



**California Department of Fish and Wildlife
Marin County
Lagunitas Creek Watershed
Stream Habitat Assessment Reports**

**Unnamed Tributary #2
of Lagunitas Creek**

Surveyed 2011

Report Completed in 2013

STREAM INVENTORY REPORT

Unnamed Tributary # 2 of Lagunitas Creek

INTRODUCTION

A stream inventory was conducted 11/8/2011 to 11/10/2011 on Unnamed Tributary # 2 of Lagunitas. The survey began at the confluence with Lagunitas Creek and extended upstream 0.2 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Unnamed Tributary # 2 of Lagunitas.

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

Unnamed Tributary # 2 of Lagunitas creek is located in Marin County, California (Map 1). It is a tributary to Lagunitas Creek, which flows into Tomales Bay, which flows into Bodega Bay, which flows into Pacific Ocean. Unnamed Tributary # 2 of Lagunitas's legal description at the confluence with Lagunitas Creek is T02N R08W Sec.4. Its location is (38:02:19.0N) 38.0386 north latitude and (122:44:46.0W) 122.7462 west longitude, LLID number 1227462380386. Unnamed Tributary # 2 of Lagunitas creek is a first order stream and has approximately 0.5 miles of blue line stream according to the USGS SAN GERONIMO 7.5 minute quadrangle. Unnamed Tributary # 2 of Lagunitas creek drains a watershed of approximately 0.2 square miles. Elevations range from about 85 feet at the mouth of the creek to 325 feet in the headwater areas (average elevation of headwaters, not highest point). Grasslands or Herbaceous vegetation dominates the watershed. The watershed is entirely federally owned, which accounts for 100% of the land area. One hundred percent of the land is considered natural. Vehicle access exists via Sir Frances Drake Blvd to the first access road to the Samuel P Taylor Campground. From this point the Cross Marin Trail to the north provides access to the confluence.

METHODS

The habitat inventory conducted in Unnamed Tributary # 2 of Lagunitas creek 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 measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time 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. All pools, except step-pools, are fully sampled.

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 Unnamed Tributary # 2 of Lagunitas 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

Unnamed Tributary #2 of Lagunitas creek

number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Unnamed Tributary # 2 of Lagunitas 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 Unnamed Tributary # 2 of Lagunitas, 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 Unnamed Tributary # 2 of Lagunitas, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Unnamed Tributary # 2 of Lagunitas, 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

Unnamed Tributary #2 of Lagunitas creek

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 Unnamed Tributary # 2 of Lagunitas 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

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- 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 Unnamed Tributary # 2 of Lagunitas 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 11/8/2011 to 11/10/2011, was conducted by C. Neill, D. Dela Vega (WSP). The total length of the stream surveyed was 1,135 feet with an additional 0 feet of side channel.

Stream flow was not measured on Unnamed Tributary # 2 of Lagunitas.

Unnamed Tributary # 2 of Lagunitas creek is an A3 channel type for 1,135 feet of the stream surveyed (Reach 1). A3 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels with depositional soils, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 45 to 46 degrees Fahrenheit. Air temperatures ranged from 48 to 52 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 33% pool units, 24% riffle units, 21% flatwater units, 18% dry units, and 3% culvert units (Graph 1). Based on total length of Level II habitat types, there were 31% flatwater units, 28% dry units, 23% riffle units, 13% pool units, and 6% culvert units (Graph 2).

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

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percent occurrence were 24% mid-channel pool units, 21% low gradient riffle units, and 18% dry units (Graph 3). Based on percent total length, there were 28% dry units, 27% step run units, and 21% low gradient riffle units.

A total of 11 pools were identified (Table 3). Main channel pools were the most frequently encountered at 82% (Graph 4), and comprised 90% 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. Zero of the 11 pools had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 11 pool tail-outs measured, 5 had a value of 1 (45%), 3 had a value of 2 (27%), and 3 had a value of 5 (27%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 1, flatwater habitat types had a mean shelter rating of 4, and pool habitats had a mean shelter rating of 7 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 4 and scour pools had a mean shelter rating of 22 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Unnamed Tributary # 2 of Lagunitas. Graph 7 describes the pool cover in Unnamed Tributary # 2 of Lagunitas. Undercut banks are the dominant pool cover type, followed by boulders.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gavel substrate was observed in 91% of pool tail-outs, and small cobble observed in 9% of pool tail-outs.

The mean percent canopy density for the surveyed length of Unnamed Tributary # 2 of Lagunitas creek was 91%. Of the canopy present, the mean percentages of hardwood and coniferous trees were 99% and 1%, respectively. Nine percent of the canopy was open. Graph 9 describes the mean percent canopy in Unnamed Tributary # 2 of Lagunitas creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 97% (Table 7). The dominant elements composing the structure of the stream banks consisted of 33% cobble/gravel, 25% bedrock, 23% boulder, and 19% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 55% of the units surveyed. Additionally, 45% of the units surveyed had

Unnamed Tributary #2 of Lagunitas creek

deciduous trees as the dominant vegetation type, and 0% had coniferous trees as the dominant vegetation type (Graph 11).

DISCUSSION

Unnamed Tributary # 2 of Lagunitas creek is a A3 channel type for the entire 1,135 feet of the stream survey. The suitability of A3 channel types for fish habitat improvement structures is/are as follows: A3 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days 11/8/2011 to 11/10/2011 ranged from 45 to 46 degrees Fahrenheit. Air temperatures ranged from 48 to 52 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 31% of the total length of this survey, riffles 23%, and pools 13%. The pools are relatively shallow, with 0 of the 11 pools having a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Eight of the 11 pool tail-outs measured had embeddedness ratings of 1 or 2. Zero of the pool tail-outs had embeddedness ratings of 3 or 4. Three 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 Unnamed Tributary # 2 of Lagunitas creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Eleven of the 11 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 7. The shelter rating in the flatwater habitats is 4. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Unnamed Tributary # 2 of Lagunitas. Undercut banks is the dominant cover type in pools, followed by boulders. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to

Unnamed Tributary #2 of Lagunitas creek

reduce density related competition.

The mean percent canopy density for the stream was 91%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage bank covered with vegetation for both the right and left banks was 97%. 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

Unnamed Tributary # 2 of Lagunitas 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 encourages 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 the Samuel P. Taylor Bike access path/ Cross Marin Trail crossing, which was indentified as a fish barrier. 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) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 3) Due to the natural high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.
- 4) 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.

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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 left bank Tributary # 2 of Lagunitas and Lagunitas, WP # 025, N38.03854 W122.74639
53	0002.00	WP # 026, Channel is dry at culvert outlet.
53	0002.00	Culvert #1 is in stream across Cross Marin Trail. Made of CMP with height =5', width =5', length = 65', diameter = 5', and plunge height = 4.5'. The culvert slope is approximately 1-2%. It is rusted through, collapsing and a possible barrier to juvenile and adults. N38.03857 W122.74664
118	0003.00	Trail crossing at top of unit
260	0004.00	Channel becomes wetted upstream of this unit.
632	0018.00	12 ft into the habitat unit is left bank tributary #001. 60 ft up the tributary is a possible barrier created by a large boulder with approximately 8 ft plunge. The dominant substrate is cobble and boulders.
632	0018.00	Unnamed left bank tributary #1 enters left bank Tributary #2 of Lagunitas. The tributary is dry and contributes 0% of flow to the receiving stream. The water temperatures downstream = 46 F and upstream = 44 F. The tributary is accessible to fish within the first 60' but no fish were observed. The tributary was checked 100' up by the survey crew. The slope is estimated to be 3-4%. N38.03892 W122.74846
907	0028.00	Dry gravel bar in habitat unit separates two pools, which are approximately 5 feet long.
917	0029.00	There is a small landslide at the top of the habitat unit.
995	0031.00	At the top of the habitat unit is a 4 foot plunge over a boulder.
1,135	0033.00	End of survey due to impassible fish barrier overgrown with vegetation (mostly poison oak). It is the potential end of accessible habitat for salmonids. There is a bedrock and boulder barrier of 10-15% gradient change and a plunge 10-12 ft, WP # 031 N38.03870 W122.74940.

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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.

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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 }

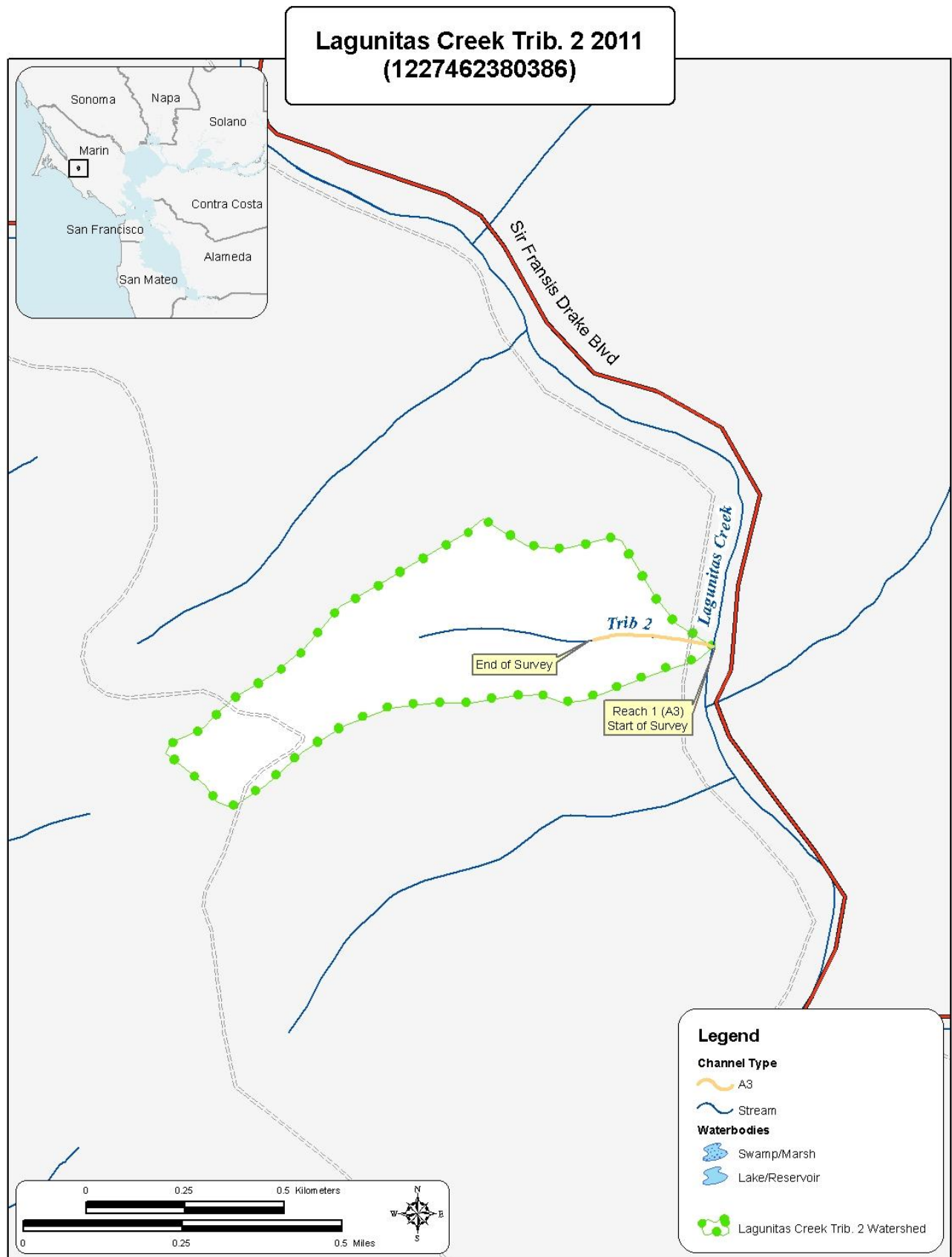
BACKWATER POOLS

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]	

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

Stream Name: 1227462380386

LLID: 1227462380386

Drainage: Tomales Bay

Survey 11/8/2011 to 11/10/2011

Confluence Location: Quad: INVERNESS

Legal Description: T000R000S00

Latitude: 38:02:19.0N

Longitude: 122:44:46.0W

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
1	0	CULVERT	3.0	65	65	5.7									
6	0	DRY	18.2	52	313	27.6									
7	7	FLATWATER	21.2	50	349	30.7	2.9	0.3	0.6	24	165	6	44		4
11	11	POOL	33.3	14	152	13.4	4.2	0.3	0.6	26	286	12	130	10	7
8	8	RIFFLE	24.2	32	256	22.6	2.1	0.1	0.2	8	66	1	7		1
Total Units	Total Units Fully Measured				Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)		
33	26				1135						517		180		

Unnamed Tributary #2 of Lagunitas creek

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: 1227462380386

LLID: 1227462380386

Drainage: Tomales Bay

Survey 11/8/2011 to 11/10/2011

Confluence Location: Quad: INVERNESS

Legal Description: T000R000S00

Latitude: 38:02:19.0N

Longitude: 122:44:46.0W

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 (%)
7	7	LGR	21.2	33	234	20.6	2.0	0.1	0.3	9	62	1	6		1	91
1	1	CAS	3.0	22	22	1.9	2.0	0.1	0.1	4	4	0	0		0	94
2	2	RUN	6.1	24	48	4.2	4.0	0.5	0.8	34	69	12	24		5	88
5	5	SRN	15.2	60	301	26.5	3.0	0.2	0.6	19	96	4	20		4	92
8	8	MCP	24.2	10	82	7.2	5.0	0.3	0.9	31	246	14	112	11	3	92
1	1	STP	3.0	55	55	4.8	5.0	0.1	0.5	14	14	3	3	1	15	98
1	1	LSBk	3.0	6	6	0.5	1.0	0.3	0.5	5	5	2	2	1	25	94
1	1	LSBo	3.0	9	9	0.8	3.0	0.6	0.9	22	22	13	13	13	20	91
6	0	DRY	18.2	52	313	27.6										90
1	0	CUL	3.0	65	65	5.7										
Total Units	Total Units Fully Measured				Total Length (ft.)						Total Area (sq.ft.)		Total Volume			
33	26				1135						517		180(cu.ft.)			

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Table 3 - Summary of Pool Habitat Types

Stream Name: 1227462380386

LLID: 1227462380386

Drainage: Tomales Bay

Survey 11/8/2011 to 11/10/2011

Confluence Location: Quad: INVERNESS

Legal Description: T000R000S00

Latitude: 38:02:19.0N

Longitude: 122:44:46.0W

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
9	9	MAIN	82	15	137	90	4.7	0.3	29	260	10	92	4
2	2	SCOUR	18	8	15	10	2.0	0.5	13	26	7	14	23
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
11	11				152					286		106	

Unnamed Tributary #2 of Lagunitas creek

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

Stream Name: 1227462380386

LLID: 1227462380386

Drainage: Tomales Bay

Survey 11/8/2011 to 11/10/2011

Confluence Location: Quad: INVERNESS

Legal Description: T000R000S00

Latitude: 38:02:19.0N

Longitude: 122:44:46.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
8	MCP	73	8	100	0	0	0	0	0	0	0	0
1	STP	9	1	100	0	0	0	0	0	0	0	0
1	LSBk	9	1	100	0	0	0	0	0	0	0	0
1	LSBo	9	1	100	0	0	0	0	0	0	0	0
Total Units			Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Feet Max Resid. Depth	Total 1< 2 Feet % Occurrence	Total 2< 3 Feet Max Resid. Depth	Total 2< 3 Feet % Occurrence	Total 3< 4 Feet Max Resid. Depth	Total 3< 4 Feet % Occurrence	Total >= 4 Feet Max Resid. Depth	Total >= 4 Feet % Occurrence
11			11	100	0	0	0	0	0	0	0	0
Mean Maximum Residual Pool Depth (ft.):			1									

Unnamed Tributary #2 of Lagunitas creek

Table 5 - Summary of Mean Percent Cover By Habitat

Stream Name:		1227462380386		Dry Units:		6		LLID:		1227462380386		Drainage:		Tomales Bay													
Survey		11/8/2011 to 11/10/2011		Confluence Location: Quad:		INVERNESS		Legal Description:		T000R000S00		Latitude:		38:02:19.0N													
Longitude:		122:44:46.0W		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	
7	7	LGR	0	14	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	CAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	8	TOTAL RIFFLE	0	13	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	RUN	55	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	5	SRN	20	38	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	7	TOTAL FLAT	30	40	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	8	MCP	38	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0
1	1	STP	0	0	0	0	0	80	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	LSBk	50	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	LSBo	0	30	0	0	0	30	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	11	TOTAL POOL	32	7	0	0	10	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	CUL																									
33	26	TOTAL	22	18	0	0	8	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Unnamed Tributary #2 of Lagunitas creek

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: 1227462380386 **Dry Units:** 6 **LLID:** 1227462380386 **Drainage:** Tomales Bay
Survey 11/8/2011 to 11/10/2011

Confluence Location: Quad: INVERNESS **Legal Description:** T000R000S00 **Latitude:** 38:02:19.0N **Longitude:** 122:44:46.0W

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
7	7	LGR	0	0	43	57	0	0	0
1	1	CAS	0	0	0	0	0	0	100
2	2	RUN	50	0	0	0	0	0	50
5	5	SRN	0	0	20	60	0	0	20
8	8	MCP	0	38	50	0	0	13	0
1	1	STP	0	0	100	0	0	0	0
1	1	LSBk	0	0	0	0	0	0	100
1	1	LSBo	0	0	0	0	0	0	100
1	0	CUL	0	0	0	0	0	0	0

Unnamed Tributary #2 of Lagunitas creek

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: 1227462380386 **LLID:** 1227462380386 **Drainage:** Tomales Bay
Survey 11/8/2011 to 11/10/2011
Confluence Location: Quad: INVERNESS **Legal Description:** T000R000S00 **Latitude:** 38:02:19.0N **Longitude:** 122:44:46.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
91	1	99	0	97	97

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.

Unnamed Tributary #2 of Lagunitas creek

Table 8 - Fish Habitat Inventory Data Summary

Stream 1227462380386 LLID: 1227462380386 Drainage Tomales Bay
 Survey Dates: 11/8/2011 to 11/10/2011 Survey Length (ft.): 1135 Main Channel (ft.): 1135 Side Channel (ft.): 0
 Confluence Location: Quad INVERNESS Legal Description: T000R000S00 Latitude: 38:02:19.0N Longitude: 122:44:46.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: A3	Canopy Density (%): 91.5	Pools by Stream Length	13.4
Reach Length (ft.): 1135	Coniferous Component (%): 0.8	Pool Frequency (%):	33.3
Riffle/Flatwater Mean Width (ft.): 2.5	Hardwood Component 99.2	Residual Pool Depth (%):	
BFW:	Dominant Bank Brush	< 2 Feet Deep:	100.0
Range (ft.): 8.00 to 10.00	Vegetative Cover (%): 97.0	2 to 2.9 Feet Deep:	0.0
Mean (ft.): 8.91	Dominant Undercut Banks	3 to 3.9 Feet Deep:	0.0
Std. Dev.: 0.83	Dominant Bank Substrate Cobble/Gravel	>= 4 Feet Deep:	0.0
Base Flow (cfs):	Occurrence of LWD (%): 0.4	Mean Max Residual Pool Depth	0.62
Water (F): 0 - 46 Air (F): 48 - 52	LWD per 100 ft.:	Mean Pool Shelter	7
Dry Channel (ft.): 313	Riffles: 0		
	Pools: 1		
	Flat: 1		
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. 45.5 2. 27.3 3. 0.0 4. 0.0 5. 27.3			

Table 9 -Mean Percentage of Dominant Substrate and Vegetation

Stream Name: 1227462380386 **LLID:** 1227462380386 **Drainage:** Tomales Bay
Survey 11/8/2011 to 11/10/2011
Confluence Location: Quad: INVERNESS **Legal Description:** T000R000S00 **Latitude:** 38:02:19.0N **Longitude:** 122:44:46.0W

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	12	25.0
Boulder	11	4	23.4
Cobble/Gravel	12	9	32.8
Sand/Silt/Clay	5	7	18.8

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	0	0	0.0
Brush	22	13	54.7
Hardwood	10	19	45.3
Coniferous	0	0	0.0
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

Unnamed Tributary #2 of Lagunitas creek

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

Stream Name: 1227462380386

LLID: 1227462380386

Drainage: Tomales Bay

Survey 11/8/2011 to 11/10/2011

Confluence Location: Quad: INVERNESS

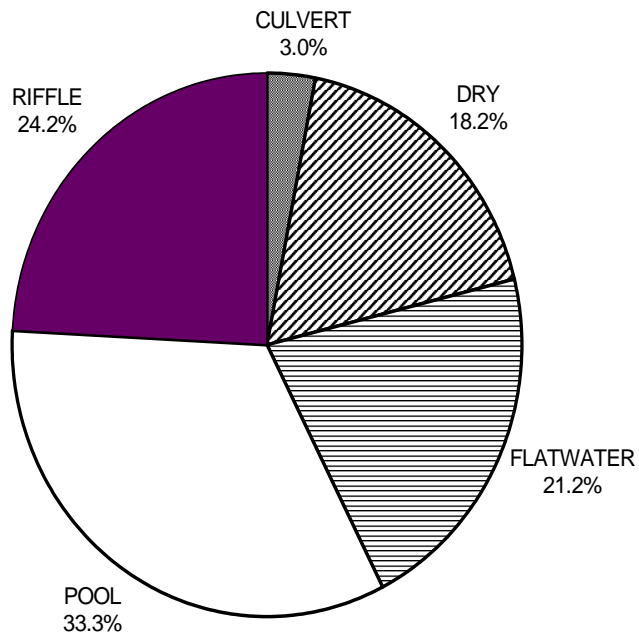
Legal Description: T000R000S00

Latitude: 38:02:19.0N

Longitude: 122:44:46.0W

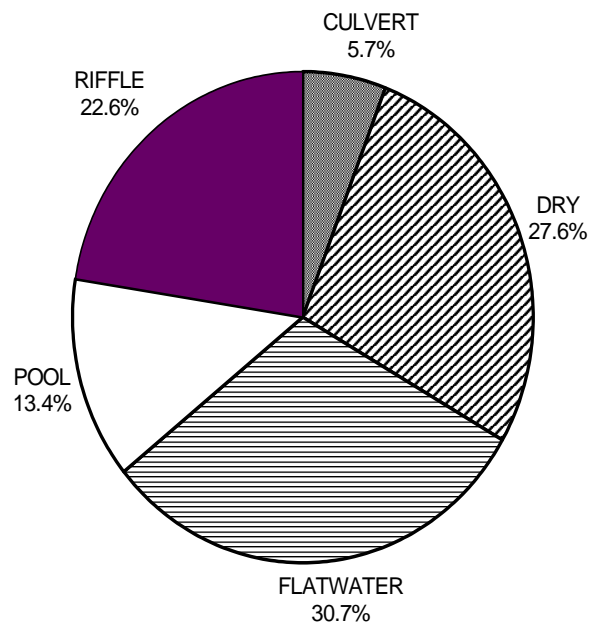
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	30	32
SMALL WOODY DEBRIS (%)	13	40	7
LARGE WOODY DEBRIS (%)	0	1	0
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION	13	0	10
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	15
BEDROCK LEDGES (%)	0	0	0

**1227462380386 2011
HABITAT TYPES BY PERCENT OCCURRENCE**



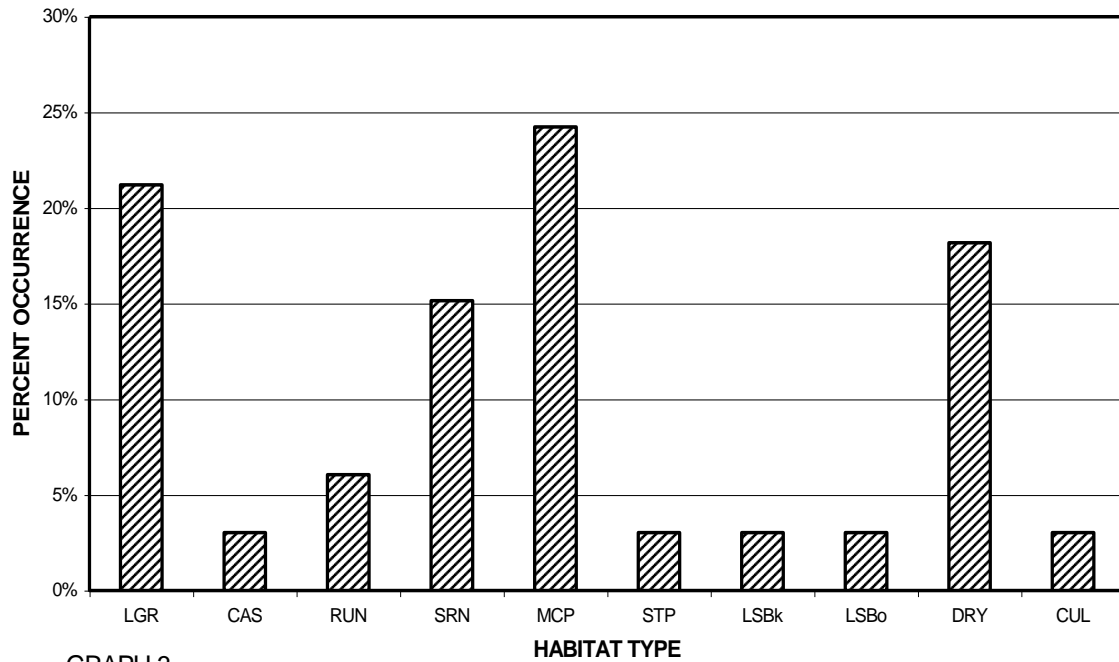
GRAPH 1

**1227462380386 2011
HABITAT TYPES BY PERCENT TOTAL LENGTH**



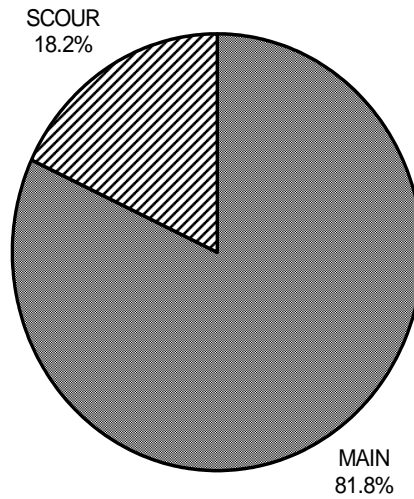
GRAPH 2

**1227462380386 2011
HABITAT TYPES BY PERCENT OCCURRENCE**



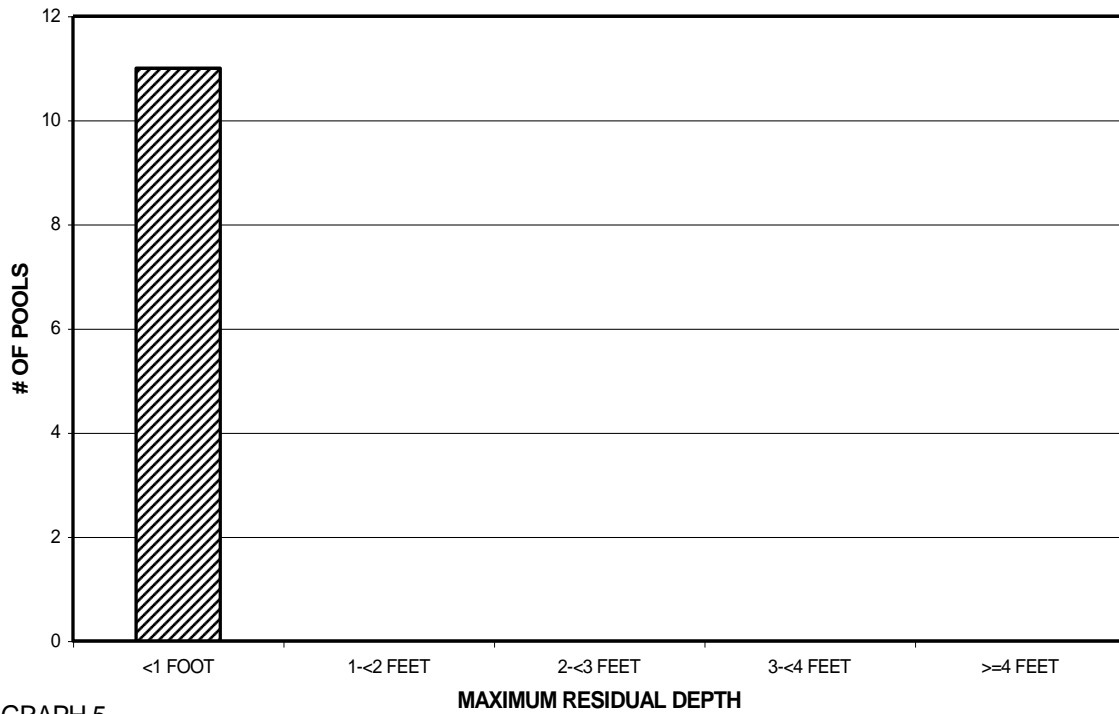
GRAPH 3

**1227462380386 2011
POOL TYPES BY PERCENT OCCURRENCE**



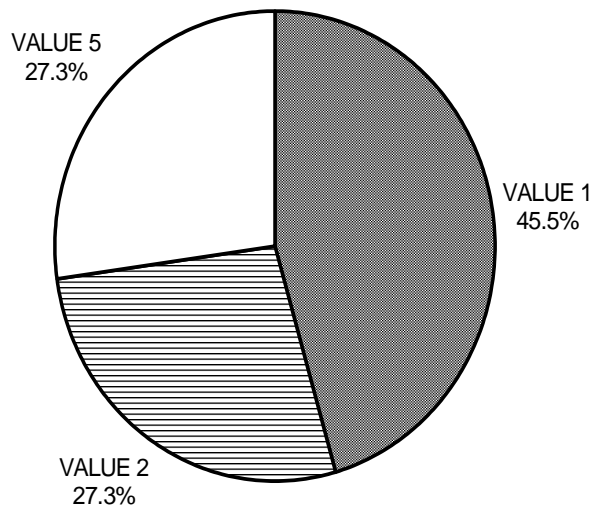
GRAPH 4

**1227462380386 2011
MAXIMUM DEPTH IN POOLS**



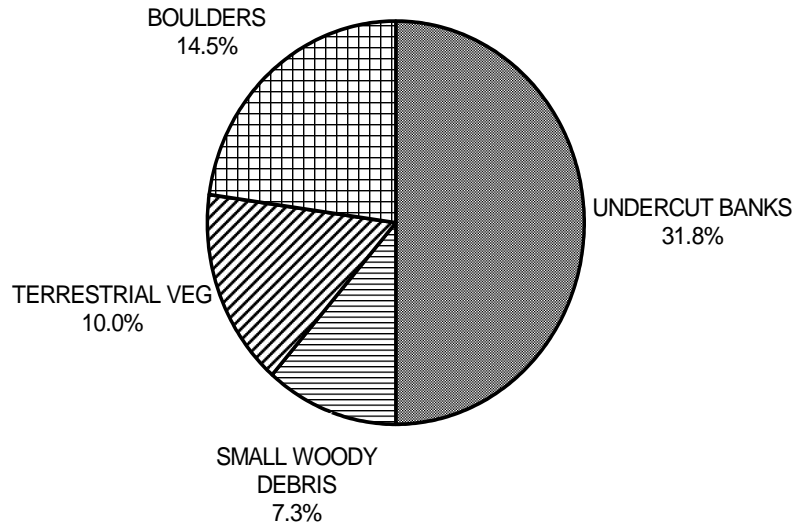
GRAPH 5

**1227462380386 2011
PERCENT EMBEDDEDNESS**



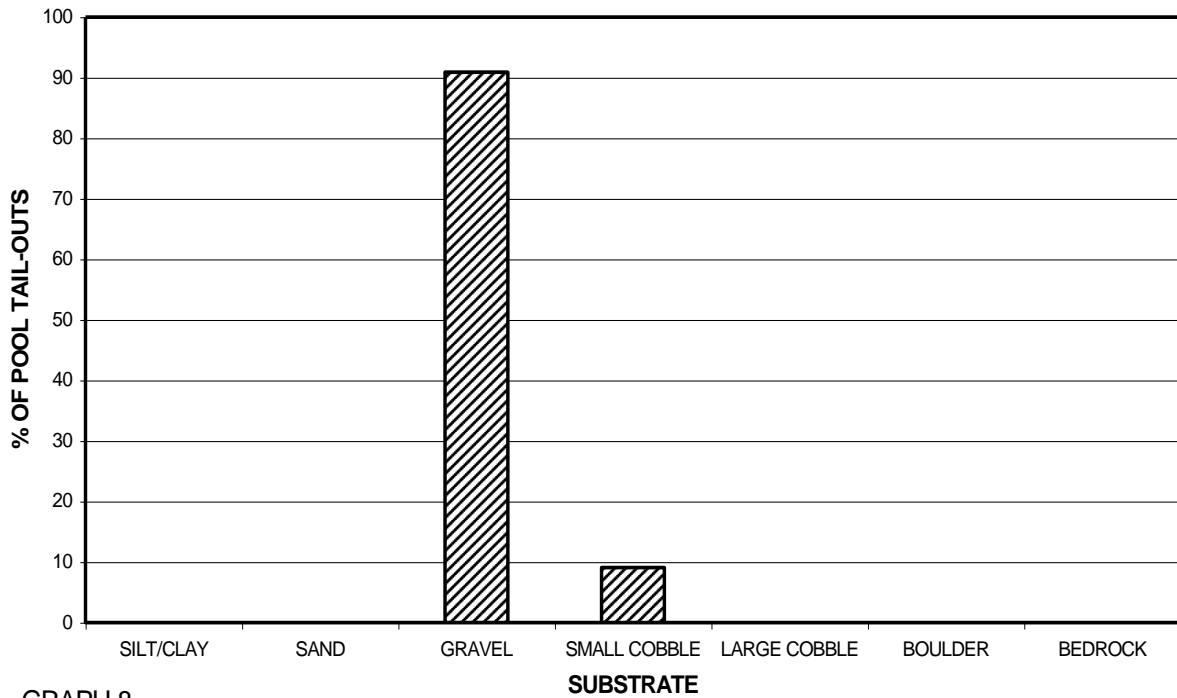
GRAPH 6

**1227462380386 2011
MEAN PERCENT COVER TYPES IN POOLS**



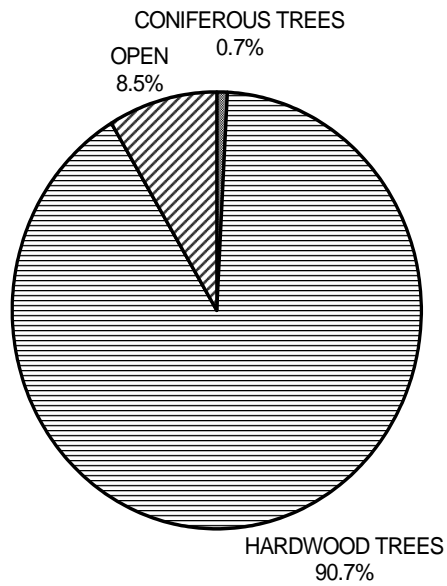
GRAPH 7

**1227462380386 2011
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



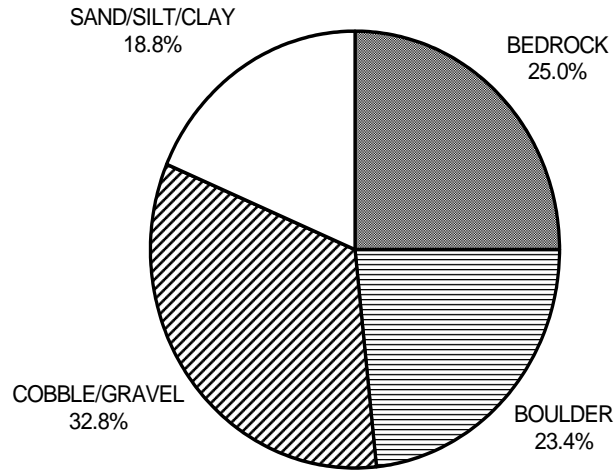
GRAPH 8

**1227462380386 2011
MEAN PERCENT CANOPY**



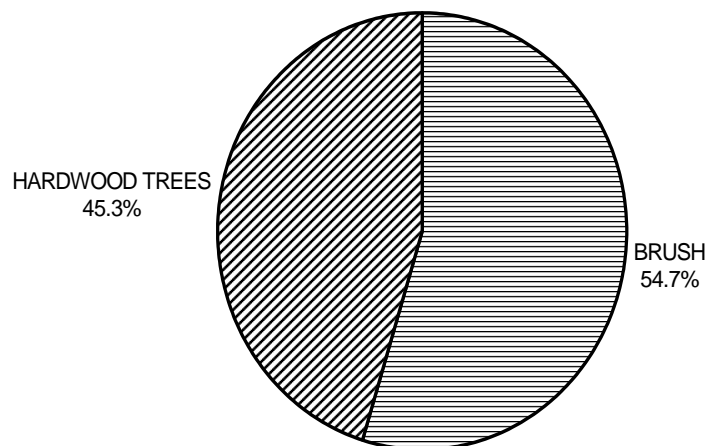
GRAPH 9

1227462380386 2011
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

1227462380386 2011
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Unnamed Tributary #2 of Lagunitas creek