CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

West Fork Sproul Creek

INTRODUCTION

A stream inventory was conducted from June 6 to July 28, 2016 on West Fork Sproul Creek. The survey began at the confluence with Sproul Creek and extended upstream 5.1 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in West Fork Sproul Creek.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, 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 Fork Sproul Creek is a tributary to Sproul Creek, tributary to South Fork Eel River, which drains to the Pacific Ocean, located in Humboldt County, California (Map 1). West Fork Sproul Creek's legal description at the confluence with Sproul Creek is T050S R03E S08. Its location is 40.0408º north latitude and -123.865º west longitude, LLID number 1238650400408. West Fork Sproul Creek is a second order stream and has approximately 5.1 miles of blue line stream according to the USGS Briceland 7.5 minute quadrangle. West Fork Sproul Creek drains a watershed of approximately 8.5 square miles. Elevations range from about 539 feet at the mouth of the creek to 2,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Sprowl Creek road off of Highway 101 near the town of Garberville.

METHODS

The habitat inventory conducted in West Fork Sproul Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al. 1998). The California Department of Fish and Wildlife (CDFW) personnel, California Conservation Corps (CCC) personnel, and Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. This inventory was conducted by a two-person team.

SAMPLING STRATEGY

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

Water and air temperatures are measured and recorded at every tenth habitat unit using a hand-held thermometer. Both temperatures are taken in degrees Fahrenheit and the time of the measurement is also recorded. Air temperatures are recorded within one foot of the water surface, while water temperatures are recorded (where possible) in flowing water within the habitat unit.

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 Fork Sproul 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.

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 Fork Sproul Creek, embeddedness was accurately 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 West Fork Sproul 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 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 Fork Sproul 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 Fork Sproul 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.

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 Fork Sproul Creek. In addition, underwater mask and snorkel observations were made at eight sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for West Fork Sproul 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 IN APPENDIX I *

The habitat inventory of June 6 to July 28, 2016 was conducted by Emily Moloney (WSP), Amidia Frederick (WSP), Alejandra Camacho (WSP), Ryan Bernstein (WSP), K. Kelson, and Chantel Moore (CCC). The total length of the stream surveyed was 29,328 feet with an additional 60 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.04 cfs on July 23, 2016.

West Fork Sproul Creek is a F4 channel type for 9,505 feet of the stream surveyed (Reach 1), an F3 channel type for 10,354 feet of the stream surveyed (Reach 2), and an E4 channel type for 9,529 feet of the stream surveyed (Reach 3). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with gravel-dominant substrates. F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with cobble-dominant substrates. E4 channels are low gradient, meandering riffle/pool streams with low width/depth ratios and little deposition. They are very efficient and stable with a high meander width ratio and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52º to 60º Fahrenheit. Air temperatures ranged from 56º to 78º Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% pool units, 39% riffle units, and 20% flatwater units (Graph 1). Based on total length of Level II habitat types there were 55% pool units, 23% riffle units, and 21% flatwater units (Graph 2).

Eighteen-Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 35%; run units, 16%; mid-channel pool units, 13%; lateral scour pool-log enhanced units, 13%. (Graph 3). Based on percent total length, low gradient riffle units made up 21%, mid-channel pool units 20%, and run units 17%.

A total of 291 pools were identified (Table 3). Scour pools were the most frequently encountered at 58% (Graph 4), and comprised 52% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. One hundred twenty-seven of the 291 pools (44%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 289 pool tail-outs measured, 85 had a value of 1 (29.4%); 102 had a value of 2 (35.3%); 64 had a value of 3

(22.1%); 19 had a value of 4 (6.6%); 19 had a value of 5 (6.6%) (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 16, flatwater habitat types had a mean shelter rating of 14, and pool habitats had a mean shelter rating of 35 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating of 43. Main channel pools had a mean shelter rating of 25. Backwater pools had a mean shelter rating of 12 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in West Fork Sproul Creek. Graph 7 describes the pool cover in West Fork Sproul 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 72% of pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 16% of pool tail-outs.

The mean percent canopy density for the surveyed length of West Fork Sproul Creek was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 74% and 26%, respectively. Graph 9 describes the mean percent canopy in West Fork Sproul Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 42% cobble/gravel, 40% sand/silt/clay, 16% bedrock, and 2% boulder. (Graph 10). Deciduous trees were the dominant vegetation type observed in 77% of the units surveyed. Additionally, 17% of the units surveyed had coniferous trees as the dominant vegetation type, and 6% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a mask and snorkel survey at eight sites for fish species composition and distribution in West Fork Sproul Creek on October 3, 2016. Water temperatures taken during the snorkeling period of 0930 to 01030 ranged from 50º to 51º Fahrenheit. The sites were sampled by Ryan Bernstein (CDFW) and Matt Rice (CDFW).

In Reach 1, which comprised the first 2,286 feet of stream, eight sites were sampled. The reach sites yielded 41 young-of-the-year steelhead (RT), and 45 young-of-the-year coho.

Other reaches were not surveyed due to weather and road constraints.

During the mask and snorkel survey, the upstream-most observation of juvenile coho salmon and

juvenile steelhead occurred at 40.0401º north latitude, -123.8750º west longitude, approximately 2,286 feet upstream from the confluence with Sproul Creek. However, juvenile coho and juvenile trout were observed approximately 28,000 feet and 29,082 feet, respectively, upstream from the confluence with Sproul Creek (see Comments and Landmarks section).

The following table displays the information yielded from the mask and snorkel sites:

Table A. Summary of results for a fish composition and distribution survey of West Fork Sproul Creek, October 3, 2016.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	Steelhead Trout			Coho Salmon		Additional Aquatic Species Observed
					YOY	1+	2+	YOY	1+	
Reach 1: F4 Channel Type										
10/03/16	1	016	Pool	593	2	0	0	0	0	
	2	019	Run	662	2	0	0	0	0	
	3	022	Pool	853	1	0	0	0	0	
	4	024	Pool	890	9	0	0	3	0	
	5	026	Pool	960	7	0	0	4	0	
	6	036	Pool	1452	4	0	0	6	0	
	7	038	Pool	1647	6	0	0	12	0	
	8	049	Pool	2286	10	0	0	20	0	

DISCUSSION

West Fork Sproul Creek is a F4 channel type for the first 9,505 feet of stream surveyed an F3 channel type for the next 10,354 feet and an E4 channel type for the remaining 9,529 feet. The suitability of F4, F3, and E4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover. E4 channel types are good for bank-placed boulders and fair for opposing wing-deflectors.

The water temperatures recorded on the survey days June 6 to July 28, 2016, ranged from 52º to 60º degrees Fahrenheit. Air temperatures ranged from 56º to 78º Fahrenheit. This is a suitable water temperature range for salmonids. However, 60º Fahrenheit, if sustained, is near the threshold stress level 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 21% of the total length of this survey, riffles 23%, and pools 55%. One hundred twenty-seven of the 291 (44%) pools had a maximum residual depth greater than two 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.

One hundred eighty-seven of the 291 pool tail-outs measured had embeddedness ratings of 1 or 2. Eighty-three of the pool tail-outs had embeddedness ratings of 3 or 4. Nineteen 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. Sediment sources in West Fork Sproul Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Two hundred fifty-five of the 291 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 35. The shelter rating in the flatwater habitats is 14. 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 Fork Sproul 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 98%. Reach 1 had a canopy density of 97%, Reach 2 had a canopy density of 98%, and Reach 3 had a canopy density of 97%. The percentage of right and left bank covered with vegetation was 99% and 99%, respectively.

RECOMMENDATIONS

West Fork Sproul Creek should be managed as an anadromous, natural production stream. Recommendations for potential habitat improvement activities are based on target habitat values suitable for salmonids in California's north coast streams. Considering the results from this stream habitat inventory, factors that affect salmonid productivity and CDFW's professional judgment, the following list prioritizes habitat improvement activities in West Fork Sproul Creek. Keep in mind, watershed and stream ecosystem processes, land use alterations, changes in land ownership, and other factors could potentially change the order of these recommendations or create the need to remove/add recommendations in the future.

1) 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.

2) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

3) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

4) 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.

COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
0	0001.00	There is active erosion on the left bank, it measures 30' long x 15' high. Bridge #1 is the crossing for an unnamed road, and is 20' high x 14' wide x 76' long. It is an automobile bridge made of steel and wood and is not a barrier to salmonids. Salmonid young-of-the-year (YOY) observed.
291	0008.00	Exposed soil on floodplain on right bank (RB) side. There is active/non-active erosion on the right bank, it measures 10' long x 10' high.
364	0010.00	There is active erosion on the left bank. It is mostly bedrock and root wad.
418	0011.00	Small woody debris (SWD) present.
496	0013.00	Stream narrows and the floodplain is elevated. Road still parallels left bank.
562	0014.00	Landslide present along right bank. Continues through three habitat units.
627	0017.00	There is non-active erosion landslide on the left bank, it measures 76' long x 45' high.
1326	0034.00	There is active erosion on the left bank, it measures 15' long x 10' high.
1452	0036.00	There is active erosion on the right bank, it measures 20' long x 10' high. Plunge 0.3' over wood with 0.9' water depth
1647	0038.00	There is active erosion on the right bank, it measures 15' long x 20' high.
1808	0042.00	Backwater pool adjacent to riffle.

2129	0045.00	There is active erosion on the right bank, it measures 60' long x 25' high. Riprap on right bank begins.
2249	0048.00	Right bank riprap ends.
2286	0049.00	There is active erosion on the left bank, it measures 50' long x 15' high. Plunge height 1.9' over wood. Water depth is 1.3'.
2911	0054.00	Large woody debris (LWD) accumulation, but does not appear to affect fish passage. It is mostly SWD. There is active erosion on the right bank, it measures 32' long x 30' high.
3162	0062.00	Boulder enhanced with multiple pools connected. Exposed sediment remnant of previous high flows.
3369	0065.00	Appears to be an old, decommissioned logging road. Some cleared forest along left and right side of road.
4037	0074.00	Left bank erosion begins. Eroding 6' above stream. Two otters spotted.
4215	0077.00	There is active erosion on the left bank, it measures 178' long x 6' high. Erosion from HU #074 ends.
4301	0078.00	There is active erosion on the right bank, it measures 30' long x 40' high.
4640	0082.00	Unit has 4' undercut bank for 10'.
5191	0091.00	There is active erosion on the right bank, it measures 61' long x 15' high.
5636	0097.00	There is active erosion on the left bank, it measures 134' long x 30' high.
5689	0098.00	Landslide from HU #097 continues.
5715	0099.00	Erosion from landslide in HU 097 ends.
5812	0101.00	Very long, shallow pool with erosion along right bank. No measurements taken.
6672	0114.00	There is active erosion on the right bank, it measures 61' long. LWD accumulation, but not a barrier to fish.
7149	0126.00	There is active erosion on the left bank, it measures 65' long.
7351	0132.00	LWD with 16' of hollow core. Alters stream hydrology.

7750	0140.00	There is active/non-active erosion on the left bank, it measures 10' long x 20' high. Channel narrows with more exposed substrate.
8116	0143.00	Tributary # 1 enters on the left bank. It contributes to approximately 0.5% of West Fork Sproul Creek's flow. The water temperature of the tributary was 58 degrees Fahrenheit, the water temperature downstream of the confluence was 60 degrees Fahrenheit, and the water temperature upstream of the confluence was 60 degrees Fahrenheit. The slope of the tributary is not measured due to hand level filled with water. The tributary is not accessible to salmonids due to steep bedrock and slope. Fish were not observed in the tributary.
9030	0157.00	Acting as a single LWD dam. Several small wood pieces present also and perpendicular to a single log that seems to extend and cover, storing some sediment and gravels. The log has 6' cover on creek. Water is seeping below the structure rather than plunging over. Plunge height would be 1.4' over log into 1.7' of water depth.
9505	0168.00	Channel type changes to an F3 at Habitat Unit (HU) #168. Channel type cross-section location is at HU#168. Steep bedrock bank on right, very gorge-like.
9735	0171.00	Left bank tributary no flow. Unlikely to be accessible by fish.
9777	0173.00	There is active erosion on the left bank, it measures 25' long x 20' high.
11164	0194.00	There is active/non-active erosion on the left bank, it measures 15' long x 7' high.
11300	0196.00	There is active erosion on the left bank, it measures 10' long x 15' high.
11634	0202.00	Plunge height 0.6' over LWD into pool 1.1' deep.
12085	0209.00	There is active erosion on the left bank, it measures 50' long x 18' high.
12245	0215.00	Right bank erosion.
12302	0217.00	Right bank erosion.
12747	0226.00	Tributary enters on the left bank. It contributes approximately 1.5% of West Fork Sproul Creek's flow. The water temp of the tributary was 59 degrees Fahrenheit. The water temp downstream and upstream of the confluence was 58 degrees Fahrenheit. The tributary is not accessible to fish.

13173	0235.00	There is a major left bank landslide measuring approximately 50' high x 60' long.
13774	0242.00	This pool is enhanced by LWD, root wads, and bedrock. The top of the pool has a log that spans the channel and acts as a dam; separating the pool upstream and slightly raising the channel elevation.
14572	0256.00	Tributary #3 enters on the right bank. It contributes to approximately 40% of West Fork Sproul Creek's flow. The water temperature of the tributary was 57 degrees Fahrenheit. The water temperature downstream of the confluence was 57 degrees Fahrenheit while the water temperature upstream was 59 degrees Fahrenheit. It is not accessible to fish.
15100	0270.00	Left bank erosion with dimensions of 10' height x 33' long.
15755	0286.00	Log debris accumulation (LDA) #001 contains 17 pieces of LWD and measures 5.5' high x 32' wide x 18' long. Water flows through it and there are no visible gaps. Retained sediment ranges from sand to gravel. Fish were observed above the LDA.
15828	0288.00	Water is flowing on the right bank due to a LWD accumulation on the left bank.
16709	0312.00	There is left bank erosion with dimension of 20' high x 45' long.
16924	0317.00	Bedrock is scouring the pool. There is a root wad present on the right bank and bedrock on the left bank.
16969	0319.00	The bedrock sheet unit is covered by SWD. The slope is >4%.
17061	0323.00	Landslide on the right bank measuring 30' high x 15' wide.
17380	0332.00	LDA #002 is 5' high x 20' wide x 6' long and contains 4 pieces of LWD. Water flows through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 31' wide x 20' long x 0.8' deep. The sediment ranges in size from silt to small cobble. The LDA is a possible barrier to juvenile salmonids as they cannot jump over the LDA. Fish were observed above the LDA.
17414	0333.00	The left bank is eroded at the top of the unit.
17596	0338.00	Riprap present on the left bank due to the bridge found in HU #339.

17778	0339.00	Bridge #2 is the crossing for an unnamed road, and is 17' high x 14' wide x 48.5' long. It is an automobile bridge (made of steel/wood) and is not a barrier to salmonids.
17911	0347.00	Left bank is eroded.
18392	0356.00	There is erosion on the right bank, it measures 4' long x 4' high. The erosion is caused by a log that is spanning the width of the channel, where water is seeping under and riffling around on the right bank.
18598	0360.00	There is erosion on the right bank at the top of the unit.
18696	0362.00	There are steep bedrock banks on both sides
18920	0368.00	There is a 1.2' plunge over bedrock into a pool of 2.4' depth.
19340	0379.00	This pool combines a riffle that divided it from the previous unit.
19624	0384.00	There is a 0.8' plunge over bedrock into a 0.6'deep pool.
19648	0385.00	There is erosion on the left bank that measures 10' high x 86' long.
19775	0389.00	Tributary #5 enters on the left bank. The water temperature of the tributary was 58 degrees Fahrenheit, the water temperature downstream of the confluence was 58 degrees Fahrenheit, and the water temperature upstream of the confluence was 57 degrees Fahrenheit. The slope of the tributary is 1.9%. The tributary is accessible to salmonids. Fish were observed in the tributary.
19799	0390.00	Channel type is an E4. Channel type cross-section location is at HU #450.
19813	0391.00	There is an accumulation of LWD which spans the bank full but not a barrier.
19876	0392.00	Bridge #3 is the crossing for an unnamed road, and is 24' high x 15' wide x 57' long. It is an automobile bridge (made of steel/wood) and is not a barrier to salmonids.
19998	0395.00	There is erosion at the top of the unit on both the left and right bank. The erosion on the left bank measures 7' high x 35' long.
20323	0401.00	LDA #3 contains 23 pieces of LWD and measures 8' high x 32' wide x 23' long. Water does not flow through the LDA and there are visible gaps in it. The gaps seen are vertical gaps seen from above. There are no

		gaps horizontally. Retained sediment ranges from sand to small cobble and measures 31' wide x 25' long x 3' deep. Fish were observed above the LDA.
20399	0404.00	There is LWD spanning the channel, but water flows underneath. YOY were observed.
20765	0411.00	There is erosion on the right bank measuring 10' high x 45' long .
20978	0418.00	There is an old logging log structure on the left bank within bankfull. The logs are held together with steel cord. In total, there are 7 pieces of LWD.
21064	0420.00	LDA #4 contains 18 pieces of LWD and measures 7' high x 39' wide x 12' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to small cobble and measures 30' wide x 25' long x 2' deep. Fish were observed above the LDA.
21087	0421.00	There is erosion on the right bank measuring 14.5' high x 18' long.
21198	0425.00	This habitat unit is log scoured. The first step has a 0.7' plunge over wood into a 0.4' deep pool. The second step has a 0.6' plunge over cobble into a 0.7' deep pool. The third step has a 0.8' plunge over wood into a 0.5' deep pool.
21506	0431.00	There is erosion on the right bank measuring 4' wide x 57' long.
21647	0437.00	There is a plunge of height 1.4' over wood into a 0.8' pool.
21750	0440.00	LDA #5 contains 20 pieces of LWD and measures 9' high x 35' wide x 16' long. Water flows through the LDA and there are visible in it. Retained sediment ranges from sand to small cobble and measures 33' wide x 30' long x 4' deep. Fish were observed above the LDA.
21784	0441.00	The water flows subsurface below a log between a riffle and the next habitat unit.
22180	0455.00	Large non-active landslide causing erosion on the left bank. Area measures approx. 40' high x 65' long.
22559	0467.00	A dry tributary is on the right bank. It has a low slope for approx. 35' then it steepens quickly up the right bank making it unacceptable for fish.
22671	0472.00	There is erosion on the left bank measuring 30' high x 30' long.

22700	0474.00	Erosion on the right bank measuring 4' high x 20' long. Tributary #6 enters on the right bank. It contributes to approximately 7% of West Fork Sproul Creek's flow. The water temperature of the tributary was 57 degrees Fahrenheit, the water temperature downstream of the confluence was 58 degrees Fahrenheit, and the water temperature upstream of the confluence was 59 degrees Fahrenheit. The slope of the tributary is 6%. The tributary is accessible to salmonids. Fish were observed in the tributary.
22988	0484.00	LDA #6 contains 14 pieces of LWD and measures 6' high x 9' wide x 52' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 15' wide x 31' long x 5' deep. Fish were observed above the LDA. The LDA appears as a barrier but there is scour under the LWD that allows fish to pass through.
23036	0487.00	LDA #7 contains 17 pieces of LWD and measures 6' high x 14' wide x 17' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to small cobble and measures 22' wide x 28' long x 4' deep. Fish were observed above the LDA.
23083	0488.00	There is small woody debris from LDA #7 covering the riffle.
23104	0489.00	Algae growth present in the pool.
23163	0492.00	This unit is covered in shrubs.
23472	0502.00	LDA #8 contains 18 pieces of LWD and measures 5' high x 21' wide x 19' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to small cobble and measures 22' wide x 28' long x 4' deep. Fish were observed above the LDA.
23658	0510.00	There is orange bacterial growth in pool. It is very shrubby in the stream.
23724	0512.00	There is erosion on the right bank measuring 8' high x 9' long.
23771	0514.00	Landslide on the right bank that extends into HU #517. It measures 25' high x 54' long. There are two conifers, cobbles, and boulders in the stream due to the landslide.
23801	0516.00	There is exposed bedrock.
23850	0519.00	There is LWD spanning the creek. There is a plunge over the wood into a pool.

23928	0525.00	Rusty/orange colored bacterial bloom present in pool.
24854	0560.00	LDA #10 contains 11 pieces of LWD and measures 5' high x 17' wide x 27' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to small cobble and measures 16' wide x 14' long x 1.5' deep. Fish were observed above the LDA. The unit below the LDA was dry for 8 feet.
25325	0575.00	There is an orange bacterium present in the pool.
25479	0578.00	There is a single piece of LWD that spans the channel width and separates this pool from the next.
25787	0591.00	There is what appears to be an old clear cut on the right bank. There are dead trees on the ground that is protecting the soil.
25962	0600.00	Tributary #7 enters on the right bank. It contributes to approximately 25% of West Fork Sproul Creek's flow. The water temperature of the tributary was 58 degrees Fahrenheit, the water temperature downstream of the confluence was 58 degrees Fahrenheit, and the water temperature upstream of the confluence was 57 degrees Fahrenheit. The slope of the tributary is 2%. The tributary is accessible to salmonids. Fish were not observed in the tributary.
26017	0604.00	Pieces of rusty sheet metal present and partially blocking water flow.
26055	0606.00	There is right bank erosion measuring 8' high x 25' long.
26215	0612.00	LDA #11 contains 5 pieces of LWD and measures 5' high x 20' wide x 9' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 17' wide x 12' long x 1' deep. Fish were observed above the LDA.
26705	0632.00	There is erosion present on the right bank measuring 20' high x 75' long.
26966	0642.00	LDA #12 contains 14 pieces of LWD and measures 5' high x 20' wide x 14' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 11' wide x 18' long x 1' deep. Fish were observed above the LDA.
26981	0643.00	The stream goes subsurface at LDA #12.
27336	0654.00	Erosion present on the right bank measuring 10' high x 30' long. LDA #13 contains 10 pieces of LWD and measures 3' high x 24' wide x 9' long. Water flows through the LDA and there are visible gaps in it.

		Retained sediment ranges from silt to gravel and measures 16' wide x 23' long x 1.2' deep. Fish were observed above the LDA.
27601	0666.00	LDA #14 contains 12 pieces of LWD and measures 7' high x 9' wide x 21' long. Water does not flow through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 9' wide x 8' long x 0.5' deep. Fish were not observed above the LDA. There is a dry unit in and above this LDA.
27734	0671.00	LDA #15 contains 7 pieces of LWD and measures 4' high x 9' wide x 20' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 8' wide x 11' long x 0.5' deep. Fish were observed above the LDA.
27793	0674.00	There is a <1' dry step separating pools within this unit.
27827	0676.00	This unit encompasses small pools separated by short dry units.
28143	0691.00	Erosion present on the left bank measuring 11' high x 35' long. There is a 3' plunge over wood into a 1.4' deep pool.
29005	0730.00	Tributary #8 enters on the right bank. It contributes to approximately 40% of West Fork Sproul Creek's flow. The water temperature of the tributary was 59 degrees Fahrenheit, the water temperature downstream of the confluence was 59 degrees Fahrenheit, and the water temperature upstream of the confluence was 60 degrees Fahrenheit. The tributary is accessible to salmonids. Fish were observed in the tributary.
29082	0735.00	Bedrock influenced pool. YOY observed.
29126	0738.00	There is erosion present that is cutting aggressively into and under the left bank.
29138	0739.00	There is a 4' elevation change from the pool surface to the top of a cascade.
29150	0740.00	There is a 6' elevation change from this unit to the next, which is a dry unit.
29285	0744.00	End of survey. The survey ended at a pool just beneath a culvert with a 9.5' plunge. Above the culvert is a dry unit with minimal channel development that has mossy soil, organic material, and vegetation in the channel. Below the ending unit are long sections of dry units with isolated pools and sections of riffle-runs. The last unidentified fish were

observed in a pool at HU #735. Coho were observed with certainty at HU # 687.

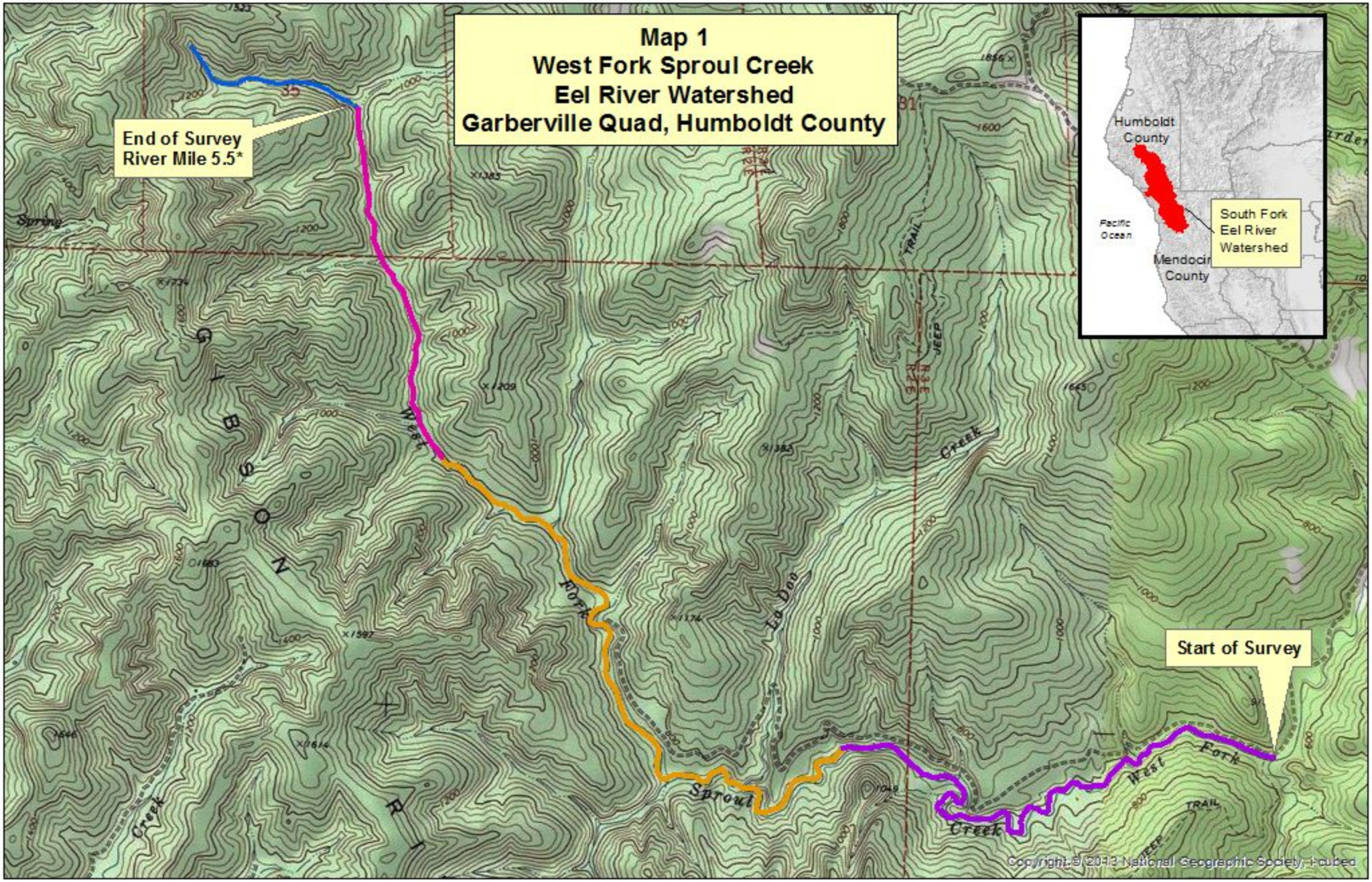
REFERENCES

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.

California Department of Fish and Wildlife

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]	



N
W E
S

Reach 1: F4 Channel Type
Reach 2: F3 Channel Type
Reach 3: E4 Channel Type
West Fork Sproul Creek

0 0.15 0.3 0.6 Miles
0 0.325 0.65 1.3 Kilometers

*River Mile indicates distance from the confluence with Sproul Creek

Coordinate System: NAD 1983 California Teale Albers
Data Sources: CDFW, USGS, Cal Water 2.21, CDF 24k

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

APPENDIX I

TABLES AND GRAPHS

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

Stream Name: West Fork Sproul Creek LLID: 1238650400408 Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016

Confluence Location: Quad: BRICELAND Legal Description: T000R000S00 Latitude: 40:02:27.0N Longitude: 123:51:54.0

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
16	1	DRY	2.1	19	301	1.0	7.0	0.0							0
150	10	FLATWATER	20.1	41	6147	20.9	12.2	0.5	0.9	371	55607	191	28704		15
291	291	POOL	39.1	56	16194	55.1	14.2	0.9	2.0	932	271277	1511	439845	1197	35
288	38	RIFFLE	38.7	23	6746	23.0	12.4	0.3	0.6	278	80189	110	31790		16

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
745	340	29388	407073	500339

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: West Fork Sproul Creek LLID: 1238650400408 Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016

Confluence Location: Quad: BRICELAND Legal Description: T000R000S00 Latitude: 40:02:27.0N Longitude: 123:51:54.0W

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 (%)
258	32	LGR	34.6	24	6072	20.7	12	0.3	1.2	281	72510	106	27420		4	97
26	4	HGR	3.5	24	629	2.1	18	0.5	1.2	376	9773	191	4973		133	99
1	1	CAS	0.1	14	14	0.0	5	0.4	0.7	60	60	24	24		5	91
3	1	BRS	0.4	10	31	0.1	2	0.2	0.5	24	72	5	14		0	100
122	7	RUN	16.4	40	4861	16.5	13	0.5	1.2	413	50427	208	25369		7	99
28	3	SRN	3.8	46	1286	4.4	11	0.6	1.1	271	7595	153	4275		32	99
1	1	TRP	0.1	20	20	0.1	5	0.4	0.7	100	100	70	70	40	30	100
98	98	MCP	13.2	59	5821	19.8	13	0.7	5.9	1024	100348	1707	167273	1346	21	98
1	1	CCP	0.1	73	73	0.2	24	1.6	3.3	1752	1752	3154	3154	2803	10	97
21	21	STP	2.8	85	1779	6.1	14	0.9	4.5	1303	27370	1970	41361	1534	40	98
96	96	LSL	12.9	41	3965	13.5	13	0.9	4.2	603	57916	818	78548	636	57	98
20	20	LSR	2.7	60	1192	4.1	21	1.6	8	1441	28821	3304	66080	2822	45	98
39	39	LSBk	5.2	67	2632	9.0	15	1.0	5.4	1110	43274	1757	68506	1332	14	97
10	10	LSBo	1.3	58	575	2.0	18	0.7	3.3	1011	10108	1242	12422	940	19	99
3	3	PLP	0.4	29	87	0.3	10	0.9	2.6	297	890	445	1336	374	22	94
1	1	SCP	0.1	39	39	0.1	12	1.7	2.6	468	468	796	796	796	5	100
1	1	BPR	0.1	11	11	0.0	21	1.1	1.8	231	231	300	300	254	20	94
16	1	DRY	2.1	19	301	1.0	7	0.0		0	0				0	100

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
745	340	29388	411714	501919

Table 3 - Summary of Pool Types

Stream Name: West Fork Sproul Creek LLID: 1238650400408 Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016

Confluence Location: Quad: BRICELAND Legal Description: T000R000S00 Latitude: 40:02:27.0N Longitude: 123:51:54.0W

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
121	121	MAIN	42	64	7693	48	13.4	0.8	1071	129569	1380	166956	25
168	168	SCOUR	58	50	8451	52	14.7	1.0	839	141009	1072	179081	43
2	2	BACKWATER	1	25	50	0	16.5	1.4	350	699	525	1050	13

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
291	291	16194	271277	347087

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

Stream Name: West Fork Sproul Creek LLID: 1238650400408 Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016

Confluence Location: Quad: BRICELAND Legal Description: T000R000S00 Latitude: 40:02:27.0N Longitude: 123:51:54.0W

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
1	TRP	0	1	100	0	0	0	0	0	0	0	0
98	MCP	34	26	27	40	41	18	18	8	8	6	6
1	CCP	0	0	0	0	0	0	0	1	100	0	0
21	STP	7	2	10	7	33	8	38	3	14	1	5
96	LSL	33	10	10	51	53	25	26	9	9	1	1
20	LSR	7	1	5	1	5	9	45	4	20	5	25
39	LSBk	13	4	10	13	33	11	28	6	15	5	13
10	LSBo	3	1	10	5	50	2	20	2	20	0	0
3	PLP	1	1	33	1	33	1	33	0	0	0	0
1	SCP	0	0	0	0	0	1	100	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
291			46	16	119	41	75	26	33	11	18	6

Mean Maximum Residual Pool Depth (ft.): 2

Stream Name: West Fork Sproul Creek LLID: 1238650400408 Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016

Confluence Location: Quad: BRICELAND Legal Description: T000R000S00 Latitude: 40:02:27.0N Longitude: 123:51:54.0W

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
1	BPR	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
291	46	16	119	41	75	26	33	11	18	6

Mean Maximum Residual Pool Depth (ft.): 2

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: West Fork Sproul Creek | LLID: 1238650400408 | Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016 | Dry Units: 16

Confluence Location: | Quad: BRICELAND | Legal Description: T000R000S00 | Latitude: 40:02:27.0N | Longitude: 123:51:54.0W

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
258	27	LGR	0	7	20	5	10	8	27	23	0
26	3	HGR	0	0	0	0	0	0	97	3	0
1	1	CAS	0	0	0	0	0	0	0	100	0
3	1	BRS	0	0	0	0	0	0	0	0	0
288	32	**TOTAL RIFFLE**	0	6	13	4	6	6	40	23	0
122	7	RUN	20	0	20	4	20	0	0	37	0
28	3	SRN	0	3	30	0	0	0	64	3	0
150	10	**TOTAL FLAT**	13	1	24	2	12	0	24	24	0
1	1	TRP	0	0	80	0	20	0	0	0	0
98	91	MCP	18	8	16	10	19	0	3	23	4
1	1	CCP	0	0	0	100	0	0	0	0	0
21	21	STP	10	13	37	15	11	0	2	11	0
96	96	LSL	6	12	66	5	7	0	1	3	0
20	19	LSR	13	3	17	58	2	0	1	4	2
39	39	LSBk	2	7	26	9	2	0	6	19	28
10	9	LSBo	18	12	8	3	0	0	6	53	0
3	3	PLP	0	7	17	0	7	0	35	18	17
1	1	SCP	0	0	0	0	0	0	0	60	40
1	1	BPR	0	5	0	95	0	0	0	0	0
291	282	**TOTAL POOL**	10	9	38	12	10	0	2	13	6
745	325	**TOTAL**	10	8	37	12	10	0	5	14	5

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: West Fork Sproul Creek LLID: 1238650400408 Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016 Dry Units: 16

Confluence Location: Quad: BRICELAND Legal Description: T000R000S00 Latitude: 40:02:27.0N Longitude: 123:51:54.0W

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
258	32	LGR	0	3	63	19	16	0	0
26	4	HGR	0	0	75	0	0	25	0
1	1	CAS	0	0	0	0	0	0	100
3	1	BRS	0	0	0	0	0	0	100
122	7	RUN	0	0	57	43	0	0	0
28	3	SRN	0	0	33	67	0	0	0
1	1	TRP	0	0	100	0	0	0	0
98	98	MCP	9	14	60	7	7	0	2
1	1	CCP	0	0	0	0	100	0	0
21	21	STP	14	10	71	0	0	5	0
96	96	LSL	13	24	54	3	5	0	1
20	20	LSR	10	0	85	0	5	0	0
39	39	LSBk	0	3	79	8	5	3	3
10	10	LSBo	0	0	70	10	0	20	0
3	3	PLP	0	0	100	0	0	0	0
1	1	SCP	0	0	0	100	0	0	0
1	1	BPR	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: West Fork Sproul Creek LLID: 1238650400408 Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016

Confluence Location: Quad: BRICELAND Legal Description: T000R000S00 Latitude: 40:02:27.0N Longitude: 123:51:54.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
98	26	74	0	99	99

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: West Fork Sproul Creek | LLID: 1238650400408 | Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016 | Survey Length (ft.): 29388 | Main Channel (ft.): 29328 | Side Channel (ft.): 60

Confluence Location: Quad: BRICELAND | Legal Description: T000R000S00 | Latitude: 40:02:27.0N | Longitude: 123:51:54.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4
Reach Length (ft.): 9505
Riffle/Flatwater Mean Width (ft.): 17.0
BFW:
Range (ft.): 21 to 37
Mean (ft.): 30
Std. Dev.: 4
Base Flow (cfs.): 0.0
Water (F): 52 - 60 Air (F): 61 - 78
Dry Channel (ft): 0

Canopy Density (%): 97.4
Coniferous Component (%): 10.8
Hardwood Component (%): 89.2
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 98.3
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 27
LWD per 100 ft.:
Riffles: 1
Pools: 3
Flat: 1

Pools by Stream Length (%): 51.9
Pool Frequency (%): 35.9
Residual Pool Depth (%):
< 2 Feet Deep: 30
2 to 2.9 Feet Deep: 33
3 to 3.9 Feet Deep: 22
>= 4 Feet Deep: 15
Mean Max Residual Pool Depth (ft.): 2.8
Mean Pool Shelter Rating: 38

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 60 Sm Cobble: 32 Lg Cobble: 5 Boulder: 2 Bedrock: 2
Embeddedness Values (%): 1. 21.7 2. 38.3 3. 33.3 4. 3.3 5. 3.3

STREAM REACH: 2

Channel Type: F3
Reach Length (ft.): 10294
Riffle/Flatwater Mean Width (ft.): 11.8
BFW:
Range (ft.): 14 to 38
Mean (ft.): 25
Std. Dev.: 7
Base Flow (cfs.): 0.0
Water (F): 56 - 60 Air (F): 58 - 78
Dry Channel (ft): 0

Canopy Density (%): 98.2
Coniferous Component (%): 14.3
Hardwood Component (%): 85.7
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 99.8
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 17
LWD per 100 ft.:
Riffles: 1
Pools: 2
Flat: 2

Pools by Stream Length (%): 56.9
Pool Frequency (%): 39.5
Residual Pool Depth (%):
< 2 Feet Deep: 49
2 to 2.9 Feet Deep: 26
3 to 3.9 Feet Deep: 17
>= 4 Feet Deep: 8
Mean Max Residual Pool Depth (ft.): 2.2
Mean Pool Shelter Rating: 18

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 58 Sm Cobble: 18 Lg Cobble: 14 Boulder: 1 Bedrock: 9
Embeddedness Values (%): 1. 43.0 2. 34.9 3. 11.6 4. 1.2 5. 9.3

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: E4
Reach Length (ft.): 9529
Riffle/Flatwater Mean Width (ft.): 6.8
BFW:
Range (ft.): 3 to 27
Mean (ft.): 15
Std. Dev.: 4
Base Flow (cfs.): 0.0
Water (F): 56 - 60 Air (F): 56 - 74
Dry Channel (ft): 301

Canopy Density (%): 97.5
Coniferous Component (%): 41.0
Hardwood Component (%): 59.0
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 99.5
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 41
LWD per 100 ft.:
Riffles: 3
Pools: 11
Flat: 3

Pools by Stream Length (%): 56.3
Pool Frequency (%): 40.3
Residual Pool Depth (%):
< 2 Feet Deep: 73
2 to 2.9 Feet Deep: 22
3 to 3.9 Feet Deep: 3
>= 4 Feet Deep: 1
Mean Max Residual Pool Depth (ft.): 1.5
Mean Pool Shelter Rating: 45

Pool Tail Substrate (%): Silt/Clay: 2 Sand: 1 Gravel: 86 Sm Cobble: 8 Lg Cobble: 0 Boulder: 1 Bedrock: 2

Embeddedness Values (%): 1. 24.5 2. 34.3 3. 23.8 4. 11.2 5. 6.3

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: West Fork Sproul Creek LLID: 1238650400408 Drainage: Eel River - South Fork

Survey Dates: 7/12/2006 to 7/28/2016

Confluence Location: Quad: BRICELAND Legal Description: T000R000S00 Latitude: 40:02:27.0N Longitude: 123:51:54.0W

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	49	59	16.0
Boulder	5	10	2.2
Cobble / Gravel	146	138	42.1
Sand / Silt / Clay	137	131	39.8

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	2	0	0.3
Brush	25	15	5.9
Hardwood Trees	249	268	76.7
Coniferous Trees	62	54	17.2
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

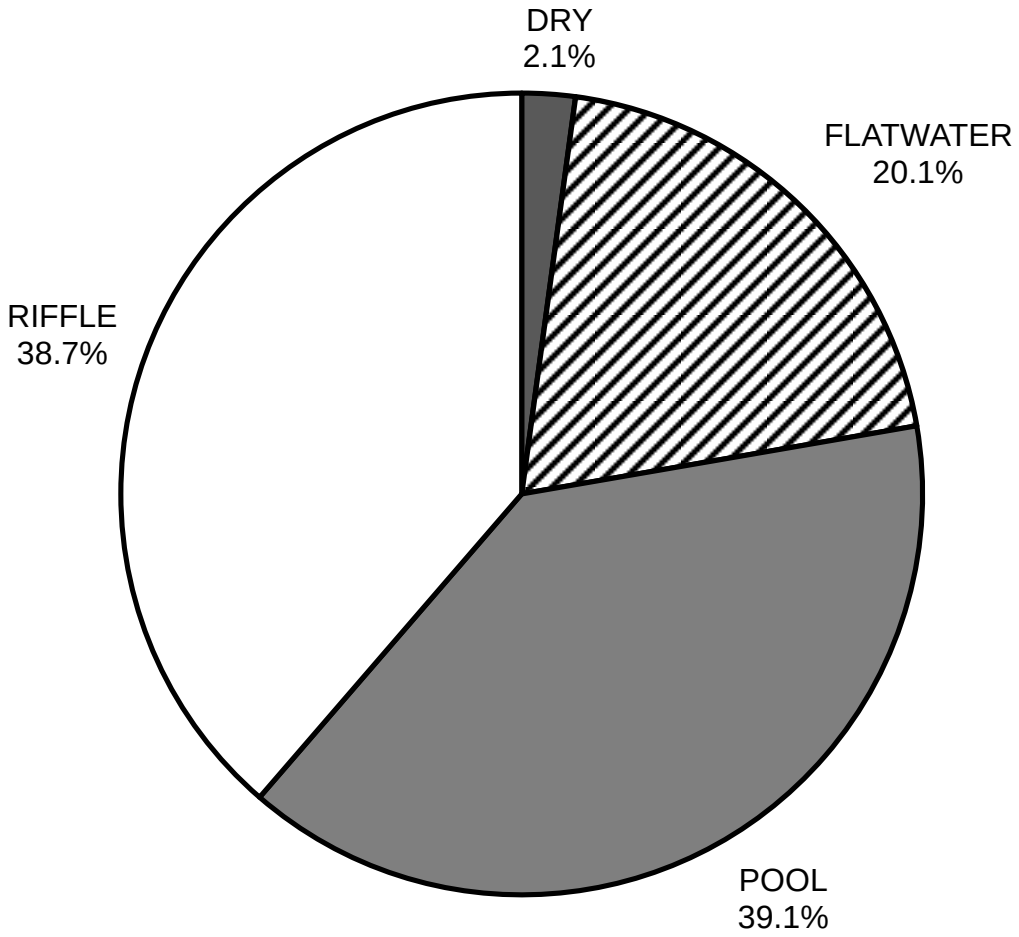
Stream Name: West Fork Sproul Creek | LLID: 1238261400695 | Drainage: Eel River-South Fork

Survey Dates: 7/12/2006 to 7/28/2016

Confluence Location: Quad: BRICELAND | Legal Description: T04SR03ES34 | Latitude: 40:04:10.0N | Longitude: 123:49:34.0W

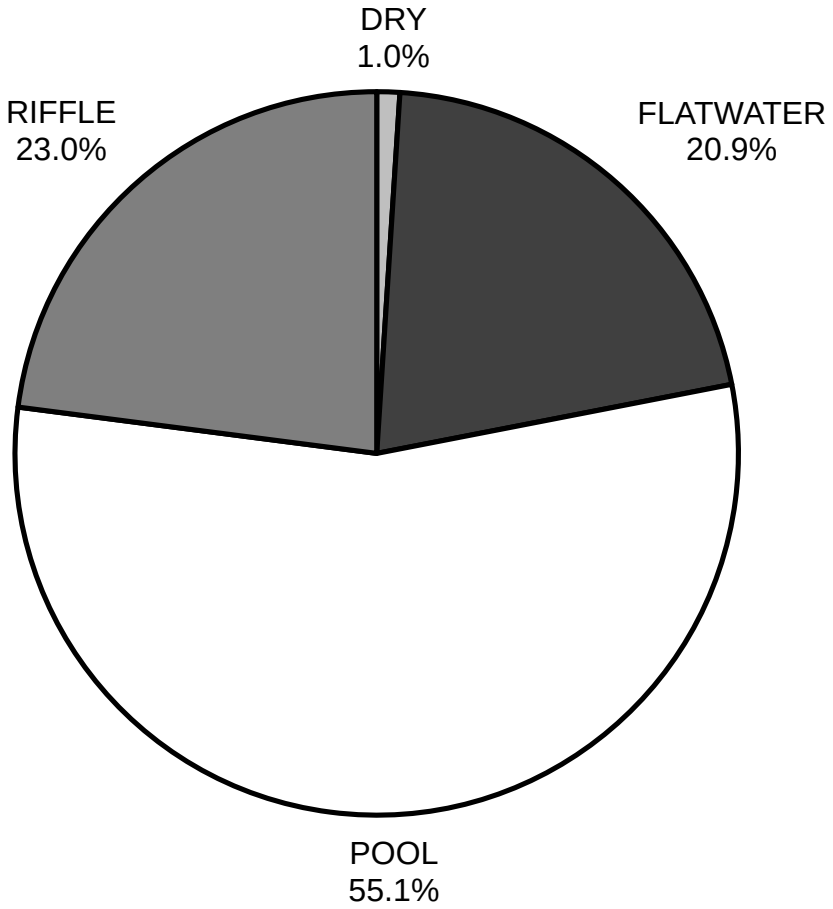
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	12	10
SMALL WOODY DEBRIS (%)	6	1	9
LARGE WOODY DEBRIS (%)	13	24	38
ROOT MASS (%)	4	3	12
TERRESTRIAL VEGETATION (%)	6	12	10
AQUATIC VEGETATION (%)	7	0	0
WHITEWATER (%)	41	24	2
BOULDERS (%)	23	24	13
BEDROCK LEDGES (%)	0	0	6

WEST FORK SPROUL CREEK 2006
HABITAT TYPES BY PERCENT OCCURRENCE



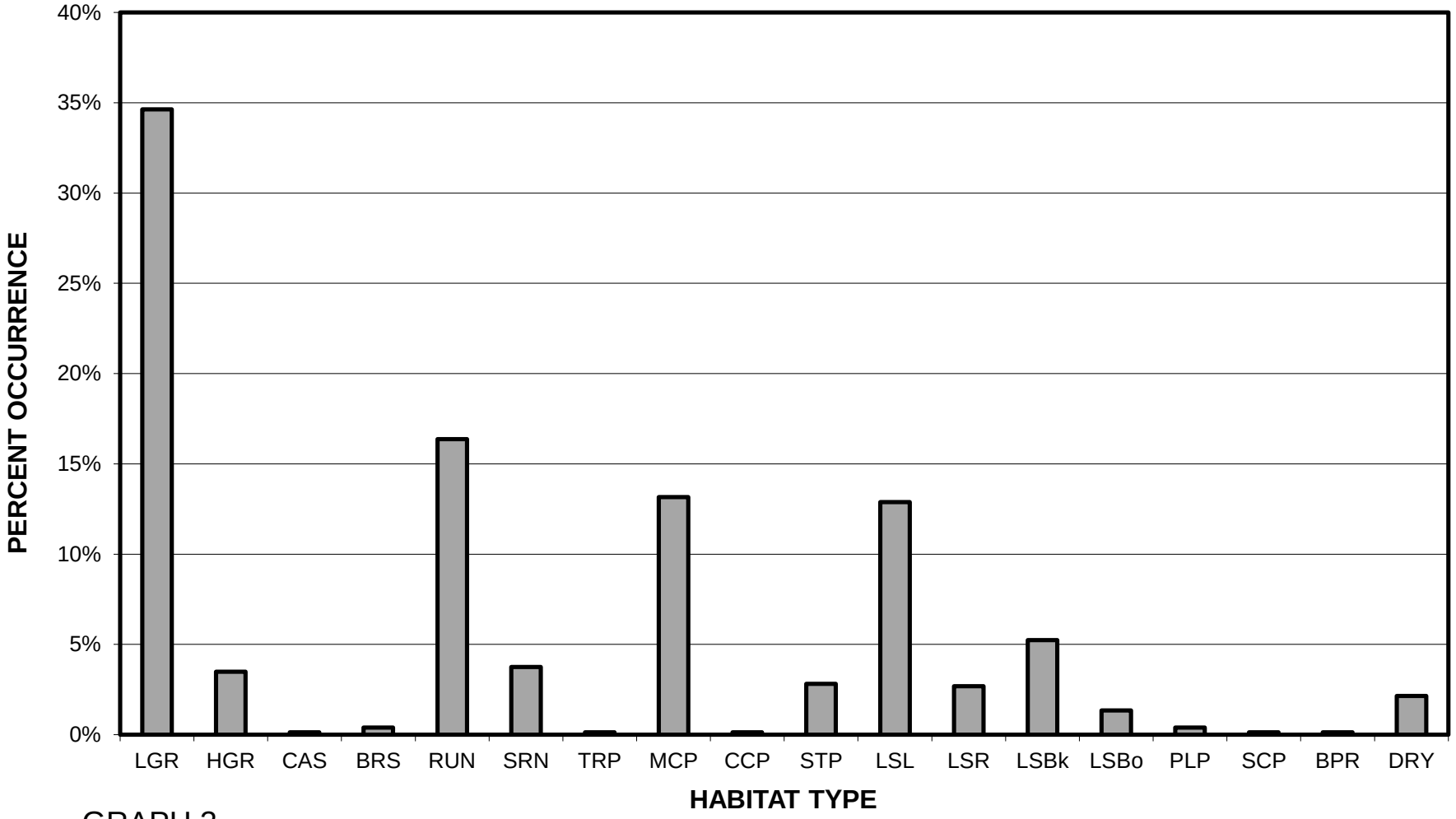
GRAPH 1

WEST FORK SPROUL CREEK 2006
HABITAT TYPES BY PERCENT TOTAL LENGTH



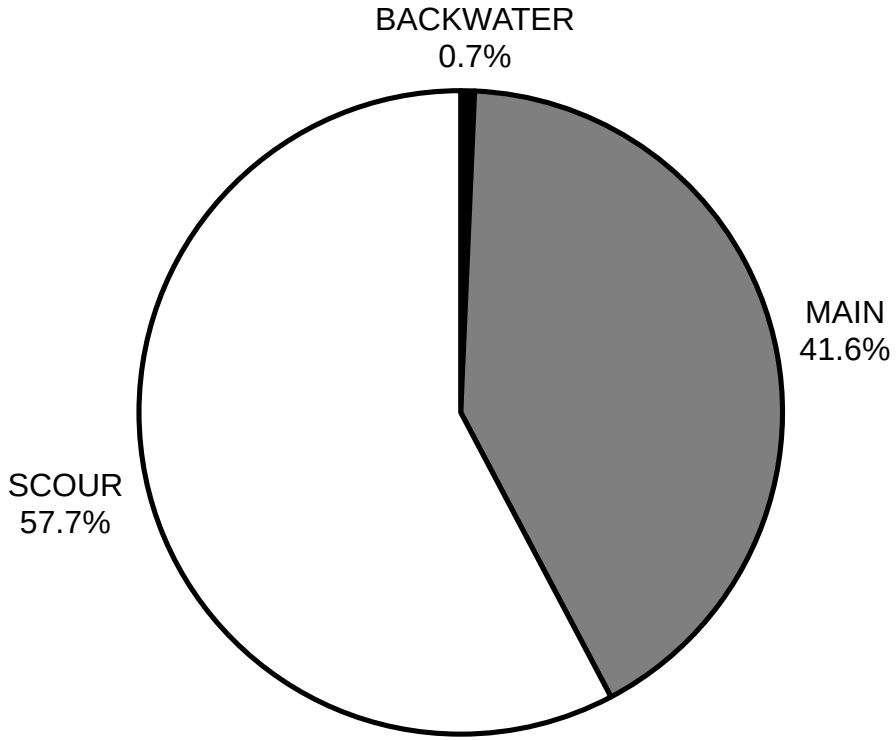
GRAPH 2

WEST FORK SPROUL CREEK 2006
HABITAT TYPES BY PERCENT OCCURRENCE



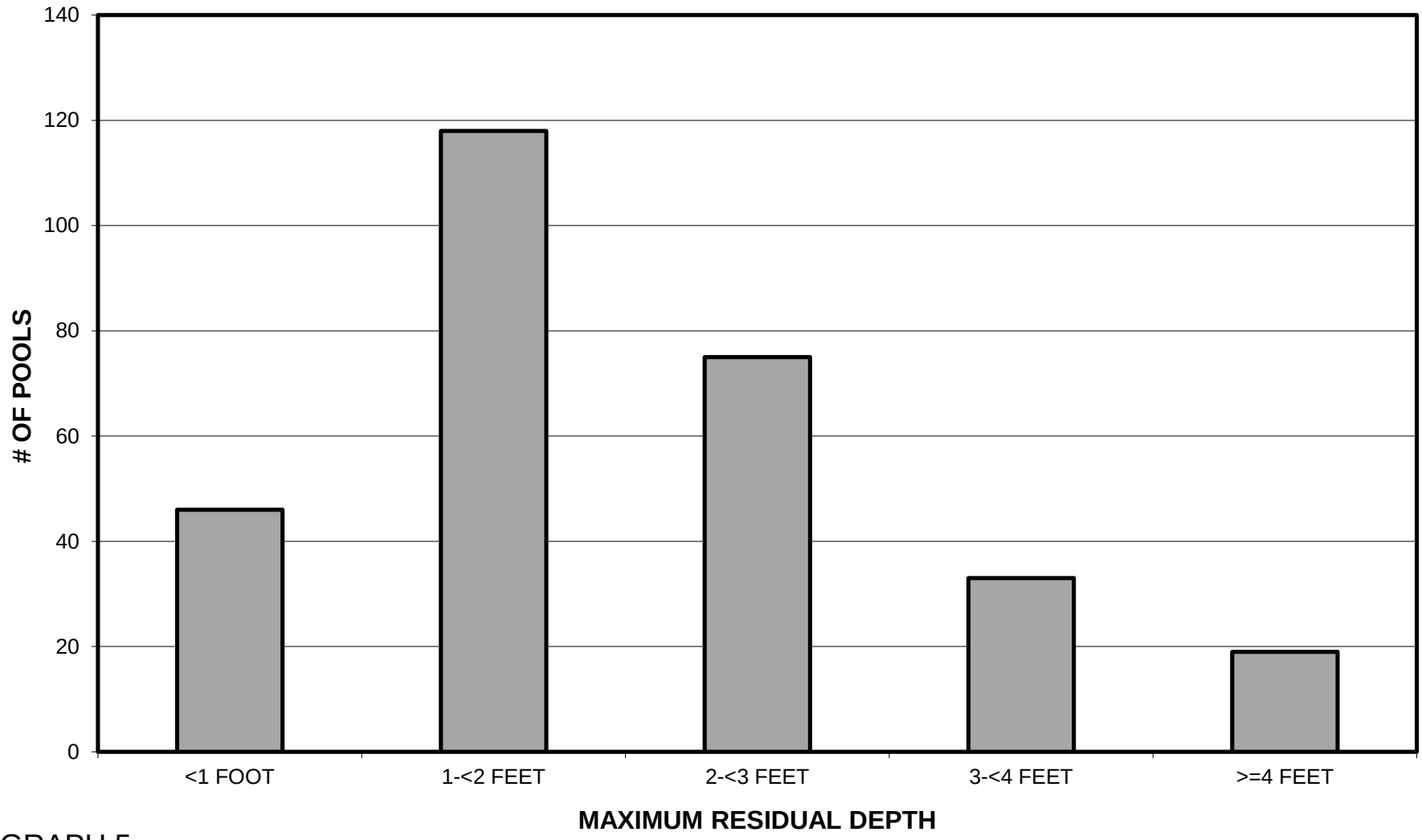
GRAPH 3

WEST FORK SPROUL CREEK 2006
POOL TYPES BY PERCENT OCCURRENCE



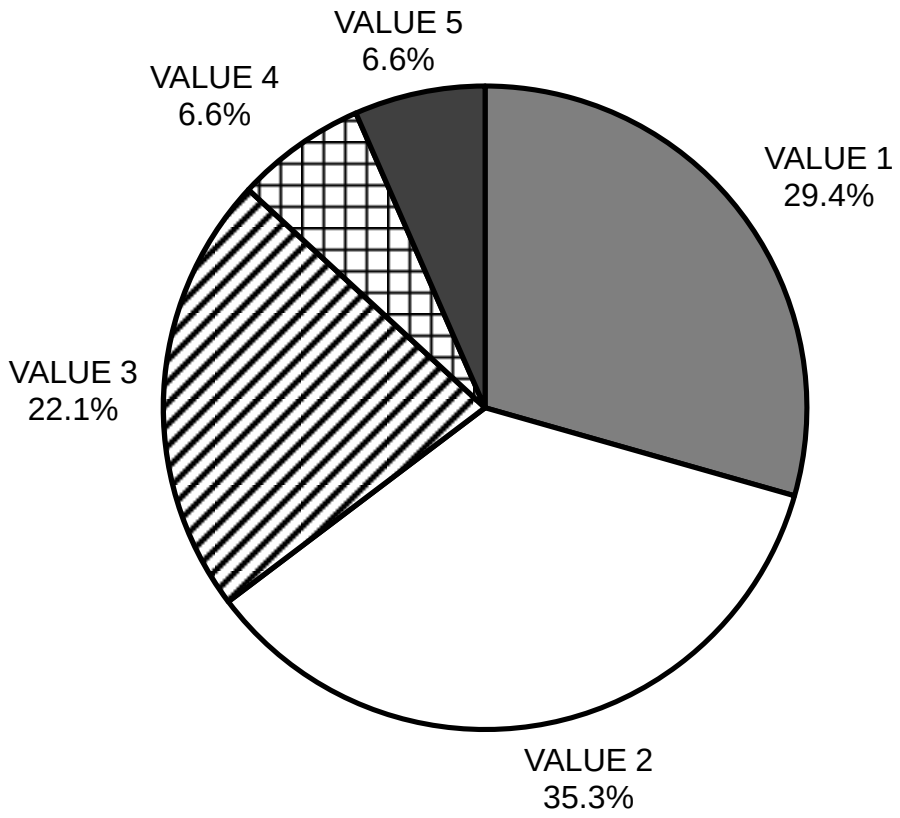
GRAPH 4

WEST FORK SPROUL CREEK 2006
MAXIMUM DEPTH IN POOLS



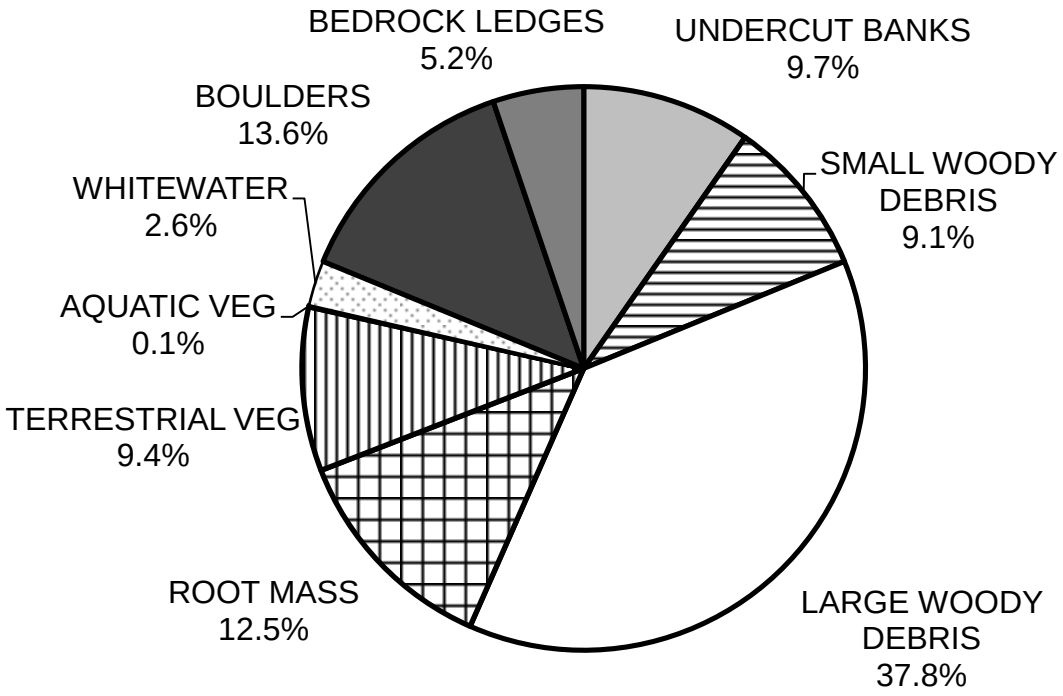
GRAPH 5

WEST FORK SPROUL CREEK 2006
PERCENT EMBEDDEDNESS



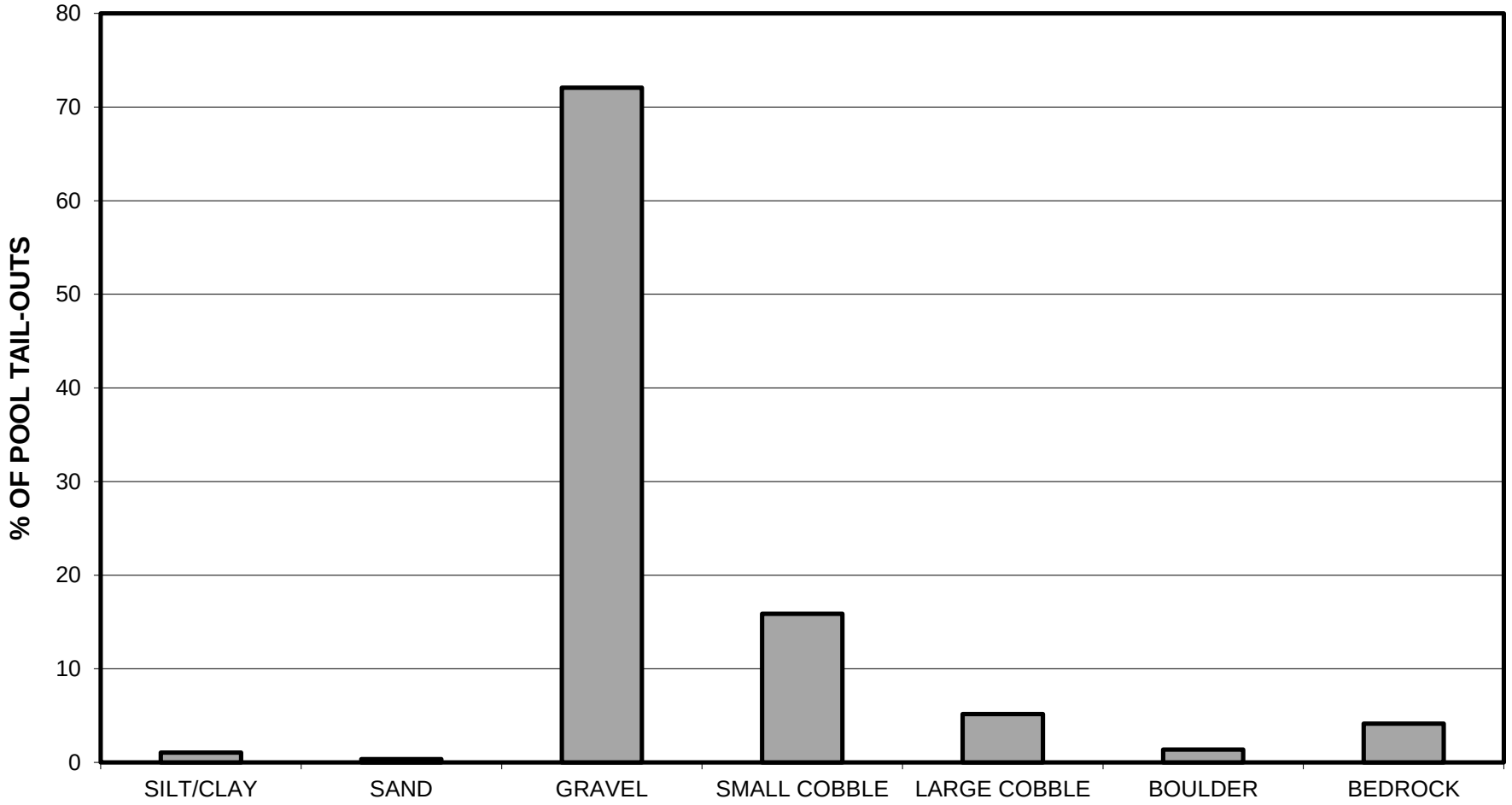
GRAPH 6

WEST FORK SPROUL CREEK 2006
MEAN PERCENT COVER TYPES IN POOLS



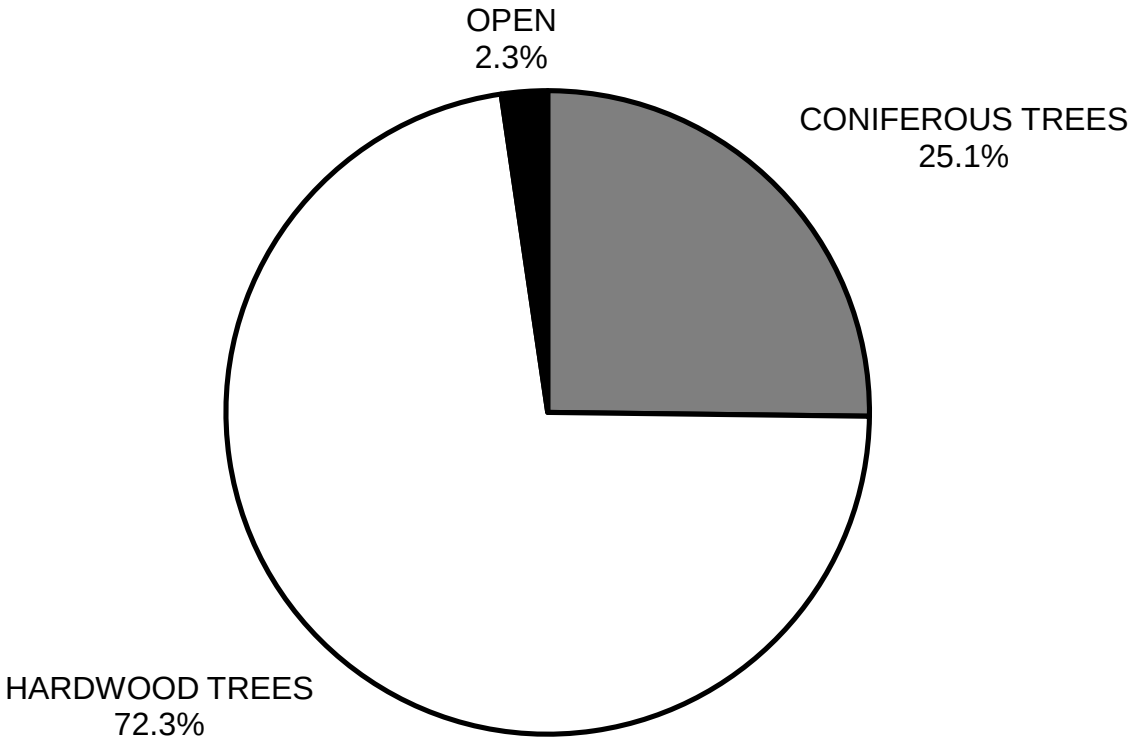
GRAPH 7

WEST FORK SPROUL CREEK 2006
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



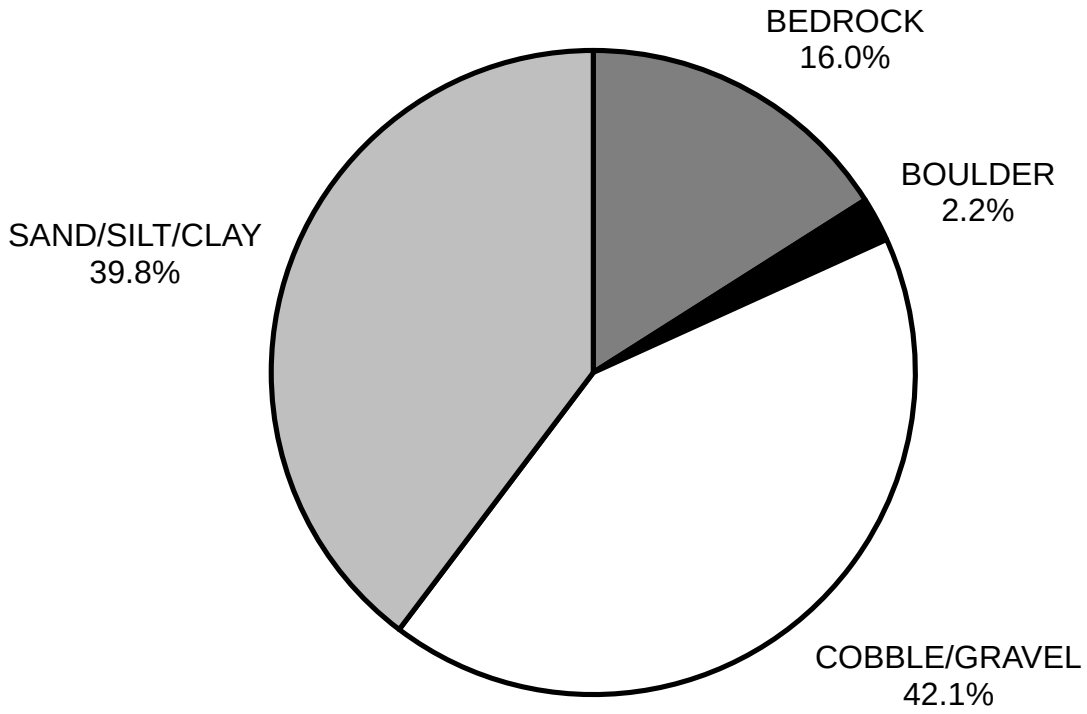
GRAPH 8

WEST FORK SPROUL CREEK 2006
MEAN PERCENT CANOPY



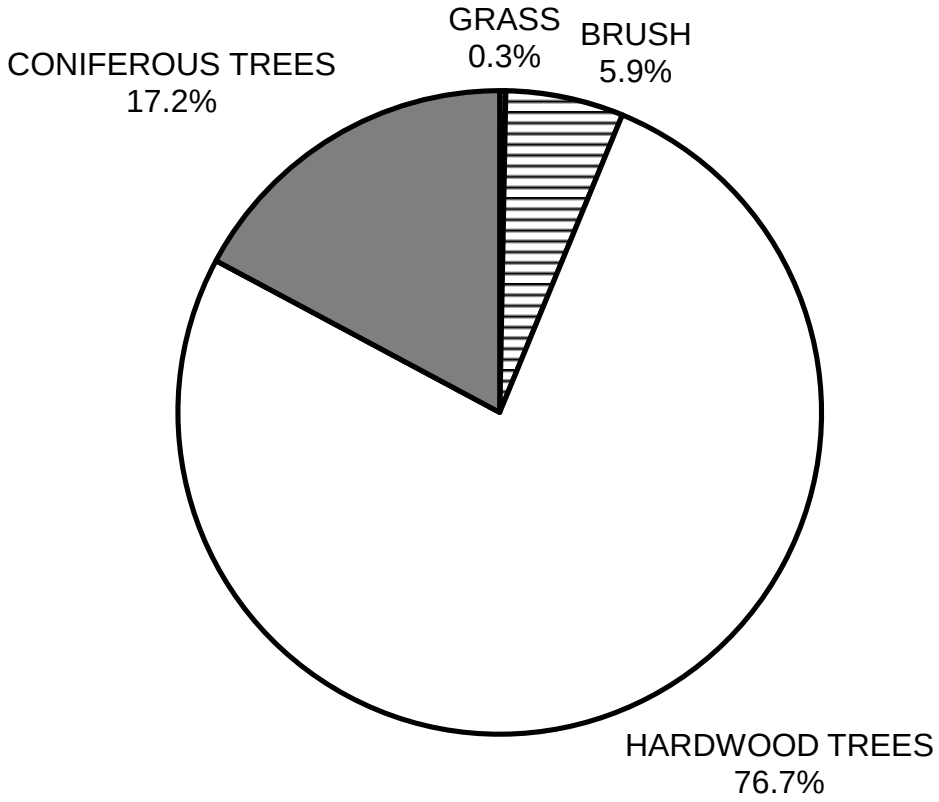
GRAPH 9

WEST FORK SPROUL CREEK 2006
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

WEST FORK SPROUL CREEK 2006
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11