

STREAM INVENTORY REPORT

North Fork Juan Creek

INTRODUCTION

A stream inventory was conducted on July 29, 2009 on North Fork Juan Creek. The survey began at the confluence with Juan Creek and extended upstream 0.5 miles.

The North 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 North 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

North Fork Juan Creek is a tributary to Juan Creek, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). North Fork Juan Creek's legal description at the confluence with Juan Creek is T22N R17W S34. Its location is 39.71134 degrees north latitude and 123.74398 degrees west longitude, LLID number 1237428397114. North Fork Juan Creek is a first order stream and has approximately 0.44 miles of blue line stream according to the USGS Lincoln Ridge 7.5 minute quadrangle. North Fork Juan Creek drains a watershed of approximately 0.96 square miles. Elevations range from about 430 feet at the mouth of the creek to 1600 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 North Fork Juan Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The 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 North 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". North Fork Juan Creek

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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 North 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 North 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 North 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

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usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In North 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 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 North 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

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- 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 North 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 29, 2009, was conducted by N. Bankston and J. Green (WSP). The total length of the stream surveyed was 2,581 feet with an additional 77 feet of side channel.

Stream flow was estimated to be 1.17 cfs during the survey period.

North Fork Juan Creek is an A3 channel type for 2,658 feet of the stream surveyed (Reach 1). A3 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 58 degrees Fahrenheit. Air temperatures ranged from 60 to 65 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 51% pool units, 44% riffle units, 2% dry units, and 1% flatwater units (Graph 1). Based on total length of Level II habitat types there were 69% riffle units, 25% pool units, and 3% flatwater units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 44%; mid-channel pool units, 26%; and plunge pool units 19% (Graph 3). Based on percent total length, low gradient riffle units made up 69%,

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mid-channel pool units 13%, and plunge pool units 8%.

A total of 46 pools were identified (Table 3). Main channel pools were the most frequently encountered at 57% (Graph 4), and comprised 64% 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. Six of the 46 pools (13%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 46 pool tail-outs measured, 24 had a value of 2 (52.2%); 13 had a value of 3 (28.3%); 2 had a value of 4 (4.3%); 7 had a value of 5 (15.2%) (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 11, flatwater habitat types had a mean shelter rating of 10, and pool habitats had a mean shelter rating of 19 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 21. Main channel pools had a mean shelter rating of 18 and backwater pools had a mean shelter rating of 8 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in North Fork Juan Creek. Graph 7 describes the pool cover in North 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 was the dominant substrate observed in 46% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 22% of the pool tail-outs.

The mean percent canopy density for the surveyed length of North Fork Juan Creek was 95%. Five percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 57% and 43%, respectively. Graph 9 describes the mean percent canopy in North Fork Juan Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 92%. The mean percent left bank vegetated was 91%. The dominant elements composing the structure of the stream banks consisted of 63% cobble/gravel, 15% boulder, 15% sand/silt/clay, and 8% bedrock (Graph 10). Brush was the dominant vegetation type observed in 64.7% of the units surveyed. Additionally, 22.5% of the units surveyed had coniferous trees as the dominant vegetation type, and 11.8% had deciduous trees as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

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

In Reach 1, which comprised the first 2,581 feet of stream, 10 sites were sampled. The reach sites yielded no fish.

The following chart displays the information yielded from these sites:

2010 North 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: B4 Channel Type									
07/20/10	1	002	4.2	35	0	0	0	0	0
	2	005	5.6	74	0	0	0	0	0
	3	010	4.2	190	0	0	0	0	0
	4	014	4.2	352	0	0	0	0	0
	5	016	4.4	449	0	0	0	0	0
	6	018	4.2	590	0	0	0	0	0
	7	020	6.5	647	0	0	0	0	0
	8	022	5.6	726	0	0	0	0	0
	9	026	5.6	852	0	0	0	0	0
	10	028	5.6	908	0	0	0	0	0

DISCUSSION

North Fork Juan Creek is an A3 channel type for the entire 2,658 feet of the stream surveyed (Reach 1). The suitability of A3 channel types for fish habitat improvement structures is as follows: A3 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on July 29, 2009, ranged from 56 to 58 degrees Fahrenheit. Air temperatures ranged from 60 to 65 degrees Fahrenheit. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

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Flatwater habitat types comprised 3% of the total length of this survey, riffles 69%, and pools 25%. Six of the 46 (13%) pools had a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for 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.

Twenty-four of the 46 pool tail-outs measured had embeddedness ratings of 1 or 2. Fifteen of the pool tail-outs had embeddedness ratings of 3 or 4. Seven of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in North Fork Juan Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-one of the 46 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 19. The shelter rating in the flatwater habitats is 10. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in North 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 structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 95%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 92% and 91%, 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) North 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 meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

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- 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) There are several log debris accumulations present on North 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 #:	Comments:
0	0001.00	Start of survey at confluence with South Fork Juan Creek. The channel is an A3. No fish were observed in the reach.
570	0018.00	There is a 9' high debris jam with very small gaps.
635	0020.00	There is a 3' high jump over a log.
714	0022.00	There is a 2.5' high jump.
926	0030.00	There is a 4' high jump.
960	0032.00	There is a 2.5' high jump.
1077	0037.00	There is 5' high plunge over boulders.
1499	0049.00	There is a 4' high jump over debris.

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- | | | |
|------|---------|--|
| 1606 | 0050.00 | There is a 2' high jump. |
| 1800 | 0058.00 | There is a 3' high plunge. |
| 2330 | 0080.00 | Log debris accumulation (LDA) #01 contains 16 pieces of large woody debris (LWD) and measures 26' high x 22' wide x 55' long. Water does not flow through the LDA and there are visible gaps in it. Retained sediment ranges from gravel to boulders and measures 9' wide x 12' long x 8' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not seen above the LDA. |
| 2562 | 0088.00 | End of survey. There is a 4' high jump. |

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: North Fork Juan Creek

LLID: 1237428397114 Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

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
2	0	DRY	2.2	30	60	2.3									
1	1	FLATWATER	1.1	70	70	2.6	7.0	0.6	1.1	441	441	265	265		10
1	0	NOSURVEY	1.1	23	23	0.9									
46	46	POOL	51.1	14	665	25.0	9.2	0.9	1.4	123	5653	135	6210	114	19
40	4	RIFFLE	44.4	46	1840	69.2	6.0	0.4	0.8	254	10142	107	4271		11
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
90	51				2658					16235			10746		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: North Fork Juan Creek

LLID: 1237428397114 Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

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 (%)
40	4	LGR	44.4	46	1840	69.2	6	0.4	1.8	254	10142	107	4271		11	95
1	1	SRN	1.1	70	70	2.6	7	0.6	1.1	441	441	265	265		10	94
23	23	MCP	25.6	15	334	12.6	10	0.9	2.4	129	2964	143	3289	123	18	94
3	3	STP	3.3	31	94	3.5	7	0.7	1.8	190	569	177	531	145	17	96
1	1	LSBo	1.1	9	9	0.3	5	0.8	1.4	43	43	38	38	34	5	100
17	17	PLP	18.9	12	207	7.8	9	0.9	3.5	111	1892	124	2108	102	21	98
2	2	DPL	2.2	10	21	0.8	9	1.0	2	93	185	121	243	103	8	97
2	0	DRY	2.2	30	60	2.3										
1	0	NS	1.1	23	23	0.9										

Total Units Fully Measured
90 51

Total Length (ft.)
2658

Total Area (sq.ft.)
16235

Total Volume (cu.ft.)
10746

Table 3 - Summary of Pool Types

Stream Name: North Fork Juan Creek

LLID: 1237428397114

Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

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
26	26	MAIN	57	16	428	64	9.3	0.9	136	3532	125	3253	18
18	18	SCOUR	39	12	216	32	9.1	0.9	108	1935	98	1763	21
2	2	BACKWATER	4	11	21	3	9.0	1.0	93	185	103	205	8

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
46	46	665	5653	5222

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

Stream Name: North Fork Juan Creek

LLID: 1237428397114

Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

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
23	MCP	50	1	4	19	83	3	13	0	0	0	0
3	STP	7	1	33	2	67	0	0	0	0	0	0
1	LSBo	2	0	0	1	100	0	0	0	0	0	0
17	PLP	37	2	12	13	76	1	6	1	6	0	0
2	DPL	4	0	0	1	50	1	50	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
46	4	9	36	78	5	11	1	2	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: North Fork Juan Creek

LLID: 1237428397114

Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

Dry Units: 2

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
40	4	LGR	0	13	13	0	0	0	3	73	0
40	4	TOTAL RIFFLE	0	13	13	0	0	0	3	73	0
1	1	SRN	0	10	10	0	0	0	10	70	0
1	1	TOTAL FLAT	0	10	10	0	0	0	10	70	0
23	23	MCP	0	6	31	6	0	0	1	54	2
3	3	STP	0	7	23	3	0	0	7	53	7
1	1	LSBo	0	0	0	0	0	0	0	100	0
17	17	PLP	1	9	21	7	0	0	14	36	12
2	2	DPL	0	0	10	0	0	0	0	90	0
46	46	TOTAL POOL	0	7	25	6	0	0	6	50	6
1	0	NS									
90	51	TOTAL	0	7	24	5	0	0	6	52	5

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: North Fork Juan Creek

LLID: 1237428397114

Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

Dry Units: 2

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
40	4	LGR	0	0	25	25	50	0	0
1	1	SRN	0	0	0	0	100	0	0
23	23	MCP	4	13	48	9	4	22	0
3	3	STP	0	0	67	0	0	33	0
1	1	LSBo	0	0	100	0	0	0	0
17	17	PLP	0	6	24	0	29	29	12
2	2	DPL	0	0	50	0	0	50	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: North Fork Juan Creek

LLID: 1237428397114 Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

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
95	43	57	0	92	91

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: North Fork Juan Creek

LLID: 1237428397114 Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

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	0	8	7.8
Boulder	12	3	14.7
Cobble / Gravel	35	29	62.7
Sand / Silt / Clay	4	11	14.7

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	0	0	0.0
Brush	30	36	64.7
Hardwood Trees	6	6	11.8
Coniferous Trees	14	9	22.5
No Vegetation	1	0	1.0

Total Stream Cobble Embeddedness Values: 3

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

StreamName: North Fork Juan Creek

LLID: 1237428397114

Drainage: Rockport

Survey Dates: 7/29/2008 to 7/29/2008

Confluence Location: Quad: LINCOLN RIDGE

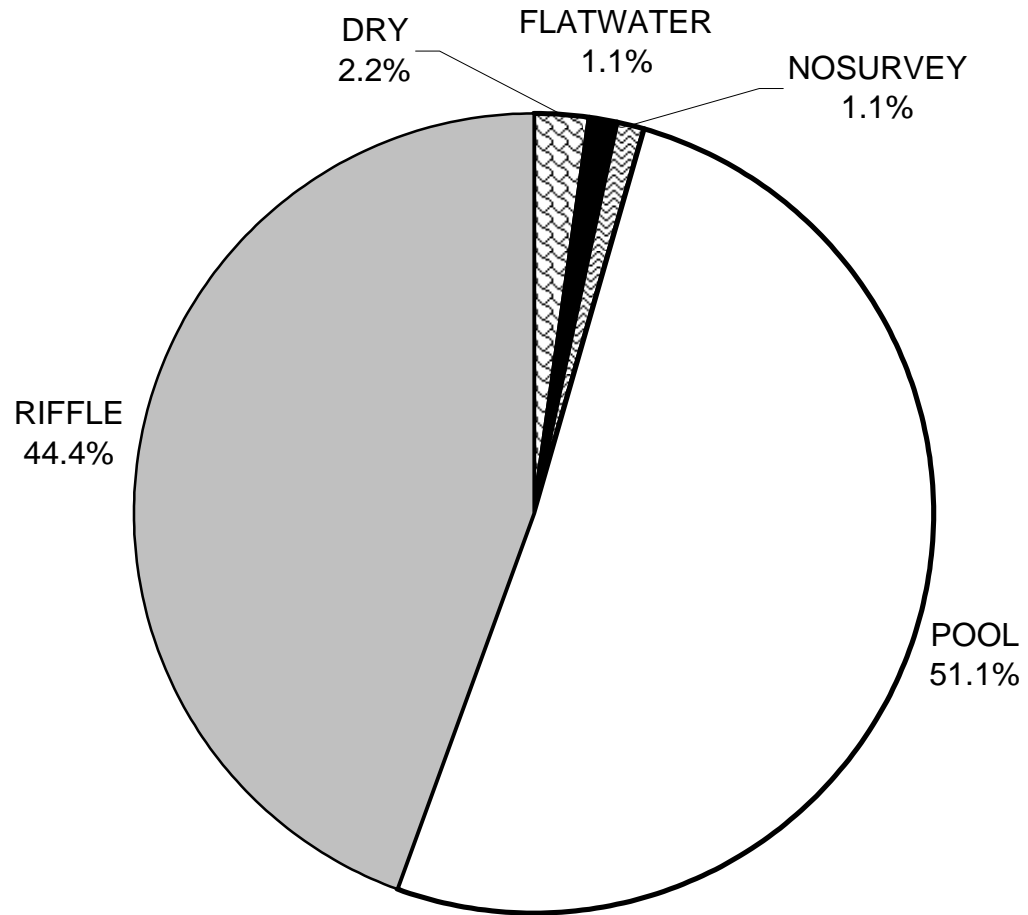
Legal Description: T22NR17WS34

Latitude: 39:42:41.0N

Longitude: 123:44:34.0W

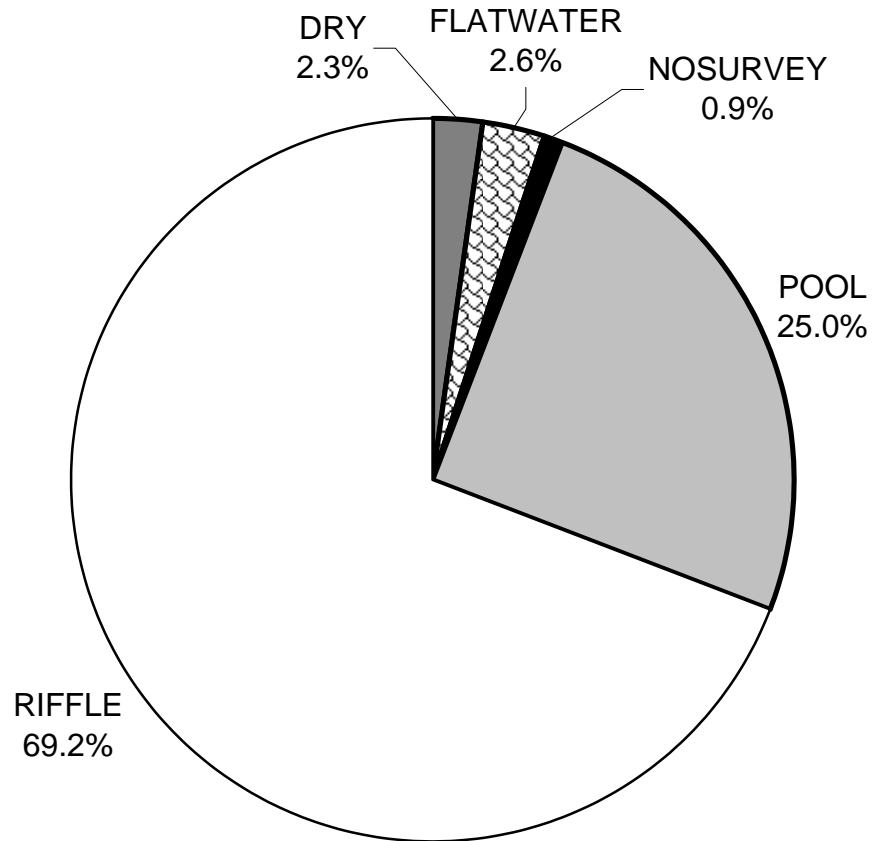
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	0
SMALL WOODY DEBRIS (%)	13	10	7
LARGE WOODY DEBRIS (%)	13	10	25
ROOT MASS (%)	0	0	6
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	3	10	6
BOULDERS (%)	73	70	50
BEDROCK LEDGES (%)	0	0	6

NORTH FORK JUAN CREEK 2009 HABITAT TYPES BY PERCENT OCCURRENCE



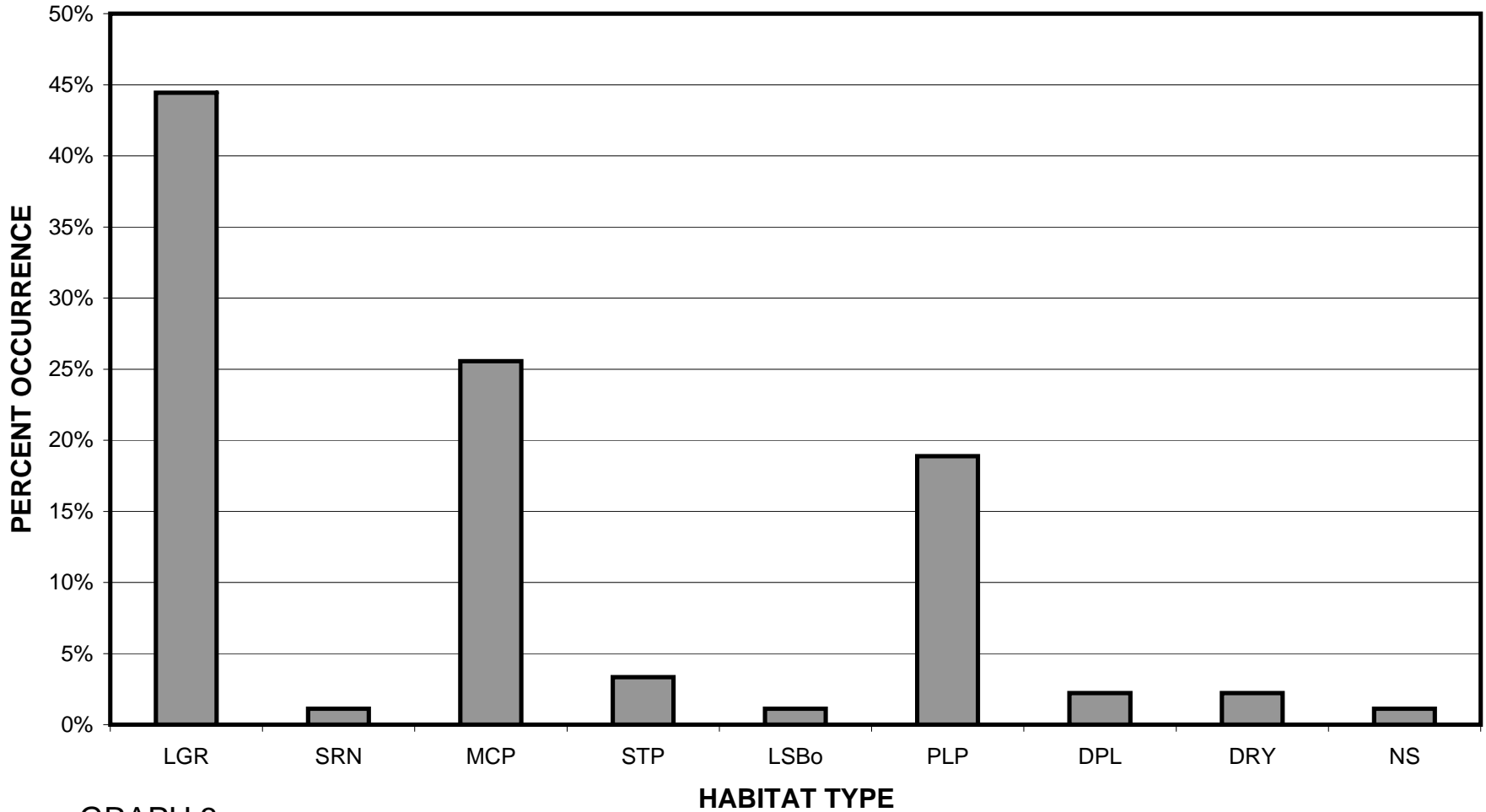
GRAPH 1

NORTH FORK JUAN CREEK 2009 HABITAT TYPES BY PERCENT TOTAL LENGTH



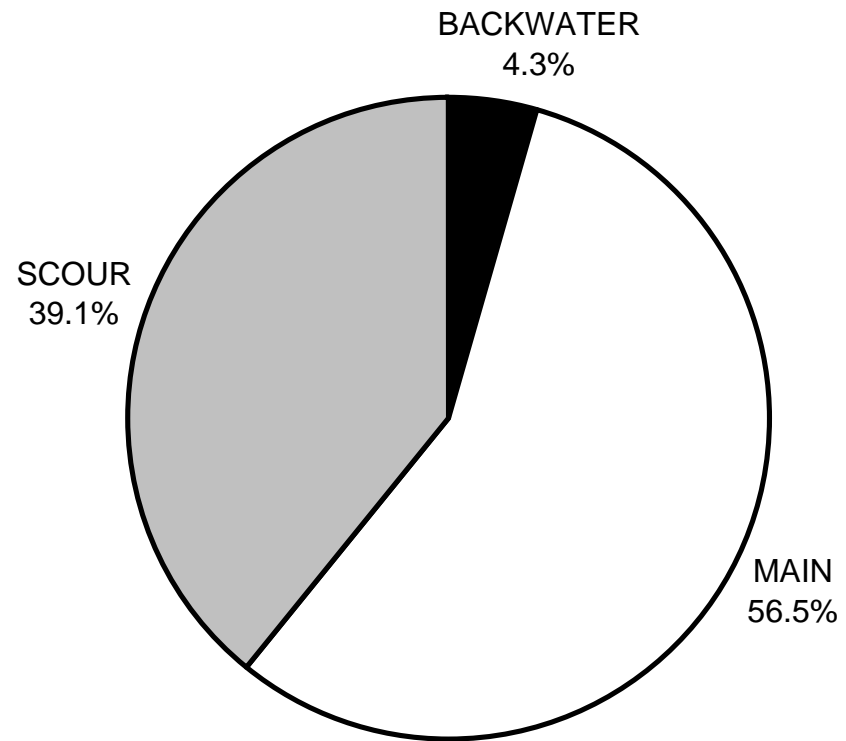
GRAPH 2

NORTH FORK JUAN CREEK 2008 HABITAT TYPES BY PERCENT OCCURRENCE



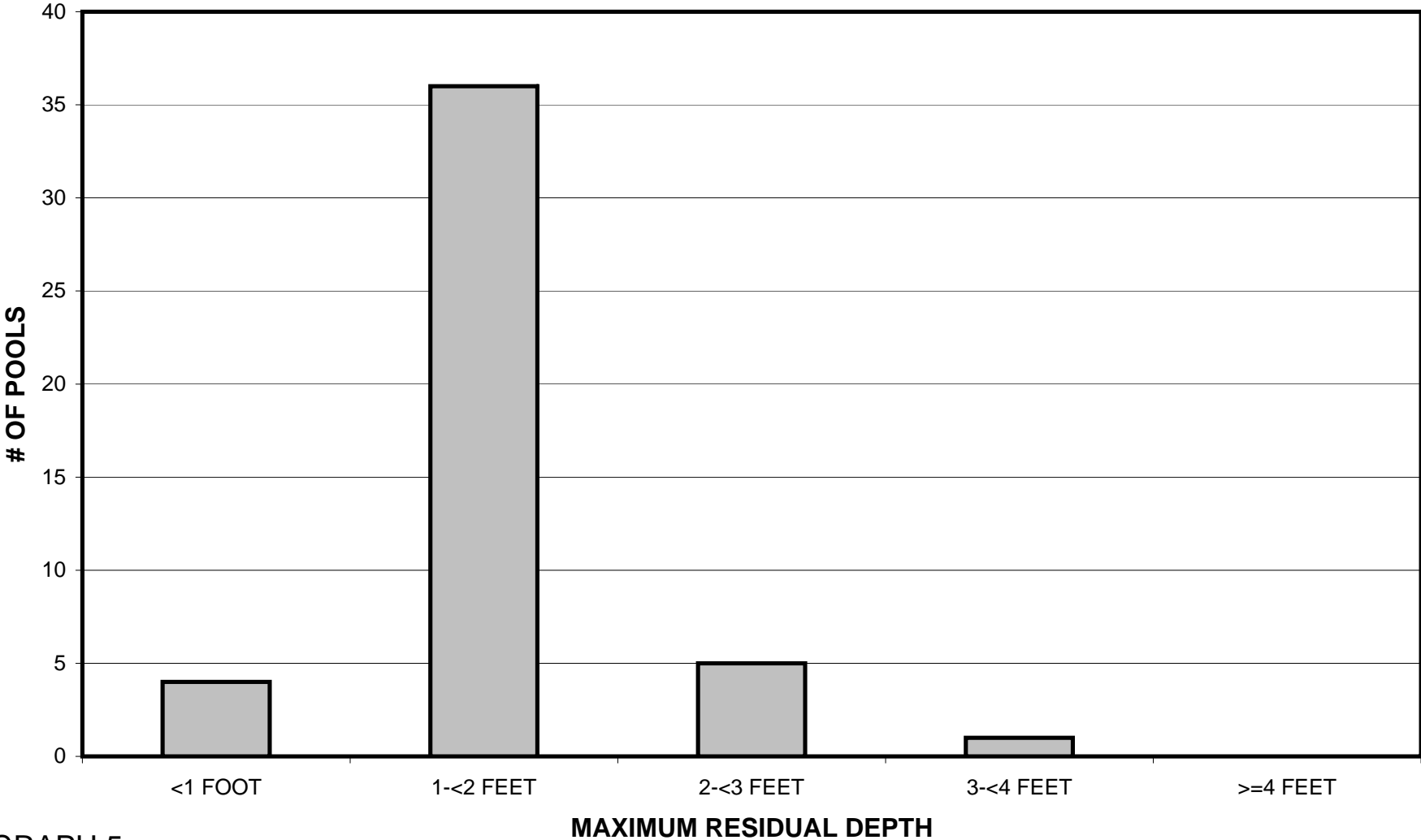
GRAPH 3

NORTH FORK JUAN CREEK 2009 POOL TYPES BY PERCENT OCCURRENCE



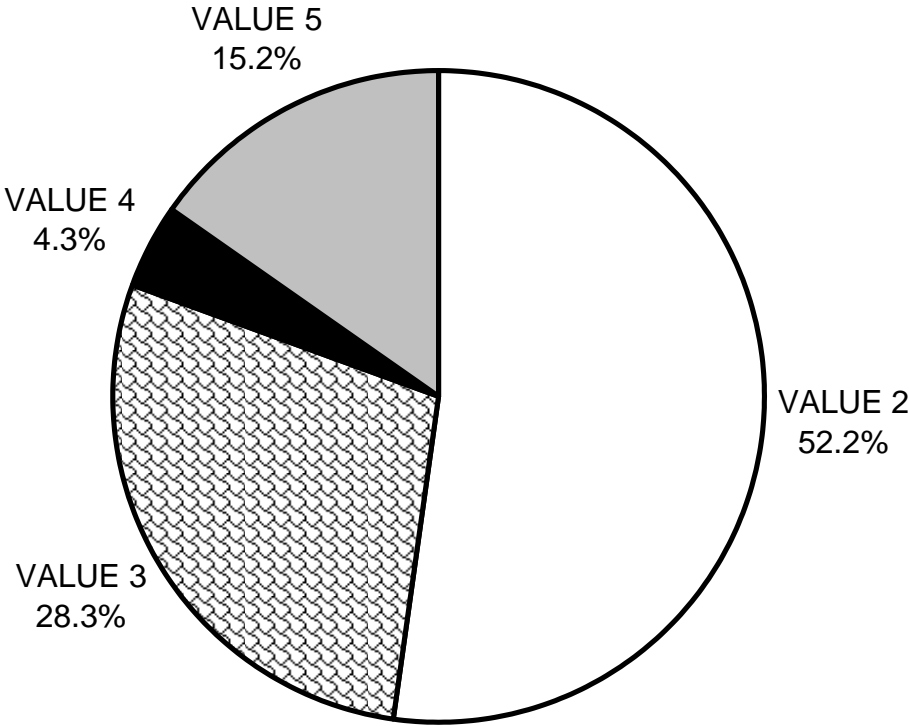
GRAPH 4

NORTH FORK JUAN CREEK 2009 MAXIMUM DEPTH IN POOLS



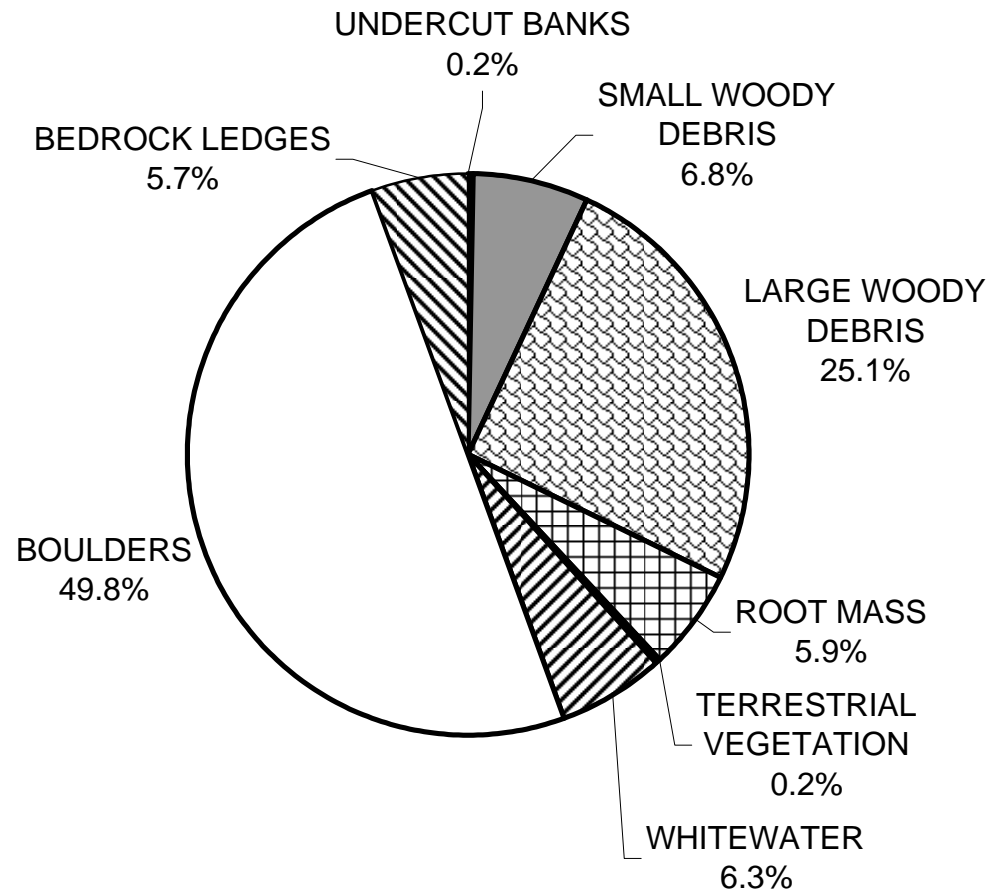
GRAPH 5

NORTH FORK JUAN CREEK 2009 PERCENT EMBEDDEDNESS



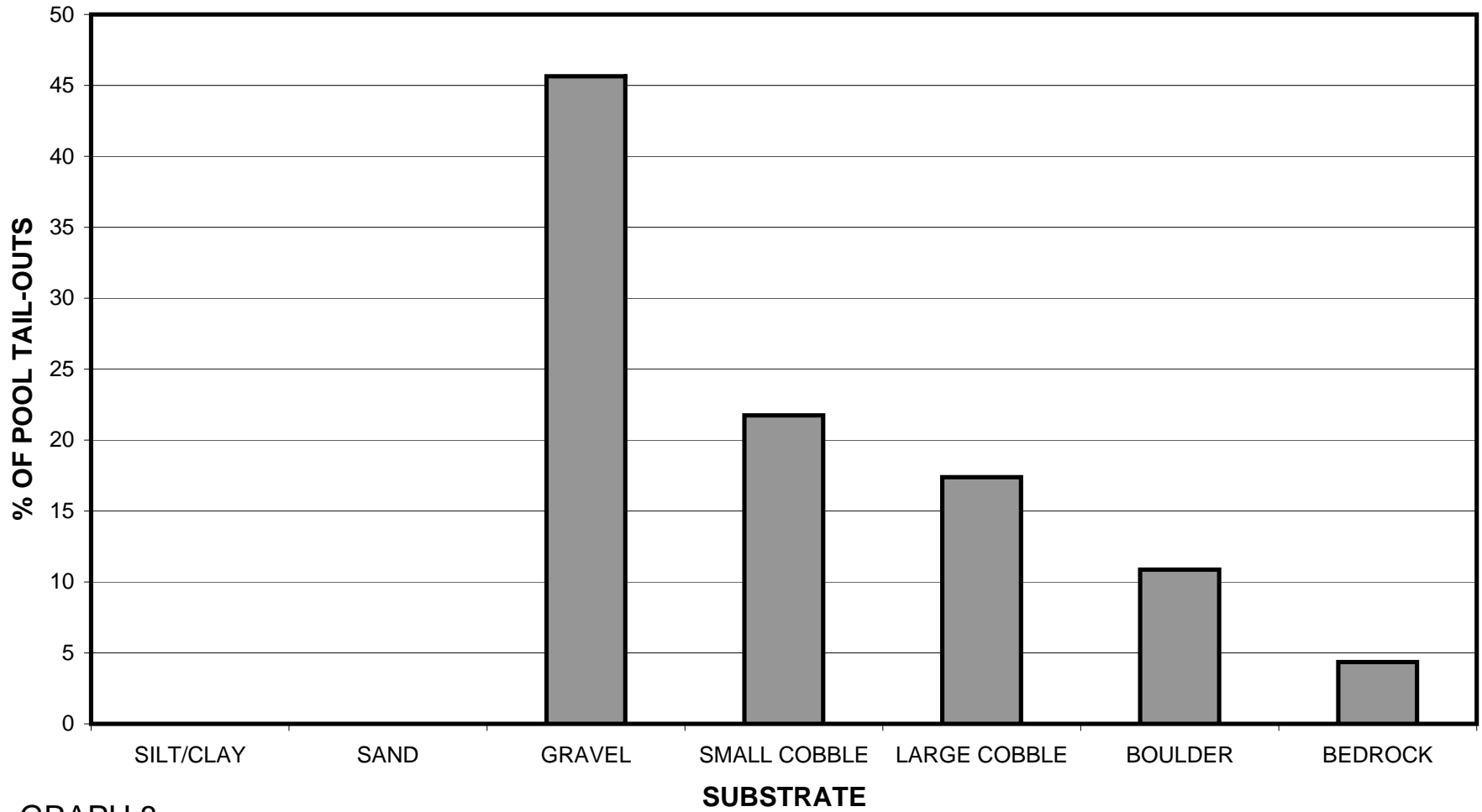
GRAPH 6

NORTH FORK JUAN CREEK 2008 MEAN PERCENT COVER TYPES IN POOLS



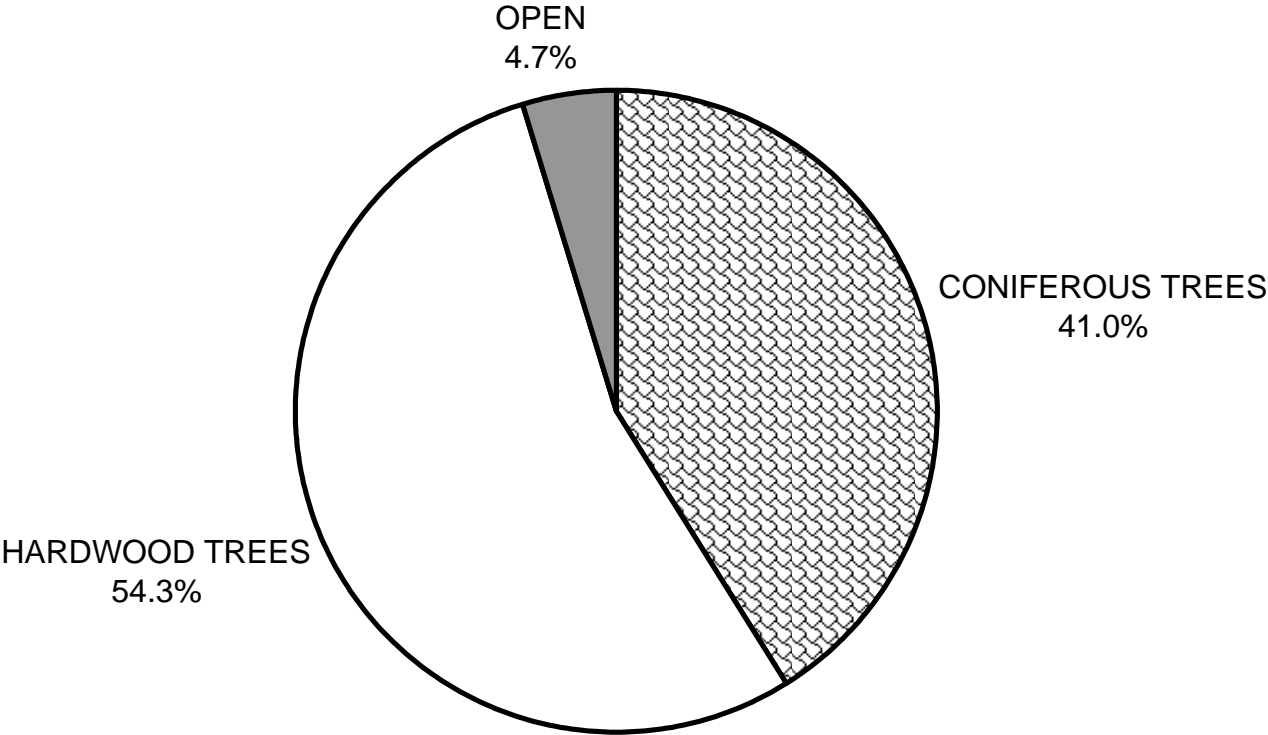
GRAPH 7

NORTH FORK JUAN CREEK 2008 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



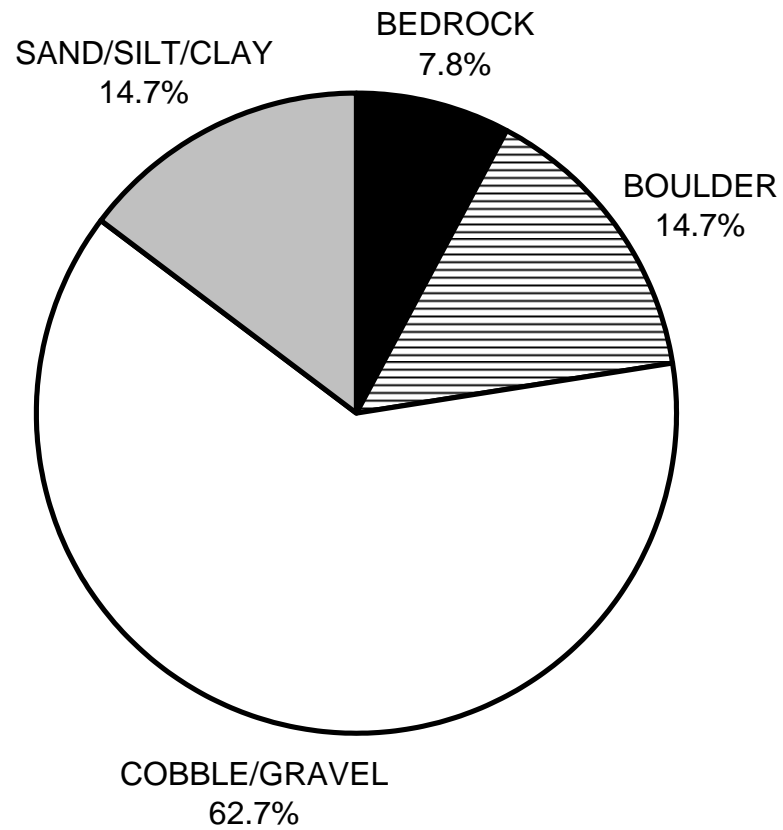
GRAPH 8

**NORTH FORK JUAN CREEK 2008
MEAN PERCENT CANOPY**



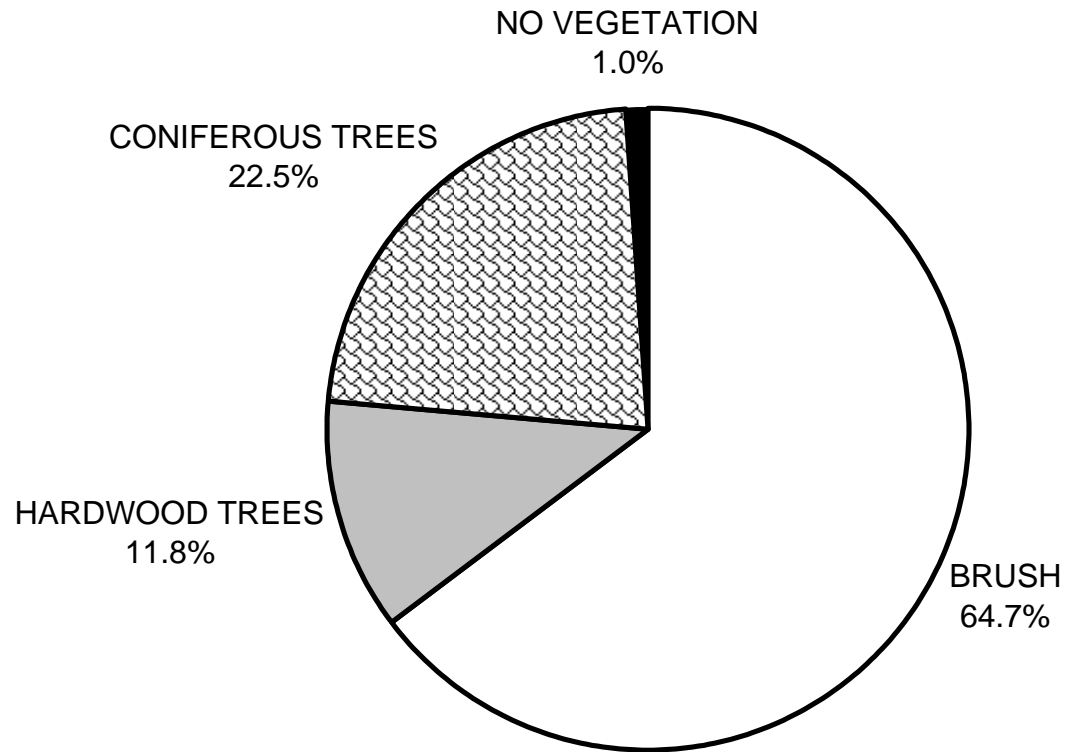
GRAPH 9

NORTH FORK JUAN CREEK 2009 DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

NORTH FORK JUAN CREEK 2009 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

