

STREAM INVENTORY REPORT

Marble Gulch

INTRODUCTION

A stream inventory was conducted from May 29 to July 17, 2013 on Marble Gulch. The survey began at the confluence with the North Fork Noyo River and extended upstream 2.3 miles.

The Marble 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 Marble 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

Marble Gulch is a tributary to the North Fork Noyo River, tributary to the Noyo River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Marble Gulch's legal description at the confluence with the North Fork Noyo River is T18N R15W S09. Its location is 39.4298 degrees north latitude 123.5413 degrees west longitude, LLID number 1235402394298. Marble Gulch is a first order stream and has approximately 1.1 miles of blue line stream according to the USGS Northspur 7.5 minute quadrangle. Marble Gulch drains a watershed of approximately 1.3 square miles. Elevations range from about 320 feet at the mouth of the creek to 1,200 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Irmulco Road, seven miles west of Willits, CA.

METHODS

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

SAMPLING STRATEGY

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

Marble Gulch

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 Marble 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". Marble 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.

Marble Gulch

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

7. Substrate Composition:

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

8. Canopy:

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

Marble Gulch

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 Marble Gulch. In addition, underwater observations were made at fourteen sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

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

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

Marble Gulch

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Marble 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 May 29 to July 17, 2013 was conducted by R. Spencer (CDFW), M. Scott (CDFW), and R. Iverson (WSP). The total length of the stream surveyed was 12,323 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.4 cfs on May 30, 2013.

Marble Gulch is a G4 channel type for all 12,323 feet of the stream surveyed. 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 59 degrees Fahrenheit. Air temperatures ranged from 55 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% pool units, 29% riffle units, 27% flatwater units, and 2% dry units (Graph 1). Based on total length of Level II habitat types there were 41% pool units, 31% flatwater units, 24% riffle units, and 5% dry units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 38%; low gradient riffle units, 23%; and step run units, 16% (Graph 3). Based on percent total length, mid-channel pool units made up 35%, step run units 22%, and low gradient riffle units 20%.

A total of 171 pools were identified (Table 3). Main channel pools were the most frequently encountered at 98% (Graph 4), and comprised 99% of the total length of all pools (Table 3).

Marble Gulch

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Thirty of the 171 pools (18%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 171 pool tail-outs measured, 73 had a value of 1 (43%); 23 had a value of 2 (14%); 38 had a value of 3 (22%); 17 had a value of 4 (10%); 20 had a value of 5 (12%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 12, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 25 (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 25 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Marble Gulch. Graph 7 describes the pool cover in Marble 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 81% of the pool tail-outs. Bedrock was the next most frequently observed dominant substrate type and occurred in 11% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Marble Gulch was 99%. One percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 31% and 69%, respectively. Graph 9 describes the mean percent canopy in Marble Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 96%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 43% sand/silt/clay, 30% cobble/gravel, 26% bedrock, and 2% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 71% of the units surveyed. Additionally, 26% of the units surveyed had deciduous trees as the dominant vegetation type, and 3% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 14 sites for species composition and distribution in Marble Gulch on September 11, 2013. The sites were sampled by B. Leonard and M. Groff (CDFW).

The reach sites yielded 48 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), one age 1+ SH/RT, one age 2+ SH/RT, 10 YOY coho salmon, and two sculpin.

Marble Gulch

The following chart displays the information yielded from these sites:

2013 Marble Gulch underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
G4 Channel Type									
09/11/13	1	003	Pool	130	3	0	0	0	0
	2	006	Pool	206	3	0	0	0	0
	3	010	Pool	313	1	0	0	0	0
	4	014	Pool	414	4	0	0	0	0
	5	017	Pool	469	5	0	0	3	0
	6	022	Pool	603	3	0	0	1	0
	7	026	Pool	722	4	0	0	6	0
	8	030	Pool	921	8	0	0	0	0
	9	040	Pool	1,304	5	0	0	0	0
	10	041	Pool	1,332	4	1	0	0	0
	11	046	Pool	1,523	3	0	0	0	0
	12	047	Pool	1,577	0	0	0	0	0
	13	053	Pool	1,898	0	0	1	0	0
	14	057	Pool	1,992	5	0	0	0	0

DISCUSSION

Marble Gulch is a G4 channel type. The suitability of G4 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.

The water temperatures recorded on the survey days May 29 to July 17, 2013 ranged from 53 to 59 degrees Fahrenheit. Air temperatures ranged from 55 to 66 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 31% of the total length of this survey, riffles 24%, and pools 41%. Thirty of the 171 (18%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Marble Gulch

Ninety-six of the 171 pool tail-outs measured had embeddedness ratings of 1 or 2. Fifty-five of the pool tail-outs had embeddedness ratings of 3 or 4. Twenty of the pool tail-outs had a rating of 5, which is considered not suitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Marble Gulch should be mapped and rated according to their potential sediment yields, and control measures should be taken.

One hundred fifty-one of the 171 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 25. 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 Marble 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 structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 99%. The percentage of right and left bank covered with vegetation was 96% and 97%, respectively.

RECOMMENDATIONS

- 1) Marble 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.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

Marble Gulch

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 North Fork Noyo River. The channel is a G4 for the entire length of the survey.
431	0016.00	A road crosses the channel. The crossing is a 13.5' wide x 63' long x 10.4' high railcar bridge.
445	0017.00	There is a 2.5' high plunge over bedrock sheet.
664	0026.00	There is a 1.5' high plunge over large woody debris (LWD).
1051	0035.00	Log debris accumulation (LDA) #01 contains three pieces of large woody debris (LWD) and measures 5' high x 16' wide x 4' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 18' wide x 60' long x 2' deep. Fish were observed above the LDA.
1670	0049.00	Right bank seep.
2124	0062.00	LDA #02 contains five pieces of LWD and measures 5' high x 15' wide x 8' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 15' wide x 80' long x 2' deep. There is a 1' high plunge over the LDA. Fish were observed above the LDA.
2177	0064.00	There is a 1' high plunge over LWD.
2268	0067.00	Right bank seep.
2753	0085.00	LDA #03 contains four pieces of LWD and measures 4' high x 8' wide x 43' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from gravel to small cobble and measures 7' wide x 100' long x 3' deep. There is a 3' high plunge over the LDA. Fish were observed above the LDA.
3112	0096.00	A logging road crosses the channel. The crossing is a 19' wide x 17' long x 8.9' high log stringer bridge. One of the logs is falling in to the channel.
3798	0115.00	Left bank seep.

Marble Gulch

4076	0119.00	Left bank seep.
4104	0120.00	Left bank seep.
4144	0123.00	There is a 1.5' high plunge over bedrock.
4370	0130.00	There is a 1.5' high plunge over bedrock.
4453	0133.00	Two back-to-back 1' high plunges over bedrock.
4846	0148.00	LDA #04 contains eight pieces of LWD and measures 6' high x 34' wide x 12' long. Water does not flow through the LDA; the flow is subsurface through it. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 15' wide x 200' long x 3' deep. Fish were observed above the LDA.
5077	0154.00	Left bank seep.
5303	0162.00	A logging road crosses the channel. The crossing is a 13.7' wide x 47' long x 4.9' high railcar bridge.
5689	0176.00	LDA #05 contains six pieces of LWD and measures 7' high x 20' wide x 20' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 20' wide x 5' deep. Fish were observed above the LDA.
5942	0185.00	Tributary #01 enters on the right bank. It contributes approximately 25% to Marble Gulch's flow. The water temperature of the tributary was 53 degrees Fahrenheit, the water temperature downstream of the tributary was 54 degrees Fahrenheit, and the water temperature upstream of the confluence was 53 degrees Fahrenheit. The slope of the tributary is 2-4%. Fish were observed in the tributary.
7513	0240.00	Erosion site on left bank measures 20' high x 7' wide. LDA #06 contains 13 pieces of LWD and measures 7' high x 14' wide x 30' long. Water does not flow through the LDA; the flow is subsurface through it. There are visible gaps in the LDA. It is not retaining sediment. Fish were observed above the LDA.
7685	0247.00	There is a 4.5' high plunge.
7702	0248.00	LDA #07 contains three pieces of LWD and measures 7.5' high x 18' wide x 8' long. Water does not flow through the LDA; the flow is subsurface through it. There are no visible gaps in the LDA. Retained sediment ranges from silt to gravel and measures 8' wide x 100' long x 5' deep. There is a 5' high plunge over the LDA. Fish were observed above the LDA.

Marble Gulch

7989	0260.00	LDA #08 contains four pieces of LWD and measures 7.5' high x 26' wide x 12' long. Water flows through the LDA and there are visible gaps in it. The LDA is not retaining sediment. Fish were observed above it.
8302	0274.00	LDA #09 contains seven pieces of LWD and measures 5.5' high x 9' wide x 14' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from gravel to large cobble and measures 10' wide x 30' long x 2' deep. Fish were above the LDA.
8758	0295.00	There is a 1.5' high plunge over log.
9168	0307.00	LDA #10 contains six pieces of LWD and measures 5.5' high x 13' wide x 6' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to small cobble and measures 10' wide x 100' long x 3' deep. There is a 3' high plunge over the LDA. Fish were observed above the LDA.
9807	0331.00	Right bank seep.
9927	0335.00	There is a 387 foot long dry section.
		LDA #11 contains 11 pieces of LWD and measures 5.5' high x 29' wide x 17' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to large cobble and measures 30' wide x 30' long x 3' deep. There is a 4' high plunge over the LDA. Small trees are growing out of it. Fish were not observed above the LDA.
		LDA #12 contains 22 pieces of LWD and measures 8' high x 25' wide x 23' long. Water does not flow through the LDA and there are visible gaps in it. Retained sediment ranges from sand to boulders and measures 15' wide x 50' long x 4' deep.
10454	0340.00	LDA #13 contains eight pieces of LWD and measures 4' high x 14' wide x 8' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to cobble and measures 10' wide x 30' long x 3' deep.
10486	0342.00	LDA #14 contains eight pieces of LWD and measures 6' high x 10' wide x 14' long. Water does not flow through the LDA; the channel is dry above it. There are no visible gaps in the LDA. Retained sediment ranges from gravel to cobble and measures 20' wide x 100' long x 4' deep.
10929	0360.00	Small woody debris accumulation is retaining a volume of sediment measuring 15' wide x 30' long x 2' deep.

Marble Gulch

11172	0367.00	LDA #15 contains three pieces of LWD and measures 4' high x 8' wide x 15' long. Water does not flow through the LDA; the flow is subsurface through it. There are no visible gaps in the LDA. Retained sediment ranges from silt to small cobble and measures 15' wide x 80' long x 4' deep. There is a 4' high plunge over the LDA.
11467	0376.00	LDA #16 contains 14 pieces of LWD and measures 6' high x 25' wide x 26' long. Water does not flow through the LDA; the flow is subsurface through it. There are visible gaps in the LDA. Retained sediment ranges from silt to large cobble and measures 15' wide x 50' long x 2' deep.
11782	0384.00	There is a 3' high plunge over LWD.
11870	0386.00	LDA #17 contains 19 pieces of LWD and measures 8' high x 25' wide x 48' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to cobble and measures 15' wide x 100' long x 4' deep. There are multiple plunges through the woody debris; two measure 3' high, one measures 2' high.
11957	0388.00	There is a 2' high plunge over roots.
12285	0398.00	There is a 3' high plunge over log.
12310	0400.00	End of survey due to diminished habitat and active logging. The stream bed is covered in algae. No fish were observed in the last 2,000 feet of the survey.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

Marble Gulch

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: Marble Gulch

LLID: 1235402394298 Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Confluence Location: Quad: NORTHSPUR Legal Description: T18NR15WS09 Latitude: 39:25:47.0N Longitude: 123:32:25.0W

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
6	0	DRY	1.5	92	549	4.5									
106	19	FLATWATER	26.5	36	3778	30.7	6.4	0.4	0.8	188	19964	72	7671		5
2	0	NOSURVEY	0.5	12	24	0.2									
171	171	POOL	42.8	29	5008	40.6	9.0	0.6	1.5	262	44729	228	38965	162	25
115	17	RIFFLE	28.8	26	2964	24.1	6.1	0.2	0.4	78	8927	22	2492		12
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
400	207				12323					73621			49128		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS09

Latitude: 39:25:47.0N

Longitude: 123:32:25.0W

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 (%)
91	12	LGR	22.8	27	2438	19.8	6	0.2	0.6	84	7630	21	1942		8	99
20	2	HGR	5.0	25	496	4.0	12	0.4	0.7	122	2445	49	978		5	99
3	2	CAS	0.8	8	23	0.2	4	0.3	0.5	24	72	6	19		50	100
1	1	BRS	0.3	7	7	0.1	3	0.1	0.3	21	21	2	2		0	100
44	11	RUN	11.0	24	1036	8.4	6	0.4	1.6	136	5985	57	2527		5	99
62	8	SRN	15.5	44	2742	22.3	6	0.4	1.1	260	16137	93	5759		4	98
152	152	MCP	38.0	28	4310	35.0	9	0.6	4.1	251	38095	221	33607	161	25	99
1	1	CCP	0.3	23	23	0.2	11	0.6	1.1	240	240	168	168	144	20	96
15	15	STP	3.8	42	623	5.1	10	0.5	2.3	383	5750	316	4738	189	22	99
1	1	LSL	0.3	22	22	0.2	14	0.2	0.9	293	293	146	146	59	75	100
2	2	PLP	0.5	15	30	0.2	16	0.6	3.1	176	351	153	306	118	18	95
6	0	DRY	1.5	92	549	4.5										
2	0	NS	0.5	12	24	0.2										

Total Units
400

Total Units Fully Measured
207

Total Length (ft.)
12323

Total Area (sq.ft.)
77019

Total Volume (cu.ft.)
50193

Table 3 - Summary of Pool Types

Stream Name: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS09

Latitude: 39:25:47.0N

Longitude: 123:32:25.0W

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
168	168	MAIN	98	30	4956	99	8.9	0.6	262	44086	163	27222	25
3	3	SCOUR	2	17	52	1	15.3	0.5	215	644	98	294	37

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
171	171	5008	44729	27516

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

Stream Name: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS09

Latitude: 39:25:47.0N

Longitude: 123:32:25.0W

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
152	MCP	89	24	16	101	66	24	16	2	1	1	1
1	CCP	1	0	0	1	100	0	0	0	0	0	0
15	STP	9	1	7	12	80	2	13	0	0	0	0
1	LSL	1	1	100	0	0	0	0	0	0	0	0
2	PLP	1	0	0	1	50	0	0	1	50	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
171	26	15	115	67	26	15	3	2	1	1

Mean Maximum Residual Pool Depth (ft.): 1.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Dry Units: 6

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS09

Latitude: 39:25:47.0N

Longitude: 123:32:25.0W

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
91	12	LGR	0	0	0	0	0	100	0	0	0
20	2	HGR	0	0	0	50	0	0	0	50	0
3	2	CAS	0	0	0	0	0	0	0	0	100
1	1	BRS	0	0	0	0	0	0	0	0	0
115	17	TOTAL RIFFLE	0	0	0	17	0	33	0	17	33
44	11	RUN	19	19	6	0	6	0	0	25	25
62	8	SRN	13	41	0	6	3	20	0	18	0
106	19	TOTAL FLAT	16	30	3	3	4	10	0	21	12
152	152	MCP	14	23	29	10	2	2	0	13	7
1	1	CCP	0	0	100	0	0	0	0	0	0
15	15	STP	7	14	23	16	0	1	9	16	14
1	1	LSL	0	25	50	0	0	0	0	25	0
2	2	PLP	48	0	0	3	0	0	25	25	0
171	171	TOTAL POOL	13	21	29	10	1	2	1	14	8
2	0	NS									
400	207	TOTAL	13	22	27	10	2	3	1	14	9

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Dry Units: 6

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS09

Latitude: 39:25:47.0N

Longitude: 123:32:25.0W

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
91	12	LGR	8	0	83	0	8	0	0
20	2	HGR	0	0	50	50	0	0	0
3	2	CAS	0	0	0	0	0	0	100
1	1	BRS	0	0	0	0	0	0	100
44	11	RUN	0	9	91	0	0	0	0
62	8	SRN	0	0	100	0	0	0	0
152	152	MCP	14	14	52	5	2	3	9
1	1	CCP	0	0	100	0	0	0	0
15	15	STP	0	0	33	0	7	7	53
1	1	LSL	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: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS09

Latitude: 39:25:47.0N

Longitude: 123:32:25.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
99	69	31	0	96	97

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Survey Length (ft.): 12323

Main Channel (ft.): 12323

Side Channel (ft.): 0

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS09 Latitude: 39:25:47.0N

Longitude: 123:32:25.0W

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

Channel Type: G4

Canopy Density (%): 98.7

Pools by Stream Length (%): 40.6

Reach Length (ft.): 12323

Coniferous Component (%): 68.6

Pool Frequency (%): 42.8

Riffle/Flatwater Mean Width (ft.): 6.2

Hardwood Component (%): 31.4

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Coniferous Trees

< 2 Feet Deep: 82

Range (ft.): 8 to 20

Vegetative Cover (%): 96.5

2 to 2.9 Feet Deep: 15

Mean (ft.): 14

Dominant Shelter: Large Woody Debris

3 to 3.9 Feet Deep: 2

Std. Dev.: 3

Dominant Bank Substrate Type: Sand/Silt/Clay

>= 4 Feet Deep: 1

Base Flow (cfs.): 0.4

Occurrence of LWD (%): 21

Mean Max Residual Pool Depth (ft.): 1.5

Water (F): 53 - 59 Air (F): 55 - 66

LWD per 100 ft.:

Mean Pool Shelter Rating: 25

Dry Channel (ft): 549

Riffles: 2

Pools: 5

Flat: 3

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 1 Gravel: 81 Sm Cobble: 7 Lg Cobble: 0 Boulder: 1 Bedrock: 11

Embeddedness Values (%): 1. 42.7 2. 13.5 3. 22.2 4. 9.9 5. 11.7

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Confluence Location: Quad: NORTHSPUR

Legal Description: T18NR15WS09

Latitude: 39:25:47.0N

Longitude: 123:32:25.0W

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	52	54	25.6
Boulder	5	4	2.2
Cobble / Gravel	62	61	29.7
Sand / Silt / Clay	88	88	42.5

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	1	0.2
Brush	5	6	2.7
Hardwood Trees	62	45	25.8
Coniferous Trees	140	155	71.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Marble Gulch

LLID: 1235402394298

Drainage: Noyo River

Survey Dates: 5/29/2013 to 7/17/2013

Confluence Location: Quad: NORTHSPUR

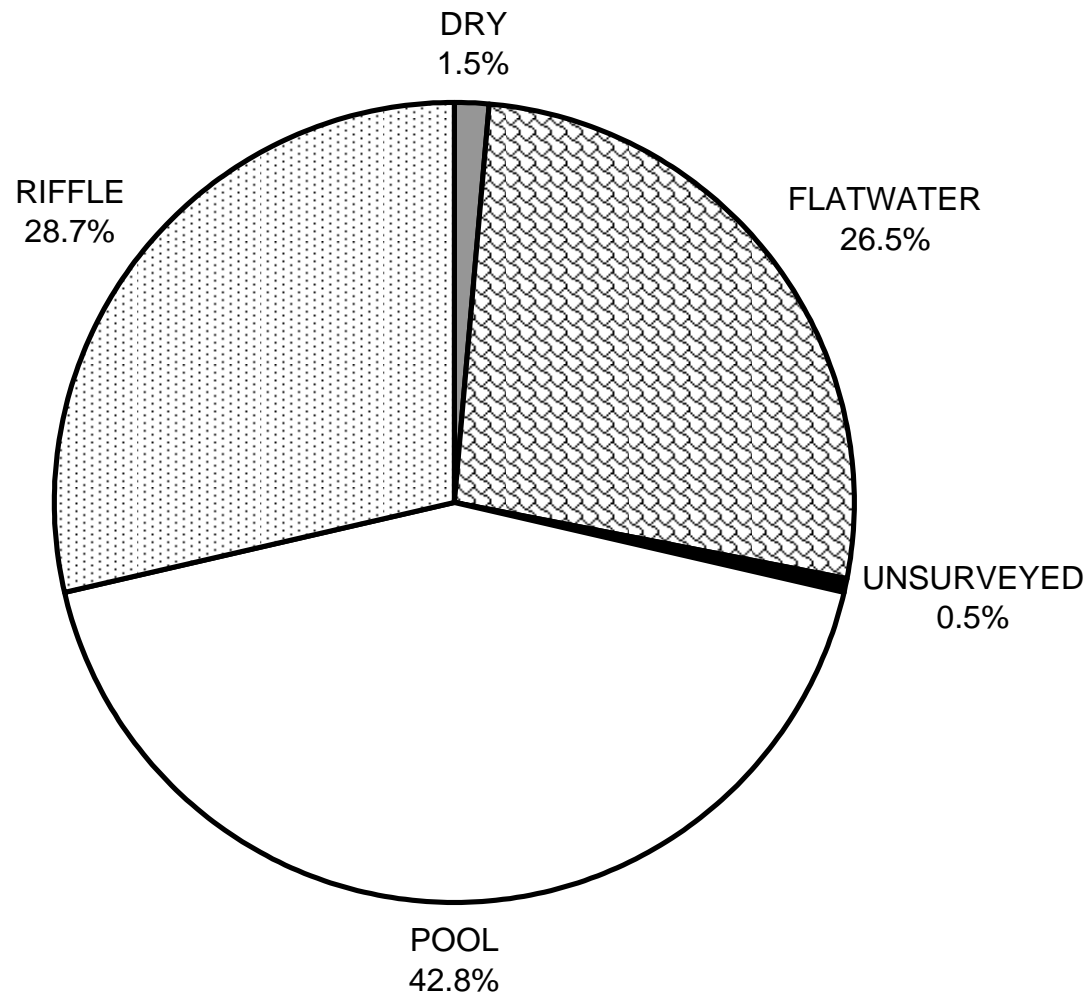
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Longitude: 123:32:25.0W

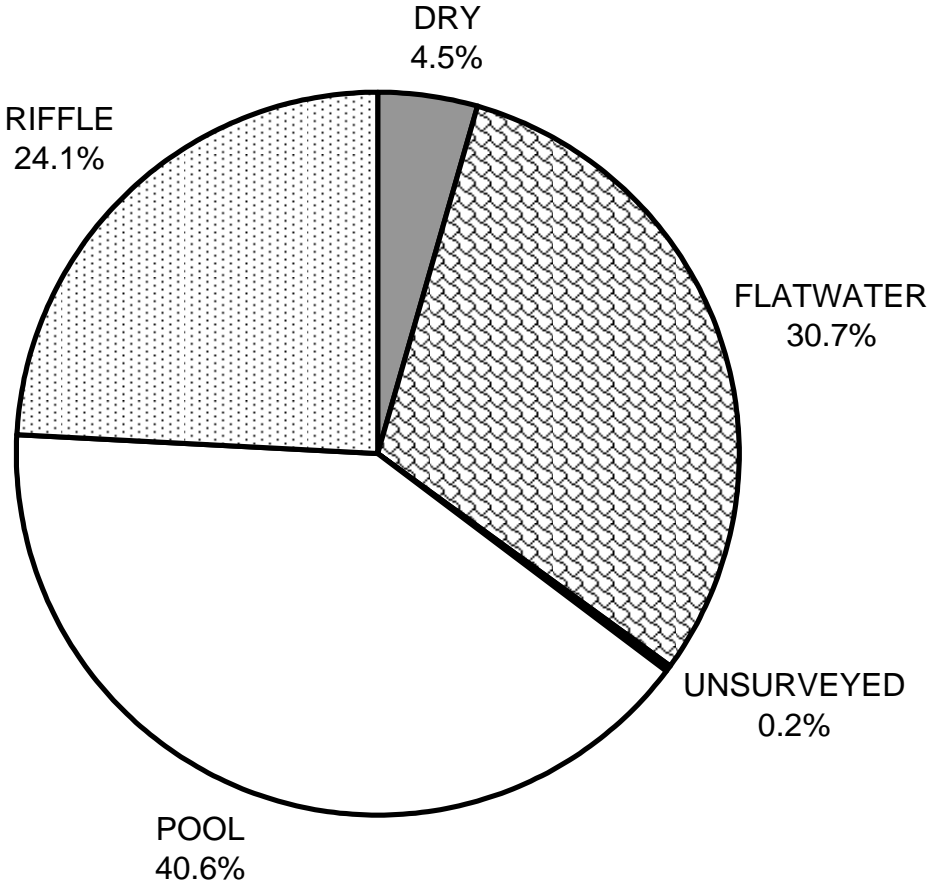
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	16	13
SMALL WOODY DEBRIS (%)	0	30	21
LARGE WOODY DEBRIS (%)	0	3	29
ROOT MASS (%)	17	3	10
TERRESTRIAL VEGETATION (%)	0	4	1
AQUATIC VEGETATION (%)	33	10	2
WHITEWATER (%)	0	0	1
BOULDERS (%)	17	21	14
BEDROCK LEDGES (%)	33	12	8

MARBLE GULCH 2013 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

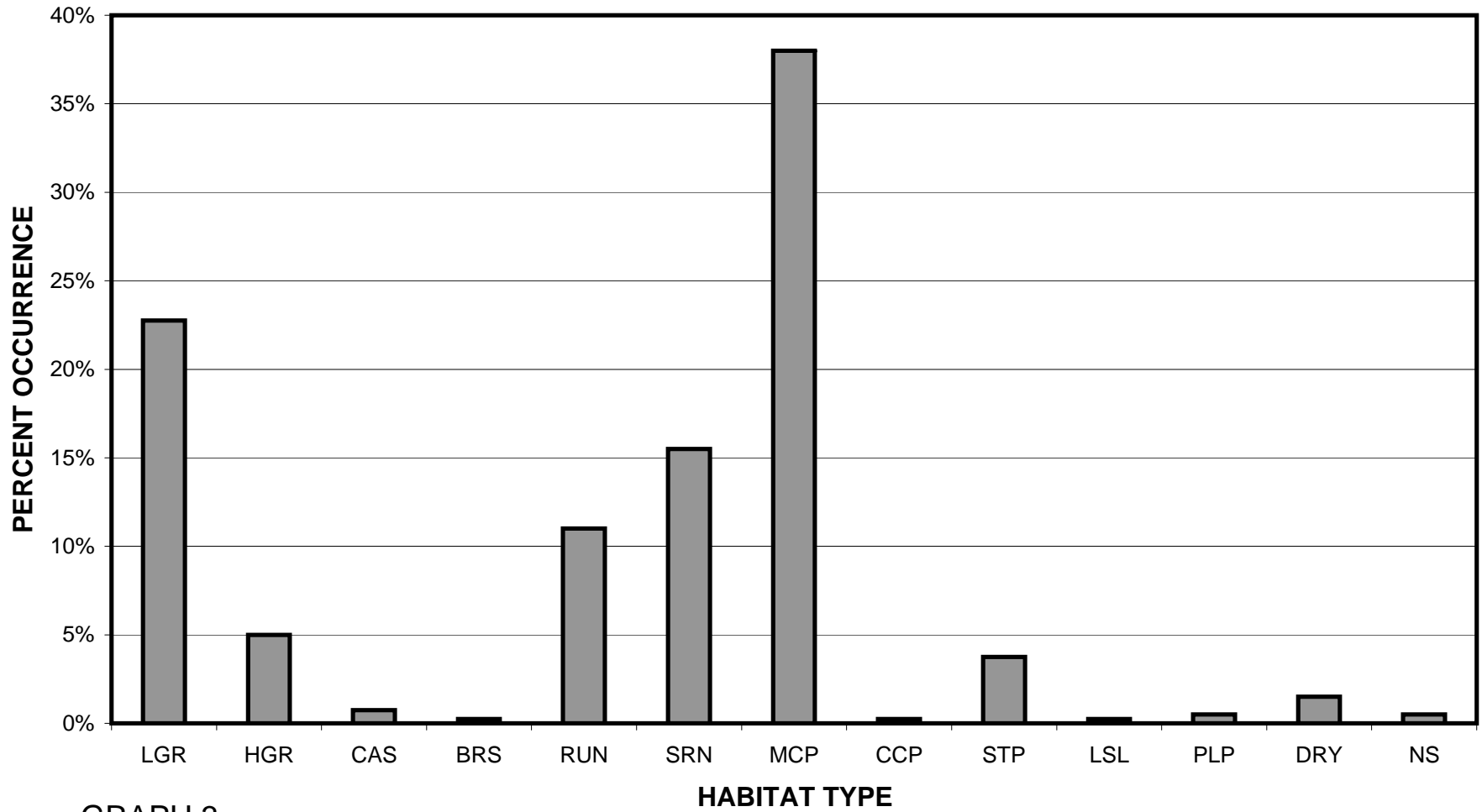
**MARBLE GULCH 2013
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

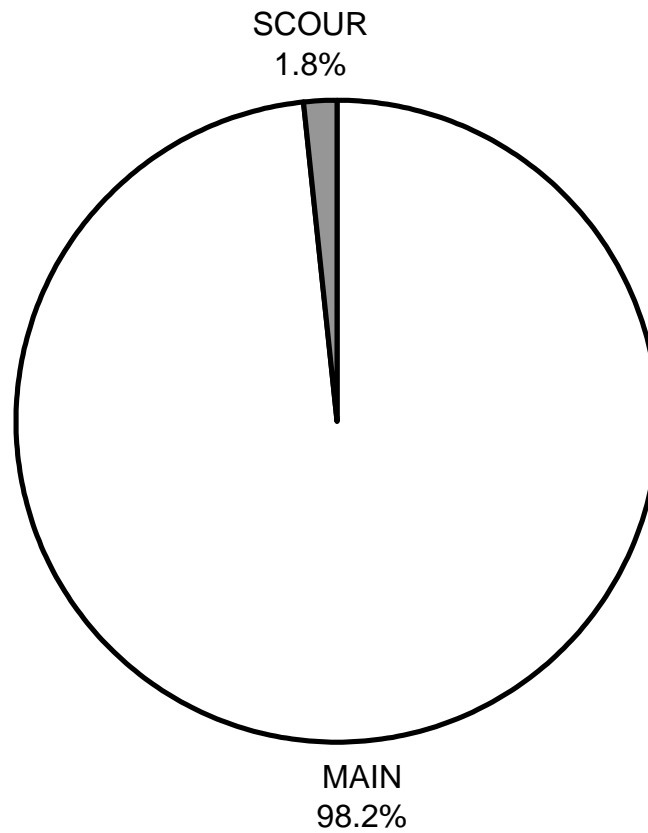
MARBLE GULCH 2013

HABITAT TYPES BY PERCENT OCCURRENCE



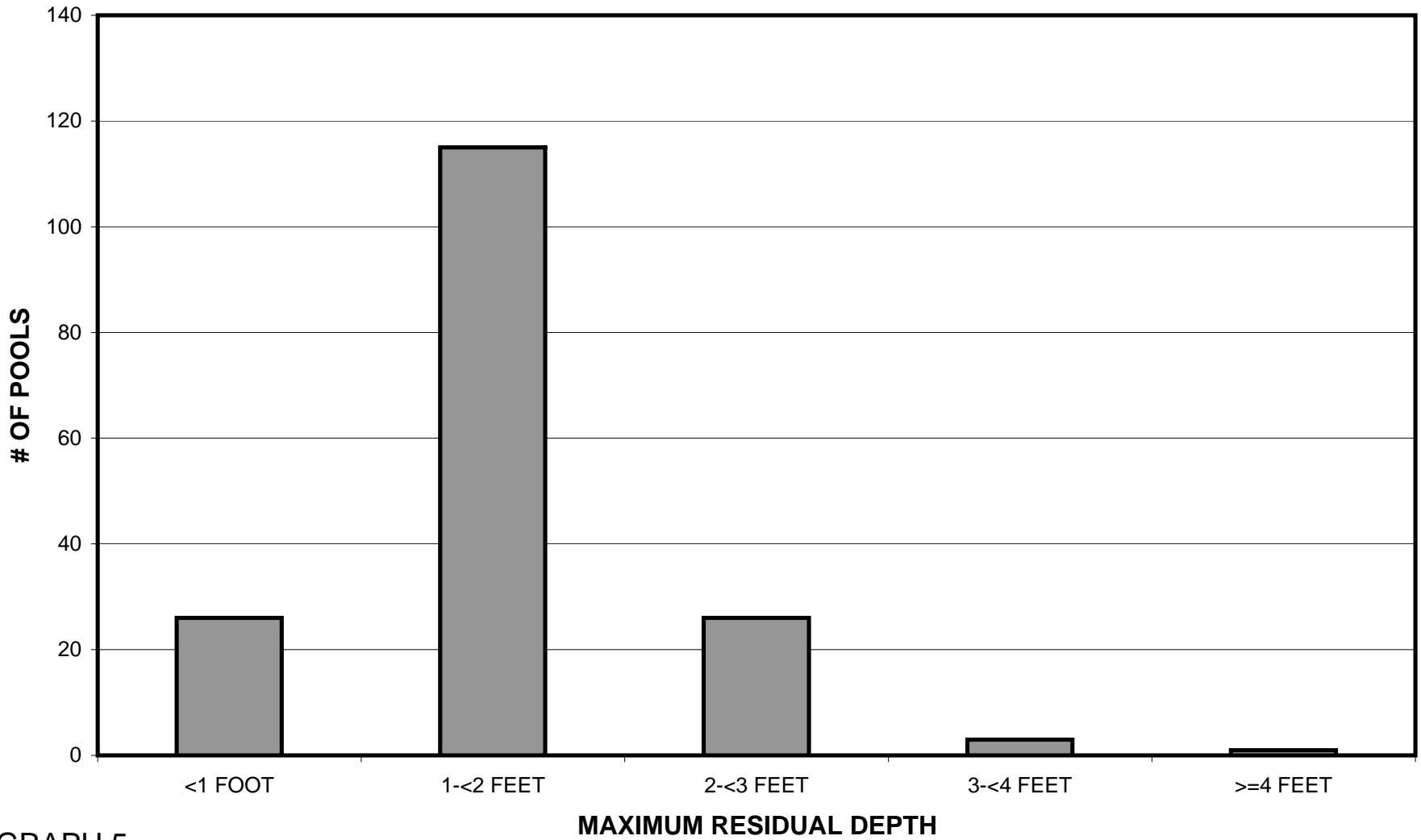
GRAPH 3

MARBLE GULCH 2013 POOL TYPES BY PERCENT OCCURRENCE



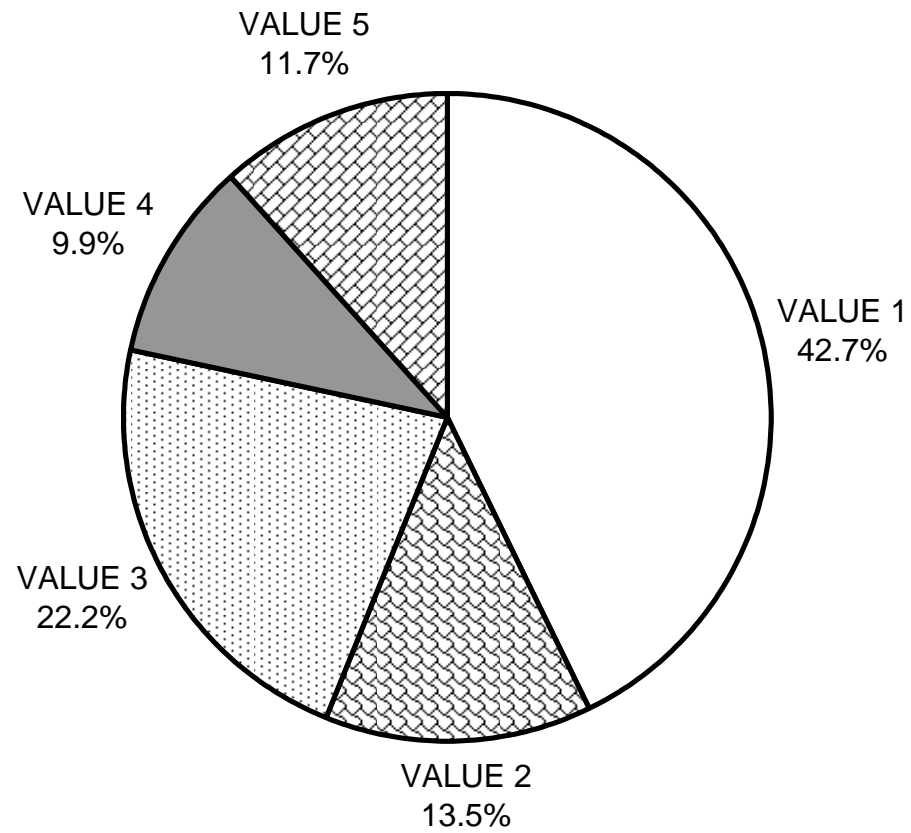
GRAPH 4

MARBLE GULCH 2013 MAXIMUM DEPTH IN POOLS



GRAPH 5

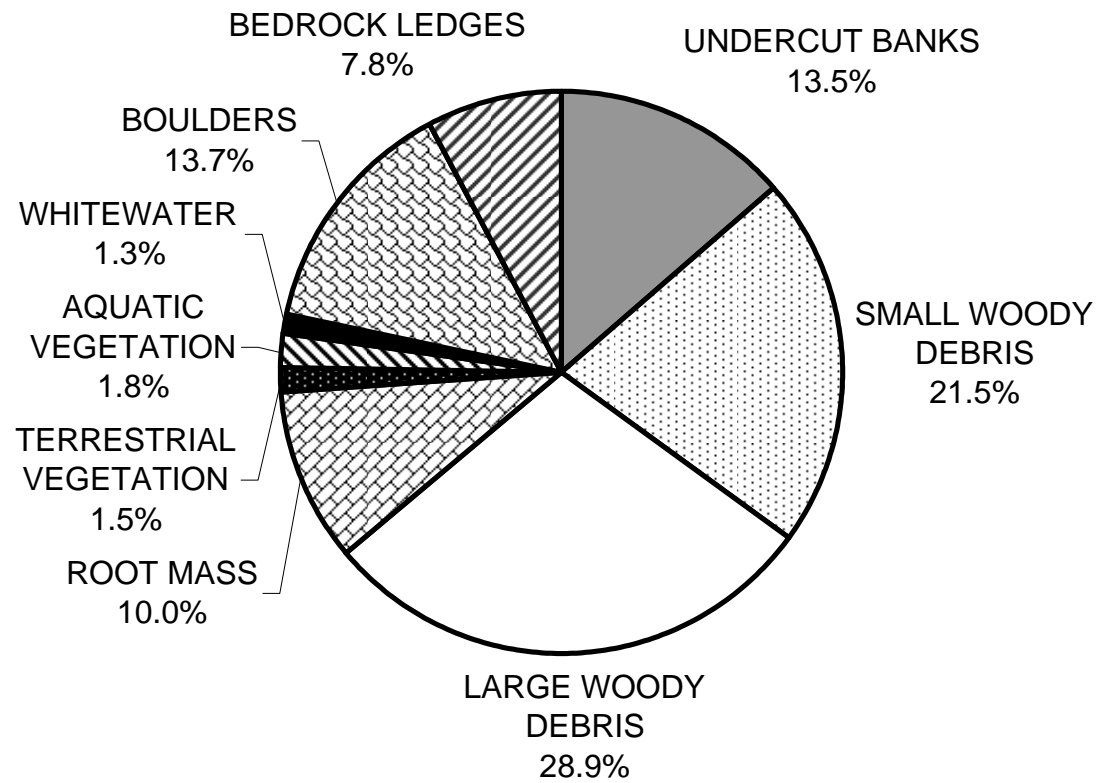
MARBLE GULCH 2013 PERCENT EMBEDDEDNESS



GRAPH 6

MARBLE GULCH 2013

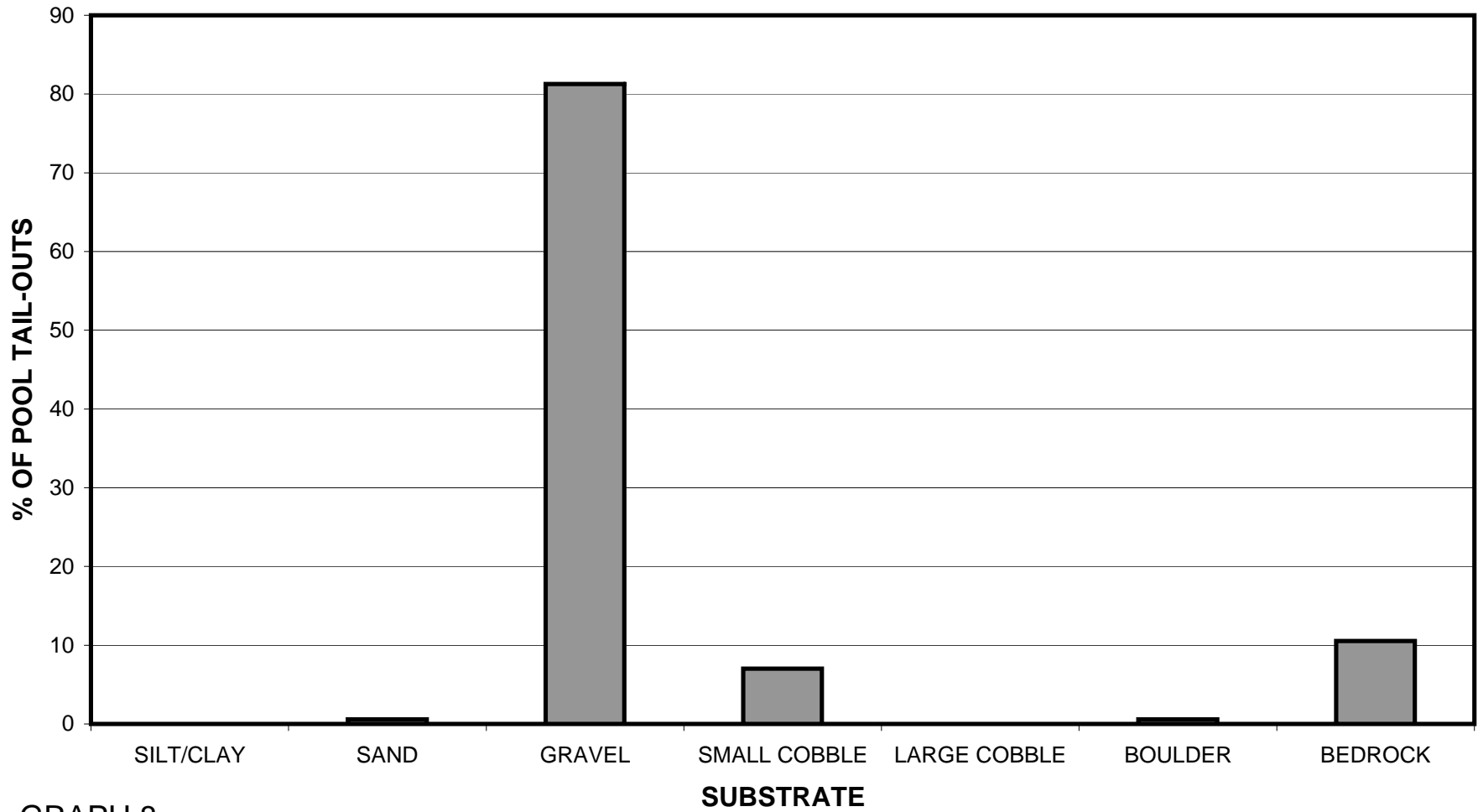
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

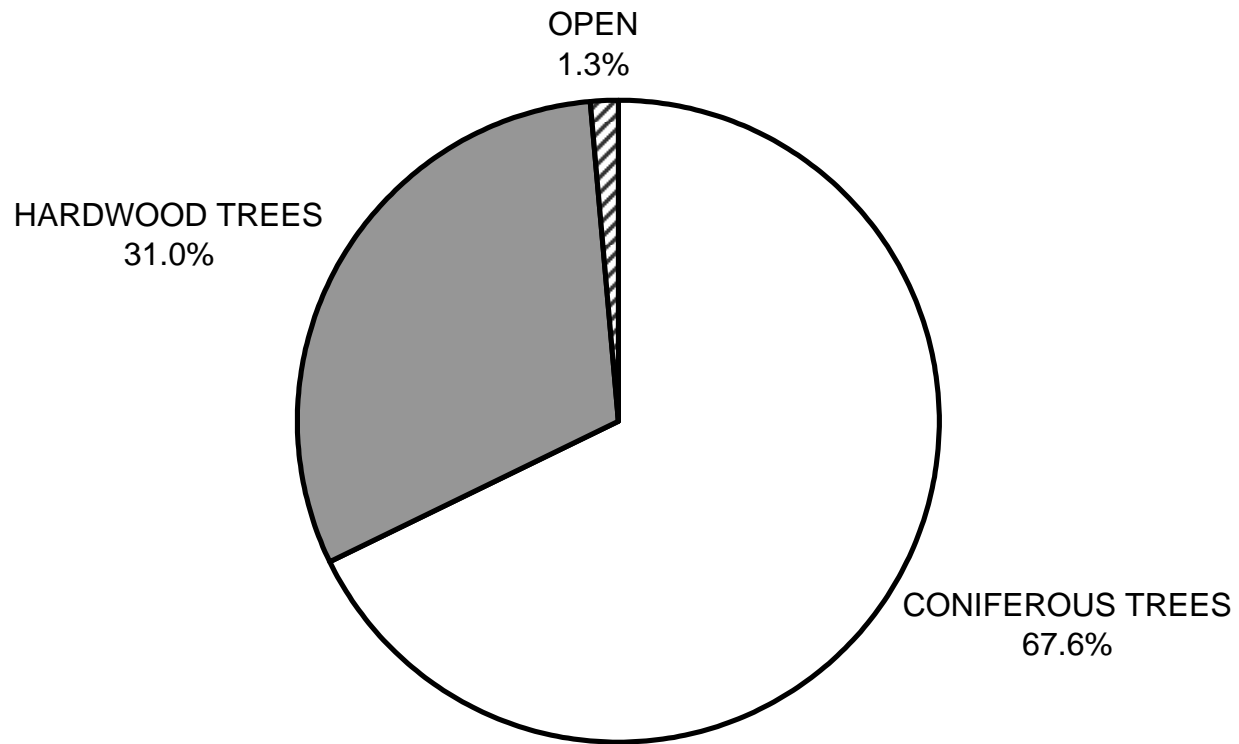
MARBLE GULCH 2013

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



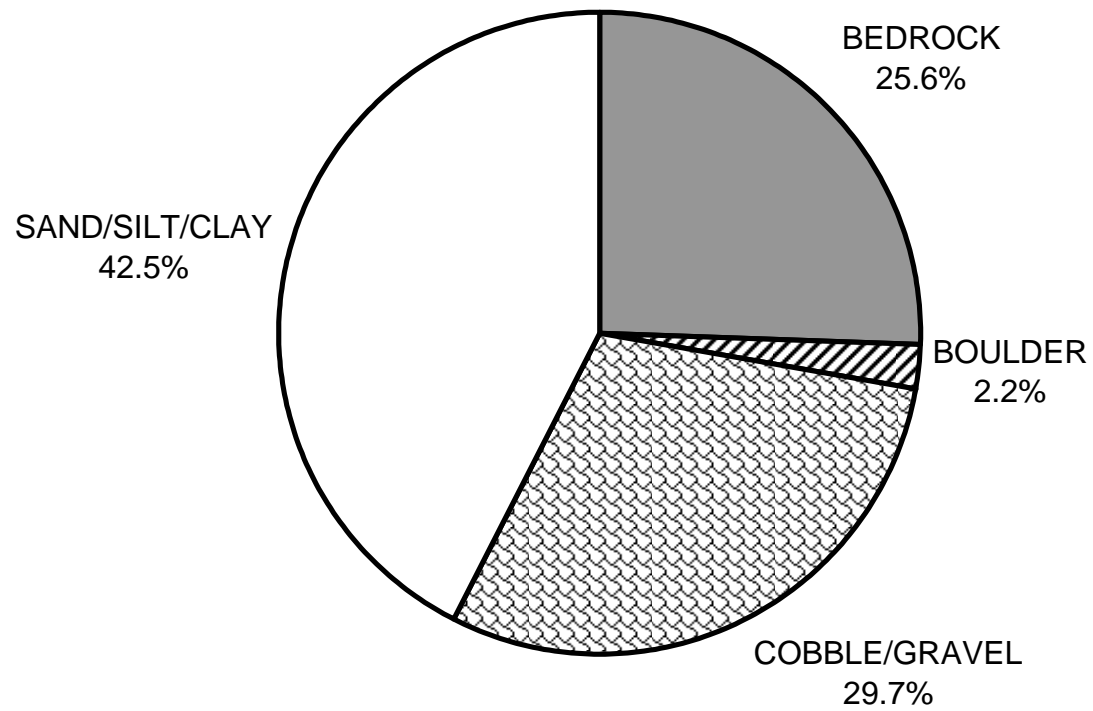
GRAPH 8

MARBLE GULCH 2013 MEAN PERCENT CANOPY



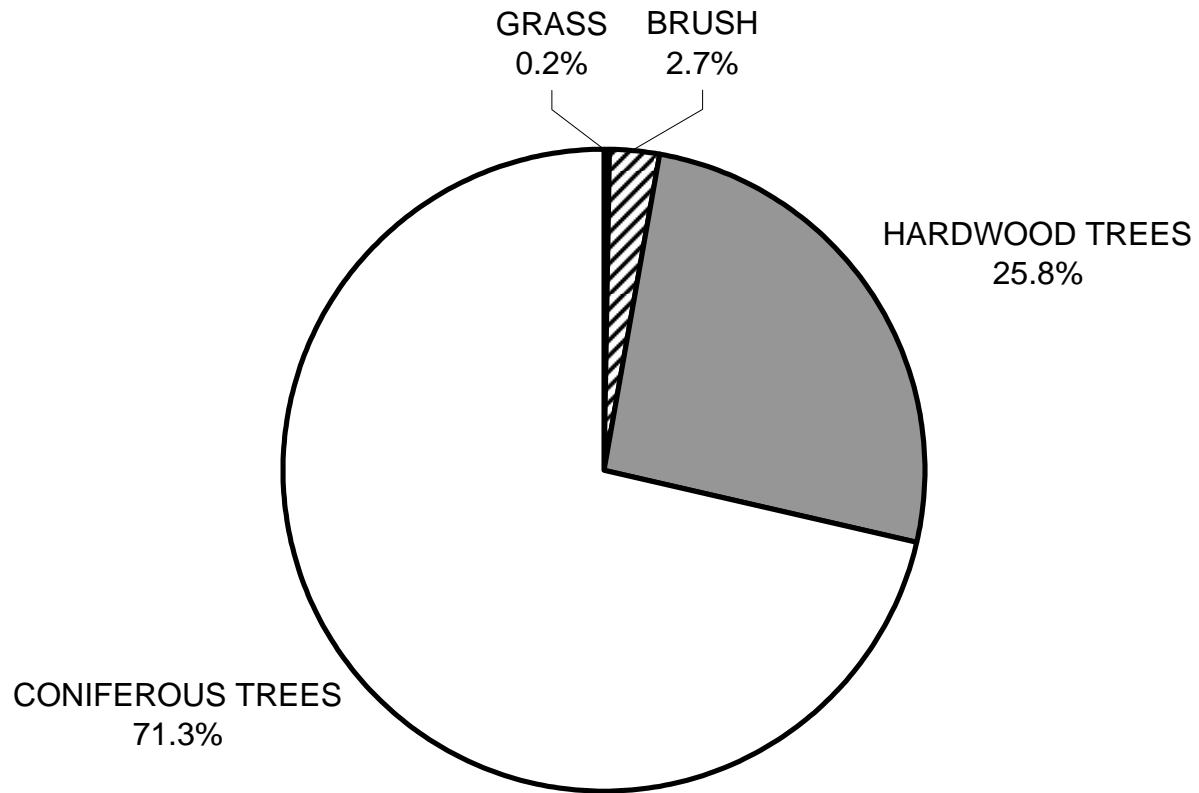
GRAPH 9

**MARBLE GULCH 2013
DOMINANT BANK COMPOSITION IN SURVEY REACH**



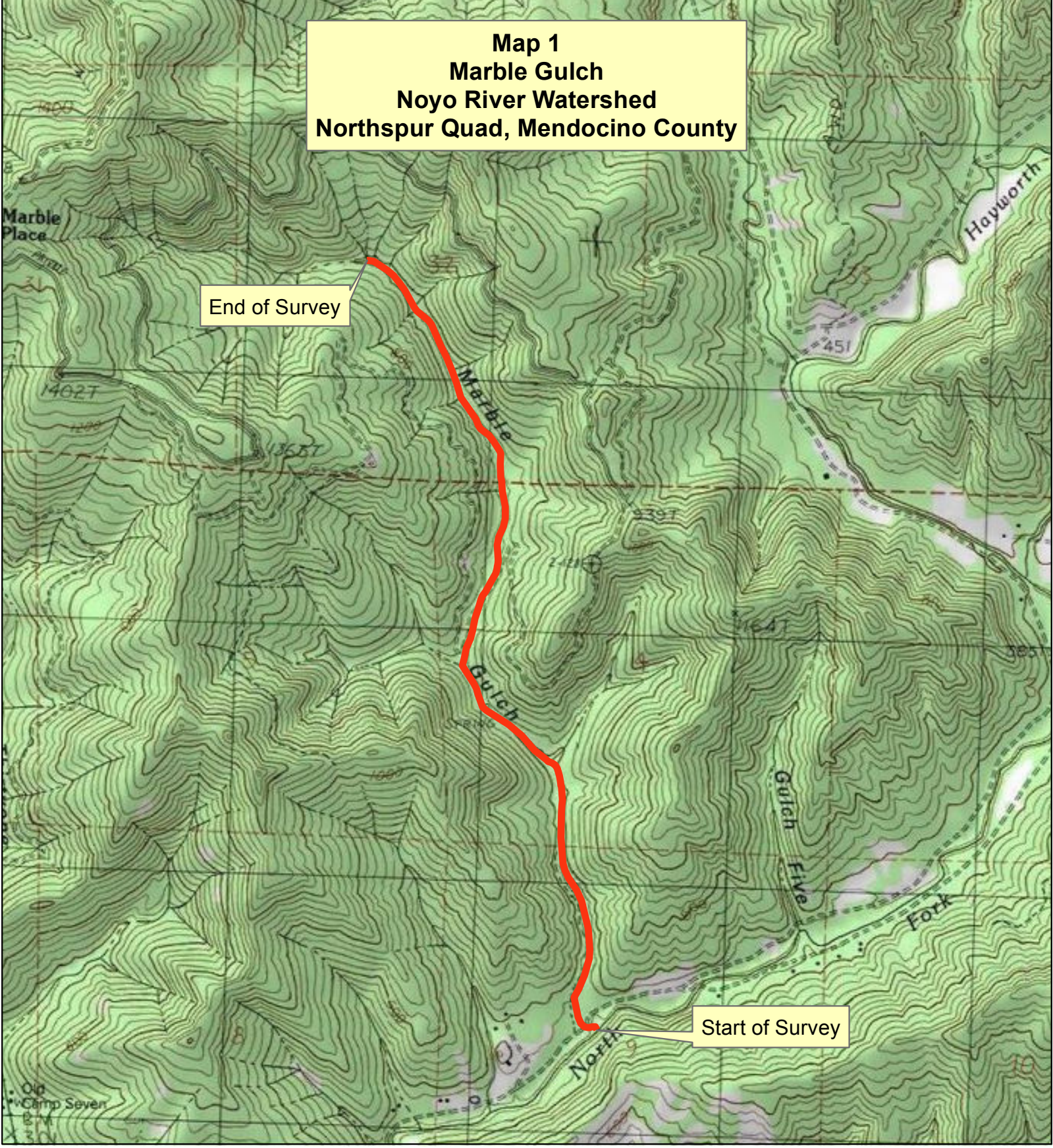
GRAPH 10

MARBLE GULCH 2013 DOMINANT BANK VEGETATION IN SURVEY REACH



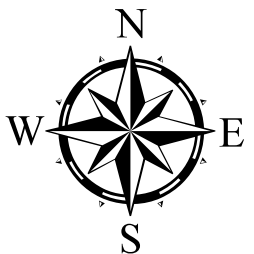
GRAPH 11

**Map 1
Marble Gulch
Noyo River Watershed
Northspur Quad, Mendocino County**



End of Survey

Start of Survey



— Channel Type G4

