

STREAM INVENTORY REPORT

Chamberlain Creek

INTRODUCTION

A stream inventory was conducted June 6 to June 22, 2011 on Chamberlain Creek. The survey began at the confluence with North Fork Big River and extended upstream 5.3 miles. Stream inventories and reports were also completed for six tributaries to Chamberlain Creek.

The Chamberlain 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 Chamberlain 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

Chamberlain Creek is a tributary to North Fork Big River, tributary to Big River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Chamberlain Creek's legal description at the confluence with North Fork Big River is T17N R15W S05. Its location is 39.3522 degrees north latitude and 123.5573 degrees west longitude, LLID number 1235560393521. Chamberlain Creek is a third order stream and has approximately 5.1 miles of blue line stream according to the USGS Northspur 7.5 minute quadrangle. Chamberlain Creek drains a watershed of approximately 12.3 square miles. Elevations range from about 300 feet at the mouth of the creek to 1,300 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is in the Jackson Demonstration State Forest and is managed for timber production. Vehicle access exists via U.S. Highway 20.

METHODS

The habitat inventory conducted in Chamberlain Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Game (DFG) personnel or Watershed Stewards Project/AmeriCorps (WSP) Members 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

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

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Chamberlain 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". Chamberlain 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 Chamberlain 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 Chamberlain 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 Chamberlain 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 Chamberlain 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 Chamberlain 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 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and 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 Chamberlain 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 6 to June 22, 2011 was conducted by A. Blessing, E. Kantorski, B. Schleifer, K. Nystrom, G. Goforth, and D. Opalacz, (WSP). The total length of the stream surveyed was 28,171 feet with an additional 163 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 8.0 cfs on June 9, 2011.

Chamberlain Creek is an F3 channel type for 16,018 feet of the stream surveyed (Reach 1), a B4 channel type for 6,965 feet of the stream surveyed (Reach 2), and an A4 channel type for 5,351 feet of the stream surveyed (Reach 3). F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 50 to 60 degrees Fahrenheit. Air temperatures ranged from 48 to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% pool units, 37% flatwater units, 14% riffle units, 3% no survey units, 1% culvert units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 57% flatwater units, 31% pool units, 9% riffle units, 1% no survey units, and 1% culvert units (Graph 2).

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Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 32%; step run units, 22%; and run units, 14% (Graph 3). Based on percent total length, step run units made up 40%; mid-channel pool units 24%, and run units 17%.

A total of 294 pools were identified (Table 3). Main channel pools were the most frequently encountered at 83% (Graph 4), and comprised 91% 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. Twenty-two of the 294 pools (7%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 294 pool tail-outs measured, 139 had a value of 1 (47.3%); 116 had a value of 2 (39.5%); 22 had a value of 3 (7.5%); 17 had a value of 5 (5.8%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 6, flatwater habitat types had a mean shelter rating of 8, and pool habitats had a mean shelter rating of 20 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 32. Main channel pools had a mean shelter rating of 18. Backwater pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Chamberlain Creek. Graph 7 describes the pool cover in Chamberlain Creek. Large woody debris is the dominant pool cover type followed by boulders.

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 66% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 19% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Chamberlain Creek was 88%. Twelve percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 40% and 60%, respectively. Graph 9 describes the mean percent canopy in Chamberlain Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 42% cobble/gravel, 35% sand/silt/clay, 20% bedrock, and 4% boulder (Graph 10). Coniferous trees were the dominant vegetation type observed in 47% of the units surveyed. Additionally, 30% of the units surveyed had deciduous as the dominant vegetation type, and 14% had brush as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 21 sites for species composition and distribution in Chamberlain Creek on July 12 and July 19, 2011. Water temperatures taken during the survey period ranged from 55 to 56 degrees Fahrenheit. Air temperatures ranged from 58 to 76 degrees Fahrenheit. The sites were sampled by I. Mikus and M. Groff (DFG).

In reach 1, which comprised the first 16,018 feet of stream, six sites were sampled. The reach sites yielded 25 young-of-the-year steelhead/rainbow trout (SH/RT), 2 age 1+ SH/RT, 2 age 2+ SH/RT, and 17 coho.

In reach 2, nine sites were sampled starting approximately 15,622 feet from the confluence with North Fork Big River and continuing upstream 6,787 feet. The reach sites yielded 22 young-of-the-year SH/RT and 8 age 1+ SH/RT.

In reach 3, six sites were sampled starting approximately 22,884 feet from the confluence with North Fork Big River and continuing upstream 1,546 feet. The reach sites yielded 13 young-of-the-year SH/RT.

The following chart displays the information yielded from these sites:

2011 Chamberlain Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Distance from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: F3 Channel Type									
07/12/11	1	117	Pool	6,497	7	1	1	7	0
07/12/11	2	254	Pool	14,452	8	0	0	3	0
07/12/11	3	264	Step-run	14,926	2	0	0	6	0
07/12/11	4	265	Pool	14,934	1	1	0	1	0
07/12/11	5	269	Pool	15,031	4	0	1	0	0
07/12/11	6	271	Pool	15,071	3	0	0	0	0
Reach 2: B4 Channel Type									
07/12/11	7	291	Pool	15,651	3	0	0	0	0
07/12/11	8	294	Pool	15,683	2	1	0	0	0
07/12/11	9	296	Pool	15,787	1	1	0	0	0
07/12/11	10	300	Pool	16,023	3	1	0	0	0
07/12/11	11	303	Pool	16,109	2	1	0	0	0
07/12/11	12	321	Pool	16,928	3	2	0	0	0
07/12/11	13	323	Pool	16,976	2	2	0	0	0

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07/12/11	14	325	Pool	17,028	3	0	0	0	0
07/12/11	15	481	Pool	22,409	3	0	0	0	0
Reach 3: A4 Channel Type									
07/19/11	16	490	Pool	22,900	4	0	0	0	0
07/19/11	17	499	Pool	23,117	4	0	0	0	0
07/19/11	18	507	Pool	23,367	5	0	0	0	0
07/19/11	19	511	Pool	23,517	0	0	0	0	0
07/19/11	20	531	Pool	24,296	0	0	0	0	0
07/19/11	21	533	Pool	24,430	0	0	0	0	0

DISCUSSION

Chamberlain Creek is an F3 channel type for the first 16,018 feet of stream surveyed, a B4 channel type for the next 6,965 feet, and an A4 channel type for the remaining 5,351 feet. The suitability of F3, B4, and A4 channel types for fish habitat improvement structures is as follows: F3 channels are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover. B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover. A4 channels are not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days June 6 to June 22, 2011, ranged from 50 to 60 degrees Fahrenheit. Air temperatures ranged from 48 to 82 degrees Fahrenheit. This is a suitable 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 57% of the total length of this survey, riffles 9%, and pools 31%. Twenty-two of the 294 pools (7%) had a residual depth greater than three feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum residual depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended in reach 1 and 2.

Two hundred fifty-five of the 294 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-two of the pool tail-outs had embeddedness ratings of 3 or 4. Seventeen 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.

Two hundred fifty-one of the 294 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 is 20. The shelter rating in the flatwater habitats is 8. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Chamberlain Creek. Large woody debris is the dominant cover type in pools followed by boulders. 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 88%. Reach 1 had a canopy density of 81%, Reach 2 had a canopy density of 94%, and Reach 3 had a canopy density of 95%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 97% and 97%, 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) Chamberlain 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) 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) 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.
- 5) Conduct a fish passage assessment at all the stream crossings. Replace any crossings not meeting DFG fish passage criteria.

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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 #:	Comment:
0	0001.00	Start of survey at the confluence with North Fork Big River. The channel is an F3. A metal and wood footbridge spans the channel. The bridge measures 7' wide x 85' long x 25' high.
45	0002.00	U.S. Highway 20 crosses the channel. The crossing is an 18' wide x 97' long x 30' high concrete bridge.
434	0011.00	Out of the influence of North Fork Big River.
954	0025.00	Water Gulch (tributary #01) enters on the right bank. The water temperature of the tributary is 50 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 52 degrees Fahrenheit. See the 2011 Water Gulch Stream Habitat Inventory Report.
1472	0038.00	Tributary #02 enters on the left bank. The water temperature of the tributary is 51 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 51 degrees Fahrenheit. The slope of the tributary is approximately 20%.
2031	0048.00	Tributary #03 enters Chamberlain Creek. The water temperature of the tributary is 52 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 51 degrees Fahrenheit. The slope of the tributary is approximately 60%.
2642	0058.00	Park Gulch (tributary #04) enters on the left bank. It contributes approximately 15% to Chamberlain Creek's flow. The water temperature of the tributary is 50 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 51 degrees Fahrenheit. See the 2011 Park Gulch Stream Habitat Inventory Report.
3145	0065.00	Log debris accumulation (LDA) #01 contains nine pieces of large woody debris (LWD) and measures 1.5' high x 20' wide x 45' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 4' wide x 10' long x 1' deep. Fish are present above the LDA.
5426	0096.00	Tributary #05 enters Chamberlain Creek. The water temperature of the tributary is 52 degrees Fahrenheit; the water temperature downstream

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and upstream of the confluence is 51 degrees Fahrenheit. The slope of the tributary is approximately 90%.

5693	0100.00	Cascade measuring 14' long x 4' high (28% slope). A logging road crosses the channel. The crossing is a 15' wide x 34' long x 30' high concrete bridge. It is not a barrier to salmonids.
6635	0117.00	West Fork Chamberlain Creek (tributary #06) enters on the right bank. It contributes approximately 33% to Chamberlain Creek's flow. The water temperature of the tributary is 51 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 51 degrees Fahrenheit. See the 2011 West Fork Chamberlain Creek Stream Habitat Inventory Report.
7990	0137.00	LDA #02 contains 16 pieces of LWD and measures 6' high x 32' wide x 38' 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.
11100	0198.00	Tributary #07 enters on the right bank. The water temperature of the tributary is 51 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 51 degrees Fahrenheit. The slope of the tributary is approximately 20%.
11777	0210.00	Tributary #08 enters on the right bank. The water temperature of the tributary is 51 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 51 degrees Fahrenheit.
13308	0232.00	There is a 2.5' high plunge.
13353	0234.00	There is a 1' high plunge.
13437	0238.00	There is a 1.5' high plunge.
14612	0257.00	Arvola Gulch (tributary #09) enters on the left bank. The water temperature of the tributary is 53 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 53 degrees Fahrenheit. See the 2011 Arvola Gulch Stream Habitat Inventory Report.
15013	0265.00	LDA #03 contains nine pieces of LWD and measures 7' high x 36' wide x 16' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 6' wide x 24' long x 3' deep. Fish are present above the LDA.
15757	0294.00	There is a 1' high plunge.

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15774	0295.00	A logging road crosses the channel. The crossing is an 8' high x 13.5' wide x 81' long corrugated metal pipe (CMP) culvert. The slope of the culvert is 1.7%. There is a 0.7' high plunge at the outlet. The culvert has no baffles or weirs. There are some holes in the bottom of the culvert and it is rusting.
15855	0296.00	The channel changes from an F3 to a B4.
16185	0303.00	LDA #04 contains three pieces of LWD and measures 2.5' high x 28' wide x 2.5' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 14' wide x 16' long x 1.5' deep. Fish are present above the LDA.
16269	0306.00	Tributary #10 enters on the right bank. The water temperature of the tributary is 54 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 8%.
16498	0312.00	LDA #05 contains 13 pieces of LWD and measures 5' high x 35' wide x 27.5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to cobble and measures 30' wide x 11' long x 3' deep. Fish are present above the LDA.
17086	0325.00	"Lost Lake Creek" (tributary #11) enters on the right bank. The water temperature of the tributary is 50 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 50 degrees Fahrenheit. See the 2011 "Lost Lake Creek" Stream Habitat Inventory Report.
17498	0338.00	LDA #06 contains six pieces of LWD and measures 5' high x 25' wide x 15' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 26' wide x 6' long x 1.5' deep. Fish are present above the LDA.
17693	0343.00	LDA #07 contains 18 pieces of LWD and measures 6' high x 35' wide x 26' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to cobble and measures 10' wide x 77' long x 3' deep. Fish are present above the LDA.
18691	0370.00	LDA #08 contains 23 pieces of LWD and measures 7' high x 40' wide x 46' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 10' wide x 17' long x 2' deep. Fish are present above the LDA.

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19174	0383.00	Tributary #12 enters on the left bank. The water temperature of the tributary is 53 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 4%. The tributary is accessible to salmonids, but no fish were observed.
19499	0388.00	LDA #09 contains five pieces of LWD and measures 3' high x 16' wide x 17' long. Water does not flow through the LDA and there are visible gaps in it. Fish are present above the LDA.
19756	0396.00	Tributary #13 enters on the right bank. The water temperature of the tributary is 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 20%.
20229	0406.00	Tributary #14 enters on the right bank. The water temperature of the tributary is 50 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 53 degrees Fahrenheit. The slope of the tributary is approximately 2%. The tributary is accessible to fish.
20300	0408.00	LDA #10 contains seven pieces of LWD and measures 10' high x 45' wide x 19' long. Water flows through the LDA and there no visible gaps in it. Retained sediment measures 18' wide x 81' long x 5' deep. Fish are present above the LDA.
20732	0418.00	LDA #11 contains nine pieces of LWD and measures 6' high x 30' wide x 25' long. Water flows through the LDA and there are visible gaps in it. Retained sediment measures 8' wide x 38' long x 2' deep. Fish are present above the LDA.
20867	0424.00	LDA #12 contains 10 pieces of LWD and measures 6' high x 27' wide x 11' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges measures 9' wide x 11' long x 1.5' deep. Fish are present above the LDA.
21350	0443.00	LDA #13 contains 16 pieces of LWD and measures 7' high x 40' wide x 45' long. Water flows through the LDA and there are visible gaps in it. Retained sediment measures 9' wide x 10' long x 2' deep. Fish are present above the LDA.
21385	0445.00	There is a 9' high plunge.
21482	0451.00	Tributary #15 enters Chamberlain Creek. The water temperature of the tributary is 54 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 54 degrees Fahrenheit. The slope of

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the tributary is approximately 2%. The tributary is accessible to salmonids, but no fish were observed.

22820	0488.00	LDA #14 contains five pieces of LWD and measures 5' high x 11' wide x 40' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 12' wide x 30' long x 1.5' deep. Fish are present above the LDA. The channel changes from a B4 to an A4.
23160	0497.00	LDA #15 contains five pieces of LWD and measures 3.5' high x 10' wide x 18' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 10' wide x 26' long x 1.5' deep. Fish are present above the LDA.
23373	0505.00	There is a 1' high bedrock plunge.
23481	0509.00	LDA #16 contains 12 pieces of LWD and measures over 10' high x 13' wide x 31' long. The LDA consists of two plunges over old growth redwood roots and boulders. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to cobble. No fish were observed above the LDA.
23673	0513.00	LDA #17 contains 12 pieces of LWD and measures 6.5' high x 11.5' wide x 55' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment.
24090	0526.00	LDA #18 contains 13 pieces of LWD and measures 2.8' high x 28' wide x 32' long. Retained sediment measures 8' wide x 15' long x 1' deep.
24516	0533.00	Tributary #16 enters on the left bank. The water temperature of the tributary is 54 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 2%. The tributary is accessible to salmonids, but no fish were observed.
24595	0538.00	LDA #19 contains five pieces of LWD and measures 3' high x 36' wide x 15' long. Retained sediment ranges from sand to cobble and measures 35' wide x 30' long x 1' deep.
24635	0541.00	There is a 1' high plunge.
24760	0544.00	There is a 3.5' high plunge.
25157	0558.00	LDA #20 contains 23 pieces of LWD and measures 2' high x 19' wide x 65' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment.

Chamberlain Creek

25384	0566.00	Tributary #17 enters on the right bank. The water temperature of the tributary is 55 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 55 degrees Fahrenheit. The slope of the tributary is approximately 2%. The tributary is accessible to salmonids, but no fish were observed.
25662	0569.00	There is a 2' high plunge.
25729	0573.00	LDA #21 contains four pieces of LWD and measures 4' high x 12' wide x 12' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to cobble and measures 30' wide x 4' long x 1' deep.
25829	0575.00	There is a 3' high plunge.
25992	0585.00	LDA #22 contains six pieces of LWD and measures 4.3' high x 16' wide x 8' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to cobble and measures 8' wide x 20' long x 2' deep.
26068	0588.00	There is a 5.5' high plunge.
26193	0595.00	A logging road crosses the channel. The crossing is a 5' high x 5' wide x 40' long CMP culvert. There is a 0.2' high plunge at the outlet. The culvert has no baffles or weirs. It has some rust. LDA #23 contains three pieces of LWD and measures 4.5' high x 8' wide x 9' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment.
26566	0604.00	Tributary #18 enters on the right bank. The water temperature of the tributary is 58 degrees Fahrenheit; the water temperature downstream and upstream of the confluence is 58 degrees Fahrenheit. The slope of the tributary is approximately 10%.
27274	0623.00	There is a 3.5' high plunge.
27432	0630.00	A logging road crosses the channel. The crossing is a 3' high x 3' wide x 35' CMP culvert. The slope of the culvert is 10%. There is a 4' high plunge at the outlet. The culvert has no baffles or weirs. The bottom of the culvert is rusting.
27657	0639.00	There is a 3' high plunge.

Chamberlain Creek

- 27968 0644.00 A logging road crosses the channel. The crossing is a 3' high x 3' wide x 38' long CMP culvert. The slope of the culvert is 6.8%. There is a 6.5' high plunge at the outlet. The culvert has no baffles or weirs. The bottom of the culvert is rusting. The culvert is a possible barrier to juvenile and adult salmonids.
- 28006 0645.00 End of survey due to 8' high plunge.

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.

Chamberlain 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: Chamberlain Creek

LLID: 1235560393521 Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Confluence Location: Quad: NORTHSPUR Legal Description: T17NR15WS05 Latitude: 39:21:08.0N Longitude: 123:33:22.0

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
4	0	CULVERT	0.6	49	195	0.7									
5	0	DRY	0.8	16	80	0.3									
241	39	FLATWATER	36.8	68	16268	57.4	9.8	0.5	0.9	600	144526	342	82455		8
17	0	NOSURVEY	2.6	24	414	1.5									
294	294	POOL	44.9	30	8732	30.8	10.4	0.7	1.6	346	101733	472	138843	300	20
94	17	RIFFLE	14.4	28	2645	9.3	8.3	0.6	0.9	275	25850	151	14150		6
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
655	350				28334					272109			235447		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Chamberlain Creek

LLID: 1235560393521

Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T17NR15WS05

Latitude: 39:21:08.0N

Longitude: 123:33:22.0W

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 (%)
78	12	LGR	11.9	29	2280	8.0	9	0.4	1.2	343	26720	181	14087		5	88
6	2	HGR	0.9	22	131	0.5	8	0.6	1	178	1069	107	644		13	55
10	3	CAS	1.5	23	234	0.8	6	1.0	2.8	69	693	59	591		7	49
1	1	POW	0.2	26	26	0.1	5	0.4	0.5	124	124	49	49		0	95
1	1	GLD	0.2	29	29	0.1	10	0.3	0.5	290	290	87	87		5	94
94	14	RUN	14.4	52	4912	17.3	13	0.5	1.5	461	43305	270	25398		6	89
145	23	SRN	22.1	78	11301	39.9	8	0.6	1.7	718	104178	410	59413		10	82
212	212	MCP	32.4	31	6663	23.5	11	0.7	6.5	378	80087	539	114275	351	18	88
6	6	CCP	0.9	35	208	0.7	11	0.6	3	436	2618	727	4362	304	13	89
26	26	STP	4.0	41	1056	3.7	9	0.5	2.3	393	10208	358	9297	191	20	90
1	1	CRP	0.2	30	30	0.1	11	0.4	1.4	314	314	251	251	125	60	90
1	1	LSR	0.2	16	16	0.1	18	0.4	1.4	274	274	192	192	109	30	76
1	1	LSBk	0.2	30	30	0.1	20	0.8	1.7	600	600	780	780	480	5	90
45	45	PLP	6.9	15	665	2.3	9	0.8	3.6	144	6485	180	8110	112	32	90
1	1	BPR	0.2	22	22	0.1	14	0.9	2.6	308	308	400	400	277	5	82
1	1	BPL	0.2	42	42	0.1	20	0.9	1.6	840	840	1176	1176	756	15	98
5	0	DRY	0.8	16	80	0.3										
4	0	CUL	0.6	49	195	0.7										
17	0	NS	2.6	24	414	1.5										

Total Units
655

Total Units Fully Measured
350

Total Length (ft.)
28334

Total Area (sq.ft.)
278112

Total Volume (cu.ft.)
239112

Table 3 - Summary of Pool Types

Stream Name: Chamberlain Creek

LLID: 1235560393521

Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T17NR15WS05

Latitude: 39:21:08.0N

Longitude: 123:33:22.0W

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
244	244	MAIN	83	32	7927	91	10.5	0.7	381	92913	334	80379	18
48	48	SCOUR	16	15	741	8	9.4	0.8	160	7672	120	5642	32
2	2	BACKWATER	1	32	64	1	17.0	0.9	574	1148	517	1033	10
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
294	294				8732					101733		87055	

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

Stream Name: Chamberlain Creek

LLID: 1235560393521

Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T17NR15WS05

Latitude: 39:21:08.0N

Longitude: 123:33:22.0W

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
212	MCP	72	34	16	120	57	40	19	12	6	6	3
6	CCP	2	3	50	2	33	0	0	1	17	0	0
26	STP	9	5	19	20	77	1	4	0	0	0	0
1	CRP	0	0	0	1	100	0	0	0	0	0	0
1	LSR	0	0	0	1	100	0	0	0	0	0	0
1	LSBk	0	0	0	1	100	0	0	0	0	0	0
45	PLP	15	6	13	27	60	9	20	3	7	0	0
1	BPR	0	0	0	0	0	1	100	0	0	0	0
1	BPL	0	0	0	1	100	0	0	0	0	0	0
Total Units			Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
294			48	16	173	59	51	17	16	5	6	2

Mean Maximum Residual Pool Depth (ft.): 1.6

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Chamberlain Creek

LLID: 1235560393521

Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Dry Units: 5

Confluence Location: Quad: NORTHSPUR

Legal Description: T17NR15WS05

Latitude: 39:21:08.0N

Longitude: 123:33:22.0W

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
78	12	LGR	20	8	4	1	0	0	0	67	0
6	2	HGR	0	0	0	0	0	0	15	85	0
10	3	CAS	0	0	0	0	0	0	40	60	0
94	17	TOTAL RIFFLE	14	6	3	1	0	0	8	69	0
1	1	POW	0	0	0	0	0	0	0	0	0
1	1	GLD	0	100	0	0	0	0	0	0	0
94	14	RUN	35	16	0	3	0	0	0	46	0
145	23	SRN	21	15	8	5	0	0	1	49	0
241	39	TOTAL FLAT	25	18	5	4	0	0	1	47	0
212	212	MCP	21	13	23	4	3	0	3	25	8
6	6	CCP	0	17	28	0	2	0	10	27	17
26	26	STP	15	17	34	4	1	0	8	16	5
1	1	CRP	90	0	0	10	0	0	0	0	0
1	1	LSR	60	10	10	20	0	0	0	0	0
1	1	LSBk	0	0	0	0	0	0	0	100	0
45	45	PLP	16	17	23	3	0	0	21	17	2
1	1	BPR	0	0	100	0	0	0	0	0	0
1	1	BPL	60	5	10	15	0	0	0	5	5
294	294	TOTAL POOL	20	14	24	4	2	0	7	23	7
4	0	CUL									
17	0	NS									
655	350	TOTAL	20	14	21	4	2	0	6	27	6

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Chamberlain Creek

LLID: 1235560393521

Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Dry Units: 5

Confluence Location: Quad: NORTHSPUR

Legal Description: T17NR15WS05

Latitude: 39:21:08.0N

Longitude: 123:33:22.0W

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
78	12	LGR	0	0	67	25	0	0	8
6	2	HGR	0	0	50	0	0	0	50
10	3	CAS	0	0	0	0	0	67	33
1	1	POW	0	0	100	0	0	0	0
1	1	GLD	0	0	100	0	0	0	0
94	14	RUN	0	0	86	14	0	0	0
145	23	SRN	0	4	74	4	9	4	4
212	212	MCP	1	18	63	6	2	1	9
6	6	CCP	0	0	100	0	0	0	0
26	26	STP	0	19	69	8	0	0	4
1	1	CRP	0	0	100	0	0	0	0
1	1	LSR	0	0	100	0	0	0	0
1	1	LSBk	0	0	0	0	0	0	100
45	45	PLP	0	44	31	2	4	4	13
1	1	BPR	0	0	100	0	0	0	0
1	1	BPL	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Chamberlain Creek

LLID: 1235560393521

Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T17NR15WS05

Latitude: 39:21:08.0N

Longitude: 123:33:22.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
88	60	40	0	97	97

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: Chamberlain Creek LLID: 1235560393521 Drainage: Big River
 Survey Dates: 6/6/2011 to 6/22/2011 Survey Length (ft.): 28334 Main Channel (ft.): 28171 Side Channel (ft.): 163
 Confluence Location: Quad: NORTHSPUR Legal Description: T17NR15WS05 Latitude: 39:21:08.0N Longitude: 123:33:22.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F3	Canopy Density (%): 81.4	Pools by Stream Length (%): 36.1
Reach Length (ft.): 15855	Coniferous Component (%): 62.5	Pool Frequency (%): 48.9
Riffle/Flatwater Mean Width (ft.): 11.0	Hardwood Component (%): 37.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 60
Range (ft.): 11 to 25	Vegetative Cover (%): 96.1	2 to 2.9 Feet Deep: 27
Mean (ft.): 16	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 9
Std. Dev.: 3	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 4
Base Flow (cfs.): 8.0	Occurrence of LWD (%): 14	Mean Max Residual Pool Depth (ft.): 2.0
Water (F): 50 - 60 Air (F): 50 - 71	LWD per 100 ft.:	Mean Pool Shelter Rating: 16
Dry Channel (ft): 0	Riffles: 1	
	Pools: 2	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 1 Gravel: 62 Sm Cobble: 14 Lg Cobble: 16 Boulder: 1 Bedrock: 6		
Embeddedness Values (%): 1. 57.7 2. 26.8 3. 6.7 4. 0.0 5. 8.7		

STREAM REACH: 2

Channel Type: B4	Canopy Density (%): 93.9	Pools by Stream Length (%): 28.3
Reach Length (ft.): 6965	Coniferous Component (%): 60.5	Pool Frequency (%): 42.2
Riffle/Flatwater Mean Width (ft.): 7.9	Hardwood Component (%): 39.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 89
Range (ft.): 3 to 16	Vegetative Cover (%): 96.9	2 to 2.9 Feet Deep: 9
Mean (ft.): 11	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 2
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 8.0	Occurrence of LWD (%): 30	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 50 - 57 Air (F): 48 - 72	LWD per 100 ft.:	Mean Pool Shelter Rating: 25
Dry Channel (ft): 0	Riffles: 2	
	Pools: 6	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 58 Sm Cobble: 35 Lg Cobble: 2 Boulder: 2 Bedrock: 2		
Embeddedness Values (%): 1. 44.4 2. 46.9 3. 3.7 4. 0.0 5. 4.9		

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: A4	Canopy Density (%): 95.3	Pools by Stream Length (%): 18.2
Reach Length (ft.): 5351	Coniferous Component (%): 54.5	Pool Frequency (%): 40.5
Riffle/Flatwater Mean Width (ft.): 5.0	Hardwood Component (%): 45.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 94
Range (ft.): 3 to 17	Vegetative Cover (%): 99.6	2 to 2.9 Feet Deep: 6
Mean (ft.): 9	Dominant Shelter: Undercut Banks	3 to 3.9 Feet Deep: 0
Std. Dev.: 3	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 8.0	Occurrence of LWD (%): 25	Mean Max Residual Pool Depth (ft.): 1.2
Water (F): 54 - 58	Air (F): 63 - 82	LWD per 100 ft.:
Dry Channel (ft): 80	Riffles: 5	Pools: 16
	Flat: 4	
Pool Tail Substrate (%): Silt/Clay: 0	Sand: 2	Gravel: 88
	Sm Cobble: 11	Lg Cobble: 0
	Boulder: 0	Bedrock: 0
Embeddedness Values (%): 1. 26.6	2. 59.4	3. 14.1
	4. 0.0	5. 0.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Chamberlain Creek

LLID: 1235560393521

Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T17NR15WS05

Latitude: 39:21:08.0N

Longitude: 123:33:22.0W

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	68	72	20.0
Boulder	14	12	3.7
Cobble / Gravel	157	135	41.7
Sand / Silt / Clay	111	131	34.6

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	31	32	9.0
Brush	56	40	13.7
Hardwood Trees	93	119	30.3
Coniferous Trees	170	159	47.0
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values:

2

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

StreamName: Chamberlain Creek

LLID: 1235560393521

Drainage: Big River

Survey Dates: 6/6/2011 to 6/22/2011

Confluence Location: Quad: NORTHSPUR

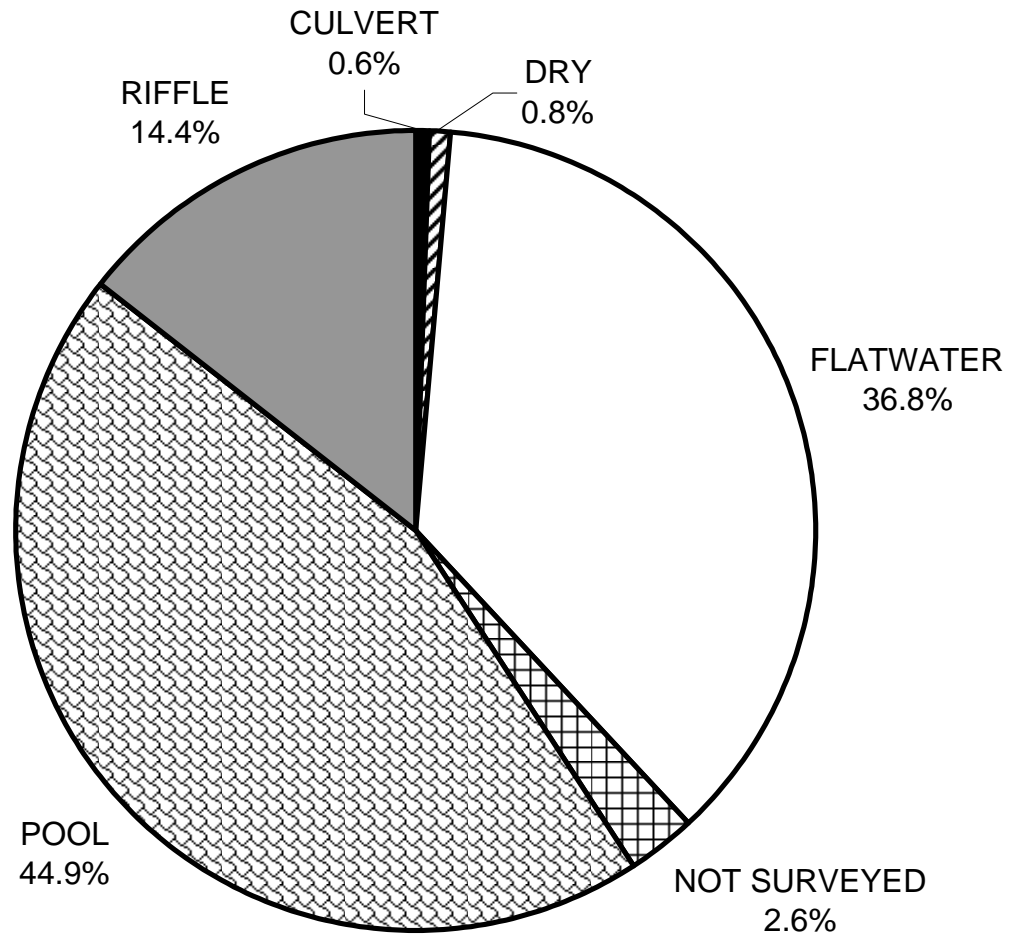
Legal Description: T17NR15WS05

Latitude: 39:21:08.0N

Longitude: 123:33:22.0W

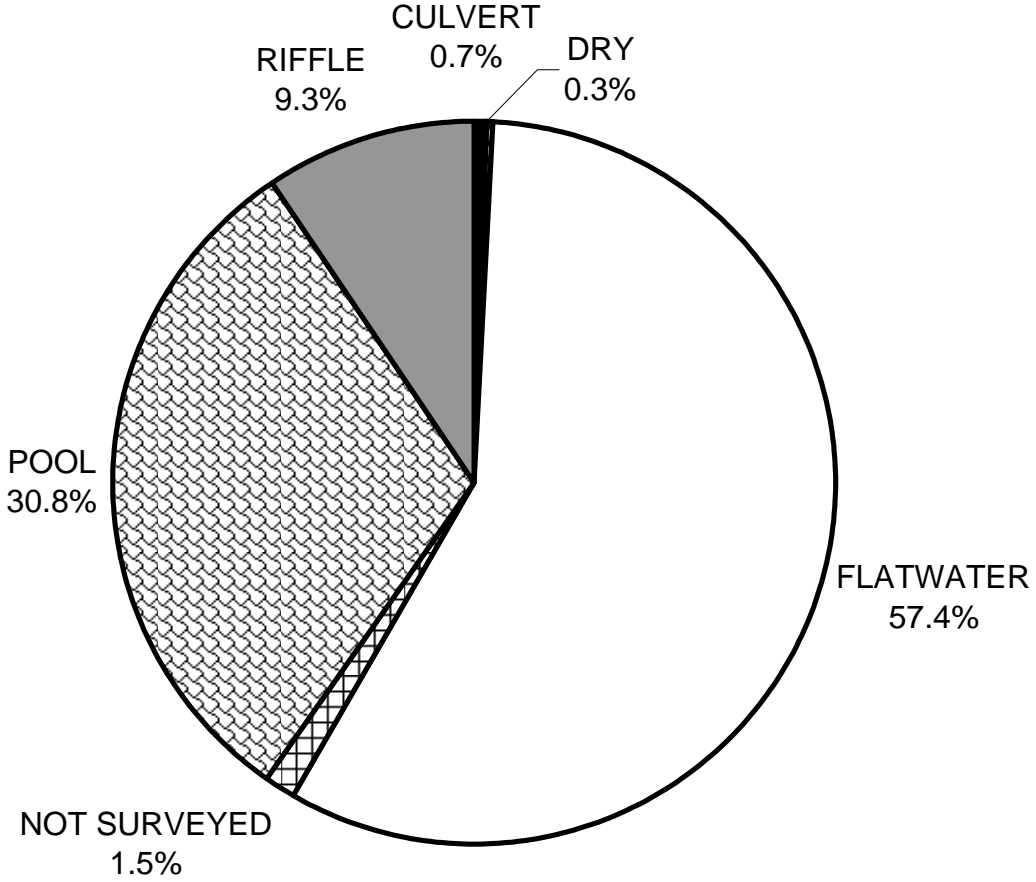
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	14	25	20
SMALL WOODY DEBRIS (%)	6	18	14
LARGE WOODY DEBRIS (%)	3	5	24
ROOT MASS (%)	1	4	4
TERRESTRIAL VEGETATION (%)	0	0	2
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	8	1	7
BOULDERS (%)	69	47	23
BEDROCK LEDGES (%)	0	0	7

CHAMBERLAIN CREEK 2011 HABITAT TYPES BY PERCENT OCCURRENCE



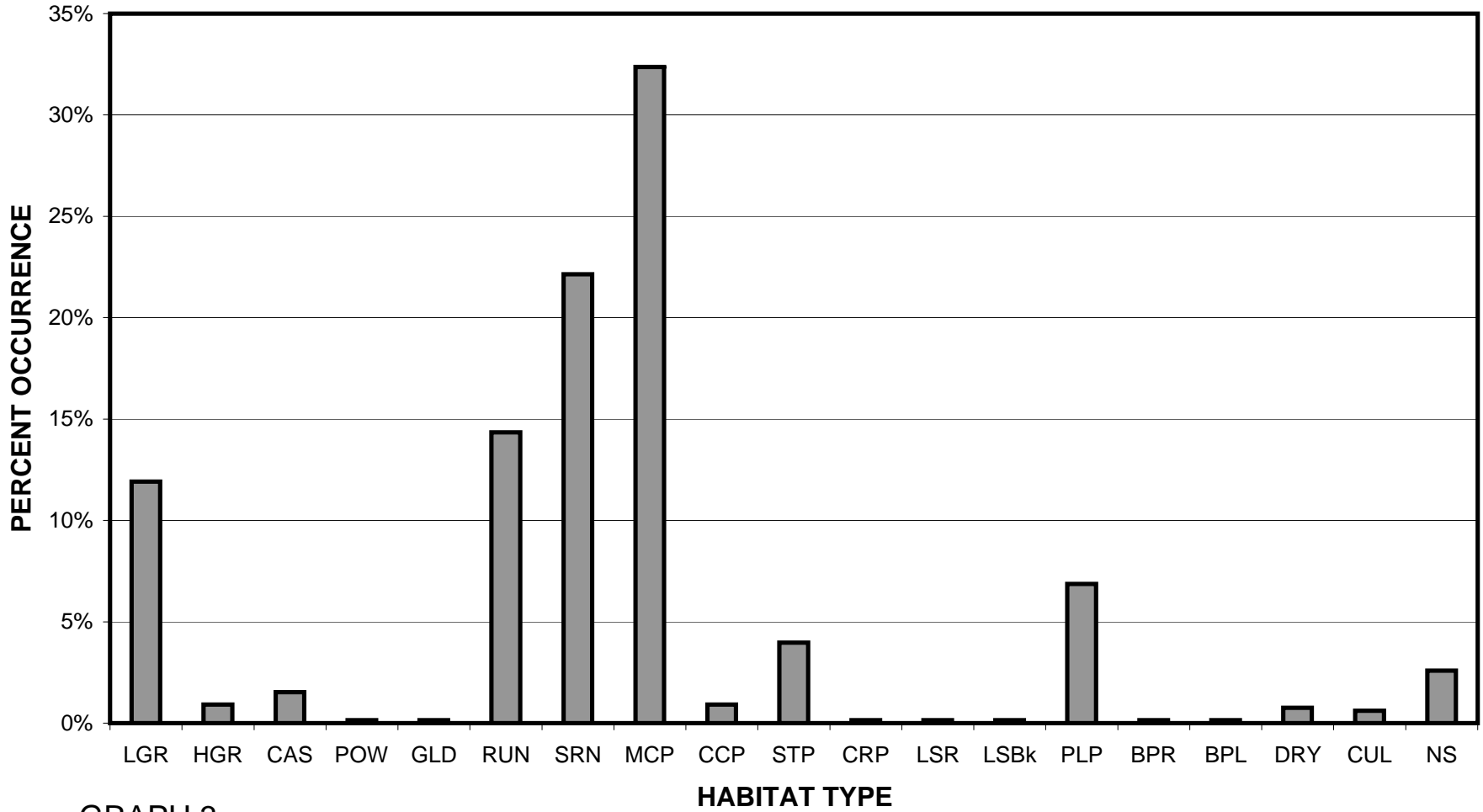
GRAPH 1

CHAMBERLAIN CREEK 2011 HABITAT TYPES BY PERCENT TOTAL LENGTH



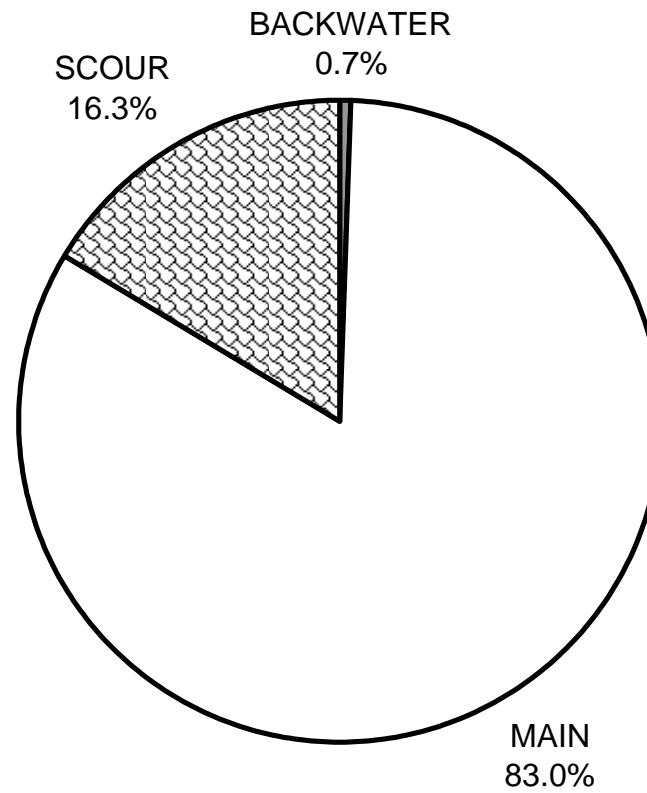
GRAPH 2

CHAMBERLAIN CREEK 2011 HABITAT TYPES BY PERCENT OCCURRENCE



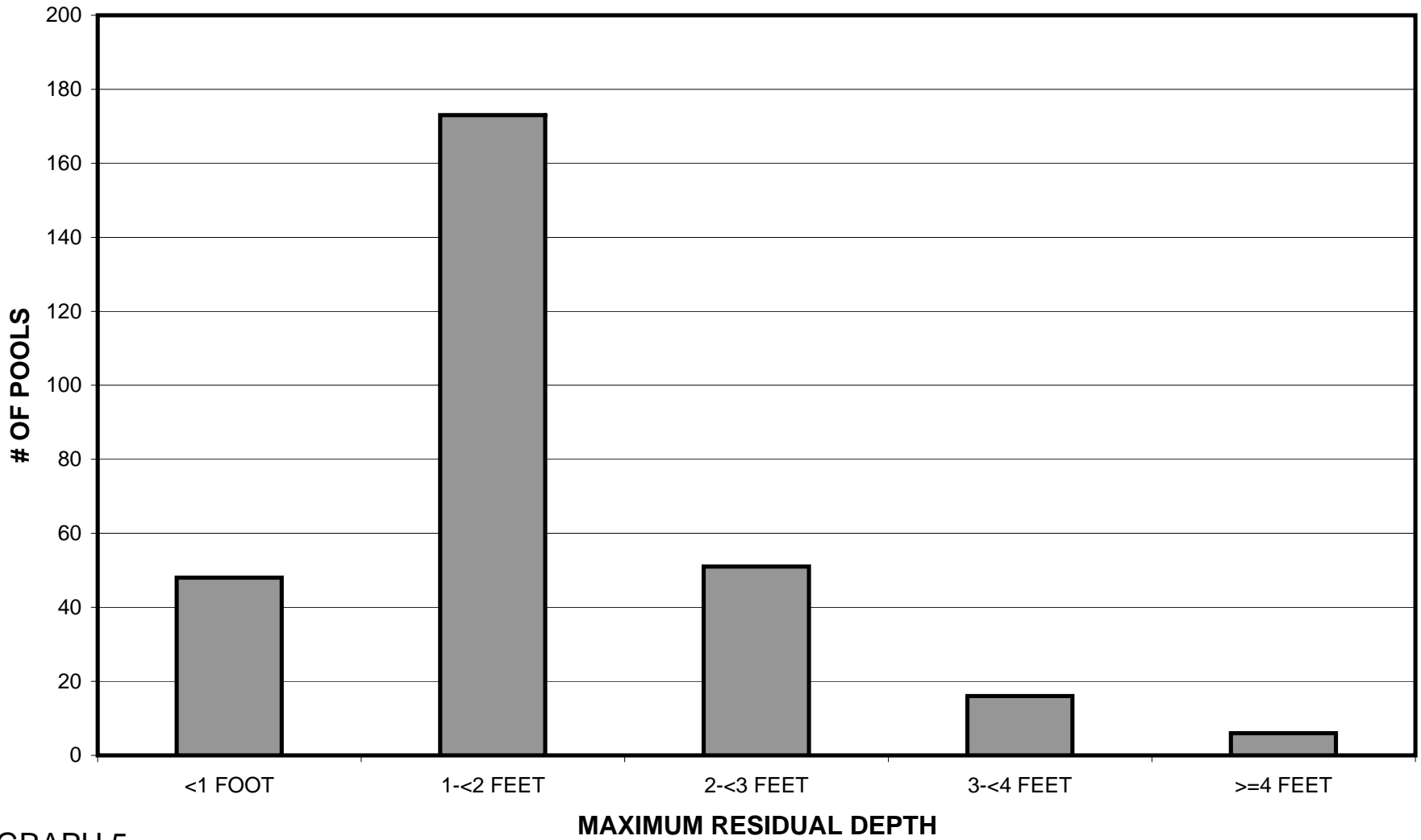
GRAPH 3

CHAMBERLAIN CREEK 2011 POOL TYPES BY PERCENT OCCURRENCE



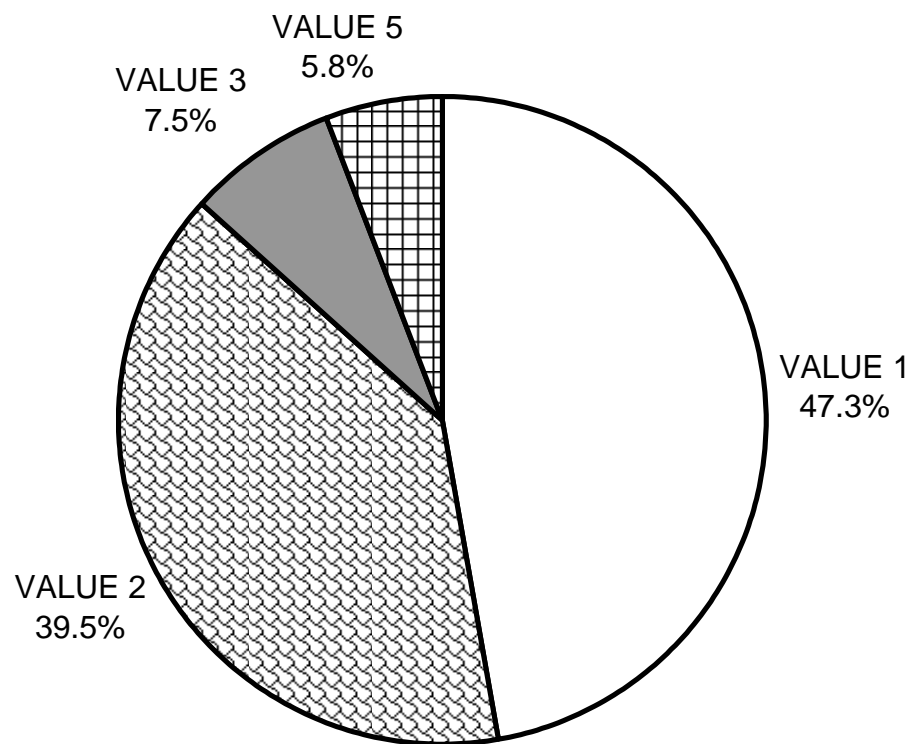
GRAPH 4

CHAMBERLAIN CREEK 2011 MAXIMUM DEPTH IN POOLS



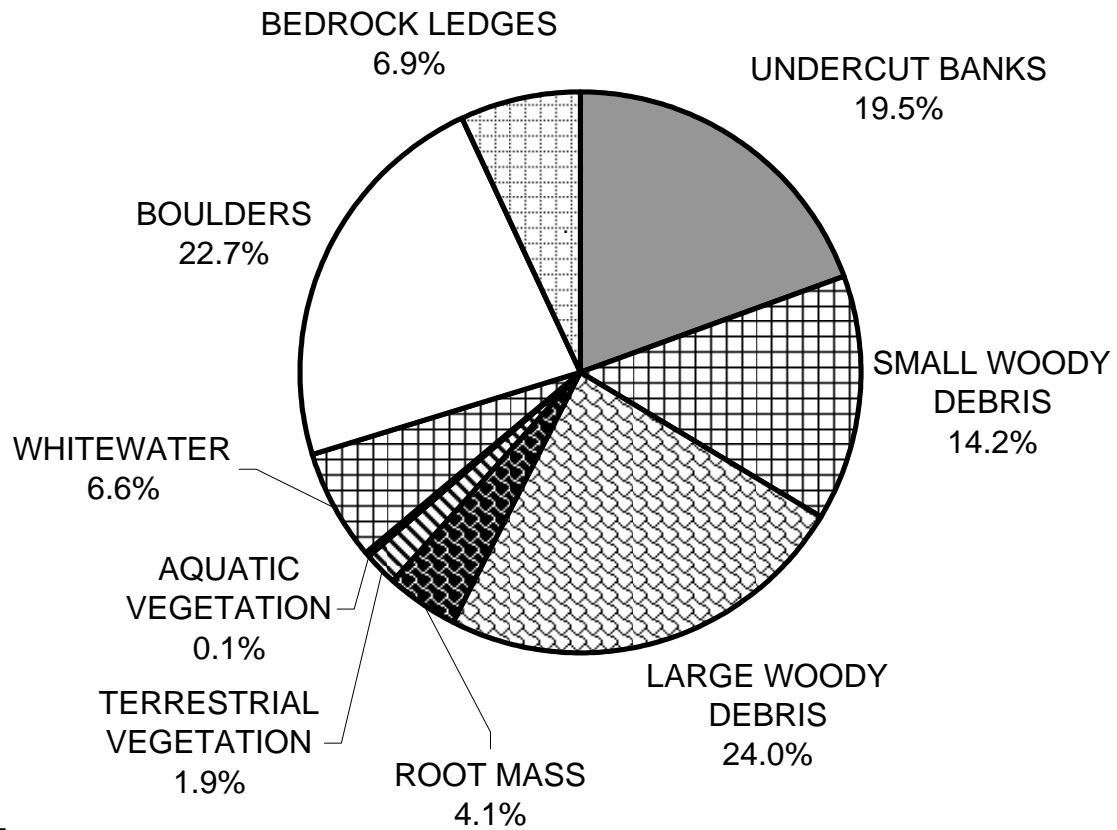
GRAPH 5

CHAMBERLAIN CREEK 2011 PERCENT EMBEDDEDNESS



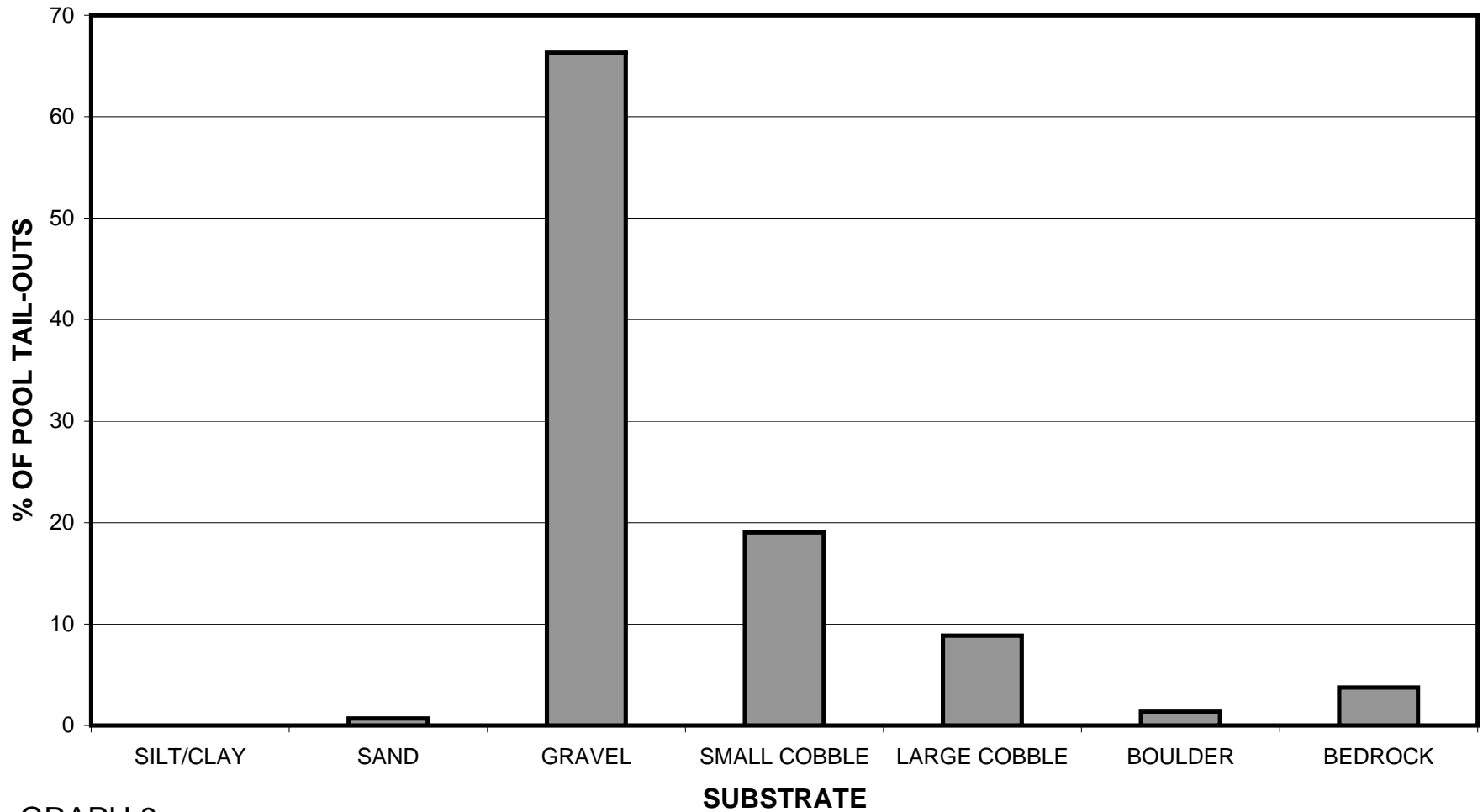
GRAPH 6

CHAMBERLAIN CREEK 2011 MEAN PERCENT COVER TYPES IN POOLS



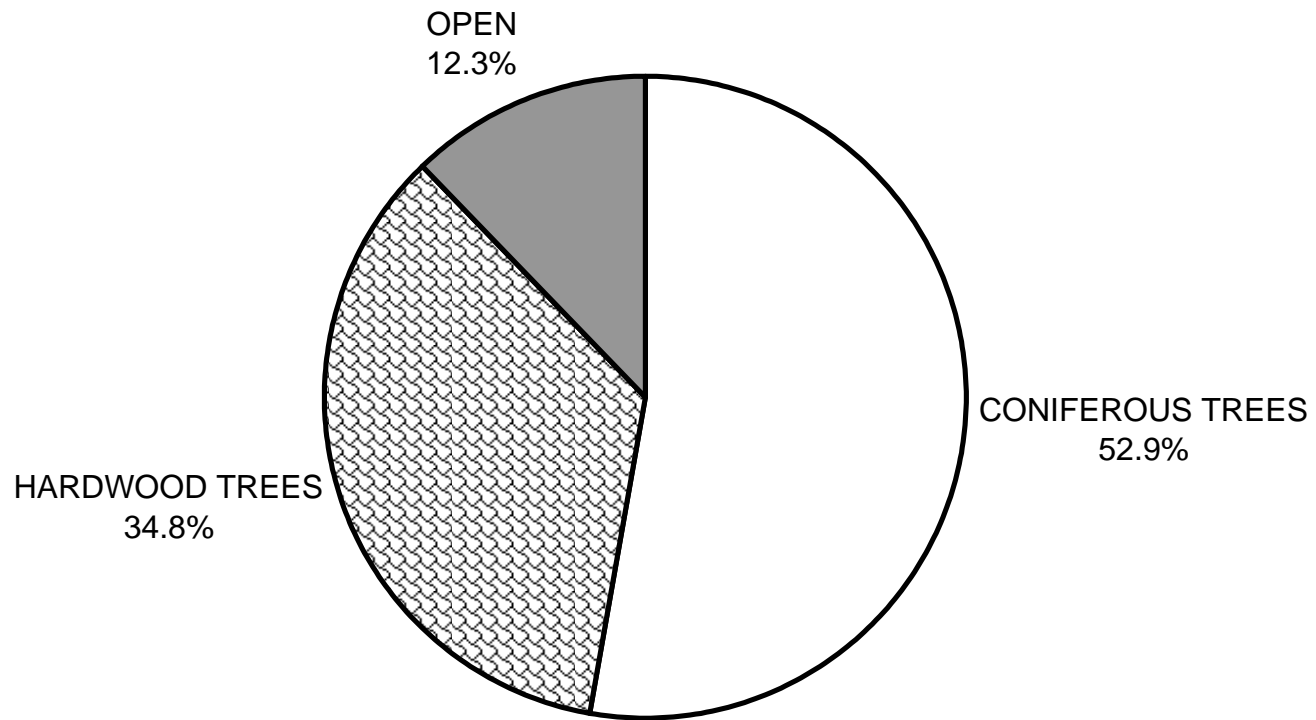
GRAPH 7

CHAMBERLAIN CREEK 2011 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



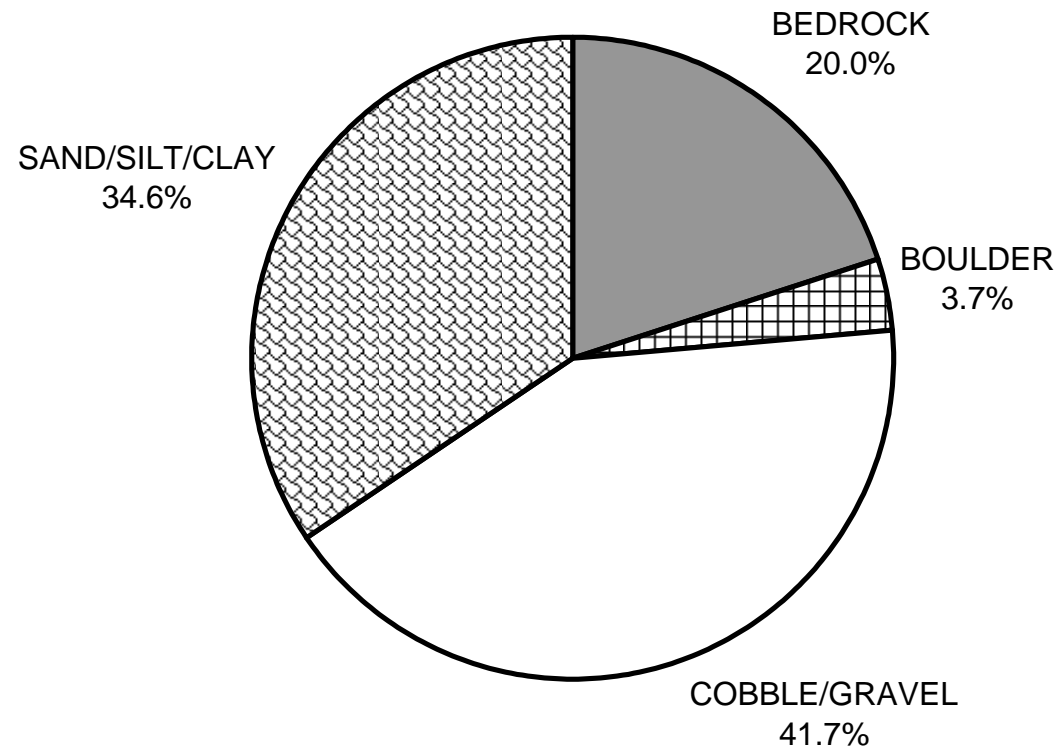
GRAPH 8

CHAMBERLAIN CREEK 2011 MEAN PERCENT CANOPY



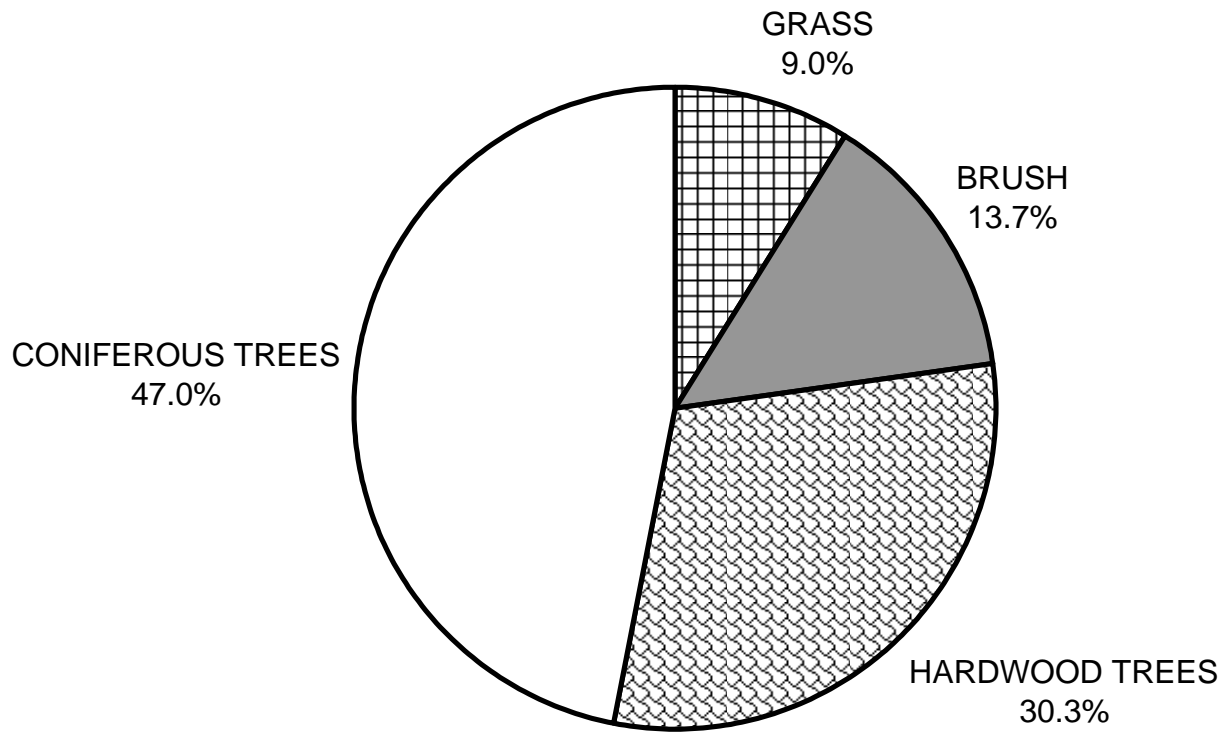
GRAPH 9

CHAMBERLAIN CREEK 2011 DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

CHAMBERLAIN CREEK 2011 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

