CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Grape Creek

Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1998

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Grape 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 Grape 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

Grape Creek is a tributary to Dry Creek which flows to the Russian River, located in Sonoma County, California (see Grape Creek map, page 2). The legal description at the confluence with Dry Creek is T9N, R10W, S2. Its location is 38°39'35" N. latitude and 122°56'4" W. longitude. Year round vehicle access exists from Highway 101 near Healdsburg, via Wine Creek Road off of West Dry Creek Road, which is off of Westside Road.

Grape Creek and its tributaries drain a basin of approximately 1.7 square miles. Grape Creek is a third order stream and has approximately 2.8 miles of blue line stream, according to the USGS Geyserville 7.5 minute quadrangle. Major tributaries include Wine Creek which is described in a separate stream report. Summer flow was measured as approximately 0.7 cfs at approximately 60' upstream from the confluence with Dry Creek on July 24, 1998 and was measured as approximately 0.95 cfs on August 6, 1998. Elevations range from approximately 80 feet at the mouth of the creek to 900 feet in the headwaters. The upper portion of Grape Creek flows through a V-shaped canyon while the lower portions traverse rolling hills bordered by vineyards, plum orchards and grazing land. The common riparian vegetation of the creek includes bay, buckeye, poison oak, and blackberry with some Douglas fir and redwood trees on the northern slopes. The watershed is entirely privately owned.

METHODS

The habitat inventory conducted in Grape Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The Americorps Volunteers that conducted the inventory were trained in standardized habitat inventory methods by the California

Department of Fish and Game (DFG). This inventory was conducted by a two person team and was supervised by Bob Coey, Russian River Basin Planner (DFG).

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This form was used in Grape Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows were also measured or estimated at major tributary confluences.

2. Channel Type:

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

3. Temperatures:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "DRY". Grape Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Grape Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4) or "not suitable" (value 5) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

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

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully measured habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual, 1998. Canopy density relates to the amount of stream shaded from the sun. In Grape Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated visually into percentages of evergreen or deciduous trees.

9. Bank Composition:

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

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed CDFG. 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 Grape Creek include:

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

HISTORICAL STREAM SURVEYS:

The Department of Fish and Game conducted a survey of Grape Creek on May 5, 1976. This survey was a complete survey that started at the mouth and ended approximately 0.2 miles from the headwaters. The average flow during the survey was estimated to be 0.5 cfs. The water temperatures ranged from 56°F to 58°F and the air temperatures ranged from 62°F to 65°F.

The substrate of the lower section consisted of 5% boulders, 15% cobble, 10% gravel, and 60% sand

and silt. The substrate of the middle section consisted of 10% boulders, 15% cobble, 20% gravel, and 55% sand and silt. The substrate of the upper section consisted of 20% bedrock, 15% boulders, 10% cobble, 20% gravel, and 35% sand and silt. The upper and lower portions of the creek had approximately 20-25% suitable habitat for steelhead. The middle section of the creek had very little suitable spawning gravel. The shelter was considered good throughout the stream with boulders and overhanging vegetation composing the shelter. No pollution was observed.

HABITAT INVENTORY RESULTS

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

The habitat inventory of Grape Creek was conducted from July 16, 1998 to August 13, 1998 by Dez Mikkelsen, Simone Watts, Shamli Tarbell, Marc Miller (AmeriCorps), and Stephanie Carey (DFG) with supervision and analysis by CDFG. The survey began at the confluence with Dry Creek and extended up Grape Creek to the end of landowner access permission. The total length of the stream surveyed was 12012 feet, with an additional 114 feet of side channel.

A flow of 0.7 cfs was measured July 24, 1998 60 feet upstream from the confluence with Dry Creek with a Marsh-McBirney Model 2000 flowmeter. A flow of 0.95 cfs was measured at the same location on August 6, 1998.

This section of Grape Creek has four channel types: from the mouth to 9597 feet an F4; next 640 feet a G4; next 1252 feet a G3 and the upper 523 feet a G6.

F4 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly gravel substrate.

G4 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 gravel substrate. G3 and G6 channel types are similar but with a predominantly cobble substrate and silt/clay substrate, respectively.

Water temperatures ranged from 60°F to 68°F. Air temperatures ranged from 58°F to 90°F. Summer temperatures were also measured using a remote temperature recorder placed in a pool (see Temperature Summary graphs at end of report). A recorder placed 100 feet downstream of Bridge #1 in Reach 1 logged temperatures every 2 hours from July 13 - September 22, 1998. The highest temperature recorded was 67°F in July and the lowest was 59°F in September.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 52% pool units, 25% flatwater units, 20% riffle units, and 1% dry streambed units. Based on total **length** there were 44% pool units, 36% flatwater units, 16% riffle units, and 0% dry streambed units (Graph 1).

Two hundred and six habitat units were measured and 27% were completely sampled. Eighteen

Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were mid-channel pools at 21%, low gradient riffles 15%, root wad scour pools 11% and runs 11% (Graph 2). By percent total **length**, mid-channel pools made up 15%, runs 13%, glides 11%, and step runs 11%.

One hundred and eight pools were identified (Table 3). Scour pools were most often encountered at 49%, and comprised 41% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty of the 108 pools (19%) had a depth of three feet or greater (Graph 4). These deeper pools comprised only 8% 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. Pool types had the highest shelter rating at 45. Flatwater had the lowest rating with 20 and riffle rated 22 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 98, scour pools rated 45, and main channel pools rated 44 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were root masses at 29%, undercut banks 25%, terrestrial vegetation 15%, and small woody debris 12%. Graph 5 describes the pool shelter in Grape Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 4 of the 6 low gradient riffles measured. Small cobble was dominant in two of the low gradient riffles (Graph 6).

No mechanical gravel sampling was conducted in 1998 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 103 pool tail-outs measured, none had a value of 1 (0%); thirty had a value of 2 (29%); forty had a value of 3 (39%); and twenty had a value of 4 (19%). Thirteen (13%) pool tail-outs rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 87%. The mean percentages of deciduous and evergreen trees were 48% and 52%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 48% and the mean percent left bank vegetated was 56%. For the habitat units measured, the dominant vegetation types for the stream banks were: 34% evergreen trees, 32% deciduous trees, 27% brush, 6% grass and 1% bare soil. The dominant substrate for the stream banks were: 84% silt/clay/sand, 7% bedrock, 7% cobble/gravel and 2% boulder (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

In the May 1976 survey, sculpin, suckers, roach and steelhead were observed in the lower section of Grape Creek. Sculpin were observed at a rate of 15-20/100' from the mouth to the first diversion dam, roach were observed at a rate of 10-20/100', and juvenile suckers were observed at a rate of 15-30/100'. Steelhead were most abundant below the first diversion dam with 0+ steelhead occurring at a rate of 15-25/100'. Above the first diversion dam, steelhead observed were estimated at a rate of 5-10/100'. In the mid-section of Grape Creek, steelhead, bluegill, and largemouth bass were observed. Bluegill were observed at a rate of 15-35/100', five largemouth bass were observed, and 0+ and 1+ steelhead were observed at a rate of 5-15/100'. In the upper section of Grape Creek, 0+ steelhead were observed at a rate of 3-10/100'. Yellow-legged frogs and tadpoles were also observed during the survey.

On September 23, 1998 a recent biological inventory was conducted in two sites of Grape Creek to document the 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 72°F and the water temperature was 62°F. The observers were Dez Mikkelsen (AmeriCorps) and Bob Coey (DFG).

The inventory of Reach 1 started at Bridge #3 and continued for approximately 385 feet. In run and pool habitat types, 38 0+ and one 1+ steelhead were observed along with 12 sculpin, 12 sunfish, and 3 yellow-legged frogs.

The inventory of Reach 1 was continued on the Mazzera property and continued for approximately 123 feet. In glide habitat types, five 0+ and one 1+ steelhead were observed.

During the habitat inventory, no 0+ salmonids were observed upstream of habitat unit 187, 11341 feet above the confluence with Dry Creek, where a bedrock falls appears to impede further passage. However, *Oncorhynchus mykiss* were observed above these falls.

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

Table 1. Species Observed in Historical and Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1976, 1998	Steelhead	DFG	N
1976, 1998	Sculpin	DFG	N
1976	Roach	DFG	N

Table 1. Species Observed in Historical and Recent Surveys			
YEARS	**SPECIES**	**SOURCE**	**Native/Introduced**
1976	Sacramento Sucker	DFG	N
1998	California Newt	DFG	N
1976, 1998	Yellow-legged Frog	DFG	N
1998	Crawdad	DFG	N
1976	Bluegill	DFG	I
1998	Sunfish	DFG	I
1976	Largemouth bass	DFG	I

Historical records reflect that no hatchery stocking, transfers, or rescues have occurred in the watershed. However, it was noted in the May 1976 survey that as part of fish rescue operations carried out by the Department of Fish and Game in the early 1950's an average of 1,000 young steelhead were rescued each year from Grape Creek.

ADULT SURVEYS:

In the May 1976 survey, five barriers were noted. The first barrier consisted of a concrete dam approximately 16 feet across and 5 feet high with removable wooden flashboards. The second barrier consisted of a concrete box culvert (24' x 29') located under the bridge at West Dry Creek Road. The water depth flowing through the culvert was less than 1/4 inch and a 1 ½' drop existed from the concrete floor of the culvert to the pool formed below. The third barrier was a 4' diversion dam constructed of four logs, 1' in diameter. The fourth barrier was a concrete diversion dam that was 9 feet across and 5 feet high with removable wooden flashboards. Lastly, the fifth barrier was a natural 5 foot waterfall located approximately 50 yards downstream from the diversion dam that was noted as the fourth barrier. The two diversion dams that were listed above along with a third diversion that was also noted during the survey were all inactive agricultural diversions.

A spawning/carcass survey was conducted in Grape Creek on March 2, 1999 beginning at the mouth of Grape Creek and extending approximately 1.5 miles upstream to the confluence with the first wet tributary located on the right bank (habitat unit #140). The water temperature was 47°F and the air temperature was 48°F. Two adult steelhead were observed actively digging a redd and spawning approximately 100 feet downstream of West Dry Creek Road. Two adult steelhead were observed at the culvert at West Dry Creek Road. Five adult steelhead were observed 50 feet downstream of the Wine Creek Road culvert and two adult steelhead were observed 20 feet upstream of Wine Creek Road. Three redds were observed throughout the survey.

DISCUSSION

Grape Creek has four channel types: F4 (9597 ft.), G4 (640 ft.), G3 (1252 ft.) and G6 (523 ft.).

There are 9597 feet of F4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, 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. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

There are 2415 feet of G4/3/6 channel types in Reach 2, 3, and 4. According to the DFG Salmonid Stream Habitat Restoration Manual, G3/4/6 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

The water temperatures recorded on the survey days 07/16/98 to 08/13/98 ranged from 60°F to 68°F. Air temperatures ranged from 58°F to 90°F. The warmer water temperatures were recorded in Reach 1. These temperatures, if sustained, are above the threshold stress level (65°F) for salmonids.

Summer temperatures measured using a remote temperature recorder placed in a pool ranged from 59° to 67°F at 100 feet downstream of Bridge #1 in Reach 1. The Temperature Summary graph shows that for much of the summer (July through August) the lower watershed exhibited temperatures near the optimal for salmonids.

Pools comprised 44% of the total **length** of this survey. In third and fourth order streams a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. In Grape Creek, the pools are relatively shallow with 19% having a maximum depth of at least 3 feet. These pools comprised 8% 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 45. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by root masses (29%), undercut banks (25%), terrestrial vegetation (15%), and small woody debris (12%).Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

All of the six low gradient riffles measured (100%) had either gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

Fifty-eight percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. None of the pool tail-outs had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In a reach comparison, Reaches 1 and 2 had the best ratings and Reaches 3 and 4 had the poorest ratings.

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. In Grape Creek, although Reaches 1 and 2 had better ratings than Reaches 3 and 4, all four of the reaches had poor embeddedness ratings and should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 87%. This is very good, since 80 percent is generally considered desirable. However, the riparian buffer is thin or nearly absent in areas with agriculture. Vineyard development within the riparian corridor could all lead to less stream canopy and channel incision causing bank erosion and higher water temperatures.

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 Wine Creek. 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. Reach 2 of Wine Creek has habitat very suitable to rearing coho. Overall, fair numbers were observed during the 1998 surveys. The 1998 surveys documented 0+ fish indicating successful spawning in the lower and middle reaches of Grape Creek. However, few 1+ fish were observed indicating poor rearing conditions the year before or poor holding-over conditions in general. Overall, habitat conditions for both steelhead and coho have declined over time.

In Reach 1 spawning and rearing habitat quality diminishes due to the effects of eroding stream banks, lack of riparian habitat, and increased temperatures and nutrient runoff. Portions of this reach has been channelized due to downcutting which has headcut upstream from Dry Creek. Thus, stream velocity has increased resulting in streambank erosion and loss of mature riparian. Little riffle habitat exists for spawning, and what does exist is unsuitable for spawning due to high gravel embeddedness. The unstable banks and effects of downcutting in this reach limits instream habitat improvement alternatives, although some opportunity exists. Any work considered in these reaches will require careful design, placement, and construction that must include protection for the unstable banks and high stream velocities.

Upstream of Reach 1 conditions are better. In Reaches 2 and 3, spawning and rearing habitat exists, canopy shading is higher, although instream shelter is still lacking and stream bank erosion is prevalent due to channel downcutting. However, many opportunities and alternatives exist for habitat improvement due to the more stable channel type.

GENERAL MANAGEMENT RECOMMENDATIONS

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

Recent winter storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the drought years. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. 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.

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1) In Grape Creek, active and potential sediment sources related to the road system need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

2) Reach 1 would benefit from the utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion. Increase the canopy on Grape Creek 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) Spawning gravels on Grape Creek are limited to relatively few reaches. Structures to decrease channel incision and recruit spawning gravel (using gravel retention structures), should be installed to trap, sort and expand redd distribution in the stream (particularly on Grape Creek in Reach 1).

4) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing >shelter is from vegetation and undercut banks. 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 the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion (Reaches 1-4). In some areas the material is at hand.

RESTORATION IMPLEMENTED

1) Access for migrating salmonids is an ongoing potential problem in Reaches 1 and 3, therefore, fish passage should be monitored, and improved where possible. Baffles should be installed in the box culvert to facilitate easier fish access. The jump pool below the box

culvert at West Dry Creek Road should be improved. The road culvert is undermining and is a fish barrier except under higher flows. Eventually this culvert will have to be replaced unless the grade is stabilized below the culvert. Future design should include both fish passage and improved passage of gravel as first priorities. The bedrock falls in Reach 3 should also be evaluated as a barrier.

PROBLEM SITES AND LANDMARKS - GRAPE CREEK SURVEY COMMENTS

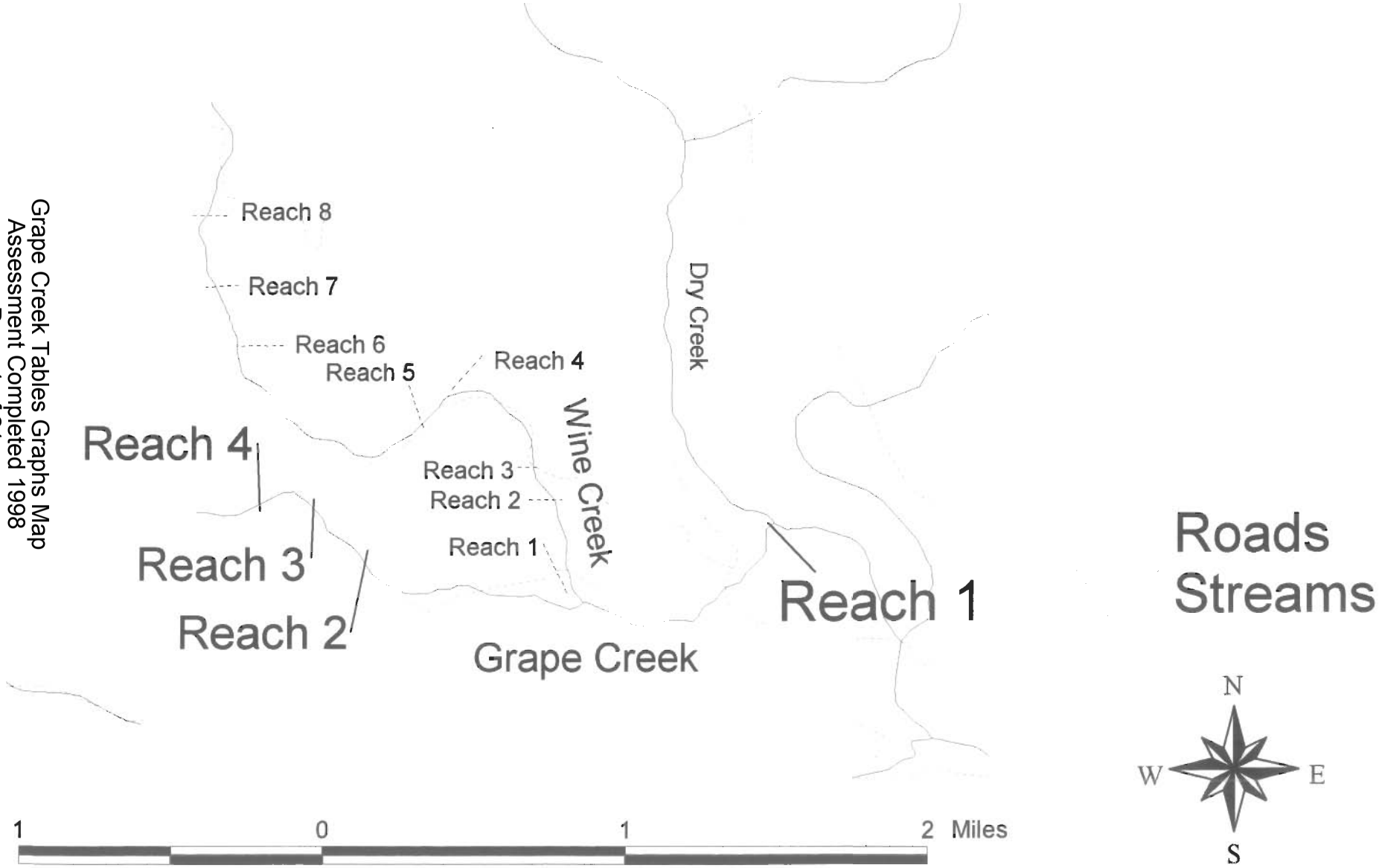
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Habitat Unit #	Stream Length(ft)	Comments
Reach 1		
6.00	244	Mimosa-exotic plant with red flowers growing along banks.
7.00	273	Erosion slide, RB 20'H X 30'W
20.00	1098	Concrete dam #1 at top of unit. One12" fish. Deep pool.
26.00	1550	Vineyard dirt road at start of unit through creek. Rip-rap RB: 15'L X 10'D
30.00	1991	Bridge #1
32.00	2199	@47' 2' DIA culvert
33.00	2269	Dam #2
34.00	2360	@53' water diversion. Increase in silt upstream of dam.
35.00	2416	Rip-rap RB: 40'L X 5'H X 5'L
36.00	2448	Several large trees with large root mass perched on bank and about to fall.
41.00	2675	Dogwood on bank.
43.00	2795	Water diversion
48.00	3018	Cars RB
51.00	3208	Rip-rap covers entire RB. Junk car LB
56.00	3482	Junk car, LB
57.00	3541	20' X 20' pile of garbage, LB
58.00	3585	Herbicides killing riparian vegetation within 5' of water. Possible old dam 6' wide. Rip-rap 15'H X 30'L X 5'D, LB
64.00	3941	Dry trib RB @ end of unit. Bridge #2. Culvert up on LB. 1.5' dia, for ditch
67.00	4099	Beautiful huge pool
69.00	4212	Bedrock begins
76.10	4776	Due to recording error flagged units from 077-086 will actually be flagged 1 unit more than they are recorded on data sheets.
82.00	5058	*Arundo* covers LB
83.00	5114	Wine creek at 35' into unit. Wine Temp:62F,Grape Temp:64F

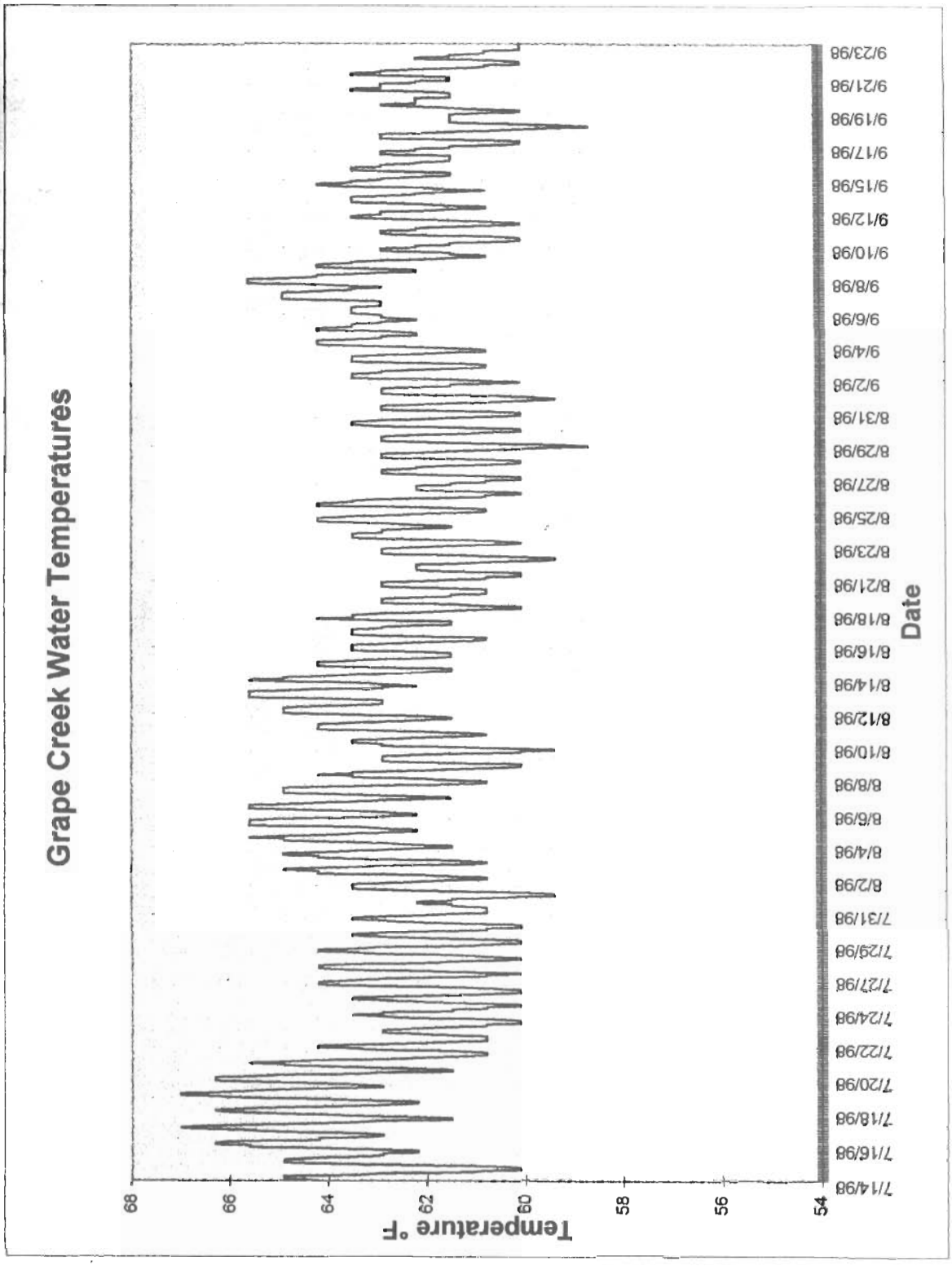
85.00	5216	*Arundo* takes over RB
90.00	5353	Stripped riparian vegetation on LB (one tree wide buffer at most). This minimal buffer continues through unit 092.
94.00	5595	Bridge #3
96.00	5721	CA newt. 12" concrete culvert RB. Broken pieces of concrete and metal culvert in creek.
103.00	6033	Riparian clearing LB.
104.00	6063	Riparian clearing, new vineyard LB, through unit 111
105.00	6164	0+ SHD (3)
107.00	6481	House RB
111.00	6633	Riparian clearing LB
113.00	6720	1+ SHD
114.00	6737	(6) 0+ SHD
116.00	6853	0+SHD
118.00	6906	0-1+ SHD sunfish
119.00	7073	NO ACCESS- road crossed stream. map wheeled
120.00	7098	Unit # 122 begins 235' upstream from bridge #4. Fence across stream
121.00	7358	0+ SHD vineyard clippings RB. Crawdad
127.00	7756	Old appliances RB
129.00	7787	12" metal culvert RB. 6' out from bank
131.00	7954	*Arundo donax* RB. Blackberries LB/RB
132.00	7979	Lots of blackberries both banks. Apple orchard LB, two 0+ SHD
140.00	8136	No unit for 134-139. Wet trib RB. See culvert form
142.00	8500	4' plunge
143.00	8531	RB intermittent stream-66F.
146.00	8737	Private road over stream
147.00	8927	Dam at top of unit
153.00	9407	Log jam at top of unit
154.00	9527	Six 0+ fish. 1" PVC wire fence across stream. Old RD RB. Good E-fish pool
Reach 2		
156.00	9597	Channel Change to G4
157.00	9664	Bridge #4. Old road LB
158.00	9684	Crawdad, 0+ fish
159.00	9723	Vehicle instream. Erosion LB (25 years old) 67'L X 14' H X 4'D. Debris dam-see dam sheet.
160.00	9757	Five 0+ fish
162.00	9839	Erosion RB
Reach 3		
170.00	10237	1+ Steelhead. 2 crayfish. Channel change to G3
171.00	10411	RD LB through unit #175
172.00	10430	1+ SHD. 2 crayfish. 0+

174.00	10580	Dry trib RB @ 40' into unit
178.00	10793	Debris accumulated over pool
Reach 4		
187.00	11341	At upper 22' of unit - steeply inclined bedrock fall approx. 11'W; @ LB - large landslide dumped many tons of soil into creek over winter 97/98
189.00	11537	Old road LB through unit#201 Salmonid seen above falls
190.00	11552	Old pump eroding
195.00	11702	Good canopy for this section of creek, however, most comes from over 20' away from banks.
203.00	11828	Water obviously subterranean. Unit filled with sediment.
204.00	11875	Old road LB through unit #208
209.00	12012	End of access - END OF SURVEY; There are salmonid juveniles upstream of this survey. Wet trib @ LB-plunge pool caused by culvert approximately 5' above pool. Evidence of pigs

Grape\ Wine Creek Habitat Inventory



Grape Creek Tables Graphs Map
Assessment Completed 1998


Grape Creek Water Temperatures
Temperature °F
68
66
64
62
60
58
56
54
Date
7/14/98
7/16/98
7/18/98
7/20/98
7/22/98
7/24/98
7/27/98
7/29/98
7/31/98
8/2/98
8/4/98
8/6/98
8/8/98
8/10/98
8/12/98
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8/29/98
8/31/98
9/2/98
9/4/98
9/6/98
9/8/98
9/10/98
9/12/98
9/15/98
9/17/98
9/19/98
9/21/98
9/23/98

Grape Creek | Drainage: Dry Creek, Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES | Survey Dates: 07/16/98 to 08/13/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T9NR10WS2 LATITUDE: 38°39'35" LONGITUDE: 122°56'4"

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
41	11	RIFFLE	20	47	1933	16	4.8	0.3	184	7564	49	2015	0	22
52	13	FLATWATER	25	83	4306	36	5.5	0.6	427	22224	262	13610	0	20
108	31	POOL	52	49	5305	44	7.9	1.2	393	42470	467	50434	348	45
2	0	DRY	1	27	53	0	0.0	0.0	0	0	0	0	0	0
3	0	CULVERT	1	176	529	4	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
206	55	12126	72259	66059

Grape Creek

Drainage: Dry Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/16/98 to 08/13/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T9NR10WS2 LATITUDE: 38°39'35" LONGITUDE: 122°56'4"

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 %
31	6	LGR	15	41	1271	10	6	0.3	1.1	195	6047	47	1450	0	16	73
4	2	HGR	2	67	269	2	5	0.3	1.1	158	633	55	220	0	3	95
4	1	CAS	2	66	262	2	3	0.3	0.9	108	430	52	206	0	75	95
2	2	BRS	1	66	131	1	4	0.2	0.9	256	512	48	96	0	5	88
18	4	GLD	9	77	1391	11	6	0.6	1.5	504	9066	296	5333	0	36	77
22	3	RUN	11	74	1625	13	7	0.6	3.1	508	11183	354	7787	0	15	97
12	6	SRN	6	108	1290	11	5	0.5	1.5	336	4033	193	2311	0	12	93
44	9	MCP	21	42	1862	15	7	1.2	10.0	352	15494	397	17489	280	48	86
8	5	STP	4	116	927	8	6	1.0	4.5	675	5399	693	5545	512	24	89
10	1	CRP	5	38	377	3	8	1.2	4.2	340	3397	412	4123	314	29	97
5	1	LSL	2	38	192	2	6	1.0	2.5	250	1252	286	1432	223	91	93
23	6	LSR	11	46	1054	9	8	1.1	3.5	426	9791	451	10362	323	38	88
2	2	LSBk	1	21	42	0	5	0.9	1.7	105	210	92	184	60	65	98
4	1	LSBo	2	61	243	2	9	0.9	2.6	512	2050	466	1863	274	45	85
9	4	PLP	4	30	268	2	14	1.8	7.4	457	4112	1040	9364	905	49	97
1	1	BPL	0	6	6	0	4	2.0	2.5	24	24	48	48	41	180	90
2	1	DPL	1	167	334	3	10	1.5	3.2	340	680	510	1020	442	15	100
2	0	DRY	1	27	53	0	0	0.0	0.0	0	0	0	0	0	0	93
3	0	CUL	1	176	529	4	0	0.0	0.0	0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
206	55	12126	74312	68833

Grape Creek | Drainage: Dry Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES | Survey Dates: 07/16/98 to 08/13/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T9NR10WS2 LATITUDE: 38°39'35" LONGITUDE: 122°56'4"

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
52	14	MAIN	48	54	2789	53	7.1	1.1	404	20996	445	23129	319	44
53	15	SCOUR	49	41	2176	41	8.7	1.2	391	20731	497	26325	381	45
3	2	BACKWATER	3	113	340	6	7.0	1.8	182	546	279	837	241	98

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
108	31	5305	42274	50291

Grape Creek — Drainage: Dry Creek, Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/16/98 to 08/13/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T9NR10WS2 LATITUDE: 38°39'35" LONGITUDE: 122°56'4"

UNITS MAX DPTH 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
42	MCP	39	0	0	17	40	16	38	6	14	3	7
8	STP	7	0	0	4	50	3	38	0	0	1	13
9	CRP	8	0	0	1	11	7	78	0	0	1	11
5	LSL	5	0	0	0	0	5	100	0	0	0	0
23	LSR	21	0	0	7	30	12	52	4	17	0	0
2	LSBk	2	0	0	2	100	0	0	0	0	0	0
4	LSBo	4	0	0	2	50	2	50	0	0	0	0
8	PLP	7	0	0	0	0	4	50	1	13	3	38
1	BPL	1	0	0	0	0	1	100	0	0	0	0
1	DPL	1	0	0	0	0	0	0	1	100	0	0

TOTAL UNITS 103

Grape Creek Drainage: Dry Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type Survey Dates: 07/16/98 to 08/13/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T9NR10WS2 LATITUDE: 38°39'35" LONGITUDE: 122°56'4"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
31	6	LGR	11	46	0	9	34	0	0	0	0
4	2	HGR	0	0	0	0	0	0	0	100	0
4	2	CAS	0	0	0	0	0	0	25	75	0
2	2	BRS	100	0	0	0	0	0	0	0	0
18	4	GLD	25	12	0	31	13	19	0	0	0
22	3	RUN	25	20	0	15	40	0	0	0	0
12	6	SRN	25	30	14	0	25	0	3	4	0
44	41	MCP	29	7	1	31	15	2	8	8	0
8	8	STP	54	7	6	7	7	3	10	6	0
10	10	CRP	4	22	3	17	29	24	0	2	0
5	5	LSL	9	43	33	15	1	0	0	0	0
23	23	LSR	17	16	6	50	10	0	1	0	0
2	2	LSBk	95	2	0	0	0	0	0	3	0
4	3	LSBo	3	0	0	0	41	19	0	37	0
9	8	PLP	13	12	8	32	22	0	6	8	0
1	1	BPL	50	40	10	0	0	0	0	0	0
2	1	DPL	80	0	0	20	0	0	0	0	0
2	0	DRY	0	0	0	0	0	0	0	0	0
3	0	CUL	0	0	0	0	0	0	0	0	0
ALL 206 HABITAT TYPES	127		24	13	5	27	15	4	5	7	0
POOLS ONLY 108	102		25	12	5	29	15	4	5	6	0

Grape Creek Drainage: Dry Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 07/16/98 to 08/13/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T9NR10WS2 LATITUDE: 38°39'35" LONGITUDE: 122°56'4"

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
31	6	LGR	0	0	67	33	0	0	0
2	2	HGR	0	0	0	0	0	50	50
2	2	CAS	0	0	0	0	0	50	50
2	2	BRS	0	0	0	0	0	0	100
4	4	GLD	25	50	25	0	0	0	0
3	3	RUN	33	33	33	0	0	0	0
6	6	SRN	0	50	17	17	0	0	17
10	10	MCP	20	60	20	0	0	0	0
5	5	STP	20	40	20	0	0	0	20
2	2	CRP	0	50	50	0	0	0	0
1	1	LSL	0	0	100	0	0	0	0
6	6	LSR	0	83	17	0	0	0	0
2	2	LSBk	0	100	0	0	0	0	0
1	1	LSBo	0	100	0	0	0	0	0
4	4	PLP	0	75	25	0	0	0	0
1	1	BPL	100	0	0	0	0	0	0
2	1	DPL	0	100	0	0	0	0	0
2	2	DRY	50	50	0	0	0	0	0
3	0	CUL	0	0	0	0	0	0	0

Grape Creek

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

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
87.48	51.85	48.15	47.98	55.70

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	5	3	7.02
Boulder	0	2	1.75
Cobble/Gravel	5	3	7.02
Silt/clay	47	49	84.21

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	3	4	6.14
Brush	13	18	27.19
Deciduous Trees	21	15	31.58
Evergreen Trees	20	19	34.21
No Vegetation	0	1	0.88

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Grape Creek
SAMPLE DATES: 07/16/98 to 08/13/98
SURVEY LENGTH:
MAIN CHANNEL: 12012 ft. SIDE CHANNEL: 114 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Geyserville Latitude: 38°39'35"
Legal Description: T9NR10WS2 Longitude: 122°56'4"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-156)

Channel Type: F4	Mean Canopy Density: 83%
Main Channel Length: 9597 ft.	Evergreen Component: 38%
Side Channel Length: 66 ft.	Deciduous Component: 62%
Riffle/Flatwater Mean Width: 6.0 ft.	Pools by Stream Length: 48%
Pool Mean Depth: 1.2 ft.	Pools >=2 ft. Deep: 71%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 19%
Water: -68°F Air: -90°F	Mean Pool Shelter Rtn: 42
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Root masses
Bank Vegetative Cover: 67%	Occurrence of LOD: 25%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 30% 3. 39% 4. 21% 5. 10%

STREAM REACH 2 (Units 157-170)

Channel Type: G4	Mean Canopy Density: 95%
Main Channel Length: 640 ft.	Evergreen Component: 88%
Side Channel Length: 0 ft.	Deciduous Component: 13%
Riffle/Flatwater Mean Width: 5.2 ft.	Pools by Stream Length: 34%
Pool Mean Depth: 1.1 ft.	Pools >=2 ft. Deep: 25%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 25%
Water: 61-66°F Air: 64-90°F	Mean Pool Shelter Rtn: 52
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 42%	Occurrence of LOD: 30%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 50% 3. 50% 4. 0% 5. 0%

STREAM REACH 3 (Units 171-188)

Channel Type: G3	Mean Canopy Density: 96%
Main Channel Length: 1252 ft.	Evergreen Component: 84%
Side Channel Length: 48 ft.	Deciduous Component: 16%
Riffle/Flatwater Mean Width: 4.1 ft.	Pools by Stream Length: 17%
Pool Mean Depth: 0.8 ft.	Pools >=2 ft. Deep: 33%
Base Flow: 1.0 cfs	Pools >=3 ft. Deep: 0%
Water: 61-64°F Air: 64-66°F	Mean Pool Shelter Rtn: 61
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 29%	Occurrence of LOD: 5%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 14% 3. 43% 4. 0% 5. 43%

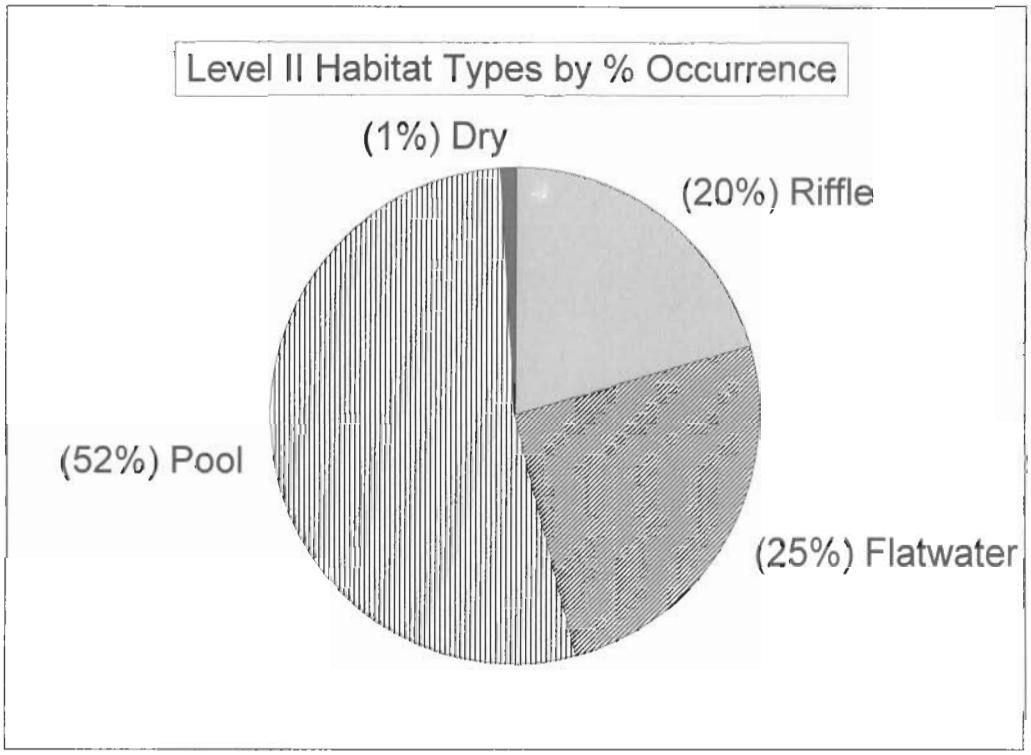
STREAM REACH 4 (Units 189-209)

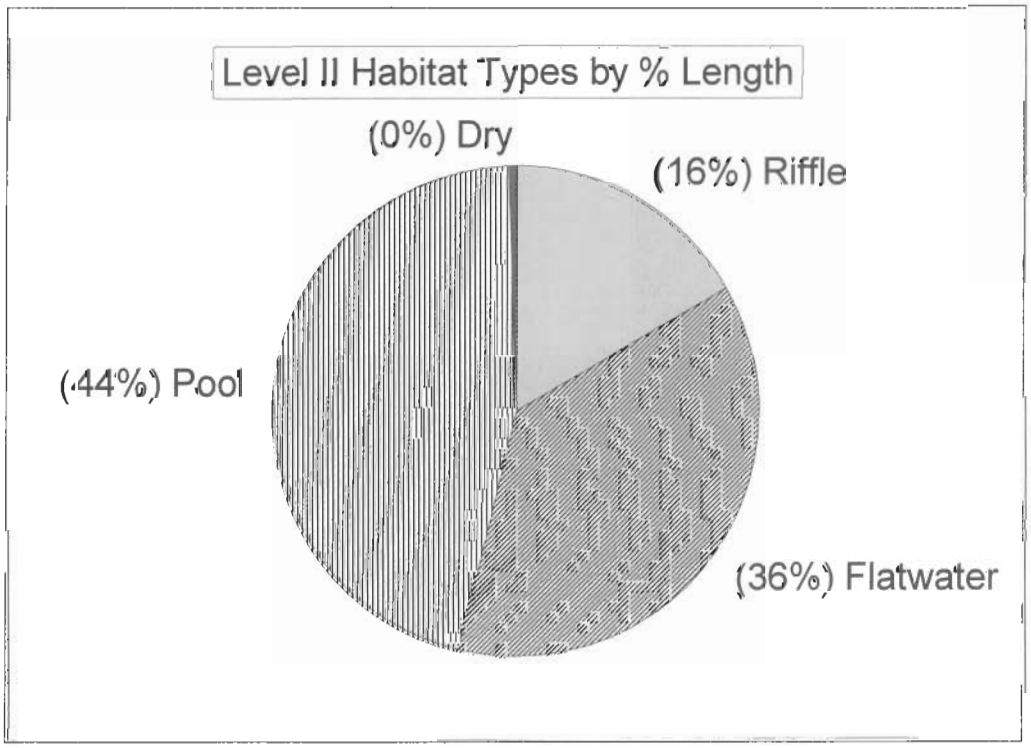
Channel Type: G6	Mean Canopy Density: 98%
Main Channel Length: 523 ft.	Evergreen Component: 69%
Side Channel Length: 0 ft.	Deciduous Component: 31%
Riffle/Flatwater Mean Width: 4.5 ft.	Pools by Stream Length: 31%
Pool Mean Depth: 1.2 ft.	Pools >=2 ft. Deep: 63%
Base Flow: 1.0 cfs	Pools >=3 ft. Deep: 25%
Water: 64-64°F Air: 75-78°F	Mean Pool Shelter Rtn: 64
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 36%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 39 ft.

Embeddness Value: 1. 0% 2. 13% 3. 25% 4. 38% 5. 25%

Grape Creek

Level II Habitat Types

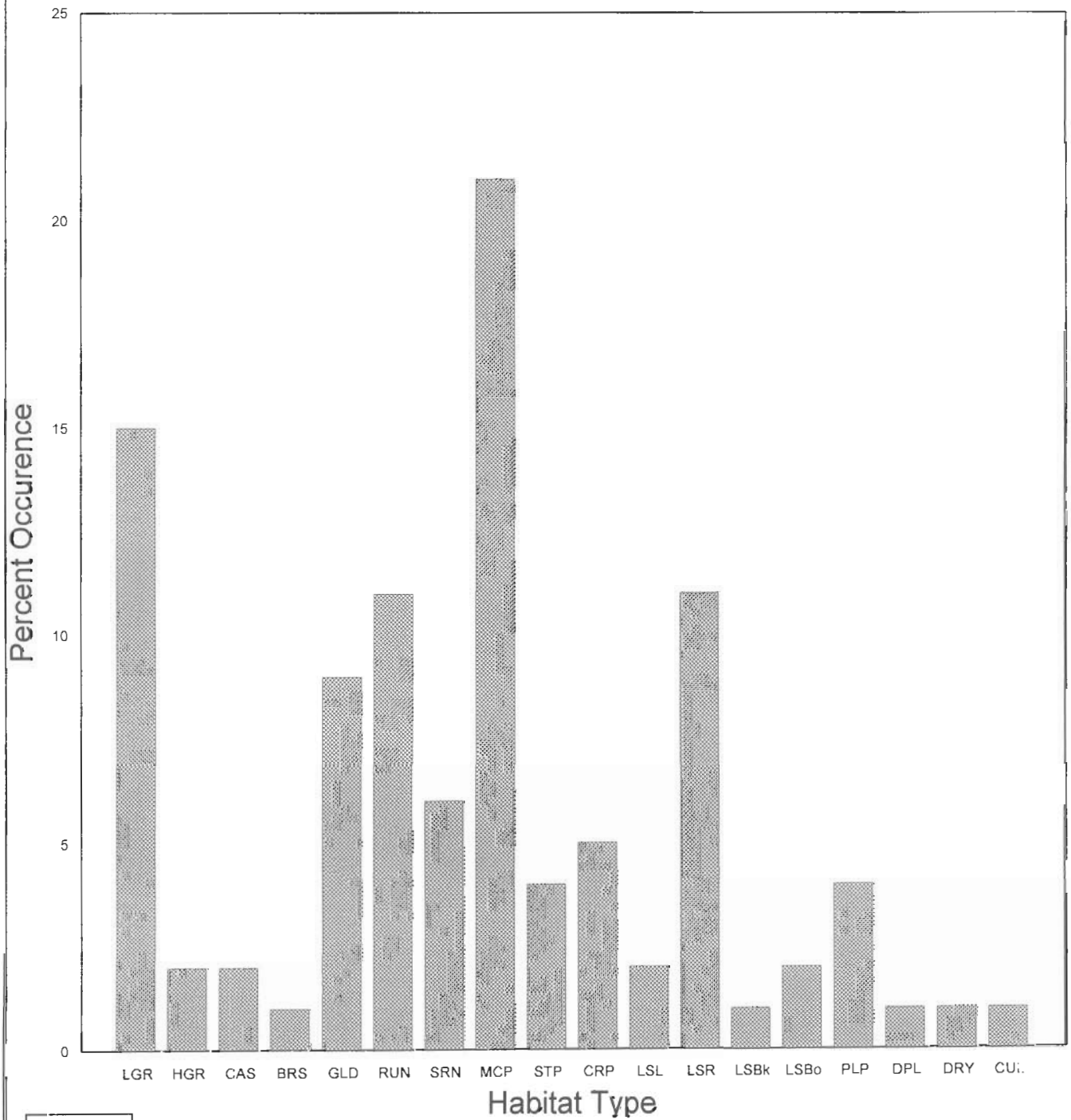




Graph 1

Grape Creek

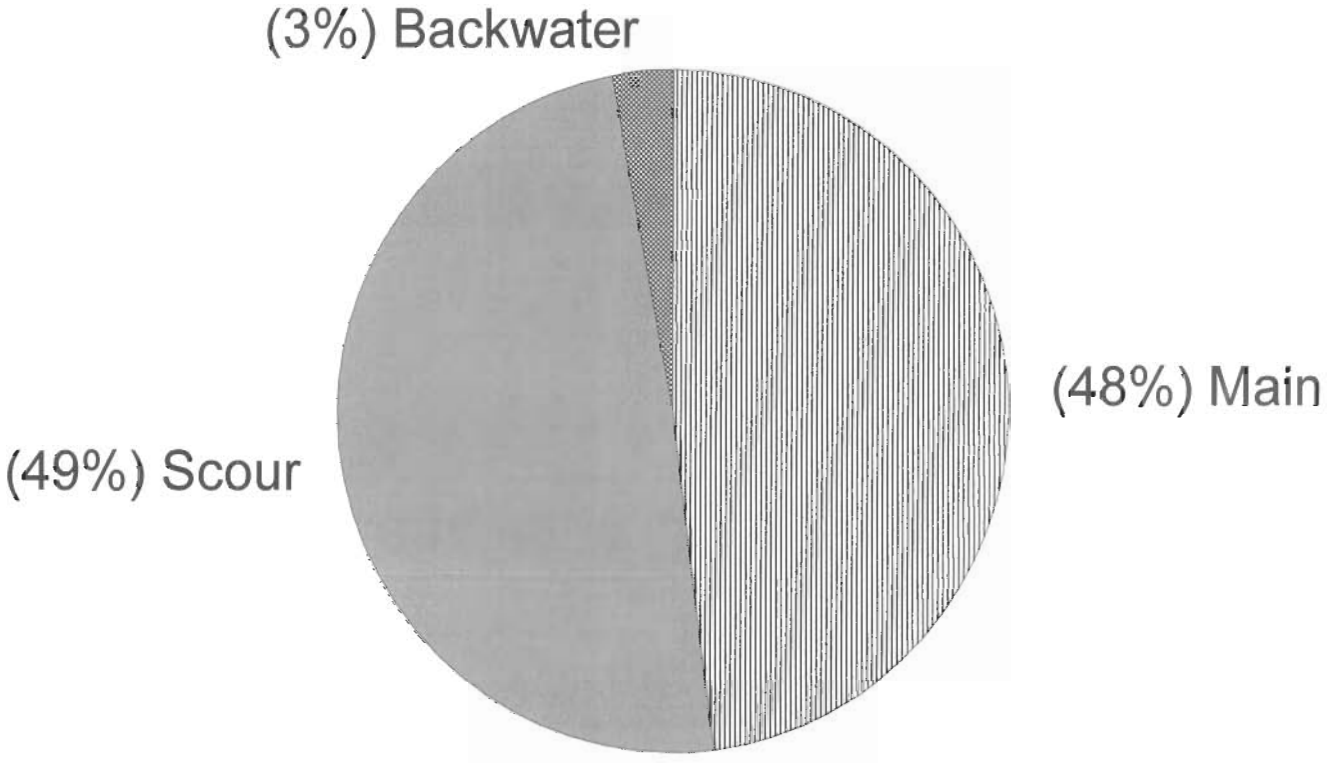
Level IV Habitat Types by % Occurrence



Graph 2

Grape Creek

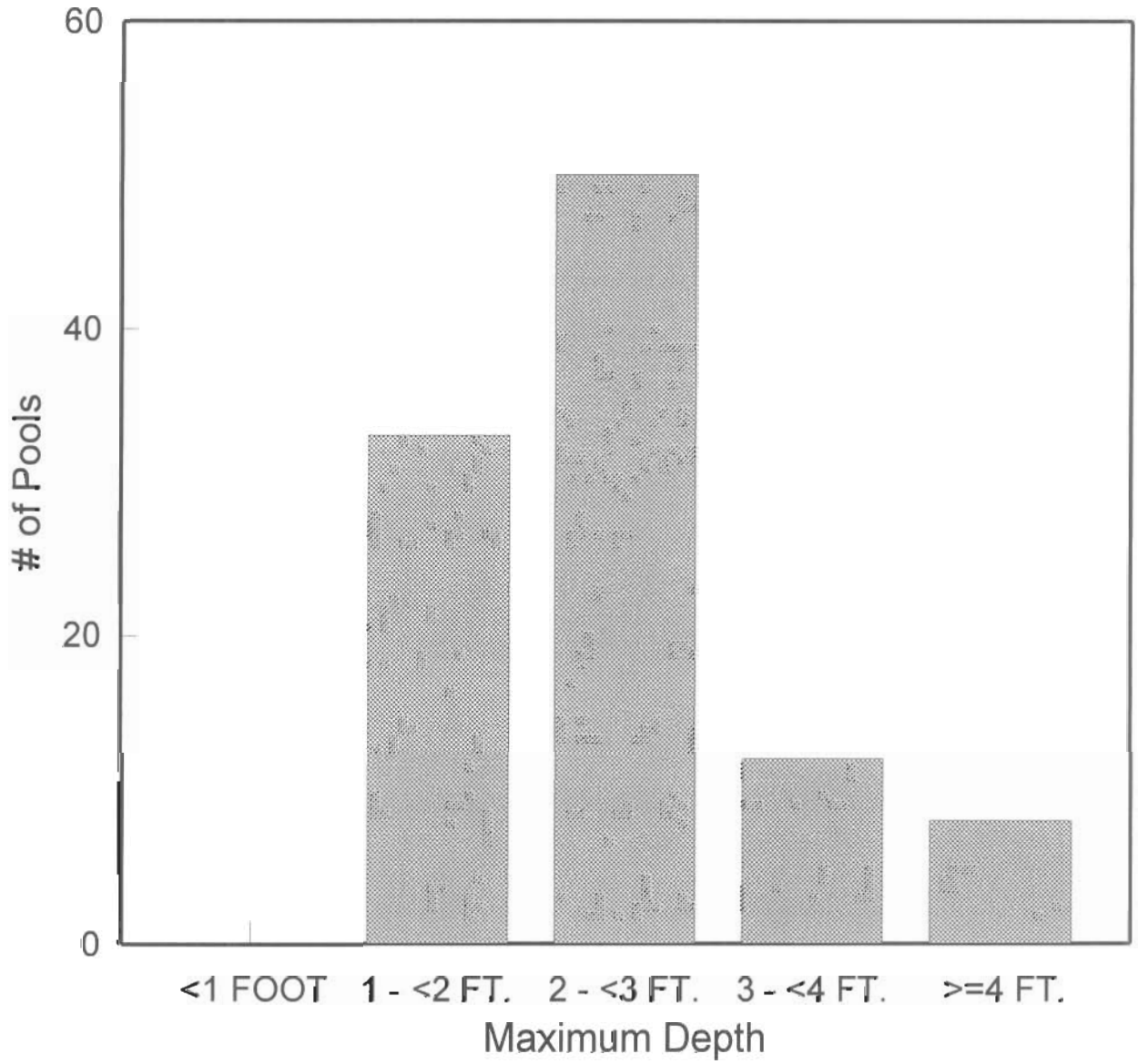
Pool Habitat Types by % Occurrence



Graph 3

Grape Creek

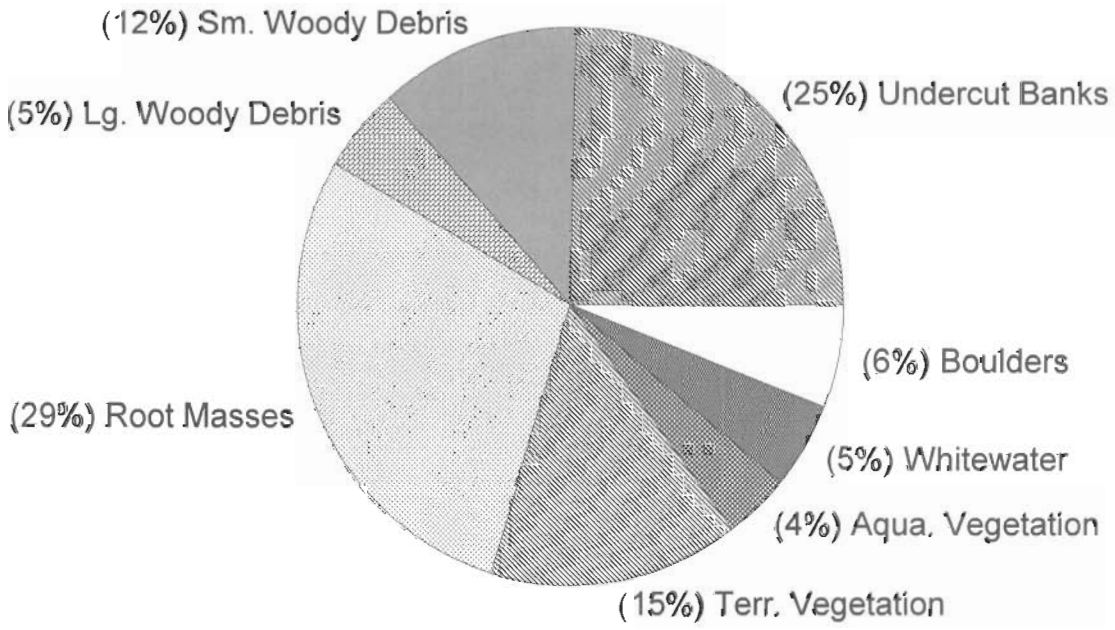
Maximum Depth in Pools



Graph 4

Grape Creek

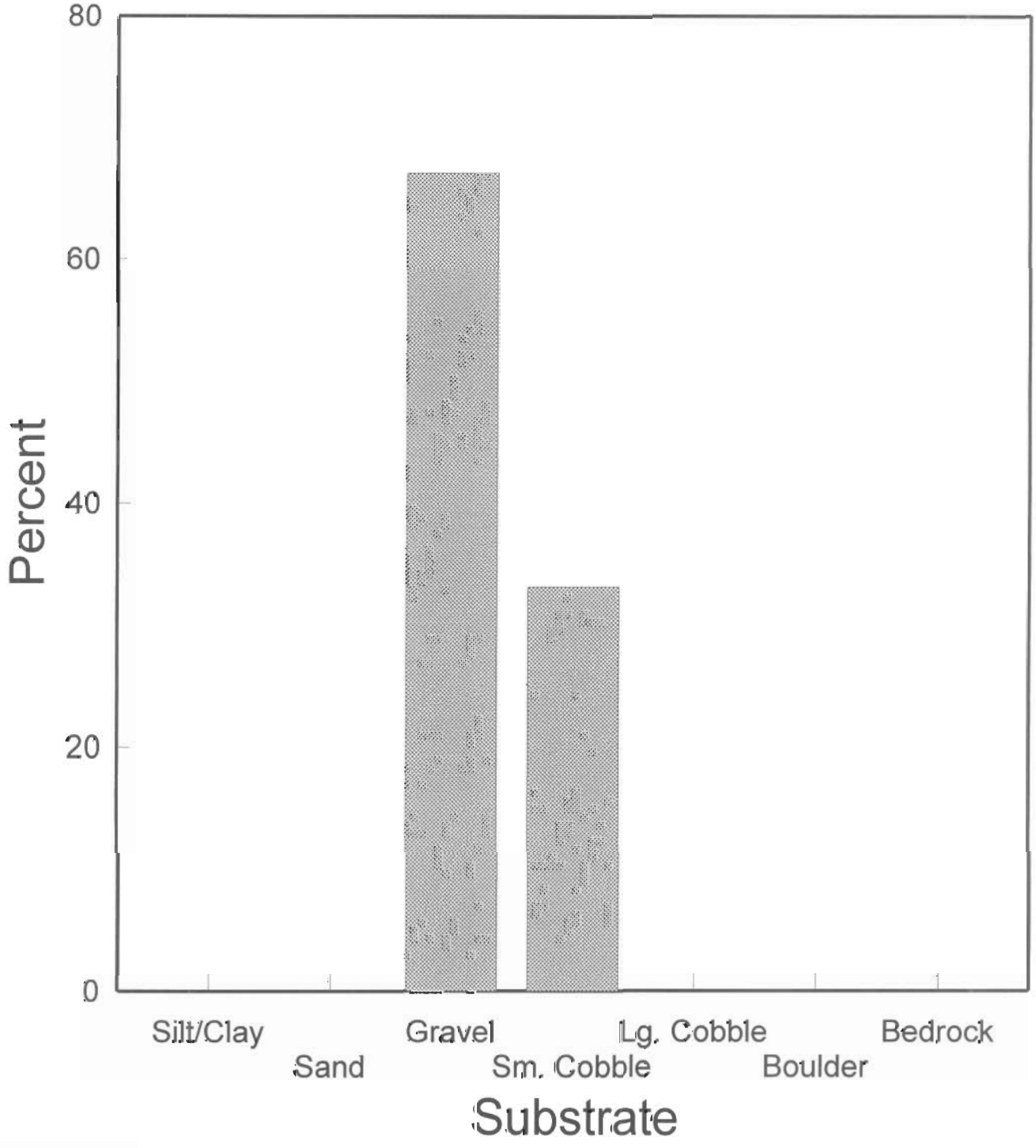
Pool Shelter Types by % Area



Graph 5

Grape Creek

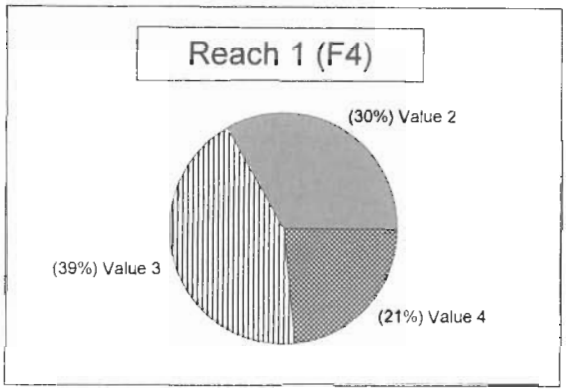
Substrate Composition in Low Gradient Riffles

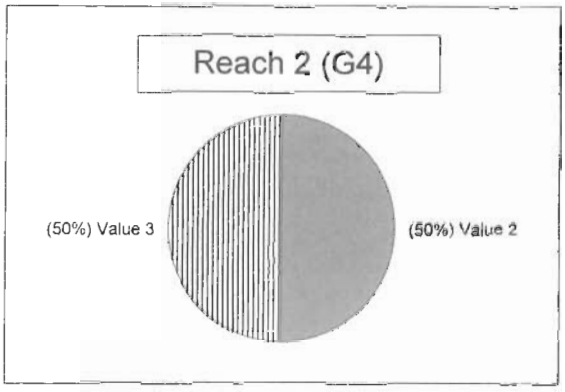


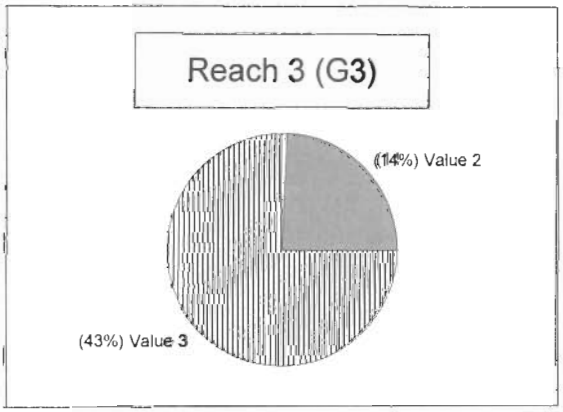
Graph 6

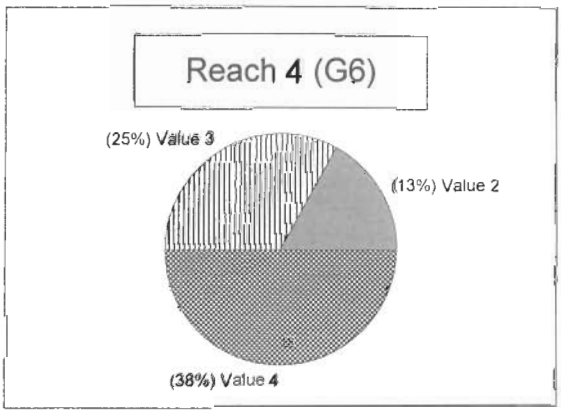
Grape Creek

Percent Cobble Embeddedness by Reach







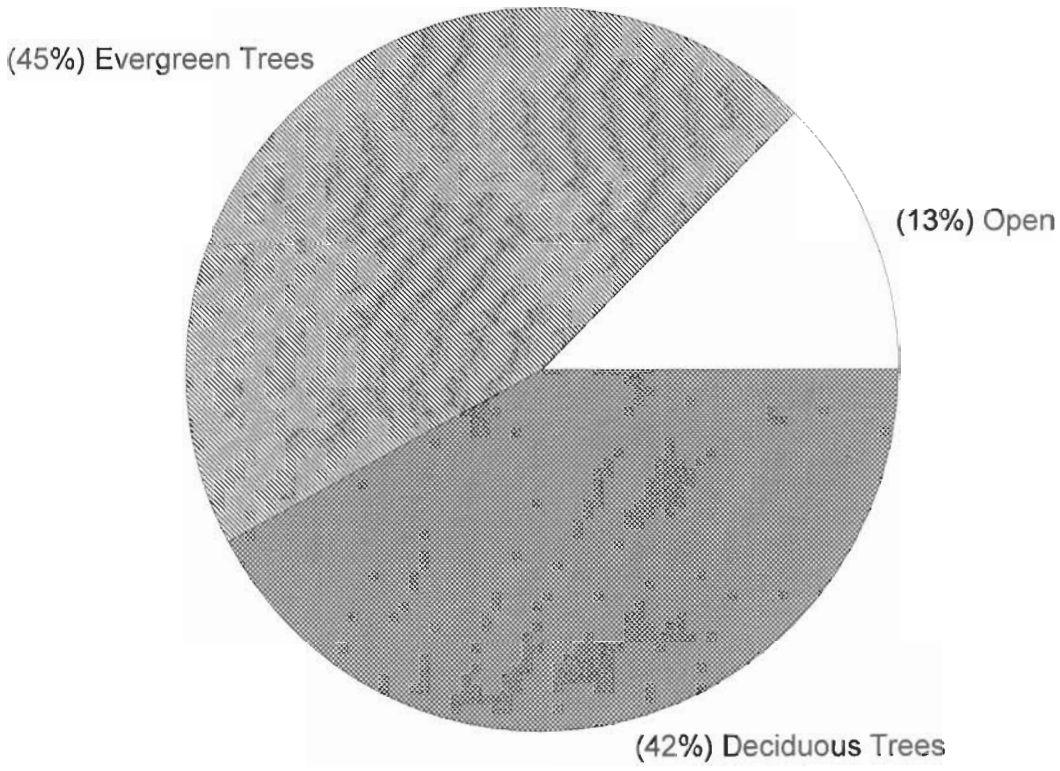


Value 1 = <25% Value 2 = 25-50% Value 3 = 51-75% Value 4 = >76%

Graph 7

Grape Creek

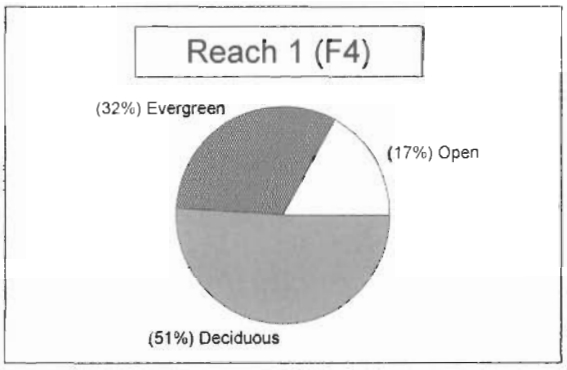
Mean Percent Canopy

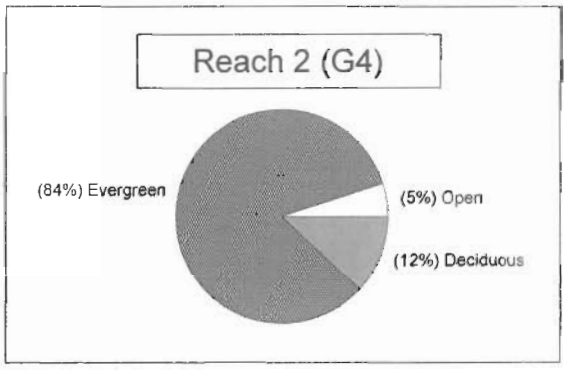


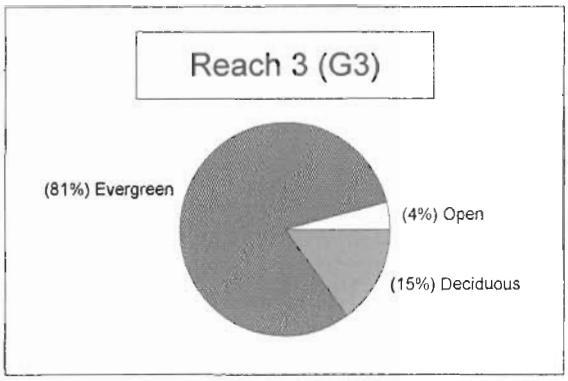
Graph 8

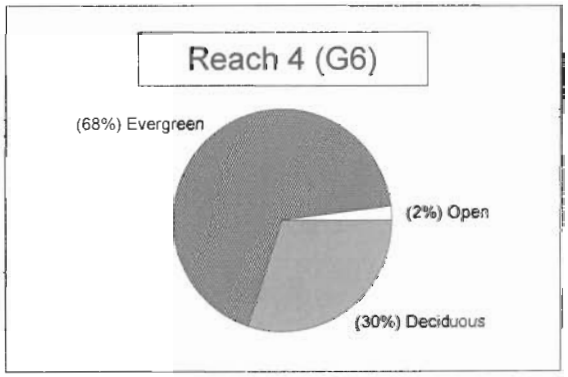
Grape Creek

Percent Canopy By Reach





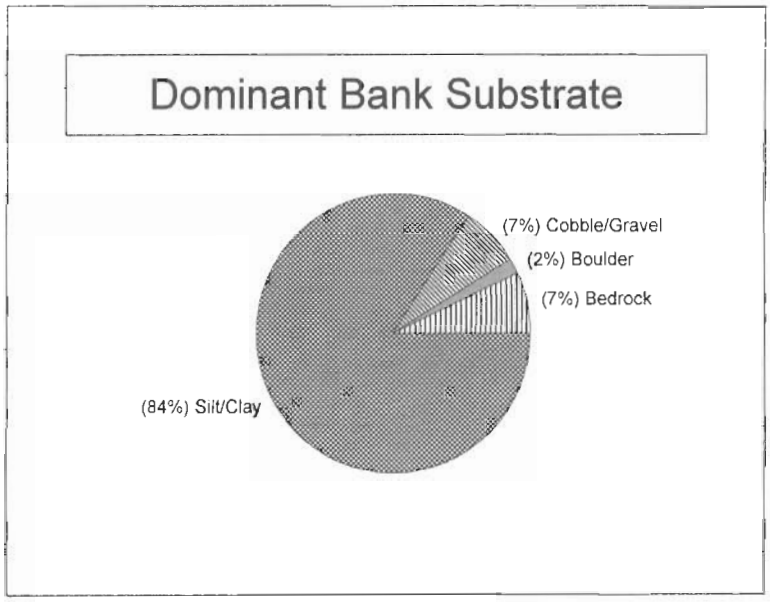


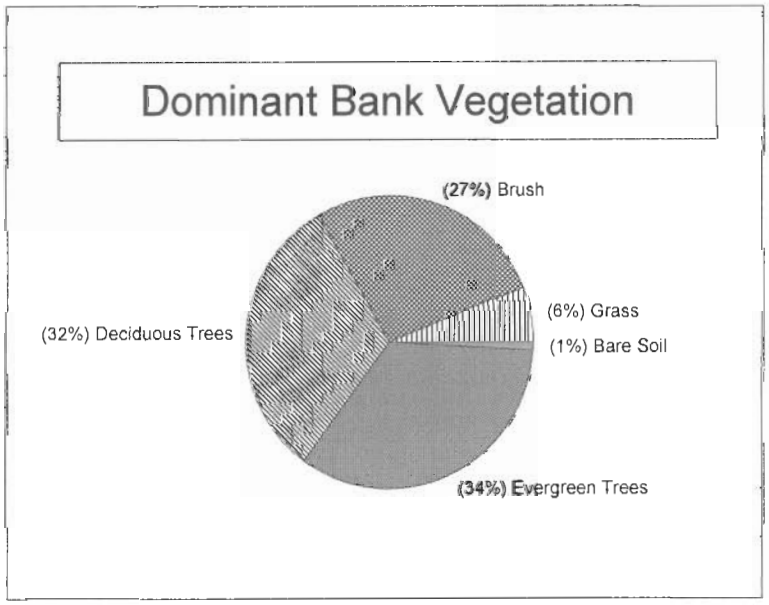


Graph 9

Grape Creek

Percent Bank Composition





Graph 10