

# STREAM INVENTORY REPORT

## Soda Creek

### INTRODUCTION

A stream inventory was conducted from May 28 to May 29, 2013 on Soda Creek. The survey began at the confluence with the North Fork Navarro River and extended upstream 0.8 miles.

The Soda 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 Soda 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

Soda Creek is a tributary to the North Fork Navarro River, tributary to the Navarro River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Soda Creek's legal description at the confluence with the North Fork Navarro River is T15N R15W S18. Its location is 39.1600 degrees north latitude and 123.5670 degrees west longitude, LLID number 1235659391601. Soda Creek is a first order stream and has approximately 2.6 miles of blue line stream according to the USGS Navarro 7.5 minute quadrangle. Soda Creek drains a watershed of approximately 1.8 square miles. Elevations range from about 90 feet at the mouth of the creek to 900 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production, recreation, and rural development. Vehicle access exists via Highway 20, west of Navarro, CA.

### METHODS

The habitat inventory conducted in Soda 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 that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. This inventory was conducted by a two-person team.

### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail

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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 Soda 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". Soda 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.

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### 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 Soda 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. 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 Soda Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. The shelter rating is then calculated 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 Soda 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 Soda 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.

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### 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 Soda Creek. In addition, underwater observations were made at seven sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## DATA ANALYSIS

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

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

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Graphics are produced from the tables using Microsoft Excel. Graphics developed for Soda 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 May 28 to May 29, 2013 was conducted by M. Groff and I. Mikus (CDFW). The total length of the stream surveyed was 4,215 feet.

Stream flow was not measured on Soda Creek.

Soda Creek is a C4 channel type for all of the 4,215 feet of the stream surveyed. C4 channels are meandering point-bar, riffle/pool, alluvial channels with broad well defined floodplain on low gradients and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 56 degrees Fahrenheit. Air temperatures ranged from 55 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 33% pool units, 31% dry units, 28% flatwater units, 7% riffle units, and 1% culvert units (Graph 1). Based on total length of Level II habitat types there were 42% dry units, 37% pool units, 18% flatwater units, 3% riffle units, and 1% culvert units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were dry units, 31%; mid-channel pool units, 30%; and run units, 25% (Graph 3). Based on percent total length, dry units made up 42%, mid-channel pool units 32%, and run units 15%.

A total of 40 pools were identified (Table 3). Main channel pools were the most frequently encountered at 92% (Graph 4), and comprised 92% of the total length of all pools (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. Twenty-one of the 40 pools (52%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 40 pool tail-outs measured, seven had a value of 1 (18%); 12 had a value of 2 (30%); 13 had a value of 3 (33%); five had a value of 4 (13%); three had a value of 5 (8%) (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 9, and pool habitats had a mean shelter rating of 15 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 16. Scour pools had a mean shelter rating of 3 (Table 3).

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

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 65% of the pool tail-outs. Silt/clay was the next most frequently observed dominant substrate type and occurred in 22% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Soda Creek was 95%. Five percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 27% and 73%, respectively. Graph 9 describes the mean percent canopy in Soda Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 96% sand/silt/clay and 4% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 59% of the units surveyed. Additionally, 21% of the units surveyed had brush as the dominant vegetation type, and 20% had hardwood trees as the dominant vegetation type (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at seven sites for species composition and distribution in Soda Creek on June 3, 2013. The sites were sampled by I. Mikus and M. Groff (CDFW).

The reach sites yielded 13 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), six age 1+ SH/RT, two age 2+ SH/RT, 21 YOY coho salmon, and four age 1+ coho salmon.

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The following chart displays the information yielded from these sites:

2013 Soda Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
C4 Channel Type									
06/03/13	1	055	Pool	2,331	8	5	0	12	4
	2	074	Pool	2,828	0	0	1	0	0
	3	083	Run	3,031	0	0	0	2	0
	4	085	Run	3,110	5	0	0	7	0
	5	087	Pool	3,145	0	1	0	0	0
	6	099	Pool	3,470	0	0	0	0	0
	7	101	Pool	3,525	0	0	1	0	0

## DISCUSSION

Soda Creek is a C4 channel type for the entire 4,215 feet of stream surveyed. The suitability of C4 channel types for fish habitat improvement structures is as follows: C4 channel types are good for bank placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days May 28 to May 29, 2013 ranged from 52 to 56 degrees Fahrenheit. Air temperatures ranged from 55 to 70 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 18% of the total length of this survey, riffles 3%, and pools 37%. Twenty-one of the 40 (52%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Nineteen of the 40 pool tail-outs measured had embeddedness ratings of 1 or 2. Eighteen of the pool tail-outs had embeddedness ratings of 3 or 4. Three of the pool tail-outs had a rating of 5, which is considered not suitable 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. Sediment sources in Soda Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

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Twenty-nine of the 40 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 15. The shelter rating in the flatwater habitats is 9. 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 Soda Creek. Small woody debris is the dominant cover type in pools followed by undercut banks. 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 95%. The percentage of right and left bank covered with vegetation was 100% and 99%, respectively.

### RECOMMENDATIONS

- 1) Soda 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.
- 4) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
- 5) Due to the culvert located at 67 feet, access for migrating salmonids is an ongoing potential problem. A fish passage assessment should be conducted at this site. If the assessment finds the culvert to be a barrier to fish passage it should be replaced with a structure that provides unimpeded fish passage. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish.



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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 the North Fork Navarro River. The channel is a C4 for the entire length of the survey.
67	0006.00	A logging road crosses the channel. The crossing is a 4.7' high x 5.5' wide x 30' long smooth-bottomed, boiler-type metal culvert. The slope of the culvert is 0.7%. The culvert is rusty. There is a hole in the top of the culvert where a piece of the metal culvert is protruding down.
97	0007.00	The channel is marshy and there is no defined main channel. Marsh plants fill the channel.
302	0013.00	End of marshy section.
1288	0042.00	Dry left bank tributary.
1465	0047.00	Site of old road crossing. No remnants of bridge or ford.
1641	0053.00	Dry right bank tributary. The only water in the tributary is in a shallow pool below the Highway 20 culvert. The pool is filled with orange algae.
2166	0055.00	Bullfrogs observed in pool.
2907	0081.00	Dry right bank tributary.
3110	0086.00	An erosion site on the left bank measures approximately 60' long x 10' high and is contributing fine sediment to the channel.
3297	0094.00	Log debris accumulation (LDA) #01 contains two pieces of large woody debris (LWD) and measures 6' high x 26' wide x 8' long. Most of the volume of the LDA is small woody debris packed with fine sediment. Water does not flow through the LDA and the channel is dry for 12' above. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 10' wide x 20' long x 1.5' deep. Fish were observed above the LDA.
3404	0099.00	Last fish observed.

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- 3488 0101.00 Woody debris, mostly small wood, is accumulating over a pool just downstream of a 4' high plunge over sediment and rootmass. The channel is dry for 29' above the plunge.
- 3889 0115.00 There is a 4' high plunge over rootmass, sediment, and LWD.
- 4188 0120.00 End of survey. There is a 3' high plunge over rootmass and sediment. The stream goes dry for over 1,000 feet. The channel is braided and ill-defined over a wide floodplain for approximately 1,000 feet above the end of survey point. Above survey endpoint, the channel narrows and is overgrown with poison oak and brush. The stream was flowing upstream at the Highway 20 culvert in the town of Navarro, but no fish were observed. The last fish was observed in Habitat Unit #099.

## 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: Soda Creek

LLID: 1235659391601 Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

Latitude: 39:09:36.0N

Longitude: 123:33:57.0W

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	30	30	0.7									
37	0	DRY	30.8	48	1775	42.1									
34	6	FLATWATER	28.3	22	749	17.8	3.9	0.3	0.6	84	2842	30	1016		9
40	40	POOL	33.3	39	1544	36.6	7.1	1.3	2.3	281	11251	444	17771	430	15
8	1	RIFFLE	6.7	15	117	2.8	4.0	0.1	0.2	83	666	8	67		0
<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>		
120	47				4215					14758			18853		

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

Stream Name: Soda Creek

LLID: 1235659391601

Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

Latitude: 39:09:36.0N

Longitude: 123:33:57.0W

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 (%)
7	1	LGR	5.8	16	112	2.7	4	0.1	0.2	83	582	8	58		0	98
1	0	HGR	0.8	5	5	0.1										
30	4	RUN	25.0	21	635	15.1	4	0.3	0.7	77	2299	23	690		13	93
4	2	SRN	3.3	28	114	2.7	3	0.4	0.8	98	390	44	175		3	98
1	1	TRP	0.8	64	64	1.5	4	1.4	2	243	243	340	340	340	0	98
36	36	MCP	30.0	38	1359	32.2	7	1.3	5.5	281	10105	437	15740	422	16	95
2	2	CRP	1.7	26	51	1.2	10	1.5	3.9	241	482	425	850	401	5	99
1	1	PLP	0.8	70	70	1.7	6	2.0	5.9	420	420	840	840	840	0	98
37	0	DRY	30.8	48	1775	42.1										92
1	0	CUL	0.8	30	30	0.7										

Total Units  
120

Total Units Fully Measured  
47

Total Length (ft.)  
4215

Total Area (sq.ft.)  
14522

Total Volume (cu.ft.)  
18694

**Table 3 - Summary of Pool Types**

Stream Name: Soda Creek

LLID: 1235659391601

Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

Latitude: 39:09:36.0N

Longitude: 123:33:57.0W

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
37	37	MAIN	93	38	1423	92	7.0	1.3	280	10348	420	15547	16
3	3	SCOUR	8	40	121	8	8.3	1.6	301	902	547	1642	3

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
40	40	1544	11251	17189

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

Stream Name: Soda Creek

LLID: 1235659391601

Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

Latitude: 39:09:36.0N

Longitude: 123:33:57.0W

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	TRP	3	0	0	0	0	1	100	0	0	0	0
36	MCP	90	0	0	19	53	9	25	5	14	3	8
2	CRP	5	0	0	0	0	1	50	1	50	0	0
1	PLP	3	0	0	0	0	0	0	0	0	1	100

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
40	0	0	19	48	11	28	6	15	4	10

Mean Maximum Residual Pool Depth (ft.): 2.3

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

Stream Name: Soda Creek

LLID: 1235659391601

Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Dry Units: 37

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

Latitude: 39:09:36.0N

Longitude: 123:33:57.0W

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
7	1	LGR	0	0	0	0	0	0	0	0	0
1	0	HGR									
8	1	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
30	4	RUN	0	0	0	0	50	50	0	0	0
4	2	SRN	0	100	0	0	0	0	0	0	0
34	6	TOTAL FLAT	0	33	0	0	33	33	0	0	0
1	1	TRP	0	0	0	0	0	0	0	0	0
36	36	MCP	25	31	26	3	6	9	0	0	0
2	2	CRP	50	0	0	50	0	0	0	0	0
1	1	PLP	0	0	0	0	0	0	0	0	0
40	40	TOTAL POOL	26	30	25	5	6	9	0	0	0
1	0	CUL									
120	47	TOTAL	23	30	22	4	9	12	0	0	0



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

Stream Name: Soda Creek

LLID: 1235659391601

Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Dry Units: 37

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

Latitude: 39:09:36.0N

Longitude: 123:33:57.0W

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
7	1	LGR	0	0	100	0	0	0	0
1	0	HGR	0	0	0	0	0	0	0
30	4	RUN	50	0	50	0	0	0	0
4	2	SRN	50	0	50	0	0	0	0
1	1	TRP	0	0	100	0	0	0	0
36	36	MCP	53	6	42	0	0	0	0
2	2	CRP	50	0	50	0	0	0	0
1	1	PLP	0	0	100	0	0	0	0

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

Stream Name: Soda Creek

LLID: 1235659391601

Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

Latitude: 39:09:36.0N

Longitude: 123:33:57.0W

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Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
95	73	27	0	100	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: Soda Creek LLID: 1235659391601 Drainage: Navarro River  
 Survey Dates: 5/28/2013 to 5/29/2013 Survey Length (ft.): 4215 Main Channel (ft.): 4215 Side Channel (ft.): 0  
 Confluence Location: Quad: NAVARRO Legal Description: T15NR15WS18 Latitude: 39:09:36.0N Longitude: 123:33:57.0W

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

**STREAM REACH: 1**

Channel Type: C4	Canopy Density (%): 95.4	Pools by Stream Length (%): 36.6
Reach Length (ft.): 4215	Coniferous Component (%): 73.4	Pool Frequency (%): 33.3
Riffle/Flatwater Mean Width (ft.): 3.9	Hardwood Component (%): 26.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 48
Range (ft.): 10 to 36	Vegetative Cover (%): 99.4	2 to 2.9 Feet Deep: 28
Mean (ft.): 16	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 15
Std. Dev.: 7	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 10
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 12	Mean Max Residual Pool Depth (ft.): 2.3
Water (F): 52 - 56 Air (F): 55 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating: 15
Dry Channel (ft): 1775	Riffles: 0	
	Pools: 4	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 23 Sand: 3 Gravel: 65 Sm Cobble: 8 Lg Cobble: 0 Boulder: 3 Bedrock: 0		
Embeddedness Values (%): 1. 17.5 2. 30.0 3. 32.5 4. 12.5 5. 7.5		

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

Stream Name: Soda Creek

LLID: 1235659391601

Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

Latitude: 39:09:36.0N

Longitude: 123:33:57.0W

**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	2	2	4.3
Sand / Silt / Clay	45	45	95.7

**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	10	10	21.3
Hardwood Trees	8	11	20.2
Coniferous Trees	29	26	58.5
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 3

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

StreamName: Soda Creek

LLID: 1235659391601

Drainage: Navarro River

Survey Dates: 5/28/2013 to 5/29/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS18

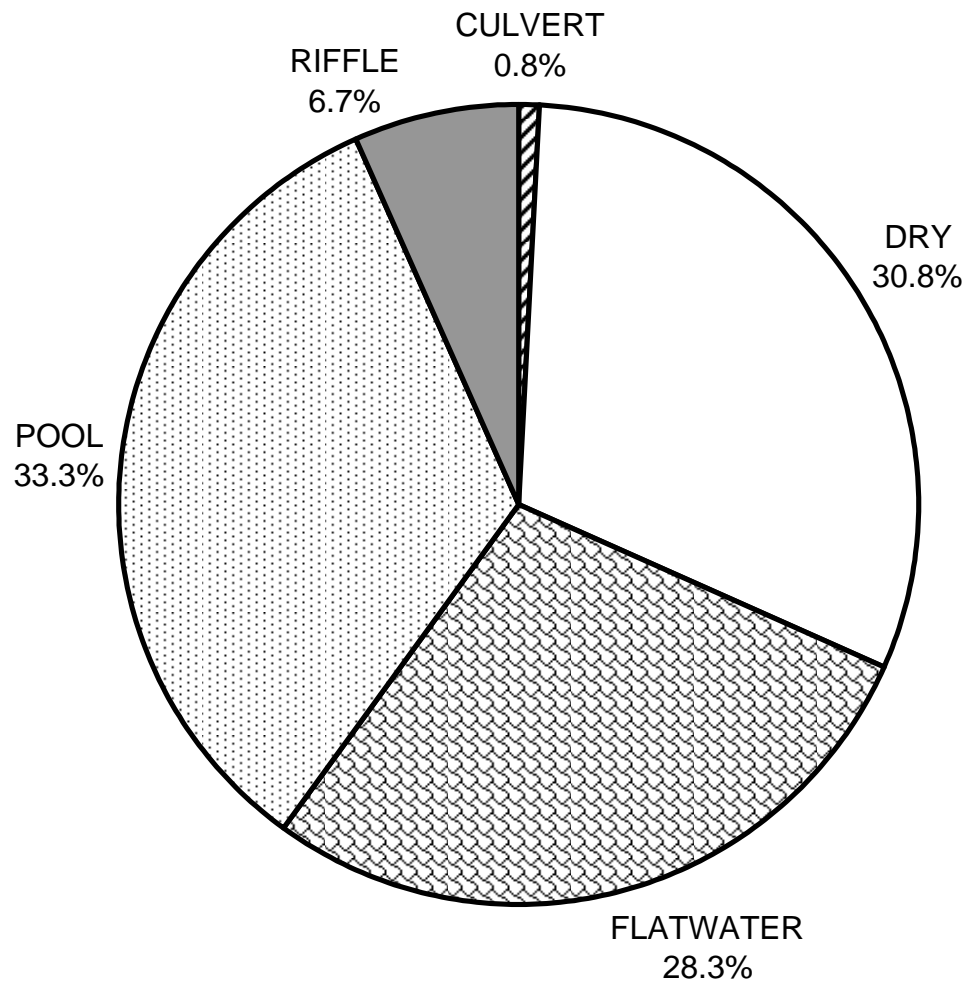
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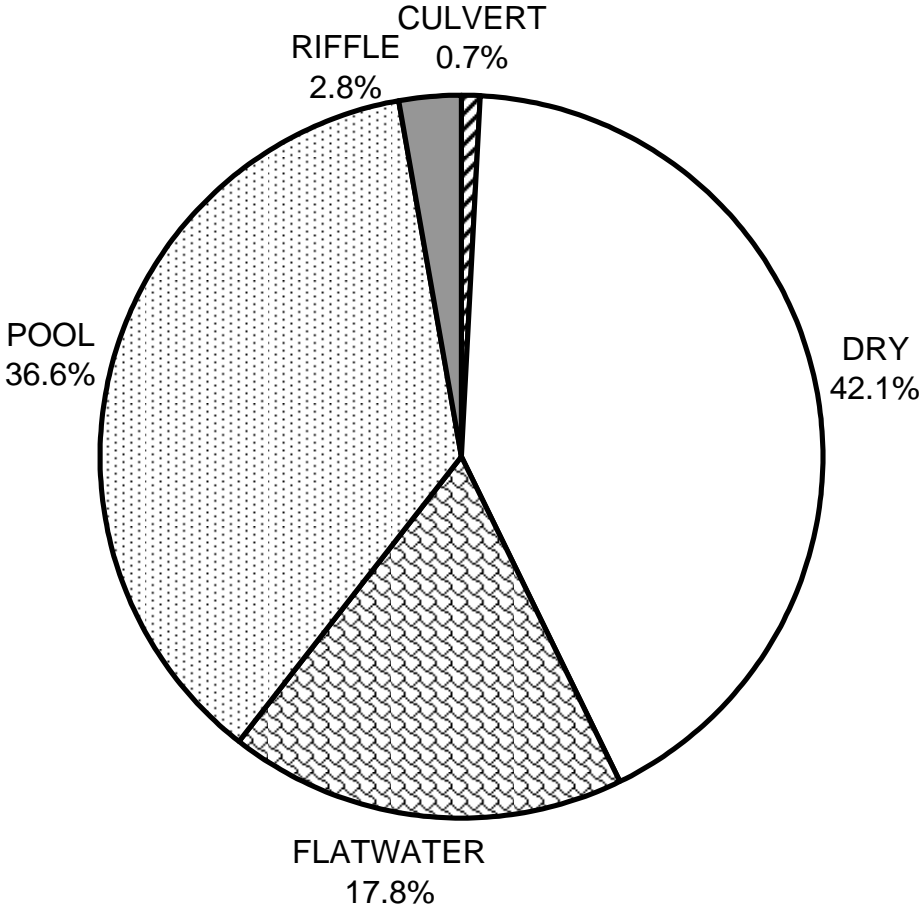
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	0	26
SMALL WOODY DEBRIS (%)	0	33	30
LARGE WOODY DEBRIS (%)	0	0	25
ROOT MASS (%)	0	0	5
TERRESTRIAL VEGETATION (%)	0	33	6
AQUATIC VEGETATION (%)	0	33	9
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	0

# SODA CREEK 2013 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

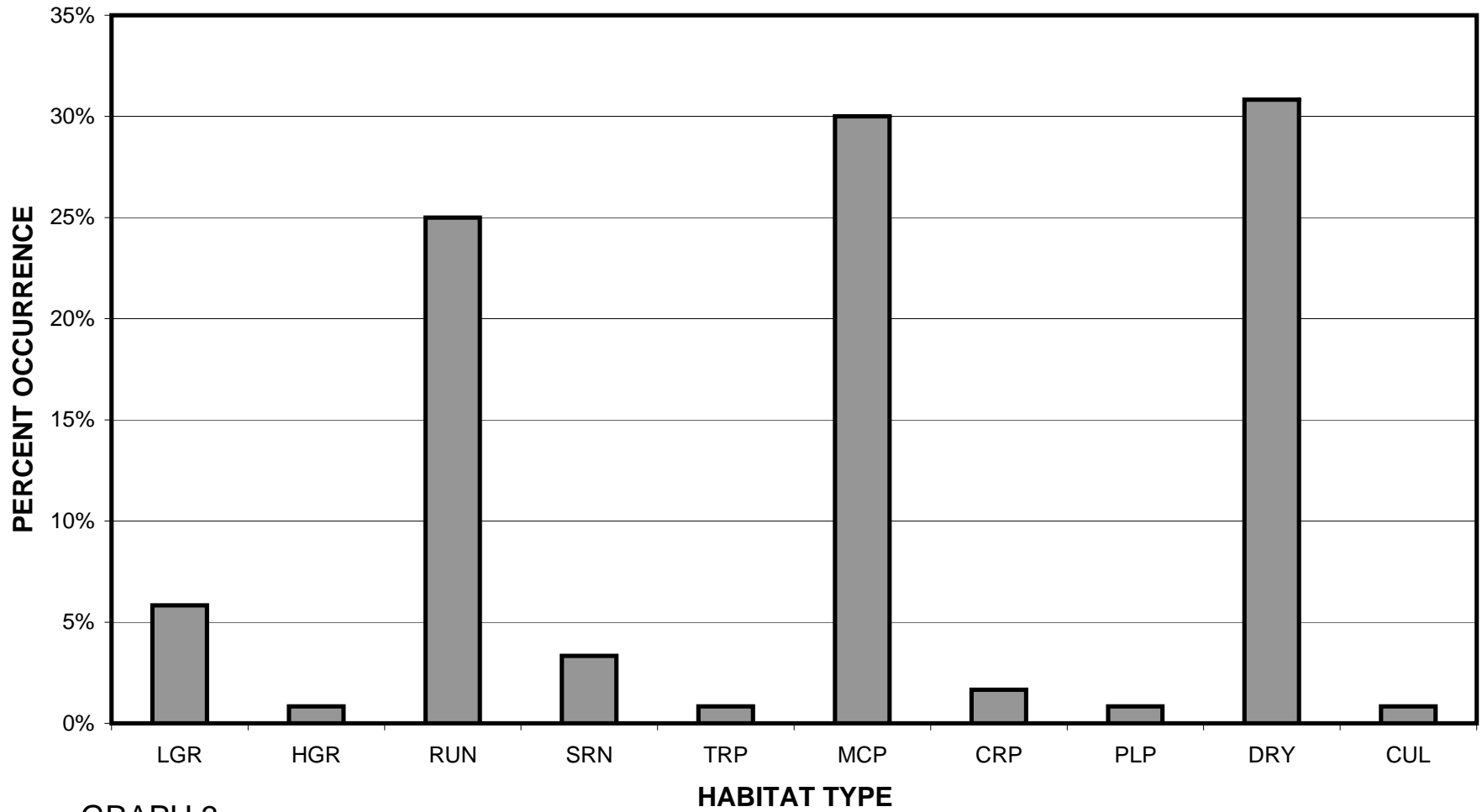
**SODA CREEK 2013  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

# SODA CREEK 2013

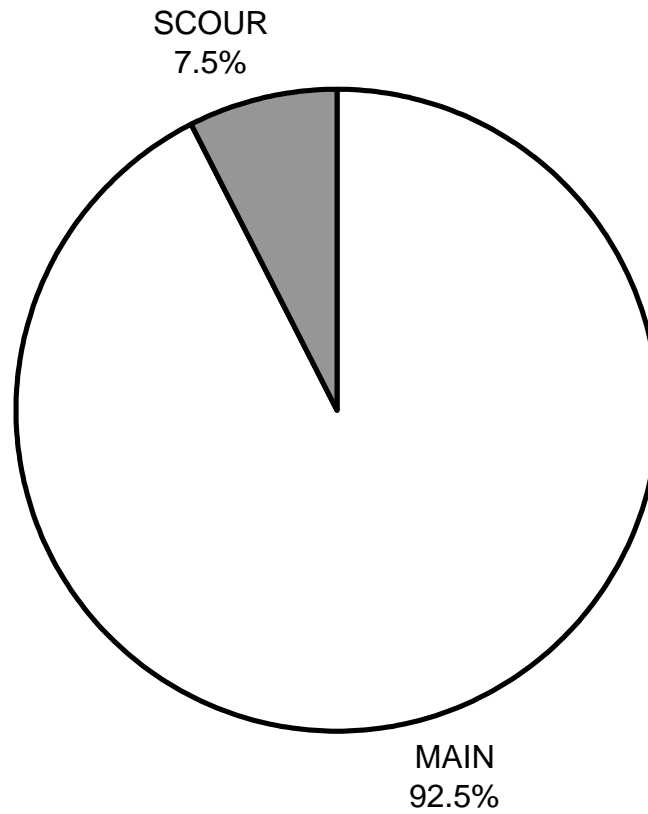
## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

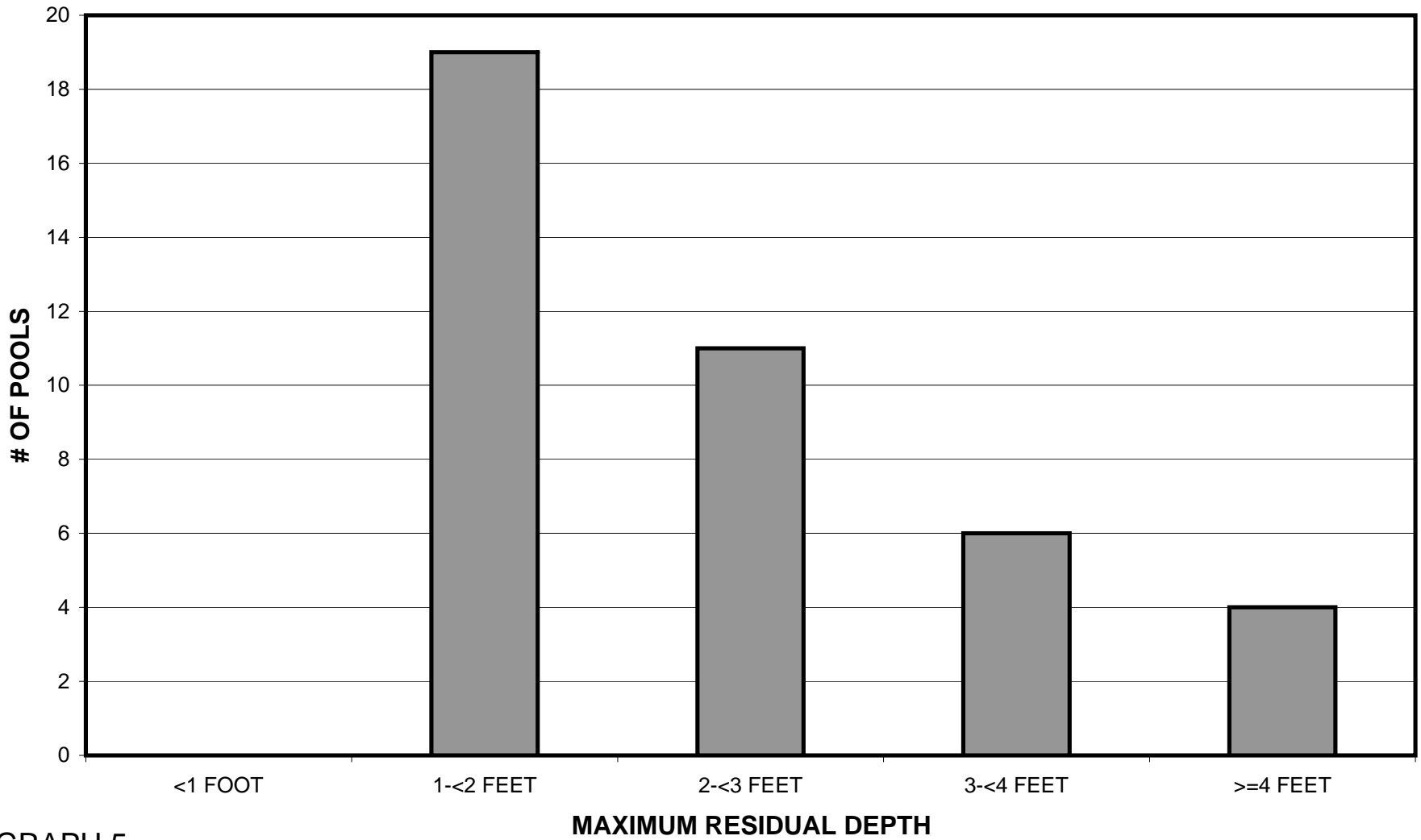


**SODA CREEK 2013  
POOL TYPES BY PERCENT OCCURRENCE**



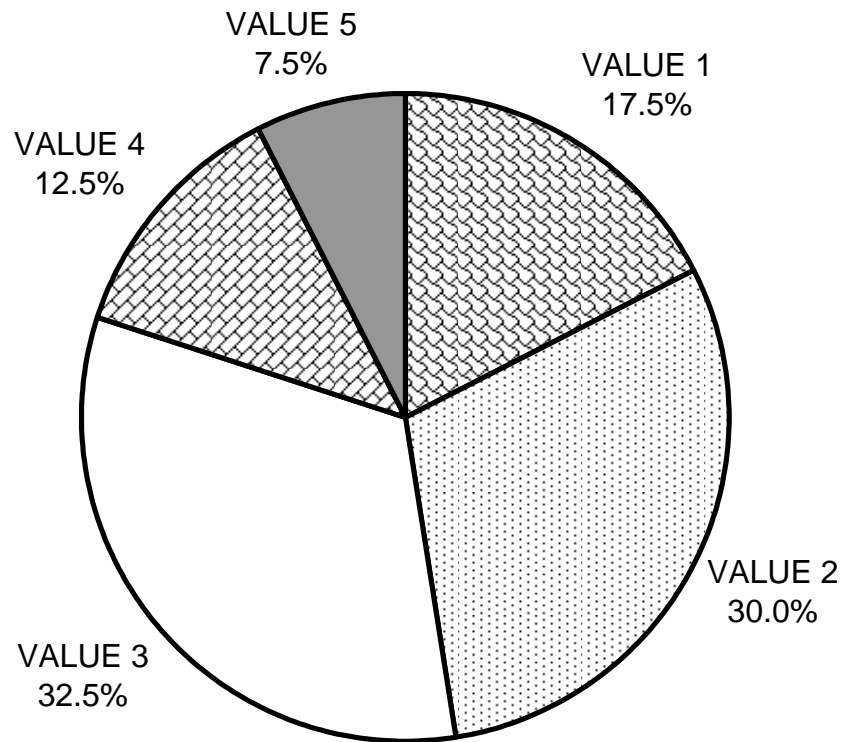
GRAPH 4

# SODA CREEK 2013 MAXIMUM DEPTH IN POOLS



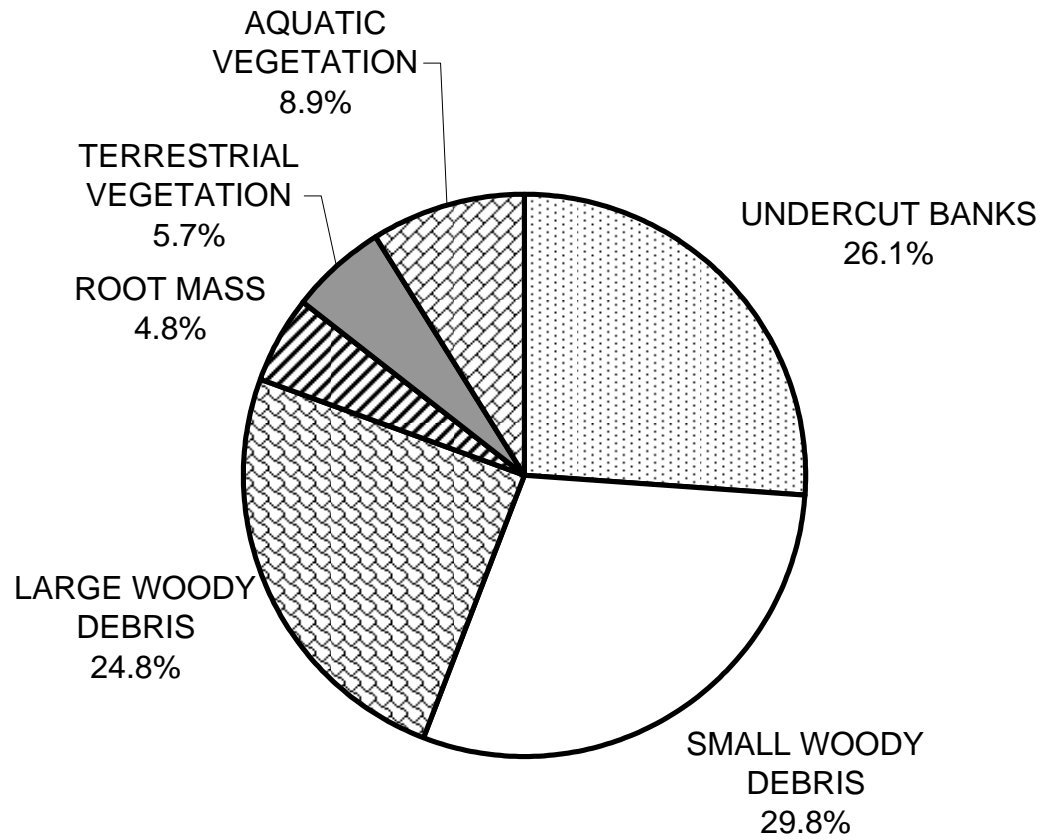
GRAPH 5

# SODA CREEK 2013 PERCENT EMBEDDEDNESS



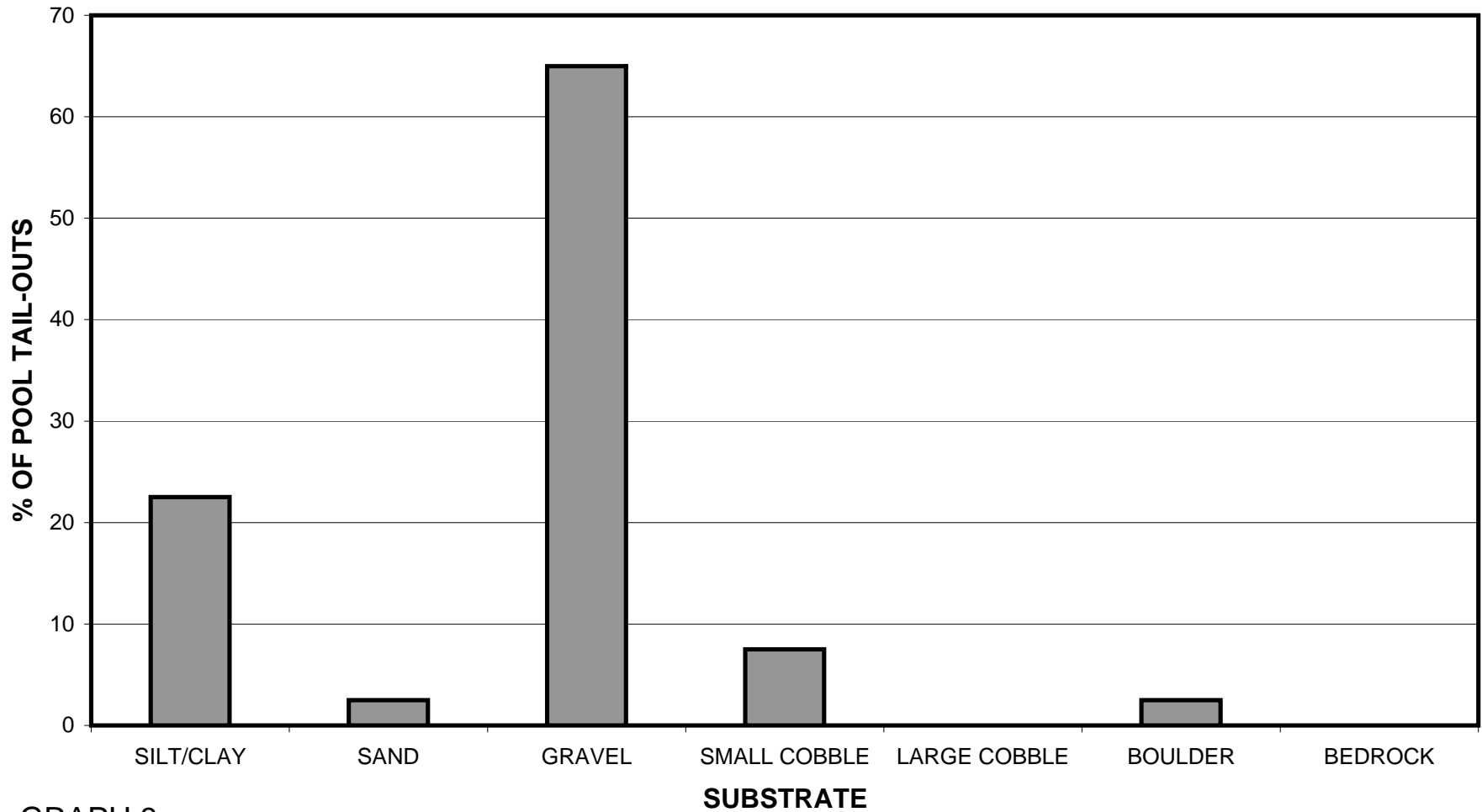
GRAPH 6

# SODA CREEK 2013 MEAN PERCENT COVER TYPES IN POOLS



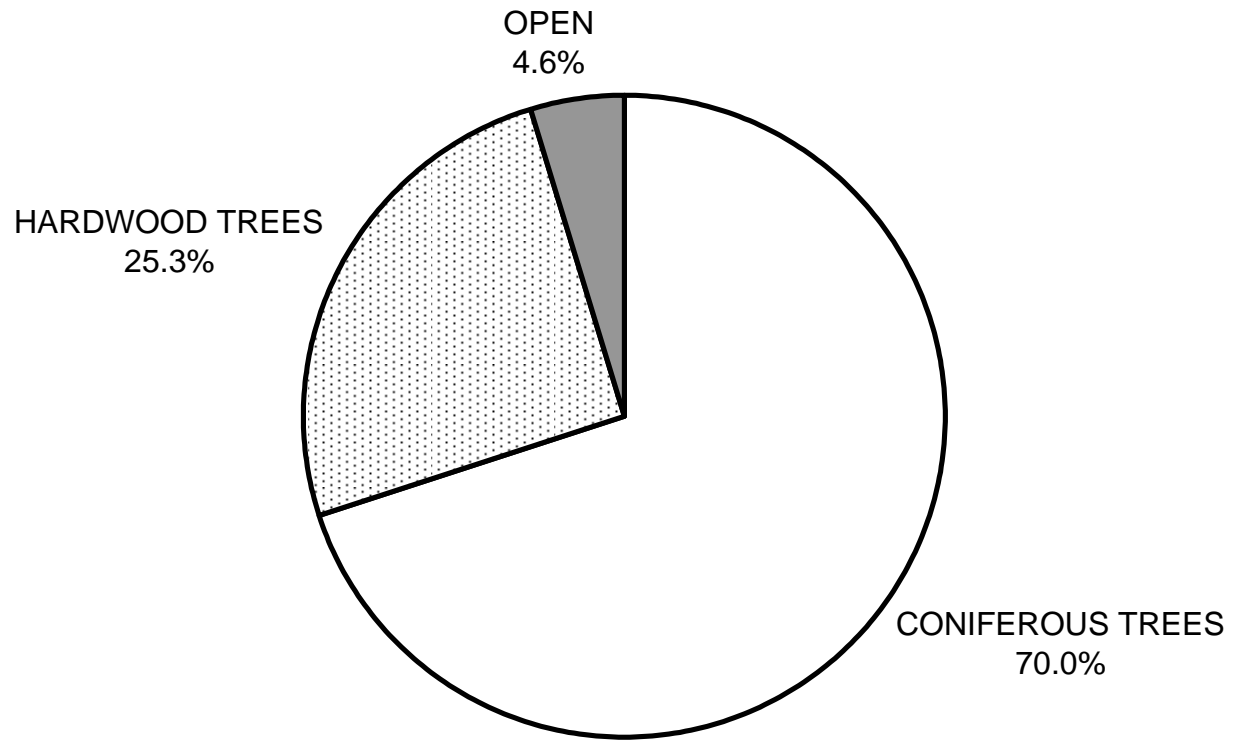
GRAPH 7

# SODA CREEK 2013 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



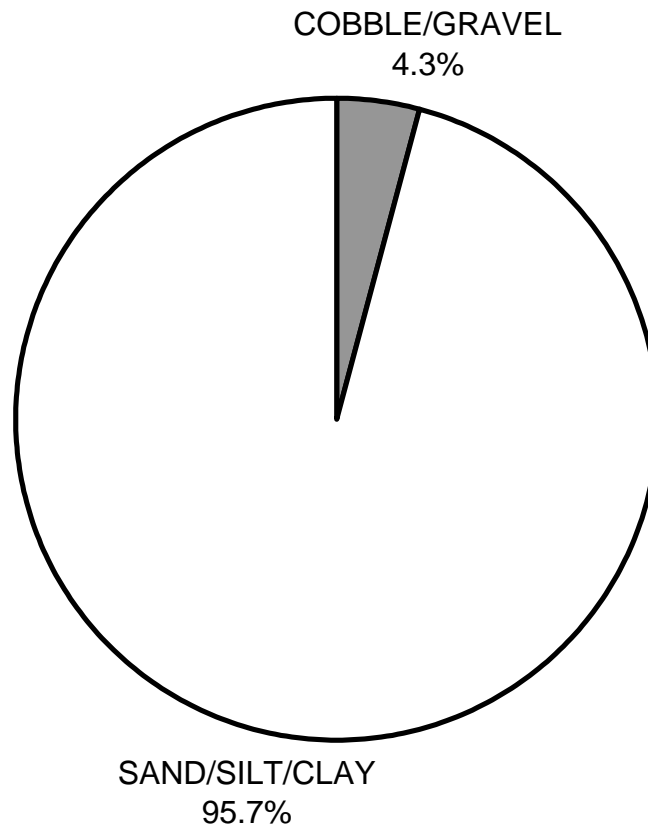
GRAPH 8

# SODA CREEK 2013 MEAN PERCENT CANOPY



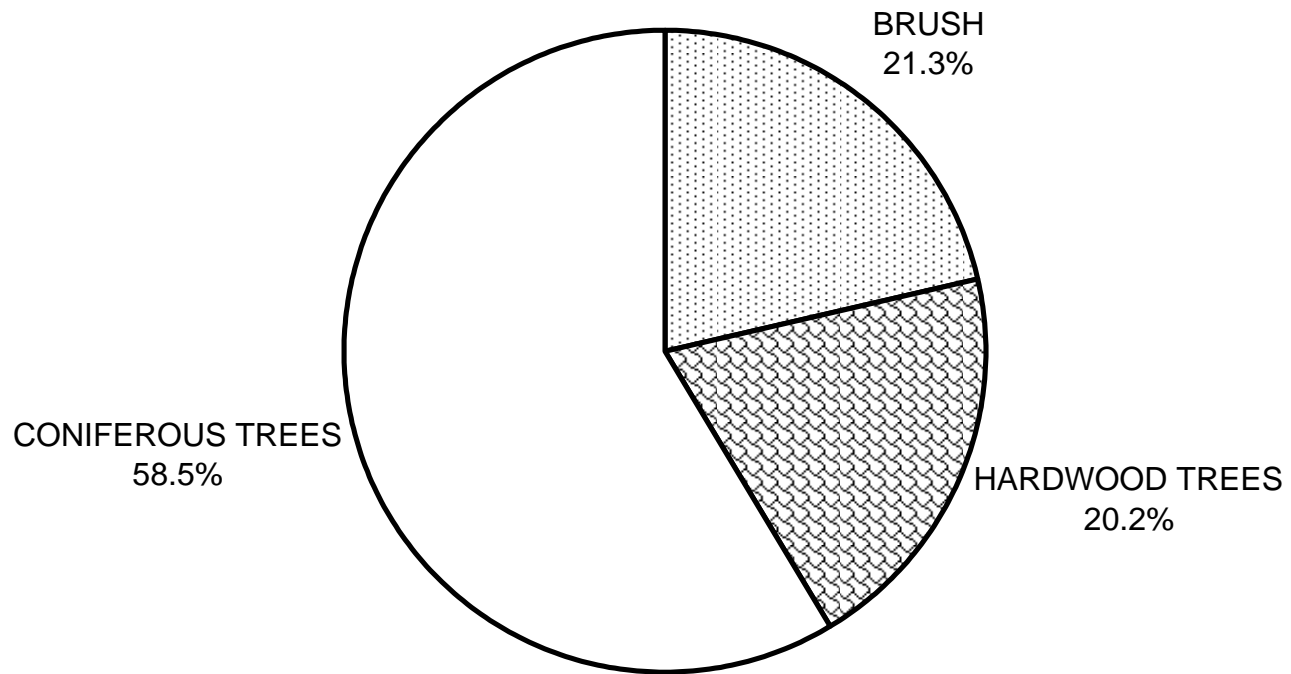
GRAPH 9

**SODA CREEK 2013  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

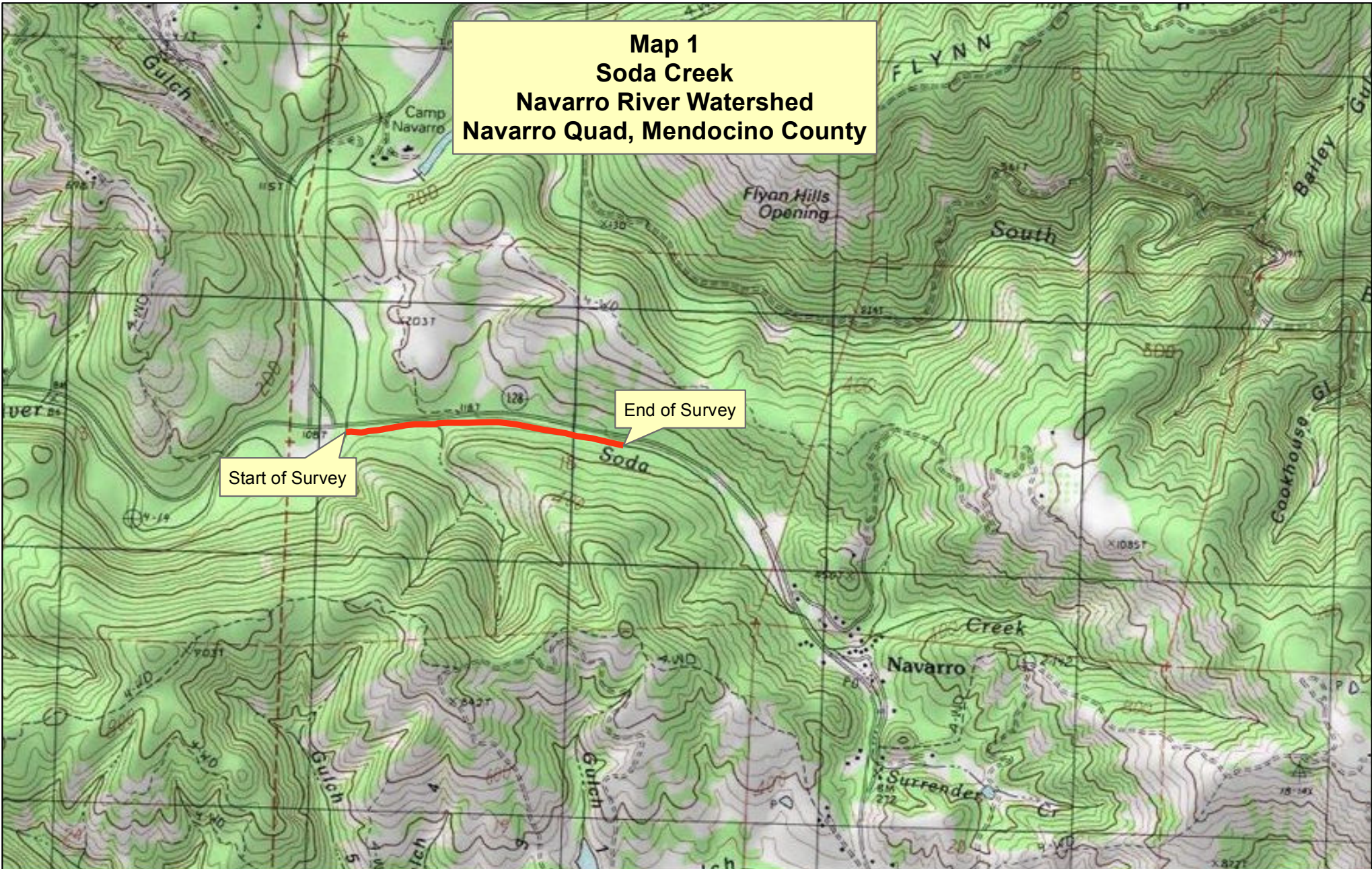
**SODA CREEK 2013  
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

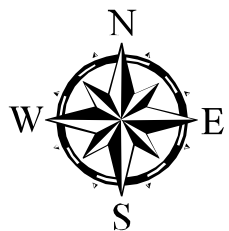


**Map 1  
Soda Creek  
Navarro River Watershed  
Navarro Quad, Mendocino County**



Start of Survey

End of Survey



— Channel Type C4

