Stream Inventory Report

Salmon Creek

Salmon Creek Watershed
Sonoma County, California

Survey: Summer 2003
Final Report: September, 2004

California Department of Fish and Game
Central Coast Region
Watershed Restoration Program

2004

CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Salmon Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2003 on Salmon Creek, a stream in the Salmon Creek watershed. The survey began above wetlands upstream of the mouth and Hwy 1 and extended upstream 15.9 miles. Stream inventories and reports were also completed for Finley Creek, Coleman Valley Creek, Fay Creek, Tannery Creek, Nolan Creek, and Thurston Creek, the major tributaries to Salmon Creek. Note that Salmon Creek mainstem, Thurston Creek, and Nolan Creek were surveyed in summer, 2003. The year 2002/2003 experienced considerably higher than average rainfall during the month of April(4.87”). The average rainfall in the month of April over the last 10 years is 2.7”. As a result, creeks throughout the northern coastal regions of the state experienced higher than average flows during the summer months. A greater number of deep pools, better than normal connectivity between pools, deep, continuous runs, and robust riffles existed in summer, 2003. Finley Creek, Coleman Valley Creek, Fay Creek and Tannery Creek were surveyed in summer, 2002. Rainfall in April, 2002 was .085”. In comparison, pools, runs, and riffles in summer, 2002 were fewer and shallower than those surveyed in 2003.

The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish and other aquatic species with an emphasis on anadromous salmonids. The objective of the biological inventory is to document salmonids, other aquatic species present, and their distribution.

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

WATERSHED OVERVIEW

Salmon Creek is located in southern Sonoma County, California and

flows into the Pacific Ocean north of Bodega Bay. The legal description at the confluence with the Pacific Ocean is T6N, R11W, Bodega. Its location is 38°21'31.93"N latitude and 123°02'52.08"W longitude. Year round vehicle access exists from Highway 1 at Chancellor Ranch.

Salmon Creek and its tributaries drain a basin of approximately 35.3 square miles. Salmon Creek is a maximum 4th order stream and has approximately 18 miles of blue line or dashed blue line stream according to the USGS Bodega, Valley Ford and Camp Meeker 7.5 minute quadrangles. Salmon Creek has six major tributaries, Finley Creek, Coleman Valley Creek, Fay Creek, Tannery Creek, Nolan Creek and Thurston Creek. These creeks were also surveyed and are discussed in separate reports. Salmon Creek also has 17 minor unnamed tributaries, which were not surveyed. Elevations range from about 0' at the mouth of the creek to 797' at the headwaters.

The vegetation in the watershed is a combination of coniferous and deciduous forests and grasslands. Primary land uses are agricultural grazing, rural, some timber, a growing presence of viticulture, and rural residential. Ninety-five percent of the watershed is privately owned. Five percent is owned by the State Department of Parks and Recreation.

Salmonid fish species historically present include coho salmon(*Oncorhynchus kisutch*), steelhead trout(*Oncorhynchus mykiss*), and California freshwater shrimp (*Syncaris pacifica*). Endangered, threatened or sensitive species currently present include steelhead trout(*Oncorhynchus mykiss*), listed as threatened on the federal endangered species list and California freshwater shrimp (*Syncaris pacifica*), listed as endangered on the federal and state endangered species lists.

METHODS

The habitat inventory conducted in Salmon Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi, et al., 1998). The California Department of Fish and Game (DFG) field crew that conducted the inventory was trained in standardized habitat inventory methods by DFG. This inventory was conducted by two person teams and was supervised by DFG's Northbay Watershed Restoration Planner, Gail Seymour.

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 Salmon Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

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. Flows were also measured or estimated at major tributary confluences.

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:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in 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. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a hip chain, and stadia rod.

5. Embeddedness:

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

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter 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 shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. 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 measured habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes which are defined in the California Salmonid Stream Habitat Restoration Manual.

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 top 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 visually into percentages of evergreen 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 measured 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 stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of four basic methods: 1) stream bank observation, 2) underwater observation, 3) electro fishing, or 4) seine netting. Methods 1-3 are discussed in the California Salmonid Stream Habitat Restoration Manual. Seine netting is a fish capture technique that involves the use of a one meter square net attached to dowels on two parallel sides. The surveyor pushes the seine through the habitat unit to catch aquatic organisms. At the end of the unit the surveyor scoops up the seine and places all captured organisms in a bucket partially filled with stream water for holding. The water is aerated with a bubbler to maintain dissolved oxygen levels and minimize stress on the organisms. All fish, amphibians, and reptiles in the holding bucket are identified to species, counted and returned to the steam. Data is recorded on an electrofishing field form. Seine netting is used to confirm the presence of a species, particularly salmon and steelhead, and is not intended to quantify a population estimate.

IMPACT INVENTORY & ANALYSIS

Problems such as migration barriers, streambed erosion, poor water quality or temperatures are noted in the comments and landmarks section. In some cases measurements are taken, an analysis of what caused the problem is made and restoration potential and alternatives are recommended.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat for data storage and analysis. Habitat is a Visual Basic extension to Microsoft Access, developed by Zebulon Young, University of California, Berkeley. This program processes and summarizes the data, and produces the following tables and appendices:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of shelter by habitat types
- Summary of dominant substrates by habitat types
- Summary of fish habitat elements by stream reach

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Salmon Creek include:

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools
- Percent embeddedness estimated in pool tail-outs
- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HISTORICAL STREAM SURVEYS:

The Department of Fish and Game has not conducted previous surveys of Salmon Creek.

HABITAT INVENTORY RESULTS FOR SALMON CREEK

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

The habitat inventory of Salmon Creek, 7/24/2003 - 8/21/2003, was conducted by M.Terry, A. Osterback and J. Facendini with supervision and analysis by California Department of Fish and Game (DFG). The survey began approximately 1.5 miles upstream of the confluence with the Pacific Ocean and extended up Salmon Creek to the end of anadromous fish passage at a series of rock falls. The total length of stream surveyed was 83,759 feet, with an additional 585 feet of side channel.

A flow of 0.3 cfs was measured on 7/23/03 at habitat unit 159, 100' above the confluence with Coleman Valley Creek. A flow of 0.07 was measured again on 9/3/03 at the same site. Stream flow was measured with a Marsh-McBirney Model 2000 flowmeter.

The surveyed section of Salmon Creek has nine reaches with eight distinct channel types: from the mouth to 6,337 feet a **F5**, from 6,337 feet to 69,395 feet (63,058 feet) an **F4**, from 69,395 feet to 70,139 feet(744 feet) an **F1**, from 70,139 feet to 73,701 feet(3,562 feet) an **F4**, from 73,701 feet to 76,451 feet (2,750 feet) an **F3**, from 76,451 feet to 79,760 (3,309 feet) a **G4**, from 79,760 feet to 82,820 feet (3,060 feet) a **B3**, from 82,820 feet to 83,248 feet (428 feet) a **B2** and from 83,248 feet to 83,759 feet(511 feet) an **A2**.

F5 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly sand substrate. F4 is gravel dominated substrate. F3 is cobble dominated substrate. F1 is bedrock dominated substrate.

G4 channel types are characterized as well entrenched "gully" step-pool channels with a low width/depth ratio, a moderate gradient (2-4%) and a predominantly gravel substrate.

B3 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and have a predominantly cobble substrate.

B2 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and have a predominantly boulder substrate.

A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate.

Water temperatures on the survey dates ranged from 54°F to 76°F. Air temperatures ranged from 48°F to 77°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of ***occurrence*** there were 38.2% Flatwater units, 31.1% Riffle units, 30.5% Pool units and 0.2% Dry units (Graph 1). Based on total ***length*** there were 39% Pool units, 32% Flatwater units, 10% Riffle units and 0.1% Dry units (Graph 2).

Nine hundred, twenty habitat units were measured and 46% were completely sampled. Fourteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent ***occurrence*** were Low Gradient Riffle at 31%, Mid-Channel Pool at 29%, Glide at 23%, Run at 15% (Graph 3). By percent total ***length***, Mid-Channel Pool at 38%, Glide at 22%, Not Surveyed at 18%, Low Gradient Riffle at 10%, Run at 10%, Step Run at 1%.

Two hundred, eighty pools were identified (Table 3). Mid-Channel Pools were most often encountered at 29% of all habitat types (Table 2), and comprised 97% of the total length of pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. One hundred forty seven of the 280 pools (53%) had a depth of three feet or greater (Graph 5). These deeper pools comprised 28% of the total length of stream habitat.

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. Pools rated 33, Riffles rated 2 and Flatwater units rated 12 (Table 1). Of the pool types, Step Pool rated 40, Mid-Channel Pool rated 3, Lateral Scour Pool - Root Wad Enhanced rated 23, Lateral Scour Pool - Log Enhanced rated 23, Trench Pool rated 23 and Lateral Scour Pool - Boulder Formed rated 5 (Table 2).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were Small Wood at 34%, Aquatic Vegetation at 15%, Terrestrial Vegetation at 15%, Large Wood at 12%, Undercut Banks at 9%, Root Mass at 8%, Boulders at 6%, Bedrock at 1%. Graph 7 describes the pool shelter in Salmon Creek.

Table 6 summarizes the dominant substrate by habitat type. In the 66 of the 285 Low-Gradient Riffles surveyed, the dominant substrate was: Gravel in 43 riffles, Sand in 10 riffles, Small Cobble in 9 riffles, Large Cobble in 3 riffles and Bedrock in 1 riffle.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 285 pool tail-outs measured, 9 had a value of 1 (3%), 136 had a value of 2 (48%), 81 had a value of 3 (28%) and 3 had a value of 4 (1%). 54 (19%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs (Graph 8). Graph 6 describes percent embeddedness of all pool tail-outs surveyed. No mechanical gravel sampling was conducted in 2003 surveys due to inadequate staffing levels.

The mean percent canopy density for the stream reach surveyed was 67%. The mean percentages of deciduous and evergreen trees were 80% and 20%, respectively. Graph 9 describes the canopy for the entire survey and Table 7 summarizes the mean percent vegetative cover for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 28% and the mean percent left bank vegetated was 26%. For the habitat units measured, the dominant vegetation types for the stream banks were: 51% Deciduous Trees, 18% Brush, 13% Bare Soil, 8% Grass and 8% Evergreen Trees (Table 8 and Graph 11). The dominant substrate for the stream banks were: 68% Silt, Clay & Sand, 23% Cobble & Gravel, 7% Bedrock and 2% Boulder (Table 8 and Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

The Department of Fish and Game has conducted previous biological inventories of Salmon Creek. A biological inventory was conducted in 2003. During the stream habitat inventory surveyors Terry, Facendini, and Osterback, observed many juvenile steelhead as well as stickleback, sculpin and unidentified non-salmonid fish. Other species observed during the stream habitat inventory included Pacific giant salamander, red legged frogs, rough-skinned newts, California freshwater shrimp, turtles, garter snakes, and crayfish.

Biological Survey Summaries

In September, 2001, DFG staff, Morgan Knechtle and crew conducted a biological survey in a middle and upper reach of Salmon Creek. The focus was to determine coho salmon presence/absence. The creek was split into two reaches and ten pools per reach were electrofished using DFG's "10 Pool" Protocol.

On 7/29/03 and 7/30/03 a biological inventory was conducted at four sites on Salmon Creek to document fish species presence. The sites were electrofished. Fish from the sites were counted by species, and returned to the stream.

The site 1 inventory began on 7/29/03 at 0910 hours at Salmon Creek Road where it becomes a dirt road and ended at 1140 hours. The distance sampled was not recorded. Habitat types sampled were low gradient riffles, glides, runs, step-runs, and mid-channel pools. Thirty-nine 0+steelhead; 19 1+steelhead; and 1 2+steelhead were observed. No coho were observed. The air temperature ranged from 54°F to 55°F and the water temperature was 56°F. The observers were Justin Smith and Mike Shugars of DFG.

The site 2 inventory began on 7/29/03 at 1250 hours at the first bridge east of the town of Bodega and ended at 1415 hours. The distance surveyed was not recorded. 34 0+steelhead; 3 1+steelhead; and 1 2+steelhead were observed. No coho were observed. Habitat types sampled were, low gradient riffles, glides, runs, and mid-channel pools. The air temperature ranged from 56°F to 61°F and the water temperature ranged from 57°F to 59°F. The observers were Justin Smith and Mike Shugars of DFG.

The site 3 inventory began on 7/30/03 at 0840 hours at the bridge before Freestone valley where road turns off from Bodega Highway and ended at 1020 hours. The distance surveyed was not recorded. Habitat types surveyed were glides, runs, and mid-channel pools. Nineteen 0+steelhead and one 1+ steelhead were observed. No coho were observed. Over 100 California freshwater shrimp were observed. The air temperature ranged from 58°F to 59°F and the water temperature was 59°F. The observers were Justin Smith and Mike Shugars of DFG.

The site 4 inventory began on 7/30/03 at 1100 hours at Salmon Creek Middle School and ended at 1240 hours. The distance surveyed was not recorded. Habitat types surveyed were glides and mid-channel pools. Six 0+steelhead; nine 1+steelhead; and one 2+ steelhead were observed. No coho were observed. The air temperature ranged from 62°F to 63°F and the water temperature ranged from 57°F to 59°F. The observers were Justin Smith and Mike Shugars of DFG.

Species Observed in Historical and Recent Surveys			
YEARS	**SPECIES**	**SOURCE**	**NATIVE/ INTRODUCED**
2001 2003	STEELHEAD TROUT *(Oncorhynchus mykiss)*	DFG	N
2003	PACIFIC LAMPREY (*Lampetra tridentatus)*	DFG	N
2001 2003	SCULPIN OR COTTOIDS *(Cottus sp.)*	DFG	N
2001 2003	CALIFORNIA OR VENUS ROACH *(Hesperoleucus symmetricus)*	DFG	N
2003	CALIFORNIA FRESHWATER SHRIMP *(Syncaris pacifica)*	DFG	N
2001 2003	THREESPINE STICKLEBACK (Gasterosteus aculeatus williamsoni)	DFG	N

DISCUSSION FOR SALMON CREEK

Salmon Creek has 9 reaches: from the mouth to 6,337 feet a **F5**, from 6,337 feet to 69,395 feet (63,058 feet) an **F4**, from 69,395 feet to 70,139 feet(744 feet) an **F1**, from 70,139 feet to 73,701 feet(3,562 feet) an **F4**, from 73,701 feet to 76,451 feet (2,750 feet) an **F3**, from 76,451 feet to 79,760 (3,309 feet) a **G4**, from 79,760 feet to 82,820 feet (3,060 feet) a **B3**, from 82,820 feet to 83,248 feet (428 feet) a **B2** and from 83,248 feet to 83,759 feet(511 feet) an **A2**.

There are 6,337 feet of **F5** channel type in **Reach 1**. According to the DFG Salmonid Stream Habitat Restoration Manual, F5 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. Many site specific projects can be designed within

this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

There are 63,058 feet of **F4** channel type in **Reaches 2 and 4**. According to the DFG Salmonid Stream Habitat Restoration Manual, F4 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

There are 744 feet of **F1** channel type in **Reach 3**. F1 channel types are good for bank-placed boulders and fair for single wing-deflectors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

There are 2,750 feet of **F3** channel type in **Reach 5.** F5 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

There are 3,309 Feet of **G4** channel type in **Reach 6.** G4 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

There are 3,060 feet of **B3** channel type in **Reach 7.** B3 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

There are 428 feet of **B2** channel type in **Reach 8.** B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

There are 511 feet of **A2** channel type in **Reach 9.** A2 channel types are generally not suitable for instream structures. These are high energy streams with stable stream banks and poor gravel retention capabilities.

The water temperatures recorded on the survey days 7/24/2003 - 8/21/2003 ranged from 54°F to 76°F. Air temperatures ranged from 54°F to 77°F. The warmest water temperatures were recorded in Reach 2.

Water temperatures in Reach 1 (where the high was 70°F) and Reach 2 (where the high was 76°F), if sustained, are above the threshold stress level (65°F) for salmonids. It is unknown if this thermal regime is typical. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

Pools comprised 39% of the total length of this survey. 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. In Salmon Creek, the pools are relatively deep with 53% having a maximum depth of at least three feet. These pools comprised 28% of the total length of stream habitat, however, in coastal coho and steelhead streams it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 35, however, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by Small Wood at 34%, Aquatic Vegetation at 15%, Terrestrial Vegetation at 15%, Large Wood at 12%, Undercut Banks at 9%, Root Mass at 8%, Boulders at 6%, Bedrock at 1%. Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides

rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Fifty-two of the 66 low gradient riffles measured (79%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Twenty nine percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 3% had a rating of 1. Cobble embeddedness measured to be 25% or less (a rating of 1) is considered best for the needs of salmon and steelhead. In a reach comparison, Reach 9 had the best rating, Reaches 2,4,6, and 7 had fair ratings, and Reaches 1,3,and 5 had the poorest ratings. (Reach 8 had insufficient data).

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. In Reaches 1 through 8 of Salmon Creek, sediment sources should be mapped and rated according to their potential sediment yields and control measures taken.

The mean percent canopy for the survey was 65%. This is a low percentage of canopy, since 80 percent is generally considered desirable. Although water temperatures in Salmon Creek are favorable to salmonids, increased canopy would eliminate hotspots that were observed in some reaches. Elevated water temperatures could be reduced by increasing stream canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream shelter and bank stability. The riparian buffer is thin or nearly absent in some areas where livestock, agriculture and/or urban development exist. Riparian removal, intensive grazing and/or vineyard development within the riparian corridor could all lead to less stream canopy and channel incision causing bank erosion and higher water temperatures.

Reaches 1, 2, and 4 had canopies of 47%, 64%, and 69%, respectively, with numerous bank erosion problems. These reaches as well as other areas with bank erosion (Reaches 5, 6, and 7) could benefit from bio-technical re-vegetation techniques using native species.

Four major LWD accumulations (Habitat Units 32, 617, 911, and 725) were identified which have the potential for causing erosion. Thirty-one major erosion sites and 24 probable diversions were also

noted.

SURVEYORS' OVERVIEW

The DFG surveyors notes state that from the start of the survey at Chancellor Ranch to Nolan Creek, Salmon Creek is extremely wide – 40-60 feet, on average. The pools range from depths of 2 – 5 ft with an occasional pool that was too deep to survey. Most of the riparian trees are alder and willow. Many trees are submerged in water and many live trees have fallen over for no apparent reason in the stretch where the creek meanders behind the town of Bodega. Surveyors found three dead steelhead (one 3" and two YOY), three dead stickleback, five dead crayfish and one 5' long dead lamprey. The dead fish were located in shallow water, less than a foot deep with an abundance of green algae.

Bodega Highway to Valley Ford Freestone Road was not surveyed as access was not granted by landowner. This stretch of stream is three stream miles long.

Above Valley Ford Freestone Road, cattle have access for approximately one-half mile and there is no canopy cover. Above Freestone Flat Road, there are large areas of erosion on the left bank.

Salmon Creek Middle School has passable natural rock falls with step pools. There were three to five 3+ steelhead in the lowest pool which was 5.5' deep. Above the falls there is significant erosion on both the right and left banks. This upper section has mostly bay and redwoods trees along the creek.

End of anadromy and end of the survey was at a total barrier consisting of stacked multiple boulders with greater than 20' diameters. Each jump is approximately 8' but there are no pools above or below each jump to facilitate passage. There is a wet gully on the right bank causing mass wasting. There are debris jams on both banks below the barrier but not all the way across the bankfull width.

GENERAL MANAGEMENT RECOMMENDATIONS

Salmon Creek should be managed as an anadromous, natural production stream.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision.

Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1) Access for migrating salmonids may be an ongoing potential problem in Reach 6, therefore, fish passage should be monitored and improved where possible.

2) There are many (16) log debris accumulations present on Salmon Creek that have the potential for causing bank erosion (one specifically upstream of the Tannery Creek confluence and three upstream of the Nolan Creek confluence). The modification of these debris accumulations is not recommended at this time, but they should be monitored. If modification becomes necessary, it must be done carefully to preserve existing habitat provided by the woody debris.

3) There are many sections spanning 3,259 linear feet of creek (Reach 2) where the stream is being impacted by livestock in the riparian zone. Livestock in streams generally inhibit the growth of new trees, exacerbate erosion, and reduce summertime survival of juvenile fish by defecating in the water. Alternatives to limit cattle access, control erosion and increase canopy should be explored with the landowner, and developed if possible.

4) Map sources of upslope and in-channel 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. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.

5) In Salmon Creek, active and potential sediment sources related to the road system need to be 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 in portions of Reaches 1, 2 and 4). In Reach 2, areas of low canopy density coincide with areas of cattle access to the riparian. The non-anadromous reach above the survey section should be assessed for planting

and treated as well, since water temperatures throughout are effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

7) Sites throughout the entire surveyed stream would benefit from the utilization of bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.

8) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from small woody debris and terrestrial and aquatic vegetation. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable (Reach 7 and 8) or in conjunction with stream bank armor to prevent erosion (Reaches 1 through 6). In some areas the material is at hand.

9) Conduct gravel sampling. Results of future sampling may indicate the need for structures that decrease channel incision, recruit and sort spawning gravel, and expand redd distribution in the stream. Where existing dams are retaining gravel, sites downstream from dams should be resurveyed for spawning gravel quality and quantity.

10) Where feasible, design and engineer pool enhancement structures to increase the number of pools in the upper reaches. This must be done where the banks are stable (Reaches 7 and 8) or in conjunction with stream bank armor to prevent erosion (Reaches 3, 4, 5,and 6).

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All locations (footage) are approximate and taken from the beginning of the survey.

Location (feet)	Notes
570	Started survey above wetlands on Chancelor Ranch at start of gravel bar on left bank. Fence on right bank falling into creek.
2,472	TRUE START Way Point004: 38 degrees 21.51', 123 degrees 03.14'; Way Point 004
2,810	Unit runs along left bank only; red legged frog; wet trib on right bank

Location (feet)	Notes
3,448	Way Point 006
4,439	algae; Way Point 008
4,718	fence on left bank; was across creek at one time
4,818	fence on left bank
5,142	algae; fence on left bank
5,142	debris accumulation right bank in entire unit but not in creek
5,343	bedrock scour pool; fence on left bank
5,473	Way Point 009
5,528	*HL
5,562	*HL
6,091	road on right bank; trail to creek; sheep on right bank; pump station @ 200' into unit on left bank; erosion at 200' into unit on right bank
6,390	CHANNEL CHANGE TO F4; algae; red legged frog
6,500	Dry trib right bank
6,594	*H
6,741	algae; wet gully left bank
7,536	Young of the year steelhead (SH); dry trib left bank 389' into unit; erosion on left bank
7,651	bedrock scour pool
7,870	wet road@ end of HU
8,070	Dry trib at 200' into unit
8,120	Way Point 012
8,471	*HL
8,589	SH
8,680	*HL
8,795	debris accumulation right bank; Way Point 013
8,862	*HL
9,101	*HL
9,212	channel completely covered by willow
9,266	Way Point 015
9,334	algae; non-salmonids
9,482	dead Young of the year SH; algae
9,782	wet road at beginning of unit; algae; 2 dead stickleback; no live fish
10,024	*HL; non-salmonids; tire right bank
10,055	Dead Young of the year SH; algae
10,332	Fence on left bank
10,592	*HL;
10,971	Dry trib left bank; Way Point 017
11,040	debris accumulation on left bank
11,105	*HL
11,304	algae
11,528	Way Point 018
11,701	dry trib right bank
11,716	fence left bank; algae
11,966	algae first 1/2 of unit
12,066	*HL; algae
12,201	fench left bank; Way Point 019
12,285	erosion left bank

Location (feet)	Notes
12,467	*H; dead SH
12,705	debris accumulation right bank
12,821	dry trib left bank
12,979	algae
13,048	*H
13,148	debris accumulation left bank
13,319	Way Point 020
14,008	wet road at end of unit
14,174	dry trib left bank
14,317	Way Point 022;
14,374	dry trib left bank
14,722	algae; 60-100 SH Young of the year
15,293	wet road at end of unit; Way Point 023
15,445	dozens of Young of the year SH
15,510	erosion on right bank, 90'w x 10' l x 3' deep influenced by high flows- upslope
15,523	Erosion right bank; 90'w x 10' l x 3' deep influenced by high flows- upslope
15,914	*HL; livestock access
15,956	*HL; Way Point 024
16,051	Finley Creek confluence 58 degrees F.; wet trib right bank 56 degrees F
16,115	fence left bank
16,248	*HL; fence left bank; algae
16,445	dead stickleback; livestock access; Way Point 027
16,540	Coleman Valley Creek confluence right bank- 58 degrees F; livestock access
16,563	dead crawfish; livestock access
16,733	Flow taken in this unit: 0.295 cfs (waypoint 002) 100' upstream from confluence w/ Coleman Valley Creek; fence left bank
16,943	*HL
17,213	*H; *HL
17,386	*H; *HL
17,421	Way Point 029
17,547	*HL; *H
17,743	DRY
17,855	*HL
18,264	most of unit completely covered by willows; Way Point 030
18,738	dry trib left bank; 2 axle trailer right bank
18,932	Way Point 031
19,203	*HL
19,478	*H
19,659	*HL
19,818	*H, *HL; Way Point 032
20,179	bedrock scour pool
20,404	*HL
20,692	*H; Way Point 033
20,986	*HL; *H
21,409	*HL
21,433	Way Point 034
21,713	*H

Location (feet)	Notes
21,917	Erosion left bank
22,181	Gully left bank
22,441	fallen fence right bank; rirap right bank; algae
22,488	trail to creek right bank; Way Point 035
22,638	*HL
22,731	*HL; wet road right bank-- four-wheeler use
22,759	wet road left bank
22,837	*HL; dead crawfish; algae
23,103	old road left bank
23,181	Way Point 037
23,338	*HL; algae
24,449	Fay Creek tributary right bank @ 45' into unit; temp of Fay 56 degrees F; confluence w/Fay temp of 58 degrees F; *HL
24,608	*H; debris accumulation left bank
24,942	*H
24,974	Dead lamprey; Way Point 039
25,289	debris accumulation right bank; *HL
25,609	*H; log enhance pool; trail to creek left bank
25,664	*H
25,744	*H
25,881	*H; debris accumulation right bank; fence right bank
26,024	*H
26,329	dry trib left bank; *H; Way Point 040
26,704	*H; algae
26,883	gully right bank; no GPS unit available
26,883	*H
26,883	>12 Young of the year SH
27,063	*H; debris accumulation left bank
27,147	*H
27,376	Way Point 041
27,748	*HL
28,227	*HL; trail to creek right bank; gully right bank
28,663	old road left bank
28,876	Way Point 042
28,931	*H
29,031	Tannery Creek confluence Way Point 043; two wet tribs right bank 10' apart; trib 1 56 degrees F, trib 2 58 degrees F
29,981	*HL; old road right bank
30,018	*H
30,667	*H
30,897	Gully left bank; propane tank right bank; erosion left bank; Way Point 044
30,927	erosion left bank; 3 fallen trees creating site for potential debris accumulation
31,151	debris accumulation left bank
31,181	*H
31,592	*H
31,606	Way Point 045
31,725	algae; CFWS

Location (feet)	Notes
31,830	debris accumulation
32,023	*H
32,119	*H
32,257	6 alder fallen in creek; *HL
32,610	pump right bank @ 100' into unit; erosion left bank at end of unit; *H
32,640	Trail to creek right bank; erosion left bank
32,828	water seep (spring?) left bank
32,830	rock dam/weir
33,135	3" pipe into creek right bank -- pump 40' away
33,372	algae; shrimp; Way Point 047
33,702	erosion left bank
33,716	fence left bank; erosion left bank
33,752	fence left bank
33,973	willow wall falling apart on left bank; true max depth could not be determined; 5.5' deepest surveyed
34,062	Way Point 048
34,292	erosion left bank; algae
34,496	2' jump over boulder cluster; 2" pipe into creek left bank; *H
34,741	oily surface water
34,832	trail to creek left bank
35,313	*H
35,332	willow wall right bank
35,391	Way Point 049
35,646	erosion right bank' willow wall didn't work right bank
35,708	bridge Way Point 050;
35,897	turtles; *H, *HL
36,545	retaining wall right bank; fench left bank; *H
37,001	bridge - Way Point051; pump and pipe right bank 20' upstream from bridge; lots of rusted metal in creek and on banks
37,051	concrete slabs on left bank; Way Point 052
37,327	concrete slabs left bank; pump left bank
37,444	Salmon Creek Road bridge Way Point 053
37,853	left bank slumped down into creek, overgrown with alders and willows; erosion right bank
37,927	fence across creek falling down; trail to creek left bank
37,975	willow tree fallen into creek; debris accumulation; *HL; Way Point 054
38,043	fence across creek; *H
38,148	fallen willow tree in creek; *H
38,178	fallen willow tree in creek; trail across creek
38,241	debris accumulation (see form)
38,555	fallen willow tree in creek; debris accumulation; pump right bank; creek too deep to measure; *H; Way Point 055
38,833	*H, *HL; Way Point 056
38,977	rock weir left bank at end of unit; gully right bank
39,102	trail to creek left bank; pier blocks on right bank 2/ concrete slabs at end of unit
39,402	Bodega Hwy bridge @ 200' into unit; Way Point 057; *H
39,597	*H
39,874	*HL; Way Point 058

Location (feet)	Notes
40,412	*H
40,500	oily water surface
40,568	*HL
40,587	Way Point 059
40,887	*H; CFW Shrimp; one fallen willow in creek
41,062	fence across creek
41,211	*H; livestock access
41,384	*H; lots of wood debris in water
41,525	*H
41,716	*H
41,733	erosion left bank (see form); Way Point 060
57,045	no access from landowners
57,100	Way Point 062 -- start again after "no access"; *H; debris accumulation
57,261	livestock access
57,391	*HL; pump left bank
57,529	Way Point 063
57,581	*HL
57,655	Bodega Hwy bridge # 2 - Way Point 064
57,672	Bridge canopy; livestock access road right bank
57,708	bridge concrete wall causing pool scour; livestock cattle access road right bank
57,806	algae; livestock access road right bank
57,827	Way Point 065
57,925	livestock access road right bank
58,006 to 59,164	livestock accessing creek on right bank
58,083	*H; livestock access to creek right bank
58,276	Way Point 066; livestock access to creek right bank
58,421	*H; Old pillars possibly from an old bridge. *H
58,943	gully left bank
58,968	Way Point 067
59,026	*HL
59,164	* HL, *H
59,595	Way Point 068
59,845	pipe into creek right bank
60,083	debris accumulation left bank; *H
60,327	Way Point 069
60,504	*H
60,574	*H
60,603	pump right bank
60,714	*H
60,798	Way Point 070; *H
61,033	*H
61,204	trail to creek right bank; erosion left bank
61,269	Way Point 071
61,416	*HL
61,636	debris accumulation
61,836	gate right bank 1/2 way across creek; gully right bank

Location (feet)	Notes
62,021	Way Point 072
62,178	*H
62,366	gully left bank
62,486	*H
62,552	*H
62,598	*H; Way Point 073
62,741	*H
62,793	*H
62,926	*HL
63,091	fence across creek
63,241	*H
63,253	Way Point 074
63,352	*H
63,479	End of unit 1' above creek summer bridge w/ stairs to creek on left bank; stairs and platform also on right bank
63,640	wet trib left bank at 51' into unit; trib 53 degrees F, confluence 54 degrees F, Way Point 075; gully right bank
63,841	tractor trailer in creek off right bank
63,951	*H; corner pool
63,962	Way Point 076
64,053	2' jump at end of unit
64,651	Way Point 077
64,781	*H
64,836	deck left bank; concrete structure; bridge -- Way Point 078
65,172	erosion right bank; fence falling over right bank
65,242	Way Point 079
65,469	wet trib left bank @ 27'; trib temp 55 degrees F, confluence temp 56 degrees F; Way Point 080
65,496	Bridge- Bohemian Hwy; Way Point 081
65,570	concrete pillows right bank; Bohemian Hwy bridge
65,660	erosion right bank
65,700	erosion right bank; path to creek right bank
65,791	Way Point 001
65,872	concrete blocks left bank; rebar/concrete/riprap right bank; car parts/junk right bank
65,913	plastic 2" tube left bank w/ stakes holding up bank for erosion prevention
66,127	debris accumulation left bank
66,138	metal in creek
66,201	Way Point 002
66,232	old erosion left bank; rootwad scour pool/ *H
66,310	shack left bank; erosion left bank gully left bank
66,371	path to creek left bank; old erosion right bank
66,449	erosion left bank
66,581	debris accumulation *HL, *HCL
66,835	gully left bank; Way Point 003
66,976	algae
67,076	*H; old car on right bank
67,167	old erosion right bank
67,275	Way Point 004

Location (feet)	Notes
67,277	*H
67,465	12 Young of the year SH
67,491	Bridge: Way Point 002
67,640	erosion right bank (see form)
67,757	*H
67,800	gully right bank
67,989	Young of the year SH
68,078	1+ SH
68,121	Way Point 006
68,157	old erosion upslope
68,285	rootwad scour pool; erosion upslope left bank
68,293	erosion left bank (see form)
68,369	*H; debris accumulation begins at end of this unit and extends through unit # 619
68,401	debris accumulation extends through this unit
68,506	*H; Way Point 007
68,753	*H; car parts right bank; fence left bank
68,843	old erosion upslope right bank
68,940	channel overgrown by willows; fence right bank
68,974	Way Point 008
69,002	2' jump at end
69,250	partially overgrown with willows; *H
69,317	concrete blocks
69,357	Way Point 009
69,414	CHANNEL CHANGE TO F1; wet tributary left bank @6' into unit, tributary temp 58 degrees F, confluence temp 62 degrees F
69,565	erosion left bank; gully left bank
69,897	1" jump in middle of the unit; Way Point 011
69,977	Bridge Way Point 013
70,109	concrete block 20'x 2' x 2' left bank to prevent erosion? erosion right bank (see form)
70,139	gully left bank
70,205	CHANNEL CHANGE to F4; erosion left bank
70,506	erosion left bank (see form)
70,571	Way Point 014
70,621	severe stretch of erosion extending through unit # 671
70,732	extensive erosion right bank
70,742	extensive erosion
70,776	concrete blocks across creek; extensive erosion
70,793	extensive erosion left bank
70,830	concrete wall to prevent erosion left bank; extensive erosion
70,911	extensive erosion left bank
70,927	extensive erosion
70,963	extensive erosion right bank
71,060	extensive erosion upslope right bank
71,251	*H; corner pool scour
71,323	erosion uplope left bank; bank covered w/ plastic tarps
71,422	many sapling trees cut down right bank
71,471	*H; pump left bank

Location (feet)	Notes
71,500	fallen tree in creek from right bank at end of unit
71,723	Way Point 016
71,774	debris accumulation (see form)
71,874	*H; upslope erosion right bank (see form)
72,040	fence posts w/ plywood left bank to prevent erosion?
72,100	fence posts w/ plywood left bank (see form)
72,167	Way Point 017
72,231	*H; gully left bank
72,306	erosion right bank (see form); Bohemian Hwy right bank
72,353	*H
72,537	*H; erosion left bank
72,646	*H; No GPS
72,777	*H
72,864	*H; erosion right bank
72,909	gully right bank
72,974	erosion left bank; partially overgrown by willows
73,065	*H; debris accumulation above water level (see form)
73,130	*HL
73,179	rootwad scour pool; Way Point 018
73,383	erosion left bank
73,431	*H
73,475	erosion left bank
73,486	erosion left bank
73,577	10+ SH Young of the year
73,633	Way Point 019
73,678	culvert right bank; gully right bank; *H; 10+ SH Young of the year
73,796	CHANNEL CHANGE to F3; erosion right bank
73,860	*H; debris accumulation (see form)
74,066	*HL; debris accumulation right bank
74,142	Way Point 020
74,161	wet trib right bank Way Point 021; corner pool and confluence pool; trib 60 degrees F, confluence 62 degrees F; erosion right bank
74,333	wet road Wp 022
74,442	erosion right bank
74,569	*H
74,582	Way Point 023
74,652	*H
75,007	*HL
75,084	Way Point 024
75,320	*H
75,373	gully left bank
75,564	erosion left bank
75,725	*H; wet gully left bank
75,740	dry trib right bank; Way Point 025
75,838	*HL
75,897	bedrock scour pool
76,173	boulder scour pool; upsloper erosion left bank

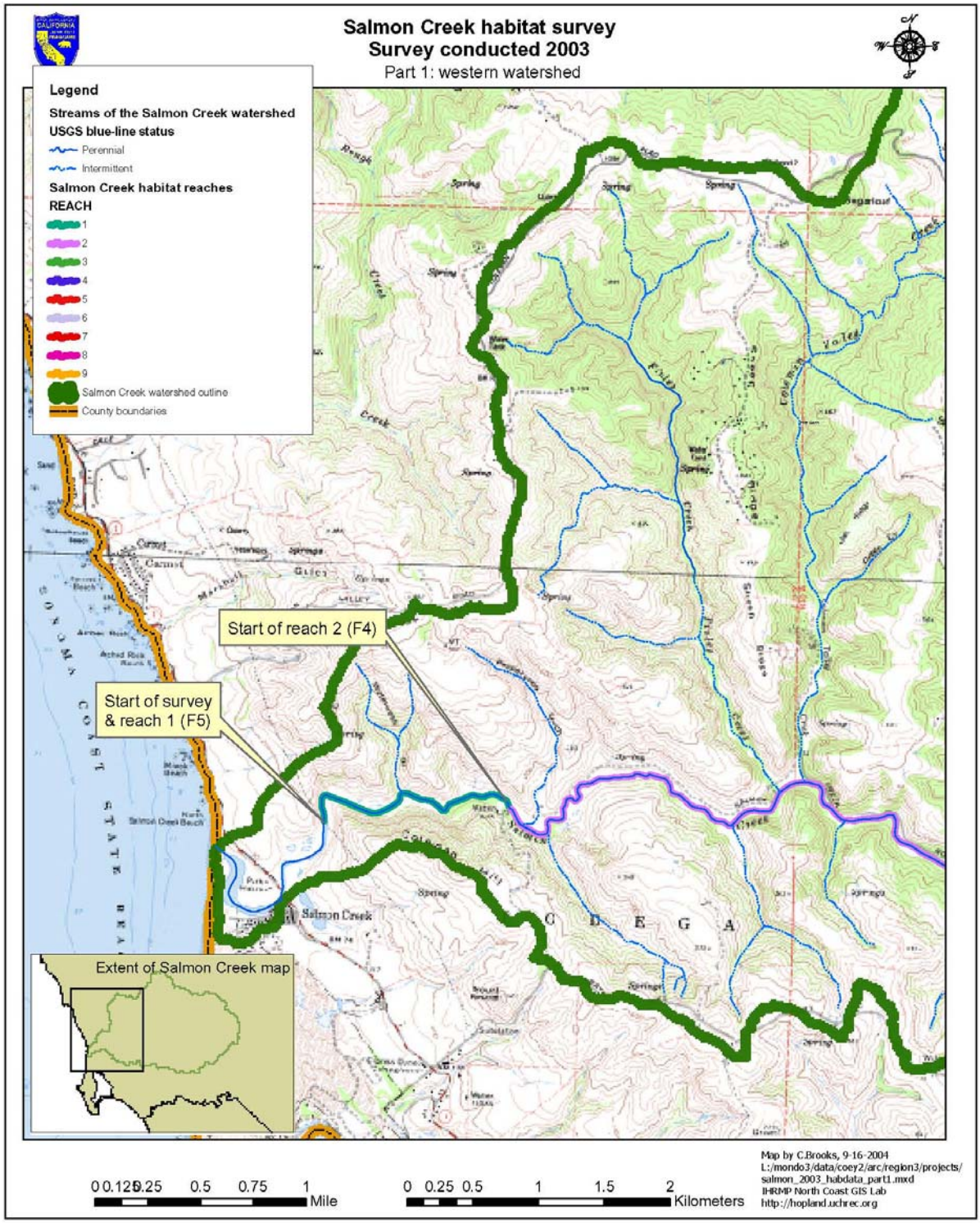
Location (feet)	Notes
76,223	erosion left bank (see form)
76,390	Bridge Way Point 025; three 4' jumps over bedrock sheets; middle pool has erosion right bank/left bank
76,451	No GPS available
76,486	CHANNEL CHANGE F4
76,563	*HCL; fence left bank
76,623	*CL
76,681	*CL
76,706	erosion left bank
76,760	Middle school stairs to creek left bank
76,806	erosion left bank
76,840	erosion left bank; Way Point 027
76,947	erosion left bank
76,979	dry trib right bank; debris accumulation @ end of unit *H
77,055	2.5" concrete pipe into creek from right bank; 2.5' concrete slabs (dam) -- water diverts around to right bank; Bridge Way Point 028; *H
77,118	erosion right bank (see form)
77,163	erosion right bank and left bank
77,243	erosion left bank (see form); fallen bay tree in creek - has potential to create a debris accumulation. Way Point 029
77,266	erosion right bank (see form); water seep or spring right bank
77,412	erosion left bank (see form); fence right bank and left bank; * HCL
77,451	erosion right bank (see form); wet trib left bank at end of unit; No GPS available; temp of trib 56 degrees F, confluence 56 degrees F
77,588	*C; Way Point 030; erosion left bank
77,619	iron oxide bacterium; fence right bank
77,670	fence right bank
77,696	erosion left bank (see form); fence right bank
77,746	*C; fence right bank
77,790	erosion right bank
77,822	*C
77,909	erosion right bank
77,947	*C; erosion left bank
78,042	*C' erosion left bank
78,073	fence right bank; old, rotted bridge - can't be used; erosion left bank
78,140	*C; house on right bank; erosion left bank and right bank; fence right bank
78,158	erosion right bank and left bank (see form); fence right bank
78,193	debris accumulation right bank; water tank right bank; fence right bank
78,246	fence right bank
78,270	*C
78,302	erosion left bank
78,340	house left bank; erosion left bank (see form); corner pool; 2" pipe along left bank; fallen bay tree from left bank- cut but still alive; *CL
78,380	house right bank; path to creek
78,478	Bohemian Lane bridge -- no GPS
78,505	*C
78,582	erosion left bank
78,720	erosion right bank; fence right bank; old telephone pole ready to fall into creek

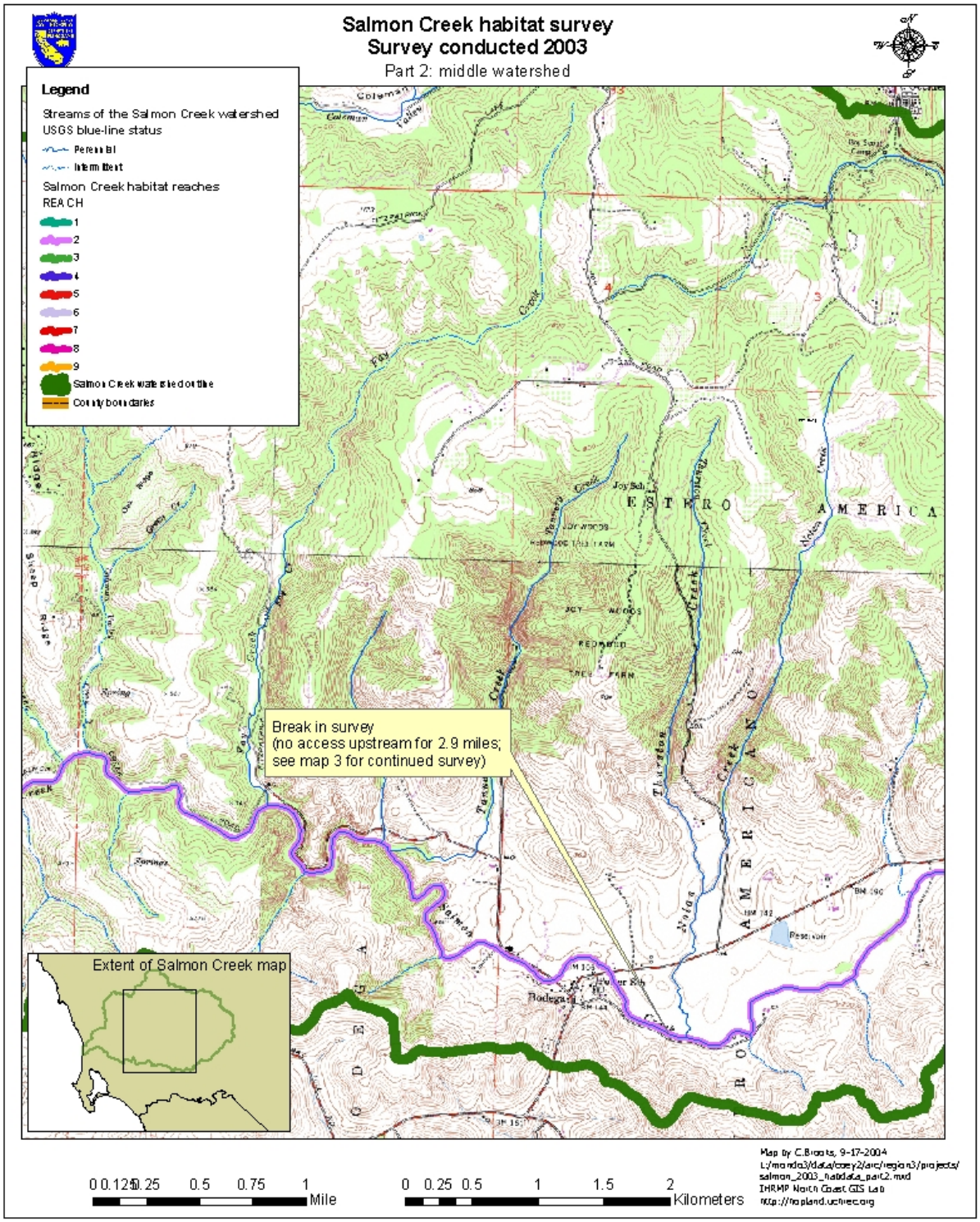
Location (feet)	Notes
78,812	*C; erosion left bank; corner pool; fence left bank
78,862	fence left bank
78,982	U shaped culvert left bank
79,014	Bohemian Hwy; fence left bank
79,065	erosion left bank; Bohemian Hwy; fence left bank
79,099	Bohemian Hwy; fence left bank
79,135	upslope erosion right bank; Bohemian Hwy; fence left bank
79,175	erosion left bank; Bohemian Hwy; fence left bank
79,304	*HL; Bohemian Hwy; fence left bank
79,399	Bohemian Hwy; fence left bank; iron oxide bacterium
79,658	erosion right bank; riprap right bank; Bohemian Hw right bank; fence left bank
79,760	erosion right bank (see form); Bohemian Hwy; fence left bank; Way Point034
79,793	CHANNEL CHANGE TO B3; erosion right bank; fence left bank
79,810	fence left bank
79,926	*H; log scour pool; fence right bank and left bank
79,936	bridge Way Point035; fence left bank
79,962	plunge pool in hihg flows/ 2.5 jump; fence left bank
80,028	gully right bank from Bohemian Hwy; fence left bank
80,118	fence left bank
80,138	shack left bank; fence left bank
80,207	fence left bank
80,268	*CL; fence left bank; Way Point 037
80,295	fence left bank
80,416	cable across creek; 3 shacks on left bank; fence left bank
80,473	rootwad scour pool; fence left bank
80,499	shack left bank
80,575	*H' house left bank; Bridge- no GPS
80,652	corner pool; house left bank; boards on left bank to deflect flow; riprap right bank; iron oxide bacterium
80,795	Bridge- Way Point 038
80,875	bridge- Way Point 039
80,955	house right bank; remnents of old dam left bank
81,039	Landowner, Dwyer (?) want copy of habitatreport; pedestrian walkway across creek (see form)
81,129	house right bank
81,147	house right bank
81,242	Bohemian Hwy bridge Way Point 040; *C
81,320	2770 Bohemain Hwy house left bank
81,391	driveway along right bank Way Point 041
81,412	Chainlink fence left bank in attempt to prevent erosion (fence in BFW)
81,509	1' diameter culvert right bank; pump/well right bank
81,547	house right bank
81,588	*C
81,694	3-5 Young of the year SH; algae
81,757	fence right bank
81,801	Bohemian Hwy left bank
81,837	Bohemian Hwy left bank;
81,925	culverts left bank

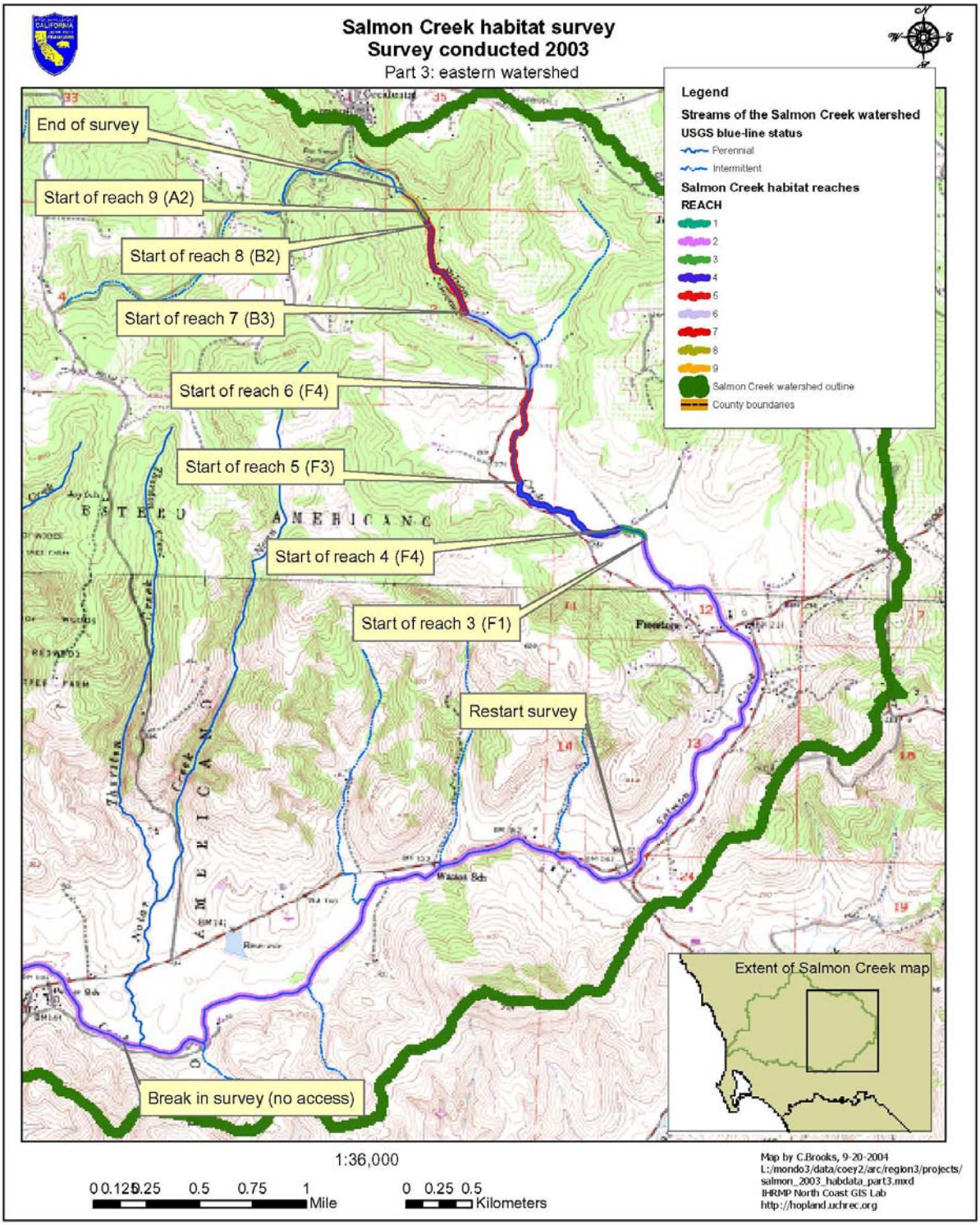
Location (feet)	Notes
81,959	house left bank
82,113	*C; concrete wall left bank - entire unit; chainlink fence right bank - 50' of unit; erosion Rb - trees falling into creek from right bank (see form)
82,355	1+ SH; debris accumulation left bank (see form)
82,499	gully right bank
82,574	erosion left bank (see form)
82,688	logs staked to prevent erosion left bank/ culvert/ wet trib at 88' into unit on left bank; Way Point 043
82,751	log stacks left bank
82,804	*C; Way Point 044
82,952	CHANNEL CHANGE TO B2
83,183	shotgun culvert left bank
83,226	wet gully right bank through Unit 909
83,248	wet gully right bank
83,275	CHANNEL CHANGE TO A2; wet gully right bank
83,427	4' jumps potential 10' jump; potential barrier; Way Point 045; wet gully right bank; debris accumulation
83,759	culvert left bank; old bus left bank; erosion right bank - TOTAL BARRIER - debris and boulder accumulation- Way Point 046;38 degrees 24' 05.5"/122 degrees 56' 31.0"; END OF SURVEY

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.


Salmon Creek habitat survey
Survey conducted 2003
Part 1: western watershed
Legend
Streams of the Salmon Creek watershed
USGS blue-line status
Perennial
Intermittent
Salmon Creek habitat reaches
REACH
1
2
3
4
5
6
7
8
9
Salmon Creek watershed outline
County boundaries
Start of reach 2 (F4)
Start of survey & reach 1 (F5)
Extent of Salmon Creek map
Salmon Creek
0 0.125 0.25 0.5 0.75 1 Mile
0 0.25 0.5 1 1.5 2 Kilometers
Map by C.Brooks, 9-16-2004
L:/mondo3/data/coey2/arc/region3/projects/salmon_2003_habdata_part1.mxd
IHRMP North Coast GIS Lab
http://hopland.uchrec.org


Salmon Creek habitat survey
Survey conducted 2003
Part 2: middle watershed
Legend
Streams of the Salmon Creek watershed
USGS blue-line status
Perennial
Intermittent
Salmon Creek habitat reaches
REACH
1
2
3
4
5
6
7
8
9
Salmon Creek watershed outline
County boundaries
Break in survey
(no access upstream for 2.9 miles;
see map 3 for continued survey)
Extent of Salmon Creek map
0 0.125 0.25 0.5 0.75 1 Mile
0 0.25 0.5 1 1.5 2 Kilometers
Map by C.Broots, 9-17-2004
L:/mendo3/data/casey2/arc/region3/projects/
salmon_2003_habdata_part2.mxd
IHRMP North Coast GIS Lab
http://nrpland.ucdavis.edu


Salmon Creek habitat survey
Survey conducted 2003
Part 3: eastern watershed
End of survey
Start of reach 9 (A2)
Start of reach 8 (B2)
Start of reach 7 (B3)
Start of reach 6 (F4)
Start of reach 5 (F3)
Start of reach 4 (F4)
Start of reach 3 (F1)
Restart survey
Break in survey (no access)
Legend
Streams of the Salmon Creek watershed
USGS blue-line status
Perennial
Intermittent
Salmon Creek habitat reaches
REACH
1
2
3
4
5
6
7
8
9
Salmon Creek watershed outline
County boundaries
Extent of Salmon Creek map
1:36,000
0 0.125 0.25 0.5 0.75 1 Mile
0 0.25 0.5 Kilometers
Map by C.Brooks, 9-20-2004
L:/mondo3/data/coey2/arc/region3/projects/salmon_2003_habdata_part3.mxd
IHRMP North Coast GIS Lab
http://hopland.uchrec.org

LEVEL III and LEVEL IV HABITAT TYPE KEY:

HABITAT TYPE	LETTER	NUMBER
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

Salmon Creek — Drainage: Pacific Ocean

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 07/24/03 to 08/21/03

Confluence Location: QUAD: Bodega Head LEGAL DESCRIPTION:T6N R11W Bodega — LATITUDE: 38.3553179' LONGITUDE: 123.0665414'

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
286	54	RIFFLE	31	31	8761	10	5.8	0.2	174	49807	47	13420	0	2
351	58	FLATWATER	38	77	27196	32	11.3	0.6	1364	478618	1768	620518	1251	12
280	274	POOL	30	118	33006	39	15.9	3.5	2500	699982	6646	1860814	5318	33
2	0	DRY	0	35	69	0	0.0	0.0	0	0	0	0	0	0
1	0	NOT SURVE	0	****	15312	18	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
920	386	84344	1228407	2494752

Salmon Creek — Drainage: Pacific Ocean

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 07/24/03 to 08/21/03

Confluence Location: QUAD: Bodega Head LEGAL DESCRIPTION:T6N R11W Bodega LATITUDE: 38.3553179' LONGITUDE: 123.0665414'

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
285	54	LGR	31	31	8711	10	6	0.2	1.1	174	49633	47	13373	0	2	64
1	0	CAS	0	50	50	0	0	0.0	0.0	0	0	0	0	0	0	75
212	31	GLD	23	87	18446	22	14	0.7	4.2	2045	433645	3003	636589	1932	15	65
135	24	RUN	15	60	8109	10	7	0.5	2.7	364	49205	234	31569	570	7	73
4	3	SRN	0	160	641	1	7	0.6	2.0	397	1586	244	974	0	22	90
2	2	TRP	0	184	368	0	7	2.1	3.1	1069	2139	2203	4406	1668	23	68
269	263	MCP	29	120	32158	38	16	3.1	434.0	2577	693191	6761	******	5390	34	69
1	1	STP	0	167	167	0	15	2.5	5.4	1253	1253	3131	3131	2756	40	75
3	3	LSL	0	32	95	0	13	1.1	3.1	362	1086	400	1201	328	23	77
3	3	LSR	0	53	160	0	14	1.1	3.0	632	1896	640	1919	201	23	53
1	1	LSBo	0	26	26	0	8	0.8	2.5	187	187	150	150	131	5	87
1	1	DPL	0	32	32	0	8	136.0	435.0	230	230	31334	31334	31311	0	65
2	0	DRY	0	35	69	0	0	0.0	0.0	0	0	0	0	0	0	0
1	0	NS	0	****	15312	18	0	0.0	0.0	0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
920	386	84344	1234051	2543320

Salmon Creek — Drainage: Pacific Ocean

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 07/24/03 to 08/21/03

Confluence Location: QUAD: Bodega Head LEGAL DESCRIPTION:T6N R11W Bodega LATITUDE: 38.3553179' LONGITUDE: 123.0665414'

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
272	266	MAIN	97	120	32693	99	16.0	3.1	2561	696582	6714	******	5353	34
7	7	SCOUR	3	40	281	1	12.4	1.0	453	3169	467	3269	245	21
1	1	BACKWATER	0	32	32	0	8.0	136.0	230	230	31334	31334	31311	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
280	274	33006	699982	1860814

Salmon Creek — Drainage: Pacific Ocean

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/24/03 to 08/21/03

Confluence Location: QUAD: Bodega Head LEGAL DESCRIPTION:T6N R11W Bodega LATITUDE: 38.3553179' LONGITUDE: 123.0665414'

UNITS MAX DPTH MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
2	TRP	1	0	0	0	0	0	0	2	100	0	0
269	MCP	96	1	0	1	0	127	47	76	28	64	24
1	STP	0	0	0	0	0	0	0	0	0	1	100
3	LSL	1	0	0	0	0	1	33	2	67	0	0
3	LSR	1	0	0	0	0	2	67	1	33	0	0
1	LSBo	0	0	0	0	0	1	100	0	0	0	0
1	DPL	0	0	0	0	0	0	0	0	0	1	100

TOTAL
UNITS
280

Salmon Creek Drainage: Pacific Ocean

Salmon Creek Drainage: Pacific Ocean

Table 5 - Summary of Shelter by Habitat Type Survey Dates: 07/24/03 to 08/21/03

Confluence Location: QUAD: Valley Ford LEGAL DESCRIPTION:1230664383554 LATITUDE: 38.3553179′ LONGITUDE: 123.0665414′

	UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
	285	59	LGR	0	0	0	0	22	0	0	78	0
	1	0	CAS	0	0	0	0	0	0	0	0	0
	212	42	GLD	2	6	2	0	14	75	0	0	0
	135	27	RUN	4	26	8	3	12	9	0	38	0
	4	3	SRN	0	0	0	0	0	0	0	62	38
	2	2	TRP	0	0	0	0	0	0	0	0	100
	269	268	MCP	9	34	12	8	15	15	0	6	1
	1	1	STP	0	0	30	0	0	0	20	30	20
	3	3	LSL	6	6	69	18	0	0	0	0	0
	3	3	LSR	9	16	0	76	0	0	0	0	0
	1	1	LSBo	0	0	0	0	0	0	0	50	50
	1	1	DPL	0	0	0	0	0	0	0	0	0
	2	0	DRY	0	0	0	0	0	0	0	0	0
	1	0	NS	0	0	0	0	0	0	0	0	0
ALL HABITAT TYPES	920	410		8	30	11	7	15	24	0	6	1
POOLS ONLY	280	279		9	34	12	8	15	15	0	6	1

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 07/24/03 to 08/21/03

Confluence Location: QUAD: Bodega Head LEGAL DESCRIPTION:T6N R11W Bodega LATITUDE: 38.3553179' LONGITUDE: 123.0665414'

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
285	66	LGR	0	15	65	14	5	0	2
1	0	CAS	0	0	0	0	0	0	0
212	53	GLD	2	51	43	4	0	0	0
135	34	RUN	9	21	50	12	3	3	3
4	3	SRN	0	0	0	0	100	0	0
2	2	TRP	0	100	0	0	0	0	0
269	265	MCP	5	80	14	0	0	1	0
1	1	STP	0	100	0	0	0	0	0
3	3	LSL	33	33	33	0	0	0	0
3	3	LSR	33	33	33	0	0	0	0
1	1	LSBo	0	0	0	0	0	100	0
1	1	DPL	0	100	0	0	0	0	0
2	1	DRY	0	0	100	0	0	0	0
1	0	NS	0	0	0	0	0	0	0

Salmon Creek (So. Sonoma County)

Table 7. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
67.31	19.93	80.02	27.50	26.27

Table 8. Salmon Creek (So. Sonoma County)

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	26	29	6.55
Boulder	13	7	2.38
Cobble/Gravel	88	105	22.98
Silt/clay	293	277	67.86

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	36	34	8.35
Brush	75	80	18.50
Deciduous Trees	226	203	51.19
Evergreen Trees	33	36	8.23
No Vegetation	50	63	13.48

Table 9 - FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Salmon Creek
SAMPLE 07/24/2003 to 08/21/2003
SURVEY LENGTH:
MAIN 83759 ft. SIDE CHANNEL: 585 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Bodega Head Latitude: 38.355'N
Legal Description: T6N R11W Bodega Longitude: 123.066'W

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01 (Units 1-39)

Channel Type: F5	Mean Canopy Density: 47 %
Main Channel: 6337 ft.	Evergreen:
Side Channel Length: 56 ft.	Deciduous: 100 %
Riffle/Flatwater Mean Width: 17.2 ft.	Pools by Stream: 58 %
Pool Mean Depth: 2.0 ft.	Pools >=2 ft. Deep: 100 %
Base Flow: cfs	Pools >=3 ft. Deep: 69 %
Water: 60-70°F Air: 54-62°F	Mean Pool Shelter: 63
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Terrestrial Veg.
Bank Vegetative Cover: 29 %	LOD Pool Shelter: 4 %
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddedness Value: 1. 0% 2. 7% 3. 21% 4. 0 % 5. 71 %

STREAM REACH 02 (Units 40-642)

Channel Type: F4	Mean Canopy Density: 64 %
Main Channel: 63058 ft.	Evergreen 10 %
Side Channel Length: 529 ft.	Deciduous 89 %
Riffle/Flatwater Mean Width: 8.4 ft.	Pools by Stream 52 %
Pool Mean Depth: 2.9 ft.	Pools >=2 ft. Deep: 99 %
Base Flow: cfs	Pools >=3 ft. Deep: 56 %
Water: 54-76°F Air: 48-77°F	Mean Pool Shelter 34
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Small Woody Debris
Bank Vegetative Cover: 27 %	LOD Pool Shelter: 28 %
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddedness Value: 1. 1% 2. 48 % 3. 34 % 4. 2 % 5. 17 %

STREAM REACH 03 (Units 643-654)

Channel Type: F1	Mean Canopy Density: 79 %
Main Channel: 744 ft.	Evergreen: 22 %
Side Channel Length: 0 ft.	Deciduous: 78 %
Riffle/Flatwater Mean Width: 7.0 ft.	Pools by Stream: 17 %
Pool Mean Depth: 1.2 ft.	Pools >=2 ft. Deep: 100 %
Base Flow: cfs	Pools >=3 ft. Deep: 0 %
Water: 58-62°F Air: 55-70°F	Mean Pool Shelter: 5
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders

Bank Vegetative Cover: 31 % LOD Pool Shelter: 0 %
Dom. Bank Substrate: Bedrock Dry Channel: 0 ft.
Embeddedness Value: 1. 0% 2. 50 % 3. 0 % 4. 0 % 5. 50 %

STREAM REACH 04 (Units 655-723)
Channel Type: F4 Mean Canopy Density: 69 %
Main Channel: 3562 ft. Evergreen: 10 %
Side Channel Length: 0 ft. Deciduous: 90 %
Riffle/Flatwater Mean Width: 4.8 ft. Pools by Stream: 31 %
Pool Mean Depth: 2.5 ft. Pools >=2 ft. Deep: 100 %
Base Flow: cfs Pools >=3 ft. Deep: 26 %
Water: 58-60°F Air: 55-67°F Mean Pool Shelter: 24
Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Terrestrial Veg.
Bank Vegetative Cover: 32 % LOD Pool Shelter: 29 %
Dom. Bank Substrate: Silt/Clay/Sand Dry Channel: 0 ft.
Embeddedness Value: 1. 11% 2. 58% 3. 21% 4. 0 % 5. 11 %

STREAM REACH 05 (Units 724-771)
Channel Type: F3 Mean Canopy Density: 83 %
Main Channel: 2750 ft. Evergreen: 10 %
Side Channel Length: 0 ft. Deciduous: 90 %
Riffle/Flatwater Mean Width: 6.1 ft. Pools by Stream: 23 %
Pool Mean Depth: 1.6 ft. Pools >=2 ft. Deep: 100 %
Base Flow: cfs Pools >=3 ft. Deep: 30 %
Water: 60-63°F Air: 67-70°F Mean Pool Shelter: 34
Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 31 % LOD Pool Shelter: 38 %
Dom. Bank Substrate: Silt/Clay/Sand Dry Channel: 0 ft.
Embeddedness Value: 1. 0% 2. 40% 3. 10 % 4. 0% 5. 50 %

STREAM REACH 06 (Units 772-840)
Channel Type: F4 Mean Canopy Density: 83 %
Main Channel: 3309 ft. Evergreen: 68 %
Side Channel Length: 0 ft. Deciduous: 32 %
Riffle/Flatwater Mean Width: 4.9 ft. Pools by Stream 41 %
Pool Mean Depth: 14.0 ft. Pools >=2 ft. Deep: 100 %
Base Flow: cfs Pools >=3 ft. Deep: 55 %
Water: 56-58°F Air: 58-64°F Mean Pool Shelter 40
Dom. Bank Veg.: Deciduous Trees Dom. Shelter: Large Woody Debris
Bank Vegetative Cover: 27 % LOD Pool Shelter: 42 %
Dom. Bank Substrate: Silt/Clay/Sand Dry Channel: 0 ft.
Embeddedness Value: 1. 14% 2. 73% 3. 14% 4. 0 % 5. 0%

STREAM REACH 07 (Units 841-901)
Channel Type: B3 Mean Canopy Density: 77 %
Main Channel: 3060 ft. Evergreen: 80 %

Side Channel Length: 0 ft.
Riffle/Flatwater Mean Width: 9.4 ft.
Pool Mean Depth: 1.5 ft.
Base Flow: cfs
Water: 57-60°F Air: 60-68°F
Dom. Bank Veg.: Deciduous Trees
Bank Vegetative Cover: 20 %
Dom. Bank Substrate: Silt/Clay/Sand
Embeddedness Value: 1. 13% 2. 53% 3. 13% 4. 0 % 5. 20%

Deciduous: 20 %
Pools by Stream: 31 %
Pools >=2 ft. Deep: 100 %
Pools >=3 ft. Deep: 47 %
Mean Pool Shelter: 30
Dom. Shelter: Large Woody Debris
LOD Pool Shelter: 44 %
Dry Channel: 0 ft.

STREAM REACH 08(Units 902-907)

Channel Type: B2
Main Channel: 428 ft.
Side Channel Length: 0 ft.
Riffle/Flatwater Mean Width: 7.0 ft.
Pool Mean Depth: ft.
Base Flow: cfs
Water: 59-59°F Air: 66-66°F
Dom. Bank Veg.: Deciduous Trees
Bank Vegetative Cover: 10 %
Dom. Bank Substrate: Silt/Clay/Sand
Embeddedness Value: 1. 0% 2. 0% 3. 0% 4. 0% 5. 0 %

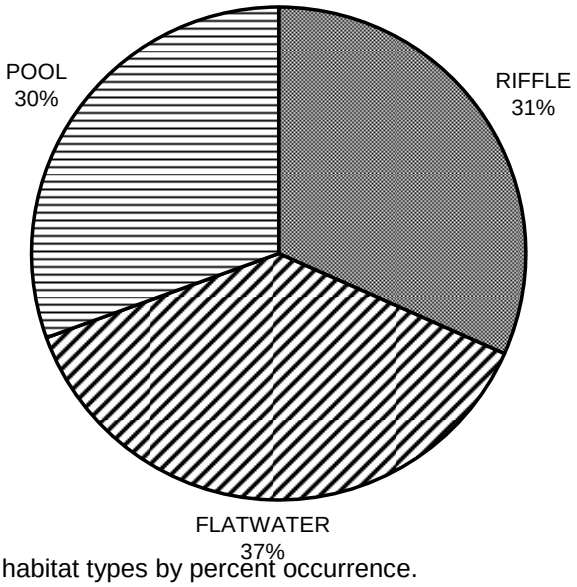
Mean Canopy Density: 88 %
Evergreen: 78 %
Deciduous: 23 %
Pools by Stream: %
Pools >=2 ft. Deep: %
Pools >=3 ft. Deep: %
Mean Pool Shelter:
Dom. Shelter: Boulders
LOD Pool Shelter: 0 %
Dry Channel: 0 ft.

STREAM REACH 09 (Units 908-911)

Channel Type: A2
Main Channel: 511 ft.
Side Channel Length: 0 ft.
Riffle/Flatwater Mean Width: 5.0 ft.
Pool Mean Depth: 0.9 ft.
Base Flow: cfs
Water: 59-60°F Air: 66-70°F
Dom. Bank Veg.: Deciduous Trees
Bank Vegetative Cover: 5 %
Dom. Bank Substrate: Boulder
Embeddedness Value: 1. 100% 2. 0 % 3. 0 % 4. 0 % 5. 0%

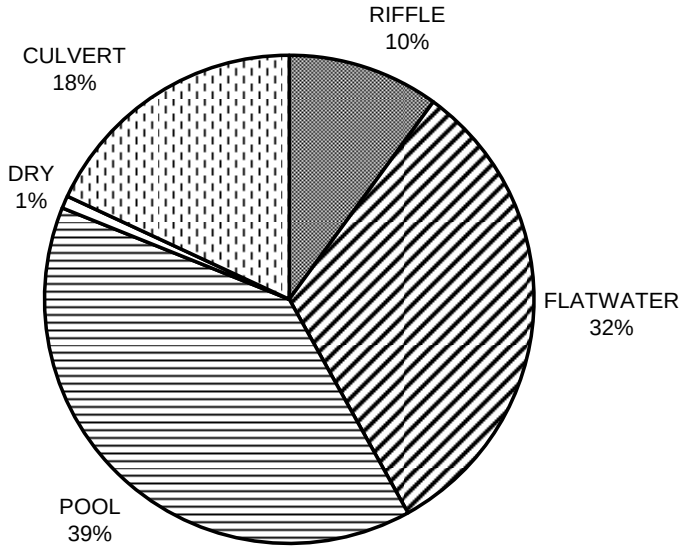
Mean Canopy Density: 82 %
Evergreen: 35 %
Deciduous: 65 %
Pools by Stream: 5 %
Pools >=2 ft. Deep: 100 %
Pools >=3 ft. Deep: 0 %
Mean Pool Shelter
Dom. Shelter: Boulders
LOD Pool Shelter: 0 %
Dry Channel: 0 ft.

SALMON CREEK
HABITAT TYPES BY PERCENT OCCURRENCE



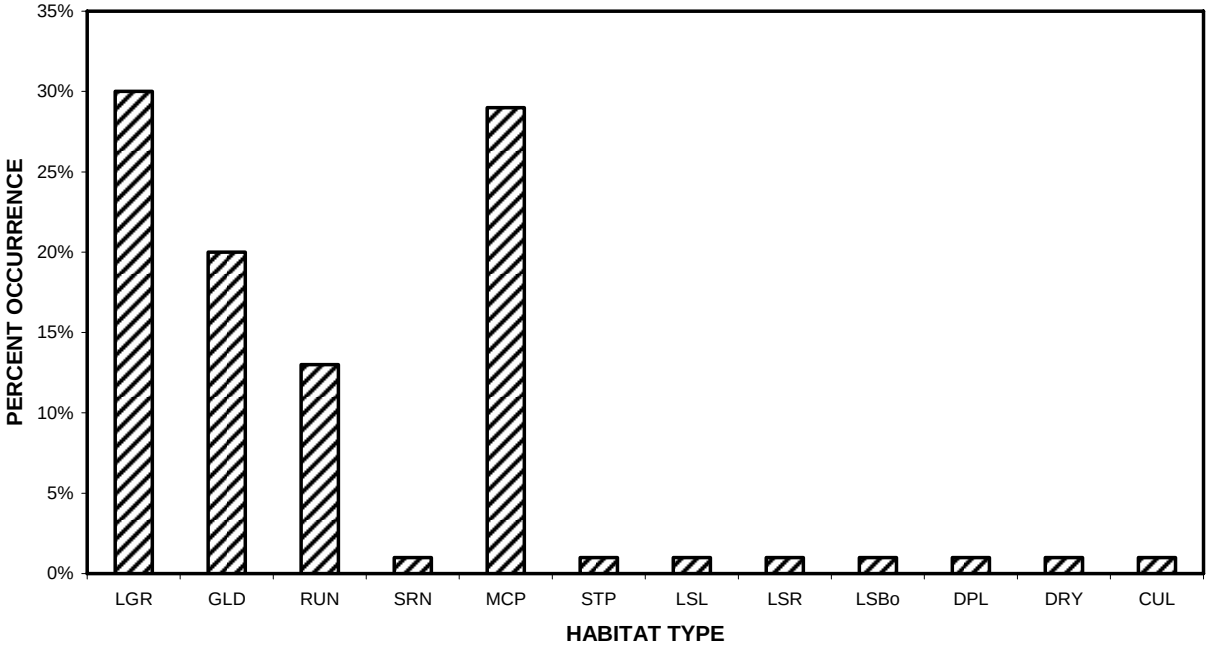
GRAPH 1. Level II habitat types by percent occurrence.

SALMON CREEK
HABITAT TYPES BY PERCENT TOTAL LENGTH



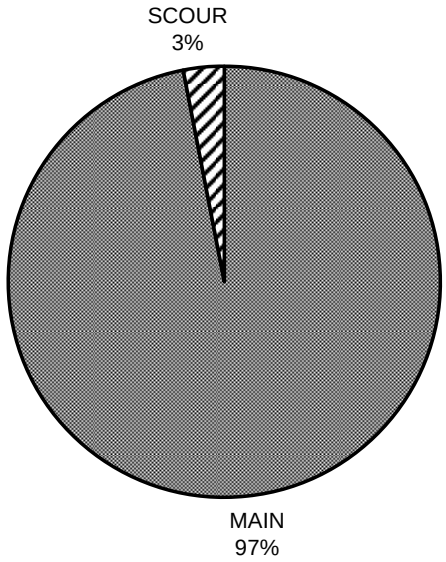
GRAPH 2. Level II habitat types by percent total length.

SALMON CREEK
HABITAT UNIT TYPES BY PERCENT OCCURRENCE

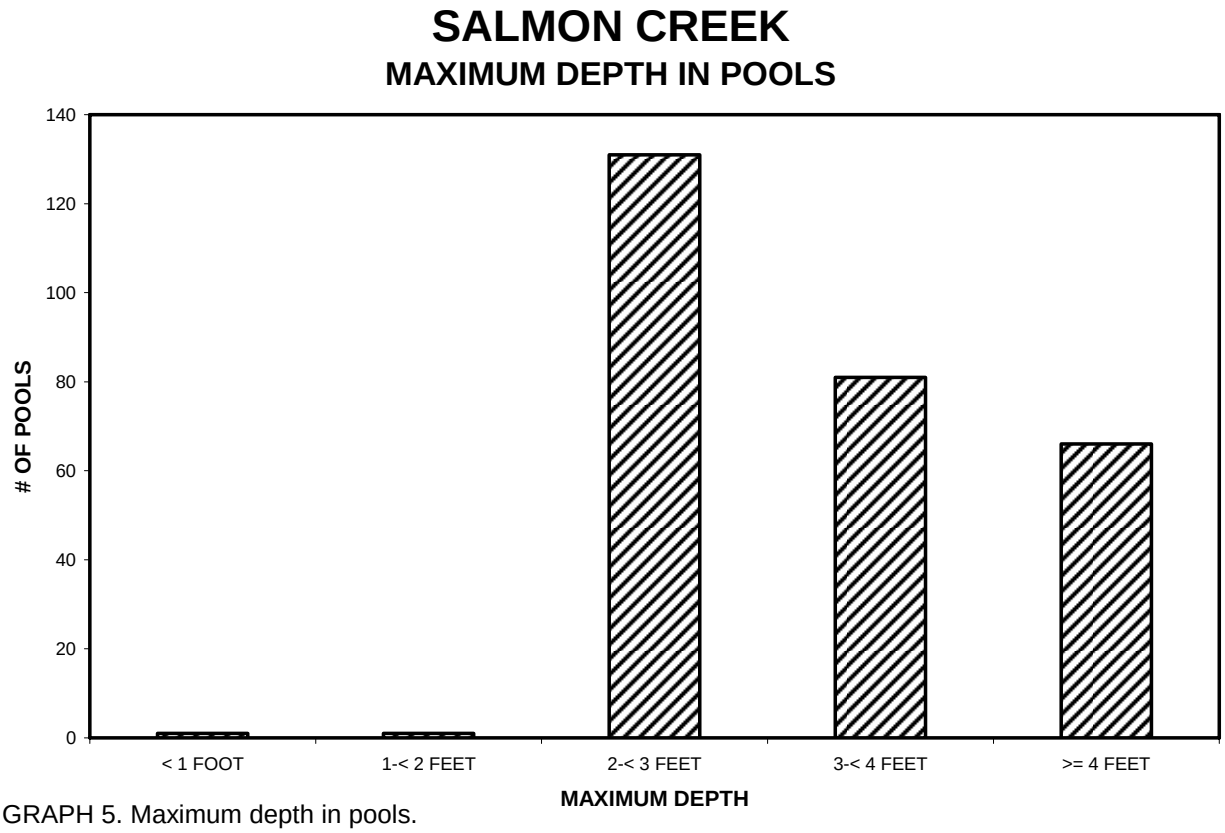


GRAPH 3. Level IV habitat unit types by percent occurrence.

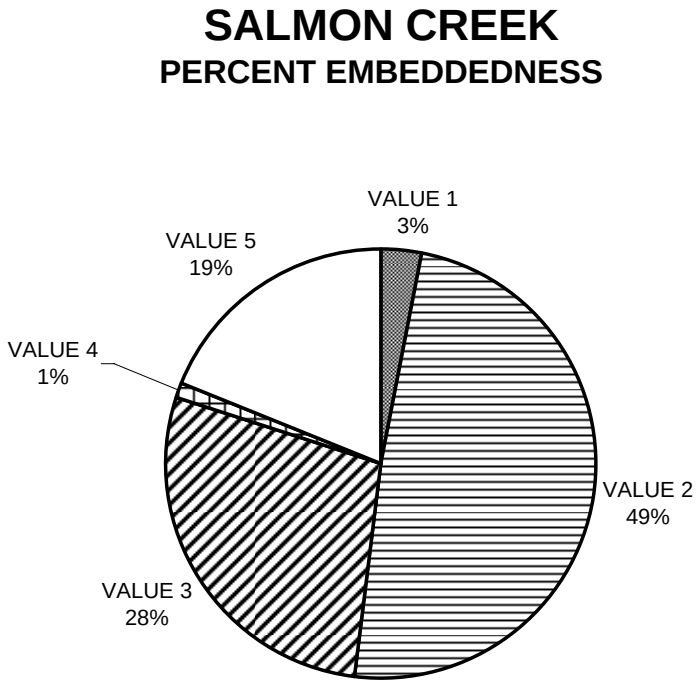
SALMON CREEK
POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4. Level I pool habitat types by percent occurrence.

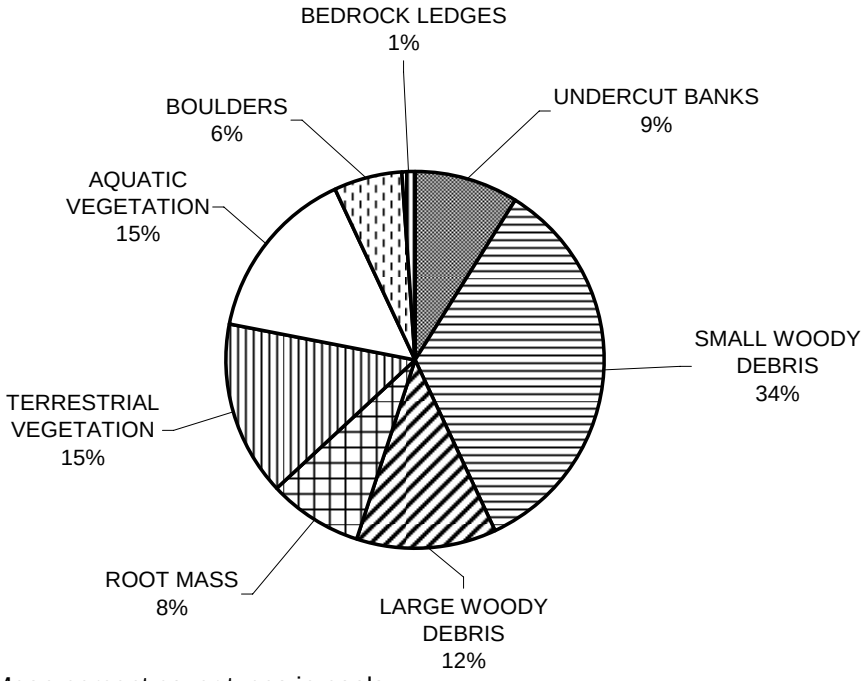


GRAPH 5. Maximum depth in pools.



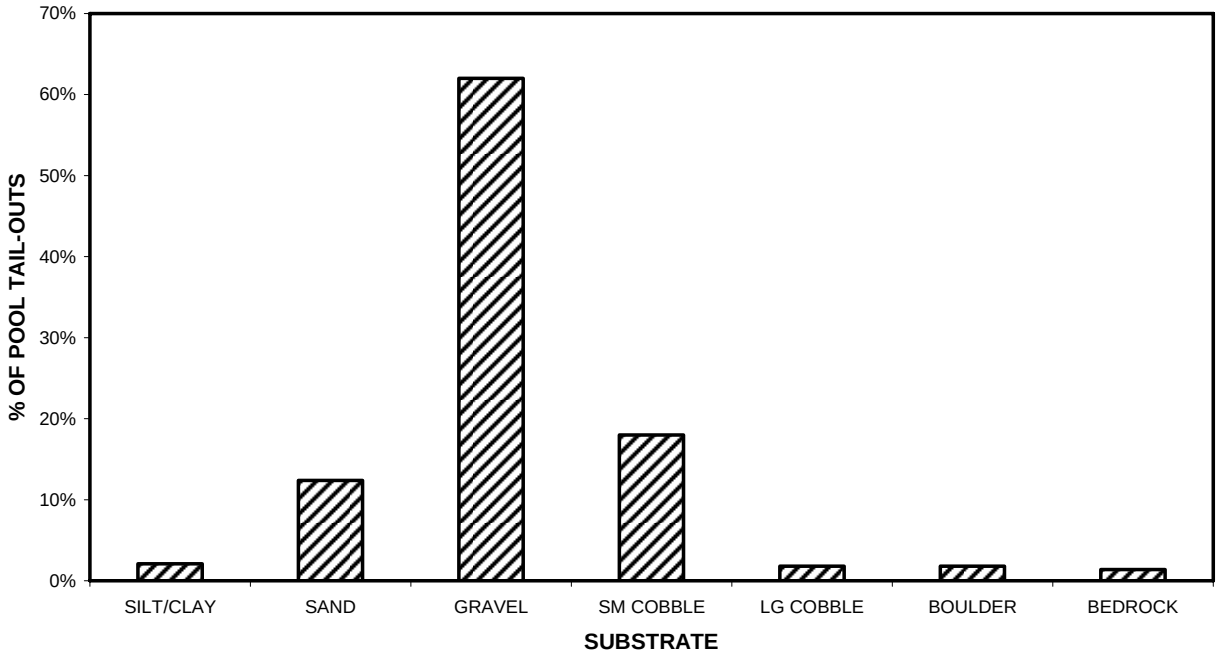
GRAPH 6. Percent embeddedness estimated at pool tail-outs.

SALMON CREEK
MEAN PERCENT COVER TYPES IN POOLS



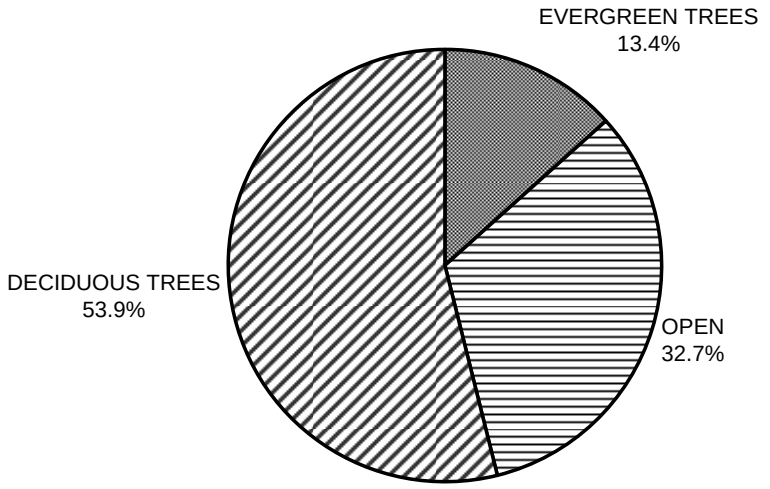
GRAPH 7. Mean percent cover types in pools.

SALMON CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



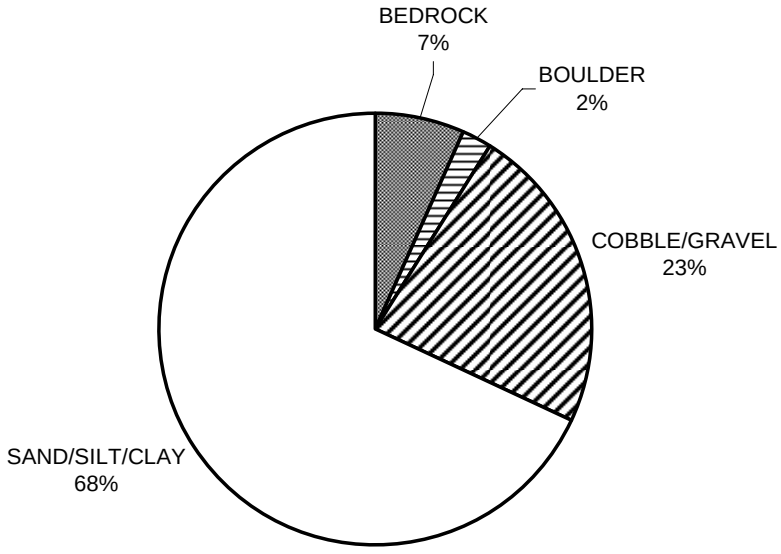
GRAPH 8. Substrate composition in pool tail-outs.

SALMON CREEK
MEAN PERCENT CANOPY



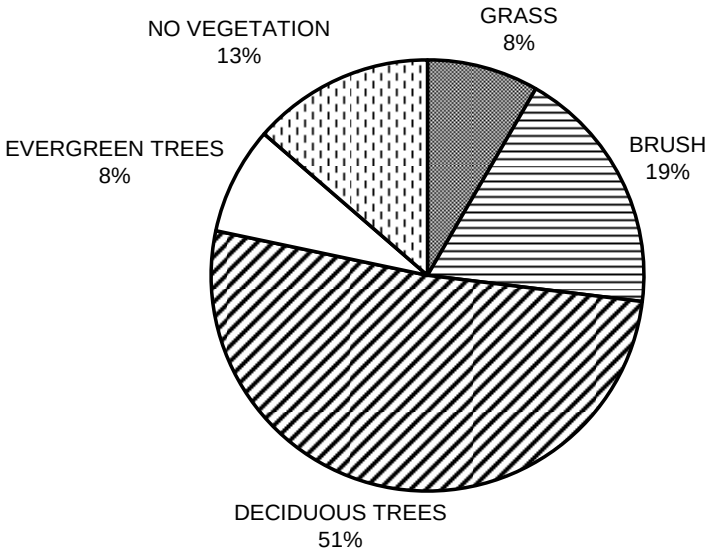
GRAPH 9. Mean percent canopy.

SALMON CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10. Dominant bank composition in survey reach.

SALMON CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11. Dominant bank vegetation in survey reach.