



CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

East Branch Little North Fork

INTRODUCTION

A stream inventory was conducted from June 16 to July 1, 2015 on East Branch Little North Fork. The survey began at the confluence with Little North Fork and extended upstream 1.3 miles.

The East Branch Little North Fork 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 East Branch Little North Fork. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

East Branch Little North Fork is a tributary to Little North Fork, tributary to Big River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). East Branch Little North Fork's legal description at the confluence with Little North Fork is T17N R16W S08. Its location is 39.3428 degrees north latitude and 123.6716 degrees west longitude, LLID number 1236704393428. East Branch Little North Fork is a first order stream and has approximately one mile of blue line stream according to the USGS Mathison Peak 7.5 minute quadrangle. East Branch Little North Fork drains a watershed of approximately 1.9 square miles. Elevations range from about 165 feet at the mouth of the creek to 800 feet in the headwater areas. Mixed conifer dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 20, east of Fort Bragg.

METHODS

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

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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 East Branch Little North Fork 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". East Branch Little North Fork 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 East Branch Little North Fork, 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.

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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 East Branch Little North Fork, 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In East Branch Little North Fork, 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 East Branch Little North Fork, 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

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(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 East Branch Little North Fork. In addition, underwater observations were made at four 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 East Branch Little North Fork 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

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HABITAT INVENTORY RESULTS

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

The habitat inventory of June 16 to July 1, 2015 was conducted by J. Lee, T. Brown, and J. Murphrey (WSP). The total length of the stream surveyed was 6,698 feet.

Stream flow was not measured on East Branch Little North Fork.

East Branch Little North Fork is an F4 channel type for 3,244 feet of the stream surveyed (Reach 1) and an E4 channel type for 3,454 feet of the stream surveyed (Reach 2). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. E4 channels are low gradient, meandering riffle/pool streams with low width/depth ratios and little deposition. They are very efficient and stable with a high meander width ratio and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 57 to 60 degrees Fahrenheit. Air temperatures ranged from 62 to 73 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 36% flatwater units, 31% pool units, 23% riffle units, and 11% dry units (Graph 1). Based on total length of Level II habitat types there were 62% flatwater units, 17% pool units, 15% riffle units, and 6% dry units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run units, 25%; low gradient riffle units, 21%; and mid-channel pool units, 17% (Graph 3). Based on percent total length, step run units made up 51%, low gradient riffle units 13%, and run units 11%.

A total of 52 pools were identified (Table 3). Main channel pools were the most frequently encountered at 58% (Graph 4), and comprised 63% 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. Twenty-one of the 52 pools (40%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 52 pool tail-outs measured, five had a value of 1 (9.6%); 12 had a value of 2 (23.1%); 21 had a value of 3 (40.4%); six had a value of 4 (11.5%); eight had a value of 5 (15.4%) (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 6, flatwater habitat types had a mean shelter rating of 24, and pool habitats had a mean shelter rating of 73 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 100. Scour pools had a mean shelter rating of 77. Main channel pools had a

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mean shelter rating of 70 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in East Branch Little North Fork. Graph 7 describes the pool cover in East Branch Little North Fork. 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 81% of the pool tail-outs. Sand was the next most frequently observed dominant substrate type and occurred in 13% of the pool tail-outs.

The mean percent canopy density for the surveyed length of East Branch Little North Fork was 96%. Four percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 20% and 80%, respectively. Graph 9 describes the mean percent canopy in East Branch Little North Fork.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 80% sand/silt/clay, 14% cobble/gravel, 5% bedrock, and 2% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 98% of the units surveyed (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at four sites for species composition and distribution in East Branch Little North Fork on August 26, 2015 (Table A). The sites were sampled by I. Mikus (CDFW), and K. Bocast (California Conservation Corps).

In Reach 1, which comprised the first 3,244 feet of stream, two sites were sampled. The reach sites yielded three young-of-the-year (YOY) steelhead trout (SH) and 33 YOY coho salmon.

In Reach 2, two sites were sampled starting approximately 5,359 feet from the confluence with Little North Fork and continuing upstream 745 feet. The reach sites yielded 17 YOY coho salmon and four age 1+ coho salmon.

During the survey, the upstream-most observation of juvenile coho salmon occurred at 39.3405 degrees north latitude, 123.6231 degrees west longitude, approximately 6,104 feet upstream from the confluence with Little North Fork.

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Table A. Summary of results for a fish composition and distribution survey within East Branch Little North Fork, 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 1: F4 Channel Type										
08/26/15	1	052	Pool	2,009	3	0	0	26	0	0
08/26/15	2	083	Pool	2,896	0	0	0	7	0	0
Reach 2: E4 Channel Type										
08/26/15	3	137	Pool	5,414	0	0	0	14	4	0
08/26/15	4	156	Pool	6,104	0	0	0	3	0	0

DISCUSSION

East Branch Little North Fork is an F4 channel type for the first 3,244 feet of stream surveyed and an E4 channel type for the remaining 3,454 feet. F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. E4 channels are good for bank-placed boulders and fair for opposing wing-deflectors.

The water temperatures recorded on the survey days June 16 to July 1, 2015, ranged from 57 to 60 degrees Fahrenheit. Air temperatures ranged from 62 to 73 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 60 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 62% of the total length of this survey, riffles 15%, and pools 17%. Twenty-one of the 52 (40%) 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.

Seventeen of the 52 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-seven of the pool tail-outs had embeddedness ratings of 3 or 4. Eight 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 East Branch Little North Fork should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty-five of the 52 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

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The mean shelter rating for pools is 73. The shelter rating in the flatwater habitats is 24. 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 East Branch Little North Fork. 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 96%. The percentage of right and left bank covered with vegetation was 100% and 99%, respectively.

RECOMMENDATIONS

East Branch Little North Fork 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 East Branch Little North Fork. 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 landslide located at 6,676 feet, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.
- 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) 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.
- 4) 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.

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Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with Little North Fork. The channel is an E4 for the entire length of the survey.
206	0008.00	There is a 1' high plunge over a log.
469	0015.00	There is a 1' high plunge over a log.
2620	0078.00	Log debris accumulation (LDA) #01 measures approximately 4' high x 16' wide x 4' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures approximately 10' wide x 25' long x 3' deep. There is a 2' high plunge over the LDA. Fish were observed above it.
2875	0083.00	There is a 2' high plunge over a log.
4565	0112.00	Dry right bank tributary.
4792	0117.00	LDA #02 contains four pieces of LWD and measures approximately 5.5' high x 10' wide x 4.5' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures approximately 10' wide x 40' long x 5' deep. Fish were observed above the LDA.
4974	0121.00	There is a 2' high plunge over woody debris.
5074	0127.00	There is a 2' high plunge over woody debris.
6024	0154.00	There is a 2' high plunge.
6234	0159.00	There is a 2' high plunge.
6567	0169.00	End of survey. Left bank landslide is over 600 feet wide and is creating an earthen dam which impounds the stream. Above the slide is an approximately 10' deep pond with no visible outflow; the water temperature at the surface of the pond was 70 degrees Fahrenheit. Standing dead, mature redwoods were present in the middle of the pond. Above the pond the channel reforms, but was dry for approximately 1,000 feet and then a shallow high gradient riffle for another 500 feet. Juvenile salmonids were observed below the slide, but not above.

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.

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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 }

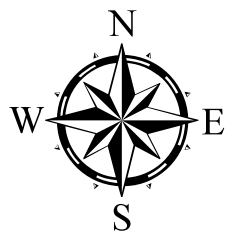
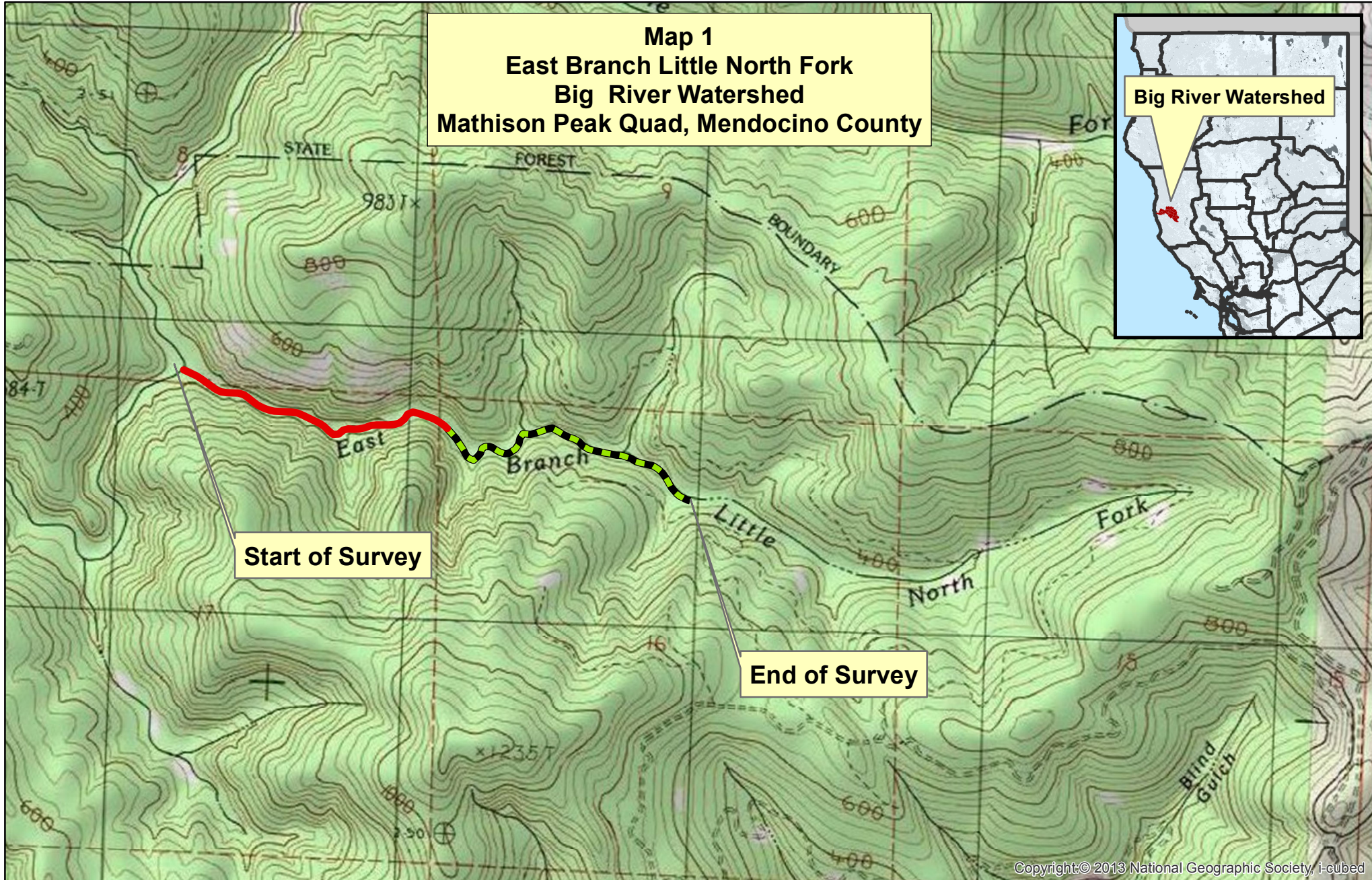
BACKWATER POOLS

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
East Branch Little North Fork
Big River Watershed
Mathison Peak Quad, Mendocino County





-  Reach 1: F4 Channel Type
-  Reach 2: E4 Channel Type



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

Stream Name: East Branch Little North Fork
LLID: 1236704393428 Drainage: Big River
Survey Dates: 6/16/2015 to 7/1/2015
Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR16WS08 Latitude: 39:20:34.0N Longitude: 123:40:13.0

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
19	0	DRY	11.2	19	369	5.5									
60	6	FLATWATER	35.5	69	4129	61.6	4.4	0.4	1.0	195	11697	77	4595		24
52	52	POOL	30.8	22	1167	17.4	7.9	0.9	1.8	169	8792	174	9071	155	73
38	7	RIFFLE	22.5	27	1033	15.4	3.6	0.1	0.3	74	2809	11	418		6
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
169	65				6698					23298			14084		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: East Branch Little North Fork

LLID: 1236704393428 Drainage: Big River

Survey Dates: 6/16/2015 to 7/1/2015

Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR16WS08 Latitude: 39:20:34.0N Longitude: 123:40:13.0W

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 (%)
35	5	LGR	20.7	25	891	13.3	3	0.1	0.3	70	2463	7	246		4	95
3	2	HGR	1.8	47	142	2.1	6	0.3	1	83	248	21	63		13	100
18	2	RUN	10.7	40	720	10.7	4	0.4	0.9	64	1143	25	457		45	99
42	4	SRN	24.9	81	3409	50.9	4	0.3	1.5	261	10949	102	4291		14	89
29	29	MCP	17.2	24	693	10.3	8	0.8	3	177	5146	166	4823	147	71	96
1	1	STP	0.6	45	45	0.7	14	1.3	2.7	567	567	794	794	737	60	97
6	6	LSL	3.6	25	152	2.3	7	1.2	3.3	168	1005	235	1409	214	89	96
4	4	LSR	2.4	18	71	1.1	8	0.7	2.4	127	508	88	353	65	135	100
11	11	PLP	6.5	18	196	2.9	8	1.0	3.7	139	1527	152	1676	135	49	97
1	1	BPL	0.6	10	10	0.1	4	0.3	1.4	40	40	16	16	12	100	100
19	0	DRY	11.2	19	369	5.5										96

Total Units
169

Total Units Fully Measured
65

Total Length (ft.)
6698

Total Area (sq.ft.)
23595

Total Volume (cu.ft.)
14128

Table 3 - Summary of Pool Types

Stream Name: East Branch Little North Fork

LLID: 1236704393428 Drainage: Big River

Survey Dates: 6/16/2015 to 7/1/2015

Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR16WS08 Latitude: 39:20:34.0N Longitude: 123:40:13.0W

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
30	30	MAIN	58	25	738	63	8.3	0.8	190	5713	167	5011	70
21	21	SCOUR	40	20	419	36	7.6	1.0	145	3039	144	3033	77
1	1	BACKWATER	2	10	10	1	4.0	0.3	40	40	12	12	100
Total Units	Total Units Fully Measured			Total Length (ft.)						Total Area (sq.ft.)			Total Volume (cu.ft.)
52	52			1167						8792			8056

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

Stream Name: East Branch Little North Fork

LLID: 1236704393428

Drainage: Big River

Survey Dates: 6/16/2015 to 7/1/2015

Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR16WS08 Latitude: 39:20:34.0N Longitude: 123:40:13.0W

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
29	MCP	56	3	10	16	55	9	31	1	3	0	0
1	STP	2	0	0	0	0	1	100	0	0	0	0
6	LSL	12	0	0	3	50	1	17	2	33	0	0
4	LSR	8	1	25	2	50	1	25	0	0	0	0
11	PLP	21	1	9	4	36	5	45	1	9	0	0
1	BPL	2	0	0	1	100	0	0	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
52	5	10	26	50	17	33	4	8	0	0

Mean Maximum Residual Pool Depth (ft.): 1.8

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: East Branch Little North Fork

LLID: 1236704393428

Drainage: Big River

Survey Dates: 6/16/2015 to 7/1/2015

Dry Units: 19

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS08

Latitude: 39:20:34.0N

Longitude: 123:40:13.0W

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
35	5	LGR	0	20	80	0	0	0	0	0	0
3	2	HGR	10	10	30	0	0	0	0	50	0
38	7	TOTAL RIFFLE	7	13	47	0	0	0	0	33	0
18	2	RUN	0	10	90	0	0	0	0	0	0
42	4	SRN	7	30	47	7	10	0	0	0	0
60	6	TOTAL FLAT	4	22	64	4	6	0	0	0	0
29	29	MCP	9	30	49	1	8	1	0	2	0
1	1	STP	0	30	65	0	5	0	0	0	0
6	6	LSL	17	37	37	0	6	2	0	0	0
4	4	LSR	3	14	70	11	3	0	0	0	0
11	11	PLP	12	21	61	3	1	0	0	0	1
1	1	BPL	0	50	50	0	0	0	0	0	0
52	52	TOTAL POOL	10	28	52	2	6	1	0	1	0
169	65	TOTAL	9	27	53	2	5	1	0	3	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: East Branch Little North Fork

LLID: 1236704393428 Drainage: Big River

Survey Dates: 6/16/2015 to 7/1/2015

Dry Units: 19

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS08 Latitude: 39:20:34.0N Longitude: 123:40:13.0W

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
35	5	LGR	0	60	40	0	0	0	0
3	2	HGR	0	0	0	50	50	0	0
18	2	RUN	0	100	0	0	0	0	0
42	4	SRN	0	75	25	0	0	0	0
29	29	MCP	17	76	3	0	0	3	0
1	1	STP	0	100	0	0	0	0	0
6	6	LSL	33	50	17	0	0	0	0
4	4	LSR	0	100	0	0	0	0	0
11	11	PLP	0	55	36	0	0	0	9
1	1	BPL	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: East Branch Little North Fork

LLID: 1236704393428

Drainage: Big River

Survey Dates: 6/16/2015 to 7/1/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR16WS08

Latitude: 39:20:34.0N

Longitude: 123:40:13.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
96	80	20	0	100	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.

Stream Name:	East Branch Little North Fork	LLID:	1236704393428	Drainage:	Big River		
Survey Dates:	6/16/2015 to 7/1/2015	Survey Length (ft.):	6698	Main Channel (ft.):	6698	Side Channel (ft.):	0
Confluence Location:	Quad: MATHISON PEAK	Legal Description:	T17NR16WS08	Latitude:	39:20:34.0N	Longitude:	123:40:13.0W

STREAM REACH: 1						
Channel Type: F4			Canopy Density (%): 97.7		Pools by Stream Length (%): 19.5	
Reach Length (ft.): 3244			Coniferous Component (%): 66.7		Pool Frequency (%): 30.0	
Riffle/Flatwater Mean Width (ft.): 4.1			Hardwood Component (%): 33.3		Residual Pool Depth (%):	
BFW:			Dominant Bank Vegetation: Coniferous Trees		< 2 Feet Deep: 63	
Range (ft.): 10 to 20			Vegetative Cover (%): 98.6		2 to 2.9 Feet Deep: 26	
Mean (ft.): 15			Dominant Shelter: Large Woody Debris		3 to 3.9 Feet Deep: 11	
Std. Dev.: 3			Dominant Bank Substrate Type: Sand/Silt/Clay		>= 4 Feet Deep: 0	
Base Flow (cfs.): 0.0			Occurrence of LWD (%): 48		Mean Max Residual Pool Depth (ft.): 1.8	
Water (F): 57 - 60 Air (F): 62 - 73			LWD per 100 ft.:		Mean Pool Shelter Rating: 90	
Dry Channel (ft): 194			Riffles: 10			
			Pools: 22			
			Flat: 8			
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 22 Gravel: 67 Sm Cobble: 11 Lg Cobble: 0 Boulder: 0 Bedrock: 0						
Embeddedness Values (%): 1. 3.7 2. 14.8 3. 51.9 4. 7.4 5. 22.2						

Channel Type: E4			Canopy Density (%): 93.6			Pools by Stream Length (%): 15.5		
Reach Length (ft.): 3454			Coniferous Component (%): 95.6			Pool Frequency (%): 31.6		
Riffle/Flatwater Mean Width (ft.): 3.9			Hardwood Component (%): 4.4			Residual Pool Depth (%):		
BFW:			Dominant Bank Vegetation: Coniferous Trees			< 2 Feet Deep: 56		
Range (ft.): 8 to 18			Vegetative Cover (%): 100.0			2 to 2.9 Feet Deep: 40		
Mean (ft.): 14			Dominant Shelter: Large Woody Debris			3 to 3.9 Feet Deep: 4		
Std. Dev.: 3			Dominant Bank Substrate Type: Sand/Silt/Clay			>= 4 Feet Deep: 0		
Base Flow (cfs.): 0.0			Occurrence of LWD (%): 46			Mean Max Residual Pool Depth (ft.): 1.8		
Water (F): 57 - 60 Air (F): 63 - 68			LWD per 100 ft.:			Mean Pool Shelter Rating: 55		
Dry Channel (ft): 175			Riffles: 5					
			Pools: 17					
			Flat: 8					
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 4 Gravel: 96 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0								
Embeddedness Values (%): 1. 16.0 2. 32.0 3. 28.0 4. 16.0 5. 8.0								

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: East Branch Little North Fork

LLID: 1236704393428 Drainage: Big River

Survey Dates: 6/16/2015 to 7/1/2015

Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR16WS08 Latitude: 39:20:34.0N Longitude: 123:40:13.0W

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	5	2	5.3
Boulder	1	1	1.5
Cobble / Gravel	7	11	13.6
Sand / Silt / Clay	53	52	79.5

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	0	1	0.8
Brush	0	1	0.8
Hardwood Trees	0	1	0.8
Coniferous Trees	66	63	97.7
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 3

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

StreamName: East Branch Little North Fork

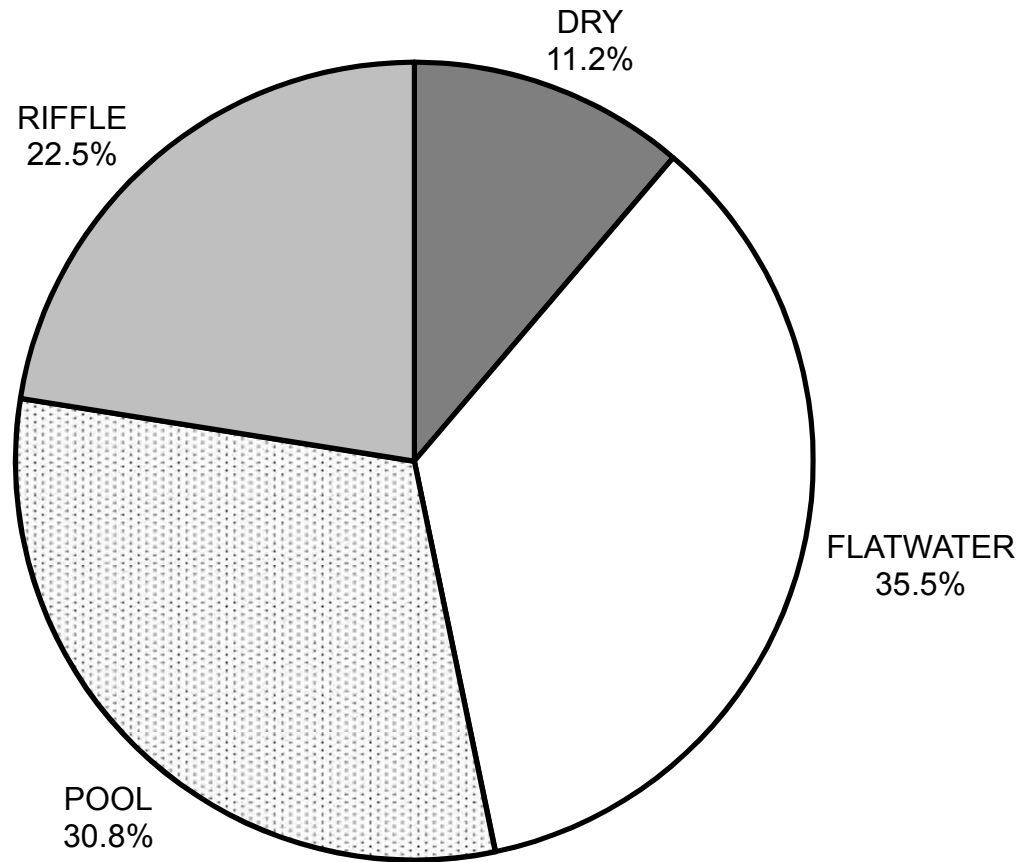
LLID: 1236704393428 Drainage: Big River

Survey Dates: 6/16/2015 to 7/1/2015

Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR16WS08 Latitude: 39:20:34.0N Longitude: 123:40:13.0W

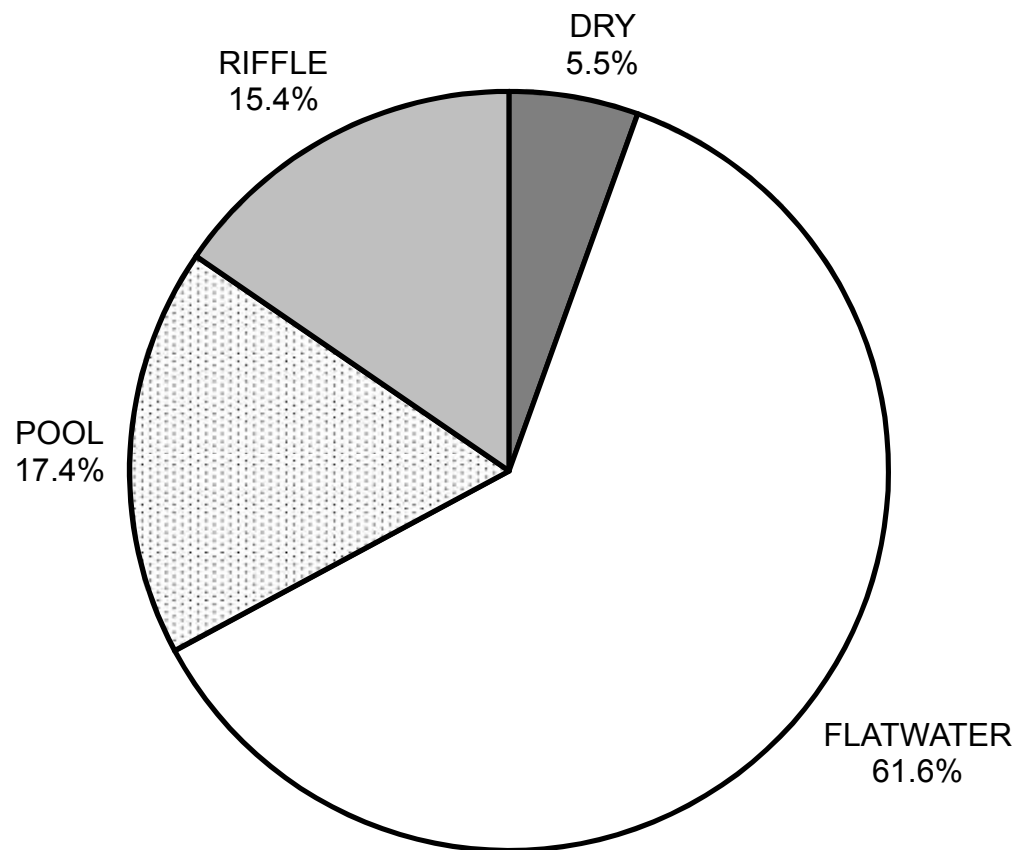
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	7	4	10
SMALL WOODY DEBRIS (%)	13	22	28
LARGE WOODY DEBRIS (%)	47	64	52
ROOT MASS (%)	0	4	2
TERRESTRIAL VEGETATION (%)	0	6	6
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	0	0	0
BOULDERS (%)	33	0	1
BEDROCK LEDGES (%)	0	0	0

EAST BRANCH LITTLE NORTH FORK 2015 HABITAT TYPES BY PERCENT OCCURRENCE



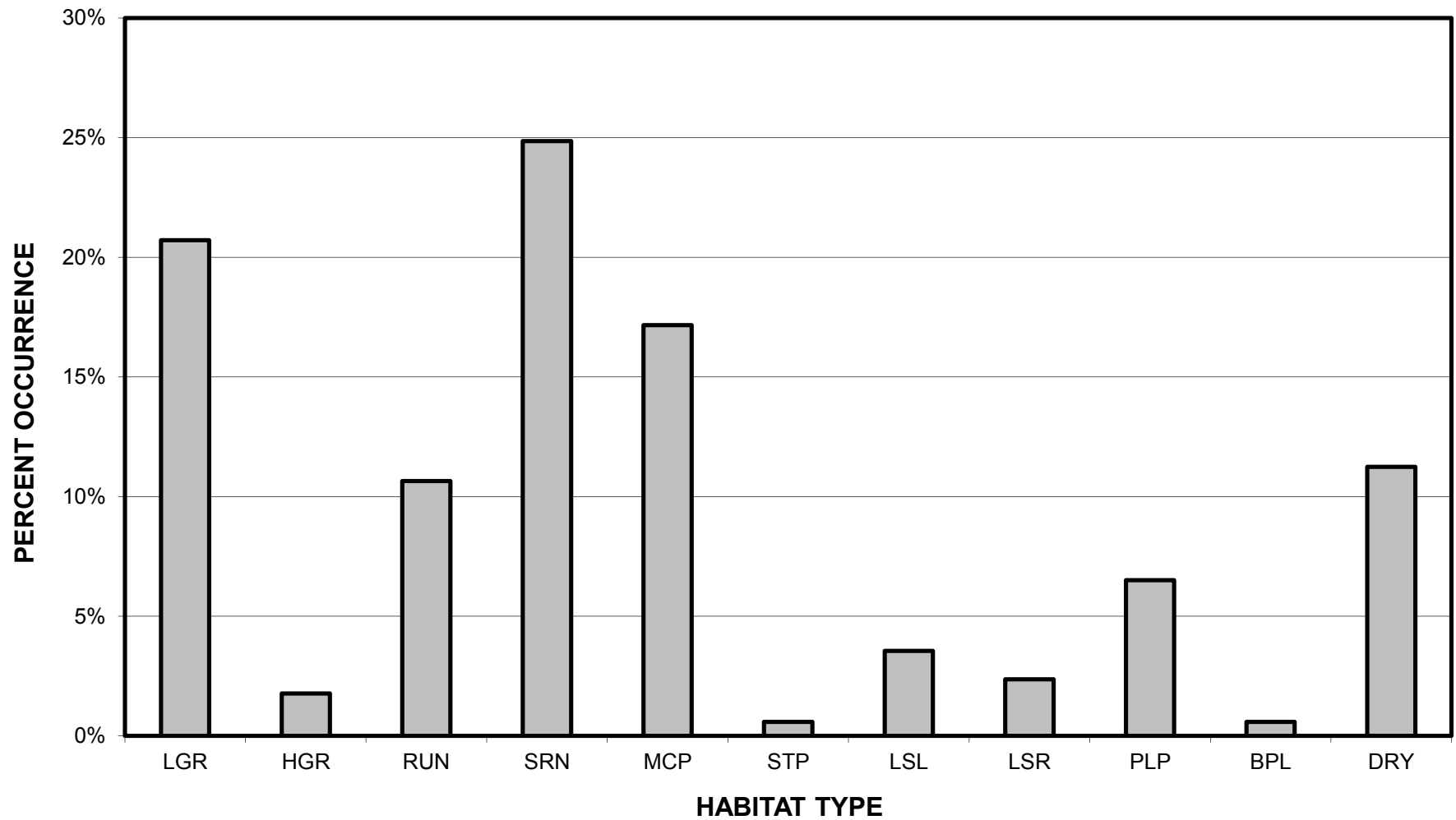
GRAPH 1

**EAST BRANCH LITTLE NORTH FORK 2015
HABITAT TYPES BY PERCENT TOTAL LENGTH**



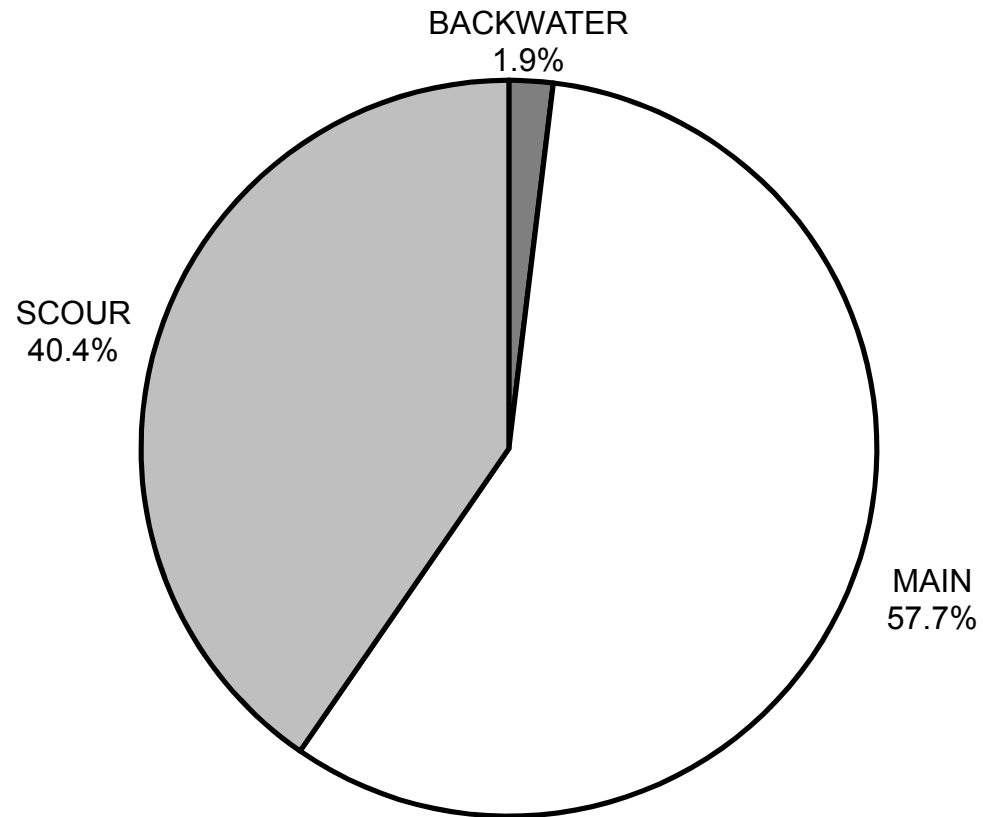
GRAPH 2

EAST BRANCH LITTLE NORTH FORK2015 HABITAT TYPES BY PERCENT OCCURRENCE



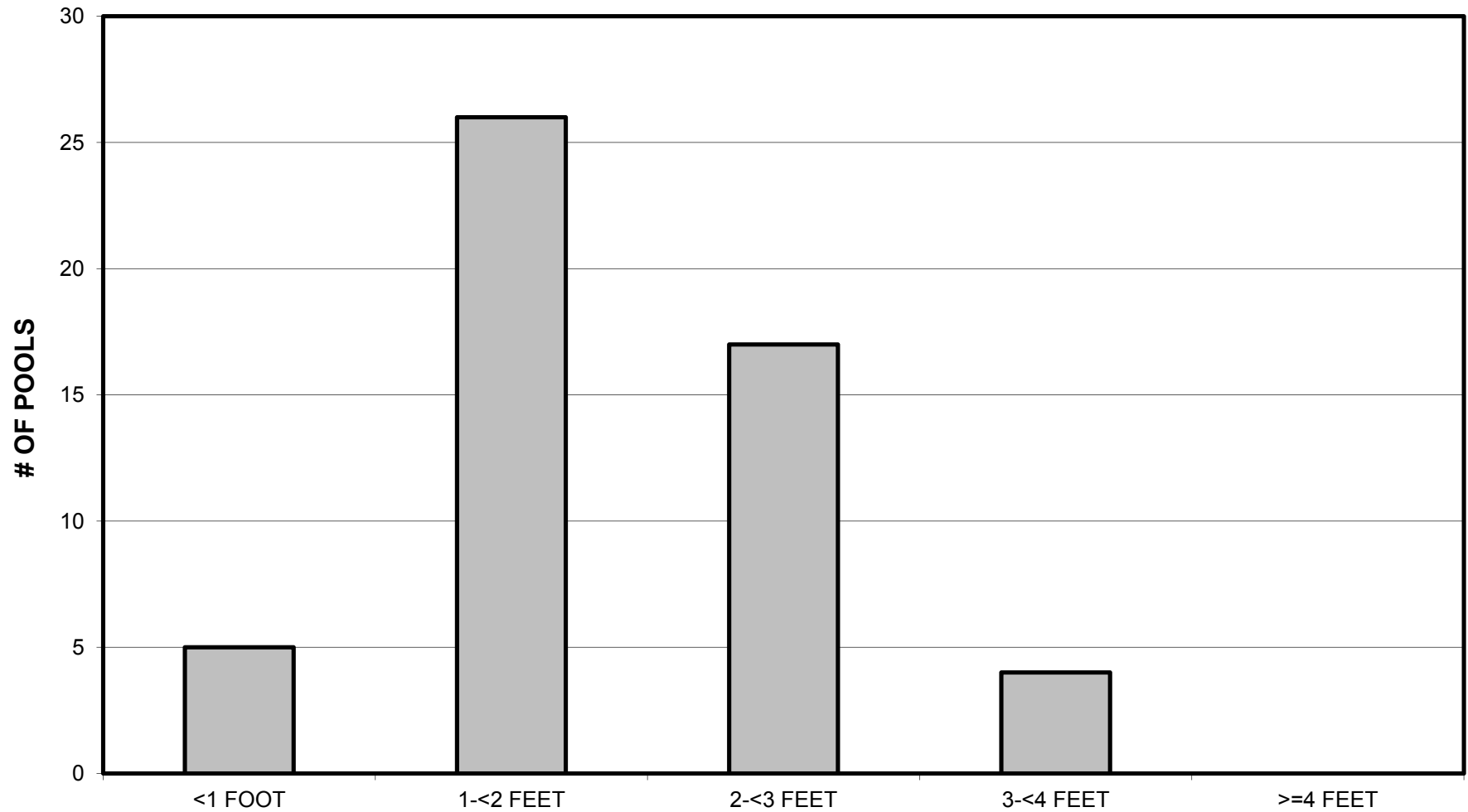
GRAPH 3

EAST BRANCH LITTLE NORTH FORK 2015 POOL TYPES BY PERCENT OCCURRENCE



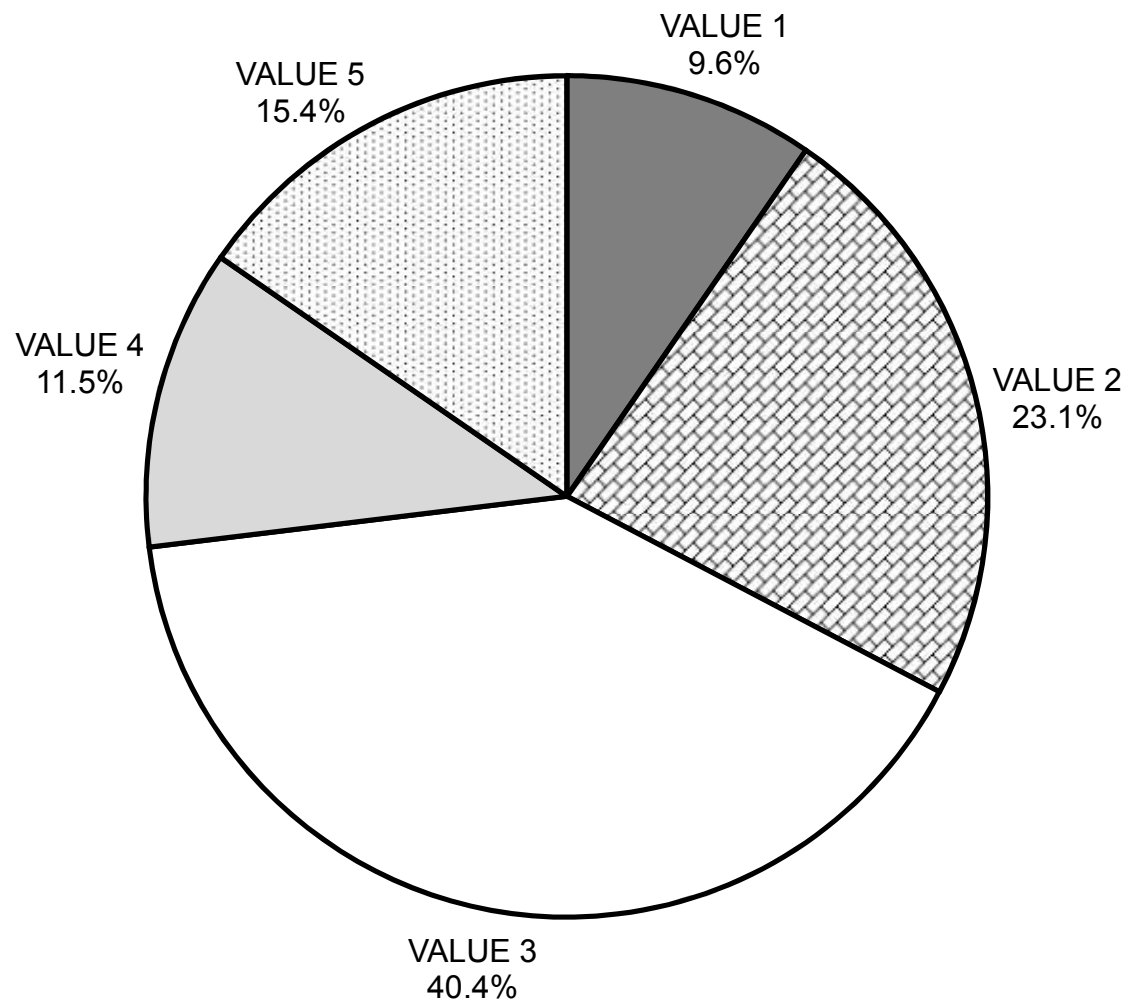
GRAPH 4

EAST BRANCH LITTLE NORTH FORK 2015 MAXIMUM DEPTH IN POOLS



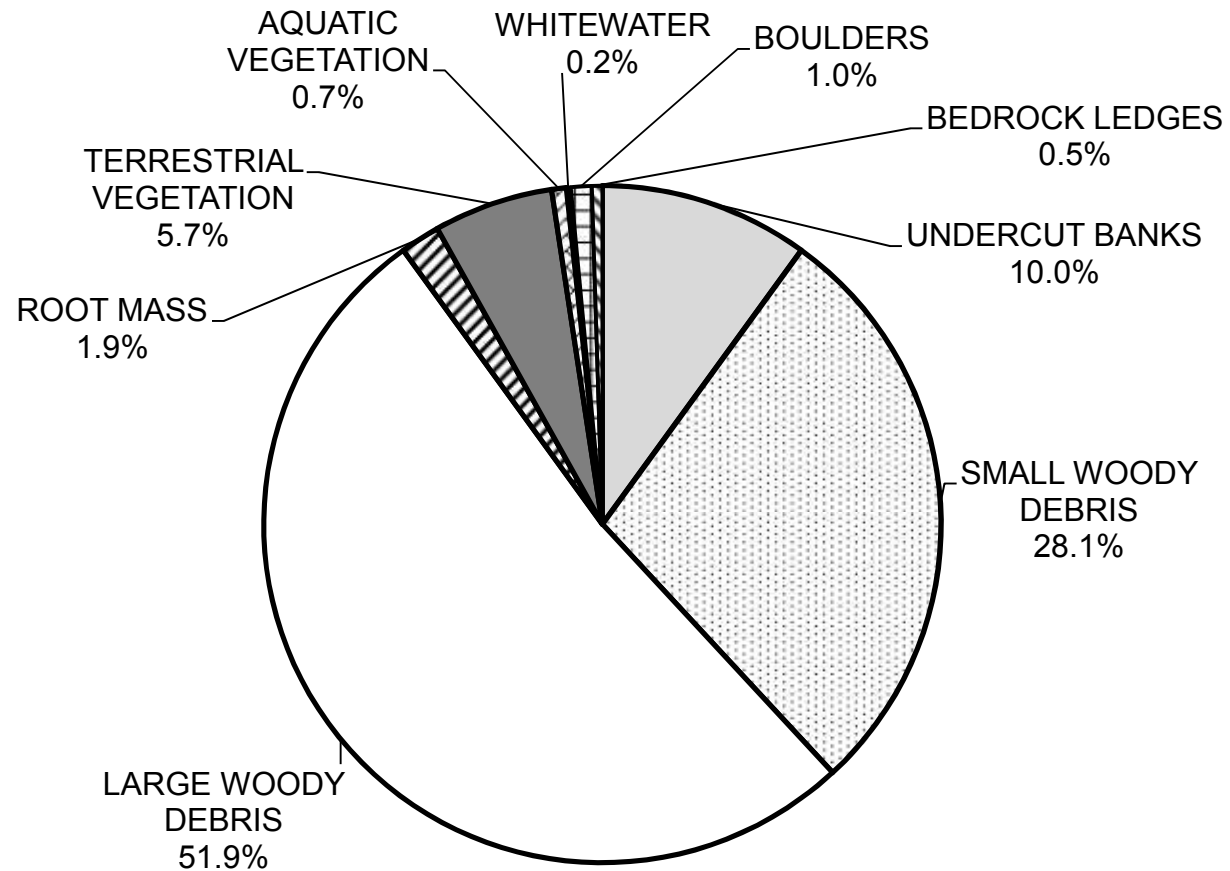
GRAPH 5

EAST BRANCH LITTLE NORTH FORK 2015 PERCENT EMBEDDEDNESS



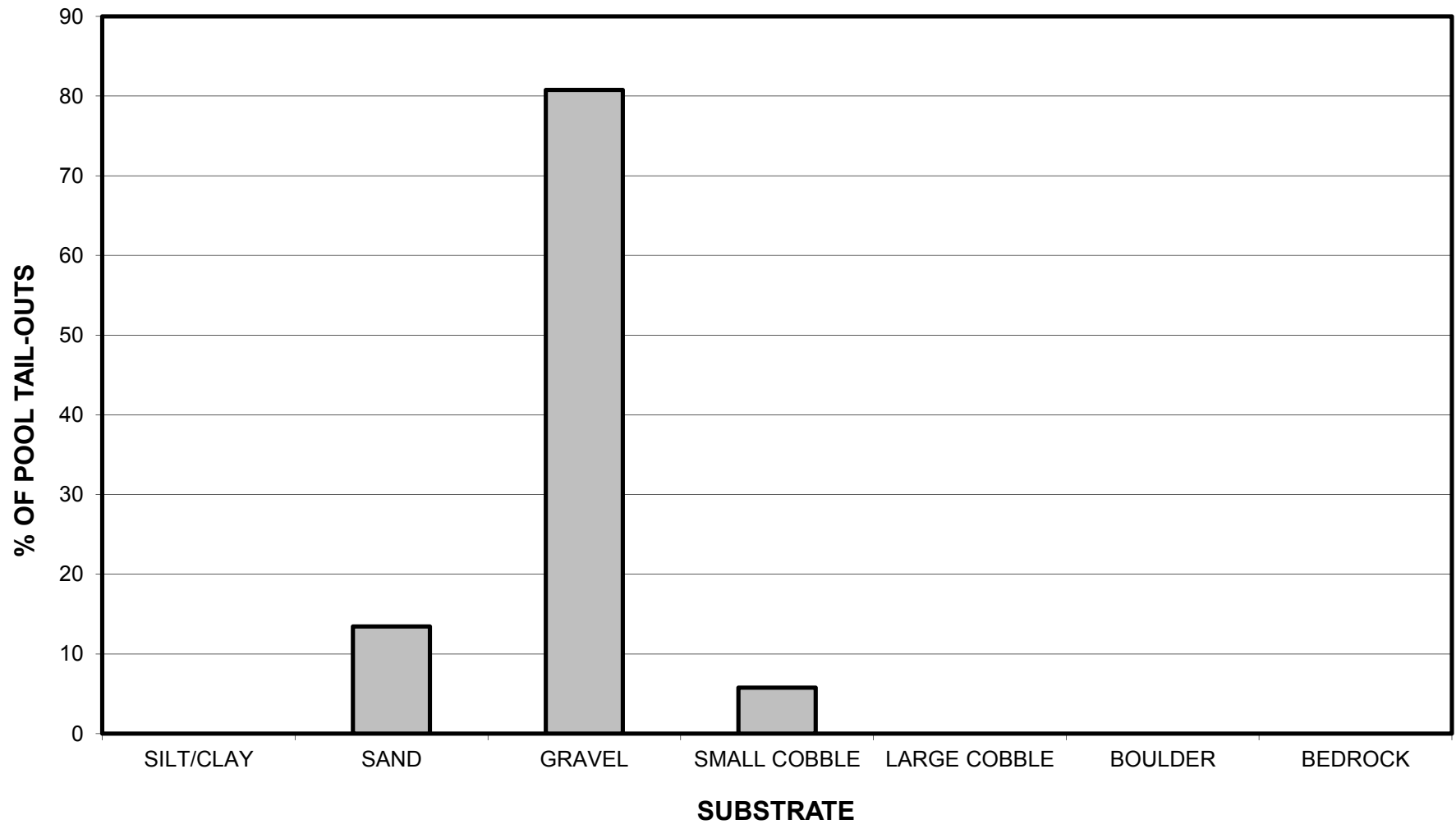
GRAPH 6

EAST BRANCH LITTLE NORTH FORK 2015 MEAN PERCENT COVER TYPES IN POOLS



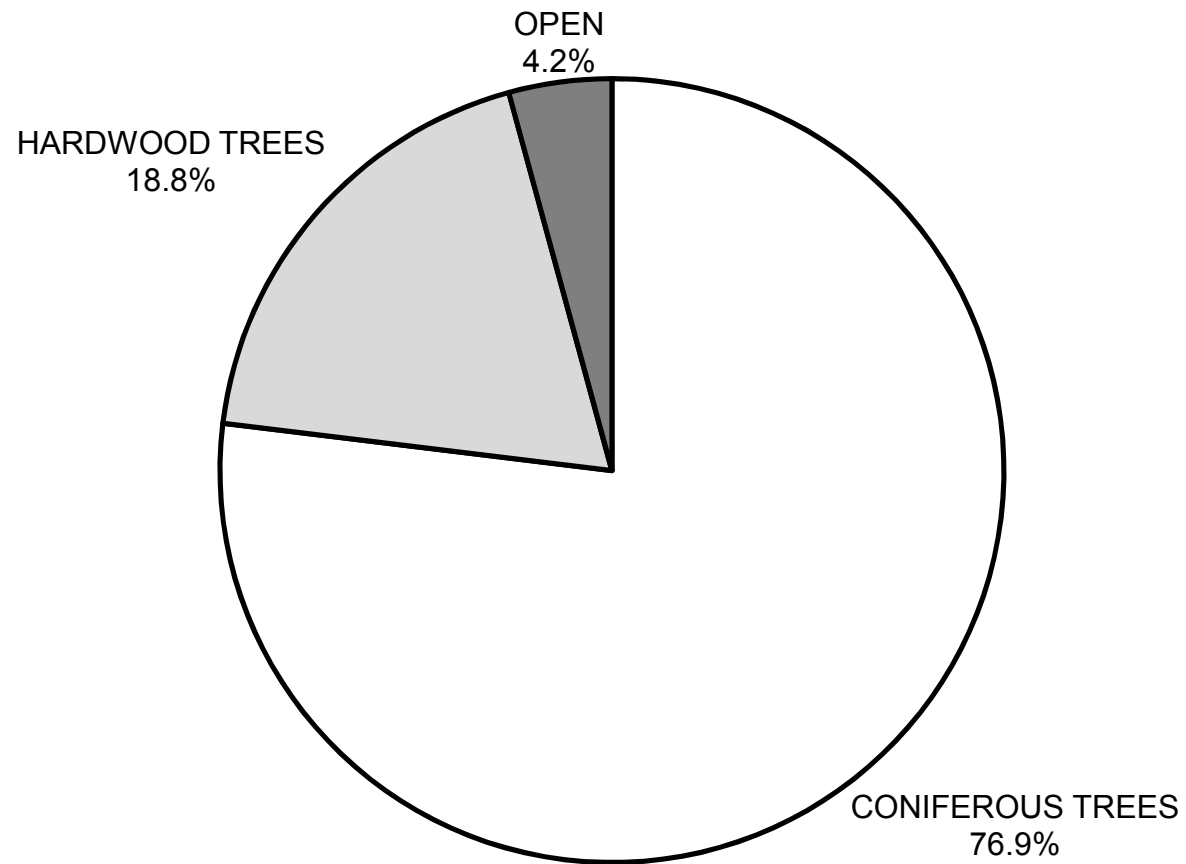
GRAPH 7

EAST BRANCH LITTLE NORTH FORK 2015 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



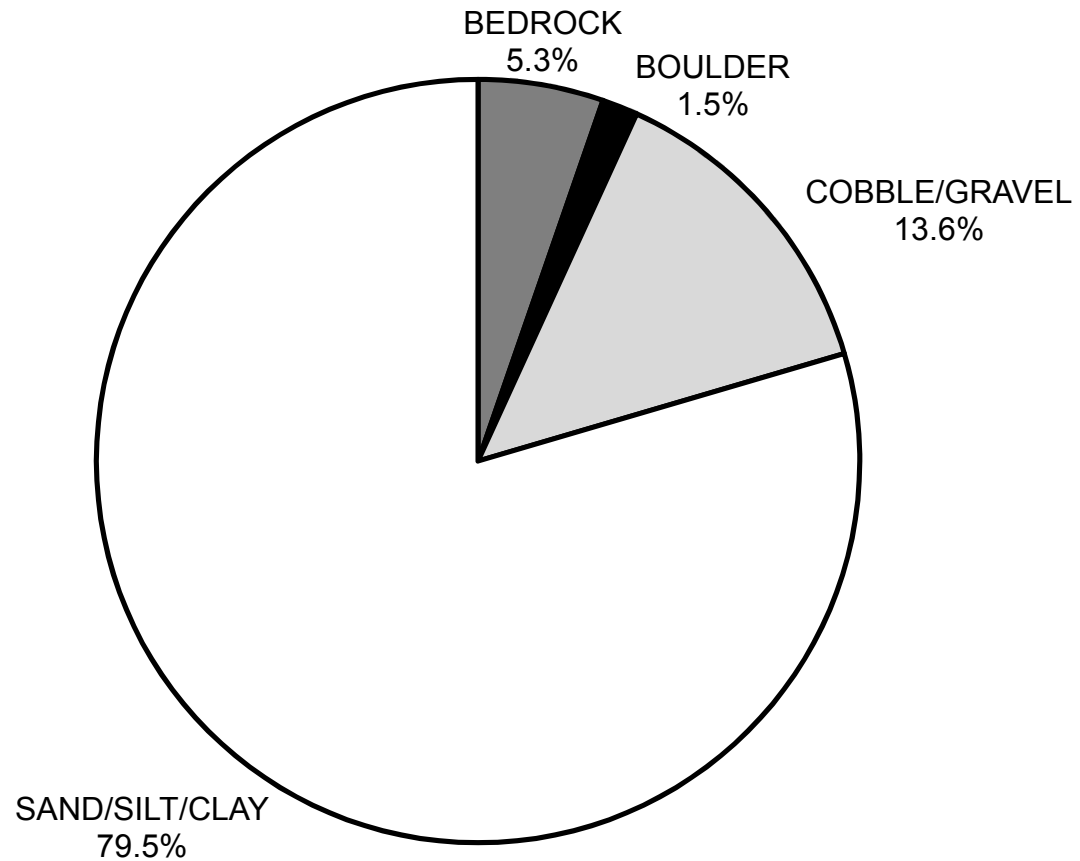
GRAPH 8

**EAST BRANCH LITTLE NORTH FORK 2015
MEAN PERCENT CANOPY**



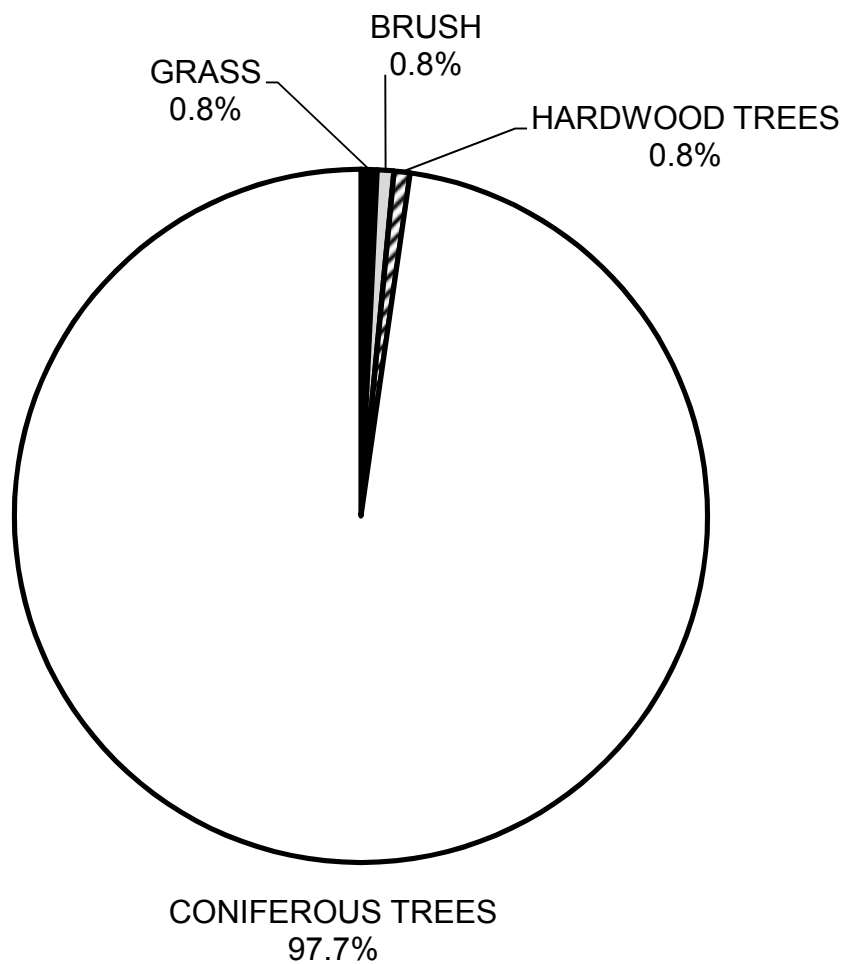
GRAPH 9

**EAST BRANCH LITTLE NORTH FORK 2015
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

EAST BRANCH LITTLE NORTH FORK 2015 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11