STREAM INVENTORY REPORT

Bear Creek

INTRODUCTION

A stream inventory was conducted during the summer of 2002 on Bear Creek. The survey began at the confluence with Elk Creek and extended upstream 0.79 miles.

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

Bear Creek is a tributary to Elk Creek, a tributary to the Middle Fork Eel River, located in Mendocino County, California (Map 1). Bear Creek's legal description at the confluence with Elk Creek is T20N R11W S00. Its location is 39E34N44O north latitude and 123E02N42O west longitude. Bear Creek is a first order stream and has approximately 3.5 miles of blue line stream according to the USGS Sanhedrin Mountain 7.5 minute quadrangle. Bear Creek drains a watershed of approximately 9.9 square miles. Elevations range from about 1,480 feet at the mouth of the creek to 6,080 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is owned by private landowners, national forest and Bureau of Land Management, and is managed for timber production, rangeland and recreation. Vehicle access exists via Highway 160 through Covelo and by Forest Service roads.

METHODS

The habitat inventory conducted in Bear 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 Bear Creek to record measurements and observations. There are nine 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". Bear 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.

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5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Bear 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 Bear 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 Bear 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 Bear 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.

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 six 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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Bear 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 July 13, and 14, 2002, was conducted by Frank Humprey (DFG) and Cletus England (DFG). The total length of the stream surveyed was 4,151 feet with an additional 133 feet of side channel.

Stream flow was measured 200 feet from the confluence with Elk Creek with a Marsh-McBirney

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Model 2000 flowmeter at 0.078 cfs on July 13, 2002.

Bear Creek is a G4 channel type for the first 1,926 feet of stream surveyed and a B2 channel type for the remaining 2,225 feet. G4 channels are entrenched "gully" step-pool channels on moderate gradients with low width /depth ratios and gravel dominant substrate. B2 channels are moderately entrenched riffle dominated channels, with infrequently spaced pools, very stable plan and profile, stable banks with low width /depth ratios on moderate gradients and boulder dominant substrate.

Water temperatures taken during the survey period ranged from 76 to 88 degrees Fahrenheit. Air temperatures ranged from 81 to 98 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 27% riffle units, 32% flatwater units, and 41% pool units (Graph 1). Based on total length of Level II habitat types there were 15% riffle units, 64% flatwater units, and 21% pool units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 35%; step-runs, 28%; and low gradient riffles, 18% (Graph 3). Based on percent total length, step-runs made up 62%, mid-channel pools 17%, and low gradient riffles 11%.

A total of 38 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 95%, and comprised 97% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twelve of the 38 pools (32%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 38 pool tail-outs measured, 0 had a value of 1 (0%); 22 had a value of 2 (58%); 15 had a value of 3 (39%); and 1 had a value of 4 (3%) (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 24, flatwater habitat types had a mean shelter rating of 23, and pool habitats had a mean shelter rating of 24 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 24. Backwater pools had a mean shelter rating of 20 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders and small woody debris are the dominant cover types in Bear Creek. Graph 7 describes the pool cover in Bear Creek. Boulders is the dominant pool cover type followed by small woody debris.

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Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 61% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 16%.

The mean percent canopy density for the surveyed length of Bear Creek was 41%. The mean percentages of deciduous and coniferous trees were 39% and 2%, respectively. Fifty nine percent of the canopy was open. Graph 9 describes the mean percent canopy in Bear Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 22%. The mean percent left bank vegetated was 28%. The dominant elements composing the structure of the stream banks consisted of 5% bedrock, 73% boulder, 19% cobble/gravel, and 4% sand/silt/clay (Graph 10). Deciduous trees was the dominant vegetation type observed in 84% of the units surveyed. Additionally, 13% of the units surveyed had brush as the dominant vegetation type, and 2% had no vegetation (Graph 11).

DISCUSSION

Bear Creek is a G4 channel type for the first 1,926 feet of stream surveyed and a B2 channel type for the remaining 2,225 feet. The suitability of G4 channel types for fish habitat improvement structures is as follows: good for bank placed boulders; fair for plunge weirs and opposing wing deflectors; poor for single wing deflectors and boulder clusters. The suitability of B2 channel types for fish habitat improvement structures is as follows: excellent for plunge weirs, single and opposing wing deflectors, and log cover.

The water temperatures recorded on the survey days July 14 and15, 2002, ranged from 76 to 88 degrees Fahrenheit. Air temperatures ranged from 81 to 96 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 64% of the total length of this survey, riffles 15%, and pools 21%. The pools are relatively shallow, with only 12 of the 38 (32%) 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.

Twenty two of the 38 pool tail-outs measured had embeddedness ratings of 1 or 2. Sixteen of the pool tail-outs had embeddedness ratings of 3 or 4. Zero of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

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Sediment sources in Bear Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Twenty nine of the 38 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 24. The shelter rating in the flatwater habitats was 23. 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, small woody debris contributes 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 41%. Reach 1 had a canopy density of 35% while Reaches 2 had a canopy density of 43%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 22% and 28%, 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) Bear Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within/above 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 Bear Creek by planting willow, alder, redwood, 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 effected 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 Bear 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 Bear 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 at confluence with Elk Creek. Channel type is G4.

182’ Stream flow measured at 0.078 cfs.

1,022’ Juvenile salmonids observed.

1,442’ Juvenile salmonids observed.

2,084’ Channel type changes from G4 to B2.

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2,144’ Large boulder creating 4’ plunge.

2,162’ Unnamed tributary enters from right bank. Tributary was dry at time of survey.

2,300’ Juvenile salmonids observed.

3,470’ Four foot cascade at top of habitat unit.

4,151’ End of survey due to possible barrier, a 10’ vertical waterfall with no jump pool. Latitude 39E34’45.0’’N Longitude 123E02’6.1’’W

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}

Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]
Culvert	(CUL)	[8.0]
Not Surveyed	(NS)	[9.0]
Not Surveyed due to a marsh	(MAR)	[9.1]

Bear Creek

Drainage: Middle Fork Eel

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

Survey Dates: 07/13/02 to 07/14/02

Confluence Location: QUAD: Sanhedrin LEGAL DESCRIPTION: T20NR11WS00 LATITUDE:39°34'44" LONGITUDE:123°2'42"

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
25	5	RIFFLE	27	26	651	15	5.0	0.3	105	2634	41	1033	0	24
30	8	FLATWATER	32	91	2739	64	7.8	0.4	567	16997	255	7662	0	23
38	38	POOL	41	24	894	21	10.2	1.2	215	8154	257	9769	229	24

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
93	51	4284	27785	18463

Bear Creek

Drainage: Middle Fork Eel

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/13/02 to 07/14/02

Confluence Location: QUAD: Sanhedrin LEGAL DESCRIPTION: T20NR11WS00 LATITUDE:39°34'44" LONGITUDE:123°2'42"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
17	2	LGR	18	28	481	11	6	0.3	1.0	146	2485	46	779	0	20	30
8	3	HGR	9	21	170	4	5	0.4	0.5	78	625	38	306	0	27	30
4	2	RUN	4	17	67	2	9	0.5	0.9	152	606	66	265	0	20	70
26	6	SRN	28	103	2672	62	7	0.4	1.4	705	18328	318	8279	0	23	37
33	33	MCP	35	22	719	17	10	1.2	3.4	202	6680	247	8141	218	24	41
3	3	STP	3	49	147	3	9	1.0	2.4	402	1206	437	1310	397	27	30
1	1	SCP	1	15	15	0	8	1.3	1.8	108	108	140	140	156	20	65
1	1	BPB	1	13	13	0	13	1.1	1.7	161	161	177	177	161	20	60

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
93	51	4284	30198	19399

Bear Creek

Drainage: Middle Fork Eel

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/13/02 to 07/14/02

Confluence Location: QUAD: Sanhedrin LEGAL DESCRIPTION: T20NR11WS00 LATITUDE:39°34'44" LONGITUDE:123°2'42"

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.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
36	36	MAIN	95	24	866	97	10.2	1.2	219	7886	263	9452	233	24
2	2	BACKWATER	5	14	28	3	10.5	1.2	134	269	159	317	158	20

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
38	38	894	8154	9769

Bear Creek — Drainage: Middle Fork Eel

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/13/02 to 07/14/02

Confluence Location: QUAD: Sanhedrin LEGAL DESCRIPTION: T20NR11WS00 LATITUDE:39°34'44" LONGITUDE:123°2'42"

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
33	MCP	87	1	3	21	64	9	27	2	6	0	0
3	STP	8	0	0	2	67	1	33	0	0	0	0
1	SCP	3	0	0	1	100	0	0	0	0	0	0
1	BPB	3	0	0	1	100	0	0	0	0	0	0
TOTAL UNITS 38			1		25		10		2		0	

Bear Creek

Drainage: Middle Fork Eel

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE

Survey Dates: 07/13/02 to 07/14/02

Confluence Location: QUAD: Sanhedrin LEGAL DESCRIPTION: T20NR11WS00 LATITUDE:39°34'44" LONGITUDE:123°2'42"

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
17	2	LGR	0	5	3	3	5	0	0	85	0
8	3	HGR	0	5	0	2	3	0	7	83	0
4	2	RUN	0	5	0	3	5	0	3	85	0
26	6	SRN	0	5	0	4	7	0	2	83	0
33	33	MCP	0	4	0	2	5	2	4	80	3
3	3	STP	0	7	2	5	3	2	5	77	0
1	1	SCP	0	5	0	0	5	0	0	90	0
1	1	BPB	0	5	0	5	5	0	0	85	0

Bear Creek

Drainage: Middle Fork Eel

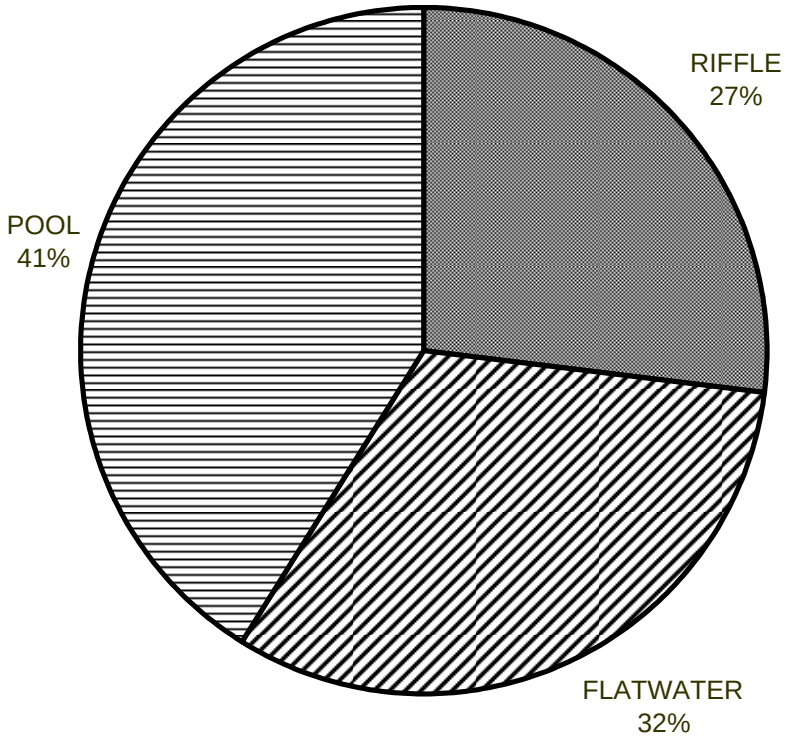
Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/13/02 to 07/14/02

Confluence Location: QUAD: Sanhedrin LEGAL DESCRIPTION: T20NR11WS00 LATITUDE:39°34'44" LONGITUDE:123°2'42"

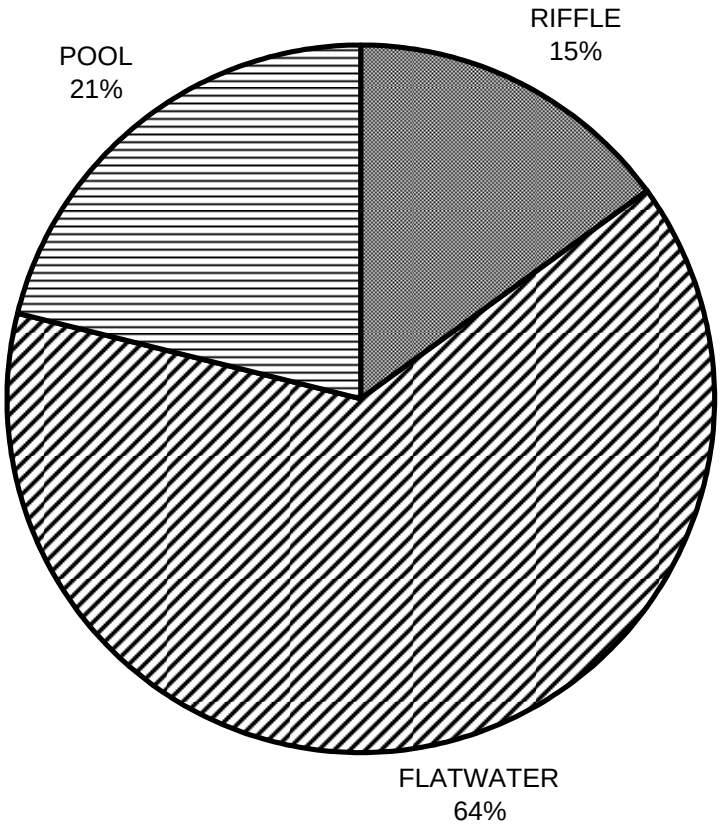
TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
17	2	LGR	0	0	0	50	0	50	0
8	3	HGR	0	0	0	0	0	100	0
4	2	RUN	0	0	100	0	0	0	0
26	6	SRN	0	0	33	33	0	33	0
33	33	MCP	0	6	85	0	0	9	0
3	3	STP	0	0	100	0	0	0	0
1	1	SCP	100	0	0	0	0	0	0
1	1	BPB	0	100	0	0	0	0	0

BEAR CREEK 2002
HABITAT TYPES BY PERCENT OCCURENCE



GRAPH 1

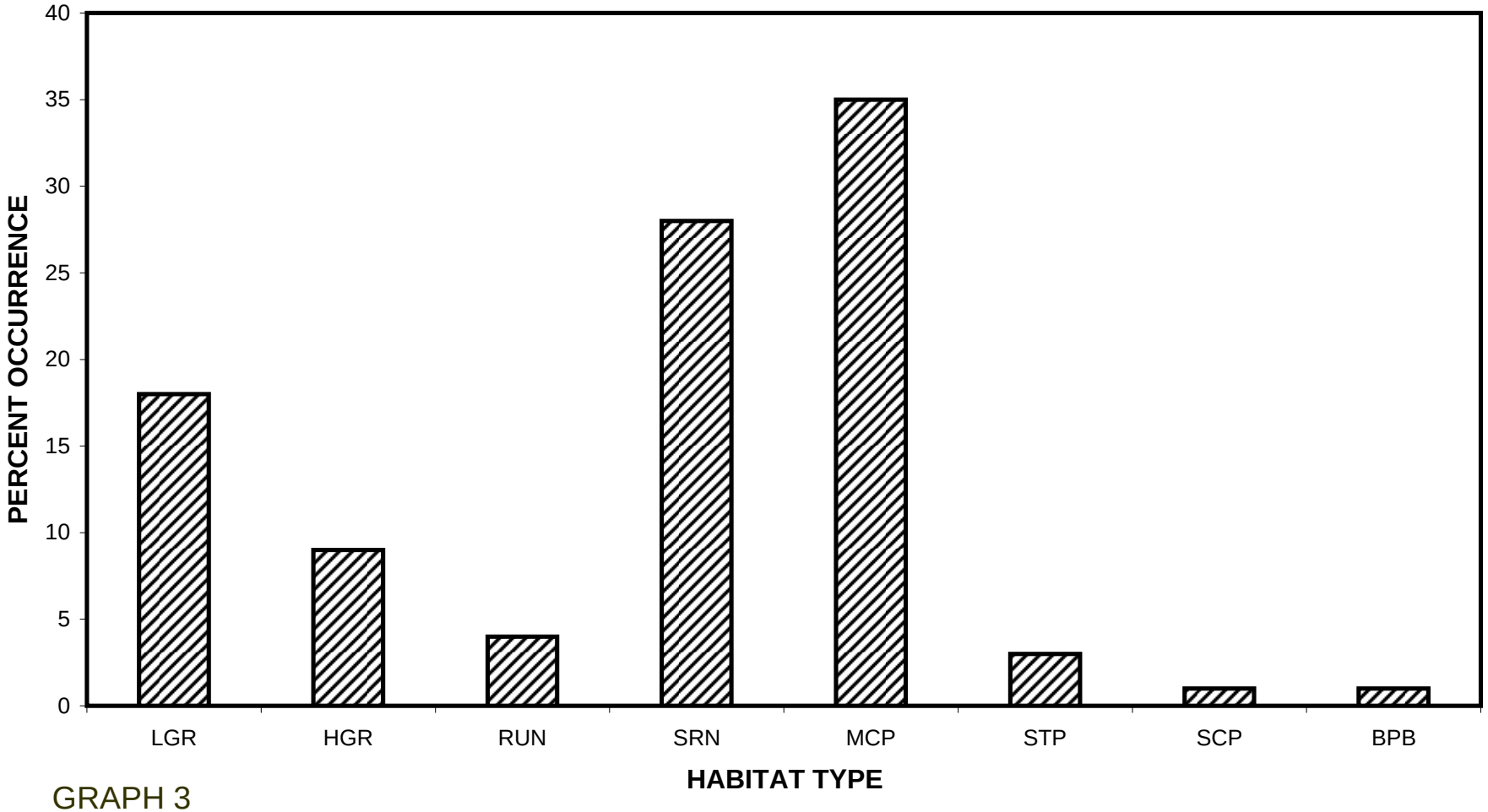
BEAR CREEK 2002
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

BEAR CREEK 2002

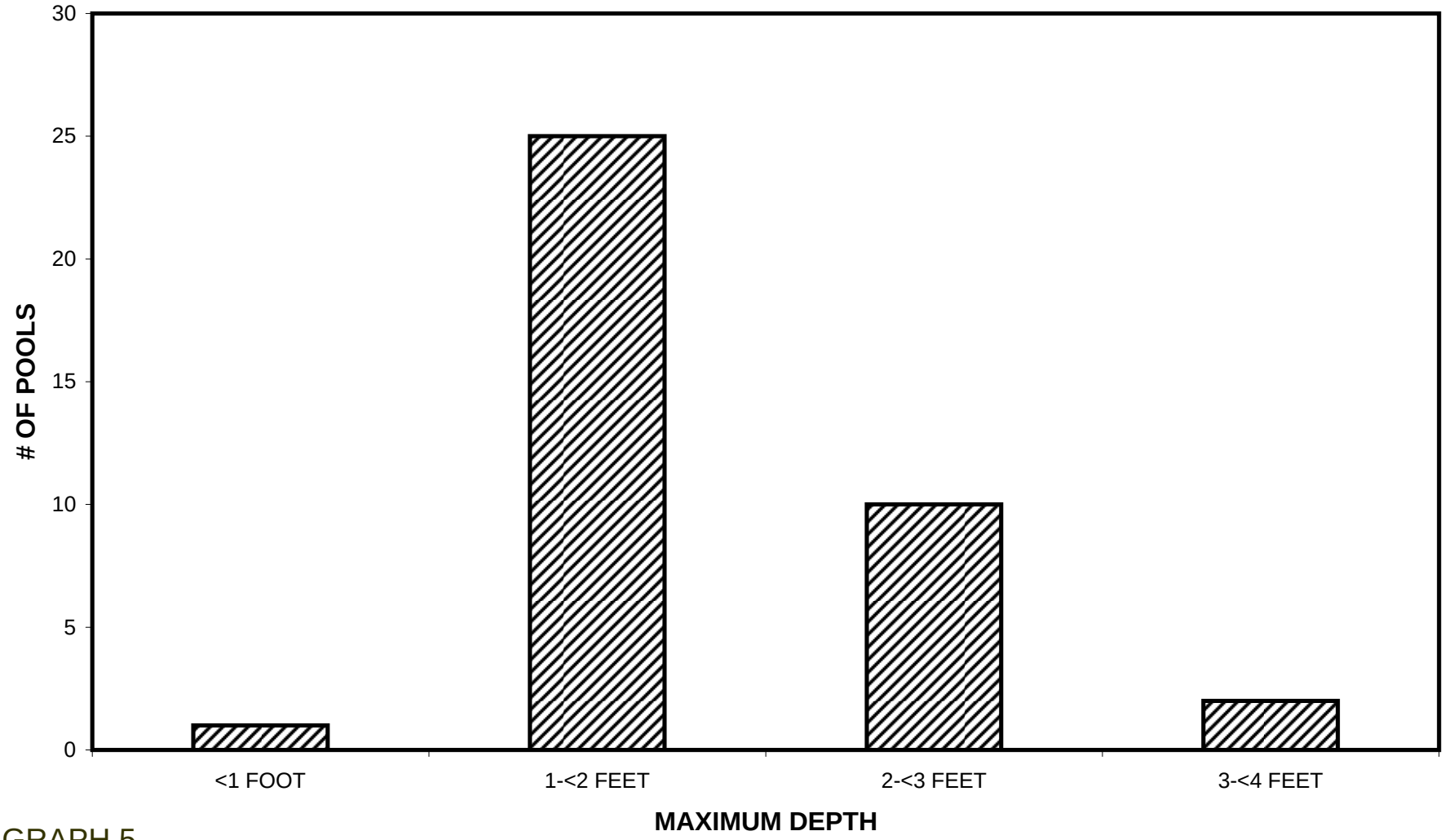
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

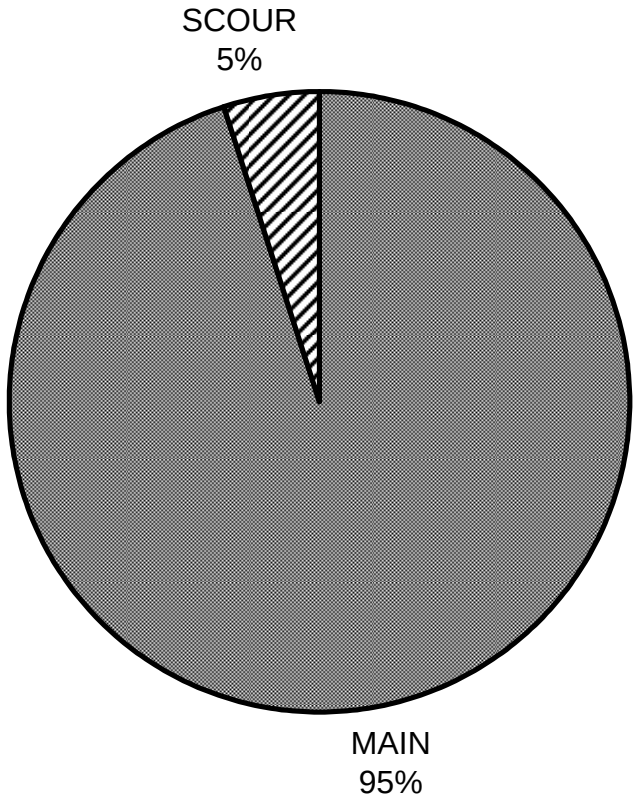
BEAR CREEK 2002

MAXIMUM DEPTH IN POOLS



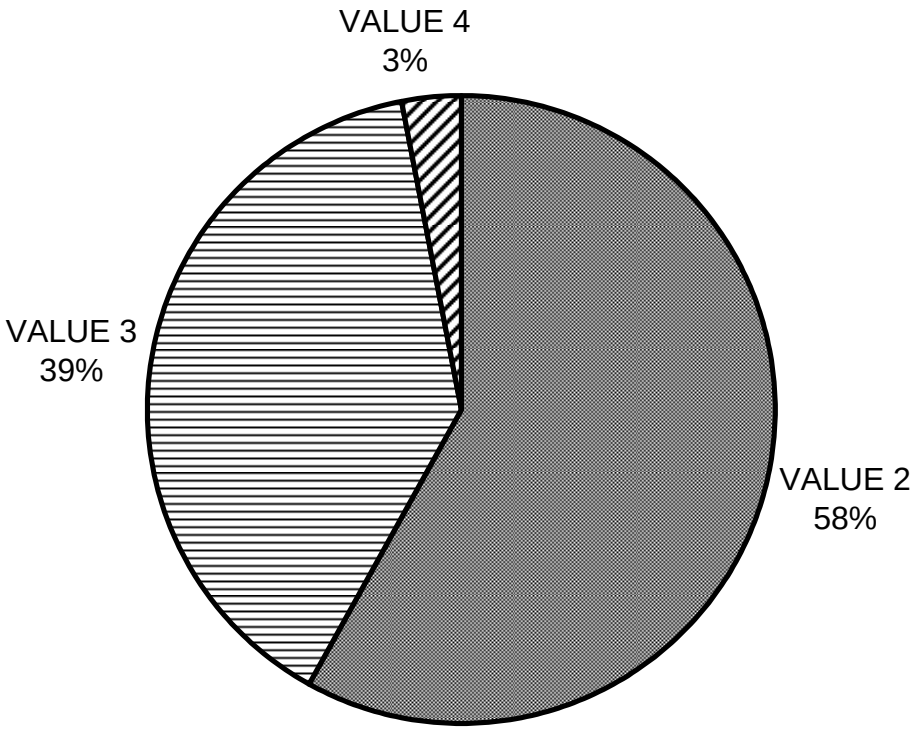
GRAPH 5

BEAR CREEK 2002
POOL HABITAT TYPES BY PERCENT OCCURRENCE



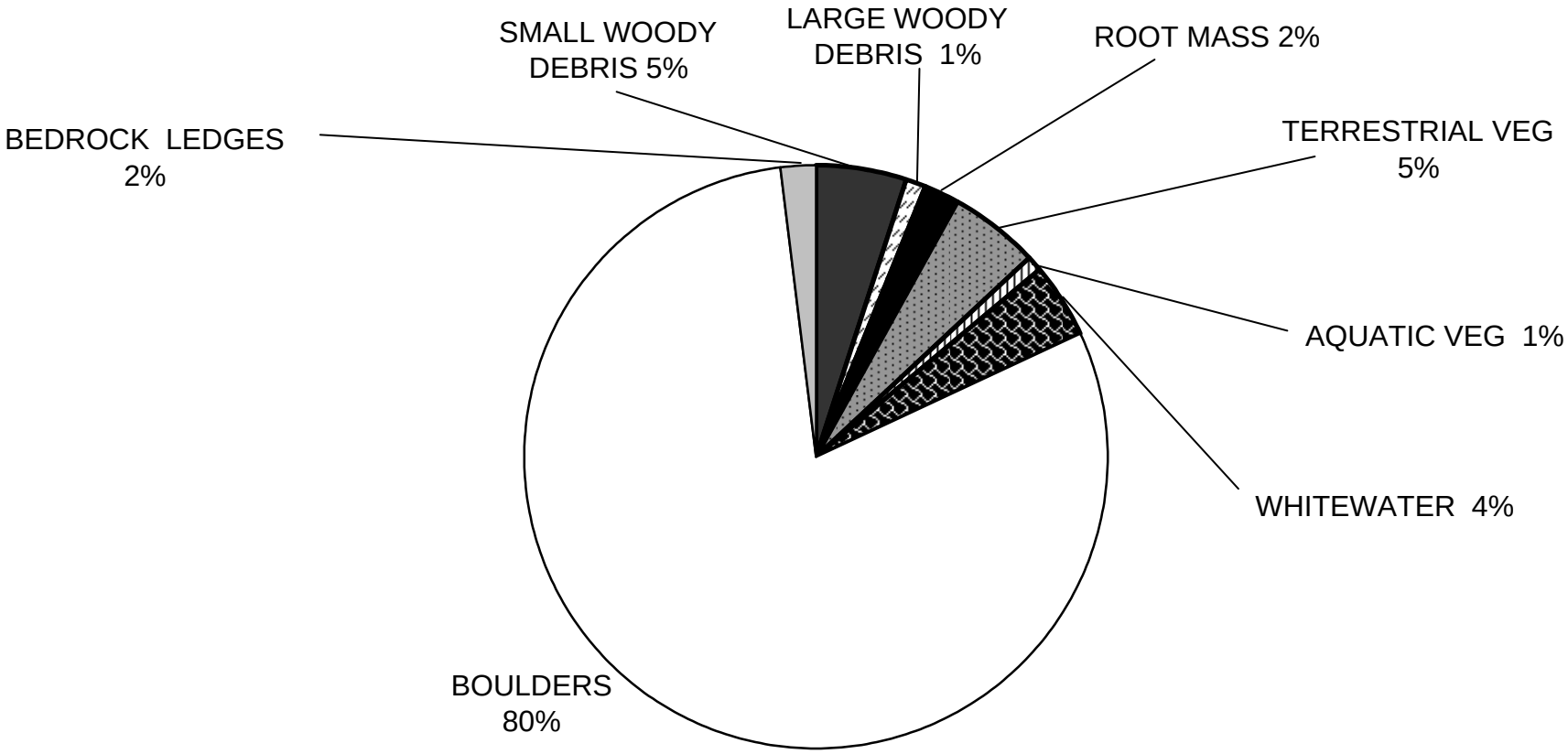
GRAPH 4

BEAR CREEK 2002
PERCENT EMBEDDEDNESS



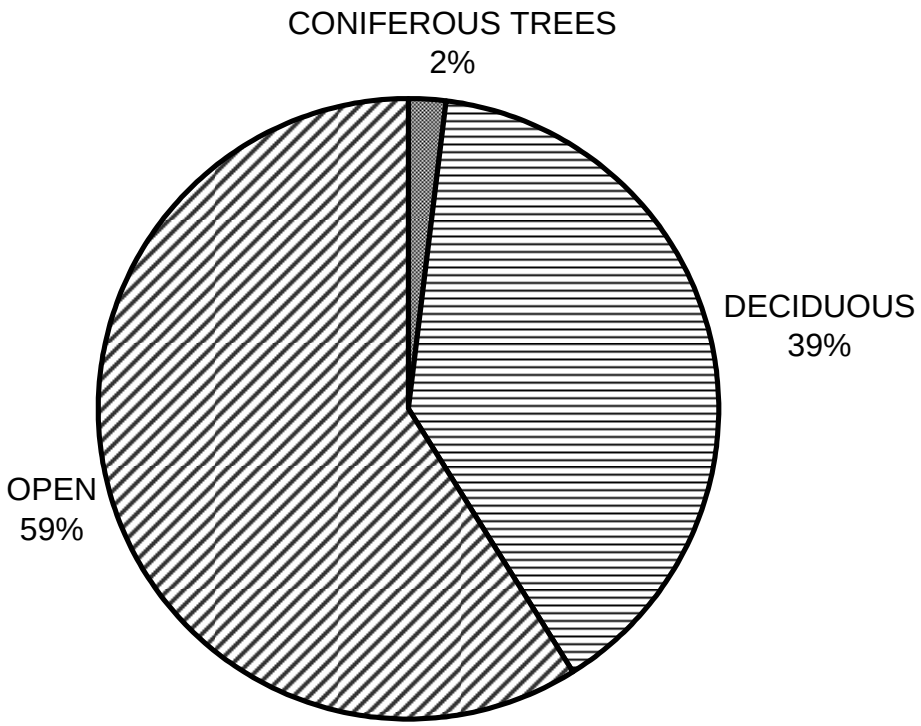
GRAPH 6

BEAR CREEK 2002
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

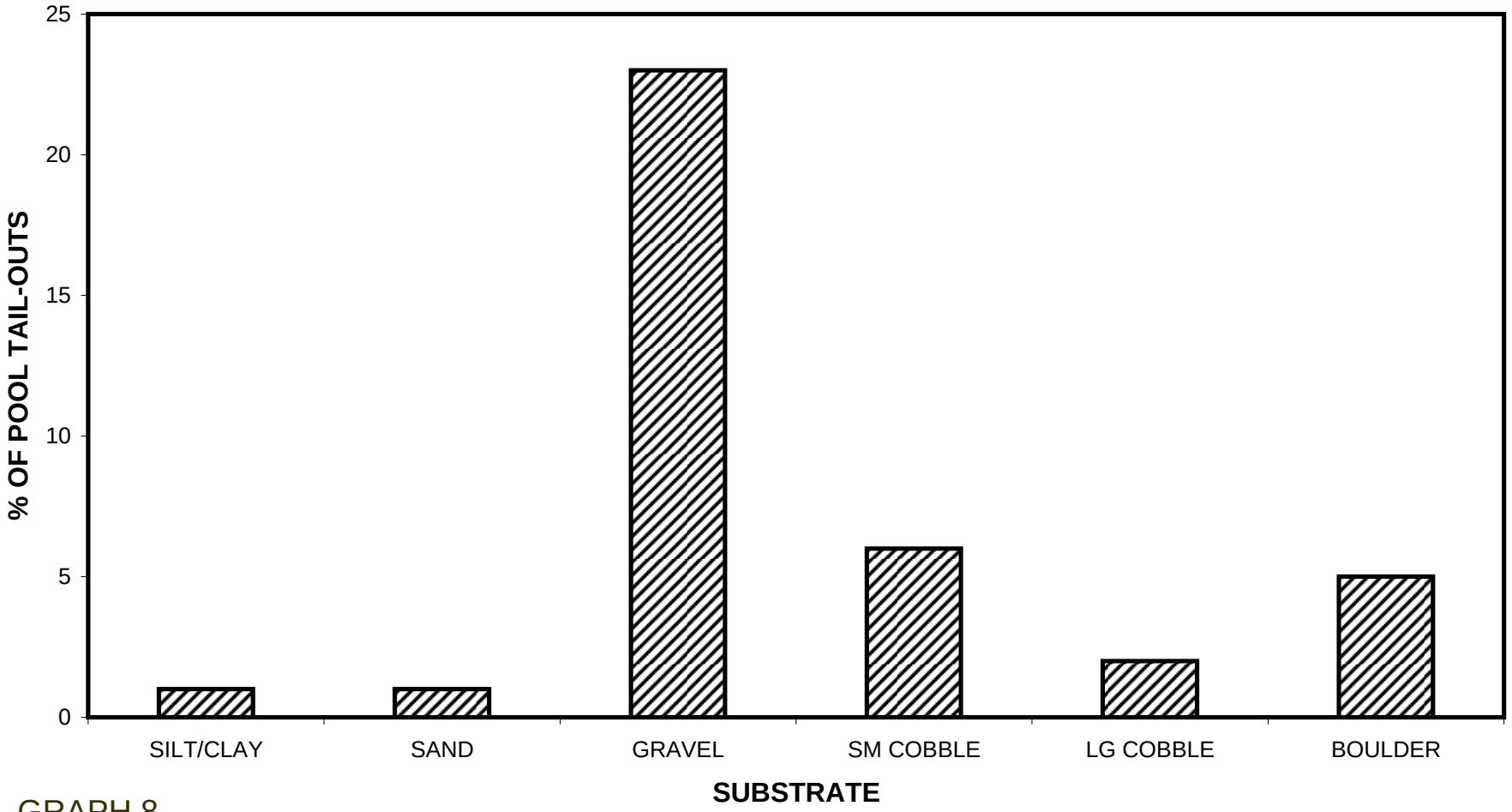
BEAR CREEK 2002
MEAN PERCENT CANOPY



GRAPH 9

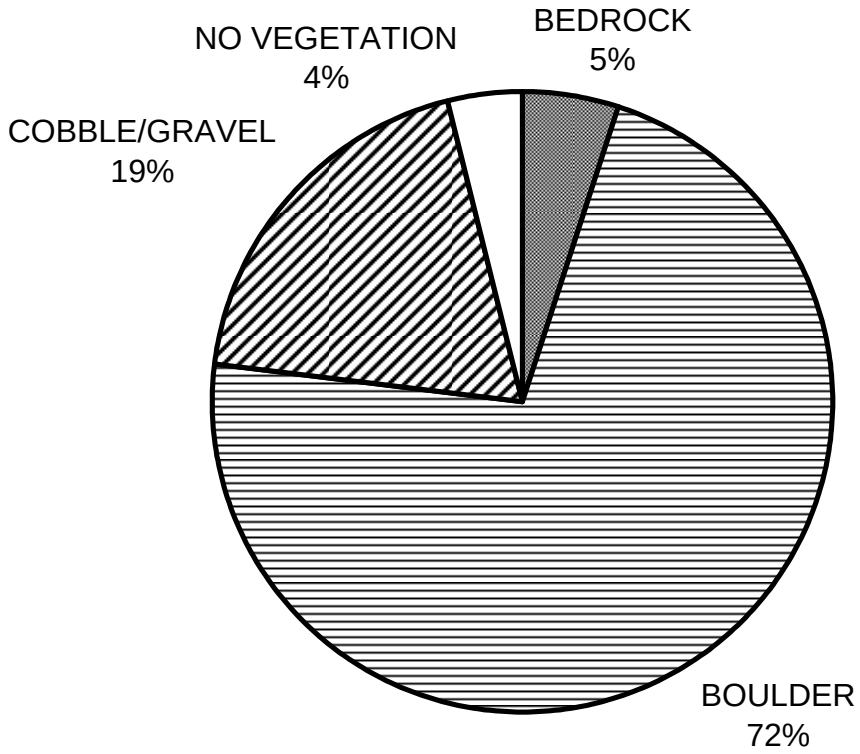
BEAR CREEK 2002

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



GRAPH 8

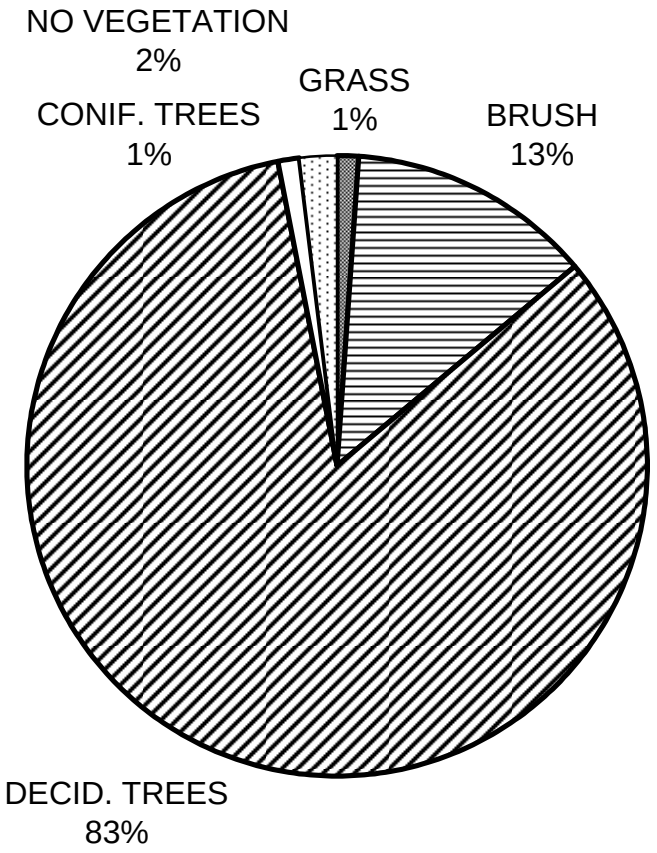
BEAR CREEK 2002
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

BEAR CREEK 2002

DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11