

# STREAM INVENTORY REPORT

## Hayworth Creek

### INTRODUCTION

A stream inventory was conducted from September 4 to October 7, 2013 on Hayworth Creek. The survey began at the confluence with the North Fork Noyo River and extended upstream 4.1 miles. Stream inventories and reports were also completed for two tributaries to Hayworth Creek.

The Hayworth 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 Hayworth 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

Hayworth Creek is a tributary to North Fork Noyo River, tributary to Noyo River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Hayworth Creek's legal description at the confluence with the North Fork Noyo River is T19N R15W S33. Its location is 39.4541 degrees north latitude and 123.5333 degrees west longitude, LLID number 1235321394542. Hayworth Creek is a second order stream and has approximately 5.2 miles of blue line stream according to the USGS Northspur 7.5 minute quadrangle. Hayworth Creek drains a watershed of approximately six square miles. Elevations range from about 575 feet at the mouth of the creek to 2,600 feet in the headwater area. 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 Hayworth 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 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

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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 Hayworth 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". Hayworth 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.

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### 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 Hayworth 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 Hayworth 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 Hayworth 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 Hayworth 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.

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### 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 Hayworth Creek. In addition, underwater observations were made at twelve 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

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Graphics are produced from the tables using Microsoft Excel. Graphics developed for Hayworth 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 September 4 to October 7, 2013 was conducted by N. Massa and M. Scott (CDFW). The total length of the stream surveyed was 21,749 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.15 cfs on September 3, 2013.

Hayworth Creek is an F3 channel type for the entire length of the survey, 21,749 feet. F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 65 degrees Fahrenheit. Air temperatures ranged from 53 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 38% riffle units, 33% pool units, and 29% flatwater units (Graph 1). Based on total length of Level II habitat types there were 49% pool units, 31% flatwater units, and 21% riffle 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, 31%; and run units, 16% (Graph 3). Based on percent total length, mid-channel pool units made up 46%, low gradient riffle units 20%, and step run units 17%.

A total of 173 pools were identified (Table 3). Main channel pools were the most frequently encountered at 98% (Graph 4), and comprised 99% of the total length of all pools (Table 3).

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Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Eighty-four of the 173 pools (49%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 173 pool tail-outs measured, 100 had a value of 1 (58%); 49 had a value of 2 (28%); three had a value of 3 (2%); 21 had a value of 5 (12%) (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 5, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 12 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 13. Main channel pools had a mean shelter rating of 11 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Hayworth Creek. Graph 7 describes the pool cover in Hayworth Creek. Boulders 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 51% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 34% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Hayworth Creek was 95%. Five percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 68% and 32%, respectively. Graph 9 describes the mean percent canopy in Hayworth Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 49% bedrock, 47% cobble/gravel, 3% sand/silt/clay, and 1% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 48% of the units surveyed. Additionally, 47% of the units surveyed had deciduous trees as the dominant vegetation type, and 5% had brush as the dominant vegetation type (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at twelve sites for species composition and distribution in Hayworth Creek on October 9, 2013. The sites were sampled by B. Leonard (CDFW) and B. Brengettsey (California Conservation Corps).

The reach sites yielded 96 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), 15 age 1+ SH/RT, five age 2+ SH/RT, 35 YOY coho salmon and three age 1+ coho salmon.

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The following chart displays the information yielded from these sites:

2013 Hayworth Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
F3 Channel Type									
10/09/13	1	154	Pool	7,194	14	2	0	18	2
	2	298	Pool	14,349	14	0	0	16	1
	3	308	Pool	14,638	6	2	0	0	0
	4	315	Pool	14,937	20	3	0	0	0
	5	317	Pool	15,029	17	2	0	0	0
	6	319	Pool	15,086	25	3	1	1	0
	7	347	Pool	15,823	0	0	1	0	0
	8	349	Pool	15,898	0	0	0	0	0
	9	352	Pool	16,102	0	0	1	0	0
	10	354	Pool	16,129	0	1	1	0	0
	11	361	Pool	16,400	0	0	0	0	0
	12	363	Pool	16,485	0	2	1	0	0

## DISCUSSION

Hayworth Creek is an F3 channel type. The suitability of F3 channel types for fish habitat improvement structures is as follows: F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover.

The water temperatures recorded on the survey days September 4 to October 7, 2013 ranged from 52 to 65 degrees Fahrenheit. Air temperatures ranged from 53 to 72 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 60 degrees Fahrenheit, if sustained, is near the threshold stress level 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 31% of the total length of this survey, riffles 11%, and pools 49%. Eighty-four of the 173 (49%) 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 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.

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One hundred forty-nine of the 173 pool tail-outs measured had embeddedness ratings of 1 or 2. Three of the pool tail-outs had embeddedness ratings of 3 or 4. Twenty-one of the pool tail-outs had a rating of 5, which is considered not suitable 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 forty-eight of the 173 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 12. The shelter rating in the flatwater habitats is 6. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Hayworth Creek. Boulders 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 95%. The percentage of right and left bank covered with vegetation was 99% and 99%, respectively.

## RECOMMENDATIONS

- 1) Hayworth 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 boulders. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Due to the bedrock outcroppings at 15,086, 15,103, and 20,600 feet, 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 the North Fork Noyo River. The channel is an F3 for the entire length of the survey.
404	0013.00	There is a 2.5' high plunge over bedrock.
433	0014.00	There is a 2' high plunge.
3690	0086.00	Log debris accumulation (LDA) #01 contains eight pieces of large woody debris (LWD) and measures 8' high x 21' wide x 9' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from gravel to large cobble and measures 21' wide x 54' long x 4' deep. There is a 5' high plunge over the LDA. Fish were observed above the LDA.
7510	0159.00	A logging road crosses the channel. The crossing is a 17.5' wide x 83' long x 14.1' high metal bridge.
9450	0200.00	Woody debris is accumulating in the channel.
10074	0214.00	A logging road crosses the channel. The crossing is a 13.9' wide x 56' long x 5.6' high wood and metal road.
14305	0298.00	There is a 3.6' high plunge over bedrock.
15086	0320.00	There is a 5' high plunge over bedrock.
15103	0321.00	There is a 5.5' high plunge over bedrock.
15150	0323.00	There is a 1.3' high plunge over bedrock.
20600	0489.00	Three plunges over bedrock. The first plunge is 1.5' high, the second plunge is 4' high, and the third plunge is 4' high. LDA #02 contains 10 pieces of LWD and measures 8' high x 13' wide x 27' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to large cobble and measures 27' wide x 20' long x 4' deep. The LDA is associated with the upstream most 4' high plunge over bedrock. Fish were not observed above the LDA.
20769	0495.00	Left bank eroding.

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20964	0501.00	Dry left bank tributary.
21630	0518.00	Left bank eroding.
21749	0520.00	End of survey.

## **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: Hayworth Creek

LLID: 1235321394542 Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Confluence Location: Quad: NORTHSPUR Legal Description: T19NR15WS33 Latitude: 39:27:15.0N Longitude: 123:31:56.0W

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
151	16	FLATWATER	29.0	44	6650	30.6	11.0	0.5	0.8	572	86316	270	40730		6
173	173	POOL	33.3	61	10554	48.5	13.8	1.1	2.3	871	150634	1256	217313	1073	12
196	24	RIFFLE	37.7	23	4545	20.9	10.6	0.3	0.5	237	46499	75	14734		5
<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>		
520	213				21749						283448		272777		

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

Stream Name: Hayworth Creek

LLID: 1235321394542

Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR15WS33

Latitude: 39:27:15.0N

Longitude: 123:31:56.0W

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 (%)
183	21	LGR	35.2	24	4336	19.9	11	0.3	1	255	46629	82	14977		6	97
7	2	HGR	1.3	20	138	0.6	10	0.3	0.6	146	1021	35	246		3	87
4	1	CAS	0.8	14	54	0.2	3	0.3	0.7	51	204	15	61		0	78
2	0	BRS	0.4	8	17	0.1										
82	8	RUN	15.8	36	2975	13.7	11	0.5	1.4	236	19351	120	9865		6	96
69	8	SRN	13.3	53	3675	16.9	11	0.5	1	907	62601	419	28922		6	94
162	162	MCP	31.2	62	9998	46.0	14	1.0	11.7	882	142886	1259	203905	1070	12	94
8	8	STP	1.5	59	475	2.2	12	1.3	4.1	762	6099	1179	9432	1056	11	96
3	3	PLP	0.6	27	81	0.4	17	2.1	4.9	550	1649	1325	3976	1248	13	93

Total Units  
520

Total Units Fully Measured  
213

Total Length (ft.)  
21749

Total Area (sq.ft.)  
280441

Total Volume (cu.ft.)  
271384

**Table 3 - Summary of Pool Types**

Stream Name: Hayworth Creek

LLID: 1235321394542

Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR15WS33

Latitude: 39:27:15.0N

Longitude: 123:31:56.0W

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
170	170	MAIN	98	62	10473	99	13.7	1.0	876	148985	1069	181812	11
3	3	SCOUR	2	27	81	1	17.3	2.1	550	1649	1248	3743	13

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
173	173	10554	150634	185555

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

Stream Name: Hayworth Creek

LLID: 1235321394542

Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR15WS33

Latitude: 39:27:15.0N

Longitude: 123:31:56.0W

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
162	MCP	94	11	7	75	46	42	26	25	15	9	6
8	STP	5	0	0	3	38	2	25	2	25	1	13
3	PLP	2	0	0	0	0	1	33	1	33	1	33

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
173	11	6	78	45	45	26	28	16	11	6

Mean Maximum Residual Pool Depth (ft.): 2.3

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

Stream Name: Hayworth Creek

LLID: 1235321394542

Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Dry Units: 0

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR15WS33

Latitude: 39:27:15.0N

Longitude: 123:31:56.0W

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
183	21	LGR	0	19	1	0	2	0	0	78	0
7	2	HGR	0	20	0	0	0	0	0	80	0
4	1	CAS	0	0	0	0	0	0	0	0	0
2	0	BRS	0	0	0	0	0	0	0	0	0
196	24	TOTAL RIFFLE	0	19	1	0	2	0	0	78	0
82	8	RUN	0	19	0	0	4	0	0	78	0
69	8	SRN	7	16	1	0	2	0	0	74	0
151	16	TOTAL FLAT	4	17	1	0	3	0	0	76	0
162	162	MCP	4	17	7	0	2	0	1	64	5
8	8	STP	0	14	8	0	1	0	5	61	11
3	3	PLP	0	7	0	0	0	0	57	37	0
173	173	TOTAL POOL	4	16	7	0	2	0	2	63	5
520	213	TOTAL	4	17	6	0	2	0	2	65	5



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

Stream Name: Hayworth Creek

LLID: 1235321394542

Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Dry Units: 0

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR15WS33

Latitude: 39:27:15.0N

Longitude: 123:31:56.0W

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
183	21	LGR	0	5	81	10	5	0	0
7	2	HGR	0	0	50	0	0	0	50
4	1	CAS	0	0	0	0	0	0	100
2	0	BRS	0	0	0	0	0	0	0
82	8	RUN	0	0	75	13	0	0	13
69	8	SRN	0	13	50	38	0	0	0
162	162	MCP	0	23	43	22	2	0	9
8	8	STP	0	13	50	0	13	0	25
3	3	PLP	0	0	0	33	0	0	67

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

Stream Name: Hayworth Creek

LLID: 1235321394542

Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR15WS33

Latitude: 39:27:15.0N

Longitude: 123:31:56.0W

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Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
95	32	68	0	99	99

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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: Hayworth Creek

LLID: 1235321394542

Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR15WS33

Latitude: 39:27:15.0N

Longitude: 123:31:56.0W

**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	90	119	49.3
Boulder	2	4	1.4
Cobble / Gravel	114	84	46.7
Sand / Silt / Clay	6	5	2.6

**Mean Percentage of Dominant Stream Bank Vegetation**

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	2	2	0.9
Brush	7	12	4.5
Hardwood Trees	106	91	46.5
Coniferous Trees	97	106	47.9
No Vegetation	0	1	0.2

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Hayworth Creek

LLID: 1235321394542

Drainage: Noyo River

Survey Dates: 9/4/2013 to 10/7/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T19NR15WS33

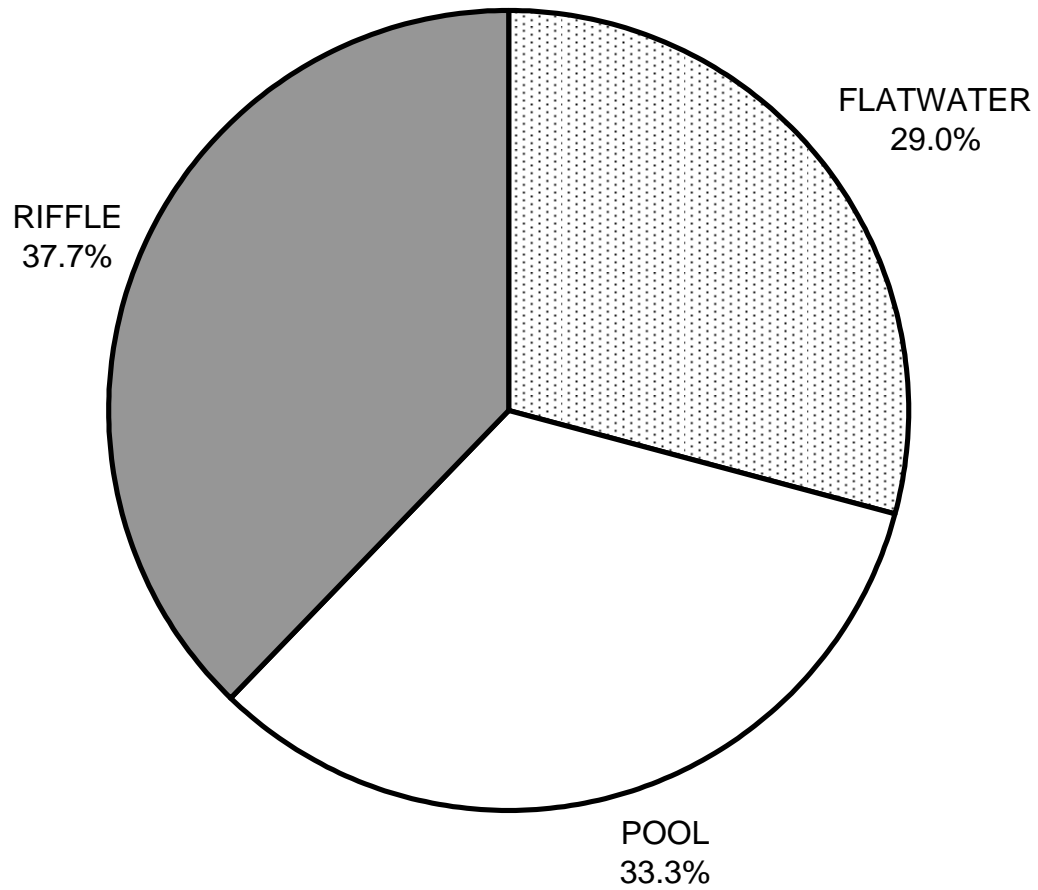
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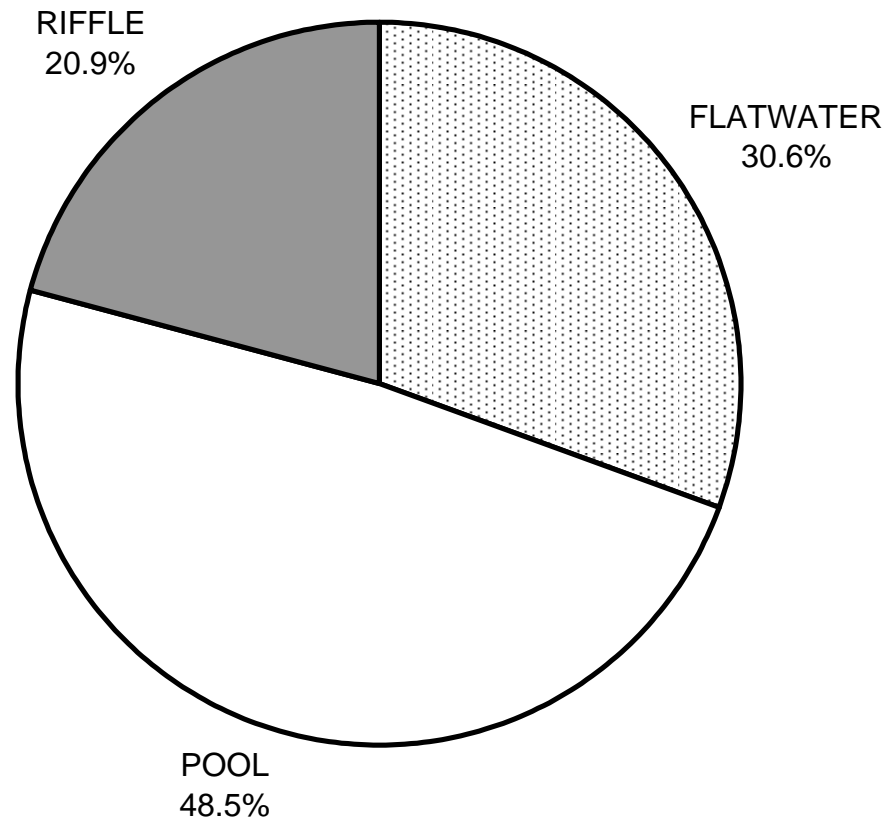
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	4	4
SMALL WOODY DEBRIS (%)	19	17	16
LARGE WOODY DEBRIS (%)	1	1	7
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION (%)	2	3	2
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	2
BOULDERS (%)	78	76	63
BEDROCK LEDGES (%)	0	0	5

# HAYWORTH CREEK 2013 HABITAT TYPES BY PERCENT OCCURRENCE



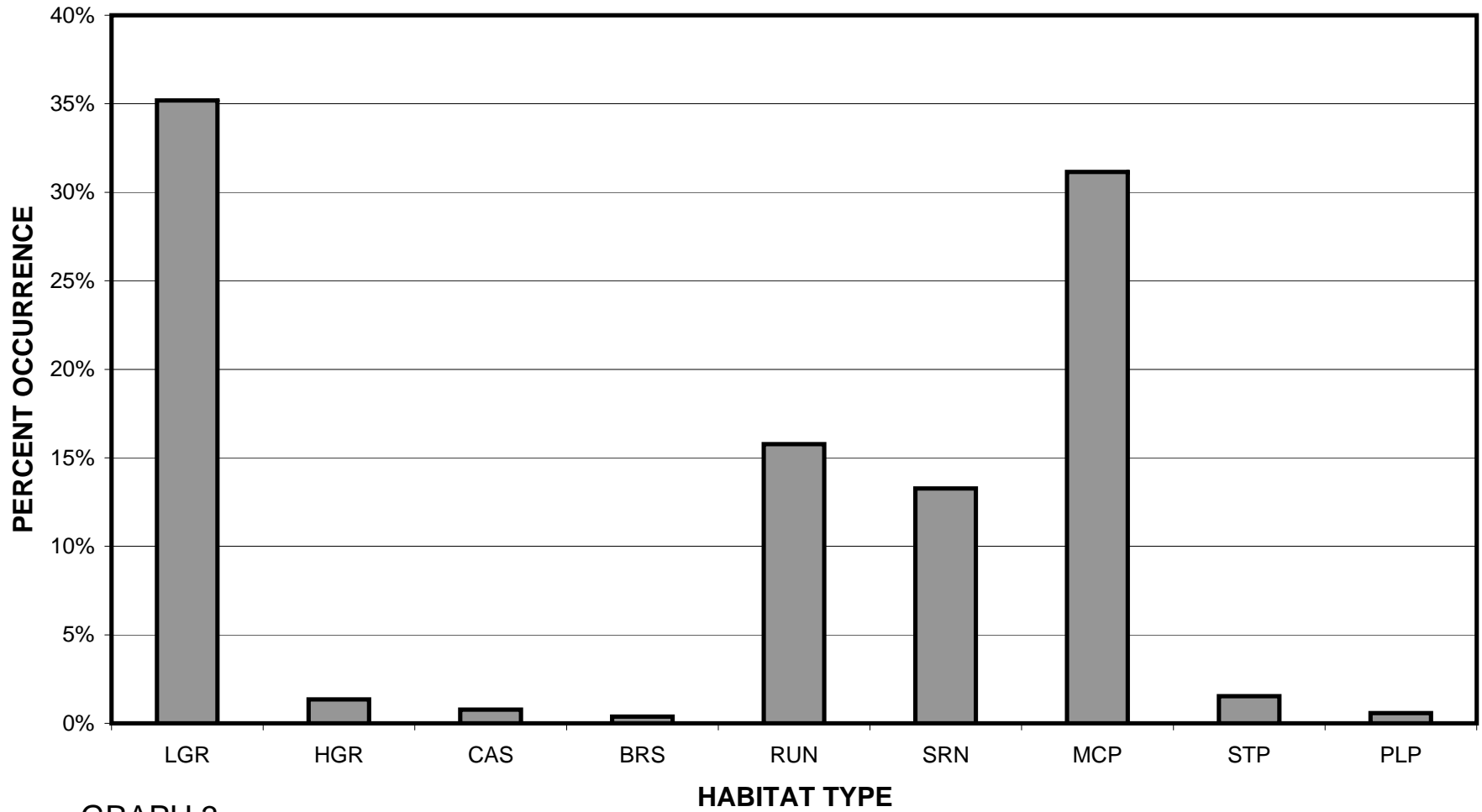
GRAPH 1

# HAYWORTH CREEK 2013 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

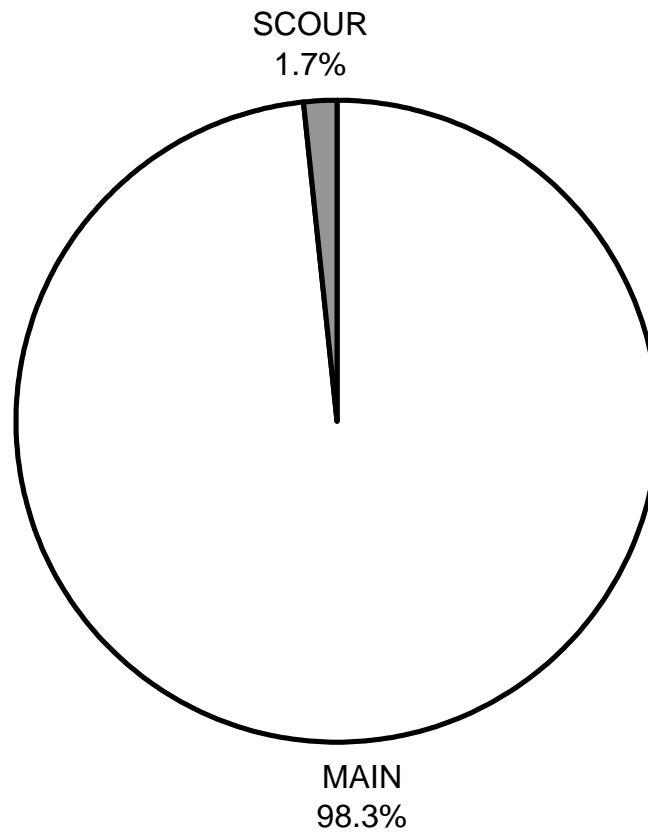
# HAYWORTH CREEK 2013 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

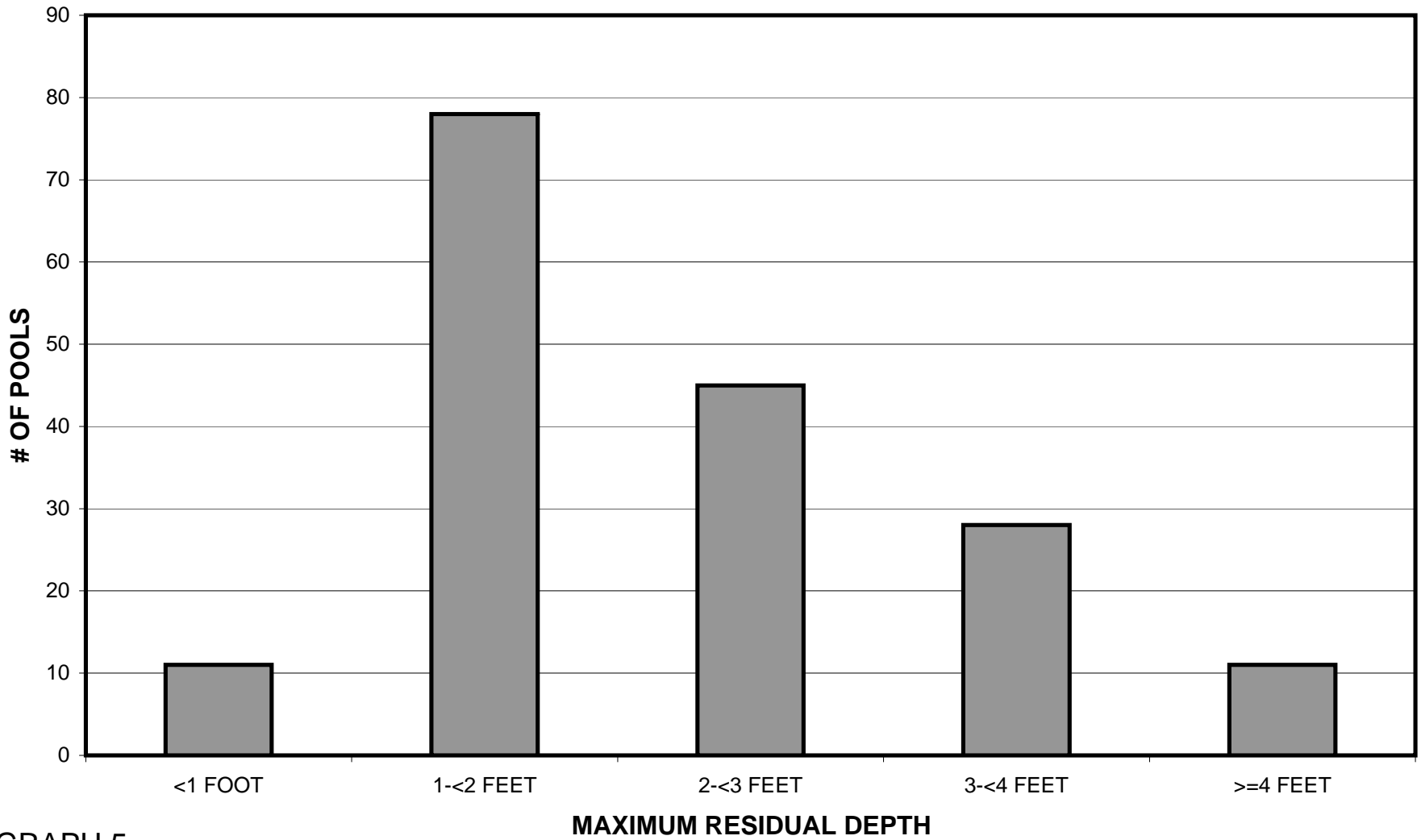


# HAYWORTH CREEK 2013 POOL TYPES BY PERCENT OCCURRENCE



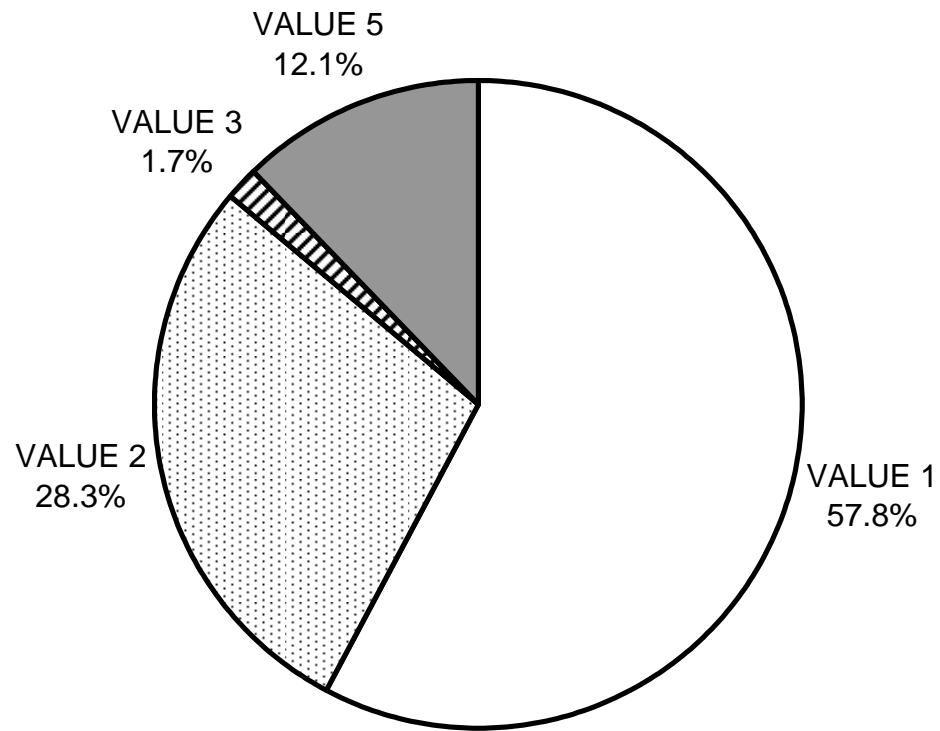
GRAPH 4

# HAYWORTH CREEK 2013 MAXIMUM DEPTH IN POOLS



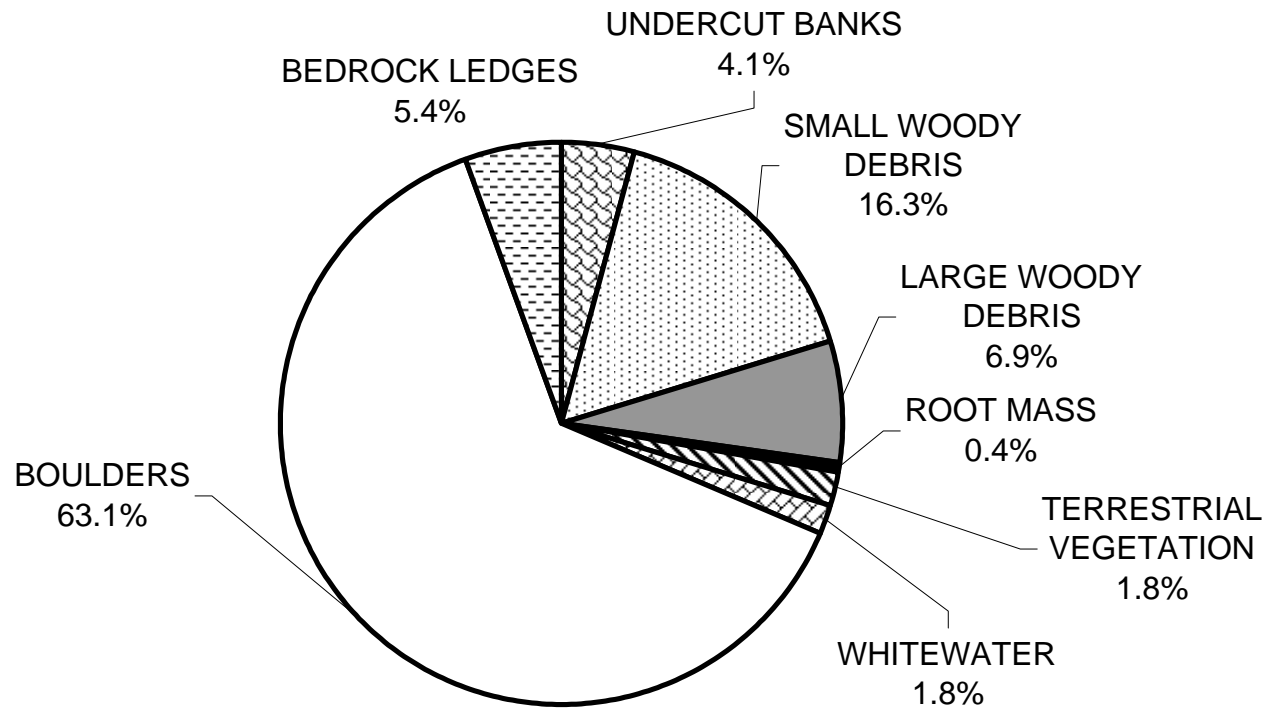
GRAPH 5

# HAYWORTH CREEK 2013 PERCENT EMBEDDEDNESS



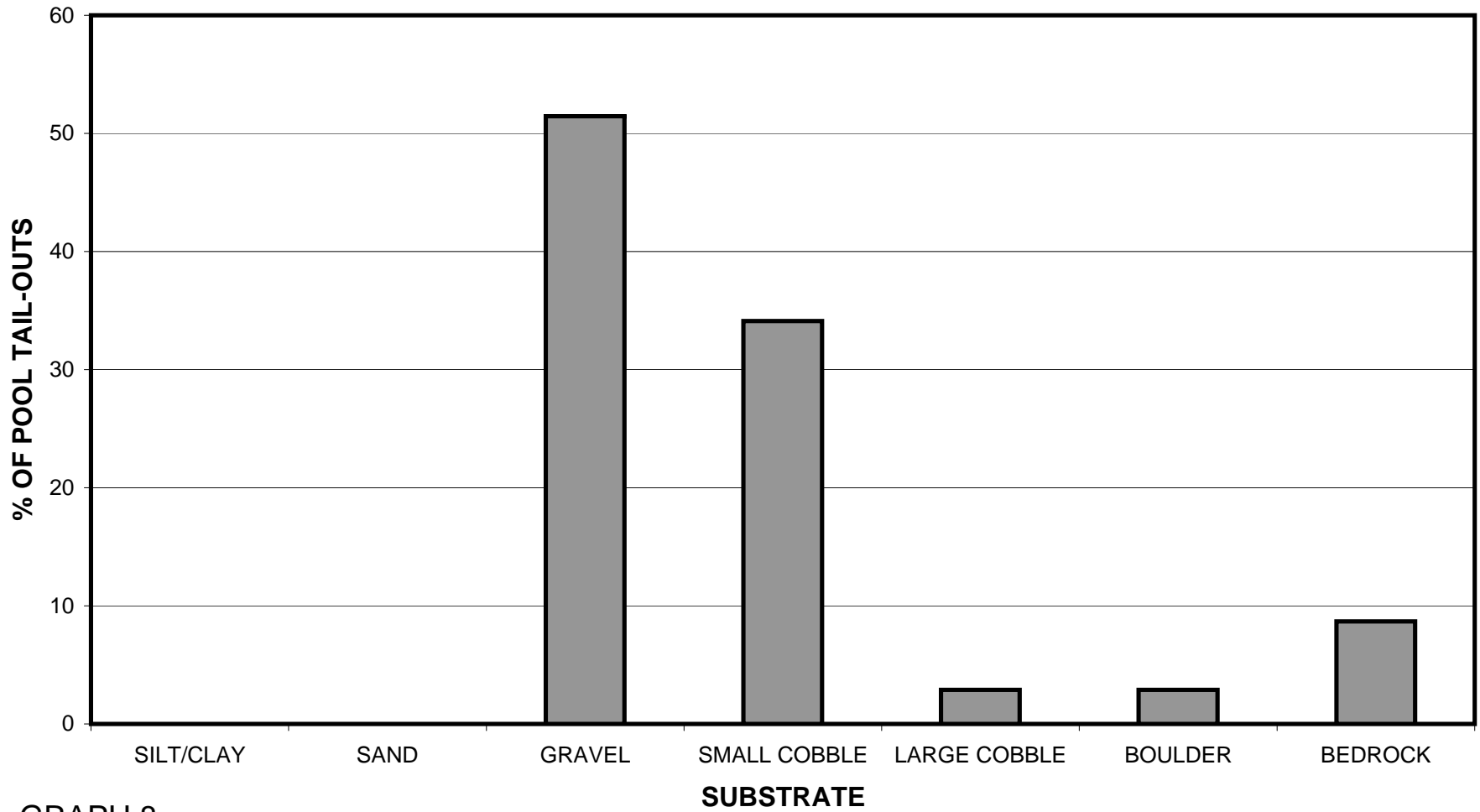
GRAPH 6

# HAYWORTH CREEK 2013 MEAN PERCENT COVER TYPES IN POOLS



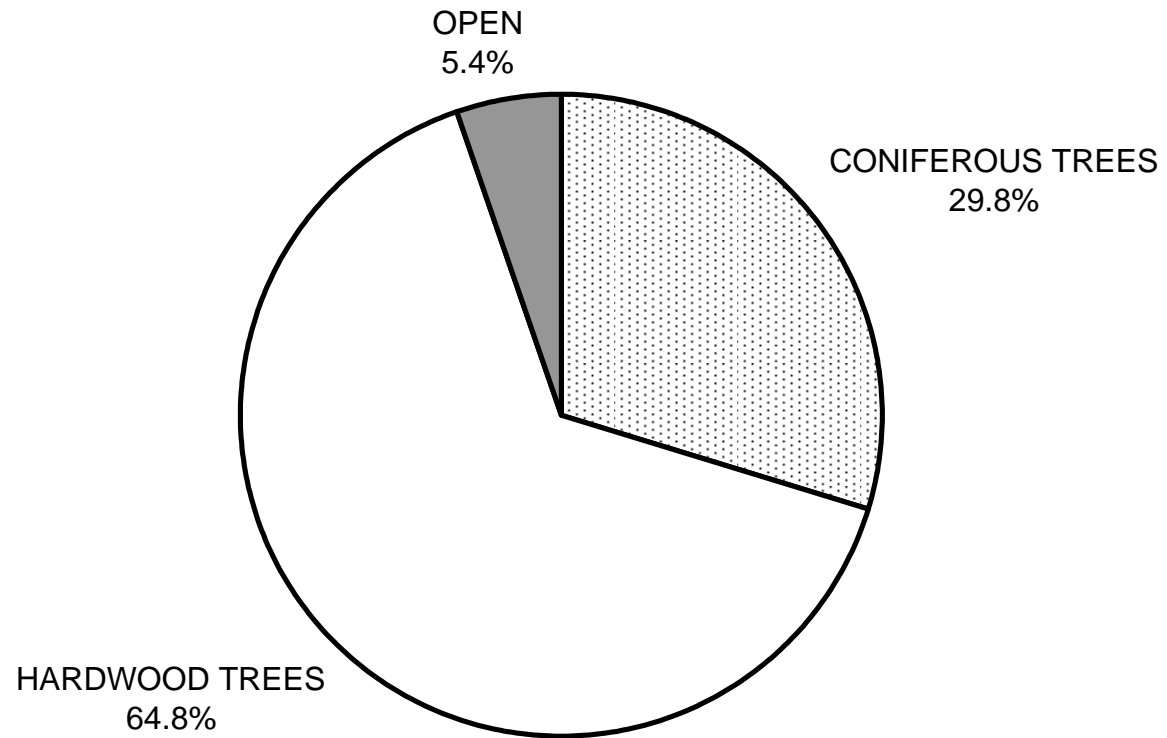
GRAPH 7

# HAYWORTH CREEK 2013 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



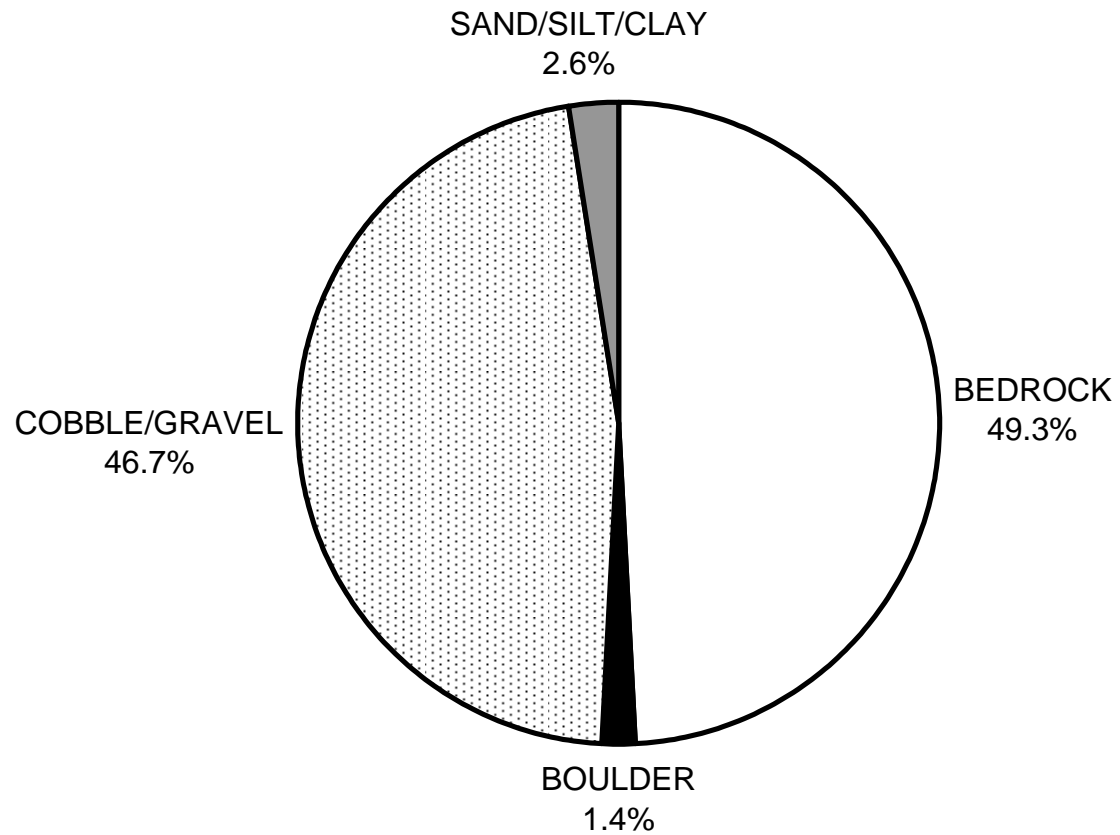
GRAPH 8

# HAYWORTH CREEK 2013 MEAN PERCENT CANOPY



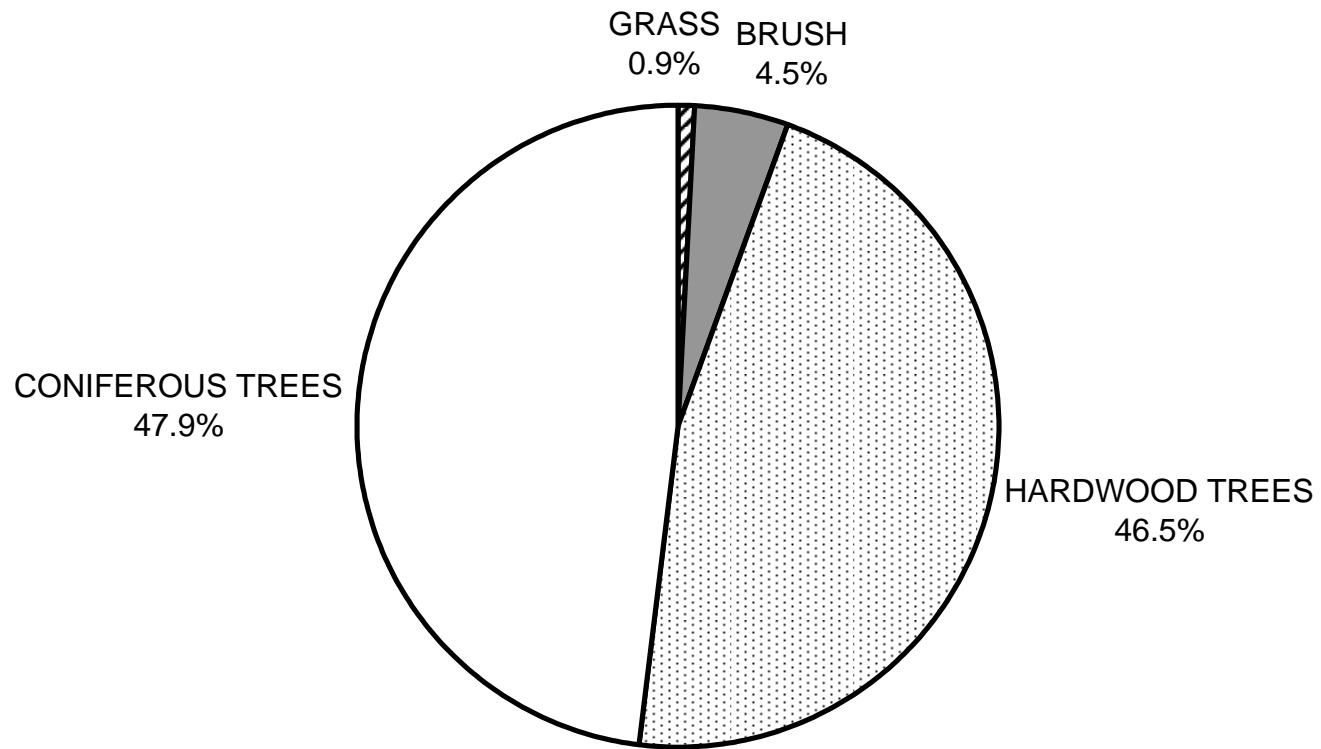
GRAPH 9

# HAYWORTH CREEK 2013 DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

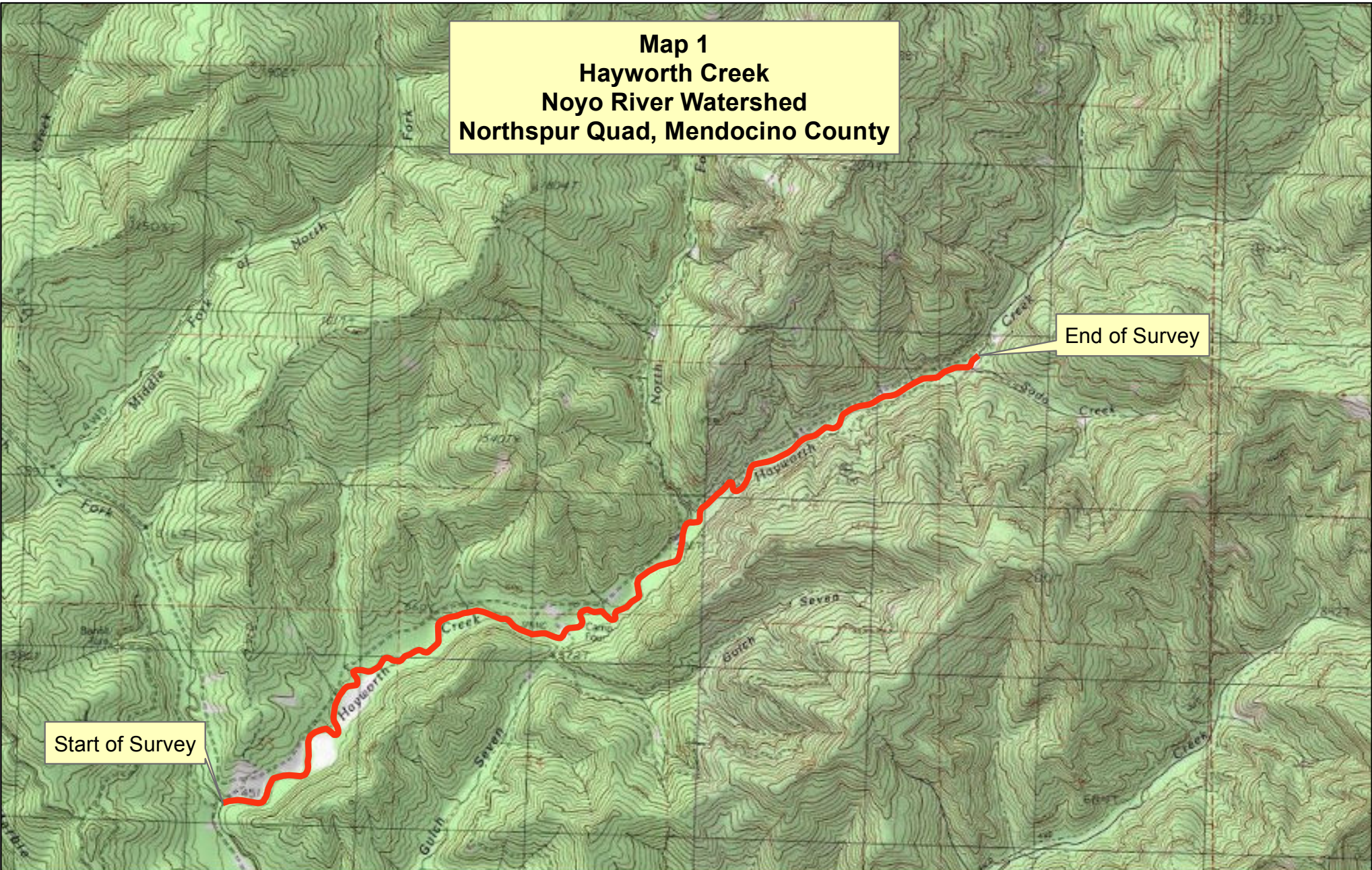
# HAYWORTH CREEK 2013 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



**Map 1**  
**Hayworth Creek**  
**Noyo River Watershed**  
**Northspur Quad, Mendocino County**



Start of Survey

End of Survey



— Channel Type F3

