



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

**Arroyo Corte Madera  
del Presidio**

*Surveyed 2009*

## STREAM INVENTORY REPORT

### Arroyo Corte Madera del Presidio

*Survey Conducted Summer 2009*

*Report Completed November 2, 2010*

### INTRODUCTION

A stream inventory was conducted during 9/14/2009 to 9/28/2009 on Arroyo Corte Madera del Presidio. The survey began at the confluence with Richardson Bay and extended upstream 3.7 miles. Stream inventories and reports were also completed for two tributaries to Arroyo Corte Madera del Presidio (Ross Creek and Warner Canyon Creek).

The Arroyo Corte Madera del Presidio 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 Corte Madera del Presidio. 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

Arroyo Corte Madera del Presidio is a tributary to Richardson Bay, which flows into San Francisco Bay, located in Marin County, California (Map 1). Arroyo Corte Madera del Presidio's legal description at the confluence with Richardson Bay is T01N R06W S28. Its location is 37°53'29.2" north latitude and 122°31'25.2" west longitude, LLID number 1225225378915. Arroyo Corte Madera del Presidio is a third order stream and has approximately 11.7 miles of blue line stream within its catchment boundary according to the USGS National Hydrography Dataset (NHD). Arroyo Corte Madera del Presidio drains a watershed of approximately 6.12 square miles. Elevations range from about 3 feet at the mouth of the creek to 2,536 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily privately owned and land use is considered 64.2% natural and 35.8% urban. Vehicle access exists via West Blithedale Drive in Mill Valley.

### METHODS

The habitat inventory conducted in Arroyo Corte Madera del Presidio 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 Game (DFG). This inventory was conducted by a two-person team.

## SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are 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 Arroyo Corte Madera del Presidio 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". Arroyo Corte Madera del Presidio habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics

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

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Arroyo Corte Madera del Presidio, 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 Corte Madera del Presidio, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Arroyo Corte Madera del Presidio, 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 Arroyo Corte Madera del Presidio, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit

were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

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 Arroyo Corte Madera del Presidio. 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 Game. 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
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Arroyo Corte Madera del Presidio 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 9/14/2009 to 9/28/2009 was conducted by A. Villalobos, T. Macias, and C. Bell (WSP). The total length of the stream surveyed was 19,706 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.52 cfs on 9/14/2009.

Arroyo Corte Madera del Presidio is an F4 channel type for the first 11,835 feet of the stream surveyed (Reach 1), and a G4 channel type for next 7,871 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. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and gravel dominant substrates.

Water temperatures taken during the survey period ranged from 59 to 66 degrees Fahrenheit. Air temperatures ranged from 57 to 74 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 34% flatwater units, 15% pool units, 29% riffle units, 17% culvert units, and 5% dry units (Graph 1). Based on total length of Level II habitat types there were 42% flatwater units, 10% pool units, 31% riffle units, 7% culvert units, and 10% dry units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by

percent occurrence were 12% Glide units, 25% Low Gradient Riffle units, 17% Culvert units, and 12% Run units (Graph 3). Based on percent total length the stream was comprised of 21% Step Run units, 28% Low Gradient Riffle units, and 12% Run units.

A total of 46 pools were identified (Table 3). Scour pools were the most frequently encountered, at 78%, and comprised 74% 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. Thirty of the 46 pools (65%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 46 pool tail-outs measured, 3 had a value of 1 (6.5%); 16 had a value of 2 (34.8%); 10 had a value of 3 (21.7%); 15 had a value of 4 (32.6%); 2 had a value of 5 (4.3%); (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 17 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 31, Scour pools had a mean shelter rating of 14 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Bedrock Ledges are the dominant cover types in Arroyo Corte Madera del Presidio. Graph 7 describes the pool cover in Arroyo Corte Madera del Presidio. Bedrock Ledges are the dominant pool cover type followed by boulders.

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 13% of pool tail-outs, and gravel dominance was observed in 72% of pool tail-outs.

The mean percent canopy density for the surveyed length of Arroyo Corte Madera del Presidio was 80%. The mean percentages of hardwood and coniferous trees were 64% and 36%, respectively. Twenty percent of the canopy was open. Graph 9 describes the mean percent canopy in Arroyo Corte Madera del Presidio.

For the stream reach surveyed, the mean percent right bank vegetated was 57%. The mean percent left bank vegetated was 50%. The dominant elements composing the structure of the stream banks consisted of 39% bedrock, 8% boulder, 8% cobble/gravel, and 44% sand/silt/clay (Graph 10). Hardwood trees were the dominant vegetation type observed in 47% of the units surveyed. Additionally, 37% of the units surveyed had brush as the dominant vegetation type, and 8% had coniferous trees as the dominant vegetation (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

## *Arroyo Corte Madera del Presidio 2009*

Two sites were electrofished for species composition and distribution in Arroyo Corte Madera del Presidio on September 29, 2009. Water temperatures taken during the electrofishing period ranged from 57 to 59 degrees Fahrenheit. Air temperatures ranged from 62 to 66 degrees Fahrenheit. The sites were sampled by C. Bell and T. Macias (WSP), and D Resnik (DFG).

The first site in reach 1 started near Sycamore Park and extended about 250 feet upstream. This site yielded no salmonids. One three-spine stickleback was captured.

The second site in reach 1 began at the Marguerite Avenue crossing and extended upstream about 400 feet. This site yielded nine young-of-the-year Steelhead/Rainbow Trout (SH/RT), one age 1+ SH/RT, and two age 2+ SH/RT. Two Pacific Giant Salamanders were also captured at this site.

The following chart displays the information yielded from these sites:

2009 Arroyo Corte Madera del Presidio Creek e-fish observations

Date	Site #	Reference Point	Distance From Reference Point (ft.)	Steelhead/Rainbow Trout			Non Salmonids
				0+	1+	2+	
9/29/2009	740	Sycamore Park	250	0	0	0	1 three-spine stickleback

2009 Arroyo Corte Madera del Presidio Creek e-fish observations

Date	Site #	Reference Point	Distance From Reference Point (ft.)	Steelhead/Rainbow Trout			Non Salmonids
				0+	1+	2+	
9/29/2009	739	Marguerite Ave	400	9	1	2	2 Pacific Giant Salamander

## DISCUSSION

Arroyo Corte Madera del Presidio is an F4 channel type for the first 11,835 feet of stream surveyed and a G4 channel type for the next 7,871 feet. The suitability of F4 channel types for fish 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 G4 channel types for fish habitat improvement structures is as follows: Good for bank-place boulders; fair for plunge weirs, opposing-wing deflectors,

and log cover; and poor for boulder clusters and single wing-deflectors.

The water temperatures recorded on the survey days 9/14/2009 to 9/28/2009, ranged from 59 to 66 degrees Fahrenheit. Air temperatures ranged from 57 to 74 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 42% of the total length of this survey, riffles 31%, and pools 10%. The pools are relatively deep, with 30 of the 46 (65%) 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.

Nineteen of the 46 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-five of the pool tail-outs had embeddedness ratings of 3 or 4. Two 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 Arroyo Corte Madera del Presidio should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-seven of the 46 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 17. 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 Bedrock Ledges in Arroyo Corte Madera del Presidio. Bedrock Ledges are the dominant cover type in pools followed by boulders. 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 80%. Reach 1 had a canopy density of 74.2%, Reach 2 had a canopy density of 95%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 57% and 50%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

## **GENERAL RECOMMENDATIONS**

Arroyo Corte Madera del Presidio 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) There are numerous possible barriers for migrating salmonids. Access should be assessed at all road crossings and dams. Where needed, crossings should be replaced or modified to improve fish passage.
- 2) 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.
- 3) Arroyo Corte Madera del Presidio 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.
- 4) Increase the canopy on Arroyo Corte Madera del Presidio Creek 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.
- 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.
- 6) 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.

### **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: Start at foot of bridge. N37.89682 W122.53526
0	0001.00	Tributaries: Right bank tributary #1: Unnamed tributary enters Arroyo Corte Madera del Presidio. Discharge estimated less than 1 cfs; Contributes an estimated 10% of flow to stream. Water temps downstream:66F, upstream: 64F & tributary: 69F. Accessible to fish. Checked 100' up tributary. Slope estimated at 1%. No fish observed.
250	0003.00	Bio Sample: (E-Fish) E-fish site #1.
713	0010.00	Access Points / Location: Bridge #1: Public driveway. W=24' H=6.3' L=23'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
736	0011.00	General Comment: Utility crossing at top of unit. Gaging station on right bank.
786	0012.00	Bio Sample: (Bank Observation) Unidentified fish observed.
1,046	0015.00	Access Points / Location: Bridge #2: La Goma Street. W=26' H=6' L=46'. Composed of concrete. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
1,146	0017.00	General Comment: Bamboo on left bank.
1,146	0017.00	Tributaries: Left bank tributary #1: Warner Canyon Creek enters Arroyo Corte Madera del Presidio. Discharge estimated at less than 1 cfs. Contributes estimated 0.5% of flow to stream. Water temperature downstream: 60F, Upstream: 59F & tributary: 59F. Accessible to fish. Checked 100' up tributary. Slope estimated less than 1%. No fish observed.
1,457	0021.00	Access Points / Location: Bridge #3: Locust Ave. W=26' H=6' L=135'. Composed of concrete. Not retaining gravel, and not down cutting. Concrete bottom creates possible barrier to juvenile salmonids.
1,638	0023.00	Bio Sample: (Bank Observation) Fish observed.
1,791	0026.00	Access Points / Location: Bridge #4: Private footbridge. W=16' H=7' L=4'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
1,810	0028.00	Access Points / Location: Bridge #5: Private footbridge. W=32' H=7'L=7'. Composed of wood and steel. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
1,884	0031.00	Bio Sample: (Bank Observation) Unidentified fish observed.

Position (ft.)	Habitat Unit #	Comments
2,025	0032.00	Access Points / Location: Bridge #6: Private driveway. W=20' H=8' L=7'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
2,032	0033.00	Structures: Left bank and right bank retaining walls present.
2,032	0033.00	Bio Sample: (Bank Observation) Unknown species of fish observed.
2,161	0034.00	Access Points / Location: Bridge #7: Private footbridge. W=16' H=10' L=8'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
2,258	0038.00	Access Points / Location: Bridge #8: Private footbridge. W=26' H=8' L=6'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
2,707	0044.00	Bio Sample: (Bank Observation) Unknown species of fish observed.
3,065	0048.00	Bio Sample: (Bank Observation) California Roach observed.
3,236	0051.00	Access Points / Location: Bridge #9: Park Ave. W=26' H=10' L=39'. Composed of concrete. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
3,497	0056.00	Bio Sample: (Bank Observation) California Roach observed.
4,258	0064.00	Access Points / Location: Bridge #10: Miller Ave. W=19' H=12' L=48'. Composed of concrete. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
4,306	0065.00	General Comment: Bamboo on left bank.
4,343	0066.00	Access Points / Location: Bridge #11: Presidio Ave. Series of two bridges. W=15' H=12' L=105'. Water to sill height is 0.1'. Composed of concrete, has a concrete and natural bottom. Not retaining gravel, but down cutting is occurring. This is a possible barrier to salmonids.
4,448	0067.00	General Comment: Vertical retaining walls on left and right banks.
4,493	0068.00	Access Points / Location: Bridge #12: Private driveway at Mill Valley Lumber Company. W=23' H=10.3' L=137'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
4,777	0071.00	Access Points / Location: Bridge #13: Private building/driveway. W=24' H=14' L=42'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
5,505	0084.00	Access Points / Location: Bridge #14: Building over creek. W=19' H=11.5' L=55'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
5,614	0086.00	Access Points / Location: Bridge #15: Miller Ave. W=17' H=9'L=31'. Composed of wood and concrete. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.

Arroyo Corte Madera del Presidio 2009

Position (ft.)	Habitat Unit #	Comments
5,964	0094.00	Tributaries: Right bank tributary #2: Old Mill Creek enters Arroyo Corte Madera del Presidio. Contributes an estimated 50% of flow to stream. Water temps downstream: 63F, upstream: 61F & tributary: 60F. Accessible to fish. Checked 30' up tributary. Slope estimated at 2%. No fish observed. N37.90507 W122.54693.
5,964	0094.00	Access Points / Location: Culvert #1: Single concrete box runs under downtown buildings. H=7' W=7' L=136'. Plunge height is 0.3'. Max depth within 5' of outlet is 3'. Culvert slope estimated at 2% and is in good condition. Possible barrier to salmonids.
6,196	0097.00	Access Points / Location: Bridge #16: Private driveway/parking lot. W=11' H=7' L=60'. Composed of steel. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
6,369	0099.00	Access Points / Location: Bridge #17: Private footbridge. W=10' H=7' L=5'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
6,415	0101.00	Access Points / Location: Culvert #2: Single concrete box culvert runs under buildings. H=6' W=8' L=154'. Max depth within 5' of outlet is 0.3'. Culvert slope estimated at 2%. Condition is good. Not likely a barrier to salmonids.
6,922	0107.00	Access Points / Location: Bridge #18: Private footbridge. W=17' H=6' L=4'. Composed of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
7,122	0110.00	Access Points / Location: Bridge #19: Gardner Street. W=10' H=7' L=40'. Composed of concrete. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
7,673	0115.00	Fish Passage: Dam #1: L=3' H=5' W(o)=12' W(d)=25'. Not a flashboard dam. Gravel is not being retained, but downcutting is occurring. Height of downcut is 1'. Height from water to sill is 0.7'. Not likely a barrier to salmonids.
8,119	0121.00	Bio Sample: (Bank Observation) Possible salmonid observed.
8,154	0122.00	Fish Passage: Culvert #3: Single concrete box culvert under private driveway. H=7' W=12' L=25'. Plunge height is 3'. Max depth within 5' of outlet is 4.2'. Culvert slope estimated at 2%. Condition is good. Not likely a barrier to salmonids.
8,578	0127.00	Access Points / Location: Bridge #20. Eldridge Ave. L=20' H=11' W=18'. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
8,823	0132.00	Access Points / Location: Bridge #21. Private footbridge. W=11' H=7' L=3'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
9,034	0134.00	Access Points / Location: Bridge #22. Private footpath. W=8' H=7' L=6'.

Arroyo Corte Madera del Presidio 2009

Position (ft.)	Habitat Unit #	Comments
		Made of concrete. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
9,100	0136.00	Access Points / Location: Bridge #23. Private footpath. W=10' H=8' L=4'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
9,206	0140.00	Fish Passage: Dam #2. L=3' H=7' W(0)=22' W(d)=27'. This is a flashboard dam. Gravel is being retained. Possible barrier to salmonids.
9,476	0144.00	Access Points / Location: Bridge #24. Private footbridge. W=12' H=6' L=10'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
9,508	0146.00	Fish Passage: Dam #3. L=2' H=9' W(0)=7 W(d)=13'. This is a flashboard dam. Downcutting is occurring. Height of downcut is 1.7'. Height from sill to water level is 1.0'. Gravel is being retained. Possible barrier to salmonids. Water undercuts dam on LB.
9,589	0151.00	Fish Passage: Dam #4. L=3' H=8' W(0)=9' W(d)=12'. This is a flashboard dam. Gravel is being retained, but down cutting is not occurring. Possible barrier to juvenile salmonids.
9,919	0162.00	Access Points / Location: Bridge #25. Private footbridge. W=8' H=5' L=15'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
10,313	0172.00	Fish Passage: Dam #5. L=2' H=8' W(0)=20' W(d)=40'. Not a flashboard dam. Down cutting is occurring. Height of downcut is unknown. Gravel is being retained. Possible barrier to salmonids.
10,329	0174.00	Access Points / Location: Bridge #26. Private footpath. W=10' H=8' L=5'. Made of wood/steel. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
10,362	0176.00	Access Points / Location: Bridge #27. Private footbridge. W=24' H=5'L=16'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
10,603	0180.00	Access Points / Location: Bridge #28. Private footbridge. W=10' H=5'L=12'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
10,631	0182.00	Access Points / Location: Bridge #29. Private footbridge. W=10' H=5'L=13'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
10,774	0185.00	Access Points / Location: Bridge #30. Private footbridge. W=17' H=6' L=12'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
10,839	0188.00	Access Points / Location: Bridge #31. King Street. W=11' H=6'L=21'. Made of concrete. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.

Arroyo Corte Madera del Presidio 2009

Position (ft.)	Habitat Unit #	Comments
10,989	0192.00	Fish Passage: Dam #6. L=1' H=2.3' W(0)=4' W(d)=10'. Not a flashboard dam. Down cutting is not occurring, but gravel is being retained. Possible barrier to juvenile salmonids.
11,042	0195.00	Access Points / Location: Bridge #32. Private footbridge. W=24' H=6'L=8'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
11,240	0199.00	Access Points / Location: Bridge #33. Private footbridge. W=22' H=7' L=4'. Made of wood. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
11,359	0203.00	Fish Passage: Dam #7: L=11' H=4' W(o)=1' W(d)=14'. Not a flashboard dam. Down cutting is not occurring, and gravel is not being retained. Not likely a barrier to salmonids.
11,440	0206.00	Fish Passage: Dam #8: L=1' H=5' W(o)=3' W(d)=15'. This is a flashboard dam. Gravel is being retained, but down cutting is not occurring. Possible barrier to salmonids.
11,484	0209.00	Access Points / Location: Bridge #34: Private footbridge. W=11' H=7' L=6'. Composed of wood and steel. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
11,561	0212.00	Access Points / Location: Bridge #35: Corte Madera Ave. W=16' H=8' L=25'. Composed of concrete. Not retaining gravel, and not down cutting. Not likely a barrier to salmonids.
11,835	0215.00	General Comment: Channel type change F4 to G4. Reach 1 to Reach 2.
12,017	0217.00	Bio Sample: (Bank Observation) Five inch fish observed.
12,043	0218.00	Fish Passage: Culvert #4: Single concrete box culvert, Marguerite Ave. H=8' W=8' L=37'. Plunge height is 1.5'. Max depth within 5' of outlet is 5.5'. Culvert slope estimated at 2%. Condition is good. Not likely a barrier to salmonids.
12,080	0219.00	Tributaries: Right bank tributary #3: Unnamed tributary enters Arroyo Corte Madera del Presidio 135 ' into unit. Discharge estimated less than 1 cfs. Contributes estimated 1% of flow to stream. Water temps downstream: 61F, upstream: 60F, tributary: 60F. Not accessible to fish. Checked 30' up tributary. Slope estimated at 20%. No fish observed.
12,080	0219.00	Fish Passage: (Other) This unit includes a 12 foot long step weir.
12,216	0220.00	Access Points / Location: Dam #9: L=2' H=2' W(o) =3' W(d) =16'. Not a flashboard dam. Gravel is being retained, but there is no down cutting. Possible barrier to salmonids
12,291	0223.00	Fish Passage: Culvert #5: Single concrete box culvert, W. Blithedale Ave. H=6' W=9' L=29'. Plunge height is 0.3'. Max depth within 5' of outlet is 2.0'. Culvert slope is flat. Condition is good. Not likely a barrier to salmonids.

Position (ft.)	Habitat Unit #	Comments
12,482	0226.00	Bio Sample: (Bank Observation) 0+ salmonid observed.
12,527	0227.00	Access Points / Location: Bridge #36: W. Blithedale Ave. W=12' H=6' L=22'. Composed of concrete. Gravel is being retained, but there is no down cutting. Not likely a barrier to salmonids.
12,549	0228.00	Bio Sample: (Bank Observation) 0+ and 1+ salmonids observed.
12,584	0229.00	Bio Sample: (Bank Observation) 1+ salmonid observed.
12,966	0233.00	General Comment: Right bank failing under fire road at culvert #6.
12,966	0233.00	Fish Passage: Culvert #6: Single concrete box culvert, fire road in Blithedale Park. H=5' W=8' L=18'. Plunge height is 0'. Max depth within 5' of outlet is 1.0'. Culvert slope is flat. Condition: right bank wall crumbling, undercutting road. Not likely a barrier to salmonids.
13,177	0236.00	Bio Sample: (Bank Observation) 0+ salmonid observed.
13,538	0237.00	Bio Sample: (Bank Observation) Salmonids observed.
13,556	0238.00	Fish Passage: Culvert #7: Single concrete box culvert, W. Blithedale Ave. H=9' W=10' L=16'. Plunge height is 1.5'. Max depth within 5' of outlet is 1.8'. Culvert slope is flat. Condition is fair. Possible barrier to salmonids.
13,620	0242.00	Access Points / Location: Bridge #37: Blithedale Park footbridge. Water to sill height is 1.0'. W=8' H=8' L=16'. Composed of wood and concrete. Not retaining gravel, but down cutting is occurring. Possible barrier to salmonids.
13,690	0244.00	Bio Sample: (Bank Observation) Salmonid observed.
13,822	0246.00	Bio Sample: (Bank Observation) crawdad observed.
14,430	0253.00	Bio Sample: (Bank Observation) Salmonid observed.
14,704	0256.00	Tributaries: Right bank tributary #4: Unnamed tributary enters Arroyo Corte Madera del Presidio 182 feet into unit. Discharge estimated less than 1 cfs. Contributes estimated 40% of flow to stream. Water temps downstream: 61F, upstream: 63F & tributary: 61F. Not accessible to fish. Checked 100' up tributary. Slope estimated at 10%. No fish observed.
17,127	0290.00	Fish Passage: Culvert #8: double concrete box culverts, Open Space fire road. H=4' W=4' L=65'. Plunge height is 3'. Max depth within 5' of outlet is 1.8'. Culvert slope estimated at 5%. Condition is rusted, rust line 0.5'. Possible barrier to salmonids.
17,884	0300.00	Bio Sample: (Bank Observation) Salamander observed.
17,925	0301.00	Tributaries: Right bank tributary #5: Galena creek enters Arroyo Corte Madera del Presidio 309' into unit. Discharge estimated less than 1 cfs; contributes 100% of flow to stream. Water temps: downstream: dry, upstream: 60F & tributary: 60F. Not accessible to fish. Checked 200' up tributary. No fish observed.

Arroyo Corte Madera del Presidio 2009

Position (ft.)	Habitat Unit #	Comments
18,234	0302.00	Tributaries: Left bank tributary #2: dry, unnamed tributary enters Arroyo Corte Madera del Presidio 448' into unit. Accessible to fish. Checked 50' up tributary. No fish observed.
19,706	0303.00	End of Survey: Channel becomes too narrow and steep to continue. N37.93405 W122.56563

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.

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**

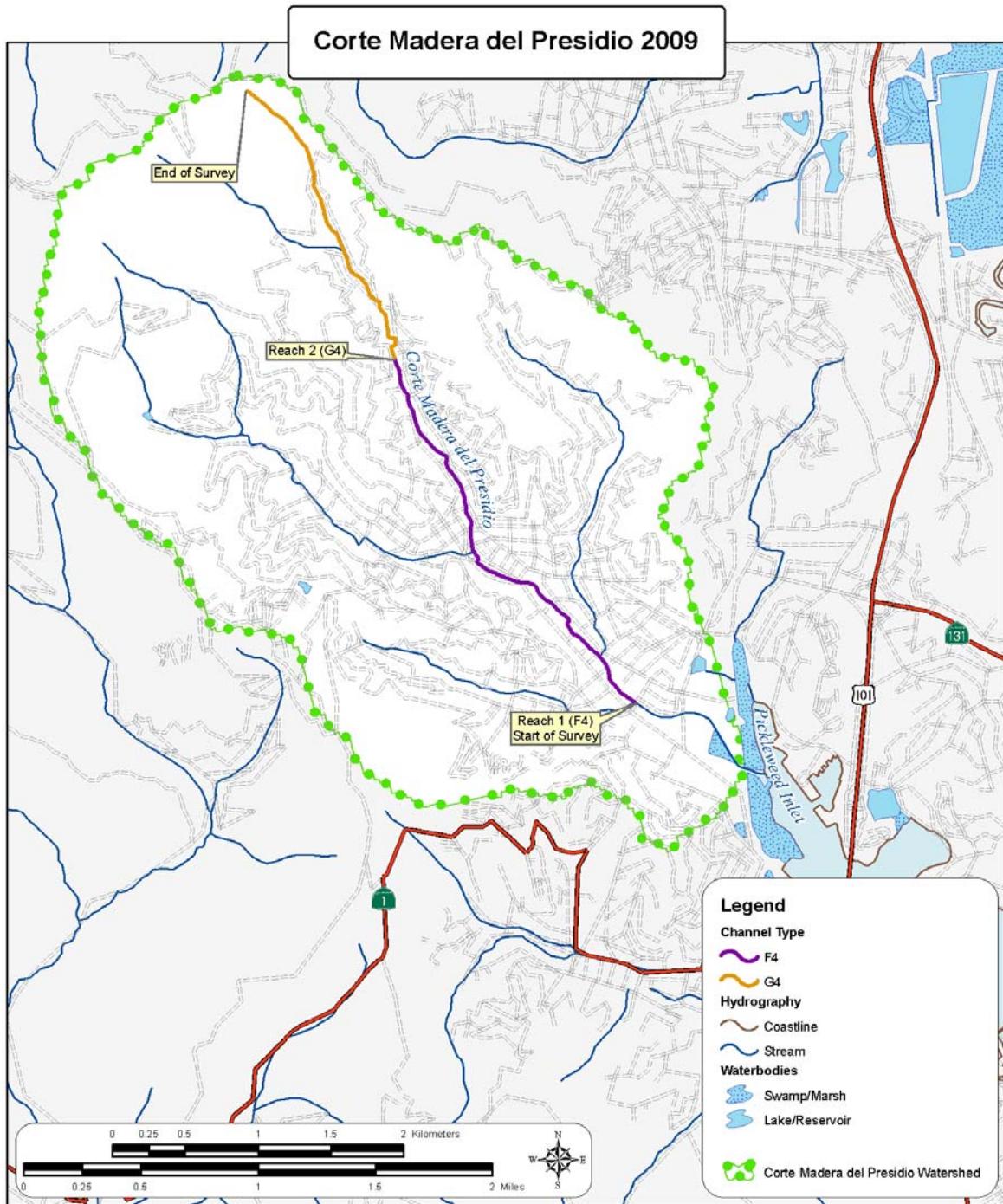
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

**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]



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

**Stream Name:** Arroyo Corte Madera del Presidio  
**Survey** 9/14/2009 to 9/28/2009

**LLID:** 1225225378915 **Drainage:** San Rafael

<b>Confluence Location: Quad:</b> SAN RAFAEL					<b>Legal Description:</b> T01NR06WS28			<b>Latitude:</b> 37:53:29.5N	<b>Longitude:</b> 122:31:21.3W						
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
53	0	CULVERT	17.5	27	1457	7.4									
14	0	DRY	4.6	144	2015	10.2									
103	103	FLATWATER	34.0	80	8195	41.6	7.5	0.5	1.2	547	56334	294	30312	6	
46	46	POOL	15.2	42	1912	9.7	12.4	1.4	2.6	510	23449	884	40645	806	17
87	87	RIFFLE	28.7	70	6127	31.1	7.0	0.2	0.4	479	41682	91	7919		0
Total Units	Total Units Fully Measured				Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)		
303	236				19706						121464		78876		

**Table 2 - Summary of Habitat Types and Measured Parameters****Stream Name:** Arroyo Corte Madera del Presidio**Survey** 9/14/2009 to 9/28/2009**LLID:** 1225225378915 **Drainage:** San Rafael

<b>Confluence Location: Quad: SAN RAFAEL</b>		<b>Legal Description:</b> T01NR06WS28		<b>Latitude:</b> 37:53:29.5N		<b>Longitude:</b> 122:31:21.3W									
Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Mean Width (%)	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 (%)
76	76	LGR	25.1	72	5465	27.7	7.0	0.2	511	38806	100	7611		0	85
1	1	CAS	0.3	12	12	0.1	2.0	0.1	22	22	2	2		0	82
10	10	BRS	3.3	65	650	3.3	5.0	0.1	285	2854	31	306		0	85
35	35	GLD	11.6	50	1761	8.9	10.0	0.6	514	17996	325	11387		2	65
37	37	RUN	12.2	64	2377	12.1	7.0	0.5	442	16336	260	9603		1	61
31	31	SRN	10.2	131	4057	20.6	6.0	0.4	710	22002	301	9322		20	92
7	7	MCP	2.3	38	263	1.3	14.0	1.7	662	4635	1476	10333	1381	14	80
1	1	CCP	0.3	72	72	0.4	16.0	1.3	1152	1152	1728	1728	1498	0	98
2	2	STP	0.7	77	154	0.8	5.0	0.9	299	598	293	585	287	105	97
4	4	CRP	1.3	47	188	1.0	10.0	1.3	500	1999	737	2949	661	9	87
2	2	LSL	0.7	100	201	1.0	10.0	1.3	1166	2331	1197	2394	1080	35	98
5	5	LSR	1.7	39	195	1.0	10.0	1.2	424	2120	716	3578	651	26	94
8	8	LSBk	2.6	47	379	1.9	10.0	1.4	497	3978	904	7231	812	9	82
3	3	LSBo	1.0	30	91	0.5	10.0	1.6	270	809	473	1418	435	20	91
14	14	PLP	4.6	26	369	1.9	16.0	1.5	416	5827	745	10429	678	9	82
14	0	DRY	4.6	144	2015	10.2									91
53	0	CUL	17.5	27	1457	7.4									83
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume			
303	236				19706					121464		78876			

**Table 3 - Summary of Pool Habitat Types****Stream Name:** Arroyo Corte Madera del Presidio**LLID:** 1225225378915**Drainage:** San Rafael**Survey**

9/14/2009 to 9/28/2009

**Confluence Location:** Quad: SAN RAFAEL**Legal Description:** T01NR06WS28**Latitude:** 37:53:29.5N**Longitude:** 122:31:21.3W

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
10	10	MAIN	22	49	489	26	12.6	1.5	638	6385	1173	11734	31
36	36	SCOUR	78	40	1423	74	12.4	1.4	474	17064	704	25350	14
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
46	46				1912					23449		37085	

**Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types****Stream Name:** Arroyo Corte Madera del Presidio**LLID:** 1225225378915**Drainage:** San Rafael**Survey** 9/14/2009 to 9/28/2009**Confluence Location: Quad:** SAN RAFAEL**Legal Description:** T01NR06WS28**Latitude:** 37:53:29.5N**Longitude:** 122:31:21.3W

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
7	MCP	15	0	0	2	29	3	43	1	14	1	14
1	CCP	2	0	0	0	0	1	100	0	0	0	0
2	STP	4	0	0	2	100	0	0	0	0	0	0
4	CRP	9	0	0	1	25	2	50	1	25	0	0
2	LSL	4	0	0	1	50	1	50	0	0	0	0
5	LSR	11	0	0	2	40	2	40	1	20	0	0
8	LSBk	17	0	0	2	25	3	38	1	13	2	25
3	LSBo	7	0	0	1	33	2	67	0	0	0	0
14	PLP	30	0	0	5	36	3	21	4	29	2	14
Total Units			Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1 < 2 Feet Max Resid. Depth	Total 1 < 2 Feet % Occurrence	Total 2 < 3 Feet Max Resid. Depth	Total 2 < 3 Feet % Occurrence	Total 3 < 4 Feet Max Resid. Depth	Total 3 < 4 Feet % Occurrence	Total >= 4 Feet Max Resid. Depth	Total >= 4 Feet % Occurrence
46			0	0	16	35	17	37	8	17	5	11

Mean Maximum Residual Pool Depth (ft.): 3

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

Stream Name: Arroyo Corte Madera del Presidio				Dry Units: 14			LLID: 1225225378915		Drainage: San Rafael			
Survey		9/14/2009 to 9/28/2009										
Confluence Location: Quad: SAN RAFAEL				Legal Description: T01NR06WS28				Latitude: 37:53:29.5N		Longitude: 122:31:21.3W		
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	Mean % Ledges
76	13	LGR	0	0	0	0	0	8	0	0	0	0
1	1	CAS	0	0	0	0	0	0	0	0	0	0
10	2	BRS	0	0	0	0	0	0	0	0	0	0
87	16	TOTAL RIFFLE	0	0	0	0	0	6	0	0	0	0
35	10	GLD	0	0	0	0	4	16	0	10	0	0
37	9	RUN	0	0	0	0	0	11	0	0	0	0
31	6	SRN	0	0	0	0	0	0	0	0	17	0
103	25	TOTAL FLAT	0	0	0	0	2	10	0	8	0	0
7	7	MCP	29	0	0	0	6	23	0	0	0	29
1	1	CCP	0	0	0	0	0	0	0	0	0	0
2	2	STP	10	0	0	0	0	30	0	10	0	0
4	4	CRP	20	0	0	0	5	0	13	13	13	25
2	2	LSL	15	25	0	25	30	0	0	5	0	0
5	5	LSR	22	18	0	32	24	0	0	4	0	0
8	8	LSBk	9	0	0	10	16	0	0	16	49	
3	3	LSBo	17	0	0	0	33	0	0	37	13	
14	14	PLP	6	0	0	0	0	0	0	37	28	
46	46	TOTAL POOL	14	3	0	6	10	5	1	19	24	
53	0	CUL										
303	87	TOTAL	8	2	0	3	6	7	1	12	13	

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

**Stream Name:** Arroyo Corte Madera del Presidio  
**Survey** 9/14/2009 to 9/28/2009

**Dry Units:** 14**LLID:** 1225225378915**Drainage:** San Rafael

<b>Confluence Location: Quad: SAN RAFAEL</b>				<b>Legal Description:</b> T01NR06WS28		<b>Latitude:</b> 37:53:29.5N	<b>Longitude:</b> 122:31:21.3W		
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
76	13	LGR	0	8	77	8	8	0	0
1	1	CAS	0	0	0	0	0	0	100
10	2	BRS	0	0	0	0	0	0	100
35	10	GLD	10	10	80	0	0	0	0
37	12	RUN	0	8	58	0	17	0	17
31	8	SRN	0	13	50	0	0	0	38
7	7	MCP	14	14	57	0	0	0	14
1	1	CCP	0	100	0	0	0	0	0
2	2	STP	0	0	50	0	0	0	50
4	4	CRP	0	25	25	25	25	0	0
2	2	LSL	0	0	100	0	0	0	0
5	5	LSR	0	0	80	20	0	0	0
8	8	LSBk	0	13	88	0	0	0	0
3	3	LSBo	33	0	67	0	0	0	0
14	14	PLP	14	7	71	0	0	0	7
53	0	CUL	0	0	0	0	0	0	0

**Table 7 - Summary of Mean Percent Canopy for Entire Stream****Stream Name:** Arroyo Corte Madera del Presidio**LLID:** 1225225378915**Drainage:** San Rafael**Survey**  
9/14/2009 to 9/28/2009**Confluence Location:** Quad: SAN RAFAEL      **Legal Description:** T01NR06WS28      **Latitude:** 37:53:29.5N      **Longitude:** 122:31:21.3W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
80	36	64	2	57	50

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.

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

Stream Arroyo Corte Madera del Presidio LLID: 1225225378915 Drainage San Rafael  
 Survey Dates: 9/14/2009 to 9/28/2009 Survey Length (ft.): 19706 Main Channel (ft.): 19706 Side Channel (ft.): 0  
 Confluence Location: Quad SAN RAFAEL Legal Description: T01NR06WS28 Latitude: 37:53:29.5N Longitude: 122:31:21.3W

**Summary of Fish Habitat Elements By Stream Reach**

**STREAM REACH: 1**

Channel Type: F4	Canopy Density (%): 74.2	Pools by Stream Length	11.9
Reach Length (ft.): 11835	Coniferous Component (%): 28.3	Pool Frequency (%):	14.0
Riffle/Flatwater Mean Width (ft.): 8.2	Hardwood Component 71.7	Residual Pool Depth (%):	
BFW:	Dominant Bank Brush	< 2 Feet Deep:	16.7
Range (ft.): 10.00 to 69.00	Vegetative Cover (%): 59.6	2 to 2.9 Feet Deep:	43.3
Mean (ft.): 14.79	Dominant Aquatic Vegetation	3 to 3.9 Feet Deep:	26.7
Std. Dev.: 5.54	Dominant Bank Substrate Bedrock	>= 4 Feet Deep:	13.3
Base Flow (cfs): 0.52	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth	2.85
Water (F): 59 - 66 Air (F): 57 - 74	LWD per 100 ft.:	Mean Pool Shelter	12
Dry Channel (ft.): 60	Riffles: 0		
	Pools: 0		
	Flat: 0		
Pool Tail Substrate (%): Silt/Clay: 3.3 Sand: 10.0 Gravel: 76.7 Sm Cobble: 6.7 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 3.3			
Embeddedness Values (%): 1. 0.0 2. 36.7 3. 23.3 4. 33.3 5. 6.7			

**STREAM REACH: 2**

Channel Type: G4	Canopy Density (%): 95.0	Pools by Stream Length	6.4
Reach Length (ft.): 7871	Coniferous Component (%): 54.5	Pool Frequency (%):	18.0
Riffle/Flatwater Mean Width (ft.): 4.9	Hardwood Component 45.5	Residual Pool Depth (%):	
BFW:	Dominant Bank Hardwood Trees	< 2 Feet Deep:	68.8
Range (ft.): 7.00 to 21.00	Vegetative Cover (%): 38.2	2 to 2.9 Feet Deep:	25.0
Mean (ft.): 11.70	Dominant Boulders	3 to 3.9 Feet Deep:	0.0
Std. Dev.: 4.09	Dominant Bank Substrate Sand/Silt/Clay	>= 4 Feet Deep:	6.3
Base Flow (cfs): 0.52	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth	2
Water (F): 59 - 63 Air (F): 63 - 73	LWD per 100 ft.:	Mean Pool Shelter	28
Dry Channel (ft.): 1955	Riffles: 1		
	Pools: 1		
	Flat: 1		
Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 18.8 Gravel: 62.5 Sm Cobble: 12.5 Lg Cobble: 6.3 Boulder 0.0 Bedrock: 0.0			
Embeddedness Values (%): 1. 18.8 2. 31.3 3. 18.8 4. 31.3 5. 0.0			

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

**Stream Name:** Arroyo Corte Madera del Presidio      **LLID:** 1225225378915      **Drainage:** San Rafael  
**Survey**      9/14/2009 to 9/28/2009  
**Confluence Location: Quad:** SAN RAFAEL      **Legal Description:** T01NR06WS28      **Latitude:** 37:53:29.5N      **Longitude:** 122:31:21.3W

**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	27	35	39.2
Boulder	6	7	8.2
Cobble/Gravel	7	6	8.2
Sand/Silt/Clay	39	31	44.3

**Mean Percentage of Dominant Stream Bank Vegetation**

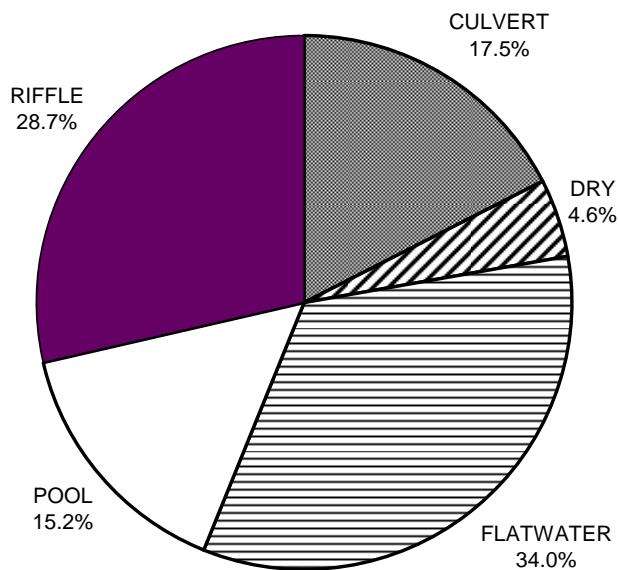
Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percentage
Grass	1	1	1.3
Brush	26	32	36.7
Hardwood	38	36	46.8
Coniferous	8	5	8.2
No Vegetation	6	5	7.0

**Total Stream Cobble Embeddedness Values:** 3

**Table 10 - Mean Percent of Shelter Cover Types For Entire Stream****Stream Name:** Arroyo Corte Madera del Presidio**LLID:** 1225225378915**Drainage:** San Rafael**Survey**  
9/14/2009 to 9/28/2009**Confluence Location: Quad:** SAN RAFAEL**Legal Description:** T01NR06WS28**Latitude:** 37:53:29.5N**Longitude:** 122:31:21.3W

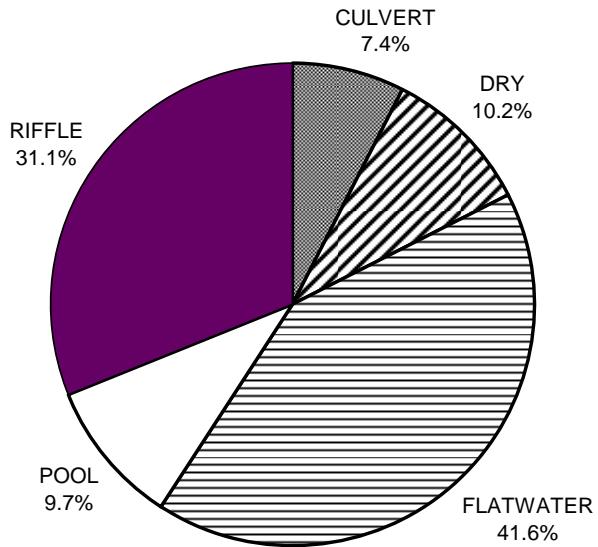
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	0	14
SMALL WOODY DEBRIS (%)	0	0	3
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	0	6
TERRESTRIAL VEGETATION	0	2	10
AQUATIC VEGETATION (%)	6	10	5
WHITEWATER (%)	0	0	1
BOULDERS (%)	0	8	19
BEDROCK LEDGES (%)	0	0	24

**ARROYO CORTE MADERA DEL PRESIDIO 2009**  
**HABITAT TYPES BY PERCENT OCCURRENCE**



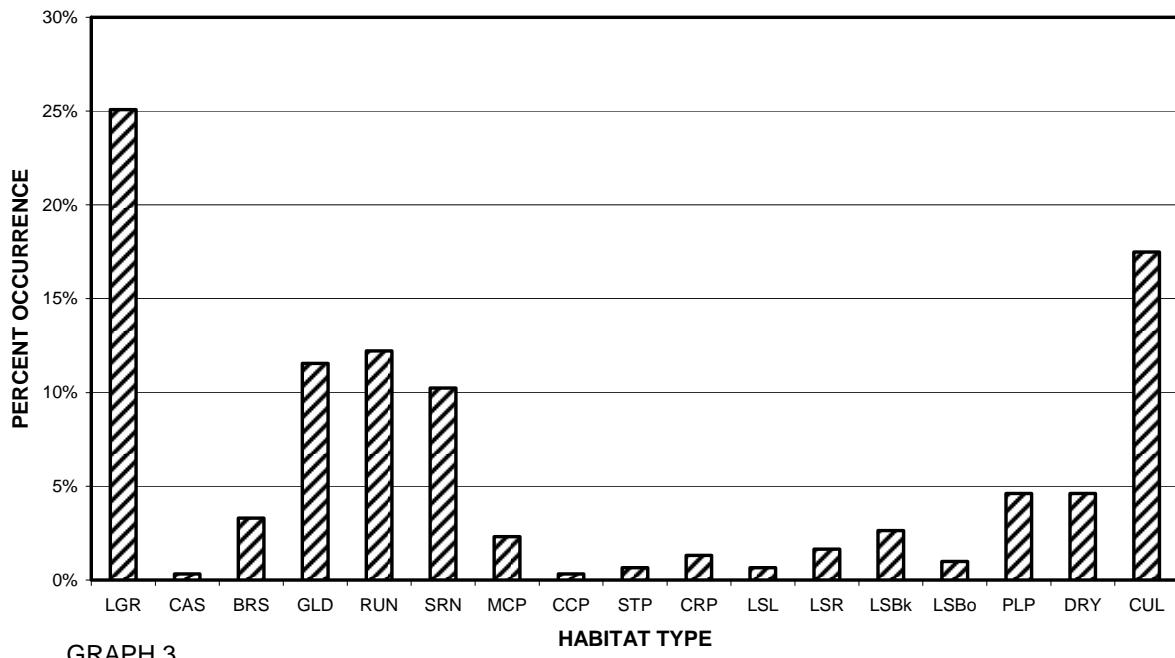
GRAPH 1

**ARROYO CORTE MADERA DEL PRESIDIO 2009**  
**HABITAT TYPES BY PERCENT TOTAL LENGTH**



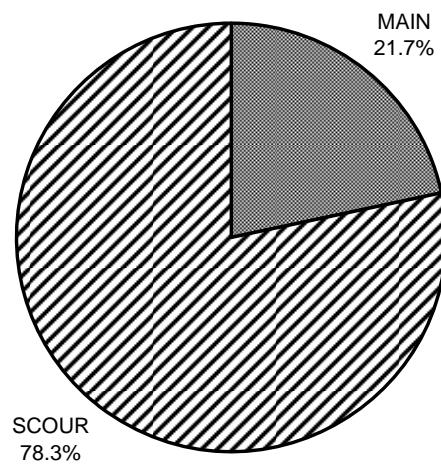
GRAPH 2

**ARROYO CORTE MADERA DEL PRESIDIO 2009  
HABITAT TYPES BY PERCENT OCCURRENCE**



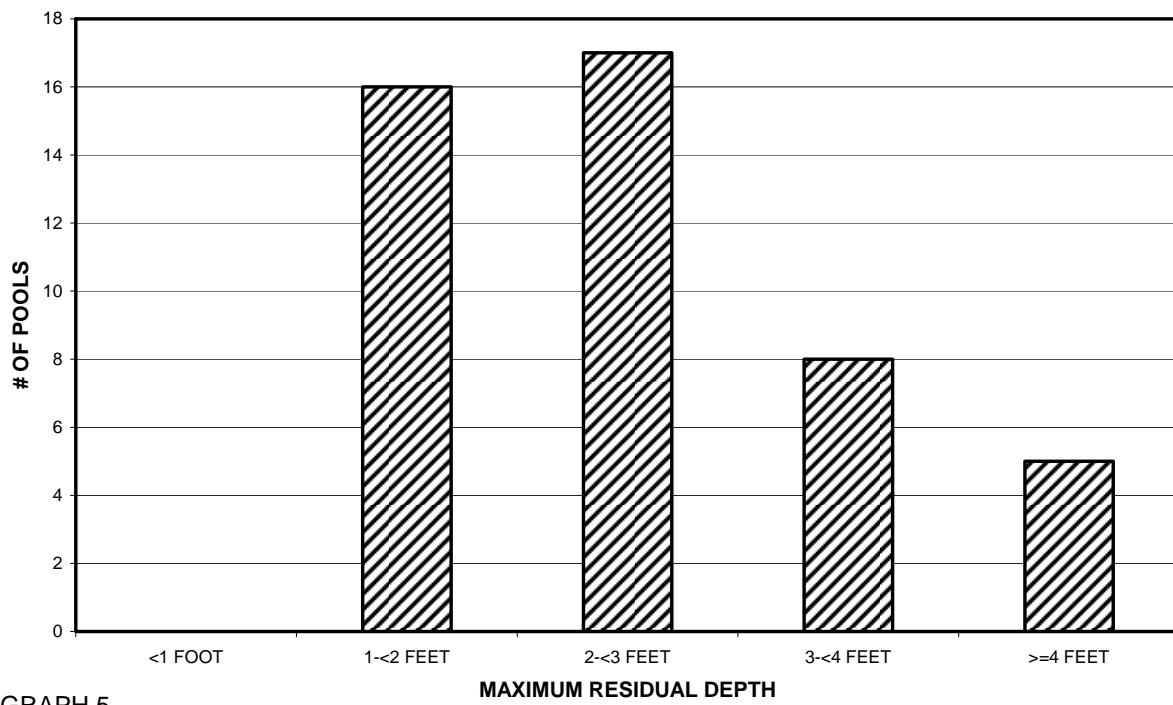
GRAPH 3

**ARROYO CORTE MADERA DEL PRESIDIO 2009  
POOL TYPES BY PERCENT OCCURRENCE**



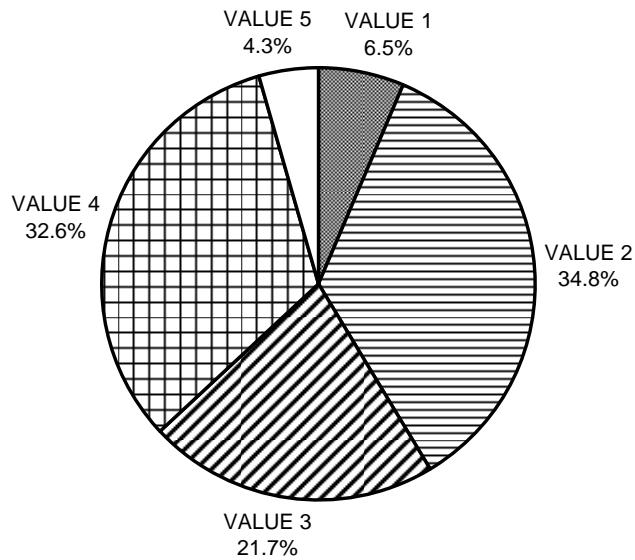
GRAPH 4

**ARROYO CORTE MADERA DEL PRESIDIO 2009  
MAXIMUM DEPTH IN POOLS**



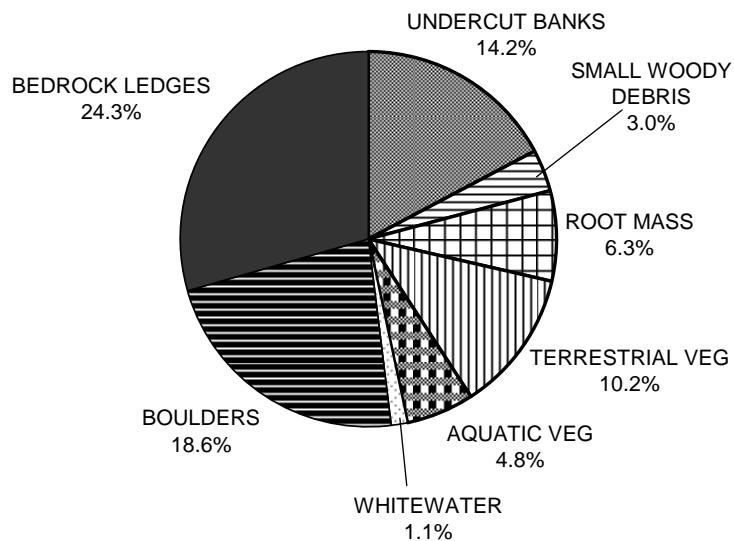
GRAPH 5

**ARROYO CORTE MADERA DEL PRESIDIO 2009  
PERCENT EMBEDDEDNESS**



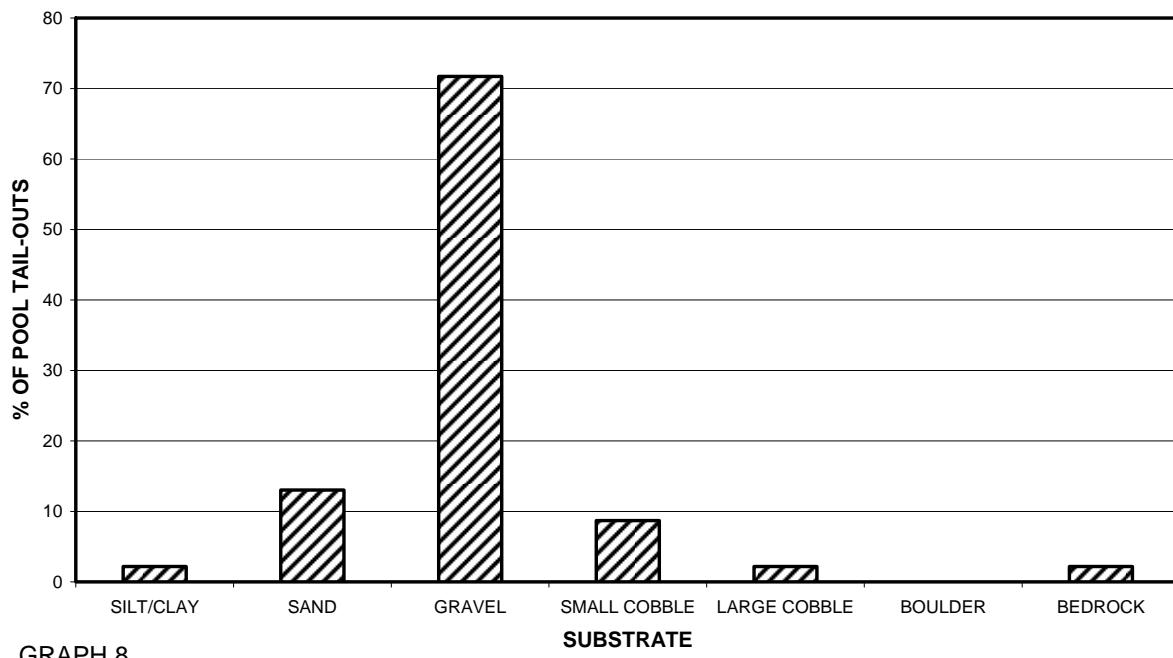
GRAPH 6

**ARROYO CORTE MADERA DEL PRESIDIO 2009  
MEAN PERCENT COVER TYPES IN POOLS**



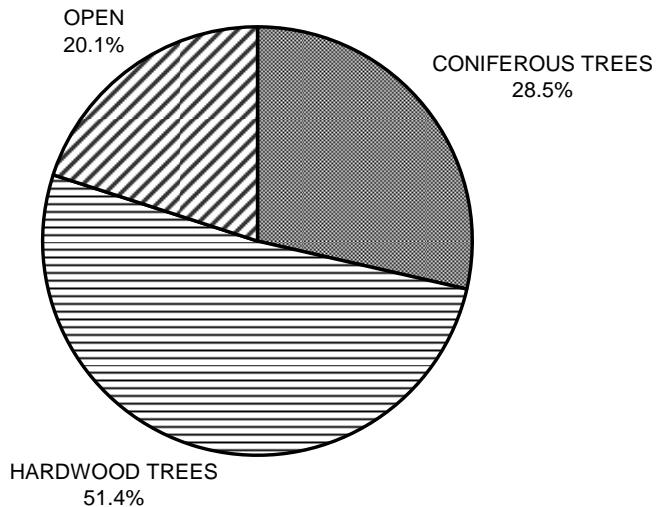
GRAPH 7

**ARROYO CORTE MADERA DEL PRESIDIO 2009  
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



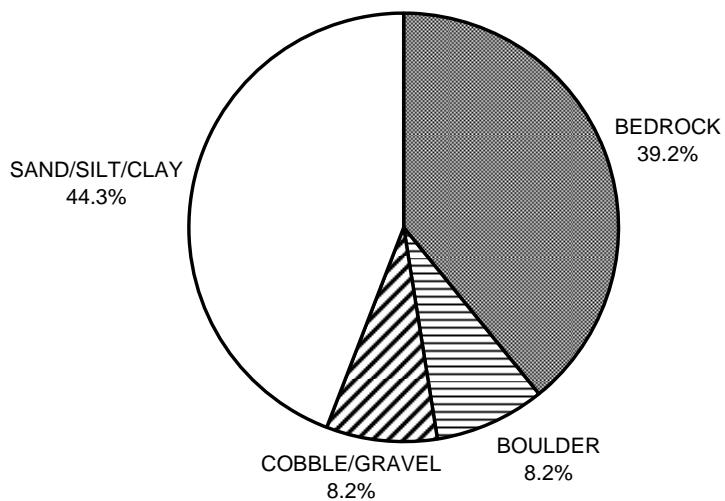
GRAPH 8

**ARROYO CORTE MADERA DEL PRESIDIO 2009  
MEAN PERCENT CANOPY**



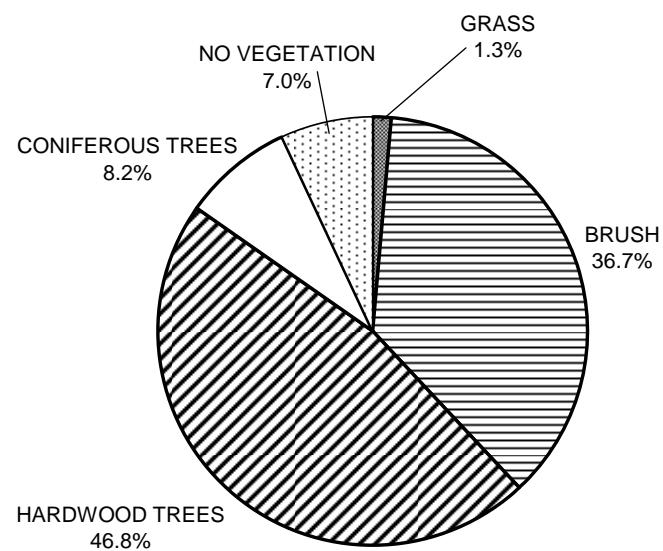
GRAPH 9

**ARROYO CORTE MADERA DEL PRESIDIO 2009  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**ARROYO CORTE MADERA DEL PRESIDIO 2009**  
**DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11