

STREAM INVENTORY REPORT

Little North Fork Ten Mile River

INTRODUCTION

A stream inventory was conducted from October 16 to October 30, 2012 on Little North Fork Ten Mile River. The survey began at the confluence with North Fork Ten Mile River and extended upstream 2.7 miles.

The Little North Fork Ten Mile 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 Ten Mile 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 Ten Mile River is a tributary to North Fork Ten Mile River, tributary to Ten Mile River, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Little North Fork Ten Mile River's legal description at the confluence with North Fork Ten Mile River is T20N R17W S13. Its location is 39.5902 degrees north latitude and 123.7117 degrees west longitude, LLID number 1237104395902. Little North Fork Ten Mile River is a second order stream and has approximately 3.6 miles of blue line stream according to the USGS Dutchmans Knoll 7.5 minute quadrangle. Little North Fork Ten Mile River drains a watershed of approximately 7.8 square miles. Elevations range from about 70 feet at the mouth of the creek to 800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production and rural development. Vehicle access exists via Georgia-Pacific Industrial Road north of Fort Bragg.

METHODS

The habitat inventory conducted in Little North Fork Ten Mile River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Wildlife (CDFW) personnel that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. This inventory was conducted by a two-person team.

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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 Little North Fork Ten Mile 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 Ten Mile 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

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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 Little North Fork Ten Mile River, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is classified according to a list of nine cover types. In Little North Fork Ten Mile River, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. The shelter rating is then calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers 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 Ten Mile 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 Ten Mile River, the dominant composition type and

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the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

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

11. Average Bankfull Width:

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

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Little North Fork Ten Mile River. In addition, underwater observations were made at two 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 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)

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- 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 Little North Fork Ten Mile 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 October 16 to October 30, 2012 was conducted by M. Groff, I. Mikus, and T. Anderson (CDFW). The total length of the stream surveyed was 14,255 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.0 cfs on November 7, 2012.

Little North Fork Ten Mile River is an F4 channel type for the entire length of the survey, 14,255 feet. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 49 to 55 degrees Fahrenheit. Air temperatures ranged from 42 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 50% pool units, 28% riffle units, 21% flatwater units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 54% pool units, 26% flatwater units, 20% riffle units, and 1% unsurveyed units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 34%; low gradient riffle units, 27%; and run units, 12% (Graph 3). Based on percent total length, mid-channel pool units made up 39%, low gradient riffle units 19%, and step run units 15%.

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A total of 147 pools were identified (Table 3). Main channel pools were the most frequently encountered at 69% (Graph 4), and comprised 75% 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. Sixty-eight of the 147 pools (46%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 147 pool tail-outs measured, 30 had a value of 1 (20.4%); 71 had a value of 2 (48.3%); 42 had a value of 3 (28.6%); four had a value of 4 (2.7%) (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 not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 0, and pool habitats had a mean shelter rating of 13 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 15. Main channel pools had a mean shelter rating of 11 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Little North Fork Ten Mile River. Graph 7 describes the pool cover in Little North Fork Ten Mile 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 90% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 8% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Little North Fork Ten Mile River was 92%. Eight percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 43% and 57%, respectively. Graph 9 describes the mean percent canopy in Little North Fork Ten Mile River.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 80% sand/silt/clay, 12% cobble/gravel, 6% bedrock, and 3% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 51% of the units surveyed. Additionally, 26% of the units surveyed had deciduous trees as the dominant vegetation type, and 22% had brush as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at two sites for species composition and distribution in Little North Fork Ten Mile River on October 24, 2012. The sites were sampled by I. Mikus (CDFW).

Two sites were sampled in Little North Fork Ten Mile River. The reach sites yielded 10 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT) and seven YOY coho salmon.

The following chart displays the information yielded from these sites:

2012 Little North Fork Ten Mile River underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
F4 Channel Type									
10/24/12	1	005	Pool	243	2	0	0	4	0
	2	285	Pool	13,940	8	0	0	3	0

DISCUSSION

Little North Fork Ten Mile River is an F4 channel type. The suitability of F4 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.

The water temperatures recorded on the survey days October 16 to October 30, 2012 ranged from 49 to 55 degrees Fahrenheit. Air temperatures ranged from 42 to 66 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 26% of the total length of this survey, riffles 20%, and pools 54%. Sixty-eight of the 147 (46%) 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.

One hundred one of the 147 pool tail-outs measured had embeddedness ratings of 1 or 2. Forty-six of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be

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25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

One hundred forty-four of the 147 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 13. The shelter rating in the flatwater habitats is 0. 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 Ten Mile 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 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 92%. The percentage of right and left bank covered with vegetation was 97% and 98%, respectively.

RECOMMENDATIONS

- 1) Little North Fork Ten Mile 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 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.

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 confluence with North Fork Ten Mile River. The channel is an F4 for the entire length of the survey.

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102	0003.00	There is a 2' high plunge over a redwood log that is placed across the stream channel perpendicular to the flow. The water is flowing under the log.
125	0004.00	Road 11000 crosses the channel. The crossing is a 20.5' wide x 62' long x 17' high metal railcar bridge with metal abutments on each bank. Below the bridge each bank is lined with boulder rip-rap and there are remnants of an old bridge crossing
491	0010.00	The right bank below Road 9000 is armored with boulder rip-rap approximately 20' long x 20' high.
1030	0019.00	Woody debris is accumulating on the remnants of a railroad trestle in the channel.
2083	0039.00	Buckhorn Creek (Tributary #01) enters from the left bank. For more information, see the 2012 Buckhorn Creek Stream Habitat Inventory Report.
2390	0046.00	Large debris accumulation (LDA #01) contains over 27 pieces of large woody debris (LWD) and measures 5' high x 65' wide x 60' long. The woody debris is accumulating on sprouts of a redwood stump (four large trees) that collapsed into the channel from the right bank. Water does not flow through the LDA; the channel is dry for 16' above it. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 40' wide x 100' long x 2.5' deep. There is a 4' high plunge over the LDA. Fish were observed above the LDA.
2792	0057.00	Road 9000 crosses the channel. The crossing is a 13' wide x 14.7' high x 54' long railcar bridge with metal abutments. Boulder rip-rap lines each bank below the bridge.
4262	0082.00	Left bank seep.
5280	0102.00	LDA #02 contains more than 22 pieces of LWD and measures 8' high x 50' wide x 28' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 5' wide x 20' long x 1' deep. Fish were observed above the LDA.
5455	0105.00	Tributary #02 enters on the right bank. It contributes approximately 10% to Little North Fork Ten Mile River's flow. The water temperature of the tributary is 54 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 55 degrees Fahrenheit. The slope of the tributary is approximately 10%. The channel is steep and full of woody debris, which may hinder fish passage.

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6982	0135.00	Tributary #03 enters on the left bank. It contributes approximately 2% to Little North Fork Ten Mile River's flow. The water temperature of the tributary is 52 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 52 degrees Fahrenheit. The slope of the tributary is approximately 10%. There is a culvert with a 5.5' high plunge at the mouth of the tributary.
6982	0135.00	An erosion site on the left bank measures approximately 50' long x 18' high. The erosion site is threatening the road.
7350	0143.00	Road 9000 crosses the channel. The crossing is a 19' wide x 74' long x 13.4' high railcar bridge. Boulder rip-rap lines each bank below the bridge.
7590	0148.00	Tributary #04 enters on the right bank. The first 100' of the tributary are currently dry. The water temperature of the tributary is 52 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 52 degrees Fahrenheit. The first 120' below the Road 9000 culvert are accessible to salmonids. There is a 1.5' high plunge from the Road 9000 culvert. Above the culvert, the slope increases to 10% and there is a 15' high waterfall.
8364	0167.00	LDA #03 contains 10 pieces of LWD and measures 4' high x 28' wide x 14' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 12' wide x 50' long x 1' deep. There is a 1.8' high plunge over the LDA. Fish were observed above the LDA.
8473	0170.00	LDA #04 contains over 17 pieces of LWD and measures 6' high x 40' wide x 27' long. The woody debris is accumulating on conifers that collapsed in to the creek from the right bank. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 6' wide x 30' long x 2' deep. Fish were observed above the LDA. The conifers that collapsed into the channel left a 25' long x 12' high section of bare bank that is contributing sediment in size ranging from silt to gravel to the channel. The erosion site may threaten the road.
8803	0177.00	An erosion site on the right bank measures approximately 30' long x 15' high. It is contributing sediment ranging in size from silt to gravel to the channel.
8914	0180.00	Tributary #05 enters on the right bank. It contributes approximately 5% to Little North Fork Ten Mile River's flow. The water temperature of the tributary is 52 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 52 degrees Fahrenheit. The

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slope of the tributary is approximately 8%. The tributary may be accessible to salmonids, but no fish were observed.

9361	0188.00	An erosion site on left bank measures approximately 35' long x 9' high. It is contributing sediment ranging in size from silt to gravel to the channel.
9884	0196.00	Barlow Gulch (Tributary #06) enters on the right bank. It contributes approximately 10% to Little North Fork Ten Mile River's flow. The water temperature of the tributary is 52 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 52 degrees Fahrenheit. The slope of the tributary is approximately 3%. A boulder rip-rap cascade at the mouth of the tributary may prevent fish passage. One fish was observed below the Road 9000 bridge.
10179	0201.00	An erosion site on the right bank measures approximately 60' long x 15' high. It is contributing fine sediment ranging in size from silt to gravel to the channel. The erosion site is threatening the road.
10502	0208.00	LDA #06 contains 14 pieces of LWD and measures 6.5' high x 48' wide x 8' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 25' wide x 100' long x 3' deep. There is a 5' high plunge over the LDA. Fish were observed above the LDA.
11010	0216.00	Left bank seep. LDA #07 contains 22 pieces of LWD and measures 7' high x 52' wide x 40' long. The woody debris is accumulating on logs that collapsed into the channel from the right bank. The right bank is now armored with boulder rip-rap measuring 45' long x 15' high. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 30' wide x 150' long x 3' deep. There is a 6' high plunge over the LDA. Fish were observed above the LDA.
11401	0225.00	Blair Gulch (Tributary #07) enters on the right bank. It contributes approximately 10% to Little North Fork Ten Mile River's flow. The water temperature of the tributary is 53 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 53 degrees Fahrenheit. The slope of the tributary is approximately 3%. The channel goes dry 100' upstream from the mouth for over 100'. Salmonids were observed in the tributary.
11870	0235.00	Tributary #08 enters on the left bank. It contributes approximately 1% to Little North Fork Ten Mile River's flow. The water temperature of the tributary is 50 degrees Fahrenheit; the water temperature downstream and upstream of the tributary is 50 degrees Fahrenheit. The

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		slope of the tributary is approximately 9%. The tributary goes dry 80' upstream from the mouth.
12225	0244.00	Mostly dry left bank tributary.
12302	0246.00	The right bank is slumping into the channel. The erosion site measures 20' long x 10' high and is contributing silt and sand to the channel.
12431	0250.00	LWD and SWD are accumulating in the channel.
12529	0252.00	Small woody debris is accumulating in the channel, creating a strainer and a winter flow plunge.
13343	0270.00	Road on right bank is within 20' of the creek.
13600	0277.00	The right bank is vertical and bare for 50' long x 10' high.
14013	0288.00	Tributary #09 enters on the left bank. It contributes approximately 3% to Little North Fork Ten Mile River's flow. The water temperature of the tributary is 49 degrees Fahrenheit, the water temperature downstream of the tributary is 49 degrees Fahrenheit, and the water temperature upstream of the confluence is 50 degrees Fahrenheit. The slope of the tributary is approximately 10%. The tributary is accessible to salmonids, but no fish were observed.
14243	0294.00	End of survey at bridge just downstream of property line. Both banks are lined with boulder rip-rap.

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]	

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

Stream Name: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR17WS13

Latitude: 39:35:25.0N

Longitude: 123:42:37.0

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
1	0	DRY	0.3	16	16	0.1									
61	8	FLATWATER	20.7	61	3736	26.2	9.3	0.5	0.9	475	28958	219	13338		0
3	0	NOSURVEY	1.0	29	88	0.6									
147	147	POOL	50.0	52	7631	53.5	13.6	0.9	2.1	697	102398	871	128075	695	13
82	10	RIFFLE	27.9	34	2784	19.5	12.1	0.2	0.5	370	30343	85	6937		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
294	165				14255					161699			148350		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR17WS13

Latitude: 39:35:25.0N

Longitude: 123:42:37.0W

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 (%)
80	8	LGR	27.2	34	2745	19.3	13	0.2	0.6	420	33622	97	7740		0	97
2	2	HGR	0.7	20	39	0.3	9	0.3	0.8	169	338	36	72		0	97
35	5	RUN	11.9	44	1546	10.8	9	0.4	1.4	338	11813	143	4990		0	91
26	3	SRN	8.8	84	2190	15.4	9	0.5	1.2	703	18288	345	8983		0	87
99	99	MCP	33.7	56	5579	39.1	13	1.0	4.5	748	74058	971	96148	779	11	93
2	2	CCP	0.7	63	126	0.9	12	1.2	2.9	806	1611	1328	2656	1143	3	93
24	24	LSL	8.2	43	1042	7.3	15	0.7	3.8	598	14341	601	14413	457	20	91
9	9	LSR	3.1	38	340	2.4	11	0.5	1.8	418	3761	307	2765	199	4	91
3	3	LSBk	1.0	33	98	0.7	16	0.6	1.8	280	839	232	696	162	2	95
10	10	PLP	3.4	45	446	3.1	19	1.1	4	779	7788	1140	11397	947	18	87
1	0	DRY	0.3	16	16	0.1										
3	0	NS	1.0	29	88	0.6										

Total Units
294

Total Units Fully Measured
165

Total Length (ft.)
14255

Total Area (sq.ft.)
166459

Total Volume (cu.ft.)
149860

Table 3 - Summary of Pool Types

Stream Name: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR17WS13

Latitude: 39:35:25.0N

Longitude: 123:42:37.0W

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
101	101	MAIN	69	56	5705	75	13.0	1.0	749	75669	787	79449	11
46	46	SCOUR	31	42	1926	25	15.0	0.7	581	26729	494	22723	15
Total Units	Total Units Fully Measured			Total Length (ft.)						Total Area (sq.ft.)			Total Volume (cu.ft.)
147	147			7631						102398			102172

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

Stream Name: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR17WS13

Latitude: 39:35:25.0N

Longitude: 123:42:37.0W

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
99	MCP	67	4	4	43	43	34	34	13	13	5	5
2	CCP	1	0	0	1	50	1	50	0	0	0	0
24	LSL	16	2	8	14	58	7	29	1	4	0	0
9	LSR	6	1	11	8	89	0	0	0	0	0	0
3	LSBk	2	0	0	3	100	0	0	0	0	0	0
10	PLP	7	0	0	3	30	3	30	3	30	1	10

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
147	7	5	72	49	45	31	17	12	6	4

Mean Maximum Residual Pool Depth (ft.): 2.1

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Dry Units: 1

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR17WS13

Latitude: 39:35:25.0N

Longitude: 123:42:37.0W

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
80	8	LGR	0	0	0	0	0	0	0	0	0
2	2	HGR	0	0	0	0	0	0	0	0	0
82	10	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
35	5	RUN	0	0	0	0	0	0	0	0	0
26	3	SRN	0	0	0	0	0	0	0	0	0
61	8	TOTAL FLAT	0	0	0	0	0	0	0	0	0
99	99	MCP	19	24	48	5	0	0	0	4	0
2	2	CCP	0	20	80	0	0	0	0	0	0
24	24	LSL	5	32	62	1	1	0	0	0	0
9	9	LSR	18	41	0	41	0	0	0	0	0
3	3	LSBk	0	100	0	0	0	0	0	0	0
10	10	PLP	4	11	82	1	0	0	1	1	0
147	147	TOTAL POOL	15	26	51	5	0	0	0	3	0
3	0	NS									
294	165	TOTAL	15	26	51	5	0	0	0	3	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Dry Units: 1

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR17WS13

Latitude: 39:35:25.0N

Longitude: 123:42:37.0W

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
80	8	LGR	0	0	100	0	0	0	0
2	2	HGR	0	0	100	0	0	0	0
35	5	RUN	0	0	100	0	0	0	0
26	3	SRN	0	0	100	0	0	0	0
99	99	MCP	5	4	89	2	0	0	0
2	2	CCP	0	0	100	0	0	0	0
24	24	LSL	0	13	88	0	0	0	0
9	9	LSR	0	0	100	0	0	0	0
3	3	LSBk	0	0	100	0	0	0	0
10	10	PLP	20	0	80	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR17WS13

Latitude: 39:35:25.0N

Longitude: 123:42:37.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
92	57	43	0	97	98

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:	Little North Fork Ten Mile River	LLID:	1237104395902	Drainage:	Rockport		
Survey Dates:	10/16/2012 to 10/30/2012	Survey Length (ft.):	14255	Main Channel (ft.):	14255	Side Channel (ft.):	0
Confluence Location:	Quad: DUTCHMANS	Legal Description:	T20NR17WS13	Latitude:	39:35:25.0N	Longitude:	123:42:37.0W

STREAM REACH: 1														
Channel Type: F4			Canopy Density (%): 92.4				Pools by Stream Length (%): 53.5							
Reach Length (ft.): 14255			Coniferous Component (%): 56.8				Pool Frequency (%): 50.0							
Riffle/Flatwater Mean Width (ft.): 10.8			Hardwood Component (%): 43.2				Residual Pool Depth (%):							
BFW:			Dominant Bank Vegetation: Coniferous Trees				< 2 Feet Deep: 54							
Range (ft.): 15 to 48			Vegetative Cover (%): 97.7				2 to 2.9 Feet Deep: 31							
Mean (ft.): 27			Dominant Shelter: Large Woody Debris				3 to 3.9 Feet Deep: 12							
Std. Dev.: 7			Dominant Bank Substrate Type: Sand/Silt/Clay				>= 4 Feet Deep: 4							
Base Flow (cfs.): 1.0			Occurrence of LWD (%): 29				Mean Max Residual Pool Depth (ft.): 2.1							
Water (F): 49 - 55			Air (F): 42 - 66				Mean Pool Shelter Rating: 13							
Dry Channel (ft): 16			LWD per 100 ft.:											
			Riffles: 3											
			Pools: 8											
			Flat: 4											
Pool Tail Substrate (%): Silt/Clay: 1			Sand: 1		Gravel: 90		Sm Cobble: 8		Lg Cobble: 1		Boulder: 0		Bedrock: 0	
Embeddedness Values (%): 1. 20.4			2. 48.3		3. 28.6		4. 2.7		5. 0.0					

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR17WS13

Latitude: 39:35:25.0N

Longitude: 123:42:37.0W

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	8	11	5.8
Boulder	5	5	3.0
Cobble / Gravel	18	20	11.5
Sand / Silt / Clay	134	129	79.7

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	0.3
Brush	38	34	21.8
Hardwood Trees	46	40	26.1
Coniferous Trees	78	90	50.9
No Vegetation	2	1	0.9

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Little North Fork Ten Mile River

LLID: 1237104395902

Drainage: Rockport

Survey Dates: 10/16/2012 to 10/30/2012

Confluence Location: Quad: DUTCHMANS

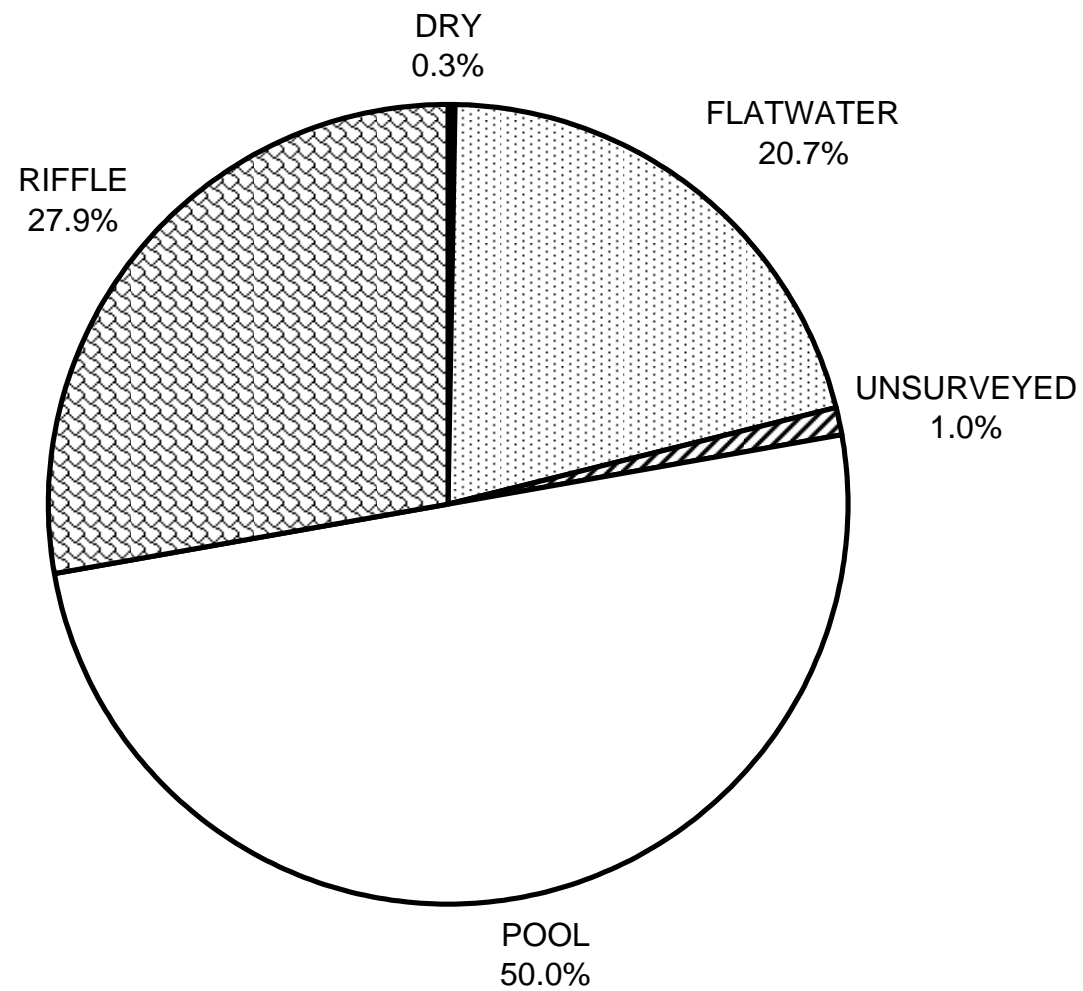
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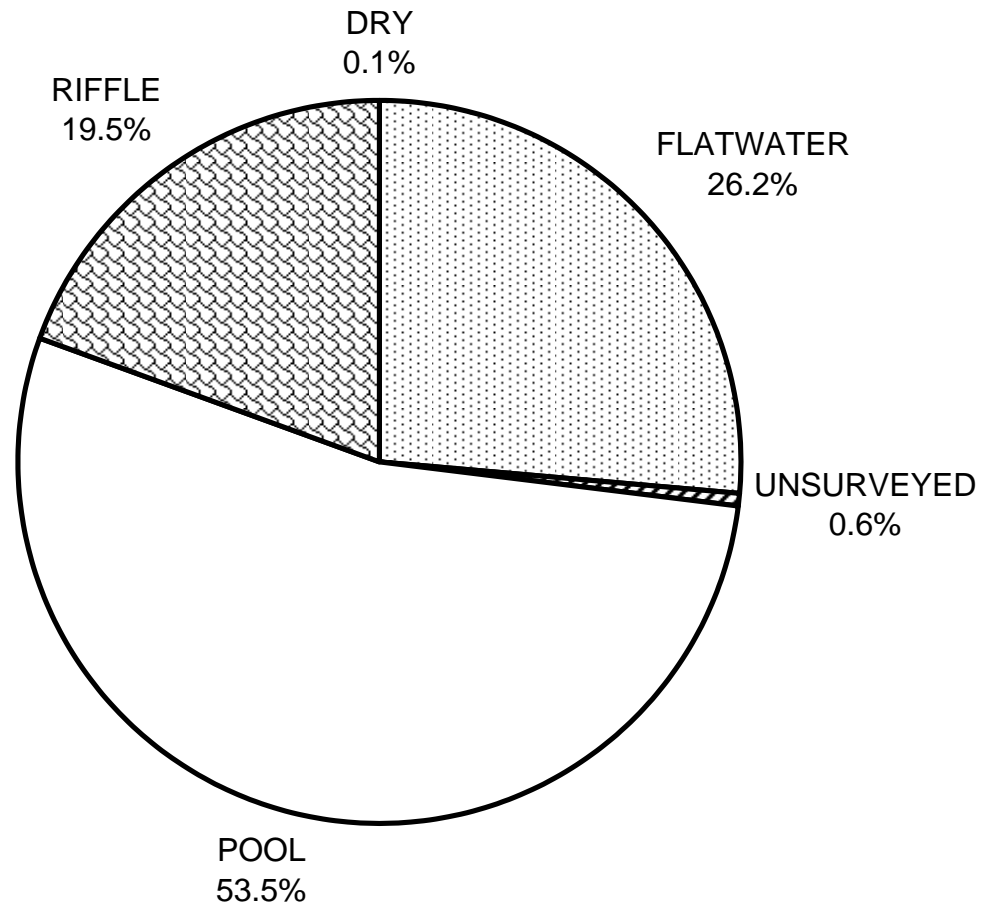
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	15
SMALL WOODY DEBRIS (%)	0	0	26
LARGE WOODY DEBRIS (%)	0	0	51
ROOT MASS (%)	0	0	5
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	3
BEDROCK LEDGES (%)	0	0	0

LITTLE NORTH FORK TEN MILE RIVER 2012 HABITAT TYPES BY PERCENT OCCURRENCE



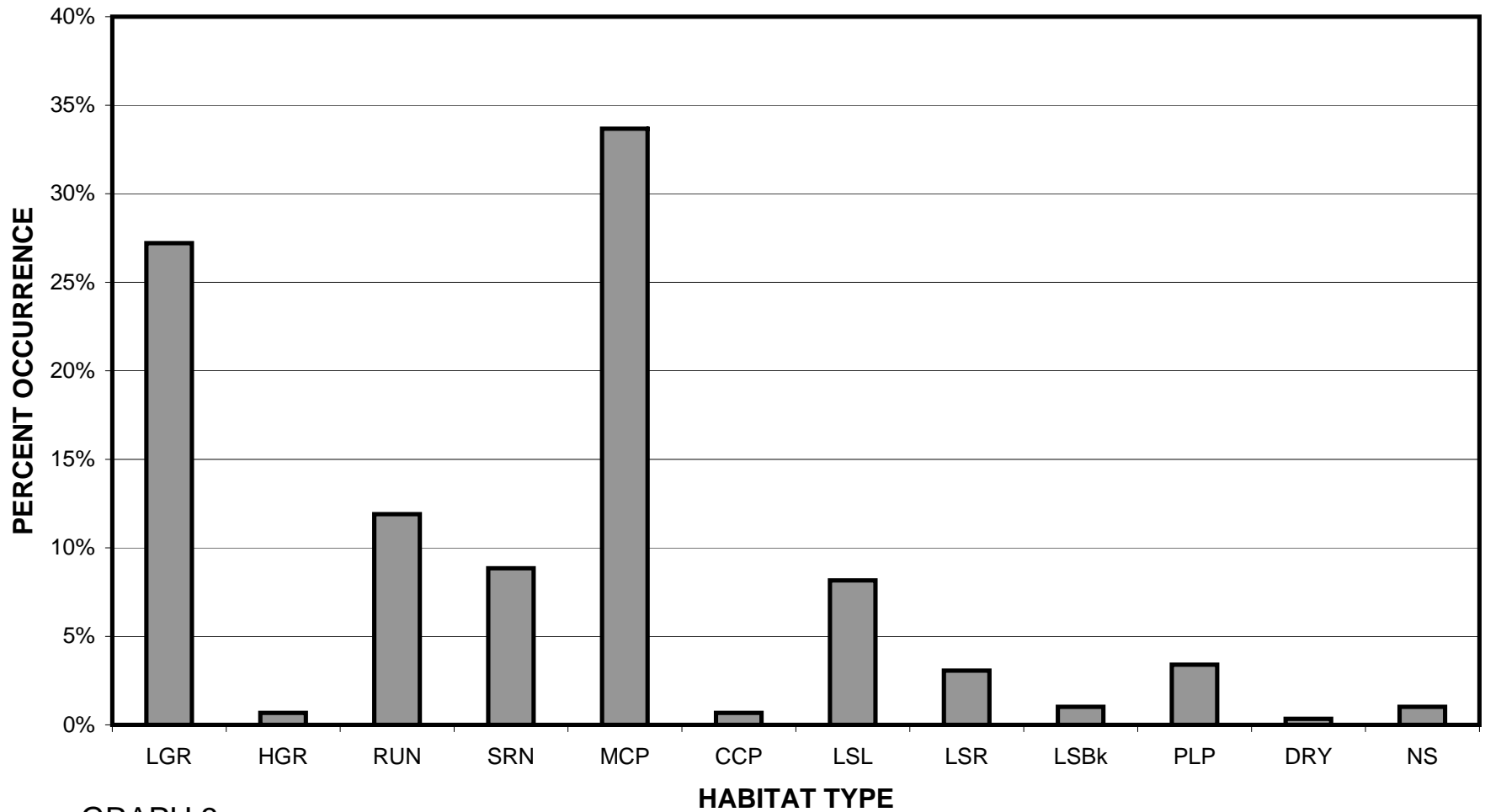
GRAPH 1

LITTLE NORTH FORK TEN MILE RIVER 2012 HABITAT TYPES BY PERCENT TOTAL LENGTH



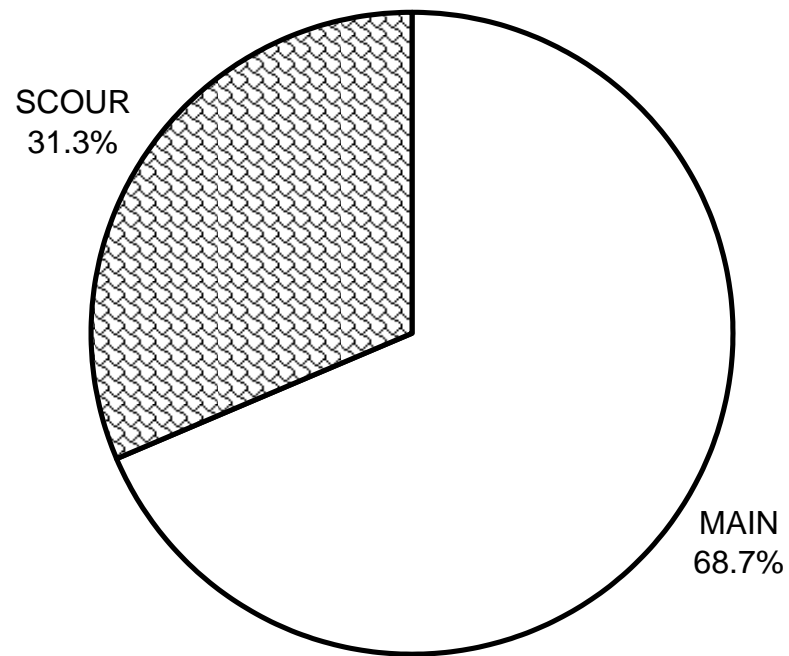
GRAPH 2

LITTLE NORTH FORK TEN MILE RIVER 2012 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

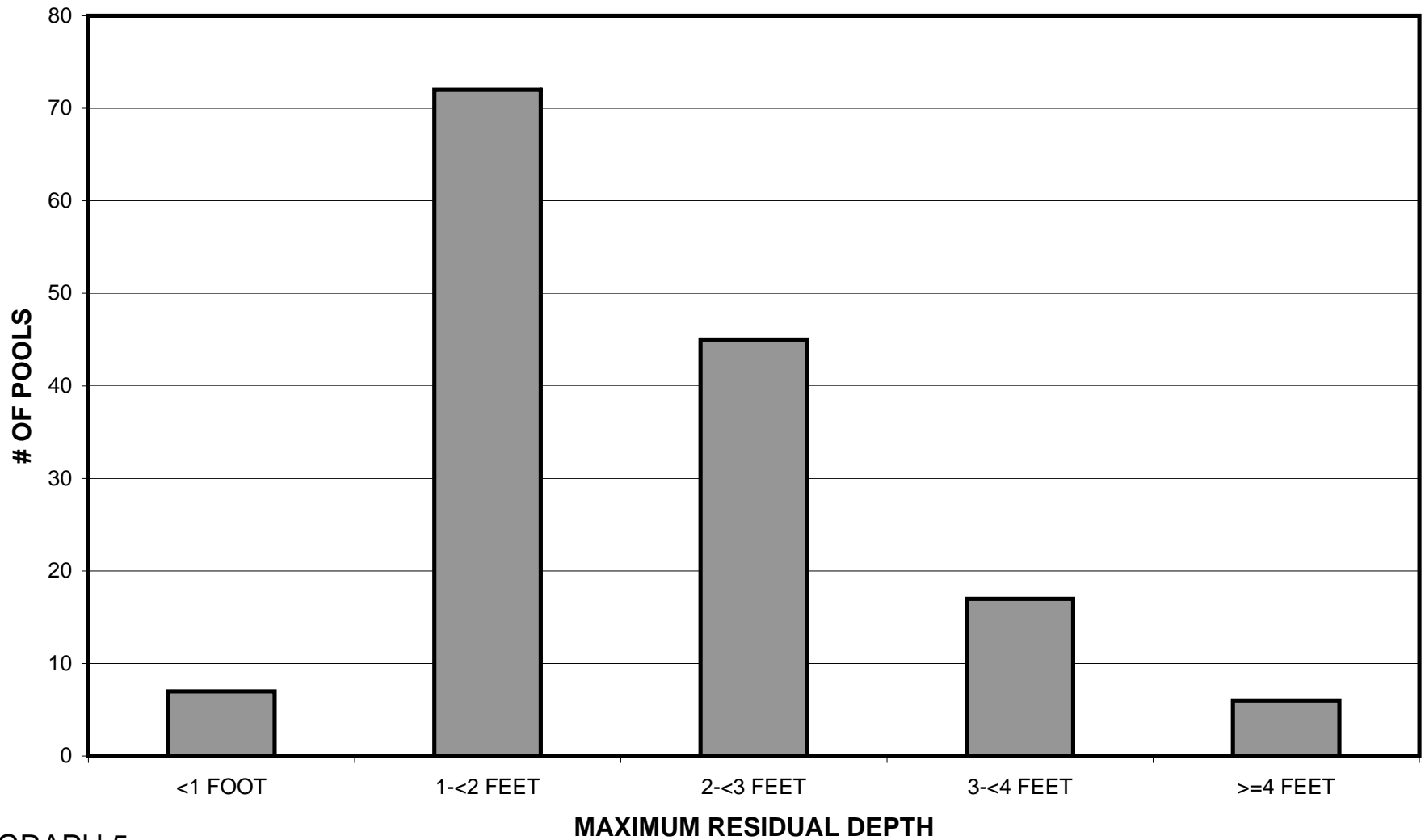
**LITTLE NORTH FORK TEN MILE RIVER 2012
POOL TYPES BY PERCENT OCCURRENCE**



GRAPH 4

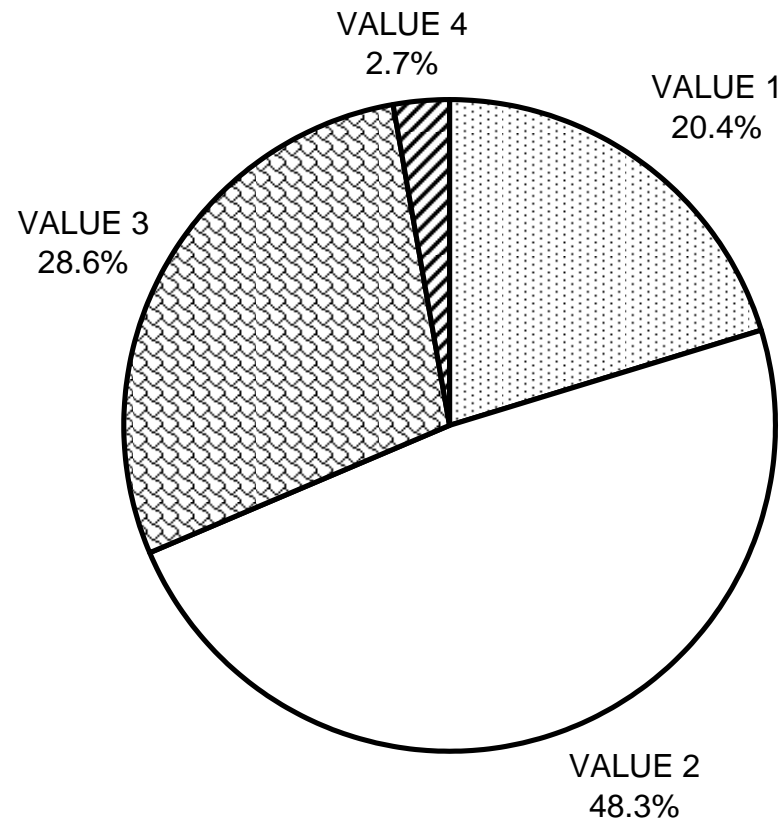
LITTLE NORTH FORK TEN MILE RIVER 2012

MAXIMUM DEPTH IN POOLS



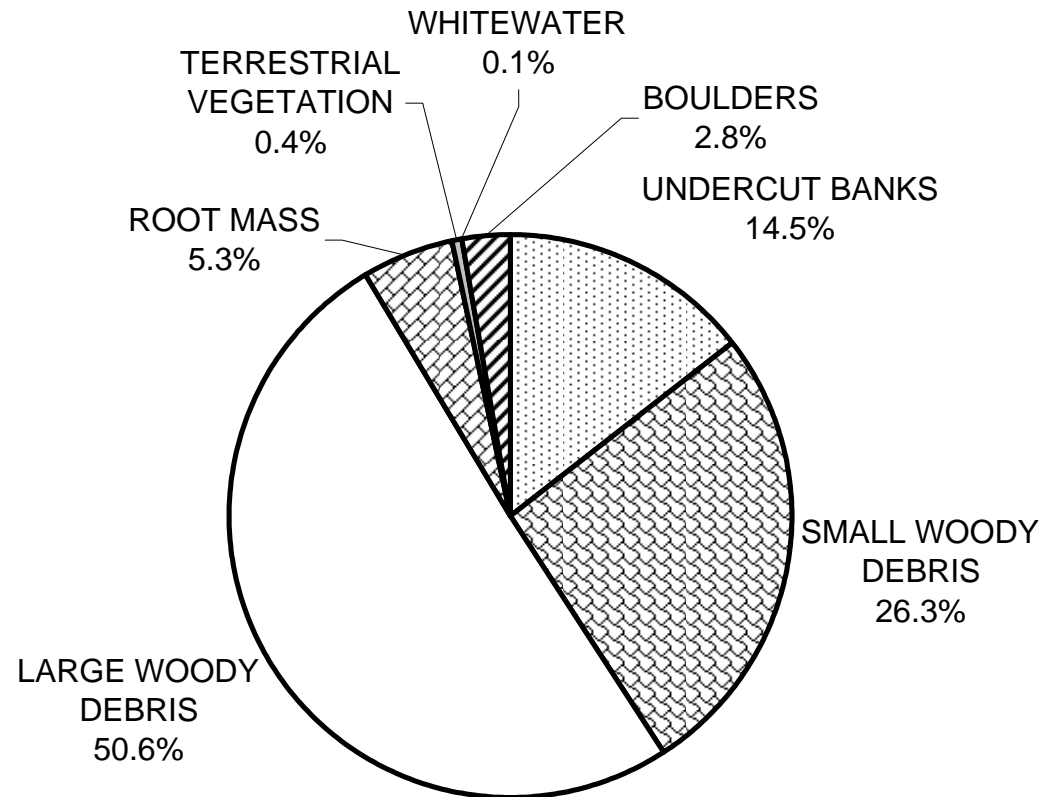
GRAPH 5

LITTLE NORTH FORK TEN MILE RIVER 2012 PERCENT EMBEDDEDNESS



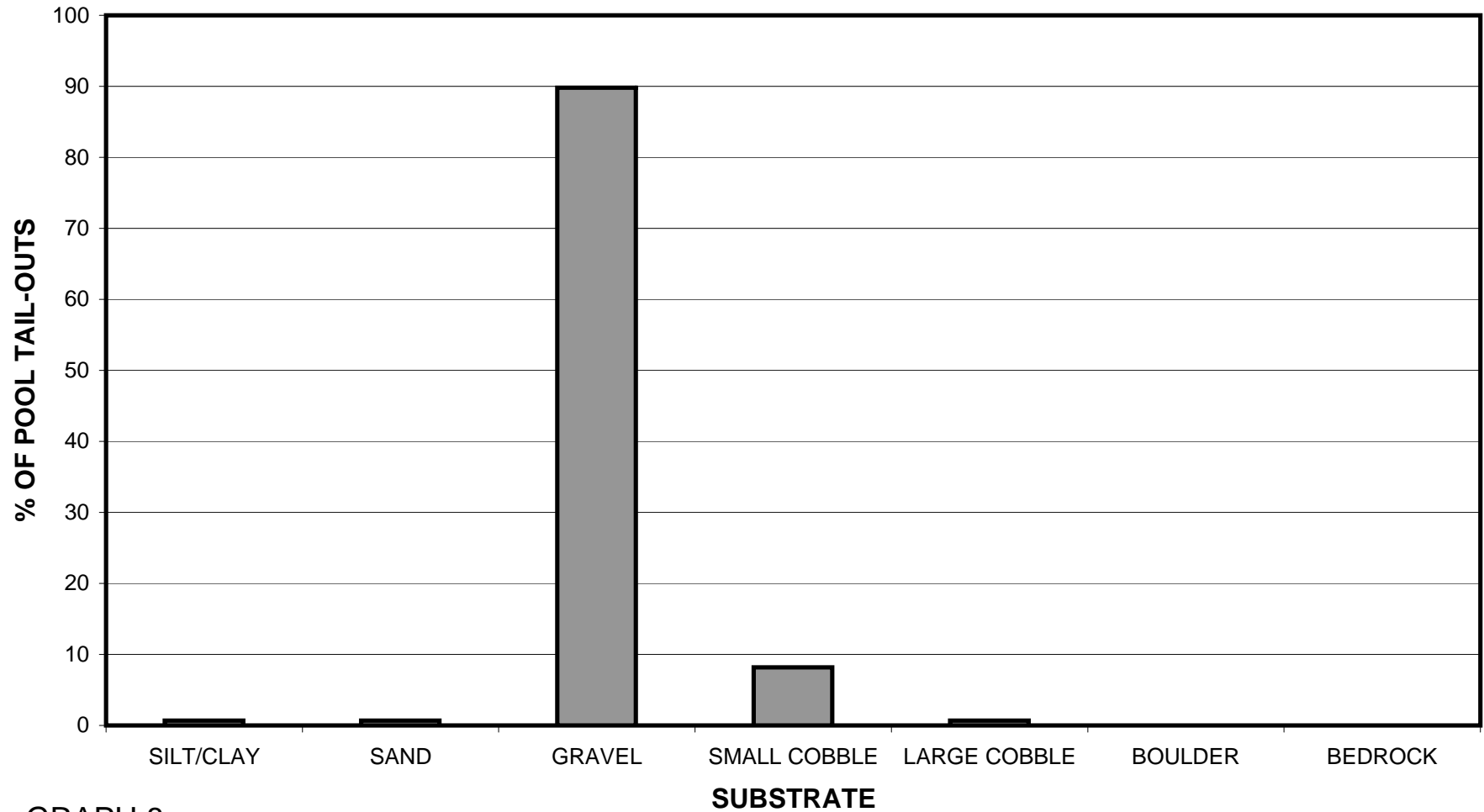
GRAPH 6

LITTLE NORTH FORK TEN MILE RIVER 2012 MEAN PERCENT COVER TYPES IN POOLS



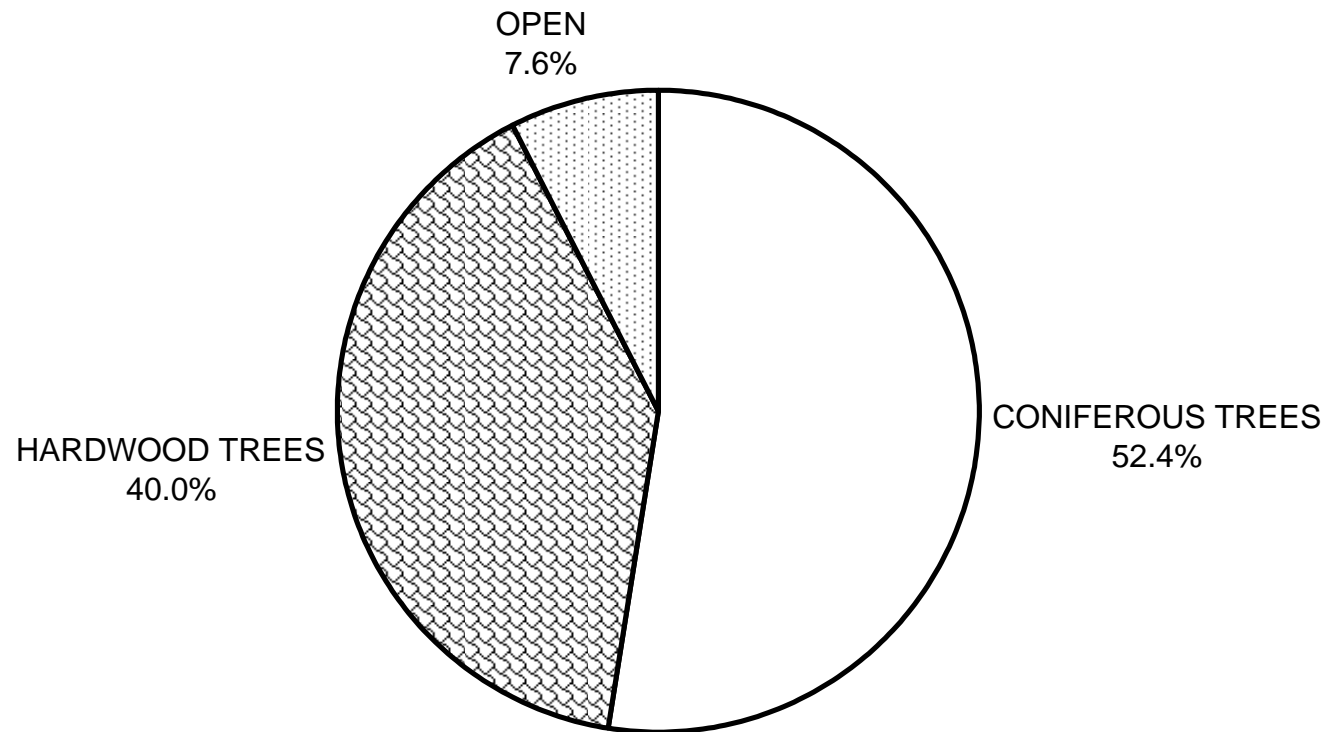
GRAPH 7

LITTLE NORTH FORK TEN MILE RIVER 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



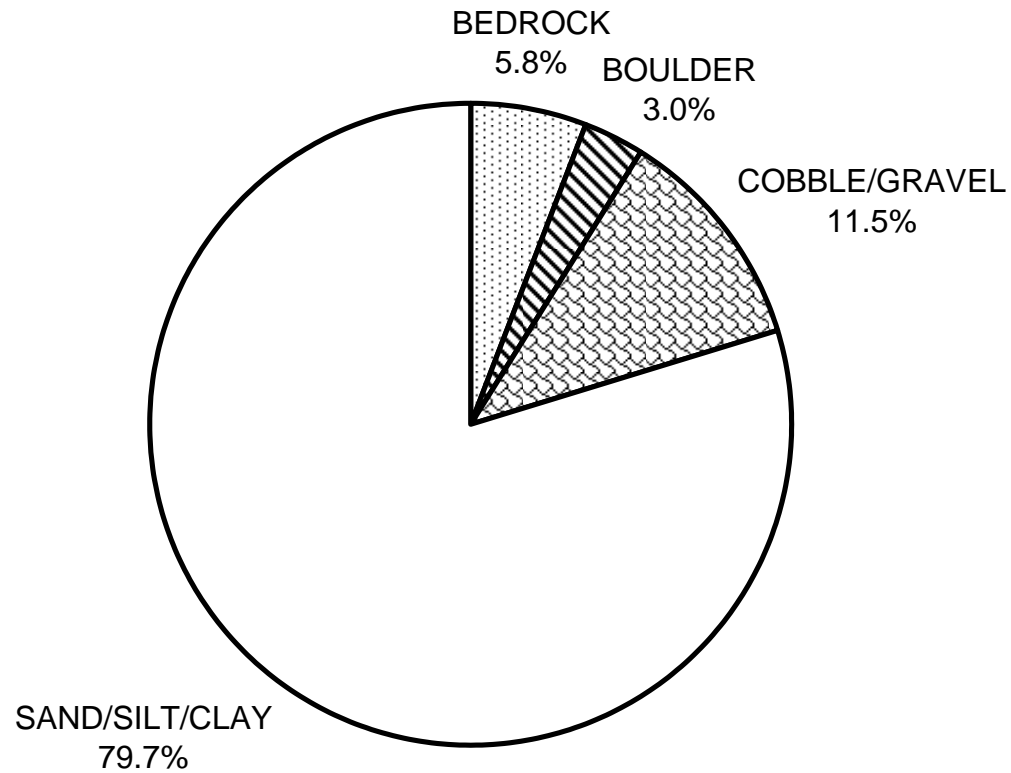
GRAPH 8

**LITTLE NORTH FORK TEN MILE RIVER 2012
MEAN PERCENT CANOPY**



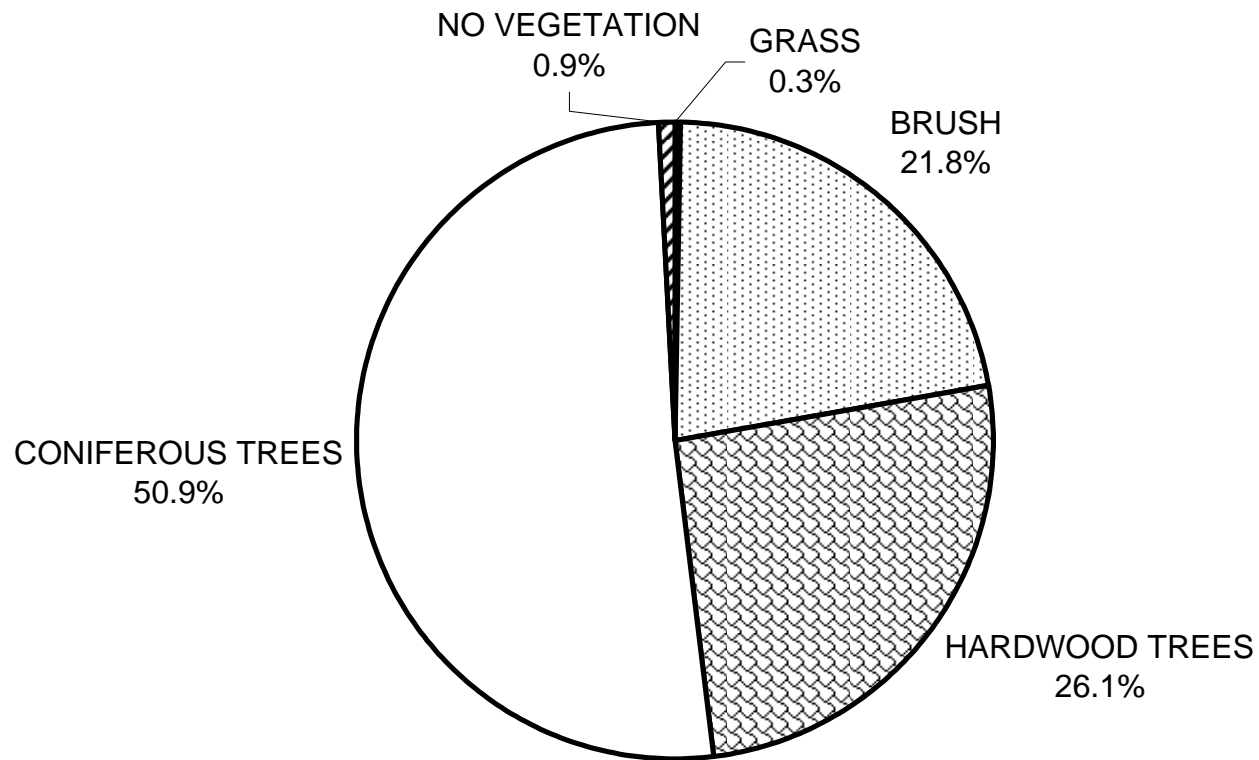
GRAPH 9

**LITTLE NORTH FORK TEN MILE RIVER 2012
DOMINANT BANK COMPOSITION IN SURVEY REACH**



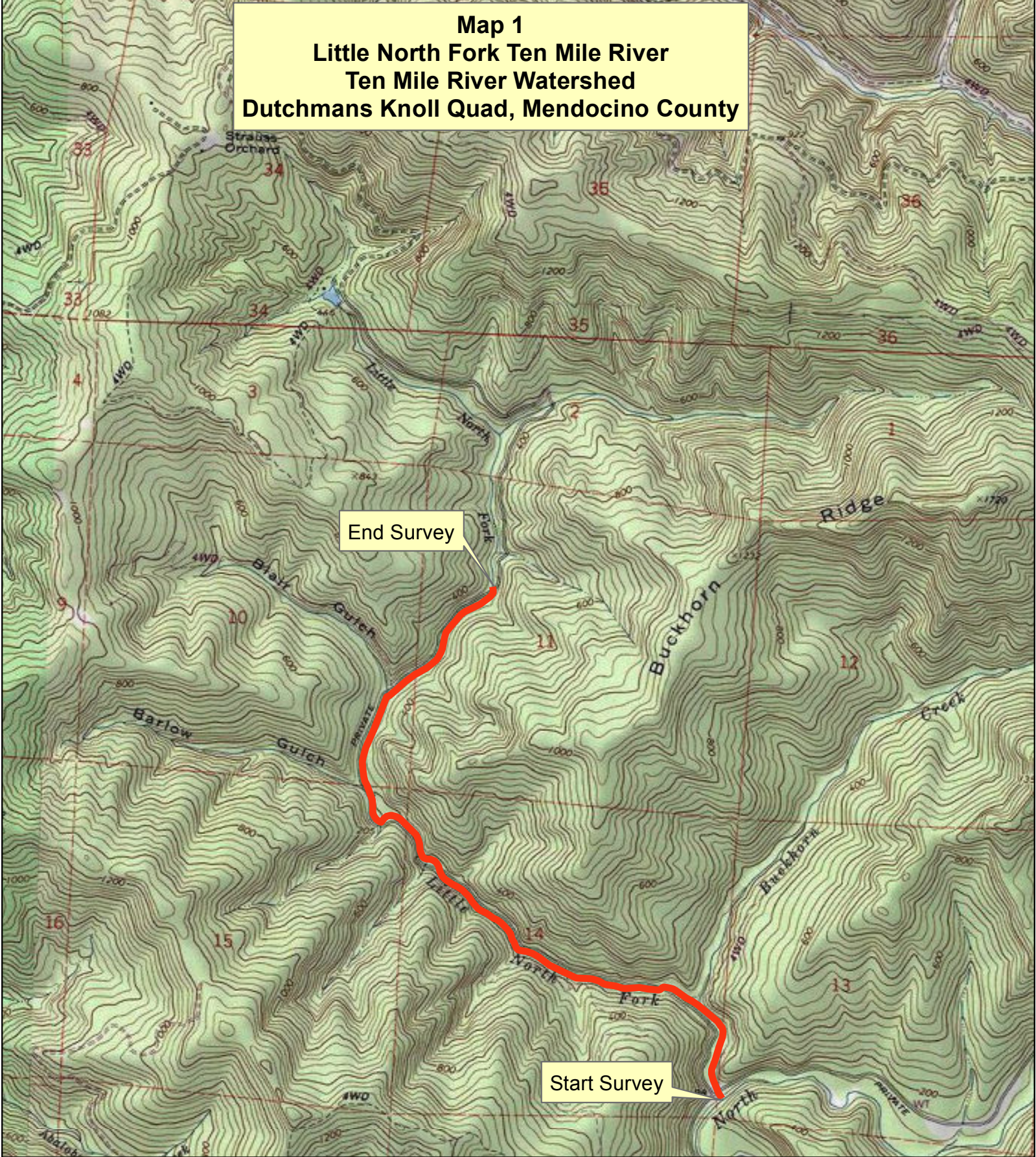
GRAPH 10

LITTLE NORTH FORK TEN MILE RIVER 2012 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Map 1
Little North Fork Ten Mile River
Ten Mile River Watershed
Dutchmans Knoll Quad, Mendocino County



 Channel Type F4

0 1,600 3,200 Feet

