

STREAM INVENTORY REPORT

Glenbrook Gulch

INTRODUCTION

A stream inventory was conducted from September 25 to October 2, 2013 on Glenbrook Gulch. The survey began at the confluence with Kaisen Gulch and extended upstream 0.6 miles.

The Glenbrook 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 Glenbrook 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

Glenbrook Gulch is a tributary to Kaisen Gulch, a tributary to the Albion River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Glenbrook Gulch's legal description at the confluence with Kaisen Gulch is T16N R16W S08. Its location is 39.2631 degrees north latitude and 123.6692 degrees west longitude, LLID number 1236691392630. Glenbrook Gulch is an intermittent stream according to the USGS Mathison Peak 7.5 minute quadrangle. Glenbrook Gulch drains a watershed of approximately 0.9 square miles. Elevations range from about 65 feet at the mouth of the creek to 550 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 a logging road off Comptche-Ukiah Road, west of Comptche, CA.

METHODS

The habitat inventory conducted in Glenbrook Gulch 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 California Conservation Corps (CCC) 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

Glenbrook Gulch

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 Glenbrook 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". Glenbrook 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.

Glenbrook Gulch

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Glenbrook 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 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 Glenbrook 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. 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 Glenbrook 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 Glenbrook 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.

Glenbrook Gulch

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Glenbrook Gulch. In addition, underwater observations were made at six 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)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Glenbrook Gulch

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Glenbrook 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 September 25 to October 2, 2013 was conducted by B. Leonard (CDFW) and B Brengettsey (CCC). The total length of the stream surveyed was 3,100 feet.

Stream flow was not measured on Glenbrook Gulch.

Glenbrook Gulch is a G4 channel type for the entire length of the survey, 3,100 feet. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 50 to 57 degrees Fahrenheit. Air temperatures ranged from 45 to 61 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 33% flatwater units, 32% pool units, 24% riffle units, and 11% dry units (Graph 1). Based on total length of Level II habitat types there were 48% flatwater units, 21% pool units, 20% riffle units, and 12% dry units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 32%; run units, 19%; and low gradient riffle units, 19% (Graph 3). Based on percent total length, step run units made up 30%, mid-channel pool units 21%; and run units 18%.

A total of 38 pools were identified (Table 3). All of the pools encountered were main channel pools.

Glenbrook Gulch

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Three of the 38 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 38 pool tail-outs measured, 11 had a value of 1 (29%); 19 had a value of 2 (50%); two had a value of 3 (5%); two had a value of 4 (5%); four had a value of 5 (11%) (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 3, flatwater habitat types had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 26 (Table 1).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Glenbrook Gulch. Graph 7 describes the pool cover in Glenbrook Gulch. Small woody debris is the dominant pool cover type followed by undercut banks.

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 75% of the pool tail-outs. Silt/clay was the next most frequently observed dominant substrate type and occurred in 11% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Glenbrook Gulch was 97%. Three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 40% and 60%, respectively. Graph 9 describes the mean percent canopy in Glenbrook Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 93%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 59% sand/silt/clay, 33% cobble/gravel, and 8% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 36% of the units surveyed. Additionally, 30% of the units surveyed had grass as the dominant vegetation type, and 21% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at six sites for species composition and distribution in Glenbrook Gulch on October 9, 2013. The sites were sampled by I. Mikus and M. Groff (CDFW).

The reach sites yielded 16 young-of-the-year coho salmon and one age 2+ steelhead/rainbow trout (SH/RT).

Glenbrook Gulch

The following chart displays the information yielded from these sites:

2013 Glenbrook Gulch underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
G4 Channel Type									
10/09/13	1	002	Pool	20	0	0	0	2	0
	2	042	Pool	997	0	0	0	2	0
	3	067	Pool	1,785	0	0	0	5	0
	4	075	Pool	1,890	0	0	0	7	0
	5	084	Pool	2,176	0	0	0	0	0
	6	090	Pool	2,291	0	0	1	0	0

DISCUSSION

Glenbrook Gulch is a G4 channel type for the entire length of the survey. The suitability of G4 channel types for fish habitat improvement structures is as follows: G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days September 25 to October 2, 2013 ranged from 50 to 57 degrees Fahrenheit. Air temperatures ranged from 45 to 61 degrees Fahrenheit. This is a good 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 48% of the total length of this survey, riffles 20%, and pools 21%. Three of the 38 (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.

Thirty of the 38 pool tail-outs measured had embeddedness ratings of 1 or 2. Four of the pool tail-outs had embeddedness ratings of 3 or 4. Four 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.

Thirty of the 36 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Glenbrook Gulch

The mean shelter rating for pools is 26. The shelter rating in the flatwater habitats is 11. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Glenbrook Gulch. Small woody debris is the dominant cover type in pools followed by undercut banks. 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 97%. The percentage of right and left bank covered with vegetation was 93% and 96%, respectively.

RECOMMENDATIONS

- 1) Glenbrook 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 small 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 Kaisen Gulch. The channel is a G4 channel type for the entire length of the survey.
212	0013.00	Two log structures in pool.
358	0019.00	Bedrock sheet.
695	0032.00	Log debris accumulation (LDA) # 1, contains two pieces of large woody debris (LWD) and measures 3.5' high x 13' wide. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 3' wide x 40' long x 2' deep. Fish were observed above the LDA.

Glenbrook Gulch

953	0040.00	A tree collapsed in to the channel from the left bank leaving erodible sediment measuring 20' long x 10'. The erosion site is contributing sand and gravel to the channel.
1146	0051.00	Channel is marshy. Grass is growing in the channel and the substrate is silt/clay.
1317	0052.00	Channel getting less marshy and turning back into creek.
1564	0062.00	Dry tributary on the right bank
1763	0067.00	Dry tributary on the left bank.
1995	0077.00	LDA #2 contains eight pieces of LWD and measures 6' high x 10' wide x 16' long. The flow is subsurface through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 6' wide x 40' long x 3' deep. Fish were observed above the LDA.
2276	0090.00	There is a 3' high plunge.
2291	0091.00	Large old growth stump in creek divides the channel. The right bank channel is dry.
2311	0092.00	LDA #3 contains five pieces of LWD and measures 5' high x 19' wide x 24' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 4' wide x 50' long x 3' deep. Fish were not observed above the LDA.
2991	0116.00	Channel is mostly mud with a wide floodplain.
3048	0118.00	Then channel is becoming highly braided and covered with grasses.
3089	0119.00	End of survey due to diminished habitat. Creek disappears in to marsh and reappears upstream with a highly restricted channel. The creek has a 1' wide bankfull width in places, with no floodplain. The gradient upstream of the end of survey increases to >4%.

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.

Glenbrook Gulch

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Glenbrook Gulch

LLID: 1236691392630 Drainage: Albion River

Survey Dates: 9/25/2013 to 10/2/2013

Confluence Location: Quad: MATHISON PEAK Legal Description: T16NR16WS08 Latitude: 39:15:47.0N Longitude: 123:40:09.0W

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
13	0	DRY	10.9	29	371	12.0									
39	9	FLATWATER	32.8	38	1471	47.5	4.1	0.2	0.5	64	2509	15	591		11
38	38	POOL	31.9	17	652	21.0	5.2	0.5	1.2	91	3469	59	2244	50	26
29	3	RIFFLE	24.4	21	606	19.5	2.5	0.1	0.3	53	1531	8	242		3
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
119	50				3100					7509			3077		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Glenbrook Gulch

LLID: 1236691392630

Drainage: Albion River

Survey Dates: 9/25/2013 to 10/2/2013

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS08

Latitude: 39:15:47.0N

Longitude: 123:40:09.0W

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 (%)
23	1	LGR	19.3	21	490	15.8	2	0.1	0.2	44	1009	4	101		0	93
4	1	HGR	3.4	16	64	2.1	2	0.1	0.2	22	88	2	9		0	97
2	1	BRS	1.7	26	52	1.7	3	0.2	0.4	92	185	18	37		10	100
23	8	RUN	19.3	24	546	17.6	4	0.3	0.8	67	1544	16	368		11	97
16	1	SRN	13.4	58	925	29.8	2	0.2	0.4	42	672	8	134		5	96
38	38	MCP	31.9	17	652	21.0	5	0.5	2.4	91	3469	59	2244	50	26	98
13	0	DRY	10.9	29	371	12.0										

Total Units
119

Total Units Fully Measured
50

Total Length (ft.)
3100

Total Area (sq.ft.)
6967

Total Volume (cu.ft.)
2893

Table 3 - Summary of Pool Types

Stream Name: Glenbrook Gulch

LLID: 1236691392630

Drainage: Albion River

Survey Dates: 9/25/2013 to 10/2/2013

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS08

Latitude: 39:15:47.0N

Longitude: 123:40:09.0W

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
38	38	MAIN	100	17	652	100	5.2	0.5	91	3469	50	1908	26

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
38	38	652	3469	1908

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

Stream Name: Glenbrook Gulch LLID: 1236691392630 Drainage: Albion River
 Survey Dates: 9/25/2013 to 10/2/2013
 Confluence Location: Quad: MATHISON PEAK Legal Description: T16NR16WS08 Latitude: 39:15:47.0N Longitude: 123:40:09.0W

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
38	MCP	100	9	24	26	68	3	8	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
38	9	24	26	68	3	8	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.2

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Glenbrook Gulch

LLID: 1236691392630

Drainage: Albion River

Survey Dates: 9/25/2013 to 10/2/2013

Dry Units: 13

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS08

Latitude: 39:15:47.0N

Longitude: 123:40:09.0W

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
23	1	LGR	0	0	0	0	0	0	0	0	0
4	1	HGR	0	0	0	0	0	0	0	0	0
2	1	BRS	0	0	0	0	70	0	0	30	0
29	3	TOTAL RIFFLE	0	0	0	0	70	0	0	30	0
23	8	RUN	47	6	9	1	8	7	0	23	0
16	1	SRN	0	95	0	0	0	0	0	5	0
39	9	TOTAL FLAT	41	17	7	1	7	6	0	21	0
38	38	MCP	29	31	24	2	3	1	0	10	0
38	38	TOTAL POOL	29	31	24	2	3	1	0	10	0
119	50	TOTAL	30	28	20	2	5	2	0	12	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Glenbrook Gulch

LLID: 1236691392630

Drainage: Albion River

Survey Dates: 9/25/2013 to 10/2/2013

Dry Units: 13

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS08

Latitude: 39:15:47.0N

Longitude: 123:40:09.0W

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
23	1	LGR	0	0	100	0	0	0	0
4	1	HGR	0	0	100	0	0	0	0
2	1	BRS	0	0	0	0	0	0	100
23	8	RUN	13	0	88	0	0	0	0
16	1	SRN	0	0	100	0	0	0	0
38	38	MCP	37	0	53	3	0	3	5

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Glenbrook Gulch

LLID: 1236691392630

Drainage: Albion River

Survey Dates: 9/25/2013 to 10/2/2013

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS08

Latitude: 39:15:47.0N

Longitude: 123:40:09.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
97	60	40	0	93	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 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Glenbrook Gulch

LLID: 1236691392630

Drainage: Albion River

Survey Dates: 9/25/2013 to 10/2/2013

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS08

Latitude: 39:15:47.0N

Longitude: 123:40:09.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	7	1	8.0
Boulder	0	0	0.0
Cobble / Gravel	19	14	33.0
Sand / Silt / Clay	24	35	59.0

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	21	9	30.0
Brush	6	15	21.0
Hardwood Trees	4	6	10.0
Coniferous Trees	16	20	36.0
No Vegetation	3	0	3.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Glenbrook Gulch

LLID: 1236691392630

Drainage: Albion River

Survey Dates: 9/25/2013 to 10/2/2013

Confluence Location: Quad: MATHISON PEAK

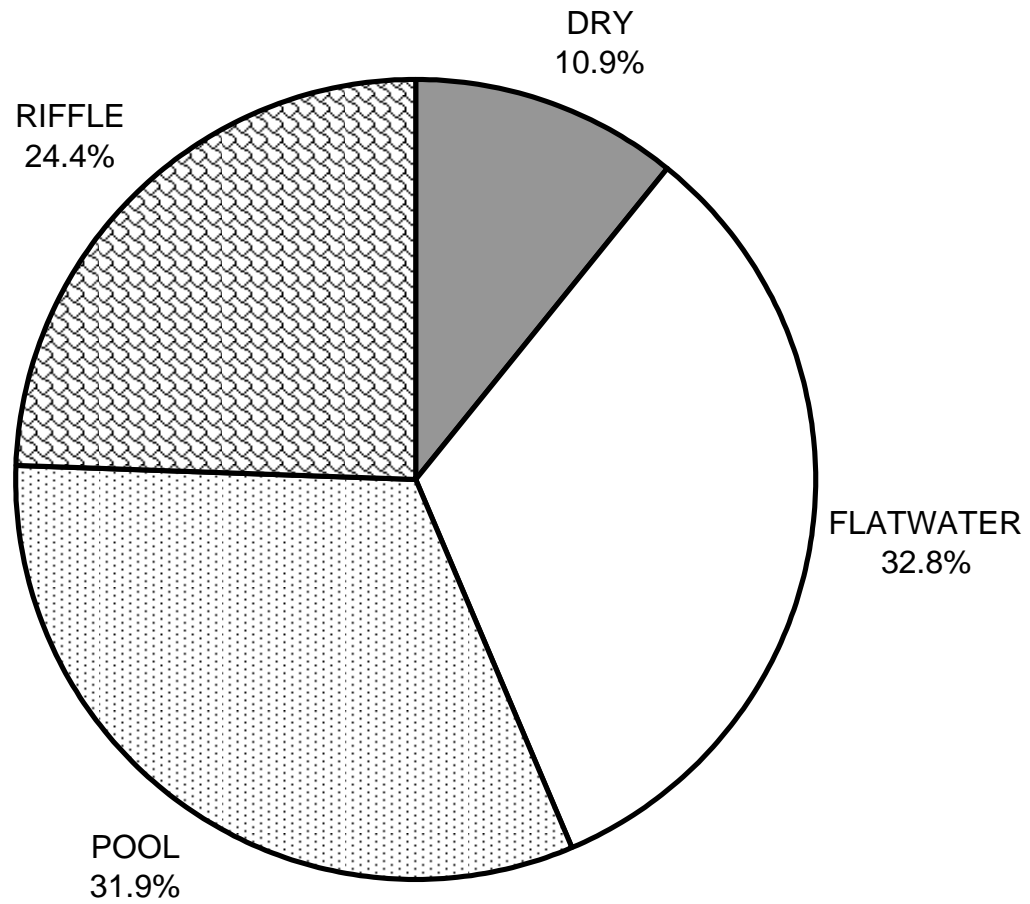
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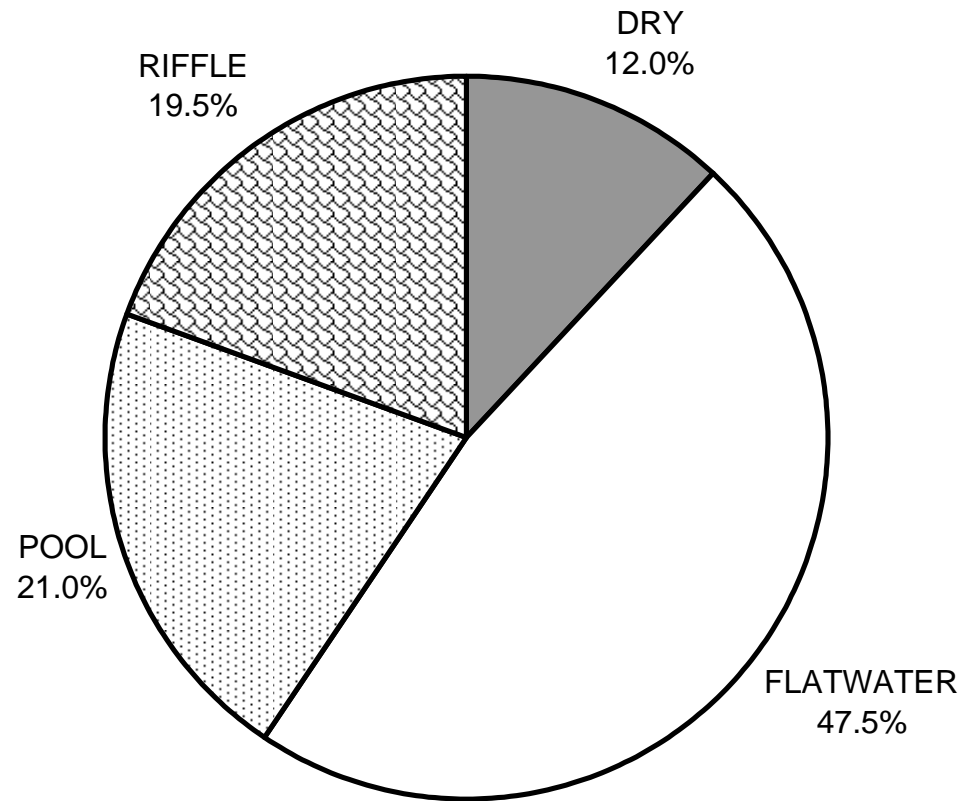
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	41	29
SMALL WOODY DEBRIS (%)	0	17	31
LARGE WOODY DEBRIS (%)	0	7	24
ROOT MASS (%)	0	1	2
TERRESTRIAL VEGETATION (%)	70	7	3
AQUATIC VEGETATION (%)	0	6	1
WHITEWATER (%)	0	0	0
BOULDERS (%)	30	21	10
BEDROCK LEDGES (%)	0	0	0

GLENBROOK GULCH 2013 HABITAT TYPES BY PERCENT OCCURRENCE



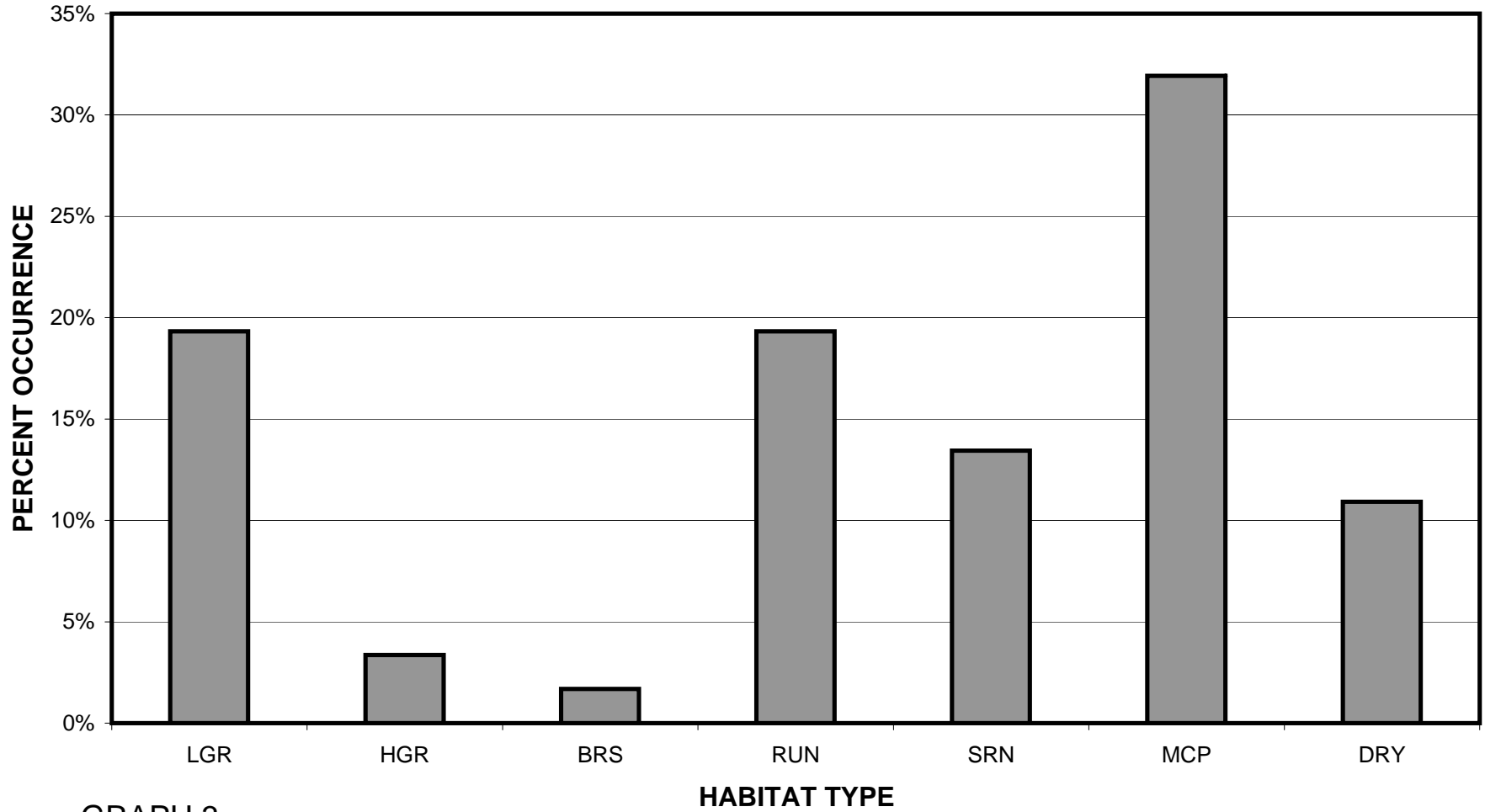
GRAPH 1

GLENBROOK GULCH 2013 HABITAT TYPES BY PERCENT TOTAL LENGTH



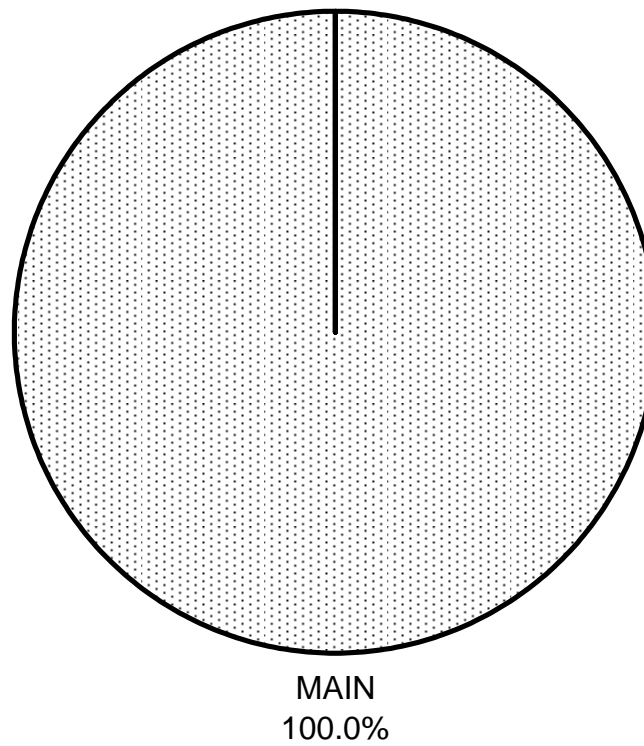
GRAPH 2

GLENBROOK GULCH 2013 HABITAT TYPES BY PERCENT OCCURRENCE



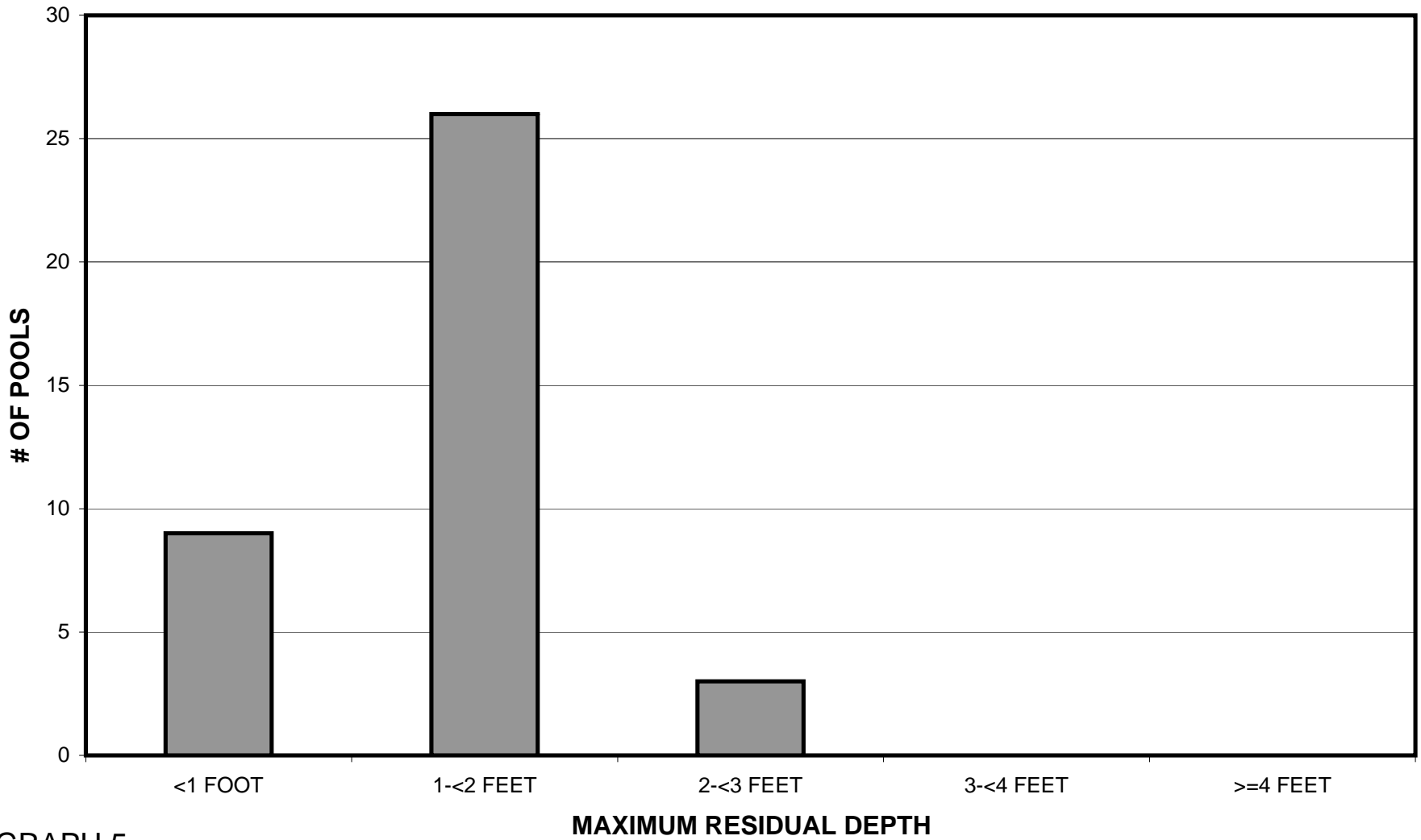
GRAPH 3

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



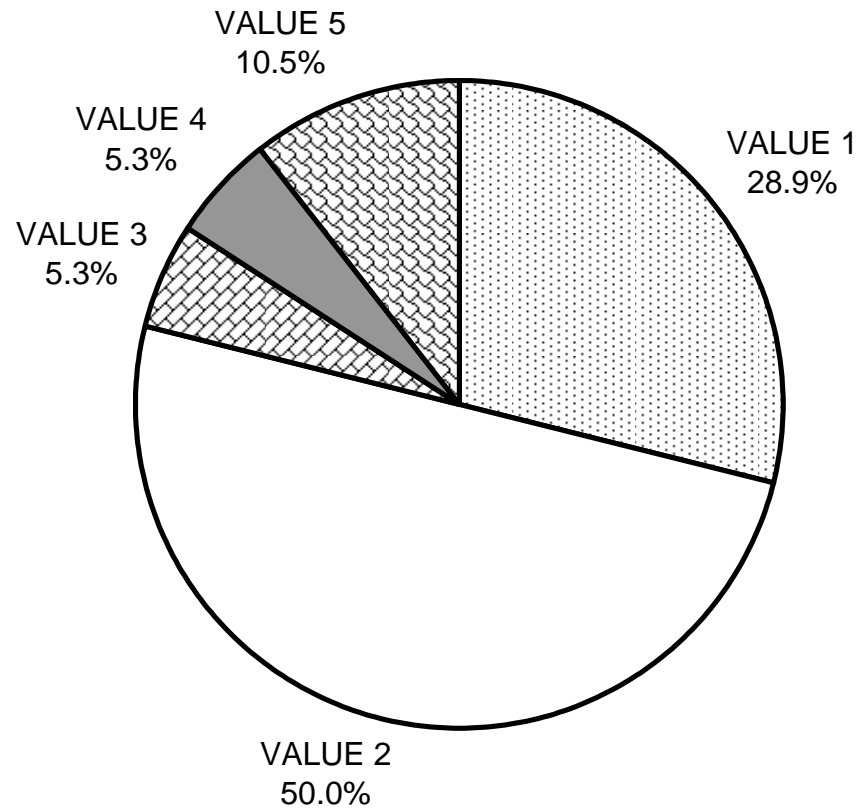
GRAPH 4

GLENBROOK GULCH 2013 MAXIMUM DEPTH IN POOLS



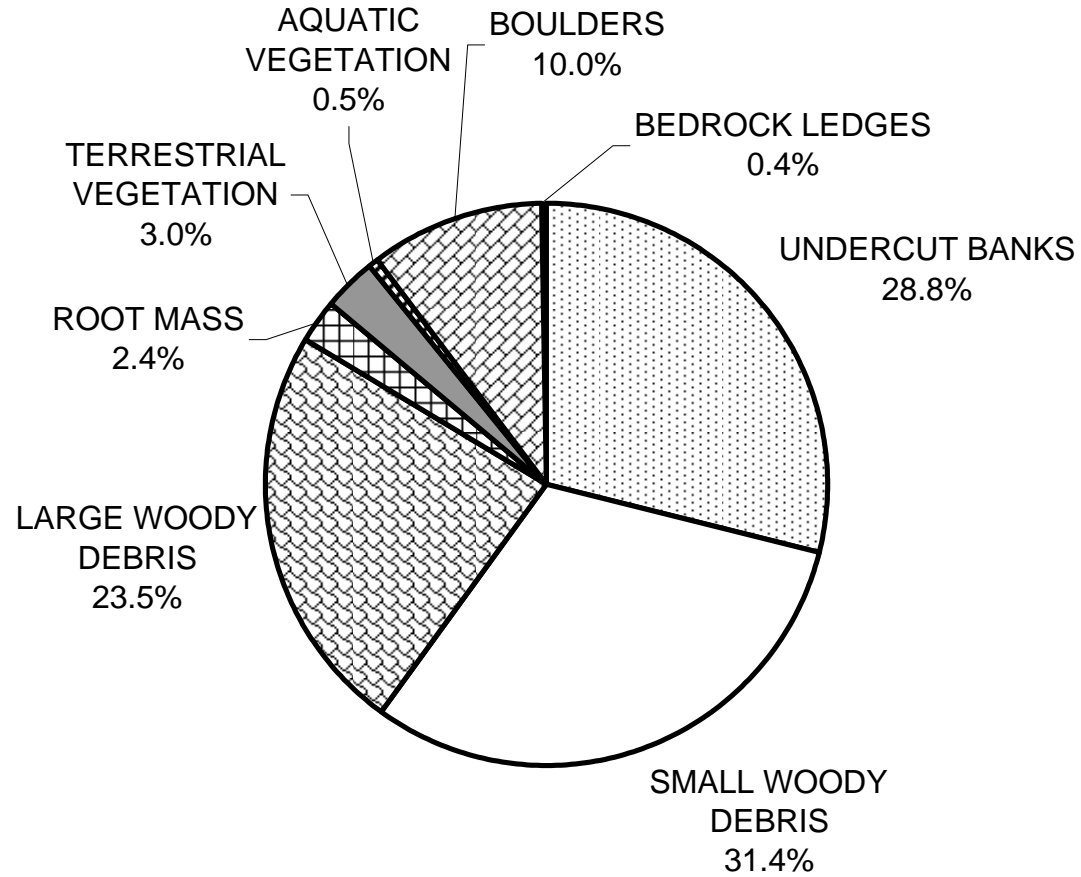
GRAPH 5

GLENBROOK GULCH 2013 PERCENT EMBEDDEDNESS



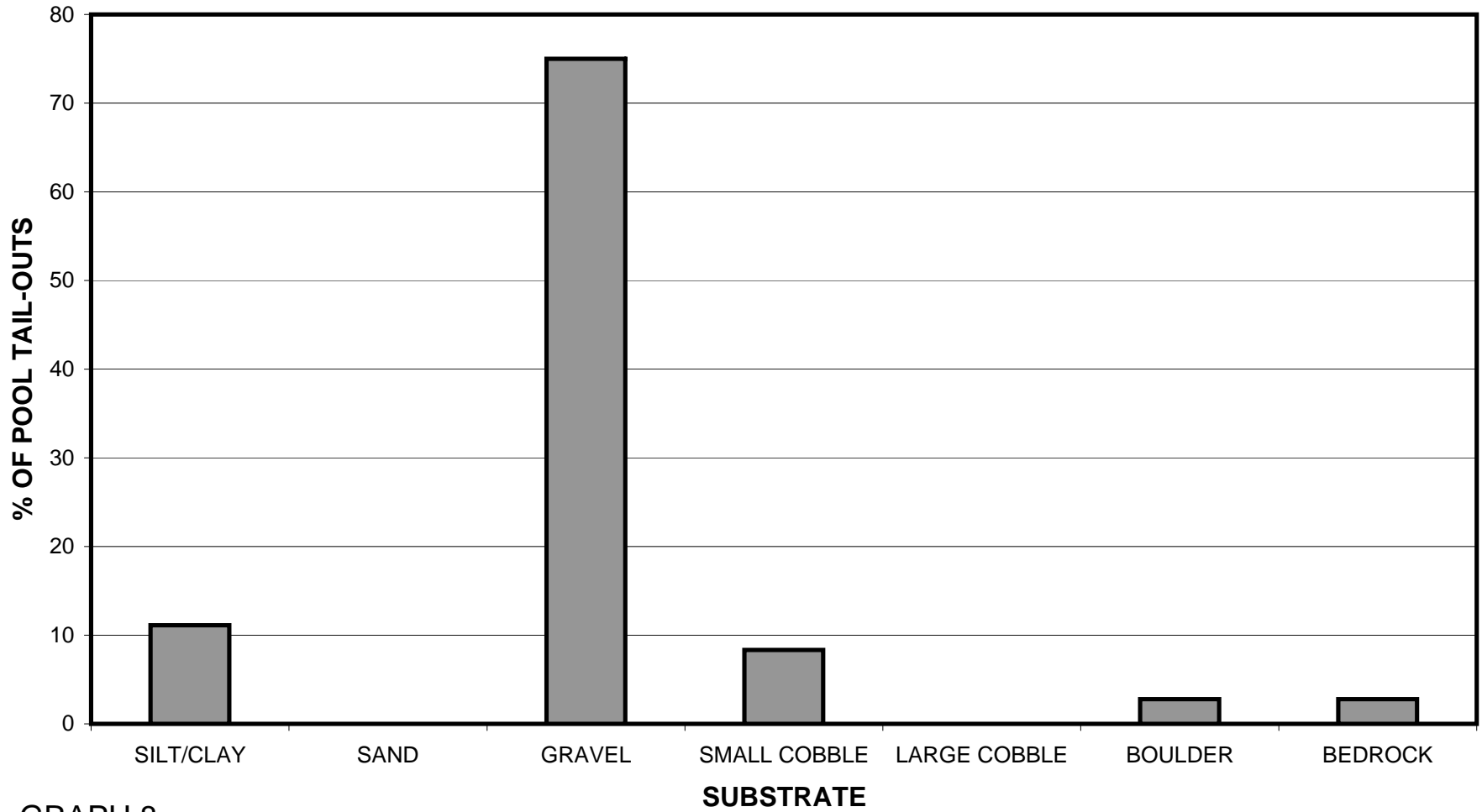
GRAPH 6

GLENBROOK GULCH 2013 MEAN PERCENT COVER TYPES IN POOLS



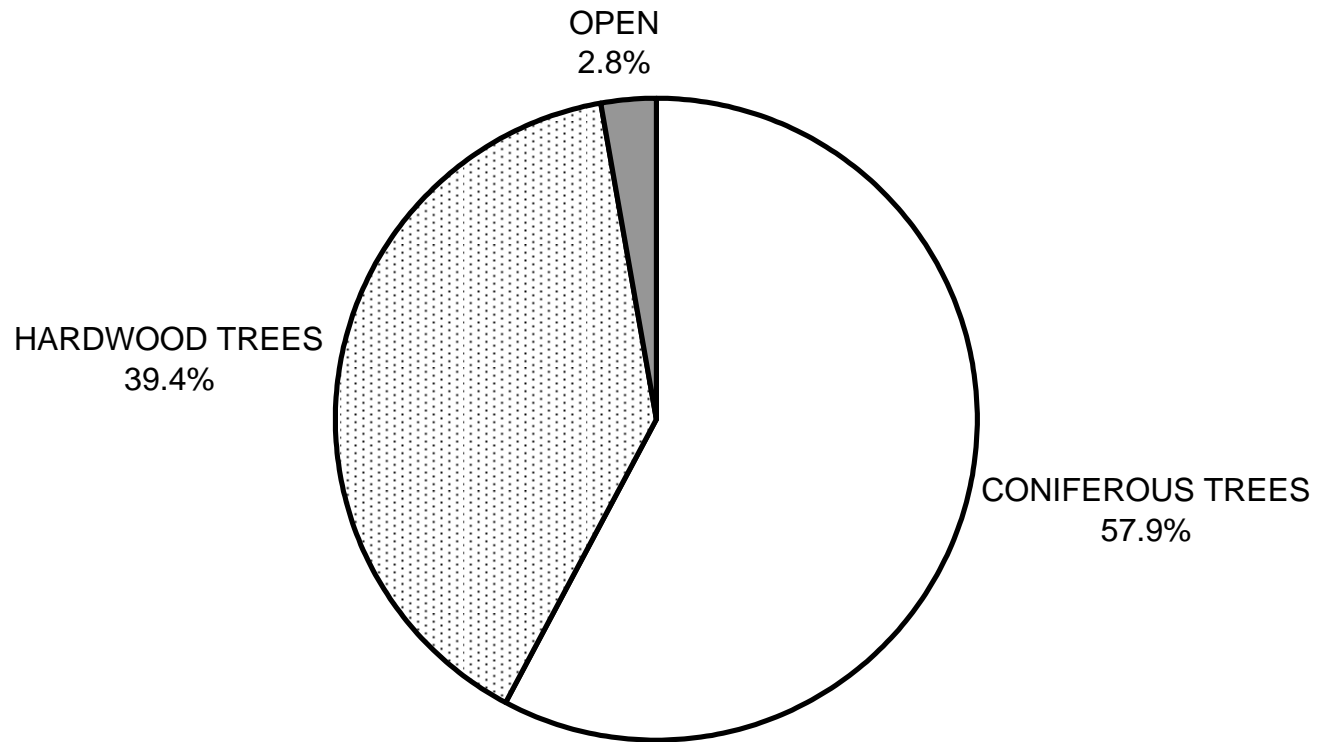
GRAPH 7

GLENBROOK GULCH 2013 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



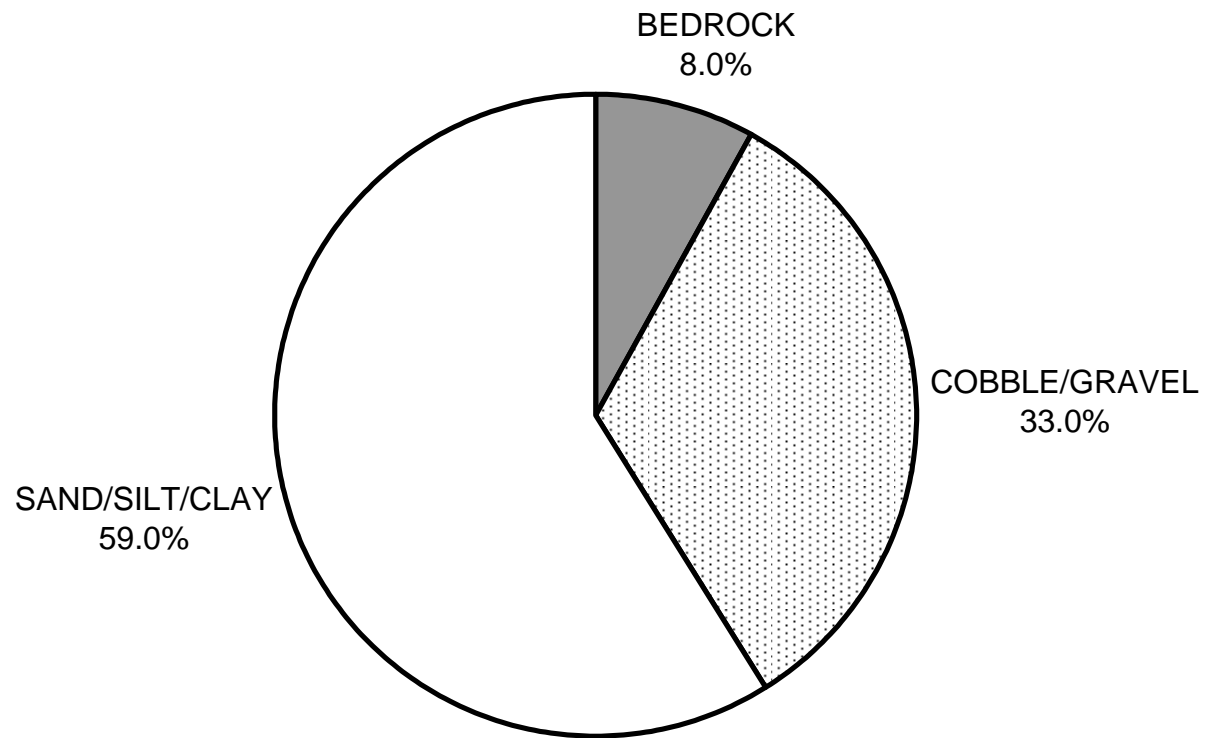
GRAPH 8

GLENBROOK GULCH 2013 MEAN PERCENT CANOPY



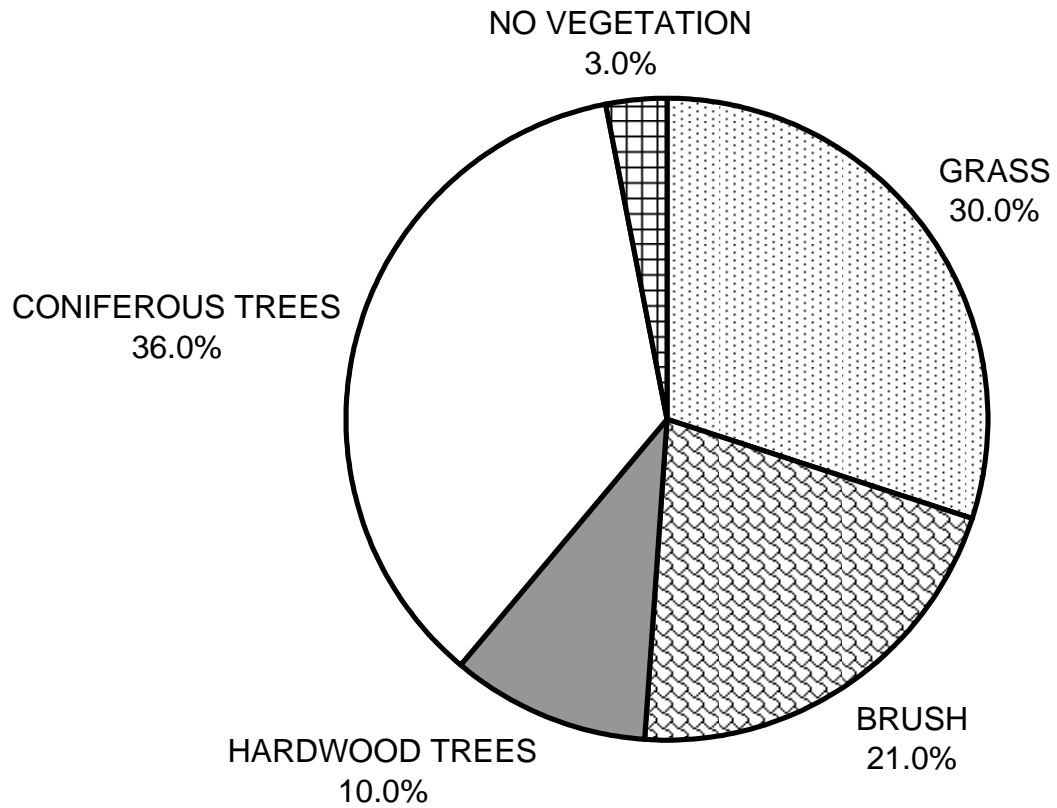
GRAPH 9

GLENBROOK GULCH 2013 DOMINANT BANK COMPOSITION IN SURVEY REACH



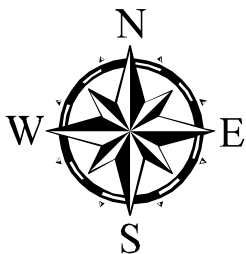
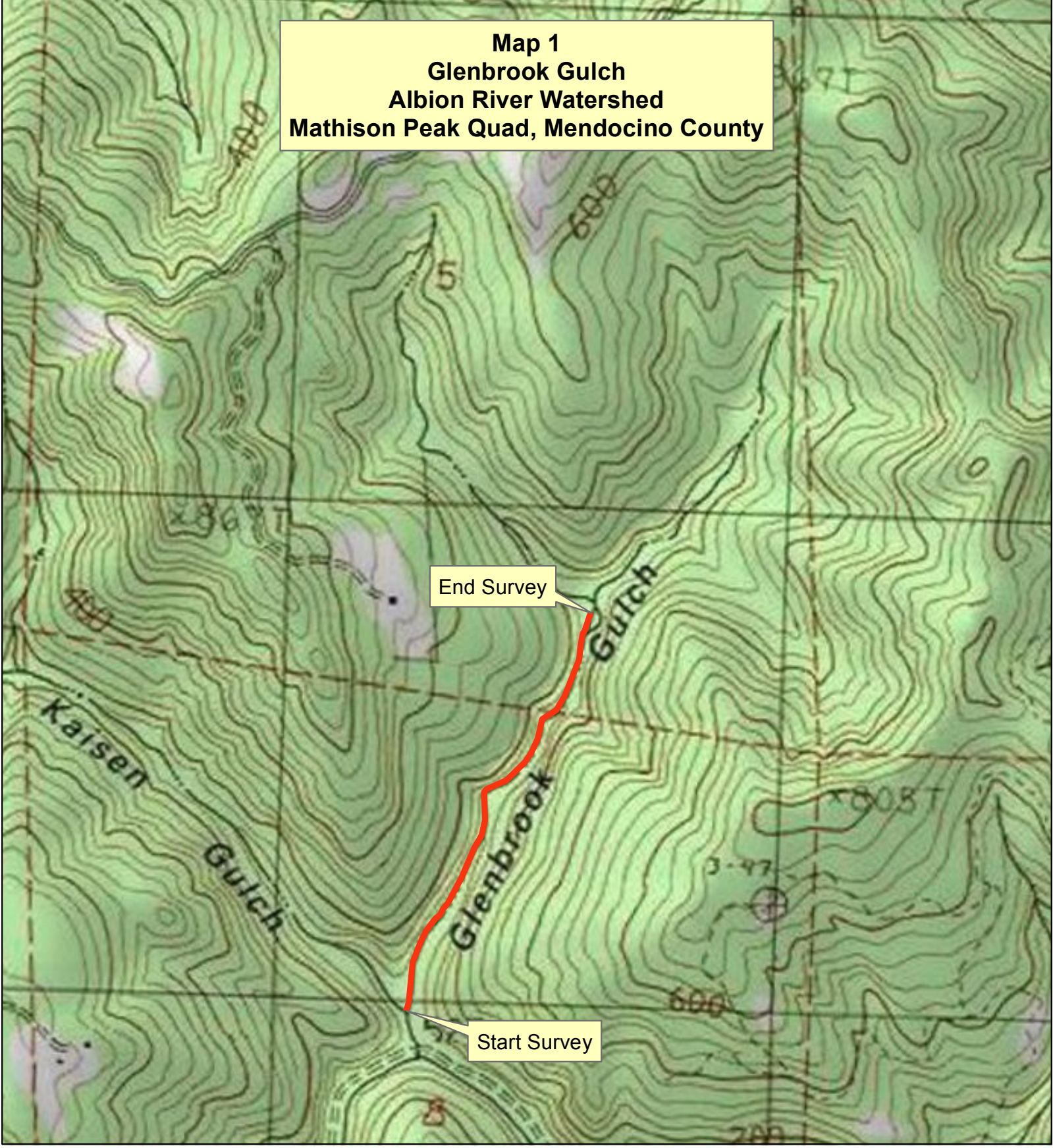
GRAPH 10

GLENBROOK GULCH 2013 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

**Map 1
Glenbrook Gulch
Albion River Watershed
Mathison Peak Quad, Mendocino County**



— Channel Type, G4

