

# STREAM INVENTORY REPORT

## “West Chamberlain Creek”

### INTRODUCTION

A stream inventory was conducted from June 6 to June 15, 2011 on an unnamed tributary to Chamberlain Creek commonly known as, and herein after referred to, as West Chamberlain Creek. The survey began at the confluence with Chamberlain Creek and extended upstream 3.3 miles. A stream inventory and report was also completed for one tributary to West Chamberlain Creek.

The West 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 West 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

West Chamberlain Creek is a tributary to Chamberlain Creek, a tributary to North Fork Big River, a tributary to Big River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). West Chamberlain Creek's legal description at the confluence with Chamberlain Creek is T18N R15W S32. Its location is 39.3660 degrees north latitude and 123.5604 degrees west longitude, LLID number 1235593393658. West Chamberlain Creek is a second order stream and has approximately 3.4 miles of blue line stream according to the USGS Northspur 7.5 minute quadrangle. West Chamberlain Creek drains a watershed of approximately 3.7 square miles. Elevations range from about 350 feet at the mouth of the creek to 1,400 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 State Route 20.

### METHODS

The habitat inventory conducted in West 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 and 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.

## West Chamberlain Creek

### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types 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 West 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". West 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

## West Chamberlain Creek

wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

### 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 West 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. In West 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. Next, 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. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent 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 densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In West 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 West Chamberlain Creek, the dominant composition type and the

## West Chamberlain Creek

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.

### 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 West Chamberlain Creek. In addition, underwater observations were made at 18 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)

## West Chamberlain Creek

- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for West 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 15, 2011 was conducted by D. Opalacz and T. Anderson (WSP). The total length of the stream surveyed was 17,340 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 2.5 cfs on June 6, 2011.

West Chamberlain Creek is an F3 channel type for 4,593 feet of the stream surveyed (Reach 1), an F4 channel type for 10,859 feet of the stream surveyed (Reach 2), and an A4 channel type for 1,888 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. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios 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 56 degrees Fahrenheit. Air temperatures ranged from 50 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 48% flatwater units, 42% pool units, and 11% riffle units (Graph 1). Based on total length of Level II habitat types there were 68% flatwater units, 24% pool units, and 8% riffle units (Graph 2).

## West Chamberlain Creek

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 40%; run units, 25%; and step run units, 22% (Graph 3). Based on percent total length, step run units made up 38%, run units 29%, and mid-channel pool units 23%.

A total of 131 pools were identified (Table 3). Main channel pools were the most frequently encountered at 96% (Graph 4), and comprised 96% 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. Thirty-six of the 131 pools (27%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 131 pool tail-outs measured, 30 had a value of 1 (22.9%); 87 had a value of 2 (66.4%); 12 had a value of 3 (9.2%); 2 had a value of 4 (1.5%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 7, flatwater habitat types had a mean shelter rating of 2, and pool habitats had a mean shelter rating of 34 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 48. Main channel pools had a mean shelter rating of 33 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in West Chamberlain Creek. Graph 7 describes the pool cover in West Chamberlain 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 44% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 27% of the pool-outs.

The mean percent canopy density for the surveyed length of West Chamberlain Creek was 92%. Eight percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 32% and 68%, respectively. Graph 9 describes the mean percent canopy in West Chamberlain Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 100%. The dominant elements composing the structure of the stream banks consisted of 55% cobble/gravel, 30% sand/silt/clay, 14% bedrock, and 1% boulder (Graph 10). Coniferous trees were the dominant vegetation type observed in 79% of the units surveyed. Additionally, 20% of the units surveyed had deciduous trees as the dominant vegetation type, and 1% had grass as the dominant vegetation type (Graph 11).

## West Chamberlain Creek

### BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 18 sites for species composition and distribution in West Chamberlain Creek on July 11 and 12, 2011. Water temperatures taken during the survey period ranged from 54 to 57 degrees Fahrenheit. Air temperatures ranged from 55 to 71 degrees Fahrenheit. The sites were sampled by I. Mikus and M. Groff (DFG).

In reach 1, which comprised the first 4,593 feet of stream, one site was sampled. The reach site yielded four young-of-the-year steelhead/rainbow trout (SH/RT) and three coho salmon.

In reach 2, seven sites were sampled starting approximately 7,315 feet from the confluence with Chamberlain Creek and continuing upstream 2,088 feet. The reach sites yielded 14 young-of-the-year SH/RT, two age 1+ SH/RT, one age 2+ SH/RT, and three coho salmon.

In reach 3, 10 sites were sampled starting approximately 15,831 feet from the confluence with Chamberlain Creek and continuing upstream 1,008 feet. The reach sites yielded two young-of-the-year SH/RT, five age 1+ SH/RT, and two age 2+ SH/RT.

The following chart displays the information yielded from these sites:

2011 West Chamberlain 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: F3 Channel Type |               |                |              |                                |       |    |    |      |    |
| 07/11/11                 | 1             | 006            | Pool         | 234                            | 4     | 0  | 0  | 3    | 0  |
| Reach 2: F4 Channel Type |               |                |              |                                |       |    |    |      |    |
|                          | 2             | 132            | Pool         | 7,345                          | 2     | 2  | 0  | 2    | 0  |
|                          | 3             | 145            | Pool         | 8,217                          | 2     | 0  | 0  | 1    | 0  |
|                          | 4             | 157            | Pool         | 8,869                          | 3     | 0  | 0  | 0    | 0  |
|                          | 5             | 159            | Pool         | 8,976                          | 1     | 0  | 0  | 0    | 0  |
|                          | 6             | 164            | Pool         | 9,184                          | 3     | 0  | 1  | 0    | 0  |
|                          | 7             | 166            | Pool         | 9,297                          | 2     | 0  | 0  | 0    | 0  |
|                          | 8             | 169            | Pool         | 9,403                          | 1     | 0  | 0  | 0    | 0  |
| Reach 3: A4 Channel Type |               |                |              |                                |       |    |    |      |    |
|                          | 9             | 285            | Pool         | 15,854                         | 0     | 1  | 1  | 0    | 0  |
|                          | 10            | 287            | Pool         | 15,912                         | 0     | 1  | 0  | 0    | 0  |
|                          | 11            | 289            | Pool         | 15,951                         | 0     | 0  | 0  | 0    | 0  |
|                          | 12            | 291            | Pool         | 16,070                         | 0     | 0  | 0  | 0    | 0  |
|                          | 13            | 294            | Pool         | 16,275                         | 1     | 0  | 1  | 0    | 0  |

## West Chamberlain Creek

|  |    |     |      |        |   |   |   |   |   |
|--|----|-----|------|--------|---|---|---|---|---|
|  | 14 | 296 | Pool | 16,305 | 1 | 0 | 0 | 0 | 0 |
|  | 15 | 297 | Pool | 16,314 | 0 | 0 | 0 | 0 | 0 |
|  | 16 | 299 | Pool | 16,503 | 0 | 1 | 0 | 0 | 0 |
|  | 17 | 301 | Pool | 16,574 | 0 | 2 | 0 | 0 | 0 |
|  | 18 | 306 | Pool | 16,839 | 0 | 0 | 0 | 0 | 0 |

## DISCUSSION

West Chamberlain Creek is an F3 channel type for the first 4,593 feet of stream surveyed, an F4 channel type for the next 10,859 feet, and an A4 channel type for the remaining 1,888 feet. The suitability of F3, F4, 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. F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. A4 channels are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days June 6 to June 15, 2011, ranged from 50 to 56 degrees Fahrenheit. Air temperatures ranged from 50 to 70 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 68% of the total length of this survey, riffles 8%, and pools 24%. Thirty-six of the 131 (27%) 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 structures that will increase or deepen pool habitat is recommended for reach 1 and 2.

One hundred seventeen of the 131 pool tail-outs measured had embeddedness ratings of 1 or 2. Fourteen of the pool tail-outs had embeddedness ratings of 3 or 4. None 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.

Ninety-two of the 131 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 34. 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 provided primarily by large woody debris in West Chamberlain Creek. Large woody debris is the dominant cover type in pools followed by small woody debris. Log and root wad cover



## West Chamberlain Creek

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 92%. Reach 1 had a canopy density of 89%, Reach 2 had a canopy density of 93%, 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 100% and 100%, 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) West 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.

### 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<br>(ft): | Habitat<br>Unit #: | Comment:  |
|-------------------|--------------------|---|
| 0                 | 0001.00            | Start of survey at the confluence with Chamberlain Creek. The channel is an F3. |
| 33                | 0002.00            | A bridge crosses the channel.   |

## West Chamberlain Creek

|      |         |   |
|------|---------|---|
| 2509 | 0051.00 | Tributary #01 enters on the right bank. It contributes approximately 1% to West Fork Chamberlain Creek's flow. The water temperature downstream of the tributary is 56 degrees Fahrenheit, the water temperature of the tributary is 55 degrees Fahrenheit, and the water temperature upstream of the confluence is 55 degrees Fahrenheit. The slope of the tributary is approximately 20%.   |
| 3010 | 0061.00 | Tributary #02 enters on the right bank. The water temperature of the tributary is 52 degrees Fahrenheit, the water temperature downstream of the tributary is 51 degrees Fahrenheit, and the water temperature upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 25%.  |
| 3824 | 0075.00 | There is a landslide on the left bank.  |
| 4593 | 0091.00 | The channel changes from an F3 to an F4.  |
| 5401 | 0104.00 | Tributary #03 enters on the left bank. It contributes approximately 5% to West Fork Chamberlain Creek's flow. The water temperature of the tributary is 53 degrees Fahrenheit, the water temperature downstream of the tributary is 53 degrees Fahrenheit, and the water temperature upstream of the confluence is 52 degrees Fahrenheit. The slope of the tributary is approximately 35%. The tributary enters the mainstem through a culvert. Water is seeping out of the ground below the culvert. |
| 5808 | 0109.00 | Tributary #04 enters on the right bank. It contributes approximately 1% to West Fork Chamberlain Creek's flow. The water temperature of the tributary is 53 degrees Fahrenheit, the water temperature downstream of the tributary is 52 degrees Fahrenheit, and the water temperature upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 25%. There is also a 6' high plunge at the mouth.  |
| 6035 | 0114.00 | There is a 2.5' high plunge.  |
| 7315 | 0132.00 | Gulch Sixteen (Tributary #05) enters on the right bank. It contributes approximately 30% to West Fork Chamberlain Creek's flow. The water temperature of the tributary is 54 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 52 degrees Fahrenheit. For more information, see the 2011 Gulch Sixteen Stream Habitat Inventory Report.   |
| 8470 | 0149.00 | Log debris accumulation (LDA) #01 contains 10 pieces of large woody debris (LWD) and measures 5' high x 11' wide x 14' long. Water flows through the LDA and there are visible gaps in it. Retained sediment  |

## West Chamberlain Creek

|       |         |   |
|-------|---------|---|
|       |         | ranges from silt to gravel and measures 8' wide x 2' long x 3' deep. Fish are present above the LDA.  |
| 9961  | 0177.00 | Tributary #06 enters on the left bank. It contributes approximately 3% to West Chamberlain Creek's flow. The water temperature of the tributary is 56 degrees Fahrenheit the water temperature downstream and upstream of the tributary is 56 degrees Fahrenheit. The slope of the tributary is approximately 18%. No fish were observed.   |
| 11120 | 0196.00 | LDA #02 contains 15 pieces of LWD and measures 6' high x 22' wide x 48' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 15' wide x 2' long x 2' deep. Fish are present above the LDA.   |
| 12032 | 0214.00 | Tributary #07 enters on the left bank. It contributes approximately 15% to West Chamberlain Creek's flow. The water temperature of the tributary is 54 degrees Fahrenheit, the water temperature downstream of the tributary is 53 degrees Fahrenheit, and the water temperature upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 30%.  |
| 12166 | 0215.00 | There is a 4' high plunge.  |
| 13901 | 0253.00 | There is a 3.9' high plunge.  |
| 14565 | 0269.00 | Tributary #08 enters on the right bank. It contributes approximately 15% to West Chamberlain Creek's flow. The water temperature of the tributary is 54 degrees Fahrenheit, the water temperature downstream of the tributary is 50 degrees Fahrenheit, and the water temperature upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 50%. |
| 14780 | 0273.00 | There is a 4' high plunge into 0.8' deep water.   |
| 14847 | 0274.00 | Woody debris is accumulating on the right bank.   |
| 15215 | 0279.00 | LDA #03 contains seven pieces of LWD and measures 6' high x 20' wide x 20' long. Water flows through the LDA. Retained sediment ranges from silt to sand and measures 12' wide x 15' long x 4' deep. Fish are present above the LDA.  |
| 15597 | 0283.00 | LDA #04 contains eight pieces of LWD and measures 6' high x 15' wide x 9' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 10' wide x 4' long x 2' deep. Fish are present above the LDA.  |

## West Chamberlain Creek

|       |         |   |
|-------|---------|---|
| 15951 | 0290.00 | Tributary #09 enters on the left bank. It contributes approximately 10% to West Chamberlain Creek's flow. The water temperature of the tributary is 55 degrees Fahrenheit, the water temperature downstream of the tributary is 56 degrees Fahrenheit, and the water temperature upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 12%. The tributary is dry 100' upstream from the mouth. |
| 16055 | 0291.00 | There is a 3.2' high plunge.  |
| 16255 | 0294.00 | Tributary #10 enters on the right bank. It contributes approximately 30% to West Chamberlain Creek's flow. The water temperature of the tributary is 53 degrees Fahrenheit, the water temperature downstream of the tributary is 51 degrees Fahrenheit, and the water temperature upstream of the confluence is 52 degrees Fahrenheit. The slope of the tributary is approximately 5%. No fish were observed in the tributary.            |
| 16754 | 0305.00 | Long steep cascade.   |
| 17231 | 0316.00 | End of survey due to 52' high bedrock waterfall.  |

## 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.

## West 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: 1235593393658

LLID: 1235593393658

Drainage: Big River

Survey Dates: 6/6/2011 to 6/15/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS32

Latitude: 39:21:57.0N

Longitude: 123:33:33.0

| 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 |
|--------------------|-----------------------------------|--------------|------------------------|-------------------|-----------------------------|------------------|------------------|------------------|----------------------|-------------------------------|-------------------------------|----------------------|---------------------------------|---------------------------------|---------------------|
| 150                | 17                                | FLATWATER    | 47.5                   | 78                | 11699                       | 67.5             | 9.7              | 0.6              | 1.2                  | 799                           | 119882                        | 503                  | 75466                           |                                 | 2                   |
| 131                | 131                               | POOL         | 41.5                   | 32                | 4201                        | 24.2             | 11.5             | 0.8              | 1.7                  | 375                           | 49148                         | 475                  | 62174                           | 324                             | 34                  |
| 35                 | 13                                | RIFFLE       | 11.1                   | 41                | 1440                        | 8.3              | 11.0             | 0.6              | 0.9                  | 389                           | 13630                         | 240                  | 8392                            |                                 | 7                   |
| Total Units<br>316 | Total Units Fully Measured<br>161 |              |                        |                   | Total Length (ft.)<br>17340 |                  |                  |                  |                      | Total Area (sq.ft.)<br>182660 |                               |                      | Total Volume (cu.ft.)<br>146033 |                                 |                     |

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

Stream Name: 1235593393658

LLID: 1235593393658

Drainage: Big River

Survey Dates: 6/6/2011 to 6/15/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS32

Latitude: 39:21:57.0N

Longitude: 123:33:33.0W

| 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 (%) |
|---------------|----------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|------------------|-----------------|--------------------|-------------------------------|----------------------|---------------------------------|---------------------------------|---------------------|-----------------|
| 29            | 9                    | LGR          | 9.2                    | 40                | 1163               | 6.7              | 9                | 0.5              | 1.2             | 395                | 11463                         | 223                  | 6475                            |                                 | 4                   | 95              |
| 2             | 2                    | HGR          | 0.6                    | 29                | 58                 | 0.3              | 10               | 1.0              | 1.4             | 222                | 444                           | 222                  | 444                             |                                 | 10                  | 98              |
| 4             | 2                    | CAS          | 1.3                    | 55                | 219                | 1.3              | 19               | 0.7              | 1.1             | 530                | 2122                          | 332                  | 1327                            |                                 | 15                  | 88              |
| 80            | 8                    | RUN          | 25.3                   | 63                | 5032               | 29.0             | 11               | 0.6              | 2.2             | 748                | 59800                         | 483                  | 38649                           |                                 | 3                   | 82              |
| 70            | 9                    | SRN          | 22.2                   | 95                | 6667               | 38.4             | 8                | 0.6              | 1.9             | 845                | 59163                         | 521                  | 36462                           |                                 | 1                   | 94              |
| 125           | 125                  | MCP          | 39.6                   | 32                | 3989               | 23.0             | 11               | 0.8              | 3.8             | 372                | 46448                         | 464                  | 57980                           | 316                             | 33                  | 92              |
| 1             | 1                    | CCP          | 0.3                    | 44                | 44                 | 0.3              | 17               | 1.5              | 2.6             | 748                | 748                           | 1496                 | 1496                            | 1122                            | 45                  | 69              |
| 1             | 1                    | LSL          | 0.3                    | 44                | 44                 | 0.3              | 12               | 0.6              | 1.1             | 528                | 528                           | 528                  | 528                             | 317                             | 20                  | 98              |
| 4             | 4                    | PLP          | 1.3                    | 31                | 124                | 0.7              | 12               | 1.0              | 2.7             | 356                | 1423                          | 543                  | 2171                            | 388                             | 55                  | 98              |

Total Units  
316

Total Units Fully Measured  
161

Total Length (ft.)  
17340

Total Area (sq.ft.)  
182139

Total Volume (cu.ft.)  
145531

|                      |                       |                    |               |            |              |
|----------------------|-----------------------|--------------------|---------------|------------|--------------|
| Stream Name:         | 1235593393658         | LLID:              | 1235593393658 | Drainage:  | Big River    |
| Survey Dates:        | 6/6/2011 to 6/15/2011 |                    |               |            |              |
| Confluence Location: | Quad: NORTHSPUR       | Legal Description: | T18NR15WS32   | Latitude:  | 39:21:57.0N  |
|                      |                       |                    |               | Longitude: | 123:33:33.0W |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
|-------------|----------------------------|--------------------|---------------------|-----------------------|
| 131         | 131                        | 4201               | 49148               | 41191                 |



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

Stream Name: 1235593393658

LLID: 1235593393658

Drainage: Big River

Survey Dates: 6/6/2011 to 6/15/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS32

Latitude: 39:21:57.0N

Longitude: 123:33:33.0W

| 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 |
|---------------|--------------|------------------------|---------------------------------|-----------------------------|-----------------------------------|-------------------------------|-----------------------------------|-------------------------------|-----------------------------------|-------------------------------|----------------------------------|------------------------------|
| 125           | MCP          | 95                     | 6                               | 5                           | 86                                | 69                            | 25                                | 20                            | 8                                 | 6                             | 0                                | 0                            |
| 1             | CCP          | 1                      | 0                               | 0                           | 0                                 | 0                             | 1                                 | 100                           | 0                                 | 0                             | 0                                | 0                            |
| 1             | LSL          | 1                      | 0                               | 0                           | 1                                 | 100                           | 0                                 | 0                             | 0                                 | 0                             | 0                                | 0                            |
| 4             | PLP          | 3                      | 0                               | 0                           | 2                                 | 50                            | 2                                 | 50                            | 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 |
|-------------|---------------------------------|-----------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|
| 131         | 6                               | 5                           | 89                               | 68                           | 28                               | 21                           | 8                                | 6                            | 0                                | 0                            |

Mean Maximum Residual Pool Depth (ft.): 1.7

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

Stream Name: 1235593393658

LLID: 1235593393658

Drainage: Big River

Survey Dates: 6/6/2011 to 6/15/2011

Dry Units: 0

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS32

Latitude: 39:21:57.0N

Longitude: 123:33:33.0W

| 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 |
|---------------|----------------------|--------------|-----------------------|------------|------------|------------------|-------------------------|---------------------------|--------------------|-----------------|-----------------------|
| 29            | 9                    | LGR          | 0                     | 7          | 23         | 0                | 0                       | 0                         | 0                  | 70              | 0                     |
| 2             | 2                    | HGR          | 0                     | 0          | 0          | 0                | 0                       | 0                         | 0                  | 100             | 0                     |
| 4             | 2                    | CAS          | 0                     | 0          | 0          | 0                | 25                      | 0                         | 0                  | 75              | 0                     |
| 35            | 13                   | TOTAL RIFFLE | 0                     | 3          | 10         | 0                | 7                       | 0                         | 0                  | 80              | 0                     |
| 80            | 8                    | RUN          | 0                     | 0          | 0          | 0                | 0                       | 0                         | 3                  | 97              | 0                     |
| 70            | 9                    | SRN          | 0                     | 0          | 0          | 0                | 0                       | 0                         | 0                  | 100             | 0                     |
| 150           | 17                   | TOTAL FLAT   | 0                     | 0          | 0          | 0                | 0                       | 0                         | 3                  | 97              | 0                     |
| 125           | 125                  | MCP          | 14                    | 22         | 42         | 10               | 1                       | 0                         | 6                  | 3               | 3                     |
| 1             | 1                    | CCP          | 30                    | 10         | 30         | 30               | 0                       | 0                         | 0                  | 0               | 0                     |
| 1             | 1                    | LSL          | 0                     | 50         | 50         | 0                | 0                       | 0                         | 0                  | 0               | 0                     |
| 4             | 4                    | PLP          | 6                     | 26         | 46         | 0                | 0                       | 0                         | 21                 | 0               | 0                     |
| 131           | 131                  | TOTAL POOL   | 13                    | 22         | 42         | 9                | 1                       | 0                         | 6                  | 2               | 2                     |
| 316           | 161                  | TOTAL        | 12                    | 21         | 39         | 9                | 2                       | 0                         | 6                  | 9               | 2                     |

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

Stream Name: 1235593393658

LLID: 1235593393658

Drainage: Big River

Survey Dates: 6/6/2011 to 6/15/2011

Dry Units: 0

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS32

Latitude: 39:21:57.0N

Longitude: 123:33:33.0W

| 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 |
|---------------|----------------------|--------------|----------------------------|-----------------------|-------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------|
| 29            | 9                    | LGR          | 0                          | 11                    | 0                       | 22                            | 44                            | 22                       | 0                        |
| 2             | 2                    | HGR          | 0                          | 0                     | 0                       | 0                             | 0                             | 100                      | 0                        |
| 4             | 2                    | CAS          | 0                          | 0                     | 50                      | 0                             | 0                             | 50                       | 0                        |
| 80            | 8                    | RUN          | 0                          | 0                     | 25                      | 13                            | 25                            | 25                       | 13                       |
| 70            | 9                    | SRN          | 0                          | 0                     | 11                      | 56                            | 22                            | 11                       | 0                        |
| 125           | 125                  | MCP          | 0                          | 7                     | 54                      | 26                            | 7                             | 5                        | 1                        |
| 1             | 1                    | CCP          | 0                          | 0                     | 0                       | 100                           | 0                             | 0                        | 0                        |
| 1             | 1                    | LSL          | 0                          | 100                   | 0                       | 0                             | 0                             | 0                        | 0                        |
| 4             | 4                    | PLP          | 0                          | 0                     | 100                     | 0                             | 0                             | 0                        | 0                        |

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

Stream Name: 1235593393658

LLID: 1235593393658

Drainage: Big River

Survey Dates: 6/6/2011 to 6/15/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS32

Latitude: 39:21:57.0N

Longitude: 123:33:33.0W

| Mean<br>Percent<br>Canopy | Mean<br>Percent<br>Conifer | Mean<br>Percent<br>Hardwood | Mean<br>Percent<br>Open Units | Mean Right<br>Bank %<br>Cover | Mean Left<br>Bank %<br>Cover |
|---------------------------|----------------------------|-----------------------------|-------------------------------|-------------------------------|------------------------------|
| 92                        | 68                         | 32                          | 0                             | 100                           | 100                          |

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.

|                                      |                                |                           |
|--------------------------------------|--------------------------------|---------------------------|
| Stream Name: 1235593393658           | LLID: 1235593393658            | Drainage: Big River       |
| Survey Dates: 6/6/2011 to 6/15/2011  | Survey Length (ft.): 17340     | Main Channel (ft.): 17340 |
|                                      |                                | Side Channel (ft.): 0     |
| Confluence Location: Quad: NORTHSPUR | Legal Description: T18NR15WS32 | Latitude: 39:21:57.0N     |
|                                      |                                | Longitude: 123:33:33.0W   |

|                                    |   |                               |                  |                                     |      |  |
|------------------------------------|---|-------------------------------|------------------|-------------------------------------|------|--|
| <b>STREAM REACH: 1</b>             |   |                               |                  |                                     |      |  |
| Channel Type:                      | F3  | Canopy Density (%):           | 88.8             | Pools by Stream Length (%):         | 28.1 |  |
| Reach Length (ft.):                | 4593  | Coniferous Component (%):     | 56.8             | Pool Frequency (%):                 | 35.6 |  |
| Riffle/Flatwater Mean Width (ft.): | 11.9  | Hardwood Component (%):       | 43.2             | Residual Pool Depth (%):            |      |  |
| BFW:                               |   | Dominant Bank Vegetation:     | Coniferous Trees | < 2 Feet Deep:                      | 81   |  |
| Range (ft.):                       | 14          to         26   | Vegetative Cover (%):         | 99.4             | 2 to 2.9 Feet Deep:                 | 13   |  |
| Mean (ft.):                        | 17  | Dominant Shelter:             | Boulders         | 3 to 3.9 Feet Deep:                 | 6    |  |
| Std. Dev.:                         | 3   | Dominant Bank Substrate Type: | Cobble/Gravel    | >= 4 Feet Deep:                     | 0    |  |
| Base Flow (cfs.):                  | 2.5   | Occurrence of LWD (%):        | 19               | Mean Max Residual Pool Depth (ft.): | 1.5  |  |
| Water (F):                         | 50 - 55   | Air (F):                      | 54 - 60          | LWD per 100 ft.:                    |      |  |
| Dry Channel (ft):                  | 0   | Riffles:                      | 4                | Mean Pool Shelter Rating:           | 18   |  |
|                                    |   | Pools:                        | 4                |                                     |      |  |
|                                    |   | Flat:                         | 3                |                                     |      |  |
| Pool Tail Substrate (%):           | Silt/Clay: 0      Sand: 0      Gravel: 28      Sm Cobble: 47      Lg Cobble: 16      Boulder: 9      Bedrock: 0 |                               |                  |                                     |      |  |
| Embeddedness Values (%):           | 1. 15.6      2. 50.0      3. 31.3      4. 3.1      5. 0.0   |                               |                  |                                     |      |  |

|                                    |              |                               |                    |                                     |              |            |            |
|------------------------------------|--------------|-------------------------------|--------------------|-------------------------------------|--------------|------------|------------|
| Channel Type:                      | F4           | Canopy Density (%):           | 92.9               | Pools by Stream Length (%):         | 23.5         |            |            |
| Reach Length (ft.):                | 10859        | Coniferous Component (%):     | 69.6               | Pool Frequency (%):                 | 42.6         |            |            |
| Riffle/Flatwater Mean Width (ft.): | 8.8          | Hardwood Component (%):       | 30.4               | Residual Pool Depth (%):            |              |            |            |
| BFW:                               |              | Dominant Bank Vegetation:     | Coniferous Trees   | < 2 Feet Deep:                      | 67           |            |            |
| Range (ft.):                       | 10 to 25     | Vegetative Cover (%):         | 99.9               | 2 to 2.9 Feet Deep:                 | 26           |            |            |
| Mean (ft.):                        | 16           | Dominant Shelter:             | Large Woody Debris | 3 to 3.9 Feet Deep:                 | 7            |            |            |
| Std. Dev.:                         | 4            | Dominant Bank Substrate Type: | Cobble/Gravel      | >= 4 Feet Deep:                     | 0            |            |            |
| Base Flow (cfs.):                  | 2.5          | Occurrence of LWD (%):        | 38                 | Mean Max Residual Pool Depth (ft.): | 1.8          |            |            |
| Water (F):                         | 50 - 56      | Air (F):                      | 51 - 70            | Mean Pool Shelter Rating:           | 41           |            |            |
| Dry Channel (ft):                  | 0            | Riffles:                      | 4                  |                                     |              |            |            |
|                                    |              | Pools:                        | 12                 |                                     |              |            |            |
|                                    |              | Flat:                         | 5                  |                                     |              |            |            |
| Pool Tail Substrate (%):           | Silt/Clay: 1 | Sand: 17                      | Gravel: 53         | Sm Cobble: 25                       | Lg Cobble: 4 | Boulder: 0 | Bedrock: 0 |
| Embeddedness Values (%):           | 1. 30.9      | 2. 65.4                       | 3. 2.5             | 4. 1.2                              | 5. 0.0       |            |            |

## Summary of Fish Habitat Elements By Stream Reach

### STREAM REACH: 3

|   |   |   |
|---|---|---|
| Channel Type: A4  | Canopy Density (%): 94.6                    | Pools by Stream Length (%): 18.8        |
| Reach Length (ft.): 1888  | Coniferous Component (%): 82.1              | Pool Frequency (%): 50.0                |
| Riffle/Flatwater Mean Width (ft.): 9.4  | Hardwood Component (%): 17.9                | Residual Pool Depth (%):                |
| BFW:  | Dominant Bank Vegetation: Coniferous Trees  | < 2 Feet Deep: 83                       |
| Range (ft.): 6 to 15  | Vegetative Cover (%): 100.0                 | 2 to 2.9 Feet Deep: 17                  |
| Mean (ft.): 11  | Dominant Shelter: Large Woody Debris        | 3 to 3.9 Feet Deep: 0                   |
| Std. Dev.: 3  | Dominant Bank Substrate Type: Cobble/Gravel | >= 4 Feet Deep: 0                       |
| Base Flow (cfs.): 2.5   | Occurrence of LWD (%): 35                   | Mean Max Residual Pool Depth (ft.): 1.4 |
| Water (F): 51 - 55 Air (F): 50 - 65   | LWD per 100 ft.:                            | Mean Pool Shelter Rating: 30            |
| Dry Channel (ft): 0   | Riffles: 6                                  |   |
|   | Pools: 16                                   |   |
|   | Flat: 19                                    |   |
| Pool Tail Substrate (%): Silt/Clay: 0 Sand: 72 Gravel: 28 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0 |   |   |
| Embeddedness Values (%): 1. 0.0 2. 100.0 3. 0.0 4. 0.0 5. 0.0   |   |   |

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

Stream Name: 1235593393658

LLID: 1235593393658

Drainage: Big River

Survey Dates: 6/6/2011 to 6/15/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS32

Latitude: 39:21:57.0N

Longitude: 123:33:33.0W

**Mean Percentage of Dominant Stream Bank Substrate**

| Dominant Class<br>of Substrate | Number of Units<br>Right Bank | Number of Units<br>Left Bank | Total Mean<br>Percent (%) |
|--------------------------------|-------------------------------|------------------------------|---------------------------|
| Bedrock                        | 30                            | 16                           | 14.3                      |
| Boulder                        | 1                             | 1                            | 0.6                       |
| Cobble / Gravel                | 81                            | 97                           | 55.3                      |
| Sand / Silt / Clay             | 49                            | 47                           | 29.8                      |

**Mean Percentage of Dominant Stream Bank Vegetation**

| Dominant Class<br>of Vegetation | Number of Units<br>Right Bank | Number of Units<br>Left Bank | Total Mean<br>Percent (%) |
|---------------------------------|-------------------------------|------------------------------|---------------------------|
| Grass                           | 1                             | 1                            | 0.6                       |
| Brush                           | 0                             | 1                            | 0.3                       |
| Hardwood Trees                  | 35                            | 31                           | 20.5                      |
| Coniferous Trees                | 125                           | 128                          | 78.6                      |
| No Vegetation                   | 0                             | 0                            | 0.0                       |

**Total Stream Cobble Embeddedness Values:**

2

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

StreamName: 1235593393658

LLID: 1235593393658

Drainage: Big River

Survey Dates: 6/6/2011 to 6/15/2011

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS32

Latitude: 39:21:57.0N

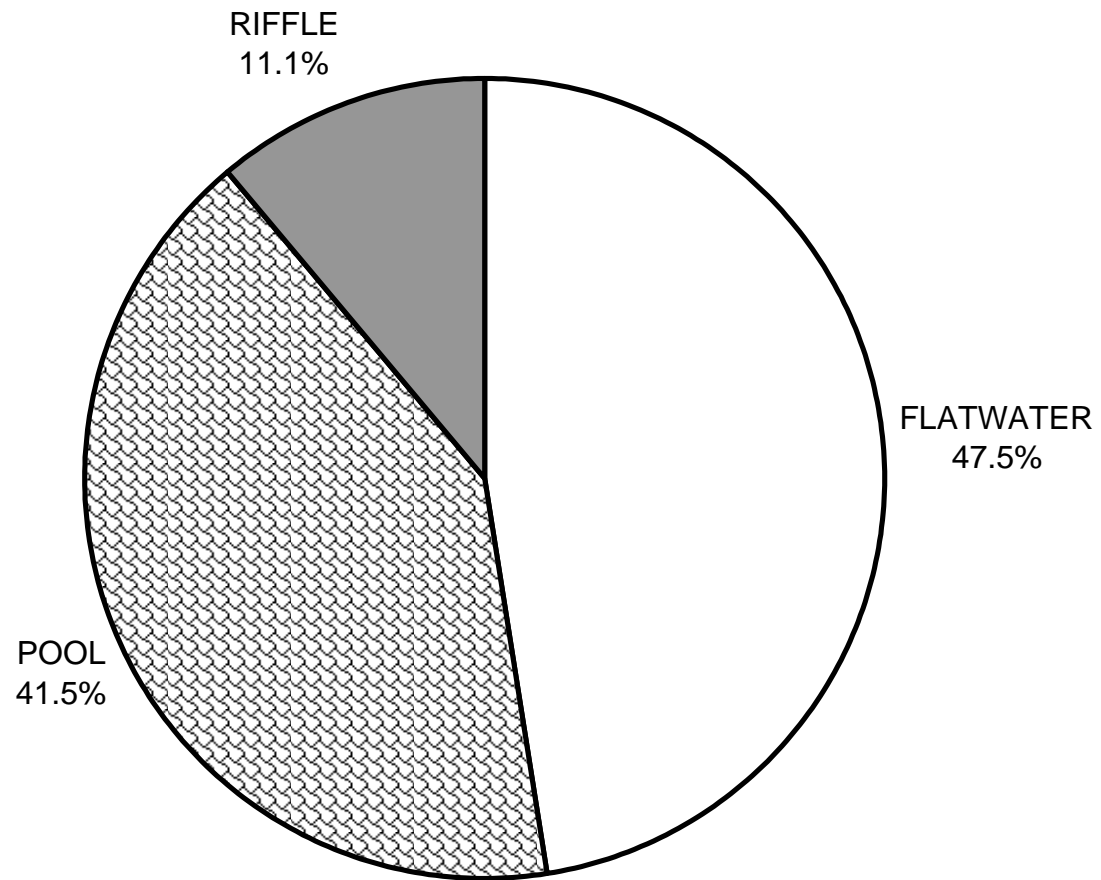
Longitude: 123:33:33.0W

---

|                            | Riffles | Flatwater | Pools |
|----------------------------|---------|-----------|-------|
| <hr/>                      |         |           |       |
| UNDERCUT BANKS (%)         | 0       | 0         | 13    |
| SMALL WOODY DEBRIS (%)     | 3       | 0         | 22    |
| LARGE WOODY DEBRIS (%)     | 10      | 0         | 42    |
| ROOT MASS (%)              | 0       | 0         | 9     |
| TERRESTRIAL VEGETATION (%) | 7       | 0         | 1     |
| AQUATIC VEGETATION (%)     | 0       | 0         | 0     |
| WHITEWATER (%)             | 0       | 3         | 6     |
| BOULDERS (%)               | 80      | 97        | 2     |
| BEDROCK LEDGES (%)         | 0       | 0         | 2     |

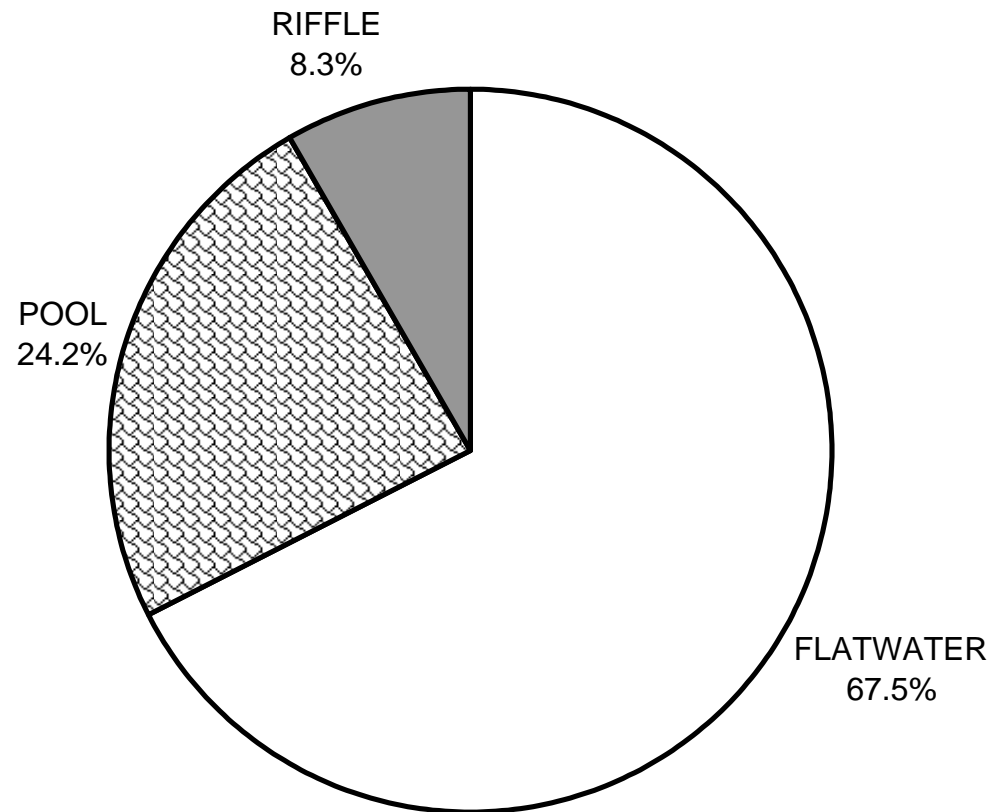


**West Chamberlain Creek 2011  
HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 1

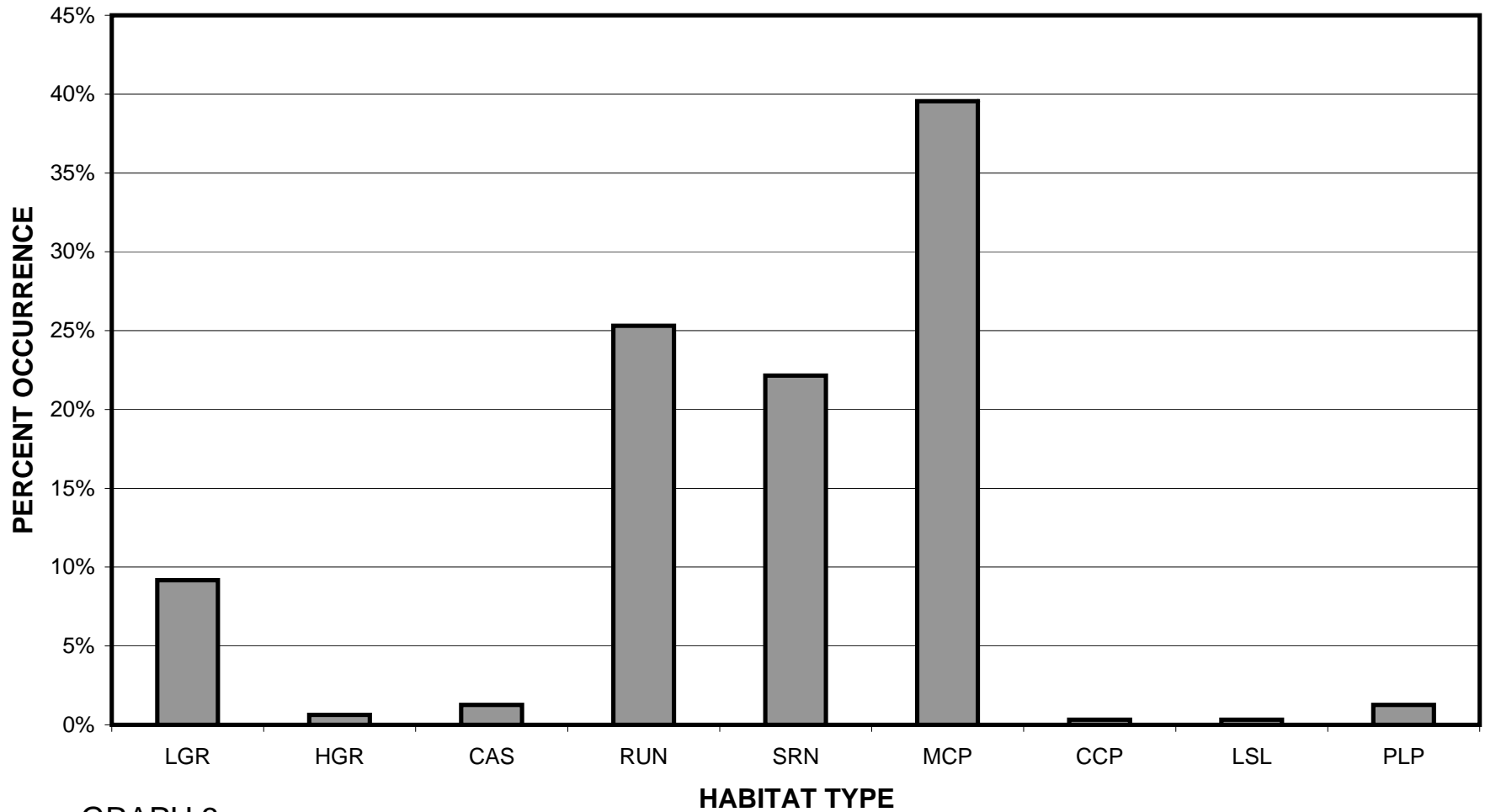
**West Chamberlain Creek 2011  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

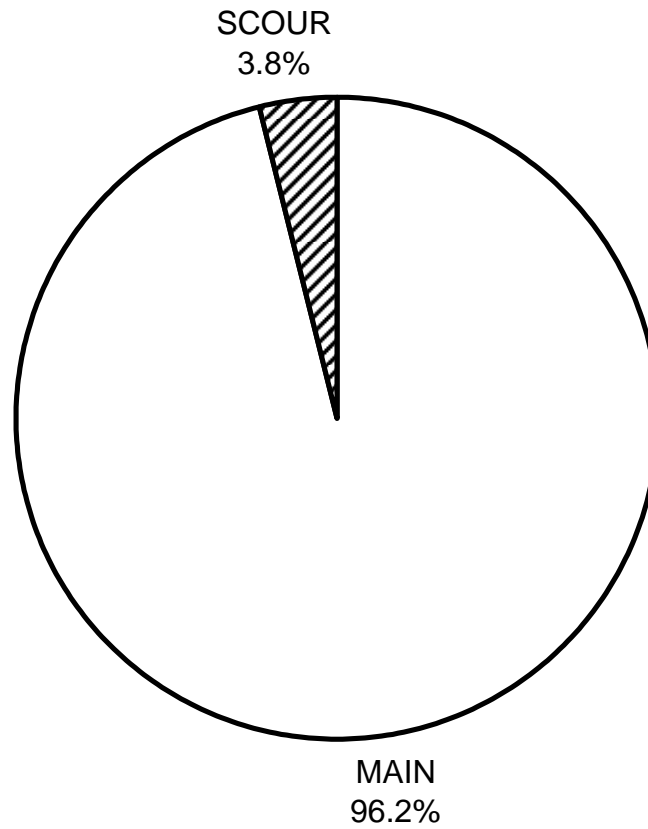
# West Chamberlain Creek 2011

## HABITAT TYPES BY PERCENT OCCURRENCE



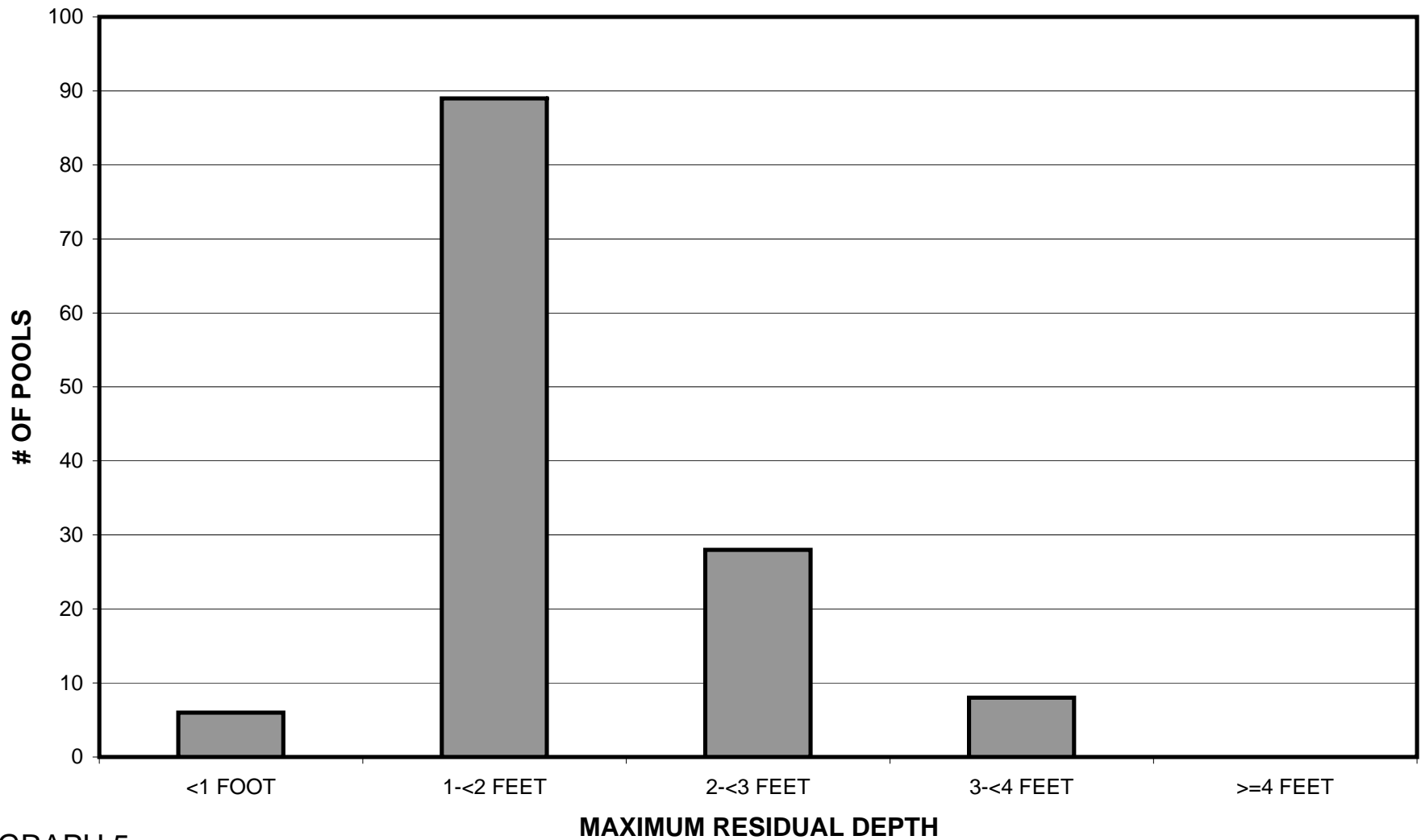
GRAPH 3

**West Chamberlain Creek 2011  
POOL TYPES BY PERCENT OCCURRENCE**



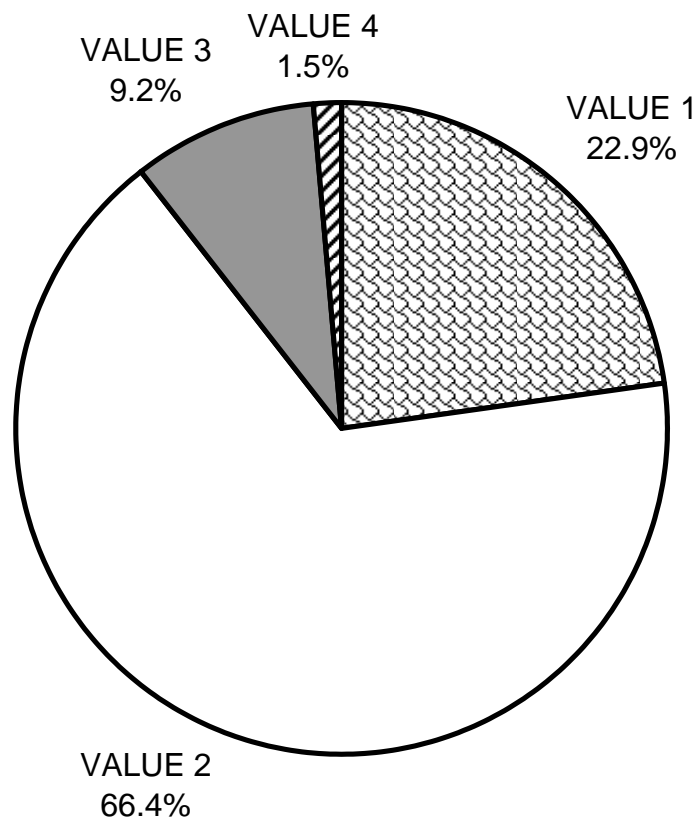
GRAPH 4

**West Chamberlain Creek 2011  
MAXIMUM DEPTH IN POOLS**



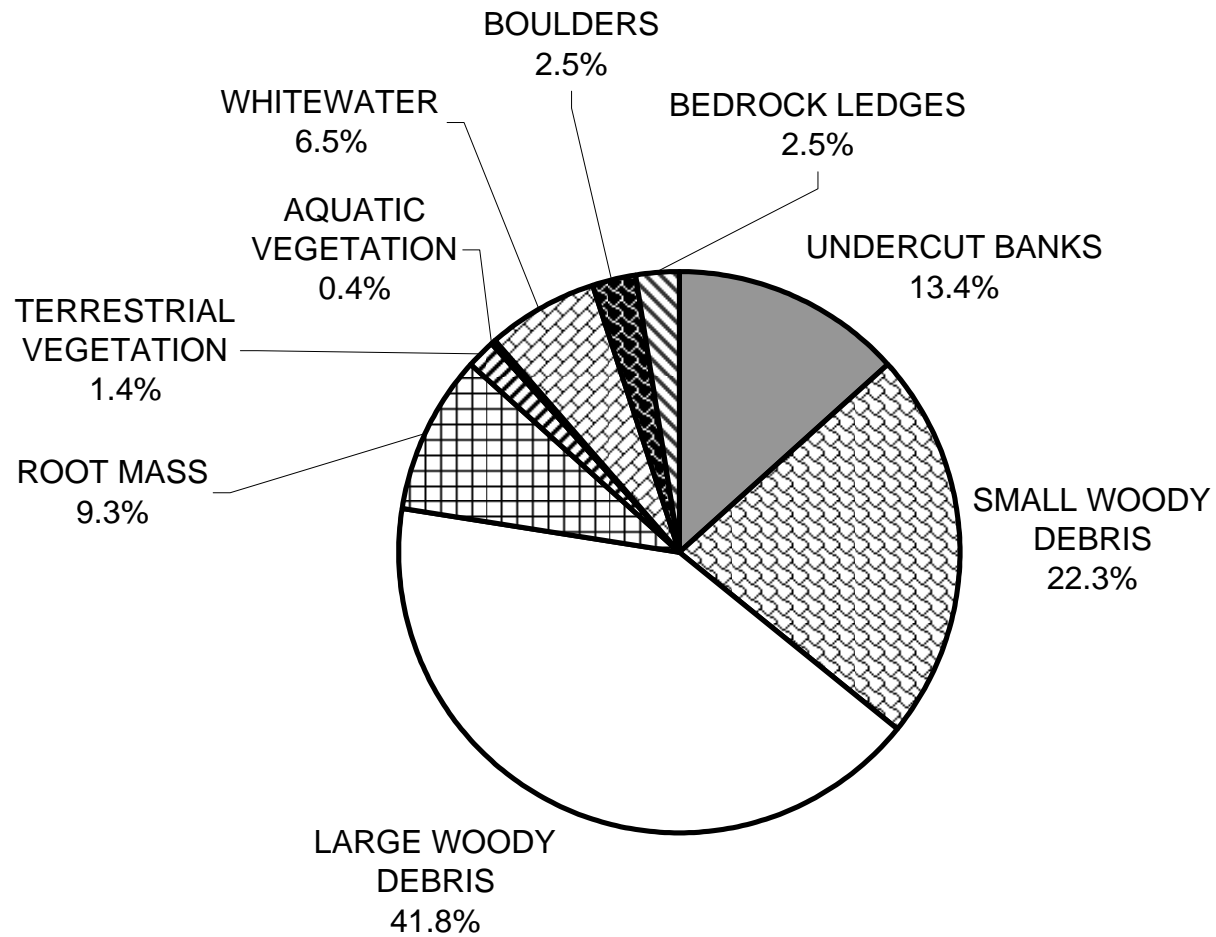
GRAPH 5

## West Chamberlain Creek 2011 PERCENT EMBEDDEDNESS



GRAPH 6

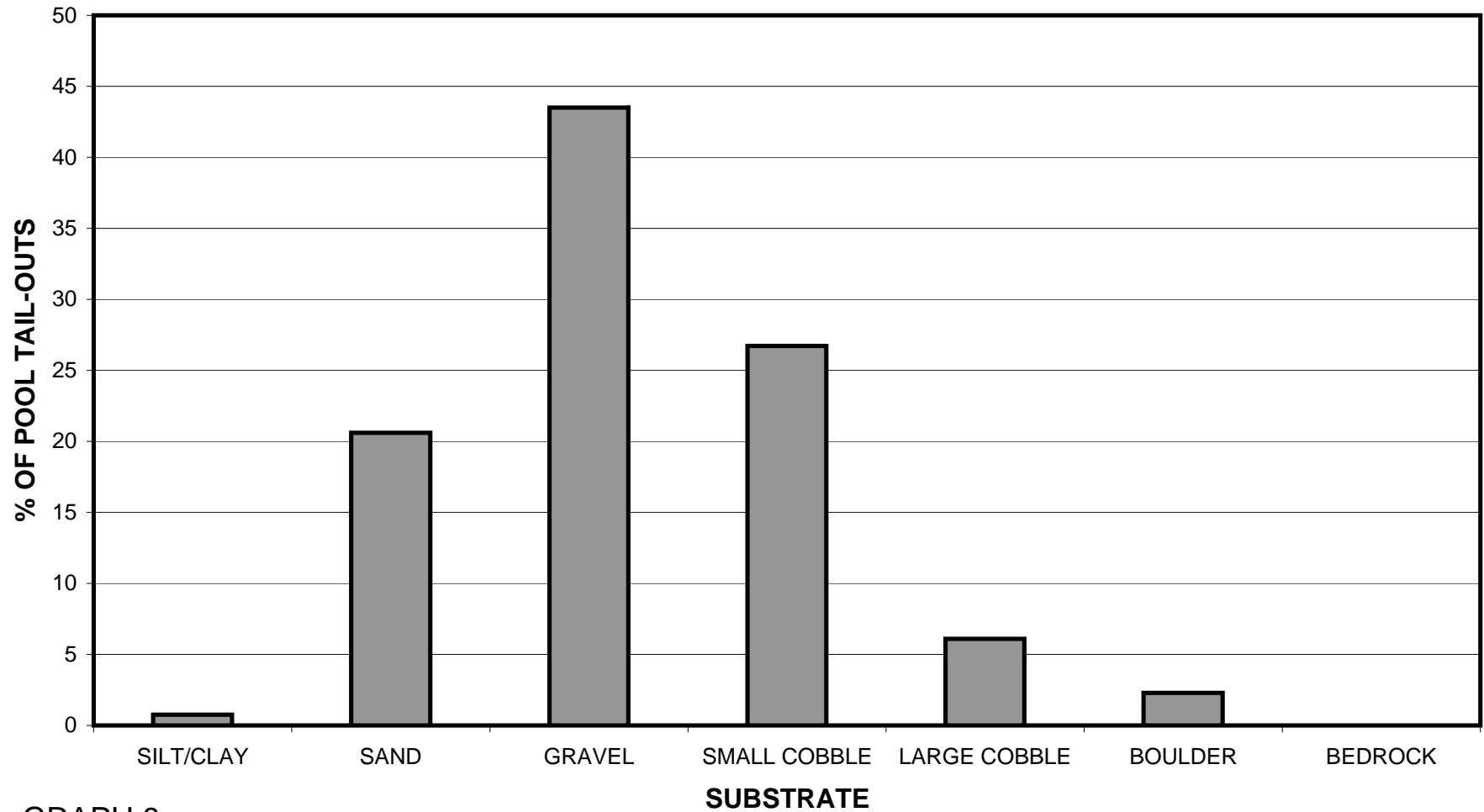
# West Chamberlain Creek 2011 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

# West Chamberlain Creek 2011

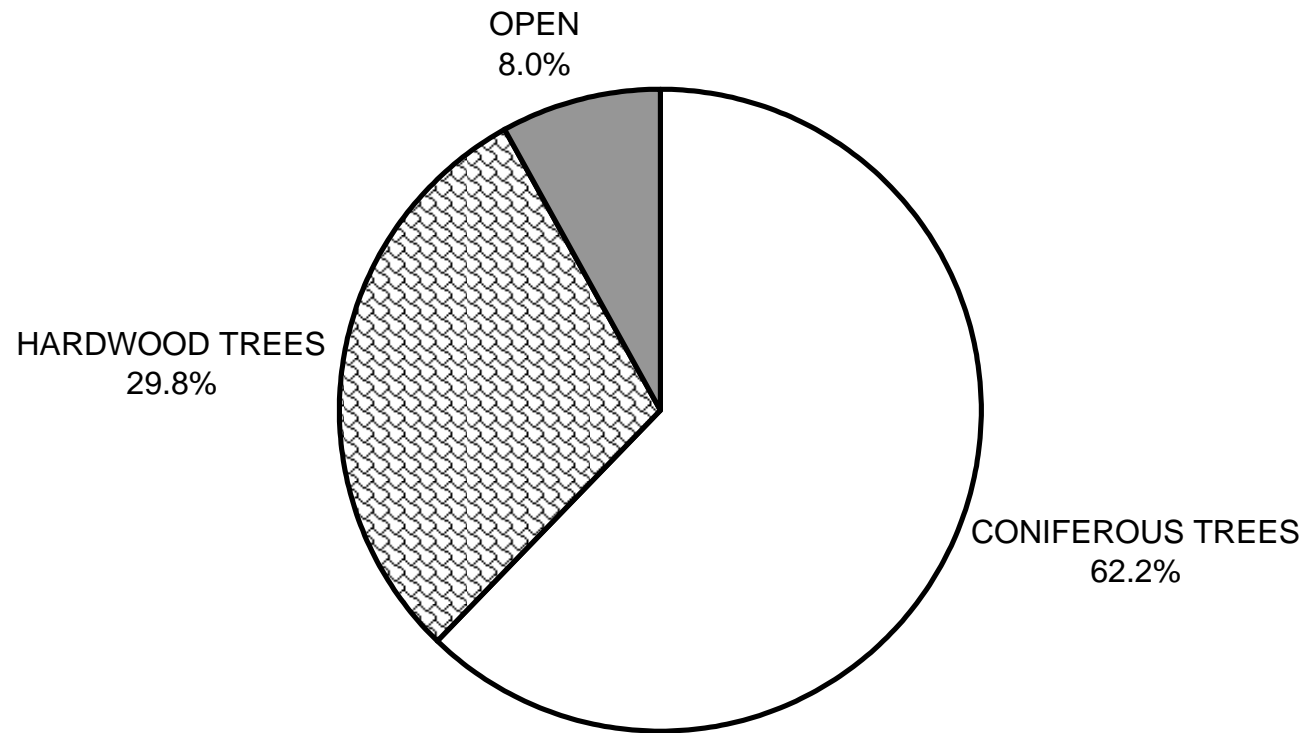
## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



GRAPH 8

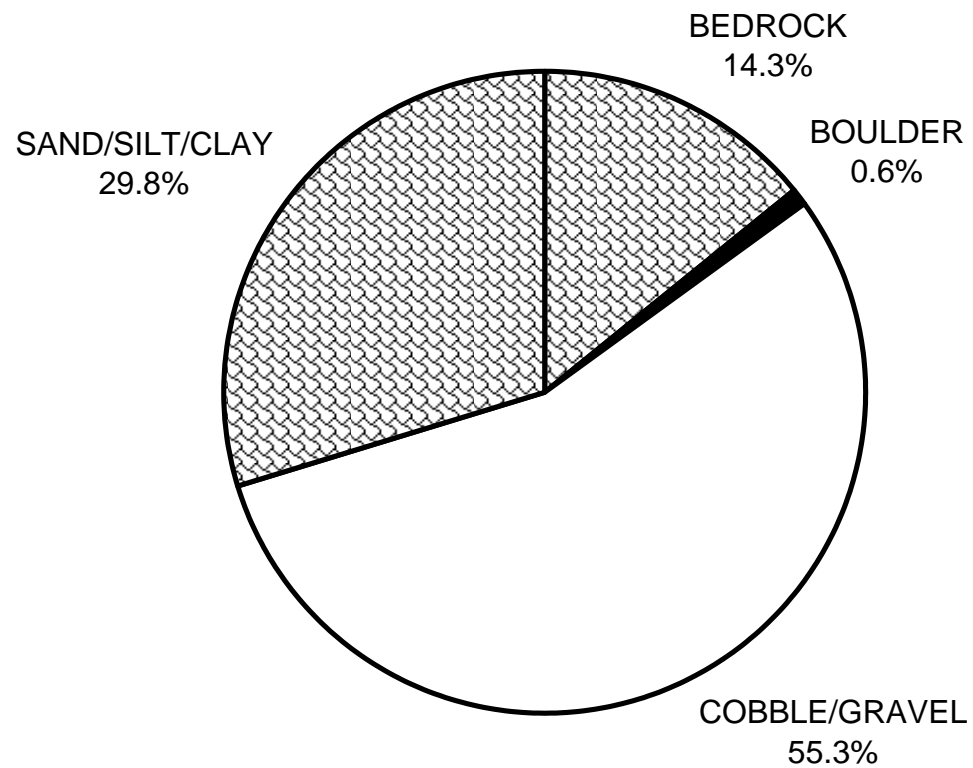


**West Chamberlain Creek 2011  
MEAN PERCENT CANOPY**



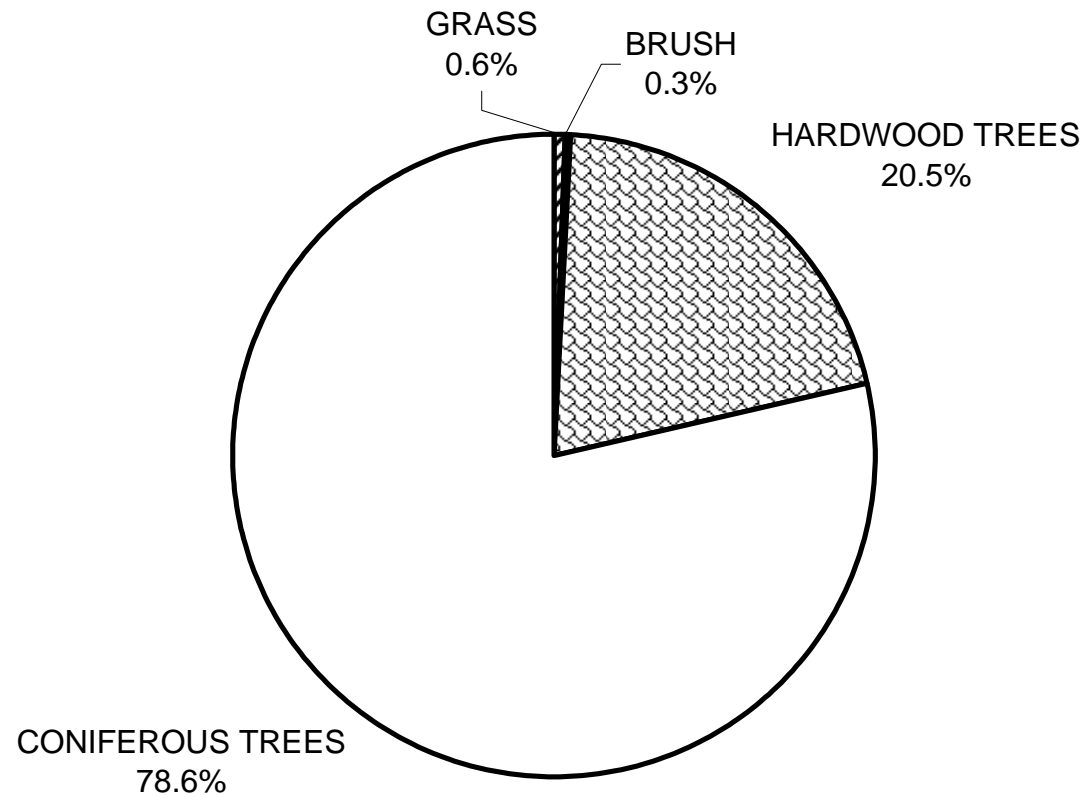
GRAPH 9

**West Chamberlain Creek 2011  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



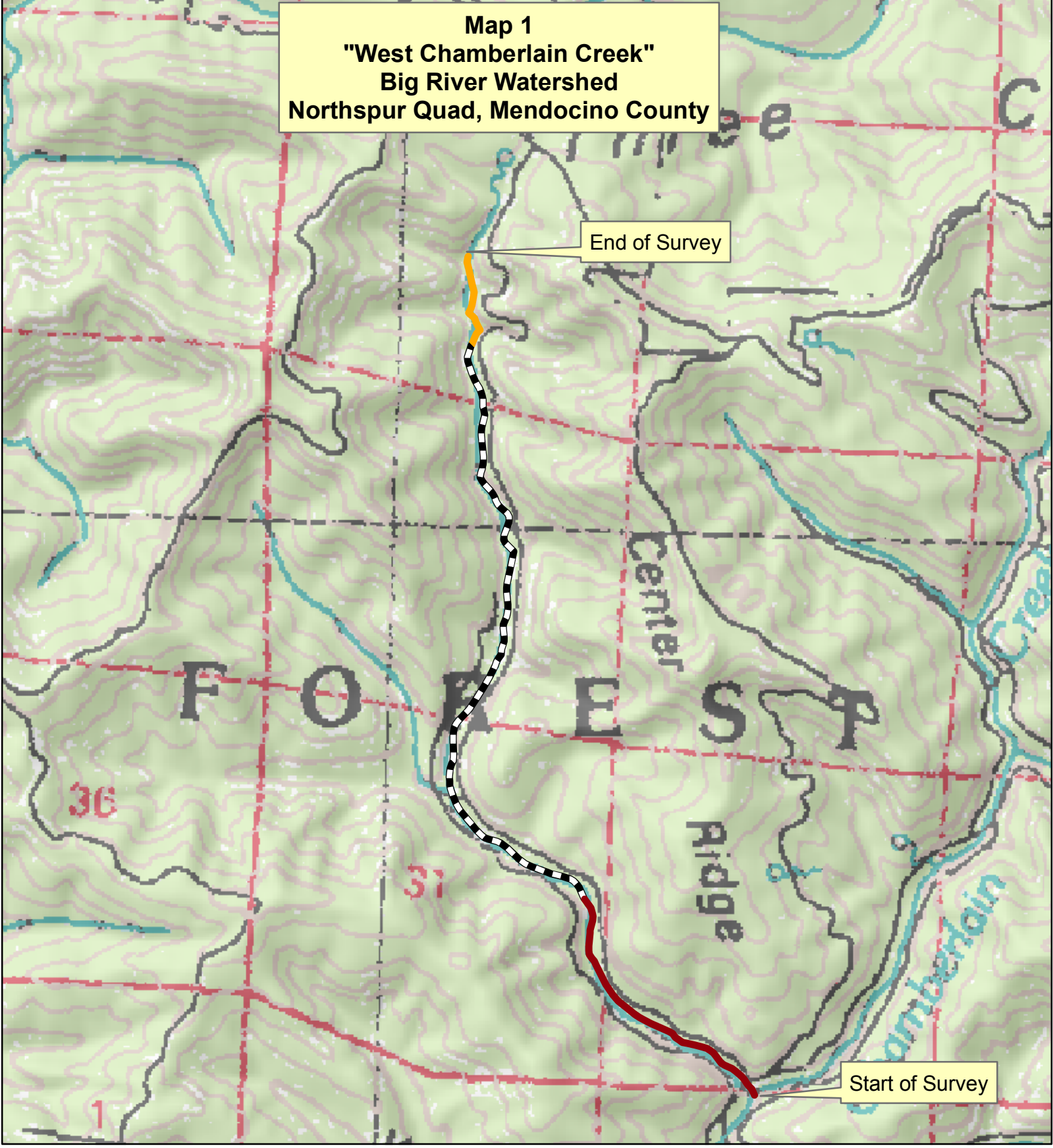
GRAPH 10

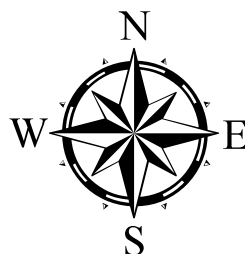
**West Chamberlain Creek 2011  
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

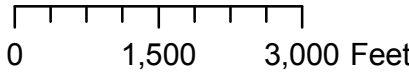
Map 1  
"West Chamberlain Creek"  
Big River Watershed  
Northspur Quad, Mendocino County






Legend

- Reach 1, F3 Channel Type
- Reach 2, F4 Channel Type
- Reach 3, A4 Channel Type



0 1,500 3,000 Feet



RESOURCES AGENCY  
CALIFORNIA  
DEPARTMENT  
FISH & GAME