

# STREAM INVENTORY REPORT

## McMullen Creek

### INTRODUCTION

A stream inventory was conducted from May 21 to May 30, 2013 on McMullen Creek. The survey began at the confluence with the Noyo River and extended upstream 1.9 miles.

The McMullen 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 McMullen 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

McMullen Creek is a tributary to the Noyo River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). McMullen Creek's legal description at the confluence with the Noyo River is T18N R14W S07. Its location is 39.4310 degrees north latitude and 123.4607 degrees west longitude, LLID number 1234595394310. McMullen Creek is a first order stream and has approximately 1.1 miles of blue line stream according to the USGS Burbeck 7.5 minute quadrangle. McMullen Creek drains a watershed of approximately 2.8 square miles. Elevations range from about 530 feet at the mouth of the creek to 1,600 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 Irmulco Road, seven miles west of Willits, CA.

### METHODS

The habitat inventory conducted in McMullen Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Wildlife (CDFW) personnel and Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. 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

## McMullen Creek

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 McMullen 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". McMullen 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 wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

## McMullen Creek

### 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 McMullen 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is classified according to a list of nine cover types. In McMullen 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. The shelter rating is then calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

### 7. Substrate Composition:

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

### 8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In McMullen 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 McMullen Creek, 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.

## **McMullen Creek**

### 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 McMullen Creek. In addition, underwater observations were made at 11 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

## DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

## McMullen Creek

Graphics are produced from the tables using Microsoft Excel. Graphics developed for McMullen 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 May 21 to May 30, 2013 was conducted by A. Blessing (CDFW), N. Massa (WSP), and J. Edgar (CDFW). The total length of the stream surveyed was 10,239 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.5 cfs on May 29, 2013.

McMullen Creek is an F4 channel type for 9,467 feet of the stream surveyed (Reach 1) and an A2 channel type for 772 feet of the stream surveyed (Reach 2). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. A2 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 48 to 54 degrees Fahrenheit. Air temperatures ranged from 48 to 64 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% pool units, 38% riffle units, 22% flatwater units, and 1% unsurveyed units (Graph 1). Based on total length of Level II habitat types there were 37% riffle units, 34% pool units, 27% flatwater units, 1% culvert units, and 1% unsurveyed units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 35%; mid-channel pool units, 34%; and step run units, 14% (Graph 3). Based on percent total length, low gradient riffle units made up 32%, mid-channel pool units 31%, and step run units 21%.

## **McMullen Creek**

A total of 126 pools were identified (Table 3). Main channel pools were the most frequently encountered at 90% (Graph 4), and comprised 94% 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. Sixteen of the 126 pools (13%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 126 pool tail-outs measured, 49 had a value of 1 (39%); 57 had a value of 2 (45%); eight had a value of 3 (6%); one had a value of 4 (1%); 11 had a value of 5 (9%) (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 6, flatwater habitat types had a mean shelter rating of 8, and pool habitats had a mean shelter rating of 28 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 33. Main channel pools had a mean shelter rating of 28 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in McMullen Creek. Graph 7 describes the pool cover in McMullen Creek. Large woody debris is the dominant pool cover type followed by boulders.

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 21% of the pool tail-outs.

The mean percent canopy density for the surveyed length of McMullen Creek was 91%. Nine percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 44% and 56%, respectively. Graph 9 describes the mean percent canopy in McMullen Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 61% sand/silt/clay, 37% cobble/gravel, and 2% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 51% of the units surveyed. Additionally, 23% of the units surveyed had hardwood trees as the dominant vegetation type, and 19% had brush as the dominant vegetation type (Graph 11).

## **BIOLOGICAL INVENTORY RESULTS**

Survey teams conducted a snorkel survey at 11 sites for species composition and distribution in McMullen Creek on September 5, 2013. The sites were sampled by B. Leonard and M. Groff (CDFW).

## McMullen Creek

In Reach 1, which comprised the first 9,467 feet of stream, 11 sites were sampled. The reach sites yielded four young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), one age 1+ SH/RT, 64 YOY coho salmon, and one sculpin.

The following chart displays the information yielded from these sites:

2013 McMullen 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: F4 Channel Type									
09/05/13	1	011	Pool	346	1	0	0	9	0
	2	015	Pool	536	3	1	0	26	0
	3	031	Pool	1,356	0	0	0	25	0
	4	125	Pool	4,269	0	0	0	4	0
	5	144	Pool	4,886	0	0	0	0	0
	6	146	Pool	5,018	0	0	0	0	0
	7	150	Pool	5,176	0	0	0	0	0
	8	159	Pool	5,483	0	0	0	0	0
	9	161	Pool	5,561	0	0	0	0	0
	10	170	Pool	5,792	0	0	0	0	0
	11	179	Pool	6,048	0	0	0	0	0

## DISCUSSION

McMullen Creek is an F4 channel type for the first 9,467 feet of stream surveyed and an A2 channel type for the remaining 772 feet. The suitability of F4 and A2 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. A2 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days May 21 to May 30, 2013 ranged from 48 to 54 degrees Fahrenheit. Air temperatures ranged from 48 to 64 degrees Fahrenheit. This is a good 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 27% of the total length of this survey, riffles 37%, and pools 34%. Sixteen of the 126 (13%) pools had a maximum residual depth greater than two 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

## **McMullen Creek**

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 structures that will increase or deepen pool habitat is recommended.

One hundred six of the 126 pool tail-outs measured had embeddedness ratings of 1 or 2. Nine 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.

One hundred twenty-three of the 126 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 28. The shelter rating in the flatwater habitats is 8. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in McMullen Creek. Large woody debris is the dominant cover type in pools followed by boulders. 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 91%. Reach 1 had a canopy density of 90%, Reach 2 had a canopy density of 94%. The percentage of right and left bank covered with vegetation was 97% and 97%, respectively.

## **RECOMMENDATIONS**

- 1) McMullen 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 large woody debris. Adding high quality complexity with woody cover in the pools is desirable.



## McMullen Creek

### 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 Noyo River. The channel is an F4.
419	0014.00	The railroad crosses the channel. The crossing is a 6' high x 8' wide x 72' long concrete box culvert. There is no plunge at the outlet of the culvert. Gravel and cobble has been deposited over 75% of the bottom of the culvert.
2575	0076.00	A logging road crosses the channel. The crossing is a 17' wide x 41' long x 3.2' high log bridge.
4397	0129.00	Erosion sites on each bank associated with old road crossing.
4675	0139.00	Log debris accumulation (LDA) #01 contains seven pieces of large woody debris (LWD) and measures 4' high x 33' wide x 16' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 7' wide x 40' long x 1.5' deep. There is a 2.5' high plunge over the LDA. Fish were not observed above the LDA.
5190	0152.00	Dry left bank tributary.
5318	0157.00	Dry left bank tributary. Three trees have collapsed in to the channel from the right bank forming LDA #02. The LDA contains six pieces of LWD and measures 4' high x 19' wide x 9' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 13' wide x 70' long x 1.5' deep. There is a 3' high plunge over the LDA.
6326	0188.00	LDA #03 contains four pieces of LWD and measures 8' high x 14' wide x 5' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to boulders and measures 6' wide x 37' long x 3' deep. There is a 4' high plunge over the LDA.
6432	0193.00	Tributary #01 enters on the right bank. It contributes approximately 5% to McMullen Creek's flow. The water temperature of the tributary was 53 degrees Fahrenheit, the water temperature downstream of the tributary was 52 degrees Fahrenheit, and the water temperature upstream of the confluence was 51 degrees Fahrenheit. The slope of the tributary

## McMullen Creek

is approximately 5%. There is a plastic culvert at the mouth with a slope of 5.7% and a 6' high plunge at the mouth.

6688	0202.00	There is a 2.5' high plunge over LWD.
6843	0206.00	Tributary #02 enters on the left bank. It contributes to approximately 40% of McMullen Creek's flow. The water temperature of the tributary was 52 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 52 degrees Fahrenheit. The slope of the tributary is approximately 2%. The tributary is accessible to salmonids, but no fish were observed.
6922	0209.00	A logging road crosses the channel. The crossing is a 13' wide x 50' long x 11.5' high railcar bridge.
6950	0211.00	Landslide on the left bank contributing sediment ranging in size from silt to cobble to the channel.
7175	0216.00	There is a 1.5' high plunge over LWD.
7212	0218.00	LDA #04 contains 16 pieces of LWD and measures 8' high x 19' wide x 30' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to boulders and measures 8' wide x 46' long x 2' deep.
8305	0258.00	LDA #05 contains four pieces of LWD and measures 4' high x 22' wide x 20' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 6' wide x 13' long x 1' deep.
8536	0266.00	LDA #06 contains two pieces of LWD and measures 6' high x 15' wide x 4' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 6' wide x 20' long x 1' deep. There is a 4' high plunge over LDA.
8554	0267.00	Right bank collapsed into channel causing water to flow underneath woody debris and substrate.
8763	0273.00	Steelhead young-of-the-year (YOY) observed.
8774	0274.00	There is a 2' high plunge over LWD.
9311	0294.00	Small slide on left bank.
9399	0298.00	Tributary #03 enters on the right bank. It contributes approximately 20% to McMullen Creek's flow. The water temperature of the tributary was 53 degrees Fahrenheit; the water temperature downstream and

## McMullen Creek

upstream of the tributary was 53 degrees Fahrenheit. The slope of the tributary is approximately 6%. The tributary is accessible to salmonids, but no fish were observed.

- |       |         |  |
|-------|---------|--|
| 9434  | 0300.00 | LDA #07 contains five pieces of LWD and measures 5' high x 15' wide x 3' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 8' wide x 30' long x 1.5' deep. |
| 9467  | 0302.00 | The channel changes from an F4 to an A2.   |
| 9517  | 0303.00 | A logging road crosses the channel. The crossing is a 13' wide x 80' long x 12' high wooden bridge.  |
| 9646  | 0304.00 | There is a 0.5' high plunge over roots.  |
| 9797  | 0310.00 | There is a 2' high plunge over roots.  |
| 9926  | 0317.00 | LDA #08 contains eight pieces of LWD and measures 6' high x 16' wide x 17' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 4' wide x 45' long x 1' deep. |
| 10154 | 0325.00 | There is a 2' high plunge over roots.  |
| 10166 | 0326.00 | End of survey. There is a 4.5' high plunge over bedrock followed by a 15' high plunge over woody debris and boulders.  |

## 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.

## McMullen Creek

### 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: McMullen Creek

LLID: 1234595394310 Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

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	CULVERT	0.3	72	72	0.7									
72	13	FLATWATER	22.1	38	2762	27.0	6.5	0.4	0.7	230	16541	83	6000		8
2	0	NOSURVEY	0.6	48	95	0.9									
126	126	POOL	38.7	28	3494	34.1	8.5	0.4	1.2	234	29423	161	20328	102	28
125	10	RIFFLE	38.3	31	3816	37.3	9.2	0.3	0.6	237	29569	60	7505		7
<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>		
326	149				10239					75534			33833		

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

Stream Name: McMullen Creek

LLID: 1234595394310

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

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 (%)
113	7	LGR	34.7	29	3290	32.1	9	0.2	0.9	240	27083	49	5551		6	92
12	3	HGR	3.7	44	526	5.1	10	0.4	0.9	229	2751	86	1026		8	89
27	6	RUN	8.3	21	570	5.6	7	0.4	0.9	130	3521	46	1231		9	98
45	7	SRN	13.8	49	2192	21.4	6	0.4	1	315	14169	116	5206		6	96
110	110	MCP	33.7	29	3217	31.4	8	0.3	3	244	26841	161	17716	100	28	90
1	1	CCP	0.3	11	11	0.1	11	0.6	1.5	115	115	92	92	69	30	86
2	2	STP	0.6	32	65	0.6	8	0.3	0.8	242	484	134	267	73	20	91
2	2	CRP	0.6	23	46	0.4	8	0.2	1.3	160	319	87	174	32	35	98
11	11	PLP	3.4	14	155	1.5	10	0.7	2.8	151	1664	189	2079	142	33	89
1	0	CUL	0.3	72	72	0.7										
2	0	NS	0.6	48	95	0.9										

Total Units  
326

Total Units Fully Measured  
149

Total Length (ft.)  
10239

Total Area (sq.ft.)  
76948

Total Volume (cu.ft.)  
33342

**Table 3 - Summary of Pool Types**

Stream Name: McMullen Creek

LLID: 1234595394310

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

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
113	113	MAIN	90	29	3293	94	8.3	0.3	243	27440	99	10845	28
13	13	SCOUR	10	15	201	6	9.5	0.6	153	1984	125	1630	33

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
126	126	3494	29423	12475

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

Stream Name: McMullen Creek

LLID: 1234595394310

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

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
110	MCP	87	50	45	47	43	12	11	1	1	0	0
1	CCP	1	0	0	1	100	0	0	0	0	0	0
2	STP	2	2	100	0	0	0	0	0	0	0	0
2	CRP	2	1	50	1	50	0	0	0	0	0	0
11	PLP	9	2	18	6	55	3	27	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
126	55	44	55	44	15	12	1	1	0	0

Mean Maximum Residual Pool Depth (ft.): 1.2



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

Stream Name: McMullen Creek

LLID: 1234595394310

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Dry Units: 0

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

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
113	7	LGR	0	25	0	9	4	0	0	61	0
12	3	HGR	22	7	13	2	0	0	0	57	0
125	10	TOTAL RIFFLE	7	20	4	7	3	0	0	60	0
27	6	RUN	12	14	10	3	0	0	0	61	0
45	7	SRN	0	19	3	0	1	0	0	78	0
72	13	TOTAL FLAT	5	17	6	2	0	0	0	70	0
110	110	MCP	21	22	28	3	2	0	0	23	0
1	1	CCP	0	20	70	0	0	0	0	10	0
2	2	STP	3	30	30	0	0	0	0	38	0
2	2	CRP	20	20	53	3	0	0	0	5	0
11	11	PLP	15	20	28	0	0	0	7	30	0
126	126	TOTAL POOL	20	22	29	2	2	0	1	23	0
1	0	CUL									
2	0	NS									
326	149	TOTAL	17	22	25	3	2	0	1	30	0

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

Stream Name: McMullen Creek

LLID: 1234595394310

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Dry Units: 0

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

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
113	7	LGR	0	0	100	0	0	0	0
12	3	HGR	0	0	67	33	0	0	0
27	6	RUN	0	0	67	0	17	0	17
45	7	SRN	0	14	86	0	0	0	0
110	110	MCP	1	1	85	5	6	0	1
1	1	CCP	0	0	100	0	0	0	0
2	2	STP	0	0	100	0	0	0	0
2	2	CRP	0	0	50	50	0	0	0
11	11	PLP	0	9	91	0	0	0	0

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

Stream Name: McMullen Creek

LLID: 1234595394310

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
91	56	44	0	97	97

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: McMullen Creek LLID: 1234595394310 Drainage: Noyo River  
 Survey Dates: 5/21/2013 to 5/30/2013 Survey Length (ft.): 10239 Main Channel (ft.): 10239 Side Channel (ft.): 0  
 Confluence Location: Quad: BURBECK Legal Description: T18NR14WS07 Latitude: 39:25:52.0N Longitude: 123:27:34.0W

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

**STREAM REACH: 1**

Channel Type: F4	Canopy Density (%): 90.3	Pools by Stream Length (%): 36.0
Reach Length (ft.): 9467	Coniferous Component (%): 54.1	Pool Frequency (%): 39.2
Riffle/Flatwater Mean Width (ft.): 8.0	Hardwood Component (%): 45.9	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 86
Range (ft.): 10 to 24	Vegetative Cover (%): 97.2	2 to 2.9 Feet Deep: 13
Mean (ft.): 16	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 1
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.5	Occurrence of LWD (%): 26	Mean Max Residual Pool Depth (ft.): 1.2
Water (F): 48 - 54 Air (F): 48 - 64	LWD per 100 ft.:	Mean Pool Shelter Rating: 28
Dry Channel (ft): 0	Riffles: 2	
	Pools: 6	
	Flat: 3	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 76 Sm Cobble: 22 Lg Cobble: 2 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 39.0 2. 45.8 3. 6.8 4. 0.8 5. 7.6		

**STREAM REACH: 2**

Channel Type: A2	Canopy Density (%): 94.1	Pools by Stream Length (%): 11.0
Reach Length (ft.): 772	Coniferous Component (%): 75.4	Pool Frequency (%): 32.0
Riffle/Flatwater Mean Width (ft.): 6.4	Hardwood Component (%): 24.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 100
Range (ft.): 8 to 14	Vegetative Cover (%): 100.0	2 to 2.9 Feet Deep: 0
Mean (ft.): 11	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 0
Std. Dev.: 2	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.5	Occurrence of LWD (%): 19	Mean Max Residual Pool Depth (ft.): 1.2
Water (F): 51 - 52 Air (F): 55 - 61	LWD per 100 ft.:	Mean Pool Shelter Rating: 27
Dry Channel (ft): 0	Riffles: 4	
	Pools: 19	
	Flat: 3	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 75 Sm Cobble: 13 Lg Cobble: 13 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 37.5 2. 37.5 3. 0.0 4. 0.0 5. 25.0		

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

Stream Name: McMullen Creek

LLID: 1234595394310

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

**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	2	3	1.7
Boulder	0	0	0.0
Cobble / Gravel	55	56	37.2
Sand / Silt / Clay	92	90	61.1

**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	7	12	6.4
Brush	37	20	19.1
Hardwood Trees	29	40	23.2
Coniferous Trees	76	77	51.3
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: McMullen Creek

LLID: 1234595394310

Drainage: Noyo River

Survey Dates: 5/21/2013 to 5/30/2013

Confluence Location: Quad: BURBECK

Legal Description: T18NR14WS07

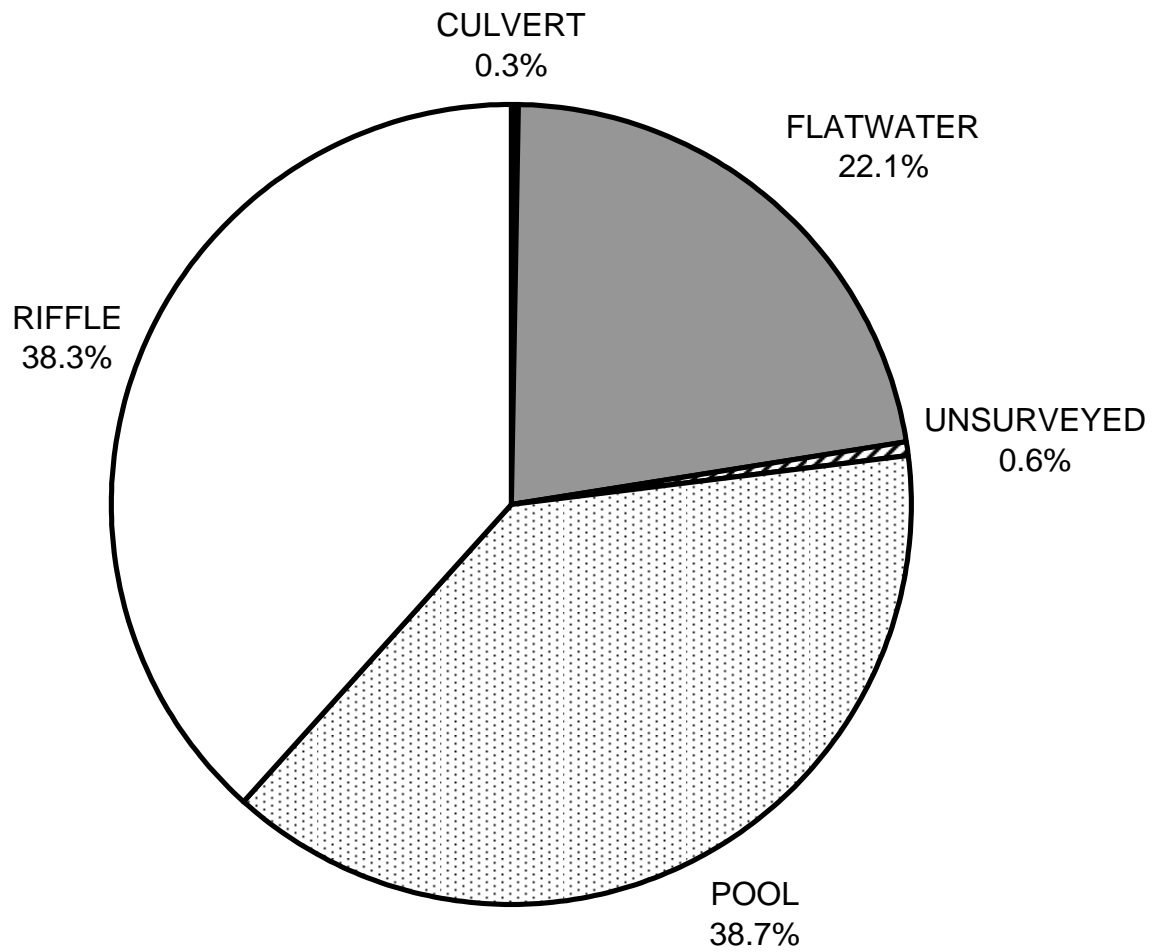
Latitude: 39:25:52.0N

Longitude: 123:27:34.0W

---

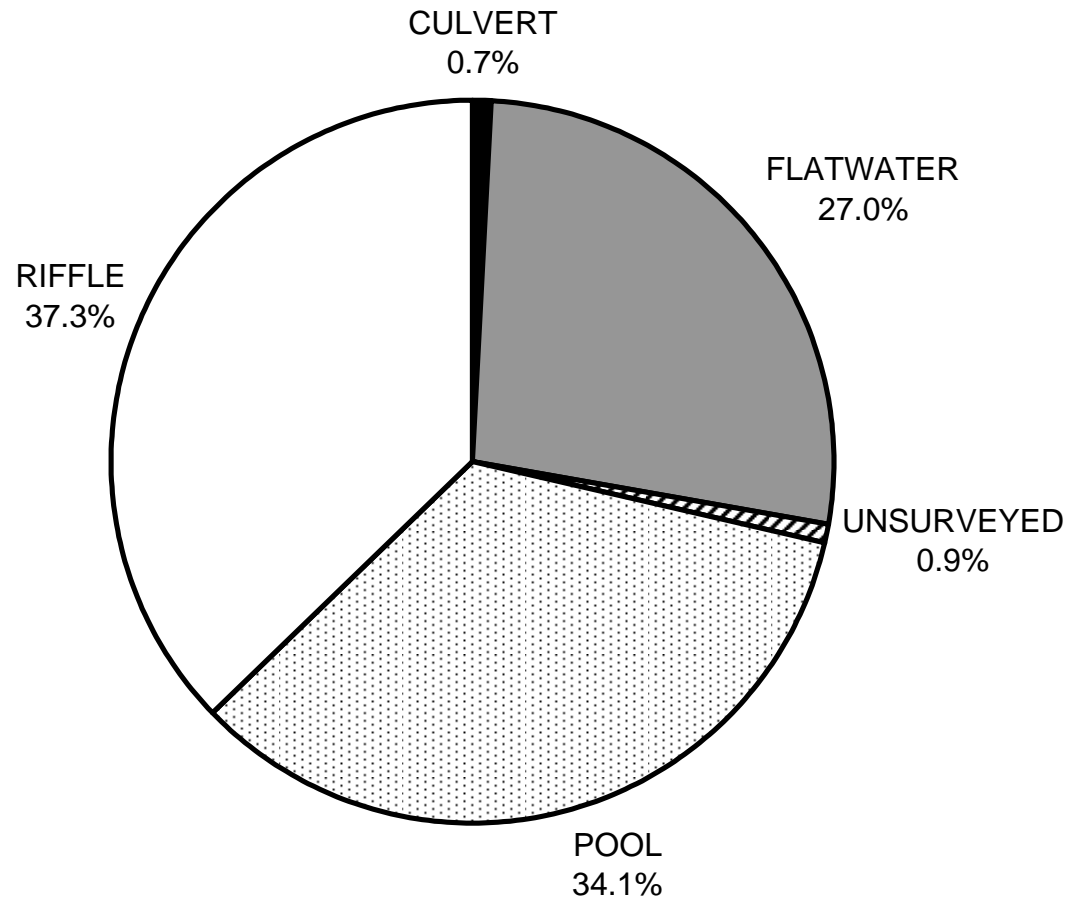
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	7	5	20
SMALL WOODY DEBRIS (%)	20	17	22
LARGE WOODY DEBRIS (%)	4	6	29
ROOT MASS (%)	7	2	2
TERRESTRIAL VEGETATION (%)	3	0	2
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	1
BOULDERS (%)	60	70	23
BEDROCK LEDGES (%)	0	0	0

# MCMULLEN CREEK 2013 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

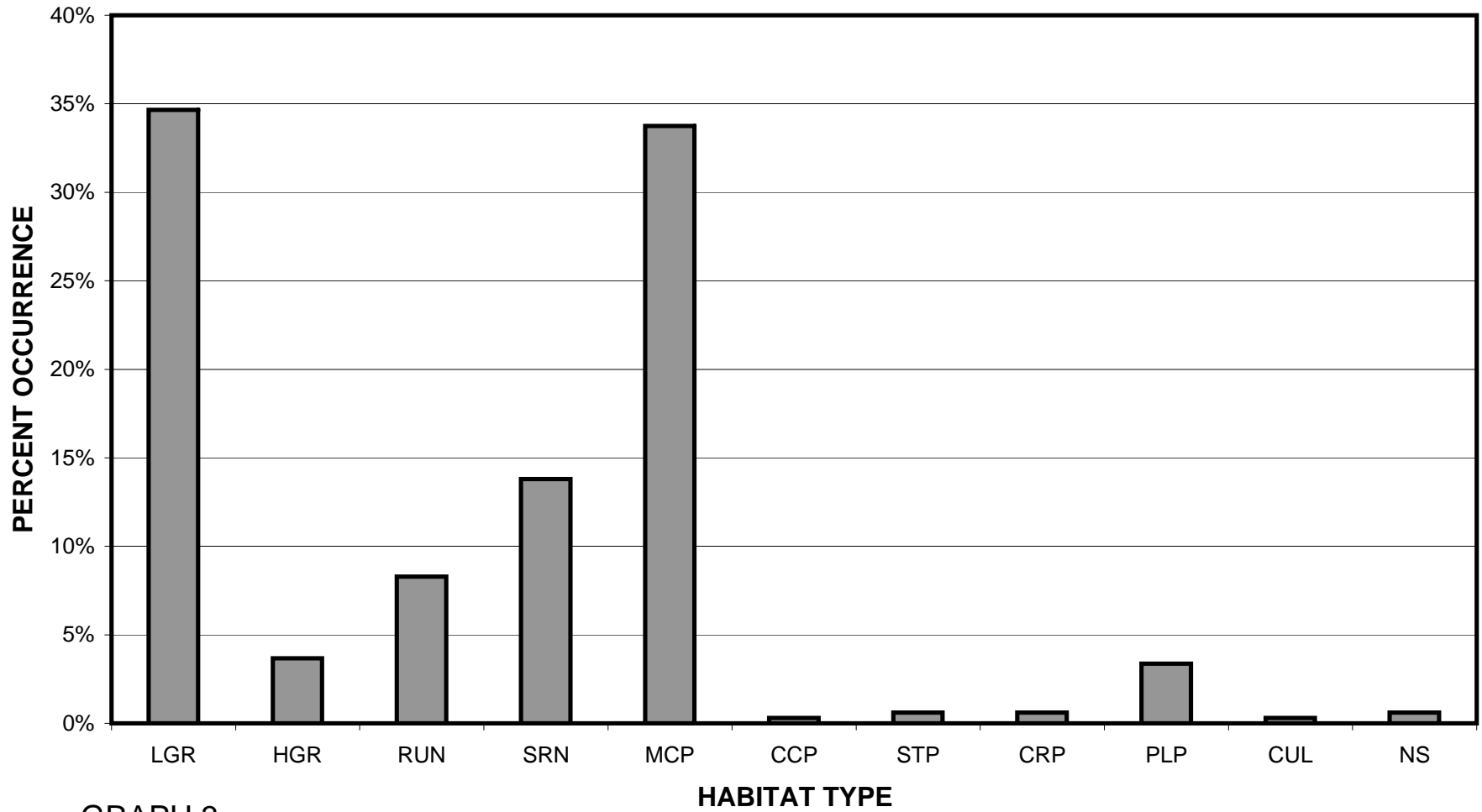
# MCMULLEN CREEK 2013 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

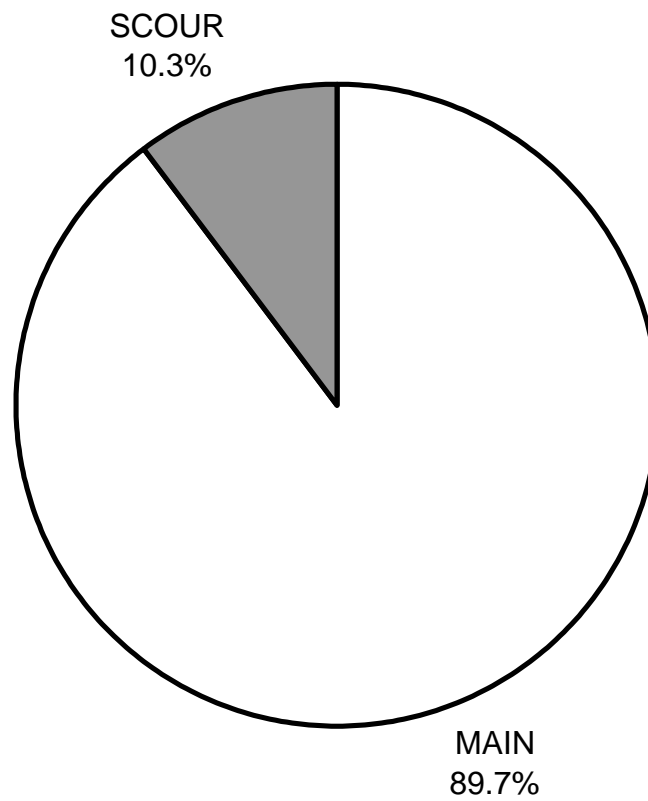


# MCMULLEN CREEK 2013 HABITAT TYPES BY PERCENT OCCURRENCE



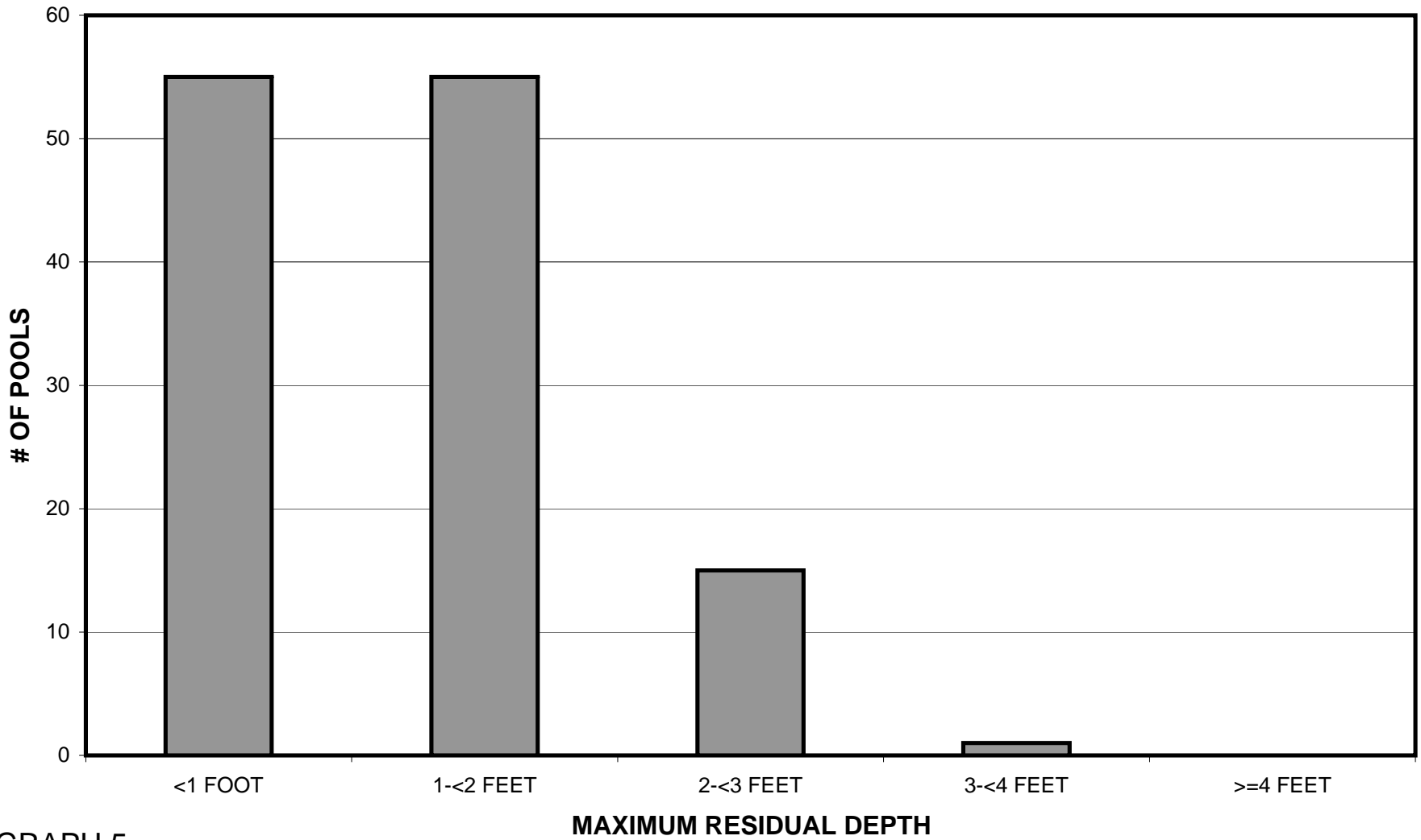
GRAPH 3

# MCMULLEN CREEK 2013 POOL TYPES BY PERCENT OCCURRENCE



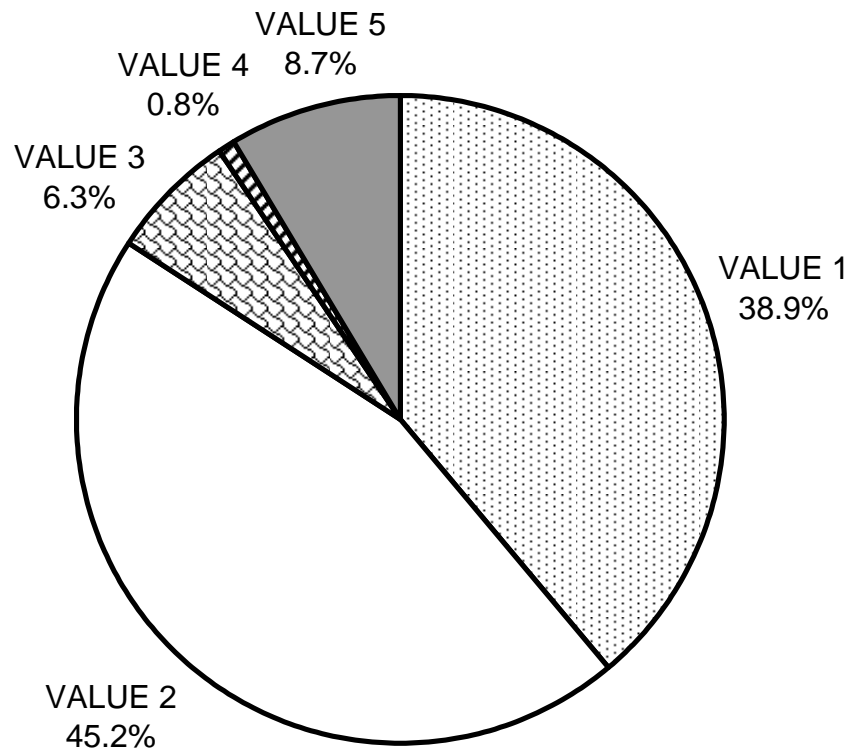
GRAPH 4

# MCMULLEN CREEK 2013 MAXIMUM DEPTH IN POOLS



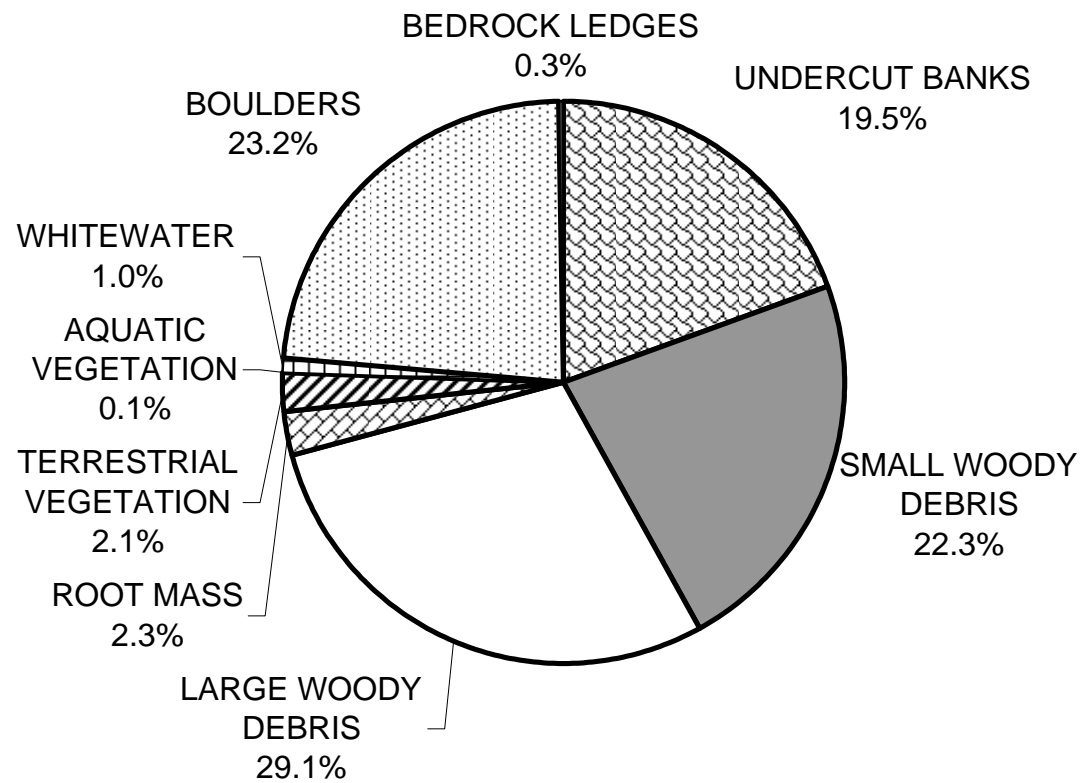
GRAPH 5

# MCMULLEN CREEK 2013 PERCENT EMBEDDEDNESS



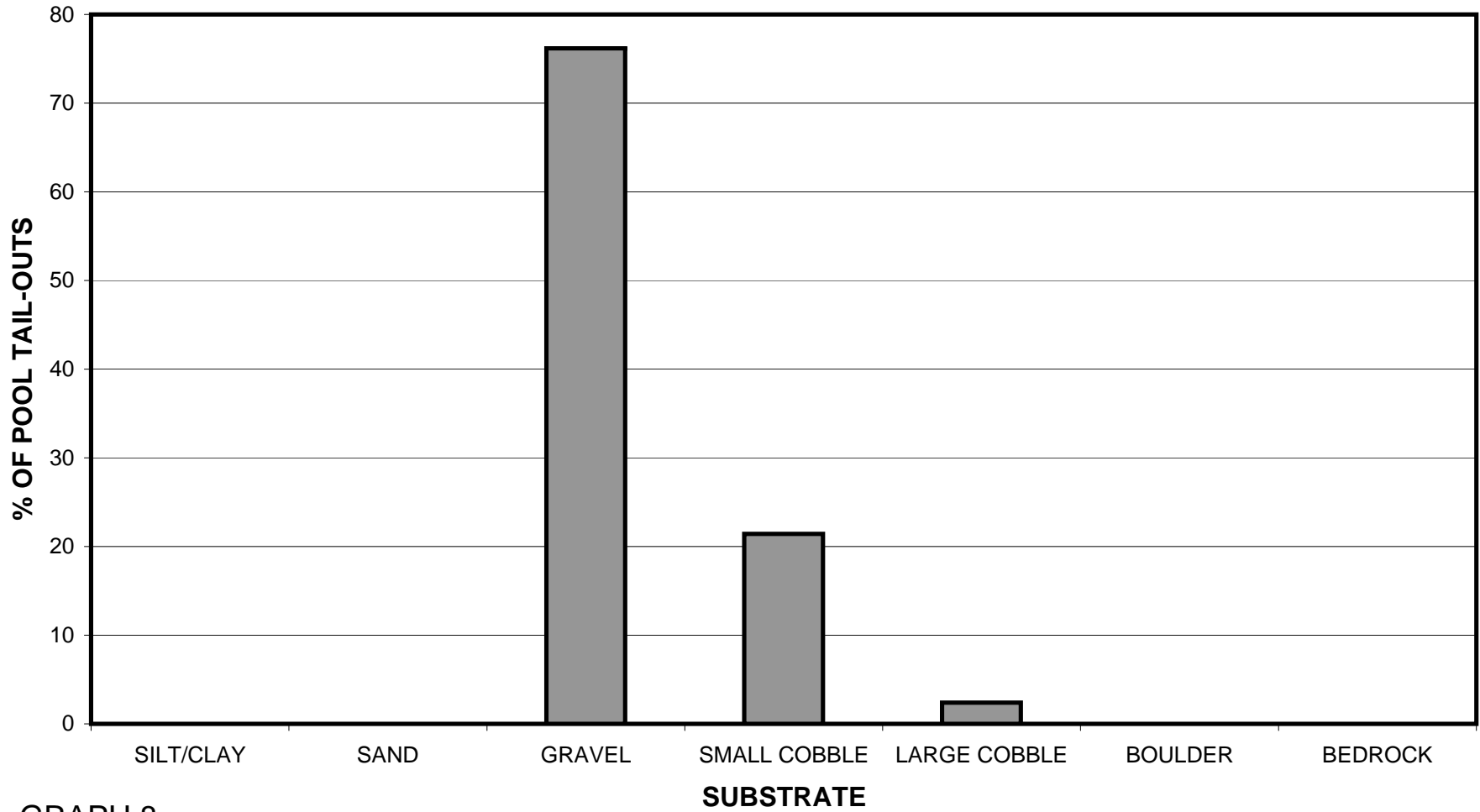
GRAPH 6

# MCMULLEN CREEK 2013 MEAN PERCENT COVER TYPES IN POOLS



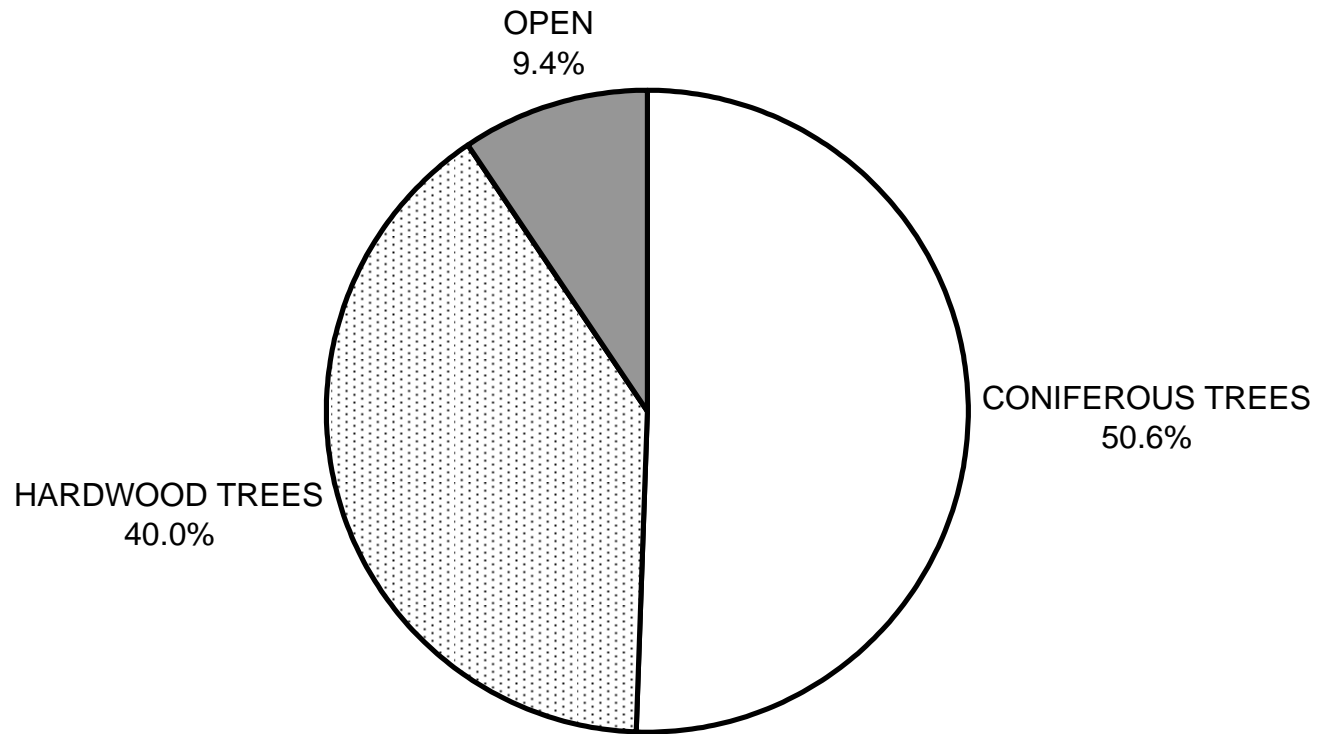
GRAPH 7

# MCMULLEN CREEK 2013 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



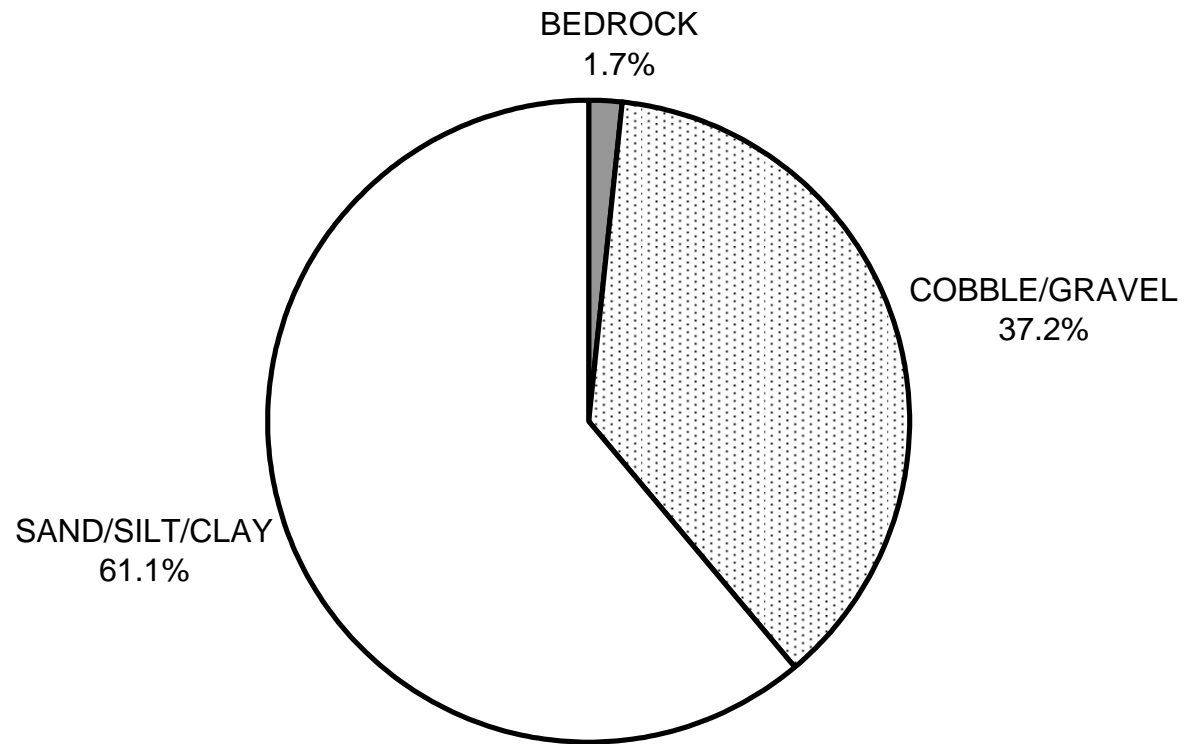
GRAPH 8

# MCMULLEN CREEK 2013 MEAN PERCENT CANOPY



GRAPH 9

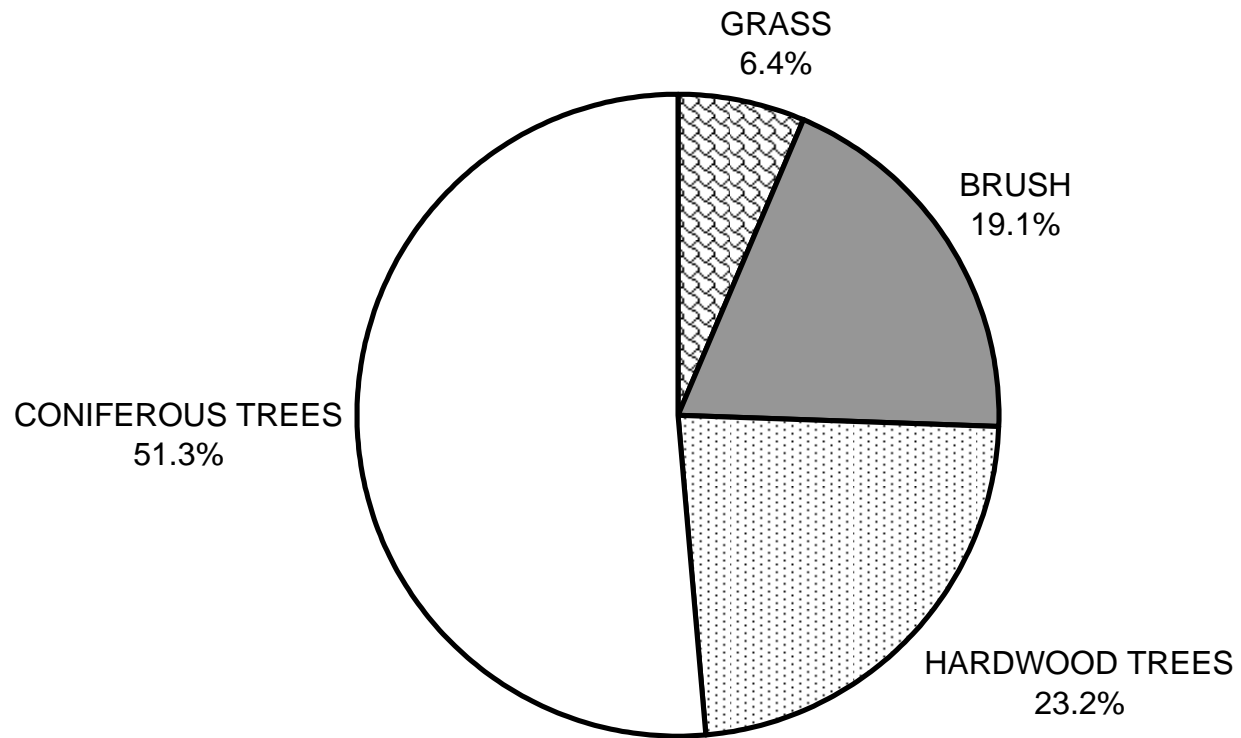
**MCMULLEN CREEK 2013  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10



# MCMULLEN CREEK 2013 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

