

# STREAM INVENTORY REPORT

## “Grover Gulch”

### INTRODUCTION

A stream inventory was conducted from June 15 to June 16, 2010 on an unnamed tributary to the North Fork of the South Fork Noyo River commonly known as and hereinafter referred to as Grover Gulch. The survey began at the confluence with the North Fork of the South Fork Noyo River and extended upstream 0.4 miles.

The Grover 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 Grover 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

Grover 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). Grover Gulch's legal description at the confluence with the North Fork of the South Fork Noyo River is T18N R16W S22. Its location is 39.40850 degrees north latitude and 123.63930 degrees west longitude, LLID number 1236381394085. Grover Gulch is an intermittent stream according to the USGS Noyo Hill 7.5 minute quadrangle. Grover 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 Grover 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 Grover 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". Grover 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 Grover 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 Grover 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 Grover 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 Grover 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 Grover 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 Grover 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 15 to June 16, 2010, was conducted by A. Glasgow and M. Groff (WSP). The total length of the stream surveyed was 2,079 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.95 cfs on June 16, 2010.

Grover Gulch is an A4 channel type for the entire 2,079 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 52 to 54 degrees Fahrenheit. Air temperatures ranged from 49 to 61 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 35% pool units, 28% riffle units, 28% flatwater units, and 9% no survey units (Graph 1). Based on total length of Level II habitat types there were 37% flatwater units, 36% riffle units, 21% pool units, and 6% no survey units (Graph 2).

Eight Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 27%; low gradient riffle units, 17%; and run units 16% (Graph 3). Based on percent total length, step run units made up 22%, low gradient riffle units 21%, and mid-channel pool units 17%.

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A total of 26 pools were identified (Table 3). Main channel pools were the most frequently encountered at 77% (Graph 4), and comprised 81% 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. Three of the 26 pools (12%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 26 pool tail-outs measured, 1 had a value of 1 (3.8%); 18 had a value of 2 (69.2%); 4 had a value of 3 (15.4%); 3 had a value of 5 (11.5%) (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 0, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 41 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 44. Scour pools had a mean shelter rating of 33 (Table 3).

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

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 77% of the pool tail-outs. Bedrock was the next most frequently observed dominant substrate type and occurred in 12% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Grover Gulch was 96%. Four percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 50% and 50%, respectively. Graph 9 describes the mean percent canopy in Grover Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 47% cobble/gravel, 43% sand/silt/clay, 10% bedrock (Graph 10). Coniferous trees were the dominant vegetation type observed in 38.6% of the units surveyed. Additionally, 37.1% of the units surveyed had deciduous trees as the dominant vegetation type, and 24.3% had brush as the dominant vegetation type (Graph 11).

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### BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 10 sites for species composition and distribution in Grover Gulch on June 17, 2010. Water temperatures taken during the survey period of 0958 hours to 1040 hours ranged from 51 to 52 degrees Fahrenheit. Air temperatures ranged from 51 to 59 degrees Fahrenheit. The sites were sampled by S. McSmith (DFG), and A. Glasgow (WSP).

The reach sites yielded 2 age 1+ steelhead/rainbow trout (SH/RT).

The following chart displays the information yielded from these sites:

2010 Grover 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									
06/17/10	1	001	Pool	16	0	1	0	0	0
	2	004	Pool	70	0	0	0	0	0
	3	007	Pool	121	0	0	0	0	0
	4	010	Pool	174	0	0	0	0	0
	5	015	Pool	256	0	1	0	0	0
	6	027	Pool	541	0	0	0	0	0
	7	029	Pool	602	0	0	0	0	0
	8	036	Pool	767	0	0	0	0	0
	9	041	Pool	849	0	0	0	0	0
	10	051	Pool	1256	0	0	0	0	0

### DISCUSSION

Grover Gulch is an A4 channel type for the entire 2,079 feet of stream surveyed. Fish habitat improvement structures are generally not suitable in A4 channel types.

The water temperatures recorded on the survey days June 15 to June 16, 2010, ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 49 to 61 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 36%, and pools 21%. Three of the 26 (12%) pools had a maximum residual depth greater than 2 feet. In general,

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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 in A4 channel types.

Nineteen of the 26 pool tail-outs measured had embeddedness ratings of 1 or 2. Four of the pool tail-outs had embeddedness ratings of 3 or 4. Three 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.

Twenty-one of the 26 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 41. The shelter rating in the flatwater habitats is 5. 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 Grover Gulch. Large woody debris is the dominant cover type in pools followed by whitewater. 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 97% and 98%, 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) Grover 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 is an A4 for the entire length of the survey, 2,079 feet.
45	0003.00	There is a 2.5' high plunge.
70	0005.00	There is a 3.5' high plunge.
142	0009.00	There is a 2' high plunge.
232	0014.00	Log debris accumulation (LDA) #01 contains ten pieces of large woody debris (LWD) and measures 5' high x 15' wide x 17' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to small cobble and measures 8' wide x 12' long x 0.5' deep. Fish were seen above the LDA.
500	0025.00	LDA #02 contains five pieces of LWD and measures 6' high x 20' wide x 12' long. Water flows through the LDA and there no visible gaps in it. Retained sediment ranges from sand to small cobble and measures 8' wide x 8' long x 1' deep. It is a possible barrier to juvenile and adult salmonids. Fish were not seen above the LDA.
662	0033.00	LDA #03 contains eight pieces of LWD and measures 4' high x 19' wide x 17' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to small cobble and measures 4' wide x 19' long x 17' deep. It is a possible barrier to juvenile and adult salmonids.
756	0036.00	There is a 3' high plunge.
913	0044.00	LDA #04 contains five pieces of LWD and measures 7' high x 16' wide x 22' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to small cobble and measures 21' wide x 25' long x 2' deep. It is a possible barrier to juvenile and adult salmonids.
979	0046.00	Tributary #01 enters on the right bank. It contributes approximately 40% of Grover Gulch's flow. The water temperature downstream and

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upstream of the tributary is 52 degrees Fahrenheit; the water temperature of the tributary is 53 degrees Fahrenheit. The slope of the tributary is approximately 4%. The tributary is not accessible to fish because it is dry 75' upstream from the mouth. Additionally, much of the channel is blocked with woody debris.

- |      |         |   |
|------|---------|---|
| 1256 | 0052.00 | A cascade with a slope of 42% is a possible barrier to salmonids.   |
| 1300 | 0054.00 | LDA #05 contains seven pieces of LWD and measures 5.5' high x 34' wide x 15' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 34' wide x 20' long x 2' deep. It is a possible barrier to juvenile and adult salmonids.                          |
| 1631 | 0065.00 | LDA #06 contains four pieces of LWD and measures 5' high x 21' wide x 5' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 6' wide x 4' long x 0.5' deep. It is possible barrier to juvenile and adult salmonids due to a 4' high plunge over logs. |
| 1689 | 0067.00 | LDA #07 contains eight pieces of LWD and measures 4.5' high x 15' wide x 34' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to small cobble and measures 13' wide x 8' long x 2' deep. It is a possible barrier to juvenile and adult salmonids.                        |
| 1723 | 0068.00 | An erosion site on the right bank measures 9' high x 40' long and is contributing sediment ranging in size from silt to gravel.   |
| 1832 | 0070.00 | LDA #08 contains five pieces of LWD and measures 3.5' high x 15' wide x 10' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to sand and measures 2' wide x 2' long x 1' deep. It is a possible barrier to juvenile and adult salmonids.                               |
| 2079 | 0075.00 | End of survey. There is a 7' high plunge over an old growth redwood log with a 1.5' deep pool below. This is a probable 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: 1236381394085

LLID: 1236381394085 Drainage: Noyo River

Survey Dates: 6/15/2010 to 6/16/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS22 Latitude: 39:24:31.0N Longitude: 123:38:17.0W

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
21	4	FLATWATER	28.0	36	763	36.7	6.6	0.5	0.7	151	3166	66	1393		5
7	0	NOSURVEY	9.3	18	127	6.1									
26	26	POOL	34.7	17	446	21.5	7.5	0.8	1.5	122	3178	119	3100	94	41
21	5	RIFFLE	28.0	35	743	35.7	5.3	0.2	0.5	161	3371	39	819		0

Total Units Fully Measured	75	Total Length (ft.)	2079	Total Area (sq.ft.)	9715	Total Volume (cu.ft.)	5312
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**Table 2 - Summary of Habitat Types and Measured Parameters**

Stream Name: 1236381394085

LLID: 1236381394085 Drainage: Noyo River

Survey Dates: 6/15/2010 to 6/16/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS22 Latitude: 39:24:31.0N Longitude: 123:38:17.0W

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 (%)
13	2	LGR	17.3	34	442	21.3	6	0.2	0.5	93	1207	16	203		0	98
6	2	HGR	8.0	48	286	13.8	5	0.3	0.8	298	1787	81	485		0	94
2	1	BRS	2.7	8	15	0.7	3	0.1	0.4	21	43	2	4		0	91
12	3	RUN	16.0	26	307	14.8	7	0.4	0.8	163	1956	69	834		0	95
9	1	SRN	12.0	51	456	21.9	5	0.5	0.7	114	1026	57	513		20	91
20	20	MCP	26.7	18	362	17.4	7	0.7	2.5	120	2391	113	2264	88	44	97
1	1	LSL	1.3	26	26	1.3	7	0.6	1.1	182	182	146	146	109	5	99
5	5	PLP	6.7	12	58	2.8	11	0.9	2	121	605	138	690	114	39	97
7	0	NS	9.3	18	127	6.1										

Total Units 75

Total Length (ft.) 2079

Total Area (sq.ft.) 9197

Total Volume (cu.ft.) 5138

**Table 3 - Summary of Pool Types**

Stream Name: 1236381394085

LLID: 1236381394085 Drainage: Noyo River

Survey Dates: 6/15/2010 to 6/16/2010

Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS22 Latitude: 39:24:31.0N Longitude: 123:38:17.0W

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
20	20	MAIN	77	18	362	81	6.8	0.7	120	2391	88	1770	44
6	6	SCOUR	23	14	84	19	10.0	0.8	131	787	113	679	33
<b>Total Units</b>	<b>Total Units Fully Measured</b>			<b>Total Length (ft.)</b>	<b>Total Length (ft.)</b>					<b>Total Area (sq.ft.)</b>		<b>Total Volume (cu.ft.)</b>	
26	26			446	446					3178		2448	

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

Stream Name: 1236381394085

Survey Dates: 6/15/2010 to 6/16/2010

LLID: 1236381394085

Drainage: Noyo River

Confluence Location: Quad: NOYO HILL

Legal Description: T18NR16WS22

Latitude: 39;24;31.0N

Longitude: 123;38;17.0W

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
20	MCP	77	3	15	15	75	2	10	0	0	0	0
1	LSL	4	0	0	1	100	0	0	0	0	0	0
5	PLP	19	0	0	4	80	1	20	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
26	3	12	20	77	3	12	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.5

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

Stream Name: 1236381394085		LLID: 1236381394085		Drainage: Noyo River							
Survey Dates: 6/15/2010 to 6/16/2010		Dry Units: 0									
Confluence Location: Quad: NOYO HILL		Legal Description: T18NR16WS22		Latitude: 39:24:31.0N Longitude: 123:38:17.0W							
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
13	2	LGR	0	0	0	0	0	0	0	0	0
6	2	HGR	0	0	0	0	0	0	0	0	0
2	1	BRS	0	0	0	0	0	0	0	0	0
21	5	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
12	3	RUN	0	0	0	0	0	0	0	0	0
9	1	SRN	10	80	0	10	0	0	0	0	0
21	4	TOTAL FLAT	10	80	0	10	0	0	0	0	0
20	20	MCP	24	6	45	9	0	0	16	0	0
1	1	LSL	0	0	100	0	0	0	0	0	0
5	5	PLP	6	18	6	6	0	0	64	0	0
26	26	TOTAL POOL	20	8	39	8	0	0	25	0	0
7	0	NS									
75	35	TOTAL	19	11	37	8	0	0	24	0	0



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

Stream Name: 1236381394085		LLID: 1236381394085		Drainage: Noyo River					
Survey Dates: 6/15/2010 to 6/16/2010		Dry Units: 0							
Confluence Location: Quad: NOYO HILL		Legal Description: T18NR16WS22		Latitude: 39:24:31.0N Longitude: 123:38:17.0W					
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
13	2	LGR	0	0	100	0	0	0	0
6	2	HGR	0	0	100	0	0	0	0
2	1	BRS	0	0	0	0	0	0	100
12	3	RUN	0	0	100	0	0	0	0
9	1	SRN	0	0	0	100	0	0	0
20	20	MCP	20	15	60	5	0	0	0
1	1	LSL	0	0	100	0	0	0	0
5	5	PLP	0	0	100	0	0	0	0

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

Stream Name: 1236381394085 LLLID: 1236381394085 Drainage: Noyo River  
 Survey Dates: 6/15/2010 to 6/16/2010  
 Confluence Location: Quad: NOYO HILL Legal Description: T18NR16WS22 Latitude: 39:24:31.0N Longitude: 123:38:17.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
96	50	50	0	97	98

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: 1236381394085      LLLID: 1236381394085      Drainage: Noyo River  
 Survey Dates: 6/15/2010 to 6/16/2010      Survey Length (ft.): 2079      Main Channel (ft.): 2079      Side Channel (ft.): 0  
 Confluence Location: Quad: NOYO HILL      Legal Description: T18NR16WS22      Latitude: 39:24:31.0N      Longitude: 123:38:17.0W

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

<b>STREAM REACH: 1</b>	
Channel Type: A4	Canopy Density (%): 96.2
Reach Length (ft.): 2079	Coniferous Component (%): 49.7
Riffle/Flatwater Mean Width (ft.): 5.9	Hardwood Component (%): 50.3
BFW:	Dominant Bank Vegetation: Coniferous Trees
Range (ft.): 7 to 15	Vegetative Cover (%): 97.7
Mean (ft.): 11	Dominant Shelter: Large Woody Debris
Std. Dev.: 2	Dominant Bank Substrate Type: Cobble/Gravel
Base Flow (cfs.): 1.0	Occurrence of LWD (%): 27
Water (F): 52 - 54	Air (F): 49 - 61
Dry Channel (ft): 0	LWD per 100 ft.: Riffles: 3 Pools: 9 Flat: 4
Pool Tail Substrate (%): Silt/Clay: 0	Sand: 0    Gravel: 77    Sm Cobble: 4    Lg Cobble: 4    Boulder: 4    Bedrock: 12
Embeddedness Values (%): 1. 3.8	2. 69.2    3. 15.4    4. 0.0    5. 11.5
	Pools by Stream Length (%): 21.5 Pool Frequency (%): 34.7 Residual Pool Depth (%): < 2 Feet Deep: 88 2 to 2.9 Feet Deep: 12 3 to 3.9 Feet Deep: 0 >= 4 Feet Deep: 0 Mean Max Residual Pool Depth (ft.): 1.5 Mean Pool Shelter Rating: 41

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

Stream Name: 1236381394085      LLLID: 1236381394085      Drainage: Noyo River  
 Survey Dates: 6/15/2010 to 6/16/2010  
 Confluence Location: Quad: NOYO HILL      Legal Description: T18NR16WS22      Latitude: 39:24:31.0N      Longitude: 123:38:17.0W

**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	4	3	10.0
Boulder	0	0	0.0
Cobble / Gravel	17	16	47.1
Sand / Silt / Clay	14	16	42.9

**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	5	12	24.3
Hardwood Trees	15	11	37.1
Coniferous Trees	15	12	38.6
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:**

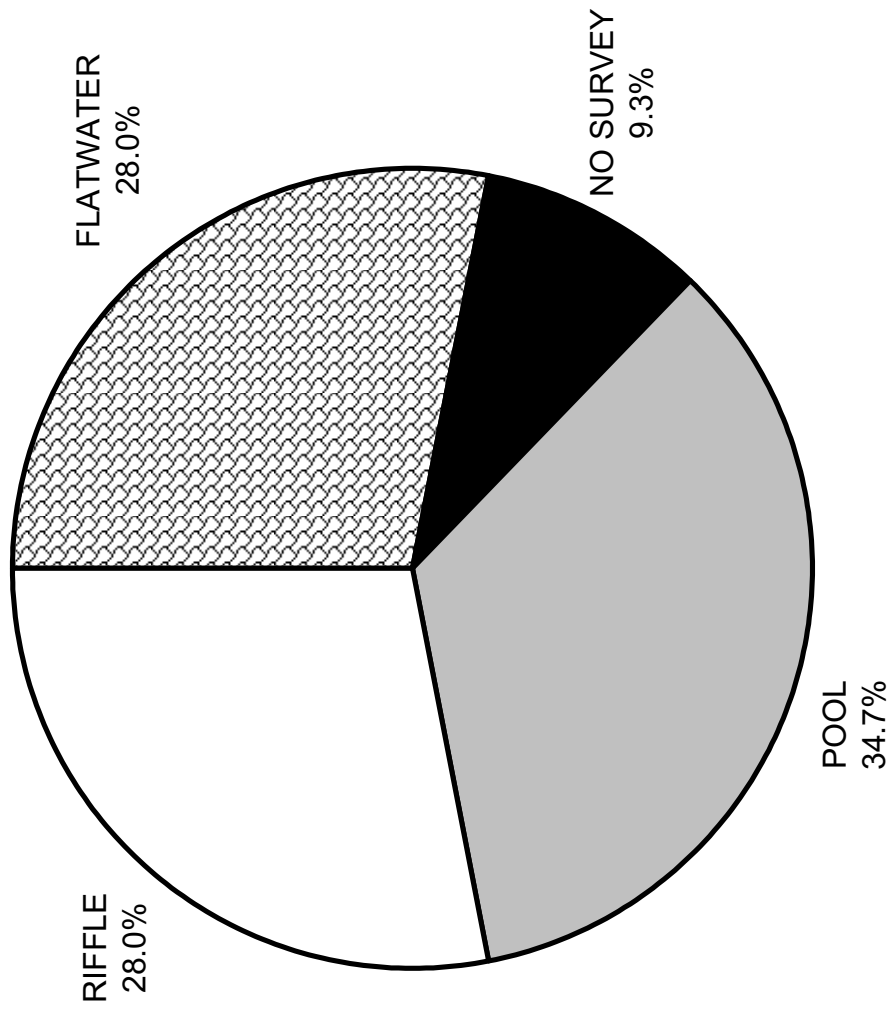
2

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

StreamName: 1236381394085      LLID: 1236381394085      Drainage: Noyo River  
 Survey Dates: 6/15/2010 to 6/16/2010  
 Confluence Location: Quad: NOYO HILL      Legal Description: T18NR16WS22      Latitude: 39:24:31.0N      Longitude: 123:38:17.0W

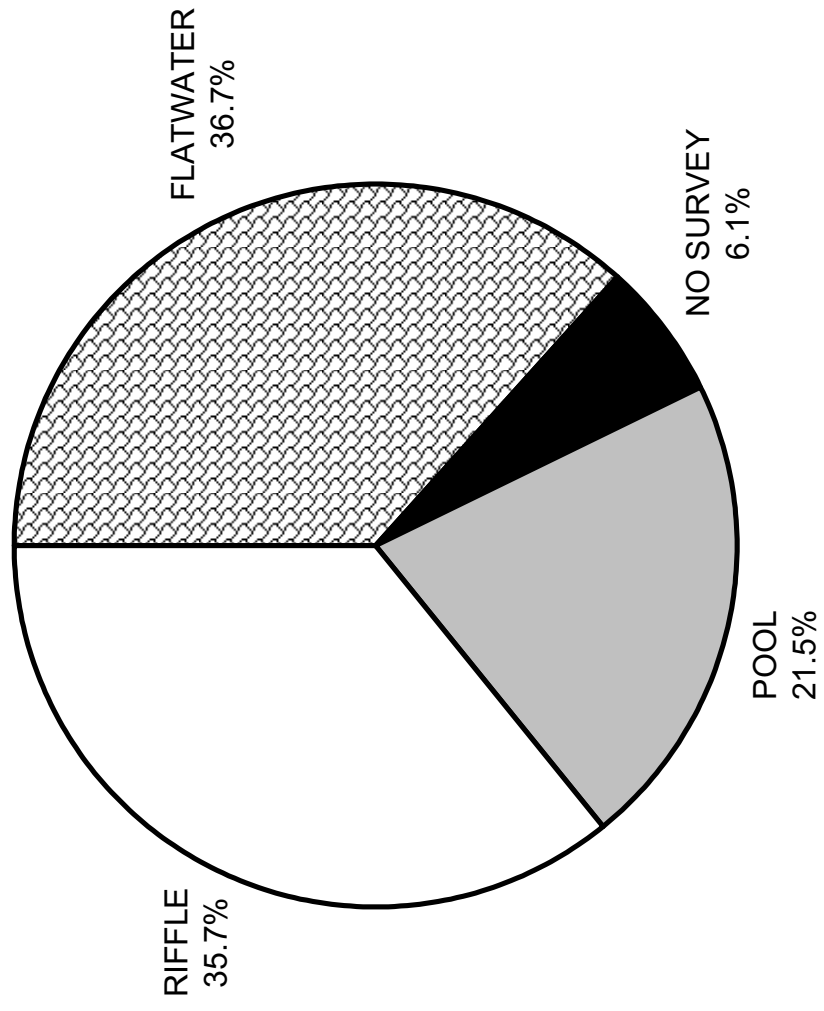
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	10	20
SMALL WOODY DEBRIS (%)	0	80	8
LARGE WOODY DEBRIS (%)	0	0	39
ROOT MASS (%)	0	10	8
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	25
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	0

**"Grover Gulch" 2010  
HABITAT TYPES BY PERCENT OCCURRENCE**



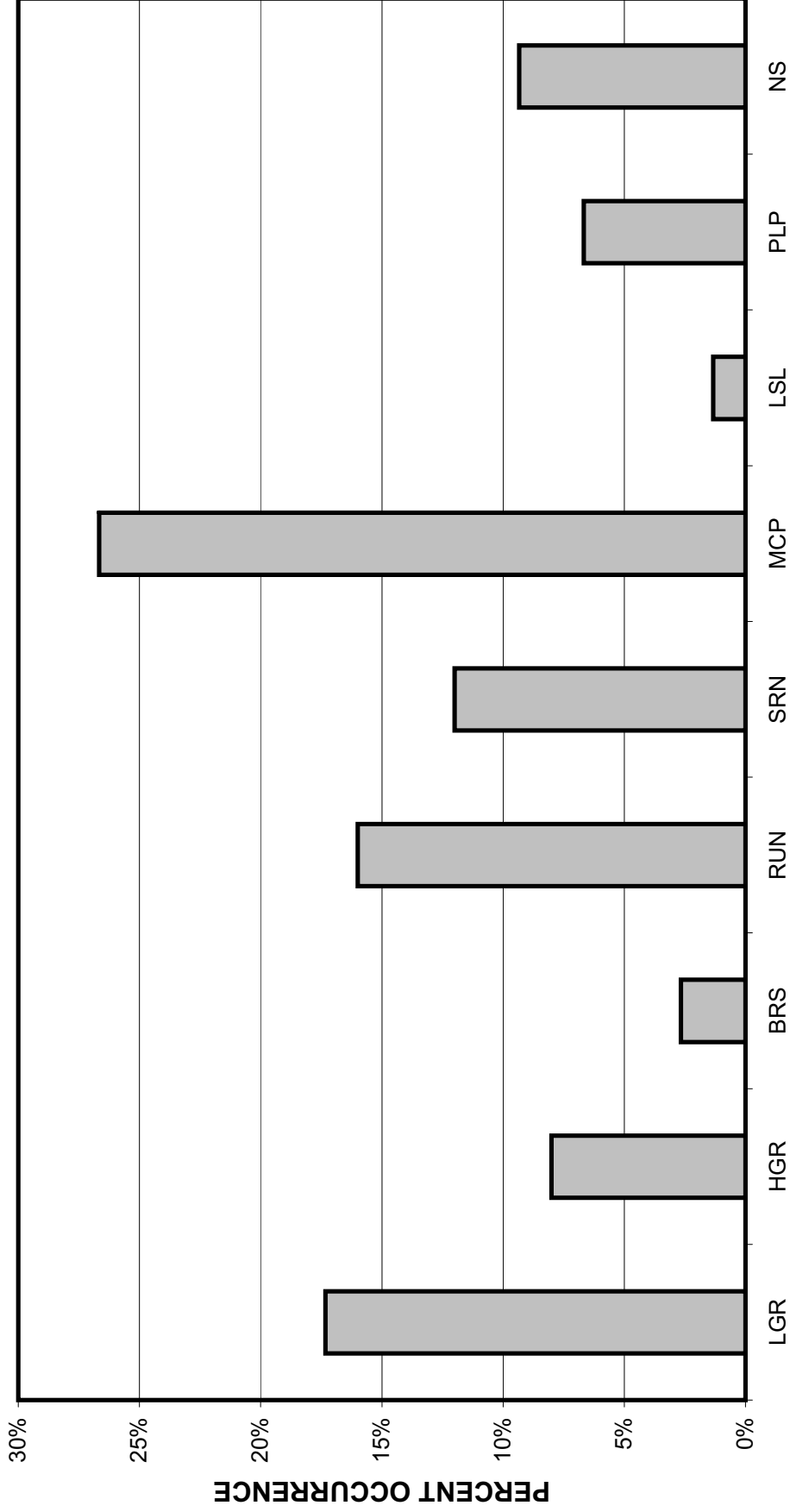
GRAPH 1

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



GRAPH 2

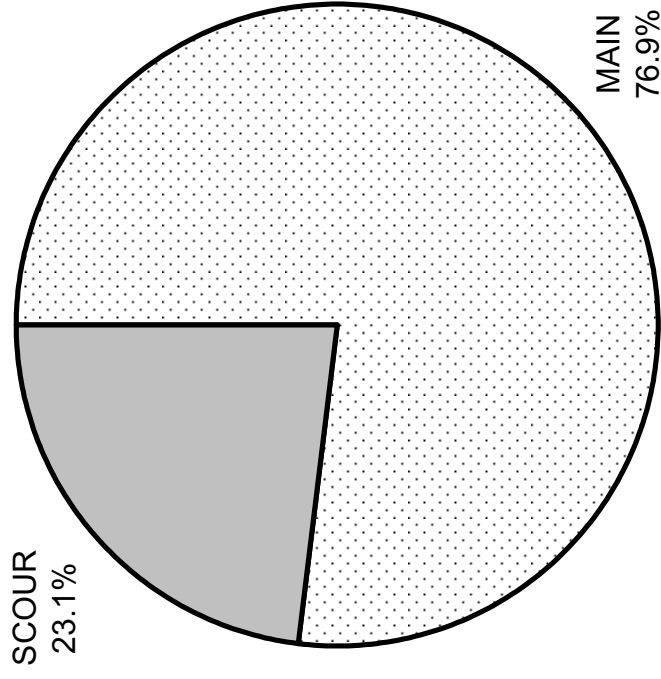
# "Grover Gulch" 2010 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

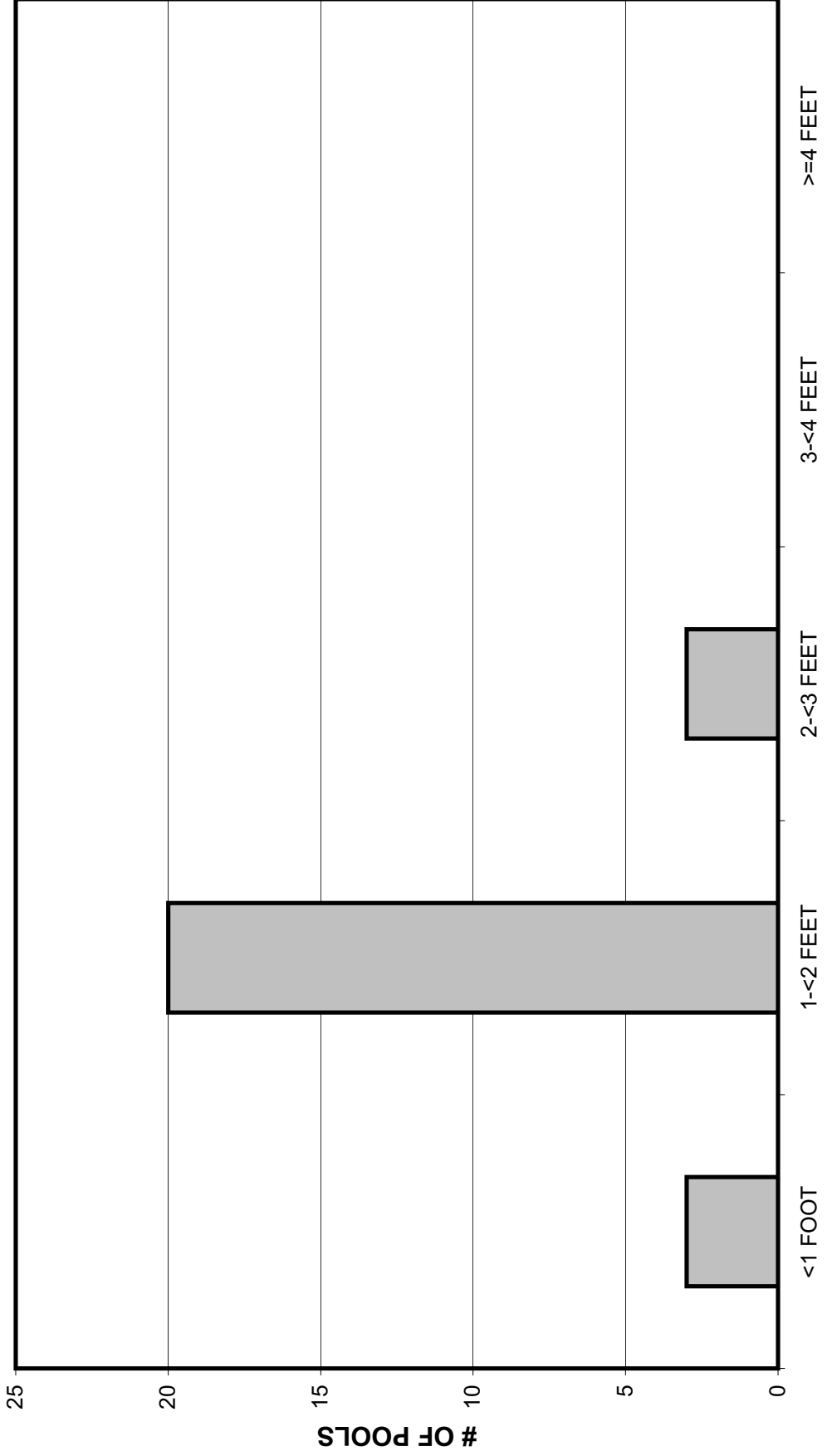


**"Grover Gulch" 2010  
POOL TYPES BY PERCENT OCCURRENCE**



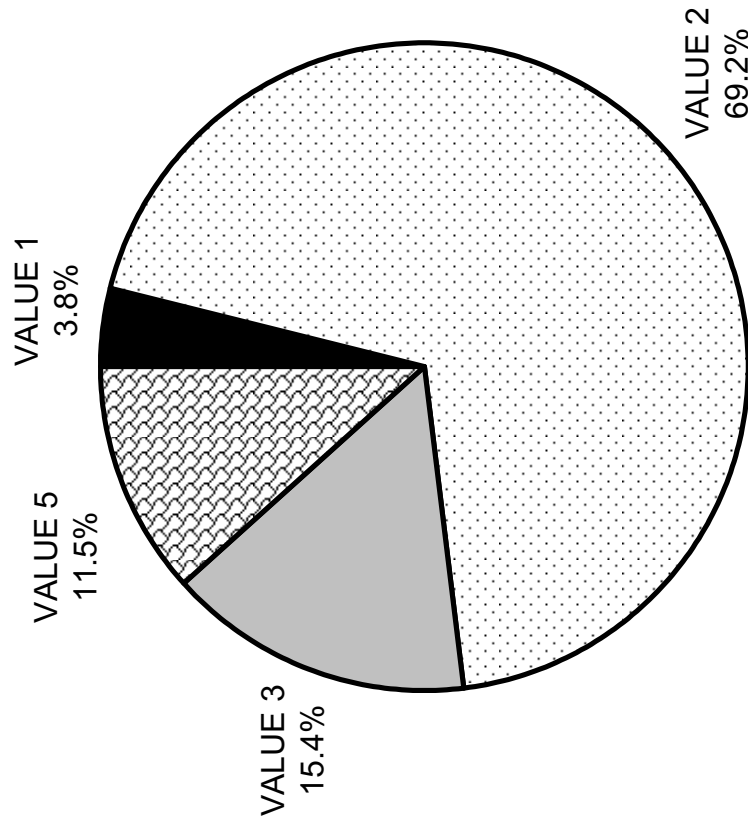
GRAPH 4

# "Grover Gulch" 2010 MAXIMUM DEPTH IN POOLS



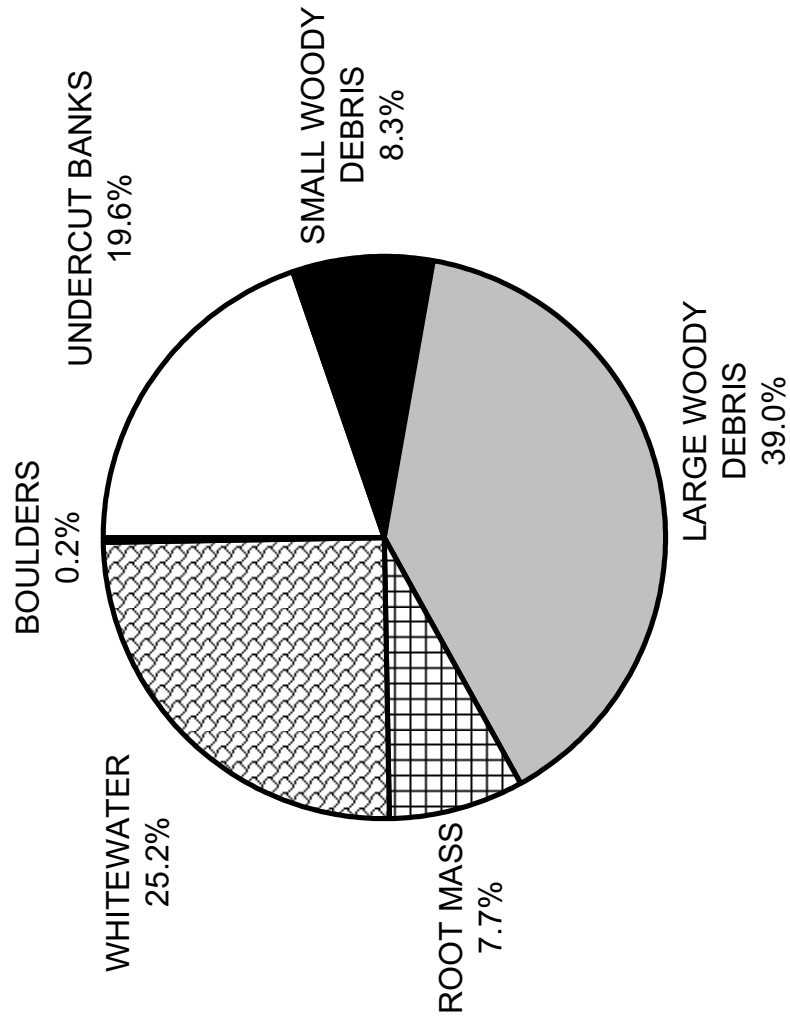
GRAPH 5

# "Grover Gulch" 2010 PERCENT EMBEDDEDNESS



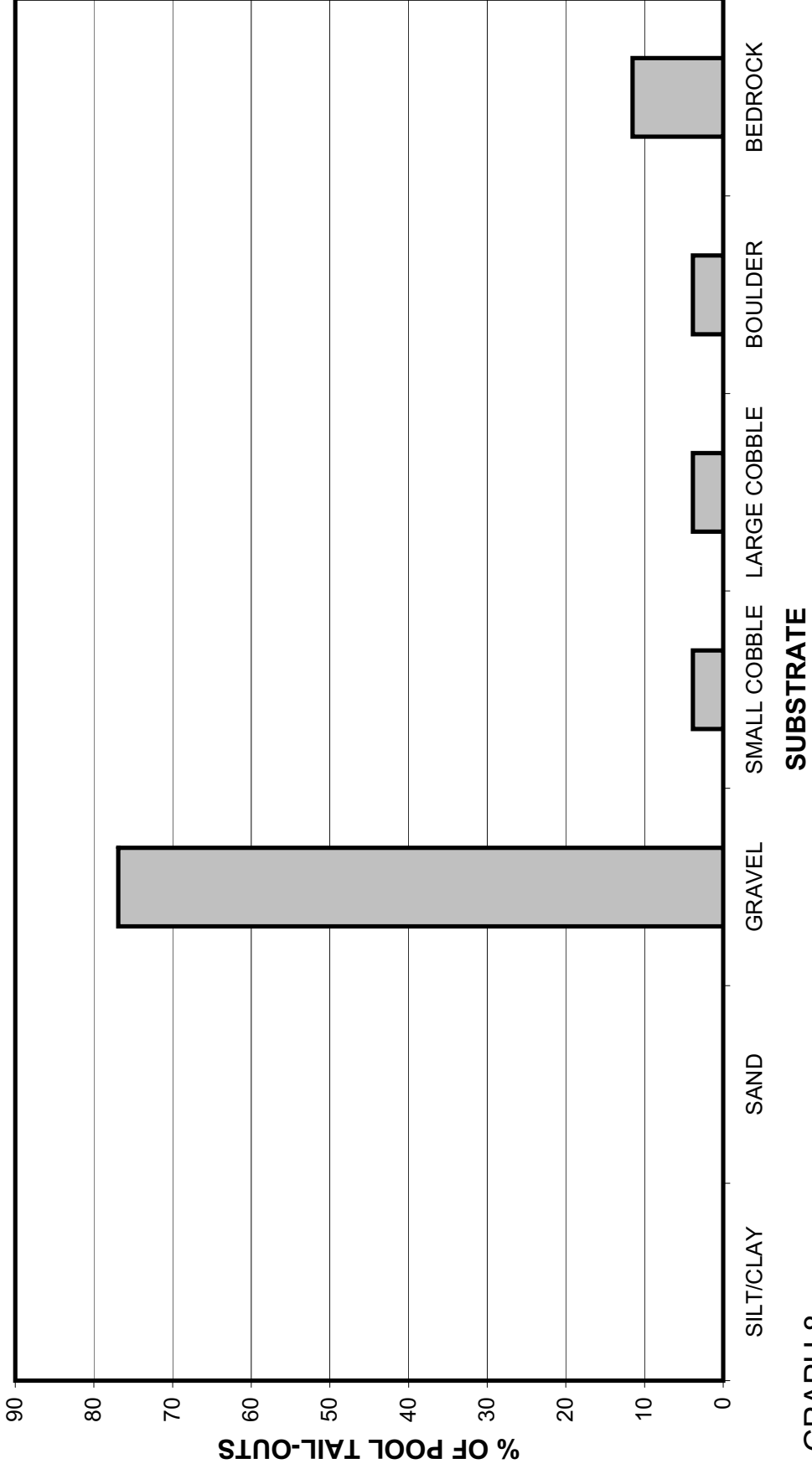
GRAPH 6

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



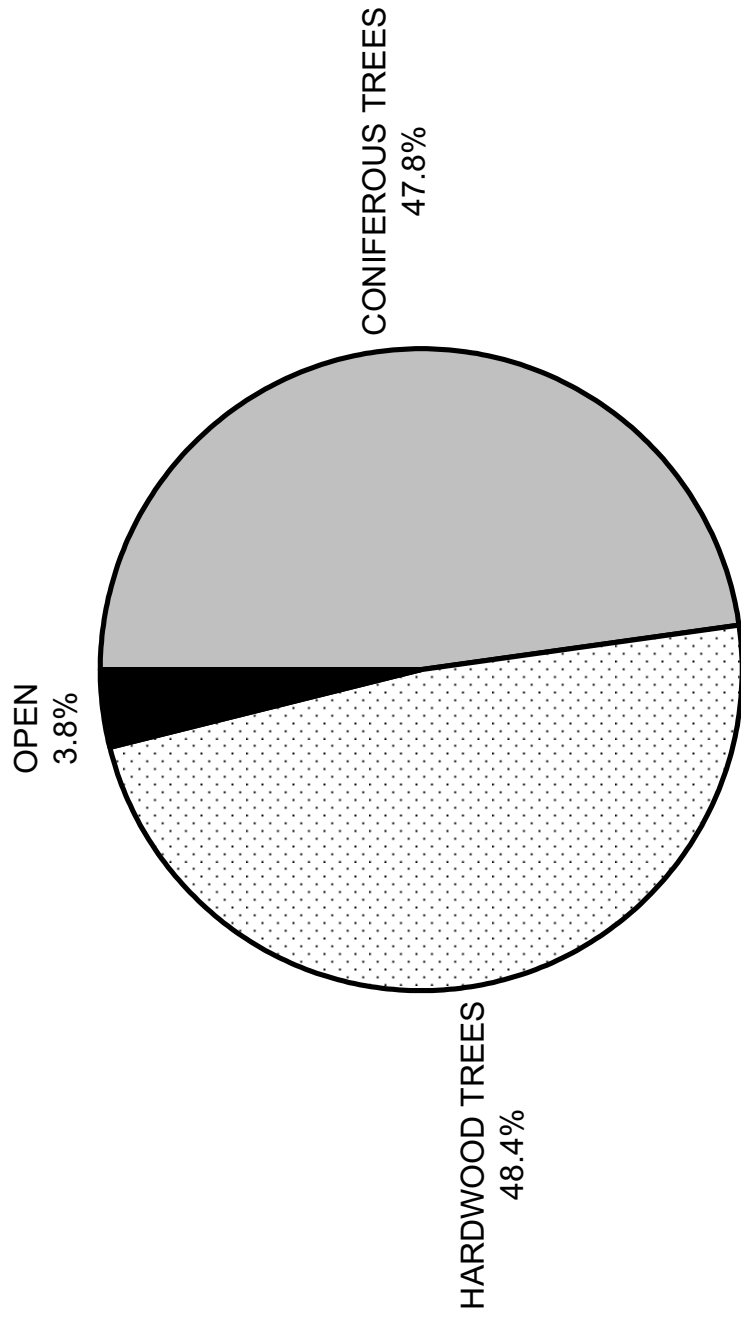
GRAPH 7

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



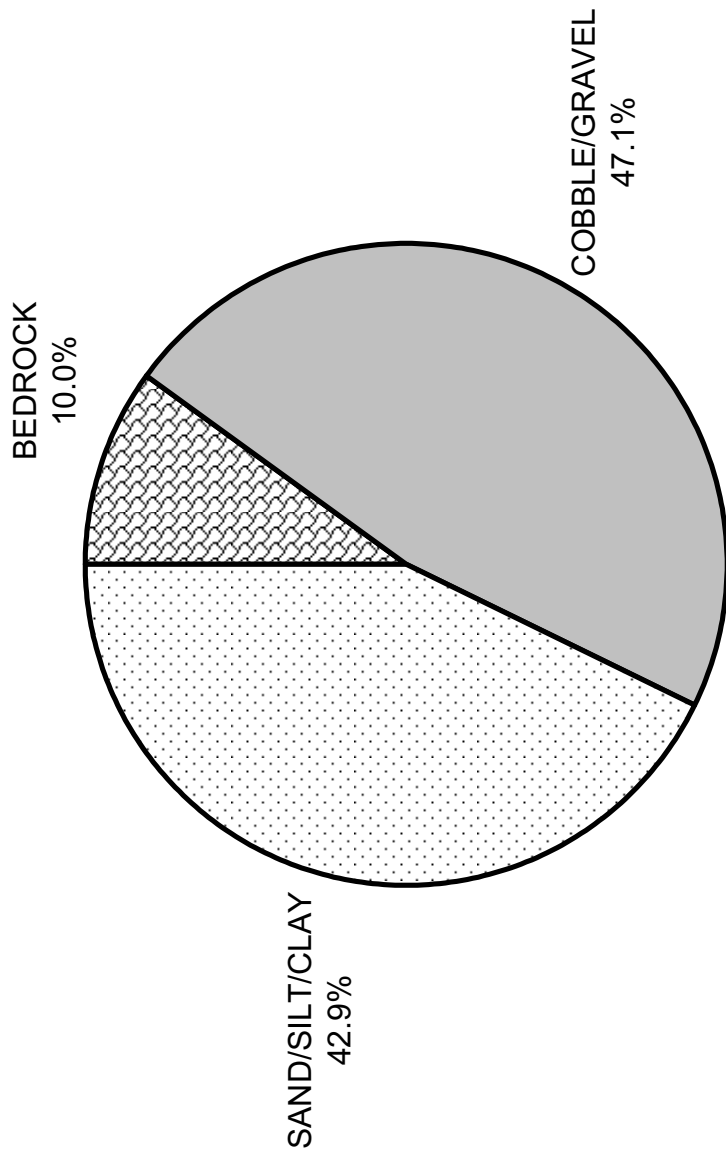
GRAPH 8

**"Grover Gulch" 2010  
MEAN PERCENT CANOPY**



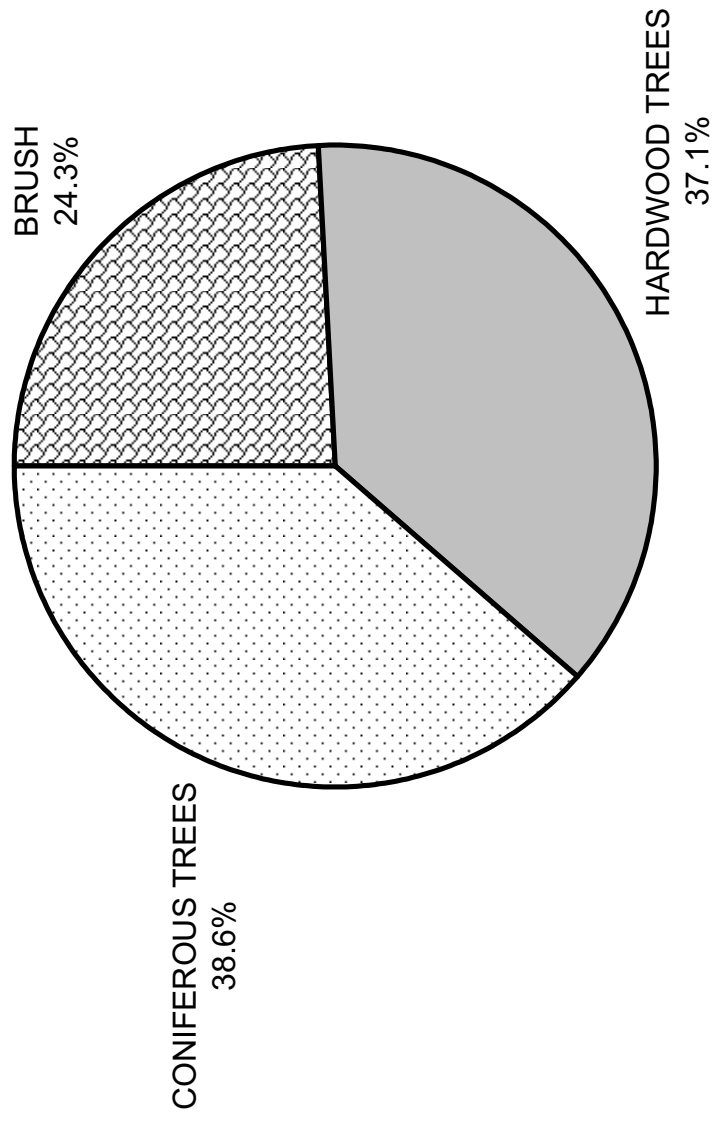
GRAPH 9

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



GRAPH 10

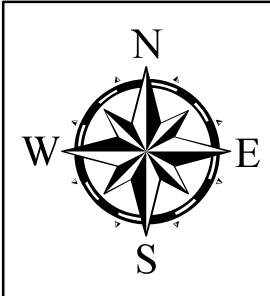
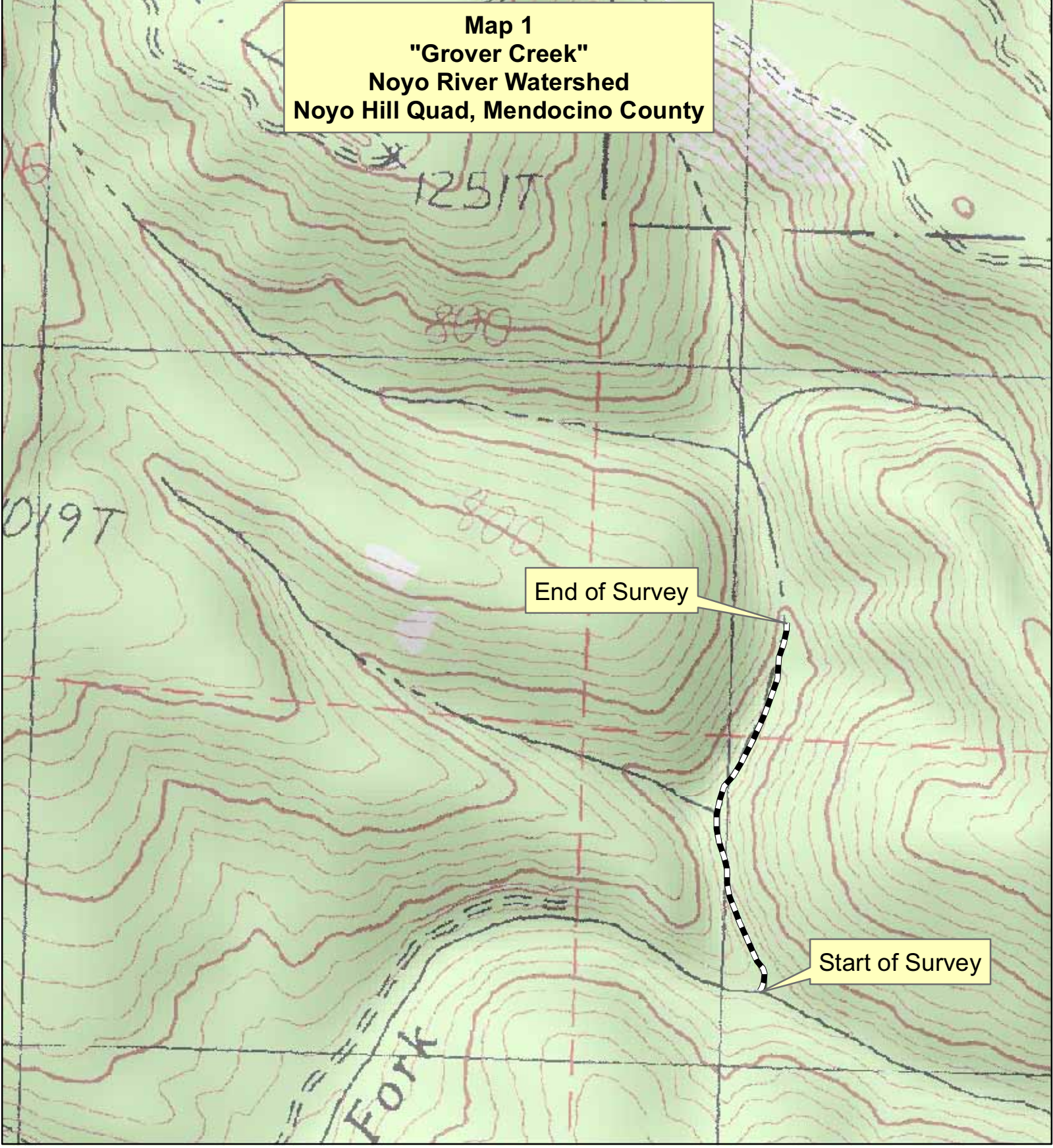
**"Grover Gulch" 2010  
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11



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



**Legend**

 Reach 1, Channel Type A4

