

CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Pole Mountain Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1996

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Pole Mountain Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids in Pole Mountain Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

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

Pole Mountain Creek is a tributary to Ward Creek which flows into Big Austin Creek, a tributary of the Russian River, located in Sonoma County, California (see Pole Mountain Creek map, page 2). The legal description at the confluence with Ward Creek is T8N, R12W, S13. Its location is 38°32'4" N. latitude and 123°8'1" W. longitude. Year round vehicle access exists from Fort Ross Road near Cazadero.

Pole Mountain Creek and its tributaries drain a basin of approximately 2.6 square miles. Pole Mountain Creek is a second order stream and has approximately 2.5 miles of blue line stream, according to the USGS Fort Ross and Cazadero 7.5 minute quadrangles. Elevations range from about 480 feet at the mouth of the creek to 1,720 feet in the headwaters. Mixed coniferous forest dominates the watershed, but there are zones of grassland and oak-woodland in the upper watershed. No sensitive plants were listed in DFG's Natural Diversity Database for Pole Mountain Creek watershed. The watershed is entirely privately owned.

METHODS

The habitat inventory conducted in Pole Mountain Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1994). The Americorps Volunteers 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 and was supervised by Bob Coey, Russian River Basin Planner (DFG).

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 Pole Mountain Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

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". Pole Mountain 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 Pole Mountain Creek, embeddedness was visually 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 Pole Mountain 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 visually 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 Pole Mountain 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 visually into percentages of evergreen 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 Pole Mountain 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.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. 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, a dBASE IV 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 tables and appendices:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Shelter by habitat types
- Dominant substrates by habitat types
- Vegetative cover and dominant bank composition
- Fish habitat elements by stream reach

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Pole Mountain Creek include:

- Level II Habitat Types by % Occurrence and % Total Length
- Level IV Habitat Types by % Occurrence
- Pool Habitat Types by % Occurrence
- Maximum Depth in Pools
- Pool Shelter Types by % Area
- Substrate Composition in Low Gradient Riffles
- Percent Cobble Embeddedness by Reach
- Mean Percent Canopy
- Mean Percent Canopy by Reach
- Percent Bank Composition and Bank Vegetation

HISTORICAL STREAM SURVEYS:

The Department of Fish and Game conducted a survey of Pole Mountain Creek in August 1965. The vegetation observed was California Laurel, Big-leaf Maple, Western Azalea, Poison Oak, and redwood. The flow was 0.8 cfs. The spawning area covered approximately 5% of the stream. The substrate consisted of 10% boulders, 40% coarse cobble, 25% fine cobble, 15% coarse gravel, 5% fine gravel, and 5% sand. Two springs were observed and some recent logging was noted.

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 5 - September 4, 1996 was conducted by Nancy and Bob Barney (NEAP) and data analyzed by Ken Bunzel (DFG). The survey began at the confluence with Ward Creek and extended up Pole Mountain Creek to the end of anadromous fish passage in the headwaters. The total length of the stream surveyed was 10,013 feet, with an additional 316 feet of side channel.

This section of Pole Mountain Creek has 2 channel types: from the mouth to 1,230 feet an F2 and the upper 8,783 feet an F3. F2 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly boulder substrate. F3 channel types are similar to F2 types, but have a cobble substrate.

Water temperatures ranged from 58°F to 68°F. Air temperatures ranged from 55°F to 85°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 40% riffle units, 32% pool units, 27% flatwater units, and 1% dry streambed units. Based on total **length** there were 50% riffle units, 26% flatwater units, 23% pool units, and less than 1% dry streambed units (Graph 1).

Three hundred, eight habitat units were measured and 23% were completely sampled. Twenty-one Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles at 35%, runs 13%, mid-channel pools 11% and glides 10% (Graph 2). By percent total **length**, low gradient riffles made up 45%, runs 12%, glides 10%, and mid-channel pools 8%.

One hundred pools were identified (Table 3). Scour pools were most often encountered at 51%, and comprised 52% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Thirty-six of the 100 pools (36%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 11% of the total length of stream habitat.

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 types had the highest shelter rating at 33. Flatwater had the lowest rating with 16 and pool rated 29 (Table 1). Of the pool types, the main channel pools had the highest mean

shelter rating at 35, scour pools rated 28, and backwater pools rated 6 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 33%, terr. vegetation 20%, and small woody debris 14%. Graph 5 describes the pool shelter in Pole Mountain Creek.

Table 6 summarizes the dominant substrate by habitat type. Small cobble or gravel were the dominant substrates observed in 5 of the 6 low gradient riffles measured (Graph 6).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 98 pool tail-outs measured, 28 had a value of 1 (29%); 37 had a value of 2 (38%); 17 had a value of 3 (17%); and 16 had a value of 4 (16%). On this scale, a value of one is best for fisheries. Graph 7 describes percent embeddedness by reach.

The mean percent canopy density for the stream reach surveyed was 76%. The mean percentages of deciduous and evergreen trees were 46% and 54%, respectively. Graph 8 describes the canopy for the entire survey and graph 9 describes the canopy by reach.

For the entire stream reach surveyed, the mean percent right bank vegetated was 36% and the mean percent left bank vegetated was 32%. For the habitat units measured, the dominant vegetation types for the stream banks were: 31% deciduous trees, 29% grass, 19% evergreen trees, 15% brush and 6% bare soil. The dominant substrate for the stream banks were: 57% cobble/gravel, 33% boulder, 5% bedrock and 5% silt/clay/sand (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

In the August 1965 survey, steelhead were observed at a rate of 15/100'. On September 10, 1996 a biological inventory was conducted in three sites of Pole Mountain Creek to document fish species composition and distribution. Each site was single pass electrofished using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, and returned to the stream.

The air temperature ranged from 71°-86°F and the water temperature ranged from 62°-63°F. The observers were Barney, Barney (NEAP) and Coey.

The inventory of Reach 1 started at the mouth and ended at the

first cascade approximately 374 feet upstream in habitat units 1-13. In riffle and pool habitat types 83 0+ and 27 1+ steelhead were observed (27/100') along with 4 crayfish and 1 unidentified frog. This section had an approximate length of 374 feet.

The inventory of Reach 2 started 50 feet downstream of the second bridge and continued for approximately 500 feet in habitat units 146-157. In pool and riffle habitat types 49 0+, 17 1+ and 4 2+ steelhead were observed (14/100') along with 3 crayfish, 6 Pacific Giant Salamanders and 1 Yellow-legged Frog.

The inventory of Reach 2 was continued starting at the third bridge and ending approximately 435 feet upstream in habitat units 259-272. In pool and riffle habitat types 9 0+ and 9 1+ steelhead (4.3/100') were observed along with 1 unidentified salamander and 1 crayfish.

During the habitat inventory, fewer salmonids were observed upstream of unit 13 where a partial cascade barrier exists at, 374 feet from the mouth. A summary of data collected appears in the table below.

Species Observed By DFG In 1996 Surveys	
SPECIES	Native/Introduced
Steelhead	N
Crayfish	N
Pacific Giant Salamander	N
Yellow-legged Frog	N

Historical records indicate no hatchery stocking, transfers or known fish rescue operations have occurred in the watershed.

DISCUSSION

Pole Mountain Creek has 2 channel types: F2 and F3. There are 1,230 feet of F2 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, F2 channel types are fair for low-stage weirs, single and opposing and log cover.

There are 8,783 feet of F3 channel type in Reach 2. F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover.

Both channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey days August 5 - September 4, 1996 ranged from 58°F to 68°F. Air temperatures ranged from 55°F to 85°F. The warmer water temperatures were recorded in Reach 2. These temperatures, if sustained, are above the threshold stress level (65°F) for salmonids. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

Pools comprised 23% of the total **length** of this survey. 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. In Pole Mountain Creek, the pools are relatively shallow with 36% having a maximum depth of at least 2 feet. These pools comprised only 11% of the total length of stream habitat. However, in coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 29. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by boulders (33%), terrestrial vegetation (20%), and small woody debris (14%). Log and root wad cover structures in the pool and flatwater habitats are needed to improve 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.

Five of the 6 low gradient riffles measured (83%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Only 33% of the pool tail-outs measured had embeddedness ratings of

either 3 or 4. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. Reach 2 had the poorest embeddedness ratings with 45% of the pool tail-outs having either a 3 or 4. Overall, the quality of potential spawning habitat is fair to good.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. The large amount of sediment in the stream is directly a result of road failure and poor road maintenance. Sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 76%. This is a fair percentage of canopy, since 80 percent is generally considered desirable. Elevated water temperatures could be reduced by increasing stream canopy. Cooler water temperatures are desirable in Pole Mountain Creek. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream structure and bank stability.

SUMMARY

Biological surveys were conducted to document fish distribution and are not representative of population information. In the fall of 1996 survey, steelhead were documented in relatively low numbers, whereas coho were not found at all. This may be due to physiological and environmental requirements for coho stringent than for steelhead, or they may be absent or present only in small numbers. Steelhead 0+ and 1+ were more numerous below the falls, indicating the falls may be a partial barrier for steelhead. However, since 0-2+ steelhead were observed, spawning in all areas has been successful in the last few years.

Stream shade canopy is slightly low in both reaches and water temperatures are somewhat high. Although spawning habitat is fair, two periodic fish barriers near the mouth may limit access for migrating salmonids.

GENERAL RECOMMENDATIONS

Pole Mountain Creek should be managed as an anadromous, natural production stream.

The winter 1995/96 storms brought down many large trees and other woody debris into the stream, which increased the number

and quality of pools since the drought. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

SPECIFIC FISHERY ENHANCEMENT RECOMMENDATIONS

- 1) Access for migrating salmonids may be a problem near the mouth at several cascades in units 14 (347 ft) upstream and 41 (1001 ft). Fish passage should be improved where possible, and the barrier monitored for blockage. In addition, a log debris accumulation approximately 1 3/4 miles from the mouth in habitat unit 278 (Reach 2) has the potential for causing bank erosion. An unstable right bank needs to be protected and/or the log debris accumulation modified. **Both modifications must be done carefully to preserve existing habitat provided by the woody debris.** In addition, a log debris accumulation in the second to last unit of the survey should be modified.
- 2) Repair sites identified from the road survey. Numerous recently constructed unimproved roads upslope from the stream are causing and have the potential to cause erosion. Gullies and washouts should be repaired, and culverts installed or upgraded, before sediment impacts available spawning gravels.
- 3) Increase the canopy on Pole Mountain Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The non-anadromous reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.
- 4) Where feasible, increase woody cover in the pool and flatwater habitat units upstream of the first falls. Most of the existing shelter is from boulders and terrestrial vegetation. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations. There are boulder-formed backwater pools located in side channels of Reaches 1 and 2 (habitat units 9.1, 11.1, 45.1, 50.1 and 95.1) that have low shelter ratings and could benefit easily from log cover. Adding woody cover must be done where the banks are stable or

in conjunction with stream bank armor to prevent erosion.

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

RESTORATION IMPLEMENTED

- 1) A road inventory may be necessary to prioritize work.
- 2) One landslide has been stabilized.
- 3) Fish passage has been monitored from 1997 to 1999.

PROBLEM SITES AND LANDMARKS - POLE MOUNTAIN CREEK SURVEY COMMENTS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
	8.00	166 VERY FEW FISH
	10.00	200 SMALL DRY TRIB RT BANK
	13.00	347 PICTURE, POSS FISH BARRIER
	14.00	394 NO FISH
	18.00	448 NO FISH, DRY STREAM BELOW, NO TAIL CREST
	19.00	459 NO FISH
	28.00	733 NO FISH, STOPPED 15 UNITS ABOVE FISH BARRIER
	34.10	879 SOME SMALL FISH
	41.00	1001 PICTURE #19, HEIGHT 6.5 PLUNGE,
	53.00	1290 RT UNSTABLE BANK, DEBRIS IN CORNER
	65.00	1599 SEE FORM, UNIT 051 CHANNEL TYPE F3
	70.00	1739 SAW SEVERAL STICKLEBACKS
	79.00	2118 CULVERT SEE FORM
	89.00	2483 FEW FISH
	93.00	2642 NO FISH
	97.00	2730 VERY FEW FISH
	102.00	2868 SEE FORM, BRIDGE
	103.00	2893 FEW FISH
	108.00	2983 VERY FEW FISH, DRY TRIB LEFT BANK
	115.00	3164 NO FISH
	118.00	3379 SEVERAL STICKLEBACK OBSERVED, NO TROUT

120.00	3404 ONE FISH (TROUT), STICKLEBACKS
128.00	3627 VERY FEW FISH, 1-2/POOL
130.00	3683 SEVERAL LARGE FISH
143.00	4064 SEE FORM - BRIDGE
148.00	4249 SLIP ON RT BANK
152.00	4358 SMALL FISH
155.00	4453 DRY TRIB LEFT BANK, NEXT UNIT RUN
167.00	4884 VERY FEW FISH
168.00	4921 NO FISH
169.00	4950 3 FISH
178.00	5220 DRY TRIB RT BANK
184.00	5420 NICE FISH
202.00	6174 WET TRIB LEFT BANK, TRAVELED 626 FT, 90-100 % CANOPY, NO FISH OBSERVED, VERY BRUSHY, POISON OAK!
207.00	6373 FEW FISH
219.00	6879 DRY TRIB RT BANK
222.00	7009 NO FISH
224.00	7042 ONE FISH
228.00	7196 ARTIFICIAL DAM POOL
241.00	7756 NO FISH
242.00	7852 DRY TRIB LEFT BANK
243.00	7884 NO FISH
259.00	8703 SEE FORM, BRIDGE
262.00	8778 VERY FEW FISH
266.00	8848 NO FISH
269.00	8953 ONE FISH
270.00	8972 NO FISH
271.00	8988 NO FISH
277.00	9162 NO FISH
278.00	9183 UNSTABLE RT BANK, NO FISH, SEE FORM
289.00	9592 NO FISH
293.00	9697 NO FISH
294.00	9742 SEE FORM, LOGJAM, NO FISH
295.00	10048 WET TRIB, LEFT BANK, NO FISH, STOPPED HERE

Pole Mountain Creek



Inland Fisheries Division
Department of Fish and Game
July 19, 1997

 Roads
Streams



0.5

Pole Mountain Creek Tables Graphs Map
Assessment Completed 1996

0.5 Miles

Pole Mountain Creek

Drainage: Ward Creek, Big Austin Creek, Russian River

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

Survey Dates: 08/05/96 to 09/04/96

Confluence Location: QUAD: FORT ROSS LEGAL DESCRIPTION: T8NR12MS13 LATITUDE: 38°32'14" LONGITUDE: 123°8'11"

HABITAT UNITS	FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT	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
122	13	RIFFILE	40	43	5195	50	6.3	0.3	179	21855	65	7988	0	33
84	21	FLATWATER	27	32	2681	26	6.8	0.5	177	14828	87	7283	0	16
100	36	POOL	32	24	2411	23	9.3	0.9	228	22780	224	22420	194	29
2	0	DRY	1	21	42	0	0.0	0.0	0	0	0	0	0	0
TOTAL UNITS	TOTAL UNITS			TOTAL LENGTH (ft.)					TOTAL AREA (sq. ft.)			TOTAL VOL. (cu. ft.)		
308	70			10329					59463			37691		

Pole Mountain Creek

Drainage: Ward Creek, Big Austin Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/05/96 to 09/04/96

Confluence Location: QUAD: FORT ROSS LEGAL DESCRIPTION: T9NR12WS13 T9NR12WS13 LATITUDE: 38°32'14" LONGITUDE: 123°8'11"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	MEAN LENGTH	TOTAL LENGTH	MEAN WIDTH	TOTAL WIDTH	MEAN DEPTH	TOTAL DEPTH	MEAN AREA	TOTAL AREA	MEAN VOLUME	TOTAL VOLUME	MEAN RESIDUAL VOLUME	MEAN SHELFER RATING	MEAN CANOPY
108	6	LGR	35	43	4633	45	6	0.2	0.6	155	16702	44	4754	0	0	6	71	
11	4	HGR	4	30	328	3	7	0.3	1.1	164	1799	51	558	0	0	48	86	
2	2	CAS	1	79	157	2	7	0.5	1.4	162	323	86	172	0	0	95	71	
1	1	BRS	0	77	77	1	6	0.5	0.9	424	424	212	212	0	0	10	24	
11	4	POM	4	21	234	2	8	0.6	2.2	138	1523	88	963	0	0	31	85	
30	7	GLD	10	33	1002	10	8	0.5	1.1	192	5770	68	2032	0	0	6	76	
39	6	RUN	13	32	1264	12	6	0.5	0.9	132	5144	62	2412	0	0	12	74	
3	3	SRN	1	55	164	2	7	0.5	1.0	328	983	192	576	0	0	17	92	
1	1	EDW	0	18	18	0	5	0.4	0.6	77	77	31	31	0	0	20	81	
34	8	MCP	11	23	777	8	9	0.8	3.2	228	7756	226	7699	192	192	27	78	
7	2	STP	2	34	235	2	10	0.8	2.4	281	1967	248	1736	205	205	74	87	
4	2	CRP	1	46	183	2	12	1.2	3.1	457	1827	524	2098	469	469	18	89	
1	1	LSL	0	35	35	0	7	1.0	1.8	216	216	216	216	173	173	90	45	
12	5	LSR	4	28	332	3	10	0.9	3.2	298	3570	328	3930	280	280	43	73	
7	2	LSBK	2	31	215	2	8	0.8	2.7	266	1863	240	1679	198	198	31	71	
14	7	LSBO	5	19	261	3	8	0.8	2.6	150	2096	130	1827	103	103	23	80	
13	4	PLP	4	17	222	2	10	0.9	4.3	169	2203	173	2252	157	157	16	82	
2	2	SCP	1	28	56	1	5	0.6	1.8	61	122	36	71	0	0	3	70	
5	3	BPB	2	12	61	1	10	0.7	2.2	133	667	104	522	80	80	7	62	
1	0	DPL	0	38	38	0	13	1.0	2.3	494	494	494	494	395	395	5	0	
2	0	DRY	1	21	42	0	0	0.0	0.0	0	0	0	0	0	0	0	0	
TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)														
308	70	10329	55524	34232														

Pole Mountain Creek

Drainage: Ward Creek, Big Austin Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/05/96 to 09/04/96

Confluence location: QUAD: FORT ROSS LEGAL DESCRIPTION: T8NR12WS13 LATITUDE: 38°32'4" LONGITUDE: 123°8'1"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	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
41	10	MAIN	41	25	1011	42	9.4	0.8	237	9722	230	9435	195	35
51	21	SCOUR	51	24	1246	52	9.2	0.9	231	11775	233	11908	201	28
8	5	BACKWATER	8	19	155	6	9.3	0.7	160	1283	136	1087	132	6
TOTAL UNITS	TOTAL UNITS			TOTAL LENGTH (ft.)	TOTAL LENGTH (ft.)				TOTAL AREA (sq.ft.)	TOTAL AREA (sq.ft.)		TOTAL VOL. (cu.ft.)	TOTAL VOL. (cu.ft.)	
100	36			2411	2411				22780	22780		22429	22429	

Pole Mountain Creek

Drainage: Ward Creek, Big Austin Creek, Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 08/05/96 to 09/04/96

Confluence Location: QUAD: FORT ROSS LEGAL DESCRIPTION: T8NR12US13 LATITUDE: 38°32'14" LONGITUDE: 123°8'11"

MEASURED UNITS	HABITAT TYPE	HABITAT PERCENT OCCURENCE	<1 FOOT MAXIMUM DEPTH OCCURENCE	<1 FOOT PERCENT OCCURENCE	1-<2 FT. MAXIMUM DEPTH OCCURENCE	1-<2 FOOT PERCENT OCCURENCE	2-<3 FT. MAXIMUM DEPTH OCCURENCE	2-<3 FOOT PERCENT OCCURENCE	3-<4 FT. MAXIMUM DEPTH OCCURENCE	3-<4 FOOT PERCENT OCCURENCE	>=4 FEET MAXIMUM DEPTH OCCURENCE	>=4 FEET PERCENT OCCURENCE
34	MCP	34	3	9	22	65	6	18	3	9	0	0
7	STP	7	1	14	3	43	3	43	0	0	0	0
4	CRP	4	0	0	1	25	2	50	1	25	0	0
1	LSL	1	0	0	1	100	0	0	0	0	0	0
12	LSR	12	0	0	7	58	3	25	2	17	0	0
7	LSBK	7	0	0	4	57	3	43	0	0	0	0
14	LSBo	14	1	7	10	71	3	21	0	0	0	0
13	PLP	13	1	8	4	31	7	54	0	0	1	8
2	SCP	2	1	50	1	50	0	0	0	0	0	0
5	BPB	5	1	20	3	60	1	20	0	0	0	0
1	DPL	1	0	0	0	0	1	100	0	0	0	0

TOTAL UNITS 100

Pole Mountain Creek

Drainage: Ward Creek, Big Austin Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 08/05/96 to 09/04/96

Confluence Location: QUAD: FORT ROSS LEGAL DESCRIPTION: T8NR12MS13 LATITUDE: 38°32'4" LONGITUDE: 123°8'1"

UNITS MEASURED	UNITS MEASURED	HABITAT TYPE	SQ. FT. UNDERCUT BANKS	SQ. FT. SMD	SQ. FT. LMD	SQ. FT. ROOT MASS VEGETATION	SQ. FT. TERR. VEGETATION	SQ. FT. AQUATIC VEGETATION	SQ. FT. WHITE WATER	SQ. FT. BOULDERS	SQ. FT. BEDROCK LEDGES
108	6	LGR	0	2	0	5	0	0	0	59	0
11	4	HGR	0	0	0	0	18	0	60	207	0
2	2	CAS	0	5	0	0	43	0	14	246	0
1	1	BRS	0	0	0	0	17	0	0	25	0
11	4	POW	3	0	9	5	7	0	0	63	0
30	7	GLD	23	2	0	0	2	0	0	12	0
39	7	RUN	5	0	7	8	20	0	0	36	0
3	3	SRN	0	0	0	0	35	0	19	88	0
1	1	EDW	0	0	0	0	16	0	0	0	0
34	34	MCP	109	84	14	217	252	0	31	476	0
7	7	STP	0	79	21	0	86	22	132	324	0
4	4	CRP	91	0	0	0	105	0	0	8	0
1	1	LSL	0	31	41	0	10	0	0	20	0
12	12	LSR	65	351	201	124	48	0	0	38	0
7	7	LSBK	5	0	2	14	200	10	0	60	107
14	14	LSBo	34	0	0	0	63	0	0	110	0
13	13	PLP	9	13	8	0	0	0	8	185	0
2	2	SCP	0	0	0	0	0	0	0	4	0
5	5	BPB	0	0	0	0	1	0	0	47	0
1	1	DPL	0	0	0	0	1	0	0	4	20
2	0	DRY	0	0	0	0	0	0	0	0	0
TOTAL	308		344	567	303	373	924	32	264	2012	127
			7%	11%	6%	8%	19%	1%	5%	41%	3%

TOTAL FOR POOLS	100	100	313	558	287	355	766	32	171	1276	127
			8%	14%	7%	9%	20%	1%	4%	33%	3%

Pole Mountain Creek

Drainage: Ward Creek, Big Austin Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/05/96 to 09/04/96

Confluence Location: QUAD: FORT ROSS LEGAL DESCRIPTION: T8NR12MS13 LATITUDE: 38°32'14" LONGITUDE: 123°8'11"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	SILT/CLAY		SAND		GRAVEL		SM COBBLE		LG COBBLE		BOULDER		BEDROCK	
			% TOTAL DOMINANT	% TOTAL DOMINANT	% TOTAL DOMINANT	% TOTAL DOMINANT	% TOTAL DOMINANT	% TOTAL DOMINANT	% TOTAL DOMINANT	% TOTAL DOMINANT	% TOTAL DOMINANT	% TOTAL DOMINANT				
108	6	LGR	0	0	0	33	50	17	0	0	0	0	0	0	0	0
11	4	HGR	0	0	25	0	0	0	0	0	0	0	50	0	25	0
2	2	CAS	0	0	0	0	0	0	0	0	0	0	100	0	0	0
1	1	BRS	0	0	0	0	0	0	0	0	0	0	0	0	100	0
11	4	POW	0	0	75	25	0	0	0	0	0	0	0	0	0	0
30	7	GLD	14	14	14	43	29	0	0	0	0	0	0	0	0	0
39	6	RUN	0	0	0	33	50	17	0	0	0	0	0	0	0	0
3	3	SRN	0	0	0	33	33	0	0	0	0	0	33	0	0	0
1	1	EDM	0	0	0	0	0	100	0	0	0	0	0	0	0	0
34	8	MCP	0	0	75	25	0	0	0	0	0	0	0	0	0	0
7	2	STP	0	0	50	0	0	0	0	0	0	0	50	0	0	0
4	2	CRP	0	0	50	0	0	0	0	0	0	0	0	0	0	0
1	1	LSL	0	0	100	0	0	0	0	0	0	0	0	0	0	0
12	5	LSR	20	20	60	0	20	0	0	0	0	0	0	0	0	0
7	2	LSBK	0	0	0	100	0	0	0	0	0	0	0	0	0	0
14	7	LSBo	0	0	71	14	14	0	0	0	0	0	0	0	0	0
13	4	PLP	0	0	0	25	0	0	0	0	0	0	50	0	25	0
2	2	SCP	0	0	50	0	50	0	0	0	0	0	0	0	0	0
5	3	BPB	0	0	67	0	0	33	0	0	0	0	0	0	0	0
1	1	DPL	0	0	0	100	0	0	0	0	0	0	0	0	0	0
2	0	DRY	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Percent Right bank & Cover	Mean Percent Left Bank & Cover
75.83	53.97	46.03	36.11	32.39

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number	Units	Right Bank	Left Bank	Total Mean Percent
Bedrock	3	4			4.86
Boulder	19	29			33.33
Cobble/gravel	45	37			56.94
Silt/clay	5	2			4.86

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number	Units	Right Bank	Left Bank	Total Mean Percent
Grass	19	23			29.17
Brush	13	9			15.28
Deciduous Trees	23	21			30.56
Evergreen Trees	15	13			19.44
No Vegetation	2	6			5.56

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Pole Mountain Creek
 SAMPLE DATES: 08/05/96 to 09/04/96
 STREAM LENGTH: 10013 ft.
 LOCATION OF STREAM MOUTH:

USGS Quad Map: FORT ROSS

Legal Description: T8NR12WS13

Latitude: 38°32'4"

Longitude: 123°8'1"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: F2
 Channel Length: 1230 ft.
 Riffle/Flatwater Mean Width: 9 ft.
 Total Pool Mean Depth: 0.8 ft.
 Base Flow: 0.0 cfs
 Water: 58 - 62 °F Air: 55 - 64 °F
 Dom. Bank Veg.: Deciduous Trees
 Vegetative Cover: 11%
 Dom. Bank Substrate: Cobble/Gravel
 Embeddness Value: 1. 19% 2. 37%

Canopy Density: 78%
 Evergreen Component: 37%
 Deciduous Component: 63%
 Pools by Stream Length: 35%
 Pools >=3 ft.deep: 5%
 Mean Pool Shelter Rtn: 19
 Dom. Shelter: Boulders
 Occurrence of LOD: 18%
 Dry Channel: 12 ft.

3. 19% 4. 26%

STREAM REACH 02

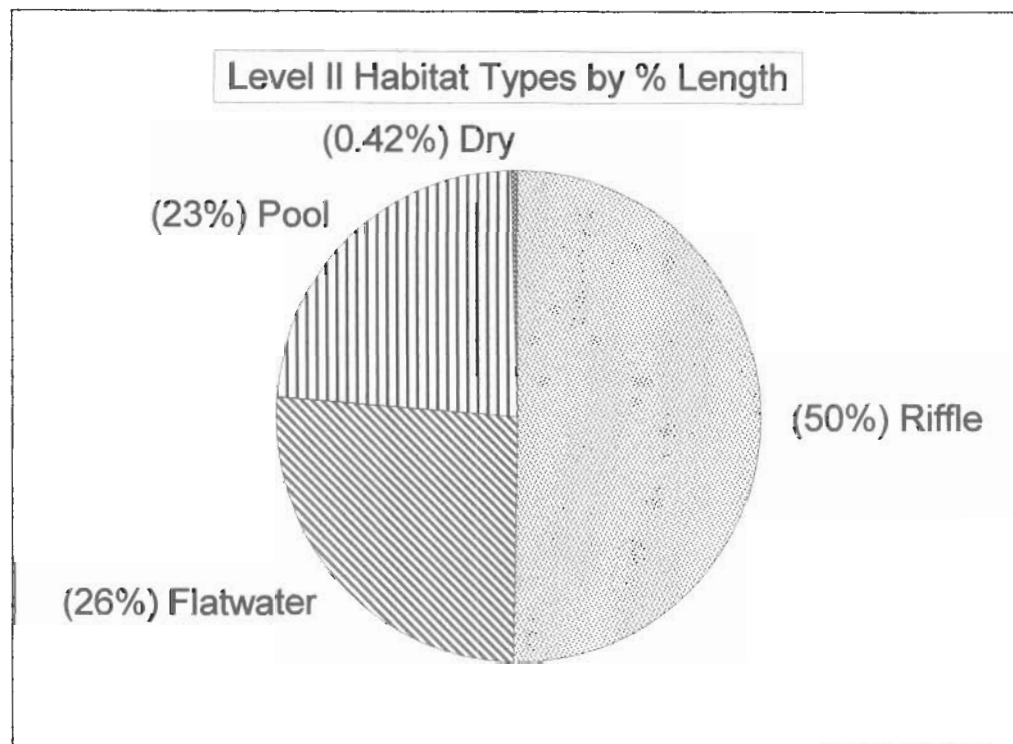
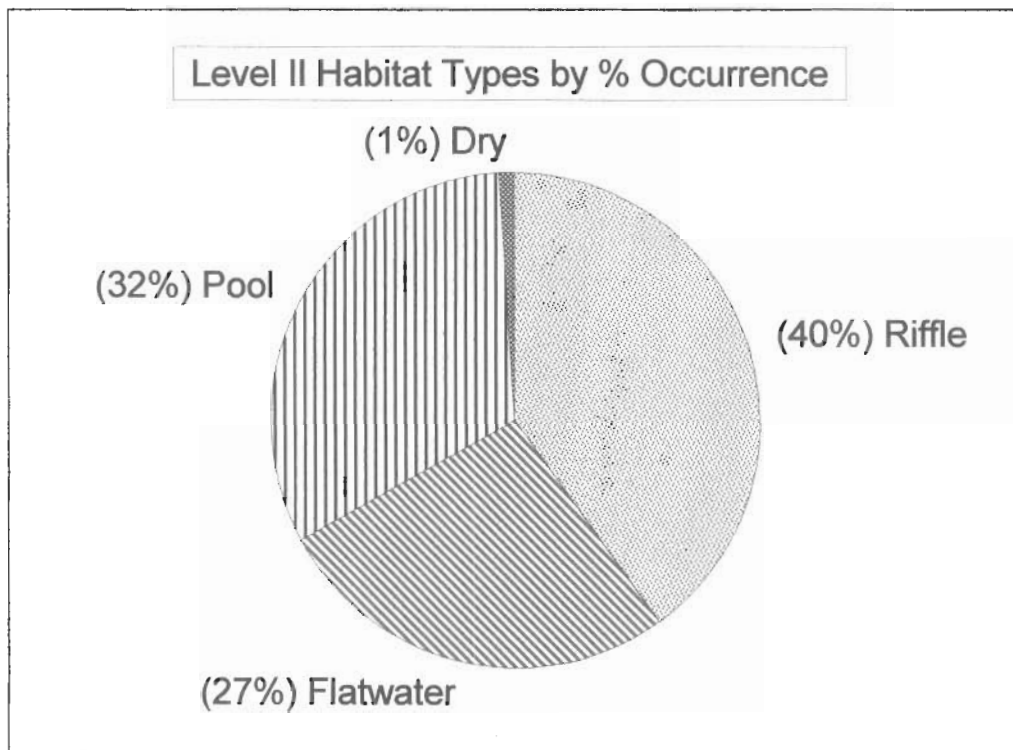
Channel Type: F3
 Channel Length: 8783 ft.
 Riffle/Flatwater Mean Width: 6 ft.
 Total Pool Mean Depth: 0.9 ft.
 Base Flow: 0.0 cfs
 Water: 58 - 68 °F Air: 56 - 85 °F
 Dom. Bank Veg.: Deciduous Trees
 Vegetative Cover: 42%
 Dom. Bank Substrate: Cobble/Gravel
 Embeddness Value: 1. 32% 2. 38%

Canopy Density: 75%
 Evergreen Component: 58%
 Deciduous Component: 42%
 Pools by Stream Length: 21%
 Pools >=3 ft.deep: 9%
 Mean Pool Shelter Rtn: 35
 Dom. Shelter: Boulders
 Occurrence of LOD: 23%
 Dry Channel: 31 ft.

3. 17% 4. 13%

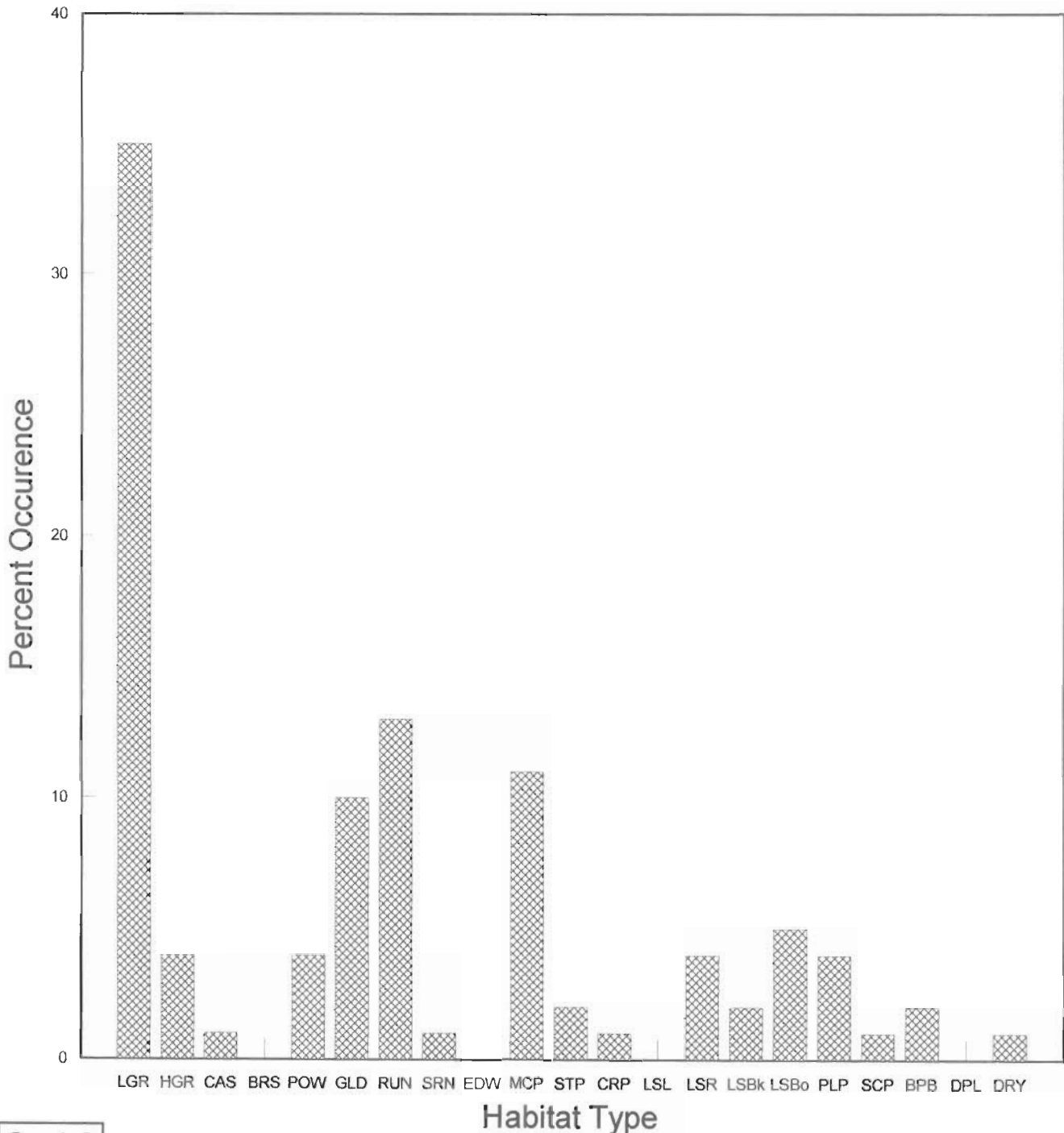
Pole Mountain Creek

Level II Habitat Types



Pole Mountain Creek

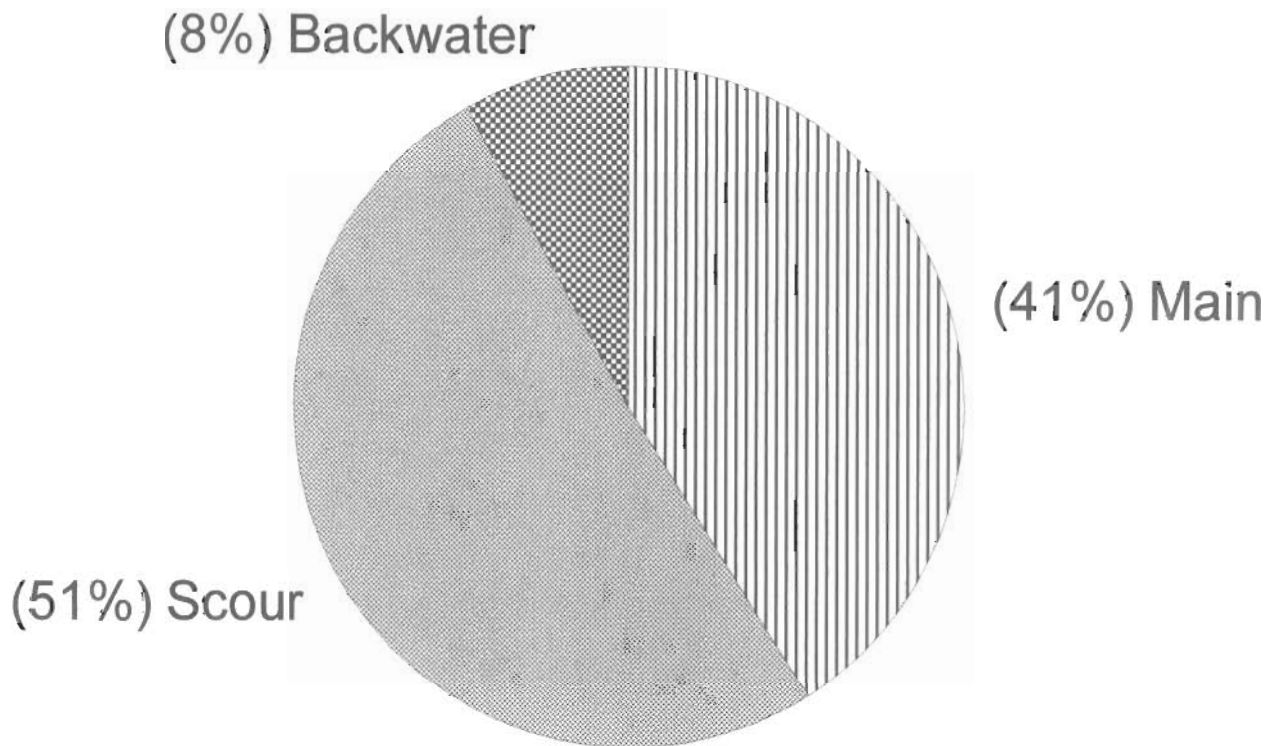
Level IV Habitat Types by % Occurrence



Graph 2

Pole Mountain Creek

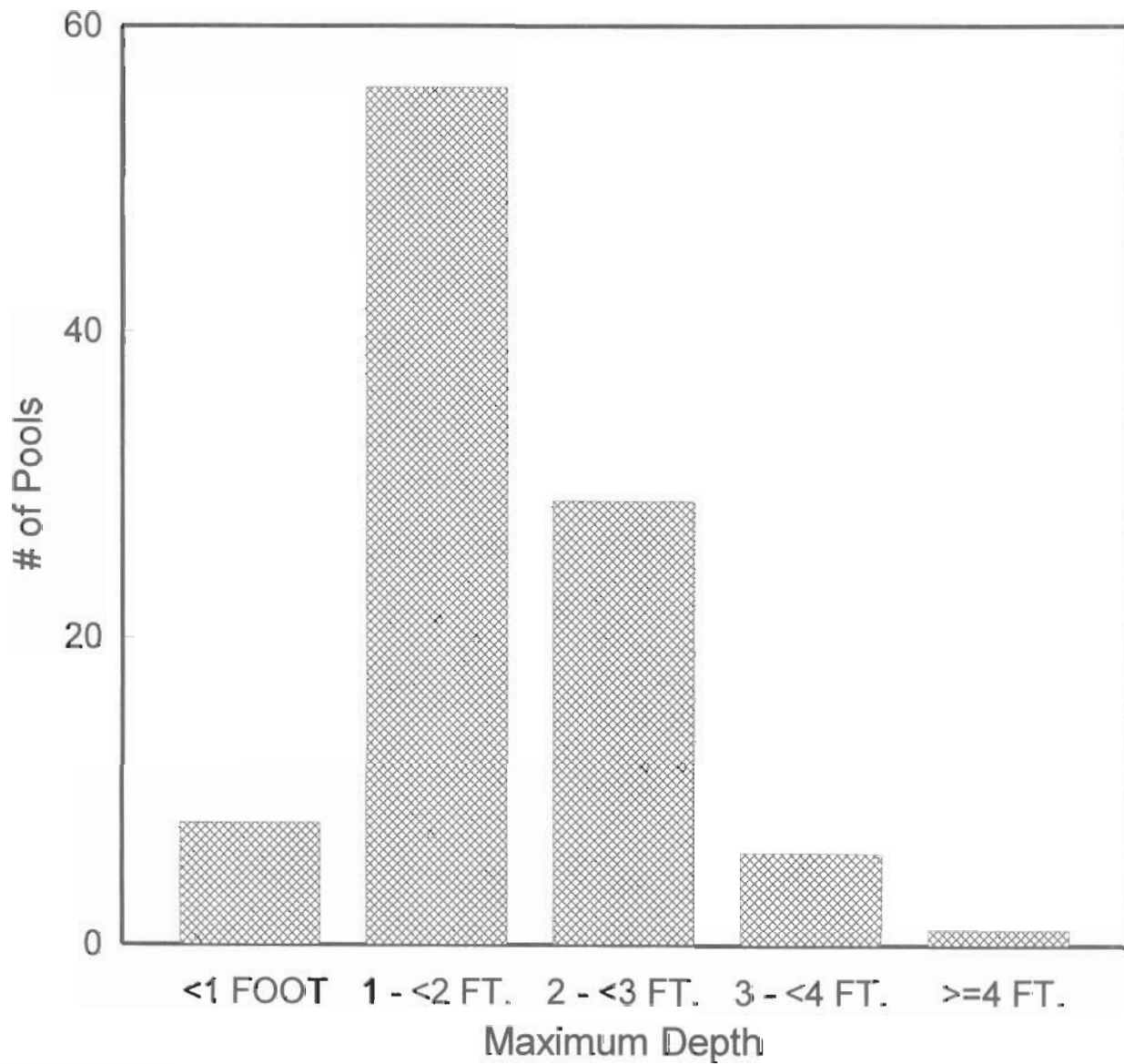
Pool Habitat Types by % Occurrence



Graph 3

Pole Mountain Creek

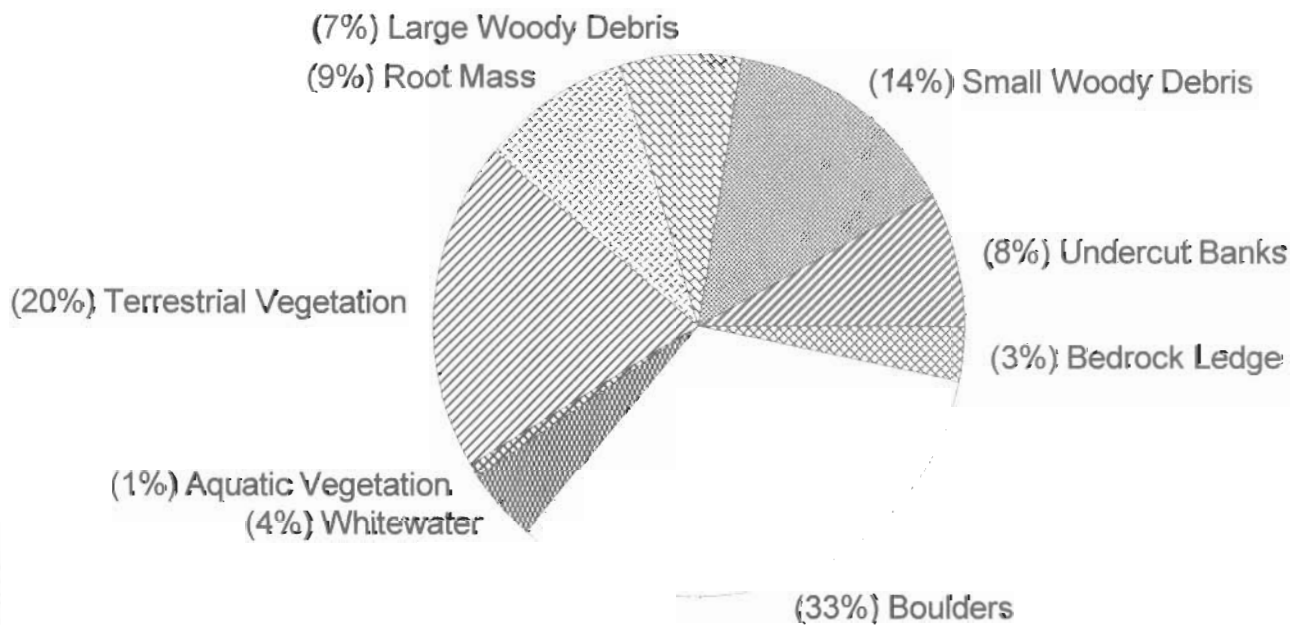
Maximum Depth in Pools



Graph 4

Pole Mountain Creek

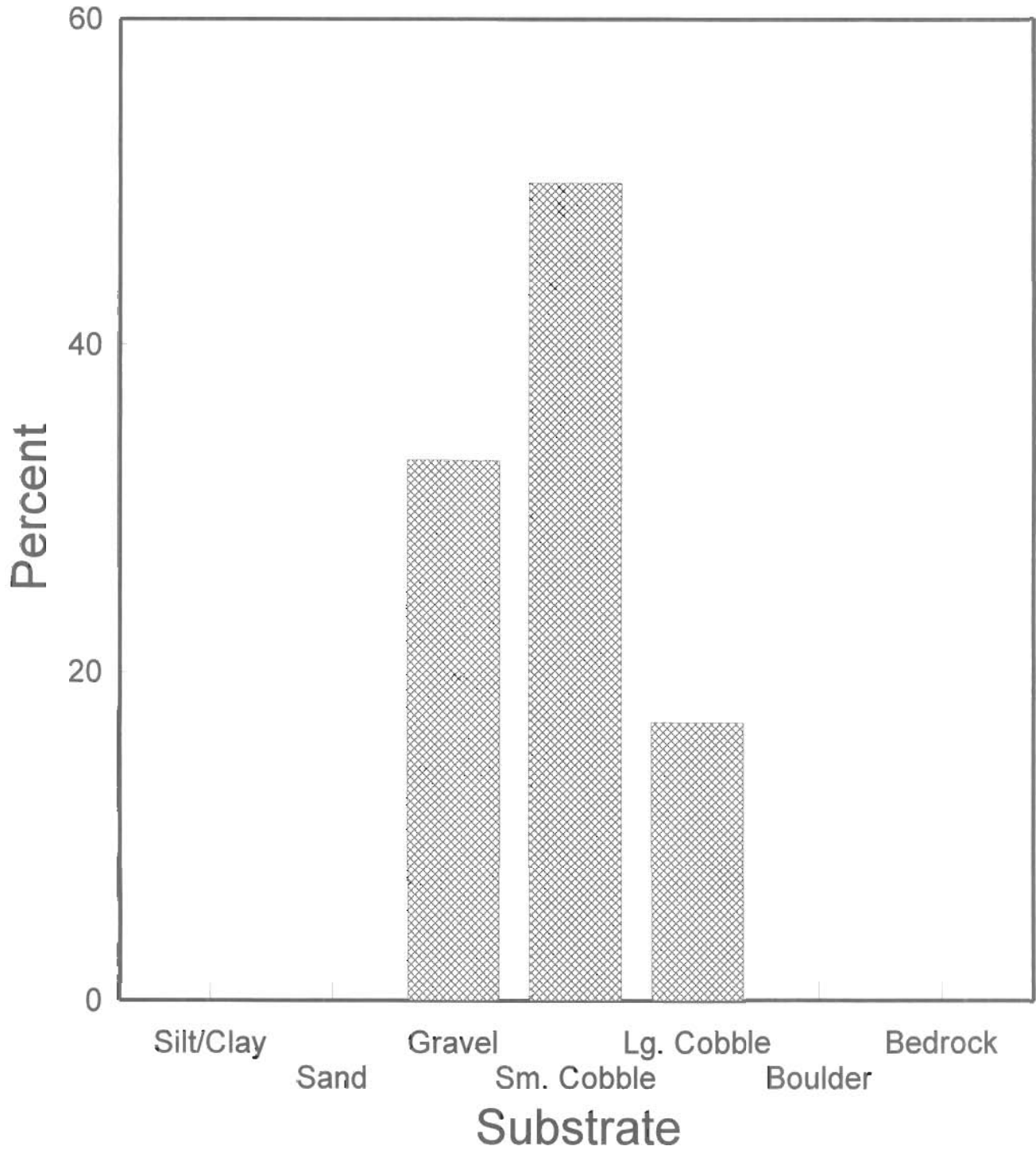
Pool Shelter Types by % Area



Graph 5

Pole Mountain Creek

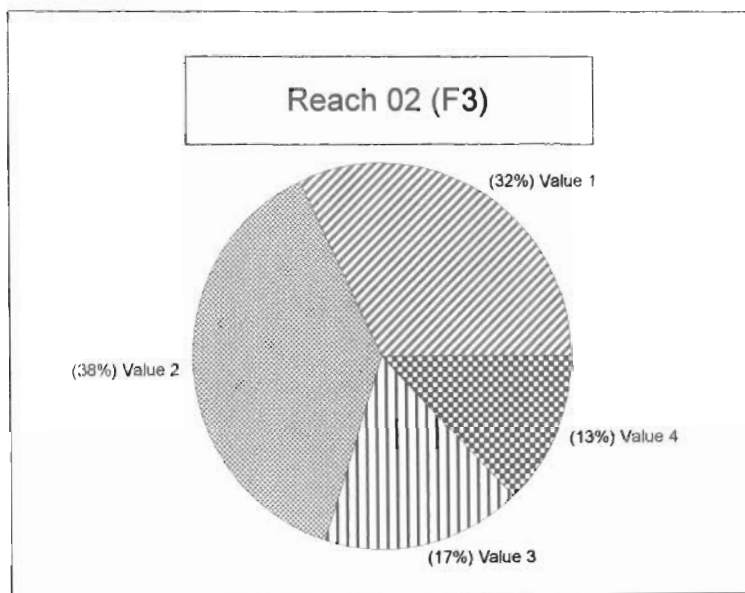
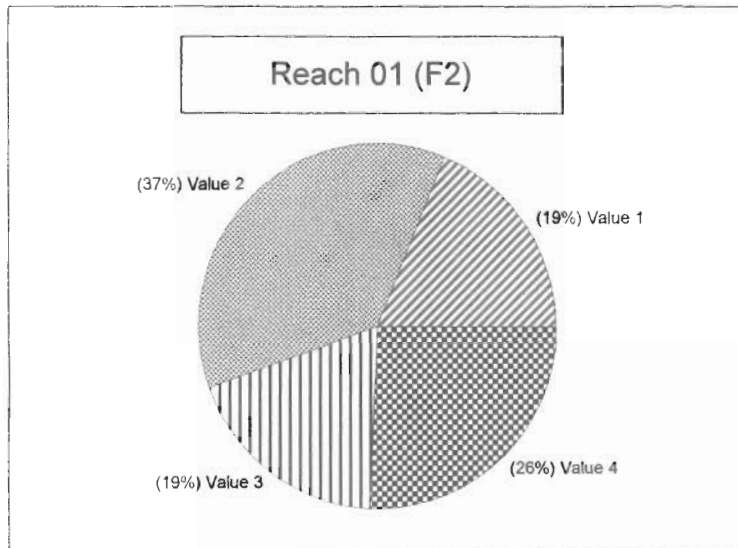
Substrate Composition in Low Gradient Riffles



Graph 6

Pole Mountain Creek

Percent Cobble Embeddedness by Reach

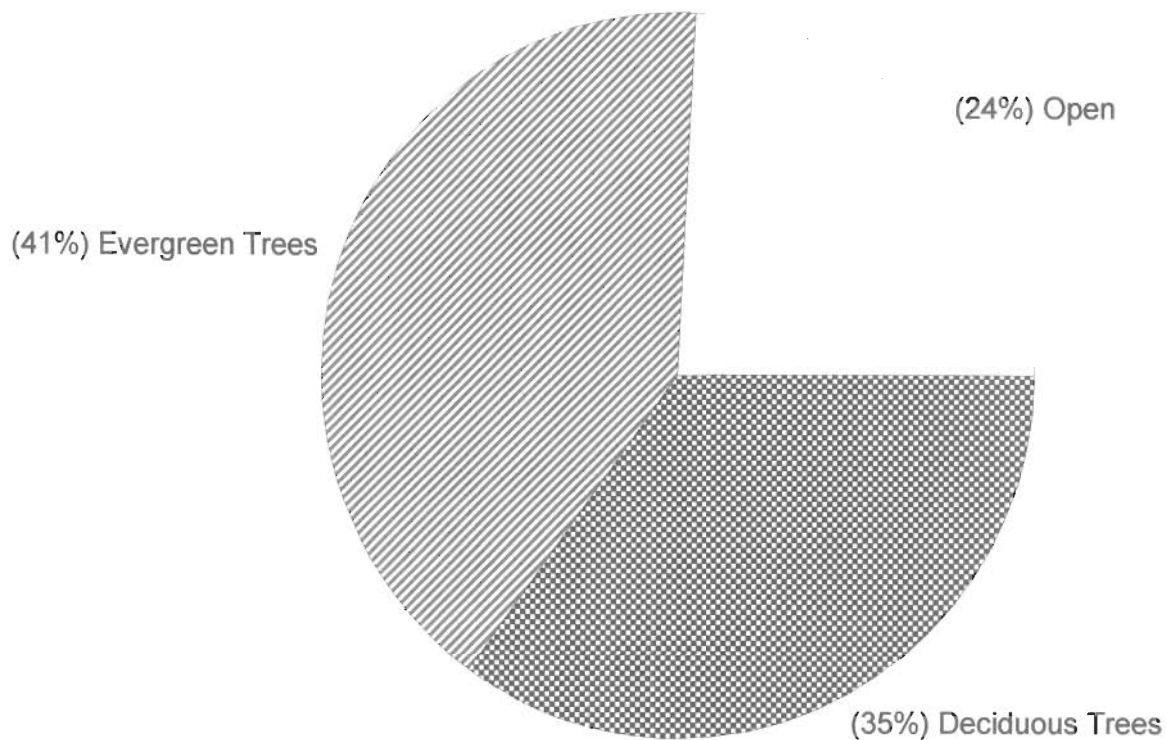


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 7

Pole Mountain Creek

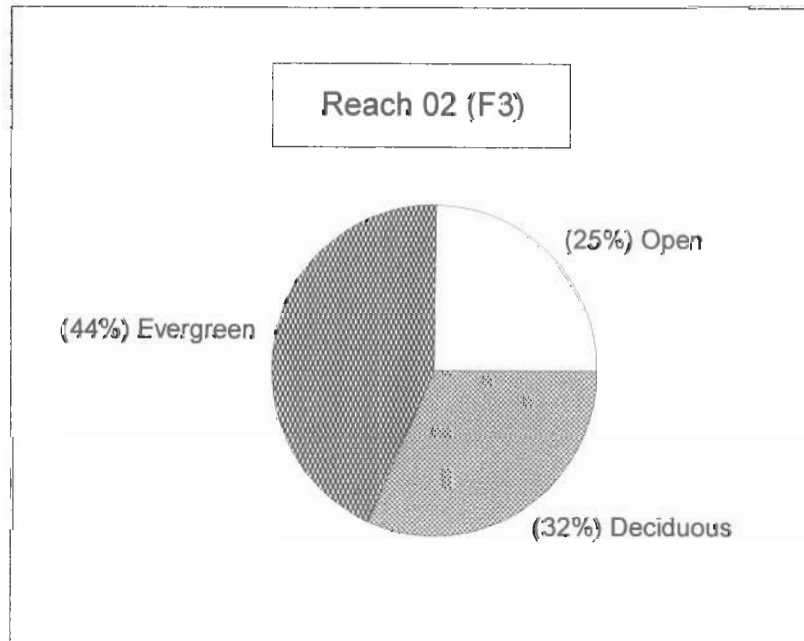
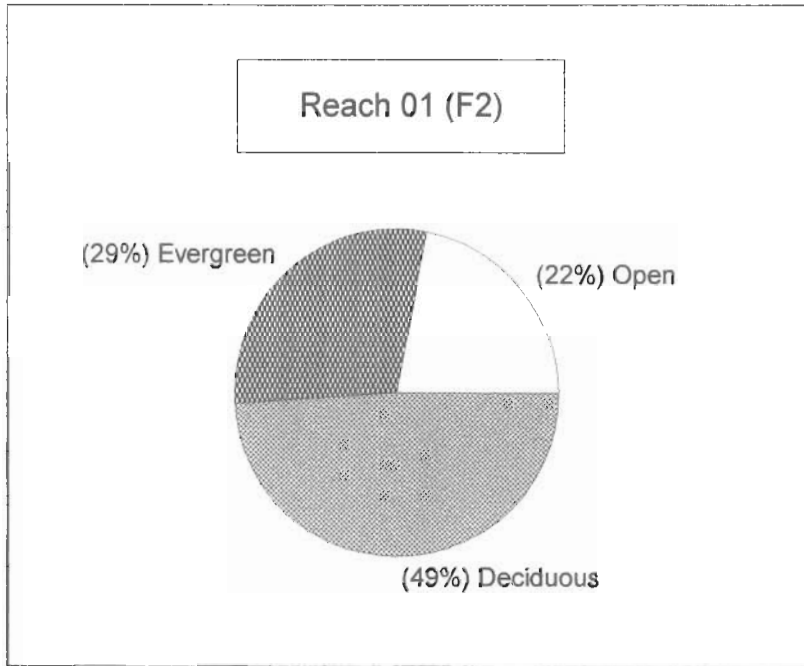
Mean Percent Canopy



Graph 8

Pole Mountain Creek

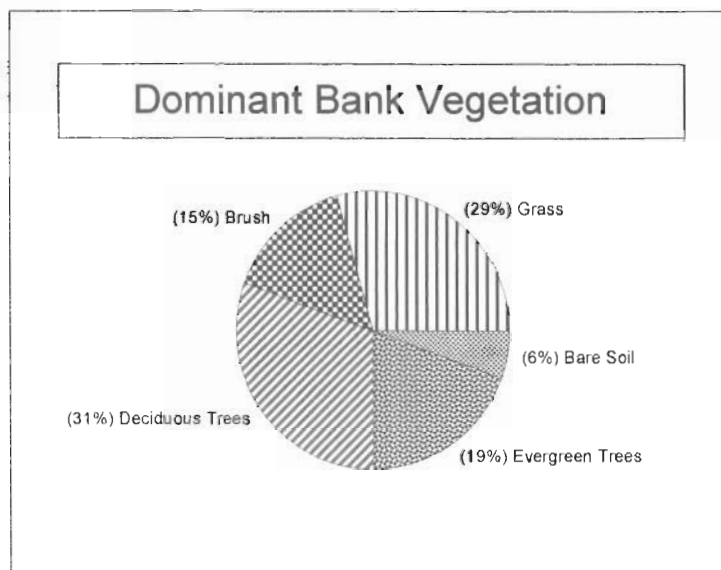
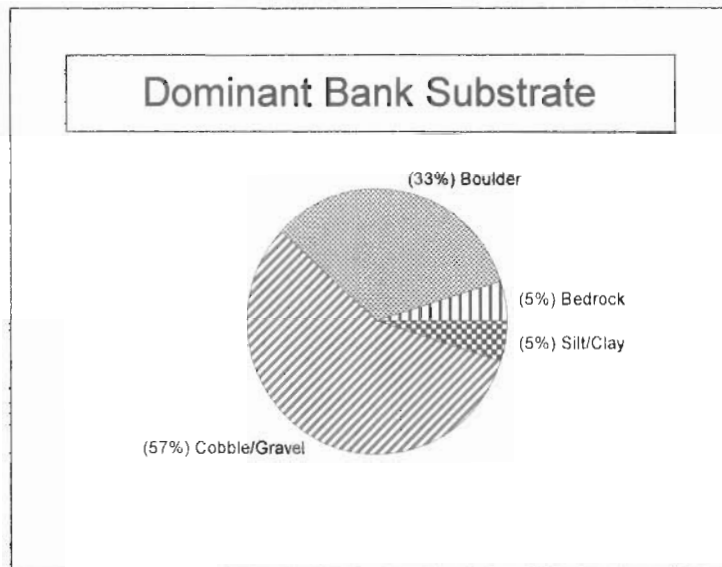
Percent Canopy by Reach



Graph 9

Pole Mountain Creek

Percent Bank Composition



Graph 10