

STREAM INVENTORY REPORT

Middle Fork Cottaneva Creek

INTRODUCTION

A stream inventory was conducted from August 27 to September 3, 2008 on Middle Fork Cottaneva Creek. The survey began at the confluence with Cottaneva Creek and extended upstream 1.0 miles.

The Middle 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 Middle 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

Middle Fork Cottaneva Creek is a tributary to Cottaneva Creek, which drains to the Pacific Ocean, in Mendocino County, California (Map 1). Middle Fork Cottaneva Creek's legal description at the confluence with Cottaneva Creek is T22N R18W S02. Its location is 39.7826° north latitude and 123.8210° west longitude, LLID number 1238199397827. Middle Fork Cottaneva Creek is a first order stream and has approximately 1.5 miles of blue line stream according to the USGS Hales Grove 7.5 minute quadrangle. Middle Fork Cottaneva Creek drains a watershed of approximately 1.9 square miles. Elevations range from about 180 feet at the mouth of the creek to 1,200 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 north of Rockport on a private road.

METHODS

The habitat inventory conducted in Middle Fork Cottaneva Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Department of Fish and Game (DFG) Fish and Wildlife Scientific Aides that conducted the inventory were trained in standardized habitat inventory methods by the 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 crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types

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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 Middle 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". Middle 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 Middle 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 Middle 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 Middle 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 Middle 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 Middle Fork Cottaneva Creek. In addition, underwater observations were made at 21 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 Middle 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 27 to September 3, 2008, was conducted by S. McSmith and I. Mikus (DFG). The total length of the stream surveyed was 5,414 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.32 cfs on September 9, 2008.

Middle Fork Cottaneva Creek is a B3 channel type for 3,608 feet of the stream surveyed (Reach 1) and a G4 channel type for 1,806 feet of the stream surveyed (Reach 2). B3 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and cobble-dominant substrates. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios, very stable with gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 58 degrees Fahrenheit. Air temperatures ranged from 54 to 74 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 35% pool units, 31% riffle units, 24% flatwater units, 8% dry units, and 2% no survey units (Graph 1). Based on total length of Level II habitat types there were 39% flatwater units, 28% riffle units, 22% pool units, 11% dry units, and 1% no survey units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 26%; mid-channel pool units, 24%; and step run units, 13% (Graph 3). Based on percent total length, step run units made up 30%, low gradient riffle units 22%, and mid-channel pool units 15%.

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A total of 66 pools were identified (Table 3). Main channel pools were the most frequently encountered at 68% (Graph 4), and comprised 68% 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. Sixteen of the 66 pools (24%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 66 pool tail-outs measured, 18 had a value of 1 (27.3%); 35 had a value of 2 (53%); 9 had a value of 3 (13.6%); 4 had a value of 4 (6.1%) (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 13, and pool habitats had a mean shelter rating of 27 (Table 1). Of the pool types, the main channel pools had had the highest mean shelter rating at 27. Scour pools had a mean shelter rating of 29 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Middle Fork Cottaneva Creek. Graph 7 describes the pool cover in Middle Fork Cottaneva Creek. Large woody debris is the dominant pool cover type followed by small 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 71% of pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 21% of pool tail-outs.

The mean percent canopy density for the surveyed length of Middle Fork Cottaneva Creek was 91%. Nine percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 14% and 86%, respectively. Graph 9 describes the mean percent canopy in Middle Fork Cottaneva Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 94%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 93% sand/silt/clay, 5% bedrock, and 1% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 61% of the units surveyed. Additionally, 24% of the units surveyed had brush as the dominant vegetation type, and 14% had deciduous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Twenty-one sites were snorkel surveyed for species composition and distribution in Middle Fork Cottaneva Creek on September 10, 2008. Water temperatures taken during the survey period of 1220 to 1440 ranged from 54 to 55 degrees Fahrenheit. Air temperatures ranged from 53 to 64 degrees Fahrenheit. The sites were sampled by I. Mikus and S. McSmith (DFG).

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In reach 1, which comprised the first 3,608 feet of stream, 10 sites were sampled. The reach sites yielded 1 young-of-the-year coho, 59 young-of-the-year steelhead/rainbow trout (SH/RT), 10 age 1+ SH/RT, and 1 age 2+ SH/RT.

In reach 2, 11 sites were sampled starting approximately 3,615 feet from the confluence with Cottaneva Creek and continuing upstream 1,763 feet. The reach sites yielded 12 young-of-the-year steelhead/rainbow trout (SH/RT), 13 age 1+ SH/RT, and 1 age 2+ SH/RT.

The following chart displays the information yielded from these sites:

2008 Middle 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: B3 Channel Type									
09/10/08	1	003	4.2	24	0	0	6	0	0
09/10/08	2	007	4.2	109	0	0	14	0	0
09/10/08	3	012	4.2	197	1	0	1	0	0
09/10/08	5	019	4.2	361	0	0	5	0	0
09/10/08	4	024	4.2	637	0	0	6	1	0
09/10/08	6	035	4.2	858	0	0	16	1	0
09/10/08	7	048	4.2	1,340	0	0	6	2	0
09/10/08	8	076	4.2	2,117	0	0	0	2	0
09/10/08	9	096	5.2	2,864	0	0	3	3	0
09/10/08	10	120	5.6	3,576	0	0	2	1	1
Reach 2: G4 Channel Type									
09/10/08	11	123	5.6	3,615	0	0	0	1	0
09/10/08	12	126	4.2	3,654	0	0	1	3	0
09/10/08	13	141	4.2	3,977	0	0	1	1	0
09/10/08	14	148	4.2	4,192	0	0	0	1	0

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Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
09/10/08	15	154	4.2	4,505	0	0	0	1	0
09/10/08	16	156	4.2	4,560	0	0	0	2	0
09/10/08	17	162	4.2	4,672	0	0	3	3	0
09/10/08	18	169	5.6	4,843	0	0	6	0	0
09/10/08	19	174	5.6	5,034	0	0	1	1	1
09/10/08	20	181	4.2	5,190	0	0	0	0	0
09/10/08	21	189	4.2	5,378	0	0	0	0	0

DISCUSSION

Middle Fork Cottaneva Creek is a B3 channel type for the first 3,608 feet of stream surveyed and a G4 channel type for the remaining 1,806 feet. The suitability of B3 and G4 channel types for fish habitat improvement structures is as follows: B3 channel types are excellent for plunge weirs, boulder clusters and bank-placed boulders, single and opposing wing-deflectors, and log cover. G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days August 27, 2008 to September 3, 2008, ranged from 54 to 58 degrees Fahrenheit. Air temperatures ranged from 54 to 74 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 39% of the total length of this survey, riffles 28%, and pools 22%. The pools are relatively shallow, with 16 of the 66 (24%) pools having a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended in the B3 channel type.

Fifty-three of the 66 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirteen 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.

Sixty-one of the 66 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

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The mean shelter rating for pools was 27. The shelter rating in the flatwater habitats was 13. 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 Middle Fork Cottaneva Creek. Large woody debris is the dominant cover type in pools followed by small 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 91%. Reach 1 had a canopy density of 90%, Reach 2 had a canopy density of 94%.

The percentage of right and left bank covered with vegetation was high at 94% and 96%, 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) Middle Fork 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) In the B3 channel type, where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 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.

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COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with North Fork Cottaneva Creek. The channel type is a B3.
331	0017.00	Log debris accumulation (LDA) #01 contains 6 pieces of large woody debris (LWD) and measured 7' high x 47' wide x and 8' long with visible gaps and water flowing through. Sediment retention ranges from sand to small cobble and measures 12' wide x 70' long x and 2' deep. This LDA serves as a possible juvenile and adult barrier even though some fish were observed.
442	0022.00	There is a fire break at the bottom with a ford crossing the creek.
659	0025.00	LDA #02 contains 13 pieces of LWD and measures 7' high x 45' wide x and 17' long with no visible gaps and no water flowing through. Sediment retention ranges from silt to small cobble and measures 45' wide x 150' long x 3' high. This LDA poses as a possible barrier to adult and juvenile salmonids though fish were observed above the barrier.
799	0032.00	There is a 1.8' log plunge.
844	0034.00	LDA #03 contains 5 pieces of LWD and measures 2.9' high x 34' wide x 4.5' long with water flowing through and no visible gaps. Sediment retention ranges from silt to small cobble and measures 15' wide x 75' long x 1.5' deep. There is a 2.2' log plunge which poses as a possible barrier for juvenile salmonids. Fish were observed above the LDA.
1117	0040.00	Tributary #01, located on the right bank, is flowing and contributes approximately 30% to the downstream flow of Cottaneva Creek. The temperature downstream of the confluence was 57 degrees Fahrenheit, the temperature of the tributary was 56 degrees Fahrenheit, and the temperature upstream of the confluence was 58 degrees Fahrenheit. The slope is 5% and the tributary is accessible to fish though no salmonids were observed in the 200' explored. A culvert with a 2.5' jump poses as a possible barrier to juvenile salmonids 150' up the tributary.
1340	0048.00	There is a 1.1' log plunge.
1448	0052.00	LDA #04 contains 16 pieces of LWD and measures 4' high x 33' wide x 9' long with water flowing through and no visible gaps. Sediment retention

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ranges from silt to large cobble and measures 21' wide x 50' long x 2' deep. Salmonid young-of-the-year (YOY) and 2+ salmonids were observed above the LDA. This LDA poses a possible barrier to salmonids.

- 1495 0054.00 LDA #05 contains 9 pieces of LWD and measures 6' high x 22' wide x 2' long with no water flowing through and no visible gaps. Sediment retention ranges from silt to small cobble and measures 12' wide x 100' long x 4' deep. With a 3.5' log plunge, this LDA serves as a possible barrier to salmonids.
- 2117 0075.00 LDA #06 contains 15 pieces of LWD and measures 8' high x 33' wide x 6' long with no visible gaps and no water flowing through. Sediment retention ranges from sand to cobble and measures 25' wide x 100' long x 6' deep. With a plunge measuring 4.0', this LDA serves as a possible barrier to juvenile and adult salmonids.
- 2408 0084.00 LDA #07 contains 17 pieces of LWD and measures 6' high x 44' wide x 4' long with no visible gaps and no water flowing through. Sediment retention ranges from sand to large cobble and measures 25' wide x 60' long x 5' deep. With a plunge measuring 5.0', this LDA serves as a possible barrier to juvenile and adult salmonids. Fish were observed about the LDA.
- 2870 0096.00 Tributary #02, located on the left bank, is flowing and contributes approximately 5% to the downstream flow of Cottaneva Creek. The temperature downstream of the confluence was 56 degrees Fahrenheit, the temperature of the tributary was 56 degrees Fahrenheit, and the temperature upstream of the confluence was 58 degrees Fahrenheit. Due to a slope of 50%, the tributary is inaccessible to fish. Of the 100' explored, no fish were observed.
- 2937 0099.00 LDA #08 contains 2 pieces of LWD and measures 3' high x 12' wide x 1' long with no visible gaps and no water flowing through. Sediment retention ranges from silt to large cobble and measures 12' wide x 40' long x 1.5' deep. There is debris plunge measuring 3.3' which poses as a possible barrier to juvenile salmonids.
- 3011 0103.00 LDA #09 contains 9 pieces of LWD and measures 6' high x 24' wide x 2' long with no visible gaps and no water flowing through. Sediment retention ranges from sand to small cobble and measures 30' wide x 20' long x 3' deep. With a plunge measuring 4.5', this LDA serves as a possible barrier to juvenile and adult salmonids.
- 043 0105.00 There is a possible salmonid barrier formed by a bedrock chute with a piece of large woody debris perched above with a 3.2' plunge and no sediment retention. Salmonid YOY were observed upstream.
- 3562 0119.00 There is a 1.6' log plunge.

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- 3583 0120.00 Tributary #03, located on the right bank, is flowing and contributes approximately 33% to the downstream flow of Cottaneva Creek. The temperature downstream of the confluence was 55 degrees Fahrenheit, the temperature of the tributary was 54 degrees Fahrenheit, and the temperature upstream of the confluence was 55 degrees Fahrenheit. Due to a slope of 35%, the tributary is inaccessible to fish. Of the 250' explored, no fish were observed.
- 3622 0122.00 There is a 3.5' log plunge.
- 3635 0123.00 LDA #10 contains 15 pieces and measures 8' high x 39' wide x 9' long with no water flowing through and no visible gaps. Sediment retention ranges from sand to small cobble and measures 31' wide x 80' long x 8' deep. This LDA poses as a possible barrier to juvenile salmonids though fish were observed above the barrier.
- 3714 0128.00 LDA #11 contains 5 pieces of LWD and measures 5' high x 26' wide x 3' long with no visible gaps and no water flowing through. Sediment retention ranges from silt to small cobble and measures 26' wide x 100' long x 3' deep. With a jump and water flowing subsurface upstream, this LDA poses as a possible barrier to juvenile salmonids.
- 4217 0147.00 There is a 4.5' jump created by an old growth root wad retaining sediment.
- 4243 0148.00 Salmonid YOY and 1+ were observed.
- 4471 0151.00 Water flows subsurface intermittently.
- 4556 0154.00 LDA #12 contains 6 pieces of LWD and measures 5' high x 22' wide x 4' long with no visible gaps and no water flowing through. Sediment retention ranges from silt to small cobble and measures 22' wide x 60' long x 4' deep. This LDA serves as a possible barrier to juvenile salmonids.
- 4585 0155.00 Salmonid YOY and 1+ were observed. There are two flags that read "2004 temporary barrier and end survey".
- 4598 0156.00 LDA #13 contains 25 pieces of LWD and measures 4' high x 44' wide x 18' long with visible gaps and no water flowing through. Sediment retention ranges from silt to small cobble and measures 37' wide x 50' long x 4' deep. This LDA serves as a possible barrier to juvenile and adult salmonids.
- 4660 0159.00 There is a 7' high log jump.
- 4673 0160.00 LDA #14 contains 7 pieces of LWD and measures 7' high x 21' wide x 9' long with no visible gaps and no water flowing through. Sediment retention ranges

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from silt to large cobble and measures 18' wide x 40' long x 6' deep. This LDA serves as a possible barrier to juvenile and adult salmonids.

- 4708 0162.00 LDA #15 contains 6 pieces of LWD and measures 5' high x 20' wide x 4' long with no visible gaps and no water flowing through. Sediment retention ranges from silt to large cobble and measures 17' wide x 60' long x 3' deep. This LDA serves as a possible barrier to juvenile and adult salmonids.
- 5059 0173.00 There is a 3.5' log plunge.
- 5069 0174.00 LDA #16 contains 17 pieces of LWD and measures 11' high x 22' wide x 21' long with no water flowing through and no visible gaps. Sediment retention ranges from silt to large cobble and measures 16' wide x 80' long x 8' deep. This LDA serves as a possible barrier to salmonids.
- 5080 0175.00 There is a 5.5' log plunge.
- 5203 0178.00 LDA #17 contains 9 pieces of LWD and measures 6' high x 18' wide x 13' long with no water flowing through and no visible gaps. Sediment retention ranges from silt to small cobble and measures 21' wide x 28' long x 3' deep. This LDA serves as a possible barrier to salmonids.
- 5263 0182.00 LDA #18 contains 17 pieces of LWD and measures 11' high x 28' wide x 42' long with no water flowing through and no visible gaps. Sediment retention ranges from silt to large cobble and measures 18' wide x 60' long x 4' wide. This LDA serves as a possible barrier to salmonids.
- 5301 0184.00 There is a 4.5' root mass jump with no jump pool.
- 5414 0188.00 LDA #19 contains 5 pieces of LWD and measures 6' high x 26' wide x 8' long with no water flowing through and visible gaps. Sediment retention ranges from silt to large cobble and measures 18' wide x 30' long x 3' deep. This LDA serves as a possible barrier for salmonids. There is evidence of a fire zone from 2008 fires on the left bank. End of survey due to an accumulation of 31 pieces of large woody debris measuring 23' long with a 9.1' elevation gain. There are a series of CCC sites with notched pieces of LWD and numerous barriers.

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: Middle Fork Cottaneva Creek

LLID: 1238199397827 Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Confluence Location: Quad: HALES GROVE

Legal Description: T22NR18WS02

Latitude: 39:46:58.0N

Longitude: 123:49:12.0

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
15	0	DRY	8.0	38	574	10.6									
45	7	FLATWATER	23.9	47	2100	38.8	5.3	0.4	0.9	198	8924	74	3311		13
3	0	NOSURVEY	1.6	13	39	0.7									
66	66	POOL	35.1	18	1166	21.5	9.8	0.7	1.6	163	10754	149	9835	122	27
59	11	RIFFLE	31.4	26	1535	28.4	7.7	0.2	0.5	126	7421	27	1592		4
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
188	84				5414					27099			14738		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Middle Fork Cottaneva Creek

LLID: 1238199397827

Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Confluence Location: Quad: HALES GROVE

Legal Description: T22NR18WS02

Latitude: 39:46:58.0N

Longitude: 123:49:12.0W

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 (%)
48	8	LGR	25.5	24	1171	21.6	8	0.2	1	153	7328	33	1572		4	91
11	3	HGR	5.9	33	364	6.7	6	0.2	0.7	54	595	12	128		3	94
21	4	RUN	11.2	23	493	9.1	5	0.3	1.1	105	2206	32	671		10	87
24	3	SRN	12.8	67	1607	29.7	6	0.4	1.2	323	7744	129	3097		18	92
45	45	MCP	23.9	18	796	14.7	10	0.7	3.3	168	7557	151	6789	123	27	91
6	6	LSL	3.2	18	105	1.9	10	0.4	1.5	145	872	83	498	55	18	89
2	2	LSR	1.1	22	43	0.8	6	0.6	1.6	153	305	107	214	80	40	96
4	4	LSBk	2.1	23	91	1.7	6	0.7	2.4	123	490	96	382	82	43	93
9	9	PLP	4.8	15	131	2.4	12	1.0	3.6	170	1531	217	1952	191	27	93
15	0	DRY	8.0	38	574	10.6										
3	0	NS	1.6	13	39	0.7										

Total Units
188

Total Units Fully Measured
84

Total Length (ft.)
5414

Total Area (sq.ft.)
28627

Total Volume (cu.ft.)
15303

Table 3 - Summary of Pool Types

Stream Name: Middle Fork Cottaneva Creek

LLID: 1238199397827

Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Confluence Location: Quad: HALES GROVE

Legal Description: T22NR18WS02

Latitude: 39:46:58.0N

Longitude: 123:49:12.0W

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
45	45	MAIN	68	18	796	68	9.7	0.7	168	7557	123	5514	27
21	21	SCOUR	32	18	370	32	10.0	0.7	152	3197	121	2533	29

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
66	66	1166	10754	8047

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

Stream Name: Middle Fork Cottaneva Creek

LLID: 1238199397827

Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Confluence Location: Quad: HALES GROVE

Legal Description: T22NR18WS02

Latitude: 39:46:58.0N

Longitude: 123:49:12.0W

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
45	MCP	68	3	7	32	71	7	16	3	7	0	0
6	LSL	9	1	17	5	83	0	0	0	0	0	0
2	LSR	3	0	0	2	100	0	0	0	0	0	0
4	LSBk	6	0	0	3	75	1	25	0	0	0	0
9	PLP	14	0	0	4	44	4	44	1	11	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
66	4	6	46	70	12	18	4	6	0	0

Mean Maximum Residual Pool Depth (ft.): 1.6

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Middle Fork Cottaneva Creek

LLID: 1238199397827

Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Dry Units: 15

Confluence Location: Quad: HALES GROVE

Legal Description: T22NR18WS02

Latitude: 39:46:58.0N

Longitude: 123:49:12.0W

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
48	8	LGR	0	23	10	0	37	0	0	30	0
11	3	HGR	0	0	70	0	0	0	0	30	0
59	11	TOTAL RIFFLE	0	18	25	0	28	0	0	30	0
21	4	RUN	0	0	80	0	0	0	0	20	0
24	3	SRN	0	3	33	0	33	0	0	30	0
45	7	TOTAL FLAT	0	2	52	0	20	0	0	26	0
45	45	MCP	10	15	52	10	2	0	0	11	0
6	6	LSL	8	20	70	2	0	0	0	0	0
2	2	LSR	15	15	0	58	13	0	0	0	0
4	4	LSBk	18	5	25	13	0	0	0	33	8
9	9	PLP	11	9	39	20	0	0	0	17	4
66	66	TOTAL POOL	10	14	48	12	2	0	0	12	1
3	0	NS									
188	84	TOTAL	9	14	47	11	5	0	0	14	1

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Middle Fork Cottaneva Creek

LLID: 1238199397827

Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Dry Units: 15

Confluence Location: Quad: HALES GROVE

Legal Description: T22NR18WS02 Latitude: 39:46:58.0N

Longitude: 123:49:12.0W

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
48	8	LGR	0	0	13	88	0	0	0
11	3	HGR	0	0	0	33	33	0	33
21	4	RUN	0	0	75	25	0	0	0
24	3	SRN	0	0	67	33	0	0	0
45	44	MCP	2	5	61	27	5	0	0
6	6	LSL	0	0	67	33	0	0	0
2	2	LSR	0	0	100	0	0	0	0
4	4	LSBk	0	0	0	75	0	0	25
9	9	PLP	0	11	44	33	0	11	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Middle Fork Cottaneva Creek

LLID: 1238199397827

Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Confluence Location: Quad: HALES GROVE

Legal Description: T22NR18WS02

Latitude: 39:46:58.0N

Longitude: 123:49:12.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
91	86	14	0	94	96

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: Middle Fork Cottaneva Creek LLID: 1238199397827 Drainage: Rockport
 Survey Dates: 8/27/2008 to 9/3/2008 Survey Length (ft.): 5414 Main Channel (ft.): 5414 Side Channel (ft.): 0
 Confluence Location: Quad: HALES GROVE Legal Description: T22NR18WS02 Latitude: 39:46:58.0N Longitude: 123:49:12.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B3	Canopy Density (%): 89.8	Pools by Stream Length (%): 23.3
Reach Length (ft.): 3608	Coniferous Component (%): 83.8	Pool Frequency (%): 35.8
Riffle/Flatwater Mean Width (ft.): 7.3	Hardwood Component (%): 16.2	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 81
Range (ft.): 15 to 32	Vegetative Cover (%): 93.3	2 to 2.9 Feet Deep: 12
Mean (ft.): 21	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 7
Std. Dev.: 4	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 39	Mean Max Residual Pool Depth (ft.): 1.5
Water (F): 54 - 58 Air (F): 54 - 74	LWD per 100 ft.:	Mean Pool Shelter Rating: 26
Dry Channel (ft): 311	Riffles: 4	
	Pools: 17	
	Flat: 6	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 70 Sm Cobble: 21 Lg Cobble: 7 Boulder: 2 Bedrock: 0		
Embeddedness Values (%): 1. 23.3 2. 53.5 3. 16.3 4. 7.0 5. 0.0		

STREAM REACH: 2

Channel Type: G4	Canopy Density (%): 94.0	Pools by Stream Length (%): 18.1
Reach Length (ft.): 1806	Coniferous Component (%): 91.4	Pool Frequency (%): 33.8
Riffle/Flatwater Mean Width (ft.): 5.4	Hardwood Component (%): 8.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 65
Range (ft.): 20 to 21	Vegetative Cover (%): 98.2	2 to 2.9 Feet Deep: 30
Mean (ft.): 21	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 4
Std. Dev.: 0	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 39	Mean Max Residual Pool Depth (ft.): 1.7
Water (F): 54 - 56 Air (F): 55 - 64	LWD per 100 ft.:	Mean Pool Shelter Rating: 29
Dry Channel (ft): 263	Riffles: 9	
	Pools: 31	
	Flat: 9	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 74 Sm Cobble: 22 Lg Cobble: 4 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 34.8 2. 52.2 3. 8.7 4. 4.3 5. 0.0		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Middle Fork Cottaneva Creek

LLID: 1238199397827

Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Confluence Location: Quad: HALES GROVE

Legal Description: T22NR18WS02

Latitude: 39:46:58.0N

Longitude: 123:49:12.0W

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	4	5	5.4
Boulder	0	0	0.0
Cobble / Gravel	0	2	1.2
Sand / Silt / Clay	80	77	93.5

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	0	1	0.6
Brush	27	13	23.8
Hardwood Trees	7	17	14.3
Coniferous Trees	50	53	61.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Middle Fork Cottaneva Creek

LLID: 1238199397827

Drainage: Rockport

Survey Dates: 8/27/2008 to 9/3/2008

Confluence Location: Quad: HALES GROVE

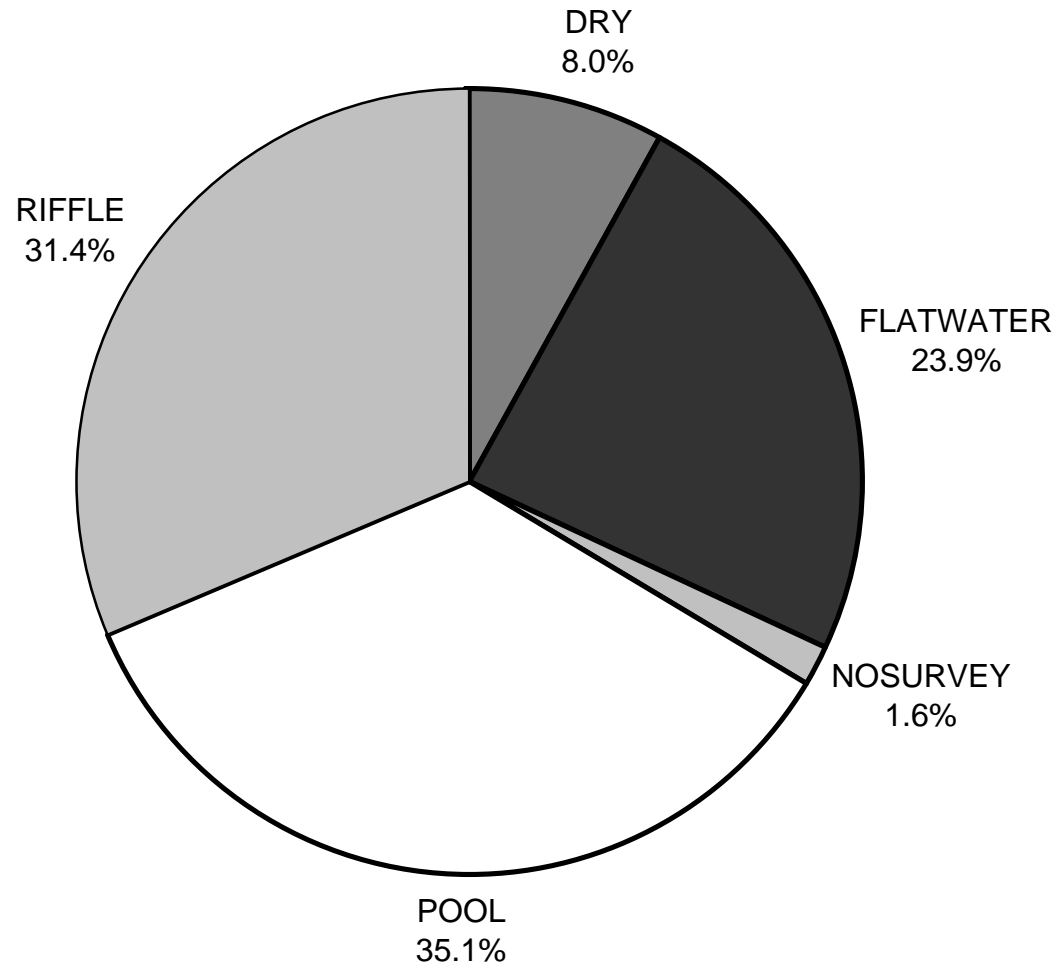
Legal Description: T22NR18WS02

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Longitude: 123:49:12.0W

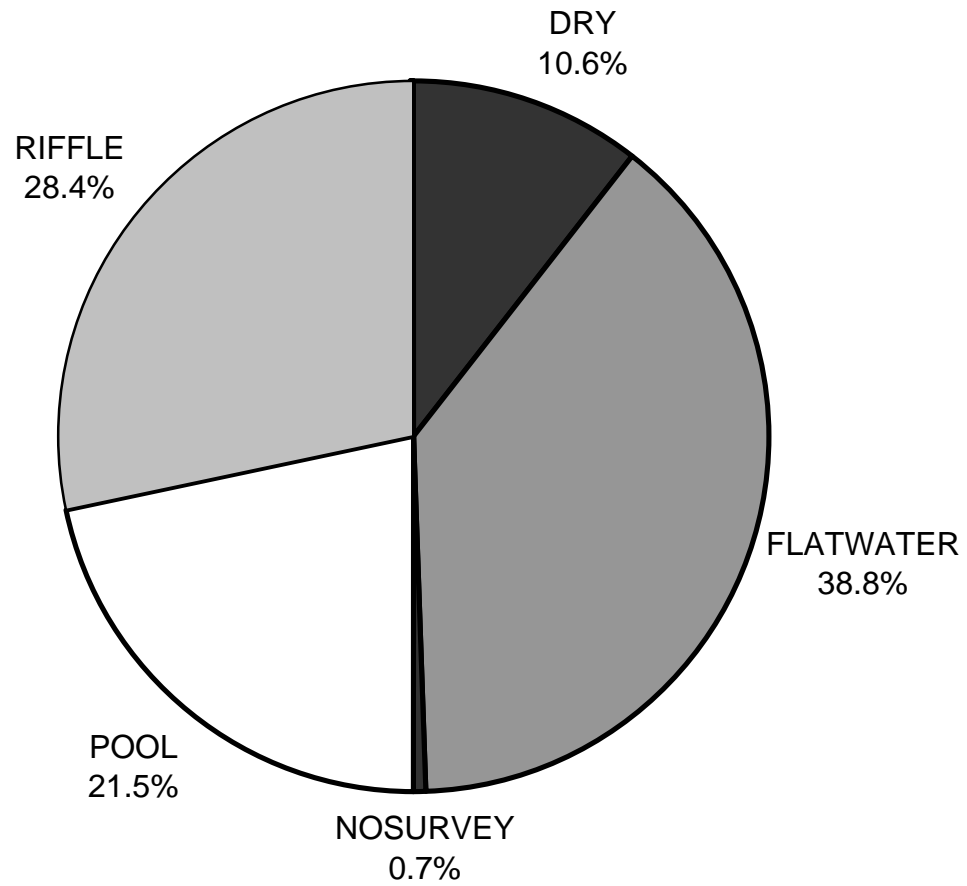
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	10
SMALL WOODY DEBRIS (%)	18	2	14
LARGE WOODY DEBRIS (%)	25	52	48
ROOT MASS (%)	0	0	12
TERRESTRIAL VEGETATION (%)	28	20	2
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	30	26	12
BEDROCK LEDGES (%)	0	0	1

MIDDLE FORK COTTANEVA CREEK 2008 HABITAT TYPES BY PERCENT OCCURRENCE



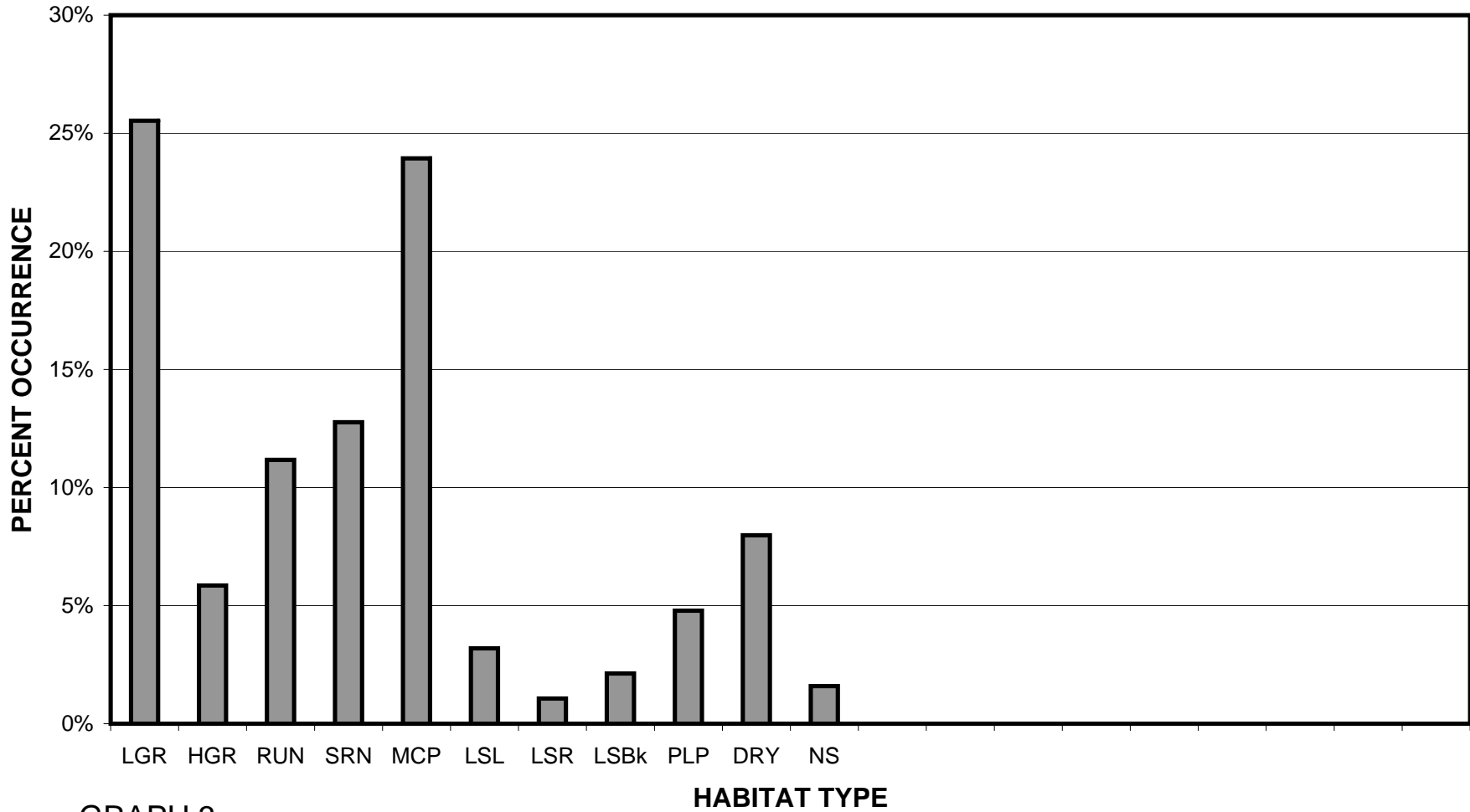
GRAPH 1

MIDDLE FORK COTTANEVA CREEK 2008 HABITAT TYPES BY PERCENT TOTAL LENGTH



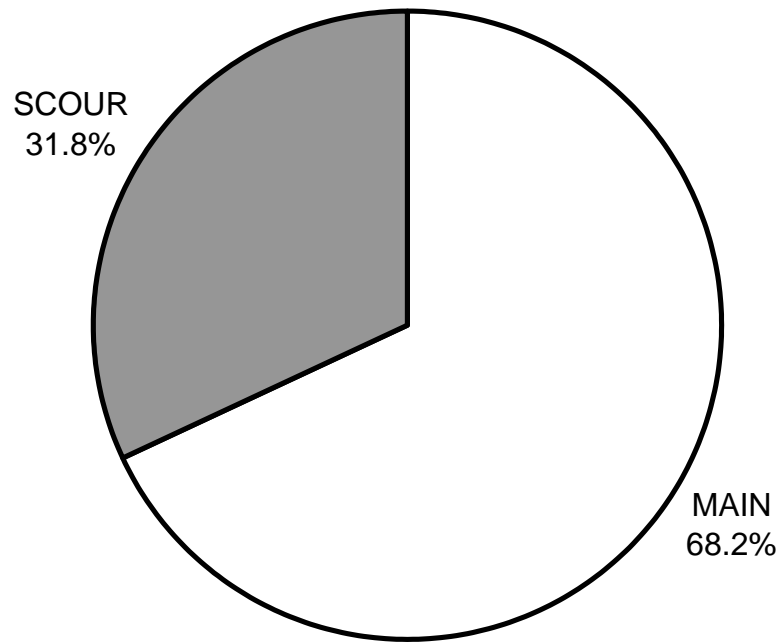
GRAPH 2

MIDDLE FORK COTTANEVA CREEK 2008 HABITAT TYPES BY PERCENT OCCURRENCE



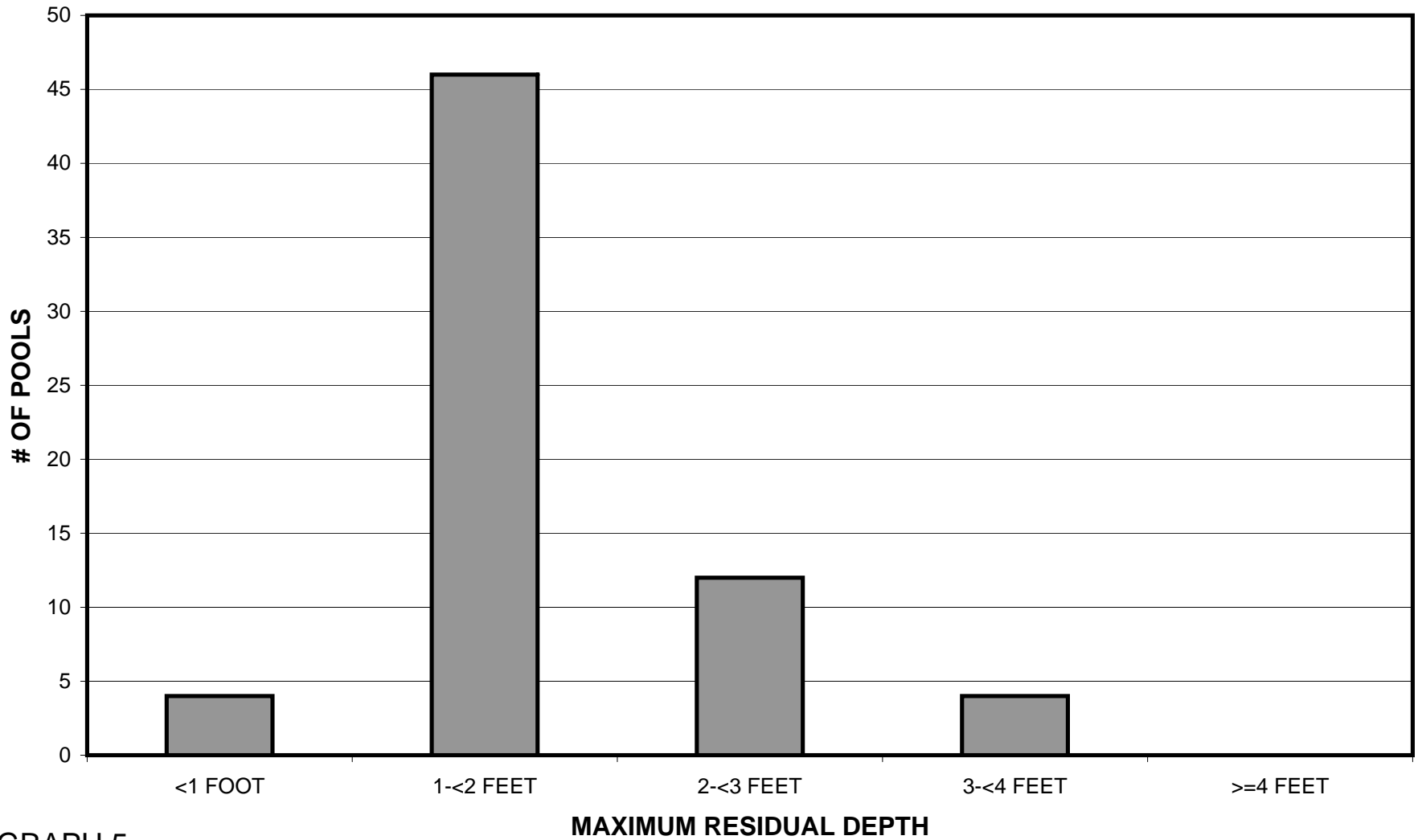
GRAPH 3

MIDDLE FORK COTTANEVA CREEK 2008 POOL TYPES BY PERCENT OCCURRENCE



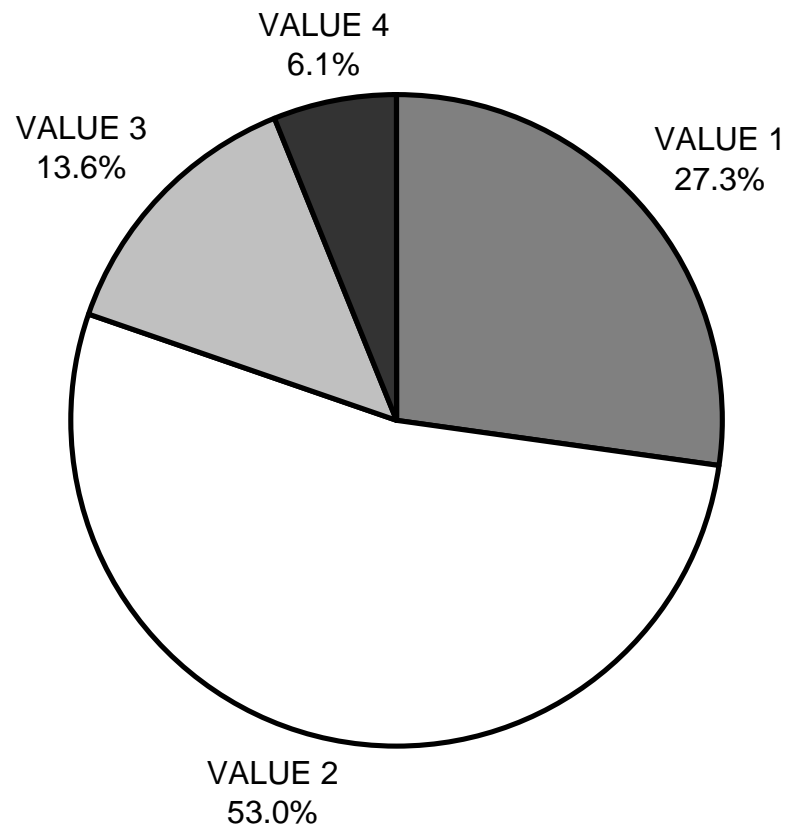
GRAPH 4

MIDDLE FORK COTTANEVA CREEK 2008 MAXIMUM DEPTH IN POOLS



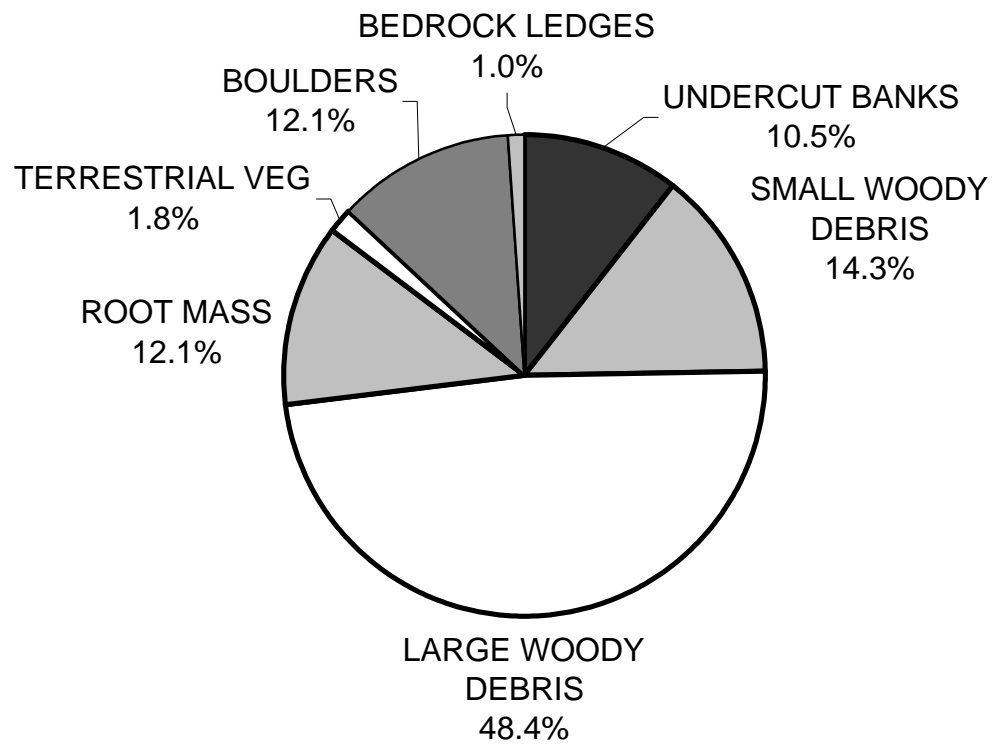
GRAPH 5

MIDDLE FORK COTTANEVA CREEK 2008 PERCENT EMBEDDEDNESS



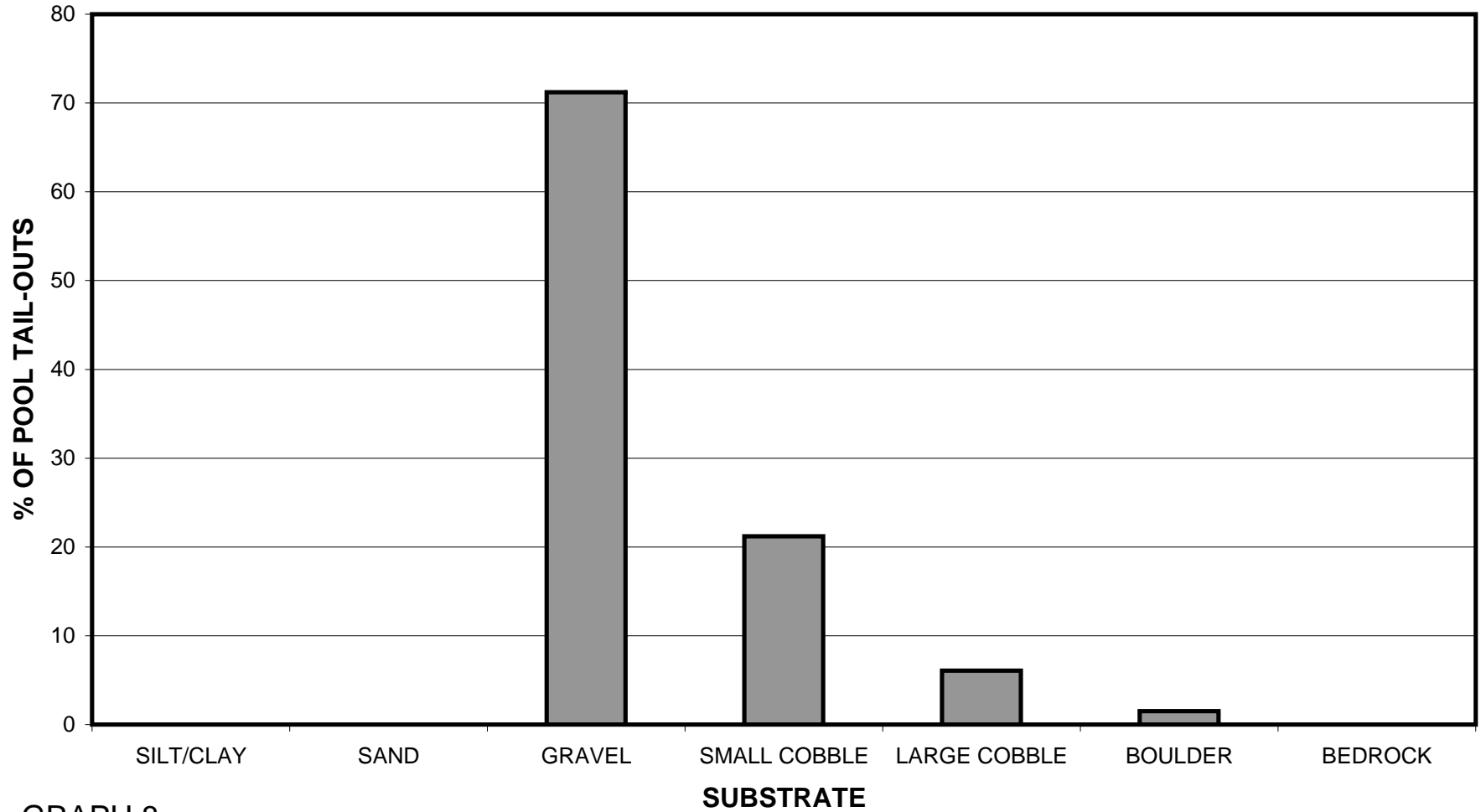
GRAPH 6

MIDDLE FORK COTTANEVA CREEK 2008 MEAN PERCENT COVER TYPES IN POOLS



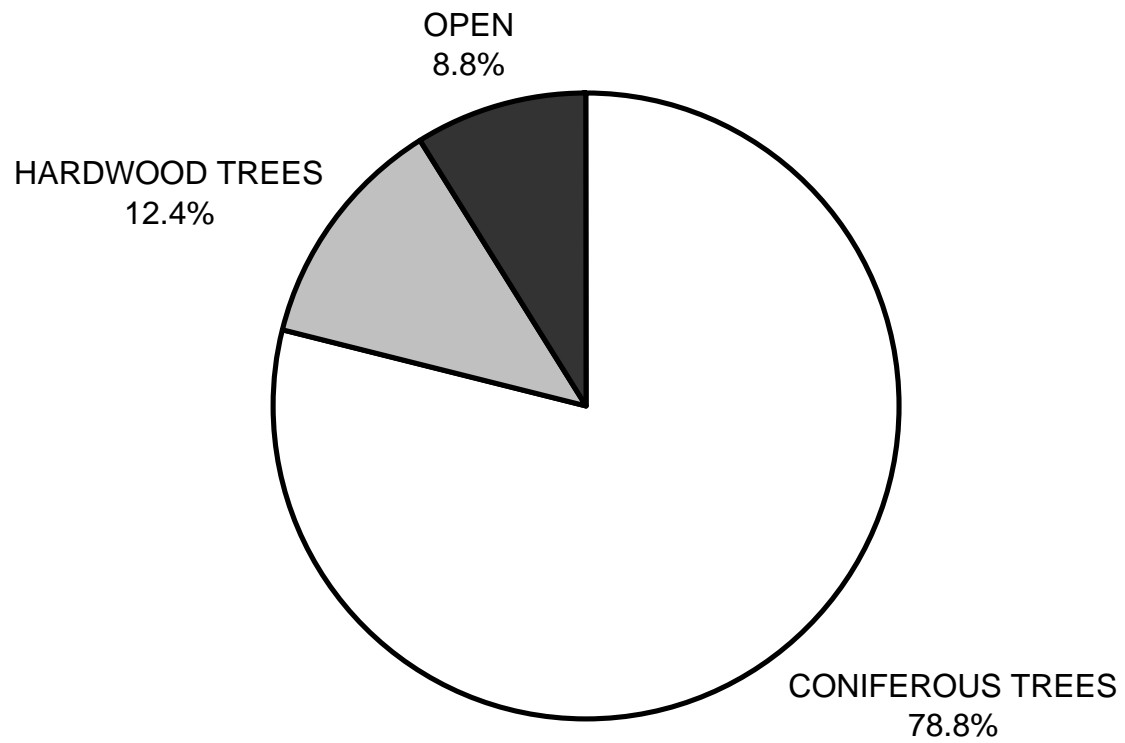
GRAPH 7

MIDDLE FORK COTTANEVA CREEK 2008 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



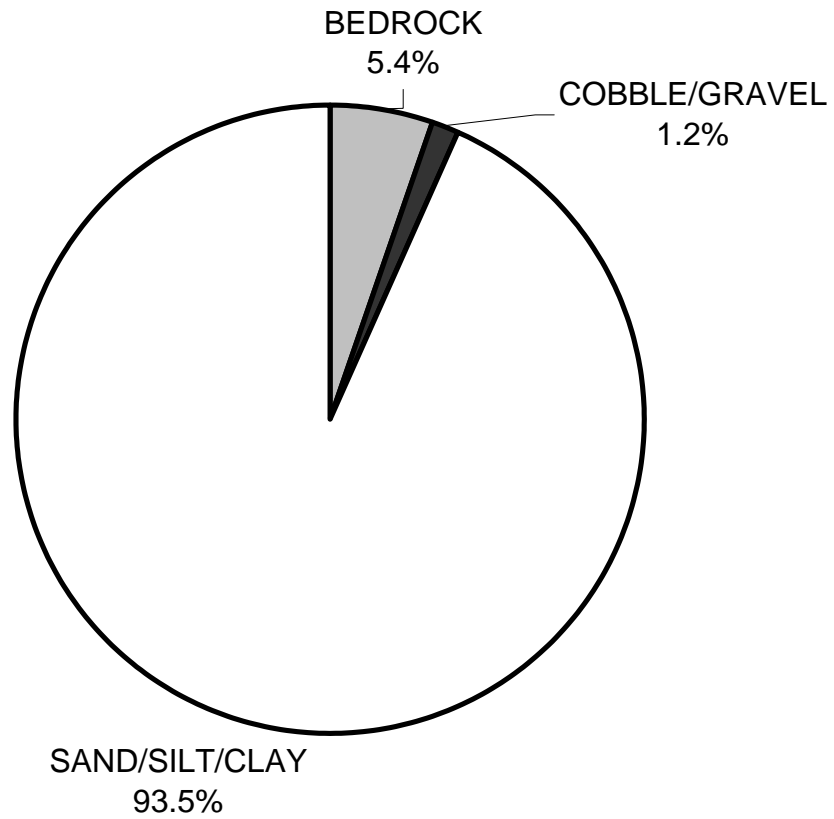
GRAPH 8

MIDDLE FORK COTTANEVA CREEK 2008 MEAN PERCENT CANOPY



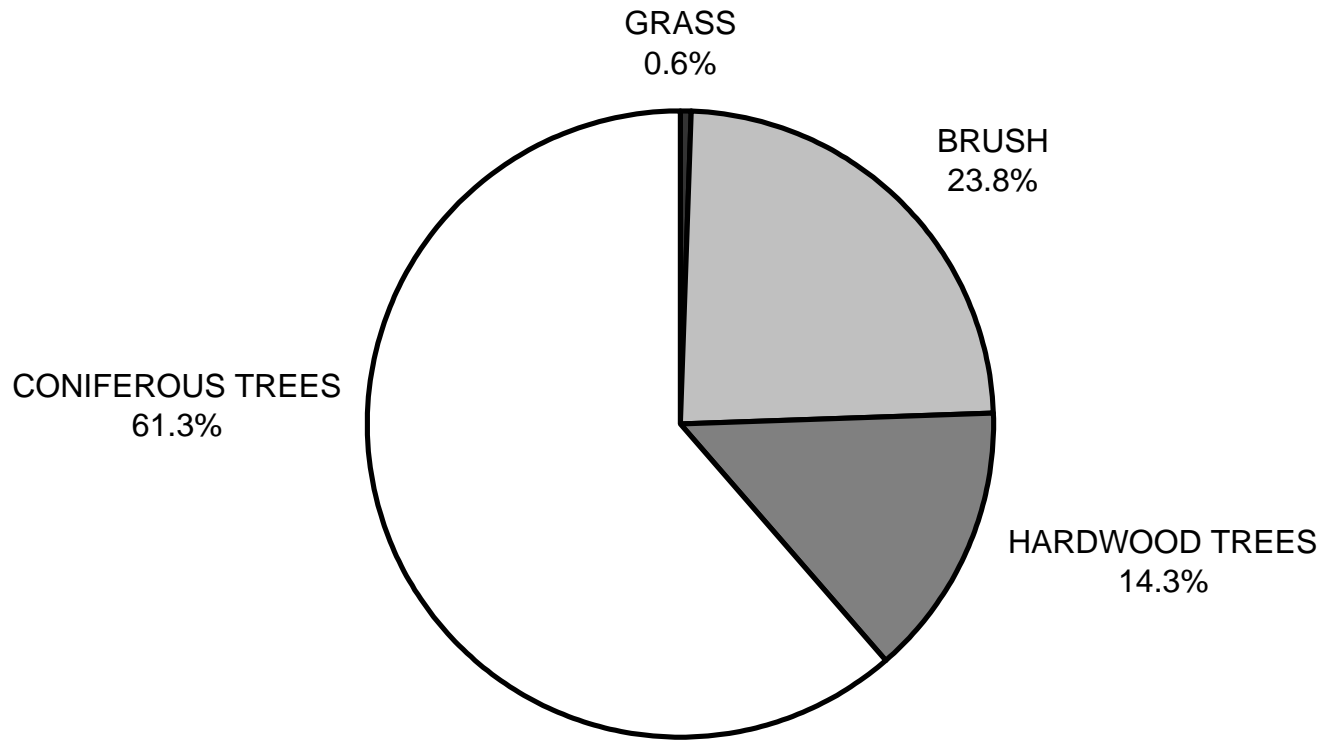
GRAPH 9

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



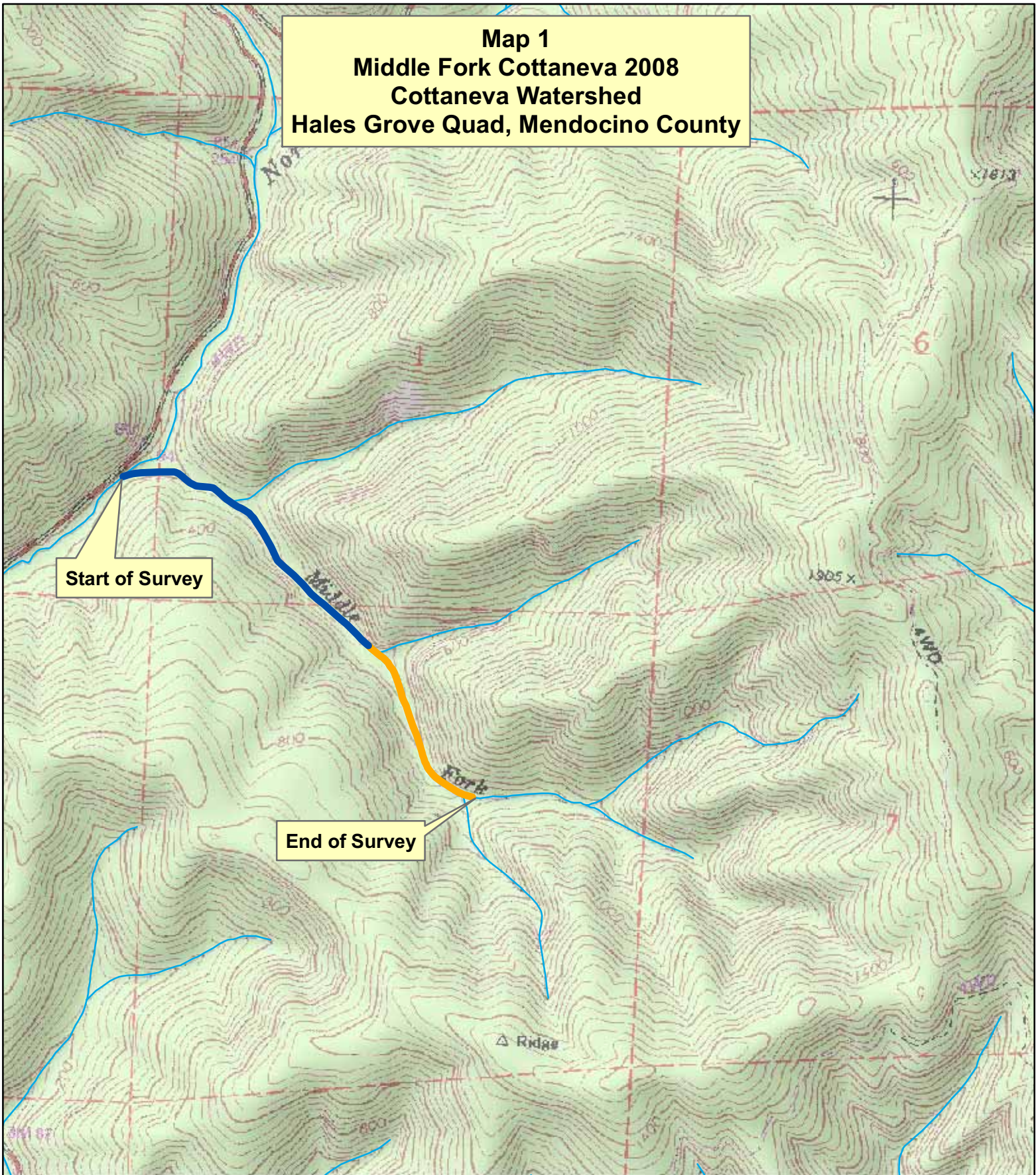
GRAPH 10

MIDDLE FORK COTTANEVA CREEK 2008 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Map 1
Middle Fork Cottaneva 2008
Cottaneva Watershed
Hales Grove Quad, Mendocino County



Start of Survey

End of Survey

Legend

- Reach 1, B3 Channel Type
- Reach 2, G4 Channel Type

