CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Gray Creek
Report Revised April 14, 2006
Report Completed *2000*
Assessment Completed 1996

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Gray 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 Gray Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Gray Creek is a tributary to East Austin Creek which flows into Big Austin Creek, a tributary of the Russian River, located in Sonoma County, California (see Gray Creek map, page 2). The legal description at the confluence with East Austin Creek is T9N, R10W, S34. Its location is 38°35'21" N. latitude and 123°3'20" W. longitude. Seasonal vehicle access exists from East Austin Creek Road (private) via Mill Creek Road near Healdsburg.

Gray Creek and its tributaries drain a basin of approximately 5.1 square miles. Gray Creek is a second order stream and has approximately 5 miles of blue line stream, according to the USGS Cazadero 7.5 minute quadrangles. Lawhead Creek and an unnamed tributary were also surveyed and the results are included in this report. Elevations range from about 360 feet at the mouth of the creek to 1240 feet in the headwaters. The stream flows through a V-shaped canyon heavily covered with redwoods, tan oaks, other hardwoods and chaparral from the headwaters to the mouth. The watershed is entirely privately owned.

METHODS

The habitat inventory conducted in Gray Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1994). The NEAP crew 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 Gray Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Gray Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Gray Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to

tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, bedrock, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Gray Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Gray Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated visually into percentages of evergreen or deciduous trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Gray Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic

methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following tables and appendices:

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

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

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

HISTORICAL STREAM SURVEYS:

The Department of Fish and Game conducted surveys of Gray Creek in May 1962, August 1977, and September 1982. The 1962 survey was conducted by car and foot with frequent stops for closer inspection. The survey began at the mouth and ended 6 miles upstream. Flow was estimated to be 4.0 cfs. The wetted width averaged 7' and ranged from 4-12'. The depth averaged 6" and ranged from 2-8". No pollution or diversions were observed, and spring development appeared to be very good.

Pool development was considered to be good with many pools observed. Shelter was considered

extremely satisfactory for small salmonids and consisted of roots, rocks and overhanging vegetation. Canopy provided 50-80% overhead cover. Air temperatures ranged from 76-79°F and water temperatures ranged from 60-61°F. Aquatic insects were noted to be common.

Substrate was described as predominantly gravel, rubble and boulders with some sections of sand scattered throughout. Spawning areas were considered to be good throughout the entire stream with the lower mid and upper mid-sections having the best spawning habitat.

Two potential barriers included a recently formed log jam located .5 miles from the mouth, and a road crossing 1 mile from the mouth, where logs and boulders pushed into the stream presented an 8' jump for migrating salmonids.

In the 1977 survey, Gray Creek was walked from the mouth to the headwaters. Near the mouth, flow was estimated to be .2 cfs, and in Lawhead Creek, flow was less than .05 cfs. The wetted width averaged 1' and ranged from 6" to 8'. Surface flow was intermittent throughout the entire stream and all tributaries except Lawhead Creek were dry.

The pool/riffle ratio was estimated as 75/25. Adequate shelter consisted of rocks and boulders with an occasional undercut bank. Air temperatures ranged from 75-86°F and water temperatures ranged from 60-66°F.

Substrate in the lower 2 miles was 10% boulders, 60% rubble, 10% gravel, 10% silt, and 10% detritus. Spawning gravels in this section were scarce. The middle 2 miles was 40% boulders, 30% rubble, 20% gravel, and 10% detritus. There was a moderate amount of spawning areas in this section, although the gravels tended to contain an excessive amount of silt. The substrate in the upper mile was almost entirely silt and had poor spawning habitat.

No pollution or diversions were observed, and 3 springs were active during the survey. Potential barriers included a log jam at the mouth, a 4' high falls and another log jam in the middle section, and several 5-6' high falls and a log jam in the upper section. A resident had reported seeing several adult steelhead upstream from all these potential barriers the previous spring. It was determined that the upper fish limit resulted from steep gradients and boulders in the streambed.

In 1982, the upper 1 mile of Gray Creek which flows parallel to Mill Creek Road, was surveyed. The flow was intermittent and stagnant in some places. The stream width was approximately 3'. A culvert at the first road crossing downstream from the headwaters had a 4' drop. The stream substrate consisted of 90% silt, 5% gravel and 5% sand. There were many trees and debris in the creek from the previous winter storms. It was determined that this upper area of Gray Creek should be considered only as a water source and not as salmonid habitat.

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 27 - September 12, 1996 was conducted by Mark Kipp and Mark Bolin (NEAP) and data analyzed by Ken Bunzel (DFG). The survey began at the confluence with East Austin Creek and extended up Gray Creek to a point 800 feet past a possible barrier at a culvert on Mill Creek Road. No fish were observed above the culvert. The total length of the stream surveyed was 27,816 feet (5 1/4 miles), with an additional 328 feet of side channel.

This section of Gray Creek has 5 channel types: from the mouth to 6,220 feet a B2; next 12,092 feet a B3; next 1,920 feet an F3; next 3,335 feet a G1 and the upper 4,249 feet an F4. B2 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 boulder substrate. B3 channel types are similar to B2 channels, except with a predominantly cobble 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.

G1 channel types are characterized as well entrenched "gully" step-pool channels with a low width/depth ratio, a moderate gradient (2- 4%) and a predominantly bedrock substrate.

F4 channels are similar to F3 channels, except with a predominantly gravel substrate.

Water temperatures ranged from 51°F to 65°F. Air temperatures ranged from 56°F to 87°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 40% pool units, 38% flatwater units, and 22% riffle units. Based on total **length** there were 58% flatwater units, 23% pool units, and 18% riffle units (Graph 1).

Two hundred, ninety-five habitat units were measured and 23% were completely sampled. Fifteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were runs at 21%, step runs 13%, low gradient riffles 13% and bedrock scour pools 10% (Graph 2). By percent total **length**, runs made up 31%, step runs 24%, low gradient riffles 11%, and step pools 6%.

One hundred, nineteen pools were identified (Table 3). Scour pools were most often encountered at 79%, and comprised 64% of the total length of pools (Graph 3). No backwater pools were identified.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. One hundred, two of the 119 pools (86%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 20% 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 132. Flatwater had the lowest rating with 81 and pool rated 87 (Table 1). Of the pool types, the main

channel pools rated 98 and scour pools rated 84 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 40%, undercut banks 16%, small woody debris 10%, and root masses 10%. Graph 5 describes the pool shelter in Gray Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel and small cobble was the dominant substrate observed in the low gradient riffles measured (Graph 6).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 117 pool tail-outs measured, none had a value of 1; 17 had a value of 2 (15%); 100 had a value of 3 (85%); and none had a value of 4. On this scale, a value of one is best for fisheries. Graph 7 describes percent embeddedness by reach.

The mean percent canopy density for the stream reach surveyed was 81%. The mean percentages of deciduous and evergreen trees were 34% and 66%, respectively. Graph 8 describes the canopy for the entire survey and graph 9 describes the canopy by reach.

For the entire stream reach surveyed, the mean percent right bank vegetated was 79% and the mean percent left bank vegetated was 80%. For the habitat units measured, the dominant vegetation types for the stream banks were: 70% evergreen trees, 20% deciduous trees, 6% brush, and 4% grass. The dominant substrate for the stream banks were: 50% silt/clay/sand, 18% bedrock, 18% cobble/gravel and 13% boulder (Graph 10).

HABITAT INVENTORY RESULTS FOR UNNAMED TRIBUTARY OF GRAY CREEK

The habitat inventory of September 5, 1996 was conducted by Mark Bolin and Mark Kipp (NEAP) and data analyzed by Ken Bunzel (DFG). The survey began at the mouth and extended upstream for 392 feet, to where the stream became intermittent.

The surveyed section of this unnamed tributary is a B3 channel type. The water temperature was 55°F and the air temperature was 63°F. Three habitat units were measured, 2 step runs and 1 plunge pool with a maximum depth of 2 feet. The plunge pool had a shelter rating of 30, with boulders dominant.
Gravel or small cobble were dominant, and no embeddedness ratings were measured.

The mean percent canopy was 97%, and Evergreen trees were dominant. The dominant substrate for the stream banks were: 50% silt/clay/sand, 33% cobble/gravel, and 17% bedrock.

No salmonids were seen above an instream culvert with a downcut located 74 feet from the mouth. A log jam at the end of the survey is another possible fish barrier.

HABITAT INVENTORY RESULTS FOR LAWHEAD CREEK

The habitat inventory of September 5, 1996 was conducted by Mark Bolin and Mark Kipp (NEAP) and data analyzed by Ken Bunzel (DFG). The survey began at the mouth and extended up Lawhead Creek for 402 feet to a log debris accumulation. No fish were seen above or below the log debris accumulation.

Lawhead Creek is an A2 channel type. A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate. This channel type is not generally considered to be salmonid habitat; however Lawhead Creek is an important source of cool flows to Gray creek

The water temperature was 57°F and the air temperature was 58°F.
The habitat types were a run, step run, cascade, bedrock formed scour pool (maximum depth 1.1 ft), and a boulder formed scour pool (maximum depth 2.0 ft).

The mean percent canopy density for the stream reach surveyed was 99%. The mean percentages of deciduous and evergreen trees were 3% and 97%, respectively. Evergreen trees were the dominant bank vegetation for all units. The dominant substrate for the stream banks were: 40% silt/clay/sand, 30% bedrock, and 30% boulder.

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

In the 1962 survey, many young of the year steelhead were observed at the points checked. In addition, 3 1+ steelhead and 16 coho juveniles were observed. It was noted that the abundance of steelhead appeared to be good, but the numbers of coho seemed small in relation to the stream's potential for salmonid production. In general, this creek was considered one of the most important, if not the most important, steelhead and coho salmon spawning areas in the upper East Austin Creek drainage.

In the 1977 survey, the lower 2 miles contained Sacramento Squawfish averaging 10/100' and 4" long, California Roach averaging 50/100' and 3" long, and Sacramento Suckers averaging 5/100' and 4" long. Juvenile 0+ and 1+ steelhead were observed from the mouth to .5 miles upstream from the mouth of Lawhead Creek at a rate of 5/100'. In general, it was noted that salmonid spawning and rearing habitat had been reduced by the low rainfalls of the last 2 winters.

On October 10, 1996 a biological inventory was conducted in four sites of Gray 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 was 70°F and the water temperature was 57°F. The observers were Kipp, Bolin (NEAP), Coey (DFG) and Campo (AmeriCorps).

The inventory of Reach 1 started at habitat unit 21 and ended approximately 688 feet upstream in habitat unit 31. In riffle and pool habitat types 142 0+ and 22 1+ steelhead (24/100') were observed along with 55 Sacramento Squawfish (8/100'), 1 sculpin, 13 Pacific giant Salamanders, 8 Yellow-legged Frogs, 5 Rough-skinned Newts and 1 crayfish. The largest squawfish observed was 5 inches long.

The inventory of Reach 2 started in habitat unit 126 and ended 1,275 feet upstream in habitat unit 136. In pool and riffle habitat types 197 0+ and 19 1+ steelhead (17/100') were observed along with 2 Sacramento Squawfish, 6 Yellow legged frogs, 2 Pacific giant salamanders and 1 Rough-skinned Newt.

The inventory of Reach 3 started in habitat unit 197 and ended 1,556 feet upstream in habitat unit 210. In pool and riffle habitat types 100 0+, 16 1+ and 2 2+ steelhead (8/100') were observed along with 5 Pacific Giant Salamanders and 4 unidentified frogs.

The inventory of Reach 5 started in habitat unit 275 and ended 857 feet upstream in habitat unit 285. In pool and riffle habitat types 58 0+, 9 1+ and 3 2+ steelhead (25/100') were observed along with 7 Pacific Giant Salamanders.

No salmonids were observed for 100' upstream of the Mill Creek Road culvert at unit 285, approximately 5 miles above the mouth.

No introduced fish species have been observed during any of the survey years. Historical records indicate no hatchery stocking, transfers, or rescues have occurred in the watershed.

Species Observed in Historical and Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1962,1977, 1996	Steelhead	DFG	N
1962	Coho	DFG	N
1996	Sculpin	DFG	N
1977, 1996	Sacramento Squawfish	DFG	N
1977	Sacramento Sucker	DFG	N
1977	California Roach	DFG	N
1996	Crayfish	DFG	N
1996	Pacific Giant Salamander	DFG	N

Species Observed in Historical and Recent Surveys			
YEARS	**SPECIES**	**SOURCE**	**Native/Introduced**
1996	Rough-skinned Newt	DFG	N
1996	Yellow-legged Frog	DFG	N

DISCUSSION

Gray Creek has 5 channel types: B2, B3, F3, G1 and F4.

There are 6,220 feet of B2 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover.

There are 12,092 feet of B3 channel type in Reach 2. B3 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 1,920 feet of F3 channel type in Reach 3. 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 3,335 feet of G1 channel type in Reach 4. G1 channel types are fair for log cover and poor for boulder clusters.

There are 4,249 feet of F4 channel type in Reach 5. F4 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover.

The water temperatures recorded on the survey days August 27 - September 12, 1996 ranged from 51°F to 65°F. Air temperatures ranged from 56°F to 87°F. This temperature regime is favorable to salmonids.

Pools comprised 23% of the total **length** of this survey. In first and second order streams a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. In Gray Creek, the pools are relatively deep with 86% having a maximum depth of at least 2 feet. However, these pools comprised only 20% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 87. Shelter ratings in this stream were measured in regard

to 0+ fish. Shelter for 1+ fish is scarce. Shelter is being provided primarily by boulders and undercut banks. Large woody debris as a shelter component is lacking. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition. Large woody debris also encourages pool scour.

The low gradient riffles measured had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Eighty-five percent of the pool tail-outs measured had embeddedness ratings of 3. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

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

The mean percent canopy for the survey was 81%. This is good, since 80 percent is generally considered desirable. However, Reach 1 with only 67% canopy, and areas with bank erosion could benefit from bank stabilization structures followed up with revegetation using native species.

Numerous gullies and washouts along the unimproved road system adjacent to the creek are impacting high quality spawning gravels and rearing habitat in gray creek. In addition, current road maintenance practices contribute huge amounts of sediment to the creek needlessly. The upper reach contains a large depositional plain of soil that is chronically contributing fines to lower reaches. A flashboard dam located at a culvert crossing exacerbates bank erosion here through saturation and slumping.

The surveyed section of the unnamed tributary of Gray Creek has 392 feet of B3 channel type. The recorded water temperature (55°F) and mean percent canopy (97%) are excellent for salmonids. Juvenile salmonids observed in the plunge pool indicate successful spawning, however, the culvert and log jam may present migration barriers.

SUMMARY

Biological surveys were conducted to document fish distribution and are not necessarily representative of population information. Steelhead were documented consistently during each past survey year and coho only in 1962. This is likely because physiological and environmental requirements for coho are more stringent than for steelhead, or coho were absent or present only in small numbers in some years. The 1996 spring surveys documented relatively few 0+ fish indicating poor spawning habitat in all reaches of Gray Creek. Also, few 1+ fish were observed

indicating poor holding-over conditions in general.

Although the stream as a whole has adequate shade canopy, canopy is low in some areas. Water temperatures are at, but not above, the threshold stress level for salmonids. Adequate spawning gravel is available, although high sediment levels from the adjacent road system likely inhibit spawning success. Shelter for juvenile rearing habitat is lacking. In addition, there is a lack of deep pools due to sediment accumulation. Conditions upstream of the Mill Creek Road culvert are very poor for salmonids, with high levels of siltation. This culvert is a possible fish barrier.

GENERAL RECOMMENDATIONS

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

The winter 1995/96 storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the drought. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat. Many signs of recent and historic tree and log removal were evident in the active channel during our survey. Efforts to increase flood protection or improve fish access in the short run, have led to long term problems in the system. 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 culvert in Reach 5 at Mill Creek Road requires maintenance. The bottom is rusting 12 feet from the end, and a concrete bib at the downstream side eliminates any plunge pool development and presents a fish barrier. This culvert should be corrected or replaced. There is a log debris accumulation in Reach 3 that is retaining large amounts of sediment. In addition, there is 1 log debris accumulation in Lawhead Creek and 1 in the unnamed tributary which may be fish barriers. The modification of these debris accumulations is recommended but**, must be done carefully to preserve existing habitat provided by the woody debris.**

2) Increase the canopy specific areas by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

3) There are 3 major bank erosion problems in Gray Creek, 1 in Lawhead Creek, and 1 in the unnamed tributary which need bank stabilization structures. In addition, structures to decrease channel incision should be installed in the upper reach of Gray Creek.

4) Adding high quality complexity to pools with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be

effective in many flatwater and pool areas.

RESTORATION IMPLEMENTED

1) There are numerous points where the toe of the fill slope of the road is within the floodplain. High flows erode this fill slope causing bank erosion and road failure. These sources of erosion related to the road system are currently being inventoried and prioritized by NEAP and Pacific Watershed Associates according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Opportunities to decrease considerable quantities of sediment to the stream are numerous with changes in road management strategy. These cost effective alternatives should be explored with landowners.

2) Spawning gravels on Gray Creek are very poor. Digger logs should be installed in run habitats, which would also increase the number, length and depth of pools. Most of the existing shelter is from boulders and undercut banks.

PROBLEM SITES AND LANDMARKS - GRAY 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	64	SQUAWFISH & SALAMANDER
3.00	314	SMALL STEEP DRY RAVINE LF BANK
4.00	365	SALMONIDS
6.00	551	SALMONIDS
8.00	647	LOG ACROSS STREAM W/ SMALL WOODY DEBRIS PILE
9.00	693	SQUAWFISH & SALMONIDS
14.00	1181	SPRINGS RT BANK
17.00	1447	RT BANK OLD DUMP, (50' X 36' X 2')
21.00	1711	WHITE LOG HOUSE (COLOMBINI) RT BANK
23.00	1755	CONCRETE & REBAR, DRIVEWAY -FORD TO COLOMBINI'S
25.00	1858	SQUAWFISH
26.00	1935	DRY SPRING RT BANK-BOTTOM OF UNIT RAVINE RT BANK-TOP OF UNIT
28.00	2069	SALMONIDS 1+
29.00	2113	NICE GRAVEL, 2+ SALMONIDS & SQUAWFISH

33.00	2400	DARK GRAY RD-FORD #1, FORD-TOP OF UNIT; SPRING LF BANK
37.00	2714	10" RESIDENT P/O SQUAWFISH 0+, 1+, 2+
38.00	2778	FILL FROM SLOPE OF ROAD COMES DOWN TO CREEK ALONG THESE UNITS
39.00	3019	DRY RAVINE RT BANK, CULVERT UNDER RD
44.00	3404	FILL FROM SLOPE OF ROAD ALONG CREEK,
45.10	3548	FEEDER STREAM, STEEP RAVINE LF BANK (58°F), TIMBER HARVEST FLAGS
48.00	3754	REDWOOD LOG W/ ROOT WAD ACROSS CREEK
50.00	3931	HUMBOLDT XING; CLASS 3 (61°F)
61.00	4684	3.5' DIA. REDWOOD LOG W/ ROOT WAD DOWN IN STREAM LF BANK
64.00	4934	SALMONIDS & SQUAWFISH
66.00	5173	MAN MADE BOULDER DAM ACROSS CREEK, DRY RAVINE LF BANK
67.00	5256	LF BANK-HORSESHOE PIT RT BANK-TRAILER
69.00	5604	DRIVEWAY FORDS CREEK 160' UP UNIT CLASS 3 DRY TRIB, LF BANK, TOP OF UNIT LEADS TO PANTHER BEDS; DRY AT CONFLUENCE
71.00	5769	RED HOUSE W/ GREEN GATE LF BANK
73.00	6116	FORD T/U FORD #2
77.00	6512	3 POOLS, ROAD 25' ABOVE POOLS
80.00	6754	STEEP RAVINE RT BANK
84.00	6979	SQUAWFISH & SALMONIDS
86.00	7101	CAR POOL
90.00	7506	SPRING RT BANK IN RAVINE
94.00	8017	HOUSE RT BANK; DRY TRIB
97.00	8200	DRIVE FORDS STREAM, SHED RT BANK
101.00	8629	0+, 1+, 2+ SALMONIDS, SQUAWFISH, NICE GRAVEL
111.00	9407	CLASS 3 T/U RT BANK, 62°F, FORD #3
113.00	9592	3 POOLS
114.00	9775	SPRING LF BANK
118.00	10045	BLOWOUT LF BANK (55'W X 100'L X 6'D)
122.00	10324	3 SMALL POOLS, RT BANK-OLD HUMBOLDT XING, POSSIBLE CLASS 3 W/ CULVERT-RUNNING WATER (62°F)
127.00	10628	REDWOOD ACROSS STRM W/ SUCKER SHOOTS
129.00	10928	LARGE LIVE REDWOOD ACROSS STREAM
132.00	11521	FEEDER STREAM LF BANK (61°F), CULVERT UNDER SIDE RD.

133.00	11599	OLD SKID TRAIL RT BANK
137.00	12106	SIDE ROAD FORDS STREAM, FORD #4
138.00	12153	2.5' FIR ACROSS STREAM; 8" TROUT
140.00	12317	2 POOLS
141.10	12384	4 POOLS
142.00	12494	SMALL BEDROCK GORGE, 5 POOLS, DRY TRIB RT BANK-CULVERT AT ROAD
144.00	12580	6" TROUT, FILL FROM SLOPE OF ROAD GOES TO CREEK-RT BANK, NICE GRAVEL
152.00	13436	SEVERAL 2+ SALMONIDS; RECENTLY FALLEN MAPLES
153.00	13502	CLASS 3 (59°F), BOTTOM OF UNIT
157.00	13811	DEBRIS PILE (LG & SM WOOD/ROOTS)
160.00	13990	SPRING R BANK
163.00	14239	ROOTWAD/LOGJAM
164.00	14359	ROAD RT BANK, FILL SLOPE
165.00	14417	FILL SLOPE TO EDGE OF CREEK
167.00	14540	0+,1+,2+ SALMONIDS
172.00	14995	3 POOLS, LG AT TOP
174.00	15070	BEAUTIFUL POOL, 9" RESIDENTS
176.00	15393	7 POOLS WITH NICE FISH, 4-6" TROUT, (0+,1+,2+) CLASS 3 RT BANK TOP OF UNIT (58°F)
179.00	15506	ROAD IS NEXT TO CREEK ALONG RT BANK
180.00	15630	WATER IS MURKY LIKE DISHWATER IN UNITS 176-184
184.00	16138	FORD CROSSES STREAM, MOST LIKELY CAUSE OF MURKY WATER, FORD #5
185.00	16290	4 POOLS, LOGJAM AT TOP OF UNIT BETWEEN THIRD AND FOURTH POOLS
186.00	16389	DRY TRIB, STEEP RAVINE, RT BANK
187.00	16471	3 POOLS
188.00	16533	BLOW OUT RT BANK
189.00	16576	FORD #6
191.00	17023	WET FEEDER STREAM RT BANK (60°F), CULVERT UNDER RD
199.00	17422	LOG JAM, LARGE BAY TREE DOWN
201.00	17509	FORD ON EDGE OF POOL, FORD #7
203.00	17673	RD LF BANK, FILL SLOPE AT CREEK
205.00	18312	BRIDGE AT DRIVE TO DOELGER RANCH
206.00	18355	6" TROUT, 0+,1+, 2+, DEBRIS PILE
207.00	18462	EROSION GULLY RT BANK
208.00	18632	4 POOLS W/ 0+, 1+, 2+ SALMONIDS, 4-8" TROUT

210.00 18761 SPRING LF BANK
211.00 1885 4 BLUE LINE TRIB (HAB. TYPED) LF BANK
213.00 19253 NEW TRACTOR DRIVEWAY FORDS CREEK;
GREAT EROSION POTENTIAL
215.00 19416 GULLY RT BANK, TOP OF UNIT
216.00 19429 EROSION GULLY RT BANK BELOW UNIT
217.00 19702 DEPOSITIONAL PLANE FROM LOGJAM;
EROSION GULLIES FROM RD-LF BANK
219.00 19802 SALMONIDS
220.00 19877 SALMONIDS 2+,1+, 6" TROUT
223.00 20200 BLOW OUT LF BANK (70'L X 35'W X 3'H),
DUMPED TWO TREES ACROSS STREAM
224.00 20232 3' FIR ACROSS STREAM, CONFLUENCE
OF LAWHEAD CREEK LF BANK (58°F)
228.00 20550 3 POOLS WITH 1 DEEP, SPRING LF BANK
229.00 20673 SPRING RT BANK
232.00 20947 SPRING RT BANK, MIDDLE OF UNIT
234.00 21135 WATERFALL - 2 PART, 15' HIGH, NOT
A FISH BARRIER
237.00 21440 STEEP, SMALL GULLY RT BANK
238.00 21682 RAVINE LF BANK 125' UP UNIT
239.00 21735 3 SHALLOW POOLS
240.00 21902 RAVINE RT BANK
241.00 21929 LOG JAM (33'W X 19'L X 7'D),
RETAINING GRAVEL, CREEK SUBTERRANEAN
242.00 22112 SALMONIDS, GULLY RT BANK
251.00 23339 HOUSE AND PUMP HOUSE LF BANK
258.00 23703 SALMONIDS 0+, 1+ (VERY FEW)
259.00 23933 BRIDGE W/ APPLIANCE PUMP
260.00 24223 LOGJAMS, BLOWOUT WATER COLLECTING
261.00 24312 S-TURN POOL WIRES INSTREAM
262.00 24408 LARGE LOGJAM W/ REDWOODS GROWING UP
FROM IT, TOP OF UNIT
263.00 24851 TWO STORY LOG HOUSE, LF BANK, W/
HORSES' FOOT BRIDGE; TOP OF UNIT
DRIVEWAY BRIDGE
264.00 25213 2 DRIVEWAY BRIDGES ON THIS UNIT
267.00 25345 LOGJAM
268.00 25575 DRIVEWAY WITH CULVERT TOP OF UNIT
269.00 25726 DRY
275.00 26215 SALMONIDS
279.00 26641 DRY RAVINE RT BANK
285.00 27010 CULVERT UNDER MILL CREEK ROAD IS
POSSIBLE FISH BARRIER

289.00 27149 OLD BRICK BAR-B-Q PITS LF BANK
290.00 27725 GULLY RAVINE LF BANK
291.00 27739 NO FISH OBSERVED ABOVE MILL CREEK ROAD CULVERT
292.00 27816 DRY RAVINE LF BANK

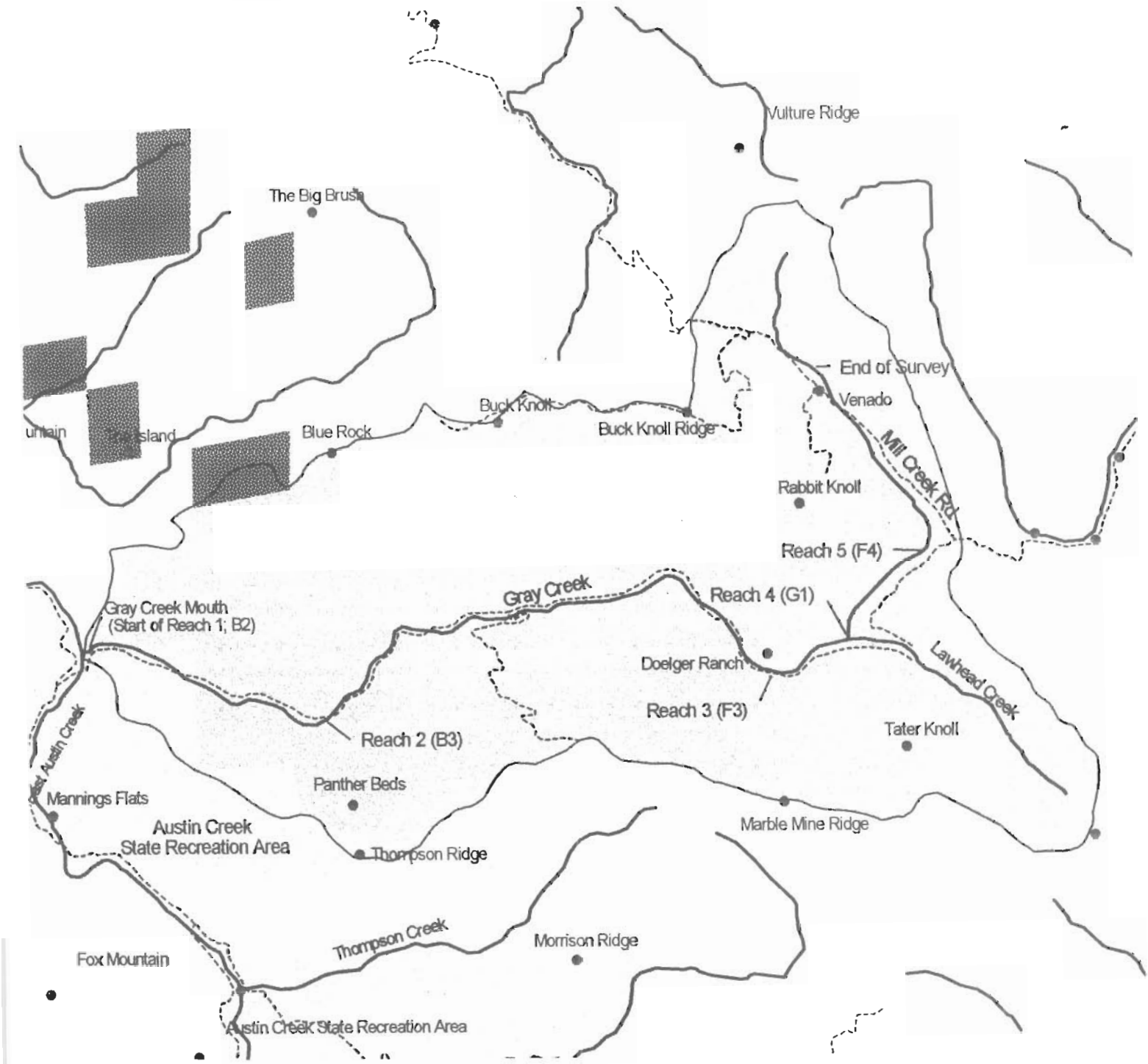
PROBLEM SITES AND LANDMARKS - UNNAMED TRIBUTARY SURVEY COMMENTS

HABITAT UNIT #	*STREAM LEN (FT.)*	*COMMENTS*
1.00	*61*	*CONFLUENCE WITH GRAY CREEK*
2.00	*75*	*PLUNGE POOL AT CULVERT - AUSTIN CREEK RD; SALMONIDS.*
3.00	*392*	*CONFLUENCE CLASS III, 57°F; LF BANK WITH 3" STEEL WATER PIPE UP THIS STREAM; FIRST 40' DRY; 30' DRY ABOVE LOG JAM.*

PROBLEM SITES AND LANDMARKS - LAWHEAD CREEK SURVEY COMMENTS

HABITAT UNIT #	*STREAM LEN (FT.)*	*COMMENTS*
1.00	*23*	*CONFLUENCE WITH GRAY CREEK*
2.00	*37*	*REDWOODS ACROSS POOL*
3.00	*288*	*CASCADE WITH NUMEROUS SHALLOW POOLS NO SALMONIDS SEEN*
5.00	*402*	*BLOWOUT 60'H X 50'L X 3'D LOG JAM 20'W X 8'D X 3'L*

Gray Creek Watershed



Gray Creek Watershed
Features of Interest
Roads
Streams
Land Ownership
Ca Dept. of Parks & Recreation
Bureau of Land Management
Gray Creek Watershed

Dept. of Fish and Game
Inland Fisheries Division
June 13, 1997

1 0 1 Miles

Gray Creek Tables Graphs Map
Assessment Completed 1996

Gray Creek

Drainage: East Austin Creek, Big Austin Creek, Russian River

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

Survey Dates: 08/27/96 to 09/12/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T9NR10WS34 LATITUDE: 38°35'21" LONGITUDE: 123°3'20"

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
64	14	RIFFLE	22	81	5175	18	7.3	0.5	360	23055	163	10421	0	132
112	16	FLATWATER	38	147	16428	58	13.9	0.6	1413	158218	433	48461	0	81
119	38	POOL	40	55	6541	23	11.2	1.3	600	71406	793	94359	638	87

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
295	68	28144	252679	153241

Gray Creek

Drainage: East Austin Creek, Big Austin Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/27/96 to 09/12/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T9NR10WS34 LATITUDE: 38°35'21" LONGITUDE: 123°3'20"

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 %
37	7	LGR	13	83	3062	11	8	0.4	1.1	404	14930	174	6436	0	111	70
22	4	HGR	7	78	1711	6	8	0.5	1.5	393	8635	180	3967	0	163	84
5	3	CAS	2	80	402	1	6	0.5	1.5	205	1027	108	538	0	135	95
12	2	GLD	4	75	903	3	16	0.7	1.3	1131	13566	815	9785	0	35	64
62	10	RUN	21	139	8635	31	7	0.5	1.6	655	40596	332	20605	0	84	79
38	4	SRN	13	181	6890	24	23	0.6	1.8	2576	97887	472	17949	0	95	85
8	2	MCP	3	71	570	2	13	1.5	4.2	949	7588	1450	11601	1208	62	87
1	1	CCP	0	32	32	0	6	0.7	1.4	134	134	94	94	67	40	95
16	6	STP	5	109	1744	6	10	1.2	5.5	1014	16232	1272	20359	989	120	93
5	2	CRP	2	49	246	1	9	1.0	2.7	456	2279	480	2400	379	43	83
6	1	LSL	2	33	196	1	9	1.2	2.8	298	1787	339	2035	299	79	77
26	10	LSR	9	45	1175	4	10	1.2	4.7	460	11960	554	14395	449	94	84
29	8	LSBk	10	52	1507	5	13	1.3	5.0	642	18611	891	25829	719	57	84
25	5	LSBo	8	39	984	3	11	1.2	3.7	445	11134	540	13509	418	116	80
3	3	PLP	1	29	87	0	19	1.8	5.1	595	1786	1370	4111	1224	67	75

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
295	68	28144	248152	153615

Gray Creek Tables Graphs Map
Assessment Completed 1996
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Gray Creek

Drainage: East Austin Creek, Big Austin Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/27/96 to 09/12/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T9NR10WS34 LATITUDE: 38°35'21" LONGITUDE: 123°3'20"

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
25	9	MAIN	21	94	2346	36	10.7	1.2	956	23896	1283	32064	1024	98
94	29	SCOUR	79	45	4195	64	11.3	1.3	507	47680	665	62529	538	84

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
119	38	6541	71576	94593

Gray Creek

Drainage: East Austin Creek, Big Austin Creek, Russian River

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

Survey Dates: 08/27/96 to 09/12/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T9NR10WS34 LATITUDE: 38°35'21" LONGITUDE: 123°3'20"

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
8	MCP	7	0	0	1	13	3	38	3	38	1	13
1	CCP	1	0	0	1	100	0	0	0	0	0	0
16	STP	13	0	0	3	19	7	44	4	25	2	13
5	CRP	4	0	0	0	0	5	100	0	0	0	0
6	LSL	5	0	0	2	33	4	67	0	0	0	0
26	LSR	22	0	0	4	15	17	65	4	15	1	4
29	LSBk	24	0	0	3	10	16	55	7	24	3	10
25	LSBo	21	0	0	3	12	18	72	4	16	0	0
3	PLP	3	0	0	0	0	1	33	1	33	1	33

TOTAL UNITS
119

Gray Creek

Drainage: East Austin Creek, Big Austin Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 08/27/96 to 09/12/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T9NR10WS34 LATITUDE: 38°35'21" LONGITUDE: 123°3'20"

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
37	7	LGR	0	17	19	0	328	0	96	1042	0
22	5	HGR	63	136	0	0	78	0	85	1160	0
5	3	CAS	0	62	0	25	0	0	98	734	0
12	2	GLD	7	7	0	0	217	0	0	205	0
62	10	RUN	398	357	47	76	327	0	118	2077	0
38	6	SRN	197	198	0	36	191	0	119	1041	0
8	8	MCP	546	193	84	310	118	0	0	417	158
1	1	CCP	0	4	0	0	0	0	0	35	0
16	16	STP	837	578	316	392	217	103	490	4433	328
5	5	CRP	177	15	0	0	153	0	86	17	0
6	6	LSL	107	65	114	3	43	317	0	43	0
26	26	LSR	883	630	547	1324	49	0	0	541	5
29	29	LSBk	307	343	178	245	277	0	67	2106	650
25	25	LSBo	740	588	227	41	391	63	65	1694	389
3	3	PLP	107	0	9	47	35	0	52	108	70
TOTAL 295	152		4369	3193	1541	2499	2424	483	1276	15653	1600
			13%	10%	5%	8%	7%	1%	4%	47%	5%
TOTAL FOR POOLS 119	119		3704	2416	1475	2362	1283	483	760	9394	1600
			16%	10%	6%	10%	5%	2%	3%	40%	7%

Gray Creek

Drainage: East Austin Creek, Big Austin Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/27/96 to 09/12/96

Confluence Location: QUAD: CAZADERO LEGAL DESCRIPTION: T9NR10WS34 LATITUDE: 38°35'21" LONGITUDE: 123°3'20"

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
37	7	LGR	0	0	14	0	86	0	0
22	5	HGR	0	0	0	40	20	40	0
5	3	CAS	0	0	0	0	0	100	0
2	2	GLD	0	0	100	0	0	0	0
2	10	RUN	0	0	30	20	50	0	0
8	5	SRN	0	0	0	20	60	20	0
2	2	MCP	0	50	0	50	0	0	0
1	1	CCP	0	0	0	0	0	100	0
6	6	STP	17	0	17	17	0	17	33
2	2	CRP	0	0	50	0	50	0	0
1	1	LSL	0	0	100	0	0	0	0
9	9	LSR	33	11	22	11	22	0	0
8	8	LSBk	13	13	38	25	0	0	13
5	5	LSBo	20	0	40	0	0	40	0
3	3	PLP	33	33	0	0	0	33	0

Gray 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
81.27	65.53	34.25	79.37	79.72

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Bedrock	12	14	18.31
Boulder	10	9	13.38
Cobble/Gravel	13	13	18.31
Silt/clay	36	35	50

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Total Mean Percent
Grass	3	2	3.52
Brush	6	3	6.34
Deciduous Tre	11	17	19.72
Evergreen Tre	51	49	70.42
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Gray Creek
SAMPLE DATES: 08/27/96 to 09/12/96
STREAM LENGTH: 27816 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: CAZADERO — Latitude: 38°35'21"
Legal Description: T9NR10WS34 — Longitude: 123°3'20"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: B2
Channel Length: 6220 ft.
Riffle/Flatwater Mean Width: 13 ft.
Total Pool Mean Depth: 1.4 ft.
Base Flow: 0.0 cfs
Water: 58 - 65 °F Air: 60 - 87 °F
Dom. Bank Veg.: Evergreen Trees
Vegetative Cover: 69%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 52% 3. 48% 4. 0%

Canopy Density: 67%
Evergreen Component: 52%
Deciduous Component: 48%
Pools by Stream Length: 29%
Pools >=3 ft. deep: 31%
Mean Pool Shelter Rtn: 88
Dom. Shelter: Boulders
Occurrence of LOD: 20%
Dry Channel: 0 ft.

STREAM REACH 02

Channel Type: B3
Channel Length: 12092 ft.
Riffle/Flatwater Mean Width: 8 ft.
Total Pool Mean Depth: 1.2 ft.
Base Flow: 0.0 cfs
Water: 57 - 65 °F Air: 56 - 87 °F
Dom. Bank Veg.: Evergreen Trees
Vegetative Cover: 78%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 2% 3. 98% 4. 0%

Canopy Density: 82%
Evergreen Component: 59%
Deciduous Component: 41%
Pools by Stream Length: 28%
Pools >=3 ft. deep: 28%
Mean Pool Shelter Rtn: 89
Dom. Shelter: Boulders
Occurrence of LOD: 18%
Dry Channel: 0 ft.

STREAM REACH 03

Channel Type: F3
Channel Length: 1920 ft.
Riffle/Flatwater Mean Width: 7 ft.
Total Pool Mean Depth: 1.0 ft.
Base Flow: 0.0 cfs
Water: 51 - 60 °F Air: 59 - 66 °F
Dom. Bank Veg.: Evergreen Trees
Vegetative Cover: 83%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 0% 3. 100% 4. 0%

Canopy Density: 93%
Evergreen Component: 83%
Deciduous Component: 17%
Pools by Stream Length: 20%
Pools >=3 ft. deep: 0%
Mean Pool Shelter Rtn: 101
Dom. Shelter: Boulders
Occurrence of LOD: 21%
Dry Channel: 0 ft.

STREAM REACH 04

Channel Type: G1
Channel Length: 3335 ft.
Riffle/Flatwater Mean Width: 6 ft.
Total Pool Mean Depth: 1.3 ft.
Base Flow: 0.0 cfs
Water: 51 - 58 °F Air: 59 - 64 °F
Dom. Bank Veg.: Evergreen Trees
Vegetative Cover: 86%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 6% 3. 100% 4. 0%

Canopy Density: 98%
Evergreen Component: 81%
Deciduous Component: 19%
Pools by Stream Length: 13%
Pools >=3 ft. deep: 20%
Mean Pool Shelter Rtn: 107
Dom. Shelter: Boulders
Occurrence of LOD: 33%
Dry Channel: 0 ft.

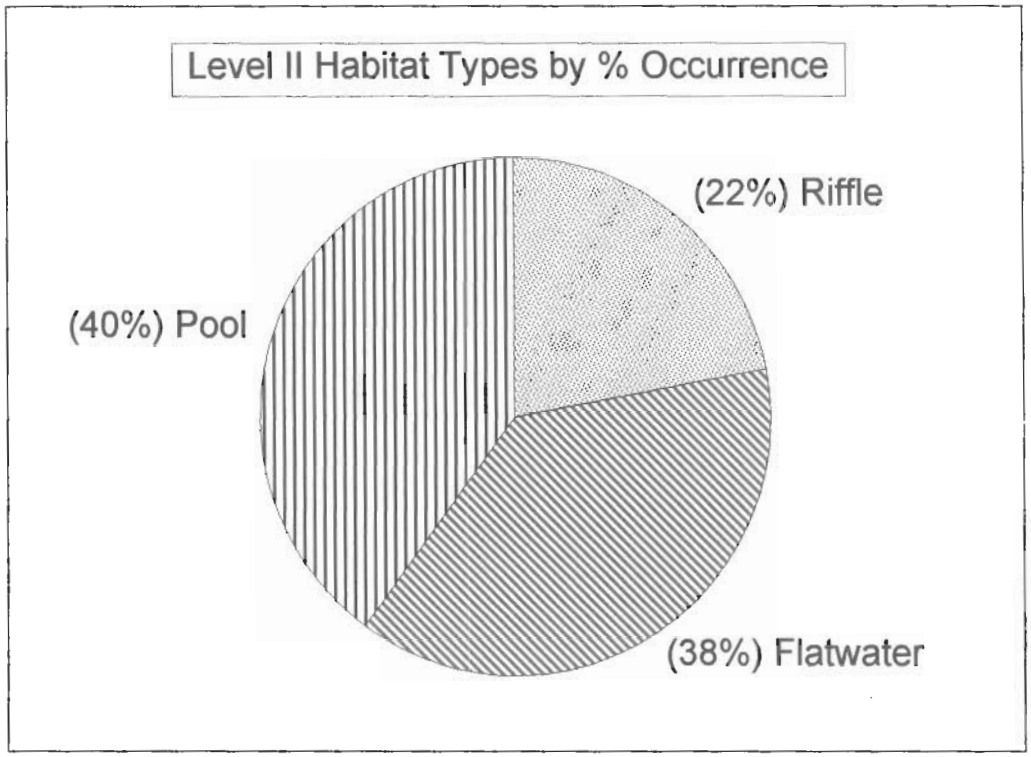
STREAM REACH 05

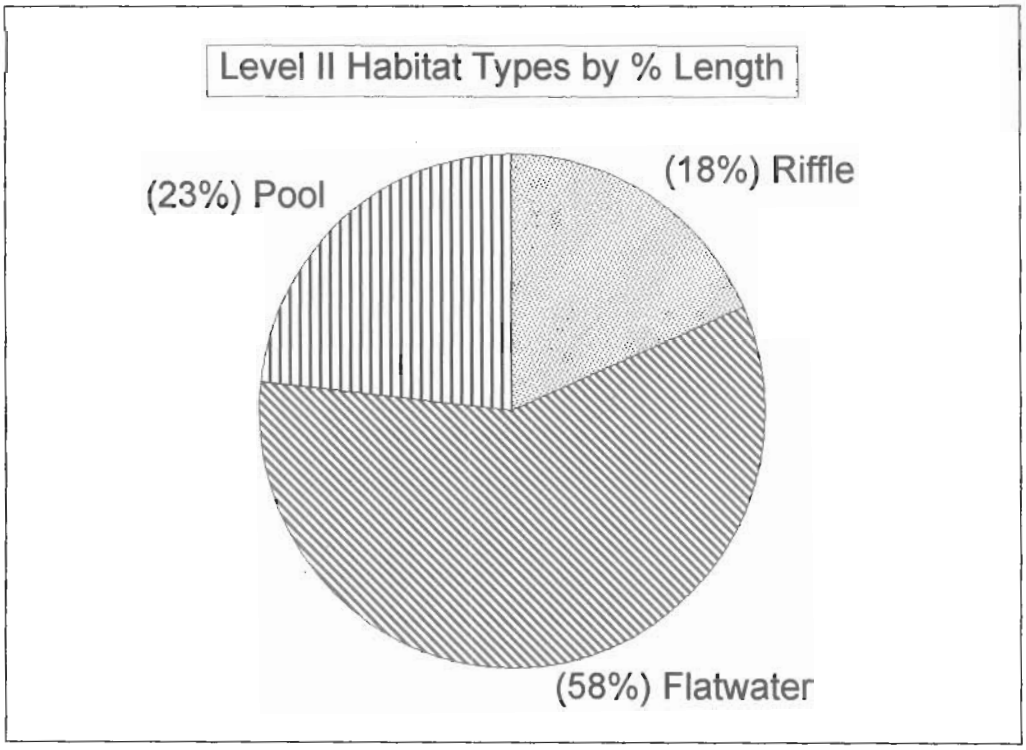
Channel Type: F4	Canopy Density: 82%
Channel Length: 4249 ft.	Evergreen Component: 87%
Riffle/Flatwater Mean Width: 26 ft.	Deciduous Component: 13%
Total Pool Mean Depth: 1.2 ft.	Pools by Stream Length: 14%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 25%
Water: 57 - 60 °F Air: 61 - 70 °F	Mean Pool Shelter Rtn: 60
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Undercut Banks
Vegetative Cover: 90%	Occurrence of LOD: 24%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

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

Gray Creek

Level II Habitat Types

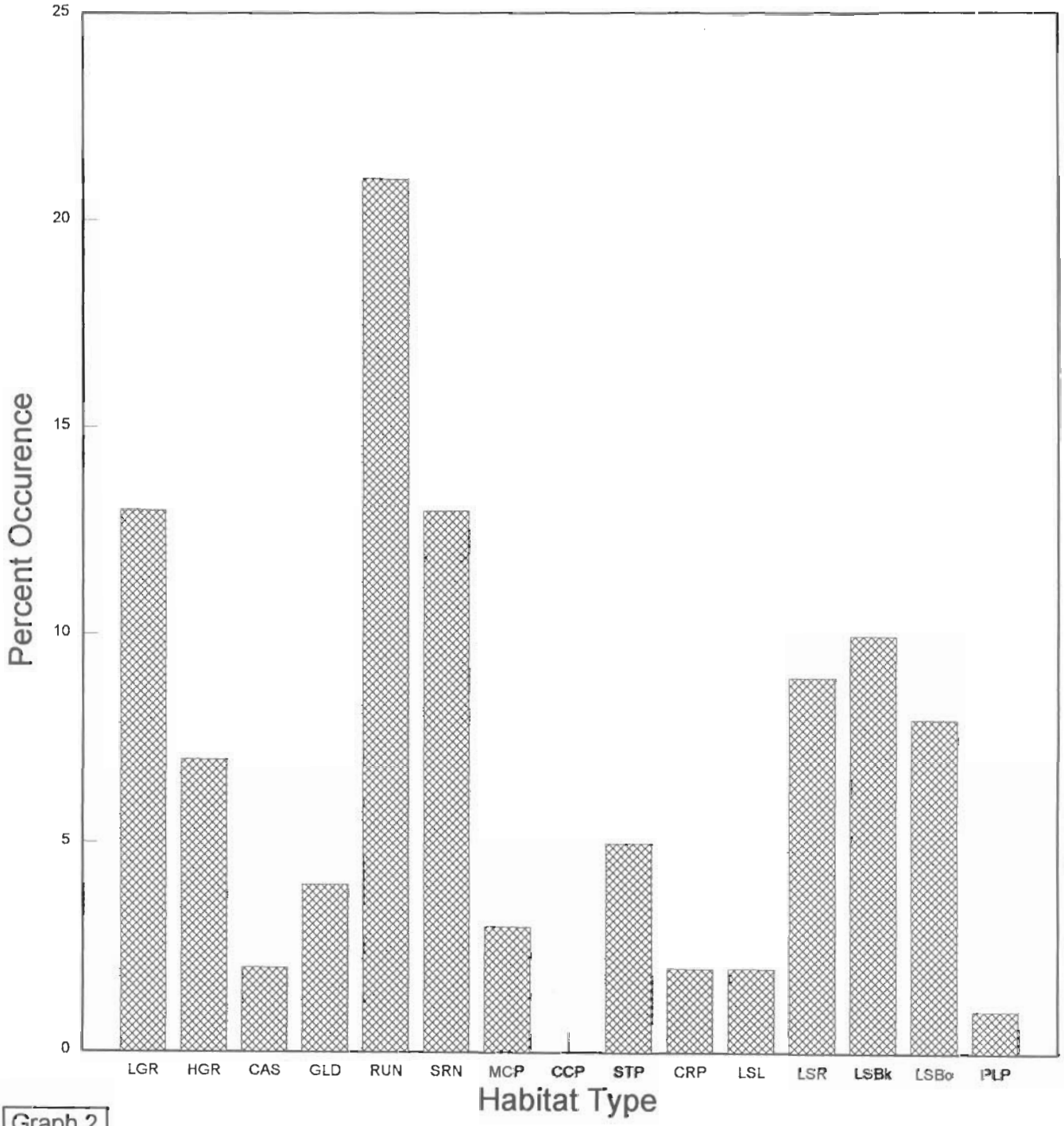




Graph 1

Gray Creek

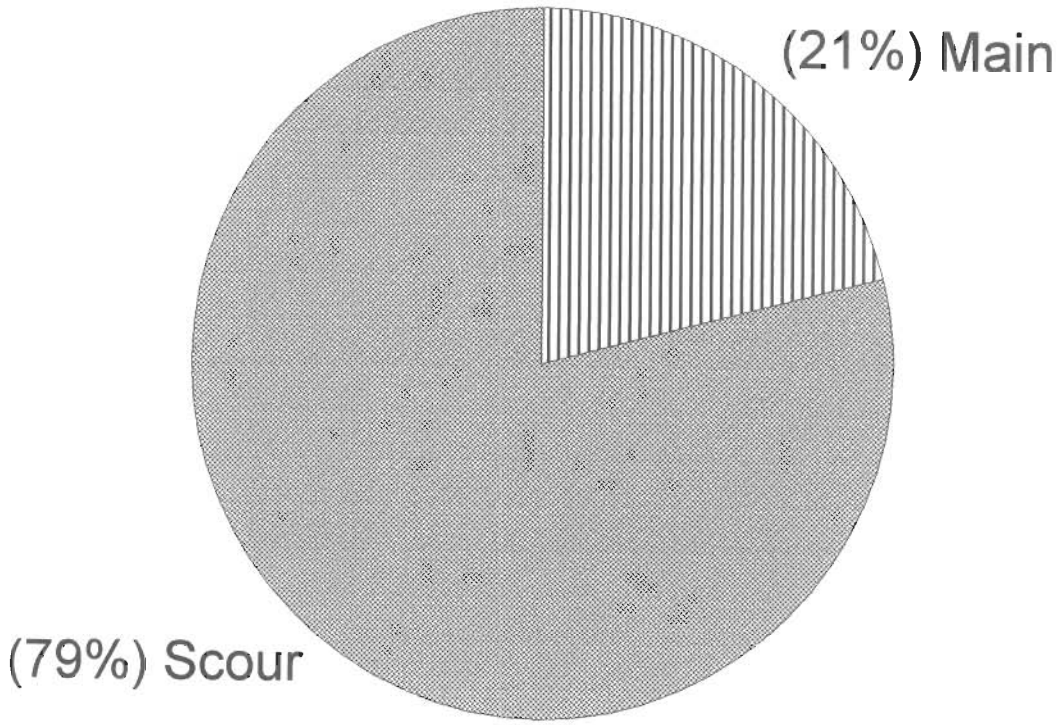
Level IV Habitat Types by % Occurrence



Graph 2

Gray Creek

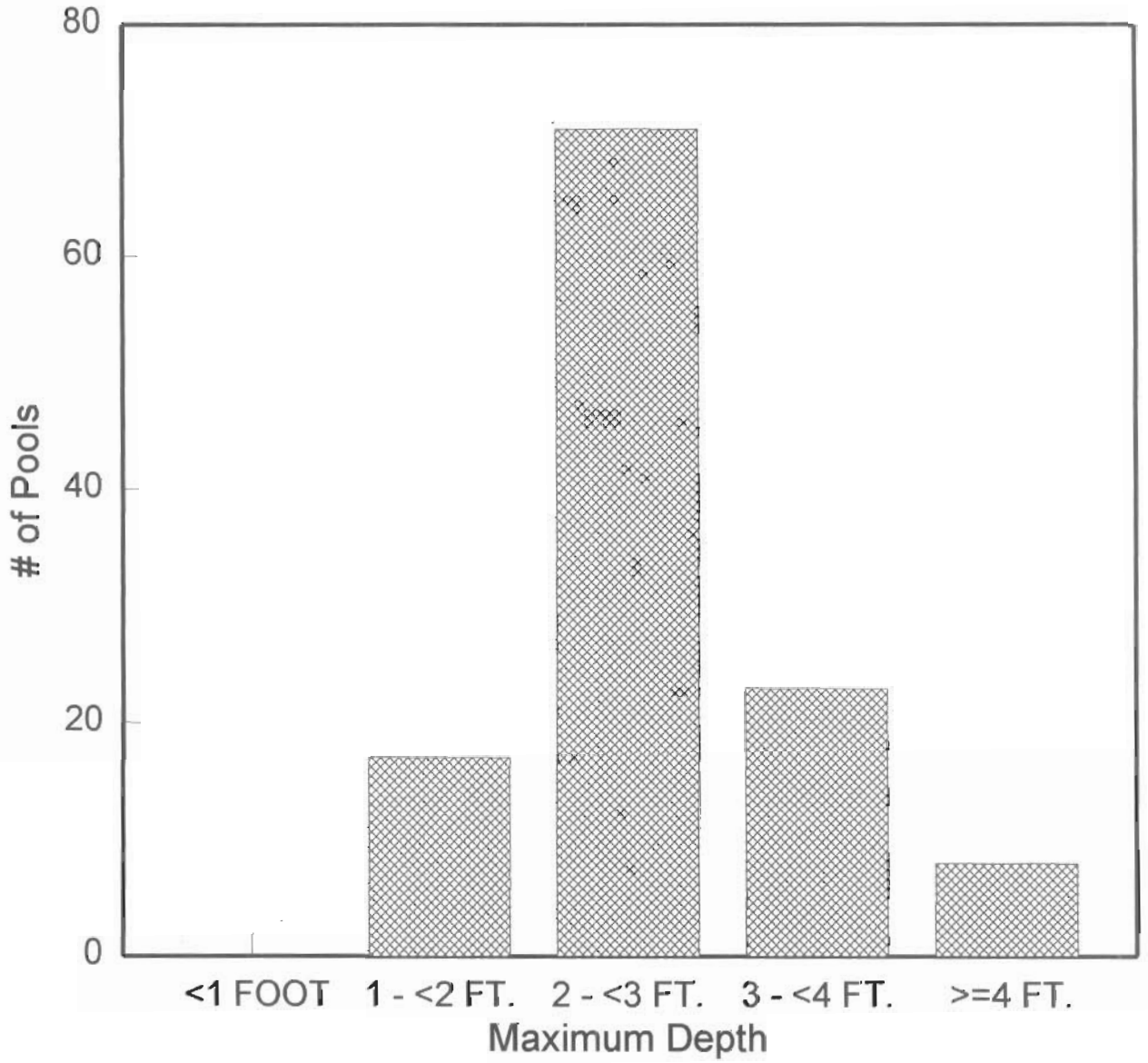
Pool Habitat Types by % Occurrence



Graph 3

Gray Creek

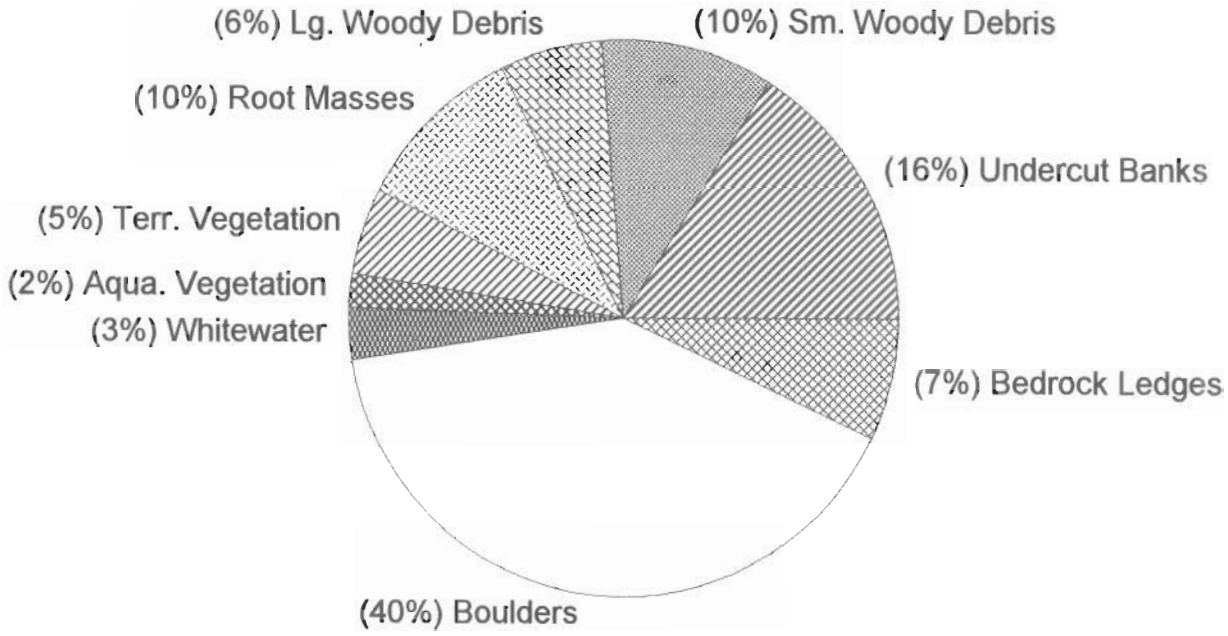
Maximum Depth in Pools



Graph 4

Gray Creek

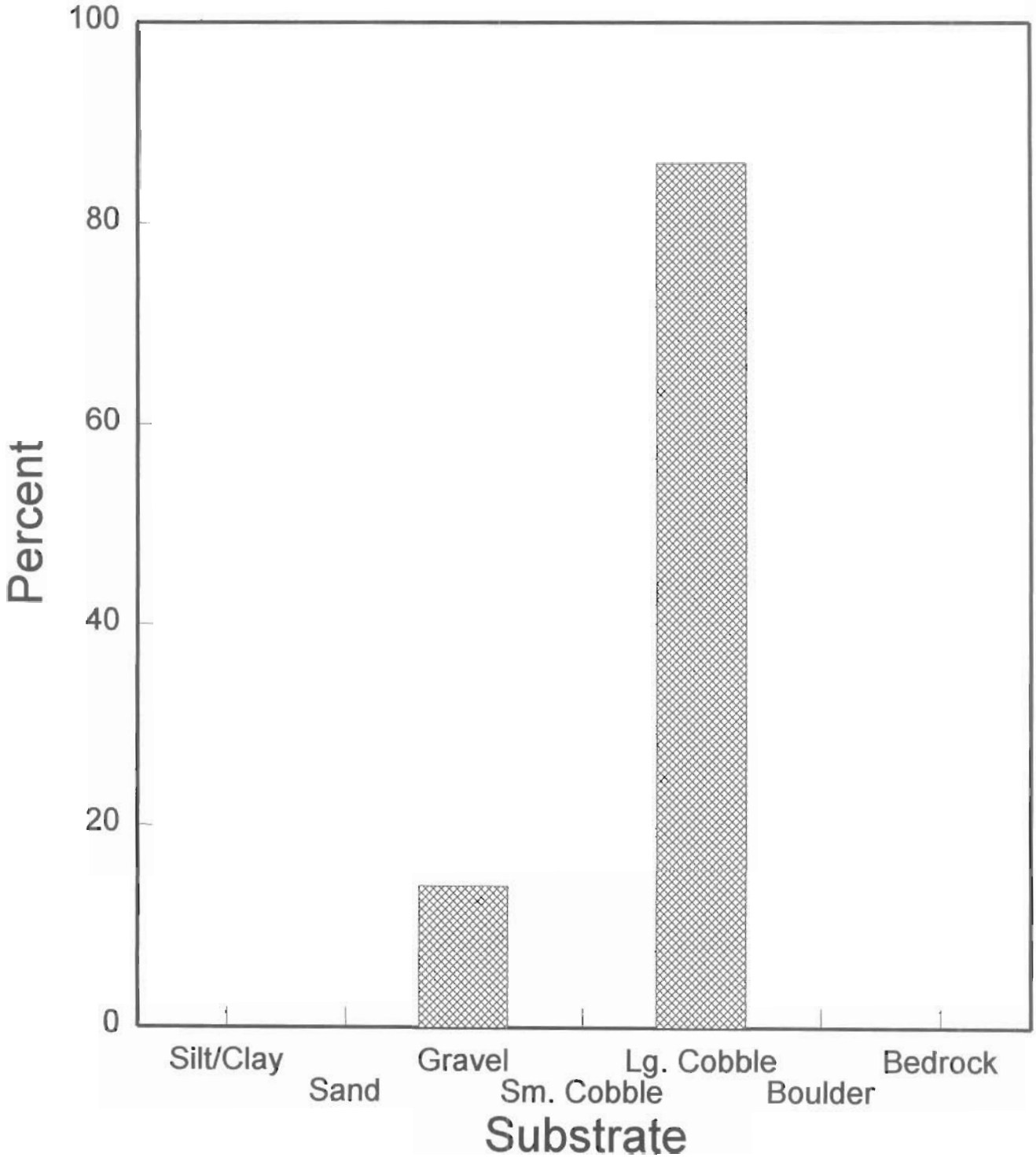
Pool Shelter Types by % Area



Graph 5

Gray Creek

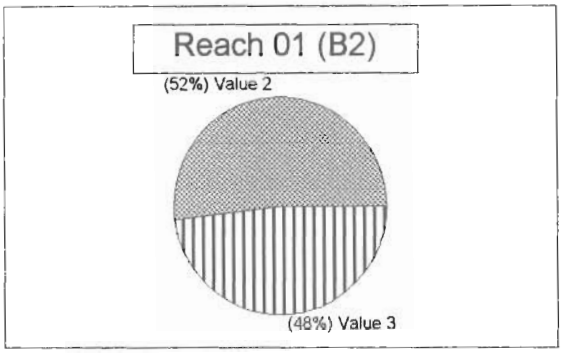
Substrate Composition in Low Gradient Riffles

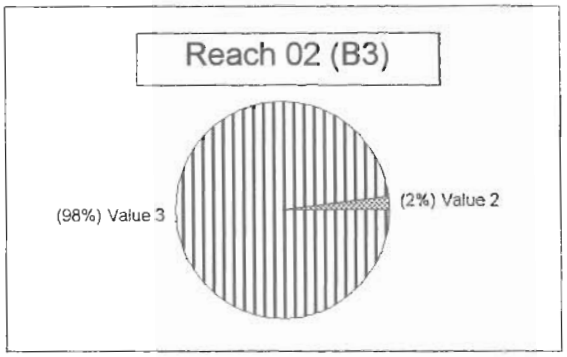


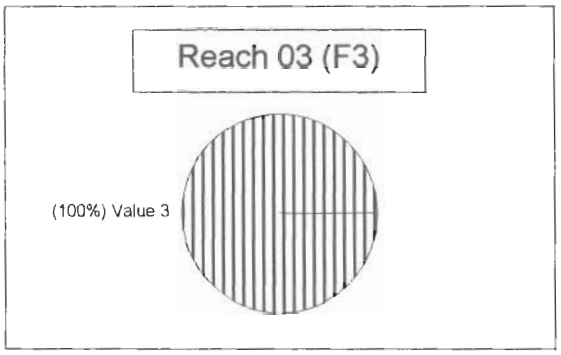
Graph 6

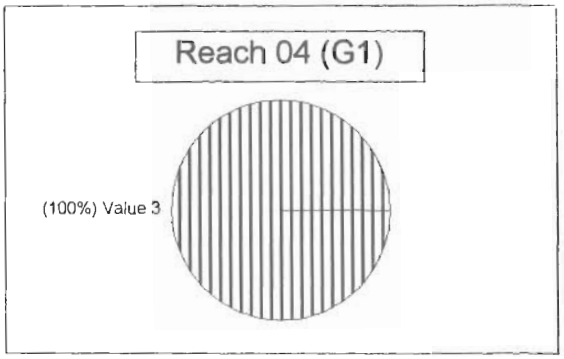
Gray Creek

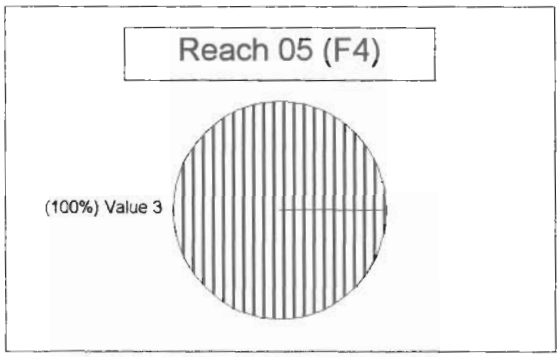
Percent Cobble Embeddedness by Reach









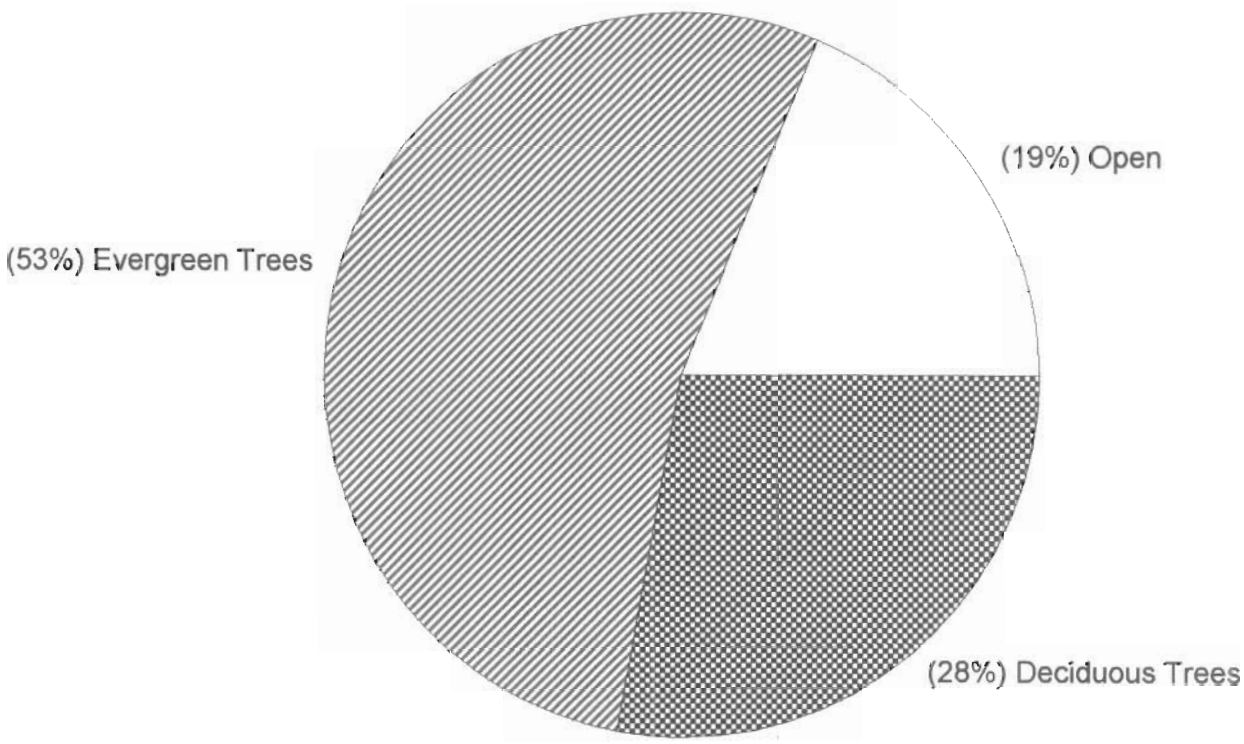


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 7

Gray Creek

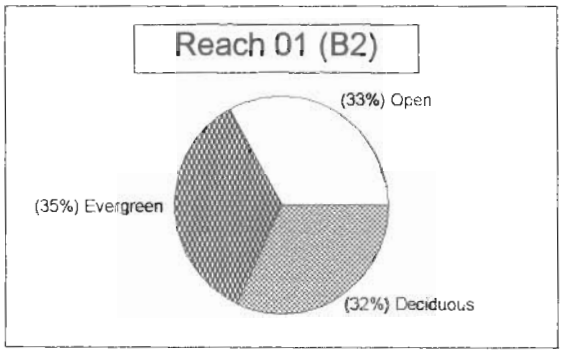
Mean Percent Canopy

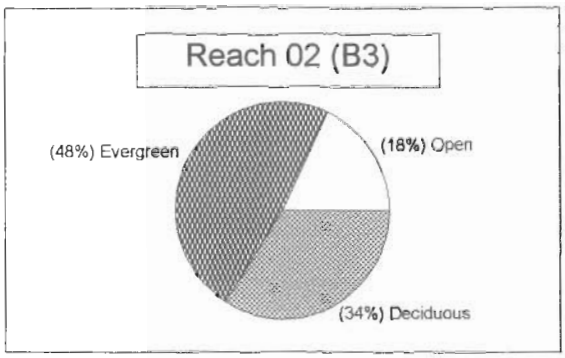


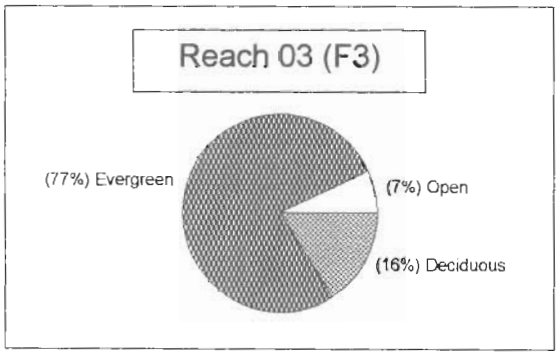
Graph 8

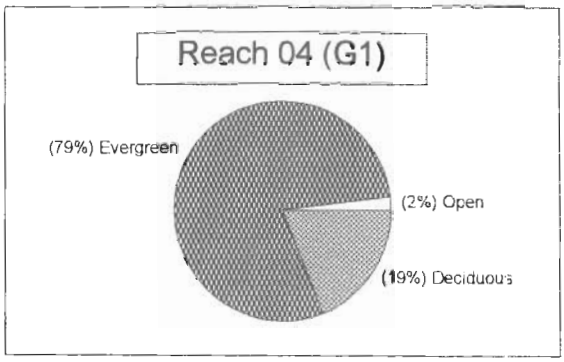
Gray Creek

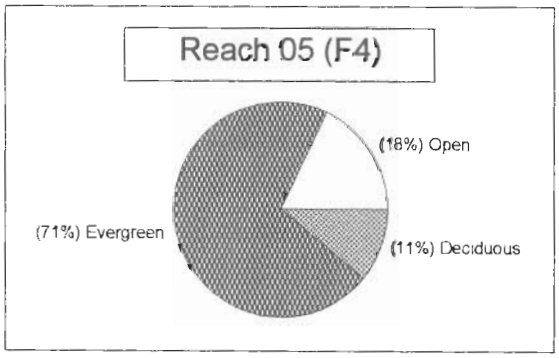
Percent Canopy By Reach







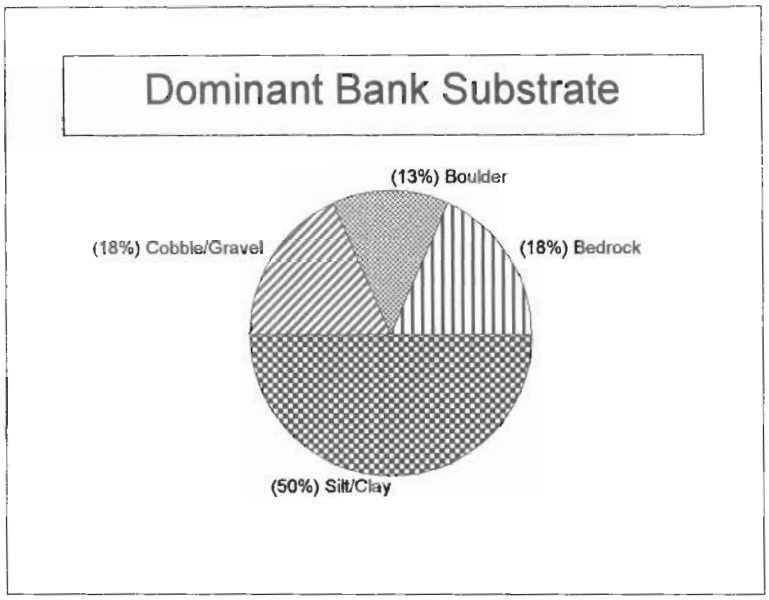


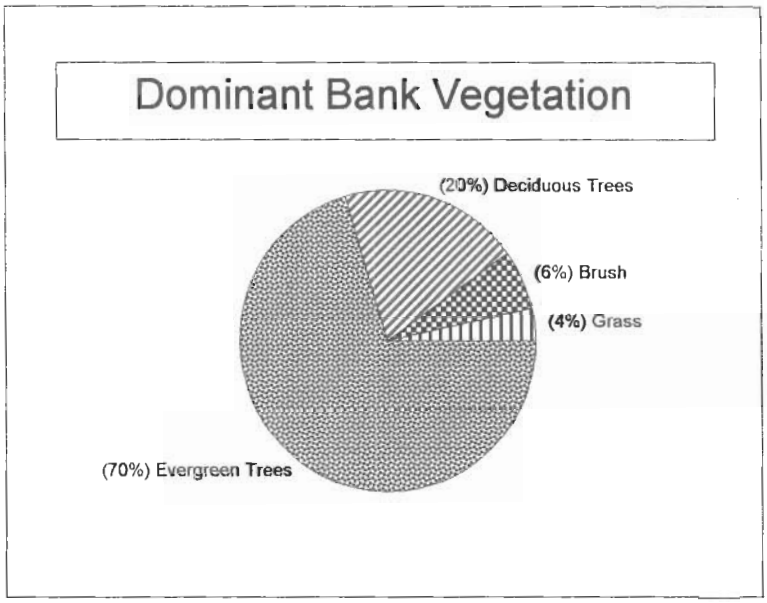


Graph 9

Gray Creek

Percent Bank Composition





Graph 10