

5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

6) Increase the canopy on Salmon Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels.

7) Maintain the exclusionary fencing along the lower reaches of the stream to control access of livestock.

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 the confluence with Hookton Slough. The channel type is a DA5. Fish access controlled by a tide gate, equipped with a fish passage door, one foot wide by two feet high. The fish passage door was closed at the time of the survey.

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1,721'	Side channel diversion is part of many smaller channels that disperse throughout an overflow area for high water and tidal flows. The overflow fills during high tide, creating a brackish marsh, approximately one mile square, with uneven depths usually no greater than two feet.
3,377'	First electrofishing site.
3,418'	Second electrofishing site.
4,394'	Channel type changes to an F5. Flow measured on August 12, 1997 was 0.88 cfs.
4,568'	Cement bridge measures 22' long x 14' wide x 6' high, precedes water diversion channel not accessible to anadromous salmonids, due to screened flashboards.
4,728'	Left bank erosion site measures 22' long x 6' high. Alders and roots still attached to the bank.
4,790'	Third electrofishing site.
4,804'	The channel is deep and u-shaped. Flow measured on August 12, 1997 was 0.22 cfs.
7,351'	Barbed-wire fence broken allowing cows access to the creek.
7,693'	Forth electrofishing site.
9,331'	Hookton Road bridge measures 20' long x 40' wide x 5' high.
10,198'	Left bank tributary, flow less than 0.01 cfs. Not accessible to anadromous salmonids.
10,343'	Fifth electrofishing site.
10,691'	Loleta Road bridge measures 30' long x 50' wide x 8' high. Upstream of the bridge is a right bank cow trail, used to move cows through the channel between grazing area and dairy.
10,861'	Highway 101 bridge measures 100' long x 100' wide x 30' high. The cow access noted above includes this length of the stream.
10,908'	Flow measured on August 12, 1997 was 0.28 cfs.
12,724'	Channel type changes to a C4.
14,565'	Train bridge measures 14' long x 75' wide x 13' high.

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14,747'	Left bank tributary (Deering Gulch), flow less than 0.01 cfs. Not accessible to anadromous salmonids.
14,757'	Private bridge and road measures 20' long x 50' wide x 7' high.
15,620'	Right bank armored with car bodies.
16,208'	Log debris accumulation (LDA) measures 20' long x 18' wide x 3' high.
16,276'	Left bank tributary (Little Salmon Creek), dry, with a sand/silt dominated channel and shallow banks.
16,354'	Right bank erosion site measures 100' long x 6' high.
17,171'	Sixth electrofishing site.
17,188'	Tompkins Hill Road bridge measures 20' long x 30' wide x 8' high.
17,418'	Flow measured on August 12, 1997 was 0.25 cfs.
17,679'	LDA measures 8' long x 25' wide x 4' high.
18,508'	Riprap measures 100' long.
18,608'	Juvenile steelhead observed.
19,894'	Left bank tributary, dry and steep with a bedrock channel. Not accessible to anadromous salmonids.
21,441'	Seventh electrofishing site.
21,460'	Right bank erosion site measures 75' long x 100' high.
21,819'	Eighth electrofishing site.
22,008'	Right bank erosion site measures 175' long x 100' high.
22,357'	Right bank erosion site measures 65' long x 100' high and is composed of Franciscan formation graywacke clay “quick-silt” or “blue-goo”.
22,437'	Right bank tributary, dry, steep and entrenched. Not accessible to anadromous salmonids.
23,034'	LDA measures 125' long x 65' wide x 35' high and is retaining some sediment.

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23,333'	Left bank erosion. A 50' long x 70' high section of bank has separated and buried the main channel, forcing the water to flow through the new entrenched channel.
23,769'	Channel type changes to an F4.
25,446'	Left bank tributary with a steep, entrenched, bedrock channel.
25,680'	Left bank gully.
26,313'	Right bank erosion site measures 200' long x 70' high.
27,386'	Right bank tributary, dry and steep. Not accessible to anadromous salmonids.
27,584'	Ninth electrofishing site.
27,900'	Flow measured on August 12, 1997 was 0.26 cfs.
29,338'	LDA measures 46' long x 40' wide x 20' high.
29,579'	Tenth electrofishing site.
29,662'	Access to road up right bank of tributary.
29,676'	Right bank tributary, steep gradient, bedrock channel with some gravel, trickle of a flow. Not accessible to anadromous salmonids.
29,866'	Frog observed.
30,060'	Right bank “blue-goo” slide measures 142' long x 70' high.
30,343'	Double-wide (flatcar) bridge measures 20' long x 45' wide x 20' high.
30,497'	Left bank erosion site measures 59' long x 80' high.
30,663'	Right bank erosion site measures 146' long x 45' high “blue-goo”.
31,283'	Eleventh electrofishing site.
31,588'	Channel type changes to an F2.
31,863'	Twelfth electrofishing site.
32,005'	Good access from road. Right bank tributary with an undefined silt channel. Not accessible to anadromous salmonids.
32,230'	Thirteenth electrofishing site.

32,350' Right bank erosion site measures 157' long x 35' high, “blue-goo”.

32,505' Left bank erosion site measures 100' long x 40' high, “blue-goo”.

32,542' Fourteenth electrofishing site.

33,000' Right bank erosion site measures 190' long x 70' high, “blue-goo”.

33,318' Right bank seep.

33,385' Left bank erosion site measures 95' long x 20' high.

33,592' Left bank tributary, narrow, trickle. Not accessible to anadromous salmonids.

34,272' Right bank tributary, dry and steep. Not accessible to anadromous salmonids.

35,187' LDA measures 20' long x 15' wide x 8' high.

35,200' Left bank draw.

35,293' Right bank erosion site measures 56' long x 75' high.

35,367' Right bank tributary. Not accessible to anadromous salmonids.

35,785' LDA measures 34' long x 15' wide x 20' high.

36,219' LDA measures 390' long x 60' wide x 15' high.

36,697' LDA measures 69' long x 30' wide x 12' high.

37,304' Channel type changes to a B3.

37,373' Left bank draw.

37,746' Left bank tributary. Not accessible to anadromous salmonids.

37,837' LDA measures 57' long x 75' wide x 12' high.

37,874' Fifteenth electrofishing site.

37,956' Left bank access on a Simpson Timber Company Road. Left bank tributary, dry. Not accessible to anadromous salmonids.

38,133' Sixteenth electrofishing site. Flow measured on August 15, 1997 was 0.18 cfs.

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38,800'	Right bank draw.
39,724'	LDA measures 15' long x 30' wide x 15' high.
40,071'	LDA measures 40' long x 20' wide x 12' high.
40,657'	LDA measures 25' long x 30' wide x 10' high.
40,702'	Left bank spring.
40,745'	Left bank erosion site measures 100' long x 40' high.
40,750'	LDA measures 65' long x 30' wide x 16' high.
41,068'	Right bank draw.
41,140'	Right bank erosion site measures 100' long x 50' high. LDA measures 13' long x 50' wide x 12' high.
41,316'	Left bank tributary, steep.
41,331'	Left bank seep, dry, bedrock dominated.
42,500'	Flatcar bridge measures 20' long x 50' wide x 20' high.
42,624'	Left bank tributary, dry. Not accessible to anadromous salmonids.
44,159'	LDA measures 43' long x 20' wide x 6' high.
44,600'	Left bank draw.
44,863'	Left bank tributary, dry. Not accessible to anadromous salmonids.
45,011'	Left bank draw.
45,210'	Right bank tributary, dry and steep. Not accessible to anadromous salmonids.
45,477'	Left bank draw, steep.
45,650'	Right bank access to the road.
47,040'	Channel type changes to an F2.
48,174'	Right bank tributary; water temperature was 58 degrees Fahrenheit. Not accessible to anadromous salmonids.

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49,384' LDA measures 73' long x 60' wide x 10' high.

50,548' Left bank tributary, dry. Not accessible to anadromous salmonids.

50,735' Left bank tributary, steep, water temperature was 57 degrees Fahrenheit. Not accessible to anadromous salmonids, less than 0.01 cfs.

51,433' LDA measures 57' long x 60' wide x 8' high.

52,089' LDA measures 26' long x 30' wide x 16' high and is retaining 10' of sediment.

52,287' Seventeenth electrofishing site.

52,669' LDA measures 43' long x 20' wide x 13' high and is retaining 6' sediment.

53,165' Eighteenth electrofishing site.

53,285' LDA measures 50' long x 45' wide x 11' high and is retaining 13' of sediment.

53,449' LDA measures 30' long x 30' wide x 12' high.

53,570' LDA measures 25' long x 30' wide x 10' high and is retaining 7' of sediment.

53,774' LDA measures 82' long x 40' wide x 13' high and is retaining 13' of sediment, creating a dry unit.

53,817' Right bank tributary, dry. Not accessible to anadromous salmonids.

53,823' Nineteenth electrofishing site.

53,851' End of survey. Flow measured on August 15, 1997 was 0.24 cfs. The survey was ended due to several LDA's that are probable barriers followed by long dry units. The LDA which began at 53,774' contains a 13' high vertical jump and a dry unit above the barrier. The jump is blocked by two logs, approximately 1.5' in diameter each, that extend from the top of the jump down into the pool, leaving no room for fish passage. No salmonids were captured at the electrofishing site at 53,832'. One, 2+ or resident steelhead was captured at 53,974'. Good spawning habitat decreased considerably above 47,155' where the channel became boulder and bedrock dominated, and lacked suitable sized spawning substrate.

REFERENCES

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LEVEL III and LEVEL IV HABITAT TYPE KEY

RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4
Dammed Pool	[DPL]	6.5