

# STREAM INVENTORY REPORT

## “Curly Gulch”

### INTRODUCTION

A stream inventory was conducted from June 28 to June 29, 2010 on an unnamed tributary to Parlin Creek commonly known as and hereinafter referred to as Curly Gulch. The survey began at the confluence with Parlin Creek and extended upstream 0.4 miles.

The Curly Gulch 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 Curly Gulch. 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

Curly Gulch is a tributary to Parlin Creek, a tributary to the South Fork Noyo River, a tributary to the Noyo River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Curly Gulch's legal description at the confluence with Parlin Creek is T18N R16W S27. Its location is 39.38511 degrees north latitude and 123.63533 degrees west longitude, LLID number 1236341393851. Curly Gulch is an intermittent stream according to the USGS Noyo Hill 7.5 minute quadrangle. Curly Gulch drains a watershed of approximately 0.36 square miles. Elevations range from about 280 feet at the mouth of the creek to 1,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is located within Jackson Demonstration State Forest and is managed for timber production. Vehicle access exists via California Division of Forestry and Fire Protection Road 340.

### METHODS

The habitat inventory conducted in Curly Gulch 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 California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail

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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 Curly Gulch 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". Curly Gulch 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 Curly Gulch, 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 Curly Gulch, 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Curly Gulch, 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 Curly Gulch, 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 Curly Gulch. In addition, underwater observations were made at 10 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)
- 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 Curly Gulch 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 June 28 to June 29, 2010, was conducted by B. Williams and B. Leonard (WSP). The total length of the stream surveyed was 1,964 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.18 cfs on June 30, 2010.

Curly Gulch is an A4 channel type for 1,964 feet of the stream surveyed. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 54 to 56 degrees Fahrenheit. Air temperatures ranged from 58 to 71 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% riffle units, 31% pool units, 30% flatwater units, 1% no survey units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 44% riffle units, 37% flatwater units, 15% pool units, 2% no survey units, and 2% dry 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, 28%; mid-channel pool units, 26%; run units, 17% (Graph 3). Based on percent total length, low gradient riffle units made up 27%, step run units 25%, and high gradient riffle units 17%.

A total of 25 pools were identified (Table 3). Main channel pools were the most frequently encountered at 84% (Graph 4), and comprised 87% 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. One of the 25 pools (4%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 25 pool tail-outs measured, 8 had a value of 1 (32%); 11 had a value of 2 (44%); 6 had a value of 3 (24%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst.

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 2, flatwater habitat types had a mean shelter rating of 1, and pool habitats had a mean shelter rating of 17 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 22. Main channel pools had a mean shelter rating of 16 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Curly Gulch. Graph 7 describes the pool cover in Curly Gulch. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 76% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 24% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Curly Gulch was 96%. Four percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 6% and 94%, respectively. Graph 9 describes the mean percent canopy in Curly Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 95%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 81% sand/silt/clay, 18% cobble/gravel, and 1% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 50% of the units surveyed. Additionally, 42% of the units surveyed had brush as the dominant vegetation type, and 6% had deciduous trees as the dominant vegetation type (Graph 11).

## **BIOLOGICAL INVENTORY RESULTS**

Survey teams conducted a snorkel survey at 10 sites for species composition and distribution in Curly Gulch on June 30, 2010. The water temperature taken during the survey period of 1130 hours to 1205 hours was 54 degrees Fahrenheit. The air temperature was 60 degrees Fahrenheit. The sites were sampled by S. McSmith and I. Mikus (DFG).

Ten sites were sampled from the confluence with Parlin Creek upstream to 1,098 feet. The sites yielded 1 young-of-the-year steelhead/rainbow trout.

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The following chart displays the information yielded from these sites:

2010 Curly Gulch underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
A4 Channel Type									
06/30/10	1	002	Riffle	68	1	0	0	0	0
	2	009	Pool	308	0	0	0	0	0
	3	016	Pool	444	0	0	0	0	0
	4	026	Pool	641	0	0	0	0	0
	5	028	Pool	695	0	0	0	0	0
	6	031	Pool	738	0	0	0	0	0
	7	040	Pool	919	0	0	0	0	0
	8	043	Pool	979	0	0	0	0	0
	9	045	Pool	1000	0	0	0	0	0
	10	051	Pool	1098	0	0	0	0	0

## DISCUSSION

Curly Gulch is an A4 channel type for the entire 1,964 of stream surveyed. Fish habitat improvement structures are generally not suitable for A4 channel types.

The water temperatures recorded on the survey days June 28 to June 29, 2010, ranged from 54 to 56 degrees Fahrenheit. Air temperatures ranged from 58 to 71 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 37% of the total length of this survey, riffles 44%, and pools 15%. One of the 25 (4%) 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 structures that will increase or deepen pool habitat is not recommended for A4 channel types.

Nineteen of the 25 pool tail-outs measured had embeddedness ratings of 1 or 2. Six of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which

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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.

All 25 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 17. The shelter rating in the flatwater habitats is 1. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in Curly Gulch. Large woody debris is the dominant cover type in pools followed by small woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 96%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 95% and 96%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

## RECOMMENDATIONS

- 1) Curly Gulch 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.

## 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 Parlin Creek. The channel is an A4 for the entire length of the survey, 1,964. Log debris accumulation (LDA) #01 contains six pieces of large woody debris (LWD) and measures 5' high x 12' wide x 9' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to



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- gravel and measures 10' wide x 18' long x 2.5' deep. Fish are present above the LDA.
- 989      0045.00      Right bank seep.
- 1083      0051.00      Tributary #01 enters on the left bank. It contributes to less than 5% of Curly Gulch's flow. The water temperature downstream and upstream of the tributary is 54 degrees Fahrenheit; the water temperature of the tributary is 54 degrees Fahrenheit. The slope of the tributary is approximately 7%. The tributary is not accessible to fish because the flow is subterranean 5' upstream from the mouth.
- LDA #02 contains three pieces of LWD and measures 5' high x 10' wide x 22' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to cobble and measures 15' wide x 35' long x 3' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
- 1509      0069.00      Tributary #02 enters on the left bank. It contributes to approximately 5% of Curly Gulch's flow. The water temperature downstream of the tributary is 54 degrees Fahrenheit, the water temperature of the tributary is 54 degrees Fahrenheit, and the water temperature upstream of the confluence is 55 degrees Fahrenheit. The slope of the tributary is approximately 15%. The tributary is inaccessible to fish due to a 10' high plunge with no jump pool below it.
- 1611      0073.00      LDA #03 contains six pieces of LWD and measures 8' high x 8' wide x 8' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 10' wide x 4' deep. It is a possible barrier to juvenile and adult salmonids. Fish are not present above the LDA.
- 1964      0081.00      End of survey due to diminished habitat and a slope greater than 12%.

## 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: 1236341393851

LLID: 1236341393851 Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS27 Latitude: 39:23:06.0N Longitude: 123:38:03.0W

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	DRY	1.2	49	49	2.5									
24	7	FLATWATER	29.6	30	729	37.1	4.7	0.4	0.8	167	4014	64	1530		1
1	0	NOSURVEY	1.2	32	32	1.6									
25	25	POOL	30.9	12	294	15.0	7.6	0.6	1.2	85	2137	64	1602	54	17
30	4	RIFFLE	37.0	29	860	43.8	5.0	0.3	0.6	96	2876	30	887		3
<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>		
81	36				1964					9027			4018		

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

Stream Name: 1236341393851

LLID: 1236341393851

Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS27

Latitude: 39:23:06.0N

Longitude: 123:38:03.0W

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 (%)
23	3	LGR	28.4	23	523	26.6	5	0.2	0.7	100	2296	25	585		0	98
7	1	HGR	8.6	48	337	17.2	5	0.5	0.8	84	588	42	294		10	96
14	3	RUN	17.3	17	243	12.4	4	0.4	1	82	1152	32	448		2	93
10	4	SRN	12.3	49	486	24.7	5	0.4	1.2	231	2310	88	875		0	94
21	21	MCP	25.9	12	257	13.1	7	0.6	2.1	87	1817	67	1417	57	16	97
1	1	LSL	1.2	8	8	0.4	17	0.4	1.3	136	136	68	68	54	30	99
1	1	LSBo	1.2	16	16	0.8	4	0.5	0.9	64	64	45	45	32	0	90
2	2	PLP	2.5	6	13	0.7	10	0.5	1.2	60	120	36	72	30	30	95
1	0	DRY	1.2	49	49	2.5										
1	0	NS	1.2	32	32	1.6										

Total Units  
81

Total Units Fully Measured  
36

Total Length (ft.)  
1964

Total Area (sq.ft.)  
8483

Total Volume (cu.ft.)  
3804

**Table 3 - Summary of Pool Types**

Stream Name: 1236341393851

LLID: 1236341393851

Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS27

Latitude: 39:23:06.0N

Longitude: 123:38:03.0W

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
21	21	MAIN	84	12	257	87	7.1	0.6	87	1817	57	1199	16
4	4	SCOUR	16	9	37	13	10.0	0.5	80	320	37	146	23

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
25	25	294	2137	1345

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

Stream Name: 1236341393851

LLID: 1236341393851

Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS27

Latitude: 39:23:06.0N

Longitude: 123:38:03.0W

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
21	MCP	84	5	24	15	71	1	5	0	0	0	0
1	LSL	4	0	0	1	100	0	0	0	0	0	0
1	LSBo	4	1	100	0	0	0	0	0	0	0	0
2	PLP	8	0	0	2	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
25	6	24	18	72	1	4	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.2

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

Stream Name: 1236341393851

LLID: 1236341393851

Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Dry Units: 1

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS27

Latitude: 39:23:06.0N

Longitude: 123:38:03.0W

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
23	3	LGR	0	0	0	0	0	0	0	0	0
7	1	HGR	0	60	40	0	0	0	0	0	0
30	4	TOTAL RIFFLE	0	60	40	0	0	0	0	0	0
14	3	RUN	100	0	0	0	0	0	0	0	0
10	4	SRN	0	0	0	0	0	0	0	0	0
24	7	TOTAL FLAT	100	0	0	0	0	0	0	0	0
21	21	MCP	12	25	54	5	0	0	1	3	0
1	1	LSL	0	20	80	0	0	0	0	0	0
1	1	LSBo	0	0	0	0	0	0	0	0	0
2	2	PLP	3	8	40	0	0	0	25	25	0
25	25	TOTAL POOL	11	23	54	4	0	0	3	5	0
1	0	NS									
81	36	TOTAL	14	24	51	4	0	0	3	5	0

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

Stream Name: 1236341393851

LLID: 1236341393851

Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Dry Units: 1

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS27

Latitude: 39:23:06.0N

Longitude: 123:38:03.0W

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
23	3	LGR	0	0	67	33	0	0	0
7	1	HGR	0	0	100	0	0	0	0
14	3	RUN	67	0	33	0	0	0	0
10	4	SRN	0	0	100	0	0	0	0
21	21	MCP	5	5	71	10	10	0	0
1	1	LSL	0	100	0	0	0	0	0
1	1	LSBo	0	0	100	0	0	0	0
2	2	PLP	0	0	100	0	0	0	0



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

Stream Name: 1236341393851

LLID: 1236341393851

Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS27

Latitude: 39:23:06.0N

Longitude: 123:38:03.0W

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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
96	94	6	0	95	96

---

Note: Mean percent conifer and hardwood for the entire reach are means of canopy components from units with canopy values greater than zero.

Open units represent habitat units with zero canopy cover.

**Table 8 - Fish Habitat Inventory Data Summary**

Stream Name: 1236341393851      LLID: 1236341393851      Drainage: Noyo River  
Survey Dates: 6/28/2010 to 6/29/2010      Survey Length (ft.): 1964      Main Channel (ft.): 1964      Side Channel (ft.): 0  
Confluence Location: Quad: NOYO HILL      Legal Description: T18NR16WS27      Latitude: 39:23:06.0N      Longitude: 123:38:03.0W

**Summary of Fish Habitat Elements By Stream Reach****STREAM REACH: 1**

Channel Type: A4	Canopy Density (%): 95.9	Pools by Stream Length (%): 15.0					
Reach Length (ft.): 1964	Coniferous Component (%): 93.9	Pool Frequency (%): 30.9					
Riffle/Flatwater Mean Width (ft.): 4.8	Hardwood Component (%): 6.1	Residual Pool Depth (%):					
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 96					
Range (ft.): 8 to 14	Vegetative Cover (%): 95.3	2 to 2.9 Feet Deep: 4					
Mean (ft.): 10	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0					
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0					
Base Flow (cfs.): 0.2	Occurrence of LWD (%): 32	Mean Max Residual Pool Depth (ft.): 1.2					
Water (F): 54 - 56	Air (F): 58 - 71	LWD per 100 ft.:					
Dry Channel (ft): 49	Riffles: 6	Mean Pool Shelter Rating: 17					
	Pools: 20						
	Flat: 5						
Pool Tail Substrate (%):	Silt/Clay: 0	Sand: 0	Gravel: 76	Sm Cobble: 24	Lg Cobble: 0	Boulder: 0	Bedrock: 0
Embeddedness Values (%):	1. 32.0	2. 44.0	3. 24.0	4. 0.0	5. 0.0		

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

Stream Name: 1236341393851

LLID: 1236341393851

Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS27

Latitude: 39:23:06.0N

Longitude: 123:38:03.0W

**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	1	0	1.4
Boulder	0	0	0.0
Cobble / Gravel	6	7	18.1
Sand / Silt / Clay	29	29	80.6

**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	0	2	2.8
Brush	15	15	41.7
Hardwood Trees	3	1	5.6
Coniferous Trees	18	18	50.0
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: 1236341393851

LLID: 1236341393851

Drainage: Noyo River

Survey Dates: 6/28/2010 to 6/29/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS27

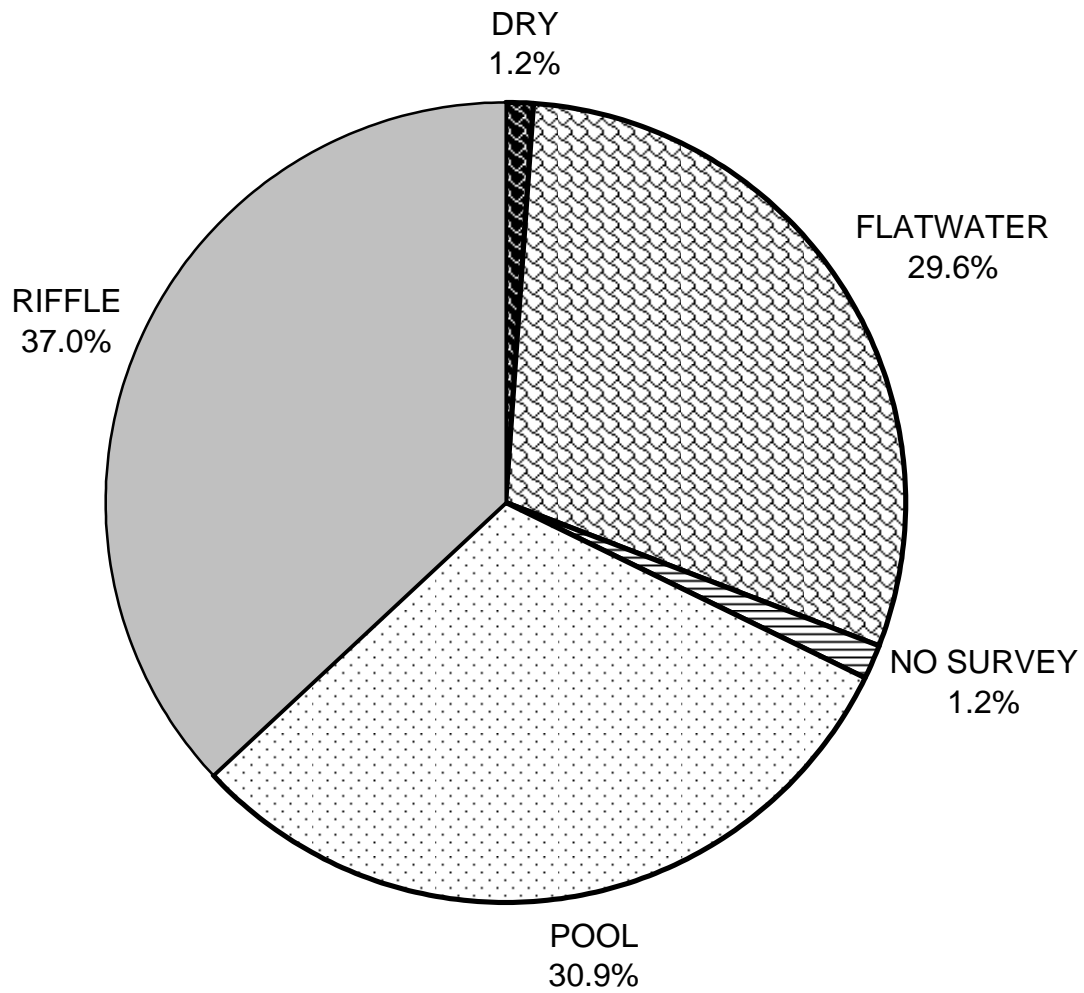
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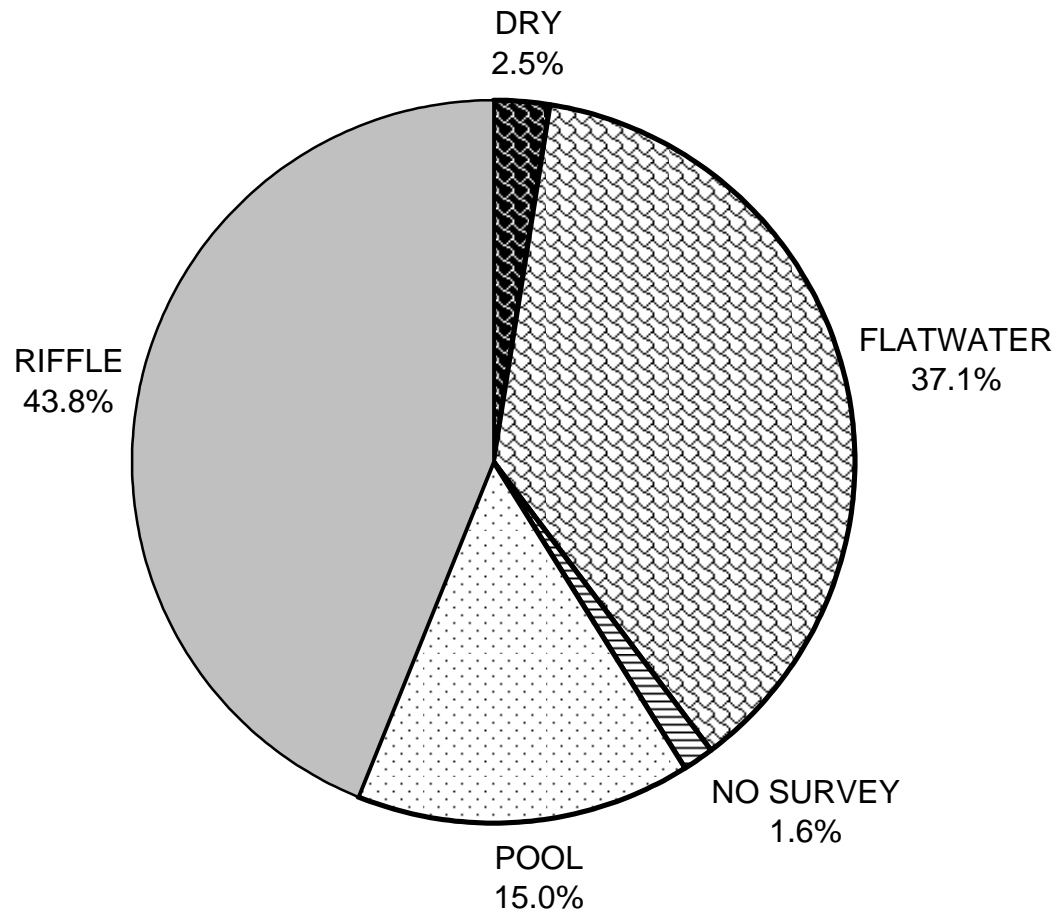
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	100	11
SMALL WOODY DEBRIS (%)	60	0	23
LARGE WOODY DEBRIS (%)	40	0	54
ROOT MASS (%)	0	0	4
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	3
BOULDERS (%)	0	0	5
BEDROCK LEDGES (%)	0	0	0

# "Curly Gulch" 2010 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

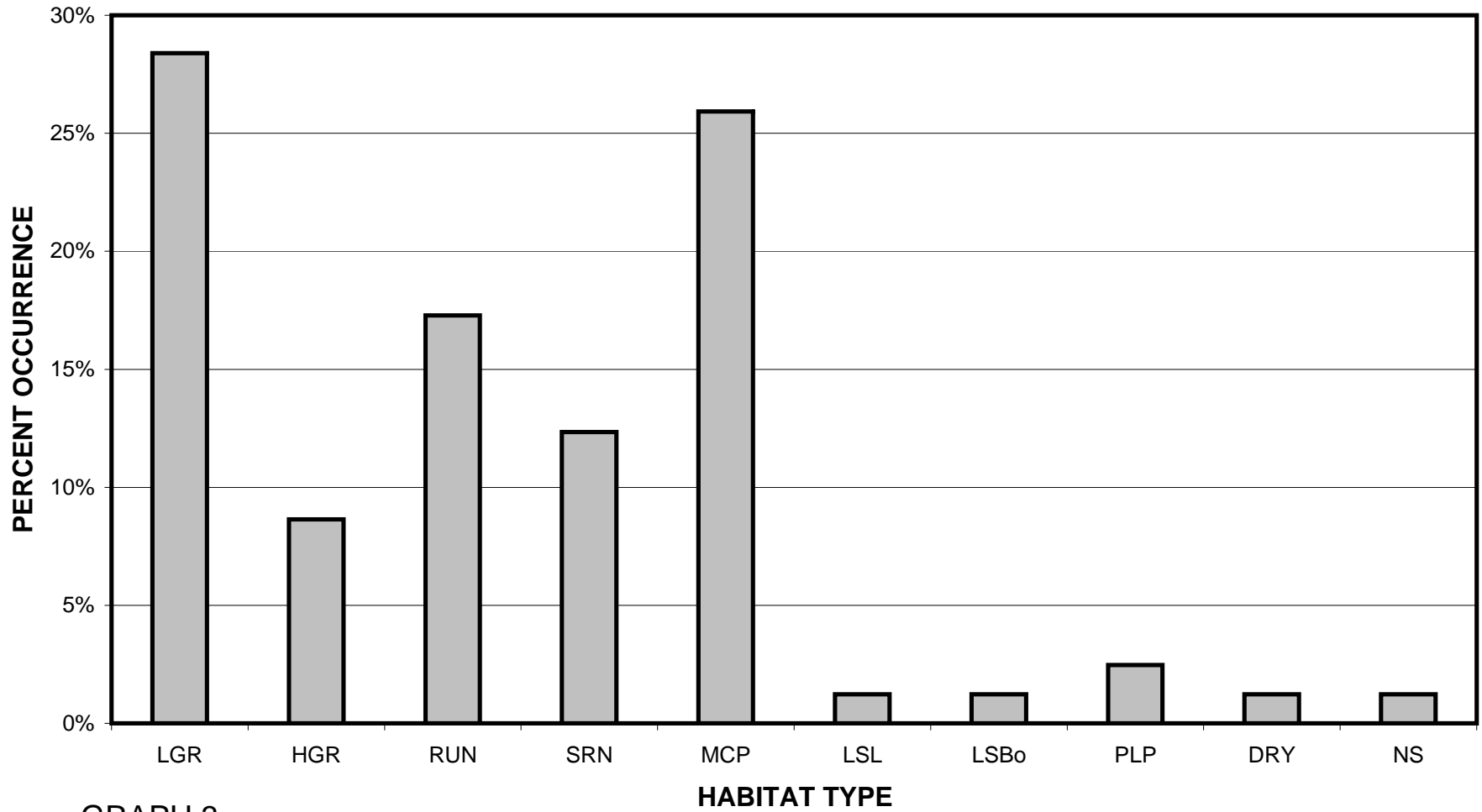
**"Curly Gulch" 2010**  
**HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

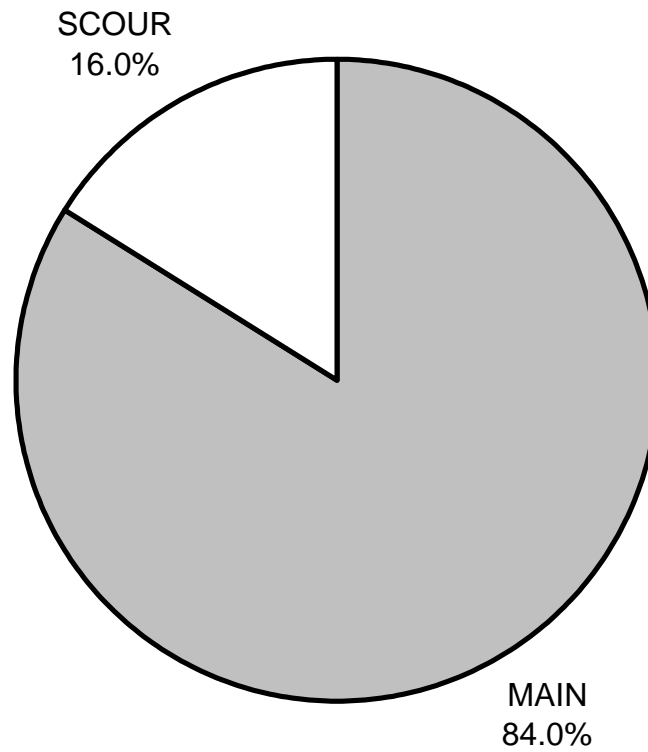
# "Curly Gulch" 2010

## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

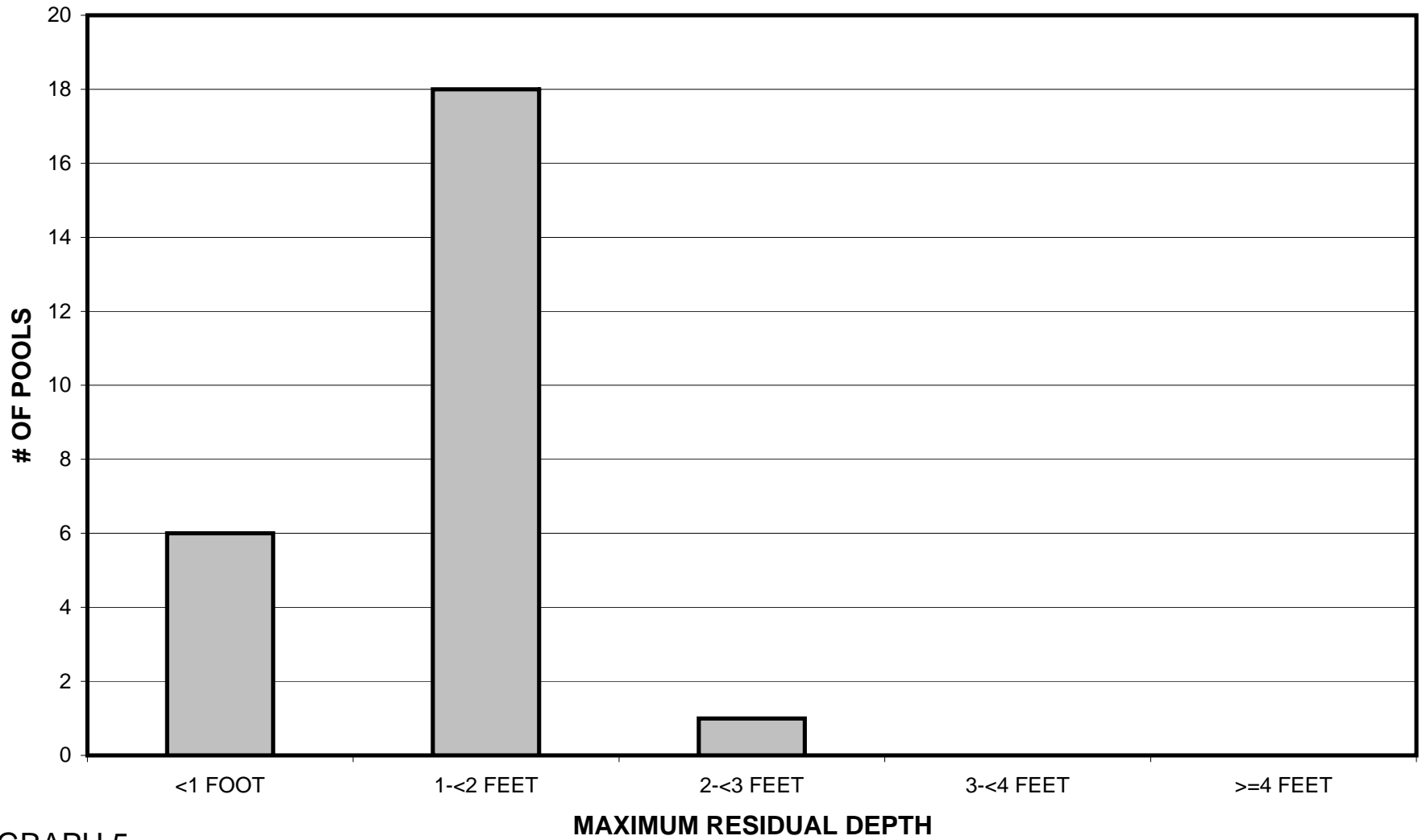
**"Curly Gulch" 2010  
POOL TYPES BY PERCENT OCCURRENCE**



GRAPH 4

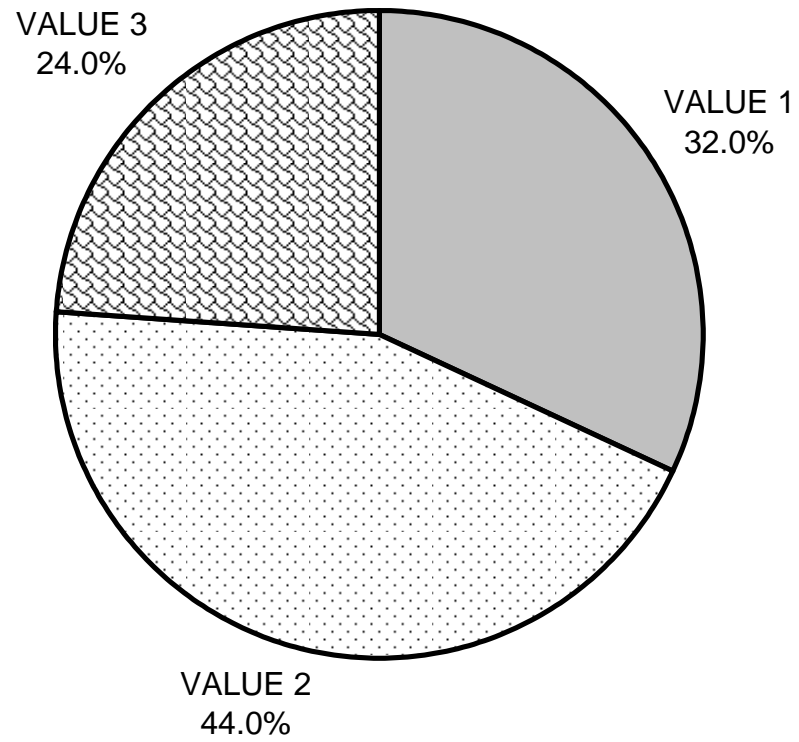


# "Curly Gulch" 2010 MAXIMUM DEPTH IN POOLS



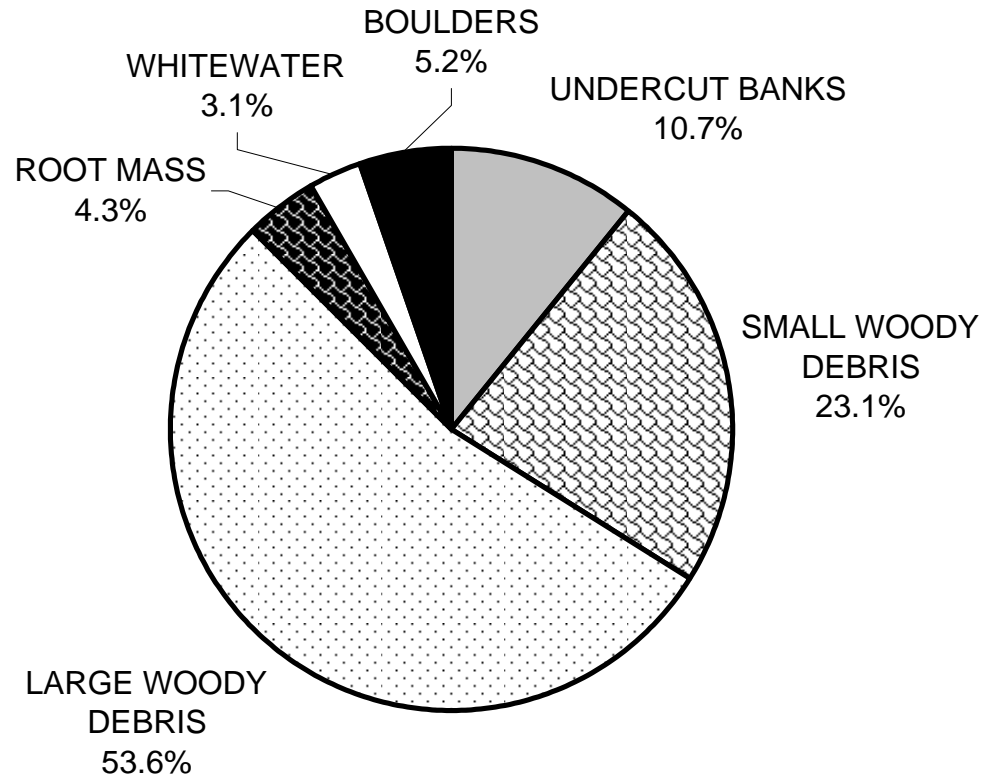
GRAPH 5

# "Curly Gulch" 2010 PERCENT EMBEDDEDNESS



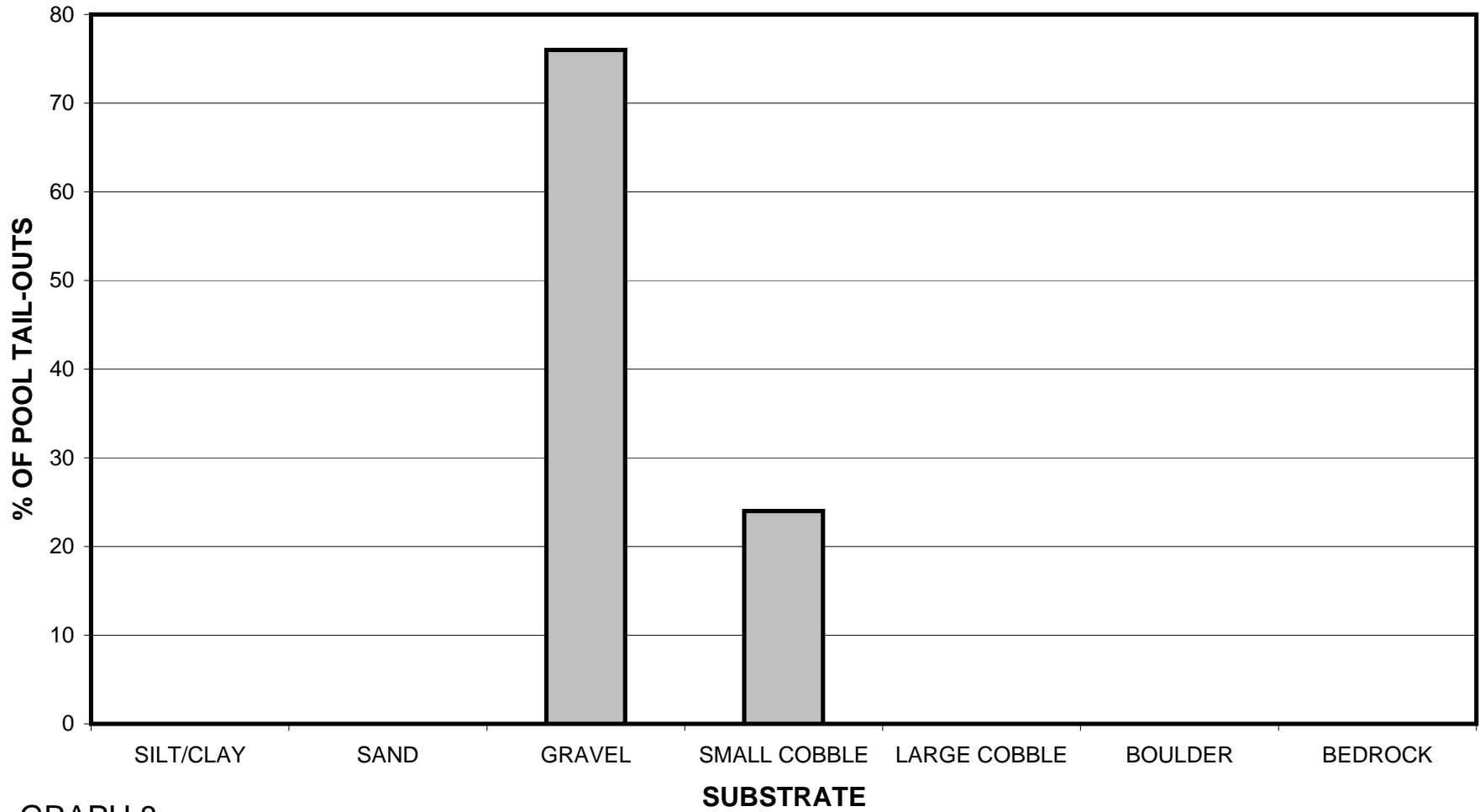
GRAPH 6

**"Curly Gulch" 2010  
MEAN PERCENT COVER TYPES IN POOLS**



GRAPH 7

# "Curly Gulch" 2010 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



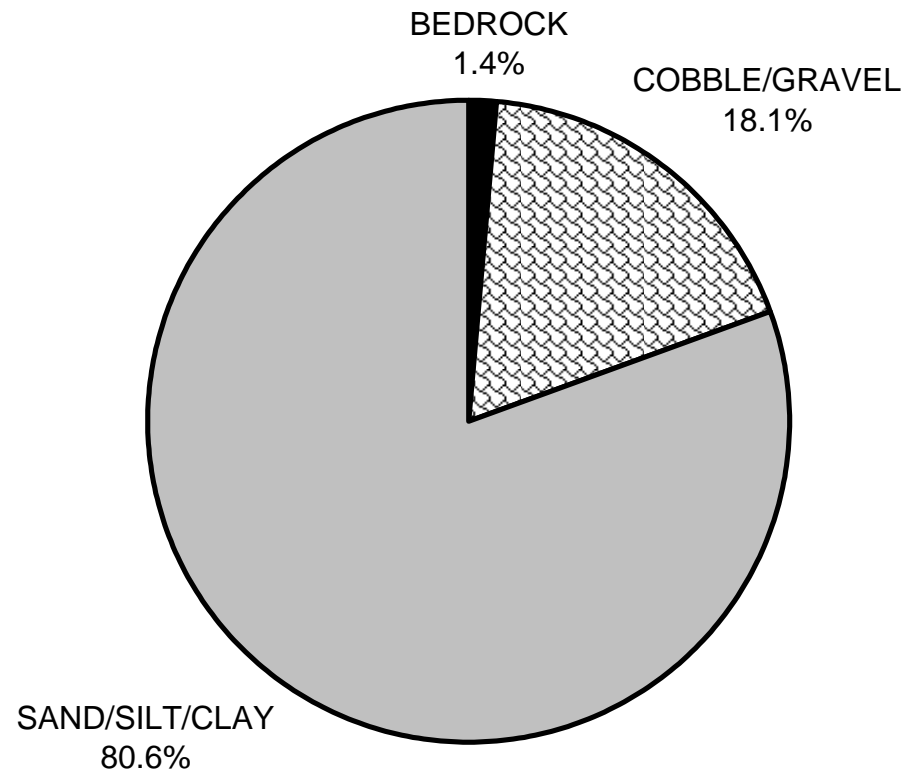
GRAPH 8

# "Curly Gulch" 2010 MEAN PERCENT CANOPY



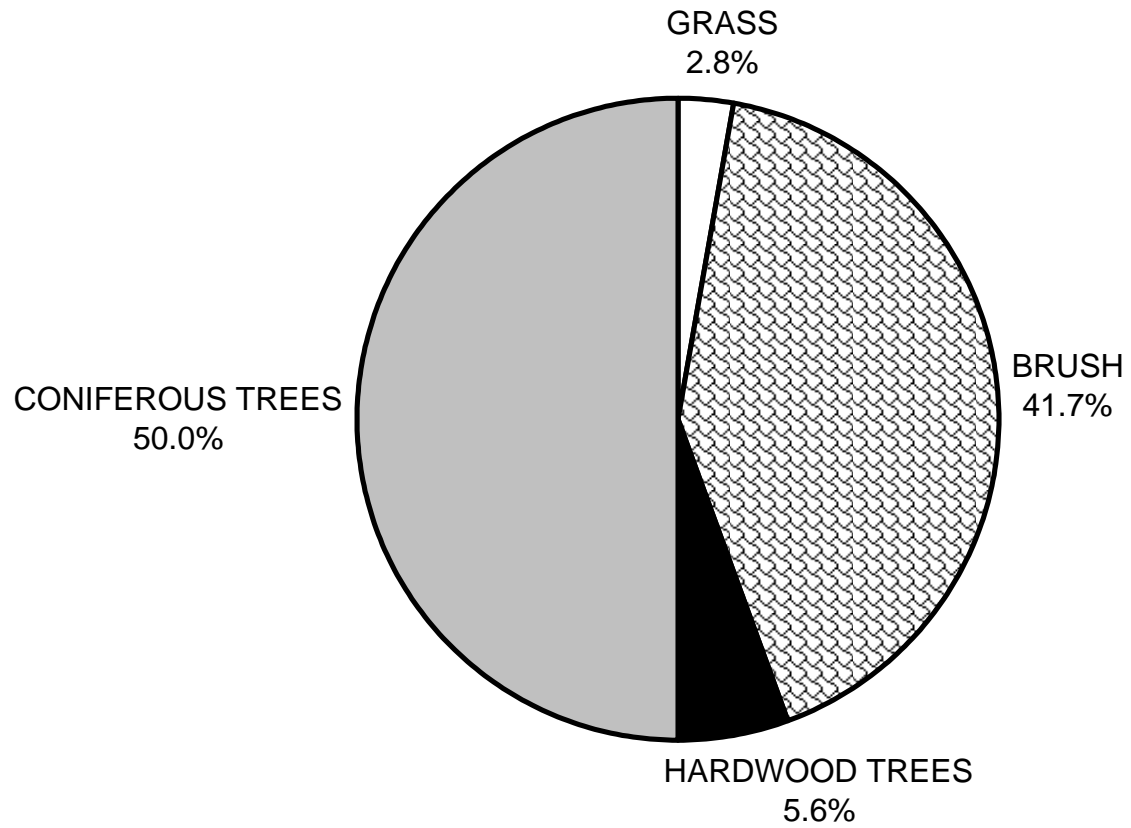
GRAPH 9

**"Curly Gulch" 2010**  
**DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**"Curly Gulch" 2010**  
**DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

