CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Rincon Creek

Assessment Completed 1999
Report Completed April 14, 2006

INTRODUCTION

A stream inventory was conducted during 6/15/1999 to 6/21/1999 on Brush/Rincon Creek. The survey began at the confluence with Santa Rosa Creek and extended upstream 2.9 miles. Stream inventory and report were completed for Brush/Rincon Creek.

The Brush/Rincon 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 Brush/Rincon 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

Brush/Rincon Creek is a tributary to Santa Rosa Creek, is a tributary to Mark West Creek, is a tributary to Russian River, is a tributary to Pacific Ocean, located in Sonoma County, California (Map 1). Brush/Rincon Creek's legal description at the confluence with Santa Rosa Creek is T007 R007 S18. Its location is 38.4525322 north latitude and 122.6761154 west longitude, LLID number 1226760384524. Brush/Rincon Creek is a third order stream and has approximately 4.11 miles of blue line stream according to the USGS Mark West Springs 7.5 minute quadrangle. Brush/Rincon Creek drains a watershed of approximately 8.7 square miles. Elevations range from about 220 feet at the mouth of the creek to 531 feet in the headwater areas. Mixed deciduous vegetation dominates the watershed. The watershed is primarily privately owned rangeland/recreation.

METHODS

The habitat inventory conducted in Brush/Rincon 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 Brush/Rincon 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". Brush/Rincon 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 Brush/Rincon 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 Brush/Rincon 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 Brush/Rincon 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 Brush/Rincon 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.

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 Brush/Rincon Creek.

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 Rincon 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 6/15/1999 to 6/21/1999 was conducted by R. Benkert, and S. Brady. The total length of the stream surveyed was 15,236 feet.

Stream flow was not measured on Brush/Rincon Creek.

Brush/Rincon Creek is a B4 channel type for 3,609.00 feet of the stream surveyed (Reach 1), a F4 channel type for 7,298.00 feet of the stream surveyed (Reach 2), a G4 channel type for 4,329.30 feet of the stream surveyed (Reach 3). F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. G4 channels are entrenched "gully" step-pool channels on moderate gradients with low width /depth ratios and gravel 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.

Water temperatures taken during the survey period ranged from 59 to 82 degrees Fahrenheit. Air temperatures ranged from 64 to 77 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% pool units, 28% riffle units, 6% flatwater units, 9% nosurvey_marsh units, 15% dry units, (Graph 1). Based on total length of Level II habitat types there were 31% pool units, 6% riffle units, 9% flatwater units, 27% nosurvey_marsh units, 26% dry units, (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 26% Low Gradient Riffle units, 25% Mid-Channel Pool units, and 15% Dry units (Graph 3). Based on percent total length, 27% Not Surveyed due to marsh units, 26% Dry units, 18% Mid-Channel Pool units.

A total of 46 pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 63%, and comprised 61% 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. Fourteen of the 34 pools (41%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 42 pool tail-outs measured, 28 had a value of 1 (66.7%); 5 had a value of 2 (11.9%); 2 had a value of 3 (4.8%); 7 had a value of 5 (16.7%) (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, etc…

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 52 , flatwater habitat types had a mean shelter rating of 41 , and pool habitats had a mean shelter rating of 12 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 14, Scour pools had a mean shelter rating of 8, Backwater pools had a mean shelter rating of 15 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Aquatic Vegetation is the dominant cover type in Brush/Rincon Creek. Graph 7 describes the pool cover in Rincon Creek. Root Mass is the dominant pool cover type followed by aquatic vegetation.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Small Cobble was observed in 51% of the pool tail-outs, while gravel observed in 22% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Rincon Creek was 59%. The mean percentages of hardwood and coniferous trees were 80% and 20%, respectively. Forty-one percent of the canopy was open. Graph 9 describes the mean percent canopy in Brush/Rincon Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 73%. The mean percent left bank vegetated was 80%. The dominant elements composing the structure of the stream banks consisted of 6% bedrock, 22% boulder, 44% cobble/gravel, 28% sand/silt/clay, (Graph 10). Deciduous Trees were the dominant vegetation type observed in 56% of the units surveyed. Additionally, 21% of the units surveyed had grass as the dominant vegetation type, and 10% had coniferous trees as the dominant vegetation (Graph 11).

DISCUSSION

Brush/Rincon Creek is a B4 channel type for the first 3,609 feet of stream surveyed and a F4 channel type for the next 7,298 feet and a G4 channel type for the remaining 4,329 feet. The suitability of B4, F4, and G4 channel types for fish habitat improvement structures is as follows: B4 types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, log cover, and single and opposing wing-deflectors. F4 channels are good for bank placed boulders; fair for plunge weirs, channel constrictors, log cover, and single and opposing wing-deflectors; and poor for boulder clusters. G4 channel types are good for bank-placed boulders; fair for plunge weirs, log cover, and opposing wing-deflectors; they are poor for boulder clusters and single wing-deflectors.

The water temperatures recorded on the survey days 6/15/1999 to 6/21/1999, ranged from 59 to 82 degrees Fahrenheit. Air temperatures ranged from 64 to 77 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 9% of the total length of this survey, riffles 6%, and pools 31%. The pools are relatively shallow, with only 14 of the 34 (41%) 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.

Thirty-three of the 42 pool tail-outs measured had embeddedness ratings of 1 or 2. Two of the pool tail-outs had embeddedness ratings of 3 or 4. Seven 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 Rincon Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-three of the 45 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 12. The shelter rating in the flatwater habitats was 41. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Aquatic Vegetation in Brush/Rincon Creek. Root Mass is the dominant cover type in pools followed by aquatic vegetation. 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 59%. Reach 1 had a canopy density of 18%, Reach 2 had a canopy density of 75.62%, Reach 3 had a canopy density of 74.87%. 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 73% and 80%, 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 RECOMMENDATIONS

Rincon 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. All road crossings should be assessed and evaluated for fish passage along Brush / Rincon Creek. Where necessary structure replacement or modification should be recommended to allow for better fish passage.

2. Increase the canopy on Rincon 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.

3. Brush / Rincon Creek would benefit from the utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.

4. Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from root masses. Adding high quality complexity with woody cover is desirable.

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.

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.

Position (ft.)	Habitat Unit #	Comments:
0	1	Start of Survey: Confluence with Santa Rosa Creek

111	2	General Comment: Ten Roach
111	2	Fish Passage: ()
270	4	General Comment: Ten Roach
300	5	General Comment: Cattails growing across channel
322	6	General Comment: 10 suckers, 15 sunfish and 1 5" RBT
322	6	Structures: Foot bridge #1 at 158'
874	8	General Comment: Twenty roach
1020	10	General Comment: Thirty roach
1268	13	Structures: Highway 12 bridge at 96' (#2)
1268	13	Fish Passage: (Culvert) at 58'
1792	18	General Comment: Weed choked channel
1792	18	Fish Passage: (Culvert) at 158'
2087	19	General Comment: 100's of roach
2314	21	General Comment: 7 8' sucker, 1 sunfish, 100's of roach
2314	21	Fish Passage: (Culvert) at 20', 3" culvert every 30'
2699	22	Fish Passage: (Culvert) at 16'
2727	23	General Comment: 100's of roach, 16 sunfish
2727	23	Fish Passage: (Culvert) at 104' and 110'
2857	24	General Comment: 100's of Roach
2857	24	Fish Passage: (Culvert) at 111'
3139	25	Fish Passage: (Culvert) at 187'
3345	26	Fish Passage: (Culvert) at 18'
3708	29	Fish Passage: (Culvert)
3850	30	General Comment: weed choked channel
3850	30	Fish Passage: (Culvert) Three at 148' (RB), 177' (LB), and 504' (RB)
4829	32	General Comment: End of day one, approx. 500 frogs
4829	32	Tributaries: at 380' Austin creek enters on left bank
4829	32	Fish Passage: (Culvert) at 298' on theright bank
5405	33	General Comment: riprap banks and algae mats
5483	34	General Comment: algae mat
5503	35	General Comment: stagnant water, covered 100% by algae mat
5848	37	General Comment: covered 100% by algae mat
5999	38	Structures: foot bridge at 423'
6183	39	General Comment: covered by algae mat
6608	40	General Comment: all cover is algae mat
7852	43	Structures: bridge, Monteuto Drive
8289	44	Tributaries: Confluence with east fork on left bank at 146'
8740	46	General Comment: concrete-like rock
8771	47	Structures: Bridge: Bridgewood Dr.

9237	50	General Comment: Re-Flag
9344	52	General Comment: skunk on left bank
9371	53	General Comment: eroded left bank at 62'
9490	55	General Comment: 3 roach
9879	63	General Comment: deer in channel
10012	64	General Comment: 10 roach
10579	77	General Comment: boulders are rip-rap
10715	79	Fish Passage: (Culvert) at 39' on right bank
11055	85	General Comment: 100's of tadpoles
11381.3	91	Fish Passage: (Culvert) 48' up right bank
12277.3	102	General Comment: 8" by-pass pipe begins for construction, upstream 8" pipe runs out of 24" culvert
12277.3	102	Fish Passage: (Dam) Coffer dam at 143' with 24" culvert running through it
12913.3	104	General Comment: New rip-rap on right bank, channel disturbed by heavy equipment
13490.3	106	Structures: New Bridge at 800'
13490.3	106	Fish Passage: (Culvert) New on left bank at 16'
13694.3	107	General Comment: water temp 61 degrees, no fish observed
13906.3	110	Structures: Bridge at 112', cross fenced at 173' an 877'
15236.3	110	End of Survey: Ended at 3915 Wallace Road

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.

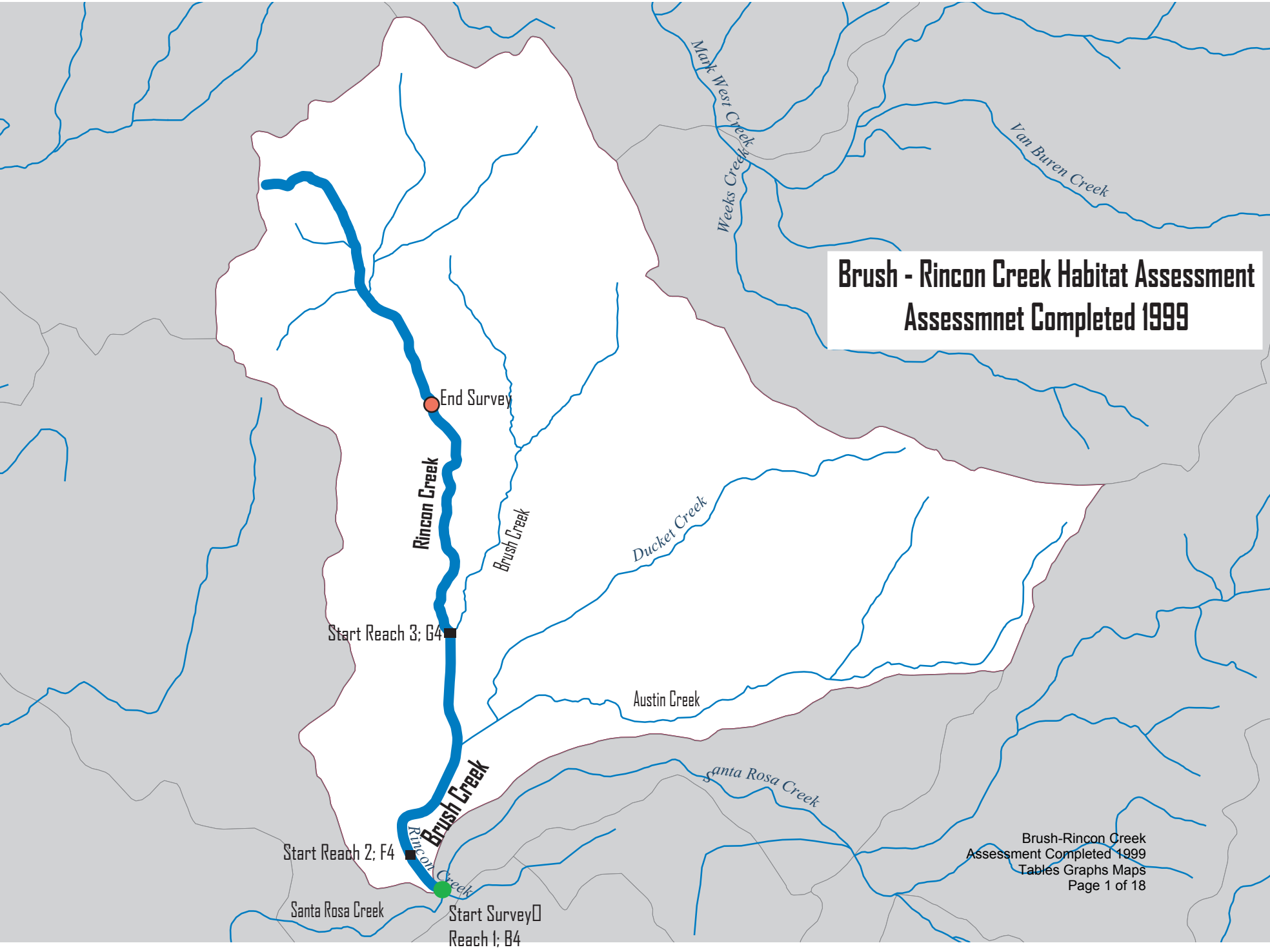
Brush - Rincon Creek Habitat Assessment
Assessmnet Completed 1999
End Survey
Rincon Creek
Brush Creek
Start Reach 3; G4
Start Reach 2; F4
Start Survey
Reach 1; B4
Santa Rosa Creek
Rincon Creek
Brush Creek
Austin Creek
Ducket Creek
anta Rosa Creek
Weeks Creek
Mark West Creek
Van Buren Creek
Brush-Rincon Creek
Assessment Completed 1999
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Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0

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
16	0	DRY	14.5	250	4000.3	26.3									
7	7	FLATWATER	6.4	201	1405	9.2	10.3	0.6	1.0	2272	15904	1407	9846		41
10	4	NOSURVEY_	9.1	416	4164	27.3	22.5	0.6	1.0	9560	95595	5904	59036		90
46	46	POOL	41.8	102	4687	30.8	11.2	0.9	1.9	1530	70378	2600	88399	2192	12
31	31	RIFFLE	28.2	32	980	6.4	4.9	0.2	0.3	170	5267	33	1017		52

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
110	88	15236.3	187144	158298

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

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 (%)
29	29	LGR	26.4	32	921	6.0	4	0.2	0.6	160	4649	33	955		52	73
2	2	BRS	1.8	30	59	0.4	10	0.1	0.3	309	618	31	62			5
7	7	GLD	6.4	201	1405	9.2	10	0.6	1.3	2272	15904	1407	9846		41	10
28	28	MCP	25.5	99	2767	18.2	12	0.9	3.6	1626	45536	2614	57516	2141	15	57
1	1	STP	0.9	111	111	0.7	4	0.3	1.1	431	431	172	172	129	1	50
4	4	CRP	3.6	178	712	4.7	15	1.1	2.8	3109	12438	4669	14007	4023	8	57
8	8	LSR	7.3	67	537	3.5	8	0.6	2.7	565	4516	502	3014	434	7	95
4	4	LSBo	3.6	73	293	1.9	8	0.4	1.4	730	2918	980	980	784	8	52
1	1	DPL	0.9	267	267	1.8	17	2.6	4.3	4539	4539	12709	12709	11801	15	0
16	0	DRY	14.5	250	4000	26.3										
10	4	MAR	9.1	416	4164	27.3	22	0.6	1.4	9560	95595	5904	59036		90	0

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
110	88	15236.3	187144	158298

Table 3 - Summary of Pool Types

Stream Name: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

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
29	29	MAIN	63	99	2878	61	11.8	0.8	1585	45967	2049	45086	14
16	16	SCOUR	35	96	1542	33	9.9	0.7	1242	19872	1546	15457	8
1	1	BACKWATER	2	267	267	6	17.0	2.6	4539	4539	11801	11801	15

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
46	46	4687	70378	72344

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

Stream Name: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

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
22	MCP	65	4	18	8	36	8	36	2	9	0	0
1	STP	3	0	0	1	100	0	0	0	0	0	0
3	CRP	9	0	0	1	33	2	67	0	0	0	0
6	LSR	18	1	17	4	67	1	17	0	0	0	0
1	LSBo	3	0	0	1	100	0	0	0	0	0	0
1	DPL	3	0	0	0	0	0	0	0	0	1	100

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
34	5	15	15	44	11	32	2	6	1	3

Mean Maximum Residual Pool Depth (ft.): 1.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999 Dry Units: 16

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

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
29	12	LGR	0	8	0	0	8	69	0	14	0
2	0	BRS									
31	12	TOTAL RIFFLE	0	8	0	0	8	69	0	14	0
7	6	GLD	0	0	0	0	0	98	0	2	0
7	6	TOTAL FLAT	0	0	0	0	0	98	0	2	0
28	26	MCP	8	9	0	20	13	30	8	10	3
1	1	STP	0	0	0	0	100	0	0	0	0
4	4	CRP	0	0	0	29	6	5	0	40	20
8	8	LSR	9	14	0	78	0	0	0	0	0
4	4	LSBo	0	0	0	0	10	15	25	50	0
1	1	DPL	20	5	5	50	20	0	0	0	0
46	44	TOTAL POOL	7	8	0	30	12	19	7	14	3
10	4	MAR	0	0	0	0	0	100	0	0	0
110	66	TOTAL	4	7	0	20	9	41	5	12	2

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999 Dry Units: 16

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

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
29	4	LGR	0	0	0	50	0	0	50
2	1	BRS	0	0	0	0	0	0	100
7	2	GLD	0	0	50	0	50	0	0
28	27	MCP	0	0	63	22	4	7	4
1	1	STP	0	0	0	0	0	0	100
4	4	CRP	0	0	75	25	0	0	0
8	8	LSR	0	13	38	50	0	0	0
4	4	LSBo	0	0	100	0	0	0	0
1	1	DPL	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
59	20	80	10	73	80

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: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

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	4	2	5.7
Boulder	11	12	21.7
Cobble / Gravel	22	25	44.3
Sand / Silt / Clay	16	14	28.3

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	12	10	20.8
Brush	3	11	13.2
Hardwood Trees	33	26	55.7
Coniferous Trees	5	6	10.4
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	7
SMALL WOODY DEBRIS (%)	8	0	8
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	0	30
TERRESTRIAL VEGETATION (%)	8	0	12
AQUATIC VEGETATION (%)	69	98	19
WHITEWATER (%)	0	0	7
BOULDERS (%)	14	2	14
BEDROCK LEDGES (%)	0	0	3

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Brush/Rincon Creek LLID: 1226760384524 Drainage: Russian River - Middle

Survey Dates: 6/15/1999 to 6/21/1999 Survey Length (ft.): 15236.3 Main Channel (ft.): 15236.3 Side Channel (ft.): 0

Confluence Location: Quad: MARK WEST Legal Description: T000R000S00 Latitude: 38:27:09.0N Longitude: 122:40:34.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: B4
Reach Length (ft.): 3609
Riffle/Flatwater Mean Width (ft.): 8.4
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs.): 0.0
Water (F): 71 - 76 Air (F): 75 - 77
Dry Channel (ft): 0

Canopy Density (%): 18.0
Coniferous Component (%): 13.8
Hardwood Component (%): 86.3
Dominant Bank Vegetation: Grass
Vegetative Cover (%): 76.2
Dominant Shelter: Aquatic Vegetation
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 0

Pools by Stream Length (%): 59.4
Pool Frequency (%): 46.2
Residual Pool Depth (%):
< 2 Feet Deep: 58
2 to 2.9 Feet Deep: 33
3 to 3.9 Feet Deep: 8
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.9
Mean Pool Shelter Rating: 20

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 33 Sm Cobble: 8 Lg Cobble: 8 Boulder: 8 Bedrock: 42

Embeddedness Values (%): 1. 41.7 2. 16.7 3. 0.0 4. 0.0 5. 41.7

STREAM REACH: 2

Channel Type: F4
Reach Length (ft.): 7298
Riffle/Flatwater Mean Width (ft.): 4.6
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs.): 0.0
Water (F): 59 - 82 Air (F): 64 - 76
Dry Channel (ft): 501

Canopy Density (%): 75.6
Coniferous Component (%): 16.5
Hardwood Component (%): 83.5
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 81.4
Dominant Shelter: Aquatic Vegetation
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 0

Pools by Stream Length (%): 23.6
Pool Frequency (%): 35.7
Residual Pool Depth (%):
< 2 Feet Deep: 55
2 to 2.9 Feet Deep: 35
3 to 3.9 Feet Deep: 5
>= 4 Feet Deep: 5
Mean Max Residual Pool Depth (ft.): 1.9
Mean Pool Shelter Rating: 11

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 30 Sm Cobble: 65 Lg Cobble: 0 Boulder: 0 Bedrock: 5

Embeddedness Values (%): 1. 75.0 2. 10.0 3. 10.0 4. 0.0 5. 5.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: G4
Reach Length (ft.): 4329.3
Riffle/Flatwater Mean Width (ft.): 6.0
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs.): 0.0
Water (F): 60 - 64 Air (F): 67 - 74
Dry Channel (ft): 3499.3

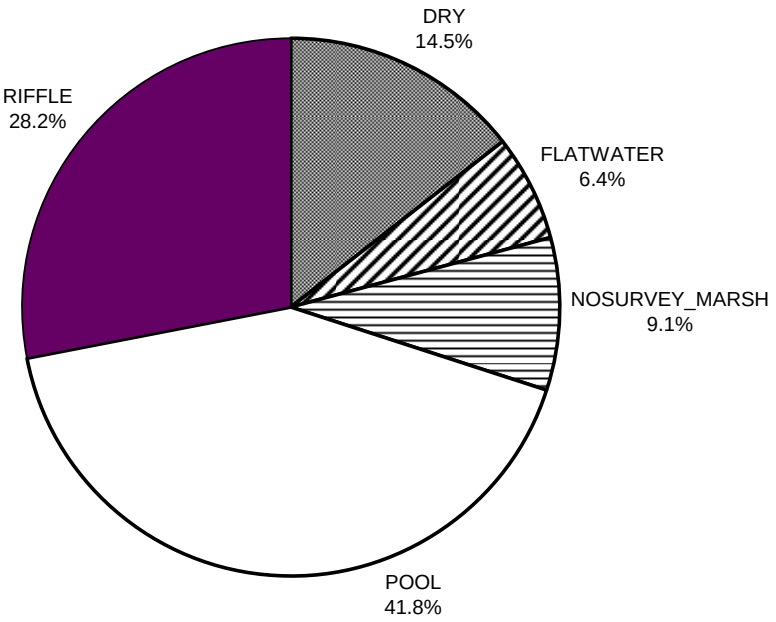
Canopy Density (%): 74.9
Coniferous Component (%): 25.7
Hardwood Component (%): 74.3
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 69.7
Dominant Shelter: Root masses
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 0
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat:

Pools by Stream Length (%): 19.0
Pool Frequency (%): 50.0
Residual Pool Depth (%):
< 2 Feet Deep: 100
2 to 2.9 Feet Deep: 0
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.4
Mean Pool Shelter Rating: 5

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 0 Sm Cobble: 69 Lg Cobble: 23 Boulder: 0 Bedrock: 8

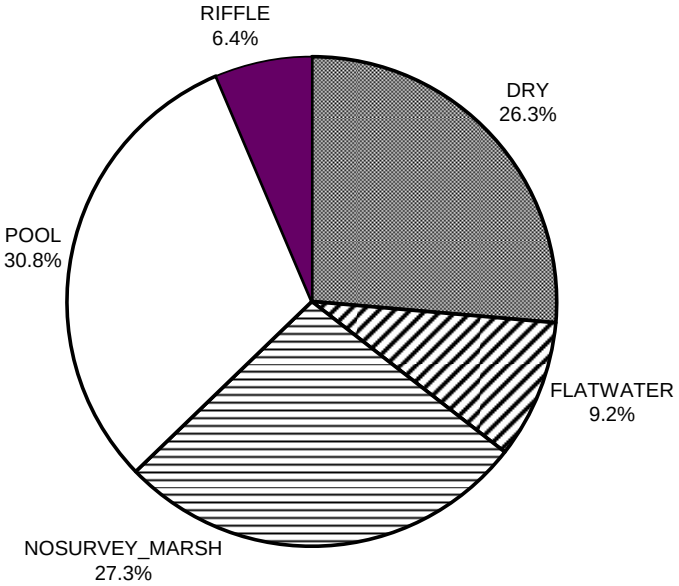
Embeddedness Values (%): 1. 80.0 2. 10.0 3. 0.0 4. 0.0 5. 10.0

RINCON CREEK 1999
HABITAT TYPES BY PERCENT OCCURRENCE



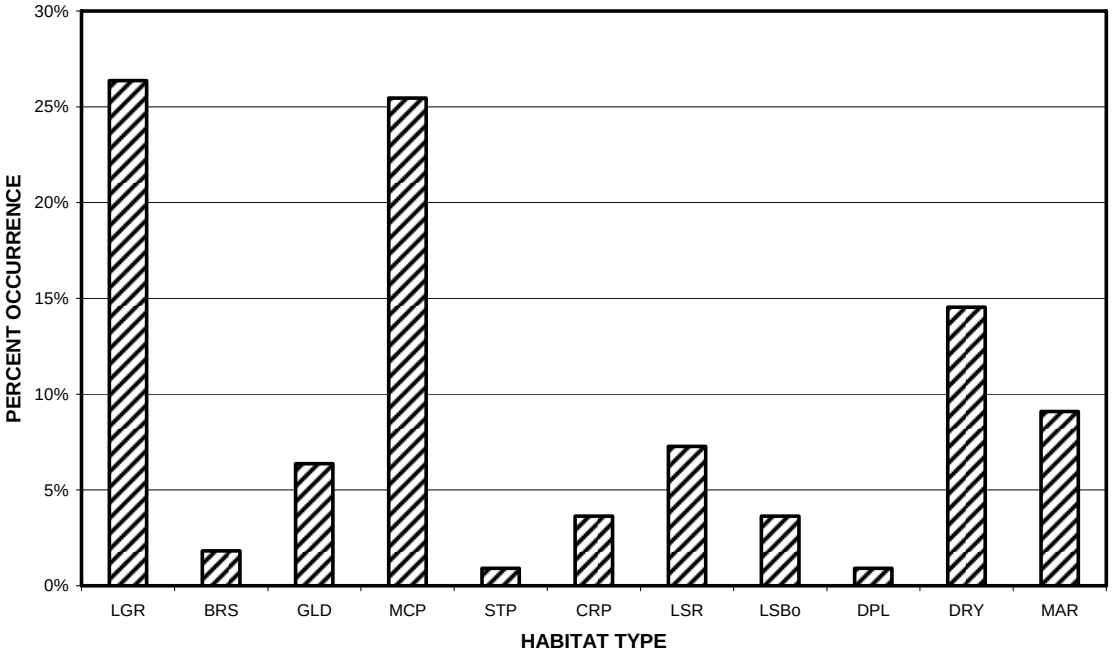
GRAPH 1: Level II Habitat Types By Percent Occurrence

RINCON CREEK 1999
HABITAT TYPES BY PERCENT TOTAL LENGTH



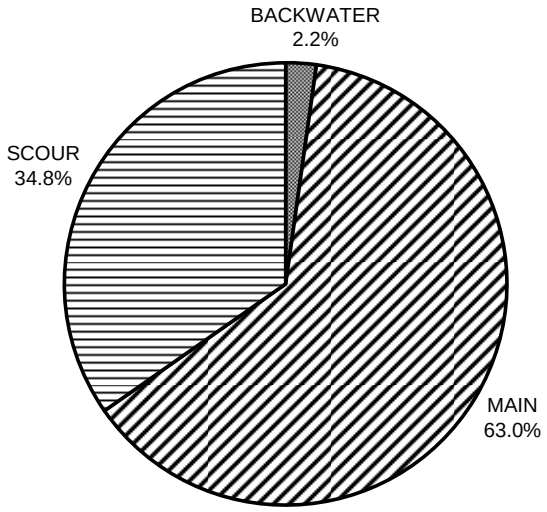
GRAPH 2: Level II Habitat Types By Percent Total Length

RINCON CREEK 1999
HABITAT TYPES BY PERCENT OCCURRENCE



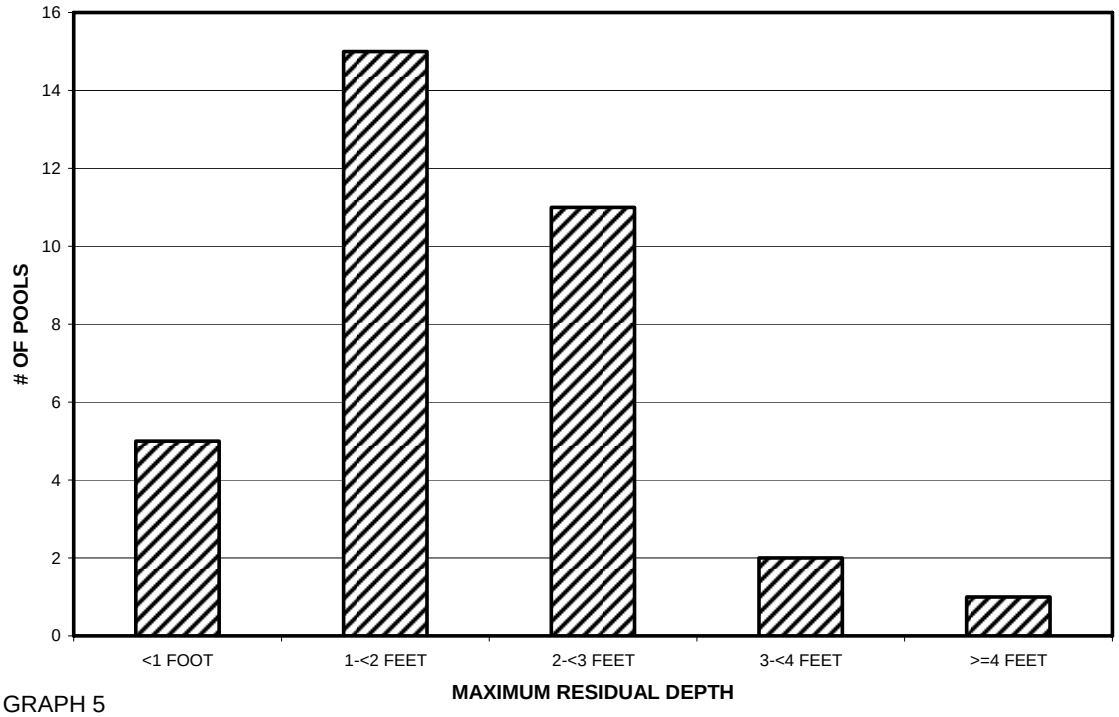
GRAPH 3: Level IV Habitat Types by Percent Occurrence

RINCON CREEK 1999
POOL TYPES BY PERCENT OCCURRENCE



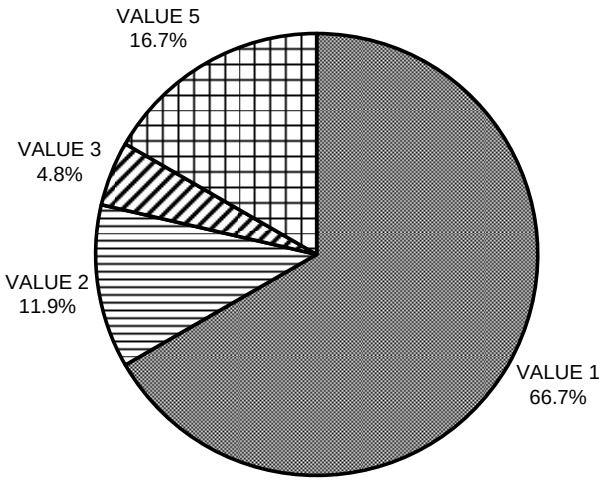
GRAPH 4: Level I Pool Types

RINCON CREEK 1999
MAXIMUM DEPTH IN POOLS



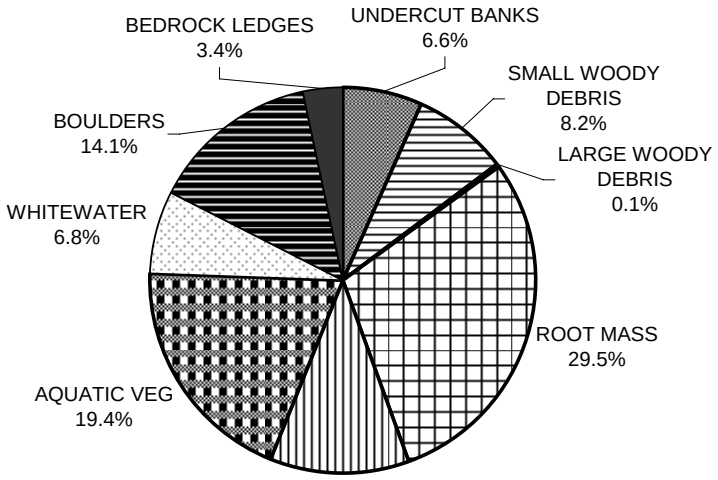
GRAPH 5

RINCON CREEK 1999
PERCENT EMBEDDEDNESS



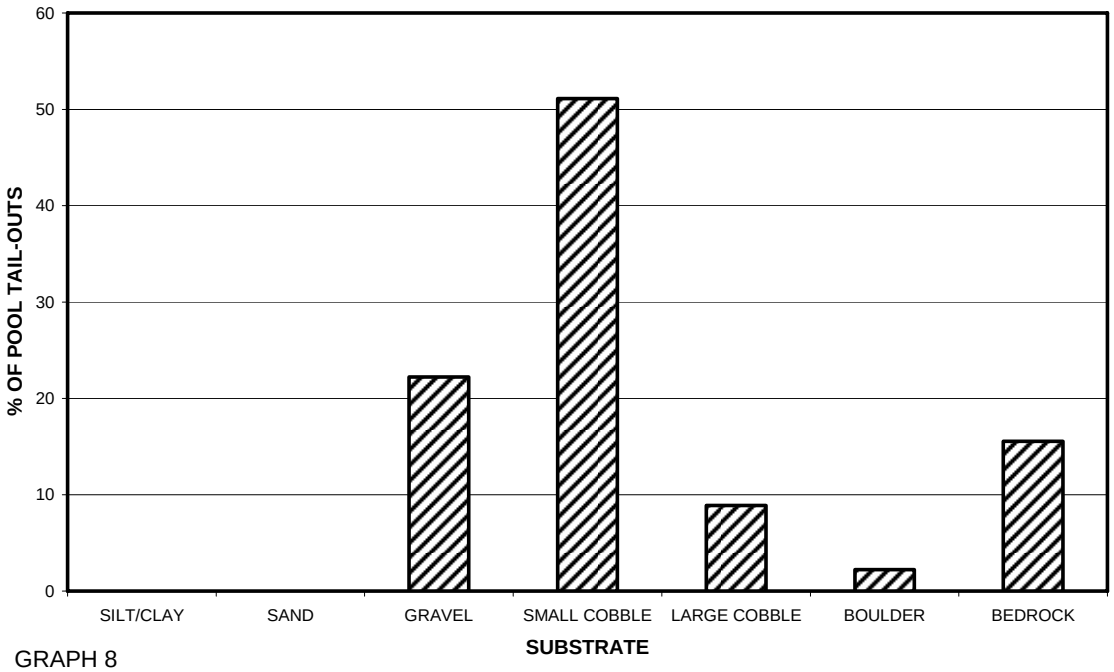
GRAPH 6

RINCON CREEK 1999
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

RINCON CREEK 1999
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS

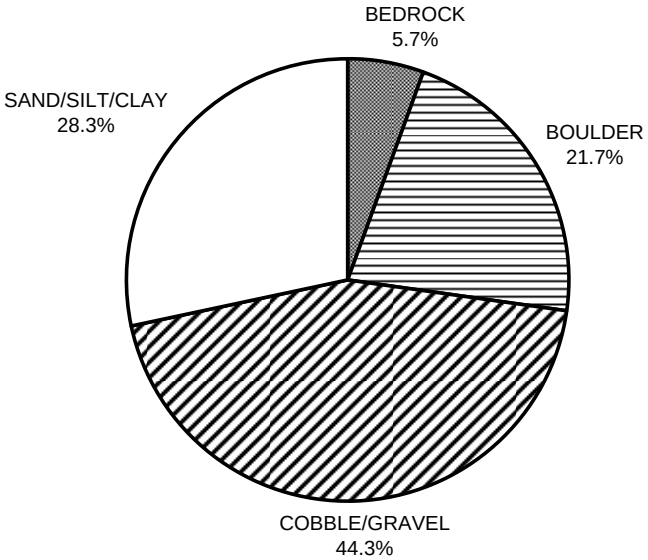


GRAPH 8

RINCON CREEK 1999
MEAN PERCENT CANOPY

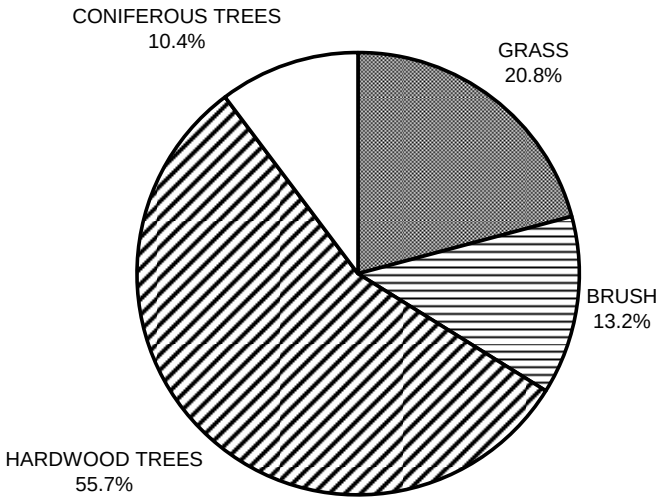
GRAPH 9

RINCON CREEK 1999
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

RINCON CREEK 1999
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11