

CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Edwards Creek

Report Revised April 14, 2006

Report Completed 2005

Assessment Completed 2002

INTRODUCTION

A stream inventory was conducted during 10/25/2002 to 11/6/2002 on Edwards Creek. The survey began at the confluence with Russian River and extended upstream 4.6 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Edwards Creek.

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

WATERSHED OVERVIEW

Edwards Creek is a tributary to Russian River, is a tributary to Pacific Ocean, located in Mendocino County, California (Appendix A). Edwards Creek's legal description at the confluence with Russian River is T12N R11W S25. Its location is 38°51'51.0" north latitude and 123°02'27.0" west longitude, LLID number 1230408388641. Edwards Creek is a second order stream and has approximately 4.205 miles of blue line stream according to the USGS Cloverdale 7.5 minute quadrangle. Edwards Creek drains a watershed of approximately 4.786 square miles. Elevations range from about 346 feet at the mouth of the creek to 1271 feet in the headwater areas. Mixed hardwood/mixed conifer forest dominates the watershed. The watershed is entirely privately owned. Vehicle access exists via jeep trails from Geysers Rd. and Hwy 128.

METHODS

The habitat inventory conducted in Edwards Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members 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.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the

parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement. All pools except step-pools are fully sampled.

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 Edwards Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

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

2. Channel Type:

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

3. Temperatures:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). 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". Edwards Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of

the cobble that is surrounded or buried by fine sediment. In Edwards Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile 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 for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Edwards Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Edwards 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 ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

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

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.16, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Edwards Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools

- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

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

The habitat inventory of 10/25/2002 to 11/6/2002, was conducted by Sarah Green (CCC), Douglas Mitchel (DFG) and Derek Acomb (DFG). The total length of the stream surveyed was 24,199 feet.

Stream flow was not measured on Edwards Creek.

Edwards Creek is a C4 channel type for 7,506 feet of the stream surveyed (Reach 1), a B2 channel type for 7,575 feet of the stream surveyed (Reach 2), a B4 channel type for 7,942 feet of the stream surveyed (Reach 3), a A2 channel type for 526 feet of the stream surveyed (Reach 4), a Aa+ channel type for 650 feet of the stream surveyed (Reach 5).

C4 channels are meandering point-bar riffle/pool alluvial channels with broad well defined floodplain on low gradients and gravel dominant substrates.

B2 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and boulder dominant substrates.

B4 channels are moderately entrenched riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks on moderate gradients with low width /depth ratios and gravel dominant substrates.

A2 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and boulder dominant substrates.

Water temperatures taken during the survey period ranged from 35 to 50 degrees Fahrenheit. Air temperatures ranged from 38 to 59 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 24% dry units, 2% culvert units, 37% flatwater units, 11% riffle units, 26% pool units, (Graph 1). Based on total **length** of Level II habitat types there were 56% dry units, 1% culvert units, 35% flatwater units, 4% riffle units, 5% pool units, (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were 24% Dry units, 2% Culvert units, 6% Run units, 7% Low Gradient Riffle units, 1% Glide units, 22% Mid-Channel Pool units, 30% Step Run units, 4% High Gradient Riffle units, 1% Trench Pool units, 1% Lateral Scour Pool - Root Wad Enhanced units, 1% Lateral Scour Pool - Bedrock Formed units, (Graph 3). Based on percent total **length**, 56% Dry units, 1% Culvert units, 3% Run units, 2% Low Gradient Riffle units, 1% Glide units, 4% Mid-Channel Pool units, 32% Step Run units, 1% High Gradient Riffle units.

A total of 54 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 93%, and comprised 93% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty three of the 54 pools (43%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 54 pool tail-outs measured, ten had a value of 2 (18.5%); nineteen had a value of 3 (35.2%); seven had a value of 4 (13%); eighteen had a value of 5 (33.3%); (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 42, flatwater habitat types had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 26 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 24, Scour pools had a mean shelter rating of 54, (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Edwards Creek. Graph 7 describes the pool cover in Edwards Creek. Boulders are the dominant pool cover type followed by bedrock ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 29% of pool tail-outs and boulders observed in 21% of pool tail-outs.

The mean percent canopy density for the surveyed length of Edwards Creek was 74%. The mean percentages of hardwood and coniferous trees were 53% and 47%, respectively. Twenty six percent of the canopy was open. Graph 9 describes the mean percent canopy in Edwards Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 15%. The mean percent left bank vegetated was 15%. The dominant elements composing the structure of the stream banks consisted of 18% bedrock, 34% boulder, 15% cobble/gravel, 33% sand/silt/clay, (Graph 10). Grass was the dominant vegetation type observed in 34% of the units surveyed.

Additionally, 27% of the units surveyed had hardwood trees as the dominant vegetation type, and 21% had coniferous trees as the dominant vegetation (Graph 11).

DISCUSSION

Edwards Creek is a C4 channel type for 7,506 feet of the stream surveyed (Reach 1), a B2 channel type for 7,575 feet of the stream surveyed (Reach 2), a B4 channel type for 7,942 feet of the stream surveyed (Reach 3), a A2 channel type for 526 feet of the stream surveyed (Reach 4), a AA3 channel type for 650 feet of the stream surveyed (Reach 5).

According to the DFG Salmonid Stream Habitat Restoration Manual, C4 channel types are good for bank-placed boulders and log cover. They are fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover.

B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover. B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs. Many site specific projects can be designed within this channel type, 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.

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.

The water temperatures recorded on the survey days 10/25/2002 to 11/6/2002, ranged from 35 to 50 degrees Fahrenheit. Air temperatures ranged from 38 to 59 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 35% of the total length of this survey, riffles 4%, and pools 5%. The pools are relatively shallow/deep, with only 23 of the 54 (43%) pools having a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Ten of the 54 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty six of the pool tail-outs had embeddedness ratings of 3 or 4. Eighteen of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or

less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Edwards Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty one of the 52 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 26. The shelter rating in the flatwater habitats was 11. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Boulders in Edwards Creek. Boulders are the dominant cover type in pools followed by bedrock ledges. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 74%. Reach 1 had a canopy density of 63.75%, Reach 2 had a canopy density of 72.6%, Reach 3 had a canopy density of 76.1%, Reach 4 had a canopy density of 96%, Reach 5 had a canopy density of 90.6%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 15% and 15%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

GENERAL MANAGEMENT RECOMMENDATIONS

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

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

RECOMMENDATIONS

- 1) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
- 2) Inventory and map sources of stream bank 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.
- 3) Fish passage should be monitored at the highway 128 culvert crossing. If necessary this culvert should be retrofitted or replaced to allow for improved fish passage.
 - 4) Increase the canopy along the lower reaches of Edwards Creek by planting appropriate native vegetation like willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.
 - 5) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
 - 6) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable.

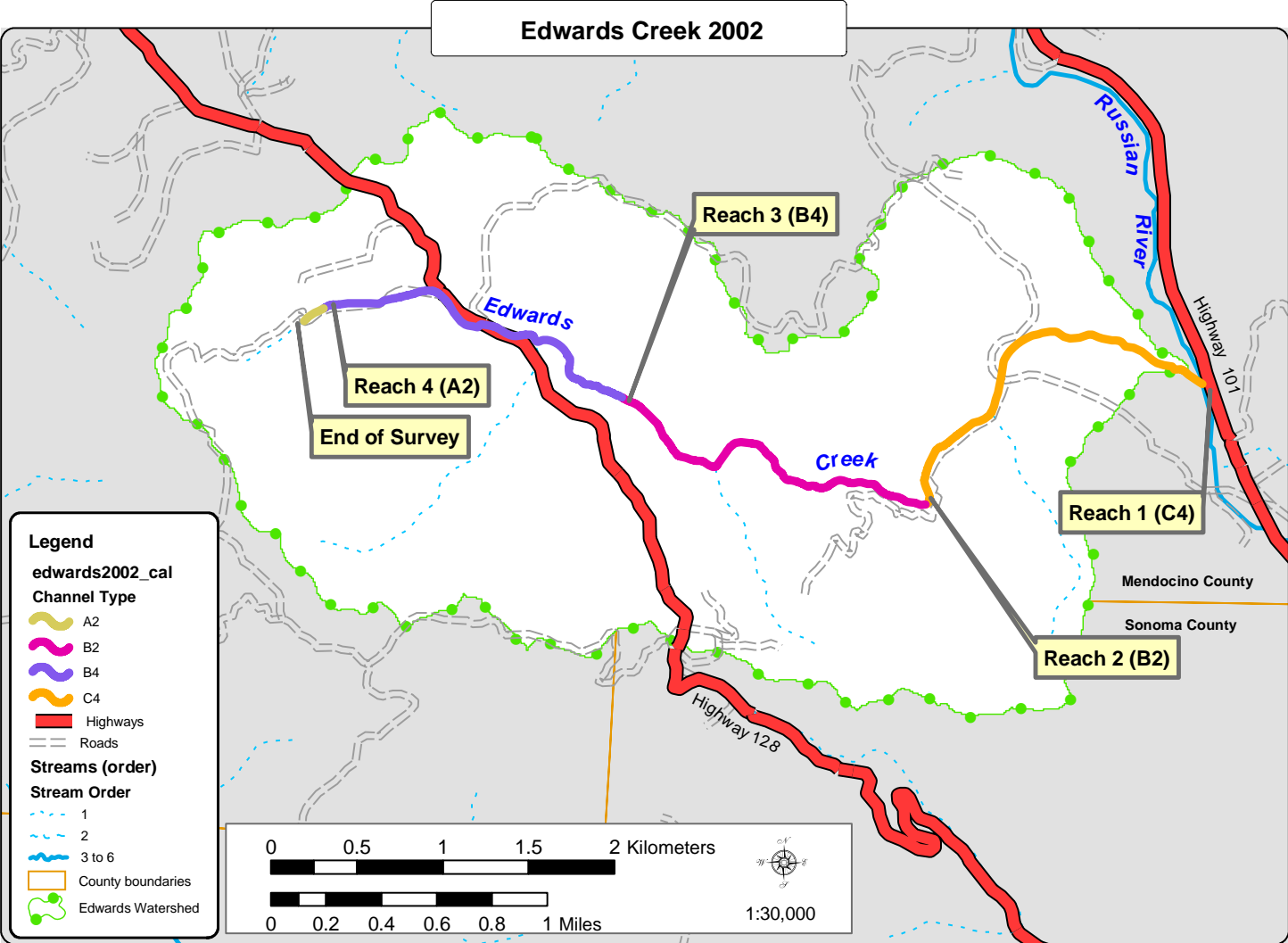
REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

McCain, M., D. Fuller, L. Decker and K. Overton. 1990. Stream habitat classification and inventory procedures for northern California. FHC Currents. No.1. U.S. Department of Agriculture. Forest Service, Pacific Southwest Region.

Rosgen, D.L., 1994. A Classification of Natural Rivers. *Catena*, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

APPENDIX A: MAP



L:\mondo3\data\stream-maps\edwards.mxd

Prepared by: Ann-Marie Osterback, May 28, 2003

Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Edwards Creek

LLID:

1230408388641

Drainage:

Russian River - Middle

Survey Dates: 10/25/2002 to 11/6/2002

Confluence Location:

Quad: CLOVERDALE

Legal Description: T12NR11WS25

Latitude: 38:51:51.0N

Longitude: 123:02:27.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max 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
4	2	CULVERT	1.9	51	203	0.8	11.5			100	400				
51	0	DRY	24.2	263	13436	55.5									
78	19	FLATWATER	37.0	108	8442	34.9	5.9	0.4	0.9	228	17777	118	9218		11
54	54	POOL	25.6	23	1243	5.1	9.1	1.0	2.0	205	11054	242	13044	229	26
24	11	RIFFLE	11.4	36	875	3.6	3.1	0.1	0.3	28	663	3	71		43
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
211	86				24199					29894			22333		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name:

1230408388641

Edwards Creek

LLID:

Drainage:

Russian River - Middle

Survey Dates: 10/25/2002 to 11/6/2002

Confluence Location:

Quad:

CLOVERDALE

Legal Description:

T12NR11WS25

Latitude: 38:51:51.0N

Longitude: 123:02:27.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)		Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max 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	Mean Canopy (%)
15	5	LGR	7.1	38	569	2.4	3	0.1	0.5	38	569	4	57		5	73	
8	5	HGR	3.8	37	294	1.2	3	0.1	1	22	176	3	21		80	71	
1	1	BRS	0.5	12	12	0.0	4	0.1	0.1	5	5	0	0			99	
2	2	GLD	0.9	66	131	0.5	10	0.8	1.5	781	1562	614	1227		8	69	
12	5	RUN	5.7	54	646	2.7	5	0.3	1.1	227	2722	73	881		12	60	
64	12	SRN	30.3	120	7665	31.7	5	0.4	1.4	136	8718	54	3474		12	69	
2	2	TRP	0.9	12	25	0.1	7	1.5	3	79	157	120	241	117	35	93	
47	47	MCP	22.3	22	1023	4.2	9	1.1	4.4	209	9807	258	12122	246	23	76	
1	1	STP	0.5	108	108	0.4	7	0.3	1.2	454	454	181	181	136		88	
2	2	LSR	0.9	19	38	0.2	8	0.9	2.1	141	282	137	274	123	95	84	
2	2	LSBk	0.9	24	49	0.2	8	0.7	1.7	177	354	113	226	98	13	92	
51	0	DRY	24.2	263	13436	55.5										71	
4	2	CUL	1.9	51	203	0.8	12			50	200					100	
Total Units	Total Units Fully Measured				Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)				
211	86				24199						25004		18704				

Table 3 - Summary of Pool Types

Stream Name: Edwards Creek

LLID:

1230408388641

Drainage:

Russian River - Middle

Survey Dates: 10/25/2002 to 11/6/2002

Confluence Location:

Quad: CLOVERDALE

Legal Description:

T12NR11WS25

Latitude: 38:51:51.0N

Longitude:

123:02:27.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
50	50	MAIN	93	23	1156	93	9.3	1.1	208	10418	238	11921	24
4	4	SCOUR	7	22	87	7	7.5	0.8	159	636	111	443	54

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
54	54	1243	11054	12364

Table 4 - Summary of Maximum Residual Pool Depths By Pool Habitat Types

Stream Name: Edwards Creek

LLID:

1230408388641

Drainage: Russian River - Middle

Survey Dates: 10/25/2002 to 11/6/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T12NR11WS25

Latitude: 38:51:51.0N

Longitude: 123:02:27.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
2	TRP	4	0	0	1	50	0	0	1	50	0	0
47	MCP	87	0	0	27	57	15	32	4	9	1	2
1	STP	2	0	0	1	100	0	0	0	0	0	0
2	LSR	4	0	0	0	0	2	100	0	0	0	0
2	LSBK	4	0	0	2	100	0	0	0	0	0	0

Total Units

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1 < 2 Foot Max Resid. Depth	Total 1 < 2 Foot % Occurrence	Total 2 < 3 Foot Max Resid. Depth	Total 2 < 3 Foot % Occurrence	Total 3 < 4 Foot Max Resid. Depth	Total 3 < 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
54	0	0	31	57	5	31	9	9	1	2

Mean Maximum Residual Pool Depth (ft.): 2

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Edwards Creek LLID: 1230408388641 Drainage: Russian River - Middle
 Survey Dates: 10/25/2002 to 11/6/2002 Dry Units: 51
 Confluence Location: Quad: CLOVERDALE Legal Description: T12NR11WS25 Latitude: 38:51:51.0N Longitude: 123:02:27.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
15	1	LGR	0	0	0	0	0	50	0	50	0
8	1	HGR	0	0	0	0	0	100	0	0	0
1	0	BRS									
24	2	TOTAL RIFFLE	0	0	0	0	0	75	0	25	0
2	2	GLD	0	0	0	50	0	0	0	10	0
12	3	RUN	0	40	0	0	27	7	0	27	0
64	7	SRN	0	0	0	7	4	0	0	89	0
78	12	TOTAL FLAT	0	10	0	13	9	2	0	60	0
2	2	TRP	0	0	0	0	0	0	0	50	50
47	43	MCP	10	3	3	9	3	5	2	41	26
1	0	STP									
2	2	LSR	65	0	0	15	15	0	0	3	0
2	2	LSBk	0	3	0	0	0	0	0	38	60
54	49	TOTAL POOL	11	3	2	8	3	4	1	39	27
4	0	CUL									
211	63	TOTAL	9	4	4	4	6	1	43	21	

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Edwards Creek

LLID:

1230408388641

Drainage: Russian River - Middle

Survey Dates: 10/25/2002 to 11/6/2002

Dry Units: 51

Confluence Location: Quad: CLOVERDALE

Legal Description: T12NR11WS25

Latitude: 38:51:51.0N

Longitude: 123:02:27.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
15	5	LGR	0	0	40	20	20	20	0
8	5	HGR	0	0	0	0	40	60	0
1	1	BRS	0	0	0	0	0	0	100
2	2	GLD	50	0	50	0	0	0	0
12	5	RUN	60	0	0	20	20	0	0
64	12	SRN	0	0	0	25	8	58	8
2	1	TRP	0	0	100	0	0	0	0
47	12	MCP	42	33	17	0	8	0	0
1	1	STP	0	0	0	0	0	0	100
2	2	LSR	0	0	50	0	0	0	50
2	2	LSBk	0	50	0	0	0	50	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Edwards Creek

LLID:

1230408388641 Drainage: Russian River - Middle

Survey Dates: 10/25/2002 to 11/6/2002

Confluence Location: Quad: CLOVERDALE Legal Description: T12NR11WS25 Latitude: 38:51:51.0N Longitude: 123:02:27.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
74	47	53	0	15	15

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Edwards Creek

LLID:

1230408388641 Drainage: Russian River - Middle

Survey Dates: 10/25/2002 to 11/6/2002

Confluence Location: Quad: CLOVERDALE

Legal Description: T12NR11WS25

Latitude: 38:51:51.0N Longitude: 123:02:27.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	8	12	18.2
Boulder	19	18	33.6
Cobble / Gravel	9	8	15.5
Sand / Silt / Clay	19	17	32.7

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	17	20	33.6
Brush	3	2	4.5
Hardwood Trees	15	15	27.3
Coniferous Trees	14	9	20.9
No Vegetation	6	9	13.6

Total Stream Cobble Embeddedness Values: 4

Table 10 - Mean Percent of Shelter Cover Types For Entire Stream

StreamName: Edwards Creek

LLID:

1230408388641 Drainage: Russian River - Middle

Survey Dates: 10/25/2002 to 11/6/2002

Confluence Location: Quad: CLOVERDALE Legal Description: T12NR11WS25 Latitude: 38:51:51.0N Longitude: 123:02:27.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	11
SMALL WOODY DEBRIS (%)	0	10	3
LARGE WOODY DEBRIS (%)	0	0	2
ROOT MASS (%)	0	13	8
TERRESTRIAL VEGETATION (%)	0	9	3
AQUATIC VEGETATION (%)	75	2	4
WHITEWATER (%)	0	0	1
BOULDERS (%)	25	60	39
BEDROCK LEDGES (%)	0	0	27

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: B4	Canopy Density (%): 76.1	Pools by Stream Length (%): 5.5
Reach Length (ft.): 7942	Coniferous Component (%): 41.1	Pool Frequency (%): 27.8
Riffle/Flatwater Mean Width (ft.): 4.3	Hardwood Component (%): 58.9	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Grass	< 2 Feet Deep: 68.2
Range (ft.): to	Vegetative Cover (%): 16.6	2 to 2.9 Feet Deep: 27.3
Mean (ft.):	Dominant Shelter: Undercut Banks	3 to 3.9 Feet Deep: 4.5
Std. Dev.:	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 1.5	Mean Max Residual Pool Depth (ft.): 1.84
Water (F): 39 - 49 Air (F): 41 - 59	LWD per 100 ft.:	Mean Pool Shelter Rating: 21
Dry Channel (ft.): 3443	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 4.5 Sand: 9.1 Gravel: 22.7 Sm Cobble: 27.3 Lg Cobble: 18.2 Boulder: 4.5 Bedrock: 13.6		
Embeddedness Values (%): 1. 0.0 2. 27.3 3. 27.3 4. 18.2 5. 27.3		

STREAM REACH: 4

Channel Type: A2	Canopy Density (%): 96.0	Pools by Stream Length (%): 1.7
Reach Length (ft.): 526	Coniferous Component (%): 75.0	Pool Frequency (%): 33.3
Riffle/Flatwater Mean Width (ft.):	Hardwood Component (%): 25.0	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation:	< 2 Feet Deep: 100.0
Range (ft.): to	Vegetative Cover (%): 0.0	2 to 2.9 Feet Deep: 0.0
Mean (ft.):	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 0.0
Std. Dev.:	Dominant Bank Substrate Type:	>= 4 Feet Deep: 0.0
Base Flow (cfs): 0	Occurrence of LWD (%): 0.0	Mean Max Residual Pool Depth (ft.): 1.6
Water (F): 41 - 41 Air (F): 45 - 45	LWD per 100 ft.:	Mean Pool Shelter Rating: 20
Dry Channel (ft.): 517	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 0.0 Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 100.0 Bedrock: 0.0		
Embeddedness Values (%): 1. 0.0 2. 0.0 3. 0.0 4. 0.0 5. 100.0		

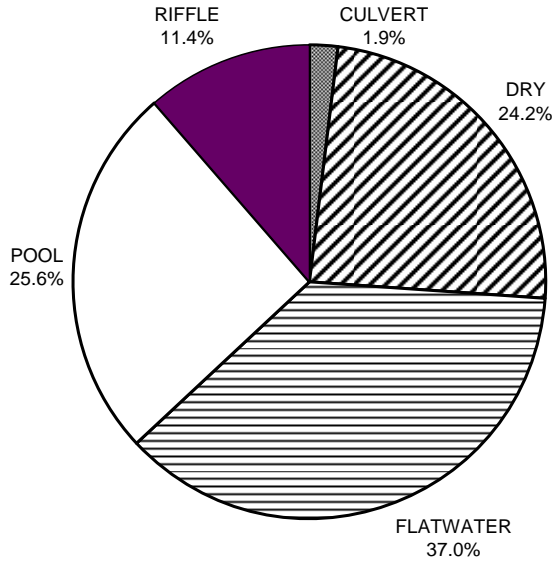
Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 5

Channel Type: AA+	Canopy Density (%): 90.7	Pools by Stream Length (%): 0.0
Reach Length (ft.): 650	Coniferous Component (%): 76.7	Pool Frequency (%): 0.0
Riffle/Flatwater Mean Width (ft.): 5.0	Hardwood Component (%): 23.3	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep:
Range (ft.): to	Vegetative Cover (%): 32.5	2 to 2.9 Feet Deep:
Mean (ft.):	Dominant Shelter:	3 to 3.9 Feet Deep:
Std. Dev.:	Dominant Bank Substrate Type: Boulder	>= 4 Feet Deep:
Base Flow (cfs): 0	Occurrence of LWD (%):	Mean Max Residual Pool Depth (ft.):
Water (F): 41 - 41 Air (F): 45 - 55	LWD per 100 ft.:	Mean Pool Shelter Rating:
Dry Channel (ft.): 490	Riffles:	
	Pools:	
	Flat:	
Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:		
Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0		

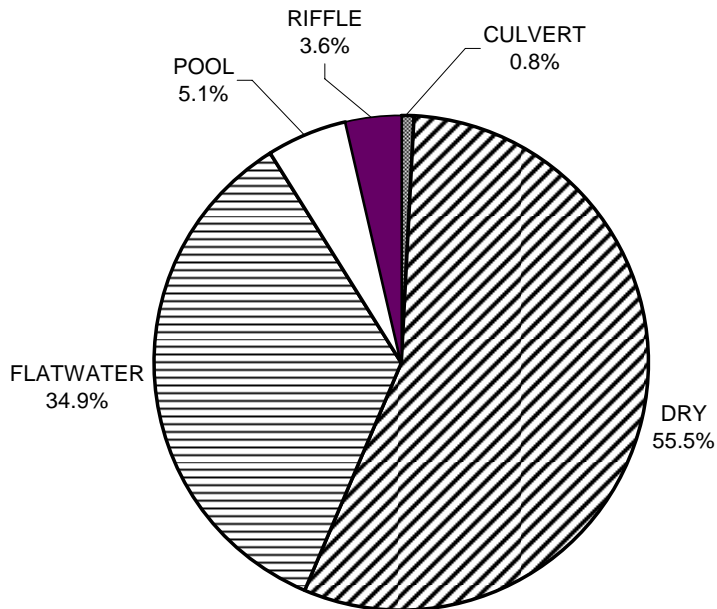
APPENDIX D: GRAPHS

**EDWARDS CREEK
HABITAT TYPES BY PERCENT OCCURRENCE**



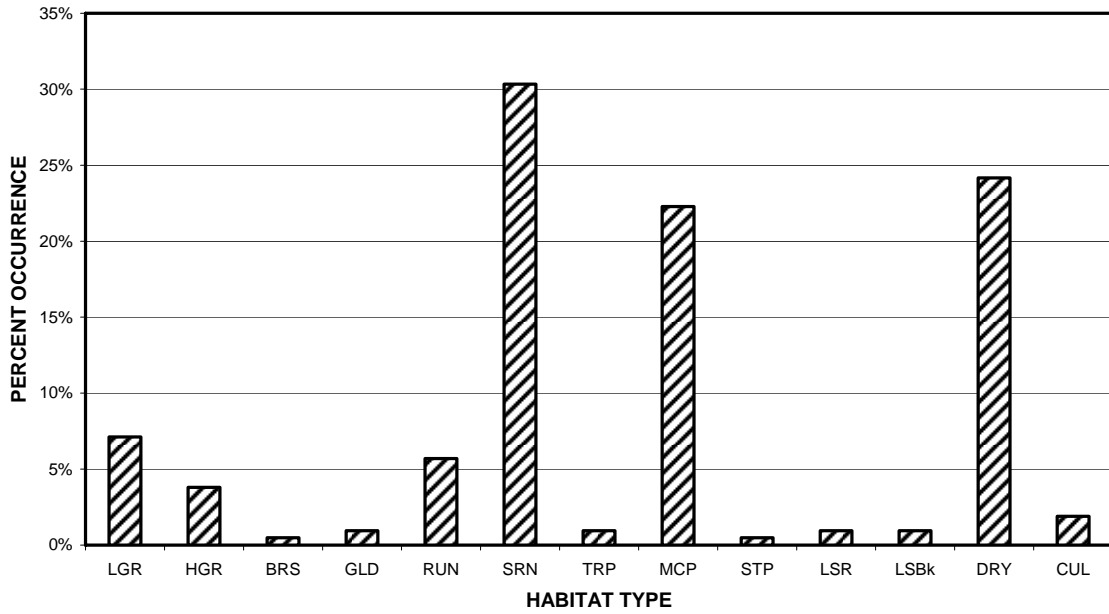
GRAPH 1: Level II habitat types by percent occurrence

**EDWARDS CREEK
HABITAT TYPES BY PERCENT TOTAL LENGTH**



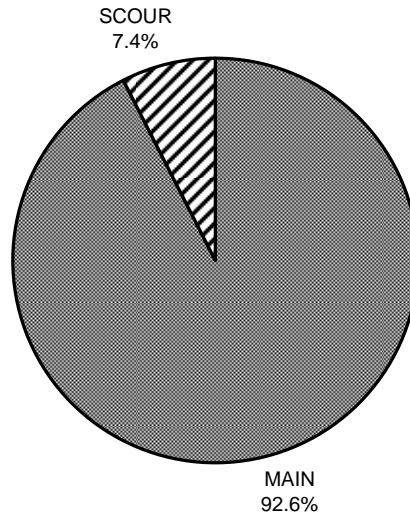
GRAPH 2: Level II habitat types by percent total length

**EDWARDS CREEK
HABITAT TYPES BY PERCENT OCCURRENCE**



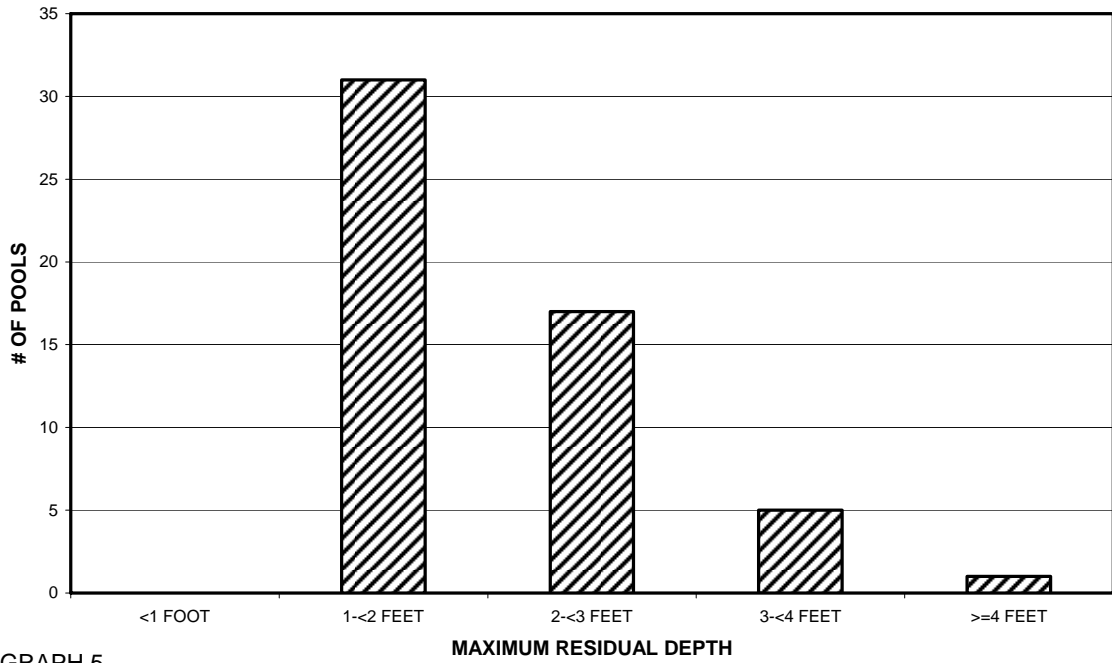
GRAPH 3: Level IV habitat types by percent occurrence

**EDWARDS CREEK
POOL TYPES BY PERCENT OCCURRENCE**



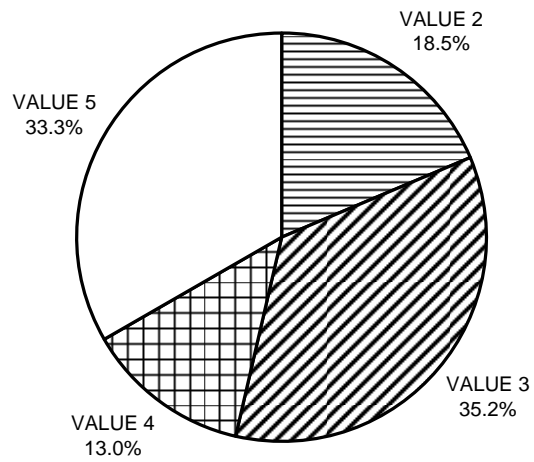
GRAPH 4: Level I pool types by percent occurrence

**EDWARDS CREEK
MAXIMUM DEPTH IN POOLS**



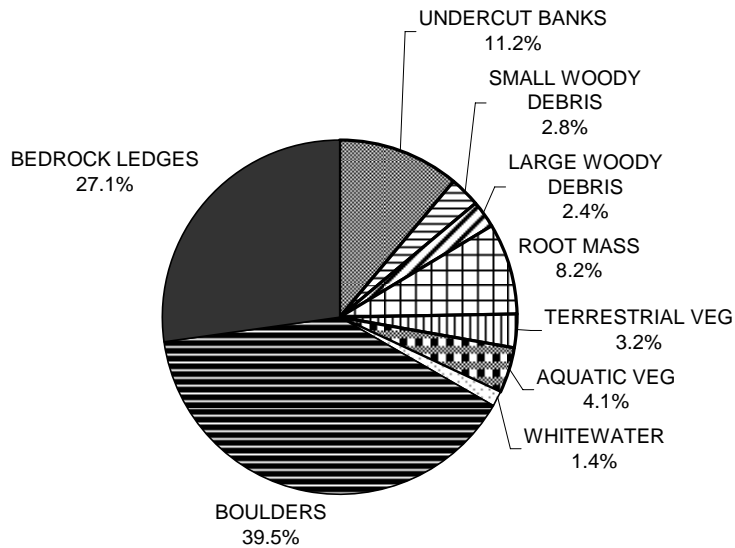
GRAPH 5

**EDWARDS CREEK
PERCENT EMBEDDEDNESS**



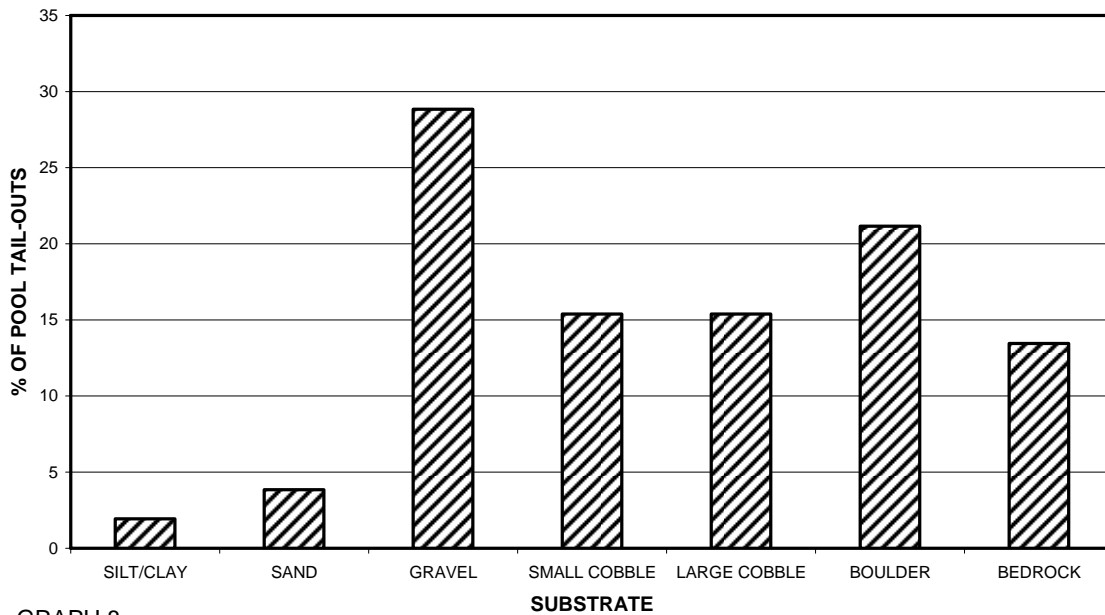
GRAPH 6

**EDWARDS CREEK
MEAN PERCENT COVER TYPES IN POOLS**



GRAPH 7

**EDWARDS CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



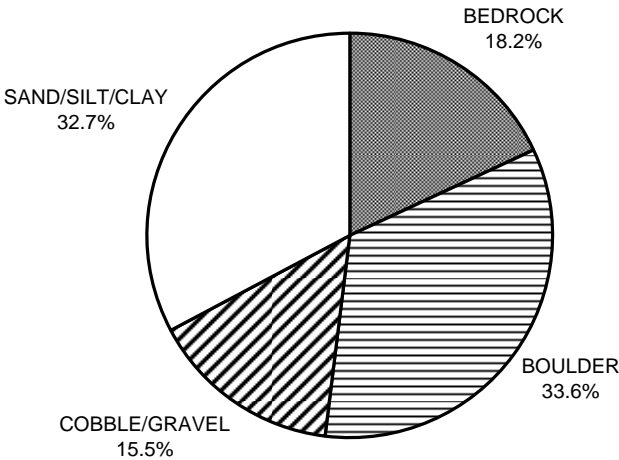
GRAPH 8

**EDWARDS CREEK
MEAN PERCENT CANOPY**



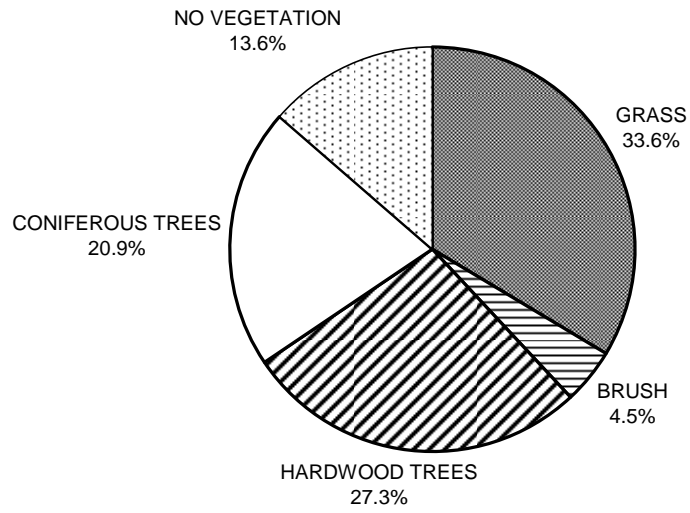
GRAPH 9

**EDWARDS CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**EDWARDS CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11