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

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Bluegum 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 Bluegum 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 Chinook salmon, coho salmon and steelhead trout.

WATERSHED OVERVIEW

Bluegum Creek is a tributary to McDonnell Creek which flows into Maacama Creek, a tributary of the Russian River, located in Sonoma County, California (see Bluegum Creek map, page 2). The legal description at the confluence with Maacama Creek is T10N, R8N, S27. Its location is 38°41'10" N. latitude and 122°41'29" W. longitude. Year round vehicle access exists from private roads via highway 128, near Calistoga.

Bluegum Creek and its tributaries drain a basin of approximately 0.7 square miles. Bluegum Creek is a second order stream and has approximately 1.5 miles of blue line stream, according to the USGS Mt. St. Helena and Jimtown 7.5 minute quadrangles. Elevations range from about 360 feet at the mouth of the creek to 800 feet in the headwaters. Oak-woodland and grassland dominate the watershed, which is entirely privately owned.

METHODS

The habitat inventory conducted in Bluegum 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 Bluegum 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 standard flow measuring equipment, if available. In some cases flows are estimated. Flows were also measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1996). 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.

3. Temperatures:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface.
Temperatures are also recorded using remote Temperature recorders which log temperature every two hours, 24 hours/day.

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". Bluegum 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 unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Bluegum 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), 76 - 100% (value 4). Additionally, a rating of "not suitable" (NS) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Bluegum Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. 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 measured habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual, 1998. Canopy density relates to the amount of stream shaded from the sun. In Bluegum 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:

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 Bluegum Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation 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 Bluegum 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

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 1-12, 1996 was conducted by Ann Huber and Sarah Nossaman (AmeriCorps) and data analyzed by Ken Bunzel (DFG). The survey began at the confluence with McDonnell Creek and extended up Bluegum Creek until salmonids were no longer observed. The total length of the stream surveyed was 10,959 feet, with an additional 59 feet of side channel. A flow of 0.30 cfs was measured on July 15, 1996 near the mouth (habitat unit 2) using a Marsh-McBirney Model 2000 flowmeter.

This section of Bluegum Creek has 3 channel types: from the mouth to 1,051 feet a B4; next 6,836 feet an F3 and the upper 3,072 feet an A6. B4 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and have a predominantly gravel substrate. F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble substrate. A6 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly silt/clay substrate.

Water temperatures ranged from 58-78°F and air temperatures ranged from 62-92°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 39% flatwater units, 33% riffle units, and 28% pool units. Based on total **length** there were 53% flatwater units, 31% riffle units, and 15% pool units (Graph 1).

Two hundred, eighty-four habitat units were measured and 24% were completely sampled. Fourteen 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 27%, runs 19%, and step runs 17% (Graph 2). By percent total **length**, step runs made up 29%, low gradient riffles 24%, and runs 21%.

Seventy-nine pools were identified (Table 3). Scour pools were most often encountered at 57%, 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. Eighteen of the 79 pools (23%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 4% 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 28. Flatwater had the lowest rating with 3 and pools rated 19 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 21, and main channel pools rated 18 (Table 3). Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 34%, undercut banks 27%, and root masses 19%. Graph 5 describes the pool shelter in Bluegum Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 1 of the 10 low gradient riffles measured. Small cobble was dominant in 4 of the low gradient riffles (Graph 6). The depth of cobble embeddedness was estimated at pool tail-outs. Of the 79 pool tail-outs measured, none had a value of 1; 39 had a value of 2 (49%); 25 had a value of 3 (32%); and 15 had a value of 4 (19%). On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 87%. The mean percentages of deciduous and evergreen trees were 43% and 57%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 64% and the mean percent left bank vegetated was 66%. For the habitat units measured, the dominant vegetation types for the stream banks were: 34% grass, 31% deciduous trees, 30% evergreen trees, 3% brush and 1% bare soil. The dominant substrate for the stream banks were: 49% silt/clay/sand, 19% bedrock, 17%

boulder and 15% cobble/gravel (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On July 17, 1996 a biological inventory was conducted in four sites of Blue Gum 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 63-80°F and the water temperature ranged from 60-65°F. The observers were Huber (AmeriCorps), Sanchez (AmeriCorps), Carey (AmeriCorps), Hards, Coey.

The inventory of Reach 1 started 25 feet upstream from the mouth in habitat unit 21 and ended in habitat unit 24. In pool and riffle habitat types 35 0+, one 1+ and one 2+ steelhead were observed along with 16 juvenile Sacramento Squawfish, two frogs and one crayfish. This section had an approximate length of 960 feet.

The inventory of Reach 2 was conducted in habitat units 30-47 and had an approximate length of 899 feet. In pool and riffle habitat types 15 0+ and 5 1+ steelhead were observed along with three frogs and eight sculpin (Cottus Sp.).

The inventory of Reach 2 was conducted in habitat units 48-60 and had an approximate length of 659 feet. In pool and riffle habitat types 29 0+ and seven 1+ steelhead were observed along with three sculpin.

The inventory of Reach 3 was conducted in habitat units 205-245 and had an approximate length of 1495 feet. In pool and riffle habitat types ten 0+ and nine 1+ steelhead were observed along with six frogs.

Another biological inventory of Bluegum Creek was conducted by Sanchez, Carey (AmeriCorps), and Coey (DFG). The inventory of Reach 1 was conducted in habitat units 39-50 and had an approximate length of 482 feet. In pool and riffle habitat types 28 0+ and two 1+ steelhead were observed along with 35 Yellow-legged Frogs, 18 sculpin and three Pacific Giant Salamanders.

The inventory of Reach 2 was conducted in habitat units 145-155 and had an approximate length of 303 feet. In pool and riffle habitat types six 0+ and nine 1+ steelhead were observed along with 13 Yellow-legged Frogs.

The inventory of Reach 3 was conducted in habitat units 205-215 and had an approximate length of 428 feet. In pool and riffle habitat types ten 0+ and two 1+ steelhead were observed along with five Yellow-legged Frogs and two Pacific Giant Salamanders.

A summary of historical and recent data collected appears in the table below.

Species Observed In DFG 1996 Survey	
SPECIES	**Native/Introduced**
Steelhead	N
Sacramento pikeminnow	N
Sculpin (Cottus Sp.)	N
Crayfish	N
Pacific Giant Salamander	N
Yellow-legged Frog	N

No introduced species were observed, and historical records reflect no hatchery stocking, transfers, or rescues have occurred in the watershed.

DISCUSSION

Bluegum Creek has three channel types: B4, F3, and A6. There are 1,051 feet of B4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, fisheries enhancement opportunities in B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs.

There are 6,836 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.

There are 3,072 feet of A6 channel type in Reach 3. A6 channel types are good for bank-placed boulders and fair for low and medium-stage weirs, opposing wing deflectors and log cover.

The B4 and F3 channel types have gradients and the stable stream banks that are suitable for instream habitat improvement alternatives designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish.

The water temperatures recorded on the survey days July 1-12, 1996 ranged from 58-78°F and air temperatures ranged from 62-92°F. The warmer water temperatures were recorded in Reach 2. These temperatures, if sustained, are above the threshold stress level 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.

The mean percent canopy for the survey was 87%. This is excellent, since 80 percent is generally considered desirable. Shade canopy increased in an upstream direction. However, the headwater areas may have low shade canopy, contributing to the higher water temperatures recorded downstream in Reaches 1 and 2. Elevated water temperatures could be reduced by increasing stream canopy throughout the watershed.

Pools comprised 15% 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 Bluegum Creek, 23% of the pools had a maximum depth of at least 2 feet, comprising 4% of the total length of stream habitat.

The mean shelter rating for pools was 19, provided primarily by boulders and undercut banks. Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

Half of the low gradient riffles measured had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids. In a reach comparison, cobble embeddedness levels increased in an upstream direction with Reach 1 having the best and Reach 3 having the poorest ratings. The best salmonid spawning habitat is in Reach 1 where gravel and cobble exist with low levels of fine sediment. Reach 2 is less suitable for spawning habitat due to higher levels of fine

sediment. Reach 3 has a predominantly silt/clay substrate, making it naturally geologically unsuitable for salmonid spawning.

SUMMARY

Biological surveys were conducted to document fish distribution and are not necessarily representative of population information. The 1996 spring surveys documented many 0+ fish indicating successful spawning, and many 1+ fish indicating good rearing conditions the year before or good holding-over conditions in general.

Although shade canopy levels are good, water temperatures are high, indicating low canopy levels upstream of the surveyed section. The best spawning habitat is in Reach 1, where gravel is abundant and fine sediment is low. Good rearing habitat exists in all reaches.

GENERAL RECOMMENDATIONS

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

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. 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) The riparian areas upstream of the surveyed section should be assessed for shade canopy and erosion, since water temperatures and fine sediment levels throughout are effected from upstream. If needed, increase the canopy by planting willow, alder, redwood, and Douglas fir where shade canopy is not at acceptable levels. In many cases, planting will also need to be coordinated to follow bank stabilization or upslope erosion control projects.

2) Armor and stabilize gullies, blow-outs and bank erosion sites (units 90, 144, 145, 163, 164, 197, 261, and 277). Planting of these sites should be done during the winter rainy season.

3) Due to its excellent habitat qualities, Bluegum Creek should be monitored for fish and macro-invertebrate populations. Data

collected will aid in restoring other similar Russian River tributaries.

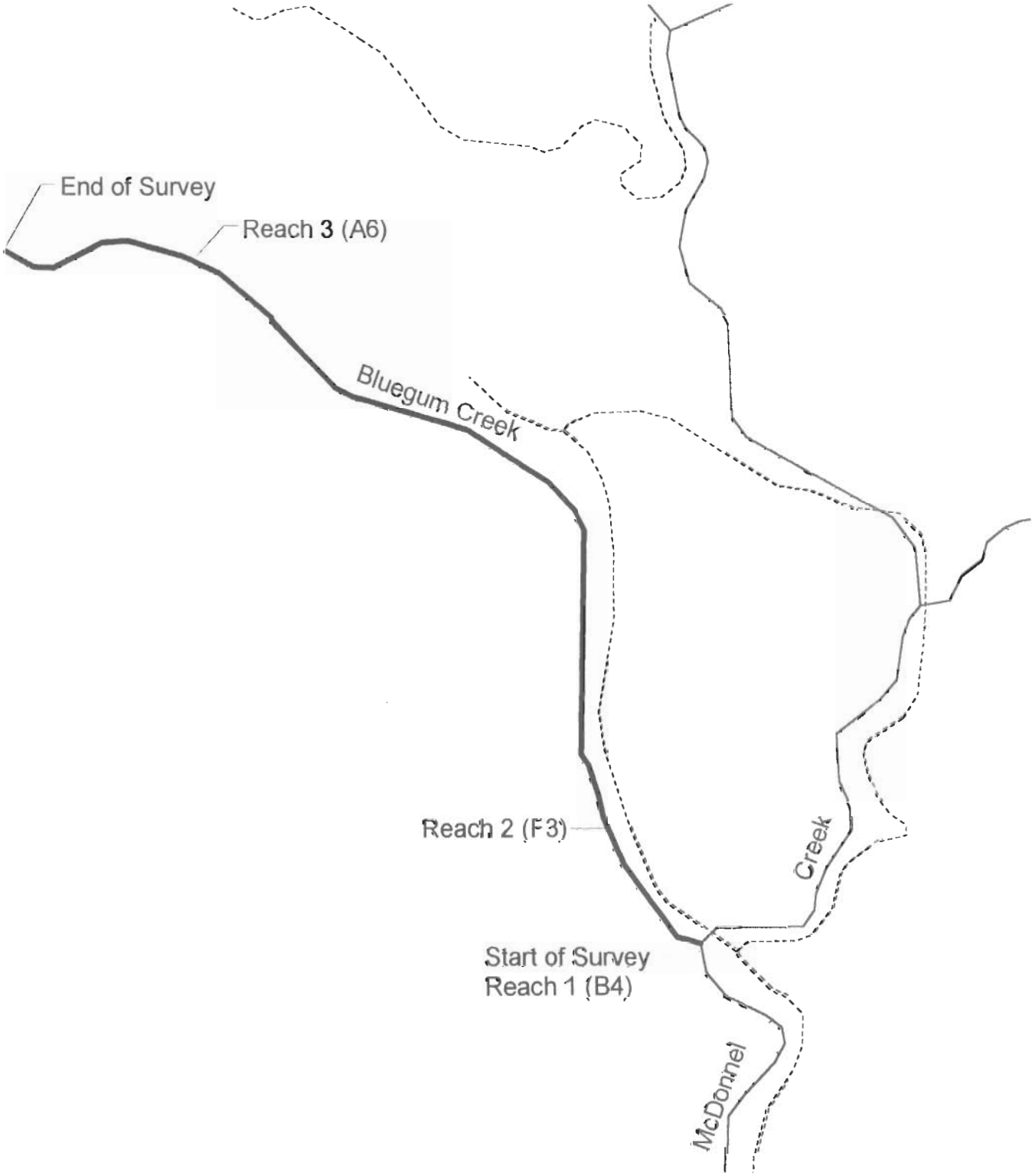
PROBLEM SITES AND LANDMARKS - BLUEGUM CREEK SURVEY COMMENTS

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
1.00	35	DIRT ROAD LF BANK UNTIL UNIT
2.00	70	ERODED RT BANK
4.00	135	ABUNDANT JUV. SQUAW, RT BANK BLOWOUT 7'H X 20'L X 5'W
5.00	243	ERODED LF BANK
76.00	3262	SMALL DRY TRIB RT BANK
77.00	3271	DRY SMALL TRIB LF BANK
81.00	3387	UNIDENTIFIED FISH 4" LONG
84.00	3521	SM DRY TRIB RT BANK
87.00	3642	GOOD CHANNEL TYPING SPOT
88.00	3684	JUV SQUAW 4" POSSIBLE SQUAW/SH
90.00	3746	BLOWOUT RT BANK 20'L X 30'H X 15'W
93.00	3817	SM DRY TRIB LF BANK
99.00	3957	SM DRY TRIB RT
113.00	4385	GOOD EF SPOT, TWO- 1+ SALMONIDS, ONE-0+ SALMONID
115.00	4474	CATTLE CROSSING
116.00	4512	TRIB RT BANK- 64°F, CONFLUENCE-64°F, 6 FT FALLS 40 FT UP TRIB, NO HABITAT ABOVE FALLS
120.00	4691	POSS CHANNEL CHANGE, MORE ENTRENCHED BEDROCK, DRY TRIB LEFT BANK
121.00	4710	POSS START OF NEW CHANNEL TYPE
125.00	4855	START VERY ENTRENCHED. POSS CHANNEL CHANGE
126.00	4925	DRY TRIB LF BANK
140.00	5236	SM DRY TRIB RT
143.00	5484	DRY TRIB LEFT BANK
144.00	5514	REVEGETATED BLOWOUT LF BANK -50'L X 30'H X 25'W
145.00	5527	UPPER HALF REVEGETATED W/ GRASS, BLOWOUT RT BANK 30'L X 35'H X 30'W
151.00	5738	SM DRY TRIB LF BANK
154.00	5793	TRIB RT BANK- 62°F, 64°F AT CONFLUENCE, 5FT HIGH BOULDER WALL

		60 FT UP, NO FISH
158.00	5909	DEAD FAWN IN CREEK
161.00	5991	DRY TRIB RT BANK
163.00	6029	ERODED TRIB RT BANK
164.00	6075	ERODED LT BANK
168.00	6157	SM DRY TRIB RT BANK
170.00	6286	SM DRY TRIB LF BANK
173.00	6410	JUV SQUAWFISH
176.00	6577	SM DRY TRIB LF BANK
182.00	6733	DRY TRIB LF BANK
187.00	7044	2+ STEELHEAD
197.00	7438	ERODED LF BANK
198.00	7459	ERODED LF BANK
203.00	7640	DRY TRIB RT BANK
206.00	7883	RD ALONG LF BANK LARGE DRY TRIB LF BANK (N. FORK)
220.00	8369	SWORD FERNS COVER WETTED CHANNEL
223.00	8440	DOWNCUT UP TO 10'H IN UNITS 205 ON
235.00	8888	DRY TRIB LT, RD 150' UP LEFT BANK
236.00	8898	DRY TRIB RT BANK
240.00	9027	HIGHLY ERODIBLE LEFT BANK
244.00	9170	LEFT BANK DRY TRIB
252.00	9597	DRY TRIB LF BANK (SUBSTANTIAL TRIB)
259.00	9823	DRY TRIB RIGHT BANK
261.00	9928	
265.00	10145	NO FISH SEEN IN UNITS 236-265
275.00	10392	CAL. NEWT
277.00	10472	CREEK IMPASSABLE DUE TO LANDSLIDE , FALLEN TREES 56'L X 75'H, HEALED OVER SCARP
283.00	10979	WET TRIB RT BANK TEMP-60°F, SAME AT CONFLUENCE, WET TRIB RT BANK TEMP-60°F,(55 FT ABOVE 1ST TRIB IN UNIT), 9'H BEDROCK FALL AT END OF UNIT NO FISH SEEN ALL DAY. END SURVEY

Bluegum Creek



Bluegum Creek — Drainage: McDonnel Creek, Maacama Creek, Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 07/01/96 to 07/12/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 — LATITUDE: 38°41'10" — LONGITUDE: 122°41'29"

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
1	0		0	56	56	1	0.0	0.0	0	0	0	0	0	0
94	14	RIFFLE	33	37	3465	31	4.4	0.2	94	8824	25	2377	0	28
110	23	FLATWATER	39	53	5843	53	5.1	0.5	176	19357	83	9128	0	3
79	32	POOL	28	22	1710	15	6.4	0.8	129	10216	107	8481	69	19

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
284	69	11074	38397	19986

Bluegum Creek

Drainage: McDonnel Creek, Maacama Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/01/96 to 07/12/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°41'29"

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 %
1	0		0	56	56	1	0	0.0	0.0	0	0	0	0	0	0	0
78	10	LGR	27	34	2616	24	5	0.3	3.0	121	9404	33	2583	0	14	82
11	1	HGR	4	72	788	7	3	0.2	0.3	24	264	5	53	0	0	96
5	3	CAS	2	12	61	1	3	0.2	0.6	28	141	6	30	0	83	97
3	1	POW	1	44	132	1	8	0.4	0.7	174	523	70	209	0	20	98
4	3	GLD	1	36	144	1	7	0.5	1.1	303	1211	154	616	0	5	95
54	12	RUN	19	44	2376	21	5	0.5	1.1	153	8264	72	3878	0	2	87
49	7	SRN	17	65	3192	29	4	0.4	1.0	161	7898	74	3603	0	4	86
26	7	MCP	9	23	604	5	7	0.8	2.5	141	3671	108	2818	68	21	89
8	4	STP	3	27	214	2	6	0.9	2.2	142	1136	139	1109	84	7	90
1	1	CRP	0	23	23	0	6	0.8	1.8	123	123	99	99	49	60	100
7	4	LSR	2	28	197	2	6	0.7	2.8	164	1150	134	935	97	44	91
11	6	LSBk	4	17	188	2	5	0.7	1.8	84	925	56	620	37	5	90
13	3	LSBo	5	25	322	3	7	0.9	2.7	163	2114	135	1755	85	20	91
13	7	PLP	5	13	163	1	7	1.0	3.7	84	1096	88	1146	63	19	87

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
284	69	11074	37921	19454

Bluegum Creek

Drainage: McDonnel Creek, Maacama Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/01/96 to 07/12/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°41'29"

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
1	0		1	56	56	3	0.0	0.0	0	0	0	0	0	0
34	11	MAIN	43	24	818	46	6.6	0.8	141	4807	115	3926	71	18
45	21	SCOUR	56	20	892	51	6.3	0.8	120	5409	101	4555	68	21

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
80	32	1766	10216	8481

Bluegum Creek

Drainage: McDonnel Creek, Maacama Creek, Russian River

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

Survey Dates: 07/01/96 to 07/12/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°41'29"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
1		1	1	100	0	0	0	0	0	0	0	0
26	MCP	33	0	0	21	81	5	19	0	0	0	0
8	STP	10	0	0	5	63	3	38	0	0	0	0
1	CRP	1	0	0	1	100	0	0	0	0	0	0
7	LSR	9	0	0	6	86	1	14	0	0	0	0
11	LSBk	14	0	0	11	100	0	0	0	0	0	0
13	LSBo	16	0	0	8	62	5	38	0	0	0	0
13	PLP	16	0	0	9	69	3	23	1	8	0	0

TOTAL UNITS 80

Bluegum Creek

Drainage: McDonnel Creek, Maacama Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 07/01/96 to 07/12/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°41'29"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	SQ. FT. UNDERCUT BANKS	SQ. FT. SWD	SQ. FT. LWD	SQ. FT. ROOT MASS	SQ. FT. TERR. VEGETATION	SQ. FT. AQUATIC VEGETATION	SQ. FT. WHITE WATER	SQ. FT. BOULDERS	SQ. FT. BEDROCK LEDGES
1	0		0	0	0	0	0	0	0	0	0
78	10	LGR	27	0	0	0	2	176	0	15	0
11	1	HGR	0	0	0	0	0	0	0	0	0
5	3	CAS	1	1	10	0	0	0	5	13	0
3	1	POW	0	0	0	0	0	0	0	44	0
4	3	GLD	7	0	0	0	0	23	0	9	0
54	12	RUN	9	0	0	0	0	14	0	11	0
49	7	SRN	3	0	0	0	0	28	0	12	0
26	26	MCP	197	4	15	9	0	32	0	106	25
8	8	STP	8	0	0	9	0	0	0	40	10
1	1	CRP	9	26	9	0	0	0	0	0	0
7	7	LSR	120	8	0	258	0	7	0	7	0
11	11	LSBk	6	0	22	0	0	0	0	15	8
13	13	LSBo	43	10	8	0	0	57	0	214	0
13	13	PLP	17	12	2	0	0	0	6	116	33
284	116	TOTAL	447	61	66	276	2	337	11	602	76
			24%	3%	4%	15%	0%	18%	1%	32%	4%
79	79	TOTAL FOR POOLS	400	60	56	276	0	96	6	498	76
			27%	4%	4%	19%	0%	7%	0%	34%	5%

Bluegum Creek — Drainage: McDonnel Creek, Maacama Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 07/01/96 to 07/12/96

Confluence Location: QUAD: MOUNT ST H LEGAL DESCRIPTION: T10NR8WS27 LATITUDE: 38°41'10" LONGITUDE: 122°41'29"

TOTAL HABITAT UNITS	UNITS SUBSTRATE 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
1	0		0	0	0	0	0	0	0
18	10	LGR	0	10	10	40	30	0	10
1	1	HGR	0	0	0	0	0	100	0
5	3	CAS	0	0	0	0	0	33	67
3	1	POW	0	0	0	0	0	100	0
4	3	GLD	0	67	33	0	0	0	0
14	13	RUN	8	8	38	23	0	23	0
9	7	SRN	0	29	0	0	14	14	43
6	7	MCP	29	0	57	14	0	0	0
8	4	STP	0	50	0	0	0	25	25
1	1	CRP	0	100	0	0	0	0	0
7	4	LSR	75	25	0	0	0	0	0
11	6	LSBk	33	17	33	0	17	0	0
3	3	LSBo	0	0	33	33	0	33	0
13	8	PLP	25	38	38	0	0	0	0

Bluegum Creek

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

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Decidous	Mean Right bank % Cover	Mean Left Bank % Cover
87.42	57.32	42.68	64.21	65.71

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	17	10	19.29
Boulder	11	13	17.14
Cobble/Gravel	9	12	15
Silt/clay	33	35	48.57

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	21	27	34.29
Brush	2	2	2.86
Deciduous Trees	28	16	31.43
Evergreen Trees	17	25	30
No Vegetation	2	0	1.43

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Bluegum Creek
SAMPLE DATES: 07/01/96 to 07/12/96
STREAM LENGTH: 11015 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: MOUNT ST H — Latitude: 38°41'10"
Legal Description: T10NR8WS27 — Longitude: 122°41'29"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: B4	Canopy Density: 78%
Channel Length: 1051 ft.	Evergreen Component: 36%
Riffle/Flatwater Mean Width: 6 ft.	Deciduous Component: 64%
Total Pool Mean Depth: 0.8 ft.	Pools by Stream Length: 18%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 0%
Water: 65 - 71 °F Air: 90 - 92 °F	Mean Pool Shelter Rtn: 19
Dom. Bank Veg.: Grass	Dom. Shelter: Aquatic Vegetation
Vegetative Cover: 71%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

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

STREAM REACH 02

Channel Type: F3	Canopy Density: 87%
Channel Length: 6836 ft.	Evergreen Component: 57%
Riffle/Flatwater Mean Width: 5 ft.	Deciduous Component: 43%
Total Pool Mean Depth: 0.9 ft.	Pools by Stream Length: 20%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 2%
Water: 60 - 78 °F Air: 62 - 92 °F	Mean Pool Shelter Rtn: 19
Dom. Bank Veg.: Grass	Dom. Shelter: Boulders
Vegetative Cover: 65%	Occurrence of LOD: 27%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 47% 3. 34% 4. 19%

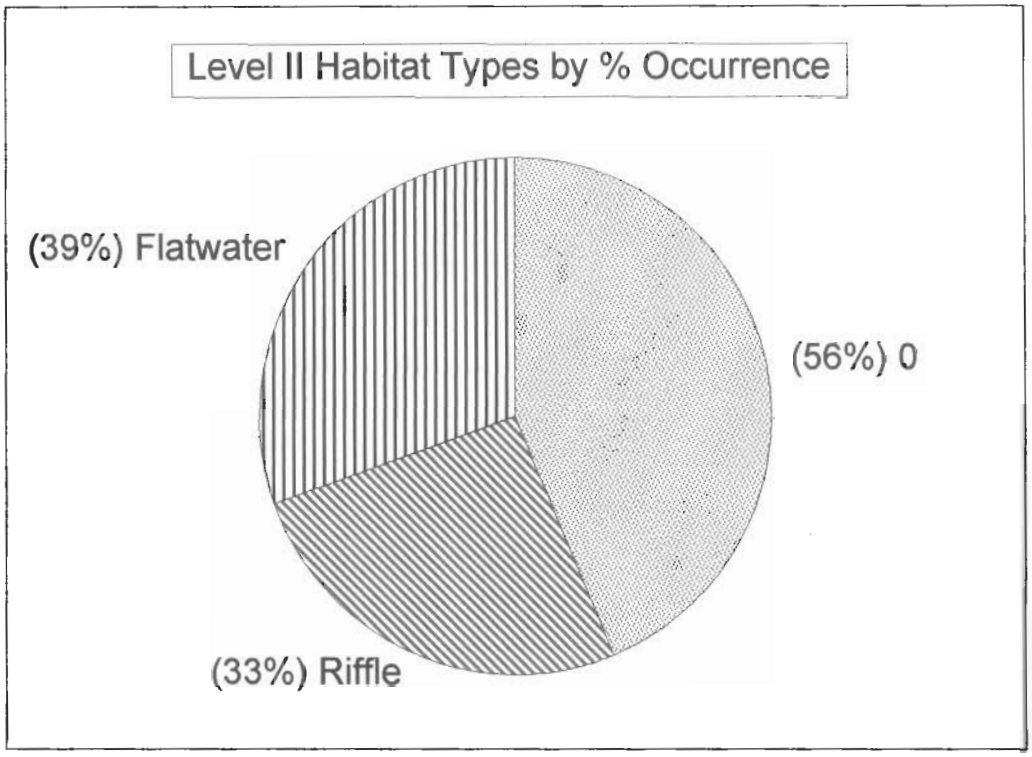
STREAM REACH 03

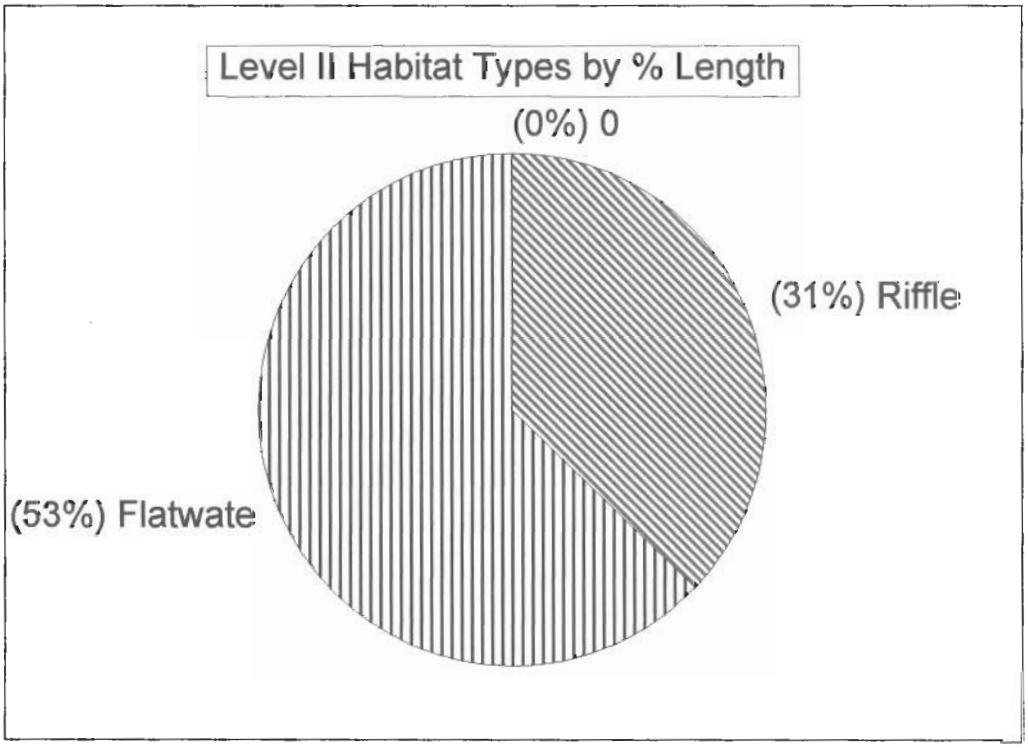
Channel Type: A6	Canopy Density: 92%
Channel Length: 3128 ft.	Evergreen Component: 68%
Riffle/Flatwater Mean Width: 3 ft.	Deciduous Component: 32%
Total Pool Mean Depth: 0.7 ft.	Pools by Stream Length: 5%
Base Flow: 0.0 cfs	Pools >=3 ft. deep: 0%
Water: 58 - 61 °F Air: 65 - 81 °F	Mean Pool Shelter Rtn: 23
Dom. Bank Veg.: Grass	Dom. Shelter: Undercut Banks
Vegetative Cover: 59%	Occurrence of LOD: 78%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 31% 3. 38% 4. 31%

Bluegum Creek

Level II Habitat Types

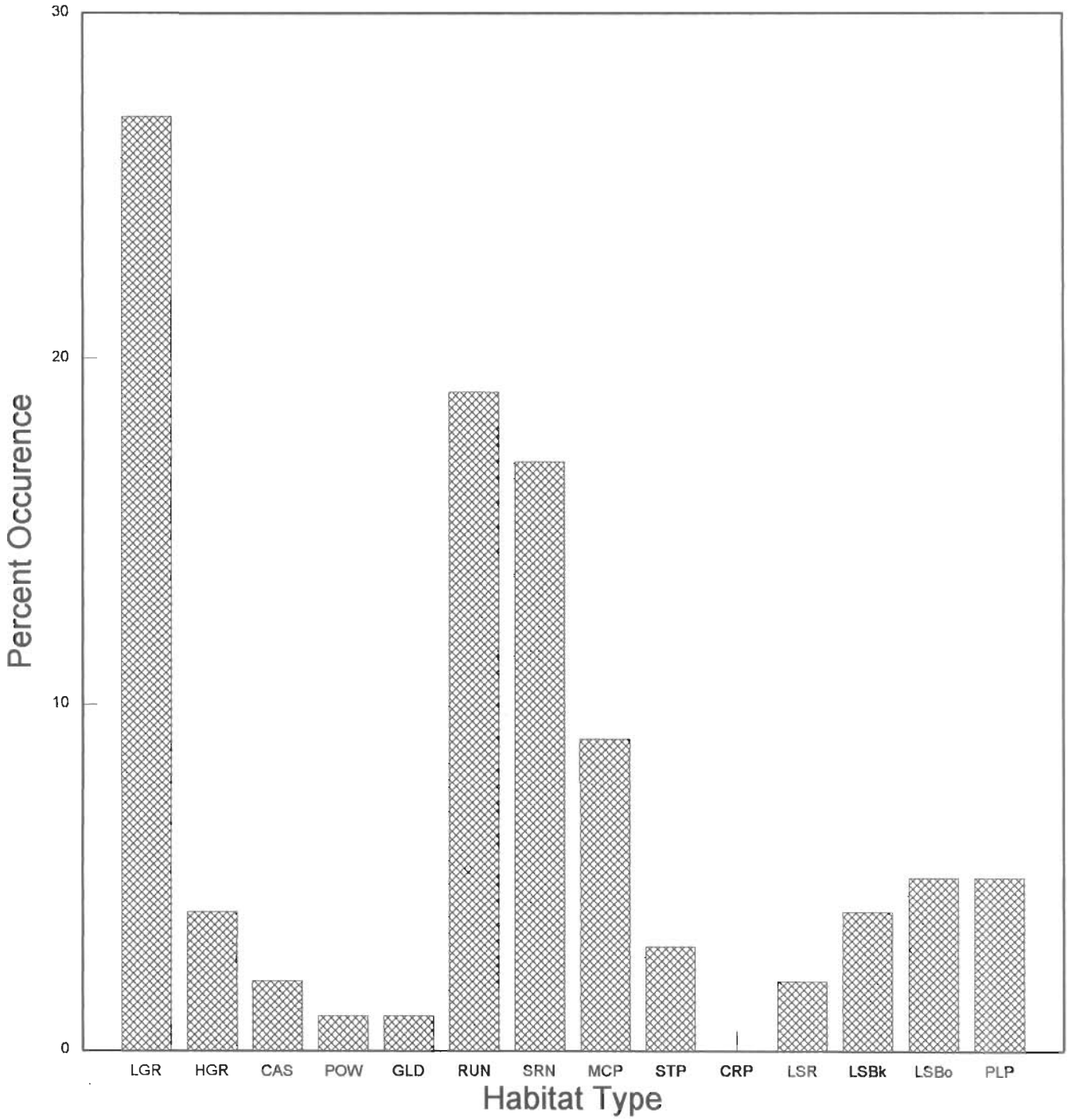




Graph 1

Bluegum Creek

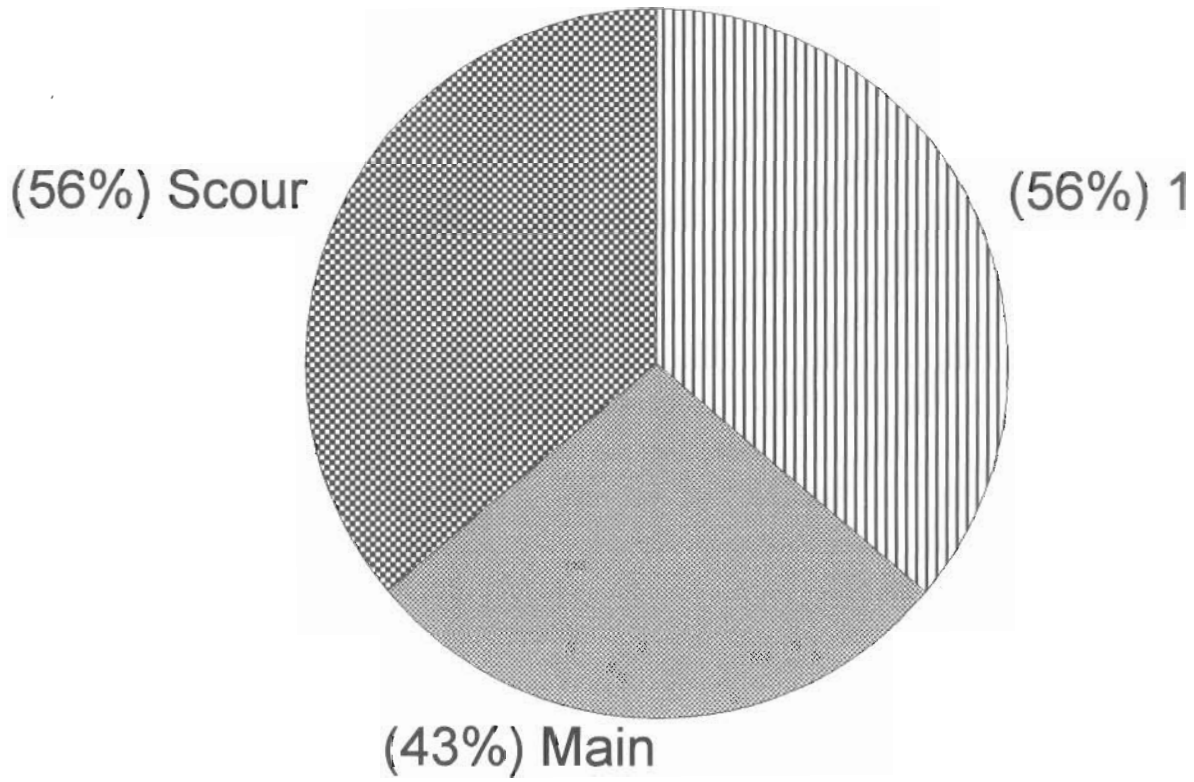
Level IV Habitat Types by % Occurrence



Graph 2

Bluegum Creek

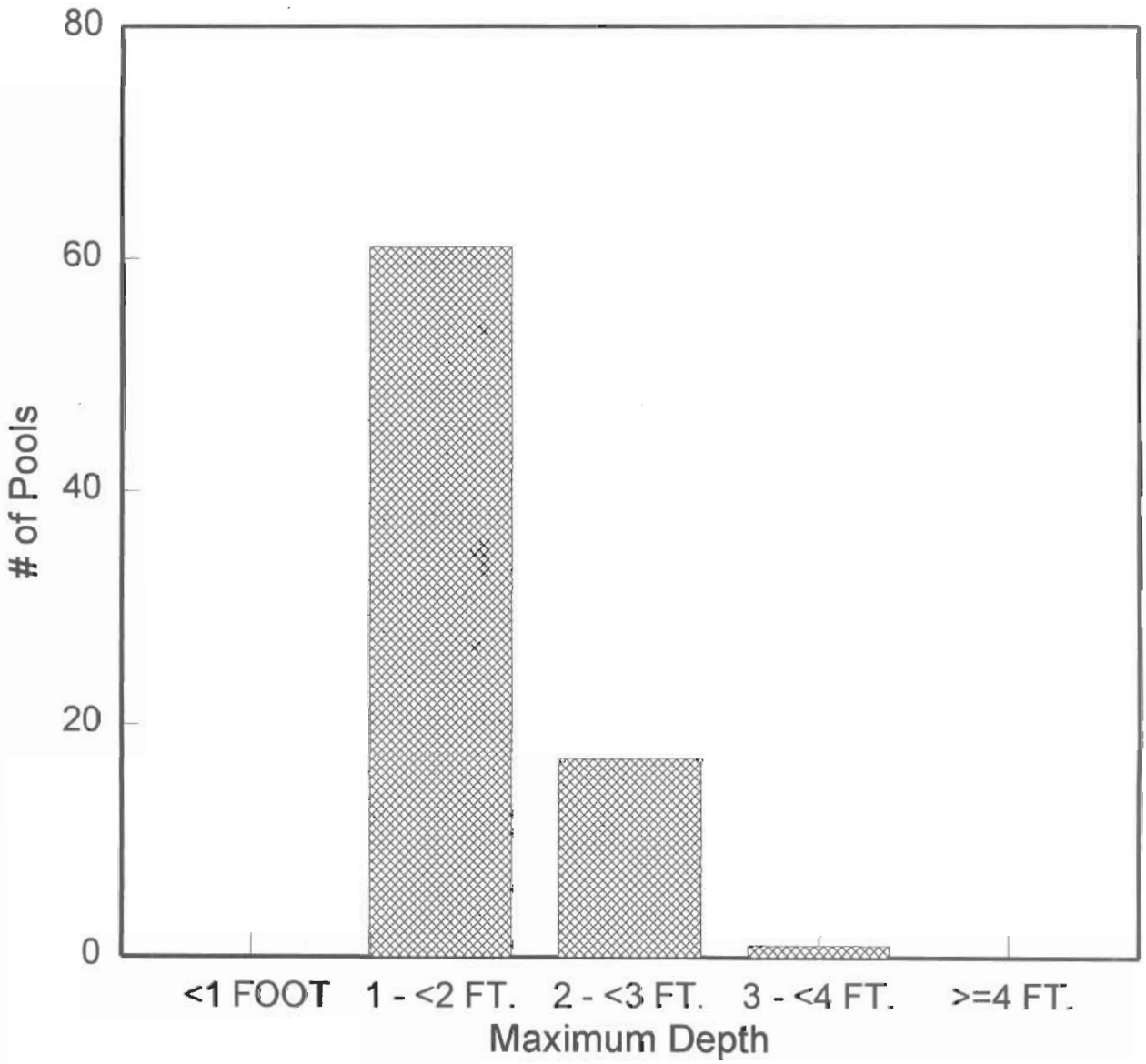
Pool Habitat Types by % Occurrence



Graph 3

Bluegum Creek

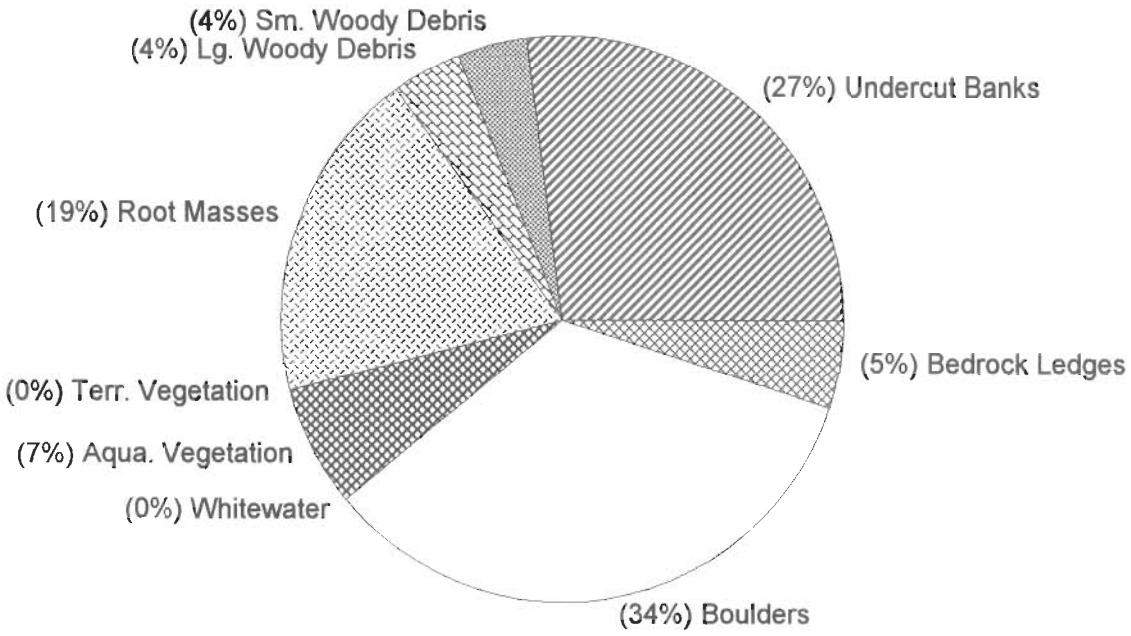
Maximum Depth in Pools



Graph 4

Bluegum Creek

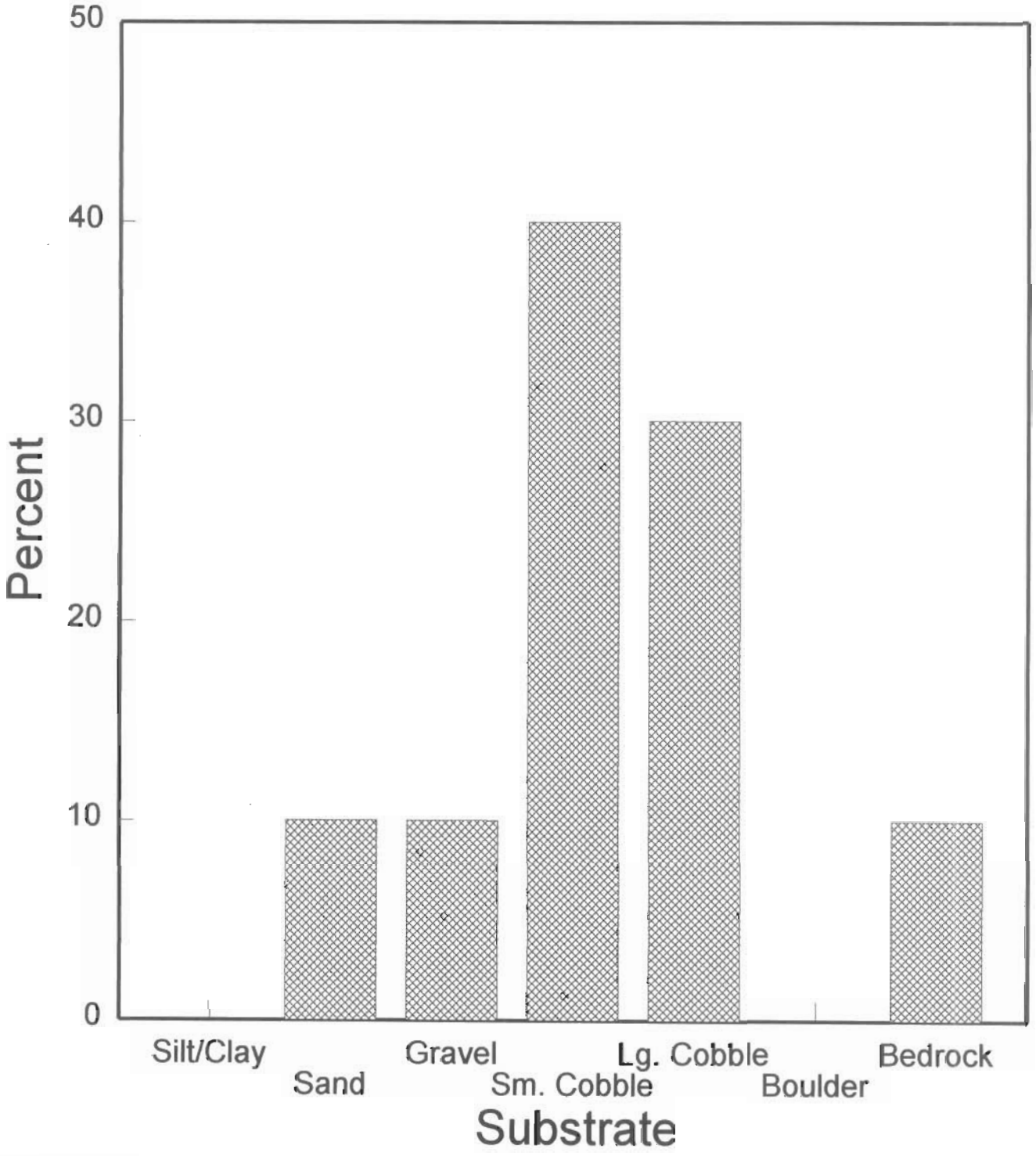
Pool Shelter Types by % Area



Graph 5

Bluegum Creek

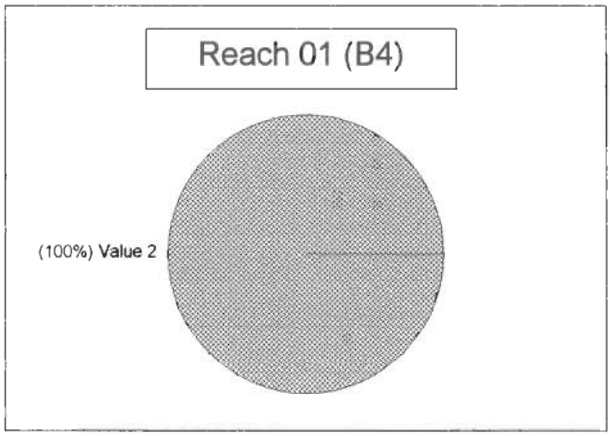
Substrate Composition in Low Gradient Riffles

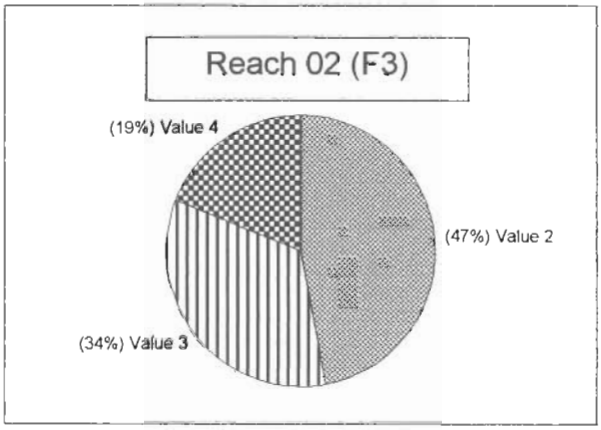


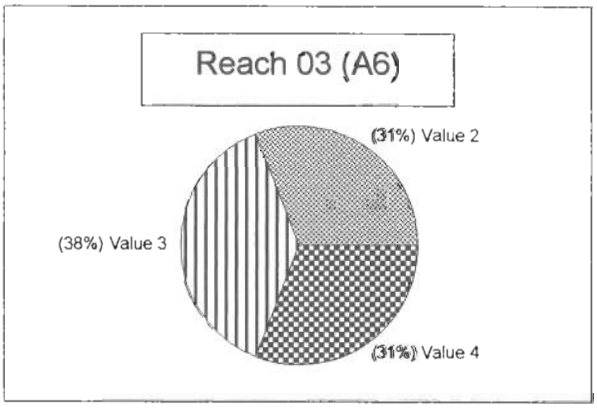
Graph 6

Bluegum Creek

Percent Cobble Embeddedness by Reach





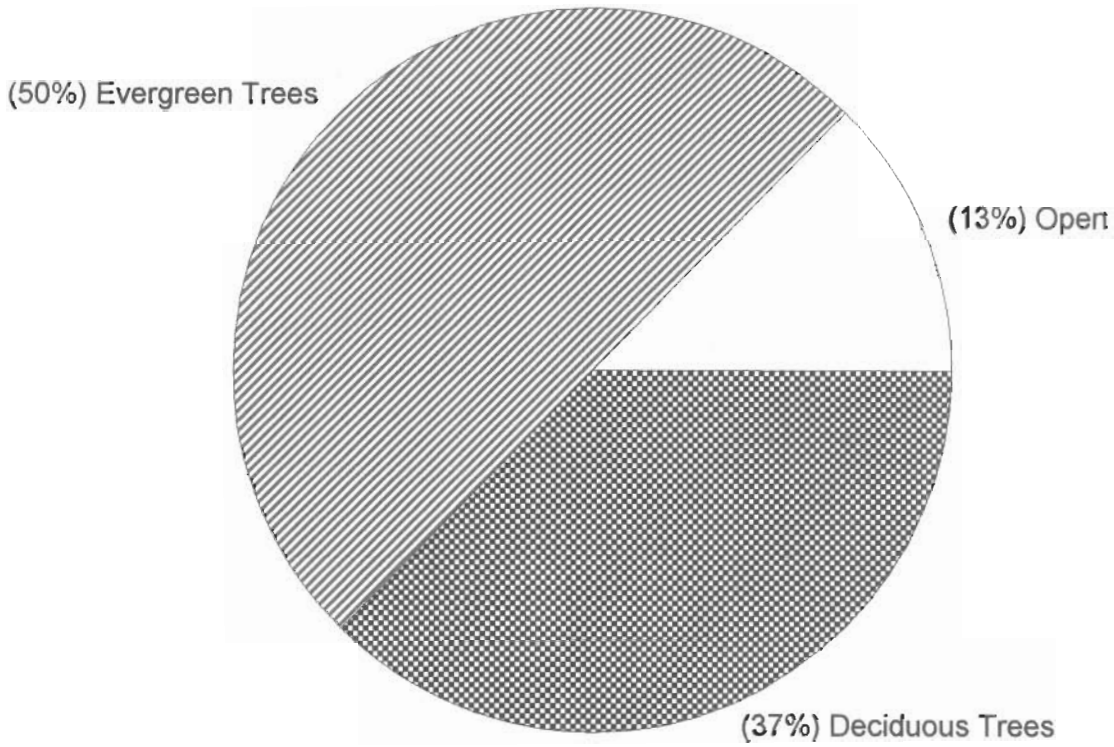


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 7

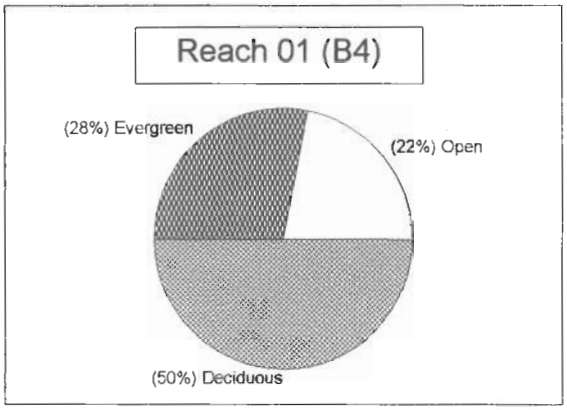
Bluegum Creek

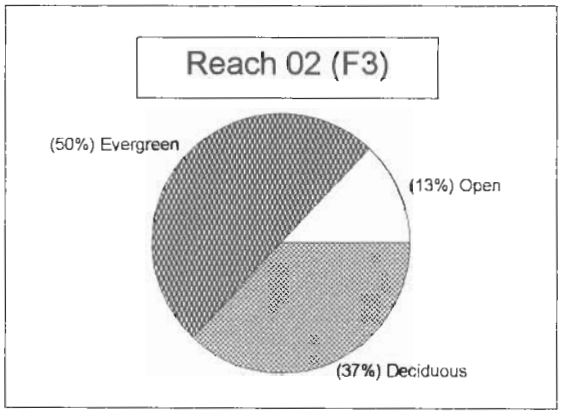
Mean Percent Canopy

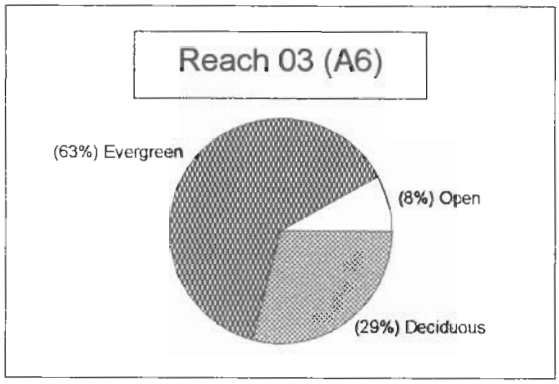


Graph 8

Bluegum Creek
Percent Canopy By Reach

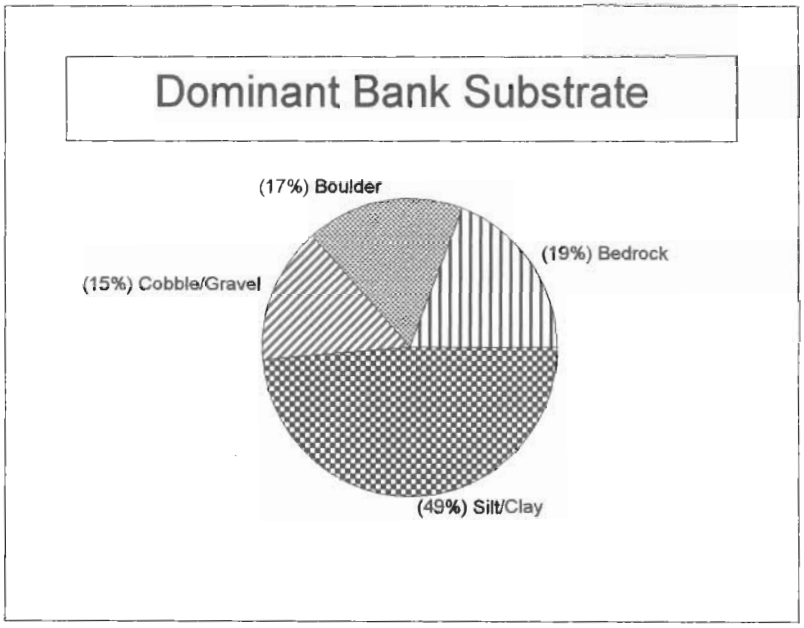


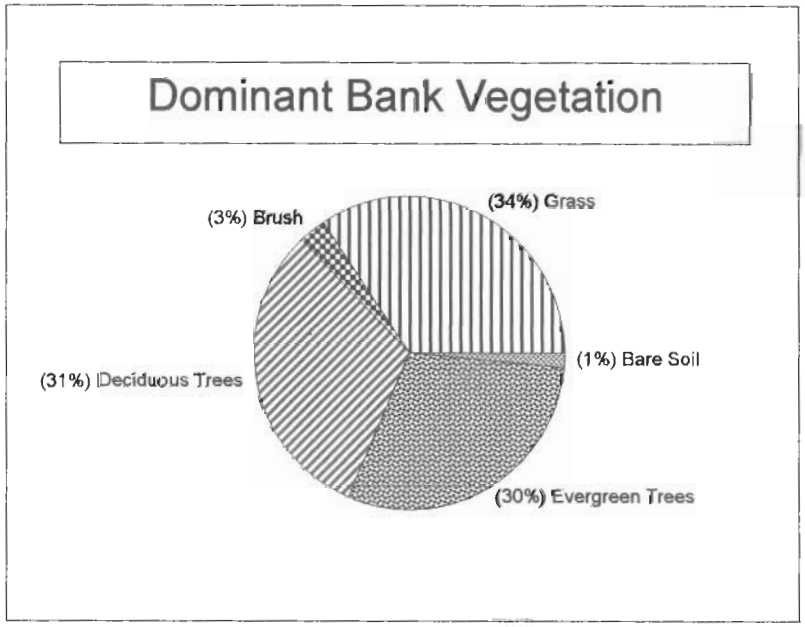




Graph 9

Bluegum Creek
Percent Bank Composition





Graph 10