

# STREAM INVENTORY REPORT

## Gulch C

### INTRODUCTION

A stream inventory was conducted from May 21 to May 23, 2013 on Gulch C. The survey began at the confluence with the Noyo River and extended upstream 1.2 miles.

The Gulch C 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 Gulch C. 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

Gulch C is a tributary to the Noyo River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Gulch C's legal description at the confluence with the Noyo River is T18N R15W S12. Its location is 39.4311 degrees north latitude and 123.4747 degrees west longitude, LLID number 1234732394311. Gulch C is a first order stream and has approximately 1.3 miles of blue line stream according to the USGS Burbeck 7.5 minute quadrangle. Gulch C drains a watershed of approximately one square mile. Elevations range from about 480 feet at the mouth of the creek to 1,100 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 Irmulco Road, seven miles west of Willits, CA.

### METHODS

The habitat inventory conducted in Gulch C 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 and Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. This inventory was conducted by a two-person team.

### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail

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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 Gulch C 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". Gulch C 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.

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### 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 Gulch C, 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 Gulch C, 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Gulch C, 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 Gulch C, 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.

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### 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 Gulch C. In addition, underwater observations were made at one site using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## DATA ANALYSIS

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

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

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Graphics are produced from the tables using Microsoft Excel. Graphics developed for Gulch C 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 May 21 to May 23, 2013 was conducted by R. Spencer (CDFW) and R. Iverson (WSP). The total length of the stream surveyed was 6,525 feet.

Stream flow was not measured on Gulch C.

Gulch C is an E4 channel type for 4,368 feet of the stream surveyed (Reach 1) and a G4 channel type for 2,157 feet of the stream surveyed (Reach 2). 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.

Water temperatures taken during the survey period ranged from 48 to 54 degrees Fahrenheit. Air temperatures ranged from 44 to 62 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 38% pool units, 32% riffle units, 23% flatwater units, 6% dry units and 1% culvert units (Graph 1). Based on total length of Level II habitat types there were 37% riffle units, 25% flatwater units, 22% pool units, 14% dry units, and 2% culvert 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, 35%; low gradient riffle units, 24%; and run units, 14% (Graph 3). Based on percent total length, low gradient riffle units made up 28%, mid-channel pool units 20%, and step run units 14%.

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A total of 84 pools were identified (Table 3). Main channel pools were the most frequently encountered at 93% (Graph 4), and comprised 90% 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. Seven of the 84 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 84 pool tail-outs measured, 23 had a value of 1 (27%); 46 had a value of 2 (55%); 14 had a value of 3 (17%); one had a value of 4 (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 2, and pool habitats had a mean shelter rating of 31 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 31. Scour pools had a mean shelter rating of 25 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Gulch C. Graph 7 describes the pool cover in Gulch C. Small woody debris is the dominant pool cover type followed by large woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 96% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 2% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Gulch C was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 21% and 79%, respectively. Graph 9 describes the mean percent canopy in Gulch C.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 62% sand/silt/clay, 34% cobble/gravel, and 3% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 68% of the units surveyed. Additionally, 20% of the units surveyed had hardwood trees as the dominant vegetation type, and 10% had brush as the dominant vegetation type (Graph 11).

## **BIOLOGICAL INVENTORY RESULTS**

Survey teams conducted a snorkel survey at one site for species composition and distribution in Gulch C on September 10, 2013. During the biological survey at least 500 feet of Gulch C was found to be dry except for the remains of Habitat Unit #005, which had shrunk to a 4.5' long x 6' wide puddle. The site was sampled by B. Leonard and M. Groff (CDFW).

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The reach site yielded four young-of-the-year (YOY) steelhead/rainbow trout (SH/RT) and one YOY coho salmon.

The following chart displays the information yielded from these sites:

2013 Gulch C 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									
09/10/13	1	005	Pool	469	4	0	0	1	0

## DISCUSSION

Gulch C is an E4 channel type for the first 4,368 feet of stream surveyed and a G4 channel type for the remaining 2,157 feet. The suitability of E4 and G4 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.

The water temperatures recorded on the survey days May 21 to May 23, 2013 ranged from 48 to 54 degrees Fahrenheit. Air temperatures ranged from 44 to 62 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 25% of the total length of this survey, riffles 37%, and pools 22%. Seven of the 84 (8%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Sixty-nine of the 84 pool tail-outs measured had embeddedness ratings of 1 or 2. Fifteen of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Gulch C should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Eighty-three of the 84 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 31. The shelter rating in the flatwater habitats is 2. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in Gulch C. Small woody debris is the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 98%. Reach 1 had a canopy density of 98% and Reach 2 had a canopy density of 98%. The percentage of right and left bank covered with vegetation was 97% and 98%, respectively.

### RECOMMENDATIONS

- 1) Gulch C 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 small woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Due to the steep jump into the culvert under the railroad at 469 feet, access for migrating salmonids is an ongoing potential problem. A fish passage assessment should be conducted at this site. If the assessment finds the culvert to be a barrier to fish passage it should be replaced with a structure that provides unimpeded fish passage. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish.

### 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 Noyo River. The channel is an E4. The first 369 feet of stream are dry.
469	0006.00	The railroad line crosses the channel. The crossing is a 5' diameter x 60' long corrugated metal culvert. There is a 4.3' high plunge at the outlet,



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The outlet is perched and sections of the metal are rusted through. Some of the water flows beneath the culvert. Both banks are eroding around the outlet of the culvert.

- 589 0010.00 A logging road crosses the channel. The crossing is a 5.2' high x 4.8' wide x 62' long corrugated metal culvert. There is no plunge at the outlet. The culvert is slightly smashed and the metal has rusted through in some areas.
- 1907 0053.00 Log debris accumulation (LDA) #01 contains nine pieces of large woody debris (LWD) and measures 9' high x 17' wide x 56' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to small cobble and measures 10' wide x 80' long x 3' deep. There is a 5' high plunge over the LDA with no jump pool below it.
- 2806 0084.00 LDA #02 contains 11 pieces of LWD and measures 4' high x 10' wide x 15' long. Water flows through the LDA and there are visible gaps in it. Retained gravel measures 6' wide x 40' long x 2' deep. There is a 3.5' high plunge over the LDA.
- 3076 0095.00 LDA #03 contains nine pieces of LWD and measures 5' high x 10' wide x 24' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment.
- 3465 0110.00 LDA #04 contains three pieces of LWD and measures 7' high x 10' wide x 6' long. Water does not flow through the LDA; the channel is dry for 10' above it. There are visible gaps in the LDA. Retained sediment ranges from gravel to small cobble and measures 10' wide x 25' long x 1' deep.
- 3714 0119.00 LDA #05 contains 12 pieces of LWD and measures 12' high x 20' wide x 24' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from gravel to small cobble and measures 10' wide x 25' long x 1' deep.
- 3786 0122.00 Dry right bank tributary.
- 3866 0125.00 There is a 1' high plunge over roots.
- 4368 0142.00 The channel changes from an E4 to a G4.
- 4545 0152.00 Dry left bank tributary.
- 4681 0158.00 There is a 3' high plunge over roots. The plunge is within a 64' long dry section.

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4830	0161.00	There is a 2' high plunge over roots and LWD.
4984	0165.00	LDA #04 contains seven pieces of LWD and measures 5' high x 20' wide x 15' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from gravel to cobble and measures 10' wide x 35' long x 2.5' deep. There is a 4' high plunge over the LDA with no jump pool below it. There is a 1.5' diameter redwood tree growing out of the LDA.
5423	0176.00	There is a 2.5' high jump over LWD.
5500	0179.00	There is a 1.5' high plunge over roots.
5530	0182.00	LDA #07 contains nine pieces of LWD and measures 5' high x 15' wide x 6' long. Water does not flow through the LDA; the channel is dry above it for 13 feet. There are visible gaps in the LDA. Retained sediment ranges from sand to large cobble and measures 7' wide x 50' long x 4' deep.
5759	0192.00	LDA #08 contains five pieces of LWD and measures 9.5' high x 8' wide x 27' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from gravel to large cobble and measures 10' wide x 80' long x 5' deep. There are multiple 3'-5' high plunges through the mass of the LDA.
6049	0204.00	Dry right bank tributary.
6110	0207.00	There is a 2' high plunge over log and boulder.
6171	0209.00	LDA #09 contains two pieces of LWD and measures 6' high x 7' wide x 10' long. Water does not flow through the LDA; the flow is subsurface through it. There are no visible gaps in the LDA. Retained sediment ranges from gravel to large cobble and measures 8' wide x 25' long x 3' deep. There is a 5' high plunge over the LDA.
6205	0212.00	LDA #10 measures 7' high x 14' wide x 12' long. Water does not flow through the LDA; the channel is dry for 175' above it. There are visible gaps in the LDA. Retained sediment ranges from sand to small cobble and measures 5' wide x 30' long x 4' deep. There is a 5' high plunge over the LDA.
6518	0221.00	End of survey due to diminished habitat. The slope of the channel increased to 15-20% for 170 feet, over which the channel was dry. The slope then decreases, but the dominant substrate is bedrock. Above the bedrock, the gradient increases again, the stream goes dry and moss is growing in the channel. The stream starts flowing again above this section, but the channel is dominated by roots, LWD and boulders.

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### 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: Gulch C

LLID: 1234732394311 Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12

Latitude: 39:25:52.0N

Longitude: 123:28:24.0W

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	CULVERT	0.9	61	122	1.9									
14	0	DRY	6.3	63	885	13.6									
50	9	FLATWATER	22.6	32	1611	24.7	3.1	0.3	0.6	71	3571	18	912		2
1	0	NOSURVEY	0.5	32	32	0.5									
84	84	POOL	38.0	17	1440	22.1	5.9	0.6	1.3	98	8229	76	6378	64	31
70	11	RIFFLE	31.7	35	2435	37.3	3.4	0.2	0.4	96	6685	20	1400		1
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>			<b>Total Volume (cu.ft.)</b>		
221	104				6525					18486			8690		

**Table 2 - Summary of Habitat Types and Measured Parameters**

Stream Name: Gulch C

LLID: 1234732394311

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12

Latitude: 39:25:52.0N

Longitude: 123:28:24.0W

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 (%)
53	7	LGR	24.0	34	1824	28.0	4	0.2	0.8	128	6810	26	1388		1	99
16	3	HGR	7.2	38	606	9.3	2	0.2	0.6	49	779	12	193		0	95
1	1	BRS	0.5	5	5	0.1	1	0.1	0.1	5	5	1	1		0	89
30	5	RUN	13.6	23	676	10.4	3	0.3	1	65	1956	18	538		2	96
20	4	SRN	9.0	47	935	14.3	3	0.2	0.7	79	1584	19	372		3	100
78	78	MCP	35.3	17	1300	19.9	6	0.5	2.6	90	6994	62	4854	50	31	98
2	2	LSL	0.9	24	47	0.7	7	0.4	1.4	152	305	72	143	56	45	96
1	1	LSBk	0.5	38	38	0.6	5	0.5	1	190	190	114	114	95	0	98
3	3	PLP	1.4	18	55	0.8	12	1.2	3.6	247	741	422	1267	401	20	98
14	0	DRY	6.3	63	885	13.6										
2	0	CUL	0.9	61	122	1.9										
1	0	NS	0.5	32	32	0.5										

Total Units  
221

Total Units Fully Measured  
104

Total Length (ft.)  
6525

Total Area (sq.ft.)  
19363

Total Volume (cu.ft.)  
8870

**Table 3 - Summary of Pool Types**

Stream Name: Gulch C

LLID: 1234732394311

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12

Latitude: 39:25:52.0N

Longitude: 123:28:24.0W

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
78	78	MAIN	93	17	1300	90	5.7	0.5	90	6994	50	3923	31
6	6	SCOUR	7	23	140	10	9.1	0.8	206	1236	235	1412	25

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
84	84	1440	8229	5335

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

Stream Name: Gulch C

LLID: 1234732394311

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12

Latitude: 39:25:52.0N

Longitude: 123:28:24.0W

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
78	MCP	93	25	32	48	62	5	6	0	0	0	0
2	LSL	2	0	0	2	100	0	0	0	0	0	0
1	LSBk	1	0	0	1	100	0	0	0	0	0	0
3	PLP	4	0	0	1	33	1	33	1	33	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
84	25	30	52	62	6	7	1	1	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3



**Table 5 - Summary of Mean Percent Cover By Habitat Type**

Stream Name: Gulch C

LLID: 1234732394311

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Dry Units: 14

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12

Latitude: 39:25:52.0N

Longitude: 123:28:24.0W

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
53	7	LGR	0	0	0	0	100	0	0	0	0
16	3	HGR	0	0	0	0	0	0	0	0	0
1	1	BRS	0	0	0	0	0	0	0	0	0
70	11	TOTAL RIFFLE	0	0	0	0	100	0	0	0	0
30	5	RUN	0	75	0	25	0	0	0	0	0
20	4	SRN	50	50	0	0	0	0	0	0	0
50	9	TOTAL FLAT	25	63	0	12	0	0	0	0	0
78	78	MCP	16	32	26	16	3	0	0	4	3
2	2	LSL	0	60	38	3	0	0	0	0	0
1	1	LSBk	0	0	0	0	0	0	0	0	0
3	3	PLP	8	7	17	65	3	0	0	0	0
84	84	TOTAL POOL	15	32	26	17	3	0	0	3	3
2	0	CUL									
1	0	NS									
221	104	TOTAL	16	33	25	17	4	0	0	3	2

**Table 6 - Summary of Dominant Substrates By Habitat Type**

Stream Name: Gulch C

LLID: 1234732394311

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Dry Units: 14

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12 Latitude: 39:25:52.0N

Longitude: 123:28:24.0W

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
53	7	LGR	0	0	71	29	0	0	0
16	3	HGR	0	0	33	33	0	0	33
1	1	BRS	0	0	0	0	0	0	100
30	5	RUN	0	0	100	0	0	0	0
20	4	SRN	0	0	100	0	0	0	0
78	78	MCP	3	4	62	28	4	0	0
2	2	LSL	0	50	50	0	0	0	0
1	1	LSBk	0	0	100	0	0	0	0
3	3	PLP	0	0	67	33	0	0	0

**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

Stream Name: Gulch C

LLID: 1234732394311

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12

Latitude: 39:25:52.0N

Longitude: 123:28:24.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
98	79	21	0	97	98

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: Gulch C LLID: 1234732394311 Drainage: Noyo River  
 Survey Dates: 5/21/2013 to 5/23/2013 Survey Length (ft.): 6525 Main Channel (ft.): 6525 Side Channel (ft.): 0  
 Confluence Location: Quad: BURBECK Legal Description: T18NR15WS12 Latitude: 39:25:52.0N Longitude: 123:28:24.0W

**Summary of Fish Habitat Elements By Stream Reach**

**STREAM REACH: 1**

Channel Type: E4	Canopy Density (%): 98.3	Pools by Stream Length (%): 25.0
Reach Length (ft.): 4368	Coniferous Component (%): 77.0	Pool Frequency (%): 40.4
Riffle/Flatwater Mean Width (ft.): 3.3	Hardwood Component (%): 23.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 89
Range (ft.): 9 to 17	Vegetative Cover (%): 97.7	2 to 2.9 Feet Deep: 9
Mean (ft.): 12	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 2
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 17	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 48 - 54 Air (F): 44 - 62	LWD per 100 ft.:	Mean Pool Shelter Rating: 33
Dry Channel (ft): 411	Riffles: 1	
	Pools: 9	
	Flat: 4	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 98 Sm Cobble: 2 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 26.3 2. 61.4 3. 12.3 4. 0.0 5. 0.0		

**STREAM REACH: 2**

Channel Type: G4	Canopy Density (%): 97.6	Pools by Stream Length (%): 16.1
Reach Length (ft.): 2157	Coniferous Component (%): 82.1	Pool Frequency (%): 33.8
Riffle/Flatwater Mean Width (ft.): 3.0	Hardwood Component (%): 17.9	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 96
Range (ft.): 9 to 13	Vegetative Cover (%): 96.8	2 to 2.9 Feet Deep: 4
Mean (ft.): 10	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 1	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 21	Mean Max Residual Pool Depth (ft.): 1.1
Water (F): 48 - 52 Air (F): 47 - 53	LWD per 100 ft.:	Mean Pool Shelter Rating: 26
Dry Channel (ft): 474	Riffles: 5	
	Pools: 16	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 93 Sm Cobble: 4 Lg Cobble: 4 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 29.6 2. 40.7 3. 25.9 4. 3.7 5. 0.0		

**Table 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: Gulch C

LLID: 1234732394311

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12

Latitude: 39:25:52.0N

Longitude: 123:28:24.0W

**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	4	2	2.9
Boulder	1	0	0.5
Cobble / Gravel	32	39	34.1
Sand / Silt / Clay	67	63	62.5

**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	3	2	2.4
Brush	11	9	9.6
Hardwood Trees	21	20	19.7
Coniferous Trees	69	72	67.8
No Vegetation	0	1	0.5

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Gulch C

LLID: 1234732394311

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/23/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR15WS12

Latitude: 39:25:52.0N

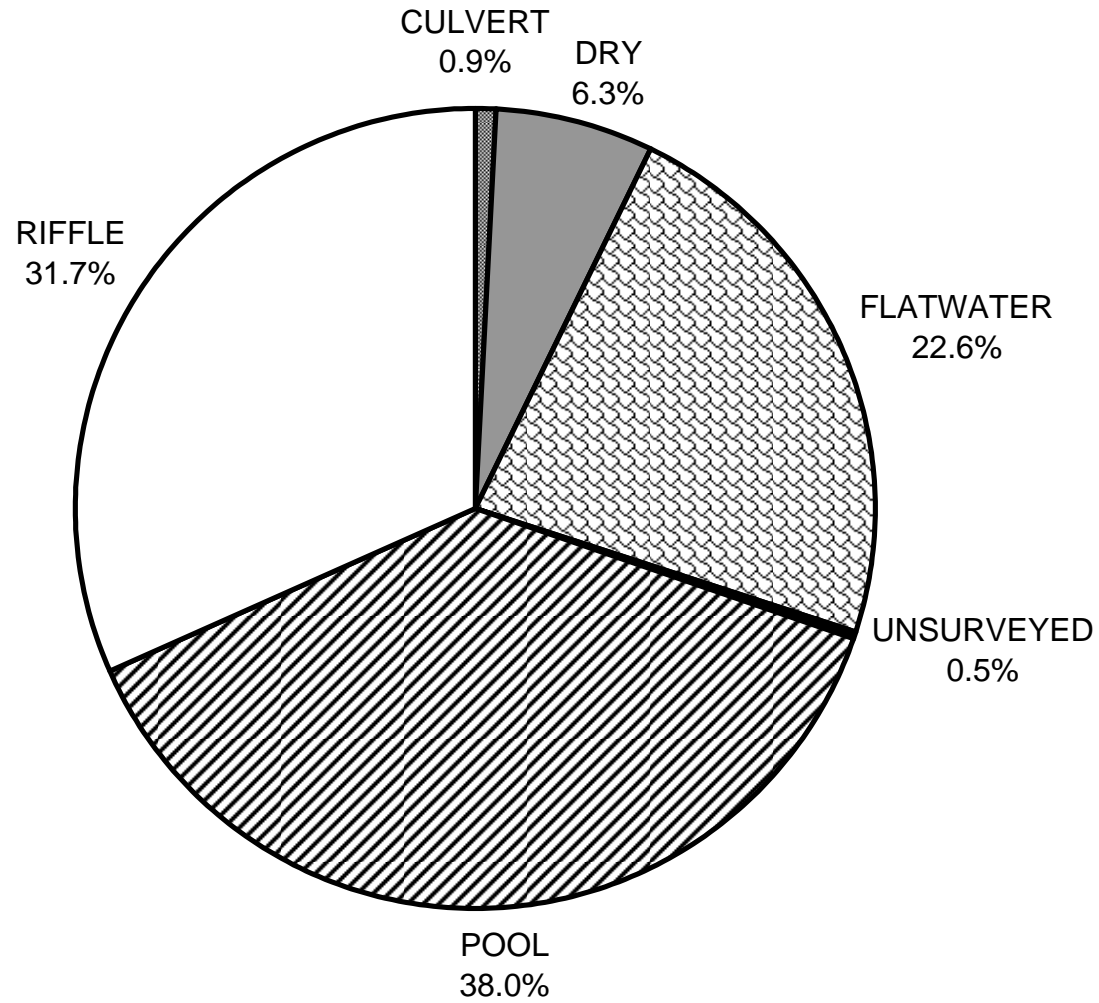
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	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	25	15
SMALL WOODY DEBRIS (%)	0	63	32
LARGE WOODY DEBRIS (%)	0	0	26
ROOT MASS (%)	0	12	17
TERRESTRIAL VEGETATION (%)	100	0	3
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	3
BEDROCK LEDGES (%)	0	0	3

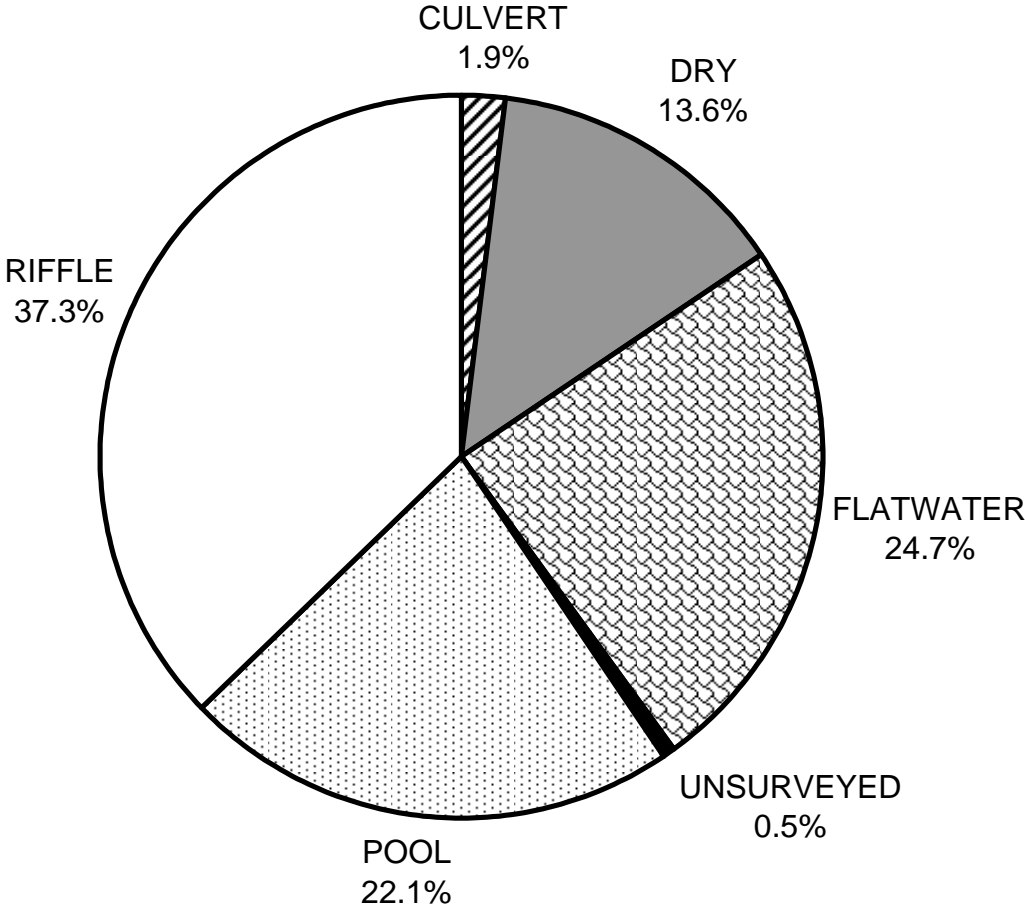
# GULCH C 2013

## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

**GULCH C 2013**  
**HABITAT TYPES BY PERCENT TOTAL LENGTH**

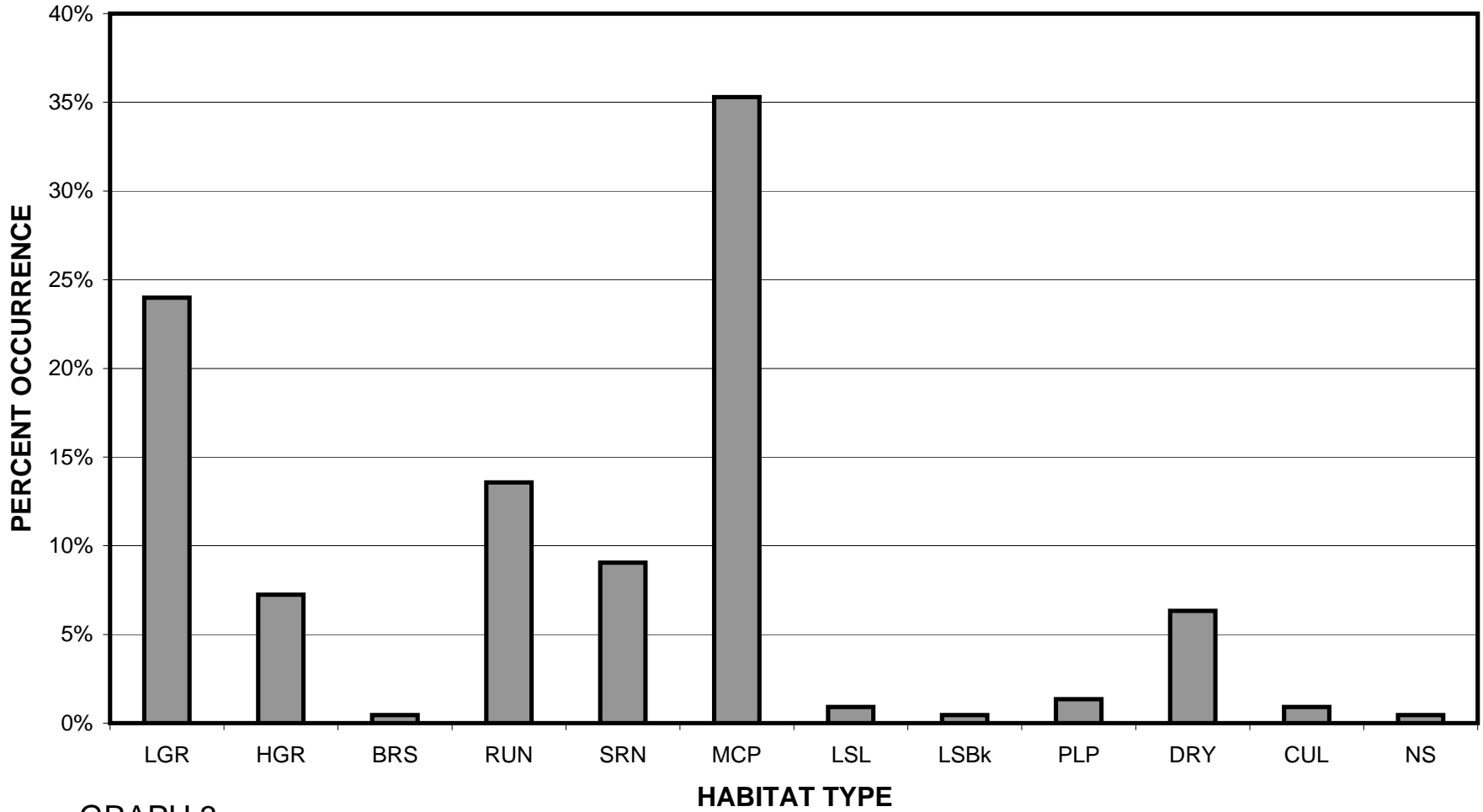


GRAPH 2



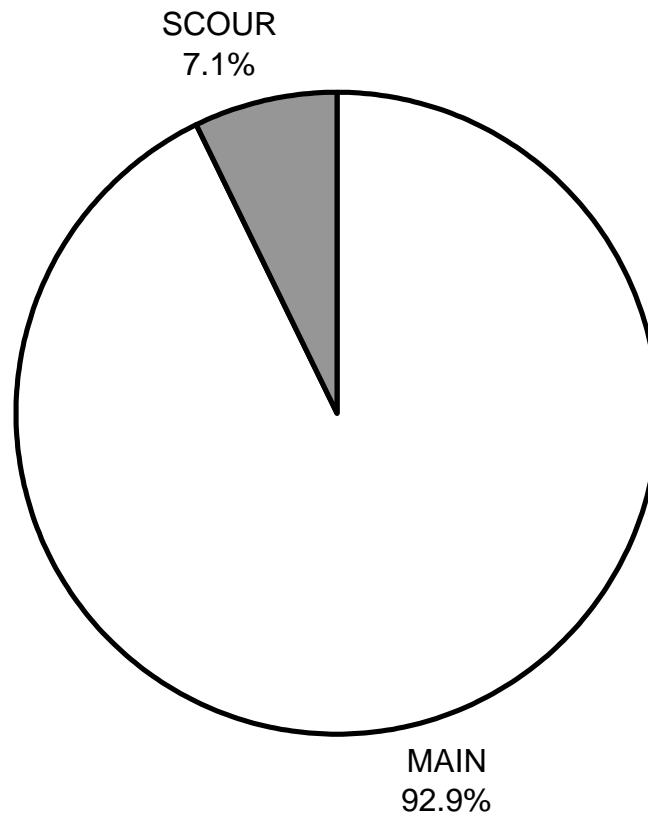
# GULCH C 2013

## HABITAT TYPES BY PERCENT OCCURRENCE



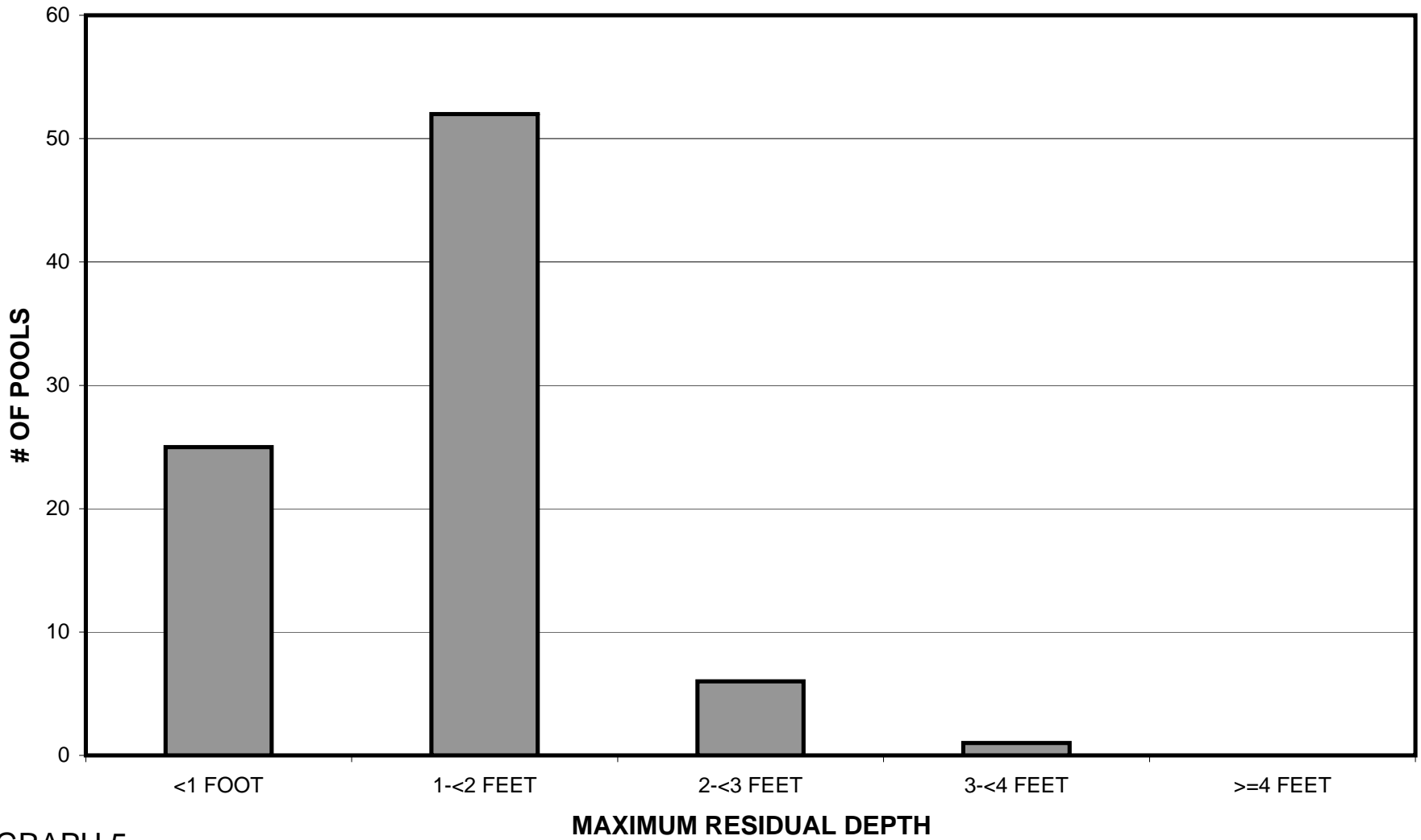
GRAPH 3

**GULCH C 2013**  
**POOL TYPES BY PERCENT OCCURRENCE**



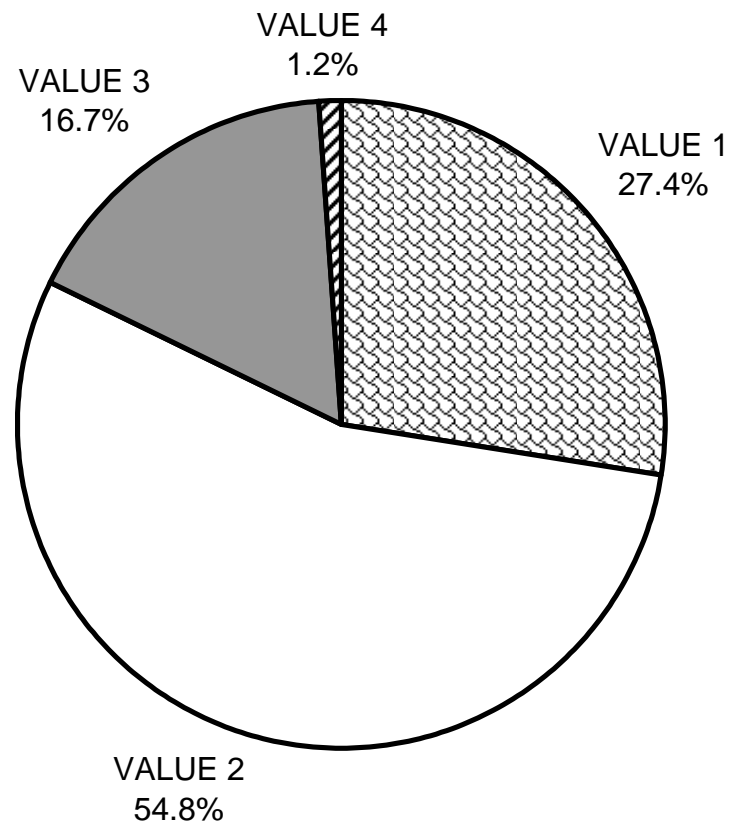
GRAPH 4

# GULCH C 2013 MAXIMUM DEPTH IN POOLS



GRAPH 5

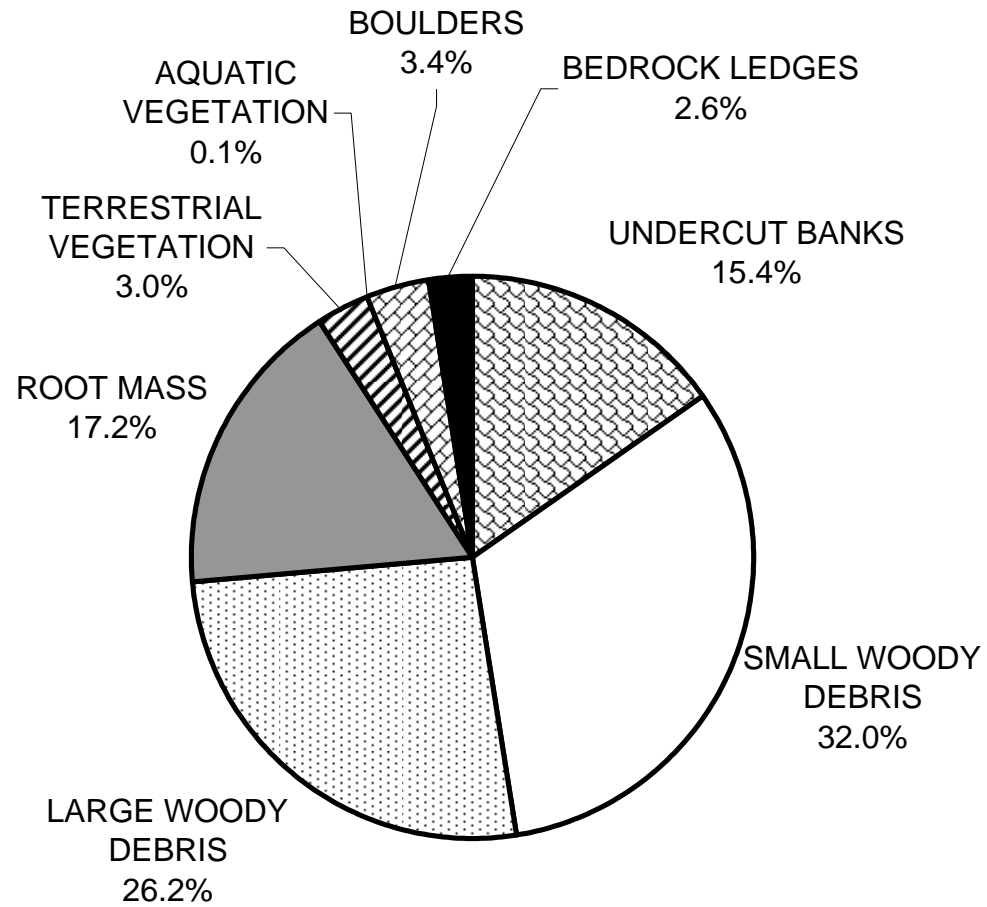
# GULCH C 2013 PERCENT EMBEDDEDNESS



GRAPH 6

# GULCH C 2013

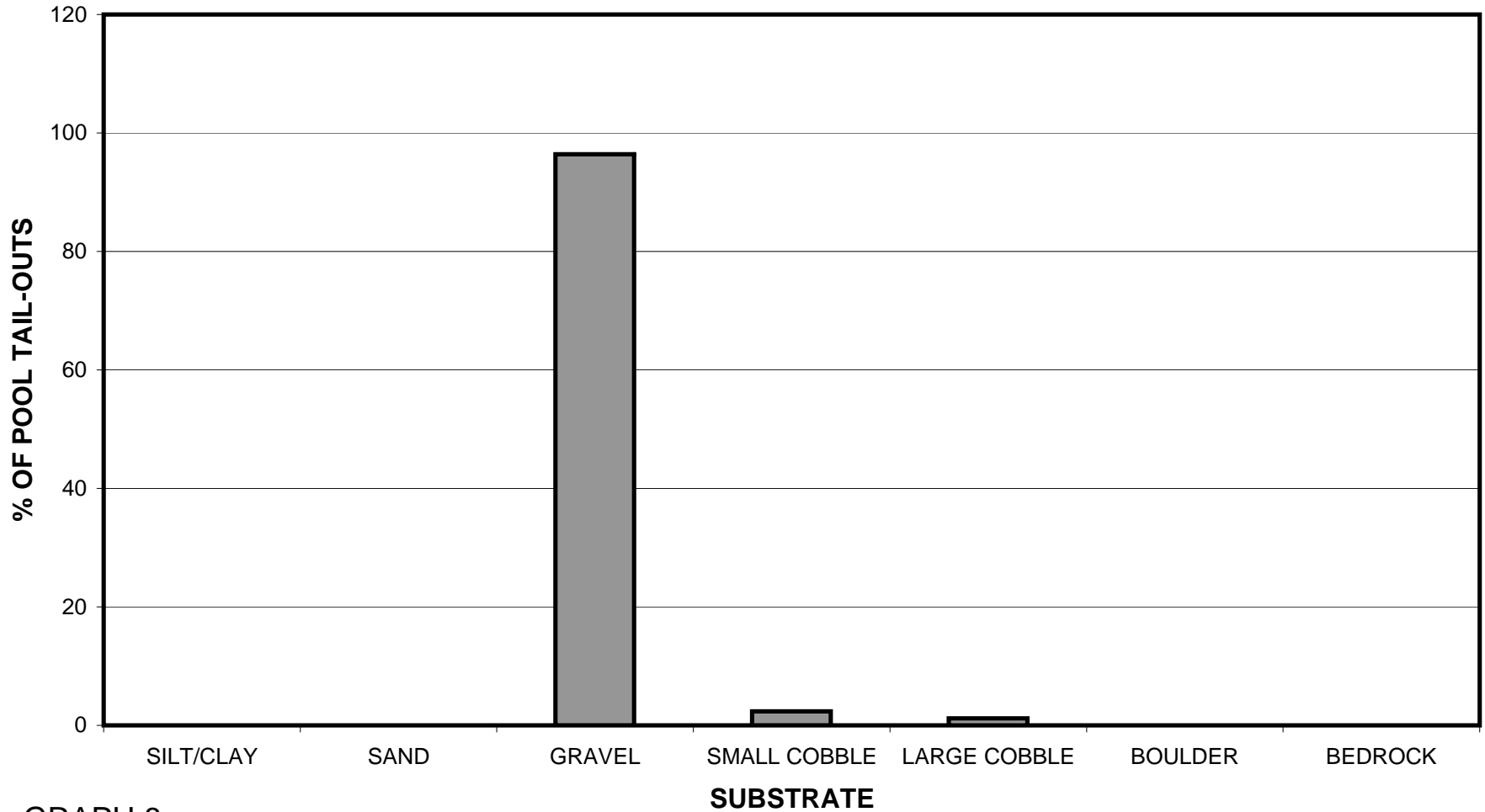
## MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

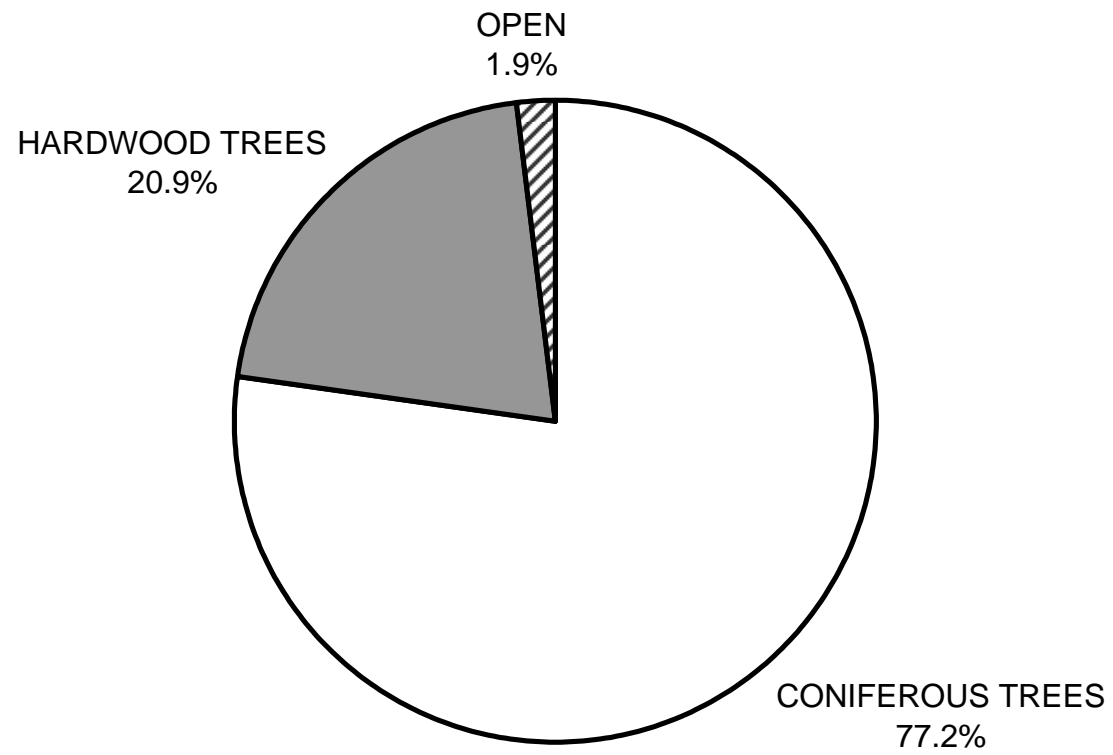
# GULCH C 2013

## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



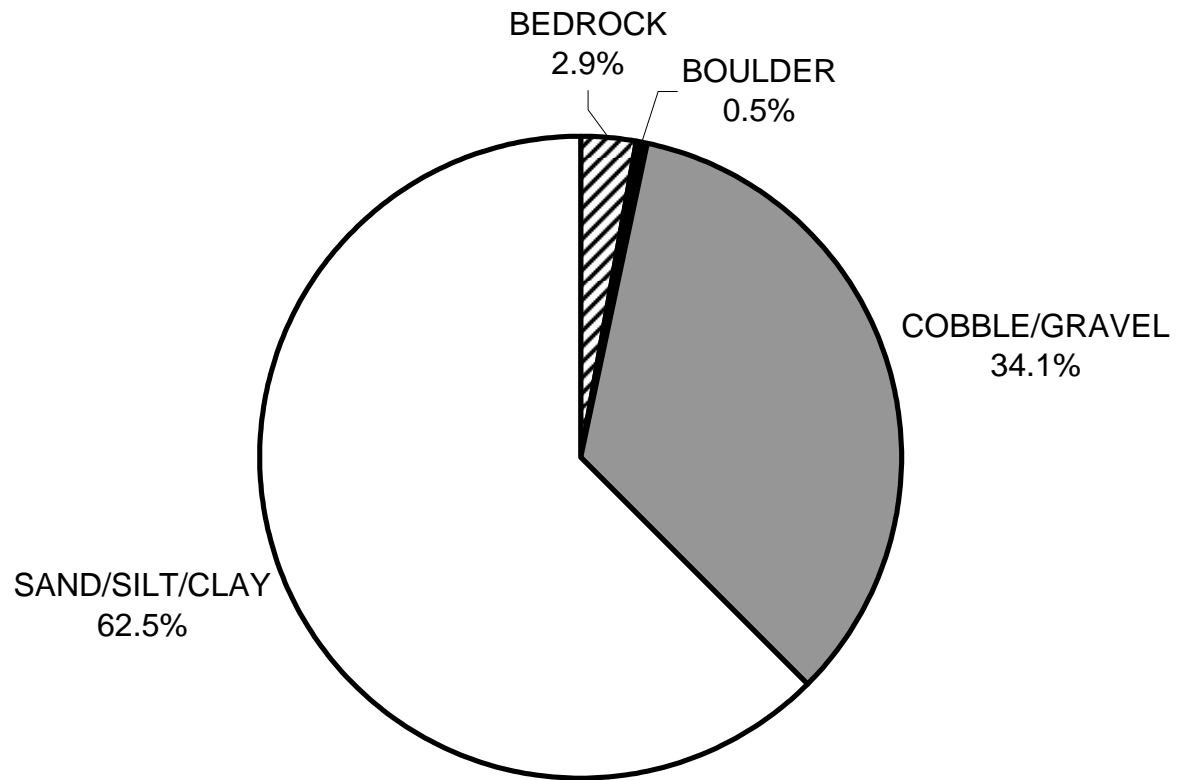
GRAPH 8

# GULCH C 2013 MEAN PERCENT CANOPY



GRAPH 9

**GULCH C 2013**  
**DOMINANT BANK COMPOSITION IN SURVEY REACH**

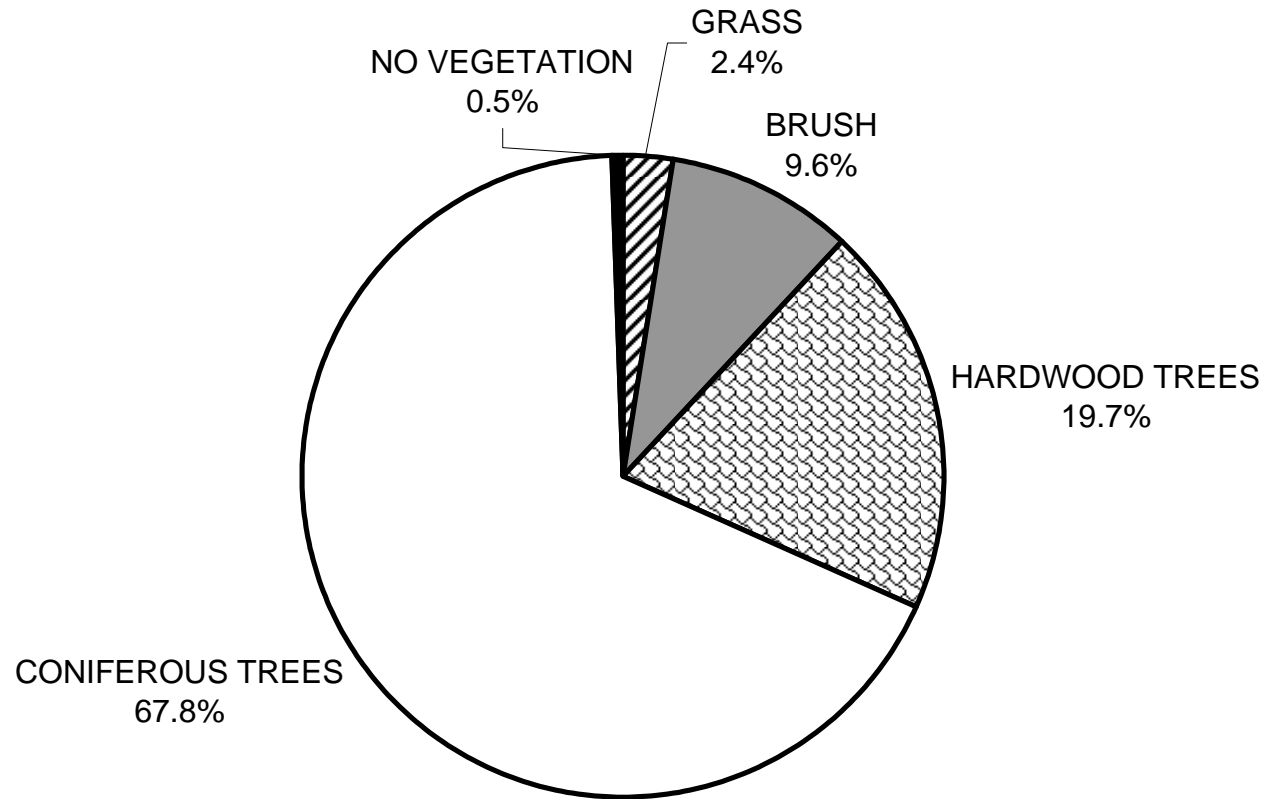


GRAPH 10



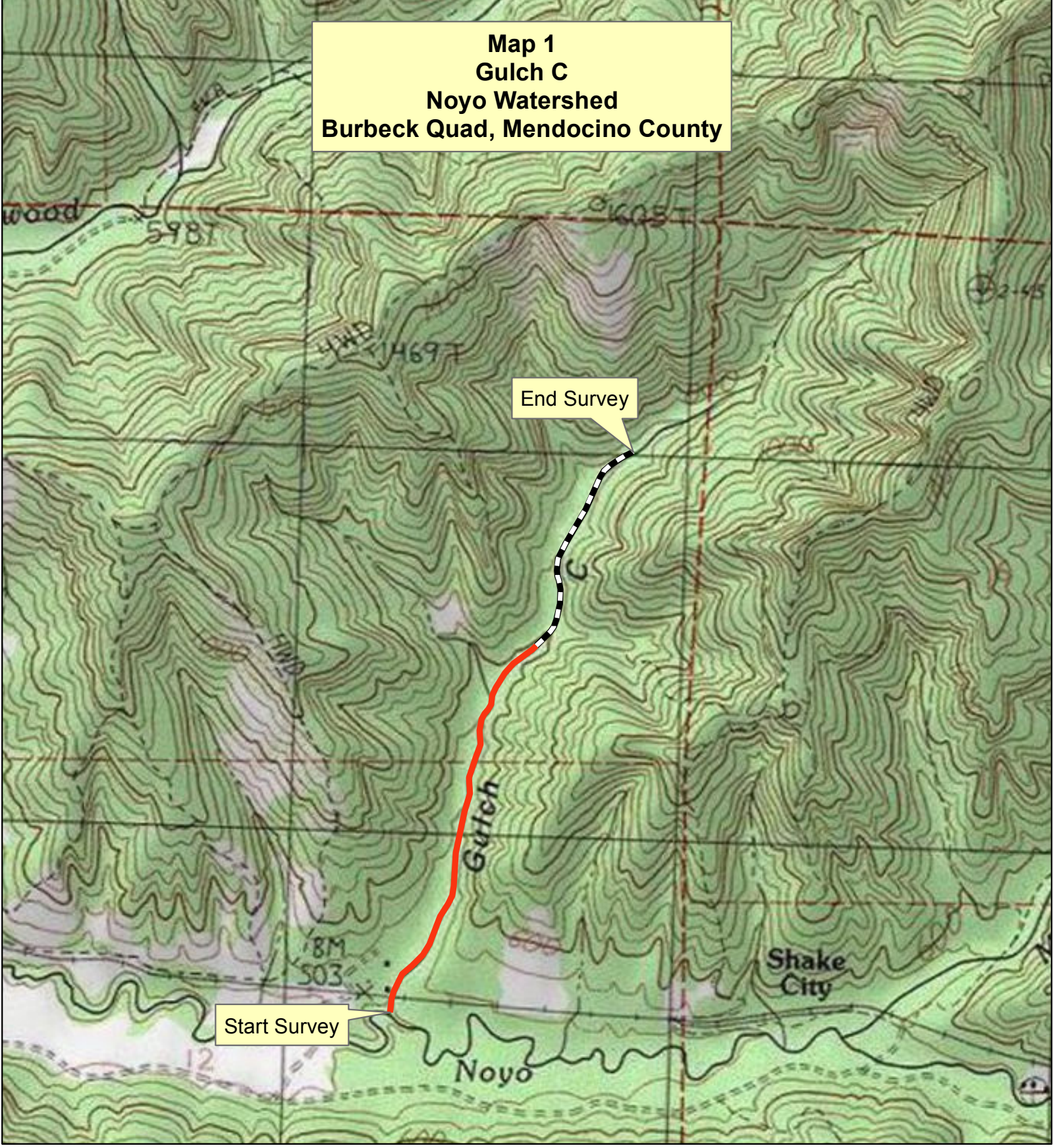
# GULCH C 2013

## DOMINANT BANK VEGETATION IN SURVEY REACH



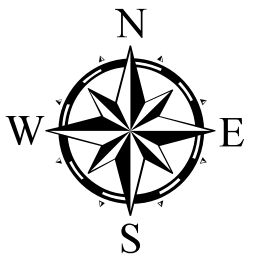
GRAPH 11



**Map 1  
Gulch C  
Noyo Watershed  
Burbeck Quad, Mendocino County**



Start Survey

End Survey



-  Reach 1, E4 Channel Type
-  Reach 2, G4 Channel Type

