

# STREAM INVENTORY REPORT

## Bailey Creek

### INTRODUCTION

A stream inventory was conducted June 5 to June 18, 2012 on Bailey Creek. The survey began at the confluence with South Branch North Fork Navarro River and extended upstream 1.3 miles.

The Bailey 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 Bailey 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

Bailey 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). Bailey Creek's legal description at the confluence with South Branch North Fork Navarro River is T15N R15W S13. Its location is 39.1566 degrees north latitude and 123.4677 degrees west longitude, LLID number 1234664391566. Bailey Creek is a first order stream and has approximately 1.3 miles of blue line stream according to the USGS Bailey Ridge 7.5 minute quadrangle. Bailey Creek drains a watershed of approximately 1.6 square miles. Elevations range from about 380 feet at the mouth of the creek to 1,000 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 Masonite Road.

### METHODS

The habitat inventory conducted in Bailey 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

## Bailey Creek

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 Bailey 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". Bailey 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.

## Bailey 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 Bailey 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 Bailey 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 Bailey 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 Bailey 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.

## **Bailey 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.

## 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 Bailey Creek. In addition, underwater observations were made at four 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 2.0.19, 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

## Bailey Creek

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Bailey 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 June 5 to June 18, 2012 was conducted by B. James, T. Anderson, and C. Tiffany (WSP). The total length of the stream surveyed was 6,806 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.08 cfs on June 6, 2012.

Bailey Creek is a B4 channel type for 6,806 feet of the stream surveyed. B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 51 to 54 degrees Fahrenheit. Air temperatures ranged from 49 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% pool units, 33% flatwater units, 25% riffle units, 1% dry units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 56% flatwater units, 27% pool units, 15% riffle units, 1% dry units, and 1% unsurveyed units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 37%; low gradient riffle units, 23%; and run units, 17% (Graph 3). Based on percent total length, step run units made up 40%, mid-channel pool units made up 24%, and run units made up 16%.

## **Bailey Creek**

A total of 59 pools were identified (Table 3). All of the pools encountered were main channel pools (Graph 4), which comprised 100% 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. Fourteen of the 59 pools (24%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 59 pool tail-outs measured, 24 had a value of 1 (40.7%); 26 had a value of 2 (44.1%); and nine had a value of 5 (15.3%) (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 not suitable 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 5, flatwater habitat types had a mean shelter rating of 1, and pool habitats had a mean shelter rating of 6 (Table 1).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Bailey Creek. Graph 7 describes the pool cover in Bailey Creek. Undercut banks are the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Sand was the dominant substrate observed in 32% of the pool tail-outs. Gravel was the next most frequently observed dominant substrate type and occurred in 29% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Bailey Creek was 97%. Three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 51% and 49%, respectively. Graph 9 describes the mean percent canopy in Bailey Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 99%. Sand/silt/clay was the dominant element composing the structure of 100% of the stream banks consisted of 100% sand/silt/clay (Graph 10). Coniferous trees were the dominant vegetation type observed in 62% of the units surveyed. Additionally, 22% of the units surveyed had deciduous trees as the dominant vegetation type, and 12% had brush as the dominant vegetation type (Graph 11).

## Bailey Creek

### BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at four sites for species composition and distribution in Bailey Creek on August 1, 2012. The sites were sampled by I. Mikus and M. Groff (CDFW).

Four sites were sampled within the first 613 feet of Bailey Creek. The reach sites yielded no fish.

The following chart displays the information yielded from these sites:

2012 Bailey Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
B4 Channel Type									
08/01/12	1	014	Pool	382	0	0	0	0	0
	2	019	Pool	529	0	0	0	0	0
	3	021	Pool	595	0	0	0	0	0
	4	022	Pool	613	0	0	0	0	0

### DISCUSSION

Bailey Creek is a B4 channel type for the entire length of the survey, 6,806 feet. The suitability of B4 channel types for fish habitat improvement structures is as follows: B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 5 to June 18, 2012 ranged from 51 to 54 degrees Fahrenheit. Air temperatures ranged from 49 to 72 degrees Fahrenheit. This is a suitable 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 56% of the total length of this survey, riffles 15%, and pools 27%. Fourteen of the 59 (24%) 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. Installing large wood structures that will increase or deepen pool habitat is recommended.

## **Bailey Creek**

Fifty of the 59 pool tail-outs measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4. Nine 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.

Thirty-eight of the 59 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 6. The shelter rating in the flatwater habitats is 1. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Bailey Creek. Undercut banks are the dominant cover type in pools followed by small 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 97%. The percentage of right and left bank covered with vegetation was 99% and 99%, respectively.

### RECOMMENDATIONS

- 1) Bailey 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) There is a log debris accumulation at 134 feet that may be impeding fish access to Bailey Creek. The modification of this debris accumulation is desirable.
- 4) Due to the bedrock outcroppings at 529 and 1,100 feet, 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.
- 5) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from undercut banks. Adding high quality complexity with woody cover in the pools is desirable.
- 6) Suitable size spawning substrate on Bailey Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.



## Bailey Creek

### COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with South Branch North Fork Navarro River. The channel is a B4 for the entire length of the survey.
134	0008.00	Log debris accumulation (LDA) #01 contains eight pieces of large woody debris (LWD) and measures 8' high x 12' wide x 12' long. Water does not flow through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel.
282	0014.00	A logging road crosses the channel. The crossing is a 10' wide x 27' long x 7' high railcar bridge.
529	0020.00	There is a 4' high plunge over bedrock.
1110	0036.00	There is a 4' high plunge.
4944	0113.00	Tributary #01 enters on the left bank. The water temperature of the tributary is 59 degrees Fahrenheit, the water temperature downstream of the tributary is 54 degrees Fahrenheit, and the water temperature upstream of the confluence is 52 degrees Fahrenheit. The tributary is accessible to salmonids, but no fish were observed.
5022	0116.00	There is a 2' high plunge onto roots.
6340	0145.00	There is a 12' high plunge.
6358	0146.00	Channel becomes marshy.
6698	0150.00	End of survey due to diminished habitat. The channel is marshy.

### 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.

## Bailey 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: Bailey Creek

LLID: 1234664391566

Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/18/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR15WS13

Latitude: 39:09:24.0N

Longitude: 123:27:59.0

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
1	0	DRY	0.7	90	90	1.3									
50	7	FLATWATER	33.3	76	3806	55.9	4.6	0.4	0.8	323	16136	145	7255		1
2	0	NOSURVEY	1.3	28	55	0.8									
59	59	POOL	39.3	31	1840	27.0	7.7	0.8	1.6	230	13596	262	15432	201	6
38	3	RIFFLE	25.3	27	1015	14.9	8.8	0.4	1.0	251	9536	84	3186		5
<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>		
150	69				6806					39268			25873		

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

Stream Name: Bailey Creek

LLID: 1234664391566

Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/18/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR15WS13

Latitude: 39:09:24.0N

Longitude: 123:27:59.0W

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 (%)
34	1	LGR	22.7	26	897	13.2	4	0.6	1.7	86	2907	51	1744		5	97
3	1	HGR	2.0	28	84	1.2	6	0.3	0.7	193	579	58	174		5	94
1	1	BRS	0.7	34	34	0.5	16	0.3	0.6	474	474	142	142		5	97
26	3	RUN	17.3	42	1095	16.1	4	0.6	1.4	220	5716	132	3431		0	99
24	4	SRN	16.0	113	2711	39.8	5	0.4	1.1	400	9597	155	3719		3	98
55	55	MCP	36.7	29	1610	23.7	8	0.8	2.8	236	12966	269	14791	206	6	97
4	4	STP	2.7	58	230	3.4	3	0.8	2.6	157	630	160	641	134	5	98
1	0	DRY	0.7	90	90	1.3										
2	0	NS	1.3	28	55	0.8										

Total Units  
150

Total Units Fully Measured  
69

Total Length (ft.)  
6806

Total Area (sq.ft.)  
32869

Total Volume (cu.ft.)  
24642

**Table 3 - Summary of Pool Types**

Stream Name: Bailey Creek

LLID: 1234664391566

Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/18/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR15WS13

Latitude: 39:09:24.0N

Longitude: 123:27:59.0W

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	100	31	1840	100	7.7	0.8	230	13596	201	11884	6

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
59	59	1840	13596	11884

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

Stream Name: Bailey Creek LLID: 1234664391566 Drainage: Navarro River  
 Survey Dates: 6/5/2012 to 6/18/2012  
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR15WS13 Latitude: 39:09:24.0N Longitude: 123:27:59.0W

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
55	MCP	93	3	5	40	73	12	22	0	0	0	0
4	STP	7	0	0	2	50	2	50	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
59	3	5	42	71	14	24	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.6

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

Stream Name: Bailey Creek

LLID: 1234664391566

Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/18/2012

Dry Units: 1

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR15WS13

Latitude: 39:09:24.0N

Longitude: 123:27:59.0W

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
34	1	LGR	0	0	0	0	0	0	0	100	0
3	1	HGR	90	10	0	0	0	0	0	0	0
1	1	BRS	90	0	0	0	0	0	0	10	0
38	3	TOTAL RIFFLE	60	3	0	0	0	0	0	37	0
26	3	RUN	0	0	0	0	0	0	0	0	0
24	4	SRN	100	0	0	0	0	0	0	0	0
50	7	TOTAL FLAT	100	0	0	0	0	0	0	0	0
55	55	MCP	52	28	10	2	0	0	0	5	1
4	4	STP	35	23	15	28	0	0	0	0	0
59	59	TOTAL POOL	51	28	11	4	0	0	0	5	1
2	0	NS									
150	69	TOTAL	53	26	10	4	0	0	0	6	0

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

Stream Name: Bailey Creek

LLID: 1234664391566

Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/18/2012

Dry Units: 1

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR15WS13

Latitude: 39:09:24.0N

Longitude: 123:27:59.0W

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
34	1	LGR	100	0	0	0	0	0	0
3	1	HGR	0	0	0	0	0	0	100
1	1	BRS	0	0	0	100	0	0	0
26	3	RUN	0	67	33	0	0	0	0
24	4	SRN	0	25	50	25	0	0	0
55	55	MCP	16	27	40	16	0	0	0
4	4	STP	0	75	25	0	0	0	0



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

Stream Name: Bailey Creek

LLID: 1234664391566

Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/18/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR15WS13

Latitude: 39:09:24.0N

Longitude: 123:27:59.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
97	49	51	0	99	99

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: Bailey Creek LID: 1234664391566 Drainage: Navarro River  
Survey Dates: 6/5/2012 to 6/18/2012 Survey Length (ft.): 6806 Main Channel (ft.): 6806 Side Channel (ft.): 0  
Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR15WS13 Latitude: 39:09:24.0N Longitude: 123:27:59.0W

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

<b>STREAM REACH: 1</b>						
Channel Type: B4	Canopy Density (%): 97.1		Pools by Stream Length (%): 27.0			
Reach Length (ft.): 6806	Coniferous Component (%): 49.2		Pool Frequency (%): 39.3			
Riffle/Flatwater Mean Width (ft.): 5.9	Hardwood Component (%): 50.8		Residual Pool Depth (%):			
BFW:	Dominant Bank Vegetation: Coniferous Trees		< 2 Feet Deep: 76			
Range (ft.): 6 to 22	Vegetative Cover (%): 98.6		2 to 2.9 Feet Deep: 24			
Mean (ft.): 12	Dominant Shelter: Undercut Banks		3 to 3.9 Feet Deep: 0			
Std. Dev.: 5	Dominant Bank Substrate Type: Sand/Silt/Clay		>= 4 Feet Deep: 0			
Base Flow (cfs.): 0.1	Occurrence of LWD (%): 9		Mean Max Residual Pool Depth (ft.): 1.6			
Water (F): 51 - 54	Air (F): 49 - 72	LWD per 100 ft.:	Mean Pool Shelter Rating: 6			
Dry Channel (ft): 90	Riffles: 2					
	Pools: 4					
	Flat: 1					
Pool Tail Substrate (%):	Silt/Clay: 19	Sand: 32	Gravel: 29	Sm Cobble: 7	Lg Cobble: 0	Boulder: 5 Bedrock: 8
Embeddedness Values (%):	1. 40.7	2. 44.1	3. 0.0	4. 0.0	5. 15.3	

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

Stream Name: Bailey Creek

LLID: 1234664391566

Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/18/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR15WS13

Latitude: 39:09:24.0N

Longitude: 123:27:59.0W

**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	69	69	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	4	1	3.6
Brush	8	9	12.3
Hardwood Trees	17	13	21.7
Coniferous Trees	40	46	62.3
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Bailey Creek

LLID: 1234664391566

Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/18/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR15WS13

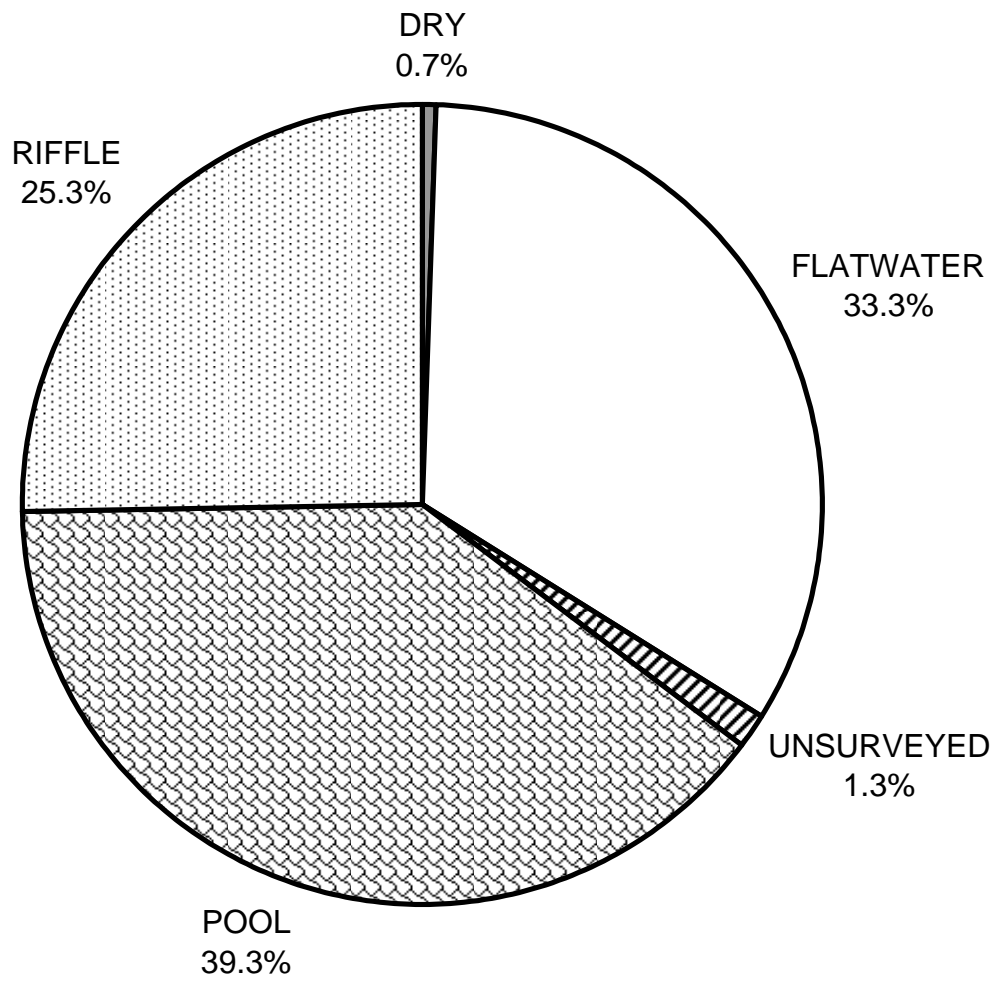
Latitude: 39:09:24.0N

Longitude: 123:27:59.0W

---

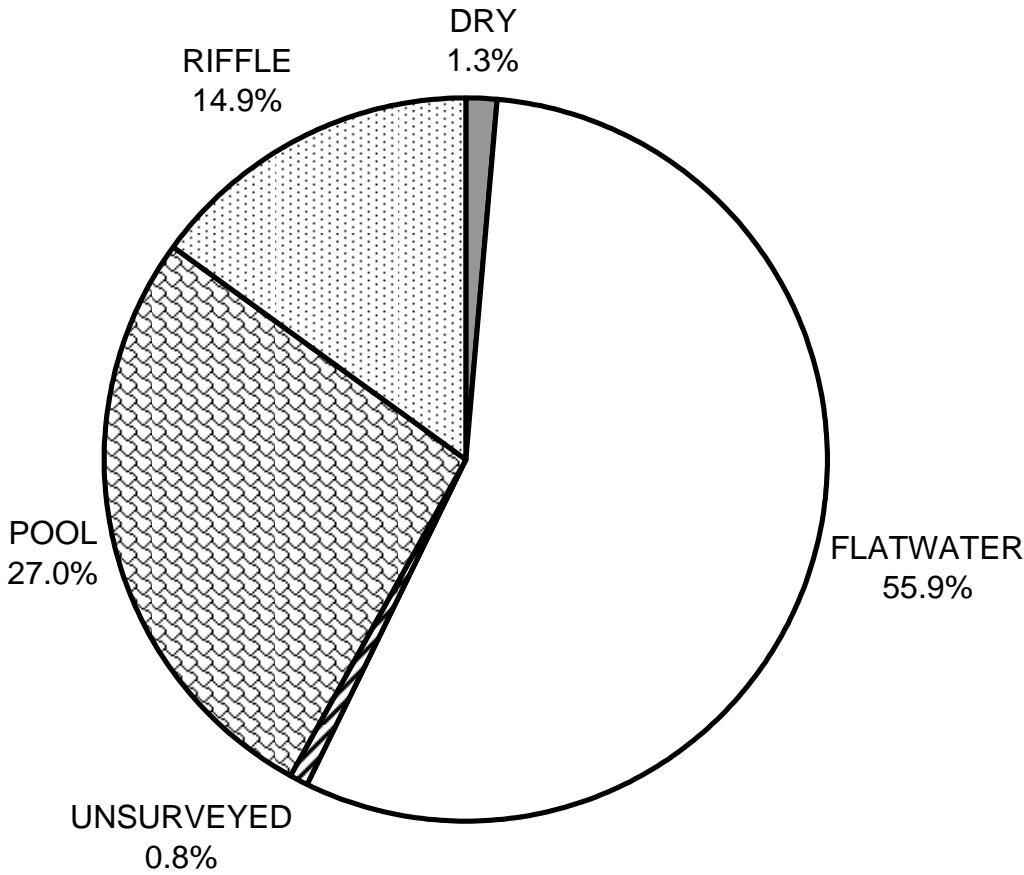
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	60	100	51
SMALL WOODY DEBRIS (%)	3	0	28
LARGE WOODY DEBRIS (%)	0	0	11
ROOT MASS (%)	0	0	4
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	37	0	5
BEDROCK LEDGES (%)	0	0	1

# BAILEY CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



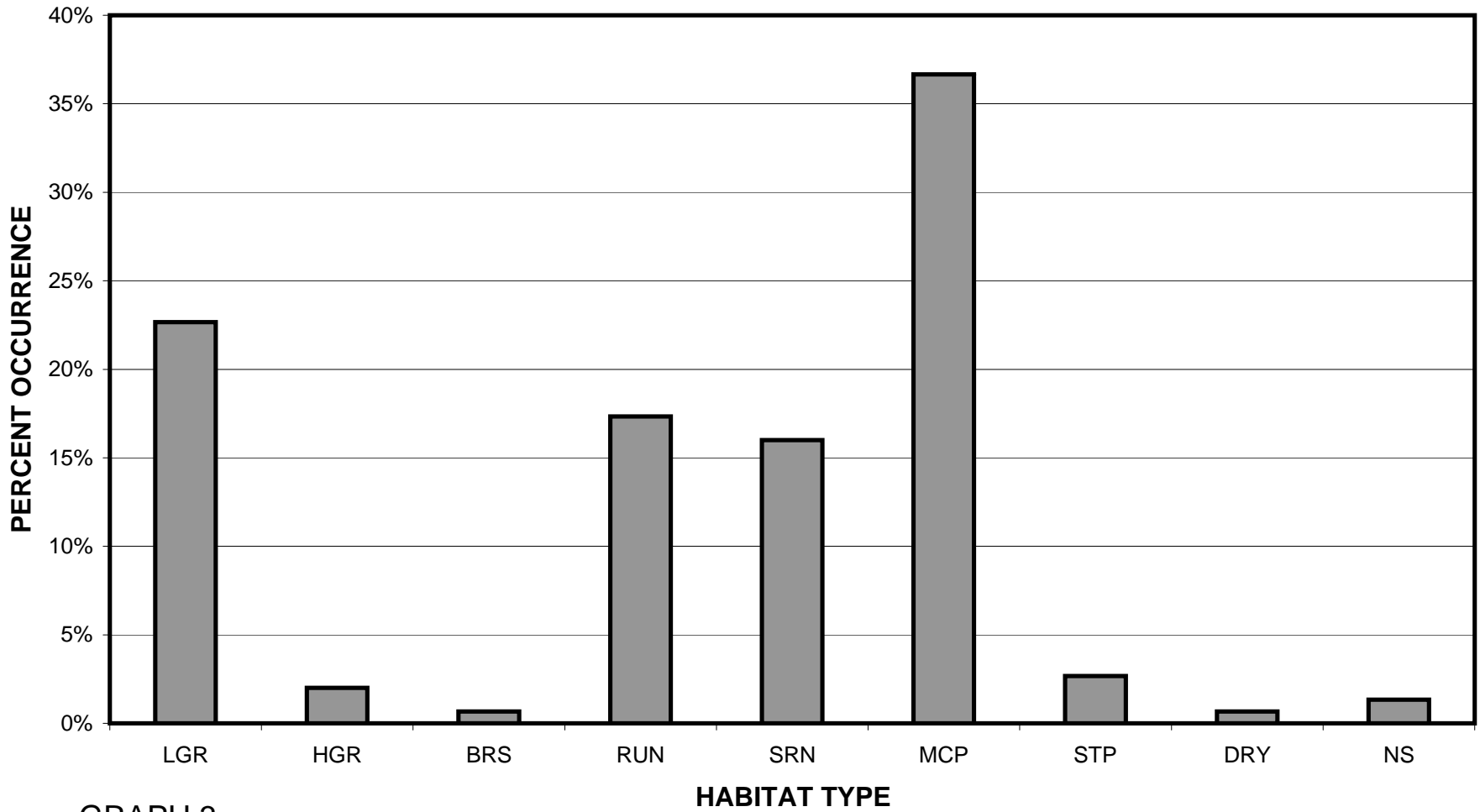
GRAPH 1

**BAILEY CREEK 2012  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



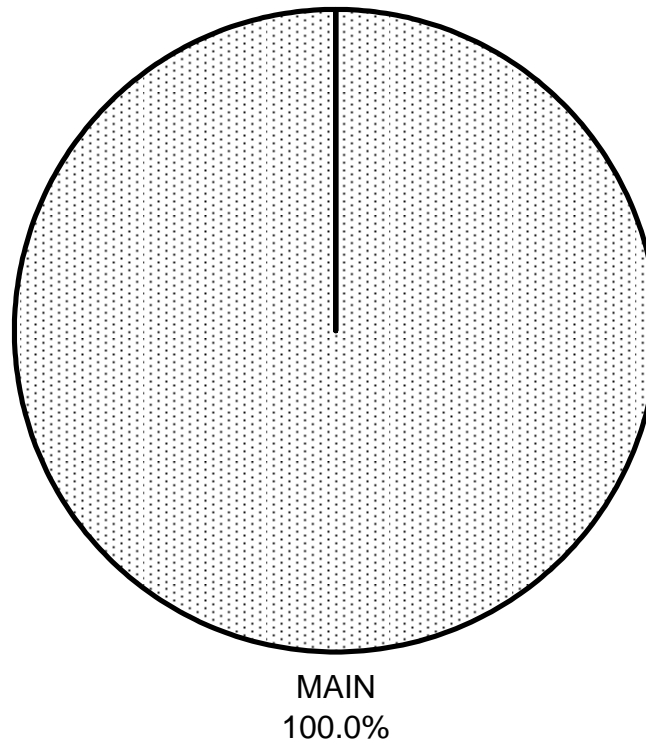
GRAPH 2

# BAILEY CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

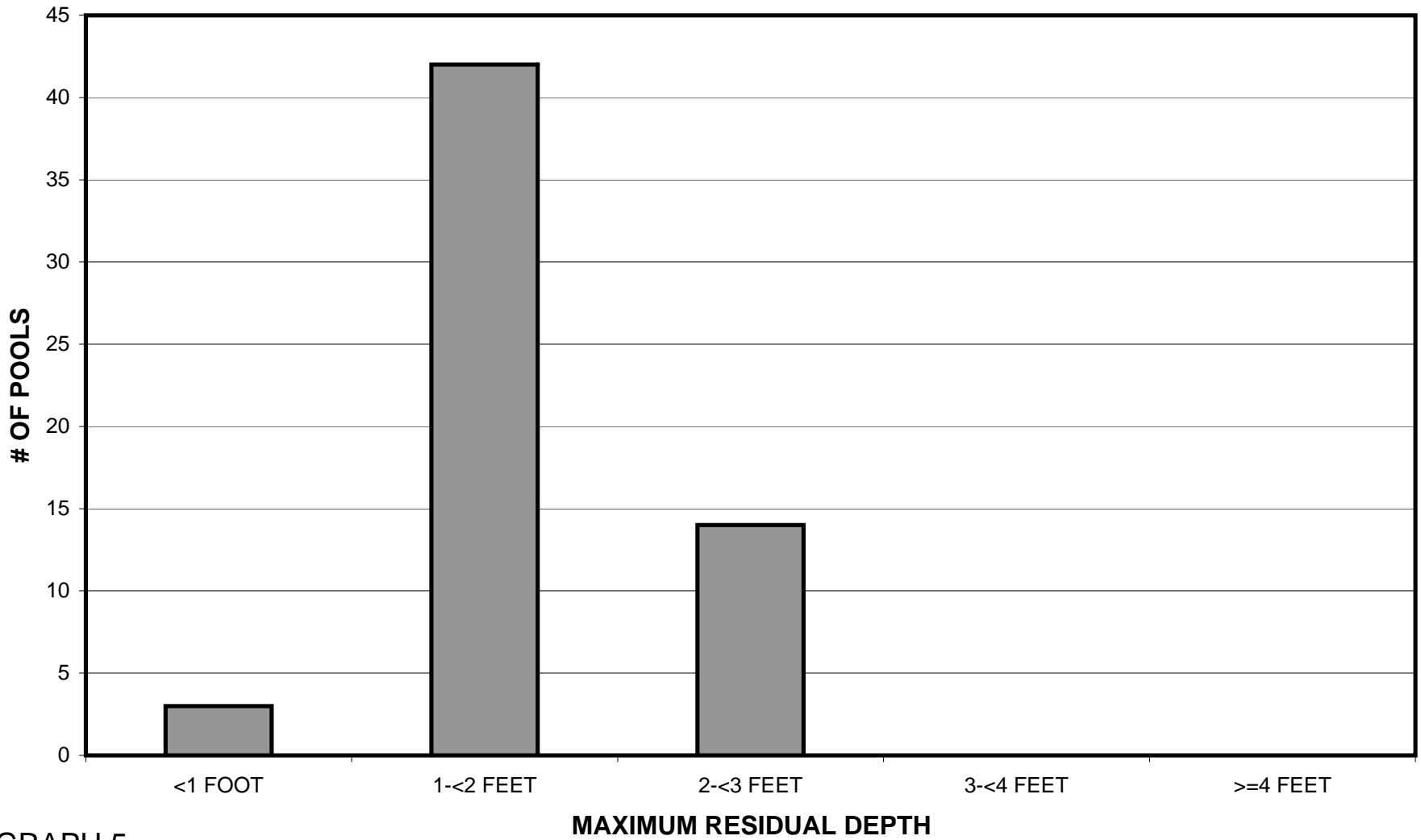
**BAILEY CREEK 2012  
POOL TYPES BY PERCENT OCCURRENCE**



GRAPH 4

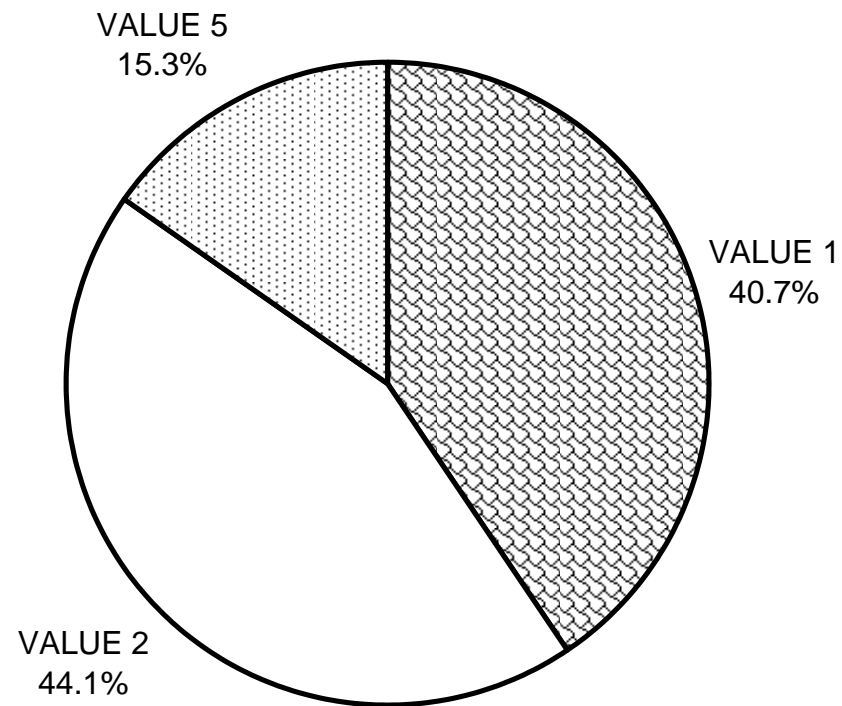


# BAILEY CREEK 2012 MAXIMUM DEPTH IN POOLS



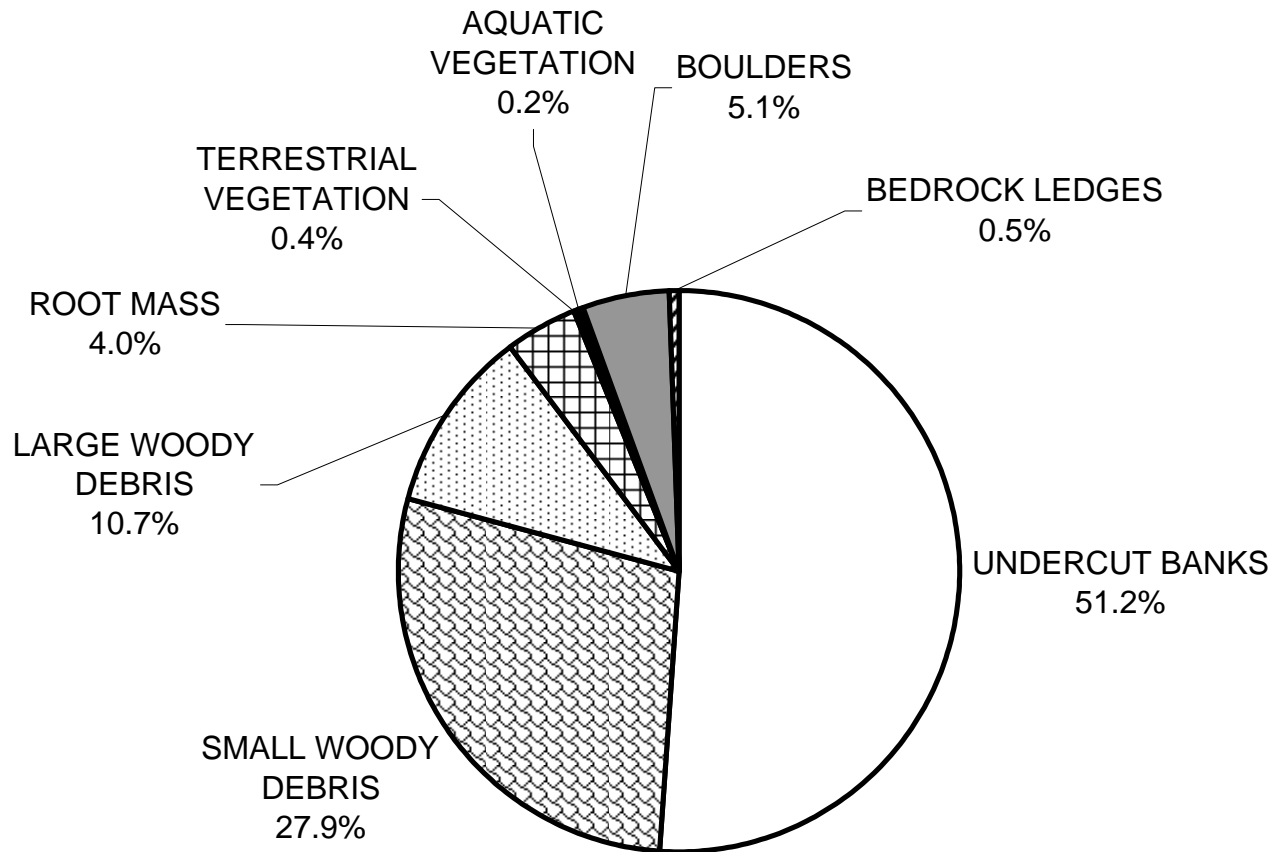
GRAPH 5

# BAILEY CREEK 2012 PERCENT EMBEDDEDNESS



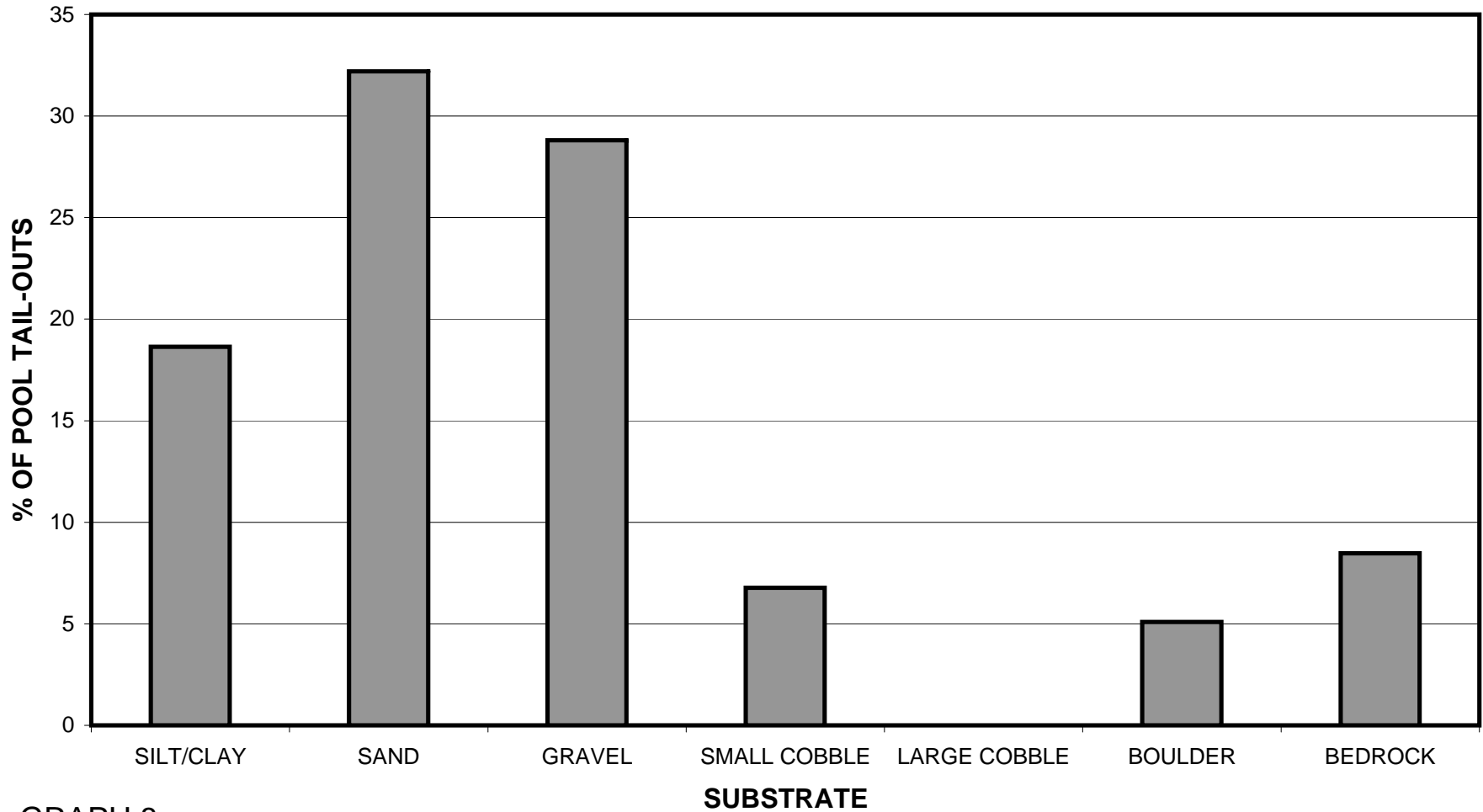
GRAPH 6

# BAILEY CREEK 2012 MEAN PERCENT COVER TYPES IN POOLS



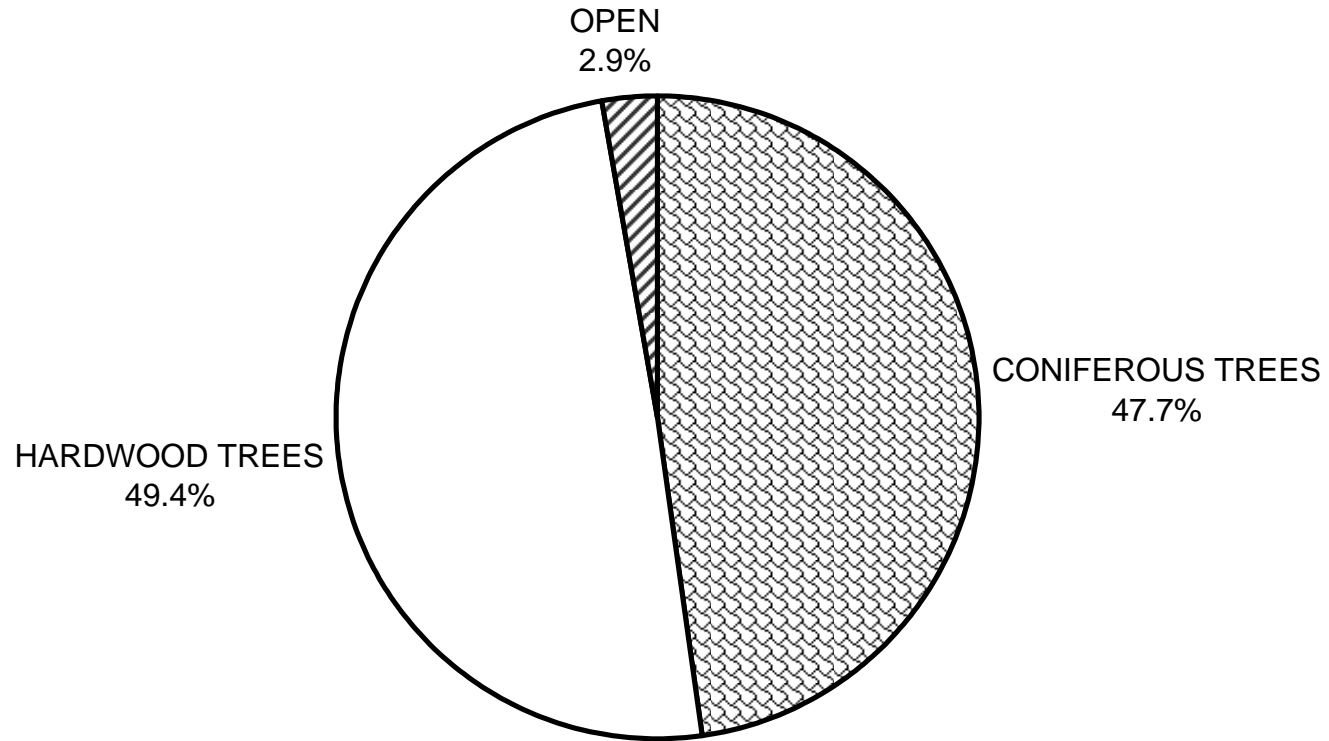
GRAPH 7

# BAILEY CREEK 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



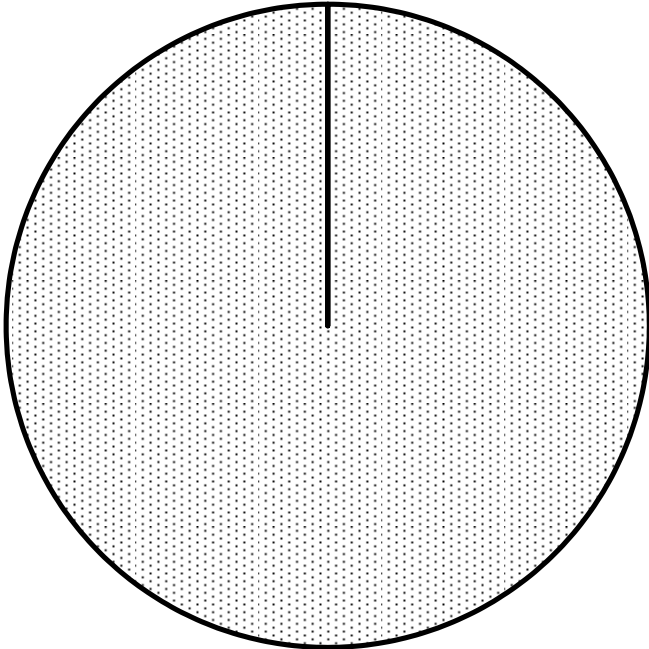
GRAPH 8

# BAILEY CREEK 2012 MEAN PERCENT CANOPY



GRAPH 9

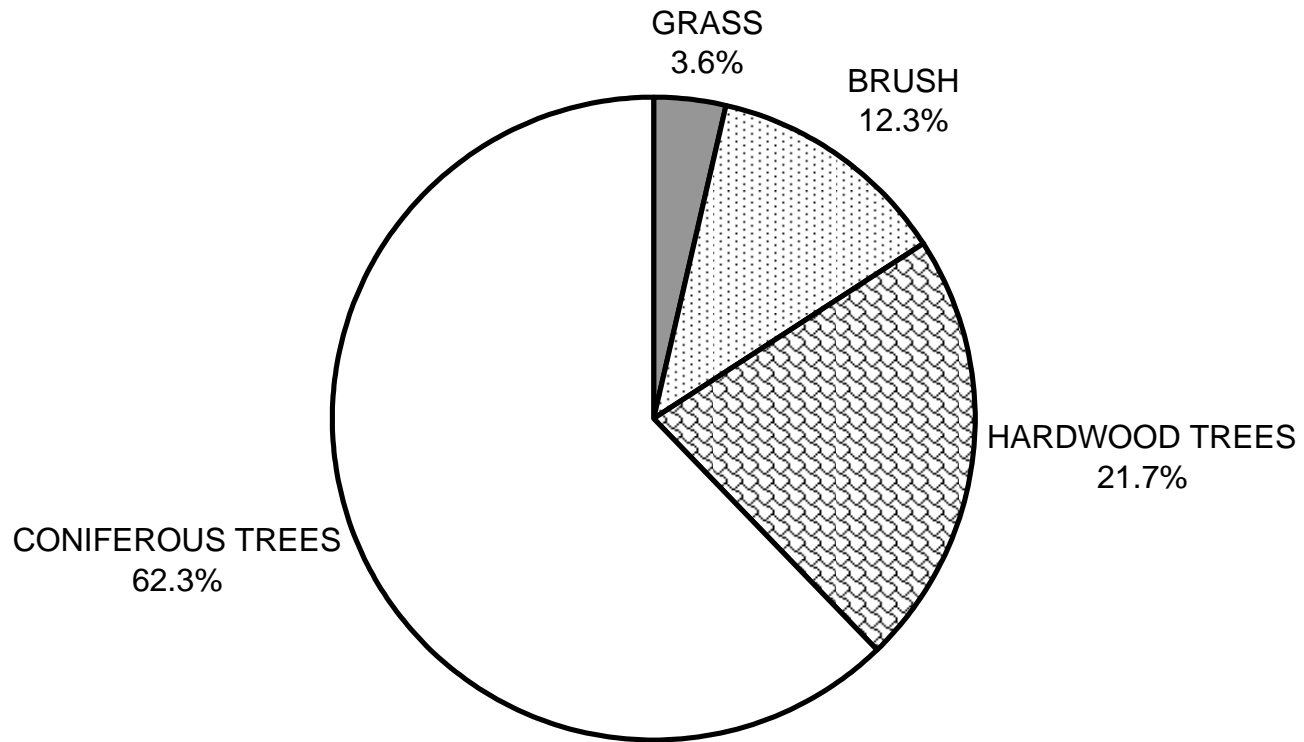
**BAILEY CREEK 2012  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



SAND/SILT/CLAY  
100.0%

GRAPH 10

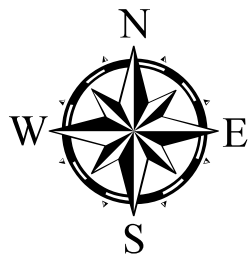
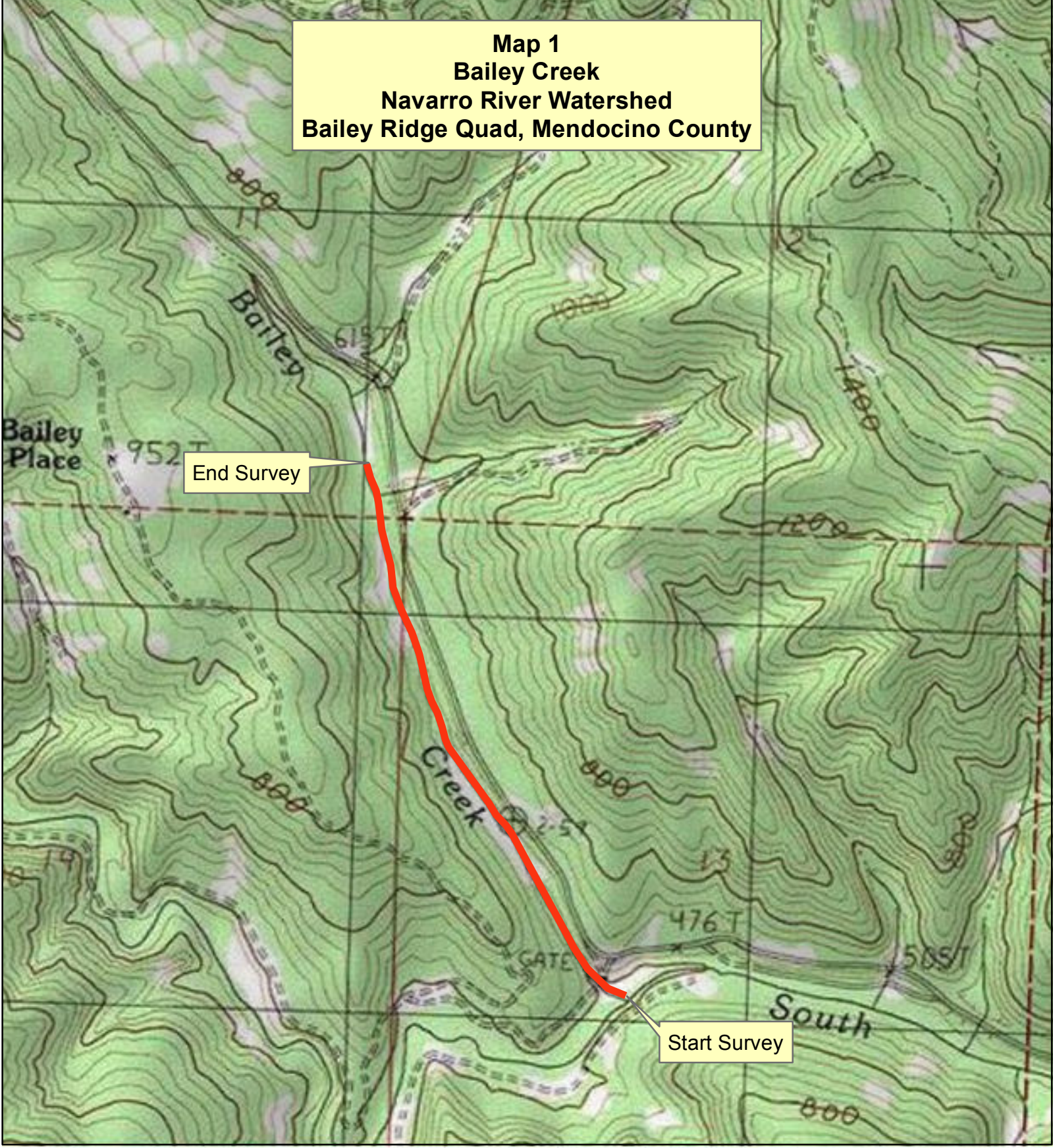
# BAILEY CREEK 2012 DOMINANT BANK VEGETATION IN SURVEY REACH




GRAPH 11



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



 Channel Type B4

