STREAM INVENTORY REPORT

John Smith Creek

INTRODUCTION

A stream inventory was conducted June 5 to June 12, 2012 on John Smith Creek. The survey began at the confluence with North Branch North Fork Navarro River and extended upstream 2.1 miles. A stream inventory and report was also completed for Johnson Creek, a tributary to John Smith Creek.

The John Smith 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 John Smith Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

John Smith Creek is a tributary to North Branch North Fork Navarro River, a tributary to North Fork Navarro River, a tributary to the Navarro River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). John Smith Creek's legal description at the confluence with Little North Fork Navarro River is T16N R15W S33. Its location is 39.2072 degrees north latitude and 123.5364 degrees west longitude, LLID number 1235351392072. John Smith Creek is a second order stream and has approximately 3.2 miles of blue line stream according to the USGS Navarro 7.5 minute quadrangle. John Smith Creek drains a watershed of approximately 5.9 square miles. Elevations range from about 275 feet at the mouth of the creek to 700 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production and rural development. Vehicle access exists via Masonite Industrial Road.

METHODS

The habitat inventory conducted in John Smith 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 Wildlife (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 John Smith 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". John Smith 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 John Smith 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 John Smith 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 John Smith 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 John Smith 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 John Smith Creek. In addition, underwater observations were made at thirteen 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 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 John Smith Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of June 5 to June 12, 2012 was conducted by R. Spencer, A. Blessing, and A. Garcia (WSP). The total length of the stream surveyed was 11,090 feet.

Stream flow was not measured on John Smith Creek.

John Smith Creek is an F4 channel type for 9,968 feet of the stream surveyed (Reach 1), and a B4 channel type for 1,122 feet of the stream surveyed (Reach 2). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 51 to 56 degrees Fahrenheit. Air temperatures ranged from 49 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 49% pool units, 29% flatwater units, 17% riffle units, and 4% dry units (Graph 1). Based on total length of Level II habitat types there were 61% pool units, 30% flatwater units, 7% riffle units, and 2% dry units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 48%; step run units, 21%; and low gradient

riffle units, 15% (Graph 3). Based on percent total length, mid-channel pool units made up 60%, step run units 24%, and low gradient riffle units 6%.

A total of 106 pools were identified (Table 3). Main channel pools were the most frequently encountered at 99% (Graph 4), and comprised 100% 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. Fifty-four of the 106 pools (51%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 106 pool tail-outs measured, 35 had a value of 1 (33%); 56 had a value of 2 (53%); 12 had a value of 3 (11%); three had a value of 5 (3%); (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 2, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 25 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 210. Main channel pools had a mean shelter rating of 23 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in John Smith Creek. Graph 7 describes the pool cover in John Smith Creek. Large woody debris is the dominant pool cover type followed by undercut banks.

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 84% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 13% of the pool tail-outs.

The mean percent canopy density for the surveyed length of John Smith Creek was 92%. Eight percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 32% and 68%, respectively. Graph 9 describes the mean percent canopy in John Smith 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 69% sand/silt/clay, 22% cobble/gravel, 7% boulders, and 2% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 55% of the units surveyed. Additionally, 32% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had brush as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 13 sites for species composition and distribution in John Smith Creek on July 30 and August 2, 2012. The sites were sampled by I. Mikus and M. Groff (CDFW).

In Reach 1, which comprised the first 9,968 feet of stream, 12 sites were sampled. The reach sites yielded 68 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), 12 age 1+ SH/RT, three age 2+ SH/RT, four YOY coho salmon, and 22 age 1+ coho salmon.

In Reach 2, one site was sampled starting approximately 10,647 from the confluence with North Branch North Fork Navarro River and continuing upstream 49 feet. The reach site yielded no fish.

The following chart displays the information yielded from these sites:

2012 John Smith 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: F4 Channel Type									
08/02/12	1	004	Pool	256	3	3	0	0	4
	2	010	Pool	530	12	0	0	0	0
	3	014	Pool	932	0	1	0	0	0
	4	017	Pool	1,043	11	0	0	0	1
	5	019	Pool	1,251	7	1	0	0	4
	6	025	Pool	1,542	8	1	0	0	3
	7	026	Pool	1,573	4	1	0	0	1
	8	028	Pool	1,645	7	2	0	0	3
	9	103	Pool	5,411	3	1	1	4	2
	10	156	Pool	8,427	6	1	1	0	1
	11	162	Pool	8,885	4	0	1	0	1
	12	174	Pool	9,733	3	1	0	0	2
Reach 2: B4 Channel Type									
	13	200	Pool	10,686	0	0	0	0	0

DISCUSSION

John Smith Creek is an F4 channel type for the first 9,968 feet of stream surveyed and a B4 channel type for the remaining 1,122 feet. The suitability of F4 and B4 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. B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 5 to June 12, 2012 ranged from 51 to 56 degrees Fahrenheit. Air temperatures ranged from 49 to 66 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 30% of the total length of this survey, riffles 7%, and pools 61%. Fifty-four of the 106 (51%) 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.

Ninety-one of the 106 pool tail-outs measured had embeddedness ratings of 1 or 2. Twelve of the pool tail-outs had embeddedness ratings of 3 or 4. Three of the pool tail-outs had a rating of 5, which is considered not suitable 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.

One hundred three of the 106 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 25. The shelter rating in the flatwater habitats is 9. 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 John Smith Creek. Large woody debris is the dominant cover type in pools followed by undercut banks. 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 92%. Reach 1 had a canopy density of 91% and Reach 2 had a canopy density of 99%. The percentage of right and left bank covered with vegetation was 99%and 99%, respectively.

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RECOMMENDATIONS

1) John Smith Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large wood. Adding high quality complexity with woody cover in the pools is desirable.

COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
77	0003.00	Masonite Road crosses the channel. The crossing is a 16' wide x 90' long x 32' high railcar bridge.
291	0006.00	A large woody debris (LWD) structure mid-channel is accumulating additional LWD and small woody debris (SWD).
381	0009.00	LWD structure is accumulating SWD.
1552	0026.00	LWD structure accumulating woody debris.
3301	0064.00	A logging road crosses the channel. The crossing is a 17' wide x 90' long x 16' high railcar bridge.
3457	0067.00	Niemela Gulch (tributary #01) enters on the right bank. The tributary is dry at the mouth. The water temperature of the tributary was 53 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 52 degrees Fahrenheit. The slope of the tributary is approximately 2%. The tributary is accessible to salmonids, but no fish were observed.
3720	0074.00	Boulder rip-rap on left bank below road.
6210	0120.00	A 6"-7" long fish observed.

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6637	0127.00	A logging road crosses the channel. The crossing is a 14' wide x 45' long x 8' high railcar bridge.
6795	0130.00	There is a 1.5' high plunge over a log.
7368	0138.00	Gulch 15 (tributary #02) enters on the left bank. It contributes approximately 5% to John Smith Creek's flow. The water temperature of the tributary was 51 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 51 degrees Fahrenheit. The slope of the tributary is approximately 1%. The tributary is accessible to salmonids, but no fish were observed.
7557	0140.00	A logging road crosses the channel. The crossing is a 10.3' wide x 51' long x 9.1' high railcar bridge.
7983	0147.00	LWD structure.
8166	0150.00	LWD structure.
8376	0156.00	LWD structure.
8458	0158.00	Two LWD structures.
8663	0160.00	LWD structure.
8773	0162.00	LWD structure.
8921	0164.00	LWD structure.
9228	0167.00	LWD structure.
9340	0169.00	Two LWD structures.
9743	0175.00	Johnson Creek (tributary #03) enters on the left bank. It contributes approximately 80% to John Smith Creek's flow. For more information, see the 2012 Johnson Creek Stream Habitat Inventory Report.
9968	0176.00	The channel changes from an F4 to a B4.
10287	0187.00	A logging road crosses the channel. The crossing is a 14' wide x 49' long x 9.1' high railcar bridge.
10407	0191.00	Log debris accumulation (LDA) #01 contains one piece of large woody debris (LWD) and measures 3' high x 11' wide x 4' 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 25' long x 1' deep. There is a 2' high plunge through the LDA.
11083	0215.00	End of survey. The stream goes dry. The channel is braided and marshy and the gradient increases.

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: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0

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
9	0	DRY	4.2	29	263	2.4									
63	16	FLATWATER	29.3	52	3285	29.6	5.8	0.5	0.8	229	14442	123	7779		9
1	0	NOSURVEY	0.5	14	14	0.1									
106	106	POOL	49.3	64	6743	60.8	10.8	1.0	2.3	723	76681	1042	110461	846	25
36	5	RIFFLE	16.7	22	785	7.1	5.1	0.2	0.5	90	3255	23	822		2

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
215	127	11090	94379	119062

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

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 (%)
32	3	LGR	14.9	22	700	6.3	4	0.2	0.8	89	2863	23	751		0	96
4	2	HGR	1.9	21	85	0.8	6	0.3	0.6	92	368	22	88		5	91
19	4	RUN	8.8	32	599	5.4	6	0.6	1.3	160	3045	96	1827		8	90
44	12	SRN	20.5	61	2686	24.2	6	0.4	1.2	252	11099	133	5833		10	93
103	103	MCP	47.9	64	6628	59.8	11	1.0	5.3	734	75576	1052	108403	856	23	92
2	2	STP	0.9	44	88	0.8	8	1.0	1.7	317	633	391	782	300	35	91
1	1	LSL	0.5	27	27	0.2	18	1.9	2.5	473	473	1276	1276	898	210	88
9	0	DRY	4.2	29	263	2.4										
1	0	NS	0.5	14	14	0.1										91

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
215	127	11090	94055	118960

Table 3 - Summary of Pool Types

Stream Name: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

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
105	105	MAIN	99	64	6716	100	10.7	1.0	726	76209	845	88742	23
1	1	SCOUR	1	27	27	0	17.5	1.9	473	473	898	898	210

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
106	106	6743	76681	89640

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

Stream Name: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

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
103	MCP	97	2	2	48	47	30	29	18	17	5	5
2	STP	2	0	0	2	100	0	0	0	0	0	0
1	LSL	1	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
106	2	2	50	47	31	29	18	17	5	5

Mean Maximum Residual Pool Depth (ft.): 2.3

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012 Dry Units: 9

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

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
32	3	LGR	0	0	0	0	0	0	0	0	0
4	2	HGR	0	0	0	0	0	50	0	50	0
36	5	TOTAL RIFFLE	0	0	0	0	0	50	0	50	0
19	4	RUN	0	33	17	17	0	0	7	27	0
44	12	SRN	14	16	6	1	43	9	1	9	0
63	16	TOTAL FLAT	10	20	9	5	31	7	2	14	0
103	103	MCP	19	17	31	5	13	4	0	10	2
2	2	STP	23	8	25	0	35	5	0	5	0
1	1	LSL	0	50	40	0	0	0	0	10	0
106	106	TOTAL POOL	19	17	31	5	13	4	0	10	2
1	0	NS									
215	127	TOTAL	18	17	28	5	15	5	0	10	1

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012 Dry Units: 9

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

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
32	3	LGR	0	0	67	33	0	0	0
4	2	HGR	50	0	0	50	0	0	0
19	4	RUN	25	0	75	0	0	0	0
44	12	SRN	8	0	75	17	0	0	0
103	103	MCP	1	5	85	8	1	0	0
2	2	STP	0	0	100	0	0	0	0
1	1	LSL	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
92	68	32	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: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012 Survey Length (ft.): 11090 Main Channel (ft.): 11090 Side Channel (ft.): 0

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4
Reach Length (ft.): 9968
Riffle/Flatwater Mean Width (ft.): 6.8
BFW:
Range (ft.): 8 to 18
Mean (ft.): 14
Std. Dev.: 2
Base Flow (cfs.): 0.0
Water (F): 51 - 56 Air (F): 49 - 66
Dry Channel (ft): 12

Canopy Density (%): 90.8
Coniferous Component (%): 65.6
Hardwood Component (%): 34.4
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 98.9
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 25
LWD per 100 ft.:
Riffles: 1
Pools: 4
Flat: 0

Pools by Stream Length (%): 62.7
Pool Frequency (%): 50.9
Residual Pool Depth (%):
< 2 Feet Deep: 46
2 to 2.9 Feet Deep: 30
3 to 3.9 Feet Deep: 18
>= 4 Feet Deep: 6
Mean Max Residual Pool Depth (ft.): 2.3
Mean Pool Shelter Rating: 25

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 1 Gravel: 83 Sm Cobble: 13 Lg Cobble: 1 Boulder: 1 Bedrock: 0

Embeddedness Values (%): 1. 32.6 2. 51.7 3. 13.5 4. 0.0 5. 2.2

STREAM REACH: 2

Channel Type: B4
Reach Length (ft.): 1122
Riffle/Flatwater Mean Width (ft.): 3.2
BFW:
Range (ft.): 10 to 15
Mean (ft.): 13
Std. Dev.: 2
Base Flow (cfs.): 0.0
Water (F): 51 - 51 Air (F): 54 - 54
Dry Channel (ft): 251

Canopy Density (%): 98.7
Coniferous Component (%): 80.0
Hardwood Component (%): 20.0
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 99.2
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 26
LWD per 100 ft.:
Riffles: 0
Pools: 5
Flat: 1

Pools by Stream Length (%): 43.6
Pool Frequency (%): 42.5
Residual Pool Depth (%):
< 2 Feet Deep: 65
2 to 2.9 Feet Deep: 24
3 to 3.9 Feet Deep: 12
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.9
Mean Pool Shelter Rating: 23

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 88 Sm Cobble: 12 Lg Cobble: 0 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 35.3 2. 58.8 3. 0.0 4. 0.0 5. 5.9

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

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	5	0	2.0
Boulder	4	13	6.6
Cobble / Gravel	33	24	22.3
Sand / Silt / Clay	86	91	69.1

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	4	4	3.1
Brush	17	9	10.2
Hardwood Trees	36	45	31.6
Coniferous Trees	71	70	55.1
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

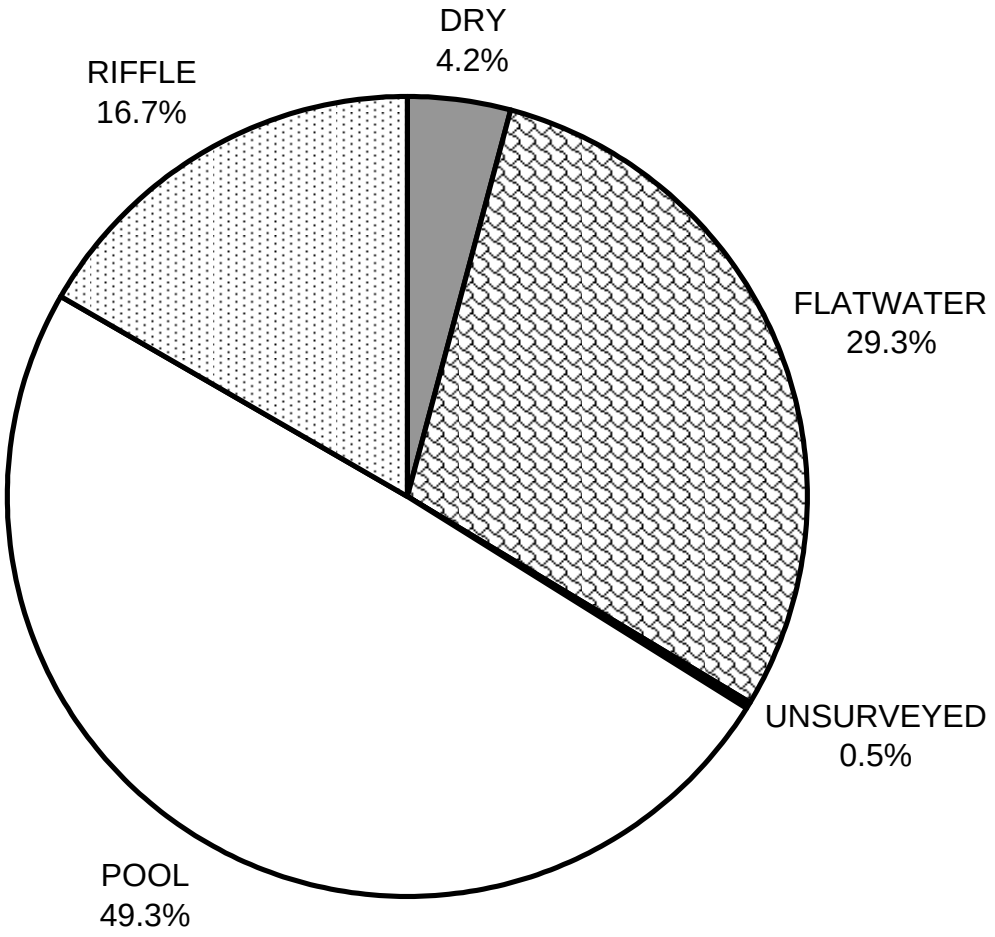
StreamName: John Smith Creek LLID: 1235351392072 Drainage: Navarro River

Survey Dates: 6/5/2012 to 6/12/2012

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS33 Latitude: 39:12:26.0N Longitude: 123:32:06.0W

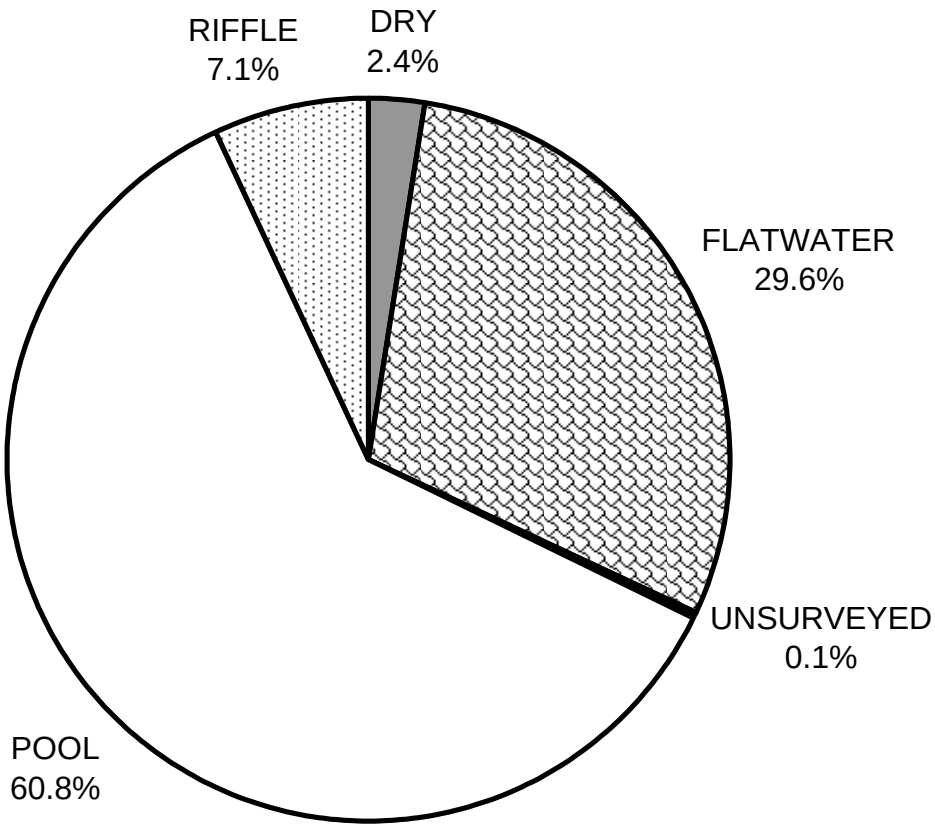
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	10	19
SMALL WOODY DEBRIS (%)	0	20	17
LARGE WOODY DEBRIS (%)	0	9	31
ROOT MASS (%)	0	5	5
TERRESTRIAL VEGETATION (%)	0	31	13
AQUATIC VEGETATION (%)	50	7	4
WHITEWATER (%)	0	2	0
BOULDERS (%)	50	14	10
BEDROCK LEDGES (%)	0	0	2

JOHN SMITH CREEK 2012
HABITAT TYPES BY PERCENT OCCURRENCE



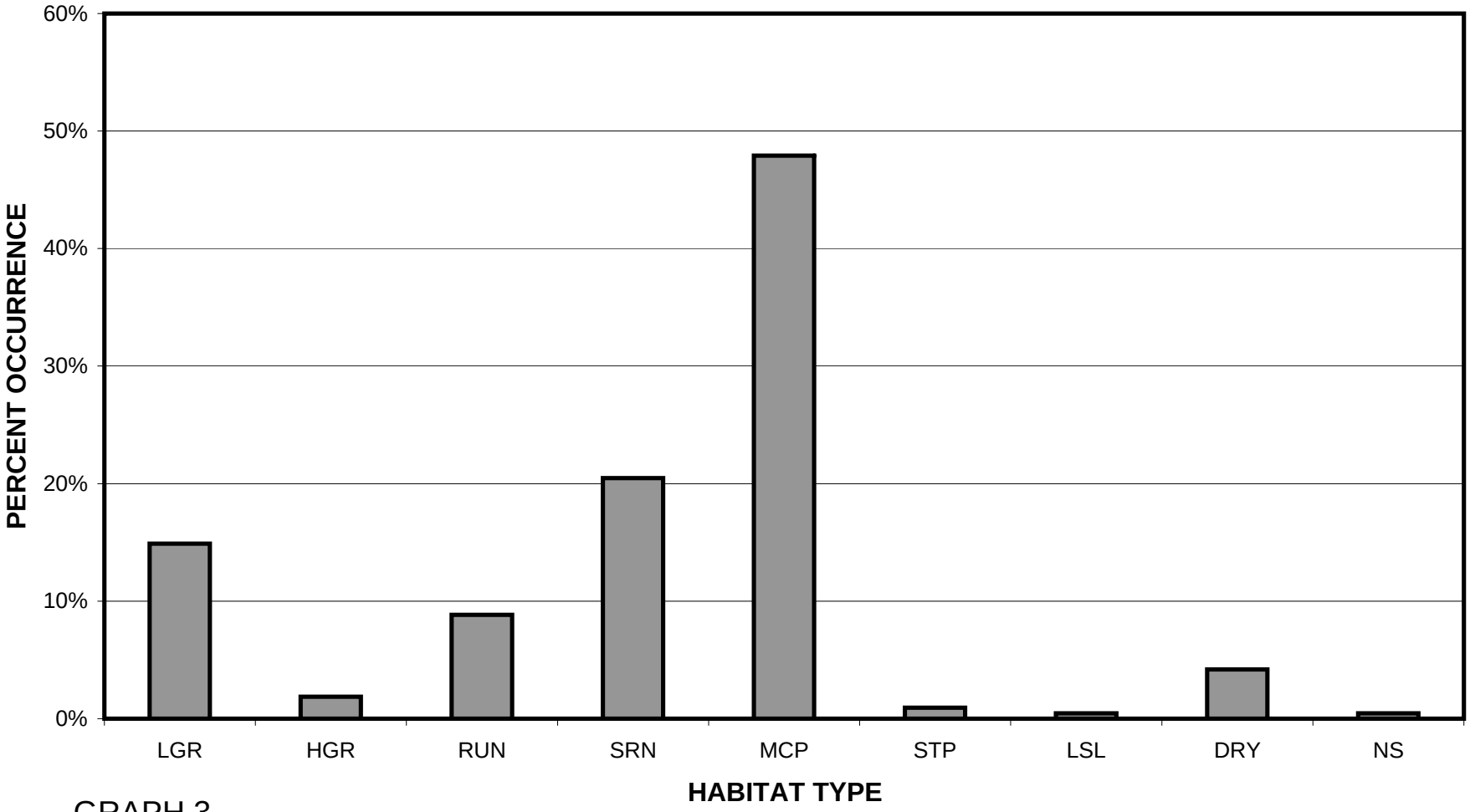
GRAPH 1

JOHN SMITH CREEK 2012
HABITAT TYPES BY PERCENT TOTAL LENGTH



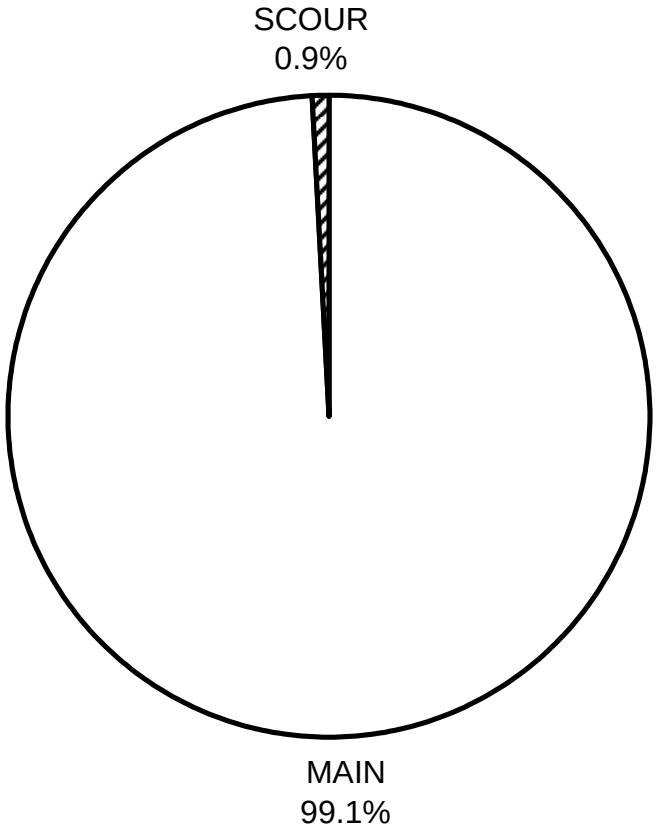
GRAPH 2

JOHN SMITH CREEK 2012
HABITAT TYPES BY PERCENT OCCURRENCE



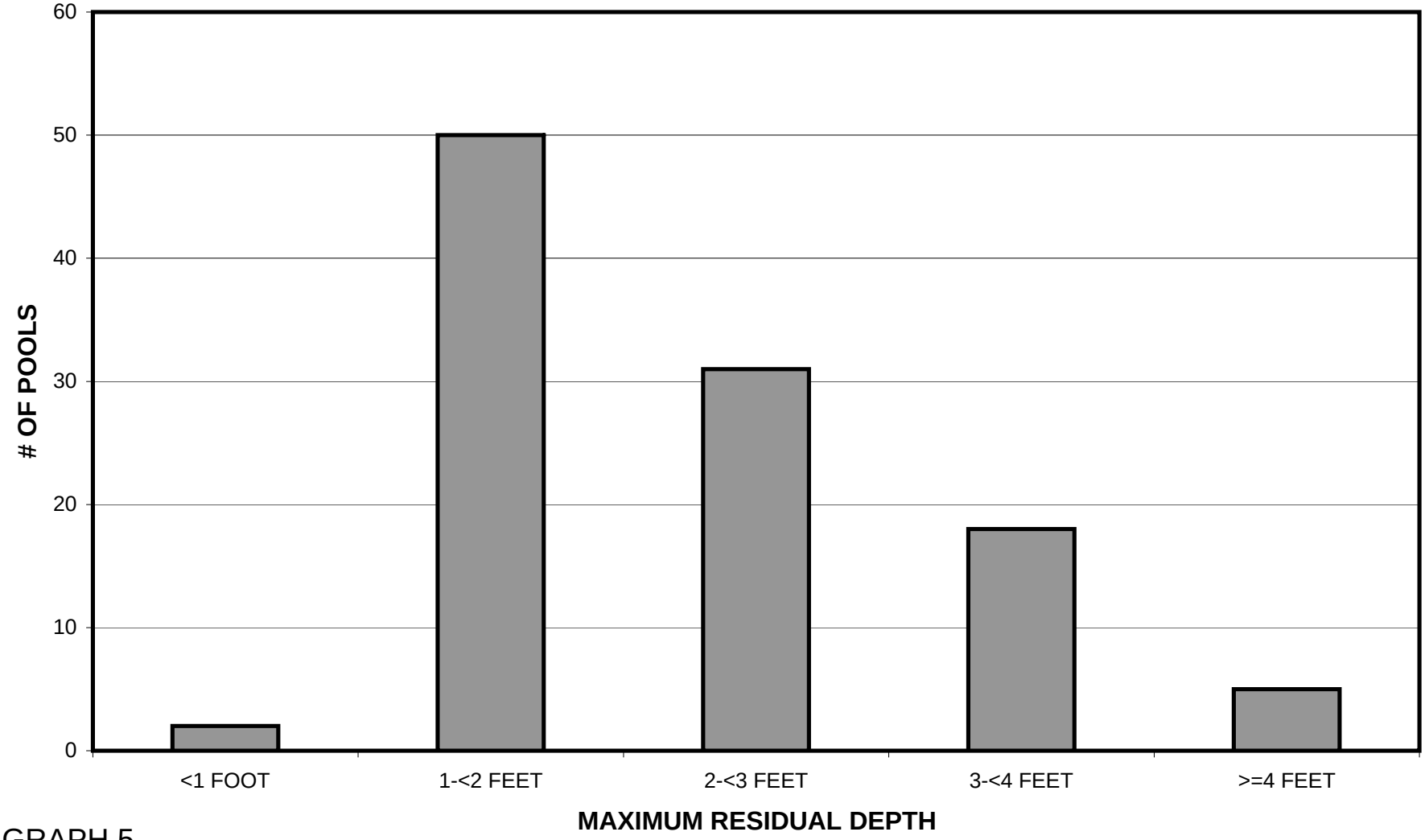
GRAPH 3

JOHN SMITH CREEK 2012
POOL TYPES BY PERCENT OCCURRENCE



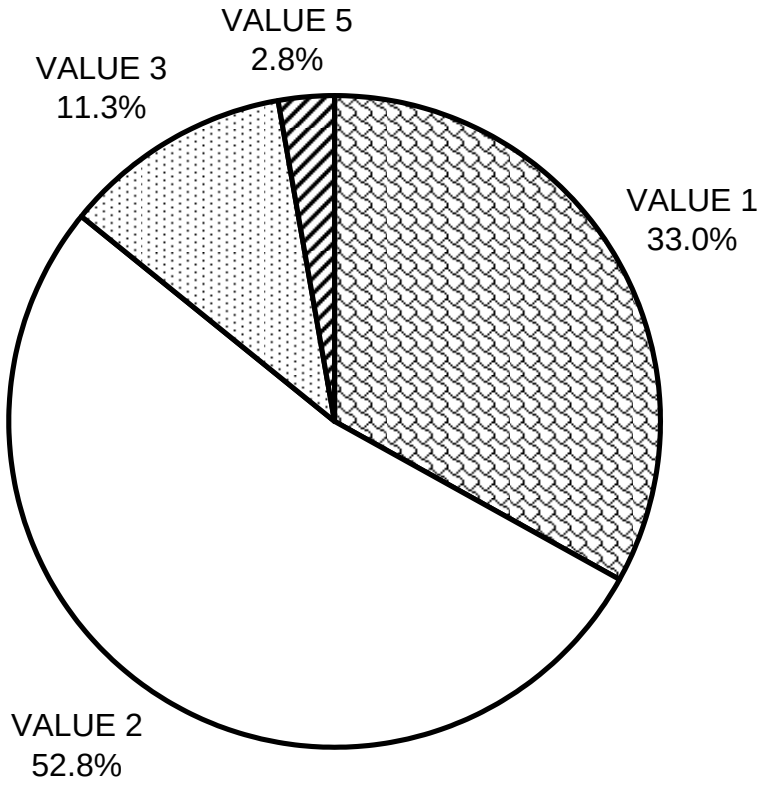
GRAPH 4

JOHN SMITH CREEK 2012
MAXIMUM DEPTH IN POOLS



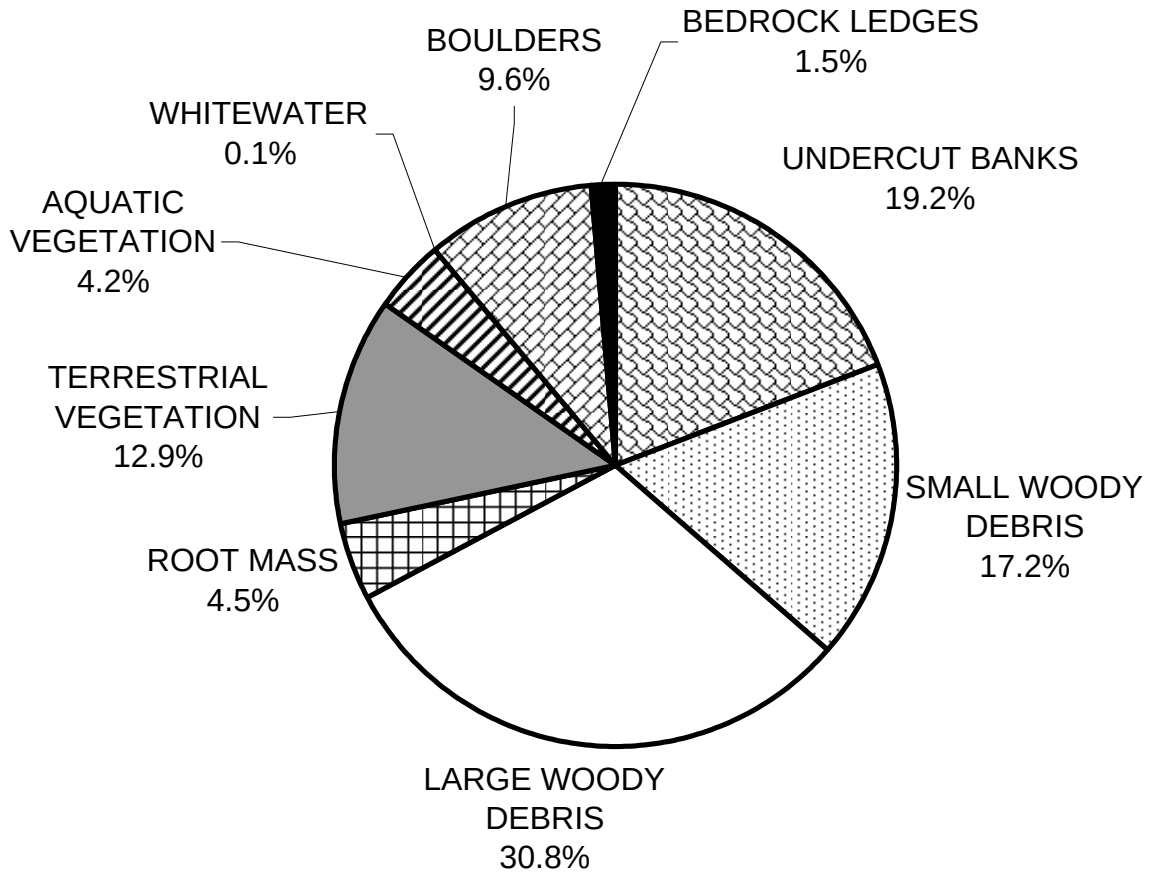
GRAPH 5

JOHN SMITH CREEK 2012
PERCENT EMBEDDEDNESS



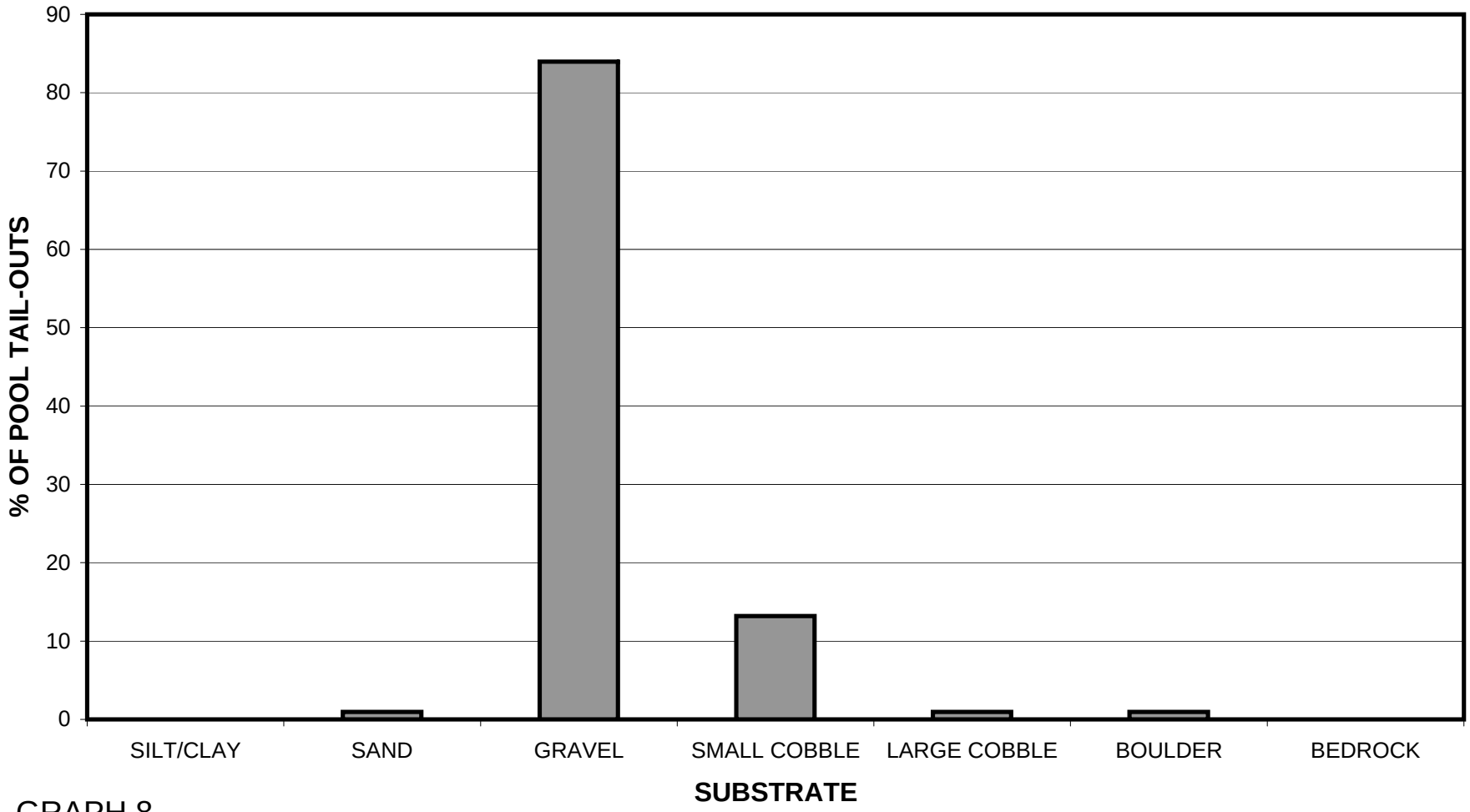
GRAPH 6

JOHN SMITH CREEK 2012
MEAN PERCENT COVER TYPES IN POOLS



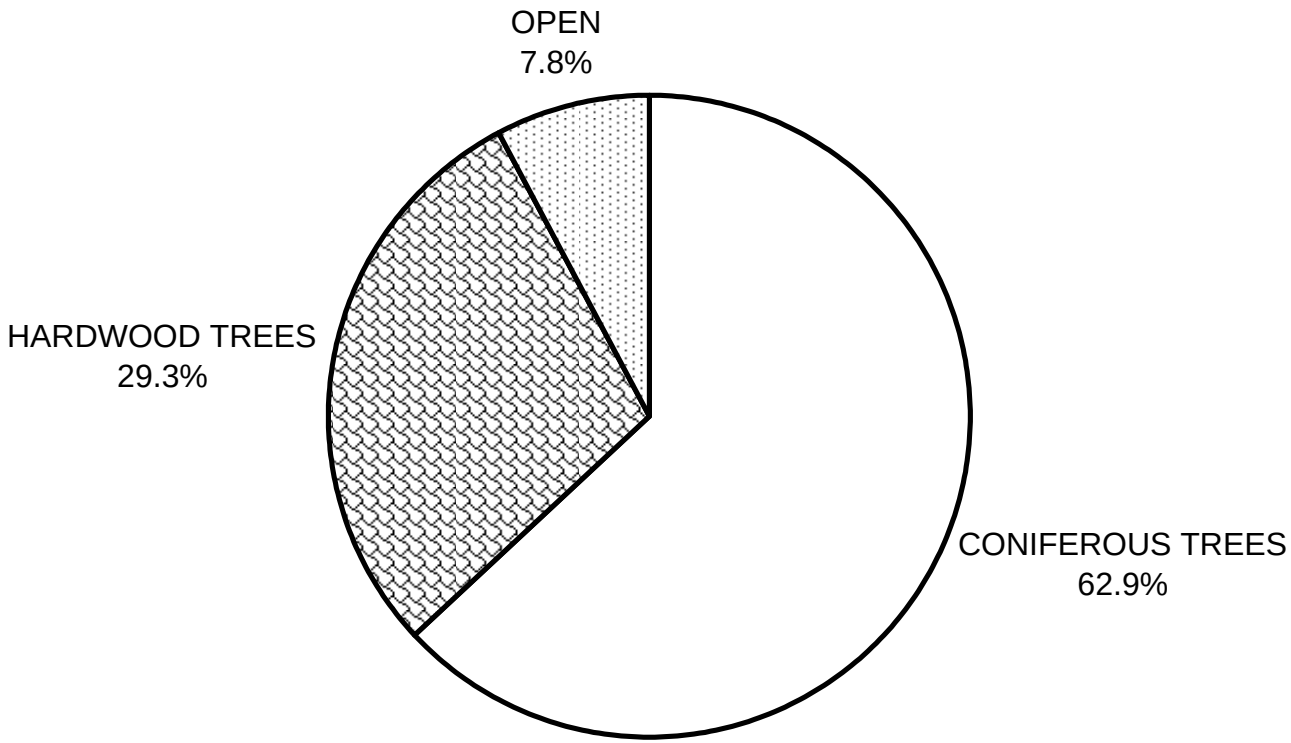
GRAPH 7

JOHN SMITH CREEK 2012
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



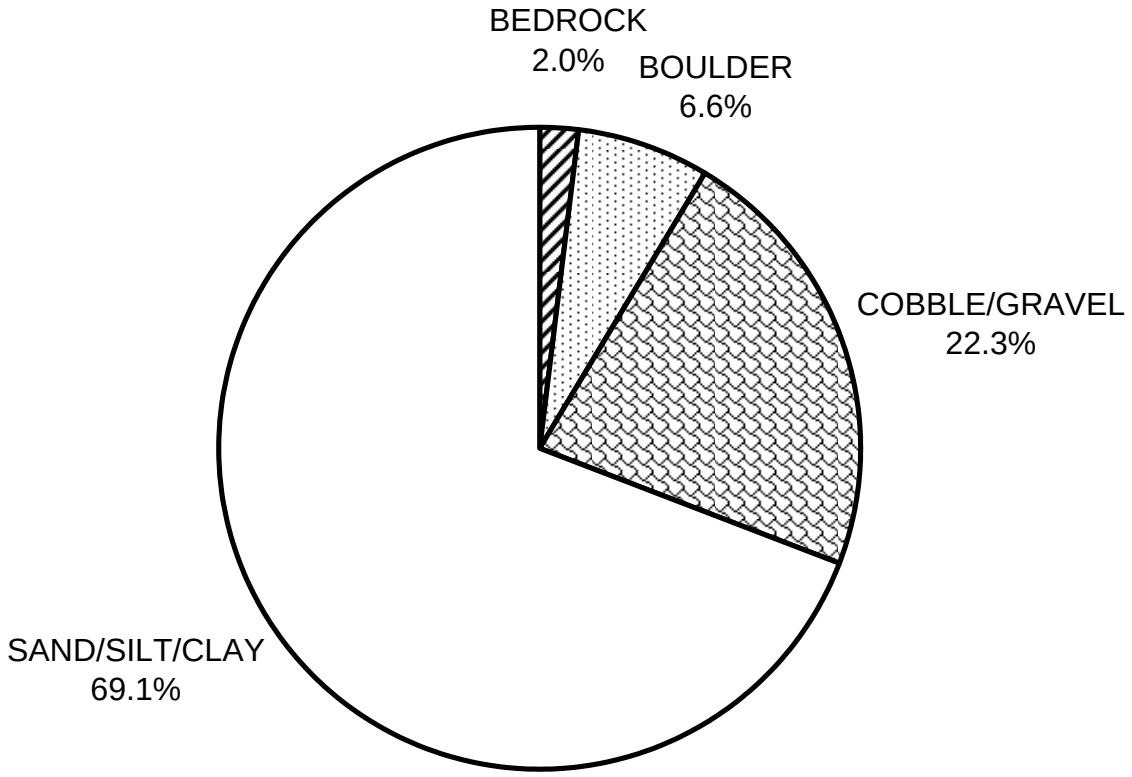
GRAPH 8

JOHN SMITH CREEK 2012
MEAN PERCENT CANOPY



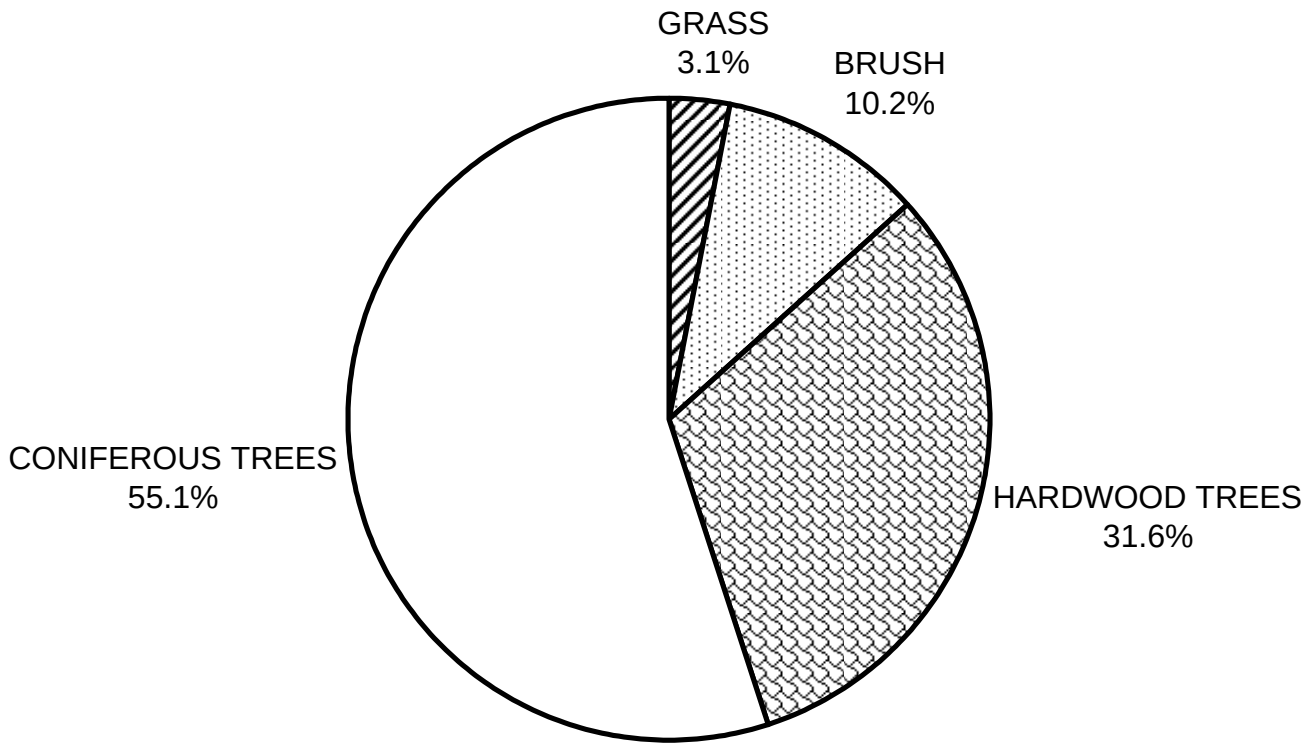
GRAPH 9

JOHN SMITH CREEK 2012
DOMINANT BANK COMPOSITION IN SURVEY REACH

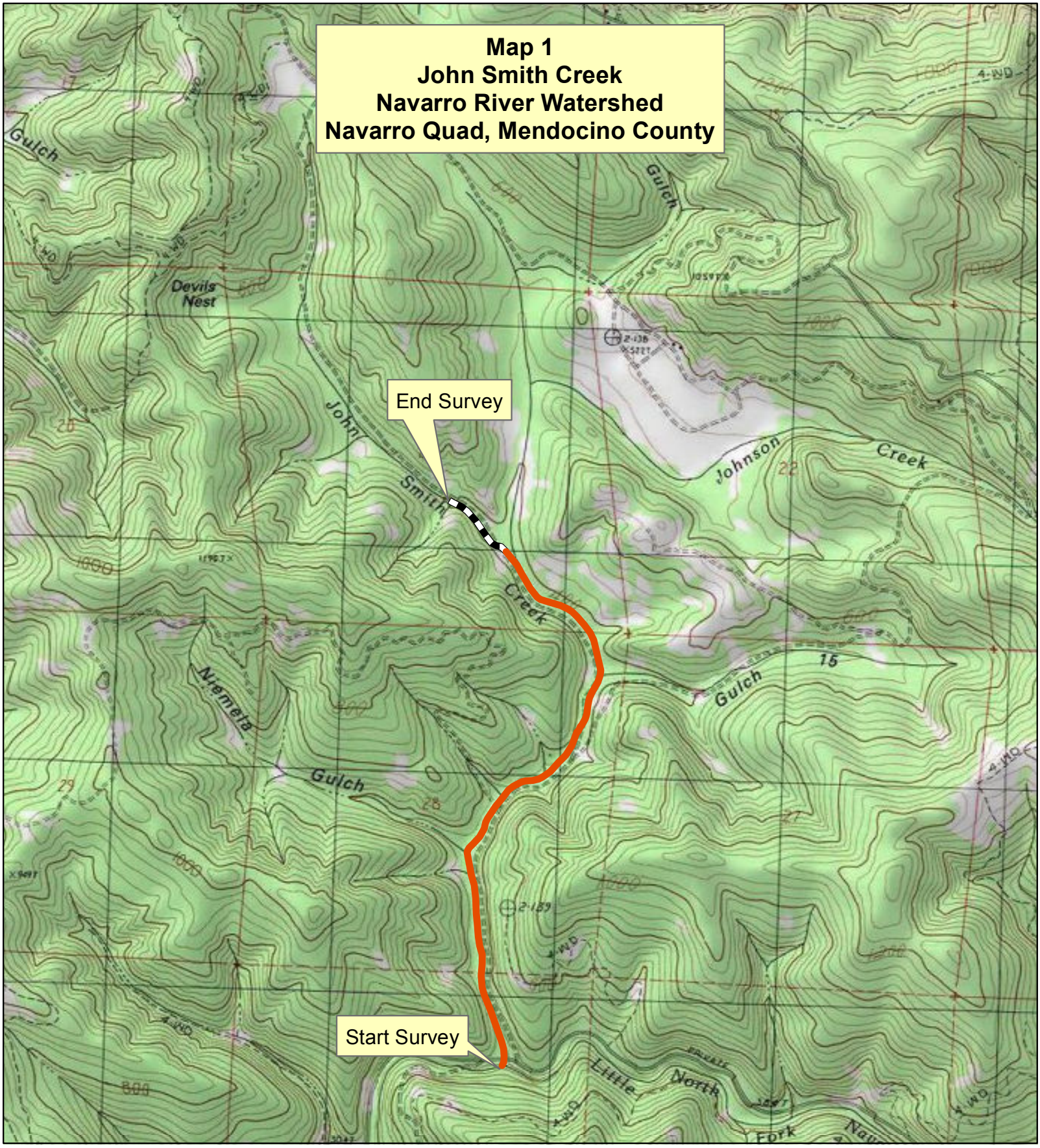


GRAPH 10

JOHN SMITH CREEK 2012
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11


Map 1
John Smith Creek
Navarro River Watershed
Navarro Quad, Mendocino County
End Survey
Start Survey
Devils Nest
John Smith Creek
Johnson Creek
Niemela Gulch
Gulch
Little North Fork
N
S
E
W
Reach 1, Channel Type F4
Reach 2, Channel Type B4
0
1,100
2,200 Feet
CALIFORNIA
DEPARTMENT OF FISH & WILDLIFE