California Department of Fish and Wildlife
Alameda County
South San Francisco Bay Watershed
Stream Habitat Assessment Reports

Alameda Creek

Surveyed 2010

Report Completed in 2013

STREAM INVENTORY REPORT

Alameda Creek

INTRODUCTION

A stream inventory was conducted during 10/12/2010 to 10/20/2010 on Alameda Creek. The survey began just upstream of the old canyon road crossing and extended upstream 5.83 miles.

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

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

Alameda Creek is a tributary to Pacific Ocean and the San Francisco Bay, located in Alameda County, California (Map 1). Alameda Creek's legal description at the confluence with Pacific Ocean is T04S R03W S12. Its location is (37:35:39.0N) 37°35”38.9’ north latitude and (122:08:28.0W) 122°08”45.8’ west longitude, LLID number 122146037941. Alameda Creek is a sixth order stream and has approximately --- miles of blue line stream according to the USGS National Hydrology Dataset (NHD). Alameda Creek drains a watershed of approximately 681.2 square miles. Elevations range from about 3278 feet below sea level at the mouth of the creek to 4341 feet in the headwater areas (average elevation of headwaters, not highest point). Grassland and herbaceous vegetation as well as mixed and evergreen forest dominate the watershed. The watershed is primarily located in urban residential areas; a small portion is privately and state park owned and is managed for rangeland. Vehicle access exists via multiple highways and urban street within the greater Richmond and Niles.

METHODS

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

Alameda Creek

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 Alameda Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

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

2. Channel Type:

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

3. Temperatures:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled

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

5. Embeddedness:

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

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Alameda Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Alameda Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Alameda Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the 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.

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)

Alameda Creek

- 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 Alameda Creek include:

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

HABITAT INVENTORY RESULTS

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

The habitat inventory of 10/12/2010 to 10/20/2010, was conducted by Griffin, A. Bell, C. (WSP). The total length of the stream surveyed was 30,786 feet with an additional 180 feet of side channel.

Stream flow was estimated to be 15.02 cfs during the survey period.

Alameda Creek is a F4 channel type for 11,522 feet of the stream surveyed (Reach 1), a DA4 channel type for 19,264 feet of the stream surveyed (Reach 2).

F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. DA4 channels are multiple channels that are deep and narrow with expansive well vegetated floodplains and associated wetlands; channels are very gentle relief with highly variable sinuosities, stable stream banks, and are gravel filled.

Water temperatures taken during the survey period ranged from 59 to 68 degrees Fahrenheit. Air temperatures ranged from 59 to 82 degrees Fahrenheit

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% flatwater units, 34% riffle units, 17% pool

units, and 4% culvert units (Graph 1). Based on total length of Level II habitat types there were 60% flatwater units, 30% riffle units, 10% pool units, and 1% culvert units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 18% Glide units, 21% Run units, and 32% Low Gradient Riffle units (Graph 3). Based on percent total length, 32% Glide units, 19% Run units, and 28% Low Gradient Riffle units.

A total of 34 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 71%, and comprised 79% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Eleven of the 32 pools (34%) had a residual depth of three feet or greater (Graph 5).

Twelve of the 32 pools (38%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 33 pool tail-outs measured, 1 had a value of 1 (3%); 10 had a value of 2 (30.3%); 6 had a value of 3 (18.2%); 3 had a value of 4 (9.1%); and 13 had a value of 5 (39.4%) (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 16 , flatwater habitat types had a mean shelter rating of 6 , and pool habitats had a mean shelter rating of 11 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 9, Scour pools had a mean shelter rating of 15 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Alameda Creek. Graph 7 describes the pool cover in Alameda Creek. Boulders are the dominant pool cover type followed by terrestrial vegetation.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. A sand substrate was observed in 21% of pool tail-outs, and gravel observed in 45% of pool tail-outs.
The mean percent canopy density for the surveyed length of Alameda Creek was 29%. The mean percentages of hardwood and coniferous trees were 100% and 0%, respectively. Seventy One percent of the canopy was open. Graph 9 describes the mean percent canopy in Alameda Creek.

Alameda Creek

For the stream reach surveyed, the mean percent right bank vegetated was 77%. The mean percent left bank vegetated was 72%. The dominant elements composing the structure of the stream banks consisted of 4% bedrock, 4% boulder, 36% cobble/gravel, 56% sand/silt/clay, (Graph 10). Hardwood/ deciduous trees were the dominant vegetation type observed in 92% of the units surveyed. Additionally, 6% of the units surveyed had Brush as the dominant vegetation type, and 1% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Roach, unidentified toads, carp, New Zealand mud snails, and stickleback were observed from the stream banks of Alameda Creek when the survey was conducted.

DISCUSSION

Alameda Creek is a F4 channel type for the first 11,522 feet of stream surveyed and a DA4 channel type for the next 19,264 feet. The suitability of F4 and DA4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; however, F4 channels are poor for bolder clusters. DA4 channel types are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days 10/12/2010 to 10/20/2010, ranged from 59 to 68 degrees Fahrenheit. Air temperatures ranged from 59 to 82 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 60% of the total length of this survey, riffles 30%, and pools 10%. The pools are relatively shallow, with only 11 of the 32 (34%) 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 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.

Eleven of the 33 pool tail-outs measured had embeddedness ratings of 1 or 2. Nine of the pool tail-outs had embeddedness ratings of 3 or 4. Thirteen 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 Alameda Creek should be mapped and rated according to their potential sediment

yields, and control measures should be taken.

Twenty of the 33 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 11. The shelter rating in the flatwater habitats was 6. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Boulders in Alameda Creek. Boulders are the dominant cover type in pools followed by terrestrial vegetation . 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 29%. Reach 1 had a canopy density of 21%, Reach 2 had a canopy density of 35%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 77% and 72%, 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

Alameda Creek should be managed as an anadromous, natural production stream.

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

RECOMMENDATIONS

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

2) The limited water temperature data available suggest that maximum

temperatures are above the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from Boulders and Terrestrial Vegetation. Adding high quality complexity with woody cover in the pools is desirable.

4) 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.

5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield, particularly in Reach 1. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Active and potential sediment sources related to the urban road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

6) Alameda Creek would benefit from utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.

7) Access for migrating salmonids should be assessed at all road crossings and dams. Sites of particular concern include both Dam sites and the first Pacific Railroad Bridge located near Highway 84/ Niles Canyon Road. There are also multiple in-stream structures that were identified as potential barriers. The most downstream barrier is located directly downstream of the Palomares Road and Highway 84 intersection; upstream, another in-stream barrier is located near the entrance of the Niles Canyon Railway Station. The last identified in-stream structure is located directly upstream of the last Pacific Railroad Bridge, west of the city of Sunol, California. 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.

Alameda Creek
COMMENTS AND LANDMARKS

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

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	Start of Survey at weir upstream of old canyon road. WP192 N37.58073 W121.96484
0	0001.00	4" roach observed
529	0003.00	rip rap on the left bank
529	0003.00	2' carp observed
2658	0016.00	Dam #1 is weir type dam retaining sediment, with a Length=15', a Height=4', a Width(0)=107', and a Width(d)=120'. No Flashboards installed, dam is creating downcutting, with a Height 4'. Sill to water level, 0'. Dam is a possible barrier to juvenile salmonids. WP194 N37.58657 W121.96165
2673	0017.00	Cable suspended across creek with small platform.
3788	0020.00	Left bank railroad retaining wall with a height of 18', runs through last 2 units
3987	0021.00	Left bank railroad retaining wall ends in unit.
4599	0025.00	Bridge #1 is a railroad bridge with a Length=13', a Height=30', and a Width=67'. It is Made of steel, retaining no gravel, and has Height water to sill of 2'. It is not a barrier to salmonids and there is no downcutting. WP196 N37.59025 W121.95726
5279	0030.00	Unidentified aquatic snail observed
5466	0031.00	12 " unidentified fish observed
7918	0050.00	Stickleback observed
8067	0051.00	12" fish observed
8472	0055.00	15' x 7' x 3' concrete slab causing scour.
8576	0057.00	footing for old bridge or dam
8919	0059.00	Bridge #2 is a railroad bridge with a Length=15', a Height=30', and a Width=200'. It is made of steel, retaining no gravel and has no sill. It is not creating downcutting and is not a possible barrier to salmonids. WP200 N37.59763 W121.94743
11486	0076.00	Bridge #3 is the Hwy84/ Niles Canyon road Bridge, which has a Length=36', a Height=25', and a Width=62'. It is made of steel, not retaining gravel and has no sill. It is not creating downcutting and is not a barrier to salmonids. WP202 N37.59874 W121.93876

Alameda Creek

Position (ft.)	Habitat Unit #	Comments:
11618	0078.00	Dam #2 footings from possible old bridge, appear to be a type of weir.
11618	0078.00	Dam #2 has a Length=3', a Height=3', a Width(0)=70', and a Width (d)=70'. No flashboards were installed and it is not creating any downcutting, and has no sill. However it is retaining gravel and is a possible barrier to juvenile salmonids. WP taken 96' upstream of Bridge #3 at Calibration WP203 N37.59428 W121.93730
11621	0079.00	Arundo on the right bank.
17057	0104.00	Bridge #4 is Niles Canyon road bridge and has a Length=n/a, a Height= 35', and a Width=68'. It is made of concrete and is retaining gravel but has no sill. It is not creating downcutting and is not a barrier to salmonids. WP206 N37.59578 W121.93007
17102	0105.00	Concrete bank for 200' along the left bank
17516	0107.00	A left bank railroad retaining wall extends through the entire unit.
17901	0109.00	Concrete bags as road stabilization on the right bank.
18875	0120.00	30' old bridge footing on the left bank.
20648	0130.00	Concrete structure across creek is a possible juvenile salmonid barrier
22569	0142.00	Large unidentified fish observed.
26206	0171.00	Bridge #5 is a Union Pacific Railroad bridge With a Length=36', a Height=25', and a Width=116'. It is made of concrete and steel, is not retaining gravel, and has no sill. It is not creating downcutting, and is not a barrier. WP taken 80' upstream at Calibration WP213 N37.59523 W121.90319
26492	0174.00	Old dam footing.
29857	0191.00	Large unidentified fish observed.
30328	0196.00	Arundo on the right bank.
30726	0199.00	Right Bank Tributary #1 is the Arroyo de la Laguna; it is wet, with 2.5 cfs, and contributes 80% of flow to the receiving stream. Water temperature downstream and in the tributary was 66F, and upstream temperature was 67F. Survey crew checked 200' upstream and found it was accessible to fish with a channel Slope= 1%. Unknown fish observed. WP 216 N37.58821 W121.89056
30786	0199.00	End of Survey because the season ended.

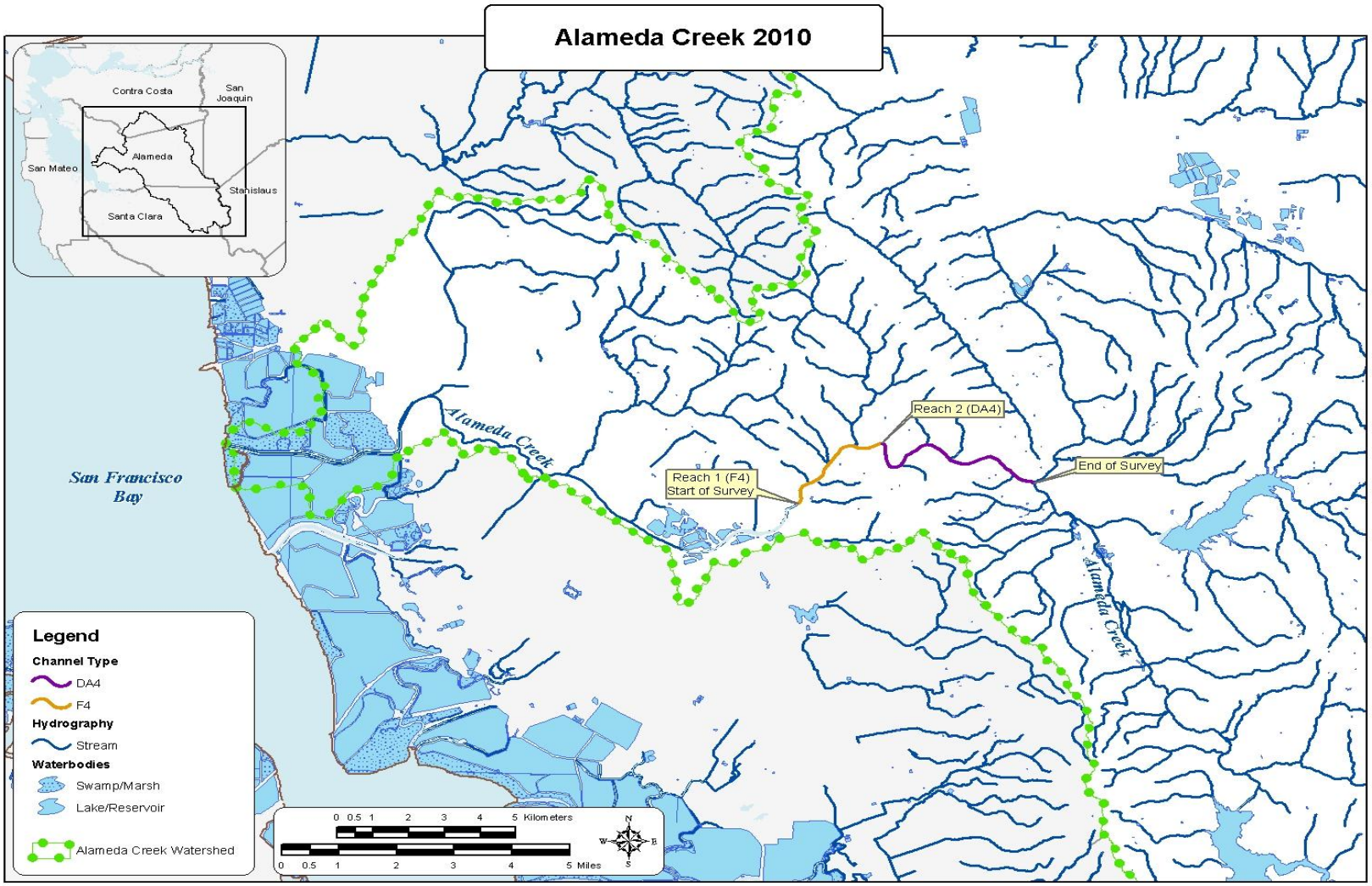
REFERENCES

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.

Alameda Creek



\\DFG\Watershed_Overview\San_Bay\2010\AlamedaCreek_2010.mxd

Prepared by: Scott Webb, April 2011

Alameda Creek

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

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

Stream Name: Alameda Creek **LLID:** 1221411375942 **Drainage:** Alameda Creek

Survey 10/12/2010 to 10/20/2010

Confluence Location: **Quad:** NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

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
7	0	CULVERT	3.5	23	163	0.5									
90	89	FLATWATER	45.0	206	18554	59.9	31.2	1.2	2.0	6183	556441	7389	665036		6
34	33	POOL	17.0	90	3069	9.9	27.1	1.2	2.6	2538	86285	5668	186887	3457	11
69	69	RIFFLE	34.5	133	9180	29.6	28.7	1.0	1.7	3609	249020	3541	244340		16

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
200	191	30966	891746	1096262

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Alameda Creek **LLID:** 1221411375942 **Drainage:** Alameda Creek

Survey 10/12/2010 to 10/20/2010

Confluence Location: Quad: NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

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 (%)
65	65	LGR	32.5	135	8804	28.4	28.0	1.0	3.0	3658	237796	3541	230191		12	29
4	4	HGR	2.0	94	376	1.2	37.0	1.2	2.8	2806	11225	3537	14150		86	14
2	2	POW	1.0	86	173	0.6	32.0	1.7	3.0	2716	5432	4638	9277		3	43
37	36	GLD	18.5	270	9992	32.3	34.0	1.2	3.5	8063	298338	9676	358028		4	30
42	42	RUN	21.0	138	5806	18.7	28.0	1.3	3.8	3912	164283	4774	200498		7	26
9	9	SRN	4.5	287	2583	8.3	35.0	1.2	2.4	10030	90268	11058	99520		7	37
12	11	TRP	6.0	133	1597	5.2	29.0	1.3	3.9	3886	46634	8896	106757	5223	9	29
11	11	MCP	5.5	62	682	2.2	25.0	1.2	2.9	1576	17332	3275	32751	1963	7	41
1	1	STP	0.5	149	149	0.5	25.0	1.2	3.2	3725	3725	7450	7450	4470	45	27
1	1	LSL	0.5	62	62	0.2	32.0	1.6	3.0	1984	1984	3571	3571	3174	5	64
6	6	LSBk	3.0	78	471	1.5	29.0	1.3	5.0	2528	15166	5737	34420	4019	8	39
2	2	LSBo	1.0	38	76	0.2	25.0	0.2	0.9	932	1864	1276	2553	55	28	8
1	1	PLP	0.5	32	32	0.1	29.0	1.8	3.7	928	928	2784	2784	1670	40	0
7	0	CUL	3.5	23	163	0.5										0

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume
200	191	30966	894975	1101949

Alameda Creek

Table 3 - Summary of Pool Habitat Types

Stream Name: Alameda Creek **LLID:** 1221411375942 **Drainage:** Alameda Creek

Survey 10/12/2010 to 10/20/2010

Confluence Location: **Quad:** NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

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
24	23	MAIN	71	101	2428	79	26.5	1.3	2774	66579	3707	85098	9
10	10	SCOUR	29	64	641	21	28.4	1.2	1994	19942	2907	29068	15

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
34	33	3069	86521	114166

Alameda Creek

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

Stream Name: Alameda Creek **LLID:** 1221411375942 **Drainage:** Alameda Creek

Survey 10/12/2010 to 10/20/2010

Confluence Location: Quad: NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

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
11	TRP	34	0	0	2	18	4	36	5	45	0	0
10	MCP	31	0	0	0	0	10	100	0	0	0	0
1	STP	3	0	0	0	0	0	0	1	100	0	0
1	LSL	3	0	0	0	0	0	0	1	100	0	0
6	LSBk	19	0	0	1	17	1	17	3	50	1	17
2	LSBo	6	2	100	0	0	0	0	0	0	0	0
1	PLP	3	0	0	0	0	0	0	1	100	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
32	2	6	3	9	15	47	11	34	1	3

Mean Maximum Residual Pool Depth (ft.): 3

Alameda Creek

Table 5 - Summary of Mean Percent Cover By Habitat

Stream Name: Alameda Creek **Dry Units:** **LLID:** 1221411375942 **Drainage:** Alameda Creek

Survey 10/12/2010 to 10/20/2010

Confluence Location: **Quad:** NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

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
65	63	LGR	0	0	2	0	5	7	9	38	0
4	4	HGR	0	0	0	0	0	3	30	68	0
2	2	POW	0	0	0	0	0	0	0	50	0
37	36	GLD	0	1	3	0	19	4	0	17	0
42	42	RUN	0	0	4	1	15	11	0	31	0
9	9	SRN	0	2	0	0	25	29	0	10	0
12	12	TRP	0	2	7	1	35	6	0	16	0
11	11	MCP	0	0	0	0	20	7	0	37	0
1	1	STP	0	0	0	0	0	30	40	0	30
1	1	LSL	0	0	100	0	0	0	0	0	0
6	6	LSBk	0	0	13	0	3	10	0	0	40
2	2	LSBo	0	0	0	0	0	0	13	88	0
1	1	PLP	0	0	0	0	0	0	90	0	10
7	0	CUL									

Alameda Creek

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Alameda Creek **Dry Units:** **LLID:** 1221411375942 **Drainage:** Alameda Creek

Survey 10/12/2010 to 10/20/2010

Confluence Location: **Quad:** NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

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
65	65	LGR	0	0	23	37	25	14	2
4	4	HGR	0	0	0	0	0	100	0
2	2	POW	0	0	100	0	0	0	0
37	37	GLD	5	19	68	3	5	0	0
42	42	RUN	0	0	74	19	5	0	2
9	9	SRN	0	0	67	33	0	0	0
12	12	TRP	8	33	58	0	0	0	0
11	11	MCP	9	0	45	18	9	0	18
1	1	STP	0	0	0	0	0	0	100
1	1	LSL	100	0	0	0	0	0	0
6	6	LSBk	17	0	33	33	0	0	17
2	2	LSBo	0	0	100	0	0	0	0
1	1	PLP	0	100	0	0	0	0	0
7	0	CUL	0	0	0	0	0	0	0

Alameda Creek

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Alameda Creek **LLID:** 1221411375942 **Drainage:** Alameda Creek

Survey 10/12/2010 to 10/20/2010

Confluence Location: **Quad:** NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
29	0	100	5	77	72

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.

Alameda Creek

Table 8 - Fish Habitat Inventory Data Summary

Stream Alameda Creek LLID: 1221411375942 Drainage Alameda Creek

Survey Dates: 10/12/2010 to 10/20/2010 Survey Length (ft.): 30966 Main Channel (ft.): 30786 Side Channel (ft.): 180

Confluence Location: Quad NILES Legal Description: T000R000S00 Latitude: 37:35:39.0N Longitude: 122:08:28.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4
Reach Length (ft.): 11522
Riffle/Flatwater Mean Width (ft.): 30.3
BFW:
Range (ft.): 30.00 to 60.00
Mean (ft.): 39.30
Std. Dev.: 8.86
Base Flow (cfs): 15.02
Water (F): 60 - 68 Air (F): 63 - 82
Dry Channel (ft.): 0

Canopy Density (%): 21.0
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Hardwood Trees
Vegetative Cover (%): 78.0
Dominant Boulders
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 0.5
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 0

Pools by Stream Length 8.5
Pool Frequency (%): 15.6
Residual Pool Depth (%):
< 2 Feet Deep: 25.0
2 to 2.9 Feet Deep: 41.7
3 to 3.9 Feet Deep: 33.3
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth 2.40
Mean Pool Shelter 13

Pool Tail Substrate (%): Silt/Clay: 8.3 Sand: 33.3 Gravel: 25.0 Sm Cobble: 8.3 Lg Cobble: 0.0 Boulder 25.0 Bedrock: 0.0
Embeddedness Values (%): 1. 0.0 2. 33.3 3. 0.0 4. 0.0 5. 66.7

STREAM REACH: 2

Channel Type: DA4
Reach Length (ft.): 19264
Riffle/Flatwater Mean Width (ft.): 29.9
BFW:
Range (ft.): 20.00 to 91.00
Mean (ft.): 44.50
Std. Dev.: 17.27
Base Flow (cfs): 15.02
Water (F): 59 - 66 Air (F): 59 - 74
Dry Channel (ft.): 0

Canopy Density (%): 34.6
Coniferous Component (%): 0.0
Hardwood Component 100.0
Dominant Bank Hardwood Trees
Vegetative Cover (%): 72.2
Dominant Terrestrial Veg.
Dominant Bank Substrate Sand/Silt/Clay
Occurrence of LWD (%): 4.9
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 0

Pools by Stream Length 10.8
Pool Frequency (%): 17.9
Residual Pool Depth (%):
< 2 Feet Deep: 10.0
2 to 2.9 Feet Deep: 50.0
3 to 3.9 Feet Deep: 35.0
>= 4 Feet Deep: 5.0
Mean Max Residual Pool Depth 2.785
Mean Pool Shelter 10

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 14.3 Gravel: 57.1 Sm Cobble: 19.0 Lg Cobble: 0.0 Boulder 4.8 Bedrock: 4.8
Embeddedness Values (%): 1. 4.8 2. 28.6 3. 28.6 4. 14.3 5. 23.8

Table 9 -Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Alameda Creek **LLID:** 1221411375942 **Drainage:** Alameda Creek

Survey 10/12/2010 to 10/20/2010

Confluence Location: **Quad:** NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

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	4	13	4.4
Boulder	6	9	3.9
Cobble/Gravel	62	76	35.9
Sand/Silt/Clay	120	94	55.7

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	0	1.0
Brush	11	13	6.3
Hardwood	177	178	92.4
Coniferous	0	0	0.0
No Vegetation	0	1	0.3

Total Stream Cobble Embeddedness Values: 4

Alameda Creek

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

Stream Name: Alameda Creek **LLID:** 1221411375942 **Drainage:** Alameda Creek

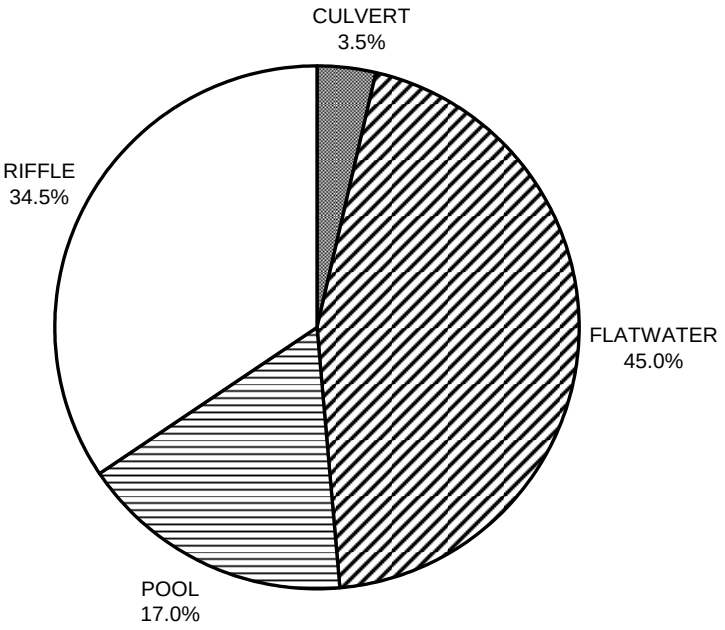
Survey 10/12/2010 to 10/20/2010

Confluence Location: **Quad:** NILES **Legal Description:** T000R000S00 **Latitude:** 37:35:39.0N **Longitude:** 122:08:28.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	0
SMALL WOODY DEBRIS (%)	0	1	1
LARGE WOODY DEBRIS (%)	2	3	8
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION	5	17	20
AQUATIC VEGETATION (%)	7	10	7
WHITEWATER (%)	10	0	5
BOULDERS (%)	40	24	23
BEDROCK LEDGES (%)	0	0	8

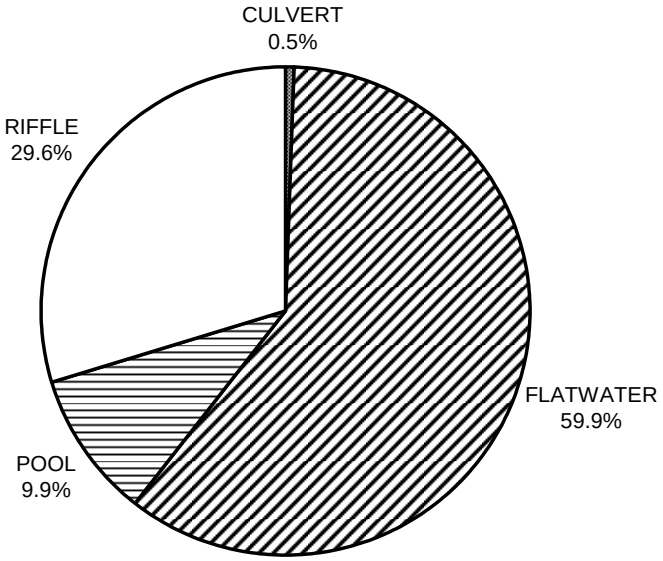
Alameda Creek

ALAMEDA CREEK 2010
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

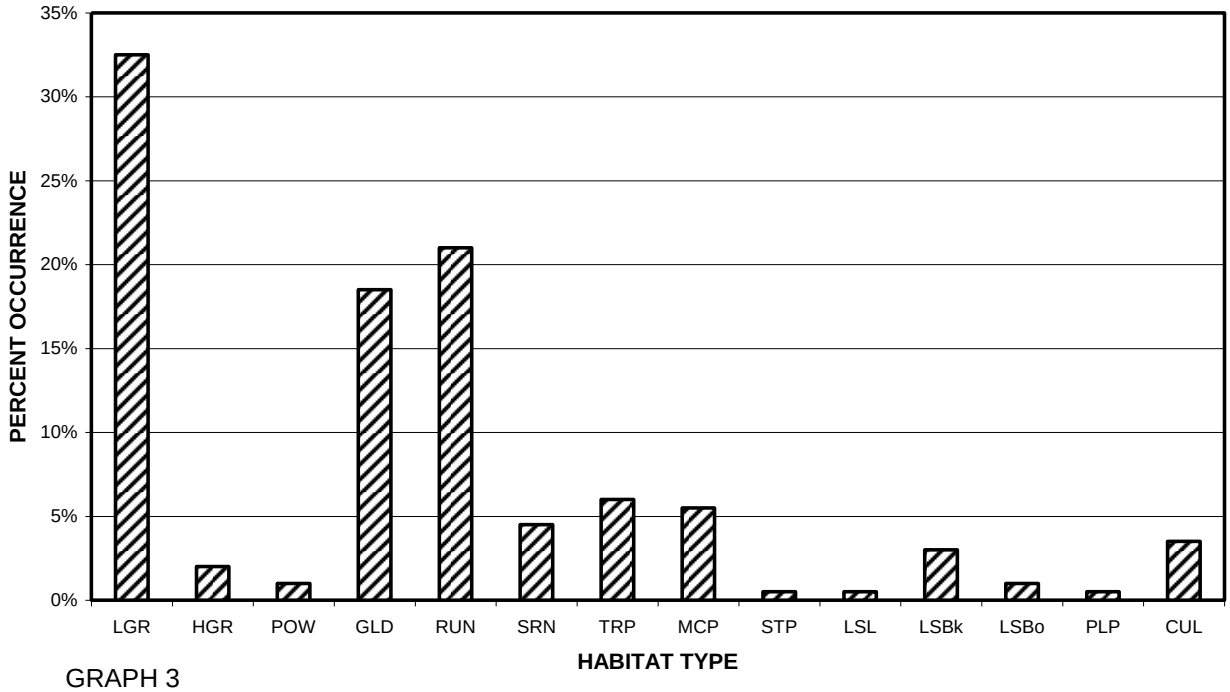
ALAMEDA CREEK 2010
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

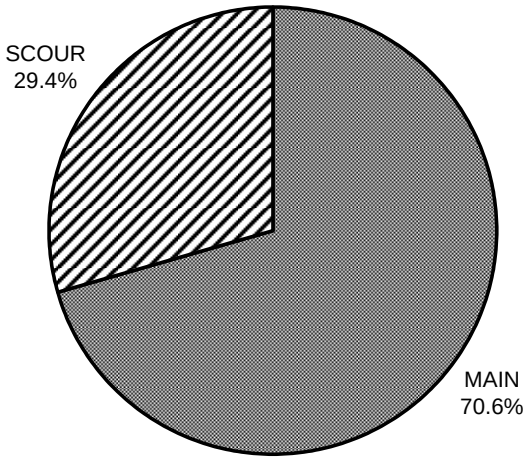
Alameda Creek

ALAMEDA CREEK 2010
HABITAT TYPES BY PERCENT OCCURRENCE



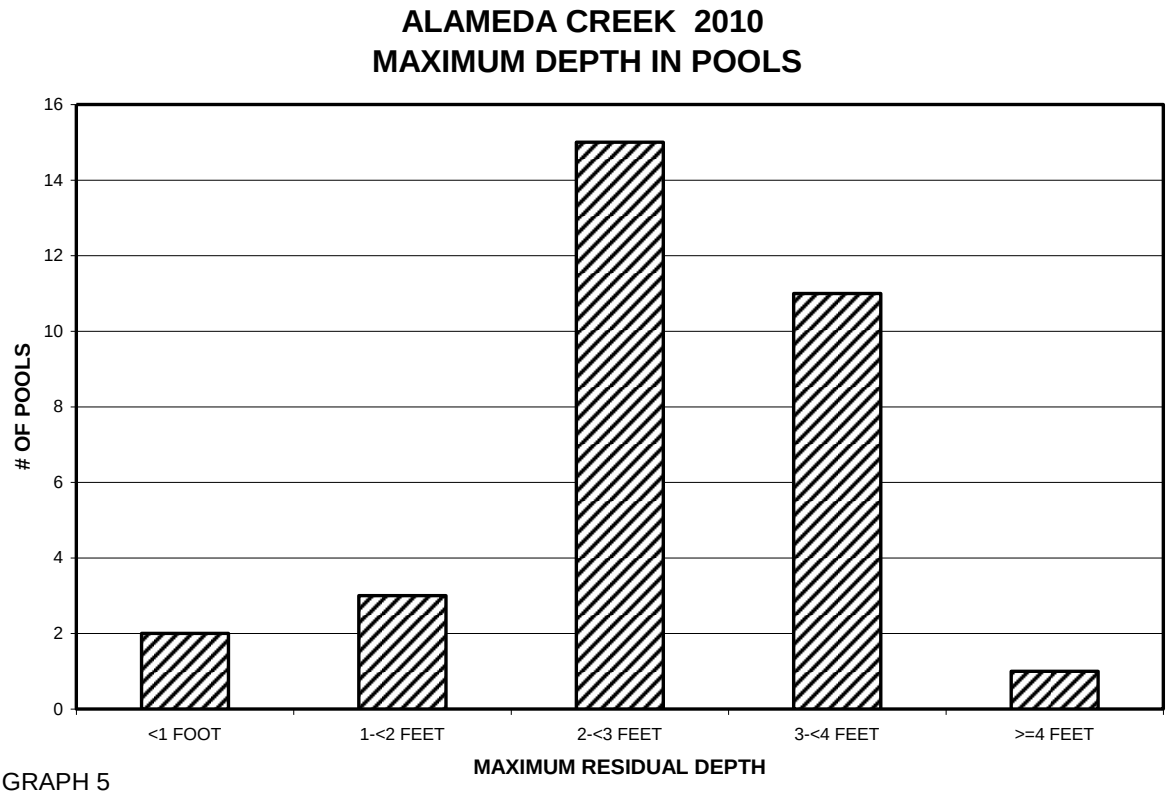
GRAPH 3

ALAMEDA CREEK 2010
POOL TYPES BY PERCENT OCCURRENCE

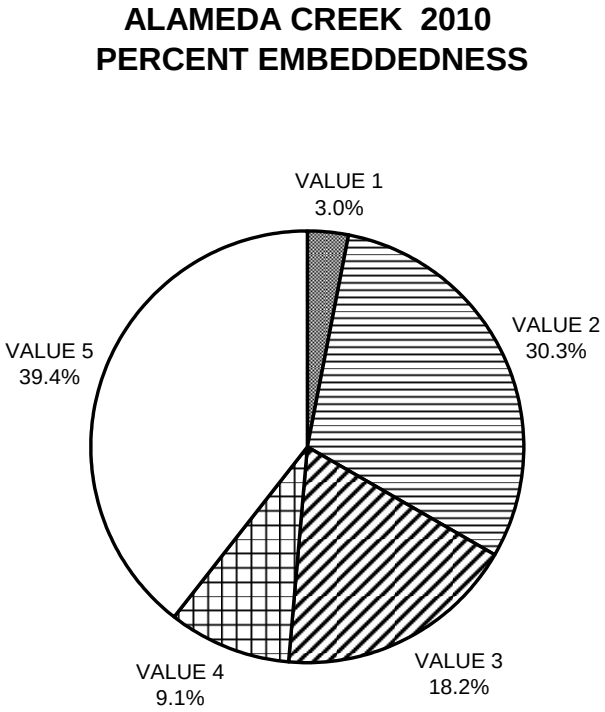


GRAPH 4

Alameda Creek

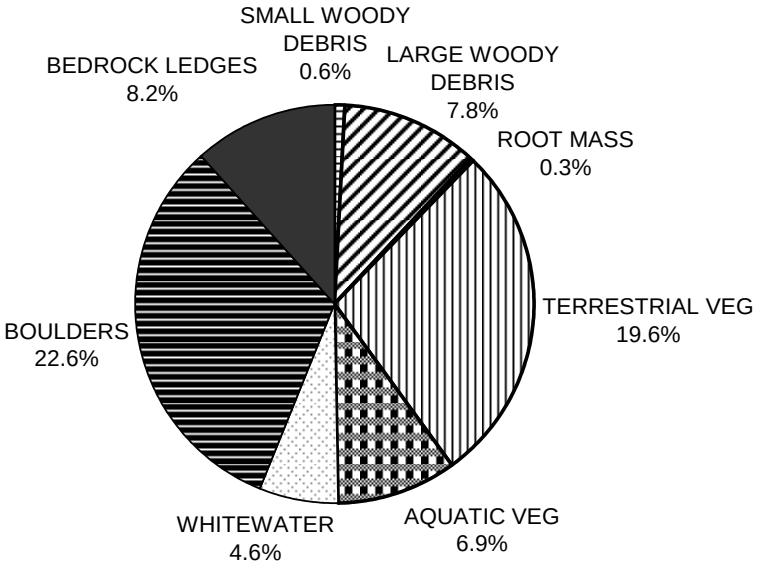


GRAPH 5



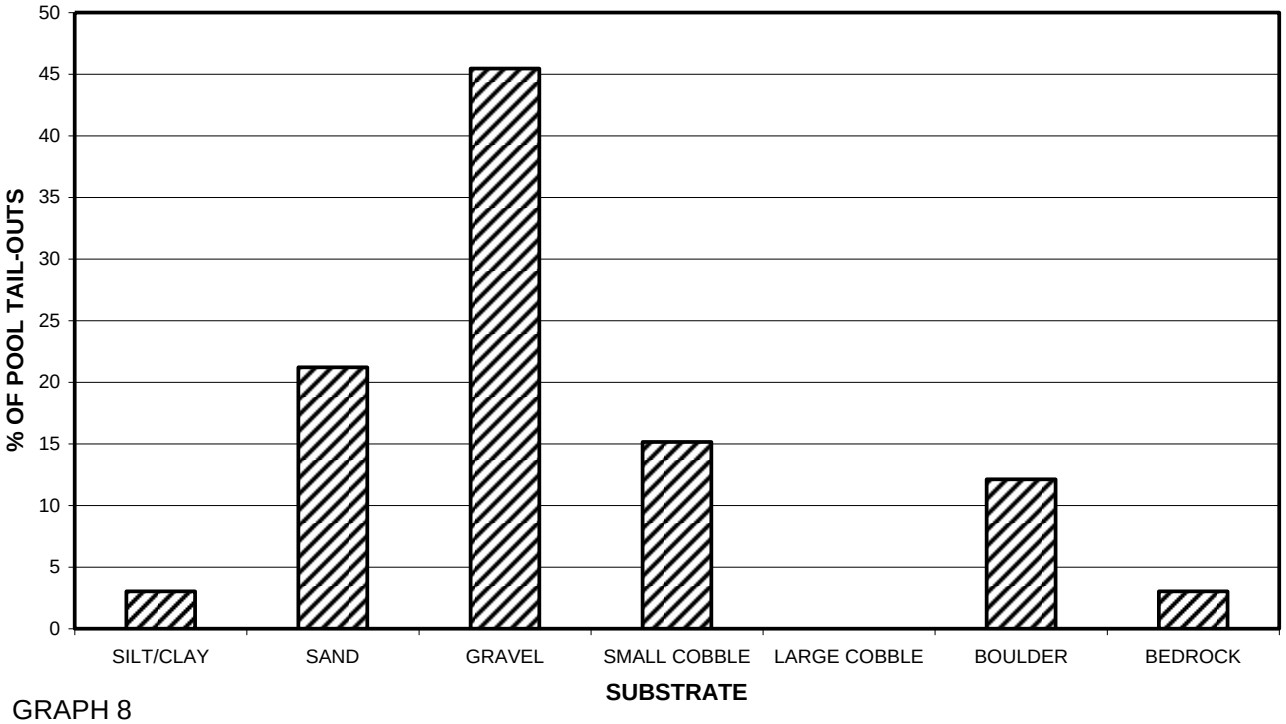
GRAPH 6

ALAMEDA CREEK 2010
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

ALAMEDA CREEK 2010
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS

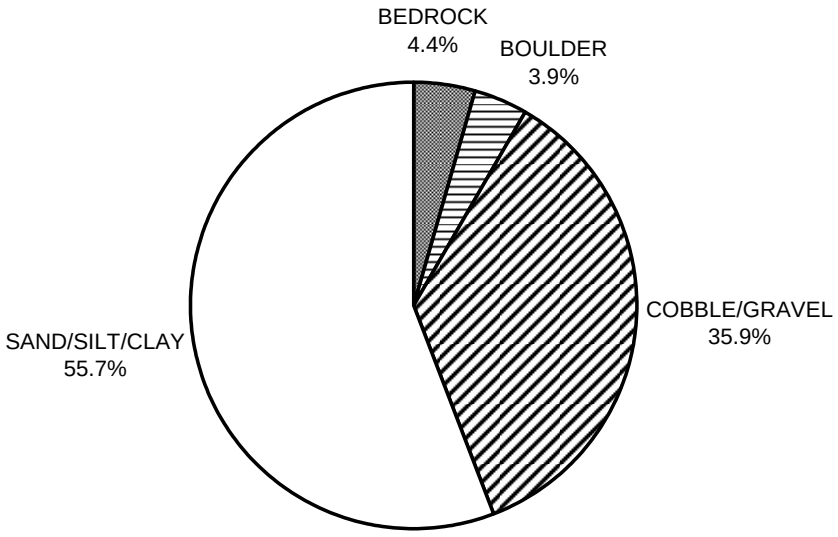


GRAPH 8

ALAMEDA CREEK 2010
MEAN PERCENT CANOPY

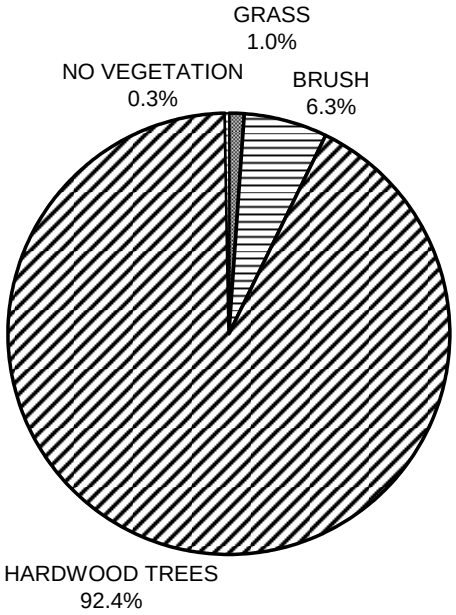
GRAPH 9

ALAMEDA CREEK 2010
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

ALAMEDA CREEK 2010
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11