

# STREAM INVENTORY REPORT

## Little North Fork Big River

### INTRODUCTION

A stream inventory was conducted from September 7 to September 22, 2010 on Little North Fork Big River. The survey began at the confluence with Big River and extended upstream 7.8 miles.

The Little North Fork Big River inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Little North Fork Big River. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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

### WATERSHED OVERVIEW

Little North Fork Big River is a tributary to Big River, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Little North Fork Big River's legal description at the confluence with Big River is T17N R17W S24. Its location is 39.3144 north latitude and 123.7056 west longitude, LLID number 1237045393145. Little North Fork Big River is a second order stream and has approximately 11.9 miles of blue line stream according to the USGS Mathison Peak 7.5 minute quadrangle. Little North Fork Big River drains a watershed of approximately 12.5 square miles. Elevations range from about 30 feet at the mouth of the creek to 800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is publicly and privately owned and is managed for timber production and recreation. Vehicle access exists via Highway 1 to Caspar Little Lake Road.

### METHODS

The habitat inventory conducted in Little North Fork Big River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and

## Little North Fork Big River

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 Little North Fork 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 clinometer, hand level, hip chain, tape measure, and a stadia rod.

#### 3. Temperatures:

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

#### 4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Little North Fork Big River habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

## Little North Fork Big River

### 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 Little North Fork Big River, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate 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. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Little North Fork Big River, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

### 7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

### 8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Little North Fork Big River, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of 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 Little North Fork Big River, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

## Little North Fork Big River

### 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 Little North Fork Big River. In addition, underwater observations were made at 10 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 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. 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

## Little North Fork Big River

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Little North Fork 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 7 to September 22, 2010, was conducted by A. Glasgow, B. Williams, and M. Groff (WSP). The total length of the stream surveyed was 41,247 feet. Little North Fork Big River has a series of five marshes totaling 5,236 feet of unsurveyed distance beginning at 1,068 feet and ending at 35,740 feet. Another 2,522 feet was not surveyed due to active logging. The unsurveyed sections are referenced in the Comments and Landmarks section of this report. The data included in this report is for the 33,489 feet actually surveyed.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.22 cfs on September 9, 2010.

Little North Fork Big River is an F4 channel type for 27,982 feet of the stream surveyed (Reach 1), and an F6 channel type for 5,507 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. F6 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and silt/clay-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 59 degrees Fahrenheit. Air temperatures ranged from 50 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% pool units, 44% flatwater units, 8% riffle units, 2% no survey units, 1% no survey due to marsh units, 1% dry units, and 1% culvert units (Graph 1). Based on total length of Level II habitat types there were 64% flatwater units, 32% pool units, and 4% riffle units (Graph 2).

## Little North Fork Big River

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 41%; step run units, 25%; and run units, 19% (Graph 3). Based on percent total length, step run units made up 47%, mid-channel pool units 30%, and run units 17%.

A total of 172 pools were identified (Table 3). Main channel pools were the most frequently encountered at 94% (Graph 4), and comprised 95% 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. One hundred forty-eight of the 172 pools (86%) had a residual depth of two feet or greater. Seventy-four of the 172 pools (43%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 172 pool tail-outs measured, 29 had a value of 1 (16.9%); 66 had a value of 2 (38.4%); 44 had a value of 3 (25.6%); 25 had a value of 4 (14.5%); 8 had a value of 5 (4.7%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited 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 0, flatwater habitat types had a mean shelter rating of 7, and pool habitats had a mean shelter rating of 55 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 56. Scour 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 Little North Fork Big River. Graph 7 describes the pool cover in Little North Fork Big River. 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 85% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 6% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Little North Fork Big River was 92%. Eight percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 21% and 79%, respectively. Graph 9 describes the mean percent canopy in Little North Fork Big River.

For the stream reach surveyed, the mean percent right bank vegetated was 94%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 94% sand/silt/clay and 5% cobble/gravel. Coniferous trees were the dominant vegetation type observed in 69% of the units surveyed. Additionally, 19% of the units surveyed had deciduous trees as the dominant vegetation type, and 10% had brush as the dominant vegetation type (Graph 11).

## Little North Fork Big River

### BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 10 sites for species composition and distribution in Little North Fork Big River on September 22, 2010. Water temperatures taken during the survey period of 0800 to 1000 were 55 degrees Fahrenheit. Air temperatures ranged from 52 to 53 degrees Fahrenheit. The sites were sampled by I. Mikus (DFG), and B. Leonard (WSP).

In reach 1, 10 sites were sampled starting at the confluence with Berry Gulch, approximately 24,633 feet from the confluence with Big River, and continuing upstream 2,784 feet. The reach sites yielded 37 young-of-the-year (YOY) steelhead/rainbow trout and 23 coho salmon YOY.

The following chart displays the information yielded from these sites:

2010 Little North Fork Big River underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: F4 Channel Type									
09/22/10	1	182	4.2	24,633	9	0	0	13	0
	2	189	4.2	25,217	4	0	0	10	0
	3	194	4.2	25,503	4	0	0	0	0
	4	203	4.2	26,279	1	0	0	0	0
	5	207	4.2	26,466	3	0	0	0	0
	6	208	4.2	26,516	5	0	0	0	0
	7	211	4.2	26,665	3	0	0	0	0
	8	217	4.2	27,074	5	0	0	0	0
	9	220	4.2	27,263	2	0	0	0	0
	10	222	4.2	27,417	1	0	0	0	0

### DISCUSSION

Little North Fork Big River is an F4 channel type for the first 27,982 feet of stream actually surveyed (Reach 1), and an F6 channel type for the remaining 5,507 feet surveyed (Reach 2). The suitability of F4 and F6 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. F6 channel types are good for bank-placed boulders and fair for plunge weirs, boulder clusters, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days September 7 to September 22, 2010, ranged from 52 to 59 degrees Fahrenheit. Air temperatures ranged from 50 to 70 degrees Fahrenheit.

## **Little North Fork Big River**

This is a suitable water temperature range for salmonids. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 64% of the total length of this survey, riffles 4%, and pools 32%. One hundred forty-eight of the 172 (86%) pools had a maximum residual depth greater than 2 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 large wood that will increase or deepen pool habitat is recommended.

Ninety-five of the 172 pool tail-outs measured had embeddedness ratings of 1 or 2. Sixty-nine 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 Little North Fork Big River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

One hundred fifty-six of the 172 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 55. The shelter rating in the flatwater habitats is 7. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in Little North Fork Big River. 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 structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 92%. Reach 1 had a canopy density of 91%, Reach 2 had a canopy density of 93%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 94% and 96%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

## **RECOMMENDATIONS**

- 1) Little North Fork Big River should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and



## Little North Fork Big River

meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

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

### COMMENTS AND LANDMARKS

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

Position (ft):	Habitat Unit #:	Comments:
0	0001.00	Start of survey at the confluence with Big River. The channel type is an F4.
34	0002.00	Road 700 crosses the channel. The crossing is a 14' wide x 17' high x 67' long wooden bridge.
402	0006.00	A dirt road fords the creek at this habitat unit.
1068	0011.00	An marsh extends 2,729 feet upstream.
3797	0012.00	Upstream end of the marsh. The channel type is F4.
4051	0014.00	A piece of large woody debris (LWD) spans the channel and is collecting small woody debris. The debris accumulation does not impede fish passage.
5532	0031.00	Woody debris is accumulating on the right bank.
8524	0064.00	Rocky Gulch enters on the right bank. It contributes to approximately 5% of Little North Fork Big River's flow. The water temperature downstream and upstream of the tributary is 59 degrees Fahrenheit; the water temperature of the tributary is 56 degrees Fahrenheit. The slope of the tributary is approximately 0.5%. Fish were observed in the tributary. For more information, see the 2010 Rocky Gulch Stream Habitat Inventory Report.

## Little North Fork Big River

9860	0079.00	A footbridge spans the channel.
11466	0091.00	A footbridge spans the channel.
12375	0100.00	Thompson Gulch enters on the right bank. It contributes to approximately 5% of Little North Fork Big River's flow. The water temperature downstream and upstream of the tributary is 53 degrees Fahrenheit; the water temperature of the tributary is 54 degrees Fahrenheit. The slope of the tributary is approximately 0.5%. Fish were observed in the tributary. For more information, see the 2010 Thompson Gulch Stream Habitat Inventory Report.
12442	0101.00	A 6' wide x 11' high x 36' long wooden footbridge spans the channel.
12780	0105.00	A 6' wide x 9' high x 35' long wooden footbridge spans the channel.
12937	0107.00	A 6' wide x 8.5' high x 38' long wooden footbridge spans the channel.
13271	0109.00	A dirt road fords the stream. There is a footbridge upstream of the ford.
14079	0116.00	Log debris accumulation (LDA) #01 contains 33 pieces of LWD and measures 7.5' high x 45' wide x 20' long. Water flows through it and there are no visible gaps in the LDA. The LDA is not retaining sediment. Fish are present above the LDA.
15188	0128.00	A 3' high concrete dam spans the channel. Woody debris is accumulating on the left bank on top of the dam. The debris accumulation spans half of the wetted width of the stream.
16958	0143.00	LDA #02 contains 44 pieces of LWD and measures 8' high x 70' wide x 22' long. Water flows through it and there are no visible gaps in the LDA. Retained sediment ranges from gravel to small cobble and measures 25' wide x 35' long x 2' deep. Fish are present above the LDA.
18812	0156.00	A logging road crosses the channel. The crossing is an 11' wide x 2.2' high x 38' long railcar bridge.
19256	0160.00	Tributary #03 enters on the left bank. It contributes to less than 1% of Little North Fork Big River's flow. The water temperature downstream and upstream of the tributary is 53 degrees Fahrenheit; the water temperature of the tributary is 53 degrees Fahrenheit. The slope of the tributary is approximately 4%. The tributary is accessible to salmonids, but no fish were observed.

## Little North Fork Big River

20221	0168.00	An erosion site on the left bank measuring 30' long x 25' high is contributing sediment ranging in size from sand to gravel.
22110	0181.00	There is an unsurveyable section of stream due to active logging. It extends 2,522 feet upstream.
24632	0182.00	Begin Reach 5. The channel type is F4. Berry Gulch enters on the right bank. It contributes to approximately 40% of Little North Fork Big River's flow. The water temperature downstream and upstream of the tributary is 53 degrees Fahrenheit; the water temperature of the tributary is 52 degrees Fahrenheit. The slope of the tributary is approximately 1%. Coho and steelhead are present in the tributary. For more information, see the 2009 Berry Gulch Stream Habitat Inventory Report.
24726	0185.00	LDA #03 contains 20 pieces of LWD and measures 5' high x 37' wide x 16' long. Water flows through it and there are no visible gaps in the LDA. The LDA is not retaining sediment. Fish are present above the LDA.
25320	0192.00	LDA #04 contains 15 pieces of LWD and measures 7' high x 46' wide x 7' long. Water does not flow through it and there are no visible gaps in the LDA. Retained sediment ranges from sand to small cobble. Fish are present above the LDA.
26615	0210.00	LDA #05 contains 10 pieces of LWD and measures 5.5' high x 39' wide x 10' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from sand to small cobble and measures 8' wide x 12' long x 3' deep. Fish are present above the LDA.
26858	0215.00	There is a 2.5' high plunge over LWD.
27043	0217.00	LDA #06 contains 17 pieces of LWD and measures 6' high x 36' wide x 28' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from sand to small cobble and measures 6' wide x 8' long x 1' deep. Fish are present above the LDA.
27578	0226.00	Tributary #05 enters on the right bank. It contributes to approximately 1% of Little North Fork Big River's flow. The water temperature downstream and upstream of the tributary is 55 degrees Fahrenheit; the water temperature of the tributary is 54 degrees Fahrenheit. The slope of the tributary is approximately 4%. The tributary is accessible to salmonids, but no fish were observed.

## Little North Fork Big River

28635	0236.00	LDA #07 contains 16 pieces of LWD and measures 7.5' high x 39' wide x 14' long. Water flows through it and there are visible gaps in the LDA. Retained sediment ranges from sand to gravel and measures 10' wide x 16' long x 3' deep. Fish are present above the LDA. There is a dry tributary on the left bank.
28867	0238.00	An erosion site on the left bank measures 30' long x 18' high. There is a large amount of LWD in the channel, possibly the remnants of an old Humboldt crossing.
28987	0241.00	LWD is accumulating in the channel creating a potential LDA. An erosion site on the right bank measures 7' tall x 10' long.
29502	0246.00	Tributary #06 enters on the right bank. It contributes to approximately 20% of Little North Fork Big River's flow. The water temperature downstream and upstream of the tributary is 55 degrees Fahrenheit; the water temperature of the tributary is 53 degrees Fahrenheit. The slope of the tributary is approximately 1%. The tributary is accessible to salmonids, but no fish were observed.
29525	0247.00	A marsh extends 833 feet upstream.
30358	0248.00	Upstream end of marsh. The channel type is F4.
30643	0253.00	A marsh extends 460 feet upstream.
31103	0254.00	Upstream end of marsh. The channel type is F4.
32795	0283.00	A marsh extends 805 feet upstream.
33600	0284.00	Upstream end of marsh. The channel type is F4.
33875	0287.00	An erosion site on the left bank measuring 15' long x 20' high is contributing sand to the channel.
33984	0291.00	LDA #08 contains 21 pieces of LWD and measures 5' high x 30' wide x 40' long. Water flows through it and there are no visible gaps in the LDA. Retained sediment ranges from sand to cobble and measures 8' wide x 15' long x 2' deep. Fish are present above the LDA.
34589	0305.00	Multiple conifers have collapsed into the channel creating a barrier. The trees are retaining sediment measuring 2' high x 15' wide x 20' long. The sediment consists of sand and gravel. No fish were observed above this point.

## Little North Fork Big River

34911	0311.00	A logging road crossing the channel. The crossing is a 8' high x 10' wide x 66' long corrugated metal culvert. The slope of the culvert is less than one percent and there is no plunge at the outlet. The culvert is in good condition. It is not a barrier to juvenile and adult salmonids.
35254	0319.00	There is a 3.5' high plunge.
35331	0321.00	A marsh extends 409 feet upstream.
35740	0322.00	Upstream end of marsh. The channel type is now an F6 (Reach 2).
36075	0332.00	LDA #09 contains 11 pieces of LWD and measures 4.5' high x 23' wide x 20' long. Water flows through it and there are visible gaps in the LDA. The LDA is not retaining sediment. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
36423	0337.00	LDA #10 contains 21 pieces of LWD and measures 5' high x 30' wide x 40' long. Water flows through it and there are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 8' wide x 10' long x 1' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
37576	0351.00	There is an old railroad trestle on the left bank.
38044	0356.00	LDA #11 contains eight pieces of LWD and measures 6' high x 25' wide x 26' long. Water flows through it and there are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 3' wide x 3' long x 2' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
38477	0365.00	There is a right bank seep entering this unit.
39954	0379.00	LDA #12 contains seven pieces of LWD and measures 6.5' high x 11' wide x 8' long. Water flows through it and there are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 8' wide x 5' long x 1' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
41247	0390.00	End of survey. A logging road crosses the channel. The crossing consists of two 4' high x 4' wide x 40' long corrugated metal pipe culverts. The slope of the culverts is less than one percent and both are in good condition. Water only flows through the culvert on the left bank. The plunge height of the culvert is 0.8' and the maximum depth within 5' of the culvert is 2'. The culverts are possible barriers to juvenile salmonids.

## Little North Fork Big River

The stream above the two culverts is thick with vegetation and barely flowing. The habitat is marsh-like with few pools and the dominant substrate is silt. Little to no spawning gravel was observed in the last 4,000 feet of the survey. No fish were observed within the last 5,000 feet of the survey.

### 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.

## Little North Fork Big River

### LEVEL III and LEVEL IV HABITAT TYPES

#### RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

#### CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

#### FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

#### MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

#### SCOUR POOLS

Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

#### BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

#### ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	





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

Stream Name: Little North Fork Big River

LLID: 1237045393145

Drainage: Big River

Survey Dates: 9/7/2010 to 9/22/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:52.0N

Longitude: 123:42:16.0W

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 (%)
33	9	LGR	8.5	36	1178	3.5	9	0.2	0.8	208	6863	35	1156		0	91
74	10	RUN	19.0	77	5690	17.1	14	1.0	3.1	855	63285	987	73064		11	91
96	13	SRN	24.6	165	15801	47.4	9	0.5	2.5	1348	129373	930	89320		5	91
159	159	MCP	40.8	62	9792	29.3	15	1.8	6.5	1042	165616	2508	398837	2194	56	92
1	1	CCP	0.3	30	30	0.1	19	1.9	3.4	570	570	1140	1140	1083	5	94
2	2	STP	0.5	55	110	0.3	12	1.8	2.7	691	1381	1261	2523	1192	58	96
3	3	CRP	0.8	89	267	0.8	20	3.3	7.4	1642	4925	5932	17796	5646	20	95
2	2	LSL	0.5	22	44	0.1	18	1.8	2.6	388	775	800	1600	722	68	95
3	3	LSR	0.8	56	167	0.5	22	2.6	6.7	1126	3377	3556	10668	2965	25	92
2	2	PLP	0.5	42	84	0.3	28	2.2	4.9	1140	2280	2946	5892	2760	90	90
2	0	DRY	0.5	48	96	0.3										
2	0	CUL	0.5	53	106	0.3										
9	0	NS	2.3	480	4320											
2	0	MAR	0.5	1781	3562											

Total Units Fully Measured  
390 204

Total Length (ft.)  
41247

Total Area (sq.ft.)  
378445

Total Volume (cu.ft.)  
601994

**Table 3 - Summary of Pool Types**

Stream Name: Little North Fork Big River

LLID: 1237045393145

Drainage: Big River

Survey Dates: 9/7/2010 to 9/22/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:52.0N

Longitude: 123:42:16.0W

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
162	162	MAIN	94	61	9932	95	15.1	1.8	1034	167567	2174	352249	56
10	10	SCOUR	6	56	562	5	21.6	2.6	1136	11357	3280	32796	45

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
172	172	10494	178924	385045

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

Stream Name: Little North Fork Big River

LLID: 1237045393145

Drainage: Big River

Survey Dates: 9/7/2010 to 9/22/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:52.0N

Longitude: 123:42:16.0W

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
159	MCP	92	0	0	24	15	69	43	43	27	23	14
1	CCP	1	0	0	0	0	0	0	1	100	0	0
2	STP	1	0	0	0	0	2	100	0	0	0	0
3	CRP	2	0	0	0	0	0	0	1	33	2	67
2	LSL	1	0	0	0	0	2	100	0	0	0	0
3	LSR	2	0	0	0	0	0	0	2	67	1	33
2	PLP	1	0	0	0	0	1	50	0	0	1	50
<b>Total Units</b>			<b>Total &lt; 1 Foot Max Resid. Depth</b>	<b>Total &lt; 1 Foot % Occurrence</b>	<b>Total 1&lt; 2 Foot Max Resid. Depth</b>	<b>Total 1&lt; 2 Foot % Occurrence</b>	<b>Total 2&lt; 3 Foot Max Resid. Depth</b>	<b>Total 2&lt; 3 Foot % Occurrence</b>	<b>Total 3&lt; 4 Foot Max Resid. Depth</b>	<b>Total 3&lt; 4 Foot % Occurrence</b>	<b>Total &gt;= 4 Foot Max Resid. Depth</b>	<b>Total &gt;= 4 Foot % Occurrence</b>
172			0	0	24	14	74	43	47	27	27	16

Mean Maximum Residual Pool Depth (ft.): 3

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

Stream Name: Little North Fork Big River

LLID: 1237045393145

Drainage: Big River

Survey Dates: 9/7/2010 to 9/22/2010

Dry Units: 2

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:52.0N

Longitude: 123:42:16.0W

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
33	9	LGR	0	0	0	0	0	0	0	0	0
33	9	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
74	10	RUN	0	25	54	0	21	0	0	0	0
96	13	SRN	14	25	21	19	3	1	0	16	1
170	23	TOTAL FLAT	6	25	39	8	13	1	0	7	1
159	159	MCP	12	29	33	15	7	1	1	2	0
1	1	CCP	0	0	100	0	0	0	0	0	0
2	2	STP	20	20	20	20	20	0	0	0	0
3	3	CRP	23	25	33	17	2	0	0	0	0
2	2	LSL	0	48	50	0	3	0	0	0	0
3	3	LSR	15	5	8	68	3	0	0	0	0
2	2	PLP	10	18	40	10	3	0	18	3	0
172	172	TOTAL POOL	12	29	33	16	7	1	1	2	0
2	0	CUL									
9	0	NS									
2	0	MAR									
390	204	TOTAL	12	28	33	15	8	1	1	2	0

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

Stream Name: Little North Fork Big River

LLID: 1237045393145

Drainage: Big River

Survey Dates: 9/7/2010 to 9/22/2010

Dry Units: 2

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:52.0N

Longitude: 123:42:16.0W

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
33	9	LGR	0	0	67	33	0	0	0
74	10	RUN	40	10	50	0	0	0	0
96	13	SRN	23	8	38	31	0	0	0
159	159	MCP	22	5	69	4	0	0	0
1	1	CCP	0	0	0	100	0	0	0
2	2	STP	0	0	50	50	0	0	0
3	3	CRP	0	0	100	0	0	0	0
2	2	LSL	0	0	100	0	0	0	0
3	3	LSR	0	0	100	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: Little North Fork Big River

LLID: 1237045393145

Drainage: Big River

Survey Dates: 9/7/2010 to 9/22/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:52.0N

Longitude: 123:42:16.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
92	79	21	0	94	96

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: Little North Fork Big River LLID: 1237045393145 Drainage: Big River  
 Survey Dates: 9/7/2010 to 9/22/2010 Survey Length (ft.): 41247 Main Channel (ft.): 41247 Side Channel (ft.): 0  
 Confluence Location: Quad: MATHISON PEAK Legal Description: T17NR17WS24 Latitude: 39:18:52.0N Longitude: 123:42:16.0W

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

**STREAM REACH: 1**

Channel Type: F4	Canopy Density (%): 91.3	Pools by Stream Length (%): 26.8
Reach Length (ft.): 27982	Coniferous Component (%): 76.5	Pool Frequency (%): 45.8
Riffle/Flatwater Mean Width (ft.): 11.8	Hardwood Component (%): 23.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 10
Range (ft.): 8 to 44	Vegetative Cover (%): 93.9	2 to 2.9 Feet Deep: 41
Mean (ft.): 26	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 31
Std. Dev.: 10	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 18
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 29	Mean Max Residual Pool Depth (ft.): 3.2
Water (F): 53 - 59 Air (F): 54 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating: 54
Dry Channel (ft): 64	Riffles: 1	
	Pools: 7	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 1 Sand: 1 Gravel: 86 Sm Cobble: 6 Lg Cobble: 4 Boulder: 1 Bedrock: 1		
Embeddedness Values (%): 1. 19.7 2. 43.5 3. 25.9 4. 8.8 5. 2.0		

**STREAM REACH: 2**

Channel Type: F6	Canopy Density (%): 93.2	Pools by Stream Length (%): 16.8
Reach Length (ft.): 5507	Coniferous Component (%): 92.4	Pool Frequency (%): 36.2
Riffle/Flatwater Mean Width (ft.): 4.3	Hardwood Component (%): 7.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 36
Range (ft.): 6 to 15	Vegetative Cover (%): 99.2	2 to 2.9 Feet Deep: 56
Mean (ft.): 10	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 8
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 27	Mean Max Residual Pool Depth (ft.): 2.2
Water (F): 52 - 55 Air (F): 50 - 58	LWD per 100 ft.:	Mean Pool Shelter Rating: 62
Dry Channel (ft): 32	Riffles: 3	
	Pools: 7	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 12 Sand: 0 Gravel: 76 Sm Cobble: 4 Lg Cobble: 0 Boulder: 0 Bedrock: 8		
Embeddedness Values (%): 1. 0.0 2. 8.0 3. 24.0 4. 48.0 5. 20.0		

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

Stream Name: Little North Fork Big River

LLID: 1237045393145

Drainage: Big River

Survey Dates: 9/7/2010 to 9/22/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

Latitude: 39:18:52.0N

Longitude: 123:42:16.0W

**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	1	1	0.5
Boulder	1	0	0.2
Cobble / Gravel	17	3	4.9
Sand / Silt / Clay	185	200	94.4

**Mean Percentage of Dominant Stream Bank Vegetation**

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	4	5	2.2
Brush	25	17	10.3
Hardwood Trees	35	41	18.6
Coniferous Trees	140	141	68.9
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 3



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

StreamName: Little North Fork Big River

LLID: 1237045393145

Drainage: Big River

Survey Dates: 9/7/2010 to 9/22/2010

Confluence Location: Quad: MATHISON PEAK

Legal Description: T17NR17WS24

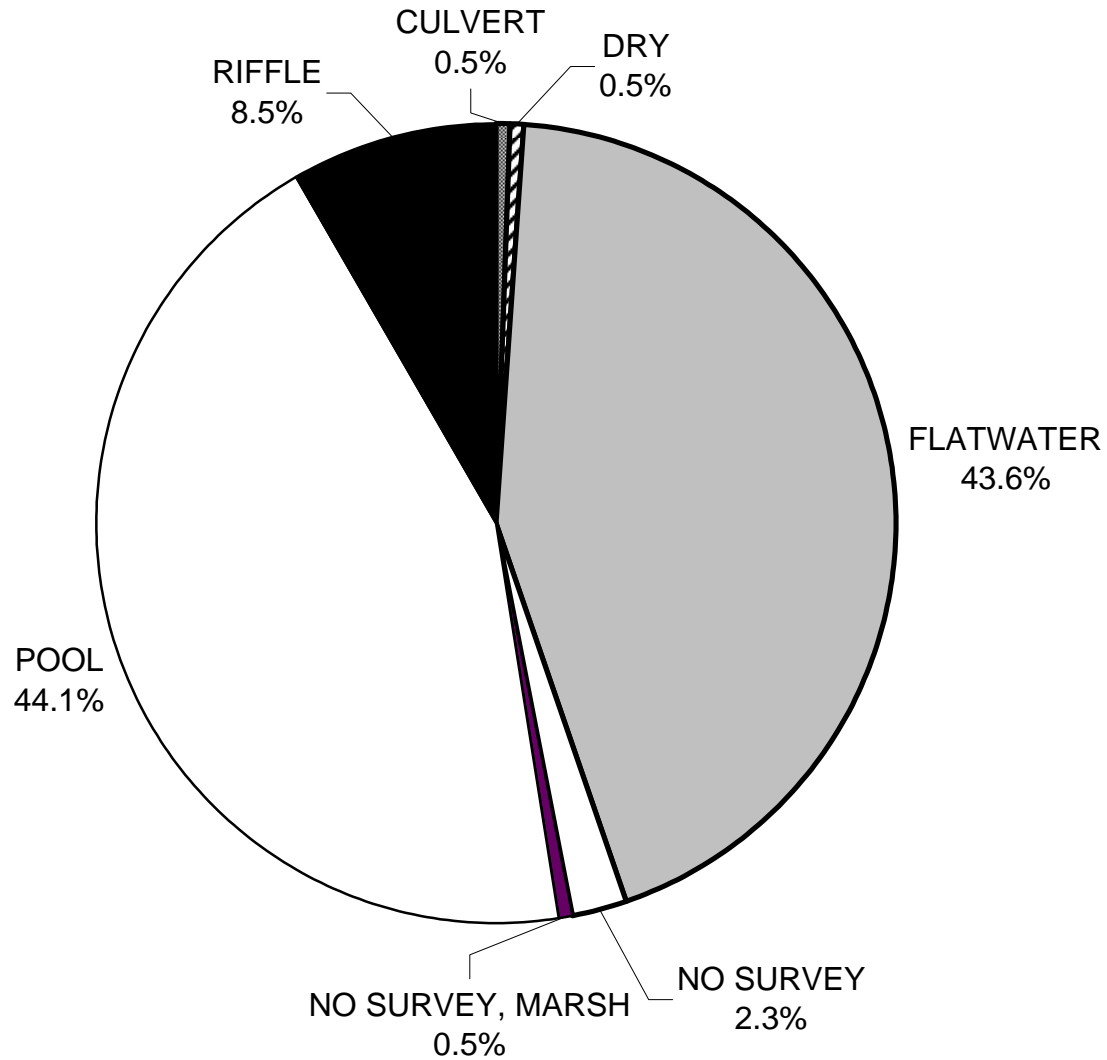
Latitude: 39:18:52.0N

Longitude: 123:42:16.0W

---

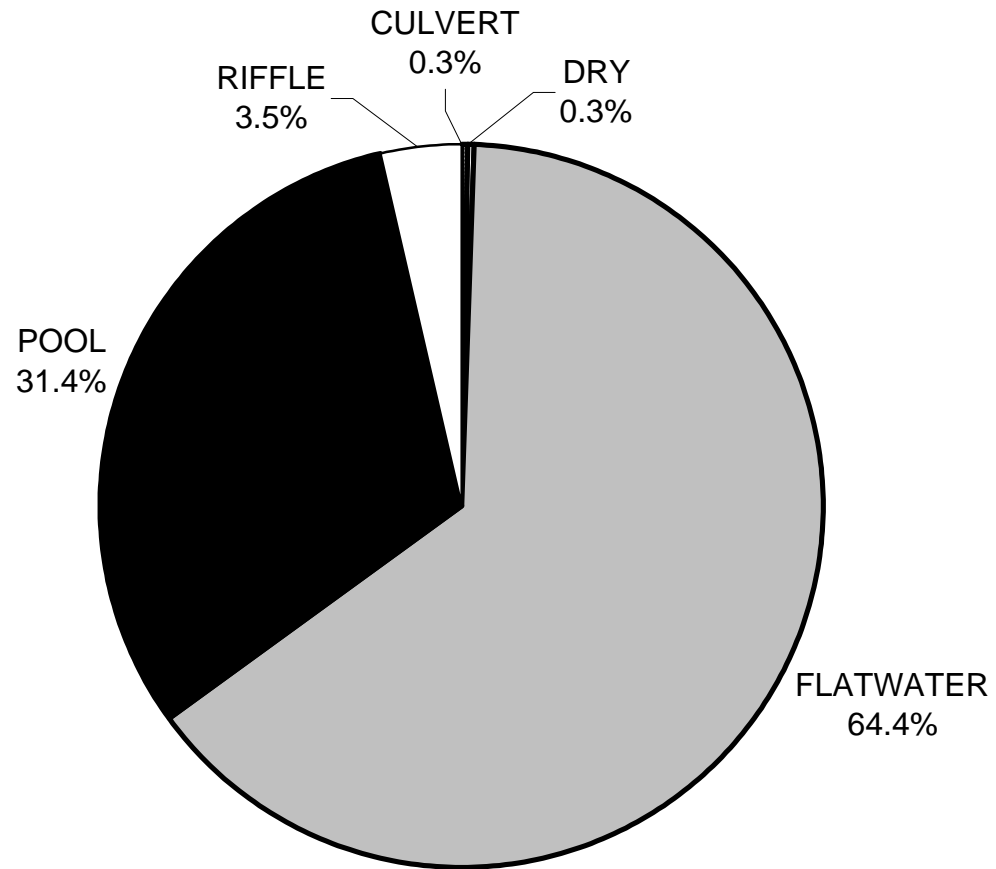
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	6	12
SMALL WOODY DEBRIS (%)	0	25	29
LARGE WOODY DEBRIS (%)	0	39	33
ROOT MASS (%)	0	8	16
TERRESTRIAL VEGETATION (%)	0	13	7
AQUATIC VEGETATION (%)	0	1	1
WHITEWATER (%)	0	0	1
BOULDERS (%)	0	7	2
BEDROCK LEDGES (%)	0	1	0

# LITTLE NORTH FORK BIG RIVER 2010 HABITAT TYPES BY PERCENT OCCURRENCE



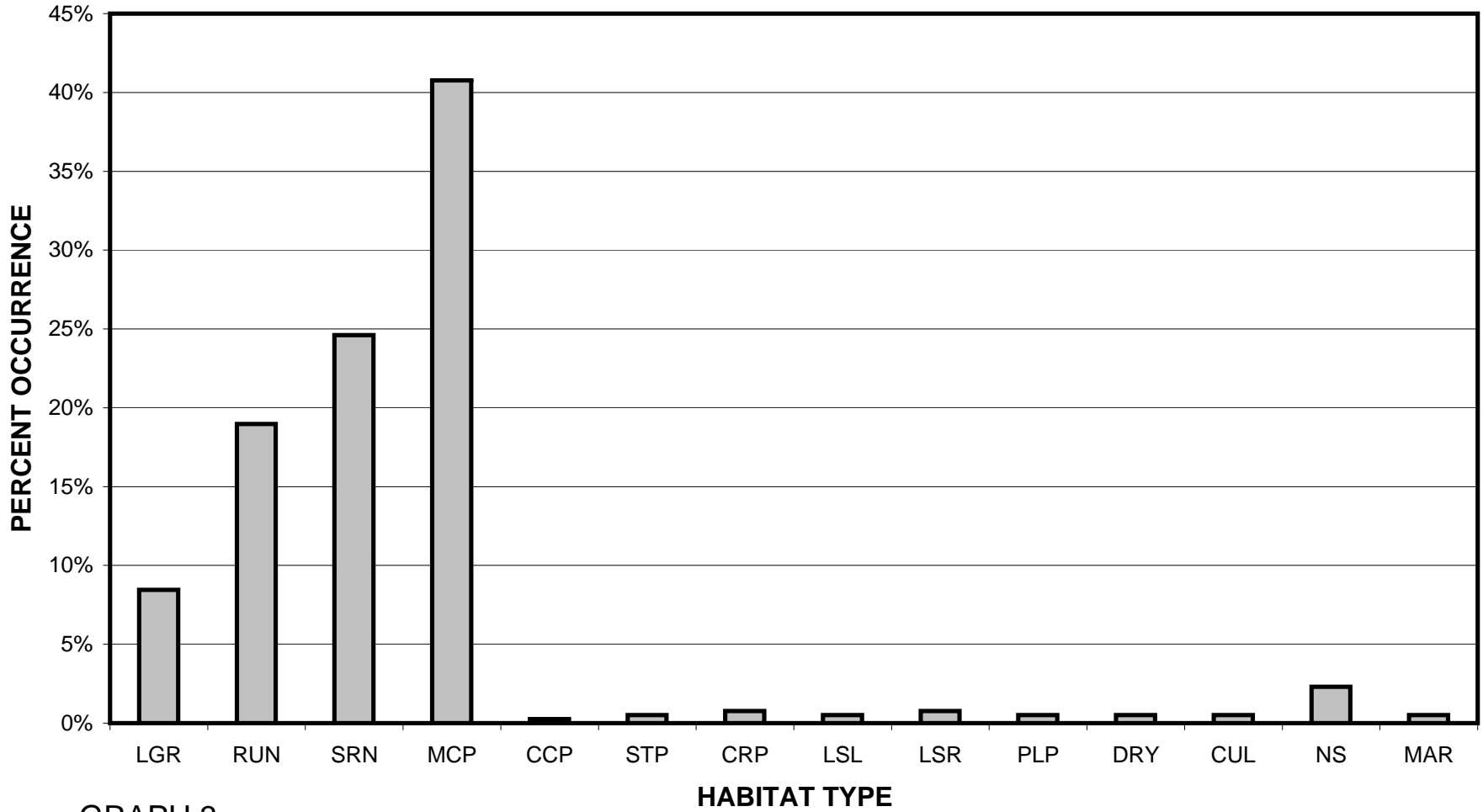
GRAPH 1

# LITTLE NORTH FORK BIG RIVER 2010 HABITAT TYPES BY PERCENT TOTAL LENGTH



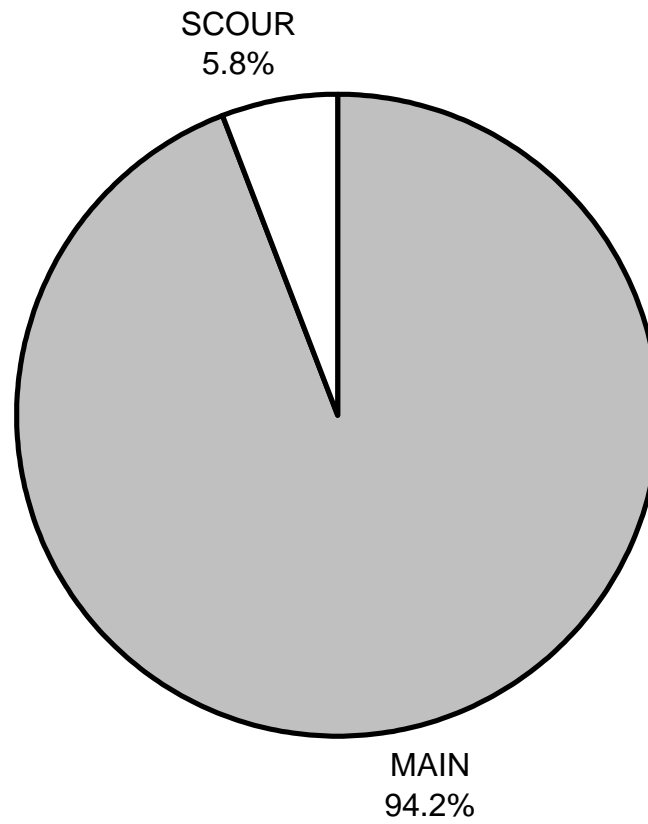
GRAPH 2

# LITTLE NORTH FORK BIG RIVER 2010 HABITAT TYPES BY PERCENT OCCURRENCE



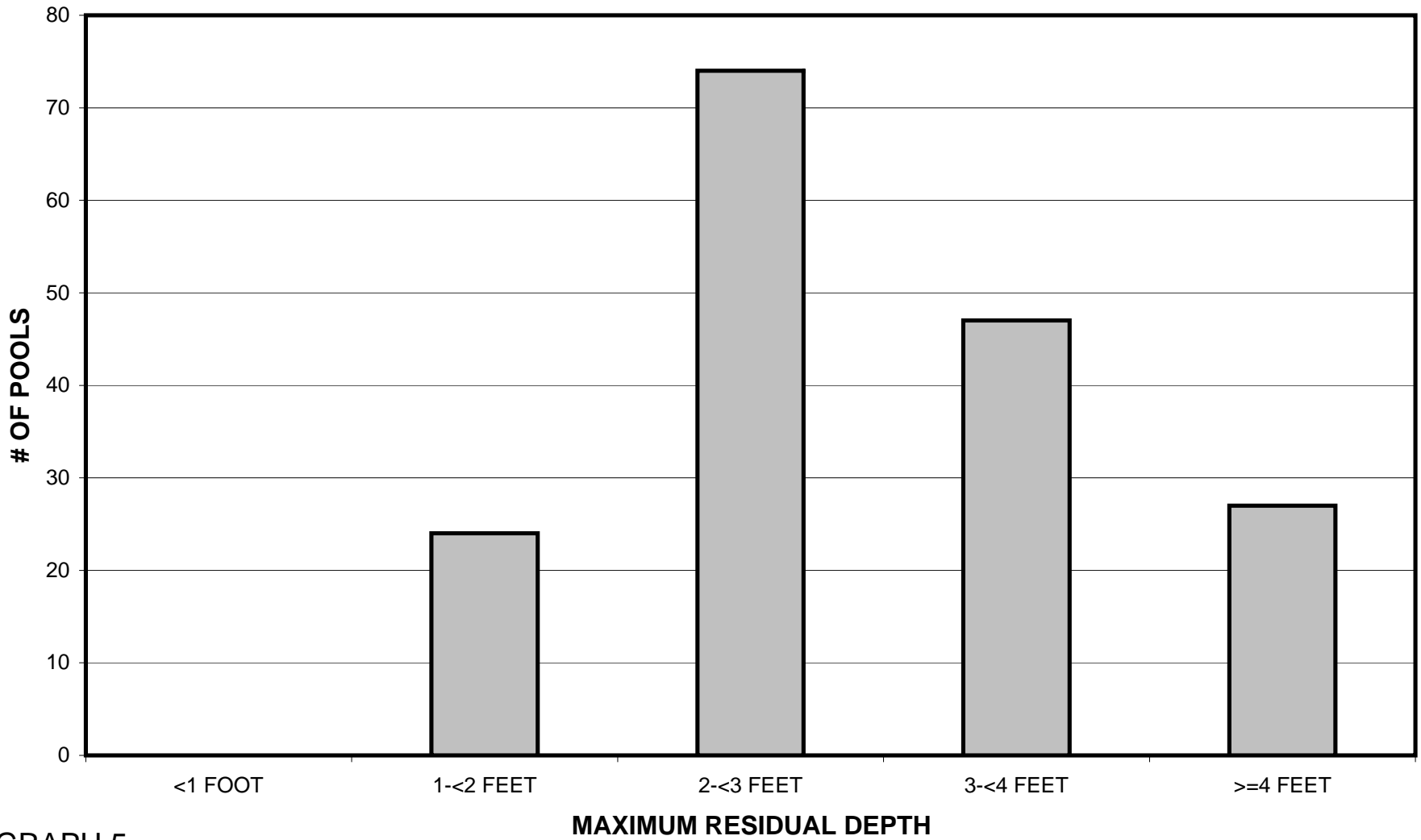
GRAPH 3

**LITTLE NORTH FORK BIG RIVER 2010  
POOL TYPES BY PERCENT OCCURRENCE**



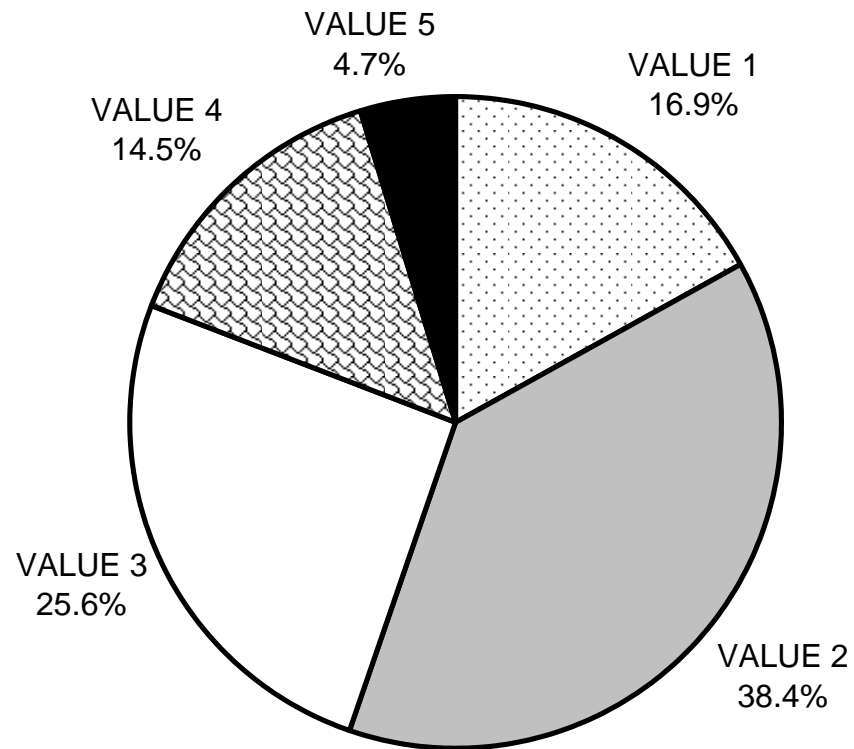
GRAPH 4

# LITTLE NORTH FORK BIG RIVER 2010 MAXIMUM DEPTH IN POOLS



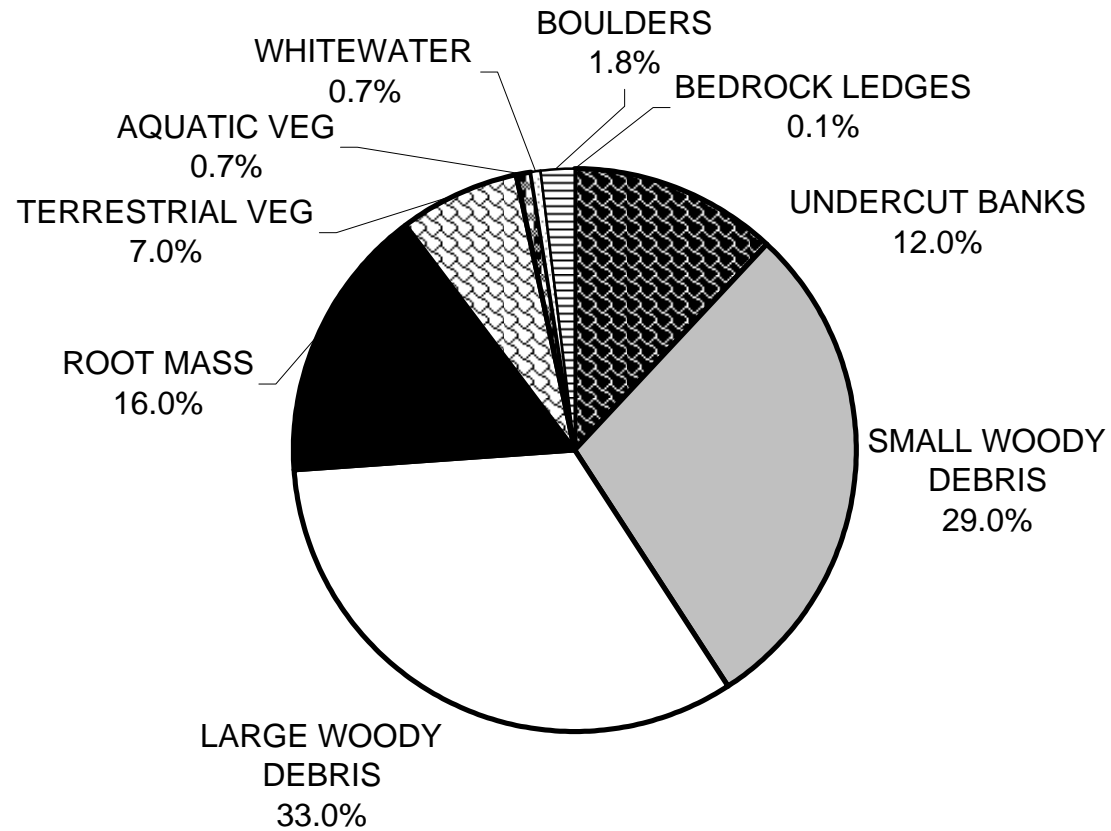
GRAPH 5

# LITTLE NORTH FORK BIG RIVER 2010 PERCENT EMBEDDEDNESS



GRAPH 6

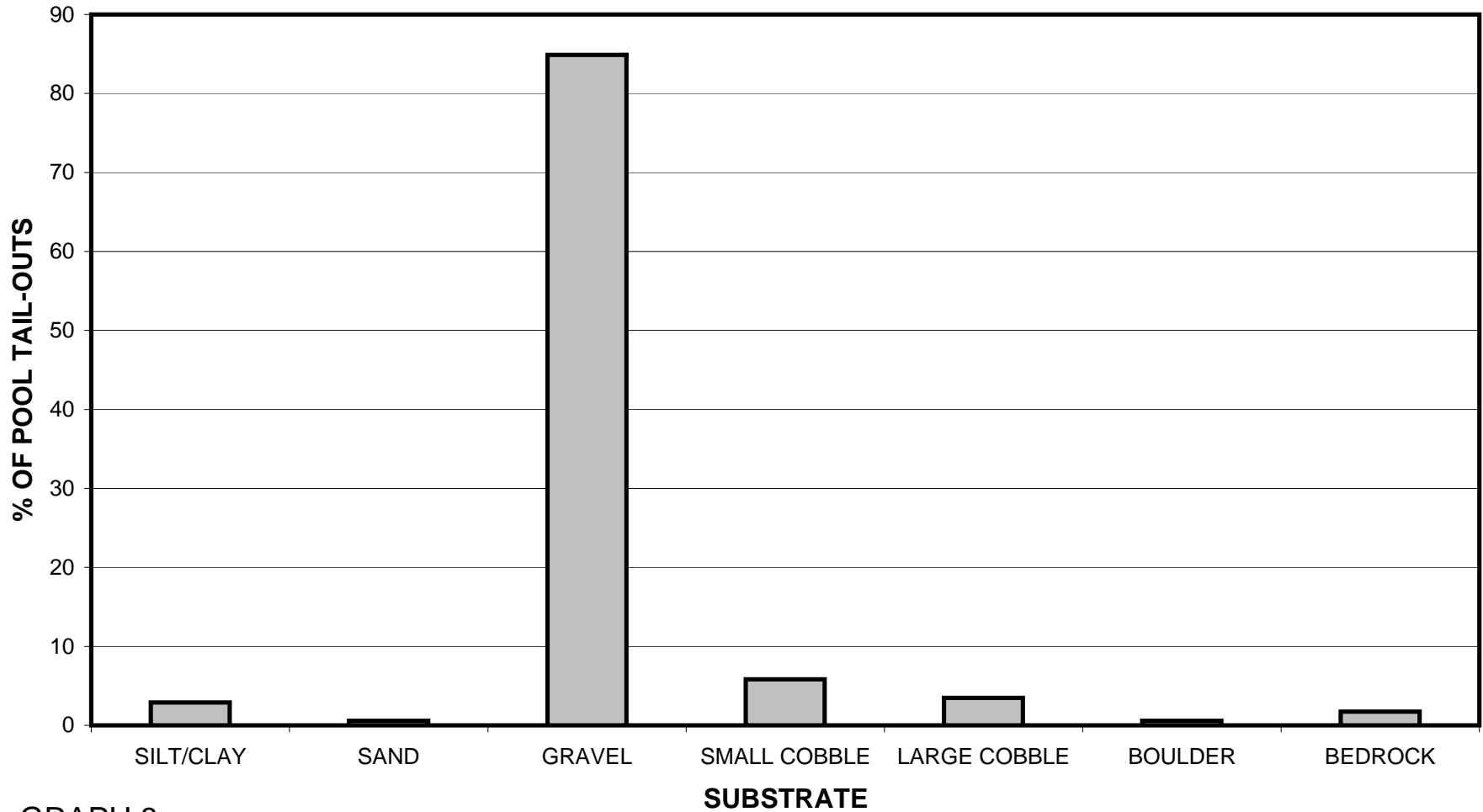
# LITTLE NORTH FORK BIG RIVER 2010 MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

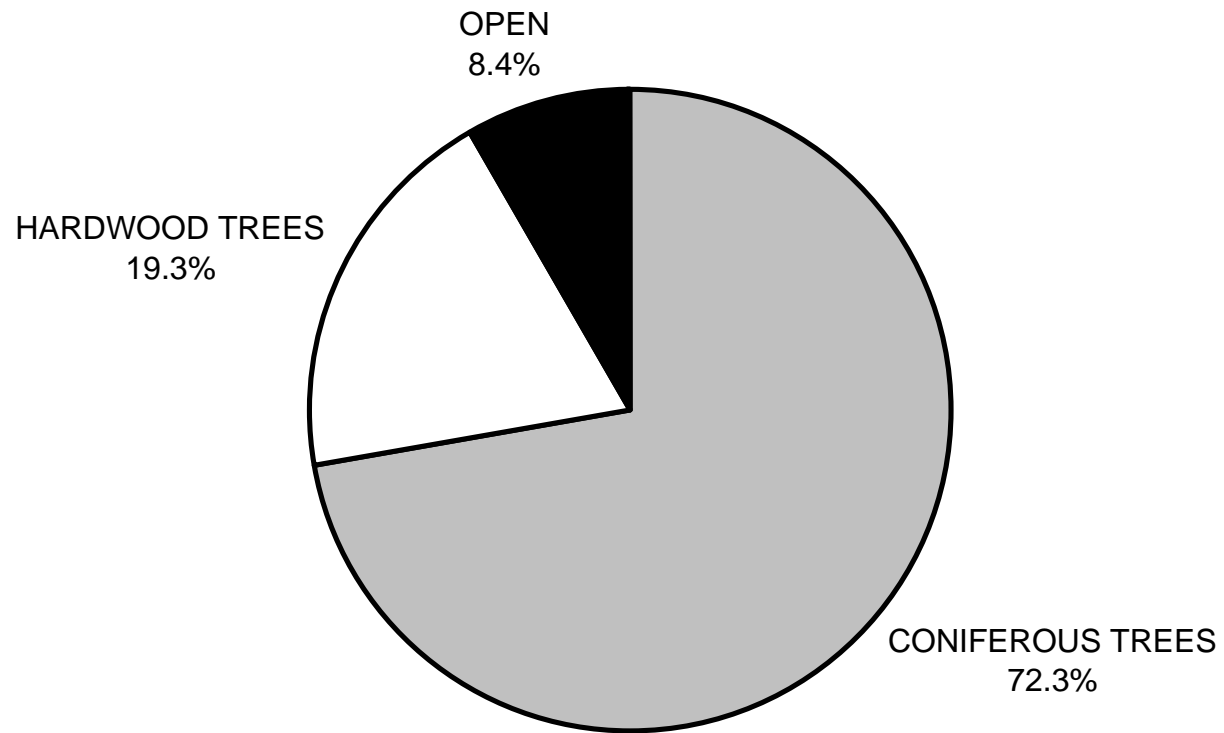


# LITTLE NORTH FORK BIG RIVER 2010 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



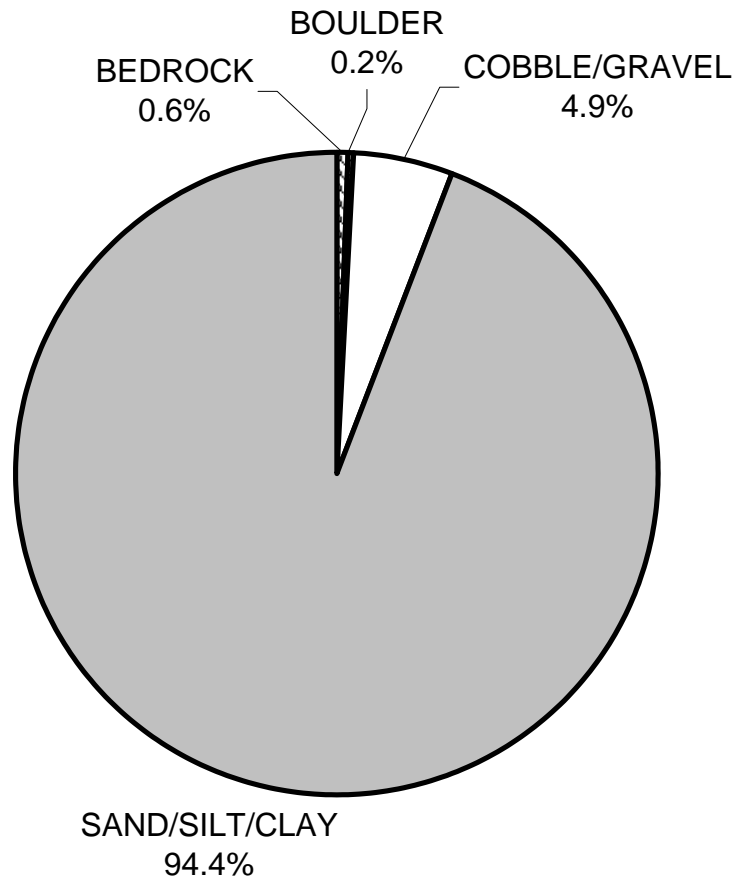
GRAPH 8

# LITTLE NORTH FORK BIG RIVER 2010 MEAN PERCENT CANOPY



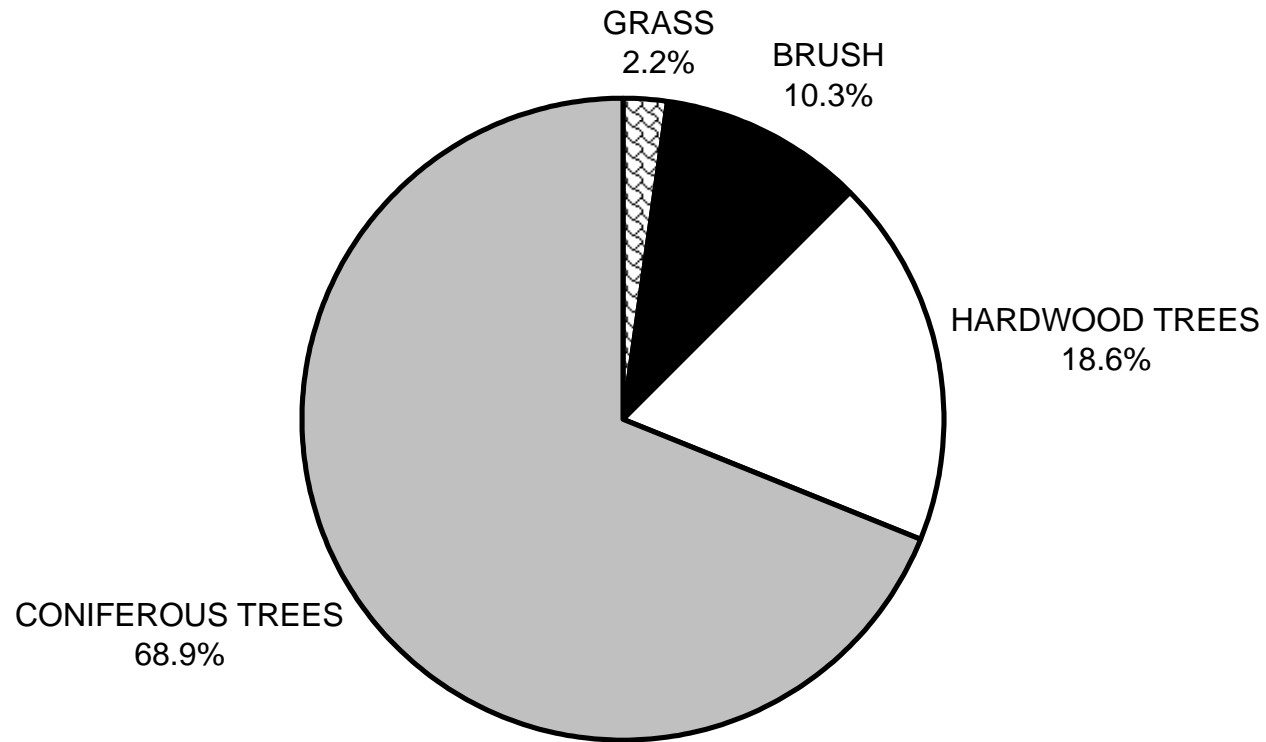
GRAPH 9

**LITTLE NORTH FORK BIG RIVER 2010  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

# LITTLE NORTH FORK BIG RIVER 2010 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

