STREAM INVENTORY REPORT

Little River

INTRODUCTION

A stream inventory was conducted July 7 to July 10, 2008 on Little River. The survey began at the confluence with Pacific Ocean and extended upstream 4.1 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Little River.

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 River is a tributary to Pacific Ocean, located in Mendocino County, California (Map 1). Little River's legal description at the confluence with Pacific Ocean is T16N R17W S06. Its location is 39.2739 degrees north latitude and 123.7913 degrees west longitude, LLID number 1237900392738. Little River is a first order stream and has approximately 5.6 miles of blue line stream according to the USGS Mendocino 7.5 minute quadrangle. Little River drains a watershed of approximately 7.0 square miles. Elevations range from about 0 feet at the mouth of the creek to 500 feet in the headwater areas. Mixed conifer and mixed hardwood forest dominates the watershed. The watershed is within a state park and is managed for recreation. Vehicle access exists via Highway 1.

METHODS

The habitat inventory conducted in Little River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries Commission (PSMFC) Fisheries Technicians 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 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.

Little River

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 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 River habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Little 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 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 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 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 River, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

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

11. Average Bankfull Width:

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

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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Little 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

Little River

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 7 to July 10, 2008, was conducted by W. Holloway and D. Wright (PSMFC). The total length of the stream surveyed was 21,391 feet with an additional 188 feet of side channel. The first 898 feet of Little River were not surveyed. The data included in this report is for the 20,493 feet actually surveyed.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.26 cfs on July 10, 2008.

Little River is an unknown channel type for the first 898 feet (Reach 1), an F3 channel type for 4,344 feet of the stream surveyed (Reach 2), a B2 channel type for 1,080 feet of the stream surveyed (Reach 3), an F3 channel type for 3,862 feet of the stream surveyed (Reach 4), and an F4 channel type for 11,395 feet of the stream surveyed (Reach 5). F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. B2 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and boulder-dominant substrates. 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 56 to 68 degrees Fahrenheit. Air temperatures ranged from 61 to 78 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 41% pool units, 29% flatwater units, and 29% riffle units (Graph 1). Based on total length of Level II habitat types there were 48% flatwater units, 31% pool units, and 21% riffle units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 28%; step run units, 19%; and lateral scour pool units, 19% (Graph 3). Based on percent total length, step run units made up 38%, low gradient riffle units 20%, and lateral scour pool (log enhanced) units 13%.

A total of 128 pools were identified (Table 3). Scour pools were the most frequently encountered at 88% (Graph 4), and comprised 88% 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. Fifty-six of the 128 pools (44%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 128 pool tail-outs measured, 32 had a value of 1 (25%); 45 had a value of 2 (35.2%); 28 had a value of 3 (21.9%); 7 had a value of 4 (5.5%); 16 had a value of 5 (12.5%); (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 32, flatwater habitat types had a mean shelter rating of 36, and pool habitats had a mean shelter rating of 67 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 80. Scour pools had a mean shelter rating of 71 and main channel pools had a mean shelter rating of 34 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Little River. Graph 7 describes the pool cover in Little River. Large woody debris is the dominant pool cover type followed by terrestrial vegetation.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 59% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 20% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Little River was 77%. Twenty-three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 28% and 72%, respectively. Graph 9 describes the mean percent canopy in Little River.

For the stream reach surveyed, the mean percent right bank vegetated was 80%. The mean percent left bank vegetated was 81%. The dominant elements composing the structure of the stream banks consisted of 86% sand/silt/clay, 6% bedrock, 4% boulder, and 4% cobble/gravel (Graph 10). Grass was the dominant vegetation type observed in 50% of the units surveyed. Additionally, 49% of the units surveyed had brush as the dominant vegetation type, and less than 1% had coniferous trees as the dominant vegetation type (Graph 11).

DISCUSSION

The first 898 feet of Little River were not surveyed. Little River is an F3 channel type for the next 4,344 feet, a B2 channel type for the next 1,080 feet, an F3 channel type for the next 3,862, and an F4 channel type for the remaining 11,395 feet. The suitability of F3, B2, and F4 channel types for fish habitat improvement structures is as follows: F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover. B2 channel types excellent for plunge weirs, single and opposing wing-deflectors, and log cover. 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 July 7 to July 10, 2008, ranged from 56 to 68 degrees Fahrenheit. Air temperatures ranged from 61 to 78 degrees Fahrenheit. 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 48% of the total length of this survey, riffles 21%, and pools 31%. Fifty-six of the 128 (44%) 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 structures that will increase or deepen pool habitat is recommended.

Seventy-seven of the 128 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty-five of the pool tail-outs had embeddedness ratings of 3 or 4. Sixteen of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

One-hundred-one of the 128 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 67. The shelter rating in the flatwater habitats is 36. 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 River. Large woody debris is the dominant cover type in pools followed by terrestrial vegetation. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover 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 77%. Reach 2 had a canopy density of 76.4%, Reach 3 had a canopy density of 70.6%, Reach 4 had a canopy density of 69.6%, and Reach 5 had a canopy density of 79.8%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 80% and 81%, 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 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 the confluence with the Pacific Ocean. Stream habitat data was not collected for the first 898 feet of Little River due to the presence of a coastal lagoon (Reach 1).
898	0002.00	Start of data collection. The channel type is an F3 (start of Reach 2).
1256	0005.00	Tributary #01 (Beal Creek) enters on the right bank. The tributary contributes to approximately 5% of Little River's flow. The water temperature downstream of the tributary is 60 degrees Fahrenheit, the water temperature of the tributary is 58 degrees Fahrenheit, and the water temperature upstream of the confluence is 61 degrees Fahrenheit. Fish are not observed in the 50' explored, though it appears accessible. The tributary is primarily marsh with substrate consisting of fines. The flow is quite slow.
1506	0010.00	There is a foot bridge crossing the unit.
2346	0026.00	The creek flow under a bridge culvert. The channel is confined by cement walls.
2807	0034.00	There is a culvert.
4185	0054.00	Log debris accumulation (LDA) #01 contains 11 pieces of large woody debris (LWD) and measures 7' high x 30' wide x 9' long. Water flows through visible gaps. Retained sediment ranges from sand to gravel and measures 30' wide x 10' long x 2' deep. Fish are present above the LDA.
5242	0065.00	The channel changes from an F3 to a B2 (start of Reach 3).
6322	0080.00	The channel changes from a B2 to an F3 (start of Reach 4)

6499	0086.00	The channel is confined by cemented walls under bridge footings.
6836	0093.00	There is a foot bridge crossing the stream. The channel is confined by concrete for about 15' underneath the bridge.
8216	0110.00	The upper 15' of the habitat unit is confined by the concrete walls of the bridge footings.
8283	0111.00	The left bank is a concrete and rock wall.
8438	0114.00	This is the last habitat unit with a positive identification of coho salmon juvenile. They have been present throughout the survey up to this point.
8554	0116.00	LDA #02 contains 21 pieces of LWD and measures 7.5' high x 53' wide x 12' long. Water flows through visible gaps. Retained sediment ranges from sand to gravel and measures 11' wide x 30' long x 1.5' deep. Fish are present above the LDA.
8880	0122.00	The upper 15' of the habitat unit are confined by concrete walls under a foot bridge.
9015	0124.00	Young-of-the-year (YOY) observed.
9538	0131.00	The upper 15' of the habitat unit is confined by concrete walls under a foot a bridge.
9854	0135.00	LDA #03 contains 15 pieces of LWD and measures 9.5' high x 53' wide x 15' long. Water flows through visible gaps. Retained sediment ranges from sand to gravel and measures 14.5' wide x 23' long x 1.5' deep. Fish are present above the LDA. As a result of the LDA, the left bank is failing.
9914	0136.00	Tributary #02 enters on the left bank. The tributary contributes to approximately 2% of Little River's flow. The water temperature downstream of the tributary is 61 degrees Fahrenheit, the water temperature of the tributary is 59 degrees Fahrenheit, and the water temperature upstream of the confluence is 60 degrees Fahrenheit. Fish are not observed in the 50' explored though it does appear accessible. The tributary itself is very shallow and narrow riffle dominated, with some very small pools. The channel changes from an F3 to an F4 (start of Reach 5).
10004	0137.00	LDA #04 contains 12 pieces of LWD and measures 6' high x 35' wide x 30' long. Water flows through visible gaps. Retained sediment ranges

		from sand to gravel and measures 15’ wide x 30’ long x 2’ deep. Fish are present above the LDA.
10208	0140.00	Fifteen feet of the habitat unit are confined by concrete walls under a foot bridge.
10722	0149.00	Tributary #03 enters on the right bank. The tributary contributes to approximately 2% of Little River’s flow. The water temperature downstream of the tributary is 61 degrees Fahrenheit, the water temperature of the tributary is 59 degrees Fahrenheit, and the water temperature upstream of the confluence is 62 degrees Fahrenheit. Fish are not observed in the 100 feet explored though it does appear accessible to salmonids. The tributary itself is very shallow and narrow with lots of sediment accumulation. The flow goes subsurface after about 40’ upstream from the mouth.
12976	0179.00	LDA #05 contains 27 pieces of LWD and measures 6’ high x 50’ wide x 40’ long. Water flows through visible gaps. Retained sediment ranges from sand to gravel and measures 16’ wide x 30’ long x 2.5’ deep. Fish are present above the LDA.
14276	0196.00	LDA #06 contains 25 pieces of LWD and measures 6.5’ high x 60’ wide x 2.5’ long. Water flows through, though there are no visible gaps. Retained sediment ranges from silt to sand and measures 30’ wide x 30’ long x 3.5’ deep. Fish are seen above the LDA.
15192	0206.00	LDA #07 contains 25 pieces of LWD and measures 5.5’ high x 55’ wide x 18’ long. Water flows through, though there no visible gaps. Retained sediment ranges from silt to gravel and measures 45’ wide x 30’ long x 4.5’ deep. Fish are present above the LDA.
15210	0207.00	Tributary #04 enters on the left bank. The tributary contributes to approximately 2% of Little River’s flow. The water temperature downstream of the tributary is 61 degrees Fahrenheit, the water temperature of the tributary is 60 degrees Fahrenheit, and the water temperature upstream of the confluence is 61 degrees Fahrenheit. Fish are not observed in the 75 feet explored. The tributary is narrow and shallow with lots of vegetation in channel.
15447	0209.00	The right bank is failing.
15694	0214.00	Tributary #05 enters on the right bank. The tributary contributes to approximately 2% of the flow to Little River. Fish are not observed in the 20’ explored. The tributary has a very low flow, is narrow, and has a high gradient.

Little River

17934	0248.00	Tributary #06 enters on the right bank. The tributary contributes to 2% of Little River's flow. The water temperature downstream of the tributary is 64 degrees Fahrenheit, the water temperature of the tributary is 60 degrees Fahrenheit, and the water temperature upstream of the confluence is 62 degrees Fahrenheit. It does not appear accessible to fish for the 40 feet explored. The tributary is shallow, with little flow and a high gradient.
18691	0258.00	There is a right bank tributary that has bedrock substrate, a high gradient cascade and is not accessible to fish.
18755	0260.00	There are 2 footbridge crossings in this habitat unit.
19608	0272.00	There is a landslide on the left bank that is 50' long x 30' high.
20017	0284.00	Last observation of steelhead YOY. Juveniles and trout over 1 year of age have been abundant throughout the survey until this point.
20494	0291.00	Tributary #07 enters on the left bank. The tributary contributes to approximately 30% of Little River's flow. The water temperature downstream of the tributary is 60 degrees Fahrenheit, the water temperature of the tributary is 59 degrees Fahrenheit, and the water temperature upstream of the confluence is 62 degrees Fahrenheit. The tributary is accessible to fish thought none were observed for the 150' explored. The tributary is shallow and void of deep pools.
20610	0295.00	There is a foot bridge crossing the stream.
21265	0307.00	End of Survey. The habitat unit is very shallow. There are numerous dry units. No fish have been observed for past 1,100'.

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

Stream Name: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0

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
2	1	CULVERT	0.6	32	65	0.3	8.0	1.7	2.8	280	560	476	952		10
1	0	DRY	0.3	102	102	0.5									
90	24	FLATWATER	29.1	110	9894	47.9	10.2	0.6	1.1	823	74048	518	46655		36
2	0	NOSURVEY		456	913										
128	128	POOL	41.4	49	6322	30.6	11.9	1.1	1.9	588	75298	829	106113	653	67
88	22	RIFFLE	28.5	49	4283	20.7	11.0	0.4	0.6	395	34740	152	13390		32

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
311	175	21579	184647	167110

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

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 (%)
85	20	LGR	27.5	48	4096	19.8	10	0.4	1	343	29166	127	10803		33	76
1	1	CAS	0.3	36	36	0.2	20	0.2	0.6	720	720	144	144		5	70
2	1	BRS	0.6	76	151	0.7	15	0.6	0.8	1103	2205	662	1323		40	78
3	1	POW	1.0	100	300	1.5	8	0.7	1.8	648	1944	454	1361		70	60
28	13	RUN	9.1	66	1852	9.0	11	0.6	1.5	699	19559	430	12027		31	77
59	10	SRN	19.1	131	7742	37.5	10	0.6	1.5	1002	59101	640	37783		39	76
13	13	MCP	4.2	55	715	3.5	12	1.0	2.6	675	8778	896	11646	676	31	75
1	1	CCP	0.3	28	28	0.1	25	1.2	2	560	560	896	896	672	70	90
3	3	CRP	1.0	73	220	1.1	11	1.0	2.1	851	2553	1122	3365	904	43	77
58	58	LSL	18.8	46	2680	13.0	12	1.0	3.4	580	33661	763	44242	592	79	75
15	15	LSR	4.9	45	668	3.2	12	1.3	3.4	522	7832	835	12521	664	65	91
22	22	LSBk	7.1	58	1274	6.2	10	1.2	3.4	600	13190	988	21729	820	66	83
15	15	LSBo	4.9	48	726	3.5	13	1.0	3.5	577	8651	778	11677	601	57	68
1	1	BPR	0.3	11	11	0.1	7	0.3	1.1	73	73	37	37	22	80	100
1	0	DRY	0.3	102	102	0.5										75
2	1	CUL	0.6	32	65	0.3	8	1.7	2.8	280	560	476	952		10	100
2	0	NS		456	913											

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
311	175	21579	188554	170506

Table 3 - Summary of Pool Types

Stream Name: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

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
14	14	MAIN	11	53	743	12	13.3	1.0	667	9338	675	9455	34
113	113	SCOUR	88	49	5568	88	11.7	1.1	583	65888	655	74052	71
1	1	BACKWATER	1	11	11	0	7.0	0.3	73	73	22	22	80

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
128	128	6322	75298	83529

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

Stream Name: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

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
13	MCP	10	0	0	10	77	3	23	0	0	0	0
1	CCP	1	0	0	0	0	1	100	0	0	0	0
3	CRP	2	0	0	2	67	1	33	0	0	0	0
58	LSL	45	2	3	35	60	18	31	3	5	0	0
15	LSR	12	0	0	5	33	8	53	2	13	0	0
22	LSBk	17	1	5	7	32	11	50	3	14	0	0
15	LSBo	12	0	0	9	60	5	33	1	7	0	0
1	BPR	1	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
128	3	2	69	54	47	37	9	7	0	0

Mean Maximum Residual Pool Depth (ft.): 1.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008 Dry Units: 1

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

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
85	21	LGR	1	9	15	0	46	0	0	27	2
1	1	CAS	0	0	0	0	0	0	0	0	100
2	1	BRS	0	0	10	0	20	0	0	0	70
88	23	TOTAL RIFFLE	0	8	14	0	43	0	0	24	10
3	1	POW	0	0	0	0	0	0	5	65	30
28	13	RUN	4	15	11	5	37	0	1	25	3
59	10	SRN	8	11	19	0	23	0	0	24	15
90	24	TOTAL FLAT	5	13	14	3	30	0	1	26	9
13	13	MCP	5	9	3	0	39	0	0	19	25
1	1	CCP	0	10	30	0	0	0	10	0	50
3	3	CRP	30	0	0	10	27	0	0	13	20
58	58	LSL	2	21	48	2	19	0	1	5	2
15	15	LSR	3	10	15	56	9	0	1	7	0
22	22	LSBk	2	4	16	1	14	0	2	9	52
15	15	LSBo	2	4	18	0	15	0	5	49	8
1	1	BPR	0	0	50	0	50	0	0	0	0
128	128	TOTAL POOL	3	13	29	8	19	0	1	13	14
2	1	CUL	0	100	0	0	0	0	0	0	0
2	0	NS									
311	176	TOTAL	3	13	25	6	23	0	1	16	13

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008 Dry Units: 1

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

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
85	21	LGR	5	0	52	29	14	0	0
1	1	CAS	0	0	0	0	0	0	100
2	1	BRS	0	0	0	0	0	0	100
3	1	POW	0	0	0	0	100	0	0
28	13	RUN	0	15	62	0	8	0	15
59	10	SRN	0	10	70	10	10	0	0
13	13	MCP	0	54	23	8	8	0	8
1	1	CCP	0	100	0	0	0	0	0
3	3	CRP	0	100	0	0	0	0	0
58	58	LSL	14	69	12	3	0	0	2
15	15	LSR	0	73	13	13	0	0	0
22	22	LSBk	0	73	14	0	5	0	9
15	15	LSBo	0	93	0	0	7	0	0
1	1	BPR	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
77	72	28	0	80	81

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 River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008 Survey Length (ft.): 21579 Main Channel (ft.): 21391 Side Channel (ft.): 188

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: NA
Reach Length (ft.): 898
Riffle/Flatwater Mean Width (ft.):
BFW:
Range (ft.): 26 to 26
Mean (ft.): 26
Std. Dev.: 0
Base Flow (cfs.):
Water (F): 0 - 0 Air (F): 0 - 0
Dry Channel (ft): 0

Canopy Density (%):
Coniferous Component (%):
Hardwood Component (%):
Dominant Bank Vegetation:
Vegetative Cover (%): 0.0
Dominant Shelter:
Dominant Bank Substrate Type:
Occurrence of LWD (%):
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 0.0
Pool Frequency (%): 0.0
Residual Pool Depth (%):
< 2 Feet Deep:
2 to 2.9 Feet Deep:
3 to 3.9 Feet Deep:
>= 4 Feet Deep:
Mean Max Residual Pool Depth (ft.):
Mean Pool Shelter Rating:

Pool Tail Substrate (%): Silt/Clay: Sand: Gravel: Sm Cobble: Lg Cobble: Boulder: Bedrock:
Embeddedness Values (%): 1. 2. 3. 4. 5. 0.0

STREAM REACH: 2

Channel Type: F3
Reach Length (ft.): 4344
Riffle/Flatwater Mean Width (ft.): 14.5
BFW:
Range (ft.): 12 to 26
Mean (ft.): 18
Std. Dev.: 4
Base Flow (cfs.): 1.3
Water (F): 58 - 66 Air (F): 61 - 67
Dry Channel (ft): 0

Canopy Density (%): 76.4
Coniferous Component (%): 24.5
Hardwood Component (%): 75.5
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 81.0
Dominant Shelter: Terrestrial Veg.
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 18
LWD per 100 ft.:
Riffles: 1
Pools: 6
Flat: 2

Pools by Stream Length (%): 25.4
Pool Frequency (%): 28.1
Residual Pool Depth (%):
< 2 Feet Deep: 44
2 to 2.9 Feet Deep: 44
3 to 3.9 Feet Deep: 11
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 2.1
Mean Pool Shelter Rating: 51

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 39 Sm Cobble: 28 Lg Cobble: 17 Boulder: 11 Bedrock: 6
Embeddedness Values (%): 1. 61.1 2. 27.8 3. 5.6 4. 0.0 5. 5.6

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: B2
Reach Length (ft.): 1080
Riffle/Flatwater Mean Width (ft.): 8.0
BFW:
Range (ft.): 12 to 16
Mean (ft.): 14
Std. Dev.: 2
Base Flow (cfs.): 1.3
Water (F): 66 - 67 Air (F): 66 - 66
Dry Channel (ft): 0

Canopy Density (%): 70.6
Coniferous Component (%): 62.5
Hardwood Component (%): 37.5
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 70.8
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 11
LWD per 100 ft.:
Riffles: 2
Pools: 2
Flat: 1

Pools by Stream Length (%): 20.5
Pool Frequency (%): 50.0
Residual Pool Depth (%):
< 2 Feet Deep: 88
2 to 2.9 Feet Deep: 13
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.6
Mean Pool Shelter Rating: 60

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 25 Sm Cobble: 0 Lg Cobble: 13 Boulder: 38 Bedrock: 25
Embeddedness Values (%): 1. 25.0 2. 0.0 3. 12.5 4. 0.0 5. 62.5

STREAM REACH: 4

Channel Type: F3
Reach Length (ft.): 3773
Riffle/Flatwater Mean Width (ft.): 8.2
BFW:
Range (ft.): 10 to 17
Mean (ft.): 14
Std. Dev.: 2
Base Flow (cfs.): 1.3
Water (F): 61 - 66 Air (F): 64 - 72
Dry Channel (ft): 0

Canopy Density (%): 69.6
Coniferous Component (%): 75.9
Hardwood Component (%): 24.1
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 78.8
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 18
LWD per 100 ft.:
Riffles: 1
Pools: 5
Flat: 3

Pools by Stream Length (%): 35.8
Pool Frequency (%): 41.4
Residual Pool Depth (%):
< 2 Feet Deep: 63
2 to 2.9 Feet Deep: 25
3 to 3.9 Feet Deep: 13
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 2.0
Mean Pool Shelter Rating: 59

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 67 Sm Cobble: 25 Lg Cobble: 8 Boulder: 0 Bedrock: 0
Embeddedness Values (%): 1. 29.2 2. 54.2 3. 16.7 4. 0.0 5. 0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 5

Channel Type: F4

Reach Length (ft.): 11296

Riffle/Flatwater Mean Width (ft.): 8.4

BFW:

Range (ft.): 7 to 24

Mean (ft.): 13

Std. Dev.: 4

Base Flow (cfs.): 1.3

Water (F): 56 - 68 Air (F): 65 - 78

Dry Channel (ft): 102

Canopy Density (%): 79.8

Coniferous Component (%): 88.4

Hardwood Component (%): 11.6

Dominant Bank Vegetation: Grass

Vegetative Cover (%): 82.6

Dominant Shelter: Large Woody Debris

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 31

LWD per 100 ft.:

Riffles: 2

Pools: 9

Flat: 3

Pools by Stream Length (%): 31.7

Pool Frequency (%): 45.3

Residual Pool Depth (%):

< 2 Feet Deep: 54

2 to 2.9 Feet Deep: 41

3 to 3.9 Feet Deep: 5

>= 4 Feet Deep: 0

Mean Max Residual Pool Depth (ft.): 1.8

Mean Pool Shelter Rating: 74

Pool Tail Substrate (%): Silt/Clay: 1 Sand: 0 Gravel: 65 Sm Cobble: 18 Lg Cobble: 4 Boulder: 0 Bedrock: 12

Embeddedness Values (%): 1. 15.4 2. 34.6 3. 28.2 4. 9.0 5. 12.8

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

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	11	10	6.0
Boulder	12	3	4.3
Cobble / Gravel	3	11	4.0
Sand / Silt / Clay	148	150	85.6

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	93	81	50.0
Brush	79	91	48.9
Hardwood Trees	0	0	0.0
Coniferous Trees	1	1	0.6
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

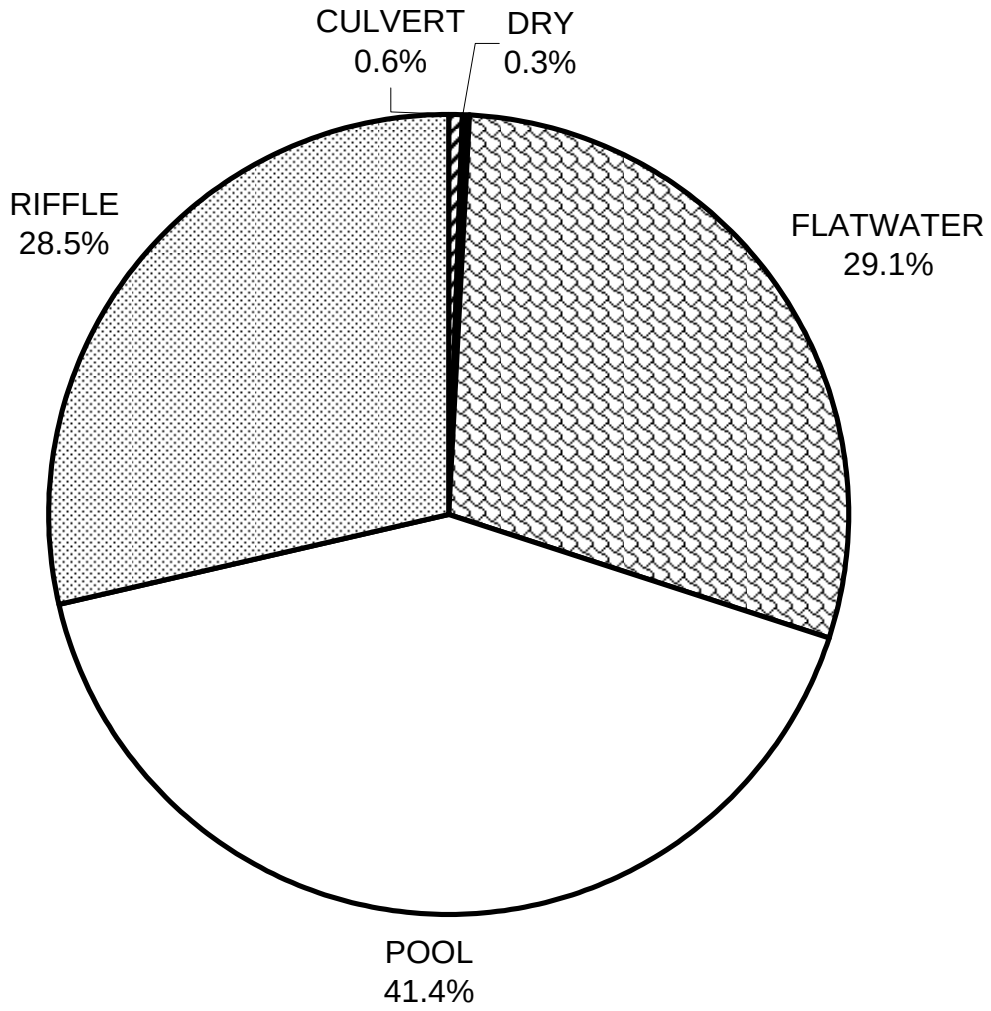
StreamName: Little River LLID: 1237900392738 Drainage: Albion River

Survey Dates: 7/7/2008 to 7/10/2008

Confluence Location: Quad: MENDOCINO Legal Description: T16NR17WS06 Latitude: 39:16:26.0N Longitude: 123:47:24.0W

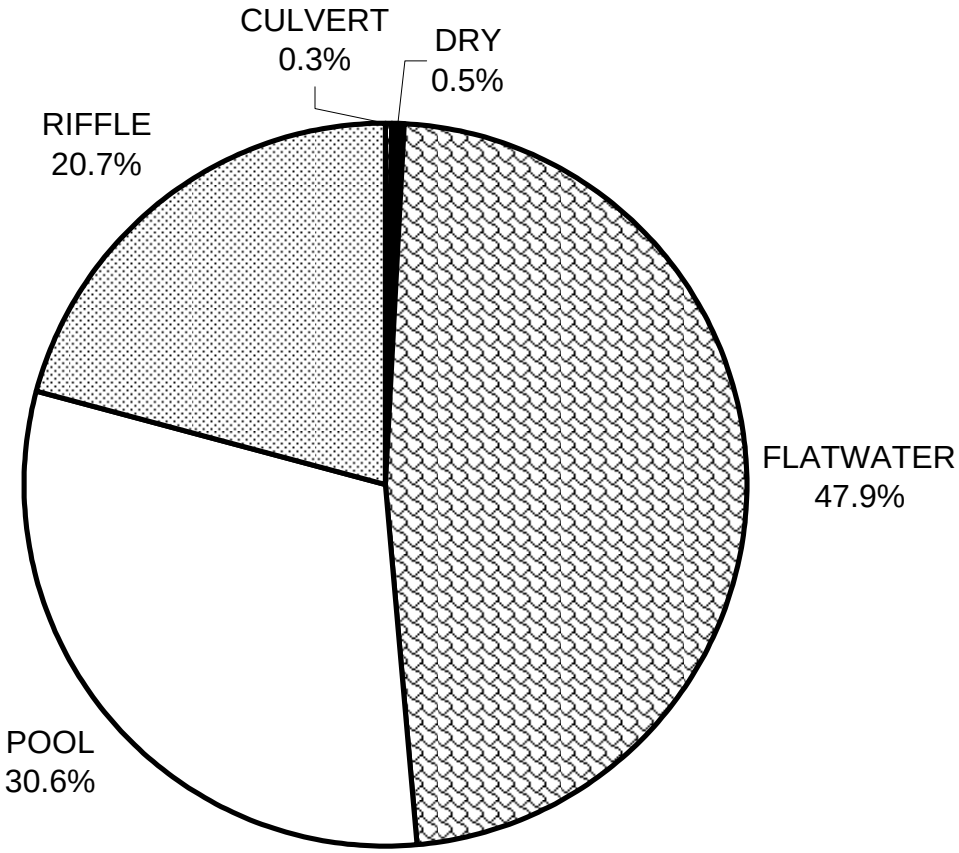
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	5	3
SMALL WOODY DEBRIS (%)	8	13	13
LARGE WOODY DEBRIS (%)	14	14	29
ROOT MASS (%)	0	3	8
TERRESTRIAL VEGETATION (%)	43	30	19
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	1	1
BOULDERS (%)	24	26	13
BEDROCK LEDGES (%)	10	9	14

LITTLE RIVER 2008
HABITAT TYPES BY PERCENT OCCURRENCE



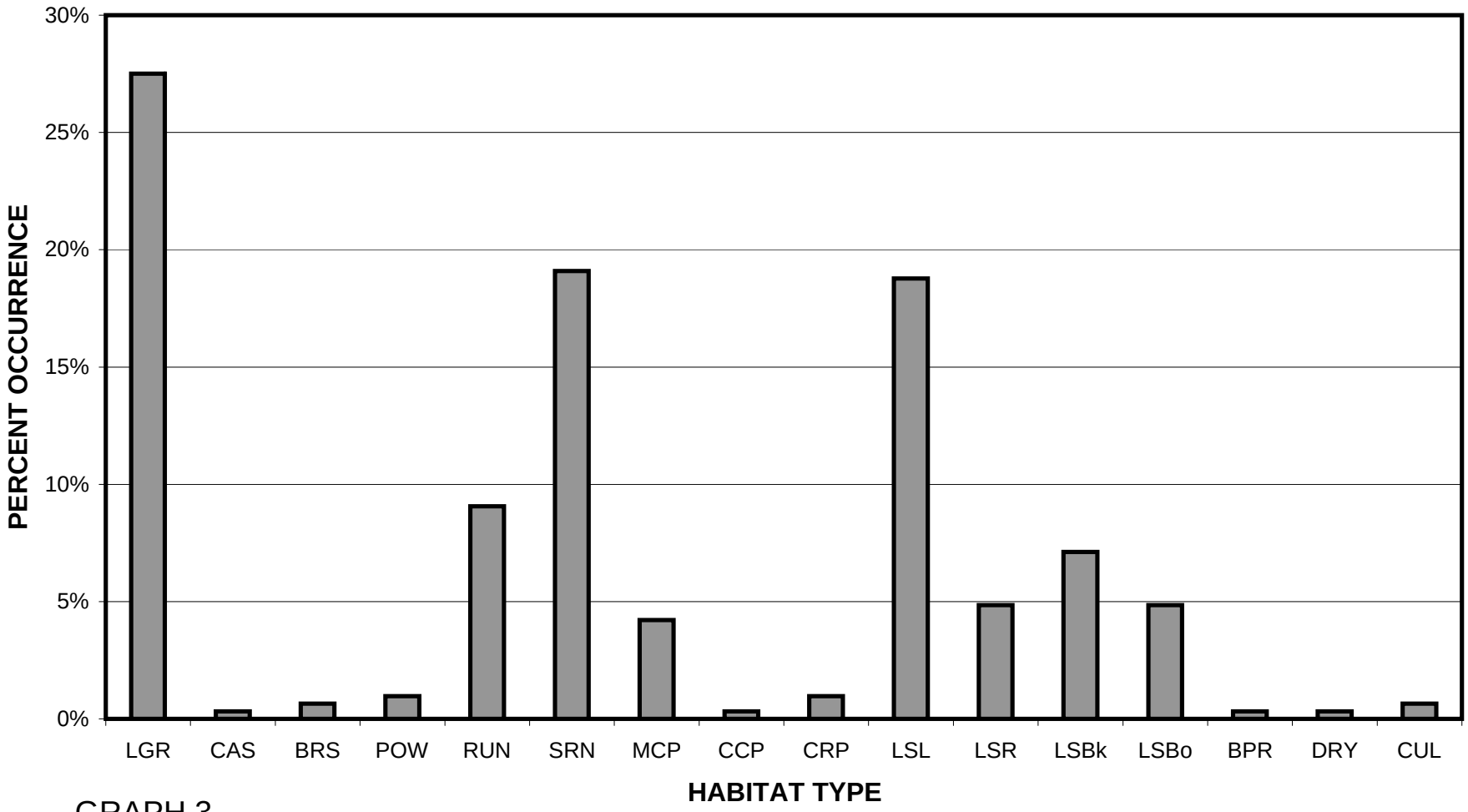
GRAPH 1

LITTLE RIVER 2008
HABITAT TYPES BY PERCENT TOTAL LENGTH



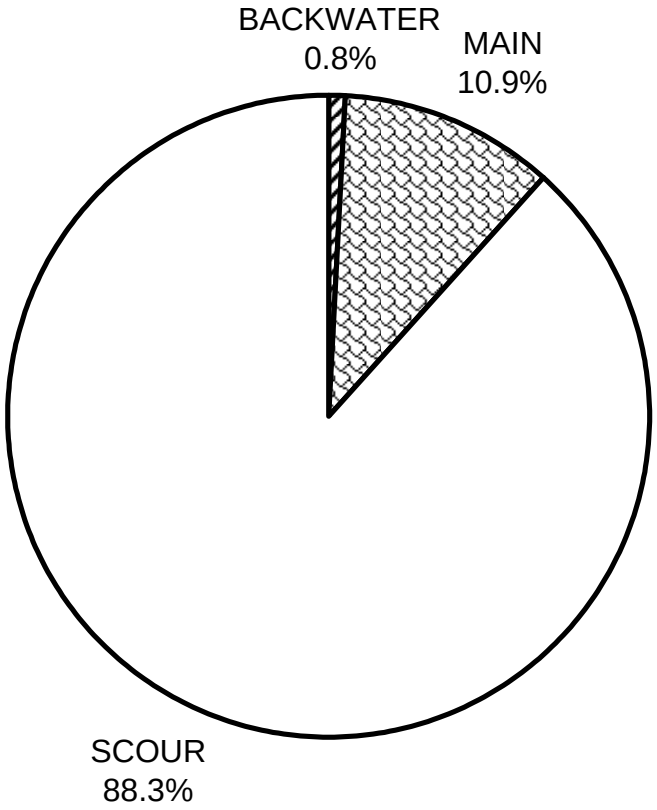
GRAPH 2

LITTLE RIVER 2008
HABITAT TYPES BY PERCENT OCCURRENCE



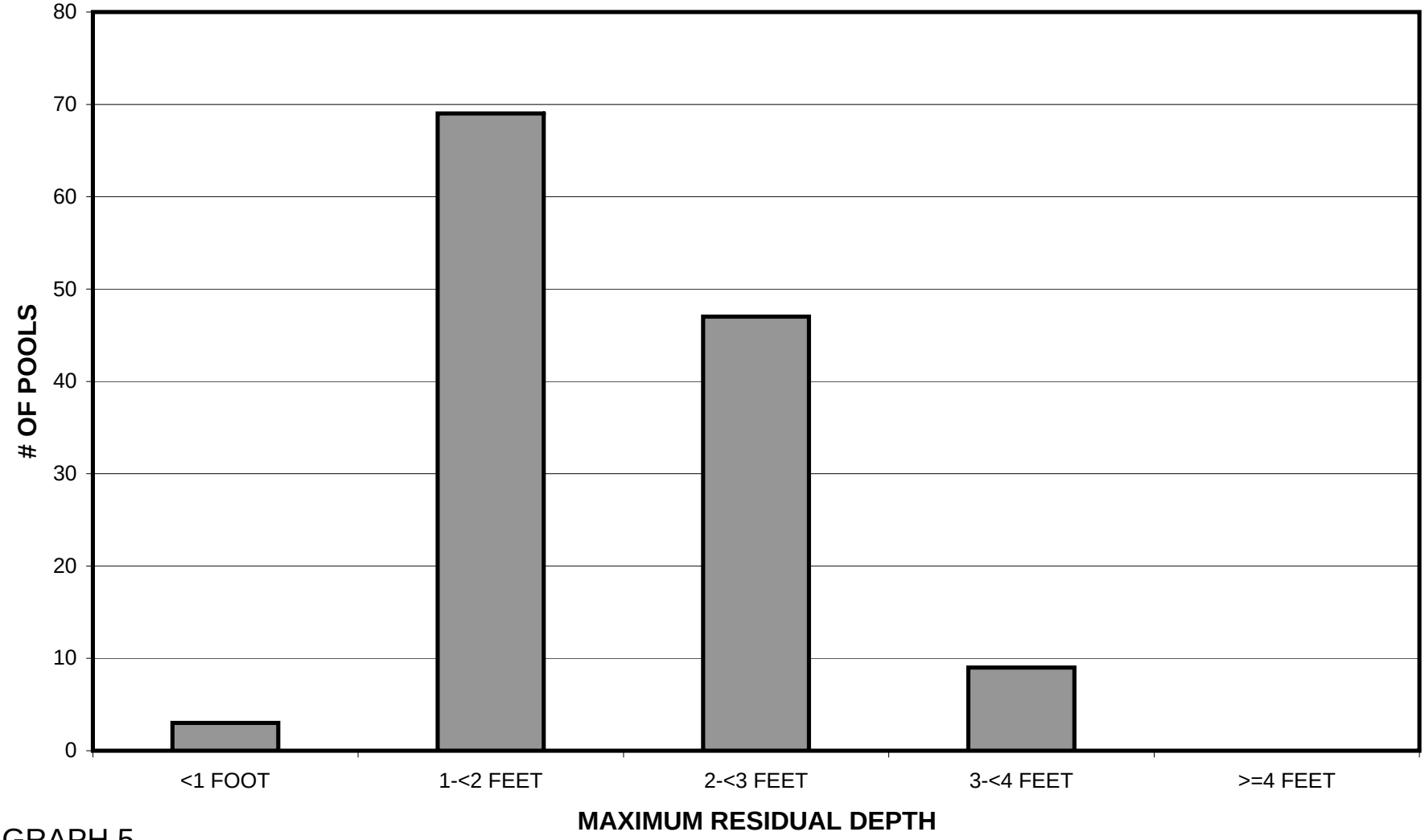
GRAPH 3

LITTLE RIVER 2008
POOL TYPES BY PERCENT OCCURRENCE



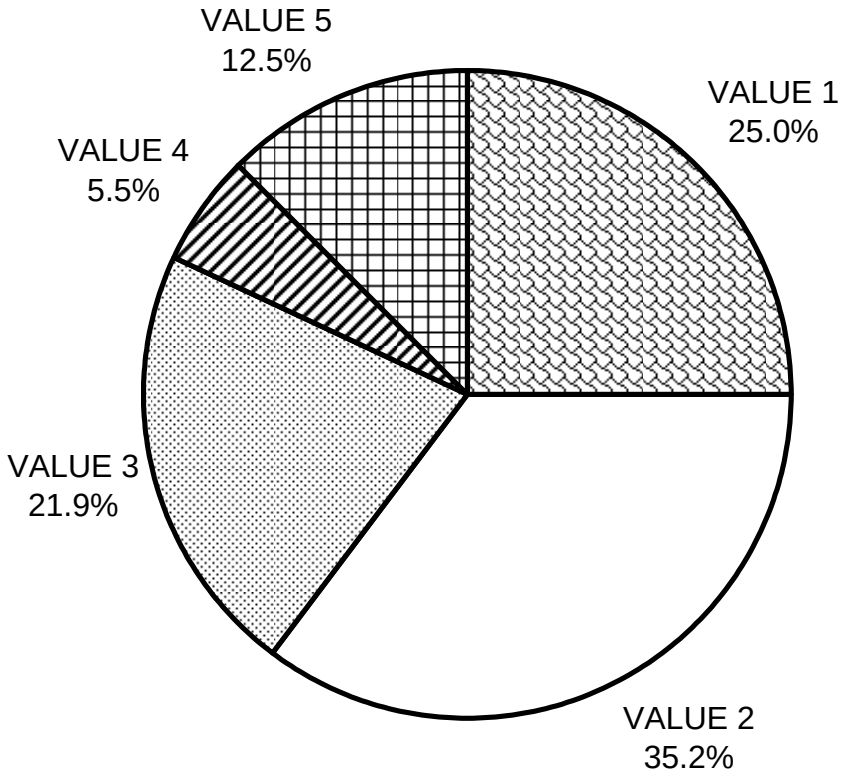
GRAPH 4

LITTLE RIVER 2008
MAXIMUM DEPTH IN POOLS



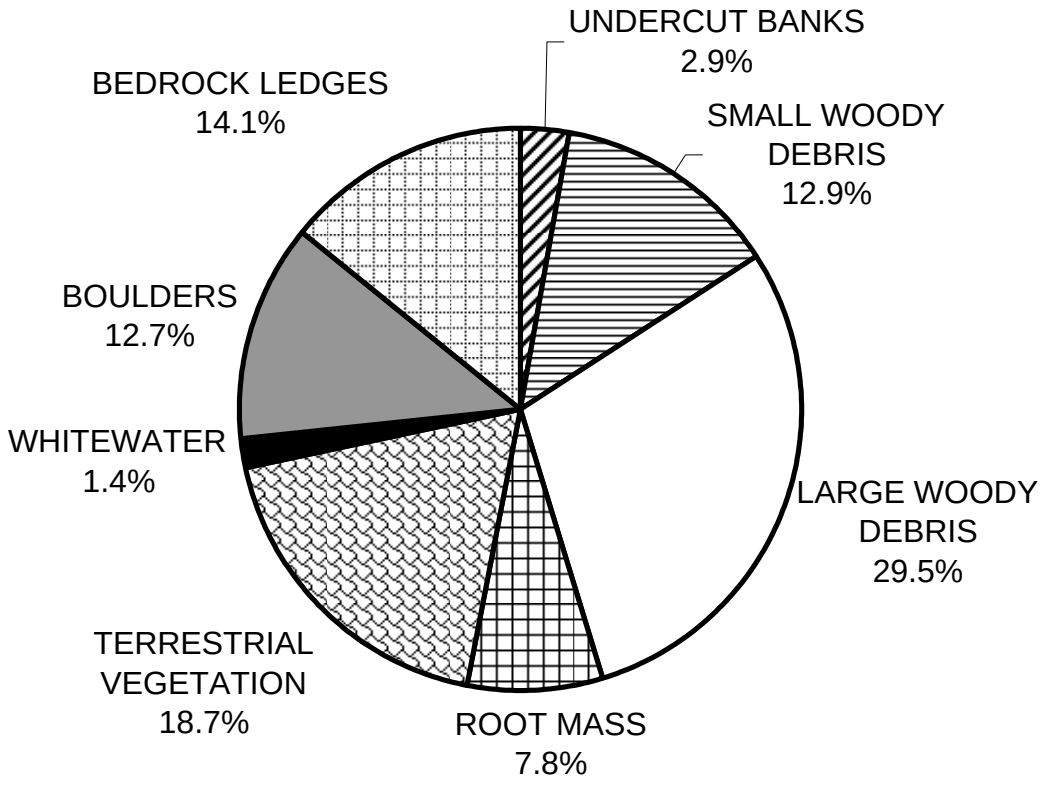
GRAPH 5

LITTLE RIVER 2008
PERCENT EMBEDDEDNESS



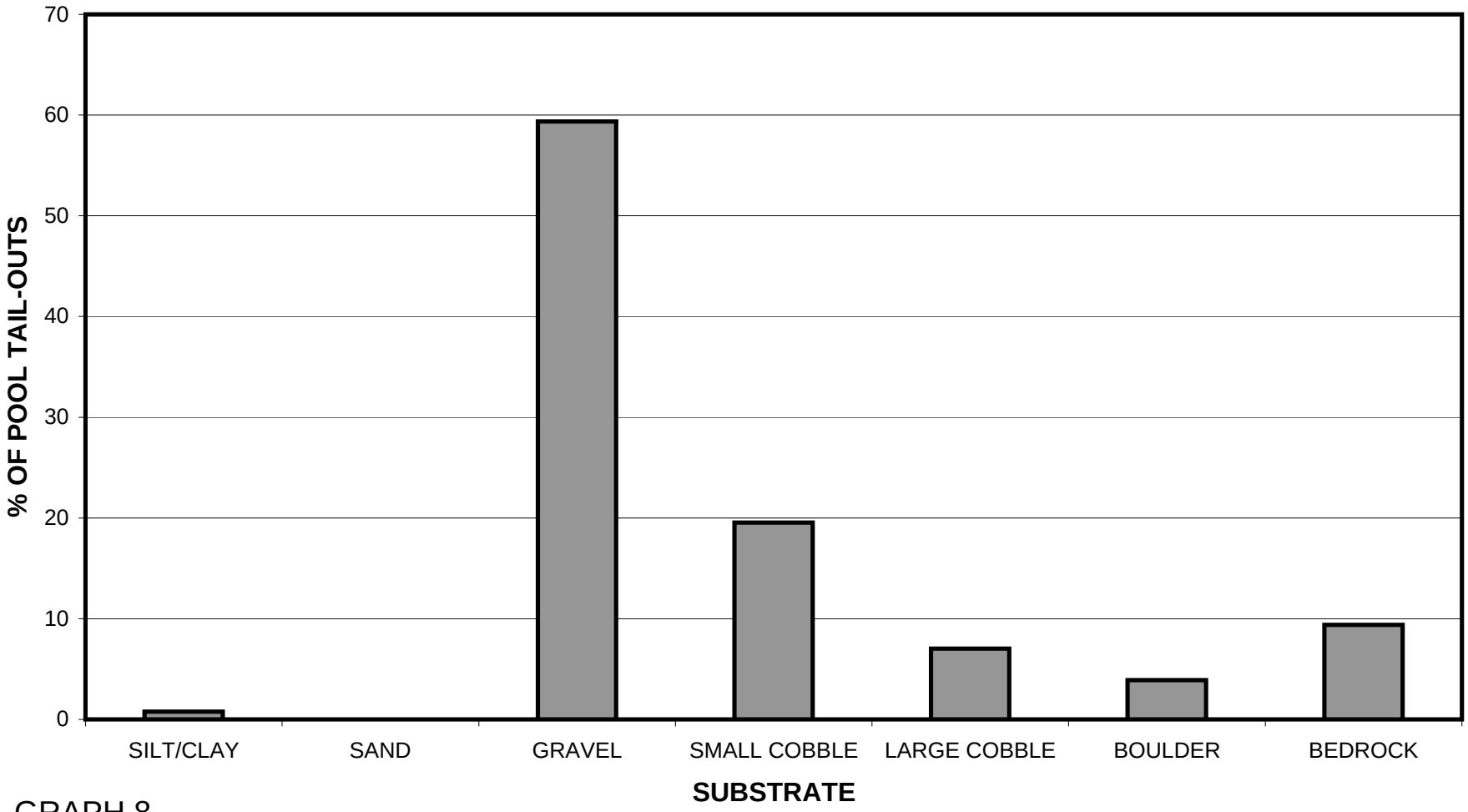
GRAPH 6

LITTLE RIVER 2008
MEAN PERCENT COVER TYPES IN POOLS



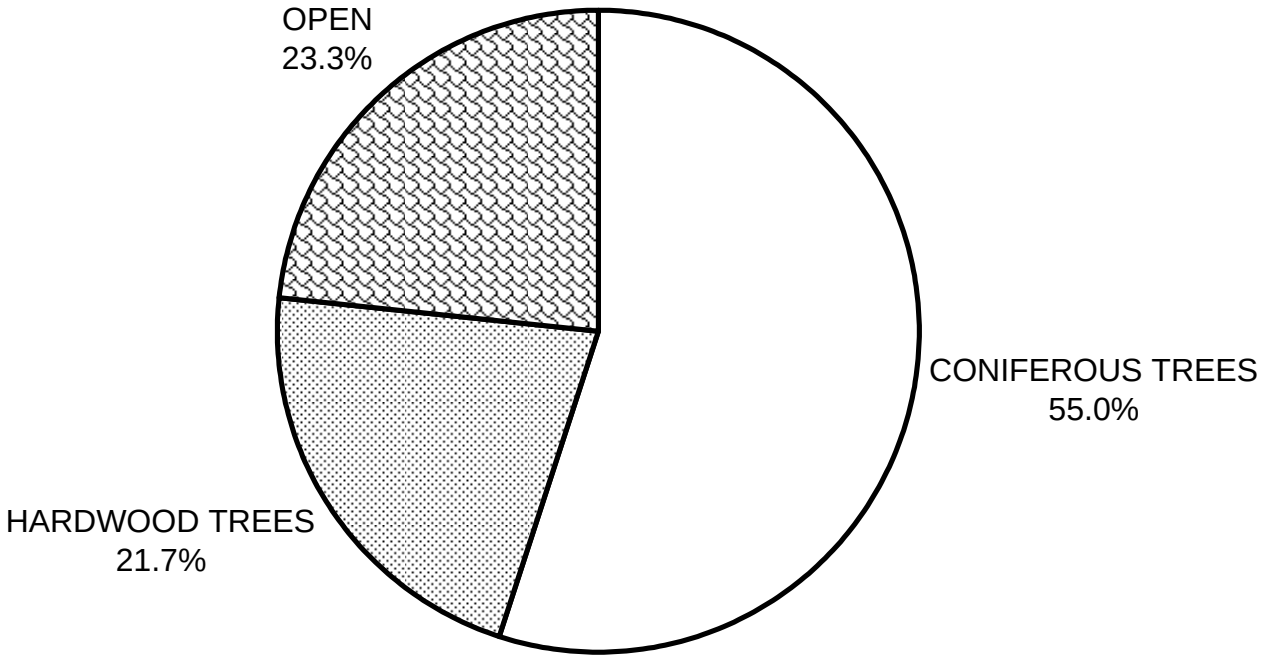
GRAPH 7

LITTLE RIVER 2008
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



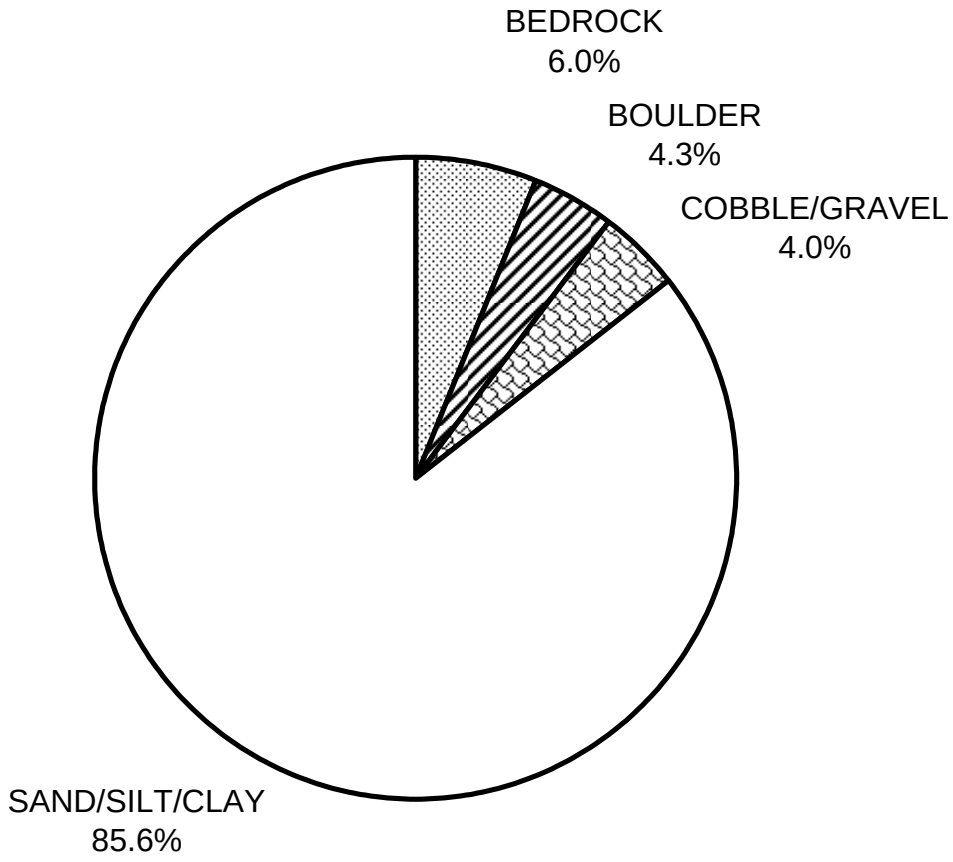
GRAPH 8

LITTLE RIVER 2008
MEAN PERCENT CANOPY



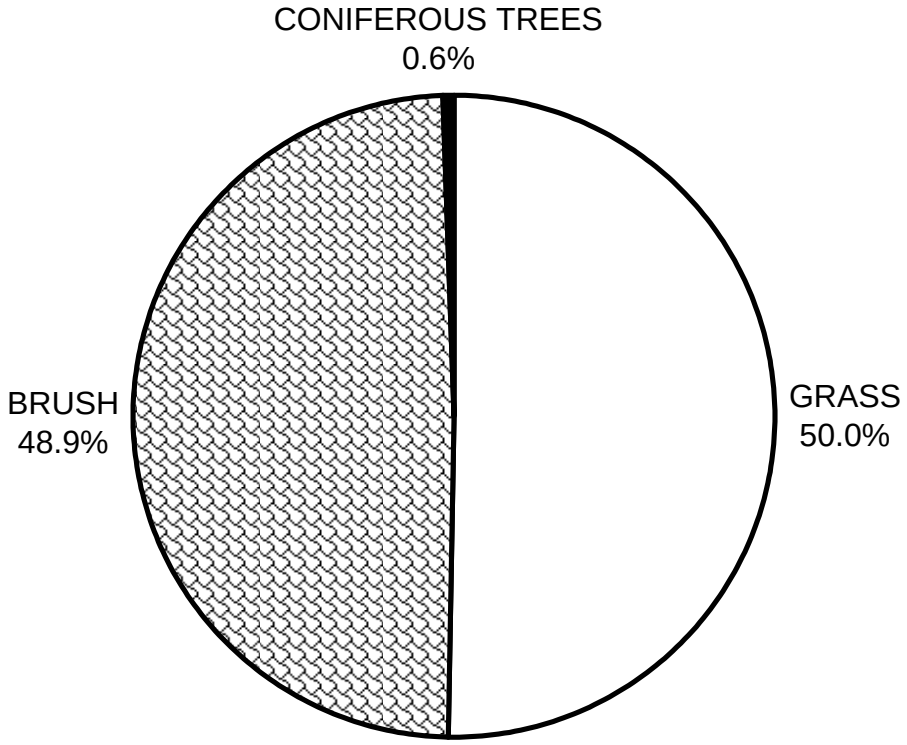
GRAPH 9

LITTLE RIVER 2008
DOMINANT BANK COMPOSITION IN SURVEY REACH

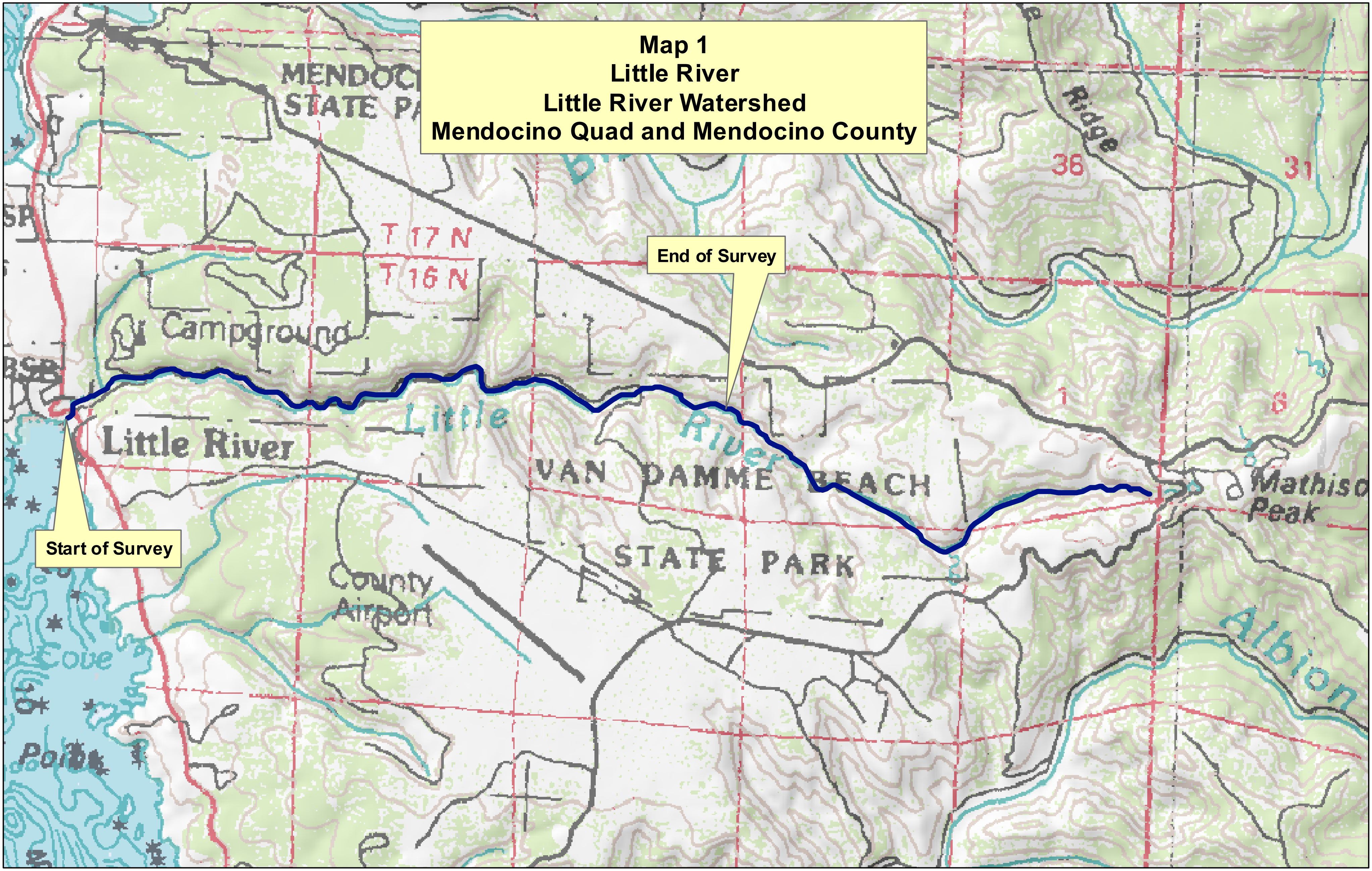


GRAPH 10

LITTLE RIVER 2008
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



N
W E
S

Legend

Little River

0 2,100 4,200 Feet

RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH & GAME