CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Big River

INTRODUCTION

A stream inventory was conducted from September 23 to October 27, 2015 on Big River. The survey began at the confluence with North Fork Big River, approximately 26.2 miles from the confluence with the Pacific Ocean, and extended upstream 12.8 miles. Stream inventories and reports were also completed for three tributaries to Big River.

The 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 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 Chinook salmon, coho salmon, and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Big River drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Big River's legal description at the confluence with the Pacific Ocean is T17N R17W S30. Its location is 39.3023 degrees north latitude and 123.7923 degrees west longitude, LLID number 1237933393021. Big River is a fifth order stream and has approximately 41.2 miles of blue line stream according to the USGS Mendocino 7.5 minute quadrangle. Big River drains a watershed of approximately 181.5 square miles. Elevations range from sea level at the mouth of the creek to 2,200 feet in the headwater areas. Mixed conifer forest and oak woodland dominate the watershed. The watershed is primarily privately owned, with some state park land, and is managed for timber production, rangeland, recreation, and rural development. Vehicle access exists via private logging roads off of Highway 20, east of Fort Bragg.

METHODS

The habitat inventory conducted in Big River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project (WSP) members and California Department of Fish and Wildlife (CDFW) personnel that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. The 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 Big 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 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". 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 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 unsuitable 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 then classified according to a list of nine cover types. In 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. The shelter rating is then calculated by multiplying the qualitative shelter value by the percent of the unit covered. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-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 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 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 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.

10. Large Woody Debris Count:

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

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate

velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Big River. In addition, underwater observations were made at seven sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.18, 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 Big 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
- 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 September 23 to October 27, 2015 was conducted by M. Groff (CDFW), I. Mikus (CDFW), K. Bocast (CDFW), D. Lam (CDFW), A. Frederick (WSP), R. Bernstein (WSP), and E. Moloney (WSP). The survey began at the confluence with North Fork Big River, approximately 26.2 miles/138,170 feet upstream from the confluence with the Pacific Ocean. The total length of the stream surveyed, starting from North Fork Big River, was 67,749 feet with an additional 180 feet of side channel.

Stream flow was estimated to be 0.4 cfs during the survey period.

Big River is an F4 channel type for 19,079 feet of the stream surveyed (Reach 1), an F3 channel type for 36,104 feet of the stream surveyed (Reach 2), and an F4 channel type for 12,566 feet of the stream surveyed (Reach 3). 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, very stable with cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 49 to 63 degrees Fahrenheit. Air temperatures ranged from 43 to 77 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% flatwater units, 26% pool units, 26% riffle units, and 10% dry units (Graph 1). Based on total length of Level II habitat types there were 47% flatwater units, 35% pool units, 11% riffle units, and 8% dry units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 23%; run units, 19%; and low gradient riffle units, 19% (Graph 3). Based on percent total length, step run units made up 33%, mid-channel pool units, 31%, and run units 14%.

A total of 191 pools were identified (Table 3). Main channel pools were the most frequently encountered at 91% (Graph 4), and comprised 93% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Eighty of the 191 pools (42%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 191 pool tail-outs measured, 136 had a value of 1 (71.2%); 34 had a value of 2 (17.8%); nine had a value of 3 (4.7%); 12 had a value of 5 (6.3%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. Additionally, a value of 5 was assigned to tail-outs deemed unsuitable 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 4, flatwater habitat types had a mean shelter rating of 3, and pool habitats had a mean shelter rating of 10 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 18. Backwater pools had a mean shelter rating of 10. Main channel pools had a mean shelter rating of 9 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Big River. Graph 7 describes the pool cover in Big River. Boulders are the dominant pool cover type followed by terrestrial vegetation.

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 58% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 25% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Big River was 89%. Eleven percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 52% and 48%, respectively. Graph 9 describes the mean percent canopy in Big River.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 33% sand/silt/clay, 31% bedrock, 30% cobble/gravel, and 6% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 46% of the units surveyed. Additionally, 43% of the units surveyed had hardwood trees as the dominant vegetation type, and 9% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

A survey team conducted a snorkel survey at seven sites for species composition and distribution in Big River on October 27, 2015 (Table A). The sites were sampled by I. Mikus and K. Bocast (CDFW).

In Reach 3, two sites were sampled starting approximately 202,162 feet from the confluence with the Pacific Ocean and continuing upstream 2,756 feet. The reach sites yielded two young-of-the-year (YOY) steelhead trout (SH), 20 YOY coho salmon, one sculpin, and 25 stickleback.

Five sites were sampled above the end of survey point, 205,919 feet upstream from the confluence with the Pacific Ocean. The sample sites yielded three YOY SH, two age 1+ SH, one age 2+ steelhead, 11 sculpin, 22 stickleback, and 16 rough-skinned newts.

During the survey, the upper-most observation of juvenile coho salmon occurred at 39.2956 degrees north latitude, 123.4022 degrees west longitude, approximately 38.8 miles upstream from the confluence with the Pacific Ocean.

Table A. Summary of results for a fish composition and distribution survey within Big River, 2015.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	Steelhead Trout			Coho Salmon		Additional Aquatic Species Observed
					YOY	1+	2+	YOY	1+	
Reach 3: F4 Channel Type										
10/27/15	1	665	Pool	202,234	1	0	0	7	0	STB
10/27/15	2	712	Pool	204,918	1	0	0	13	0	STB, SCP
Above End of Survey										
10/27/15	3	--	Run	--	1	1	0	0	0	STB, SCP, RSN
10/27/15	4	--	Pool	--	0	0	0	0	0	STB, RSN
10/27/15	5	--	Run	--	1	0	0	0	0	STB
10/27/15	6	--	Pool	--	1	1	0	0	0	SCP, RSN
10/27/15	7	--	Pool	--	0	0	1	0	0	SCP, RSN

Species Abbreviations: SCP=Sculpin (Unidentified Species); STB=Stickleback (Unidentified Species); RSN=Rough-skinned Newt.

DISCUSSION

Big River is an F4 channel type for the first 19,079 feet of stream surveyed, an F3 channel type for the next 36,104 feet, and an F4 channel type for the remaining 12,566 feet. The suitability of F4 and F3 channel types for fish habitat improvement structures is as follows: F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. F3 channels are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover.

The water temperatures recorded on the survey days September 23 to October 27, 2015 ranged from 49 to 63 degrees Fahrenheit. Air temperatures ranged from 43 to 77 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 63 degrees Fahrenheit, if sustained, is near the threshold stress level for salmonids. 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 47% of the total length of this survey, riffles 11%, and pools 35%. Eighty of the 191 (42%) 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 order or larger 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.

One hundred seventy of the 191 pool tail-outs measured had embeddedness ratings of 1 or 2. Nine of the pool tail-outs had embeddedness ratings of 3 or 4. Twelve of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

One hundred fifty-eight of the 191 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 10. The shelter rating in the flatwater habitats is 3. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Big River. Boulders are the dominant cover type in pools followed by terrestrial vegetation. 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 81%, Reach 2 had a canopy density of 90%, and Reach 3 had a canopy density of 94%. The percentage of right and left bank covered with vegetation was 97% and 99%, respectively.

RECOMMENDATIONS

Big River should be managed as an anadromous, natural production stream. Recommendations for potential habitat improvement activities are based on target habitat values suitable for salmonids in California's north coast streams. Considering the results from this stream habitat inventory, factors that affect salmonid productivity and CDFW's professional judgment, the following list prioritizes habitat improvement activities in Big River. Keep in mind, watershed and stream ecosystem processes, land use alterations, changes in land ownership, and other factors could potentially change the order of these recommendations or create the need to remove/add recommendations in the future.

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

2) 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.

3) The limited water temperature data available suggest that maximum temperatures are within 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.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the confluence with the Pacific Ocean.

Position (ft):	Habitat unit #:	Comments:
0	0000.00	Confluence with the Pacific Ocean. The first 26.2 miles/138,170 feet of Big River were not surveyed.
138,170	0001.00	Start of survey at the confluence with North Fork Big River. The channel is an F4.
140,308	0019.00	The L&M Road crosses the channel. The crossing is a railcar bridge with a log abutment on the right bank and boulder rip-rap on the left bank below the bridge.
142,997	0030.00	Dietz Gulch (Tributary #01) enters on the left bank. It contributes approximately 5% to Big River's flow. The water temperature of the tributary was 54 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 54 degrees Fahrenheit. The slope of the tributary is approximately 6%. Dietz Gulch has an approximately 25' high bedrock water fall approximately 150' upstream from its confluence with Big River.
144,992	0038.00	South Fork Big River (Tributary #02) enters on the left bank. It contributes approximately 35% to Big River's flow. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 54 degrees Fahrenheit. For more information, see the 2015 South Fork Big River Stream Habitat Inventory Report.
146,362	0048.00	A landslide on the left bank measures approximately 45' long x25' high and is contributing sediment ranging in size from silt to cobble.
146,904	0055.00	A landslide on the left bank measures approximately 100' long x 200' high and is contributing sediment ranging in size from silt to cobble, small woody debris, and large woody debris (LWD).
148,918	0073.00	A landslide on the left bank measures approximately 50' long x 40' high and is contributing sediment ranging in size from silt to boulders and woody debris to the channel.
150,208	0088.00	Dry right bank tributary. The tributary has multiple bedrock plunges and the slope is greater than 10%.

152,546	0108.00	Almost dry tributary on the right bank. The tributary has multiple plunges over bedrock and log debris accumulations (LDAs).
156,223	0141.00	A landslide on the left bank measures approximately 80' long x 30' high and is contributing cobble and boulders to the channel.
156,959	0147.00	A logging road crosses the channel. The crossing is an approximately 20' high bridge. The right bank below the bridge is armored with boulder rip-rap; the left bank below the bridge is bedrock.
157,249	0149.00	Dry right bank tributary. The channel changes from an F4 to an F3.
159,271	0160.00	Left bank seep.
160,916	0176.00	Dry right bank tributary.
161,987	0183.00	Russell Brook (Tributary #03) enters on the left bank. It was not flowing at the mouth. The water temperature of the tributary was 55 degrees Fahrenheit, the water temperature downstream of the confluence was 57 degrees Fahrenheit, and the water temperature upstream of the confluence was 59 degrees Fahrenheit. For more information, see the 2015 Russell Brook Stream Habitat Inventory Report.
163,078	0196.00	An erosion site on the left bank measures approximately 70' long x 10' high and is contributing sediment ranging in size from silt to boulders to the channel.
166,294	0221.00	A logging road crosses the channel. The crossing is an approximately 20' high railcar bridge. The right bank below the bridge is bedrock. The left bank has a corrugated metal sheet abutment with boulder rip-rap below it.
168,398	0241.00	Dry right bank tributary.
168,170	0242.00	Dry left bank tributary.
173,781	0275.00	A scarp on the left bank measures approximately 80' long x 12' high and is contributing sediment ranging in size from silt to gravel to the channel.
176,598	0301.00	Pigpen Gulch (Tributary #04) enters on the right bank. It contributes less than 5% to Big River's flow. The water temperature of the tributary was 53 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 53 degrees Fahrenheit. For more information, see the 2014 Pigpen Gulch Stream Habitat Inventory Report.

178,686	0318.00	An erosion site on the left bank measures approximately 80' long x 10' high and is contributing silt and sand to the channel.
180,356	0336.00	A landslide on the right bank measures approximately 50' high x 60' long and is contributing silt, sand and woody debris to the channel.
182,002	0351.00	A landslide on the right bank measures approximately 80' high x 25' wide and is contributing sediment ranging in size from silt to cobble to the channel.
182,943	0365.00	Martin Creek (Tributary #05) enters on the right bank. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 56 degrees Fahrenheit. For more information, see the 2014 Martin Creek Stream Habitat Inventory Report.
183,077	0366.00	A logging road crosses the channel. The crossing is an approximately 22' high bridge. Boulder rip-rap lines both banks below the bridge for approximately 80' long x 8' high.
186,977	0413.00	Tributary #06 enters on the right bank. It was dry at the mouth. The water temperature of the tributary was 57 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 58 degrees Fahrenheit. The slope of the tributary is approximately 8%. There is a boulder and woody debris barrier approximately 200' upstream from the confluence with Big River.
188,778	0440.00	Left bank seep.
189,340	0445.00	Left bank seep.
190,460	0459.00	Tributary #07 enters on the right bank. It contributes less than 1% to Big River's flow. The water temperature of the tributary was 57 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 56 degrees Fahrenheit. The slope of the tributary is approximately 25%.
191,127	0466.00	Derelict log and timber bridge spans channel.
191,780	0481.00	A landslide on the right bank measures approximately 100' high x 30' long and is contributing sediment ranging in size from silt to gravel to the channel.
192,362	0486.00	Left bank seep. Tributary #08 enters on the left bank. It contributes less than 1% to Big River's flow. The water temperature of the tributary was 55 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 57 degrees Fahrenheit. The slope of the tributary

		is approximately 5%. The tributary has three bedrock plunges; the first is approximately 8' high, the second is 4' high, the third is 6' high.
192,637	0488.00	Left bank seep.
193,126	0495.00	A landslide on the right bank measures approximately 180' high x 150' long and is contributing silt to the channel.
193,353	0499.00	The channel changes from an F3 to an F4.
193,976	0509.00	Dry left bank tributary; it has a high slope.
195,386	0534.00	Dry left bank tributary; it has a high slope. Dry right bank tributary.
195,977	0544.00	Wet ford across the channel. Evidence of cows crossing.
196,022	0545.00	An erosion site on the left bank measures approximately 50' long x 12' high and is contributing silt and sand to the channel.
196,709	0552.00	Dry right bank tributary.
197,135	0560.00	Valentine Creek (Tributary #09) enters on the left bank. It was dry at the mouth. The water temperature of the tributary was 53 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 52 degrees Fahrenheit. For more information see the 2014 Valentine Creek Stream Habitat Inventory Report.
197,246	0562.00	Approximately 16 pieces of LWD accumulating in the channel.
198,828	0601.00	Dry right bank tributary.
199,057	0608.00	An erosion site on the right bank measures approximately 40' long x 15' high and is contributing silt and sand to the channel.
199,766	0619.00	Left bank seep. A landslide on the left bank measures approximately 60' long x 25' high and is contributing sediment ranging in size from silt to cobble to the channel.
200,206	0623.00	Small left bank tributary.
200,495	0630.00	Decommissioned ford.
201,598	0654.00	Possible relic road eroding into the channel on the right bank. The erosion site measures approximately 100' long x 15' high and is contributing silt and sand to the channel.
201,963	0661.00	Dry left bank tributary.

202,280	0668.00	A 6.5' high railcar bridge spans the channel. It is buttressed by logs.
202,301	0669.00	The left bank is eroding along the remnants of an old road.
202,449	0673.00	Woody debris accumulating in the channel.
202,566	0676.00	Dry left bank tributary.
202,984	0680.00	Dry right bank tributary.
203,295	0685.00	The right bank is eroding along the remains of and old road. The erosion site measures approximately 50' long x 12' high and is contributing silt and sand to the channel.
203,721	0690.00	Summer steelhead observed in pool.
204,086	0696.00	Dry right bank tributary.
204,116	0697.00	Dry left bank tributary.
204,204	0700.00	Dry right bank tributary.
204,229	0701.00	Ephemeral tributary eroding gully into remnants of old road on the right bank. The gully measures approximately 5' wide x 15' long x 3' high.
204,860	0712.00	Rice Creek (Tributary #10) enters on the left bank. It contributes approximately 5% to Big River's flow. The water temperature of the tributary was 55 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 54 degrees Fahrenheit. For more information see the 2014 Rice Creek Stream Habitat Inventory Report.
205,185	0717.00	An erosion site on the right bank measures approximately 40' long x 15' high and is contributing sediment ranging in size from silt to gravel to the channel.
205,200	0718.00	Dry right bank tributary.
205,900	0727.00	An erosion site on the right bank measures approximately 50' long x 10' high and is contributing sediment ranging in size from silt to gravel to the channel. End of survey; channel is dry. Potential habitat continues for approximately two miles above this point; approximately 9,500 feet of it is dry, 1,000 feet of it is wet. The majority of the wetted channel is made up of runs and shallow pools; only six significant pools were observed over this length. Fish were observed up to where Big River splits with a right bank tributary. Big River is completely dry above the split and doesn't appear to ever have summer habitat. The right bank

tributary has potential habitat, but the slope is over 4%. Above the end of survey point the slope of Big River increases to over 4%. Big River in general has a mix of cobble, gravel, boulders and sand in the stream channel. Active and relic roads often follow close to the stream channel and the headwaters stream channel may be constricted by these roads. The roads have great erosion potential and sediment input potential.

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.

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]	

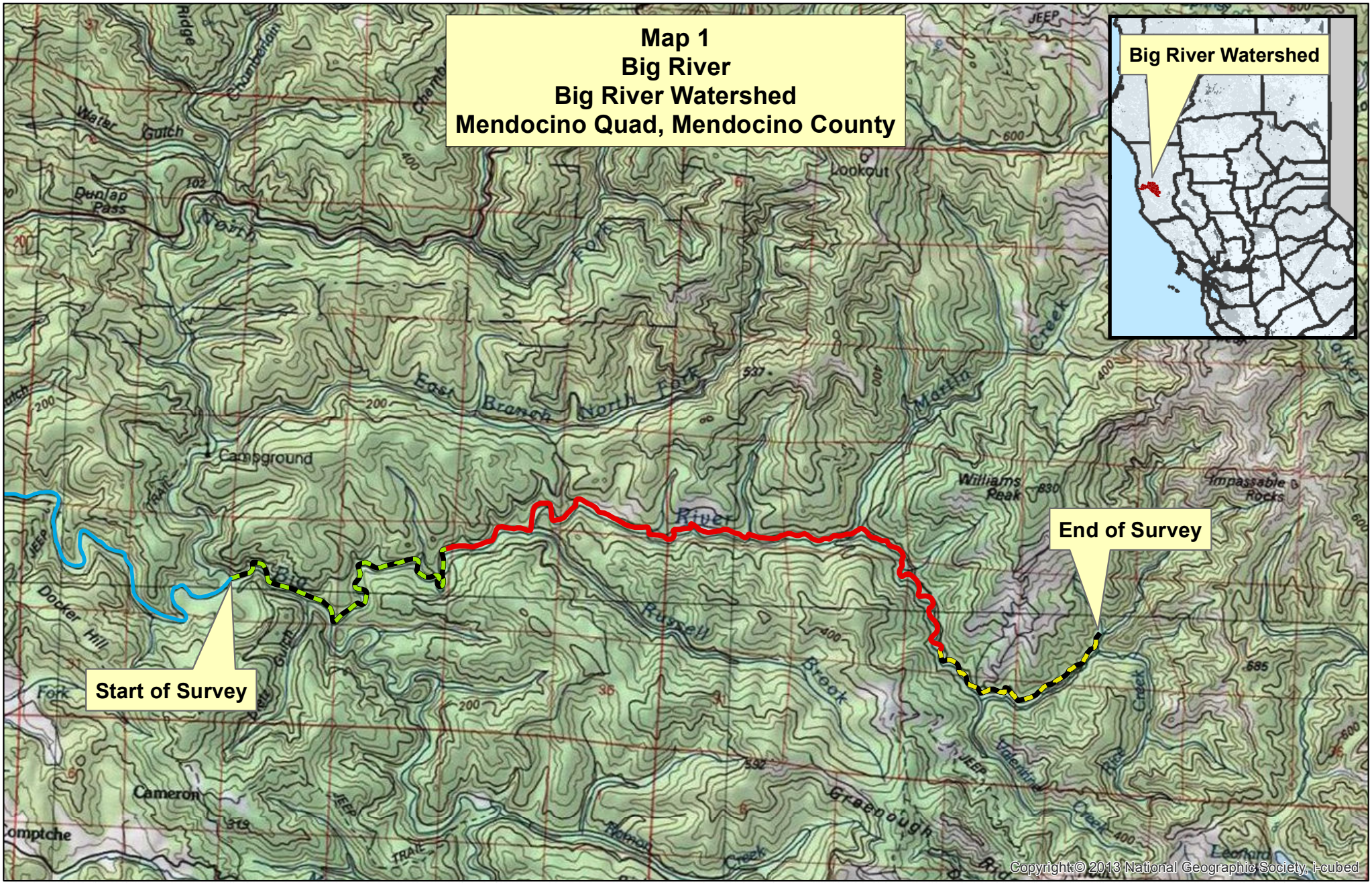

Map 1
Big River
Big River Watershed
Mendocino Quad, Mendocino County
Big River Watershed
Start of Survey
End of Survey
Campground
Lookout
Williams Peak
Impassable Rocks
Cameron
Copyright © 2013 National Geographic Society, i-cubed
N
W
E
S
Unsurveyed
Reach 1: F4 Channel Type
Reach 2: F3 Channel Type
Reach 3: F4 Channel Type
0 0.5 1 2
Miles
CALIFORNIA
DEPARTMENT OF
FISH & WILDLIFE

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

Stream Name: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
76	0	DRY	10.4	68	5146	7.6									
273	30	FLATWATER	37.4	116	31785	46.8	10.3	0.5	1.1	1478	403461	732	199841		3
191	191	POOL	26.2	123	23482	34.6	18.8	1.4	3.0	2661	508188	4907	937152	4447	10
189	23	RIFFLE	25.9	40	7516	11.1	6.5	0.2	0.4	142	26919	27	5052		4

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
729	244	67929	938567	1142045

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

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 (%)
136	16	LGR	18.7	42	5692	8.4	6	0.1	0.7	125	16952	21	2907		5	87
52	6	HGR	7.1	35	1812	2.7	9	0.2	0.6	211	10958	45	2335		3	86
1	1	BRS	0.1	12	12	0.0	2	0.2	0.3	17	17	3	3		0	80
138	18	RUN	18.9	67	9204	13.5	11	0.5	1.9	1480	204215	759	104711		4	92
135	12	SRN	18.5	167	22581	33.2	9	0.5	1.6	1475	199120	692	93404		2	89
168	168	MCP	23.0	127	21321	31.4	19	1.5	6.8	2762	464079	5204	874220	4731	9	89
3	3	CCP	0.4	97	290	0.4	28	1.7	5.6	2840	8520	7656	22967	6980	3	79
2	2	STP	0.3	60	119	0.2	14	1.5	4.2	801	1602	1457	2914	1344	5	86
1	1	CRP	0.1	64	64	0.1	21	1.9	3.5	1277	1277	2426	2426	2426	30	82
3	3	LSL	0.4	40	120	0.2	16	0.8	2	568	1705	533	1600	418	55	97
3	3	LSR	0.4	66	199	0.3	13	0.8	2.3	929	2786	981	2944	795	8	94
6	6	LSBk	0.8	151	907	1.3	20	0.8	3.4	3055	18331	2984	17902	2398	0	89
4	4	LSBo	0.5	95	380	0.6	23	1.1	3.7	2214	8855	2528	10113	2146	20	92
1	1	SCP	0.1	82	82	0.1	14	1.9	3.1	1033	1033	2066	2066	1963	10	97
76	0	DRY	10.4	68	5146	7.6										94

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
729	244	67929	939450	1140512

Table 3 - Summary of Pool Types

Stream Name: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

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
173	173	MAIN	91	126	21730	93	18.8	1.5	2741	474201	4731	818385	9
17	17	SCOUR	9	98	1670	7	18.9	0.9	1938	32953	1708	29036	18
1	1	BACKWATER	1	82	82	0	14.0	1.9	1033	1033	1963	1963	10

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
191	191	23482	508188	849384

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

Stream Name: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

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
168	MCP	88	0	0	36	21	59	35	38	23	35	21
3	CCP	2	0	0	1	33	1	33	0	0	1	33
2	STP	1	0	0	1	50	0	0	0	0	1	50
1	CRP	1	0	0	0	0	0	0	1	100	0	0
3	LSL	2	0	0	2	67	1	33	0	0	0	0
3	LSR	2	0	0	2	67	1	33	0	0	0	0
6	LSBk	3	0	0	2	33	3	50	1	17	0	0
4	LSBo	2	0	0	2	50	0	0	2	50	0	0
1	SCP	1	0	0	0	0	0	0	1	100	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
191	0	0	46	24	65	34	43	23	37	19

Mean Maximum Residual Pool Depth (ft.): 3

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015 Dry Units: 76

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

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
136	16	LGR	0	2	0	0	50	0	0	48	0
52	6	HGR	0	0	0	0	10	0	0	90	0
1	1	BRS	0	0	0	0	0	0	0	0	0
189	23	TOTAL RIFFLE	0	1	0	0	40	0	0	59	0
138	18	RUN	38	25	0	0	15	0	0	22	0
135	12	SRN	0	33	3	0	0	0	0	63	0
273	30	TOTAL FLAT	28	27	1	0	11	0	0	33	0
168	168	MCP	7	12	17	2	21	0	0	32	9
3	3	CCP	0	0	0	0	100	0	0	0	0
2	2	STP	0	0	0	0	0	0	0	100	0
1	1	CRP	0	70	30	0	0	0	0	0	0
3	3	LSL	0	30	70	0	0	0	0	0	0
3	3	LSR	0	2	58	27	0	0	0	13	0
6	6	LSBk	0	0	0	0	0	0	0	0	0
4	4	LSBo	20	5	0	0	21	0	0	54	0
1	1	SCP	0	0	0	0	0	0	0	100	0
191	191	TOTAL POOL	7	12	18	3	20	0	0	32	8
729	244	TOTAL	8	13	16	2	20	0	0	34	7

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015 Dry Units: 76

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

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
136	16	LGR	0	0	56	13	13	13	6
52	6	HGR	0	0	17	17	67	0	0
1	1	BRS	0	0	0	0	0	0	100
138	18	RUN	0	0	61	17	17	6	0
135	12	SRN	0	0	67	17	17	0	0
168	168	MCP	0	11	73	2	4	4	6
3	3	CCP	0	0	100	0	0	0	0
2	2	STP	0	0	0	0	0	50	50
1	1	CRP	0	100	0	0	0	0	0
3	3	LSL	0	33	67	0	0	0	0
3	3	LSR	0	33	33	0	33	0	0
6	6	LSBk	0	0	67	0	17	0	17
4	4	LSBo	0	0	50	0	25	25	0
1	1	SCP	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
89	48	52	0	97	99

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: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015 Survey Length (ft.): 67929 Main Channel (ft.): 67749 Side Channel (ft.): 180

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4
Reach Length (ft.): 19079
Riffle/Flatwater Mean Width (ft.): 13.7
BFW:
Range (ft.): 34 to 100
Mean (ft.): 56
Std. Dev.: 16
Base Flow (cfs.): 0.4
Water (F): 54 - 62 Air (F): 48 - 77
Dry Channel (ft): 84

Canopy Density (%): 80.9
Coniferous Component (%): 41.7
Hardwood Component (%): 58.3
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 98.8
Dominant Shelter: Terrestrial Veg.
Dominant Bank Substrate Type: Bedrock
Occurrence of LWD (%): 9
LWD per 100 ft.:
Riffles: 0
Pools: 1
Flat: 1

Pools by Stream Length (%): 50.2
Pool Frequency (%): 34.7
Residual Pool Depth (%):
< 2 Feet Deep: 10
2 to 2.9 Feet Deep: 31
3 to 3.9 Feet Deep: 27
>= 4 Feet Deep: 33
Mean Max Residual Pool Depth (ft.): 3.6
Mean Pool Shelter Rating: 10

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 31 Sm Cobble: 54 Lg Cobble: 15 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 90.4 2. 9.6 3. 0.0 4. 0.0 5. 0.0

STREAM REACH: 2

Channel Type: F3
Reach Length (ft.): 36104
Riffle/Flatwater Mean Width (ft.): 8.6
BFW:
Range (ft.): 25 to 61
Mean (ft.): 44
Std. Dev.: 9
Base Flow (cfs.): 0.4
Water (F): 52 - 60 Air (F): 44 - 66
Dry Channel (ft): 1462

Canopy Density (%): 90.1
Coniferous Component (%): 48.2
Hardwood Component (%): 51.8
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 97.1
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 10
LWD per 100 ft.:
Riffles: 1
Pools: 1
Flat: 1

Pools by Stream Length (%): 32.7
Pool Frequency (%): 27.7
Residual Pool Depth (%):
< 2 Feet Deep: 21
2 to 2.9 Feet Deep: 36
3 to 3.9 Feet Deep: 24
>= 4 Feet Deep: 20
Mean Max Residual Pool Depth (ft.): 3.0
Mean Pool Shelter Rating: 7

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 66 Sm Cobble: 13 Lg Cobble: 8 Boulder: 11 Bedrock: 1

Embeddedness Values (%): 1. 71.1 2. 18.6 3. 3.1 4. 0.0 5. 7.2

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: F4
Reach Length (ft.): 12566
Riffle/Flatwater Mean Width (ft.): 5.5
BFW:
Range (ft.): 17 to 39
Mean (ft.): 28
Std. Dev.: 6
Base Flow (cfs.): 0.4
Water (F): 49 - 63 Air (F): 43 - 65
Dry Channel (ft): 3600

Canopy Density (%): 93.8
Coniferous Component (%): 51.4
Hardwood Component (%): 48.6
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 97.9
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Bedrock
Occurrence of LWD (%): 8
LWD per 100 ft.:
Riffles: 1
Pools: 2
Flat: 1

Pools by Stream Length (%): 16.0
Pool Frequency (%): 18.3
Residual Pool Depth (%):
< 2 Feet Deep: 50
2 to 2.9 Feet Deep: 33
3 to 3.9 Feet Deep: 14
>= 4 Feet Deep: 2
Mean Max Residual Pool Depth (ft.): 2.2
Mean Pool Shelter Rating: 15

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 74 Sm Cobble: 14 Lg Cobble: 0 Boulder: 2 Bedrock: 10

Embeddedness Values (%): 1. 47.6 2. 26.2 3. 14.3 4. 0.0 5. 11.9

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

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	76	75	30.9
Boulder	15	16	6.4
Cobble / Gravel	69	75	29.5
Sand / Silt / Clay	84	78	33.2

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	3	1	0.8
Brush	22	21	8.8
Hardwood Trees	126	86	43.4
Coniferous Trees	91	135	46.3
No Vegetation	2	1	0.6

Total Stream Cobble Embeddedness Values: 2

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

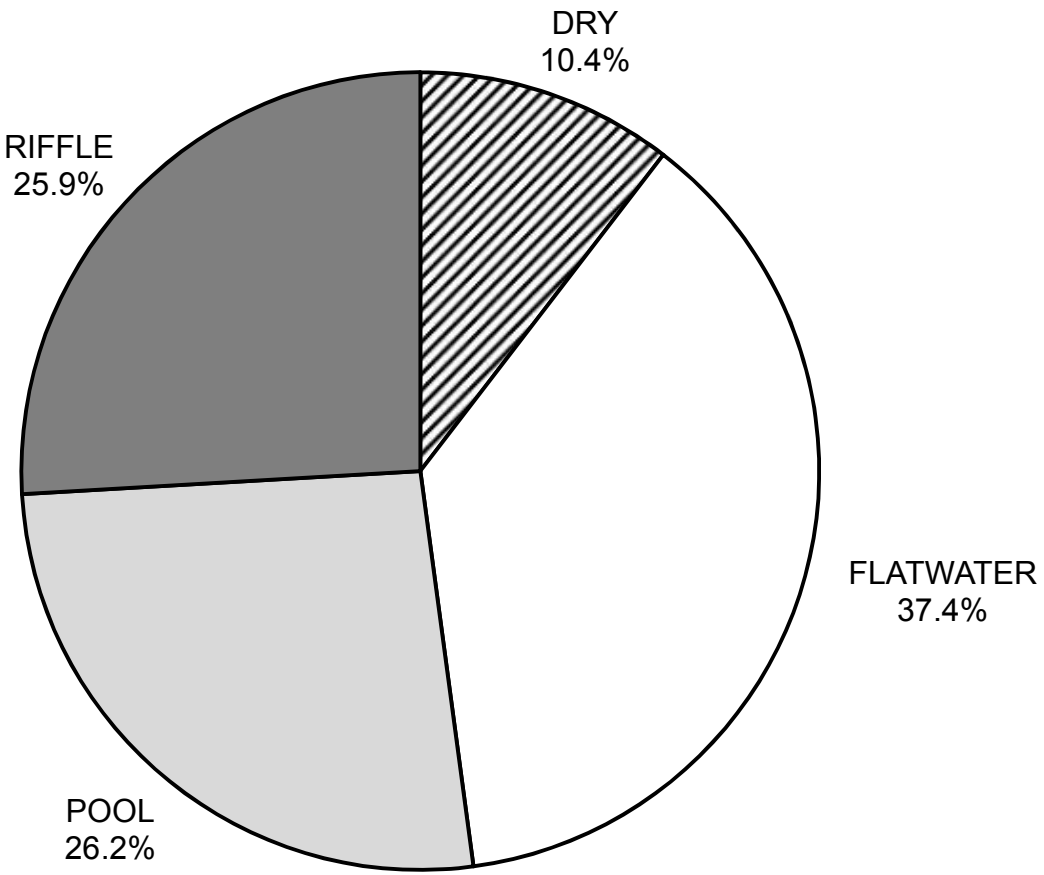
StreamName: Big River LLID: 1237933393021 Drainage: Big River

Survey Dates: 9/23/2015 to 10/27/2015

Confluence Location: Quad: MENDOCINO Legal Description: T17NR16WS23 Latitude: 39:18:08.0N Longitude: 123:47:36.0W

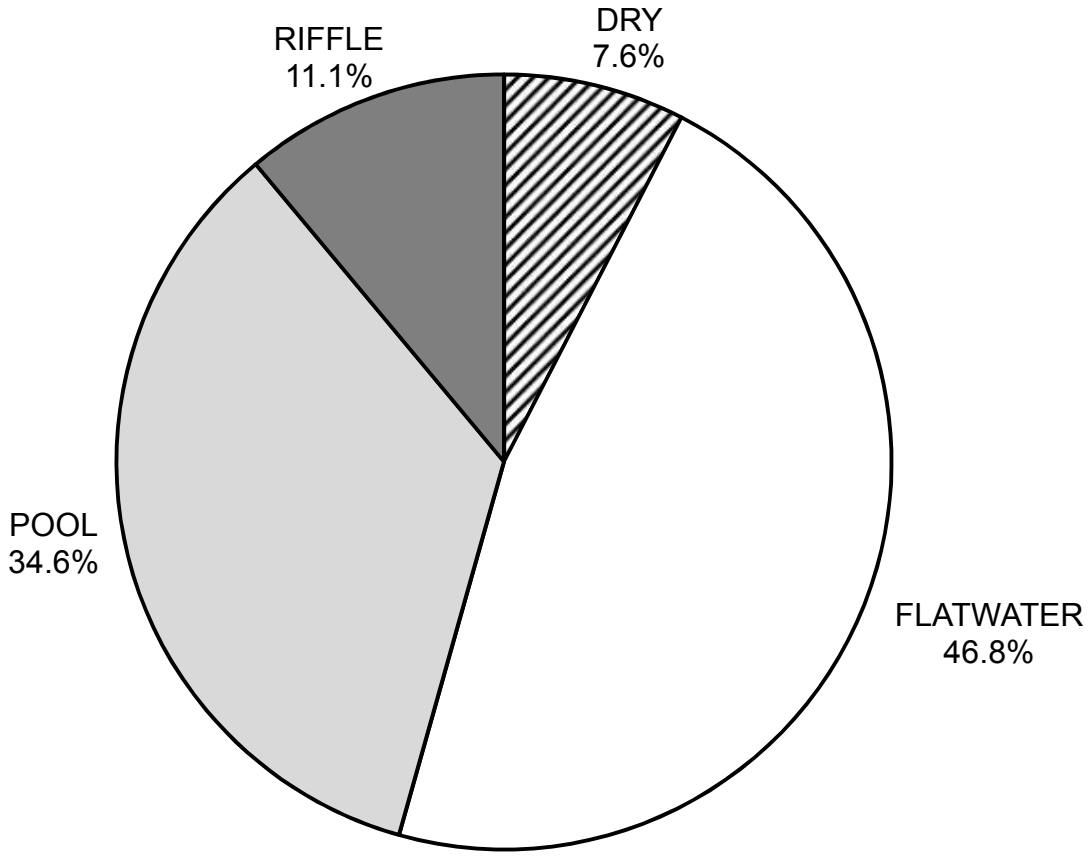
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	28	7
SMALL WOODY DEBRIS (%)	1	27	12
LARGE WOODY DEBRIS (%)	0	1	18
ROOT MASS (%)	0	0	3
TERRESTRIAL VEGETATION (%)	40	11	20
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	59	33	32
BEDROCK LEDGES (%)	0	0	8

BIG RIVER 2015
HABITAT TYPES BY PERCENT OCCURRENCE



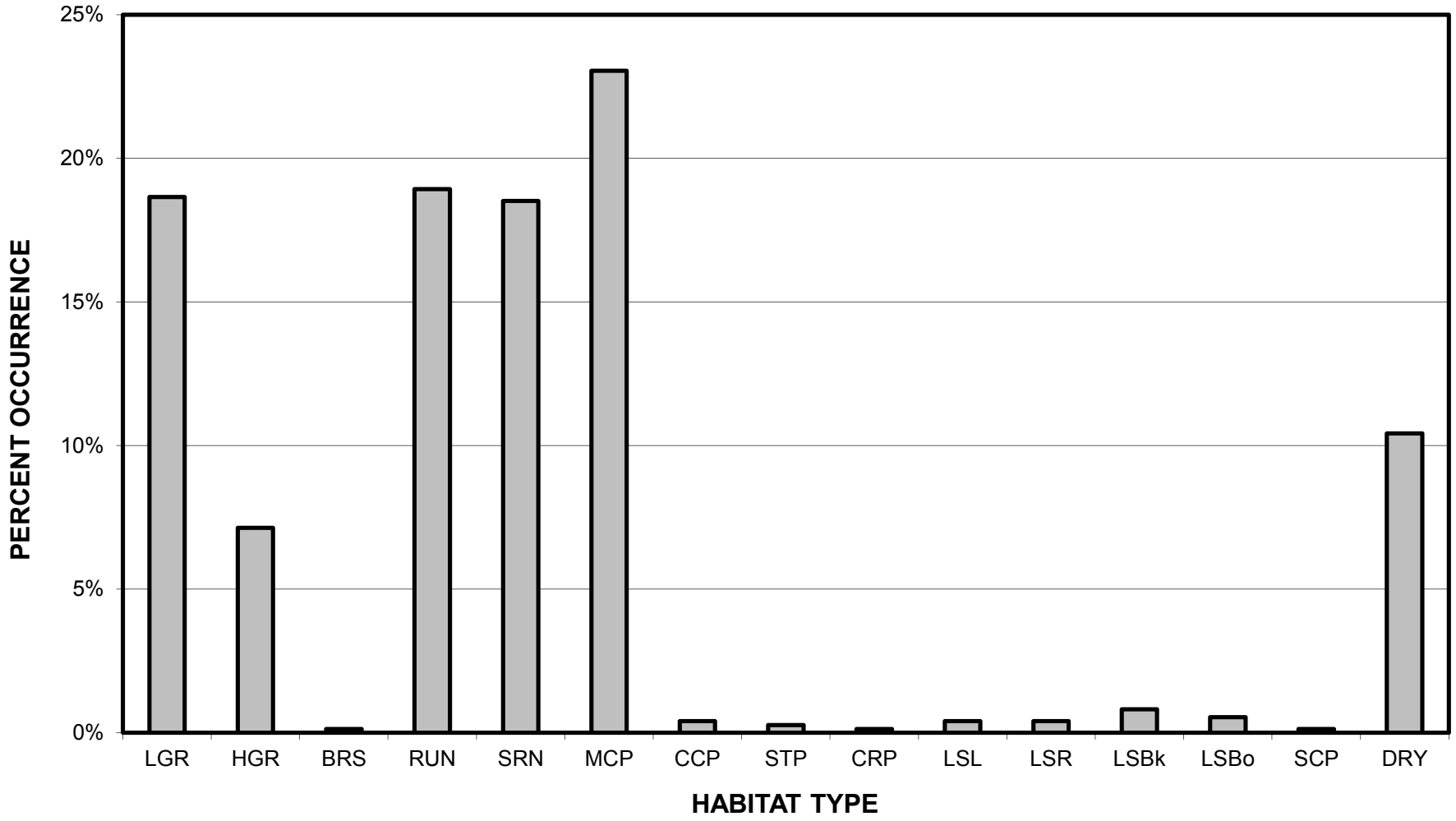
GRAPH 1

BIG RIVER 2015
HABITAT TYPES BY PERCENT TOTAL LENGTH



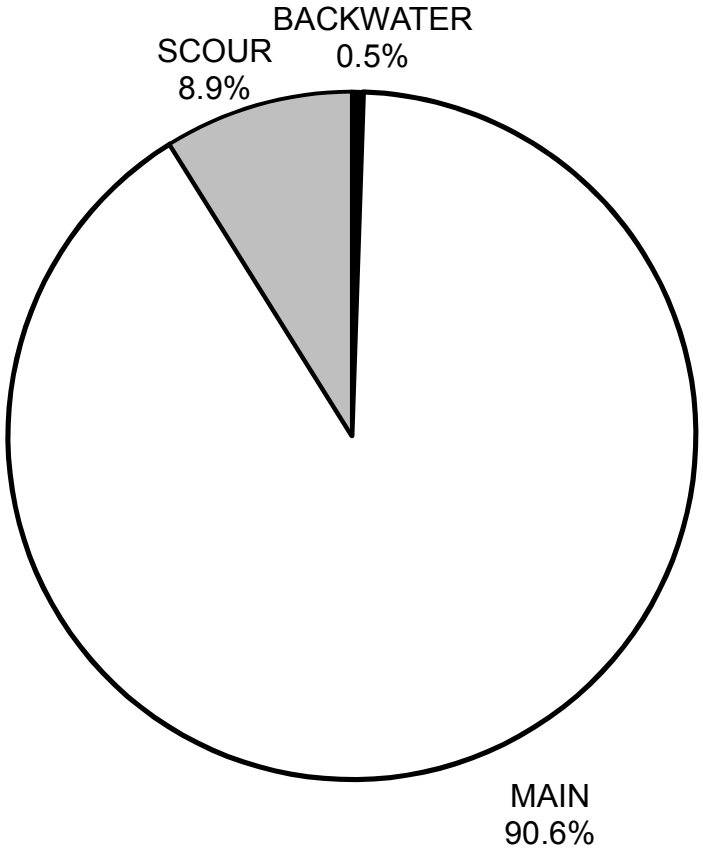
GRAPH 2

BIG RIVER 2015
HABITAT TYPES BY PERCENT OCCURRENCE



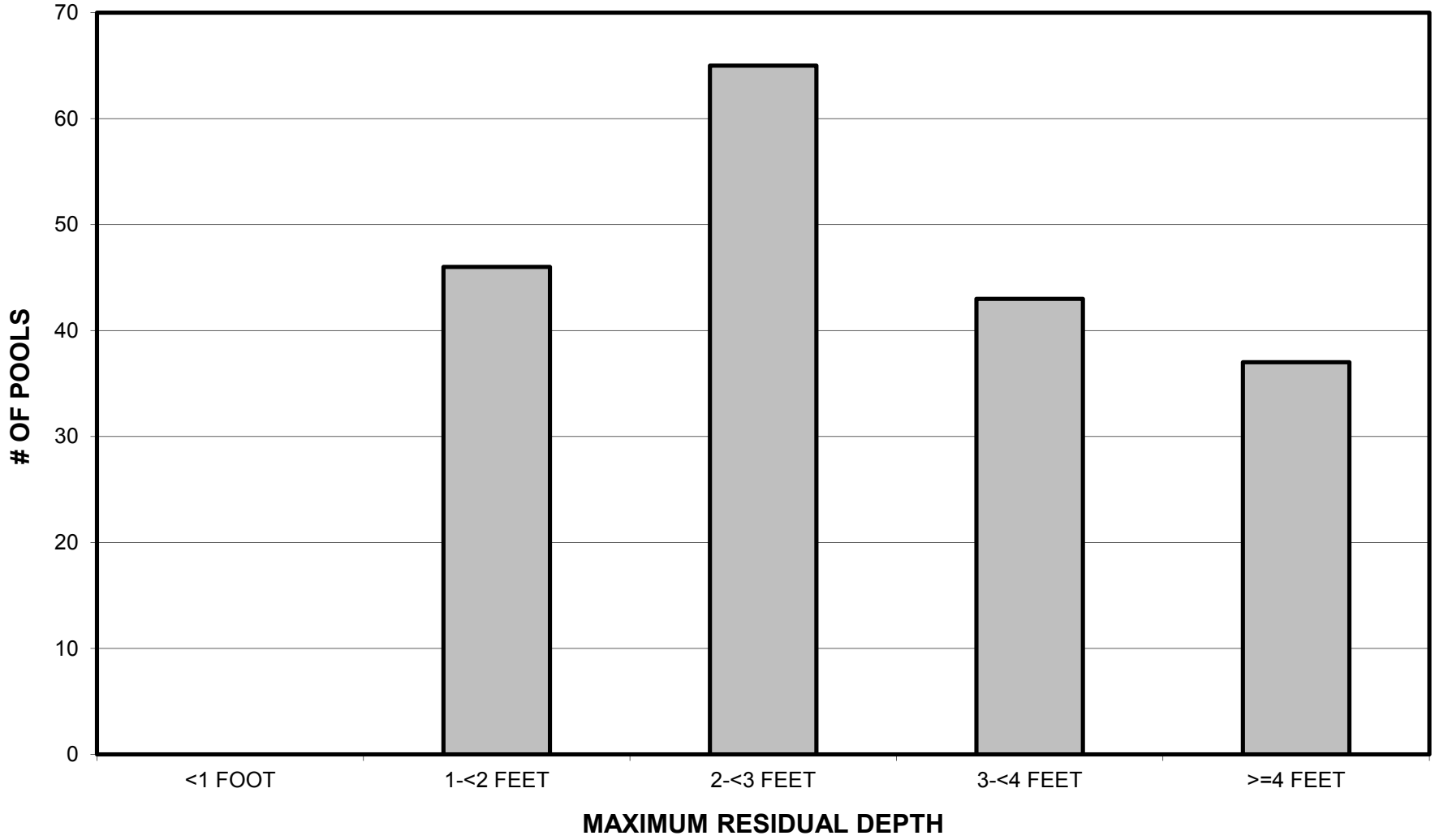
GRAPH 3

BIG RIVER 2015
POOL TYPES BY PERCENT OCCURRENCE



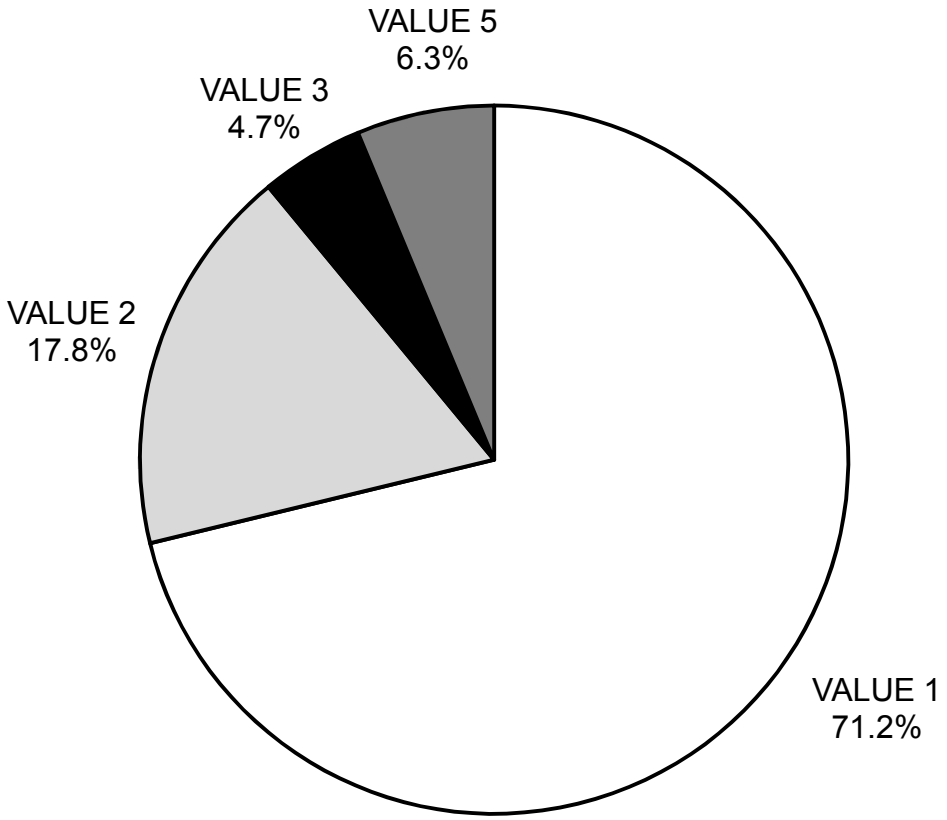
GRAPH 4

BIG RIVER 2015
MAXIMUM DEPTH IN POOLS



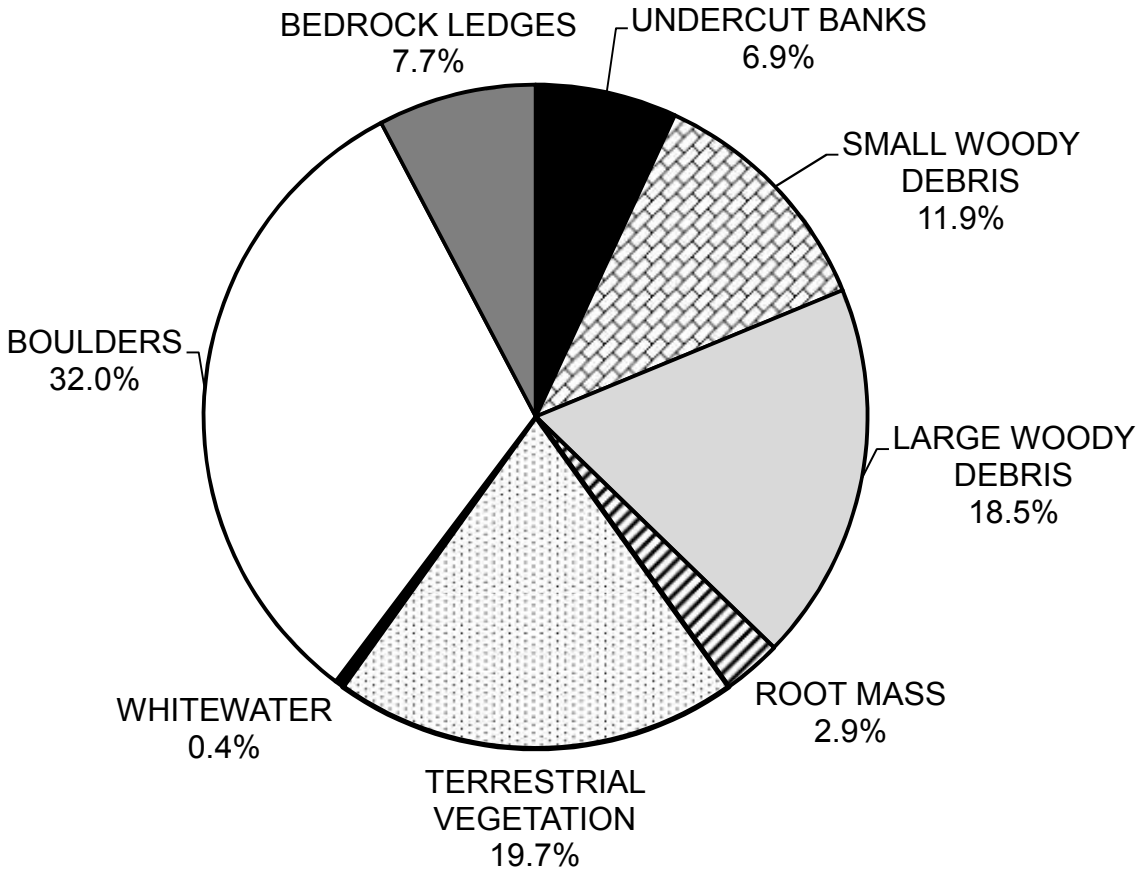
GRAPH 5

BIG RIVER 2015
PERCENT EMBEDDEDNESS



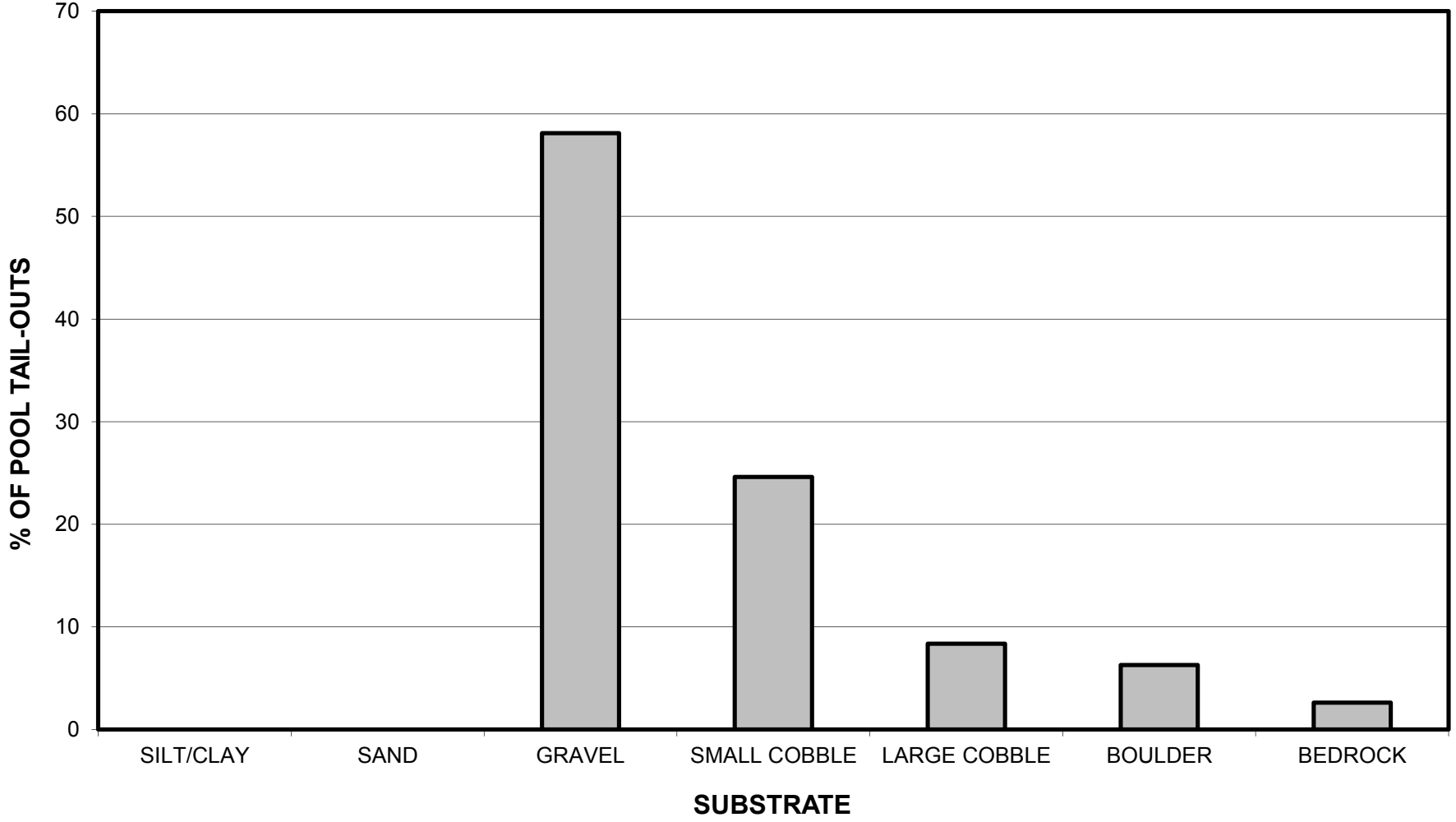
GRAPH 6

BIG RIVER 2015
MEAN PERCENT COVER TYPES IN POOLS



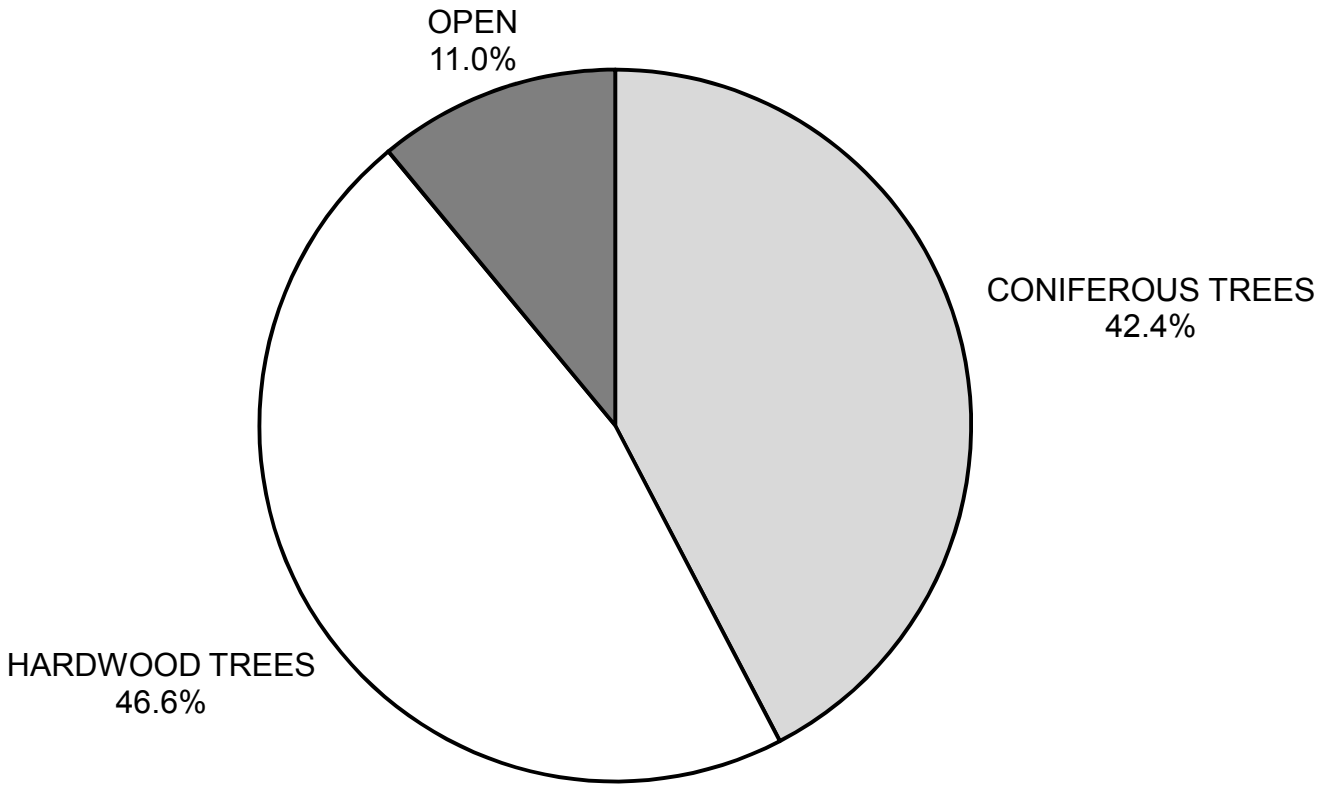
GRAPH 7

BIG RIVER 2015
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



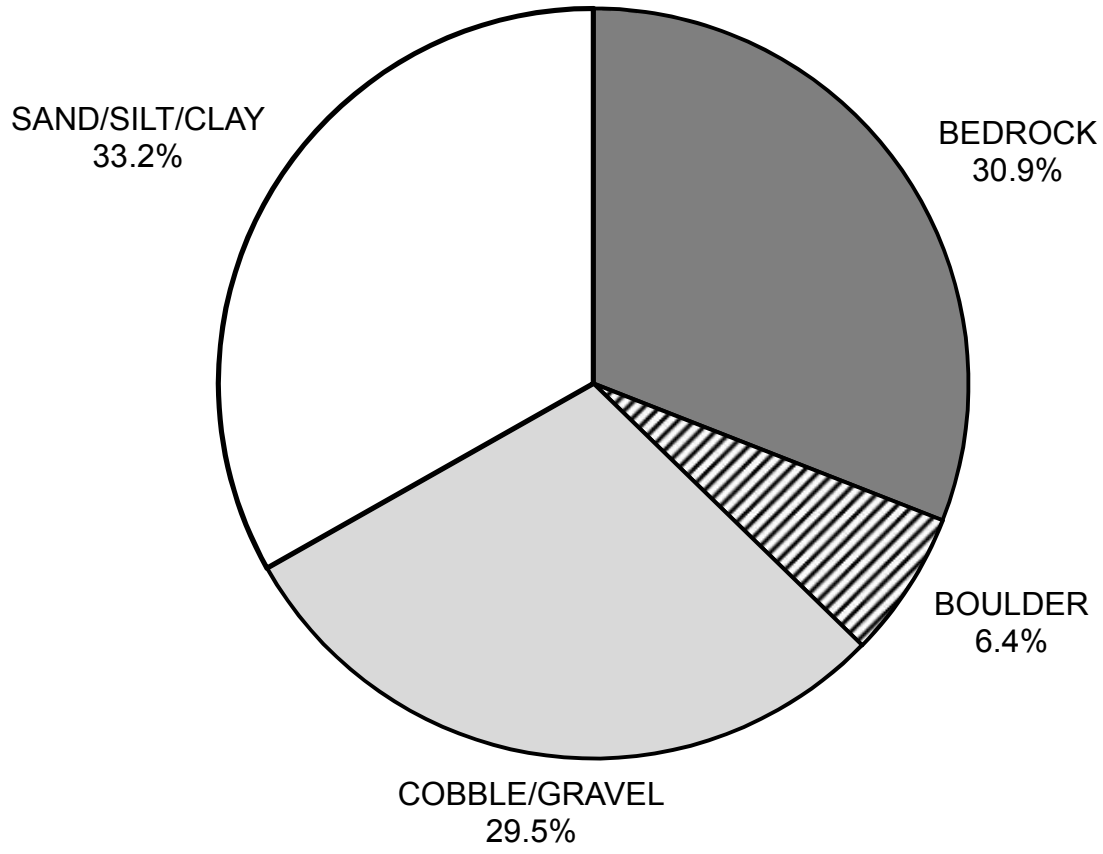
GRAPH 8

BIG RIVER 2015
MEAN PERCENT CANOPY



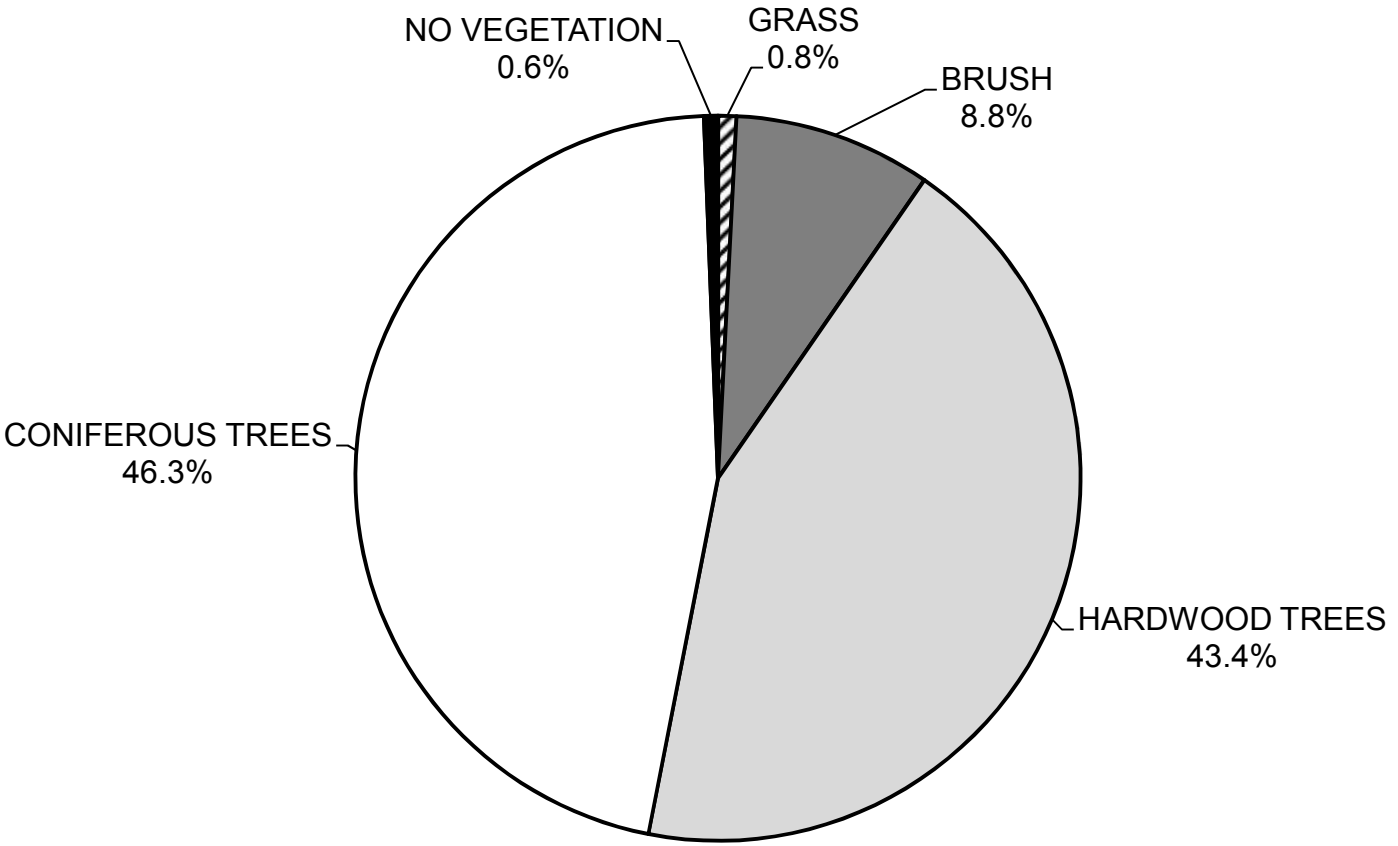
GRAPH 9

BIG RIVER 2015
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

BIG RIVER 2015
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11