



## CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

### STREAM INVENTORY REPORT

#### Laguna Creek

#### INTRODUCTION

A stream inventory was conducted on July 28, 2015 on Laguna Creek. The survey began at the confluence with Big River and extended upstream 1.8 miles.

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

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for 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

Laguna Creek is a tributary to Big River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Laguna Creek's legal description at the confluence with Big River is T17N R16W S31. Its location is 39.2874 degrees north latitude and 123.6893 degrees west longitude, LLID number 1236881392874. Laguna Creek is a first order stream and has approximately 4.7 miles of blue line stream according to the USGS Mathison Peak 7.5 minute quadrangle. Laguna Creek drains a watershed of approximately 4.7 square miles. Elevations range from about 25 feet at the mouth of the creek to 400 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Comptche-Ukiah Road, west of Comptche.

#### METHODS

The habitat inventory conducted in Laguna Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Wildlife (CDFW). The 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.

**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 Laguna 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 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". Laguna 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 Laguna 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 unsuitable 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

## California Department of Fish and Wildlife

energy, and allow separation of territorial units to reduce density related competition for prey. 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 Laguna 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. The shelter rating is then calculated by multiplying the qualitative shelter value by the percent of the unit covered. 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 Laguna 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 Laguna 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),

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bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

### **BIOLOGICAL INVENTORY**

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Laguna Creek. In addition, underwater observations were made at six sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

### **DATA ANALYSIS**

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

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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Laguna 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 July 28, 2015 was conducted by J. Guzek and J. Lee (WSP). The total length of the stream surveyed was 9,384 feet.

Stream flow was not measured on Laguna Creek.

Laguna Creek is an E6 channel type for all 9,384 feet of the stream surveyed. E6 channels are low gradient, meandering riffle/pool streams with low width/depth ratios and little deposition. They are very efficient and stable with a high meander width ratio and silt/clay-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 64 degrees Fahrenheit. Air temperatures ranged from 59 to 85 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 35% flatwater units, 31% dry units, 29% pool units, and 4% marsh units (Graph 1). Based on total length of Level II habitat types there were 57% marsh units, 19% dry units, 13% pool units, and 12% flatwater units (Graph 2).

Four Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were run units, 33%; dry units, 31%; and mid-channel pool units, 29% (Graph 3). Based on percent total length, marsh units made up 57%, dry units 19%, and mid-channel pool units 13%.

A total of 14 pools were identified (Table 3). All of the pools encountered were main channel pools.

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Nine of the 14 pools (64%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the pool tail-outs measured, all 14 had a value of 5 (100%) (Graph 6). A value of 5 was assigned to tail-outs deemed unsuitable 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. Flatwater habitat types had a mean shelter rating of 20 and pool habitats had a mean shelter rating of 31 (Table 1).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Laguna Creek. Graph 7 describes the pool cover in Laguna Creek. Small woody debris is the dominant pool cover type followed by large woody debris.

## California Department of Fish and Wildlife

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Silt/clay was the dominant substrate observed in 86% of the pool tail-outs. Gravel was the next most frequently observed dominant substrate type and occurred in 14% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Laguna Creek was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 40% and 60%, respectively. Graph 9 describes the mean percent canopy in Laguna Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 100% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 47% of the units surveyed. Additionally, 28% of the units surveyed had coniferous trees as the dominant vegetation type, and 25% had hardwood trees as the dominant vegetation type (Graph 11).

### BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at six sites for species composition and distribution in Laguna Creek on August 26, 2015 (Table A). The sites were sampled by I. Mikus (CDFW) and K. Bocast (California Conservation Corps).

The sites yielded three young-of-the-year (YOY) steelhead trout (SH), one age 1+ SH, 11 YOY coho salmon, one age 1+ coho salmon, approximately 200 stickleback, and one rough-skinned newt.

During the survey, the upstream-most observation of juvenile coho salmon occurred at 39.2879 degrees north latitude, 123.6866 degrees west longitude, approximately 1,082 feet upstream from the confluence with Big River.

Table A. Summary of results for a fish composition and distribution survey within Laguna Creek, 2015.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	Steelhead			Coho Salmon		Additional Aquatic Species Observed
					YOY	1+	2+	YOY	1+	
E6 Channel Type										
08/26/15	1	002	Pool	368	0	0	0	5	0	STB
08/26/15	2	008	Pool	694	1	0	0	4	0	STB, NEW
08/26/15	3	013	Pool	1,050	0	1	0	0	0	STB
08/26/15	4	014	Pool	1,082	1	0	0	2	1	STB
08/26/15	5	046	Pool	9,320	1	0	0	0	0	STB
08/26/15	6	048	Pool	9,384	0	0	0	0	0	STB

NEW= Rough-skinned newt; STB=Stickleback

## DISCUSSION

Laguna Creek is an E6 channel type for the entire length of the survey. The suitability of E6 channel types for fish habitat improvement structures is as follows: E6 channels are good for bank-placed boulders and fair for opposing wing-deflectors.

The water temperatures recorded on the survey day July 28, ranged from 54 to 64 degrees Fahrenheit. Air temperatures ranged from 59 to 85 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 64 degrees Fahrenheit, if sustained, is near the threshold stress level for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 12% of the total length of this survey and pools 13%. Nine of the 14 (64%) pools had 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.

All 14 of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Sediment sources in Laguna Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Twelve of the 14 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools is 31. The shelter rating in the flatwater habitats is 20. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in Laguna Creek. Small woody debris is the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 98%. In general, revegetation projects are considered when canopy density is less than 80%. The percentage of right and left bank covered with vegetation was 97% and 98%, respectively.

## RECOMMENDATIONS

Laguna Creek should be managed as an anadromous, natural production stream. Recommendations for potential habitat improvement activities are based on target habitat values suitable for salmonids in California's north coast streams. Considering the results from this stream habitat inventory, factors that affect salmonid productivity and CDFW's professional judgment, the following list prioritizes habitat improvement activities in Laguna Creek. Keep in mind, watershed and stream ecosystem processes, land use alterations, changes in land

## California Department of Fish and Wildlife

ownership, and other factors could potentially change the order of these recommendations or create the need to remove/add recommendations in the future.

- 1) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from small woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 2) Suitable size spawning substrate on Laguna Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.
- 3) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
- 4) The limited water temperature data available suggest that maximum temperatures are within 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 three to five years.

### COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with Big River. The channel is an E6 for the entire length of the survey. The first 300 feet of Laguna Creek were dry.
395	0005.00	A road crosses the channel. The crossing is a 9' wide x 35' long x 9' high railcar bridge.
1893	0028.00	Salmonid observed.
2446	0036.00	Tributary #01 enters on the left bank. It contributes approximately 20% to Laguna Creek's flow.
2660	0037.00	A 5,280' long unsurveyed marsh.
8014	0039.00	There is a 698' long unsurveyed section.
8712	0040.00	Stickleback and possibly salmonids observed.
8998	0045.00	A 264' long unsurveyed section.



## California Department of Fish and Wildlife

- |      |         |  |
|------|---------|--|
| 9320 | 0047.00 | A road crosses the channel. The crossing is a 11' wide x 23' long x 4.5' high railcar bridge.      |
| 9339 | 0048.00 | End of survey due to diminished habitat; the channel was mostly dry above the end of survey point. |

## 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.

## California Department of Fish and Wildlife

### 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

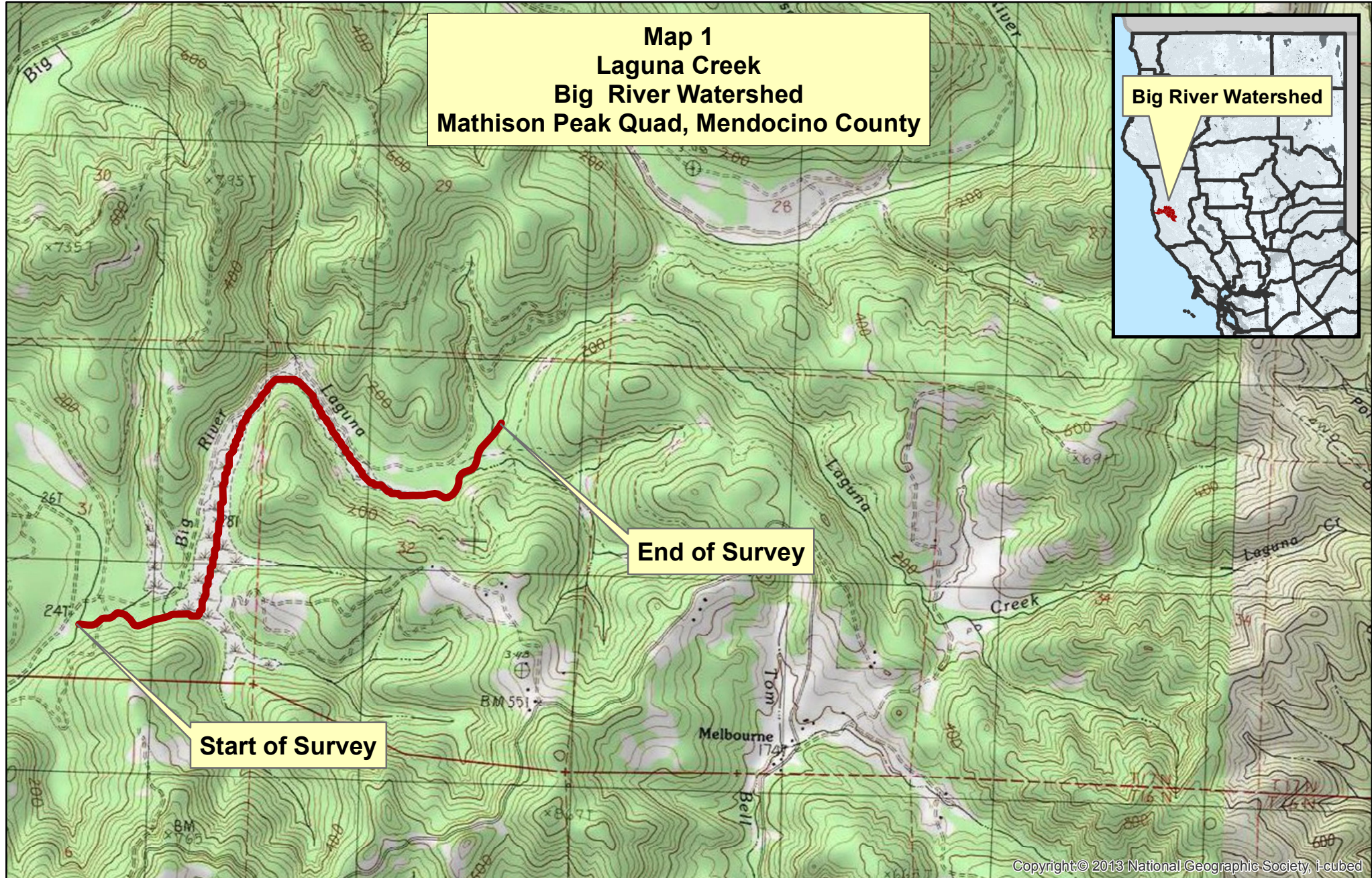
Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

#### 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]	



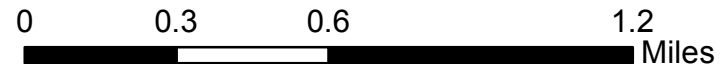
**Map 1**  
**Laguna Creek**  
**Big River Watershed**  
**Mathison Peak Quad, Mendocino County**



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E6 Channel Type





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

Stream Name: Laguna Creek

LLID: 1236881392874

Drainage: Big River

Survey Dates: 7/28/2015 to 7/28/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS31

Latitude: 39:17:15.0N

Longitude: 123:41:17.0

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
15	0	DRY	31.3	115	1732	18.5									
17	2	FLATWATER	35.4	67	1134	12.1	5.5	0.7	2.0	250	4250	175	2975		20
2	0	MARSH	4.2	2666	5333	56.8									
14	14	POOL	29.2	85	1185	12.6	12.2	1.2	2.7	1100	15406	1375	19256	1302	31
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
48	16				9384					19656			22231		

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

Stream Name: Laguna Creek

LLID: 1236881392874

Drainage: Big River

Survey Dates: 7/28/2015 to 7/28/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS31

Latitude: 39:17:15.0N

Longitude: 123:41:17.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	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 (%)
16	1	RUN	33.3	67	1076	11.5	6	0.7	1.8	210	3360	147	2352		30	98
1	1	SRN	2.1	58	58	0.6	5	0.7	2.2	290	290	203	203		10	
14	14	MCP	29.2	85	1185	12.6	12	1.2	4.2	1100	15406	1375	19256	1302	31	97
15	0	DRY	31.3	115	1732	18.5										98
2	0	MAR	4.2	2666	5333	56.8										

Total Units  
48

Total Units Fully Measured  
16

Total Length (ft.)  
9384

Total Area (sq.ft.)  
19056

Total Volume (cu.ft.)  
21811

Table 3 - Summary of Pool Types

Stream Name: Laguna Creek

LLID: 1236881392874

Drainage: Big River

Survey Dates: 7/28/2015 to 7/28/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS31

Latitude: 39:17:15.0N

Longitude: 123:41:17.0W

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
14	14	MAIN	100	85	1185	100	12.2	1.2	1100	15406	1302	18233	31

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
14	14	1185	15406	18233

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

Stream Name: Laguna Creek

LLID: 1236881392874

Drainage: Big River

Survey Dates: 7/28/2015 to 7/28/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS31

Latitude: 39:17:15.0N

Longitude: 123:41:17.0W

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
14	MCP	100	0	0	5	36	2	14	6	43	1	7

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
14	0	0	5	36	2	14	6	43	1	7

Mean Maximum Residual Pool Depth (ft.): 2.7

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

Stream Name: Laguna Creek

LLID: 1236881392874

Drainage: Big River

Survey Dates: 7/28/2015 to 7/28/2015

Dry Units: 15

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS31

Latitude: 39:17:15.0N

Longitude: 123:41:17.0W

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
0	0	TOTAL RIFFLE									
16	1	RUN	0	80	0	0	20	0	0	0	0
1	1	SRN	20	50	30	0	0	0	0	0	0
17	2	TOTAL FLAT	10	65	15	0	10	0	0	0	0
14	14	MCP	5	59	24	0	9	4	0	0	0
14	14	TOTAL POOL	5	59	24	0	9	4	0	0	0
2	0	MAR									
48	16	TOTAL	6	59	23	0	9	3	0	0	0



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

Stream Name: Laguna Creek

LLID: 1236881392874

Drainage: Big River

Survey Dates: 7/28/2015 to 7/28/2015

Dry Units: 15

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS31

Latitude: 39:17:15.0N

Longitude: 123:41:17.0W

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
16	1	RUN	100	0	0	0	0	0	0
1	1	SRN	100	0	0	0	0	0	0
14	14	MCP	93	7	0	0	0	0	0

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

Stream Name: Laguna Creek LLID: 1236881392874 Drainage: Big River  
Survey Dates: 7/28/2015 to 7/28/2015  
Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR16WS31 Latitude: 39:17:15.0N Longitude: 123:41:17.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
98	60	40	0	97	98

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.

Stream Name:	Laguna Creek	LLID:	1236881392874	Drainage:	Big River
Survey Dates:	7/28/2015 to 7/28/2015	Survey Length (ft.):	9384	Main Channel (ft.):	9384
				Side Channel (ft.):	0
Confluence Location:	Quad: MATHISON PEAK	Legal Description:	T17NR16WS31	Latitude:	39:17:15.0N
				Longitude:	123:41:17.0W

<b>STREAM REACH: 1</b>									
Channel Type:	E6					Canopy Density (%):	97.6	Pools by Stream Length (%):	12.6
Reach Length (ft.):	9384					Coniferous Component (%):	60.2	Pool Frequency (%):	29.2
Riffle/Flatwater Mean Width (ft.):	5.5					Hardwood Component (%):	39.8	Residual Pool Depth (%):	
BFW:						Dominant Bank Vegetation:	Brush	< 2 Feet Deep:	36
Range (ft.):	15	to	30			Vegetative Cover (%):	97.5	2 to 2.9 Feet Deep:	14
Mean (ft.):	20					Dominant Shelter:	Small Woody Debris	3 to 3.9 Feet Deep:	43
Std. Dev.:	5					Dominant Bank Substrate Type:	Sand/Silt/Clay	>= 4 Feet Deep:	7
Base Flow (cfs.):	0.0					Occurrence of LWD (%) :	23	Mean Max Residual Pool Depth (ft.):	2.7
Water (F):	54 - 64	Air (F):	59 - 85			LWD per 100 ft.:		Mean Pool Shelter Rating:	31
Dry Channel (ft):	1732					Riffles:			
						Pools:	7		
						Flat:	5		
Pool Tail Substrate (%):	Silt/Clay: 86	Sand: 0	Gravel: 14	Sm Cobble: 0	Lg Cobble: 0	Boulder: 0	Bedrock: 0		
Embeddedness Values (%):	1. 0.0	2. 0.0	3. 0.0	4. 0.0	5. 100.0				

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

Stream Name: Laguna Creek

LLID: 1236881392874

Drainage: Big River

Survey Dates: 7/28/2015 to 7/28/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS31

Latitude: 39:17:15.0N

Longitude: 123:41:17.0W

**Mean Percentage of Dominant Stream Bank Substrate**

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	0	0	0.0
Boulder	0	0	0.0
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	16	16	100.0

**Mean Percentage of Dominant Stream Bank Vegetation**

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	0	0.0
Brush	6	9	46.9
Hardwood Trees	6	2	25.0
Coniferous Trees	4	5	28.1
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:**

5

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

StreamName: Laguna Creek

LLID: 1236881392874

Drainage: Big River

Survey Dates: 7/28/2015 to 7/28/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS31

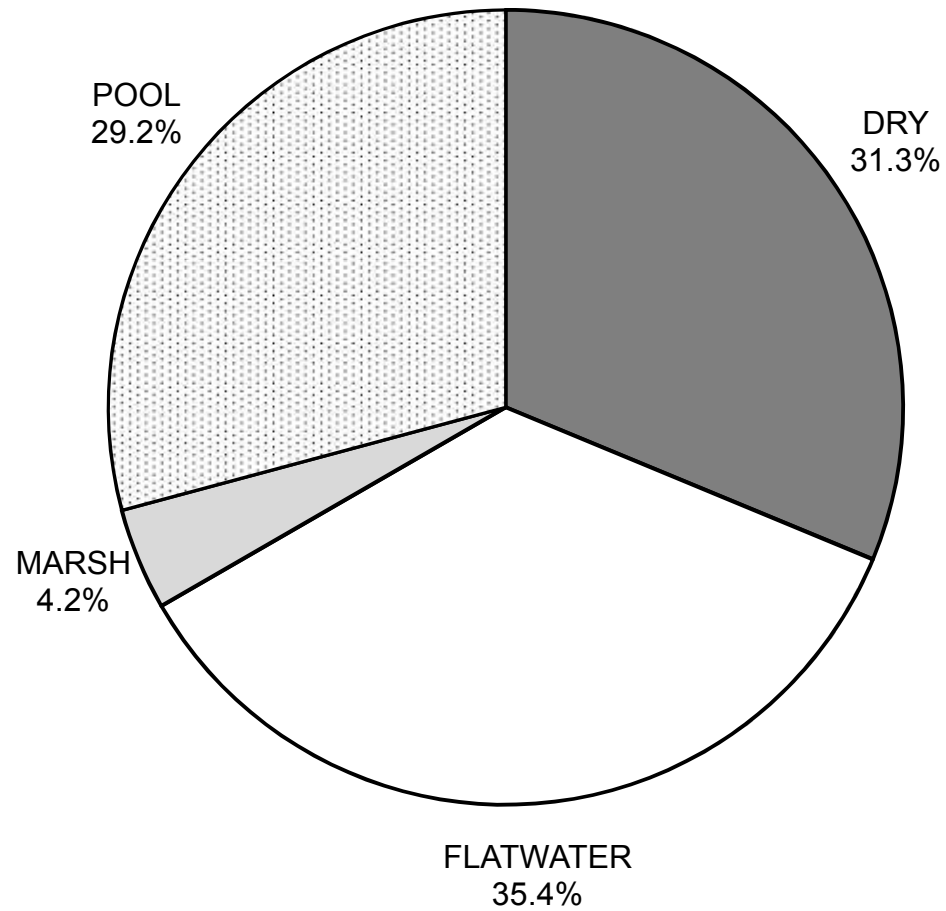
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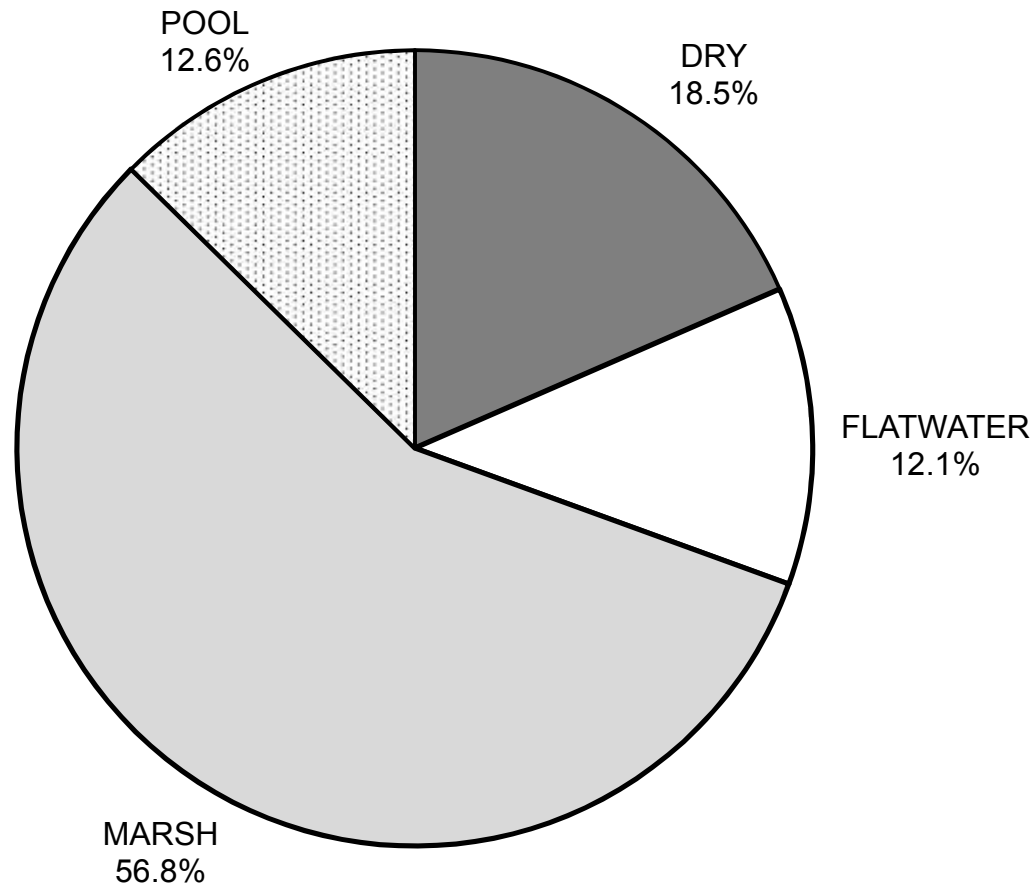
	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)		10	5
SMALL WOODY DEBRIS (%)		65	59
LARGE WOODY DEBRIS (%)		15	24
ROOT MASS (%)		0	0
TERRESTRIAL VEGETATION (%)		10	9
AQUATIC VEGETATION (%)		0	4
WHITEWATER (%)		0	0
BOULDERS (%)		0	0
BEDROCK LEDGES (%)		0	0

**LAGUNA CREEK 2015  
HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 1

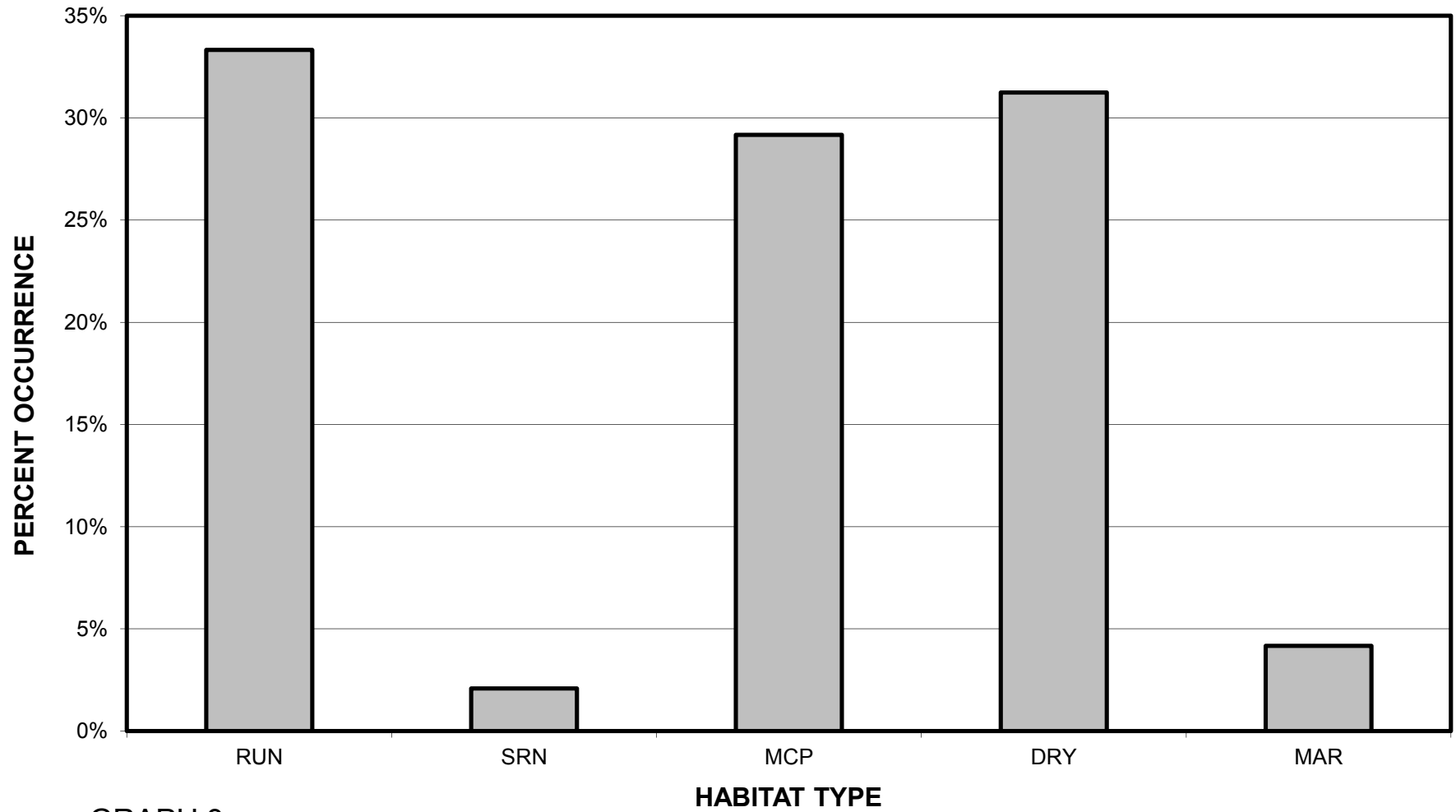
**LAGUNA CREEK 2015**  
**HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

# LAGUNA CREEK 2015

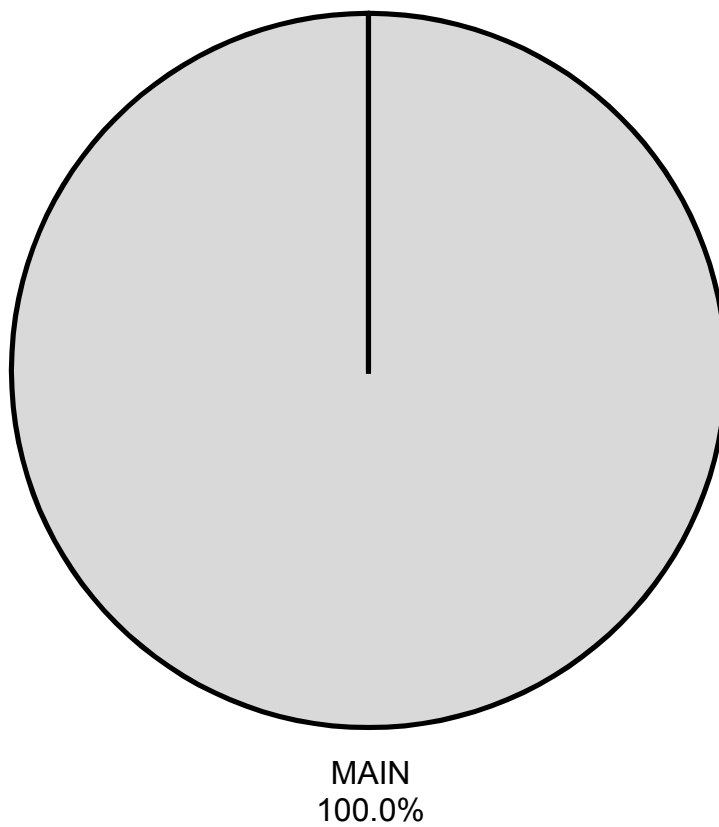
## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

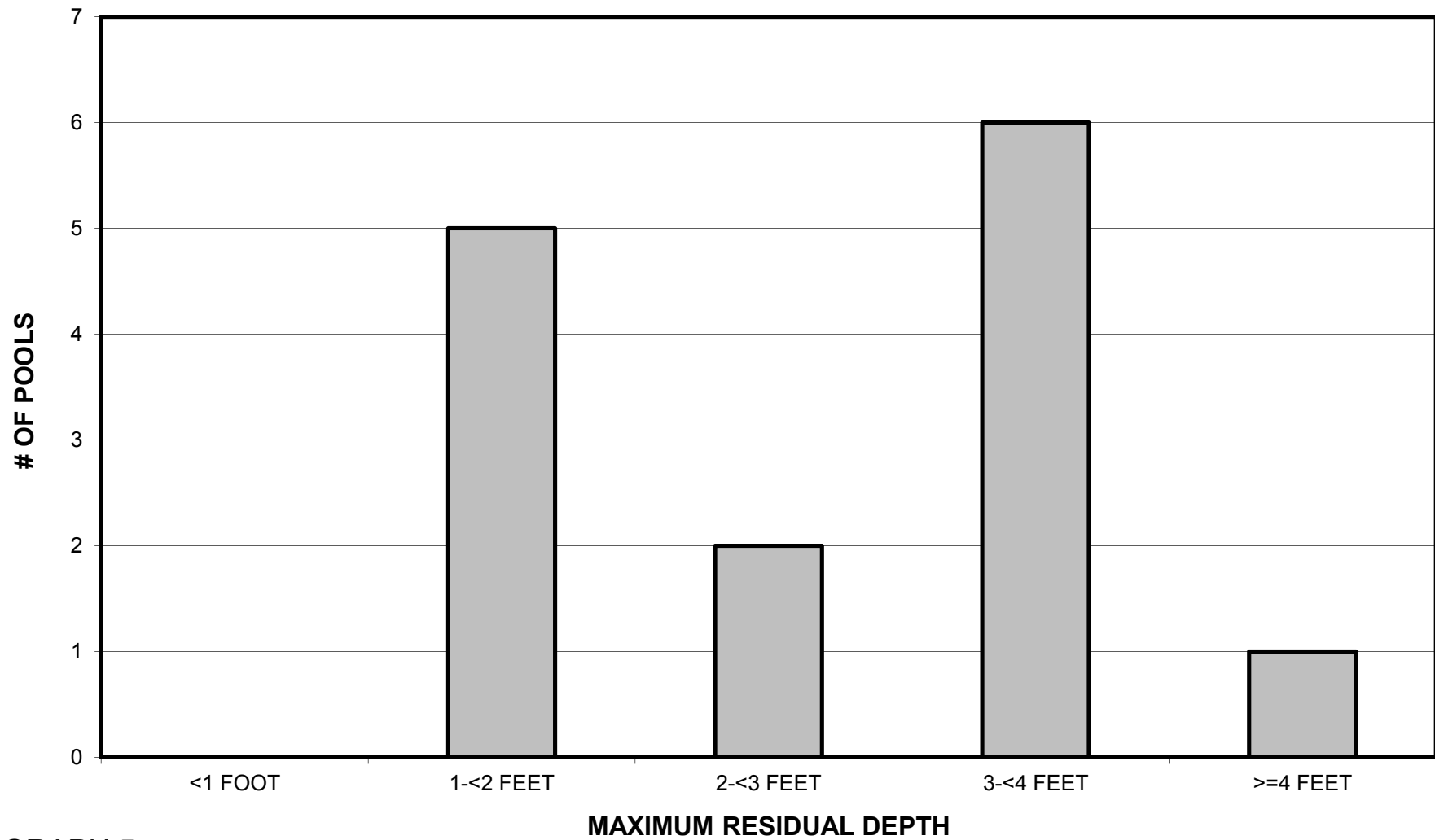


**LAGUNA CREEK 2015  
POOL TYPES BY PERCENT OCCURRENCE**



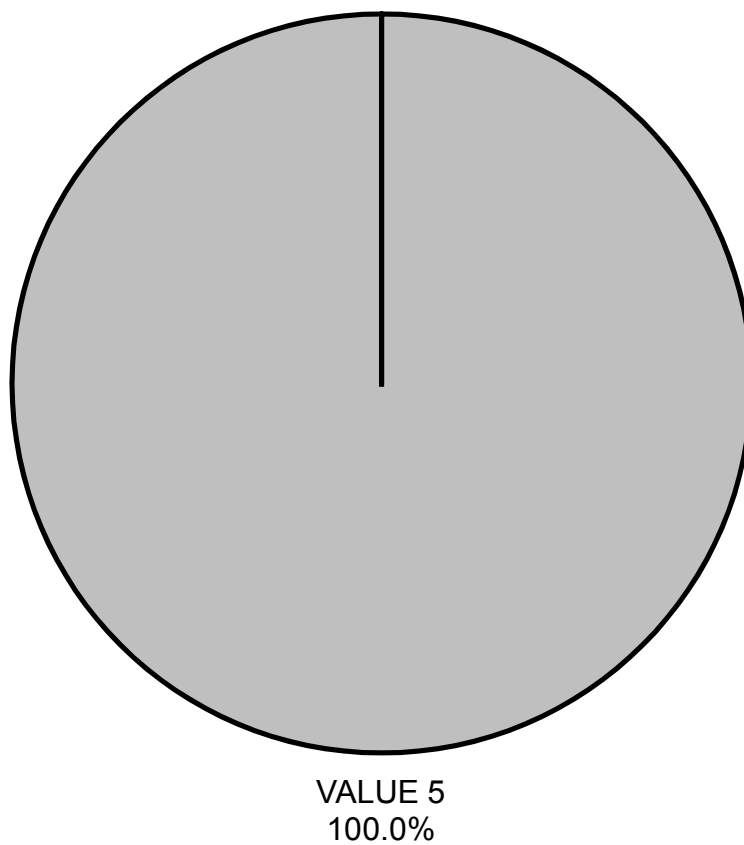
GRAPH 4

# LAGUNA CREEK 2015 MAXIMUM DEPTH IN POOLS



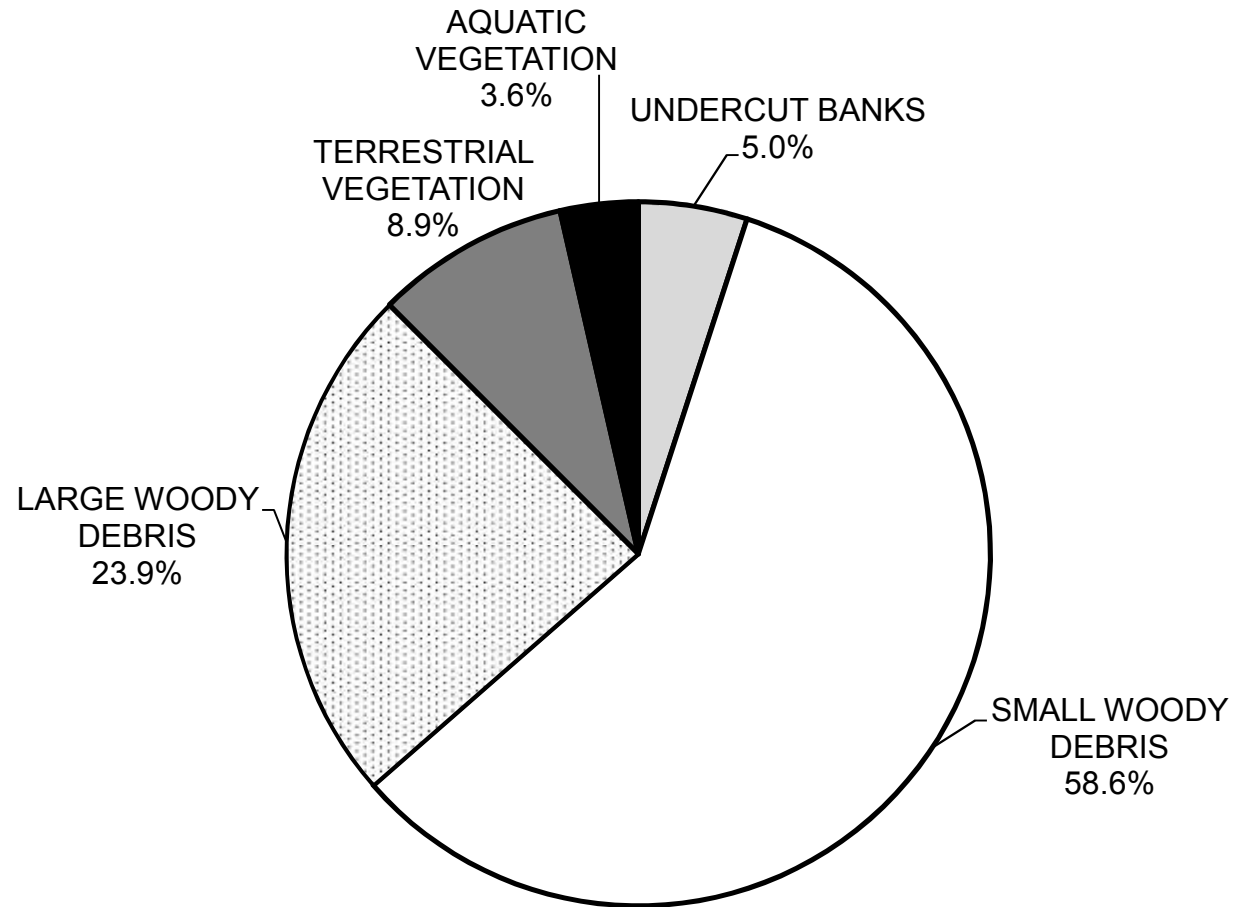
GRAPH 5

**LAGUNA CREEK 2015  
PERCENT EMBEDDEDNESS**



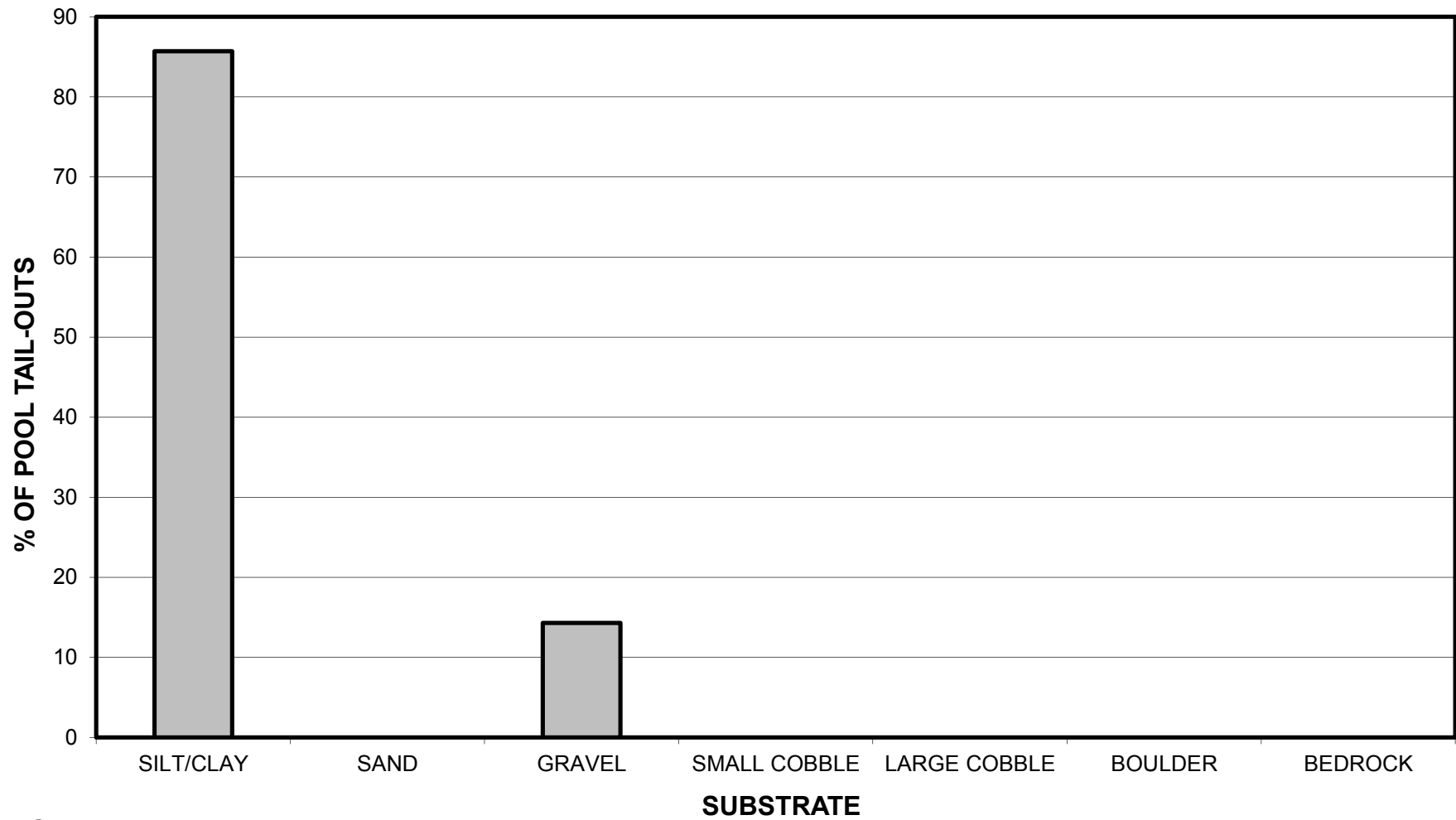
GRAPH 6

# LAGUNA CREEK 2015 MEAN PERCENT COVER TYPES IN POOLS



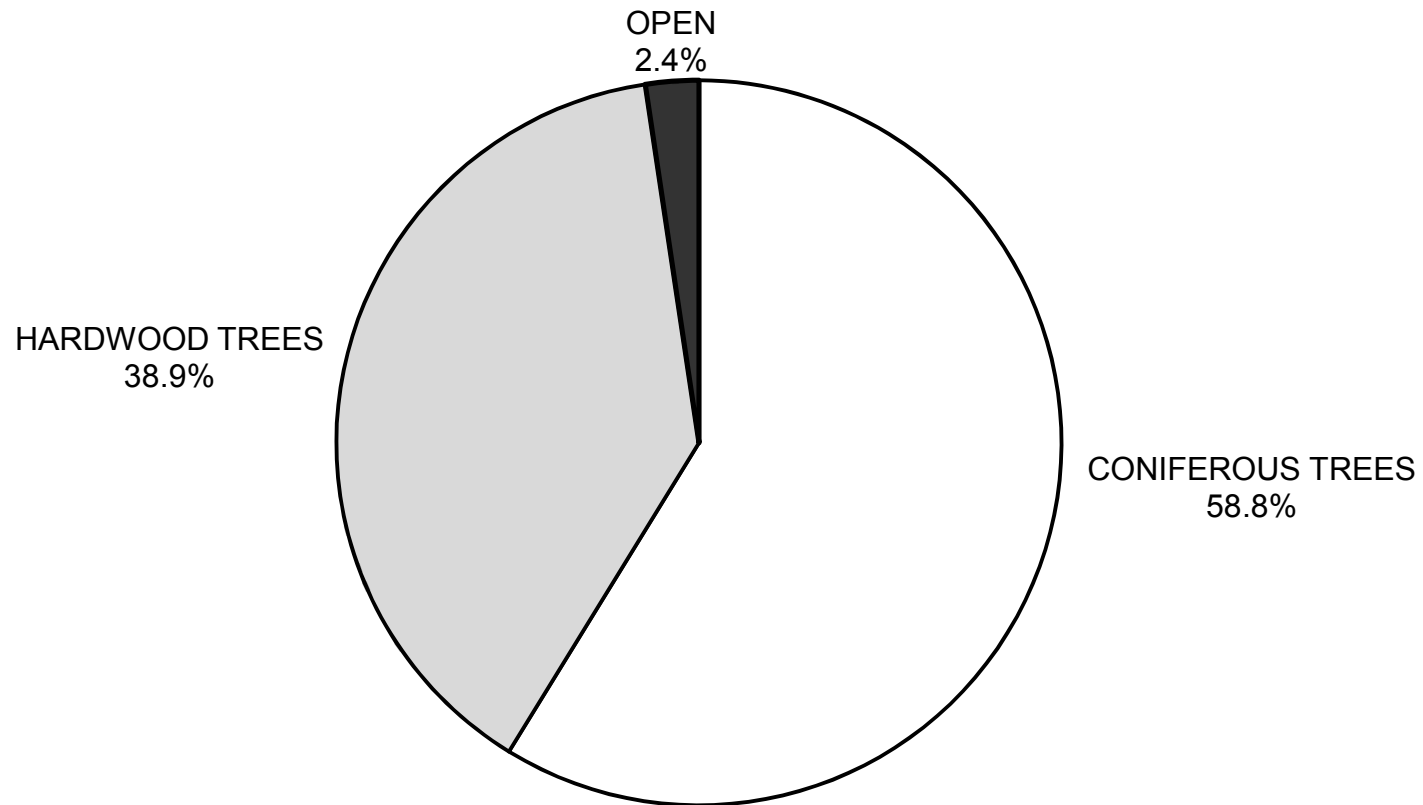
GRAPH 7

# LAGUNA CREEK 2015 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



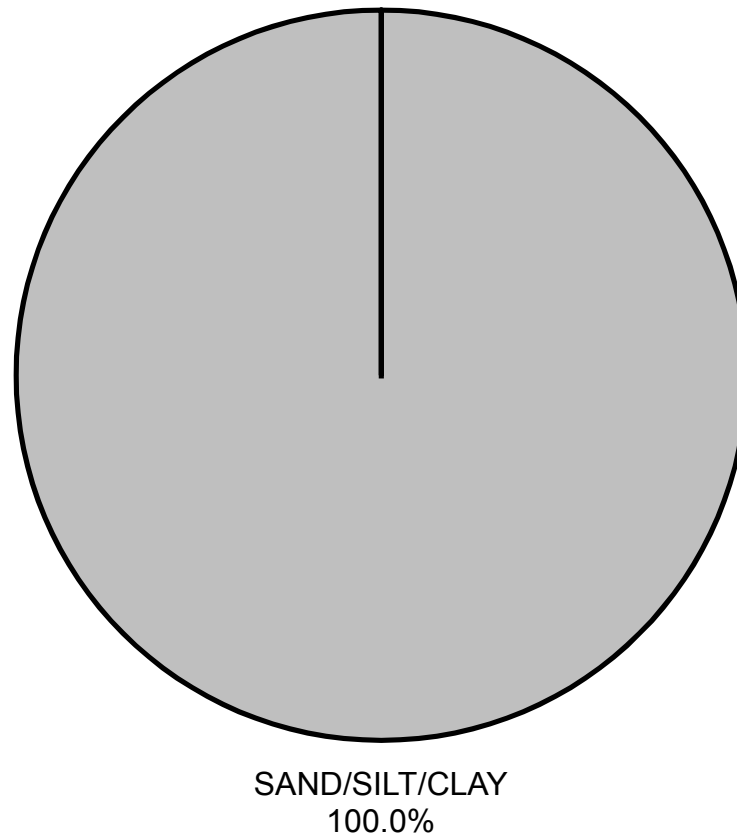
GRAPH 8

# LAGUNA CREEK 2015 MEAN PERCENT CANOPY



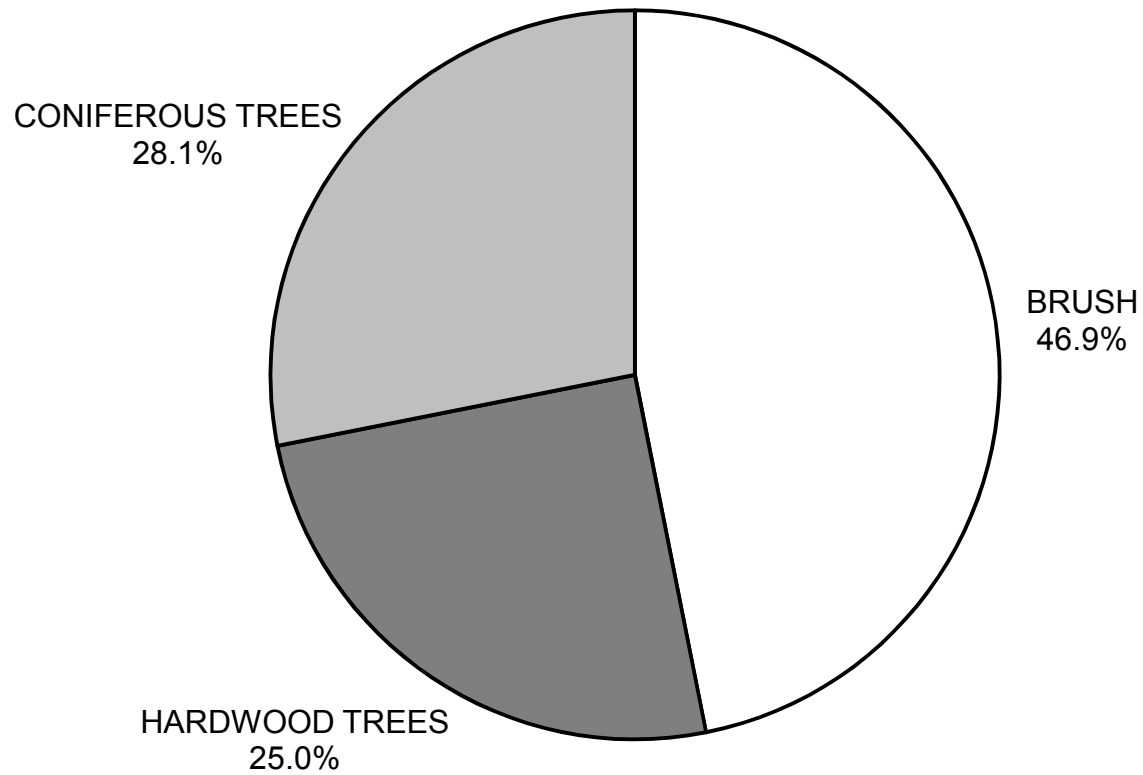
GRAPH 9

**LAGUNA CREEK 2015**  
**DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**LAGUNA CREEK 2015  
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11