

STREAM INVENTORY REPORT

Cottaneva Creek

INTRODUCTION

A stream inventory was conducted from August 28 to September 16, 2008 on Cottaneva Creek. The survey began at the confluence with Pacific Ocean and extended upstream 4.9 miles. Stream inventories and reports were also completed for four tributaries to Cottaneva Creek.

The 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 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

Cottaneva Creek drains to the Pacific Ocean in Mendocino County, California (Map 1). Cottaneva Creek's legal description at the confluence with Pacific Ocean is T22N R18W S23. Its location is 39.7360 north latitude and 123.8291 west longitude, LLID number 1238282397361. Cottaneva Creek is a third order stream and has approximately 4.7 miles of blue line stream according to the USGS Westport and Hales Grove 7.5 minute quadrangles. Cottaneva Creek drains a watershed of approximately 16.4 square miles. Elevations range from about 0 feet at the mouth of the creek to 1,100 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 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 their lengths are measured. All pool units are measured for maximum depth, depth of pool tail

Cottaneva Creek

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 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". 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.

Cottaneva Creek

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In 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 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 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 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.

Cottaneva Creek

10. Large Woody Debris Count:

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

11. Average Bankfull Width:

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

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Cottaneva Creek. In addition, underwater observations were made at 17 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

Cottaneva Creek

Graphics are produced from the tables using Microsoft Excel. Graphics developed for 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 28 to September 16, 2008, was conducted by E. Hicks, J. Braren, and B. Quaglieri (WSP). The total length of the stream surveyed was 25,612 feet with an additional 298 feet of side channel. The first 1,909 feet of the stream was not surveyed.

Stream flow was not measured on mainstem Cottaneva Creek during the survey.

Cottaneva Creek is a F4 channel type for 7,039 feet of the stream surveyed (Reach 1), and a C4 channel type for 18,871 feet of the stream surveyed (Reach 2). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with gravel-dominant substrates. 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 51 to 58 degrees Fahrenheit. Air temperatures ranged from 44 to 64 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 50% pool units, 37% flatwater units, and 13% riffle units (Graph 1). Based on total length of Level II habitat types there were 50% flatwater units, 42% pool units, and 8% riffle units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 43%; run units, 20%; and step run units 17% (Graph 3). Based on percent total length, mid-channel pool units made up 36%, step run units 34% and run units 15%.

Cottaneva Creek

A total of 164 pools were identified (Table 3). Main channel pools were the most frequently encountered at 87% (Graph 4), and comprised 88% 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. Forty-six of the 164 pools (28%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 164 pool tail-outs measured, 110 had a value of 1 (67.1%); 48 had a value of 2 (29.3%); 1 had a value of 3 (0.6%); 1 had a value of 4 (0.6%); 4 had a value of 5 (2.4%) (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 unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 3, flatwater habitat types had a mean shelter rating of 17, and pool habitats had a mean shelter rating of 35 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 36. Scour pools had a mean shelter rating of 28 and backwater pools had a mean shelter rating of 30 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 93% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 5% of pool the tail-outs.

The mean percent canopy density for the surveyed length of Cottaneva Creek was 93%. Seven percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 78% and 22%, respectively. Graph 9 describes the mean percent canopy in Cottaneva Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 57% sand/silt/clay, 40% cobble/gravel, 2% boulder, and 1% bedrock (Graph 10). Deciduous trees were the dominant vegetation type observed in 67% of the units surveyed. Additionally, 19% of the units surveyed had brush as the dominant vegetation type, and 11% had coniferous trees as the dominant vegetation type (Graph 11).

Cottaneva Creek

BIOLOGICAL INVENTORY RESULTS

Seventeen sites were snorkel surveyed for species composition and distribution in Cottaneva Creek on September 17 to September 18, 2008. The sites were sampled by S. McSmith and I. Mikus (DFG).

In reach 1, which comprised the first 7,039 feet of stream surveyed, 9 sites were sampled. The reach sites yielded 28 young-of-the-year steelhead/rainbow trout (SH/RT), 2 age 1+ SH/RT and 0 age 2+ SH/RT, 1 young-of-the-year coho, 33 three-spine stickleback, and 1 unidentified sculpin.

In reach 2, 8 sites were sampled starting approximately 7,040 feet from the start of survey and continuing upstream 18,573 feet from the start of survey. The reach sites yielded 65 young-of-the-year SH/RT, 3 age 1+ SH/RT, 1 age 2+ SH/RT, 9 young-of-the-year coho, and 24 three-spine stickleback.

The following chart displays the information yielded from these sites:

2008 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									
09/17/08	1	056	4.2	6,407	0	0	5	0	0
09/17/08	2	058	4.2	6,477	0	0	0	0	0
09/17/08	3	059	3.3	6,545	0	0	2	0	0
09/17/08	5	061	3.3	6,770	0	0	2	0	0
09/17/08	4	062	4.2	6,835	0	0	3	0	0
09/17/08	6	068	4.2	7,179	0	0	1	0	0
09/17/08	7	074	3.4	7,489	1	0	7	1	0
09/17/08	8	093	4.2	8,859	0	0	7	1	0
09/17/08	9	094	3.3	8,926	0	0	1	0	0
Reach 2: C4 Channel Type									
09/18/08	10	095	4.2	8,948	0	0	1	1	0

Cottaneva Creek

Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
09/18/08	11	097	4.2	9,027	0	0	8	0	0
09/18/08	12	098	4.2	9,108	0	0	6	0	0
09/18/08	13	104	4.2	9,731	0	0	7	0	0
09/18/08	14	107	4.2	9,931	0	0	2	0	0
09/18/08	15	109	4.2	10,032	0	0	9	0	0
09/18/08	16	271	4.2	23,181	3	0	10	0	0
09/18/08	17	322	4.2	27,521	6	0	22	2	1

DISCUSSION

Cottaneva Creek is an F4 channel type for the first 7,039 feet of stream surveyed and a C4 channel type for the remaining 18,871 feet. The suitability of F4 and C4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. 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 August 28 to September 16, 2008, ranged from 51 to 58 degrees Fahrenheit. Air temperatures ranged from 44 to 64 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 50% of the total length of this survey, riffles 8%, and pools 42%. The pools are relatively shallow, with 46 of the 164 (28%) 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 of 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 deepen pool habitat is recommended.

One hundred fifty-eight of the 164 pool tail-outs measured had embeddedness ratings of 1 or 2. Two of the pool tail-outs had embeddedness ratings of 3 or 4. Four of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Cottaneva Creek

One hundred sixty of the 164 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 35. The shelter rating in the flatwater habitats was 17. 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 Cottaneva Creek. Small woody debris is the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover 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 93%. Reach 1 had a canopy density of 96%, Reach 2 had a canopy density of 91.

The percentage of right and left bank covered with vegetation was 97% and 98%, 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) Cottaneva Creek should be managed as an anadromous, natural production stream.
- 2) 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.
- 3) 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.
- 4) There are sections where the stream is being impacted from cattle in the riparian zone. Alternatives should be explored with the grazer and developed if possible.
- 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.

Cottaneva Creek

COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the upstream end of the estuary approximately 1,909 feet from the confluence with the Pacific Ocean. This unit is within the influence of the estuary. The channel type above is an F4.
22	0002.00	Bridge #01 to the Rockport Beach campground is at the top of this unit measuring 10.5' wide x 10.7' high x 88' long and is constructed of steel and wood. This bridge is not a barrier to salmonids.
22	0002.00	Salmonid young-of-the-year (YOY) was observed.
1077	0014.00	There are remnants of a relic bridge in this unit.
1296	0019.00	There are remnants of a relic bridge with concrete blocks and a wood-plank buttress on the right bank of this unit.
1617	0023.00	A Channel Type of F4 was taken in this unit. Reach 1 extends through Habitat Unit #094.
1840	0026.00	There is rip rap on the left bank of this unit.
2032	0028.00	There are remnants of a relic trestle in this unit.
2480	0031.00	Tributary #01 (South Fork Cottaneva Creek) is flowing from the left bank contributing 15% of the flow to Cottaneva Creek. The temperature downstream of the confluence as well as the temperature of the tributary was 56 degrees Fahrenheit. The temperature upstream of the confluence was 54 degrees Fahrenheit. The tributary has a gradient of 2% and is accessible to fish with salmonid YOY observed within the first 200' of the tributary.
2649	0033.00	There are remnants of a relic bridge in this unit. Log debris accumulation (LDA) #01 contains nine pieces of large woody debris (LWD) and measures 6' high x 29' wide x 37' long with water flowing through and visible gaps.
2879	0035.00	There are remnants of a relic bridge in this unit.

Cottaneva Creek

3543	0044.00	There is rip rap on the left bank of this unit alongside Highway 1. LDA #02 contains eleven pieces of LWD and measures 6' high x 24' wide x 12' long with water flowing through and visible gaps.
4636	0059.00	Bridge #02 is located at the top of this unit measuring 17' wide x 7.3' high x 37' long and is constructed of steel and wood.
4724	0060.00	There was salmonid YOY observed. LDA #03 contains twelve pieces of LWD and measures 8' high x 26' wide x 18' long with water flowing through and visible gaps.
5040	0065.00	LDA #04 contains twelve pieces of LWD and measures 5' high x 23' wide x 53' long with water flowing through and visible gaps.
6533	0088.00	LDA #05 contains fourteen pieces of LWD and measures 7' high x 25' wide x 25' long with water flowing through and visible gaps.
8948	0095.00	Reach 2 begins at the bottom of this unit, the channel type is now a C4.
8074	0107.00	Tributary #02 (Powderhouse Gulch), located on the left bank, contributes to 2% of the flow to Cottaneva Creek. The temperature downstream of the confluence was 54 degrees, the temperature of the tributary was 52 degrees, and the temperature upstream of the confluence was 56 degrees. The slope of the tributary was 2% and appears accessible to fish though no fish were observed in the 100' explored up the tributary.
8175	0109.00	LDA #06 is located at the top of this habitat unit containing thirteen pieces of LWD and measures 6' high x 6' wide x 56' long with water flowing through and visible gaps. Sediment retention ranges from silt to sand and measures 33' wide x 8' long x 4' deep.
9489	0130.00	LDA #07 contains nine pieces of LWD and measures 7' high x 25' feet wide x 18' long with water flowing through and visible gaps.
9691	0134.00	There was a salmonid 1+ observed.
10118	0139.02	The pool-tail out in this unit is dry.
10766	0148.00	LDA #08 contains nine pieces of LWD and measures 8' high x 26' wide x 10' long with water flowing through and no visible gaps.
11712	0160.00	Barbed wire fence runs across the creek in this habitat unit.

Cottaneva Creek

13631	0185.00	LDA #09, located in the middle of this habitat unit, contains thirteen pieces of LWD and measures 7' high x 33' wide x 16' long with water flowing through and no visible gaps.
13804	0189.00	There was a 2+ year old salmonid observed.
14197	0195.00	LDA #10, located at the bottom of this habitat unit, contains six pieces of LWD and measures 7' high x 30' wide x 7' long with water flowing through and no visible gaps.
14567	0198.00	There was salmonid YOY observed. LDA #11 contains six pieces of LWD and measures 5' high x 42' wide x 13' long with water flowing through and no visible gaps.
15339	0204.00	There is evidence of cattle access to the creek.
15831	0211.00	There is rip rap on the left bank in this unit.
15956	0212.00	There is evidence of cattle access to the creek.
16148	0217.00	LDA #12, located at the top of this habitat unit, contains one piece of LWD and measures 7' high x 15' wide x 10' long and has water flowing through with no visible gaps. There is an erosion site on the right bank with fine sediment measuring 26' wide x 12' long.
16675	0222.00	There is an erosion site on the right bank.
17720	0234.00	LDA #13 contains eight pieces of LWD and measures 5' high x 15' wide x 8' long with water flowing through and no visible gaps.
17861	0236.00	Tributary #03, located on the left bank, is intermittent and stagnant with water and does not contribute any flow to the main stem. The temperature of the tributary was 54 degrees Fahrenheit. The slope is 1% and the tributary is not accessible to fish. No fish were observed in the 350' explored up the tributary.
18443	0239.00	There is a gate with barbed wire fence leaning into the creek.
18941	0243.00	LDA #14 contains three pieces of LWD and measures 6' high x 22' wide x 3' long with water flowing through and visible gaps.
18988	0244.00	LDA #15 contains four pieces of LWD and measures 6' high x 31' wide x 14' long with water flowing through and no visible gaps.

Cottaneva Creek

19045	0246.00	LDA #16, located at the bottom of this habitat unit, consists of four pieces of LWD and measures 5' wide x 35' wide x 6' long with water flowing through and no visible gaps.
19446	0246.01	The pool-tail out is dry. Water runs subsurface.
19507	0248.00	Tributary #04, located on the right bank, is stagnant and does not contribute any flow to the main stem. The temperature of the main stem upstream and downstream of the confluence as well as the temperature of the tributary was 54 degrees Fahrenheit. The slope is 1% and the tributary is accessible to fish though none were observed in the 400' explored.
20165	0256.00	LDA #17 contains seven pieces of LWD and measures 6' high x 28' wide x 12' long with water flowing through and visible gaps. There was a salmonid 1+ observed.
20205	0257.00	There is a cattle exclusion fence that runs across the creek in this unit.
20344	0258.00	Bridge #03 (Highway 1 Bridge) measures 43' wide x 3.8' high x 75' long and is constructed of concrete. It covers the middle to top of this habitat unit and defines the banks at this location.
20384	0259.00	Tributary #05, located on the left bank, is flowing and contributes approximately 1% of the flow to Cottaneva Creek. The temperature downstream of the confluence was 52 degrees Fahrenheit, the temperature of the tributary was 56 degrees Fahrenheit, and the temperature upstream of the confluence was 54 degrees Fahrenheit. The slope is 1% and is accessible to fish. Salmonid YOY were observed within the 150' explored.
22209	0281.00	Tributary #06, located on the right bank, is flowing and contributes approximately 1% to the flow of Cottaneva Creek. The temperature downstream of the confluence was 53 degrees Fahrenheit, the temperature of the tributary was 52 degrees Fahrenheit, and the temperature upstream of the confluence was 54 degrees Fahrenheit. The slope is 10% and the tributary is accessible to fish though none were observed in the 100' explored.
22422	0282.00	There is culvert on the right bank coming directly into the tributary with a 4.4' plunge.
22994	0285.00	There is a California Conservation Corps (CCC) in-stream structure installed on the right bank of this unit.

Cottaneva Creek

23181	0287.00	There is a CCC in-stream structure installed on the right bank of this unit.
23536	0291.00	LDA #18 contains eight pieces of LWD and measures 5' high x 56' wide x 25' long with water flowing through and visible gaps. Sediment retention ranges from silt to gravel and measures 20' wide x 10' long x and 3' deep.
24543	0308.00	There is a CCC in-stream structure installed on the right bank of this unit.
24684	0309.00	LDA #19 contains fourteen pieces of LWD and measures 6' high x 55' wide x 44' long with water flowing through and visible gaps. Sediment retention ranges from silt to small cobble and measures 5' wide x 5' long x 1' deep.
25181	0318.00	LDA #020 contains twelve pieces of LWD and measures 7' high x 40' wide x 30' long with water flowing through and visible gaps.
25259	0320.00	There is a CCC in-stream structure installed on the right bank of this unit.
25612	0322.00	End of survey at the confluence of North Fork Cottaneva Creek and Middle Fork Cottaneva Creek.

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.

Cottaneva Creek

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

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

CASCADE

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

FLATWATER

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

MAIN CHANNEL POOLS

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

SCOUR POOLS

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

BACKWATER POOLS

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

ADDITIONAL UNIT DESIGNATIONS

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

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

Stream Name: Cottaneva Creek

LLID: 1238282397361 Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
1	0	DRY	0.3	10	10	0.0									
121	16	FLATWATER	37.0	107	12918	49.9	9.9	0.6	1.1	1032	124898	609	73744		17
164	164	POOL	50.2	66	10806	41.7	17.9	1.4	2.6	1236	202743	2423	397376	1969	35
41	3	RIFFLE	12.5	53	2176	8.4	6.0	0.3	0.4	153	6253	44	1803		3
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
327	183				25910					333894			472922		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Cottaneva Creek

LLID: 1238282397361

Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0W

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 (%)
41	3	LGR	12.5	53	2176	8.4	6	0.3	0.6	153	6253	44	1803		3	93
1	0	POW	0.3	61	61	0.2										
65	10	RUN	19.9	61	3962	15.3	8	0.6	1.6	447	29085	289	18763		17	90
55	6	SRN	16.8	162	8895	34.3	13	0.6	1.9	2007	110374	1144	62925		17	93
140	140	MCP	42.8	66	9305	35.9	18	1.4	5.5	1267	177321	2535	354888	2062	35	93
1	1	CCP	0.3	24	24	0.1	16	1.5	2.2	384	384	730	730	576	60	97
2	2	STP	0.6	100	199	0.8	23	1.4	2.6	2057	4114	3436	6873	2707	75	97
1	1	CRP	0.3	52	52	0.2	26	2.4	3.5	1352	1352	3786	3786	3245	20	97
9	9	LSL	2.8	70	634	2.4	16	1.4	4.6	1191	10719	2008	18073	1641	26	90
8	8	LSR	2.4	54	435	1.7	17	1.3	3.5	829	6629	1248	9985	972	35	85
2	2	LSBo	0.6	54	107	0.4	14	1.1	2.9	763	1525	1066	2132	912	20	93
1	1	DPL	0.3	50	50	0.2	14	0.9	1.8	700	700	910	910	630	30	97
1	0	DRY	0.3	10	10	0.0										

Total Units
327

Total Units Fully Measured
183

Total Length (ft.)
25910

Total Area (sq.ft.)
348455

Total Volume (cu.ft.)
480867

Table 3 - Summary of Pool Types

Stream Name: Cottaneva Creek

LLID: 1238282397361

Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0W

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
143	143	MAIN	87	67	9528	88	18.1	1.4	1271	181818	2061	294738	36
20	20	SCOUR	12	61	1228	11	16.8	1.4	1011	20225	1381	27613	29
1	1	BACKWATER	1	50	50	0	14.0	0.9	700	700	630	630	30

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
164	164	10806	202743	322981

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

Stream Name: Cottaneva Creek

LLID: 1238282397361

Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0W

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
140	MCP	85	1	1	43	31	56	40	31	22	9	6
1	CCP	1	0	0	0	0	1	100	0	0	0	0
2	STP	1	0	0	0	0	2	100	0	0	0	0
1	CRP	1	0	0	0	0	0	0	1	100	0	0
9	LSL	5	0	0	1	11	6	67	1	11	1	11
8	LSR	5	0	0	3	38	2	25	3	38	0	0
2	LSBo	1	0	0	1	50	1	50	0	0	0	0
1	DPL	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
164			1	1	49	30	68	41	36	22	10	6

Mean Maximum Residual Pool Depth (ft.): 2.6

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Cottaneva Creek

LLID: 1238282397361

Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Dry Units: 1

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0W

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
41	3	LGR	0	50	0	0	50	0	0	0	0
41	3	TOTAL RIFFLE	0	50	0	0	50	0	0	0	0
1	0	POW									
65	10	RUN	14	37	7	7	35	0	0	1	0
55	6	SRN	10	19	13	8	50	0	0	0	0
121	16	TOTAL FLAT	13	30	9	7	41	0	0	0	0
140	140	MCP	21	30	24	15	10	0	0	1	0
1	1	CCP	10	40	0	0	50	0	0	0	0
2	2	STP	0	28	63	5	3	0	0	3	0
1	1	CRP	0	0	0	70	30	0	0	0	0
9	9	LSL	19	21	43	8	6	0	1	2	0
8	8	LSR	25	16	10	38	9	0	0	1	0
2	2	LSBo	15	5	10	20	0	0	0	50	0
1	1	DPL	0	75	0	0	25	0	0	0	0
164	164	TOTAL POOL	20	28	24	16	10	0	0	1	0
327	183	TOTAL	19	29	22	15	13	0	0	1	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Cottaneva Creek

LLID: 1238282397361

Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Dry Units: 1

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0W

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
41	3	LGR	0	0	100	0	0	0	0
1	0	POW	0	0	0	0	0	0	0
65	10	RUN	0	20	70	10	0	0	0
55	6	SRN	0	0	100	0	0	0	0
140	140	MCP	23	38	37	1	1	0	0
1	1	CCP	0	100	0	0	0	0	0
2	2	STP	0	0	100	0	0	0	0
1	1	CRP	100	0	0	0	0	0	0
9	9	LSL	11	44	44	0	0	0	0
8	8	LSR	0	38	63	0	0	0	0
2	2	LSBo	0	0	100	0	0	0	0
1	1	DPL	100	0	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Cottaneva Creek

LLID: 1238282397361

Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
93	22	78	0	97	98

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: Cottaneva Creek LLID: 1238282397361 Drainage: Rockport
 Survey Dates: 8/28/2008 to 9/16/2008 Survey Length (ft.): 25910 Main Channel (ft.): 25612 Side Channel (ft.): 298
 Confluence Location: Quad: WESTPORT Legal Description: T22NR18WS23 Latitude: 39:44:10.0N Longitude: 123:49:42.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4	Canopy Density (%): 96.1	Pools by Stream Length (%): 56.8
Reach Length (ft.): 7039	Coniferous Component (%): 11.4	Pool Frequency (%): 53.2
Riffle/Flatwater Mean Width (ft.): 8.4	Hardwood Component (%): 88.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 24
Range (ft.): 29 to 60	Vegetative Cover (%): 100.0	2 to 2.9 Feet Deep: 38
Mean (ft.): 39	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 26
Std. Dev.: 8	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 12
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 18	Mean Max Residual Pool Depth (ft.): 2.7
Water (F): 54 - 58 Air (F): 44 - 64	LWD per 100 ft.:	Mean Pool Shelter Rating: 37
Dry Channel (ft): 0	Riffles: 1	
	Pools: 4	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 4 Gravel: 96 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 62.0 2. 34.0 3. 0.0 4. 0.0 5. 4.0		

STREAM REACH: 2

Channel Type: C4	Canopy Density (%): 91.0	Pools by Stream Length (%): 36.1
Reach Length (ft.): 18573	Coniferous Component (%): 27.4	Pool Frequency (%): 48.9
Riffle/Flatwater Mean Width (ft.): 10.2	Hardwood Component (%): 72.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 33
Range (ft.): 16 to 47	Vegetative Cover (%): 96.2	2 to 2.9 Feet Deep: 43
Mean (ft.): 33	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 20
Std. Dev.: 7	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 4
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 25	Mean Max Residual Pool Depth (ft.): 2.5
Water (F): 51 - 58 Air (F): 49 - 59	LWD per 100 ft.:	Mean Pool Shelter Rating: 34
Dry Channel (ft): 10	Riffles: 1	
	Pools: 5	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 2 Sand: 0 Gravel: 91 Sm Cobble: 7 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 69.3 2. 27.2 3. 0.9 4. 0.9 5. 1.8		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Cottaneva Creek

LLID: 1238282397361

Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Confluence Location: Quad: WESTPORT

Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0W

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	2	0.8
Boulder	3	4	1.9
Cobble / Gravel	62	85	40.2
Sand / Silt / Clay	117	92	57.1

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	4	4	2.2
Brush	31	37	18.6
Hardwood Trees	121	125	67.2
Coniferous Trees	26	16	11.5
No Vegetation	1	1	0.5

Total Stream Cobble Embeddedness Values: 1

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

StreamName: Cottaneva Creek

LLID: 1238282397361

Drainage: Rockport

Survey Dates: 8/28/2008 to 9/16/2008

Confluence Location: Quad: WESTPORT

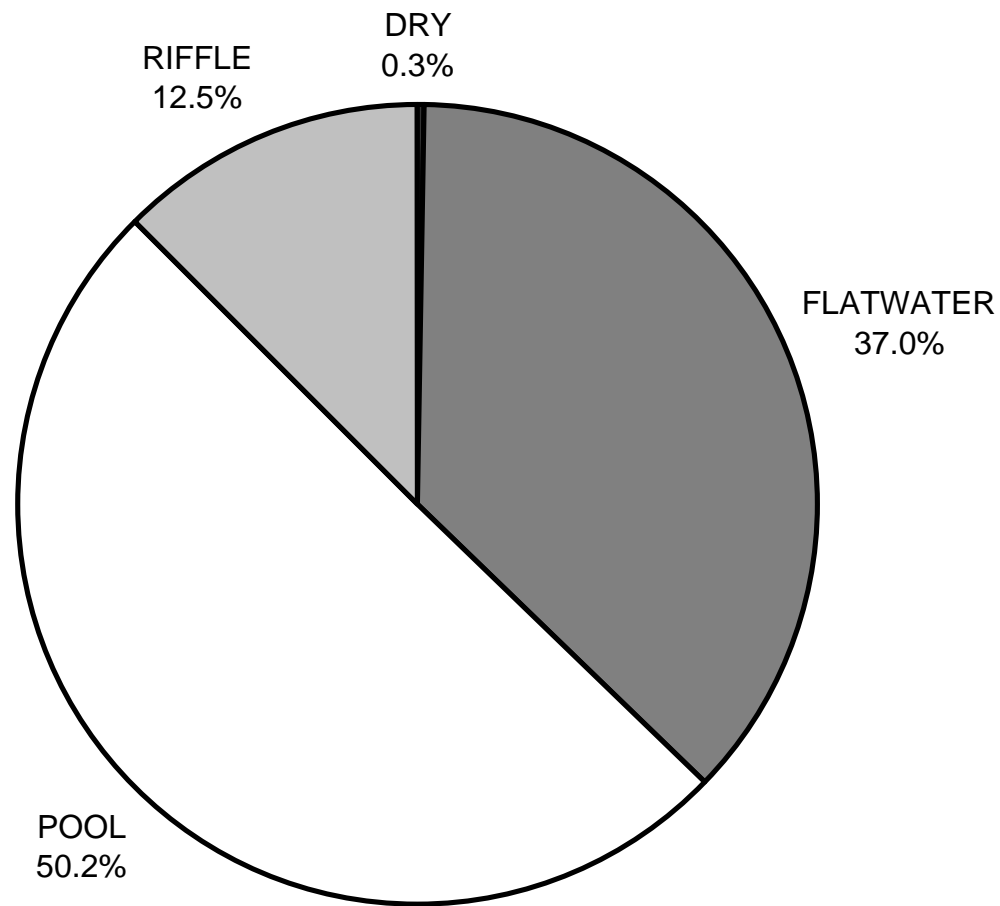
Legal Description: T22NR18WS23

Latitude: 39:44:10.0N

Longitude: 123:49:42.0W

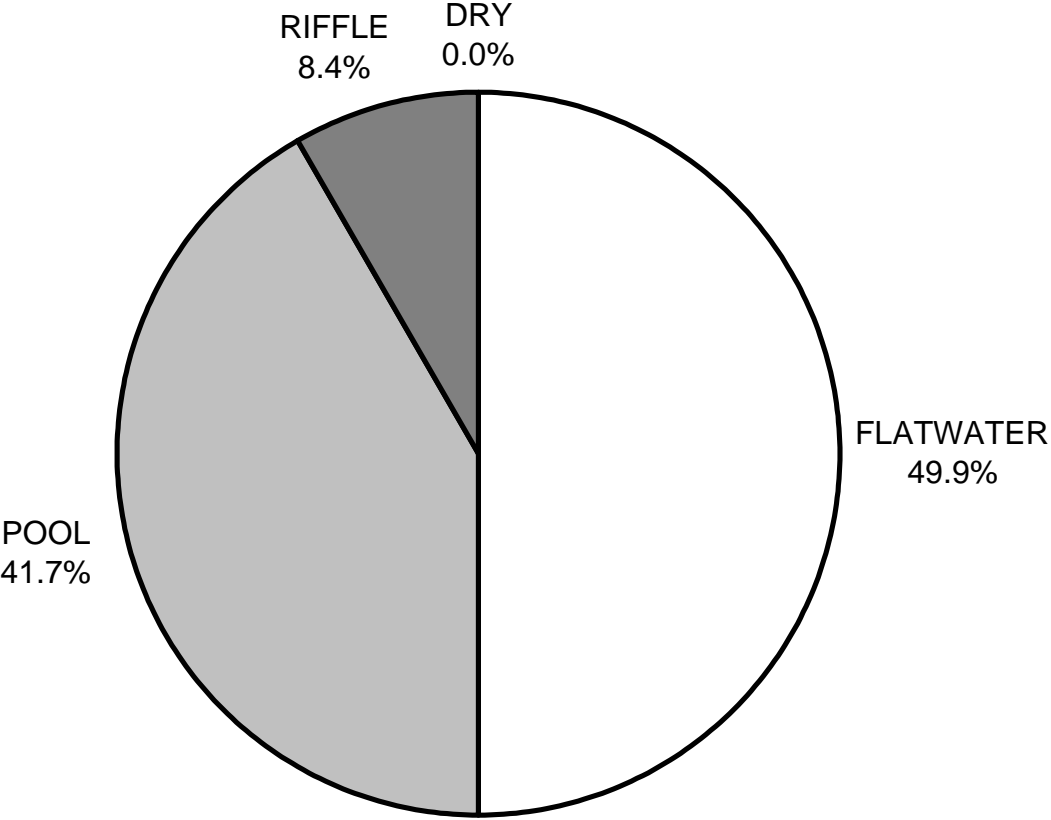
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	13	20
SMALL WOODY DEBRIS (%)	50	30	28
LARGE WOODY DEBRIS (%)	0	9	24
ROOT MASS (%)	0	7	16
TERRESTRIAL VEGETATION (%)	50	41	10
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	1
BEDROCK LEDGES (%)	0	0	0

**COTTANEVA CREEK 2008
HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 1

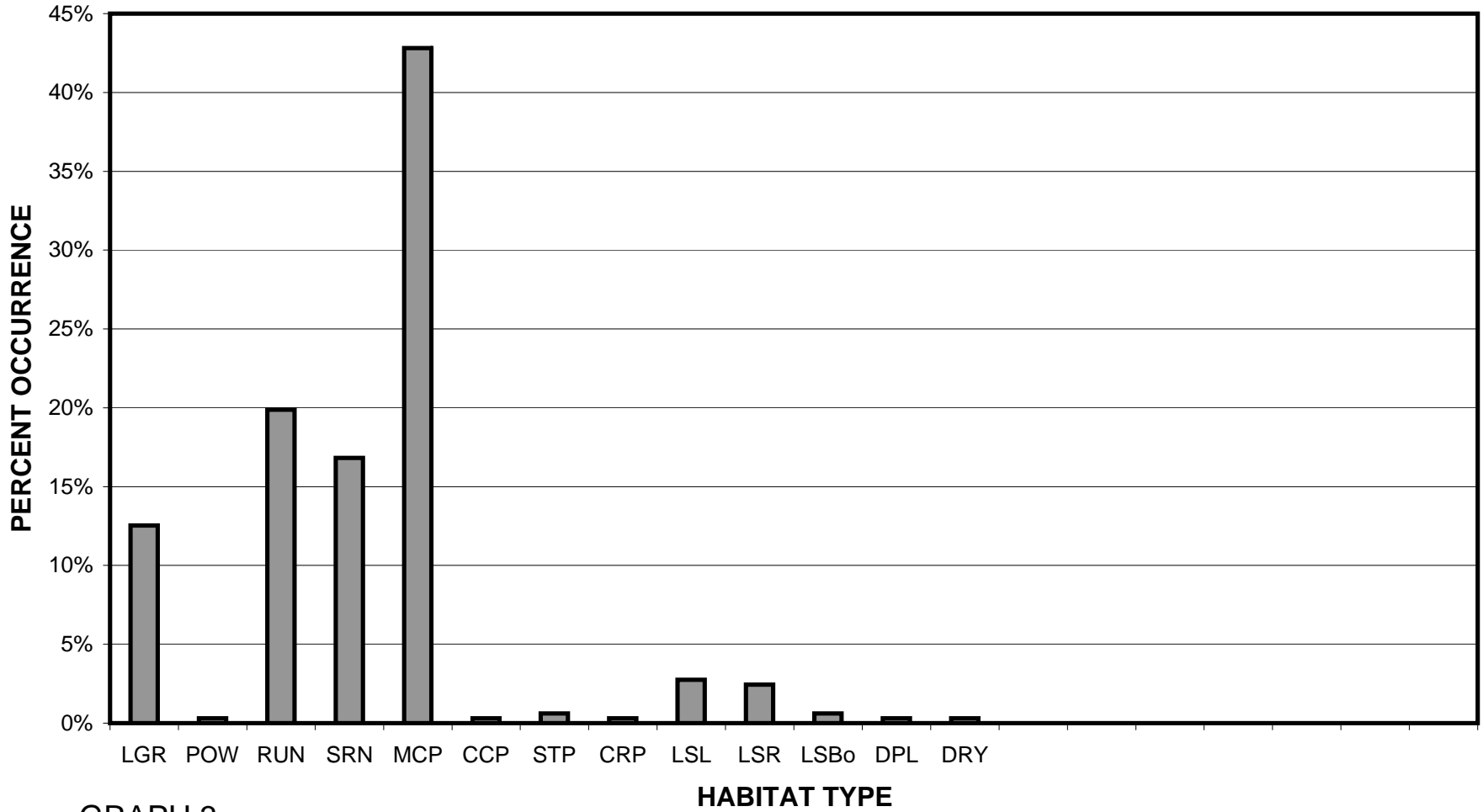
**COTTANEVA CREEK 2008
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

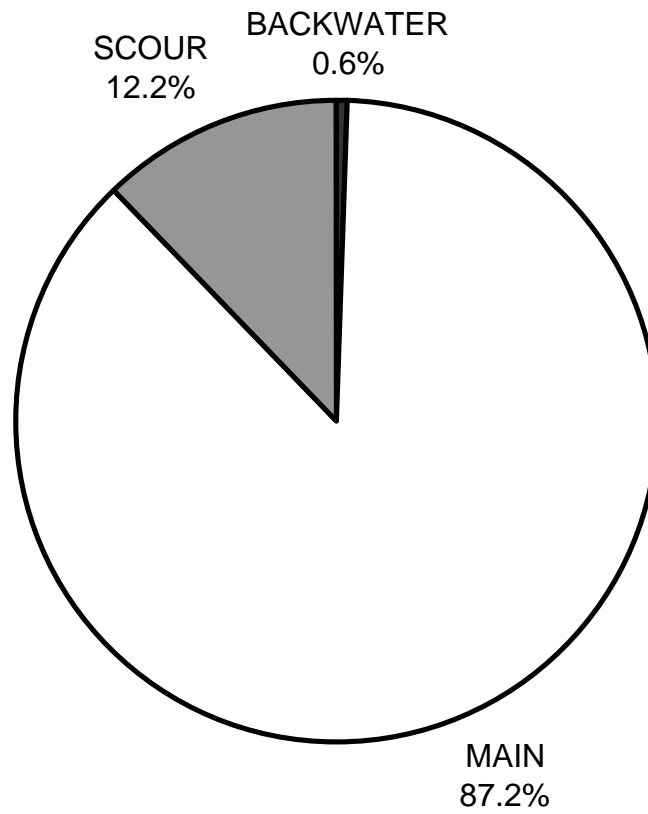
COTTANEVA CREEK 2008

HABITAT TYPES BY PERCENT OCCURRENCE



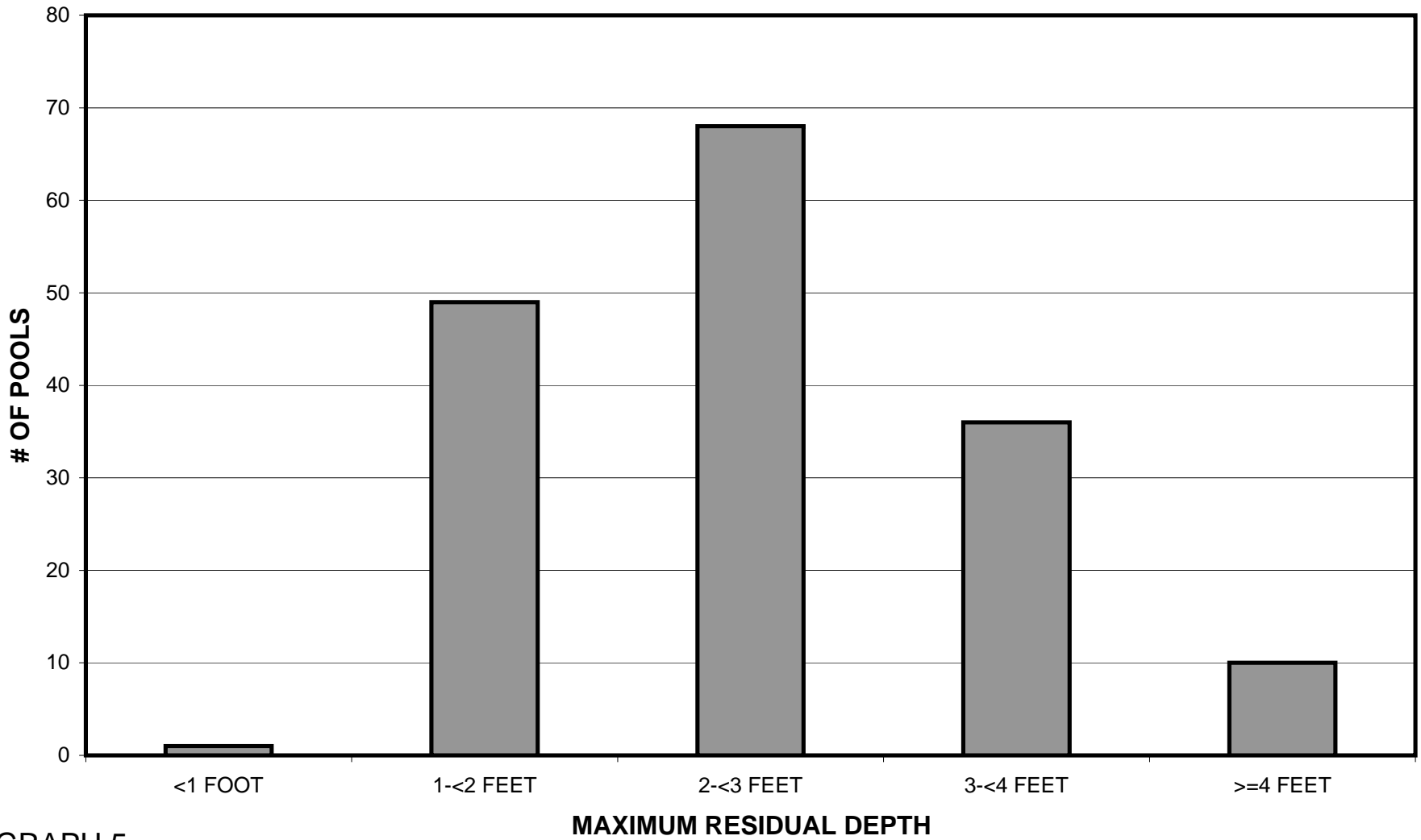
GRAPH 3

COTTANEVA CREEK 2008 POOL TYPES BY PERCENT OCCURRENCE



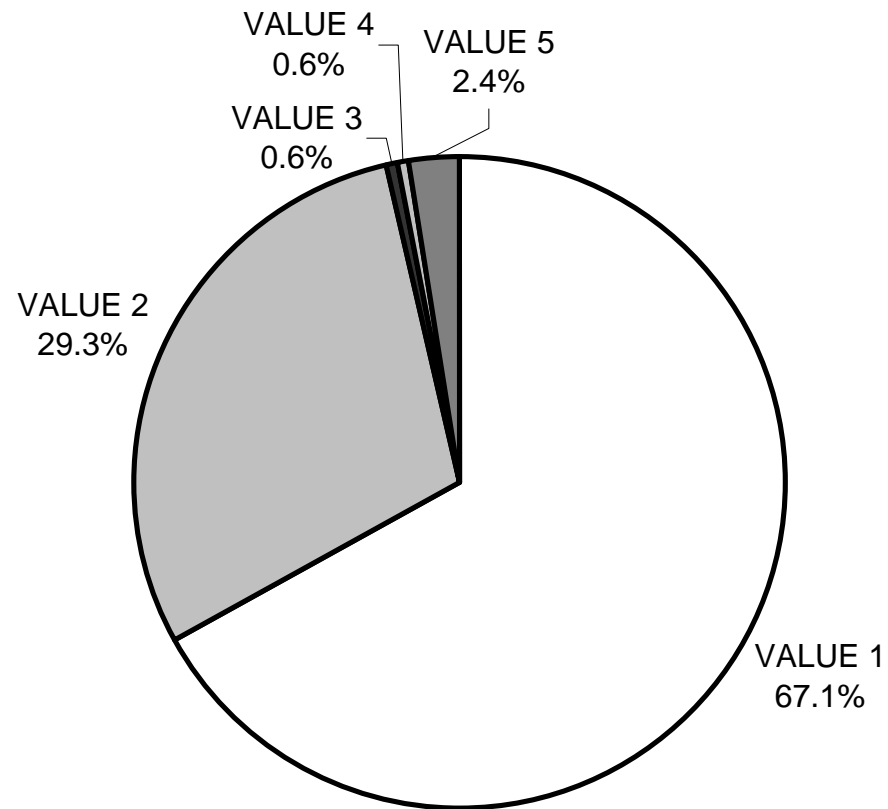
GRAPH 4

COTTANEVA CREEK 2008 MAXIMUM DEPTH IN POOLS



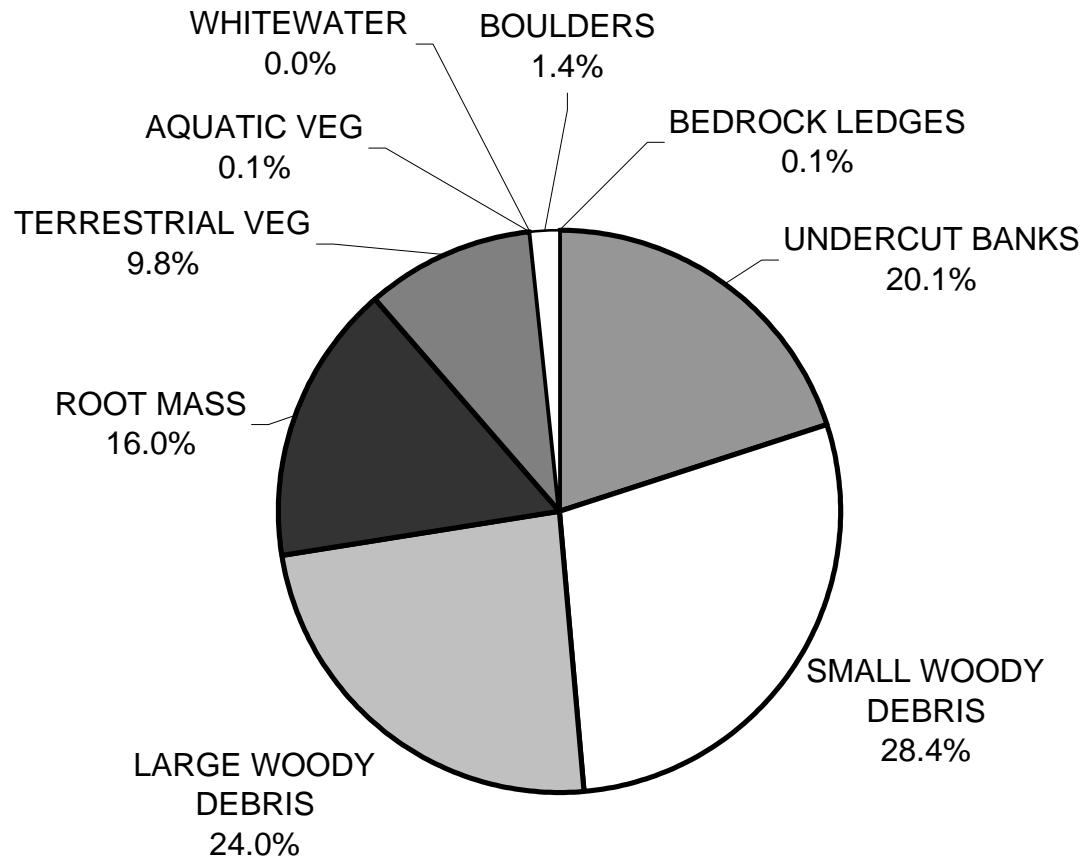
GRAPH 5

COTTANEVA CREEK 2008 PERCENT EMBEDDEDNESS



GRAPH 6

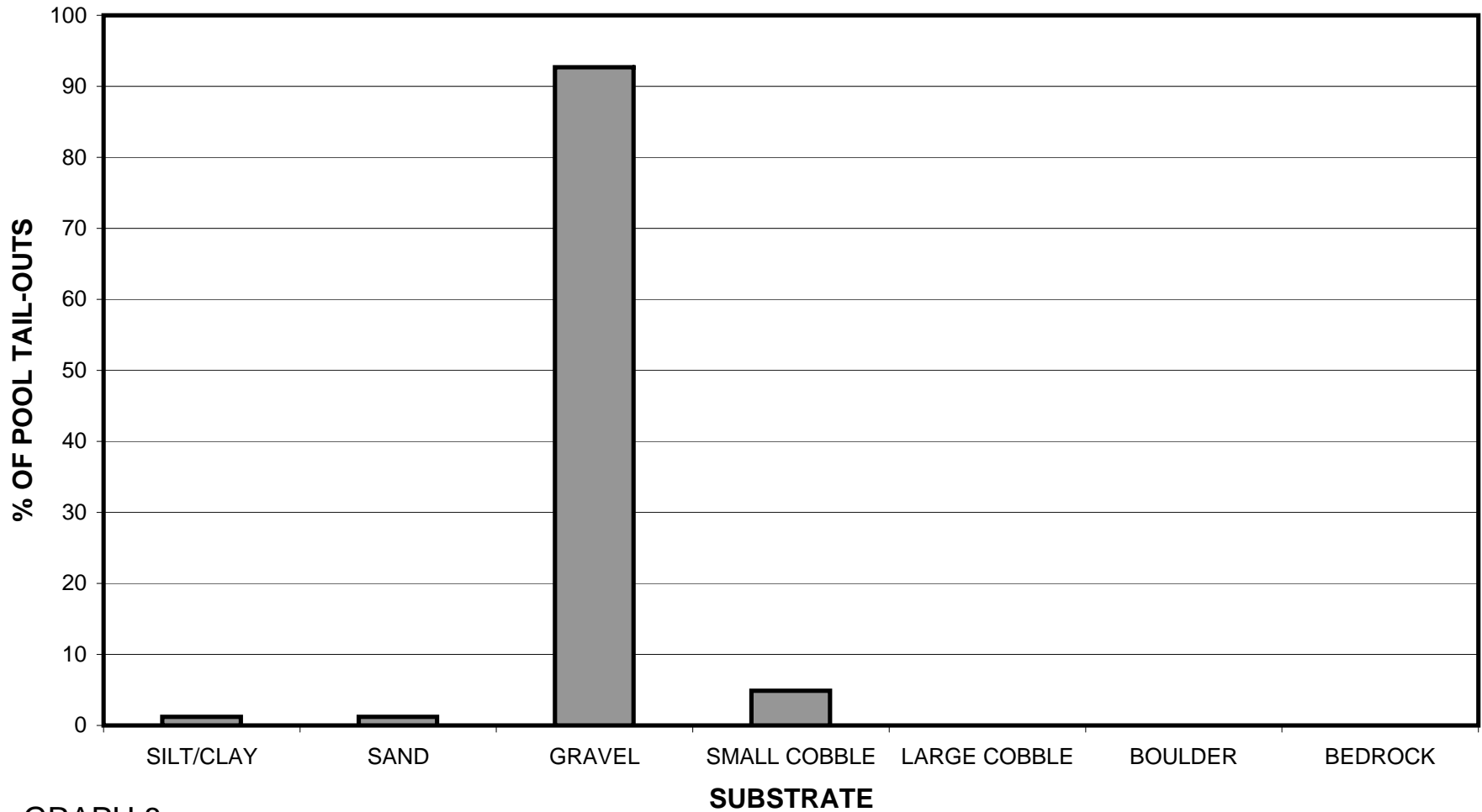
COTTANEVA CREEK 2008 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

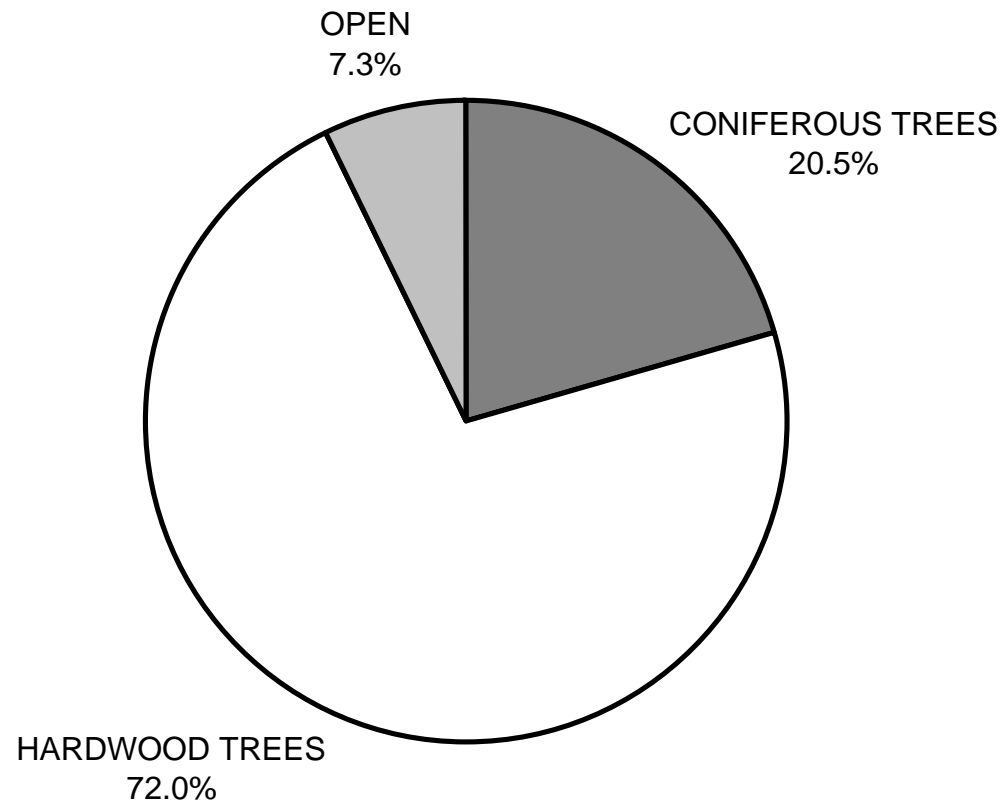
COTTANEVA CREEK 2008

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



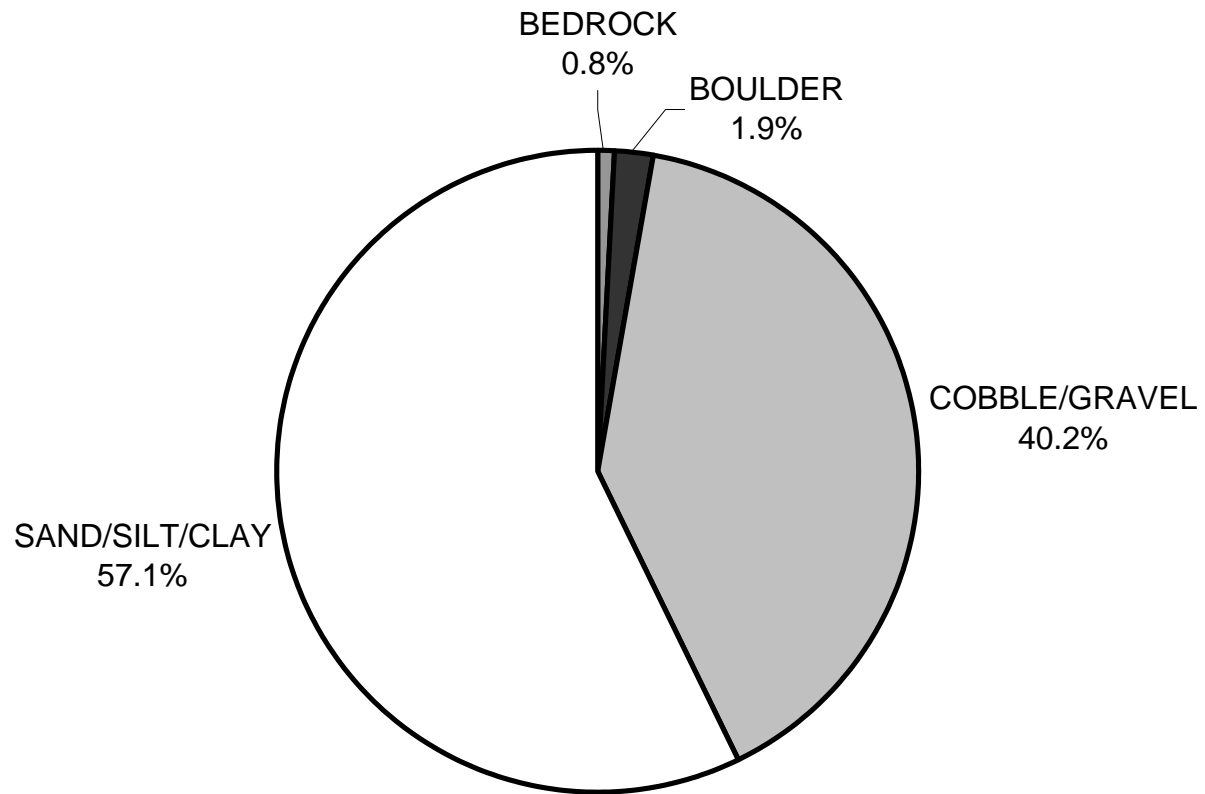
GRAPH 8

COTTANEVA CREEK 2008 MEAN PERCENT CANOPY



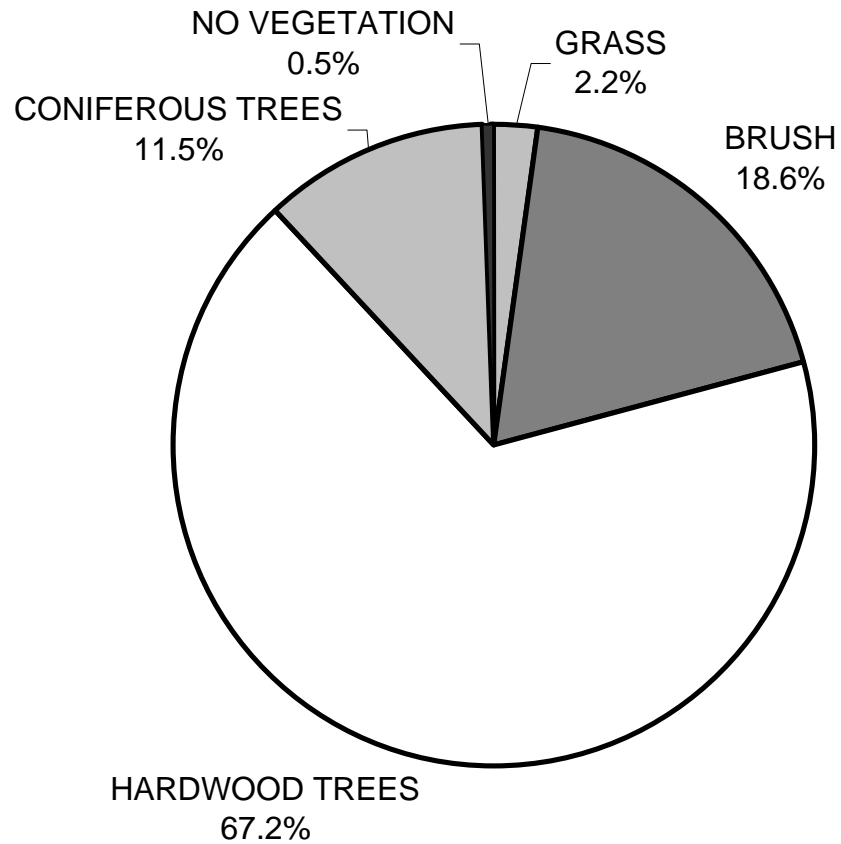
GRAPH 9

**COTTANEVA CREEK 2008
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

COTTANEVA CREEK 2008 DOMINANT BANK VEGETATION IN SURVEY REACH

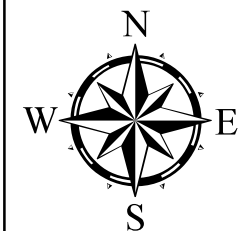


GRAPH 11



Map 1
Cottaneva Creek 2008
Cottaneva Watershed
Hales Grove Quad, Mendocino County

End of Survey

Start of Survey



Legend

-  Reach 1, F4 Channel Type
-  Reach 2, C4 Channel Type

