

# STREAM INVENTORY REPORT

## Campbell Creek

### INTRODUCTION

A stream inventory was conducted from June 11 to July 11, 2012 on Campbell Creek. The survey began at the confluence with South Fork Ten Mile River and extended upstream 4.9 miles.

The Campbell 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 Campbell 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

Campbell Creek is a tributary to South Fork Ten Mile River, tributary to Ten Mile River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Campbell Creek's legal description at the confluence with South Fork Ten Mile River is T19N R17W S14. Its location is 39.5122 degrees north latitude and 123.7157 degrees west longitude, LLID number 1237143395122. Campbell Creek is a first order stream and has approximately four miles of blue line stream according to the USGS Dutchman's Knoll 7.5 minute quadrangle. Campbell Creek drains a watershed of approximately 4.3 square miles. Elevations range from about 38 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 and as rangeland. Vehicle access exists via Camp 1 Ten Mile Road, north of Fort Bragg.

### METHODS

The habitat inventory conducted in Campbell Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Wildlife (CDFW) personnel that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. This inventory was conducted by a two-person team.

### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and

## Campbell Creek

their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

### HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Campbell 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". Campbell 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.

## Campbell 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 Campbell Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

### 6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Campbell 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 Campbell 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 Campbell 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.

## Campbell 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 Campbell Creek. In addition, underwater observations were made at nineteen 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 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

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

## Campbell Creek

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Campbell 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 June 11 to July 11, 2012 was conducted by M. Groff and I. Mikus, (CDFW). The total length of the stream surveyed was 25,710 feet with an additional 51 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.79 cfs on June 11, 2012.

Campbell Creek is an F4 channel type for 3,378 feet of the stream surveyed (Reach 1), a C4 channel type for 1,581 feet of the stream surveyed (Reach 2), an F4 channel type for 17,138 feet of the stream surveyed (Reach 3), and a G4 channel type for 3,664 feet of the stream surveyed (Reach 4). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and 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. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 55 degrees Fahrenheit. Air temperatures ranged from 42 to 68 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 47% pool units, 29% riffle units, 22% flatwater units, 1% dry units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 47% pool units, 28% flatwater units, 24% riffle units, and 1% dry units (Graph 2).

## Campbell Creek

Sixteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 39%; low gradient riffle units, 17%; and high gradient riffle units, 12% (Graph 3). Based on percent total length, mid-channel pool units made up 41%, step run units 18%, and low gradient riffle units 16%.

A total of 383 pools were identified (Table 3). Main channel pools were the most frequently encountered at 82% (Graph 4), and comprised 87% 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. One hundred twelve of the 383 pools (29%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 383 pool tail-outs measured, 234 had a value of 1 (61.1%); 122 had a value of 2 (31.9%); 20 had a value of 3 (5.2%); 7 had a value of 5 (1.8%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 2, and pool habitats had a mean shelter rating of 11 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 13. Main channel pools had a mean shelter rating of 10. Backwater pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Campbell Creek. Graph 7 describes the pool cover in Campbell 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 87% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 8% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Campbell Creek was 95%. Five percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 49% and 51%, respectively. Graph 9 describes the mean percent canopy in Campbell Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 95% sand/silt/clay, 3% cobble/gravel, and 2% bedrock (Graph 10). Brush was the dominant vegetation type observed in 57% of the units surveyed. Additionally, 24% of the units surveyed had deciduous trees as the dominant vegetation type, and 19% had coniferous trees as the dominant vegetation type (Graph 11).

## Campbell Creek

### BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 19 sites for species composition and distribution in Campbell Creek on June 25, 2012 and October 3, 2012. The sites were sampled by I. Mikus and M. Groff (CDFW).

In Reach 1, which comprised the first 3,378 feet of stream, three sites were sampled. The reach sites yielded 15 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), two age 1+ SH/RT, 10 YOY coho salmon, one age 1+ coho salmon, and four sculpin.

In Reach 2, three sites were sampled starting approximately 3,827 from the confluence with South Fork Ten Mile River and continuing upstream 996 feet. The reach sites yielded 12 YOY SH/RT, two age 1+ SH/RT, 10 YOY coho salmon, and one age 1+ coho salmon.

In Reach 3, 13 sites were sampled starting approximately 5,001 from the confluence with South Fork Ten Mile River and continuing upstream 12,021 feet. The reach sites yielded 58 YOY SH/RT, 11 age 1+ SH/RT, 12 YOY coho salmon, six age 1+ coho salmon, and two sculpin.

The following chart displays the information yielded from these sites:

2012 Campbell Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: F4 Channel Type									
06/25/12	1	025	Pool	818	8	0	0	3	0
	2	083	Pool	3,112	3	1	0	4	1
	3	087	Pool	3,283	4	1	0	3	0
Reach 2: C4 Channel Type									
06/25/12	4	100	Pool	3,864	3	1	0	4	0
	5	113	Pool	4,359	5	0	0	5	1
	6	128	Pool	4,823	4	0	0	1	0
Reach 3: F4 Channel Type									
06/25/12	7	133	Pool	5,045	6	2	0	2	0
	8	135	Pool	5,082	4	0	0	0	0
	9	141	Pool	5,285	3	1	0	5	0
	10	143	Pool	5,367	1	0	0	5	6
10/03/12	11	464	Pool	15,755	4	0	0	2	0
	12	469	Pool	15,899	2	1	0	3	0
	13	473	Pool	16,003	8	0	0	0	0

## Campbell Creek

	14	477	Pool	16,132	11	2	0	0	0
	15	482	Pool	16,255	5	1	0	0	0
	16	498	Pool	16,693	8	2	0	0	0
	17	501	Pool	16,940	5	2	0	0	0
	18	505	Run	17,008	0	0	0	0	0
	19	506	Pool	17,022	1	0	0	0	0

### DISCUSSION

Campbell Creek is an F4 channel type for the first 3,378 feet of stream surveyed, a C4 channel type for the next 1,581 feet, an F4 channel type for the next 17,138 feet, and a G4 channel type for the remaining 3,664 feet. The suitability of F4, C4, and G4 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. 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 June 11 to July 11, 2012 ranged from 52 to 55 degrees Fahrenheit. Air temperatures ranged from 42 to 68 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 28% of the total length of this survey, riffles 24%, and pools 47%. One hundred twelve of the 383 (29%) pools had 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 large wood structures that will deepen pool habitat is recommended.

Three hundred fifty-six of the 383 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty of the pool tail-outs had embeddedness ratings of 3 or 4. Seven 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.

Three hundred sixty-four of the 383 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools is 11. The shelter rating in the flatwater habitats is 2. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being



## Campbell Creek

provided primarily by large woody debris in Campbell 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 structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 95%. Reach 1 had a canopy density of 93%, Reach 2 had a canopy density of 95%, Reach 3 had a canopy density of 95%, and Reach 4 had a canopy density of 97%. The percentage of right and left bank covered with vegetation was 99% and 99%, respectively.

### RECOMMENDATIONS

- 1) Campbell Creek should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

### 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 South Fork Ten Mile River. The channel is an F4.
202	0008.00	A logging road crosses the channel. The crossing is a 12.7' wide x 53' long x 5.7' high railcar bridge. Boulder rip-rap lines both banks below the bridge.

## Campbell Creek

718	0023.00	A logging road crosses the channel. The crossing is a 12.6' wide x 52.5' long x 4.6' high railcar bridge. Boulder rip-rap lines both banks below the bridge.
1242	0036.00	Road from horse pasture on the right bank leads to creek. Evidence of horses on the gravel bar.
1816	0048.00	There is a 0.3' high plunge over log.
2669	0071.00	Dry right bank tributary.
3112	0084.00	Dry right bank tributary.
3378	0091.00	The channel changes from an F4 to a C4.
4959	0131.00	The channel changes from a C4 to an F4.
5651	0152.00	Log Debris Accumulation (LDA) #01 contains eight pieces of large woody debris (LWD) and measures 5' high x 38' wide x 7' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 20' wide x 60' long x 2' deep. Water flows under accumulated sediment and the left bank for 20 feet upstream of the LDA. Fish are present above the LDA.
7815	0213.00	There is a 0.5' high plunge over log.
7930	0216.00	Dry right bank tributary.
8565	0235.00	An erosion site on the left bank measures approximately 20' high x 30' long. It is contributing sediment ranging in size from silt to gravel to the channel.
8967	0245.00	There is a 1' high plunge over small woody debris (SWD).
9390	0260.00	Left bank seep. Stream has re-channelized on right bank due to an LDA that blocked the left bank and forced the stream to the right.
9424	0262.00	An erosion site on the right bank measures approximately 50' long x 10' high. It is contributing sediment ranging in size from silt to gravel to the channel.
9828	0275.00	There is a 0.9' high plunge over log.
10172	0285.00	There is a 1.8' high plunge over woody debris.

## Campbell Creek

10267	0291.00	An erosion site on the left bank measures approximately 30' long x 20' high. It is contributing sediment ranging in size from silt to gravel to the channel.
10434	0297.00	There is a 0.9' high plunge over log.
10640	0305.00	Left bank seep.
10849	0309.00	There is a 0.8' high plunge over railroad tie.
11171	0319.00	Remnants of a railroad trestle on right bank are accumulating LWD.
11249	0322.00	An erosion site on the right bank measures approximately 12' long x 7' high. It is contributing fine sediment to the channel.
11900	0344.00	An erosion site on the left bank measures approximately 40' high x 40' long. It is contributing sediment ranging in size from silt to gravel to the channel. LWD is accumulating in the channel.
11969	0346.00	Left bank seep. LWD is accumulating in the channel.
12231	0351.00	Left bank seep.
12690	0365.00	Right bank seep.
12756	0367.00	LDA #02 contains 14 pieces of LWD and measures 8' high x 37' wide x 10' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 15' wide x 25' long x 2' deep. Fish are present above the LDA. An erosion site on the right bank measures approximately 50' long x 5' high. It is contributing fine sediment to the channel.
12859	0370.00	Remnants of railroad trestle on left bank.
13198	0381.00	Remnants of railroad trestle on right bank.
13417	0386.00	There is a 0.8' high plunge over log.
13496	0388.00	Left bank seep.
13573	0390.00	Tributary #01 enters on the right bank. It contributes less than 5% to Campbell Creek's flow. The water temperature of the tributary is 53 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 54 degrees Fahrenheit. The slope of the tributary is approximately 3%. Only the first 15' of the tributary has water, the rest is dry.

## Campbell Creek

13628	0392.00	Remnants of railroad trestle on right bank. LDA #03 contains 10 pieces of LWD and measures 6' high x 27' wide x 13' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment. Fish are present above the LDA.
13840	0399.00	LDA #04 contains eight pieces of LWD and measures 7' high x 21' wide x 14' long. The woody debris is accumulating on the remnants of a railroad crossing in the channel. Water flows through the LDA and there are no visible gaps in it. The LDA is not retaining sediment. Fish are present above the LDA.
14404	0418.00	Remnants of railroad trestle on right bank. There is a 0.5' high plunge over a log.
14451	0419.00	Dry left bank tributary.
15125	0443.00	Willows from both banks have collapsed in to the channel. They are sprouting and collecting SWD.
15853	0469.00	There is a 1.5' to 2.5' high plunge over LWD.
15909	0471.00	LWD and SWD is accumulating in the channel.
16132	0478.00	Tributary #02 enters on the left bank. It contributes approximately 5% to Campbell Creek's flow. The water temperature of the tributary is 53 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 52 degrees Fahrenheit. The slope of the tributary is approximately 8-10%. The tributary goes dry approximately 150 feet upstream from the mouth.
16335	0485.00	LDA #05 contains 30 pieces of LWD and measures 4' high x 25' wide x 47' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 12' wide x 40' long x 2' deep. Fish are present above the LDA.
16360	0486.00	An erosion site on the right bank measures approximately 40' long x 8' high. It is contributing fine sediment to the channel.
16437	0490.00	Right bank seep.
16971	0504.00	"West Fork Campbell Creek" (tributary #03) enters on the right bank. It contributes approximately 10% to Campbell Creek's flow. The water temperature of the tributary is 53 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 53 degrees Fahrenheit. The slope of the tributary is approximately 3-4%. The

## Campbell Creek

tributary is accessible to salmonids. Salmonids were observed in the tributary.

17008	0506.00	LWD is accumulating on the remnants of railroad trestles in the channel.
17034	0508.00	LDA #06 contains five pieces of LWD and measures 4' high x 18' wide x 14' long. The woody debris is accumulating on the remnants of an old railroad trestle. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 10' wide x 50' long x 3' deep. There are two 2.5' high plunges over the LDA. Fish are present above the LDA.
17069	0510.00	LDA #07 contains 12 pieces of LWD and measures 7' high x 25' wide x 18' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment. Fish are present above the LDA.
17131	0513.00	LDA #08 contains 13 pieces of LWD and measures 7' high x 25' wide x 18' long. Water does not flow through the LDA; the channel is dry above it. There are visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 12' wide x 100' long x 4' deep. Fish are present above the LDA.
17590	0526.00	LDA #09 contains seven pieces of LWD and measures 4' high x 18' wide x 11' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 3' wide x 6' long x 1.5' deep. Fish are present above the LDA.
17702	0530.00	Right bank seep.
17820	0534.00	Remnants of railroad crossing.
18147	0547.00	LDA #10 contains seven pieces of LWD and measures 3.5' high x 15' wide x 11' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 4' wide x 10' long x 1' deep. Fish are present above the LDA.
18374	0557.00	Tributary #04 enters on the left bank. It contributes less than 5% to Campbell Creek's flow. The water temperature of the tributary is 54 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 55 degrees Fahrenheit. The slope of the tributary is approximately 10%. The tributary is accessible to salmonids, but it is intermittently dry.
18862	0573.00	Left bank seep.
19159	0581.00	LWD and SWD are accumulating on top of boulders in the channel.

## Campbell Creek

19378	0587.00	There is a 2.1' high plunge over woody debris.
19703	0596.00	Remnants of railroad trestle in creek.
19854	0601.00	There is a 0.5' high plunge over woody debris.
20042	0607.00	Remnants of railroad trestle on left bank.
20102	0609.00	LDA #11 contains 10 pieces of LWD and measures 4.5' high x 32' wide x 20' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 20' wide x 50' long x 2.5' deep. 2.5' high plunge over LDA on right bank. 3' high plunge over LDA on left bank; there is less flow and more SWD blockage on the left bank. Fish are present above the LDA.
20230	0613.00	LDA #12 contains 14 pieces of LWD and measures 5' high x 20' wide x 30' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 8' wide x 30' long x 3' deep. Fish are present above the LDA.
20309	0615.00	Tributary #05 enters on the left bank. It contributes approximately 5% to Campbell Creek's flow. The water temperature of the tributary is 52 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 53 degrees Fahrenheit. The slope of the tributary is approximately 20%. The tributary is not accessible to salmonids.
20470	0619.00	LDA #13 contains 13 pieces of LWD and measures 4.5' high x 30' wide x 25' long. The woody debris is accumulating on the remnants of railroad trestles. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 12' wide x 50' long x 2' deep. Fish are present above the LDA.
20636	0627.00	Remnants of railroad trestle on right bank.
20729	0631.00	LDA #14 contains 12 pieces of LWD and measures 5' high x 24' wide x 25' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 15' wide x 60' long x 2.5' deep. There is a 3' high plunge over the LDA. Fish are present above the LDA. Right bank seep. The right bank is eroding at the seep and under a redwood ring just downstream of it. The erosion site measures approximately 20' high x 18' long; it is contributing fine sediment to the channel.
20910	0635.00	LDA #15 contains seven pieces of LWD and measures 4.5' high x 24' wide x 25' long. The woody debris is accumulating on the remnants of railroad trestles across the channel. Water flows through the LDA and

## Campbell Creek

there are no visible gaps in it. The LDA is not retaining sediment. Fish are present above the LDA.

21048	0640.00	LDA #16 contains 12 pieces of LWD and measures 4.5' high x 17' wide x 14' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 10' wide x 50' long x 1' deep. Fish are present above the LDA.
21237	0646.00	Dry right bank tributary.
21437	0651.00	Left bank seep. There is a 0.5' high plunge over log.
21482	0654.00	Right bank seep.
21620	0657.00	LDA #17 contains over 25 pieces of LWD and measures 5' high x 31' wide x 31' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 20' wide x 100' long x 3' deep. Fish are present above the LDA.
21778	0662.00	Water plunging through sediment and LWD.
21809	0663.00	Left bank seep.
21876	0666.00	An erosion site on the right bank measures approximately 30' long x 30' high; it is contributing fine sediment to the channel.
22046	0673.00	The channel changes from an F4 to a G4. LDA #18 contains 10 pieces of LWD and measures 6' high x 19' wide x 15' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to large cobble and measures 12' wide x 40' long x 1.5' deep. There is a 2.5' high plunge over the LDA. Fish are present above the LDA.
22243	0681.00	There is a 1.5' high plunge over log.
22270	0682.00	There is a 1' high plunge over woody debris.
22303	0684.00	LDA #19 contains nine pieces of LWD and measures 5' high x 16' wide x 14' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 8' wide x 60' long x 2.5' deep. There is a 3.5' high plunge over the LDA. Fish are present above the LDA.
22514	0689.00	Remnants of railroad trestle on right bank. There is a 0.5' high plunge over woody debris.

## Campbell Creek

22554	0692.00	LDA #20 contains 17 pieces of LWD and measures 3' high x 29' wide x 24' long. Water does not flow through the LDA; the flow is subterranean through the sediment retained above the LDA. There are visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 15' wide x 60' long x 2' deep. There is a 2.5' high plunge over the LDA. Fish are present above the LDA.
22600	0694.00	Remnants of railroad trestle across the channel accumulating woody debris on the right bank.
22656	0697.00	LDA #21 contains one piece of LWD and measures 4.5' high x 18' wide x 3' long. Water does not flow through the LDA; the channel is dry for 58' above it. There are visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 15' wide x 60' long x 1' deep. There is a 2.5' high plunge over the LDA. Fish are present above the LDA.
22666	0698.00	There is a 0.5' high plunge over log.
22740	0700.00	Remnants of railroad trestles on the right bank.
22846	0705.00	Woody debris is accumulating on top of boulders creating a high gradient section measuring 7.7' high x 27' long. Water is flowing through the sediment; the thalweg is dry.
22974	0713.00	LDA #22 contains 11 pieces of LWD and measures 4' high x 22' wide x 26' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 20' wide x 50' long x 1' deep. There is a 3' high plunge over the LDA. Fish are present above the LDA.
23014	0716.00	Dry right bank tributary.
23200	0722.00	Salmonid young-of-the-year (YOY) observed.
23287	0726.00	Dry left bank tributary.
23374	0729.00	Remnants of railroad trestle on left bank.
23645	0740.00	Dry left bank tributary.
23685	0742.00	Salmonid observed.
23824	0747.00	LDA #23 contains 12 pieces of LWD and measures 6' high x 23' wide x 19' long. Water not flowing through the LDA; the channel is dry for 30'



## Campbell Creek

above it. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 12' wide x 100' long x 1' deep. Fish are present above the LDA.

24033	0755.00	LDA #24 contains eight pieces of LWD and measures 7' high x 10' wide x 20' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 10' wide x 100' long x 4' deep. There is a 4.5' high plunge over the LDA. Fish are present above the LDA.
24133	0760.00	Dry right bank tributary.
24257	0764.00	Salmonid observed.
24303	0766.00	Left bank seep.
24360	0767.00	There is a 3.5' high bedrock sheet.
24496	0772.00	There is a 3.5' high plunge over bedrock.
24991	0788.00	"North Fork Campbell Creek" (tributary #06) enters on the right bank. It contributes approximately 45% to Campbell Creek's flow. The water temperature of the tributary is 54 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 54 degrees Fahrenheit. The slope of the tributary is approximately 3-4%. The tributary is to salmonids, but no fish were observed.
25570	0806.00	LDA #25 contains over 30 pieces of LWD and measures 8' high x 26' wide x 87' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 20' wide x 60' long x 4' deep. There is a 4.5' high plunge over the LDA with no jump pool below it. No fish were observed above the LDA.
25668	0810.00	LDA #26 contains nine pieces of LWD and measures 7' high x 12' wide x 23' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 12' wide x 30' long x 2' deep. There is a 4' high plunge over the LDA.
25700	0812.00	End of survey at 6' high plunge over sediment. The channel is dry above the plunge; the water is flowing subsurface and plunging into the pool below through holes in the sediment. The habitat diminishes above the plunge and much of the channel is dry. The slope of the channel is 14.3% over the last 185 feet of the survey.

## **Campbell 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.

## Campbell 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: Campbell Creek

LLID: 1237143395122 Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Confluence Location: Quad: DUTCHMANS Legal Description: T19NR16WS17 Latitude: 39:30:44.0N Longitude: 123:42:51.0

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
8	0	DRY	1.0	18	140	0.5									
180	28	FLATWATER	22.1	40	7191	27.9	5.9	0.3	0.8	229	41234	84	15163		2
5	0	NOSURVEY	0.6	25	125	0.5									
383	383	POOL	47.1	32	12103	47.0	9.7	0.8	1.7	299	114537	307	117526	245	11
237	33	RIFFLE	29.2	26	6202	24.1	8.7	0.2	0.5	177	41910	43	10173		0
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>			<b>Total Volume (cu.ft.)</b>		
813	444				25761					197681			142862		

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

Stream Name: Campbell Creek

LLID: 1237143395122 Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Confluence Location: Quad: DUTCHMANS Legal Description: T19NR16WS17 Latitude: 39:30:44.0N Longitude: 123:42:51.0W

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 (%)
138	13	LGR	17.0	29	3999	15.5	8	0.2	0.8	213	29460	46	6316		0	96
98	19	HGR	12.1	22	2195	8.5	9	0.2	0.9	160	15702	43	4229		1	97
1	1	BRS	0.1	8	8	0.0	5	0.1	0.1	16	16	2	2		0	95
95	13	RUN	11.7	27	2521	9.8	6	0.3	1.2	173	16453	62	5931		3	92
85	15	SRN	10.5	55	4670	18.1	6	0.3	1.2	278	23589	103	8767		1	94
313	313	MCP	38.5	33	10458	40.6	9	0.8	4.7	315	98735	327	102244	261	10	95
1	1	CCP	0.1	12	12	0.0	6	0.4	0.9	72	72	43	43	29	0	93
1	1	STP	0.1	33	33	0.1	10	0.8	1.8	330	330	330	330	264	0	90
10	10	CRP	1.2	30	305	1.2	13	0.8	3.8	354	3538	352	3518	278	10	94
11	11	LSL	1.4	24	268	1.0	11	0.6	3.1	230	2528	186	2042	138	26	95
2	2	LSR	0.2	20	39	0.2	13	0.6	1.5	247	495	190	379	140	5	93
15	15	LSBk	1.8	32	487	1.9	10	0.5	2.6	270	4056	179	2692	131	5	96
1	1	LSBo	0.1	19	19	0.1	5	0.5	1.2	95	95	67	67	48	5	85
28	28	PLP	3.4	16	461	1.8	10	1.0	3.9	159	4457	210	5888	182	13	94
1	1	DPL	0.1	21	21	0.1	11	0.6	1.2	231	231	323	323	139	10	92
8	0	DRY	1.0	18	140	0.5										
5	0	NS	0.6	25	125	0.5										

Total Units  
813

Total Units Fully Measured  
444

Total Length (ft.)  
25761

Total Area (sq.ft.)  
199758

Total Volume (cu.ft.)  
142770

**Table 3 - Summary of Pool Types**

Stream Name: Campbell Creek

LLID: 1237143395122

Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T19NR16WS17

Latitude: 39:30:44.0N

Longitude: 123:42:51.0W

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
315	315	MAIN	82	33	10503	87	9.5	0.8	315	99137	260	81891	10
67	67	SCOUR	17	24	1579	13	10.7	0.8	226	15169	175	11695	13
1	1	BACKWATER	0	21	21	0	11.0	0.6	231	231	139	139	10

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
383	383	12103	114537	93724

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

Stream Name: Campbell Creek

LLID: 1237143395122

Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T19NR16WS17

Latitude: 39:30:44.0N

Longitude: 123:42:51.0W

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
313	MCP	82	15	5	207	66	79	25	11	4	1	0
1	CCP	0	1	100	0	0	0	0	0	0	0	0
1	STP	0	0	0	1	100	0	0	0	0	0	0
10	CRP	3	0	0	6	60	2	20	2	20	0	0
11	LSL	3	0	0	9	82	1	9	1	9	0	0
2	LSR	1	0	0	2	100	0	0	0	0	0	0
15	LSBk	4	0	0	14	93	1	7	0	0	0	0
1	LSBo	0	0	0	1	100	0	0	0	0	0	0
28	PLP	7	1	4	13	46	12	43	2	7	0	0
1	DPL	0	0	0	1	100	0	0	0	0	0	0
<b>Total Units</b>			<b>Total &lt; 1 Foot Max Resid. Depth</b>	<b>Total &lt; 1 Foot % Occurrence</b>	<b>Total 1&lt; 2 Foot Max Resid. Depth</b>	<b>Total 1&lt; 2 Foot % Occurrence</b>	<b>Total 2&lt; 3 Foot Max Resid. Depth</b>	<b>Total 2&lt; 3 Foot % Occurrence</b>	<b>Total 3&lt; 4 Foot Max Resid. Depth</b>	<b>Total 3&lt; 4 Foot % Occurrence</b>	<b>Total &gt;= 4 Foot Max Resid. Depth</b>	<b>Total &gt;= 4 Foot % Occurrence</b>
383			17	4	254	66	95	25	16	4	1	0

Mean Maximum Residual Pool Depth (ft.): 1.7

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

Stream Name: Campbell Creek

LLID: 1237143395122

Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Dry Units: 8

Confluence Location: Quad: DUTCHMANS

Legal Description: T19NR16WS17

Latitude: 39:30:44.0N

Longitude: 123:42:51.0W

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
138	13	LGR	0	0	0	0	0	0	0	0	0
98	19	HGR	0	0	0	0	100	0	0	0	0
1	1	BRS	0	0	0	0	0	0	0	0	0
237	33	TOTAL RIFFLE	0	0	0	0	100	0	0	0	0
95	13	RUN	0	25	25	0	50	0	0	0	0
85	15	SRN	25	50	0	0	25	0	0	0	0
180	28	TOTAL FLAT	8	33	17	0	42	0	0	0	0
313	313	MCP	12	40	43	0	4	0	0	0	0
1	1	CCP	0	0	0	0	0	0	0	0	0
1	1	STP	0	0	0	0	0	0	0	0	0
10	10	CRP	42	30	28	0	0	0	0	0	0
11	11	LSL	2	39	59	0	0	0	0	0	0
2	2	LSR	0	80	20	0	0	0	0	0	0
15	15	LSBk	39	27	31	2	0	0	0	0	0
1	1	LSBo	0	100	0	0	0	0	0	0	0
28	28	PLP	3	19	67	0	1	0	5	5	0
1	1	DPL	0	10	90	0	0	0	0	0	0
383	383	TOTAL POOL	12	38	45	0	3	0	1	1	0
5	0	NS									
813	444	TOTAL	12	38	44	0	4	0	1	1	0



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

Stream Name: Campbell Creek

LLID: 1237143395122

Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Dry Units: 8

Confluence Location: Quad: DUTCHMANS

Legal Description: T19NR16WS17

Latitude: 39:30:44.0N

Longitude: 123:42:51.0W

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
138	13	LGR	0	0	100	0	0	0	0
98	19	HGR	0	0	100	0	0	0	0
1	1	BRS	0	0	0	0	0	0	100
95	13	RUN	0	0	100	0	0	0	0
85	15	SRN	0	0	100	0	0	0	0
313	313	MCP	1	0	98	0	0	0	0
1	1	CCP	0	0	100	0	0	0	0
1	1	STP	0	0	100	0	0	0	0
10	10	CRP	0	0	100	0	0	0	0
11	11	LSL	0	0	100	0	0	0	0
2	2	LSR	0	0	100	0	0	0	0
15	15	LSBk	0	0	100	0	0	0	0
1	1	LSBo	0	0	100	0	0	0	0
28	28	PLP	4	18	79	0	0	0	0
1	1	DPL	0	0	100	0	0	0	0

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

Stream Name: Campbell Creek

LLID: 1237143395122      Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Confluence Location: Quad: DUTCHMANS      Legal Description: T19NR16WS17      Latitude: 39:30:44.0N      Longitude: 123:42:51.0W

---

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
95	51	49	0	99	99

---

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

**Table 8 - Fish Habitat Inventory Data Summary**

Stream Name: Campbell Creek LLID: 1237143395122 Drainage: Rockport  
 Survey Dates: 6/11/2012 to 7/11/2012 Survey Length (ft.): 25761 Main Channel (ft.): 25710 Side Channel (ft.): 51  
 Confluence Location: Quad: DUTCHMANS Legal Description: T19NR16WS17 Latitude: 39:30:44.0N Longitude: 123:42:51.0W

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

**STREAM REACH: 1**

Channel Type: F4	Canopy Density (%): 93.2	Pools by Stream Length (%): 65.5
Reach Length (ft.): 3378	Coniferous Component (%): 5.3	Pool Frequency (%): 60.0
Riffle/Flatwater Mean Width (ft.): 7.4	Hardwood Component (%): 94.7	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 43
Range (ft.): 15 to 23	Vegetative Cover (%): 99.1	2 to 2.9 Feet Deep: 46
Mean (ft.): 20	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 11
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.8	Occurrence of LWD (%): 12	Mean Max Residual Pool Depth (ft.): 2.0
Water (F): 52 - 55 Air (F): 42 - 62	LWD per 100 ft.:	Mean Pool Shelter Rating: 11
Dry Channel (ft): 0	Riffles: 1	
	Pools: 3	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 63.0 2. 35.2 3. 1.9 4. 0.0 5. 0.0		

**STREAM REACH: 2**

Channel Type: C4	Canopy Density (%): 94.8	Pools by Stream Length (%): 63.2
Reach Length (ft.): 1581	Coniferous Component (%): 7.7	Pool Frequency (%): 52.5
Riffle/Flatwater Mean Width (ft.): 8.7	Hardwood Component (%): 92.3	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 57
Range (ft.): 19 to 25	Vegetative Cover (%): 99.7	2 to 2.9 Feet Deep: 38
Mean (ft.): 23	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 5
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.8	Occurrence of LWD (%): 19	Mean Max Residual Pool Depth (ft.): 1.9
Water (F): 52 - 53 Air (F): 57 - 59	LWD per 100 ft.:	Mean Pool Shelter Rating: 9
Dry Channel (ft): 0	Riffles: 0	
	Pools: 3	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 90 Sm Cobble: 10 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 52.4 2. 38.1 3. 9.5 4. 0.0 5. 0.0		

### Summary of Fish Habitat Elements By Stream Reach

#### STREAM REACH: 3

Channel Type: F4	Canopy Density (%): 94.7	Pools by Stream Length (%): 46.0
Reach Length (ft.): 17087	Coniferous Component (%): 57.6	Pool Frequency (%): 46.6
Riffle/Flatwater Mean Width (ft.): 8.6	Hardwood Component (%): 42.4	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 77
Range (ft.): 11 to 32	Vegetative Cover (%): 99.1	2 to 2.9 Feet Deep: 19
Mean (ft.): 18	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 3
Std. Dev.: 5	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.8	Occurrence of LWD (%): 28	Mean Max Residual Pool Depth (ft.): 1.6
Water (F): 52 - 55    Air (F): 48 - 68	LWD per 100 ft.:	Mean Pool Shelter Rating: 10
Dry Channel (ft): 12	Riffles: 3	
	Pools: 10	
	Flat: 5	
Pool Tail Substrate (%): Silt/Clay: 0    Sand: 1    Gravel: 83    Sm Cobble: 11    Lg Cobble: 4    Boulder: 0    Bedrock: 0		
Embeddedness Values (%): 1. 63.2    2. 30.8    3. 4.3    4. 0.0    5. 1.6		

#### STREAM REACH: 4

Channel Type: G4	Canopy Density (%): 96.6	Pools by Stream Length (%): 27.6
Reach Length (ft.): 3664	Coniferous Component (%): 74.4	Pool Frequency (%): 39.3
Riffle/Flatwater Mean Width (ft.): 4.4	Hardwood Component (%): 25.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 73
Range (ft.): 10 to 18	Vegetative Cover (%): 99.7	2 to 2.9 Feet Deep: 24
Mean (ft.): 13	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 4
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.8	Occurrence of LWD (%): 35	Mean Max Residual Pool Depth (ft.): 1.6
Water (F): 54 - 55    Air (F): 53 - 66	LWD per 100 ft.:	Mean Pool Shelter Rating: 12
Dry Channel (ft): 128	Riffles: 5	
	Pools: 18	
	Flat: 8	
Pool Tail Substrate (%): Silt/Clay: 0    Sand: 0    Gravel: 89    Sm Cobble: 5    Lg Cobble: 4    Boulder: 2    Bedrock: 0		
Embeddedness Values (%): 1. 52.7    2. 30.9    3. 10.9    4. 0.0    5. 5.5		

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

Stream Name: Campbell Creek

LLID: 1237143395122

Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T19NR16WS17

Latitude: 39:30:44.0N

Longitude: 123:42:51.0W

**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	5	9	1.6
Boulder	1	2	0.3
Cobble / Gravel	14	12	2.9
Sand / Silt / Clay	424	421	95.2

**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	1	1	0.2
Brush	246	258	56.8
Hardwood Trees	115	97	23.9
Coniferous Trees	82	88	19.1
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 1

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

StreamName: Campbell Creek

LLID: 1237143395122

Drainage: Rockport

Survey Dates: 6/11/2012 to 7/11/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T19NR16WS17

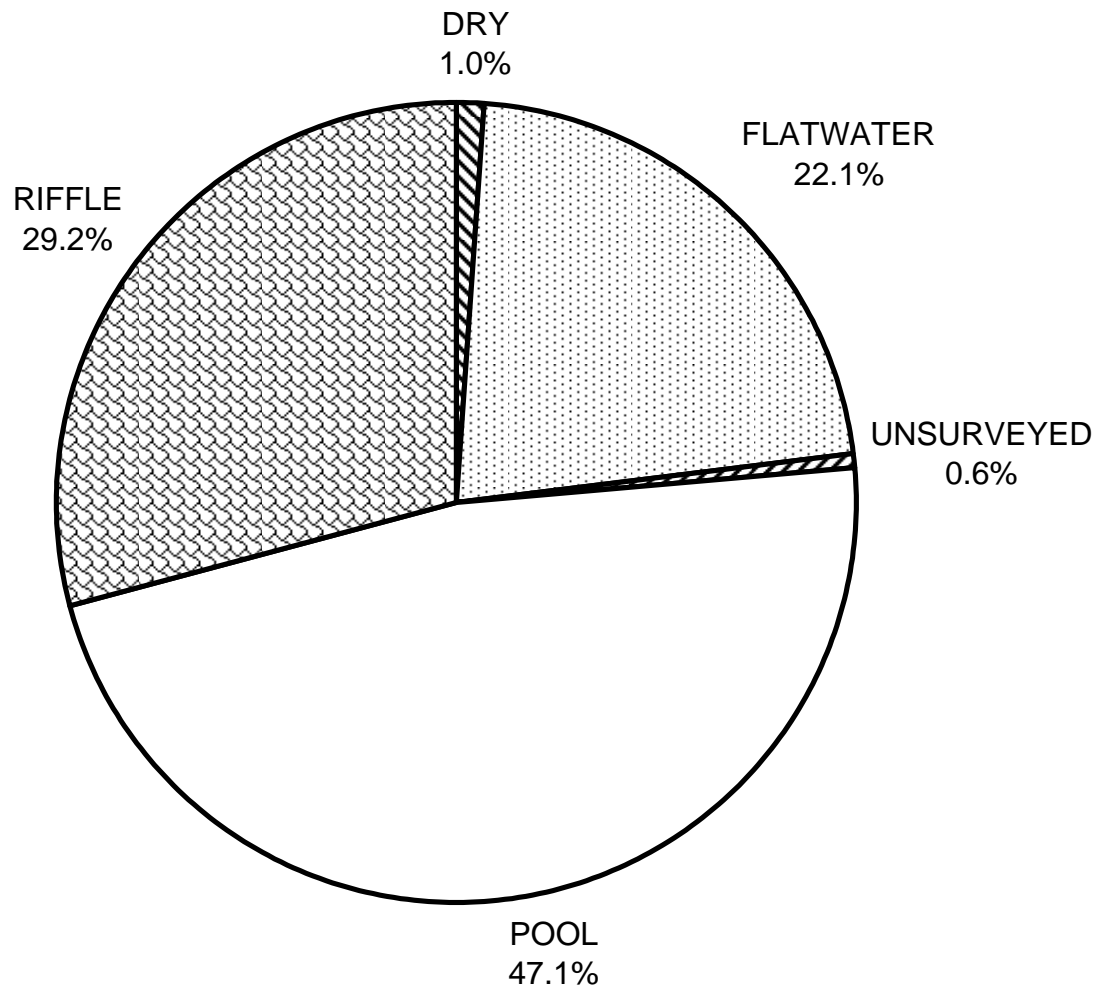
Latitude: 39:30:44.0N

Longitude: 123:42:51.0W

---

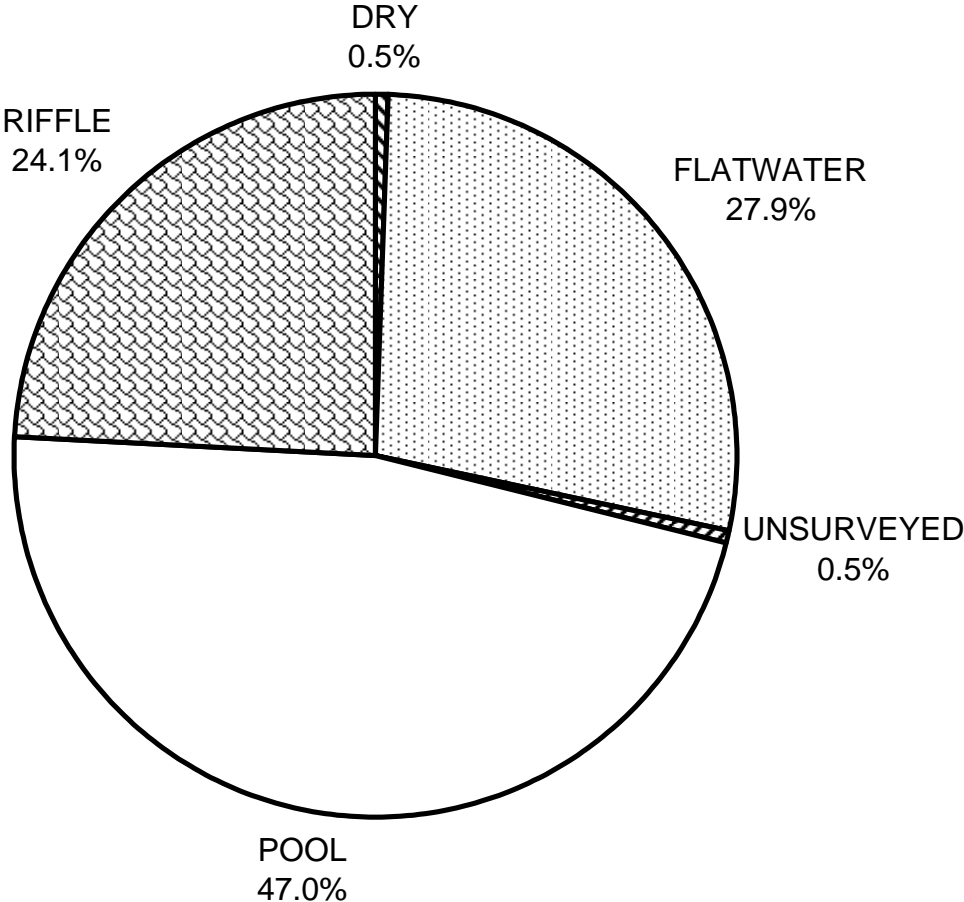
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	8	12
SMALL WOODY DEBRIS (%)	0	33	38
LARGE WOODY DEBRIS (%)	0	17	45
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION (%)	100	42	3
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	1
BOULDERS (%)	0	0	1
BEDROCK LEDGES (%)	0	0	0

# CAMPBELL CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

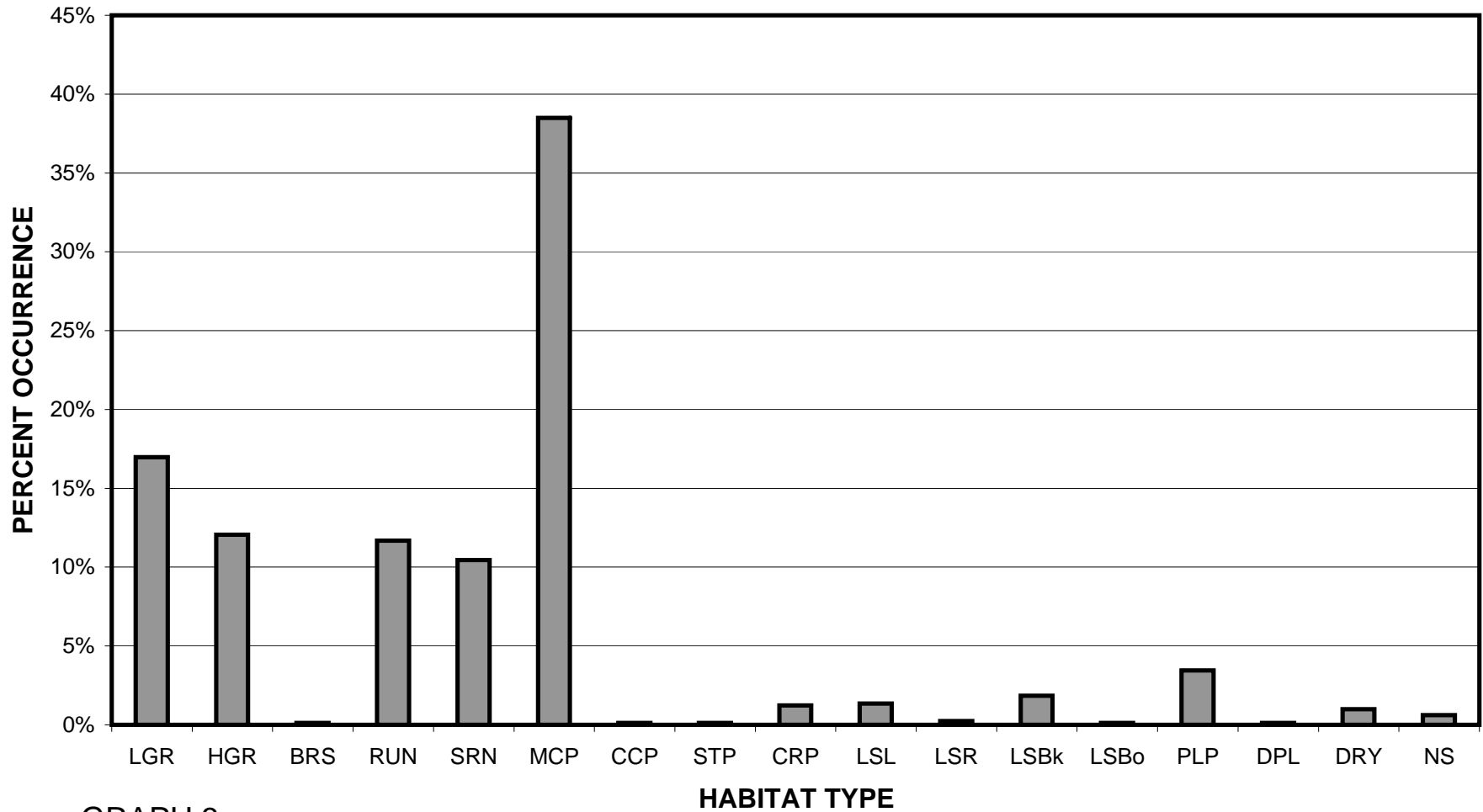
**CAMPBELL CREEK 2012  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

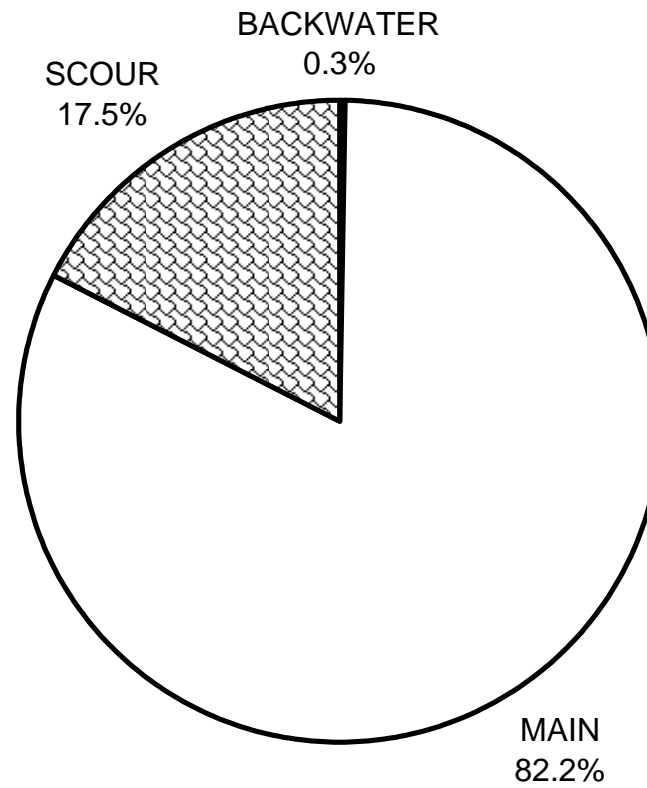


# CAMPBELL CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



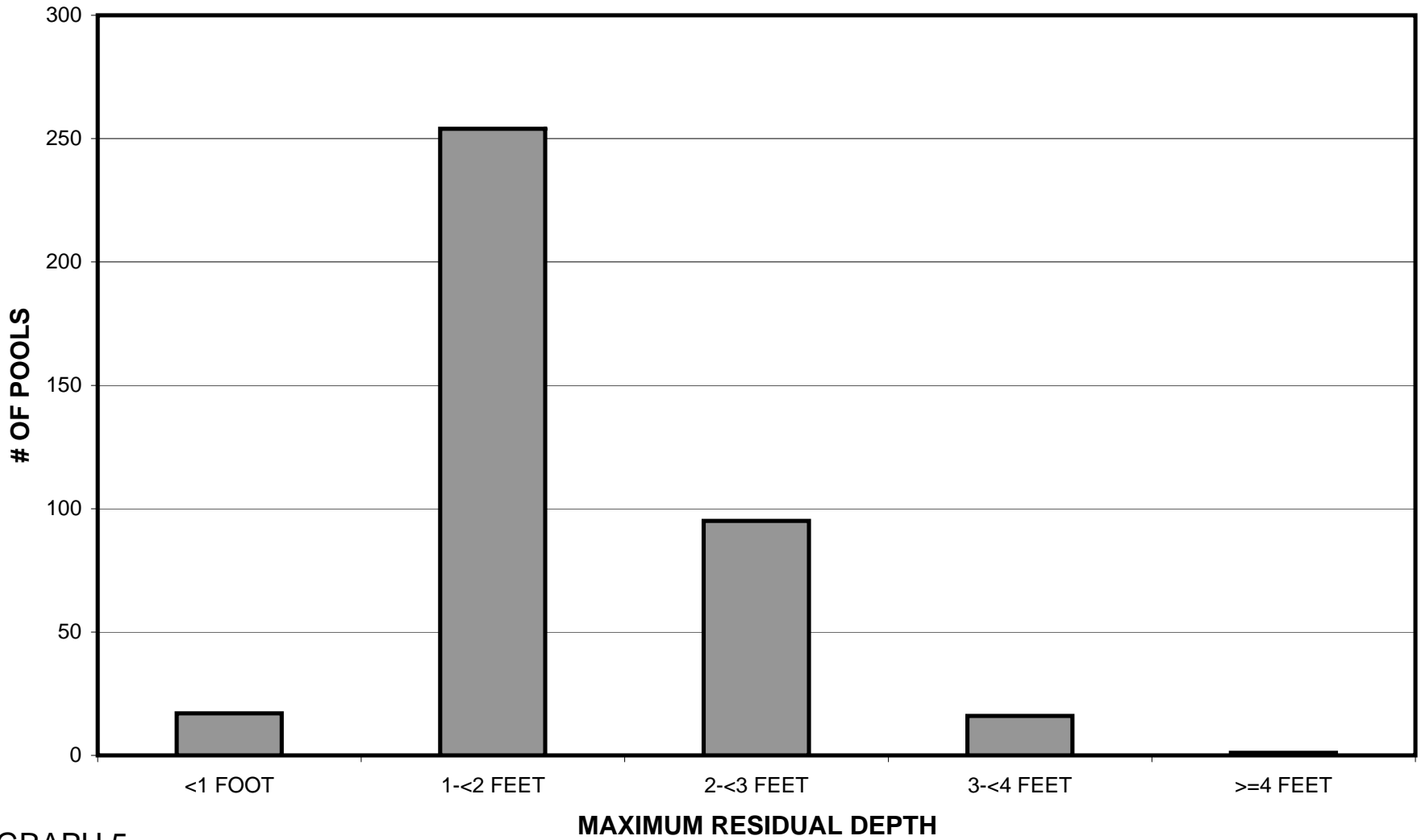
GRAPH 3

# CAMPBELL CREEK 2012 POOL TYPES BY PERCENT OCCURRENCE



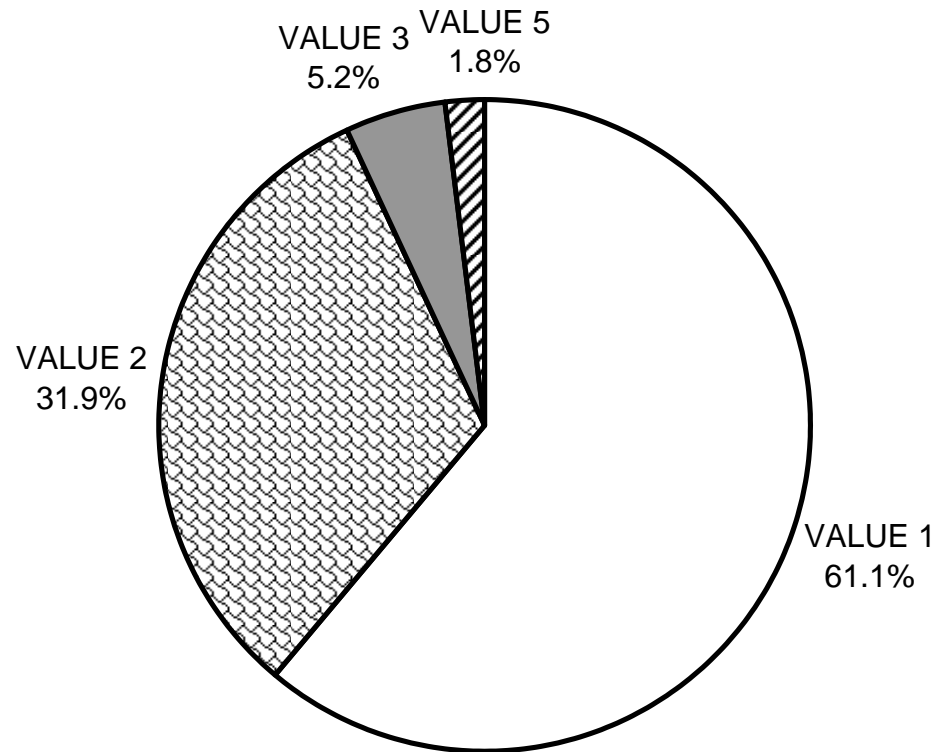
GRAPH 4

# CAMPBELL CREEK 2012 MAXIMUM DEPTH IN POOLS



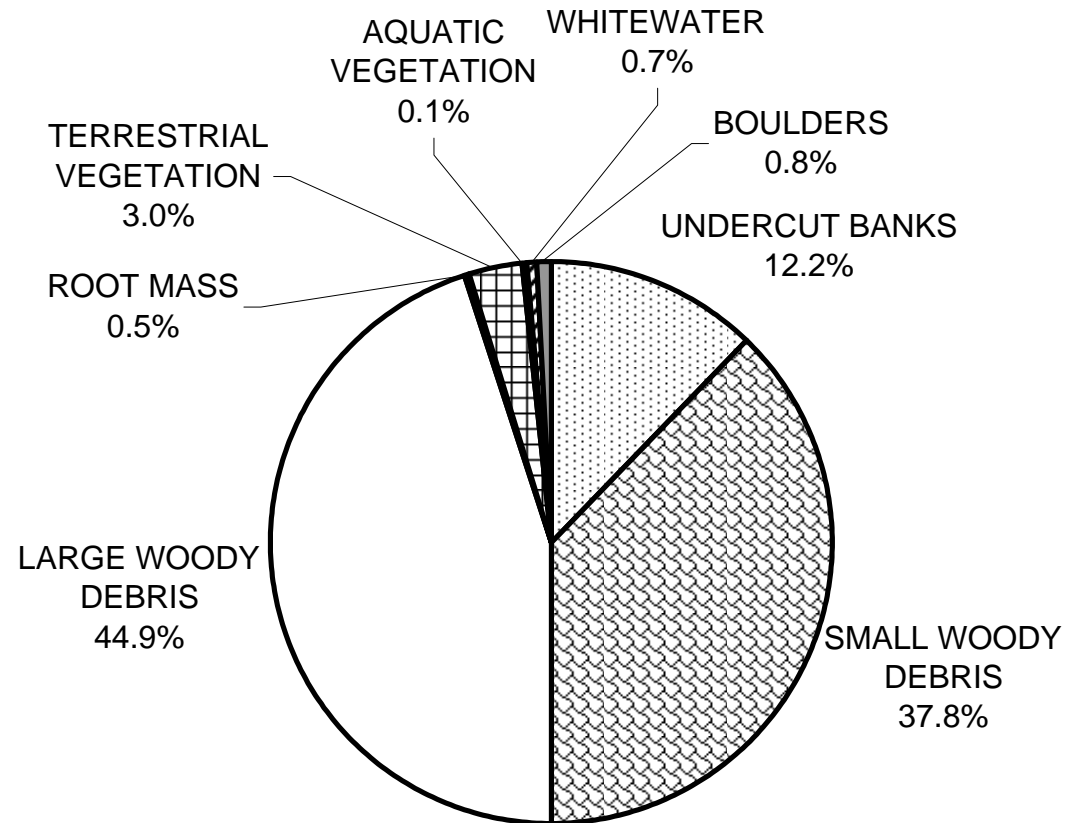
GRAPH 5

# CAMPBELL CREEK 2012 PERCENT EMBEDDEDNESS



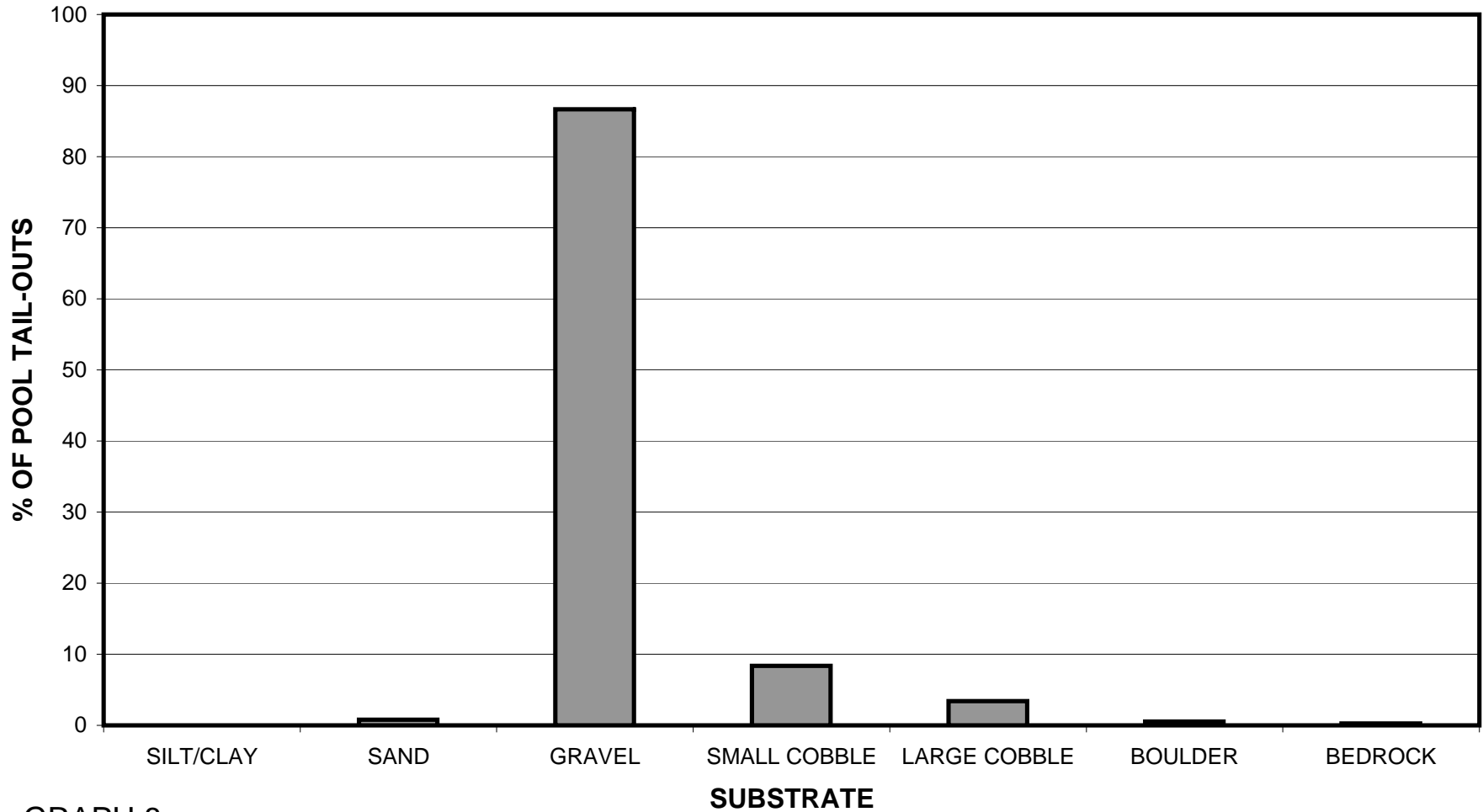
GRAPH 6

# CAMPBELL CREEK 2012 MEAN PERCENT COVER TYPES IN POOLS



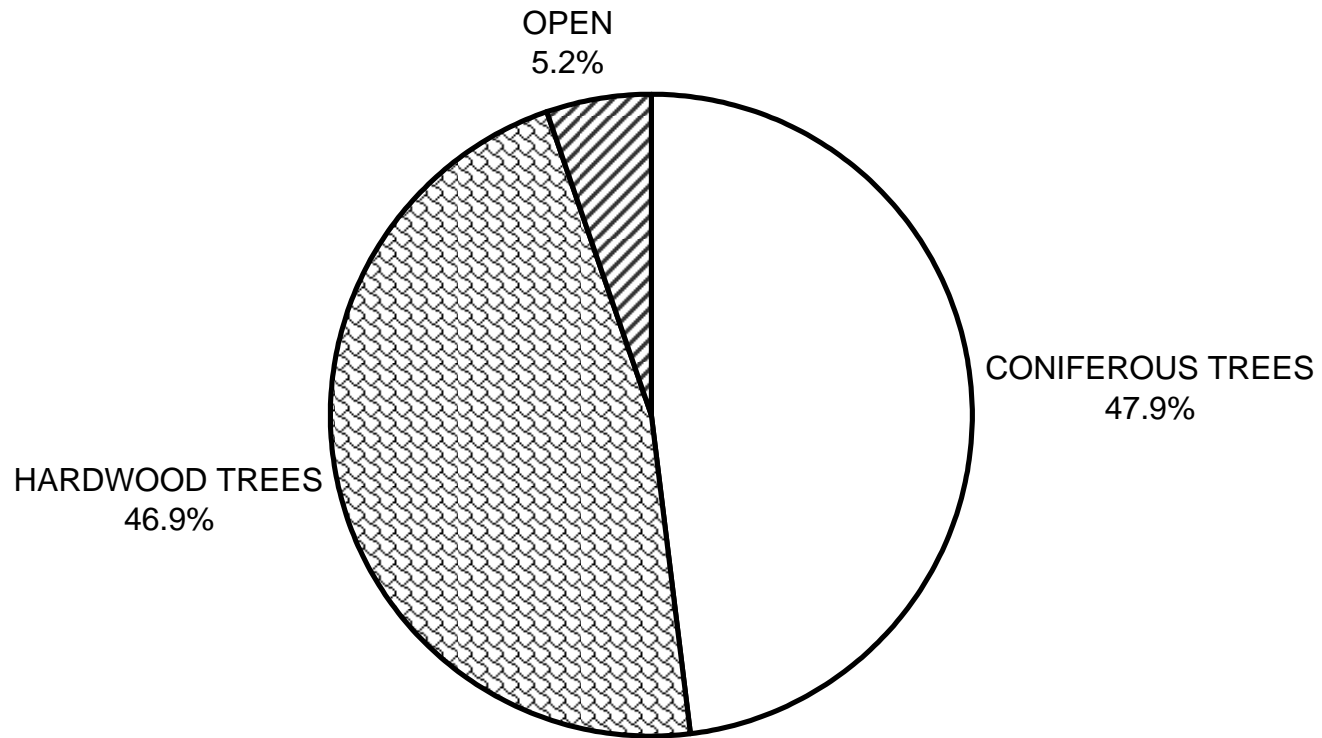
GRAPH 7

# CAMPBELL CREEK 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



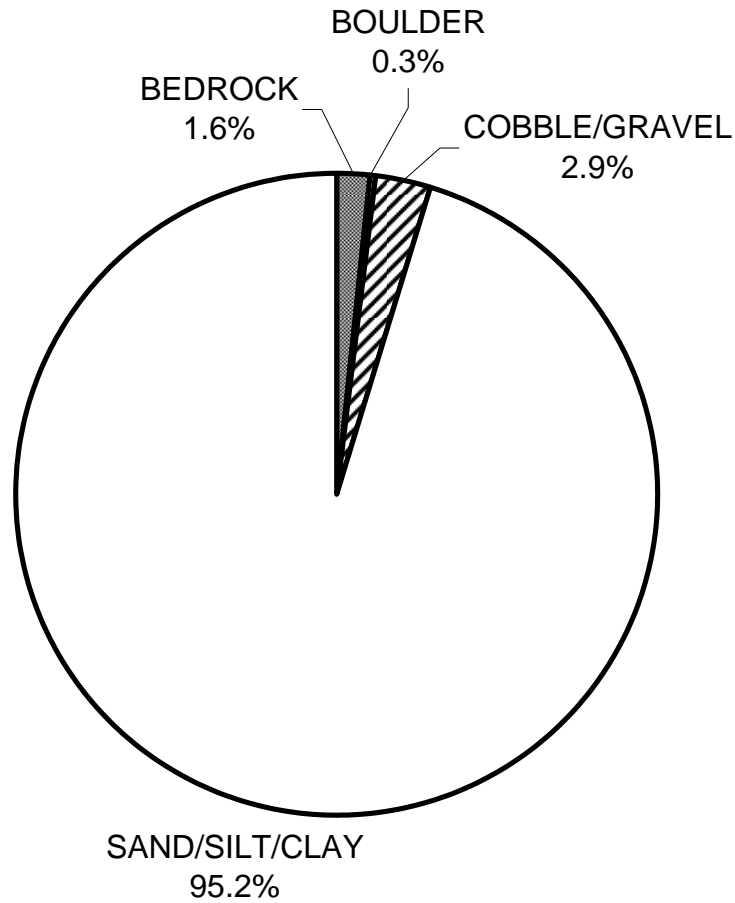
GRAPH 8

# CAMPBELL CREEK 2012 MEAN PERCENT CANOPY



GRAPH 9

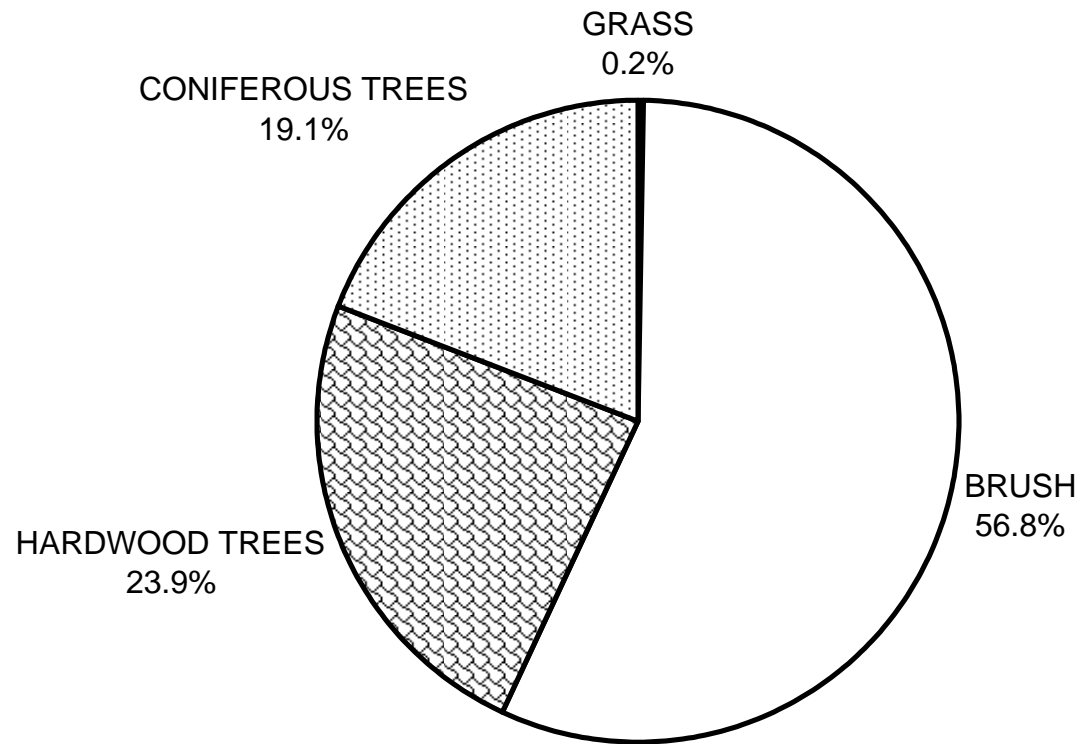
**CAMPBELL CREEK 2012  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10



# CAMPBELL CREEK 2012 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



**Map 1  
Campbell Creek  
Ten Mile River Watershed  
Dutchmans Knoll Quad, Mendocino County**

Start of Survey

End of Survey

- Reach 1, F4 Channel Type
- Reach 2, C4 Channel Type
- Reach 3, F4 Channel Type
- Reach 4, G4 Channel Type

