STREAM INVENTORY REPORT

Peterson Gulch

INTRODUCTION

A stream inventory was conducted from June 7 to June 10, 2010 on Peterson Gulch. The survey began at the confluence with South Fork Noyo River and extended upstream 0.6 miles.

The Peterson 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 Peterson 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

Peterson 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). Peterson Gulch's legal description at the confluence with South Fork Noyo River is T18N R16W S30. Its location is 39.3878 north latitude and 123.6816 west longitude, LLID number 1236805393879. Peterson Gulch is an ephemeral stream according to the USGS Noyo Hill 7.5 minute quadrangle. Peterson Gulch drains a watershed of approximately 0.49 square miles. Elevations range from about 100 feet at the mouth of the creek to 600 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. Foot access is available by crossing South Fork Noyo River from California Department of Forestry and Fire Protection (CDF) Road 300.

METHODS

The habitat inventory conducted in Peterson 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

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 Peterson 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". Peterson 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.

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 Peterson 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 Peterson 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 densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Peterson 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 Peterson 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.

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 Peterson Gulch. In addition, underwater observations were made at 21 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

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Graphics are produced from the tables using Microsoft Excel. Graphics developed for Peterson 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 7 to June 10, 2010, was conducted by B. Williams and L. Ritchey (WSP). The total length of the stream surveyed was 2,926 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.46 cfs on June 7, 2010.

Peterson Gulch is an E4 channel type for 707 feet of the stream surveyed (Reach 1), a G4 channel type for 1,214 feet of the stream surveyed (Reach 2), a B4 channel type for 740 feet of the stream surveyed (Reach 3), and an A4 channel type for 265 feet of the stream surveyed (Reach 4). E4 channels are low gradient, meandering riffle/pool streams with low width/depth ratios and little deposition. They are very efficient and stable with a high meander width ratio and gravel-dominant substrates. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low 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. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 55 degrees Fahrenheit. Air temperatures ranged from 53 to 62 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 33% riffle units, 33% pool units, 31% flatwater units, 2% dry units, and 1% no survey units (Graph 1). Based on total length of Level II habitat types there were 42% flatwater units, 33% riffle units, 18% pool units, 3% dry units, and 3% no survey units (Graph 2).

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Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 29%; mid-channel pool units, 23%; and step run units, 20% (Graph 3). Based on percent total length, step run units made up 33%, low gradient riffle units 27%, and mid-channel pool units 13%.

A total of 40 pools were identified (Table 3). Main channel pools were the most frequently encountered at 70% (Graph 4), and comprised 72% 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. Three of the 40 pools (8%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 40 pool tail-outs measured, 18 had a value of 1 (45%); 17 had a value of 2 (42.5%); 4 had a value of 3 (10%); 1 had a value of 5 (2.5%) (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 3, flatwater habitat types had a mean shelter rating of 16, 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 38. Main channel pools had a mean shelter rating of 19 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Peterson Gulch. Graph 7 describes the pool cover in Peterson 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 92% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 8% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Peterson Gulch was 93%. Seven percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 8% and 92%, respectively. Graph 9 describes the mean percent canopy in Peterson 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 86% sand/silt/clay, 12% cobble/gravel, 2% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 55% of the units surveyed. Additionally, 40% of the units surveyed had brush as the dominant vegetation type, and 5% had deciduous trees as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 21 sites for species composition and distribution in Peterson Gulch on June 4, 2010. The sites were sampled by I. Mikus (DFG), and B. Williams (WSP).

In reach 1, which comprised the first 707 feet of stream, 9 sites were sampled. The reach sites yielded 2 young-of-the-year steelhead/rainbow trout (SH/RT), and 1 age 1+ SH/RT.

In reach 2, 10 sites were sampled starting approximately 707 from the confluence with South Fork Noyo River and continuing upstream 995 feet. The reach sites yielded no fish.

In reach 3, 2 sites were sampled starting approximately 2,186 from the confluence with South Fork Noyo River and continuing upstream 136 feet. The reach sites yielded no fish.

The following chart displays the information yielded from these sites:

2010 Peterson 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: E4 Channel Type									
06/14/10	1	002	Pool	77	0	1	0	0	0
	2	004	Pool	112	1	0	0	0	0
	3	011	Pool	279	1	0	0	0	0
	4	012	Pool	320	0	0	0	0	0
	5	014	Pool	360	0	0	0	0	0
	6	017	Pool	436	0	0	0	0	0
	7	019	Pool	478	0	0	0	0	0
	8	021	Pool	548	0	0	0	0	0
	9	023	Pool	587	0	0	0	0	0
Reach 2: G4 Channel Type									
	11	026	Pool	721	0	0	0	0	0
	12	028	Pool	746	0	0	0	0	0
	13	045	Pool	1140	0	0	0	0	0
	14	047	Pool	1178	0	0	0	0	0
	15	049	Pool	1260	0	0	0	0	0
	16	053	Pool	1351	0	0	0	0	0
	17	061	Pool	1513	0	0	0	0	0

	18	064	Pool	1577	0	0	0	0	0
	19	066	Pool	1602	0	0	0	0	0
	20	070	Pool	1702	0	0	0	0	0
Reach 3: B4 Channel Type									
	21	095	Pool	2186	0	0	0	0	0
	22	100	Pool	2301	0	0	0	0	0

DISCUSSION

Peterson Gulch is an E4 channel type for the first 707 feet of stream surveyed, a G4 channel type for the next 1,214 feet of stream surveyed (Reach 2), a B4 channel type for the next 740 feet of the stream surveyed (Reach 3), and an A4 channel type for the remaining 265 feet (Reach 4). The suitability of E4, G4, B4, and A4 channel types for fish habitat improvement structures is as follows: E4 channel types are good for bank-placed boulders and fair for opposing wing-deflectors. G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, 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. A4 channel types are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days June 7 to June 10, 2010, ranged from 52 to 55 degrees Fahrenheit. Air temperatures ranged from 53 to 62 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 42% of the total length of this survey, riffles 33%, and pools 18%. Three of the 40 (8%) 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 large wood that will increase or deepen pool habitat is recommended.

Thirty-five of the 40 pool tail-outs measured had embeddedness ratings of 1 or 2. Four 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 Peterson Gulch should be mapped and rated according to their potential sediment yields, and control measures should be taken.

All 40 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

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The mean shelter rating for pools is 25. The shelter rating in the flatwater habitats is 16. 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 Peterson 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 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 93%. Reach 1 had a canopy density of 94%, Reach 2 had a canopy density of 92%, Reach 3 had a canopy density of 93%, and Reach 4 had a canopy density of 86%. 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) Peterson 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) 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) Modify the log debris accumulation at 279’ to provide fish passage.

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 E4.
68	0002.00	There is a 0.8' high plunge.

279	0011.00	Log debris accumulation (LDA) #01 contains six pieces of large woody debris (LWD) and measures 3.5' high x 15' wide x 14.5' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from silt to small cobble and measures 5' wide x 20' long x 1.5' deep. It is a possible barrier to juvenile salmonids due to the 1.8' high plunge over the LDA. Fish are not present above the LDA.
707	0026.00	The channel changes from an E4 to a G4.
1362	0055.00	LDA #02 contains three pieces of LWD and measures 6.5' high x 14' wide x 13' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from sand to small cobble and measures 7' wide x 10' long x 3' deep. It is a possible barrier to juvenile and adult salmonids.
1399	0057.00	Tributary #01 enters on the left bank. It contributes to approximately 35% of Peterson Gulch's flow. The water temperature downstream and upstream of the tributary is 53 degrees Fahrenheit; the water temperature of the tributary is 53degrees Fahrenheit. The slope of the tributary is approximately 2%. The tributary is accessible to fish, but no fish were observed.
1565	0064.00	There is a 1.6' high plunge.
1577	0065.00	An erosion site on the left bank measures 10' high x 35' long.
1675	0069.00	LDA #03 contains three pieces of LWD and measures 5' high x 8' wide x 11' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from sand to gravel and measures 5.5' wide x 10' long x 2' deep. It is a possible barrier to juvenile and adult salmonids due to a 2.9’ plunge.
1794	0074.00	There is a 1.3' high plunge.
1839	0078.00	There is a 1.4' high plunge.
1849	0079.00	There is a 2.7' high plunge.
1921	0085.00	The channel changes from a G4 to a B4.
2156	0094.00	There is a 1.3' high plunge.
2212	0097.00	LDA #04 contains four pieces of LWD and measures 3.5' high x 14' wide x 10.5' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 7'

		wide x 16' long x 2' deep. It is a possible barrier to juvenile and adult salmonids.
2301	0101.00	A redwood log more than 80’ long is lying in the channel creating a 6' high jump with no pool below it.
2399	0103.00	There is a 2.8' high plunge.
2661	0114.00	The channel changes from a B4 to an A4.
2760	0118.00	There is a 2.7' high plunge with no pool below it.
2835	0119.00	Tributary #02 enters on the right bank. It contributes to approximately 5% of Peterson Gulch's flow. The water temperature downstream and upstream of the tributary is 52 degrees Fahrenheit; the water temperature of the tributary is 52 degrees Fahrenheit. The slope of the tributary is approximately 50%. The tributary is not accessible to fish.
2926	0120.00	End of survey due to diminished habitat. There is a lack of pools and the stream has a high gradient. The channel splits approximately 300 feet upstream from the end of survey, and the gradient is approximately 15%. Woody debris chokes the channel.

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: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

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
2	0	DRY	1.7	48	97	3.3									
37	5	FLATWATER	30.8	33	1239	42.3	4.1	0.5	1.0	178	6571	94	3461		16
1	0	NOSURVEY	0.8	83	83	2.8									
40	40	POOL	33.3	14	541	18.5	6.6	0.6	1.3	92	3663	83	3335	62	25
40	8	RIFFLE	33.3	24	966	33.0	4.1	0.2	0.5	83	3310	23	933		3

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
120	53	2926	13544	7729

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

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 (%)
35	6	LGR	29.2	23	789	27.0	4	0.2	0.6	64	2252	15	527		0	95
5	2	HGR	4.2	35	177	6.0	4	0.4	0.7	138	690	48	241		13	93
13	2	RUN	10.8	20	264	9.0	4	0.5	0.9	105	1368	53	684		25	91
24	3	SRN	20.0	41	975	33.3	4	0.5	1.5	226	5420	121	2899		10	93
28	28	MCP	23.3	14	392	13.4	6	0.6	2.2	91	2557	87	2435	66	19	93
1	1	LSL	0.8	23	23	0.8	9	0.3	1.1	207	207	145	145	62	90	91
11	11	PLP	9.2	11	126	4.3	7	0.6	1.8	82	899	69	754	53	34	92
2	0	DRY	1.7	48	97	3.3										
1	0	NS	0.8	83	83	2.8										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
120	53	2926	13393	7686

Table 3 - Summary of Pool Types

Stream Name: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

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
28	28	MAIN	70	14	392	72	6.2	0.6	91	2557	66	1847	19
12	12	SCOUR	30	12	149	28	7.5	0.6	92	1106	54	643	38

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
40	40	541	3663	2490

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

Stream Name: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

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
28	MCP	70	9	32	16	57	3	11	0	0	0	0
1	LSL	3	0	0	1	100	0	0	0	0	0	0
11	PLP	28	1	9	10	91	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
40	10	25	27	68	3	8	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010 Dry Units: 2

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

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
35	6	LGR	0	0	0	0	0	0	0	0	0
5	2	HGR	0	10	60	0	30	0	0	0	0
40	8	TOTAL RIFFLE	0	10	60	0	30	0	0	0	0
13	2	RUN	5	13	78	0	5	0	0	0	0
24	3	SRN	18	50	25	0	0	0	8	0	0
37	5	TOTAL FLAT	11	31	51	0	3	0	4	0	0
28	28	MCP	30	26	37	1	2	0	5	0	0
1	1	LSL	10	30	60	0	0	0	0	0	0
11	11	PLP	6	16	57	1	2	2	16	0	0
40	40	TOTAL POOL	22	23	44	1	2	1	8	0	0
1	0	NS									
120	53	TOTAL	20	23	45	1	3	0	7	0	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010 Dry Units: 2

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

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
35	6	LGR	0	0	100	0	0	0	0
5	2	HGR	0	0	100	0	0	0	0
13	2	RUN	0	0	100	0	0	0	0
24	3	SRN	0	0	100	0	0	0	0
28	28	MCP	0	14	79	0	0	0	7
1	1	LSL	0	0	100	0	0	0	0
11	11	PLP	0	18	73	9	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
93	92	8	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: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010 Survey Length (ft.): 2926 Main Channel (ft.): 2926 Side Channel (ft.): 0

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: E4
Reach Length (ft.): 707
Riffle/Flatwater Mean Width (ft.): 5.3
BFW:
Range (ft.): 10 to 14
Mean (ft.): 11
Std. Dev.: 1
Base Flow (cfs.): 0.5
Water (F): 53 - 55 Air (F): 53 - 62
Dry Channel (ft): 0

Canopy Density (%): 94.2
Coniferous Component (%): 91.2
Hardwood Component (%): 8.8
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 97.5
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 44
LWD per 100 ft.:
Riffles: 2
Pools: 15
Flat: 4

Pools by Stream Length (%): 27.7
Pool Frequency (%): 40.0
Residual Pool Depth (%):
< 2 Feet Deep: 70
2 to 2.9 Feet Deep: 30
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.6
Mean Pool Shelter Rating: 31

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 60.0 2. 40.0 3. 0.0 4. 0.0 5. 0.0

STREAM REACH: 2

Channel Type: G4
Reach Length (ft.): 1214
Riffle/Flatwater Mean Width (ft.): 5.5
BFW:
Range (ft.): 6 to 14
Mean (ft.): 8
Std. Dev.: 2
Base Flow (cfs.): 0.5
Water (F): 53 - 53 Air (F): 55 - 61
Dry Channel (ft): 0

Canopy Density (%): 92.4
Coniferous Component (%): 89.3
Hardwood Component (%): 10.7
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 96.4
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 37
LWD per 100 ft.:
Riffles: 4
Pools: 12
Flat: 5

Pools by Stream Length (%): 22.5
Pool Frequency (%): 37.3
Residual Pool Depth (%):
< 2 Feet Deep: 100
2 to 2.9 Feet Deep: 0
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.1
Mean Pool Shelter Rating: 27

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 86 Sm Cobble: 14 Lg Cobble: 0 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 45.5 2. 50.0 3. 0.0 4. 0.0 5. 4.5

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: B4
Reach Length (ft.): 740
Riffle/Flatwater Mean Width (ft.): 2.6
BFW:
Range (ft.): 5 to 11
Mean (ft.): 7
Std. Dev.: 3
Base Flow (cfs.): 0.5
Water (F): 52 - 53 Air (F): 57 - 58
Dry Channel (ft): 97

Canopy Density (%): 93.3
Coniferous Component (%): 98.7
Hardwood Component (%): 1.3
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 94.5
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 26
LWD per 100 ft.:
Riffles: 8
Pools: 17
Flat: 4

Pools by Stream Length (%): 9.7
Pool Frequency (%): 27.6
Residual Pool Depth (%):
< 2 Feet Deep: 100
2 to 2.9 Feet Deep: 0
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.1
Mean Pool Shelter Rating: 11

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 25.0 2. 25.0 3. 50.0 4. 0.0 5. 0.0

STREAM REACH: 4

Channel Type: A4
Reach Length (ft.): 265
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 6 to 6
Mean (ft.): 6
Std. Dev.: 0
Base Flow (cfs.): 0.5
Water (F): 52 - 52 Air (F): 57 - 57
Dry Channel (ft): 0

Canopy Density (%): 86.0
Coniferous Component (%): 95.0
Hardwood Component (%): 5.0
Dominant Bank Vegetation:
Vegetative Cover (%): 0.0
Dominant Shelter:
Dominant Bank Substrate Type:
Occurrence of LWD (%):
LWD per 100 ft.:
Riffles: 5
Pools:
Flat: 8

Pools by Stream Length (%): 0.0
Pool Frequency (%): 0.0
Residual Pool Depth (%):
< 2 Feet Deep:
2 to 2.9 Feet Deep:
3 to 3.9 Feet Deep:
>= 4 Feet Deep:
Mean Max Residual Pool Depth (ft.):
Mean Pool Shelter Rating:

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:
Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

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	1	1.9
Boulder	0	0	0.0
Cobble / Gravel	7	6	12.3
Sand / Silt / Clay	45	46	85.8

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	0	0.0
Brush	20	22	39.6
Hardwood Trees	3	3	5.7
Coniferous Trees	30	28	54.7
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

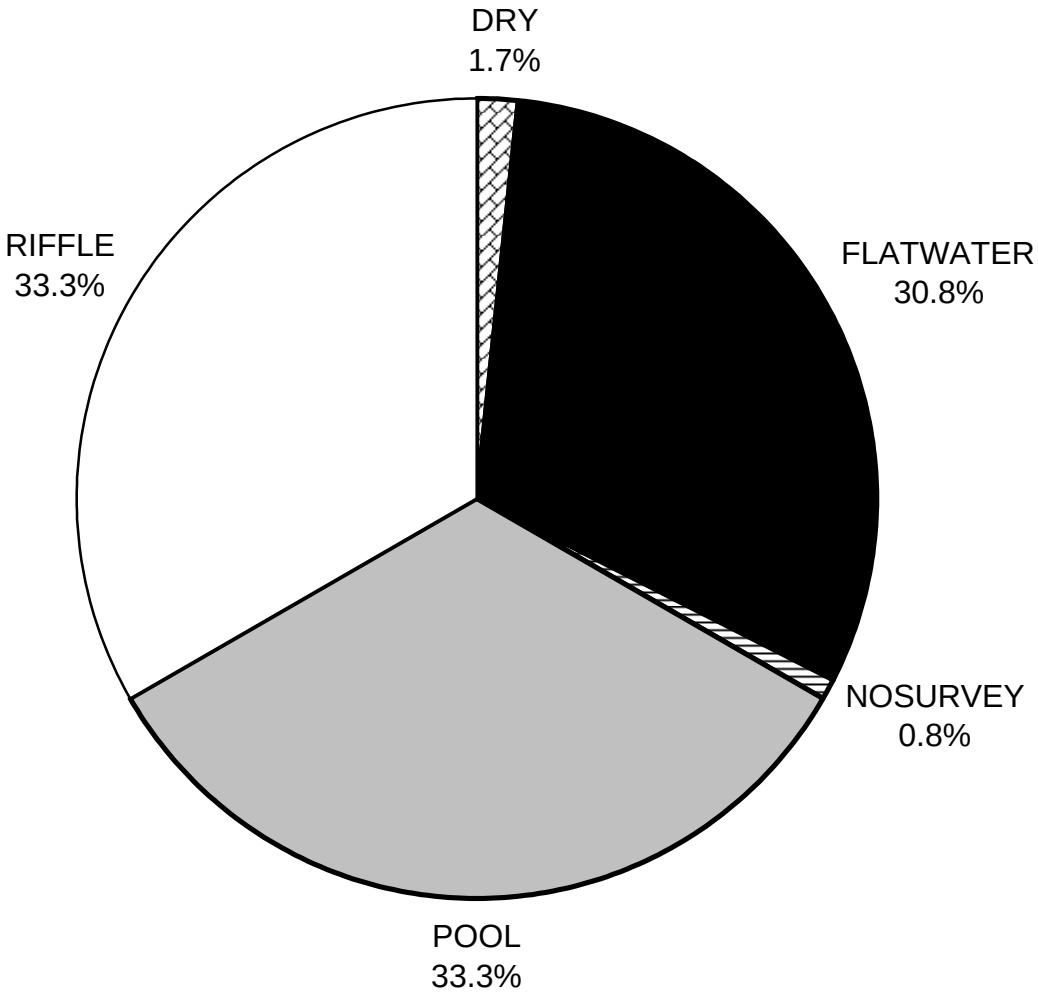
StreamName: Peterson Gulch LLID: 1236805393879 Drainage: Noyo River

Survey Dates: 6/7/2010 to 6/10/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS30 Latitude: 39:23:16.0N Longitude: 123:40:50.0W

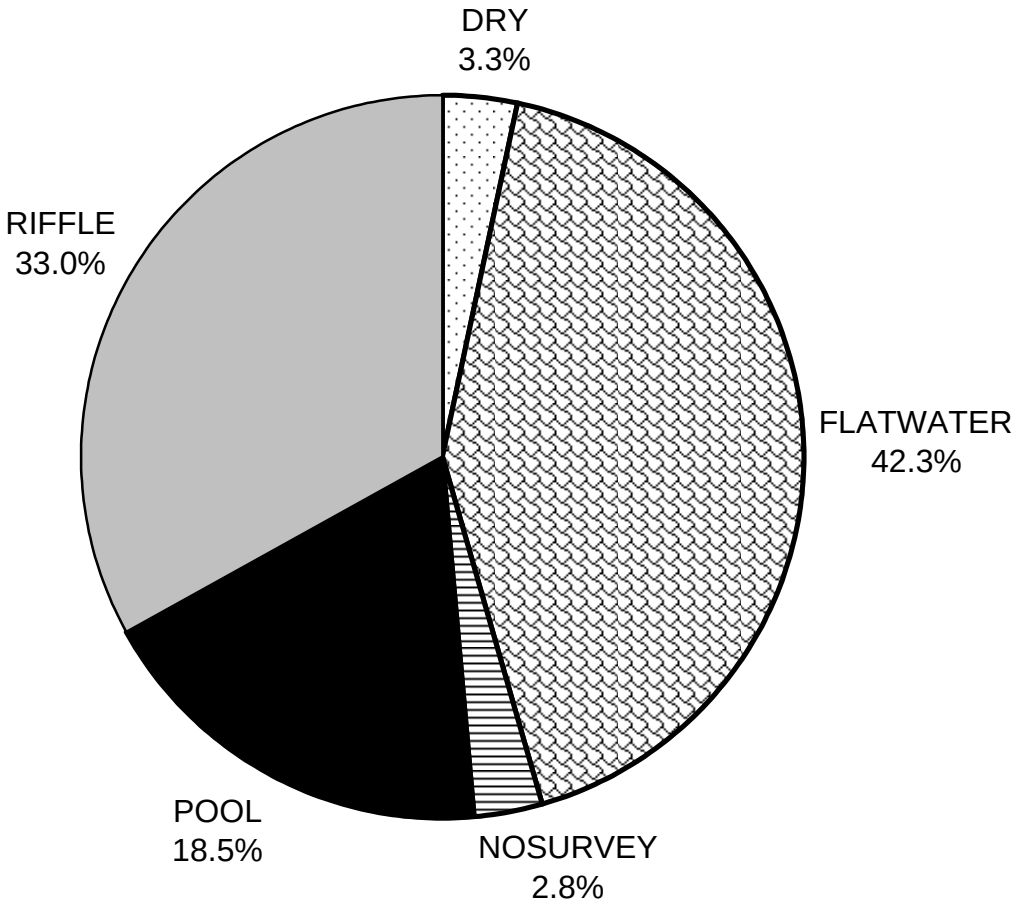
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	11	22
SMALL WOODY DEBRIS (%)	10	31	23
LARGE WOODY DEBRIS (%)	60	51	44
ROOT MASS (%)	0	0	1
TERRESTRIAL VEGETATION (%)	30	3	2
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	0	4	8
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	0

PETERSON GULCH 2010
HABITAT TYPES BY PERCENT OCCURRENCE



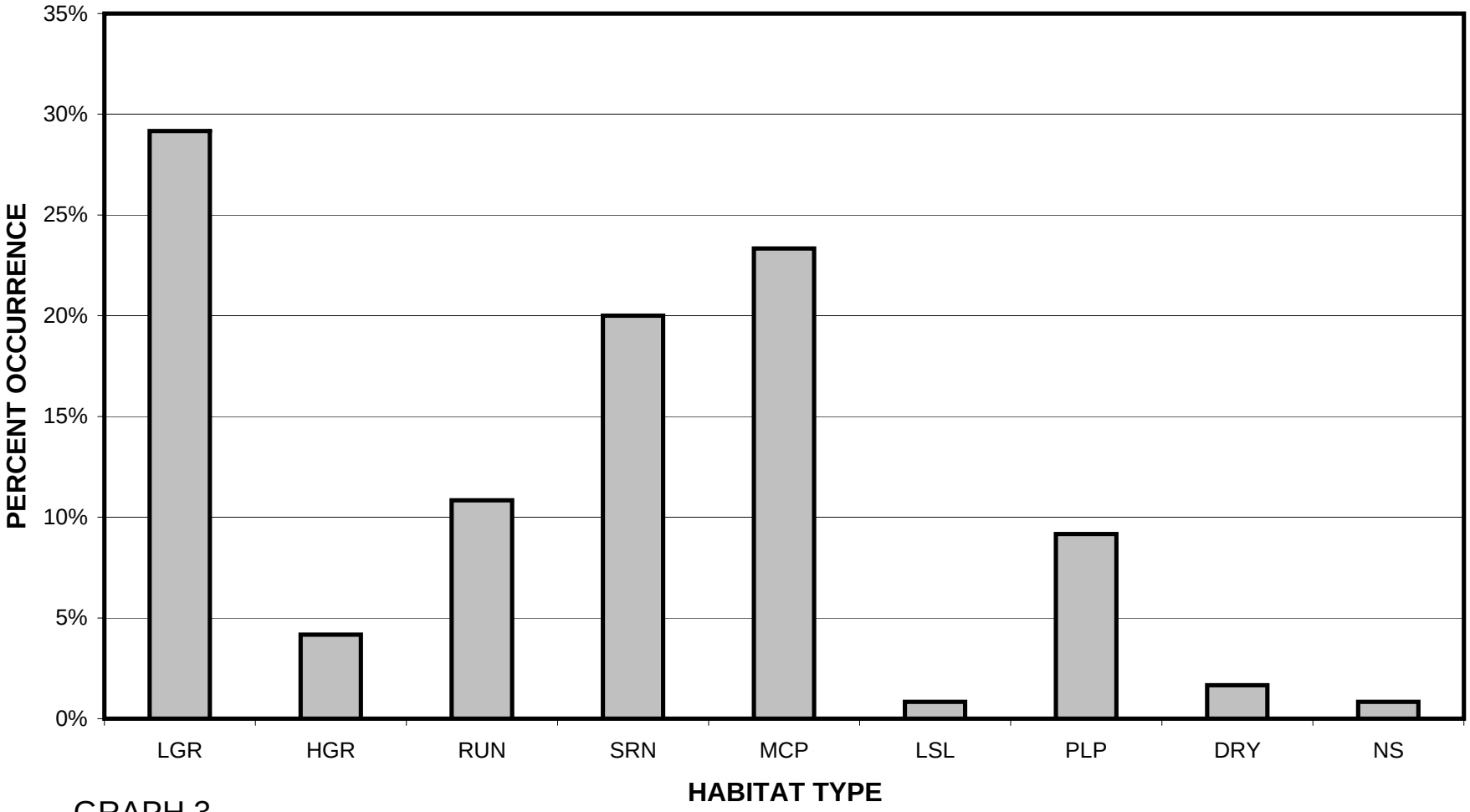
GRAPH 1

PETERSON GULCH 2010
HABITAT TYPES BY PERCENT TOTAL LENGTH



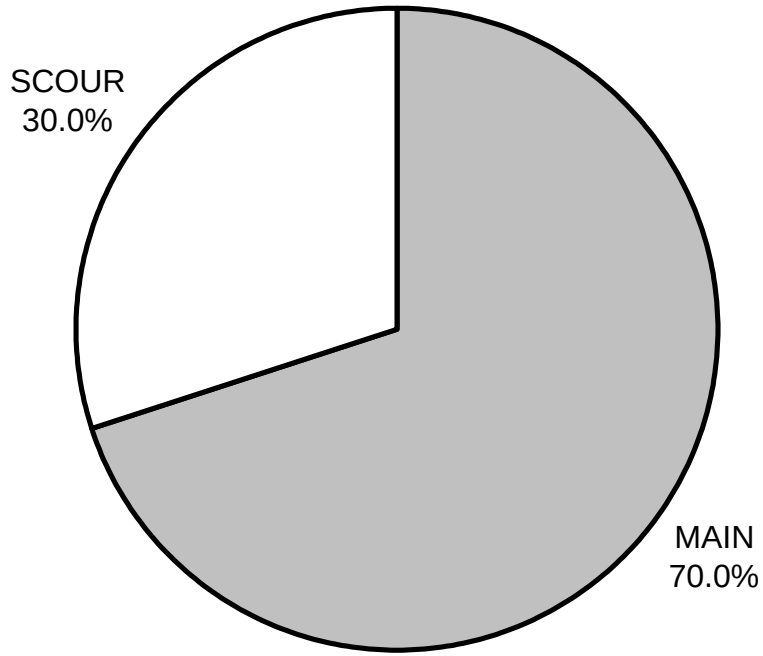
GRAPH 2

PETERSON GULCH 2010
HABITAT TYPES BY PERCENT OCCURRENCE



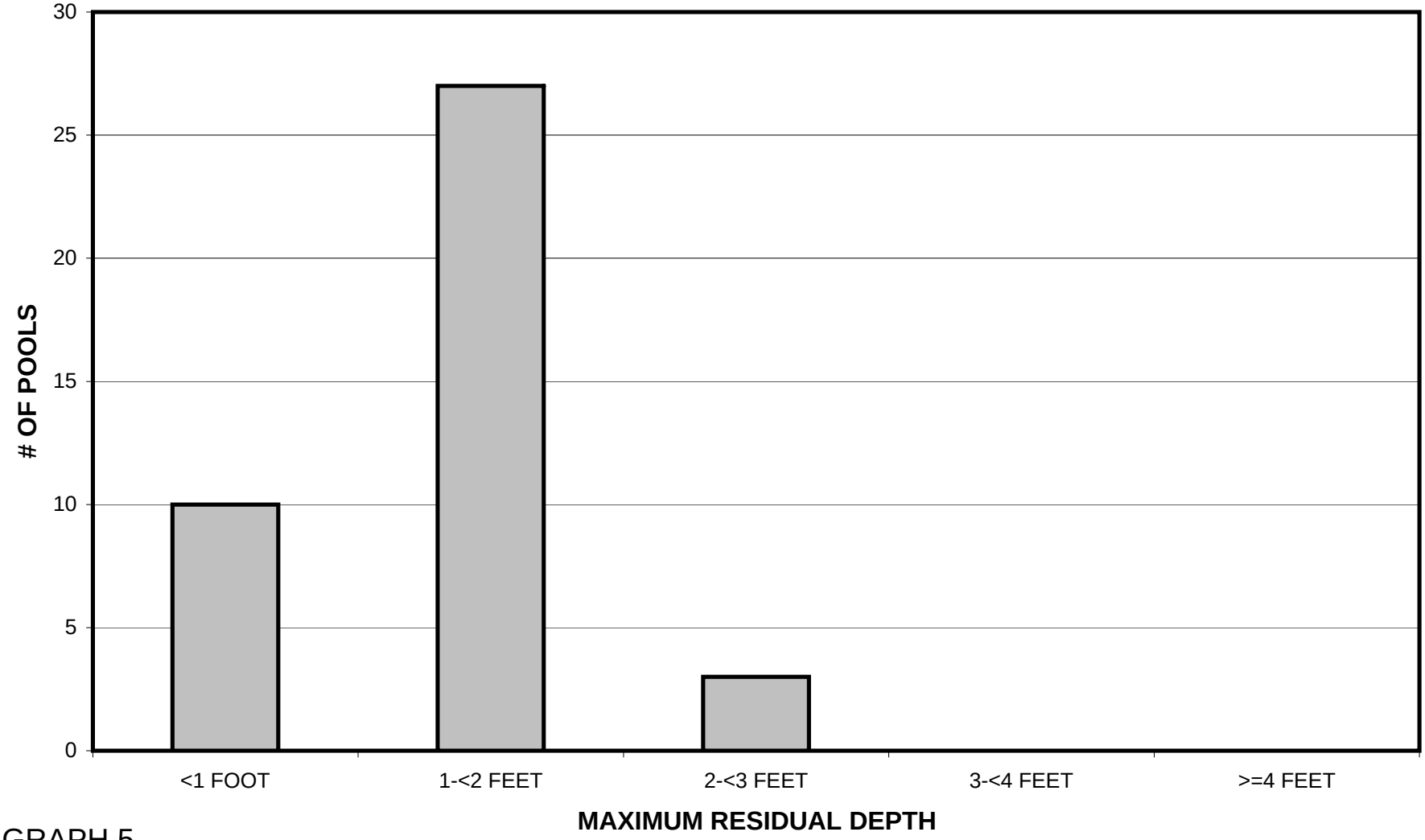
GRAPH 3

PETERSON GULCH 2010
POOL TYPES BY PERCENT OCCURRENCE



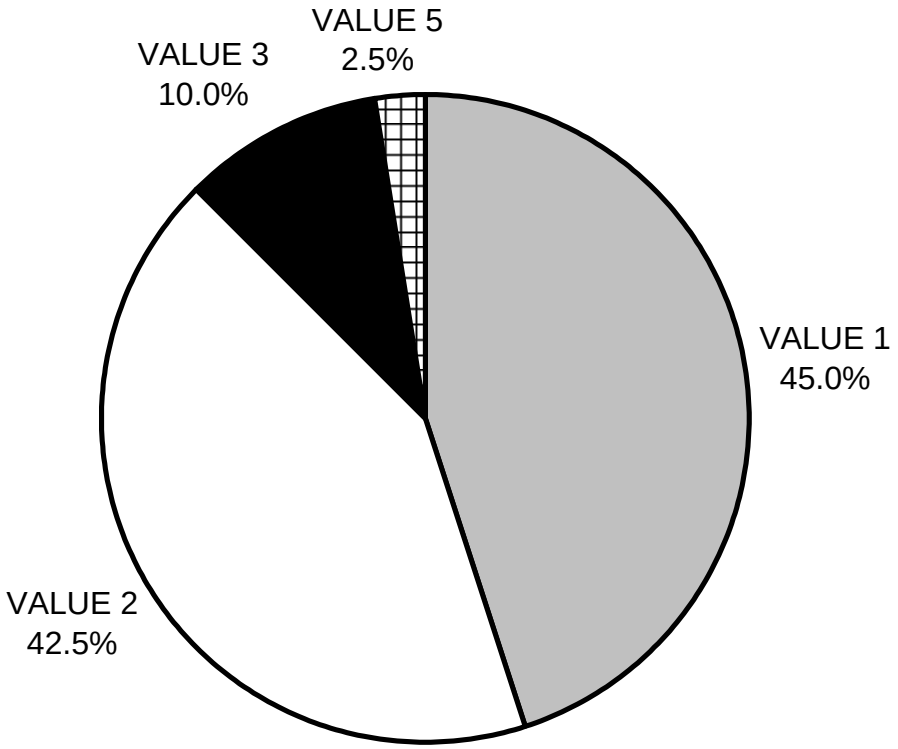
GRAPH 4

PETERSON GULCH 2010
MAXIMUM DEPTH IN POOLS



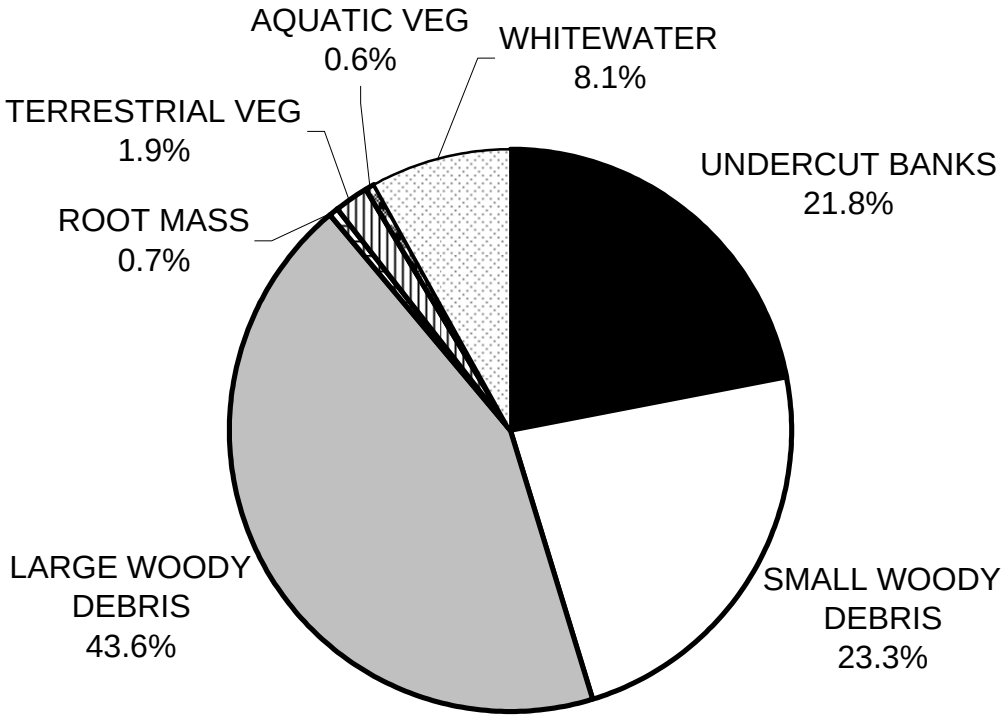
GRAPH 5

PETERSON GULCH 2010
PERCENT EMBEDDEDNESS



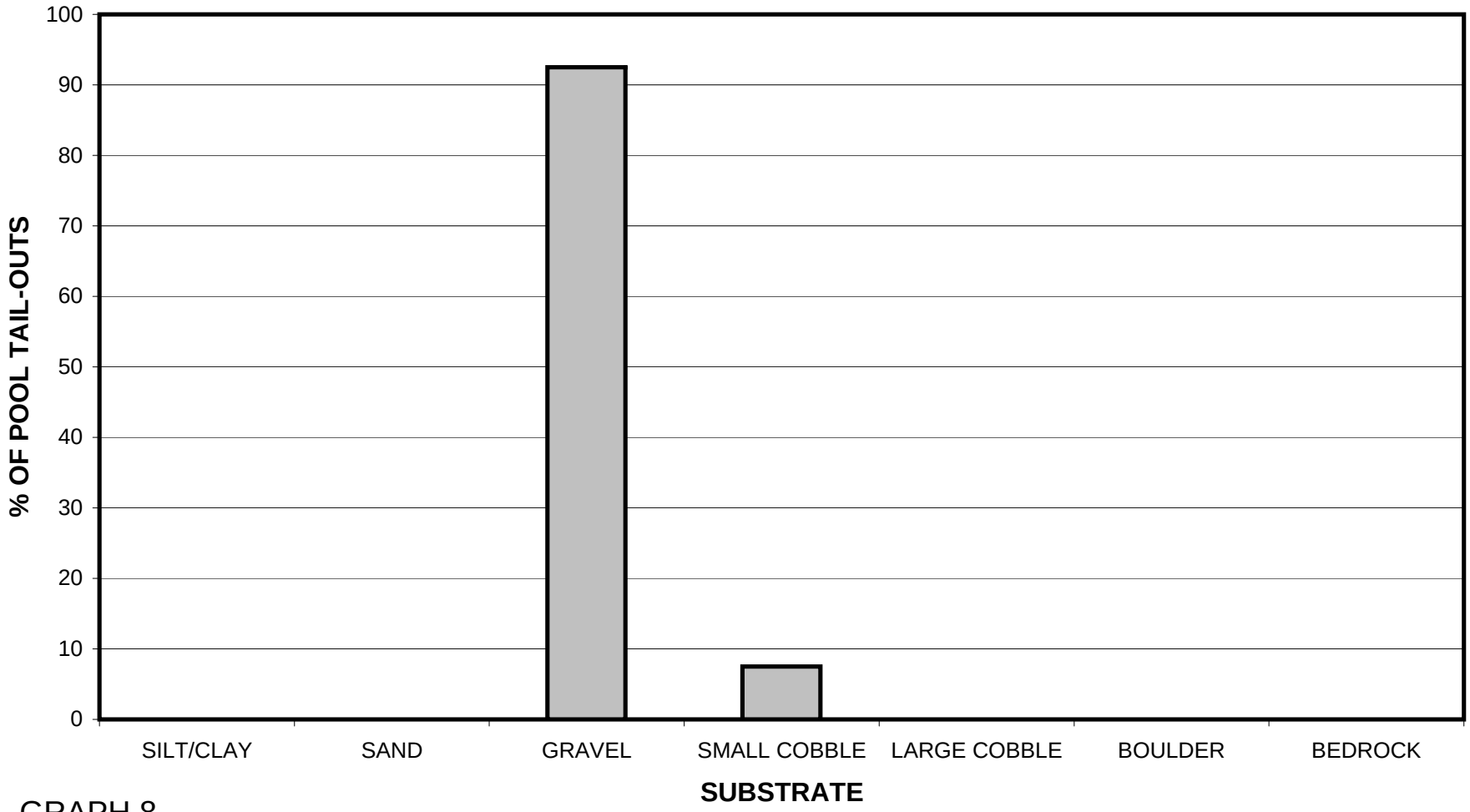
GRAPH 6

PETERSON GULCH 2010
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

PETERSON GULCH 2010
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS

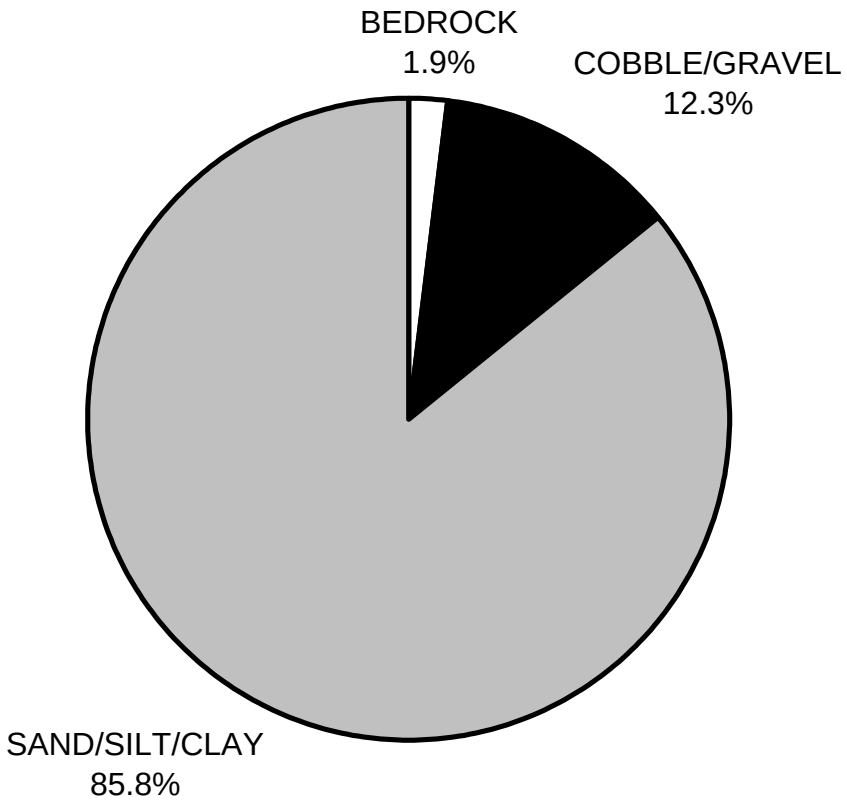


GRAPH 8

PETERSON GULCH 2010
MEAN PERCENT CANOPY

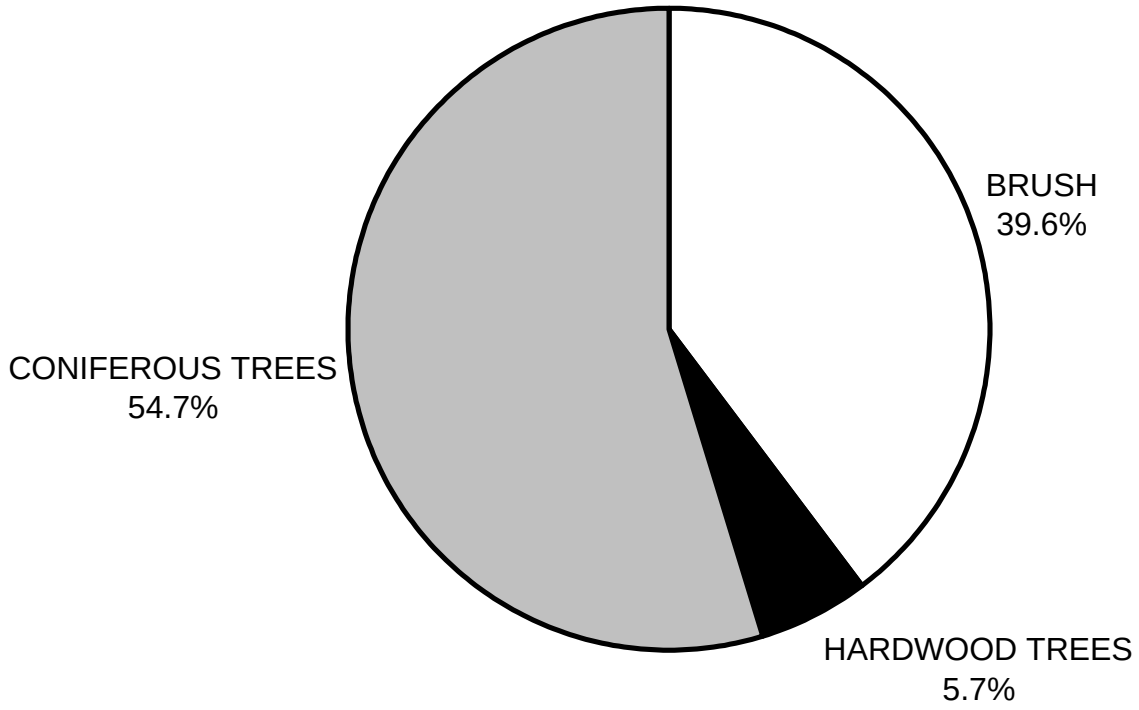
GRAPH 9

PETERSON GULCH 2010
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

PETERSON GULCH 2010
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11