

# STREAM INVENTORY REPORT

## “Shooter Gulch”

### INTRODUCTION

A stream inventory was conducted from June 14 to June 15, 2010 on an unnamed tributary to the North Fork of the South Fork Noyo River commonly know as and hereinafter referred to as Shooter Gulch. The survey began at the confluence with the North Fork of the South Fork Noyo River and extended upstream 0.3 miles.

The Shooter 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 Shooter 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

Shooter Gulch is a tributary to the North Fork of the South Fork Noyo River, 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). Shooter Gulch's legal description at the confluence with the North Fork of the South Fork Noyo River is T18N R16W S21. Its location is 39.40526 degrees north latitude and 123.64754 degrees west longitude, LLID number 1236464394053. Shooter Gulch is an intermittent stream according to the USGS Noyo Hill 7.5 minute quadrangle. Shooter Gulch drains a watershed of approximately 0.34 square miles. Elevations range from about 220 feet at the mouth of the creek to 1,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is in the Jackson Demonstration State Forest and is managed by the California Department of Forestry and Fire Protection for timber production. Vehicle access exists via California Division of Forestry and Fire Protection Road 300 to Road 360 to Road 361.

### METHODS

The habitat inventory conducted in Shooter 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.

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### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

### HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Shooter 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". Shooter 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

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

### 5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Shooter 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 Shooter 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 densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Shooter 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 Shooter Gulch, the dominant composition type and the dominant

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vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

### 10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

### 11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

## BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Shooter 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)

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- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Shooter 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 14 to June 15, 2010, was conducted by A. Glasgow and M. Groff (WSP). The total length of the stream surveyed was 1,809 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.02 cfs on June 14, 2010.

Shooter Gulch is a G4 channel type for 1,454 feet of the stream surveyed (Reach 1), and an A4 channel type for 355 feet of the stream surveyed (Reach 2). A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates. G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 53 to 56 degrees Fahrenheit. Air temperatures ranged from 50 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 40% riffle units, 31% flatwater units, 17% pool units, 7% dry units, and 5% no survey units (Graph 1). Based on total length of Level II habitat types there were 43% riffle units, 37% flatwater units, 11% dry units, 5% pool units, and 4% no survey 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, 33%; run units, 16%; and step run units, 16%

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(Graph 3). Based on percent total length, low gradient riffle units made up 38%, step run units 26%, run units 11%, and dry units 11%.

A total of 10 pools were identified (Table 3). Main channel pools were the most frequently encountered at 70% (Graph 4), and comprised 69% 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. None of the 10 pools had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 10 pool tail-outs measured, 8 had a value of 2 (80%); 2 had a value of 3 (20%) (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 0, flatwater habitat types had a mean shelter rating of 7, 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 37. Main channel pools had a mean shelter rating of 24 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Shooter Gulch. Graph 7 describes the pool cover in Shooter 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 100% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Shooter Gulch was 91%. Nine percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 22% and 78%, respectively. Graph 9 describes the mean percent canopy in Shooter Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 98%. The mean percent left bank vegetated was 99%. The dominant elements composing the structure of the stream banks consisted of 66% sand/silt/clay and 34% cobble/gravel (Graph 10). Brush was the dominant vegetation type observed in 39.5% of the units surveyed. Additionally, 34.2% of the units surveyed had coniferous trees as the dominant vegetation type, and 26.3% 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 Shooter Gulch on June 17, 2010. Water temperatures taken during the survey period of 0837

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hours to 0917 hours ranged from 51 to 52 degrees Fahrenheit. The air temperature was 54 degrees Fahrenheit. The sites were sampled by S. McSmith (DFG), and A. Glasgow (WSP).

The reach sites yielded no fish.

The following chart displays the information yielded from these sites:

2010 Shooter Gulch underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: G4 Channel Type									
06/17/10	1	009	Pool	344	0	0	0	0	0
	2	020	Pool	719	0	0	0	0	0
	3	024	Pool	806	0	0	0	0	0
	4	026	Pool	837	0	0	0	0	0
	5	028	Pool	875	0	0	0	0	0
	6	030	Pool	898	0	0	0	0	0
	7	033	Pool	1011	0	0	0	0	0
	8	039	Pool	1208	0	0	0	0	0
	9	044	Pool	1389	0	0	0	0	0
	10	048	Pool	1481	0	0	0	0	0

## DISCUSSION

Shooter Gulch is a G4 channel type for the first 1,454 feet of stream surveyed and an A4 channel type for the remaining 355 feet. The suitability of G4 and A4 channel types for fish habitat improvement structures is as follows: G4 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover. A4 channel types are generally not suitable for fish habitat improvement structures.

The water temperatures recorded on the survey days June 14 to June 15, 2010, ranged from 53 to 56 degrees Fahrenheit. Air temperatures ranged from 50 to 70 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 43%, and pools 5%. None of the 10 (0%) 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

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have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing large wood that will increase or deepen pool habitat is recommended.

Eight of the 10 pool tail-outs measured had embeddedness ratings of 1 or 2. Two of the pool tail-outs had embeddedness ratings of 3 or 4. None 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.

All 10 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 7. 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 Shooter 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 91%. Reach 1 had a canopy density of 89%, Reach 2 had a canopy density of 93%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 98% and 99%, 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) Shooter 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.



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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 of the South Fork Noyo River. The channel type is a G4.
806	0025.00	Log debris accumulation (LDA) 01 contains six pieces of LWD and measures 5' high x 41' wide x 22' long. Water does not flow through; the stream is dry above the LDA. There are no visible gaps in the LDA. Retained sediment ranges from sand to small cobble and measures 10' wide x 5' long x 0.5' deep. The LDA is a potential barrier to salmonids.
898	0031.00	Log debris accumulation (LDA) 02 contains five pieces of large woody debris (LWD) and measures 6' high x 30' wide x 45' long. Water does not flow through the LDA; the stream is dry above it. There are visible gaps in the LDA. Retained sediment ranges from sand to small cobble and measures 6' wide x 5' long x 0.5' deep. It is a possible barrier to juvenile and adult salmonids. Fish were not observed above the LDA.
1011	0034.00	LDA 03 contains six pieces of LWD and measures 5' high x 41' wide x 22' long. Water does not flow through; the stream is dry above the LDA. There are no visible gaps in the LDA. Retained sediment ranges from sand to small cobble and measures 10' wide x 5' long x 0.5' deep. The LDA is a possible barrier to juvenile and adult salmonids.
1179	0038.00	Left bank seep.
1189	0039.00	There is a 2' high plunge over a bedrock sheet.
1481	0049.00	Tributary 01 enters on the left bank. It contributes approximately 50% of Shooter Gulch's flow. The water temperature downstream of the tributary is 53 degrees Fahrenheit, the water temperature of the tributary is 53 degrees Fahrenheit, and the water temperature upstream of the confluence is 53 degrees Fahrenheit. The slope of the tributary is greater than 4%. Only the first 350' of tributary are accessible to fish due to the high gradient upstream from the confluence and LWD accumulating in the channel. No fish were observed in the tributary.
1631	0054.00	There is a 3' high bedrock plunge with no jump pool below.

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- 1711      0057.00      LDA 04 contains five pieces of LWD and measures 6' high x 11' wide x 13' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to small cobble and measures 6' wide x 5' long x 0.5' deep. The LDA is a possible barrier to juvenile and adult salmonids.
- 1789      0058.00      End of survey. LDA 05 contains eight pieces of LWD and measures 6' high x 16' wide x 20' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to cobble and measures 14' wide x 20' long x 1.5' deep. There is no jump pool beneath the LDA. It is a possible barrier to juvenile salmonids and a potential end of anadromy.

## 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: 1236464394053

LLID: 1236464394053 Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS21 Latitude: 39:24:19.0N Longitude: 123:38:47.0W

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
4	0	DRY	6.9	48	194	10.7									
18	3	FLATWATER	31.0	38	676	37.4	4.5	0.4	0.8	195	3507	78	1410		7
3	0	NOSURVEY	5.2	23	69	3.8									
10	10	POOL	17.2	10	95	5.3	6.7	0.7	1.2	57	571	46	458	38	28
23	6	RIFFLE	39.7	34	775	42.8	4.9	0.2	0.4	103	2377	20	459		0
<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>		
58	19				1809					6454			2326		

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

Stream Name: 1236464394053

LLID: 1236464394053

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS21

Latitude: 39:24:19.0N

Longitude: 123:38:47.0W

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 (%)
19	3	LGR	32.8	36	686	37.9	5	0.2	0.7	133	2531	23	444		0	92
3	2	HGR	5.2	24	72	4.0	4	0.2	0.3	52	157	7	22		0	91
1	1	CAS	1.7	17	17	0.9	8	0.3	0.5	116	116	35	35		0	98
9	1	RUN	15.5	23	204	11.3	6	0.5	1.1	108	972	54	486		20	90
9	2	SRN	15.5	52	472	26.1	4	0.4	0.8	238	2144	90	814		0	91
7	7	MCP	12.1	9	66	3.6	7	0.7	1.3	59	413	47	331	38	24	90
2	2	LSL	3.4	8	15	0.8	6	0.8	1.5	44	88	36	71	31	55	91
1	1	PLP	1.7	14	14	0.8	5	0.7	1.6	70	70	56	56	49	0	85
4	0	DRY	6.9	48	194	10.7										
3	0	NS	5.2	23	69	3.8										

Total Units  
58

Total Units Fully Measured  
19

Total Length (ft.)  
1809

Total Area (sq.ft.)  
6490

Total Volume (cu.ft.)  
2260

**Table 3 - Summary of Pool Types**

Stream Name: 1236464394053

LLID: 1236464394053

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS21

Latitude: 39:24:19.0N

Longitude: 123:38:47.0W

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
7	7	MAIN	70	9	66	69	7.1	0.7	59	413	38	269	24
3	3	SCOUR	30	10	29	31	5.7	0.7	53	158	37	111	37

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
10	10	95	570	380

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

Stream Name: 1236464394053

LLID: 1236464394053

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS21

Latitude: 39:24:19.0N

Longitude: 123:38:47.0W

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
7	MCP	70	1	14	6	86	0	0	0	0	0	0
2	LSL	20	0	0	2	100	0	0	0	0	0	0
1	PLP	10	0	0	1	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
10	1	10	9	90	0	0	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.2

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

Stream Name: 1236464394053

LLID: 1236464394053

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Dry Units: 4

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS21

Latitude: 39:24:19.0N

Longitude: 123:38:47.0W

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
19	3	LGR	0	0	0	0	0	0	0	0	0
3	2	HGR	0	0	0	0	0	0	0	0	0
1	1	CAS	0	0	0	0	0	0	0	0	0
23	6	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
9	1	RUN	20	10	10	40	20	0	0	0	0
9	2	SRN	0	0	0	0	0	0	0	0	0
18	3	TOTAL FLAT	20	10	10	40	20	0	0	0	0
7	7	MCP	0	56	44	0	0	0	0	0	0
2	2	LSL	0	20	80	0	0	0	0	0	0
1	1	PLP	0	0	0	0	0	0	0	0	0
10	10	TOTAL POOL	0	44	56	0	0	0	0	0	0
3	0	NS									
58	19	TOTAL	3	39	49	6	3	0	0	0	0



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

Stream Name: 1236464394053

LLID: 1236464394053

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Dry Units: 4

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS21

Latitude: 39:24:19.0N

Longitude: 123:38:47.0W

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
19	3	LGR	0	0	100	0	0	0	0
3	2	HGR	0	0	100	0	0	0	0
1	1	CAS	100	0	0	0	0	0	0
9	1	RUN	0	0	100	0	0	0	0
9	2	SRN	0	0	100	0	0	0	0
7	7	MCP	14	0	71	14	0	0	0
2	2	LSL	0	0	100	0	0	0	0
1	1	PLP	0	0	100	0	0	0	0

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

Stream Name: 1236464394053

LLID: 1236464394053

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS21

Latitude: 39:24:19.0N

Longitude: 123:38:47.0W

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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
91	78	22	0	98	99

---

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: 1236464394053 LLID: 1236464394053 Drainage: Noyo River  
 Survey Dates: 6/14/2010 to 6/15/2010 Survey Length (ft.): 1809 Main Channel (ft.): 1809 Side Channel (ft.): 0  
 Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS21 Latitude: 39:24:19.0N Longitude: 123:38:47.0W

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

**STREAM REACH: 1**

Channel Type: G4	Canopy Density (%): 89.9	Pools by Stream Length (%): 6.2
Reach Length (ft.): 1454	Coniferous Component (%): 80.3	Pool Frequency (%): 20.0
Riffle/Flatwater Mean Width (ft.): 4.3	Hardwood Component (%): 19.7	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 100
Range (ft.): 9 to 15	Vegetative Cover (%): 99.0	2 to 2.9 Feet Deep: 0
Mean (ft.): 11	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.): 0.0	Occurrence of LWD (%): 21	Mean Max Residual Pool Depth (ft.): 1.2
Water (F): 53 - 56 Air (F): 50 - 70	LWD per 100 ft.:	Mean Pool Shelter Rating: 19
Dry Channel (ft): 185	Riffles: 4	
	Pools: 21	
	Flat: 4	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 77.8 3. 22.2 4. 0.0 5. 0.0		

**STREAM REACH: 2**

Channel Type: A4	Canopy Density (%): 93.8	Pools by Stream Length (%): 1.4
Reach Length (ft.): 355	Coniferous Component (%): 73.3	Pool Frequency (%): 7.7
Riffle/Flatwater Mean Width (ft.): 5.2	Hardwood Component (%): 26.7	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 100
Range (ft.): 8 to 11	Vegetative Cover (%): 97.1	2 to 2.9 Feet Deep: 0
Mean (ft.): 9	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.): 0.0	Occurrence of LWD (%): 12	Mean Max Residual Pool Depth (ft.): 1.5
Water (F): 53 - 53 Air (F): 50 - 55	LWD per 100 ft.:	Mean Pool Shelter Rating: 100
Dry Channel (ft): 9	Riffles: 5	
	Pools: 20	
	Flat: 6	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 0.0 2. 100.0 3. 0.0 4. 0.0 5. 0.0		

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

Stream Name: 1236464394053

LLID: 1236464394053

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS21

Latitude: 39:24:19.0N

Longitude: 123:38:47.0W

**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	0	0	0.0
Boulder	0	0	0.0
Cobble / Gravel	6	7	34.2
Sand / Silt / Clay	13	12	65.8

**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	0	0.0
Brush	8	7	39.5
Hardwood Trees	4	6	26.3
Coniferous Trees	7	6	34.2
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: 1236464394053

LLID: 1236464394053

Drainage: Noyo River

Survey Dates: 6/14/2010 to 6/15/2010

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS21

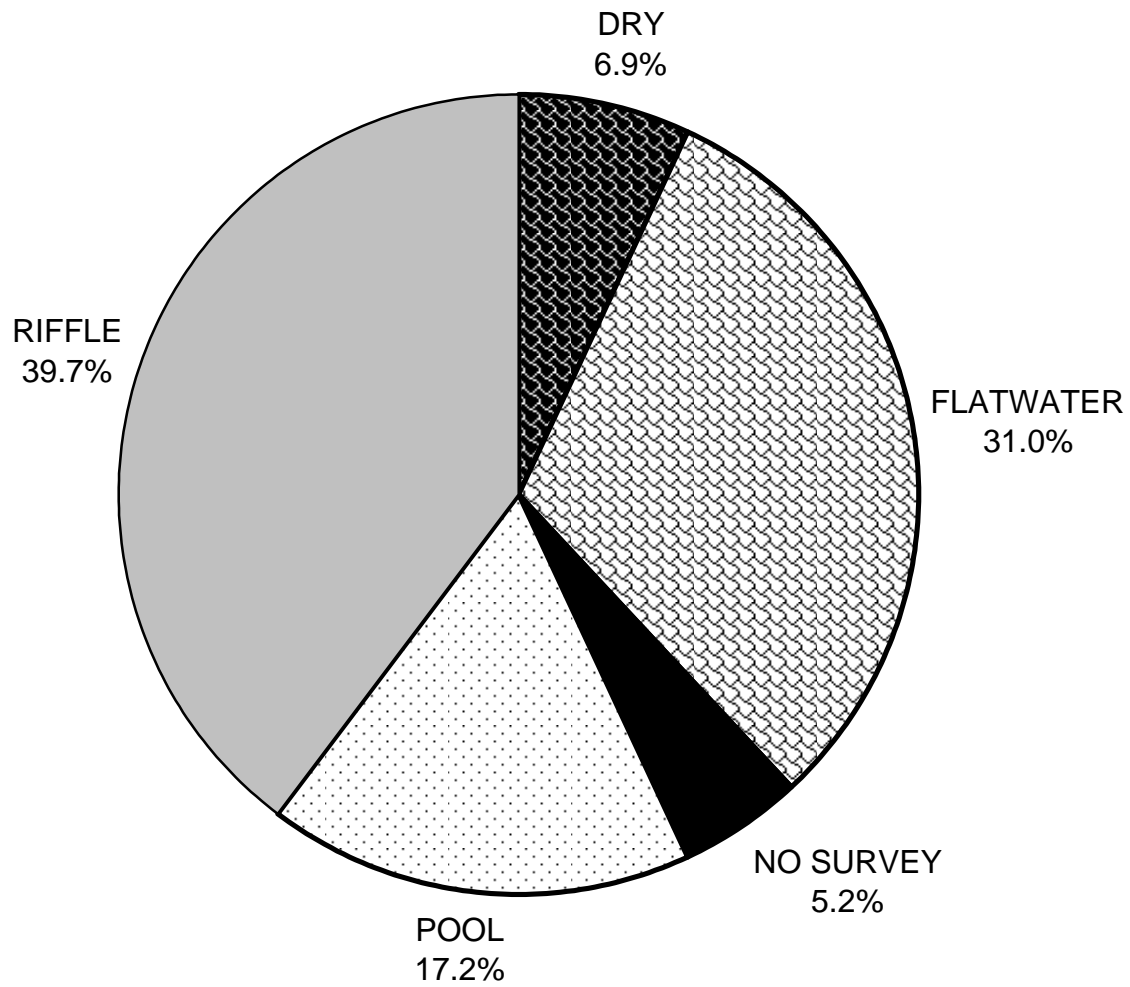
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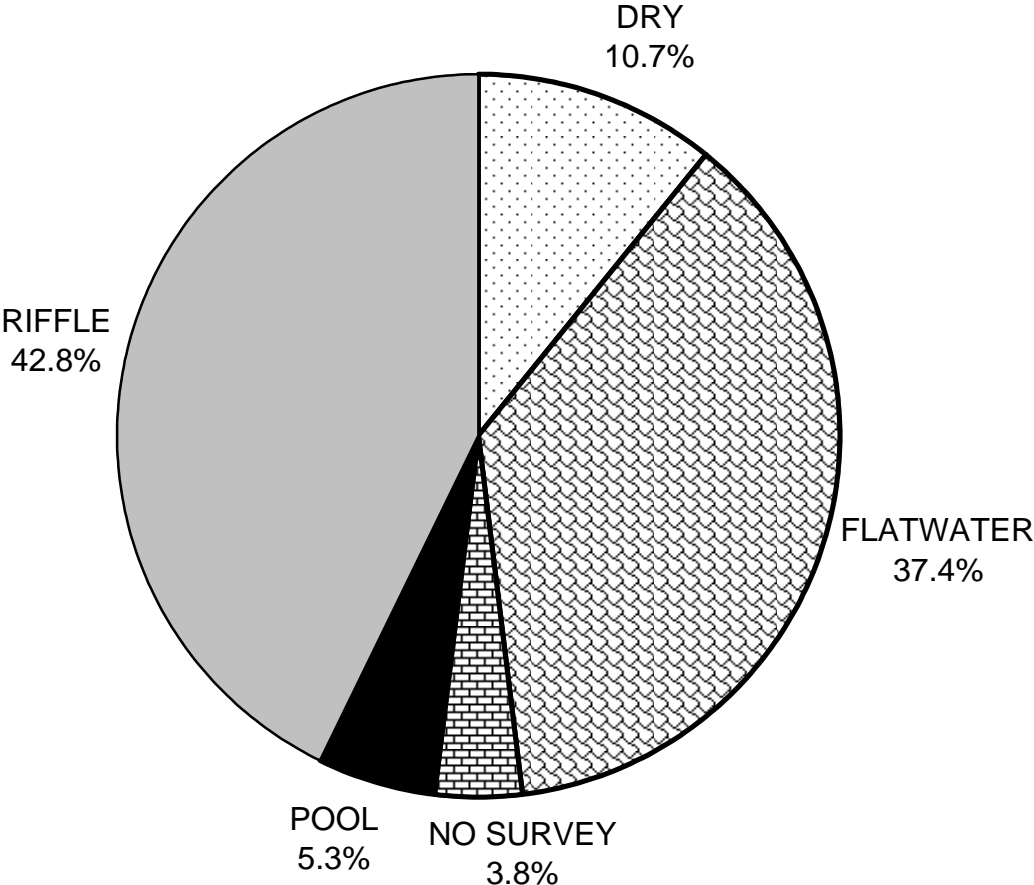
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	20	0
SMALL WOODY DEBRIS (%)	0	10	44
LARGE WOODY DEBRIS (%)	0	10	56
ROOT MASS (%)	0	40	0
TERRESTRIAL VEGETATION (%)	0	20	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	0

# "Shooter Gulch" 2010 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

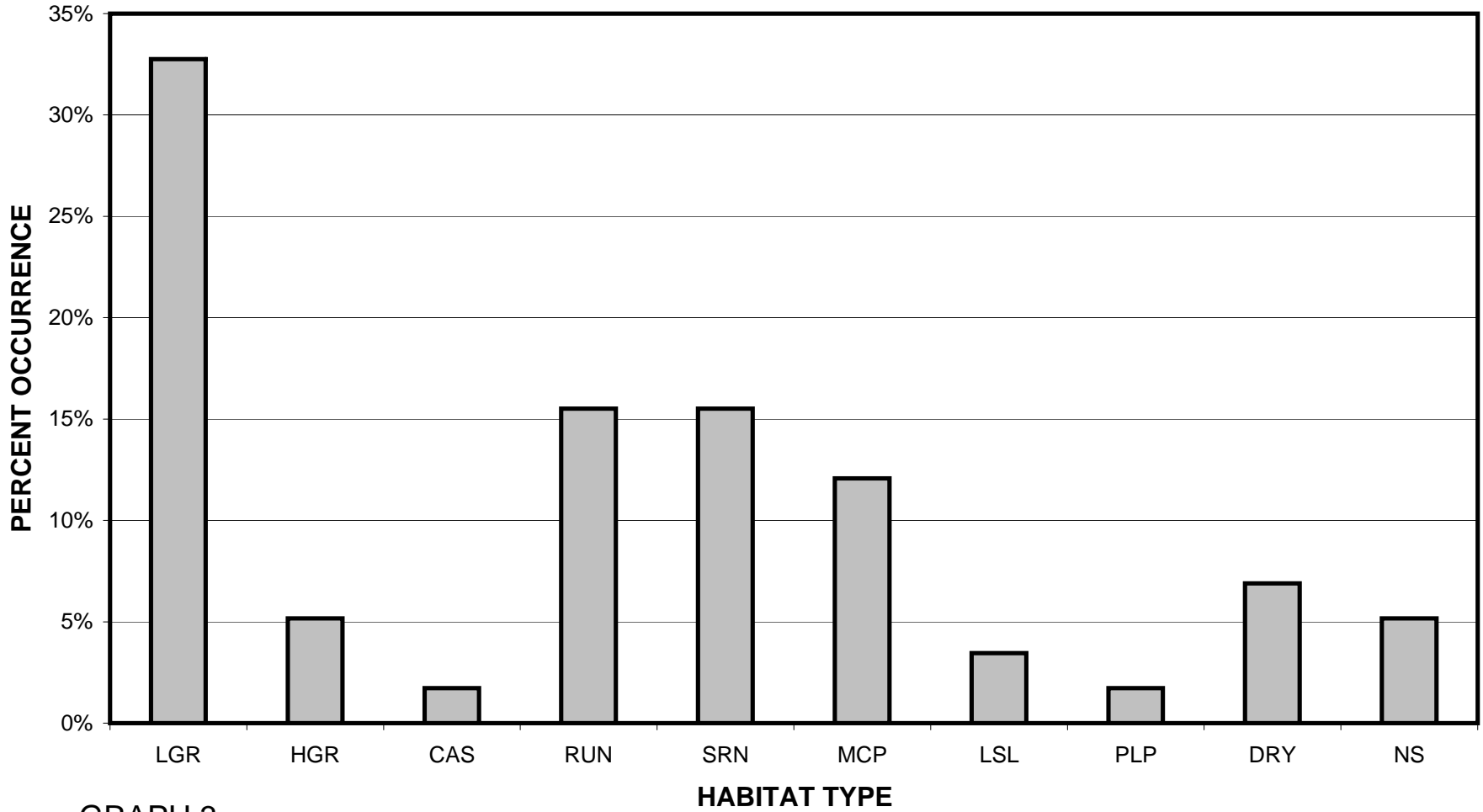
**"Shooter Gulch" 2010  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

# "Shooter Gulch" 2010

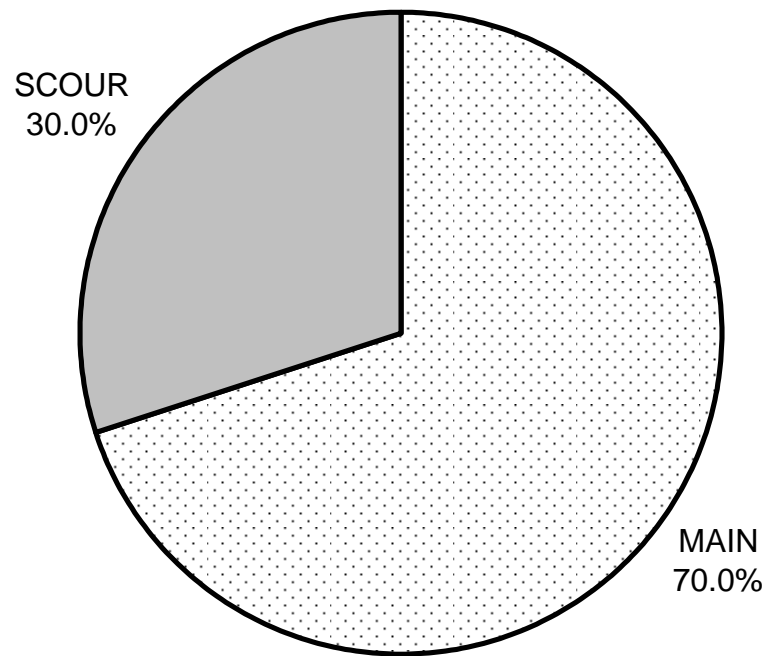
## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

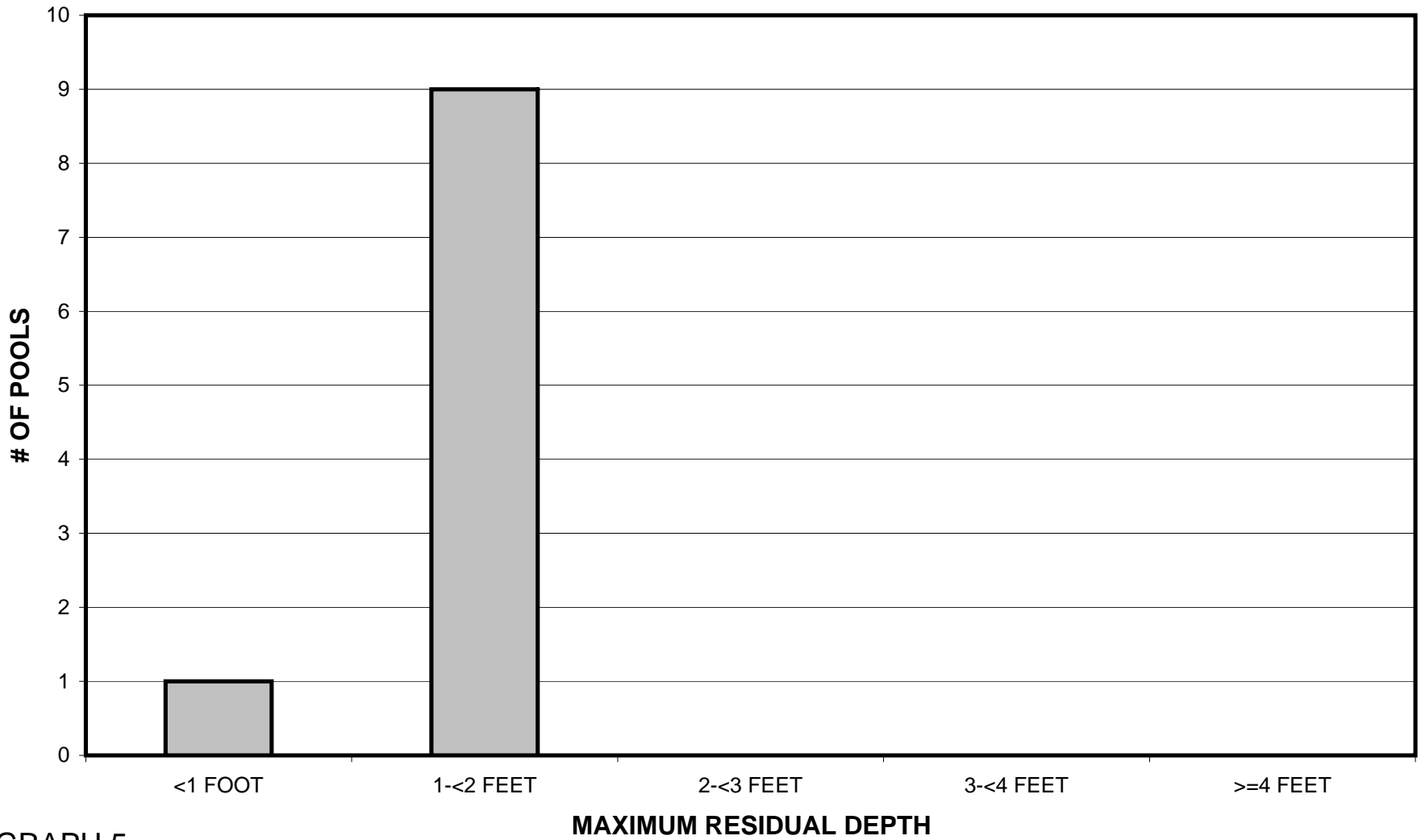


**"Shooter Gulch" 2010  
POOL TYPES BY PERCENT OCCURRENCE**



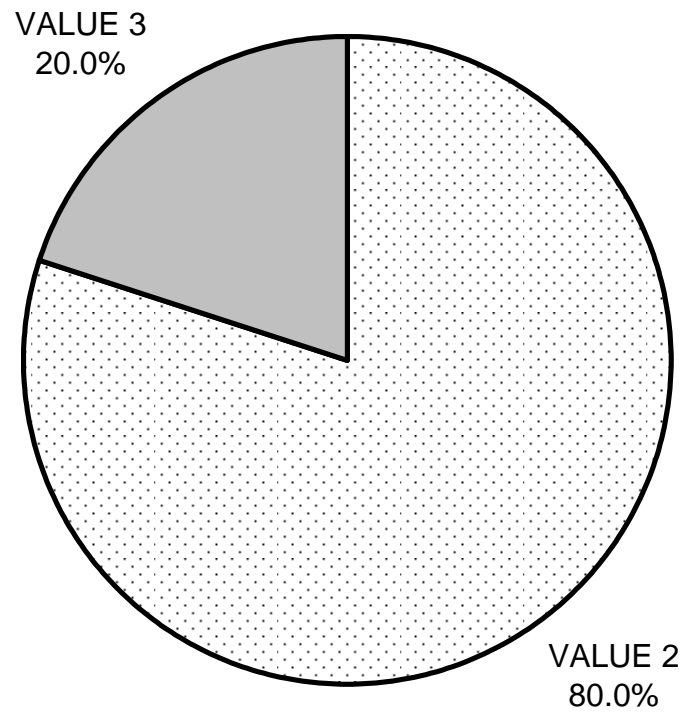
GRAPH 4

# "Shooter Gulch" 2010 MAXIMUM DEPTH IN POOLS



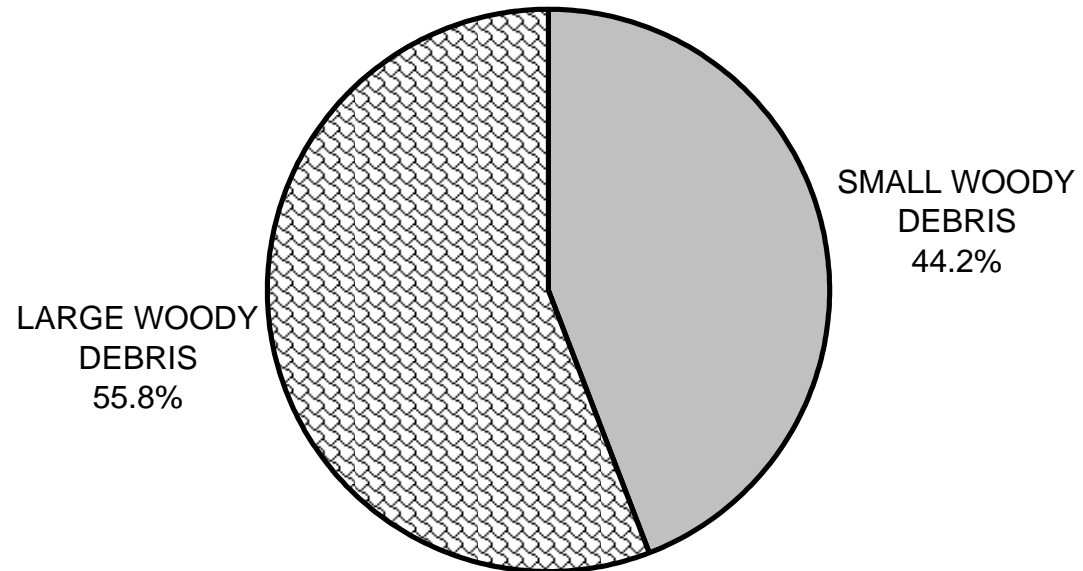
GRAPH 5

# "Shooter Gulch" 2010 PERCENT EMBEDDEDNESS



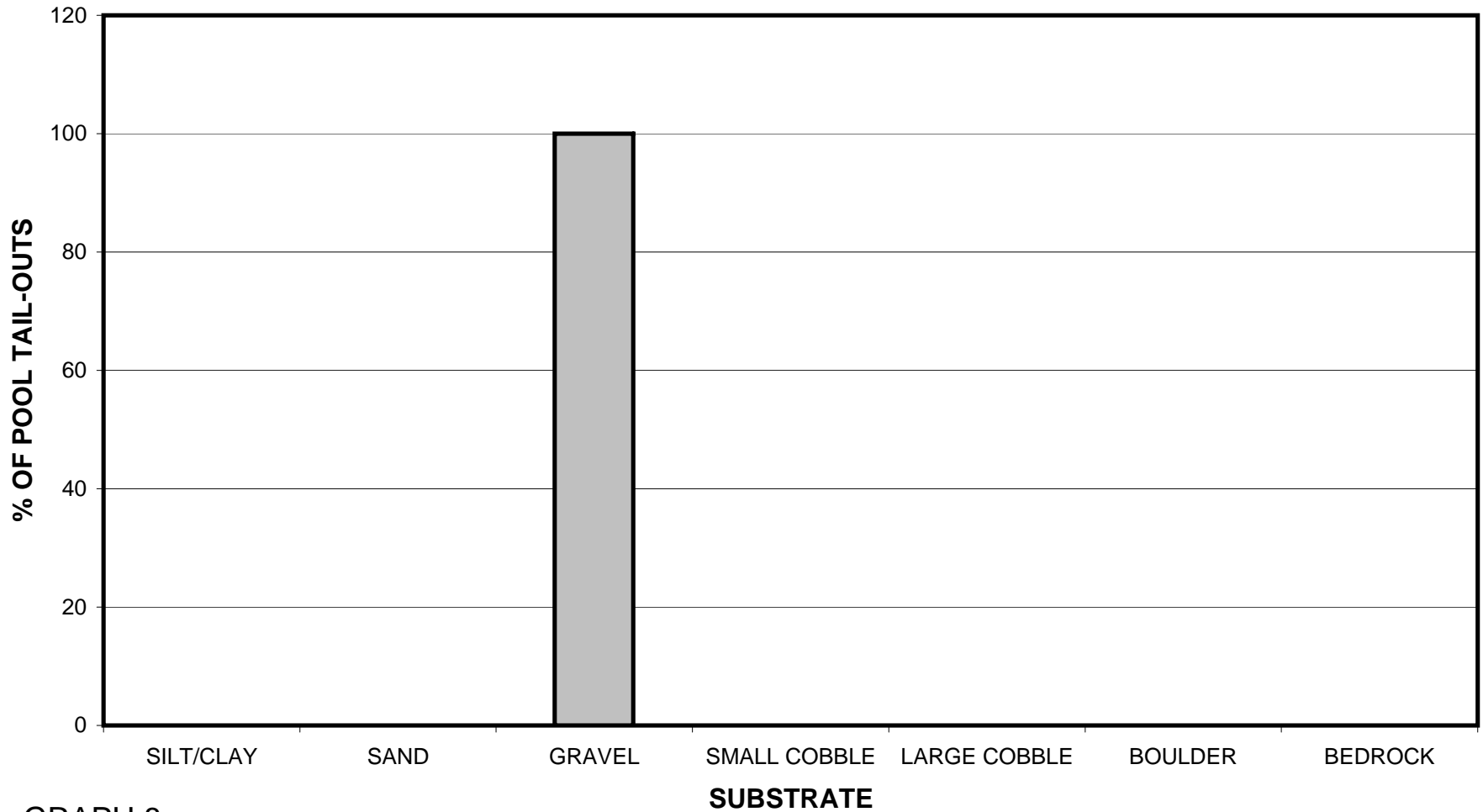
GRAPH 6

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



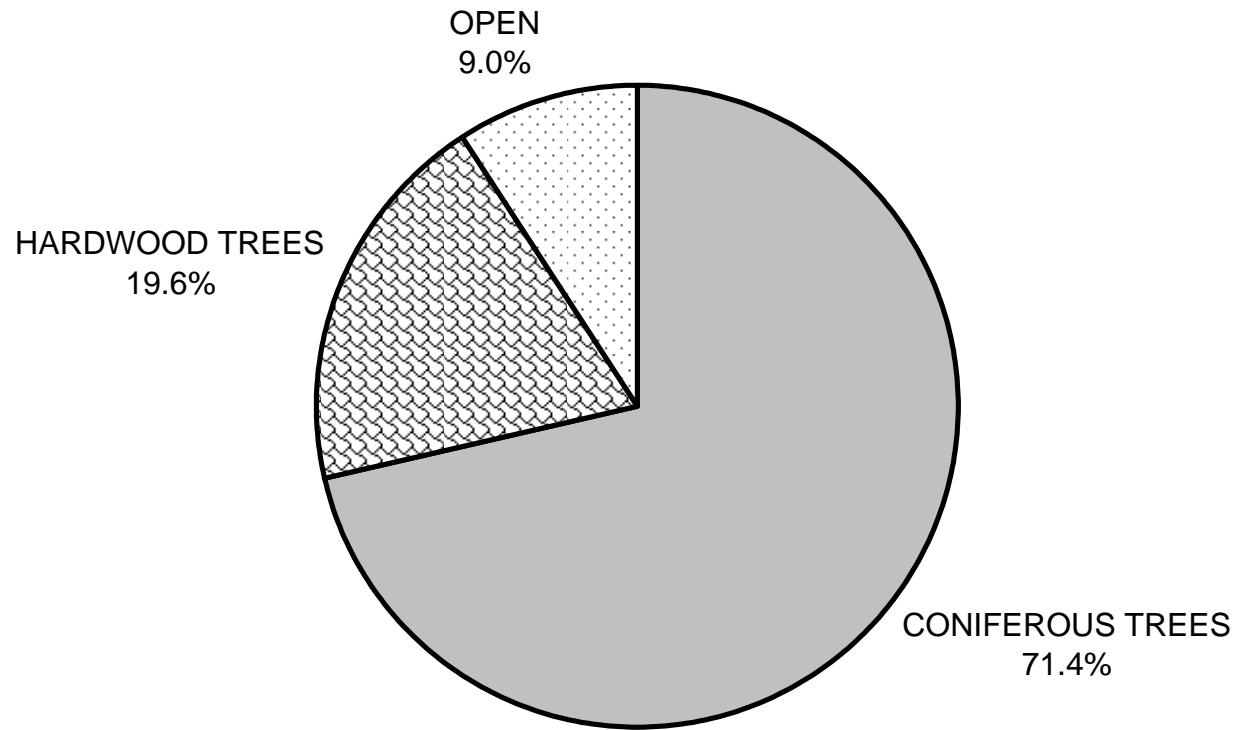
GRAPH 7

**"Shooter Gulch" 2010**  
**SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



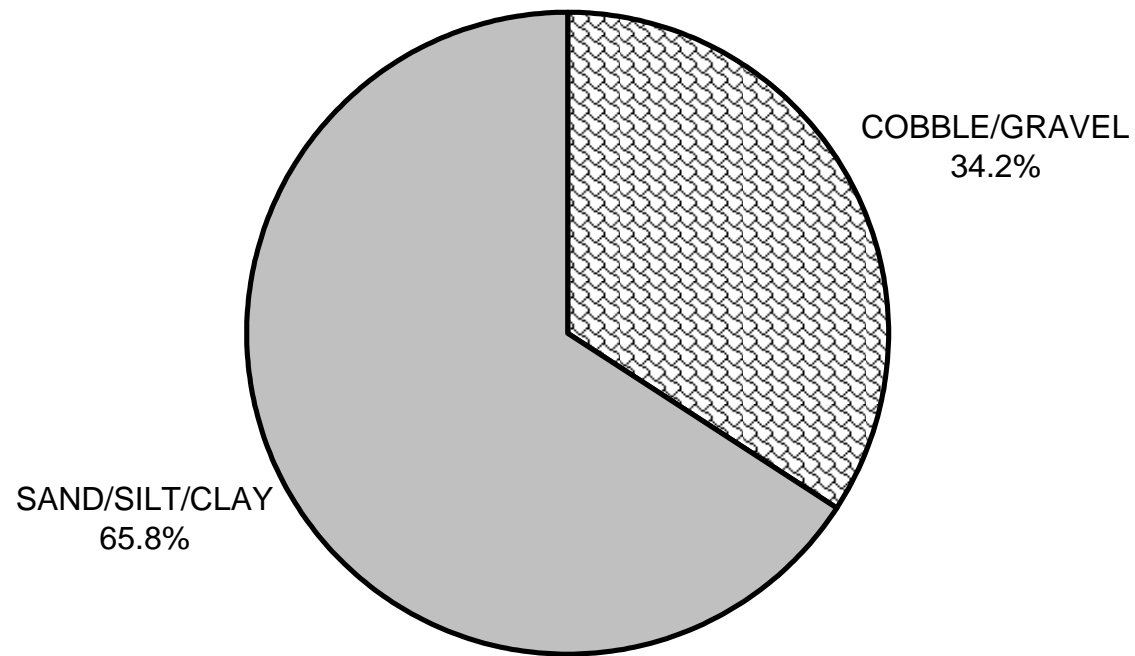
GRAPH 8

**"Shooter Gulch" 2010  
MEAN PERCENT CANOPY**



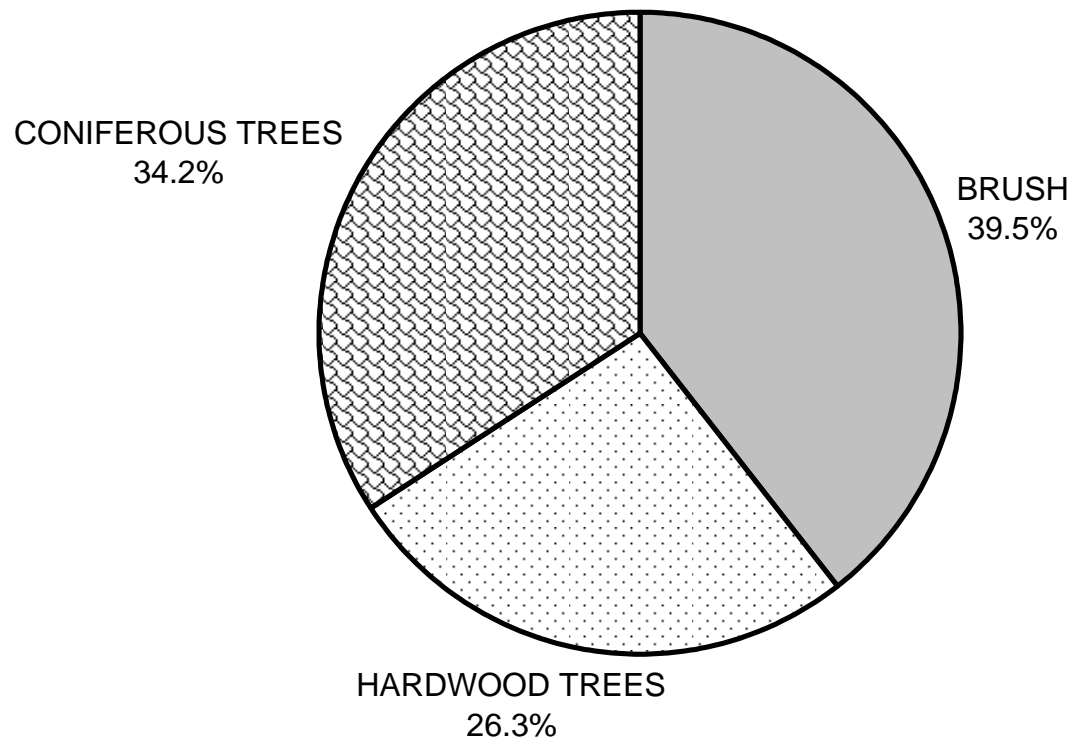
GRAPH 9

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



GRAPH 10

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



GRAPH 11



**Map 1**  
**"Shooter Creek"**  
**Noyo River Watershed**  
**Noyo Hill Quad, Mendocino County**

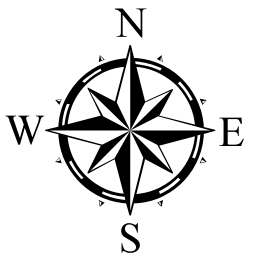
Start of Survey

End of Survey

FORK

CAMPGROUND

60



**Legend**

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

