

# STREAM INVENTORY REPORT

## Gulch Eleven

### INTRODUCTION

A stream inventory was conducted from July 17 to July 18, 2012 on Gulch Eleven. The survey began at the confluence with South Fork Ten Mile River and extended upstream one mile. A stream inventory and report were also completed for one tributary to Gulch Eleven.

The Gulch Eleven 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 Eleven. 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 Eleven is a tributary to South Fork Ten Mile River, a tributary to Ten Mile River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Gulch Eleven's legal description at the confluence with South Fork Ten Mile River is T19N R16W S25. Its location is 39.4790 degrees north latitude and 123.5936 degrees west longitude, LLID number 1235924394790. Gulch Eleven is a first order stream and has approximately 0.2 miles of blue line stream according to the USGS Northspur 7.5 minute quadrangle. Gulch Eleven drains a watershed of approximately 2.5 square miles. Elevations range from about 425 feet at the mouth of the creek to 1,000 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 Camp One Ten Mile Road north of Fort Bragg, CA.

### METHODS

The habitat inventory conducted in Gulch Eleven follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Wildlife (CDFW). This inventory was conducted by a two-person team.

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### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.).

### HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Gulch Eleven 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 Eleven 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

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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 Gulch Eleven, 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 Eleven, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. The shelter rating is then calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

### 7. Substrate Composition:

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

### 8. Canopy:

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

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

## **DATA ANALYSIS**

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

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

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- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Gulch Eleven 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 July 17 to July 18, 2012 was conducted by R. Spencer and B. James (WSP). The total length of the stream surveyed was 5,180 feet with an additional 136 feet of side channel.

Stream flow was not measured on Gulch Eleven.

Gulch Eleven is an E4 channel type for the entire length of the survey. 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.

Water temperatures taken during the survey period ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 56 to 64 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% pool units, 28% flatwater units, 25% riffle units, 4% unsurveyed units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 43% flatwater units, 36% pool units, 18% riffle units, 4% unsurveyed units, and 1% dry units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 39%; step run units, 24%; and low gradient riffle units, 19% (Graph 3). Based on percent total length, step run units made up 40%, mid-channel pool units 34%, and low gradient riffle units 12%.

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A total of 75 pools were identified (Table 3). Main channel pools were the most frequently encountered at 96% (Graph 4), and comprised 97% 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. Nine of the 75 pools (12%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 75 pool tail-outs measured, 10 had a value of 1 (13.3%); 59 had a value of 2 (78.7%); five had a value of 3 (6.7%); one had a value of 4 (1.3%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 6, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 38 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 39. Scour pools had a mean shelter rating of 23 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Gulch Eleven. Graph 7 describes the pool cover in Gulch Eleven. 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 83% 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 Gulch Eleven was 94%. Six percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 38% and 62%, respectively. Graph 9 describes the mean percent canopy in Gulch Eleven.

For the stream reach surveyed, the mean percent right bank vegetated was 96%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 54% sand/silt/clay, 38% cobble/gravel, 6% bedrock, and 3% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 58% of the units surveyed. Additionally, 31% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had brush as the dominant vegetation type (Graph 11).

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### BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at five sites for species composition and distribution in Gulch Eleven on September 26, 2012. The sites were sampled by I. Mikus and M. Groff (CDFW).

The five sites were sampled within the first 1,711 feet of Gulch Eleven. The sites yielded 25 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), one age 1+ SH/RT, and five YOY coho salmon.

The following chart displays the information yielded from these sites:

2012 Gulch Eleven underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
E4 Channel Type									
09/26/12	1	013	Pool	311	3	0	0	2	0
	2	036	Pool	1,199	9	1	0	2	0
	3	042	Pool	1,310	4	0	0	1	0
	4	058	Pool	1,626	5	0	0	0	0
	5	061	Pool	1,711	4	0	0	0	0

### DISCUSSION

Gulch Eleven is an E4 channel type. The suitability of E4 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.

The water temperatures recorded on the survey days July 17 to July 18, 2012 from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 56 to 64. This is a good water temperature range for salmonids. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 43% of the total length of this survey, riffles 18%, and pools 36%. Nine of the 75 (12%) 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 structures that will deepen pool habitat is recommended.

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Sixty-nine of the 75 pool tail-outs measured had embeddedness ratings of 1 or 2. Six 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 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.

Sixty-eight of the 75 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 38. The shelter rating in the flatwater habitats is 6. 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 Gulch Eleven. Large woody debris is the dominant cover type in pools followed by small woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 94%. The percentage of right and left bank covered with vegetation was 96% and 98%, respectively.

### RECOMMENDATIONS

- 1) Gulch Eleven 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.

### 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 South Fork Ten Mile River. The channel is an E4 for the entire length of the survey.
1141	0035.00	Remnants of railroad trestle.



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- 1199 0037.00 Tributary #01 enters on the left bank. It contributes approximately 40% to Gulch Eleven's flow. The water temperature of the tributary was 54 degrees Fahrenheit, the water temperature downstream of the tributary was 56 degrees Fahrenheit, and the water temperature upstream of the confluence was 58 degrees Fahrenheit. For more information, see the 2012 Unnamed Tributary to Gulch Eleven Stream Habitat Inventory Report.
- 1230 0039.00 Erosion site contributing fine sediment to the channel.
- 3130 0100.03 Left bank seep.
- 3358 0114.00 There is a 1.5' high plunge over a log.
- 3384 0116.00 Log debris accumulation (LDA) #01 contains 25 pieces of large woody debris (LWD) and measures 10' high x 50' wide x 60' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to cobble and measures 30' wide x 30' long x 5' deep. There is a 4' high plunge over the LDA. Fish were observed above the LDA.
- 3704 0125.00 LDA #02 contains six pieces of LWD and measures 11' high x 34' wide x 23' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to cobble and measures 15' wide x 45' long x 5' deep. There are two plunges over the LDA: a 2.5' high plunge followed by 3' high plunge. No fish were observed above the LDA.
- 3943 0134.00 LDA #03 contains two pieces of LWD and measures 6.5' high x 11' wide x 8' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 15' wide x 6' long x 50' deep. There is a 6' high plunge over the LDA.
- 5161 0173.00 End of survey due to diminished habitat. The gradient increases 200' upstream of the end of survey and the channel narrows. No fish were observed beyond HU#118.

## 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 Eleven

LLID: 1235924394790 Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Confluence Location: Quad: NORTHSPUR Legal Description: T19NR16WS25 Latitude: 39:28:44.0N Longitude: 123:35:33.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
2	0	DRY	1.1	18	35	0.7									
50	11	FLATWATER	27.8	46	2276	42.8	5.0	0.3	0.6	230	11477	76	3797		6
8	0	NOSURVEY	4.4	24	189	3.6									146
75	75	POOL	41.7	25	1885	35.5	6.9	0.5	1.2	161	12091	117	8788	80	38
45	9	RIFFLE	25.0	21	931	17.5	4.8	0.2	0.4	93	4179	28	1241		6
<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>		
180	95				5316					27747			13826		

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

Stream Name: Gulch Eleven

LLID: 1235924394790

Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR16WS25

Latitude: 39:28:44.0N

Longitude: 123:35:33.0W

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 (%)
34	7	LGR	18.9	19	658	12.4	4	0.2	0.5	71	2428	17	573		7	99
11	2	HGR	6.1	25	273	5.1	7	0.3	0.6	168	1848	65	716		3	92
7	2	RUN	3.9	24	166	3.1	5	0.3	0.6	117	822	35	247		10	96
43	9	SRN	23.9	49	2110	39.7	5	0.3	0.9	254	10941	85	3654		6	97
71	71	MCP	39.4	26	1812	34.1	7	0.5	2.7	163	11567	116	8261	79	39	94
1	1	STP	0.6	14	14	0.3	9	0.4	1	120	120	84	84	48	60	89
3	3	LSL	1.7	20	59	1.1	8	0.7	2.4	135	405	148	444	114	23	96
2	0	DRY	1.1	18	35	0.7										
8	0	NS	4.4	24	189	3.6									146	94

Total Units  
180

Total Units Fully Measured  
95

Total Length (ft.)  
5316

Total Area (sq.ft.)  
28130

Total Volume (cu.ft.)  
13979

**Table 3 - Summary of Pool Types**

Stream Name: Gulch Eleven

LLID: 1235924394790

Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR16WS25

Latitude: 39:28:44.0N

Longitude: 123:35:33.0W

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
72	72	MAIN	96	25	1826	97	6.9	0.5	162	11686	79	5575	39
3	3	SCOUR	4	20	59	3	7.5	0.7	135	405	114	341	23

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
75	75	1885	12091	5916

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

Stream Name: Gulch Eleven

LLID: 1235924394790

Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR16WS25

Latitude: 39:28:44.0N

Longitude: 123:35:33.0W

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
71	MCP	95	29	41	34	48	8	11	0	0	0	0
1	STP	1	0	0	1	100	0	0	0	0	0	0
3	LSL	4	0	0	2	67	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
75	29	39	37	49	9	12	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.2

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

Stream Name: Gulch Eleven

LLID: 1235924394790

Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Dry Units: 2

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR16WS25

Latitude: 39:28:44.0N

Longitude: 123:35:33.0W

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
34	7	LGR	0	50	50	0	0	0	0	0	0
11	2	HGR	0	0	0	0	0	0	0	100	0
45	9	TOTAL RIFFLE	0	25	25	0	0	0	0	50	0
7	2	RUN	0	35	55	0	10	0	0	0	0
43	9	SRN	0	23	28	1	8	0	0	40	0
50	11	TOTAL FLAT	0	25	32	1	8	0	0	33	0
71	71	MCP	6	30	36	14	6	2	2	4	0
1	1	STP	0	10	50	40	0	0	0	0	0
3	3	LSL	0	20	60	15	0	0	5	0	0
75	75	TOTAL POOL	6	29	37	15	6	1	2	4	0
8	5	NS	0	42	54	4	0	0	0	0	0
180	100	TOTAL	5	30	37	13	6	1	1	7	0

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

Stream Name: Gulch Eleven

LLID: 1235924394790

Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Dry Units: 2

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR16WS25

Latitude: 39:28:44.0N

Longitude: 123:35:33.0W

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
34	7	LGR	0	0	57	43	0	0	0
11	2	HGR	0	0	50	50	0	0	0
7	2	RUN	0	0	50	0	0	0	50
43	9	SRN	0	0	67	33	0	0	0
71	71	MCP	3	6	75	14	0	0	3
1	1	STP	0	0	100	0	0	0	0
3	3	LSL	0	0	100	0	0	0	0



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

Stream Name: Gulch Eleven

LLID: 1235924394790

Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR16WS25

Latitude: 39:28:44.0N

Longitude: 123:35:33.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
94	62	38	0	96	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 Eleven      LLID: 1235924394790      Drainage: Rockport  
 Survey Dates: 7/17/2012 to 7/18/2012      Survey Length (ft.): 5316      Main Channel (ft.): 5180      Side Channel (ft.): 136  
 Confluence Location: Quad: NORTHSPUR      Legal Description: T19NR16WS25      Latitude: 39:28:44.0N      Longitude: 123:35:33.0W

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

**STREAM REACH: 1**

Channel Type: E4	Canopy Density (%): 94.4	Pools by Stream Length (%): 35.5
Reach Length (ft.): 5180	Coniferous Component (%): 61.7	Pool Frequency (%): 41.7
Riffle/Flatwater Mean Width (ft.): 4.9	Hardwood Component (%): 38.3	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 88
Range (ft.): 12 to 29	Vegetative Cover (%): 96.8	2 to 2.9 Feet Deep: 12
Mean (ft.): 16	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 31	Mean Max Residual Pool Depth (ft.): 1.2
Water (F): 56 - 60    Air (F): 56 - 64	LWD per 100 ft.:	Mean Pool Shelter Rating: 38
Dry Channel (ft): 35	Riffles: 2	
	Pools: 9	
	Flat: 3	
Pool Tail Substrate (%): Silt/Clay: 3    Sand: 5    Gravel: 83    Sm Cobble: 8    Lg Cobble: 0    Boulder: 0    Bedrock: 1		
Embeddedness Values (%): 1. 13.3    2. 78.7    3. 6.7    4. 1.3    5. 0.0		

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

Stream Name: Gulch Eleven

LLID: 1235924394790

Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR16WS25

Latitude: 39:28:44.0N

Longitude: 123:35:33.0W

**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	9	3	5.9
Boulder	3	2	2.5
Cobble / Gravel	43	34	38.1
Sand / Silt / Clay	46	62	53.5

**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	0	1	0.5
Brush	13	8	10.4
Hardwood Trees	39	24	31.2
Coniferous Trees	49	68	57.9
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Gulch Eleven

LLID: 1235924394790

Drainage: Rockport

Survey Dates: 7/17/2012 to 7/18/2012

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR16WS25

Latitude: 39:28:44.0N

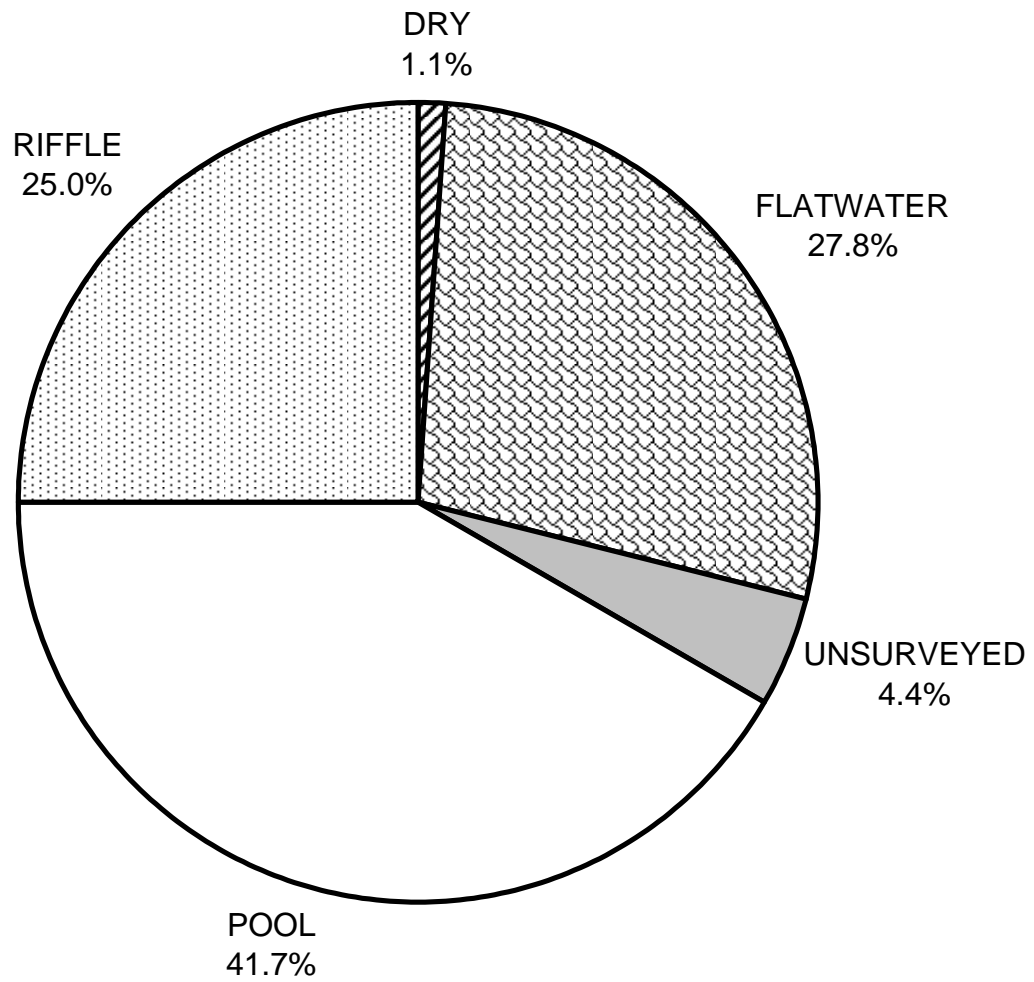
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	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	0	6
SMALL WOODY DEBRIS (%)	25	25	29
LARGE WOODY DEBRIS (%)	25	32	37
ROOT MASS (%)	0	1	15
TERRESTRIAL VEGETATION (%)	0	8	6
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	0	0	2
BOULDERS (%)	50	33	4
BEDROCK LEDGES (%)	0	0	0

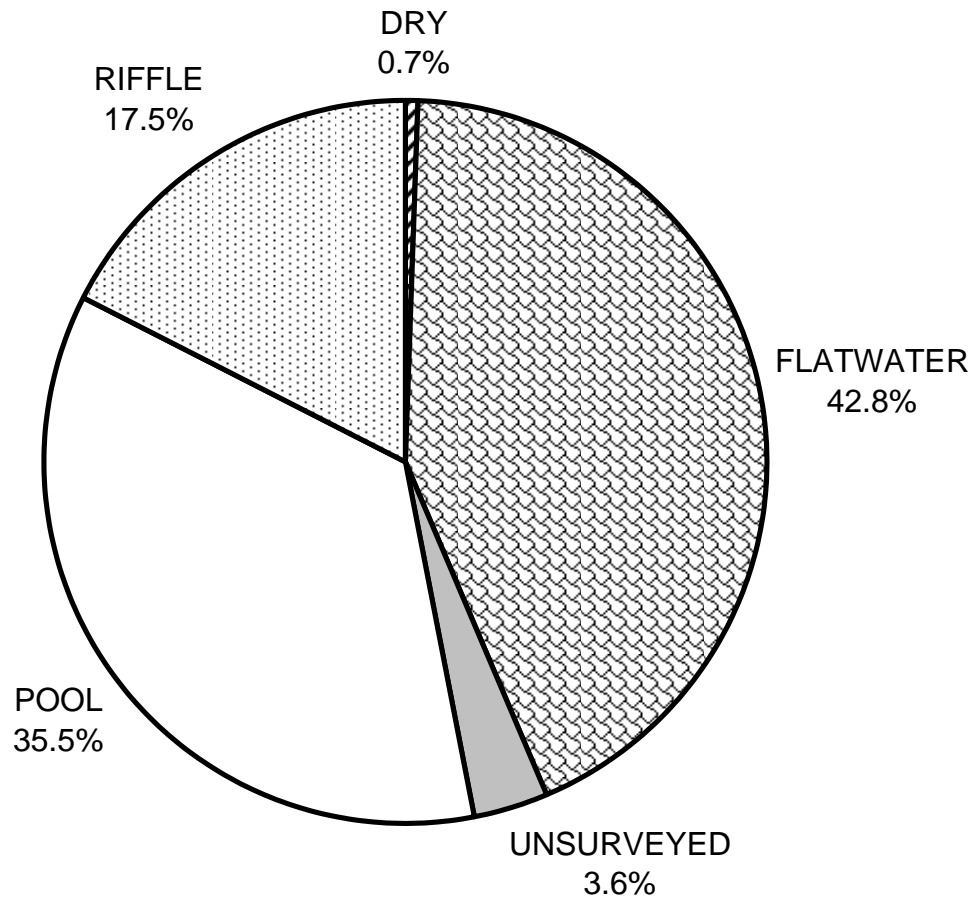
# GULCH ELEVEN 2012

## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

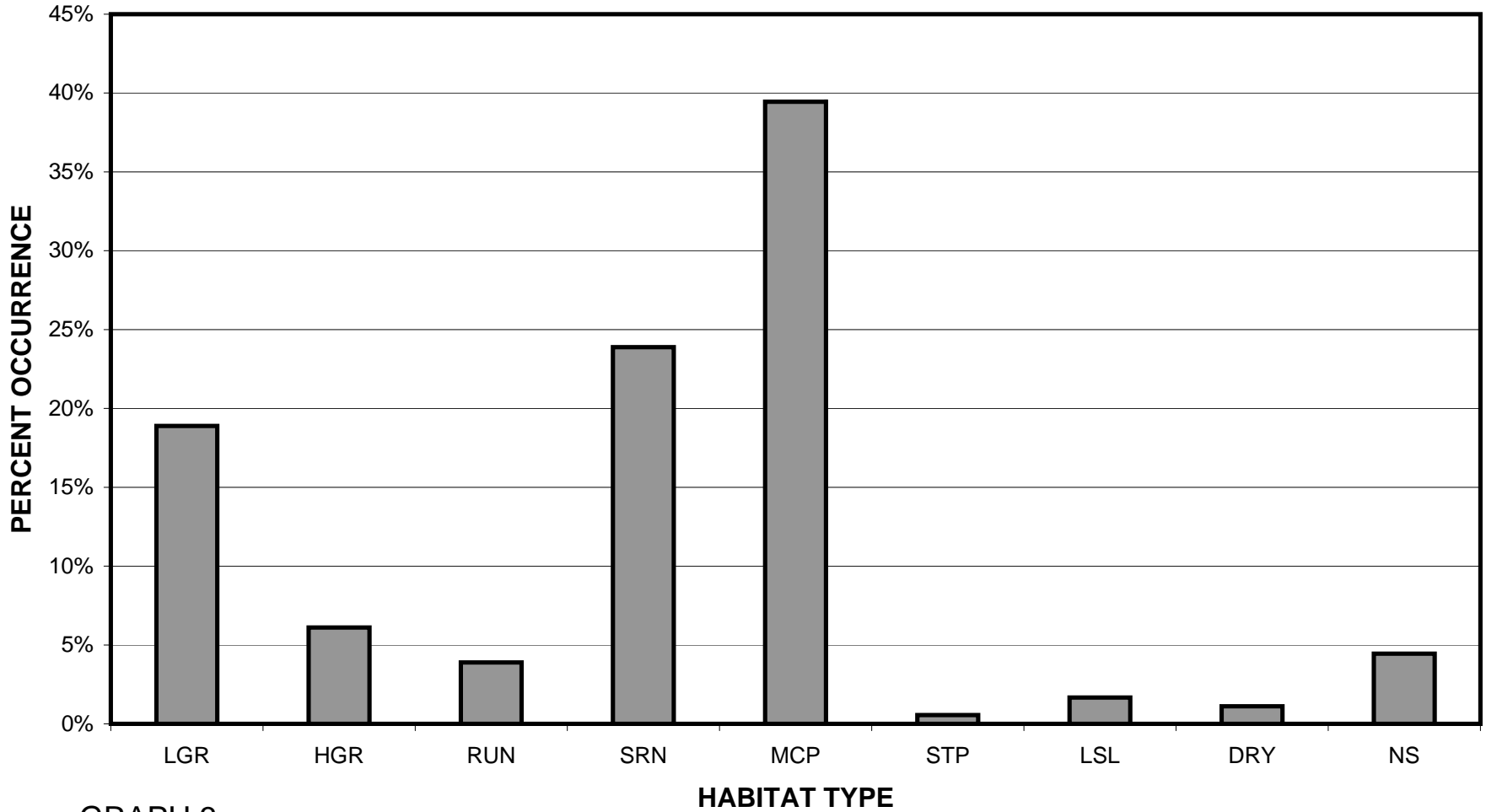
# GULCH ELEVEN 2012 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

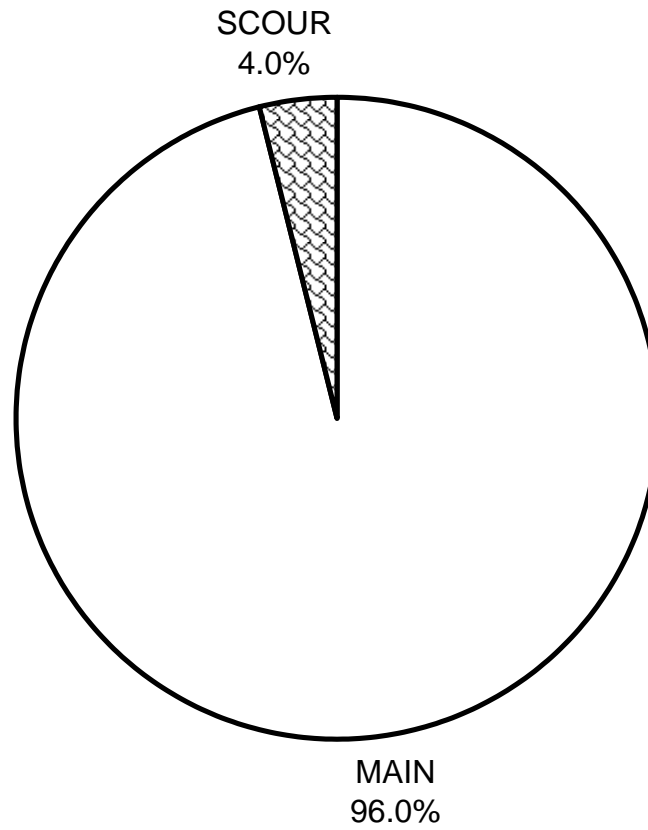
# GULCH ELEVEN 2012

## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

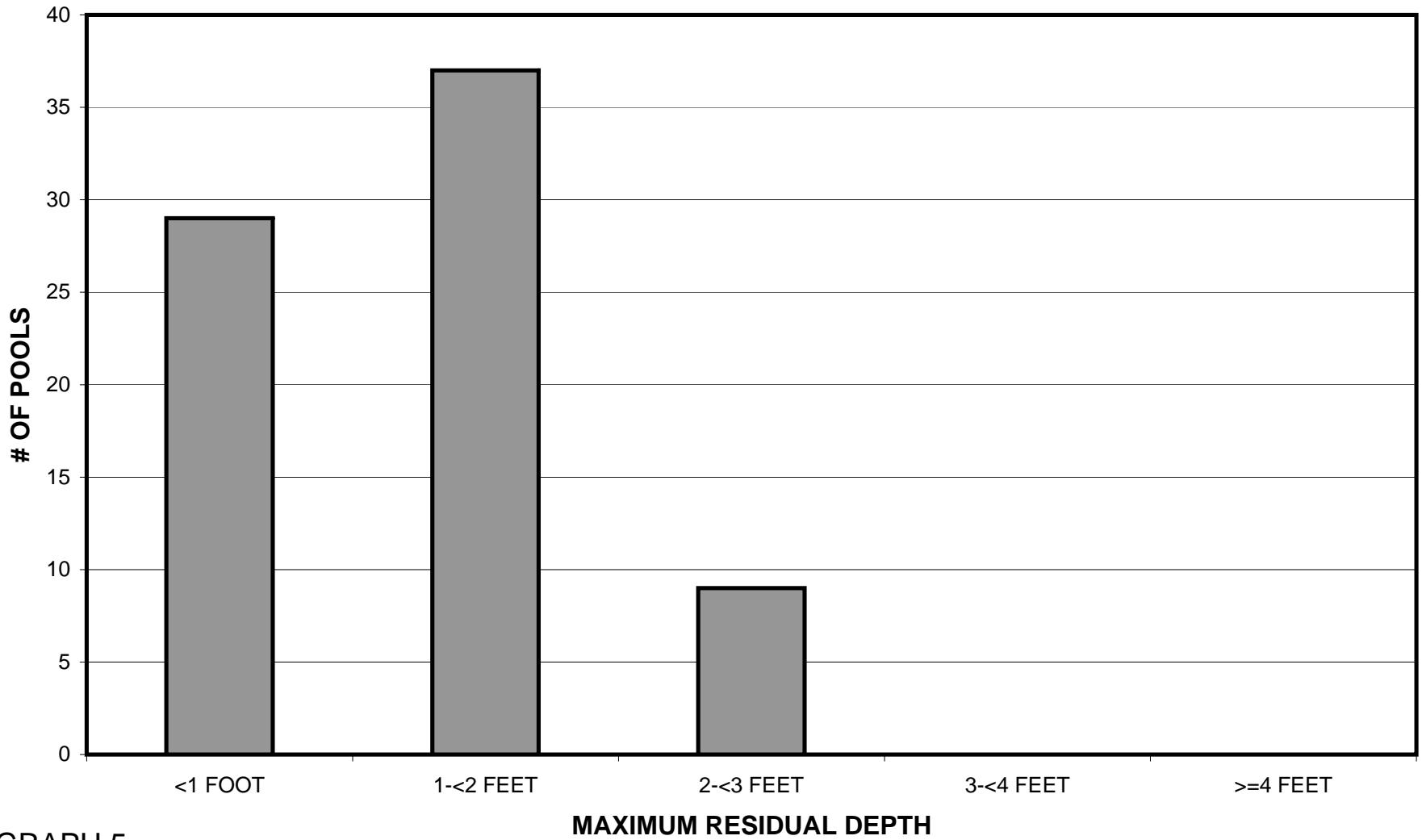
**GULCH ELEVEN 2012  
POOL TYPES BY PERCENT OCCURRENCE**



GRAPH 4

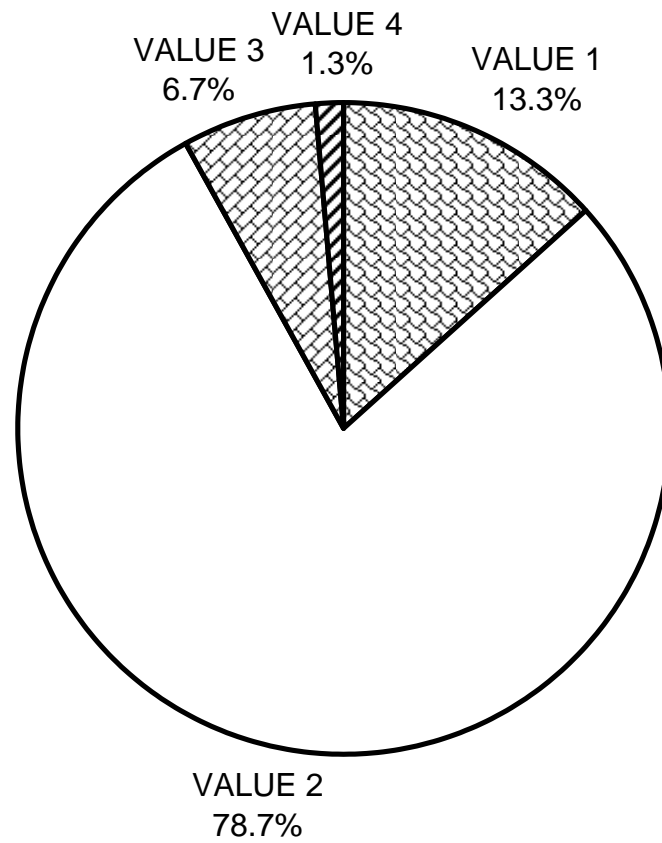


# GULCH ELEVEN 2012 MAXIMUM DEPTH IN POOLS



GRAPH 5

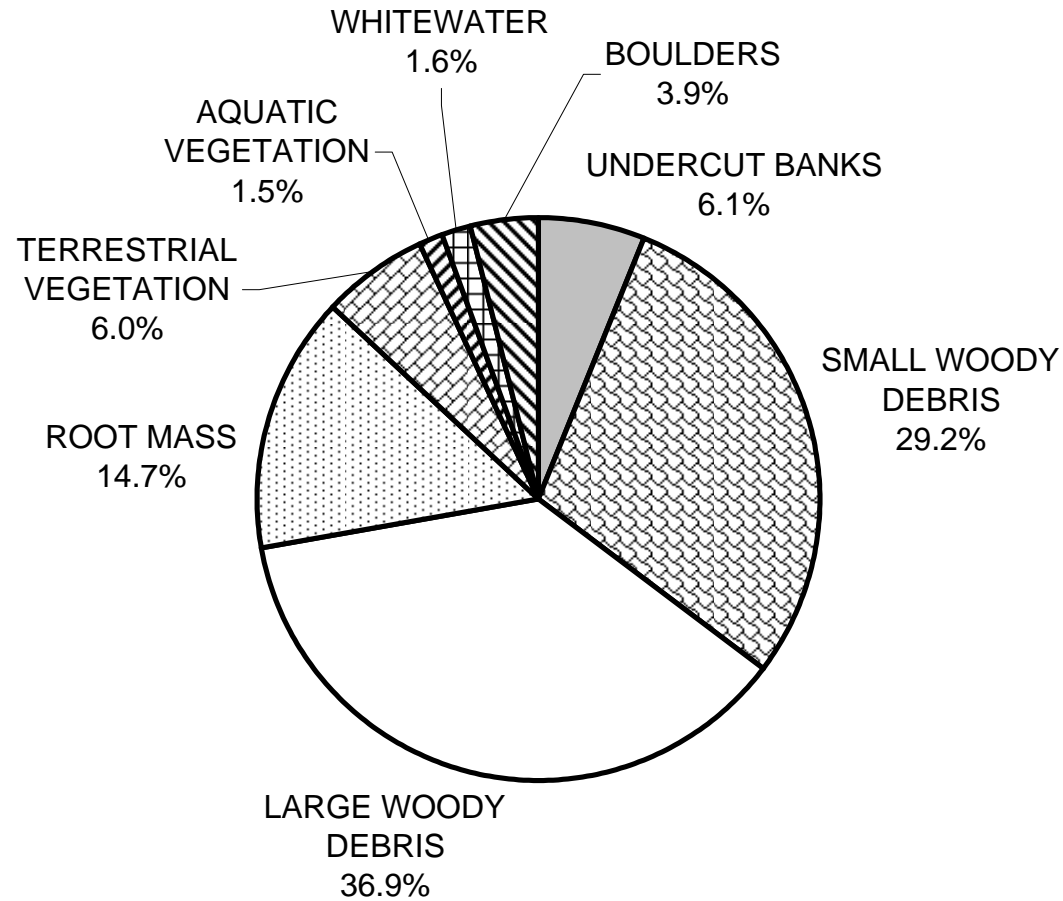
# GULCH ELEVEN 2012 PERCENT EMBEDDEDNESS



GRAPH 6

# GULCH ELEVEN 2012

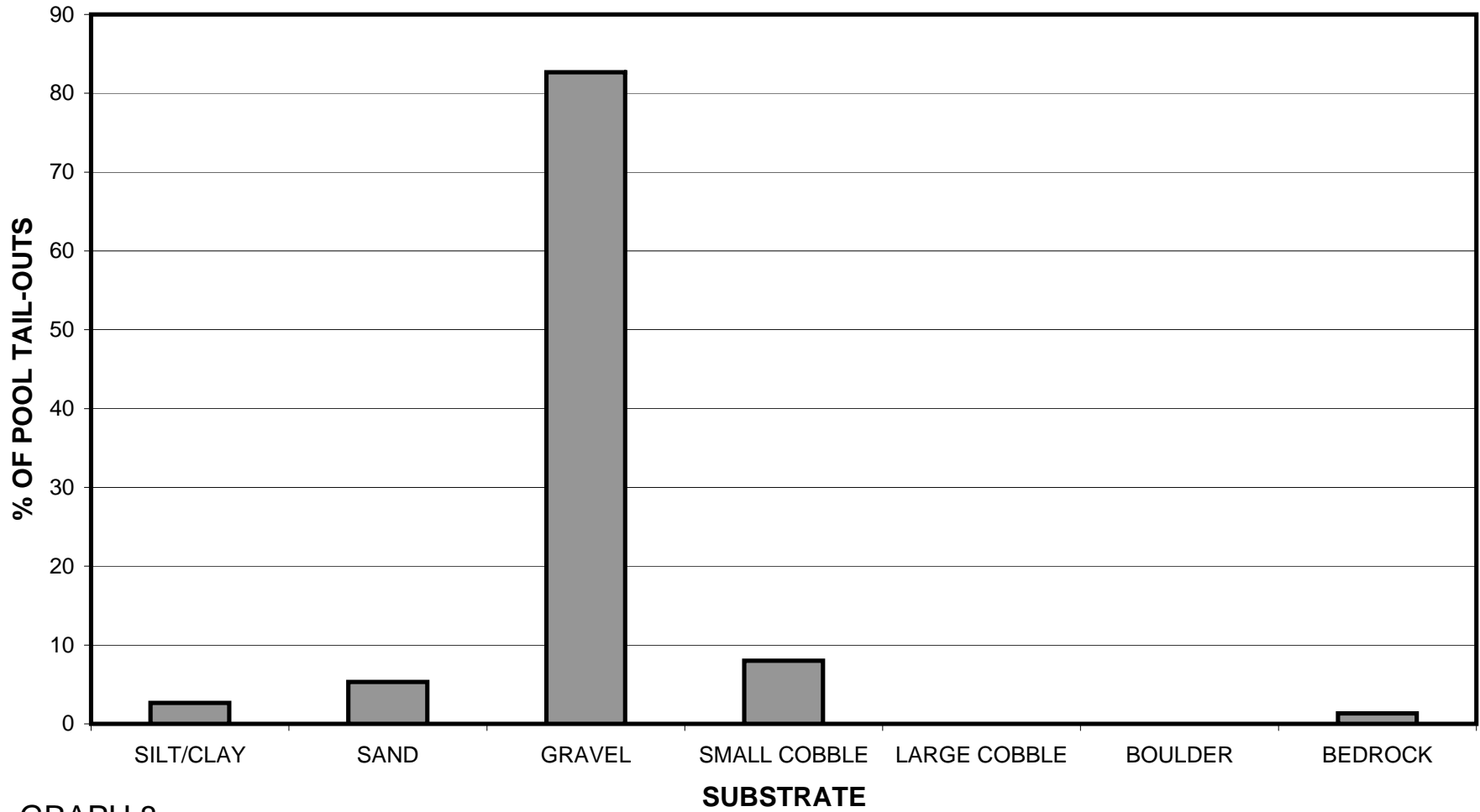
## MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

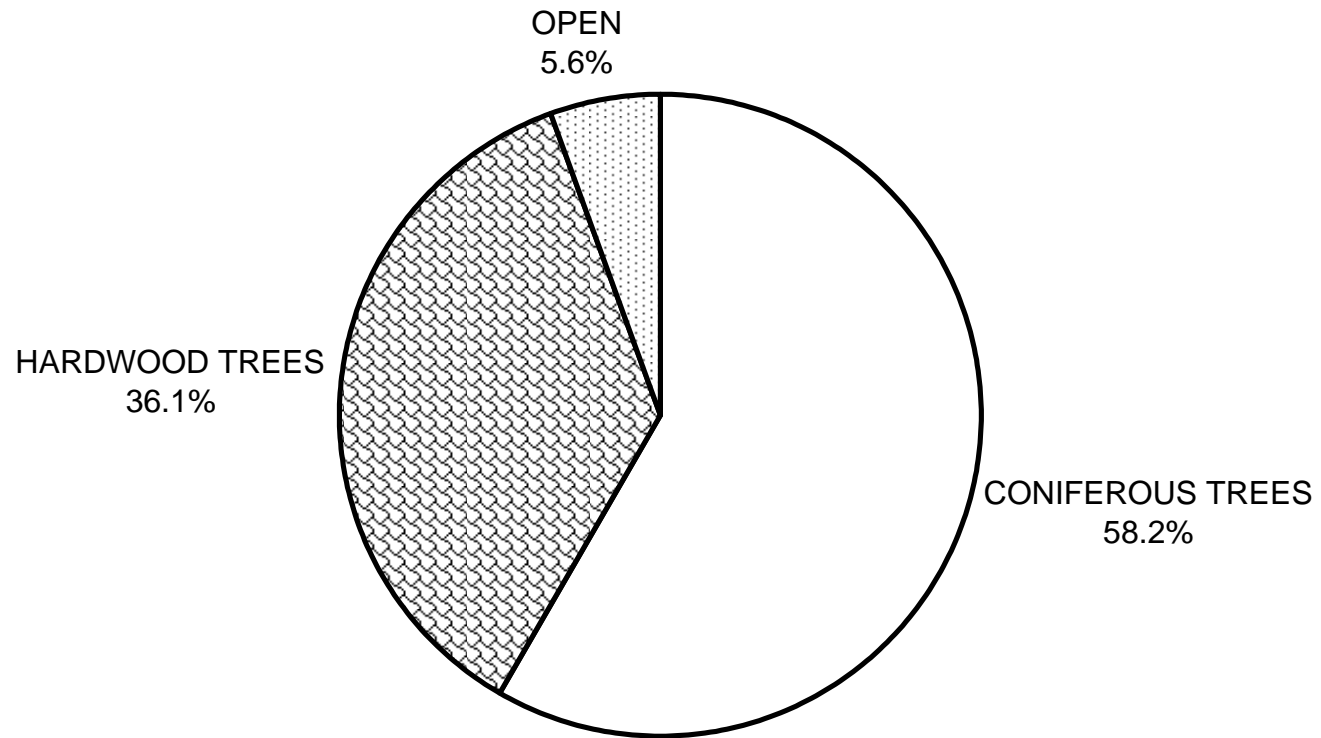
# GULCH ELEVEN 2012

## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



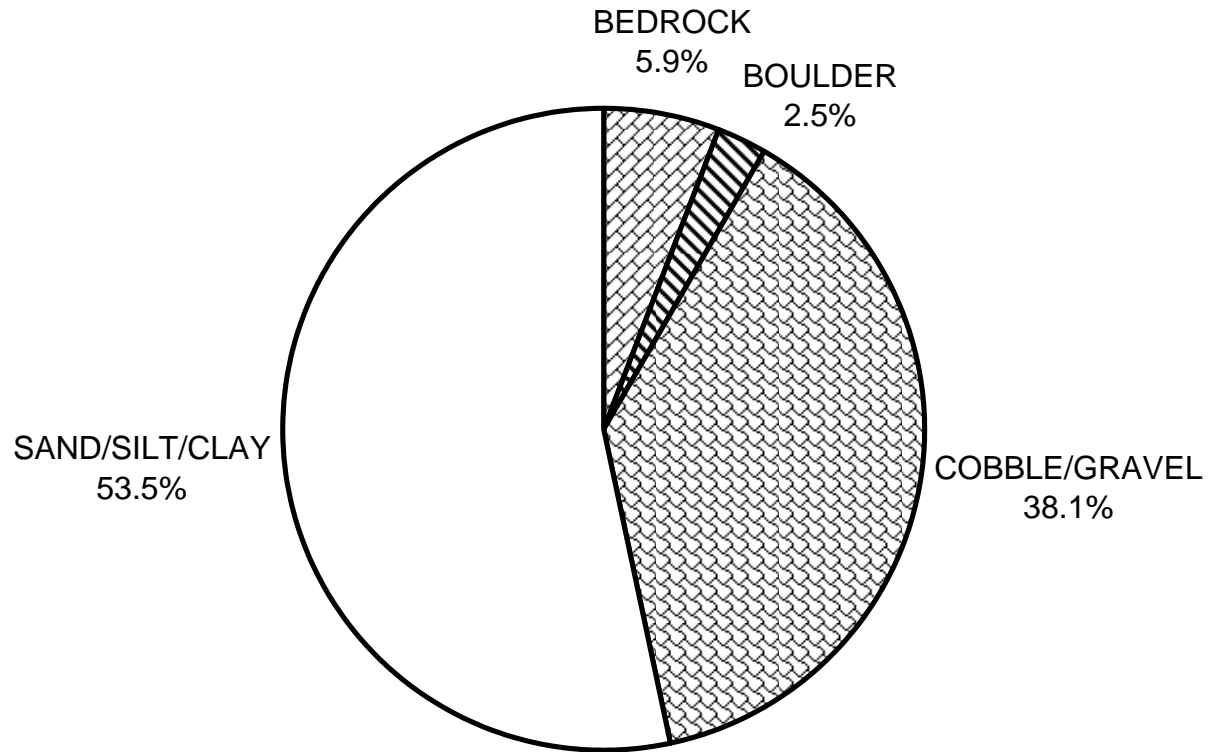
GRAPH 8

# GULCH ELEVEN 2012 MEAN PERCENT CANOPY



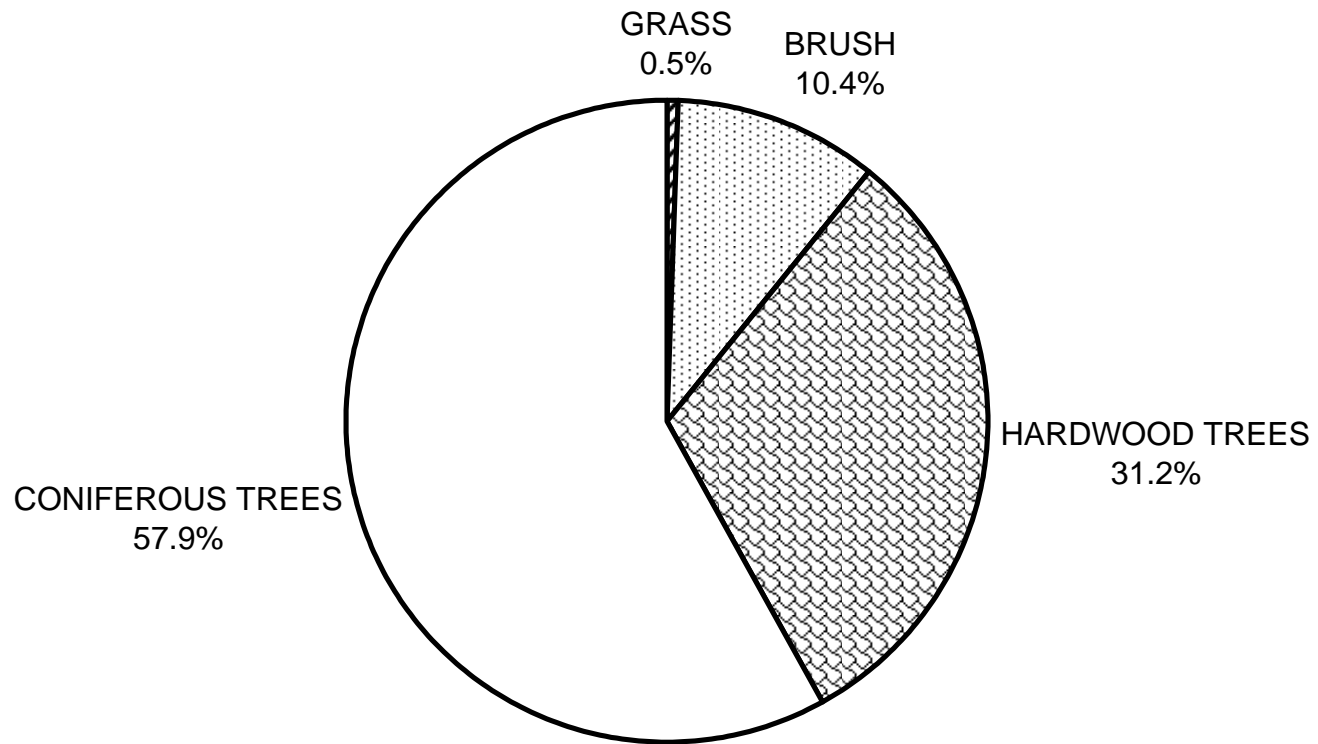
GRAPH 9

**GULCH ELEVEN 2012**  
**DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

# GULCH ELEVEN 2012 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



**Map 1  
Gulch Eleven  
Ten Mile River Watershed  
Northspur Quad, Mendocino County**

Start of Survey

End of Survey

— Reach 1, Channel Type E4

