NORTH COAST WATERSHED AND FISHERY IMPROVEMENT PROGRAM

STREAM INVENTORY REPORT

Rice Creek, Big River, 2002

CALIFORNIA DEPARTMENT OF FISH AND GAME

2003

Northern California-North Coast Region

STREAM INVENTORY REPORT

Rice Creek

INTRODUCTION

A stream inventory was conducted beginning August 12, and ending August 14, 2002 on Rice Creek. The survey began at the confluence with Big River and extended upstream 1.45 miles.

The Rice Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Rice Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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.

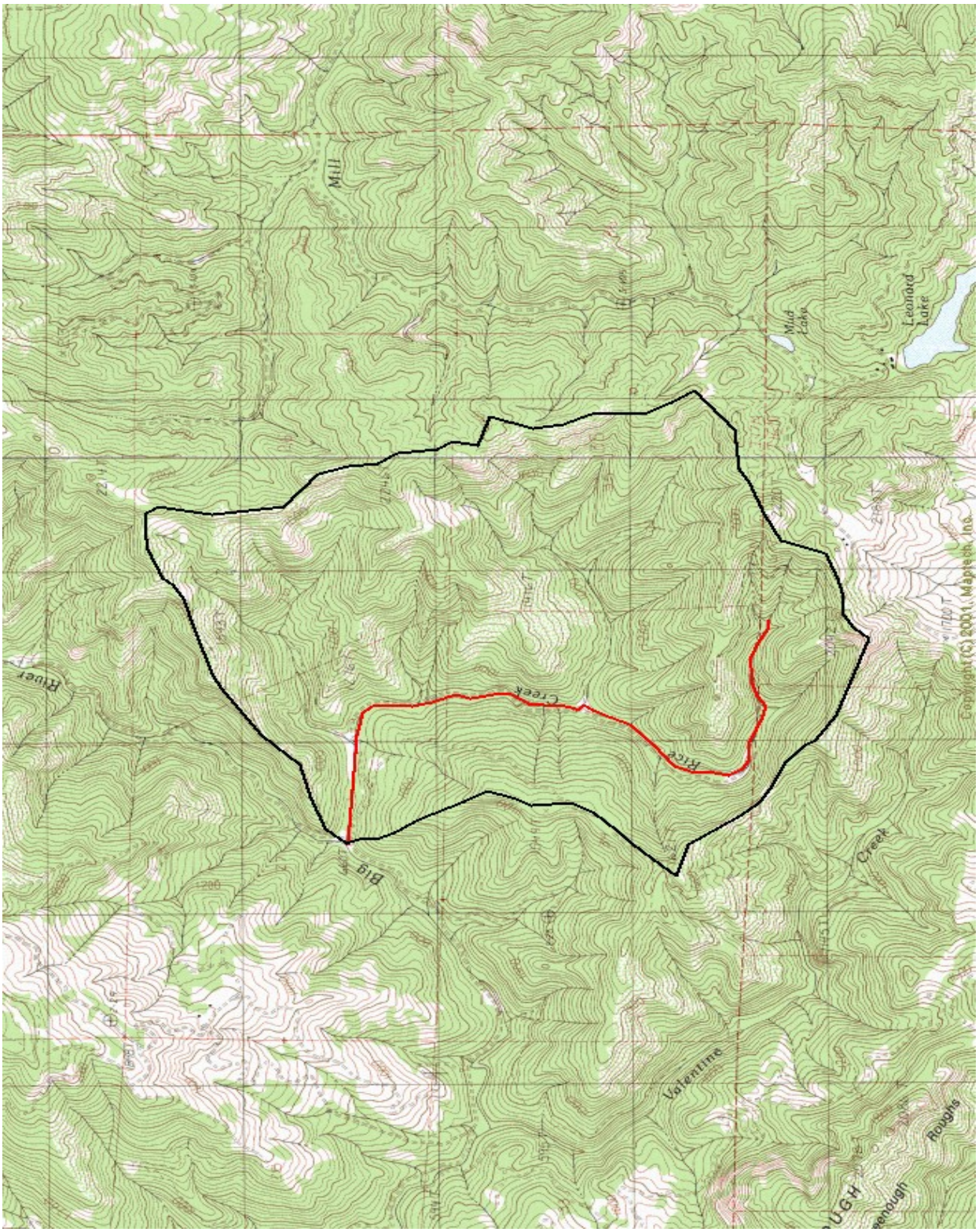
WATERSHED OVERVIEW

Rice Creek is a tributary to the Big River, a tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). Rice Creek's legal description at the confluence with Big River is T17N R14W S27. Its location is 39°29′57″ North latitude and 123°40′12″ West longitude. Rice Creek is a first order stream and has approximately 2.4 miles of solid blue line stream according to the USGS Greenough Ridge 7.5 minute quadrangle. Rice Creek drains a watershed of approximately 2.6 square miles. Elevations range from about 620 feet at the mouth of the creek to 1960 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production and recreation. Vehicle access exists via logging roads from Highway 20 at mile marker 27.

Reconnaissance surveys were conducted on Rice Creek and the East Branch of Rice Creek by CDFG in 1959 (California Department of Fish and Game 1959). No fish were noted during these surveys.

METHODS

The habitat inventory conducted in Rice Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Game Scientific Aids (DFG) and Watershed Stewards



MAP 1. RICE CREEK.

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.

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 Rice Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

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

2. Channel Type:

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

3. Temperatures:

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

middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Rice 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 Rice 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 particle size, bedrock, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Rice 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 densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Rice 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 deciduous trees.

9. Bank Composition and Vegetation:

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

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Rice Creek. 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 8.4, a dBASE 4.2 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 six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

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

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length

- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 12 through 14, 2002, was conducted by Kate Grossman (WSP) and Kristi Knechtle (DFG). The total length of the stream surveyed was 9,351 feet.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.018 cfs on September 24, 2002.

Rice Creek is an F4 channel type for 9,351 feet of stream surveyed. F4 channel types are classified as entrenched meandering riffle/pool channels on low gradients with a high width/depth ratio and a gravel-dominated substrate.

Water temperatures taken during the survey period ranged from 57 to 68 degrees Fahrenheit. Air temperatures ranged from 63 to 93 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% pool units, 33% flatwater units, 14% riffle units, and 11% dry units (Graph 1). Based on total length of Level II habitat types there were 56% flatwater units, 19% pool units, 16% dry units, and 10% riffle units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 29%; step runs, 26%; and low gradient riffles, 13% (Graph 3). Based on percent total length, step runs made up, 50%, dry, 16%, and mid-channel pools, 13%.

A total of 87 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 70%, and comprised 70% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twenty-one of the 87 pools (24%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 87 pool tail-outs measured, 7 had a value of 1 (8%); 25 had a value of 2 (29%); 24 had a value of 3 (28%); 12 had a value of 4 (14%); and 19 had a value of 5 (22%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 21, flatwater habitat types had a mean shelter rating of 13, and pool habitats had a mean shelter rating of 39 (Table 1). Of the pool types, scour pools had the highest mean shelter rating at 41. Main channel pools had a mean shelter rating of 39 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Rice Creek. Graph 7 describes the pool cover in Rice Creek. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 64% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 24%.

The mean percent canopy density for the surveyed length of Rice Creek was 82%. The mean percentages of deciduous and coniferous trees were 13% and 87%, respectively. Graph 9 describes the mean percent canopy in Rice Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 53%. The mean percent left bank vegetated was 61%. The dominant elements composing the structure of the stream banks consisted of 3% bedrock, 7% boulder, 47% cobble/gravel, and 43% sand/silt/clay (Graph 10). Coniferous trees were the dominant vegetation type observed in 67% of the units surveyed. Additionally, 23% of the units surveyed had grass as the dominant vegetation type, and 8% had deciduous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Young of year salmonids were detected using streambank observation techniques during the Rice Creek stream survey.

DISCUSSION

Rice Creek is a F4 channel type for the entire 9,351 feet of stream surveyed. The suitability of F4 channel type for fish habitat improvement structures is as follows: F4 channel types are good for bank placed boulders, fair for plunge weirs, single opposing wing deflectors, channel constrictors, and log cover

The water temperatures recorded on the survey days August 12 through August 14, 2002 ranged from 57 to 68 degrees Fahrenheit. Air temperatures ranged from 63 to 93 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 60° F, if sustained, is near the threshold stress level for salmonids. 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 56% of the total length of this survey, riffles 10%, pools 19%, and dry 16%. The pools are relatively shallow, with 21 of the 87 (15%) pools having a maximum 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 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.

Thirty-two of the 87 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty-six of the pool tail-outs had embeddedness ratings of 3 or 4. Nineteen 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 Rice Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Seventy-seven of the 87 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good spawning salmonids.

The mean shelter rating for pools was 39. The shelter rating in the flatwater habitats was 13. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in all habitat types. Additionally, small woody debris contributes a small amount. 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 82%. In general, revegetation projects are

considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 53% and 61%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Rice Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the suitable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) 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.

4) Increase woody cover in the pools and flatwater habitat units. Much of the existing cover is from large woody debris. Adding high quality complexity with log and root wad cover is desirable.

5) 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.

6) 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.

7) Increase the canopy on Rice Creek by planting 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.

8) Suitable size spawning substrate on Rice Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

9) There are several log debris accumulations present on Rice Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

10) There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives should be explored with the grazier and developed if possible.

11) Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

COMMENTS AND LANDMARKS

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

0'	BEGIN SURVEY 35 FEET FROM THE CONFLUENCE WITH BIG RIVER. THE CHANNEL TYPE IS AN F4. WET CROSSING IN THE CHANNEL.
91'	SALMONIDS NOTED
137'	YEARLING STEELHEAD. 7 PIECES OF LWD IN THE CHANNEL CAUSING LITTLE SCOUR. NOT RETAINING SEDIMENT.
231'	LARGE DOUGLAS FIR ROOTMASS EXTENDING OVER CHANNEL AND CAUSING SCOUR.
1019',	4 PIECES OF LARGE WOOD IN CHANNEL. OLD ROAD ON RIGHT BANK APPEARS TO BE ERODING.
1389'	LARGE BOULDERS IN CHANNEL. GRADIENT INCREASES.
1556'	CUT FIREWOOD ON THE LEFT BANK, 10 TO 15 PIECES OF LWD IN CHANNEL CAUSING LOG JAM AND RETAINING GRAVEL BEHIND IT.
1790'	GRADIENT HAS LEVELED OFF BUT NO FISH SEEN.
1895'	UNIDENTIFIED FROG.
1952'	2 STEELHEAD YEARLINGS, 2 YEAR PLUS. WILLOWS GROWING IN WATER
2032'	DRY RIGHT BANK TRIBUTARY.
2250'	DOWNED REDWOOD ACROSS CHANNEL BUT 6 FEET ABOVE WATER SURFACE.
2331'	THREE FOOT PLUNGE INTO POOL.
2341'	WET CROSSING.

2603' CHANNEL TYPE TAKEN - F4

3893' RIGHT BANK TRIBUTARY. DRY, 2 FOOT DIAMETER CULVERT WITH A HIGH GRADIENT UP TO CULVERT.

3933' LARGE WOODY DEBRIS WITH SMALL WOODY DEBRIS PILE AT TOP OF UNIT, WITH SEDIMENT PILE AT THE TOP. WATER SEEPING THROUGH.

3963' OLD CABLE IN POOL

4102' LARGE WOODY DEBRIS (LWD) PILE 17 FEET LONG, 15 WIDE, AND 8 FEET HIGH. POTENTIAL BARRIER.

4407' STEELHEAD, YEARLING PLUS.

4476' NINE PIECES OF LWD WITH SMALL WOODY DEBRIS (SWD). VERY GOOD SHELTER.

4528' POSSIBLE MAN MADE WATER BAR INTO THE CREEK. BOULDERS ON BANK.

4553' CREEK FOLLOWS ALONG THE ROAD

4569' LWD PILE; SIX FEET HIGH 18 FEET LONG 20 FEET WIDE.

4708' MASS OF ROOTS ABOVE POOL.

4727' 10 TO 15 LARGE LOGS IN CHANNEL.

4795' LAYER OF SEDIMENT COVERING SUBSTRATE IN POOL.

4811' LWD PILE 25 FEET LONG 35 FEET WIDE 10 FEET HIGH.

5015' BIG LWD PILE AT TOP OF POOL, POTENTIAL BARRIER 18 FEET WIDE 13 FEET HIGH AND 25 FEET LONG. HUGE SUBSTRATE PILES WITHIN THE LOGS AND SMALL WOODY DEBRIS. SUBSTRATE PILE ATOP 13 FOOT ELEVATION CHANGE AND DRY CHANNEL ATOP OF LWD PILE.

5193' DRY LEFT BANK TRIBUTARY.

5240' LWD PILE ASSOCIATED WITH SWD. 15 FEET WIDE, 3 FEET HIGH, AND 10 FEET LONG. GREAT SHELTER.

5369' THREE LOGS CABLED TO THE RIGHT BANK. ROAD ABOVE THE LOGS.

5434' RESIDENT STEELHEAD.

5449' WET CROSSING.

5553' LOG AND ROOT ENHANCED POOL BUT POOL IS GREATER THAN 60% OF THE WETTED WIDTH.

5678' UNDERCUT BANK OF 4 FEET IN SOME SECTIONS. LWD AT THE TOP MAKING A 5 FOOT PLUNGE. SUBSTRATE PILED BEHIND THE LWD PILE.

5778' 3 FOOT PLUNGE.

5884' TWO SMALL POOLS WITH EXPOSED SUBSTRATE BETWEEN THEM.

6018' THERE IS A 2 FOOT PLUNGE OVER A LOG. SUBSTRATE PILED AT THE TOP OF THE LOG.

6134' ONE PIECE OF LARGE WOOD IN THE WATER.

6295' PILE OF LWD AT THE TOP OF THE UNIT. 8 FEET HIGH BUT NOT STOPPING THE FLOW. 10 PIECES OF LWD.

6316' A LOT OF SLASH ON THE BANKS AND IN CHANNEL. RELATIVELY LITTLE CANOPY.

6368' SUBSURFACE FLOW. CHANNEL IS SILT CLAY BUT MORE LIKE A FLOODPLAIN OVERGROWN WITH HUCKELBERRY AND GRASS IN CHANNEL. MAY BE A PROBLEM FOR SALMONIDS MIGRATING UPSTREAM BECAUSE WE CAN HEAR FLOW GOING UNDER LOGS AND SLASH ON LEFT BANK. BUT GRASS IS GROWING

6420' NOT SURVEYED - MARSHY STAGNENT POND ABOUT 15 FEET WIDE. CANNOT SEE THE BOTTOM. LOGS FLOATING. BANKS ARE A CLAY MATERIAL.

6510' CONTINUATION OF THE POND BUT MEASURABLE AND VISIBLE TO THE BOTTOM. 4 PIECES OF LWD PROVIDING SHELTER.

6555' ONE STEELHEAD YOY AND MANY NEWTS.

6649' LEFT BANK EROSION CAUSING TREE TO FALL INTO CHANNEL.

6743' RING OF REDWOOD TREES HAS FALLEN FROM THE RIGHT BANK ACROSS THE CHANNEL AT THE TOP OF THE UNIT. 2 TO 3 OTHER PIECES OF LWD ALSO IN THE CHANNEL.

6849' PLUNGE OVER ROOTS.

6860' GRADIENT INCREASES ABOUT 3 FEET IN 5 FOOT SECTION.

6865' TWO PIECES OF LWD BLOCKING THE CHANNEL.

6887' VERY SWAMPY.

6901' WET CROSSING.

6991' RIGHT BANK TRIBUTARY. FLOWING SLIGHTLY.

6999' FLOW REDUCED BEYOND TRIBUTARY. VERY OVERGROWN,FERNS AND HORSETAIL.

7039' DRY CHANNEL, VERY ENTRENCHED.

7177' STEELHEAD YOY.

7213' LWD. ABOUT 10 LOGS VERTICALLY LYING DOWN IN THE CHANNEL.

7363' 3 PIECES OF LWD BLOCKING THE CHANNEL AND RETAINING GRAVEL

7383' LARGE PILE OF LOGS RETAINING GRAVEL. DEBRIS JAMS SOMETIMES COVERING ENTIRE CHANNEL.

7785' SEVERAL PACIFIC GIANT SALAMANDERS IN POOL.

7921' LARGE LWD JAM, RETAINING A LOT OF GRAVEL ABOVE IT. 3 TO 4 FOOT JUMP ABOVE THE LOG JAM.

8092' 6 PIECES OF LWD CAUSING POOL AND RETAINING SOME GRAVEL ABOVE.

8108' SUBSURFACE FLOW.

8201' ABOUT A 5% GRADIENT INCREASE AT THE BEGINNING OF THE UNIT. 5 LOGS WITHIN THE CHANNEL. RISES ABOUT 12 FEET IN 20 FEET OF DISTANCE . RETAINING GRAVEL AT TOP.

8323' 1 PIECE OF LWD. BLOCKING CHANNEL AND RETAINING 1 FOOT OF GRAVEL.

8445' 2 PIECES OF LWD IN CHANNEL.

8682' DRY RIGHT BANK TRIBUTARY.

8762' 6 LOGS IN CHANNEL RETAINING GRAVEL.

8792' DRY LEFT BANK TRIBUTARY.

8842' MANY LOGS IN CHANNEL, NOT RETAINING SEDIMENT.

8960' ABOUT 20 LOGS IN CHANNEL. GRADIENT BEGINNING TO INCREASE.

9201' 4 PIECES OF LWD IN THE CHANNEL.

9342' END OF SURVEY. BELIEVED TO BE THE END OF ANADROMY. PASSED OVER MULTIPLE LOG JAMS THAT WERE POTENTIAL BARRIERS. LARGE SECTIONS OF DRY CHANNEL FOLLOWED BY SMALL POOLS OR RIFFLES. GRADIENT WAS BEGINNING TO INCREASE AND THE SURVEY WAS ENDED.

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.

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: RICE CREEK
SAMPLE DATES: 08/12/02 to 08/14/02
STREAM LENGTH: 9351 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: GREENOUGHR — Latitude: 39°29'57"
Legal Description: T17NR14WS27 — Longitude: 123°40'12"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: F4	Canopy Density: 82%
Channel Length: 9261 ft.	Coniferous Component: 87%
Riffle/flatwater Mean Width: 5 ft.	Deciduous Component: 13%
Total Pool Mean Depth: 0.8 ft.	Pools by Stream Length: 19%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 7%
Water: 057- 068°F Air: 063-093°F	Mean Pool Shelter Rtn: 39
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Large Woody Debris
Vegetative Cover: 60%	Occurrence of LOD: 30%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 1451 ft.

Embeddness Value: 1. 8% 2.29% 3. 28% 4. 14% 5. 22%

RICE CREEK — Drainage: BIG RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 08/12/02 to 08/14/02

Confluence Location: QUAD: GREENOUGHR LEGAL DESCRIPTION: T17NR14WS27 LATITUDE:39°29'57" LONGITUDE:123°40'12"

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
29	4	RIFFLE	14	32	936	10	4.8	0.3	71	2054	15	448	0	21
69	10	FLATWATER	33	75	5149	56	5.2	0.3	191	13172	69	4763	0	13
87	87	POOL	42	20	1725	19	7.9	0.8	158	13767	134	11628	97	39
23	1	DRY	11	63	1451	16	2.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
208	102	9261	28993	16840

RICE CREEK

Drainage: BIG RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/12/02 to 08/14/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17NR14WS27 LATITUDE:39°29'57" LONGITUDE:123°40'12"

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 %
27	3	LGR	13	34	916	10	4	0.2	0.4	80	2172	12	329	0	2	84
2	1	HGR	1	10	20	0	7	0.6	1.3	42	84	25	50	0	80	79
2	2	GLD	1	27	54	1	7	0.5	1.1	173	345	92	184	0	15	57
12	5	RUN	6	38	457	5	5	0.3	1.8	185	2217	74	890	0	11	82
55	3	SRN	26	84	4638	50	5	0.2	0.7	213	11737	45	2490	0	15	85
61	61	MCP	29	20	1202	13	8	0.7	4.2	158	9613	130	7930	94	39	80
5	5	CRP	2	23	117	1	8	0.6	2.9	193	963	126	628	93	31	72
8	8	LSL	4	24	194	2	7	0.8	2.6	172	1373	146	1165	105	38	86
3	3	LSR	1	19	58	1	6	0.6	1.6	117	352	77	231	40	85	88
2	2	LSBk	1	22	44	0	6	0.8	1.8	134	268	106	211	84	8	85
8	8	PLP	4	14	110	1	10	1.1	3.4	150	1198	183	1463	139	43	74
23	1	DRY	11	63	1451	16	2	0.0	0.0	0	0	0	0	0	0	88

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
208	102	9261	30322	15572

RICE CREEK — Drainage: BIG RIVER

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 08/12/02 to 08/14/02

Confluence Location: QUAD: GREENOUGHR LEGAL DESCRIPTION: T17NR14WS27 LATITUDE:39°29'57" LONGITUDE:123°40'12"

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
61	61	MAIN	70	20	1202	70	7.8	0.7	158	9613	130	7930	94	39
26	26	SCOUR	30	20	523	30	8.1	0.8	160	4154	142	3698	104	41

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
87	87	1725	13767	11628

RICE CREEK Drainage: BIG RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES Survey Dates: 08/12/02 to 08/14/02

Confluence LocLocation: QUAD: GREENOUGHR LEGAL DESCRIPTION: T17NR14WS27 LATITUDE:39°29'57" LONGITUDE:123°40'12"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
61	MCP	70	2	3	48	79	8	13	2	3	1	2
5	CRP	6	0	0	2	40	3	60	0	0	0	0
8	LSL	9	1	13	6	75	1	13	0	0	0	0
3	LSR	3	0	0	3	100	0	0	0	0	0	0
2	LSBk	2	0	0	2	100	0	0	0	0	0	0
8	PLP	9	0	0	2	25	3	38	3	38	0	0

TOTAL UNITS
87

RICE CREEK — Drainage: BIG RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 08/12/02 to 08/14/02

Confluence Location: QUAD: GREENOUGHR LEGAL DESCRIPTION: T17NR14WS27 LATITUDE:39°29'57" LONGITUDE:123°40'12"

UNITS MEASURED	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
27	2	LGR	0	45	0	0	0	0	0	5	0
2	1	HGR	0	10	0	0	0	0	20	70	0
2	2	GLD	8	0	0	0	55	38	0	0	0
12	4	RUN	18	23	0	3	25	10	0	23	0
55	3	SRN	13	3	20	0	10	10	5	5	0
61	61	MCP	11	23	33	3	11	3	1	11	3
5	5	CRP	32	18	18	0	16	10	0	6	0
8	8	LSL	11	23	53	4	6	0	0	0	0
3	3	LSR	13	7	57	23	0	0	0	0	0
2	2	LSBk	0	20	0	0	10	0	0	50	20
8	8	PLP	17	23	26	17	3	3	6	3	3
23	1	DRY	0	0	0	0	0	0	0	0	0

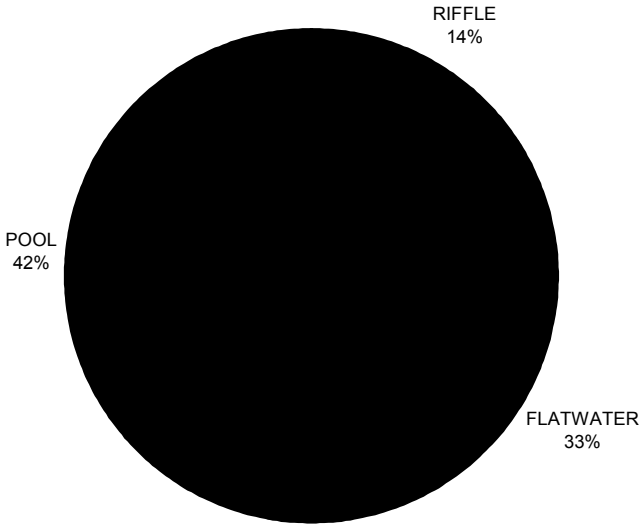
RICE CREEK Drainage: BIG RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 08/12/02 to 08/14/02

Confluence Location: QUAD: GREENOUGHR LEGAL DESCRIPTION: T17NR14WS27 LATITUDE:39°29'57" LONGITUDE:123°40'12"

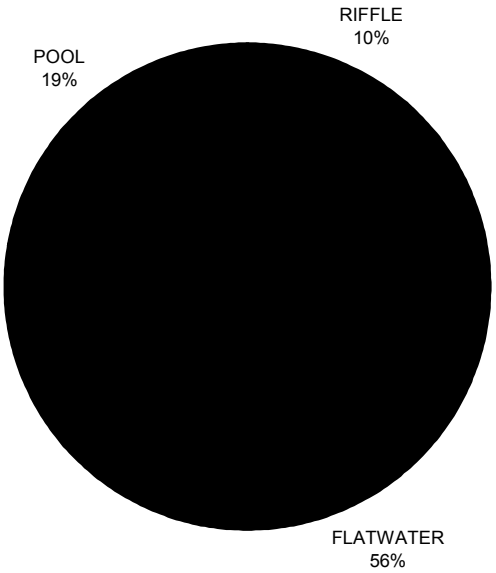
TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
27	3	LGR	0	0	67	0	33	0	0
2	1	HGR	0	0	0	0	0	100	0
2	2	GLD	0	0	100	0	0	0	0
12	5	RUN	0	20	80	0	0	0	0
55	3	SRN	0	0	100	0	0	0	0
61	9	MCP	11	44	33	0	0	11	0
5	2	CRP	0	0	100	0	0	0	0
8	3	LSL	33	0	33	0	33	0	0
3	1	LSR	0	100	0	0	0	0	0
2	0	LSBk	0	0	0	0	0	0	0
8	1	PLP	0	0	100	0	0	0	0
23	1	DRY	0	0	100	0	0	0	0

RICE CREEK
HABITAT TYPES BY PERCENT OCCURENCE



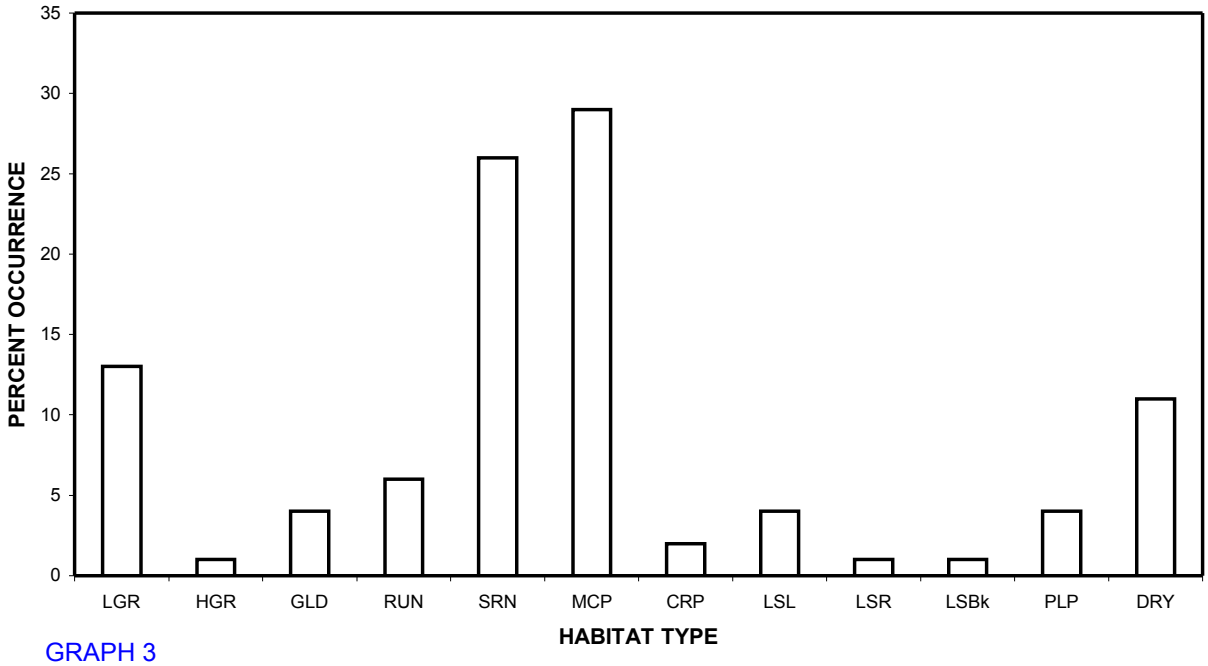
GRAPH 1

RICE CREEK
HABITAT TYPES BY PERCENT TOTAL LENGTH



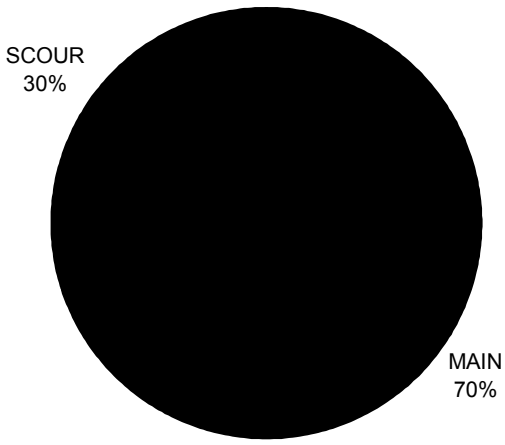
GRAPH 2

RICE CREEK
HABITAT TYPES BY PERCENT OCCURRENCE



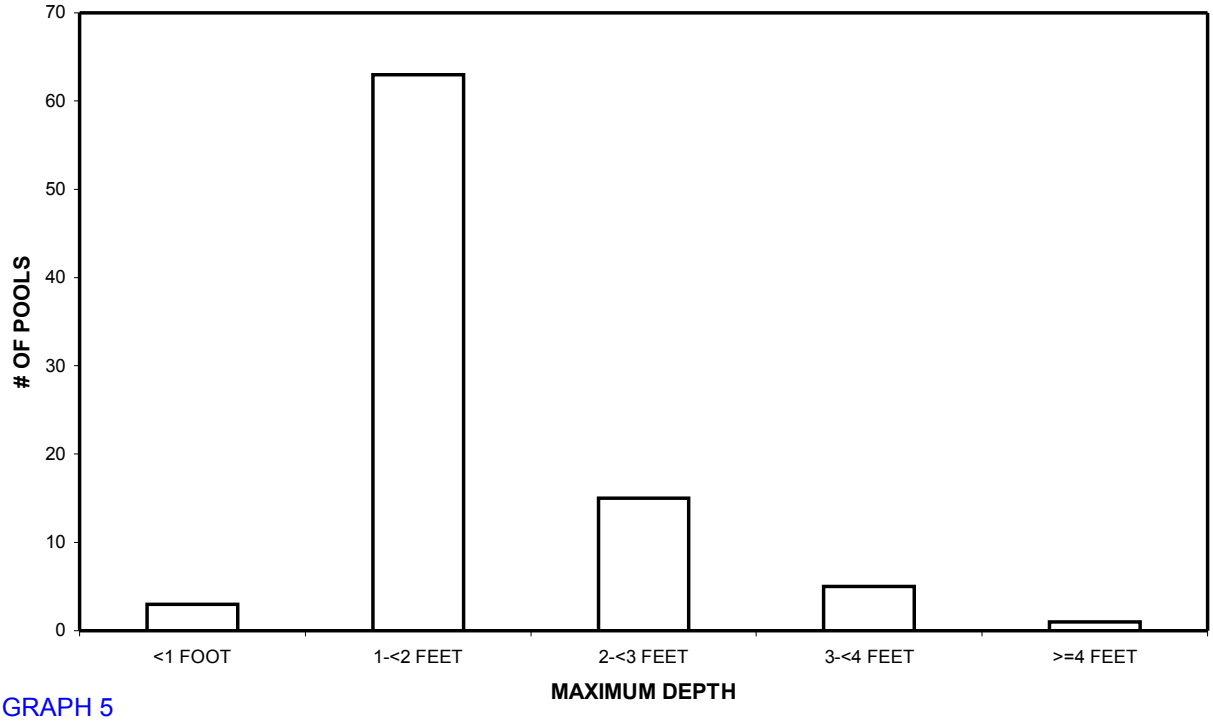
GRAPH 3

RICE CREEK
POOL HABITAT TYPES BY PERCENT OCCURRENCE



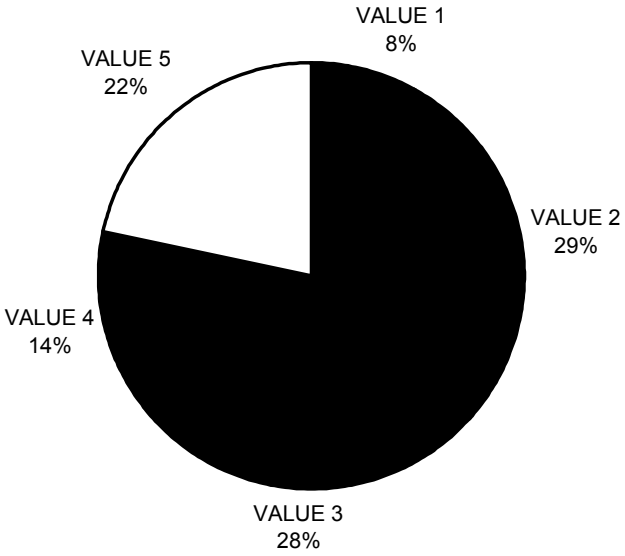
GRAPH 4

RICE CREEK
MAXIMUM DEPTH IN POOLS



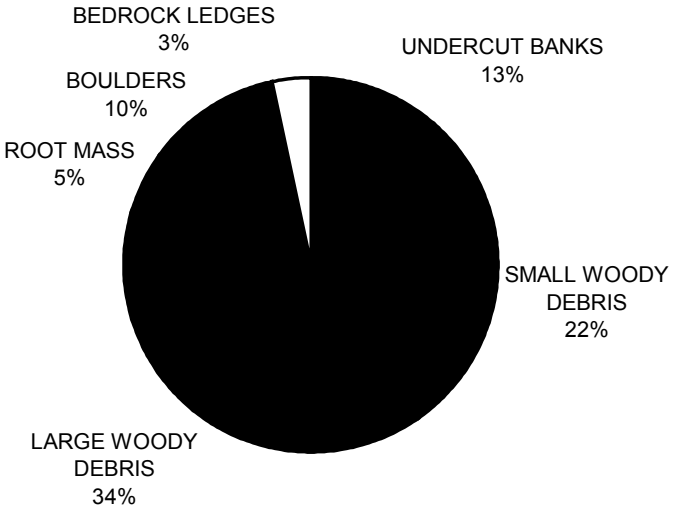
GRAPH 5

RICE CREEK
PERCENT EMBEDDEDNESS



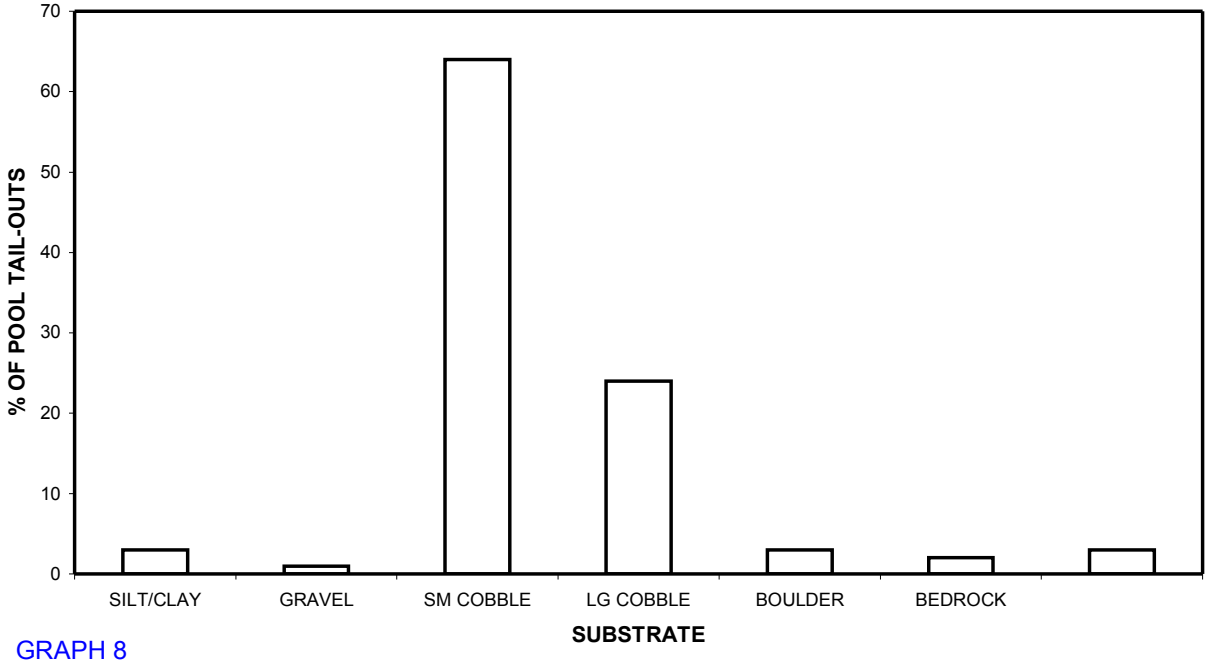
GRAPH 6

RICE CREEK
MEAN PERCENT COVER TYPES IN POOLS



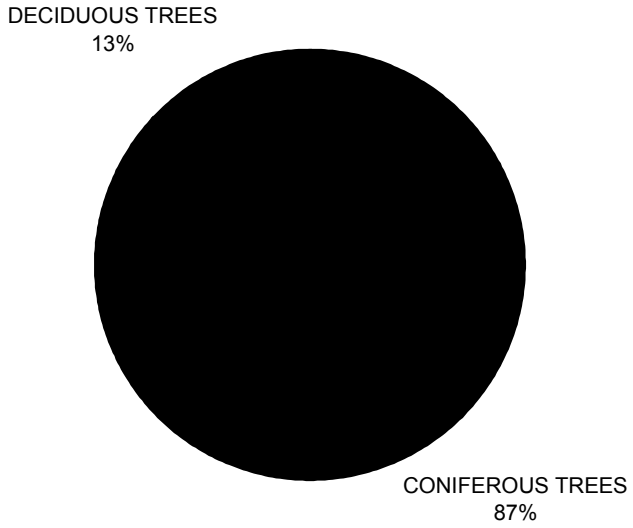
GRAPH 7

RICE CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



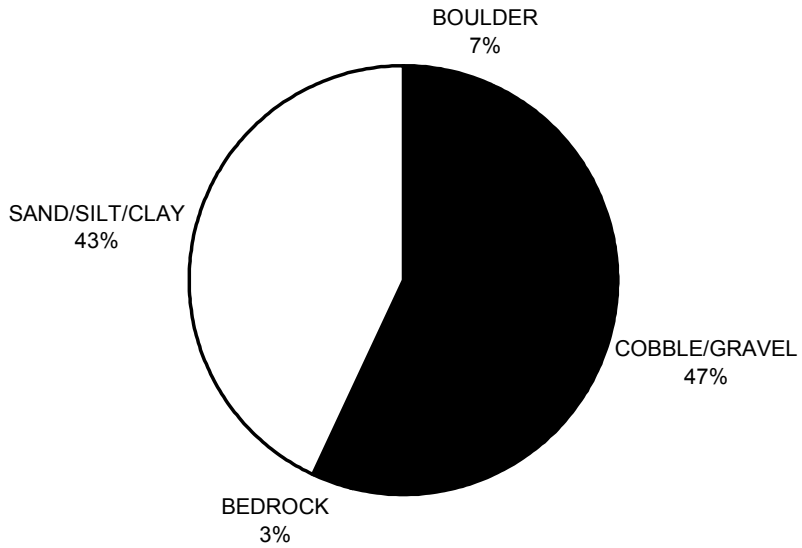
GRAPH 8

RICE CREEK
MEAN PERCENT CANOPY



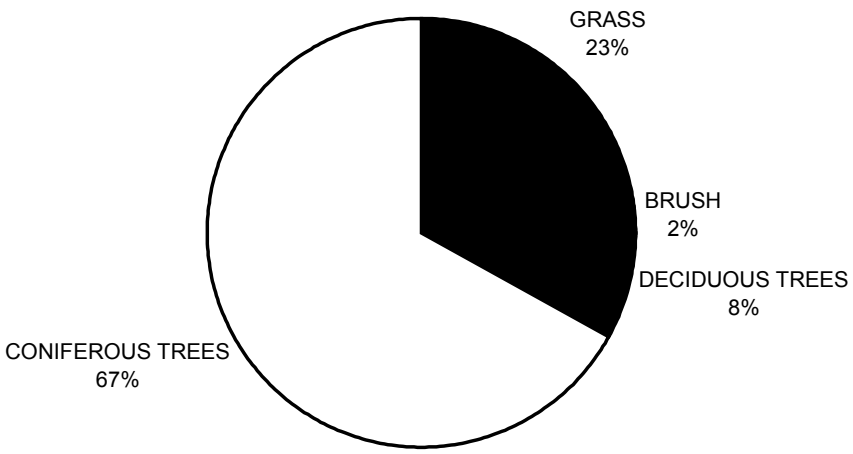
GRAPH 9

RICE CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

RICE CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11