CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
UNNAMED CREEK "Turtle Creek"
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1995

INTRODUCTION

A stream inventory was conducted during the spring of 1995 on an unnamed tributary to the Russian River commonly referred to as **"Griffin", "Bishops' Ranch" or "Turtle" Creek** to assess habitat conditions for anadromous salmonids. 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. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution. After analysis of historical information and data gathered recently, stream restoration and enhancement recommendations are presented.

WATERSHED OVERVIEW

The creek is located near the town of Healdsburg in Sonoma County, California (see watershed map, page 2). The legal description at the confluence with the Russian River is T8N R09W S21. Its location is 38°31'41" N. latitude and 122°51'40" W. longitude.

This creek is a first order intermittent stream and has approximately 3.5 miles of blue line stream, according to the USGS Healdsburg and Guerneville 7.5 minute quadrangles. The creek drains a watershed of approximately 3.7 square miles. Summer flow was measured at approximately 1.8 cfs at the mouth, in May 1995, although the stream is intermittent through summer. Elevations range from about 60 feet at the mouth of the creek to 600 feet in the headwater areas. Year round vehicle access to the watershed exists via Westside Rd, and then west up a private ranch road near the town of Healdsburg.

The headwaters are located in a steep, narrow canyon that widens into a narrow valley. The creek drains from 3 lakes of approximately 1 acre in size. Vegetation in the upper watershed includes redwood, maple, alder, bay and oak, with willows, ash and cottonwood in the lower drainage area. The stream flows northeast and is deeply incised throughout. A minor unnamed tributary (commonly referred to as Keepo Creek) provides cooler temperatures through subsurface spring fed flow in the lower watershed. No suitable spawning or rearing habitat exists currently in Keepo

Creek.

STREAM SURVEYS:

No past DFG stream surveys were conducted on this creek although some information is available from long term landowners in the basin. Apparently, adult steelhead were commonly seen throughout the stream, and coho salmon occasionally. The streambed has reportedly dropped 12-20 feet in the lower watershed due to degradation of the mainstem. This headcut is checked by a rock falls below Westside Rd., although evidence of 6-8 ft. of downcutting is apparent up to the first dam. The first ½ mile of the stream was channelized at some point during gravel mining operations along the mainstem.

METHODS

The habitat inventory conducted in this unnamed creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) seasonal Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG) and CCC in May 1994. This inventory was conducted by a two person team, under the supervision of Robert Coey, DFG's Russian River Basin Planner.

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 the unnamed 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 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 by David Rosgen (1985). 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 four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Water and air temperatures, and time taken, are measured by crew members with handheld 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 Ryan Tempmentors 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". The 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. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken 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. Embeddedness was ocularly estimated and the values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4).

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 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. 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 habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes. Mechanical substrate sampling is also conducted to quantify the percentage of fine sediment within spawning gravels.

A substrate sample was taken in a potential spawning riffle in Reach 1 on December 1, 1995. The sample consisted of one 12" McNeil sample to characterize the reach.

The sample was placed through a series of sieves with diameters of 0.85mm, 2.37mm, 4.7mm, 12.5mm, 25.4mm, 50.8mm, 76.2mm and 150mm. Displacement volumes were measured for particles in each size classification. Finally, the remaining sample less than 0.85mm was placed in Imhoff cones for 1 hour with the volume of fines settled out measured.

8. Canopy:

Stream canopy is estimated using handheld spherical densitometers and is a measure of the water surface shaded during periods of high sun. An estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

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. The dominant composition type in both the right and left banks was selected from a list of eight options on 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 Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following 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
- Shelter type areas by habitat types

Graphics are produced from the tables using Lotus 1-2-3. Graphics developed for include:

- Riffle, flatwater, pool habitats by percent occurrence
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Maximum depth in pools
- Percent embeddedness by reach
- Substrate composition in low gradient riffles
- Mean percent canopy
- Percent bank composition
- Cover type areas in pools
- Percent canopy by reach

HABITAT INVENTORY RESULTS

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

The habitat inventory of May 5 through May 23, 1995, was conducted by John Fort, Pam Higgins, Kurt Gregory and Ken Mogan (Americorps) under the direction of DFG. The total length of the stream surveyed was 13,200 feet.

Flow was measured at the bottom of the survey reach with a Marsh-

McBirney Model 2000 flowmeter at 1.8 cfs on May 5, 1995. Water temperatures measured during the survey period (May 5 to May 23, 1995) by crew members with handheld thermometers ranged from 54 to 68 degrees Fahrenheit. Air temperatures ranged from 54 to 73 degrees Fahrenheit. A Ryan tempmentor was placed in a pool in Reach 1 below the first ranch bridge in the intermittent section, and recorded temperatures from early July to mid October, 1995 (see Tempmentor Summary graph at end of report). The highest temperature recorded was 63°F and the lowest was 51°F. The mean of the daily highs for the month of July was 62°F, August, 60°F, September, 58°F and October, 54°F. On July 26, 1995 water temperatures were spot checked upstream in Reach 3, and measured 74°F, flow was minimal. Canopy is minimal here. Temperature taken at the Westside Rd. culvert over Keepo Creek on May 31 was 65°F, flow was minimal. In this area the banks were severely eroded, the riparian denuded, and there was evidence of livestock in the stream. On July 26 water temperature on Keepo Creek at the same location was 60°F and flow was now intermittent.

This unnamed creek (map on page 2) is a B4 channel type for the first 2,128 feet of stream reach surveyed (from the mouth to the first private ranch road bridge below Westside Rd). B4 channels are moderate gradient (2-4%), moderately confined, cobble/gravel channels. The next 2,361 feet (to just above Westside Rd.) is an F4 channel type. F4 channels are entrenched meandering riffle/pool channels on low gradients (<2%) with high width/depth ratio and cobble substrate. The next 7,758 feet (to the bedrock section below the first dam) returns to a B4 channel type. The next 507 feet is a B1 channel type. B1 channels are also moderate gradient, moderately confined channels but are bedrock controlled.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, riffles made up 28%, flatwater types 31%, and pools 41% (Graph 1). Flatwater habitat types made up 42% of the total survey **length**, riffles 24%, and pools 34%. None of the survey length was dry.

Three hundred, eighty Level IV habitat units were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were low gradient riffles, 28%; glides, 25%; and mid channel pools, 13% (Graph 2). By percent total **length**, low gradient riffles made up 23%, glides 27%, and mid-channel POOLS 11%.

One hundred, fifty-six pools were identified (Table 3). Scour pools were most often encountered at 56%, and comprised 63% of the

total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Seventy-two of the 156 pools (46%) had a depth of two feet or greater (Graph 4).

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. Mean shelter rating for all pools rated 34 (Table 1). Lateral scour-root wad enhanced pools averaged 50 and mid-channel pools averaged 32 (Table 2). A shelter rating of at least 80 is desirable. Reach 1 had an average pool shelter value of 77 (although only 13% of the reach is pools); Reach 2 averaged 42; Reach 3 averaged 26 and Reach 4 averaged 0 (Appendix B).

Table 10 summarizes total cover by habitat type. Root mass, small woody debris and undercut banks are the dominant cover types for pools. Aquatic vegetation and boulders are lacking in nearly all habitat types. Graph 10 describes the pool cover.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 81 of the 105 low gradient riffles (77%, Graph 7). Sand was the next most frequently observed dominant substrate type, and occurred in 64% of the lateral scour-root wad enhanced pools. The amount of fines in pools has been shown to be an indicator of watershed health.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 156 pool tail-outs measured, 73% of the pools in Reach 1 had an embeddedness rating of 1 (Appendix B); in Reach 2, 60% were rated a 1 or 2;, 70% of the pools in Reach 3 had a embeddedness rating of 3 or 4; and in Reach 4, 100% were rated a 4 (although this is a bedrock reach). On this scale, a value of one is the best for fisheries (Graph 5).

Sampling was conducted in the field by Mogan and Gregory (Americorps). Laboratory analysis was done by Fort, Huber, Nossaman, Sanchez (Americorps) and Hards (Intern) in May of 1996. The data was then summarized and analyzed with a computer program written by Dwain Goforth (National Park Service). The analysis showed the sample to be 16.9% fines (<0.85 mm). The summary showed 75% of the substrate to be less than 18mm, 50% to be less than 6mm and 25% to be less than 1.55mm (see Grain Size Distribution Plot).

Thirty-three percent of the survey reach lacked shade canopy. Of the 66% of the stream covered with canopy, 41% was composed of deciduous trees (mainly willow, alder and bay), and 59% was composed of evergreen and coniferous trees (Appendix A, Graph 8).

In general canopy decreases in an upstream direction. Canopy averaged 68% in Reach 1, 77% in Reach 2, 64% in Reach 3 and 13% in Reach 4 (Appendix B, Graph 11).

For the stream reach surveyed, the mean percent right bank vegetated was 61% and the mean percent left bank vegetated was 60% (Appendix A). The dominant elements composing the structure of the stream banks consisted of 81% silt/clay, 15% bedrock, 4% cobble/gravel. Additionally, 25% of the banks were covered with deciduous trees, 36% with coniferous trees (including downed trees, logs, and root wads), and 24% with brush (Appendix C).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

A biological inventory was taken on May 23-24, 1995. Single pass electrofishing was the method used. The air temperature was 65°F and the water temperature was 57°F. The observers were Coey, Higgins and Fort.

In Reach 1, downstream 200 feet from Griffin's first ranch bridge, 64 juvenile green sunfish were observed along with 2 adult sunfish, 11 roach, 2 fathead minnow, 6 0+ steelhead, 1 1+ steelhead and 3 juvenile coho. In addition 3 1+ steelhead were observed in a glide habitat type. The coho and 1+ steelhead were only found in deep pools (3'+).

In Reach 2, in pool habitat types of units 30-50, 6 roach were observed along with 1 sucker. This section had good habitat but few fish.

The inventory continued starting 200 feet upstream from Russels Gate in units 204-227 of Reach 3. In pool and glide habitat types 15 roach, 3 fathead minnows, 16 sunfish (juvenile and adult), 1 sucker and 1 bullfrog polliwog were observed. In habitat units 316-334 of Reach 3, 7 roach, 1 fathead minnow, 6 sunfish (juvenile and adult), 1 small mouth bass and 1 bullfrog polliwog were observed in pool habitat types.

In Reach 4, fish were observed visually. Only adult and juvenile blue gill and roach were observed.

Another biological inventory of Reach 2 was conducted on May 31, 1995. The air temperature was 83°F and the water temperature was 59°F. The observer was Coey.

Above Westside Bridge Road for 100 feet in pool and run habitat types, 6 juvenile green sunfish were observed along with 11 roach and 1 fathead minnow. For 100 feet below the Westside Rd. bridge in pool and run habitat types, 23 roach and 2 fathead minnows were observed. Below the north running unnamed tributary (Keepo Creek) and below Westside Bridge Road in pool, riffle and run habitat types, 3 juvenile green sunfish, 19 roach and 5 fathead minnows were observed. Temperature taken at the Westside Rd. culvert over Keepo Creek was 65°F. In this area the banks were severely eroded, the riparian denuded, and there was evidence of livestock in the stream.

On July 26, 1995 this unnamed creek was spot checked for species presence. 0+ steelhead, juvenile coho salmon, fathead minnows and juvenile and adult green sunfish and blue gill were observed downstream below the Ranch Rd. bridge in several deep holes adjacent to the Hop Kiln Winery. Water temperature in these holes was 62°F, and flow was intermittent. Upstream in Reach 3, the water temperature was 74°F and flow was minimal (although some pool habitat did occur). Water temperature on Keepo Creek was 60°F and flow was intermittent. The non-native and warm water species are believed to come from at least one of two reservoirs in the headwaters which also hold large mouth bass. No screens exist on the spillways of either dams.

ADULT SURVEYS:

A carcass\spawning survey was taken on March 7, 1995. Observers were Higgins, Fort and Mogan. Air temperature was 64°F and water temperature was 53°F.

The survey began at the confluence with the Russian River and continued up to the concrete dam fish barrier. At the confluence, 2 Western Pond Turtles were observed. In Reach 3 (habitat unit #230), an 18-20" steelhead was observed on a redd (2'x 3'). Gravel quality was poor to fair. The redd was located directly in the middle of a cattle crossing, with cattle present.

DISCUSSION

In general, Reach 1 and 2 have poor spawning habitat and fair rearing habitat. Reach 3 has poor spawning habitat and poor rearing habitat. Reach 4 has no spawning habitat and very poor rearing habitat.

The F4 channel type of Reach 2 is good for bank-placed boulders and single and opposing wing-deflectors. They are fair for low-stage

(low profile) weirs, boulder clusters and channel constrictors. Log cover structures can be used to increase instream cover.

The B channel types of Reaches 1,2 and 4 are excellent for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover. Any instream habitat work considered in this stream will require careful design, placement, and construction that must include protection for the unstable banks.

The water temperatures recorded on the survey days May 5-23, 1995 ranged from 54-68°F. Air temperatures ranged from 56-73°F. The warmest water temperatures were recorded in Reach 3. This is a fair water temperature regime for salmonids. However, spot temperatures checked in July showed some Reaches were in the low 70's. Temperatures in the 70's, if sustained, are near the threshold stress level for salmonids. This seems to be typical for Reaches 3 and 4, which lack mature stream canopy. Our electrofishing samples found steelhead more frequently in the cooler, shadier sample sites, and coho exclusively there. Interestingly, water temperatures later in summer when flows were intermittent and air temperatures are warmer, were cooler than earlier in summer, when flows were higher and air temperatures cooler. Reach 2 seems to have temperatures more favorable to salmonids. Activities to increase canopy (especially in Reaches 1,3 and 4) should be encouraged.

Pools comprised 42% of the total **length** of this survey and 67 of the 156 pools (43%) have a maximum depth greater than 2 feet. 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 coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat.

Most of the deeper pools occur in Reach 1, therefore, installing structures in Reaches 2 and 3 that will increase pool habitat is recommended for locations where their installation will not jeopardize unstable stream banks, or subject the structures to high stream energy.

Streamwide, the mean shelter rating for pools was low with a rating of 34 and flatwater habitats was even lower at 10. A pool shelter rating of approximately 100 is desirable. Shelter values decline in an upstream direction, indicating decreasing habitat suitability and availability upstream of Westside Rd. Reach 1 had an average

shelter value of 77; Reach 2 was 39; Reach 3 was 26 and Reach 4 was 0.

The relatively small amount of cover that now exists is being provided primarily by root mass, small woody debris and undercut banks. The occurrence of large woody debris overall is extremely small (5% in Reach 1 and 1% in Reach 2). Log and root wad cover structures in the pool and flatwater habitats are needed to effectively improve both summer and winter salmonid habitat in these reaches. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition. These structures also provide cover for spawning adults at high velocities and when streams clear between storms.

Seventy-seven of the 105 low gradient riffles had gravel as the dominant substrate. This is generally considered good for spawning salmonids. However, embeddedness ratings increased moving upstream (particularly in Reaches 3 and 4), indicating poor spawning habitat. Limiting access to livestock, abandoning or improving and armoring crossings, and initiating bank protection measures where needed would improve spawning conditions in the upper reaches.

Embeddedness ratings were better in Reaches 1 and 2 than in Reaches 3 or 4. By default, Reach 4 ratings were 100% a level 4 due to being a bedrock channel. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. Sediment sources from the numerous crossings and failing banks should be mapped and rated according to their potential sediment yields, and control measures taken.

The gravel program analyzed the substrate sample data for egg to emergence survival rates for steelhead and coho. The survival rates are based on a 95% confidence interval and used the Fredle Index. Based on this index and the data on the unnamed creek, the mean egg to emergence survival rate would be 31% for steelhead and 9% for coho.

The mean percent canopy for the stream was 66%. This is a fair percentage of canopy, since 80 percent is generally considered optimum. However, the upper reaches are lacking in mature canopy, and in general canopy decreases in an upstream direction (Appendix B, Graph 11). In areas of stream bank erosion, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization and cattle exclusion fencing is recommended.

Interviews with local landowners indicate this creek once held a fair population of salmonids year round. Today they are nearly

absent and some fish spilled from the ponds above preside. Recent biological surveys were conducted to document fish distribution and are not necessarily representative of population information. In 1995, steelhead and coho were documented in Reach 1, steelhead only in Reach 2, and neither in Reaches 3 or 4. This is likely because physiological and environmental requirements for coho are more stringent than for steelhead, and habitat conditions clearly deteriorate in an upstream direction. Large numbers of green sunfish and largemouth bass were seen in all reaches and the numbers and size of these predatory alien game fish which prey on young salmonids also increase in an upstream direction. Few 1+ salmonids were observed indicating poor rearing conditions the year before or poor holding-over conditions in general. The dam at the end of our survey reach is a complete barrier at all flows. Because habitat conditions upstream of our survey reach are marginal for salmonids, modifying the barrier is not recommended. However, a screen on the spillway would be desirable.

GENERAL RECOMMENDATIONS

This unnamed creek should be returned to 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) Increase the canopy by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels (portions of Reach 2, and much of Reaches 1, 3 and 4). The reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

2) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing cover is from small woody debris. 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 in Reaches 2 and 3. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.

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

4) A screening device to keep the warmwater species (such as green sunfish and largemouth bass) from spilling over the dam at the first lake would improve conditions for salmonids throughout the stream below, since the large number of these alien predatory fish are likely preying on juvenile salmonids and other native fishes.

5) Monitor temperatures in the upper riparian re-vegetation areas.

RESTORATION IMPLEMENTED

1) There are at least three sections (in Reaches 2, 3 and 4) where the stream is being impacted from cattle trampling and degrading the riparian zone, and defecating in the water. Alternatives to limit cattle access, control erosion and increase canopy, should be explored with the landowners, and developed if possible.

2) Active and potential sediment sources related to the permanent road system, and the temporary crossings need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

Specifically at crossings:

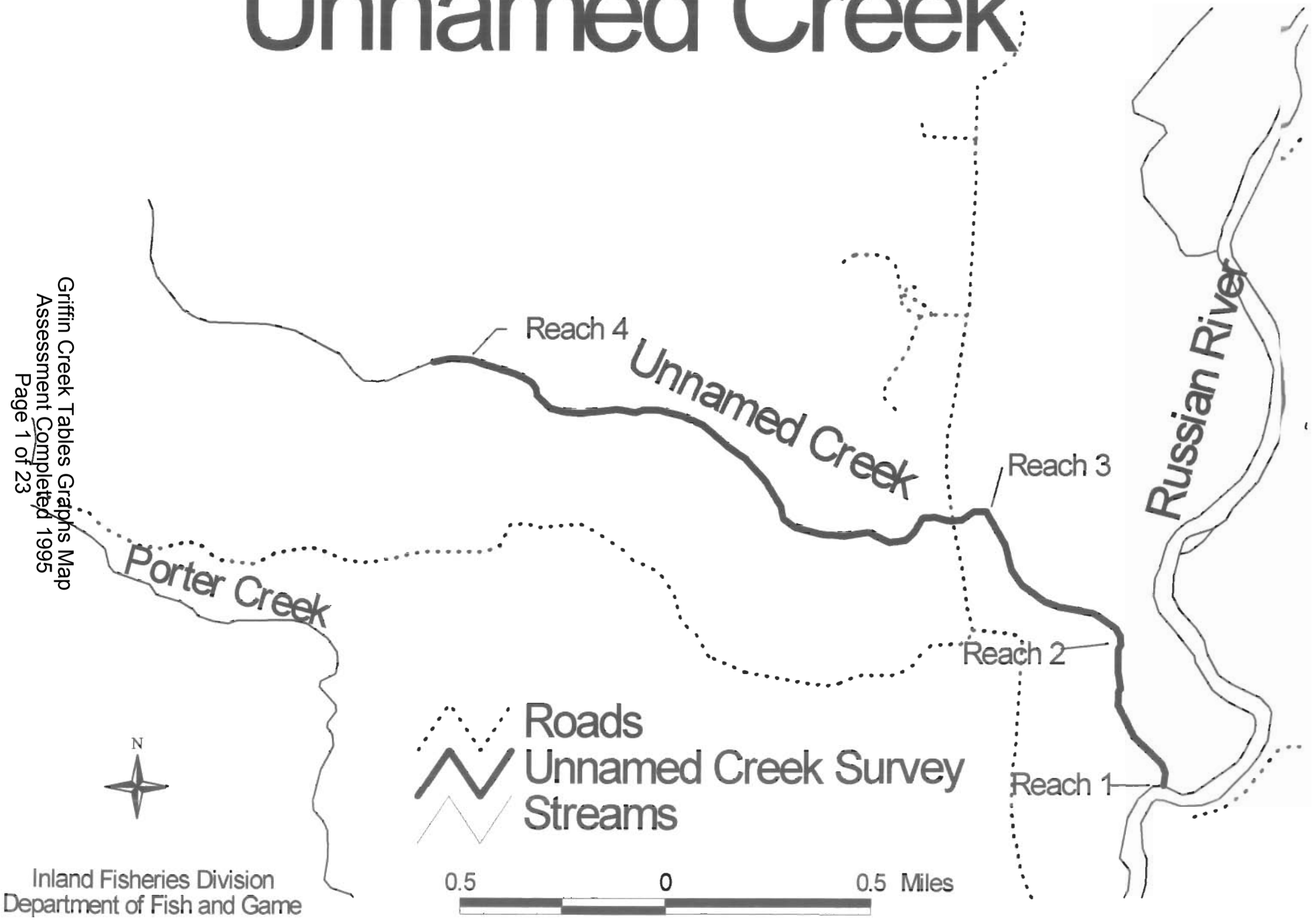
#1) The culvert in Reach 3 would be best replaced with a railcar bridge, seasonal or a dry fiord. At the very least a new oval shaped culvert should be installed.
#2) abandon crossing or create summer crossing only.
#3) replace undersize culvert on tributary or abandon road crossing
#4) abandon crossing or create summer crossing only.
#5) Replace undersize culvert

PROBLEM SITES AND LANDMARKS - UNNAMED CREEK SURVEY COMMENTS

HABUNIT UNIT #	STREAM LENGTH	COMMENTS
1.00	300	RUSSIAN RIVER BACKED UP INTO UNNAMED CREEK; HIGH WATER
2.00	850	RT. BANK CHANNELIZED, ERODING/RIVER CROSSING (POS. COW), FLOW TAKEN
3.00	870	BULLFROG, GREEN SUNFISH, POLLIWOG
6.00	1183	FLOW READING
8.00	1262	GULLY
9.00	1315	POSS. GRADIENT CHANGE
11.00	1488	CHANNEL TYPING DONE
13.00	1543	LF. BANK BLOWOUT; POSS. REST. SITE
14.00	1642	404 OF RATTLESNAKE
15.00	1658	RT. BANK BLOWOUT
22.00	1907	BLOWOUT LF. BANK
25.00	2128	RAIL CAR BRIDGE #1
26.00	2163	CHANNEL CHANGE
27.00	2184	12% GRADE
34.00	2447	CONCRETE OAD 4" WIDE FOR SUMMER DAM
56.00	3037	8" DIAM. PLASTIC DRAIN ON RT. BANK. ORIGIN? ALSO SM. WASHOUT IN RT. BANK
104.00	4369	TRIB. LF. BANK 57°F
108.00	4455	BRIDGE #2 10' HIGH X 8'; CANOPY IS BRIDGE
109.00	4471	CHANNEL CHANGE
136.00	5174	BANK FAILURE NEEDS PLANTING
166.00	6285	BANK ERODING
167.00	6298	RESTORATION SITE?
192.00	6952	GOOD RESTORATION SITE
193.00	6982	ROACH IN POOL
195.00	7037	MASSIVE BANK FAILURE 1 FT. BANK
196.00	7070	RT. BANK BLOWOUT
200.00	7188	18" RATTLESNAKE
210.00	7471	BLOW OUT AT CORNER POOL
211.00	7518	CHANNEL CHANGE
218.00	7658	3' OF FALLS. EST. 19% GRADIENT
227.00	7943	FLOATING CATTLE FENCE
230.00	8020	REDD FROM SPAWNING SURVEY, CATTLE CROSSING
235.00	8161	LARGE BANK FAILURE, LF. BANK. 80' LONG
252.00	8691	FLOATING CATTLE FENCE ACROSS CREEK
256.00	8781	POSSIBLE REVEG/RESTORATION SITE NEXT 100'

260.00	8856	METAL CULVERT IN CREEK 7' DIA. 28' LONG
267.00	9147	CATTLE CROSSING
269.00	9201	LF. BANK BLOWOUT
288.00	9920	RESTORATION SITE
291.00	9973	SUMMER DIRT ROAD CROSSING
317.00	10839	CROSSING LF. BANK
322.00	11020	CROSSING RT. BANK
324.00	11112	USED BY COWS
338.00	11589	CHANNEL TYPE
340.00	11679	DRY TRIB. ON LF. BANK
344.00	11784	SUMMER CROSSING
362.00	12475	CULVERT RT. BANK, CATTLE CROSSING
363.00	12536	3-4 SUNFISH
364.00	12601	HEAVY ALGAE; CHANNEL CHANGE
369.00	12878	MANY UNKNOWN FISH, POSS. SUNFISH
372.00	12975	TRIB. LF. BANK
373.00	13006	42% GRADIENT CASCADE
375.00	13045	TRIB. IS DAMMED AND EARTHEN DAM BEHIND DAM DRY FOR 140'. SPRING FED TRIB. ABOVE. BLOWOUT ON SPILLSIDE OF DAM (15.5' X 30') ENDS AT CEMENT DAM. (29' WIDE, 13' LONG)

Unnamed Creek



Unnamed Creek - com. "Bishops" or "Griffin" Creek Drainage: Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES Survey Dates: 05/05/95 to 05/23/95

Confluence Location: QUAD: HEALD&GUER LEGAL DESCRIPTION: T08NR09WS21 LATITUDE: 38°31'41" LONGITUDE: 122°51'40"

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
108	101	RIFFLE	28	29	3182	24	8.7	0.2	261	28151	67	7215	0	1
116	114	FLATWATER	31	47	5494	42	8.1	0.5	380	44125	279	32334	0	10
156	152	POOL	41	29	4524	34	10.6	1.1	330	51464	418	65175	345	34

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
380	367	13200	123740	104724

Unnamed Creek - com. "Bishops" or "Griffin" Creek — Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 05/05/95 to 05/23/95

Confluence Location: QUAD: HEALD&GUER LEGAL DESCRIPTION: T08NR09WS21 LATITUDE: 38°31'41" LONGITUDE: 122°51'40"

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 %
105	98	LGR	28	29	3097	23	9	0.2	1.0	261	27376	66	6964	0	1	63
2	2	HGR	1	27	54	0	10	0.5	1.0	260	521	113	226	0	30	58
1	1	CAS	0	31	31	0	8	0.1	0.2	254	254	25	25	0	0	20
94	92	GLD	25	38	3594	27	9	0.6	6.0	345	32475	284	26653	0	8	65
20	20	RUN	5	89	1771	13	6	0.5	2.3	574	11482	281	5615	0	20	73
2	2	SRN	1	65	130	1	8	0.4	1.2	84	167	33	67	0	0	55
51	51	MCP	13	27	1396	11	10	1.1	4.8	286	14589	356	18145	292	32	61
20	19	CRP	5	31	616	5	9	1.2	8.5	289	5785	345	6903	288	20	48
4	3	LSL	1	39	156	1	13	1.1	5.0	488	1950	608	2433	519	38	60
47	47	LSR	12	33	1574	12	13	1.1	5.2	461	21671	624	29333	516	50	83
10	10	LSBk	3	31	314	2	11	1.1	3.2	342	3421	400	4002	341	2	77
4	4	LSBo	1	36	144	1	10	1.2	2.6	344	1374	398	1593	320	18	61
3	2	PLP	1	17	50	0	11	0.9	1.8	162	485	143	428	99	60	48
1	1	SCP	0	15	15	0	4	0.6	1.3	60	60	36	36	30	80	90
8	7	BPB	2	14	115	1	8	1.1	3.0	123	982	152	1217	128	0	63
4	4	BPR	1	20	79	1	6	0.7	1.3	159	635	117	467	85	48	88
2	2	BPL	1	11	21	0	9	1.4	2.5	102	204	164	329	151	50	88
2	2	DPL	1	22	45	0	7	1.0	3.6	154	307	145	290	112	60	53

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
380	367	13200	123739	104724

Unnamed Creek - com. "Bishops" or "Griffin" Creek — Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 05/05/95 to 05/23/95

Confluence Location: QUAD: HEALD&GUER LEGAL DESCRIPTION: T08NR09WS21 LATITUDE: 38°31'41" LONGITUDE: 122°51'40"

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
51	51	MAIN	33	27	1396	31	10.1	1.1	286	14589	356	18145	292	32
88	85	SCOUR	56	32	2853	63	11.4	1.1	394	34687	508	44692	421	36
17	16	BACKWATER	11	16	275	6	7.4	1.0	129	2188	138	2338	113	29

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
156	152	4524	51464	65175

Unnamed Creek - com. "Bishops" or "Griffin" Creek — Drainage: Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 05/05/95 to 05/23/95

Confluence Location: QUAD: HEALD&GUER LEGAL DESCRIPTION: T08NR09WS21 LATITUDE: 38°31'41" LONGITUDE: 122°51'40"

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
51	MCP	33	0	0	33	65	11	22	5	10	2	4
20	CRP	13	0	0	9	45	10	50	0	0	1	5
4	LSL	3	0	0	2	50	0	0	1	25	1	25
47	LSR	30	0	0	24	51	17	36	5	11	1	2
10	LSBk	6	0	0	7	70	2	20	1	10	0	0
4	LSBo	3	0	0	0	0	4	100	0	0	0	0
3	PLP	2	0	0	3	100	0	0	0	0	0	0
1	SCP	1	0	0	1	100	0	0	0	0	0	0
8	BPB	5	1	13	3	38	3	38	1	13	0	0
4	BPR	3	2	50	2	50	0	0	0	0	0	0
2	BPL	1	0	0	1	50	1	50	0	0	0	0
2	DPL	1	0	0	1	50	0	0	1	50	0	0

TOTAL UNITS 156

Unnamed Creek - com. "Bishops" or "Griffin" Creek Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 05/05/95 to 05/23/95

Confluence Location: QUAD: HEALD&GUER LEGAL DESCRIPTION: T08NR09WS21 LATITUDE: 38°31'41" LONGITUDE: 122°51'40"

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
105	98	LGR	1	9	77	8	2	0	4
2	2	HGR	0	50	0	0	0	0	50
1	1	CAS	0	0	0	0	0	0	100
92	92	GLD	9	27	53	3	0	1	9
20	20	RUN	15	10	65	5	0	0	5
2	2	SRN	0	0	0	0	0	0	100
51	51	MCP	12	33	51	4	0	0	0
19	19	CRP	10	40	45	5	0	0	0
3	3	LSL	0	25	75	0	0	0	0
47	47	LSR	13	64	23	0	0	0	0
10	10	LSBk	10	50	30	0	0	0	10
4	4	LSBe	0	50	50	0	0	0	0
2	2	PLP	33	0	33	0	0	0	33
1	1	SCP	100	0	0	0	0	0	0
7	7	BPB	38	25	25	0	0	0	13
4	4	BPR	25	50	25	0	0	0	0
2	2	BPL	0	50	50	0	0	0	0
2	2	DPL	0	50	0	0	0	0	50

Unnamed Creek - com. "Bishops" or "Griffin" Creek Drainage: Russian River

Table 10 - Summary of Shelter Type Areas by Habitat Type Survey Dates: 05/05/95 to 05/23/95

Confluence Location: QUAD: HEALD&GUER LEGAL DESCRIPTION: T08NR09WS21 LATITUDE: 38°31'41" LONGITUDE: 122°51'40"

UNITS MEASURED	UNITS FULLY 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
105	98	LGR	0	21	5	0	0	0	0	0	0
2	2	HGR	0	9	28	5	0	0	5	0	0
1	1	CAS	0	0	0	0	0	0	0	0	0
94	92	GLD	35	3299	1942	172	83	4	0	0	0
20	20	RUN	31	910	294	340	62	0	0	0	0
2	2	SRN	0	0	0	0	0	0	0	0	0
51	51	MCP	188	679	218	203	370	60	0	0	22
20	19	CRP	44	153	25	153	278	9	0	0	0
4	3	LSL	16	11	134	0	37	0	0	0	0
47	47	LSR	806	802	164	2969	70	0	6	11	10
10	10	LSBk	41	0	0	0	0	0	0	0	0
4	4	LSBo	37	5	0	5	0	0	0	16	30
3	2	PLP	0	21	63	21	0	0	0	0	0
1	1	SCP	7	7	10	0	0	0	0	0	0
8	7	BPB	0	0	0	0	0	0	0	0	0
4	4	BPR	0	80	0	39	13	0	0	0	0
2	2	BPL	0	15	0	15	0	0	0	0	0
2	2	DPL	4	67	0	0	0	0	0	0	0
TOTAL 380	367		1209	6079	2883	3922	913	73	11	27	62
TOTAL FOR POOLS 156	152		1143	1840	614	3405	768	69	6	27	62

Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Decidous	Mean Right bank % Cover	Mean Left Bank % Cover
66.08	59.21	40.79	61.22	59.60

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	59	55	15
Boulder	1	0	0.13
Cobble/Gravel	15	15	3.95
Silt/clay	305	310	80.92

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	41	55	12.65
Brush	92	88	23.72
Decid. Trees	96	92	24.77
Conif. Trees	137	136	35.97
No Vegetation	14	8	2.90

FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Unnamed Trib ('Griffin')
SAMPLE DATES: 05/05/95 to 05/23/95
STREAM LENGTH: 13023 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: HEALD&GUER — Latitude: 38°31'41"
Legal Description: T08NR09WS21 — Longitude: 122°51'40"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: B4
Channel Length: 2128 ft.
Riffle/Flatwater Mean Width: 12 ft.
Total Pool Mean Depth: 1.3 ft.
Base Flow: 1.8 cfs
Water: 55 - 58 °F Air: 56 - 62 °F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 54%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 55% 2. 18% 3. 0% 4. 27%

Canopy Density: 68%
Coniferous Component: 0%
Deciduous Component: 100%
Pools by Stream Length: 13%
Pools >=3 ft.deep: 27%
Mean Pool Shelter Rtn: 77
Dom. Shelter: Small Woody Debris
Occurrence of LOD: 24%
Dry Channel: 0 ft.

STREAM REACH 02

Channel Type: F4
Channel Length: 2631 ft.
Riffle/Flatwater Mean Width: 8 ft.
Total Pool Mean Depth: 1.1 ft.
Base Flow: 1.8 cfs
Water: 54 - 58 °F Air: 56 - 66 °F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 65%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 12% 2. 48% 3. 19% 4. 21%

Canopy Density: 77%
Coniferous Component: 42%
Deciduous Component: 58%
Pools by Stream Length: 37%
Pools >=3 ft.deep: 10%
Mean Pool Shelter Rtn: 42
Dom. Shelter: Small Woody Debris
Occurrence of LOD: 35%
Dry Channel: 0 ft.

STREAM REACH 03

Channel Type: B4
Channel Length: 7758 ft.
Riffle/Flatwater Mean Width: 8 ft.
Total Pool Mean Depth: 1.1 ft.
Base Flow: 1.8 cfs
Water: 54 - 68 °F Air: 54 - 73 °F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 60%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 9% 2. 21% 3. 35% 4. 35%

Canopy Density: 64%
Coniferous Component: 71%
Deciduous Component: 29%
Pools by Stream Length: 41%
Pools >=3 ft.deep: 11%
Mean Pool Shelter Rtn: 26
Dom. Shelter: Root masses
Occurrence of LOD: 46%
Dry Channel: 0 ft.

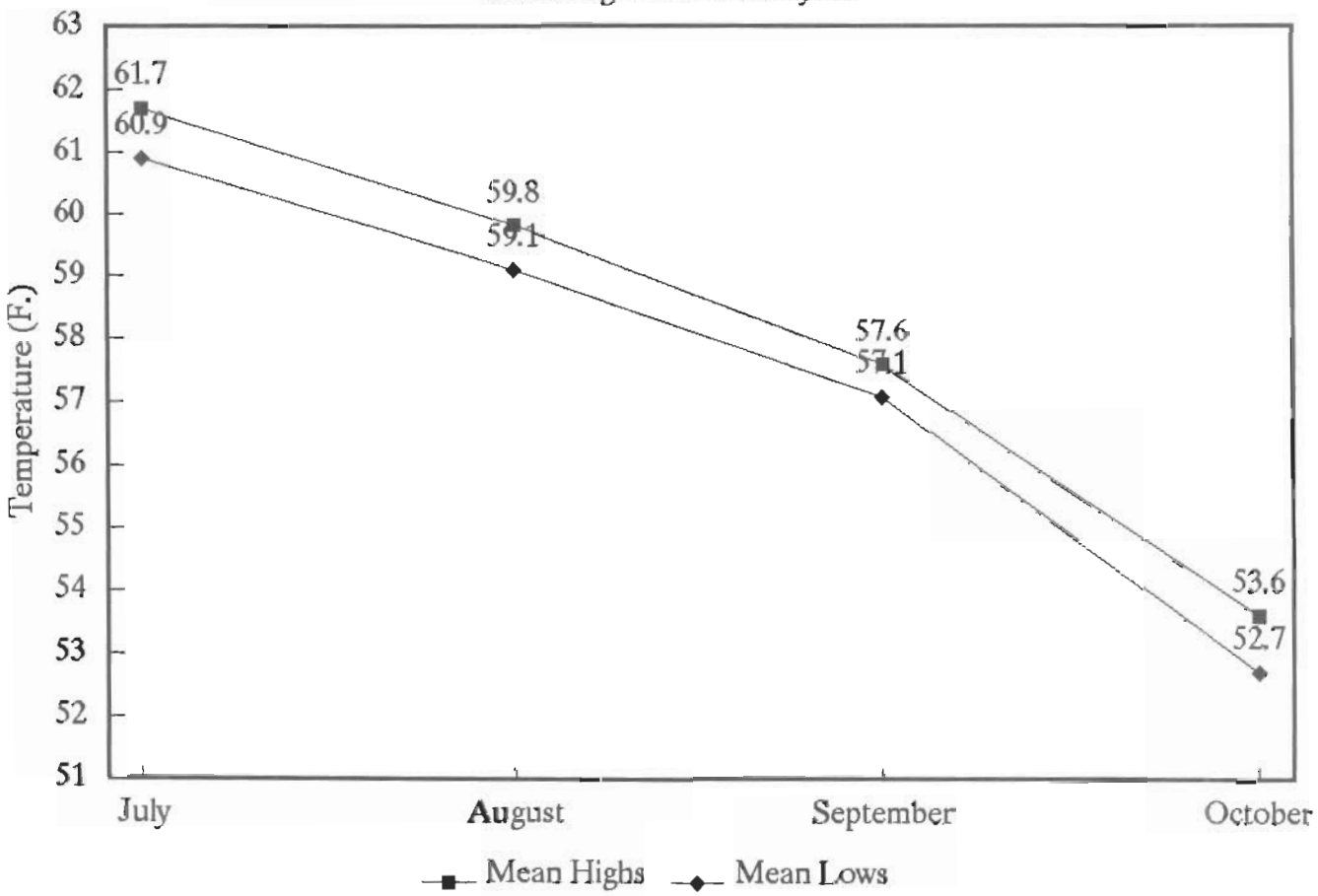
STREAM REACH 04

Channel Type: B1
Channel Length: 507 ft.
Riffle/Flatwater Mean Width: 8 ft.
Total Pool Mean Depth: 1.0 ft.
Base Flow: 1.8 cfs
Water: 61 - 61 °F Air: 71 - 71 °F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 56%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 0% 3. 0% 4. 100%

Canopy Density: 13%
Coniferous Component: 91%
Deciduous Component: 9%
Pools by Stream Length: 16%
Pools >=3 ft.deep: 33%
Mean Pool Shelter Rtn: 0
Dom. Shelter: Undercut Banks
Occurrence of LOD: 0%
Dry Channel: 0 ft.

Griffin Creek Tempmentor Summary

Mean Highs and Lows by Month

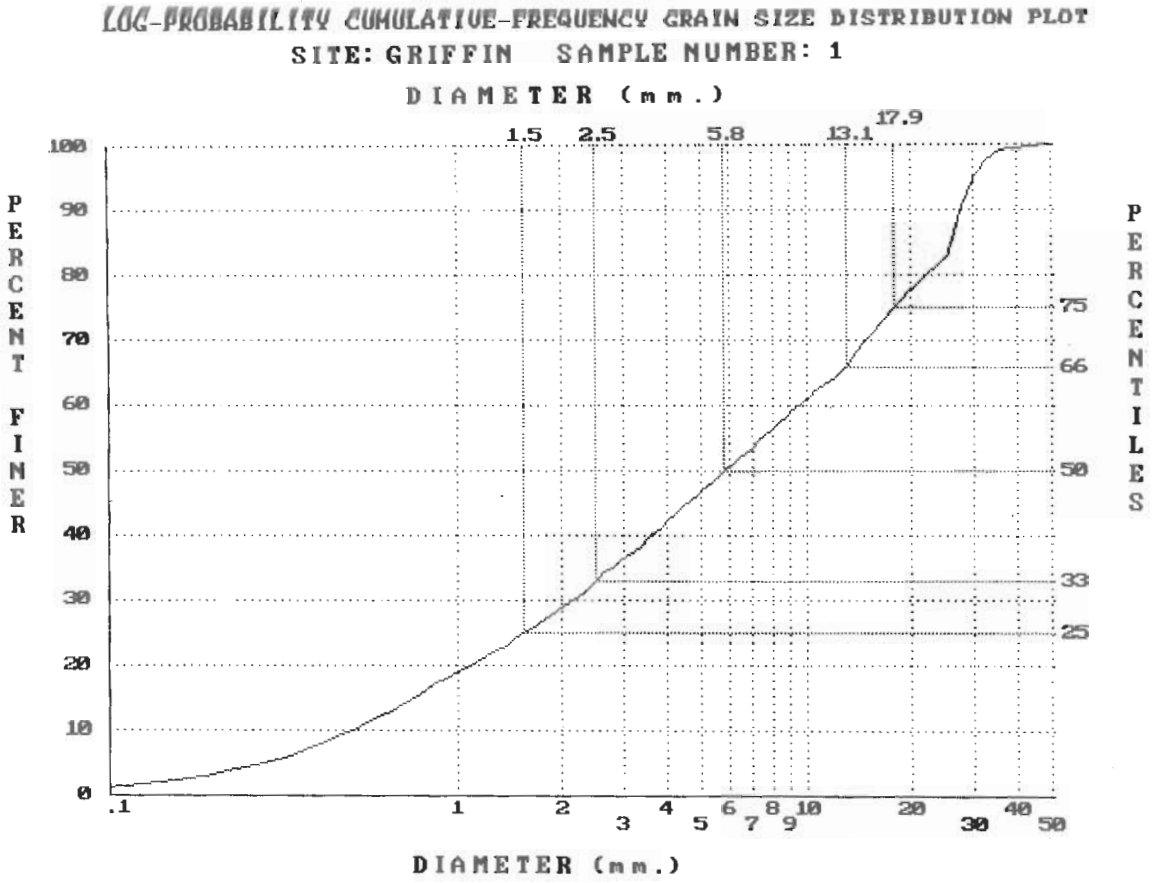


GRAIN SIZE PERCENTILE DISTRIBUTION

Whole Sample Number 1 of 1 total samples from Sample Site: GRIFFIN

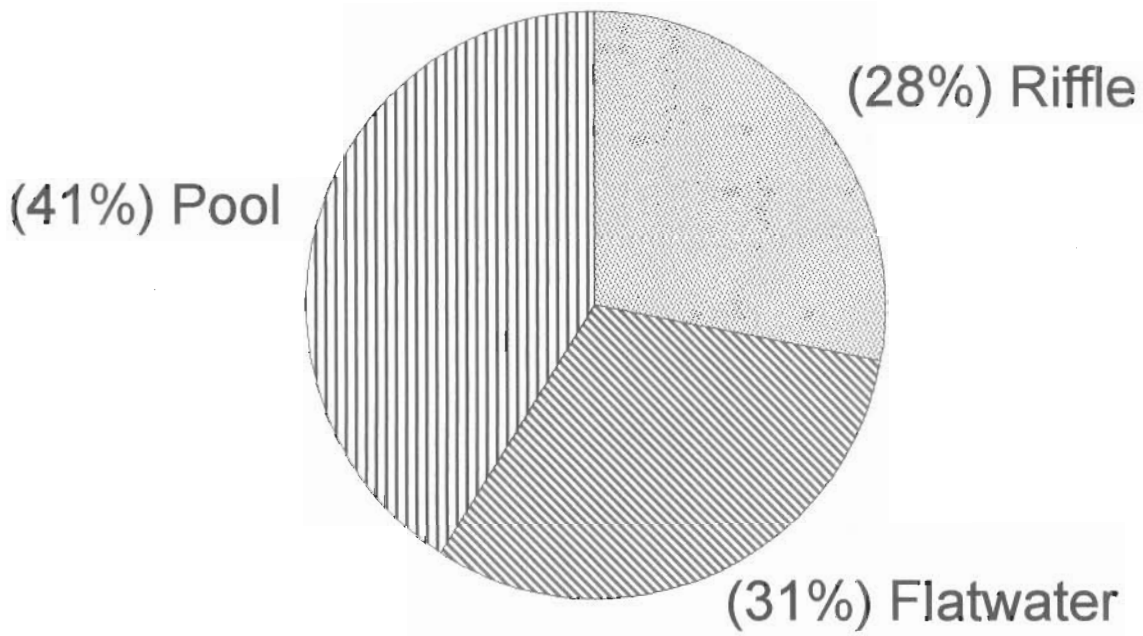
NOTES: Sample was taken in Reach 3 at habitat unit #149

D 1 = 0.09 mm	D 26 = 1.66 mm	D 51 = 6.13 mm	D 76 = 18.53 mm
D 2 = 0.14 mm	D 27 = 1.77 mm	D 52 = 6.44 mm	D 77 = 19.18 mm
D 3 = 0.19 mm	D 28 = 1.88 mm	D 53 = 6.79 mm	D 78 = 20.15 mm
D 4 = 0.23 mm	D 29 = 2.00 mm	D 54 = 7.09 mm	D 79 = 21.16 mm
D 5 = 0.28 mm	D 30 = 2.13 mm	D 55 = 7.46 mm	D 80 = 21.96 mm
D 6 = 0.32 mm	D 31 = 2.27 mm	D 56 = 7.81 mm	D 81 = 23.07 mm
D 7 = 0.37 mm	D 32 = 2.41 mm	D 57 = 8.23 mm	D 82 = 24.23 mm
D 8 = 0.41 mm	D 33 = 2.50 mm	D 58 = 8.71 mm	D 83 = 25.41 mm
D 9 = 0.45 mm	D 34 = 2.60 mm	D 59 = 9.04 mm	D 84 = 25.67 mm
D 10 = 0.50 mm	D 35 = 2.80 mm	D 60 = 9.61 mm	D 85 = 25.92 mm
D 11 = 0.54 mm	D 36 = 2.90 mm	D 61 = 10.06 mm	D 86 = 26.18 mm
D 12 = 0.59 mm	D 37 = 3.13 mm	D 62 = 10.46 mm	D 87 = 26.51 mm
D 13 = 0.65 mm	D 38 = 3.31 mm	D 63 = 11.08 mm	D 88 = 26.89 mm
D 14 = 0.71 mm	D 39 = 3.44 mm	D 64 = 11.98 mm	D 89 = 27.32 mm
D 15 = 0.75 mm	D 40 = 3.59 mm	D 65 = 12.45 mm	D 90 = 27.60 mm
D 16 = 0.80 mm	D 41 = 3.81 mm	D 66 = 13.10 mm	D 91 = 28.04 mm
D 17 = 0.86 mm	D 42 = 3.94 mm	D 67 = 13.42 mm	D 92 = 28.51 mm
D 18 = 0.93 mm	D 43 = 4.16 mm	D 68 = 13.76 mm	D 93 = 29.01 mm
D 19 = 1.01 mm	D 44 = 4.38 mm	D 69 = 14.28 mm	D 94 = 29.60 mm
D 20 = 1.10 mm	D 45 = 4.58 mm	D 70 = 14.81 mm	D 95 = 30.19 mm
D 21 = 1.17 mm	D 46 = 4.81 mm	D 71 = 15.37 mm	D 96 = 31.13 mm
D 22 = 1.27 mm	D 47 = 5.02 mm	D 72 = 15.95 mm	D 97 = 32.14 mm
D 23 = 1.38 mm	D 48 = 5.30 mm	D 73 = 16.55 mm	D 98 = 33.53 mm
D 24 = 1.46 mm	D 49 = 5.56 mm	D 74 = 17.17 mm	D 99 = 35.87 mm
D 25 = 1.55 mm	D 50 = 5.84 mm	D 75 = 17.90 mm	D100 = 50.80 mm


LOG-PROBABILITY CUMULATIVE-FREQUENCY GRAIN SIZE DISTRIBUTION PLOT
SITE: GRIFFIN SAMPLE NUMBER: 1
DIAMETER (mm.)
1.5
2.5
5.8
13.1
17.9
PERCENT FINER
PERCENTILES
75
66
50
33
25
DIAMETER (mm.)

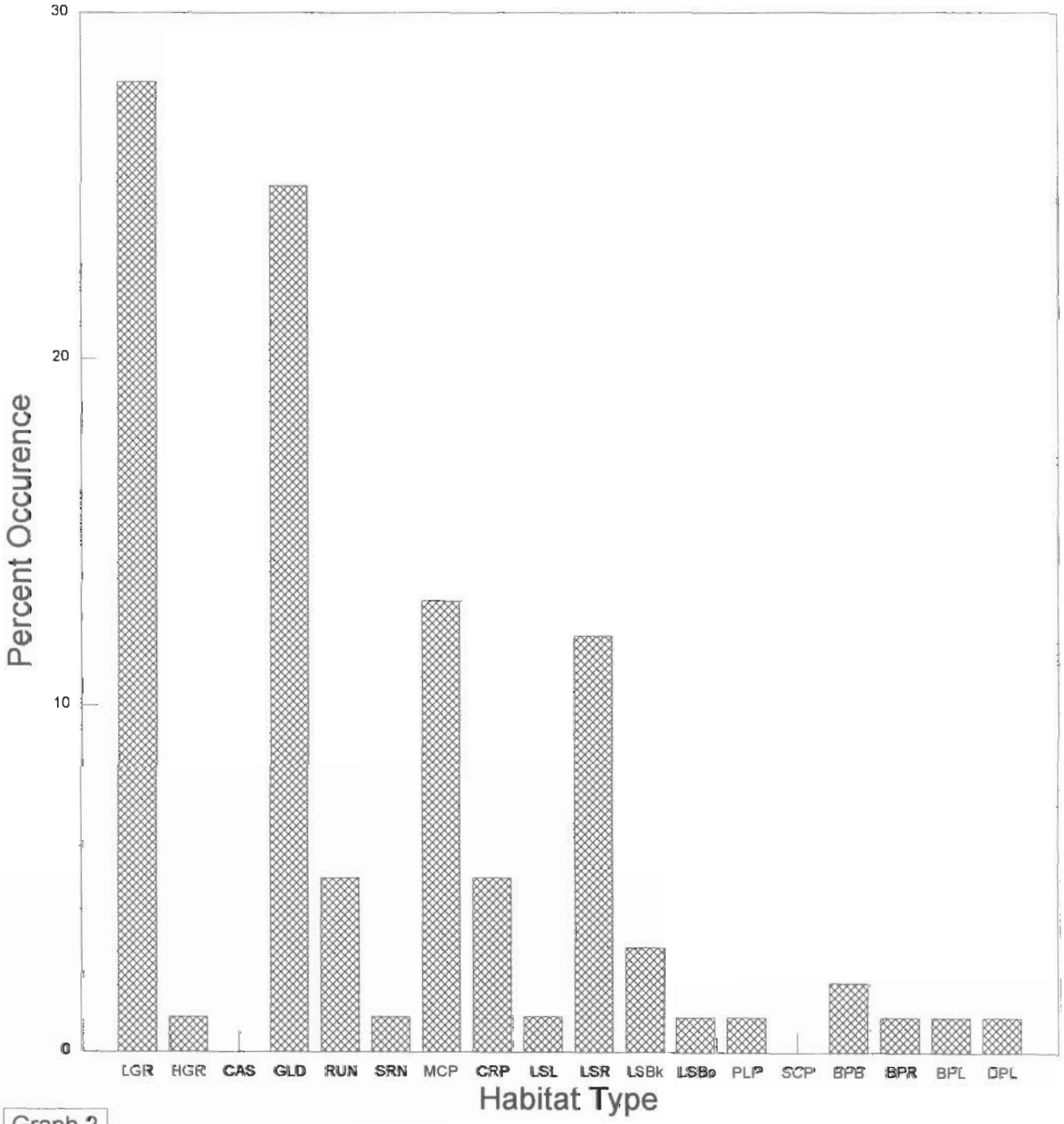
Unnamed Creek

Level II Habitat Types by % Occurrence



Graph 1

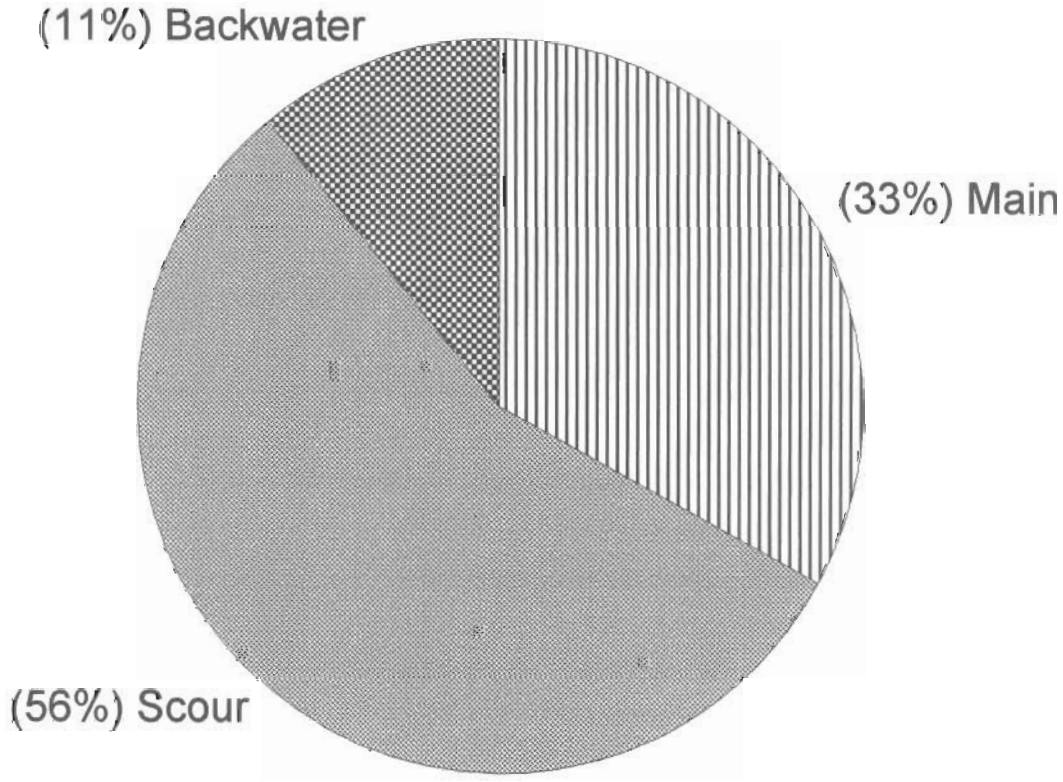
Unnamed Creek
Level IV Habitat Types by Percent Occurrence



Graph 2

Unnamed Creek

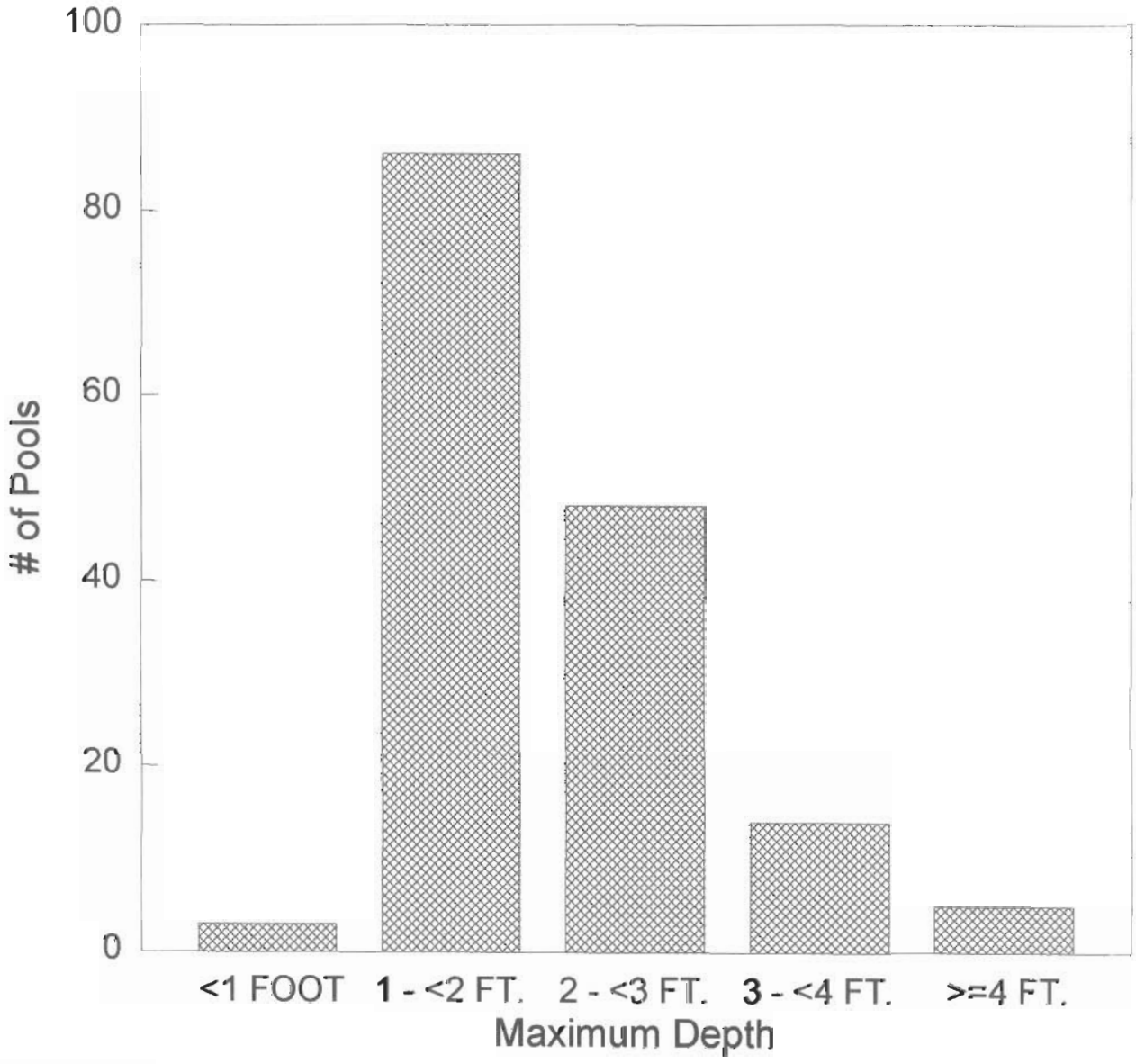
Pool Habitat Types by % Occurrence



Graph 3

Unnamed Creek

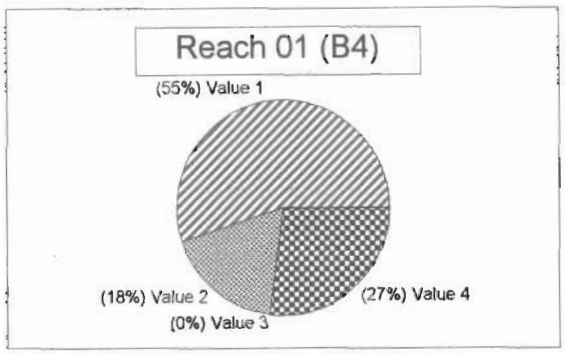
Maximum Depth in Pools

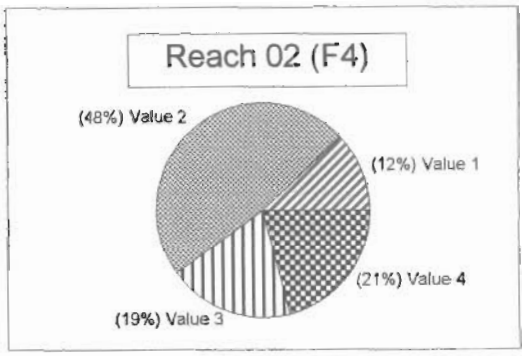


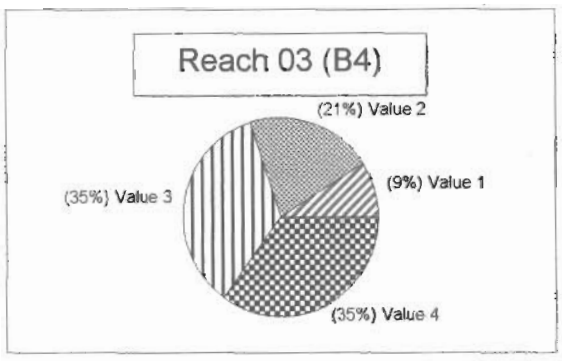
Graph 4

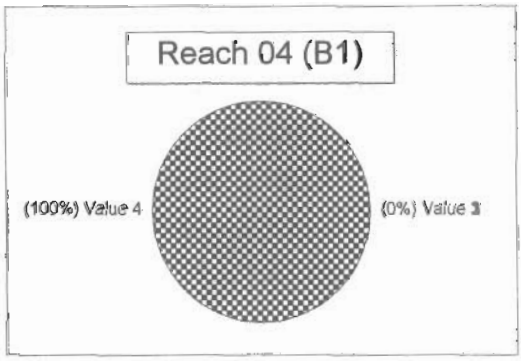
Unnamed Creek

Percent Embeddedness by Reach







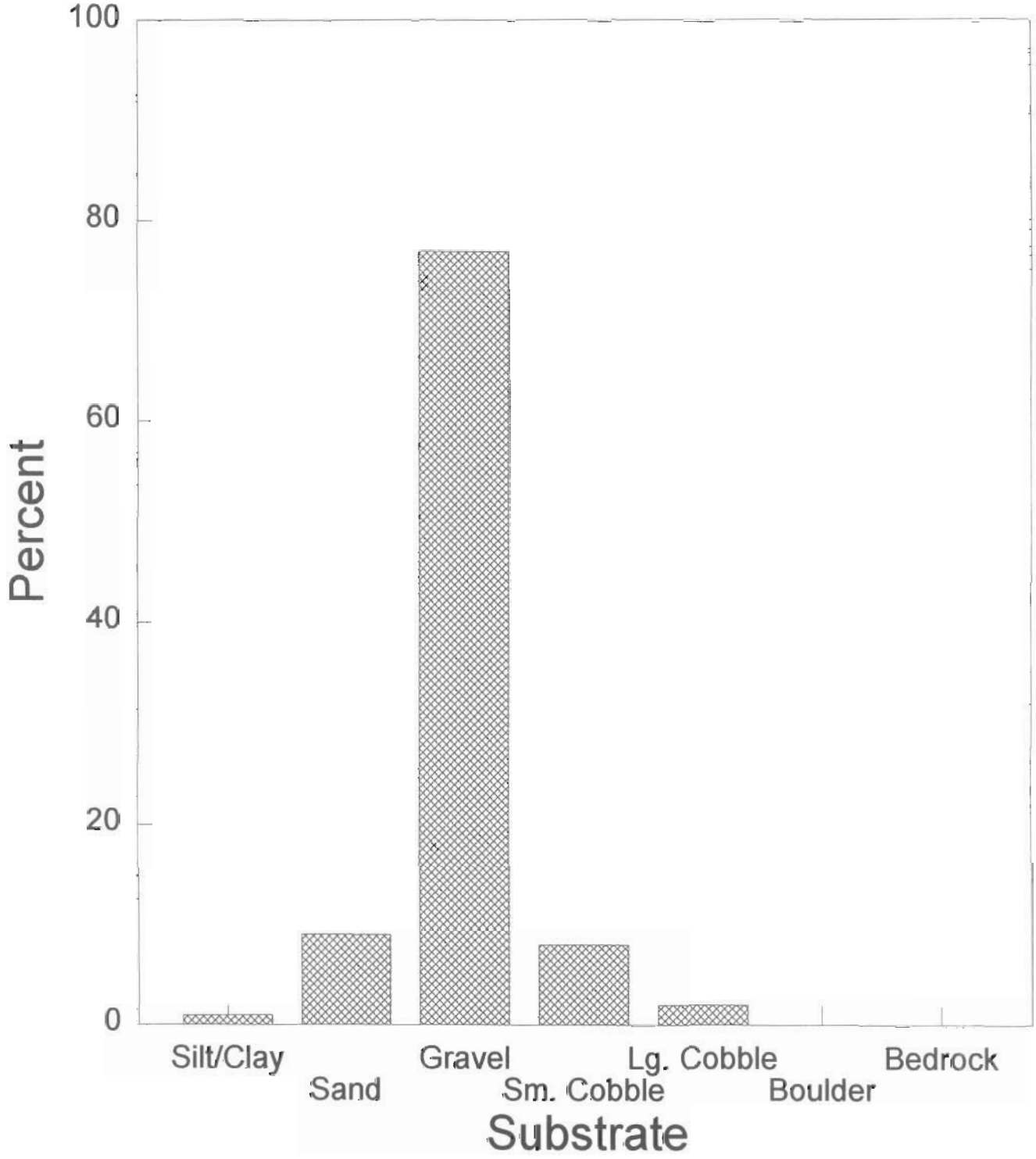


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 5

Unnamed Creek

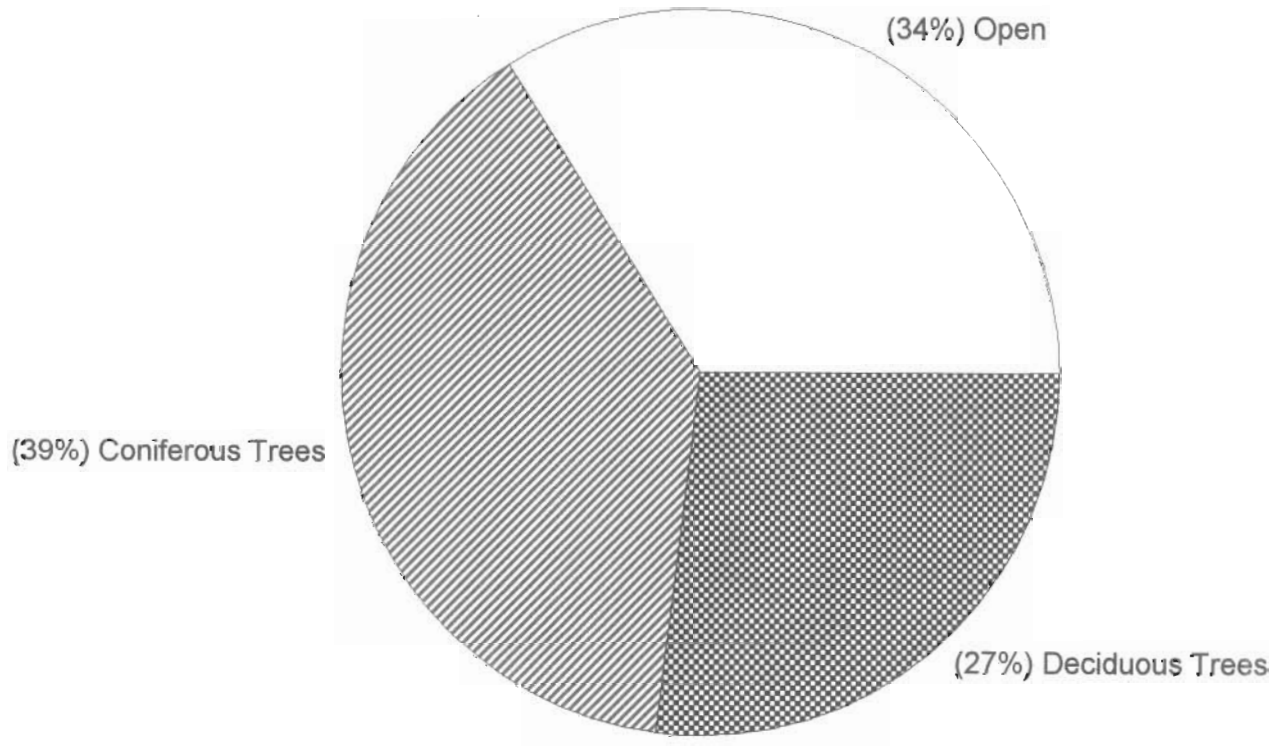
Substrate Composition in Low Gradient Riffles



Graph 7

Unnamed Creek

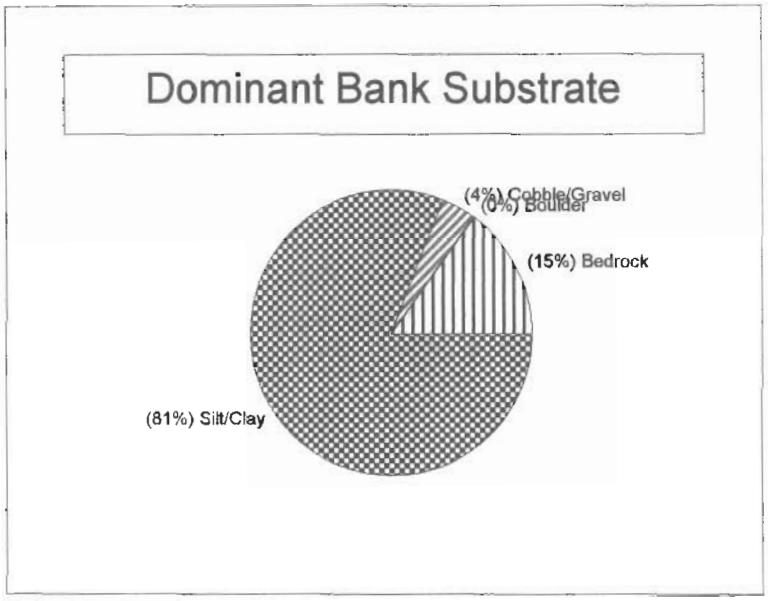
Mean Percent Canopy

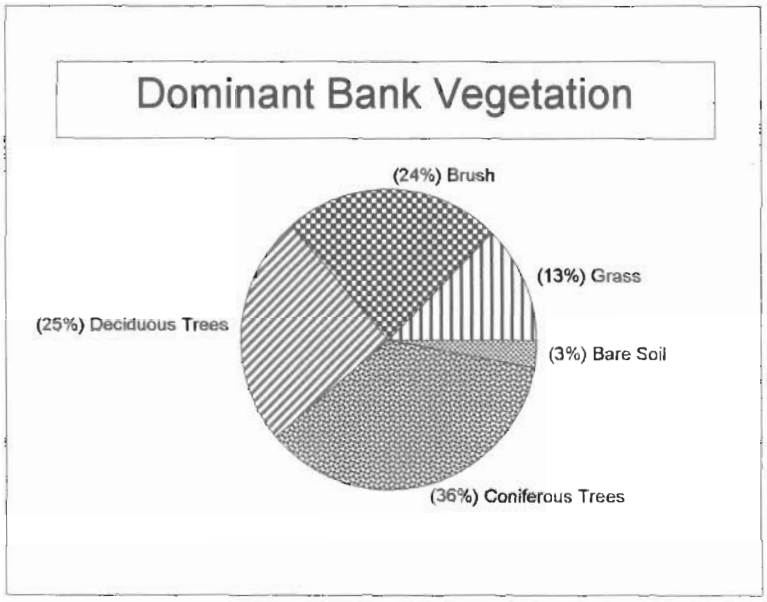


Graph 8

Unnamed Creek

Percent Bank Composition

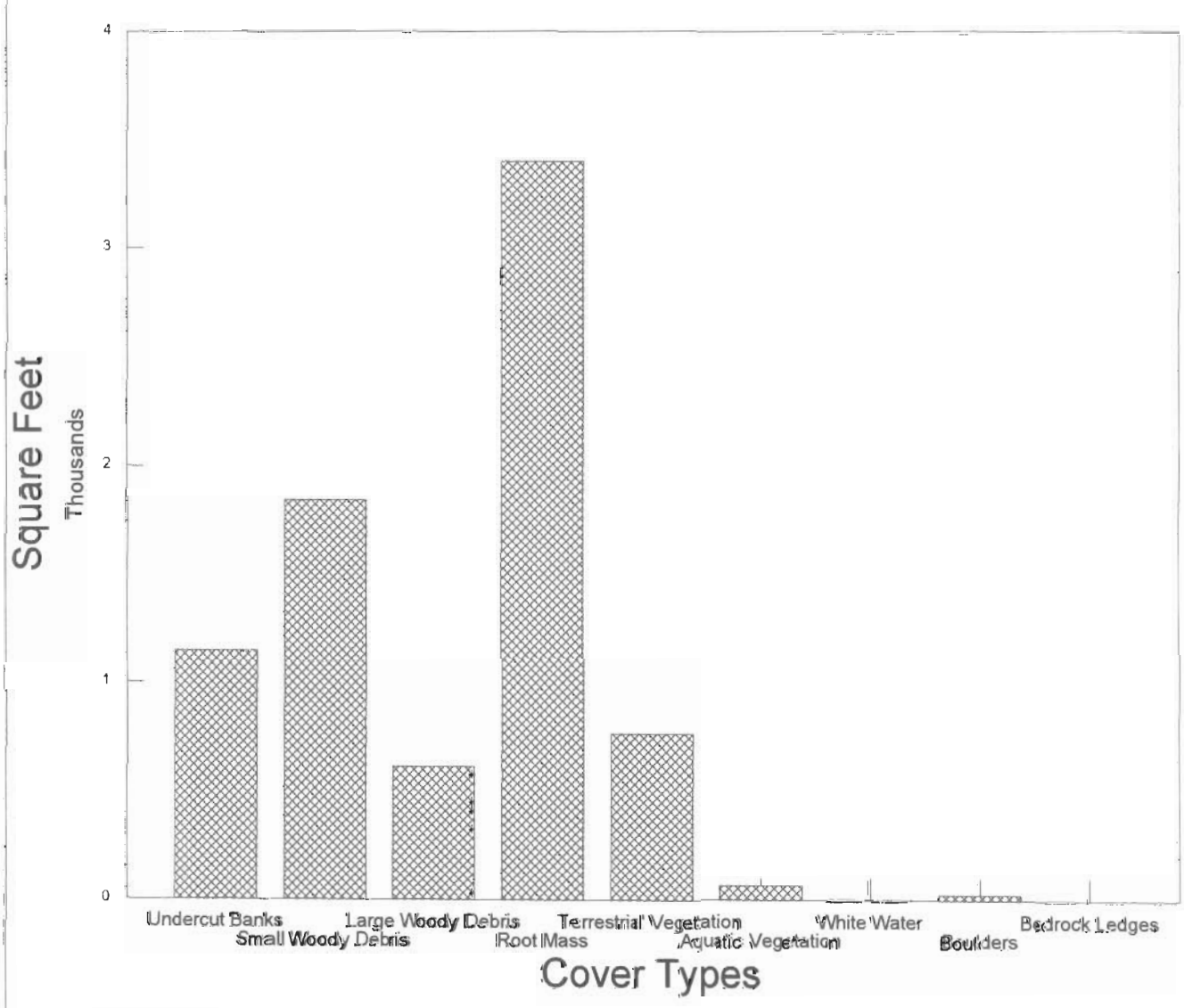




Graph 9

Unnamed Creek

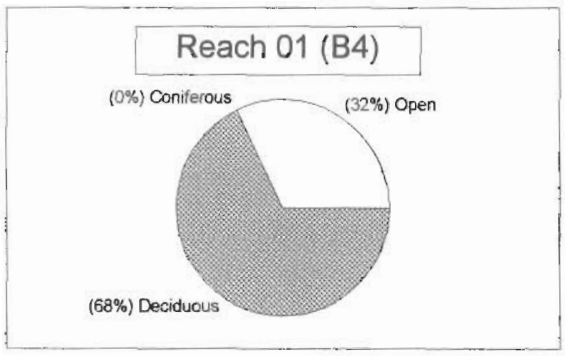
Cover Type Areas in Pools

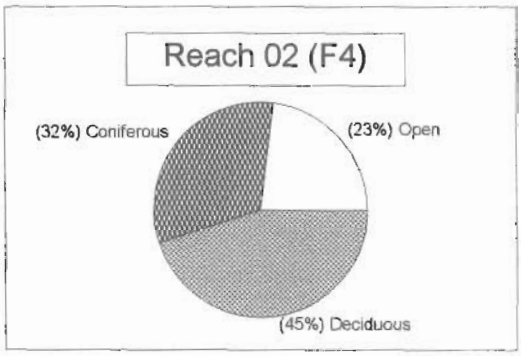


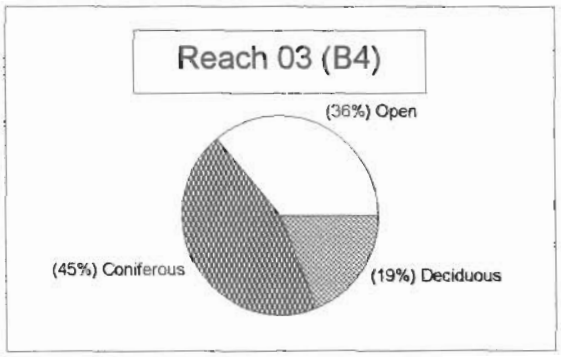
Graph 10

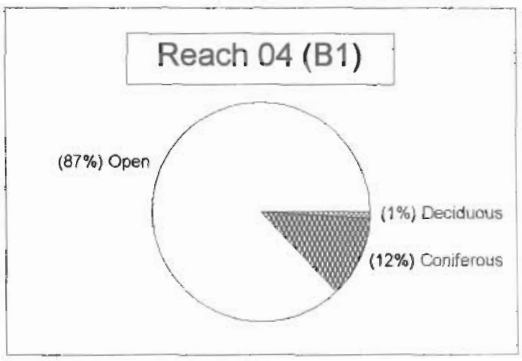
Unnamed Creek

Percent Canopy by Reach









Graph 11