CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Biggs Gulch

INTRODUCTION

A stream inventory was conducted from May 26 to June 2, 2015 on Biggs Gulch. The survey began at the confluence with South Fork Big River and extended upstream 0.6 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Biggs Gulch.

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

Biggs Gulch is a tributary to South Fork Big River, tributary to Big River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Biggs Gulch's legal description at the confluence with South Fork Big River is T17N R15W S34. Its location is 39.2880 degrees north latitude and 123.5153 degrees west longitude, LLID number 1235141392880. Biggs Gulch is an intermittent stream according to the USGS Comptche 7.5 minute quadrangle. Biggs Gulch drains a watershed of approximately 0.8 square miles. Elevations range from about 225 feet at the mouth of the creek to 900 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Comptche-Ukiah Road, southeast of Fort Bragg.

METHODS

The habitat inventory conducted in Biggs Gulch 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 Biggs Gulch 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". Biggs Gulch 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 Biggs Gulch, 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 Biggs Gulch, 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 Biggs Gulch, 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 Biggs Gulch, 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.

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 Biggs Gulch 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 May 26 to June 2, 2015 was conducted by J. Lee (WSP), T. Brown (WSP), I. Mikus (CDFW), and J. Murphrey (WSP). The total length of the stream surveyed was 3,432 feet.

Stream flow was too low to measure on Biggs Gulch.

Biggs Gulch is a G4 channel type for all 3,432 feet of the stream surveyed. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 56 degrees Fahrenheit. Air temperatures ranged from 54 to 67 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 31% pool units, 30% riffle units, 29% flatwater units, 9% dry units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 34% flatwater units, 29% riffle units, 25% pool units, 11% dry units, and 1% unsurveyed units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 28%; low gradient riffle units, 26%; and run units, 16% (Graph 3). Based on percent total length, low gradient riffle units made up 25%, mid-channel pool units 23%, and step run units 21%.

A total of 46 pools were identified (Table 3). Main channel pools were the most frequently encountered at 89% (Graph 4), and comprised 92% 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. Ten of the 46 pools (22%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 46 pool tail-outs measured, six had a value of 1 (13%); 19 had a value of 2 (41%); 14 had a value of 3 (30%); one had a value of 4 (2%); six had a value of 5 (13%) (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 1, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 47 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 66. Main channel pools had a mean shelter rating of 45 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Biggs Gulch. Graph 7 describes the pool cover in Biggs Gulch. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 78% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 9% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Biggs Gulch was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 46% and 54%, respectively. Graph 9 describes the mean percent canopy in Biggs Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 92%. The mean percent left bank vegetated was 93%. The dominant elements composing the structure of the stream banks consisted of 76% sand/silt/clay, 12% bedrock, 9% cobble/gravel, and 3% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 54% of the units surveyed. Additionally, 26% of the units surveyed had hardwood trees as the dominant vegetation type, and 19% had brush as the dominant vegetation type (Graph 11).

DISCUSSION

Biggs Gulch is a G4 channel type for the entire length of the survey. The suitability of G4 channel types for fish habitat improvement structures is as follows: G4 channels are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days May 26 to June 2, 2015 ranged from 52 to 56 degrees Fahrenheit. Air temperatures ranged from 54 to 67 degrees Fahrenheit. This is a suitable water temperature range 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 34% of the total length of this survey, riffles 29%, and pools 25%. Ten of the 46 (22%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Twenty-five of the 46 pool tail-outs measured had embeddedness ratings of 1 or 2. Fifteen of the pool tail-outs had embeddedness ratings of 3 or 4. Six 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. Sediment sources in Biggs Gulch should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty of the 46 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 47. The shelter rating in the flatwater habitats is 5. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in Biggs Gulch. Large woody debris is the dominant cover type in pools followed by small woody debris. 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 98%. The percentage of right and left bank covered with vegetation was 92% and 93%, respectively.

RECOMMENDATIONS

Biggs Gulch 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 Biggs Gulch. 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) Due to the log debris accumulation (LDA) at 144', access for migrating salmonids is an ongoing potential problem. The LDA consists of a large root wad and is wedged between bedrock banks. This LDA should be evaluated and modified if it is determined to be a barrier.

2) 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.

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 beginning of the survey reach.

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with South Fork Big River. The channel is a G4 for the entire length of the survey.
144	0009.00	Log debris accumulation (LDA) #01 contains two pieces of large woody debris (LWD) and measures 12' high x 11' wide x 5' 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 gravel and measures 8' wide x 50' long x 8' deep. There is a 10.5' high plunge over the LDA. Fish were not observed above the LDA.
376	0019.00	LDA #02 contains four pieces of LWD and measures 3' high x 11' wide x 10' 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 gravel and measures 10' wide x 14' long x 3' deep. There is a 2' high plunge over the LDA.

497	0025.00	LDA #03 contains five pieces of LWD and measures 3' high x 6' wide x 15' 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 gravel and measures 4' wide x 50' long x 2' deep. There is a 2' high plunge over the LDA.
708	0031.00	There is a 1.5' high plunge over woody debris.
731	0032.00	LDA #04 contains seven pieces of LWD and measures 3' high x 13' wide x 7' 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 gravel and measures 10' wide x 25' long x 3' deep. There is a 2.5' high plunge over the LDA.
862	0038.00	Site of old road crossing.
1041	0046.00	Gully on right bank eroding decommissioned road fill.
1195	0052.00	LDA #05 contains four pieces of LWD and measures 3' high x 11' wide x 10' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 4' wide x 29' long x 2' deep. There is a 2.2' high plunge over the LDA.
1416	0060.00	There is a 2.5' high plunge over bedrock.
1424	0061.00	Tributary #01 enters on the left bank. The first 20 feet of the tributary were dry. Above this, it was barely flowing. The water temperature of the tributary was 52 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 52 degrees Fahrenheit. The slope of the tributary is approximately 70%.
1701	0068.00	There is a 1.7' high plunge over woody debris.
1743	0070.00	LDA #06 contains eight pieces of LWD and measures 4' high x 10' wide x 6' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment. There is a 1.5' high plunge over the LDA.
2191	0092.00	LDA #07 contains five pieces of LWD and measures 4.5' high x 9' wide x 5' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to sand and measures 9' wide x 70' long x 5' deep. There is a 4.5' high plunge over the LDA.
2364	0098.00	LDA #08 contains five pieces of LWD and measures 6' high x 9' wide x 4' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment measures 9' wide x 15' long x 6' deep. There is a 6' high plunge over the LDA.

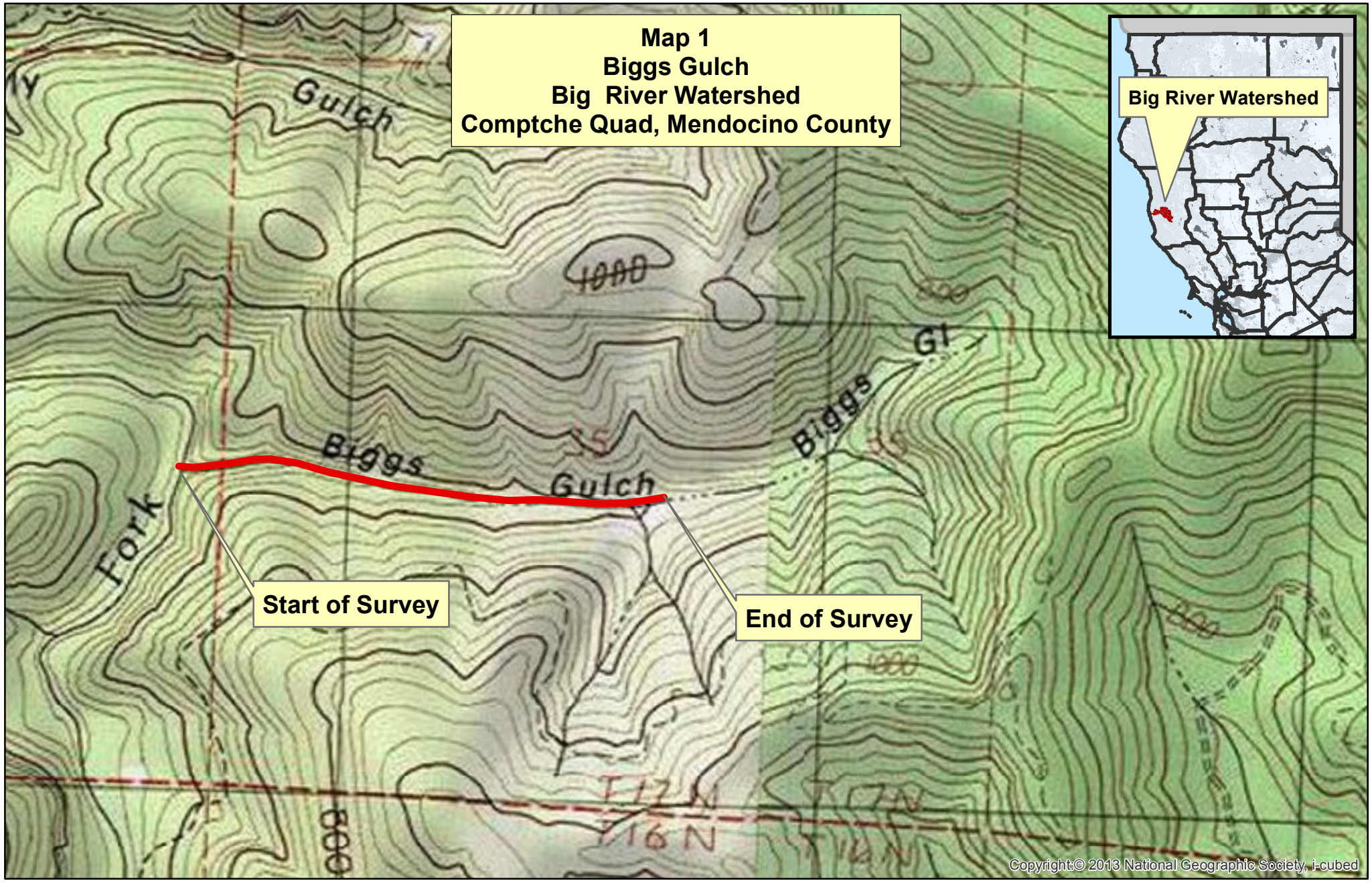
2654	0114.00	LDA #10 contains four pieces of LWD and measures 5' high x 8' wide x 3' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment measures 8' wide x 40' long x 5' deep.
2914	0124.00	LDA #10 contains four pieces of LWD and measures 4' high x 12' wide x 5' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 10' wide x 20' long x 4' deep. There is a 5' high plunge over the LDA.
2961	0127.00	Dry tributary on the left bank.
3008	0129.00	LDA #11 contains seven pieces of LWD and measures 12' high x 14' wide x 15' 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 gravel and measures 10' wide x 30' long x 4.5' deep. There is a 4.5' high plunge over the LDA. Tributary #02 enters on the left bank. The water temperature downstream of the confluence was 54 degrees Fahrenheit and the water temperature upstream of the confluence was 53 degrees Fahrenheit. The slope of the tributary is approximately 70%.
3401	0148.00	End of survey. The slope increases and the channel goes dry. There are some small puddles approximately 400 feet upstream from the end of survey point.

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
Biggs Gulch
Big River Watershed
Comptche Quad, Mendocino County
Big River Watershed
Gulch
1000
Biggs
Gulch
Biggs
Gulch
Fork
Start of Survey
End of Survey
T17N
T16N
800
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N
W
E
S
G4 Channel Type
0
0.125
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Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0

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
13	0	DRY	8.8	28	364	10.6									
43	7	FLATWATER	29.1	27	1162	33.9	4.1	0.3	0.8	114	4911	39	1688		5
1	0	UNSURVEYED	0.7	33	33	1.0									
46	46	POOL	31.1	19	864	25.2	6.1	0.8	1.6	111	5088	97	4467	86	47
45	8	RIFFLE	30.4	22	1009	29.4	3.3	0.1	0.4	43	1953	6	260		1

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
148	61	3432	11951	6414

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

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 (%)
38	5	LGR	25.7	23	872	25.4	3	0.1	0.6	45	1709	7	258		0	99
5	2	HGR	3.4	21	107	3.1	4	0.1	0.3	32	159	3	16		3	100
2	1	BRS	1.4	15	30	0.9	4	0.1	0.7	59	118	6	12		0	99
24	4	RUN	16.2	18	443	12.9	4	0.3	0.8	73	1760	25	605		1	98
19	3	SRN	12.8	38	719	20.9	4	0.4	0.9	169	3205	58	1101		10	97
41	41	MCP	27.7	19	794	23.1	6	0.8	3.9	113	4627	99	4075	88	45	97
3	3	LSL	2.0	14	42	1.2	7	0.5	1.4	92	275	54	163	45	83	100
2	2	PLP	1.4	14	28	0.8	7	0.9	2.2	93	186	114	229	105	40	100
13	0	DRY	8.8	28	364	10.6										
1	0	NS	0.7	33	33	1.0										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
148	61	3432	12038	6459

Table 3 - Summary of Pool Types

Stream Name: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

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
41	41	MAIN	89	19	794	92	6.0	0.8	113	4627	88	3607	45
5	5	SCOUR	11	14	70	8	7.0	0.7	92	461	69	346	66

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
46	46	864	5088	3953

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

Stream Name: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

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
41	MCP	89	2	5	30	73	6	15	3	7	0	0
3	LSL	7	1	33	2	67	0	0	0	0	0	0
2	PLP	4	0	0	1	50	1	50	0	0	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
46	3	7	33	72	7	15	3	7	0	0

Mean Maximum Residual Pool Depth (ft.): 1.6

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015 Dry Units: 13

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

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
38	5	LGR	0	0	0	0	0	0	0	0	0
5	2	HGR	0	0	0	0	0	0	0	100	0
2	1	BRS	0	0	0	0	0	0	0	0	0
45	8	TOTAL RIFFLE	0	0	0	0	0	0	0	100	0
24	4	RUN	100	0	0	0	0	0	0	0	0
19	3	SRN	17	28	28	20	7	0	0	0	0
43	7	TOTAL FLAT	37	21	21	15	5	0	0	0	0
41	41	MCP	17	19	58	1	1	0	0	3	0
3	3	LSL	2	47	52	0	0	0	0	0	0
2	2	PLP	15	8	53	0	0	0	0	25	0
46	46	TOTAL POOL	16	20	57	1	1	0	0	4	0
1	0	NS									
148	61	TOTAL	18	20	53	2	1	0	0	5	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015 Dry Units: 13

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

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
38	5	LGR	0	0	80	20	0	0	0
5	2	HGR	0	0	100	0	0	0	0
2	1	BRS	0	0	0	0	0	0	100
24	4	RUN	0	25	75	0	0	0	0
19	3	SRN	0	33	67	0	0	0	0
41	41	MCP	27	46	22	5	0	0	0
3	3	LSL	0	100	0	0	0	0	0
2	2	PLP	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
98	54	46	0	92	93

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: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015 Survey Length (ft.): 3432 Main Channel (ft.): 3432 Side Channel (ft.): 0

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: G4
Reach Length (ft.): 3432
Riffle/Flatwater Mean Width (ft.): 3.7
BFW:
Range (ft.): 6 to 13
Mean (ft.): 9
Std. Dev.: 2
Base Flow (cfs.): 0.0
Water (F): 52 - 56 Air (F): 54 - 67
Dry Channel (ft): 364

Canopy Density (%): 97.9
Coniferous Component (%): 53.6
Hardwood Component (%): 46.4
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 92.2
Dominant Shelter: Large Woody Debris
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 41
LWD per 100 ft.:
Riffles: 4
Pools: 15
Flat: 4

Pools by Stream Length (%): 25.2
Pool Frequency (%): 31.1
Residual Pool Depth (%):
< 2 Feet Deep: 78
2 to 2.9 Feet Deep: 15
3 to 3.9 Feet Deep: 7
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.6
Mean Pool Shelter Rating: 47

Pool Tail Substrate (%): Silt/Clay: 4 Sand: 2 Gravel: 78 Sm Cobble: 9 Lg Cobble: 4 Boulder: 2 Bedrock: 0

Embeddedness Values (%): 1. 13.0 2. 41.3 3. 30.4 4. 2.2 5. 13.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

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	7	7	11.9
Boulder	1	3	3.4
Cobble / Gravel	8	2	8.5
Sand / Silt / Clay	43	47	76.3

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	1	0	0.8
Brush	10	12	18.6
Hardwood Trees	20	11	26.3
Coniferous Trees	28	36	54.2
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 3

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

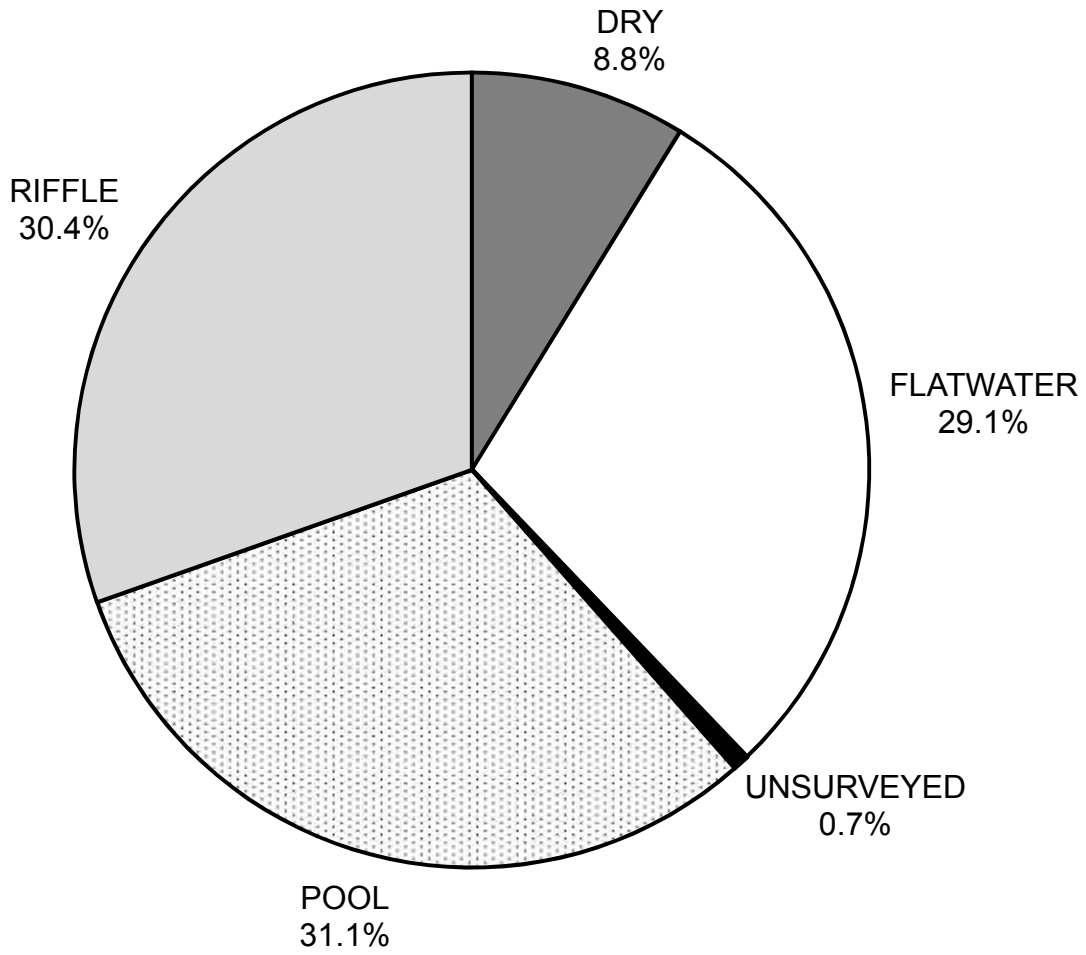
StreamName: Biggs Gulch LLID: 1235141392880 Drainage: Big River

Survey Dates: 5/26/2015 to 6/2/2015

Confluence Location: Quad: COMPTCHE Legal Description: T17NR15WS34 Latitude: 39:17:17.0N Longitude: 123:30:51.0W

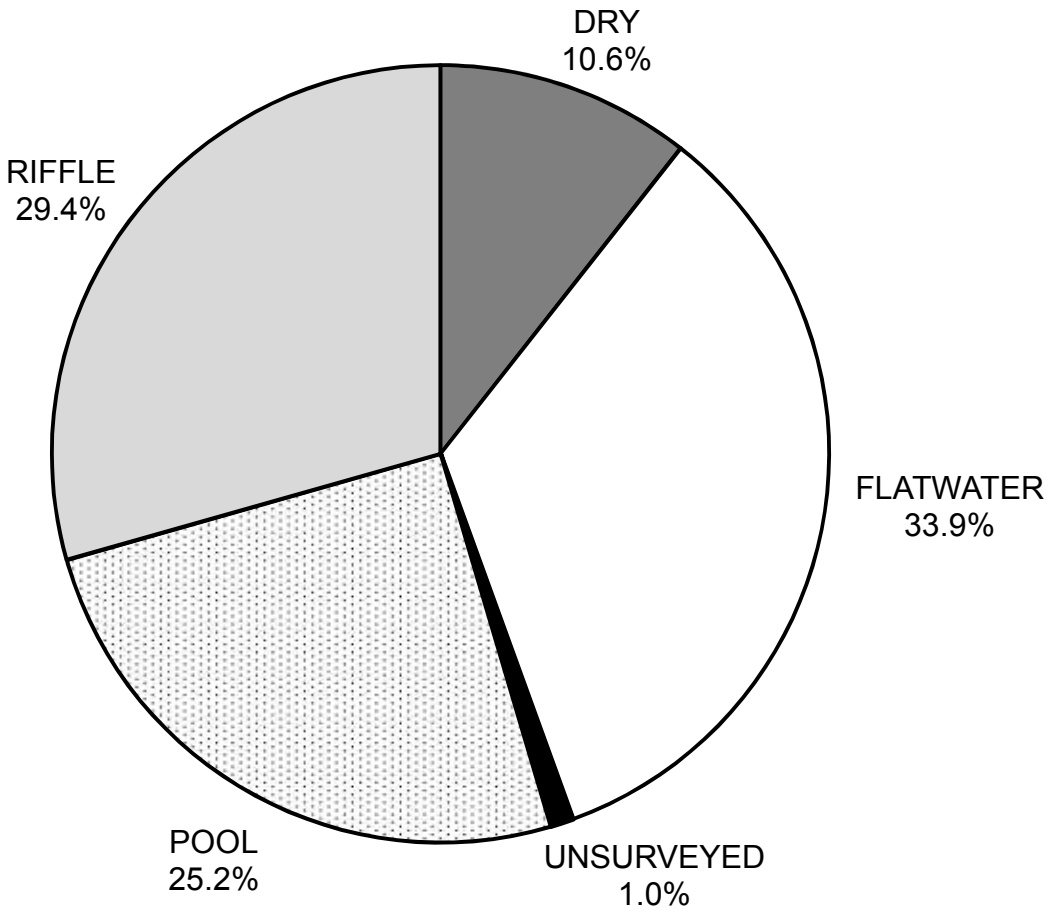
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	37	16
SMALL WOODY DEBRIS (%)	0	21	20
LARGE WOODY DEBRIS (%)	0	21	57
ROOT MASS (%)	0	15	1
TERRESTRIAL VEGETATION (%)	0	5	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	100	0	4
BEDROCK LEDGES (%)	0	0	0

BIGGS GULCH 2015
HABITAT TYPES BY PERCENT OCCURRENCE



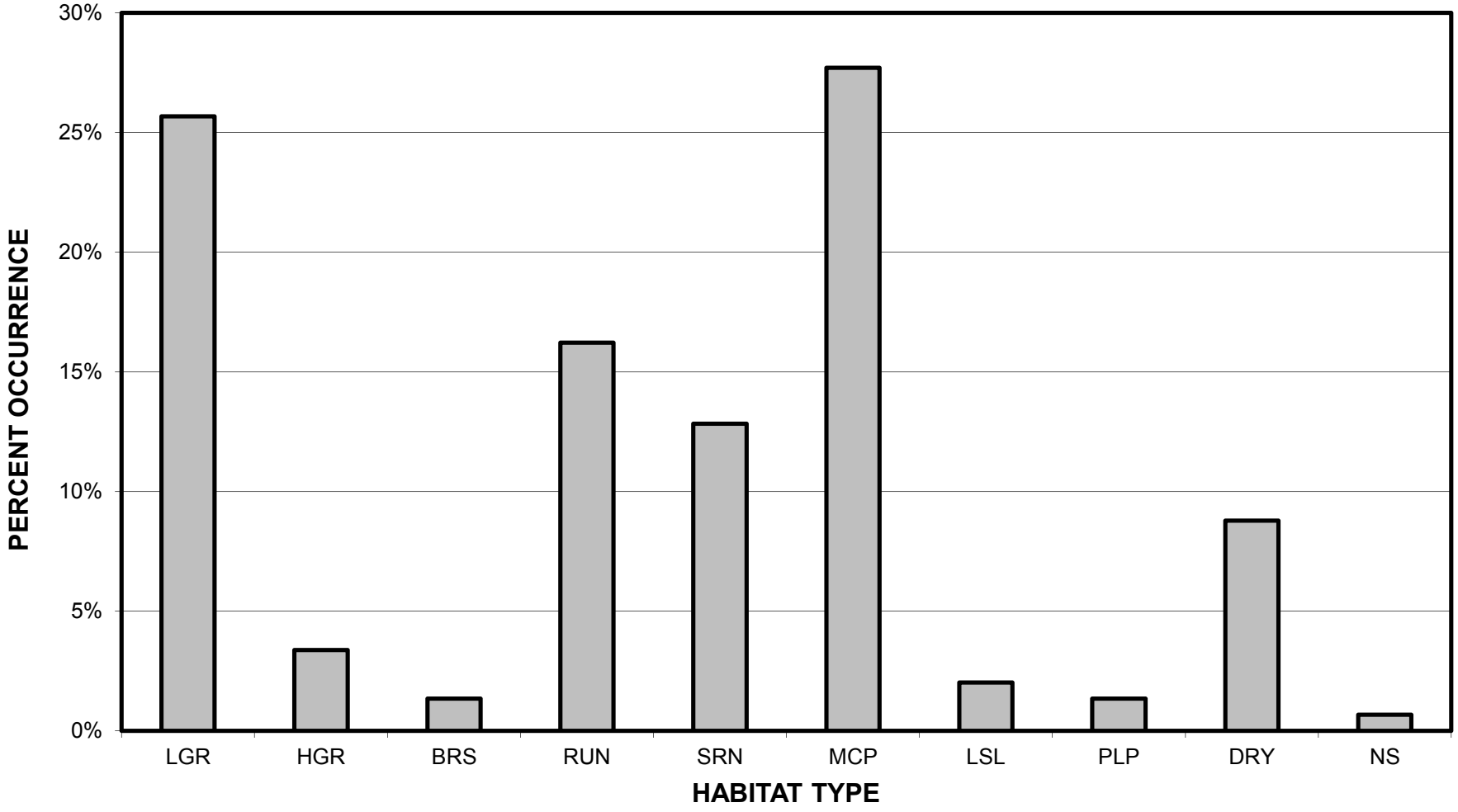
GRAPH 1

BIGGS GULCH 2015
HABITAT TYPES BY PERCENT TOTAL LENGTH



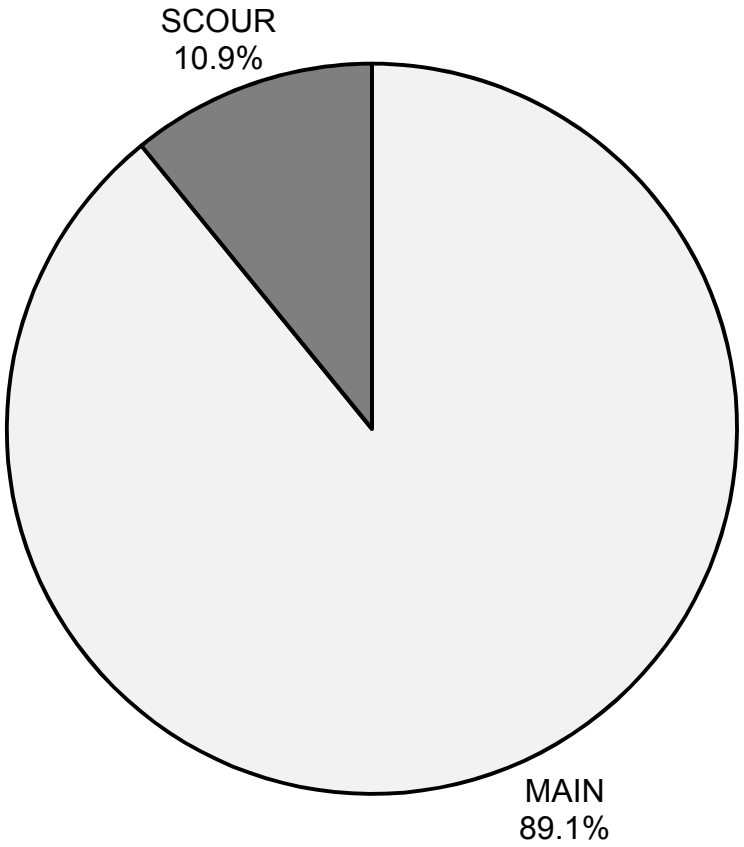
GRAPH 2

BIGGS GULCH 2015
HABITAT TYPES BY PERCENT OCCURRENCE



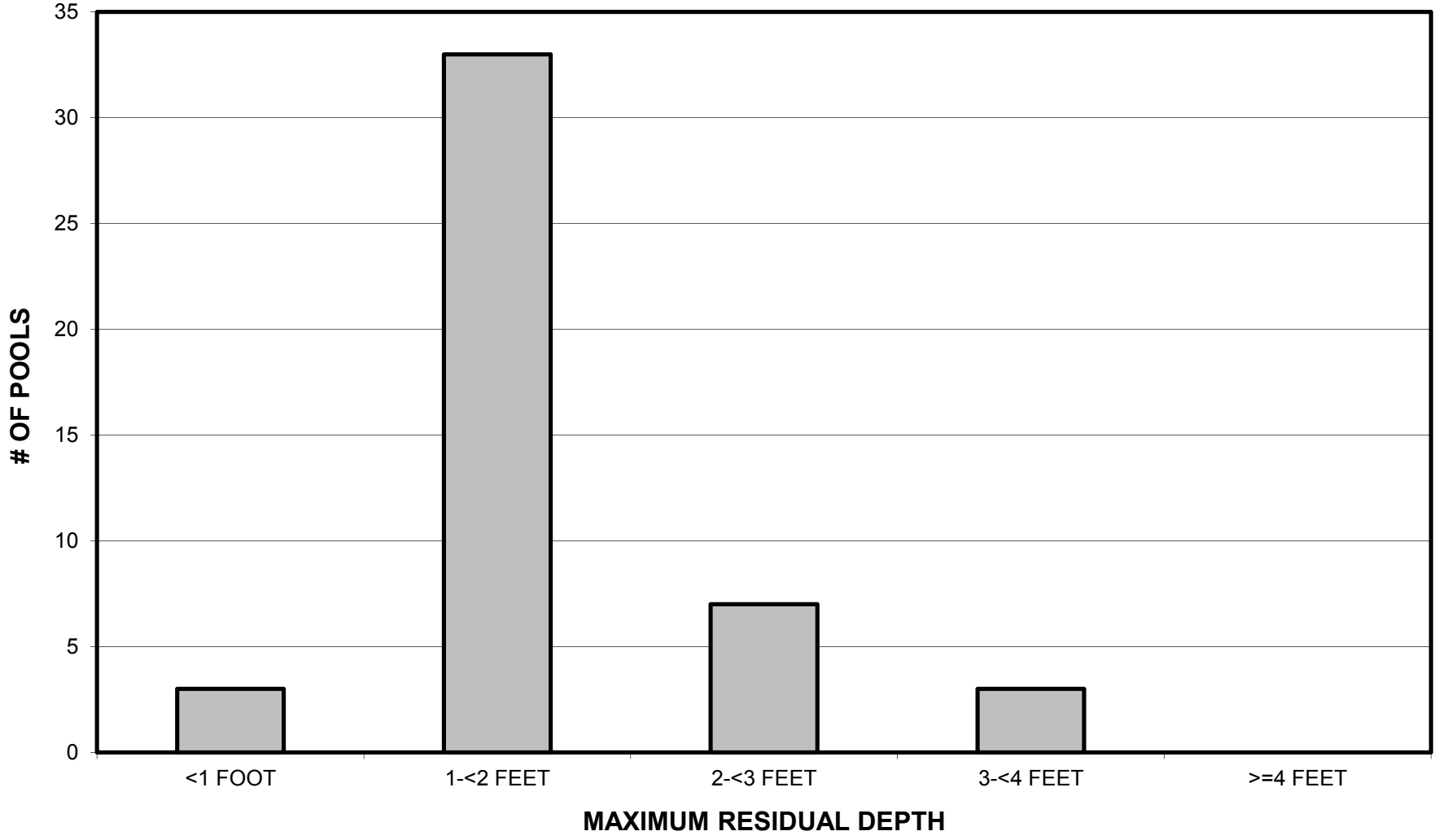
GRAPH 3

BIGGS GULCH 2015
POOL TYPES BY PERCENT OCCURRENCE



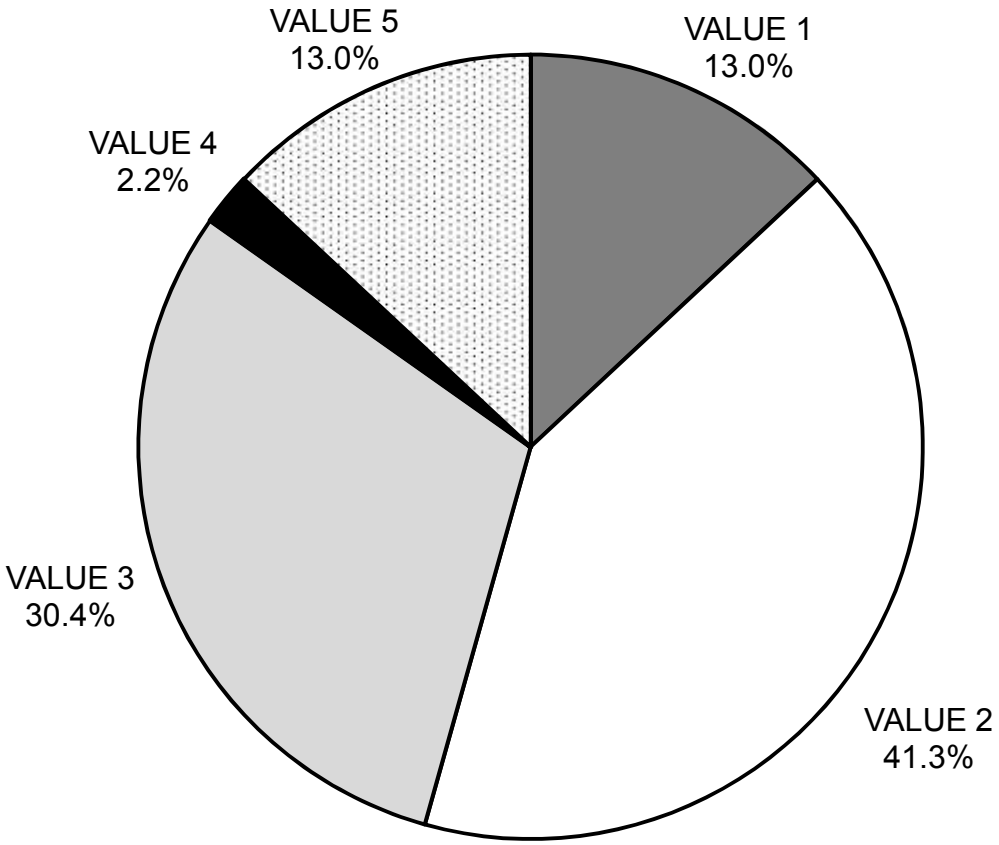
GRAPH 4

BIGGS GULCH 2015
MAXIMUM DEPTH IN POOLS



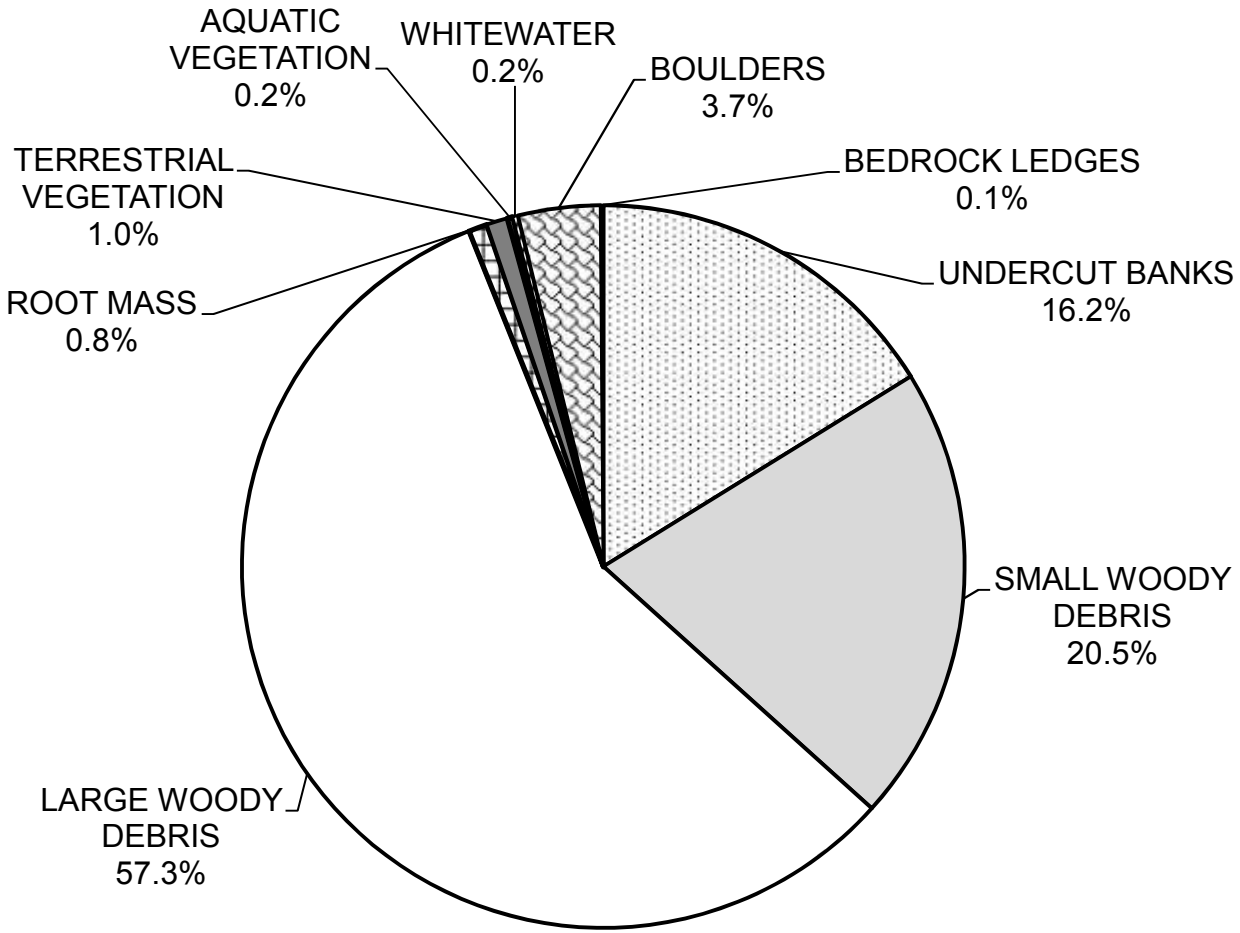
GRAPH 5

BIGGS GULCH 2015
PERCENT EMBEDDEDNESS



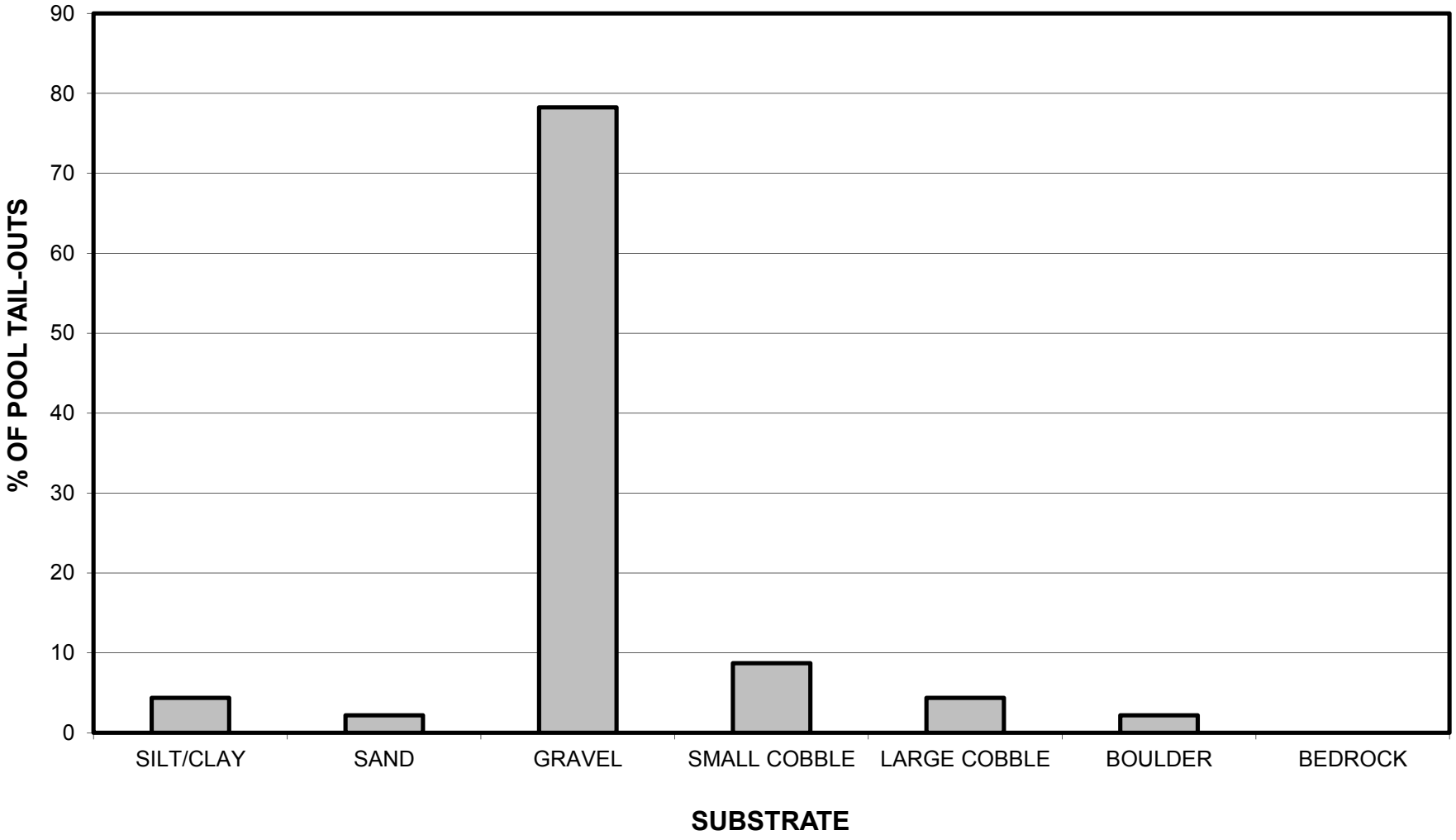
GRAPH 6

BIGGS GULCH 2015
MEAN PERCENT COVER TYPES IN POOLS



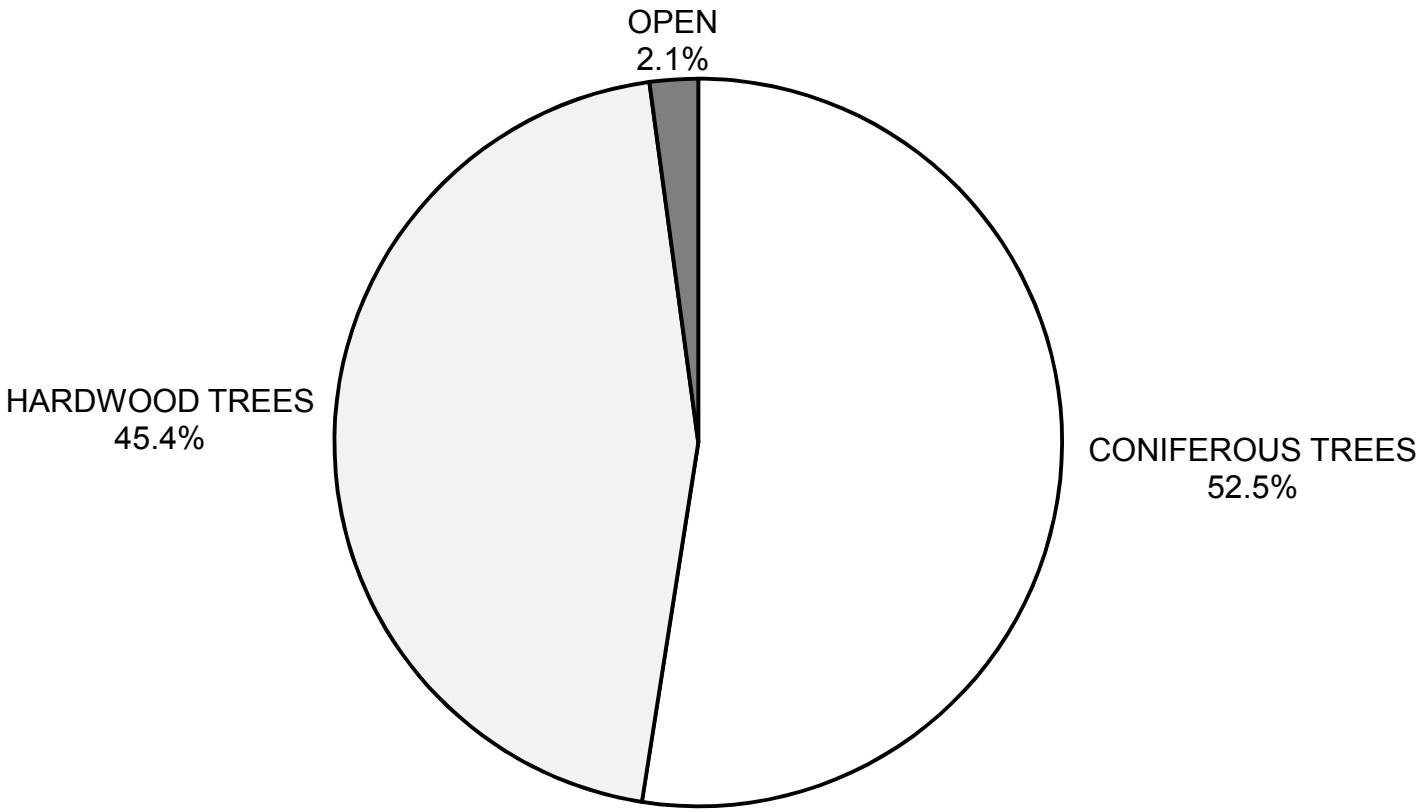
GRAPH 7

BIGGS GULCH 2015
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



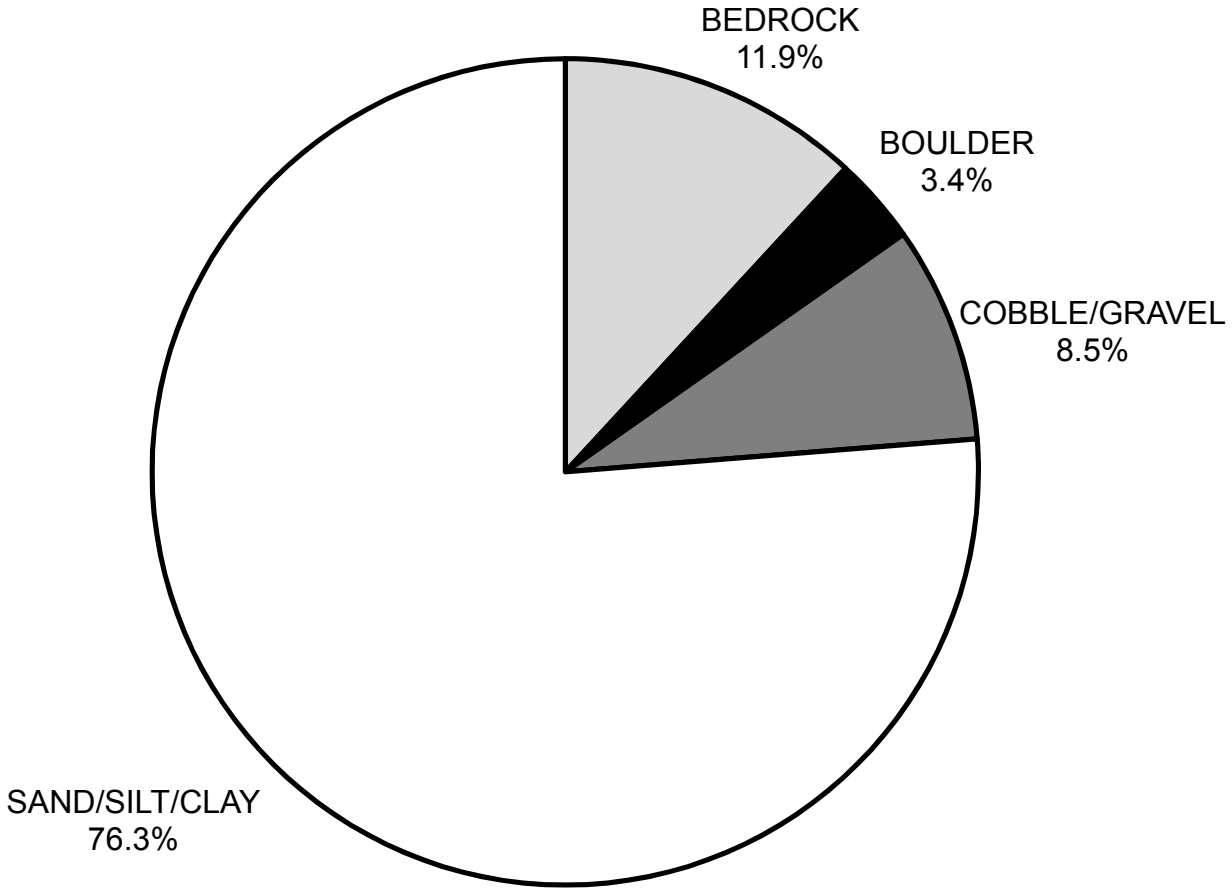
GRAPH 8

BIGGS GULCH 2015
MEAN PERCENT CANOPY



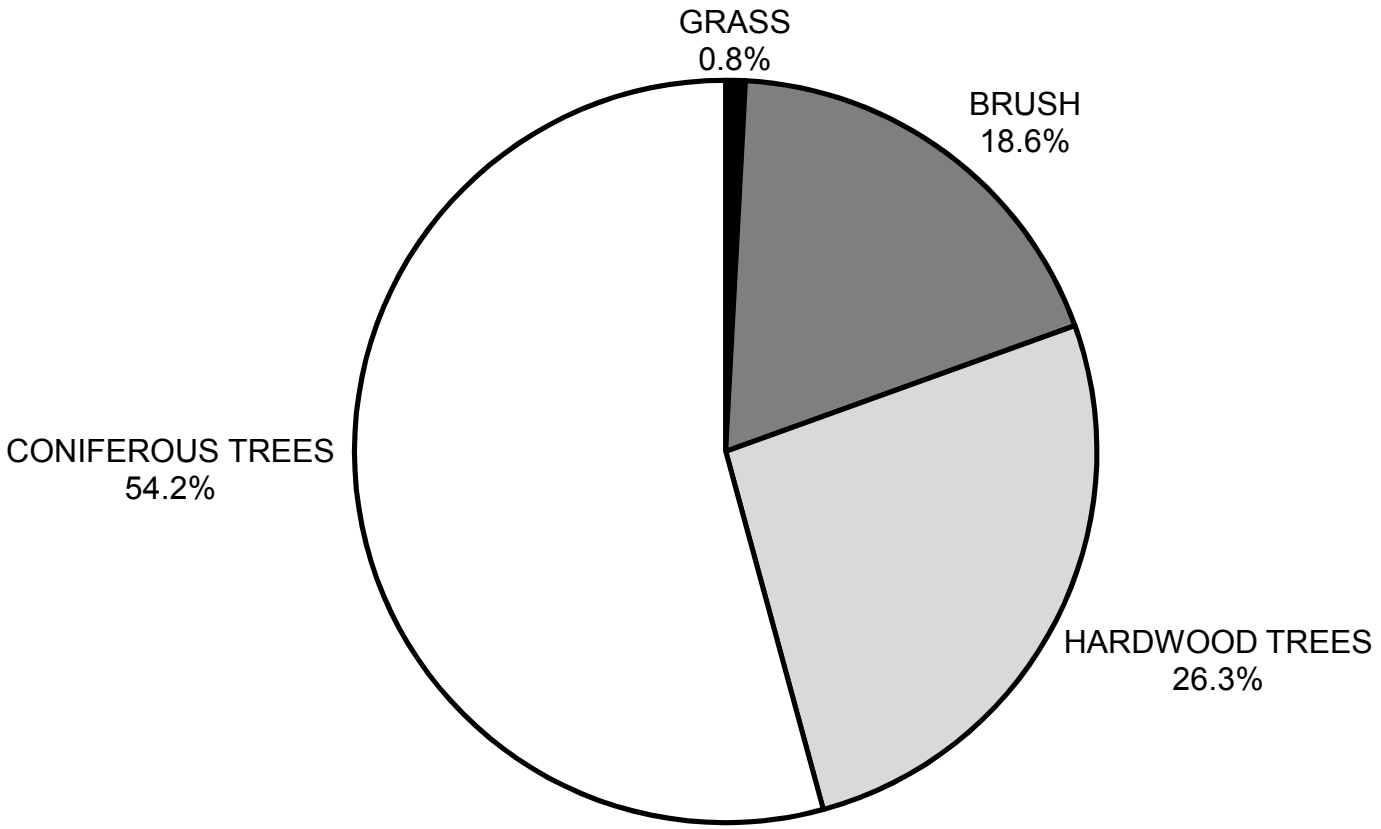
GRAPH 9

BIGGS GULCH 2015
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

BIGGS GULCH 2015
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11