STREAM INVENTORY REPORT

South Fork Big River

INTRODUCTION

A stream inventory was conducted beginning July 9 and ending September 18, 2002 on South Fork Big River. The South Fork Big River was split equally into two separate stream habitat surveys due to time constraints and lack of human resources. This report includes results from survey one, the South Fork Big River survey from the confluence with Big River upstream 11.7 miles, and survey two, from 11.7 miles upstream of Big River confluence to 9.2 miles upstream to the headwaters.

The South Fork Big 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 Big 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 Big River is a tributary to Big River, tributary to Pacific Ocean, located in Mendocino County, California (Map 1-3). South Fork Big River's legal description at the confluence with Big River is T17N R15W S33. Its location is 39°17′44″ north latitude and 123°31′57″ west longitude. South Fork Big River is a third order stream and has approximately 107,240 feet of solid blue line stream and 8,865 feet of dashed blue line stream according to the USGS Comptche, Greenough Ridge, Bailey Ridge, and Orr Springs 7.5 minute quadrangle. South Fork Big River drains a watershed of approximately 54.3 square miles. Elevations range from about 190 feet at the mouth of the creek to 2,797 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is owned by state and private entities for recreational, residential, and timber production. Vehicle access exists via Highway 20 at mile marker 17.55 east of the Chamberlain Creek Bridge. Mendocino Redwood Company logging roads are used to access the stream from this point. The South Fork Big River can also be accessed from Comptche Ukiah Road to Orr Springs Road, south of Mendocino.

A reconnaissance survey was conducted on the South Fork Big River by CDFG in 1958 (California Department of Fish and Game 1958) and again in 1966 (California Department of Fish and Game 1966). Coho salmon and steelhead trout were noted in the 1958 and 1966 surveys as being in abundance.

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METHODS

The habitat inventory conducted in South Fork Big River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998). The California Department of Fish and Game field crew and the 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 Big 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 Big 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 Big 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 Big 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 Big 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 evergreen 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 Big 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 Big River. Sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following seven tables:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of shelter by habitat types
- Summary of dominant substrates by habitat types
- Summary of fish habitat elements by stream reach

Graphics are produced from the tables using Microsoft Excel. Graphics developed for South Fork Big River include:

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools
- Percent embeddedness estimated in pool tail-outs
- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HABITAT INVENTORY RESULTS

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

The South Fork Big River habitat inventory was done in two parts. Survey one extends from the confluence with Big River upstream 61,998 feet. Survey two starts at this point and extends upstream 48,502 feet to the end of anadromy.

MAINSTEM SOUTH FORK BIG RIVER, SURVEY ONE

The habitat inventory of July 9 to September 18, 2002, was conducted by R. Wells, H. Kleeb, S. Thompson, and T. Pagliuca (WSP/AmeriCorps). The total length of the stream surveyed was 61,998 feet.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 4.7 cfs on September 12, 2002 on South Fork Big River.

South Fork Big River is an F3 channel type for the entire 61,998 feet of stream surveyed. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 58 to 78 degrees Fahrenheit. Air temperatures ranged from 55 to 91 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% flatwater units, 34% pool units, and 24% riffle units (Graph 1). Based on total length of Level II habitat types there were 52% flatwater units, 39% pool units, and 9% riffle units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 31%; mid-channel pools, 25%; and low-gradient riffles, 24% (Graph 3). Based on percent total length, runs made up 39% and mid-channel pools, 30%.

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A total of 168 pools were identified (Table 3). Main-channel pools were the most frequently encountered, at 77%, and comprised 81% 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. One hundred twenty-eight of the 165 measured pools (77%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 166 pool tail-outs measured, 104 had a value of 1 (63%); 31 had a value of 2 (19%); 21 had a value of 3 (13%); 0 had a value of 4 (0%); and 10 had a value of 5 (6%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 31, pool habitats had a mean shelter rating of 25, and flatwater habitat types had a mean shelter rating of 23 (Table 1). Of the pool types, main-channel pools had the highest mean shelter rating at 26. Scour pools had a mean shelter rating of 23 and backwater pools had a mean shelter rating of 15 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in South Fork Big River. Graph 7 describes the pool cover in South Fork Big River. Boulders are the dominant pool cover type followed by bedrock ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 73% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 18%.

The mean percent canopy density for the surveyed length of South Fork Big River was 76%. In the closed canopy, the mean percentages of deciduous and coniferous trees were 70% and 30%, respectively. Graph 9 describes the mean percent canopy in South Fork Big River.

For the stream reach surveyed, the mean percent right bank vegetated was 87%. The mean percent left bank vegetated was 90%. The dominant elements composing the structure of the stream banks consisted of 63% bedrock, 26% cobble/gravel, 10% sand/silt/clay, and 1% boulder (Graph 10). Deciduous trees were the dominant vegetation type observed in 84% of the units surveyed. Additionally, 9% of the units surveyed had grass as the dominant vegetation type, and 6% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

No biological inventory was conducted on South Fork Big River, survey one. Young of year, yearling, and resident salmonid presence was observed from the stream banks in the entire length of South Fork Big River, Survey one.

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DISCUSSION

South Fork Big River is an F3 channel type for the entire 61,998 feet of stream surveyed. The suitability of F3 channel types for fish habitat improvement structures is as follows: F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors; fair for plunge weirs, boulder clusters, channel constrictors, and log cover.

The water temperatures recorded on the survey days July 9 through September 18, 2002 ranged from 58 to 78 degrees Fahrenheit. Air temperatures ranged from 55 to 91 degrees Fahrenheit. This is an unsuitable water temperature range for salmonids. The recorded water temperatures of 60 degrees Fahrenheit and below are suitable for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 52% of the total length of this survey, pools 39%, and riffles 9%. The pools are relatively deep, with 128 of the 165 (77%) measured pools having a maximum depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third order streams, a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. In third order streams, a primary pool is defined to have a depth of three feet or greater, occupy at least half the width of the low flow channel, and be as long as the low flow channel width.

One hundred thirty-five of the 166 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-one 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.

One hundred twenty of the 166 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 low at 25. The shelter rating in the flatwater habitats was slightly lower at 23. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, aquatic vegetation 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 76%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 87% and 90%, respectively.

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RECOMMENDATIONS

1) South Fork Big River should be managed as an anadromous, natural production stream.

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

3) Increase the canopy on South Fork Big River by planting 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.

4) 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.

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

COMMENTS AND LANDMARKS

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

Position (ft):	Comments:
0'	Begin survey at the confluence with Big River. The channel type was taken in habitat unit 23 and is an F3.
692'	End of influence.
2520'	Channel type determination made.
3260'	YOY present
4345'	Right bank landslide 15 feet wide, 40 feet high, and 10 feet deep.
11197'	SWD accumulation
11409'	Substrate too small to spawn in.
14610'	Coho YOY

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18610'	Bridge 1 and left bank trib 1.
19281'	Road on the right bank well maintained. Waterhole. Coho YOY.
22110'	Left bank landslide boulder and silt. 150 feet tall and 55 feet long. Possibly old crossing. Also a spring on the left bank. Cold water.
23148'	Left bank dry trib.
25105'	LDA has 32 pieces of LWD.
25180'	Coho YOY. 34 pieces of LWD.
25747'	11 pieces of LWD.
27030'	Vehicle crossing, no bridge.
27633'	SWD accumulation
28134'	Right bank trib - Ramon Creek.
29804'	Channel becoming entrenched.
30208'	Channel back to normal.
31191'	Dried right bank trib with moist substrate. No flow.
37194'	Mettick Creek enters on the left bank in this unit. Right bank landslide 10 feet long and 30 feet high. Delivers boulder to silt.
38353'	Anderson Gulch enters on left bank.
38709'	Landslide 15 feet long and 35 feet high. Single piece of LWD.
38808'	Unnamed trib enters on the left bank. Steep gradient greater than 20%. Flow is less than 0.01 cfs.
39692'	Right bank landslide 40 feet long and 10 feet high.
40912'	Six pieces of LWD.
41022'	Dry right bank trib.
41175'	Dominated by bedrock.
42348'	YOY observed in pool.

42670'	Three pieces of LWD.
43277'	Three pieces of LWD.
44862'	Boardman Gulch enters on right bank. 3 pieces of LWD in unit.
45670'	Three pieces of LWD.
46915'	Pool tail crest is dry for about 5 feet. Salmonid YOY.
47916'	Four pieces of LWD.
48228'	Four pieces of LWD.
48755'	Two pieces of LWD.
49030'	Two pieces of LWD.
50342'	Landslide on left bank 30 feet long and 8 feet high. Depositing boulders and silt into stream.
50421'	Five pieces of LWD.
51485'	Four pieces of LWD.
52260'	Four pieces of LWD.
52936'	Four pieces of LWD.
53584'	Three pieces of LWD.
54097'	Two pieces of LWD.
54821'	Single piece of LWD.
56124'	Two pieces of LWD.
56266'	Unknown concrete structure in channel. 15 feet long, 8 feet wide, and 4 feet high.
56329'	Single piece of LWD.
56626'	Steam donkey on right bank.
56784'	Piston in channel. From steam donkey?

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58261'	Right bank trib flowing underground for about 20 feet. 10% slope, no fish observed 100 feet upstream.
58432'	Three pieces of LWD.
58710'	Two pieces of LWD.
59020'	Two pieces of LWD.
59456'	Small right bank slide road very close to creek. 10 feet long, 30 feet high, and 5 feet deep. Mostly depositing silt and sand. Single piece of LWD.
59812'	Two pieces of LWD.
60215'	Five pieces of LWD.
61428'	Single piece of LWD.
61708'	End of survey one. The remainder of the south fork big river was completed by theFort Bragg crew.

MAINSTEM SOUTH FORK BIG RIVER, SURVEY TWO

The habitat inventory of August 27 to September 16, 2002, was conducted by S. Monday and K. Knechtle (DFG). The total length of the stream surveyed was 48,522 feet.

South Fork Big River is a C3 channel type for 18,641 feet, an F3 for 17,481 feet, a B1 for 6,424 feet, and a C2 for 3,973 feet of stream surveyed. C3 channels are low gradient, meandering, point bar, riffle/pool, alluvial channels with broad, well defined floodplains and cobble-dominant substrates. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. B1 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools; very stable plan and profile, stable banks with boulder-dominant substrates. C2 channels are low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplains and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 55 to 71 degrees Fahrenheit. Air temperatures ranged from 56 to 94 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 47% pool units, 35% flatwater units, 17% riffle units, and 1% was dry (Graph 1). Based on total length of Level II habitat types there were 49% flatwater units, 37% pool units, 12% riffle units, and 2% was dry (Graph 2).

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Twenty Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 28%; step runs, 24%; and low-gradient riffles 16% (Graph 3). Based on percent total length, step runs made up, 38%, mid-channel pools, 22%, and low-gradient riffles, 11%.

A total of 268 pools were identified (Table 3). Main-channel pools were the most frequently encountered, at 62%, and comprised 64% 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. Seventy-eight of the 268 fully measured pools (29%) had a depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 268 pool tail-outs measured, 53 had a value of 1 (20%); 76 had a value of 2 (28%); 43 had a value of 3 (16%); 1 had a value of 4 (0%); and 95 had a value of 5 (35%) (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 25, riffle habitat types had a mean shelter rating of 23, and flatwater habitat types had a mean shelter rating of 18 (Table 1). Of the pool types, backwater pools had the highest mean shelter rating at 29. Scour pools had a mean shelter rating of 26 and backwater pools had a mean shelter rating of 25 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in South Fork Big River. Graph 7 describes the pool cover in South Fork Big River. Bedrock ledges are the dominant pool cover type followed by boulders.

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 44% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 19%.

The mean percent canopy density for the surveyed length of South Fork Big River was 81%. In the closed canopy, the mean percentages of deciduous and coniferous trees were 44% and 56%, respectively. Graph 9 describes the mean percent canopy in South Fork Big River.

For the stream reach surveyed, the mean percent right bank vegetated was 48%. The mean percent left bank vegetated was 55%. The dominant elements composing the structure of the stream banks consisted of 43% sand/silt/clay, 34% bedrock, 15% cobble/gravel, and 8% boulder (Graph 10). Coniferous trees were the dominant vegetation type observed in 52% of the units surveyed. Additionally, 36% of the units surveyed had deciduous trees as the dominant vegetation type, and 7% had grass as the dominant vegetation (Graph 11).

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BIOLOGICAL INVENTORY RESULTS (Survey Two)

No biological inventory was conducted on South Fork Big River, survey two. Young of year and yearling salmonid presence was observed from the stream banks in South Fork Big River, survey two, up to 48,111 feet.

DISCUSSION (Survey Two)

South Fork Big River is a C3 channel type for 18,641 feet, an F3 for 17,481 feet, a B1 for 6,424 feet, and a C2 for the remaining 3,973 feet of stream surveyed. The suitability of C3, F3, B1, and C2 channel types for fish habitat improvement structures are as follows: C3 channel types are excellent for bank-placed boulders and good for plunge weirs, boulder clusters, single and opposing wing-deflectors, and log cover. F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors; fair for plunge weirs, boulder clusters, channel constrictors and log cover. B1 channel types are excellent for bank-placed boulders and good for log cover. C2 channel types are good for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days August 27 through September 16, 2002 ranged from 55 to 71 degrees Fahrenheit. Air temperatures ranged from 56 to 94 degrees Fahrenheit. This is an unsuitable water temperature range for salmonids. The recorded water temperatures of 60 degrees Fahrenheit and below are suitable for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Riffles habitat types comprised 49%, of the total length of this survey, pools 37%, and flatwater 12%. The pools are relatively shallow, with only 78 of the 268 (29%) pools having a maximum depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third order streams, a primary pool is defined to have a maximum depth of at least three 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.

One hundred twenty-nine of the 268 pool tail-outs measured had embeddedness ratings of 1 or 2. Forty-four of the pool tail-outs had embeddedness ratings of 3 or 4. Ninety-five 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 South Fork Big River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

One hundred sixty-nine of the 268 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 low at 25. The shelter rating in the flatwater habitats was slightly lower at 18. A pool shelter rating of approximately 100 is desirable. The amount of

cover that now exists is being provided primarily by boulders in all habitat types. Additionally, bedrock ledges contribute 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 81%. 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 48% and 55%, 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 (Survey Two)

1) South Fork Big River should be managed as an anadromous, natural production stream.

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

3) Active and potential sediment sources need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

4) 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.

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

6) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

7) Increase the canopy on South Fork Big River by planting redwood and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

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

COMMENTS AND LANDMARKS (Survey Two)

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

Position (ft):	Comments:
0'	Begin survey – South Fork Big River was split in two sections and surveyed by different crews. This is the survey of the second half of the South Fork Big River close to the MRC/private land boundry. Approx 61,998 feet upstream from the confluence with Big River
126'	2 inch black pipe with filter/screen in pool and running up the bank. Steelhead YOY.
357'	stickleback YOY.
483'	Coho YOY. Spring at the top of unit on left bank.
741'	Slide on left bank contributing fines and debris: 200 feet high and 100 feet long.
785'	Slide from previous unit extends into this unit.
798'	Downed trees from slide in this unit.
939'	Spring on left bank
1065'	Two pieces of LWD fell into stream. Steelhead yearling.
1614'	Water pump on the left bank, not currently pumping.
1749'	Old propane tank on left bank: 10 feet long and 2.5 feet wide.
2115'	House on right bank at the top of the unit.
2217'	Dry left bank tributary.
2273'	Right bank tributary 150 feet into unit.
2698'	90 feet into unit there is a pump on the left bank with screen on end of hose. Pipes going up the left bank. A substrate diversion was made to a small dug pool. 2 feet by 1 foot. Cobble and boulder. 125 feet into unit there is a dry right bank tributary.

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3084'	Wet crossing 40 feet into unit.
3450'	Crayfish in pool. Pool is bedrock scour greater than 60%.
3512'	Dry right bank tributary. 236 feet into unit there is an old rope suspension bridge.
3790'	Pump in pool running pipe up to house on the left bank.
3954'	262 feet into unit there is a railroad car bridge. Under the bridge there is a 2 inch pipe with a filter running up the right bank.
4336'	Man-made dam from boulders and cobble to create pool. Potential barrier for migrating YOY. 8 feet wide and 1.5 feet tall.
4556'	Dam is where the pool tail crest should be.
5776'	Water pump with screen on right bank.
6410'	Left bank spring 142 feet into unit. Car parts within the stream.
6730'	Possible tributary during high flows 200 feet into unit.
6770'	Random pieces of metal in the stream. Possible old dump site.
6881'	Left bank tributary at the beginning of unit.
7029'	Left bank offstream pump. Channel type taken in this unit.
7359'	Orr Springs Road bridge 38 feet into unit.
7485'	Daugherty Creek enters on the left bank 50 feet into unit.
7575'	Old log bridge 40 feet into unit. No center cross logs to cross
7721'	Flat car bridge across channel. 30 feet up bedrock banks.
7754'	Bedrock on both sides of channel possible cause of scour.
8184'	Dry right bank tributary.
8605'	Left bank waterall at 100 feet dry. Many juvenile salamanders.
9115'	Flowing right bank tributary 30 feet into unit.
9477'	Possible coho YOY. 3 foot jump up to next section.

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9599'	12 feet into unit there is a bridge about 10 feet above the stream. Concrete structure 10 feet by 5 feet on the left bank.
9912'	Old foot bridge not currently in use.
10521'	Right bank erosion from road to stream. 20 feet wide and 30 feet high.
10920'	Scour from root mass and LWD greater than 60%.
10998'	Possible old redd 80 feet into unit. Bridge crosses over unit.
11078'	Old wet crossing in unit.
11494'	20 feet into unit there is a left bank trib with little flow.
11604'	Scour from bedrock greater than 60%.
11902'	Ammocete in pool about 6 inches long.
12088'	135 feet into unit there is a bridge over the channel.
12372'	Water pump on left bank with piping up to house. Possible dry left bank tributary.
12452'	Trash and toys in stream.
12540'	Garbage in stream.
13049'	Pool created from bedrock scour on both sides greater than 60%.
13184'	Culvert on right bank 3 feet in diameter dripping water. Culvert under Orr Springs Road.
13199'	Bedrock scour greater than 60%.
13886'	Pump on right bank activly pumping.
14673'	Old wet crossing 100 feet into unit.
14822'	20 feet into unit a bridge crosses river. Appears to be in good condition.
15026'	Pump 125 feet into unit house on right bank.
15258'	Water from black 2 inch pipe flowing into stream.
15758'	Slide on left bank 30 feet long and 40 feet high.

16681' Pump and hose in stream. House on right bank.

17098' Johnson Creek enters on right bank. 8 foot culvert, water seeping under the pipe.

17184' No access.

19611' Dry right bank tributary 61 feet into unit. 4 foot culvert.

19834' Pool starts 20 feet into unit 203, but is seperated by gravel.

20223' Left bank road to stream about 164 feet into unit. Flat car bridge 205 feet into unit, and wet left bank trib about 291 feet into unit.

20644' New channel type.

21592' Wet crossing 5 feet into unit. Cable in stream 75 feet into unit.

21679' Flat car bridge 72 feet into unit. 2 yearling steelhead.

21808' Old wet crossing at the beginning of unit.

23590' Right bank rock-armor 50 feet into unit 12 ft. High. At 145 ft. Armor extends up to orr springs road. 20 ft. Wide.

23735' Rock armor continued 98 ft into unit.

23973' Channel splits at 105 feet.

24393' Unidentified frog.

26104' Right bank tributary at the top of the unit. Wet culvert about 300 feet up the trib.

26424' Two rusted cars at the top of unit on right bank about 35 feet from the stream.

26773' Split channel, one side is dry.

27105' Dark Gulch enters on right bank 107 feet into unit. Flowing. Old skid trail at top of unit falling into the stream, contributing fines.

27273' Right bank seems to be unstable, contributing fines and LWD.

27467' Spring on left bank. Eight pieces of LWD contributing to the scour.

27542' Right and left bank erosion. Recent slides. On the right bank there is a LWD and SWD pile 8 feet high, 15 feet wide, and 50 feet long.

27696' One foot culvert on right bank - dry.

27808' Bedrock scour greater than 60%.

27912' Spring on left bank at the top of unit.

28397' Dry left bank tributary with about a 75% gradient 30 feet into the unit.

28642' Old slide on the right bank, 120 feet long and 100 feet high contributing fines.

29025' Right and left bank erosion contributing fines.

29208' Dry tributary on right bank 62 feet into unit.

30218' Flowing left bank tributary 144 feet into unit very small.

30433' Dry right bank tributary 10 feet into unit. Culvert at the road about 300 feet up bank.

31262' Small pool at right bank seperated by gravel bar.

31319' Left bank tributary 44 feet into unit. Little water.

31490' Dry left bank tributary 30 feet into unit.

31572' Five pieces of LWD on left bank.

31662' Dry left bank tributary 40 feet into unit.

31722' Channel splits 58 feet into unit, large tree fell across stream from left bank.

31959' Dry right bank tributary at 100 feet.

32567' Flat car bridge 68 feet into unit. Left bank culvert at 70 feet about 1 foot in diameter.

32967' Small right bank pool separated by small gravel bar.

33070' 145 feet into unit there is a right bank culvert 2 feet in diameter about 20 feet up the bank.

33642' Dry left bank tributary 10 feet into unit. Large slide about 71 feet long on the left bank and about 200 feet high.

33766' Dry left bank tributary 147 feet into unit.

35019' Left bank tributary 30 feet into unit- wet.

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35251' Dry left bank tributary 205 feet into unit.

35834' Montgomery Creek 17 feet into unit. Flowing.

35873' Orr Springs Road bridge crossing 166 feet into unit.

36847' Concrete 5’ x 5’ x 4’ on the left bank.

36966' Dry right bank tributary at top of unit.

37361' Dry right bank tributary 15 feet into unit.

37450' Coho YOY. Scour created by bedrock greater than 60%.

37552' Orr Springs Road bridge crosses over stream. Concrete sides.

37626' Unit begins at the end of the bridge.

37725' One foot culvert on right bank - dry.

38125' Took channel type at the beginning of unit. 1 foot culvert at the top of unit - dry.

38732' 197 feet into unit there is a dry right bank tributary.

39192' Green moss layer on the bedrock.

39455' Coho YOY.

39998' One foot culvert about 30 feet into unit. Dry.

40170' Ditch relief culvert on right bank.

40506' Scour from boulder greater than 60%.

40928' Unnamed tributary #1 enters on the right bank. Concrete bottom bridge over the tributary. Very little flow.

41101' Single piece of LWD associated with SWD. Coho and steelhead YOY.

41156' 80 cm dead steelhead. Steelhead YOY.

41931' Six pieces of LWD within stream collecting sediment on top.

41948' Unnamed tributary #2 enters 5 feet into unit.

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42007' Orr Springs Road bridge about 45 feet into unit.

42312' Dry left bank tributary 28 feet into unit.

42448' Large boulders creating a 5 foot jump. Potential coho barrier.

42501' Potential coho barrier, 5 foot jump from bottom of pool.

42554' Steelhead yearling and YOY.

42781' Unnamed tributary #3 on the right bank about 49 feet into unit. Tributary is dry at the mouth.

42830' Dense alders within the stream/riparian.

43054' Orr Springs Ukiah bridge about 100 feet long. Highly sedimented.

43240' 3-5 yearling steelhead.

43371' Loose sediment along the right bank.

43627' Dry left bank tributary about 300 feet into unit.

43950' Large boulders in unit. Two 3 foot jumps with no pools above or below.

44030' Left bank slide about 14 feet into unit.

44134' Slide on left bank about 20 feet high and 150 feet long contributing fines.

44152' Masses of grass covering a big section of this unit.

44209' Slide continues into this unit roughly 40 feet high.

44264' Right bank full of boulder rip-rap. Orr Springs Road at top of bank about 25 feet high.

44329' Dry left bank tributary at the top of the unit.

44549' Took channel type. Right bank culvert about 2 foot diameter - dry.

44615' Left bank slide 30 to 40 feet tall and 60 to 70 feet long. Contributing fines.

44693' 4 foot high plunge.

45227' Dry right bank tributary about 144 feet into unit.

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45431' Two pieces of LWD with some SWD. LWD is about 50 feet in length.

46280' 1.5 foot culvert on right bank.

46318' 71 feet into unit there is a dry right bank culvert about 1.5 feet in diameter.

46477' Foot bridge over unit. Good condition about 8 feet off of the water.

46598' 38 feet into unit there is a dry left bank culvert about 1.5 foot diameter.

46710' 46 feet into unit there is a foot bridge. Boulder rip rap on right and left banks.

46936' Hundreds of tadpoles all over unit.

46959' Building over unit, about 20 feet long and 20 feet wide. Canopy was taken under building. Building stood about 8 feet above stream.

47041' Thermometer was lost so no temps were taken for the remainder of the day. Layer of moss/algae on substrate.

47163' Tapped hot spring on the right bank with bath house. Man-made dam at the top of the pool. 7 feet wide and 4 feet high. Water cascading off of either end. Water is very warm between 75 and 80 degrees. Water from spring running through bath house.

47193' 2 tapped hot springs within unit. Foot bridge at the top of unit.

47256' 35 feet into unit hot spring/pool plunges into stream.

47343' Water significantly slows down after the hot springs.

47418' 200 feet into unit there is a dry right bank tributary.

47683' 10 to 20 steelhead YOY and a yearling steelhead. 10 to 12 newts.

47694' 130 feet into unit there is an old man-made dam not currently working. 10 feet wide and 3 feet high. 221 feet into unit there is a dry left bank tributary.

48007' Steelhead yearling and YOY. Multiple newts and frogs.

48020' 22 feet into unit there is a dry right bank tributary.

48048' Gradient has increased through the last few units.

48111' 10 to 20 steelhead YOY. Steelhead yearling. Newts and frogs in pool as well.

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48130' 60 feet into unit there is an old wooden bridge that is falling apart.

48221' Dry left bank tributary about 16 feet into unit.

48252' Very high gradient. Big boulders. Old trash/dump site on the right bank about 190 feet into unit.

48502' End of survey -reached end of anadromy. Significant gradient increase over the last 2000 feet of survey. Dry channel currently dominates the stream. Intermittent channel with isolated pools holding steelhead yearling and YOY, as well as many newts, salamanders and frogs.

South Fork Big River

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]		

South Fork Big River

TABLES AND GRAPHS (Survey One)

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: SOUTH FORK BIG RIVER
SAMPLE DATES: 07/09/02 to 09/18/02
STREAM LENGTH: 61998 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: COMPTCHE — Latitude: 39°30'21"
Legal Description: T17NR15WS33 — Longitude: 123°53'33"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: F3	Canopy Density: 76%
Channel Length: 61998 ft.	Coniferous Component: 30%
Riffle/flatwater Mean Width: 19 ft.	Deciduous Component: 70%
Total Pool Mean Depth: 2.1 ft.	Pools by Stream Length: 39%
Base Flow: 4.7 cfs	Pools >=3 ft.deep: 76%
Water: 058- 078°F Air: 055-091°F	Mean Pool Shelter Rtn: 25
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 89%	Occurrence of LOD: 7%
Dom. Bank Substrate: Bedrock	Dry Channel: 0 ft.

Embeddness Value: 1. 62% 2.19% 3. 13% 4. 0% 5. 6%

SOUTH FORK BIG RIVER — Drainage: BIG RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 07/09/02 to 09/18/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
116	11	RIFFLE	24	47	5437	9	20.9	0.3	711	82480	188	21823	0	31
206	24	FLATWATER	42	160	32870	52	17.1	0.7	2191	451351	1651	340139	0	23
168	165	POOL	34	146	24514	39	27.5	2.1	3969	666822	8820	******	7949	25

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
490	200	62821	1200654	1843694

SOUTH FORK BIG RIVER — Drainage: BIG RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 07/09/02 to 09/18/02

Confluence Locacion: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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 %
116	11	LGR	24	47	5437	9	21	0.3	1.0	711	82480	188	21823	0	31	78
21	1	GLD	4	131	2747	4	22	0.6	1.2	3168	66528	1901	39917	0	5	76
150	19	RUN	31	162	24270	39	18	0.7	2.4	2073	310888	1630	244474	0	19	74
35	4	SRN	7	167	5853	9	14	0.6	1.7	2509	87828	1690	59154	0	45	79
3	3	TRP	1	136	407	1	23	3.8	11.0	3522	10565	17242	51726	16538	25	72
124	121	MCP	25	153	18938	30	28	2.2	10.0	4213	522472	9753	******	8847	26	75
2	2	CCP	0	145	289	0	38	1.6	3.2	5529	11058	7672	15344	6566	15	80
1	1	STP	0	153	153	0	18	3.0	5.0	2616	2616	7849	7849	7326	30	97
1	1	LSL	0	53	53	0	30	1.2	2.4	1511	1511	1813	1813	1511	45	85
4	4	LSR	1	74	294	0	30	1.3	3.2	1982	7929	2515	10058	2118	49	72
31	31	LSBk	6	138	4277	7	25	1.7	6.5	3553	110157	6043	187331	5191	19	78
2	2	BPB	0	52	103	0	13	0.9	2.7	624	1248	520	1040	0	15	98

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
490	200	62821	1215279	1849898

SOUTH FORK BIG RIVER — Drainage: BIG RIVER

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 07/09/02 to 09/18/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
130	127	MAIN	77	152	19787	81	28.1	2.2	4205	546687	9882	******	8981	26
36	36	SCOUR	21	128	4624	19	26.1	1.6	3322	119596	5533	199202	4747	23
2	2	BACKWATER	1	52	103	0	12.5	0.9	624	1248	520	1040	0	15

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
168	165	24514	667531	1484918

SOUTH FORK BIG RIVER — Drainage: BIG RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/09/02 to 09/18/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
3	TRP	2	0	0	0	0	0	0	0	0	3	100
124	MCP	74	3	2	1	1	21	17	47	38	52	42
2	CCP	1	0	0	0	0	1	50	1	50	0	0
1	STP	1	0	0	0	0	0	0	0	0	1	100
1	LSL	1	0	0	0	0	1	100	0	0	0	0
4	LSR	2	0	0	0	0	1	25	3	75	0	0
31	LSBk	18	0	0	0	0	10	32	11	35	10	32
2	BPB	1	0	0	1	50	1	50	0	0	0	0

TOTAL UNITS
168

SOUTH FORK BIG RIVER — Drainage: BIG RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 07/09/02 to 09/18/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
116	11	LGR	1	7	5	0	0	40	0	47	0
21	1	GLD	50	0	0	0	0	0	0	50	0
150	19	RUN	2	13	3	1	17	26	0	33	4
35	4	SRN	0	25	0	0	8	25	3	40	0
3	3	TRP	0	13	7	3	3	7	0	7	60
124	121	MCP	5	11	8	5	10	13	0	33	16
2	2	CCP	15	15	35	0	0	5	0	30	0
1	1	STP	0	10	0	0	0	0	0	0	90
1	1	LSL	30	10	50	0	0	0	0	10	0
4	4	LSR	0	11	28	33	5	6	0	18	0
31	31	LSBk	7	13	2	6	6	19	0	20	26
2	2	BPB	30	10	0	10	10	0	0	15	25

SOUTH FORK BIG RIVER — Drainage: BIG RIVER

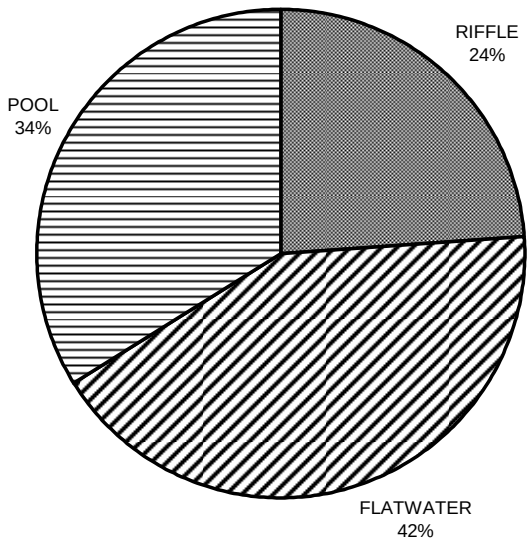
Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 07/09/02 to 09/18/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15W33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
116	11	LGR	0	0	55	27	9	9	0
21	1	GLD	0	0	100	0	0	0	0
150	19	RUN	0	0	68	11	11	11	0
35	4	SRN	0	0	0	50	25	25	0
3	3	TRP	0	0	33	0	0	0	67
124	119	MCP	1	4	55	10	9	8	13
2	2	CCP	0	0	50	50	0	0	0
1	1	STP	0	0	0	0	0	0	100
1	1	LSL	0	0	100	0	0	0	0
4	4	LSR	0	0	75	0	0	25	0
31	31	LSBk	0	3	84	6	6	0	0
2	2	BPB	0	0	100	0	0	0	0

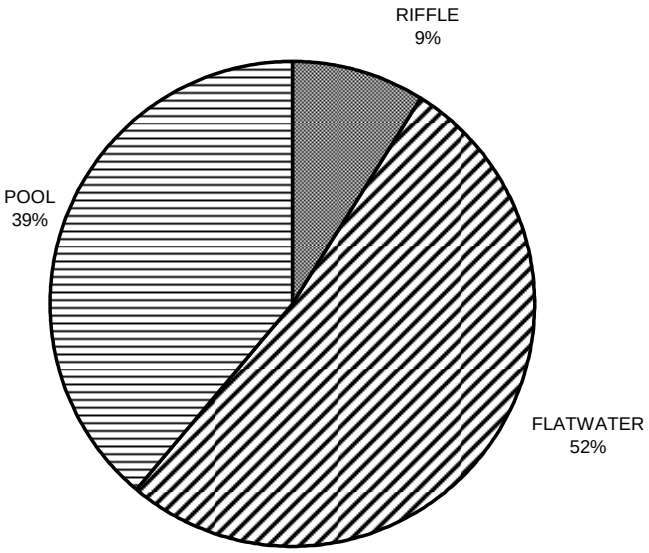
SOUTH FORK BIG RIVER (SURVEY ONE)

HABITAT TYPES BY PERCENT OCCURRENCE



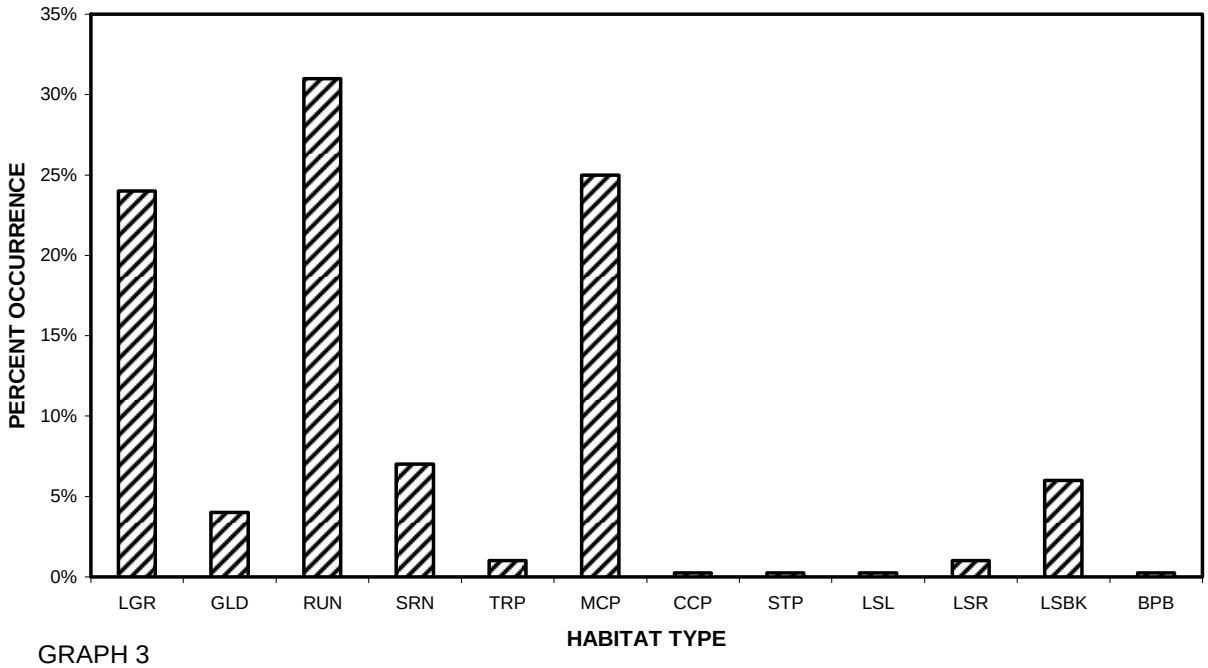
GRAPH 1

SOUTH FORK BIG RIVER (SURVEY ONE)
HABITAT TYPES BY PERCENT TOTAL LENGTH



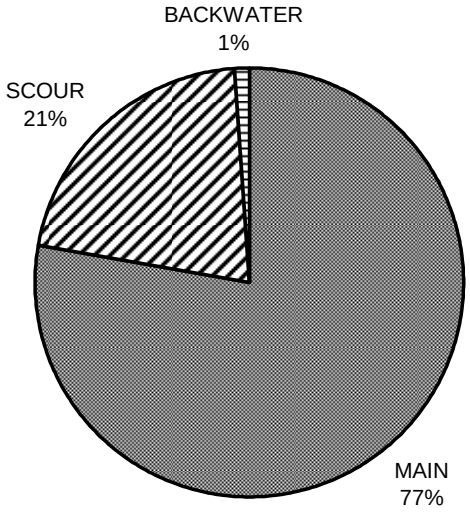
GRAPH 2

SOUTH FORK BIG RIVER (SURVEY ONE)
HABITAT UNIT TYPES BY PERCENT OCCURRENCE



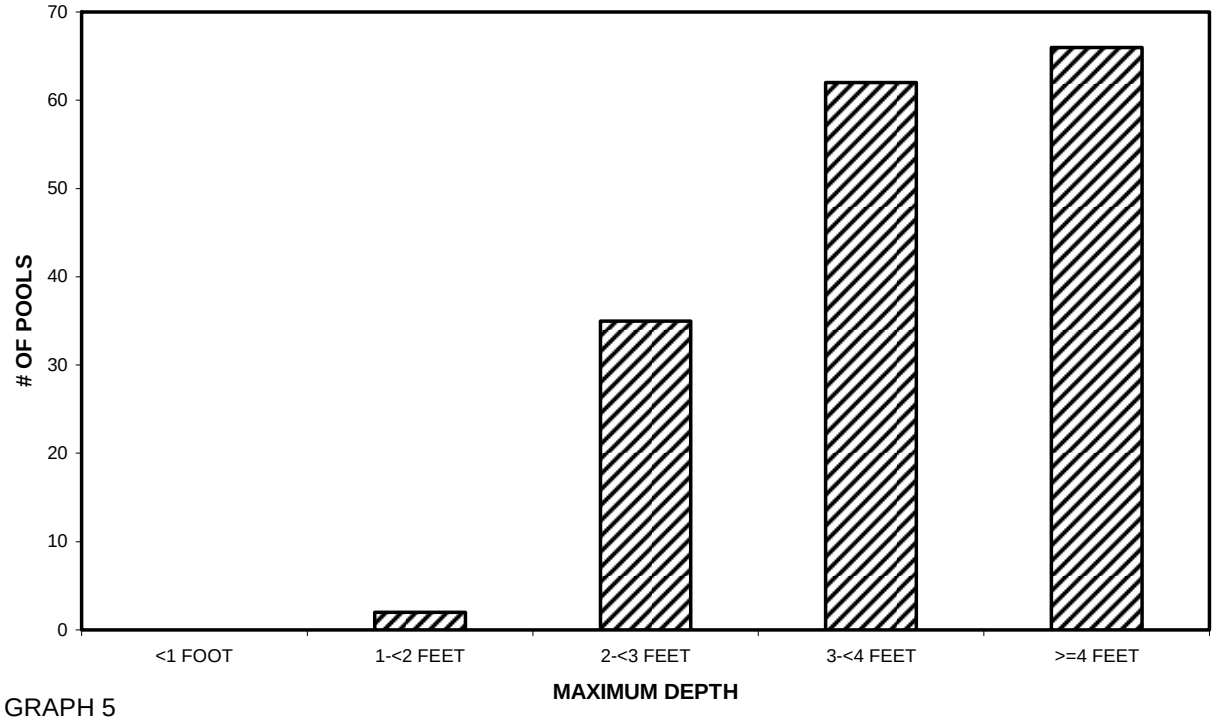
GRAPH 3

SOUTH FORK BIG RIVER (SURVEY ONE)
POOL HABITAT TYPES BY PERCENT OCCURRENCE



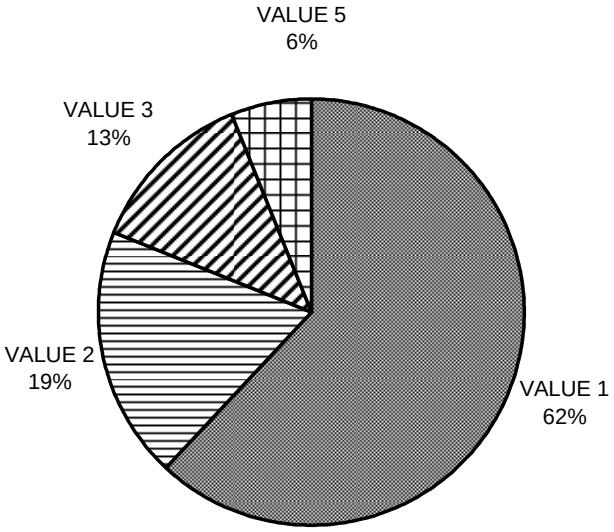
GRAPH 4

SOUTH FORK BIG RIVER (SURVEY ONE)
MAXIMUM DEPTH IN POOLS



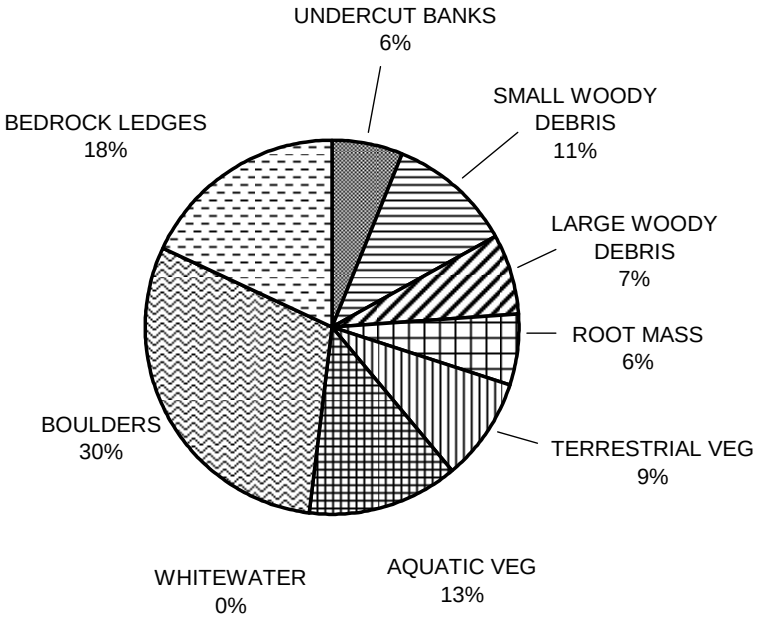
GRAPH 5

SOUTH FORK BIG RIVER (SURVEY ONE)
PERCENT EMBEDDEDNESS



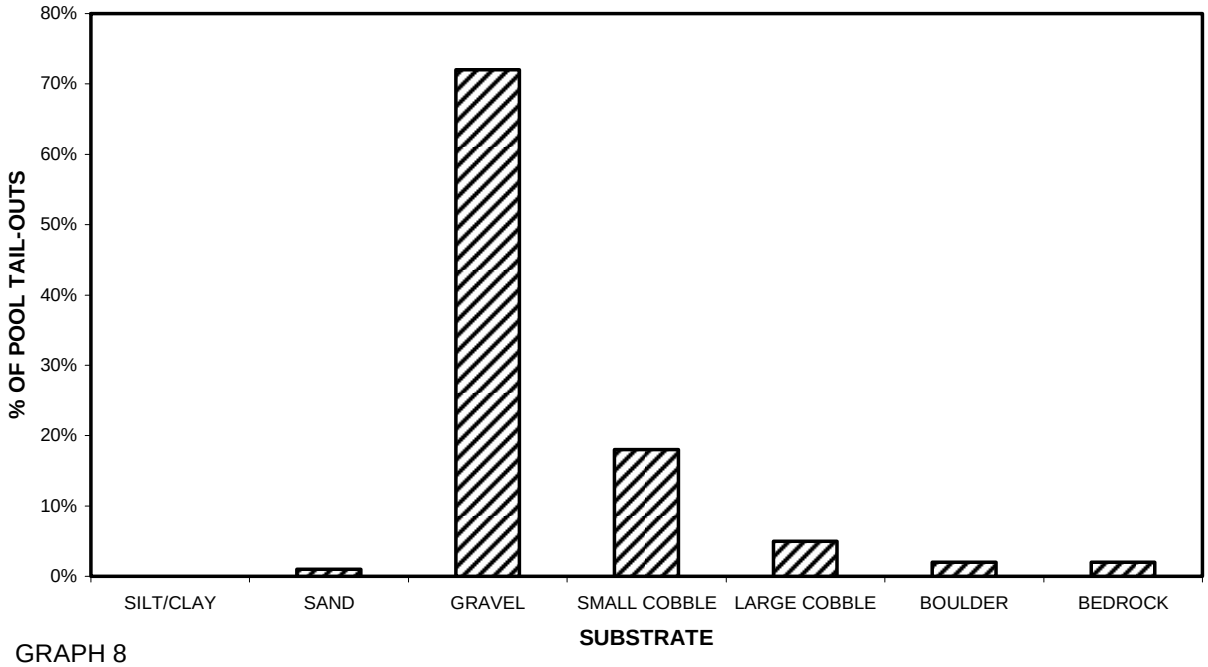
GRAPH 6

SOUTH FORK BIG RIVER (SURVEY ONE)
MEAN PERCENT COVER TYPES IN POOLS



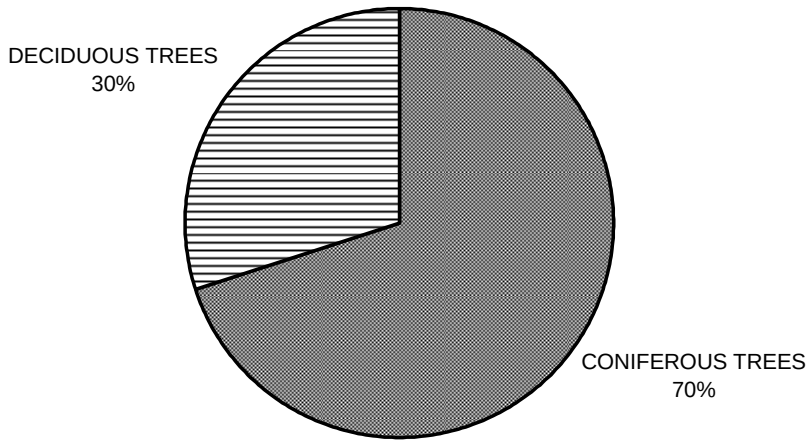
GRAPH 7

SOUTH FORK BIG RIVER (SURVEY ONE)
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



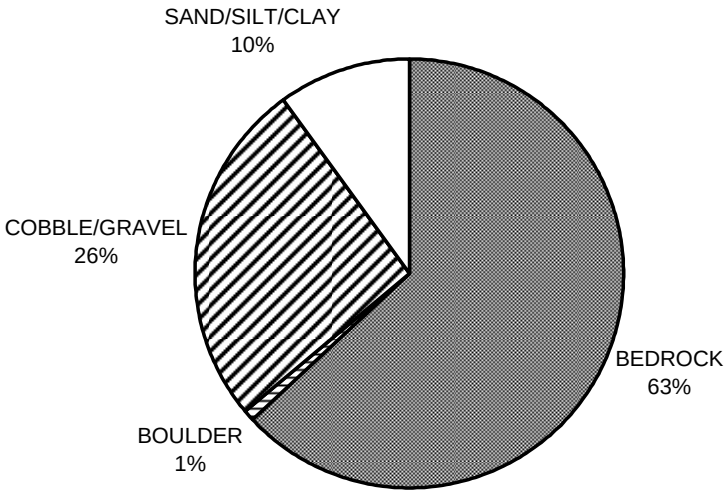
GRAPH 8

SOUTH FORK BIG RIVER (SURVEY ONE)
MEAN PERCENT CANOPY



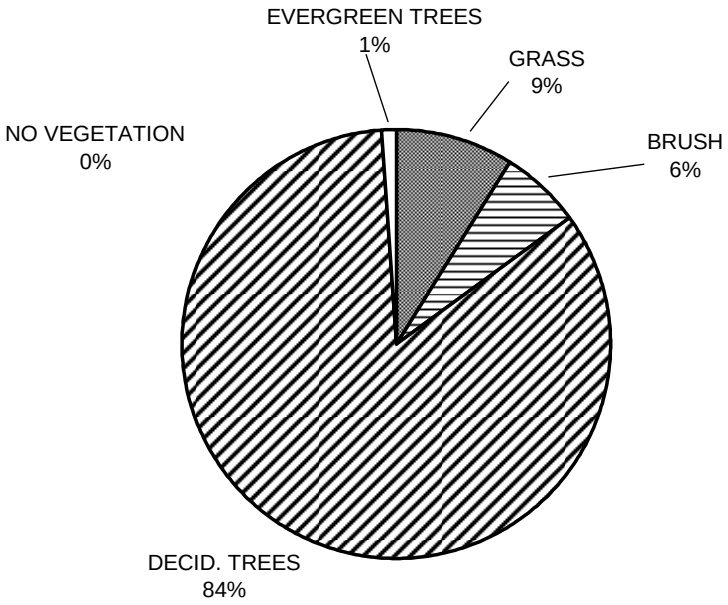
GRAPH 9

SOUTH FORK BIG RIVER (SURVEY ONE)
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

SOUTH FORK BIG RIVER (SURVEY ONE)
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

South Fork Big River

TABLES AND GRAPHS (Survey Two)

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: S.F. BIG RIVER 2ND HALF
SAMPLE DATES: 08/27/02 to 09/16/02
STREAM LENGTH: 48522 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: COMPTCHE — Latitude: 39°30'21"
Legal Description: T17NR15WS33 — Longitude: 123°53'33"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: C3	Canopy Density: 79%
Channel Length: 18641 ft.	Coniferous Component: 55%
Riffle/flatwater Mean Width: 11 ft.	Deciduous Component: 45%
Total Pool Mean Depth: 1.6 ft.	Pools by Stream Length: 42%
Base Flow: 4.7 cfs	Pools >=3 ft.deep: 45%
Water: 056- 065°F Air: 056-094°F	Mean Pool Shelter Rtn: 22
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Bedrock Ledges
Vegetative Cover: 52%	Occurrence of LOD: 4%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 29% 2.28% 3. 14% 4. 0% 5. 30%

Length of stream section not surveyed within survey reach and not included in above totals or calculations: 2003 ft.

STREAM REACH 02

Channel Type: F3	Canopy Density: 79%
Channel Length: 17481 ft.	Coniferous Component: 66%
Riffle/flatwater Mean Width: 11 ft.	Deciduous Component: 34%
Total Pool Mean Depth: 1.2 ft.	Pools by Stream Length: 40%
Base Flow: 4.7 cfs	Pools >=3 ft.deep: 26%
Water: 055- 065°F Air: 056-085°F	Mean Pool Shelter Rtn: 26
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Boulders
Vegetative Cover: 47%	Occurrence of LOD: 6%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 15% 2.34% 3. 20% 4. 1% 5. 30%

STREAM REACH 03

Channel Type: B1	Canopy Density: 83%
Channel Length: 6424 ft.	Coniferous Component: 55%
Riffle/flatwater Mean Width: 8 ft.	Deciduous Component: 45%
Total Pool Mean Depth: 0.9 ft.	Pools by Stream Length: 26%
Base Flow: 4.7 cfs	Pools >=3 ft.deep: 10%
Water: 055- 071°F Air: 056-079°F	Mean Pool Shelter Rtn: 30
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Boulders
Vegetative Cover: 52%	Occurrence of LOD: 5%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 10 ft.

Embeddness Value: 1. 12% 2.19% 3. 19% 4. 0% 5. 50%

STREAM REACH 04

Channel Type: C2	Canopy Density: 90%
Channel Length: 3973 ft.	Coniferous Component: 28%
Riffle/flatwater Mean Width: 5 ft.	Deciduous Component: 72%

South Fork Big River

Total Pool Mean Depth: 1.2 ft.
Base Flow: 4.7 cfs
Water: 000- 062°F Air: 000-070°F
Dom. Bank Veg.: Coniferous Trees
Vegetative Cover: 64%
Dom. Bank Substrate: Silt/Clay/Sand

Pools by Stream Length: 21%
Pools >=3 ft.deep: 12%
Mean Pool Shelter Rtn: 34
Dom. Shelter: Boulders
Occurrence of LOD: 4%
Dry Channel: 987 ft.

Embeddness Value: 1. 16% 2.24% 3. 4% 4. 0% 5. 56%

S.F. BIG RIVER 2ND HALF Drainage: BIG RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES Survey Dates: 08/27/02 to 09/16/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

N L L)	MEAN SHELTER RATING	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 VO (cu.ft.
0	23	95	19	RIFFLE	17	59	5584	12	7.7	0.3	336	31905	118	11210	
0	18	201	25	FLATWATER	35	113	22797	49	11.7	0.5	1192	239609	708	142228	
0	25	268	268	POOL	47	65	17304	37	13.2	1.3	967	259103	1587	425396	118
0	0	8	0	DRY	1	125	997	2	0.0	0.0	0	0	0	0	

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
572	312	46682	530617	578835

S.F. BIG RIVER 2ND HALF Drainage: BIG RIVER

Table 3 - SUMMARY OF POOL TYPES Survey Dates: 08/27/02 to 09/16/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
167	167	MAIN	62	66	11102	64	13.8	1.3	1047	174887	1803	301184	1328	25
97	97	SCOUR	36	62	6048	35	12.4	1.3	854	82869	1258	122052	957	26
4	4	BACKWATER	1	39	154	1	8.0	1.3	337	1346	540	2161	417	29

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
268	268	17304	259103	425396

South Fork Big River

S.F. BIG RIVER 2ND HALF — Drainage: BIG RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 08/27/02 to 09/16/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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 %
89	14	LGR	16	61	5410	11	9	0.3	1.4	432	38491	154	13686	0	21	79
3	2	HGR	1	48	143	0	6	0.3	1.1	136	409	41	123	0	60	38
1	1	CAS	0	14	14	0	4	0.1	0.3	17	17	2	2	0	10	100
2	2	BRS	0	9	17	0	3	0.2	0.4	18	37	3	6	0	3	90
21	3	GLD	4	92	1937	4	25	0.8	2.2	2677	56224	2051	43070	0	10	84
41	6	RUN	7	57	2356	5	12	0.5	1.9	986	40435	533	21840	0	11	83
139	16	SRN	24	133	18504	38	9	0.4	2.0	991	137721	521	72464	0	23	81
1	1	TRP	0	31	31	0	9	2.4	5.3	279	279	670	670	586	30	40
163	163	MCP	28	67	10948	22	14	1.3	7.3	1047	170652	1775	289302	1297	25	80
1	1	CCP	0	90	90	0	40	3.0	6.0	3600	3600	10800	10800	9360	25	90
2	2	STP	0	17	33	0	10	1.3	3.2	178	356	206	412	176	25	95
8	8	CRP	1	62	497	1	12	1.4	4.0	764	6111	1157	9255	894	29	76
2	2	LSL	0	29	58	0	10	1.1	2.3	290	580	307	614	227	80	90
11	11	LSR	2	42	467	1	10	0.9	2.9	433	4758	411	4524	272	43	75
63	63	LSBk	11	72	4537	9	13	1.3	8.2	1035	65202	1578	99416	1203	20	82
8	8	LSBo	1	51	407	1	12	0.9	3.2	694	5556	733	5865	528	28	88
5	5	PLP	1	16	82	0	9	2.6	10.0	133	664	475	2377	444	30	94
3	3	SCP	1	35	104	0	7	0.8	1.8	265	796	207	621	153	33	80
1	1	BPB	0	50	50	0	11	2.8	4.4	550	550	1540	1540	1210	15	85
8	0	DRY	1	125	997	2	0	0.0	0.0	0	0	0	0	0	0	92

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
572	312	46682	532437	576586

S.F. BIG RIVER 2ND HALF — Drainage: BIG RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 08/27/02 to 09/16/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
1	TRP	0	0	0	0	0	0	0	0	0	1	100
163	MCP	61	1	1	62	38	56	34	19	12	25	15
1	CCP	0	0	0	0	0	0	0	0	0	1	100
2	STP	1	0	0	0	0	1	50	1	50	0	0
8	CRP	3	0	0	0	0	4	50	3	38	1	13
2	LSL	1	0	0	0	0	2	100	0	0	0	0
11	LSR	4	0	0	5	45	6	55	0	0	0	0
63	LSBk	24	0	0	15	24	26	41	15	24	7	11
8	LSBo	3	1	13	3	38	3	38	1	13	0	0
5	PLP	2	0	0	2	40	0	0	0	0	3	60
3	SCP	1	0	0	3	100	0	0	0	0	0	0
1	BPB	0	0	0	0	0	0	0	0	0	1	100

TOTAL UNITS
268

S.F. BIG RIVER 2ND HALF — Drainage: BIG RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 08/27/02 to 09/16/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
89	14	LGR	0	6	0	0	17	3	0	53	21
3	2	HGR	0	5	0	0	40	0	8	10	38
1	1	CAS	0	10	0	0	0	0	10	60	20
2	2	BRS	0	5	0	0	5	0	20	0	20
21	3	GLD	20	7	0	0	40	0	0	13	20
41	6	RUN	10	15	2	3	22	0	0	23	23
139	16	SRN	0	9	8	1	17	4	0	40	22
1	1	TRP	10	0	0	0	0	0	0	10	80
163	160	MCP	5	10	5	3	7	2	0	33	34
1	1	CCP	10	10	50	10	0	0	0	15	5
2	2	STP	0	20	0	0	0	5	5	55	15
8	8	CRP	7	18	15	3	5	5	0	21	26
2	2	LSL	0	25	55	0	0	15	0	5	0
11	11	LSR	26	10	7	43	3	7	0	4	0
63	63	LSBk	4	7	2	2	6	3	1	26	50
8	8	LSBo	6	19	5	4	4	9	0	50	5
5	5	PLP	0	2	4	0	0	4	10	24	56
3	3	SCP	0	20	13	20	13	3	0	23	7
1	1	BPB	0	0	0	0	10	0	0	70	20
8	0	DRY	0	0	0	0	0	0	0	0	0

S.F. BIG RIVER 2ND HALF — Drainage: BIG RIVER

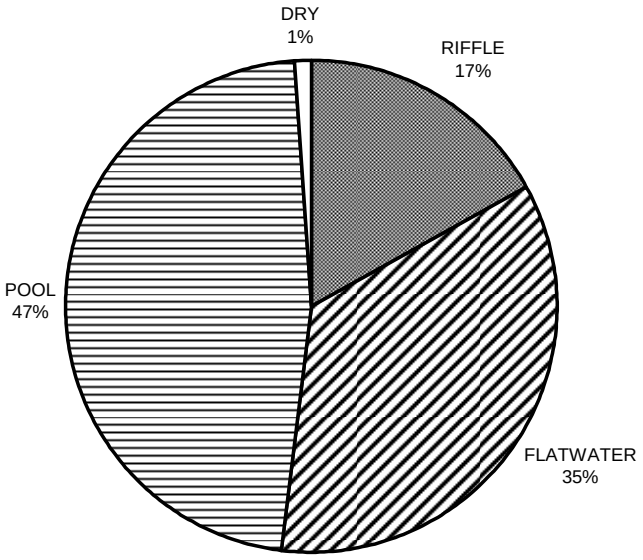
Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 08/27/02 to 09/16/02

Confluence Location: QUAD: COMPTCHE LEGAL DESCRIPTION: T17NR15WS33 LATITUDE:39°30'21" LONGITUDE:123°53'33"

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
89	14	LGR	0	0	14	43	7	14	21
3	2	HGR	0	0	0	0	50	0	50
1	1	CAS	0	0	0	0	0	0	100
2	2	BRS	0	0	0	0	0	0	100
21	3	GLD	0	0	67	33	0	0	0
41	6	RUN	0	0	50	17	0	0	33
139	16	SRN	0	6	19	19	19	13	25
1	1	TRP	0	0	0	0	0	0	100
163	23	MCP	0	13	9	17	17	22	22
1	0	CCP	0	0	0	0	0	0	0
2	1	STP	0	0	0	0	0	0	100
8	2	CRP	0	0	0	0	50	50	0
2	2	LSL	0	50	0	0	50	0	0
11	5	LSR	0	20	60	20	0	0	0
63	10	LSBk	0	20	10	30	10	0	30
8	2	LSBo	0	0	0	50	0	0	50
5	3	PLP	0	33	0	0	0	33	33
3	1	SCP	0	0	100	0	0	0	0
1	1	BPB	0	0	0	0	0	100	0
8	0	DRY	0	0	0	0	0	0	0

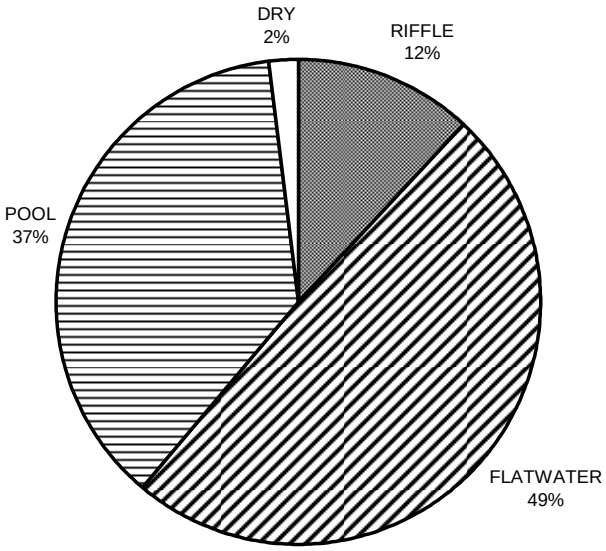
SOUTH FORK BIG RIVER (SURVEY TWO)

HABITAT TYPES BY PERCENT OCCURRENCE



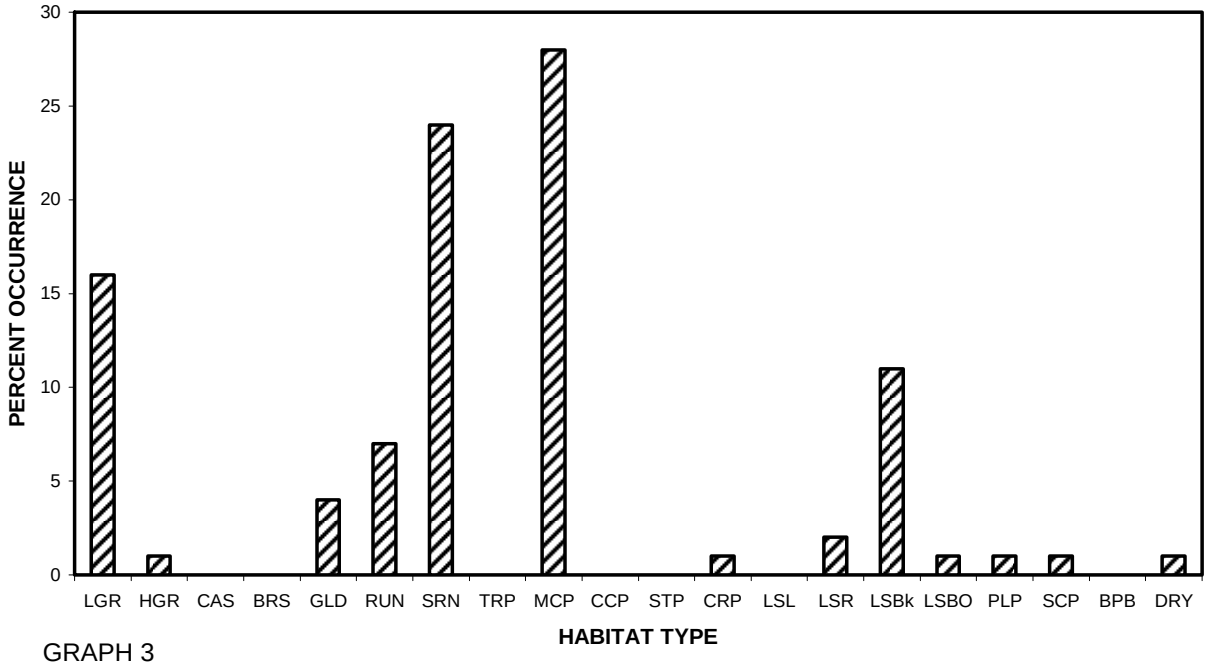
GRAPH 1

SOUTH FORK BIG RIVER (SURVEY TWO)
HABITAT TYPES BY PERCENT TOTAL LENGTH



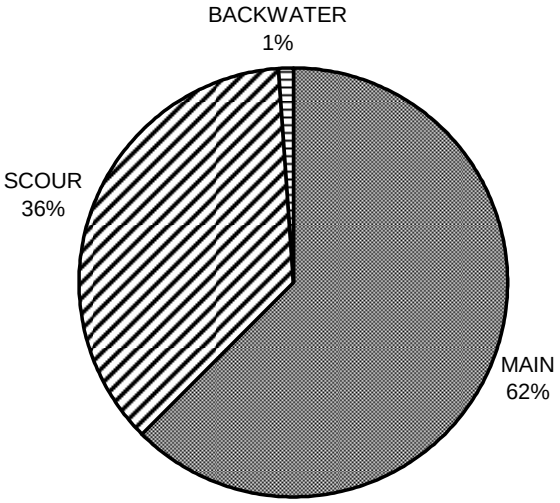
GRAPH 2

SOUTH FORK BIG RIVER (SURVEY TWO)
HABITAT TYPES BY PERCENT OCCURRENCE



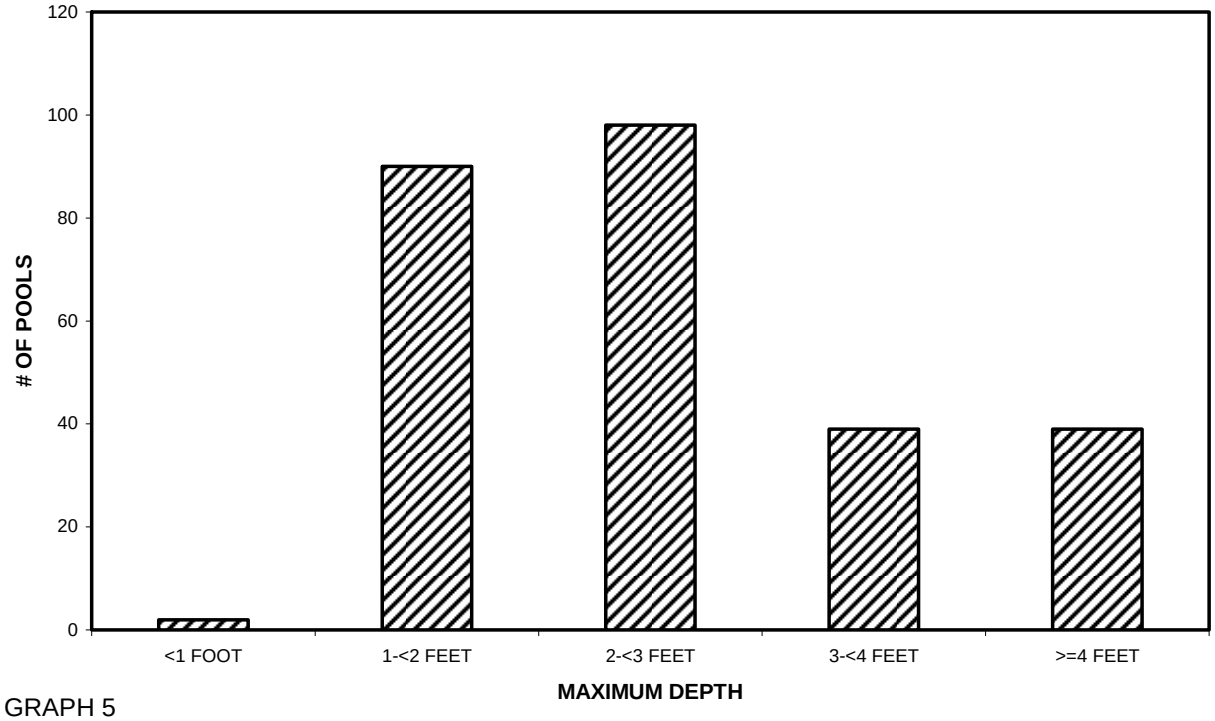
GRAPH 3

SOUTH FORK BIG RIVER (SURVEY TWO)
POOL HABITAT TYPES BY PERCENT OCCURRENCE



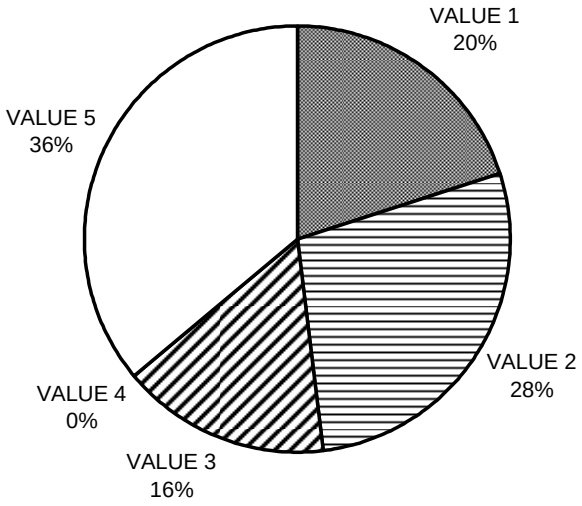
GRAPH 4

SOUTH FORK BIG RIVER (SURVEY TWO)
MAXIMUM DEPTH IN POOLS



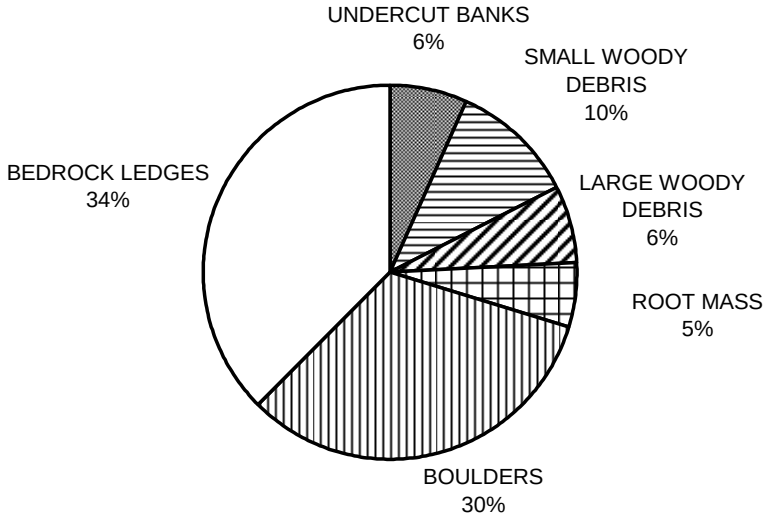
GRAPH 5

SOUTH FORK BIG RIVER (SURVEY TWO)
PERCENT EMBEDDEDNESS



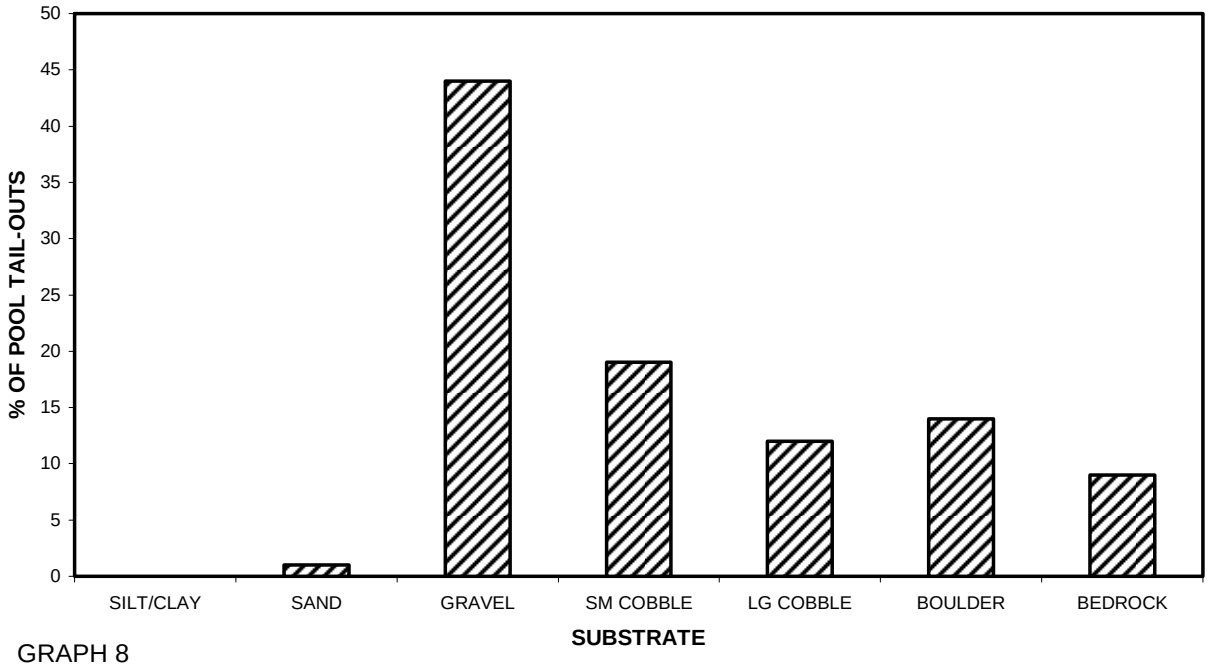
GRAPH 6

SOUTH FORK BIG RIVER (SURVEY TWO)
MEAN PERCENT COVER TYPES IN POOLS



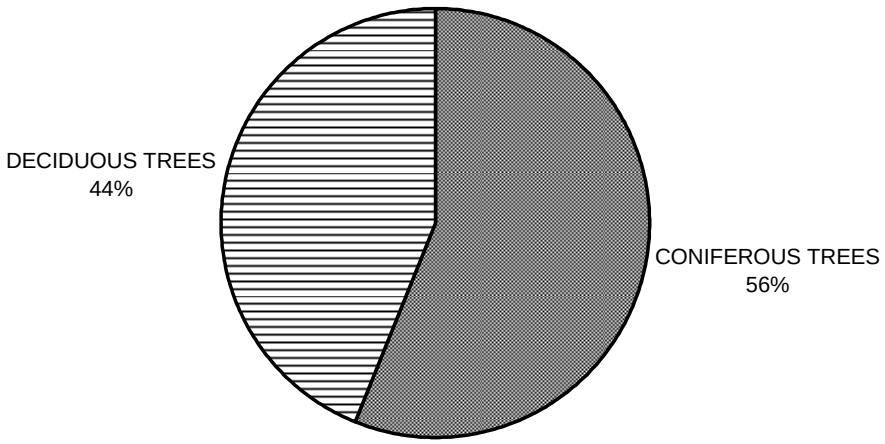
GRAPH 7

SOUTH FORK BIG RIVER (SURVEY TWO)
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



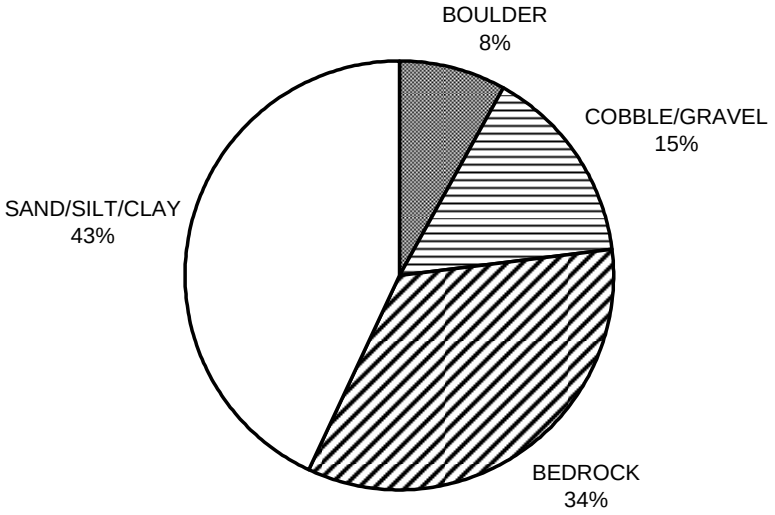
GRAPH 8

SOUTH FORK BIG RIVER (SURVEY TWO)
MEAN PERCENT CANOPY



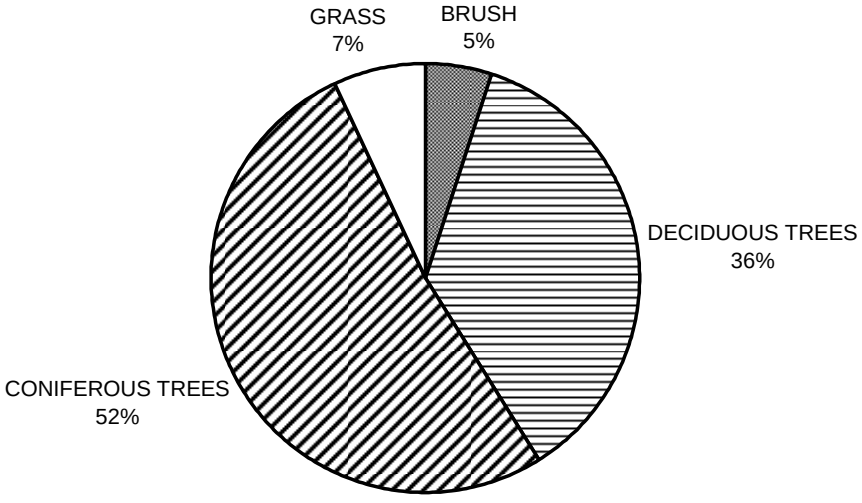
GRAPH 9

SOUTH FORK BIG RIVER (SURVEY TWO)
DOMINANT BANK COMPOSITION IN SURVEY REACH



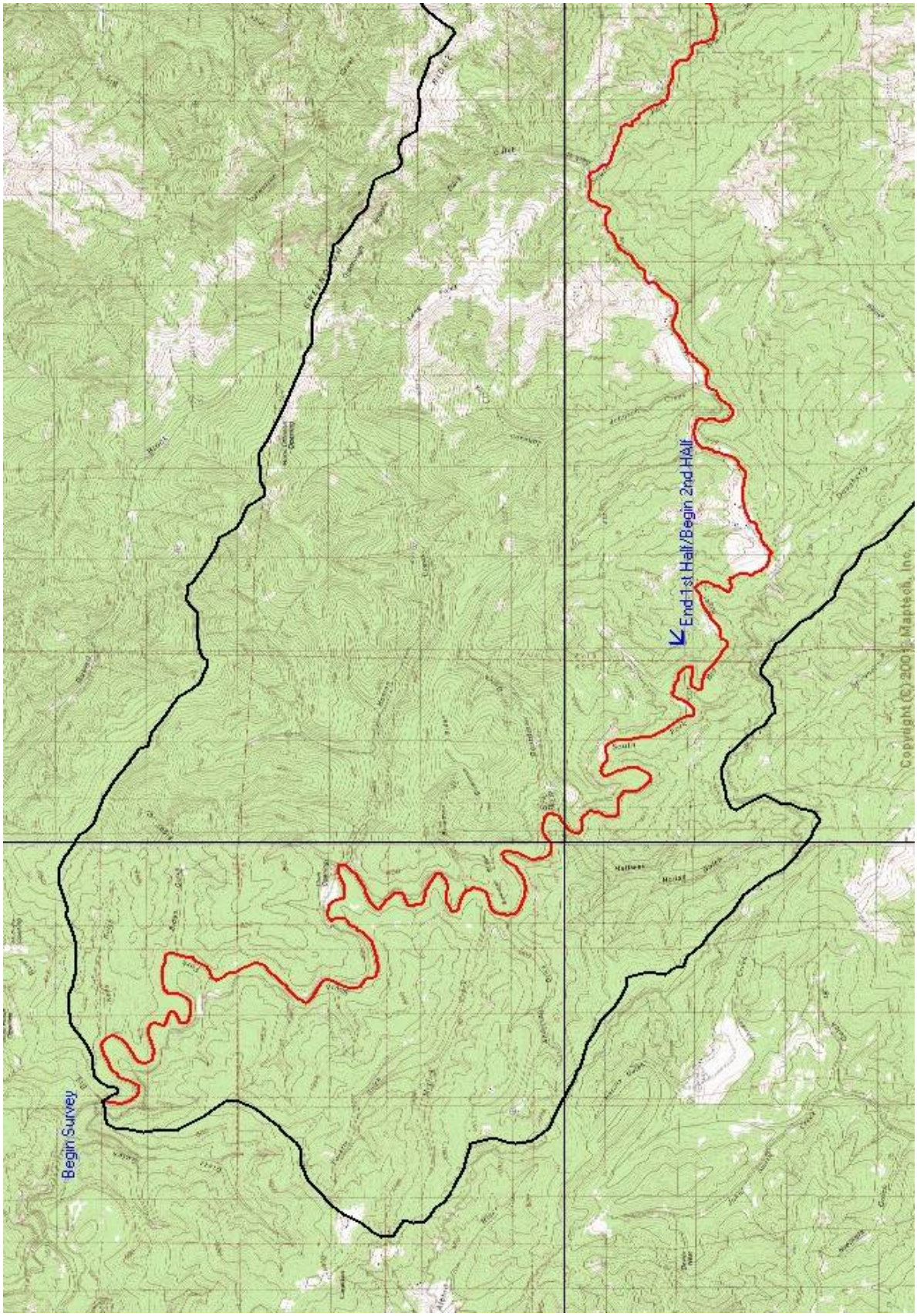
GRAPH 10

SOUTH FORK BIG RIVER (SURVEY TWO)
DOMINANT BANK VEGETATION IN SURVEY REACH



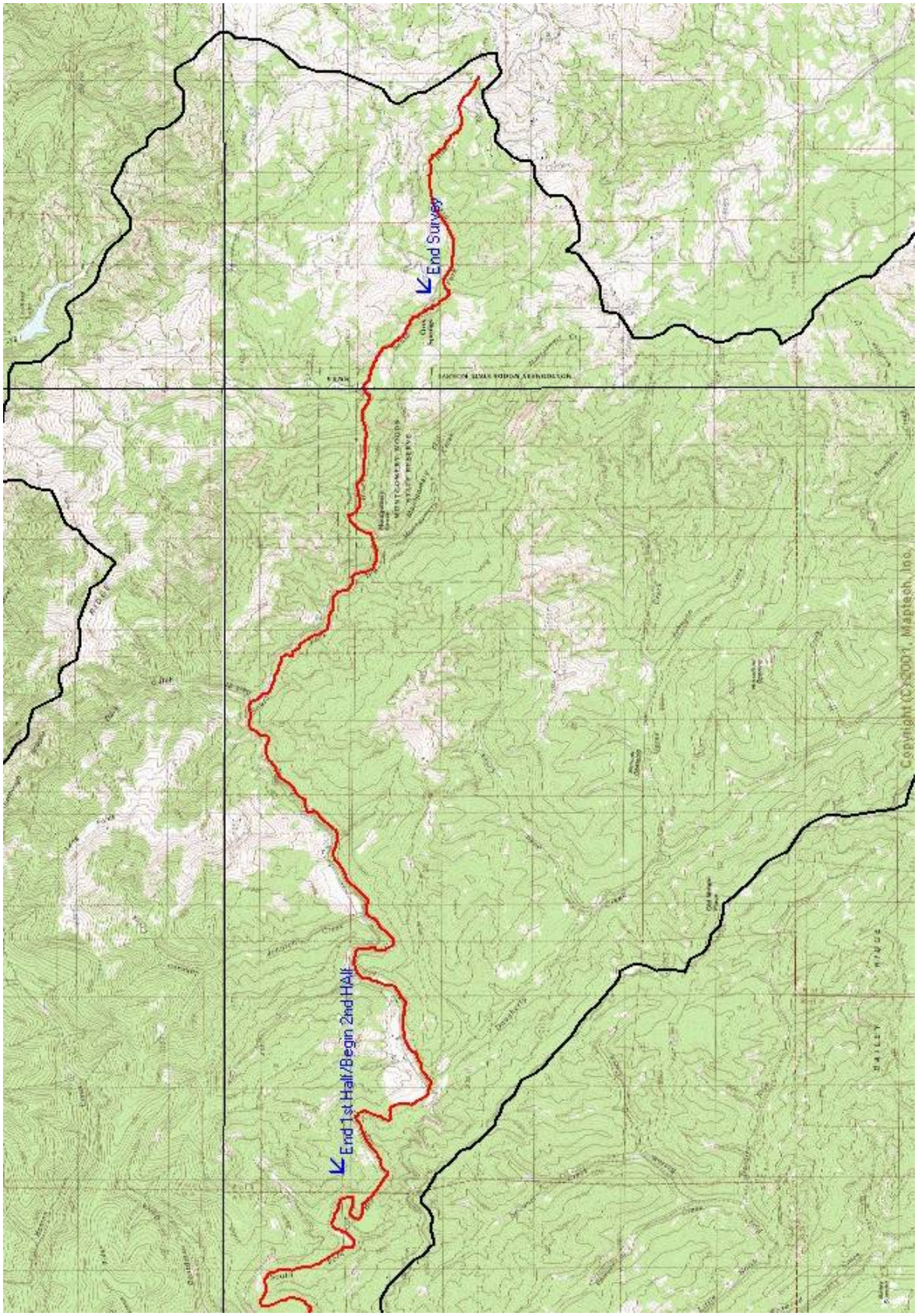
GRAPH 11

South Fork Big River



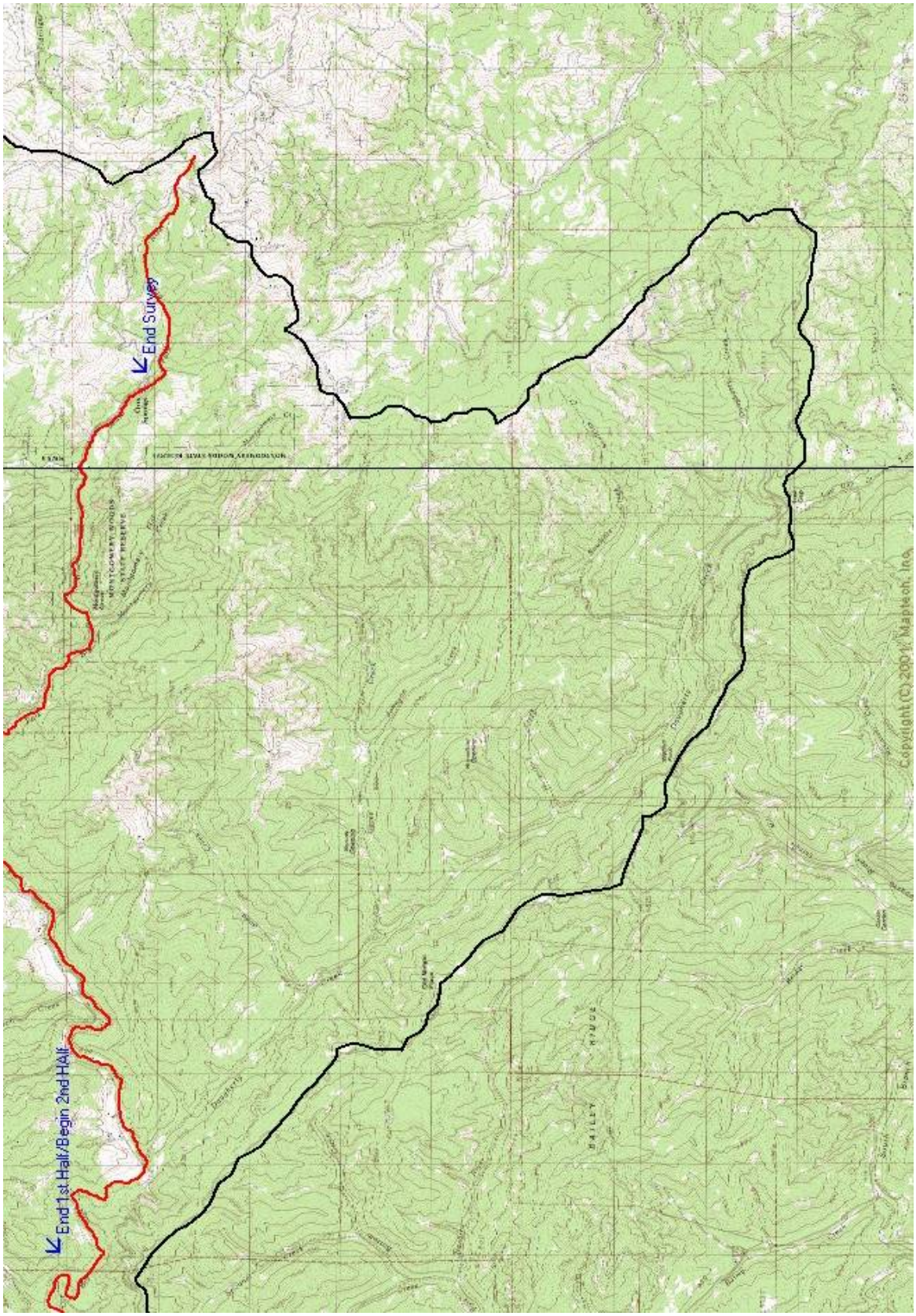
MAP 1. Map showing South Fork Big River stream habitat inventory and watershed boundary.

South Fork Big River



MAP 2. Map showing South Fork Big River stream habitat inventory and watershed boundary.

South Fork Big River



MAP 3. Map showing South Fork Big River stream habitat inventory and watershed boundary.

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.