

STREAM INVENTORY REPORT

Shingle Mill Creek

INTRODUCTION

A stream inventory was conducted from April 30 to May 8, 2012 on Shingle Mill Creek. The survey began at the confluence with South Branch North Fork Navarro River and extended upstream 1.2 miles.

The Shingle Mill Creek 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 Shingle Mill Creek. 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

Shingle Mill Creek is a tributary to South Branch North Fork Navarro River, tributary to North Fork Navarro River, tributary to the Navarro River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Shingle Mill Creek's legal description at the confluence with South Branch North Fork Navarro River is T15N R14W S17. Its location is 39.1591 degrees north latitude and 123.4265 degrees west longitude, LLID number 1234252391591. Shingle Mill Creek is an intermittent stream according to the USGS Bailey Ridge 7.5 minute quadrangle. Shingle Mill Creek drains a watershed of approximately 1.3 square miles. Elevations range from about 540 feet at the mouth of the creek to 1,300 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Rose Creek Road, a private logging road off Masonite Industrial Road.

METHODS

The habitat inventory conducted in Shingle Mill Creek 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 DFG. 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 Shingle Mill Creek 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". Shingle Mill Creek 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

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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 Shingle Mill Creek, 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. 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 Shingle Mill Creek, 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 Shingle Mill Creek, 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 Shingle Mill Creek, the dominant composition type and the dominant

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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 Shingle Mill Creek. In addition, underwater observations were made at six 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)

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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 Shingle Mill Creek 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 April 30 to May 8, 2012 was conducted by R. Spencer, M. Zee, and A. Garcia (WSP). The total length of the stream surveyed was 6,468 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.33 cfs on May 2, 2012.

Shingle Mill Creek is a G4 channel type for 4,838 feet of the stream surveyed (Reach 1), and an A4 channel type for 1,630 feet of the stream surveyed (Reach 2). G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 47 to 56 degrees Fahrenheit. Air temperatures ranged from 48 to 69 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 36% pool units, 33% riffle units, 30% flatwater units, 1% dry units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 48% flatwater units, 28% riffle units, 22% pool units, and 1% dry units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 24%; step run units, 19%; and high gradient

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riffle units, 17% (Graph 3). Based on percent total length, step run units made up 40%, mid-channel pool units 16%, low gradient riffle units 14%, and high gradient riffle units, 14%.

A total of 79 pools were identified (Table 3). Main channel pools were the most frequently encountered at 72% (Graph 4), and comprised 77% 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. Fourteen of the 79 pools (18%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 79 pool tail-outs measured, 17 had a value of 1 (21.5%); 40 had a value of 2 (50.6%); 19 had a value of 3 (24.1%); 2 had a value of 4 (2.5%); 1 had a value of 5 (1.3%) (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 1, flatwater habitat types had a mean shelter rating of 1, and pool habitats had a mean shelter rating of 22 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 60. Scour pools had a mean shelter rating of 30. Main channel pools had a mean shelter rating of 18 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Shingle Mill Creek. Graph 7 describes the pool cover in Shingle Mill Creek. 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 76% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 19% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Shingle Mill Creek was 95%. Five percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 47% and 53%, respectively. Graph 9 describes the mean percent canopy in Shingle Mill Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 96%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 57% sand/silt/clay, 39% cobble/gravel, 2% bedrock, and 2% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 45% of the units surveyed. Additionally, 38% of the units surveyed had deciduous trees as the dominant vegetation type, and 15% had brush as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at six sites for species composition and distribution in Shingle Mill Creek on August 1, 2012. The sites were sampled by I. Mikus and M. Groff (DFG).

In Reach 1, which comprised the first 4,838 feet of stream, six sites were sampled. The reach sites yielded no fish.

The following chart displays the information yielded from these sites:

2012 Shingle Mill Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: G4 Channel Type									
08/01/12	1	002	Pool	24	0	0	0	0	0
	2	003	Pool	36	0	0	0	0	0
	3	007	Pool	120	0	0	0	0	0
	4	014	Pool	330	0	0	0	0	0
	5	018	Pool	434	0	0	0	0	0
	6	019	Pool	458	0	0	0	0	0

DISCUSSION

Shingle Mill Creek is a G4 channel type for the first 4,838 feet of stream surveyed and an A4 channel type for the remaining 1,630 feet. The suitability of G4 and A4 channel types for fish habitat improvement structures is as follows: G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover. A4 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days April 30 to May 9, 2012 ranged from 47 to 56 degrees Fahrenheit. Air temperatures ranged from 48 to 69 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 48% of the total length of this survey, riffles 28%, and pools 22%. Fourteen of the 79 (18%) 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

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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. In Reach 1, installing large wood structures that will increase or deepen pool habitat is recommended.

Fifty-seven of the 79 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-one of the pool tail-outs had embeddedness ratings of 3 or 4. One 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.

Seventy-five of the 79 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 22. The shelter rating in the flatwater habitats is 1. 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 Shingle Mill Creek. 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 95%. Reach 1 had a canopy density of 95% and Reach 2 had a canopy density of 96%. The percentage of right and left bank covered with vegetation was 96% and 96%, respectively.

RECOMMENDATIONS

- 1) Shingle Mill Creek 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) Due to the bedrock sheet in the lower 72' of Shingle Mill Creek, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

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COMMENTS AND LANDMARKS

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

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with South Branch North Fork Navarro River. The channel is a G4.
15	0002.00	There is a 1.5' high plunge over bedrock. The water plunges onto boulders below.
36	0004.00	There is a 2.6' high bedrock sheet.
72	0006.00	There is a 2.2' high plunge over bedrock. Water plunges onto boulders below.
87	0007.00	Rose Creek Road crosses the channel. The crossing is a 13.7' wide x 51' long railcar bridge approximately 13.5' high above the channel. Boulder rip-rap lines both banks under the bridge for approximately 40 feet. The bridge is not a barrier to salmonids, but some of the rip-rap may have collapsed in to the channel creating a series of two boulder plunges. The first plunge measures 2.7' high and the second plunge is 2' high.
653	0025.00	Log debris accumulation (LDA) #01 contains 22 pieces of large woody debris (LWD) and measures 5.5' high x 24' wide x 5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to large cobble and measures 10' wide x 30' long x 3' deep. It is a possible barrier to juvenile and adult salmonids due to the 5.5' high plunge over the LDA with no jump pool below.
915	0033.00	There is a 2.1' high plunge over root mass.
1318	0045.00	LDA #02 contains 12 pieces of LWD and measures 4.6' high x 11' wide x 4' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to sand and measures 8' wide x 10' long x 0.5' deep. There is a 2.2' high plunge over the LDA with no jump pool below it. The LDA is a possible barrier to juvenile and adult salmonids.
1329	0046.00	An erosion site on the left bank measures approximately 35' high x 30' long. It is contributing fine sediment to the channel.

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1960	0069.00	LDA #03 contains 10 pieces of LWD and measures 4' high x 21' wide x 5.5' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 2' wide x 15' long x 0.5' deep. It is a possible barrier to juvenile and adult salmonids.
2265	0081.00	Dry tributary on right bank.
2520	0088.00	There is a 1.7' high plunge over log.
2570	0091.00	There is a 1.2' high plunge over logs.
2596	0093.00	There is a 0.5' high plunge over log.
2961	0103.00	There is a 3.5' high plunge over redwood root mass.
3072	0108.00	There is a 1.5' high plunge over log.
3085	0109.00	Dry tributary on the right bank.
3109	0110.00	There is a 0.8' high plunge over log and root mass.
3155	0112.00	Right bank slide contributing fine sediment to the channel. There is a 2.7' high plunge over a log.
3176	0113.00	There is a 0.7' high plunge over log.
3650	0122.00	Tributary #01 enters on the right bank. It contributes approximately 33% to Shingle Mill Creek's flow. The water temperature of the tributary was 54 degrees Fahrenheit, the water temperature downstream of the tributary was 54 degrees Fahrenheit, and the water temperature upstream of the confluence was 50 degrees Fahrenheit. The tributary has a slope of approximately 4% for the first 500', then increases to approximately 10%. Approximately 500' upstream there is a 4' high plunge over woody debris and root mass. There is a 1.7' high plunge over root mass at the mouth of the tributary, which prevents juvenile access. The first 500' may be accessible to adult salmonids, but no fish were observed. The culvert at the Masonite Road crosses approximately 1000' upstream from the mouth and is creating an impasse for salmonids.
4324	0134.00	There is a 2.6' high plunge over LWD and small woody debris (SWD).
4770	0145.00	There is a 1.4' high plunge over log.
4838	0149.00	The channel changes from a G4 to an A4.

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4853	0150.00	LDA #04 contains seven pieces of LWD and measures 4' high x 28' wide x 5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 15' wide x 30' long x 2' deep. There is a 4' high plunge over the LDA with no jump pool below it. The LDA is a possible barrier to juvenile and adult salmonids.
4960	0153.00	LDA #05 contains four pieces of LWD and measures 3.5' high x 10' wide x 5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 4' wide x 10' long x 3' deep. It is a possible strainer barrier to juvenile and adult salmonids.
4978	0154.00	LDA #06 contains one piece of LWD and measures 5.5' high x 10' wide x 9' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 6' wide x 18' long x 2.5' deep. It is a possible strainer barrier to juvenile and adult salmonids.
5003	0156.00	There is a 3' high plunge over rootwad.
5039	0159.00	There is a 0.8' high plunge over rootwad.
5064	0161.00	LDA #07 contains five pieces of LWD and measures 3' high x 11' wide x 3' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 3' wide x 2' long x 1' deep. There is a 1.3' high plunge over the LDA. It is a possible barrier to juvenile and adult salmonids.
5105	0164.00	There is a 2.5' high plunge over root mass.
5215	0167.00	LDA #08 contains two pieces of LWD and measures 3.5' high x 11' wide x 4.5' long. 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 7' long x 1' deep. It is a possible strainer barrier to juvenile and adult salmonids.
5382	0173.00	There is a 6.5' high plunge over root mass and bedrock.
5913	0194.00	Tributary #02 enters on the right bank. It contributes approximately 50% to Shingle Mill Creek's flow. The water temperature of the tributary was 52 degrees Fahrenheit, the water temperature downstream of the tributary was 52 degrees Fahrenheit, and the water temperature upstream of the confluence was 55 degrees Fahrenheit. The slope of the tributary is approximately 5%. The tributary not accessible to salmonids.

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6104	0207.00	There is a 1.4' high plunge over root mass.
6452	0221.00	End of survey. The channel opens up in to a marsh and the stream goes dry.

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: Shingle Mill Creek

LLID: 1234252391591

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/8/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS17

Latitude: 39:09:33.0N

Longitude: 123:25:31.0

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	0	DRY	0.9	35	70	1.1									
66	17	FLATWATER	29.9	47	3110	48.1	5.2	0.3	0.6	253	16666	95	6287		1
2	0	NOSURVEY	0.9	15	30	0.5									
79	79	POOL	35.7	18	1431	22.1	6.9	0.6	1.4	120	9495	94	7420	68	22
72	19	RIFFLE	32.6	25	1827	28.2	5.2	0.2	0.4	90	6507	21	1527		1
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
221	115				6468					32668			15234		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Shingle Mill Creek

LLID: 1234252391591

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/8/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS17

Latitude: 39:09:33.0N

Longitude: 123:25:31.0W

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 (%)
31	7	LGR	14.0	29	913	14.1	6	0.2	0.7	155	4819	39	1207		1	97
37	9	HGR	16.7	24	886	13.7	5	0.2	0.5	62	2281	12	442		2	98
2	2	CAS	0.9	10	19	0.3	4	0.4	1.4	31	62	11	22		0	100
2	1	BRS	0.9	4	9	0.1	2	0.1	0.2	13	25	1	3		0	100
24	7	RUN	10.9	21	511	7.9	4	0.3	0.9	81	1938	22	530		1	95
42	10	SRN	19.0	62	2599	40.2	6	0.4	1.1	373	15656	146	6152		2	98
54	54	MCP	24.4	19	1029	15.9	6	0.5	2.7	116	6265	84	4542	59	18	94
1	1	CCP	0.5	9	9	0.1	3	0.2	1.6	27	27	8	8	5	0	100
2	2	STP	0.9	34	68	1.1	8	0.7	1.9	240	480	270	540	174	15	88
6	6	LSL	2.7	16	95	1.5	9	0.4	2.3	114	682	71	424	60	35	97
2	2	LSR	0.9	18	37	0.6	6	0.4	1.1	103	205	63	126	39	5	99
1	1	LSBk	0.5	21	21	0.3	6	0.2	0.9	116	116	58	58	23	0	99
12	12	PLP	5.4	13	160	2.5	10	0.7	3.3	135	1619	136	1629	107	34	91
1	1	DPL	0.5	12	12	0.2	8	0.6	1.7	102	102	92	92	61	60	94
2	0	DRY	0.9	35	70	1.1										
2	0	NS	0.9	15	30	0.5										100

Total Units
221

Total Units Fully Measured
115

Total Length (ft.)
6468

Total Area (sq.ft.)
34275

Total Volume (cu.ft.)
15775

Table 3 - Summary of Pool Types

Stream Name: Shingle Mill Creek

LLID: 1234252391591

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/8/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS17

Latitude: 39:09:33.0N

Longitude: 123:25:31.0W

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
57	57	MAIN	72	19	1106	77	6.2	0.5	119	6772	62	3550	18
21	21	SCOUR	27	15	313	22	8.8	0.6	125	2621	84	1684	30
1	1	BACKWATER	1	12	12	1	8.5	0.6	102	102	61	61	60

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
79	79	1431	9495	5295

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

Stream Name: Shingle Mill Creek LLID: 1234252391591 Drainage: Navarro River
 Survey Dates: 4/30/2012 to 5/8/2012
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS17 Latitude: 39:09:33.0N Longitude: 123:25:31.0W

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
54	MCP	68	12	22	34	63	8	15	0	0	0	0
1	CCP	1	0	0	1	100	0	0	0	0	0	0
2	STP	3	1	50	1	50	0	0	0	0	0	0
6	LSL	8	1	17	4	67	1	17	0	0	0	0
2	LSR	3	1	50	1	50	0	0	0	0	0	0
1	LSBk	1	1	100	0	0	0	0	0	0	0	0
12	PLP	15	1	8	6	50	3	25	2	17	0	0
1	DPL	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
79	17	22	48	61	12	15	2	3	0	0

Mean Maximum Residual Pool Depth (ft.): 1.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Shingle Mill Creek LLID: 1234252391591 Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/8/2012 Dry Units: 2

Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS17 Latitude: 39:09:33.0N Longitude: 123:25:31.0W

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
31	7	LGR	0	20	0	5	0	0	0	75	0
37	9	HGR	0	100	0	0	0	0	0	0	0
2	2	CAS	0	0	0	0	0	0	0	0	0
2	1	BRS	0	0	0	0	0	0	0	0	0
72	19	TOTAL RIFFLE	0	60	0	3	0	0	0	37	0
24	7	RUN	0	0	0	0	0	0	0	100	0
42	10	SRN	0	30	70	0	0	0	0	0	0
66	17	TOTAL FLAT	0	15	35	0	0	0	0	50	0
54	54	MCP	18	19	34	17	1	1	7	4	0
1	1	CCP	0	0	0	0	0	0	0	0	0
2	2	STP	0	5	0	0	5	0	10	80	0
6	6	LSL	3	14	66	17	0	0	0	0	0
2	2	LSR	0	0	100	0	0	0	0	0	0
1	1	LSBk	0	0	0	0	0	0	0	0	0
12	12	PLP	10	7	50	7	0	1	24	0	0
1	1	DPL	10	10	10	70	0	0	0	0	0
79	79	TOTAL POOL	14	16	40	15	1	1	9	4	0
2	0	NS									
221	115	TOTAL	13	17	38	14	1	1	8	7	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Shingle Mill Creek LLID: 1234252391591 Drainage: Navarro River
 Survey Dates: 4/30/2012 to 5/8/2012 Dry Units: 2
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS17 Latitude: 39:09:33.0N Longitude: 123:25:31.0W

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
31	7	LGR	0	0	100	0	0	0	0
37	9	HGR	0	0	67	33	0	0	0
2	2	CAS	50	0	50	0	0	0	0
2	1	BRS	100	0	0	0	0	0	0
24	7	RUN	0	0	86	14	0	0	0
42	10	SRN	10	0	70	20	0	0	0
54	54	MCP	17	13	61	6	0	2	2
1	1	CCP	100	0	0	0	0	0	0
2	2	STP	0	0	50	50	0	0	0
6	6	LSL	0	17	83	0	0	0	0
2	2	LSR	0	50	50	0	0	0	0
1	1	LSBk	0	0	100	0	0	0	0
12	12	PLP	8	25	67	0	0	0	0
1	1	DPL	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Shingle Mill Creek LLID: 1234252391591 Drainage: Navarro River
 Survey Dates: 4/30/2012 to 5/8/2012
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS17 Latitude: 39:09:33.0N Longitude: 123:25:31.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
95	53	47	0	96	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: Shingle Mill Creek LLID: 1234252391591 Drainage: Navarro River
 Survey Dates: 4/30/2012 to 5/8/2012 Survey Length (ft.): 6468 Main Channel (ft.): 6468 Side Channel (ft.): 0
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS17 Latitude: 39:09:33.0N Longitude: 123:25:31.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: G4	Canopy Density (%): 94.9	Pools by Stream Length (%): 20.9
Reach Length (ft.): 4838	Coniferous Component (%): 56.9	Pool Frequency (%): 36.5
Riffle/Flatwater Mean Width (ft.): 6.5	Hardwood Component (%): 43.1	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 85
Range (ft.): 7 to 16	Vegetative Cover (%): 95.1	2 to 2.9 Feet Deep: 11
Mean (ft.): 11	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 4
Std. Dev.: 3	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.3	Occurrence of LWD (%): 19	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 47 - 54 Air (F): 48 - 69	LWD per 100 ft.:	Mean Pool Shelter Rating: 26
Dry Channel (ft): 0	Riffles: 3	
	Pools: 16	
	Flat: 3	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 2 Gravel: 70 Sm Cobble: 28 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 18.5 2. 44.4 3. 35.2 4. 0.0 5. 1.9		

STREAM REACH: 2

Channel Type: A4	Canopy Density (%): 96.4	Pools by Stream Length (%): 25.6
Reach Length (ft.): 1630	Coniferous Component (%): 46.5	Pool Frequency (%): 34.2
Riffle/Flatwater Mean Width (ft.): 3.2	Hardwood Component (%): 53.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 76
Range (ft.): 9 to 17	Vegetative Cover (%): 97.9	2 to 2.9 Feet Deep: 24
Mean (ft.): 12	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.3	Occurrence of LWD (%): 19	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 50 - 56 Air (F): 50 - 68	LWD per 100 ft.:	Mean Pool Shelter Rating: 12
Dry Channel (ft): 70	Riffles: 4	
	Pools: 7	
	Flat: 3	
Pool Tail Substrate (%): Silt/Clay: 8 Sand: 4 Gravel: 88 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 28.0 2. 64.0 3. 0.0 4. 8.0 5. 0.0		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Shingle Mill Creek

LLID: 1234252391591

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/8/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS17

Latitude: 39:09:33.0N

Longitude: 123:25:31.0W

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	3	1	1.7
Boulder	2	3	2.2
Cobble / Gravel	41	50	39.2
Sand / Silt / Clay	70	62	56.9

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	3	1	1.7
Brush	15	19	14.7
Hardwood Trees	36	53	38.4
Coniferous Trees	62	43	45.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Shingle Mill Creek

LLID: 1234252391591

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/8/2012

Confluence Location: Quad: BAILEY RIDGE

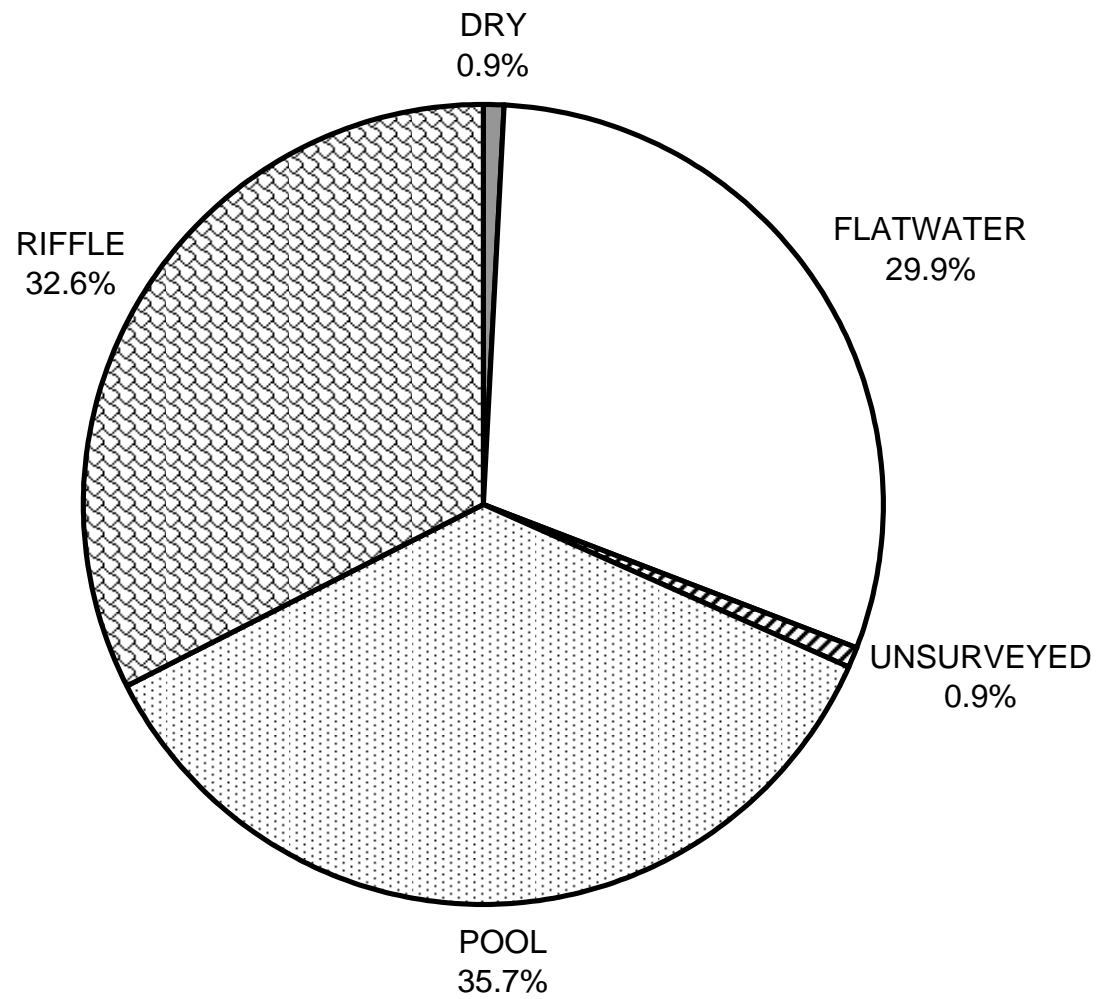
Legal Description: T15NR14WS17

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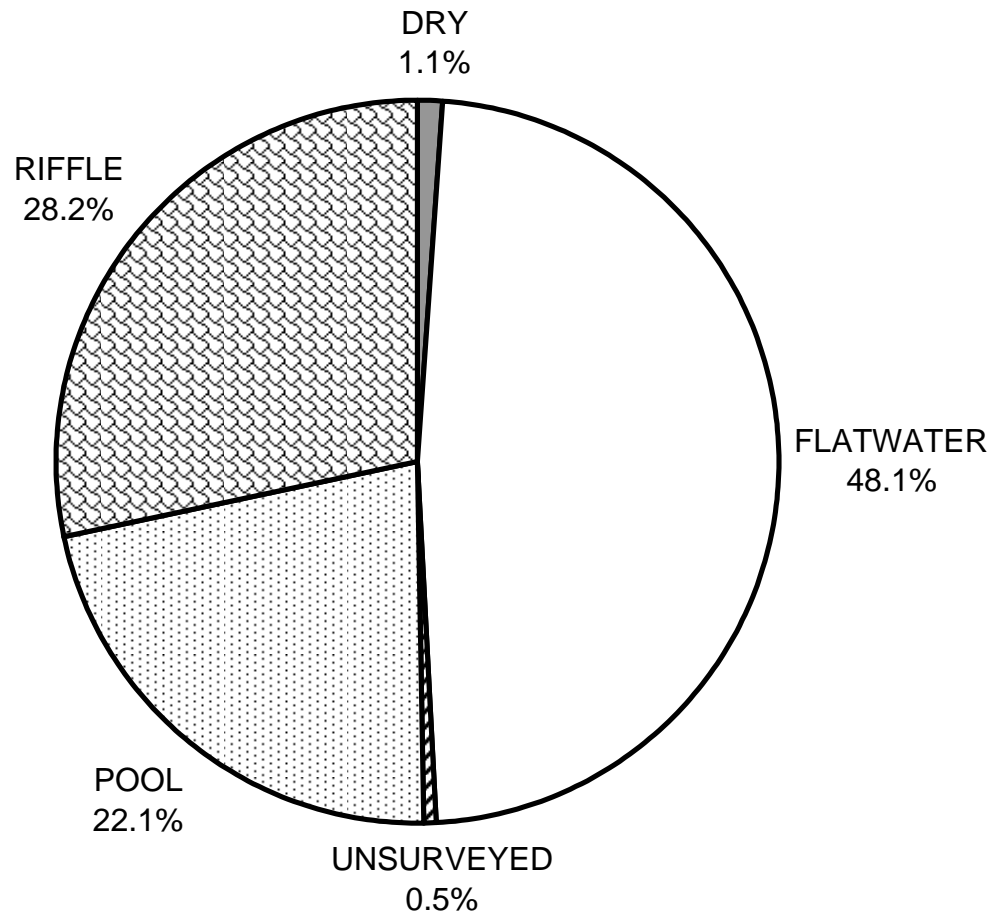
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	14
SMALL WOODY DEBRIS (%)	60	15	16
LARGE WOODY DEBRIS (%)	0	35	40
ROOT MASS (%)	3	0	15
TERRESTRIAL VEGETATION (%)	0	0	1
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	0	0	9
BOULDERS (%)	37	50	4
BEDROCK LEDGES (%)	0	0	0

SHINGLE MILL CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



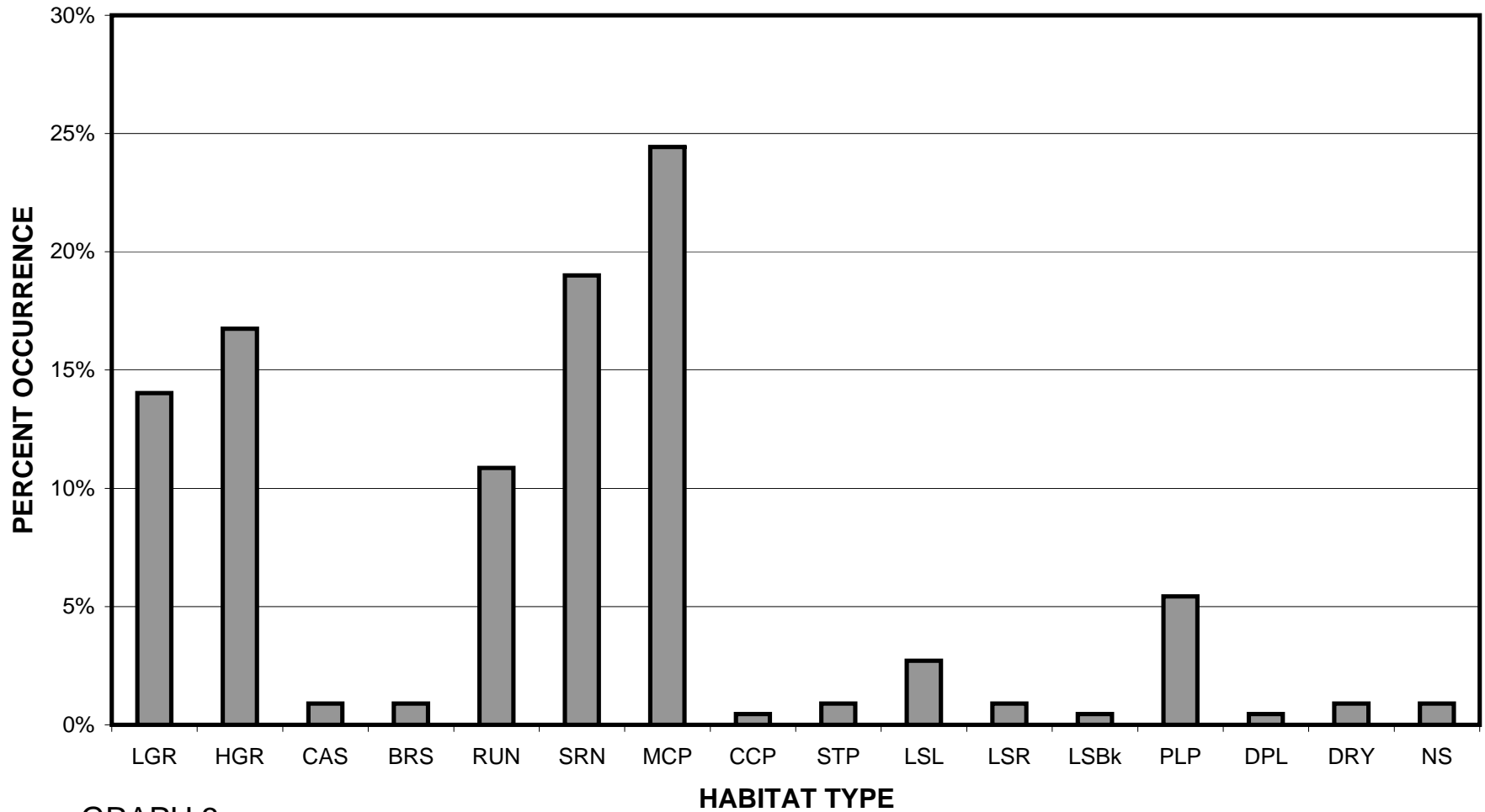
GRAPH 1

SHINGLE MILL CREEK 2012 HABITAT TYPES BY PERCENT TOTAL LENGTH



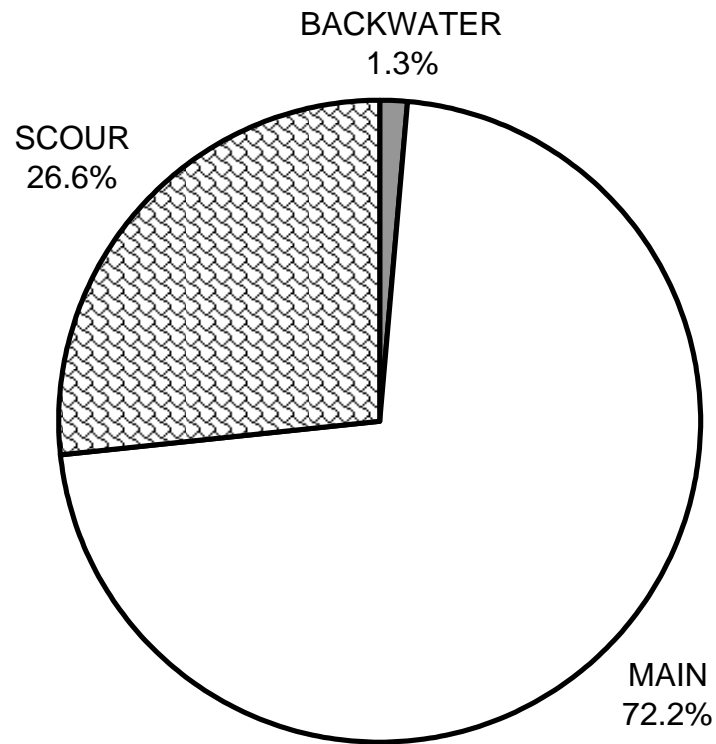
GRAPH 2

SHINGLE MILL CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



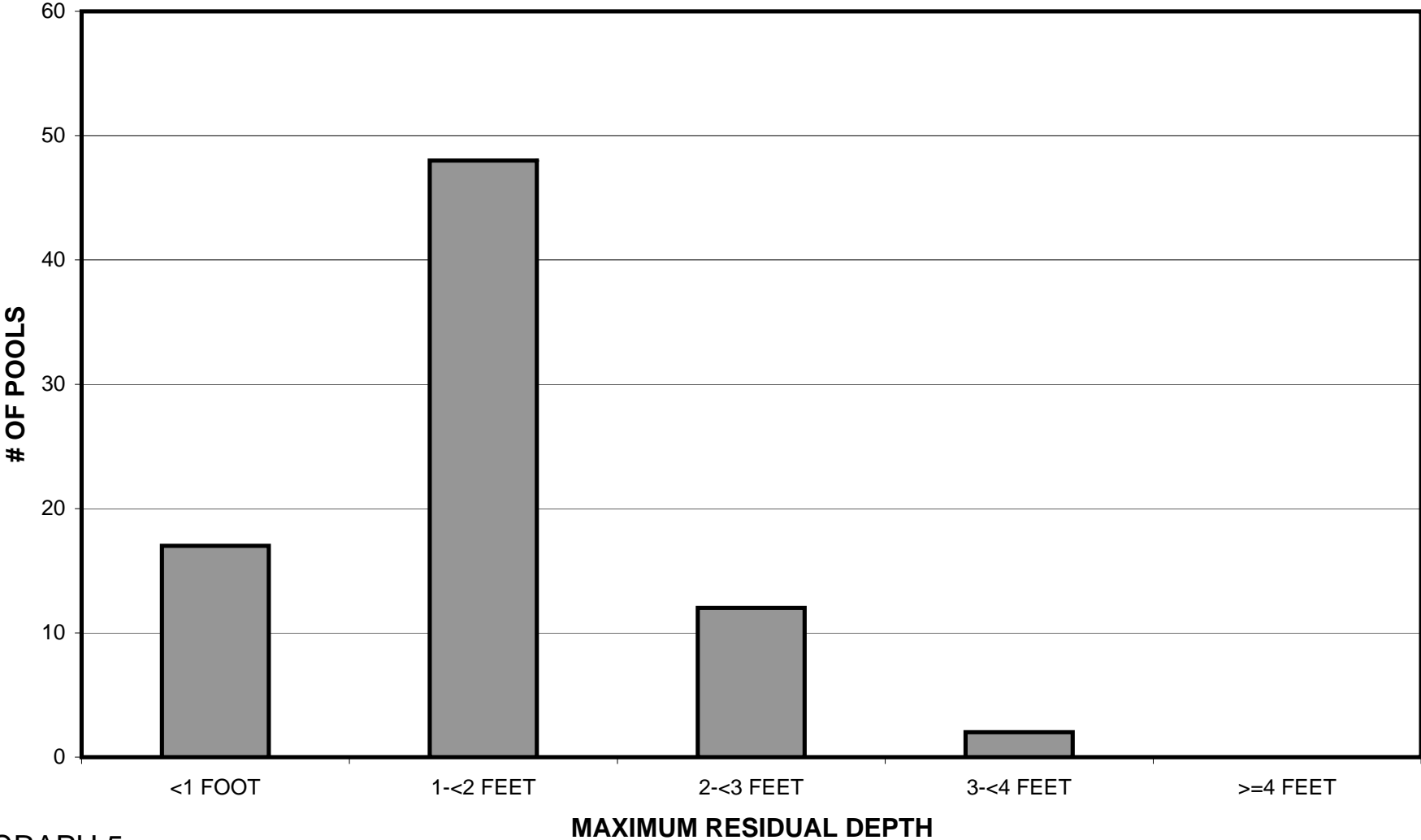
GRAPH 3

SHINGLE MILL CREEK 2012 POOL TYPES BY PERCENT OCCURRENCE



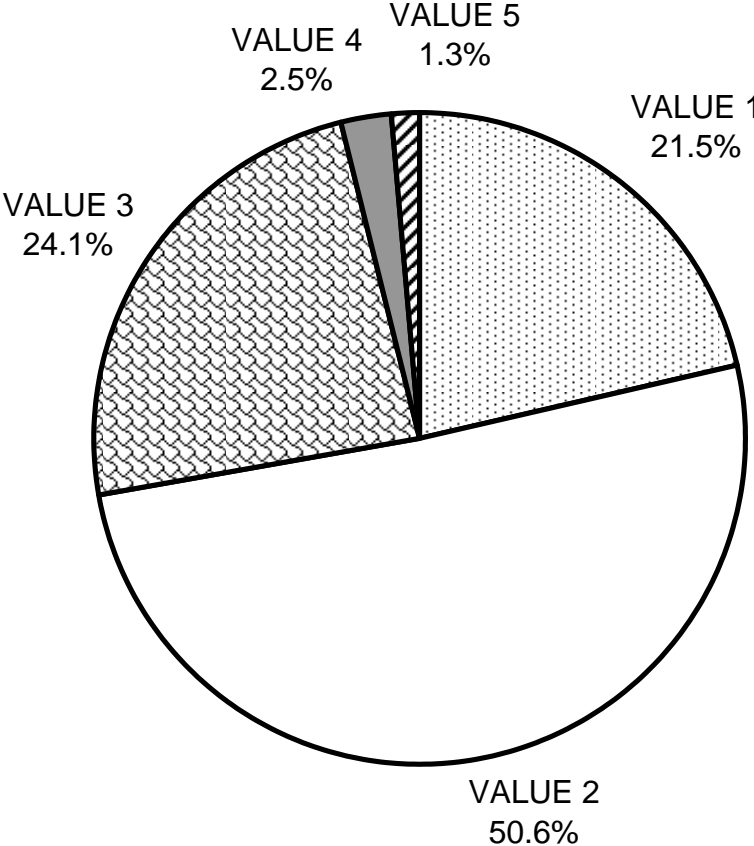
GRAPH 4

SHINGLE MILL CREEK 2012 MAXIMUM DEPTH IN POOLS



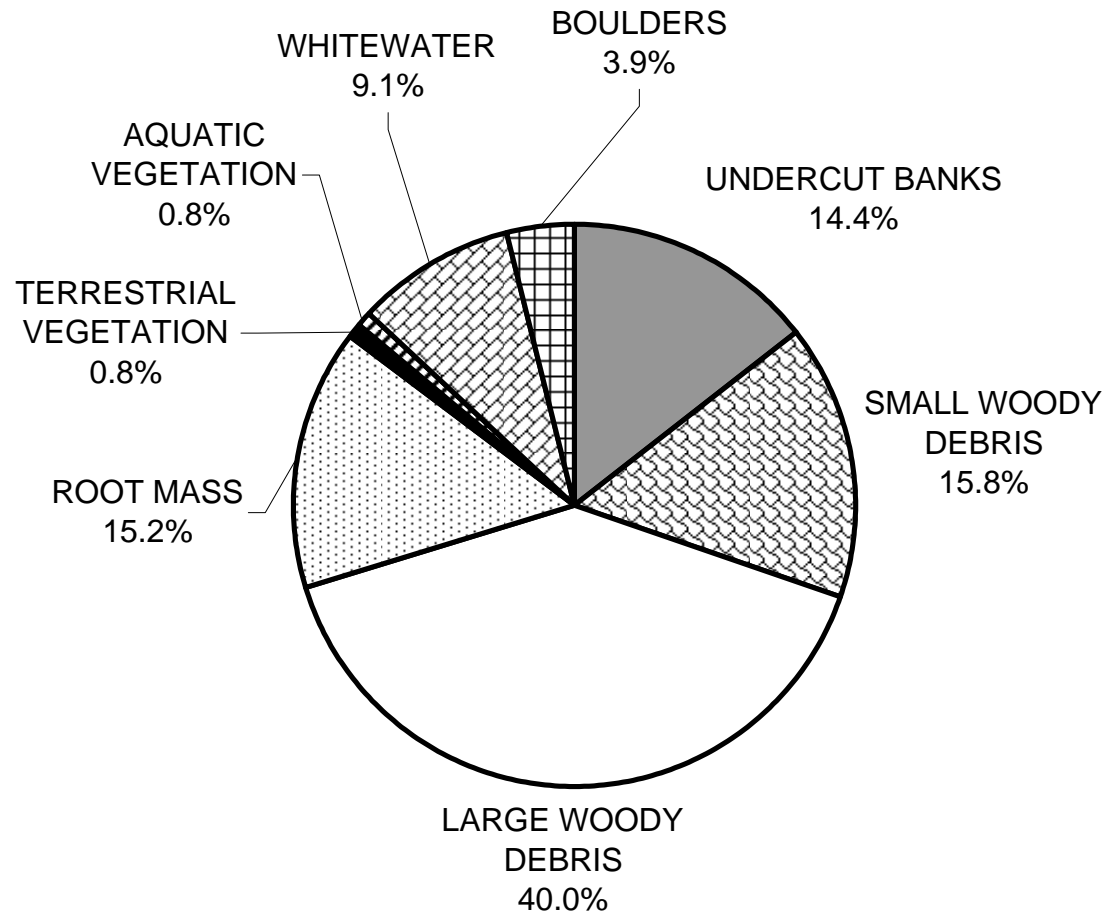
GRAPH 5

SHINGLE MILL CREEK 2012 PERCENT EMBEDDEDNESS



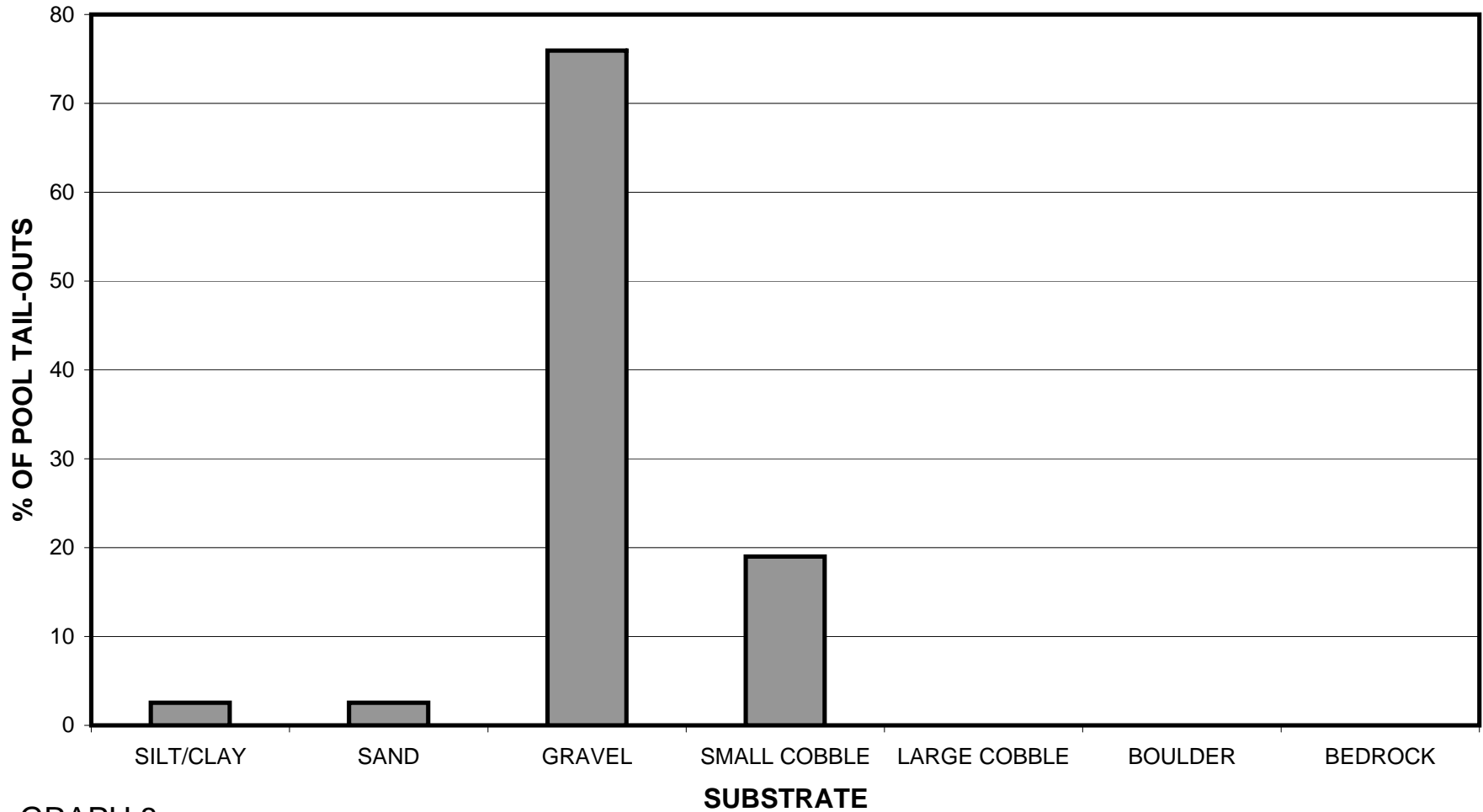
GRAPH 6

SHINGLE MILL CREEK 2012 MEAN PERCENT COVER TYPES IN POOLS



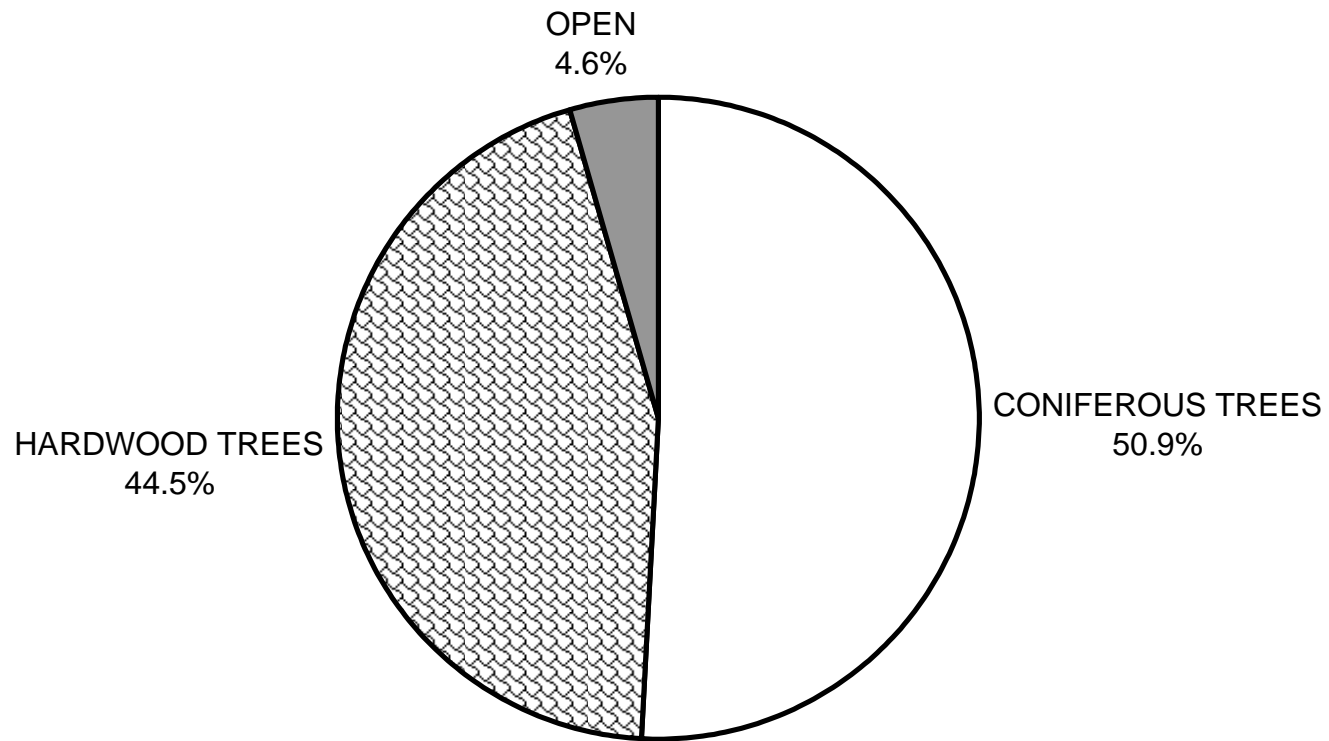
GRAPH 7

SHINGLE MILL CREEK 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



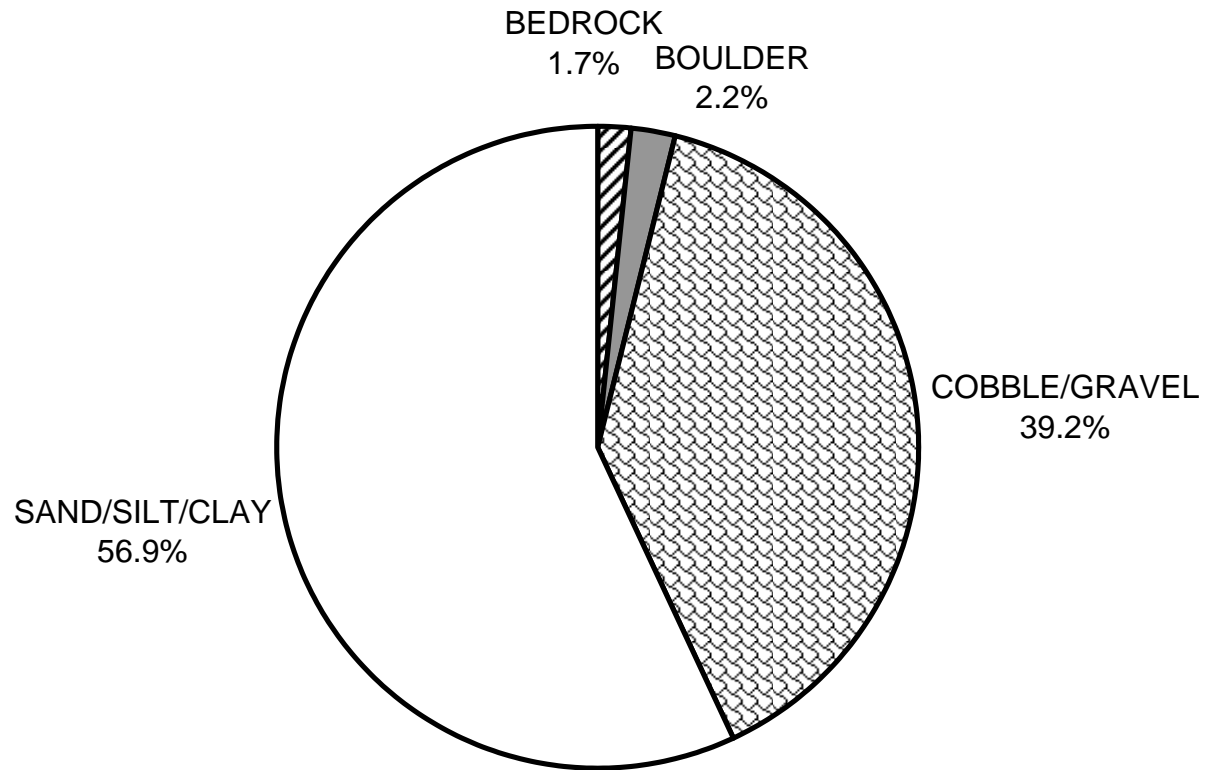
GRAPH 8

SHINGLE MILL CREEK 2012 MEAN PERCENT CANOPY



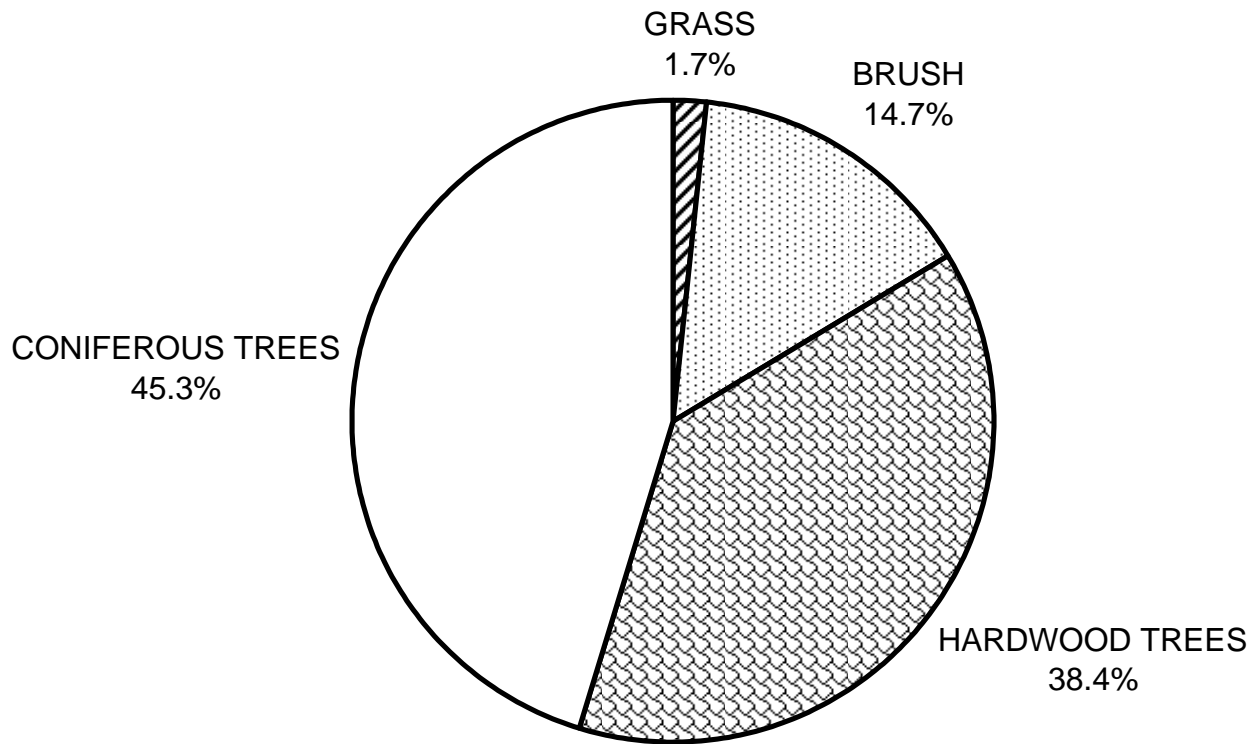
GRAPH 9

SHINGLE MILL CREEK 2012 DOMINANT BANK COMPOSITION IN SURVEY REACH



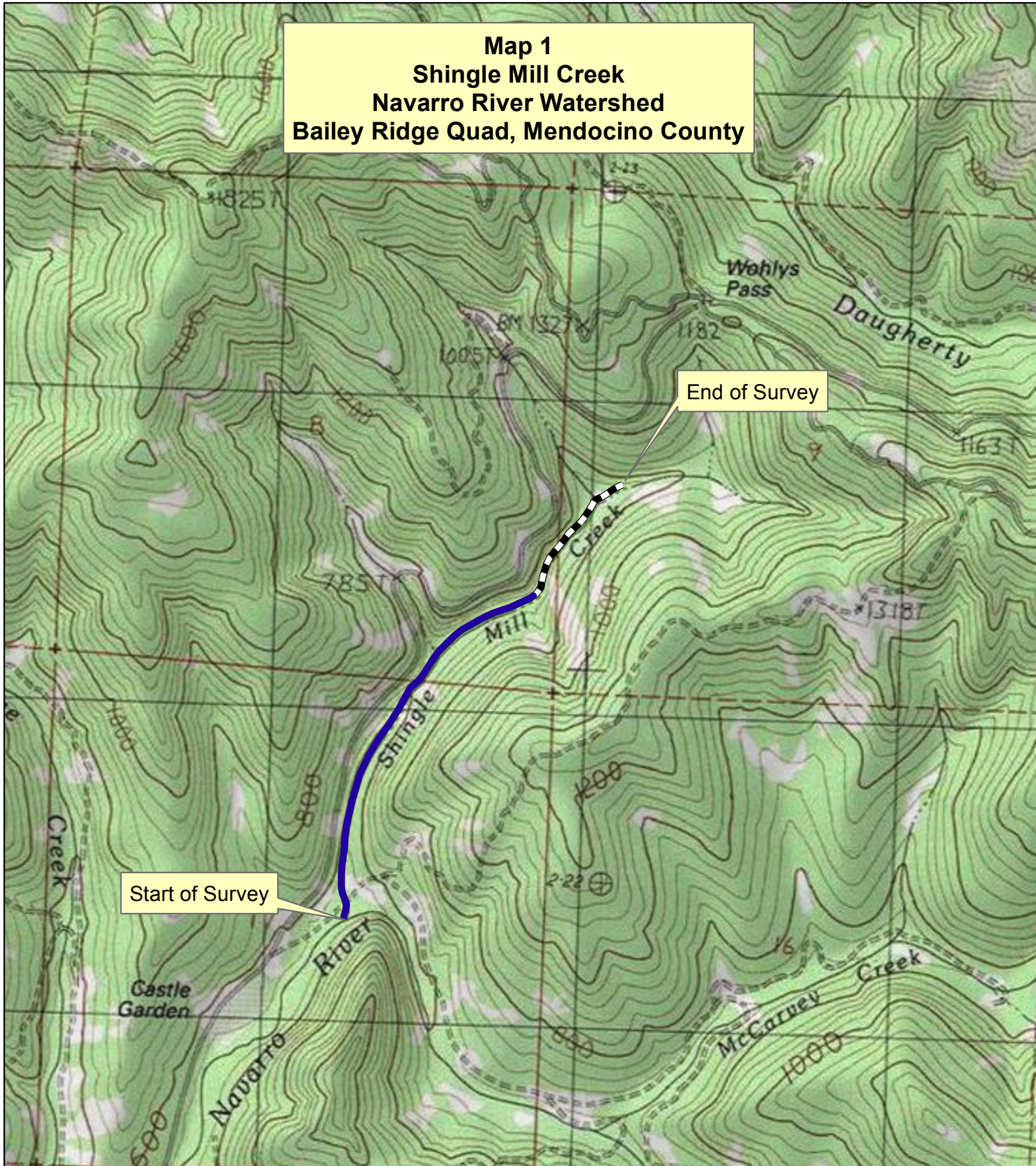
GRAPH 10

SHINGLE MILL CREEK 2012 DOMINANT BANK VEGETATION IN SURVEY REACH



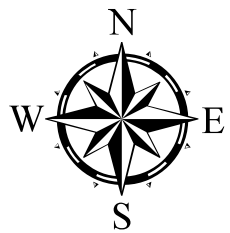
GRAPH 11



Map 1
Shingle Mill Creek
Navarro River Watershed
Bailey Ridge Quad, Mendocino County



Start of Survey

End of Survey



-  Reach 1, G4 Channel Type
-  Reach 2, A4 Channel Type

