CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Dutch Bill Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1997

INTRODUCTION

A stream inventory was conducted during the summer of 1997 on Dutch Bill 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 Dutch Bill 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

Dutch Bill Creek is a tributary to the Russian River , located in Sonoma County, California (see Dutch Bill Creek map, page 2). The legal description at the confluence with the Russian River is T7N, R10W,S7. Its location is 38°27'56" N. latitude and 123°00'32" W. longitude. Year round vehicle access exists from Highway 101 taking Highway 12 West, via Bodega Hwy. to Bohemian Hwy., through the town of Occidental (headwaters), to the town of Monte Rio (mouth).

Dutch Bill Creek and its tributaries drain a basin of approximately 11.6 square miles. Dutch Bill Creek is a third order stream and has approximately 9.0 miles of blue line stream, according to the USGS Duncan Mills and Camp Meeker 7.5 minute quadrangles. Major tributaries included in this report are: Tyrone Gulch, Crawford Gulch, Duvoul Creek, Grub Creek, Alder Creek, Baumert Springs, and an unnamed tributary. Lancel Creek is described in a separate stream report. Summer flow was measured as approximately .18 cfs at the mouth. Elevations range from about 5 feet at the mouth of the creek to 1140 feet in the headwaters. An evergreen forest dominates the watershed, but there are zones of grassland and oak-woodland in the upper watershed. The watershed is entirely privately owned.

METHODS

The habitat inventory conducted in Dutch Bill Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al., 1997). 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 Dutch Bill Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

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

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1996). This methodology is described in the California Salmonid Stream Habitat Restoration Manual. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

3. Temperatures:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Temperatures were 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". Dutch Bill 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 Dutch Bill 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). A rating of "not suitable" (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 Dutch Bill 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, 1997. Canopy density relates to the amount of stream shaded from the sun. In Dutch Bill 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 Dutch Bill Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

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

DATA ANALYSIS

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

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

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Dutch Bill 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:

In October, 1954 Dutch Bill Creek was surveyed to document fish species, in connection with the chemical treatment of the Russian River tributaries to control the 'rough fish' population. Steelhead and coho salmon were observed, the ratio being about 10 to 1 in favor of steelhead. No 'rough' species were observed. The flow was estimated to be less than one cubic foot per second.

On July 18, 1996 the National Marine Fisheries Service (NMFS) conducted a snorkel survey estimation of fish species in Dutch Bill Creek. The inventory was taken from ten pool habitats beginning upstream of Camp Meeker. During their survey they found 276 young of the year (0+) steelhead (SH); 14 one year old (1+)SH; 5 resident SH/rainbow trout; 9 sculpin and 1 California roach.

HABITAT INVENTORY RESULTS

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

The habitat inventory of Dutch Bill Creek was conducted from August 12 to September 10, 1997 by Jon Campo, Simone Watts, Marc Miller (AmeriCorps), and Lloyd Strecker (Volunteer). The survey began at the confluence with the Russian River and extended up Dutch Bill Creek to the end of anadromous fish passage at the town of Occidental. The total length of the stream surveyed was 38,871 feet.

A flow of 0.18 cfs was measured on 9/4/97 at habitat unit #072 with a Marsh-McBirney Model 2000 flowmeter.

Dutch Bill Creek has eight channel types: from the mouth to 16,253 feet an F4; next 1,320 feet an F3; next 2,825 feet an F2; next 1,637 feet an F3; next 631 feet an F1; next 4,694 feet an F3; next

10,983 feet an F2 and the upper 528 feet a G2.

F channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio. F4 types have a predominantly gravel substrate, F3 channel types have predominantly cobble substrate, F2 has predominantly boulder substrate and F1 has a predominantly bedrock substrate.

G2 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 boulder substrate.

Water temperatures ranged from 53°F to 66°F. Air temperatures ranged from 58°F to 68°F. Summer temperatures were also measured using remote temperature recorders placed in pools (see Temperature Summary graphs at end of report). A recorder in Reach 5 logged temperatures every two hours from July 2 - September 26, 1997. The highest temperature recorded was 64°F in August and the lowest was 54°F in September.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 40% pool units, 27% flatwater units, 26% riffle units, and 7% dry streambed units. Based on total length there were 29% dry streambed units, 27% flatwater units, 26% pool units, and 18% riffle units (Graph 1).

Four hundred fifteen habitat units were measured and 21% were completely sampled. 21 Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent occurrence were low gradient riffles at 24%, runs 13%, root wad scour pools 12% and boulder scour pools 10% (Graph 2). By percent total length, dry streambed made up 29%, low gradient riffles 16%, step runs 14%, and runs 9%.

One hundred sixty-four pools were identified (Table 3). Scour pools were most often encountered at 70%, and comprised 59% 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. 37 of the 164 pools (23%) had a depth of three feet or greater (Graph 4). These deeper pools comprised 10% 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 21. Riffle had the lowest rating with 0 and flatwater rated 4 (Table 1). Of the pool types, the scour pools had the highest mean

shelter rating at 25, backwater pools rated 18, and main channel pools rated 12 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 30%, root masses 29%, large woody debris 15%, and undercut banks 15%. Graph 5 describes the pool shelter in Dutch Bill Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in two of the 18 low gradient riffles measured. Small cobble was dominant in six of the low gradient riffles (Graph 6).

No mechanical gravel sampling was conducted in 1997 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 163 pool tail-outs measured, 21% had a value of 1; 58% had a value of 2; 11% had a value of 3; and 9% had a value of 4. 37% of the pool tail-out substrates were not suitable for spawning due to the natural geomorphology. On this scale, a value of one is best for fisheries.

The mean percent canopy density for the stream reach surveyed was 90%. 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 78% and the mean percent left bank vegetated was 81%. For the habitat units measured, the dominant vegetation types for the stream banks were: 48% deciduous trees, 48% evergreen trees and 4% brush. The dominant substrate for the stream banks were: 83% silt/clay/sand, 11% bedrock, and 6% boulder (Graph 10).

HABITAT INVENTORY RESULTS FOR MAJOR TRIBUTARIES
(*Except Lancel Creek*)

Results for the habitat inventories of Alder Creek, Baurmert Springs Creek, Crawford Gulch Creek, Duvoul Creek, Grub Creek, Tyrone Gulch Creek and an unnamed tributary are summarized in the table below.

Dutch Bill Tributary Results									
Creek	Length	High Temp (F)	% Pools Occurring	% Pools by Length	Mean Pool Shelter Rating	Dom. Pool Shelter	Dom. Embed.	Mean Canopy	Channel Types

Dutch Bill Tributary Results									
Alder	989'	61	25	3	16	Boulder	1/5	95%	A2
Baumert Springs	1023'	57	40	23	10	Boulder	1/5	94%	B2
Crawford Gulch	307'	59	13	5	60	Boulder	2	93%	A2
Duvoul	742'	63	30	18	23	Boulder	1/5	82%	B2
Grub	6206'	70	23	4	20	Boulder	3/5	79%	F2,G3, A2
Tyrone Gulch	723'	60	36	21	33	Undercut Bank	1/2	94%	B2,A3
Unnamed	1697'	58	36	25	29	Undercut Bank	2/3	95%	F3

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On October 22, 23, and 27 1997 a biological inventory was conducted in ten sites of Dutch Bill Creek to document fish species composition and distribution. Each site was single pass electrofished using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, and returned to the stream. The air temperature ranged from 57°F to 64°F and the water temperature from 52°F. to 58°F. The observers were Bob Coey, Marc Miller, Todd Parlato, and Shamli Tarbell.

The inventory of Reach 1 started on the downstream side of bridge #1 (Bohemian Highway) and continued for approximately 1170 feet. In intermittent pool habitat types, no salmonids were observed. The species observed were: two Sacramento squawfish, 25 sculpin, and three Sacramento suckers.

The inventory of Reach 1 was continued starting at the confluence with Tyrone Gulch and ending approximately 845 feet upstream. In run and pool habitat types 25 0+, and three 1+ steelhead were observed along with two Sacramento squawfish, 60 sculpin, and two 6" Sacramento suckers.

The inventory of Reach 3 started 754 feet downstream of the fish ladder and ended approximately 754 feet upstream. In riffle, run, and pool habitat types 31 0+, and two 1+ steelhead were observed along with 90 sculpin, three Sacramento suckers, and one bluegill.

The inventory of Reach 4 was started 225 feet upstream from the top of the fish ladder and continued for approximately 657 feet. In pool, run, and riffle habitat types 31 0+, and 15 1+ steelhead were observed along with 61 sculpin and one bluegill.

The inventory of Reach 6 was started from the Westminster Bridge and continued for approximately 625 feet. In pool, run, and riffle habitat types 31 0+, 19 1+, three 2+ and one resident steelhead were observed along with 63 sculpin.

The inventory of Reach 7 was conducted 450 feet downstream from the confluence with Alder Creek and continued for approximately 450 feet. In pool, run, and riffle habitat types 43 0+ and three 1+ steelhead were observed along with 24 sculpin.

The inventory of Reach 7 was continued beginning at habitat unit #340 and ending at the confluence with Lancel Creek. In riffle and pool habitat types 52 0+, six 1+, and three 2+ steelhead were observed along with 25 sculpin, and one bluegill.

The inventory of Reach 7 was continued beginning at habitat unit #360 and ending at unit #370. In run and pool habitat types 25 0+ and one 1+ steelhead were observed along with 18 sculpin.

The inventory of Reach 8 was started from habitat unit #406 and ended at habitat unit #410. In pool, run, and riffle habitat types 63 0+, 8 1+, and two 2+ steelhead were observed.

The inventory of Reach 8 was continued beginning at dam #4 and continued for approximately 94 feet. In pool habitat types six 0+, one 1+, and two 2+ steelhead were observed.

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

Species Observed in Historical and Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1954,1996,1997	Steelhead	DFG,NMFS	N
1954	Coho Salmon	DFG	N
1996,1997	Sculpin	DFG,NMFS	N
1997	Sacramento Squawfish	DFG	N

Species Observed in Historical and Recent Surveys			
YEARS	**SPECIES**	**SOURCE**	**Native/Introduced**
1997	Sacramento Sucker	DFG	N
1996,1997	California Roach	DFG,NMFS	N
1997	Bluegill	DFG	I

NMFS = National Marine Fisheries Service

Historical records reflect coho salmon fingerlings were stocked in Dutch Bill Creek in 1969 and 1970, Table 2. Historical records also reflect that fish transfer/rescue operations occurred in 1955, 1956, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1966, 1967, 1968, 1969, 1970, and 1971.

Table 2. Summary of fish hatchery-stocking into Dutch Bill Creek				
YEAR	**SPECIES**	**SOURCE**	#	**SIZE**
1969	SS	???	10000	YEAR
1970	SS	Noyo River	10010	YEAR

SS = coho (silver) salmon
YEAR = yearling

Table 3. Summary of fish hatchery - transfers/rescues from Dutch Bill Creek					
YEAR	**LOCATION**	**SOURCE**	**SPECIES**	#	**SIZE**
1955	Russian River	Dutch Bill	SH	10,400	FING
1956	Russian River	Dutch Bill	SH	5,992	FING
1958	Austin Cr	Dutch Bill	SH	6,694	FING
1959	Austin Cr	Dutch Bill	SH	41,494	FING
1960	Austin Cr	Dutch Bill	SH	7,690	FING
1961	Austin Cr	Dutch Bill	SH	18,527	FING

Table 3. Summary of fish hatchery - transfers/rescues from Dutch Bill Creek					
1962	Austin Cr	Dutch Bill	SH	5,651	FING
1963	Austin Cr	Dutch Bill	SH	2,624	FING
1963	Austin Cr	Dutch Bill	SS	???	FING
1964	Austin Cr	Dutch Bill	SH	13,520	FING
1966	Russian River	Dutch Bill	SH	15,680	FING
1967	Russian River	Dutch Bill	SH	23,867	FING
1968	Austin Cr	Dutch Bill	SS	30,032	FING
1968	Russian River	Dutch Bill	SS	8,194	FING
1969	Austin Cr	Dutch Bill	SS	29,684	FING
1970	Austin Cr	Dutch Bill	SS	4,277	FING
1970	Green Valley Cr	Dutch Bill	SH	1,170	FING
1970	Russian River	Dutch Bill	SH	5,106	FING
1970	Russian River	Dutch Bill	SS	1,768	FING
1971	Russian River	Dutch Bill	SS	1,800	FING

SH = steelhead
SS = coho (silver) salmon
FING = fingerling (1st year)

JUVENILE SURVEYS OF TRIBUTARIES

A summary of the juvenile surveys conducted in 1997 in Crawford Gulch Creek, Duvoul Creek, Grub Creek, and Tyrone Gulch Creek appears in the table below. Fair numbers of 0+, 1+, and 2+ steelhead were found in all the tributaries listed above, with the exception of Crawford Gulch Creek. Tyrone Gulch Creek had good numbers of 0+ and 1+ steelhead, but no 2+ steelhead. Tyrone Gulch Creek is a small, but important tributary.

Dutch Bill Tributary Data - Juvenile Surveys				
Creek	0+ Steelhead	1+ Steelhead	2+ Steelhead	Other Species
Crawford Gulch	0	0	0	pacific giant salamander, crawdad
Duvoul	12	1	2	sculpin

Dutch Bill Tributary Data - Juvenile Surveys				
Grub	9	11	1	pacific giant salamander
Tyrone Gulch	36	5	0	pacific giant salamander, crawdad, sculpin

ADULT SURVEYS:

A spawning survey was conducted in Dutch Bill Creek on February 3, 1998, beginning at habitat unit #022 (Reach 1) and extending into Tyrone Gulch. Two live steelhead, one male and one female, were observed near a redd. The steelhead pair were 24" to 28" in length and were located 200 yards below bridge #3. Two additional redds were observed, one located beneath bridge #3 and one located 70 yards upstream of bridge #3.

Another spawning/carcass survey was conducted in two sites of Dutch Bill Creek on February 27, 1998. This survey began at the Mt. Zion Bridge #5 (Reach 2) and extended to habitat unit #180 (Reach 4) approximately 2000 feet above the fish ladder. One redd was observed.

The survey continued starting from bridge #7 and ending at habitat unit #240 (Reach 6). Five adult steelhead were observed just downstream of dam #2 at Alliance Redwoods. Three of these were greater than 24", one was approximately 18", and one was approximately 12". A male and female pair were spawning and the smaller jacks were competing to be part of the act. Under bridge #9, one 28" steelhead was observed near a redd. Upstream of bridge #9, two steelhead, greater than 24" in length, were observed near a redd. One 12" steelhead was observed in the same vicinity. A total of five redds were observed.

DISCUSSION

Dutch Bill Creek has 8 channel types: F4 (16253 ft.), F3 (1320 ft.), F2 (2825 ft.), F3 (1637 ft.), F1 (631 ft.), F3 (4694 ft.), F2 (10983 ft.) and G2 (528 ft.).

There are 16253 feet of F4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual F1 channel types are good for bank-placed boulders and fair for single wing-deflectors and log cover.

F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

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.

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.

G2 channel types are fair for log cover.

Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey days 08/12/97 to 09/10/97 ranged from 57°F to 66°F. Air temperatures ranged from 58°F to 68°F. These temperatures are within the threshold stress level (65°F) for salmonids.

Summer temperatures measured using remote temperature recorders placed in pools ranged from 54° to 64° F for Reach 5. This thermal regime is favorable to salmonids.

Pools comprised 26% 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 Dutch Bill Creek, the pools are relatively deep with 23% having a maximum depth of at least 3 feet. These pools comprised 10% of the total length of stream habitat. However, 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 21. 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 boulders (30%), root masses (29%), large woody debris (15%), and undercut banks (15%). 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.

Eight of the 18 low gradient riffles measured (44%) had either gravel or small cobble as the dominant substrate. This is generally considered fair for spawning salmonids.

Seventy-nine percent of the pool tail-outs measured had embeddedness ratings of either 1 or 2. Only 21% had a rating of 3

or 4. 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 mean percent canopy for the entire survey was 90%. This is very good, since 80 percent is generally considered desirable. Large trees contribute shade and provide a long term source of large woody debris needed for instream structure and bank stability.

DISCUSSION OF MAJOR TRIBUTARIES
(Except Lancel Creek)

ALDER CREEK

Alder Creek has one channel type: A2 (989 ft.).

There are 989 feet of A2 channel type in Reach 1. 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.

According to the DFG Salmonid Stream Habitat Restoration Manual, the high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

Pools comprised only 3% of the total ***length*** *of this survey. Therefore, installing structures that will increase pool habitat is recommended for locations where their installation will not jeopardize any unstable stream banks, or subject the structures to high stream energy.*

The mean shelter rating for pools was 16. A pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by boulders (98%), large woody debris (2%), undercut banks (0%), and small woody debris (0%). Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

BAUMERT SPRINGS CREEK

This section of Baumert Springs has one channel type: 1023 feet.

There are 1023 feet of B2 channel type in Reach 1. 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.

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.

Pools comprised 23% of the total length of this survey. The mean shelter rating for pools was 10. 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 boulders (55%), undercut banks (17%), small woody debris (13%), and large woody debris (10%).

Fifty-eight percent of the pool tail-outs measured had an embeddedness rating of 5 which is considered unsuitable for spawning due to the natural geomorphology. Only 25% 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.

CRAWFORD GULCH CREEK

Crawford Gulch has one channel type: A2 (307 ft.).

According to the DFG Salmonid Stream Habitat Restoration Manual, the high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

Pools comprised 5% of the total length of this survey. The mean shelter rating for the pool was 60. This is good since approximately 80 is desirable. The pool shelter that now exists is being provided primarily by undercut banks (40%), boulders (40%) and large woody debris (20%).

DUVOUL CREEK

Duvoul Creek has one channel type: B2 (742 ft.).

According to the DFG Salmonid Stream Habitat Restoration Manual B2 channel types are low and medium-stage plunge weirs, single and

opposing wing deflectors and bank cover.

GRUB CREEK

Grub Creek has 3 channel types: F2 (4113 ft.), G3 (1116 ft.) and A2 (978 ft.).

There are 4113 feet of F2 channel type in Reach 1. F2 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly boulder substrate.

According to the DFG Salmonid Stream Habitat Restoration Manual, F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

There are 1116 feet of G3 channel type in Reach 2. G3 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 cobble substrate. G3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

In Reach 3 there is 978 feet of A2 channel type. The high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

Many site specific projects can be designed within the (F2 and G3) channel types, especially to increase pool frequency, volume and shelter. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey days 08/05/97 to 08/07/97 ranged from 60°F to 70°F. Air temperatures ranged from 72°F to 94°F. The warmer water temperatures were recorded in Reach 2. These temperatures, if sustained, are above the threshold stress level (65°F) for salmonids.

It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the lower cooler sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling

conducted.

Neither of the two low gradient riffles measured had either gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

Eighty-nine percent of the pool tail-outs measured had embeddedness ratings of either 3 or 5. An embeddedness rating of 5 is considered unsuitable for spawning due to the natural geomorphology. 0% 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.

TYRONE GULCH CREEK

Tyrone Gulch has two channel types: B2 (723 ft.) and A3 (917 ft.). There are 723 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.

In Reach 2 there is 917 feet of A3 channel type. A3 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly cobble substrate. A3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

UNNAMED TRIBUTARY

Unnamed tributary has one channel type: F3 (1697 ft.)

There are 1697 feet of F3 channel type in Reach 1. F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble substrate.

According to the DFG Salmonid Stream Habitat Restoration Manual, 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.

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 intermittently. 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. Overall, fair numbers of steelhead (but no coho) were observed during the 1997 surveys. The 1998 spring surveys documented 0+ fish indicating successful spawning in the middle reaches of Dutch Bill Creek. Many 1+ fish were observed indicating good rearing conditions the year before or good holding-over conditions in general. Overall however, habitat conditions for both steelhead and coho have declined over time.

In general, Reaches 3-7 of Dutch Bill Creek are good for salmon and steelhead habitat. Some deep, sheltered sections of the stream occur in the mid and upper Reaches which may be used as rearing habitat. However, in the lower Reaches (1 and the lower portion of 2) pool shelter and frequency are lacking and portions are dry, limiting successful spawning and rearing. Portions of Dutch Bill have been channelized from road construction and urbanization along the creek, thus stream velocity has increased resulting in downcutting, streambank erosion and loss of mature riparian. Riffle habitat exists for spawning, but many areas are unsuitable for spawning due to high gravel embeddedness. Winter resting cover from high velocities and summer rearing habitat for juveniles is lacking. The effects of channelization limits instream habitat improvement alternatives, although some opportunity exists. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks and high stream velocities. Reaches 2 and 4 are good for bank-placed boulders and single and opposing wing-deflectors. They are fair for low-stage (low profile) weirs, boulder clusters and channel constrictors. Log cover structures can be used to increase instream shelter.

GENERAL RECOMMENDATIONS

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

Shortly before the survey, winter storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since drought years. This woody debris, if left undisturbed, would have provided fish shelter and rearing habitat, and offset channel incision. Recently, many logs were removed by flood control crews 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 and the city should be educated 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) Access for migrating salmonids is an ongoing potential problem, therefore, fish passage should be improved where possible. Baffles should be installed in several tributary culverts to facilitate easier fish access.

2) 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 all the reaches. Where feasible, design and engineer pool enhancement structures to increase the length and depth of pools in all reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

3) In Dutch Bill Creek, active and potential sediment sources related to the County road system need to be improved, and treated according to their potential for sediment yield to the stream and its tributaries. Maintenance of ditches, culverts, and inboard cutbank slides should be improved to decrease the potential of sediment delivery to Dutch Bill Creek. During storms, surface runoff over the road causes outboard cutbank slides, delivering sediment and threatening the road integrity. This is primarily due to the existing conditions of the road drainage network

.4) Spawning gravels on Dutch Bill 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 Dutch Bill Creek Reaches 3-7)

5) Map sources of upslope and in-channel erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against urban runoff.

6) Access for migrating salmonids is an ongoing potential problem, therefore, fish passage should be monitored before and after improvements of culverts.

RESTORATION IMPLEMENTED

1) The fish ladder at Reach 3 should be improved to pass fish easier at all flows.

DUTCH BILL CREEK TRIBUTARY RECOMMENDATIONS

BAUMERT SPRINGS CREEK

1) Access for migrating salmonids is an ongoing potential problem in Reach 1, therefore, fish passage should be monitored, and improved where possible. An instream culvert located at habitat unit #030 is a possible fish barrier and needs to be repaired. Future design should include improved passage of gravel and fish passage as a first priority.

DUVOUL CREEK

1) Access for migrating salmonids is an ongoing potential problem in Reach 1, therefore, fish passage should be monitored, and improved where possible. A culvert located at habitat unit #001 is a possible fish barrier that should be analyzed for fish passage and baffles should be installed if necessary. A permanent barrier exists at 668' (30' high bedrock waterfall).

GRUB CREEK

1) Access for migrating salmonids is an ongoing potential problem in Reach 1, therefore, fish passage should be monitored, and improved where possible. The concrete box culvert at habitat unit #003 should be analyzed for fish passage and baffles should be installed if necessary.

2) There are at least 2 sections (Reach 2 and Reach 3) where the stream is being impacted from livestock in the riparian zone. Livestock in streams generally inhibit the growth of new trees, exasperate erosion, and reduce summertime survival of juvenile fish by defecating in the water. Alternatives to limit cattle access, control erosion and increase canopy, should be explored with the landowner, and developed if possible.

3) Near-stream riparian planting along any portion of the stream

should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.

4) In Grub 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.

TYRONE GULCH CREEK

1) A culvert located at habitat unit #004 is a partial fish barrier that should be replaced with an arched culvert to improve passage.

PROBLEM SITES AND LANDMARKS - DUTCH BILL 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	372	LG. ROOTWAD TUCKED UNDERNEATH BRIDGE, POSSIBLE FOR RESTORATION USE
3.00	537	O+ SHD
4.00	610	POSSIBLE RESTORATION MATERIALS; RT WAD, LWD
5.00	692	RIP RAP RB
6.00	816	CULVERT LB 18"
9.00	1009	0+
12.00	1176	RIP RAP, EROSION, 0+ SHD
13.00	1258	RUSTED CAR IN CR.
14.00	1288	0+ SHD
18.00	1525	0+, 1+, 2+ SHD
19.00	2447	BRIDGE AND CULVERT LB
20.00	2542	3 POOLS SERIES
27.00	4473	DOZER TRACKS IN CR.
28.00	4502	PUMP IN CR. CULVERT
29.00	7732	CULVERT ,TRIB PUMP @ 1800' RB
30.00	7764	MANY 0+
31.00	7922	PIPE ACROSS CR.
32.00	7962	0+, 1+, 2+;RB RETAINING WALL
33.00	8948	SEE YELLOW BK
34.00	8964	0+ SHD, RIP RAP
35.00	9244	LONG RIP RAP UNIT RB
36.00	9317	0+SHD, 68 DEG. WATER; ALGAE
38.00	9500	SEE JOURNAL

39.00	11430	BRIDGE @ 600', BLOWOUT @ 1000'
41.00	11508	WET TRIB LB, 2 CULVERTS 0+SHD
43.00	11565	RETAINING WALL LB, 40'L X 8' H
44.00	11601	CONCRETE UTILITY BOX 0+ SHD
45.00	11661	RIPRAP LB 90'L
47.00	12097	RIPRAP LB 90'L
48.00	12132	0+SHD
50.00	12327	0+, 1+ SHD
51.00	12593	2 RETAINING WALLS 90'L LB
52.00	12623	CRAWFISH, 0+SHD
54.00	12806	50 0+SHD
55.00	12853	RIPRAP RB 50'L
56.00	12913	1+ SHD
60.00	13134	DRY TRIB LB W/CULVERT UNDER TYRONE RD. 0+, 1+ SHD
61.00	13154	DRY TRIB W/CULVERT LB
62.00	13190	0+ SHD
66.00	13401	227' VEGETATED GRAVEL BAR
68.00	13498	EROSION LB
69.00	13585	EROSION LB CAUSED BY ROAD RUNOFF
71.00	13696	12" CULVERT LB
72.00	13726	PUMP ON LB W/PUMP HOUSE
79.00	14051	6"CRAWFISH; LANDOWNER SAYS HE HAS SEEN SEVERAL 18" SHD
86.00	14551	BOULDERS = CONCRETE SLABS (4) CULVERT LB
87.00	14603	POSSIBLE RESTORATION SITE, SHELTER ENHANCEMENT
88.00	14660	WET TRIB LB
89.00	14742	DRY TRIB RB W/2 CULVERTS
95.00	15117	LANDOWNER TRAINBRIDGE
96.00	15160	LG AMOUNTS OF COBBLE
98.00	15300	PUMP ON RB; SHD SPAWNING PAIR PHOTOGRAPH - MR. FINER TOOK PHOTO
101.00	15606	RB 12" CULVERT
107.00	15893	JUV. SCULPIN
108.00	15972	LG COBBLE TRANSITION FROM GRAVEL
112.00	16153	RETAINING WALL RB
115.00	16290	CHANNEL CHANGE TO F3
120.00	16660	0+SHD
121.00	16731	LG CULVERT
123.00	16840	BRIDGE 5
125.00	17037	LB STORAGE ITEMS; FURNITURE , EMPTY DRUMS, METAL BOXES. ALL UNDERNEATH A TARP
129.00	17231	MANY SQUAWFISH
132.00	17425	0+SHD
135.00	17656	BEGINNING OF F2
138.00	17858	0+SHD

139.00	17955	1"PVC PIPE
140.00	18037	DRY TRIB LB
142.00	18180	EROSION RB 30'L X 15'W X 3'D
143.00	18616	18" CULVERT ON RB
145.00	19006	3 8" BLUEGILLS, 1+ SHD, SCULPIN, CRAYFISH
146.00	19200	DRY TRIB RB 18" CULVERT
147.00	19328	2+ SHD, BEGINNING OF FISH LADDER
148.00	19648	3 ½' JUMP UP TO SECOND STEP. END OF UNIT @ END OF LADDER. SEE BK
149.00	19709	RB RIPRAP, RETAINING WALL
155.00	20476	BEGINNING OF F3 CHANNEL TYPE
156.00	20516	OLD BRIDGE ABUTMENT , BLOWN OUT FOR SOME TIME
157.00	20595	DRY TRIB RB
164.00	21008	DRY TRIB RB
165.00	21048	SCULPIN
171.00	21351	MORE BEDROCK OBSERVED ON BANKS; 0+ SHD
174.00	21501	CULVERT RB - NEEDS MAIN.
181.00	21932	DUVOUL TRIB RB; CULVERT (SEE FORM) MANY 0+, 1+; 1-2+ SHD
182.00	21970	RIPRAP RB
184.00	22043	SCULPIN AND CRAYFISH
186.00	22189	0+ SHD; BEDROCK = CONCRETE; 80'L RETAINING WALL RB CHANNEL CHANGE TO F1
187.00	22259	A FEW 1+ AND 0+ SHD
188.00	22280	ACTIVE EROSION RB - 100'L
189.00	22394	10" CULVERT LB
191.00	22530	CULVERT LB
194.00	22698	POOL FORMED @ WESTMINSTER DAM; *POSSIBLE RESTORATION SITE*
195.00	23494	CHANNEL CHANGE TO F3; FOOTBRIDGE OVER DAM; POOL BACKED UP
197.00	23646	*POSSIBLE RESTORATION SITE*; GOOD POOL - NO SHELTER
198.00	23745	12" CULVERT RB
199.00	23822	PICNIC AREA LB
200.00	23887	GRUB CREEK RB; PICNIC AREA LB
203.00	24153	PUMP RB
205.00	24306	0+ SHD
207.00	24389	REMAINS OF OLD CONCRETE DAM
214.00	24813	MANY SHD; 0+, 1+, 2+, RES?- GREAT POOL
216.00	24933	BRIDGE#7
219.00	25123	0+, 1+,SHD
221.00	25253	WELL IN STREAM - 3' CORRUGATED STEEL; 1+, 0+ SHD

224.00	25443	FOOT BRIDGE
229.00	25828	SCULPIN, 0+ SHD, 1+, 2+, CRAWFISH
230.00	26255	CONCRETE DEFLECTOR WEIR; RIPRAP LB; BRIDGE #8
231.00	26291	RIPRAP LB
232.00	26388	WET TRIB LB W/CONCRETE WEIR ACTING AS A DAM W/ACTIVE PUMP
236.00	26672	Bridge #9
239.00	26897	LOTS OF BEDROCK
242.00	27190	1+ SHD
243.00	27210	1+ SHD
246.00	27392	*POSSIBLE RESTORATION* LACK OF LWD
247.00	27417	CHANNEL CHANGE TO F2
258.00	28072	1+ SHD
264.00	28376	18" CULVERT RB - ERODING
268.00	28587	1+ SHD
269.00	28868	LOGJAM; 20" CULVERT RB
271.00	29244	PUMP RB W/PIPING EXTENDING UPSLOPE INTO DRY TRIB, CULVERT EXTENDING UNDER ROAD- (BOHE. HWY.) 0+ SHD
272.00	29283	DRY TRIB LB; 0+ SHD
274.00	29370	2+ SHD
276.00	29453	0+ SHD
277.00	29492	1+ SHD
278.00	29526	EROSION RB - SEE EROSION FORM
283.00	29868	CEMENT WELL RB; WATER HOLDING TANK RB W/1" PVC RUNNING 15' OVER CREEK TO SPRING LB
286.00	30028	ALDER CREEK TRIB RB COBBLE WALL LB W/12' CEMENT DRAINAGE CHUTE; DRAINAGE FROM TRIB WHICH FLOWS UNDER ROAD (BOHE. HWY.) IS DRY
296.00	30523	0+ SHD; 1+ SHD
297.00	30553	OLD FRIDGE IN CREEK
299.00	30617	0+ SHD
301.00	30795	0+ SHD
306.00	31176	0+ SHD
307.00	31269	0+ SHD, SCULPIN
313.00	31626	2+ SHD, 0+ SHD
315.00	31878	WET TRIB LB; 2" PVC PIPE FROM WET TRIB OVER CREEK 3"
316.00	32175	CULVERT RB; 2" PIPE LAYING LENGTHWISE IN CREEK EXTENDING 346' - NOT IN USE
320.00	32373	BRIDGE #10 @ TOWER RD.
322.00	32491	SCULPIN

326.00	33149	CAMP MEEKER DAM - SUMMER FLASHBOARD
327.00	33179	0+ SHD, DRY TRIB LB
332.00	33389	0+ SHD
334.00	33513	0+ SHD; BRIDGE #11 - BOHE. HWY.
336.00	33658	0+ SHD
338.00	34016	1 1/4" WATER DIVERSION PIPE (PVC) 4.5' OVER CREEK
339.00	34060	0+ SHD
341.00	34254	0+ SHD
342.00	34482	0+ SHD; EROSION - SEE FORM
343.00	34509	0+ SHD
345.00	34705	(3) 2+ SHD(POSSIBLE RESIDENTS) NICE POOL
349.00	34938	0+ SHD
352.00	35189	LANCEL CREEK CONFLUENCE RB
353.00	35241	0+ SHD; 2+ SHD
356.00	35357	ABUNDANCE OF SMALL BLACK SNAILS
357.00	35388	2+ SHD, 0+ SHD
358.00	35456	1" PVC PIPE ACROSS CREEK; 2' ABOVE CREEK
359.00	35494	0+ SHD
361.00	35555	CULVERT LB; EROSION LB; LOG JAM (SEE FORM)
365.00	35703	DRY TRIB
366.00	35751	0+ SH
374.00	36301	CULVERT LB - DRAINAGE FROM ROAD
381.00	36629	0+ SHD
382.00	36719	2.5' CULVERT RB - 110' OFF BANK
383.00	36748	0+ SHD
385.00	36833	0+ SHD
392.00	37192	0+ SHD
395.00	37390	0+ SHD
396.00	37570	DRY TRIB LB
397.00	37654	0+ SHD
404.00	38181	0+ SHD
406.00	38441	CHANNEL CHANGE TO G
410.00	38749	CULVERT - SEE FORM; 1 3/4" METAL PIPE RUNNING 7.5' ACROSS CREEK
414.00	39036	FLASHBOARD DAM 4 - SEE FORM; INSULATED 1" PIPE 4' OVER CREEK
416.00	39147	0+ SHD; BACKED UP BY ROCK WEIR; 2 4" WATER PIPES 7' OVER CREEK; PUMPHOUSE RB; 1 1/4" PVC IN CREEL
419.00	39244	CULVERT LB - SEE FORM
421.00	39306	0+ SHD
424.00	39418	CULVERT LB - SEE FORM
425.00	39508	0+ SHD
427.00	39592	INSTREAM CULVERT - SEE FORM
429.00	40402	END OF SURVEY

PROBLEM SITES AND LANDMARKS - ALDER CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
1.00	434	FIRST 148' CHANNELIZED BY 4 8'ROCK WALLS W/CONCRETE BOTTOM BRIDGE FORM 2 DRY TRIBS RB
3.00	695	BEDROCK CASCADE 14.5' JUMP . ROCK WALLS BOTH BANKS W/DECK LB. SERIES OF CASCADES 8.5', 8.5',11'.8" SEDIMENT SOURCE LB--SEE FIELD BOOK
8.00	991	OLD ROCK DAM-SHEET FILLED W/GRAVEL TO RIM DRY ABOVE TO HEADWATERS AREA. RD 40' ABOVE END OF SURVEY. #008 . SEE FIELD BK. #2 FOR ADDITIONAL COMMENTS.

PROBLEM SITES AND LANDMARKS - BAUMERT SPRINGS SURVEY COMMENTS

HABITAT UNIT #	DISTANCE UPSTREAM	COMMENTS
2	77	(4) 0+ SH
5	206	0+ SH
11	444	Bank Armorment LB
12	473	Rock
14	512	Pump piping found throughout creek on LB & RB
15	539	fish spotted above
23	755	Erosion Blowout
24	764	Culvert in stream.
25	799	Culvert LB. Two massive water tanks on LB Dia= 17'
30	1023	-Culvert -Instream Barrier: could be repaired. ****End of Survey****

PROBLEM SITES AND LANDMARKS - DUVOUL CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS

1.00	79	CULVERT
2.00	116	FRESHWATER SNAILS
6.00	617	BARRIER 80' ANGLE BEDROCK FALLS 30.5' HIGH
8.00	668	Definite Barrier- 80 degree angle bedrock falls 30.5' high
9.00	674	Juvenile newts
10.00	744	*** unit #008 ****End of Survey****

PROBLEM SITES AND LANDMARKS - GRUB CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
1.00	126	1' of gravel aggraded at mouth
3.00	248	BEDROCK = CONCRETE BOX CULVERT, DEPTH LESS THAN .1, BUT STILL FLOWING
5.00	585	ROAD ENTER CREEK THEN LEAVES CR. 100' UPSTREAM . 2 LOG WEIRS RETAINING GRAVEL. INCREASING GRADE @ START OF UNIT. DRY TRIB LB
6.00	609	RD RUNS ALONG CR. LB . 3-4 0+ SHD
7.00	792	WATER DIVERSION PIPE OVER CR. 12" CULVERT LB NO MAINTENANCE . DRY TRIB RB
18.00	1404	DRY TRIB RB. RB BLOWOUT DOWN TO BEDROCK 25L X 50W X 10D
19.00	1421	12" CULVERT LB NO MAINT.
20.00	1440	DRY TRIB RB
21.00	1451	TADPOLES
22.00	1478	ACTIVE EROSION FROM ROAD LB 50L X 20H
23.00	1529	2 SM. FROGS
24.00	1562	12" CULVERT LB NO MAINT. 2+ SHD
32.00	2087	BLOWOUT RB
34.00	2229	1+ SHD
36.00	2368	DRY TRIB LB. ACTIVE EROSION ALONG RD. LB 30L X 10 H
38.00	3011	PLASTIC & METAL PIECES IN CR. DRY TRIB LB. 2 FORKS. CULVERT IN STREAM 12" CULVERT LB.
39.00	3030	OLD ROCK DAM RB. 2 LG PIECES OF DAM IN CR. BANK EROSION 370' INTO UNIT. RIPARIAN ZONE IS DEPLETED.
40.00	4115	OLD LAKE BED 1ST 600' OF UNIT LG.

		DRY TRIB RB. ARRUNDO DONAX LB 30'. CROSSING AFTER LAKE BED RD. INTO LAKE BED (DRY TRIB)
41.00	4126	DRY TRIB RB
42.00	4292	18" CULVERT LB. UNDERSIZED FOR TRIBS
43.00	4310	LOTS 'O' FROGS CULVERT INSTREAM @ END OF UNIT
44.00	4908	DRY TRIB RB-2 DRY TRIB LB SM. SLIDE LB 35L X 40W X 10D BLANCHARD PROP. BEGINS FLOATING FENCE 370' INTO UNIT
47.00	4991	MACROINVERTEBRATES
48.00	5231	DRY TRIB RB. BANK SLUMP LB 60W X 50L BOULDER CLOG AT END OF UNIT
50.00	5344	DRY TRIB LB. 2 BANK EROSION RB 30L X 30 W X 10 D EVIDENCE OF COWS IN CR.
52.00	5556	DRY TRIB RB COW TRAILS ALONG CR. LB/RB
53.00	5610	MACROINVERTEBRATES
56.00	5698	DRY TRIB LB
57.00	5866	BANK EROSION RB 30L x 40 W x 5D BANK EROSION LB SLIDE 25L X 40W X 5D
60.00	6007	ERODED BANK LB 40L X 20W
63.00	6090	EVID. OF COWS IN CR. DRY TRIB LB
64.00	6184	BANK EROSION R/B 30L X 35W
66.00	6211	17.5' BEDROCK CASCADE AT HEADWATERS FORK. DRY ABOVE CHANNEL WIDTH LESS THAN 3' NO FISH OBSERVED 8/7/97. END OF SURVEY***

PROBLEM SITES AND LANDMARKS - TYRONE GULCH CREEK SURVEY COMMENTS

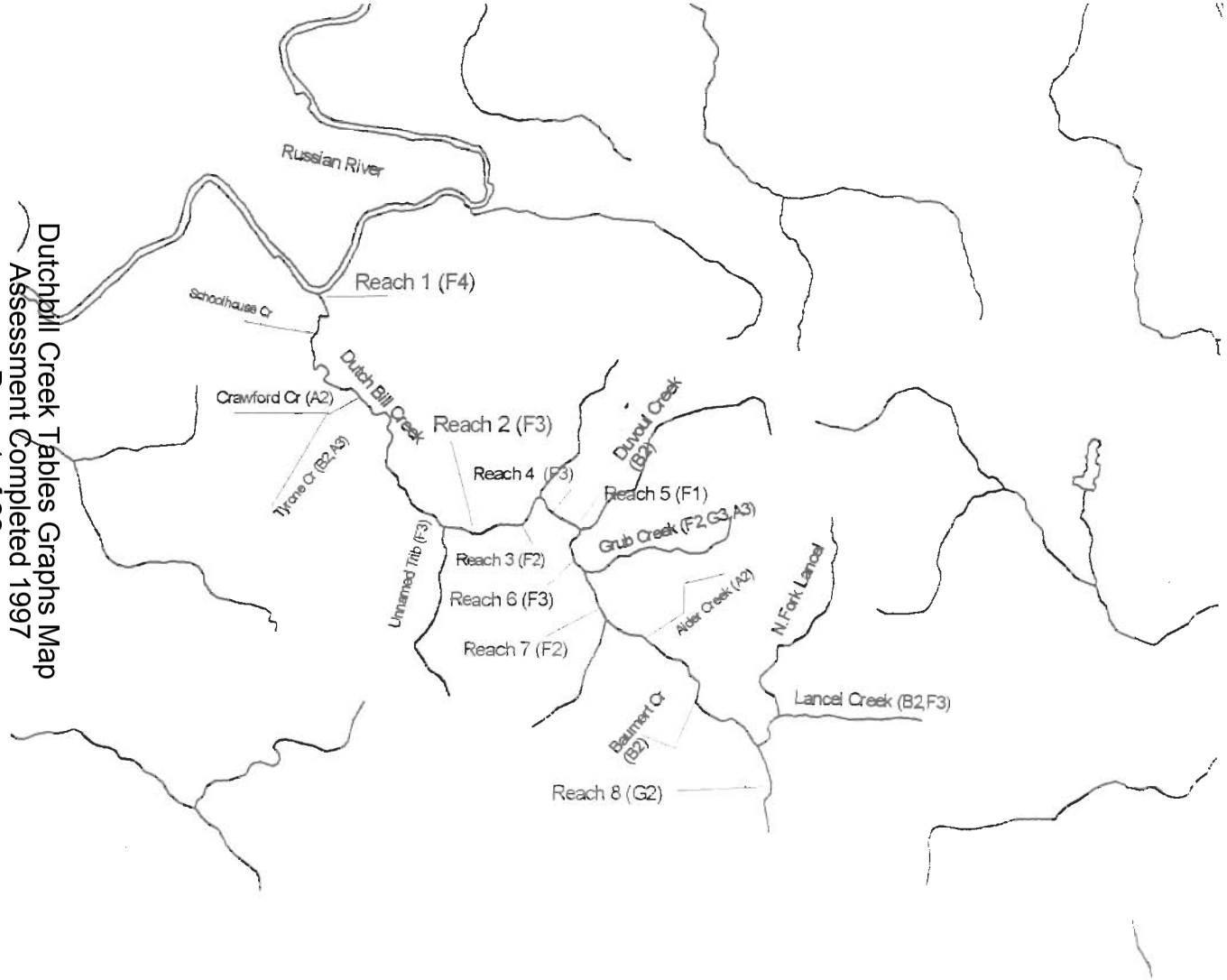
HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
1.00	111	Culvert sheet, Hab unit#004 landowner says not as many prawns as in the past-or steelhead. He thinks the decline occurred when the culvert was placed. Flows under landowner porch; concrete weir; 0plus SHD
3.00	447	0 plus SHD
4.00	477	pump on r/b; 0 plus

8.00	633	confluence with Crawford Gulch tributary
11.00	795	Beginning of new channel
21.00	1331	Sculpin; 0 plus SHD; dry trib at r/b
26.00	1528	2 plus SHD; residents?
28.00	1640	END OF SURVEY**

PROBLEM SITES AND LANDMARKS - UNNAMED CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
3.00	85	0 plus SHD
8.00	256	2 0plus SHD; pumphouse on r/b
11.00	390	Sculpin; 0plus SHD
13.00	472	channel type
14.00	573	Channel Type
19.00	758	0 plus SHD
31.00	1164	0 plus SHD, Sculpin
32.00	1266	Dry trib at R/B
35.00	1521	Dry Trib RB
36.00	1697	Railroad tracks up above; fish - END OF SURVEY***

Dutchbill Creek



Streams

N
W E
S

2 0 2 4 Miles

Inland Fisheries Division
Department of Fish and Game
1997

Dutchbill Creek Tables Graphs Map
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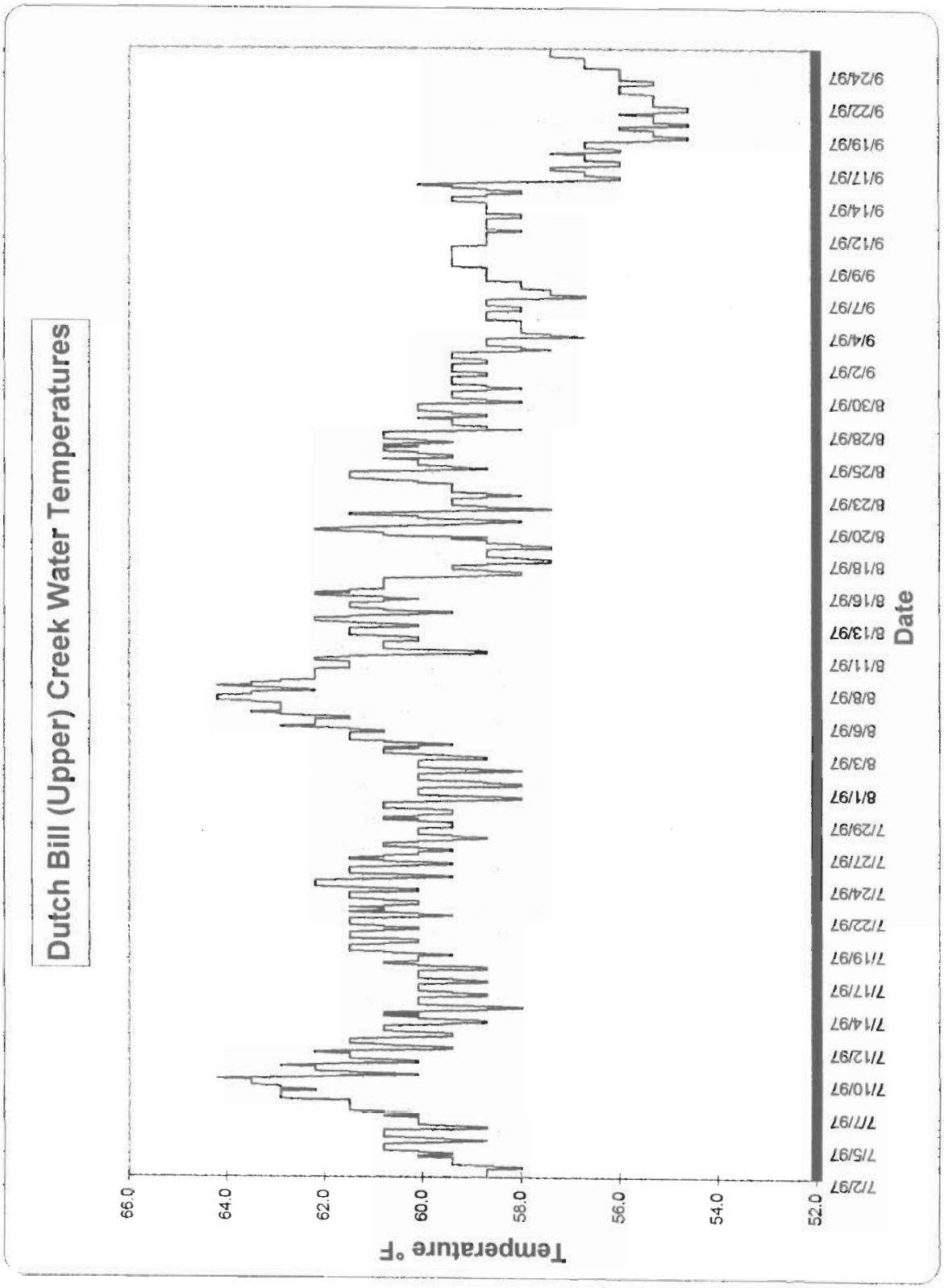
Dutch Bill (Upper) Creek Water Temperatures
Temperature °F
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
Date
7/2/97
7/5/97
7/7/97
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9/2/97
9/4/97
9/7/97
9/9/97
9/12/97
9/14/97
9/17/97
9/19/97
9/22/97
9/24/97

DUTCHBILL CREEK — Drainage: Rusian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 08/12/97 to 09/10/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
109	15	RIFFLE	26	64	6952	18	6.3	0.3	281	30578	97	10564	0	0
112	13	FLATWATER	27	96	10725	27	10.5	0.6	806	90248	475	53155	0	4
164	59	POOL	40	62	10119	26	12.5	1.3	1057	173368	2613	428508	1452	21
30	0	DRY	7	383	11475	29	12.0	2.0	540	16200	1080	32400	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
415	87	39271	310394	524627

DUTCHBILL CREEK

Drainage: Rusian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/12/97 to 09/10/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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 %
99	11	LGR	24	64	6356	16	7	0.3	1.1	324	32100	110	10873	0	0	93
4	1	HGR	1	31	122	0	7	0.6	0.8	196	784	118	470	0	0	93
3	1	CAS	1	123	370	1	3	0.2	0.6	26	79	5	16	0	0	85
3	2	BRS	1	35	104	0	4	0.3	0.5	57	170	16	49	0	0	90
23	3	GLD	6	77	1772	5	14	0.7	1.2	1196	27503	793	18247	0	3	88
52	4	RUN	13	66	3423	9	10	0.5	1.3	536	27896	301	15667	0	3	94
37	6	SRN	9	149	5530	14	8	0.6	1.5	818	30257	424	15695	0	6	89
1	1	TRP	0	66	66	0	10	1.7	3.2	660	660	1122	1122	0	5	100
32	9	MCP	8	53	1705	4	13	1.3	5.5	738	23606	1139	36448	1000	11	94
3	3	CCP	1	59	177	0	17	1.7	5.7	976	2927	1817	5451	1553	13	82
9	4	STP	2	88	793	2	10	1.2	4.2	662	5956	881	7927	711	18	93
4	1	CRP	1	61	244	1	9	0.9	3.2	524	2095	468	1871	558	13	92
2	2	LSL	0	48	96	0	15	1.6	4.5	885	1770	2099	4197	3630	40	88
48	18	LSR	12	54	2610	7	11	1.2	6.2	645	30969	920	44155	984	28	88
14	6	LSBk	3	61	849	2	11	1.6	5.6	695	9733	1233	17266	1045	14	90
40	7	LSBo	10	46	1850	5	11	1.1	4.5	543	21716	747	29893	551	23	94
7	4	PLP	2	43	302	1	21	1.7	5.5	877	6136	2045	14314	1908	33	74
1	1	BPR	0	35	35	0	10	0.9	2.8	333	333	299	299	0	30	95
1	1	BPL	0	25	25	0	9	1.0	2.7	225	225	225	225	0	10	60
2	2	DPL	0	684	1367	3	51	3.8	9.8	33059	66117	*****	260935	66864	15	60
30	0	DRY	7	383	11475	29	12	2.0	3.7	540	16200	1080	32400	0	0	87

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
415	87	39271	307231	517520

DUTCHBILL CREEK

Drainage: Rusian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/12/97 to 09/10/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
45	17	MAIN	27	61	2741	27	12.8	1.3	737	33148	1132	50947	977	12
115	38	SCOUR	70	52	5951	59	11.8	1.2	628	72259	967	111163	912	25
4	4	BACKWATER	2	357	1427	14	30.3	2.4	16669	66675	65365	261459	66864	18

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
164	59	10119	172082	423569

DUTCHBILL CREEK — Drainage: Rusian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 08/12/97 to 09/10/97

Confluence Location: QUAD: — LEGAL DESCRIPTION: — LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
1	TRP	1	0	0	0	0	0	0	1	100	0	0
32	MCP	20	0	0	15	47	12	38	2	6	3	9
3	CCP	2	0	0	1	33	1	33	0	0	1	33
9	STP	5	0	0	4	44	4	44	0	0	1	11
3	CRP	2	0	0	1	33	1	33	1	33	0	0
2	LSL	1	0	0	1	50	0	0	0	0	1	50
48	LSR	29	0	0	19	40	17	35	9	19	3	6
14	LSBk	9	0	0	4	29	6	43	2	14	2	14
40	LSBo	24	0	0	22	55	13	33	4	10	1	3
7	PLP	4	0	0	2	29	1	14	1	14	3	43
1	BPR	1	0	0	0	0	1	100	0	0	0	0
1	BPL	1	0	0	0	0	1	100	0	0	0	0
2	DPL	1	0	0	0	0	0	0	0	0	2	100

TOTAL UNITS 163

DUTCHBILL CREEK

Drainage: Rusian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 08/12/97 to 09/10/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
99	14	LGR	0	0	0	0	0	0	0	100	0
4	1	HGR	0	0	0	0	0	0	0	0	0
3	1	CAS	0	0	0	0	0	0	0	0	0
3	2	BRS	0	0	0	0	0	0	0	0	0
23	3	GLD	0	10	90	0	0	0	0	0	0
52	6	RUN	0	0	0	0	0	0	0	100	0
37	7	SRN	1	0	0	0	0	0	3	66	30
1	1	TRP	0	0	0	0	0	0	0	0	100
32	31	MCP	29	6	1	34	2	0	0	28	0
3	3	CCP	10	14	17	31	3	0	0	24	0
9	8	STP	0	0	0	4	0	0	0	92	4
4	3	CRP	63	8	0	0	3	0	0	26	0
2	2	LSL	14	56	16	5	9	0	0	0	0
48	47	LSR	18	4	4	66	1	2	0	5	0
14	13	LSBk	10	5	0	12	0	0	0	29	44
40	38	LSBo	2	1	4	13	0	0	0	78	1
7	7	PLP	8	8	7	2	0	29	28	12	5
1	1	BPR	0	0	0	80	0	0	0	20	0
1	1	BPL	0	0	0	50	0	50	0	0	0
2	2	DPL	18	0	42	20	0	0	0	20	0
30	0	DRY	0	0	0	0	0	0	0	0	0
415	191	ALL HABITAT TYPES	14	4	15	28	1	2	2	31	3
164	157	POOLS ONLY	15	4	15	29	1	3	2	30	2

DUTCHBILL CREEK

Drainage: Rusian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/12/97 to 09/10/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
99	18	LGR	0	0	11	33	33	22	0
4	1	HGR	0	0	0	0	0	100	0
3	1	CAS	0	0	0	0	0	100	0
3	1	BRS	0	0	0	0	0	0	100
23	6	GLD	0	67	33	0	0	0	0
32	8	RUN	0	25	13	25	13	13	13
27	7	SRN	0	14	14	29	0	29	14
1	1	TRP	0	0	0	0	0	0	100
32	9	MCP	0	56	11	0	11	11	11
3	3	CCP	33	0	67	0	0	0	0
9	4	STP	0	0	0	0	0	50	50
4	1	CRP	100	0	0	0	0	0	0
2	2	LSL	0	50	50	0	0	0	0
38	19	LSR	5	42	26	26	0	0	0
14	6	LSBk	0	0	33	17	17	0	33
20	8	LSBo	0	25	13	25	13	25	0
7	3	PLP	0	67	0	0	0	0	33
1	1	BPR	0	0	100	0	0	0	0
1	1	BPL	100	0	0	0	0	0	0
2	2	DPL	0	50	0	0	50	0	0
30	21	DRY	0	24	76	0	0	0	0

DUTCHBILL 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
90.17	52.10	47.90	78.31	80.91

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	16	11	10.63
Boulder	7	8	5.91
Cobble/Gravel	0	1	0.39
Silt/clay	104	107	83.07

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	4	6	3.94
Deciduous Trees	67	55	48.03
Evergreen Trees	55	66	47.64
No Vegetation	1	0	0.39

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: DUTCHBILL CREEK
SAMPLE DATES: 08/12/97 to 09/10/97
SURVEY LENGTH:
MAIN CHANNEL: 38871 ft. SIDE CHANNEL: 400 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-114)

Channel Type: F4	Mean Canopy Density: 89%
Main Channel Length: 16253 ft.	Evergreen Component: 48%
Side Channel Length: 288 ft.	Deciduous Component: 52%
Riffle/Flatwater Mean Width: 5.6 ft.	Pools by Stream Length: 19%
Pool Mean Depth: 1.3 ft.	Pools >=2 ft. Deep: 68%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 30%
Water: 59-64°F Air: 59-71°F	Mean Pool Shelter Rtn: 25
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Root masses
Bank Vegetative Cover: 86%	Occurrence of LOD: 38%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 11345 ft.

Embeddness Value: 1. 27% 2. 37% 3. 13% 4. 23%

STREAM REACH 2 (Units 115-134)

Channel Type: F3	Mean Canopy Density: 87%
Main Channel Length: 1320 ft.	Evergreen Component: 35%
Side Channel Length: 0 ft.	Deciduous Component: 65%
Riffle/Flatwater Mean Width: 13.0 ft.	Pools by Stream Length: 41%
Pool Mean Depth: 1.3 ft.	Pools >=2 ft. Deep: 67%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 11%
Water: 60-60°F Air: 59-62°F	Mean Pool Shelter Rtn: 26
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Root masses
Bank Vegetative Cover: 82%	Occurrence of LOD: 53%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 78% 3. 22% 4. 0%

STREAM REACH 3 (Units 135-154)

Channel Type: F2	Mean Canopy Density: 82%
Main Channel Length: 2825 ft.	Evergreen Component: 52%
Side Channel Length: 0 ft.	Deciduous Component: 48%
Riffle/Flatwater Mean Width: 13.4 ft.	Pools by Stream Length: 21%
Pool Mean Depth: 2.3 ft.	Pools >=2 ft. Deep: 80%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 60%
Water: 60-62°F Air: 61-72°F	Mean Pool Shelter Rtn: 35
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 66%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 60% 3. 0% 4. 40%

STREAM REACH 4 (Units 155-185)

Channel Type: F3	Mean Canopy Density: 90%
Main Channel Length: 1637 ft.	Evergreen Component: 39%
Side Channel Length: 0 ft.	Deciduous Component: 61%
Riffle/Flatwater Mean Width: 11.3 ft.	Pools by Stream Length: 21%
Pool Mean Depth: 1.1 ft.	Pools >=2 ft. Deep: 22%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 11%
Water: 58-62°F Air: 58-72°F	Mean Pool Shelter Rtn: 23
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Root masses
Bank Vegetative Cover: 69%	Occurrence of LOD: 48%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 22% 2. 78% 3. 0% 4. 0%	

STREAM REACH 5 (Units 186-194)

Channel Type: F1	Mean Canopy Density: 98%
Main Channel Length: 631 ft.	Evergreen Component: 31%
Side Channel Length: 0 ft.	Deciduous Component: 69%
Riffle/Flatwater Mean Width: 9.3 ft.	Pools by Stream Length: 25%
Pool Mean Depth: 1.8 ft.	Pools >=2 ft. Deep: 67%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 33%
Water: 58-66°F Air: 58-73°F	Mean Pool Shelter Rtn: 8
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Bedrock Ledges
Bank Vegetative Cover: 66%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 0% 2. 33% 3. 0% 4. 67%	

STREAM REACH 6 (Units 195-246)

Channel Type: F3	Mean Canopy Density: 89%
Main Channel Length: 4694 ft.	Evergreen Component: 45%
Side Channel Length: 0 ft.	Deciduous Component: 55%
Riffle/Flatwater Mean Width: 8.7 ft.	Pools by Stream Length: 41%
Pool Mean Depth: 1.5 ft.	Pools >=2 ft. Deep: 72%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 33%
Water: 60-66°F Air: 66-73°F	Mean Pool Shelter Rtn: 17
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 79%	Occurrence of LOD: 50%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 28% 2. 28% 3. 0% 4. 44%	

STREAM REACH 7 (Units 247-405)

Channel Type: F2
Main Channel Length: 10983 ft.
Side Channel Length: 112 ft.
Riffle/Flatwater Mean Width: 6.1 ft.
Pool Mean Depth: 1.1 ft.
Base Flow: 0.0 cfs
Water: 57-62°F Air: 58-76°F
Dom. Bank Veg.: Deciduous Trees
Bank Vegetative Cover: 76%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 22% 3. 3% 4. 72%

Mean Canopy Density: 92%
Evergreen Component: 64%
Deciduous Component: 36%
Pools by Stream Length: 31%
Pools >=2 ft. Deep: 45%
Pools >=3 ft. Deep: 13%
Mean Pool Shelter Rtn: 18
Dom. Shelter: Boulders
Occurrence of LOD: 24%
Dry Channel: 130 ft.

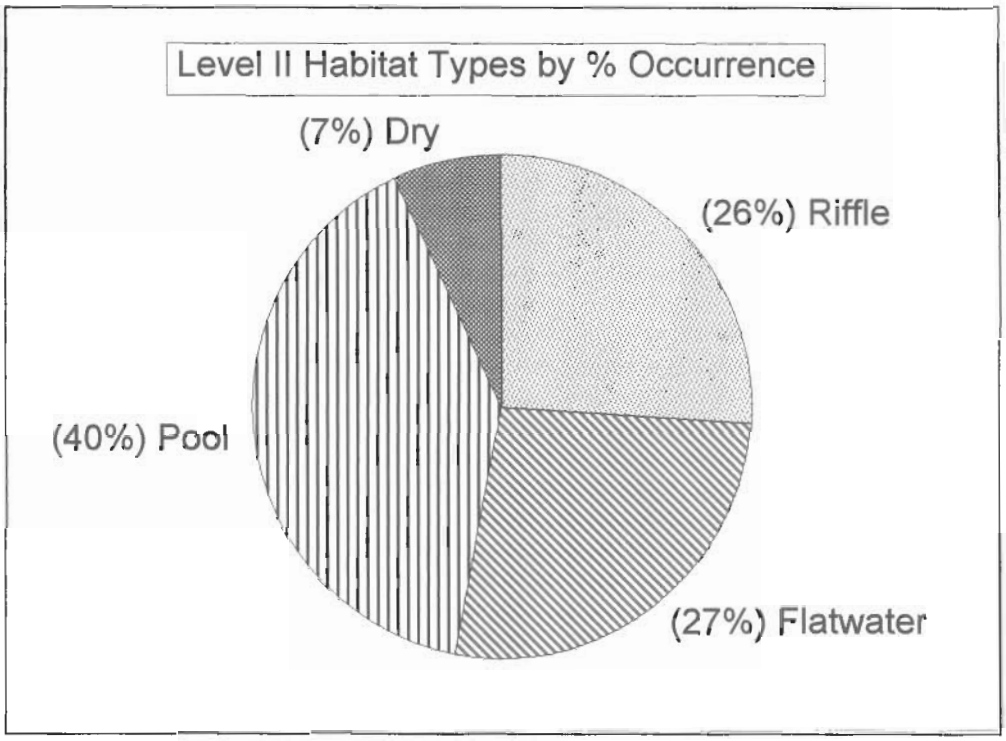
STREAM REACH 8 (Units 406-412)

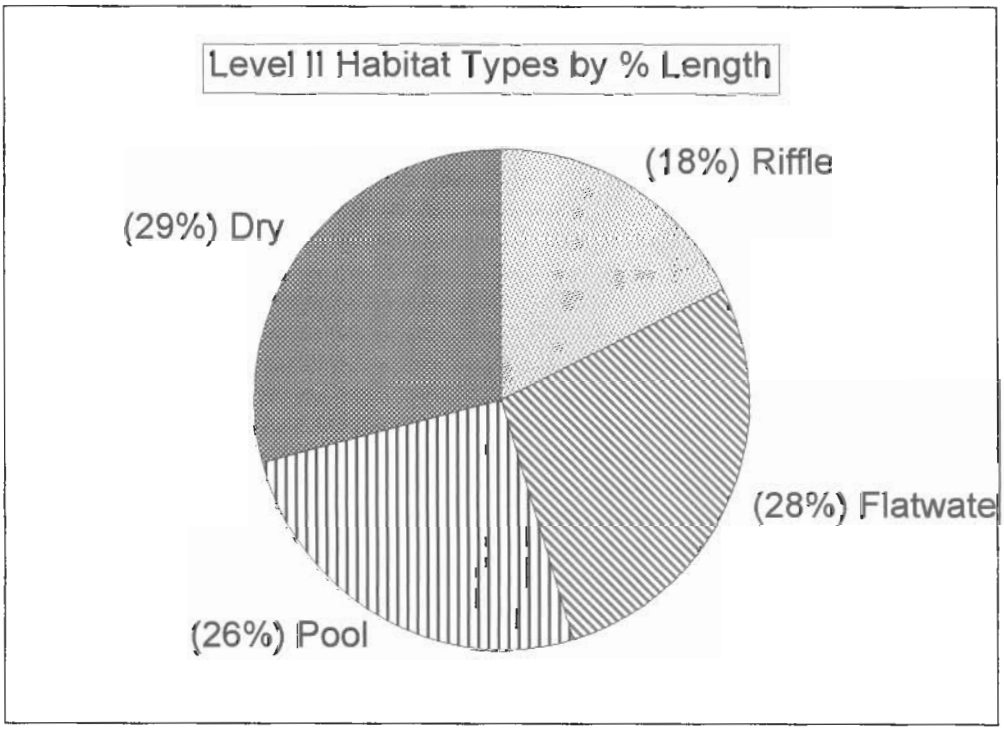
Channel Type: G2
Main Channel Length: 528 ft.
Side Channel Length: 0 ft.
Riffle/Flatwater Mean Width: 3.5 ft.
Pool Mean Depth: 1.3 ft.
Base Flow: 0.0 cfs
Water: 60-60°F Air: 686-686°F
Dom. Bank Veg.: Deciduous Trees
Bank Vegetative Cover: 87%
Dom. Bank Substrate: Silt/Clay/Sand
Embeddness Value: 1. 0% 2. 100% 3. 0% 4. 0%

Mean Canopy Density: 98%
Evergreen Component: 88%
Deciduous Component: 12%
Pools by Stream Length: 21%
Pools >=2 ft. Deep: 50%
Pools >=3 ft. Deep: 50%
Mean Pool Shelter Rtn: 13
Dom. Shelter: Bedrock Ledges
Occurrence of LOD: 0%
Dry Channel: 0 ft.

Dutch Bill Creek

Level II Habitat Types

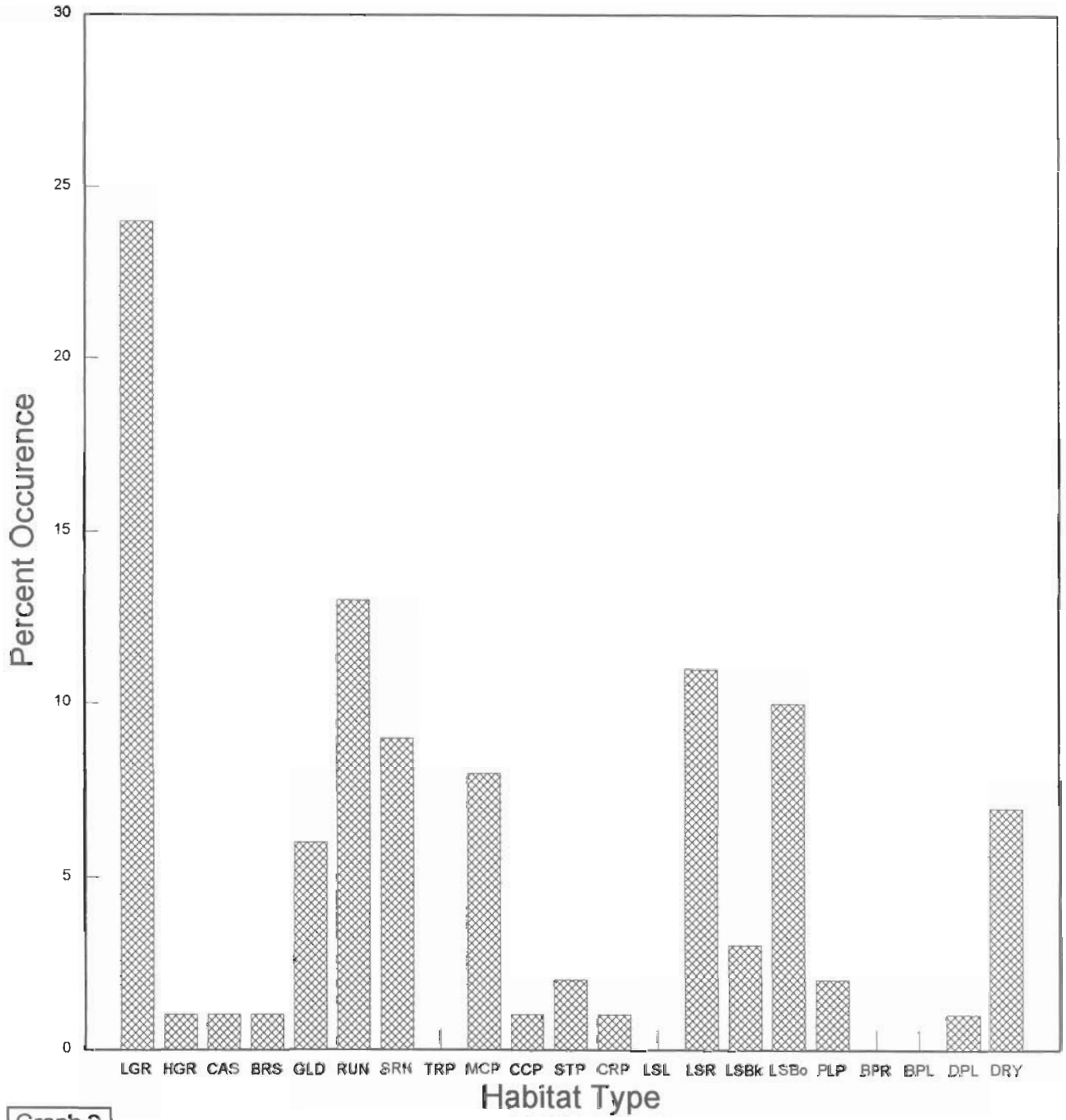




Graph 1

Dutch Bill Creek

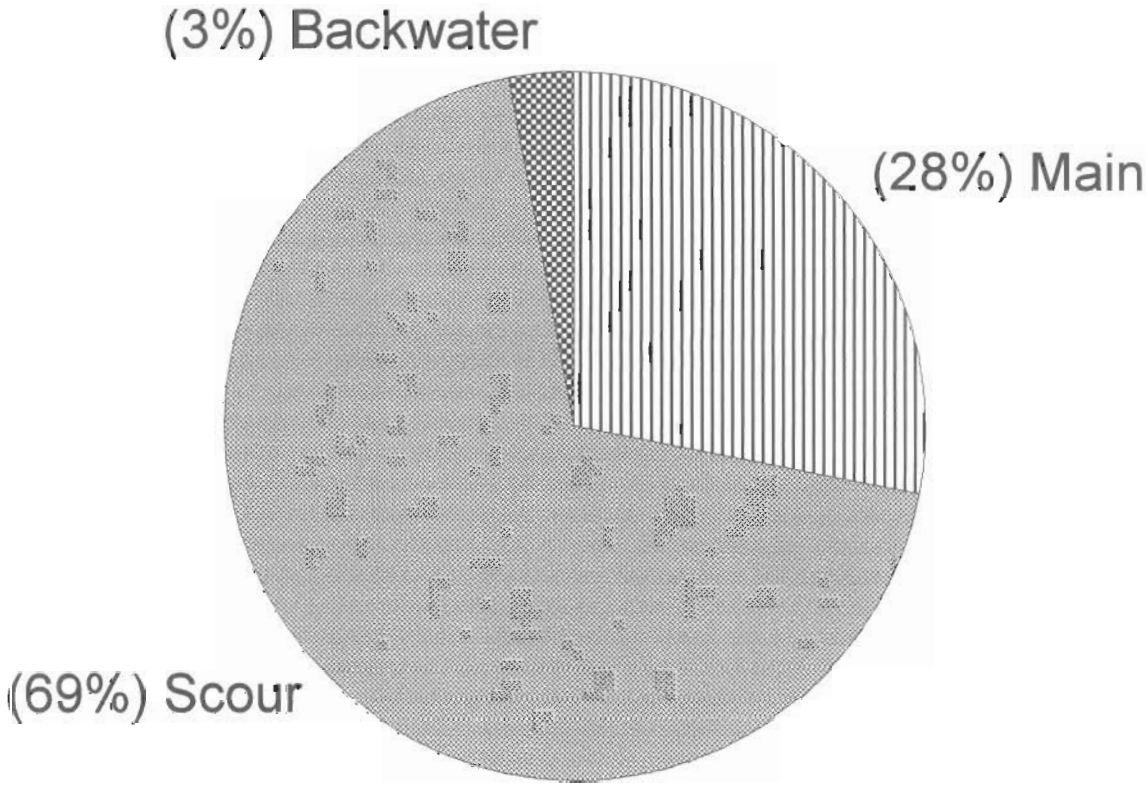
Level IV Habitat Types by % Occurrence



Graph 2

Dutch Bill Creek

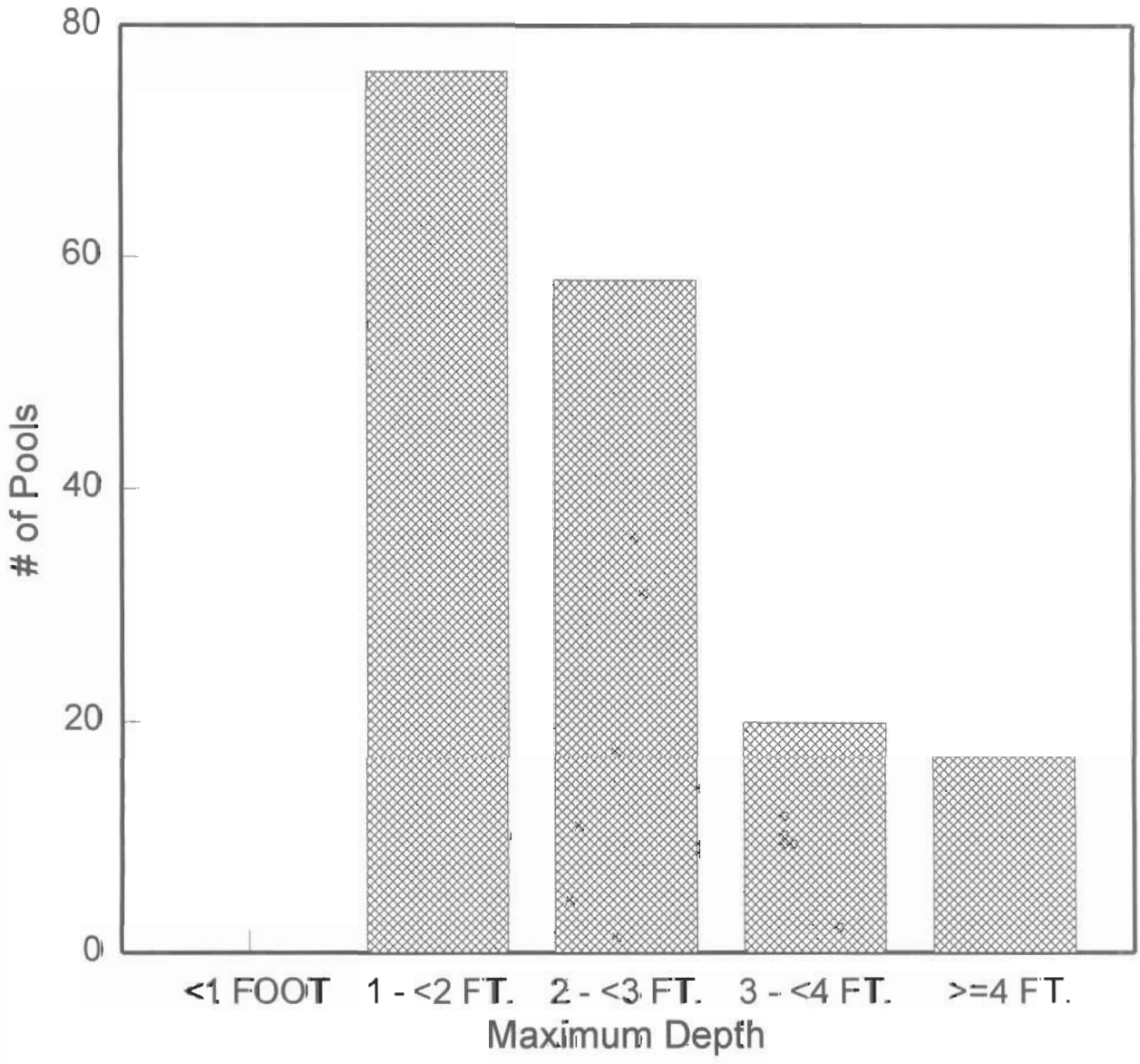
Pool Habitat Types by % Occurrence



Graph 3

Dutch Bill Creek

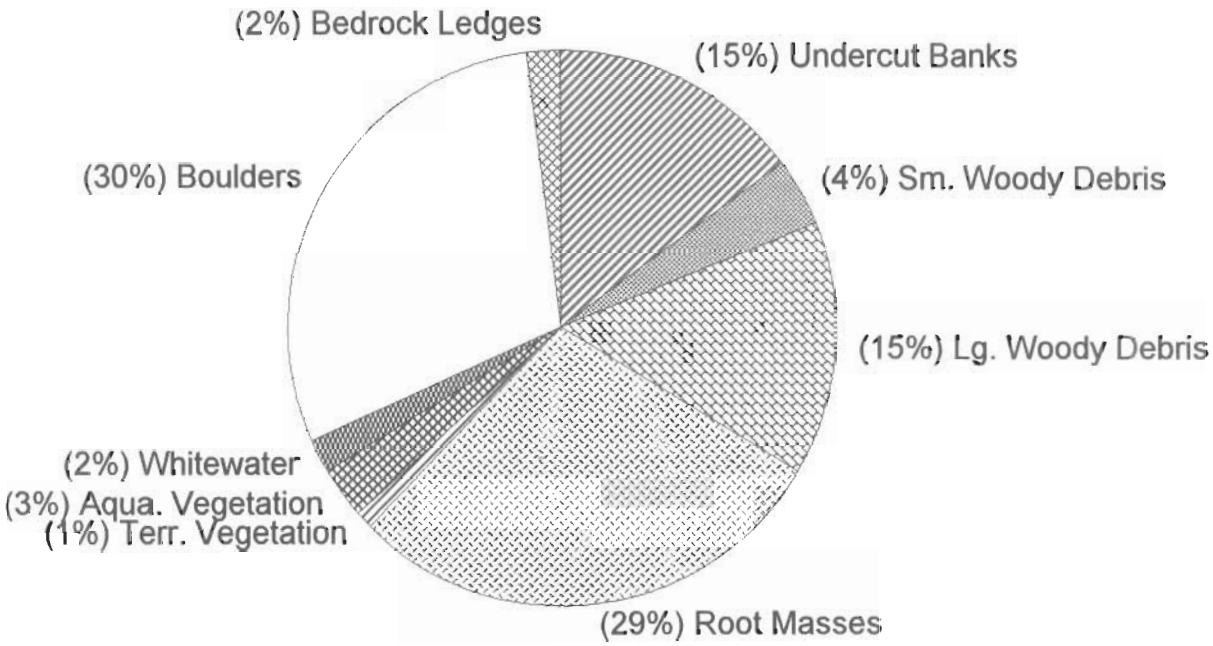
Maximum Depth in Pools



Graph 4

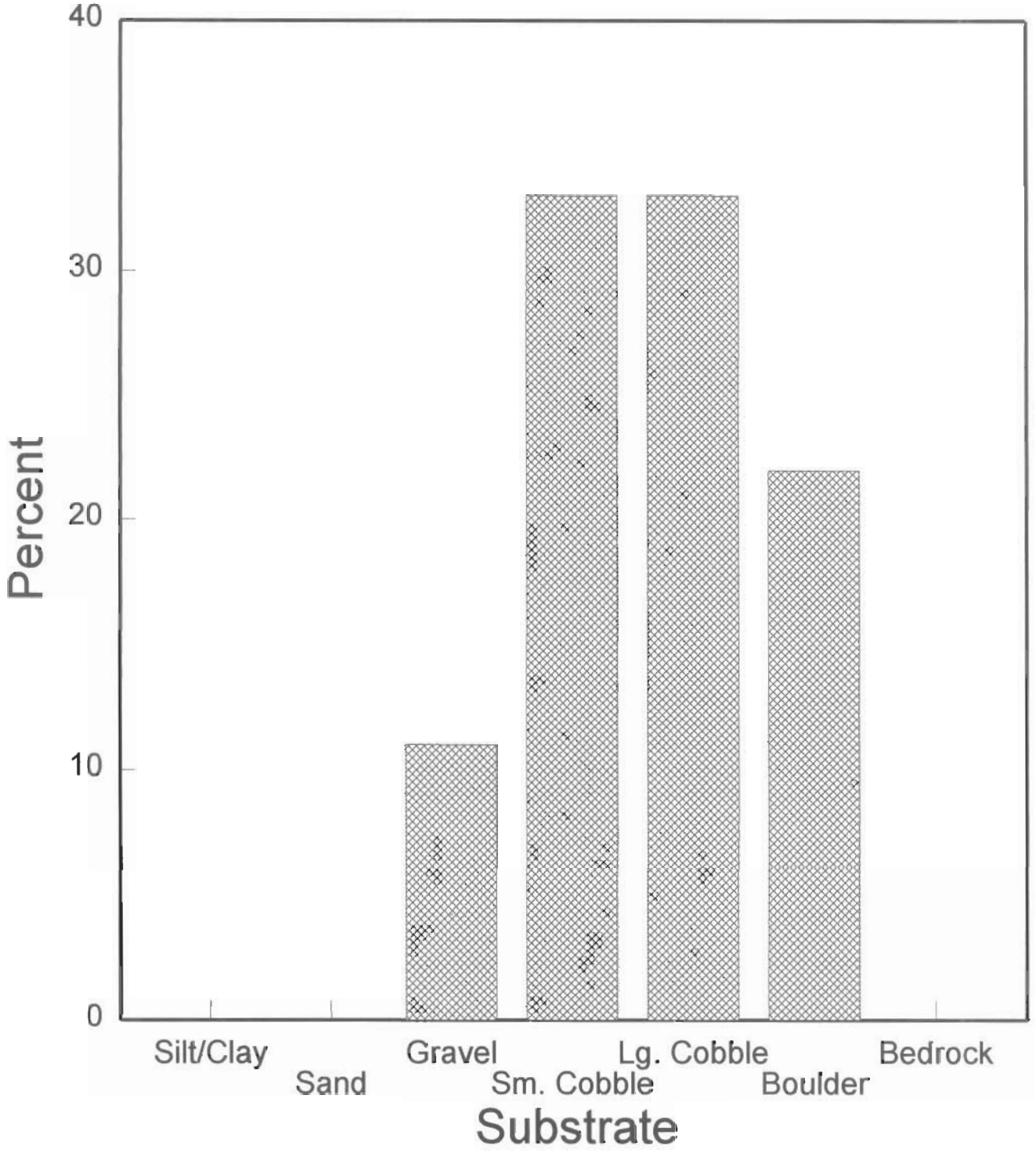
Dutchbill Creek

Pool Shelter Types by % Area



Dutch Bill Creek

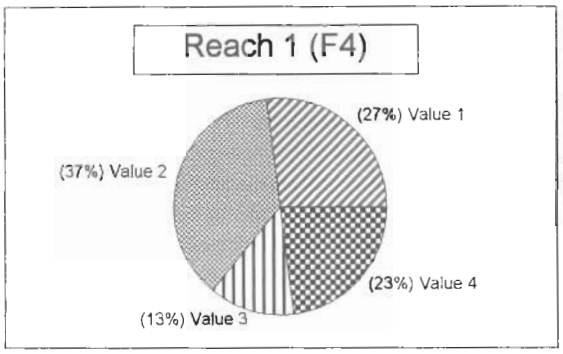
Substrate Composition in Low Gradient Riffles

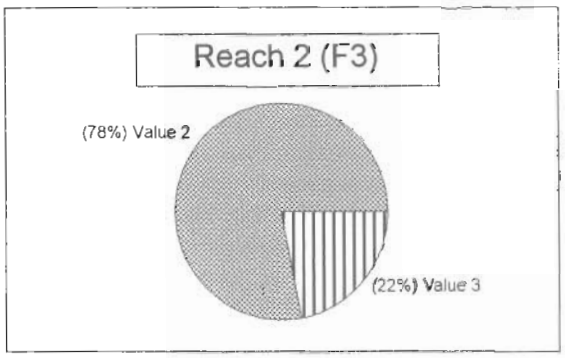


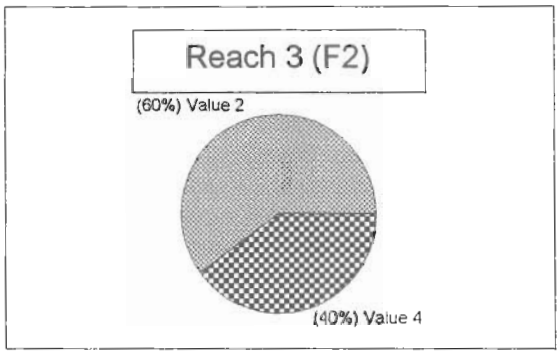
Graph 6

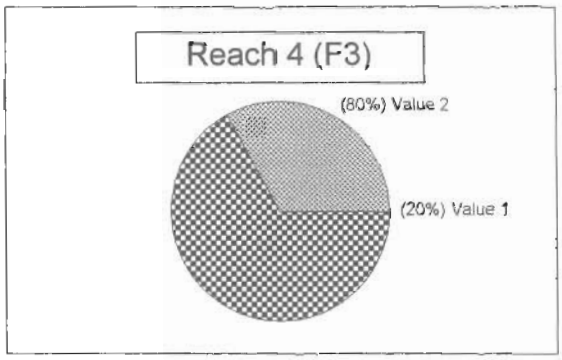
DUTCHBILL CREEK

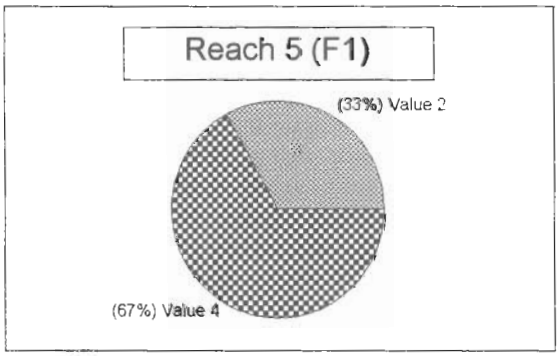
Percent Cobble Embeddedness by Reach

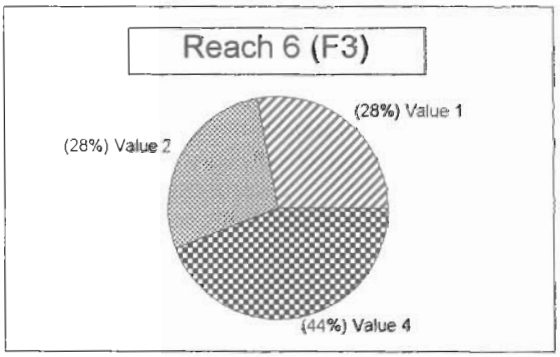


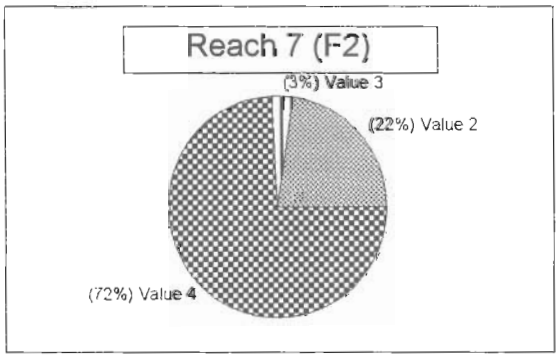


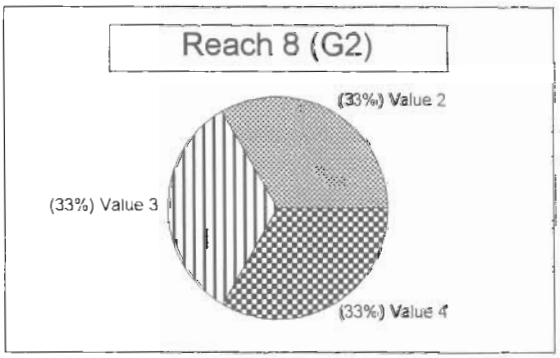










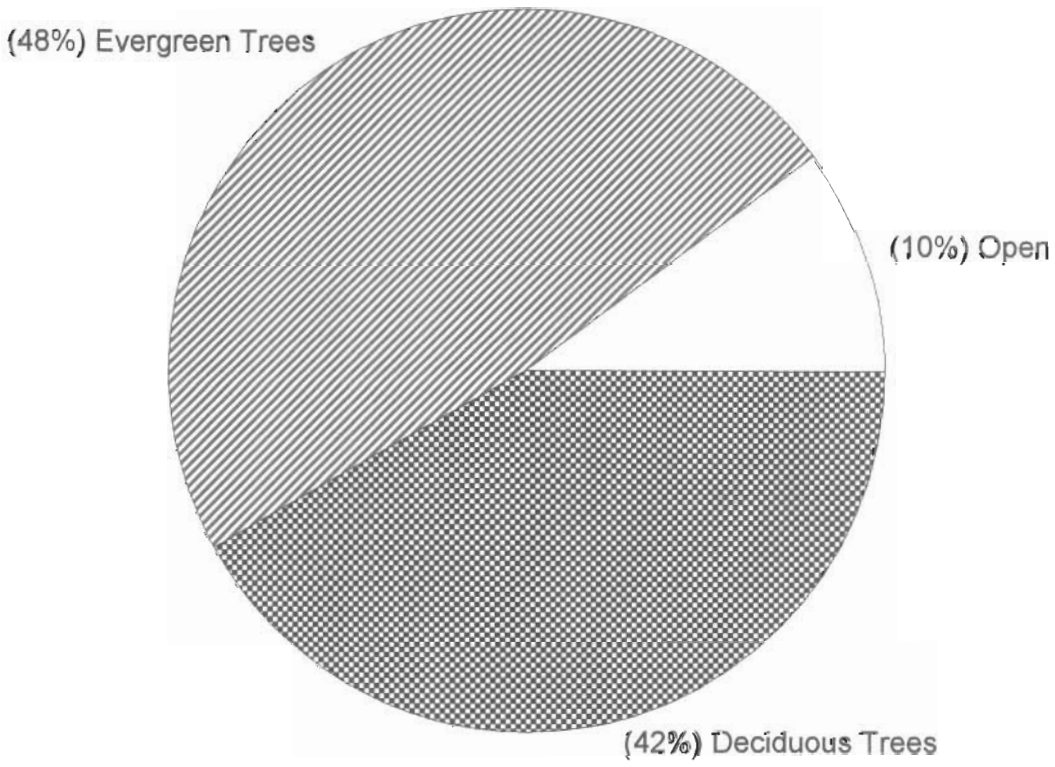


Value **1** = <25% Value **2** = 25-50% Value 3 = **5**1-75% Value 4 = >76%

Graph 7

Dutch Bill Creek

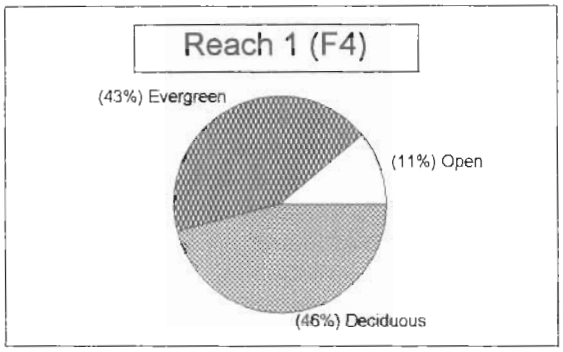
Mean Percent Canopy

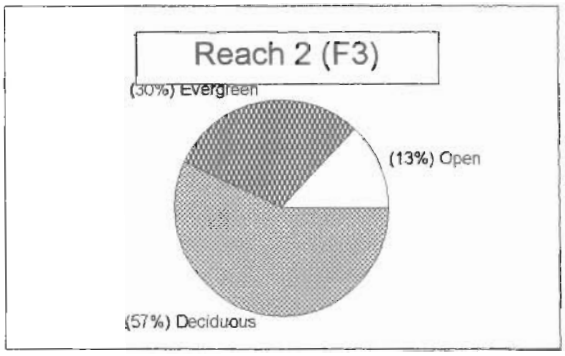


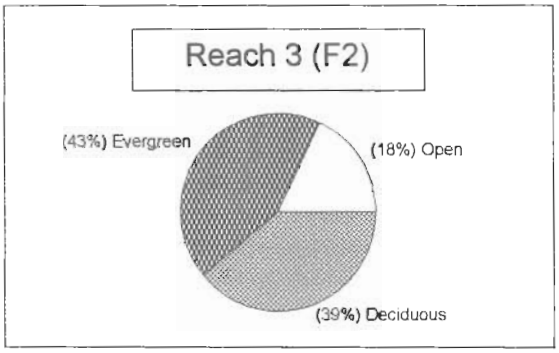
Graph 8

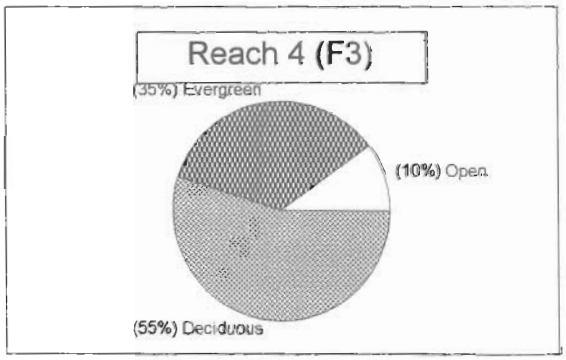
DUTCHBILL CREEK

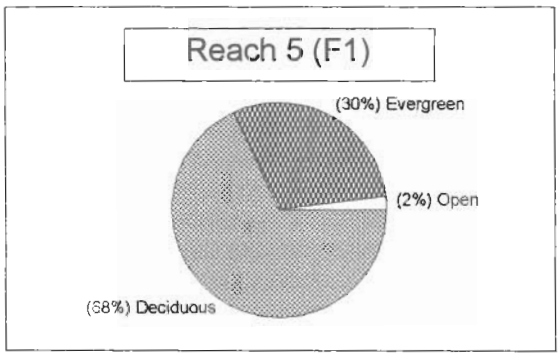
Percent Canopy By Reach

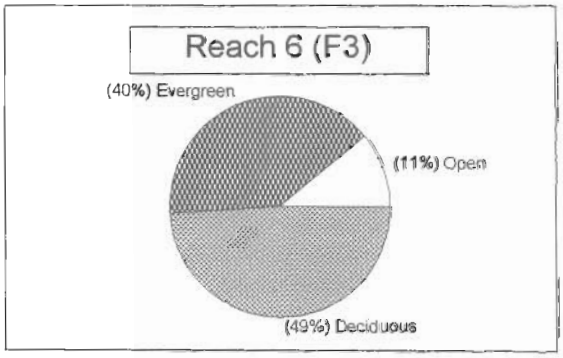


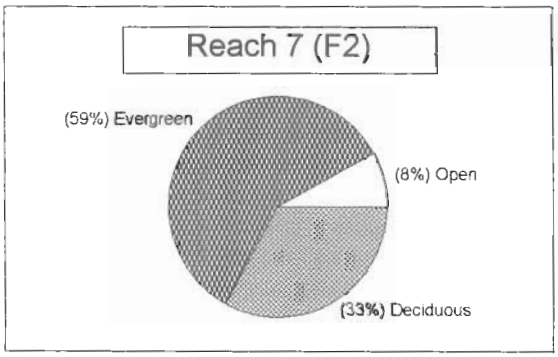


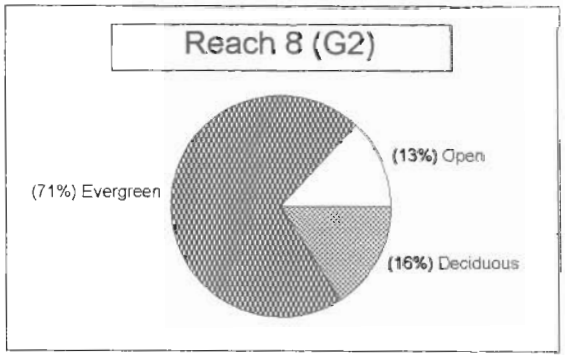








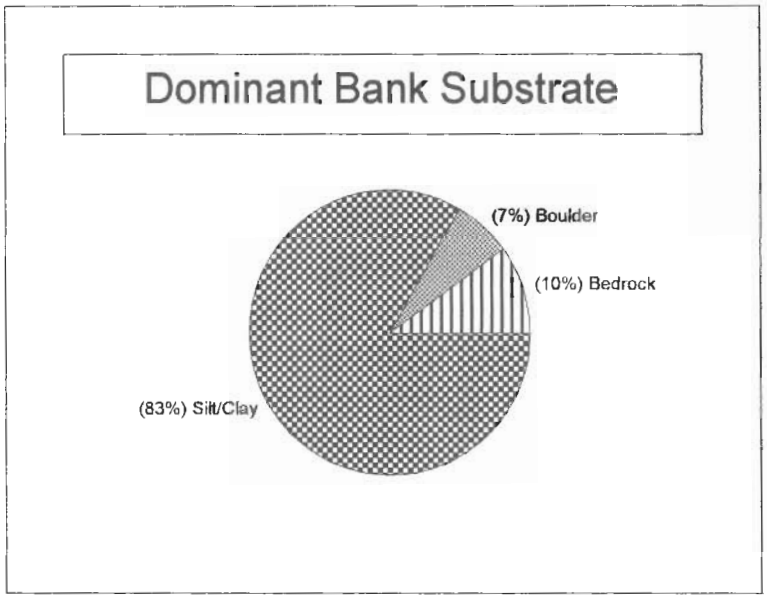


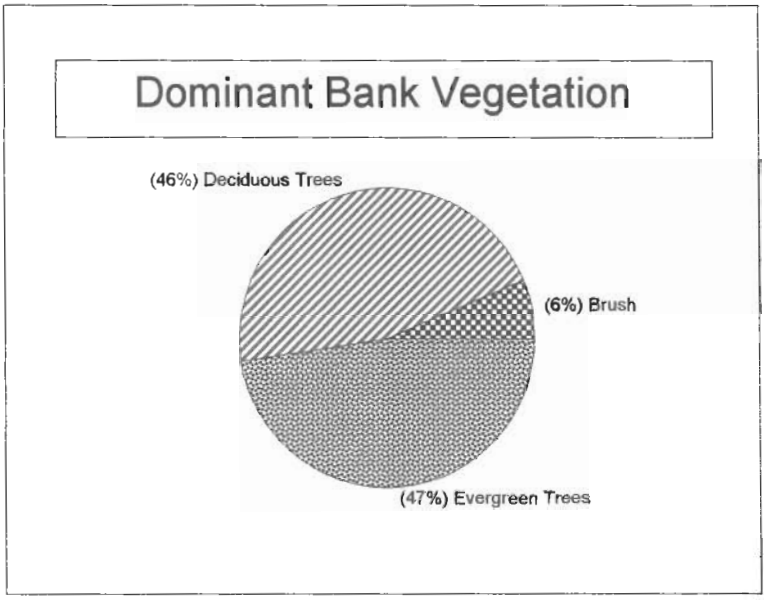


Graph 9

Dutch Bill Creek

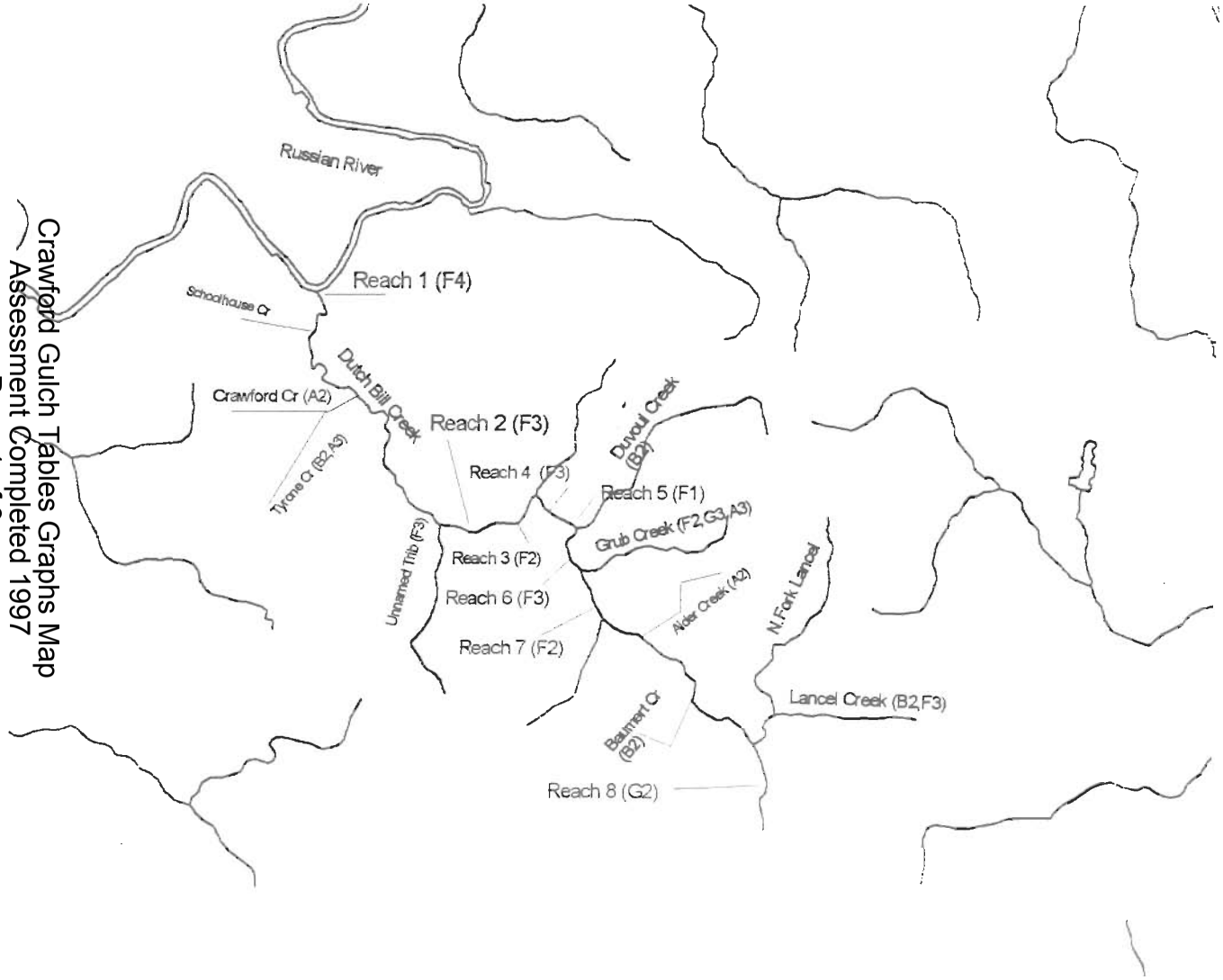
Percent Bank Composition





Graph 10

Dutchbill Creek



Streams

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Crawford Gulch Tables Graphs Map
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Crawford Gulch — Drainage: Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 09/11/97

Confluence Location: QUAD: — LEGAL DESCRIPTION: — LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
5	3	RIFFLE	63	32	161	52	6.0	0.4	110	549	57	287	0	2
2	1	FLATWATER	25	65	130	42	5.0	0.3	224	448	67	134	0	20
1	1	POOL	13	16	16	5	8.0	1.7	128	128	218	218	205	60

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
8	5	307	1125	639

Crawford Gulch | Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS | Survey Dates: 09/11/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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 %
3	1	LGR	38	35	105	34	6	0.1	0.3	50	151	5	15	0	0	97
2	2	CAS	25	28	56	18	6	0.6	2.0	140	279	84	167	0	3	80
2	1	SRN	25	65	130	42	5	0.3	0.8	224	448	67	134	0	20	100
1	1	PLP	13	16	16	5	8	1.7	2.9	128	128	218	218	205	60	100

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
8	5	307	1006	534

Crawford Gulch

Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 09/11/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
1	1	SCOUR	100	16	16	100	8.0	1.7	128	128	218	218	205	60

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
1	1	16	128	218

Crawford Gulch | Drainage: Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES | Survey Dates: 09/11/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
1	PLP	100	0	0	0	0	1	100	0	0	0	0

TOTAL UNITS
1

Crawford Gulch — Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type — Survey Dates: 09/11/97

Confluence Location: QUAD: — LEGAL DESCRIPTION: — LATITUDE: 0°0'0" — LONGITUDE: 0°0'0"

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
3	1	LGR	0	0	0	0	0	0	0	0	0
2	2	CAS	0	0	0	0	0	0	0	100	0
2	1	SRN	40	0	20	0	0	0	0	40	0
1	1	PLP	40	0	20	0	0	0	0	40	0
8	5	[illegible] HABITAT TYPES	35	0	17	0	0	0	0	48	0
1	1	POOLS ONLY	40	0	20	0	0	0	0	40	0

Crawford Gulch

Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 09/11/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
3	1	LGR	0	0	0	0	100	0	0
2	2	CAS	0	0	0	0	0	0	100
1	1	SRN	100	0	0	0	0	0	0
1	1	PLP	100	0	0	0	0	0	0

Crawford Gulch

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
92.86	76.43	23.57	76.00	66.00

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	0	0	0
Boulder	0	0	0
Cobble/Gravel	0	0	0
Silt/clay	5	5	100

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	0	0	0
Deciduous Trees	1	0	10
Evergreen Trees	4	4	80
No Vegetation	0	1	10

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Crawford Gulch
SAMPLE DATES:
SURVEY LENGTH:
MAIN CHANNEL: 307 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

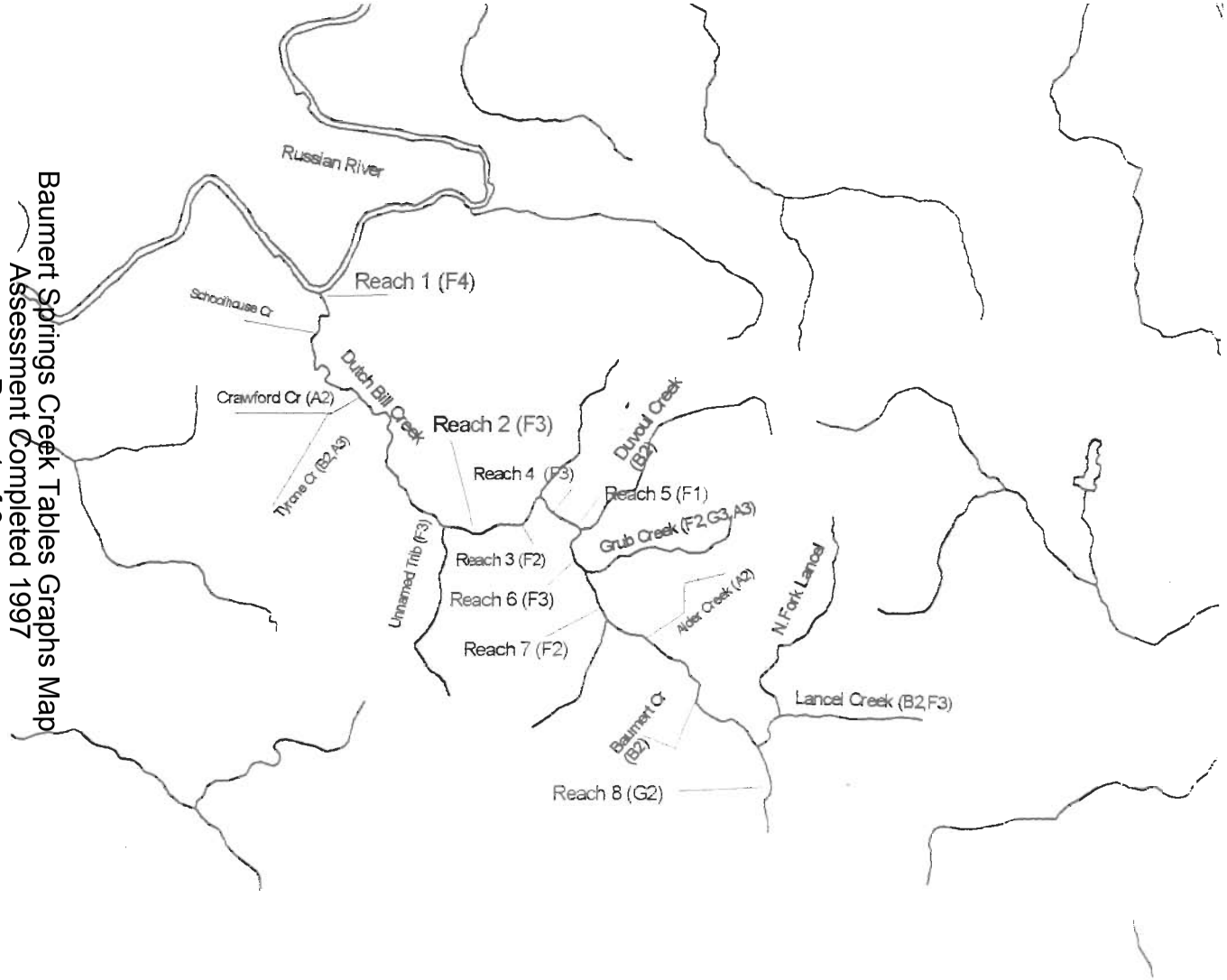
SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-8)

Channel Type: A2	Mean Canopy Density: 93%
Main Channel Length: 307 ft.	Evergreen Component: 76%
Side Channel Length: 0 ft.	Deciduous Component: 24%
Riffle/Flatwater Mean Width: 5.8 ft.	Pools by Stream Length: 5%
Pool Mean Depth: 1.7 ft.	Pools >=2 ft. Deep: 100%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 59-59°F Air: 74-74°F	Mean Pool Shelter Rtn: 60
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 71%	Occurrence of LOD: 20%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

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

Dutchbill Creek



Streams

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Baumert Springs Creek Tables Graphs Map
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Baumert Springs Drainage: Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES Survey Dates: 09/30/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
14	3	RIFFLE	47	44	621	61	4.7	0.2	142	1990	35	493	0	3
2	2	FLATWATER	7	33	66	6	4.8	0.3	135	269	41	82	0	5
12	5	POOL	40	19	234	23	6.1	0.8	119	1425	98	1177	88	10
2	0	DRY	7	51	102	10	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.)
30	10	1023	3684	1752

Baurmert Springs — Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 09/30/97

Confluence Location: QUAD: — LEGAL DESCRIPTION: — LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	TOTAL LENGTH	MEAN WIDTH	MEAN DEPTH	MAXIMUM DEPTH	MEAN AREA	TOTAL AREA EST.	MEAN VOLUME	TOTAL VOLUME EST.	MEAN RESIDUAL POOL VOL	MEAN SHELTER RATING	MEAN CANOPY
#			%	ft.	ft.	%	ft.	ft.	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		%
3	0	LGR	10	35	105	10	0	0.0	0.0	0	0	0	0	0	0	85
5	2	HGR	17	41	206	20	5	0.2	0.5	111	554	22	111	0	0	98
6	1	CAS	20	52	310	30	5	0.3	2.2	205	1229	61	368	0	10	92
1	1	RUN	3	37	37	4	5	0.4	0.8	139	139	56	56	0	5	100
1	1	SRN	3	29	29	3	5	0.2	0.4	131	131	26	26	0	5	100
2	1	MCP	7	17	34	3	6	0.8	1.9	98	196	78	157	62	13	100
2	1	STP	7	39	78	8	7	0.8	1.8	239	477	186	372	133	15	95
1	0	LSBk	3	16	16	2	5	0.7	1.5	80	80	56	56	40	0	0
3	1	LSBo	10	18	54	5	7	0.7	1.7	121	362	87	260	66	15	90
4	2	PLP	13	13	52	5	6	0.9	3.2	78	311	83	333	112	6	94
2	0	DRY	7	51	102	10	0	0.0	0.0	0	0	0	0	0	0	95

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
30	10	1023	3477	1738

Baurmert Springs | Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES | Survey Dates: 09/30/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
4	2	MAIN	33	28	112	48	6.5	0.8	168	673	132	528	98	14
8	3	SCOUR	67	15	122	52	5.9	0.8	94	753	81	649	79	9

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
12	5	234	1425	1177

Baurmert Springs | Drainage: Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES | Survey Dates: 09/30/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
2	MCP	17	0	0	2	100	0	0	0	0	0	0
2	STP	17	0	0	2	100	0	0	0	0	0	0
1	LSBk	8	0	0	1	100	0	0	0	0	0	0
3	LSBo	25	0	0	3	100	0	0	0	0	0	0
4	PLP	33	0	0	3	75	0	0	1	25	0	0

TOTAL UNITS
12

Baumert Springs | Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type | Survey Dates: 09/30/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" | LONGITUDE: 0°0'0"

	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
	3	0	LGR	0	0	0	0	0	0	0	0	0
	5	2	HGR	0	0	0	0	0	0	0	0	0
	6	1	CAS	0	0	0	0	0	0	0	100	0
	1	1	RUN	100	0	0	0	0	0	0	0	0
	1	1	SRN	100	0	0	0	0	0	0	0	0
	2	2	MCP	22	22	7	0	0	0	0	48	0
	2	2	STP	6	0	25	6	0	0	0	62	0
	1	1	LSBk	0	0	0	0	0	0	0	0	0
	3	3	LSBo	23	29	0	0	0	0	0	49	0
	4	4	PLP	20	0	0	0	0	0	0	60	20
	2	0	DRY	0	0	0	0	0	0	0	0	0
TOTAL HABITAT TYPES	30	17		24	10	8	2	0	0	0	54	2
POOLS ONLY	12	12		17	13	10	2	0	0	0	55	3

Baumert Springs | Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE | Survey Dates: 09/30/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
3	0	LGR	0	0	0	0	0	0	0
5	2	HGR	0	0	0	0	0	100	0
6	1	CAS	0	0	0	0	0	100	0
1	1	RUN	0	0	100	0	0	0	0
1	1	SRN	0	0	100	0	0	0	0
2	1	MCP	0	100	0	0	0	0	0
2	1	STP	0	0	0	0	0	100	0
0	0	LSBk	0	0	0	0	0	0	0
1	1	LSBo	0	100	0	0	0	0	0
4	2	PLP	0	50	50	0	0	0	0
1	1	DRY	0	0	0	100	0	0	0

Baurmert Springs

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
94.44	67.22	32.78	67.27	83.64

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	3	2	22.73
Boulder	0	1	4.55
Cobble/Gravel	0	0	0
Silt/clay	8	8	72.73

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	1	0	4.55
Deciduous Trees	2	2	18.18
Evergreen Trees	7	9	72.73
No Vegetation	1	0	4.55

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Baurmert Springs
SAMPLE DATES:
SURVEY LENGTH:
MAIN CHANNEL: 1023 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

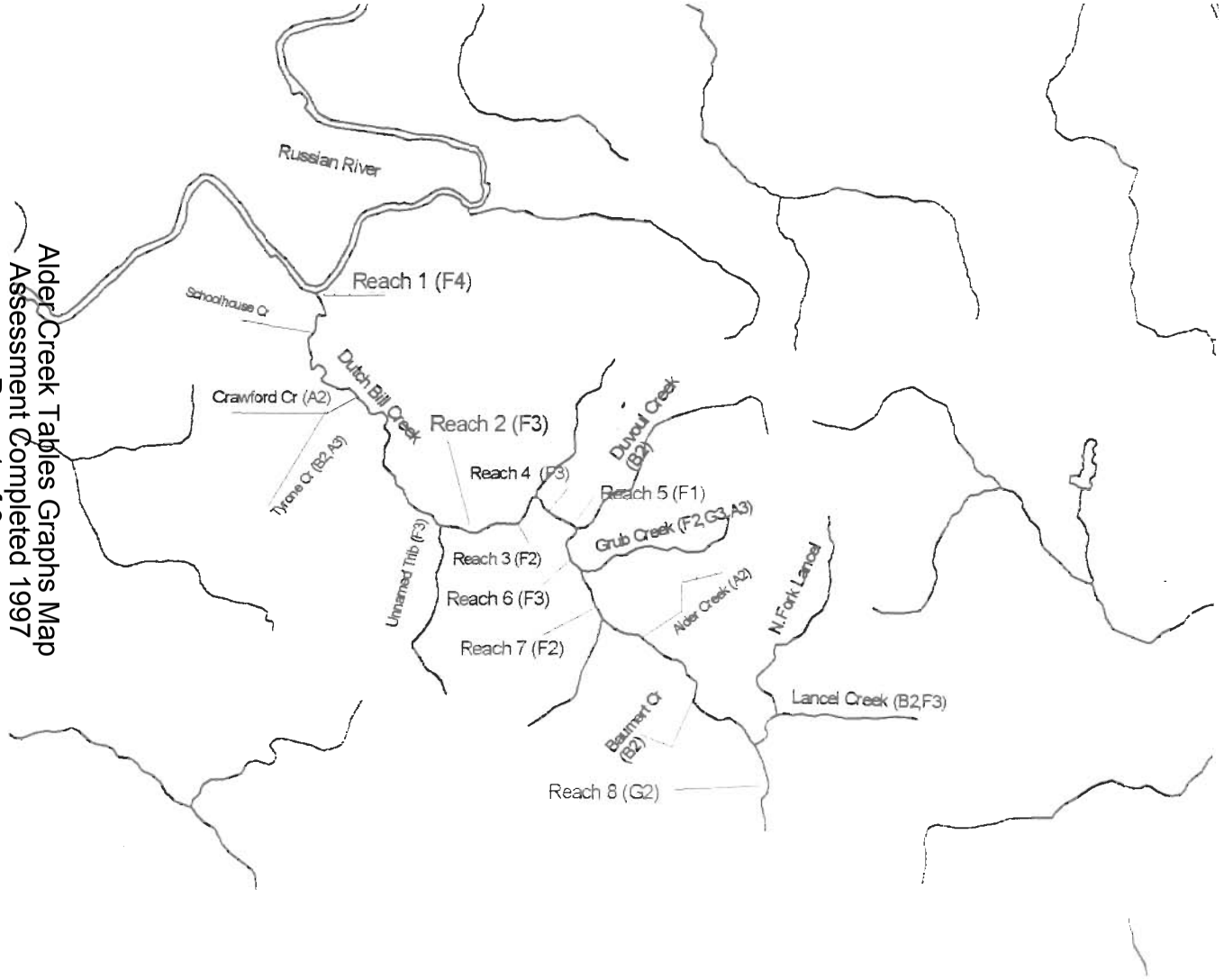
SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-30)

Channel Type: B2	Mean Canopy Density: 94%
Main Channel Length: 1023 ft.	Evergreen Component: 67%
Side Channel Length: 0 ft.	Deciduous Component: 33%
Riffle/Flatwater Mean Width: 4.7 ft.	Pools by Stream Length: 23%
Pool Mean Depth: 0.8 ft.	Pools >=2 ft. Deep: 8%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 8%
Water: 56-57°F Air: 58-66°F	Mean Pool Shelter Rtn: 10
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 75%	Occurrence of LOD: 25%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 102 ft.

Embeddness Value: 1. 25% 2. 17% 3. 0% 4. 58%

Dutchbill Creek



Alder Creek Tables Graphs Map
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Streams

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Inland Fisheries Division
Department of Fish and Game
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ALDER GREEK

Drainage: Russian River

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

Survey Dates: 08/06/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
2	2	FLATWATER	25	41	83	8	3.3	0.9	71	143	64	127	0	8
2	2	POOL	25	15	30	3	11.3	0.9	92	185	85	169	0	16
4	0	DRY	50	219	876	89	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.)
8	4	989	327	296

ALDER CREEK

Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/06/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
1	1	RUN	13	32	32	3	4	0.3	1.4	66	66	20	20	0	5	95
1	1	SRN	13	51	51	5	3	1.4	1.5	77	77	107	107	0	10	95
1	1	STP	13	22	22	2	5	0.8	2.0	77	77	62	62	0	30	95
1	1	PLP	13	9	9	1	18	1.0	2.7	107	107	107	107	0	2	95
4	0	DRY	50	219	876	89	0	0.0	0.0	0	0	0	0	0	0	95

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
8	4	989	327	296

ALDER CREEK

Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/06/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
1	1	MAIN	50	22	22	72	4.5	0.8	77	77	62	62	0	30
1	1	SCOUR	50	9	9	28	18.0	1.0	107	107	107	107	0	2

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
2	2	30	185	169

ALDER CREEK

Drainage: Russian River

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

Survey Dates: 08/06/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
1	STP	50	0	0	0	0	1	100	0	0	0	0
1	PLP	50	0	0	0	0	1	100	0	0	0	0

TOTAL UNITS
2

ALDER CREEK

Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 08/06/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
1	1	RUN	0	10	0	0	0	0	0	90	0
1	1	SRN	0	0	0	0	0	0	0	100	0
1	1	STP	0	0	0	0	0	0	0	100	0
1	1	PLP	0	0	25	0	0	0	0	75	0
4	0	DRY	0	0	0	0	0	0	0	0	0
8	4	ALL HABITAT TYPES	0	1	2	0	0	0	0	97	0
2	2	POOLS ONLY	0	0	2	0	0	0	0	98	0

ALDER CREEK

Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/06/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
1	1	RUN	0	100	0	0	0	0	0
1	1	SRN	0	100	0	0	0	0	0
1	1	STP	0	0	0	0	0	0	100
1	1	PLP	0	100	0	0	0	0	0
1	1	DRY	0	0	0	0	0	100	0

ALDER 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
95.00	77.86	22.14	50.00	49.00

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	1	3	40
Boulder	2	1	30
Cobble/Gravel	0	0	0
Silt/clay	2	1	30

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	0	0	0
Deciduous Trees	2	2	40
Evergreen Trees	3	3	60
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: ALDER CREEK
SAMPLE DATES:
SURVEY LENGTH:
MAIN CHANNEL: 989 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

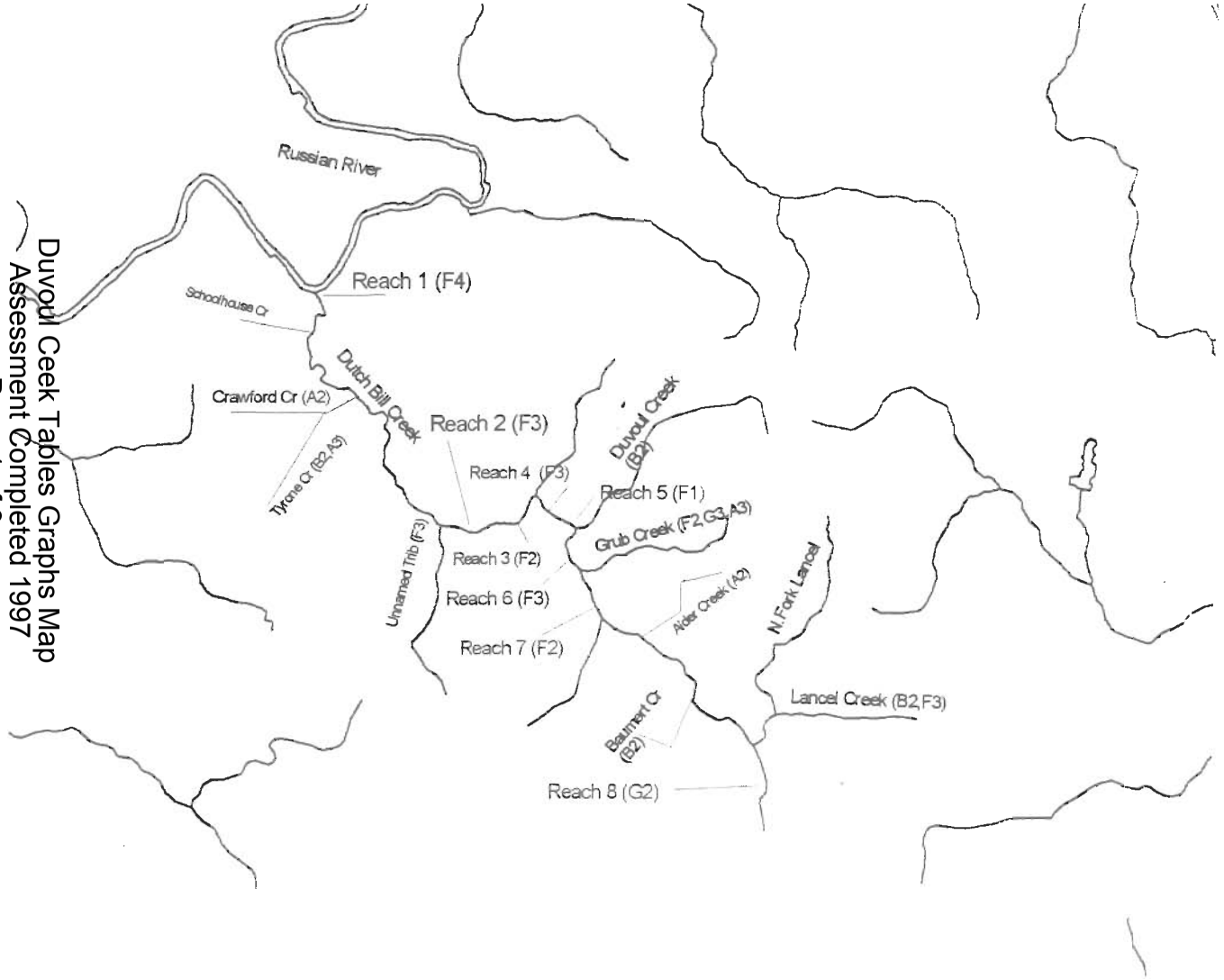
SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-8)

Channel Type: A2	Mean Canopy Density: 95%
Main Channel Length: 989 ft.	Evergreen Component: 78%
Side Channel Length: 0 ft.	Deciduous Component: 22%
Riffle/Flatwater Mean Width: 3.3 ft.	Pools by Stream Length: 3%
Pool Mean Depth: 0.9 ft.	Pools >=2 ft. Deep: 100%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 61-61°F Air: 76-76°F	Mean Pool Shelter Rtn: 16
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 50%	Occurrence of LOD: 25%
Dom. Bank Substrate: Bedrock	Dry Channel: 876 ft.

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

Dutchbill Creek



Streams

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DEVOUL CREEK

Drainage: Russian River

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

Survey Dates: 07/29/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
3	3	RIFFLE	30	74	223	30	2.5	0.2	130	390	36	108	0	3
2	1	FLATWATER	20	54	107	14	2.8	0.2	127	254	35	70	0	0
3	1	POOL	30	46	137	18	9.8	1.0	307	922	273	820	66	23
2	0	DRY	20	138	276	37	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.)
10	5	742	1565	998

DEVOUL CREEK

Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 07/29/97

Confluence Location: QUAD: LEGAL DESCRIPTION:

LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
1	1	LGR	10	16	16	2	3	0.1	0.2	28	28	3	3	0	0	75
1	1	HGR	10	173	173	23	4	0.3	0.9	345	345	104	104	0	10	70
1	1	BRS	10	35	35	5	1	0.1	0.2	17	17	2	2	0	0	70
1	0	RUN	10	37	37	5	2	0.1	0.8	33	33	3	3	0	0	95
1	1	SRN	10	70	70	9	4	0.3	1.0	221	221	66	66	0	0	75
2	0	MEP	20	12	24	3	11	1.1	2.4	101	201	86	172	66	40	75
1	1	STP	10	113	113	15	8	0.9	1.8	721	721	649	649	0	5	90
2	0	DRY	20	138	276	37	0	0.0	0.0	0	0	0	0	0	0	95

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
10	5	742	1565	998

Duvoul Ceek Tables Graphs Map
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DEVOUL CREEK

Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 07/29/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
3	1	MAIN	100	46	137	100	9.8	1.0	307	922	273	820	66	23

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
3	1	137	922	820

DEVOUL CREEK

Drainage: Russian River

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

Survey Dates: 07/29/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
2	MCP	67	0	0	0	0	2	100	0	0	0	0
1	STP	33	0	0	1	100	0	0	0	0	0	0

TOTAL UNITS 3

DEVOUL CREEK

Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 07/29/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
1	1	LGR	0	0	0	0	0	0	0	0	0
1	1	HGR	0	5	0	5	10	0	0	80	0
1	1	BRS	0	0	0	0	0	0	0	0	0
1	0	RUN	0	0	0	0	0	0	0	0	0
1	1	SRN	0	0	0	0	0	0	0	0	0
2	1	MCP	0	0	0	0	0	0	0	25	75
1	1	STP	85	0	0	0	0	0	0	15	0
2	0	DRY	0	0	0	0	0	0	0	0	0
ALL 10 HABITAT TYPES	6		30	3	0	3	5	0	0	51	9
POOLS ONLY 3	2		63	0	0	0	0	0	0	18	19

DEVOUL CREEK

Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 07/29/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
1	1	LGR	0	0	100	0	0	0	0
	1	HGR	0	0	0	0	0	100	0
	1	BRS	0	0	0	0	0	0	100
	1	RUN	0	0	0	100	0	0	0
	1	SRN	0	0	0	0	0	0	100
	1	MCP	0	100	0	0	0	0	0
	1	STP	0	100	0	0	0	0	0
	2	DRY	0	0	0	50	50	0	0

DEVOUL 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
82.22	60.00	40.00	25.56	20.56

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	5	6	61.11
Boulder	0	0	0
Cobble/Gravel	1	0	5.56
Silt/clay	3	3	33.33

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	0	0	0
Deciduous Trees	1	2	16.67
Evergreen Trees	4	4	44.44
No Vegetation	4	3	38.89

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: DEVOUL CREEK
SAMPLE DATES:
SURVEY LENGTH:
MAIN CHANNEL: 742 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

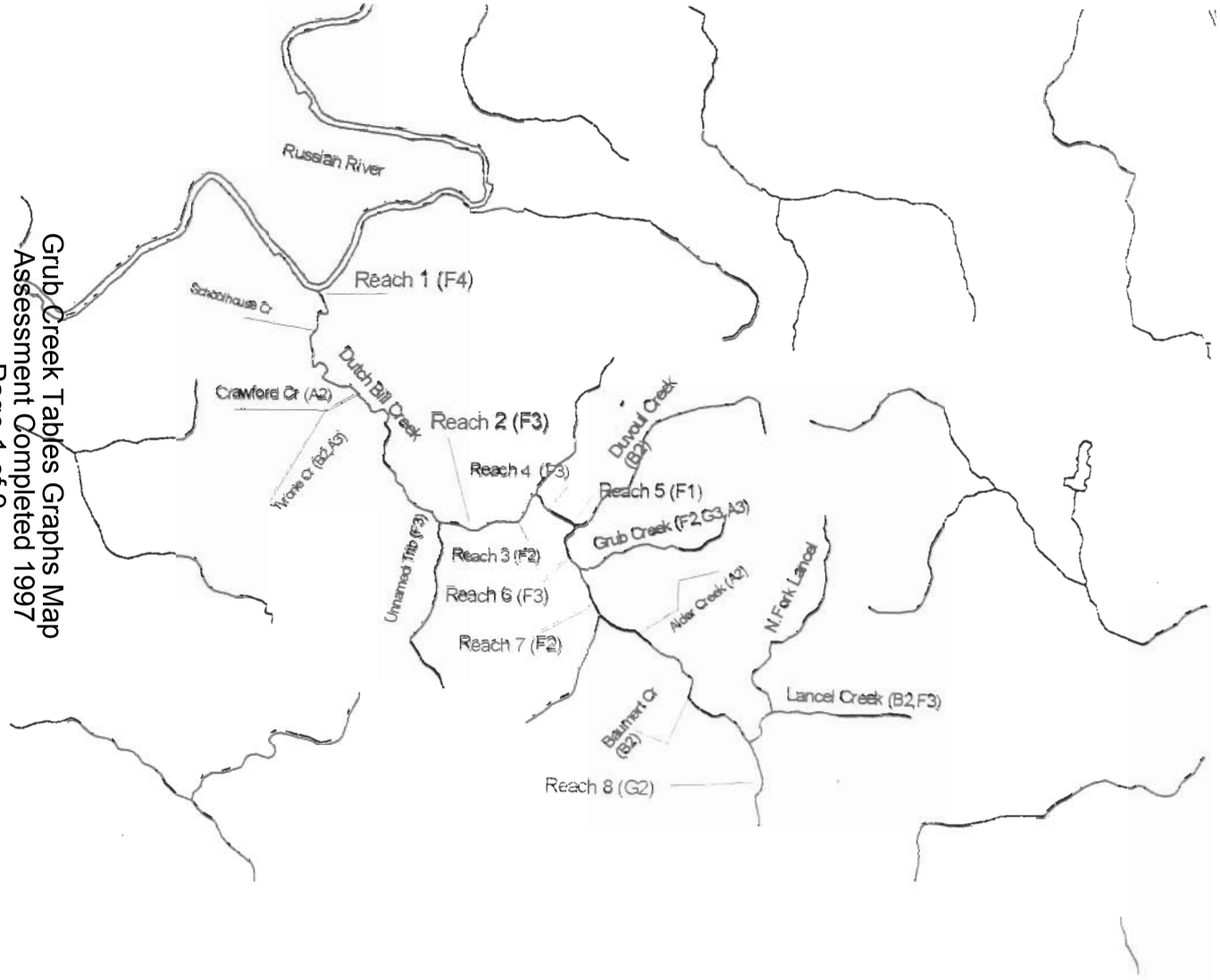
SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-10)

Channel Type: B2	Mean Canopy Density: 82%
Main Channel Length: 742 ft.	Evergreen Component: 60%
Side Channel Length: 0 ft.	Deciduous Component: 40%
Riffle/Flatwater Mean Width: 2.6 ft.	Pools by Stream Length: 18%
Pool Mean Depth: 1.0 ft.	Pools >=2 ft. Deep: 67%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 63-63°F Air: 65-65°F	Mean Pool Shelter Rtn: 23
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 23%	Occurrence of LOD: 0%
Dom. Bank Substrate: Bedrock	Dry Channel: 276 ft.

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

Dutchbill Creek



Streams

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Grub Creek Tables Graphs Map
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Grub Creek

Drainage: Russian River

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

Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
6	2	RIFFLE	9	55	329	5	4.8	0.3	303	1818	56	334	0	5
17	5	FLATWATER	26	29	488	8	4.1	0.5	92	1557	44	745	0	10
15	6	POOL	23	19	278	4	6.6	1.2	120	1796	156	2341	148	20
28	0	DRY	42	183	5112	82	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.)
66	13	6206	5170	3419

Grub Creek

Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: LEGAL DESCRIPTION:

LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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 %
5	1	LGR	8	53	264	4	5	0.2	0.7	365	1825	39	194	0	5	82
1	1	CAS	2	65	65	1	6	0.5	0.7	179	179	89	89	0	5	85
11	4	RUN	17	22	238	4	4	0.5	1.2	64	709	33	362	0	11	83
6	1	SRN	9	42	250	4	4	0.5	1.1	137	821	62	371	0	5	90
7	1	MCP	11	20	138	2	7	1.3	3.2	151	1059	203	1424	172	25	94
2	1	LSBk	3	23	46	1	4	1.0	2.0	76	153	76	153	0	5	90
2	1	LSBo	3	16	32	1	6	1.0	1.9	80	159	81	162	0	13	88
4	3	PLP	6	15	62	1	7	1.3	2.6	114	456	163	650	101	21	86
28	0	DRY	42	183	5112	82	0	0.0	0.0	0	0	0	0	0	0	77

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
66	13	6206	5361	3405

Grub Creek | Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES | Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
7	1	MAIN	47	20	138	50	7.4	1.3	151	1059	203	1424	172	25
8	5	SCOUR	53	17	140	50	6.0	1.2	96	768	121	965	101	15

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
15	6	278	1827	2388

Grub Creek | Drainage: Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES | Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
7	MCP	47	0	0	3	43	3	43	1	14	0	0
2	LSBk	13	0	0	1	50	1	50	0	0	0	0
2	LSBo	13	0	0	2	100	0	0	0	0	0	0
4	PLP	27	0	0	1	25	3	75	0	0	0	0

TOTAL UNITS
15

Grub Creek | Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type | Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
5	1	LGR	0	0	0	0	0	0	0	100	0
1	1	CAS	0	0	0	0	15	0	85	0	0
11	4	RUN	0	0	0	0	0	0	0	100	0
6	1	SRN	0	0	0	0	0	0	0	100	0
7	7	MCP	0	0	0	71	0	0	0	19	10
2	2	LSBk	0	0	0	0	0	0	0	100	0
2	2	LSBo	0	0	0	0	0	0	0	100	0
4	4	PLP	0	12	26	45	0	0	0	17	0
28	0	DRY	0	0	0	0	0	0	0	0	0
TOTAL 66 HABITAT TYPES	22		0	3	7	41	1	0	5	38	4
POOLS ONLY 15	15		0	4	9	52	0	0	0	30	5

Grub Creek | Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE | Survey Dates: 08/05/97 to 08/07/97

Confluence Location: QUAD: | LEGAL DESCRIPTION: | LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
5	2	LGR	0	0	0	0	50	0	50
1	1	CAS	0	0	0	0	0	100	0
1	4	RUN	50	0	0	0	0	25	25
6	2	SRN	0	0	0	0	0	50	50
7	1	MCP	0	100	0	0	0	0	0
2	1	LSBk	0	100	0	0	0	0	0
2	1	LSBo	0	100	0	0	0	0	0
4	3	PLP	33	33	0	0	0	33	0
8	5	DRY	0	0	20	20	20	40	0

Grub 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
83.21	61.92	38.08	46.25	50.24

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	6	3	21.43
Boulder	0	0	0
Cobble/Gravel	0	0	0
Silt/clay	15	18	78.57

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	2	1	7.14
Brush	0	0	0
Deciduous Trees	5	3	19.05
Evergreen Trees	12	16	66.67
No Vegetation	2	1	7.14

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Grub Creek
SAMPLE DATES: 08/05/97 to 08/07/97
SURVEY LENGTH:
MAIN CHANNEL: 6206 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-40)

Channel Type: F2	Mean Canopy Density: 89%
Main Channel Length: 4113 ft.	Evergreen Component: 78%
Side Channel Length: 0 ft.	Deciduous Component: 22%
Riffle/Flatwater Mean Width: 4.8 ft.	Pools by Stream Length: 6%
Pool Mean Depth: 1.2 ft.	Pools >=2 ft. Deep: 54%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 8%
Water: 60-65°F Air: 74-94°F	Mean Pool Shelter Rtn: 22
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 55%	Occurrence of LOD: 35%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 3369 ft.

Embeddness Value: 1. 0% 2. 13% 3. 50% 4. 38%

STREAM REACH 2 (Units 41-48)

Channel Type: G3	Mean Canopy Density: 76%
Main Channel Length: 1116 ft.	Evergreen Component: 25%
Side Channel Length: 0 ft.	Deciduous Component: 75%
Riffle/Flatwater Mean Width: 4.0 ft.	Pools by Stream Length: 2%
Pool Mean Depth: 1.6 ft.	Pools >=2 ft. Deep: 100%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 70-70°F Air: 72-72°F	Mean Pool Shelter Rtn: 5
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 58%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 1072 ft.

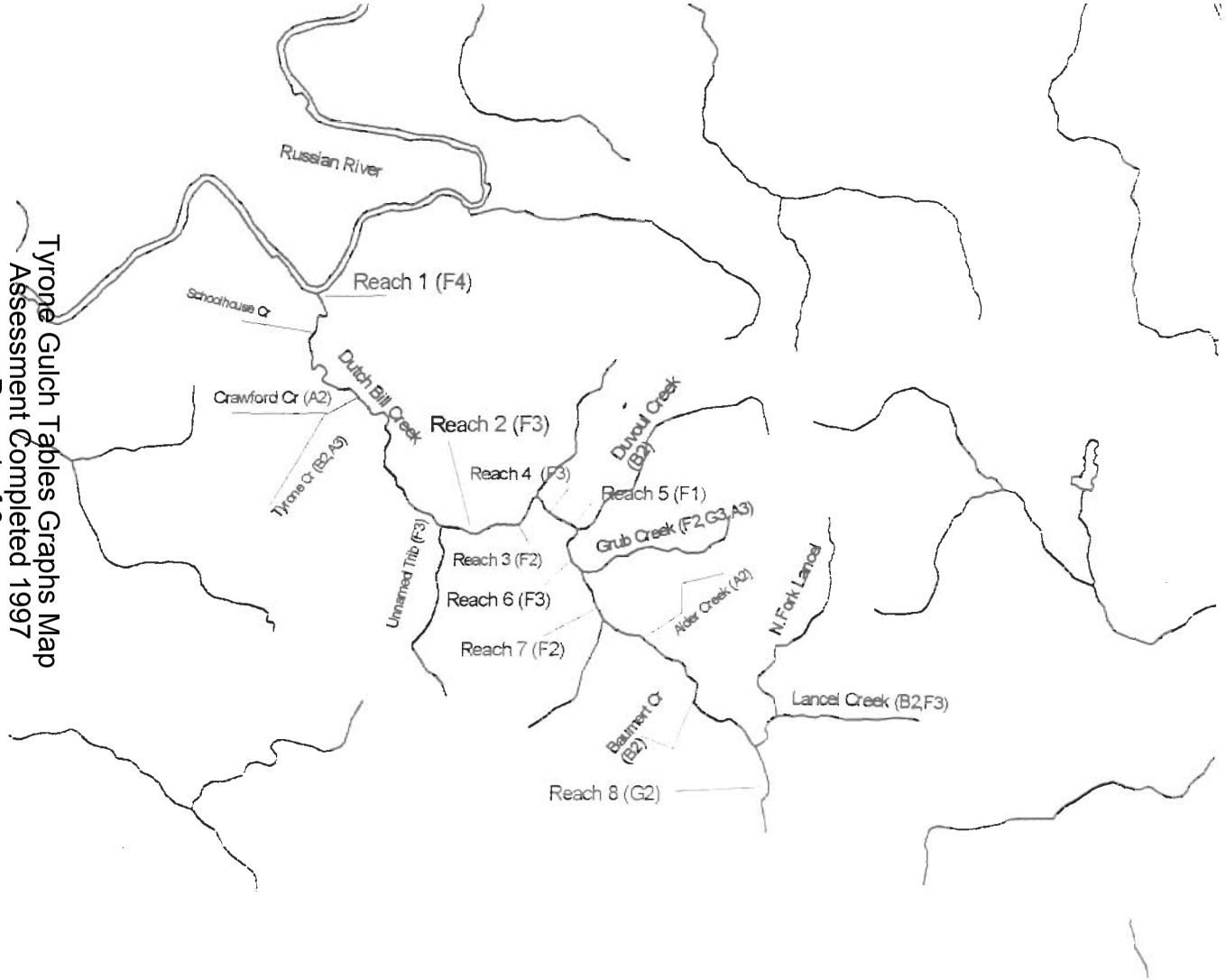
Embeddness Value: 1. 2. 3. 4.

STREAM REACH 3 (Units 49-66)

Channel Type: A2	Mean Canopy Density: 74%
Main Channel Length: 978 ft.	Evergreen Component: 42%
Side Channel Length: 0 ft.	Deciduous Component: 58%
Riffle/Flatwater Mean Width: 3.6 ft.	Pools by Stream Length: 1%
Pool Mean Depth: 1.0 ft.	Pools >=2 ft. Deep: 0%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 66-NA°F Air: 72-88°F	Mean Pool Shelter Rtn: 10
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 30%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 671 ft.

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

Dutchbill Creek



Tyrone Gulch Tables Graphs Map
Assessment Completed 1997
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Streams

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Inland Fisheries Division
Department of Fish and Game
1997

Tyrone Gulch

Drainage: Russian River

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

Survey Dates: 09/11/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
12	7	RIFFLE	43	66	795	48	3.2	0.3	195	2344	51	607	0	0
4	2	FLATWATER	14	86	344	21	5.6	0.4	385	1539	132	528	0	10
10	5	POOL	36	35	350	21	7.2	0.7	212	2120	152	1517	117	30
2	1	DRY	7	76	151	9	2.0	0.1	40	80	4	8	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
28	15	1640	6083	2660

Tyrone Gulch

Drainage: Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 09/11/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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 %
5	1	LGR	18	75	375	23	5	0.2	0.5	707	3535	141	707	0	0	92
4	3	HGR	14	72	288	18	3	0.3	0.9	132	528	41	165	0	0	97
2	2	CAS	7	46	92	6	3	0.4	0.8	90	180	36	72	0	0	98
1	1	BRS	4	40	40	2	3	0.2	0.5	84	84	17	17	0	0	90
1	1	RUN	4	40	40	2	5	0.5	0.7	166	166	83	83	0	20	95
3	1	SRN	11	101	304	19	6	0.3	0.5	603	1809	181	543	0	0	95
1	1	TRP	4	63	63	4	6	0.8	1.1	378	378	302	302	265	10	100
4	1	STP	14	46	184	11	6	0.5	1.9	232	929	124	495	75	19	90
1	1	CRP	4	30	30	2	5	0.7	1.8	143	143	100	100	71	80	85
1	1	LSL	4	21	21	1	10	0.9	2.0	210	210	189	189	147	80	95
3	1	PLP	11	17	52	3	10	0.9	2.4	153	460	143	430	70	18	95
2	1	DRY	7	76	151	9	2	0.1	0.4	40	80	4	8	0	0	100

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
28	15	1640	8503	3111

Tyrone Gulch

Drainage: Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 09/11/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
5	2	MAIN	50	49	247	71	5.6	0.6	261	1307	159	797	138	17
5	3	SCOUR	50	21	103	29	8.8	0.9	163	813	144	719	96	43

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
10	5	350	2120	1517

Tyrone Gulch — Drainage: Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 09/11/97

Confluence Location: QUAD: — LEGAL DESCRIPTION: — LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
1	TRP	10	0	0	1	100	0	0	0	0	0	0
4	STP	40	0	0	4	100	0	0	0	0	0	0
1	CRP	10	0	0	1	100	0	0	0	0	0	0
1	LSL	10	0	0	0	0	1	100	0	0	0	0
3	PLP	30	0	0	2	67	1	33	0	0	0	0

TOTAL UNITS
10

Tyrone Gulch

Drainage: Russian River

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 09/11/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
5	1	LGR	0	0	0	0	0	0	0	0	0
4	3	HGR	0	0	0	0	0	0	0	0	0
2	2	CAS	0	0	0	0	0	0	0	0	0
1	1	BRS	0	0	0	0	0	0	0	0	0
1	1	RUN	70	0	30	0	0	0	0	0	0
3	1	SRN	0	0	0	0	0	0	0	0	0	0
1	1	TRP	25	0	50	0	0	0	0	25	0
4	4	STP	57	0	0	15	0	0	0	28	0
1	1	CRP	60	30	0	10	0	0	0	0	0
1	1	LSL	50	0	50	0	0	0	0	0	0
3	3	PLP	47	7	9	28	0	0	0	9	0
2	1	DRY	0	0	0	0	0	0	0	0	0
ALL HABITAT TYPES 28	20		54	7	19	10	0	0	0	11	0
POOLS ONLY 10	10		53	7	18	11	0	0	0	12	0

Tyrone Gulch

Drainage: Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 09/11/97

Confluence Location: QUAD: LEGAL DESCRIPTION: LATITUDE: 0°0'0" LONGITUDE: 0°0'0"

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
5	1	LGR	0	0	0	100	0	0	0
4	3	HGR	0	0	0	0	0	100	0
2	2	CAS	0	0	0	0	0	50	50
1	1	BRS	0	0	0	0	0	0	100
1	1	RUN	0	0	0	100	0	0	0
1	1	SRN	0	0	0	100	0	0	0
1	1	TRP	0	100	0	0	0	0	0
1	1	STP	0	0	0	0	0	100	0
1	1	CRP	0	0	0	100	0	0	0
1	1	LSL	0	100	0	0	0	0	0
3	1	PLP	0	0	0	0	100	0	0
2	2	DRY	0	0	0	50	0	50	0

Tyrone Gulch

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
94.25	62.25	37.75	81.25	85.00

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	0	0	0
Boulder	0	0	0
Cobble/Gravel	0	0	0
Silt/clay	16	16	100

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	0	0	0
Brush	0	2	6.25
Deciduous Trees	9	3	37.50
Evergreen Trees	7	11	56.25
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Tyrone Gulch
SAMPLE DATES:
SURVEY LENGTH:
MAIN CHANNEL: 1640 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Latitude: 0°0'0"
Legal Description: Longitude: 0°0'0"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-10)

Channel Type: B2	Mean Canopy Density: 95%
Main Channel Length: 723 ft.	Evergreen Component: 71%
Side Channel Length: 0 ft.	Deciduous Component: 29%
Riffle/Flatwater Mean Width: 5.4 ft.	Pools by Stream Length: 17%
Pool Mean Depth: 0.8 ft.	Pools >=2 ft. Deep: 25%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 59-59°F Air: 64-64°F	Mean Pool Shelter Rtn: 48
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 76%	Occurrence of LOD: 40%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 111 ft.

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

STREAM REACH 2 (Units 11-28)

Channel Type: A3	Mean Canopy Density: 94%
Main Channel Length: 917 ft.	Evergreen Component: 56%
Side Channel Length: 0 ft.	Deciduous Component: 44%
Riffle/Flatwater Mean Width: 2.9 ft.	Pools by Stream Length: 24%
Pool Mean Depth: 0.7 ft.	Pools >=2 ft. Deep: 17%
Base Flow: 0.0 cfs	Pools >=3 ft. Deep: 0%
Water: 59-60°F Air: 64-69°F	Mean Pool Shelter Rtn: 18
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 90%	Occurrence of LOD: 20%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 40 ft.

Embeddness Value: 1. 17% 2. 67% 3. 0% 4. 17%