



**California Department of Fish and Wildlife**  
**East Marin County**  
**San Francisco Bay Watersheds**  
**Stream Habitat Assessment Reports**

# **San Anselmo Creek**

*Surveyed 2009*

*Report Completed in 2013*



**STREAM INVENTORY REPORT**

**San Anselmo Creek**

INTRODUCTION

A stream inventory was conducted during 8/18/2009 to 8/25/2009 on San Anselmo Creek. The survey began at the confluence with Corte Madera Creek and extended upstream 6.6 miles. Stream inventories and reports were also completed for five tributaries to San Anselmo Creek (Cascade Creek, Carey Camp Creek, Sleepy Hollow Creek, Deer Park Creek, and Fairfax Creek).

The San Anselmo Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in San Anselmo 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 steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

San Anselmo Creek is a tributary to Corte Madera Creek, which is a tributary to San Francisco Bay, located in Marin County, California (Map 1). San Anselmo Creek's legal description at the confluence with Corte Madera Creek is T02N R06W S31. Its location is 37°57'58" north latitude and 122°33'33" west longitude, LLID number 1225583379661. San Anselmo Creek is a third order stream and has approximately 27.87 miles of blue line stream within its catchment boundary according to the USGS National Hydrography Dataset (NHD). San Anselmo Creek drains a watershed of approximately 14.7 square miles. Elevations range from about 30 feet at the mouth of the creek to 1,634 feet in the headwater areas. Mixed hardwood forest dominates the watershed. The watershed is primarily privately owned and land use is considered 71.2% natural and 28.8% urban. Vehicle access exists via Sir Francis Drake Blvd in San Anselmo.

METHODS

The habitat inventory conducted in San Anselmo Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Wildlife (CDFW). This inventory was conducted by a two-person team.

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### 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 fully measured. All other habitat unit types encountered for the first time in each reach 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 San Anselmo Creek to record measurements and observations. There are eleven components to the inventory form.

#### 1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

#### 2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

#### 3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

#### 4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). 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". San Anselmo 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

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measured using a clinometer, hip chain, and stadia rod.

### 5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In San Anselmo Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

### 6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile 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 for prey. 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 San Anselmo 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In San Anselmo 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 hardwood 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 San Anselmo Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were

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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.

### 10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

### 11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

## BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in San Anselmo Creek. In addition, two 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 Stream Habitat 2.0.18, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream

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- Mean Percent Shelter Cover Types for Entire Stream

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

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

### HABITAT INVENTORY RESULTS

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

The habitat inventory of 8/18/2009 to 8/25/2009 was conducted by A. Villalobos, C. Bell, and T. Macias (WSP). The total length of the stream surveyed was 34,943 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter on 8/18/2009. The flow was too low to get an accurate reading.

San Anselmo Creek is an F4 channel type for 28,474 feet of the stream surveyed (Reach 1), and an A4 channel type for 6,469 feet of the stream surveyed (Reach 2).

F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 74 degrees Fahrenheit. Air temperatures ranged from 53 to 79 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 20% dry units, 30% flatwater units, 20% riffle units, 19% pool units, and 12% culvert units (Graph 1). Based on total length of Level II habitat types there were 48% dry units, 27% flatwater units, 10% riffle units, 11% pool units, and 4% culvert units (Graph 2).

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Eighteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 20% Dry units, 17% Glide units and 17% Low Gradient Riffle units. (Graph 3). Based on percent total length the most frequent types were 48% Dry units, 18% Glide units and 8% Low Gradient Riffle units.

A total of 58 pools were identified (Table 3). Scour pools were the most frequently encountered at 52% and comprised 59% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Forty-one of the 58 pools (71%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 58 pool tail-outs measured, 20 had a value of 1 (34.5%); 12 had a value of 2 (20.7%); 17 had a value of 3 (29.3%); and 9 had a value of 4 (15.5%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

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 0, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 14 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 10, Scour pools had a mean shelter rating of 18, and Backwater pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in San Anselmo Creek. Graph 7 describes the pool cover in San Anselmo Creek. Boulders are the dominant pool cover type followed by undercut banks.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Sand dominance was observed in 14% of pool tail-outs and gravel dominance was observed in 79% of pool tail-outs.

The mean percent canopy density for the surveyed length of San Anselmo Creek was 85%. The mean percentages of hardwood and coniferous trees were 98% and 2%, respectively. Fifteen percent of the canopy was open. Graph 9 describes the mean percent canopy in San Anselmo Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 49%. The mean percent left bank vegetated was 53%. The dominant elements composing the structure of the stream banks consisted of 28% bedrock, 3% boulder, and 69% sand/silt/clay (Graph 10). Hardwood trees were the dominant vegetation type observed in 65% of the units surveyed. Additionally, 27% of the units surveyed had brush as the dominant vegetation type, and 3% had grass as the dominant vegetation (Graph 11).

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### BIOLOGICAL INVENTORY RESULTS

Two sites were electrofished for species composition and distribution in San Anselmo Creek on September 30, 2009. Water temperatures taken during the electrofishing period ranged from 56 to 64 degrees Fahrenheit. Air temperatures ranged from 51 to 73 degrees Fahrenheit. The sites were sampled by C Bell, T Macias (WSP), and D Resnik (CDFW).

The first electrofishing site yielded three young-of-the-year Steelhead/Rainbow Trout (SH/RT), no age 1+ SH/RT, three age 2+ SH/RT, seventeen sculpin, and forty-seven California roach.

The second electrofishing site was confined to one small pool located about 300 feet downstream of the confluence with Cascade Creek. No fish were captured at this site.

The following chart displays the information yielded from these sites:

2009 San Anselmo Creek e-fish observations

Date	Site #	Reference Point	Distance From Reference Point (ft.)	Steelhead/Rainbow Trout			Non Salmonids Name species
				0+	1+	2+	
9/30/2009	733	N/A	N/A	3	0	3	17 sculpin, 47 California roach

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Date	Site #	Reference Point	Distance From Reference Point (ft.)	Steelhead/Rainbow Trout			Non Salmonids Name species
				0+	1+	2+	
9/30/2009	734	Cascade Creek Confluence	300	0	0	0	No other species

### DISCUSSION

San Anselmo Creek is an F4 channel type for the first 28,474 feet of stream surveyed and an A4 channel type for the remaining 6,469 feet surveyed. The suitability of F4 channel types for fish

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habitat improvement structures is as follows: Good for bank-placed boulders; Fair for plunge weirs, single and opposing wing deflectors, channel constrictors, and log cover; and Poor for boulder clusters. The suitability of A4 channel types for fish habitat improvement structures is as follows: Good for bank-placed boulders; fair for plunge weirs, opposing wing-deflectors, and log cover; poor for boulder clusters and single wing-deflectors.

The water temperatures recorded on the survey days 8/18/2009 to 8/25/2009, ranged from 56 to 74 degrees Fahrenheit. Air temperatures ranged from 53 to 79 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 27% of the total length of this survey, riffles 10%, and pools 11%. The pools are relatively deep, with 41 of the 58 (71%) pools having a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width

Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of any log debris accumulations (LDA's) in the stream.

Thirty-two of the 58 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-six of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in San Anselmo Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty-seven of the 58 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 14. The shelter rating in the flatwater habitats was 6. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in San Anselmo Creek. Boulders are the dominant cover type in pools followed by undercut banks. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 85%. Reach 1 had a canopy density of 83.8%, Reach 2 had a canopy density of 95.5%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 49% and 53%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of

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coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

### GENERAL RECOMMENDATIONS

San Anselmo 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.

### RECOMMENDATIONS

- 1) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from Boulders. Adding high quality complexity with woody cover in the pools is desirable.
- 2) The limited water temperature data available suggest that maximum temperatures are 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) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 4) Access for migrating salmonids should be assessed at all road crossings and dams. Particular sites of concern include both residential ford crossings located in residential area of western portion of the town of Fairfax, and both Elliot Natural Preserve ford crossings, the Bridge Avenue Road Bridge, Saunders Avenue Road Bridge, and Bolinas Road Bridge, and the Center Boulevard/ San Anselmo Avenue in-stream Culvert. Other specific sites include all five dam sites in Reach 1 and their associated fish ladders, the old Dam sill site near Creek City Park, and all the structural developments that span the creek channel in downtown San Anselmo (between Habitat Unit #40-51). All fish passage assessments should be done according to Part 9 of the California Salmonid Stream Habitat Restoration Manual (Flosi et al, 1998). Where needed, crossings should be replaced or modified to improve fish passage.
- 5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. 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.

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- 6) Increase the canopy on San Anselmo Creek, particularly in Reach 1, by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.
- 7) San Anselmo Creek would benefit from utilizing 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.

### 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.)	Habitat Unit #	Comments
0	0001.00	Start of survey at the confluence with Corte Madera Creek and San Anselmo Creek.
10	0002.00	There is a retaining wall on the left bank.
246	0006.00	There is a retaining wall that consists of railroad ties on the right bank.
772	0011.00	Bridge #1 is made of cement, on Sir Francis Drake Blvd. The width is 48 ft, the height is 17 ft, and the length is 41 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
995	0013.00	There was runoff flowing into stream on the left bank. The flow was estimated to be less than 1 cubic feet per second (cfs).
1,055	0014.00	One stickleback and one salmonid young of the year (YOY) were observed.
1,314	0017.00	Bridge #2 is made of cement on Winship Ave. The width is 22 ft, the height is 16 ft, and the length is 25 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
1,684	0023.00	There were vertical cement retaining walls on the right bank.

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Position (ft.)	Habitat Unit #	Comments
1,862	0024.00	Bridge #3 is a private footbridge made of wood and metal. The width is 50 ft, the height is 17 ft, and the length is 5 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
2,067	0027.00	Bridge #4 is a private footbridge made of cement. The width is 35 ft, the height is 16 ft, and the length is 25 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
2,445	0032.00	One roach observed.
2,843	0033.00	Bridge #5 is made of cement on Barber Ave. The width is 68 ft, the height is 13 ft, and the length is 39 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
3,268	0036.00	Bridge #6 is a private footbridge made of wood and cement. The width is 60 ft, the height is 15 ft, and the length is 5 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
3,273	0037.00	One roach observed.
3,525	0038.00	Bridge #7 is made of cement on Sir Francis Drake Blvd. The width is 40 ft, the height is 16 ft, and the length is 99 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
3,667	0040.00	One roach and suckers were observed.
3,667	0040.00	Bridge #8 is made of cement at a building over the channel. The width is 50 ft, the height is 18 ft, and the length is 62 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
3,852	0043.00	Bridge #9 is made of cement at a building over the channel. The width is 46 ft, the height is 15 ft, and the length is 107 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
3,993	0045.00	An old bridge sill creates a 1.5 ft drop at the downstream edge into the downstream unit.
4,022	0046.00	One roach was observed.
4,158	0047.00	Bridge #10 is a private footbridge made of metal. The width is 48 ft, the height is 18 ft, and the length is 10 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
4,228	0049.00	Bridge #11 is made of cement at a shopping center over the channel. The width is 28 ft, the height is 11 ft, and the length is 101 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.

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Position (ft.)	Habitat Unit #	Comments
4,228	0049.00	One large unidentified fish was observed.
4,336	0051.00	Bridge #12 is made of cement at a building over the channel. The width is 42 ft, the height is 14 ft, and the length is 199 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
4,590	0053.00	Bridge #13 is made of cement on Bridge Ave. The width is 44 ft, the height is 15 ft, and the length is 43 ft. It was not retaining gravel or down cutting. The bridge is possibly a barrier to salmonids.
4,633	0054.00	One sculpin was observed.
4,785	0055.00	Bridge #14 is made of cement on San Anselmo Ave. The width is 35 ft, the height is 13 ft, and the length is 35 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
4,820	0056.00	One California roach was observed.
5,114	0058.00	tributary #1 on the left bank is a dry, unnamed tributary which enters San Anselmo Creek 189 ft into the unit. The water temperature downstream was 67F, the temperature upstream was 67F, and the tributary was dry. It is accessible to fish (checked 10 ft up the tributary). The slope is estimated at 10%. No fish were observed while we were there.
5,478	0060.00	One roach and one sculpin were observed.
5,770	0064.00	Bridge #15 is made of cement on Madrone Ave. The width is 25 ft, the height is 13 ft, and the length is 29 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
5,851	0066.00	One California roach was observed.
6,105	0069.00	tributary #2 on the left bank is an unnamed tributary that is at the upstream edge of the unit. The discharge is estimated to be less than 1 cfs, and it contributes about 5% of flow to the stream. The water temperature downstream is 68F, the temperature upstream is 68F, and the tributary is 63F. It is accessible to fish (checked 20 ft up the tributary). The slope is estimated to be less than 5%. No fish were observed while we were there. The coordinate point of the confluence is: N37.97889 W122.56653.
6,288	0071.00	Bridge #16 is made of cement at Nokomis Ave. The width is 72 ft, the height is 11 ft, and the length is 32 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
6,635	0074.00	There is a vertical retaining wall on the left bank.

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Position (ft.)	Habitat Unit #	Comments
6,981	0076.00	Tributary #1 on the right bank is a dry, and unnamed tributary which enters San Anselmo Creek 35 ft into the unit. The water temperature downstream is 65F, the temperature upstream is 65F, and the tributary is dry. We checked 20 ft up the tributary. The slope is estimated to be less than 8%. No fish were observed while we were there. The coordinate point of the confluence is: N37.97806 W122.56892.
7,188	0079.00	Bridge #17 is a private footbridge made of wood. The width is 66 ft, the height is 17 ft, and the length is 5 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
7,344	0083.00	Suckers were observed.
7,560	0085.00	A PVC pipe with a 2 inch diameter spans the creek.
7,833	0088.00	There is a utility crossing 8 feet above the streambed at the bottom of the unit.
8,263	0093.00	Tributary #3 on the left bank is a dry, unnamed tributary which enters San Anselmo Creek. The water temperature downstream was 61F, the temperature upstream was 61F, and the tributary was dry. It is accessible to fish (checked 100 ft up the tributary). The slope is estimated to be less than 5%. No fish were observed while we were there.
8,263	0093.00	One roach and suckers were observed.
8,700	0099.00	Bridge #18 is made of cement at Saunders Ave. The width is 46 ft, the height is 13 ft, and the length is 42 ft. The water to sill height is 1 ft. Gravel was being retained, and down cutting was occurring. The bridge is not likely a barrier to salmonids.
8,742	0100.00	Dam #1 which is not a flashboard dam has a fish ladder in place. The length of the dam is 4 ft, the height is 5 ft, and the entire width is 40 ft. Gravel was being retained, and down cutting was occurring. The height of the down cut was 7 ft. The dam and associated fish ladder is not likely a barrier to juvenile or adult salmonids when maintained.
9,617	0106.00	Tributary #4 on the left bank is a dry, unnamed tributary which enters San Anselmo Creek. The water temperature downstream was 61F, the temperature upstream was 61F, and the tributary was dry. It is accessible to fish (we checked 20 ft up the tributary). The slope is estimated to be less than 5%. No fish were observed while we were there.
9,683	0107.00	There is a pump with a 2 inch diameter on the left bank.

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Position (ft.)	Habitat Unit #	Comments
10,887	0125.00	There is a concrete slab downstream of the culvert. There is a 3 ft drop at the downstream edge of this unit into the downstream unit.
10,919	0126.00	Culvert #1 is a single in-stream concrete box culvert in good condition, at Center Blvd/San Anselmo Ave. It splits into two culverts at the upstream end. The culvert height is 16 ft, the width is 36 ft, the length is 278 ft, and the plunge height is 3 ft. The maximum depth within 5 ft of the outlet is 1.8 ft. The slope was estimated at 0%. The culvert is a possible barrier to juvenile and adult salmonids.
11,197	0127.00	There is arundo on the left bank and English ivy on both banks.
12,381	0139.00	tributary #2 on the right bank is a dry, unnamed tributary which enters San Anselmo Creek 16 ft into the unit. The water temperature downstream was 64F, the temperature upstream was 64F, and the tributary was dry. It is inaccessible to fish (we checked 50 ft up the tributary). The slope is unknown. No fish were observed while we were there.
13,097	0151.00	Dam #2 is not a flashboard dam. Bridge #19 spans over the dam, and there is a fish ladder present. The dam length is 21 ft, the height is 8 ft, and the entire width is 40 ft. Gravel was being retained, and down cutting was occurring. The height of the downcut was 7'. The sill to water level is 1.4 ft. The dam is not a possible barrier to juvenile or adult salmonids.
13,097	0151.00	Bridge #19 is made of cement on Pastori Ave. Dam #2 with the fish ladder is under this bridge. The bridge width is 34 ft, the height is 15 ft, and the length is 21 ft. Gravel was being retained, and down cutting was occurring. The bridge is not likely a barrier to salmonids.
13,372	0154.00	There is a large structure supported by cement pilings that extends half way across the creek bed. It is over 20 ft above the streambed. Water has eroded the soil around some pilings. The structure continues through habitat unit #156.
13,643	0157.00	There is a concrete utility crossing in-stream, which is not a barrier to salmonids.
13,648	0158.00	There is a large, failing retaining wall made of steel and wood on the left bank that is falling into the stream.
13,648	0158.00	Tributary #5 on the left bank is an unnamed tributary which enters San Anselmo Creek 100 ft into the unit. The discharge is estimated to be less than 1 cfs, and it contributes 0% of flow to the stream. The water temperature downstream was 65F, the temperature upstream was 65F, and the tributary was 61F. It is accessible to fish (checked 100 ft up the

## San Anselmo Creek 2009

Position (ft.)	Habitat Unit #	Comments
		tributary). The slope is estimated to be less than 5%. No fish were observed while we were there.
14,621	0167.00	Dam #3 is not a flashboard dam. The length is 18 ft, the height is 6 ft, and the entire width is 59 ft. Gravel was being retained, but down cutting was not occurring. The sill to water level is 0.5 ft. The dam is a possible barrier to juvenile and adult salmonids.
15,095	0175.00	Bridge #20 is a private footbridge made of wood. The width is 46 ft, the height is 20 ft, and the length is 5 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
15,100	0176.00	Tributary #6 on the left bank is Fairfax Creek which enters San Anselmo Creek. The discharge is estimated to be at 1 cfs, and it contributes about 5% of its flow to the stream. The water temperature downstream was 60F, the temperature upstream was 60F, and the tributary was 65F. It is inaccessible to fish (we fully surveyed the tributary). The slope is 0%. No fish were observed while we were there.
15,206	0177.00	One 6 inch steelhead/rainbow trout was observed.
15,254	0178.00	Bridge #21 is a private footbridge made of wood. The width is 40 ft, the height is 15 ft, and the length is 5 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
15,300	0181.00	One juvenile steelhead/rainbow trout was observed.
15,524	0183.00	tributary #3 on the right bank is a dry, unnamed tributary which enters San Anselmo Creek. The water temperature downstream was 61F, the temperature upstream was 61F, and the tributary was dry. It is inaccessible to fish (we checked 50 ft up the tributary). The slope is estimated to be greater than 10%. No fish were observed while we were there.
15,641	0185.00	There is a failing retaining wall on the left bank.
15,911	0188.00	Tributary #4 on the right bank is Deer Park Creek which enters San Anselmo Creek 42 ft into the unit. The water temperature downstream was 64F, the temperature upstream was 64F, and the tributary was 60F. It is accessible to fish (we checked 100 ft up the tributary). The slope is estimated to be at less than 5%. No fish were observed while we were there.
16,190	0192.00	Bridge #22 is made of cement on Creek Road. The width is 100 ft, the height is 15 ft, and the length is 34 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.

## San Anselmo Creek 2009

Position (ft.)	Habitat Unit #	Comments
16,417	0197.00	One juvenile steelhead/rainbow trout was observed.
16,607	0201.00	There is a 3 ft drop at the down stream edge into habitat unit #200.
16,686	0203.00	There is arundo on the right bank.
17,214	0213.00	Bridge #23 is made of cement on Bolinas Road. The width is 18 ft, the height is 14 ft, and the length is 48 ft. The water to sill height is 0 ft. Gravel was being retained, but there was no down cutting. The bridge is not likely a barrier to salmonids.
17,647	0222.00	Tributary #5 on the right bank is an unnamed tributary which enters San Anselmo Creek 34 ft into the unit. It was wet but not flowing and contributes 0% of its flow to the stream. The water temperature downstream was 60F, the temperature upstream was 60F, and the tributary was 60F. IT is inaccessible to fish (we checked 50 ft up the tributary). The slope is estimated to be greater than 10%. No fish were observed while we were there.
19,324	0224.00	Dam #4 is a flashboard dam with the boards gone. The length is 2 ft, the height is 8 ft, the entire width is 30 ft, and the flashboard width is 19 ft. Gravel was being retained, and down cutting was occurring. The height of the downcut was 5 ft. The dam is possibly a barrier to juvenile and adult salmonids.
20,910	0226.00	Bridge #24 is made of wood on Meadow Way. The width is 66 ft, the height is 19 ft, and the length is 14 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
20,924	0227.00	There is a utility crossing 1412 ft into the unit.
23,042	0228.00	Dam #5 is not a flashboard dam. The length is 54 ft, the height is not applicable, and the entire width is 27 ft. Down cutting was occurring, and the height of the downcut was 6.2 ft. The dam is not a barrier to salmonids.
23,042	0228.00	Bridge #25 is made of cement on Canyon Road. The width is 27 ft, the height is 11 ft, and the length is 15 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
23,096	0229.00	There is a utility crossing 1856 ft into the unit.
23,096	0229.00	Tributary #7 on the left bank is dry, unnamed tributary enters San Anselmo Creek. The discharge is 0 cfs. Downstream, upstream, and the tributary are dry. It is accessible to fish (we checked 93 ft up the tributary). The slope was measured at 2.9% using a hand level. No fish were observed while we were

## San Anselmo Creek 2009

Position (ft.)	Habitat Unit #	Comments
		there.
25,909	0230.00	Bridge #26 is a private footbridge made of wood. The width is 26 ft, the height is 9 ft, and the length is 4 ft. The water to sill height is 0 ft. It was not retaining gravel or down cutting. The bridge is not a barrier to salmonids.
26,055	0232.00	Bridge #27 is a private driveway made of wood. The width is 25 ft, the height is 9 ft, and the length is 4 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
26,740	0234.00	Bridge #28 is made of natural bottom at the Elliot Nature Preserve ford crossing. The width is 65 ft, the height is 0 ft, and the length is 9 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
27,190	0236.00	Bridge #29 is the Elliot Nature Preserve ford crossing. The width is 88 ft, the height is 0 ft, and the length is 8 ft. The water to sill height is 0 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
27,198	0237.00	Tributary #6 on the right bank is Carey Camp Creek which enters San Anselmo Creek 51 ft into the unit. The discharge is 0 cfs. Downstream, upstream, and the tributary are dry. The tributary is inaccessible to fish due to placed riprap at the mouth. We surveyed the entire tributary. The slope was measured at 29.7% at the mouth using a hand level. Fish were observed upstream during the survey.
27,371	0238.00	Bridge #30 is the Elliot Nature Preserve ford crossing. The width is 36 ft, the height is 0 ft, and the length is 7 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
27,795	0242.00	Bridge #31 is a footpath in the Elliot Nature Preserve made of natural bottom. The width is 37 ft, the height is 0 ft, and the length is 8 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
27,984	0244.00	One possible salmonid young of the year was observed from the bank.
28,181	0249.00	Tributary #8 on the left bank is a dry, unnamed tributary which enters San Anselmo Creek. The discharge is 0 cfs. The water temperature downstream was 63F, the temperature upstream was 63F, and the tributary was dry. It is accessible to fish (we checked 20 ft up the tributary). The slope is estimated to be greater than 10%. Fish (possibly salmonids) were observed while we were there.

## San Anselmo Creek 2009

Position (ft.)	Habitat Unit #	Comments
28,181	0249.00	One salmonid young of the year and one 6 inch steelhead/rainbow trout were observed from the bank.
28,396	0255.00	Tributary #9 on the left bank is Cascade Creek which enters San Anselmo Creek. The discharge was estimated to be less than 1 cfs, and it contributes 100% of its flow to the stream. The water temperature downstream was 62F, the temperature upstream was 64F, and the tributary was 62F. It is accessible to fish (we checked 120 ft up the tributary). The slope was measured at 4.4% with a hand level. Fish were observed during the full survey. Please see report for further information. The coordinate point of the confluence is: N37.98134 W122.61995.
29,765	0260.00	Bridge #32 is the Nature Preserve footpath ford crossing made of natural bottom. The width is 21 ft, the height is 0 ft, and the length is 5 ft. It was not retaining gravel or down cutting. The bridge is not likely a barrier to salmonids.
31,139	0270.00	Salamanders were observed from the bank.
31,299	0272.00	Tributary #10 on the left bank is a dry, unnamed tributary which enters San Anselmo Creek. The discharge is 0 cfs, and it contributes 0% of its flow to the stream. The water temperature downstream was 58F, and upstream and the tributary were dry. It is inaccessible to fish (we checked 20 ft up the tributary). The slope was estimated to be 45%. No fish were observed while we were there.
31,414	0277.00	Tributary #7 on the right bank is a dry, unnamed tributary which enters San Anselmo Creek 190 ft into the unit. The discharge is 0 cfs. Upstream, downstream, and the tributary were dry. It is inaccessible to fish (we checked 30 ft up the tributary). The slope was estimated at 26%. No fish were observed while we were there.
32,867	0289.00	Tributary #8 on the right bank is an unnamed tributary which enters San Anselmo Creek. The discharge is estimated to be less than 1 cfs, and it contributes 100% of its flow to the stream. The water temperature downstream was 61F, upstream was dry, and the tributary was 60F. It is inaccessible to fish (we checked 44 ft up the tributary). The slope was estimated at 15%. No fish were observed while we were there.
33,306	0298.00	Tributary #9 on the right bank is a dry, unnamed tributary which enters San Anselmo Creek. The discharge is 0 cfs. The water temperature downstream was 60F, the temperature upstream is unknown, and the tributary was dry. It is inaccessible to fish (we checked 15 ft up the tributary). The slope was estimated at 38%. No fish were observed while we were there.

## San Anselmo Creek 2009

Position (ft.)	Habitat Unit #	Comments
33,342	0300.00	There is a 12 foot vertical drop at the top of the unit.
33,625	0305.00	Tributary #11 on the left bank is a dry, unnamed tributary which enters San Anselmo Creek. The discharge is 0 cfs. Downstream, upstream, and the tributary were dry. It is inaccessible to fish (we checked 10 ft up the tributary). The slope was estimated at 42%. No fish were observed while we were there.
34,019	0306.00	Tributary #12 on the left bank is a dry, unnamed tributary which enters San Anselmo Creek. The discharge is 0 cfs. Downstream, upstream, and the tributary were dry. It is inaccessible to fish (we checked 10 ft up the tributary). The slope was estimated at 40%. No fish were observed while we were there.
34,943	0307.00	End of survey at a cliff that was too steep to climb and could be a potential barrier to salmonid fish passage.

## 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.
- McCain, M., D. Fuller, L. Decker and K. Overton. 1990. Stream habitat classification and inventory procedures for northern California. FHC Currents. No.1. U.S. Department of Agriculture. Forest Service, Pacific Southwest Region.
- Rosgen, D.L., 1994. A Classification of Natural Rivers. *Catena*, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

## San Anselmo Creek 2009

### LEVEL III and LEVEL IV HABITAT TYPES

#### RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

#### CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

#### FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

#### MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

#### SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

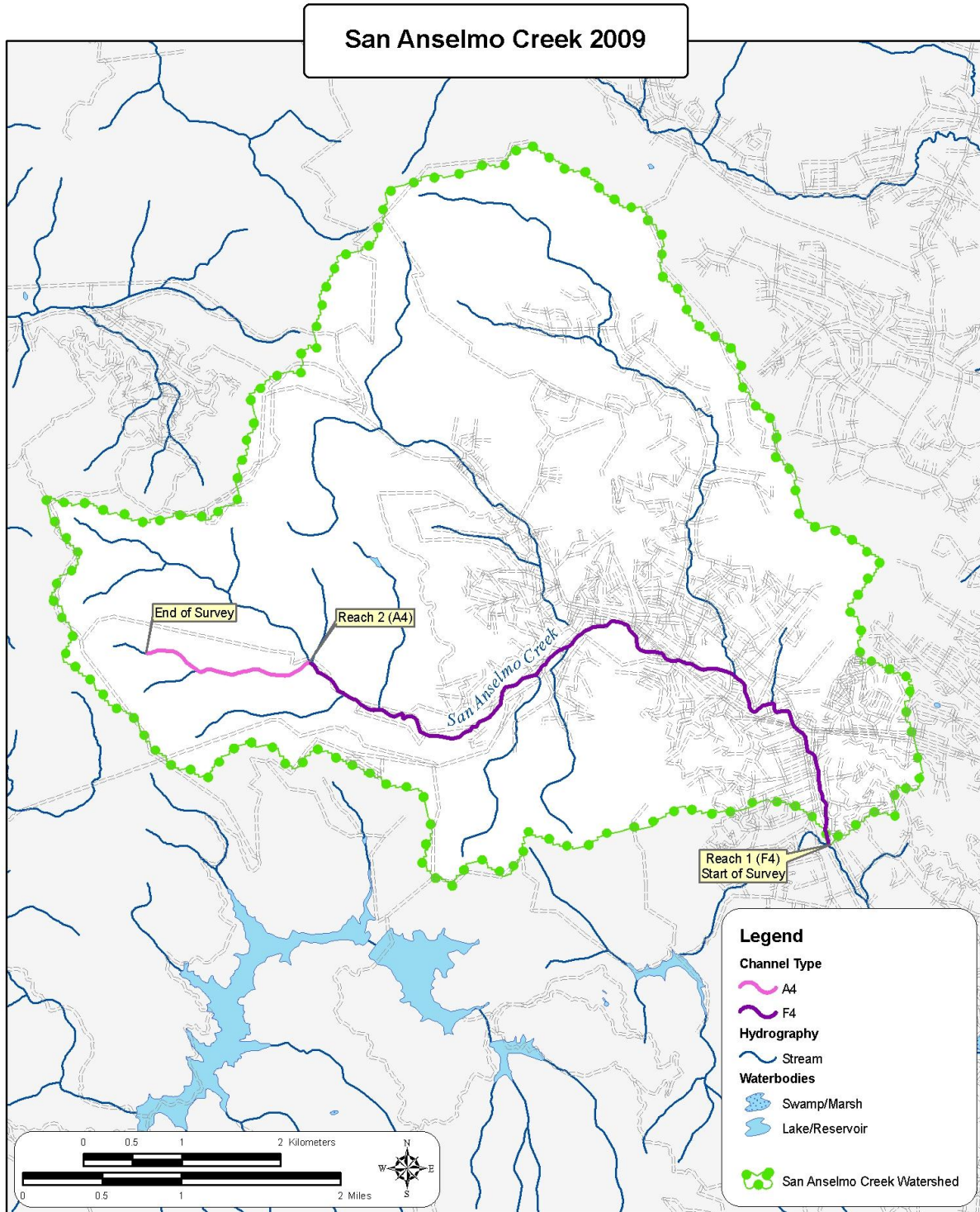
#### BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

#### ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

# San Anselmo Creek 2009



# San Anselmo Creek 2009

**Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types**

**Stream Name:** San Anselmo Creek  
**Survey** 8/18/2009 to 8/25/2009

**LLID:** 1225583379661

**Drainage:** San Rafael

**Confluence Location: Quad:** SAN RAFAEL

**Legal Description:** T02NR06WS31

**Latitude:** 37:57:58.2N

**Longitude:** 122:33:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max 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
36	0	CULVERT	11.7	40	1424	4.1									
60	0	DRY	19.5	279	16749	47.9									
91	91	FLATWATER	29.6	105	9513	27.2	11.3	0.7	1.4	1321	120168	1197	108919		6
58	58	POOL	18.9	64	3737	10.7	12.1	1.2	2.5	828	48015	1246	72264	1127	14
62	62	RIFFLE	20.2	57	3520	10.1	7.5	0.2	0.4	312	19364	73	4512		0
Total Units	Total Units Fully Measured				Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)		
307	211				34943						187547		185696		

# San Anselmo Creek 2009

## Table 2 - Summary of Habitat Types and Measured Parameters

**Stream Name:** San Anselmo Creek  
**Survey** 8/18/2009 to 8/25/2009

**LLID:** 1225583379661 **Drainage:** San Rafael

**Confluence Location: Quad:** SAN RAFAEL

**Legal Description:** T02NR06WS31

**Latitude:** 37:57:58.2N

**Longitude:** 122:33:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max 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	Mean Canopy (%)
51	51	LGR	16.6	55	2808	8.0	9.0	0.2	1.6	357	18221	85	4349		0	85
9	9	CAS	2.9	71	635	1.8	2.0	0.2	0.9	81	732	10	90		0	97
2	2	BRS	0.7	38	77	0.2	5.0	0.2	1.0	206	411	36	73		0	77
52	52	GLD	16.9	120	6264	17.9	14.0	0.9	4.0	1847	96060	1826	94935		8	86
33	33	RUN	10.7	73	2412	6.9	8.0	0.4	2.2	513	16942	283	9351		4	81
6	6	SRN	2.0	140	837	2.4	9.0	0.5	1.5	1194	7167	772	4633		0	83
21	21	MCP	6.8	59	1236	3.5	13.0	1.2	4.3	860	18060	1413	29668	1267	10	85
4	4	CCP	1.3	64	257	0.7	13.0	1.3	3.0	760	3040	1080	4320	1010	6	93
2	2	STP	0.7	23	46	0.1	6.0	0.8	2.0	132	263	121	243	121	10	97
5	5	CRP	1.6	90	448	1.3	12.0	1.2	3.8	1028	5138	1591	7954	1429	6	97
2	2	LSL	0.7	37	74	0.2	8.0	0.9	3.5	300	599	214	429	154	25	47
3	3	LSR	1.0	56	168	0.5	13.0	0.9	2.3	680	2040	634	1903	574	5	87
10	10	LSBk	3.3	89	886	2.5	11.0	1.4	4.4	1059	10594	1862	18620	1741	30	85
8	8	LSBo	2.6	72	577	1.7	13.0	0.9	2.9	951	7610	1016	8130	863	14	88
2	2	PLP	0.7	17	34	0.1	18.0	1.5	2.7	308	615	482	965	482	8	74
1	1	BPB	0.3	11	11	0.0	5.0	0.6	1.2	55	55	33	33	33	10	97
60	0	DRY	19.5	279	16749	47.9										85
36	0	CUL	11.7	40	1424	4.1										64
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume				
307	211				34943					187547		185696				

**San Anselmo Creek 2009**

**Table 3 - Summary of Pool Habitat Types**

**Stream Name:** San Anselmo Creek

**LLID:** 1225583379661

**Drainage:** San Rafael

**Survey** 8/18/2009 to 8/25/2009

**Confluence Location: Quad:** SAN RAFAEL

**Legal Description:** T02NR06WS31

**Latitude:** 37:57:58.2N

**Longitude:** 122:33:30.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid. Vol (cu.ft.)	Mean Shelter Rating
27	27	MAIN	47	57	1539	41	12.2	1.2	791	21363	1144	30884	10
30	30	SCOUR	52	73	2187	59	12.2	1.2	887	26597	1148	34453	18
1	1	BACKWATER	2	11	11	0	5.0	0.6	55	55	33	33	10
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
58	58				3737					48015		65371	

**San Anselmo Creek 2009**

**Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types**

**Stream Name:** San Anselmo Creek  
**Survey** 8/18/2009 to 8/25/2009

**LLID:** 1225583379661 **Drainage:** San Rafael

**Confluence Location: Quad:** SAN RAFAEL **Legal Description:** T02NR06WS31 **Latitude:** 37:57:58.2N **Longitude:** 122:33:30.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
21	MCP	36	1	5	6	29	5	24	7	33	2	10
4	CCP	7	0	0	1	25	0	0	3	75	0	0
2	STP	3	0	0	1	50	1	50	0	0	0	0
5	CRP	9	0	0	1	20	1	20	3	60	0	0
2	LSL	3	0	0	1	50	0	0	1	50	0	0
3	LSR	5	0	0	1	33	2	67	0	0	0	0
10	LSBk	17	0	0	3	30	3	30	2	20	2	20
8	LSBo	14	0	0	1	13	7	88	0	0	0	0
2	PLP	3	0	0	0	0	2	100	0	0	0	0
1	BPB	2	0	0	1	100	0	0	0	0	0	0
<b>Total Units</b>			<b>Total &lt; 1 Foot Max Resid. Depth</b>	<b>Total &lt; 1 Foot % Occurrence</b>	<b>Total 1 &lt; 2 Feet Max Resid. Depth</b>	<b>Total 1 &lt; 2 Feet % Occurrence</b>	<b>Total 2 &lt; 3 Feet Max Resid. Depth</b>	<b>Total 2 &lt; 3 Feet % Occurrence</b>	<b>Total 3 &lt; 4 Feet Max Resid. Depth</b>	<b>Total 3 &lt; 4 Feet % Occurrence</b>	<b>Total &gt;= 4 Feet Max Resid. Depth</b>	<b>Total &gt;= 4 Feet % Occurrence</b>
58			1	2	16	28	21	36	16	28	4	7
Mean Maximum Residual Pool Depth (ft.):			3									

**San Anselmo Creek 2009**

**Table 5 - Summary of Mean Percent Cover By Habitat Type**

Stream Name:		San Anselmo Creek		Dry Units:		60		LLID:		1225583379661		Drainage:		San Rafael	
Survey		8/18/2009 to 8/25/2009		Confluence Location: Quad:		SAN RAFAEL		Legal Description:		T02NR06WS31		Latitude:		37:57:58.2N	
Longitude:		122:33:30.0W		Habitat Units		Units Fully Measured		Habitat Type		Mean % Undercut Banks		Mean % SWD		Mean % LWD	
Mean % Root Mass		Mean % Terr. Vegetation		Mean % Aquatic Vegetation		Mean % White Water		Mean % Boulders		Mean % Bedrock Ledges					
51	48	LGR	0	0	0	0	0	0	0	0	0	0	0	0	0
9	8	CAS	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	BRS	0	0	0	0	0	0	0	0	0	0	0	0	0
62	58	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0	0	0	0	0
52	44	GLD	9	0	0	5	7	2	0	24	3				
33	31	RUN	0	0	0	0	1	3	0	9	0				
6	6	SRN	0	0	0	0	0	0	0	0	0				
91	81	TOTAL FLAT	5	0	0	3	4	2	0	16	2				
21	21	MCP	28	0	0	12	0	5	0	32	4				
4	4	CCP	0	0	0	45	0	0	0	55	0				
2	2	STP	0	0	0	0	0	0	0	25	25				
5	5	CRP	10	0	0	0	16	0	0	27	7				
2	2	LSL	50	0	10	10	0	0	0	30	0				
3	3	LSR	0	3	0	77	0	0	0	20	0				
10	10	LSBk	26	1	0	6	15	8	0	4	30				
8	8	LSBo	14	5	0	14	3	0	0	65	0				
2	2	PLP	0	0	0	15	0	0	0	50	35				
1	1	BPB	0	0	0	0	0	0	0	0	100				
58	58	TOTAL POOL	19	1	0	15	4	3	0	32	11				
36	0	CUL													
307	197	TOTAL	8	0	0	6	3	2	0	16	4				

**San Anselmo Creek 2009**

**Table 6 - Summary of Dominant Substrates By Habitat Type**

**Stream Name:** San Anselmo Creek      **Dry Units:** 60      **LLID:** 1225583379661      **Drainage:** San Rafael  
**Survey** 8/18/2009 to 8/25/2009

**Confluence Location:** Quad: SAN RAFAEL      **Legal Description:** T02NR06WS31      **Latitude:** 37:57:58.2N      **Longitude:** 122:33:30.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
51	43	LGR	0	9	81	7	0	2	0
9	8	CAS	0	0	38	0	0	0	63
2	2	BRS	0	0	0	0	0	0	100
52	44	GLD	0	39	57	2	2	0	0
33	30	RUN	0	27	63	0	0	0	10
6	6	SRN	0	0	67	0	17	0	17
21	21	MCP	0	52	24	0	0	0	24
4	4	CCP	0	50	25	0	0	25	0
2	2	STP	0	0	0	0	0	0	100
5	5	CRP	0	20	60	0	0	20	0
2	2	LSL	0	100	0	0	0	0	0
3	3	LSR	0	0	100	0	0	0	0
10	10	LSBk	0	40	60	0	0	0	0
8	8	LSBo	0	25	75	0	0	0	0
2	2	PLP	0	0	100	0	0	0	0
1	1	BPB	0	0	0	0	0	0	100
36	1	CUL	0	0	100	0	0	0	0

## San Anselmo Creek 2009

### Table 7 - Summary of Mean Percent Canopy for Entire Stream

**Stream Name:** San Anselmo Creek  
**Survey** 8/18/2009 to 8/25/2009

**LLID:** 1225583379661 **Drainage:** San Rafael

**Confluence Location: Quad:** SAN RAFAEL **Legal Description:** T02NR06WS31 **Latitude:** 37:57:58.2N **Longitude:** 122:33:30.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
85	2	98	1	49	53

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

# San Anselmo Creek 2009

**Table 8 - Fish Habitat Inventory Data Summary**

Stream San Anselmo Creek LLID: 1225583379661 Drainage San Rafael  
 Survey Dates: 8/18/2009 to 8/25/2009 Survey Length (ft.): 34943 Main Channel (ft.): 34943 Side Channel (ft.): 0  
 Confluence Location: Quad SAN RAFAEL Legal Description: T02NR06WS31 Latitude: 37:57:58.2N Longitude: 122:33:30.0W

## Summary of Fish Habitat Elements By Stream Reach

**STREAM REACH: 1**

Channel Type: F4	Canopy Density (%): 83.8	Pools by Stream Length	12.6
Reach Length (ft.): 28474	Coniferous Component (%): 1.8	Pool Frequency (%):	18.4
Riffle/Flatwater Mean Width (ft.): 10.4	Hardwood Component 98.2	Residual Pool Depth (%):	
BFW:	Dominant Bank Hardwood Trees	< 2 Feet Deep:	17.0
Range (ft.): 21.00 to 39.00	Vegetative Cover (%): 49.5	2 to 2.9 Feet Deep:	40.4
Mean (ft.): 28.06	Dominant Boulders	3 to 3.9 Feet Deep:	34.0
Std. Dev.: 4.97	Dominant Bank Substrate Sand/Silt/Clay	>= 4 Feet Deep:	8.5
Base Flow (cfs): N/A	Occurrence of LWD (%): 0.1	Mean Max Residual Pool Depth	2.78
Water (F): 58 - 67 Air (F): 59 - 79	LWD per 100 ft.:	Mean Pool Shelter	15
Dry Channel (ft.): 11131	Riffles: 0		
	Pools: 0		
	Flat: 0		

Pool Tail Substrate (%): Silt/Clay: 2.1 Sand: 14.9 Gravel: 80.9 Sm Cobble: 2.1 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0  
 Embeddedness Values (%): 1. 23.4 2. 25.5 3. 34.0 4. 17.0 5. 0.0

**STREAM REACH: 2**

Channel Type: A4	Canopy Density (%): 95.5	Pools by Stream Length	2.5
Reach Length (ft.): 6469	Coniferous Component (%): 0.0	Pool Frequency (%):	21.2
Riffle/Flatwater Mean Width (ft.): 2.6	Hardwood Component 100.0	Residual Pool Depth (%):	
BFW:	Dominant Bank Hardwood Trees	< 2 Feet Deep:	81.8
Range (ft.): 11.00 to 22.00	Vegetative Cover (%): 55.4	2 to 2.9 Feet Deep:	18.2
Mean (ft.): 13.35	Dominant Boulders	3 to 3.9 Feet Deep:	0.0
Std. Dev.: 2.04	Dominant Bank Substrate Sand/Silt/Clay	>= 4 Feet Deep:	0.0
Base Flow (cfs): N/A	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth	1.50
Water (F): 56 - 74 Air (F): 53 - 77	LWD per 100 ft.:	Mean Pool Shelter	7
Dry Channel (ft.): 5618	Riffles: 0		
	Pools: 1		
	Flat: 2		

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 9.1 Gravel: 72.7 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 18.2  
 Embeddedness Values (%): 1. 81.8 2. 0.0 3. 9.1 4. 9.1 5. 0.0

## San Anselmo Creek 2009

**Table 9 -Mean Percentage of Dominant Substrate and Vegetation**

**Stream Name:** San Anselmo Creek **LLID:** 1225583379661 **Drainage:** San Rafael  
**Survey** 8/18/2009 to 8/25/2009  
**Confluence Location: Quad:** SAN RAFAEL **Legal Description:** T02NR06WS31 **Latitude:** 37:57:58.2N **Longitude:** 122:33:30.0W

### Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percentage (%)
Bedrock	39	31	28.2
Boulder	3	4	2.8
Cobble/Gravel	1	0	0.4
Sand/Silt/Clay	81	89	68.5

### Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percentage
Grass	4	4	3.2
Brush	31	37	27.4
Hardwood	82	78	64.5
Coniferous	0	2	0.8
No Vegetation	7	3	4.0

**Total Stream Cobble Embeddedness Values:** 2

## San Anselmo Creek 2009

### Table 10 - Mean Percent of Shelter Cover Types For Entire Stream

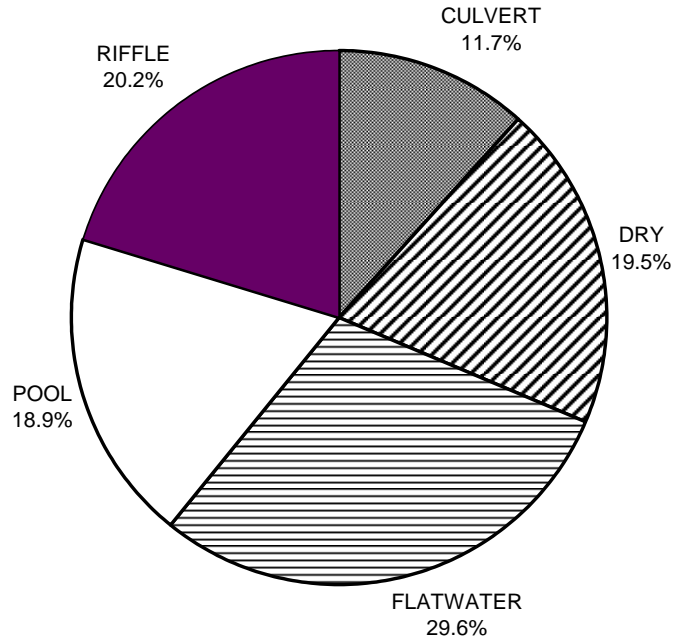
**Stream Name:** San Anselmo Creek  
**Survey** 8/18/2009 to 8/25/2009

**LLID:** 1225583379661 **Drainage:** San Rafael

**Confluence Location: Quad:** SAN RAFAEL **Legal Description:** T02NR06WS31 **Latitude:** 37:57:58.2N **Longitude:** 122:33:30.0W

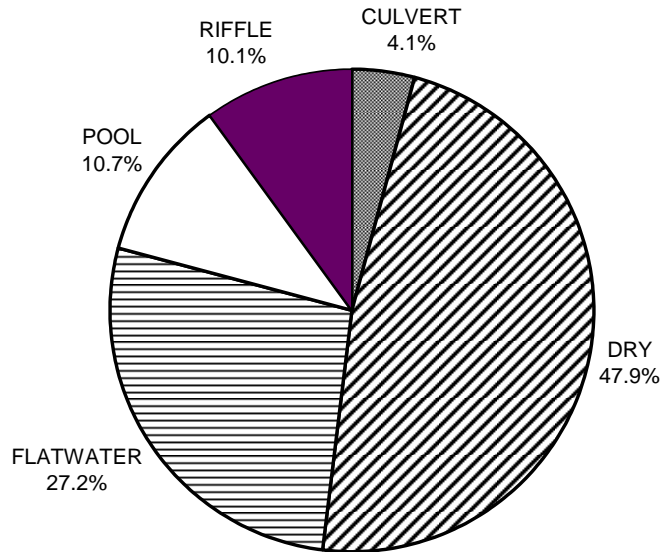
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	5	19
SMALL WOODY DEBRIS (%)	0	0	1
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	3	15
TERRESTRIAL VEGETATION	0	4	4
AQUATIC VEGETATION (%)	0	2	3
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	16	32
BEDROCK LEDGES (%)	0	2	11

**SAN ANSELMO CREEK 2009  
HABITAT TYPES BY PERCENT OCCURRENCE**



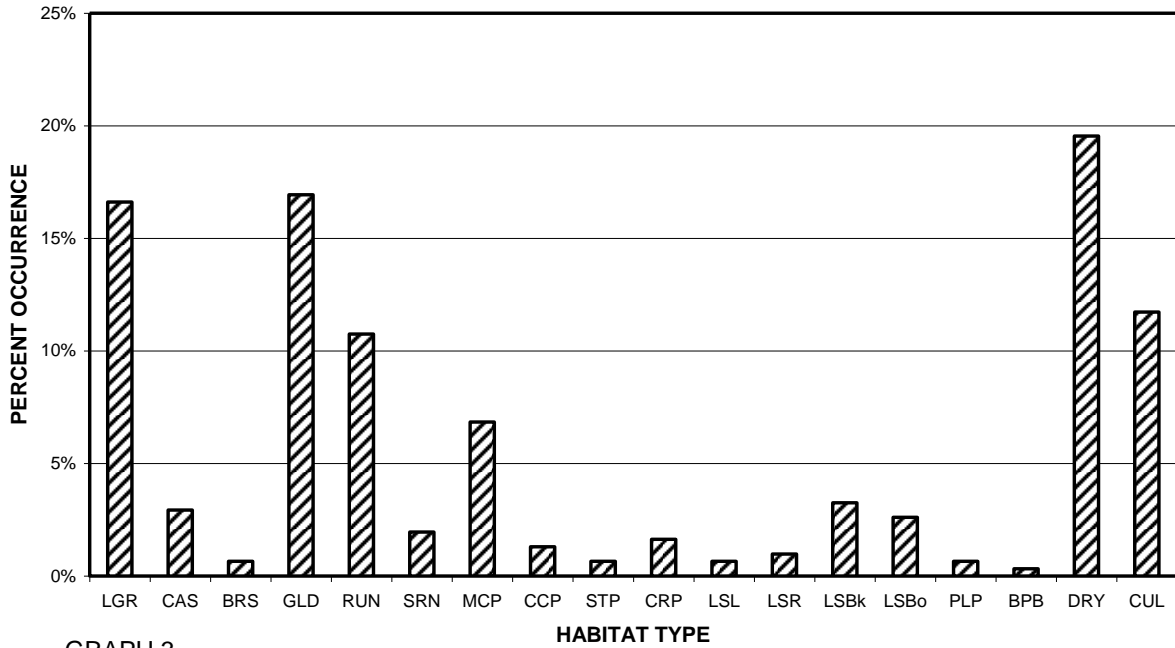
GRAPH 1

**SAN ANSELMO CREEK 2009  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



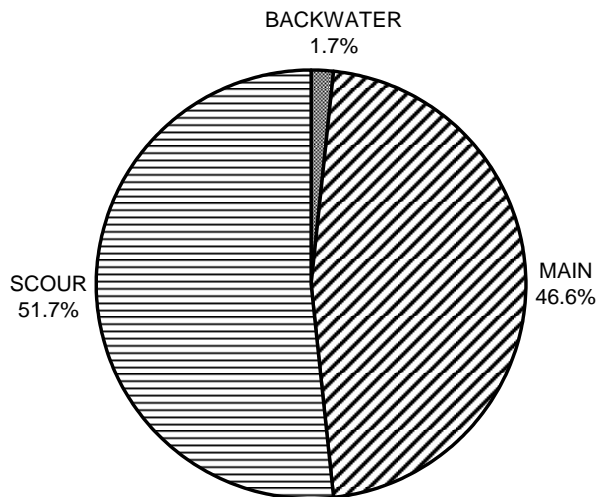
GRAPH 2

**SAN ANSELMO CREEK 2009  
HABITAT TYPES BY PERCENT OCCURRENCE**



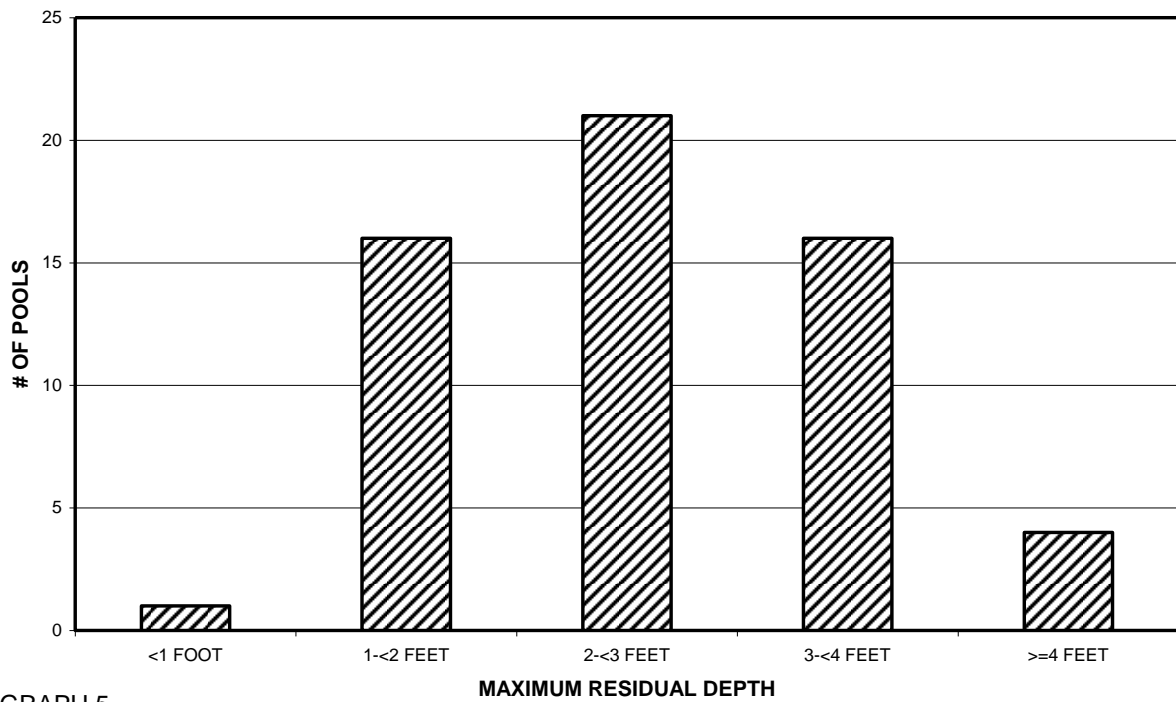
GRAPH 3

**SAN ANSELMO CREEK 2009  
POOL TYPES BY PERCENT OCCURRENCE**



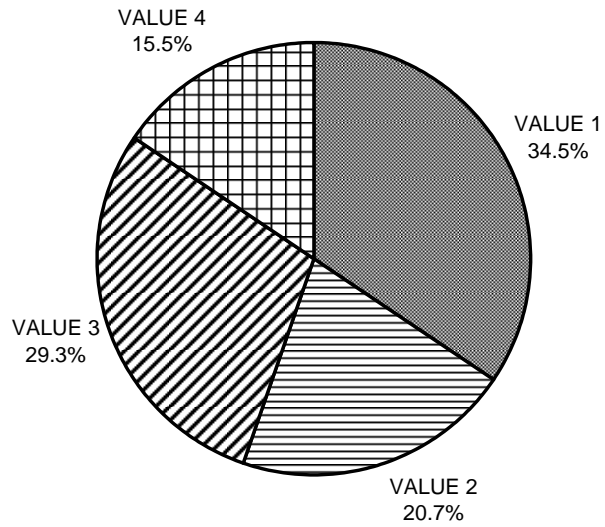
GRAPH 4

**SAN ANSELMO CREEK 2009  
MAXIMUM DEPTH IN POOLS**



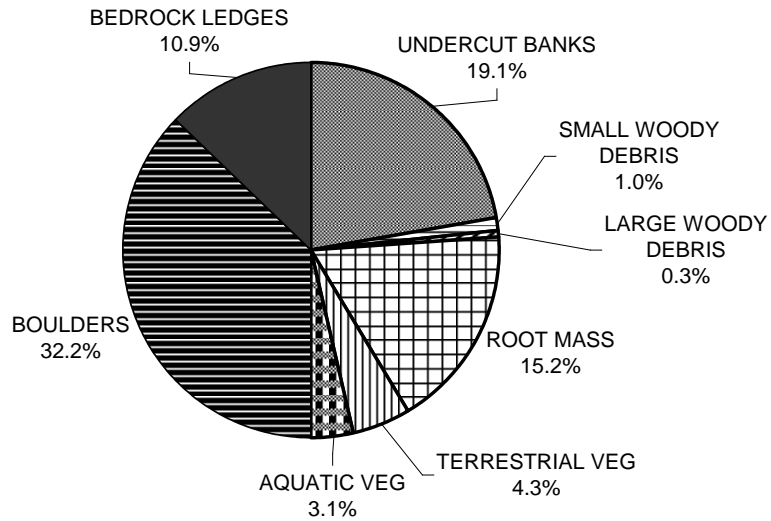
GRAPH 5

**SAN ANSELMO CREEK 2009  
PERCENT EMBEDDEDNESS**



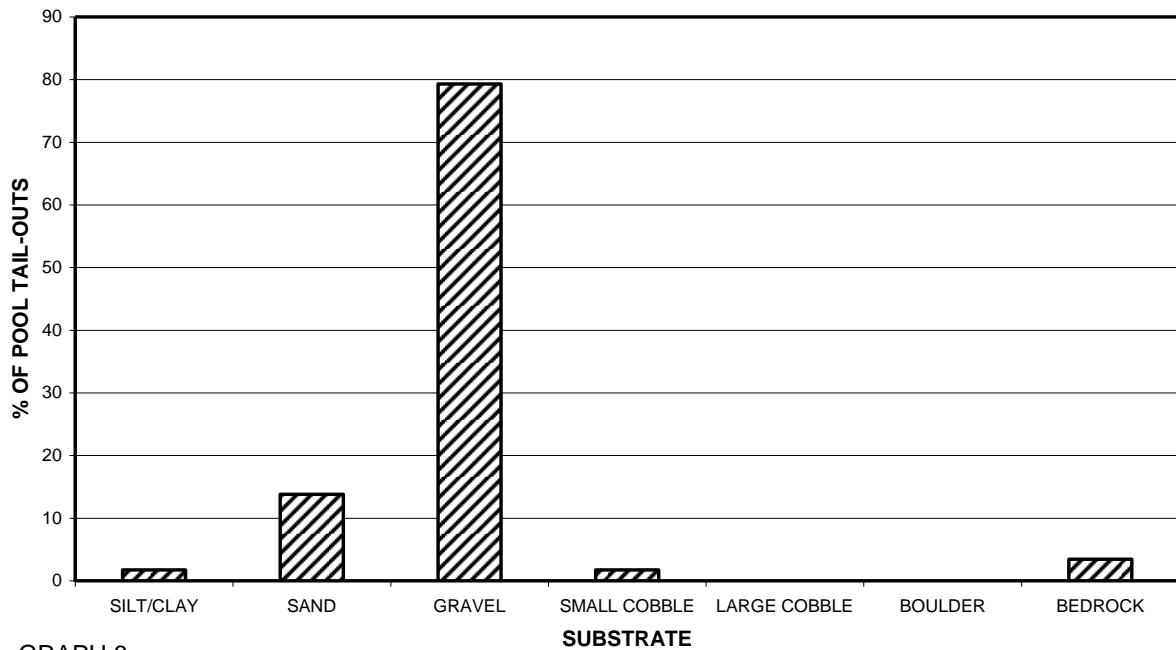
GRAPH 6

**SAN ANSELMO CREEK 2009  
MEAN PERCENT COVER TYPES IN POOLS**



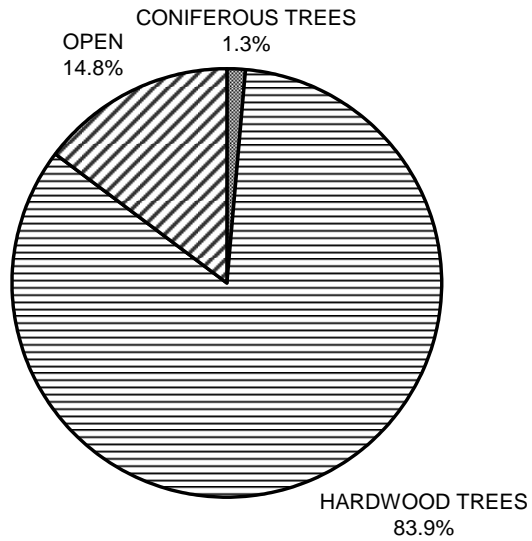
GRAPH 7

**SAN ANSELMO CREEK 2009  
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



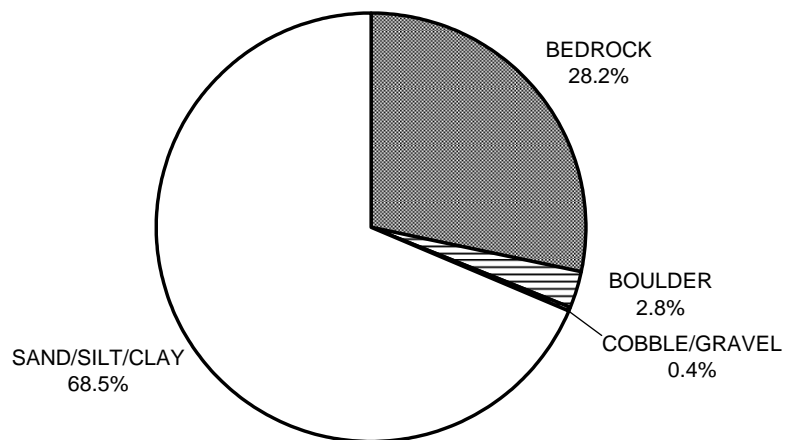
GRAPH 8

**SAN ANSELMO CREEK 2009  
MEAN PERCENT CANOPY**



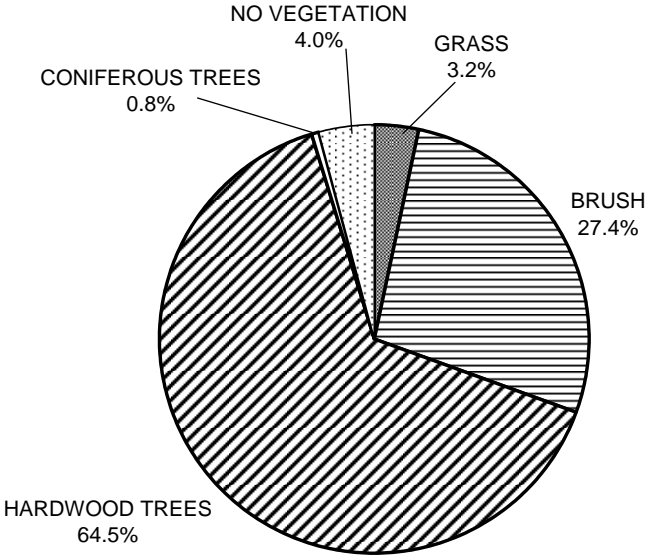
GRAPH 9

**SAN ANSELMO CREEK 2009  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**SAN ANSELMO CREEK 2009  
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11