



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

# **Unnamed Tributary # 3 of Lagunitas Creek**

*Surveyed 2011*

*Report Completed in 2013*

## **Unnamed Tributary # 3 of Lagunitas creek**

### **STREAM INVENTORY REPORT**

#### **Unnamed Tributary # 3 of Lagunitas Creek**

#### INTRODUCTION

A stream inventory was conducted during 11/1/2011 to 11/4/2011 on Unnamed Tributary # 3 of Lagunitas. The survey began at the confluence with Lagunitas Creek and extended upstream 0.4 miles. Stream inventories and reports were also completed for two adjacent tributaries of Lagunitas.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Unnamed Tributary # 3 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 # 3 of Lagunitas 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 # 3 of Lagunitas's legal description at the confluence with Lagunitas Creek is T02N R08W Sec.4. Its location is (38:02:43.0N) 38.0453 north latitude and (122:45:05.0W) 122.7514 west longitude, LLID number 1227514380453. Unnamed Tributary # 3 of Lagunitas is a first order stream and has approximately 0.8 miles of blue line stream according to the USGS INVERNESS 7.5 minute quadrangle. Unnamed Tributary # 3 of Lagunitas drains a watershed of approximately 0.3 square miles. Elevations range from about 75 feet at the mouth of the creek to 443 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 the intersection of Platform Bridge Rd and Sir Francis Drake Blvd. From this intersection the Cross-Marin Trail is accessible with access to the tributary along the trail to the south-east of the intersection.

#### METHODS

The habitat inventory conducted in Unnamed Tributary # 3 of Lagunitas 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.

## Unnamed Tributary # 3 of Lagunitas creek

### SAMPLING STRATEGY

The inventory uses a method that samples approximately 100% 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. 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 # 3 of Lagunitas 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". Unnamed Tributary # 3 of Lagunitas 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

## **Unnamed Tributary # 3 of Lagunitas creek**

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 # 3 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 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 Unnamed Tributary # 3 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 densiometers 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 # 3 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 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 # 3 of Lagunitas, the dominant composition type

### **Unnamed Tributary # 3 of Lagunitas creek**

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)
- 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 # 3 of Lagunitas include:

## **Unnamed Tributary # 3 of Lagunitas creek**

- 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 11/1/2011 to 11/4/2011, was conducted by C. Neill, D. Dela Vega, (WSP). The total length of the stream surveyed was 2,162 feet.

Stream flow was not measured on Unnamed Tributary # 3 of Lagunitas.

Unnamed Tributary # 3 of Lagunitas is a B4 channel type for 1,567 feet of the stream surveyed (Reach 1), and a NA channel type for 595 feet of the stream surveyed (Reach 2). B4 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and gravel dominant substrates.

Water temperatures taken during the survey period ranged from 47 to 53 degrees Fahrenheit. Air temperatures ranged from 48 to 58 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 33% dry units, 31% pool units, 21% flatwater units, 13% riffle units, and 3% culvert units (Graph 1). Based on total length of Level II habitat types there were 53% dry units, 20% flatwater units, 11% riffle units, 10% pool units , and 5% culvert units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 33% Dry units, 23% Mid-Channel Pool units, and 18% Step Run units (Graph 3). Based on percent total length were 53% Dry units, 19% Step Run units, and 8% Low Gradient Riffle units.

A total of 12 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 92%, and comprised 91% 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

## **Unnamed Tributary # 3 of Lagunitas creek**

salmonids increases with depth. Zero of the 12 pools (0% ) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 12 pool tail-outs measured, 5 had a value of 1 (41.7%); 5 had a value of 2 (41.7%); 2 had a value of 5 (16.7%); (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 4 , flatwater habitat types had a mean shelter rating of 3 , and pool habitats had a mean shelter rating of 40 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 16, and Scour pools had a mean shelter rating of 300 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Unnamed Tributary # 3 of Lagunitas. Graph 7 describes the pool cover in Unnamed Tributary # 3 of Lagunitas. Boulders are the dominant pool cover type followed by undercut banks.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 75% of pool tail-outs and small Cobble observed in 17% of pool tail-outs

The mean percent canopy density for the surveyed length of Unnamed Tributary # 3 of Lagunitas was 96%. The mean percentages of hardwood and coniferous trees were 80% and 20%, respectively. Four percent of the canopy was open. Graph 9 describes the mean percent canopy in Unnamed Tributary # 3 of Lagunitas.

For the stream reach surveyed, the mean percent right bank vegetated was 95%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 42% sand/silt/clay, 22% bedrock, 18% cobble/gravel, and 17% boulder (Graph 10). Hardwood Trees were the dominant vegetation type observed in 51.3% of the units surveyed. Additionally, 39.5% of the units surveyed had Brush as the dominant vegetation type, and 9.2% had Coniferous Trees as the dominant vegetation (Graph 11).

## **DISCUSSION**

Unnamed Tributary # 3 of Lagunitas is a B4 channel type for the first 1,567 feet of stream surveyed and a NA channel type for the remaining 595 feet. The suitability of B4 channel types for fish habitat improvement structures is as follows: excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing- deflectors, and log cover. The suitability of NA channel types cannot be assessed.

The water temperatures recorded on the survey days 11/1/2011 to 11/4/2011, ranged from 47 to 53 degrees Fahrenheit. Air temperatures ranged from 48 to 58 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer

### **Unnamed Tributary # 3 of Lagunitas creek**

months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 20% of the total length of this survey, riffles 11%, and pools 10%. The pools are relatively shallow, with 0 of the 12 (0%) pools having a maximum residual depth greater than 2 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.

Ten of the 12 pool tail-outs measured had embeddedness ratings of 1 or 2. Zero of the pool tail-outs had embeddedness ratings of 3 or 4. Two 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 # 3 of Lagunitas should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Eleven of the 12 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 40. The shelter rating in the flatwater habitats was 3. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Unnamed Tributary # 3 of Lagunitas. Boulders are the dominant cover type in pools followed by undercut banks. 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 96%. Reach 1 had a canopy density of 95.6%, Reach 2 had a canopy density of 95.5%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 95% and 96%, 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**

Unnamed Tributary # 3 of Lagunitas 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



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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 hiking Trail crossing and the associated culvert, which was indentified as a juvenile fish barrier. Upstream of the culvert is a plugged and degraded trash-rack which needs to be continually assessed for fish passage after high flow events. 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 Boulders. Adding high quality complexity with woody cover in the pools is desirable.

### 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 # Comments**

- |   |  |
|---|--|
| 0 | 0001.00 Start of survey at the confluence of Left Bank Tributary #003 of Lagunitas and Lagunitas Creek.<br>WP # 015 N38.04573 W122.75167 |
|---|--|

## Unnamed Tributary # 3 of Lagunitas creek

### Position Habitat Unit # Comments

- 117 0002.00 Channel cross-section taken at the top of the habitat Unit. The culvert inlet could benefit from erosion control. Sack-concrete was used at inlet and degraded trash guard is in the next unit.
- 117 0002.00 Culvert #1 is in stream under Cross Marin Trail. It is made of CMP with height =5', width =5', length = 115', diameter = 5', and has an estimated slope= 1%. The channel is dry and the culvert is a potential barrier to juveniles. The Culvert is rusted through and collapsing. WP# 016 N38.04514 W122.75244
- 1216 0021.00 Habitat unit is partially dry.
- 1216 0021.00 Unnamed right bank tributary #1 enters Left Bank Tributary #3 of Lagunitas. The channel is dry, contributes 0% of flow, and has an estimated slope = 4-10%. The tributary was checked 20ft up by the survey crew and is not accessible to fish. The water temperature upstream = 51 F and downstream = 51 F. The dominant substrate is cobble and gravel. WP# 019, N38.04384 W122.75480
- 1786 0033.00 Unnamed right bank tributary #2 enters Left Bank Tributary #3 of Lagunitas. The channel is dry, contributing 0% of flow, and has an estimated slope= 4-8%. The Tributary was checked 125 feet up by the survey crew and it is accessible to adult fish. The water temperature is unknown. The tributary substrate is cobble to boulder and is fairly steep from the beginning. WP# 021 N38.04292 W122.75658
- 1946 0036.00 At the top of the unit on the right bank is a dry drainage. Rough skinned newt observed in drainage.
- 1982 0037.00 At top of unit is large boulder, which is a potential fish barrier
- 1993 0038.00 Unnamed left bank tributary # 3 enters Left Bank Tributary #3 of Lagunitas 90 feet into the unit. The Channel is dry, contributing 0% flow, and has an estimated slope=10-20%. The tributary was checked 75 feet up by the survey crew and it is not accessible to fish. The water temperature is unknown. The tributary is extremely steep from the beginning and the substrate is primarily boulders. WP#022 N38.04248 W122.75691
- 2162 0039.00 End of Survey due to safety concerns.

## **Unnamed Tributary # 3 of Lagunitas creek**

### 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.

## Unnamed Tributary # 3 of Lagunitas 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 }

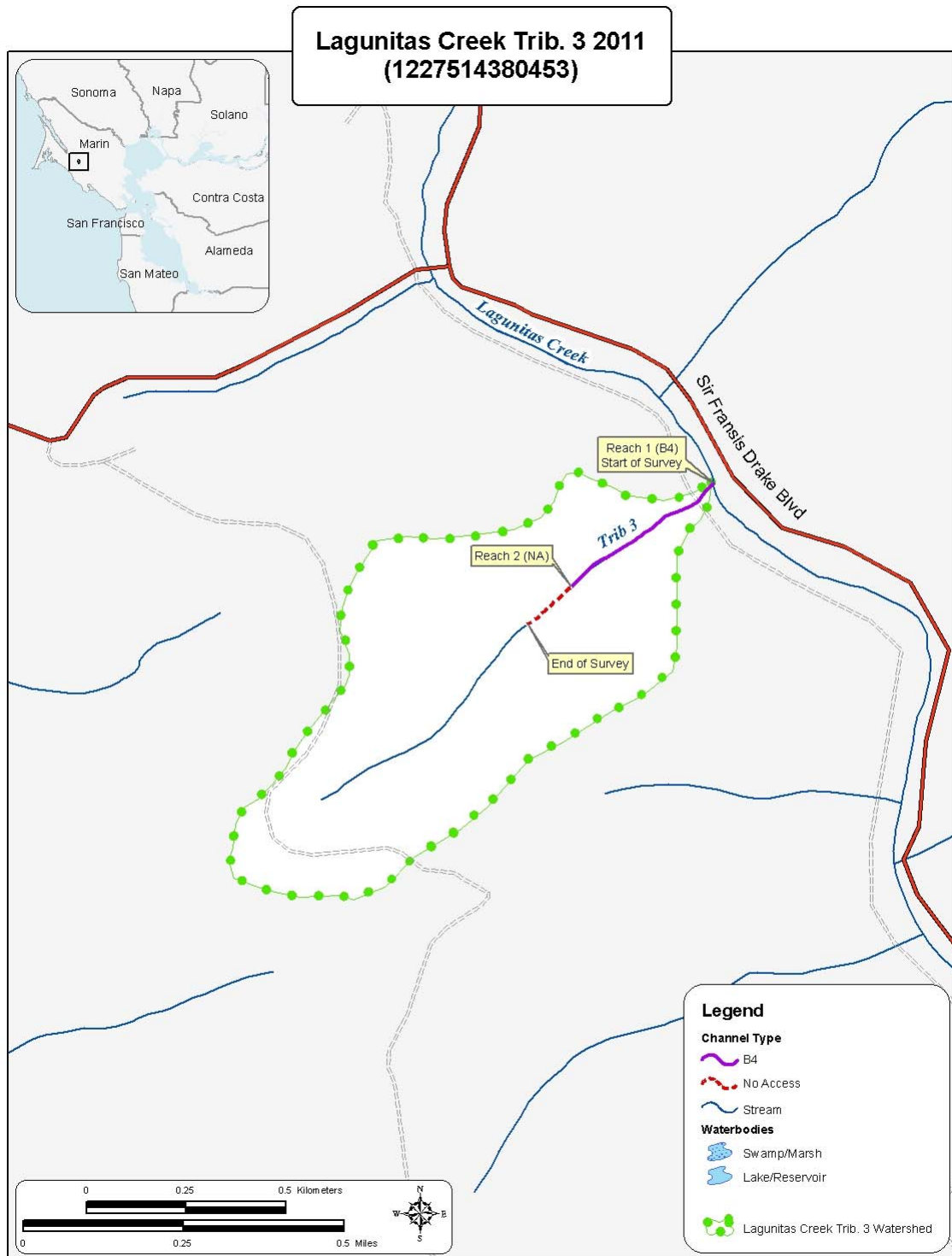
#### BACKWATER POOLS

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]	

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WDFGWatershed\_OverviewMarin\_Coastal2011LagunitasCreekTrib3\_2011.mxd

Prepared by: Scott Webb, December 2011

# Unnamed Tributary # 3 of Lagunitas creek

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

**Stream Name:** 1227514380453

**LLID:** 1227514380453

**Drainage:** Tomales Bay

**Survey** 11/1/2011 to 11/4/2011

**Confluence Location: Quad:** INVERNESS

**Legal Description:** T000R000S00

**Latitude:** 38:02:43.0N

**Longitude:** 122:45:05.0W

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	2.6	115	115	5.3									
13	0	DRY	33.3	89	1155	53.4									
8	8	FLATWATER	20.5	55	440	20.4	2.5	0.3	0.6	33	268	11	86		3
12	12	POOL	30.8	18	218	10.1	3.7	0.4	0.9	47	561	30	359	23	40
5	5	RIFFLE	12.8	47	234	10.8	2.1	0.3	0.5	12	59	1	7		4
Total Units	Total Units Fully Measured				Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)		
39	25				2162						887		453		

# Unnamed Tributary # 3 of Lagunitas creek

## Table 2 - Summary of Habitat Types and Measured Parameters

**Stream Name:** 1227514380453

**LLID:** 1227514380453

**Drainage:** Tomales Bay

**Survey** 11/1/2011 to 11/4/2011

**Confluence Location: Quad:** INVERNESS

**Legal Description:** T000R000S00

**Latitude:** 38:02:43.0N

**Longitude:** 122:45:05.0W

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 (%)
4	4	LGR	10.3	45	180	8.3	2.0	0.3	1.0	13	51	1	6		1	95
1	1	BRS	2.6	54	54	2.5	3.0	0.2	0.7	8	8	2	2		15	91
1	1	RUN	2.6	35	35	1.6	2.0	0.3	0.7	49	49	15	15		15	97
7	7	SRN	17.9	58	405	18.7	3.0	0.3	0.9	31	219	10	71		1	97
9	9	MCP	23.1	14	130	6.0	4.0	0.4	1.6	46	418	29	259	22	17	94
2	2	STP	5.1	34	68	3.1	4.0	0.6	1.5	55	110	45	91	37	10	99
1	1	LSBk	2.6	20	20	0.9	2.0	0.2	0.5	32	32	10	10	6	300	92
13	0	DRY	33.3	89	1155	53.4										96
1	0	CUL	2.6	115	115	5.3										
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>			<b>Total Volume</b>			
39	25				2162					887			453(cu.ft.)			

**Unnamed Tributary # 3 of Lagunitas creek**

**Table 3 - Summary of Pool Habitat Types**

**Stream Name:** 1227514380453

**LLID:** 1227514380453

**Drainage:** Tomales Bay

**Survey** 11/1/2011 to 11/4/2011

**Confluence Location: Quad:** INVERNESS

**Legal Description:** T000R000S00

**Latitude:** 38:02:43.0N

**Longitude:** 122:45:05.0W

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
11	11	MAIN	92	18	198	91	3.8	0.5	48	529	25	250	16
1	1	SCOUR	8	20	20	9	2.0	0.2	32	32	6	6	300
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>		<b>Total Volume (cu.ft.)</b>	
12	12				218					561		256	



**Unnamed Tributary # 3 of Lagunitas creek**

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

**Stream Name:** 1227514380453 **LLID:** 1227514380453 **Drainage:** Tomales Bay  
**Survey** 11/1/2011 to 11/4/2011

**Confluence Location: Quad:** INVERNESS **Legal Description:** T000R000S00 **Latitude:** 38:02:43.0N **Longitude:** 122:45:05.0W

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
9	MCP	75	6	67	3	33	0	0	0	0	0	0
2	STP	17	1	50	1	50	0	0	0	0	0	0
1	LSBk	8	1	100	0	0	0	0	0	0	0	0
<b>Total Units</b>			<b>Total &lt; 1 Foot Max Resid. Depth</b>	<b>Total &lt; 1 Foot % Occurrence</b>	<b>Total 1 &lt; 2 Feet Max Resid. Depth</b>	<b>Total 1 &lt; 2 Feet % Occurrence</b>	<b>Total 2 &lt; 3 Feet Max Resid. Depth</b>	<b>Total 2 &lt; 3 Feet % Occurrence</b>	<b>Total 3 &lt; 4 Feet Max Resid. Depth</b>	<b>Total 3 &lt; 4 Feet % Occurrence</b>	<b>Total &gt;= 4 Feet Max Resid. Depth</b>	<b>Total &gt;= 4 Feet % Occurrence</b>
12			8	67	4	33	0	0	0	0	0	0
Mean Maximum Residual Pool Depth (ft.):			1									

**Unnamed Tributary # 3 of Lagunitas creek**

**Table 5 - Summary of Mean Percent Cover By Habitat**

**Stream Name:** 1227514380453      **Dry Units:** 13      **LLID:** 1227514380453      **Drainage:** Tomales Bay  
**Survey** 11/1/2011 to 11/4/2011  
**Confluence Location: Quad:** INVERNESS      **Legal Description:** T000R000S00      **Latitude:** 38:02:43.0N      **Longitude:** 122:45:05.0W

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
4	4	LGR	0	0	0	0	0	0	0	25	0
1	1	BRS	45	0	10	45	0	0	0	0	0
1	1	RUN	0	100	0	0	0	0	0	0	0
7	7	SRN	0	0	0	0	0	0	0	29	0
9	9	MCP	22	21	7	0	0	0	0	28	0
2	2	STP	0	0	0	0	0	0	0	100	0
1	1	LSBk	0	5	95	0	0	0	0	0	0
1	0	CUL									

**Unnamed Tributary # 3 of Lagunitas creek**

**Table 6 - Summary of Dominant Substrates By Habitat Type**

**Stream Name:** 1227514380453      **Dry Units:** 13      **LLID:** 1227514380453      **Drainage:** Tomales Bay  
**Survey** 11/1/2011 to 11/4/2011

**Confluence Location:** **Quad:** INVERNESS      **Legal Description:** T000R000S00      **Latitude:** 38:02:43.0N      **Longitude:** 122:45:05.0W

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
4	4	LGR	0	0	50	25	25	0	0
1	1	BRS	0	0	0	0	0	0	100
1	1	RUN	100	0	0	0	0	0	0
7	7	SRN	0	0	57	14	14	14	0
9	9	MCP	33	11	44	0	0	0	11
2	2	STP	0	0	0	50	50	0	0
1	1	LSBk	0	0	100	0	0	0	0
1	0	CUL	0	0	0	0	0	0	0

**Unnamed Tributary # 3 of Lagunitas creek**

**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

<b>Stream Name:</b>	1227514380453	<b>LLID:</b>	1227514380453	<b>Drainage:</b>	Tomales Bay
<b>Survey</b>	11/1/2011 to 11/4/2011				
<b>Confluence Location:</b>	<b>Quad:</b> INVERNESS	<b>Legal Description:</b>	T000R000S00	<b>Latitude:</b>	38:02:43.0N
				<b>Longitude:</b>	122:45:05.0W
Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
96	20	80	0	95	96

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 # 3 of Lagunitas creek

**Table 8 - Fish Habitat Inventory Data Summary**

Stream 1227514380453 LLID: 1227514380453 Drainage Tomales Bay  
 Survey Dates: 11/1/2011 to 11/4/2011 Survey Length (ft.): 2162 Main Channel (ft.): 2162 Side Channel (ft.): 0  
 Confluence Location: Quad INVERNESS Legal Description: T000R000S00 Latitude: 38:02:43.0N Longitude: 122:45:05.0W

## Summary of Fish Habitat Elements By Stream Reach

### STREAM REACH: 1

Channel Type: B4	Canopy Density (%): 95.6	Pools by Stream Length: 11.2
Reach Length (ft.): 1567	Coniferous Component (%): 27.9	Pool Frequency (%): 36.0
Riffle/Flatwater Mean Width (ft.): 2.2	Hardwood Component: 72.1	Residual Pool Depth (%):
BFW:	Dominant Bank: Hardwood Trees	< 2 Feet Deep: 100.0
Range (ft.): 10.00 to 12.00	Vegetative Cover (%): 97.7	2 to 2.9 Feet Deep: 0.0
Mean (ft.): 10.80	Dominant: Boulders	3 to 3.9 Feet Deep: 0.0
Std. Dev.: 0.98	Dominant Bank Substrate: Sand/Silt/Clay	>= 4 Feet Deep: 0.0
Base Flow (cfs):	Occurrence of LWD (%): 9.7	Mean Max Residual Pool Depth: 0.82
Water (F): 0 - 53 Air (F): 48 - 56	LWD per 100 ft.:	Mean Pool Shelter: 48
Dry Channel (ft.): 792	Riffles: 2	
	Pools: 3	
	Flat: 1	

Pool Tail Substrate (%): Silt/Clay: 11.1 Sand: 0.0 Gravel: 77.8 Sm Cobble: 11.1 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0  
 Embeddedness Values (%): 1. 33.3 2. 44.4 3. 0.0 4. 0.0 5. 22.2

### STREAM REACH: 2

Channel Type: NA	Canopy Density (%): 95.5	Pools by Stream Length: 7.1
Reach Length (ft.): 595	Coniferous Component (%): 7.5	Pool Frequency (%): 21.4
Riffle/Flatwater Mean Width (ft.): 2.6	Hardwood Component: 92.5	Residual Pool Depth (%):
BFW:	Dominant Bank: Brush	< 2 Feet Deep: 100.0
Range (ft.): 7.00 to 10.00	Vegetative Cover (%): 91.6	2 to 2.9 Feet Deep: 0.0
Mean (ft.): 8.07	Dominant: Boulders	3 to 3.9 Feet Deep: 0.0
Std. Dev.: 1.44	Dominant Bank Substrate: Cobble/Gravel	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth: 1.13
Water (F): 47 - 53 Air (F): 56 - 58	LWD per 100 ft.:	Mean Pool Shelter: 13
Dry Channel (ft.): 363	Riffles: 0	
	Pools: 0	
	Flat: 2	

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. 66.7 2. 33.3 3. 0.0 4. 0.0 5. 0.0

**Unnamed Tributary # 3 of Lagunitas creek**

**Table 9 -Mean Percentage of Dominant Substrate and Vegetation**

**Stream Name:** 1227514380453 **LLID:** 1227514380453 **Drainage:** Tomales Bay  
**Survey** 11/1/2011 to 11/4/2011  
**Confluence Location: Quad:** INVERNESS **Legal Description:** T000R000S00 **Latitude:** 38:02:43.0N **Longitude:** 122:45:05.0W

**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	22.4
Boulder	10	3	17.1
Cobble/Gravel	8	6	18.4
Sand/Silt/Clay	16	16	42.1

**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	15	15	39.5
Hardwood	20	19	51.3
Coniferous	3	4	9.2
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

## Unnamed Tributary # 3 of Lagunitas creek

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

**Stream Name:** 1227514380453

**LLID:** 1227514380453

**Drainage:** Tomales Bay

**Survey** 11/1/2011 to 11/4/2011

**Confluence Location: Quad:** INVERNESS

**Legal Description:** T000R000S00

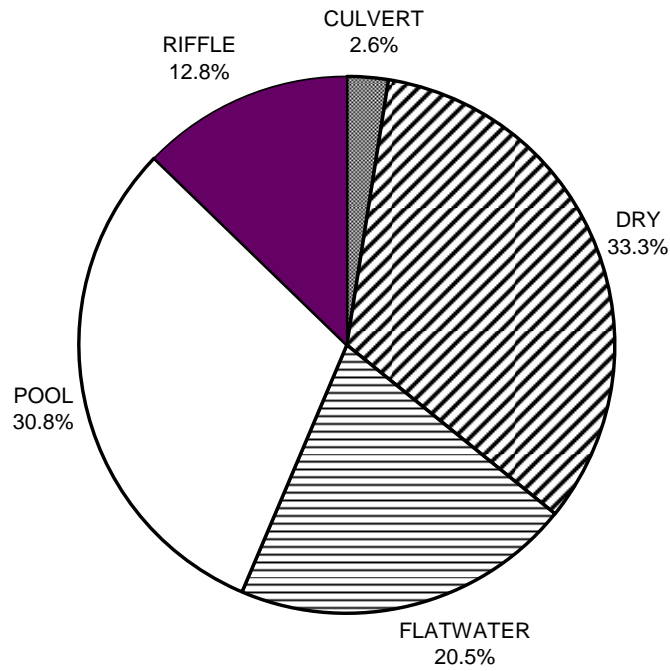
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**Longitude:** 122:45:05.0W

	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	9	0	17
SMALL WOODY DEBRIS (%)	0	13	16
LARGE WOODY DEBRIS (%)	2	0	13
ROOT MASS (%)	9	0	0
TERRESTRIAL VEGETATION	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	20	25	38
BEDROCK LEDGES (%)	0	0	0

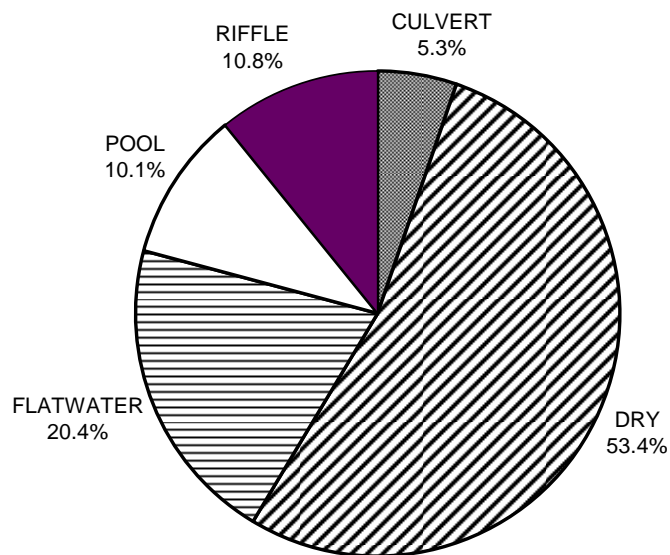
Unnamed Tributary # 3 of Lagunitas creek

1227514380453 2011  
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

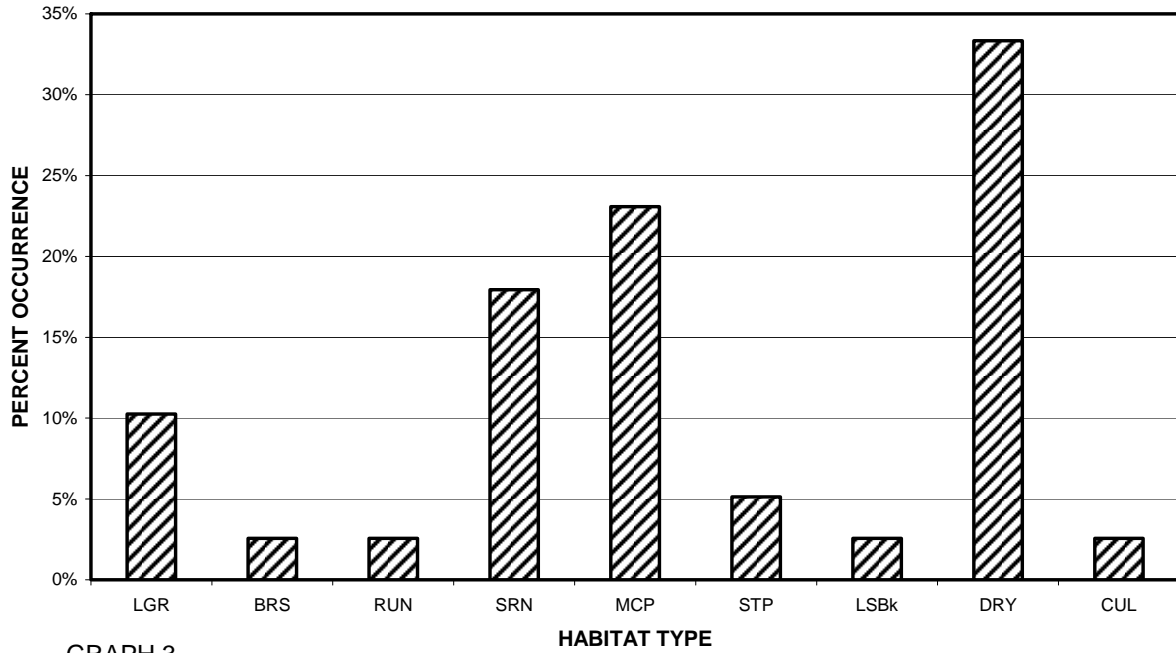
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HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

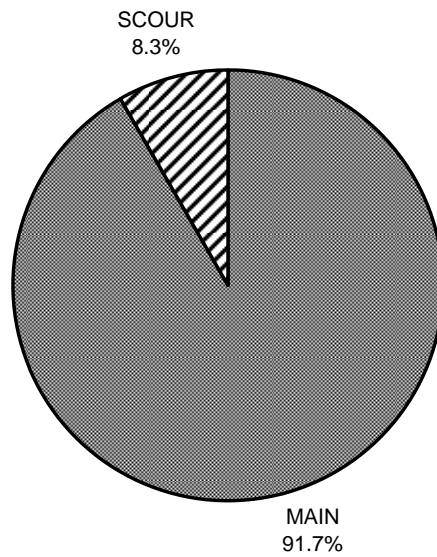


1227514380453 2011  
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

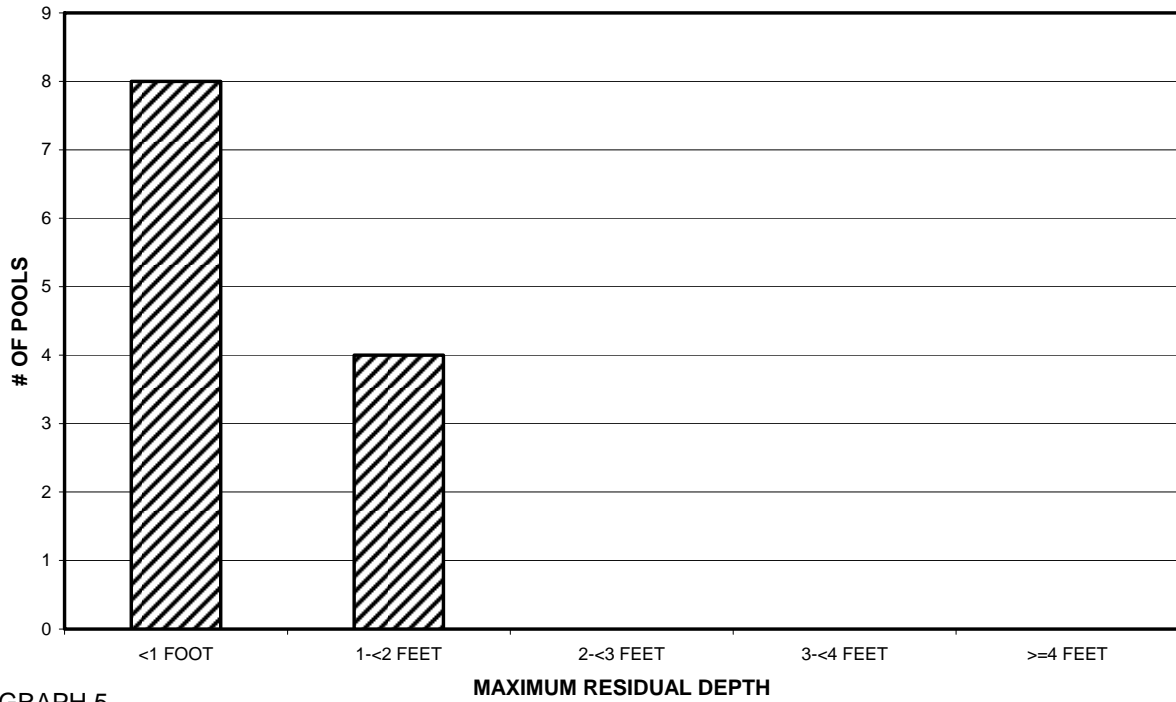
1227514380453 2011  
POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

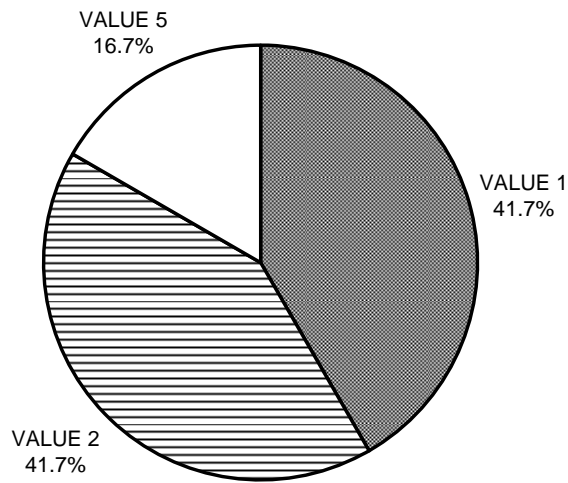
Unnamed Tributary # 3 of Lagunitas creek

1227514380453 2011  
MAXIMUM DEPTH IN POOLS



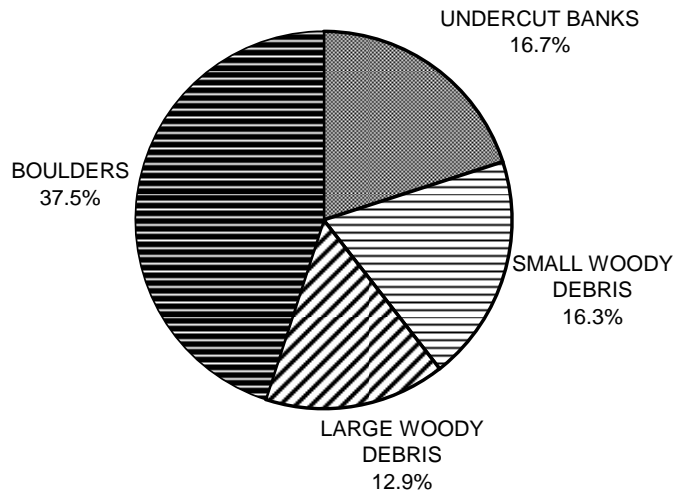
GRAPH 5

1227514380453 2011  
PERCENT EMBEDDEDNESS



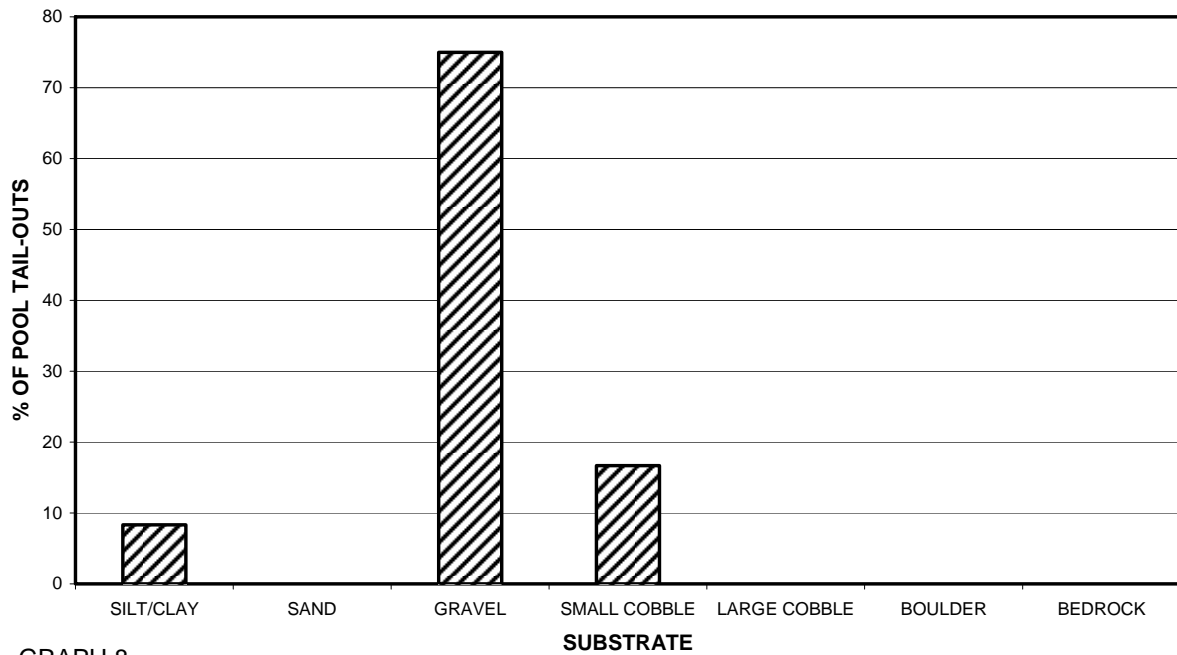
GRAPH 6

1227514380453 2011  
MEAN PERCENT COVER TYPES IN POOLS



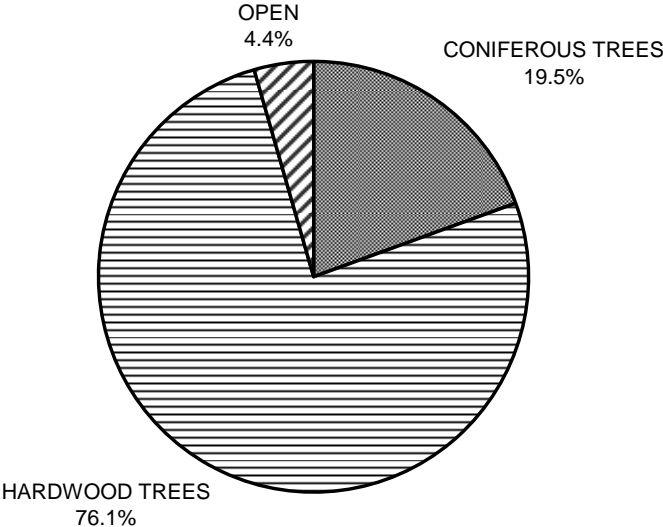
GRAPH 7

1227514380453 2011  
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



GRAPH 8

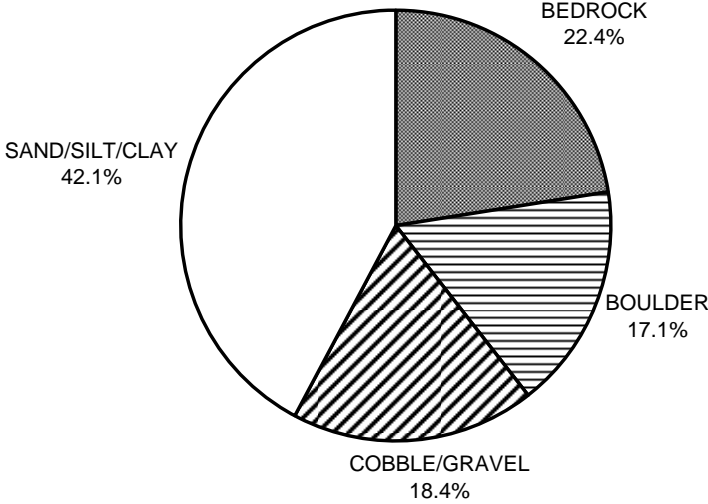
1227514380453 2011  
MEAN PERCENT CANOPY



GRAPH 9

Unnamed Tributary # 3 of Lagunitas creek

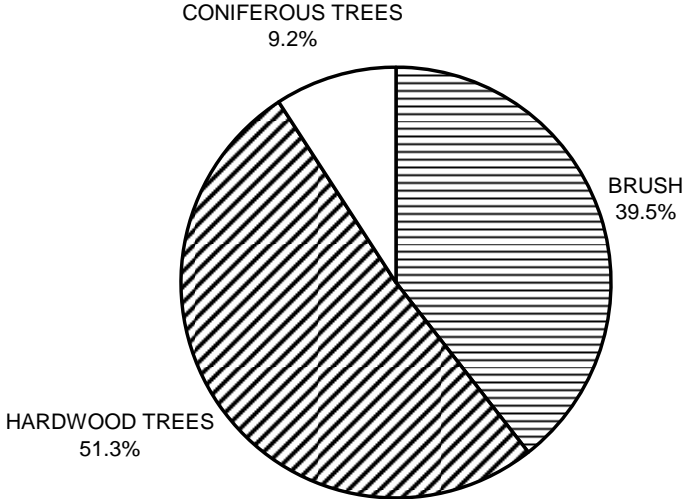
1227514380453 2011  
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

Unnamed Tributary # 3 of Lagunitas creek

1227514380453 2011  
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11