



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

Arroyo San Jose Creek

Surveyed 2009

Report Completed in 2013

Arroyo San Jose

STREAM INVENTORY REPORT

Arroyo San Jose

INTRODUCTION

A stream inventory was conducted 7/14/2009 to 7/16/2009 on Arroyo San Jose. The survey began at the confluence with Novato Creek and extended upstream 3.9 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Arroyo San Jose.

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

WATERSHED OVERVIEW

Arroyo San Jose is located in Marin County, California (Map 1). It is a tributary to Novato Creek, which flows into San Pablo Bay, which flows into Pacific Ocean. Arroyo San Jose's legal description at the confluence with Novato Creek is T03N R06W Sec.21. Its location is (38:04:51.8N) 38.0815 north latitude and (122:31:38.8W) 122.5255 west longitude, LLID number 1225255380815. Arroyo San Jose is a second order stream and has approximately 6.1 miles of blue line stream according to the USGS National Hydrology Dataset (NHD). Arroyo San Jose drains a watershed of approximately 7.4 square miles. Elevations range from about 0 feet at the mouth of the creek to 1,886 feet in the headwater areas (average elevation of headwaters, not highest point). Evergreen forest dominates the watershed. The watershed is primarily privately owned, which accounts for 65% of the land area. Sixty-eight percent of the land is considered natural, 30% is urban, and 2% is agricultural. Vehicle access exists via Ignacio Boulevard located off Highway 101 South of the town of Novato, Ca. Multiple residential access streets such as Fairway Drive and Spyglass Drive provide further access upstream to the headwaters of Arroyo San Jose.

METHODS

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

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SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are fully measured. All other habitat unit types encountered for the first time in each reach are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Arroyo San Jose 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 San Jose habitat

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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 San Jose, 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 such as 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 Arroyo San Jose, 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 San Jose, 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

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usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Arroyo San Jose, 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 San Jose.

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)

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- 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 San Jose 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 7/14/2009 to 7/16/2009, was conducted by Bell C., Macias T. (CCC)/(WSP). The total length of the stream surveyed was 20,641 feet with an additional 0 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.11 cfs on the July 16, 2009.

Arroyo San Jose is a F4 channel type for 17,307 feet of the stream surveyed (Reach 1), a A4 channel type for 3,334 feet of the stream surveyed (Reach 2). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width to depth ratios, and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 61 to 64 degrees Fahrenheit. Air temperatures ranged from 76 to 84 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 32% flatwater units, 23% pool units, 21% culvert units, 13% dry units, 9% riffle units, 1% not surveyed units (Graph 1). Based on total length of Level II habitat types, there were 37% dry units, 29% flatwater units, 23% pool units, 6% culvert units, 3% riffle units, 2% not surveyed units (Graph 2).

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

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percent occurrence were 21% culvert units, 18% glide units, 13% dry units (Graph 3). Based on percent total length, 37% dry units, 20% glide units, 14% dammed pool units.

A total of 34 pools were identified (Table 3). Main channel pools were the most frequently encountered at 50% (Graph 4), and comprised 24% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty of the 34 pools (89%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 34 pool tail-outs measured, 2 had a value of 2 (6%), 10 had a value of 3 (29%), 14 had a value of 4 (41%), 1 had a value of 5 (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 28, and pool habitats had a mean shelter rating of 31 (Table 1). Of the pool types, the backwater pools had a mean shelter rating of 0, main channel pools had a mean shelter rating of 37, and scour pools had a mean shelter rating of 21 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Root masses are the dominant cover type in Arroyo San Jose. Graph 7 describes the pool cover in Arroyo San Jose. Root masses 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. Gravel substrate was observed in 63% of pool tail-outs; and sand substrate was observed in 22% of pool tail-outs.

The mean percent canopy density for the surveyed length of Arroyo San Jose was 83%. Of the canopy present, the mean percentages of hardwood and coniferous trees were 97% and 3%, respectively. Seventeen percent of the canopy was open. Graph 9 describes the mean percent canopy in Arroyo San Jose.

For the stream reach surveyed, the mean percent right bank vegetated was 56%. The mean percent left bank vegetated was 58% (Table 7). The dominant elements composing the structure of the stream banks consisted of 84% sand/silt/clay, 10% boulder, 6% bedrock, 0% cobble/gravel (Graph 10). Deciduous trees were the dominant vegetation type observed in 71% of the units surveyed. Additionally, 17% of the units surveyed had brush as the dominant vegetation type, and 6% had no vegetation as the dominant vegetation type (Graph 11).

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DISCUSSION

Arroyo San Jose is a F4 channel type for 17,307 feet of the stream surveyed, a A4 channel type for 3,334 feet of the stream surveyed. The suitability of F4, and A4 channel types for fish habitat improvement structures is/are as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; and A4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days July 14 to July 16, 2009, ranged from 61 to 64 degrees Fahrenheit. Air temperatures ranged from 76 to 84 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 60° F, if sustained, is near the threshold stress level for salmonids. This is a fair to poor water temperature for salmonids. 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 32% of the total length of this survey, riffles 9%, and pools 23%. The pools are relatively deep, with 24 of the 34 (89%) pools having a maximum residual depth greater than two 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 the numerous log debris accumulations (LDA's) in the stream.

Two of the 34 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-four of the pool tail-outs had embeddedness ratings of 3 or 4. One 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 San Jose should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Eighteen of the 34 pool tail-outs measured had gravel and small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools is 31. The shelter rating in the flatwater habitats is 28. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by root masses in Arroyo San Jose. Root masses 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.

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The mean percent canopy density for the stream was 83%. Reach 1 had a canopy density of 83.1%, and Reach 2 had a canopy density of 47%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 56% and 58%, 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 San Jose should be managed as an anadromous, natural production stream.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

RECOMMENDATIONS

- 1) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from Root Masses. Adding high quality complexity with woody cover in the pools is desirable.
- 2) 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.
- 3) Access for migrating salmonids should be assessed at all road crossings and dams. Sites of concern should include all ten Dam sites surveyed throughout and upstream of the Marin Country Club Golf Course, the Bel Marin Keys Boulevard Road Bridge and Fairway Drive Road Bridge, the St. Andrew's Drive in-stream Culvert, and the Spyglass Road Ford crossing and the associated upstream crossing (about 2,200 ft upstream). 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.
- 4) 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.
- 5) Arroyo San Jose Creek would benefit from utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This

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would discourage lateral migration of the base flow channel and decrease bank erosion.

- 6) Increase the canopy on Arroyo San Jose Creek, particularly from the Marin Country Club Golf Course upstream to Reach 2, by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.
- 7) The limited water temperature data available suggest that maximum temperatures are above the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

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 Unit #	Memo
0	0001.00	The survey was started upstream of tidal influence.
832	0007.00	There is a culvert on the right bank with a diameter of 3.5 ft.
1,365	0013.00	One sculpin was observed.
1,421	0014.00	There is a culvert on the right bank that was dry and has a diameter of 4 ft.
2,200	0020.00	There is a large boulder apron placed that spans the channel width. It is downstream of Bridge #1 and is a possible fish barrier.
2,220	0021.00	Bridge #1 made of concrete is on Bel Marin Keys Blvd. The width is 55 ft, the height is 6 ft, and the length is 108 ft. The water to sill height is 0.9 ft. It was retaining gravel and downcutting. The bridge is a possible barrier to salmonids.
2,332	0022.00	There was a crew trimming blackberries on the streambanks.
2,409	0023.00	Bridge #2 made of concrete and steel is a park footbridge at the Marin Humane Society. The width is 56 ft, the height is 14 ft, and the length is 25 ft. The water to sill height is not applicable. It was not retaining gravel (there is a natural bottom) or downcutting. The bridge is not a barrier to salmonids because it has a natural bottom.
2,409	0023.00	Bridge #2 38.06896 122.53610

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Position	Habitat Unit #	Memo
2,434	0024.00	There is a metal pipe with a 3 inch diameter that crosses the stream at the top of the unit.
2,876	0025.00	Dam #1 has length 3 ft, height 0.5 ft, and full width 11 ft. It has no flashboards but the opening is 3 ft. The dam was retaining gravel but not downcutting. The sill to water level is not applicable. The dam is not a possible barrier to juvenile or adult salmonids.
2,876	0025.00	Dam #1 38.06855 122.53748
2,966	0029.00	Bridge #3 made of wood and steel is a railroad bridge. The width is 46 ft, the height is 10 ft, and the length is 28 ft. The water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. There are wooden pilings that are rotting around water level. The bridge is not a barrier to salmonids because it has a natural bottom.
2,966	0029.00	Bridge #3 38.06853 122.53790
3,195	0032.00	Bridge #4, which is Highway 101, is made of concrete. The width is 36 ft, the height is 7.5 ft, and the length is 251 ft. The water to sill height is not applicable. It was not retaining gravel (there is a natural bottom) or downcutting. The bridge is not a barrier to salmonids because it has a natural bottom.
3,195	0032.00	Bridge #4 38.06797 122.53886
3,446	0033.00	One California roach and some possible salmonids were observed.
3,926	0037.00	There is a culvert with a 3 ft diameter that was dry and is on the right bank.
4,267	0041.00	Tributary #1 on the right bank is an unnamed tributary that enters Arroyo San Jose. It was dry with a discharge of 0 cubic feet per second (cfs). It contributes 0% of its flow to the stream. It is accessible to fish (confirmed by checking 50 ft up the tributary). The tributary slope is unknown and no fish were observed at the time.
4,267	0041.00	Tributary #1 on the right bank 38.06823 122.54185
5,195	0054.00	Bridge #5 made of cement is a public road, Ignacio Blvd. The width is 22 ft, the height is 8 ft, and the length is 114 ft. The water to sill height is not applicable (it is dry). The bridge was not retaining gravel (it has a natural bottom) or downcutting. It is not a possible barrier to salmonids.
5,195	0054.00	Bridge #5 38.06726 122.54477
5,309	0055.00	The banks at this location are cement and form a trapezoid channel.
5,309	0055.00	Tributary #2 on the right bank is unnamed and enters Arroyo San Jose. It was flowing and had a discharge of about 1 cfs. The slope is unknown. The tributary is accessible to fish but no fish were observed at the time.

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Position	Habitat Unit #	Memo
5,444	0056.00	Dam #2 is 135 ft upstream of Bridge #5. The length is 14 ft, the height is 6 ft, and the full width is 24 ft. It does not have flashboards. The sill to water level is not applicable. The dam was retaining gravel but was not downcutting. It is a possible barrier to juvenile and adult salmonids.
7,103	0071.00	Dam #3 has a length of 5 ft, height of 1 ft, and an entire width of 24 ft. The sill to water level is not applicable. It does not have flashboards. The dam was not downcutting.
7,103	0071.00	The downstream edge of Dam #3 38.06842 122.55028
7,246	0075.00	Dam #4 has a length of 63 ft, a height of 6 ft, and an entire width of 27 ft. The length includes a 40 ft boulder apron downstream of the dam. The dam does not have flashboards, and the sill to water level is not applicable. It was not retaining gravel or downcutting. The dam is a possible barrier to juvenile and adult salmonids.
7,246	0075.00	Dam #4 38.06868 122.55093
7,309	0076.00	Several dead crayfish were observed. The channel is choked with algae and silt at this location.
7,502	0079.00	Tributary #3, Ignacio Creek, is on the left bank and enters Arroyo San Jose 29 feet into the unit. It was not flowing and the discharge was 0 cfs. It contributes 0% of its flow to the stream. The slope is unknown. The tributary is accessible to fish (confirmed by checking 400 ft up the tributary). A few minnows and a roach were observed in a small pool.
7,502	0079.00	Tributary #3 on the left bank 38.06858 122.55184
8,250	0085.00	The channel is choked with mint plants.
8,407	0088.00	A concrete trapezoid channel begins 48 ft into unit 88 and ends at the upstream edge of unit 90.
8,591	0089.00	Bridge #6 made of cement is a public road, Alameda de la Loma Ave. The width is 16 ft, the height is 8 ft, and the length is 91 ft. The water to sill height is not applicable. It was not retaining gravel or downcutting. The bridge is not a barrier to salmonids because it has a natural bottom.
8,591	0089.00	Bridge #6 38.06684 122.55454
8,682	0090.00	There is a 2 inch pipe shooting water up from the bottom of the concrete trapezoid channel.
9,274	0097.00	There is a trapezoid, concrete structure with outcrops that precedes Bridge #7 and is used to slow waterflow.
9,373	0098.00	Bridge #7 made of concrete is a public road, Fairway Drive. The width is 17 ft, the height is 8 ft, the length is 154 ft, and the water to sill height is 5 ft. It was not retaining gravel or downcutting. The bridge is a possible barrier to salmonids.

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Position	Habitat Unit #	Memo
9,373	0098.00	Bridge #7 38.06665 122.55717
9,527	0099.00	Unit 99 is a spillway below Dam #5.
9,579	0100.00	Dam #5 holds back water to create a golf course pond. It is 52 ft upstream of Bridge #7. The length is 7 ft, the height is 8 ft, and the entire width is 65 ft. There are no flashboards but the opening width is 43 ft. The sill to water level is not applicable. The dam was not downcutting. It is a possible barrier to juvenile and adult salmonids.
9,586	0101.00	This unit is a golf course pond (dammed pool). It was not fully surveyed due to extreme length, width, and depth.
10,576	0102.00	Dam #6 creates a golf course pond. The length is 4 ft, the height is 6 ft, and the entire width is 35 ft. There are no flashboards but the opening is 25 ft. The sill to water level is not applicable. It is unknown whether the dam was retaining gravel, but it was not downcutting. The dam is a possible barrier to juvenile and adult salmonids.
10,576	0102.00	Dam #6 38.06504 122.56005
10,580	0103.00	Unit 103 is a shallow golf course pond.
10,771	0104.00	Bridge #8 composed of wood and metal is a golf course footbridge. It is 191 ft upstream of Dam #6. The width is 95 ft, the height is 13 ft, the length is 4 ft, and the water to sill height is not applicable. It was not retaining gravel or downcutting. The bridge is not a barrier to salmonids because it has a natural bottom.
10,775	0105.00	This habitat unit is another golf course pond. It was not fully surveyed due to extreme length, width, and depth.
10,775	0105.00	Tributary #4 on the right bank is unnamed and enters Arroyo San Jose. There was minimal flow, and the mouth was choked with vegetation. It is accessible to fish (confirmed by checking 60 ft up the tributary). The slope is unknown. No fish were observed at the time.
11,131	0106.00	Dam #7 has flashboards and has a length of 5 ft, a height of 5.5 ft, and an entire width of 32 ft. The water to sill height is not applicable. The dam was retaining gravel but was not downcutting. It is a possible barrier to juvenile and adult salmonids.
11,131	0106.00	Dam #7 38.06470 122.56182
11,132	0107.00	This unit is another golf course pond. It was not fully surveyed due to extreme length, width, and depth.
11,132	0107.00	3 Western Pond Turtles were observed.
11,745	0108.00	Bridge #9 made of concrete and metal is a golf course footbridge. The width is 27 ft, the height is 4 ft, the length is 8 ft, and the water to sill height is not applicable. It was not retaining gravel or downcutting. The bridge is not a barrier to salmonids because it has

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Position	Habitat Unit #	Memo
		an natural bottom.
11,745	0108.00	Bridge #9 38.06389 122.56355
11,768	0110.00	Dam #8 creates a golf course pond and is located 15 ft upstream of Bridge #9. The length is 0.5 ft, the height is 4 ft, and the entire width is 27 ft. The sill to water level is not applicable. The dam has flashboards present. It was retaining gravel but was not downcutting. The dam is a possible barrier to juvenile and adult salmonids.
11,768	0111.00	This unit is another golf course pond. It was not fully surveyed due to extreme length, width, and depth.
11,768	0111.00	A river otter was observed.
11,923	0112.00	Bridge #10 made of wood and metal is a golf course footbridge. It is located 175.5 ft upstream of Bridge #9. The width is 100 ft, the height is 13 ft, the length is 5 ft, and the water to sill height is not applicable. It was not retaining gravel or downcutting. The bridge is not a barrier to salmonids because it has a natural bottom.
11,928	0113.00	This unit is another golf course pond. It was not fully surveyed due to extreme length, width, and depth.
11,928	0113.00	One unidentified fish and mallards ducks were observed.
12,501	0115.00	Dam #9 creates a golf course pond. The length is 0.5 ft, the height is 4 ft, and the entire width is 27 ft. The will to water level is not applicable. There are flashboards present. The dam was not retaining gravel or downcutting. It is a possible barrier to juvenile and adult salmonids.
12,501	0115.00	Dam #9 38.06283 122.56570
12,547	0117.00	This unit is another golf course pond. It was not fully surveyed due to extreme length, width, and depth. The channel is also choked with aquatic plants.
12,547	0117.00	Mallard ducks were observed.
12,950	0119.00	Bridge #11 made of wood is a golf course footbridge. The width is 31 ft, the height is 4 ft, the length is 4 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downutting. The bridge is not a barrier to salmonids.
12,950	0119.00	Bridge #11 38.06222 122.56743
13,155	0121.00	Bridge #12 made of stone and cement is a golf course footbridge. The width is 19 ft, the height is 6 ft, the length is 6 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. The bridge is not a barrier to salmonids.
13,155	0121.00	Bridge #12 38.06250 122.56878

Arroyo San Jose

Position	Habitat Unit #	Memo
13,350	0123.00	Bridge #13 made of steel and concrete is a golf course footbridge. The top edge of the bridge is located 200 ft upstream of Bridge #12. The width is 24 ft, the height is 5 ft, the length is 11 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. The bridge is not a barrier to salmonids.
13,361	0124.00	Dam #10 creates a golf course pond and is located 200 ft upstream from Bridge #12. The length is 0.5 ft, the height is 2.6 ft, the entire width is 16 ft, and the sill to water level is not applicable. There are flashboards present. The dam was not retaining gravel or downcutting. It is a possible barrier to juvenile and adult salmonids.
14,135	0128.00	Bridge #14 made of cement and metal is a golf course footbridge. The width is 32 ft, the height is 3.5 ft, the length is 20 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. The bridge is not a barrier to salmonids.
14,135	0128.00	Bridge #14 38.06250 122.57214
14,426	0130.00	Bridge #15 made of cement is a public road, Capilano Drive. The width is 13 ft, the height is 3 ft, the length is 90 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. The bridge is not a barrier to salmonids.
14,426	0130.00	Bridge #15 38.06224 122.57338
14,628	0132.00	Bridge #16 made of wood is a golf course footbridge. The width is 30 ft, the height is 3 ft, the length is 4 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. The bridge is not a barrier to salmonids.
14,628	0132.00	Bridge #16 38.06215 122.57371
14,889	0134.00	Bridge #17 made of cement and steel is a golf course footbridge. The width is 44 ft, the height is 4 ft, the length is 8 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. The bridge is not a barrier to salmonids.
14,889	0134.00	Bridge #17 38.06160 122.57442
15,890	0136.00	Bridge #18. made of cement and steel is a golf course footbridge. The width is 27 ft, the height is 4 ft, the length is 9 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. The bridge is not a barrier to salmonids.
15,890	0136.00	Bridge #18 38.06118 122.57779
15,899	0137.00	The golf course ends 392 ft into the unit.

Arroyo San Jose

Position	Habitat Unit #	Memo
16,366	0138.00	Culvert #1, an instream concrete box culvert in good condition, is on St. Andrews Drive. The height is 5 ft, the width is 6 ft, the length is 141 ft, the diameter is 6 ft, and the plunge height is not applicable. The slope is also not applicable. The max depth within 5 ft of the outlet is not applicable, because the culvert was dry. There was 1 to 3 ft of gravel accumulation inside the culvert at the time. The culvert is not a barrier to juvenile or adult salmonids.
16,366	0138.00	Culvert #1 38.06139 122.57967
16,507	0139.00	Tributary #5 on the left bank is unnamed and enters Arroyo San Jose 315 feet into the unit. It was dry at the time, so the discharge was 0 cfs, and it contributed 0% of its flow to the stream. The slope is unknown. It is accessible to fish (confirmed by checking 100 ft up the tributary). No fish were observed at the time.
16,507	0139.00	Tributary #5 on the left bank 38.06252 122.58145
17,307	0140.00	Bridge #19 is a ford crossing made of natural bottom at a private road, Spyglass Road. The width is 20 ft, the height is 0 ft, and length is 10 ft, and the water to sill height is not applicable. It was not retaining gravel or downcutting. The bridge is not a barrier to salmonids.
17,307	0140.00	Bridge #19 38.06248 122.58200
18,134	0143.00	The length of the unsurveyed portion of the unit measured approximately 196 feet from the bank. There was dense willows on the banks and in the streams.
18,330	0144.00	The banks are being stabilized with erosion control netting starting 200 ft into the unit.
18,330	0144.00	Tributary #6 on the right bank is unnamed and enters Arroyo San Jose 1,026 ft into the unit. It was dry at the time, so the discharge was 0 cfs, and it contributed 0% of its flow to the stream. It is accessible to fish (confirmed by checking 100 ft up the tributary). The slope is unknown. No fish were observed at the time.
18,330	0144.00	Tributary #6 on the right bank 38.06205 122.58829
19,507	0145.00	Bridge #20 is a ford crossing/footpath. The width is 16 ft, the height is 0 ft, the length is 5 ft, and the water to sill height is not applicable. It was not retaining gravel (it has a natural bottom) or downcutting. The bridge is not a barrier to salmonids.
19,507	0145.00	Bridge #20 38.06210 122.58907
19,512	0146.00	Tributary #7 on the right bank is unnamed and enters Arroyo San Jose 668 ft into the unit. It was dry at the time, so the discharge was 0 cfs, and it contributed 0% its flow to the stream. The tributary is accessible to fish. The slope is unknown. No fish were observed at the time.

Arroyo San Jose

Position	Habitat Unit #	Memo
19,512	0146.00	Tributary #7 on the right bank 38.06298 122.59086
20,641	0146.00	The survey ended due to a 25 to 30 ft dry waterfall.

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.

Arroyo San Jose

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 }

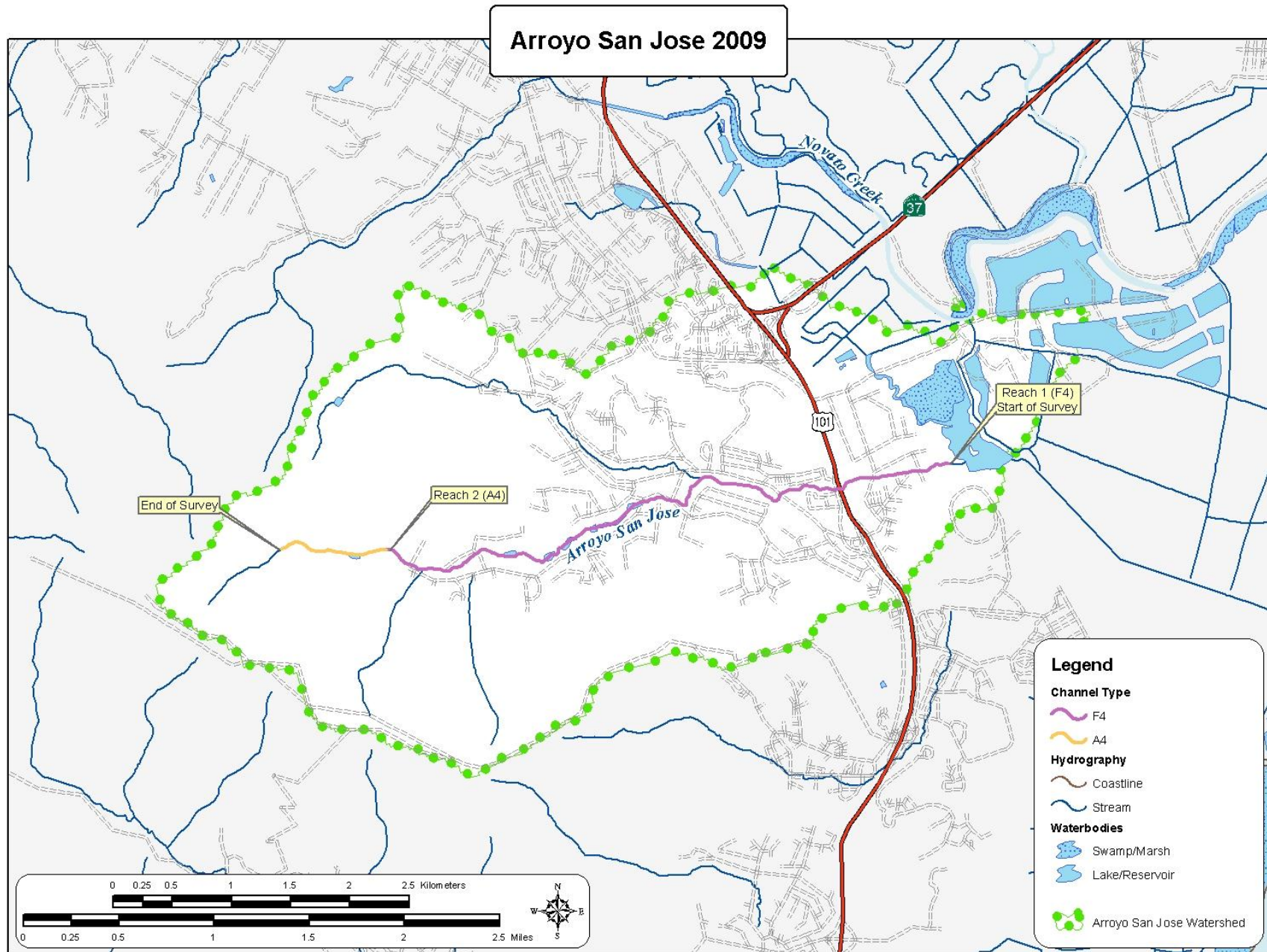
BACKWATER POOLS

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 marsh	(MAR)	[9.1]	

Arroyo San Jose



Arroyo San Jose

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

Stream Name: Arroyo San Jose

LLID: 1225255380815

Drainage: Novato

Survey Dates: 7/14/2009 to 7/16/2009

Confluence Location: Quad: NOVATO

Legal Description: T03NR06WS21

Latitude: 38:04:51.8N

Longitude: 122:31:38.8W

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
13	12	RIFFLE	8.9	50	650	3.1	8.1	0.2	0.3	322	4189	58	751		
47	47	FLATWATER	32.2	129	6077	29.4	9.4	0.9	1.7	1391	65386	1903	89422		28
34	29	POOL	23.3	139	4722	22.9	15.1	1.3	3.2	1214	41281	1507	47709	1273	31
19	0	DRY	13.0	399	7590	36.8									
31	0	CULVERT	21.2	39	1198	5.8									
2	0	NOSURVEY	1.4	202	404	2.0									
Total Units	Total Units Fully Measured				Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)		
146	88				20641						110856		137882		

Arroyo San Jose

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Arroyo San Jose

LLID: 1225255380815

Drainage: Novato

Survey Dates: 7/14/2009 to 7/16/2009

Confluence Location: Quad: NOVATO

Legal Description: T03NR06WS21

Latitude: 38:04:51.8N

Longitude: 122:31:38.8W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
10	10	LGR	6.8	55	553	2.7	7.0	0.2	0.8	363	3635	67	670			86
1	1	HGR	0.7	20	20	0.1	16.0	0.1	0.2	32	32	3	3			73
2	1	BRS	1.4	38	77	0.4	8.0	0.1	0.1	200	400	20	40			67
27	27	GLD	18.5	154	4166	20.2	11.0	1.1	5.1	1981	53486	2969	80165		29	84
12	12	RUN	8.2	91	1087	5.3	6.0	0.5	2.6	491	5896	262	3143		28	83
8	8	SRN	5.5	103	824	4.0	9.0	0.6	4.0	751	6004	764	6114		25	89
17	17	MCP	11.6	66	1125	5.5	14.0	1.2	4.9	954	16214	1324	22507	1103	37	86
1	1	CRP	0.7	115	115	0.6	15.0	1.0	2.1	1725	1725	2070	2070	1725	45	76
5	5	LSR	3.4	71	356	1.7	14.0	1.8	5.4	960	4798	2055	10277	1837	22	88
2	2	LSBo	1.4	80	159	0.8	13.0	1.3	3.2	1164	2328	2148	4296	1817	18	90
2	2	PLP	1.4	33	66	0.3	18.0	0.9	2.7	613	1226	771	1543	536	10	66
7	2	DPL	4.8	414	2901	14.1	22.0			4460	31220					2
19	0	DRY	13.0	399	7590	36.8										94
31	0	CUL	21.2	39	1198	5.8										
2	0	NS	1.4	202	404	2.0										
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)				
146	88				20641					126963		130828				

Arroyo San Jose

Table 3 - Summary of Pool Habitat Types

Stream Name: Arroyo San Jose

LLID: 1225255380815

Drainage: Novato

Survey Dates: 7/14/2009 to 7/16/2009

Confluence Location: Quad: NOVATO

Legal Description: T03NR06WS21

Latitude: 38:04:51.8N

Longitude: 122:31:38.8W

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
17	17	MAIN	50	66	1125	24	14.5	1.2	954	16214	1103	18749	37
10	10	SCOUR	29	70	696	15	14.6	1.4	1008	10077	1562	15617	21
7	2	BACKWATER	7	414	2901		22.5		4460	31220		0	
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
34	29				4722					57511		34366	

Arroyo San Jose

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

Stream Name: Arroyo San Jose

LLID: 1225255380815

Drainage: Novato

Survey Dates: 7/14/2009 to 7/16/2009

Confluence Location: Quad: NOVATO

Legal Description: T03NR06WS21

Latitude: 38:04:51.8N

Longitude: 122:31:38.8W

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
17	MCP	63	0	0	1	6	6	35	7	41	3	18
1	CRP	4	0	0	0	0	1	100	0	0	0	0
5	LSR	19	0	0	0	0	1	20	2	40	2	40
2	LSBo	7	0	0	1	50	0	0	1	50	0	0
2	PLP	7	0	0	0	0	2	100	0	0	0	0
0	DPL	0	0	0	0	0	0	0	0	0	0	0
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
27			0	0	2	7	10	37	10	37	5	19
Mean Maximum Residual Pool Depth (ft.):			3									

Arroyo San Jose

Table 5 - Summary of Mean Percent Cover By Habitat

Stream Name:		Arroyo San Jose		Dry Units:		19		LLID:		1225255380815		Drainage:		Novato							
Survey Dates:		7/14/2009 to 7/16/2009																			
Confluence Location: Quad:				NOVATO				Legal Description:				T03NR06WS21		Latitude:		38:04:51.8N		Longitude:		122:31:38.8W	
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										
10	0	LGR																			
1	0	HGR																			
2	0	BRS																			
13	0	TOTAL RIFFLE																			
27	14	GLD	22	0	0	26	25	9	0	19	0										
12	3	RUN	0	0	0	8	25	33	0	33	0										
8	2	SRN	35	0	0	10	5	0	0	0	0										
47	19	TOTAL FLAT	20	0	0	21	23	12	0	19	0										
17	15	MCP	25	0	0	22	23	11	0	20	0										
1	1	CRP	50	0	0	50	0	0	0	0	0										
5	5	LSR	17	0	0	77	0	6	0	0	0										
2	2	LSBo	0	0	0	0	0	0	0	50	50										
2	2	PLP	0	0	0	0	0	0	0	100	0										
7	0	DPL																			
34	25	TOTAL POOL	20	0	0	31	14	8	0	24	4										
31	0	CUL																			
2	0	NS																			
146	44	TOTAL	20	0	0	27	18	9	0	22	2										

Arroyo San Jose

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Arroyo San Jose **Dry Units:** 19 **LLID:** 1225255380815 **Drainage:** Novato

Survey Dates: 7/14/2009 to 7/16/2009

Confluence Location: Quad: NOVATO **Legal Description:** T03NR06WS21 **Latitude:** 38:04:51.8N **Longitude:** 122:31:38.8W

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
10	9	LGR	0	0	44	11	22	11	11
1	1	HGR	0	0	0	0	0	100	0
2	0	BRS	0	0	0	0	0	0	0
27	21	GLD	10	62	29	0	0	0	0
12	8	RUN	13	0	63	0	0	13	13
8	8	SRN	0	13	50	13	13	13	0
17	17	MCP	18	65	12	0	6	0	0
1	1	CRP	0	100	0	0	0	0	0
5	5	LSR	0	60	40	0	0	0	0
2	2	LSBo	0	100	0	0	0	0	0
2	2	PLP	0	50	50	0	0	0	0
7	2	DPL	50	50	0	0	0	0	0
31	0	CUL	0	0	0	0	0	0	0
2	0	NS	0	0	0	0	0	0	0

Arroyo San Jose

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Arroyo San Jose

LLID: 1225255380815

Drainage: Novato

Survey Dates: 7/14/2009 to 7/16/2009

Confluence Location: Quad: NOVATO

Legal Description: T03NR06WS21

Latitude: 38:04:51.8N

Longitude: 122:31:38.8W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
83	3	97	1	56	58

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.

Arroyo San Jose

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Arroyo San Jose LLID: 1225255380815 Drainage: Novato
 Survey Dates: 7/14/2009 to 7/16/2009 Survey Length (ft.): 20641 Main Channel (ft.): 20641 Side Channel (ft.): 0
 Confluence Location: Quad: NOVATO Legal Description: T03NR06WS21 Latitude: 38:04:51.8N Longitude: 122:31:38.8W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4	Canopy Density (%): 83.1	Pools by Stream Length (%): 27.3
Reach Length (ft.): 17307	Coniferous Component (%): 3.2	Pool Frequency (%): 24.5
Riffle/Flatwater Mean Width (ft.): 9.3	Hardwood Component (%): 96.8	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 7.4
Range (ft.): 13.00 to 33.00	Vegetative Cover (%): 56.4	2 to 2.9 Feet Deep: 37.0
Mean (ft.): 20.61	Dominant Shelter: Root masses	3 to 3.9 Feet Deep: 37.0
Std. Dev.: 5.59	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 18.5
Base Flow (cfs): 0.11	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.): 3.20
Water (F): 61 - 64 Air (F): 76 - 84	LWD per 100 ft.:	Mean Pool Shelter Rating: 31
Dry Channel (ft.): 4679	Riffles: 0	
	Pools: 0	
	Flat: 0	
Pool Tail Substrate (%): Silt/Clay: 3.7 Sand: 22.2 Gravel: 63.0 Sm Cobble: 3.7 Lg Cobble: 3.7 Boulder: 0.0 Bedrock: 3.7		
Embeddedness Values (%): 1. 0.0 2. 7.4 3. 37.0 4. 51.9 5. 3.7		

STREAM REACH: 2

Channel Type: A4	Canopy Density (%): 47.0	Pools by Stream Length (%): 0.0
Reach Length (ft.): 3334	Coniferous Component (%): 0.0	Pool Frequency (%): 0.0
Riffle/Flatwater Mean Width (ft.): 3.0	Hardwood Component (%): 100.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep:
Range (ft.): 15.00 to 33.00	Vegetative Cover (%): 95.0	2 to 2.9 Feet Deep:
Mean (ft.): 17.57	Dominant Shelter:	3 to 3.9 Feet Deep:
Std. Dev.: 6.30	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep:
Base Flow (cfs):	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.):
Water (F): 0 - 0 Air (F): 0 - 0	LWD per 100 ft.:	Mean Pool Shelter Rating:
Dry Channel (ft.): 2911	Riffles:	
	Pools:	
	Flat: 0	
Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:		
Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0		

Arroyo San Jose

Table 9 -Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Arroyo San Jose

LLID: 1225255380815 **Drainage:** Novato

Survey Dates: 7/14/2009 to 7/16/2009

Confluence Location: Quad: NOVATO

Legal Description: T03NR06WS21

Latitude: 38:04:51.8N

Longitude: 122:31:38.8W

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	4	5	5.8
Boulder	9	7	10.3
Cobble/Gravel	0	0	0.0
Sand/Silt/Clay	65	66	84.0

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	4	4.5
Brush	15	12	17.3
Hardwood Trees	54	57	71.2
Coniferous Trees	1	0	0.6
No Vegetation	5	5	6.4

Total Stream Cobble Embeddedness Values: 4

Arroyo San Jose

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

Stream Name: Arroyo San Jose

LLID: 1225255380815 **Drainage:** Novato

Survey Dates: 7/14/2009 to 7/16/2009

Confluence Location: Quad: NOVATO

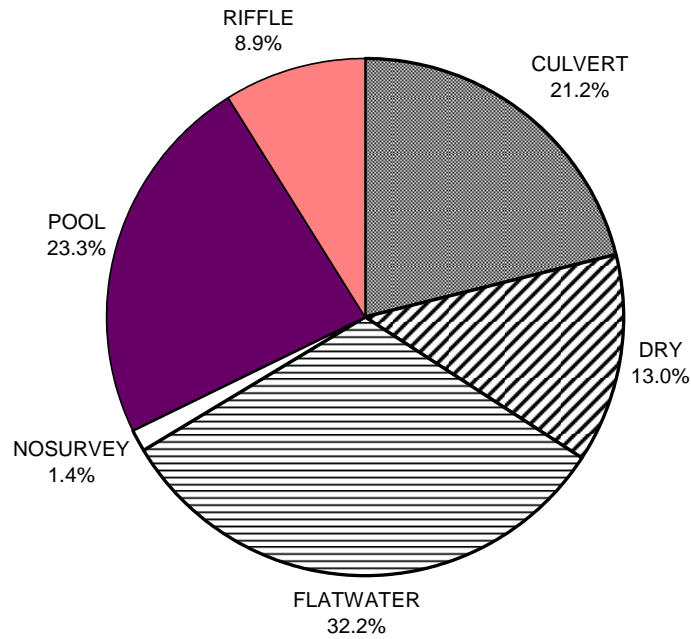
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Latitude: 38:04:51.8N

Longitude: 122:31:38.8W

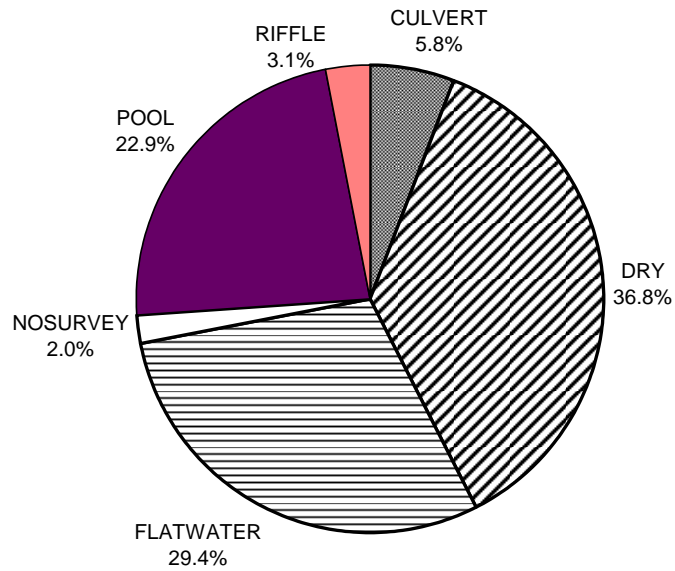
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)		20	20
SMALL WOODY DEBRIS (%)		0	0
LARGE WOODY DEBRIS (%)		0	0
ROOT MASS (%)		21	31
TERRESTRIAL VEGETATION (%)		23	14
AQUATIC VEGETATION (%)		12	8
WHITEWATER (%)		0	0
BOULDERS (%)		19	24
BEDROCK LEDGES (%)		0	4

**SAN JOSE, ARROYO 2009
HABITAT TYPES BY PERCENT OCCURRENCE**



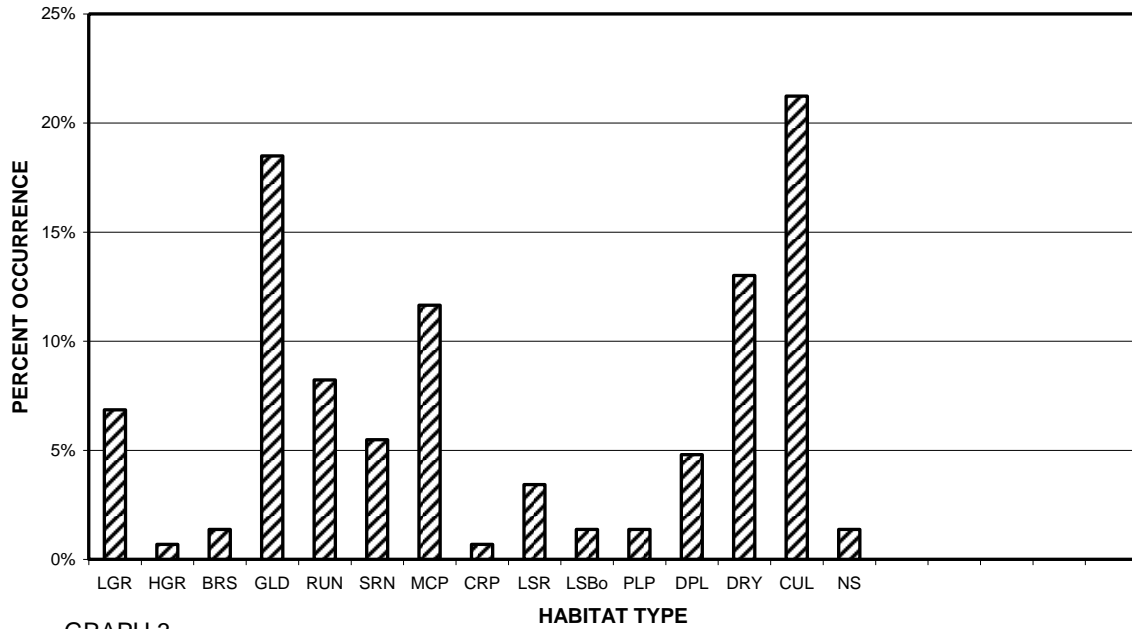
GRAPH 1

**SAN JOSE, ARROYO 2009
HABITAT TYPES BY PERCENT TOTAL LENGTH**



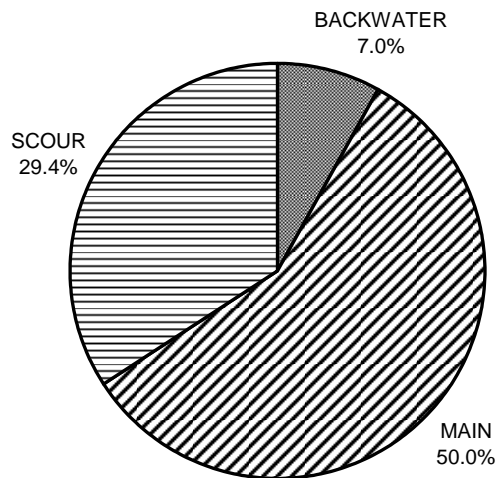
GRAPH 2

**SAN JOSE, ARROYO 2009
HABITAT TYPES BY PERCENT OCCURRENCE**



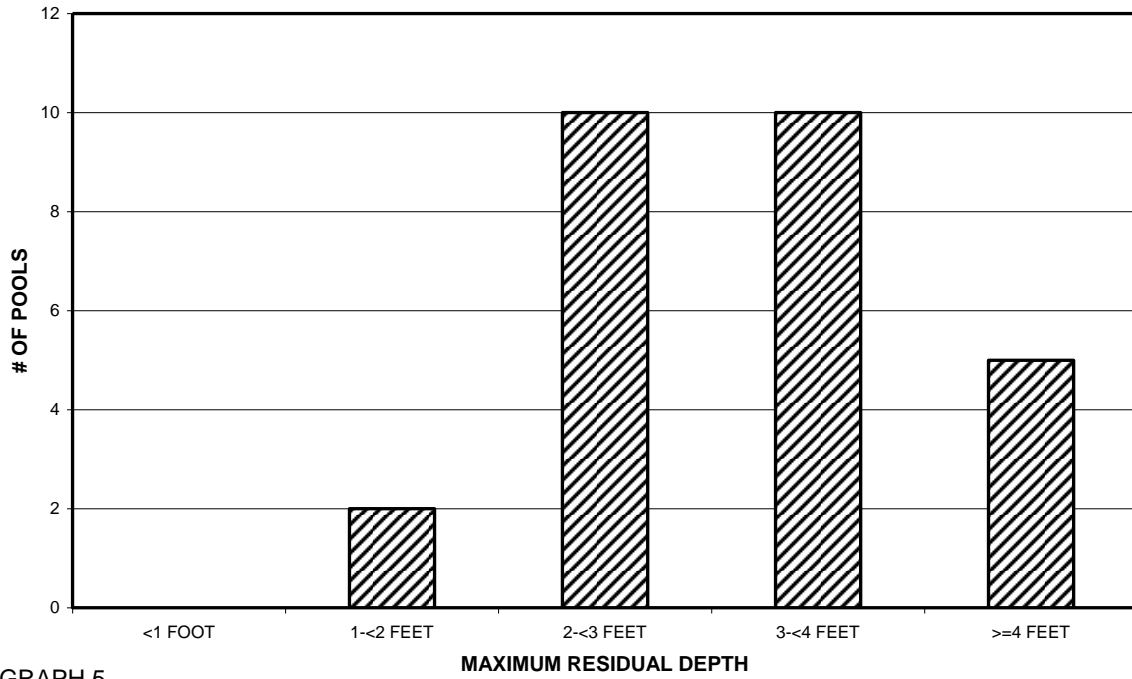
GRAPH 3

**SAN JOSE, ARROYO 2009
POOL TYPES BY PERCENT OCCURRENCE**



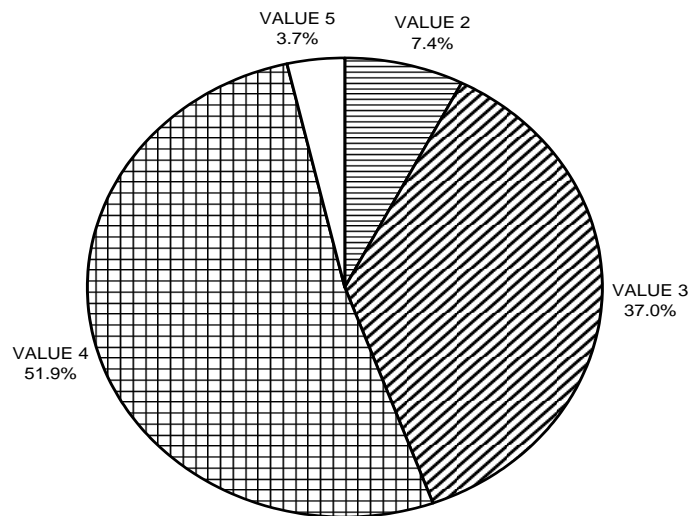
GRAPH 4

**SAN JOSE, ARROYO 2009
MAXIMUM DEPTH IN POOLS**



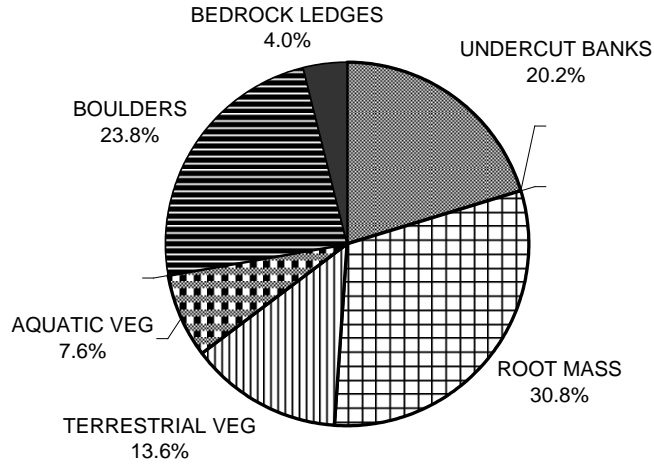
GRAPH 5

**SAN JOSE, ARROYO 2009
PERCENT EMBEDDEDNESS**



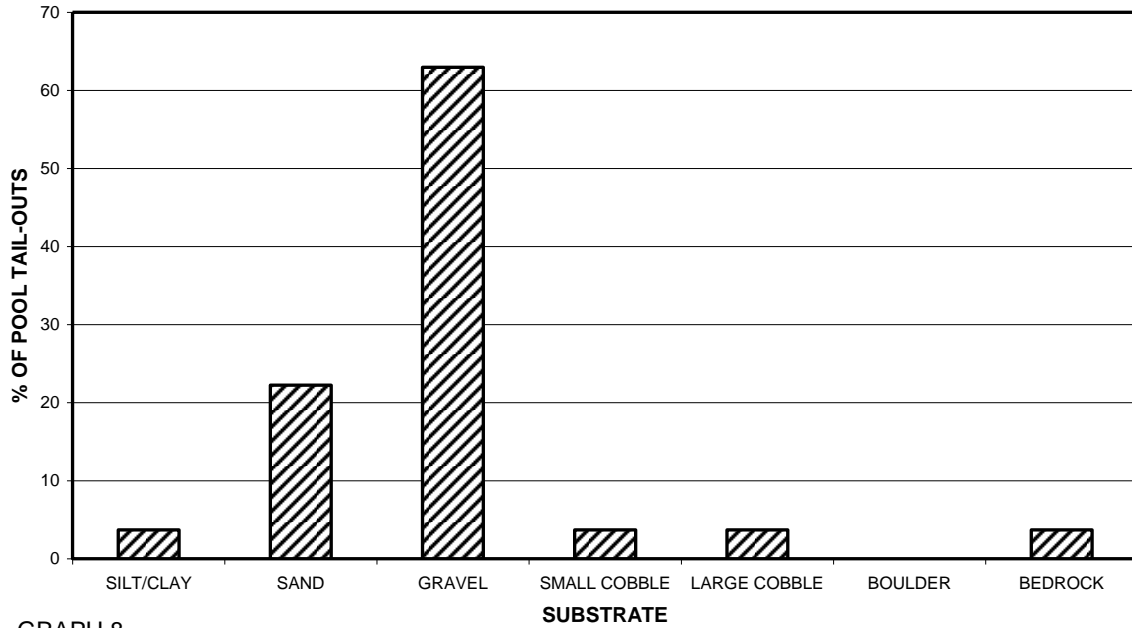
GRAPH 6

**SAN JOSE, ARROYO 2009
MEAN PERCENT COVER TYPES IN POOLS**



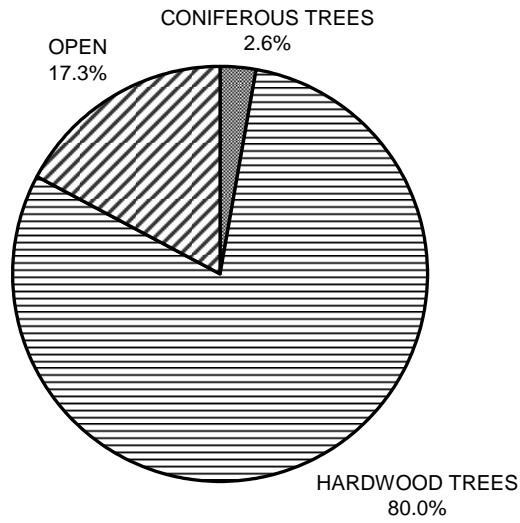
GRAPH 7

**SAN JOSE, ARROYO 2009
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



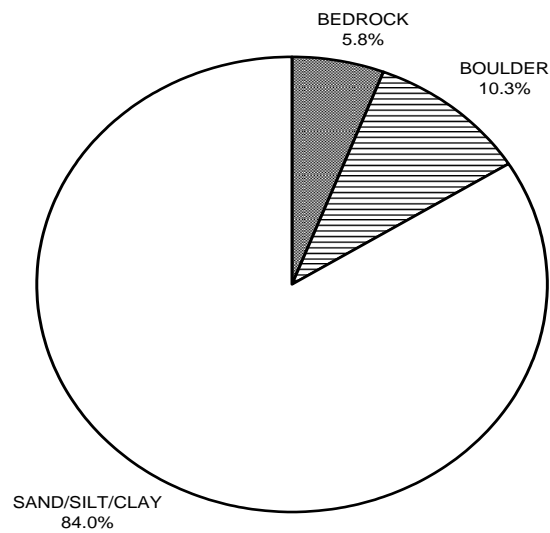
GRAPH 8

**SAN JOSE, ARROYO 2009
MEAN PERCENT CANOPY**



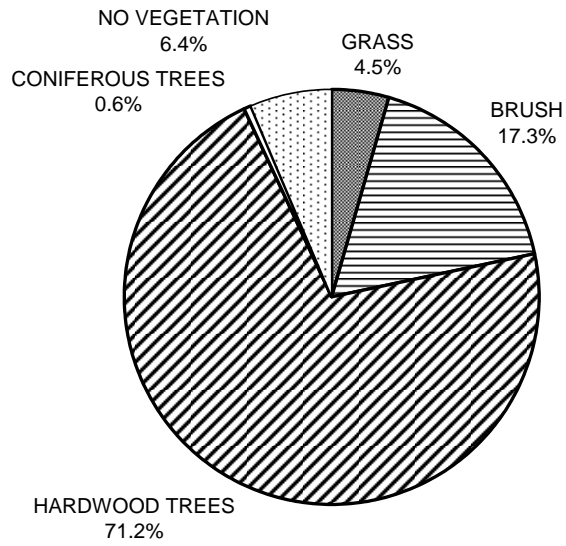
GRAPH 9

**SAN JOSE, ARROYO 2009
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**SAN JOSE, ARROYO 2009
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11