STREAM INVENTORY REPORT

RAIL CREEK

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Rail Creek. The survey began 11,764 feet (2.23 mile) above the confluence with the East Fork Scott River and extended upstream 0.2 miles.

The Rail Creek 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 Rail Creek. 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 Chinook salmon, 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

Rail Creek is a tributary to the East Fork Scott River, located in Siskiyou County, California (Map 1). Rail Creek's legal description at the confluence with the East Fork Scott River is T41N R7W S20. Its location is 41°23'0.1" north latitude and 122°40'37" west longitude. Rail Creek is a first order stream and has approximately 4.7 miles of blue line stream according to the USGS Gazelle and Scott Mountain 7.5 minute quadrangles. Rail Creek drains a watershed of approximately 9 square miles. Elevations range from about 4000 feet at the mouth of the creek to about 7100 feet in the headwater areas. Douglas fir/grass/oak/mixed hardwood/mixed conifer forest dominates the watershed. The watershed is primarily privately owned and national forest land and is managed for timber production/rangeland/recreation. Vehicle access exists via Highway 3 or the Gazelle - Callahan Road.

METHODS

The habitat inventory conducted in Rail Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors, and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) 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 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. All pools except step-pools are fully sampled.

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 Rail Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at 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 (1985 rev. 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 (1988). 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". Rail Creek 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 Rail Creek, 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 particle size, bedrock, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide 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. 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 Rail Creek, 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 Rail Creek, 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 deciduous 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 Rail Creek 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.

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'.

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 Rail Creek. In addition, eighteen sites were snorkel dived. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual.*

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, 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 Pool Depths by Habitat Types
- Dominant Substrates by Habitat Types
- Mean Percent Shelter by Habitat Types
- Mean Percent Vegetative Cover
- Fish Habitat Elements by Stream Reach
- Dominant Vegetation Type for Entire Stream
- Mean Percent Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Rail Creek include:

- Riffle, Flatwater, Pool Habitats by Percent Occurrence
- Riffle, Flatwater, Pool Habitats by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Total Pools by Maximum Depths
- Embeddedness
- Pool Cover by Cover Type
- Dominant Substrate in Low Gradient Riffles
- Mean Percent Canopy
- Bank Composition by Composition Type
- Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

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

The habitat inventory of October 1, and 3, 2002, was conducted by S. Maurer and S. Mahon (DFG) on October 1; and S. Maurer and B. Boyle (DFG) on October 3. The total length of the stream surveyed was 1003 feet with an additional 41 feet of side channel.

Although stream flow was not measured on Rail Creek on the dates of this survey, a stream flow measurement on October 7, 2002 (snorkel survey date) showed a stream flow of 0.91 cubic feet per second (cfs).

Rail Creek is an A2 channel type with an average bankfull width of 15 feet for the entire 1003 feet of the stream surveyed. A2 channels are steep, narrow, cascading, step-pool streams and high energy, high debris transport associated with depositional soils and boulder channels.

Water temperatures taken during the survey period ranged from 43 to 47 degrees Fahrenheit. Air temperatures ranged from 50 to 57 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 48% riffle units, 28% flatwater units, and 24% pool units (Graph 1). Based on total length of Level II habitat types there were 55% riffle units, 31% flatwater units, and 14% pool units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were high gradient riffle, 27%; step run, 23%; and cascade, low gradient riffle, and plunge pool, each at 8% (Graph 3). Based on percent total length, step runs made up 30%, high gradient riffles 25%, and cascades 13%.

A total of 6 pools were identified (Table 3). Scour pools were the most frequently encountered, at 50%, (Graph 4) and comprised 47% of the total length of all pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. All six of the pools (100%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 6 pool tail-outs measured, 2 had a value of 1 (40%); 0 had a value of 2 (0%); 1 had a value of 3 (20%); 0 had a value of 4 (0%); and 2 had a value of 5 (40%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 30, flatwater habitat types had a mean shelter rating of 13, and pool habitats had a mean shelter rating of 21 (Table 1). Of the pool types, the Scour pools had the highest mean shelter rating at 30. Main channel pools had a mean shelter rating of 15 (Table 3).

Reach one was not surveyed due to no landowner permission. In reach two, Rail Creek had a total of 10 pieces of LWD. This is an average of 0.96 pieces of LWD per 100'.

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Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Rail Creek. Graph 7 describes the pool cover in Rail Creek. Boulders are the dominant pool cover type followed by bedrock ledges and whitewater.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Boulders were the dominant substrate observed in 60% of pool tail-outs while large cobble and bedrock were the next most frequently observed substrate type, each at 20%.

The mean percent canopy density for the surveyed length of Rail Creek was 58%. The mean percentages of deciduous and coniferous trees were 12% and 46%, respectively. Forty-two percent of the canopy was open. Graph 9 describes the mean percent canopy in Rail Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 29%. The mean percent left bank vegetated was 25%. The dominant elements composing the structure of the stream banks consisted of 50% bedrock, 23% boulder, 27% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 39% of the units surveyed. Also, 31% of the units surveyed had deciduous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were snorkel-dived for species composition and distribution in Rail Creek on October 9, 2002. Water temperatures taken during the dive period were 50 degrees Fahrenheit. Air temperatures were76 degrees Fahrenheit. The sites were sampled by S. Maurer (DFG). NOTE: There is a dam on Rail Creek approximately 1,795 feet (0.34 miles) from the confluence with the East Fork Scott River. Fish passage is blocked. Therefore, the trout observed in Rail Creek are either land-locked steelhead or resident trout.

The first site sampled was habitat unit #17, a run, located approximately 594 feet from the survey start.

The second site sampled was habitat unit #22, a lateral scour pool – bedrock formed, located approximately 925 feet from the survey start.

The third site sampled was habitat unit #24, a high gradient riffle, located approximately 972 feet from the survey start.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from start (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead			Coho		
							YOY	1+	2+	YOY	1+	2+
10/9/02	1	594	17	3.3	2	A2	4	0	0	0	0	0
10/9/02	2	925	22	5.4	2	A2	7	4	1	0	0	0
10/9/02	3	972	24	1.2	2	A2	1	1	0	0	0	0

DISCUSSION

Rail Creek is an A2 channel type for the entire survey length of 1,003 feet. A2 channel types are generally not suitable for fish habitat improvement structures. High energy streams with stable stream banks have poor gravel retention capabilities.

The water temperatures recorded on the survey days October 1 and 3, 2003, ranged from 43 to 47 degrees Fahrenheit. Air temperatures ranged from 50 to 57 degrees Fahrenheit. To make any further 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 28% of the total length of this survey, riffles 48%, and pools 24%. The pools are relatively deep, with all six (100%) pools having a maximum 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 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 for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Two of the 6 pool tail-outs measured had embeddedness ratings of 1 or 2. 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 Rail Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

None of the 6 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

The mean shelter rating for pools was 21. The shelter rating in the flatwater habitats was 13. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, bedrock ledges and whitewater contribute a small amount. 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 58%. Reach 1 was not surveyed while Reach 2 had a canopy density of 58%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 24% and 25%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Rail Creek should be managed as an anadromous, natural production stream.

Rail

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) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable.

5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

6) 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.

7) Increase the canopy on Rail Creek by planting willow, alder, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

8) Suitable size spawning substrate on Rail Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

9) There are several log debris accumulations present on Rail Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

10) There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives should be explored with the grazier and developed if possible.

11) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

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.

0' Begin survey 11,764 feet (2.23 mile) above confluence with E. Fork Scott River at USFS property line. Channel type is A2.

594' Dive 1.

925' Dive 2. Flow taken here 10/10/2002; 0.91 cfs.

972' Dive 3.

1,044' End of Survey at confluence with Rock Fence Creek due to time constraints.

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.

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}
FLAT WATER			
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]	

Rail Creek

Drainage: EAST FORK SCOTT RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES

Survey Dates: 10/01/02 to 10/03/02

Confluence Location: QUAD: Gazelle Mt LEGAL DESCRIPTION: T41NR07WS20 LATITUDE:41°22'60" LONGITUDE:122°40'41"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN 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
12	5	RIFFLE	48	48	571	55	9.8	0.7	433	5196	317	3806	0	30
7	2	FLATWATER	28	47	327	31	10.5	1.1	234	1638	254	1781	0	13
6	6	POOL	24	24	146	14	9.5	1.5	211	1264	307	1840	226	21

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
25	13	1044	8099	7426

Rail Creek Drainage: EAST FORK SCOTT RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES Survey Dates: 10/01/02 to 10/03/02

Confluence Location: QUAD: Gazelle Mt LEGAL DESCRIPTION: T41NR07WS20 LATITUDE:41°22'60" LONGITUDE:122°40'41"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
1	TRP	17	0	0	0	0	1	100	0	0	0	0
1	STP	17	0	0	0	0	1	100	0	0	0	0
1	LSBk	17	0	0	0	0	1	100	0	0	0	0
2	PLP	33	0	0	0	0	2	100	0	0	0	0
1	BPB	17	0	0	0	0	0	0	1	100	0	0

TOTAL UNITS
6

Rail Creek

Drainage: EAST FORK SCOTT RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 10/01/02 to 10/03/02

Confluence Location: QUAD: Gazelle Mt LEGAL DESCRIPTION: T41NR07WS20 LATITUDE:41°22'60" LONGITUDE:122°40'41"

UNITS MEASURED	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
2	1	LGR	0	0	0	0	0	0	20	70	10
7	2	HGR	0	0	0	0	0	0	30	65	5
2	1	CAS	0	0	0	0	0	0	35	60	5
1	1	BRS	0	0	0	0	0	0	40	40	20
1	1	RUN	0	5	0	0	5	0	20	60	10
6	1	SRN	0	10	0	0	0	0	10	80	0
1	1	TRP	0	0	0	0	0	0	25	70	5
1	1	STP	0	0	0	0	0	0	10	75	15
1	1	LSBk	0	10	10	10	0	0	15	25	30
2	2	PLP	0	0	0	0	0	0	33	30	38
1	1	BPB	0	0	0	0	0	0	0	35	65

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Drainage: EAST FORK SCOTT RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 10/01/02 to 10/03/02

Confluence Location: QUAD: Gazelle Mt LEGAL DESCRIPTION: T41NR07WS20 LATITUDE:41°22'60" LONGITUDE:122°40'41"

TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
2	1	LGR	0	0	0	0	0	100	0
7	2	HGR	0	0	0	0	0	100	0
2	1	CAS	0	0	0	0	0	100	0
1	1	BRS	0	0	0	0	0	0	100
1	1	RUN	0	0	100	0	0	0	0
6	1	SRN	0	0	0	0	100	0	0
1	1	TRP	0	0	0	0	0	0	100
1	1	STP	0	0	0	0	0	100	0
1	1	LSBk	0	0	0	0	0	0	100
2	2	PLP	0	0	0	0	0	50	50
1	1	BPB	0	0	100	0	0	0	0

Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Deciduous	Mean Percent Open units	Mean Right bank % Cover	Mean Left Bank % Cover
58	80	20	0	23.8	25.0

Note: Mean percent conifer and deciduous 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.

80 x .58 = 46% conifers

20 x .58 = 12% deciduous

100 - 58 = 42% open canopy

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Rail Creek
SAMPLE DATES: 10/01/02 to 10/03/02
STREAM LENGTH: 12767 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Gazelle Mt — Latitude: 41°22'60"
Legal Description: T41NR07WS20 — Longitude: 122°40'41"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: N/A	Canopy Density: **********%
Channel Length: 0 ft.	Coniferous Component: **********%
Riffle/flatwater Mean Width: *********	Deciduous Component: **********%
Total Pool Mean Depth: **** ft.	Pools by Stream Length: **********%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: **********%
Water: - °F Air: - °F	Mean Pool Shelter Rtn: **********
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Undercut Banks
Vegetative Cover: **********%	Occurrence of LOD: **********%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

Embeddness Value: 1. **********% 2.**********% 3. **********% 4. **********% 5. **********%

Length of stream section not surveyed within survey reach and not included in above totals or calculations: 11764 ft.

STREAM REACH 2

Channel Type: A2	Canopy Density: 58%
Channel Length: 1003 ft.	Coniferous Component: 80%
Riffle/flatwater Mean Width: 10 ft.	Deciduous Component: 20%
Total Pool Mean Depth: 1.5 ft.	Pools by Stream Length: 10%
Base Flow: 0.9 cfs	Pools >=3 ft.deep: 20%
Water: 43 - 47 °F Air: 50 -57 °F	Mean Pool Shelter Rtn: 22
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Boulders
Vegetative Cover: 25%	Occurrence of LOD: 1%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

Embeddness Value: 1. 33% 2.0% 3. 17% 4. 0% 5. 50%

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	7	6	50
Boulder	4	2	23.1
Cobble/Gravel	2	5	26.9
Silt/clay	0	0	0

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	0	0	0
Brush	4	2	23.1
Decid. Trees	4	4	30.8
Conif. Trees	4	6	38.5
No Vegetation	1	1	7.7

Total stream average embeddedness value for pool 3

TABLE 10. MEAN PERCENT OF SHELTER COVER TYPES FOR ENTIRE STREAM

Stream: Rail Creek Drainage: EAST FORK SCOTT RIVER

Survey Date: 10/01/02 to 10/03/02

	RIFFLES	FLATWATER	POOLS
UNDERCUT BANKS	0	0	0
SMALL WOODY DEBRIS	1.9	7.5	1.4
LARGE WOODY DEBRIS	0.8	0	1.4
ROOTS	0.8	0	1.4
TERRESTRIAL VEG	0.4	2.5	0
AQUATIC VEG	0	0	0
WHITEWATER	23.1	15	17.9
BOULDERS	54.2	70	48.6
BEDROCK LEDGES	18.8	5	29.3

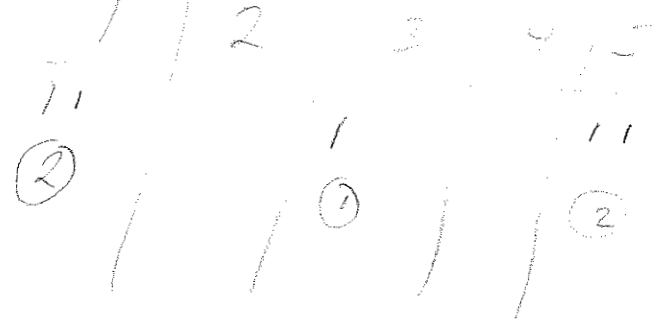
Rail Snack - 2002

Embeddedness % Results

of 1's : 2 = 40%
# of 2's : ~~0~~
# of 3's : 1 = 20%
# of 4's : ~~0~~
# of 5's : 2 = 40%

T = 5

Graph 6



Pool Tail Substrate Calculations

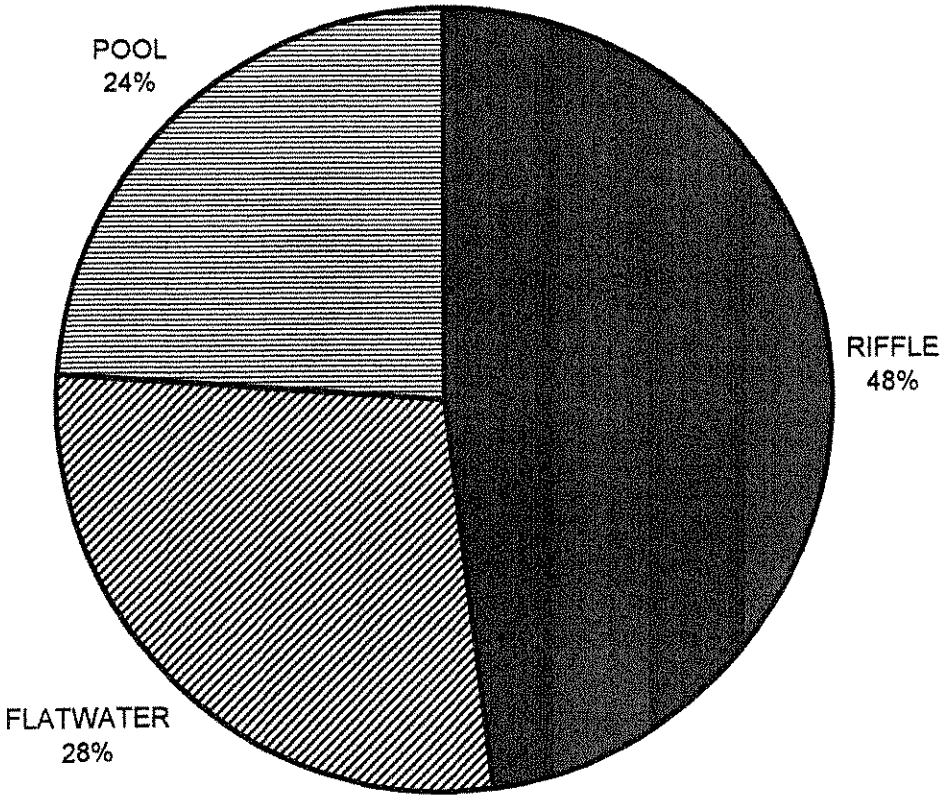
Graph 8

=0
=0
=0
=0
= 1 = 20%
3 = 60%
1 = 20%

5

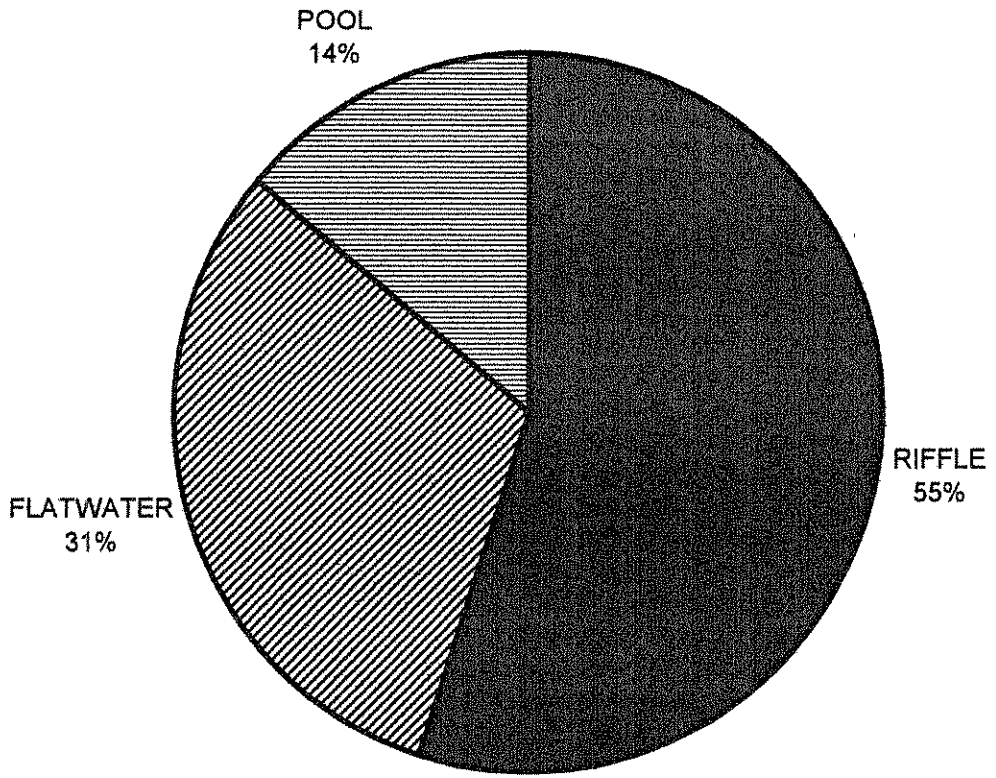
A	B	C	D	E	F	G
				1	///	1
				(1)	(3)	(1)

RAIL CREEK 2002
HABITAT TYPES BY PERCENT OCCURENCE



GRAPH 1

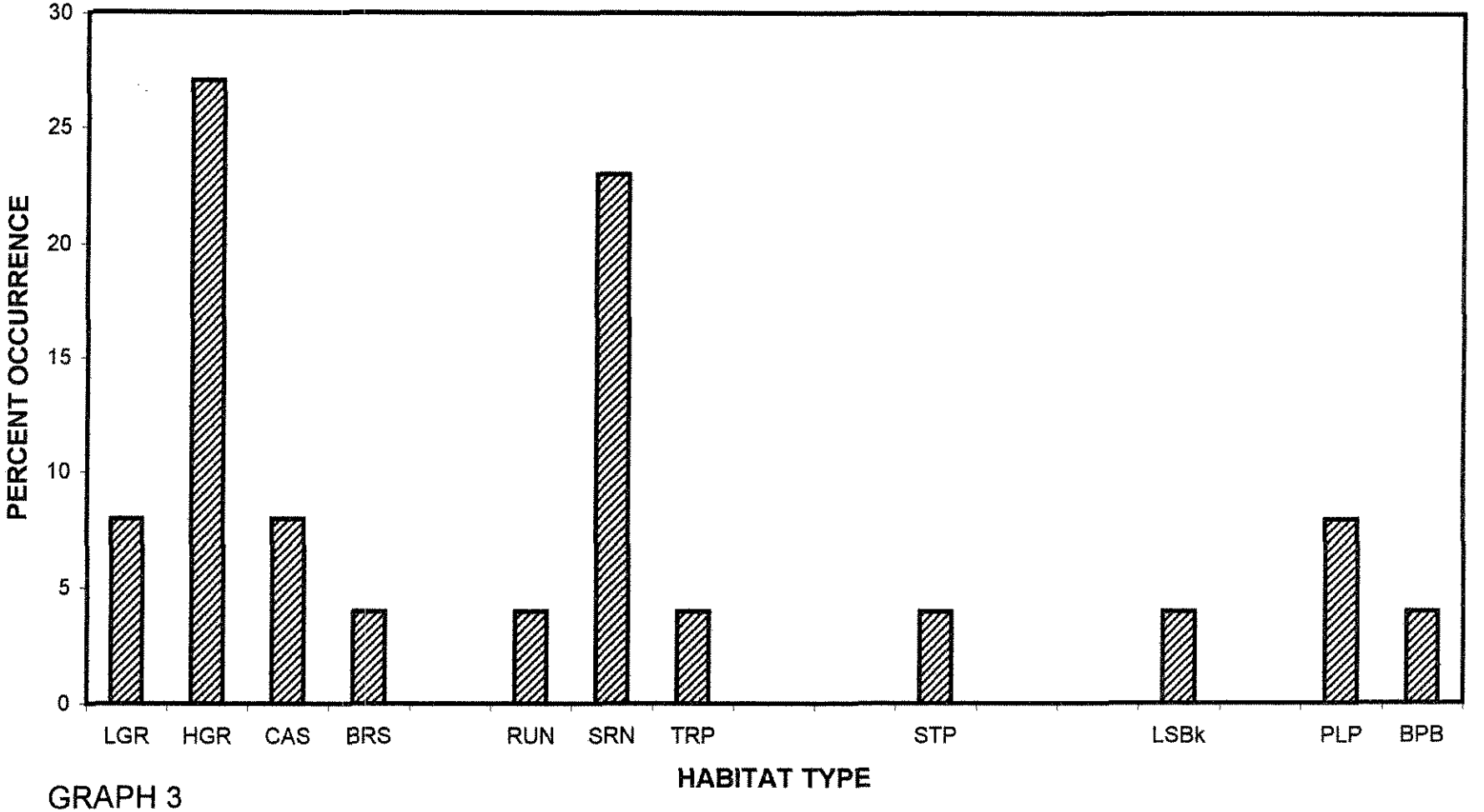
RAIL CREEK 2002
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

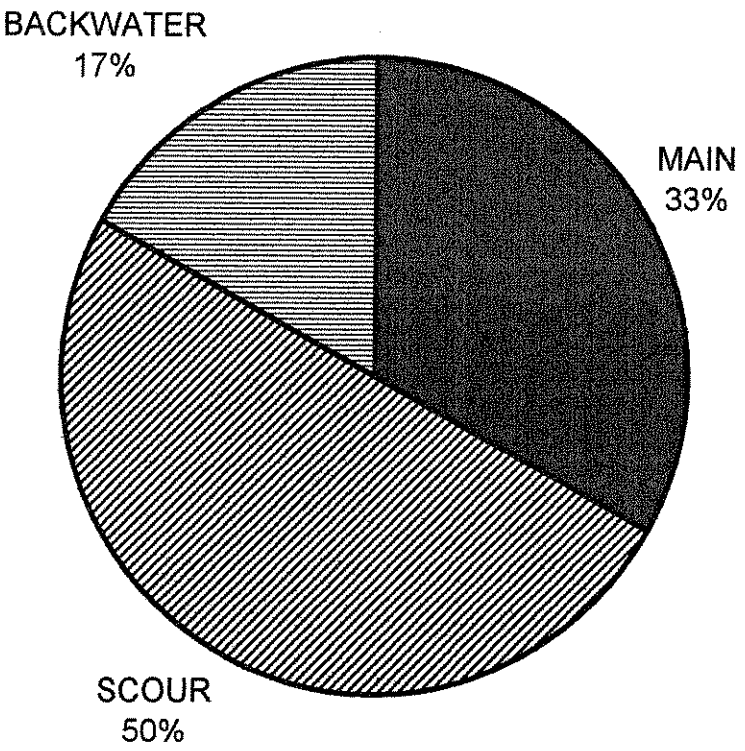
RAIL CREEK 2002

HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

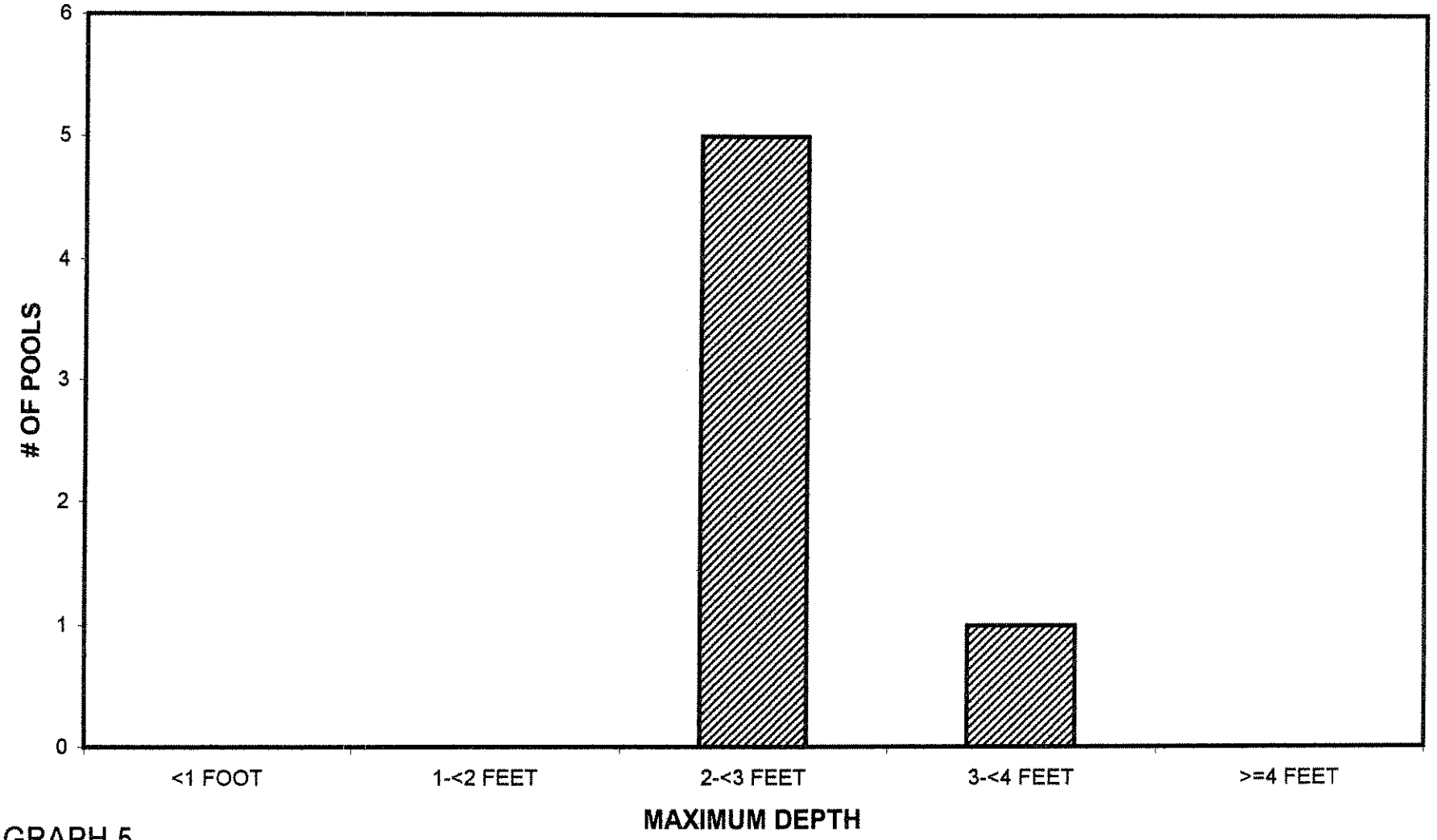
RAIL CREEK 2002
POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

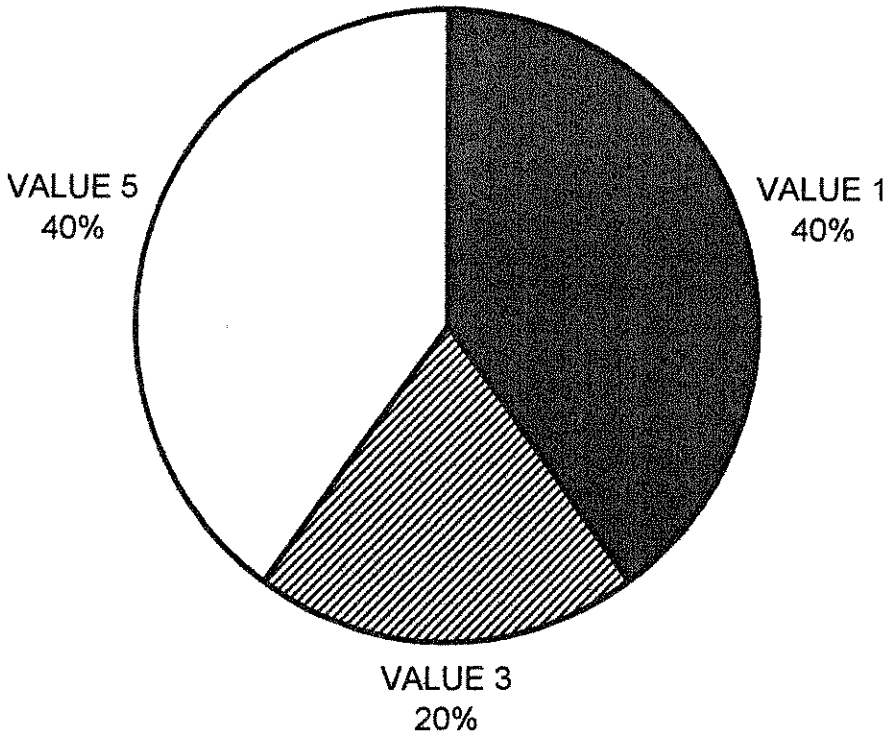
RAIL CREEK 2002

MAXIMUM DEPTH IN POOLS



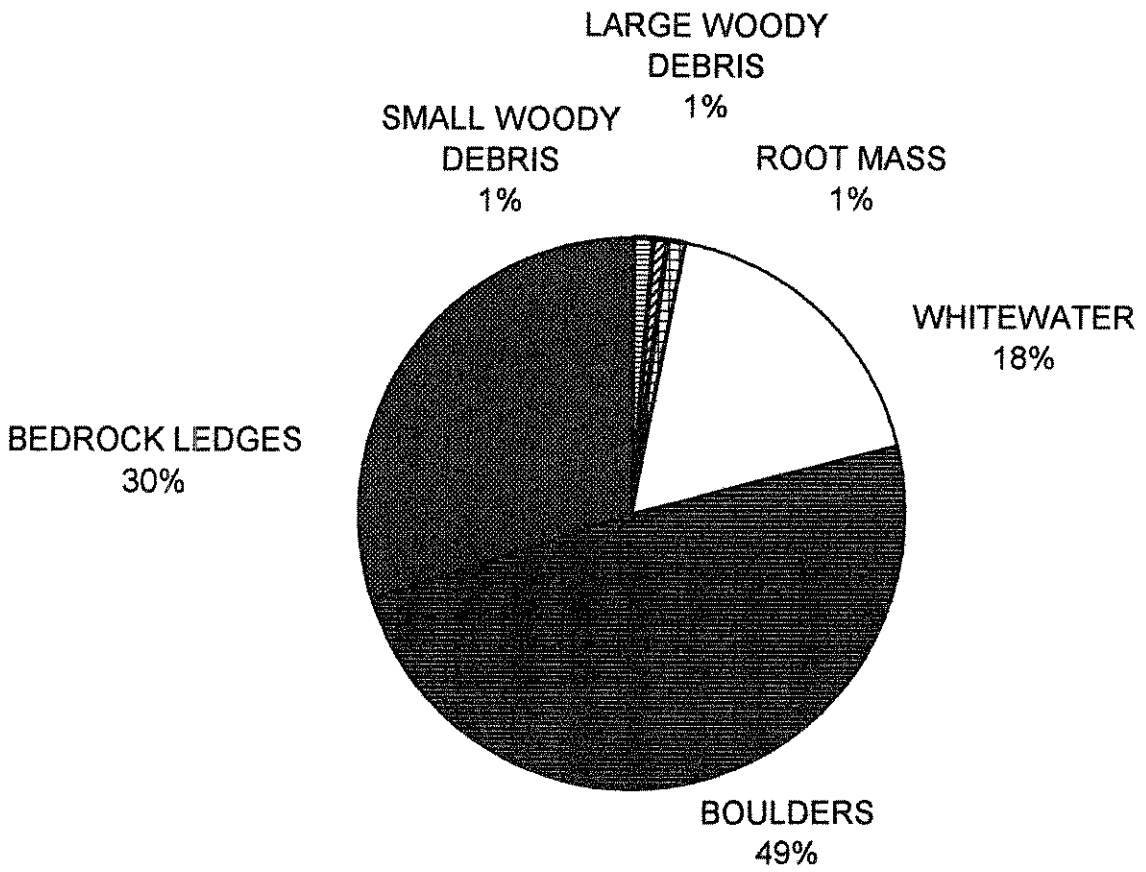
GRAPH 5

RAIL CREEK 2002
PERCENT EMBEDDEDNESS



GRAPH 6

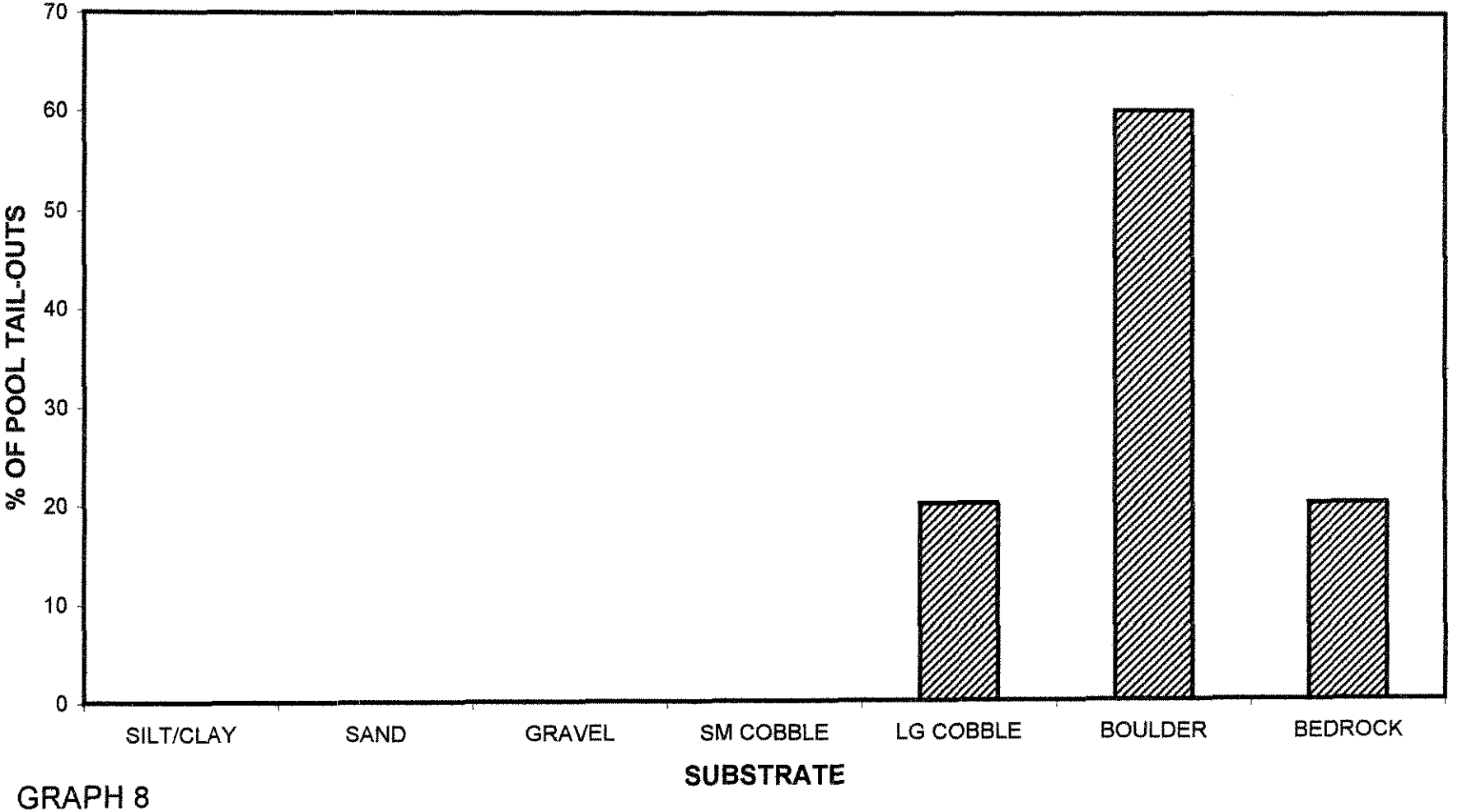
RAIL CREEK 2002
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

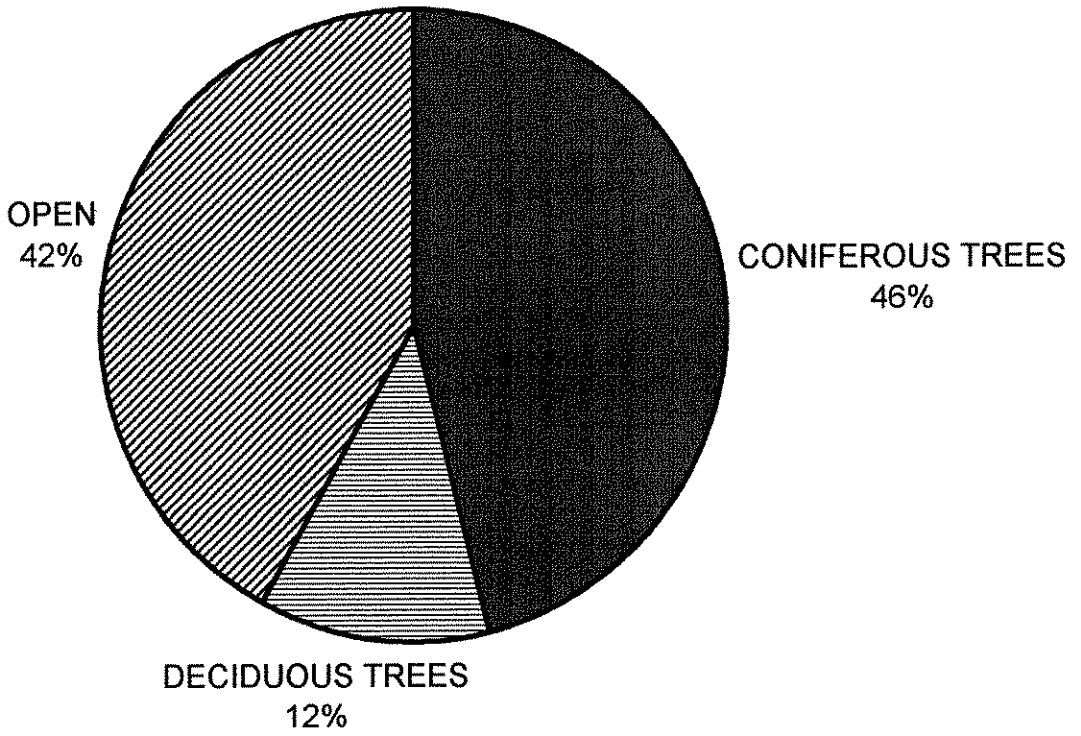
RAIL CREEK 2002

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



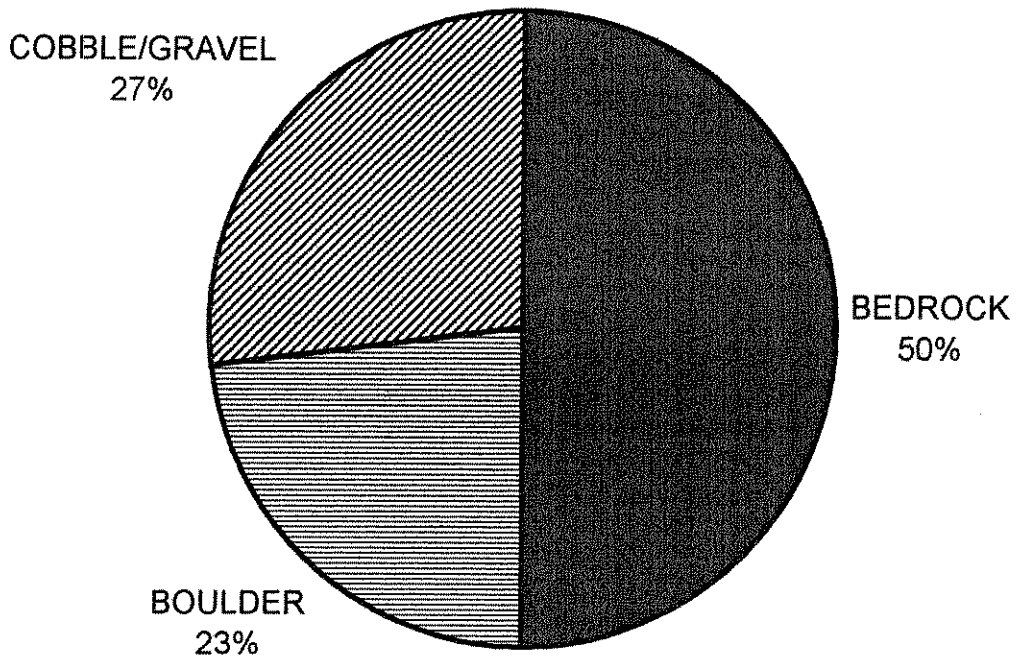
GRAPH 8

RAIL CREEK 2002
MEAN PERCENT CANOPY



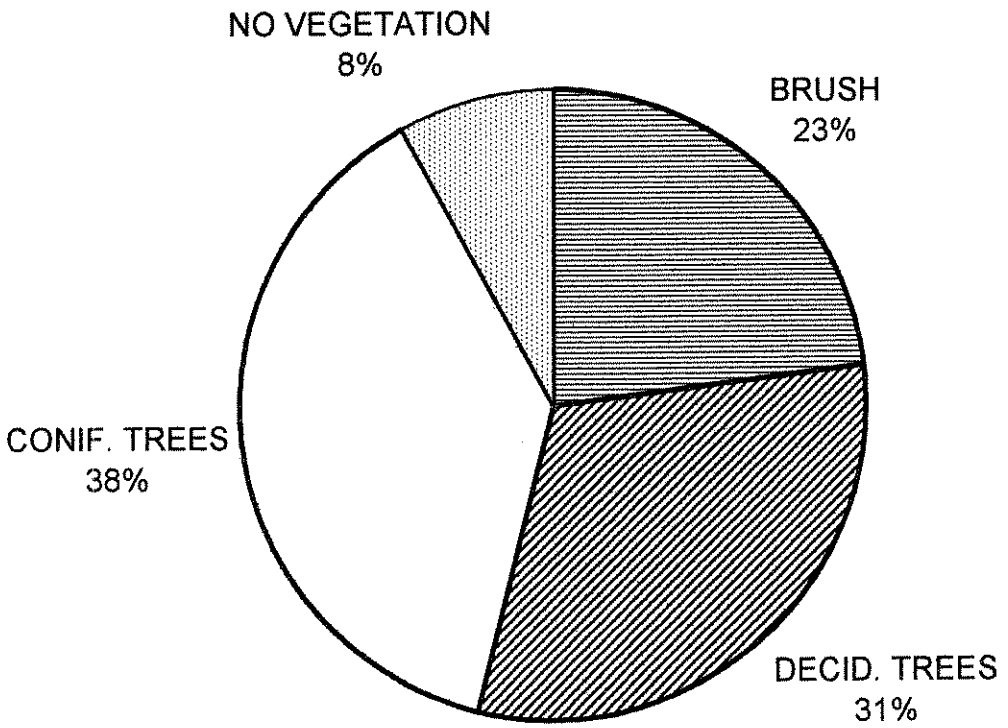
GRAPH 9

RAIL CREEK 2002
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

RAIL CREEK 2002
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11