

STREAM INVENTORY REPORT

South Fork Bear Haven Creek

INTRODUCTION

A stream inventory was conducted from October 3 to October 10, 2012 on South Fork Bear Haven Creek. The survey began at the confluence with Bear Haven Creek and extended upstream 1.3 miles.

The South Fork Bear Haven 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 Bear Haven 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

South Fork Bear Haven Creek is a tributary to Bear Haven Creek, tributary to Middle Fork Ten Mile River, tributary to Ten Mile River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). South Fork Bear Haven Creek's legal description at the confluence with Bear Haven Creek is T20N R16W S29. Its location is 39.5605 degrees north latitude and 123.6714 degrees west longitude, LLID number 1236701395604. South Fork Bear Haven Creek is a first order stream and has approximately 0.6 miles of blue line stream according to the USGS Dutchmans Knoll 7.5 minute quadrangle. South Fork Bear Haven Creek drains a watershed of approximately 1.6 square miles. Elevations range from about 160 feet at the mouth of the creek to 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 Georgia-Pacific Industrial Road, north of Fort Bragg.

METHODS

The habitat inventory conducted in South Fork Bear Haven Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Wildlife (CDFW) personnel that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. 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 Bear Haven 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 Bear Haven 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

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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 South Fork Bear Haven 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is classified according to a list of nine cover types. In South Fork Bear Haven 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. The shelter rating is then calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In South Fork Bear Haven 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 Bear Haven Creek, the dominant composition type and

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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 South Fork Bear Haven 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 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)

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- 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 South Fork Bear Haven 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 October 3 to October 10, 2012 was conducted by B. Leonard, R. Spencer, and T. Anderson (CDFW). The total length of the stream surveyed was 6,715 feet.

Stream flow was not measured on South Fork Bear Haven Creek.

South Fork Bear Haven Creek is a G4 channel type for 3,593 feet of the stream surveyed (Reach 1) and an A3 channel type for 3,122 feet of the stream surveyed (Reach 2). G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and gravel-dominant substrates. 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 49 to 52 degrees Fahrenheit. Air temperatures ranged from 41 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 41% pool units, 32% flatwater units, 19% riffle units, and 8% dry units (Graph 1). Based on total length of Level II habitat types there were 47% flatwater units, 24% pool units, 16% dry units, and 12% riffle units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 39%; step run units, 26%; and low gradient riffle units, 14% (Graph 3). Based on percent total length, step run units made up 43%, mid-channel pool units 22%, and dry units 16%.

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A total of 87 pools were identified (Table 3). Main channel pools were the most frequently encountered at 97% (Graph 4), and comprised 95% 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. Ten of the 87 pools (11%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 87 pool tail-outs measured, 25 had a value of 2 (28.7%); 52 had a value of 3 (59.8%); nine had a value of 4 (10.3%); one had a value of 5 (1.1%) (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 1, 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 main channel pools had the highest mean shelter rating at 43. Scour pools had a mean shelter rating of 28 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in South Fork Bear Haven Creek. Graph 7 describes the pool cover in South Fork Bear Haven Creek. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 77% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 20% of the pool tail-outs.

The mean percent canopy density for the surveyed length of South Fork Bear Haven Creek was 99%. One percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 39% and 61%, respectively. Graph 9 describes the mean percent canopy in South Fork Bear Haven Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 70% cobble/gravel, 24% sand/silt/clay, 4% bedrock, and 2% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 44% of the units surveyed. Additionally, 37% of the units surveyed had brush as the dominant vegetation type, and 19% had deciduous trees as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at ten sites for species composition and distribution in South Fork Bear Haven Creek on October 19, 2012. The sites were sampled by B. Leonard and T. Anderson (CDFW).

In Reach 1, which comprised the first 3,593 feet of stream, five sites were sampled. The reach sites yielded 17 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), four age 1+ SH/RT, and six YOY coho salmon.

In Reach 2, five sites were sampled starting approximately 3,593 from the confluence with Bear Haven Creek and continuing upstream 1,016 feet. The reach sites yielded one YOY SH/RT.

The following chart displays the information yielded from these sites:

2012 South Fork Bear Haven 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: G4 Channel Type									
10/18/12	1	002	Pool	54	4	2	0	0	0
	2	080	Pool	2,149	5	1	0	1	0
	3	091	Pool	2,565	0	0	0	1	0
	4	095	Pool	2,651	7	1	0	2	0
	5	096	Pool	2,677	1	0	0	2	0
Reach 2: A3 Channel Type									
10/18/12	6	122	Pool	3,593	1	0	0	0	0
	7	141	Pool	4,332	0	0	0	0	0
	8	147	Pool	4,476	0	0	0	0	0
	9	149	Pool	4,513	0	0	0	0	0
	10	153	Pool	4,609	0	0	0	0	0

DISCUSSION

South Fork Bear Haven Creek is a G4 channel type for the first 3,593 feet of stream surveyed and an A3 channel type for the remaining 3,122 feet. The suitability of G4 and A3 channel types for fish habitat improvement structures is as follows: G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover. A3 channels are generally not suitable for fish habitat improvement projects.

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The water temperatures recorded on the survey days October 3 to October 11, 2012 ranged from 49 to 52 degrees Fahrenheit. Air temperatures ranged from 41 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 47% of the total length of this survey, riffles 12%, and pools 24%. Ten of the 87 (11%) 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. In reach 1 the G4 channel type, installing large wood structures that will increase or deepen pool habitat is recommended.

Twenty-five of the 87 pool tail-outs measured had embeddedness ratings of 1 or 2. Sixty-one of the pool tail-outs had embeddedness ratings of 3 or 4. One 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 Bear Haven Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Eighty-four of the 87 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 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 large woody debris in South Fork Bear Haven Creek. Large woody debris is the dominant cover type in pools followed by small 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 99%. Reach 1 had a canopy density of 98% and Reach 2 had a canopy density of 100%. The percentage of right and left bank covered with vegetation was 97% and 99%, respectively.

RECOMMENDATIONS

- 1) South Fork Bear Haven 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) In Reach 1, increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 4) 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.

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 the confluence with Bear Haven Creek. The channel is a G4.
54	0003.00	Log debris accumulation (LDA) #01 contains 10 pieces of large woody debris (LWD) and measures 5' high x 27' wide x 9' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 10' wide x 55' long x 4' deep. Fish were observed above the LDA.
160	0006.00	LDA #02 contains 10 pieces of LWD and measures 3.5' high x 32' wide x 12' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to cobble and measures 20' wide x 40' long x 4' deep. Fish were observed above the LDA.
458	0015.00	Dry left bank tributary.
857	0031.00	Tributary #01 enters on the left bank. The water temperature of the tributary is 49 degrees Fahrenheit, the water temperature downstream of the tributary is 49 degrees Fahrenheit, and the water temperature upstream of the confluence is 50 degrees Fahrenheit. The slope of the tributary is approximately 9%. The tributary is not accessible to salmonids.
1184	0044.00	Flow is subterranean for 125'.
1367	0048.00	There is a 2' high plunge.

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2219	0084.00	LDA #03 contains four pieces of LWD and measures 4' high x 15' wide x 7' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to cobble and measures 12' wide x 30' long x 3' deep. Fish were observed above the LDA.
2258	0086.00	A logging road crosses the channel. The crossing is a 10' wide x 28' long x 2' high metal bridge. The bridge appears to be at bankfull width height.
2651	0096.00	There is a 2' diameter culvert on right bank. The culvert is surrounded by boulder rip-rap.
3442	0118.00	There is a 2' high plunge.
3593	0123.00	The channel changes from a G4 to an A3.
3785	0132.00	Dry right bank tributary.
3832	0134.00	LDA #04 contains 12 pieces of LWD and measures 7' high x 20' wide x 30' long. Water does not flow through the LDA; the channel is dry for 293' above it. There are no visible gaps in the LDA. Retained sediment ranges from sand to cobble and measures 12' wide x 40' long x 5' deep. Fish were not observed above the LDA.
4727	0158.00	Dry right bank tributary.
5811	0188.00	Dry left bank tributary.
6695	0210.00	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 Bear Haven Creek

LLID: 1236701395604 Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Confluence Location: Quad: DUTCHMANS Legal Description: T20NR16WS29 Latitude: 39:33:37.0N Longitude: 123:40:12.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
16	0	DRY	7.6	68	1096	16.3									
67	5	FLATWATER	31.9	47	3166	47.1	4.2	0.3	0.7	126	8452	37	2449		12
1	0	NOSURVEY	0.5	19	19	0.3									
87	87	POOL	41.4	19	1625	24.2	7.9	0.6	1.3	147	12792	121	10549	91	43
39	4	RIFFLE	18.6	21	809	12.0	4.6	0.1	0.3	47	1838	7	255		1
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
210	96				6715					23081			13254		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: South Fork Bear Haven Creek

LLID: 1236701395604

Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS29

Latitude: 39:33:37.0N

Longitude: 123:40:12.0W

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 (%)
30	2	LGR	14.3	20	591	8.8	2	0.1	0.2	28	834	3	83		0	100
8	1	HGR	3.8	24	191	2.8	5	0.1	0.3	60	480	6	48		0	100
1	1	CAS	0.5	27	27	0.4	9	0.2	0.4	73	73	15	15		5	100
13	2	RUN	6.2	19	253	3.8	4	0.4	0.8	86	1112	30	395		10	100
54	3	SRN	25.7	54	2913	43.4	4	0.3	0.9	153	8276	41	2196		13	99
81	81	MCP	38.6	18	1462	21.8	8	0.6	3.6	146	11849	123	9939	92	44	99
2	2	CCP	1.0	25	50	0.7	6	0.4	0.9	157	314	94	188	55	8	100
1	1	STP	0.5	39	39	0.6	7	0.3	1.2	259	259	130	130	78	45	100
3	3	LSL	1.4	25	74	1.1	5	0.5	1.3	123	370	98	293	68	28	100
16	0	DRY	7.6	68	1096	16.3										100
1	0	NS	0.5	19	19	0.3										

Total Units
210

Total Units Fully Measured
96

Total Length (ft.)
6715

Total Area (sq.ft.)
23565

Total Volume (cu.ft.)
13286

Table 3 - Summary of Pool Types

Stream Name: South Fork Bear Haven Creek

LLID: 1236701395604

Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS29

Latitude: 39:33:37.0N

Longitude: 123:40:12.0W

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
84	84	MAIN	97	18	1551	95	8.0	0.6	148	12422	91	7675	43
3	3	SCOUR	3	25	74	5	5.0	0.5	123	370	68	205	28

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
87	87	1625	12792	7879

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

Stream Name: South Fork Bear Haven Creek

LLID: 1236701395604

Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS29

Latitude: 39:33:37.0N

Longitude: 123:40:12.0W

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
81	MCP	93	21	26	50	62	9	11	1	1	0	0
2	CCP	2	2	100	0	0	0	0	0	0	0	0
1	STP	1	0	0	1	100	0	0	0	0	0	0
3	LSL	3	0	0	3	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
87	23	26	54	62	9	10	1	1	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: South Fork Bear Haven Creek

LLID: 1236701395604

Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Dry Units: 16

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS29

Latitude: 39:33:37.0N

Longitude: 123:40:12.0W

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
30	2	LGR	0	0	0	0	0	0	0	0	0
8	1	HGR	0	0	0	0	0	0	0	0	0
1	1	CAS	0	0	0	0	0	0	0	100	0
39	4	TOTAL RIFFLE	0	0	0	0	0	0	0	100	0
13	2	RUN	0	100	0	0	0	0	0	0	0
54	3	SRN	3	13	13	3	0	0	0	67	0
67	5	TOTAL FLAT	2	48	8	2	0	0	0	40	0
81	81	MCP	13	32	42	3	0	0	0	8	1
2	2	CCP	0	75	25	0	0	0	0	0	0
1	1	STP	10	30	35	15	0	0	0	10	0
3	3	LSL	0	10	85	3	0	0	0	2	0
87	87	TOTAL POOL	13	32	43	3	0	0	0	8	1
1	0	NS									
210	96	TOTAL	12	33	41	3	0	0	0	10	1

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: South Fork Bear Haven Creek

LLID: 1236701395604

Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Dry Units: 16

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS29

Latitude: 39:33:37.0N

Longitude: 123:40:12.0W

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
30	2	LGR	0	0	100	0	0	0	0
8	1	HGR	0	0	100	0	0	0	0
1	1	CAS	0	0	0	0	0	100	0
13	2	RUN	0	0	100	0	0	0	0
54	3	SRN	0	0	100	0	0	0	0
81	81	MCP	38	0	57	4	0	1	0
2	2	CCP	0	0	50	50	0	0	0
1	1	STP	100	0	0	0	0	0	0
3	3	LSL	0	0	67	33	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: South Fork Bear Haven Creek

LLID: 1236701395604

Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS29

Latitude: 39:33:37.0N

Longitude: 123:40:12.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
99	61	39	0	97	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: South Fork Bear Haven Creek LLID: 1236701395604 Drainage: Rockport
 Survey Dates: 10/3/2012 to 10/10/2012 Survey Length (ft.): 6715 Main Channel (ft.): 6715 Side Channel (ft.): 0
 Confluence Location: Quad: DUTCHMANS Legal Description: T20NR16WS29 Latitude: 39:33:37.0N Longitude: 123:40:12.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: G4	Canopy Density (%): 98.3	Pools by Stream Length (%): 31.6
Reach Length (ft.): 3593	Coniferous Component (%): 64.1	Pool Frequency (%): 44.3
Riffle/Flatwater Mean Width (ft.): 3.8	Hardwood Component (%): 35.9	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 83
Range (ft.): 9 to 17	Vegetative Cover (%): 98.3	2 to 2.9 Feet Deep: 15
Mean (ft.): 11	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 2
Std. Dev.: 2	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 41	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 49 - 52 Air (F): 41 - 66	LWD per 100 ft.:	Mean Pool Shelter Rating: 41
Dry Channel (ft): 522	Riffles: 2	
	Pools: 11	
	Flat: 4	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 2 Gravel: 81 Sm Cobble: 15 Lg Cobble: 2 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 35.2 3. 51.9 4. 11.1 5. 1.9		

STREAM REACH: 2

Channel Type: A3	Canopy Density (%): 100.0	Pools by Stream Length (%): 15.7
Reach Length (ft.): 3122	Coniferous Component (%): 55.0	Pool Frequency (%): 37.5
Riffle/Flatwater Mean Width (ft.): 9.0	Hardwood Component (%): 45.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 97
Range (ft.): 8 to 18	Vegetative Cover (%): 97.8	2 to 2.9 Feet Deep: 3
Mean (ft.): 12	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 3	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 37	Mean Max Residual Pool Depth (ft.): 1.1
Water (F): 49 - 50 Air (F): 49 - 58	LWD per 100 ft.:	Mean Pool Shelter Rating: 46
Dry Channel (ft): 574	Riffles: 5	
	Pools: 16	
	Flat: 7	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 70 Sm Cobble: 27 Lg Cobble: 3 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 18.2 3. 72.7 4. 9.1 5. 0.0		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: South Fork Bear Haven Creek

LLID: 1236701395604

Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS29

Latitude: 39:33:37.0N

Longitude: 123:40:12.0W

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	7	1	4.1
Boulder	3	1	2.1
Cobble / Gravel	62	74	70.1
Sand / Silt / Clay	25	21	23.7

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	1	0	0.5
Brush	35	37	37.1
Hardwood Trees	19	17	18.6
Coniferous Trees	42	43	43.8
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 3

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

StreamName: South Fork Bear Haven Creek

LLID: 1236701395604

Drainage: Rockport

Survey Dates: 10/3/2012 to 10/10/2012

Confluence Location: Quad: DUTCHMANS

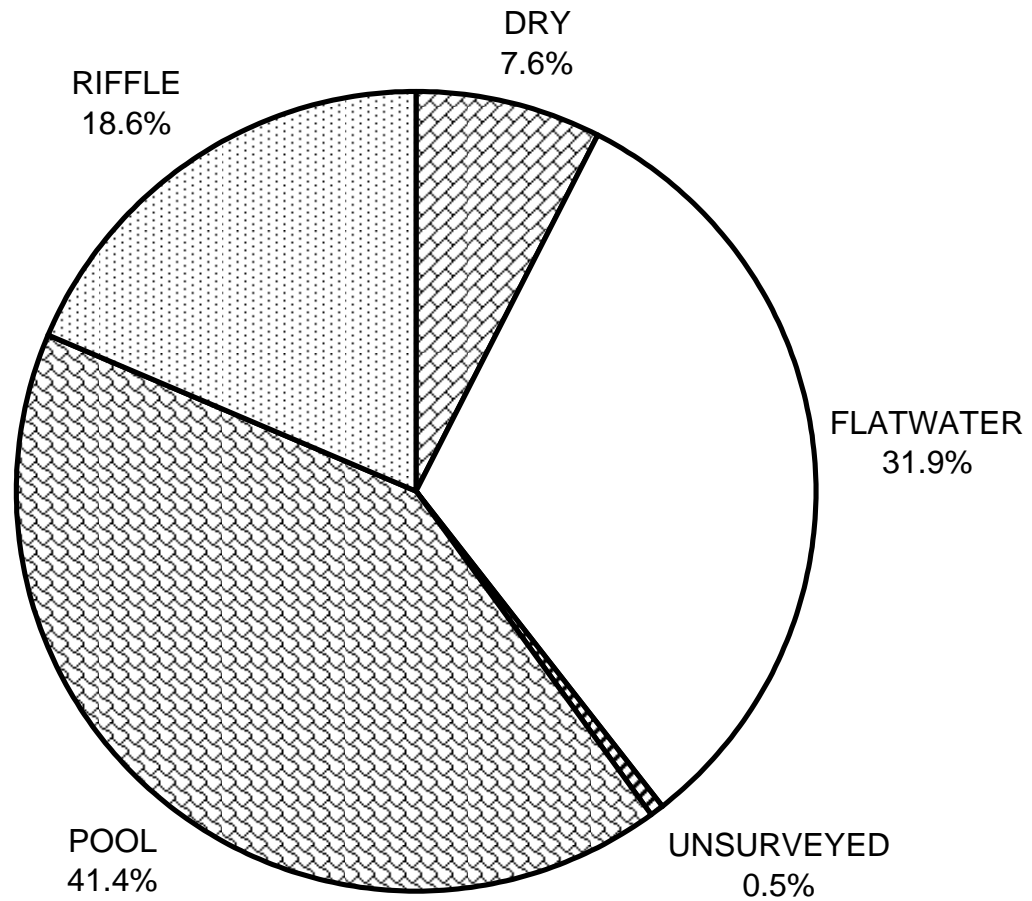
Legal Description: T20NR16WS29

Latitude: 39:33:37.0N

Longitude: 123:40:12.0W

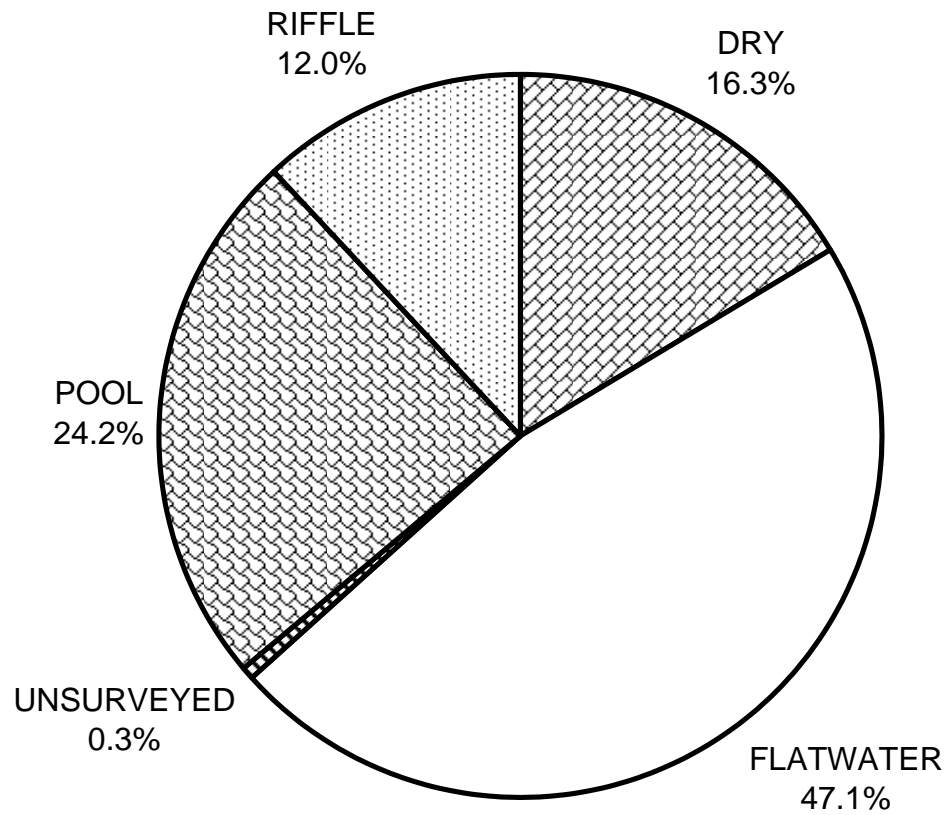
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	2	13
SMALL WOODY DEBRIS (%)	0	48	32
LARGE WOODY DEBRIS (%)	0	8	43
ROOT MASS (%)	0	2	3
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	100	40	8
BEDROCK LEDGES (%)	0	0	1

SOUTH FORK BEAR HAVEN CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



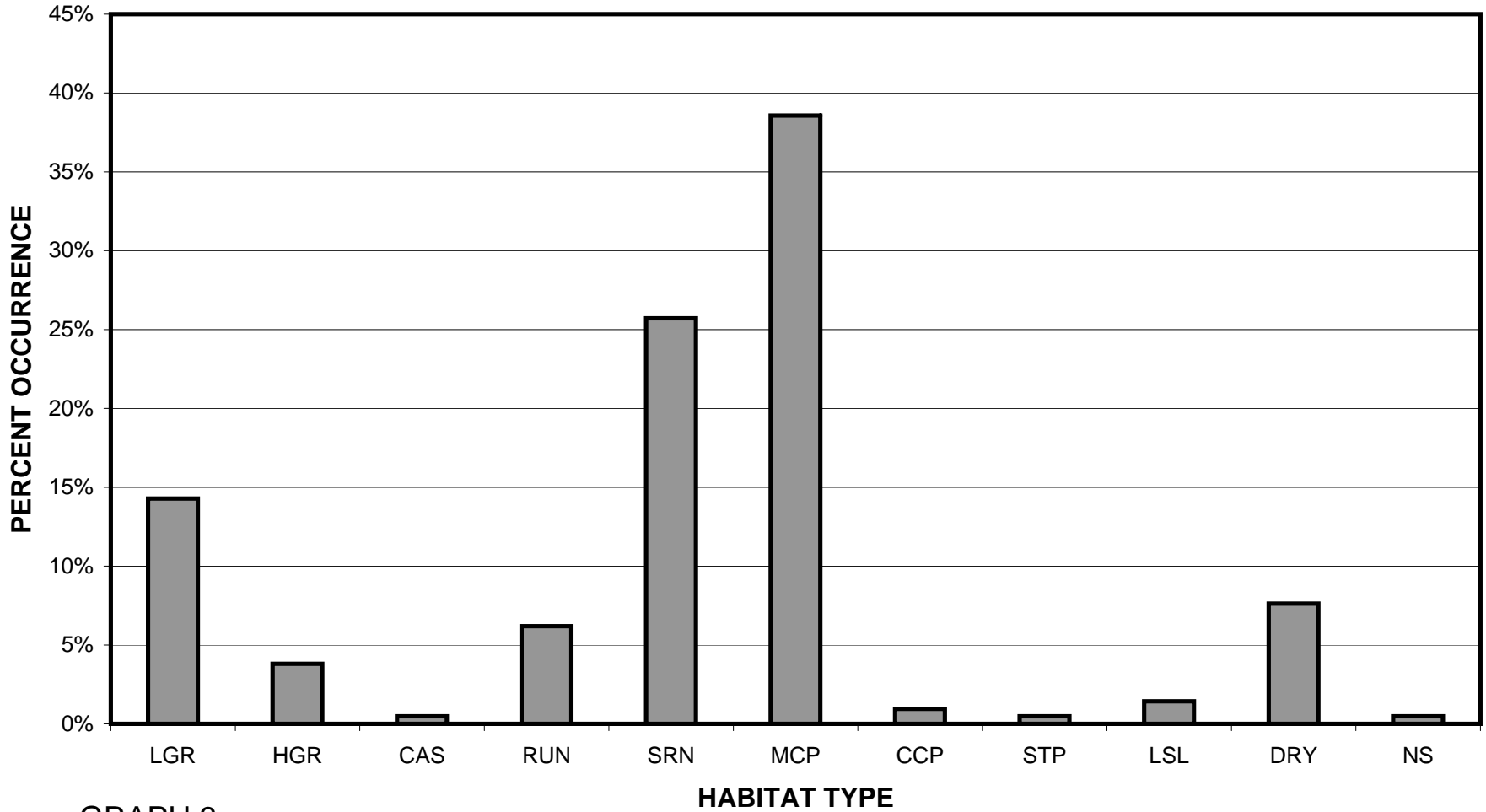
GRAPH 1

SOUTH FORK BEAR HAVEN CREEK 2012 HABITAT TYPES BY PERCENT TOTAL LENGTH



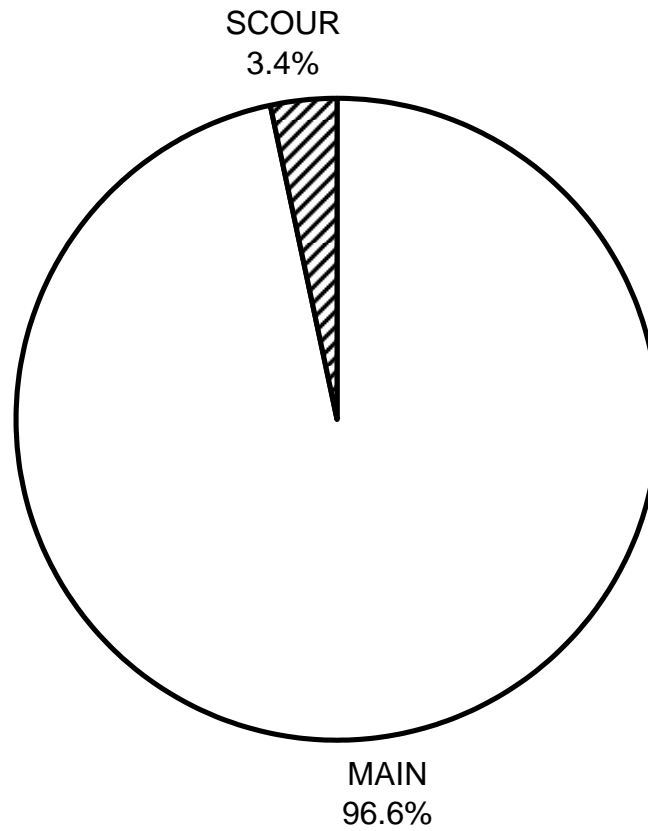
GRAPH 2

SOUTH FORK BEAR HAVEN CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



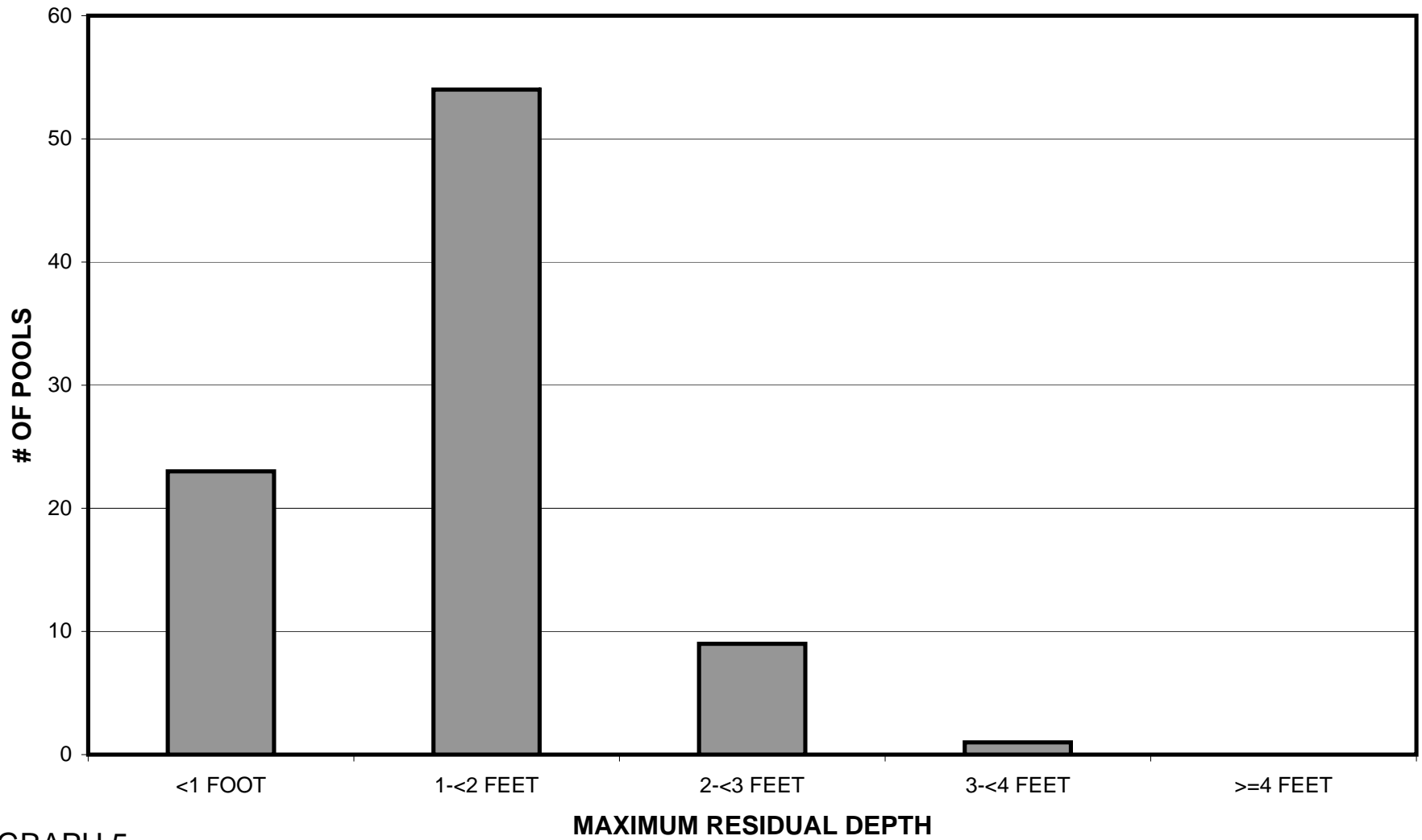
GRAPH 3

SOUTH FORK BEAR HAVEN CREEK 2012 POOL TYPES BY PERCENT OCCURRENCE



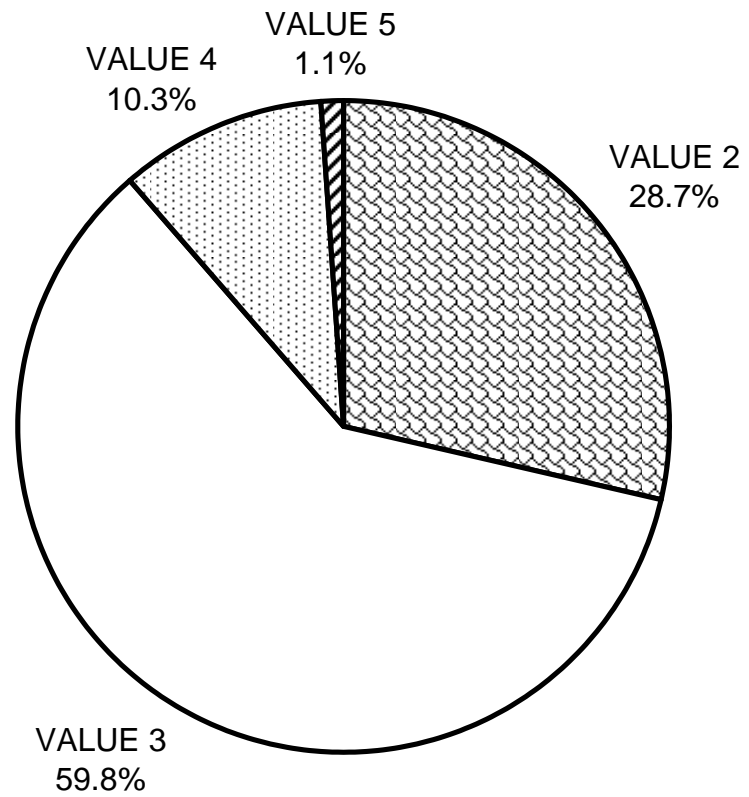
GRAPH 4

SOUTH FORK BEAR HAVEN CREEK 2012 MAXIMUM DEPTH IN POOLS



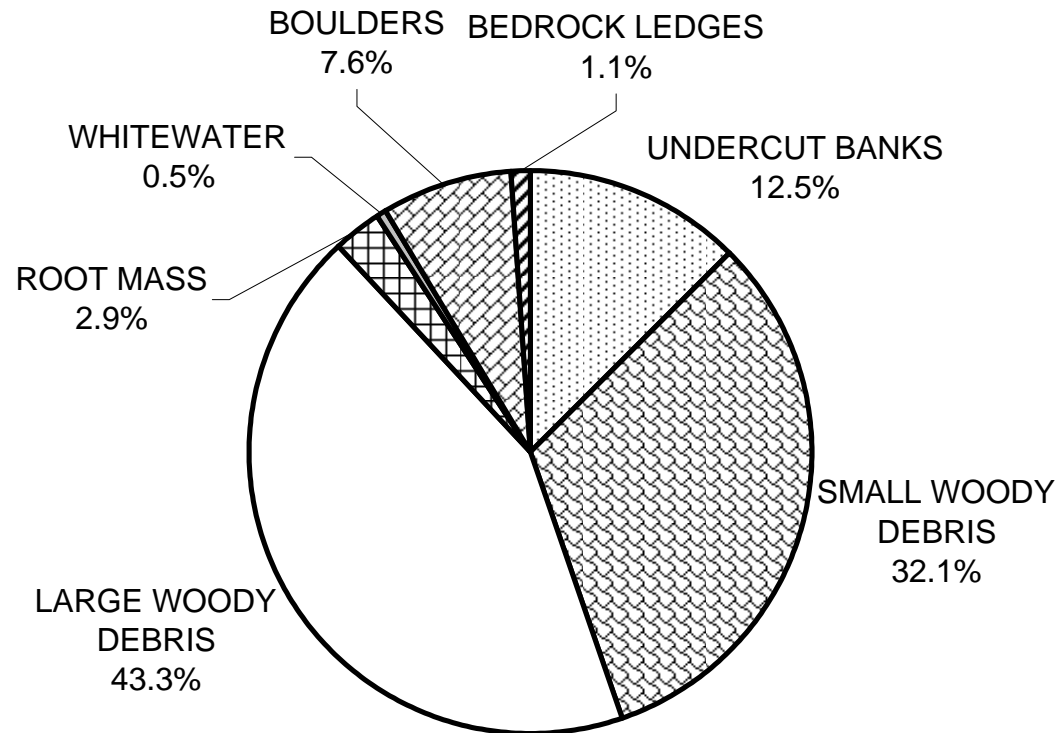
GRAPH 5

SOUTH FORK BEAR HAVEN CREEK 2012 PERCENT EMBEDDEDNESS



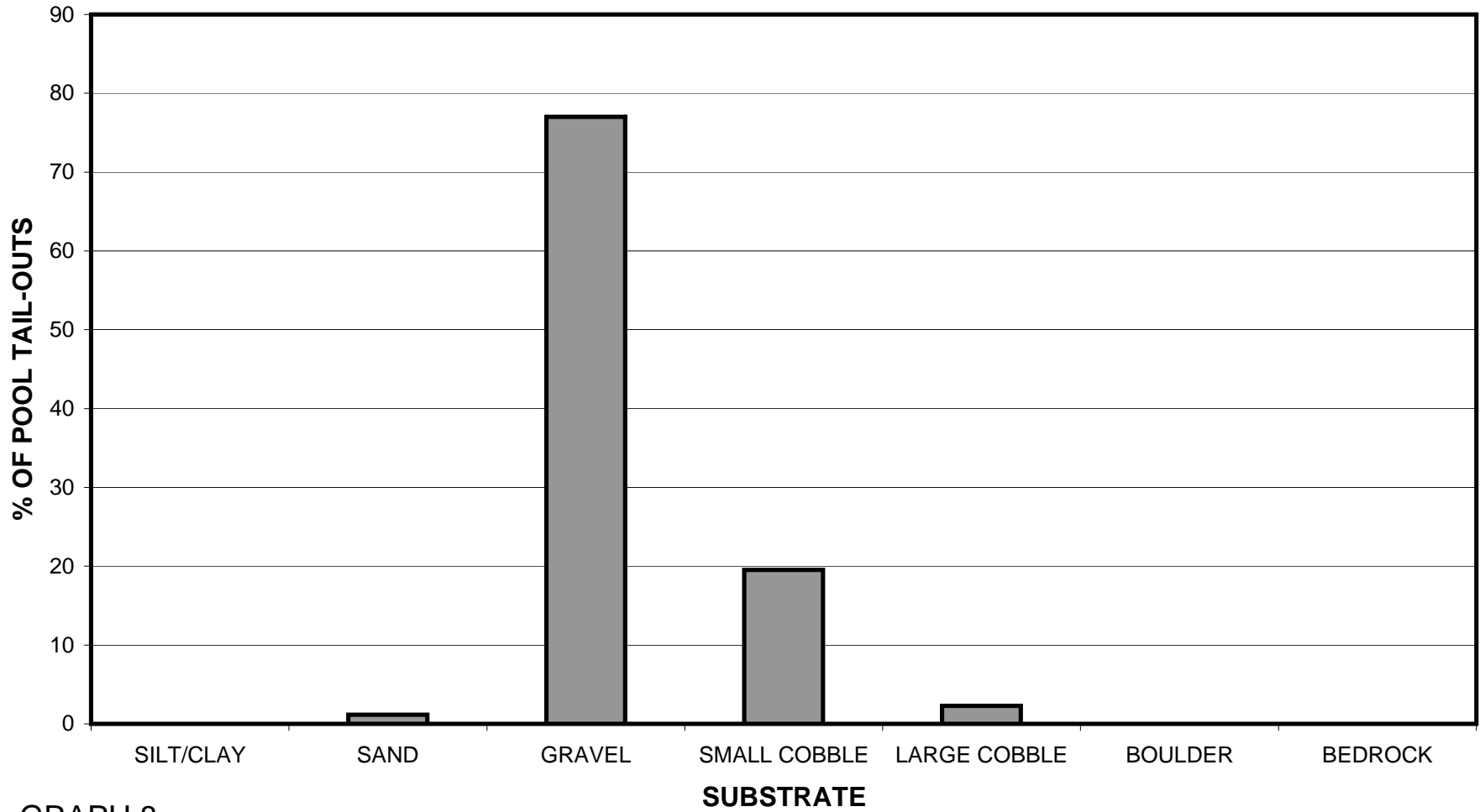
GRAPH 6

SOUTH FORK BEAR HAVEN CREEK 2012 MEAN PERCENT COVER TYPES IN POOLS



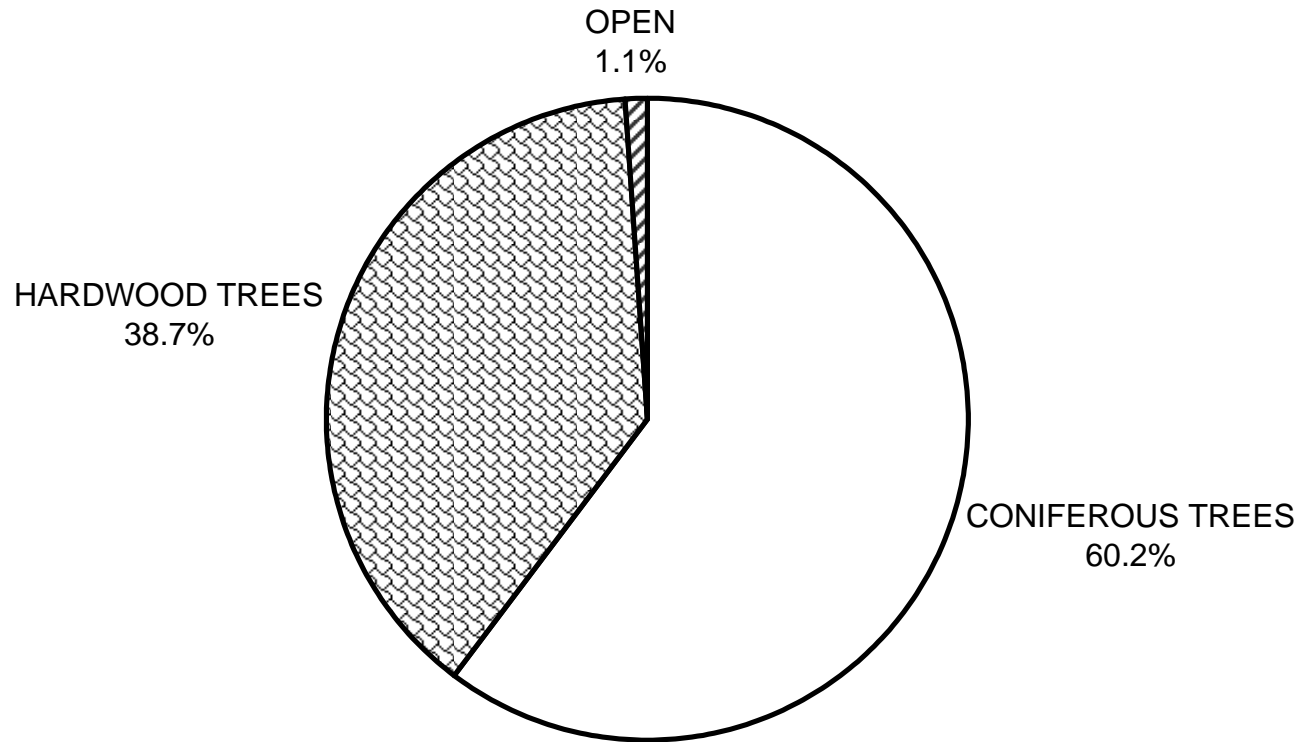
GRAPH 7

SOUTH FORK BEAR HAVEN CREEK 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



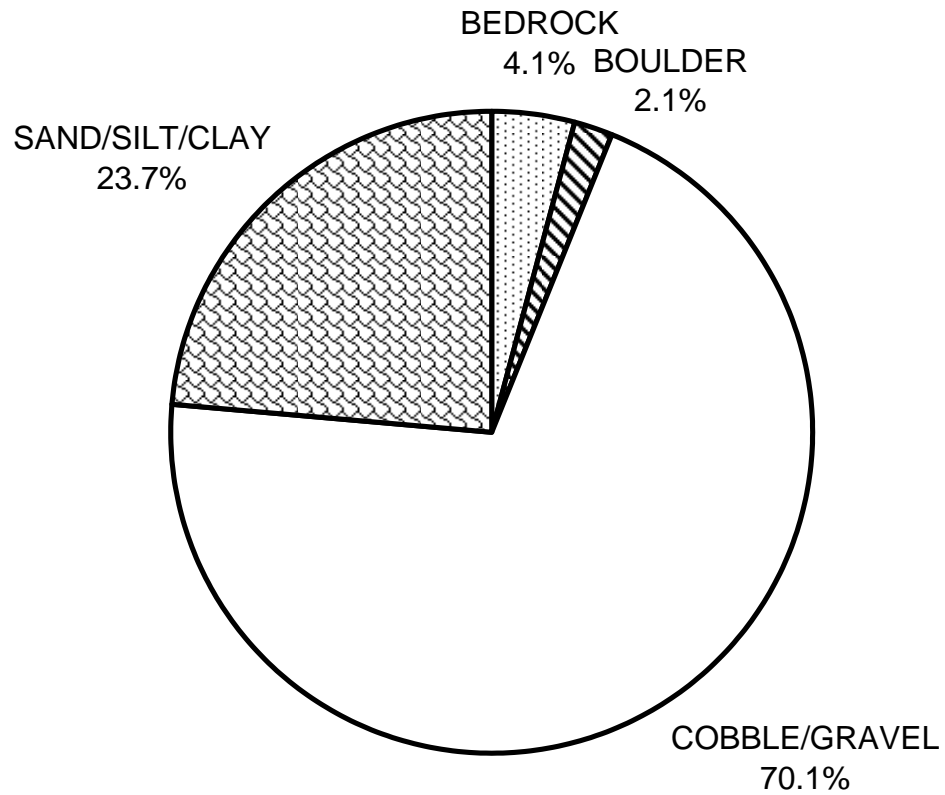
GRAPH 8

**SOUTH FORK BEAR HAVEN CREEK 2012
MEAN PERCENT CANOPY**



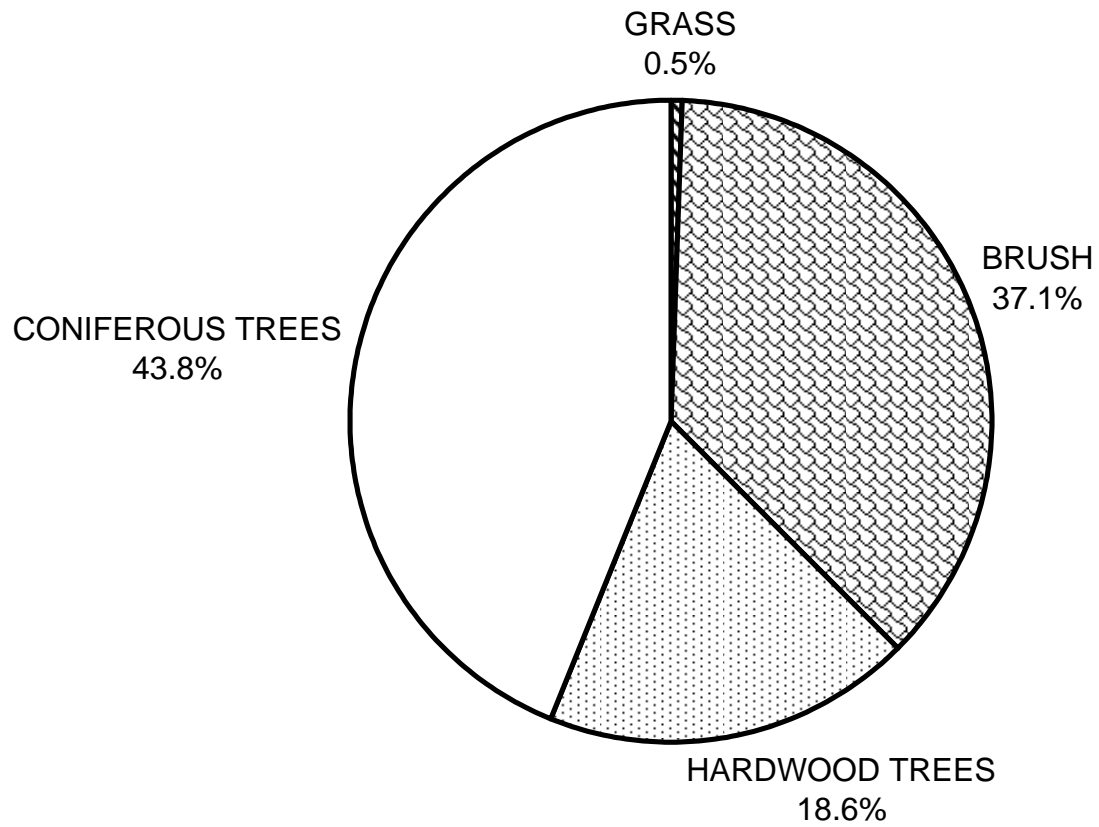
GRAPH 9

**SOUTH FORK BEAR HAVEN CREEK 2012
DOMINANT BANK COMPOSITION IN SURVEY REACH**



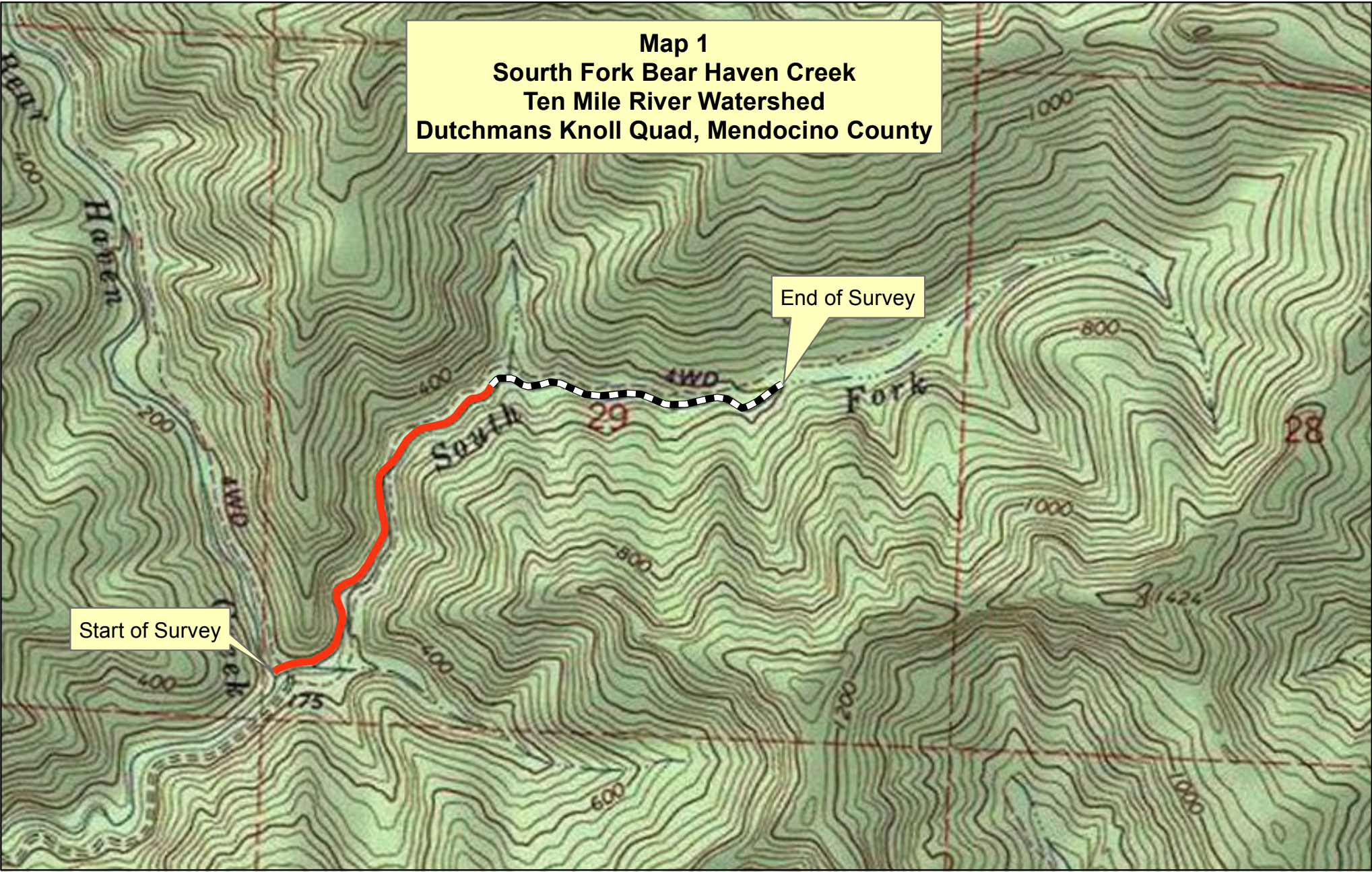
GRAPH 10



**SOUTH FORK BEAR HAVEN CREEK 2012
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

Map 1
South Fork Bear Haven Creek
Ten Mile River Watershed
Dutchmans Knoll Quad, Mendocino County



-  Reach 1, Channel Type G4
-  Reach 2, Channel Type A3

