

# STREAM INVENTORY REPORT

## South Fork Cottaneva Creek

### INTRODUCTION

A stream inventory was conducted from August 11 to August 26, 2008 on South Fork Cottaneva Creek. The survey began at the confluence with Cottaneva Creek and extended upstream 2.8 miles. Stream inventories and reports were also completed for three tributaries to South Fork Cottaneva Creek.

The South Fork Cottaneva 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 South Fork Cottaneva 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

South Fork Cottaneva Creek is a tributary to Cottaneva Creek, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). South Fork Cottaneva Creek's legal description at the confluence with Cottaneva Creek is T22N R18W S24. Its location is 39.7390° north latitude and 123.8180° west longitude, LLID number 1238169397391. South Fork Cottaneva Creek is a third order stream and has approximately 5.6 miles of blue line stream according to the USGS Westport 7.5 minute quadrangle. South Fork Cottaneva Creek drains a watershed of approximately 5.4 square miles. Elevations range from about 10 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 Highway 1 at Rockport, north of Fort Bragg.

### METHODS

The habitat inventory conducted in South Fork Cottaneva Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). 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

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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 South Fork Cottaneva 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". South Fork Cottaneva 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 South Fork Cottaneva 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 unsuited 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 South Fork Cottaneva 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 South Fork Cottaneva 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 South Fork Cottaneva 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 South Fork Cottaneva Creek. In addition, underwater observations were made at 30 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 Game. 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 South Fork Cottaneva 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 August 11 to August 26, 2008, was conducted by M. Westersund and B. Leonard (WSP). The total length of the stream surveyed was 14,741 feet with an additional 128 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.79 cfs on August 13, 2008.

South Fork Cottaneva Creek is an F4 channel type for 11,305 feet of the stream surveyed (Reach 1) and a B4 channel type for 3,436 feet of the stream surveyed (Reach 2). B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel-dominant substrates. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 57 degrees Fahrenheit. Air temperatures ranged from 51 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% flatwater units, 34% pool units, 28% riffle units, 1% no survey units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 51% flatwater units, 24% pool units, 24% riffle units and 1% no survey units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 33%; low gradient riffle units, 25%; and run

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units, 23% (Graph 3). Based on percent total length, run units made up 28%, mid-channel pool units 24%, and low gradient riffle units 22%.

A total of 124 pools were identified (Table 3). Main channel pools were the most frequently encountered at 99% (Graph 4), and comprised 99% 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. Two of the 124 pools (2%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 124 pool tail-outs measured, 71 had a value of 1 (57.3%); 43 had a value of 2 (34.7%); 10 had a value of 3 (8.1%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst.

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 4, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 22 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 22. Scour pools had a mean shelter rating of 20 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in South Fork Cottaneva Creek. Graph 7 describes the pool cover in South Fork Cottaneva Creek. Large woody debris is the dominant pool cover type followed by root mass.

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 45% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 45% of the pool tail-outs.

The mean percent canopy density for the surveyed length of South Fork Cottaneva Creek was 92%. Eight percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 62% and 38%, respectively. Graph 9 describes the mean percent canopy in South Fork Cottaneva Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 85%. The mean percent left bank vegetated was 81%. The dominant elements composing the structure of the stream banks consisted of 65% sand/silt/clay, 32% cobble/gravel, 2% boulder, and 1% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 55% of the units surveyed. Additionally, 34% of the units surveyed had coniferous trees as the dominant vegetation type, and 9% had brush as the dominant vegetation type (Graph 11).

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### BIOLOGICAL INVENTORY RESULTS

Thirty sites were snorkel surveyed for species composition and distribution in South Fork Cottaneva Creek on August 26, September 2 and September 4, 2008. Water temperatures were not taken during the survey periods. The sites were sampled by A. Renger, T. Tollefson, I. Mikus and S. McSmith (DFG).

In reach 1, which comprised the first 11,305 feet of stream, 20 sites were sampled. The reach sites yielded 174 young-of-the-year steelhead/rainbow trout (SH/RT), 20 age 1+ SH/RT and three age 2+ SH/RT and 17 coho.

In reach 2, ten sites were sampled starting approximately 11,306 from the confluence with Cottaneva Creek and continuing upstream 3,107 feet. The reach sites yielded 42 young-of-the-year SH/RT, 13 age 1+ SH/RT, and one age 2+ SH/RT.

The following chart displays the information yielded from these sites:

2008 South Fork Cottaneva Creek underwater observations.

Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
Reach 1: F4 Channel Type									
08/26/08	1	002	3.3	24	0	0	9	0	0
08/26/08	2	005	4.2	112	3	0	12	0	0
08/26/08	3	013	4.2	413	8	0	18	2	0
08/26/08	4	062	4.2	3,216	1	0	6	1	0
08/26/08	5	064	4.2	3,291	1	0	6	0	0
08/26/08	6	132	4.2	6,556	1	0	8	0	0
08/26/08	7	134	1.2	6,604	3	0	3	4	0
08/26/08	8	140	4.2	6,939	0	0	9	2	0
08/26/08	9	144	4.2	7,092	0	0	14	0	0
08/26/08	10	146	4.2	7,136	0	0	10	0	0
09/04/08	11	150	4.2	7,333	0	0	4	2	1
09/04/08	12	154	3.3	7,551	0	0	6	0	0

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Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
09/04/08	13	158	4.2	7,635	0	0	3	0	0
09/04/08	14	162	4.2	7,800	0	0	5	1	0
09/04/08	15	177	4.2	8,486	0	0	6	1	0
09/04/08	16	179	4.2	8,708	0	0	4	1	0
09/04/08	17	191	4.2	9,246	0	0	10	2	1
09/04/08	18	206	4.2	9,875	0	0	7	1	1
09/04/08	19	225	4.2	10,456	0	0	18	1	0
09/04/08	20	234	4.2	10,821	0	0	16	2	0
Reach 2 : B4 Channel Type									
09/02/08	21	249	3.4	11,343	0	0	5	2	0
09/02/08	22	252	1.1	11,430	0	0	8	3	0
09/02/08	23	264	5.6	11,775	0	0	11	1	0
09/02/08	24	275	4.2	12,054	0	0	4	0	0
09/02/08	25	290	4.2	12,601	0	0	5	1	0
09/02/08	26	304	3.3	12,969	0	0	3	1	0
09/02/08	27	315	4.2	13,349	0	0	1	1	0
09/02/08	28	331	4.2	13,725	0	0	3	4	1
09/02/08	29	344	4.2	14,103	0	0	1	0	0
09/02/08	30	354	3.3	14,411	0	0	1	0	0

DISCUSSION

South Fork Cottaneva Creek is an F4 channel type for the first 11,305 feet of stream surveyed and a B4 channel type for the remaining 3,436 feet. The suitability of F4 and B4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed



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boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days August 11 to August 26, 2008, ranged from 52 to 57 degrees Fahrenheit. Air temperatures ranged from 51 to 70 degrees Fahrenheit. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 51% of the total length of this survey, riffles 24%, and pools 24%. The pools are relatively shallow, with 2 of the 124 (2%) pools having a maximum residual depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum residual depth is at least three 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.

One hundred fourteen of the 124 pool tail-outs measured had embeddedness ratings of 1 or 2. Ten of the pool tail-outs had embeddedness ratings of 3 or 4. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

One hundred eleven of the 124 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 was 22. The shelter rating in the flatwater habitats was 5. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in South Fork Cottaneva Creek. Large woody debris is the dominant cover type in pools followed by root mass. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 92%. Reach 1 had a canopy density of 90%, Reach 2 had a canopy density of 93%.

The percentage of right and left bank covered with vegetation was 85% and 81%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

## RECOMMENDATIONS

- 1) South Fork Cottaneva Creek should be managed as an anadromous, natural production stream.

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- 2) Where feasible, design and engineer pool enhancement structures to increase the number of pools or deepen existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 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) 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 confluence with Cottaneva Creek. Reach 1 begins, a F4 channel type.
336	0012.00	Out of the influence of Cottaneva Creek.
901	0020.00	Culvert on the left bank.
2008	0041.00	Tributary #01 is located on the left bank, and contributes approximately 1% of the flow to South Fork Cottaneva Creek. The temperature downstream of the confluence was 54 degrees, the temperature of the tributary was 54 degrees, and the temperature upstream of the confluence was 54 degrees. The slope of the tributary appears accessible to fish, but there were no fish observed in the explored area.
3332	0065.00	Log debris accumulation (LDA) #01 contains 5 pieces of LWD and measures 4' high x 20' wide x 35' long with water flowing through and visible gaps. Sediment retention ranges from sand to gravel, and measures 20' wide x 45' long x 3' deep.

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3546	0066.02	LDA #02 contains 8 pieces of LWD and measures 7' high x 25' wide x 30' long with water flowing through and no visible gaps. Sediment retention ranges from sand to small cobble, and measures 40' wide x 60' long x 3' deep.
4366	0084.00	Tributary #02 is located on the left bank, and contributes approximately 2% of the flow to South Fork Cottaneva Creek. The temperature downstream of the confluence was 56 degrees, the temperature of the tributary was 56 degrees, and the temperature upstream of the confluence was 56 degrees. The slope of the tributary is 2% and it appears accessible to fish though no fish were observed in the 150 feet observed up the tributary.
5861	0117.00	LDA #03 contains 6 pieces of LWD and measures 5' high x 15' wide x 23' long with water flowing through and no visible gaps. Sediment retention ranges from gravel to small cobble, and measures 20' wide x 35' long x 3' deep.
6987	0142.00	Tributary #03 is located on the left bank, and contributes approximately 3% of the flow to South Fork Cottaneva Creek. The temperature downstream of the confluence was 53 degrees, the temperature of the tributary was 52 degrees, and the temperature upstream of the confluence was 55 degrees. The slope of the tributary is 2%, and a young of year was seen within 150 feet of the mouth of the tributary.
8211	0173.00	LDA #04 contains 4 pieces of LWD, with water flowing through and no visible gaps. There was no sediment retention.
8345	0174.00	LDA #05 contains 4 pieces of LWD and measures 10' high x 28' wide x 9' long with water flowing through and visible gaps. There was no sediment retention.
8791	0182.00	LDA #06 contains 1 piece of LWD and it measures 2' high x 16' wide x 1' long with water flowing through and no visible gaps. Sediment retention ranges from gravel to small cobble, and measures 15' wide x 10' long x 2' deep.
9037	0188.00	LDA #07 contains 2 pieces of LWD and it measures 2' high x 26' wide x 4' long with water flowing through and no visible gaps. Sediment retention ranges from sand to small cobble, and measures 20' wide x 30' long x 2' deep.
9672	0201.00	LDA #08 contains 20 pieces of LWD, with water flowing through and visible gaps. Sediment retention ranges from sand to small cobble, and measures 30' wide x 40' long x 5' deep.

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9875	0206.00	LDA #09 contains 10 pieces of LWD and it measures 10' high x 30' wide x 60' long with water flowing through and no visible gaps. Sediment retention ranges from sand to small cobble, and measures 5' wide x 55' long x 35' deep.
10798	0234.00	LDA #10 contains 4 pieces of LWD and it measures 8' high x 30' wide x 10' long with water flowing through and no visible gaps. Sediment retention ranges from silt to large cobble, and measures 30' wide x 35' long x 4' deep.
11267	0247.00	Tributary #03 (Kimball Gulch) enters on the right bank, contributes approximately 30% of the flow of South Fork Cottaneva Creek. The temperature downstream of the confluence was 53 degrees, the temperature of the tributary was 54 degrees, and the temperature upstream of the confluence was 54 degrees.
11305	0248.00	Reach 2 begins at the bottom of this unit, a B4 channel type.
11775	0264.00	LDA #11 contains 1 piece of LWD and it measures 4' high x 28' wide x 4' long with water flowing through and no visible gaps. Sediment retention ranges from silt to small cobble, and measures 20' wide x 25' long x 2' deep.
11882	0267.00	LDA #12 contains 3 pieces of LWD and it measures 7' high x 18' wide x 10' long with water flowing through and visible gaps. Sediment retention ranges from silt to small cobble, and measures 15' wide x 15' long x 3' deep.
11950	0270.00	LDA #13 contains 9 pieces of LWD and it measures 7' high x 45' wide x 14' long with water flowing through and visible gaps. Sediment retention ranges from sand to large cobble, and measures 20' wide x 50' long x 5' deep.
12075	0276.00	LDA #14 contains 9 pieces of LWD and it measures 10' high x 45' wide x 54' long with water flowing through and no visible gaps. Sediment retention ranges from silt to large cobble, and measures 45' wide x 55' long x 10' deep.
12110	0277.00	LDA #15 contains 6 pieces of LWD and it measures 5' high x 42' wide x 30' long with water flowing through and no visible gaps. Sediment retention ranges from silt to boulders, and measures 21' wide x 35' long x 3' deep.
12334	0284.00	LDA #16 contains 6 pieces of LWD and it measures 6' high x 16' wide x 12' long with no water flowing through and no visible gaps. Sediment

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		retention ranges from silt to large boulders, and measures 15' wide x 29' long x 3' deep.
12703	0294.00	LDA #17 contains 6 pieces of LWD and it measures 8' high x 24' wide x 18' long with water flowing through and no visible gaps. Sediment retention ranges from silt to large cobble, and measures 5' wide x 25' long x 3' deep.
12860	0299.00	LDA #18 contains 14 pieces of LWD and it measures 8' high x 50' wide x 46' long with water flowing through and visible gaps. Sediment retention ranges from silt to boulder, and measures 20' wide x 30' long x 3' deep.
13052	0306.00	LDA #19 contains 6 pieces of LWD and it measures 8' high x 20' wide x 17' long with water flowing through and visible gaps. Sediment retention ranges from silt to large boulders, and measures 15' wide x 4' long x 30' deep.
13331	0314.00	Tributary #04 is located on the left bank, and contributes approximately 0.1% of the flow to South Fork Cottaneva Creek. The temperature downstream of the confluence was 56 degrees, the temperature of the tributary was 56 degrees, and the temperature upstream of the confluence was 56 degrees. The slope of the tributary is 3% and appears to be accessible to fish, but there were no fish seen in the 50 feet explored.
13349	0315.00	LDA #20 contains 3 pieces of LWD and it measures 5' high x 28' wide x 25' long with water flowing through and visible gaps. Sediment retention ranges from silt to boulder, and measures 10' wide x 15' long x 4' deep.
13529	0324.00	LDA #21 contains 1 piece of LWD and it measures 6' high x 20' wide x 3' long with water flowing through and no visible gaps. Sediment retention ranges from silt to boulder, and measures 15' wide x 20' long x 3' deep.
13578	0325.00	LDA #22 contains 3 pieces of LWD and it measures 7' high x 20' wide x 15' long with water flowing through and visible gaps. Sediment retention ranges from silt to boulder, and measures 25' wide x 25' long x 3' deep.
14116	0345.00	A dry tributary on the right bank.
14313	0352.00	LDA #23 contains 3 pieces of LWD and it measures 6' high x 20' wide x 50' long with water flowing through and no visible gaps. Sediment

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retention ranges from silt to boulder, and measures 30' wide x 30' long x 4' deep.

14541      0361.00      At bottom of unit 361 the creek forks. An intermittent branch enters on the right bank.

14705      0363.00      LDA #24 contains 30 pieces of LWD and it measures 20' high x 50' wide x 100' long with water flowing through and visible gaps. Sediment retention ranges from silt to boulder, and measures 50' wide x 50' long x 8' deep.

14741      0364.00      End of survey due to LDA clogged with vegetation and sediment. Slope approximately 20%.

## 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: South Fork Cottaneva Creek

LLID: 1238169397391 Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24

Latitude: 39:44:21.0N

Longitude: 123:49:01.0W

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
2	0	DRY	0.5	24	48	0.3									
136	14	FLATWATER	37.0	56	7574	50.9	10.4	0.4	0.9	587	79827	257	34951		5
2	0	NOSURVEY	0.5	65	130	0.9									
124	124	POOL	33.7	29	3559	23.9	13.4	0.7	1.8	396	49131	412	51042	301	22
104	17	RIFFLE	28.3	34	3558	23.9	9.5	0.3	0.7	265	27598	70	7246		4
<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>		
368	155				14869					156556			93239		



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

Stream Name: South Fork Cottaneva Creek

LLID: 1238169397391

Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24

Latitude: 39:44:21.0N

Longitude: 123:49:01.0W

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 (%)
91	13	LGR	24.7	36	3231	21.7	10	0.2	2	285	25970	72	6568		4	94
13	4	HGR	3.5	25	327	2.2	9	0.3	1.2	200	2604	62	800		4	93
2	0	POW	0.5	31	62	0.4										
6	3	GLD	1.6	55	329	2.2	9	0.5	1	334	2004	145	871		4	90
83	7	RUN	22.6	51	4196	28.2	11	0.4	1.4	538	44680	219	18217		5	93
45	4	SRN	12.2	66	2987	20.1	11	0.4	1.2	862	38782	406	18290		4	94
123	123	MCP	33.4	29	3534	23.8	13	0.7	3.4	397	48831	412	50652	301	22	91
1	1	PLP	0.3	25	25	0.2	12	1.0	1.7	300	300	390	390	300	20	91
2	0	DRY	0.5	24	48	0.3										
2	0	NS	0.5	65	130	0.9										

Total Units  
368

Total Units Fully Measured  
155

Total Length (ft.)  
14869

Total Area (sq.ft.)  
163171

Total Volume (cu.ft.)  
95788

**Table 3 - Summary of Pool Types**

Stream Name: South Fork Cottaneva Creek

LLID: 1238169397391

Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24

Latitude: 39:44:21.0N

Longitude: 123:49:01.0W

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
123	123	MAIN	99	29	3534	99	13.4	0.7	397	48831	301	36665	22
1	1	SCOUR	1	25	25	1	12.0	1.0	300	300	300	300	20

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
124	124	3559	49131	36965

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

Stream Name: South Fork Cottaneva Creek

LLID: 1238169397391

Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24

Latitude: 39:44:21.0N

Longitude: 123:49:01.0W

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
123	MCP	99	1	1	86	70	34	28	2	2	0	0
1	PLP	1	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
124	1	1	87	70	34	27	2	2	0	0

Mean Maximum Residual Pool Depth (ft.): 1.8

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

Stream Name: South Fork Cottaneva Creek

LLID: 1238169397391

Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Dry Units: 2

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24

Latitude: 39:44:21.0N

Longitude: 123:49:01.0W

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
91	11	LGR	0	11	25	19	5	0	0	14	0
13	3	HGR	0	30	0	10	0	0	0	60	0
104	14	TOTAL RIFFLE	0	15	19	17	4	0	0	24	0
2	0	POW									
6	3	GLD	0	23	0	27	17	0	0	0	0
83	7	RUN	0	26	7	41	26	0	0	0	0
45	4	SRN	0	73	23	5	0	0	0	0	0
136	14	TOTAL FLAT	0	39	10	28	16	0	0	0	0
123	123	MCP	2	16	49	17	3	0	1	11	2
1	1	PLP	0	0	100	0	0	0	0	0	0
124	124	TOTAL POOL	2	16	49	17	3	0	1	11	2
2	0	NS									
368	152	TOTAL	1	18	43	18	4	0	1	11	2

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

Stream Name: South Fork Cottaneva Creek

LLID: 1238169397391

Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Dry Units: 2

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24 Latitude: 39:44:21.0N

Longitude: 123:49:01.0W

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
91	13	LGR	0	0	77	15	0	8	0
13	4	HGR	0	0	25	0	0	75	0
2	0	POW	0	0	0	0	0	0	0
6	3	GLD	0	0	67	0	33	0	0
83	7	RUN	0	0	57	43	0	0	0
45	4	SRN	0	0	75	25	0	0	0
123	123	MCP	2	29	52	7	1	9	0
1	1	PLP	0	0	100	0	0	0	0

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

Stream Name: South Fork Cottaneva Creek

LLID: 1238169397391

Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24

Latitude: 39:44:21.0N

Longitude: 123:49:01.0W

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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
92	38	62	0	85	81

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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: South Fork Cottaneva Creek LLID: 1238169397391 Drainage: Rockport  
 Survey Dates: 8/11/2008 to 8/26/2008 Survey Length (ft.): 14869 Main Channel (ft.): 14741 Side Channel (ft.): 128  
 Confluence Location: Quad: WESTPORT Legal Description: T22NR18WS24 Latitude: 39:44:21.0N Longitude: 123:49:01.0W

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

**STREAM REACH: 1**

Channel Type: F4	Canopy Density (%): 91.0	Pools by Stream Length (%): 25.8
Reach Length (ft.): 11305	Coniferous Component (%): 27.4	Pool Frequency (%): 34.9
Riffle/Flatwater Mean Width (ft.): 10.4	Hardwood Component (%): 72.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 63
Range (ft.): 16 to 30	Vegetative Cover (%): 80.7	2 to 2.9 Feet Deep: 34
Mean (ft.): 23	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 2
Std. Dev.: 5	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.8	Occurrence of LWD (%): 40	Mean Max Residual Pool Depth (ft.): 1.8
Water (F): 52 - 57 Air (F): 51 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating: 22
Dry Channel (ft): 0	Riffles: 1	
	Pools: 5	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 47 Sm Cobble: 49 Lg Cobble: 3 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 62.1 2. 32.2 3. 5.7 4. 0.0 5. 0.0		

**STREAM REACH: 2**

Channel Type: B4	Canopy Density (%): 92.8	Pools by Stream Length (%): 18.0
Reach Length (ft.): 3436	Coniferous Component (%): 62.7	Pool Frequency (%): 31.1
Riffle/Flatwater Mean Width (ft.): 9.0	Hardwood Component (%): 37.3	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 89
Range (ft.): 8 to 23	Vegetative Cover (%): 87.9	2 to 2.9 Feet Deep: 11
Mean (ft.): 18	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 4	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.8	Occurrence of LWD (%): 49	Mean Max Residual Pool Depth (ft.): 1.5
Water (F): 53 - 55 Air (F): 52 - 63	LWD per 100 ft.:	Mean Pool Shelter Rating: 21
Dry Channel (ft): 48	Riffles: 2	
	Pools: 11	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 38 Sm Cobble: 35 Lg Cobble: 22 Boulder: 5 Bedrock: 0		
Embeddedness Values (%): 1. 45.9 2. 40.5 3. 13.5 4. 0.0 5. 0.0		

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

Stream Name: South Fork Cottaneva Creek

LLID: 1238169397391

Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24

Latitude: 39:44:21.0N

Longitude: 123:49:01.0W

**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	1	3	1.3
Boulder	3	3	1.9
Cobble / Gravel	55	45	32.3
Sand / Silt / Clay	96	104	64.5

**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	3	1	1.3
Brush	11	18	9.4
Hardwood Trees	96	75	55.2
Coniferous Trees	45	61	34.2
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2



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

StreamName: South Fork Cottaneva Creek

LLID: 1238169397391

Drainage: Rockport

Survey Dates: 8/11/2008 to 8/26/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS24

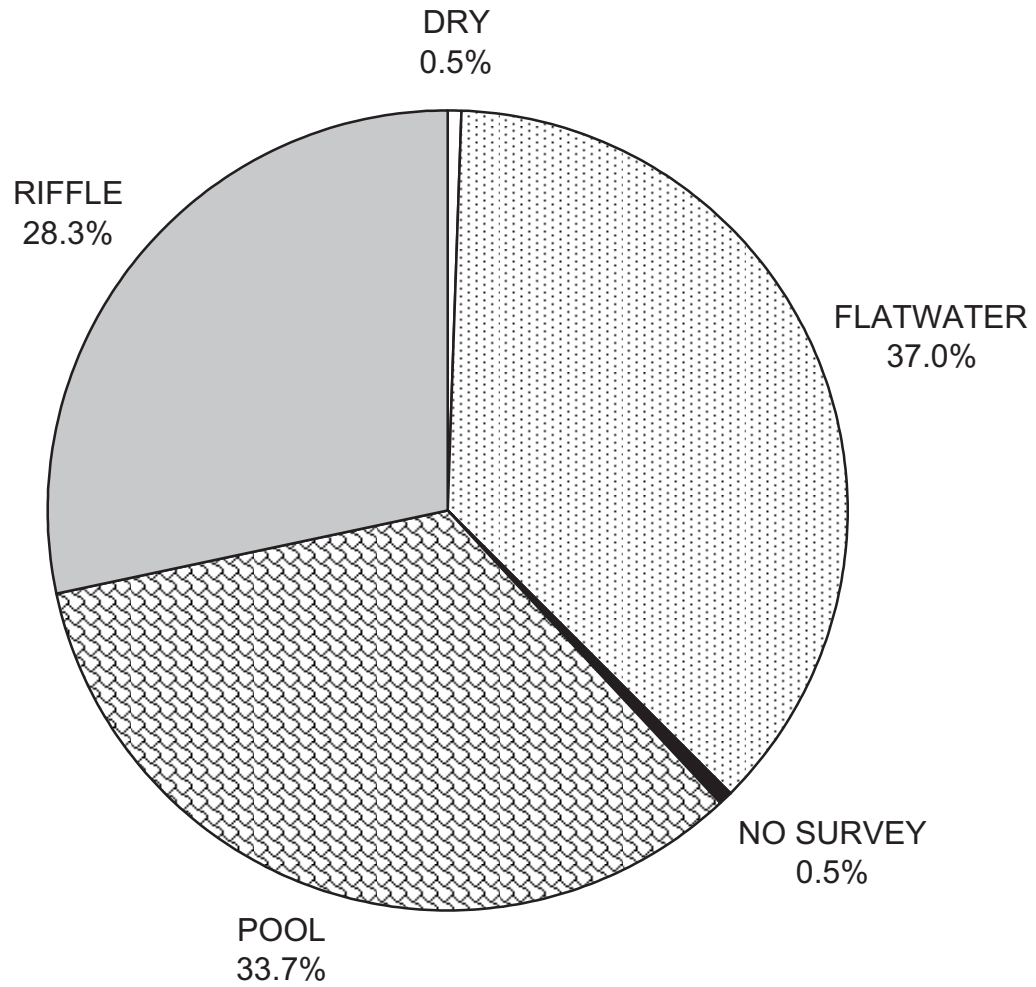
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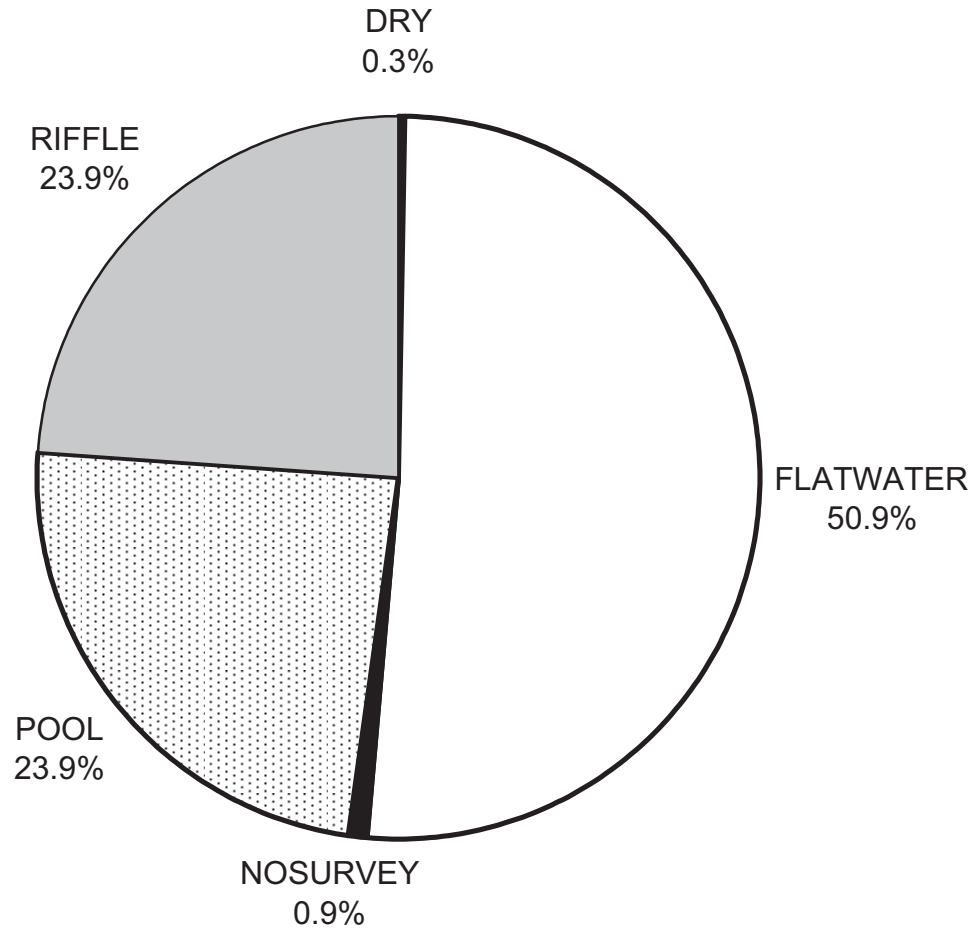
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	0	2
SMALL WOODY DEBRIS (%)	15	39	16
LARGE WOODY DEBRIS (%)	19	10	49
ROOT MASS (%)	17	28	17
TERRESTRIAL VEGETATION (%)	4	16	3
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	1
BOULDERS (%)	24	0	11
BEDROCK LEDGES (%)	0	0	2

# SOUTH FORK COTTANEVA CREEK 2008 HABITAT TYPES BY PERCENT OCCURRENCE



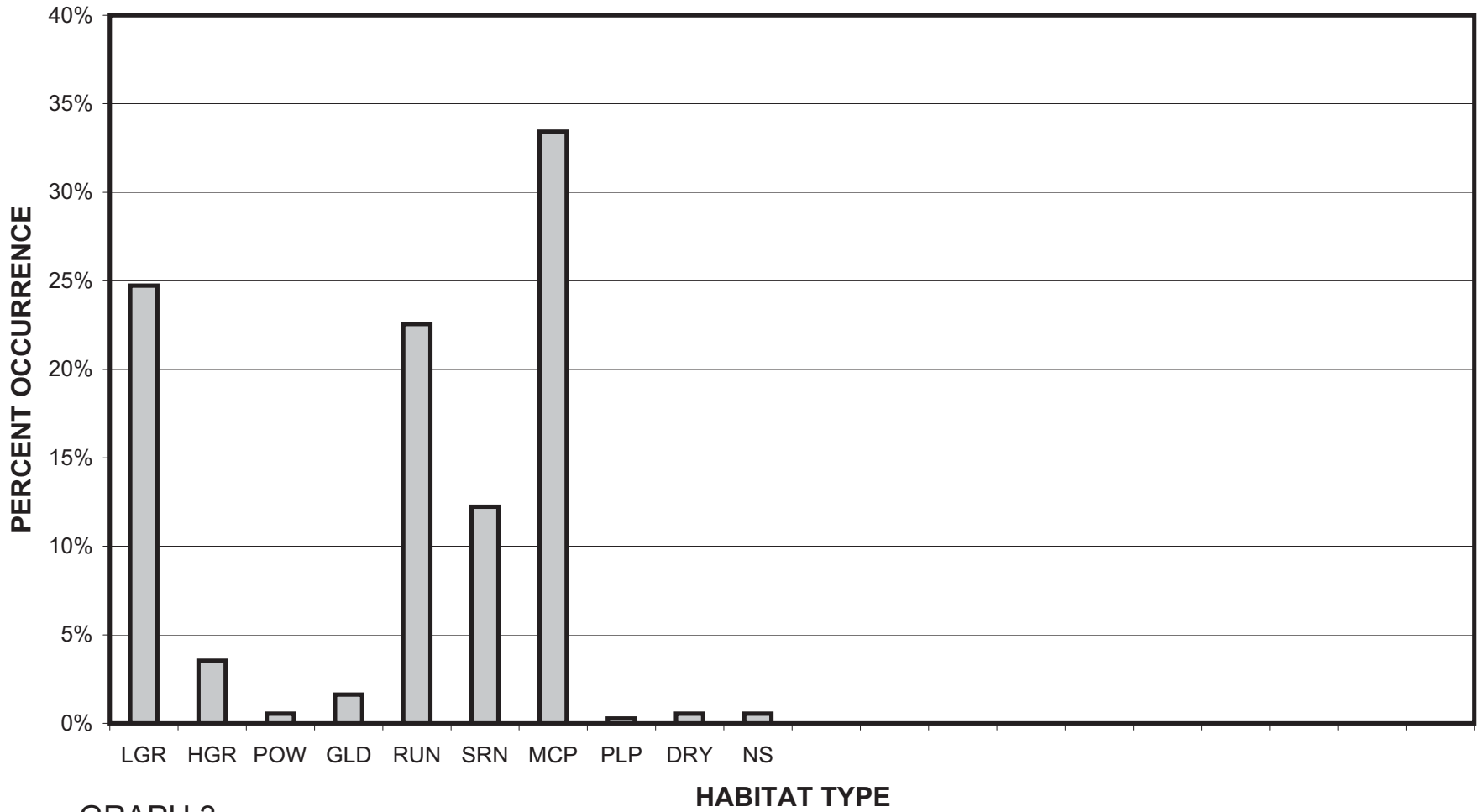
GRAPH 1

# SOUTH FORK COTTANEVA CREEK 2008 HABITAT TYPES BY PERCENT TOTAL LENGTH



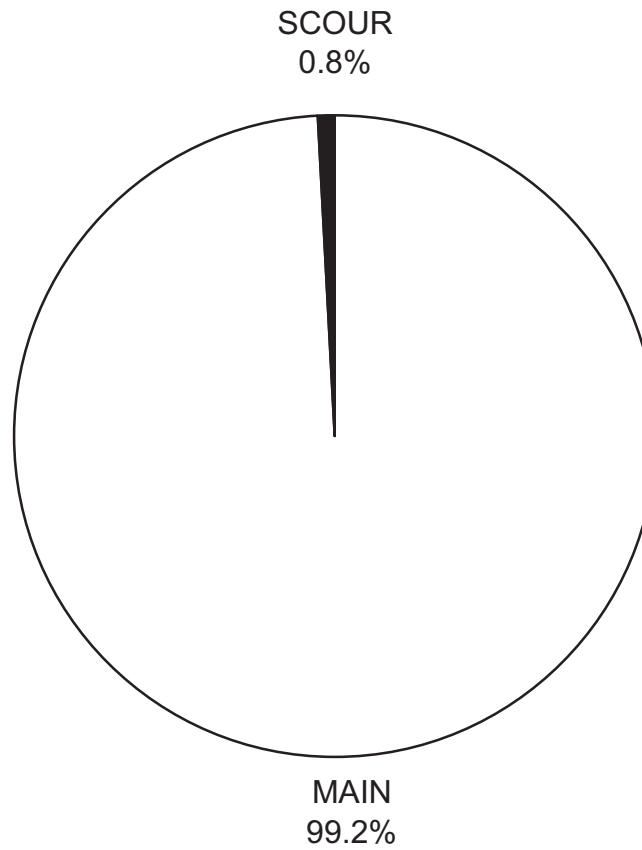
GRAPH 2

# SOUTH FORK COTTANEVA CREEK 2008 HABITAT TYPES BY PERCENT OCCURRENCE



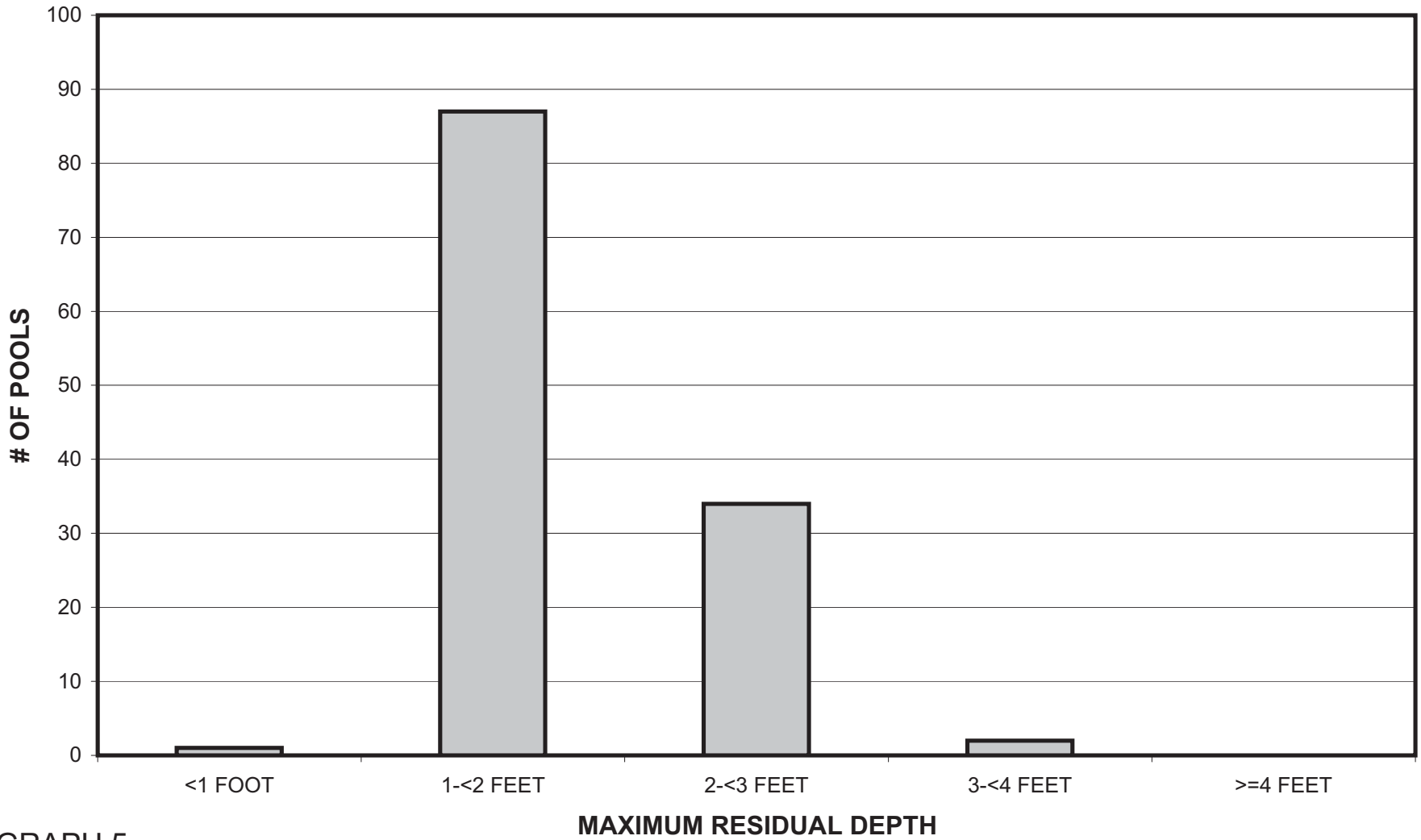
GRAPH 3

# SOUTH FORK COTTANEVA CREEK 2008 POOL TYPES BY PERCENT OCCURRENCE



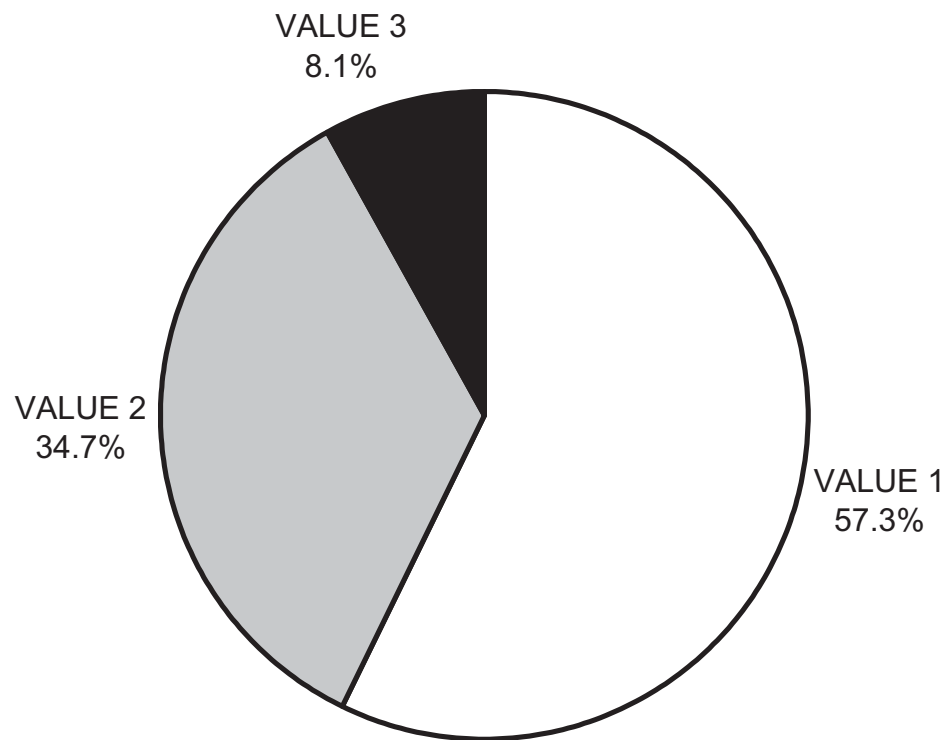
GRAPH 4

# SOUTH FORK COTTANEVA CREEK 2008 MAXIMUM DEPTH IN POOLS



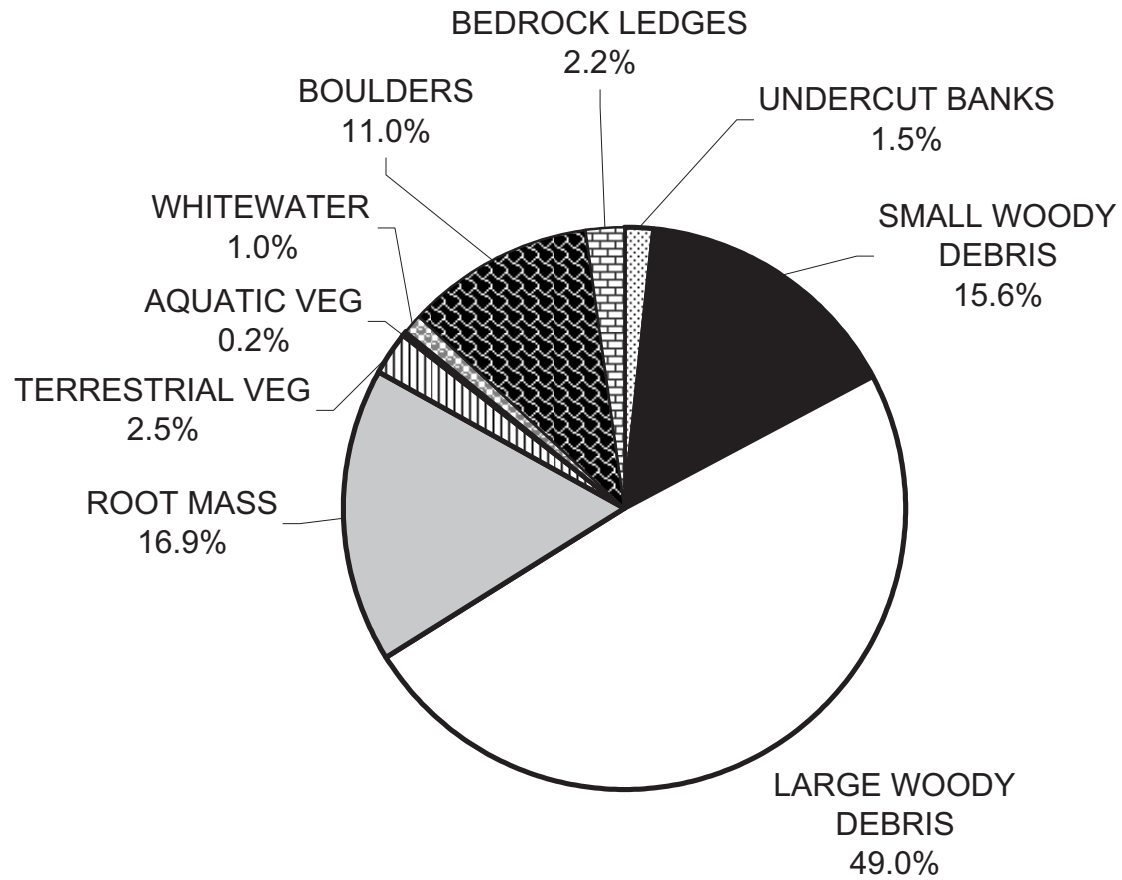
GRAPH 5

# SOUTH FORK COTTANEVA CREEK 2008 PERCENT EMBEDDEDNESS



GRAPH 6

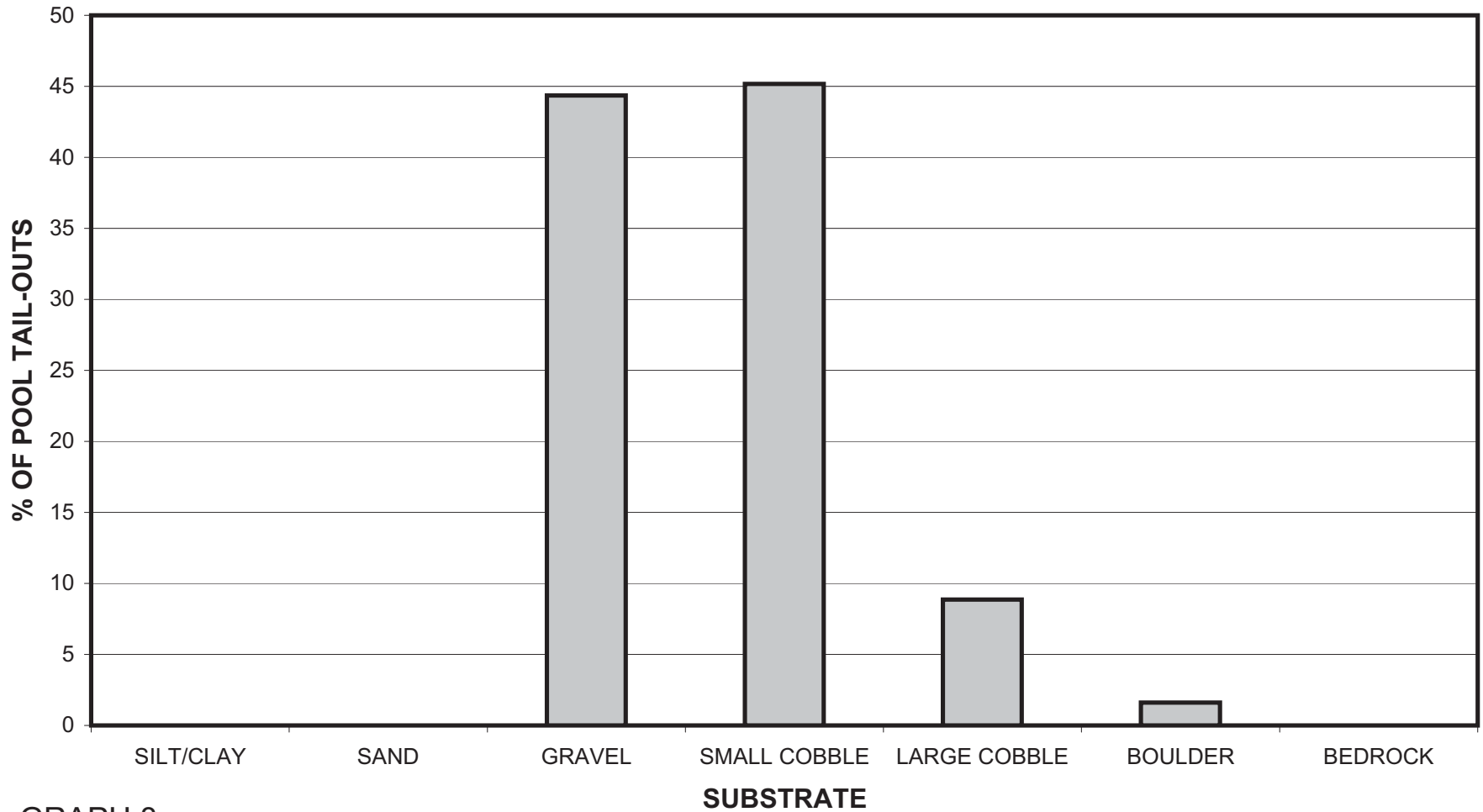
# SOUTH FORK COTTANEVA CREEK 2008 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

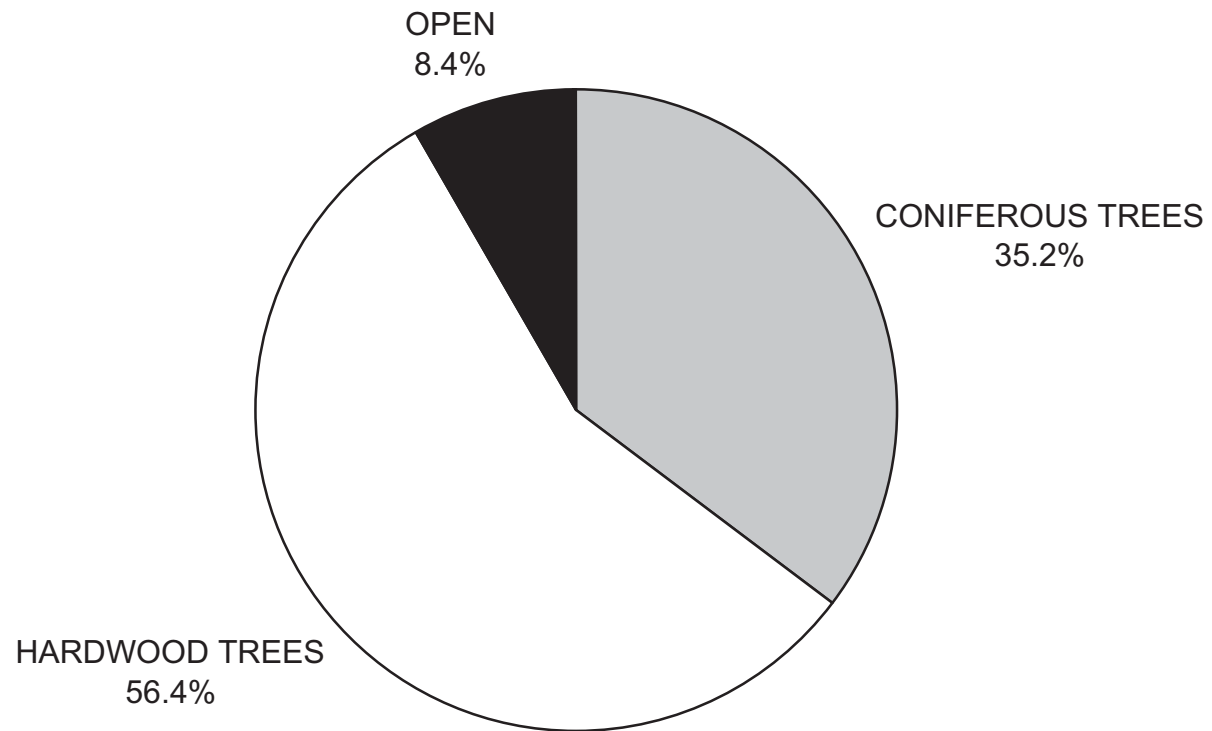


# SOUTH FORK COTTANEVA CREEK 2008 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



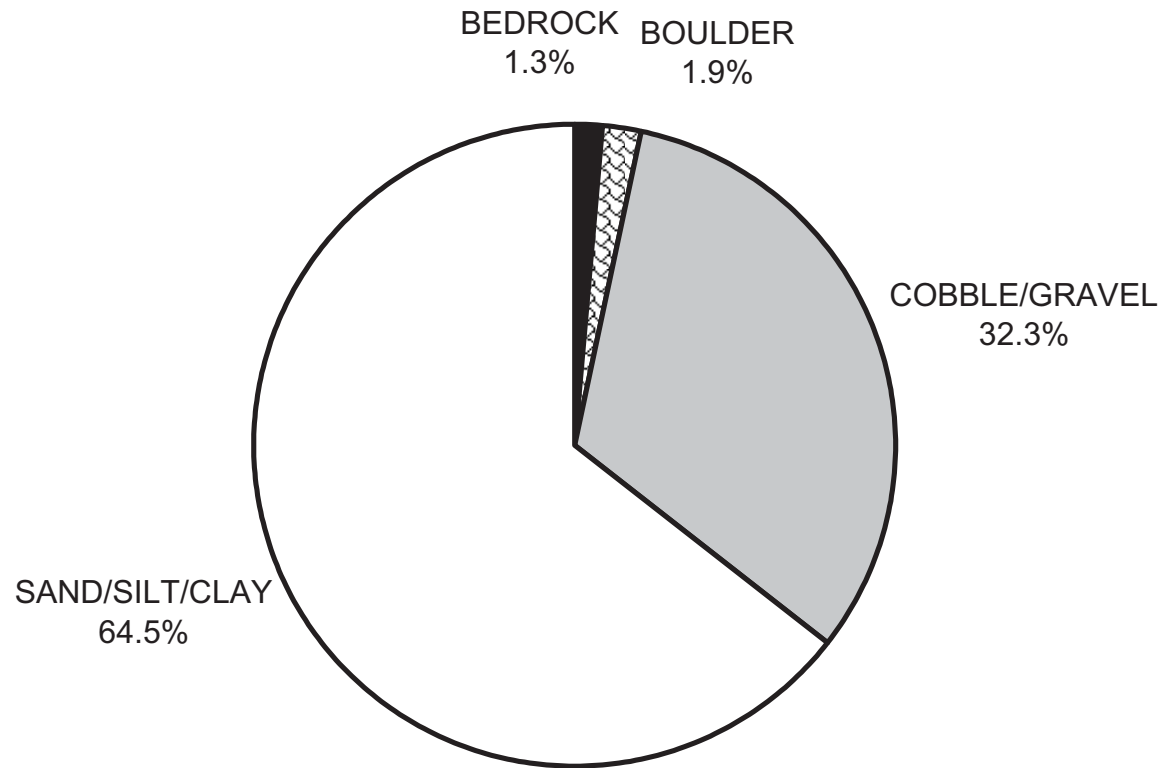
GRAPH 8

# SOUTH FORK COTTANEVA CREEK 2008 MEAN PERCENT CANOPY



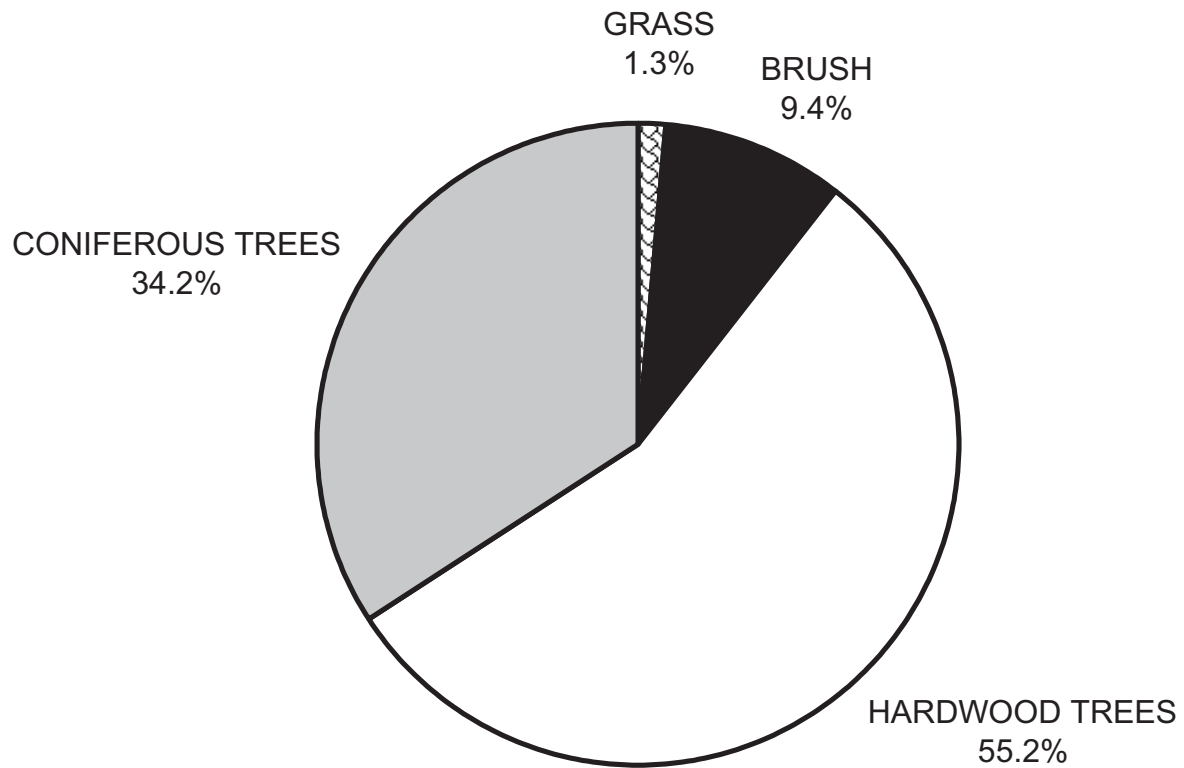
GRAPH 9

# SOUTH FORK COTTANEVA CREEK 2008 DOMINANT BANK COMPOSITION IN SURVEY REACH



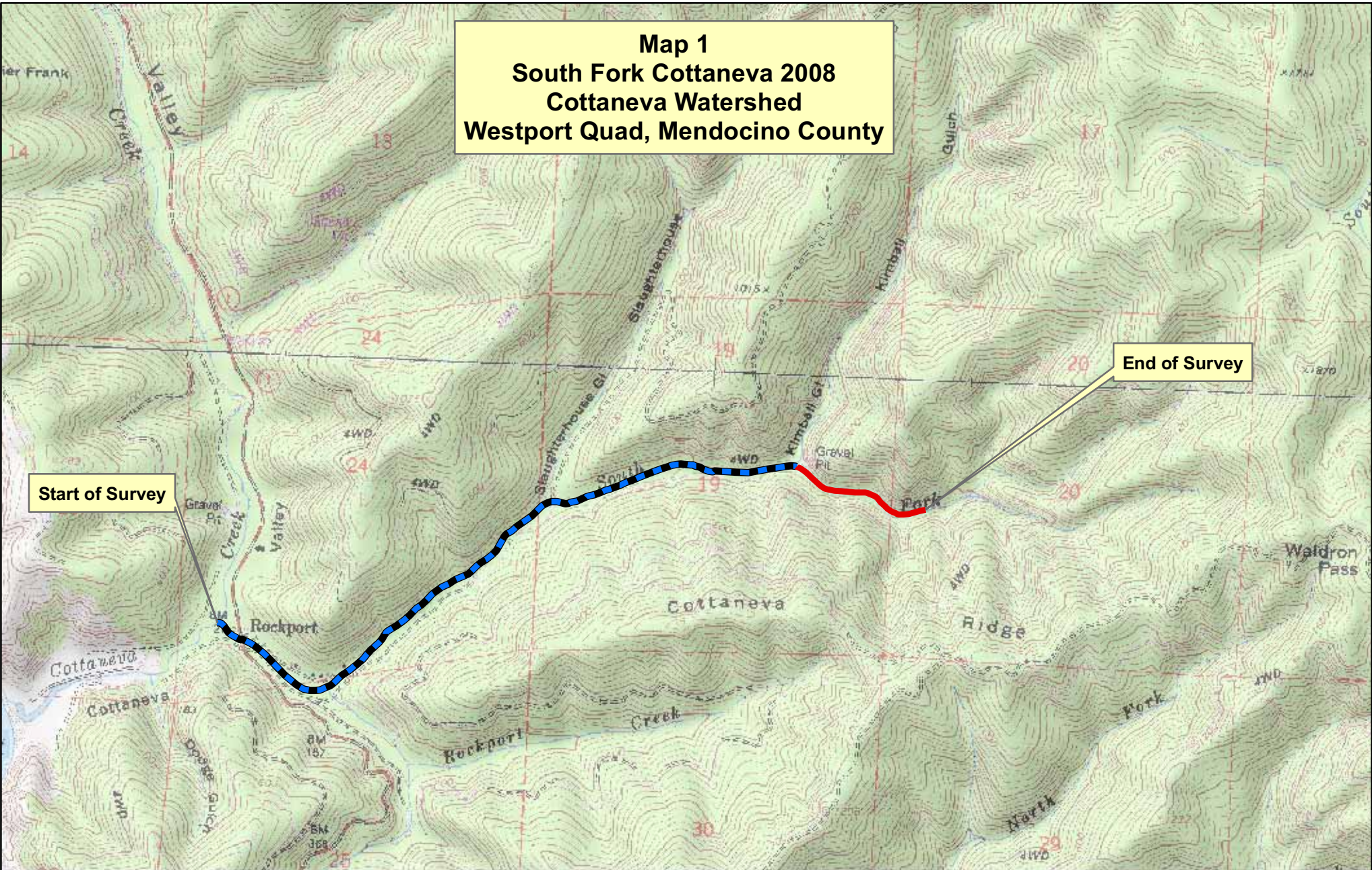
GRAPH 10

# SOUTH FORK COTTANEVA CREEK 2008 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



**Map 1**  
**South Fork Cottaneva 2008**  
**Cottaneva Watershed**  
**Westport Quad, Mendocino County**



Start of Survey

End of Survey

**Legend**

-  Reach2, B4 Channel Type
-  Reach1, F4 Channel Type

