

STREAM INVENTORY REPORT

Grouse Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Grouse Creek. The survey began at the confluence with the East Fork Scott River and extended upstream 2.4 miles.

The Grouse 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 Grouse 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 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

Grouse Creek is a tributary to East Fork Scott River, a tributary to the Scott River, a tributary to the Klamath River, which drains to the Pacific Ocean. It is located in Siskiyou County, California (Map 1). Grouse Creek's legal description at the confluence with East Fork Scott River is T40N R07W S19. Its location is 41.3179 degrees north latitude and 122.7239 degrees west longitude. Grouse Creek is a third order stream and has approximately five miles of blue line stream according to the USGS Scott Mountain 7.5 minute quadrangle. Grouse Creek drains a watershed of approximately 12 square miles. Elevations range from about 3,600 feet at the mouth of the creek to about 6,300 feet in the headwater areas. Douglas fir, grass, oak, mixed hardwood, and mixed conifer forests dominate the watershed. The watershed is primarily privately owned and national forest land and is managed for timber production, rangeland, and recreation. Vehicle access exists via Highway 3 to Forest Service road or the Gazelle - Callahan Road.

METHODS

The habitat inventory conducted in Grouse 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.

Grouse Creek

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 Grouse 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". Grouse 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

Grouse Creek

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 Grouse 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 not suitable 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 Grouse 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Grouse 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 Grouse 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

Grouse Creek

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 Grouse 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

Grouse Creek

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Grouse 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
- Substrate Composition in Pool Tail-outs
- 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 July 12 to August 13, 2002 was conducted by T. Behm and S. Maurer (DFG). The total length of stream surveyed was 12,532 feet.

A stream flow measurement of Grouse Creek on August 14, 2002 showed a stream flow of 0.77 cubic feet per second (cfs).

The following table summarizes bankfull widths in Grouse Creek:

REACH	LENGTH	BANKFULL WIDTH	CHANNEL TYPE
1	8,895	27.25	B3
2	406	24	A1
3	680	25	A3
4	1,979	25	A1
5	572	32	A2

B3 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and cobble dominant substrates. A1 channels are steep, narrow, cascading step-pool streams with high energy/debris transport associated with depositional soils but very stable bedrock channels. A3 channels are steep, narrow, cascading step-pool streams with high energy/debris transport associated with depositional soils and cobble channels. A2 channels are steep, narrow, cascading step-pool streams with high energy and high debris transport associated with depositional soils and boulder channels.

Grouse Creek

Water temperatures taken during the survey period ranged from 57 to 74 degrees Fahrenheit. Air temperatures ranged from 61 to 97 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% riffle units, 34% flatwater units, and 21% pool units (Graph 1). Based on total length of Level II habitat types there were 49% riffle units, 37% flatwater units, and 14% pool units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 23%; step run units, and high gradient riffle units, both at 22%; and run units, 15% (Graph 3). Based on percent total length, low gradient riffle units made up 28%, step runs units 24%, and high gradient riffle units 17%.

A total of 40 pools were identified (Table 3). Scour pools were the most frequently encountered, at 60%, (Graph 4) and comprised 52% 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. Nine of the 40 pools (23%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 40 pool tail-outs measured, nine had a value of 1 (23%); 26 had a value of 2 (65%); two had a value of 3 (5%); three had a value of 5 (7%) (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 22, flatwater habitat types had a mean shelter rating of 19, and pool habitats had a mean shelter rating of 16 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 17. Main channel pools had a mean shelter rating of 15 (Table 3).

Grouse Creek contained a total of 42 pieces of large woody debris (LWD). This is an average of 0.31 pieces of LWD per 100'. The following table summarizes large woody debris in Grouse Creek:

Reach	Total Pieces	Average pieces LWD per 100'
1	14	0.16
2	2	0.15
3	2	0.29
4	11	0.56
5	13	2.27

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

Grouse Creek

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 35 % of pool tail-outs while large cobble was the next most frequently observed substrate type, at 23%.

The mean percent canopy density for the surveyed length of Grouse Creek was 57%. The mean percentages of deciduous and coniferous trees were 51% and 49%, respectively. Forty-three percent of the canopy was open. Graph 9 describes the mean percent canopy in Grouse Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 33%. The mean percent left bank vegetated was 31%. The dominant elements composing the structure of the stream banks consisted of 51% boulders, 31% bedrock, 13% cobble/gravel, and 4% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 49% of the units surveyed. Additionally, 20% had coniferous trees as the dominant vegetation, and 20% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Twenty-five sites were snorkeled for species composition and distribution in Grouse Creek between August 6 and August 19, 2002. Water temperatures taken during the dive period ranged from 66 to 68 degrees Fahrenheit. Air temperatures ranged from 66 to 92 degrees Fahrenheit. The sites were sampled by S. Maurer (DFG).

The following table 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+
8/6/02	1	97	2	5.3	1	B3	23	1	0	69	0	0
8/6/02	2	157	3	3.3	1	B3	30	1	0	19	0	0
8/6/02	3	814	11	1.2	1	B3	24	1	0	4	0	0
8/6/02	4	2,227	25	5.6	1	B3	23	4	3	47	0	0
8/6/02	5	2,302	27	3.3	1	B3	85	0	0	73	0	0
8/6/02	6	2,548	31	1.1	1	B3	26	1	1	2	0	0
8/12/02	7	4,315	49	3.3	1	B3	37	3	0	11	0	0
8/12/02	8	4,784	53	5.4	1	B3	56	6	3	54	0	0
8/12/02	9	5,135	60	1.1	1	B3	39	0	0	11	0	0
8/12/02	10	5,970	68	1.1	1	B3	25	3	4	3	0	0
8/12/02	11	7,444	90	3.3	1	B3	51	4	3	48	0	0
8/12/02	12	7,782	95	5.4	1	B3	58	5	7	49	0	0
8/19/02	19	8,802	111	1.1	1	B3	14	1	2	16	0	0

Grouse Creek

Date	Site #	Approx. Dist. from start (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead			Coho		
							YOY	1+	2+	YOY	1+	2+
8/19/02	20	8,895	112	4.4	2	A1	35	1	1	46	0	0
8/19/02	21	9,150	117	3.1	2	A1	6	2	0	1	0	0
8/19/02	25	9,443	126	6.2	3	A3	14	3	1	19	0	0
8/19/02	26	9,672	130	1.1	3	A3	5	1	0	0	0	0
8/19/02	27	9,714	131	5.4	3	A3	15	2	2	8	0	0
8/19/02	28	9,779	133	3.3	3	A3	23	1	0	2	0	0
8/19/02	29	9,918	135	3.3	3	A3	17	0	0	0	0	0
8/19/02	30	10,096	139	4.1	4	A1	19	8	5	0	0	0
8/19/02	31	10,467	146	4.2	4	A1	11	2	0	0	0	0
8/19/02	32	10,577	151	1.1	4	A1	12	3	0	0	0	0
8/19/02	33	10,922	159	3.4	4	A1	5	1	0	0	0	0
8/19/02	34	11,366	168	3.3	4	A1	16	0	0	0	0	0
8/19/02	35	12,235	181	1.1	5	A2	0	0	0	0	0	0
8/19/02	36	12,281	182	3.3	5	A2	10	0	0	0	0	0
8/19/02	37	12,504	186	5.6	5	A2	7	1	1	0	0	0

Six sites were snorkel-dived again on October 10, 2002. Water temperatures measured during the re-dive period ranged from 49 to 51 degrees Fahrenheit. Air temperatures ranged from 64 to 72 degrees Fahrenheit. The sites were sampled by S. Maurer.

Date	Site #	Approx. Dist. from start (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead			Coho		
							YOY	1+	2+	YOY	1+	2+
10/10/02	1	97	2	5.3	1	B3	40	2	0	85	0	0
10/10/02	2	157	3	3.3	1	B3	9	1	0	5	0	0
10/10/02	3	814	11	1.2	1	B3	6	0	0	0	0	0
10/10/02	4	8,802	111	1.1	1	B3	12	1	0	7	0	0
10/10/02	5	8,895	112	4.4	2	A1	14	1	0	24	0	0
10/10/02	6	9,150	117	3.1	2	A1	1	0	0	0	0	0

Grouse Creek

DISCUSSION

Grouse Creek is a B3 channel type for the first 8,895 feet, an A1 channel type for the next 406 feet, an A3 channel type for the next 680 feet, an A1 channel type for the next 1,979 feet, and an A2 channel type for the final 572 feet. The suitability of channel types for fish habitat improvement structures is as follows: B3 channel types are excellent for plunge weirs, boulder clusters and bank-placed boulders, single and opposing wing-deflectors, and log cover. A1, A3, and A2 channel types are generally not suitable for fish habitat improvement structures.

The water temperatures recorded during the survey period of July 12 to August 13, 2002 ranged from 57 to 74 degrees Fahrenheit. Air temperatures ranged from 61 to 97 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 34% of the total length of this survey, riffles 45%, and pools 21%. The pools are relatively shallow, with nine of the 40 (23%) pools having a maximum depth greater than three feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum depth of at least three 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.

Thirty-five of the 40 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 Grouse Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirteen of the 40 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 16. The shelter rating in the flatwater habitats was 19. 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 structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 57%. Reach 1 had a canopy density of 54%, Reach 2 had a canopy density of 43%, Reach 3 had a canopy density of 59%, Reach 4 had a canopy density of 64% and Reach 5 had a canopy density of 76%. In general, revegetation projects are considered when canopy density is less than 80%.

Grouse Creek

The percentage of right and left bank covered with vegetation was moderate at 33% and 31%, 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. Grouse Creek should be managed as an anadromous, natural production stream. Based on available information, favorable water temperatures, gradient and flow regimes exist in the stream to support various life history stages of salmonids.
2. Spawning and rearing distribution within Grouse Creek for the various species of salmonids utilizing the stream should be determined.
3. Barriers within the stream blocking or impeding fish movement should be identified and treated according to their potential to increase useable habitat.
4. Active and potential sediment sources related to streambank erosion, the road system, mining activities and landslides should be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
5. Irrigation diversions should be screened to prevent entrainment of juvenile salmonids into ditches.
6. 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.
7. Increase woody cover in pools and flatwater habitat units.
8. If there are areas where the stream is impacted from cattle trampling the riparian zone, alternatives to minimize or prevent continued degradation should be explored with the landowner and developed if 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.

Position (ft):	Comments:
-------------------	-----------

0'	Start of survey at the confluence with East Fork Scott River. The channel is an A2.
97 '	Dive site #1.

Grouse Creek

157'	Dive site #2.
814'	Dive site #3.
1,065'	Road crossing.
2,227'	Dive site #4. Confluence with Hayes Gulch.
2,302'	Dive site #5.
2,548'	Dive site #6.
2,790'	20' x 10' chunk of concrete in stream.
3,403'	Low water crossing.
4,148'	Tributary enters on each bank.
4,315'	Dive site #7.
4,784'	Dive site #8.
5,135'	Dive site #9.
5,813'	Low water crossing.
8,389'	Debris jam creates five-foot high plunge.
5,970'	Dive site #10.
6,151'	Road crossing.
6,200'	Road crossing.
6,398'	Carmen Creek enters on the left bank. It has very little water.
6,736'	Crayfish observed.
7,444'	Dive site #11.
7,782'	Dive site #12.
7,976'	Log jam creates barrier during low flows.
8,148'	Landslide from Forest Road 40N03 caused by approximately 400 feet of collection from inboard ditch to an 18" CMP with a plugged pipe which has overtopped.

Grouse Creek

8,758'	Low water crossing.
8,802'	Dive site #19.
8,895'	Dive site #20. Foothill yellow-legged frog observed.
9,150'	Dive site #21.
9,943'	Dive site #25. Crayfish observed.
9,672'	Dive site #26.
9,714'	Dive site #27.
9,779'	Dive site #28. Foothill yellow-legged frog and monarch butterfly observed.
9,918'	Dive site #29. Seep.
10,096'	Dive site #30.
10,467'	Dive site #31. Large boulders partially damming pool.
10,552'	Right bank tributary.
10,577'	Dive site #32.
10,905'	Old concrete on right bank.
10,922'	Dive site #33.
11,019'	Large chunk of old concrete in middle of pool.
11,366'	Dive site #34.
11,704'	Deep pool with 5' high plunge to lower end of 25' long bedrock sheet.
11,794'	Diversion ditch, right bank. Currently not in use, but not disconnected from stream.
11,824'	Right bank tributary.
12,235'	Dive site #35.
12,281'	Dive site #36.
12,504'	Dive site #37. End of Survey at end of USFS property line.

Grouse Creek

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.

Grouse Creek

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]	

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

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

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS19 LATITUDE: 41°19'4" LONGITUDE: 122°43'28"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	MEAN LENGTH (ft.)	TOTAL PERCENT LENGTH (ft.)	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	MEAN ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	MEAN ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
86	20	RIFFLE	45	72	6214	49	12.9	0.6	738	63433	470	40421	0	22
64	22	FLATWATER	34	73	4670	37	11.6	0.8	711	45532	607	38867	0	19
40	40	POOL	21	46	1828	14	11.9	1.4	486	19458	693	27715	484	16
TOTAL UNITS	TOTAL UNITS			TOTAL LENGTH (ft.)					TOTAL AREA (sq. ft.)			TOTAL VOL. (cu. ft.)		
190	82			12712					128423			107003		

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07W319 LATITUDE:41°19'4" LONGITUDE:122°43'28"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	ft.	#	TOTAL LENGTH	ft.	#	TOTAL LENGTH	ft.	MEAN WIDTH	ft.	MEAN DEPTH	ft.	MAXIMUM DEPTH	MEAN AREA	TOTAL AREA	MEAN VOLUME	TOTAL VOLUME	MEAN RESIDUAL	MEAN SHELTER	MEAN CANOPY
			#														sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		\$
44	12	LGR	23	82	3608	28	13	0.5	1.5	780	34335	448	19712	0	22	52							
33	6	HGR	17	67	2218	17	14	0.7	2.4	838	27666	641	21150	0	23	58							
9	2	BRS	5	43	388	3	9	0.5	1.1	179	1609	89	805	0	18	65							
1	1	POW	1	26	26	0	11	0.8	1.6	200	200	160	160	0	40	45							
1	1	GID	1	41	41	0	10	1.3	2.0	369	369	480	480	0	15	63							
29	13	RUN	15	55	1598	13	12	0.8	2.1	730	21169	610	17694	0	18	59							
33	7	SRN	17	91	3005	24	11	0.8	2.2	799	26367	684	22577	0	19	57							
2	2	TRP	1	40	79	1	8	1.2	3.4	294	588	358	716	229	10	39							
6	6	MCP	3	35	207	2	12	1.2	2.9	374	2244	442	2654	253	15	77							
5	5	STP	3	104	519	4	12	1.6	4.5	1057	5285	1540	7701	1127	18	58							
2	2	LGR	1	70	140	1	17	1.2	2.4	1029	2058	1178	2356	663	23	48							
13	13	LSBK	7	39	509	4	11	1.4	4.5	391	5077	603	7833	446	12	59							
4	4	LSBO	2	46	183	1	12	1.0	2.9	446	1783	425	1702	221	13	31							
5	5	PLP	3	25	125	1	14	2.2	8.3	311	1555	748	3740	609	31	77							
3	3	BPB	2	22	66	1	12	1.1	2.8	289	868	338	1014	227	5	47							
TOTAL UNITS	TOTAL UNITS				LENGTH (ft.)					AREA (sq.ft)			TOTAL VOL. (cu.ft)										
190	82				12712					131173			110292										

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07MS19 LATITUDE:41°19'4" LONGITUDE:122°43'28"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq. ft.)	TOTAL AREA (sq. ft.)	MEAN VOLUME (cu. ft.)	TOTAL VOLUME (cu. ft.)	MEAN RESIDUAL POOL VOL. (cu. ft.)	MEAN SHELTER RATING
13	13	MAIN	33	62	805	44	11.2	624	8116	852	11071	585	15
24	24	SCOUR	60	40	957	52	12.2	436	10473	651	15630	460	17
3	3	BACKWATER	8	22	66	4	12.3	289	868	338	1014	227	5
TOTAL UNITS	TOTAL UNITS			TOTAL LENGTH (ft.)				TOTAL AREA (sq. ft.)		TOTAL VOL. (cu. ft.)			
40	40			1828				19458		27715			

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS19 LATITUDE: 41°19'4" LONGITUDE: 122°43'28"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT		<1 FOOT		1-2 FT.		1-2 FT.		2-3 FT.		3-4 FT.		3-4 FT.		>4 FEET		>4 FEET	
			MAXIMUM	DEPTH OCCURRENCE	MAXIMUM	DEPTH OCCURRENCE	MAXIMUM	DEPTH OCCURRENCE	MAXIMUM	DEPTH OCCURRENCE	MAXIMUM	DEPTH OCCURRENCE	MAXIMUM	DEPTH OCCURRENCE	MAXIMUM	DEPTH OCCURRENCE	MAXIMUM	DEPTH OCCURRENCE	MAXIMUM	DEPTH OCCURRENCE
2	TRP	5	0	0	0	1	50	0	0	1	50	0	0	1	50	0	0	0	0	0
6	MCP	15	0	0	0	2	33	4	67	0	0	0	0	0	0	0	0	0	0	0
5	STP	13	0	0	0	0	0	3	60	1	20	1	20	1	20	1	20	1	20	20
2	LSR	5	0	0	0	1	50	1	50	0	0	0	0	0	0	0	0	0	0	0
13	LSBK	33	0	0	0	3	23	7	54	2	15	1	15	1	15	1	15	1	15	8
4	LSBO	10	0	0	0	3	75	1	25	0	0	0	0	0	0	0	0	0	0	0
5	FLP	13	0	0	0	1	20	1	20	2	40	1	40	1	40	1	40	1	40	20
3	BPE	8	0	0	0	1	33	2	67	0	0	0	0	0	0	0	0	0	0	0

TOTAL

UNITS

40

0 12 19 6 3

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40NR07WS19 LATITUDE: 41°19'4" LONGITUDE: 122°43'28"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SWD	MEAN % LWD	MEAN % ROOT MASS VEGETATION	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
44	12	LGR	1	3	4	1	8	0	25	58	0
33	6	HGR	0	3	4	2	0	0	31	61	0
9	2	BRS	0	0	0	0	0	0	63	30	8
1	1	POW	0	0	0	0	0	0	30	60	10
1	1	GLD	0	25	0	0	0	0	10	40	25
29	13	RUN	7	1	2	3	3	0	9	70	5
33	7	SRN	2	3	1	2	2	0	26	61	2
2	2	TRP	0	0	0	0	0	0	18	53	30
6	6	MCP	0	0	0	3	5	0	10	75	7
5	5	STP	2	5	4	0	0	0	27	28	34
2	2	LSR	20	0	0	60	10	0	0	10	0
13	13	LSBK	4	3	0	3	2	0	15	51	22
4	4	LSBO	0	1	0	9	1	0	19	65	5
5	5	PLP	6	6	3	2	5	0	27	33	18
3	3	BPB	0	0	0	0	3	0	23	63	10

Grouse Creek

Drainage: EAST FORK SCOTT RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/12/02 to 08/13/02

Confluence Location: QUAD: Scott Mtn LEGAL DESCRIPTION: T40N07W519 LATITUDE: 41°19'4" LONGITUDE: 122°43'28"

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
44	12	LGR	0	0	0	0	67	25	8
33	6	HGR	0	0	0	0	0	100	0
9	2	ERS	0	0	0	0	0	0	100
1	1	POW	0	0	0	0	0	100	0
1	1	GID	0	0	0	0	0	0	100
29	13	RUN	0	0	15	15	23	31	15
33	7	SRN	0	0	0	0	29	57	14
2	2	TRP	0	0	0	0	0	50	50
6	6	MCP	0	0	17	0	33	50	0
5	5	STP	0	0	0	0	0	40	60
2	2	LSR	0	0	0	0	0	100	0
13	13	LSBK	0	0	38	15	8	15	23
4	4	LSBO	0	0	0	0	25	75	0
5	5	PLP	0	0	0	60	20	0	20
3	3	BFB	0	0	33	0	0	67	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
57	49	51	0	33.4	31.2

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.

$$49 \times .57 = 28\% \text{ coniferous}$$

$$51 \times .57 = 29\% \text{ deciduous}$$

$$100 - 57 = 43\% \text{ Open}$$

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Grouse Creek
 SAMPLE DATES: 07/12/02 to 08/13/02
 STREAM LENGTH: 12532 ft.
 LOCATION OF STREAM MOUTH:

USGS Quad Map: Scott Mtn
 Legal Description: T40NR07WS19

Latitude: 41°19'4"
 Longitude: 122°43'28"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: B3
 Channel Length: 8895 ft.
 Riffle/flatwater Mean Width: 13 ft.
 Total Pool Mean Depth: 1.2 ft.
 Base Flow: 1.1 cfs
 Water: 57 - 74 °F Air: 61 -97 °F
 Dom. Bank Veg.: Deciduous Trees
 Vegetative Cover: 33%
 Dom. Bank Substrate: Boulder

Canopy Density: 54%
 Coniferous Component: 47%
 Deciduous Component: 53%
 Pools by Stream Length: 9%
 Pools >=3 ft.deep: 5%
 Mean Pool Shelter Rtn: 14
 Dom. Shelter: Boulders
 Occurrence of LOD: 3%
 Dry Channel: 0 ft.

Embeddness Value: 1. 5% 2.84% 3. 11% 4. 0% 5. 0%

STREAM REACH 2

Channel Type: A1
 Channel Length: 406 ft.
 Riffle/flatwater Mean Width: 12 ft.
 Total Pool Mean Depth: 1.1 ft.
 Base Flow: 1.1 cfs
 Water: 64 - 64 °F Air: 77 -84 °F
 Dom. Bank Veg.: Deciduous Trees
 Vegetative Cover: 17%
 Dom. Bank Substrate: Boulder

Canopy Density: 43%
 Coniferous Component: 64%
 Deciduous Component: 36%
 Pools by Stream Length: 37%
 Pools >=3 ft.deep: 25%
 Mean Pool Shelter Rtn: 16
 Dom. Shelter: Boulders
 Occurrence of LOD: 3%
 Dry Channel: 0 ft.

Embeddness Value: 1. 25% 2.75% 3. 0% 4. 0% 5. 0%

STREAM REACH 3

Channel Type: A3
 Channel Length: 680 ft.
 Riffle/flatwater Mean Width: 12 ft.
 Total Pool Mean Depth: 1.0 ft.
 Base Flow: 1.1 cfs
 Water: 64 - 68 °F Air: 86 -89 °F
 Dom. Bank Veg.: Deciduous Trees
 Vegetative Cover: 32%
 Dom. Bank Substrate: Boulder

Canopy Density: 59%
 Coniferous Component: 48%
 Deciduous Component: 52%
 Pools by Stream Length: 14%
 Pools >=3 ft.deep: 0%
 Mean Pool Shelter Rtn: 13
 Dom. Shelter: Boulders
 Occurrence of LOD: 0%
 Dry Channel: 0 ft.

Embeddness Value: 1. 67% 2.33% 3. 0% 4. 0% 5. 0%

STREAM REACH 4

Channel Type: A1
 Channel Length: 1979 ft.
 Riffle/flatwater Mean Width: 12 ft.
 Total Pool Mean Depth: 1.9 ft.
 Base Flow: 1.1 cfs
 Water: 60 - 67 °F Air: 72 -93 °F
 Dom. Bank Veg.: Deciduous Trees

Canopy Density: 64%
 Coniferous Component: 54%
 Deciduous Component: 46%
 Pools by Stream Length: 36%
 Pools >=3 ft.deep: 46%
 Mean Pool Shelter Rtn: 16
 Dom. Shelter: Boulders

Vegetative Cover: 36%
Dom. Bank Substrate: Boulder

Occurrence of LOD: 0%
Dry Channel: 0 ft.

Embeddness Value: 1. 38% 2. 38% 3. 0% 4. 0% 5. 23%

STREAM REACH 5

Channel Type: A2
Channel Length: 572 ft.
Riffle/flatwater Mean Width: 13 ft.
Total Pool Mean Depth: 1.8 ft.
Base Flow: 1.1 cfs
Water: 62 - 64 °F Air: 85 - 86 °F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 41%
Dom. Bank Substrate: Boulder

Canopy Density: 76%
Coniferous Component: 38%
Deciduous Component: 62%
Pools by Stream Length: 5%
Pools >=3 ft. deep: 100%
Mean Pool Shelter Rtn: 40
Dom. Shelter: Boulders
Occurrence of LOD: 4%
Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 100% 3. 0% 4. 0% 5. 0%

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	22	29	31.1
Boulder	45	39	51.2
Cobble/Gravel	10	12	13.4
Silt/clay	5	2	4.3

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	13	14	16.5
Brush	13	12	15.2
Decid. Trees	43	37	48.8
Conif. Trees	13	19	19.5
No Vegetation	0	0	0

Total stream average embeddedness value for pool

2.1

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

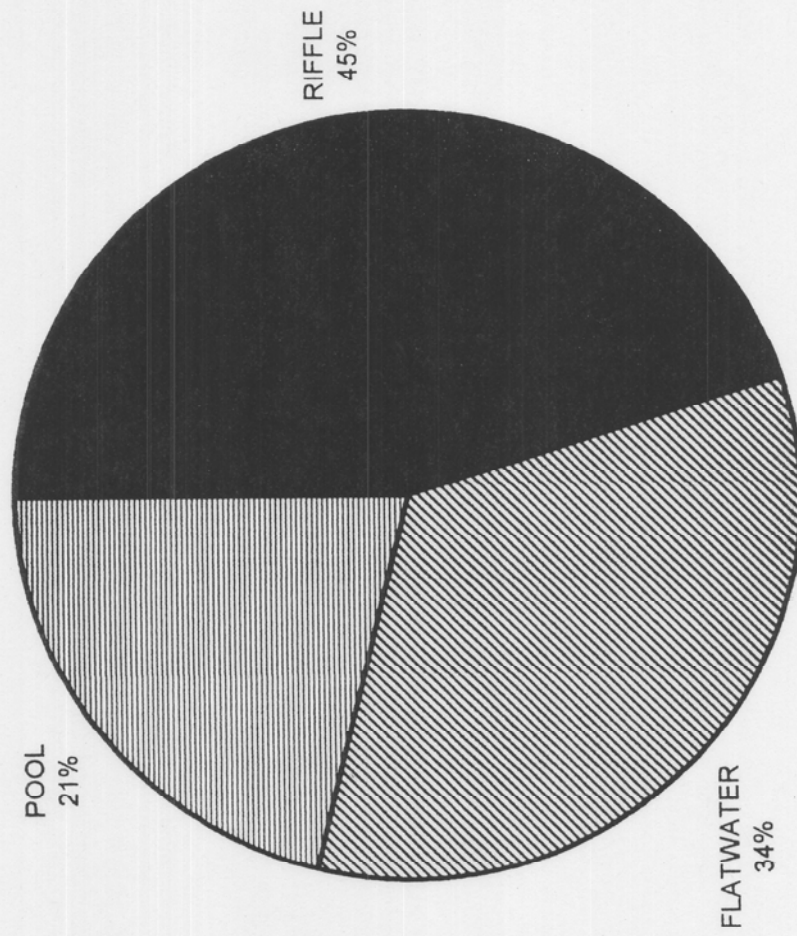
Stream: Grouse Creek Drainage: EAST FORK SCOTT RIVER

Survey Date: 07/12/02 to 08/13/02

	RIFFLES	FLATWATER	POOLS
UNDERCUT BANKS	3.1	7.2	3.4
SMALL WOODY DEBRIS	2.9	2.6	2.5
LARGE WOODY DEBRIS	1.7	1.5	0.9
ROOTS	3.6	2.2	5.6
TERRESTRIAL VEG	3.7	3.0	2.9
AQUATIC VEG	0	0	0
WHITewater	20.1	15	17.8
BOULDERS	54.9	63.3	49.8
BEDROCK LEDGES	9.9	5.2	17.3

GROUSE CREEK 2002

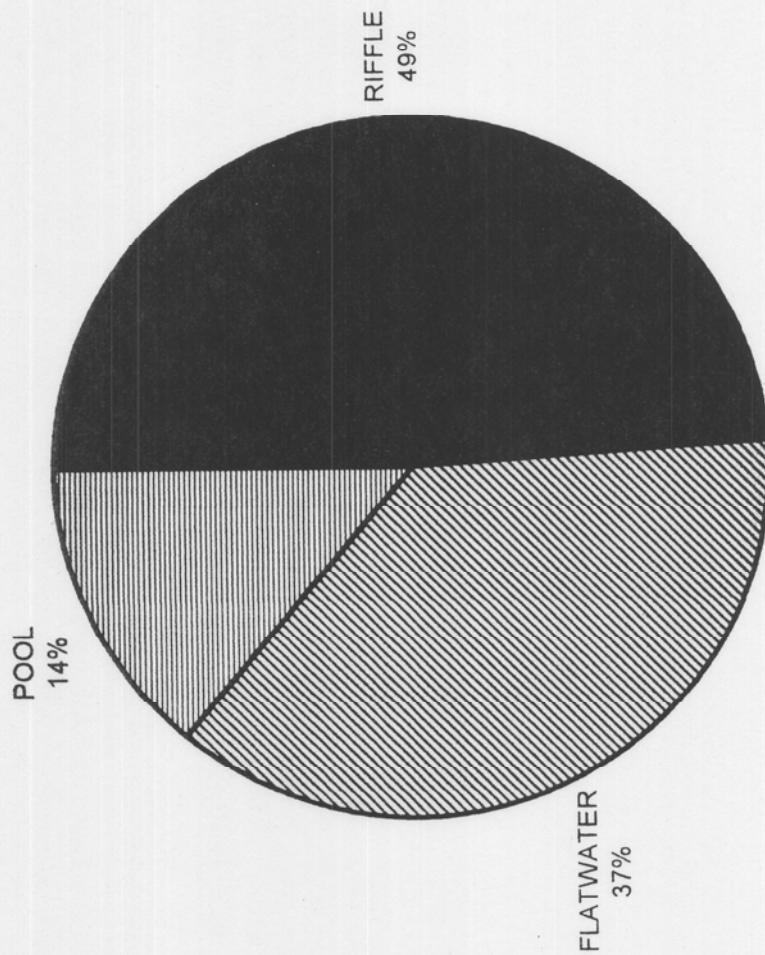
HABITAT TYPES BY PERCENT OCCURENCE



GRAPH 1

GROUSE CREEK 2002

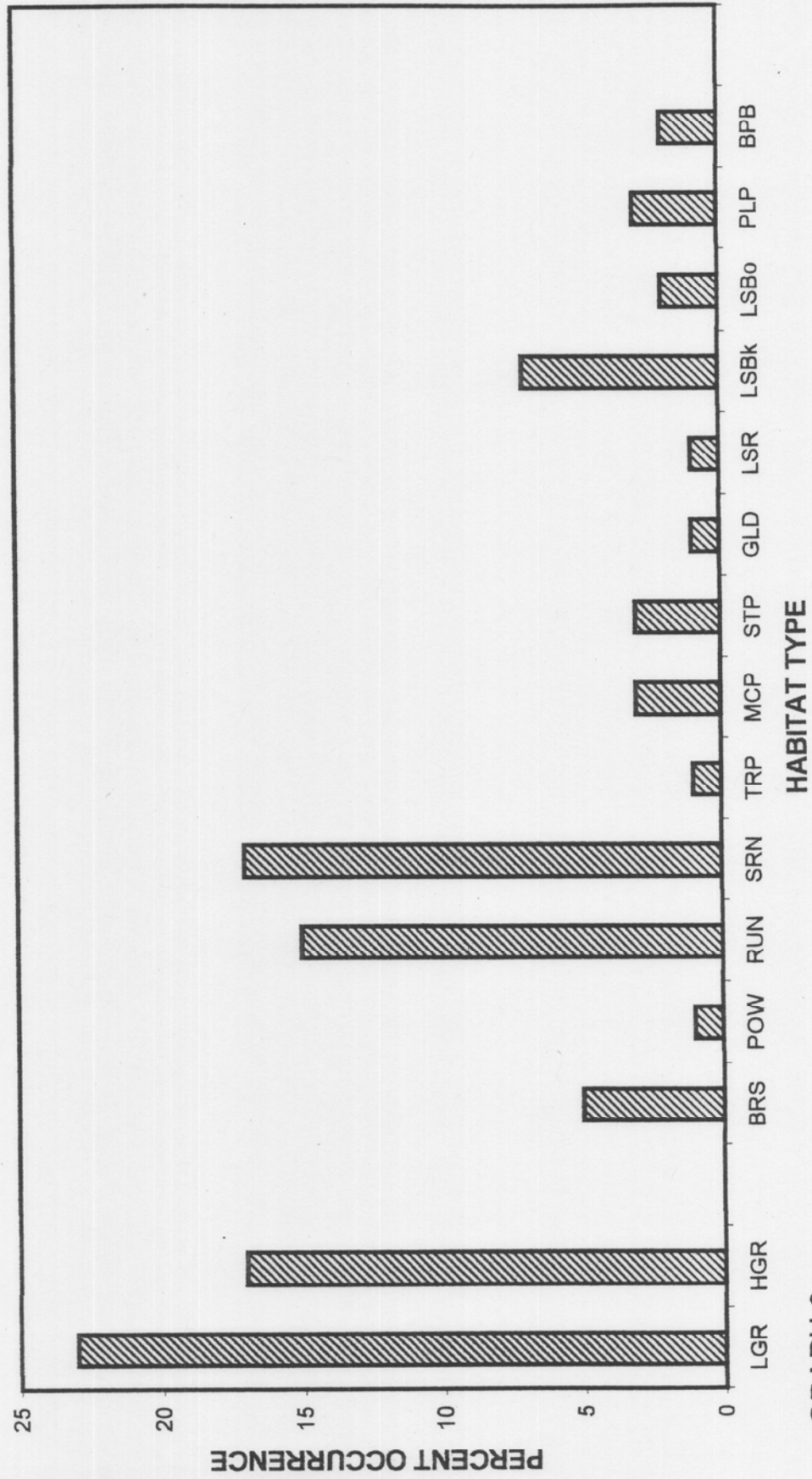
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

GROUSE CREEK 2002

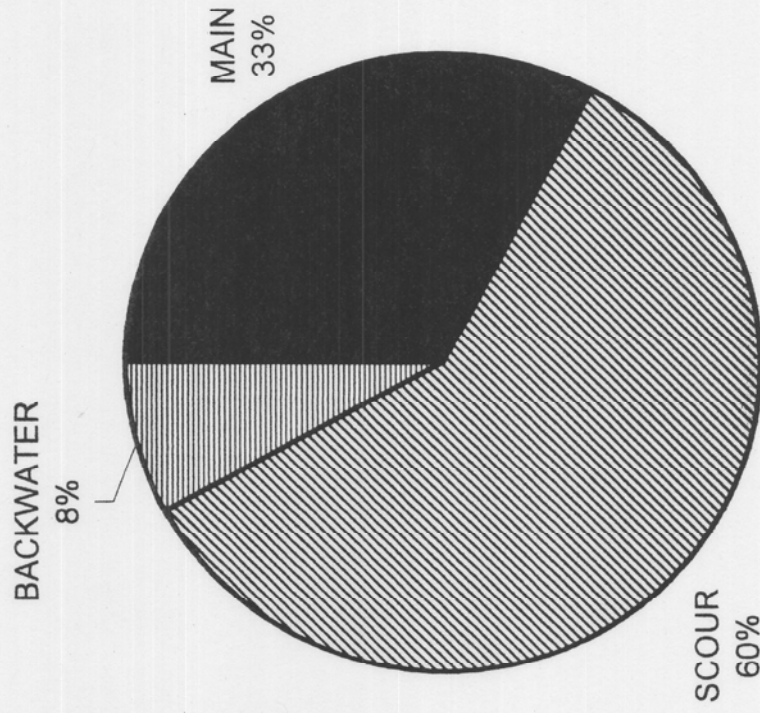
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

GROUSE CREEK 2002

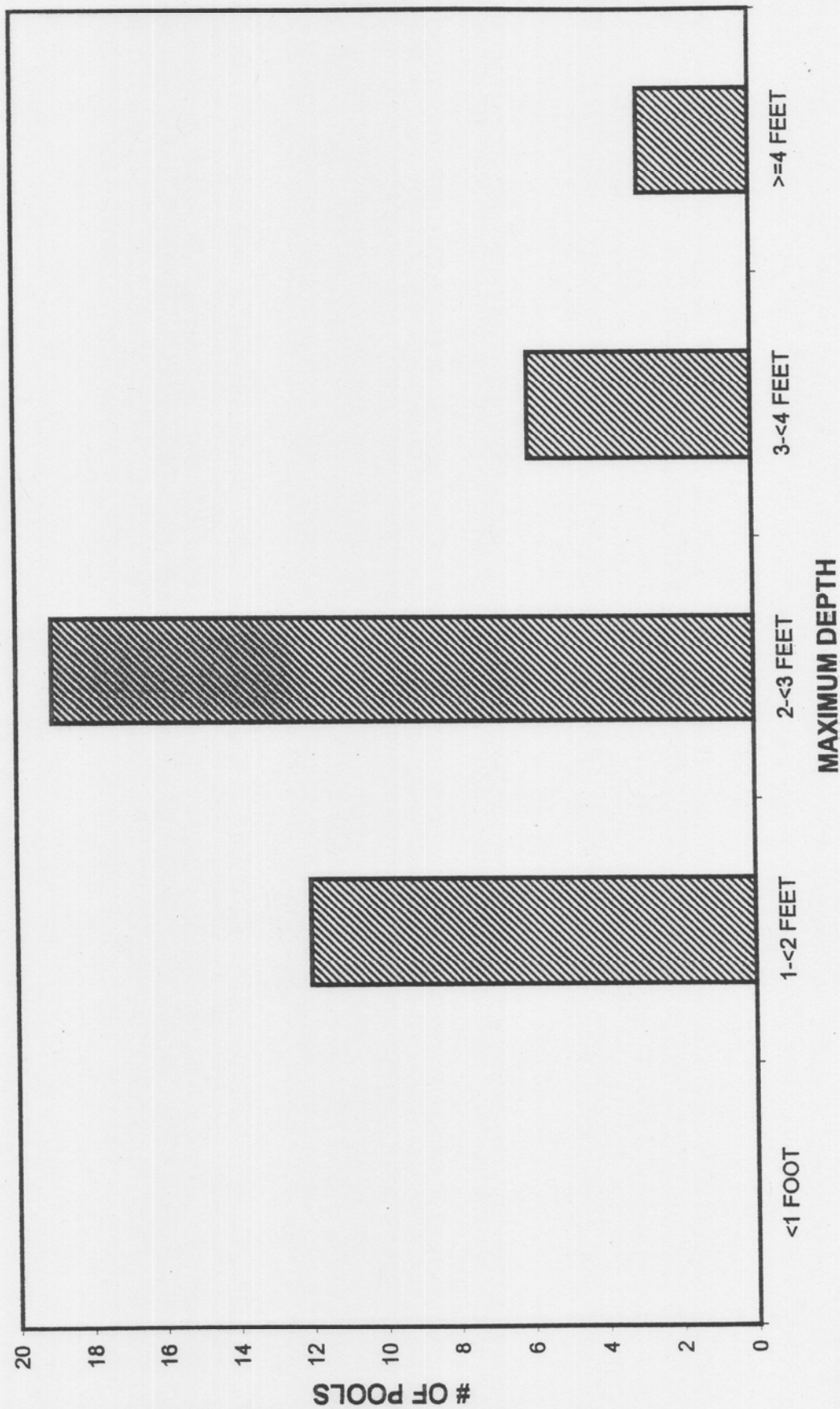
POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

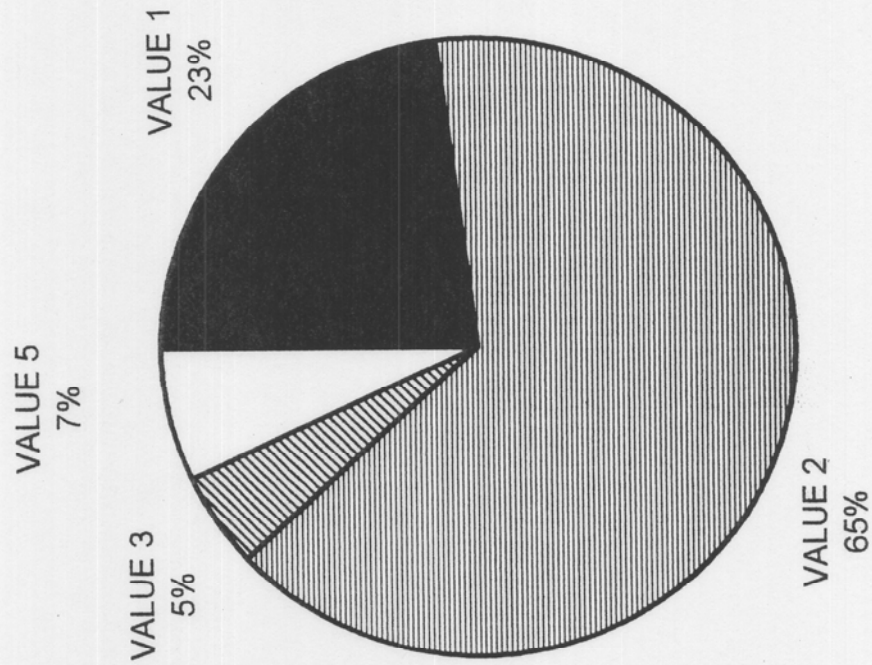
GROUSE CREEK 2002

MAXIMUM DEPTH IN POOLS



GRAPH 5

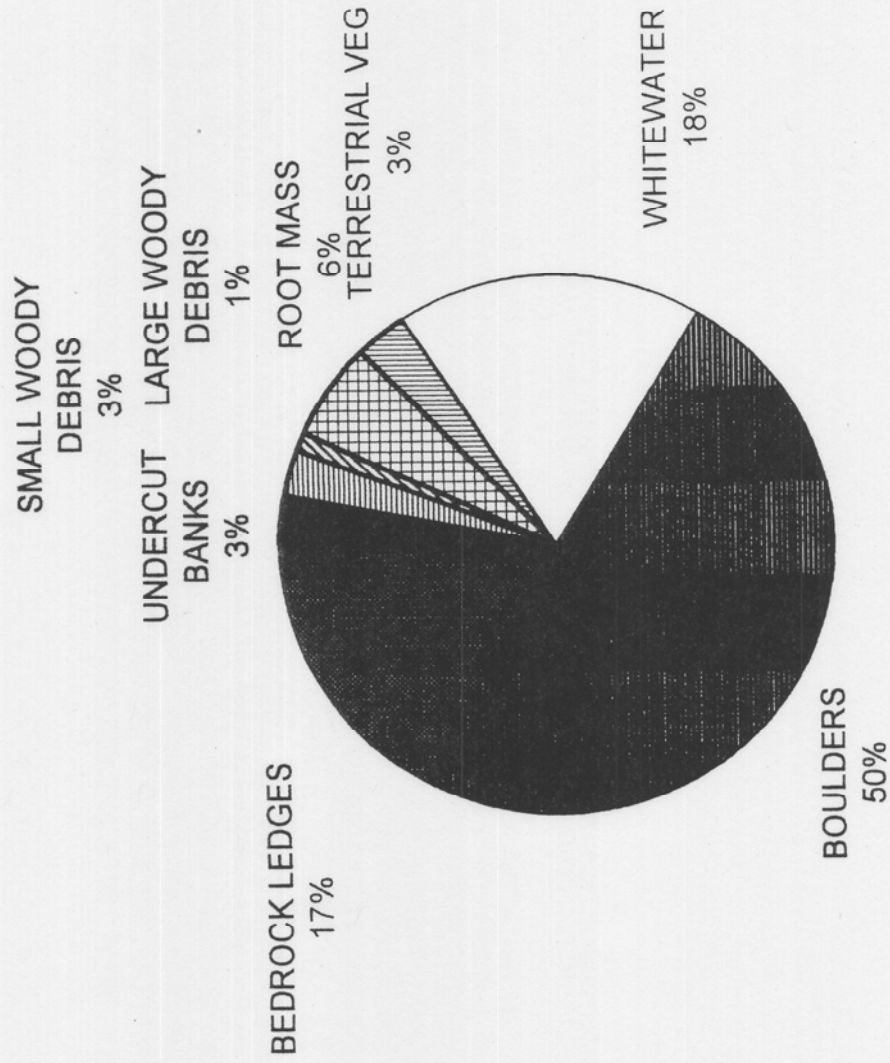
GROUSE CREEK 2002 PERCENT EMBEDDEDNESS



GRAPH 6

GROUSE CREEK 2002

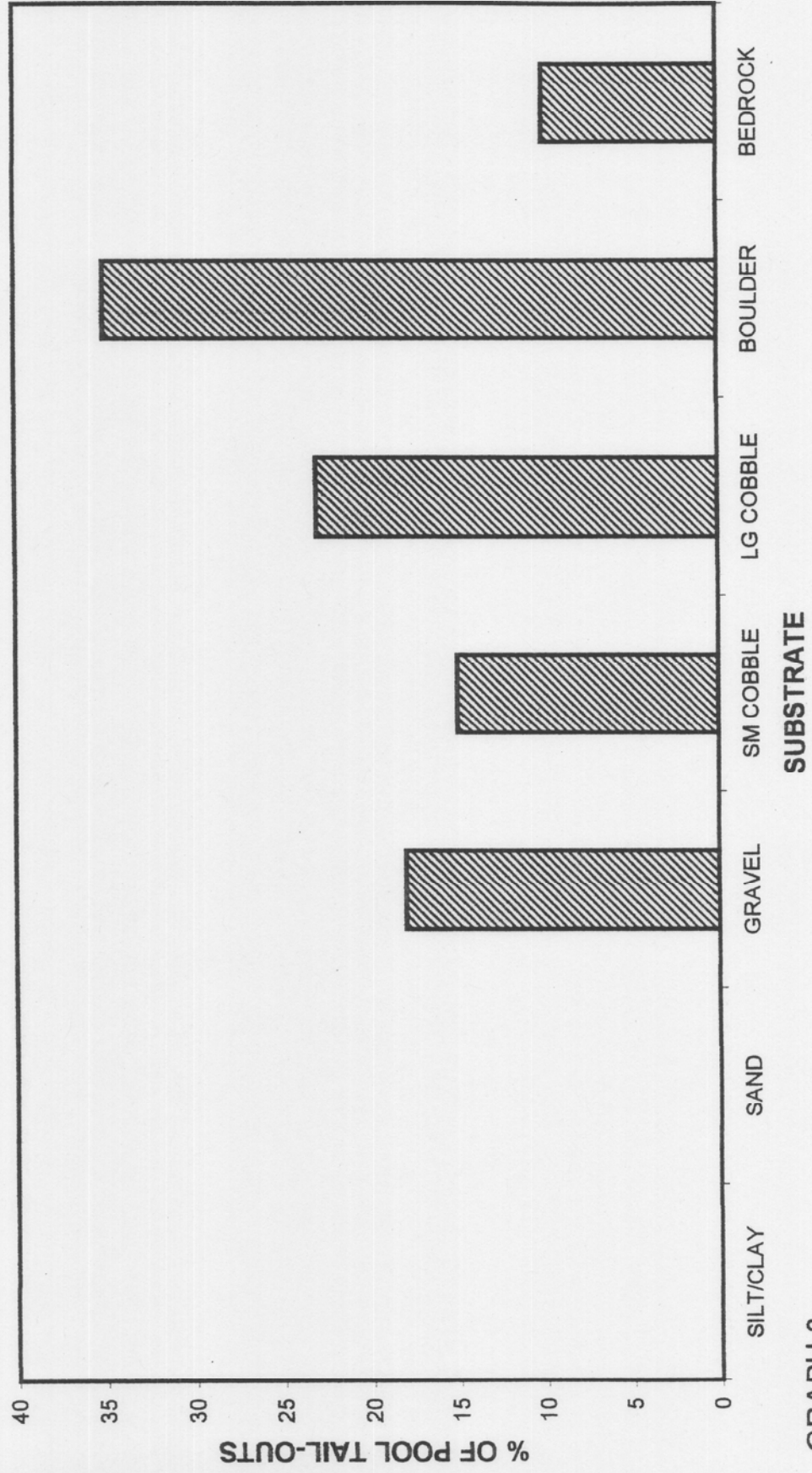
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

GROUSE CREEK 2002

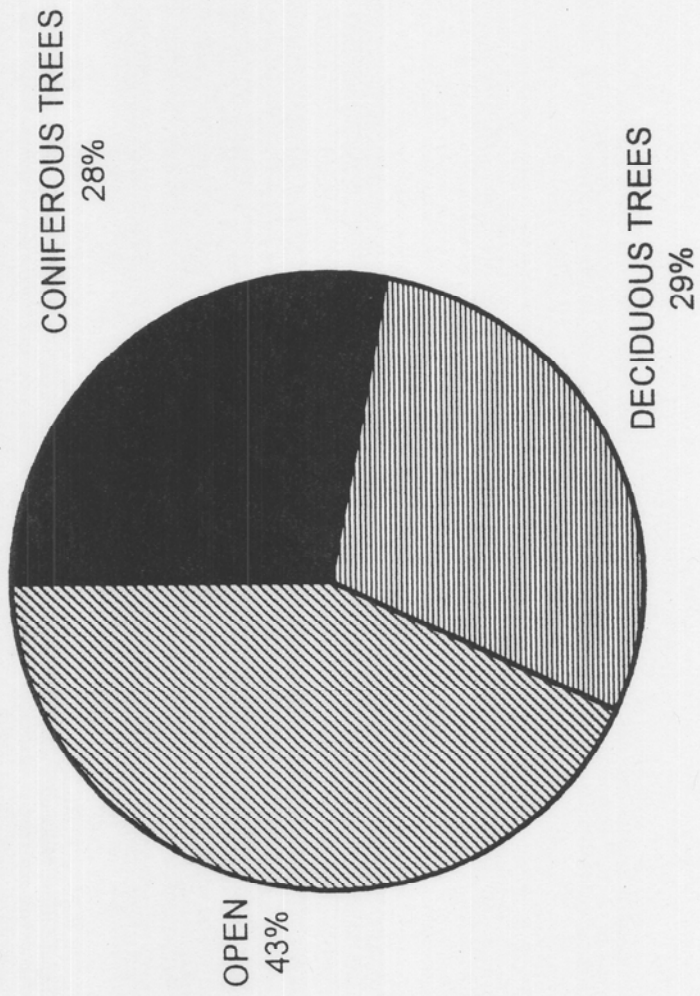
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



GRAPH 8

GROUSE CREEK 2002

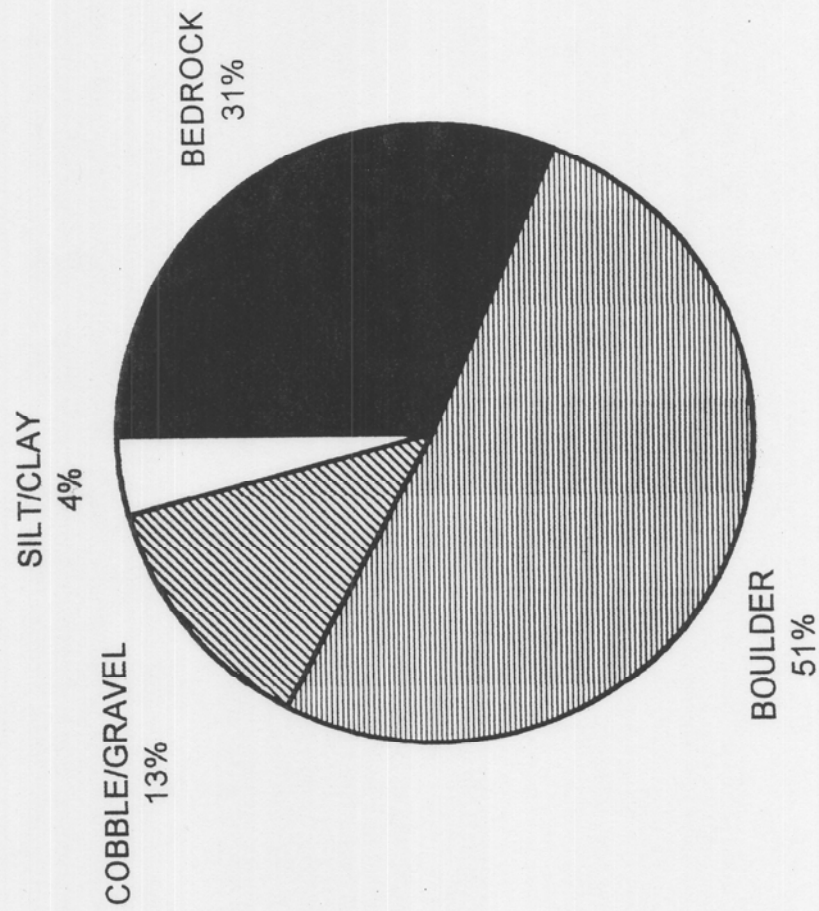
MEAN PERCENT CANOPY



GRAPH 9

GROUSE CREEK 2002

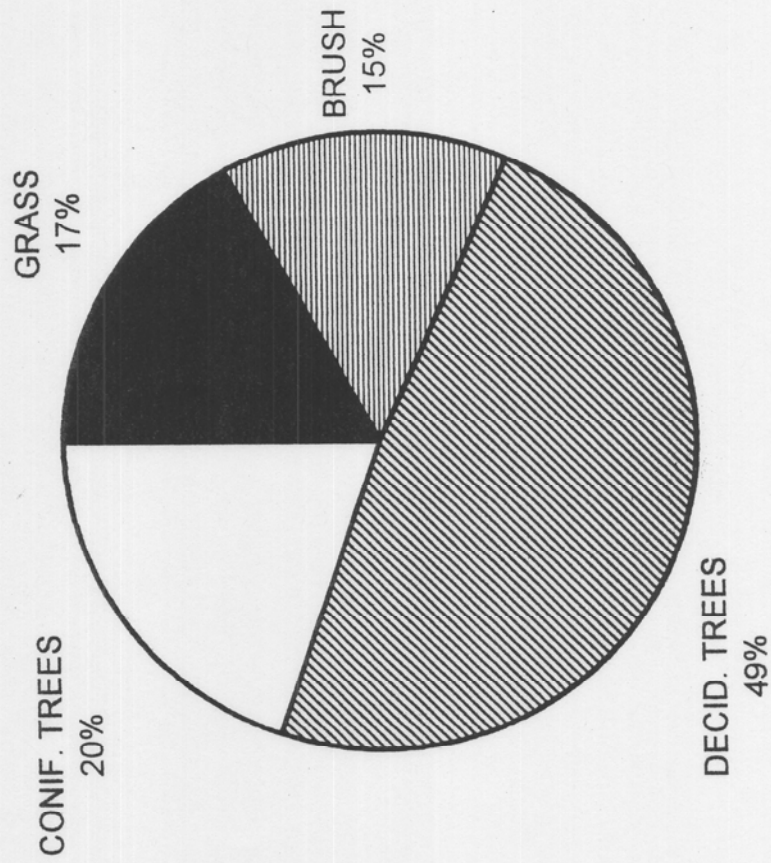
DOMINANT BANK COMPOSITION IN SURVEY REACH



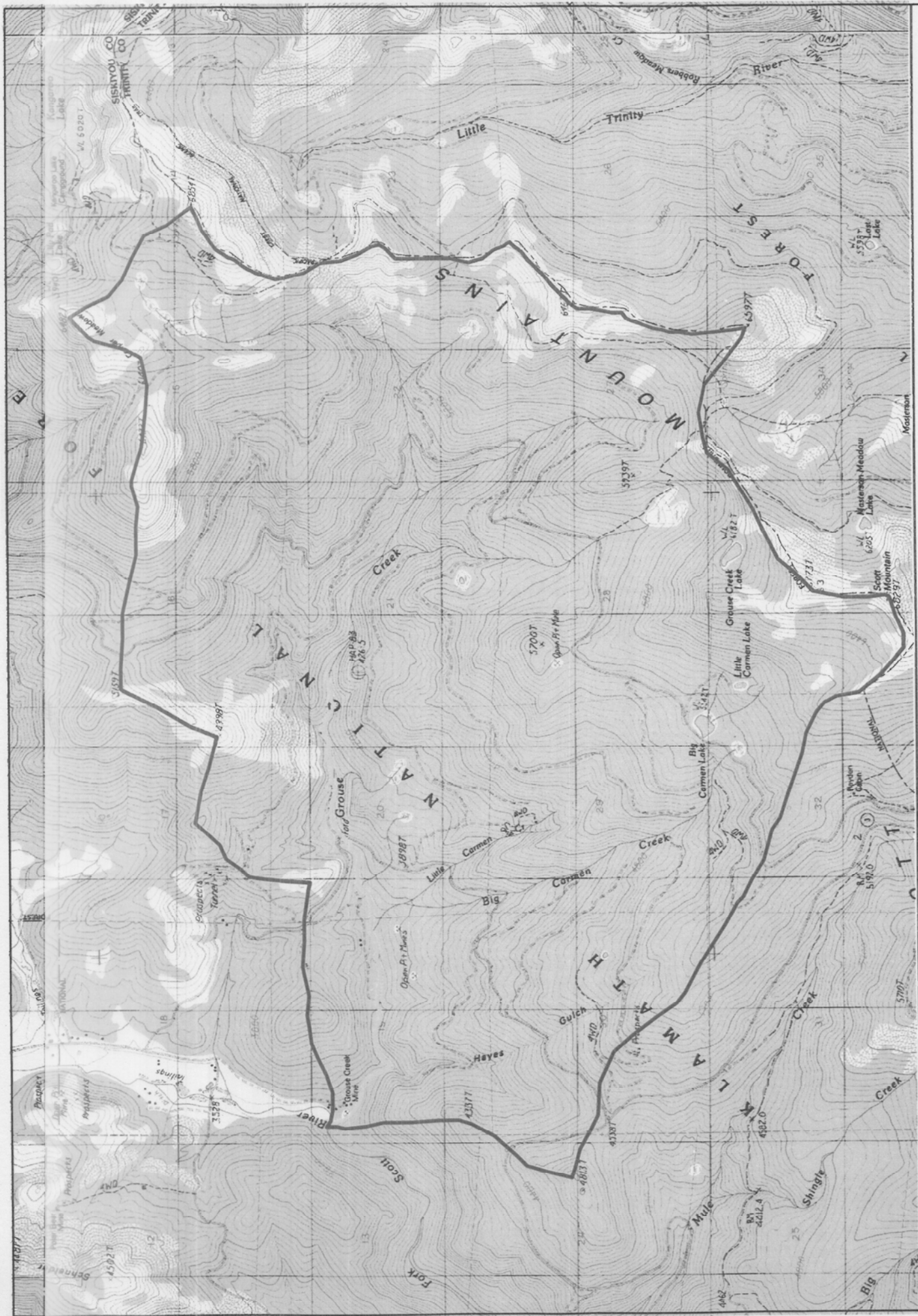
GRAPH 10

GROUSE CREEK 2002

DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



Name: SCOTT MT
Date: 7/29/2004
Scale: 1 inch equals 3076 feet

Location: 041° 18' 30.9" N 122° 40' 54.0" W
Caption: Grouse Creek
2002 Survey