

STREAM INVENTORY REPORT

Unnamed Tributary to Redwood Creek

INTRODUCTION

A stream inventory was conducted from June 11 to June 13, 2012 on an unnamed tributary to Redwood Creek. The survey began at the confluence with Redwood Creek and extended upstream 0.8 miles. A stream inventory and report was also completed for one tributary to the unnamed tributary.

The unnamed tributary 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 the unnamed tributary. 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

The unnamed tributary is a tributary to Redwood Creek, tributary to South Fork Ten Mile River, tributary to Ten Mile River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). The unnamed tributary's legal description at the confluence with Redwood Creek is T19N R16W S12. Its location is 39.5110 degrees north latitude and 123.5933 degrees west longitude, LLID number 1235921395111. The unnamed tributary is a first order stream and has approximately 0.3 miles of blue line stream according to the USGS Sherwood Peak 7.5 minute quadrangle. The unnamed tributary drains a watershed of approximately 1.7 square miles. Elevations range from about 500 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 Camp One Ten Mile Road north of Fort Bragg.

METHODS

The habitat inventory conducted in the unnamed tributary 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.

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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 the unnamed tributary 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". The unnamed tributary 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

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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 the unnamed tributary, 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is classified according to a list of nine cover types. In the unnamed tributary, 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 for each fully-described habitat unit by multiplying shelter value and percent 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 the unnamed tributary, 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 the unnamed tributary, the dominant composition type and the

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dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

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 the unnamed tributary. In addition, underwater observations were made at nine 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)

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- 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 1235921395111 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 11 to June 13, 2012 was conducted by A. Blessing and T. Anderson (WSP). The total length of the stream surveyed was 4,418 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.36 cfs on June 12, 2012.

The unnamed tributary is an F4 channel type for 1,527 feet of the stream surveyed (Reach 1) and a G4 channel type for 2,891 feet of the stream surveyed (Reach 2). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 51 to 55 degrees Fahrenheit. Air temperatures ranged from 51 to 64 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% pool units, 35% flatwater units, 14% riffle units, 5% dry units, 2% unsurveyed units, and 1% culvert units (Graph 1). Based on total length of Level II habitat types there were 50% flatwater units, 32% pool units, 7% riffle units, 6% dry units, 2% unsurveyed units, and 2% culvert units (Graph 2).

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Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 36%; step run unit, 27%; and low gradient riffle units, 12% (Graph 3). Based on percent total length, step run units made up 47%, mid-channel pool units 26%, low gradient riffle units 6%, and dry units 6%.

A total of 57 pools were identified (Table 3). Main channel pools were the most frequently encountered at 93% (Graph 4), and comprised 97% 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. Six of the 57 pools (11%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 57 pool tail-outs measured, all of them had a value of 2 (100%) (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 3, flatwater habitat types had a mean shelter rating of 7, and pool habitats had a mean shelter rating of 30 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 30 and the scour pools had a mean shelter rating of 30 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in the unnamed tributary. Graph 7 describes the pool cover in the unnamed tributary. Small woody debris is 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 75% of the pool tail-outs. Sand was the next most frequently observed dominant substrate type and occurred in 21% of the pool tail-outs.

The mean percent canopy density for the surveyed length of the unnamed tributary was 99%. One percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 17% and 83%, respectively. Graph 9 describes the mean percent canopy in the unnamed tributary.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 100%. The dominant elements composing the structure of the stream banks consisted of 90% sand/silt/clay, 9% cobble/gravel, and 1% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 80% of the units surveyed. Additionally, 10% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had brush as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at nine sites for species composition and distribution in the unnamed tributary on September 26, 2012. The sites were sampled by I. Mikus and M. Groff (CDFW).

In Reach 1, which comprised the first 1,527 feet of stream, nine sites were sampled. The reach sites yielded nine young-of-the-year steelhead/rainbow trout (SH/RT), and three age 1+ SH/RT.

The following chart displays the information yielded from these sites:

2012 unnamed tributary to Redwood Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: F4 Channel Type									
09/26/12	1	009	Pool	322	6	0	0	0	0
	2	010	Pool	373	1	0	0	0	0
	3	013	Pool	476	2	1	0	0	0
	4	019	Pool	742	0	1	0	0	0
	5	023	Pool	871	0	0	0	0	0
	6	029	Pool	1,101	0	0	0	0	0
	7	041	Pool	1,437	0	0	0	0	0
	8	043	Pool	1,489	0	0	0	0	0
	9	044	Pool	1,527	0	1	0	0	0

DISCUSSION

The unnamed tributary to Redwood Creek is an F4 channel type for the first 1,527 feet of stream surveyed and a G4 channel type for the remaining 2,891 feet. The suitability of F4 and G4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 11 to June 13, 2012 ranged from 51 to 55 degrees Fahrenheit. Air temperatures ranged from 51 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.

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Flatwater habitat types comprised 50% of the total length of this survey, riffles 7%, and pools 32%. Six of the 57 (11%) 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 structures that will increase or deepen pool habitat is recommended.

All of the 57 pool tail-outs measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4. None 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.

Forty-five of the 57 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 30. The shelter rating in the flatwater habitats is 7. 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 the unnamed tributary. 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 99%. Reach 1 had a canopy density of 99% and Reach 2 had a canopy density of 99%. The percentage of right and left bank covered with vegetation was 100% and 100%, respectively.

RECOMMENDATIONS

- 1) The unnamed tributary to Redwood 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 small woody debris. Adding high quality complexity with woody cover in the pools is desirable.

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COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with Redwood Creek. The channel is an F4.
555	0015.00	Woody debris is accumulating in the channel.
760	0021.00	Woody debris is accumulating in the channel.
1150	0031.00	There is a 0.5' high plunge.
1489	0044.00	Tributary #01 enters on the right bank. It contributes approximately 70% to the unnamed tributary's flow. The water temperature of the tributary is 51 degrees Fahrenheit, the water temperature downstream of the tributary is 51 degrees Fahrenheit, and the water temperature upstream of the confluence is 50 degrees Fahrenheit. For more information see the Unnamed Tributary to an Unnamed Tributary to Redwood Creek Stream Habitat Inventory Report
1527	0045.00	The channel changes from an F4 to a G4.
1637	0049.00	Log debris accumulation (LDA) #01 contains three pieces of large woody debris (LWD) and measures 3' high x 7' 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 4' wide x 8' long x 1.5' deep. Fish were not observed above the LDA.
2311	0066.00	There is a 0.5' high plunge.
2652	0078.00	LDA #02 contains two pieces of LWD and measures 4' high x 11' wide x 11' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 4' wide x 60' long x 1' deep. There is a 3' high plunge over the LDA.
3903	0109.00	LDA #03 contains three pieces of LWD and measures 5' high x 11.5' wide x 11' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 4' wide x 8' long x 2' deep.
4192	0125.00	There is a 3' high plunge.

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- 4199 0126.00 Road 14900 crosses the channel. The crossing is a 5.5' high x 5.5' wide x 80' long corrugated metal culvert. The culvert has a slope of 3% and there is a 3' high plunge at the outlet. The maximum depth within 5' of the outlet is 1.6'. The middle of the culvert is misshapen and the bottom is rusty.
- 4405 0130.00 End of survey at LDA #04. Above the Road 14900 culvert, the slope increases from 3.3% to 11.6%. The channel is full of woody debris which is creating a series of jumps with shallow riffles and runs between them. There are few pools. LDA #04 contains four pieces of LWD and measures 10' high x 13' wide x 9' long. Water does not flow through the LDA and the channel is dry for 70' above it. There are no visible gaps in the LDA. Retained sediment ranges from gravel to boulders and measures 4' wide x 60' long x 3' deep. There is a 5' plunge from 1' diameter whole in the LDA. The maximum depth below the LDA is 0.6'.

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.

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

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

CASCADE

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

FLATWATER

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

MAIN CHANNEL POOLS

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

SCOUR POOLS

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

BACKWATER POOLS

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

ADDITIONAL UNIT DESIGNATIONS

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

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

Stream Name: 1235921395111

LLID: 1235921395111 Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Confluence Location: Quad: SHERWOOD PEAK Legal Description: T19NR16WS12 Latitude: 39:30:40.0N Longitude: 123:35:32.0

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
1	0	CULVERT	0.8	80	80	1.8									
6	0	DRY	4.6	47	280	6.3									
45	9	FLATWATER	34.6	49	2223	50.3	5.6	0.3	0.7	261	11728	76	3420		7
3	0	NOSURVEY	2.3	28	85	1.9									
57	57	POOL	43.8	25	1423	32.2	7.4	0.7	1.4	195	11135	184	10492	133	30
18	5	RIFFLE	13.8	18	327	7.4	5.1	0.2	0.4	69	1251	19	337		3
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
130	71				4418					24114			14249		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: 1235921395111

LLID: 1235921395111

Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Confluence Location: Quad: SHERWOOD PEAK Legal Description: T19NR16WS12 Latitude: 39:30:40.0N Longitude: 123:35:32.0W

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 (%)
15	4	LGR	11.5	18	273	6.2	6	0.3	0.6	73	1090	21	309		3	100
3	1	HGR	2.3	18	54	1.2	4	0.2	0.4	57	170	11	34		5	100
10	3	RUN	7.7	16	163	3.7	6	0.5	0.9	110	1100	53	535		7	100
35	6	SRN	26.9	59	2060	46.6	5	0.3	0.9	336	11757	87	3055		7	98
47	47	MCP	36.2	24	1130	25.6	7	0.7	2.7	194	9105	185	8694	136	29	99
1	1	CCP	0.8	38	38	0.9	8	0.9	2.5	323	323	388	388	291	30	100
5	5	STP	3.8	41	206	4.7	7	0.5	1.8	285	1425	230	1151	143	42	100
4	4	PLP	3.1	12	49	1.1	6	0.6	1.3	71	283	65	260	45	30	100
6	0	DRY	4.6	47	280	6.3										
1	0	CUL	0.8	80	80	1.8										
3	0	NS	2.3	28	85	1.9										

Total Units
130

Total Units Fully Measured
71

Total Length (ft.)
4418

Total Area (sq.ft.)
25253

Total Volume (cu.ft.)
14424

Table 3 - Summary of Pool Types

Stream Name: 1235921395111

LLID: 1235921395111

Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR16WS12

Latitude: 39:30:40.0N

Longitude: 123:35:32.0W

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
53	53	MAIN	93	26	1374	97	7.5	0.7	205	10852	140	7416	30
4	4	SCOUR	7	12	49	3	6.1	0.6	71	283	45	180	30

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
57	57	1423	11135	7597

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

Stream Name: 1235921395111

LLID: 1235921395111

Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Confluence Location: Quad: SHERWOOD PEAK Legal Description: T19NR16WS12 Latitude: 39:30:40.0N Longitude: 123:35:32.0W

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
47	MCP	82	8	17	34	72	5	11	0	0	0	0
1	CCP	2	0	0	0	0	1	100	0	0	0	0
5	STP	9	0	0	5	100	0	0	0	0	0	0
4	PLP	7	1	25	3	75	0	0	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
57	9	16	42	74	6	11	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: 1235921395111

LLID: 1235921395111

Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Dry Units: 6

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR16WS12

Latitude: 39:30:40.0N

Longitude: 123:35:32.0W

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
15	4	LGR	0	30	0	0	0	0	0	70	0
3	1	HGR	0	100	0	0	0	0	0	0	0
18	5	TOTAL RIFFLE	0	53	0	0	0	0	0	47	0
10	3	RUN	13	87	0	0	0	0	0	0	0
35	6	SRN	22	42	3	1	18	0	0	13	0
45	9	TOTAL FLAT	19	57	2	1	12	0	0	9	0
47	47	MCP	14	51	33	2	0	0	0	1	0
1	1	CCP	30	20	50	0	0	0	0	0	0
5	5	STP	9	42	47	0	0	0	1	1	0
4	4	PLP	3	33	31	0	0	0	31	3	0
57	57	TOTAL POOL	13	48	34	2	0	0	2	1	0
1	0	CUL									
3	0	NS									
130	71	TOTAL	13	49	28	2	2	0	2	4	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: 1235921395111

LLID: 1235921395111

Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Dry Units: 6

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR16WS12

Latitude: 39:30:40.0N

Longitude: 123:35:32.0W

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
15	4	LGR	0	0	100	0	0	0	0
3	1	HGR	0	0	100	0	0	0	0
10	3	RUN	0	0	100	0	0	0	0
35	6	SRN	0	0	100	0	0	0	0
47	47	MCP	0	15	81	2	2	0	0
1	1	CCP	0	100	0	0	0	0	0
5	5	STP	0	0	100	0	0	0	0
4	4	PLP	0	50	50	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: 1235921395111

LLID: 1235921395111

Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR16WS12

Latitude: 39:30:40.0N

Longitude: 123:35:32.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
99	83	17	0	100	100

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: 1235921395111 LLID: 1235921395111 Drainage: Rockport
 Survey Dates: 6/11/2012 to 6/13/2012 Survey Length (ft.): 4418 Main Channel (ft.): 4418 Side Channel (ft.): 0
 Confluence Location: Quad: SHERWOOD PEAK Legal Description: T19NR16WS12 Latitude: 39:30:40.0N Longitude: 123:35:32.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4	Canopy Density (%): 98.8	Pools by Stream Length (%): 61.7
Reach Length (ft.): 1527	Coniferous Component (%): 77.9	Pool Frequency (%): 56.8
Riffle/Flatwater Mean Width (ft.): 7.4	Hardwood Component (%): 22.1	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 80
Range (ft.): 8 to 11	Vegetative Cover (%): 99.8	2 to 2.9 Feet Deep: 20
Mean (ft.): 10	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 1	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.4	Occurrence of LWD (%): 35	Mean Max Residual Pool Depth (ft.): 1.5
Water (F): 51 - 55 Air (F): 51 - 64	LWD per 100 ft.:	Mean Pool Shelter Rating: 33
Dry Channel (ft): 0	Riffles: 2	
	Pools: 9	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 28 Gravel: 68 Sm Cobble: 4 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 100.0 3. 0.0 4. 0.0 5. 0.0		

STREAM REACH: 2

Channel Type: G4	Canopy Density (%): 99.2	Pools by Stream Length (%): 16.6
Reach Length (ft.): 2891	Coniferous Component (%): 86.9	Pool Frequency (%): 37.2
Riffle/Flatwater Mean Width (ft.): 4.6	Hardwood Component (%): 13.1	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 97
Range (ft.): 6 to 11	Vegetative Cover (%): 99.9	2 to 2.9 Feet Deep: 3
Mean (ft.): 8	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.4	Occurrence of LWD (%): 23	Mean Max Residual Pool Depth (ft.): 1.2
Water (F): 51 - 52 Air (F): 51 - 62	LWD per 100 ft.:	Mean Pool Shelter Rating: 27
Dry Channel (ft): 280	Riffles: 8	
	Pools: 10	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 16 Gravel: 81 Sm Cobble: 3 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 100.0 3. 0.0 4. 0.0 5. 0.0		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: 1235921395111

LLID: 1235921395111

Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR16WS12

Latitude: 39:30:40.0N

Longitude: 123:35:32.0W

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	0	0	0.0
Boulder	1	0	0.7
Cobble / Gravel	6	7	9.2
Sand / Silt / Clay	64	64	90.1

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	7	7	9.9
Hardwood Trees	8	6	9.9
Coniferous Trees	56	58	80.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: 1235921395111

LLID: 1235921395111

Drainage: Rockport

Survey Dates: 6/11/2012 to 6/13/2012

Confluence Location: Quad: SHERWOOD PEAK

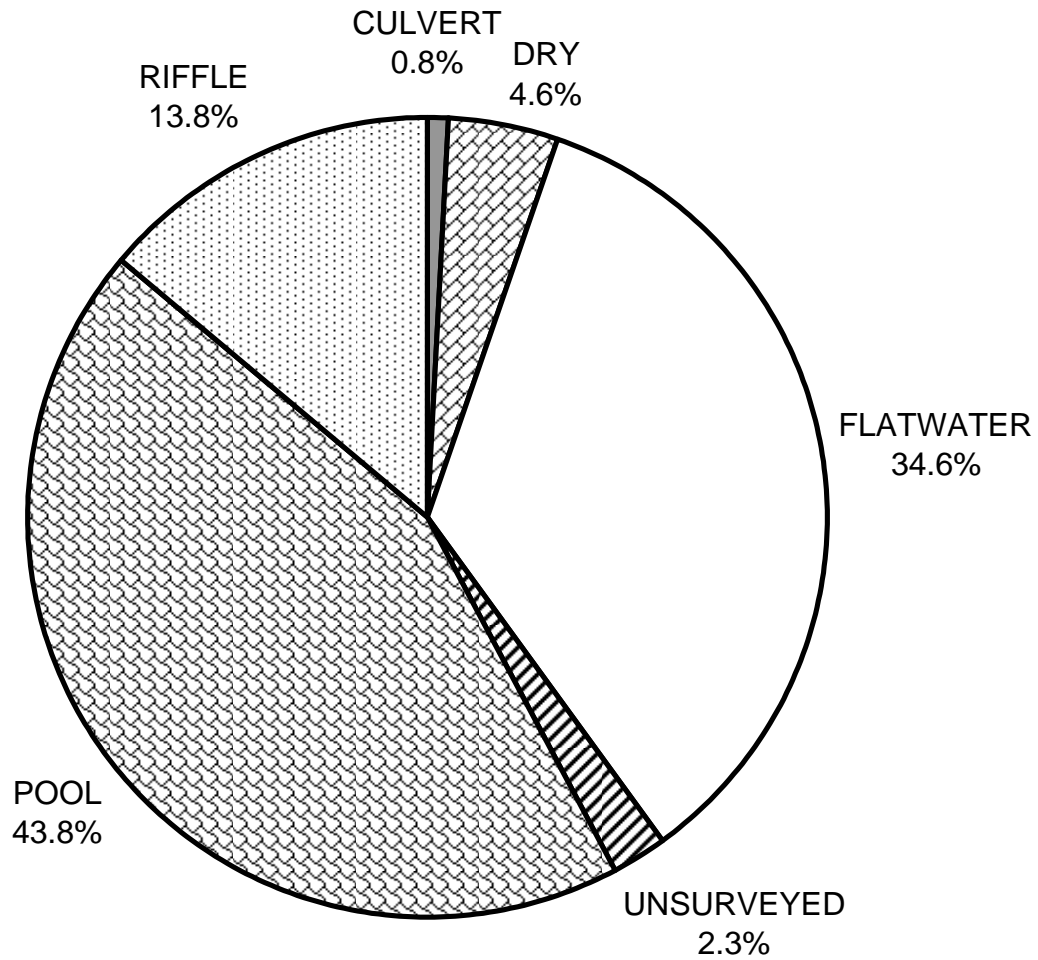
Legal Description: T19NR16WS12

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Longitude: 123:35:32.0W

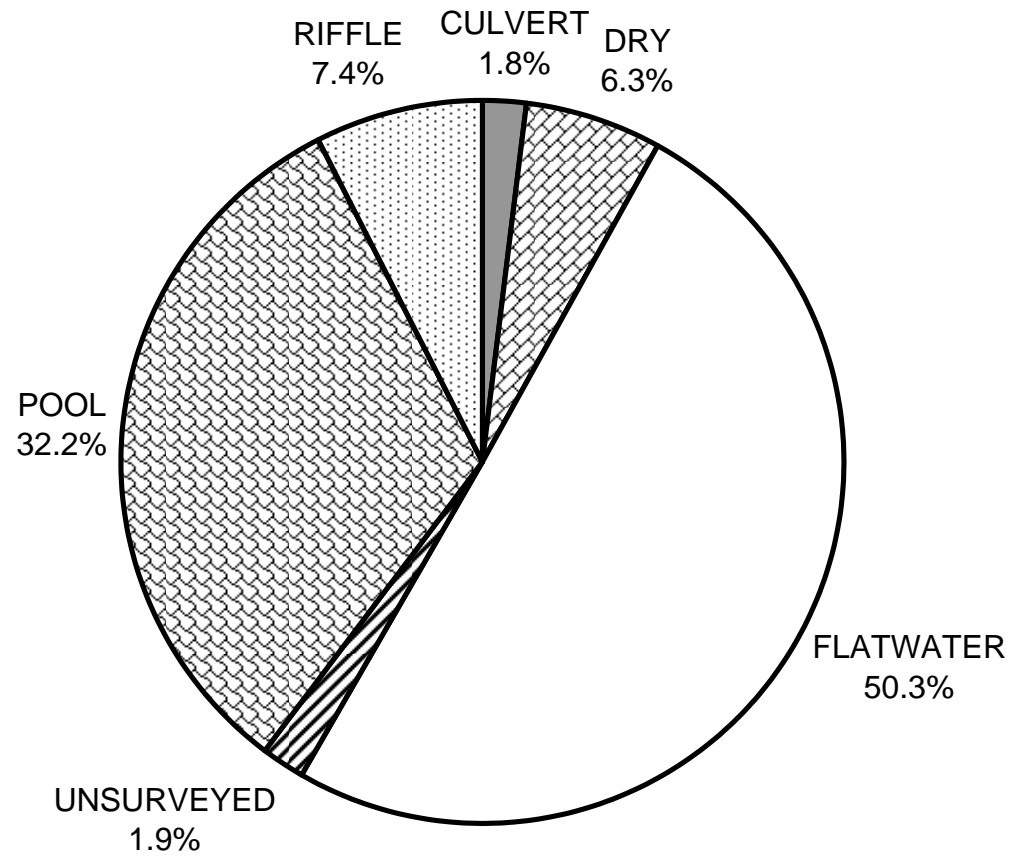
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	19	13
SMALL WOODY DEBRIS (%)	53	57	48
LARGE WOODY DEBRIS (%)	0	2	34
ROOT MASS (%)	0	1	2
TERRESTRIAL VEGETATION (%)	0	12	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	2
BOULDERS (%)	47	9	1
BEDROCK LEDGES (%)	0	0	0

UNNAMED TRIBUTARY TO REDWOOD CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

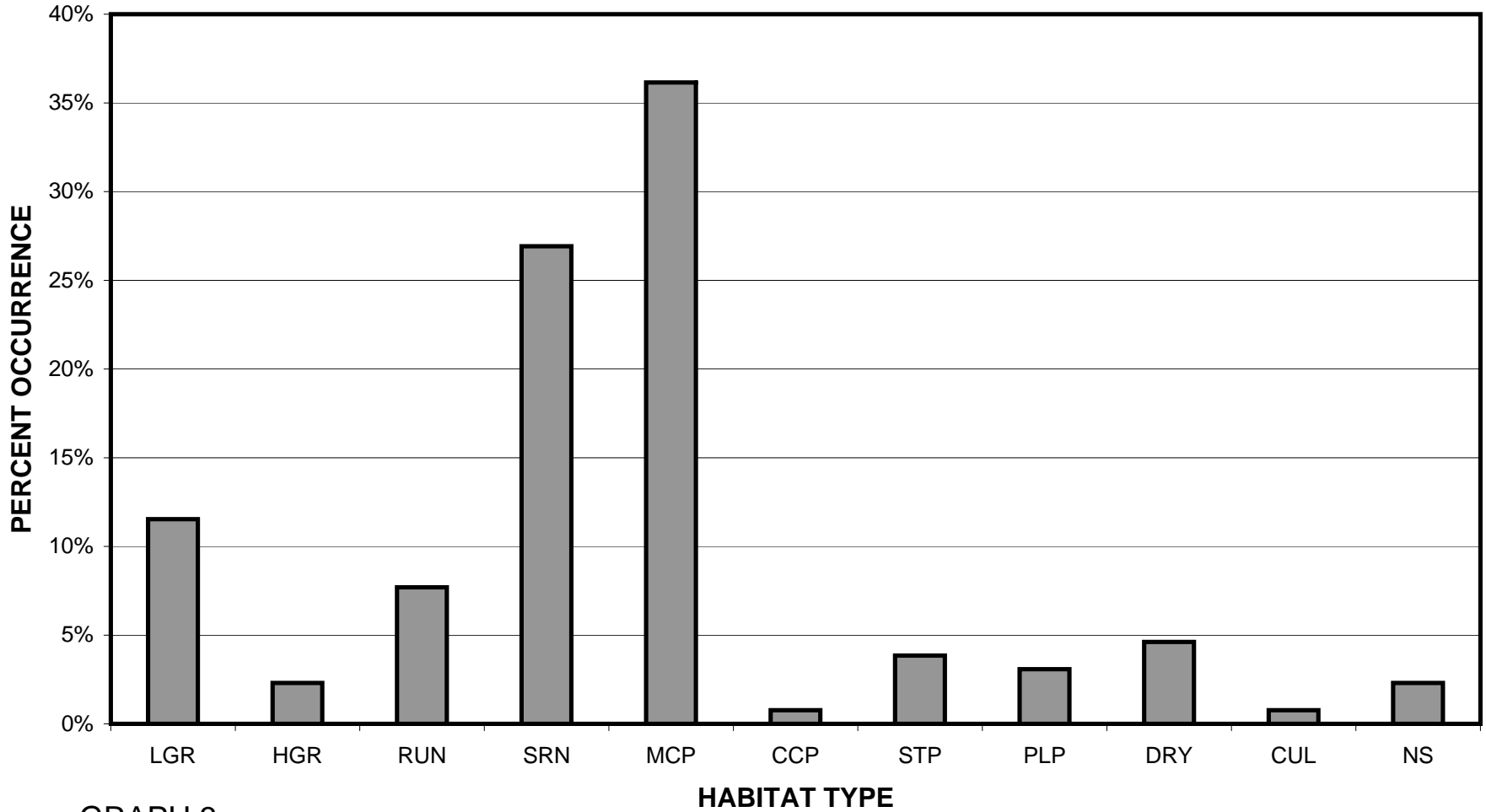
UNNAMED TRIBUTARY TO REDWOOD CREEK 2012 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

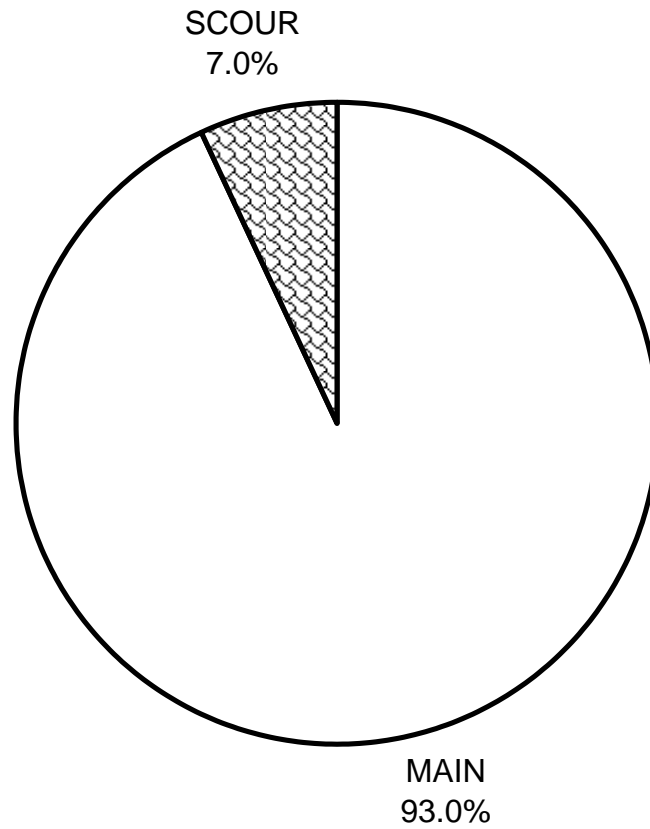
UNNAMED TRIBUTARY TO REDWOOD CREEK 2012

HABITAT TYPES BY PERCENT OCCURRENCE



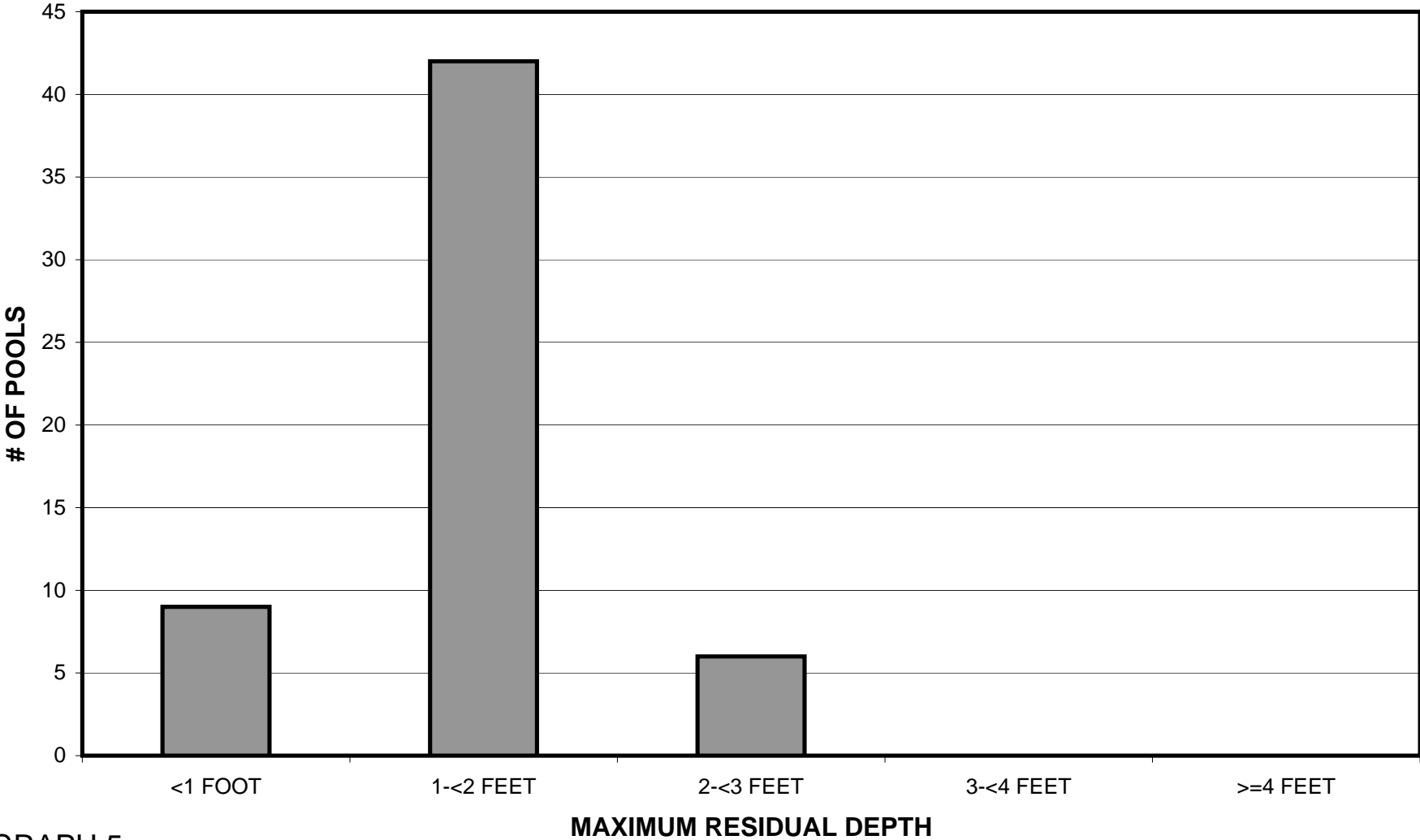
GRAPH 3

**UNNAMED TRIBUTARY TO REDWOOD CREEK 2012
POOL TYPES BY PERCENT OCCURRENCE**



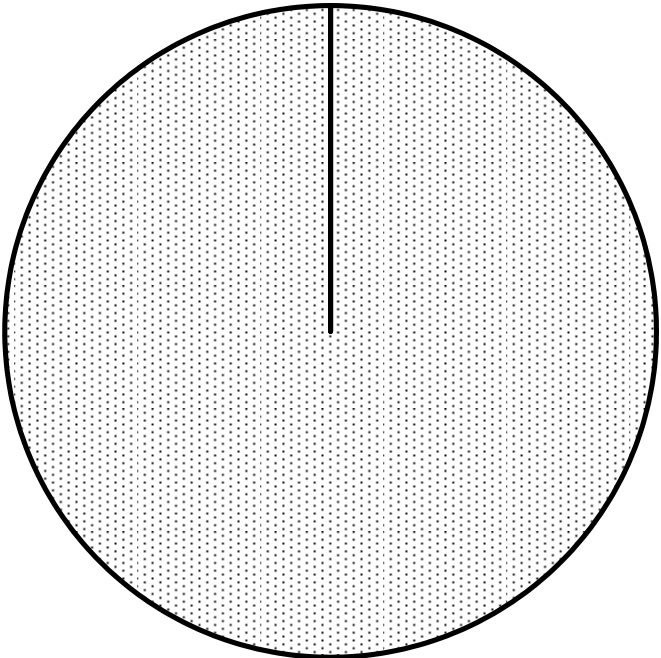
GRAPH 4

**UNNAMED TRIBUTARY TO REDWOOD CREEK 2012
MAXIMUM DEPTH IN POOLS**



GRAPH 5

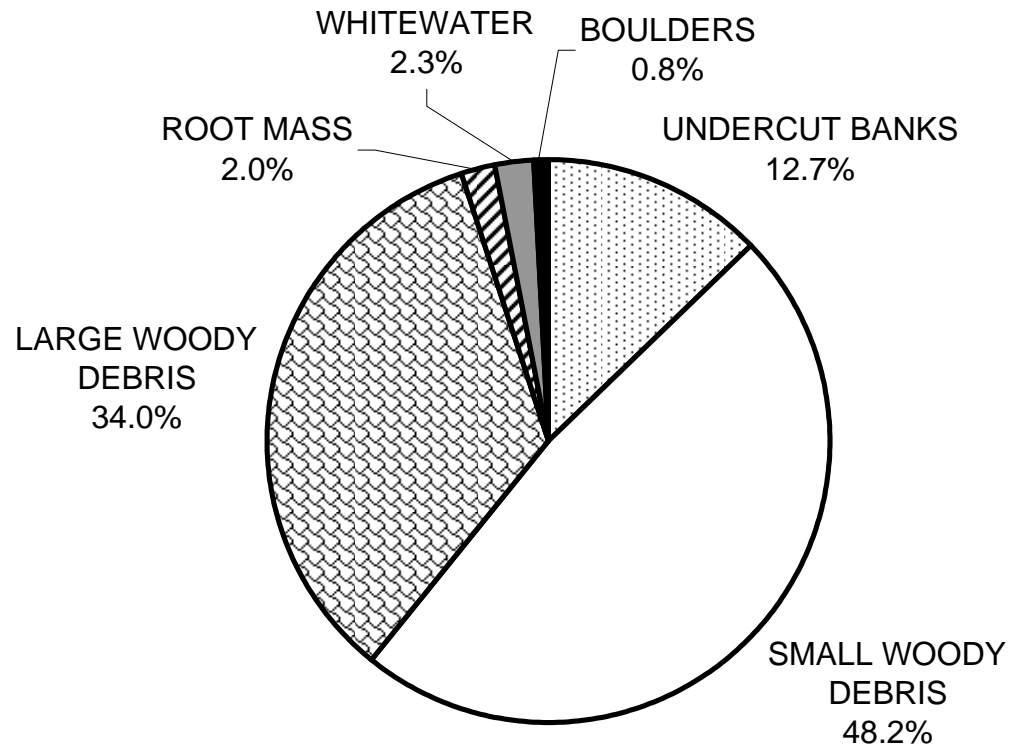
**UNNAMED TRIBUTARY TO REDWOOD CREEK 2012
PERCENT EMBEDDEDNESS**



VALUE 2
100.0%

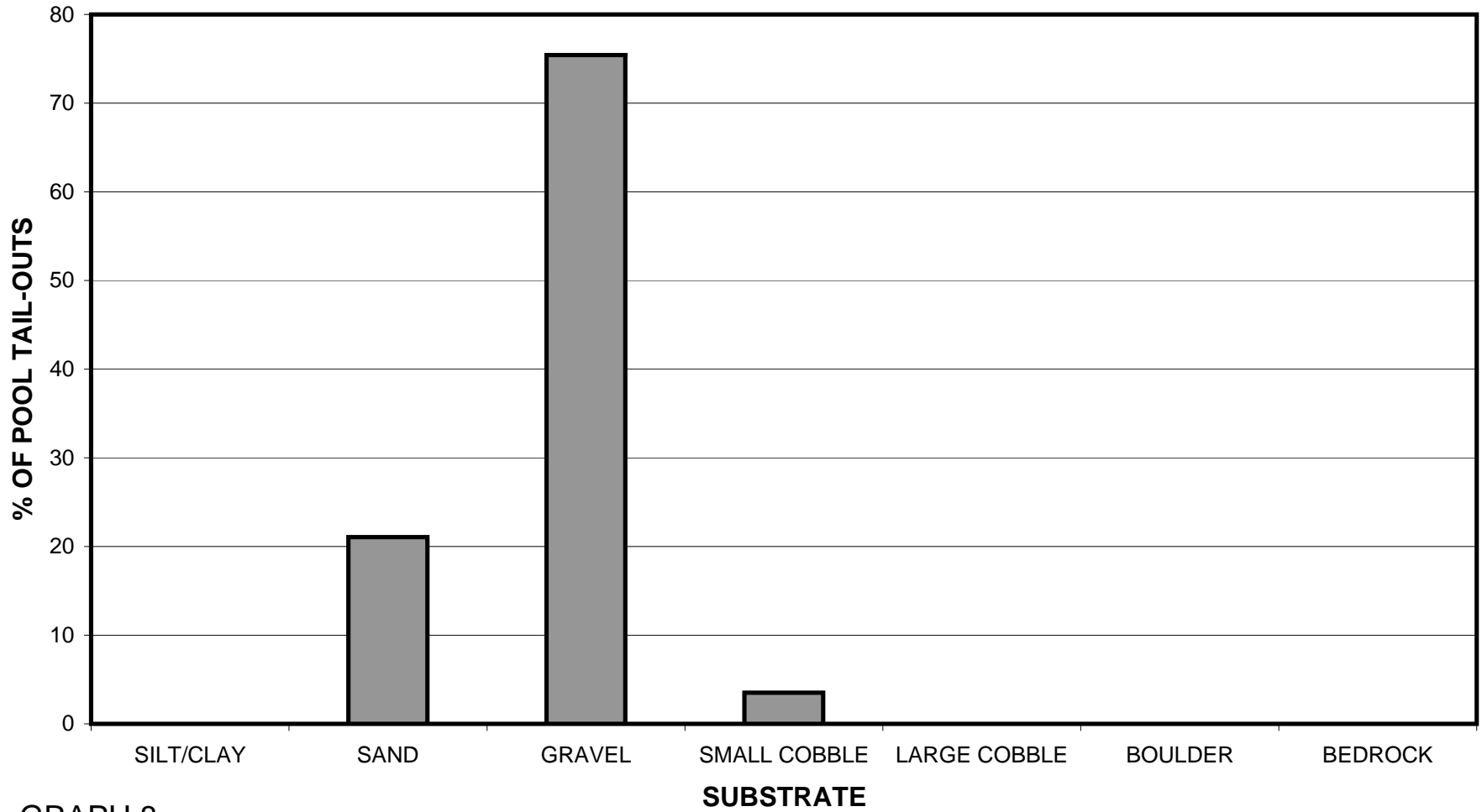
GRAPH 6

UNNAMED TRIBUTARY TO REDWOOD CREEK 2012 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

UNNAMED TRIBUTARY TO REDWOOD CREEK 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



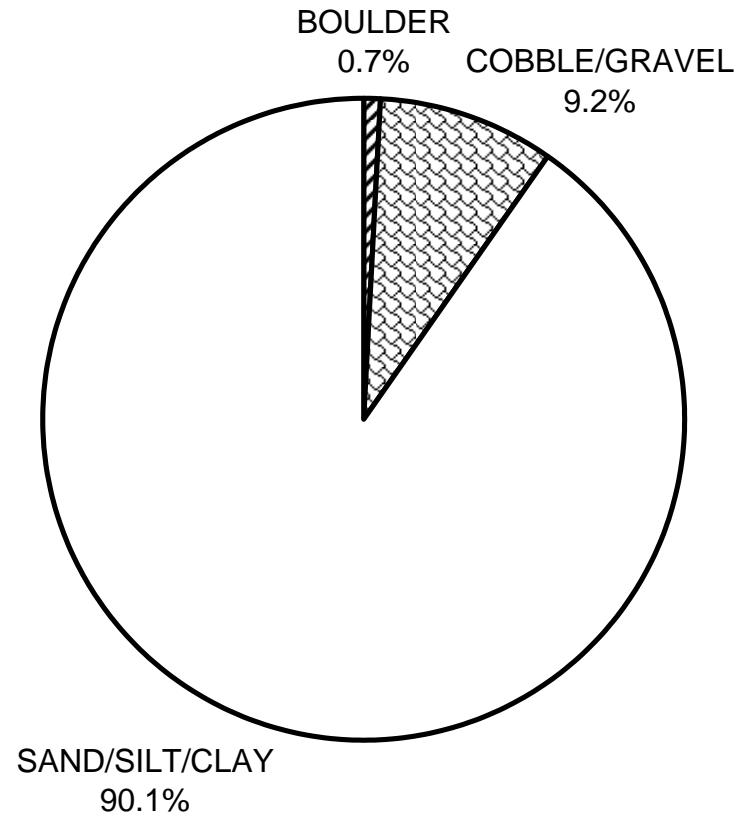
GRAPH 8

**UNNAMED TRIBUTARY TO REDWOOD CREEK 2012
MEAN PERCENT CANOPY**



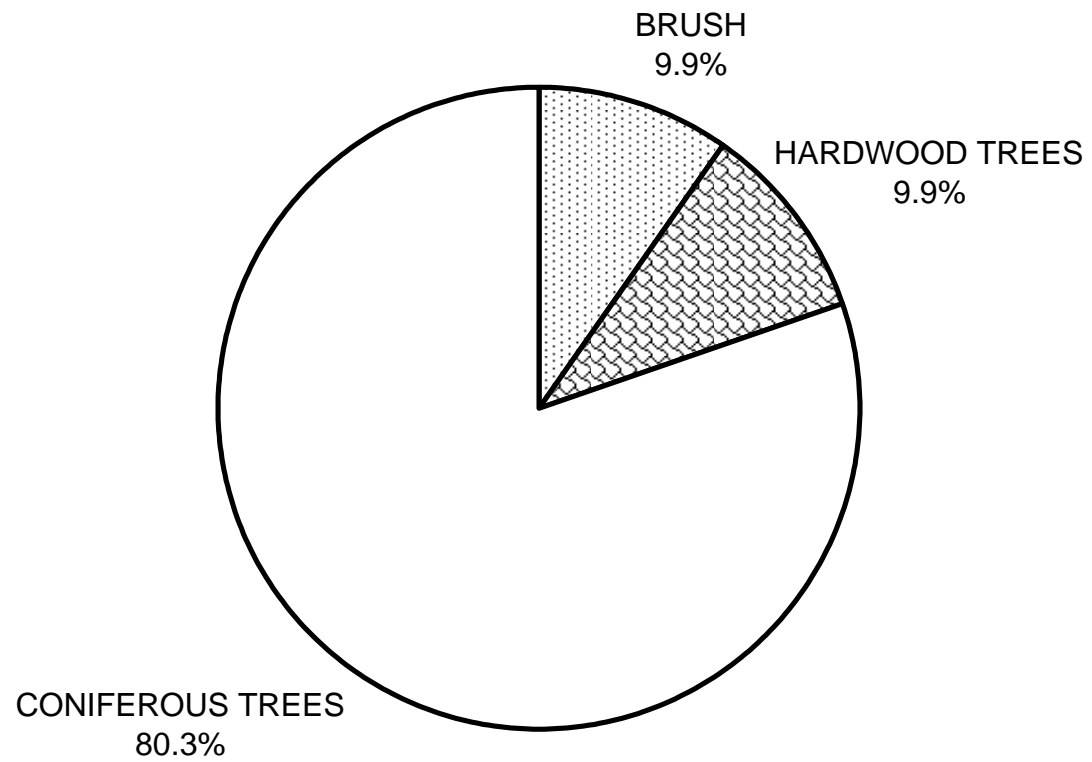
GRAPH 9

**UNNAMED TRIBUTARY TO REDWOOD CREEK 2012
DOMINANT BANK COMPOSITION IN SURVEY REACH**



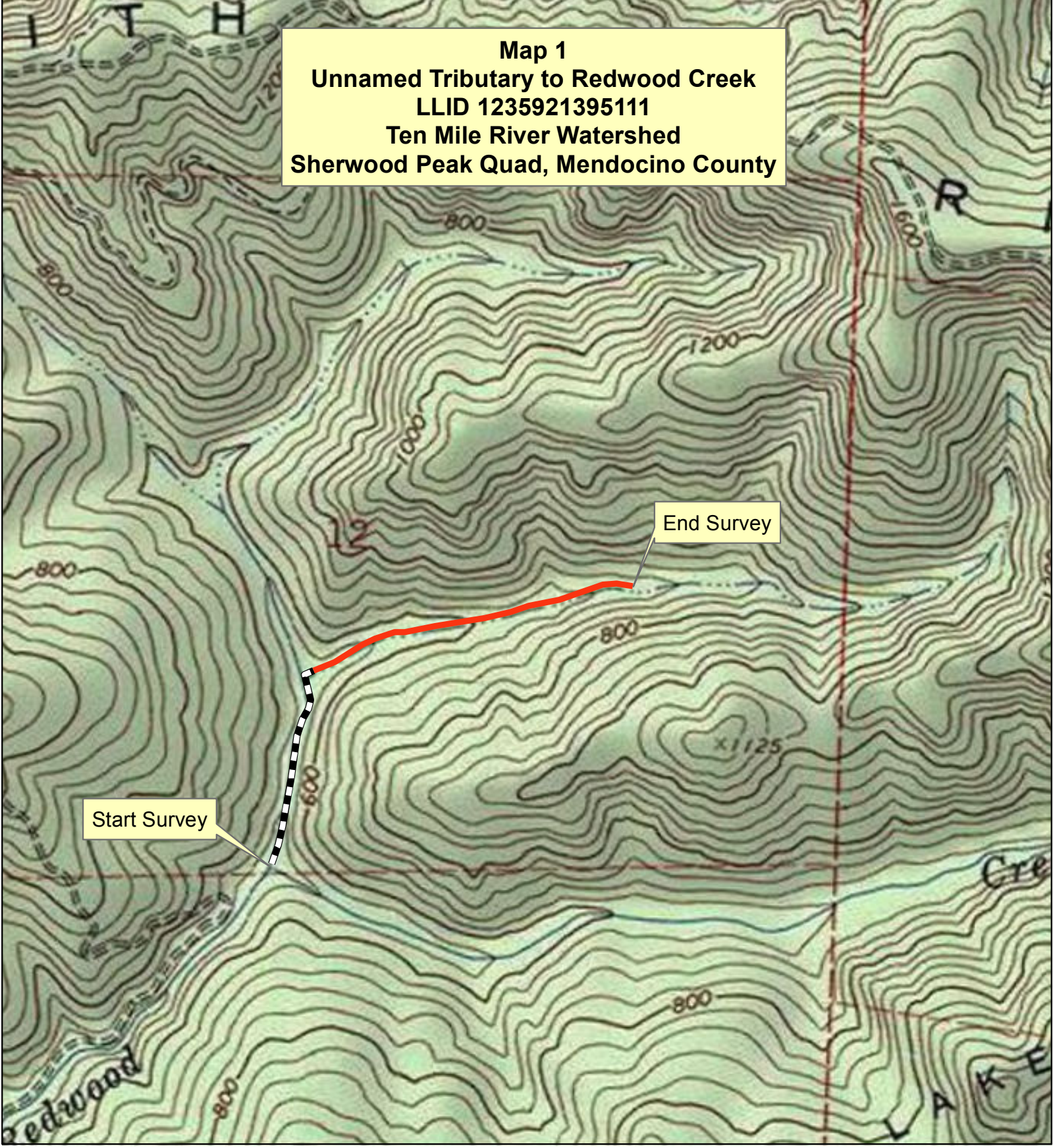
GRAPH 10

**UNNAMED TRIBUTARY TO REDWOOD CREEK 2012
DOMINANT BANK VEGETATION IN SURVEY REACH**



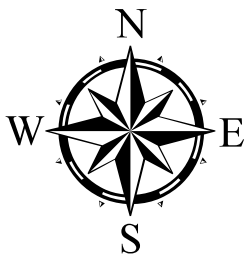
GRAPH 11



Map 1
Unnamed Tributary to Redwood Creek
LLID 1235921395111
Ten Mile River Watershed
Sherwood Peak Quad, Mendocino County



Start Survey

End Survey



-  Reach 1, Channel Type F4
-  Reach 2, Channel Type G4

