

STREAM INVENTORY REPORT

South Fork Juan Creek

INTRODUCTION

A stream inventory was conducted July 9 to July 21, 2009 on South Fork Juan Creek. The survey began at the confluence with Juan Creek and extended upstream 1.4 miles.

The South Fork Juan 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 South Fork Juan 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 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

South Fork Juan Creek is a tributary to Juan Creek, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). South Fork Juan Creek's legal description at the confluence with Juan Creek is T22N R17W S34. Its location is 39.71135 degrees north latitude and 123.74398 degrees west longitude, LLID number 1237428397115. South Fork Juan Creek is a second order stream and has approximately 0.77 miles of blue line stream according to the USGS Lincoln Ridge 7.5 minute quadrangle. South Fork Juan Creek drains a watershed of approximately 2.2 square miles. Elevations range from about 430 feet at the mouth of the creek to 1,800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 1 approximately 21 miles north of Fort Bragg.

METHODS

The habitat inventory conducted in South Fork Juan Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries (PSMFC) Fisheries Technician and Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

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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 South Fork Juan 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". South Fork Juan 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

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

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In South Fork Juan Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In South Fork Juan 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 South Fork Juan Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were

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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 South Fork Juan Creek. In addition, underwater observations were made at ten sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

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

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- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for South Fork Juan 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 July 9 to July 21, 2009, was conducted by N. Bankston, J. Green (WSP), and W. Holloway (PSMFC). The total length of the stream surveyed was 7,556 feet with an additional 169 feet of side channel.

Stream flow was estimated to be 2.33 cfs during the survey period.

South Fork Juan Creek is a G3 channel type for 7,725 feet of the stream surveyed (Reach 1). G3 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 57 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 46% pool units, 41% riffle units, and 10% flatwater units (Graph 1). Based on total length of Level II habitat types there were 54% riffle units, 25% pool units, and 14% flatwater units (Graph 2).

Fourteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 32%; mid-channel pool units, 28%; high gradient riffle units, 9%; and plunge pool units 9% (Graph 3). Based on percent total length, low gradient riffle units made up 43%, mid-channel pool units 15%, and step run units 12%.

A total of 96 pools were identified (Table 3). Main channel pools were the most frequently

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encountered at 66% (Graph 4), and comprised 71% 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. Thirteen of the 96 pools (14%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 96 pool tail-outs measured, 4 had a value of 1 (4.2%); 35 had a value of 2 (36.5%); 28 had a value of 3 (29.2%); 4 had a value of 4 (4.2%); 25 had a value of 5 (26%) (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 8, flatwater habitat types had a mean shelter rating of 12, and pool habitats had a mean shelter rating of 43 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 47. Main channel pools had a mean shelter rating of 43 and backwater pools had a mean shelter rating of 34 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in South Fork Juan Creek. Graph 7 describes the pool cover in South Fork Juan Creek. Boulders are the dominant pool cover type followed by large woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel the dominant substrate observed in 34% of the pool tail-outs. Boulders were the next most frequently observed dominant substrate type and occurred in observed in 23% of the pool tail-outs.

The mean percent canopy density for the surveyed length of South Fork Juan Creek was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 62% and 38%, respectively. Graph 9 describes the mean percent canopy in South Fork Juan Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 69%. The mean percent left bank vegetated was 72%. The dominant elements composing the structure of the stream banks consisted of 68% sand/silt/clay, 22% cobble/gravel, 7% boulder, and 3% bedrock (Graph 10). Brush was the dominant vegetation type observed in 41% of the units surveyed. Additionally, 28% of the units surveyed had coniferous trees as the dominant vegetation type, and 27% had deciduous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 10 sites for species composition and distribution in South Fork Juan Creek on July 20, 2010. The sites were sampled by I. Mikus (DFG) and M. Groff (WSP).

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In reach 1, which comprised the first 7,556 feet of stream, 10 sites were sampled. The reach sites yielded 20 young-of-the-year steelhead/rainbow trout (SH/RT), and one age 1+ SH/RT.

The following chart displays the information yielded from these sites:

2010 South Fork Juan 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: F2 Channel Type									
07/20/10	1	003	4.2	67	2	0	0	0	0
	2	047	4.2	1,438	1	1	0	0	0
	3	051	4.2	1,494	1	0	0	0	0
	4	068	4.2	2,421	2	0	0	0	0
	5	074	4.4	2,639	2	0	0	0	0
	6	090	4.2	3,177	6	0	0	0	0
	7	108	4.2	3,983	5	0	0	0	0
	8	114	4.4	4,383	1	0	0	0	0
	9	123	5.6	9,212	0	0	0	0	0
	10	125	4.2	4,670	0	0	0	0	0

DISCUSSION

South Fork Juan Creek is a G3 channel type for the entire 7,725 feet of the stream surveyed (Reach 1). The suitability of G3 channel types for fish habitat improvement structures is as follows: G3 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days July 9 to July 21, 2009, ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 57 to 72 degrees Fahrenheit. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 14% of the total length of this survey, riffles 54%, and pools 25%. Thirteen of the 96 (14%) 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

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increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Thirty-nine of the 96 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty-two of the pool tail-outs had embeddedness ratings of 3 or 4. Twenty-five 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 South Fork Juan Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Fifty-one of the 96 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Forty-five of the 96 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools is 43. The shelter rating in the flatwater habitats is 12. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in South Fork Juan Creek. Boulders are the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 98%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 69% and 72%, 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) South Fork Juan 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

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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 boulders. Adding high quality complexity with woody cover in the pools is desirable.
- 5) 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.
- 6) 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.
- 7) Suitable size spawning substrate on South Fork Juan Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.
- 8) There are several log debris accumulations present on South Fork Juan Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comment:
0	0001.00	Start of survey at confluence with North Fork Juan Creek and mainstem Juan Creek. The survey consists of one reach; the channel is a G3.
145	0008.00	Log debris accumulation (LDA) #01 contains six pieces of large woody debris (LWD) and measures 9' high x 22' wide x 26' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to small cobble and measures 18' wide x 27' long x 3' deep. It is a possible barrier to juvenile and adult salmonids because LWD is blocking fish passage.

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1101	0039.00	LDA #02 contains more than 15 pieces of LWD and measures 12' high x 60' wide x 85' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to small cobble and measures 20' wide x 27' long x 3' deep. It is not a possible barrier to juvenile and adult salmonids. A left bank failure measures 40' wide x 100' high.
1420	0050.00	Tributary #01 enters on the left bank. It contributes two percent to the flow of South Fork Juan Creek. The temperature downstream of the tributary is 51 degrees Fahrenheit, the temperature of the tributary is 56 degrees Fahrenheit, and the temperature upstream of the confluence is 57 degrees Fahrenheit. The tributary is accessible to salmonids, but no fish were observed. The gradient becomes very steep approximately 30' upstream from the mouth.
1670	0056.00	Several trees have fallen into the creek. Small woody debris (SWD) is accumulating in the channel.
2005	0063.00	LDA #03 contains seven pieces of LWD and measures 9' high x 20' wide x 30' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to large cobble and measures 15' wide x 20' long x 1' deep. It is a possible barrier to juvenile and adult salmonids because sediment and SWD block fish passage.
2331	0069.00	Tributary #02 enters on the left bank. The tributary is shallow and there are no residual pools. It contributes 2% to the flow of South Fork Hardy Creek. The temperature downstream of the tributary is 56 degrees Fahrenheit, the temperature of the tributary is 54 degrees Fahrenheit, and the temperature upstream of the confluence is 56 degrees Fahrenheit. The tributary is accessible to fish, but no fish were observed. The gradient increases approximately 50' upstream from the mouth.
2894	0087.00	Large SWD accumulation.
3087	0091.00	Tributary #03 enters on the right bank. It contributes 10% to the flow of South Fork Juan Creek. The temperature downstream of the tributary is 56 degrees Fahrenheit, the temperature of the tributary is 57 degrees Fahrenheit, and the temperature upstream of the confluence is 57 degrees Fahrenheit. The tributary is accessible to salmonids, but no fish were observed.
3156	0094.00	There is a large old metal structure on the right bank.
3333	0098.00	There is fire damage along the upper right bank.
3870	0108.00	LDA #04 contains 20 pieces of LWD and measures 11' high x 40' wide x 35' long. Water flows through the LDA and there are no visible gaps in

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		it. Retained sediment ranges from silt to sand and measures 15' wide x 20' long x 1.5' deep. It is a possible barrier to juvenile and adult salmonids because fine sediment has filled in the gaps between logs.
4251	0114.00	LDA #05 contains 25 pieces of LWD and measures 17' high x 40' wide x 45' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 25' wide x 20' long x 3' deep. It is a possible barrier to juvenile and adult salmonids because of a 6' high plunge over the LDA.
4329	0117.00	There are right bank and left bank failures. There is fire damage on both sides of the creek.
4516	0124.00	Left bank failure.
4580	0126.00	Tributary #04 enters on the left bank. It contributes 10 percent to the flow of South Fork Juan Creek. The temperature downstream of the tributary is 55 degrees Fahrenheit, the temperature of the tributary is 51 degrees Fahrenheit, and the temperature upstream of the confluence is 57 degrees Fahrenheit. The tributary is accessible to salmonids during higher flows. No fish were observed.
4678	0127.00	Left bank failure.
4891	0130.00	Left bank failure.
4957	0131.00	Left bank failure.
5190	0139.00	Right bank failure.
5267	0141.00	A 5' high plunge onto boulders is a possible barrier to salmonids.
5513	0152.00	LDA #06 contains five pieces of LWD and measures 5.5' high x 16' wide x 12' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to small cobble and measures 5' wide x 11' long x 3' deep. It is not a possible barrier to juvenile and adult salmonids. Fish are not seen above the LDA.
5543	0154.00	The channel is very entrenched. The left bank is failing.
5856	0166.00	LDA #07 contains eight pieces of LWD and measures 6.5' high x 40' wide x 40' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to small cobble and measures 8' wide x 50' long x 3' deep. It is not a possible barrier to juvenile and adult salmonids.

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5964	0169.00	LDA #08 contains 12 pieces of LWD and measures 11' high x 14' wide x 60' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to small cobble and measures 6' wide x 12' long x 1.5' deep. It is not a possible barrier to juvenile and adult salmonids.
6303	0182.00	Tributary #05 enters on the left bank. The temperature downstream of the tributary is 57 degrees Fahrenheit, the temperature of the tributary is 57 degrees Fahrenheit, and the temperature upstream of the confluence is 58 degrees Fahrenheit. The tributary is accessible to salmonids, but no fish were observed.
6351	0183.00	LDA #09 contains 11 pieces of LWD and measures 25' high x 25' wide x 45' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to small cobble and measures 10' wide x 60' long x 2.5' deep. It is a possible barrier to juvenile and adult salmonids because old growth logs are blocking fish passage.
6565	0187.00	Left bank failure.
6872	0192.00	There are fire damaged logs in the creek.
6958	0195.00	LDA #10 contains 35 pieces of LWD and measures 10' high x 20' wide x 110' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to small cobble and measures 15' wide x 20' long x 2' deep. It is a possible barrier to juvenile and adult salmonids because there is a 6.5' high plunge over the LDA.
7556	0207.00	End of survey.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

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

Stream Name: South Fork Juan Creek

LLID: 1237428397115 Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Confluence Location: Quad: LINCOLN RIDGE Legal Description: T22NR17WS34 Latitude: 39:42:41.0N Longitude: 123:44:34.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
4	0	DRY	1.9	94	374	4.8									
20	3	FLATWATER	9.5	54	1073	13.9	7.3	0.7	1.0	395	7901	307	6144		12
3	0	NOSURVEY	1.4	60	180	2.3									
96	96	POOL	45.7	20	1908	24.7	10.7	0.8	1.4	200	19209	227	21760	159	43
87	12	RIFFLE	41.4	48	4190	54.2	7.3	0.5	0.8	202	17532	94	8139		8
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
210	111				7725					44641			36044		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: South Fork Juan Creek

LLID: 1237428397115 Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Confluence Location: Quad: LINCOLN RIDGE Legal Description: T22NR17WS34 Latitude: 39:42:41.0N Longitude: 123:44:34.0W

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 (%)
67	8	LGR	31.9	49	3289	42.6	7	0.4	1	199	13318	71	4757		7	98
19	3	HGR	9.0	46	869	11.2	7	0.7	1.4	167	3177	120	2272		12	97
1	1	CAS	0.5	32	32	0.4	12	0.6	1	326	326	196	196		10	97
6	1	RUN	2.9	23	139	1.8	5	0.6	0.9	133	798	80	479		5	99
14	2	SRN	6.7	67	934	12.1	8	0.8	1.4	526	7365	421	5893		15	97
58	58	MCP	27.6	20	1153	14.9	11	0.7	2.9	200	11585	213	12380	149	41	98
5	5	STP	2.4	40	200	2.6	9	0.5	2.4	293	1463	277	1383	125	66	96
4	4	LSL	1.9	20	81	1.0	13	0.5	1.3	244	977	218	872	123	33	94
1	1	LSBk	0.5	12	12	0.2	7	0.6	0.9	80	80	64	64	48	5	94
4	4	LSBo	1.9	23	93	1.2	12	0.6	1.9	238	953	211	845	127	19	99
19	19	PLP	9.0	16	299	3.9	12	1.0	3.7	185	3509	294	5590	237	58	98
1	1	BPB	0.5	12	12	0.2	6	0.8	1.3	72	72	72	72	58	5	93
4	4	DPL	1.9	14	58	0.8	10	0.6	1.8	143	570	139	555	87	41	96
4	0	DRY	1.9	94	374	4.8										
3	0	NS	1.4	60	180	2.3										99

Total Units Fully Measured
210 111

Total Length (ft.)
7725

Total Area (sq.ft.)
44192

Total Volume (cu.ft.)
35357

Table 3 - Summary of Pool Types

Stream Name: South Fork Juan Creek

LLID: 1237428397115

Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T22NR17WS34

Latitude: 39:42:41.0N

Longitude: 123:44:34.0W

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
63	63	MAIN	66	21	1353	71	10.5	0.7	207	13048	147	9271	43
28	28	SCOUR	29	17	485	25	11.5	0.9	197	5519	198	5549	47
5	5	BACKWATER	5	14	70	4	8.8	0.6	128	642	81	404	34
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
96	96				1908					19209		15224	

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

Stream Name: South Fork Juan Creek

LLID: 1237428397115

Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T22NR17WS34

Latitude: 39:42:41.0N

Longitude: 123:44:34.0W

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
58	MCP	60	11	19	39	67	8	14	0	0	0	0
5	STP	5	1	20	3	60	1	20	0	0	0	0
4	LSL	4	2	50	2	50	0	0	0	0	0	0
1	LSBk	1	1	100	0	0	0	0	0	0	0	0
4	LSBo	4	1	25	3	75	0	0	0	0	0	0
19	PLP	20	2	11	13	68	1	5	3	16	0	0
1	BPB	1	0	0	1	100	0	0	0	0	0	0
4	DPL	4	2	50	2	50	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
96			20	21	63	66	10	10	3	3	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: South Fork Juan Creek

LLID: 1237428397115

Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Dry Units: 4

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T22NR17WS34

Latitude: 39:42:41.0N

Longitude: 123:44:34.0W

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
67	8	LGR	0	1	24	0	7	0	26	41	0
19	3	HGR	0	0	0	0	0	0	33	67	0
1	1	CAS	0	0	0	0	0	0	100	0	0
87	12	TOTAL RIFFLE	0	0	15	0	5	0	35	45	0
6	1	RUN	0	10	0	0	0	0	0	0	90
14	2	SRN	0	25	50	0	0	0	0	25	0
20	3	TOTAL FLAT	0	20	33	0	0	0	0	17	30
58	58	MCP	1	16	37	2	1	0	6	34	3
5	5	STP	1	5	20	0	0	0	26	48	0
4	4	LSL	5	24	54	0	5	0	0	13	0
1	1	LSBk	0	0	0	0	0	0	0	0	100
4	4	LSBo	10	4	11	0	0	0	0	75	0
19	19	PLP	1	4	32	0	3	1	30	31	0
1	1	BPB	0	0	0	0	0	0	0	30	70
4	4	DPL	0	38	20	0	0	0	0	43	0
96	96	TOTAL POOL	2	14	33	1	1	0	11	35	4
3	0	NS									
210	111	TOTAL	1	12	31	1	2	0	13	35	4

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: South Fork Juan Creek

LLID: 1237428397115

Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Dry Units: 4

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T22NR17WS34

Latitude: 39:42:41.0N

Longitude: 123:44:34.0W

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
67	8	LGR	0	0	0	50	25	25	0
19	3	HGR	0	0	33	33	0	33	0
1	1	CAS	0	0	0	0	0	0	100
6	1	RUN	0	0	100	0	0	0	0
14	2	SRN	0	0	50	50	0	0	0
58	58	MCP	5	33	41	7	9	5	0
5	5	STP	0	0	60	20	0	20	0
4	4	LSL	0	50	25	25	0	0	0
1	1	LSBk	0	0	100	0	0	0	0
4	4	LSBo	0	25	50	25	0	0	0
19	19	PLP	0	21	37	0	21	21	0
1	1	BPB	100	0	0	0	0	0	0
4	4	DPL	25	75	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: South Fork Juan Creek

LLID: 1237428397115 Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Confluence Location: Quad: LINCOLN RIDGE Legal Description: T22NR17WS34 Latitude: 39:42:41.0N Longitude: 123:44:34.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
98	38	62	0	69	72

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 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: South Fork Juan Creek

LLID: 1237428397115

Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Confluence Location: Quad: LINCOLN RIDGE

Legal Description: T22NR17WS34

Latitude: 39:42:41.0N

Longitude: 123:44:34.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	4	3	3.2
Boulder	6	9	6.8
Cobble / Gravel	24	24	21.6
Sand / Silt / Clay	77	75	68.5

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	6	3	4.1
Brush	42	48	40.5
Hardwood Trees	27	33	27.0
Coniferous Trees	35	27	27.9
No Vegetation	1	0	0.5

Total Stream Cobble Embeddedness Values: 3

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

StreamName: South Fork Juan Creek

LLID: 1237428397115

Drainage: Rockport

Survey Dates: 7/9/2009 to 7/21/2009

Confluence Location: Quad: LINCOLN RIDGE

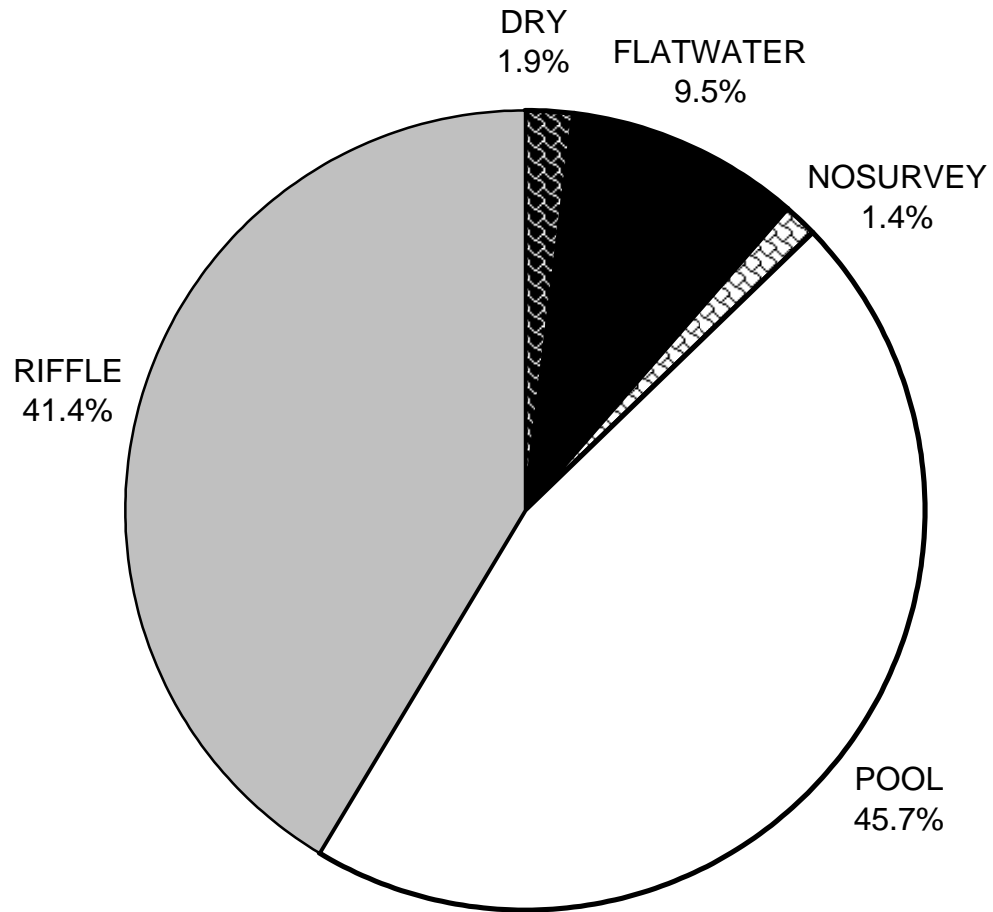
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Latitude: 39:42:41.0N

Longitude: 123:44:34.0W

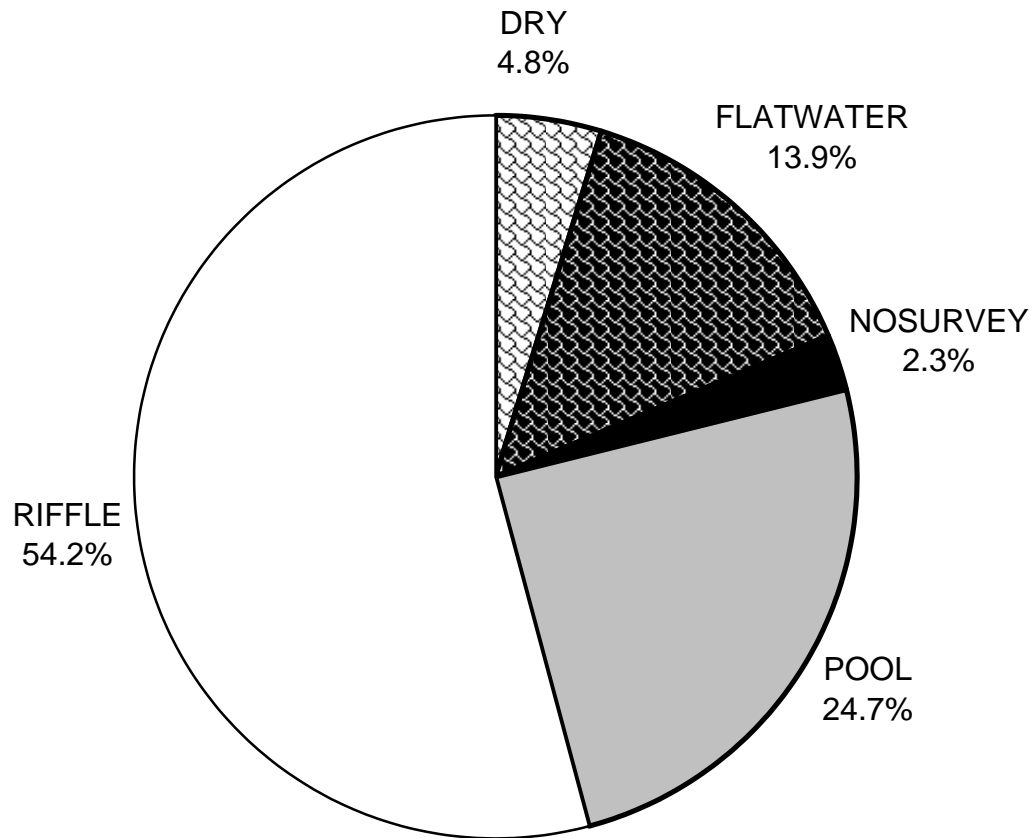
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	2
SMALL WOODY DEBRIS (%)	0	20	14
LARGE WOODY DEBRIS (%)	15	33	33
ROOT MASS (%)	0	0	1
TERRESTRIAL VEGETATION (%)	5	0	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	35	0	11
BOULDERS (%)	45	17	35
BEDROCK LEDGES (%)	0	30	4

SOUTH FORK JUAN CREEK 2009 HABITAT TYPES BY PERCENT OCCURRENCE



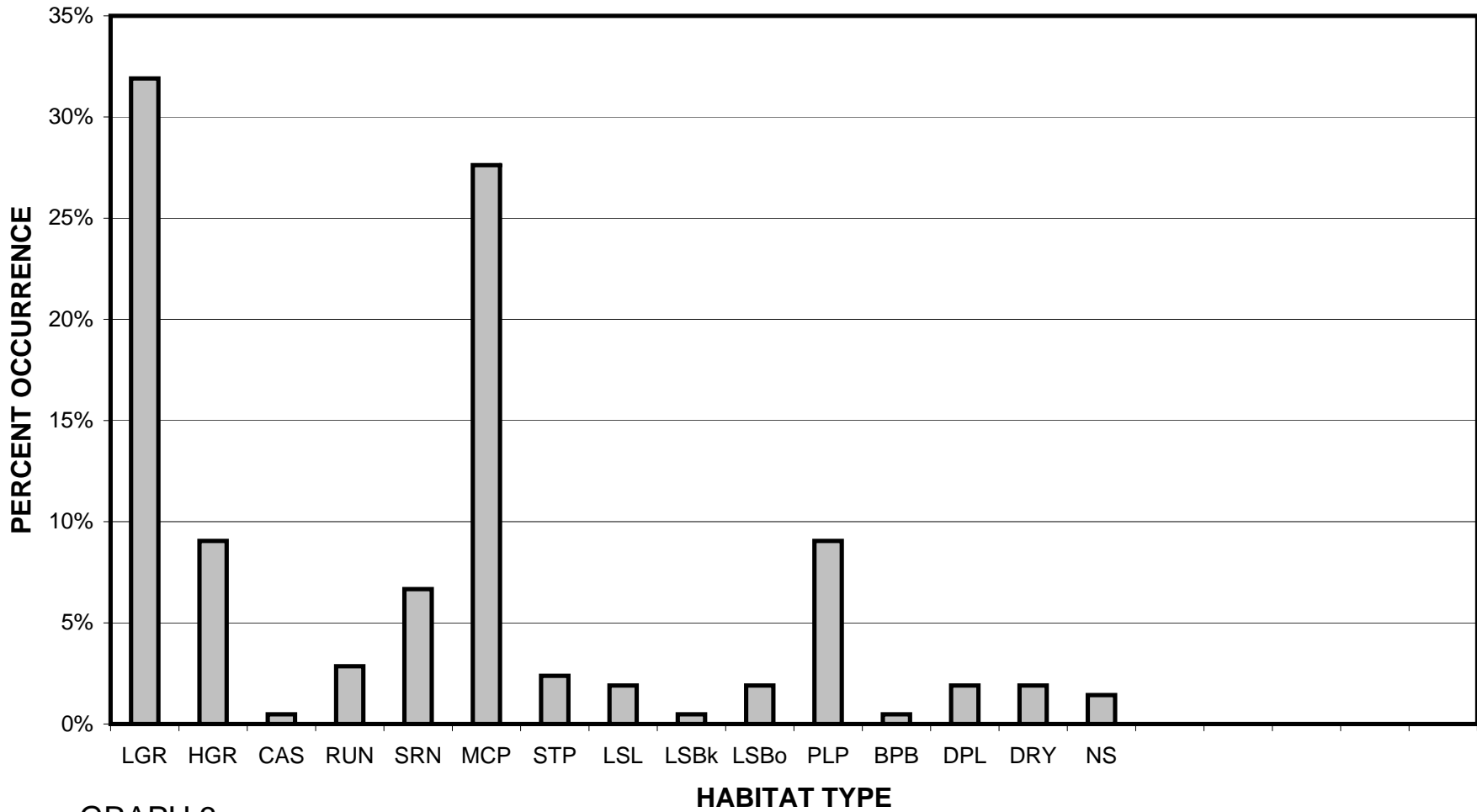
GRAPH 1

SOUTH FORK JUAN CREEK 2009 HABITAT TYPES BY PERCENT TOTAL LENGTH



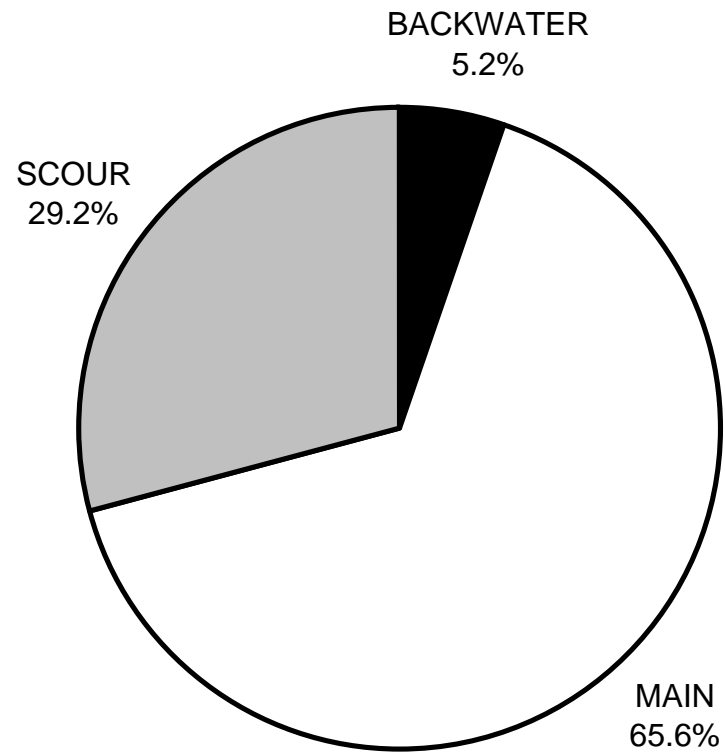
GRAPH 2

SOUTH FORK JUAN CREEK 2009 HABITAT TYPES BY PERCENT OCCURRENCE



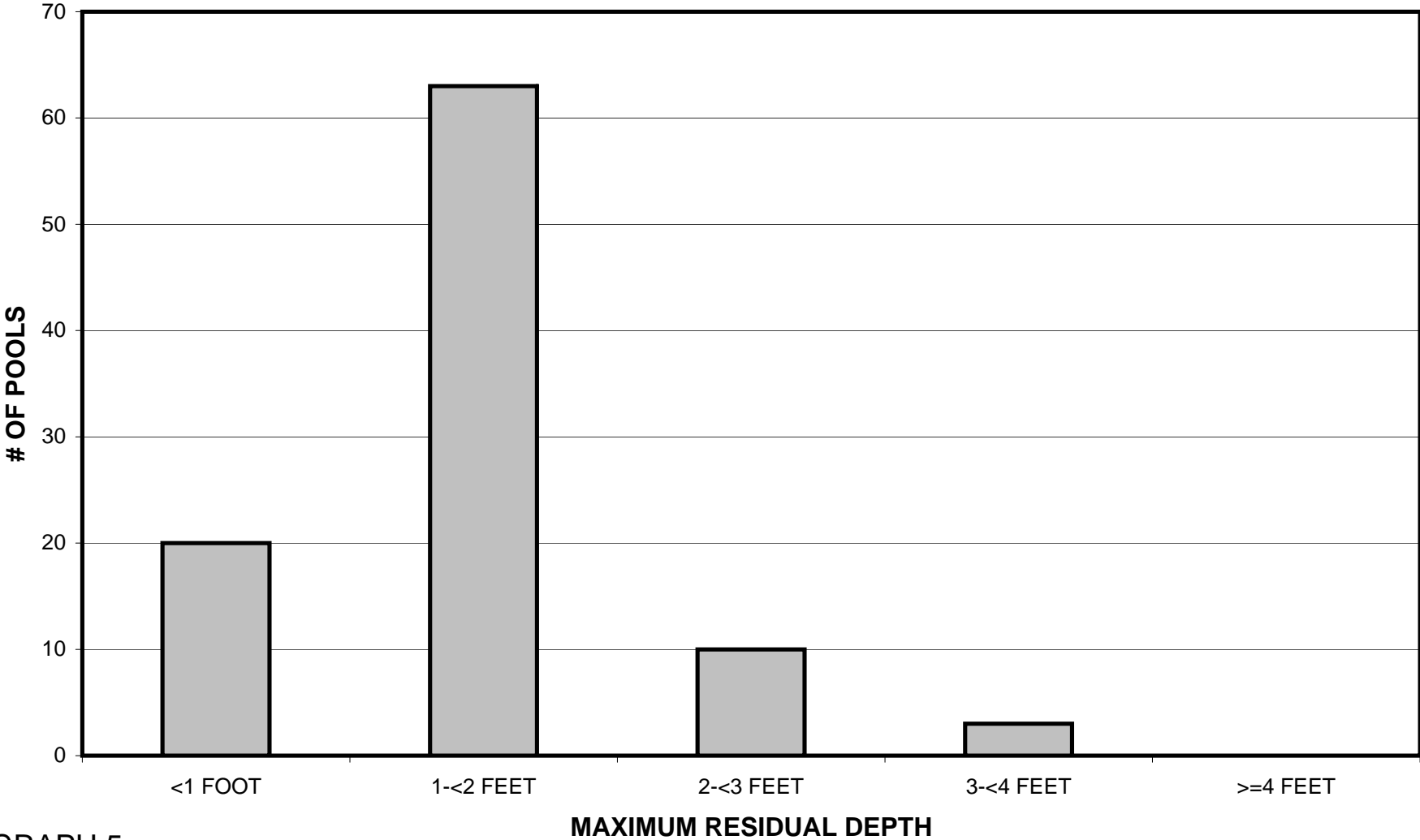
GRAPH 3

SOUTH FORK JUAN CREEK 2009 POOL TYPES BY PERCENT OCCURRENCE



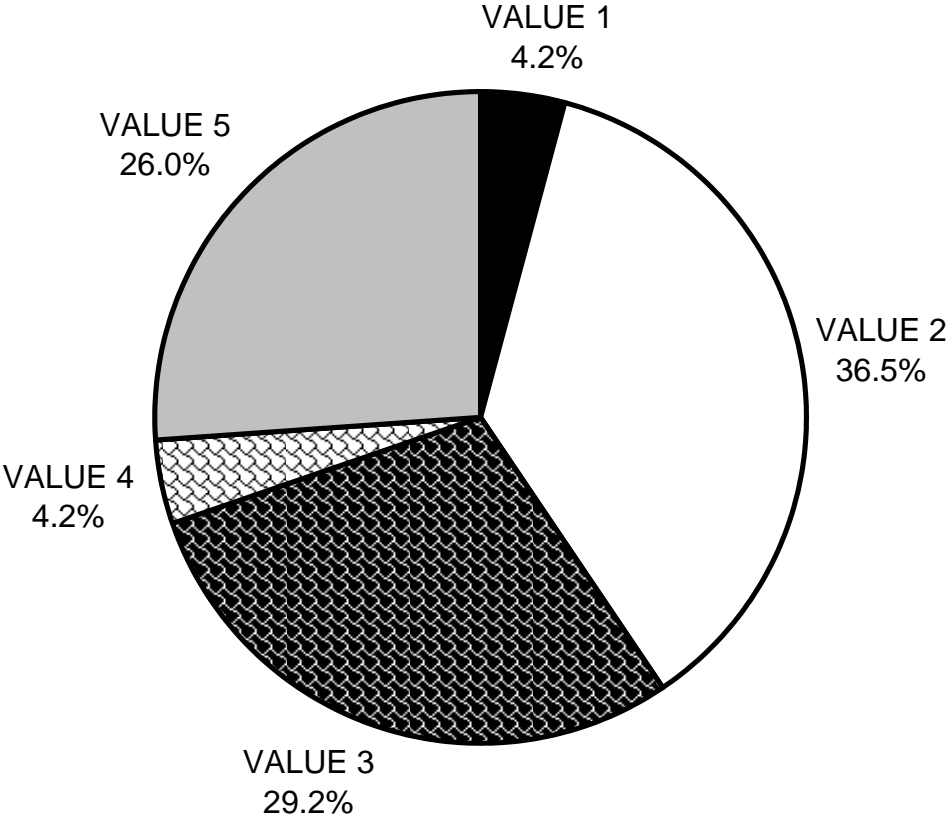
GRAPH 4

SOUTH FORK JUAN CREEK 2009 MAXIMUM DEPTH IN POOLS



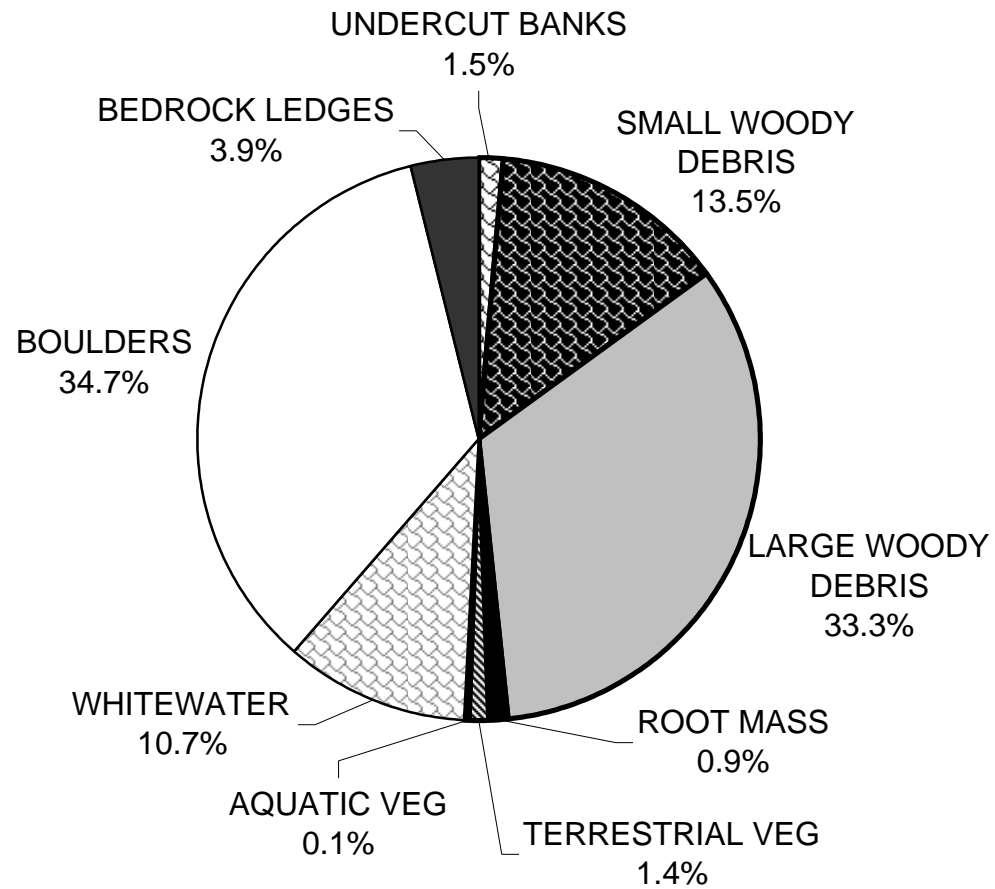
GRAPH 5

SOUTH FORK JUAN CREEK 2009 PERCENT EMBEDDEDNESS



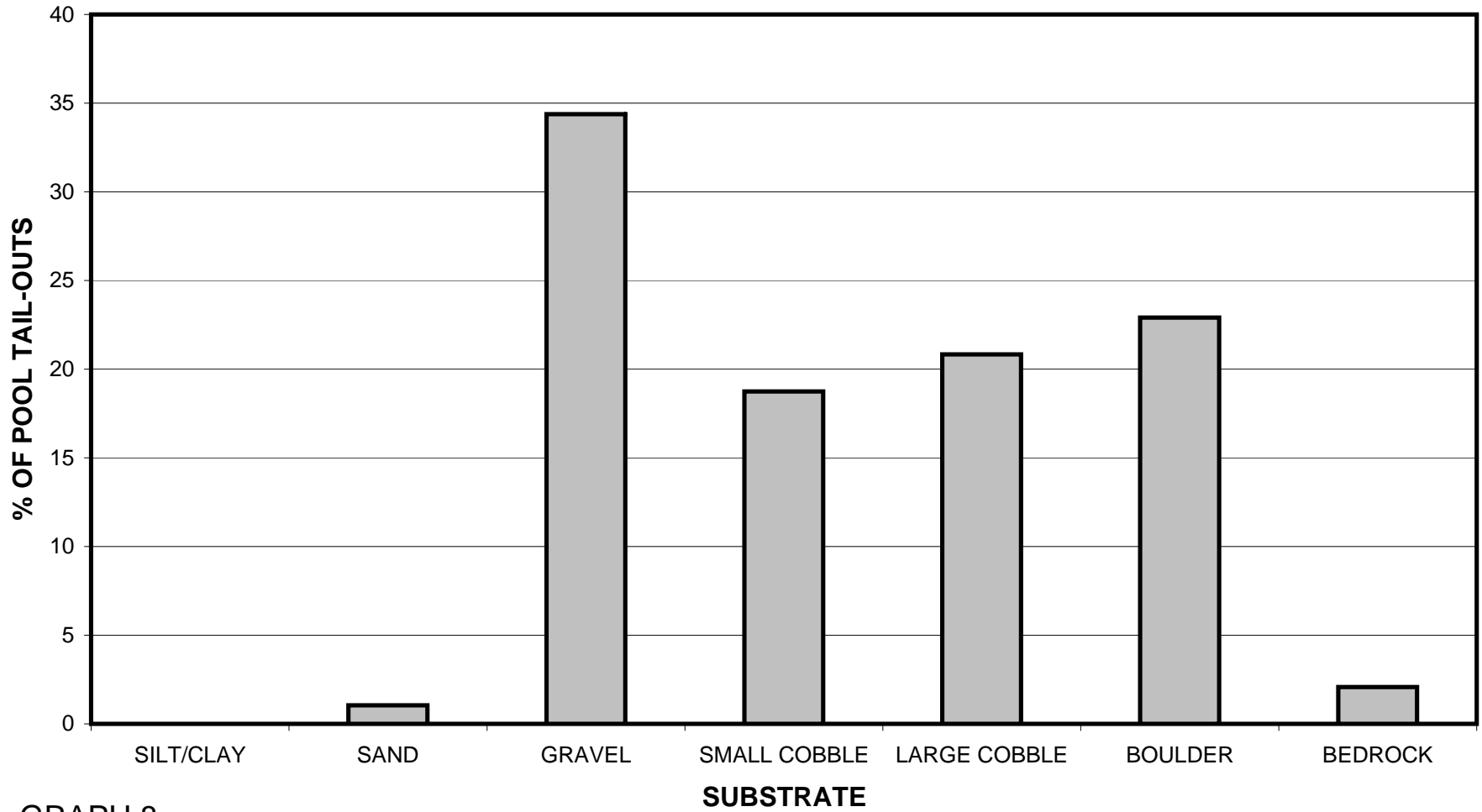
GRAPH 6

SOUTH FORK JUAN CREEK 2009 MEAN PERCENT COVER TYPES IN POOLS



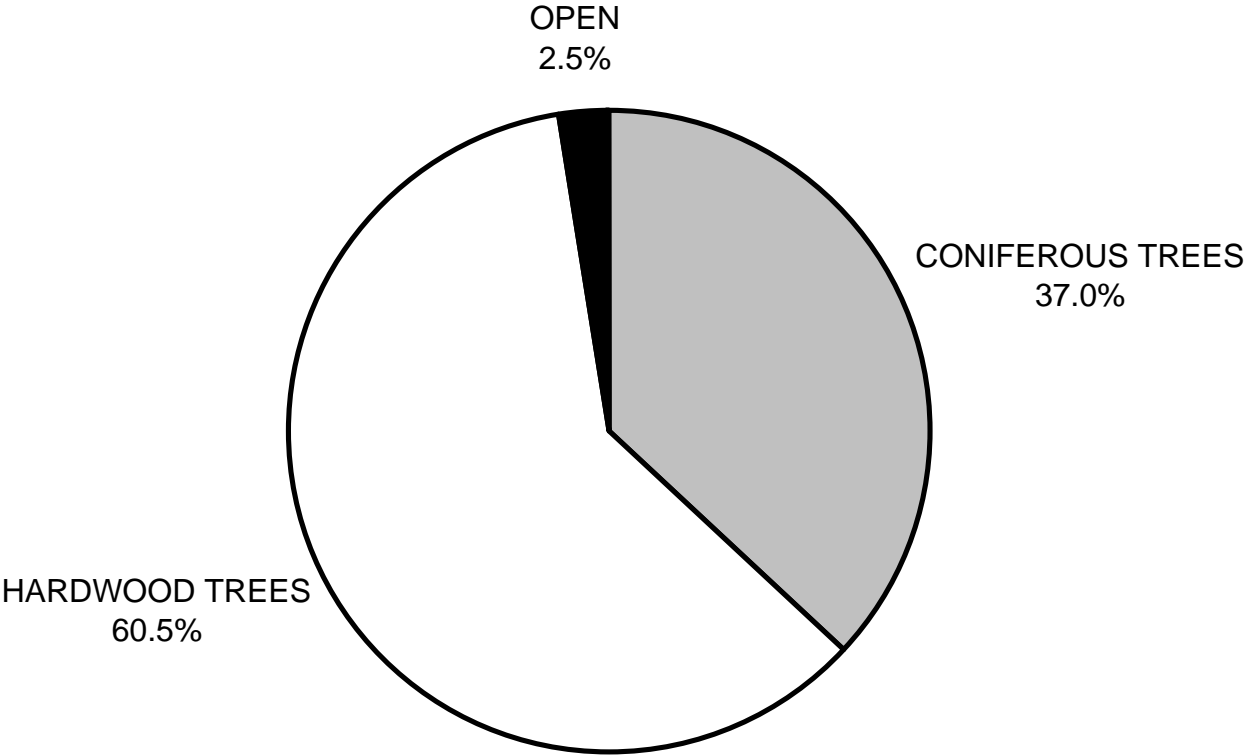
GRAPH 7

SOUTH FORK JUAN CREEK 2009 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



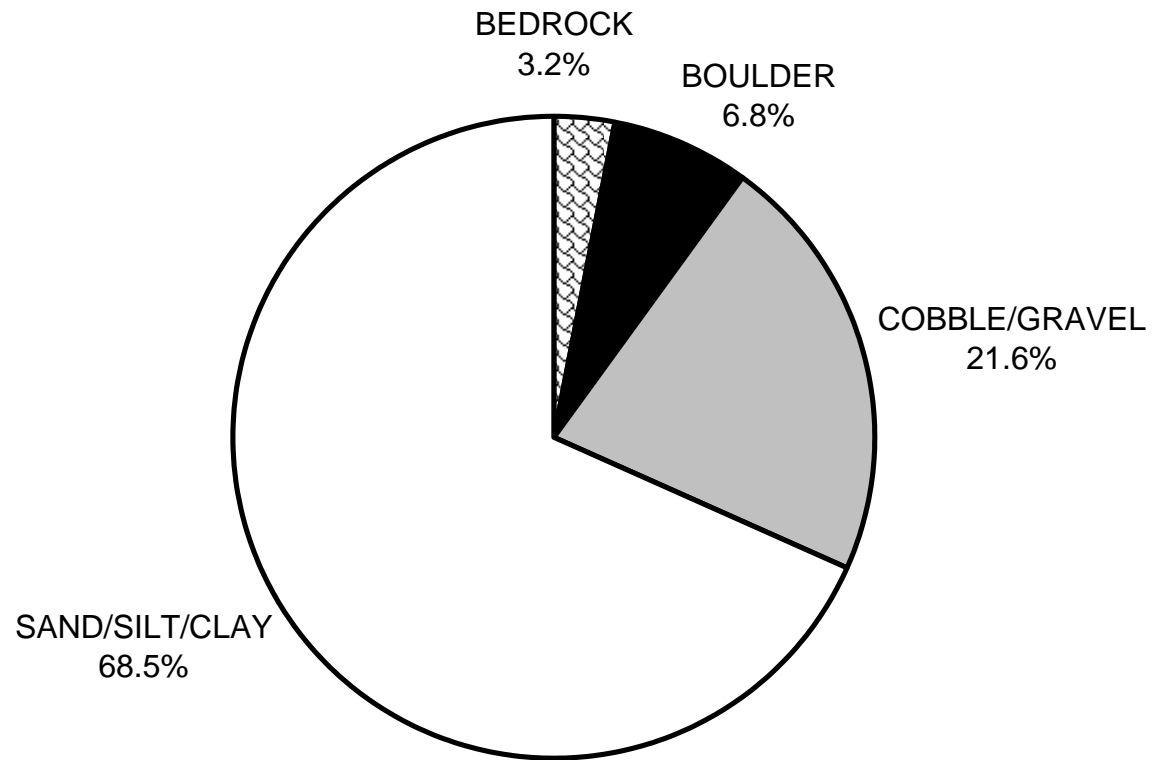
GRAPH 8

**SOUTH FORK JUAN CREEK 2009
MEAN PERCENT CANOPY**



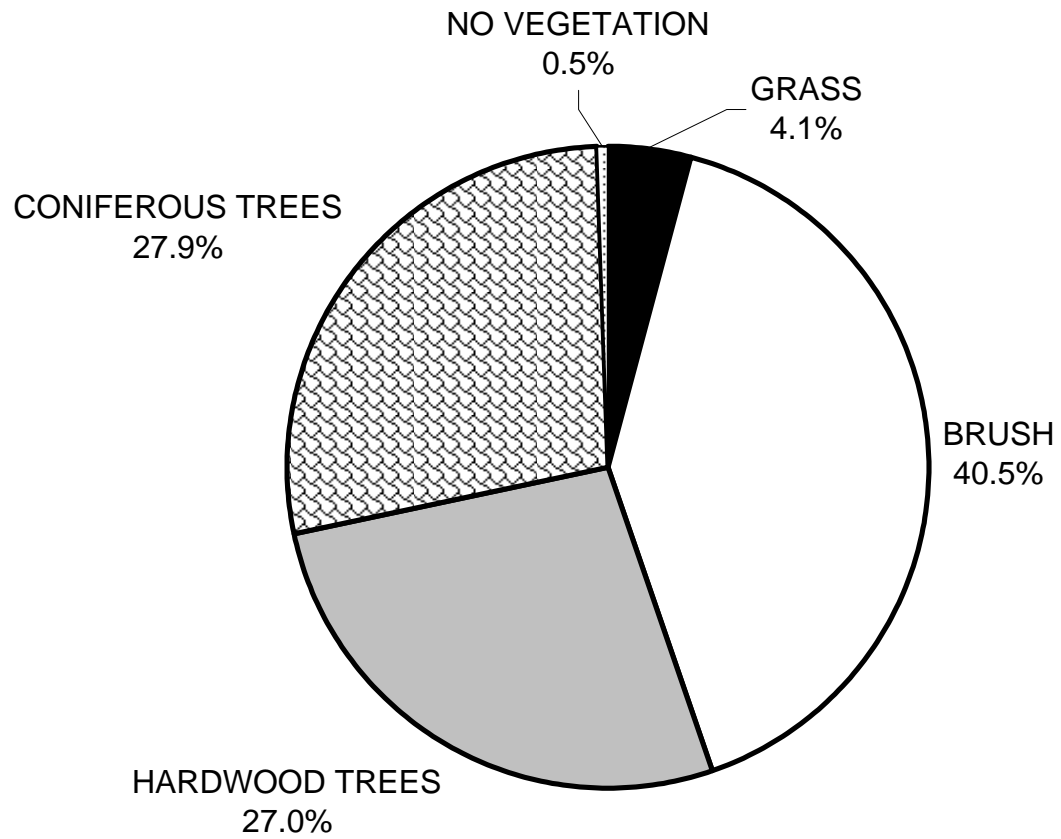
GRAPH 9

**SOUTH FORK JUAN CREEK 2009
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

SOUTH FORK JUAN CREEK 2009 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

