California Department of Fish and Wildlife
San Mateo County
San Mateo Coastal Watersheds
Stream Habitat Assessment Reports

Arroyo Leon Creek

Surveyed 2011

Report Completed in 2013

STREAM INVENTORY REPORT

Arroyo Leon

INTRODUCTION

A stream inventory was conducted 5/16/2011 to 6/8/2011 on Arroyo Leon. The survey began at the confluence with Pilarcitos Creek and extended upstream 7 miles.

The Arroyo Leon inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Arroyo Leon. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for 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 Leon is located in San Mateo County, California (Map 1). It is a tributary to Pilarcitos Creek, which flows into Half Moon Bay, which flows into Pacific Ocean. Arroyo Leon's legal description at the confluence with Pilarcitos Creek is T05S R05W Sec.29. Its location is 37.4652 north latitude and 122.4253 west longitude, LLID number 1224253374652. Arroyo Leon is a third order stream and has approximately 6.5 miles of blue line stream according to the USGS National Hydrology Dataset (NHD). Arroyo Leon drains a watershed of approximately 8.6 square miles. Elevations range from about 59 feet at the mouth of the creek to 2,057 feet in the headwater areas. Grasslands or Herbaceous vegetation dominates the watershed. The watershed is primarily privately owned, which accounts for 73% of the land area. Ninety-seven percent of the land is considered natural, 1% is urban, and 1% is agricultural. Vehicle access to the confluence of the watershed exists at the intersection of San Benito Street and Mill Street in the city of Half Moon Bay, Ca. Further access to the watershed exists via Higgins Canyon Road.

METHODS

The habitat inventory conducted in Arroyo Leon 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.

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

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Arroyo Leon, 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 Leon, 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 Leon, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Arroyo Leon, 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 Leon. In addition, 3 sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

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

- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Arroyo Leon 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 5/16/2011 to 6/8/2011, was conducted by D. Dela Vega, J. Hanson (CCC)/(WSP)The total length of the stream surveyed was 36,963 feet with an additional 437 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.713 cfs on May 17, 2011, and 1.246 cfs on June 9, 2011.

Arroyo Leon is a F4 channel type for 6,388 feet of the stream surveyed (Reach 1), a C4 channel type for 4,699 feet of the stream surveyed (Reach 2), a F4 channel type for 4,429 feet of the stream surveyed (Reach 3), a NA channel type for 2,854 feet of the stream surveyed (Reach 4), a F4 channel type for 2,560 feet of the stream surveyed (Reach 5), a A1 channel type for 902 feet of the stream surveyed (Reach 6), a F4 channel type for 1,707 feet of the stream surveyed (Reach 7), a B1 channel type for 705 feet of the stream surveyed (Reach 8), a F3 channel type for 739 feet of the stream surveyed (Reach 9), a G1 channel type for 200 feet of the stream surveyed (Reach 10), a F4 channel type for 4,772 feet of the stream surveyed (Reach 11), a G2 channel type for 2,849 feet of the stream surveyed (Reach 12), a A2 channel type for 4,596 feet of the stream surveyed (Reach 13). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width to depth ratios, and gravel-dominant substrates. C4 channels are meandering point-bar, riffle/pool, alluvial channels with broad well-defined floodplain on low gradients, and gravel-dominant substrates. A1 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and stable bedrock-dominant substrates. B1 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks, and bedrock-

dominant substrates. F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width to depth ratios, and cobble-dominant substrates. G1 channels are entrenched 'gully' step-pool channels on moderate gradients with low width to depth ratios, very stable with bedrock-dominant substrates. G2 channels are entrenched 'gully' step-pool channels on moderate gradients with low width to depth ratios, and boulder-dominant substrates. A2 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and boulder-dominant substrates. NA channels had no access.

Water temperatures taken during the survey period ranged from 49 to 54 degrees Fahrenheit. Air temperatures ranged from 50 to 63 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% pool units, 34% flatwater units, 19% riffle units, 2% culvert units, 0% dry units, and 0% not surveyed units (Graph 1). Based on total length of Level II habitat types, there were 52% flatwater units, 26% pool units, 14% riffle units, 8% not surveyed units, 1% culvert units, and 0% dry units (Graph 2).

Twenty Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 21% step run units, 14% low gradient riffle units, and 12% mid-channel pool units (Graph 3). Based on percent total length, 40% step run units, 10% step pool units, and 10% low gradient riffle units.

A total of 256 pools were identified (Table 3). Scour pools were the most frequently encountered at 51% (Graph 4), and comprised 37% 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. Twelve of the 256 pools (5%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 256 pool tail-outs measured, 111 had a value of 1 (43%), 110 had a value of 2 (43%), 21 had a value of 3 (8%), 1 had a value of 4 (0%), 8 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 26, flatwater habitat types had a mean shelter rating of 25, and pool habitats had a mean shelter rating of 47 (Table 1). Of the pool types, the backwater pools had a mean shelter rating of 23, main channel pools had a mean shelter rating of 37, and scour pools had a mean shelter rating of 58 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks is the dominant cover type in Arroyo Leon. Graph 7 describes the pool cover in Arroyo Leon. Undercut banks 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. Gravel substrate was observed in 76% of pool tail-outs; and small cobble substrate was observed in 16% of pool tail-outs.

The mean percent canopy density for the surveyed length of Arroyo Leon was 91%. Of the canopy present, the mean percentages of hardwood and coniferous trees were 97% and 3%, respectively. Nine percent of the canopy was open. Graph 9 describes the mean percent canopy in Arroyo Leon.

For the stream reach surveyed, the mean percent right bank vegetated was 85%. The mean percent left bank vegetated was 84% (Table 7). The dominant elements composing the structure of the stream banks consisted of 73% sand/silt/clay, 14% cobble/gravel, 9% bedrock, and 5% boulder (Graph 10). Brush was the dominant vegetation type observed in 62% of the units surveyed. Additionally, 36% of the units surveyed had deciduous trees as the dominant vegetation type, and 1% had coniferous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted an electrofishing survey at 3 sites for species composition and distribution in Arroyo Leon on June 22- 23, 2011. On June 22, water temperatures taken during the electrofishing period of 1030 to 1340 ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 56 to 61 degrees Fahrenheit. On June 23, water temperatures taken during the electrofishing period of 0900 to 1010 ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 65 to 60 degrees Fahrenheit. The sites were sampled by D. Acomb, D. Resnik (CDFW), and D.Dela Vega, J. Hanson (WSP).

In reach 1, 1 site was sampled starting approximately 979 ft from the confluence with Pilarcitos Creek and continuing upstream 600 feet. The reach sites yielded 2 young-of-the-year SH/RT,2 age 1+ SH/RT, 15 age 2+ SH/RT, and 16 three-spine stickleback.

In reach 5, 1 site was sampled starting approximately 18,370 ft from the confluence with Pilarcitos Creek and continuing upstream 600 feet. The reach sites yielded 4 young-of-the-year SH/RT, 4 age 1+ SH/RT, 7 age 2+ SH/RT, and 1 newt.

In reach 12, 1 site was sampled starting approximately 29,955 ft from the confluence with Pilarcitos Creek. The site yielded 4 young-of-the-year SH/RT, 11 age 1+ SH/RT, and 4 age 2+ SH/RT.

The following chart displays the information yielded from these sites:

Arroyo Leon

2011 Arroyo Leon Creek electrofishing observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: F4 Channel Type									
06/23/11	3	20	5.1	979	2	2	15	0	0
Reach 5: F4 Channel Type									
6/22/11	2	259	3.4	18,370	4	4	7	0	0
Reach 12: G2 Channel Type									
06/22/11	1	473	5.1	29,955	4	11	4	0	0

DISCUSSION

Arroyo Leon is a F4 channel type for 6,388 feet of the stream surveyed, a C4 channel type for 4,699 feet of the stream surveyed, a F4 channel type for 4,429 feet of the stream surveyed, a NA channel type for 2,854 feet of the stream surveyed, a F4 channel type for 2,560 feet of the stream surveyed, a A1 channel type for 902 feet of the stream surveyed, a F4 channel type for 1,707 feet of the stream surveyed, a B1 channel type for 705 feet of the stream surveyed, a F3 channel type for 739 feet of the stream surveyed, a G1 channel type for 200 feet of the stream surveyed, a F4 channel type for 4,772 feet of the stream surveyed, a G2 channel type for 2,849 feet of the stream surveyed, a A2 channel type for 4,596 feet of the stream surveyed. The suitability of F4, C4, NA, A1, B1, F3, G1, G2, and A2 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; C4 channel types are good for bank placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; NA channel types were not surveyed and suitability cannot be assessed; A1 channels are generally not suitable for fish habitat improvement projects; B1 channel types are excellent for bank-placed boulders and good for log cover; F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover; G1 channel types are fair for log cover; G2 channel types are fair for log cover; and A2 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days 5/16/2011 to 6/8/2011 ranged from 49 to 54 degrees Fahrenheit. Air temperatures ranged from 50 to 63 degrees Fahrenheit. This is a good water temperature range 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 52% of the total length of this survey, riffles 14%, and pools 26% (44% pool units, 34% flatwater units, 19% riffle units, 2% culvert units, 0% dry units, 0% not surveyed units). The pools are relatively shallow, with 12 of the 256 (5%) pools having a maximum residual depth greater than three feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum residual depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. 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 hundred twenty-one of the 256 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-two of the pool tail-outs had embeddedness ratings of 3 or 4. Eight 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 Leon should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Two hundred twenty-nine of the 256 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 47. The shelter rating in the flatwater habitats is 25. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Arroyo Leon. Undercut banks 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 91%. Reach 1 had a canopy density of 85.9%, Reach 2 had a canopy density of 95.9%, Reach 3 had a canopy density of 89.8%, Reach 4 had a canopy density of N/A. Reach 5 had a canopy density of 96.1%, Reach 6 had a canopy density of 95.5%, Reach 7 had a canopy density of 91.6%, Reach 8 had a canopy density of 95.4%, Reach 9 had a canopy density of 91.1%, Reach 10 had a canopy density of 96.5%, Reach 11 had a canopy density of 92.7%, Reach 12 had a canopy density of 90.8%, and Reach 13 had a canopy density of 92%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 85% and 84%, 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 Leon

Arroyo Leon 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) Access for migrating salmonids should be assessed at all road crossings and dams. Sites of particular concern include all six identified Dam sites, both Higgin Canyon Road culverts located just southeast of the town of Half Moon Bay. Although all of the Bridges identified were not considered barriers, future assessment should be done for the Miramontes Road Bridge and the multiple private access road bridges that extend from Higgins Canyon Road. 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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from Undercut Banks. Adding high quality complexity with woody cover in the pools is desirable.

3) 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.

4) There are several log debris accumulations present on Arroyo Leon Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

5) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position	Habitat Unit #	Memo
0	0001.00	Start of Survey at the confluence of Pilarcitos.
0	0001.00	There is an erosion site along the right bank with sand bags.
60	0002.00	There are rat poison boxes along both the right and left bank at the start of the survey and they end at unit 020.
157	0005.00	There is a degraded pipe in the creek on the right bank.
427	0009.00	There is an erosion site along the left bank with large block concrete.
708	0014.00	There is a 1" copper pipe across stream bed.
708	0014.00	There are retaining walls on the left bank.
932	0016.00	There is a retaining wall along the left bank.
1,054	0017.00	There is an old tank in the stream
1,094	0018.00	The creek dries to intermittent pools in dry months.
1,184	0020.00	Bridge # 1 is Miramontes Rd, which is made of concrete, with length = 35', height = 13.5', width = 62', and the height from water to sill = N/A. The bridge is not retaining gravel, there is no associated downcutting, and it is not a barrier. There are gabions on the left and right bank under bridge. WP #003 N37.46219 W122.42653
1,219	0021.00	Rat poison box are not observed after this unit.
1,219	0021.00	Right bank tributary #1 is unnamed and is wet and flowing with a discharge = 0cfs, contributing 0% of the flow to the stream. The water temperature upstream = 50F, downstream = 50 F, and in the tributary = 50F. The crew checked 100' up and found that it is accessible to fish. The estimated slope = 1%. No fish were observed. There is a culvert upstream and the dominant substrate is sand and silt. WP#004 N37.46211 W122.42664
1,471	0025.00	There is an erosion site on the left bank with rip rap in place.
1,623	0028.00	There is rip rap on the left bank, where there is an erosion site.

Position	Habitat Unit #	Memo
1,670	0029.00	The left bank rip rap continues through this unit.
1,717	0030.00	The left bank rip rap continues through this unit.
1,750	0031.00	There is a staff plate on the left bank.
2,162	0039.00	There is rip rap on the left bank.
2,651	0049.00	There is a water pump and small dam at end of unit.
2,782	0051.00	Large Debris Accumulation (LDA) #1 is in the middle of the unit and has a height= 5ft, width = 10ft, and length = 7ft, with 4 pieces of large wood. Water flows through, there are no visible gaps in the accumulation, and there is no sediment retention. There were no fish seen above. It is not a barrier to juveniles, but is a barrier for adults when there is low summer flow. WP#009 N37.45958 W122.42637
3,374	0062.00	There is erosion along the left bank, approximately 50' high and 100' wide.
3,565	0065.00	30 ft into the unit is left bank stabilization with wood structures
4,218	0071.00	There is small erosion on the left bank, approximately 10' high and 2' wide. It is about 30' into the unit and caused by a pipe that drains water. There are two drainage pipes, one is permanent.
4,442	0072.00	There is a drainage pipe on the left bank.
4,478	0073.00	There is rip rap on the left bank.
4,603	0076.00	There is rip rap on the left bank about 30' into the unit and is 50' long.
4,814	0078.00	In the middle of the unit there is a small plunge, which is not scouring, but is creating bubbles.
4,931	0079.00	There is rip rap on the left bank.
4,983	0081.00	There is rip rap on the left bank.
5,145	0084.00	There is a broken pvc pipe sticking out of the right bank.
5,659	0095.00	There is a small wood accumulation in the middle of the unit
5,730	0096.00	Unidentified fish observed upstream.
5,730	0096.00	LDA #2 is in the middle of the unit, with height = 6ft, width = 17ft, length = 9ft, and has 5 pieces of large wood. Water flows through, there are no visible gaps, and there is no sediment retention. Fish were seen above the accumulation. It is not a barrier to juveniles, but could be a barrier to adults during

Position	Habitat Unit #	Memo
		summer flows. WP#014 N37.45958 W122.42637
5,790	0097.00	Unidentified fish observed
6,102	0101.00	Three unidentified fish observed swimming upstream
6,149	0102.00	There is a small wood accumulation covering 80% of the unit.
6,284	0104.00	There are small wood masses installed along the right bank, which are held with string.
6,382	0106.00	Dam #1 has length =6', height =24', width (o)=22, width (d)=70', and the height from water to sill = N/A. There are no flashboards, no associated downcutting, and it is not retaining gravel. The dam is not likely a possible barrier to juveniles or adults. It is an old dam and not in use anymore. There is a box culvert bottom. WP#016 N37.45401 W122.42403
7,312	0121.01	There is a right bank wetted side channel with no flow.
7,632	0122.01	The side channel is an isolated pool on the left bank. There is no pool tail out information.
7,688	0124.00	One identified fish observed.
7,953	0128.00	One unidentified fish observed
8,002	0129.00	Left bank tributary #2 is unnamed. It is wet, with an estimated discharge >1 cfs, and contributes approximately 1-3% of flow to the receiving stream. The water temperature upstream = 52F, downstream = 53, and in the tributary = 56F. The crew checked 50' up and found that it is accessible to fish. The estimated slope = 1%. No fish were observed. The channel is extremely narrow, densely vegetated, and appears to be a drainage feature from the road. WP#020 N37.45199 W122.42196
8,420	0132.00	Five stickleback were observed in the culvert.
8,420	0132.00	Culvert #1 is under Higgins Canyon Rd. There is one associated culvert, which is made of CMP. With height = 11', width = 11', length = 150', diameter = 11', and plunge height = N/A. The maximum depth within 5' = 1.2'. The culvert slope = 0%. It is in good condition and is not likely a barrier to juveniles or adults. WP#021 N37.45166 W122.42058
8,646	0135.00	There is a sand bag on the right bank retaining a wall approximately 10' tall and 20' wide.

Position	Habitat Unit #	Memo
8,798	0136.00	There is arundo on the left bank
8,838	0137.00	Dam #2 has length =14', height =25', width (o) =10', and width (d)=70'. There are no flashboards, but there is downcutting = 3.8'. The height from the water to sill = 0.5'. The dam is retaining gravel, and it is a possible barrier to juveniles, but not a barrier to adults. The dam does not appear to be in use. It has a box culvert top and a cement bottom. WP#023 N37.45157 W122.41971
9,639	0149.00	LDA#003 has height = 6', width = 24', length = 10', and 3 pieces of large wood. Water does not flow, there are no visible gaps, and no sediment retention. No fish were seen above the accumulation. It is not likely a possible barrier to juveniles or adults. There is a gap under the accumulation to the streambed. WP#025 N37.45169 W122.41749
9,665	0149.01	The channel is wetted, but there is no flow.
9,665	0149.03	The connection to the main channel is dry.
9,716	0151.00	Rough skinned newts and deer tracks observed.
9,914	0153.00	Newt observed
9,945	0154.00	There is arundo on the left bank.
9,945	0154.00	Otter tracks observed
10,000	0155.00	Dam #3 has length =10', height =10', width(0)=9', and width(d)=30'. There are no flashboards, but there is downcutting = 3.4'. The height from the sill to the water level = 2.6'. The dam is retaining gravel. It is not likely a barrier to adults, but is likely a barrier to juveniles. There is large wood across the stream bed creating dam/plunge. WP#027 N37.45175 W122.41653
10,085	0157.00	Unidentified fish observed
10,197	0159.00	LDA #004 has height = 9', width = 23', length = 52', and 4 pieces of large wood. Water does not flow through and there are no visible gaps. Sand and gravel sized sediment is retained with width = 23', length = 60', and depth = 1'. No fish were observed, and it is not likely a barrier to juveniles or adults. There is a pool available under the accumulation The accumulation is created by a right bank landslide. WP#028 N37.45181 W122. 41584
10,249	0160.00	There is little arundo on the right bank.

Position	Habitat Unit #	Memo
10,249	0160.00	Right bank tributary #3 is unnamed. It is wet, with discharge = 0 cfs, and contributes < 1% of flow to the receiving stream. Water temperature upstream = 55F, downstream = 55 F, and in the tributary = 53 F. The crew checked 125' up and found that it is accessible to fish for the first 100', then the gradient becomes very steep. The estimated slope = 2-3%. No fish observed, but newts were observed. The dominant substrate is sand and silt. WP#29N37.45164 W122.41568
10,570	0164.00	Unidentified fish and newts observed
10,955	0170.00	Newt observed
11,173	0175.00	LDA #005 has height = 7', width = 24', length = 32', and 7 pieces of large wood. Water flows through, there are visible gaps, and there is no sediment retention. At time of survey the accumulation was not likely a barrier to juveniles or adults. WP# 032 N37.45054 W122. 41403
11,283	0178.00	Otter tracks observed on the right bank
11,731	0186.00	Unidentified fish observed
11,781	0187.00	LDA #006 has height = 13', width = 38', length = 78, and 8-10 pieces of large wood. Water flows through and there are visbile gaps. Fine sand is being retained with width = 10', length = 17', and depth = 3'. It is not likely a barrier to juveniles or adults. There are lots visible gaps near the right bank. The accumulation consists of two sections of wood accumulation about 20' apart. WP#034 N37.44973 W122. 41291
12,033	0190.00	There is a small landslide slumping into the left bank.
12,155	0192.00	LDA #007 has height = 10', width = 20', length = 32', and 4 piecesn of large wood. Water flows through, there are no visible gaps, and there is no sediment retention. It is not likely a possible barrier to juveniles but is a potential barrier for adults, due to a lot of small wood. The accumulation is primarily composed of small wood. WP#35 N37.44958 W122. 41230
12,767	0202.00	There is a 10"diameter pipe buried in the bottom of the streambed
13,013	0205.00	Dam #004 has length =6' and height =12'.There are no flashboards, but there is downcutting. The height

Position	Habitat Unit #	Memo
		from the sill to the water level = N/A. It is not likely a possible barrier to juveniles or adults. WP#037 N37.44849 W122.41034
13,048	0208.00	There are electrical wires exposed on an old pump on the left bank.
13,141	0209.00	Bridge #2 is a driveway off of Higgins Canyon Rd. It is made of wood and steel with length =13', height =15', width = 75', and the height from the sill to the water level = 3'. The bridge is not retaining gravel, and there is no associated downcutting. It is a possible barrier. The reminant sill on the bottom of the bridge is now part of the stream bed. WP#038 N37.44859 W122.40977
13,274	0214.00	The right bank is eroding next to the driveway/road.
13,650	0219.00	Right bank tributary #4 is unnamed. It is wet with flow = 0 cfs, and contributes 0% of flow to the receiving stream. Water temperature upstream = 52 F, downstream = 52F, and in the tributary = 52 F. The crew checked 25' up and found that it is accessible to fish for the first 25'. The estimated slope >10%. No fish were observed, but newts were observed. WP#40N37.44823 W122.40854
13,848	0222.00	Unidentified fish observed
13,944	0225.00	Newts observed
14,201	0230.00	Dam #005 has length = 6', height = 6', width(0)=6', width(d)=18', and the height from the sill to the water level = 1.5'. There are no flashboards. There is downcutting with height = 2.5'. It is retaining gravel, and is a possible barrier to juvenile andadults. WP#042 N37.44732 W122.40759
14,302	0233.00	There is a 6' diameter metal pipe layed through the stream and on the left bank.
14,680	0237.00	There is a 2 foot tall dam. WP#044
15,079	0243.00	End of landowner access, Mills creek flows into Arroyo Leon in no access unit.
17,933	0244.00	Begin access.
18,623	0258.00	Along the right bank there is 1" pvc piping coming from the upstream bridge. It appears to be unused.
18,664	0259.00	Bridge #3 is a driveway off Higgins Canyon Rd, made of concrete and steel, with length = 15', height = 11', width =50', and the height from the water to sill

Position	Habitat Unit #	Memo
		= N/A. It is not retaining gravel, there is no downcutting, and it is not likely a possible barrier. There are sand bags to protect the left bank of the bridge. WP#048 N37.43951 W122.39951
18,731	0262.00	Along the left bank there are two 2" rubber pipes in the ground with the open end in the creek.
18,797	0263.00	Along the right bank is 5" PVC pipe leading into the creek bed.
18,797	0263.00	Right bank tributary #5 is unnamed. It is dry with flow = 0 cfs. Water temperature upstream = 51 F, downstream = 51F, and in the tributary = N/A. The crew checked 40' up and the tributary is accessible to fish for the first 40'. After 40' there were trash/ car parts in the tributary, and then gradient increases. The estimated slope = 5-10%. No fish were observed. N37.43946 W122.39940
18,900	0266.00	On the right bank there is a 1" rubber pipe leading into the creek.
18,900	0266.00	Erosion on the left bank is 30 ft tall and 30 ft wide.
19,304	0271.00	At the top of the unit, on the right bank, is a 1" metal pipe hanging over the creek within bankfull width. There is also a 1" rubber pipe leading from the right bank into the creek.
19,385	0272.00	Unidentified fish observed
19,704	0278.00	Newt observed
19,907	0282.00	The property adjacent to the right bank has a submersible pump and well unit, with pipes leading into the creek.
19,907	0282.00	Right bank tributary #006 is in the middle of the unit and is unnamed. It is wet, with flow = 0 cfs. The water temperature upstream = 52 F, downstream = 52F, and in the tributary = 52F. The crew checked 60' up and found that the tributary is accessible to fish. The estimated slope = 2-4%. No fish were observed. The tributary has stagnant pools with pools = 0.4' deep. WP#52N37.43889 W122.39684
20,377	0283.00	Erosion on the right bank is 40' tall and 35' wide.
20,618	0289.00	Potential adult barrier during low summer flows. The unit has bedrock substrate, with thin sheet water.
20,792	0293.00	There is a small pump hose in the water on the left bank with 10" pipe and gabions in the creek.

Position	Habitat Unit #	Memo
		Calibration WP#053 N37.43832 W122.39472
21,085	0300.00	Bobcat tracks observed
21,112	0301.00	Culvert #2 is in stream under Higgins Canyon Rd. There is one associated culvert, which is made of CMP with height =10', width =10', length =128', diameter = 10', plunge height = 0.7', and the maximum depth within 5' =1.9'. The culvert slope = 1%. The bottom of the culvert is rusted and bare. It is a possible barrier to juveniles or adults. WP#054 N37.43836 W122.39366
21,300	0303.00	There is a 2" pipe on the right bank, which is within bankfull width, but is not in the wetter portion of the creek. Calibration WP#055 N37.43815 W122.39353
21,389	0305.00	LDA #008 has height = 6', width = 18', length = 6', and 5 pieces of large wood. Water flows through and there are visible gaps. Sand and gravel sized sediment is retained with width = 9', length = 20', and depth = 5'. It is a possible barrier to juveniles, but is not likely a barrier to adults. A 3' plunge is created by small wood. The large wood creates a cascade, not a plunge pool. WP#056 N37.43821 W122.39346
21,633	0310.00	There is an 8" diameter PVC pipe embedded in the left bank.
21,655	0311.00	Newt observed
21,703	0313.00	LDA #009 has height = 4.5', width = 11', length = 21', and 5 pieces of large wood. Water flows through, there are no visible gaps, and there is no sediment retention. Fish were seen above. The LDA is not likely a possible barrier to juveniles or adults. WP#057 N37.43822 W122.39289
21,724	0314.00	There is rip rap on the left bank.
21,918	0318.00	There is a 5' diameter PVC pipe in the streambed
21,918	0318.00	74ft into the unit is a landslide on the right bank.
22,055	0320.00	Culverts are in place to stabilize the left bank from units 318-321. There are cement bottom multi-culvert bank stabilizers on the right bank, which extend across the streambed, with an approximate length of 120', creating a plunge pool.
22,075	0321.00	There are more culverts as stabilizers on the left bank.
22,169	0323.00	165 ft from the bottom of the unit there is a pump and

Position	Habitat Unit #	Memo
		hose, 1" diameter, on the right bank. There is sediment accumulation, about 2' deep, on the right bank from the blown-out dam. Calibration WP#058 N37.43858 W122.39111
22,423	0324.00	The canopy density <10%. 30' into the unit the substrate changes from large cobble to gravel.
22,542	0328.00	There are power lines above the creek. A potential trout redd was observed.
22,542	0328.00	There is a small landslide on the right bank at the bottom of the unit. Along the left bank there are stairs leading to the creek The next small left bank landslide is 3' x 6' x 9'.
22,672	0332.00	150' into the unit is a left bank drainage with lots of granitic gravel. 300' into the unit is a pump and hose.
22,672	0332.00	Unidentified fish observed
23,329	0339.00	In the middle of the unit there is a large amount of small wood accumulating.
23,491	0342.00	Salmonid observed
23,807	0347.00	150' into the unit is a car, which is providing shelter (shelter rating called bedrock ledge).
24,013	0348.00	Temporary small cobble rock dam
24,039	0349.00	At the start of the unit is a 1" pipe and pump on the right bank, with 3' corrugated pipe at the top of the bank
24,250	0353.00	At the beginning of the unit there is a plastic 1" pipe coming out of the creek bank and leading into the creek.
24,250	0353.00	Left bank tributary #007 is unnamed. It is wet with flow = 0.2 cfs, and contributes an estimated <1% of flow to the receiving stream. The water temperature upstream = 50F, downstream = 51F, and in the tributary = 51F. The crew checked 100' and found that it is not accessible to fish. The estimated slope >4%. No fish were observed. The mouth of the tributary has a 90 degree slope. 50' up the tributary the brush has been cleared. The road top is contributing sediment into the tributary. The dominant substrate is bedrock and silt. The water is murky from the silt. Approximately 80 ft downstream of WP # 061 N37.44062 W122.38818
24,250	0353.00	The brush has been cleared, exposing soil, along the

Position	Habitat Unit #	Memo
		left bank, starting 15 ft into the unit and continuing to the end of the unit.
24,333	0354.00	At the beginning of the unit there are rebar/cement blocks on both banks. 10' into the unit on the left bank there is a 1' pipe leading into the creek from an electric pump.
24,493	0357.00	Along the right bank there is a piece of cement, a 1" metal pipe in creek, and chain link erosion control.
24,527	0358.00	There is an erosion site on the right bank, approximately 150 ft from the end of the unit, with height = 50' and width = 50'. There is a 2' corrugated metal pipe down slope.
24,721	0363.00	At the top of the unit there is a small wood accumulation on the left bank of the creek creating sediment retention and a dam pool. Calibration WP#062 N37.44117 W122.38776
24,746	0365.00	180' into the unit is an old unused garden hose in the creek and on the left bank. The last 10 ft of the unit has a large black tarp strung along the right bank.
24,980	0368.00	The hose in unit 365 is coming out of the left bank.
25,117	0371.00	There is a 1" diameter hose at end of the unit.
25,335	0378.00	Dam #6 has length =10', height =10', width(0)=18', and width(d)=28'. The height of the downcutting = 1.6', and the height from the sill to the water level = 0.5'. There are no flashboards. The dam is retaining gravel. It is not likely a possible barrier to juveniles or adults. On the right bank of the dam is a valve, 1.5' in diameter. There is a large 1" pipe across the top. WP# 064 N37.44214 W122.38686
25,600	0381.00	Left bank tributary #008 is unnamed. It is wet, but not flowing, with discharge = 0 cfs. The water temperature upstream = 52F, downstream = 51F, and in the tributary = 51F. The crew checked 30' up and it is not accessible to fish. The estimated slope >5%. No fish were observed. 50' up the tributary becomes filled with sediment. The channel is narrow with silt and sand substrate. Small pools are present, but there is no flow. WP#65N37.44285 W122.38646
25,785	0383.00	There are lots of metal pipes and valves in creek. There is an unused old 1' diameter cement culvert in the streambed.

Position	Habitat Unit #	Memo
26,056	0387.00	LDA #010 has height = 20', width = 27', length = 36', and 9-11 pieces of large wood. Water flows through, there are visible gaps, and sand and gravel sized sediment is being retained with width =12', length =10', and depth =3'. It is a possible barrier to juveniles, but not likely to adults. The LDA is creating step pools. WP#067 N37.44338 W122.38577
26,611	0394.00	LDA #011 has height = 4', width = 17', length = 13', and 6 pieces of wood. Water flows through and there are visible gaps. Sand and gravel sized sediment is being retained with width =16', length = 20', and depth = 3'. Fish were seen above. It is not likely a possible barrier to juveniles or adults. WP#068 N37.44423 W122.38473
26,691	0396.00	Left bank tributary #009 is unnamed and dry. The water temperature upstream = 52F, downstream = 52 F, and in the tributary = 52 F. The crew checked 80' up and found that it is accessible to fish for the first 60'. The estimated slope >4%. No fish were observed. There are two small pools of water in the tributary. 60' up is a 4ft vertical plunge. The dominant substrate is silt and sand. The channel is overgrown with vegetation and roots. N37.44437 W122.38437
26,705	0397.00	There is a 1ft diameter culvert pipe embedded in the left bank.
27,187	0404.00	From 30' into unit 404 through 406 there is an unstable right bank approximately 100' l x 40' w x 15' h with multiple plastic 1 ft diameter pipes coming from up slope down into the creek bed. Picture taken.
27,351	0407.00	Unidentified fish observed
27,798	0412.00	Bridge #4 is an off-road access extension of Higgins Canyon Rd made of wood and steel, with length =11', height =5', and width =17'. The bridge is not retaining gravel, and there is no associated downcutting. The height from water to sill = N/A. It is not a barrier. WP#071 N37.44508 W122.38202
27,831	0414.00	There is a 2' pipe in the creek and a barrel in the pool off of the right bank. At the bottom of the there are sand bags and a pump on the right bank.
28,273	0428.00	Unidentified fish observed
28,567	0437.00	LDA #012 has a height = 5', width = 14', length = 20',

Position	Habitat Unit #	Memo
		and 4 pieces of large wood. Water flows through, there are no visible gaps, and there is no sediment retention. Fish were seen above. It is not likely a possible barrier to juveniles or adults. WP#074 N37.44618 W122.38053
28,782	0441.00	Left bank tributary #010 is unnamed. It is wet with an estimated flow = 0.5 cfs, and contributes <1% of flow to the receiving stream. The water temperature upstream = 50F, downstream = 50 F, and in the tributary = 52 F. The crew checked 350' up and found that it is accessible to fish for 60 feet at which point the grade increases to about 10%. At sixty feet up there are pools, but the tributary is not flowing. At 260' up it begins to flow again. The dominant substrate is bedrock. There is a car in the tributary. No fish were observed. WP#075N37.44608 W122.38010
28,830	0442.00	Unidentified fish observed
29,239	0446.00	Right bank tributary #011 is unnamed. It is primarily dry, with some stagnate pools. The flow = 0cfs, and it contributes 0% of flow to the receiving stream. The water temperature upstream = 51 F, downstream = 51 F, and in the tributary = 53 F. The crew checked 75' up and found that it is accessible to fish for the first 50'. The estimated slope = 3-4%. No fish were observed. The dominant substrate is sand/silt/clay. WP#077 N37.44642 W122.37896
29,265	0447.00	Two unidentified fish observed
29,439	0449.00	Unidentified fish observed
29,518	0451.00	20ft into the unit is a 1" pipe laying across the creek from the left bank to the right bank.
29,709	0453.00	There is one car at the bottom of the unit on the left bank and two cars at the top of the unit. Calibration WP#078 N37.44701 W122.37759
29,771	0455.00	Unidentified young-of-the-year (YOY) salmonid observed
29,802	0456.00	30' into the unit is a 1" metal pipe from the right bank into creek. 150' into the unit is a 2" plastic pipe from the right bank into the creek.
29,802	0456.00	Unidentified fish observed.
29,989	0457.00	LDA #013 has a height =4', width = 17', length= 12', and 5 pieces of large wood. Water flows through and

Position	Habitat Unit #	Memo
		there are visible gaps. Sand and gravel sized sediment is being retained with width = 2', length = 5', and depth = 1'. Fish were seen above. It is not likely a possible barrier to juveniles or adults. WP#079 N37.45181 W122. 41584
30,161	0459.00	At the bottom of the unit is a 1.5" metal pipe in the creek coming from the right bank.
30,408	0462.00	Three salmonid YOY observed
30,427	0463.00	Three salmonid YOY observed at the top of the unit
30,994	0471.00	Unidentified fish observed
31,104	0475.00	One fish observed, potentially a sucker, approximately 5" long
31,644	0491.00	Unidentified fish observed
31,979	0501.00	LDA #014 is 40" into unit. It has height = 4', width = 12', length = 40', and 6 pieces of large wood. Water flows through, there are no visible gaps, and there is no sediment retention. Fish were seen above. It is not likely a possible barrier to juveniles or adults. WP#002 N37.44665 W122.37157
32,263	0506.00	Unidentified fish observed
32,367	0509.00	One salmonid YOY observed
32,754	0515.00	At the top of the unit there is an open 1" pvc plastic pipe on the left bank at the water's edge.
32,872	0518.00	Unidentified fish observed
33,082	0520.00	There is erosion 16' into unit 10'wide x 20' high.
33,321	0524.00	Unidentified YOY observed.
33,807	0533.00	Right bank tributary #012 is unnamed. It is wet, with estimated discharge = 0.5-1 cfs. The tributary contributes an estimated <1% of flow to the receiving stream. Water temperature upstream = 52F, downstream = 51F, and in the tributary = 52F. The crew checked 350' up and found that it is not accessible to fish. The estimated slope 5-10%. No fish were observed. WP#006 N37.44973 W122.36754
33,952	0534.00	This is the last access point off of Higgins Canyon Rd.
34,124	0537.00	Right bank tributary #013 is unnamed. It is wet and flowing with estimated discharge = 1 cfs. The tributary contributes an estimated 5-10% of flow to

Position	Habitat Unit #	Memo
		the receiving stream. The water temperatures upstream = 51f, downstream = 51, and in the tributary = 52F. The crew checked 75' up and found that it is not accessible to fish. The estimated slope = 4-10%. No fish were observed. The tributary is entrenched and the dominant substrate is bedrock. 50' there is a LDA, which makes it inaccessible to fish. WP#007 N37.45020 W122.36652
34,675	0541.00	One YOY salmonid observed
34,829	0542.00	LDA #015 has length = 10', and 4-5 pieces of large wood. Water flows through, there are no visible gaps, and there is no sediment retention. Fish were seen above. It is not likely a possible barrier to juveniles or adults. WP#008 N37.45020 W122.36504
35,204	0550.00	Newt observed
35,382	0553.00	LDA #016 has height = 7', width = 16', length = 13', and 2 pieces of wood. Water flows through and there are visible gaps. Sand, gravel, and cobble sized sediment is being retained with width = 11', length = 15', and depth = 2'. Fish were seen above. It is not likely a possible barrier to juveniles or adults. WP#009 N37.45027 W122.36305
35,413	0554.00	There is a transition out of the redwoods into hardwood forests near the creek.
35,438	0555.00	Unidentified fish observed
35,478	0556.00	Right bank tributary #014 is unnamed. It is wet and flowing with an estimated discharge = 1-3 cfs. The tributary contributes an estimated 10-15% of flow to the receiving stream. The water temperature upstream = 51F, downstream = 52 F, and in the tributary = 51 F. The crew checked 175' up and found that the tributary is accessible to fish for the first 70'. The first 70' are low gradient, then the gradient increases to an estimated 10%. The estimated slope = 8-10%. No fish were observed. The dominant substrate is bedrock, boulder, and large cobble. There is a 10" diameter pipe stuck in the tributary about 30 ft long. It appears to not be in use. N37.45020 W122.36272
35,532	0557.00	Unidentified fish observed
36,267	0569.00	Newt observed
36,309	0570.00	There are Redwoods near the creek

Position	Habitat Unit #	Memo
36,309	0570.00	Unidentified fish observed
36,442	0572.00	One salmonid YOY observed
36,442	0572.00	LDA #017 is located at the top of the unit and has height = 7', width = 16', length = 14', and 7 pieces of large wood. Water flows through and there are visible gaps. Sand and gravel sized sediment is being retained with width = 5'W, length =17', and depth = 4'. Fish were seen above. It is not likely a possible barrier to juveniles or adults. WP#012 N37.44949 W122.35984
36,559	0574.00	80' into the unit there is a 1" pvc pipe coming from the right bank into the creek.
36,778	0576.00	120' into the unit is a 1" pvc pipe leading from the right bank into the creek.
36,963	0577.00	End of Survey due to the channel becoming overgrown and inaccessible. WP#013 N37.44979 W122.35863

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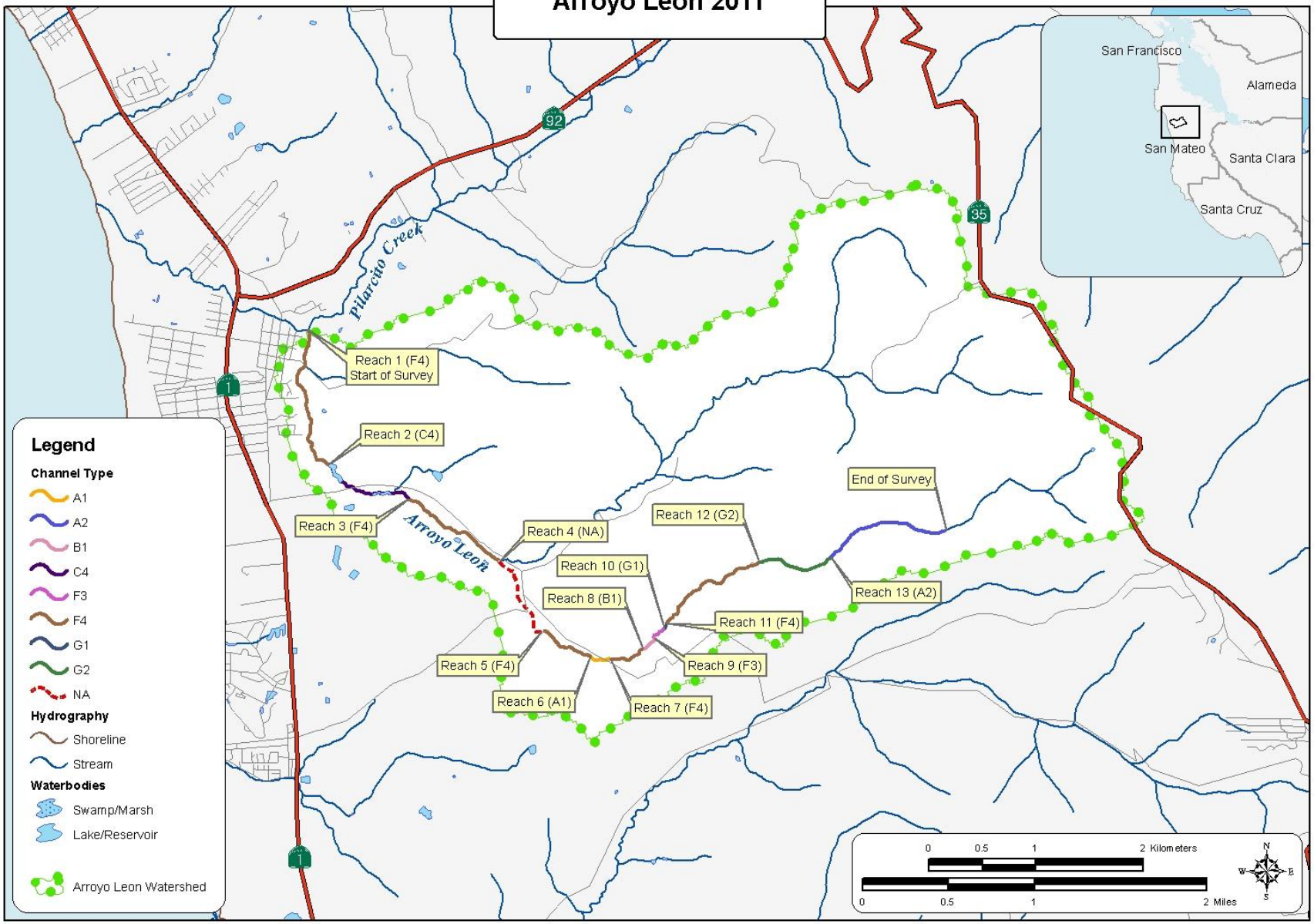
LEVEL III and LEVEL IV HABITAT TYPES

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 Leon 2011



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Prepared by: Scott Webb, February 2012

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

Stream Name: Arroyo Leon **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: **Quad:** HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

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
12	0	CULVERT	2.1	34	404	1.1									
2	0	DRY	0.3	16	32	0.1									
200	200	FLATWATER	34.2	97	19366	51.8	8.2	0.6	1.1	758	151568	492	98454		25
1	0	NOSURVEY	0.2	2854	2854	7.6									
256	255	POOL	43.8	37	9563	25.6	9.3	0.8	1.6	311	79705	358	91750	270	47
114	114	RIFFLE	19.5	45	5181	13.9	8.4	0.5	0.9	323	36814	170	19355		26

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
585	569	37400	268087	209559

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Arroyo Leon **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: Quad: HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
83	83	LGR	14.2	46	3786	10.1	9.0	0.5	1.7	356	29549	173	14351		14	92
10	10	HGR	1.7	38	379	1.0	7.0	0.5	1.2	197	1970	103	1032		29	97
18	18	CAS	3.1	52	938	2.5	8.0	0.8	3.0	276	4976	213	3838		81	93
3	3	BRS	0.5	26	78	0.2	5.0	0.4	1.6	106	319	45	135		23	92
27	27	GLD	4.6	66	1790	4.8	9.0	0.6	1.7	566	15274	379	10230		22	87
48	48	RUN	8.2	53	2530	6.8	8.0	0.6	2.1	422	20260	274	13174		24	92
125	125	SRN	21.4	120	15046	40.2	8.0	0.6	2.2	928	116034	600	75050		26	90
70	70	MCP	12.0	27	1908	5.1	9.0	0.9	3.3	241	16868	297	20774	229	32	93
43	43	STP	7.4	90	3880	10.4	8.0	0.4	2.0	562	24177	385	16547	221	47	92
51	51	CRP	8.7	28	1428	3.8	9.0	0.9	3.2	273	13918	364	18565	282	35	92
39	38	LSL	6.7	28	1106	3.0	10.0	0.9	3.5	281	10943	380	14823	290	99	90
5	5	LSR	0.9	27	135	0.4	9.0	0.8	1.7	228	1142	255	1276	190	42	93
4	4	LSBk	0.7	22	89	0.2	9.0	0.6	1.8	200	801	203	812	150	11	98
4	4	LSBo	0.7	24	98	0.3	9.0	0.8	2.3	210	841	255	1020	209	18	83
27	27	PLP	4.6	24	635	1.7	12.0	1.1	3.3	277	7491	439	11859	362	58	92
1	1	SCP	0.2	25	25	0.1	25.0	1.6	3.2	625	625	1000	1000	1000	5	100
12	12	DPL	2.1	22	259	0.7	10.0	1.0	4.3	239	2869	425	5094	403	25	92
2	0	DRY	0.3	16	32	0.1										
12	0	CUL	2.1	34	404	1.1										
1	0	NS	0.2	2854	2854	7.6										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume
585	569	37400	268057	209581(cu.ft.)

Table 3 - Summary of Pool Habitat Types

Stream Name: Arroyo Leon **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: **Quad:** HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

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
113	113	MAIN	44	51	5788	61	8.4	0.7	363	41045	226	25353	37
130	129	SCOUR	51	27	3491	37	9.9	0.9	270	35126	291	37849	58
13	13	BACKWATER	5	22	284	3	11.5	1.1	269	3494	453	5432	23

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
256	255	9563	79664	68634

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

Stream Name: Arroyo Leon **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: **Quad:** HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

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 Occurence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
70	MCP	27	4	6	51	73	13	19	2	3	0	0
43	STP	17	14	33	28	65	1	2	0	0	0	0
51	CRP	20	2	4	29	57	19	37	1	2	0	0
38	LSL	15	2	5	26	68	6	16	4	11	0	0
5	LSR	2	0	0	5	100	0	0	0	0	0	0
4	LSBk	2	0	0	4	100	0	0	0	0	0	0
4	LSBo	2	1	25	2	50	1	25	0	0	0	0
27	PLP	11	2	7	14	52	9	33	2	7	0	0
1	SCP	0	0	0	0	0	0	0	1	100	0	0
12	DPL	5	3	25	5	42	2	17	1	8	1	8

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
255	28	11	164	64	51	20	11	4	1	0

Mean Maximum Residual Pool Depth (ft.): 2

Table 5 - Summary of Mean Percent Cover By Habitat

Stream Name: Arroyo Leon **Dry Units:** 2 **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: **Quad:** HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

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
83	83	LGR	13	17	3	11	18	0	0	10	1
10	10	HGR	5	0	10	5	26	0	10	25	0
18	18	CAS	6	14	11	6	4	0	21	22	6
3	3	BRS	0	0	33	0	23	0	7	17	20
114	114	TOTAL RIFFLE	11	15	6	9	17	0	5	13	2
27	27	GLD	22	11	6	20	14	0	0	2	3
48	48	RUN	18	17	3	21	14	0	0	2	2
125	124	SRN	26	12	3	25	23	0	1	4	2
200	199	TOTAL FLAT	23	13	3	23	19	0	1	3	2
70	70	MCP	25	17	5	26	13	0	0	3	5
43	42	STP	10	8	5	9	26	0	15	22	3
51	51	CRP	32	15	2	21	4	0	0	5	7
39	38	LSL	12	47	26	11	1	0	1	0	2
5	5	LSR	29	9	13	29	0	0	0	0	0
4	4	LSBk	25	25	0	13	0	0	0	0	38
4	4	LSBo	5	5	8	5	0	25	0	28	25
27	27	PLP	19	8	10	20	6	0	32	1	4
1	1	SCP	0	100	0	0	0	0	0	0	0
12	12	DPL	26	25	10	20	3	0	0	8	0
256	254	TOTAL POOL	21	19	9	18	10	0	6	6	5
12	0	CUL									
1	0	NS									
585	567	TOTAL	20	16	6	18	15	0	4	7	4

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Arroyo Leon **Dry Units:** 2 **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: **Quad:** HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

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
83	83	LGR	0	17	64	18	1	0	0
10	10	HGR	0	0	10	40	20	10	20
18	18	CAS	0	11	33	6	6	17	28
3	3	BRS	0	0	0	0	0	0	100
27	27	GLD	11	78	11	0	0	0	0
48	48	RUN	4	38	52	6	0	0	0
125	125	SRN	0	22	71	5	2	0	1
70	70	MCP	21	63	13	1	0	0	1
43	43	STP	2	9	51	9	7	16	5
51	51	CRP	25	63	10	2	0	0	0
39	38	LSL	18	76	5	0	0	0	0
5	5	LSR	0	80	20	0	0	0	0
4	4	LSBk	25	50	25	0	0	0	0
4	4	LSBo	25	25	50	0	0	0	0
27	27	PLP	26	67	4	0	0	0	4
1	1	SCP	100	0	0	0	0	0	0
12	12	DPL	17	50	33	0	0	0	0
12	0	CUL	0	0	0	0	0	0	0
1	0	NS	0	0	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Arroyo Leon **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: **Quad:** HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
91	3	97	0	85	84

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Arroyo Leon LLID: 1224253374652 Drainage San Mateo Coastal

Survey Dates: 5/16/2011 to 6/8/2011 Survey Length (ft.): 37400 Main Channel (ft.): 36963 Side Channel (ft.): 437

Confluence Location: Quad HALF MOON BAY Legal Description: T000R000S00 Latitude: 37:27:55.0N Longitude: 122:25:31.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4
Reach Length (ft.): 6388
Riffle/Flatwater Mean Width (ft.): 9.2
BFW:
Range (ft.): 13.00 to 19.00
Mean (ft.): 16.02
Std. Dev.: 1.81
Base Flow (cfs): 1.714
Water (F): 49 - 52 Air (F): 50 - 59
Dry Channel (ft.): 0

Canopy Density (%): 85.9
Coniferous Component (%): 0.5
Hardwood Component 99.5
Dominant Bank Brush
Vegetative Cover (%): 76.5
Dominant Small Woody Debris
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 4.9
LWD per 100 ft.:
Riffles: 0
Pools: 2
Flat: 0

Pools by Stream Length 25.4
Pool Frequency (%): 39.6
Residual Pool Depth (%):
< 2 Feet Deep: 69.0
2 to 2.9 Feet Deep: 23.8
3 to 3.9 Feet Deep: 7.1
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.74
Mean Pool Shelter 41

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 4.9 Gravel: 92.7 Sm Cobble: 2.4 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 68.3 2. 26.8 3. 4.9 4. 0.0 5. 0.0

STREAM REACH: 2

Channel Type: C4
Reach Length (ft.): 4262
Riffle/Flatwater Mean Width (ft.): 10.1
BFW:
Range (ft.): 16.00 to 24.00
Mean (ft.): 20.00
Std. Dev.: 3.18
Base Flow (cfs): 1.714
Water (F): 50 - 54 Air (F): 54 - 58
Dry Channel (ft.): 32

Canopy Density (%): 95.9
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Hardwood Trees
Vegetative Cover (%): 68.3
Dominant Undercut Banks
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 1.1
LWD per 100 ft.:
Riffles: 0
Pools: 1
Flat: 0

Pools by Stream Length 21.7
Pool Frequency (%): 42.4
Residual Pool Depth (%):
< 2 Feet Deep: 28.6
2 to 2.9 Feet Deep: 53.6
3 to 3.9 Feet Deep: 17.9
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 2.30
Mean Pool Shelter 30

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 92.6 Sm Cobble: 7.4 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 33.3 2. 55.6 3. 11.1 4. 0.0 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: F4
Reach Length (ft.): 4429
Riffle/Flatwater Mean Width (ft.): 10.3
BFW:
Range (ft.): 13.00 to 19.00
Mean (ft.): 15.73
Std. Dev.: 1.83
Base Flow (cfs): 1.714
Water (F): 50 - 54 Air (F): 53 - 57
Dry Channel (ft.): 0

Canopy Density (%): 89.8
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Hardwood Trees
Vegetative Cover (%): 80.6
Dominant Undercut Banks
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 7.3
LWD per 100 ft.:
Riffles: 0
Pools: 4
Flat: 0

Pools by Stream Length 24.3
Pool Frequency (%): 46.2
Residual Pool Depth (%):
< 2 Feet Deep: 47.2
2 to 2.9 Feet Deep: 44.4
3 to 3.9 Feet Deep: 8.3
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 2.05
Mean Pool Shelter 57

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 12.1 Gravel: 69.7 Sm Cobble: 18.2 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 20.6 2. 58.8 3. 20.6 4. 0.0 5. 0.0

STREAM REACH: 4

Channel Type: NA
Reach Length (ft.): 2854
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 14.00 to 14.00
Mean (ft.): 14.00
Std. Dev.: 0.00
Base Flow (cfs): 1.714
Water (F): 54 - 54 Air (F): 55 - 55
Dry Channel (ft.): 0

Canopy Density (%):
Coniferous Component (%):
Hardwood Component
Dominant Bank
Vegetative Cover (%): 0.0
Dominant
Dominant Bank Substrate
Occurrence of LWD (%):
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length 0.0
Pool Frequency (%): 0.0
Residual Pool Depth (%):
< 2 Feet Deep:
2 to 2.9 Feet Deep:
3 to 3.9 Feet Deep:
>= 4 Feet Deep:
Mean Max Residual Pool Depth
Mean Pool Shelter

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

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 5

Channel Type: F4
Reach Length (ft.): 2560
Riffle/Flatwater Mean Width (ft.): 7.5
BFW:
Range (ft.): 9.00 to 12.00
Mean (ft.): 10.63
Std. Dev.: 0.92
Base Flow (cfs): 1.714
Water (F): 50 - 52 Air (F): 51 - 54
Dry Channel (ft.): 0

Canopy Density (%): 96.1
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Brush
Vegetative Cover (%): 70.1
Dominant Root masses
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 2.6
LWD per 100 ft.:
Riffles: 0
Pools: 2
Flat: 0

Pools by Stream Length 16.3
Pool Frequency (%): 41.9
Residual Pool Depth (%):
< 2 Feet Deep: 94.4
2 to 2.9 Feet Deep: 5.6
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.46
Mean Pool Shelter 48

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 88.9 Sm Cobble: 11.1 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 55.6 2. 44.4 3. 0.0 4. 0.0 5. 0.0

STREAM REACH: 6

Channel Type: A1
Reach Length (ft.): 902
Riffle/Flatwater Mean Width (ft.): 6.5
BFW:
Range (ft.): 9.00 to 10.00
Mean (ft.): 9.53
Std. Dev.: 0.50
Base Flow (cfs): 1.714
Water (F): 49 - 53 Air (F): 53 - 63
Dry Channel (ft.): 0

Canopy Density (%): 95.5
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Brush
Vegetative Cover (%): 77.6
Dominant Undercut Banks
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 10.0
LWD per 100 ft.:
Riffles: 2
Pools: 4
Flat: 0

Pools by Stream Length 12.4
Pool Frequency (%): 31.6
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.23
Mean Pool Shelter 42

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 100. Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 83.3 2. 16.7 3. 0.0 4. 0.0 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 7

Channel Type: F4
Reach Length (ft.): 1707
Riffle/Flatwater Mean Width (ft.): 5.9
BFW:
Range (ft.): 8.00 to 12.00
Mean (ft.): 9.69
Std. Dev.: 1.72
Base Flow (cfs): 1.714
Water (F): 49 - 50 Air (F): 52 - 54
Dry Channel (ft.): 0

Canopy Density (%): 91.6
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Hardwood Trees
Vegetative Cover (%): 91.9
Dominant Undercut Banks
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 4.6
LWD per 100 ft.:
Riffles: 1
Pools: 4
Flat: 0

Pools by Stream Length 12.1
Pool Frequency (%): 41.4
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.26
Mean Pool Shelter 36

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 90.9 Sm Cobble: 9.1 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 54.5 2. 45.5 3. 0.0 4. 0.0 5. 0.0

STREAM REACH: 8

Channel Type: B1
Reach Length (ft.): 705
Riffle/Flatwater Mean Width (ft.): 6.0
BFW:
Range (ft.): 9.00 to 9.00
Mean (ft.): 9.00
Std. Dev.: 0.00
Base Flow (cfs): 1.714
Water (F): 50 - 51 Air (F): 52 - 53
Dry Channel (ft.): 0

Canopy Density (%): 95.4
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Brush
Vegetative Cover (%): 93.1
Dominant Undercut Banks
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 5.8
LWD per 100 ft.:
Riffles: 1
Pools: 4
Flat: 0

Pools by Stream Length 9.5
Pool Frequency (%): 25.0
Residual Pool Depth (%):
< 2 Feet Deep: 66.7
2 to 2.9 Feet Deep: 33.3
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.76
Mean Pool Shelter 100

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 100. Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 0.0 2. 66.7 3. 0.0 4. 33.3 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 9

Channel Type: F3
Reach Length (ft.): 739
Riffle/Flatwater Mean Width (ft.): 8.2
BFW:
Range (ft.): 8.00 to 9.00
Mean (ft.): 8.58
Std. Dev.: 0.49
Base Flow (cfs): 1.714
Water (F): 51 - 51 Air (F): 53 - 56
Dry Channel (ft.): 0

Canopy Density (%): 91.1
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Brush
Vegetative Cover (%): 84.2
Dominant Undercut Banks
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 0.4
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 1

Pools by Stream Length 25.3
Pool Frequency (%): 50.0
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1
Mean Pool Shelter 28

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 66.7 Sm Cobble: 33.3 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 83.3 2. 16.7 3. 0.0 4. 0.0 5. 0.0

STREAM REACH: 10

Channel Type: G1
Reach Length (ft.): 200
Riffle/Flatwater Mean Width (ft.): 6.3
BFW:
Range (ft.): 8.00 to 8.00
Mean (ft.): 8.00
Std. Dev.: 0.00
Base Flow (cfs): 1.714
Water (F): 49 - 51 Air (F): 50 - 56
Dry Channel (ft.): 0

Canopy Density (%): 96.5
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Brush
Vegetative Cover (%): 93.3
Dominant Large Woody Debris
Dominant Bank Substrate Bedrock
Occurrence of LWD (%): 21.7
LWD per 100 ft.:
Riffles: 2
Pools: 2
Flat: 3

Pools by Stream Length 60.0
Pool Frequency (%): 50.0
Residual Pool Depth (%):
< 2 Feet Deep: 66.7
2 to 2.9 Feet Deep: 33.3
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.6
Mean Pool Shelter 47

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 33.3 Sm Cobble: 66.7 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 33.3 2. 66.7 3. 0.0 4. 0.0 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 11

Channel Type: F4
Reach Length (ft.): 4772
Riffle/Flatwater Mean Width (ft.): 7.0
BFW:
Range (ft.): 5.00 to 12.00
Mean (ft.): 8.48
Std. Dev.: 2.37
Base Flow (cfs): 1.714
Water (F): 49 - 53 Air (F): 50 - 60
Dry Channel (ft.): 0

Canopy Density (%): 92.7
Coniferous Component (%): 3.3
Hardwood Component 96.7
Dominant Bank Brush
Vegetative Cover (%): 94.8
Dominant Terrestrial Veg.
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 9.8
LWD per 100 ft.:
Riffles: 1
Pools: 3
Flat: 1

Pools by Stream Length 17.1
Pool Frequency (%): 41.9
Residual Pool Depth (%):
< 2 Feet Deep: 91.7
2 to 2.9 Feet Deep: 5.6
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 2.8
Mean Max Residual Pool Depth 1.45
Mean Pool Shelter 44

Pool Tail Substrate (%): Silt/Clay: 5.6 Sand: 2.8 Gravel: 66.7 Sm Cobble: 25.0 Lg Cobble: 0.0 Boulder 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 38.9 2. 50.0 3. 2.8 4. 0.0 5. 8.3

STREAM REACH: 12

Channel Type: G2
Reach Length (ft.): 2849
Riffle/Flatwater Mean Width (ft.): 7.9
BFW:
Range (ft.): 7.00 to 11.00
Mean (ft.): 8.67
Std. Dev.: 0.91
Base Flow (cfs): 1.714
Water (F): 49 - 51 Air (F): 50 - 57
Dry Channel (ft.): 0

Canopy Density (%): 90.8
Coniferous Component (%): 0.6
Hardwood Component 99.4
Dominant Bank Brush
Vegetative Cover (%): 95.6
Dominant Terrestrial Veg.
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 5.7
LWD per 100 ft.:
Riffles: 1
Pools: 2
Flat: 1

Pools by Stream Length 36.0
Pool Frequency (%): 50.0
Residual Pool Depth (%):
< 2 Feet Deep: 86.2
2 to 2.9 Feet Deep: 13.8
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.34
Mean Pool Shelter 64

Pool Tail Substrate (%): Silt/Clay: 6.9 Sand: 0.0 Gravel: 55.2 Sm Cobble: 20.7 Lg Cobble: 10.3 Boulder 3.4 Bedrock: 3.4
Embeddedness Values (%): 1. 27.6 2. 44.8 3. 17.2 4. 0.0 5. 10.3

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 13

Channel Type: A2
Reach Length (ft.): 4596
Riffle/Flatwater Mean Width (ft.): 8.1
BFW:
Range (ft.): 7.00 to 12.00
Mean (ft.): 9.09
Std. Dev.: 1.63
Base Flow (cfs): 1.714
Water (F): 50 - 51 Air (F): 53 - 55
Dry Channel (ft.): 0

Canopy Density (%): 92.0
Coniferous Component (%): 19.3
Hardwood Component 80.7
Dominant Bank Brush
Vegetative Cover (%): 98.0
Dominant Terrestrial Veg.
Dominant Bank Substrate Cobble/Gravel
Occurrence of LWD (%): 7.8
LWD per 100 ft.:
Riffles: 2
Pools: 2
Flat: 1

Pools by Stream Length 62.9
Pool Frequency (%): 53.6
Residual Pool Depth (%):
< 2 Feet Deep: 97.3
2 to 2.9 Feet Deep: 2.7
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 1.1
Mean Pool Shelter 48

Pool Tail Substrate (%): Silt/Clay: 5.4 Sand: 0.0 Gravel: 62.2 Sm Cobble: 21.6 Lg Cobble: 8.1 Boulder 2.7 Bedrock: 0.0
Embeddedness Values (%): 1. 48.6 2. 37.8 3. 8.1 4. 0.0 5. 5.4

Table 9 -Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Arroyo Leon **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: **Quad:** HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

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	48	57	9.2
Boulder	25	27	4.6
Cobble/Gravel	77	78	13.6
Sand/Silt/Clay	419	407	72.6

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percentage
Grass	4	4	0.7
Brush	338	362	61.5
Hardwood	223	191	36.4
Coniferous	4	10	1.2
No Vegetation	0	2	0.2

Total Stream Cobble Embeddedness Values: 2

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

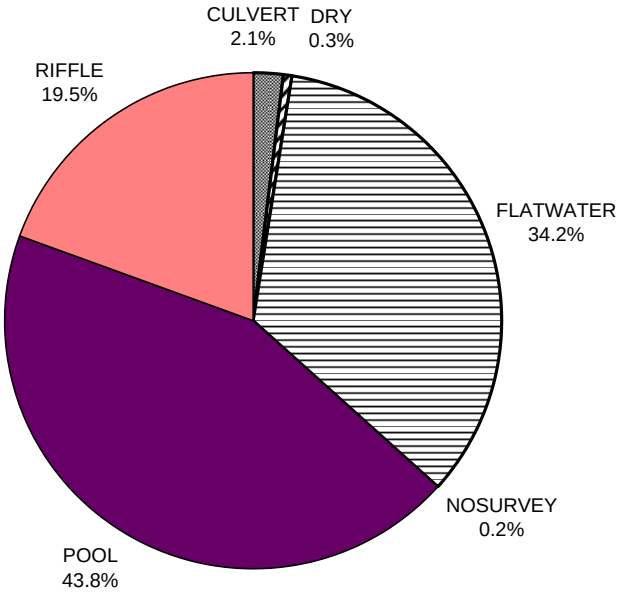
Stream Name: Arroyo Leon **LLID:** 1224253374652 **Drainage:** San Mateo Coastal

Survey 5/16/2011 to 6/8/2011

Confluence Location: **Quad:** HALF MOON BAY **Legal Description:** T000R000S00 **Latitude:** 37:27:55.0N **Longitude:** 122:25:31.0W

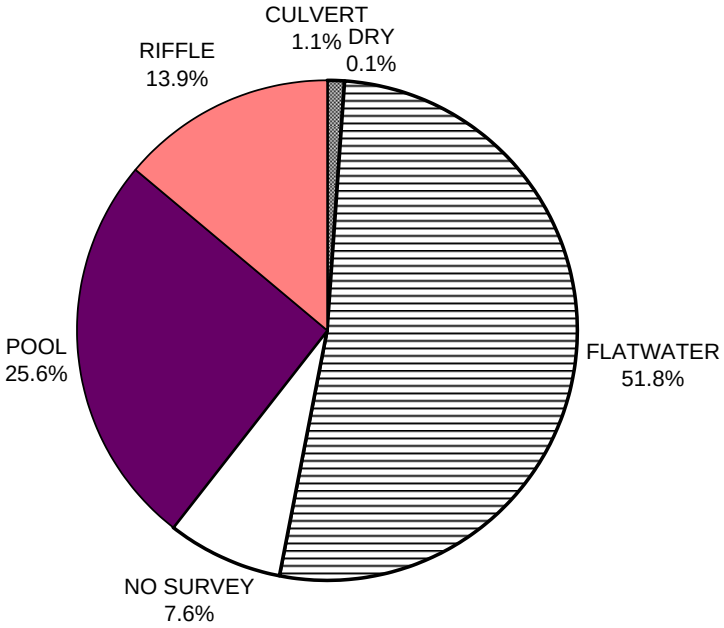
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	11	23	21
SMALL WOODY DEBRIS (%)	15	13	19
LARGE WOODY DEBRIS (%)	6	3	9
ROOT MASS (%)	9	23	18
TERRESTRIAL VEGETATION	17	19	10
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	5	1	6
BOULDERS (%)	13	3	6
BEDROCK LEDGES (%)	2	2	5

LEON, ARROYO 2011
HABITAT TYPES BY PERCENT OCCURRENCE



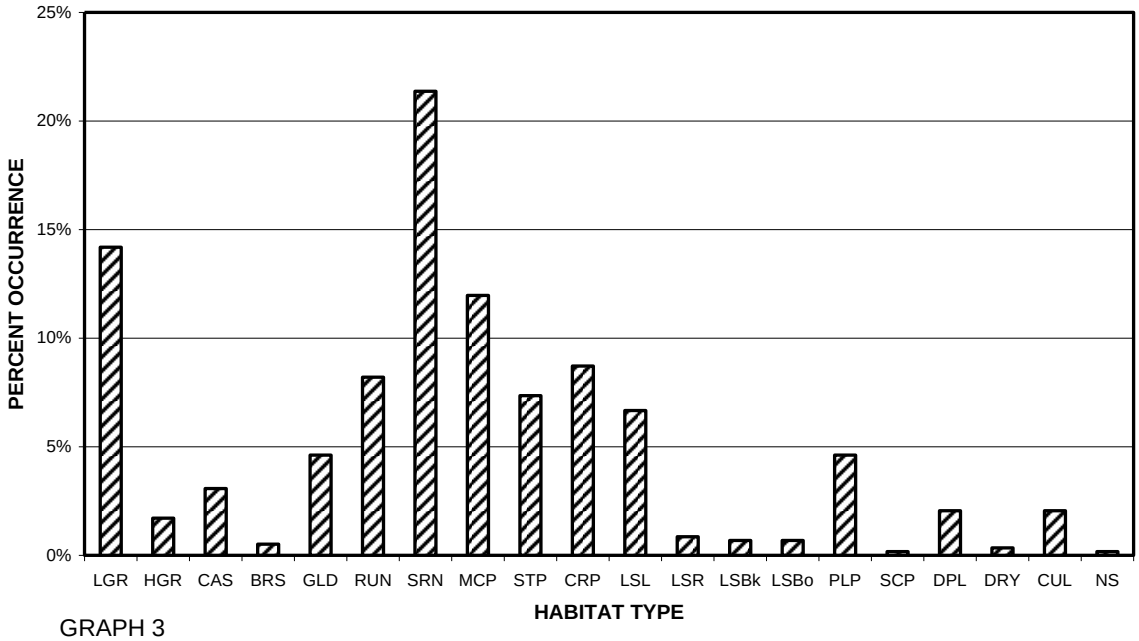
GRAPH 1

LEON, ARROYO 2011
HABITAT TYPES BY PERCENT TOTAL LENGTH



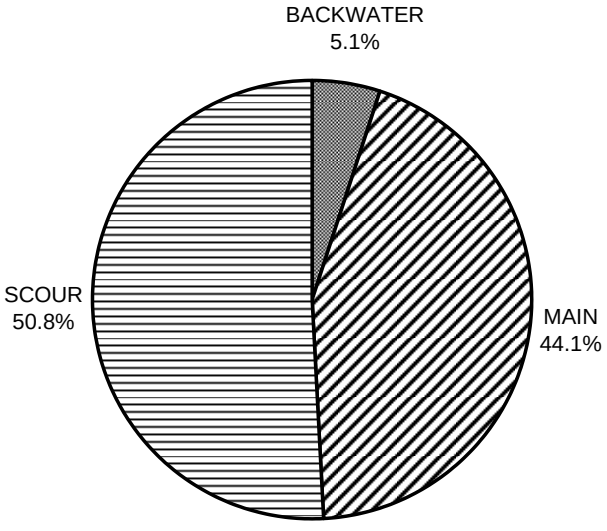
GRAPH 2

LEON, ARROYO 2011
HABITAT TYPES BY PERCENT OCCURRENCE

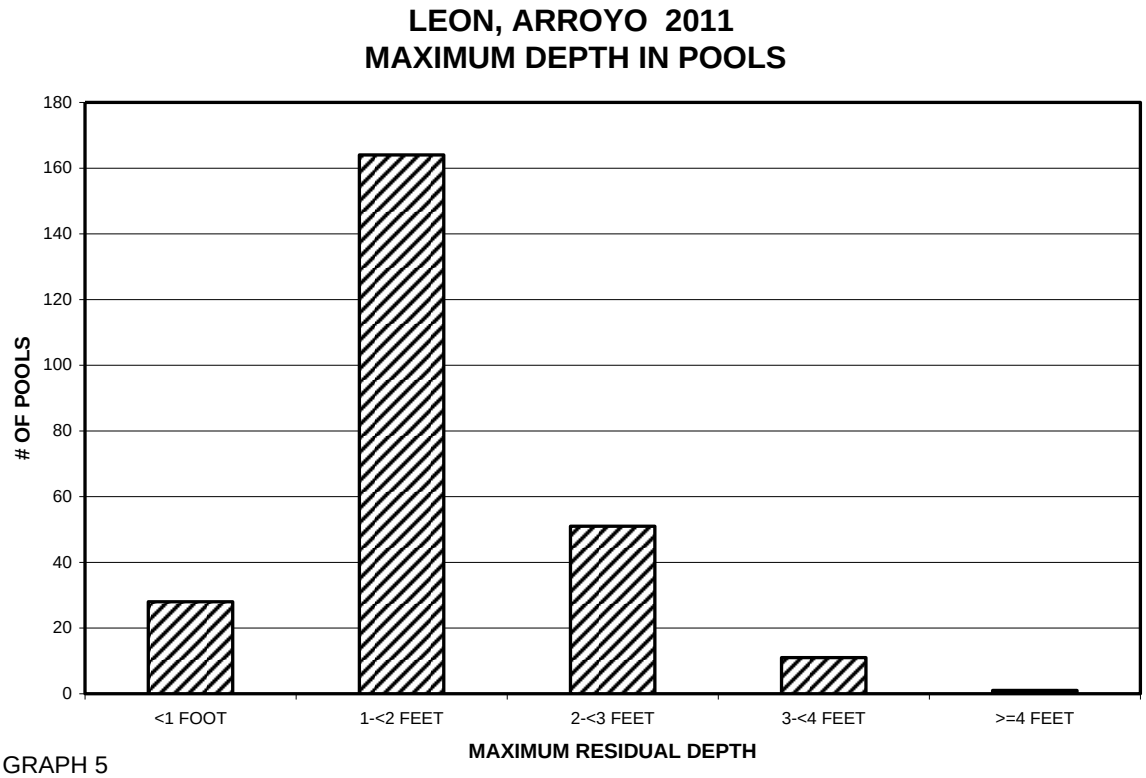


GRAPH 3

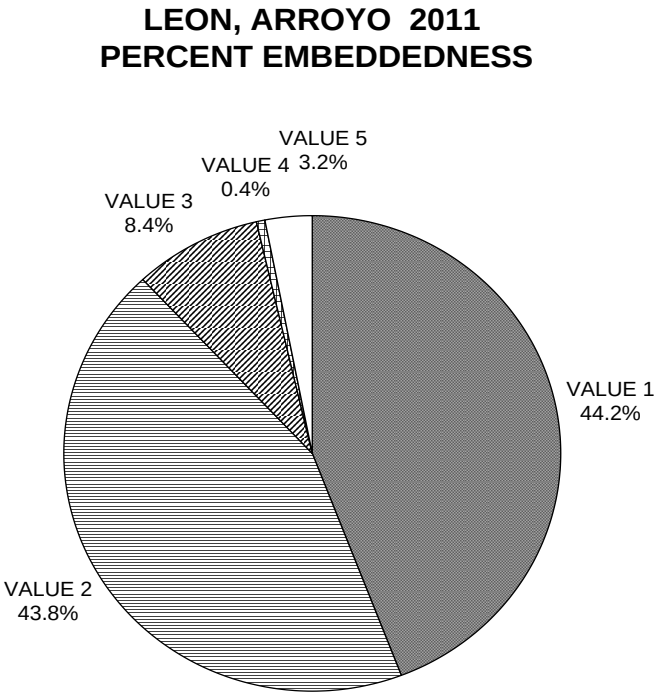
LEON, ARROYO 2011
POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

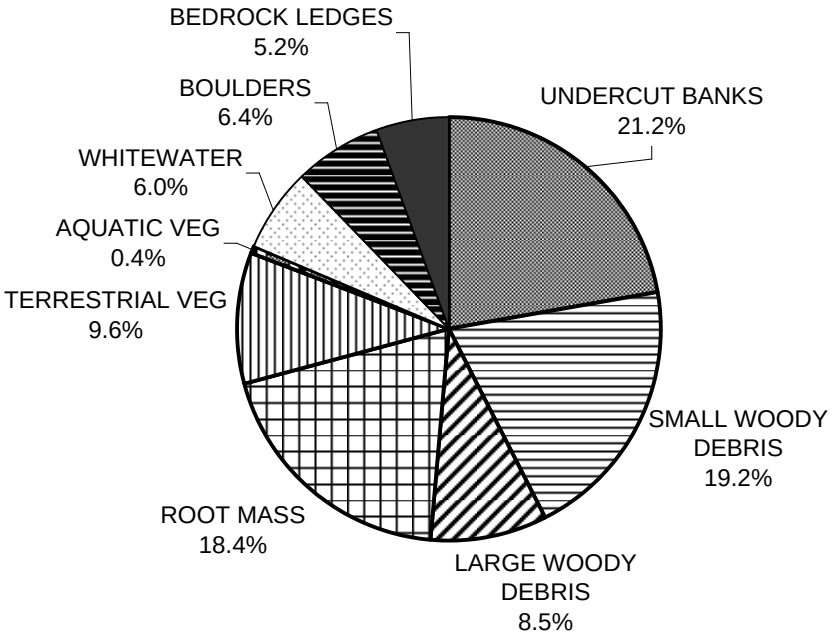


GRAPH 5



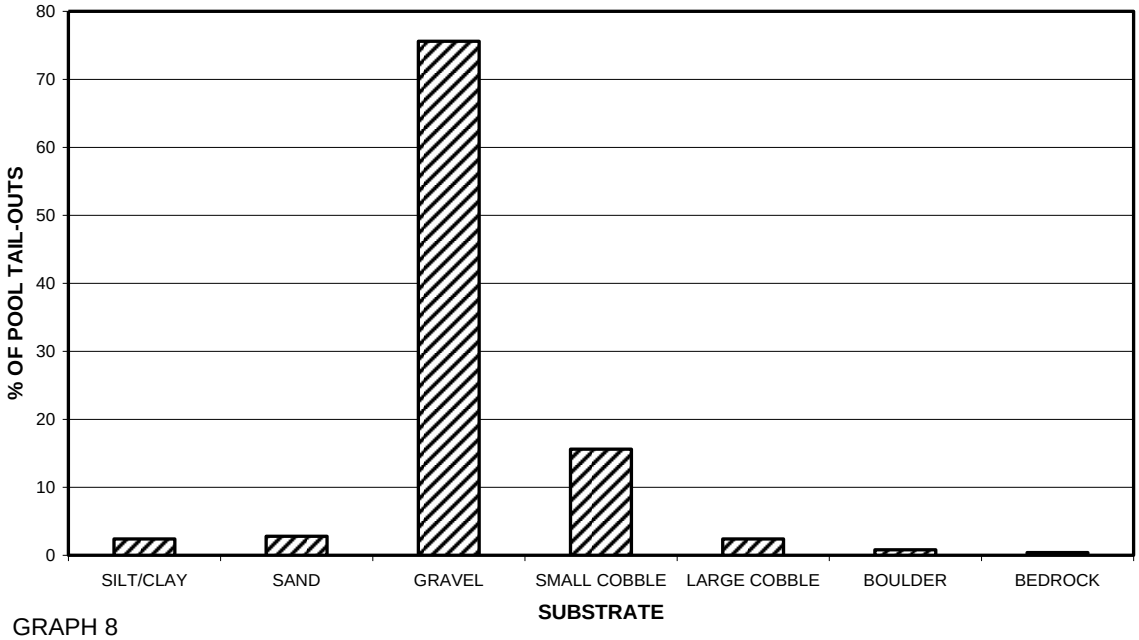
GRAPH 6

LEON, ARROYO 2011
MEAN PERCENT COVER TYPES IN POOLS



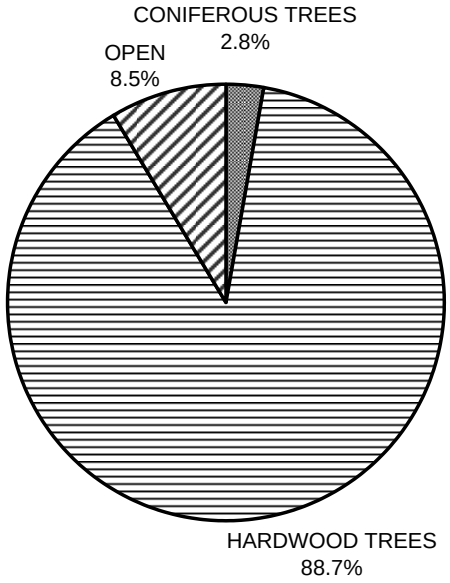
GRAPH 7

LEON, ARROYO 2011
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



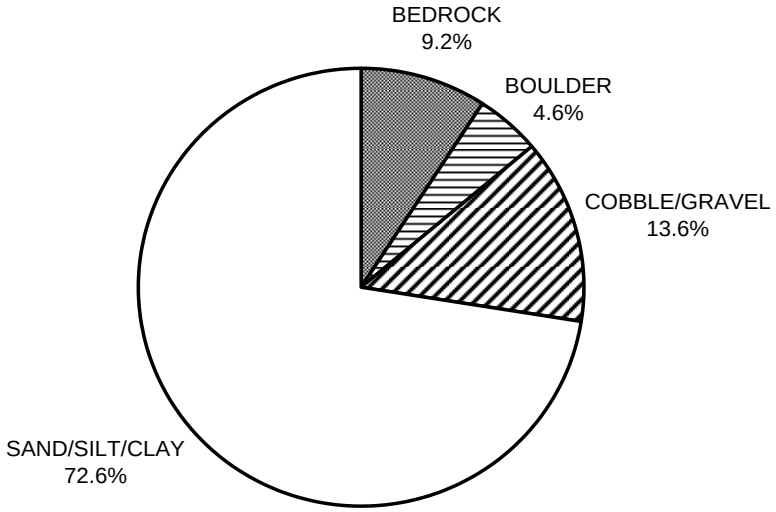
GRAPH 8

LEON, ARROYO 2011
MEAN PERCENT CANOPY



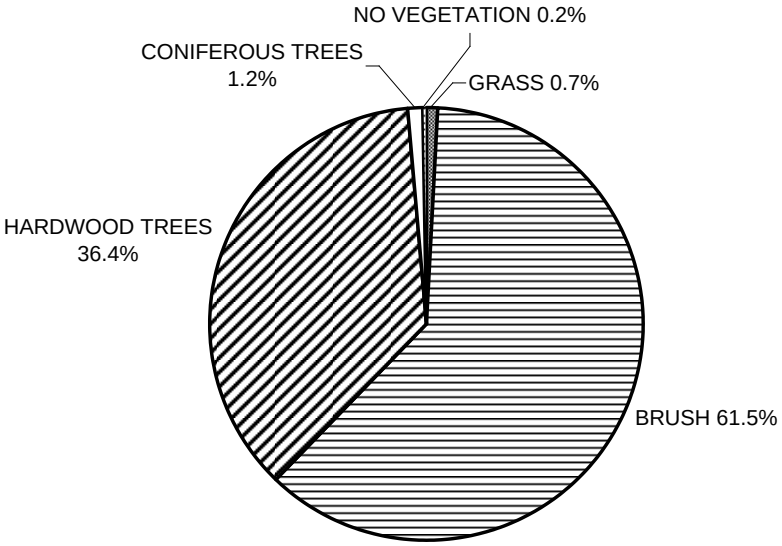
GRAPH 9

LEON, ARROYO 2011
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

LEON, ARROYO 2011
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11