

STREAM INVENTORY REPORT

Railroad Gulch

INTRODUCTION

A stream inventory was conducted from August 18 to August 19, 2010 on Railroad Gulch. The survey began at the confluence with Big River and extended upstream 1.4 miles.

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 Big River, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Railroad Gulch's legal description at the confluence with Big River is T17N R17W S24. Its location is 39.3158 north latitude and 123.7090 west longitude, LLID number 1237077393156. Railroad Gulch is a first order stream and has approximately 0.94 miles of blue line stream according to the USGS Mathison Peak 7.5 minute quadrangle. Railroad Gulch drains a watershed of approximately 1.7 square miles. Elevations range from about 25 feet at the mouth of the creek to 1,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is owned by Jackson Demonstration State Forest and is managed timber production and recreation. Vehicle access exists via Highway 1 to Caspar Little Lake Road to Jackson State Forest Road 700.

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 that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the

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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.

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

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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 rootwads) was estimated and recorded.

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10. Large Woody Debris Count:

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

11. Average Bankfull Width:

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

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 August 18 to August 19, 2010, was conducted by M. Groff and B. Williams (WSP), and I. Mikus (DFG). The total length of the stream surveyed was 7,260 feet. A section of Railroad Gulch was not surveyed due to an unsurveyable marsh from 553 feet to 3,007 feet. The data included in this report is for the 4,806 feet actually surveyed.

Stream flow was not measured on Railroad Gulch.

Railroad Gulch is an F6 channel type for 553 feet of the stream surveyed (Reach 1), an undetermined channel type channel type for 2,454 feet of the stream surveyed (Reach 2), and an F4 channel type for 4,253 feet of the stream surveyed (Reach 3). F6 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and silt/clay-dominant substrates. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 55 to 67 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% pool units, 36% flatwater units, 19% riffle units, 1% culvert units, 1% no survey due to marsh units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 47% flatwater units, 42% pool units, 8% riffle units, 2% culvert units, and 1% dry units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 33%; step run units, 19%; low gradient riffle units, 18%; and run units, 17% (Graph 3). Based on percent total length, no survey due to marsh units made up 34%, mid-channel pool units 22%, step run units 21%, and run units 11%.

A total of 60 pools were identified (Table 3). Main channel pools were the most frequently encountered at 78% (Graph 4), and comprised 82% 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. Ten of the 60 pools (17%) had a residual depth of two feet or greater (Graph 5).

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The depth of cobble embeddedness was estimated at pool tail-outs. Of the 60 pool tail-outs measured, 10 had a value of 1 (16.7%); 26 had a value of 2 (43.3%); 11 had a value of 3 (18.3%); 7 had a value of 4 (11.7%); 6 had a value of 5 (10%) (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 0, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 22 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 24. Scour pools had a mean shelter rating of 18 (Table 3).

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

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 83% of the pool tail-outs. Silt/clay and sand substrate type were the next most frequently observed dominant substrate types and each occurred in 8% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Railroad Gulch was 91%. Nine 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 98%. The mean percent left bank vegetated was 88%. The dominant elements composing the structure of the stream banks consisted of 68% sand/silt/clay, 27% cobble/gravel, 4% bedrock, 1% boulder (Graph 10). Brush was the dominant vegetation type observed in 45% of the units surveyed. Additionally, 37% of the units surveyed had coniferous trees as the dominant vegetation type, and 15% had deciduous trees as the dominant vegetation type (Graph 11).

DISCUSSION

Railroad Gulch is an F6 channel type for 553 feet, an undetermined channel type for 2,454 feet (Reach 2), and an F4 channel type for the remaining 4,253 feet (Reach 3). The suitability of F6 and F4 channel types for fish habitat improvement structures is as follows: F6 channel types are good for bank-placed boulders and fair for plunge weirs, boulder clusters, single and opposing wing-deflectors, and log cover. F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days August 18 to August 19, 2010, ranged from 55 to 59 degrees Fahrenheit. Air temperatures ranged from 55 to 67 degrees Fahrenheit. This is

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a suitable water temperature range for salmonids. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 47% of the total length of this survey, riffles 8%, and pools 42%. Ten of the 60 (17%) pools had a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing large wood that will increase or deepen pool habitat is recommended.

Thirty-six of the 60 pool tail-outs measured had embeddedness ratings of 1 or 2. Eighteen of the pool tail-outs had embeddedness ratings of 3 or 4. Six 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.

Fifty of the 60 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 22. 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 small woody debris in Railroad Gulch. Small woody debris is the dominant cover type in pools followed by large woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover 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 91%. Reach 1 had a canopy density of 93%, Reach 3 had a canopy density of 91%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 98% and 88%, 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

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meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

- 3) Conduct a fish passage assessment on the Road 720 stream crossing at 184 feet. Develop alternatives to improve fish passage.
- 4) 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.
- 5) 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 Big River. Reach 1 channel type is F6.
184	0008.00	Road 720 spans the channel. The crossing is a 7.5' high x 6.5' wide x 88' long corrugated metal pipe. The slope of the culvert is less than one percent. There is no plunge at the outlet. The culvert is in good condition with little rust. The culvert is a possible barrier to juvenile and adult salmonids due to a 6' high x 6.5' foot diameter redwood log sitting flush with the culvert's inlet. Small woody debris and silt are accumulating on the sides of the log, blocking the culvert inlet.
553	0011.00	Begin Reach 2. Reach 2 was not surveyed due to the presence of a marsh.
3007	0012.00	End of marsh. Begin Reach 3. The channel type is F4.
3673	0027.00	Woody debris is accumulating in the channel; most of it is small woody debris. The debris accumulation measures 4.5' high x 4' long x 13' wide. It is accumulating sediment ranging in size from silt to gravel measuring 6' wide x 30' long x 3' deep.
4395	0047.00	Woody debris is accumulating in the channel.

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- 4904 0058.00 There is a 1.5' diameter CMP in the channel.
- 5023 0062.00 Woody debris is accumulating in the channel.
- 5367 0073.00 Tributary #01 enters on the left bank. It contributes to approximately 5% of Railroad Gulch's flow. The water temperature downstream and upstream of the tributary is 56 degrees Fahrenheit; the water temperature of the tributary is 55 degrees Fahrenheit. The slope of the tributary is approximately 2%. The tributary goes dry 15' upstream from the mouth.
- 5381 0074.00 Four foot high plunge formed by redwood rootwad on the left bank.
- 6187 0097.00 There is a 1.5' high plunge over large woody debris.
- 6277 0100.00 Right bank seep.
- 6369 0104.00 There is a 1' high plunge.
- 6416 0107.00 Log debris accumulation (LDA) #01 contains five pieces of large woody debris (LWD) and measures 4' high x 18' wide x 10' long. There are no gaps in the LDA. Retained sediment ranges from silt to gravel and measures 9' wide x 20' long x 2' deep. The flow is subsurface above the LDA.
- 6467 0109.00 LDA #02 contains seven pieces of LWD and measures 4' high x 11' wide x 9' long. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 6' wide x 40' long x 3' deep. The channel is dry above the LDA. It is a possible barrier to juvenile and adult salmonids because of the 3' high plunge over LWD.
- 6776 0124.00 Small woody debris is accumulating in the channel.
- 7260 0140.00 End of survey due to diminished habitat. Tributary #02 enters on the right bank. It contributes to approximately 70% of Railroad Gulch's flow. The water temperature downstream and upstream of the tributary is 55 degrees Fahrenheit; the water temperature of the tributary is 54 degrees Fahrenheit. The slope of the tributary is approximately 2.5%. The tributary is accessible to fish, but no fish were observed.

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: 1237077393156 Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR17WS24 Latitude: 39:18:56.0N Longitude: 123:42:28.0W

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
1	0	CULVERT	0.7	88	88	1.8									
2	0	DRY	1.4	32	64	1.3									
50	8	FLATWATER	36.0	45	2267	47.2	4.6	0.4	0.8	307	15343	144	7221		6
1	0	NO SURVEY													
60	60	POOL	43.2	33	2003	41.7	7.5	0.7	1.4	249	14969	260	15589	190	22
26	3	RIFFLE	18.7	15	384	8.0	5.8	0.1	0.4	53	1370	7	179		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
140	71				7260					31683			22989		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Railroad Gulch

LLID: 1237077393156

Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:56.0N

Longitude: 123:42:28.0W

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 (%)
25	2	LGR	18.0	15	363	7.6	7	0.2	0.4	52	1288	8	189		0	93
1	1	BRS	0.7	21	21	0.4	4	0.1	0.4	55	55	6	6		0	100
24	2	RUN	17.3	32	769	16.0	6	0.6	0.9	293	7032	163	3914		15	88
26	6	SRN	18.7	58	1498	31.2	4	0.4	1.1	311	8099	138	3593		3	90
1	1	TRP	0.7	45	45	0.9	5	0.5	1.2	225	225	203	203	113	0	94
46	46	MCP	33.1	35	1603	33.4	7	0.7	3.3	252	11571	270	12426	200	24	91
1	1	CRP	0.7	23	23	0.5	16	1.3	2	368	368	589	589	478	5	96
4	4	LSL	2.9	36	142	3.0	8	0.4	1.4	298	1193	213	851	136	15	93
3	3	LSBk	2.2	34	103	2.1	6	0.4	1.5	214	643	146	437	82	2	91
5	5	PLP	3.6	17	87	1.8	10	0.8	2.6	194	969	217	1084	158	34	91
2	0	DRY	1.4	32	64	1.3										
1	0	CUL	0.7	88	88	1.8										
1	0	MARSH														

Total Units
140

Total Units Fully Measured
71

Total Length (ft.)
7260

Total Area (sq.ft.)
31443

Total Volume (cu.ft.)
23291

Table 3 - Summary of Pool Types

Stream Name: Railroad Gulch

LLID: 1237077393156

Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:56.0N

Longitude: 123:42:28.0W

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
47	47	MAIN	78	35	1648	82	7.1	0.7	251	11796	198	9327	24
13	13	SCOUR	22	27	355	18	9.0	0.6	244	3173	159	2061	18

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
60	60	2003	14969	11388

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

Stream Name: Railroad Gulch

LLID: 1237077393156

Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:56.0N

Longitude: 123:42:28.0W

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
1	TRP	2	0	0	1	100	0	0	0	0	0	0
46	MCP	77	3	7	35	76	7	15	1	2	0	0
1	CRP	2	0	0	0	0	1	100	0	0	0	0
4	LSL	7	1	25	3	75	0	0	0	0	0	0
3	LSBk	5	0	0	3	100	0	0	0	0	0	0
5	PLP	8	0	0	4	80	1	20	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
60	4	7	46	77	9	15	1	2	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Railroad Gulch

LLID: 1237077393156

Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Dry Units: 2

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:56.0N

Longitude: 123:42:28.0W

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
25	2	LGR	0	0	0	0	0	0	0	0	0
1	1	BRS	0	0	0	0	0	0	0	0	0
26	3	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
24	2	RUN	0	25	0	0	75	0	0	0	0
26	6	SRN	0	77	13	0	10	0	0	0	0
50	8	TOTAL FLAT	0	56	8	0	36	0	0	0	0
1	1	TRP	0	0	0	0	0	0	0	0	0
46	46	MCP	5	46	30	1	17	0	0	1	1
1	1	CRP	0	100	0	0	0	0	0	0	0
4	4	LSL	0	9	84	0	8	0	0	0	0
3	3	LSBk	0	100	0	0	0	0	0	0	0
5	5	PLP	4	12	81	0	3	0	0	0	0
60	60	TOTAL POOL	4	42	38	1	14	0	0	1	0
1	0	CUL									
1	0	MAR									
140	71	TOTAL	4	43	35	1	16	0	0	1	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Railroad Gulch

LLID: 1237077393156

Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Dry Units: 2

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:56.0N

Longitude: 123:42:28.0W

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
25	2	LGR	0	0	100	0	0	0	0
1	1	BRS	0	0	0	0	0	0	100
24	2	RUN	0	0	100	0	0	0	0
26	6	SRN	0	0	100	0	0	0	0
1	1	TRP	100	0	0	0	0	0	0
46	46	MCP	15	9	76	0	0	0	0
1	1	CRP	0	0	100	0	0	0	0
4	4	LSL	0	0	100	0	0	0	0
3	3	LSBk	0	0	100	0	0	0	0
5	5	PLP	20	0	80	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Railroad Gulch

LLID: 1237077393156

Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:56.0N

Longitude: 123:42:28.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
91	68	32	0	98	88

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: 1237077393156 Drainage: Big River
 Survey Dates: 8/18/2010 to 8/19/2010 Survey Length (ft.): 7260 Main Channel (ft.): 7260 Side Channel (ft.): 0
 Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR17WS24 Latitude: 39:18:56.0N Longitude: 123:42:28.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F6	Canopy Density (%): 93.4	Pools by Stream Length (%): 66.4
Reach Length (ft.): 553	Coniferous Component (%): 50.0	Pool Frequency (%): 50.0
Riffle/Flatwater Mean Width (ft.):	Hardwood Component (%): 50.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 80
Range (ft.): 13 to 13	Vegetative Cover (%): 78.0	2 to 2.9 Feet Deep: 20
Mean (ft.): 13	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 0	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 38	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 59 - 59 Air (F): 59 - 59	LWD per 100 ft.:	Mean Pool Shelter Rating: 6
Dry Channel (ft): 0	Riffles: 0	
	Pools: 2	
	Flat: 5	
Pool Tail Substrate (%): Silt/Clay: 100 Sand: 0 Gravel: 0 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 0.0 4. 0.0 5. 100.0		

STREAM REACH: 2

Channel Type: NA	Canopy Density (%):	Pools by Stream Length (%): 0.0
Reach Length (ft.): 2454	Coniferous Component (%):	Pool Frequency (%): 0.0
Riffle/Flatwater Mean Width (ft.):	Hardwood Component (%):	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation:	< 2 Feet Deep:
Range (ft.): 15 to 15	Vegetative Cover (%): 0.0	2 to 2.9 Feet Deep:
Mean (ft.): 15	Dominant Shelter:	3 to 3.9 Feet Deep:
Std. Dev.: 0	Dominant Bank Substrate Type:	>= 4 Feet Deep:
Base Flow (cfs.): 0.0	Occurrence of LWD (%):	Mean Max Residual Pool Depth (ft.):
Water (F): 56 - 56 Air (F): 62 - 62	LWD per 100 ft.:	Mean Pool Shelter Rating:
Dry Channel (ft): 0	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:		
Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0		

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: F4	Canopy Density (%): 91.1	Pools by Stream Length (%): 38.5
Reach Length (ft.): 4253	Coniferous Component (%): 69.3	Pool Frequency (%): 42.6
Riffle/Flatwater Mean Width (ft.): 5.0	Hardwood Component (%): 30.7	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 84
Range (ft.): 8 to 15	Vegetative Cover (%): 94.2	2 to 2.9 Feet Deep: 15
Mean (ft.): 11	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 2
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 27	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 55 - 56 Air (F): 55 - 67	LWD per 100 ft.:	Mean Pool Shelter Rating: 24
Dry Channel (ft): 64	Riffles: 2	
	Pools: 6	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 9 Gravel: 91 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 18.2 2. 47.3 3. 20.0 4. 12.7 5. 1.8		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Railroad Gulch

LLID: 1237077393156

Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:56.0N

Longitude: 123:42:28.0W

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	5	0	3.5
Boulder	0	1	0.7
Cobble / Gravel	21	18	27.5
Sand / Silt / Clay	45	52	68.3

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	1	3	2.8
Brush	27	37	45.1
Hardwood Trees	10	11	14.8
Coniferous Trees	33	20	37.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values:

3

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

StreamName: Railroad Gulch

LLID: 1237077393156

Drainage: Big River

Survey Dates: 8/18/2010 to 8/19/2010

Confluence Location: Quad: MATHISON PEAK

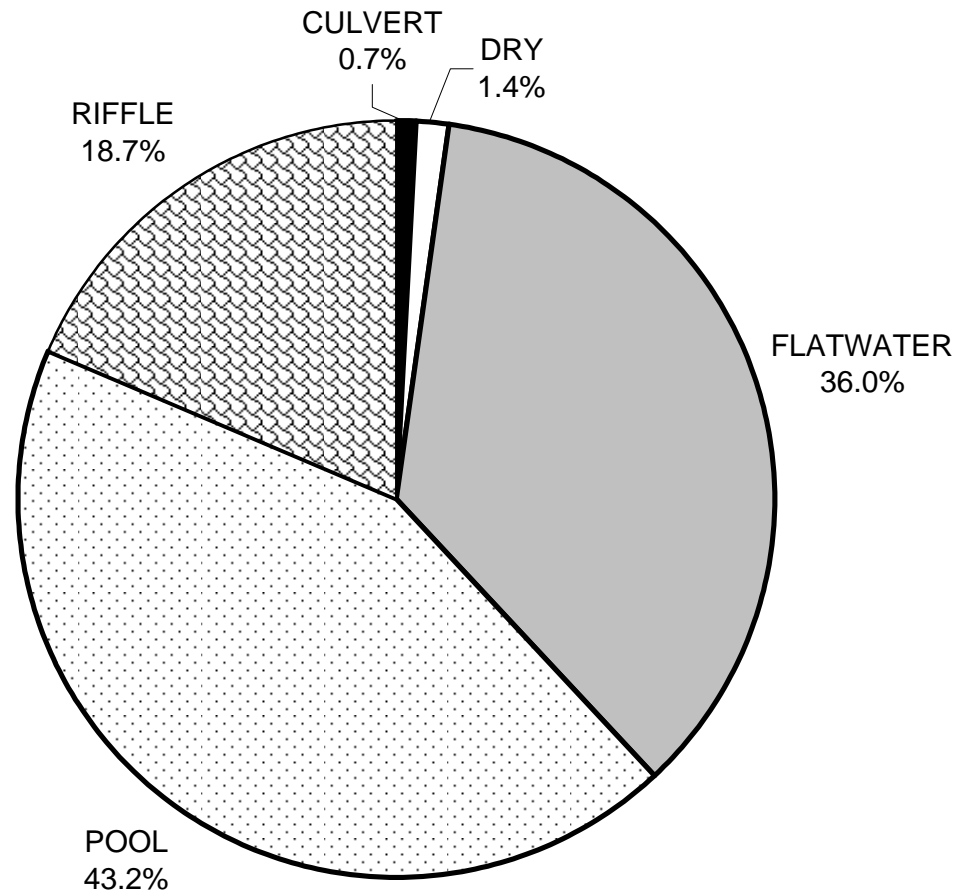
Legal Description: T17NR17WS24

Latitude: 39:18:56.0N

Longitude: 123:42:28.0W

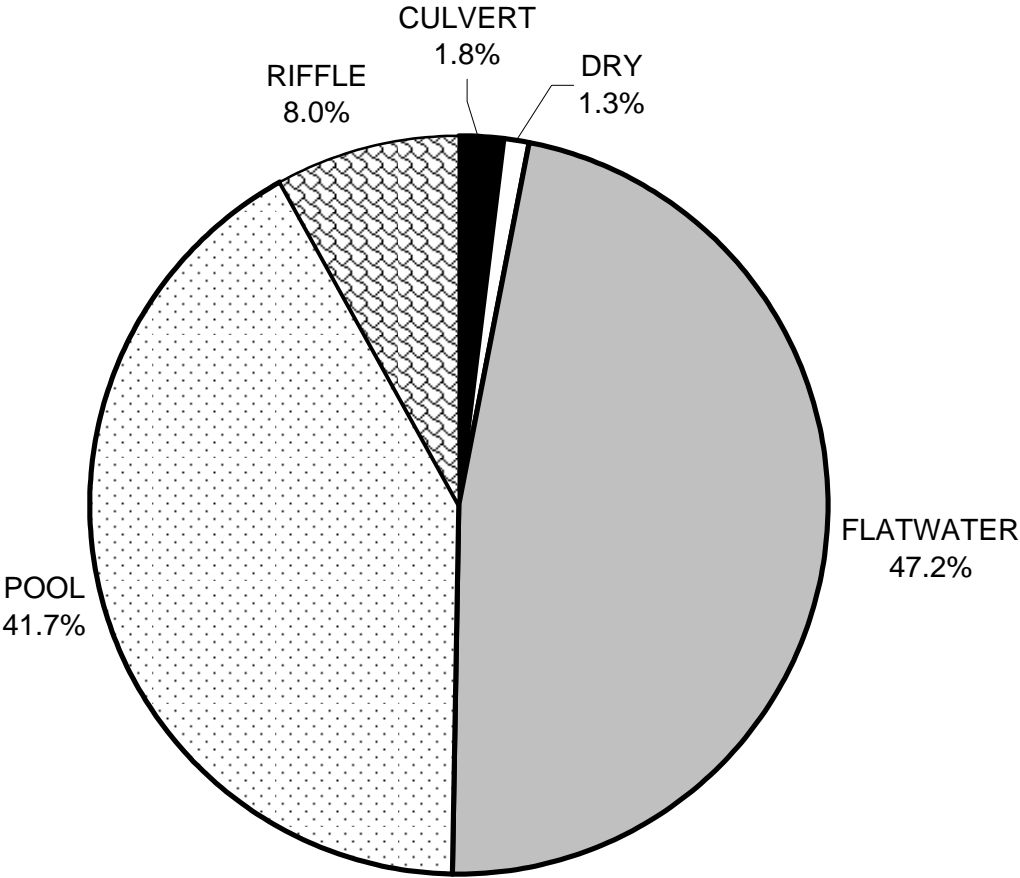
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	4
SMALL WOODY DEBRIS (%)	0	56	42
LARGE WOODY DEBRIS (%)	0	8	38
ROOT MASS (%)	0	0	1
TERRESTRIAL VEGETATION (%)	0	36	14
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	1
BEDROCK LEDGES (%)	0	0	0

RAILROAD GULCH 2010 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

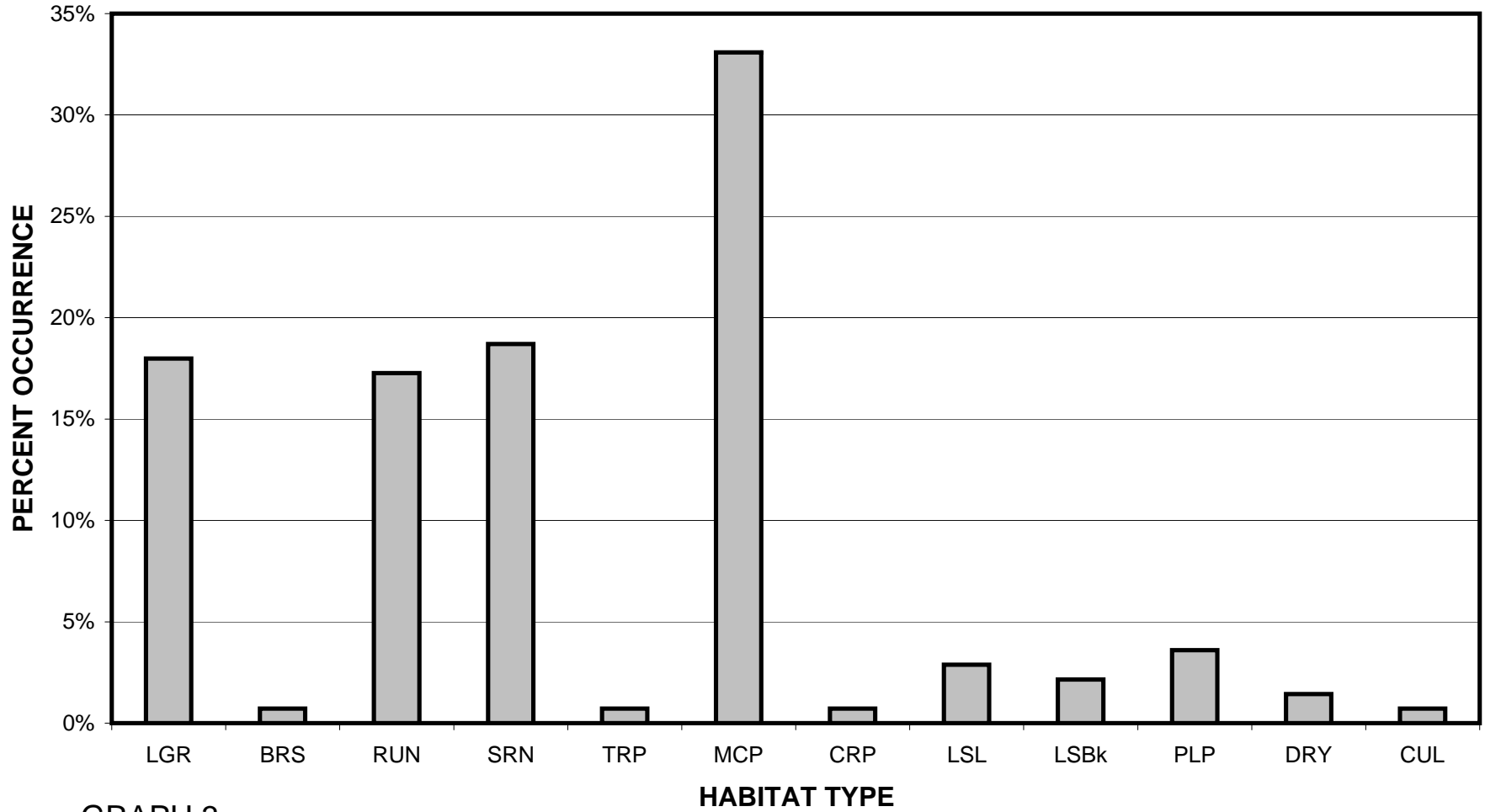
**RAILROAD GULCH 2010
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

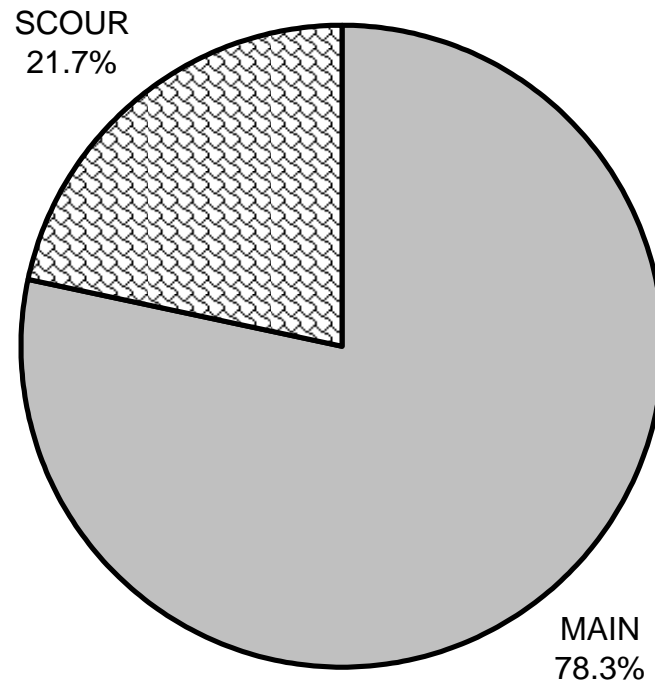
RAILROAD GULCH 2010

HABITAT TYPES BY PERCENT OCCURRENCE



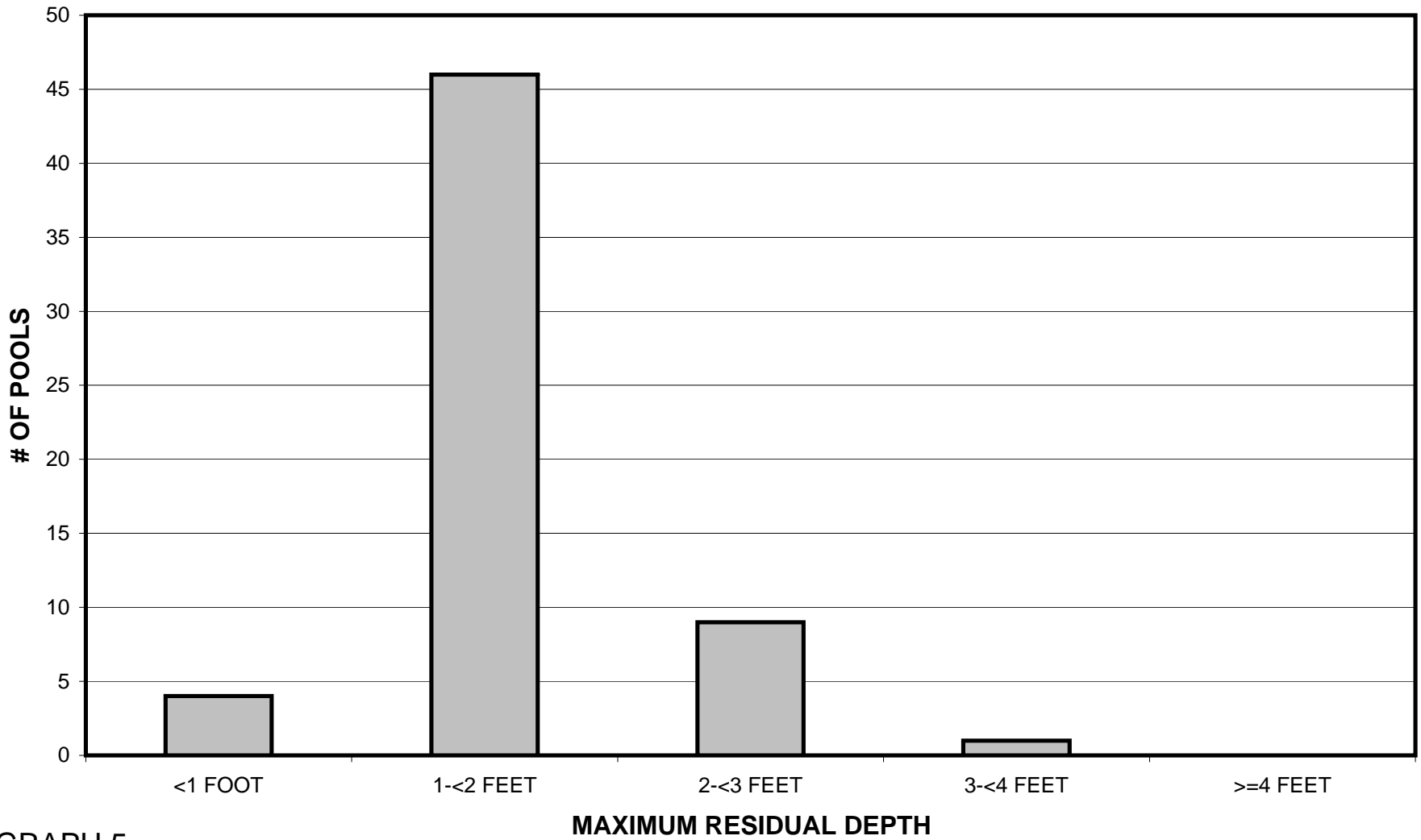
GRAPH 3

RAILROAD GULCH 2010 POOL TYPES BY PERCENT OCCURRENCE



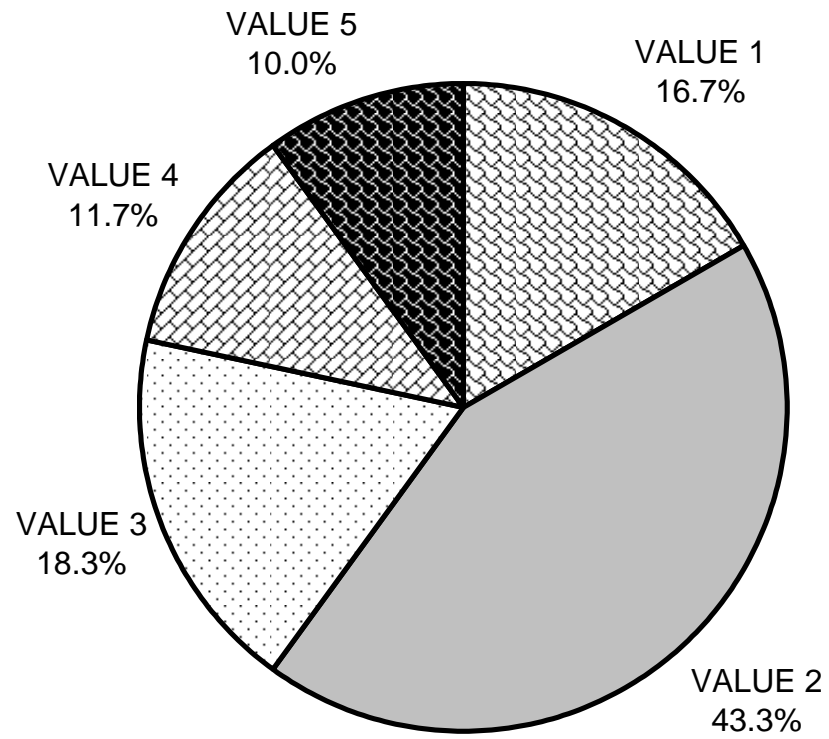
GRAPH 4

RAILROAD GULCH 2010 MAXIMUM DEPTH IN POOLS



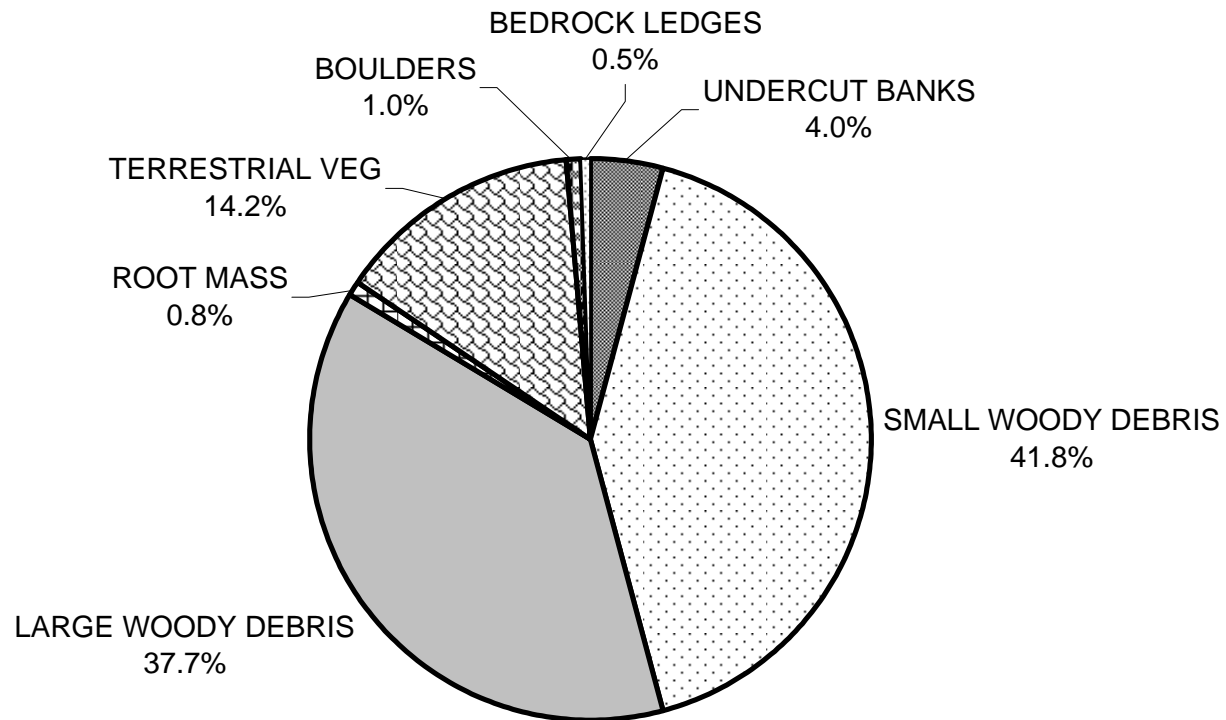
GRAPH 5

RAILROAD GULCH 2010 PERCENT EMBEDDEDNESS



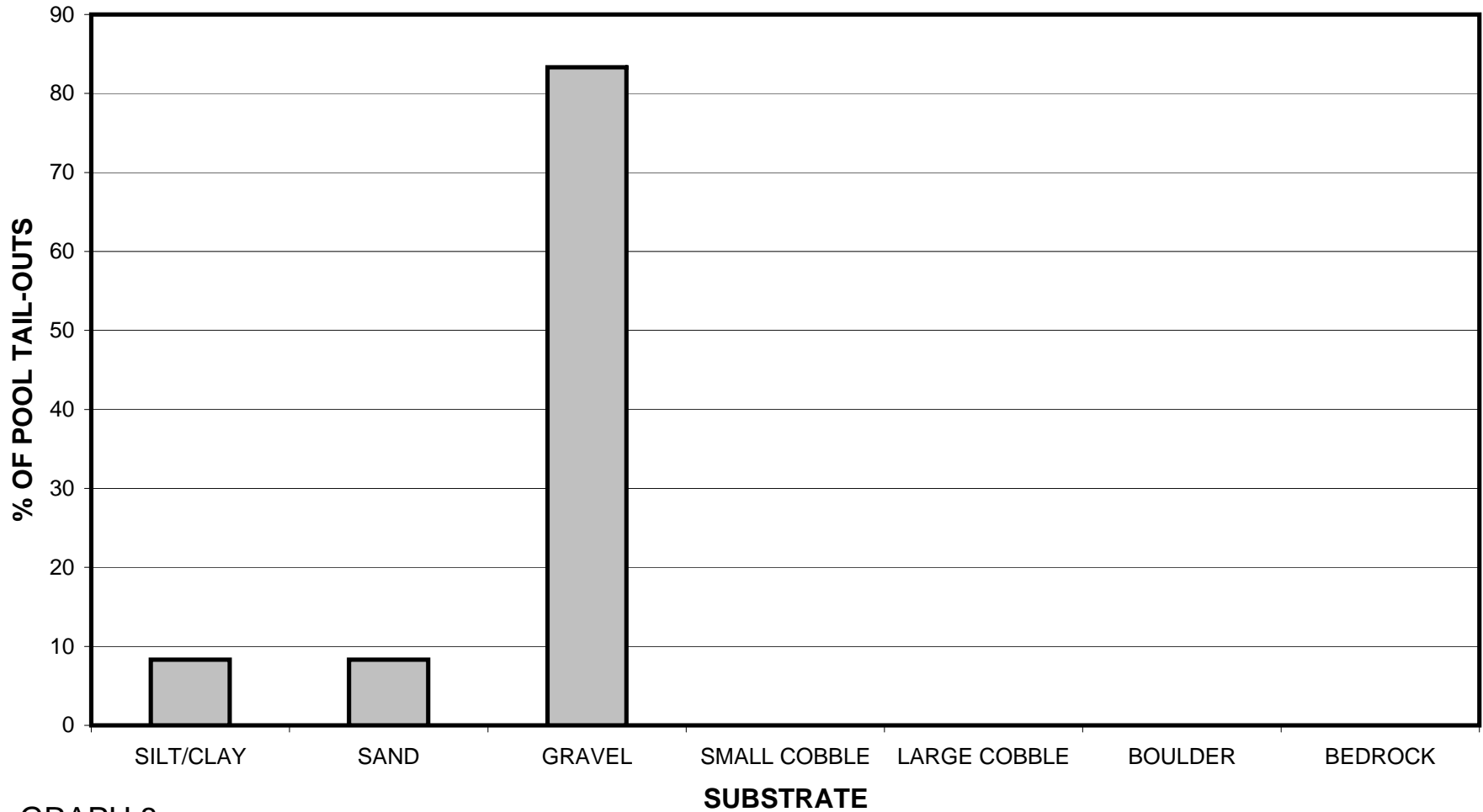
GRAPH 6

RAILROAD GULCH 2010 MEAN PERCENT COVER TYPES IN POOLS



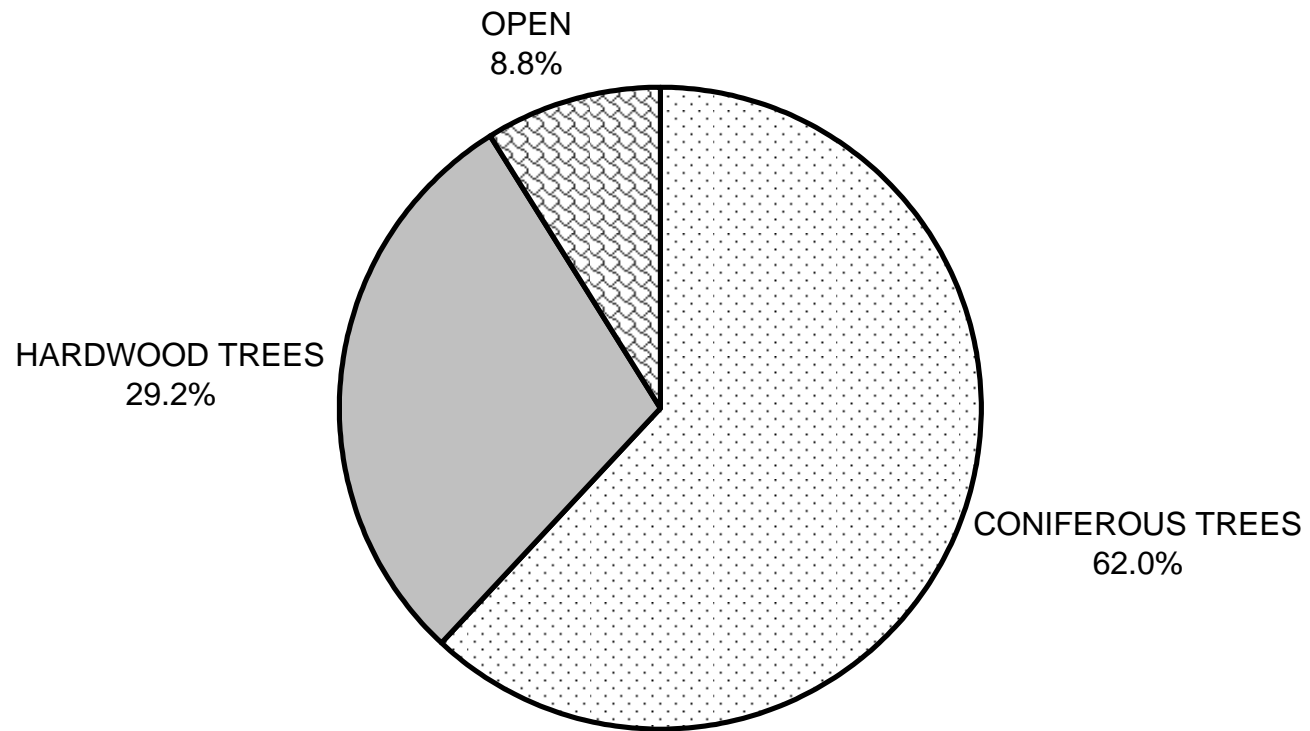
GRAPH 7

RAILROAD GULCH 2010 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



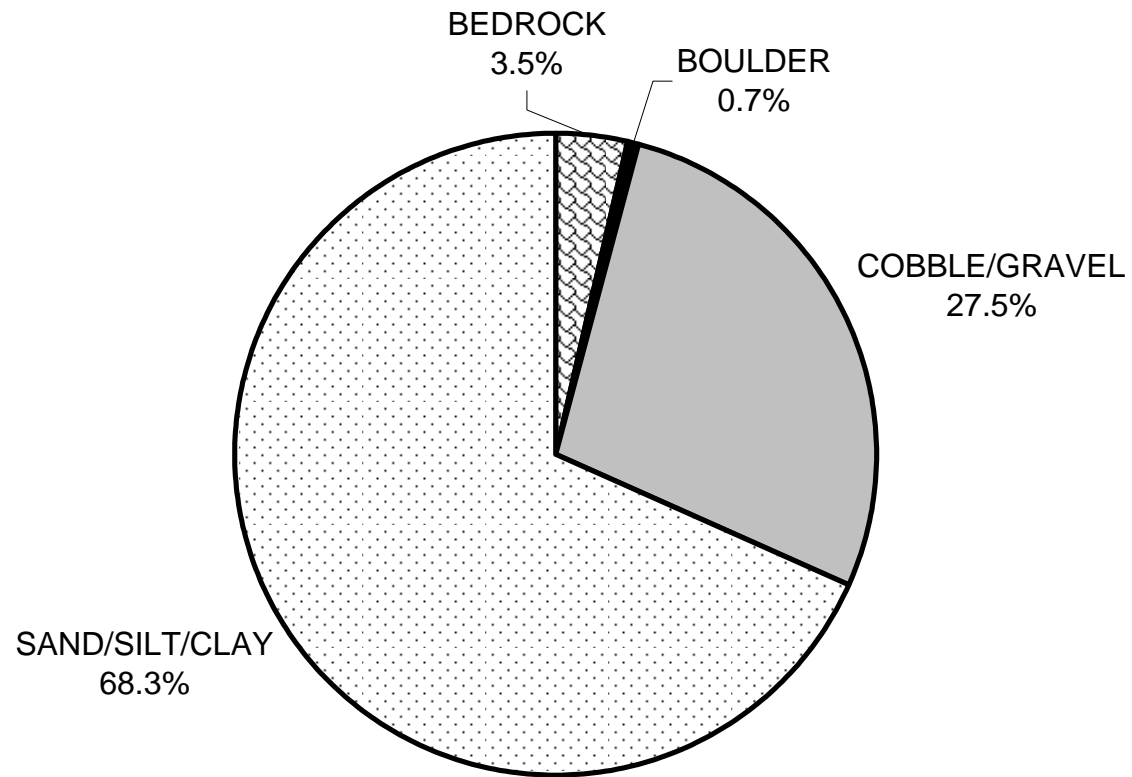
GRAPH 8

RAILROAD GULCH 2010 MEAN PERCENT CANOPY



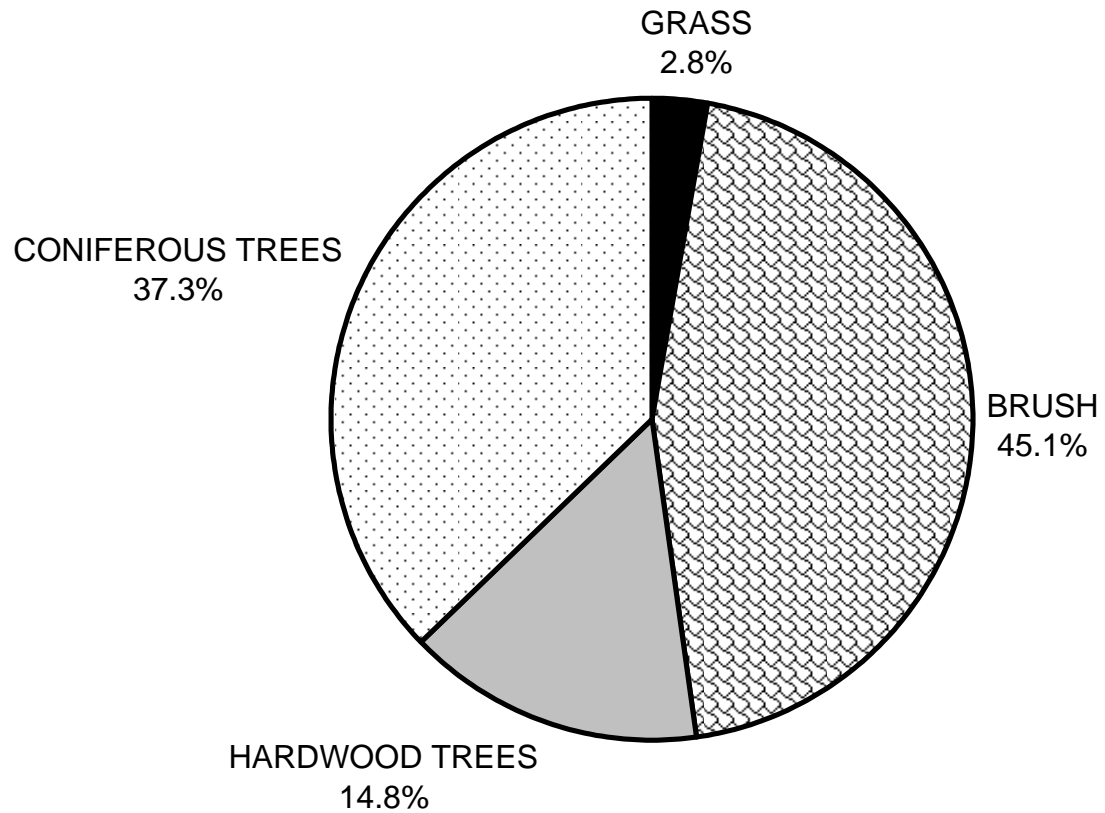
GRAPH 9

RAILROAD GULCH 2010 DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

RAILROAD GULCH 2010 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

