CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
North Fork Santa Rosa Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1998

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on North Fork Santa Rosa Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids in North Fork Santa Rosa Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for 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

North Fork Santa Rosa Creek is a tributary to Santa Rosa Creek, which flows into the Laguna de Santa Rosa, a tributary to Mark West Creek, a tributary of the Russian River, located in Sonoma County, California (see North Fork Santa Rosa Creek map, page 2). The legal description at the confluence with Santa Rosa Creek is T07N, R06W, S06. Its location is 38°29'30.3" N. latitude and 123°33'50.2" W. longitude. Year round vehicle access exists from Highway 101 to Highway 12 East, via Los Alamos Road, via Ranch Road.

North Fork Santa Rosa Creek and its tributaries drain a basin of approximately 0.97 square miles. North Fork Santa Rosa Creek is a first order stream and has approximately 1.63 miles of blue line stream, according to the USGS Kenwood 7.5 minute quadrangles. Summer flow was measured as approximately 0.7 cfs at habitat unit #006 on August 13, 1998. Elevations range from about 997 feet at the mouth of the creek to 2000 feet in the headwaters. Hardwood forest dominates the watershed, but there is a large amount of shrub and coniferous woodland mixed in. There is also a small zone of herbaceous in the lower part of the watershed. The watershed is owned partly by the BLM and is managed for public and recreational use, and partly by private landowners and is managed for agricultural, grazing and forest land. However, no sensitive plants or animals were listed in the DFG's Natural Diversity Database as occurring within the North Fork Santa Rosa Creek watershed.

METHODS

The habitat inventory conducted in Sample Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The AmeriCorps Volunteers that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two person team and was supervised by Bob Coey, Russian River Basin Planner (DFG).

HABITAT INVENTORY COMPONENTS

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

1. Flow:

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

2. Channel Type:

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

3. Temperatures:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from

a standard list of 24 habitat types. Dewatered units are labeled "DRY". North Fork Santa Rosa Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements were in feet to the nearest tenth.

5. Embeddedness:

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

6. Shelter Rating:

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

7. Substrate Composition:

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

8. Canopy:

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

9. Bank Composition:

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

BIOLOGICAL INVENTORY

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

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed CDFG. This program processes and summarizes the data, and produces the following tables and appendices:

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

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for North Fork Santa Rosa Creek include:

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

- Mean Percent Canopy
- Mean Percent Canopy by Reach
- Percent Bank Composition and Bank Vegetation

HISTORICAL STREAM SURVEYS:

No historical steam surveys exist for North Fork Santa Rosa Creek.

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 13, 1998 to August 18, 1998 was conducted by Steve Brady and Ron Benkert (Sonoma County Water Agency) with supervision and analysis by CDFG. The survey began at the confluence with Santa Rosa Creek and extended up North Fork Santa Rosa to a steep series of cascades. The total length of the stream surveyed was 5354 feet, with no additional feet of side channel.

A flow of 0.7 cfs was measured on August 13, 1998 at habitat unit #006 with a Global flow meter.

This section of North Fork Santa Rosa has three channel types: from the mouth to 3253 feet an F1; next 1895 feet a C3 and the upper 206 feet an A1.

F1 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly bedrock substrate.

C3 channel types are low gradient (<2%), meandering, point-bar, riffle/pool, alluvial channels with a broad, well defined floodplain and a predominantly cobble substrate.

A1 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly bedrock substrate.

Water temperatures ranged from 58°F to 66°F. Air temperatures ranged from 59°F to 80°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 46% pool units, 37% riffle units, 15% flatwater units, and 2% dry streambed units. Based on total **length** there were 41% pool units, 28% riffle units, 21% flatwater units, and 10% dry streambed units (Graph 1).

Two hundred and fifteen habitat units were measured and 46% were completely sampled. Twenty-one Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent **occurrence** were mid-channel pools at 24%, high gradient riffles

20%, low gradient riffles 12% and step runs 10% (Graph 2). By percent total **length**, mid-channel pools made up 21%, high gradient riffles 18%, step runs 17%, and dry streambed 10%.

Ninety-nine pools were identified (Table 3). Main Channel pools were most often encountered at 62%, and comprised 69% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Five of the 99 pools (5%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 2% of the total length of stream habitat.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool types had the highest shelter rating at 22. Flatwater had the lowest rating with 5 and riffle rated 7 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 28, backwater pools rated 22, and main channel pools rated 19 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 29%, undercut banks 18%, root masses 17% and small woody debris 13%. Graph 5 describes the pool shelter in North Fork Santa Rosa.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 3 of the 5 low gradient riffles measured. Small cobble was dominant in 2 of the low gradient riffles (Graph 6).

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

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 91 pool tail-outs measured, 29 had a value of 1 (32%); 33 had a value of 2 (36%); 17 had a value of 3 (19%); and one had a value of 4 (1%). Eleven (12%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Sand/silt/gravel/cobble was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 87%. The mean percentages of deciduous and evergreen trees were 31% and 69%, respectively. Graph 8 describes the canopy for the entire survey and graph 9 describes the canopy by reach.

For the entire stream reach surveyed, the mean percent right bank vegetated was 33% and the mean percent left bank vegetated was 38%. For the habitat units measured, the dominant vegetation types for the stream banks were: 71% evergreen trees, 23% deciduous trees, 3% grass, 2% brush and 0% bare soil. The dominant substrate for the stream banks were: 37% cobble/gravel, 35% silt/clay/sand, 24% bedrock and 4% boulder (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

No biological survey was conducted in 1998/1999 on North Fork Santa Rosa Creek, however, steelhead and sculpin were observed during the habitat inventory.

During the habitat inventory, no salmonids/anadromous salmonids/rainbow trout were observed upstream of unit #206, 5354 feet above the confluence with Santa Rosa Creek where a steep cascade.

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

\Table 1. Species Observed in Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1998	Steelhead	SCWA	N
1998	Sculpin	SCWA	N

No introduced fish species were observed during the survey of North Fork Santa Rosa Creek, however introduced fish have been observed in Santa Rosa Creek. Historical records reflect that no hatchery stocking, transfers, or rescues have occurred in North Fork Santa Rosa Creek. However, transfers and rescues have occurred in Santa Rosa Creek.

ADULT SURVEYS:

No spawning/carcass survey was conducted in 1998/1999 on North Fork Santa Rosa Creek.

DISCUSSION

North Fork Santa Rosa has three channel types: F1 (3253 ft.), C3 (1895 ft.) and A1 (206 ft.).

There are 3253 feet of F1 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, F1 channel types are good for bank-placed boulders and fair for single wing-deflectors and log cover. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

There are 1895 feet of C3 channel type in Reach 2. According to the DFG Salmonid Stream Habitat Restoration Manual, C3 channel types are excellent for bank-placed boulders and good for low-stage weirs, boulder clusters, single and opposing wing deflectors and log cover. They are fair for medium-stage weirs.

There are 206 feet of A1 channel type in Reach 3. According to the DFG Salmonid Stream Habitat Restoration Manual, the high energy, steep gradient A1 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 August 13, 1998, to August 18, 1998, ranged from 58°F to 66°F. Air temperatures ranged from 59°F to 80°F. The warmer water temperatures (63°F-66°) were recorded in Reach 1. This temperature regime is slightly unfavorable to salmonids. However, the cooler water temperatures in Reach 2 (58°-63°F) and Reach 3 (58°F), are favorable to salmonids.

It is unknown if this thermal regime is typical. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and\or more extensive biological sampling conducted.

Pools comprised 41% of the total **length** of this survey. 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. In North Fork Santa Rosa, the pools are relatively shallow with 5% having a maximum depth of at least 2 feet. These pools comprised 2% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 22. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by boulders (29%), undercut banks (18%), root masses (17%), and small woody debris (13%).Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

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

Twenty of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 32% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In a reach comparison, Reaches 1 and 2 had the best ratings and Reach 3 had the poorest ratings. However, the substrate in Reach 3 consists of bedrock, which is considered undesirable for spawning salmonids.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel and/or because of fine sediment capping the redd and preventing fry emergence. In North Fork Santa Rosa/Reach 3, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken, due to high rates of embeddedness/fine sediment. However, in

Reach 2, the embeddedness is excellent for salmonids. Reach 1 is more favorable for salmonids than Reach 3, but not as favorable as Reach 2.

The mean percent canopy for the survey was 87%. This is very good, since 80 percent is generally considered desirable.

GENERAL MANAGEMENT RECOMMENDATIONS

North Fork Santa Rosa Creek should be managed as an anadromous, natural production stream.

Recent winter storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the drought years. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Efforts to increase flood protection or improve fish access in the short run, have led to long term problems in the system. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

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

2) In North Fork Santa Rosa Creek, active and potential sediment sources related to the road system need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

3) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.

4) Pool depth enhancement of existing viable pools.

PROBLEM SITES AND LANDMARKS - NORTH FORK SANTA ROSA CREEK SURVEY COMMENTS

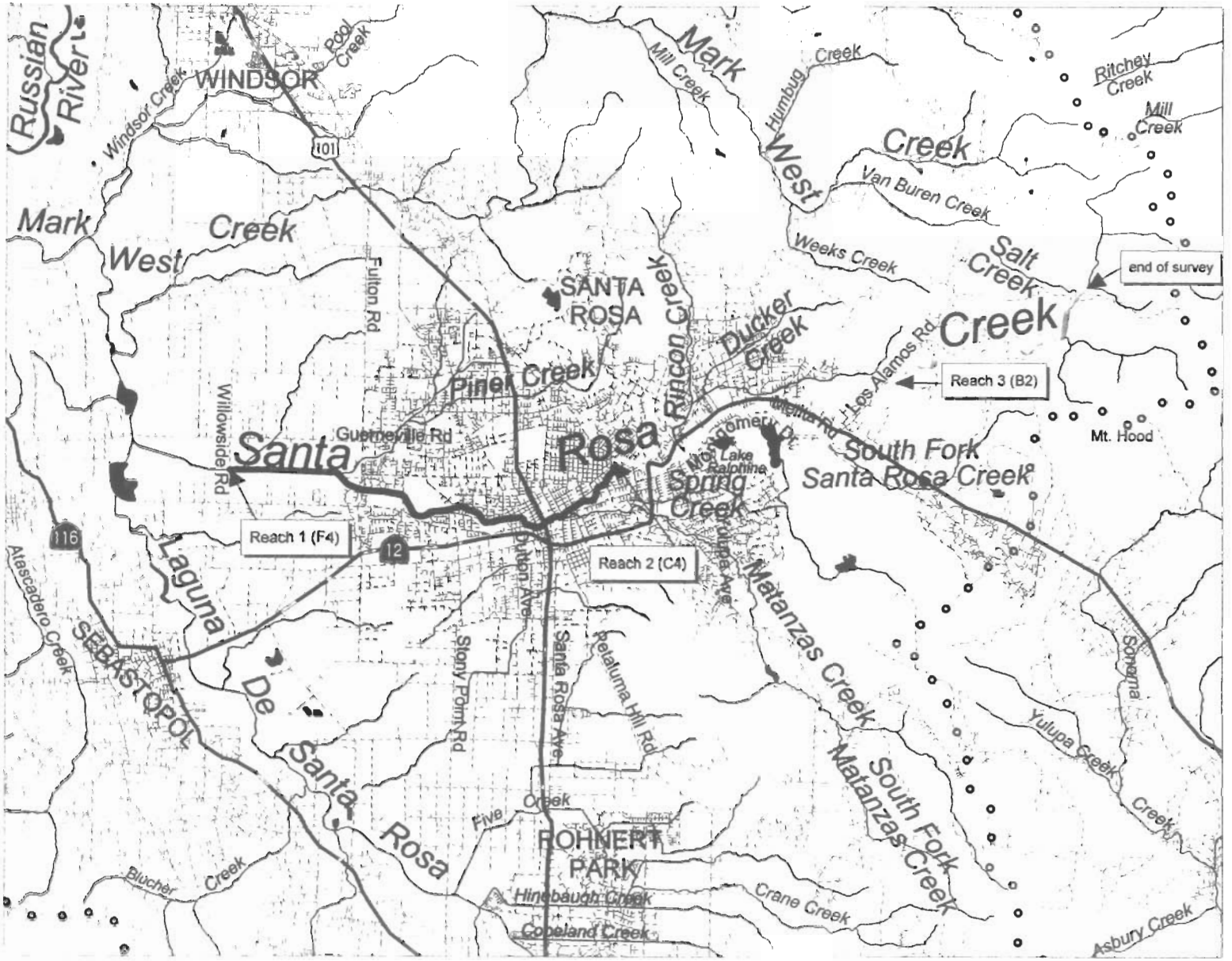
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

HABITAT UNIT#	STREAM LENGTH(FT)	COMMENTS
Reach 1		
1.00	15	Survey began at confluence with Santa Rosa Creek.
6.00	79	1-0+STHD.
7.00	97	1-0+STHD.
10.00	124	2-0+STHD.
11.00	133	1-0+STHD.
12.00	144	2-0+STHD.
14.00	178	6.1 side channel at 21' on left bank. 1-0+STHD.
15.00	206	5-0+, 2-1+, and 1-2+STHD.
17.00	269	1-0+STHD.
18.00	299	4-0+STHD.
19.00	327	1-0+STHD.
20.00	348	1 sculpin, 2-0+, 1-1+, and 1-2+STHD.
21.00	393	1-0+STHD.
22.00	412	1-0+STHD.
23.00	445	2-0+STHD.
26.00	494	2-0+ & 1-1+STHD.
28.00	550	1-0+ & 2-1+STHD.
30.00	617	1-1+STHD.
35.00	703	At 15' gully on left bank.
36.00	719	1-0+STHD.
38.00	774	At 16' erosion on right bank. 1-0+STHD.
40.00	845	2-0+ & 1-1+STHD.
42.00	915	At 10' gully on right bank. At 15' erosion on right bank. 2-0+ & 1-1+STHD.
48.00	1023	4-0+STHD.
49.00	1031	At 5' 6.1 side channel on right bank.
51.00	1065	Springs on right bank.
52.00	1086	6-0+STHD.
53.00	1126	5-0+ & 1-1+STHD.
54.00	1149	Erosion on left bank.
55.00	1190	Debris jam and erosion on right bank.
58.00	1258	Over 10-0+STHD.

60.00	1330	12-0+ & 1-1+STHD.
62.00	1385	1-0+STHD.
64.00	1433	2-0+STHD.
66.00	1494	4-0+STHD.
68.00	1557	12-0+STHD.
70.00	1629	6-0+ & 1-1+STHD.
75.00	1717	At 3' 6.1 side channel on left bank.
76.00	1736	1-0+STHD.
79.00	1812	2-0+STHD. End of day.
82.00	1884	3-0+ & 2-1+STHD. Erosion on right bank.
86.00	1993	3-0+STHD.
88.00	2064	At 54' gully on right bank. 3-0+STHD.
91.00	2152	Erosion on left bank. 6-0+STHD.
92.00	2196	1-0+STHD.
95.00	2253	Pool created by partial debris jam that crosses 2/3 of the channel.
97.00	2335	Erosion on left bank.
99.00	2388	Erosion on right bank. 4-0+ & 2-1+STHD.
103.00	2443	Erosion on left bank. 2-0+STHD.
104.00	2451	Erosion on left bank.
105.00	2458	Erosion on left bank.
106.00	2478	Erosion on left bank.
107.00	2496	4-0+STHD.
108.00	2518	Old debris jam that the channel has gone around. Retaining . approximately 4 ft of gravel. 2-0+ & 1-1+STHD.
110.00	2546	4-0+ & 1-1+STHD.
113.00	2643	Erosion on left bank. 4-0+STHD.
114.00	2655	Erosion on left bank.
115.00	2672	Erosion on left bank.
116.00	2688	Erosion on left bank.
121.00	2768	6-0+ & 2-1+STHD.
122.00	2796	Erosion on left bank.
124.00	2852	4-0+ & 2-1+STHD.
129.00	2962	2-0+STHD.
131.00	2999	3-0+STHD.
133.00	3124	4-0+STHD.
134.00	3158	4-0+STHD.
Reach 2		
139.00	3286	Channel type change to a C3. 3-0+STHD.
143.00	3423	Confluence with trib on right bank. 3-0+STHD.
144.00	3793	Dry.
145.00	3811	3-0+STHD.
146.00	3846	Dry.
147.00	3878	12-0+STHD.
149.00	3888	9-0+STHD.

151.00	3920	10-0+STHD.
152.00	3931	Dry.
153.00	3947	1-0+STHD.
154.00	4066	Dry.
157.00	4178	3-0+STHD.
158.00	4222	Gully on left bank.
159.00	4252	Gully on left bank. 3-0+STHD.
162.00	4398	1-0+STHD.
163.00	4422	4-0+STHD.
166.00	4464	At 12' 6.1 side channel.
167.00	4490	6-0+STHD.
169.00	4522	4-0+ & 1-1+STHD.
171.00	4582	At 3' three inch newt. Aquatic vegetation is algae.
173.00	4618	5-0+, 2-1+, & 1-2+STHD.
175.00	4636	2-0+STHD.
177.00	4664	3-0+STHD.
181.00	4725	At 16' fence crosses channel.
185.00	4780	At 14' gully on left bank.
186.00	4836	Erosion on left bank.
189.00	4992	1-0+ & 1-1+STHD.
191.00	5046	1-1+STHD.
193.00	5107	At 30' gully on right bank.
194.00	5148	At 10' trib on left bank. 50' up trib.
Reach 3		
195.00	5172	Channel type change to an A1.
202.00	5273	1-2+STHD.
206.00	5354	End of Survey. Steep series of cascades above this pool.
		1-1+STHD.

Santa Rosa Creek



N

Russian River basin boundary

Streams

Channel types

F4

C4

F6

Waterbodies

Roads

City limits (as of 2000)

2 0 2 4 Miles

5 0 5 Kilometers

Scale = 1:150,000

Central Coast Region
Department of Fish and Game

February 8, 2001
I:/mondo3/data/stream-projects/santarosa.apr

North Fork Santa Rosa Creek Tables Graphs Map
Assessment Completed 1998
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APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: North Fork Santa Rosa
SAMPLE DATES: 08/13/98 to 08/18/96
SURVEY LENGTH:
MAIN CHANNEL: 5354 ft. SIDE CHANNEL: 0 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Kenwood Latitude: 38°29'30"
Legal Description: T07NR06WS06 Longitude: 122°33'50"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-138)

Channel Type: F1	Mean Canopy Density: 85%
Main Channel Length: 3253 ft.	Evergreen Component: 79%
Side Channel Length: 0 ft.	Deciduous Component: 21%
Riffle/Flatwater Mean Width: 3.6 ft.	Pools by Stream Length: 45%
Pool Mean Depth: 0.6 ft.	Pools >=2 ft. Deep: 5%
Base Flow: 0.7 cfs	Pools >=3 ft. Deep: 2%
Water: 63-66°F Air: 74-80°F	Mean Pool Shelter Rtn: 24
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 33%	Occurrence of LOD: 35%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 0 ft.

Embeddness Value: 1. 25% 2. 37% 3. 25% 4. 0% 5. 14%

STREAM REACH 2 (Units 139-194)

Channel Type: C3	Mean Canopy Density: 90%
Main Channel Length: 1895 ft.	Evergreen Component: 50%
Side Channel Length: 0 ft.	Deciduous Component: 50%
Riffle/Flatwater Mean Width: 3.3 ft.	Pools by Stream Length: 34%
Pool Mean Depth: 0.5 ft.	Pools >=2 ft. Deep: 0%
Base Flow: 0.7 cfs	Pools >=3 ft. Deep: 0%
Water: 58-63°F Air: 59-74°F	Mean Pool Shelter Rtn: 16
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 41%	Occurrence of LOD: 12%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 535 ft.

Embeddness Value: 1. 46% 2. 43% 3. 7% 4. 0% 5. 4%

STREAM REACH 3 (Units 195-206)

Channel Type: A1	Mean Canopy Density: 94%
Main Channel Length: 206 ft.	Evergreen Component: 43%
Side Channel Length: 0 ft.	Deciduous Component: 57%
Riffle/Flatwater Mean Width: 2.2 ft.	Pools by Stream Length: 44%
Pool Mean Depth: 0.8 ft.	Pools >=2 ft. Deep: 33%
Base Flow: 0.7 cfs	Pools >=3 ft. Deep: 0%
Water: 58-58°F Air: 59-59°F	Mean Pool Shelter Rtn: 23
Dom. Bank Veg.: Evergreen Trees	Dom. Shelter: Boulders
Bank Vegetative Cover: 39%	Occurrence of LOD: 0%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 0 ft.

Embeddness Value: 1. 33% 2. 0% 3. 17% 4. 17% 5. 33%

Santa Rosa Creek- North Fork — Drainage: Santa Rosa Creek

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 08/13/98 to 08/18/98

Confluence Location: QUAD: Kenwood — LEGAL DESCRIPTION: T07NR06WS06 — LATITUDE: 38°29'30" — LONGITUDE: 122°33'50"

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
79	8	RIFFLE	37	19	1499	28	3.4	0.2	76	5980	12	985	0	7
33	2	FLATWATER	15	34	1131	21	3.7	0.3	129	4264	33	1094	9	5
99	88	POOL	46	22	2189	41	4.9	0.6	117	11567	74	7320	62	22
4	0	DRY	2	134	535	10	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
215	98	5354	21811	9399

Santa Rosa Creek- North Fork — Drainage: Santa Rosa Creek

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 08/13/98 to 08/18/98

Confluence Location: QUAD: Kenwood — LEGAL DESCRIPTION: T07NR06WS06 — LATITUDE: 38°29'30" — LONGITUDE: 122°33'50"

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 %
26	5	LGR	12	16	410	8	3	0.1	0.5	43	1130	6	150	0	5	85
42	3	HGR	20	23	983	18	4	0.2	0.8	110	4623	19	781	0	8	87
6	0	CAS	3	11	65	1	2	0.2	0.7	20	119	4	25	0	6	96
5	0	BRS	2	8	41	1	3	0.1	0.4	28	142	6	29	0	0	93
11	0	RUN	5	21	236	4	4	0.3	0.7	80	881	23	248	9	6	91
22	2	SRN	10	41	895	17	4	0.2	0.8	155	3409	39	851	0	5	87
2	2	TRP	1	32	63	1	3	0.8	2.6	117	235	123	246	111	7	98
51	50	MCP	24	22	1103	21	5	0.6	3.3	106	5398	69	3537	58	17	85
1	1	CCP	0	16	16	0	4	0.5	1.1	63	63	32	32	25	20	100
7	7	STP	3	46	321	6	5	0.5	1.4	207	1450	95	663	74	35	97
9	9	CRP	4	30	270	5	4	0.7	1.9	145	1304	101	912	87	16	88
1	1	LSL	0	11	11	0	4	0.4	0.8	44	44	17	17	13	120	60
7	7	LSR	3	27	190	4	6	0.6	1.8	154	1081	90	627	74	56	92
6	4	LSBk	3	22	133	2	5	0.6	1.5	117	701	79	473	65	8	88
2	2	LSBo	1	18	36	1	3	0.4	1.2	44	89	18	36	13	2	84
2	2	PLP	1	11	21	0	3	0.8	2.0	32	65	27	55	22	24	91
7	0	SCP	3	0	0	0	0	0.0	0.0	0	0	0	0	0	0	0
2	1	BPB	1	5	9	0	11	0.8	1.4	99	198	79	158	69	20	88
1	1	BPR	0	7	7	0	7	0.6	1.2	49	49	29	29	25	30	80
1	1	BPL	0	9	9	0	6	0.4	0.9	54	54	22	22	11	16	100
4	0	DRY	2	134	535	10	0	0.0	0.0	0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
215	98	5354	21036	8892

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Santa Rosa Creek- North Fork

Drainage: Santa Rosa Creek

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/13/98 to 08/18/98

Confluence Location: QUAD: Kenwood LEGAL DESCRIPTION: T07NR06WS06 LATITUDE: 38°29'30" LONGITUDE: 122°33'50"

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	60	MAIN	62	25	1503	69	5.0	0.6	117	7146	73	4478	61	19
27	25	SCOUR	27	24	661	30	4.6	0.6	122	3284	79	2121	66	28
11	3	BACKWATER	11	2	25	1	8.0	0.6	67	741	43	477	35	22

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
99	88	2189	11171	7076

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Santa Rosa Creek- North Fork — Drainage: Santa Rosa Creek

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 08/13/98 to 08/18/98

Confluence Location: QUAD: Kenwood LEGAL DESCRIPTION: T07NR06WS06 LATITUDE: 38°29'30" LONGITUDE: 122°33'50"

UNITS MAX DPTH MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
2	TRP	2	1	50	0	0	1	50	0	0	0	0
51	MCP	52	24	47	25	49	1	2	1	2	0	0
1	CCP	1	0	0	1	100	0	0	0	0	0	0
7	STP	7	3	43	4	57	0	0	0	0	0	0
9	CRP	9	2	22	7	78	0	0	0	0	0	0
1	LSL	1	1	100	0	0	0	0	0	0	0	0
7	LSR	7	4	57	3	43	0	0	0	0	0	0
6	LSBk	6	1	17	5	83	0	0	0	0	0	0
2	LSBo	2	1	50	1	50	0	0	0	0	0	0
2	PLP	2	0	0	0	0	2	100	0	0	0	0
0	PLP	0	0	0	0	0	0	0	0	0	0	0
1	BPB	1	0	0	1	100	0	0	0	0	0	0
1	BPR	1	0	0	1	100	0	0	0	0	0	0
1	BPL	1	1	100	0	0	0	0	0	0	0	0

TOTAL UNITS
91

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Santa Rosa Creek- North Fork

Drainage: Santa Rosa Creek

Table 5 - Summary of Shelter by Habitat Type

Survey Dates: 08/13/98 to 08/18/98

Confluence Location: QUAD: Kenwood LEGAL DESCRIPTION: T07NR06WS06 LATITUDE: 38°29'30" LONGITUDE: 122°33'50"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
26	17	LGR	0	33	32	3	3	2	0	28	0
42	40	HGR	1	4	0	3	4	34	0	54	0
6	5	CAS	0	0	0	4	4	0	0	92	0
5	1	BRS	0	0	0	0	0	0	0	0	0
11	9	RUN	25	14	0	39	2	0	0	20	0
22	19	SRN	1	0	0	4	7	11	0	70	7
2	2	TRP	0	10	0	0	0	0	29	3	58
51	51	MCP	24	10	6	11	2	0	0	35	12
1	1	CCP	0	25	0	60	0	0	0	15	0
7	7	STP	15	3	0	12	0	32	0	36	1
9	9	CRP	10	21	1	42	9	0	0	15	2
1	1	LSL	0	80	0	0	0	0	0	20	0
7	7	LSR	22	23	14	29	0	0	0	11	0
6	6	LSBk	0	0	0	0	0	8	0	12	79
2	2	LSBo	0	0	0	59	0	0	0	41	0
2	2	PLP	0	0	0	0	0	0	0	38	62
7	0	SCP	0	0	0	0	0	0	0	0	0
2	1	BPB	0	25	0	0	0	0	0	75	0
1	1	BPR	0	30	0	70	0	0	0	0	0
1	1	BPL	0	0	80	0	0	0	0	20	0
4	0	DRY	0	0	0	0	0	0	0	0	0
ALL HABITAT TYPES 215	182		13	10	4	13	3	13	0	37	6
POOLS ONLY 99	91		18	13	5	17	2	8	0	29	8

Santa Rosa Creek- North Fork Drainage: Santa Rosa Creek

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 08/13/98 to 08/18/98

Confluence Location: QUAD: Kenwood LEGAL DESCRIPTION: T07NR06WS06 LATITUDE: 38°29'30" LONGITUDE: 122°33'50"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
5	5	LGR	0	0	60	40	0	0	0
4	4	HGR	0	0	25	0	0	25	50
0	0	CAS	0	0	0	0	0	0	0
2	2	BRS	0	0	50	0	0	0	50
0	0	RUN	0	0	0	0	0	0	0
2	2	SRN	0	0	100	0	0	0	0
2	2	TRP	0	50	0	0	0	0	50
50	50	MCP	4	18	40	4	14	4	16
1	1	CCP	0	0	100	0	0	0	0
7	7	STP	0	0	43	14	14	0	29
9	9	CRP	0	22	56	22	0	0	0
1	1	LSL	0	0	0	100	0	0	0
7	7	LSR	0	29	14	57	0	0	0
4	4	LSBk	0	0	75	0	0	25	0
2	2	LSBo	0	0	50	50	0	0	0
2	2	PLP	0	0	0	0	0	0	100
0	0	SCP	0	0	0	0	0	0	0
1	1	BPB	0	0	0	0	100	0	0
1	1	BPR	0	100	0	0	0	0	0
1	1	BPL	0	0	0	100	0	0	0
4	0	DRY	0	0	0	0	0	0	0

Santa Rosa Creek- North Fork

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

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
87.08	68.60	31.40	33.43	37.59

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	23	25	23.53
Boulder	5	4	4.41
Cobble/Gravel	37	39	37.25
Silt/clay	37	34	34.80

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	5	1	2.94
Brush	2	3	2.45
Deciduous Trees	28	19	23.04
Evergreen Trees	66	79	71.08
No Vegetation	1	0	0.49