

# STREAM INVENTORY REPORT

## McCarvey Creek

### INTRODUCTION

A stream inventory was conducted from April 30 to May 21, 2012 on McCarvey Creek. The survey began at the confluence with South Branch North Fork Navarro River and extended upstream 1.4 miles.

The McCarvey 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 McCarvey 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

McCarvey Creek is a tributary to South Branch North Fork Navarro River, tributary to North Fork Navarro River, tributary to Navarro River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). McCarvey Creek's legal description at the confluence with South Branch North Fork Navarro River is T15N R14W S16. Its location is 39.1534 degrees north latitude and 123.4171 degrees west longitude, LLID number 1234157391534. McCarvey Creek is a first order stream and has approximately 1.4 miles of blue line stream according to the USGS Bailey Ridge 7.5 minute quadrangle. McCarvey Creek drains a watershed of approximately 1.8 square miles. Elevations range from about 620 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 McCarvey 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 McCarvey 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". McCarvey 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 McCarvey 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 McCarvey 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 McCarvey 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 McCarvey 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 McCarvey Creek. In addition, underwater observations were made at five 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 McCarvey 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 21, 2012 was conducted by C. Tiffany, A. Garcia, M. Zee, A. Blessing, and T. Anderson (WSP). The total length of the stream surveyed was 7,303 feet with an additional 110 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.30 cfs on May 16, 2012.

McCarvey Creek is a G4 channel type for 7,413 feet of the stream surveyed. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 48 to 56 degrees Fahrenheit. Air temperatures ranged from 48 to 74 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 50% pool units, 31% flatwater units, 17% riffle units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 50% flatwater units, 29% pool units, 19% riffle units, 2% dry units, and 1% unsurveyed units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 41%; run units, 19%; and step run units, 13% (Graph 3). Based on percent total length, run units made up 26%, step run units 24%, and mid-channel pool units 23%.

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A total of 114 pools were identified (Table 3). Main channel pools were the most frequently encountered at 82% (Graph 4), and comprised 82% 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. Twelve of the 114 pools (11%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 114 pool tail-outs measured, 44 had a value of 1 (38.6%); 41 had a value of 2 (36%); 18 had a value of 3 (15.8%); 11 had a value of 5 (9.6%) (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 4, flatwater habitat types had a mean shelter rating of 7, and pool habitats had a mean shelter rating of 15 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 20. Main channel pools had a mean shelter rating of 14 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in McCarvey Creek. Graph 7 describes the pool cover in McCarvey Creek. Undercut banks are 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 75% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 12% of the pool tail-outs.

The mean percent canopy density for the surveyed length of McCarvey Creek was 94%. Six percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 61% and 39%, respectively. Graph 9 describes the mean percent canopy in McCarvey Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 94%. The mean percent left bank vegetated was 94%. The dominant elements composing the structure of the stream banks consisted of 79% sand/silt/clay, 15% cobble/gravel, 4% bedrock, and 1% boulders (Graph 10). Deciduous trees were the dominant vegetation type observed in 54% of the units surveyed. Additionally, 34% of the units surveyed had coniferous trees as the dominant vegetation type, and 6% had grass as the dominant vegetation type (Graph 11).

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### BIOLOGICAL INVENTORY RESULTS

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

Five sites were sampled within the first 1,159 feet of McCarvey Creek. The reach sites yielded one young-of-the-year steelhead/rainbow trout (SH/RT), and three age 1+ SH/RT.

The following chart displays the information yielded from these sites:

2012 McCarvey Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
G4 Channel Type									
08/01/12	1	016	Pool	535	0	2	0	0	0
	2	022	Pool	754	0	0	0	0	0
	3	029	Pool	915	0	1	0	0	0
	4	031	Pool	1079	1	0	0	0	0
	5	033	Pool	1159	0	0	0	0	0

### DISCUSSION

McCarvey Creek is a G4 channel type for the entire length of the survey, 7,413 feet. The suitability of G4 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.

The water temperatures recorded on the survey days April 30 to May 21, 2012 ranged from 48 to 56 degrees Fahrenheit. Air temperatures ranged from 48 to 74 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 50% of the total length of this survey, riffles 19%, and pools 29%. Twelve of the 114 (11%) 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.

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Eighty-five of the 114 pool tail-outs measured had embeddedness ratings of 1 or 2. Eighteen of the pool tail-outs had embeddedness ratings of 3 or 4. Eleven 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.

Ninety-nine of the 114 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 15. The shelter rating in the flatwater habitats is 7. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in McCarvey Creek. Undercut banks are 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 94%. The percentage of right and left bank covered with vegetation was 94% and 94%, respectively.

### RECOMMENDATIONS

- 1) McCarvey 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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from undercut banks. 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 South Branch North Fork Navarro River. The channel is a G4 for the entire length of the survey. A 1.3' high plunge at the mouth is a possible low flow juvenile barrier.



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193	0006.00	Log debris accumulation (LDA) #01 contains four pieces of large woody debris (LWD) and measures 5' high x 14' wide x 11' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 2' wide x 120' long x 1.5' deep. There is a 2.5' high plunge over the LDA. Fish are present above the LDA.
300	0010.00	A landslide on the left bank measures approximately 200' long x 30' high; it is contributing silt, sand and gravel to the channel.
420	0013.00	There is a 3.5' high plunge over small woody debris (SWD).
741	0022.00	There is a 0.8' high plunge over log.
761	0024.00	There is a 0.8' high plunge over boulders.
784	0026.00	LDA #02 contains 11 pieces of LWD and measures 7' high x 14.5' wide x 30' 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 40' long x 2.5' deep. The LDA consists of two plunges: the first plunge is 3.5' high, the second plunge is 1.5' high. Fish are present above the LDA.
1687	0055.00	There is a 1.7' high plunge.
1703	0056.00	Tributary #01 enters on the right bank. It contributes approximately 5% to McCarvey Creek's flow. The water temperature of the tributary was 55 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 48 degrees Fahrenheit. The slope of the tributary is approximately 25%. The tributary is not accessible to salmonids.
2010	0067.00	A logging road crosses the channel. The crossing is a 13.8' wide x 14.5' high x 51' long railcar bridge.
2425	0076.00	Landslide contributing sediment to the channel.
2718	0087.00	Tributary #02 enters on the right bank. It contributes approximately 5% to McCarvey Creek's flow. The water temperature of the tributary was 48 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 48 degrees Fahrenheit. The slope of the tributary is approximately 15%. The tributary not accessible to salmonids.
2871	0091.00	There is a 2' high plunge.
3011	0097.00	There is a 0.5' high plunge.

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3292	0106.00	There is a 0.8' high plunge.
3402	0113.00	There is a 0.5' high plunge.
3431	0114.00	LDA #03 contains three pieces of LWD and measures 3' high x 7' wide x 7' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment. The LDA consists of two plunges: the first plunge is 0.5' high, the second plunge is 1' high. Fish are present above the LDA.
3449	0115.00	There is a 2.2' high plunge.
3928	0126.00	Tributary #03 enters on the right bank. It contributes approximately 5% to McCarvey Creek's flow. The water temperature of the tributary was 51 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 54 degrees Fahrenheit. The slope of the tributary is approximately 15%. The tributary not accessible to salmonids.
4135	0133.00	LDA #04 contains six pieces of LWD and measures 7' high x 20' wide x 33' 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 25' long x 1' deep. The LDA consists of two plunges: the first plunge is 4' high and the second plunge is 2' high. Fish are present above the LDA.
4869	0161.00	A landslide is 28' long x 8.5' high.
4895	0163.00	There is a 4' high plunge.
5254	0174.00	Tributary #04 enters on the left bank. It contributes approximately 10% to McCarvey Creek's flow. The water temperature of the tributary was 52 degrees Fahrenheit, the water temperature downstream of the tributary was 54 degrees Fahrenheit, and the water temperature upstream of the confluence was 55 degrees Fahrenheit. The slope of the tributary is approximately 11%. The first 100' is accessible to salmonids.
5573	0178.00	A landslide on the right bank measures approximately 10' high x 40' long. A landslide on the left bank measures 12' high x 40' long.
5719	0180.00	Left bank landslide measures approximately 50' high x 15' long.
6247	0199.00	There is a 3' high plunge.
6662	0217.00	Tributary #05 enters on the left bank. It contributes approximately 65% to McCarvey Creek's flow. The water temperature of the tributary was 55 degrees Fahrenheit; the water temperature downstream and upstream

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of the tributary was 55 degrees Fahrenheit. The slope of the tributary is approximately 30%. The tributary not accessible to salmonids.

- 7124      0223.00      LDA #05 contains three pieces of LWD and measures 8' high x 19' wide x 14' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 7' wide x 2.5' long x 4.5' deep. It is a possible strainer barrier to juvenile and adult salmonids. No fish were observed above the LDA.
- 7294      0225.00      End of survey due to high gradient. The slope is 17%.

## 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: McCarvey Creek

LLID: 1234157391534 Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/21/2012

Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS16 Latitude: 39:09:12.0N Longitude: 123:24:57.0

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	0.4	154	154	2.1									
72	12	FLATWATER	31.4	51	3677	49.6	6.6	0.4	0.8	357	25684	131	9411		7
2	0	NOSURVEY	0.9	22	44	0.6									
114	114	POOL	49.8	19	2135	28.8	6.8	0.5	1.3	130	14859	103	11750	70	15
40	14	RIFFLE	17.5	35	1403	18.9	5.5	0.3	0.5	160	6397	45	1807		4
<b>Total Units</b>	<b>Total Units Fully Measured</b>				<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>			<b>Total Volume (cu.ft.)</b>		
229	140				7413					46939			22968		

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

Stream Name: McCarvey Creek

LLID: 1234157391534

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/21/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS16

Latitude: 39:09:12.0N

Longitude: 123:24:57.0W

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 (%)
27	8	LGR	11.8	39	1041	14.0	6	0.3	1	229	6185	66	1784		3	100
11	4	HGR	4.8	30	332	4.5	6	0.2	0.6	73	801	17	183		5	94
1	1	CAS	0.4	21	21	0.3	4	0.4	0.7	71	71	29	29		10	100
1	1	BRS	0.4	9	9	0.1	5	0.2	0.6	44	44	9	9		5	98
43	7	RUN	18.8	44	1907	25.7	7	0.3	0.9	297	12792	89	3846		8	90
29	5	SRN	12.7	61	1770	23.9	6	0.4	1	440	12750	188	5466		5	91
93	93	MCP	40.6	19	1727	23.3	7	0.5	4	127	11836	100	9306	68	14	94
1	1	CCP	0.4	23	23	0.3	8	0.8	1.6	186	186	186	186	149	10	97
2	2	LSL	0.9	18	37	0.5	5	0.2	0.8	128	257	74	149	96	15	100
2	2	LSBk	0.9	27	54	0.7	5	0.4	1.1	130	260	81	163	55	5	95
16	16	PLP	7.0	18	294	4.0	7	0.6	2.9	145	2321	122	1947	73	23	91
1	0	DRY	0.4	154	154	2.1										100
2	0	NS	0.9	22	44	0.6										99

Total Units  
229

Total Units Fully Measured  
140

Total Length (ft.)  
7413

Total Area (sq.ft.)  
47501

Total Volume (cu.ft.)  
23067

**Table 3 - Summary of Pool Types**

Stream Name: McCarvey Creek

LLID: 1234157391534

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/21/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS16

Latitude: 39:09:12.0N

Longitude: 123:24:57.0W

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
94	94	MAIN	82	19	1750	82	6.8	0.5	128	12022	69	6363	14
20	20	SCOUR	18	19	385	18	6.6	0.5	142	2837	72	1376	20

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
114	114	2135	14859	7738

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

Stream Name: McCarvey Creek

LLID: 1234157391534

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/21/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS16

Latitude: 39:09:12.0N

Longitude: 123:24:57.0W

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
93	MCP	82	25	27	60	65	7	8	0	0	1	1
1	CCP	1	0	0	1	100	0	0	0	0	0	0
2	LSL	2	2	100	0	0	0	0	0	0	0	0
2	LSBk	2	0	0	2	100	0	0	0	0	0	0
16	PLP	14	4	25	8	50	4	25	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
114	31	27	71	62	11	10	0	0	1	1

Mean Maximum Residual Pool Depth (ft.): 1.3



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

Stream Name: McCarvey Creek

LLID: 1234157391534

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/21/2012

Dry Units: 1

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS16

Latitude: 39:09:12.0N

Longitude: 123:24:57.0W

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
27	8	LGR	52	26	2	0	0	0	0	20	0
11	4	HGR	0	0	0	0	0	0	33	67	0
1	1	CAS	0	0	0	0	0	0	100	0	0
1	1	BRS	0	0	0	0	0	0	0	0	100
40	14	TOTAL RIFFLE	26	13	1	0	0	0	20	30	10
43	7	RUN	14	44	0	17	21	0	0	4	0
29	5	SRN	45	23	16	0	0	0	5	11	0
72	12	TOTAL FLAT	27	36	6	10	13	0	2	7	0
93	93	MCP	33	34	20	3	1	1	3	4	1
1	1	CCP	0	0	0	0	0	0	70	5	25
2	2	LSL	40	48	13	0	0	0	0	0	0
2	2	LSBk	50	0	0	0	0	0	0	0	50
16	16	PLP	16	16	16	3	0	0	39	10	0
114	114	TOTAL POOL	31	31	19	3	1	1	9	5	2
2	0	NS									
229	140	TOTAL	30	30	16	3	2	1	9	7	3

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

Stream Name: McCarvey Creek LLID: 1234157391534 Drainage: Navarro River  
 Survey Dates: 4/30/2012 to 5/21/2012 Dry Units: 1  
 Confluence Location: Quad: BAILEY RIDGE Legal Description: T15NR14WS16 Latitude: 39:09:12.0N Longitude: 123:24:57.0W

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
27	8	LGR	0	0	88	13	0	0	0
11	4	HGR	0	0	50	50	0	0	0
1	1	CAS	0	0	0	0	0	0	100
1	1	BRS	0	0	0	0	0	0	100
43	7	RUN	29	14	57	0	0	0	0
29	5	SRN	0	0	80	20	0	0	0
93	93	MCP	22	35	38	3	0	0	2
1	1	CCP	0	100	0	0	0	0	0
2	2	LSL	0	50	50	0	0	0	0
2	2	LSBk	50	0	50	0	0	0	0
16	16	PLP	25	6	69	0	0	0	0

**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

Stream Name: McCarvey Creek

LLID: 1234157391534

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/21/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS16

Latitude: 39:09:12.0N

Longitude: 123:24:57.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
94	39	61	0	94	94

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 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: McCarvey Creek

LLID: 1234157391534

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/21/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS16

Latitude: 39:09:12.0N

Longitude: 123:24:57.0W

**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	10	2	4.3
Boulder	2	1	1.1
Cobble / Gravel	23	20	15.4
Sand / Silt / Clay	105	117	79.3

**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	11	6	6.1
Brush	5	11	5.7
Hardwood Trees	86	65	53.9
Coniferous Trees	38	58	34.3
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: McCarvey Creek

LLID: 1234157391534

Drainage: Navarro River

Survey Dates: 4/30/2012 to 5/21/2012

Confluence Location: Quad: BAILEY RIDGE

Legal Description: T15NR14WS16

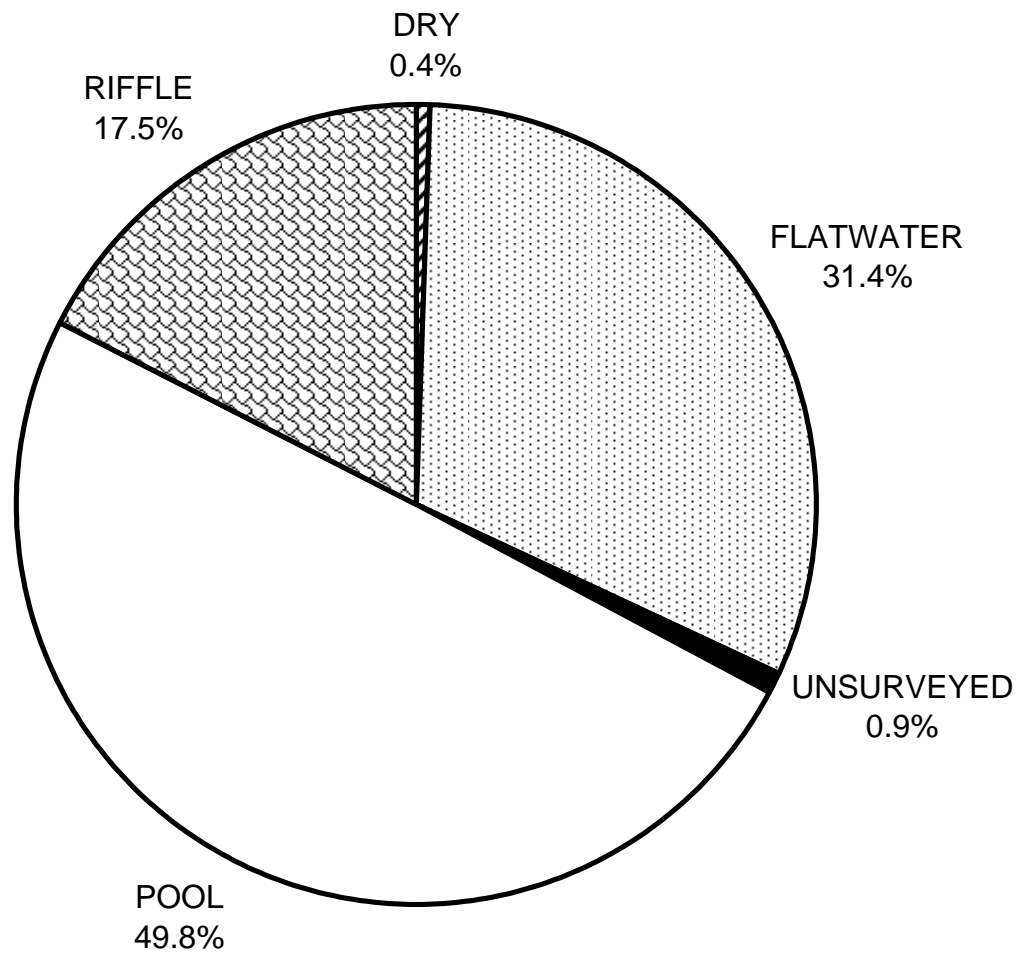
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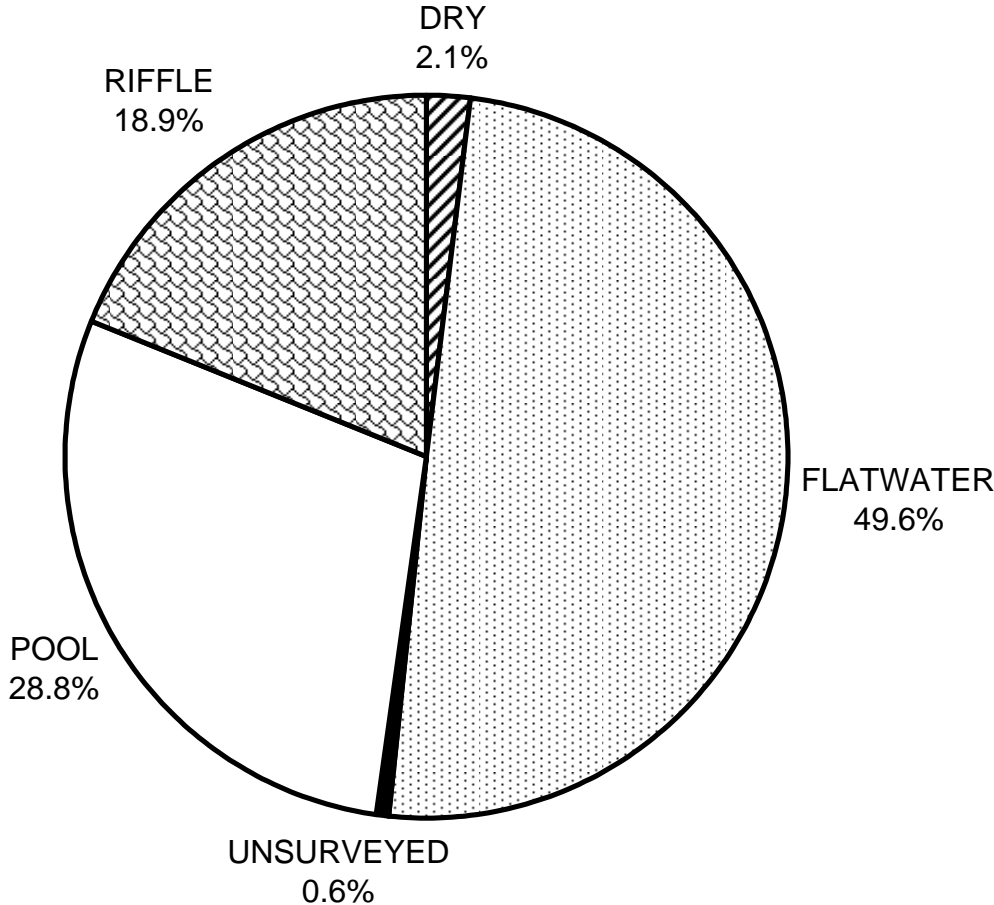
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	26	27	31
SMALL WOODY DEBRIS (%)	13	36	31
LARGE WOODY DEBRIS (%)	1	6	19
ROOT MASS (%)	0	10	3
TERRESTRIAL VEGETATION (%)	0	13	1
AQUATIC VEGETATION (%)	0	0	1
WHITEWATER (%)	20	2	9
BOULDERS (%)	30	7	5
BEDROCK LEDGES (%)	10	0	2

# MCCARVEY CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

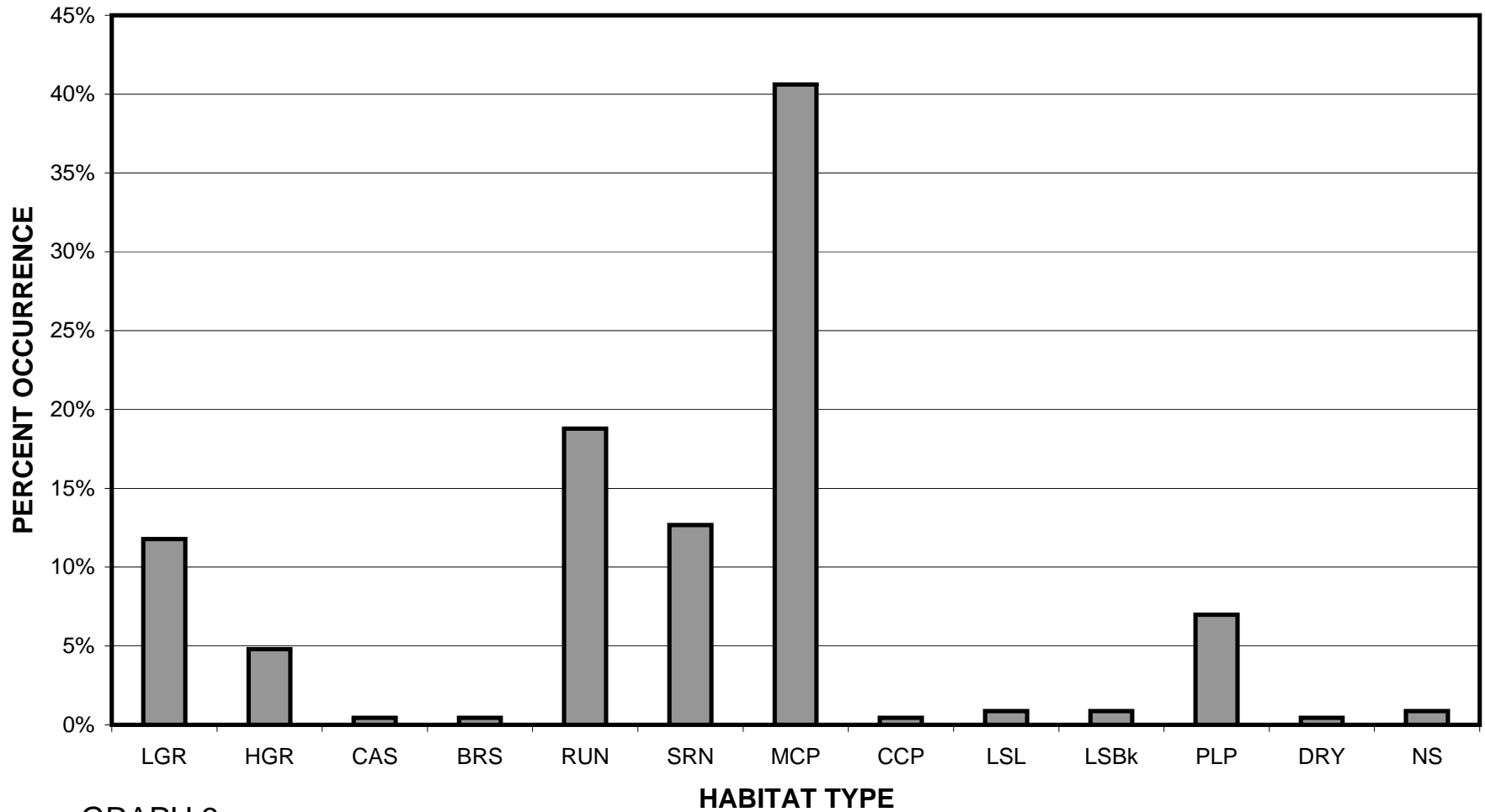
# MCCARVEY CREEK 2012 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

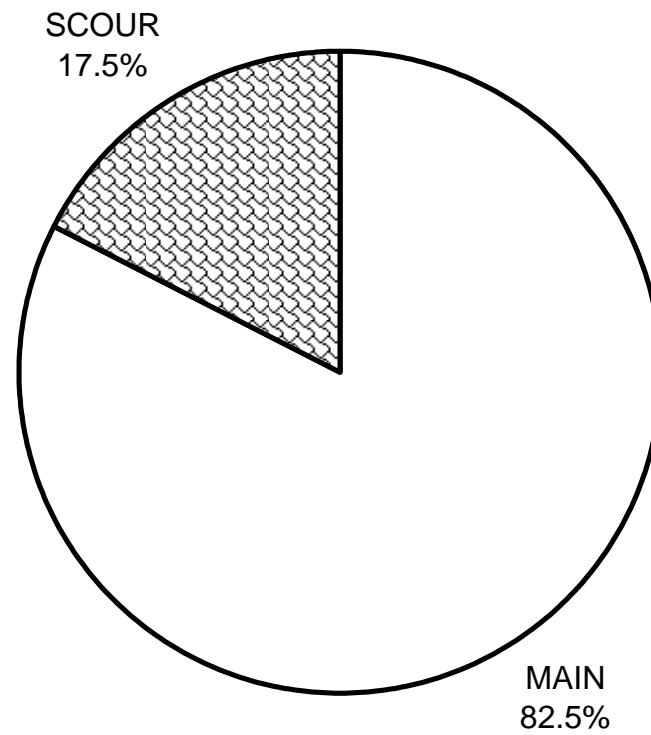


# MCCARVEY CREEK 2012 HABITAT TYPES BY PERCENT OCCURRENCE



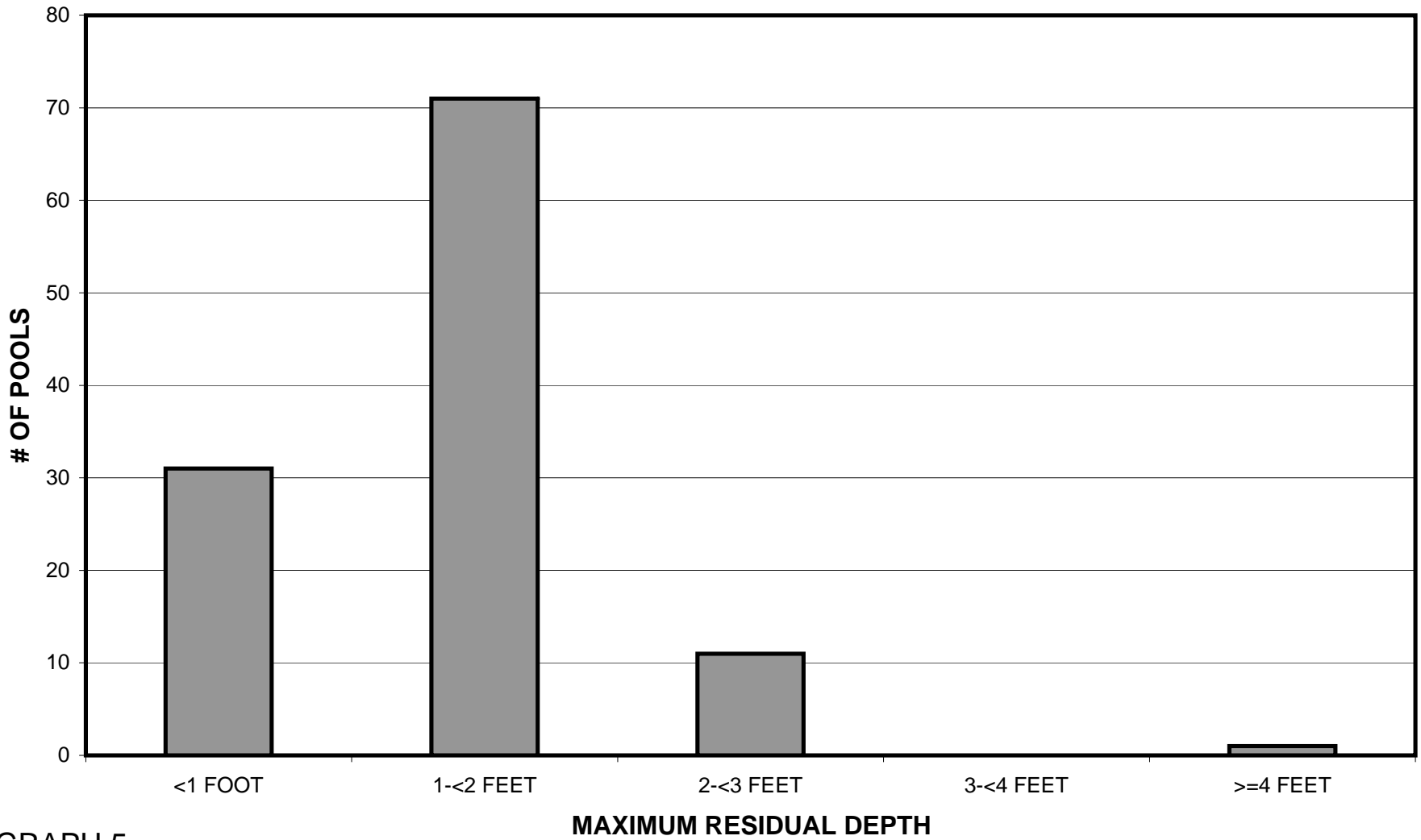
GRAPH 3

# MCCARVEY CREEK 2012 POOL TYPES BY PERCENT OCCURRENCE



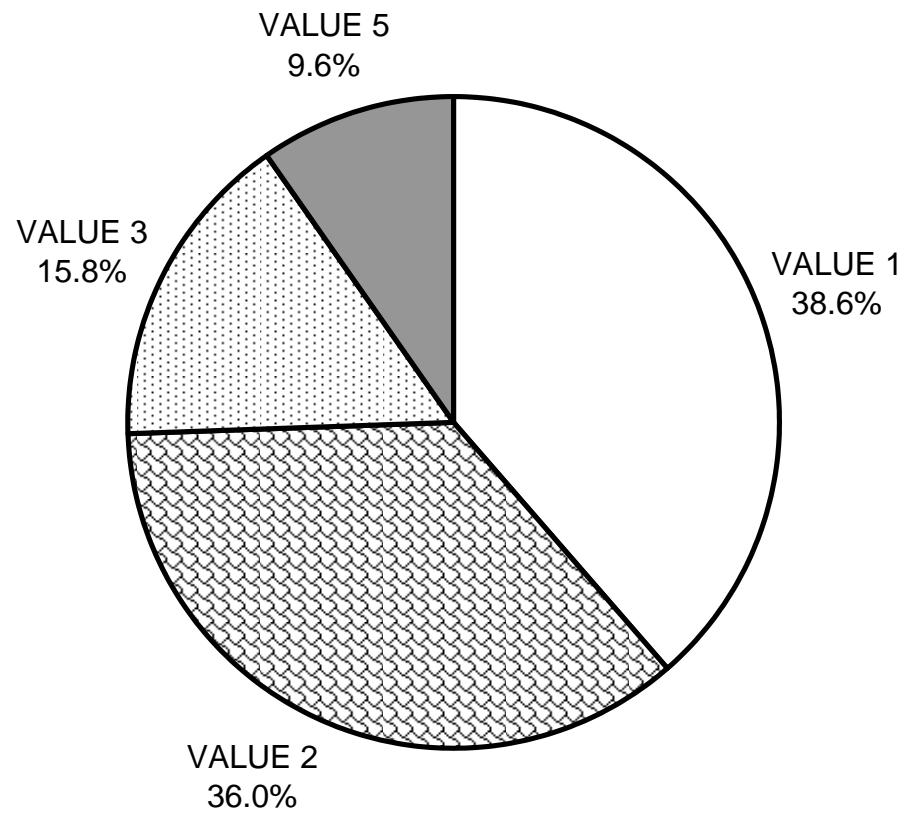
GRAPH 4

# MCCARVEY CREEK 2012 MAXIMUM DEPTH IN POOLS



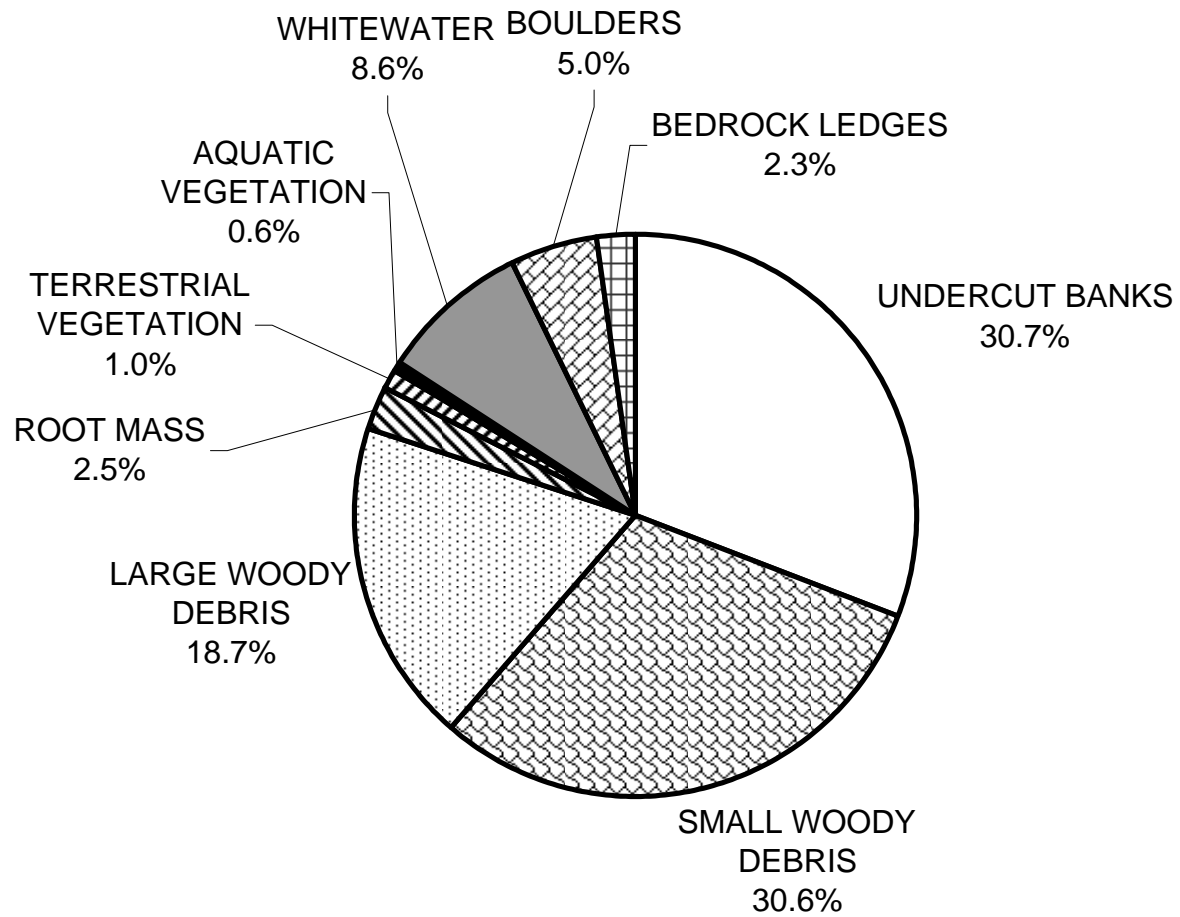
GRAPH 5

# MCCARVEY CREEK 2012 PERCENT EMBEDDEDNESS



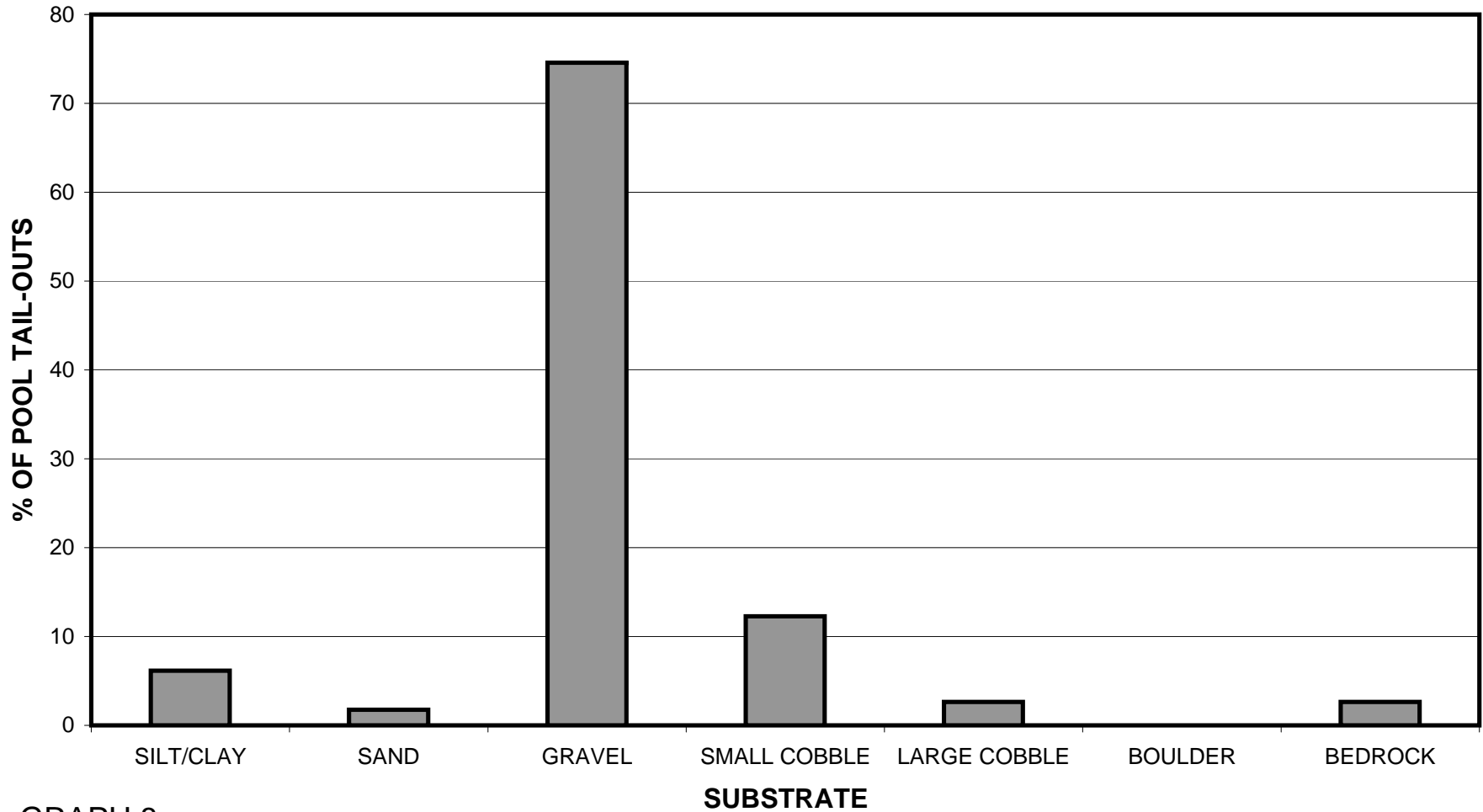
GRAPH 6

# MCCARVEY CREEK 2012 MEAN PERCENT COVER TYPES IN POOLS



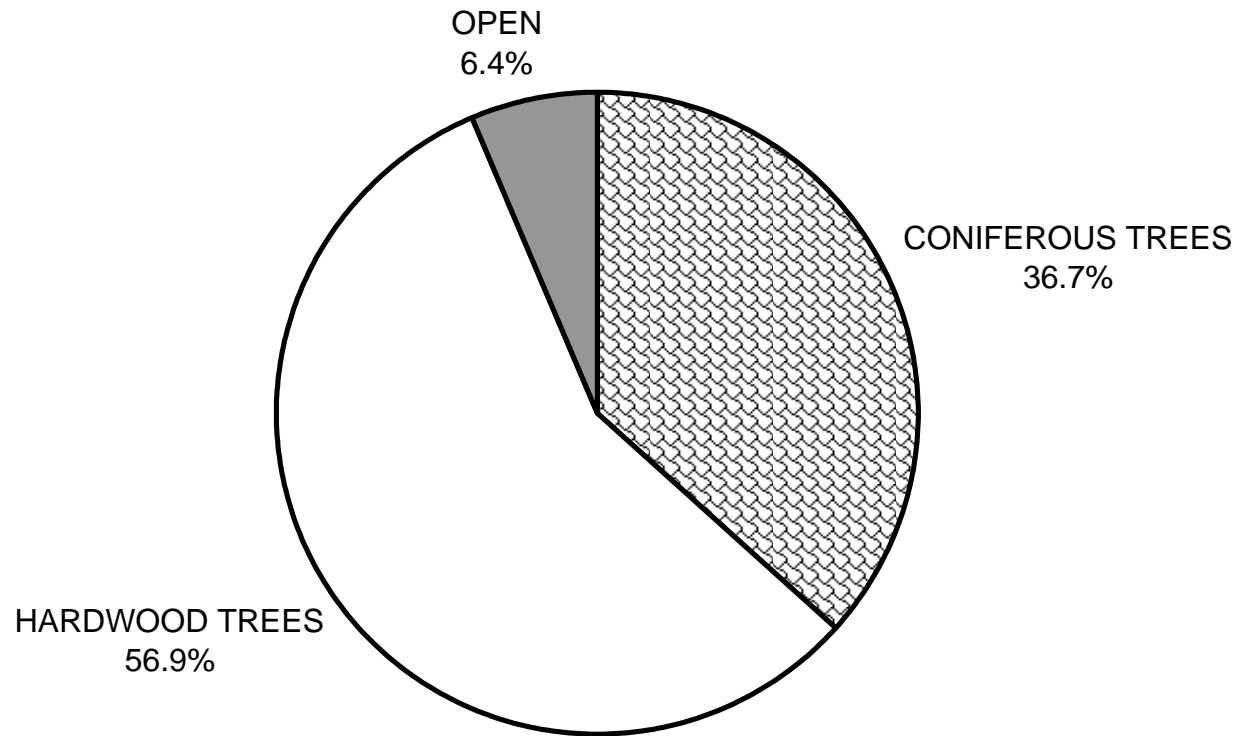
GRAPH 7

# MCCARVEY CREEK 2012 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



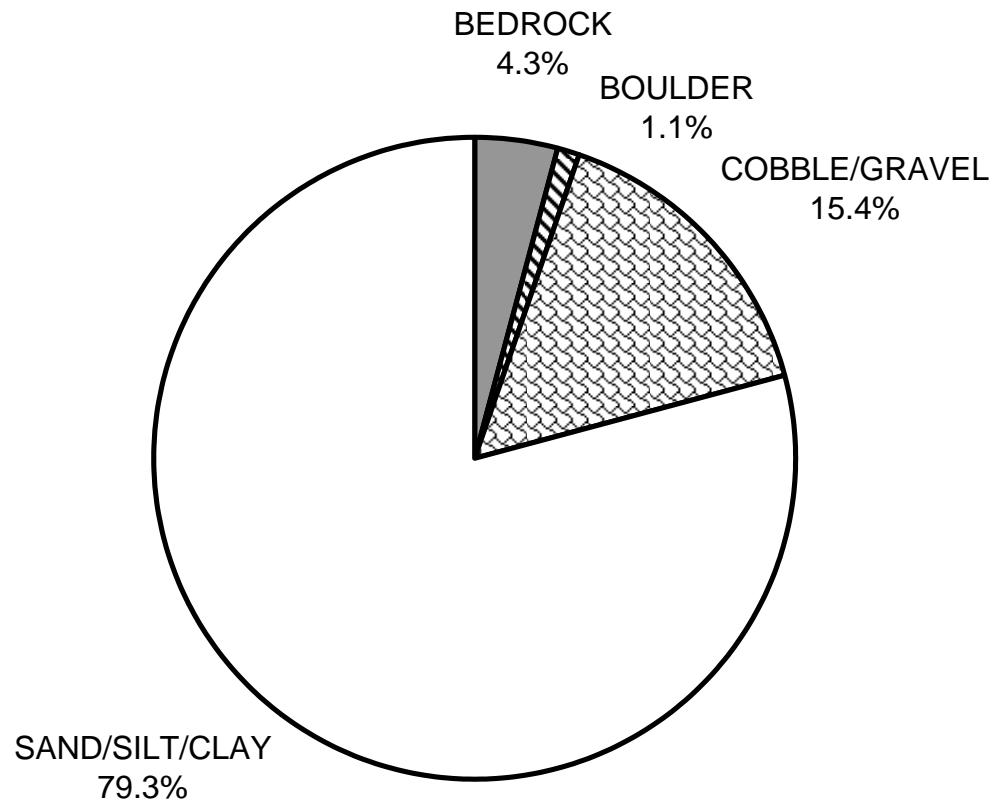
GRAPH 8

# MCCARVEY CREEK 2012 MEAN PERCENT CANOPY



GRAPH 9

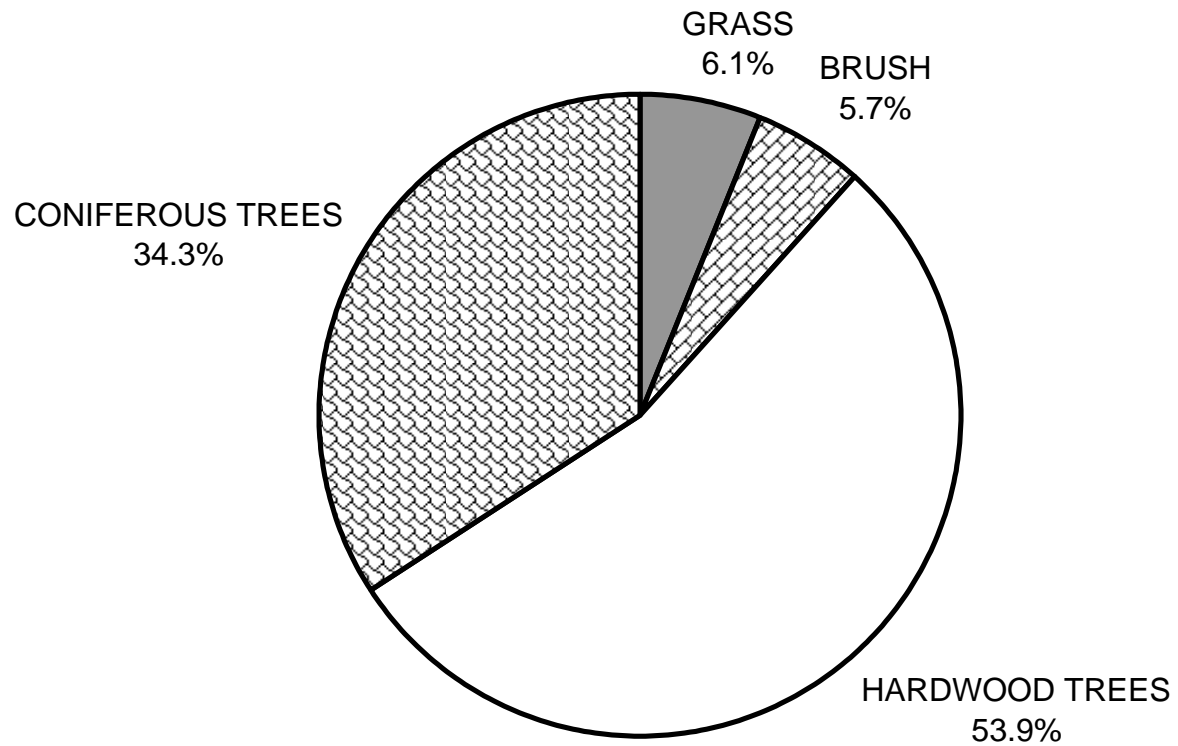
# MCCARVEY CREEK 2012 DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

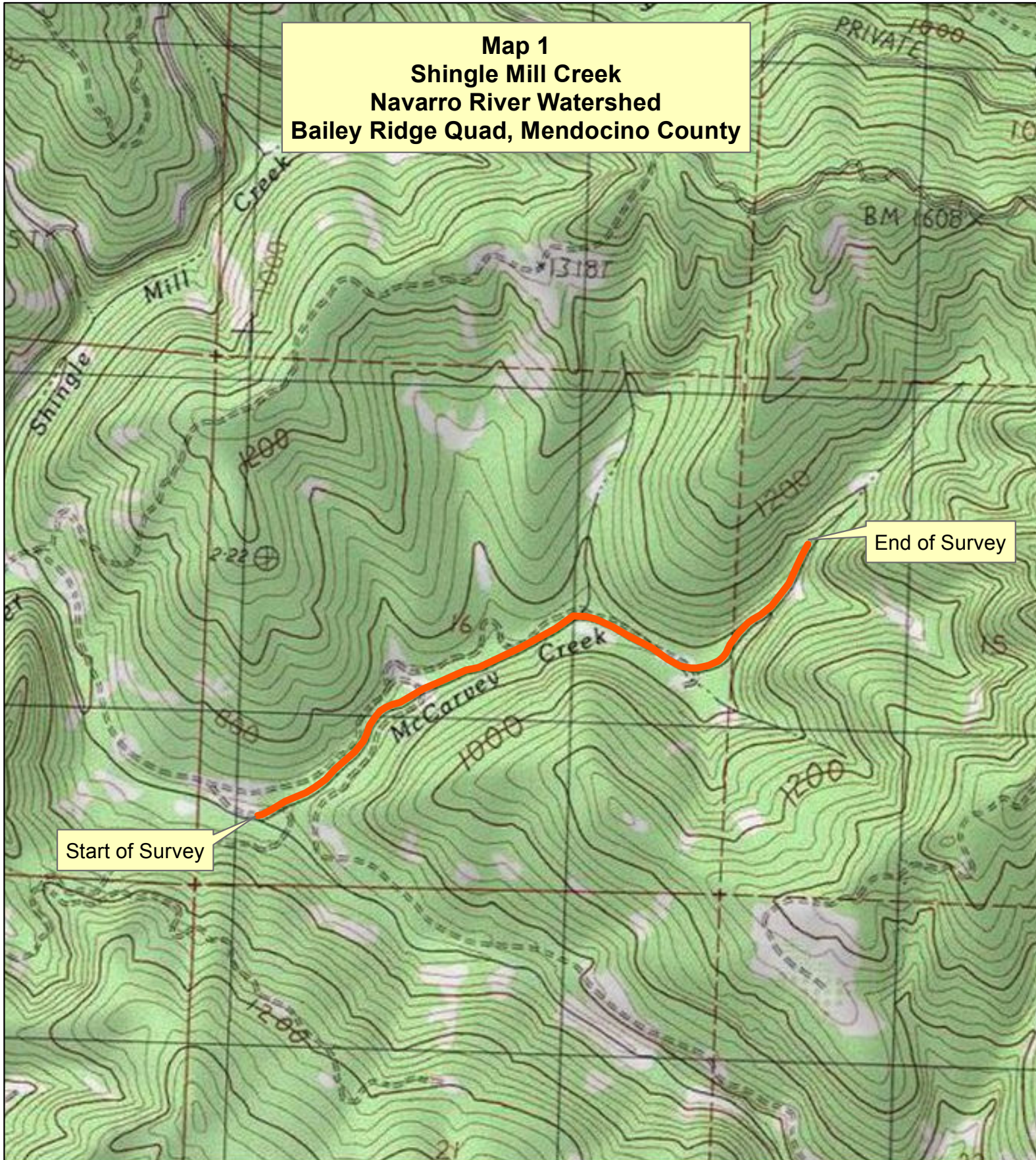


# MCCARVEY CREEK 2012 DOMINANT BANK VEGETATION IN SURVEY REACH



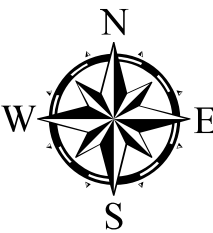
GRAPH 11

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



Start of Survey

End of Survey



Channel Type G4

