

STREAM INVENTORY REPORT

Redwood Creek

INTRODUCTION

A stream inventory was conducted on April 30, 2012 on Redwood Creek. The survey began at the confluence with Little North Fork Navarro River and extended upstream 0.1 miles.

The Redwood 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 Redwood 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

Redwood Creek is a tributary to Little North Fork Navarro River, a tributary to North Branch North Fork Navarro River, a tributary to North Fork Navarro River, a tributary to the Navarro River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Redwood Creek's legal description at the confluence with Little North Fork Navarro River is T16N R15W S35. Its location is 39.2026 degrees north latitude and 123.5006 degrees west longitude, LLID number 1234994392025. Redwood Creek is a first order stream and has approximately one mile of blue line stream according to the USGS Bailey Ridge 7.5 minute quadrangle. Redwood Creek drains a watershed of approximately 1.4 square miles. Elevations range from about 375 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 a private logging road off of Masonite Industrial Road.

METHODS

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

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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 Redwood 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 Redwood 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 Redwood 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 Redwood 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

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(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 Redwood Creek. In addition, underwater observations were made at one site 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

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Graphics are produced from the tables using Microsoft Excel. Graphics developed for Redwood 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 April 30, 2012 was conducted by T. Anderson (WSP) and B. Leonard (CDFW). The total length of the stream surveyed was 620 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.43 cfs on April 30, 2012.

Redwood Creek is a B3 channel type for 620 feet of the stream surveyed. B3 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and cobble-dominant substrates.

The water temperature taken during the survey period was 52 degrees Fahrenheit. The air temperature was 86 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 50% riffle units, 25% flatwater units, 13% pool units, and 13% dry units (Graph 1). Based on total length of Level II habitat types there were 54% dry units, 33% riffle units, 10% flatwater units, and 3% pool units (Graph 2).

Five Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were high gradient riffle units, 38% and run units, 25% (Graph 3). Based on percent total length, dry units made up 54%, high gradient riffle units 28%, and run units 10%.

One pool was identified (Table 3). The one pool measured was a main channel pool (Table 3).

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Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. The one pool measured did not have a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. The one pool tail-out measured had an embeddedness value of 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 0, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 20 (Table 1).

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

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 the one pool tail-out measured.

The mean percent canopy density for the surveyed length of Redwood Creek was 94%. Six percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 55% and 45%, respectively. Graph 9 describes the mean percent canopy in Redwood Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 98%. The mean percent left bank vegetated was 84%. The elements composing the structure of the stream banks consisted of 100% cobble/gravel (Graph 10). Brush was the dominant vegetation type observed in 63% of the units surveyed. Additionally, 25% of the units surveyed had coniferous trees as the dominant vegetation type, and 13% had deciduous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at one site for species composition and distribution in Redwood Creek on July 31, 2012. The sites were sampled by I. Mikus and M. Groff (CDFW).

The one site was sampled within the first 100 feet of Redwood Creek. The site yielded one sculpin.

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The following chart displays the information yielded from these sites:

2012 Redwood Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
B3 Channel Type									
07/31/12	1	004	Pool	100	0	0	0	0	0

DISCUSSION

Redwood Creek is a B3 channel type for the entire length of the survey, 620 feet. The suitability of B3 channel types for fish habitat improvement structures is as follows: B3 channel types are excellent for plunge weirs, boulder clusters and bank-placed boulders, single and opposing wing-deflectors, and log cover.

The water temperature recorded on the survey day April 30, 2012 was 52 degrees Fahrenheit. The air temperature was 86 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 10% of the total length of this survey, riffles 33%, and pools 3%. The one pool measured did not have a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width.

The one pool tail-out measured had an embeddedness rating 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.

The one pool tail-out 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 20. The shelter rating in the flatwater habitats is 5. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Redwood Creek. Boulders and large woody debris are the dominant cover type in pools. 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.

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The mean percent canopy density for the stream was 94%. The percentage of right and left bank covered with vegetation was 98% and 84%, respectively.

RECOMMENDATIONS

- 1) 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.

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 Little North Fork Navarro River. The channel is a B3 for the entire length of the survey.
100	0005.00	A logging road crosses the channel. The crossing is a 5.2' high x 28' long x 19' wide log bridge.
139	0006.00	The channel is dry for 334 feet.
518	0008.00	End of survey. The channel goes dry for approximately 600 feet. At 202' upstream from the end of survey point there is a log debris accumulation with a 9' high plunge. At 600' upstream from the end of survey point there is a possible barrier created by bedrock and root mass.

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: Redwood Creek

LLID: 1234994392025 Drainage: Navarro River

Survey Dates: 4/30/2012 to 4/30/2012

Confluence Location: Quad: BAILEY RIDGE Legal Description: T16NR15WS35 Latitude: 39:12:09.0N Longitude: 123:29:58.0

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	12.5	334	334	53.9									
2	2	FLATWATER	25.0	32	64	10.3	6.0	0.4	0.7	153	306	55	110		5
1	1	POOL	12.5	18	18	2.9	7.0	0.9	1.4	126	126	151	151	113	20
4	1	RIFFLE	50.0	51	204	32.9	4.0	0.3	0.6	245	979	73	294		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
8	4				620					1412			555		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Redwood Creek

LLID: 1234994392025

Drainage: Navarro River

Survey Dates: 4/30/2012 to 4/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T16NR15WS35

Latitude: 39:12:09.0N

Longitude: 123:29:58.0W

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 (%)
1	0	LGR	12.5	32	32	5.2										
3	1	HGR	37.5	57	172	27.7	4	0.3	0.6	245	734	73	220		0	96
2	2	RUN	25.0	32	64	10.3	6	0.4	0.8	153	306	55	110		5	95
1	1	MCP	12.5	18	18	2.9	7	0.9	1.4	126	126	151	151	113	20	88
1	0	DRY	12.5	334	334	53.9										

Total Units
8

Total Units Fully Measured
4

Total Length (ft.)
620

Total Area (sq.ft.)
1167

Total Volume (cu.ft.)
481

Table 3 - Summary of Pool Types

Stream Name: Redwood Creek

LLID: 1234994392025

Drainage: Navarro River

Survey Dates: 4/30/2012 to 4/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T16NR15WS35

Latitude: 39:12:09.0N

Longitude: 123:29:58.0W

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
1	1	MAIN	100	18	18	100	7.0	0.9	126	126	113	113	20

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
1	1	18	126	113

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

Stream Name: Redwood Creek LLID: 1234994392025 Drainage: Navarro River
 Survey Dates: 4/30/2012 to 4/30/2012
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T16NR15WS35 Latitude: 39:12:09.0N Longitude: 123:29:58.0W

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
1	MCP	100	0	0	1	100	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
1	0	0	1	100	0	0	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Redwood Creek

LLID: 1234994392025

Drainage: Navarro River

Survey Dates: 4/30/2012 to 4/30/2012

Dry Units: 1

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T16NR15WS35

Latitude: 39:12:09.0N

Longitude: 123:29:58.0W

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
1	0	LGR									
3	1	HGR	0	0	0	0	0	0	0	0	0
4	1	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
2	2	RUN	0	0	0	0	0	0	0	100	0
2	2	TOTAL FLAT	0	0	0	0	0	0	0	100	0
1	1	MCP	0	0	45	10	0	0	0	45	0
1	1	TOTAL POOL	0	0	45	10	0	0	0	45	0
8	4	TOTAL	0	0	23	5	0	0	0	73	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Redwood Creek LLID: 1234994392025 Drainage: Navarro River
 Survey Dates: 4/30/2012 to 4/30/2012 Dry Units: 1
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T16NR15WS35 Latitude: 39:12:09.0N Longitude: 123:29:58.0W

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
1	0	LGR	0	0	0	0	0	0	0
3	1	HGR	0	0	100	0	0	0	0
2	2	RUN	0	0	100	0	0	0	0
1	1	MCP	0	0	0	0	100	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Redwood Creek

LLID: 1234994392025

Drainage: Navarro River

Survey Dates: 4/30/2012 to 4/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T16NR15WS35

Latitude: 39:12:09.0N

Longitude: 123:29:58.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
94	45	55	0	98	84

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: Redwood Creek LLID: 1234994392025 Drainage: Navarro River
 Survey Dates: 4/30/2012 to 4/30/2012 Survey Length (ft.): 620 Main Channel (ft.): 620 Side Channel (ft.): 0
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T16NR15WS35 Latitude: 39:12:09.0N Longitude: 123:29:58.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B3	Canopy Density (%): 93.8	Pools by Stream Length (%): 2.9
Reach Length (ft.): 620	Coniferous Component (%): 45.0	Pool Frequency (%): 12.5
Riffle/Flatwater Mean Width (ft.): 5.3	Hardwood Component (%): 55.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 100
Range (ft.): 15 to 15	Vegetative Cover (%): 90.6	2 to 2.9 Feet Deep: 0
Mean (ft.): 15	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 0
Std. Dev.: 0	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.4	Occurrence of LWD (%): 11	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 52 - 52 Air (F): 86 - 86	LWD per 100 ft.:	Mean Pool Shelter Rating: 20
Dry Channel (ft): 334	Riffles: 0	
	Pools: 6	
	Flat: 0	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 100.0 4. 0.0 5. 0.0		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Redwood Creek

LLID: 1234994392025

Drainage: Navarro River

Survey Dates: 4/30/2012 to 4/30/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T16NR15WS35

Latitude: 39:12:09.0N

Longitude: 123:29:58.0W

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	4	4	100.0
Sand / Silt / Clay	0	0	0.0

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	0	0.0
Brush	4	1	62.5
Hardwood Trees	0	1	12.5
Coniferous Trees	0	2	25.0
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 3

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

StreamName: Redwood Creek

LLID: 1234994392025

Drainage: Navarro River

Survey Dates: 4/30/2012 to 4/30/2012

Confluence Location: Quad: BAILEY RIDGE

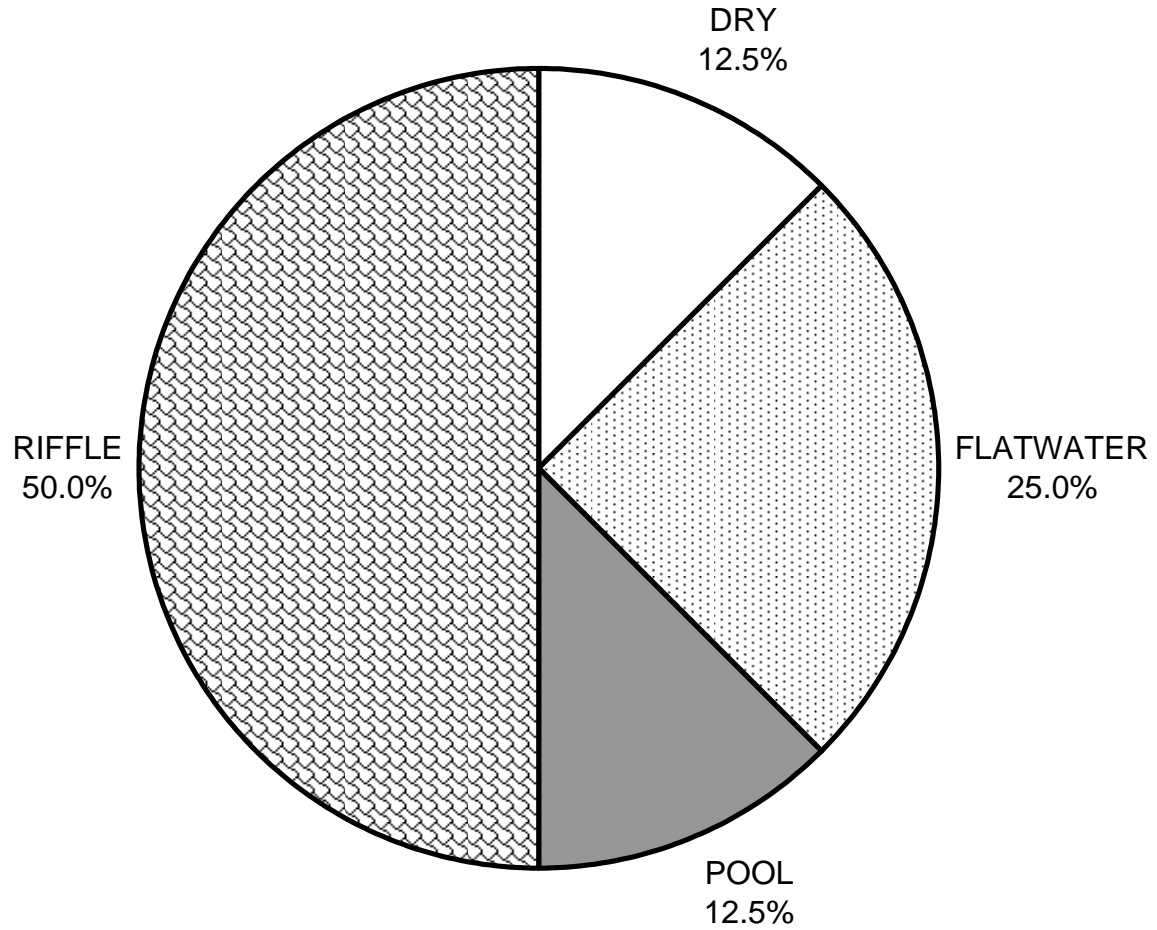
Legal Description: T16NR15WS35

Latitude: 39:12:09.0N

Longitude: 123:29:58.0W

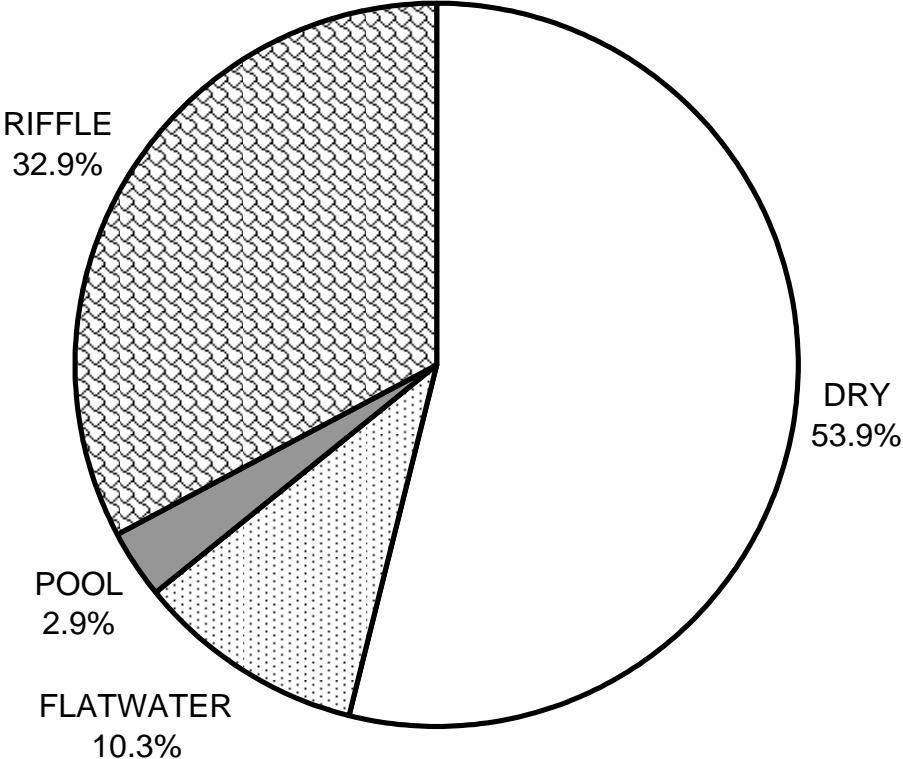
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	0
SMALL WOODY DEBRIS (%)	0	0	0
LARGE WOODY DEBRIS (%)	0	0	45
ROOT MASS (%)	0	0	10
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	100	45
BEDROCK LEDGES (%)	0	0	0

REDWOOD CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



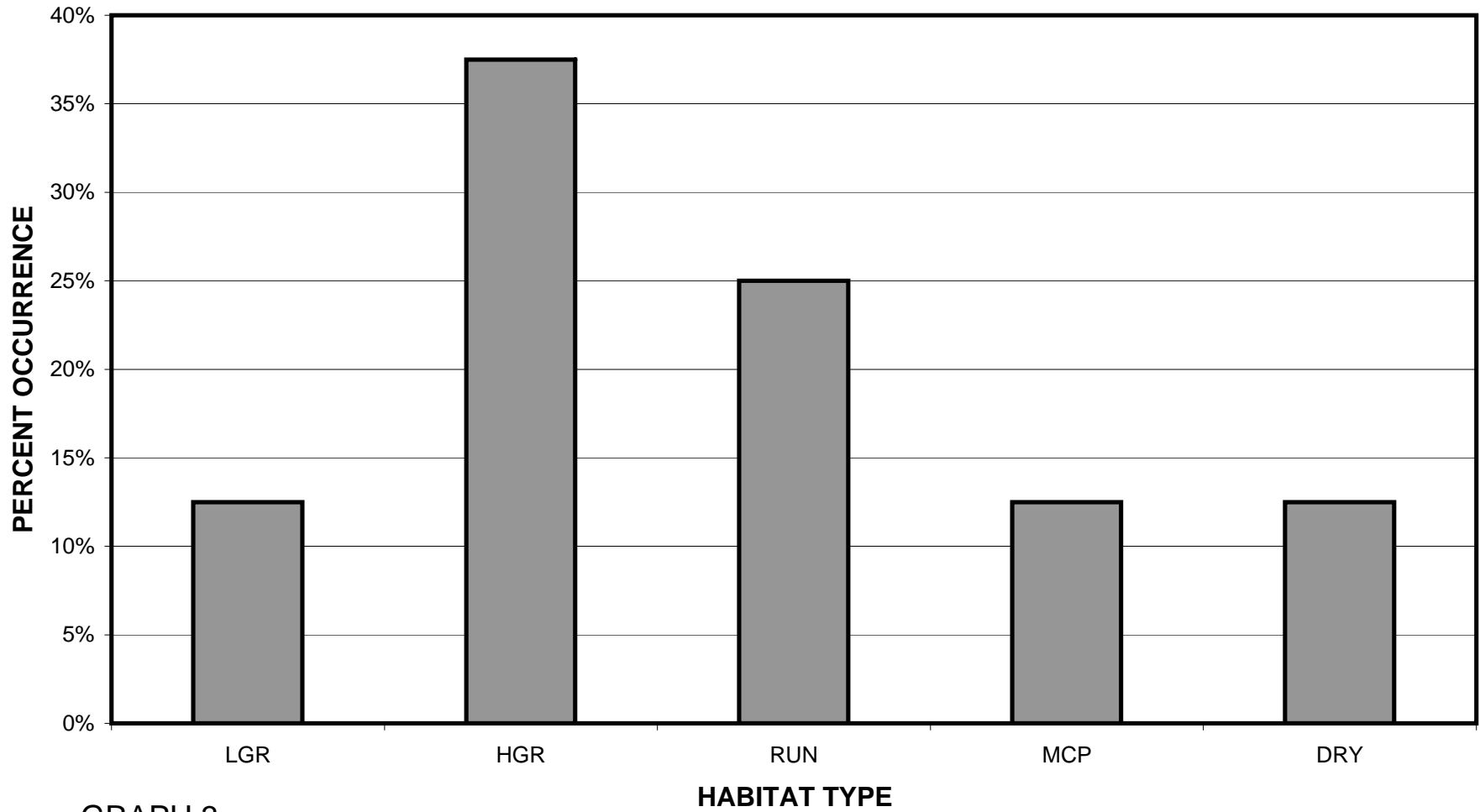
GRAPH 1

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



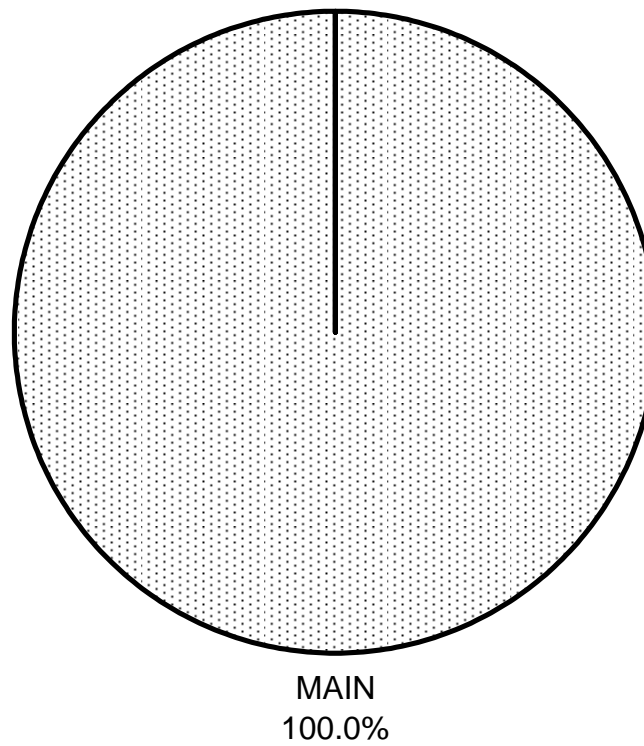
GRAPH 2

REDWOOD CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



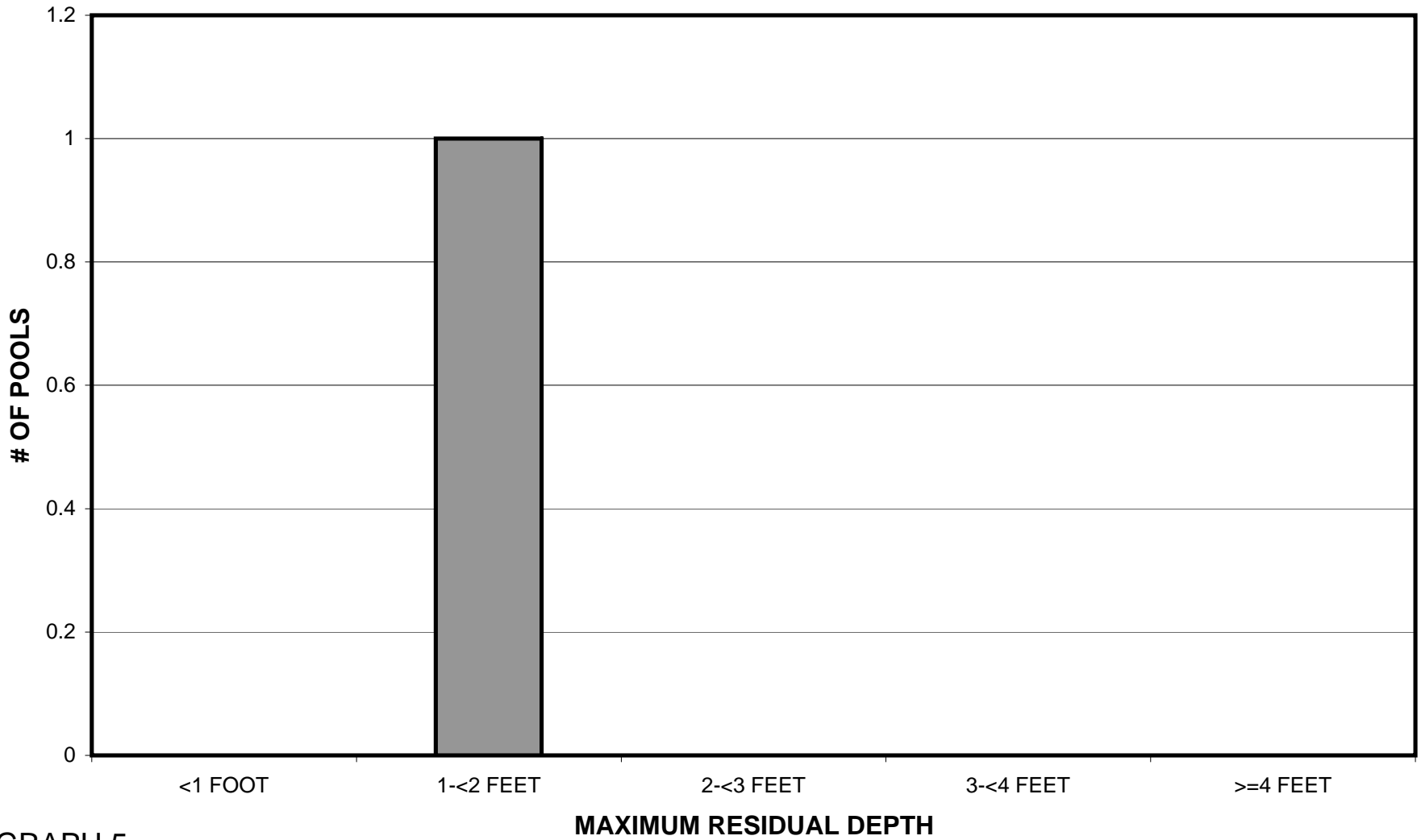
GRAPH 3

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



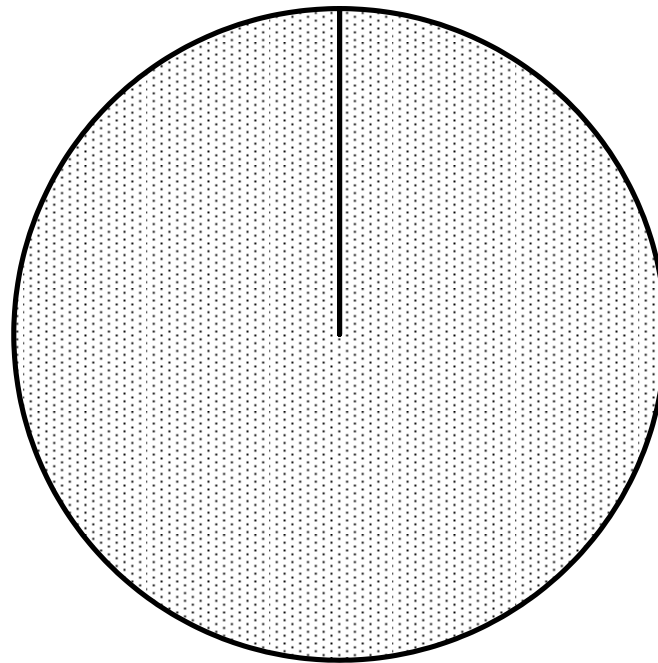
GRAPH 4

REDWOOD CREEK 2012 MAXIMUM DEPTH IN POOLS



GRAPH 5

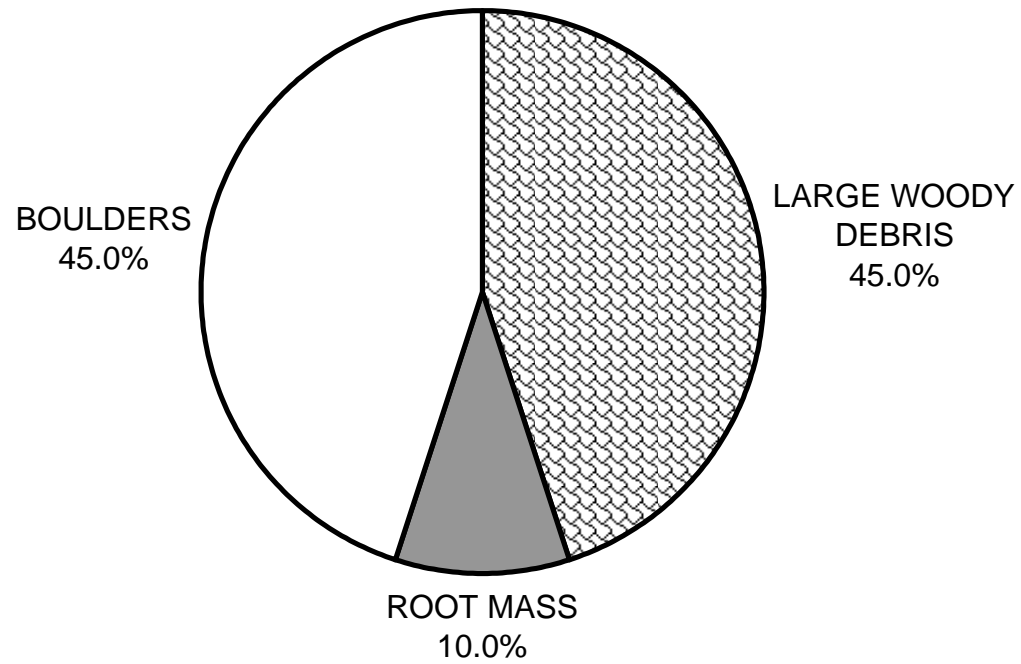
REDWOOD CREEK 2012 PERCENT EMBEDDEDNESS



VALUE 3
100.0%

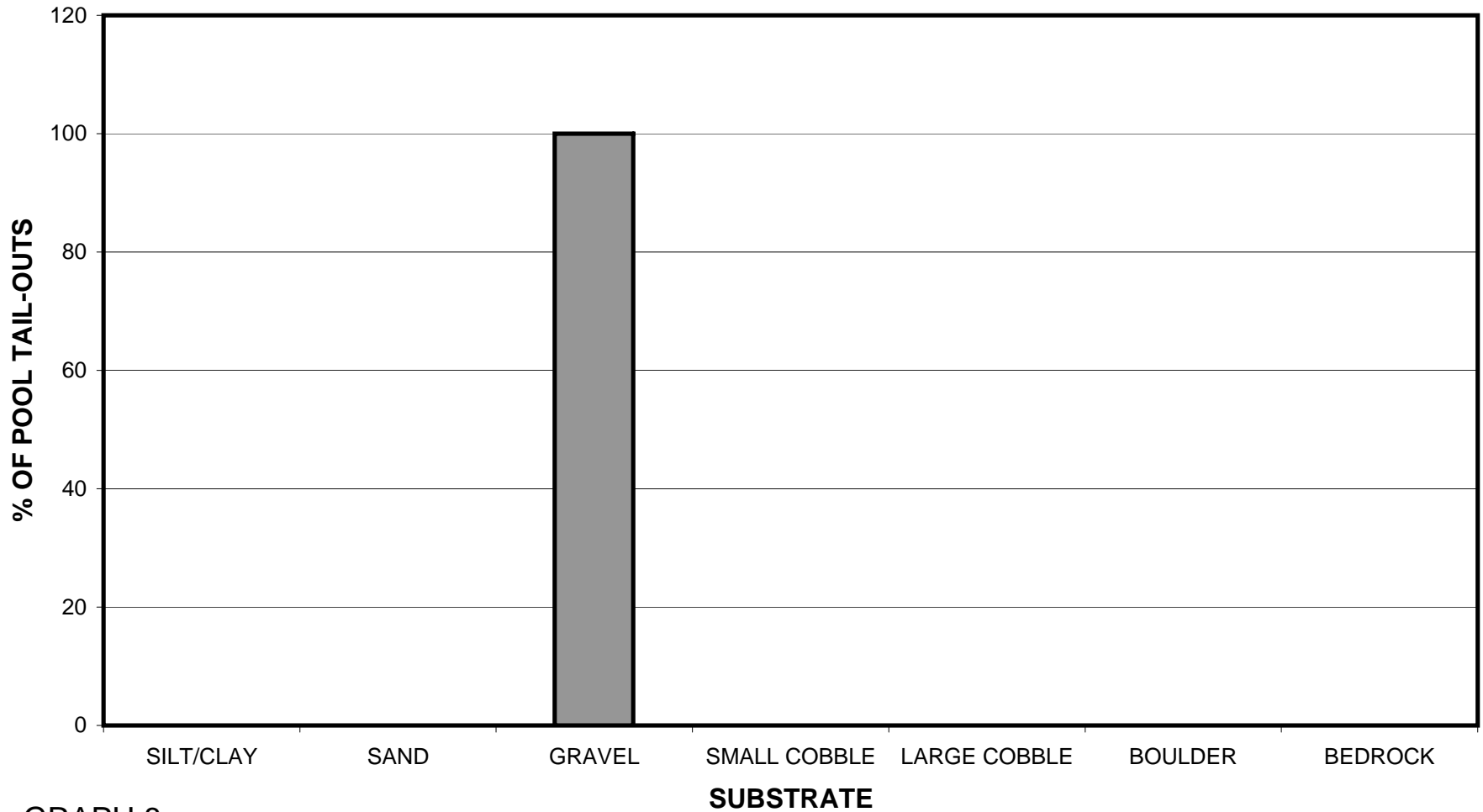
GRAPH 6

**REDWOOD CREEK 2012
MEAN PERCENT COVER TYPES IN POOLS**



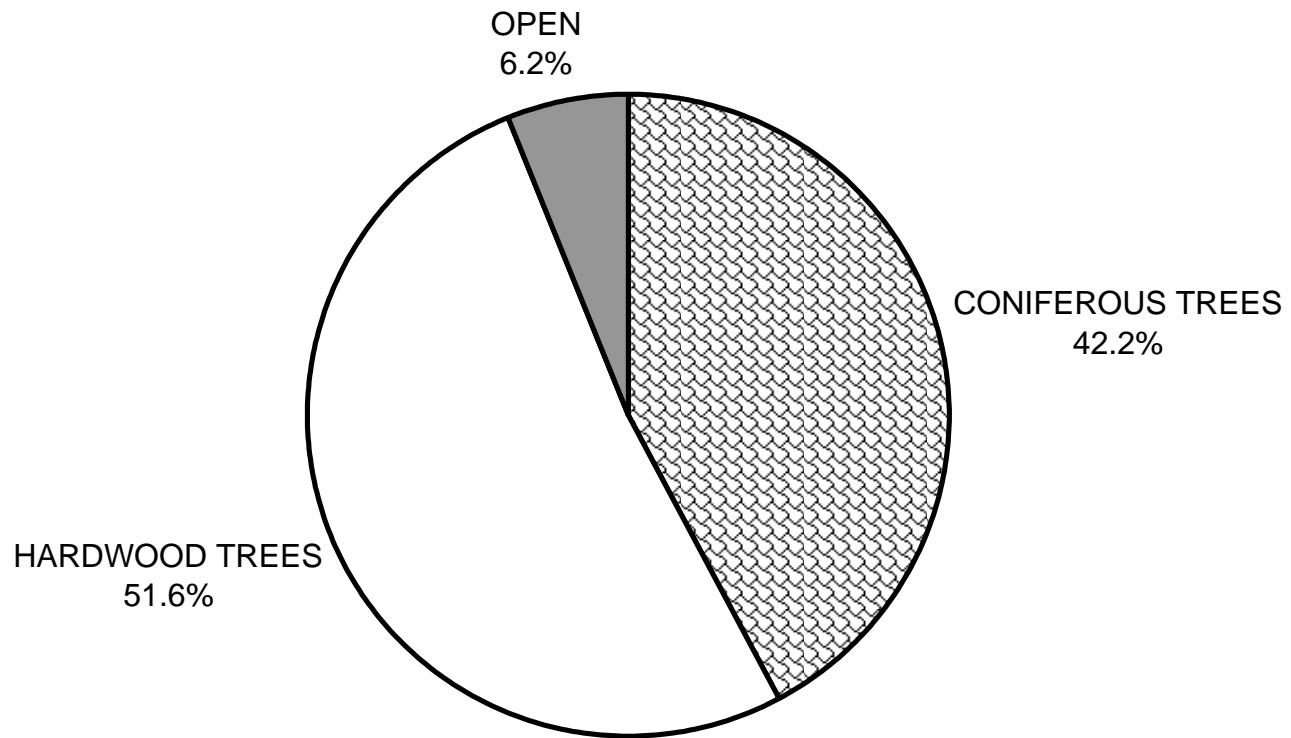
GRAPH 7

REDWOOD CREEK 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



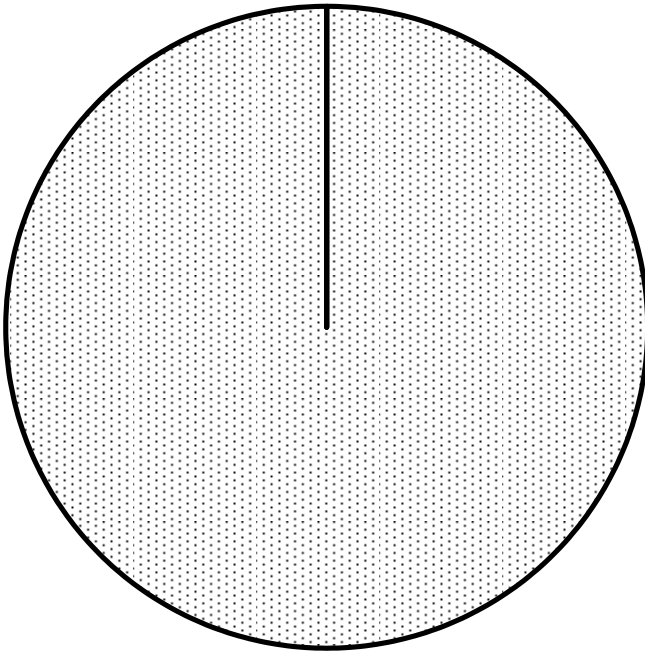
GRAPH 8

REDWOOD CREEK 2012 MEAN PERCENT CANOPY



GRAPH 9

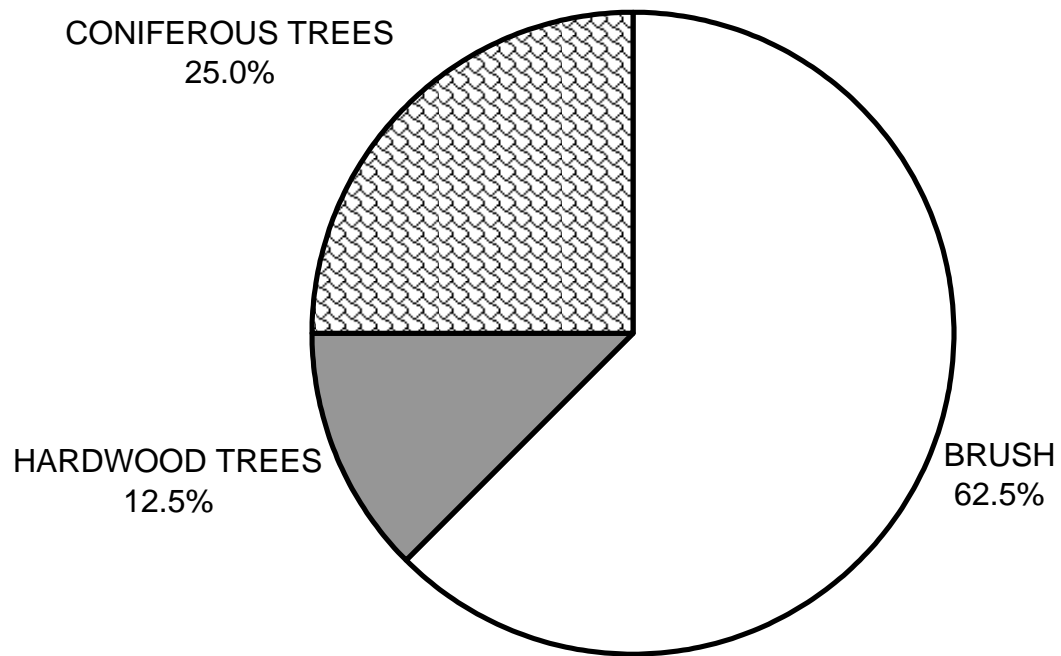
**REDWOOD CREEK 2012
DOMINANT BANK COMPOSITION IN SURVEY REACH**



COBBLE/GRAVEL
100.0%

GRAPH 10

REDWOOD CREEK 2012 DOMINANT BANK VEGETATION IN SURVEY REACH

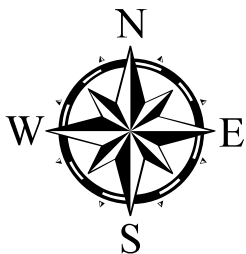
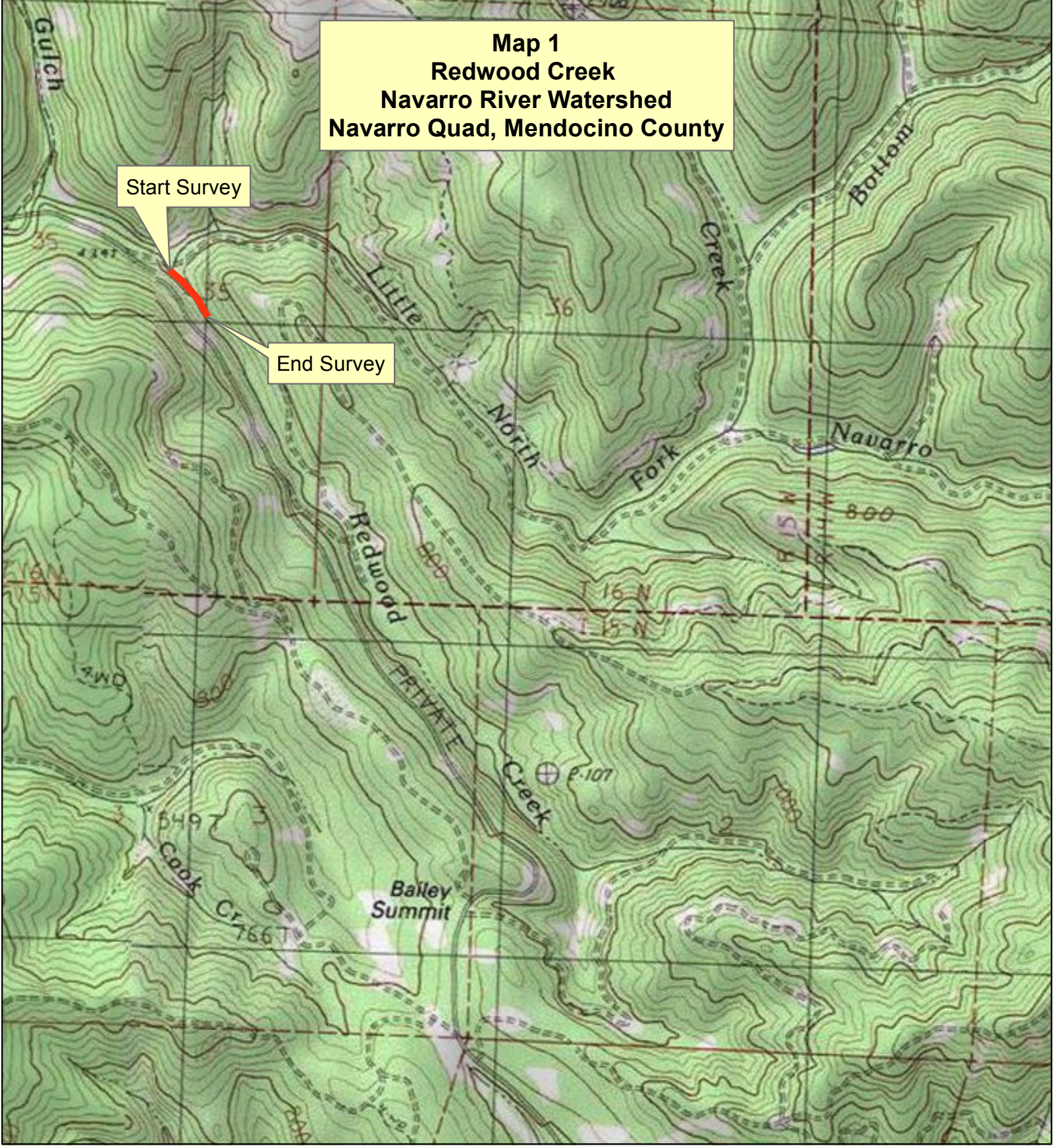



GRAPH 11

Map 1
Redwood Creek
Navarro River Watershed
Navarro Quad, Mendocino County

Start Survey

End Survey



 Channel Type B3

