

# **STREAM INVENTORY REPORT**

## **South Branch North Fork Navarro River**

### INTRODUCTION

A stream inventory was conducted from July 22 to August 14, 2013 on South Branch North Fork Navarro River. The survey began at the confluence with the North Fork Navarro River and extended upstream 18.1 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in South Branch North Fork Navarro River.

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 Branch North Fork Navarro River is a tributary to the North Fork Navarro River, a tributary to the Navarro River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). South Branch North Fork Navarro River's legal description at the confluence with the North Fork Navarro River is T15N R15W S07. Its location is 39.1714 degrees north latitude and 123.5608 degrees west longitude, LLID number 1235596391714. South Branch North Fork Navarro River is a third order stream and has approximately 17.6 miles of blue line stream according to the USGS Navarro 7.5 minute quadrangle. South Branch North Fork Navarro River drains a watershed of approximately 29.2 square miles. Elevations range from about 90 feet at the mouth of the creek to 2,500 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production, recreation, and rural development. Vehicle access exists via Masonite Industrial Road, west of Navarro, CA.

### METHODS

The habitat inventory conducted in South Branch North Fork Navarro River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Wildlife (CDFW) personnel and Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. 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

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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 Branch North Fork Navarro River to record measurements and observations. There are eleven components to the inventory form.

#### 1. Flow:

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

#### 2. Channel Type:

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

#### 3. Temperatures:

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

#### 4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". South Branch North Fork Navarro 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.

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### 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 Branch North Fork Navarro 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 not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

### 6. Shelter Rating:

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

### 9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In South Branch North Fork Navarro 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.

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### 10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

### 11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

## DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

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

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness

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- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

### HABITAT INVENTORY RESULTS

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

The habitat inventory of July 22 to August 14, 2013 was conducted by M. Groff (CDFW), B. Leonard (CDFW), R. Spencer (CDFW), M. Scott (CDFW), and T. Longley (WSP). The total length of the stream surveyed was 95,388 feet with an additional 235 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.24 cfs on August 15, 2013.

South Branch North Fork Navarro River is an F4 channel type for 56,788 feet of the stream surveyed (Reach 1), an F3 channel type for 31,905 feet of the stream surveyed (Reach 2), a B3 channel type for 4,593 feet of the stream surveyed (Reach 3), and an A3 channel type for 2,102 feet of the stream surveyed (Reach 4). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. B3 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and cobble-dominant substrates. A3 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 67 degrees Fahrenheit. Air temperatures ranged from 53 to 80 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% riffle units, 32% flatwater units, 30% pool units, 1% dry units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 42% flatwater units, 30% riffle units, 28% pool units, and 1% dry units (Graph 2).

Sixteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 31%; mid-channel pool units, 26%; and run units, 20% (Graph 3). Based on percent total length, low gradient riffle units made up 26%, mid-channel pool units 24%, and step run units 21%.

A total of 372 pools were identified (Table 3). Main channel pools were the most frequently encountered at 88% (Graph 4), and comprised 88% of the total length of all pools (Table 3).

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Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. One hundred forty-five of the 372 pools (39%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 372 pool tail-outs measured, 106 had a value of 1 (29%); 152 had a value of 2 (41%); 87 had a value of 3 (23%); 17 had a value of 4 (5%); 10 had a value of 5 (3%); (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

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 7, flatwater habitat types had a mean shelter rating of 7, and pool habitats had a mean shelter rating of 26 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 27. Scour pools had a mean shelter rating of 13 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in South Branch North Fork Navarro River. Graph 7 describes the pool cover in South Branch North Fork Navarro River. Large woody debris is 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 71% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 22% of the pool tail-outs.

The mean percent canopy density for the surveyed length of South Branch North Fork Navarro River was 89%. Eleven percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 58% and 42%, respectively. Graph 9 describes the mean percent canopy in South Branch North Fork Navarro River.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 38% cobble/gravel, 31% sand/silt/clay, 25% bedrock, and 7% boulders (Graph 10). Hardwood trees were the dominant vegetation type observed in 59% of the units surveyed. Additionally, 32% of the units surveyed had coniferous trees as the dominant vegetation type, and 8% had brush as the dominant vegetation type (Graph 11).

## **DISCUSSION**

South Branch North Fork Navarro River is an F4 channel type for the first 56,788 feet of stream surveyed, an F3 channel type for the next 31,905 feet, a B3 channel type for the next 4,593 feet, and an A3 channel type for the remaining 2,102 feet. The suitability of F4, F3, B3, and A3 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel

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constrictors, and log cover. F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, 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. A3 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days July 22 to August 14, 2013 ranged from 56 to 67 degrees Fahrenheit. Air temperatures ranged from 53 to 80 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 67 degrees F, if sustained, is near the threshold stress level for coho salmon. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 42% of the total length of this survey, riffles 30%, and pools 28%. One hundred forty-five of the 372 (39%) pools had a maximum residual depth greater than three feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum residual 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.

Two hundred fifty-eight of the 372 pool tail-outs measured had embeddedness ratings of 1 or 2. One hundred four of the pool tail-outs had embeddedness ratings of 3 or 4. Ten of the pool tail-outs had a rating of 5, which is considered not suitable 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 Branch North Fork Navarro River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Three hundred forty-four of the 372 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 is 26. The shelter rating in the flatwater habitats is 7. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in South Branch North Fork Navarro River. Large woody debris is the dominant cover type in pools followed by boulders. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 89%. Reach 1 had a canopy density of 87%, Reach 2 had a canopy density of 91%, Reach 3 had a canopy density of 93%, and Reach 4 had a canopy density of 98%. The percentage of right and left bank covered with vegetation was 97% and 97%, respectively.

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### RECOMMENDATIONS

- 1) South Branch North Fork Navarro 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 three to five years.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 4) 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.
- 5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

### COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with the North Fork Navarro River. The channel is an F4.
2461	0032.00	Flow is subterranean through log and rootwad spanning the channel.
2466	0033.00	Log debris accumulation (LDA) #01 contains over 30 pieces of large woody debris (LWD) and measures 6' high x 60' wide x 43' long (most of the mass of the LDA is small woody debris). Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and is estimated to be 20' wide x 50' long x 2.5' deep. Fish were observed above the LDA.
5368	0061.00	A redwood tree collapsed in to the channel from the left bank. It is lying perpendicular to the flow of the creek and is accumulating woody debris on the right bank half of the channel. It is retaining sediment ranging in size from silt to gravel and measures 1' deep x 30' long x 10' wide.



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11214	0116.00	Approximately 85% of this pool is covered by floating wood, most of which is small woody debris.
11626	0122.00	A landslide on the left bank measures 70' long x 70' high. The landslide is mostly revegetated. Woody debris is accumulating on the right bank.
11684	0123.00	A landslide on the right bank measures 70' long x 70' high; it is approximately 70% revegetated.
12922	0136.00	A landslide on the left bank measures 60' long x 90' high and is approximately 30% revegetated. It is contributing sediment ranging in size from silt to boulders to the channel.
14981	0151.00	Old road crossing site.
16314	0164.00	Tributary #01 enters on the left bank. It contributes to less than 5% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 60 degrees Fahrenheit. There is a 10' high boulder cascade with a 12' high bedrock waterfall directly above it at the mouth of the tributary.
18531	0186.00	Cookhouse Gulch (Tributary #02) enters on the left bank. It contributes to less than 5% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 57 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 61 degrees Fahrenheit. The slope of the tributary is approximately 200%. There is a 15' high boulder cascade at the mouth.  Elkhorn Gulch (Tributary #03) enters on the left bank. It contributes to less than 5% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 57 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 61 degrees Fahrenheit. The slope of the tributary is approximately 50% and the dominant substrate is boulders.
20234	0201.00	Woody debris is accumulating on a 3 foot diameter redwood tree that collapsed in to the channel from the left bank, and is now lying perpendicular to the flow of the stream, creating LDA #02. LDA #02 contains over 30 pieces of LWD and measures 12' high x 45' wide x 50' long. Water flows through the LDA and there is a visible gap in it on the left bank at a bedrock pinch point. The LDA is not retaining sediment. Fish were observed above the LDA.
22233	0219.00	Tributary #04 enters on the right bank. It contributes to approximately 1% of South Branch North Fork Navarro's flow. The water temperature of the tributary was 59 degrees Fahrenheit; the water temperature

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		downstream and upstream of the confluence was 62 degrees Fahrenheit. The slope of the tributary is approximately 10%. The tributary has too little flow and is too narrow to support salmonids.
23311	0225.00	LDA #03 contains over 40 pieces of LWD and measures 11' high x 40' wide x 55' long. Water flows through the LDA and there are no visible gaps in it. The LDA is not retaining sediment. Fish were observed above the LDA.
24795	0239.00	Tributary #05 enters on the left bank. It contributes to approximately 1% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 58 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 64 degrees Fahrenheit. The slope of the tributary is 4-5%. There is too little flow and the tributary is too narrow to support salmonids.
31742	0309.00	Dry right bank tributary.
34629	0343.00	Tributary #06 enters on the left bank. It contributes to less than 5% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 55 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 58 degrees Fahrenheit. The slope of the tributary is approximately 15%. The tributary goes dry 100' upstream from the mouth.
35257	0353.00	Dry right bank tributary.
37105	0370.00	A logging road crosses the channel. The crossing is a 14' wide x 48' long x 9' high railcar bridge with redwood log abutments.
37228	0372.00	Dry left bank tributary.
39104	0394.00	Tributary #07 enters on the left bank. It contributes to less than 1% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 56 degrees Fahrenheit, the water temperature downstream of the confluence was 63 degrees Fahrenheit, and the water temperature upstream of the confluence was 62 degrees Fahrenheit. There is an 11' high bedrock waterfall at the mouth of the tributary.
41857	0421.00	Tributary #08 enters on the left bank. It contributes to less than 1% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 58 degrees Fahrenheit, the water temperature downstream of the confluence was 63 degrees Fahrenheit, and the water temperature upstream of the confluence was 64 degrees Fahrenheit. The slope of the tributary is 5-10%. The first 3' of the tributary were dry; the channel goes completely dry 30' upstream from the mouth.

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42292	0425.00	A logging road crosses the channel. The crossing is a 14' wide x 53' long x 15' high railcar bridge with redwood log abutments.
44563	0443.00	Bailey Creek (Tributary #09) enters on the right bank. It contributes to less than 5% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 54 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 57 degrees Fahrenheit. For more information, see the 2012 Bailey Creek Stream Habitat Inventory Report.
44756	0445.00	Right bank seep (may be part of Bailey Creek's flow).
47257	0472.00	Tributary #10 enters on the right bank. It contributes to less than 1% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 58 degrees Fahrenheit. The slope of the tributary is over 10% and the flow is intermittent.
48180	0478.00	Tributary #11 enters on the right bank. It contributes to approximately 5% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 57 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 59 degrees Fahrenheit. The slope of the tributary is approximately 10% and the flow is intermittent.
48960	0489.00	Tributary #12 enters on the left bank. It contributes to approximately 1% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 60 degrees Fahrenheit. The slope of the tributary is 4-10%. The tributary is barely flowing and the channel is intermittently dry. There is a 4.5' high plunge over rootmass 30' upstream from the mouth.
53527	0534.00	An erosion site on the left bank measures approximately 30' long x 8' high and is contributing sediment ranging in size from silt to gravel to the channel.
54611	0548.00	An erosion site on the right bank measures approximately 100' long x 10' high and is contributing sediment ranging in size from silt to gravel to the channel.
56703	0573.00	Bear Creek (Tributary #13) enters on the left bank. It contributes to approximately 10% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 58 degrees Fahrenheit. For more information, see the 2012 Bear Creek Stream Habitat Inventory Report.

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56788	0574.00	The channel changes from an F4 to an F3.
57297	0580.00	A logging road crosses the channel. The crossing is a 13.5' wide x 54' long x 15' high railcar bridge.
57711	0584.00	Bridge Creek (Tributary #14) enters on the right bank. It contributes to approximately 1% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 63 degrees Fahrenheit, the water temperature downstream of the confluence was 55 degrees Fahrenheit, and the water temperature upstream of the confluence was 56 degrees Fahrenheit. For more information, see the 2012 Bridge Creek Stream Habitat Inventory Report.
59573	0613.00	Left bank seep.
63487	0663.00	Shingle Mill Creek (Tributary #15) enters on the right bank. It contributes to approximately 5% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 63 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 65 degrees Fahrenheit. For more information, see the 2012 Shingle Mill Creek Stream Habitat Inventory Report.
66638	0704.00	Skid road on right bank.
67373	0716.00	Erosion site on the left bank measures 30' high x 30' wide.
67870	0724.00	LWD structure on right bank.
67910	0725.00	LWD structure on left bank.
68253	0728.00	LWD structure on left bank.
69108	0740.00	McCarvey Creek (Tributary #16) enters on the right bank. It contributes to approximately 5% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 63 degrees Fahrenheit, the water temperature downstream of the confluence was 61 degrees Fahrenheit, and the water temperature upstream of the confluence was 63 degrees Fahrenheit. For more information, see the 2012 McCarvey Creek Stream Habitat Inventory Report.
69678	0751.00	LDA #04 contains five pieces of LWD and measures 3' high x 40' wide x 5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from gravel to large cobble and is estimated to be 35' wide x 50' long x 2' deep. Fish were observed above the LDA.
70416	0759.00	LDA #05 contains 12 pieces of LWD and measures 7' high x 51' wide x 24' long. Water flows through the LDA and there are visible gaps in it.

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		Retained sediment ranges from gravel to boulders and is estimated to be 50' wide x 50' long x 2' deep. Fish were observed above the LDA.
71396	0769.00	Erosion site on the left bank measures 40' high x 60' wide.
71496	0771.00	Erosion site on the right bank measures 30' high x 15' wide. LDA #06 contains eight pieces of LWD and measures 12' high x 45' wide. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment. Fish were observed above the LDA.
72133	0780.00	LDA #07 contains 40 pieces of LWD and measures 10' high x 60' wide x 55' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from gravel to boulders and is estimated to be 40' wide x 80' long x 5' deep. Fish were observed above the LDA.
72427	0787.00	LDA #08 measures 7' high x 25' wide x 10' long. The wood is accumulating on top of bedrock. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to boulders and is estimated to be 15' wide x 40' long x 2' deep. Fish were observed above the LDA.
73246	0799.00	LDA #09 contains eight pieces of LWD and measures 8' high x 40' wide x 15' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from gravel to boulders and is estimated to be 12' wide x 100' long x 3' deep. Fish were observed above the LDA.
73898	0812.00	Right bank erosion measures 8' high x 88' long.
73986	0813.00	Erosion site on the left bank measures 15' high x 30' wide and is contributing fine sediment to the channel.
74563	0821.00	There is a 1.5' high plunge over log.
74599	0822.00	LDA #10 contains 45 pieces of LWD and measures 10' high x 60' wide x 30' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to boulders and is estimated to be 60' wide x 100' long x 5' deep. Fish were observed above the LDA.
75429	0832.00	Left bank seep.
75935	0842.00	There is a 1.8' high plunge over boulder.
75965	0844.00	LDA #11 contains 10 pieces of LWD and measures 8' high x 35' wide x 12' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to boulders and is estimated to be 30' wide x 50' long x 2' deep. Fish were observed above the LDA.

## South Branch North Fork Navarro River

76058	0846.00	LDA #12 contains over 50 pieces of LWD and measures 15' high x 100' wide x 80' long. Flow is subsurface through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to boulders and is estimated to be 50' wide x 100' long x 3' deep. Fish were observed above the LDA.
77013	0861.00	Spring on left bank.
77174	0865.00	Landslide on right bank is approximately 40' high x 50' wide. LDA #13 contains 11 pieces of LWD and measures 7' high x 35' wide x 24' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment. Fish were observed above the LDA.
77562	0873.00	LDA #14 contains 11 pieces of LWD and measures 8' high x 45' wide x 15' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from gravel to boulders and is estimated to be 30' wide x 85' long x 2' deep. Fish were observed above the LDA.
77868	0879.00	Left bank seep.
77985	0880.00	Malcolm's Ridge road crosses the channel. The crossing is a 13.7' wide x 50' long x 12.7' high railcar bridge.
78062	0882.00	LDA #15 contains five pieces of LWD and measures 7' high x 30' wide x 9' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from gravel to boulders and is estimated to be 30' wide x 100' long x 4' deep. Fish were observed above the LDA.
78329	0888.00	LWD structure on right bank.
79223	0899.00	LWD structure on right bank.
80181	0917.00	LWD structure on each bench.
81139	0928.00	Tributary #17 enters on the left bank. It contributes to approximately 10% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 59 degrees Fahrenheit, the water temperature downstream of the confluence was 59 degrees Fahrenheit, and the water temperature upstream of the confluence was 60 degrees Fahrenheit. The slope of the tributary is 2-4% for the first 60 feet, then increases to 5-10%. The tributary is accessible to salmonids, but no fish were observed.
81295	0929.00	LWD structure on left bank.

## South Branch North Fork Navarro River

81728	0936.00	The right bank is eroding under the rootmass of the trees on the bank. The eroded area is approximately 15' high x 30 wide.
83220	0958.00	Rock weir.
84003	0972.00	Left bank seep.
84327	0980.00	Rose Creek (Tributary #18) enters on the left bank. It contributes to approximately 25% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 58 degrees Fahrenheit, the water temperature downstream of the confluence was 59 degrees Fahrenheit, and the water temperature upstream of the confluence was 65 degrees Fahrenheit. For more information, see the 2012 Rose Creek Stream Habitat Inventory Report.
84682	0987.00	LWD structure on the right bank.
84939	0994.00	LDA #16 contains one rootwad and measures 7' high x 12' wide x 8' long. Water does not flow through the LDA; the channel is dry for 20' above it. There are no visible gaps in the LDA. Retained sediment ranges from gravel to boulders and is estimated to be 15' wide x 20' long x 1' deep. Fish were observed above the LDA.
85397	1004.00	Low Gap Creek (Tributary #19) enters on the right bank. It contributes to approximately 50% of South Branch North Fork Navarro River's flow. The water temperature of the tributary was 56 degrees Fahrenheit, the water temperature downstream of the confluence was 56 degrees Fahrenheit, and the water temperature upstream of the confluence was 58 degrees Fahrenheit. For more information, see the 2013 Low Gap Creek Stream Habitat Inventory Report.
85630	1007.00	LDA #17 contains eight pieces of LWD and measures 9' high x 25' wide x 13' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to small cobble and is estimated to be 15' wide x 70' long x 3' deep. There is a 4' high plunge over the LDA. Fish were observed above the LDA.
86281	1018.00	LWD structure on left bank.
87190	1046.00	LWD structure on the right bank.
87205	1047.00	Landslide on the right bank measures 50' high x 40' wide.
87319	1051.00	LDA #18 contains 23 pieces of LWD and measures 9' high x 27' wide x 13' long. Flow is subsurface through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and is estimated

## South Branch North Fork Navarro River

		to be 25' wide x 100' long x 4' deep. There is a 5' high plunge over the LDA. Fish were observed above the LDA.
87350	1052.00	There is a 5' high plunge over LDA.
88569	1082.00	There is a 2' high plunge over log.
88693	1088.00	The channel changes from an F3 to a B3.
88932	1094.00	There is a 2' high plunge over a log.
89079	1099.00	Left bank seep. Landslide on left bank is approximately 50' high x 60' wide. The landslide is becoming revegetated.
89223	1102.00	LDA #19 contains two pieces of LWD and measures 5.5' high x 29' wide x 3' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to boulders and is estimated to be 30' wide x 50' long x 2' deep. There is a 3' high plunge over the LDA. Fish were observed above it.
89341	1106.00	LDA #20 contains eight pieces of LWD and measures 8' high x 23' wide x 10' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to large cobble and is estimated to be 20' wide x 20' long x 2' deep. Fish were observed above the LDA.
91365	1142.00	LDA #21 contains 17 pieces of LWD and measures 9' high x 33' wide x 13' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment. There is a 9' high plunge over the LDA. Fish were observed above the LDA.
92152	1164.00	LDA #22 contains over 20 pieces of LWD and measures 11' high x 47' wide x 15' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to boulders and is estimated to be 50' wide x 250' long x 10' deep. There is an 11' high plunge over the LDA. Fish were observed above it.
92417	1167.00	LDA #23 contains 30 pieces of LWD and measures 15' high x 50' wide x 45' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to boulders. There is a 2' high plunge over the LDA. Fish were observed above it.
92813	1172.00	A road failure is associated with an active landslide on the right bank. It is pulling down approximately 400 feet of hillside and a 100 foot long section of the road. At the top of the slide there is a bare, overhanging section of bank perched over the stream. Toward the stream the slide has revegetated with brush and alders. A spring flows along the west side of the slide. Most of the bottom of the slide has been scoured away



## South Branch North Fork Navarro River

by the South Branch North Fork Navarro River, leaving a heavily silted stream bed with less than 50% canopy cover. The upstream portion of the slide area is still choked by sediment, creating a small LDA and multiple channels which have routed around several partially buried, living redwood trees. The section of channel impacted by the landslide has a gradient of 15-25% for about 50 feet.

92865	1175.00	LDA #24 is associated with a landslide. It contains nine pieces of LWD and measures 12' high x 18' wide x 40' long. Water flows through the LDA and there are visible gaps in it. Retained sediment is estimated to be 50' wide x 200' long x 5' deep. Fish were observed above the LDA.
93034	1180.00	LDA #25 contains nine pieces of LWD and measures 7' high x 23' wide x 13' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from gravel to boulders and is estimated to be 25' wide x 100' long x 4' deep. There is a 4' high plunge over the LDA. Fish were observed above it.
93247	1185.00	LDA #26 contains four pieces of LWD and measures 8' high x 17' wide x 19' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from gravel to boulders and is estimated to be 30' wide x 30' long x 3' deep. Fish were observed above the LDA.
93286	1188.00	The channel changes from a B3 to an A3.
94206	1212.00	LDA #27 contains 17 pieces of LWD and measures 9' high x 58' wide x 17' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment ranges from silt to boulders and is estimated to be 40' wide x 250' long x 7' deep. There is a 9' high plunge over the LDA. Fish were observed above it.
94393	1217.00	LDA #28 contains six pieces of LWD and measures 10' high x 20' wide x 20' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from gravel to boulders and is estimated to be 20' wide x 80' long x 2' deep. There is a 3' high plunge over the LDA and boulders. Fish were observed above the LDA.
94511	1222.00	LDA #29 contains 12 pieces of LWD and measures 7' high x 35' wide x 23' long. Flow is subsurface through the LDA and there are visible gaps in it. Retained sediment ranges from sand to boulders and is estimated to be 20' wide x 50' long x 3' deep. Fish were observed above the LDA.
94624	1223.00	LDA #30 contains four pieces of LWD and measures 5' high x 21' wide x 2' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment ranges from sand to boulders and is estimated to be 20' wide x 100' long

## South Branch North Fork Navarro River

		x 4' deep. There is a 5' high plunge over the LDA. Fish were observed above it.
94862	1229.00	LDA #31 contains 26 pieces of LWD and measures 7' high x 24' wide x 69' long. Water does not flow through the LDA; the channel is dry above it for 20 feet. There are no visible gaps in the LDA. Retained sediment ranges from sand to boulders and is estimated to be 20' wide x 100' long x 5' deep. There is a 6' high plunge over the LDA. Fish were observed above it.
95226	1242.00	There is a 3' high plunge over boulders.
95343	1247.00	End of survey at Mendocino Redwood Company property boundary. The stream is intermittent and the slope is somewhere between 6% and 10%. Abundant habitat is still available and salmonids are still present.

### 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.

## South Branch North Fork Navarro 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]	

**Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types**

Stream Name: South Branch North Fork Navarro River

LLID: 1235596391714 Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS07

Latitude: 39:10:17.0N

Longitude: 123:33:35.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
13	0	DRY	1.0	52	674	0.7									
400	45	FLATWATER	31.9	100	40075	41.9	11.9	0.5	1.2	1157	462830	777	310623		7
7	0	NOSURVEY	0.6	42	293	0.3									
372	372	POOL	29.7	71	26356	27.6	17.1	1.2	2.9	1275	474400	2205	820216	1895	26
461	69	RIFFLE	36.8	61	28225	29.5	10.4	0.3	0.5	329	151670	93	43084		7
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>			<b>Total Volume (cu.ft.)</b>		
1253	486				95623					1088900			1173923		

**Table 2 - Summary of Habitat Types and Measured Parameters**

Stream Name: South Branch North Fork Navarro River

LLID: 1235596391714

Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS07

Latitude: 39:10:17.0N

Longitude: 123:33:35.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
393	52	LGR	31.4	63	24624	25.8	11	0.3	0.9	341	133926	87	34293		6	90
58	13	HGR	4.6	55	3195	3.3	9	0.3	1	361	20911	138	7980		8	87
8	3	CAS	0.6	48	387	0.4	10	0.4	1.1	92	735	40	322		27	96
2	1	BRS	0.2	10	19	0.0	2	0.1	0.3	18	36	2	4		0	85
2	1	GLD	0.2	174	349	0.4	28	0.9	3.1	7812	15624	7031	14062		0	96
248	27	RUN	19.8	77	19216	20.1	11	0.5	2.1	684	169676	387	95974		6	93
150	17	SRN	12.0	137	20510	21.4	12	0.5	2.3	1517	227502	1027	154108		10	91
327	327	MCP	26.1	71	23124	24.2	17	1.2	7.2	1285	420217	2269	742104	1958	27	89
1	1	STP	0.1	36	36	0.0	27	0.8	2.5	875	875	787	787	700	90	92
2	2	CRP	0.2	62	124	0.1	18	1.8	6.8	1662	3324	4938	9876	4605	15	98
7	7	LSL	0.6	72	502	0.5	17	1.3	3.5	1172	8202	1834	12835	1510	26	87
9	9	LSR	0.7	60	544	0.6	17	1.1	4	1079	9715	1329	11963	1077	14	87
18	18	LSBk	1.4	87	1570	1.6	15	1.2	4.9	1308	23552	1761	31694	1416	2	85
5	5	LSBo	0.4	72	360	0.4	20	1.1	3.2	1392	6959	1807	9035	1480	5	94
3	3	PLP	0.2	32	96	0.1	19	1.0	3.2	519	1557	641	1922	503	52	95
13	0	DRY	1.0	52	674	0.7										
7	0	NS	0.6	42	293	0.3										85

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
1253	486	95623	1042811	1126957

**Table 3 - Summary of Pool Types**

Stream Name: South Branch North Fork Navarro River

LLID: 1235596391714

Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS07

Latitude: 39:10:17.0N

Longitude: 123:33:35.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Residual Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Residual Pool Vol (cu.ft.)	Estimated Total Resid.Vol. (cu.ft.)	Mean Shelter Rating
328	328	MAIN	88	71	23160	88	17.2	1.2	1284	421091	1954	640920	27
44	44	SCOUR	12	73	3196	12	16.7	1.2	1212	53309	1452	63868	13

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
372	372	26356	474400	704788

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

Stream Name: South Branch North Fork Navarro River

LLID: 1235596391714

Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS07

Latitude: 39:10:17.0N

Longitude: 123:33:35.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
327	MCP	88	2	1	72	22	122	37	73	22	58	18
1	STP	0	0	0	0	0	1	100	0	0	0	0
2	CRP	1	0	0	1	50	0	0	0	0	1	50
7	LSL	2	0	0	0	0	3	43	4	57	0	0
9	LSR	2	0	0	0	0	8	89	0	0	1	11
18	LSBk	5	0	0	1	6	11	61	4	22	2	11
5	LSBo	1	0	0	2	40	2	40	1	20	0	0
3	PLP	1	0	0	1	33	1	33	1	33	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1<2 Foot Max Resid. Depth	Total 1<2 Foot % Occurrence	Total 2<3 Foot Max Resid. Depth	Total 2<3 Foot % Occurrence	Total 3<4 Foot Max Resid. Depth	Total 3<4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
372	2	1	77	21	148	40	83	22	62	17

Mean Maximum Residual Pool Depth (ft.): 2.9

**Table 5 - Summary of Mean Percent Cover By Habitat Type**

Stream Name: South Branch North Fork Navarro River

LLID: 1235596391714

Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013

Dry Units: 13

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS07

Latitude: 39:10:17.0N

Longitude: 123:33:35.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
393	52	LGR	2	11	0	4	2	9	0	72	0
58	13	HGR	0	0	0	0	0	3	0	97	0
8	3	CAS	0	0	0	0	0	0	0	100	0
2	1	BRS	0	0	0	0	0	0	0	0	0
461	69	TOTAL RIFFLE	2	8	0	3	2	7	0	78	0
2	1	GLD	0	0	0	0	0	0	0	0	0
248	27	RUN	0	11	6	13	1	0	0	65	4
150	17	SRN	2	12	5	3	0	1	0	66	11
400	45	TOTAL FLAT	1	11	6	9	0	0	0	66	7
327	327	MCP	11	11	24	9	2	0	0	24	19
1	1	STP	0	5	70	10	5	0	0	10	0
2	2	CRP	20	0	0	0	0	0	0	80	0
7	7	LSL	2	43	43	12	0	0	0	0	0
9	9	LSR	13	46	39	2	0	0	0	0	0
18	18	LSBk	33	27	13	0	10	0	0	0	17
5	5	LSBo	13	0	0	10	0	0	0	77	0
3	3	PLP	0	0	22	0	0	0	3	75	0
372	372	TOTAL POOL	11	12	24	8	2	0	0	24	18
7	0	NS									
1253	486	TOTAL	9	12	21	8	2	1	0	31	16



**Table 6 - Summary of Dominant Substrates By Habitat Type**

Stream Name: South Branch North Fork Navarro River LLID: 1235596391714 Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013 Dry Units: 13

Confluence Location: Quad: NAVARRO Legal Description: T15NR15WS07 Latitude: 39:10:17.0N Longitude: 123:33:35.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
393	52	LGR	0	0	44	38	13	4	0
58	13	HGR	0	0	31	8	23	38	0
8	3	CAS	0	0	0	0	0	100	0
2	1	BRS	0	0	0	0	0	0	100
2	1	GLD	0	0	100	0	0	0	0
248	27	RUN	0	0	63	30	4	4	0
150	17	SRN	6	0	35	24	24	6	6
327	327	MCP	3	10	46	20	11	5	4
1	1	STP	0	0	0	100	0	0	0
2	2	CRP	0	50	0	0	0	50	0
7	7	LSL	0	29	57	14	0	0	0
9	9	LSR	0	0	89	11	0	0	0
18	18	LSBk	0	0	100	0	0	0	0
5	5	LSBo	0	0	80	0	0	0	20
3	3	PLP	0	0	0	0	33	67	0

**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

Stream Name: South Branch North Fork Navarro River

LLID: 1235596391714

Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS07

Latitude: 39:10:17.0N

Longitude: 123:33:35.0W

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Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
89	42	58	0	97	97

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Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

**Table 8 - Fish Habitat Inventory Data Summary**

Stream Name: South Branch North Fork Navarro River LLID: 1235596391714 Drainage: Navarro River  
 Survey Dates: 7/22/2013 to 8/14/2013 Survey Length (ft.): 95623 Main Channel (ft.): 95388 Side Channel (ft.): 235  
 Confluence Location: Quad: NAVARRO Legal Description: T15NR15WS07 Latitude: 39:10:17.0N Longitude: 123:33:35.0W

**Summary of Fish Habitat Elements By Stream Reach**

**STREAM REACH: 1**

Channel Type: F4	Canopy Density (%): 86.6	Pools by Stream Length (%): 29.9
Reach Length (ft.): 56788	Coniferous Component (%): 35.1	Pool Frequency (%): 31.2
Riffle/Flatwater Mean Width (ft.): 12.7	Hardwood Component (%): 64.9	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 4
Range (ft.): 19 to 53	Vegetative Cover (%): 98.1	2 to 2.9 Feet Deep: 36
Mean (ft.): 38	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 31
Std. Dev.: 8	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 28
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 9	Mean Max Residual Pool Depth (ft.): 3.4
Water (F): 56 - 65 Air (F): 53 - 78	LWD per 100 ft.:	Mean Pool Shelter Rating: 8
Dry Channel (ft): 5	Riffles: 1	
	Pools: 2	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 2 Gravel: 82 Sm Cobble: 9 Lg Cobble: 2 Boulder: 2 Bedrock: 2		
Embeddedness Values (%): 1. 45.3 2. 44.7 3. 8.9 4. 0.0 5. 1.1		

**STREAM REACH: 2**

Channel Type: F3	Canopy Density (%): 90.6	Pools by Stream Length (%): 27.0
Reach Length (ft.): 31905	Coniferous Component (%): 43.8	Pool Frequency (%): 30.6
Riffle/Flatwater Mean Width (ft.): 11.0	Hardwood Component (%): 56.2	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 28
Range (ft.): 18 to 35	Vegetative Cover (%): 96.6	2 to 2.9 Feet Deep: 48
Mean (ft.): 29	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 16
Std. Dev.: 4	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 7
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 18	Mean Max Residual Pool Depth (ft.): 2.5
Water (F): 56 - 67 Air (F): 56 - 80	LWD per 100 ft.:	Mean Pool Shelter Rating: 41
Dry Channel (ft): 71	Riffles: 1	
	Pools: 5	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 1 Sand: 0 Gravel: 62 Sm Cobble: 34 Lg Cobble: 2 Boulder: 1 Bedrock: 0		
Embeddedness Values (%): 1. 9.5 2. 39.2 3. 39.9 4. 9.5 5. 1.9		

### Summary of Fish Habitat Elements By Stream Reach

#### STREAM REACH: 3

Channel Type: B3	Canopy Density (%): 93.0	Pools by Stream Length (%): 11.2
Reach Length (ft.): 4593	Coniferous Component (%): 58.8	Pool Frequency (%): 21.4
Riffle/Flatwater Mean Width (ft.): 8.3	Hardwood Component (%): 41.3	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 82
Range (ft.): 15 to 20	Vegetative Cover (%): 95.1	2 to 2.9 Feet Deep: 14
Mean (ft.): 16	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 5
Std. Dev.: 2	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 12	Mean Max Residual Pool Depth (ft.): 1.7
Water (F): 56 - 60 Air (F): 58 - 80	LWD per 100 ft.:	Mean Pool Shelter Rating: 50
Dry Channel (ft): 337	Riffles: 2	
	Pools: 11	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 64 Sm Cobble: 14 Lg Cobble: 5 Boulder: 5 Bedrock: 14		
Embeddedness Values (%): 1. 36.4 2. 27.3 3. 18.2 4. 0.0 5. 18.2		

#### STREAM REACH: 4

Channel Type: A3	Canopy Density (%): 97.7	Pools by Stream Length (%): 9.7
Reach Length (ft.): 2102	Coniferous Component (%): 62.6	Pool Frequency (%): 21.7
Riffle/Flatwater Mean Width (ft.): 6.7	Hardwood Component (%): 37.4	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 62
Range (ft.): 18 to 24	Vegetative Cover (%): 94.4	2 to 2.9 Feet Deep: 31
Mean (ft.): 19	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 8
Std. Dev.: 2	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 9	Mean Max Residual Pool Depth (ft.): 1.9
Water (F): 57 - 58 Air (F): 62 - 68	LWD per 100 ft.:	Mean Pool Shelter Rating: 40
Dry Channel (ft): 261	Riffles: 8	
	Pools: 13	
	Flat: 4	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 8 Gravel: 38 Sm Cobble: 46 Lg Cobble: 8 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 15.4 2. 30.8 3. 30.8 4. 15.4 5. 7.7		

**Table 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: South Branch North Fork Navarro River

LLID: 1235596391714

Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS07

Latitude: 39:10:17.0N

Longitude: 123:33:35.0W

**Mean Percentage of Dominant Stream Bank Substrate**

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	119	122	24.8
Boulder	35	32	6.9
Cobble / Gravel	169	196	37.6
Sand / Silt / Clay	163	136	30.8

**Mean Percentage of Dominant Stream Bank Vegetation**

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	4	3	0.7
Brush	27	53	8.2
Hardwood Trees	314	261	59.2
Coniferous Trees	140	167	31.6
No Vegetation	1	2	0.3

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: South Branch North Fork Navarro River

LLID: 1235596391714

Drainage: Navarro River

Survey Dates: 7/22/2013 to 8/14/2013

Confluence Location: Quad: NAVARRO

Legal Description: T15NR15WS07

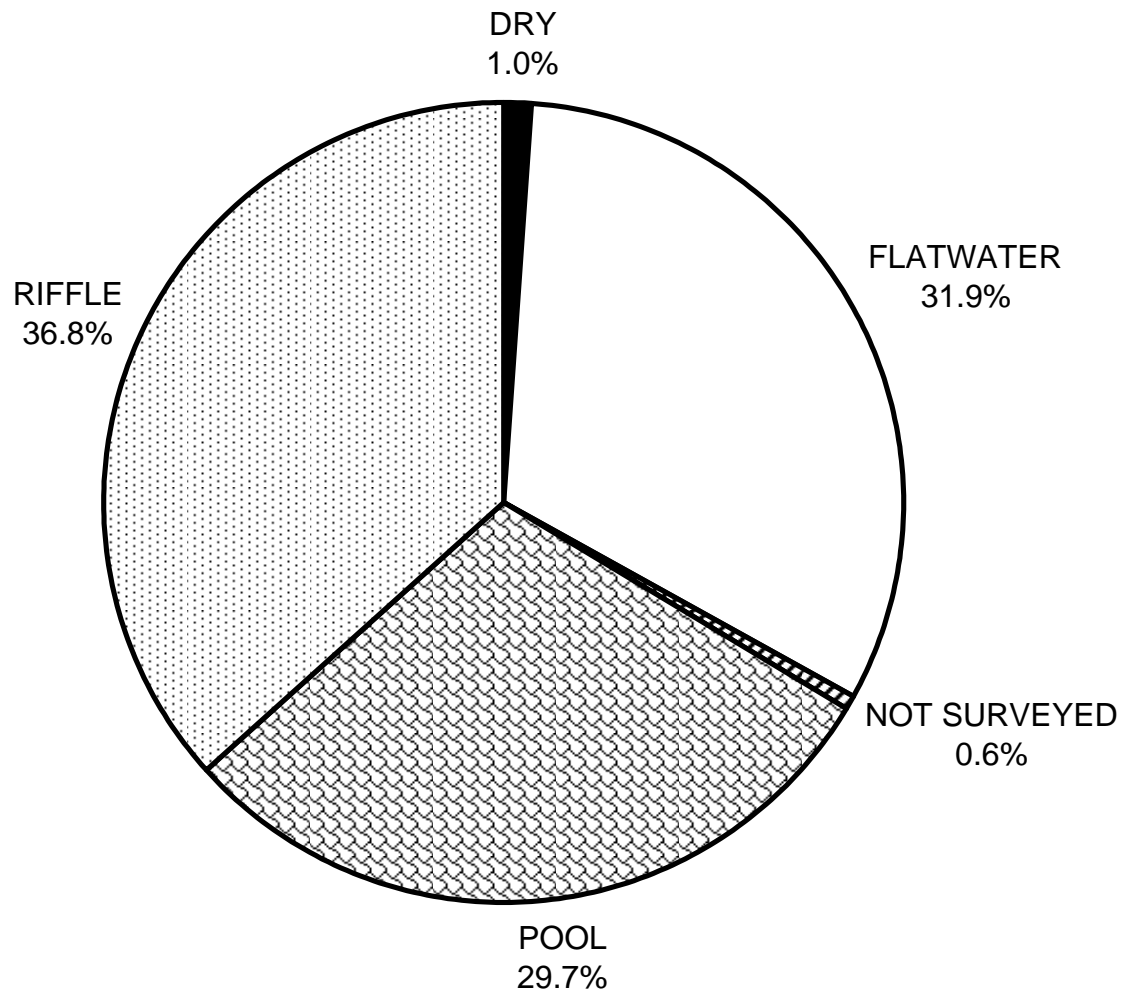
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Longitude: 123:33:35.0W

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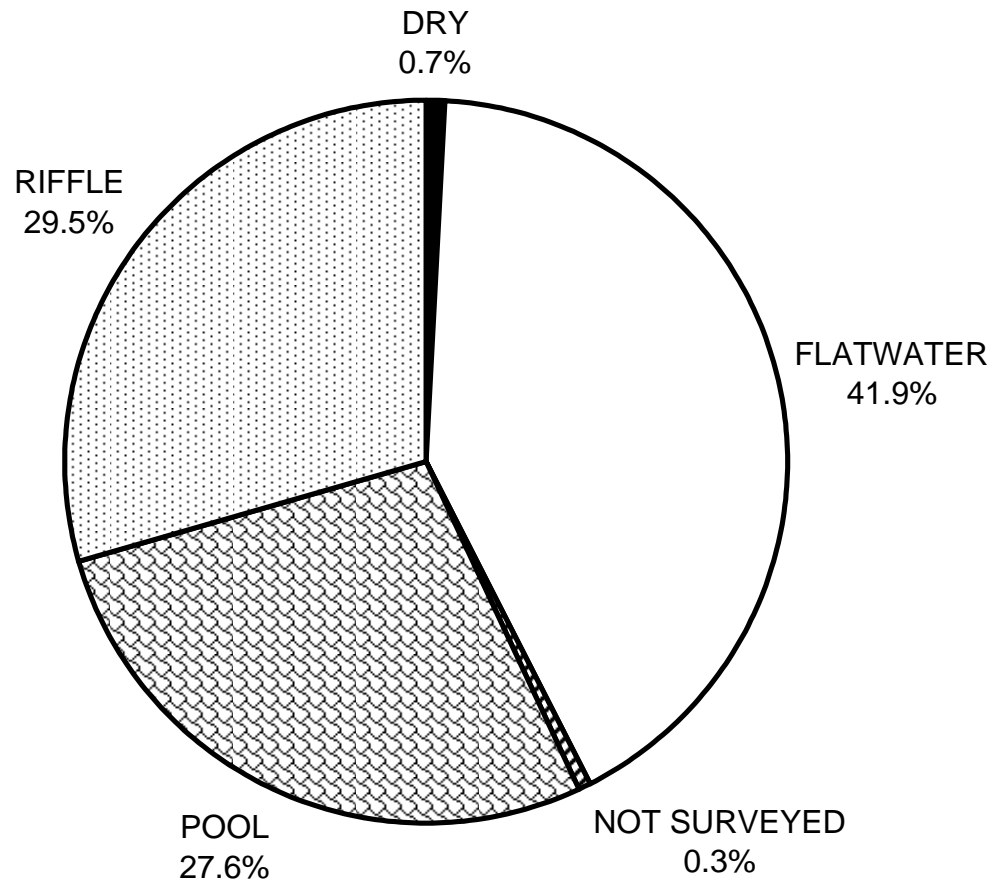
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	2	1	11
SMALL WOODY DEBRIS (%)	8	11	12
LARGE WOODY DEBRIS (%)	0	6	24
ROOT MASS (%)	3	9	8
TERRESTRIAL VEGETATION (%)	2	0	2
AQUATIC VEGETATION (%)	7	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	78	66	24
BEDROCK LEDGES (%)	0	7	18

# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

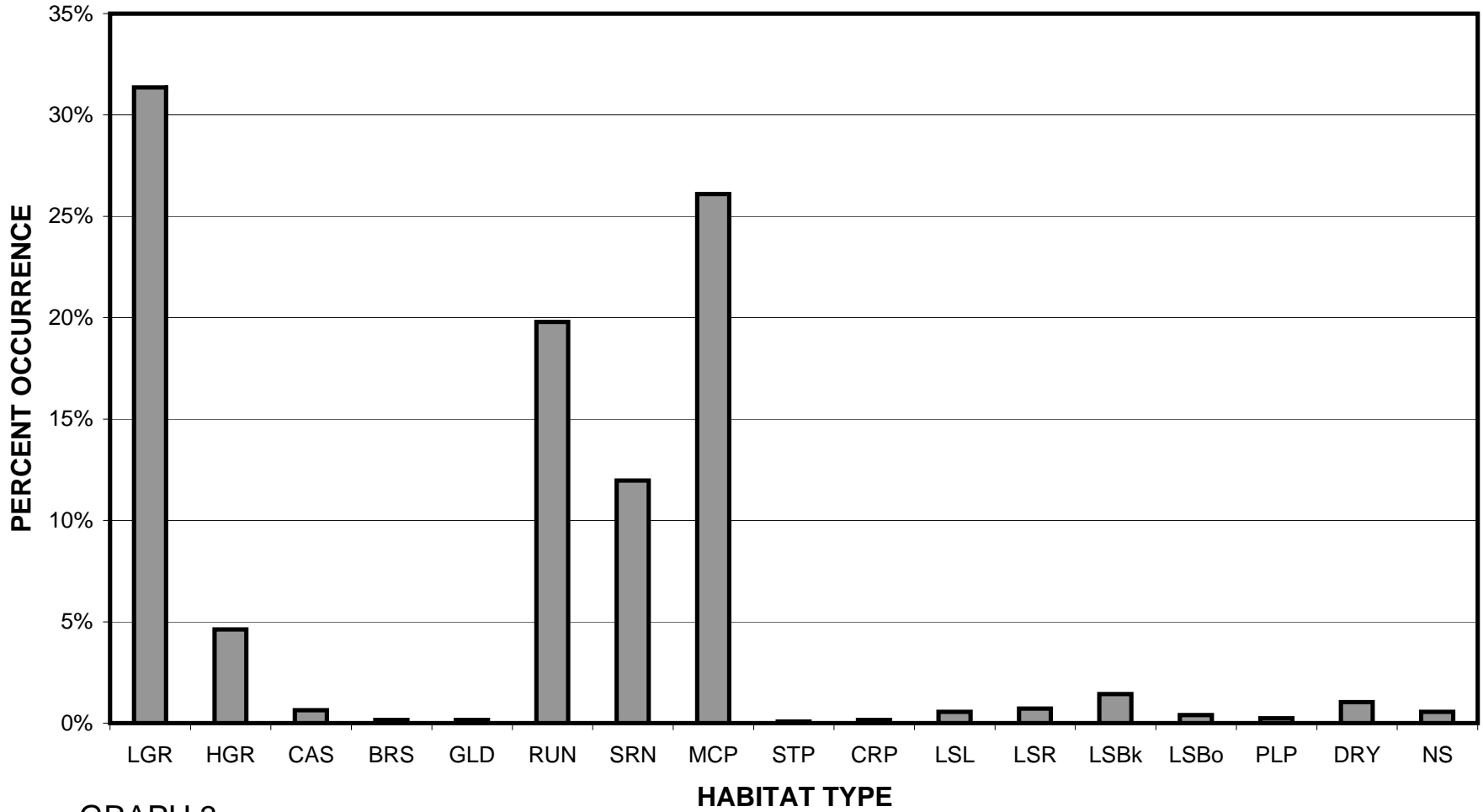
# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

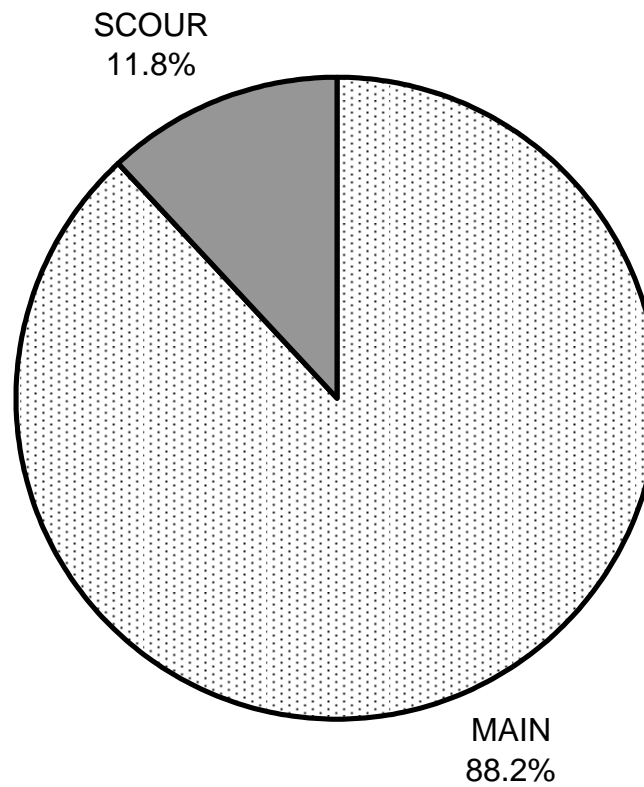


# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 HABITAT TYPES BY PERCENT OCCURRENCE



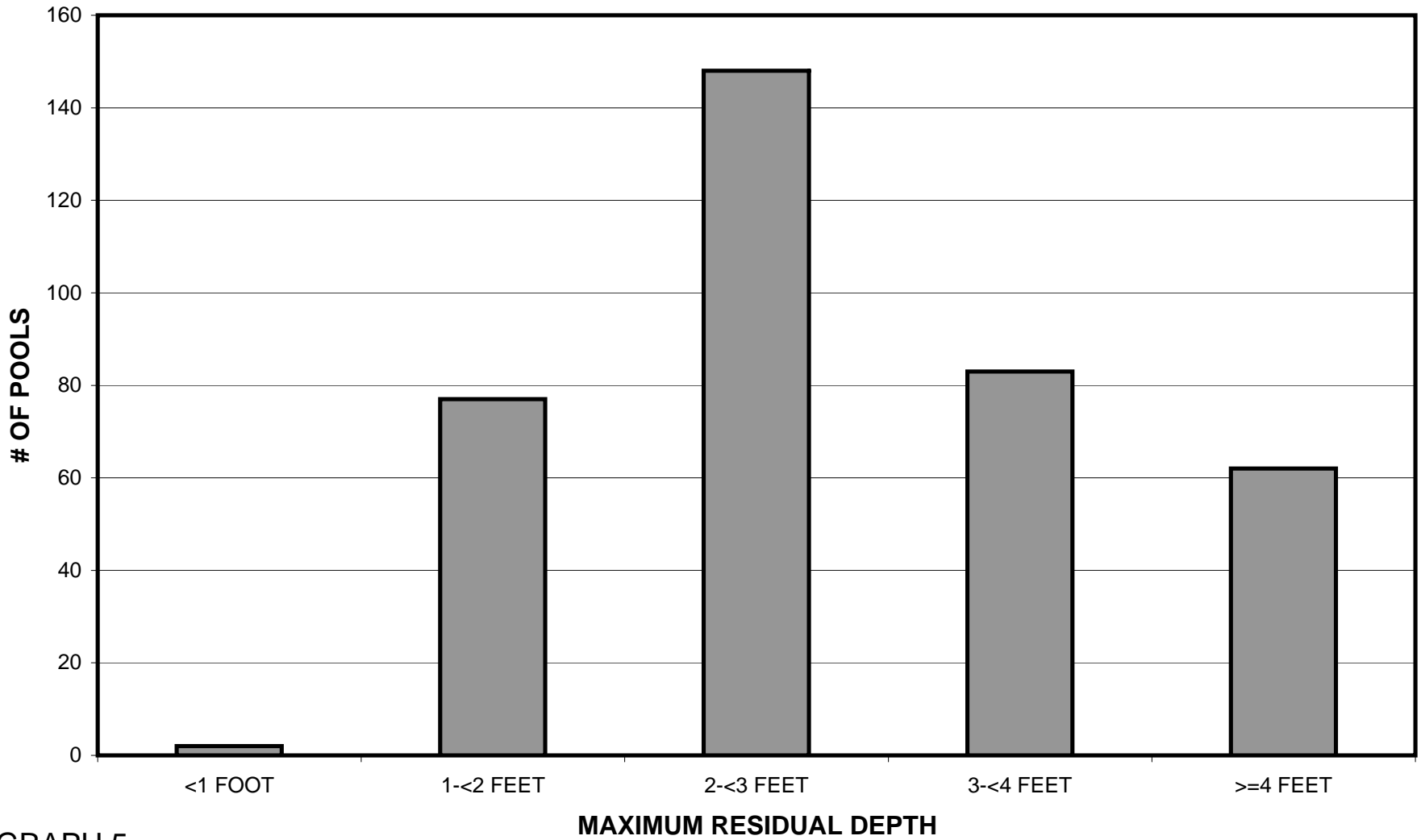
GRAPH 3

**SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013  
POOL TYPES BY PERCENT OCCURRENCE**



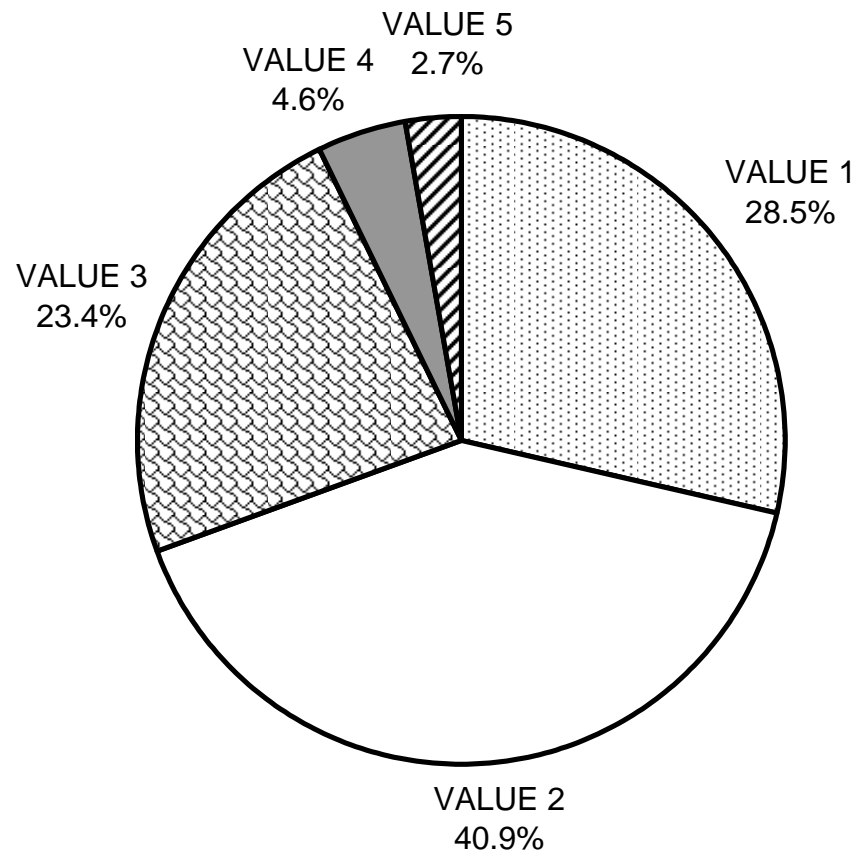
GRAPH 4

# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 MAXIMUM DEPTH IN POOLS



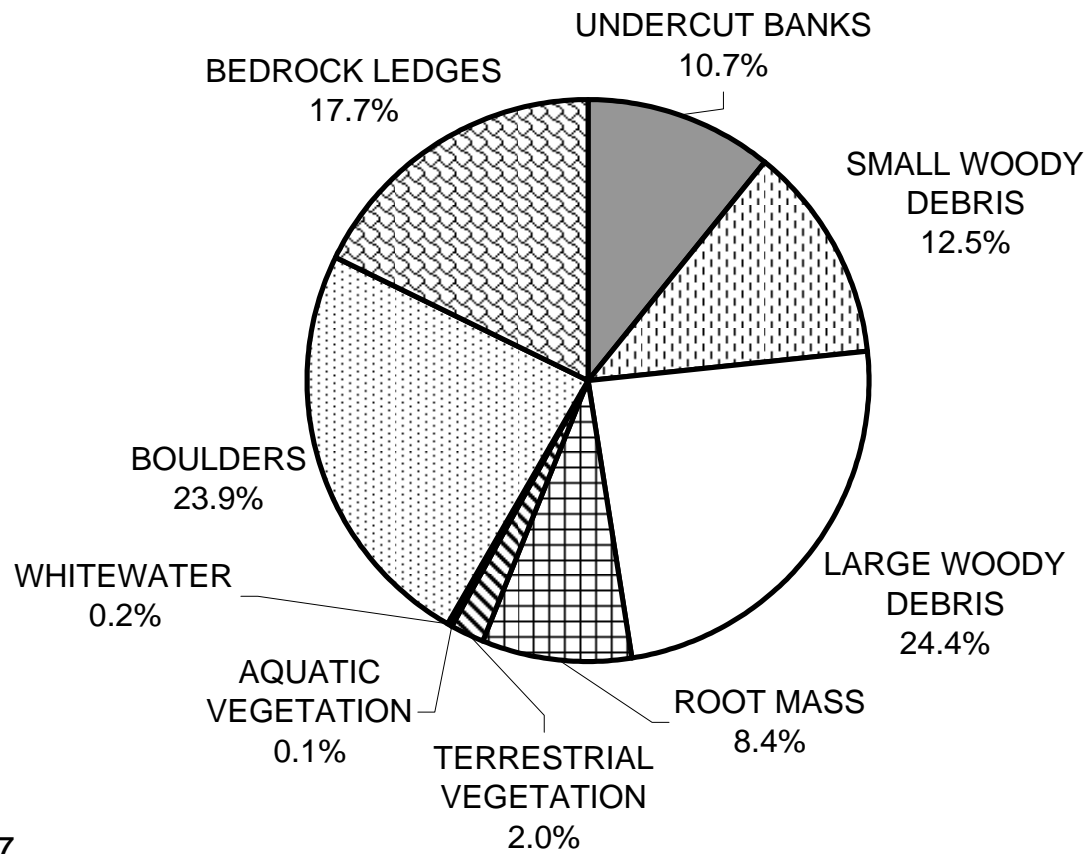
GRAPH 5

# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 PERCENT EMBEDDEDNESS



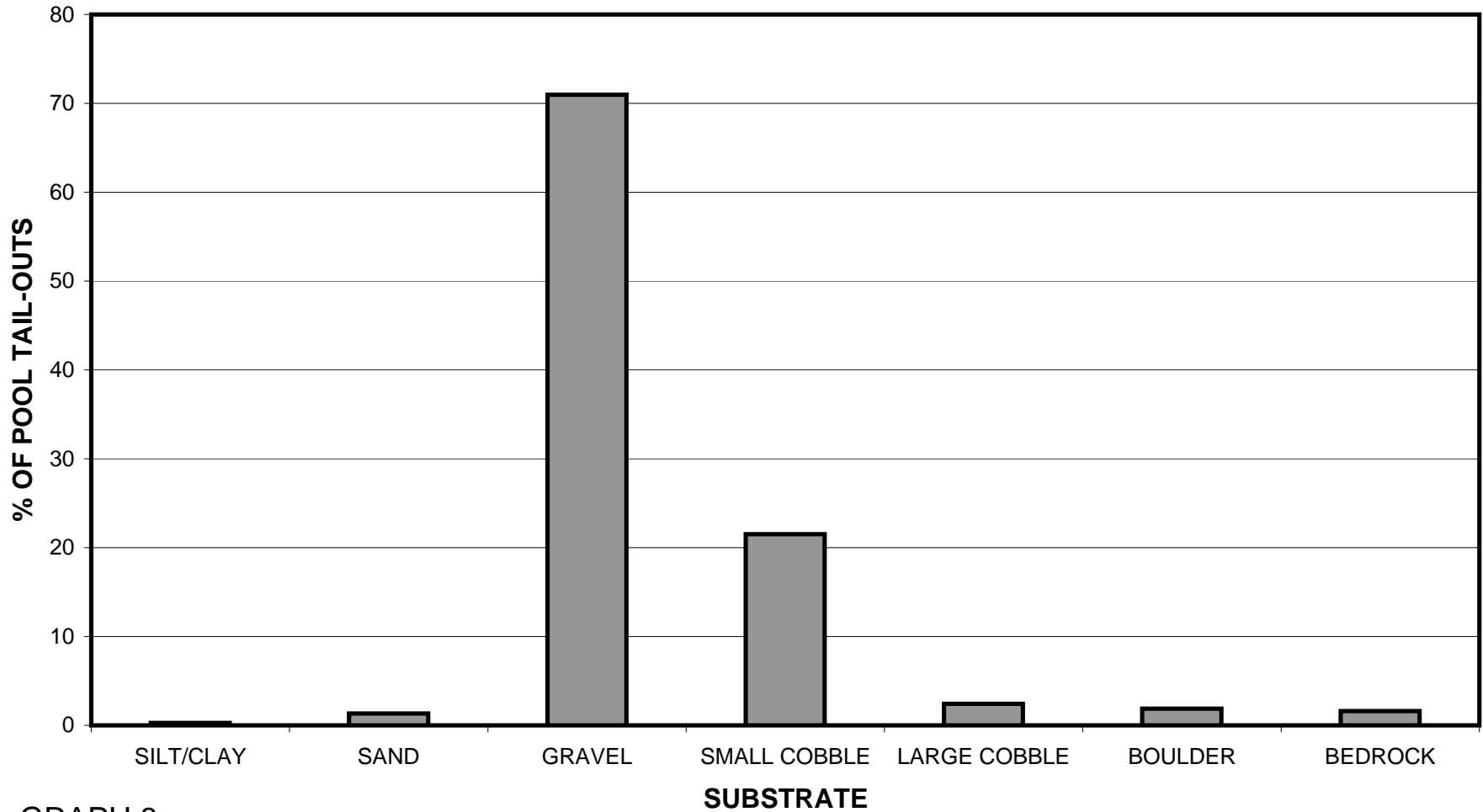
GRAPH 6

# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 MEAN PERCENT COVER TYPES IN POOLS



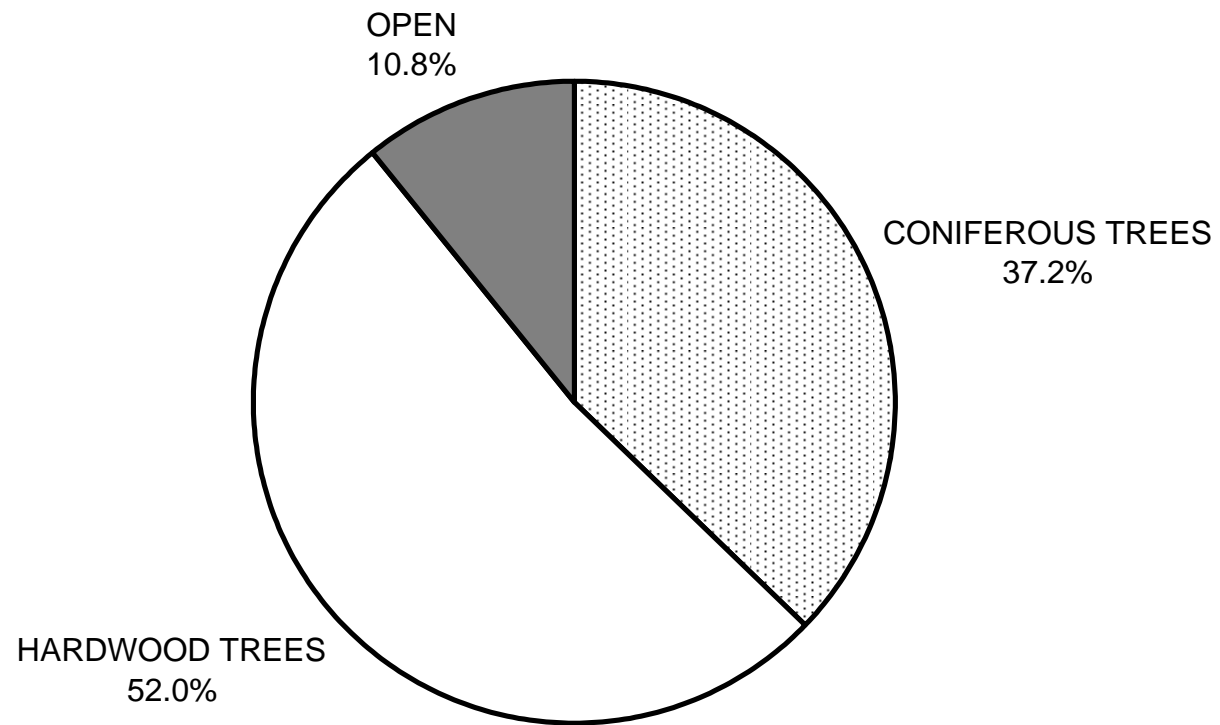
GRAPH 7

# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



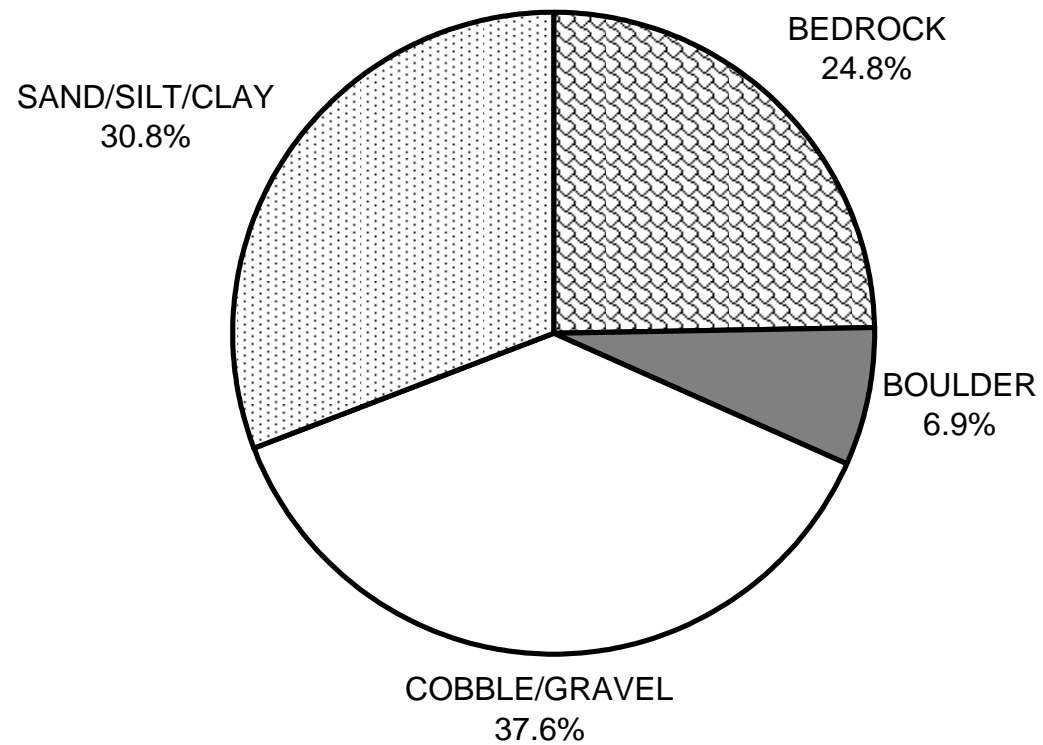
GRAPH 8

**SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013  
MEAN PERCENT CANOPY**



GRAPH 9

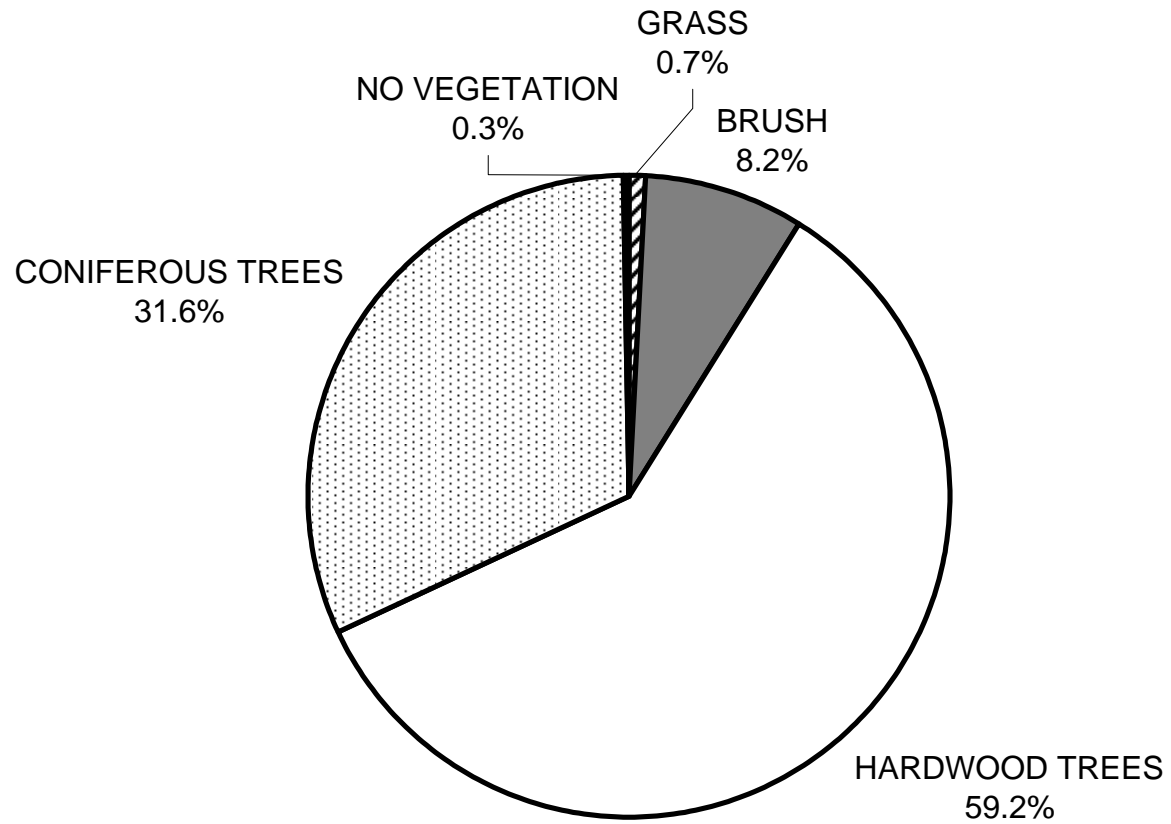
# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10



# SOUTH BRANCH NORTH FORK NAVARRO RIVER 2013 DOMINANT BANK VEGETATION IN SURVEY REACH







GRAPH 11

**Map 1**  
**South Branch North Fork Navarro River**  
**Navarro River Watershed**  
**Navarro Quad, Mendocino County**

Start of Survey

End of Survey

-  Reach 1, Channel Type F4
-  Reach 2, Channel Type F3
-  Reach 3, Channel Type B3
-  Reach 4, Channel Type A3

