STREAM INVENTORY REPORT

South Fork Garcia River, Garcia River, 2002

CALIFORNIA DEPARTMENT OF FISH AND GAME

2003

Central Coast Region

STREAM INVENTORY REPORT

South Fork Garcia River

INTRODUCTION

A stream inventory was conducted beginning August 8 and ending August 10, 2002 on South Fork Garcia River. The survey began at the confluence with Garcia River and extended upstream 1.99 miles.

The South Fork Garcia River 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 South Fork Garcia River. 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

South Fork Garcia River is a tributary to the Garcia River, tributary to the Pacific Ocean, located in Mendocino County, California (Map 1). South Fork Garcia River's legal description at the confluence with Garcia River is T12N R15W S31. Its location is 38°51′23″ north latitude and 123°33′38″ west longitude. South Fork Garcia River is a second order stream and has approximately 2.66 miles of solid blue line stream according to the USGS Gualala 7.5 minute quadrangle. South Fork Garcia River drains a watershed of approximately 4.41 square miles. Elevations range from about 200 feet at the mouth of the creek to 895 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via logging roads from Highway 1 to Iverson Road to Fish Rock Road. Fish Rock road leads to the headwaters of the South Fork Garcia River and a logging road follows the river to the confluence with Garcia River.

METHODS

The habitat inventory conducted in South Fork Garcia River 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 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 South Fork Garcia River 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". South Fork Garcia River 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 South Fork Garcia River, 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 South Fork Garcia River, 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 South Fork Garcia River, 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 South Fork Garcia River, 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 South Fork Garcia River. This sampling technique is 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 South Fork Garcia River 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 8 to August 10, 2002, was conducted by Libby Earthman and Jen Presnell (WSP). The total length of the stream surveyed was 10,520 feet.

Stream flow was not measured on South Fork Garcia River.

South Fork Garcia River is an F4 channel type for 6,653 feet and a B3 for 3,789 feet of stream surveyed. F4 channel types are classified as entrenched, meandering, riffle/pool channels, on low gradients, with high width/depth ratios and gravel-dominated substrates. B3 channel types are classified as moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools; very stable plan and profile, stable banks, and cobble-dominated substrates.

Water temperatures taken during the survey period ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 58 to 82 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of **occurrence** there were 51% pool units, 32% flatwater units, and 17% riffle units (Graph 1). Based on total **length** of Level II habitat types there were 59% flatwater units, 29% pool units, and 12% riffle units (Graph 2).

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Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent **occurrence** were runs, 31%; mid-channel pools, 27%; and low gradient riffles, 17% (Graph 3). Based on percent total **length**, runs made up, 59%, mid-channel pools, 16%, and low gradient riffles, 12%.

A total of 100 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 57%, and comprised 58% 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. Forty-four of the 100 pools measured (44%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 100 pool tail-outs measured, 18 had a value of 1 (18%); 42 had a value of 2 (42%); 28 had a value of 3 (28%); 2 had a value of 4 (2%); and 10 had a value of 5 (10%) (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. Pool habitats had a mean shelter rating of 36, flatwater habitat types had a mean shelter rating of 1, and riffle habitat types had a mean shelter rating of 0 (Table 1). Of the pool types, backwater pools had the highest mean shelter rating at 90. Main channel pools had a mean shelter rating of 40, and scour pools had mean shelter rating of 30 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in South Fork Garcia River. Graph 7 describes the pool cover in South Fork Garcia River. 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 86% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 11%.

The mean percent canopy density for the surveyed length of South Fork Garcia River was 92%. The mean percentages of deciduous and coniferous trees were 65% and 35%, respectively. Graph 9 describes the mean percent canopy in South Fork Garcia River.

For the stream reach surveyed, the mean percent right bank vegetated was 38%. The mean percent left bank vegetated was 43%. The dominant elements composing the structure of the stream banks consisted of 75% sand/silt/clay, 24% cobble/gravel, and 1% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 44% of the units surveyed. Additionally, 33% of the units surveyed had deciduous trees as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Young of year salmonid presence was observed from the stream banks in South Fork Garcia River up to 10,094 feet. Yearling salmonids were observed up to 10,522 feet. Snorkel surveys by Mendocino Redwood Company on 8/21/2002 found that salmonids in the South Fork Garcia consisted of both steelhead trout and coho salmon (Mendocino Redwood Co. 2002).

DISCUSSION

South Fork Garcia River is an F4 channel type for 6,653 feet and a B3 for 3,789 feet of stream surveyed. The suitability of F4 and B3 channel types for fish habitat improvement structures are as follows: F4 channel types are good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. B3 channel types are excellent for plunge weirs, boulder clusters and bank placed boulders, single and opposing wing deflectors, and log cover.

The water temperatures recorded on the survey days August 8 to August 10, 2002 ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 64 to 82 degrees Fahrenheit. This is a suitable water temperature range for salmonids. Maximum Average Weekly Temperature (MWAT) at two stations on South Fork Garcia ranged from 12.6 - 15.8 C (54.7 – 60.4 F) in 1994-2002 (Mendocino Redwood Co. data).

Flatwater habitat types comprised 59% of the total length of this survey, pools 29%, and riffles 12%. The pools are relatively shallow, with 44 of the 99 (44%) measured 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.

Sixty of the 100 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty of the pool tail-outs had embeddedness ratings of 3 or 4. Ten 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 source control efforts in the watershed may be having a beneficial effect in controlling fine sediments.

Ninety-seven of the 100 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 36. The shelter rating in the flatwater habitats was 1. 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 92%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 38% and 43%, 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) South Fork Garcia River should be managed as an anadromous, natural production stream.

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

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

4) Continue to identify and treat remaining sources of potential sediment yield.

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 at confluence with Garcia River. Channel type is an F4. Dry channel 1 foot to 18 feet from confluence.
312'	One steelhead yoy.
377'	Hobo temp. One stickleback.

559'	Instream structure at 30 feet.
600'	Instream structure. 100 steelhead yoy.
742'	Gravel bar on right bank. LWD.
1156'	LWD project, good cover.
1196'	Dry left bank tributary at 84 feet.
1736'	Spring at 27 feet. Undercut bank 3 feet.
1763'	At 12 feet, 1.2 deep pool intersects pool in unit 26.01.
2044'	Pool is enhanced by LWD.
2073'	Right bank spring at 43.5 feet.
2197'	80 steelhead yoy. Right bank erosion at 33-94 feet, 30 feet high.
2864'	Salmonid redd at 21 feet.
2924'	30 steelhead yoy.
2959'	Right bank spring feeding into a pool, size 26.9'x6'x1.4'.
3096'	Two 1+ steelhead and an instream structure.
3124'	Instream structure.
3152'	Potential salmonid redd at 5 feet.
3182'	Pool at 17 feet, LWD on right bank.
3329'	2.7 foot plunge from upper unit.
3353'	150 steelhead yoy.
3734'	Instream structure.
3953'	Instream structure at 61 feet.
4129'	One 1+ steelhead, 5 yoy steelhead.
4180'	Down cut road on right bank.
4426'	One stickleback, 10 steelhead yoy.
4506'	Dry right bank trib at 58 feet. Culvert removal.
4915'	LWD jam 15'x25'x8'.
5215'	50 Steelhead yoy.
5248'	Salmonid redd at 93 feet.
5438'	LWD project site. MCRCD plot 1.
5457'	18'x30'x8' log jam, passable. Pool underneath.
5694'	Bank erosion from 1' to 15' in unit 15'x8'.
5822'	Instream structure.
5862'	At 63' dry gully with pulled crossing.
6104'	Right bank mass wasting 40'x35'.
6130'	At 110' an instream structure 4'x5'x1'. LWD accumulation at 130 feet.
6317'	Railroad tracks within stream.
6497'	Many young conifers in understory.
6542'	Project at upper end of unit.
6581'	Left bank bedrock, root, LWD scour.
6605'	Plunge pool at 39', 5'x16'x1.3'(0.7). Plunge is over 1.6' over log.
6940'	One 1+ steelhead, 20 yoy. Instream structure.
7057'	1.6 foot plunge.
7079'	Salmonid redd at 3'.
7142'	Erosive left bank.
7184'	1.8 foot plunge.
7300'	Salmonid redd at 8 feet.
7334'	Salmonid redd at 62'.
7657'	Three 1+ steelhead and one 1+ SH.
7795'	Left bank trib, dry.

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7914'	Left bank trib, wet at 37 feet. Walked 300 feet up trib and salmonids.
7951'	Possible salmonid redds at 80' and 100'. Remains of a culvert.
8246'	Large sediment deposit on left bank.
8273'	Small erosion on right bank.
8557'	Channel type changed to F4.
8581'	Remains of a culvert within stream.
9171'	Instream structure.
9740'	Left bank dry gully at 15 feet. Left bank road.
9812'	Unstable banks, 5 fallen trees.
9917'	Left bank revegetation, right bank road. Log jam.
9957'	10 LWS, 10 SWD. Right bank road, erosive 1-20 feet. Left bank erosive reveg project. Bridge at 70.3 feet.
10027'	3.3 foot plunge.
10094'	Dry gully at 33 feet. 5 steelhead yoy.
10162'	Right bank road.
10236'	Road stabilization project on right bank.
10422'	3 foot plunge.
10431'	Culvert remains.
10507'	Instream structure, plunge 2.5 feet.
10522'	End of survey. Walked dry stream for 150 feet. One 1+ steelhead at top of unit and confluence with Fleming. End of anadromy.

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.

Mendocino Redwood Co. 2002. Aquatic Species Distribution on Mendocino Redwood Company Forestlands1994-1996 and 2000-2002. Mendocino Redwood Company, LLC. Fort Bragg CA.

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]

TABLES AND GRAPHS

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: SOUTH FORK GARCIA
SAMPLE DATES: 08/08/02 to 08/10/02
STREAM LENGTH: 10520 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: GUALALA — Latitude: 38°51'23"
Legal Description: T12NR15WS31 — Longitude: 123°33'38"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: F4	Canopy Density: 93%
Channel Length: 4725 ft.	Coniferous Component: 25%
Riffle/flatwater Mean Width: 8 ft.	Deciduous Component: 75%
Total Pool Mean Depth: 1.0 ft.	Pools by Stream Length: 28%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 3%
Water: 056- 060°F Air: 064-082°F	Mean Pool Shelter Rtn: 34
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Root masses
Vegetative Cover: 39%	Occurrence of LOD: 24%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 27% 2.43% 3. 30% 4. 0% 5. 0%

STREAM REACH 2

Channel Type: B3	Canopy Density: 88%
Channel Length: 3789 ft.	Coniferous Component: 46%
Riffle/flatwater Mean Width: 12 ft.	Deciduous Component: 54%
Total Pool Mean Depth: 1.1 ft.	Pools by Stream Length: 27%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 9%
Water: 056- 060°F Air: 058-077°F	Mean Pool Shelter Rtn: 40
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Large Woody Debris
Vegetative Cover: 48%	Occurrence of LOD: 46%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 8% 2.36% 3. 25% 4. 6% 5. 25%

STREAM REACH 3

Channel Type: F4	Canopy Density: 96%
Channel Length: 1928 ft.	Coniferous Component: 35%
Riffle/flatwater Mean Width: 6 ft.	Deciduous Component: 65%
Total Pool Mean Depth: 1.1 ft.	Pools by Stream Length: 33%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 0%
Water: 058- 059°F Air: 073-079°F	Mean Pool Shelter Rtn: 47
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Large Woody Debris
Vegetative Cover: 43%	Occurrence of LOD: 54%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 19% 2.48% 3. 30% 4. 0% 5. 4%

SOUTH FORK GARCIA — Drainage: GARCIA RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 08/08/02 to 08/10/02

Confluence Location: QUAD: GUALALA LEGAL DESCRIPTION: T12NR15WS31 LATITUDE:38°51'23" LONGITUDE:123°33'38"

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
34	7	RIFFLE	17	37	1261	12	7.0	0.3	247	8383	60	2036	0	0
64	12	FLATWATER	32	98	6254	59	9.4	0.4	723	46269	259	16581	0	1
100	100	POOL	51	30	3049	29	11.6	1.0	343	34281	383	38309	295	36

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
198	119	10564	88933	56926

SOUTH FORK GARCIA — Drainage: GARCIA RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 08/08/02 to 08/10/02

Confluence Location: QUAD: GUALALA LEGAL DESCRIPTION: T12NR15WS31 LATITUDE:38°51'23" LONGITUDE:123°33'38"

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 %
34	7	LGR	17	37	1261	12	7	0.3	0.6	247	8383	60	2036	0	0	94
2	1	GLD	1	32	64	1	13	0.3	0.9	590	1180	177	354	0	0	100
62	11	RUN	31	100	6190	59	9	0.4	1.5	735	45571	267	16525	0	1	90
54	54	MCP	27	31	1667	16	11	1.1	4.2	351	18959	439	23703	348	32	94
2	2	CCP	1	35	71	1	8	1.5	2.9	282	564	400	801	342	0	86
1	1	STP	1	17	17	0	16	0.4	1.3	109	109	44	44	33	20	100
9	9	CRP	5	36	320	3	13	1.0	3.8	444	3995	433	3899	329	44	96
8	8	LSL	4	23	184	2	12	0.8	2.9	247	1978	211	1689	146	41	90
14	14	LSR	7	36	503	5	11	0.8	2.8	392	5494	336	4707	241	35	89
3	3	LSBk	2	47	142	1	9	0.9	2.2	423	1270	405	1215	334	95	95
7	7	PLP	4	15	105	1	13	1.0	2.5	201	1408	233	1628	167	21	94
2	2	BPL	1	20	40	0	15	1.3	2.8	252	504	312	624	130	90	80

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
198	119	10564	89415	57224

SOUTH FORK GARCIA — Drainage: GARCIA RIVER

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 08/08/02 to 08/10/02

Confluence Location: QUAD: GUALALA LEGAL DESCRIPTION: T12NR15WS31 LATITUDE:38°51'23" LONGITUDE:123°33'38"

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
57	57	MAIN	57	31	1755	58	11.3	1.1	344	19631	431	24547	342	30
41	41	SCOUR	41	31	1254	41	11.8	0.9	345	14146	320	13138	236	40
2	2	BACKWATER	2	20	40	1	15.0	1.3	252	504	312	624	130	90

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
100	100	3049	34281	38309

SOUTH FORK GARCIA — Drainage: GARCIA RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 08/08/02 to 08/10/02

Confluence Location: QUAD: GUALALA LEGAL DESCRIPTION: T12NR15WS31 LATITUDE:38°51'23" LONGITUDE:123°33'38"

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
54	MCP	54	0	0	29	54	22	41	2	4	1	2
2	CCP	2	0	0	1	50	1	50	0	0	0	0
1	STP	1	0	0	1	100	0	0	0	0	0	0
9	CRP	9	0	0	5	56	3	33	1	11	0	0
8	LSL	8	0	0	6	75	2	25	0	0	0	0
14	LSR	14	0	0	8	57	6	43	0	0	0	0
3	LSBk	3	0	0	2	67	1	33	0	0	0	0
7	PLP	7	0	0	4	57	3	43	0	0	0	0
2	BPL	2	0	0	0	0	2	100	0	0	0	0

TOTAL UNITS
100

SOUTH FORK GARCIA — Drainage: GARCIA RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 08/08/02 to 08/10/02

Confluence Location: QUAD: GUALALA LEGAL DESCRIPTION: T12NR15WS31 LATITUDE:38°51'23" LONGITUDE:123°33'38"

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
34	0	LGR	0	0	0	0	0	0	0	0	0
2	0	GLD	0	0	0	0	0	0	0	0	0
62	3	RUN	0	27	43	7	0	0	0	23	0
54	44	MCP	5	26	48	17	3	0	0	2	0
2	0	CCP	0	0	0	0	0	0	0	0	0
1	1	STP	30	30	20	20	0	0	0	0	0
9	9	CRP	22	29	22	27	0	0	0	0	0
8	8	LSL	8	36	48	6	0	0	0	2	0
14	14	LSR	9	13	21	54	0	0	0	4	0
3	3	LSBk	0	30	50	7	0	0	0	0	0
7	7	PLP	6	10	49	6	0	0	30	0	0
2	2	BPL	0	33	43	20	0	0	0	0	0

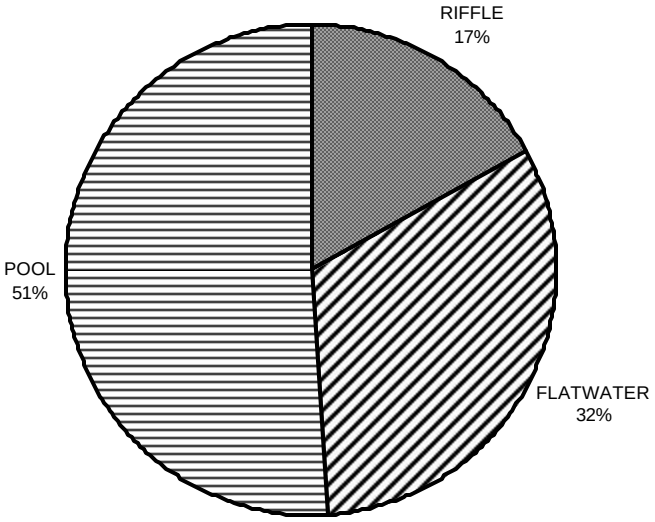
SOUTH FORK GARCIA — Drainage: GARCIA RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 08/08/02 to 08/10/02

Confluence Location: QUAD: GUALALA LEGAL DESCRIPTION: T12NR15WS31 LATITUDE:38°51'23" LONGITUDE:123°33'38"

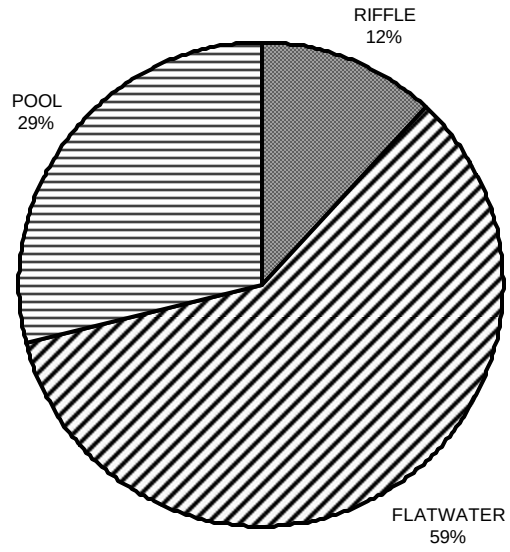
TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
34	7	LGR	0	0	86	14	0	0	0
2	1	GLD	0	100	0	0	0	0	0
62	11	RUN	0	9	82	9	0	0	0
54	14	MCP	0	86	7	7	0	0	0
2	1	CCP	0	100	0	0	0	0	0
1	1	STP	0	100	0	0	0	0	0
9	6	CRP	0	83	17	0	0	0	0
8	3	LSL	0	67	33	0	0	0	0
14	5	LSR	20	0	80	0	0	0	0
3	2	LSBk	0	50	50	0	0	0	0
7	3	PLP	0	100	0	0	0	0	0
2	2	BPL	0	100	0	0	0	0	0

SOUTH FORK GARCIA RIVER
HABITAT TYPES BY PERCENT OCCURENCE



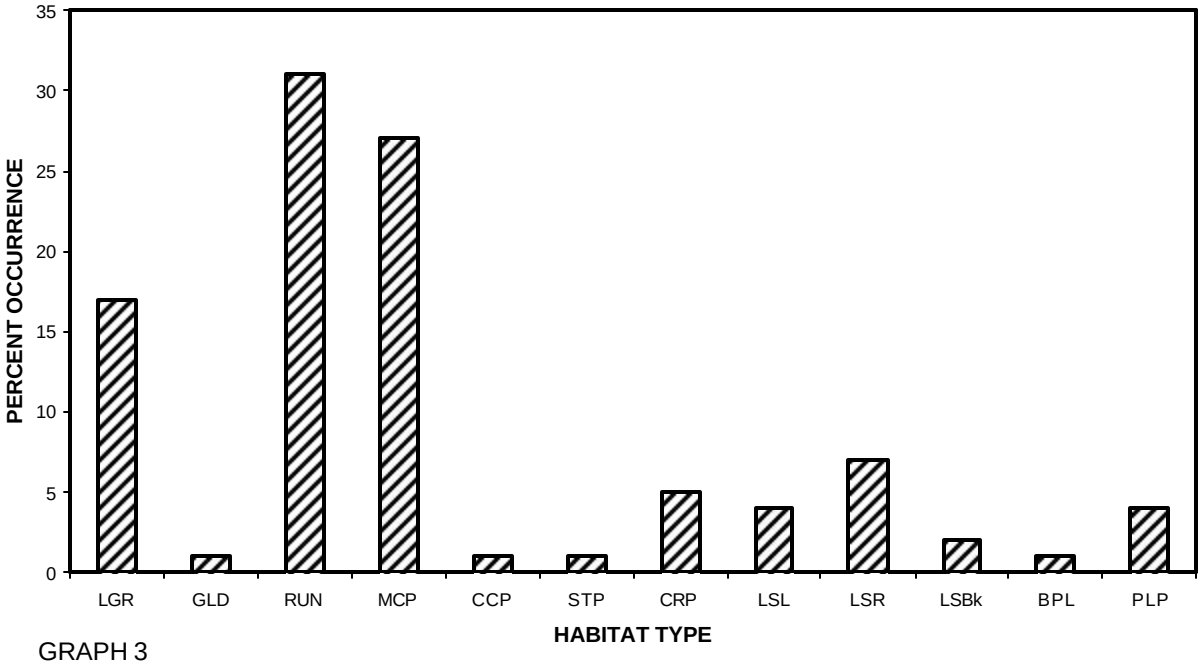
GRAPH 1

SOUTH FORK GARCIA RIVER
HABITAT TYPES BY PERCENT TOTAL LENGTH



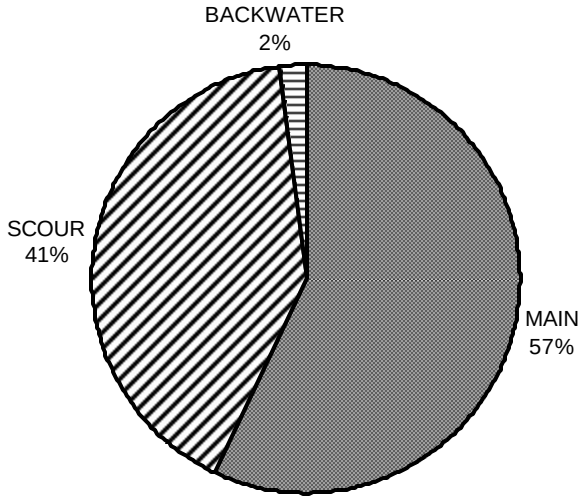
GRAPH 2

SOUTH FORK GARCIA RIVER
HABITAT TYPES BY PERCENT OCCURRENCE



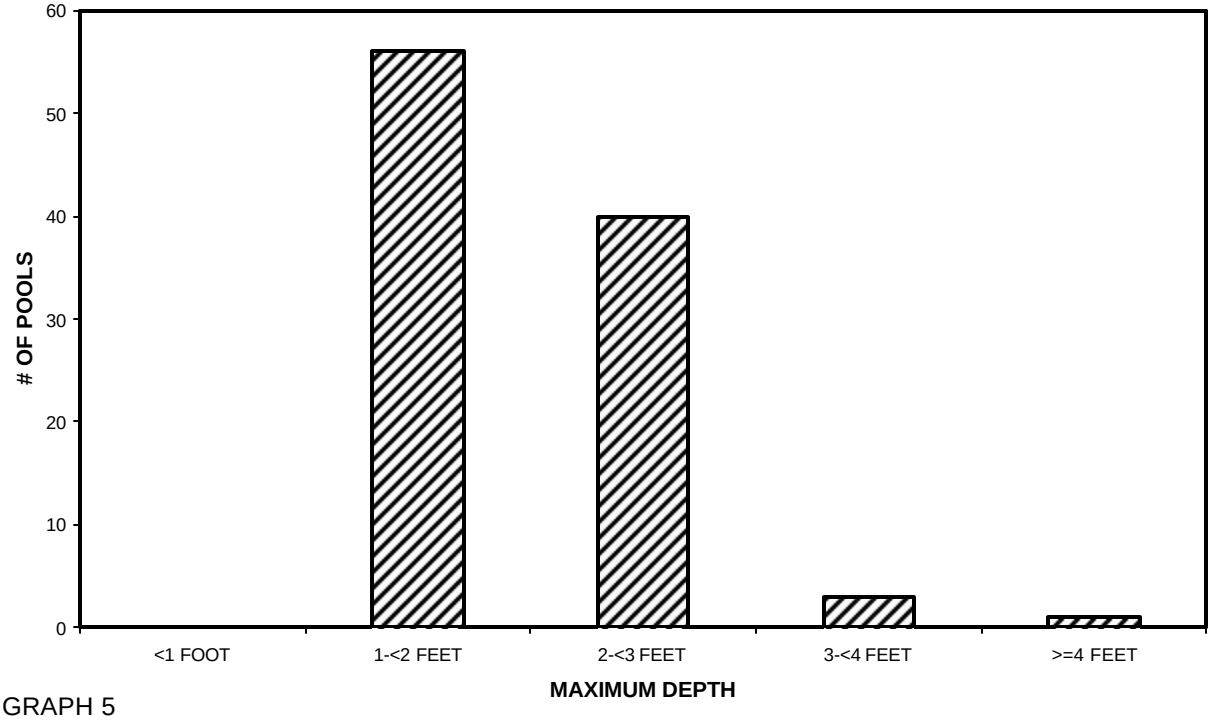
GRAPH 3

SOUTH FORK GARCIA RIVER
POOL HABITAT TYPES BY PERCENT OCCURRENCE



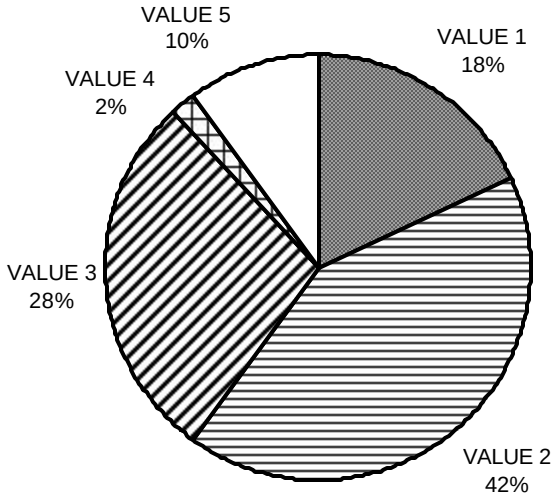
GRAPH 4

SOUTH FORK GARCIA RIVER
MAXIMUM DEPTH IN POOLS



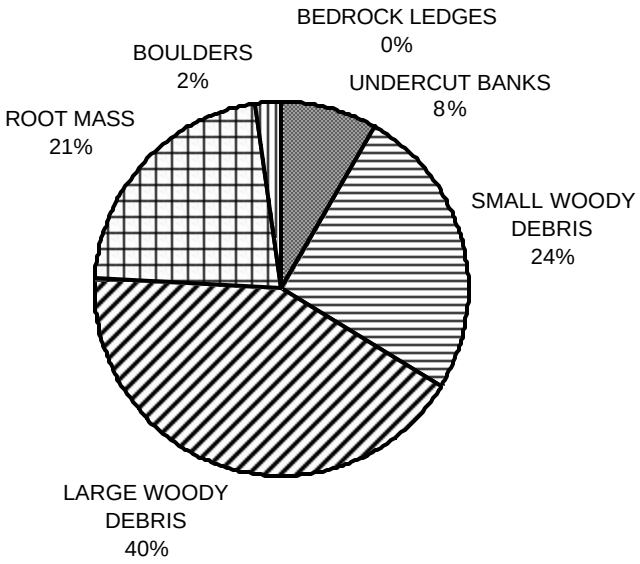
GRAPH 5

SOUTH FORK GARCIA RIVER
PERCENT EMBEDDEDNESS



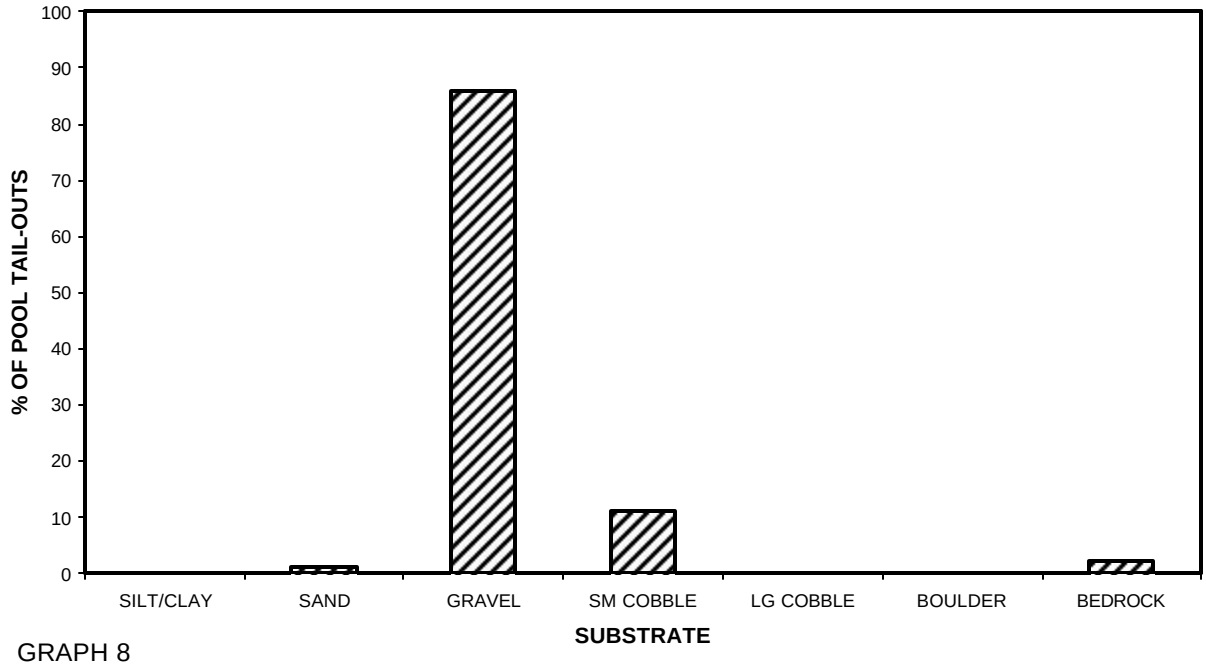
GRAPH 6

SOUTH FORK GARCIA RIVER
MEAN PERCENT COVER TYPES IN POOLS



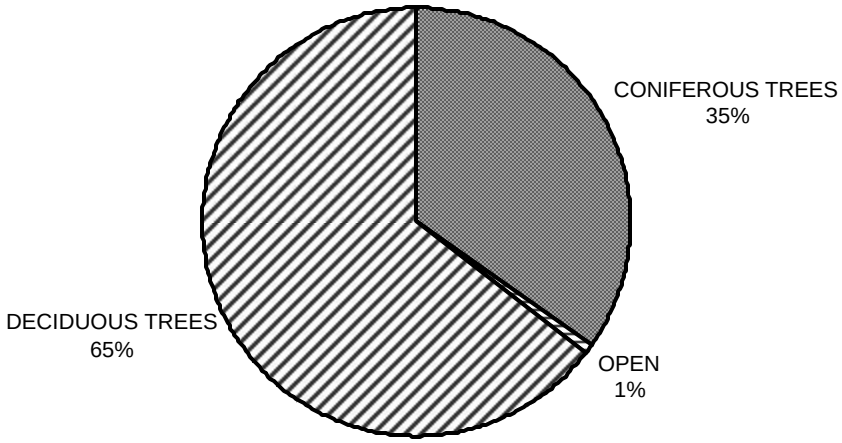
GRAPH 7

SOUTH FORK GARCIA RIVER
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



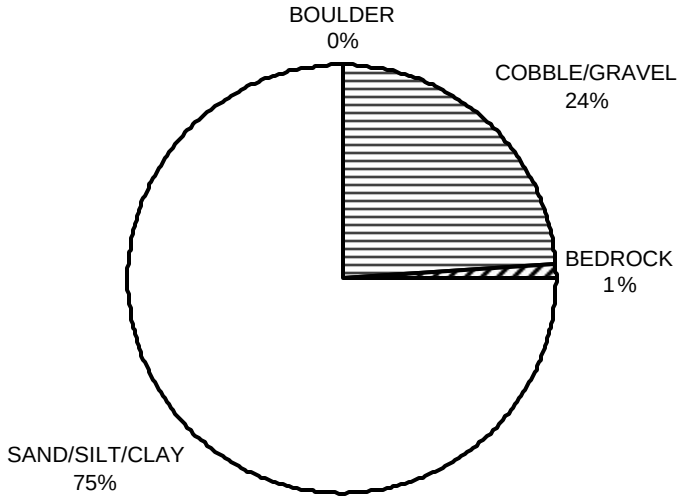
GRAPH 8

SOUTH FORK GARCIA RIVER
MEAN PERCENT CANOPY



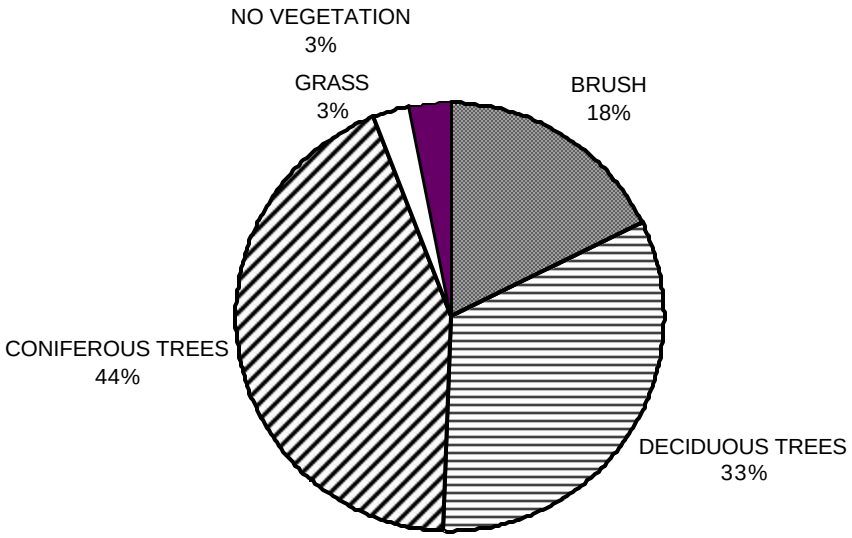
GRAPH 9

SOUTH FORK GARCIA RIVER
DOMINANT BANK COMPOSITION IN SURVEY REACH

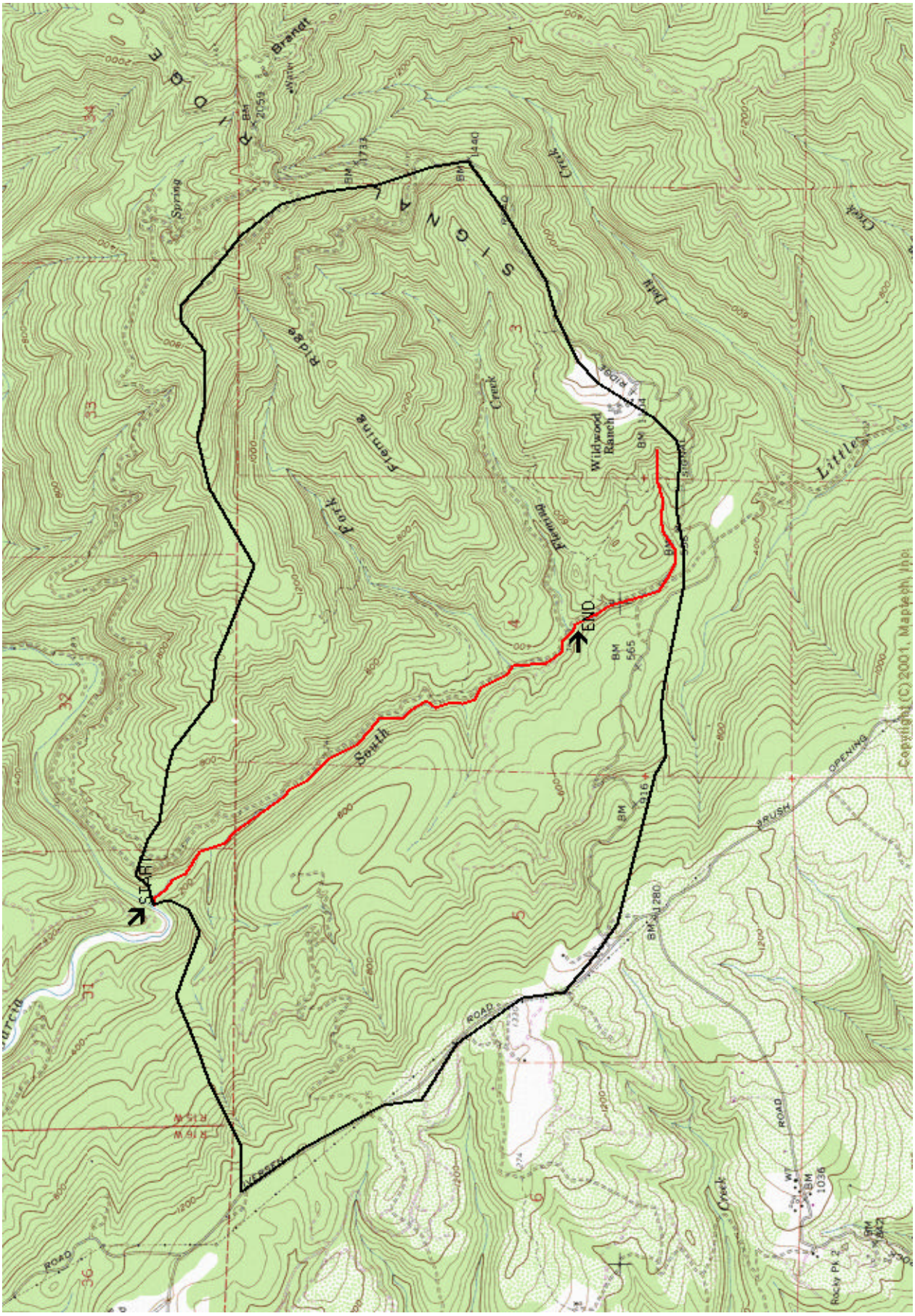


GRAPH 10

SOUTH FORK GARCIA RIVER
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



MAP 1. SOUTH FORK GARCIA RIVER.