

STREAM INVENTORY REPORT

Bear Gulch

INTRODUCTION

A stream inventory was conducted from June 14 to June 22, 2010 on Bear Gulch. The survey began at the confluence with South Fork Noyo River and extended upstream 1.3 miles.

The Bear Gulch 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 Bear Gulch. 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

Bear Gulch is a tributary to South Fork Noyo River, tributary to Noyo River, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Bear Gulch's legal description at the confluence with South Fork Noyo River is T18N R16W S29. Its location is 39.3844 north latitude and 123.6741 west longitude, LLID number 1236730393844. Bear Gulch is a first order stream and has approximately 0.74 miles of blue line stream according to the USGS Noyo Hill 7.5 minute quadrangle. Bear Gulch drains a watershed of approximately 1.06 square miles. Elevations range from about 140 feet at the mouth of the creek to 900 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is located within Jackson Demonstration State Forest and is managed for timber production. Vehicle access exists via California Department of Forestry and Fire Protection (CDF) Road 300.

METHODS

The habitat inventory conducted in Bear Gulch 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.

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

Bear Gulch

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 Bear Gulch 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". Bear Gulch 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.

Bear Gulch

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 Bear Gulch, 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 unsuited 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 Bear Gulch, 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 Bear Gulch, 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 Bear Gulch, 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.

Bear Gulch

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 Bear Gulch. In addition, underwater observations were made at 28 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

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

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

Bear Gulch

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Bear Gulch 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 14 to June 22, 2010, was conducted by B. Williams and A. Glasgow (WSP), and I. Mikus (DFG). The total length of the stream surveyed was 7,116 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.19 cfs on June 15, 2010.

Bear Gulch is a F4 channel type for 6,263 feet of the stream surveyed (Reach 1), and a G4 channel type for 853 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. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 50 to 55 degrees Fahrenheit. Air temperatures ranged from 47 to 63 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% pool units, 30% flatwater units, and 30% riffle units (Graph 1). Based on total length of Level II habitat types there were 43% flatwater units, 26% riffle units, 30% pool units, and 1% culvert units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 36%; low gradient riffle units, 27%; and run units 18% (Graph 3). Based on percent total length, mid-channel pool units made up 28%, step run units 27%, and low gradient riffle units 24%.

Bear Gulch

A total of 111 pools were identified (Table 3). Main channel pools were the most frequently encountered at 95% (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. Fourteen of the 111 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 111 pool tail-outs measured, 38 had a value of 1 (34.2%); 40 had a value of 2 (36%); 23 had a value of 3 (20.7%); 5 had a value of 4 (4.5%); 5 had a value of 5 (4.5%) (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 unsuited 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 0, flatwater habitat types had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 25 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 26. Scour pools had a mean shelter rating of 18 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Bear Gulch. Graph 7 describes the pool cover in Bear Gulch. 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 88% of the pool tail-outs. Bedrock was the next most frequently observed dominant substrate type and occurred in 7% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Bear Gulch was 97%. Three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 10% and 90%, respectively. Graph 9 describes the mean percent canopy in Bear Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 96%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 96% sand/silt/clay and 3% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 54% of the units surveyed. Additionally, 25% of the units surveyed had brush as the dominant vegetation type, and 16% had deciduous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 28 sites for species composition and distribution in Bear Gulch on June 21, 2010. Water temperatures taken during the survey period of 1200 to

Bear Gulch

1340 ranged from 53 to 54 degrees Fahrenheit. Air temperatures ranged from 68 to 69 degrees Fahrenheit. The sites were sampled by I. Mikus (DFG), and B. Williams (WSP).

In reach 1, which comprised the first 6,279 feet of stream, 28 sites were sampled. The reach sites yielded 1 young-of-the-year steelhead/rainbow trout (SH/RT), 3 age 1+ SH/RT, 2 coho salmon, and 2 sculpin.

The following chart displays the information yielded from these sites:

2010 Bear Gulch 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									
06/21/10	1	006	Pool	198	0	0	0	0	0
	2	009	Pool	294	0	0	0	0	0
	3	010	Pool	326	0	0	0	0	0
	4	012	Pool	357	0	1	0	2	0
	5	014	Pool	418	0	0	0	0	0
	6	016	Pool	484	0	0	0	0	0
	7	018	Pool	521	0	0	0	0	0
	8	025	Pool	684	0	0	0	0	0
	9	027	Pool	706	0	0	0	0	0
	10	031	Pool	814	0	0	0	0	0
	11	036	Pool	1185	0	0	0	0	0
	12	051	Pool	1545	0	0	0	0	0
	13	052	Pool	1583	0	0	0	0	0
	14	058	Pool	1792	0	0	0	0	0
	15	070	Pool	2117	0	0	0	0	0
	16	078	Pool	2274	0	0	0	0	0
	17	081	Pool	2336	0	0	0	0	0
	18	099	Pool	2910	0	0	0	0	0
	19	110	Pool	3232	0	1	0	0	0
	20	166	Riffle	4521	0	0	0	0	0
	21	167	Pool	4532	1	0	0	0	0
	22	169	Pool	4561	0	1	0	0	0
	23	186	Pool	4969	0	0	0	0	0
	24	190	Pool	5061	0	0	0	0	0

Bear Gulch

	25	204	Pool	5313	0	0	0	0	0
	26	208	Pool	5399	0	0	0	0	0
	27	220	Pool	5587	0	0	0	0	0
	28	233	Pool	5993	0	0	0	0	0

DISCUSSION

Bear Gulch is an F4 channel type for the first 6,263 feet of stream surveyed (Reach 1), and a G4 channel type for the remaining 853 feet (Reach 2). The suitability of F4 and G4 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. G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days June 14 to June 22, 2010, ranged from 50 to 55 degrees Fahrenheit. Air temperatures ranged from 47 to 63 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 43% of the total length of this survey, riffles 26%, and pools 30%. Fourteen of the 111 (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.

Seventy-eight of the 111 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-eight of the pool tail-outs had embeddedness ratings of 3 or 4. Five of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Bear Gulch should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Ninety-eight of the 111 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 11. 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 Bear Gulch. 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

Bear Gulch

structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 97%. Reach 1 had a canopy density of 96%, Reach 2 had a canopy density of 96%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 96% and 96%, 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) Bear Gulch 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) 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 large woody debris. 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:
0	0001.00	Start of survey at the confluence with the South Fork Noyo River. The channel is an F4.
64	0004.00	Road 300 crosses the channel. Crossing is a 7.5' high x 10' wide x 49' long corrugated metal pipe and possible barrier to juvenile salmonids. The slope of the culvert is one percent. The maximum depth within five feet of the culvert outlet is 0.8 feet.

Bear Gulch

113	0005.00	There is a 6' high x 50' long area of exposed substrate on the right bank.
534	0020.00	Tributary #01 enters on the left bank. It contributes to approximately 5% of Bear Gulch's flow. The water temperature downstream and upstream of the tributary is 54 degrees Fahrenheit; the water temperature of the tributary is 54 degrees Fahrenheit. The slope of the tributary is approximately 3%. The tributary is accessible to fish. No fish were observed in the tributary.
799	0031.00	An erosion site on the right bank measuring 5' high x 15' long is contributing fine sediment and gravel to the channel.
1293	0043.00	Log debris accumulation (LDA) #01 contains eight pieces of large woody debris (LWD) and measures 4' high x 27' wide x 10' long. Water flows through and there are no visible gaps in the LDA. Retained sediment ranges from sand to gravel and measures 20' wide x 30' long x 3' deep. Fish are present above the LDA. An erosion site on the left bank measures 45' high x 60' long. It is being revegetated by ferns.
1486	0049.00	LDA #02 contains eight pieces of LWD and measures 2' high x 16' wide x 10' long. Water flows through and there are visible gaps in the LDA. Retained sediment ranges from sand to gravel and measures 30' wide x 12' long x 1.5' deep. Fish are present above the LDA.
1730	0058.00	LDA #03 contains nine pieces of LWD and measures 5' high x 29' wide x 9' long. Water flows through and there are no visible gaps in the LDA. Retained sediment ranges from sand to gravel and measures 20' wide x 25' long x 2.5' deep. Fish are present above the LDA.
2104	0070.00	LDA #04 contains three pieces of LWD and measures 4.5' high x 14' wide x 2' long. Water flows through and there are visible gaps in the LDA. Retained sediment ranges from sand to gravel and measures 15' wide x 20' long x 2' deep. Fish are present above the LDA.
2529	0089.00	There is a dry tributary on the right bank.
2722	0095.00	There is a 1.0' high plunge over a log.
3021	0105.00	Tributary #02 enters on the right bank. It contributes to approximately 5% of Bear Gulch's flow. The water temperature downstream of the tributary is 52 degrees Fahrenheit, the water temperature of the tributary is 53 degrees Fahrenheit, and the water temperature upstream of the confluence is 51 degrees Fahrenheit. The slope of the tributary is approximately 6%. The tributary is not accessible to fish.

Bear Gulch

3216	0110.00	An erosion site on the left bank measuring 25' high x 25' long is contributing minimal sediment to the channel.
3894	0137.00	An erosion site on the left bank measuring 25' high x 25' long is contributing sediment to the channel.
3945	0141.00	LDA #05 contains nine pieces of LWD and measures 4' high x 10' wide x 16' long. Water flows through and there are visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 15' wide x 20' long x 2' deep. Fish are present above the LDA.
3959	0142.00	LDA #05.
3985	0144.00	There is a 2.1' high plunge.
4393	0160.00	Tributary #03 enters on the right bank. It contributes to approximately 5% of Bear Gulch's flow. The water temperature downstream of the tributary is 53 degrees Fahrenheit, the water temperature of the tributary is 53 degrees Fahrenheit, and the water temperature upstream of the confluence is 54 degrees Fahrenheit. The slope of the tributary is approximately 8%. The tributary is not accessible to fish.
4941	0185.00	Left bank seep.
5174	0197.00	Tributary #04 enters on the left bank. It contributes to approximately 5% of Bear Gulch's flow. The water temperature downstream and upstream of the tributary is 51 degrees Fahrenheit; the water temperature of the tributary is 53 degrees Fahrenheit. The slope of the tributary is approximately 2%. The tributary is not accessible to fish.
5243	0202.00	There is a left bank seep.
6263	0246.00	The channel changes from an F4 to a G4.
6473	0256.00	LDA #06 contains six pieces of LWD and measures 3' high x 7' wide x 13' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 15' wide x 25' long x 1.5' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
6547	0259.00	LDA #07 contains four pieces of LWD and measures 5' high x 11' wide x 15' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 15' wide x 10' long x 3' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.

Bear Gulch

- 6657 0264.00 LDA #08 contains three pieces of LWD and measures 5.5' high x 8' wide x 5' long. Retained sediment ranges from silt to gravel and measures 10' wide x 10' long x 3' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
- 7116 0284.00 End of survey due to diminished habitat. The creek separates into two separate channels. There is minimal habitat upstream of the divide. Each channel has a plunge with no jump pool below.

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.

Bear Gulch

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: Bear Gulch

LLID: 1236730393844 Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS29 Latitude: 39:23:04.0N Longitude: 123:40:23.0W

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
1	0	CULVERT	0.4	49	49	0.7									
85	13	FLATWATER	29.9	36	3069	43.1	5.0	0.3	0.7	132	11197	44	3758		11
1	0	NOSURVEY	0.4	16	16	0.2									
111	111	POOL	39.1	19	2134	30.0	7.8	0.6	1.4	148	16468	131	14509	99	25
86	13	RIFFLE	30.3	21	1848	26.0	5.0	0.2	0.4	108	9264	23	2004		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
284	137				7116					36928			20272		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Bear Gulch

LLID: 1236730393844

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS29

Latitude: 39:23:04.0N

Longitude: 123:40:23.0W

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 (%)
77	11	LGR	27.1	22	1673	23.5	5	0.2	0.6	109	8387	20	1555		0	96
6	1	HGR	2.1	24	143	2.0	6	0.4	0.6	158	949	63	379		0	100
3	1	BRS	1.1	11	32	0.4	5	0.4	0.7	44	132	18	53		0	99
51	7	RUN	18.0	23	1161	16.3	5	0.4	0.9	82	4171	31	1562		1	97
34	6	SRN	12.0	56	1908	26.8	5	0.3	0.8	190	6460	60	2042		22	95
102	102	MCP	35.9	19	1964	27.6	8	0.6	3	146	14904	127	12928	95	25	97
1	1	CCP	0.4	16	16	0.2	8	0.6	0.9	128	128	102	102	77	10	94
2	2	STP	0.7	22	43	0.6	12	1.4	3.7	241	481	365	729	317	60	98
2	2	LSR	0.7	26	53	0.7	8	0.3	1.1	195	391	111	222	64	5	100
1	1	LSBk	0.4	19	19	0.3	11	0.2	1.1	167	167	84	84	33	5	98
3	3	PLP	1.1	13	39	0.5	10	0.7	2.3	132	397	148	444	115	32	99
1	0	CUL	0.4	49	49	0.7										
1	0	NS	0.4	16	16	0.2										

Total Units
284

Total Units Fully Measured
137

Total Length (ft.)
7116

Total Area (sq.ft.)
36566

Total Volume (cu.ft.)
20101

Table 3 - Summary of Pool Types

Stream Name: Bear Gulch

LLID: 1236730393844

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS29

Latitude: 39:23:04.0N

Longitude: 123:40:23.0W

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	95	19	2023	95	7.7	0.6	148	15513	99	10442	26
6	6	SCOUR	5	19	111	5	9.4	0.5	159	955	84	505	18

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
111	111	2134	16468	10948

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

Stream Name: Bear Gulch

LLID: 1236730393844

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS29

Latitude: 39:23:04.0N

Longitude: 123:40:23.0W

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
102	MCP	92	11	11	79	77	11	11	1	1	0	0
1	CCP	1	1	100	0	0	0	0	0	0	0	0
2	STP	2	0	0	1	50	0	0	1	50	0	0
2	LSR	2	1	50	1	50	0	0	0	0	0	0
1	LSBk	1	0	0	1	100	0	0	0	0	0	0
3	PLP	3	1	33	1	33	1	33	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
111	14	13	83	75	12	11	2	2	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Bear Gulch

LLID: 1236730393844

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Dry Units: 0

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS29

Latitude: 39:23:04.0N

Longitude: 123:40:23.0W

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
77	11	LGR	0	0	0	0	0	0	0	0	0
6	1	HGR	0	0	0	0	0	0	0	0	0
3	1	BRS	0	0	0	0	0	0	0	0	0
86	13	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
51	7	RUN	70	0	0	30	0	0	0	0	0
34	6	SRN	50	30	20	0	0	0	0	0	0
85	13	TOTAL FLAT	57	20	13	10	0	0	0	0	0
102	102	MCP	17	26	42	10	0	0	5	0	0
1	1	CCP	0	20	80	0	0	0	0	0	0
2	2	STP	20	5	30	8	0	0	35	0	3
2	2	LSR	0	60	0	40	0	0	0	0	0
1	1	LSBk	0	40	10	0	0	0	0	0	50
3	3	PLP	13	28	17	3	0	0	38	0	0
111	111	TOTAL POOL	16	26	41	10	0	0	6	0	1
1	0	CUL									
1	0	NS									
284	137	TOTAL	17	26	40	10	0	0	6	0	1

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Bear Gulch

LLID: 1236730393844

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Dry Units: 0

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS29

Latitude: 39:23:04.0N

Longitude: 123:40:23.0W

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
77	11	LGR	0	0	100	0	0	0	0
6	1	HGR	0	0	100	0	0	0	0
3	1	BRS	0	0	0	0	0	0	100
51	7	RUN	0	0	100	0	0	0	0
34	6	SRN	0	0	100	0	0	0	0
102	102	MCP	2	10	84	0	0	0	4
1	1	CCP	0	0	100	0	0	0	0
2	2	STP	0	0	50	0	0	0	50
2	2	LSR	0	0	100	0	0	0	0
1	1	LSBk	0	0	100	0	0	0	0
3	3	PLP	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Bear Gulch

LLID: 1236730393844

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS29

Latitude: 39:23:04.0N

Longitude: 123:40:23.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
97	90	10	0	96	96

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: Bear Gulch LLID: 1236730393844 Drainage: Noyo River
 Survey Dates: 6/14/2010 to 6/22/2010 Survey Length (ft.): 7116 Main Channel (ft.): 7116 Side Channel (ft.): 0
 Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS29 Latitude: 39:23:04.0N Longitude: 123:40:23.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4	Canopy Density (%): 96.6	Pools by Stream Length (%): 31.3
Reach Length (ft.): 6263	Coniferous Component (%): 90.8	Pool Frequency (%): 39.6
Riffle/Flatwater Mean Width (ft.): 5.1	Hardwood Component (%): 9.2	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 86
Range (ft.): 5 to 13	Vegetative Cover (%): 95.9	2 to 2.9 Feet Deep: 12
Mean (ft.): 10	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 2
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 25	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 50 - 55 Air (F): 47 - 63	LWD per 100 ft.:	Mean Pool Shelter Rating: 24
Dry Channel (ft): 0	Riffles: 2	
	Pools: 6	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 1 Sand: 1 Gravel: 89 Sm Cobble: 0 Lg Cobble: 0 Boulder: 1 Bedrock: 8		
Embeddedness Values (%): 1. 37.1 2. 37.1 3. 17.5 4. 3.1 5. 5.2		

STREAM REACH: 2

Channel Type: G4	Canopy Density (%): 96.4	Pools by Stream Length (%): 20.6
Reach Length (ft.): 853	Coniferous Component (%): 88.5	Pool Frequency (%): 35.9
Riffle/Flatwater Mean Width (ft.): 4.5	Hardwood Component (%): 11.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 100
Range (ft.): 7 to 12	Vegetative Cover (%): 95.6	2 to 2.9 Feet Deep: 0
Mean (ft.): 9	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 38	Mean Max Residual Pool Depth (ft.): 1.1
Water (F): 52 - 54 Air (F): 52 - 60	LWD per 100 ft.:	Mean Pool Shelter Rating: 35
Dry Channel (ft): 0	Riffles: 8	
	Pools: 18	
	Flat: 8	
Pool Tail Substrate (%): Silt/Clay: 14 Sand: 0 Gravel: 86 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 14.3 2. 28.6 3. 42.9 4. 14.3 5. 0.0		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Bear Gulch

LLID: 1236730393844

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS29

Latitude: 39:23:04.0N

Longitude: 123:40:23.0W

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	1	0	0.4
Boulder	0	0	0.0
Cobble / Gravel	3	6	3.3
Sand / Silt / Clay	133	131	96.4

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	5	9	5.1
Brush	30	38	24.8
Hardwood Trees	24	19	15.7
Coniferous Trees	78	71	54.4
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Bear Gulch

LLID: 1236730393844

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/22/2010

Confluence Location: Quad: NOYO HILL

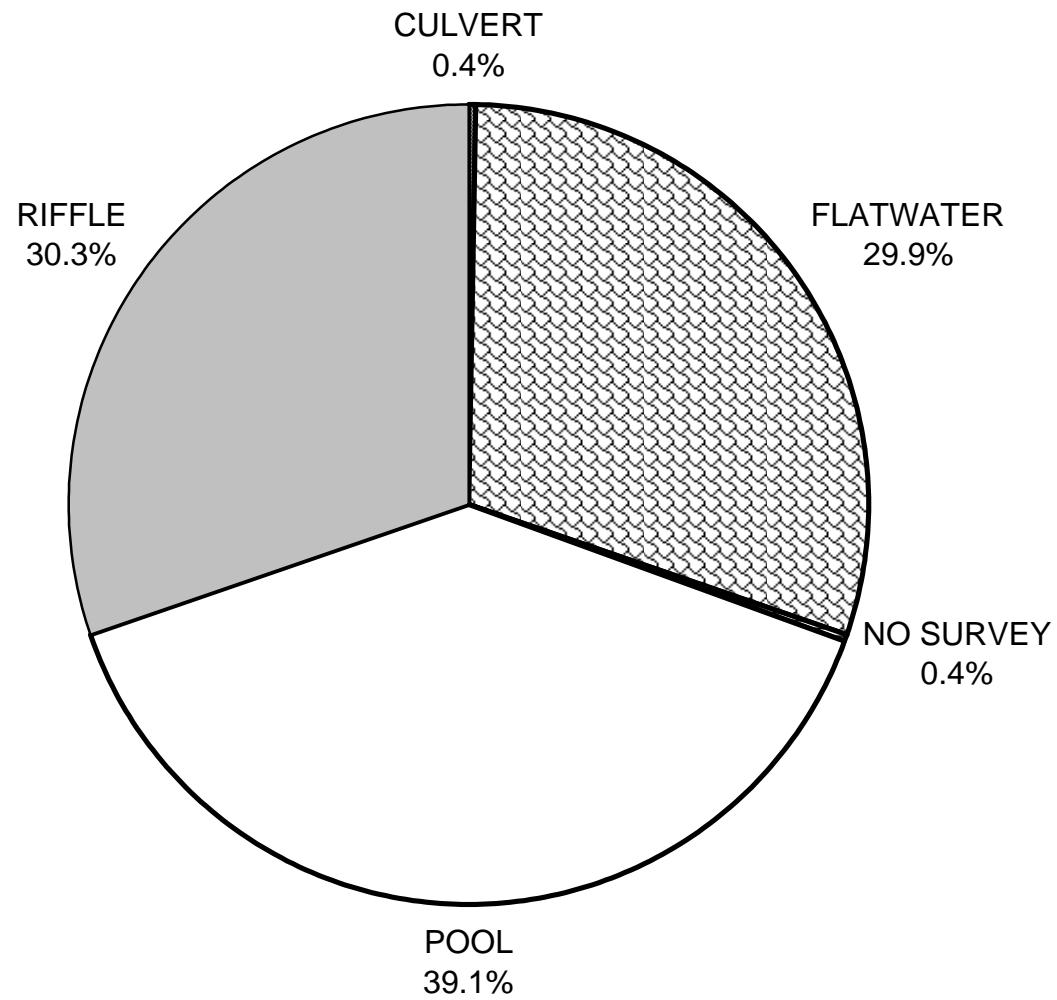
Legal Description: T18NR16WS29

Latitude: 39:23:04.0N

Longitude: 123:40:23.0W

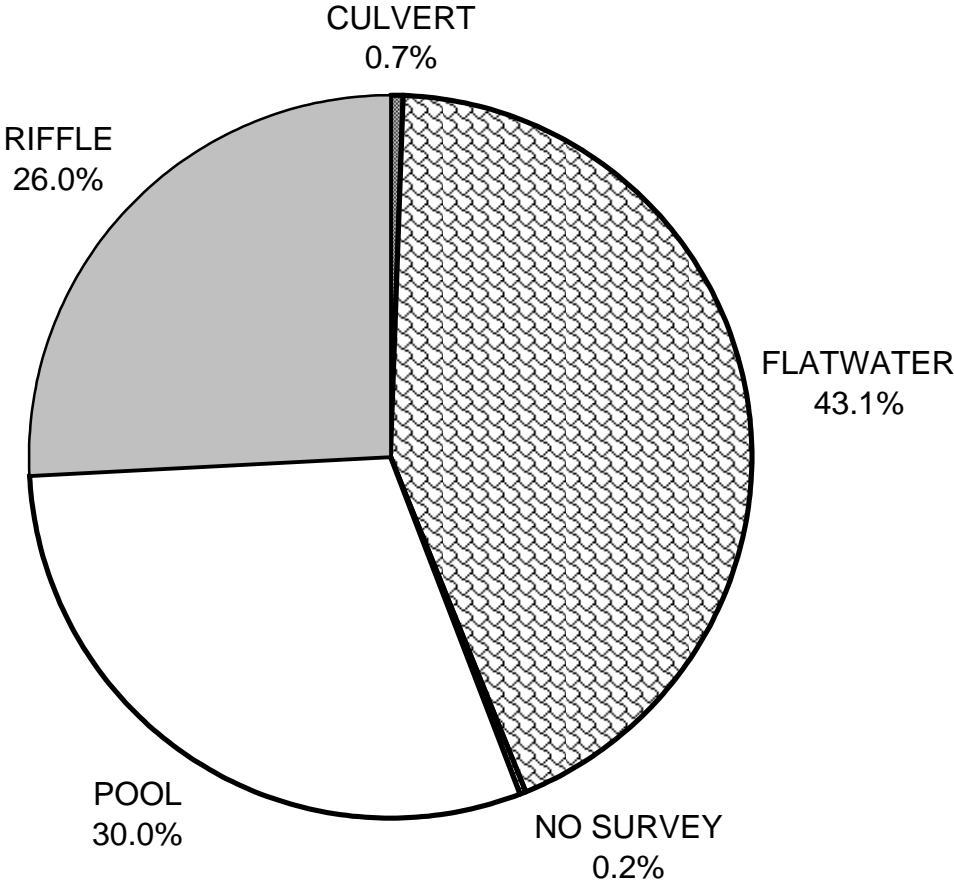
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	57	16
SMALL WOODY DEBRIS (%)	0	20	26
LARGE WOODY DEBRIS (%)	0	13	41
ROOT MASS (%)	0	10	10
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	6
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	1

BEAR GULCH 2010 HABITAT TYPES BY PERCENT OCCURRENCE



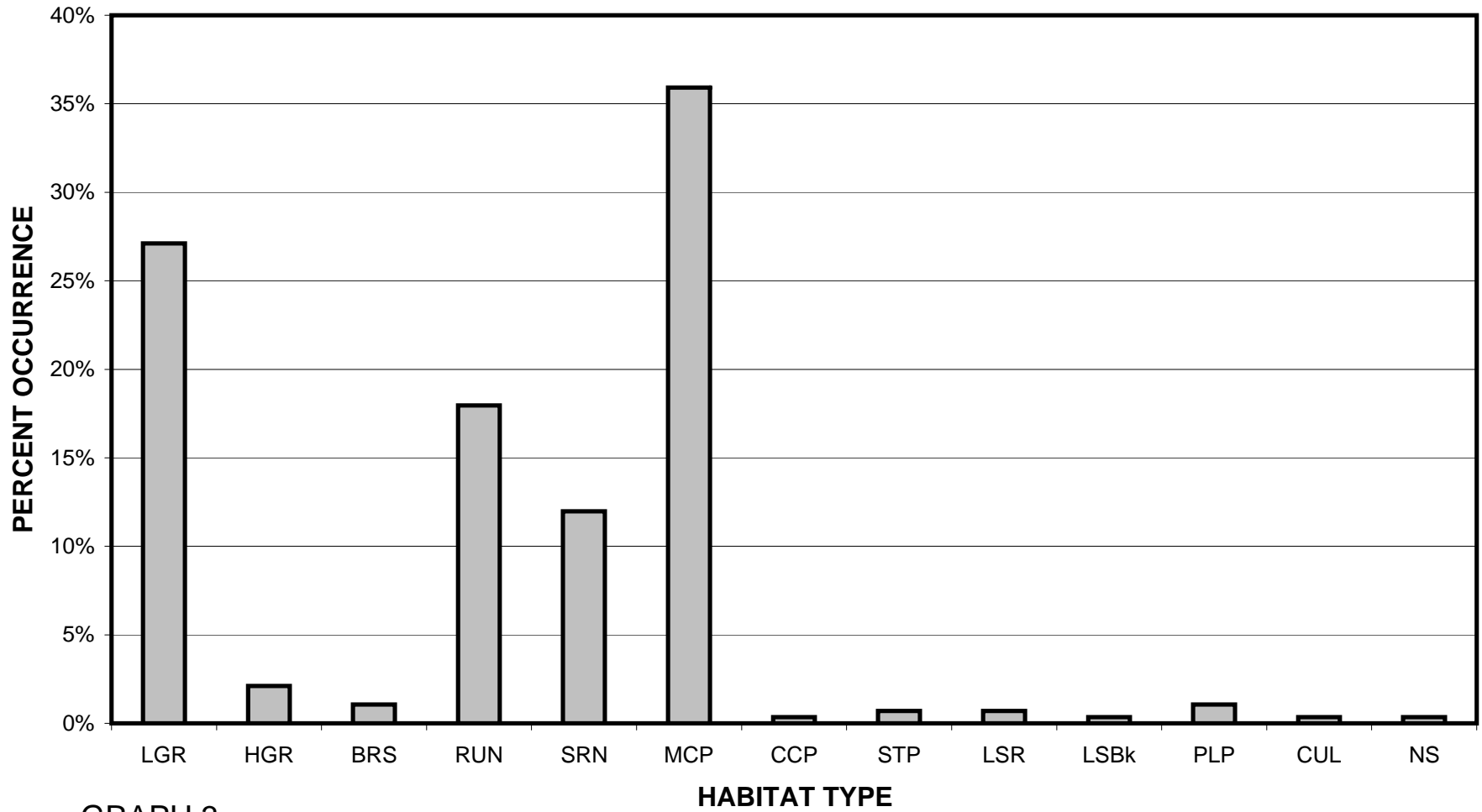
GRAPH 1

**BEAR GULCH 2010
HABITAT TYPES BY PERCENT TOTAL LENGTH**



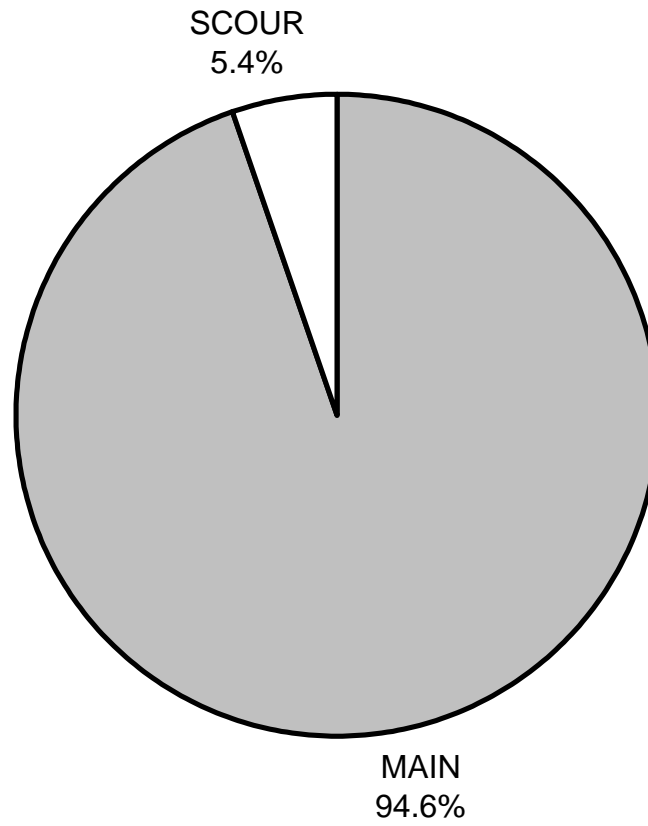
GRAPH 2

BEAR GULCH 2010 HABITAT TYPES BY PERCENT OCCURRENCE



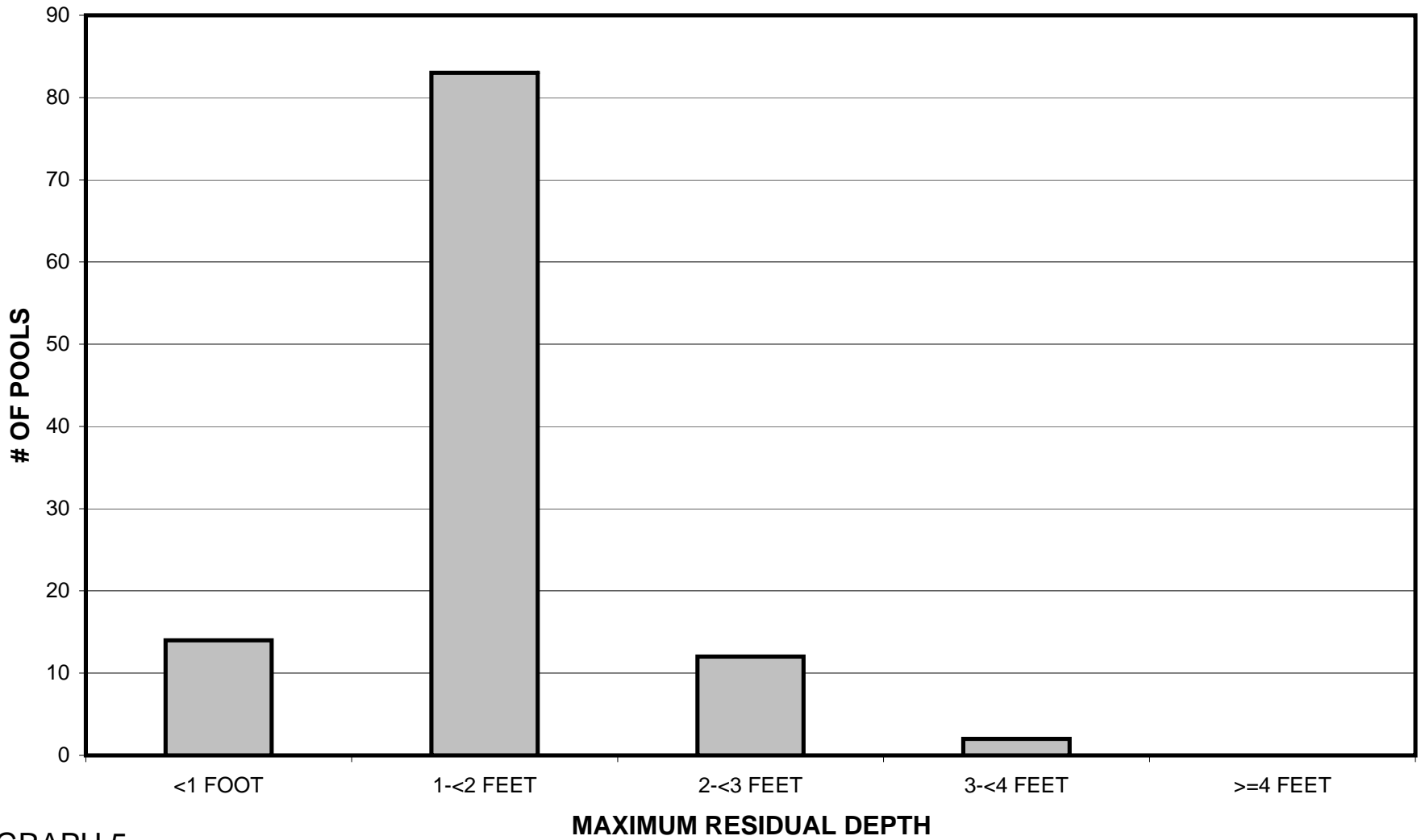
GRAPH 3

BEAR GULCH 2010 POOL TYPES BY PERCENT OCCURRENCE



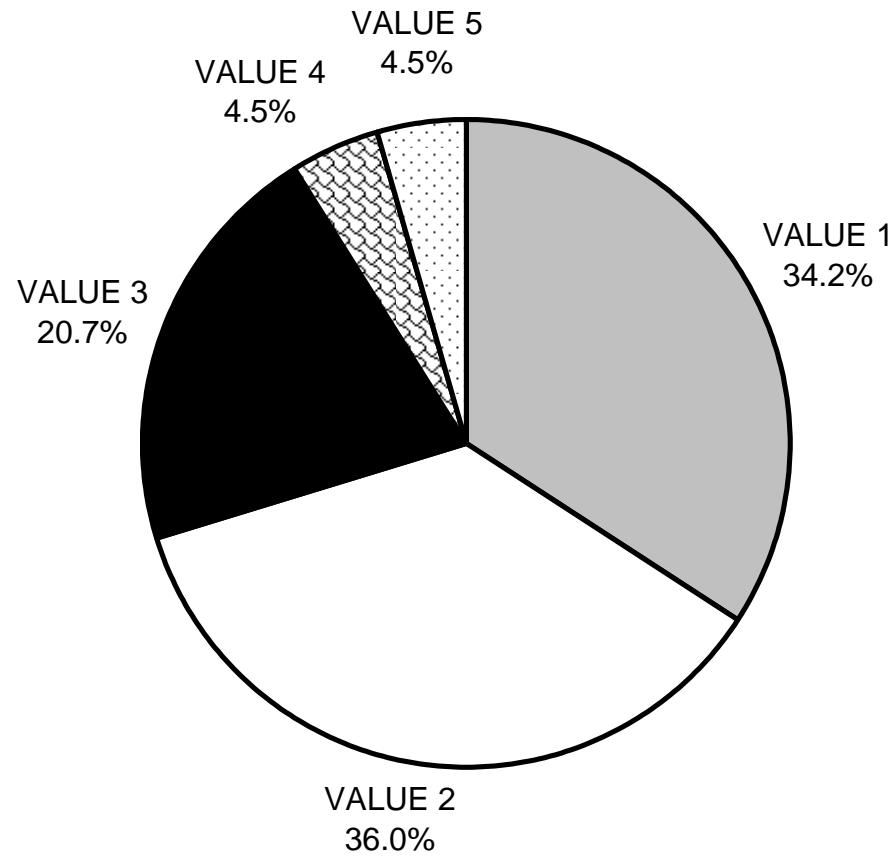
GRAPH 4

BEAR GULCH 2010 MAXIMUM DEPTH IN POOLS



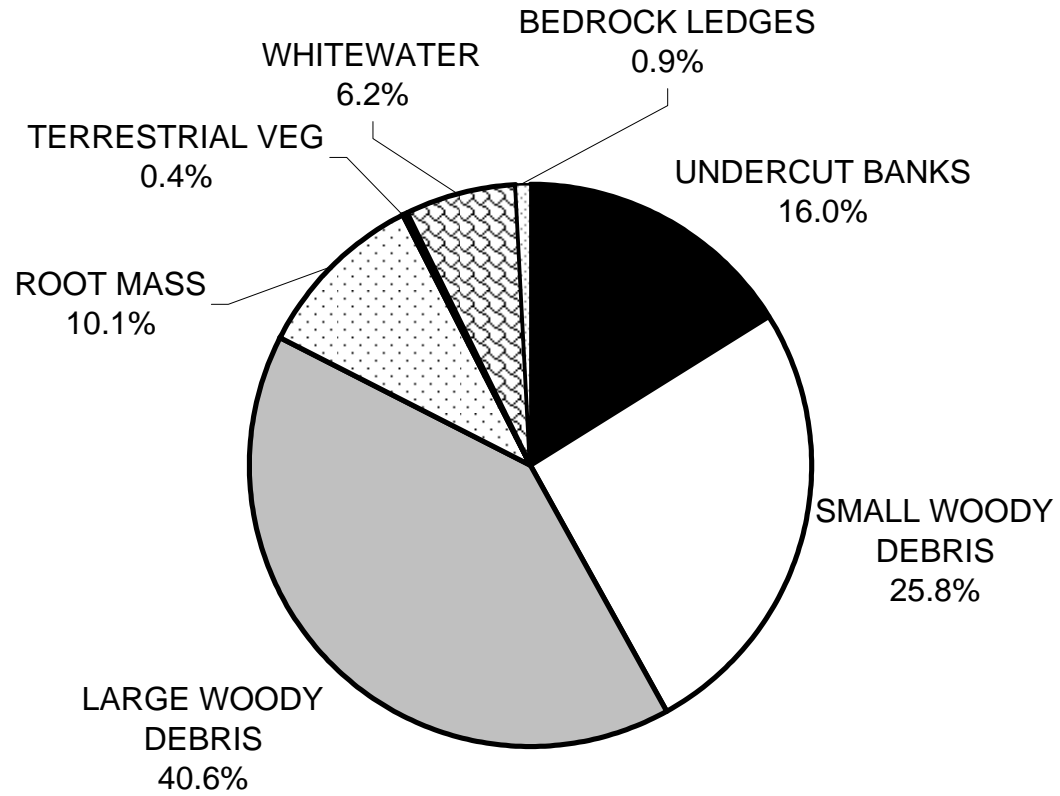
GRAPH 5

BEAR GULCH 2010 PERCENT EMBEDDEDNESS



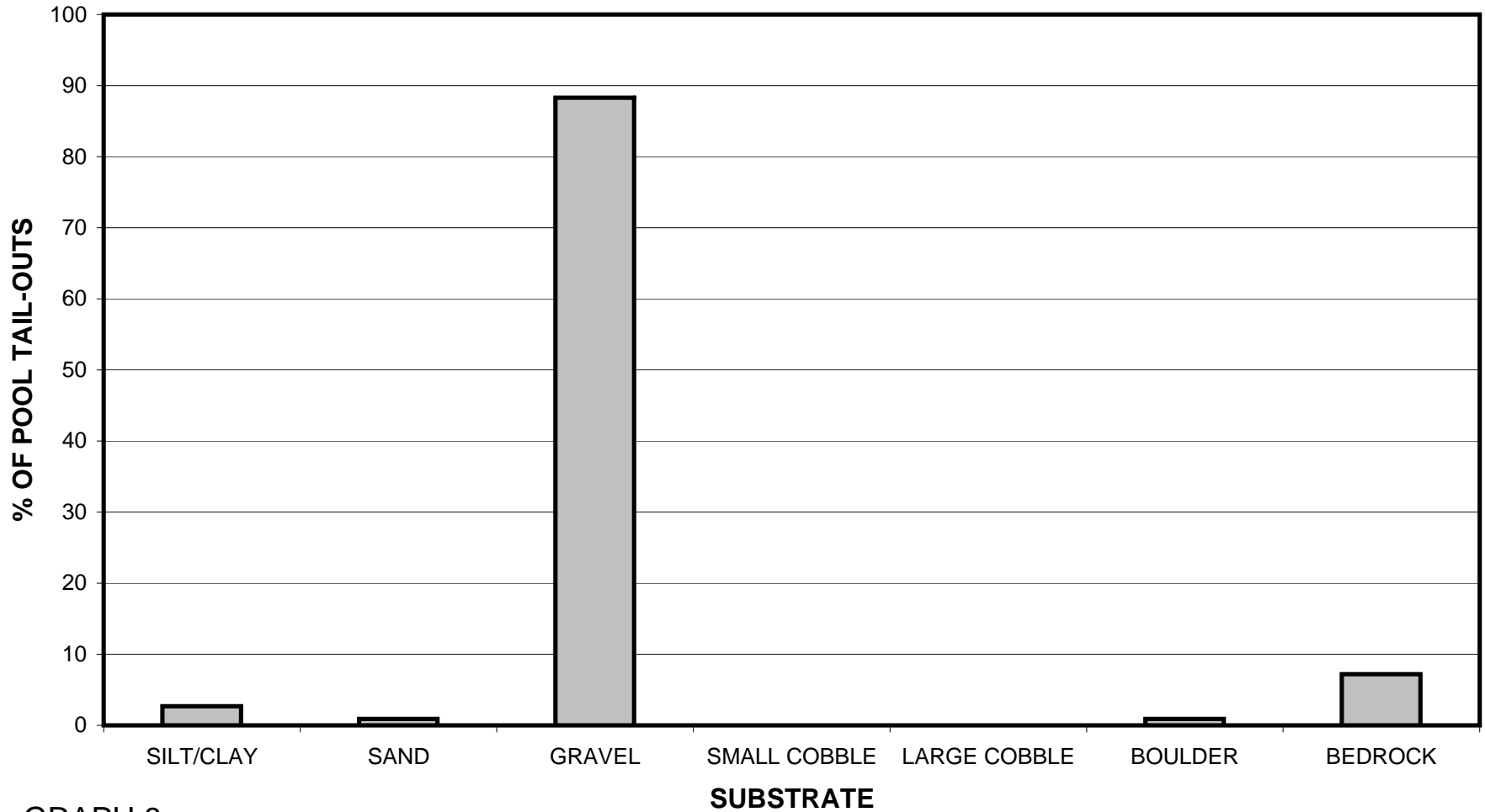
GRAPH 6

BEAR GULCH 2010 MEAN PERCENT COVER TYPES IN POOLS



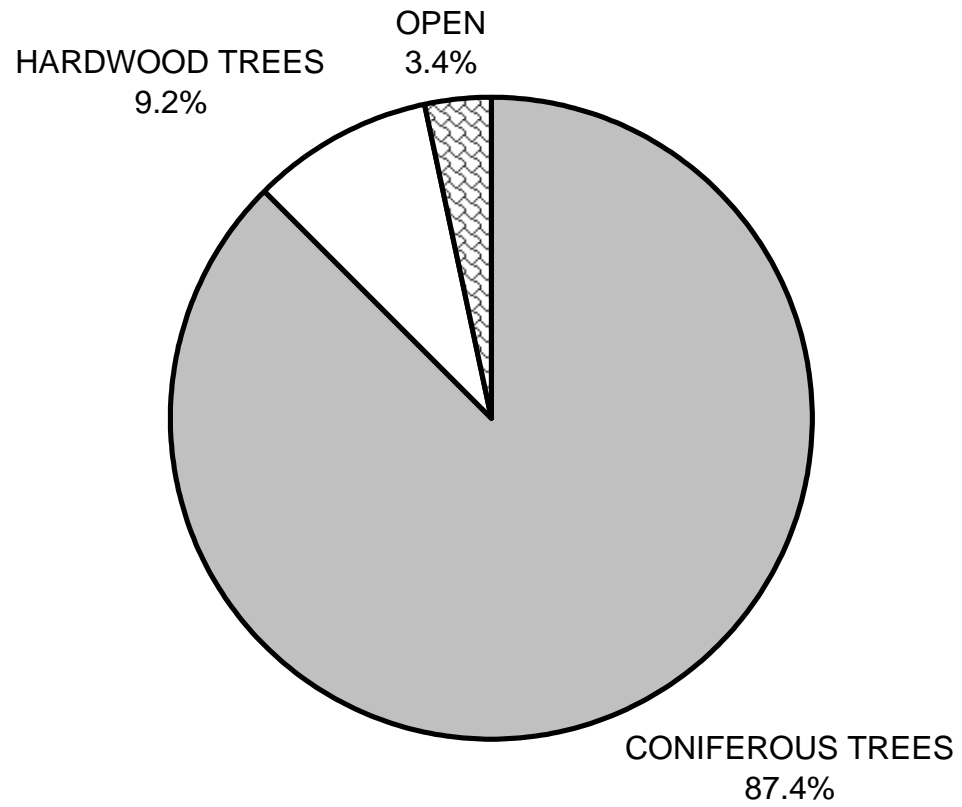
GRAPH 7

BEAR GULCH 2010 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



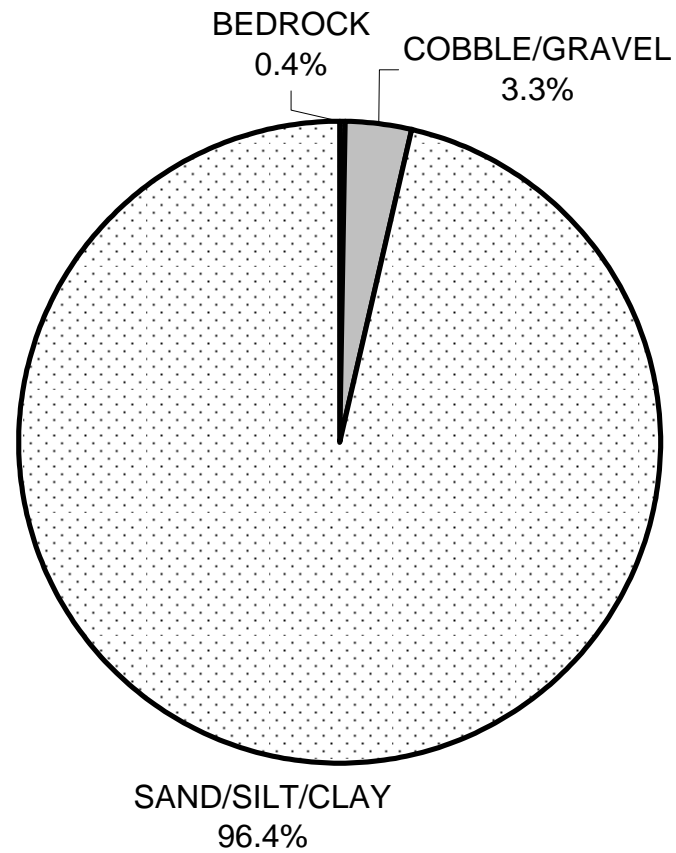
GRAPH 8

BEAR GULCH 2010 MEAN PERCENT CANOPY



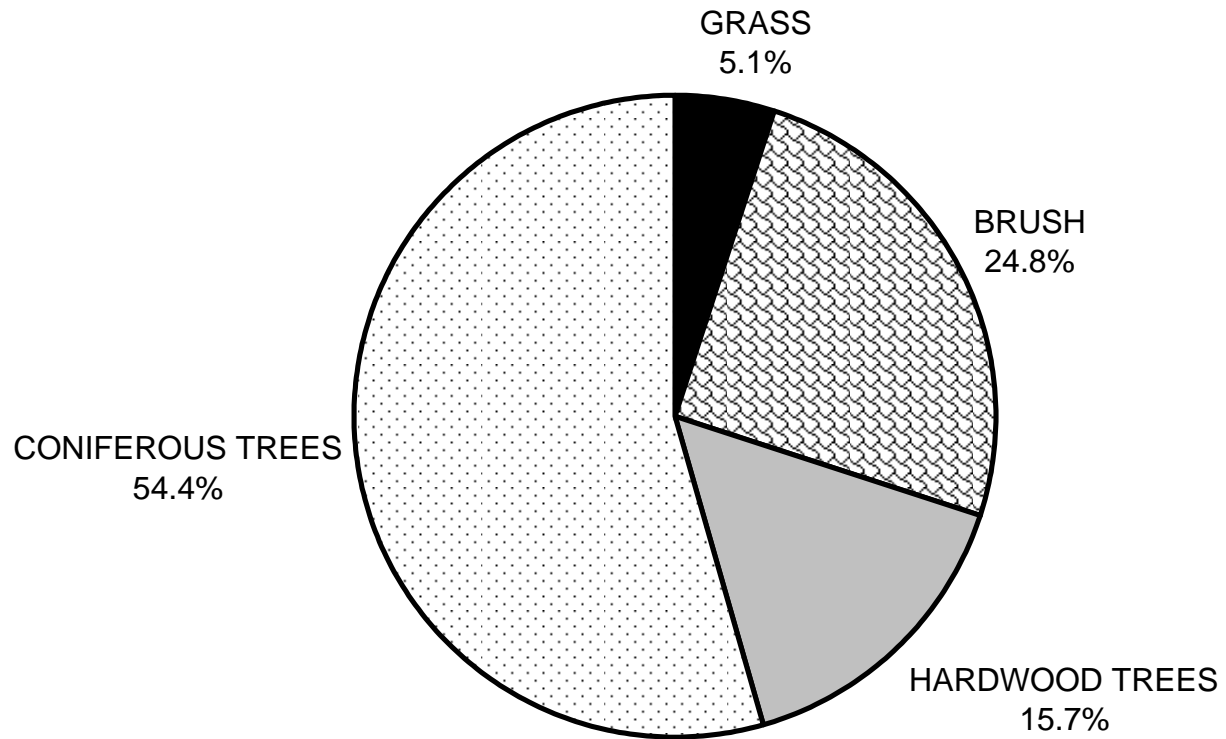
GRAPH 9

BEAR GULCH 2010 DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

BEAR GULCH 2010 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

