

# STREAM INVENTORY REPORT

## Rose Creek

### INTRODUCTION

A stream inventory was conducted from May 9 to May 30, 2012 on Rose Creek. The survey began at the confluence with South Branch North Fork Navarro River and extended upstream 1.1 miles. A stream inventory and report was also completed for one tributary to Rose Creek.

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

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

Rose Creek is a tributary to South Branch North Fork Navarro River, tributary to North Fork Navarro River, tributary to the Navarro River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Rose Creek's legal description at the confluence with South Branch North Fork Navarro River is T15N R14W S23. Its location is 39.1402 degrees north latitude and 123.3769 degrees west longitude, LLID number 1233756391403. Rose Creek is a second order stream and has approximately 1.1 miles of blue line stream according to the USGS Bailey Ridge 7.5 minute quadrangle. Rose Creek drains a watershed of approximately 1.6 square miles. Elevations range from about 900 feet at the mouth of the creek to 1,600 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 Rose Creek Road, a private logging road accessed from Masonite Industrial Road.

### METHODS

The habitat inventory conducted in Rose 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

## Rose Creek

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

#### 1. Flow:

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

#### 2. Channel Type:

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

#### 3. Temperatures:

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

#### 4. Habitat Type:

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

## Rose Creek

### 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 Rose 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 not suitable 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 Rose Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

### 7. Substrate Composition:

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

### 8. Canopy:

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

## Rose Creek

### 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 2.0.19, 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 Rose 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

## Rose Creek

- 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 May 9 to May 30, 2012 was conducted by A. Garcia, R. Spencer, and T. Anderson (WSP). The total length of the stream surveyed was 5,873 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.72 cfs on May 16, 2012.

Rose Creek is an A3 channel type for 5,873 feet of the stream surveyed. A3 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 48 to 53 degrees Fahrenheit. Air temperatures ranged from 52 to 64 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% riffle units, 34% pool units, 21% flatwater units, and 2% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 59% riffle units, 22% flatwater units, 18% pool units, and 1% unsurveyed units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 27%; low gradient riffle units, 26%; and high gradient riffle units, 15% (Graph 3). Based on percent total length, low gradient riffle units made up 33%, high gradient riffle units 26%, and mid-channel pool units 14%.

A total of 71 pools were identified (Table 3). Main channel pools were the most frequently encountered at 83% (Graph 4), and comprised 85% 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. Nine of the 71 pools (13%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 71 pool tail-outs measured, 13 had a value of 1 (18.3%); 50 had a value of 2 (70.4%); 8 had a value of 3 (11.3%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst.

## **Rose Creek**

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 6, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 14 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 20. Main channel pools had a mean shelter rating of 12 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Rose Creek. Graph 7 describes the pool cover in Rose Creek. Boulders are the dominant pool cover type followed by large woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 66% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 17% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Rose Creek was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 37% and 63%, respectively. Graph 9 describes the mean percent canopy in Rose 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 81% sand/silt/clay, 18% bedrock, 1% boulder, and 1% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 58% of the units surveyed. Additionally, 38% of the units surveyed had deciduous trees as the dominant vegetation type, and 4% had brush as the dominant vegetation type (Graph 11).

## **DISCUSSION**

Rose Creek is an A3 channel type for the entire length of the survey, 5,873 feet. A3 channels are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days May 9 to May 30, 2012 ranged from 48 to 53 degrees Fahrenheit. Air temperatures ranged from 52 to 64 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 22% of the total length of this survey, riffles 59%, and pools 18%. Nine of the 71 (13%) pools had 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.

## Rose Creek

Sixty-three of the 71 pool tail-outs measured had embeddedness ratings of 1 or 2. Eight of the pool tail-outs had embeddedness ratings of 3 or 4. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Fifty-nine of the 71 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 is 14. The shelter rating in the flatwater habitats is 6. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Rose Creek. Boulders are 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%. The percentage of right and left bank covered with vegetation was 97% and 98%, respectively.

## RECOMMENDATIONS

- 1) Rose Creek should be managed as an anadromous, natural production stream.
- 2) 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 3 to 5 years.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from boulders. 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 (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with the South Branch North Fork Navarro River. The channel is an A3 for the entire length of the survey.

## Rose Creek

- 332 0014.00 Tributary #01 enters on the left bank. It contributes approximately 10% to Rose Creek's flow. The water temperature of the tributary was 54 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 50 degrees Fahrenheit. The slope of the tributary is approximately 10%. The tributary not accessible to salmonids due to an eight foot tall bedrock sheet 30' upstream from the mouth.
- 604 0025.00 Log debris accumulation (LDA) #01 contains 14 pieces of large woody debris (LWD) and measures 9' high x 49' wide x 12' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 35' wide x 50' long x 5' deep. The LDA consists of two plunges: the first is 4.2' high, the second is 3.5' high. Fish are present above the LDA.
- 1386 0049.00 There is a 2' high plunge over bedrock.
- 2153 0071.00 LDA #02 contains four pieces of LWD and measures 5.2' high x 23' wide x 5' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to boulders and measures 15' wide x 35' long x 3' deep. There is a 4' high plunge over the LDA. Fish are present above the LDA.
- 2161 0072.00 There is a 2' high plunge.
- 2231 0073.00 A landslide on left bank is contributing woody debris to the channel.
- 2276 0075.00 There is a 1.3' high plunge over log.
- 2343 0077.00 LDA #03 contains eight pieces of LWD and measures 5' high x 25' wide x 7' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 18' wide x 70' long x 3' deep. There is a 4' high plunge over the LDA. Fish are present above the LDA.
- 3072 0094.00 LDA #04 contains one piece of LWD and measures 3.5' high x 15' wide x 2.5' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to large cobble and measures 12' wide x 60' long x 2' deep. There is a 3' high plunge over the LDA. Fish are present above the LDA.
- 3424 0105.00 Tributary #02 enters on the left bank. It contributes approximately 15% to Rose Creek's flow. The water temperature of the tributary was 53 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 60 degrees Fahrenheit. For more information, see the 2012 Unnamed Tributary to Rose Creek Stream Habitat Inventory Report.



## Rose Creek

- 3489 0108.00 There is a 2.5' high plunge with no jump pool below.
- 3568 0110.00 LDA #05 contains three pieces of LWD and measures 5.5' high x 14' wide x 6' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 13' wide x 60' long x 3' deep. There is a 2.5' high plunge over the LDA. No fish were observed above the LDA.
- 3635 0114.00 LDA #06 contains two pieces of LWD and measures 4' high x 13' wide x 6.5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 10' wide x 30' long x 2' deep. There is a 3' high plunge over the LDA.
- 3692 0118.00 LDA #07 contains one piece of LWD and measures 7' high x 6.5' wide x 3' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 5' wide x 60' long x 3' deep. There is a 4.5' high plunge over the LDA.
- 3769 0121.00 LDA #08 contains 11 pieces of LWD and measures 6' high x 15' wide x 16' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 12' wide x 35' long x 3' deep. There is a 4' high plunge over the LDA with no jump pool below it.
- 3833 0125.00 LDA #09 contains four pieces of LWD and measures 6' high x 16' wide x 10' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 10' wide x 60' long x 5' deep. There is a 4' high plunge over the LDA. The water flows subsurface above the LDA.
- 3981 0130.00 LDA #10 contains six pieces of LWD and measures 8' high x 18' wide x 5' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 10' wide x 80' long x 4' deep. There is a 7' high plunge over the LDA.
- 4069 0134.00 LDA #11 contains four pieces of LWD and measures 7' high x 21' wide x 6' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 15' wide x 60' long x 3' deep. There is a 4' high plunge over the LDA.
- 4174 0137.00 LDA #12 contains four pieces of LWD and measures 6' high x 18' wide x 5' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 13' wide x 80' long x 3' deep.

## Rose Creek

- 4594 0152.00 LDA #13 contains 11 pieces of LWD and measures 8' high x 28' wide x 10' long. Water flows subsurface through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 20' wide x 40' long x 4' deep.
- 4699 0156.00 LDA #14 contains six pieces of LWD and measures 3.5' high x 17' wide x 5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 10' wide x 100' long x 2' deep. The LDA consists of two plunges, both are 3' high.
- 5186 0177.00 LDA #15 contains six pieces of LWD and measures 5' high x 14' wide x 6' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 10' wide x 50' long x 4' deep. There is a 3' high plunge over the LDA.
- 5311 0186.00 LDA #16 contains four pieces of LWD and measures 7' high x 14' wide x 12' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to large cobble and measures 14' wide x 20' long x 7' deep.
- 5819 0207.00 There is a 4' high plunge.
- 5864 0209.00 LDA #17 contains eight pieces of LWD and measures 6' high x 18' wide x 16' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 16' wide x 10' long x 5' deep. There is a 5' high plunge over the LDA. End of survey due to diminished habitat. Above LDA #17, the stream becomes narrow and steep.

## 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.

## Rose Creek

### LEVEL III and LEVEL IV HABITAT TYPES

#### RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

#### CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

#### FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

#### MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

#### SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

#### BACKWATER POOLS

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

#### ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

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

Stream Name: Rose Creek

LLID: 1233756391403 Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS23 Latitude: 39:08:25.0N Longitude: 123:22:32.0

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
43	6	FLATWATER	20.6	30	1310	22.3	5.8	0.5	0.9	171	7341	84	3631		6
4	0	NOSURVEY	1.9	14	56	1.0									
71	71	POOL	34.0	15	1030	17.5	7.7	0.6	1.3	111	7881	106	7497	81	14
91	16	RIFFLE	43.5	38	3477	59.2	5.3	0.4	0.7	113	10306	43	3919		6
<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>		
209	93				5873					25528			15046		

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

Stream Name: Rose Creek

LLID: 1233756391403

Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS23

Latitude: 39:08:25.0N

Longitude: 123:22:32.0W

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 (%)
55	7	LGR	26.3	35	1925	32.8	6	0.3	0.8	70	3824	19	1028		4	99
32	7	HGR	15.3	47	1505	25.6	5	0.4	1	177	5652	75	2405		9	99
2	1	CAS	1.0	13	26	0.4	11	0.4	0.6	77	154	31	62		10	87
2	1	BRS	1.0	10	21	0.4	2	0.1	0.3	12	24	1	2		5	97
28	5	RUN	13.4	25	689	11.7	6	0.5	1	163	4552	80	2245		3	95
15	1	SRN	7.2	41	621	10.6	5	0.5	1.1	212	3173	106	1586		20	98
57	57	MCP	27.3	14	824	14.0	7	0.7	3.8	110	6244	109	6225	85	12	98
2	2	STP	1.0	28	55	0.9	7	0.4	0.9	184	367	124	248	77	15	98
1	1	LSL	0.5	13	13	0.2	10	0.6	1.4	130	130	91	91	78	20	90
1	1	LSBk	0.5	19	19	0.3	6	0.1	0.9	108	108	54	54	11	5	90
10	10	PLP	4.8	12	119	2.0	9	0.6	2	103	1031	88	878	68	21	99
4	0	NS	1.9	14	56	1.0										92

Total Units  
209

Total Units Fully Measured  
93

Total Length (ft.)  
5873

Total Area (sq.ft.)  
25259

Total Volume (cu.ft.)  
14826

**Table 3 - Summary of Pool Types**

Stream Name: Rose Creek

LLID: 1233756391403

Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS23

Latitude: 39:08:25.0N

Longitude: 123:22:32.0W

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
59	59	MAIN	83	15	879	85	7.5	0.6	112	6611	84	4976	12
12	12	SCOUR	17	13	151	15	8.7	0.6	106	1270	64	773	20

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
71	71	1030	7881	5749

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

Stream Name: Rose Creek

LLID: 1233756391403

Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS23

Latitude: 39:08:25.0N

Longitude: 123:22:32.0W

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
57	MCP	80	14	25	35	61	5	9	3	5	0	0
2	STP	3	2	100	0	0	0	0	0	0	0	0
1	LSL	1	0	0	1	100	0	0	0	0	0	0
1	LSBk	1	1	100	0	0	0	0	0	0	0	0
10	PLP	14	1	10	8	80	1	10	0	0	0	0

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
71	18	25	44	62	6	8	3	4	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3

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

Stream Name: Rose Creek

LLID: 1233756391403

Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Dry Units: 0

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS23

Latitude: 39:08:25.0N

Longitude: 123:22:32.0W

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
55	7	LGR	0	0	0	0	0	0	40	60	0
32	7	HGR	0	0	9	0	0	0	3	88	0
2	1	CAS	0	0	0	0	0	0	50	50	0
2	2	BRS	0	0	0	0	0	0	100	0	0
91	17	TOTAL RIFFLE	0	0	5	0	0	0	27	68	0
28	5	RUN	0	0	100	0	0	0	0	0	0
15	1	SRN	0	0	0	0	0	0	30	70	0
43	6	TOTAL FLAT	0	0	50	0	0	0	15	35	0
57	57	MCP	16	4	23	2	0	0	17	28	9
2	2	STP	0	0	20	0	0	0	60	20	0
1	1	LSL	0	0	100	0	0	0	0	0	0
1	1	LSBk	0	0	0	0	0	0	0	100	0
10	10	PLP	14	11	29	0	0	0	26	20	0
71	71	TOTAL POOL	15	5	24	2	0	0	20	27	7
4	0	NS									
209	94	TOTAL	12	4	23	2	0	0	20	33	6



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

Stream Name: Rose Creek

LLID: 1233756391403

Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Dry Units: 0

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS23

Latitude: 39:08:25.0N

Longitude: 123:22:32.0W

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
55	7	LGR	0	0	86	14	0	0	0
32	7	HGR	0	0	86	0	0	0	14
2	1	CAS	0	0	0	0	100	0	0
2	1	BRS	0	0	0	0	0	0	100
28	5	RUN	0	0	100	0	0	0	0
15	1	SRN	0	0	100	0	0	0	0
57	57	MCP	0	26	67	2	2	2	2
2	2	STP	0	50	50	0	0	0	0
1	1	LSL	0	0	100	0	0	0	0
1	1	LSBk	0	0	100	0	0	0	0
10	10	PLP	0	20	80	0	0	0	0

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

Stream Name: Rose Creek

LLID: 1233756391403

Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS23

Latitude: 39:08:25.0N

Longitude: 123:22:32.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
98	63	37	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.

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

Stream Name: Rose Creek LLID: 1233756391403 Drainage: Navarro River  
 Survey Dates: 5/9/2012 to 5/30/2012 Survey Length (ft.): 5873 Main Channel (ft.): 5873 Side Channel (ft.): 0  
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS23 Latitude: 39:08:25.0N Longitude: 123:22:32.0W

**Summary of Fish Habitat Elements By Stream Reach**

<b>STREAM REACH: 1</b>							
Channel Type: A3		Canopy Density (%): 97.7		Pools by Stream Length (%): 17.5			
Reach Length (ft.): 5873		Coniferous Component (%): 62.5		Pool Frequency (%): 34.0			
Riffle/Flatwater Mean Width (ft.): 5.5		Hardwood Component (%): 37.5		Residual Pool Depth (%):			
BFW:		Dominant Bank Vegetation: Coniferous Trees		< 2 Feet Deep: 87			
Range (ft.): 10 to 18		Vegetative Cover (%): 97.7		2 to 2.9 Feet Deep: 8			
Mean (ft.): 13		Dominant Shelter: Boulders		3 to 3.9 Feet Deep: 4			
Std. Dev.: 2		Dominant Bank Substrate Type: Sand/Silt/Clay		>= 4 Feet Deep: 0			
Base Flow (cfs.): 0.7		Occurrence of LWD (%): 17		Mean Max Residual Pool Depth (ft.): 1.3			
Water (F): 48 - 53 Air (F): 52 - 64		LWD per 100 ft.:		Mean Pool Shelter Rating: 14			
Dry Channel (ft): 0		Riffles: 2					
		Pools: 7					
		Flat: 4					
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 8 Gravel: 66 Sm Cobble: 17 Lg Cobble: 4 Boulder: 3 Bedrock: 1							
Embeddedness Values (%): 1. 18.3 2. 70.4 3. 11.3 4. 0.0 5. 0.0							

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

Stream Name: Rose Creek

LLID: 1233756391403

Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS23

Latitude: 39:08:25.0N

Longitude: 123:22:32.0W

**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	20	13	17.7
Boulder	1	0	0.5
Cobble / Gravel	0	1	0.5
Sand / Silt / Clay	72	79	81.2

**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	5	3	4.3
Hardwood Trees	39	31	37.6
Coniferous Trees	49	59	58.1
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Rose Creek

LLID: 1233756391403

Drainage: Navarro River

Survey Dates: 5/9/2012 to 5/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS23

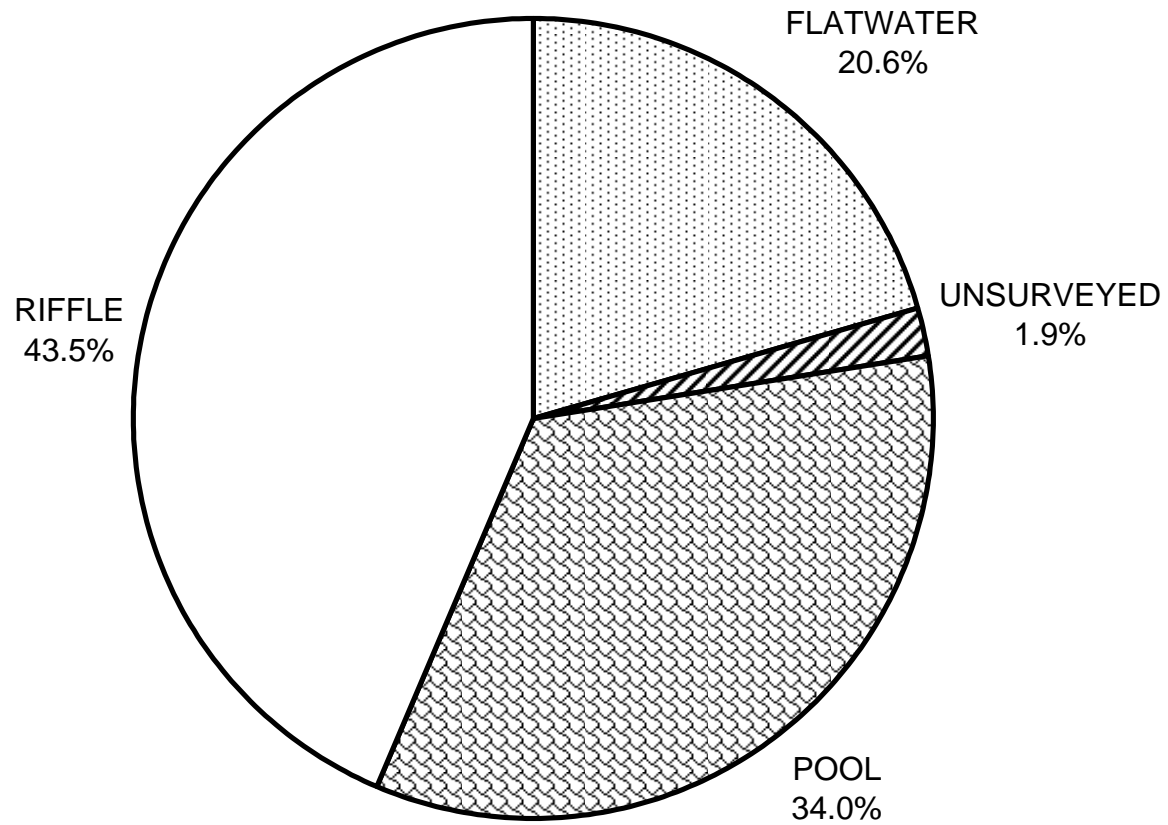
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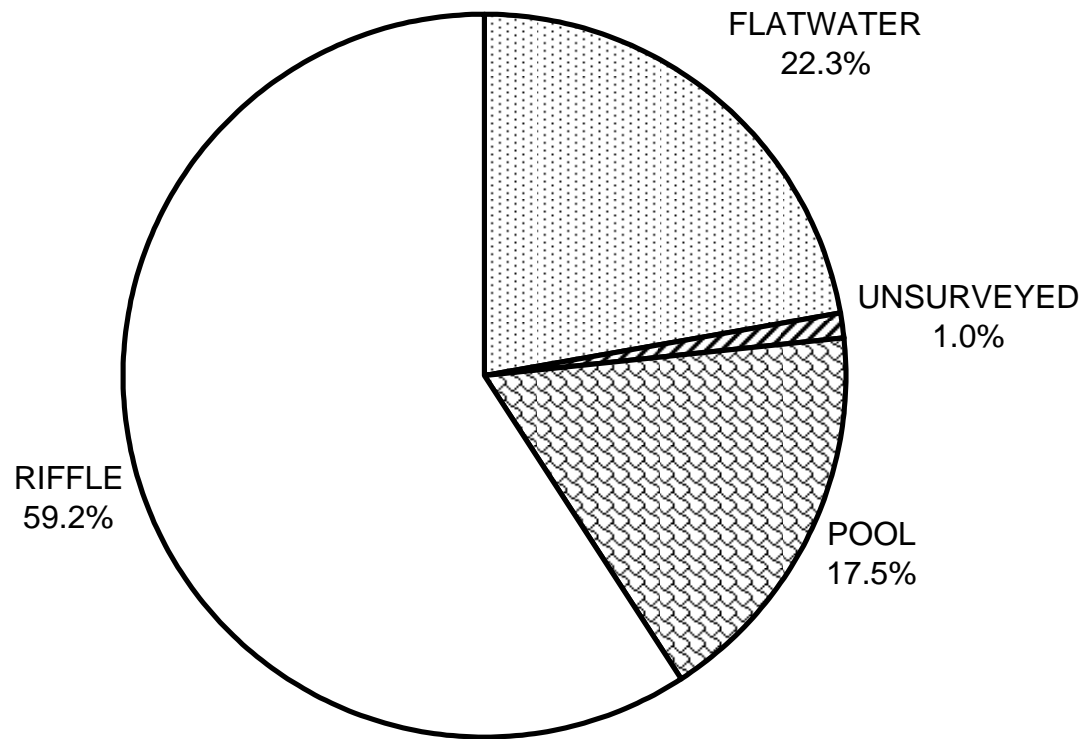
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	0	15
SMALL WOODY DEBRIS (%)	0	0	5
LARGE WOODY DEBRIS (%)	5	50	24
ROOT MASS (%)	0	0	2
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	27	15	20
BOULDERS (%)	68	35	27
BEDROCK LEDGES (%)	0	0	7

# ROSE CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



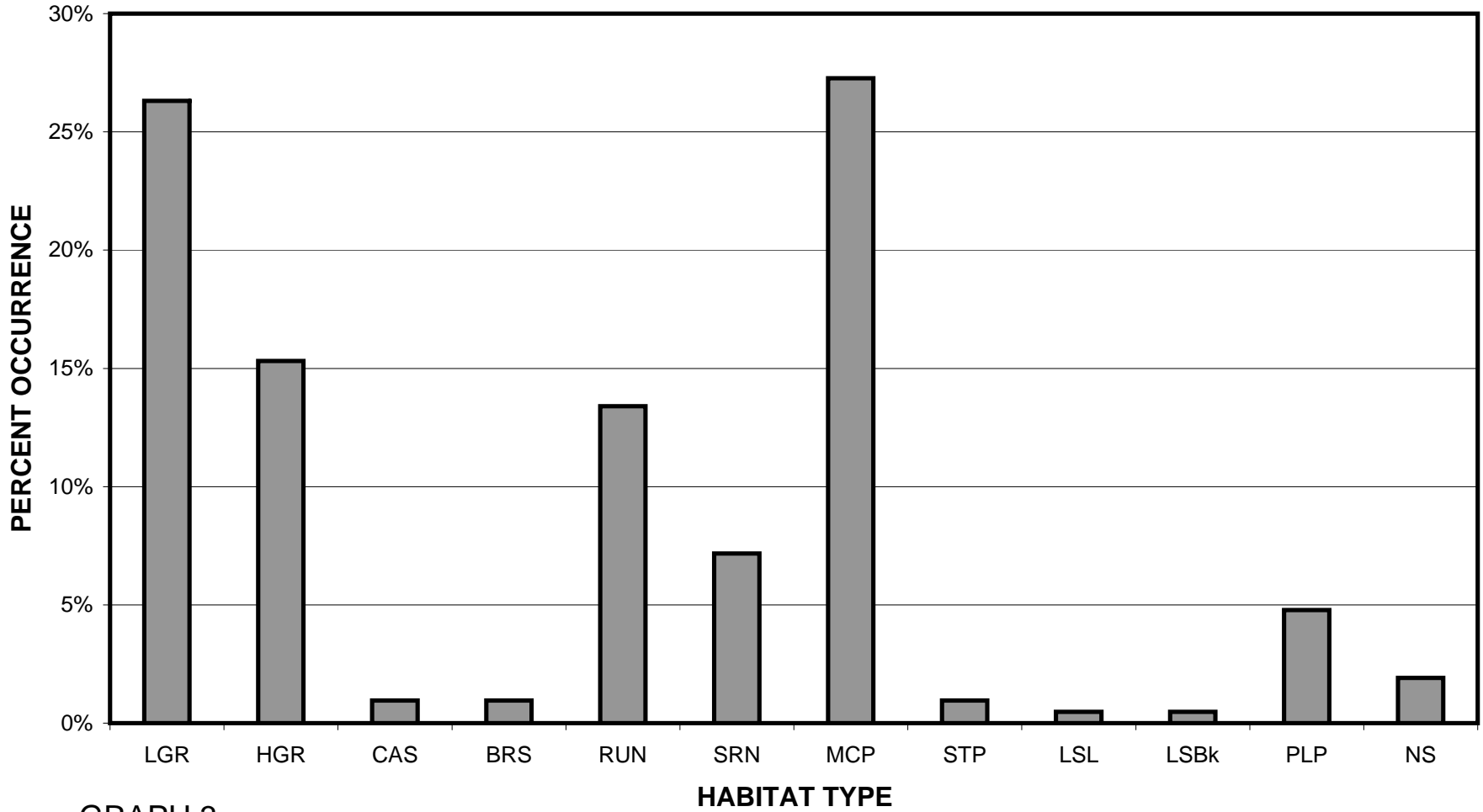
GRAPH 1

# ROSE CREEK 2012 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

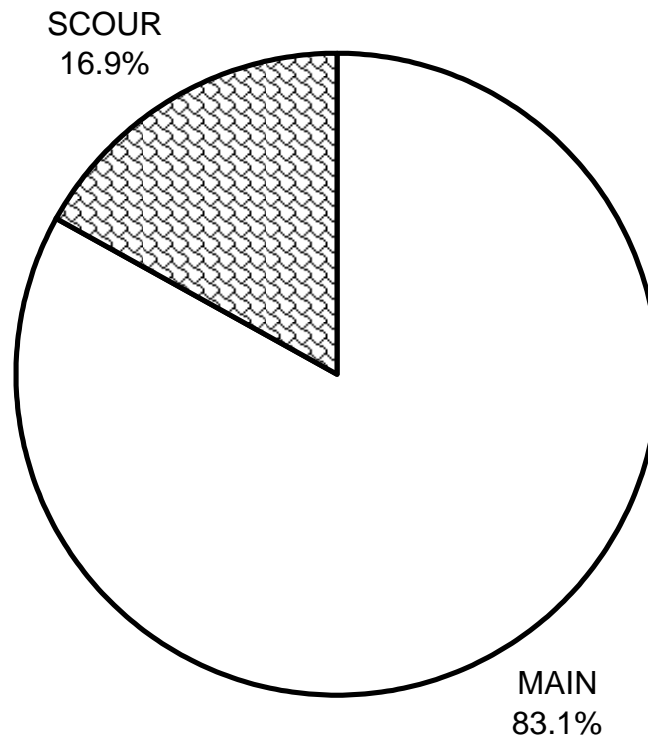
# ROSE CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

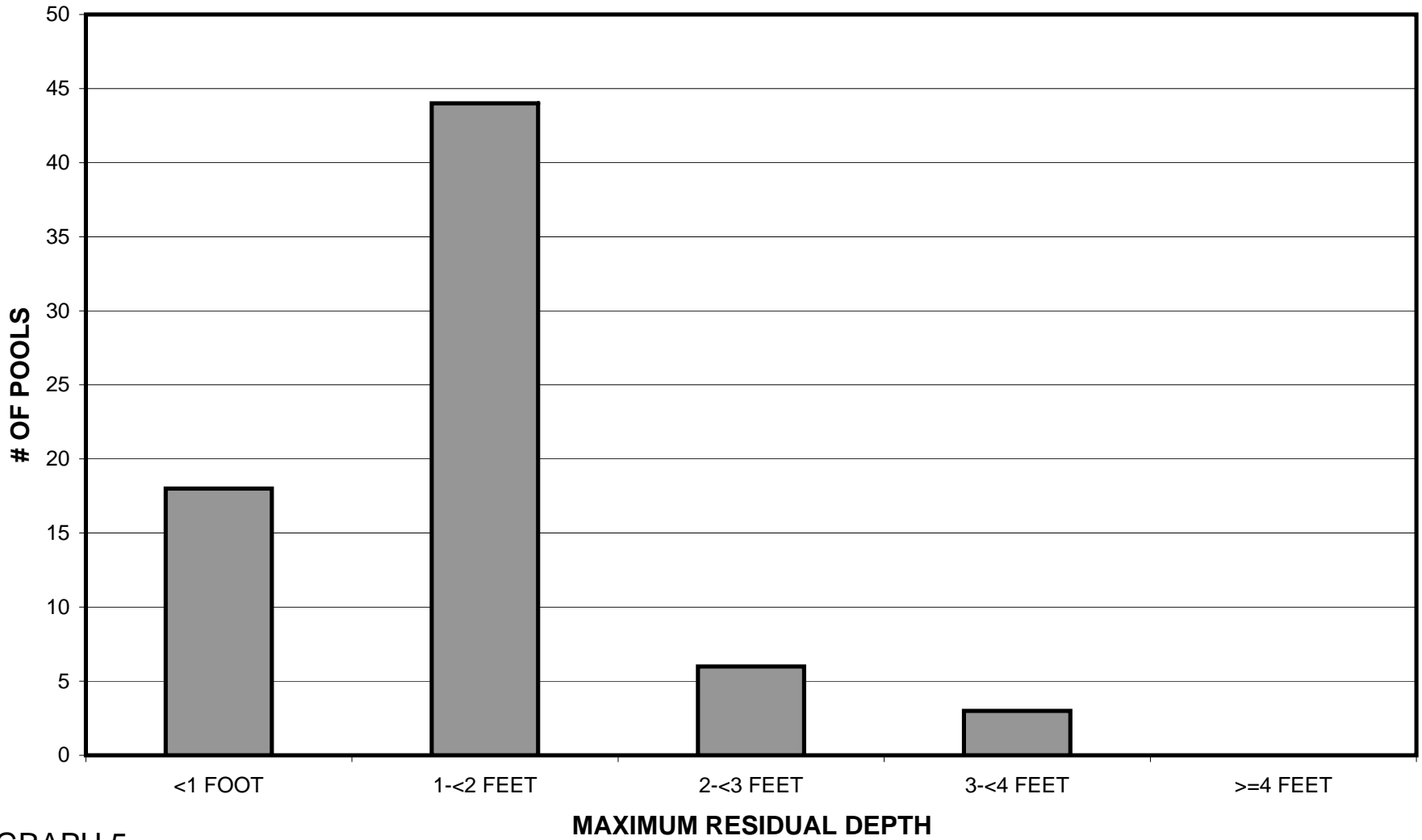


**ROSE CREEK 2012  
POOL TYPES BY PERCENT OCCURRENCE**



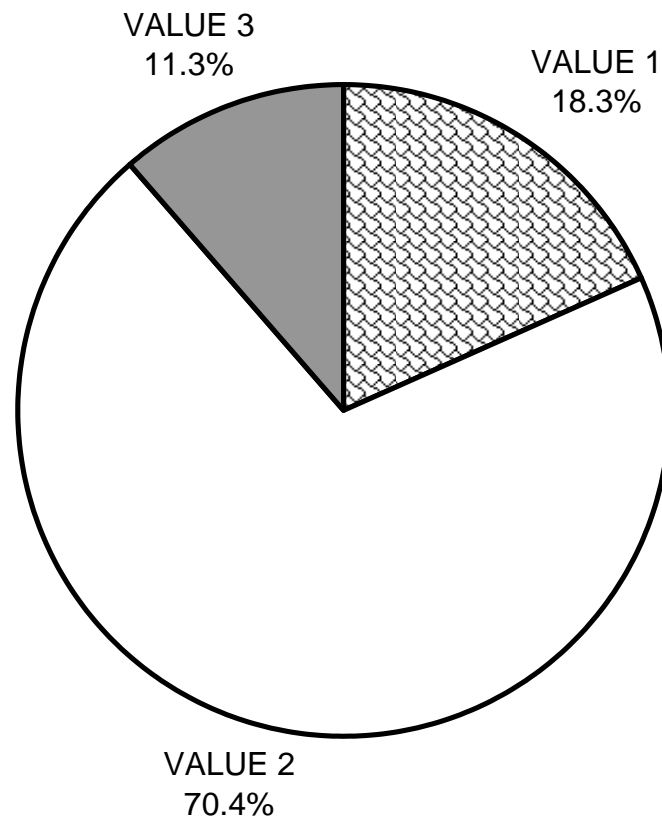
GRAPH 4

# ROSE CREEK 2012 MAXIMUM DEPTH IN POOLS



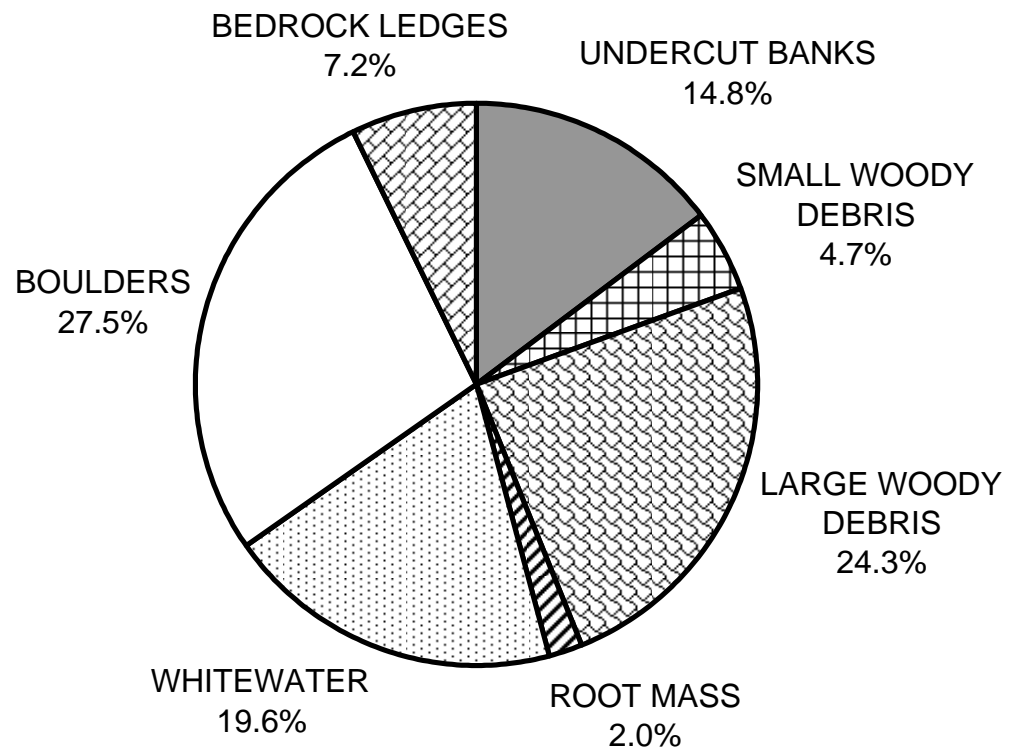
GRAPH 5

# ROSE CREEK 2012 PERCENT EMBEDDEDNESS



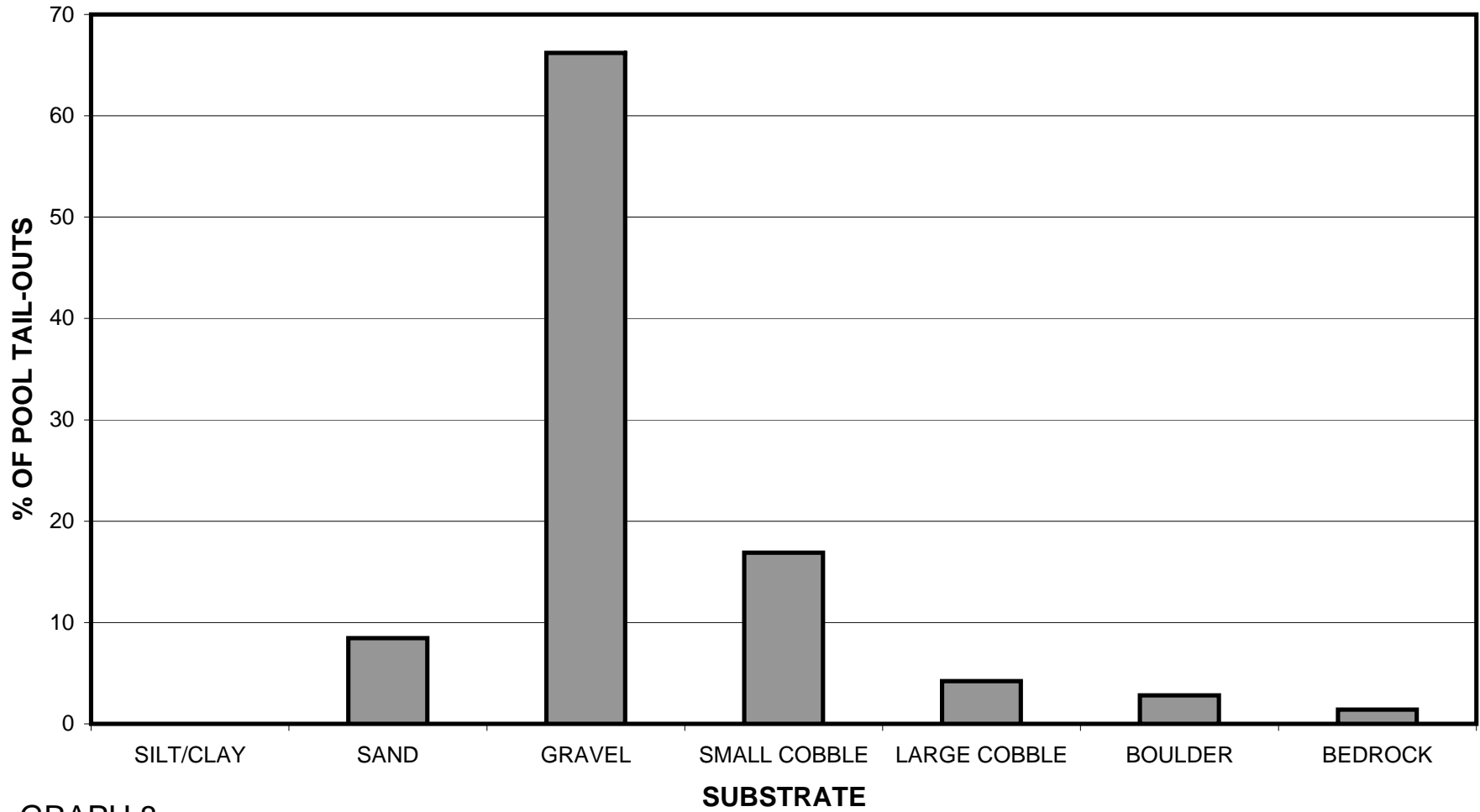
GRAPH 6

# ROSE CREEK 2012 MEAN PERCENT COVER TYPES IN POOLS



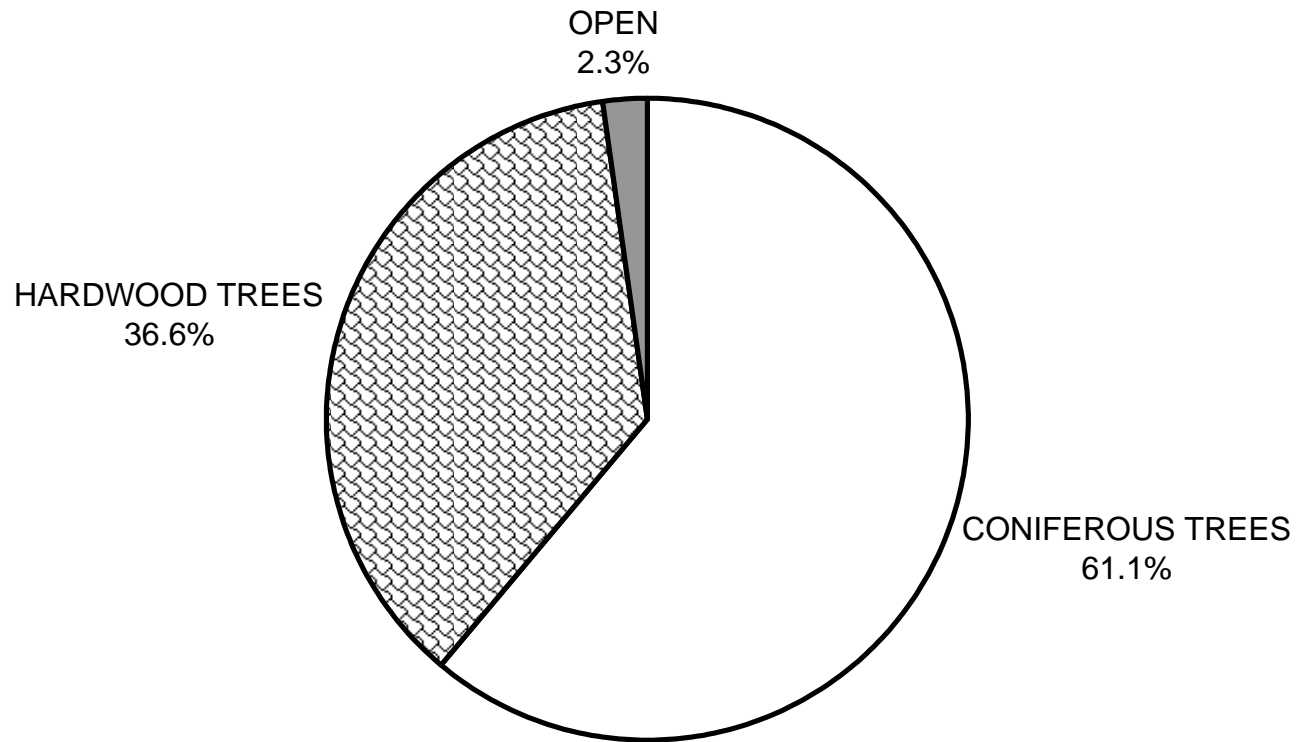
GRAPH 7

# ROSE CREEK 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



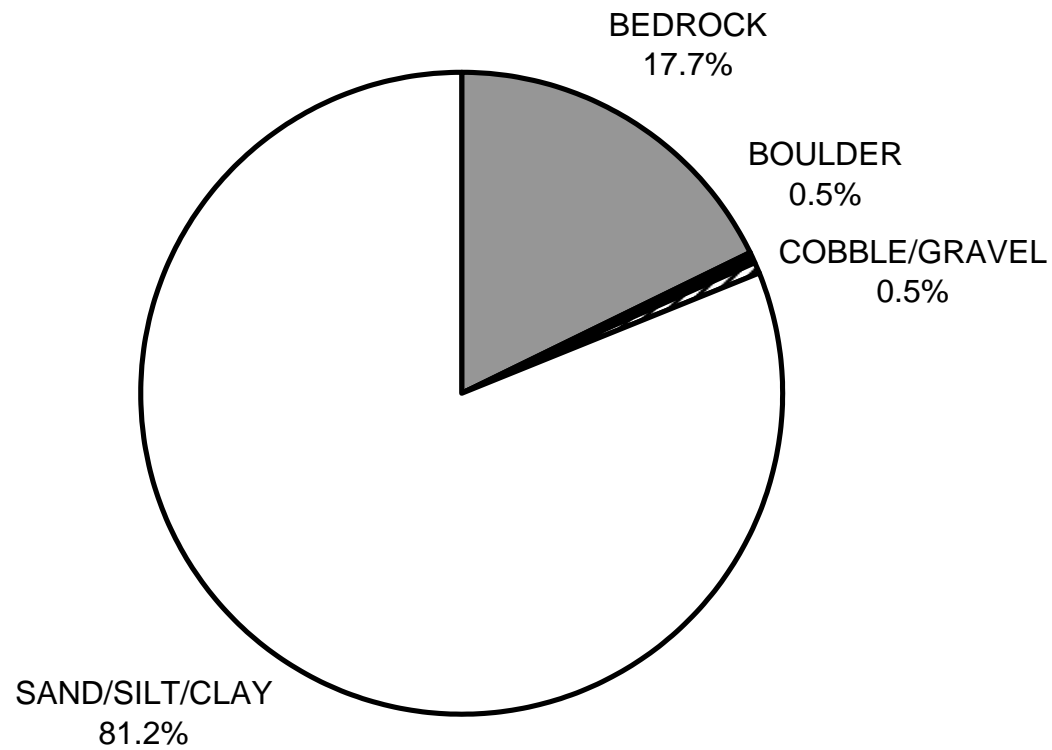
GRAPH 8

# ROSE CREEK 2012 MEAN PERCENT CANOPY



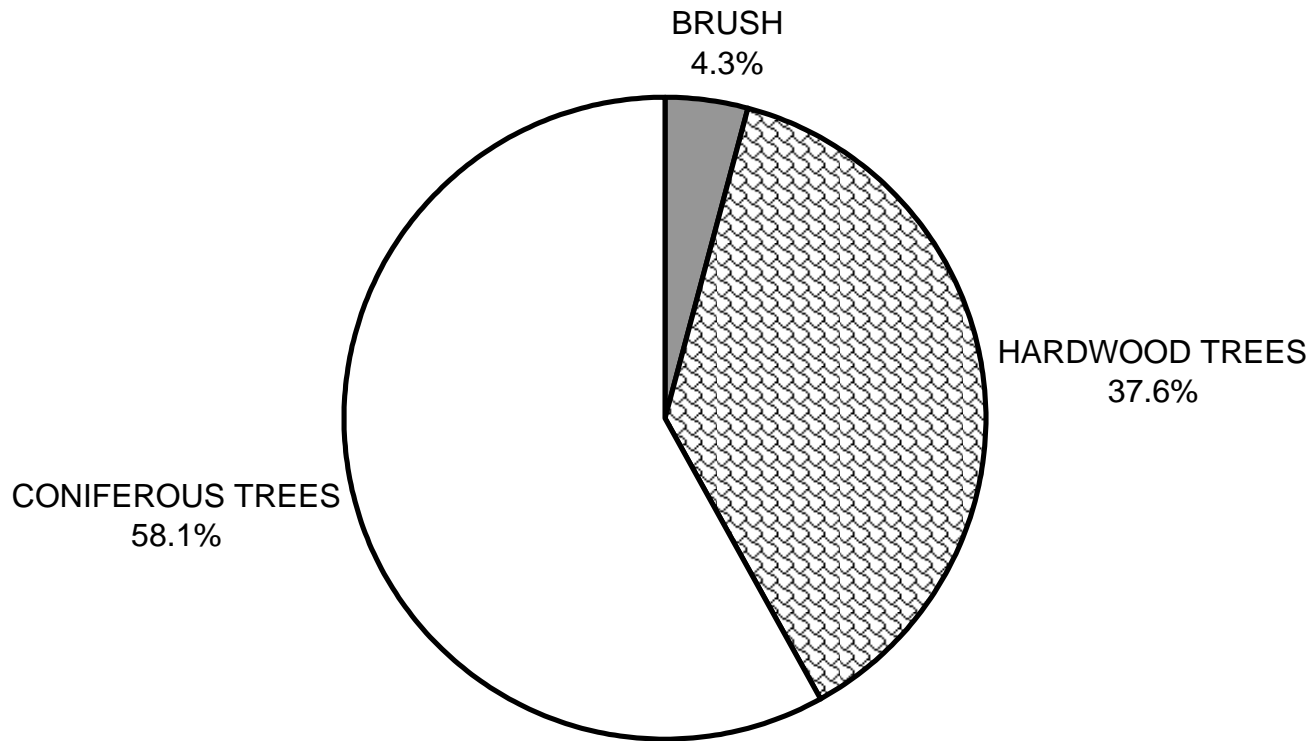
GRAPH 9

**ROSE CREEK 2012  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

# ROSE CREEK 2012 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



**Map 1  
Rose Creek  
Navarro River Watershed  
Bailey Ridge Quad, Mendocino County**

Start of Survey

End of Survey

— Channel Type A3

