



**California Department of Fish and Wildlife
Marin County
San Pablo Bay Watershed
Stream Habitat Assessment Reports**

San Pablo Creek

Surveyed 2010

Report Completed in 2013



STREAM INVENTORY REPORT

San Pablo Creek

San Pablo Creek

INTRODUCTION

A stream inventory was conducted during 7/26/2010 to 8/12/2010 on San Pablo Creek. The survey began about 1.4 miles upstream of the confluence with San Pablo Bay (connects with Pacific Ocean) and extended upstream 8.3 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in San Pablo Creek.

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 Pablo Creek is a tributary to San Pablo Bay, tributary to Pacific Ocean, located in Contra Costa County, California (Map 1). San Pablo Creek's legal description at the confluence with Pacific Ocean is T02N R05W S35. Its location is 37°58'35.0" north latitude and 122°22'56.0" west longitude, LLID number 1223821379763. San Pablo Creek is a fourth order stream and has approximately 87.41 miles of blue line stream according to the USGS National Hydrology Dataset (NHD) quad San Quentin. San Pablo Creek drains a watershed of approximately 42.28 square miles. Elevations range from sea level at the mouth of the creek to 1,900 feet in the headwater areas. Grasslands/herbaceous lands, evergreen forest and low intensity residential dominate the watershed. The watershed is primarily privately owned. Vehicle access exists via Richmond Parkway to Parr Boulevard.

METHODS

The habitat inventory conducted in San Pablo Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and 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.

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

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

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In San Pablo Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26

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- 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 Pablo 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 Pablo 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 Pablo Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

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

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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 Pablo Creek.

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
- Mean Percent Shelter Cover Types for Entire Stream

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

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence

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- 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 7/26/2010 to 8/12/2010 was conducted by Andrew Griffin and Chris Bell (WSP). The total length of the stream surveyed was 43,991 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.94 cfs on July 26, 2010.

San Pablo Creek is a NA channel type for 350 feet of the stream surveyed (Reach 1), a F6 channel type for 16,824 feet of the stream surveyed (Reach 2), a NA channel type for 1,950 feet of the stream surveyed (Reach 3), and a F6 channel type for 24,867 feet of the stream surveyed (Reach 4).

F6 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and silt/clay dominant substrates.

Water temperatures taken during the survey period ranged from 57 to 62 degrees Fahrenheit. Air temperatures ranged from 56 to 67 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were <1% no survey units, 21% riffle units, 54% flatwater units, 4% culvert units, and 20% pool units (Graph 1). Based on total length of Level II habitat types there were 5% no survey units, 12% riffle units, 62% flatwater units, 6% culvert units, and 15% pool units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 35% Glide units, 18% Run units, and 20% Low Gradient Riffle units (Graph 3). The most frequent habitat types based on percent total length were 47% Glide units, 14% Run units, and 13% Mid-Channel Pool units.

A total of 102 pools were identified (Table 3). Main Channel pools were the most frequently

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encountered, at 89%, and comprised 92% 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. Twenty-one of the 102 pools (21%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 102 pool tail-outs measured, 4 had a value of 2 (3.9%); 11 had a value of 3 (10.8%); 21 had a value of 4 (20.6%); and 66 had a value of 5 (64.7%) (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 1, flatwater habitat types had a mean shelter rating of 4, and pool habitats had a mean shelter rating of 19 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 20, Scour pools had a mean shelter rating of 15 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial Vegetation is the dominant cover types in San Pablo Creek. Graph 7 describes the pool cover in San Pablo Creek. Terrestrial Vegetation is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. A silt/clay substrate type was observed in 42% of pool tail-outs and gravel observed in 31% of pool tail-outs.

The mean percent canopy density for the surveyed length of San Pablo 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 Pablo Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 77%. The mean percent left bank vegetated was 74%. The dominant elements composing the structure of the stream banks consisted of 3% bedrock, 2% boulder, 1% cobble/gravel, and 94% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 82% of the units surveyed. Additionally, 14% of the units surveyed had brush as the dominant vegetation type, and 1% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Unidentified fishes, large 5 inch roaches and suckers, and sticklebacks were observed from stream banks of San Pablo Creek.

DISCUSSION

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San Pablo Creek is a NA channel type for the first 350 feet of stream surveyed (Reach 1), a F6 channel type for the next 16,824 feet of the stream surveyed (Reach 2), a NA channel type for the next 1,950 feet of the stream surveyed (Reach 3) and a F6 channel type for 24,867 feet of the stream surveyed (Reach 4). The suitability of F6 channel type for fish habitat improvement structures is good for bank-placed boulders, and fair for plunge weirs, boulder clusters, single and opposing wing deflectors and log cover.

The water temperatures recorded on the survey days 7/26/2010 to 8/12/2010, ranged from 57 to 62 degrees Fahrenheit. Air temperatures ranged from 56 to 67 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 62% of the total length of this survey, riffles 12%, and pools 15%. 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 the numerous log debris accumulations (LDA's) in the stream.

Four of the 102 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty two of the pool tail-outs had embeddedness ratings of 3 or 4. Sixty six 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 Pablo Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Sixty seven of the 102 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 19. The shelter rating in the flatwater habitats was 4. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Terrestrial Vegetation in San Pablo Creek. Terrestrial Vegetation is the dominant cover type in pools followed by small woody debris. 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 2 had a canopy density of 78.8% and Reach 4 had a canopy density of 87.8%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 77% and 74%, 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.

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GENERAL RECOMMENDATIONS

San Pablo 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) San Pablo Creek is predominantly an urban watershed. Access for migrating salmonids should be assessed at all road crossings, dams, and in-stream structures. Site of particular concern include all the Highway 80 culverts and associated residential drainage culverts as well as the Hillside Road/ Dam access road culvert and Castro Ranch Road culvert. Although all the urban and residential access road Bridges were not identified as barrier to fish passage, these bridges should be continually assessed. 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.
- 2) 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.
- 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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from Boulders and Terrestrial Vegetation. Adding high quality complexity with woody cover in the pools is desirable.
- 5) Suitable size spawning substrate on San Pablo Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.
- 6) Increase the canopy throughout San Pablo Creek by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. In many cases, planting will need to be

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coordinated to follow bank stabilization or upslope erosion control projects.

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

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 Habitat Comments:

(ft.) Unit #

0 0001.00 Start of Survey at WP60 N37.96739 W122.36662. Habitat Unit #1 is at WP61 N37.96747 W122.36553 where survey began.

350 0002.00 Channel is covered with rip rap.

2113 0006.00 Channel is boxed in by 20' high cement walls.

2337 0007.00 Bridge #1 is a railroad bridge that is made of concrete And is 40' wide, 16' high, and 42' long. The bridge is not retaining Gravel, is creating downcutting, and is not a barrier to salmonids. WP62 N37.96675 W122.122.35884

3111 0009.00 Bridge #2 is a railroad bridge made of steel, that is 32'wide, 20' high, and 30' long. The bridge is not retaining gravel, is not creating downcutting, and is not a possible barrier to salmonids. WP63 N37.96682 W122.35655.

3187 0011.00 Bridge #3 is a road bridge made of concrete, and is 32' wide, 15' high, and 54' long. The Bridge is not retaining gravel, is not creating downcutting, and is not a possible barrier to salmonids. No WP taken.

3241 0012.00 Channel with 18' high concrete walls ends in this unit.

3268 0013.00 2.5' plunge at bottom of the unit. Banks are covered with cement and rip-rap

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Position Habitat Comments:
(ft.) Unit #

4072 0021.00 Banks are reinforced with Rip rap sections, throughout the unit.

4089 0022.00 Unidentified fish observed.

4501 0024.00 Arundo on the left bank.

4765 0027.00 Bridge #4 is a road bridge made of steel and concrete which is 60' wide, 15' high and 77' long. The Bridge is not retraining gravel and is not a barrier to salmonids. It is not creating downcutting. WP66 N37.96400 W122.35457.

4842 0028.00 Wooden retaining structure holding back soil on the right bank.

5203 0032.00 Arundo on the left bank

5203 0032.00 Unidentified fish observed.

5992 0041.00 5'concrete wall on the right bank.

6286 0045.00 Many embedded shopping carts in creek bed.

6399 0047.00 Many tires in the creek bed.

6464 0048.00 Boulders and planting project on the left bank is old restoration project created to prevent erosion.

8434 0076.00 Bridge # 5 is the San Pablo Road Bridge; it is made of concrete And is 60' wide, 20' high, and 164' long. The bridge is not retaining gravel and is not a barrier to salmonids. It is not creating downcutting. WP71 N37.96296 W122.34506.

9132 0080.00 Silty sediment falling into creek from residential property.

9614 0089.00 Concrete slabs on the left bank.

9794 0091.00 Concrete slabs on the left bank.

10210 0099.00 Boulders placed on the left bank.

10368 0101.00 Large cobble rip rap on the left bank.

10460 0104.00 Concrete slabs on the left bank.

11355 0118.00 Left bank erosion site is 10' by 13'

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Position Habitat Comments:

(ft.) Unit #

- 11690 0123.00 Bridge # 6 is a road bridge made of concrete, which is 60' wide, 20' high, and 44' long. The bridge is not retaining gravel and is not a barrier to salmonids. It is not creating downcutting.
WP77 N37.96203 W122.33643.
- 11868 0125.00 Concrete slabs on the left bank.
- 12043 0128.00 Concrete slabs in creek bed.
- 12273 0134.00 Concrete slabs on the left bank. 30' tall concrete wall on right bank continues upstream
- 12515 0137.00 Concrete bags on banks and concrete outcrop in stream bed.
- 12975 0144.00 Bridge # 7 is a backway Cemetery access road that is made of concrete, and is 64' wide, 24' high, and 19' long. It is not retaining gravel and is not a barrier to salmonids. It is not creating downcut.
WP80 N37.96280 W122.33266
- 13261 0148.00 Street runoff is contributing to creek via culvert.
- 13872 0153.00 Culvert #1 is under HWY 80. The culvert is made of concrete and has an estimated 2% slope. It is in good condition, with a length=518', a height= 20', and a width= 20'. It is a possible barrier to juveniles and adult salmon. The maximum depth at the outlet of the culvert= 0.4' WP82 N37.96258 W122.32822.
- 14390 0154.00 Concrete flood channel begins here. It has collected silt deposition and willows are growing.
- 14988 0158.00 Culvert #2 is in good condition and is composed of 3 culverts which are made of concrete. They are 623' long, 10' high, and 20' wide. The culvert slope is estimated to be 1%. It is a possible barrier to adults and juvenile salmon. The maximum depth at the outlet of the culvert= 1'.
WP 83 N37.96453 W122.32442
- 15611 0159.00 Channel with willow forest continues.
- 15611 0159.00 Left bank tributary # 1 is flowing with <1 CFS and contributes <1% of the flow of San Pablo. Upstream and downstream temperatures= 61. The tributary temperature= 58. No fish were observed and it is not accessible to fish. The tributary enters the concrete channel through 2' diameter culvert. WP84 N37.96461 W122.32413
- 16124 0161.00 Concrete channel continues.
- 16191 0162.00 Concrete channel ends.

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Position Habitat Comments:

(ft.) Unit #

- 16191 0162.00 Right bank tributary#1 is flowing with <1 CFS and contributes <1% of the flow to the receiving stream. It is not accessible to fish and has an estimated slope=0%. The tributary enters through a concrete culvert 2' in diameter. WP86 N37.96526 W122.32253
- 16229 0163.00 Sand and gravel dam is 0.8' high and spans 70% of creek.
- 16425 0166.00 concrete channel begins along the right bank
- 16492 0167.00 Concrete channel ends along the right bank.
- 16707 0169.00 3' diameter CMP culvert enters from street.
- 16915 0171.00 Road and culvert construction. 259' into the unit, culvert is smashed and blocked with sediment.
- 16915 0171.00 Culvert # 3 is a CMP culvert, with a length=259', a height=14', and a width= 20'. The culvert is smashed at 259'. It is a barrier to salmonids. Lake backed up behind construction zone. Maximum depth at the outlet is 0.7' WP88 N37.96638 W122.31934
- 17174 0172.00 Construction zone blocks water. Lake at least 10' deep backed up for about .25 miles. WP89 N37.96569 W122.31337
- 20821 0194.00 Planting project on Right Bank.
- 21063 0198.00 Bridge #8 is the Appian Way road bridge which is 63' long, 25' high, and 97' wide. It is made of concrete, it not retaining gravel, has no sill, and is not a barrier to salmonids. It is not creating downcutting. WP92 N37.96655 W122.30936.
- 21196 0200.00 Left Bank tributary#2 comes out of culvert. Flagged and marked on topographic map.
- 21196 0200.00 Left Bank Tributary #2 is unnamed and enters San Pablo Creek. It is flowing with a discharge <1 est, and contributes <1% of flow to the receiving stream. Water temperatures downstream and upstream=60 and water temperature within the tributary= 70F. The survey crew checked 100' upstream and found it is not accessible to fish, with a Slope= 2%. No fish were observed. WP93 N37.96656 W122.30859
- 21869 0206.00 Arundo on Right Bank.
- 22838 0219.00 On the left Bank is a dry 4' diameter Culvert tilting into stream.
- 23069 0223.00 On the left bank are Concrete bricks creates wall 7' high and 50' long. The wood and boards creates small plunge (Coffer Dam)
- 23313 0228.00 Large 5" fish- potentially roach and/or suckers
- 23928 0237.00 Right bank tributary #2 is unnamed and enters San Pablo

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Position Habitat Comments:
(ft.) Unit #

- Creek. It is flowing with a discharge <1cfs, and contributes 5% of flow to the receiving stream. Water temperatures upstream downstream and within the tributary= 60. the survey crew checked 150' upstream and found it is accessible to fish , with a slope= 1%. Fish were observed in the tributary. WP98 N37.96745 W122.30193
- 23928 0237.00 Stickleback observed
- 24203 0244.00 A lot of ivy in channel
- 24372 0248.00 Several logs creating a continuous scour pool
- 24633 0253.00 Left bank tributary #3 is not flowing and has an estimated slope=5%. Water temperature upstream and downstream= 58. It is accessible to fish but no fish were observed. WP103 N37.96662 W122.30033.
- 25864 0275.00 5" fish observed
- 26024 0278.00 Culvert #4 is the May Rd culvert, and is composed of 2 culverts which are made of concrete and in good condition. They are 137' long, 10' high, and 13' wide. The maximum depth at the outlet of the culvert= 0.6'. The culverts are not a barrier to salmonids. WP 106 N37.96466 W122.29655.
- 26542 0288.00 Left bank tributary # 4 is unnamed and enters San Pablo creek. It is dry with Upstream and Downstream water temperatures= 58F. The tributary has an estimated slope= 3%, and it is accessible to fish but no fish were observed. WP108 N37.96418 W122.29557
- 27361 0296.00 Left bank Tributary #5 is unnamed and enters San Pablo creek. It is dry, with no discharge and no % contribution. It is accessible to fish but no fish were observed. Upstream and downstream water temperatures = 59F. the tributary has an estimated slope =2%. WP 110 N37.96420 W122.29198.
- 28012 0302.00 Rip rap on Right Bank.
- 29296 0317.00 Left bank tributary# 6 is flowing with <1CFS and contributes <1% of the flow. It is accessible to fish but no fish were observed. Temperature of the tributary is 60F. Temp of the creek upstream and downstream is 58F. The Estimated slope of the channel= 3% WP 113 N37.96365 W122.28753.
- 29558 0319.00 Bridge #9 is made of wood and concrete, and is 45' wide, 11' high, and 25' long. It is not retaining gravel and is not creating downcutting. It is not a barrier to salmonids. WP 114 N37.96319 W122.28703.
- 29904 0323.00 5' small wood accumulation at top of unit.

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Position Habitat Comments:
(ft.) Unit #

- 30551 0331.00 Freshwater clams observed.
- 31409 0341.00 Bridge # 10 is a footbridge made of wood, and is 46' wide, 16' high, and 7' long. It is not retaining gravel and is not creating downcutting. It is not a barrier to salmonids.
WP 117 N37.96171 W122.38407
- 31649 0344.00 Bridge #11 is the D'avila Road bridge which is made of concrete, and is 20' wide, 7' high, and 29' long. It is not retaining gravel, because it has a natural bottom. It is not creating downcutting, and is not a barrier to salmonids.
WP 119 N37.96120 W122.28333
- 32618 0355.00 Silt accumulation in culvert closest to the right bank.
- 32618 0355.00 Culvert #5 is composed of 2 culverts which are made of concrete; it is 152' long, 6' high, and 12' wide, with an estimated slope of 0%.
The maximum at the outlet of the culvert= 0.5'. It is in good condition and is not a barrier to salmonids. WP121 N37.96170 W122.28080
- 32770 0356.00 Crayfish and stickleback observed.
- 33230 0359.00 Unit has dense aquatic vegetation.
- 34195 0374.00 Bay tree fallen in stream at top of unit retains silt.
- 34322 0377.00 Culvert # 6 is composed of one CMP pipe arch culvert, with a Length= 82', a Height= 8', and a Width= 15'. The maximum depth at the outlet of the culvert = 1'. It is in good condition, and is not a barrier to salmonids, with an estimated slope =0%.
WP124 N37.95864 W122.27896.
- 34830 0387.00 Left bank tributary# 7 is not flowing and is accessible to fish but no fish observed. Upstream and downstream water temperatures= 59F.
The estimated slope of the channel is 5%.
WP 126 N37.95757 W122.27876
- 35294 0390.00 Crayfish observed.
- 35328 0391.00 Stickleback observed.
- 36273 0405.00 Bay tree covered in English ivy fell 50' into unit.
- 36481 0408.00 Dense grassy vegetation in channel.
- 36531 0409.00 Floating aquatic vegetation covers this unit.
- 36590 0410.00 Unit is choked with cat tails.
- 36953 0416.00 Left bank tributary #8 is not flowing but is accessible to fish.

San Pablo Creek

Position Habitat Comments:

(ft.) Unit #

- No fish observed. Channel has an estimated slope= 1%.
Downstream and upstream water temperatures= 58F. Culvert 50'
upstream. WP130 N37.95489 W122.27553.
- 37171 0420.00 Unidentified turtle on bottom of
streambed
- 37977 0432.00 Unidentified turtle basking on bank.
- 38156 0433.00 stickleback observed
- 38679 0443.00 Culvert # 7 is composed of one concrete box culvert with a Length= 167,
a Height= 12', and a Width= 12'. The maximum depth at the outlet
of the culvert= 0.2'. The culvert condition is good. It is a possible
barrier to salmonids. WP 133 N37.95409 W122.27120
- 38969 0447.00 Right bank tributary #3 is flowing with <1 CFS and contributes 20%
of flow. The estimated slope of the channel is 1%. It is accessible to
fish but no fish were observed. The tributary water
temperature is 58F. Upstream and downstream water temperatures are 58F.
WP134 N37.95407 W122.27058.
- 39664 0451.00 Left bank Tributary #9 is flowing with <1 CFS and contributes 5%
of flow. The estimated slope of the channel is 2%. It is accessible
to fish but no fish were observed. The tributary temperature is
60F. Upstream and Downstream temperatures are 60F.
WP135 N37.95278 W122.27034
- 39761 0452.00 Talk with landowner: excessive silt in creek washed down in winter of 2009-2010..
Castro road culvert plugs. Neighbors rescue newts when crossing
road.
- 40147 0453.00 Bay tree fallen on the left bank.
- 41188 0471.00 2 unidentified frogs observed.
- 41535 0476.00 5 dead raccoons on the right bank
- 42906 0486.00 Right bank tributary #4 is dry with no discharge and no contribution.
It is accessible to fish but no fish were observed. The tributary has an
Estimated slope of 0%. Upstream and Downstream temperatures are 60F.
WP140 N37.94782 W122.26776.
- 42906 0486.00 Left bank tributary #10 is flowing with <1 CFS and contributes
5% of flow. It is accessible to fish but no fish were observed.
The tributary has an estimated slope of 1%. The tributary temperature is
64F. Upstream and Downstream temperatures are 60F.
WP140 N37.94782 W122.26776
- 42928 0487.00 Unidentified frog observed.

San Pablo Creek

Position Habitat Comments:

(ft.) Unit #

43928 0499.00 Culvert #8 is composed of 4 culverts which are made of concrete, with a Length= 63', a Height= 3', and a Width= 3'. The maximum depth at the outlet of the culvert= 1'. The culverts are in good condition and are creating a barrier to salmonids. WP142 N38.94585 W122.26542

43991 0499.00 End of Survey at marshy area immediately below San Pablo Dam Spillway. WP142 N37.94585 W122.26542

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 Pablo Creek

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 }

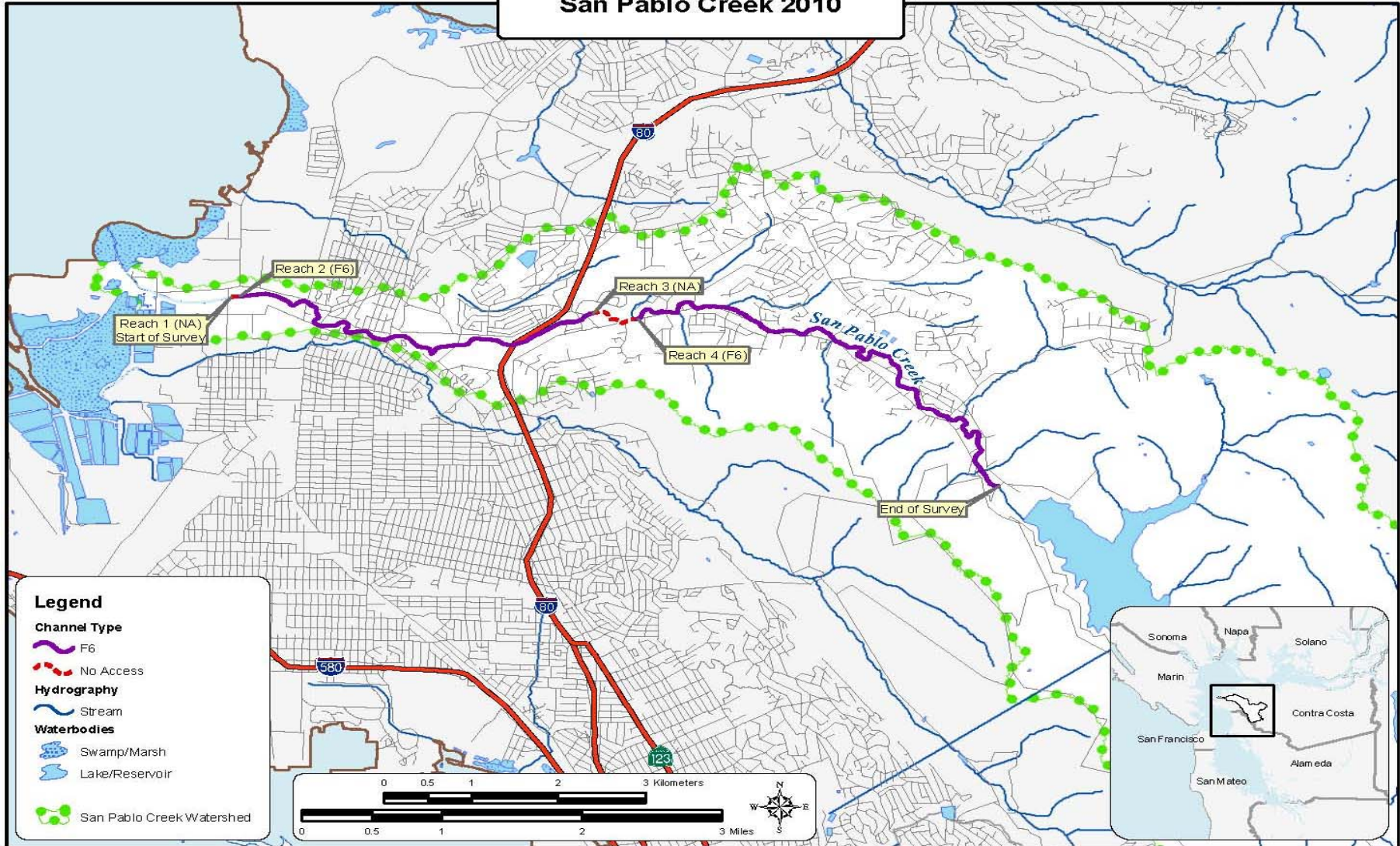
BACKWATER POOLS

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 Pablo Creek 2010



San Pablo Creek

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

Stream Name:		San Pablo Creek										LLID:		1223821379763			Drainage:		Pinole										
Survey		7/26/2010 to 8/12/2010										Confluence Location:		Quad:		SAN QUENTIN		Legal Description:		T02NR05WS35		Latitude:		37:58:35.0N		Longitude:		122:22:56.0W	
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														
19	1	CULVERT	3.8	134	2555	5.8	32.0			1728	32832				0														
269	268	FLATWATER	53.9	101	27106	61.6	8.9	0.7	1.3	953	256482	889	239148		4														
2	1	NOSURVEY	0.4	1150	2300	5.2									0														
102	102	POOL	20.4	65	6598	15.0	12.4	1.3	2.5	811	82773	1443	147210	1124	19														
107	107	RIFFLE	21.4	51	5432	12.3	8.4	0.3	0.5	491	52581	113	12081		1														
Total Units	Total Units Fully Measured				Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)																
499	479				43991						424669		398438																

San Pablo Creek

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: San Pablo Creek

LLID: 1223821379763

Drainage: Pinole

Survey 7/26/2010 to 8/12/2010

Confluence Location: Quad: SAN QUENTIN

Legal Description: T02NR05WS35

Latitude: 37:58:35.0N

Longitude: 122:22:56.0W

Habitat Units Canopy	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 (%)
100	100	LGR	20.0	41	4076	9.3	8.0	0.3	1.4	323	32263	92	9152		1	82
7	7	BRS	1.4	194	1356	3.1	18.0	0.2	0.9	2903	20319	418	2928		1	49
177	176	GLD	35.5	117	20685	47.0	10.0	0.9	4.0	1209	214064	1241	219639		5	84
88	88	RUN	17.6	70	6122	13.9	7.0	0.5	2.0	464	40858	215	18921		4	80
4	4	SRN	0.8	75	299	0.7	6.0	0.5	1.3	454	1817	235	940		1	
3	3	TRP	0.6	62	187	0.4	7.0	0.7	2.5	454	1362	569	1706	334	70	70
87	87	MCP	17.4	67	5822	13.2	13.0	1.3	5.7	852	74116	1535	133532	1199	18	88
1	1	CCP	0.2	56	56	0.1	12.0	1.7	3.0	672	672	1344	1344	1142	30	86
6	6	CRP	1.2	46	273	0.6	12.0	1.3	3.0	546	3276	900	5398	712	4	89
1	1	LSL	0.2	73	73	0.2	17.0	1.6	3.2	1241	1241	2482	2482	1986	75	70
2	2	LSR	0.4	70	140	0.3	11.0	0.8	1.8	801	1602	1020	2039	701	20	94
1	1	LSBo	0.2	17	17	0.0	12.0	1.5	3.0	204	204	408	408	306	10	100
1	1	PLP	0.2	30	30	0.1	10.0	0.7	2.2	300	300	300	300	210	5	90
19	1	CUL	3.8	134	2555	5.8	32.0			1728	32832				0	0
2	1	NS	0.4	1150	2300	5.2	0.0			0	0				0	0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume			
499	479				43991					424924			398790			

San Pablo Creek

Table 3 - Summary of Pool Habitat Types

Stream Name: San Pablo Creek

LLID: 1223821379763

Drainage: Pinole

Survey 7/26/2010 to 8/12/2010

Confluence Location: Quad: SAN QUENTIN

Legal Description: T02NR05WS35

Latitude: 37:58:35.0N

Longitude: 122:22:56.0W

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
91	91	MAIN	89	67	6065	92	12.5	1.3	837	76150	1170	106426	20
11	11	SCOUR	11	48	533	8	12.1	1.2	602	6623	743	8176	15
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
102	102				6598					82773		114602	

San Pablo Creek

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

Stream Name: San Pablo Creek **LLID:** 1223821379763 **Drainage:** Pinole
Survey: 7/26/2010 to 8/12/2010

Confluence Location: Quad: SAN QUENTIN **Legal Description:** T02NR05WS35 **Latitude:** 37:58:35.0N **Longitude:** 122:22:56.0W

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
3	TRP	3	0	0	2	67	1	33	0	0	0	0
87	MCP	85	0	0	20	23	50	57	15	17	2	2
1	CCP	1	0	0	0	0	0	0	1	100	0	0
6	CRP	6	0	0	1	17	4	67	1	17	0	0
1	LSL	1	0	0	0	0	0	0	1	100	0	0
2	LSR	2	0	0	2	100	0	0	0	0	0	0
1	LSBo	1	0	0	0	0	0	0	1	100	0	0
1	PLP	1	0	0	0	0	1	100	0	0	0	0
Total			Total < 1 Foot Max	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
102			0	0	25	25	56	55	19	19	2	2
Mean Maximum Residual Pool Depth (ft.):			3									

San Pablo Creek

Table 5 - Summary of Mean Percent Cover By Habitat

Stream Name:		San Pablo Creek		Dry Units:		LLID: 1223821379763		Drainage:		Pinole	
Survey Dates:		7/26/2010 to 8/12/2010		Confluence Location: Quad:		SAN QUENTIN		Legal Description:		T02NR05WS35	
Latitude:		37:58:35.0N		Longitude:		122:22:56.0W					
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
100	86	LGR	0	0	0	0	0	0	0	4	0
7	7	BRS	0	0	0	9	6	0	0	0	0
107	93	TOTAL RIFFLE	0	0	0	1	0	0	0	4	0
177	163	GLD	0	6	3	3	8	2	0	7	0
88	77	RUN	0	1	0	0	7	3	0	0	0
4	4	SRN	0	0	0	0	0	0	0	25	0
269	244	TOTAL FLAT	0	4	2	2	8	2	0	5	0
3	3	TRP	0	10	0	10	53	27	0	0	0
87	87	MCP	4	26	5	9	24	1	0	8	0
1	1	CCP	0	0	0	40	60	0	0	0	0
6	5	CRP	4	0	0	6	10	0	0	0	0
1	1	LSL	0	60	40	0	0	0	0	0	0
2	2	LSR	13	0	0	38	50	0	0	0	0
1	1	LSBo	0	0	0	0	0	0	0	100	0
1	1	PLP	0	0	100	0	0	0	0	0	0
102	101	TOTAL POOL	4	23	5	9	25	2	0	8	0
19	5	CUL	0	0	0	0	0	0	0	0	0
2	1	NS	0	0	0	0	0	0	0	0	0
499	444	TOTAL	1	8	2	3	10	2	0	6	0

San Pablo Creek

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: San Pablo Creek

Dry Units:

LLID: 1223821379763

Drainage: Pinole

Survey 7/26/2010 to 8/12/2010

Confluence Location: Quad: SAN QUENTIN

Legal Description: T02NR05WS35 **Latitude:** 37:58:35.0N

Longitude: 122:22:56.0W

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
100	45	LGR	2	7	71	7	7	7	0
7	5	BRS	0	0	0	0	0	0	100
177	84	GLD	68	19	13	0	0	0	0
88	33	RUN	27	24	39	3	0	0	6
4	0	SRN	0	0	0	0	0	0	0
3	3	TRP	100	0	0	0	0	0	0
87	87	MCP	85	10	5	0	0	0	0
1	1	CCP	100	0	0	0	0	0	0
6	6	CRP	100	0	0	0	0	0	0
1	1	LSL	100	0	0	0	0	0	0
2	2	LSR	50	0	50	0	0	0	0
1	1	LSBo	0	0	100	0	0	0	0
1	1	PLP	100	0	0	0	0	0	0
19	1	CUL	0	0	0	0	0	0	100
2	0	NS	0	0	0	0	0	0	0

San Pablo Creek

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name:	San Pablo Creek			LLID:	1223821379763	Drainage:	Pinole	
Survey	7/26/2010 to 8/12/2010							
Confluence Location:	Quad:	SAN QUENTIN	Legal Description:	T02NR05WS35	Latitude:	37:58:35.0N	Longitude:	122:22:56.0W
Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover			
85	2	98	0	77	74			

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 Pablo Creek

Table 8 - Fish Habitat Inventory Data Summary

Stream	San Pablo Creek	LLID: 1223821379763	Drainage	Pinole
Survey Dates:	7/26/2010 to 8/12/2010	Survey Length (ft.):	43991	Main Channel (ft.): 43991
Channel (ft.):	0			Side
Confluence Location:	Quad SAN QUENTIN	Legal Description:	T02NR05WS35	Latitude: 37:58:35.0N
Longitude:	122:22:56.0W			

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type:	NA	Canopy Density (%):		Pools by Stream Length	0.0
Reach Length (ft.):	350	Coniferous Component (%):		Pool Frequency (%):	0.0
Riffle/Flatwater Mean Width (ft.):		Hardwood Component		Residual Pool Depth (%):	
BFW:		Dominant Bank		< 2 Feet Deep:	
Range (ft.):	32.00 to 32.00	Vegetative Cover (%):	0.0	2 to 2.9 Feet Deep:	
Mean (ft.):	32.00	Dominant		3 to 3.9 Feet Deep:	
Std. Dev.:	0.00	Dominant Bank Substrate		>= 4 Feet Deep:	
Base Flow (cfs):	0.94	Occurrence of LWD (%):	0.0	Mean Max Residual Pool	
Depth		LWD per 100 ft.:		Mean Pool Shelter	
Water (F):	60 - 60	Riffles:			
Air (F):	60 - 60	Pools:			
Dry Channel (ft.):	0	Flat:			
Pool Tail Substrate (%):	Silt/Clay:	Sand:	Gravel:	Sm Cobble:	Lg Cobble:
Bedrock:					Boulder
Embeddedness Values (%):	1.	2.	3.	4.	5. 0.0

STREAM REACH: 2

Channel Type:	F6	Canopy Density (%):	78.8	Pools by Stream Length	8.0
Reach Length (ft.):	16824	Coniferous Component (%):	2.3	Pool Frequency (%):	
11.8		Hardwood Component	97.7	Residual Pool Depth (%):	
Riffle/Flatwater Mean Width (ft.):	10.4	Dominant Bank	Hardwood Trees	< 2 Feet Deep:	25.0
BFW:		Vegetative Cover (%):	72.0	2 to 2.9 Feet Deep:	65.0
Range (ft.):	10.00 to 32.00	Dominant	Boulders	3 to 3.9 Feet Deep:	10.0
Mean (ft.):	15.50	Dominant Bank Substrate	Sand/Silt/Clay	>= 4 Feet Deep:	0.0
Std. Dev.:	4.50	Occurrence of LWD (%):	2.1	Mean Max Residual Pool	
Base Flow (cfs):	0.94	LWD per 100 ft.:		Mean Pool Shelter	11
Depth	2.36	Riffles:	0		
Water (F):	59 - 61	Pools:	1		
Air (F):	58 - 67	Flat:	0		
Dry Channel (ft.):	0				
Pool Tail Substrate (%):	Silt/Clay: 25.0	Sand: 35.0	Gravel: 25.0	Sm Cobble: 5.0	Lg Cobble: 5.0
Bedrock:	5.0				Boulder 0.0
Embeddedness Values (%):	1. 0.0	2. 5.0	3. 10.0	4. 20.0	5. 65.0

San Pablo Creek

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type:	NA	Canopy Density (%):		Pools by Stream Length	0.0	
Reach Length (ft.):	1950	Coniferous Component (%):		Pool Frequency (%):	0.0	
Riffle/Flatwater Mean Width (ft.):		Hardwood Component		Residual Pool Depth (%):		
BFW:		Dominant Bank		< 2 Feet Deep:		
Range (ft.):	16.00 to 16.00	Vegetative Cover (%):	0.0	2 to 2.9 Feet Deep:		
Mean (ft.):	16.00	Dominant		3 to 3.9 Feet Deep:		
Std. Dev.:	0.00	Dominant Bank Substrate		>= 4 Feet Deep:		
Base Flow (cfs):	0.94	Occurrence of LWD (%):		Mean Max Residual Pool		
Depth		LWD per 100 ft.:		Mean Pool Shelter		
Water (F):	60 - 60	Air (F):	63 - 63			
Dry Channel (ft.):	0	Riffles:				
		Pools:				
		Flat:				
Pool Tail Substrate (%):	Silt/Clay:	Sand:	Gravel:	Sm Cobble:	Lg Cobble:	Boulder
Bedrock:						
Embeddedness Values (%):	1.	2.	3.	4.	5.	0.0

STREAM REACH: 4

Channel Type:	F6	Canopy Density (%):	87.8	Pools by Stream Length	21.1	
Reach Length (ft.):	24867	Coniferous Component (%):	1.7	Pool Frequency (%):		
25.1		Hardwood Component	98.3	Residual Pool Depth (%):		
Riffle/Flatwater Mean Width (ft.):	7.8	Dominant Bank	Hardwood Trees	< 2 Feet Deep:	24.4	
BFW:		Vegetative Cover (%):	78.1	2 to 2.9 Feet Deep:	52.4	
Range (ft.):	8.00 to 115.0	Dominant	Terrestrial Veg.	3 to 3.9 Feet Deep:	20.7	
Mean (ft.):	19.87	Dominant Bank Substrate	Sand/Silt/Clay	>= 4 Feet Deep:	2.4	
Std. Dev.:	24.26	Occurrence of LWD (%):	2.2	Mean Max Residual Pool		
Base Flow (cfs):	0.94	LWD per 100 ft.:		Mean Pool Shelter	21	
Depth	2.55	Riffles:	0			
Water (F):	57 - 62	Air (F):	56 - 66			
Dry Channel (ft.):	0	Pools:	1			
		Flat:	0			
Pool Tail Substrate (%):	Silt/Clay: 46.3	Sand: 18.3	Gravel: 32.9	Sm Cobble: 2.4	Lg Cobble: 0.0	Boulder 0.0
Bedrock:	0.0					
Embeddedness Values (%):	1. 0.0	2. 3.7	3. 11.0	4. 20.7	5. 64.6	

San Pablo Creek

Table 9 -Mean Percentage of Dominant Substrate and Vegetation

Stream Name: San Pablo Creek **LLID:** 1223821379763 **Drainage:** Pinole
Survey: 7/26/2010 to 8/12/2010
Confluence Location: Quad: SAN QUENTIN **Legal Description:** T02NR05WS35 **Latitude:** 37:58:35.0N **Longitude:** 122:22:56.0W

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	7	6	3.0
Boulder	1	7	1.8
Cobble/Gravel	3	2	1.1
Sand/Silt/Clay	207	203	94.0

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	3	2	1.1
Brush	25	35	13.8
Hardwood	184	174	82.1
Coniferous	1	0	0.2
No Vegetation	5	7	2.8

Total Stream Cobble Embeddedness Values: 4

San Pablo Creek

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

Stream Name: San Pablo Creek

LLID: 1223821379763 **Drainage:** Pinole

Survey 7/26/2010 to 8/12/2010

Confluence Location: Quad: SAN QUENTIN

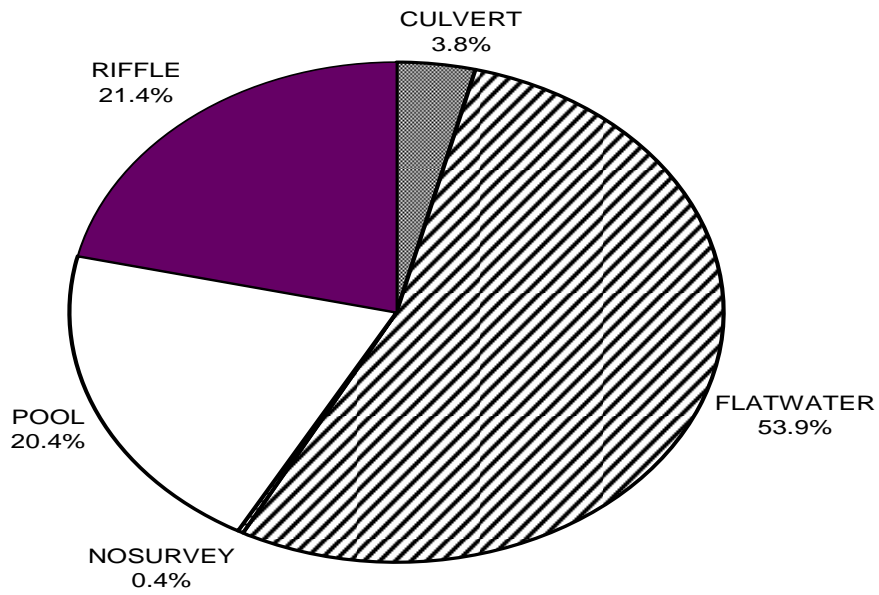
Legal Description: T02NR05WS35

Latitude: 37:58:35.0N

Longitude: 122:22:56.0W

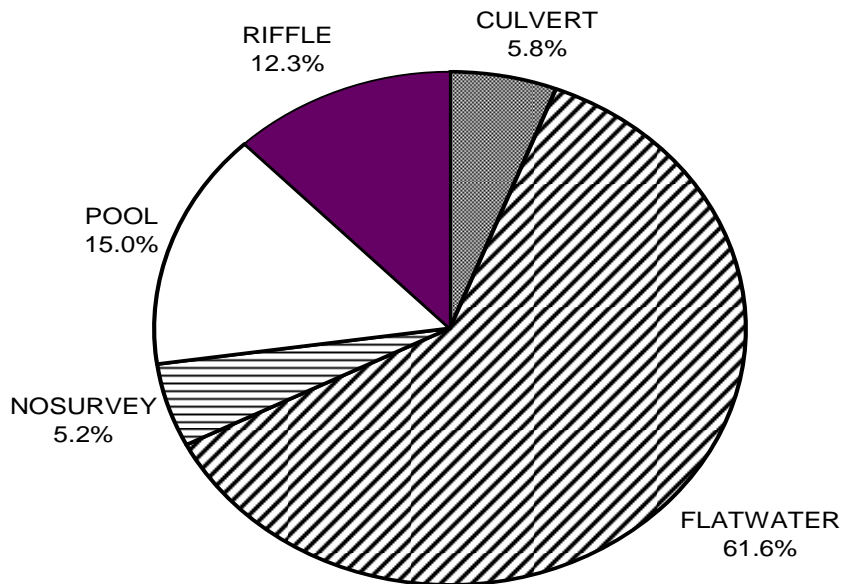
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	4
SMALL WOODY DEBRIS (%)	0	4	23
LARGE WOODY DEBRIS (%)	0	2	5
ROOT MASS (%)	1	2	9
TERRESTRIAL VEGETATION	0	8	25
AQUATIC VEGETATION (%)	0	2	2
WHITEWATER (%)	0	0	0
BOULDERS (%)	4	5	8
BEDROCK LEDGES (%)	0	0	0

**SAN PABLO CREEK 2010
HABITAT TYPES BY PERCENT OCCURRENCE**



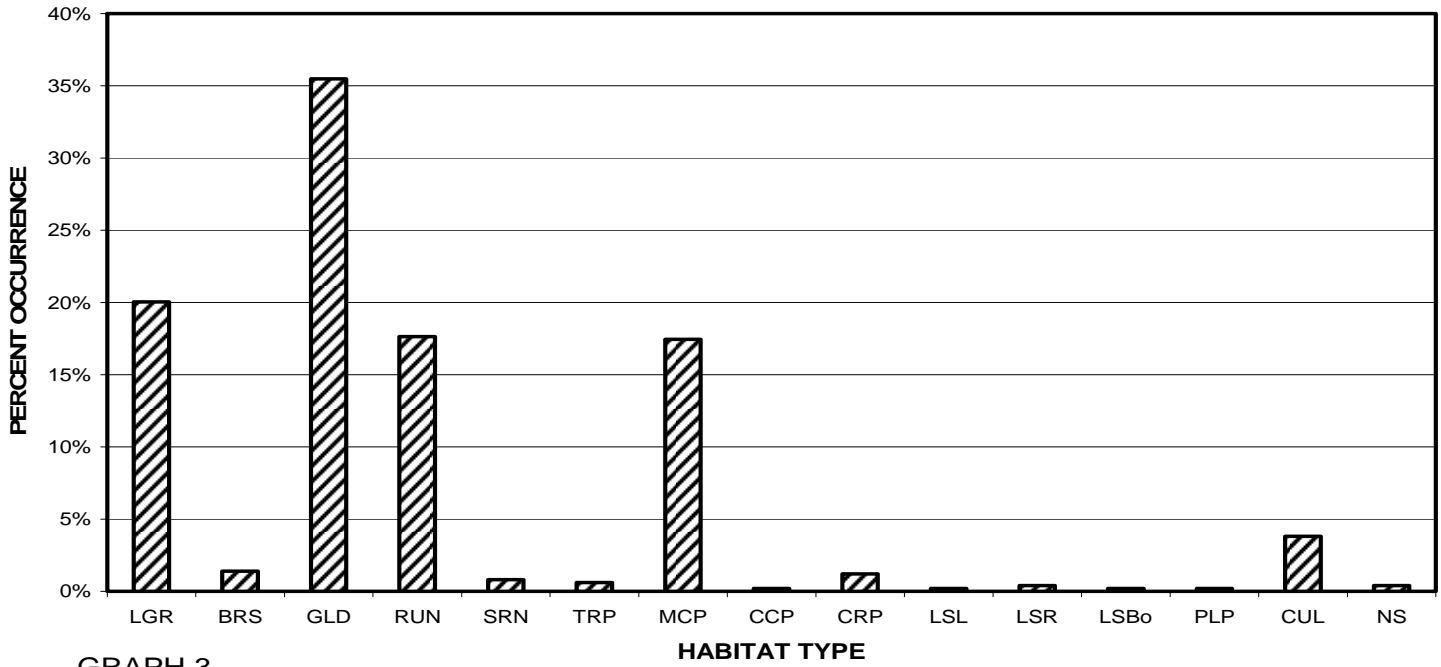
GRAPH 1

**SAN PABLO CREEK 2010
HABITAT TYPES BY PERCENT TOTAL LENGTH**

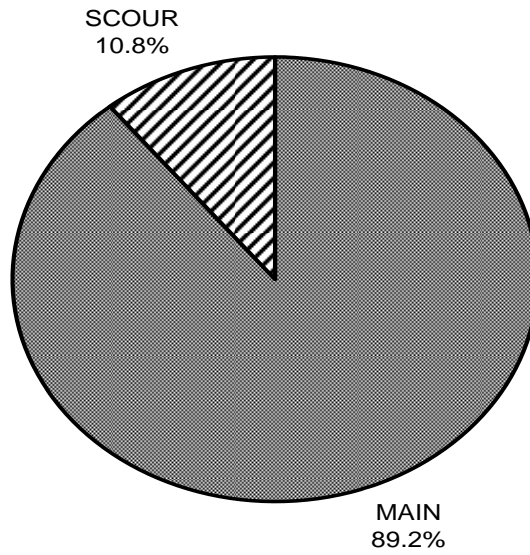


GRAPH 2

SAN PABLO CREEK 2010 HABITAT TYPES BY PERCENT OCCURRENCE



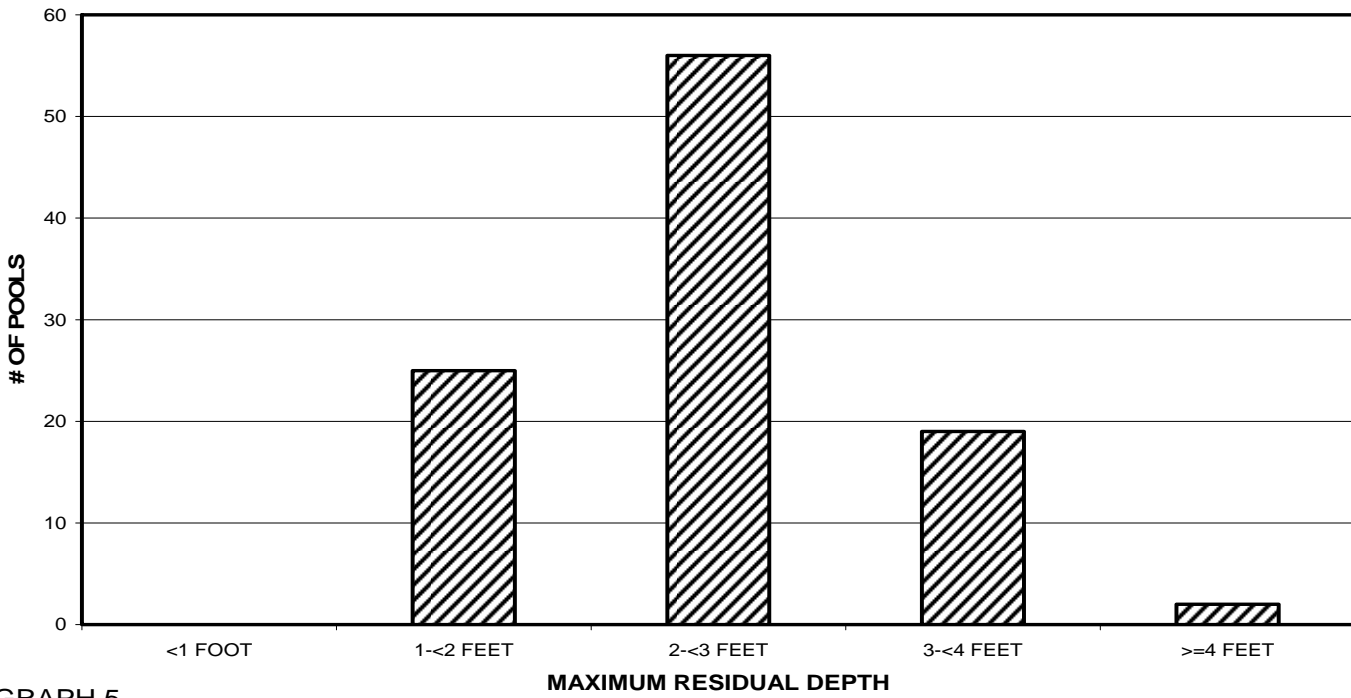
SAN PABLO CREEK 2010 POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

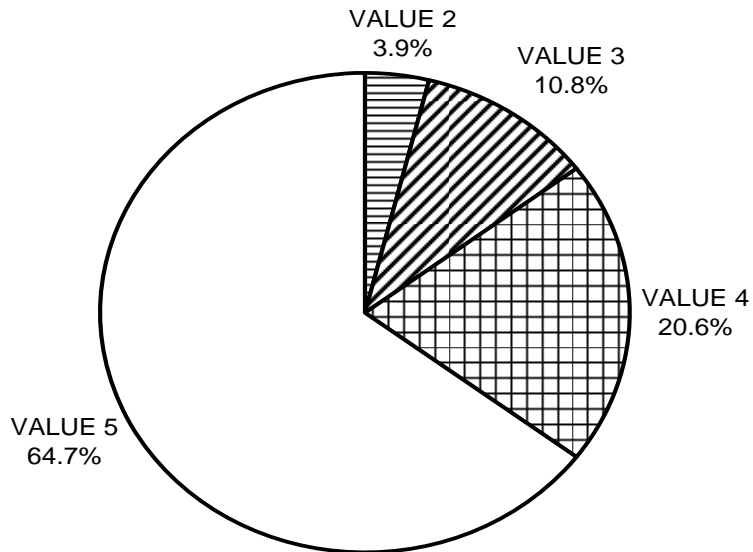
San Pablo Creek

**SAN PABLO CREEK 2010
MAXIMUM DEPTH IN POOLS**



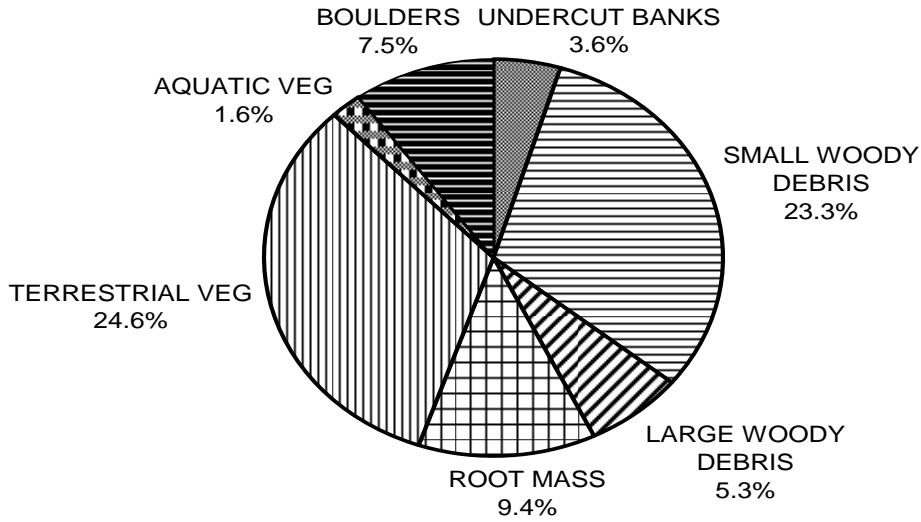
GRAPH 5

**SAN PABLO CREEK 2010
PERCENT EMBEDDEDNESS**



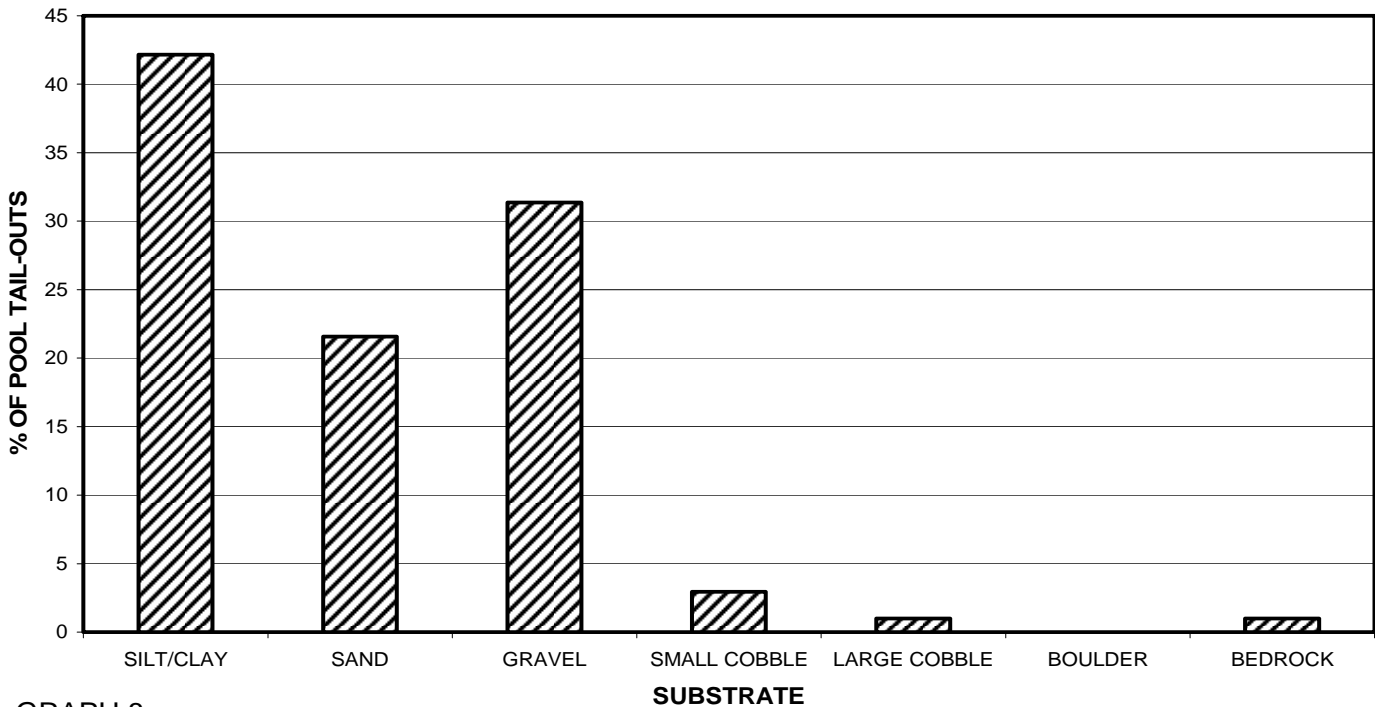
GRAPH 6

**SAN PABLO CREEK 2010
MEAN PERCENT COVER TYPES IN POOLS**



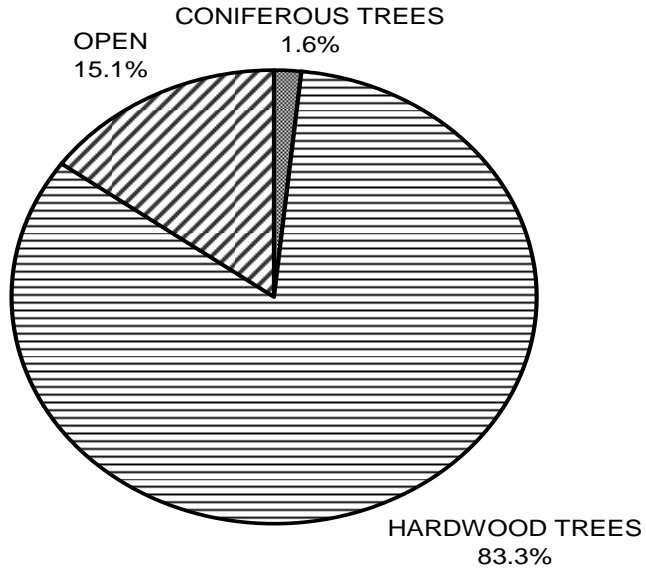
GRAPH 7

**SAN PABLO CREEK 2010
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



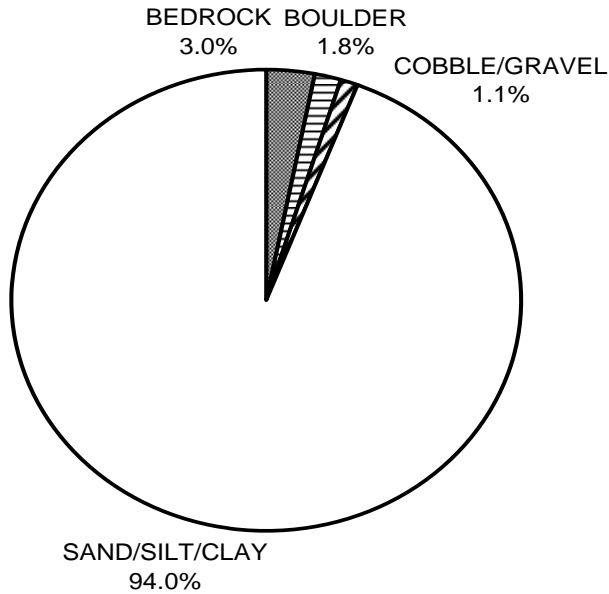
GRAPH 8

**SAN PABLO CREEK 2010
MEAN PERCENT CANOPY**



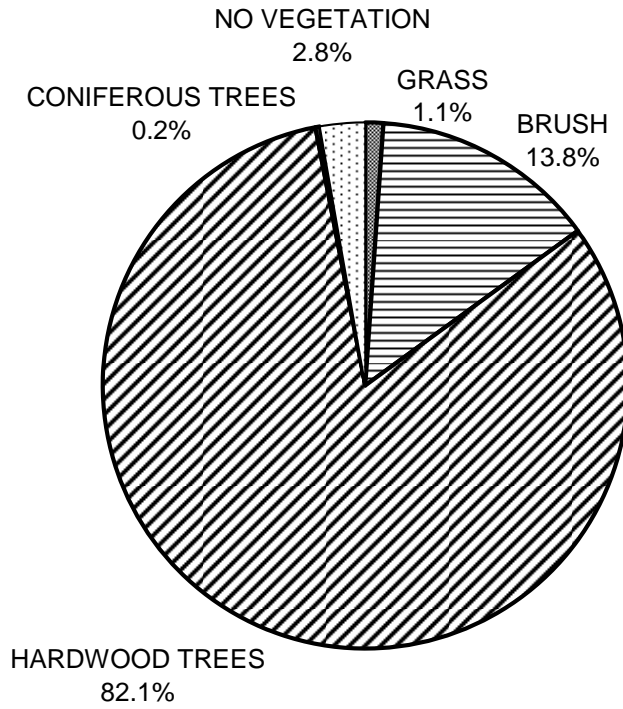
GRAPH 9

**SAN PABLO CREEK 2010
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

SAN PABLO CREEK 2010 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11