

STREAM INVENTORY REPORT

Railroad Gulch

INTRODUCTION

A stream inventory was conducted June 2 to June 17, 2003 on Railroad Gulch. The survey began at the confluence with Albion River and extended upstream 2.7 miles. Stream inventories and reports were also completed for one tributary to Railroad Gulch.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Railroad Gulch.

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

Railroad Gulch is a tributary to the Albion River, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Railroad Gulch's legal description at the confluence with Albion River is T16N R17W S23. Its location is 39.2404 degrees north latitude and 123.7198 degrees west longitude, LLID number 1237188392406. Railroad Gulch is a second order stream and has approximately 1.7 miles of blue line stream according to the USGS Elk 7.5 minute quadrangle. Railroad Gulch drains a watershed of approximately 4.5 square miles. Elevations range from about 10 feet at the mouth of the creek to 600 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 Albion Ridge Road, off U.S. Highway 1.

METHODS

The habitat inventory conducted in Railroad Gulch follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) Members and California Conservation Corps (CCC) Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

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

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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 Railroad 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". Railroad 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.

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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 Railroad Gulch, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Railroad Gulch, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Railroad 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 Railroad 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 root wads) 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.

DATA ANALYSIS

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

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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Railroad 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

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- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of June 2 to June 17, 2003, was conducted by J. Crews (DFG), B. Budnick (CCC), S. Sellars and G. Trousdale (WSP). The total length of the stream surveyed was 14,040 feet with an additional 915 feet of side channel.

Stream flow was not measured on Railroad Gulch.

Railroad Gulch is a C4 channel type for 4,888 feet of the stream surveyed (Reach 1), and an F4 channel type for 10,067 feet of the stream surveyed (Reach 2). C4 channels are meandering point-bar, riffle/pool, alluvial channels with broad well defined floodplains on low gradients and gravel-dominant substrates. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 56 degrees Fahrenheit. Air temperatures ranged from 55 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 41% pool units, 29% flatwater units, 27% riffle units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 37% flatwater units, 35% riffle units, 24% pool units, and 2% dry units (Graph 2).

Fourteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 26%; mid-channel pool units, 19%; and run units, 16% (Graph 3). Based on percent total length, low gradient riffle units made up 34%, run units 23%, and glide units 15%.

A total of 93 pools were identified (Table 3). Main channel pools were the most frequently encountered at 53% (Graph 4), and comprised 61% 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. Forty-eight of the 91 pools (53%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 91 pool tail-outs measured, 12 had a value of 2 (13.2%); 30 had a value of 3 (33%); 35 had a value of 4 (38.5%);

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14 had a value of 5 (15.4%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 20, flatwater habitat types had a mean shelter rating of 28, and pool habitats had a mean shelter rating of 40 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 48. Main channel pools had a mean shelter rating of 35 and backwater pools had a mean shelter rating of 33 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Railroad Gulch. Graph 7 describes the pool cover in Railroad Gulch. Large woody debris is the dominant pool cover type followed by terrestrial vegetation.

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 81% of the pool tail-outs. Bedrock was the next most frequently observed dominant substrate type and occurred in 10% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Railroad Gulch was 84%. Sixteen percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 32% and 68%, respectively. Graph 9 describes the mean percent canopy in Railroad Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 68%. The mean percent left bank vegetated was 68%. The dominant elements composing the structure of the stream banks consisted of 98% sand/silt/clay and 2% cobble/gravel (Graph 10). Brush was the dominant vegetation type observed in 41% of the units surveyed. Additionally, 25% of the units surveyed had grass as the dominant vegetation type, and 24% had coniferous trees as the dominant vegetation type (Graph 11).

DISCUSSION

Railroad Gulch is a C4 channel type for the first 4,888 feet of stream surveyed and an F4 channel type for the next 10,067 feet. The suitability of C4 and F4 channel types for fish habitat improvement structures is as follows: C4 channel types are excellent for bank-placed boulders and log cover. F4 channel types are good for bank-placed boulders and fair for single wing-deflectors and log cover.

The water temperatures recorded on the survey days June 2 to June 17, 2003, ranged from 54 to 56 degrees Fahrenheit. Air temperatures ranged from 55 to 80 degrees Fahrenheit. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

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Flatwater habitat types comprised 37% of the total length of this survey, riffles 35%, and pools 24%. Forty-eight of the 91 (53%) 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 increase or deepen pool habitat is recommended.

Twelve of the 91 pool tail-outs measured had embeddedness ratings of 1 or 2. Sixty-five of the pool tail-outs had embeddedness ratings of 3 or 4. Fourteen of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Railroad Gulch should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Seventy-six of the 91 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 40. The shelter rating in the flatwater habitats is 28. 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 Railroad Gulch. Large woody debris is the dominant cover type in pools followed by terrestrial vegetation. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 84%. Reach 1 had a canopy density of 79.7%, Reach 2 had a canopy density of 86.6%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 68% and 68%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

- 1) Railroad 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.

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- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

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 Albion River. The channel is a C4. Young-of-the-year and 1+ salmonids were observed along the length of the survey.
1450	0023.00	Log debris accumulation (LDA) #01 is retaining two feet of sediment.
2243	0035.00	LDA #02 consists of five pieces of large woody debris (LWD) and measures 20' long x 20' wide.
2318	0035.00	LDA #03 consists of two pieces of LWD. Small woody debris (SWD) is associated with the LDA.
2342	0036.00	LDA #04 consists of ten pieces of LWD and measures 14' long x 14' wide x 2' high. SWD is associated with the LDA.
2557	0042.00	LDA #05 consists of three pieces of LWD and associated SWD. It measures 4' long x 18' wide. The LDA is retaining 1.5' of gravel.
2947	0049.02	LDA #06.
3798	0067.00	LDA #07.
3993	0073.00	There is a left bank tributary.
4175	0077.00	The channel changes from a C4 to an F4.
4378	0082.00	LDA #08 consists of two pieces of LWD and associated SWD. It measures 6' long x 30' wide x 5' high. The LDA is retaining one foot of sediment. The plunge height over the LDA is less than one foot.

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4533	0085.00	LDA #09 consists of five pieces of LWD and associated SWD. It measures 10' long x 40' wide x 4' high.
5105	0101.00	LDA #10 consists of two pieces of LWD and associated SWD. It measures 5' long x 20' wide x 4' high. The LDA is not retaining sediment.
5914	0114.00	There is a right bank tributary.
6347	0125.00	LDA #11.
7344	0144.00	LDA #12 consists of seven pieces of LWD and associated SWD.
7562	0147.00	There is a left bank tributary.
7713	0149.00	LDA #13 consists of four pieces of LWD and associated SWD.
7726	0149.00	LDA #14 consists of 10 pieces of LWD and associated SWD. It measures 15' long x 10' wide x 8' high.
8471	0152.00	LDA #15.
8914	0168.00	LDA #16.
9306	0171.00	There is a left bank tributary.
9746	0175.00	LDA #17.
9920	0178.00	LDA #18.
10389	0188.00	There is a right bank tributary.
11202	0197.00	LDA #19 consists of 10 pieces of LWD and associated SWD. It measures 8' long x 20' wide x 5' high. The LDA is retaining two feet of gravel.
11702	0198.00	LDA #20 consists of five pieces of LWD and associated SWD. It measures 10' long x 20' wide x 4' high.
12414	0204.00	LDA #21 consists of 10 pieces of LWD and associated SWD. It measures 8' long x 20' wide x 5' high. The LDA is retaining two feet of gravel.

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12750	0206.00	LDA #22 consists of six pieces of LWD and associated SWD. It measures 20' long x 5' wide x 2' high. The LDA is retaining three feet of gravel.
13043	0206.00	LDA #23 measures 40' long x 5' wide x 7.5' high.
13291	0206.00	LDA #24 consists of 11 pieces of LWD and associated SWD. It measures 5' long x 15' wide x 4' high. The LDA is retaining four feet of gravel.
13303	0208.00	A left bank spring is actively eroding 30' feet of the left bank, contributing gravel to the channel. LDA #25 consists of six pieces of LWD and associated SWD. It measures 20' long x 30' wide x 10' high. The LDA is a potential fish barrier.
13725	0209.00	End of survey due to time constraints and impassable terrain (LDA's, fallen trees and thick brush).

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: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

Latitude: 39:14:26.0N

Longitude: 123:43:08.0

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
3	0	DRY	1.3	91	272	1.8									
66	12	FLATWATER	29.2	85	5590	37.4	8.5	0.8	1.6	705	46516	636	41999		28
3	0	NOSURVEY	1.3	44	131	0.9									
1	0	NOSURVEY_	0.4	163	163	1.1									
93	91	POOL	41.2	39	3614	24.2	10.1	1.1	2.1	395	36727	660	60702	489	40
60	6	RIFFLE	26.5	86	5185	34.7	5.4	0.9	1.5	490	29416	302	18112		20
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
226	109				14955					112660			120813		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

Latitude: 39:14:26.0N

Longitude: 123:43:08.0W

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 (%)
59	5	LGR	26.1	87	5148	34.4	6	0.7	2.7	574	33838	333	19626		24	87
1	1	HGR	0.4	37	37	0.2	2	2.0	2.4	74	74	148	148		0	81
29	5	GLD	12.8	77	2224	14.9	10	0.7	2.5	693	20103	505	14644		19	80
37	7	RUN	16.4	91	3366	22.5	8	0.9	2.4	713	26384	730	27017		35	83
42	41	MCP	18.6	45	1873	12.5	10	1.2	3.5	441	18531	793	33287	583	35	81
5	5	CCP	2.2	28	141	0.9	9	0.7	1.8	254	1272	307	1229	179	34	84
2	2	STP	0.9	92	183	1.2	10	1.5	3.4	828	1656	1467	2934	1219	45	86
11	10	CRP	4.9	33	365	2.4	8	0.9	3.1	310	3406	470	5175	346	20	88
14	14	LSL	6.2	34	478	3.2	11	1.0	3.5	388	5429	591	8276	427	63	86
10	10	LSR	4.4	36	363	2.4	12	1.0	3.5	428	4275	715	7153	550	54	86
5	5	PLP	2.2	18	88	0.6	11	1.2	3.4	181	905	279	1397	220	50	86
3	3	BPL	1.3	24	73	0.5	10	0.7	2.2	272	815	283	850	190	20	90
1	1	DPL	0.4	50	50	0.3	8	0.8	2.1	400	400	360	360	320	70	94
3	0	DRY	1.3	91	272	1.8										83
3	0	NS	1.3	44	131	0.9										85
1	0	MAR	0.4	163	163	1.1										

Total Units
226

Total Units Fully Measured
109

Total Length (ft.)
14955

Total Area (sq.ft.)
117087

Total Volume (cu.ft.)
122095

Stream Name: Railroad Gulch	LLID: 1237188392406	Drainage: Albion River
Survey Dates: 6/2/2003 to 6/17/2003		
Confluence Location: Quad: ELK	Legal Description: T16NR17WS23	Latitude: 39:14:26.0N Longitude: 123:43:08.0W

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
49	48	MAIN	53	45	2197	61	9.9	1.2	438	21455	575	27598	35
40	39	SCOUR	43	32	1294	36	10.4	1.0	351	14057	411	16455	48
4	4	BACKWATER	4	31	123	3	9.3	0.7	304	1215	222	889	33
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)	
93	91				3614					36727		44942	

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

Stream Name: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

Latitude: 39:14:26.0N

Longitude: 123:43:08.0W

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
42	MCP	46	1	2	14	33	21	50	6	14	0	0
4	CCP	4	1	25	3	75	0	0	0	0	0	0
2	STP	2	0	0	0	0	1	50	1	50	0	0
10	CRP	11	1	10	6	60	2	20	1	10	0	0
14	LSL	15	0	0	8	57	5	36	1	7	0	0
10	LSR	11	0	0	5	50	4	40	1	10	0	0
5	PLP	5	0	0	2	40	1	20	2	40	0	0
3	BPL	3	1	33	1	33	1	33	0	0	0	0
1	DPL	1	0	0	0	0	1	100	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
91			4	4	39	43	36	40	12	13	0	0

Mean Maximum Residual Pool Depth (ft.): 2.1

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Dry Units: 3

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

Latitude: 39:14:26.0N

Longitude: 123:43:08.0W

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
59	5	LGR	8	8	10	5	63	0	0	8	0
1	1	HGR	0	0	0	0	0	0	0	0	0
60	6	TOTAL RIFFLE	8	8	10	5	63	0	0	8	0
29	6	GLD	8	16	24	0	50	0	0	2	0
37	7	RUN	18	20	17	0	31	13	0	1	0
66	13	TOTAL FLAT	14	19	20	0	38	8	0	2	0
42	42	MCP	18	15	32	3	30	1	0	1	0
5	5	CCP	36	27	16	7	14	0	0	0	0
2	2	STP	0	18	15	40	8	0	15	5	0
11	10	CRP	32	15	41	0	12	0	0	0	0
14	14	LSL	14	20	50	6	10	0	0	0	0
10	10	LSR	8	11	17	54	9	1	1	0	0
5	5	PLP	12	12	55	0	15	2	4	0	0
3	3	BPL	0	17	50	0	33	0	0	0	0
1	1	DPL	10	40	10	40	0	0	0	0	0
93	92	TOTAL POOL	17	16	35	9	21	1	1	1	0
3	0	NS									
1	0	MAR									
226	111	TOTAL	17	16	33	8	23	1	1	1	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Dry Units: 3

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

Latitude: 39:14:26.0N

Longitude: 123:43:08.0W

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
59	5	LGR	20	0	60	20	0	0	0
1	1	HGR	100	0	0	0	0	0	0
29	6	GLD	0	67	33	0	0	0	0
37	7	RUN	14	0	86	0	0	0	0
42	40	MCP	28	38	33	3	0	0	0
5	5	CCP	20	20	60	0	0	0	0
2	2	STP	0	50	50	0	0	0	0
11	10	CRP	20	30	50	0	0	0	0
14	14	LSL	7	57	36	0	0	0	0
10	10	LSR	20	20	60	0	0	0	0
5	5	PLP	0	80	20	0	0	0	0
3	3	BPL	33	33	33	0	0	0	0
1	1	DPL	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

Latitude: 39:14:26.0N

Longitude: 123:43:08.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
84	68	32	0	68	68

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: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Survey Length (ft.): 14955

Main Channel (ft.): 14040

Side Channel (ft.): 915

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

Latitude: 39:14:26.0N

Longitude: 123:43:08.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: C4

Reach Length (ft.): 4175

Riffle/Flatwater Mean Width (ft.): 7.2

BFW:

Range (ft.): 7 to 16

Mean (ft.): 12

Std. Dev.: 3

Base Flow (cfs.): 2.7

Water (F): 54 - 56

Air (F): 55 - 80

Dry Channel (ft): 222

Canopy Density (%): 79.7

Coniferous Component (%): 74.3

Hardwood Component (%): 25.7

Dominant Bank Vegetation: Brush

Vegetative Cover (%): 67.2

Dominant Shelter: Large Woody Debris

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 31

LWD per 100 ft.:

Riffles: 3

Pools: 3

Flat: 3

Pools by Stream Length (%): 30.3

Pool Frequency (%): 37.5

Residual Pool Depth (%):

< 2 Feet Deep: 42

2 to 2.9 Feet Deep: 39

3 to 3.9 Feet Deep: 19

>= 4 Feet Deep: 0

Mean Max Residual Pool Depth (ft.): 2.1

Mean Pool Shelter Rating: 33

Pool Tail Substrate (%): Silt/Clay: 6

Sand: 6

Gravel: 68

Sm Cobble: 6

Lg Cobble: 0

Boulder: 0

Bedrock: 13

Embeddedness Values (%): 1. 0.0

2. 0.0

3. 9.7

4. 67.7

5. 22.6

STREAM REACH: 2

Channel Type: F4

Reach Length (ft.): 9865

Riffle/Flatwater Mean Width (ft.): 7.9

BFW:

Range (ft.): 6 to 16

Mean (ft.): 11

Std. Dev.: 3

Base Flow (cfs.): 2.7

Water (F): 54 - 56

Air (F): 56 - 61

Dry Channel (ft): 50

Canopy Density (%): 86.6

Coniferous Component (%): 63.8

Hardwood Component (%): 36.2

Dominant Bank Vegetation: Brush

Vegetative Cover (%): 69.3

Dominant Shelter: Large Woody Debris

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 30

LWD per 100 ft.:

Riffles: 2

Pools: 6

Flat: 5

Pools by Stream Length (%): 21.2

Pool Frequency (%): 43.5

Residual Pool Depth (%):

< 2 Feet Deep: 50

2 to 2.9 Feet Deep: 40

3 to 3.9 Feet Deep: 10

>= 4 Feet Deep: 0

Mean Max Residual Pool Depth (ft.): 2.0

Mean Pool Shelter Rating: 45

Pool Tail Substrate (%): Silt/Clay: 0

Sand: 3

Gravel: 88

Sm Cobble: 0

Lg Cobble: 0

Boulder: 0

Bedrock: 8

Embeddedness Values (%): 1. 0.0

2. 20.0

3. 45.0

4. 23.3

5. 11.7

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

Latitude: 39:14:26.0N

Longitude: 123:43:08.0W

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	0	0	0.0
Boulder	0	0	0.0
Cobble / Gravel	1	1	2.1
Sand / Silt / Clay	46	46	97.9

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	12	12	25.5
Brush	17	22	41.5
Hardwood Trees	4	4	8.5
Coniferous Trees	14	9	24.5
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values:

4

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

StreamName: Railroad Gulch

LLID: 1237188392406

Drainage: Albion River

Survey Dates: 6/2/2003 to 6/17/2003

Confluence Location: Quad: ELK

Legal Description: T16NR17WS23

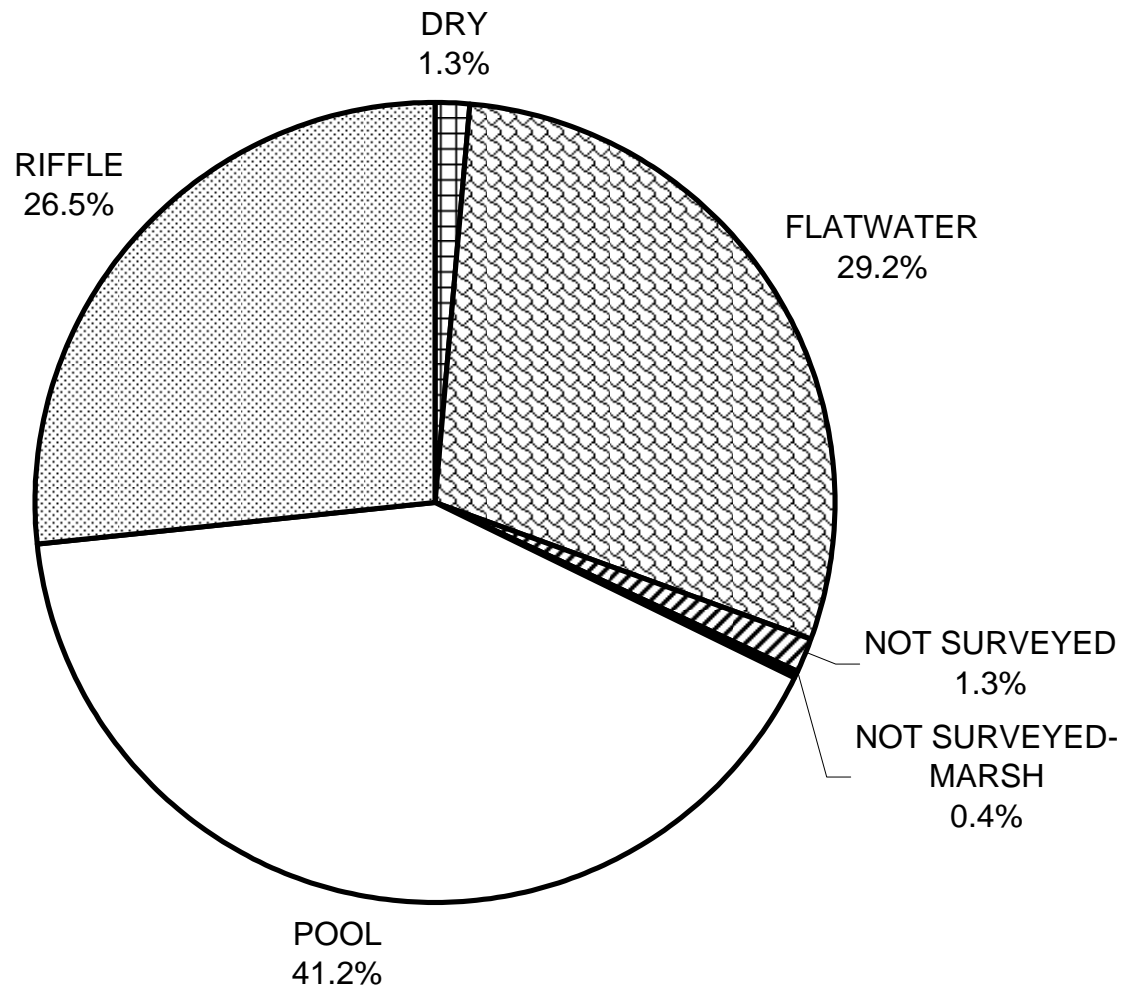
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Longitude: 123:43:08.0W

	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)	8	14	17
SMALL WOODY DEBRIS (%)	8	19	16
LARGE WOODY DEBRIS (%)	10	20	35
ROOT MASS (%)	5	0	9
TERRESTRIAL VEGETATION (%)	63	38	21
AQUATIC VEGETATION (%)	0	8	1
WHITEWATER (%)	0	0	1
BOULDERS (%)	8	2	1
BEDROCK LEDGES (%)	0	0	0

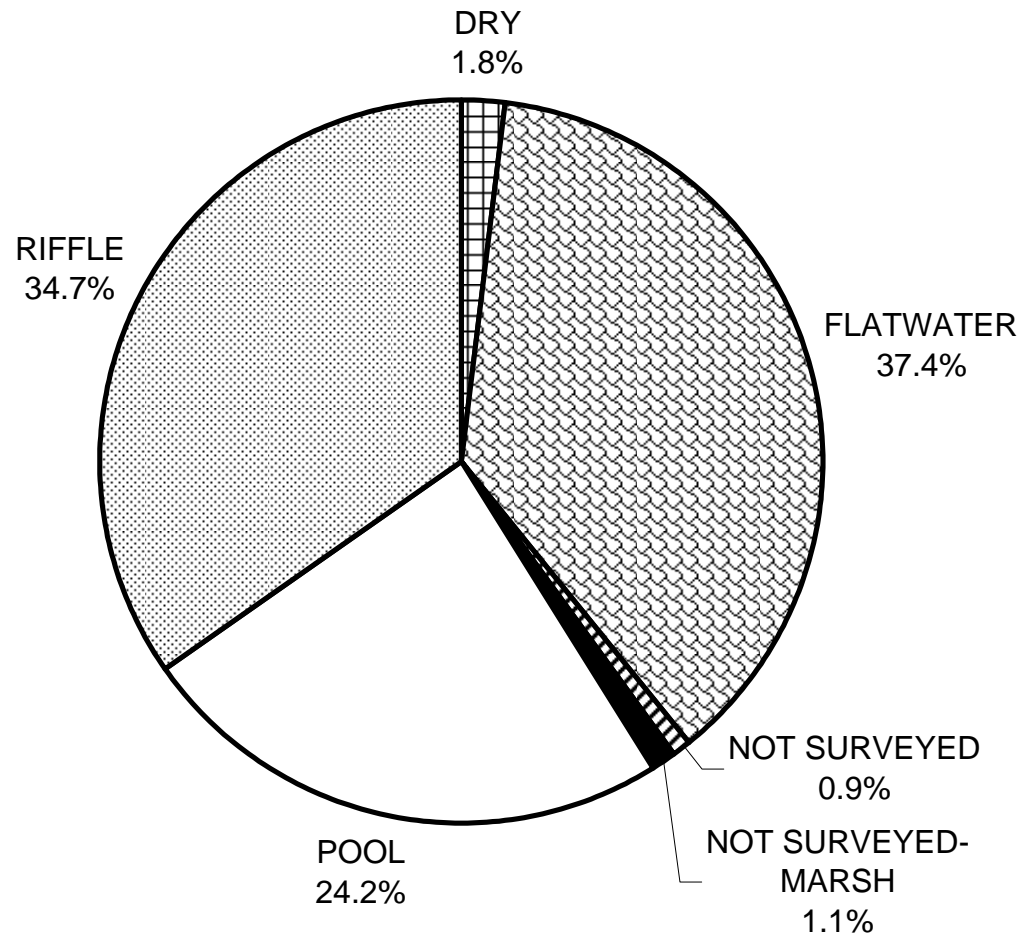
RAILROAD GULCH 2003

HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

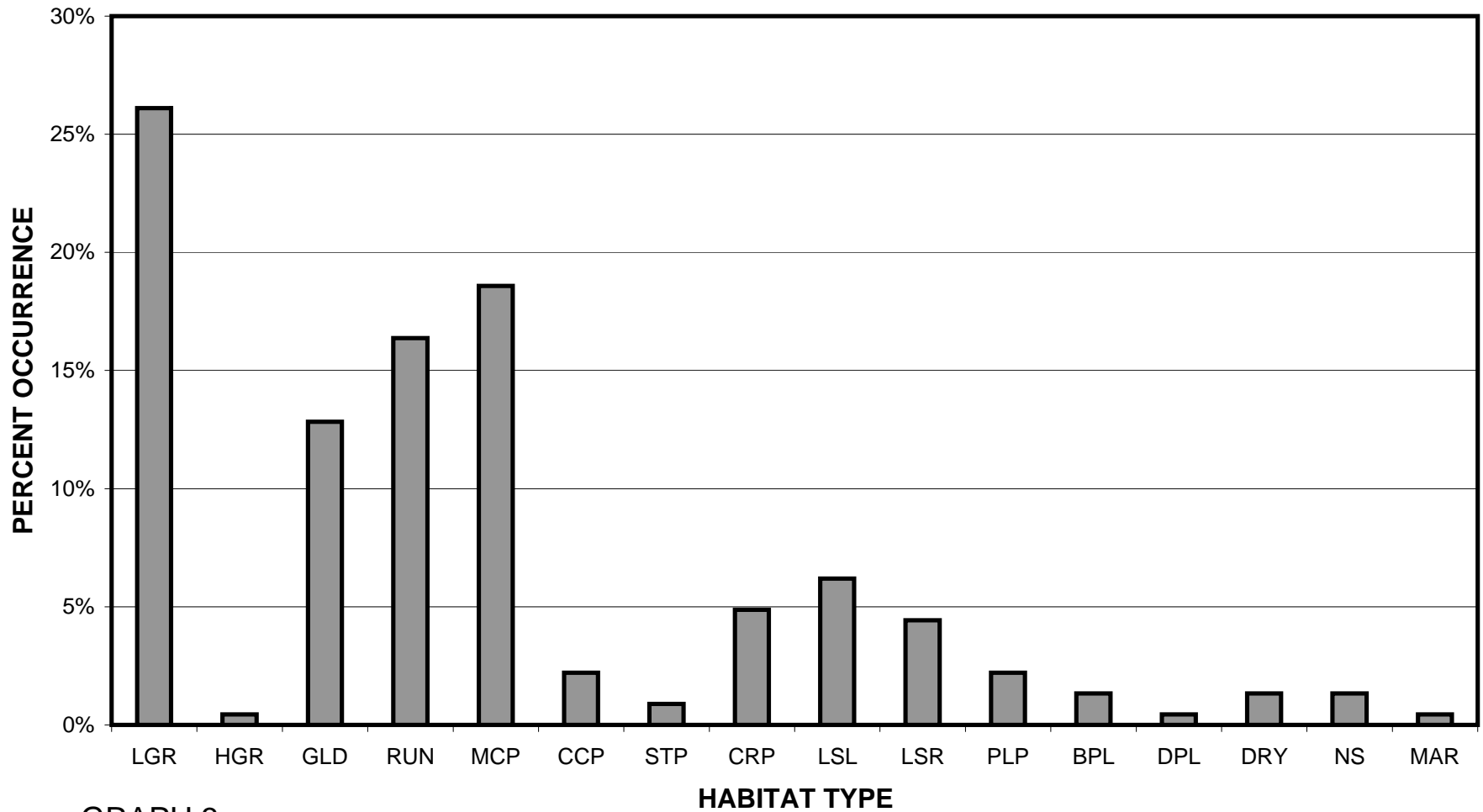
RAILROAD GULCH 2003 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

RAILROAD GULCH 2003

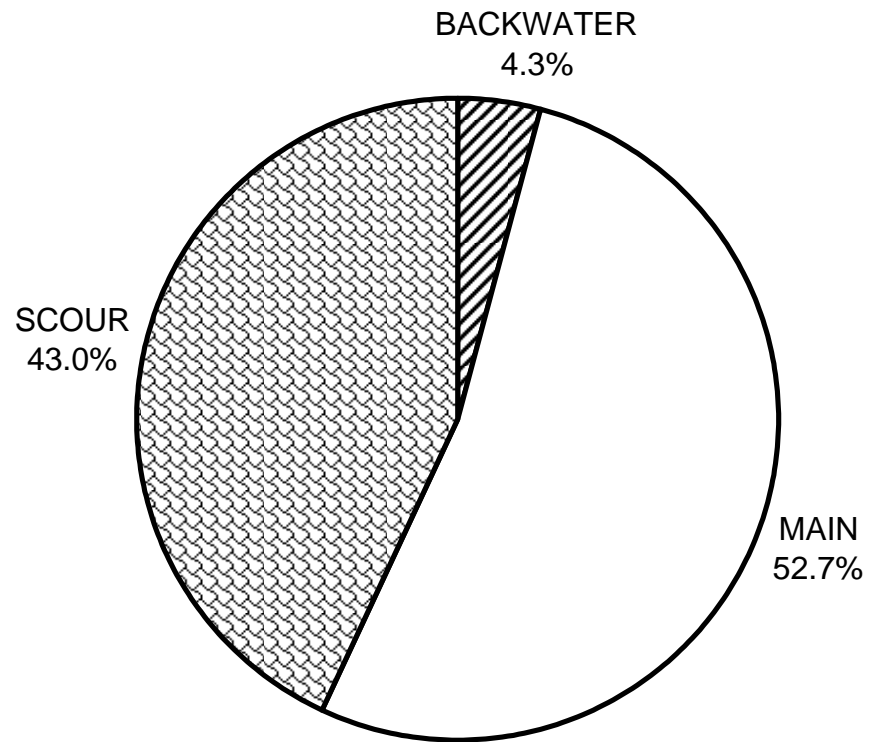
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

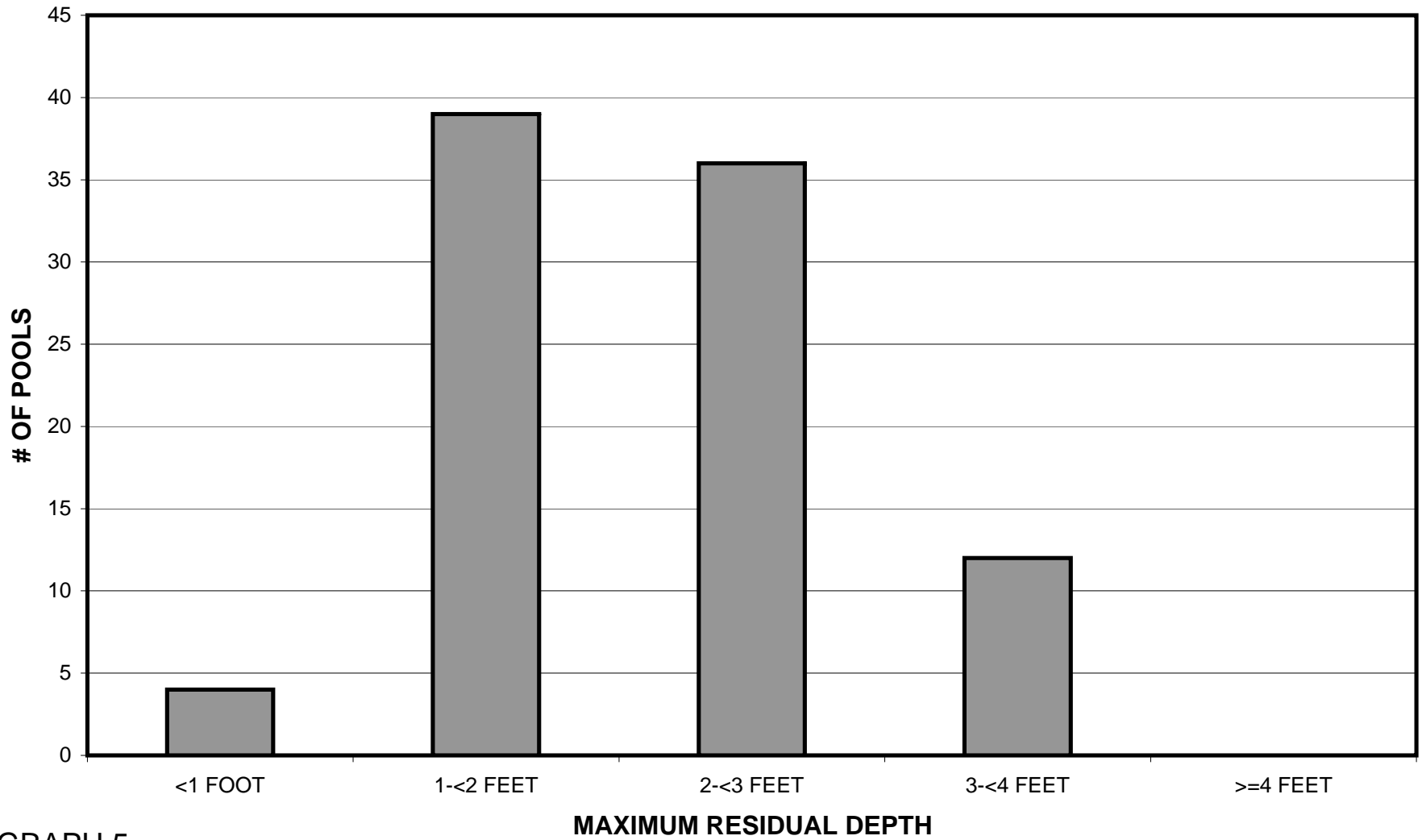
RAILROAD GULCH 2003

POOL TYPES BY PERCENT OCCURRENCE



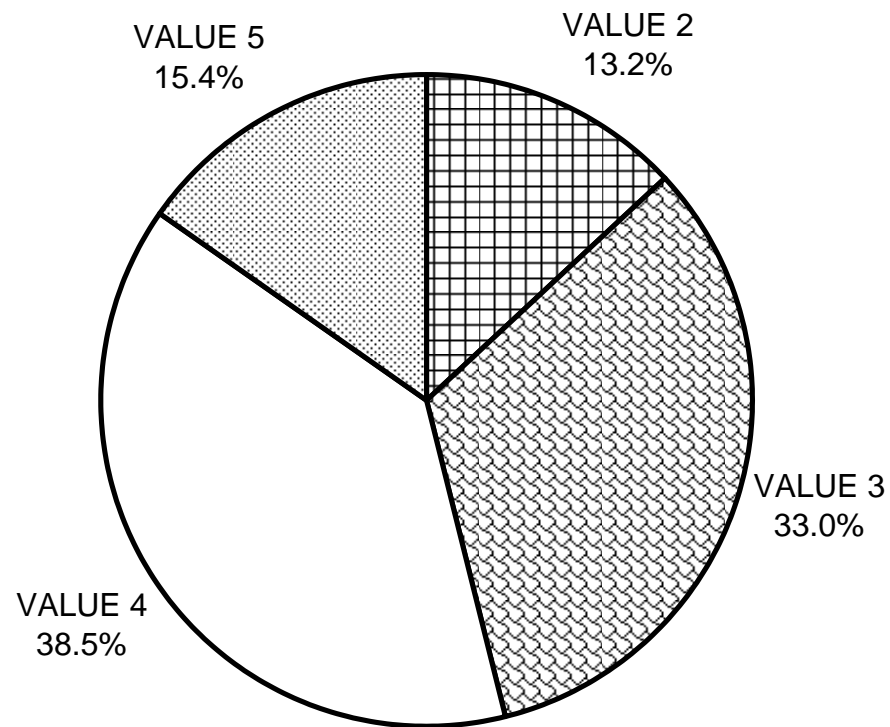
GRAPH 4

RAILROAD GULCH 2003 MAXIMUM DEPTH IN POOLS



GRAPH 5

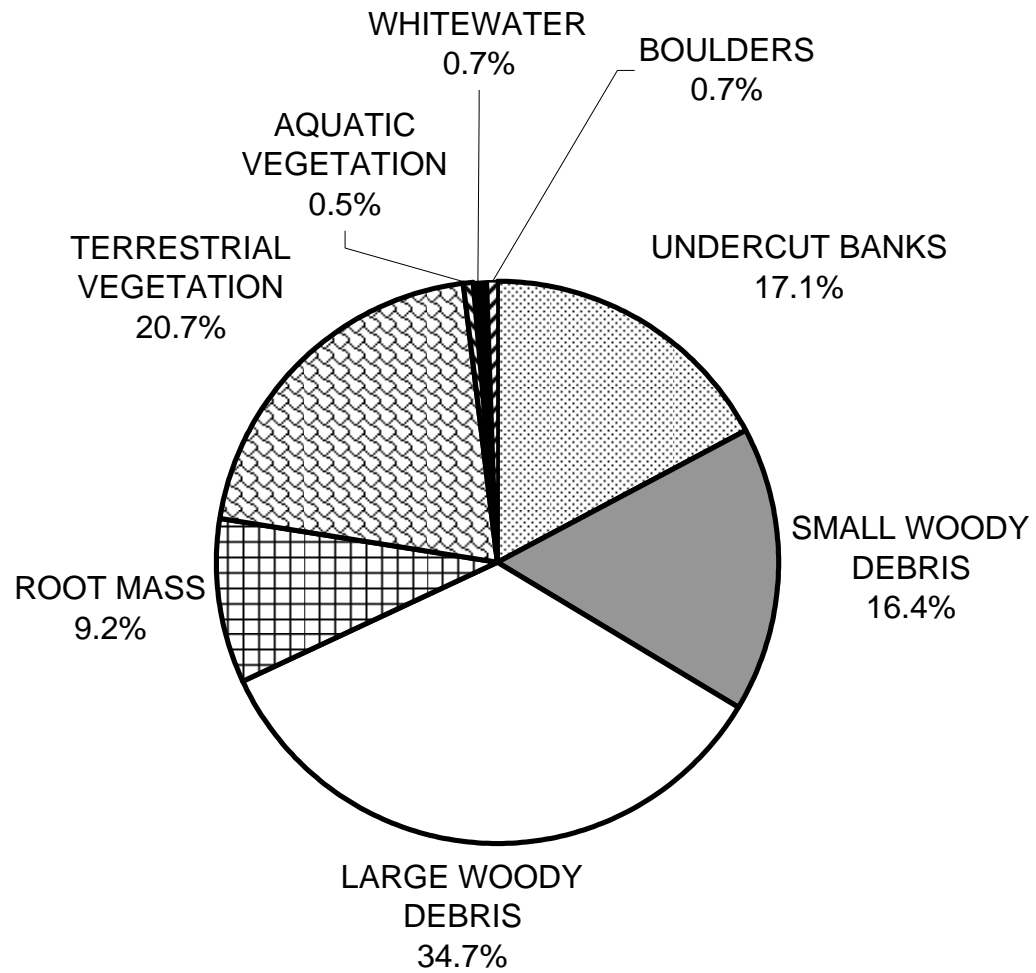
RAILROAD GULCH 2003 PERCENT EMBEDDEDNESS



GRAPH 6

RAILROAD GULCH 2003

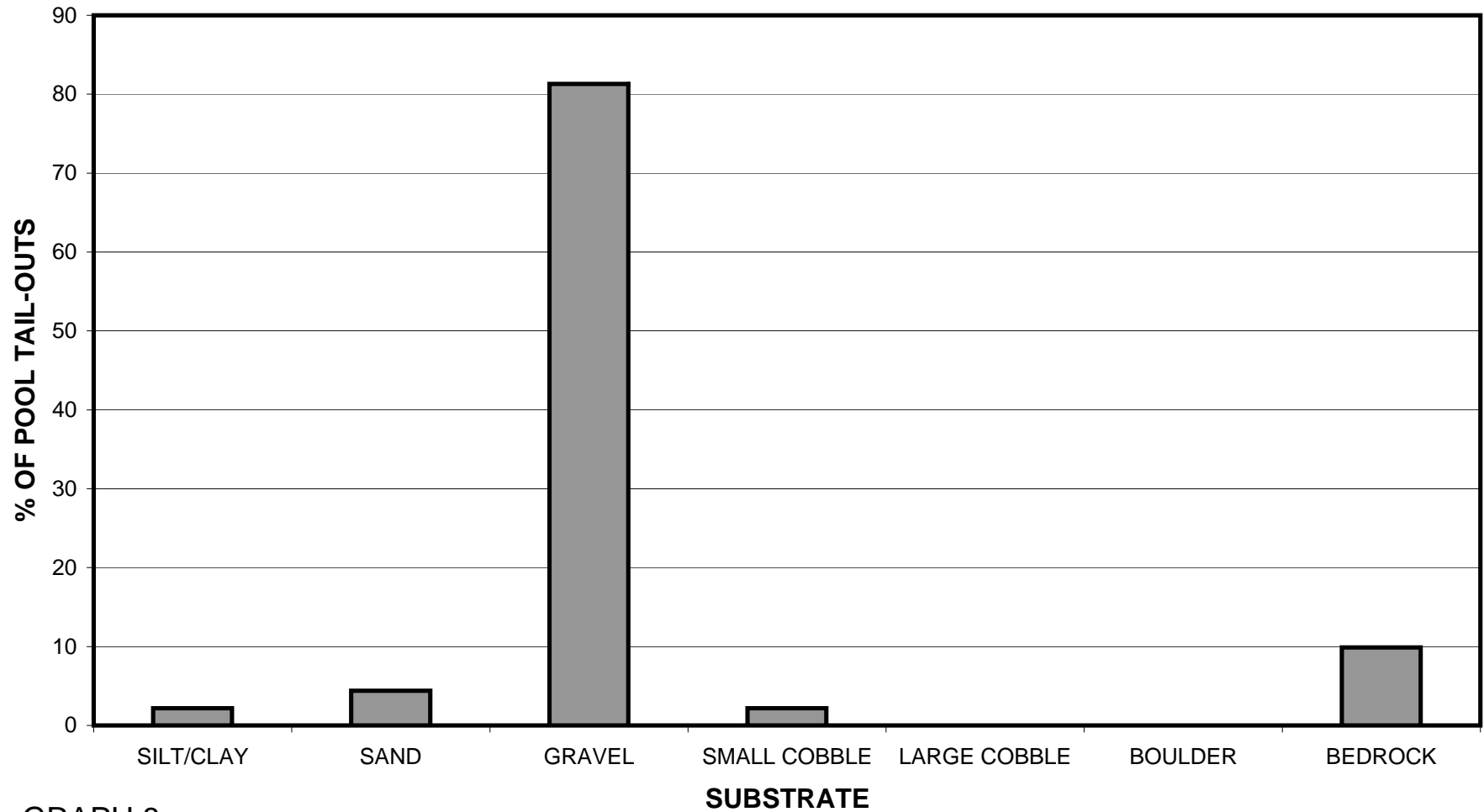
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

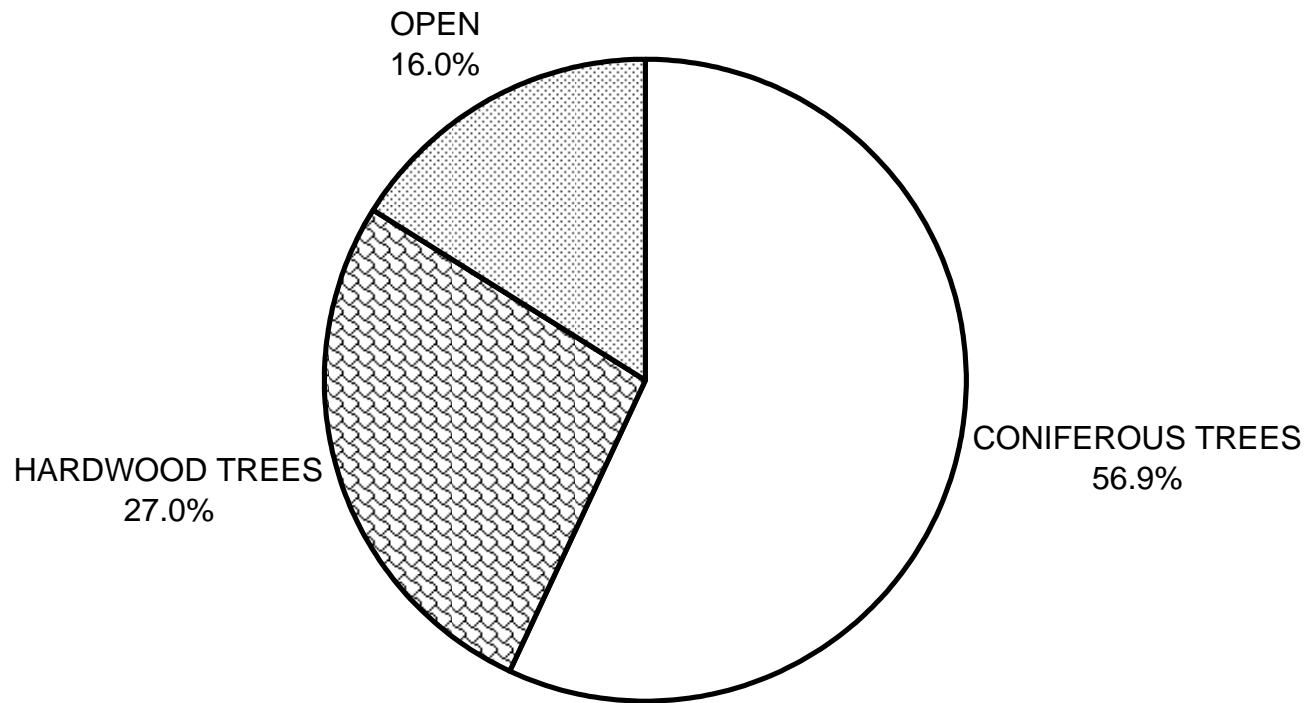
RAILROAD GULCH 2003

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



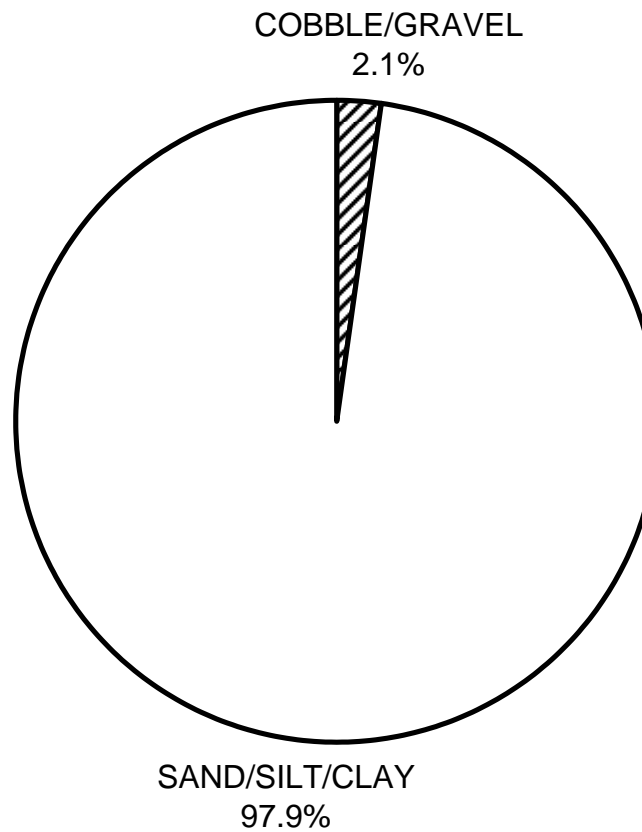
GRAPH 8

RAILROAD GULCH 2003 MEAN PERCENT CANOPY



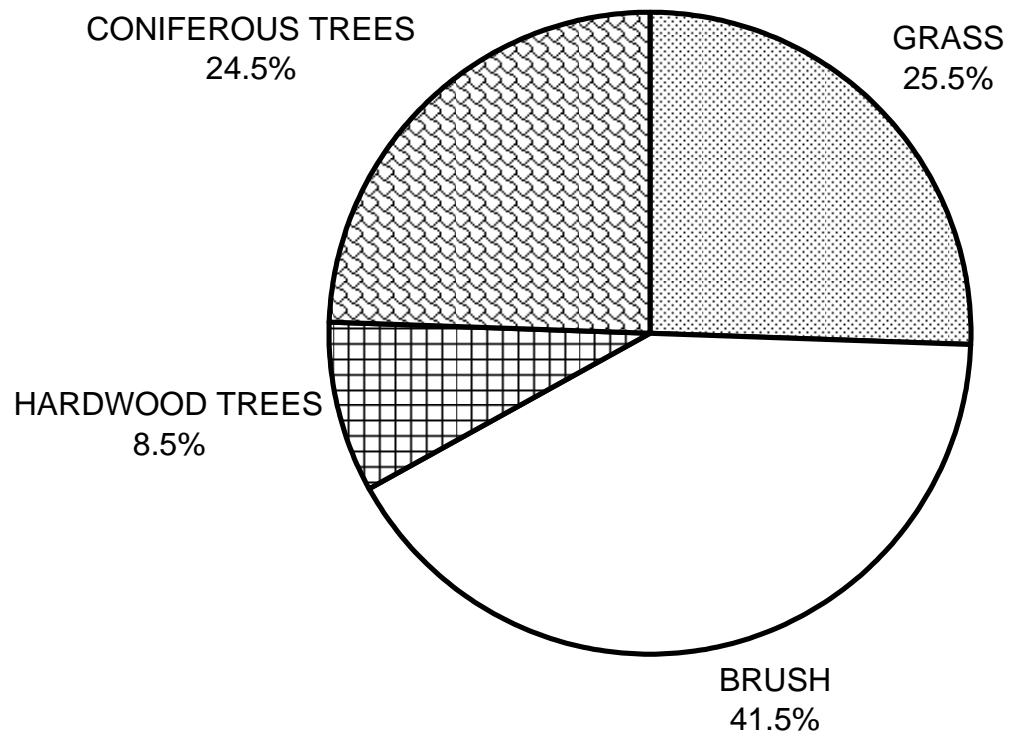
GRAPH 9

RAILROAD GULCH 2003
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

RAILROAD GULCH 2003
DOMINANT BANK VEGETATION IN SURVEY REACH





GRAPH 11

**Map 1
Railroad Gulch
Albion River Watershed
Elk Quad, Mendocino County**

Start of Survey

End of Survey

Legend

-  Reach 1, C4 Channel Type
-  Reach 2, F4 Channel Type

0 1,500 3,000 Feet

