

# STREAM INVENTORY REPORT

## Big Gulch

### INTRODUCTION

A stream inventory was conducted from May 1 to May 3, 2012 on Big Gulch. The survey began at the confluence with Little North Fork Navarro River and extended upstream 0.4 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Big Gulch.

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

Big Gulch is a tributary to Little North Fork Navarro River, a tributary North Branch North Fork Navarro River, a tributary to North Fork Navarro River, a tributary to the Navarro River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Big Gulch's legal description at the confluence with Little North Fork Navarro River is T16N R15W S35. Its location is 39.2044 degrees north latitude and 123.5058 degrees west longitude, LLID number 1235045392044. Big Gulch is a first order stream and has approximately 1.1 miles of blue line stream according to the USGS Navarro 7.5 minute quadrangle. Big Gulch drains a watershed of approximately 0.7 square miles. Elevations range from about 390 feet at the mouth of the creek to 900 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 Masonite Industrial Road.

### METHODS

The habitat inventory conducted in Big 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 crest (measured in the thalweg), dominant substrate composing the pool tail crest, and

## Big Gulch

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 Big 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". Big 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.

#### 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 Big Gulch, embeddedness was

## Big Gulch

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 Big 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 Big 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 Big 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.

### 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

## **Big Gulch**

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.

## 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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Big 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

## **Big Gulch**

### HABITAT INVENTORY RESULTS

\* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT \*

The habitat inventory of May 1 to May 3, 2012 was conducted by B. Leonard (CDFW) and T. Anderson (WSP). The total length of the stream surveyed was 1,942 feet.

Stream flow was not measured on Big Gulch.

Big Gulch is an A4 channel type for 1,942 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 46 to 52 degrees Fahrenheit. Air temperatures ranged from 46 to 52 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% pool units, 29% flatwater units, 27% riffle units, 4% unsurveyed units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 44% flatwater units, 28% pool units, 24% riffle units, and 4% unsurveyed 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, 36%; low gradient riffle units, 21%; run units, 14%; and step run units, 14% (Graph 3). Based on percent total length, step run units made up 32%, mid-channel pool units 25%, and low gradient riffle units 20%.

A total of 27 pools were identified (Table 3). All of the pools encountered were main channel pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Five of the 26 pools (19%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 27 pool tail-outs measured, one had a value of 1 (4%); 25 had a value of 2 (93%); one had a value of 3 (4%); (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 24, flatwater habitat types had a mean shelter rating of 10, and pool habitats had a mean shelter rating of 66 (Table 1).

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

## **Big Gulch**

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. Small cobble 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 Big Gulch was 95%. Five percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 27% and 73%, respectively. Graph 9 describes the mean percent canopy in Big Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 94%. The mean percent left bank vegetated was 94%. The dominant elements composing the structure of the stream banks consisted of 43% cobble/gravel, 36% sand/silt/clay, 11% bedrock, and 10% boulders (Graph 10). Brush was the dominant vegetation type observed in 44% of the units surveyed. Additionally, 33% of the units surveyed had coniferous trees as the dominant vegetation type, and 13% had deciduous trees as the dominant vegetation type (Graph 11).

## DISCUSSION

Big Gulch is an A4 channel type for the entire length of the survey, 1,942 feet. A4 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days May 1 to May 3, 2012 ranged from 46 to 52 degrees Fahrenheit. Air temperatures ranged from 46 to 52 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 44% of the total length of this survey, riffles 24%, and pools 28%. Five of the 26 (19%) 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 are generally not recommended in A4 channels due to the high stream energy.

Twenty-six of the 27 pool tail-outs measured had embeddedness ratings of 1 or 2. One 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 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.

## Big Gulch

Twenty-five of the 27 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 66. The shelter rating in the flatwater habitats is 10. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in Big 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 95%. The percentage of right and left bank covered with vegetation was 94% and 94%, respectively.

### RECOMMENDATIONS

- 1) Big Gulch should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

### COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with Little North Fork Navarro River. The channel is an A4 for the entire length of the survey.
80	0005.00	Large woody debris (LWD) and small woody debris (SWD) is accumulating in the channel. The water is flowing through the sediment which is being retained by the accumulated debris.
195	0010.00	Log debris accumulation (LDA) #01 contains 13 pieces of large woody debris (LWD) and measures 8.5' high x 12' wide x 82' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to small cobble and measures 3' wide x 6' long x 4' deep. There is a 2.5' high plunge over the LDA. Redwood logs are lying in the channel parallel to the flow; the logs are retaining sediment

## Big Gulch

above the LDA and potentially blocking the path over the LDA for adult salmonids. The LDA may be the remains of a historic road crossing.

- |      |         |  |
|------|---------|--|
| 955  | 0039.00 | LDA #02 contains 18 pieces of LWD and measures 9' high x 19' wide x 15' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 15' wide x 54' long x 5' deep.    |
| 1308 | 0049.00 | LDA #03 contains 16 pieces of LWD and measures 7' high x 15' wide x 32' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to small cobble and measures 10' wide x 32' long x 4' deep. |
| 1822 | 0062.00 | There is a 2' high plunge over boulders.   |
| 1875 | 0066.00 | There is a 1' high plunge over boulders.   |
| 1928 | 0070.00 | End of survey at boulder/bedrock cascade. The cascade measures 67' long and has a slope of 34%. There is a 7' high plunge over boulders at the top of the cascade with no jump pool below it.  |

## 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.



## Big 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: Big Gulch

LLID: 1235045392044 Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS35 Latitude: 39:12:16.0N Longitude: 123:30:16.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
1	0	DRY	1.4	5	5	0.3									
20	4	FLATWATER	28.6	43	852	43.9	5.0	0.4	0.8	176	3526	72	1437		10
3	0	NOSURVEY	4.3	25	76	3.9									
27	26	POOL	38.6	20	538	27.7	7.8	0.5	1.3	154	4171	122	3296	84	66
19	4	RIFFLE	27.1	25	471	24.3	5.5	0.3	0.5	103	1948	25	473		24
<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>		
70	34				1942					9644			5207		

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

Stream Name: Big Gulch

LLID: 1235045392044

Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Confluence Location: Quad: NAVARRO

Legal Description: T16NR15WS35

Latitude: 39:12:16.0N

Longitude: 123:30:16.0W

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 (%)
15	3	LGR	21.4	26	393	20.2	6	0.2	0.5	117	1756	23	351		2	100
2	0	HGR	2.9	18	36	1.9										100
2	1	CAS	2.9	21	42	2.2	4	0.5	0.8	59	118	29	59		90	100
10	2	RUN	14.3	23	231	11.9	6	0.5	1	115	1154	49	488		5	90
10	2	SRN	14.3	62	621	32.0	4	0.4	0.8	237	2373	95	949		15	100
25	24	MCP	35.7	19	477	24.6	8	0.5	3	148	3710	120	3000	82	67	93
2	2	STP	2.9	30	61	3.1	8	0.5	1.4	227	455	147	294	114	60	100
1	0	DRY	1.4	5	5	0.3										
3	0	NS	4.3	25	76	3.9										

Total Units Fully Measured  
70 34

Total Length (ft.)  
1942

Total Area (sq.ft.)  
9564

Total Volume (cu.ft.)  
5141

**Table 3 - Summary of Pool Types**

Stream Name: Big Gulch

LLID: 1235045392044

Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Confluence Location: Quad: NAVARRO

Legal Description: T16NR15WS35

Latitude: 39:12:16.0N

Longitude: 123:30:16.0W

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
27	26	MAIN	100	20	538	100	7.8	0.5	154	4171	84	2268	66

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
27	26	538	4171	2268

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

Stream Name: Big Gulch

LLID: 1235045392044

Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Confluence Location: Quad: NAVARRO

Legal Description: T16NR15WS35

Latitude: 39:12:16.0N

Longitude: 123:30:16.0W

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
24	MCP	92	6	25	13	54	4	17	1	4	0	0
2	STP	8	0	0	2	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
26	6	23	15	58	4	15	1	4	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3

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

Stream Name: Big Gulch

LLID: 1235045392044

Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Dry Units: 1

Confluence Location: Quad: NAVARRO

Legal Description: T16NR15WS35

Latitude: 39:12:16.0N

Longitude: 123:30:16.0W

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
15	3	LGR	100	0	0	0	0	0	0	0	0
2	0	HGR									
2	1	CAS	0	10	0	0	0	0	30	60	0
19	4	TOTAL RIFFLE	50	5	0	0	0	0	15	30	0
10	2	RUN	0	50	0	0	0	0	0	50	0
10	2	SRN	30	45	8	0	0	0	18	0	0
20	4	TOTAL FLAT	15	48	4	0	0	0	9	25	0
25	25	MCP	11	25	26	6	5	0	12	15	0
2	2	STP	23	18	13	10	0	0	8	30	0
27	27	TOTAL POOL	11	24	25	6	4	0	12	16	0
3	0	NS									
70	35	TOTAL	14	26	21	5	4	0	12	18	0

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

Stream Name: Big Gulch

LLID: 1235045392044

Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Dry Units: 1

Confluence Location: Quad: NAVARRO

Legal Description: T16NR15WS35

Latitude: 39:12:16.0N

Longitude: 123:30:16.0W

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
15	3	LGR	0	0	100	0	0	0	0
2	0	HGR	0	0	0	0	0	0	0
2	1	CAS	100	0	0	0	0	0	0
10	2	RUN	0	0	100	0	0	0	0
10	2	SRN	0	0	100	0	0	0	0
25	25	MCP	8	0	88	0	0	4	0
2	2	STP	0	0	100	0	0	0	0

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

Stream Name: Big Gulch

LLID: 1235045392044

Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Confluence Location: Quad: NAVARRO

Legal Description: T16NR15WS35

Latitude: 39:12:16.0N

Longitude: 123:30:16.0W

---

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
95	73	27	0	94	94

---

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: Big Gulch LLID: 1235045392044 Drainage: Navarro River  
 Survey Dates: 5/1/2012 to 5/3/2012 Survey Length (ft.): 1942 Main Channel (ft.): 1942 Side Channel (ft.): 0  
 Confluence Location: Quad: NAVARRO Legal Description: T16NR15WS35 Latitude: 39:12:16.0N Longitude: 123:30:16.0W

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

**STREAM REACH: 1**

Channel Type: A4	Canopy Density (%): 95.0	Pools by Stream Length (%): 27.7
Reach Length (ft.): 1942	Coniferous Component (%): 73.3	Pool Frequency (%): 38.6
Riffle/Flatwater Mean Width (ft.): 5.3	Hardwood Component (%): 26.7	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 81
Range (ft.): 7 to 12	Vegetative Cover (%): 93.7	2 to 2.9 Feet Deep: 15
Mean (ft.): 9	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 4
Std. Dev.: 2	Dominant Bank Substrate Type: Cobble/Gravel	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 20	Mean Max Residual Pool Depth (ft.): 1.3
Water (F): 46 - 52 Air (F): 46 - 52	LWD per 100 ft.:	Mean Pool Shelter Rating: 66
Dry Channel (ft): 5	Riffles: 6	
	Pools: 12	
	Flat: 4	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 4 Gravel: 81 Sm Cobble: 11 Lg Cobble: 0 Boulder: 4 Bedrock: 0		
Embeddedness Values (%): 1. 3.7 2. 92.6 3. 3.7 4. 0.0 5. 0.0		

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

Stream Name: Big Gulch

LLID: 1235045392044

Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Confluence Location: Quad: NAVARRO

Legal Description: T16NR15WS35

Latitude: 39:12:16.0N

Longitude: 123:30:16.0W

**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	2	6	11.4
Boulder	4	3	10.0
Cobble / Gravel	17	13	42.9
Sand / Silt / Clay	12	13	35.7

**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	3	4	10.0
Brush	14	17	44.3
Hardwood Trees	7	2	12.9
Coniferous Trees	11	12	32.9
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Big Gulch

LLID: 1235045392044

Drainage: Navarro River

Survey Dates: 5/1/2012 to 5/3/2012

Confluence Location: Quad: NAVARRO

Legal Description: T16NR15WS35

Latitude: 39:12:16.0N

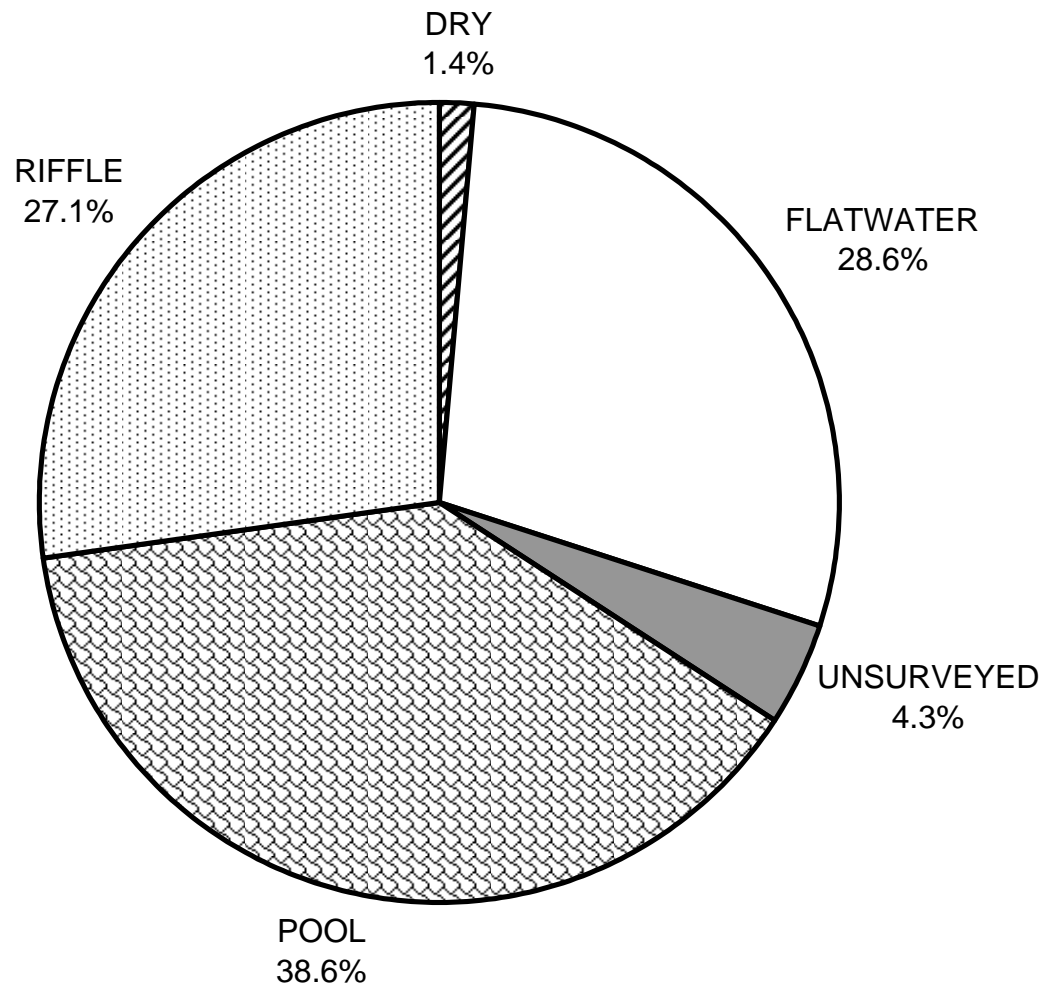
Longitude: 123:30:16.0W

---

	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	50	15	11
SMALL WOODY DEBRIS (%)	5	48	24
LARGE WOODY DEBRIS (%)	0	4	25
ROOT MASS (%)	0	0	6
TERRESTRIAL VEGETATION (%)	0	0	4
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	15	9	12
BOULDERS (%)	30	25	16
BEDROCK LEDGES (%)	0	0	0

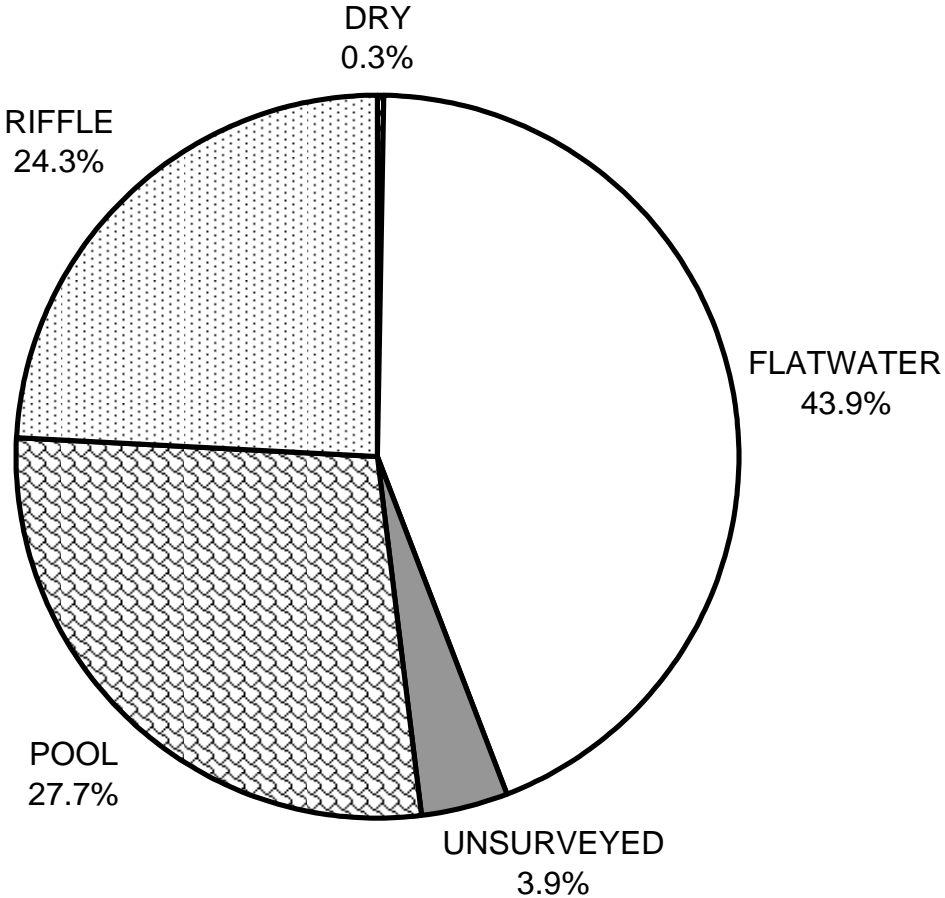
# BIG GULCH 2012

## HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

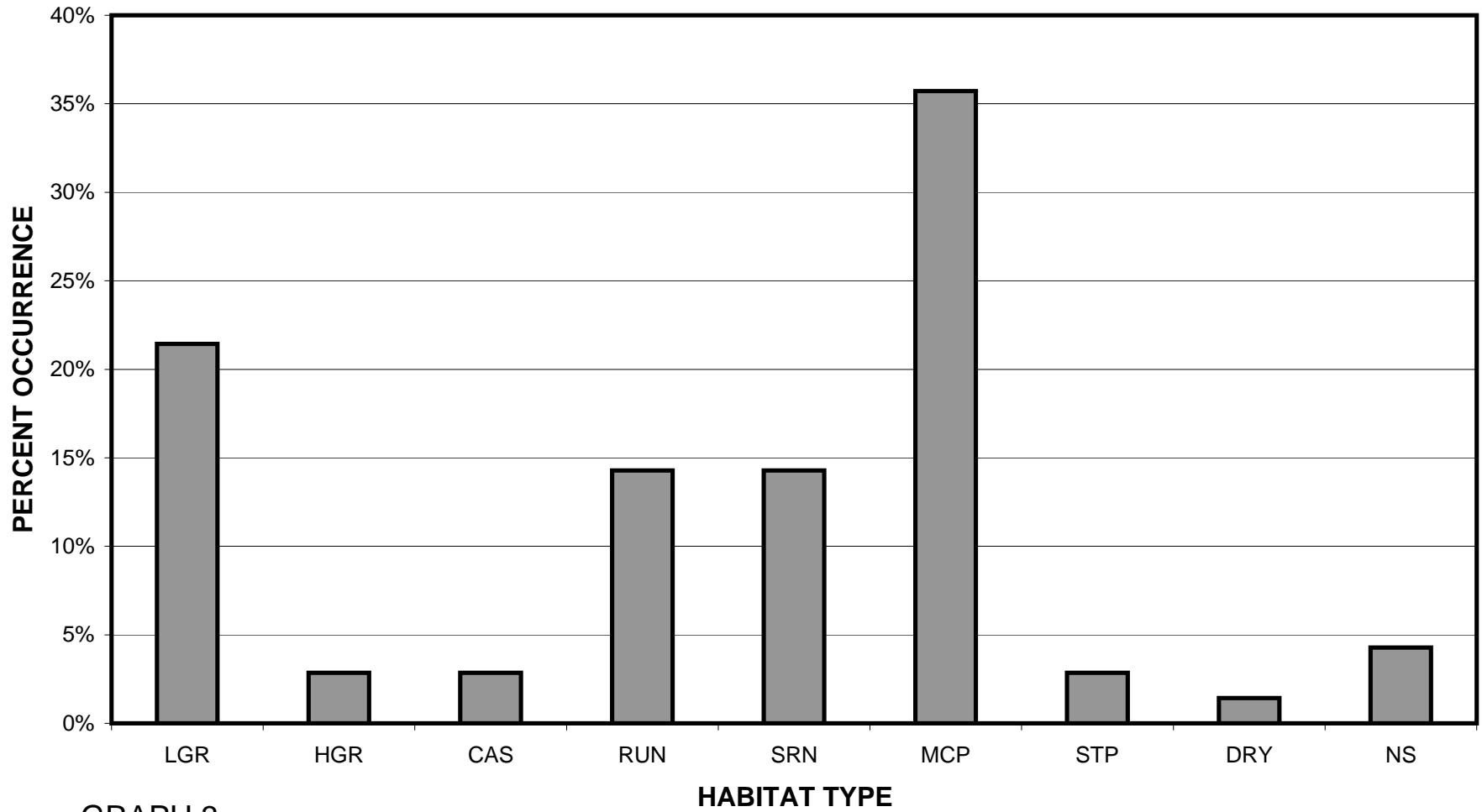
**BIG GULCH 2012**  
**HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

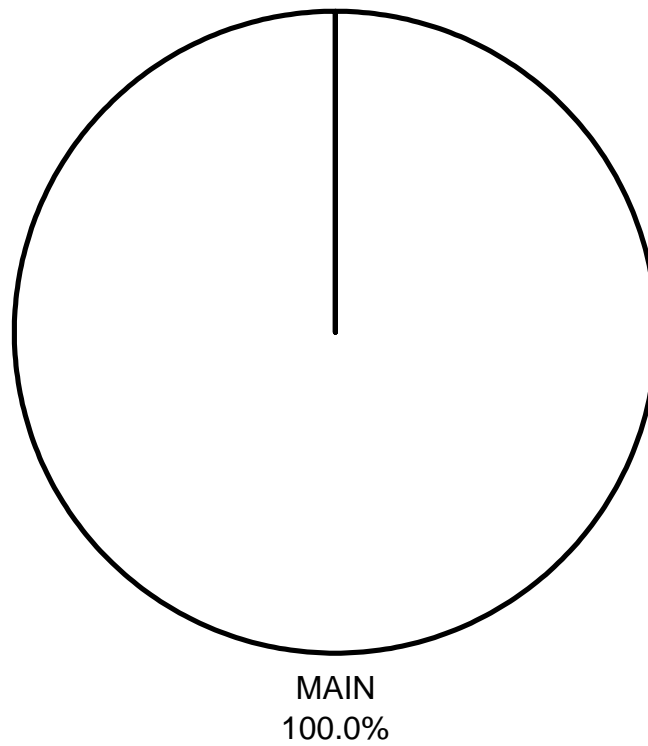
# BIG GULCH 2012

## HABITAT TYPES BY PERCENT OCCURRENCE



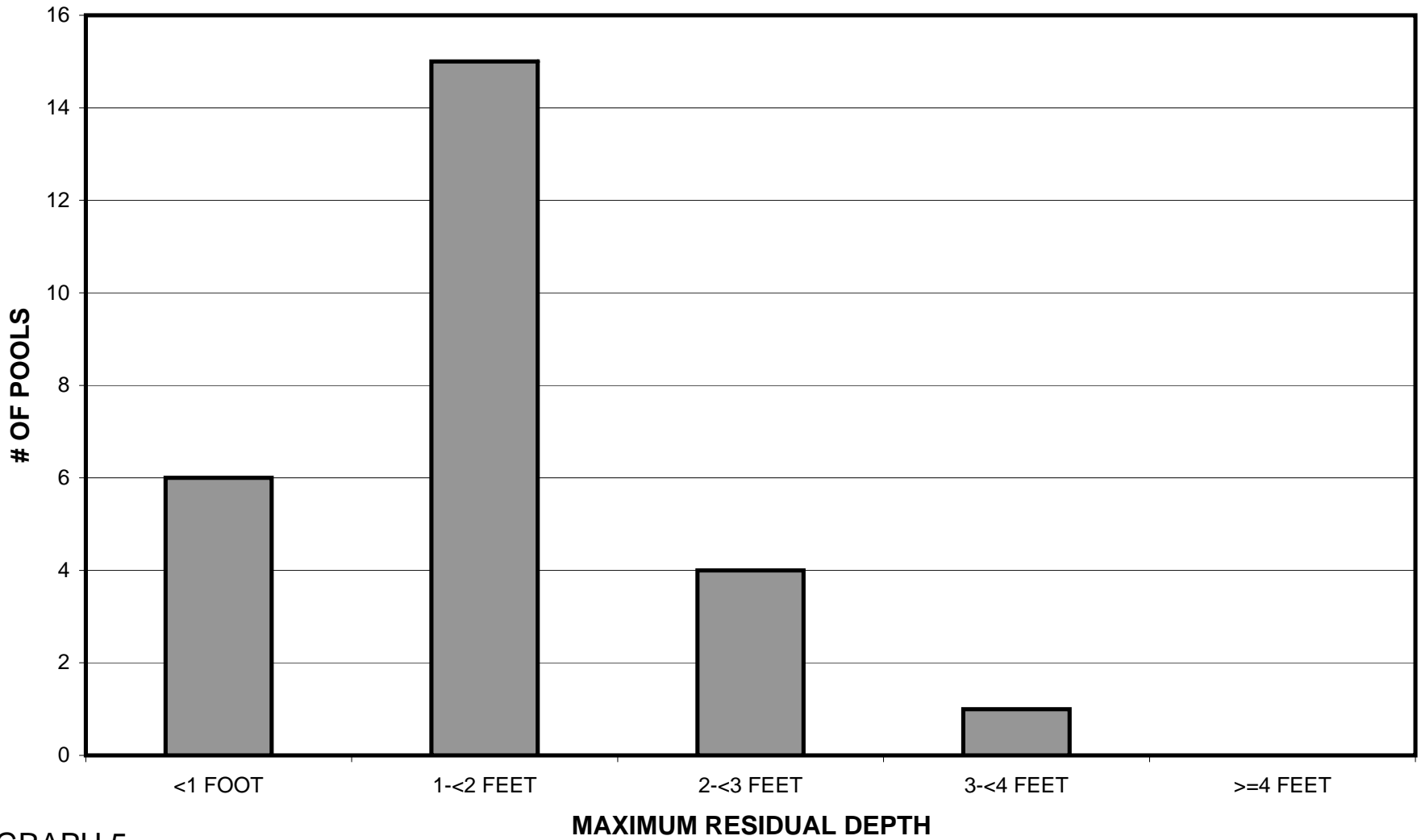
GRAPH 3

**BIG GULCH 2012**  
**POOL TYPES BY PERCENT OCCURRENCE**



GRAPH 4

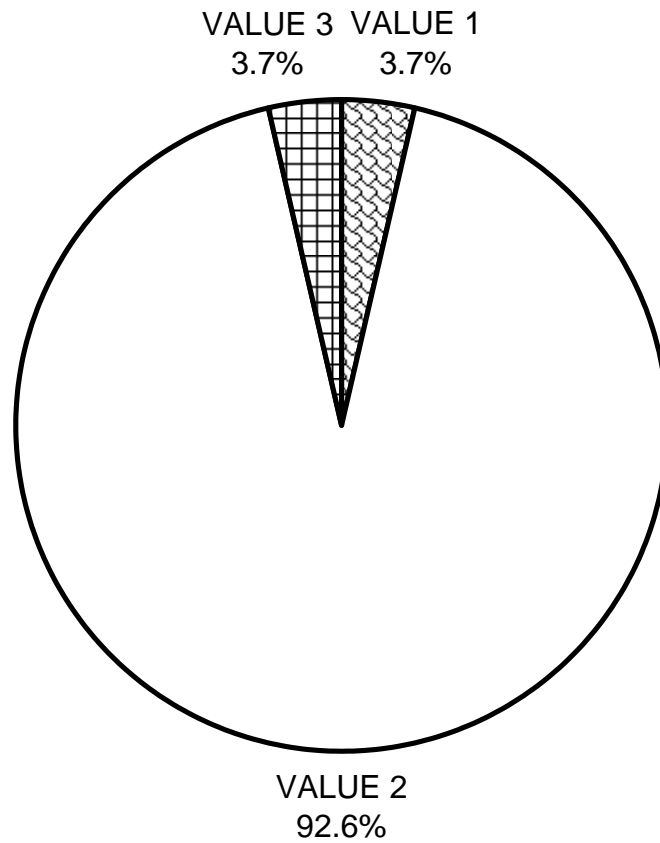
# BIG GULCH 2012 MAXIMUM DEPTH IN POOLS



GRAPH 5



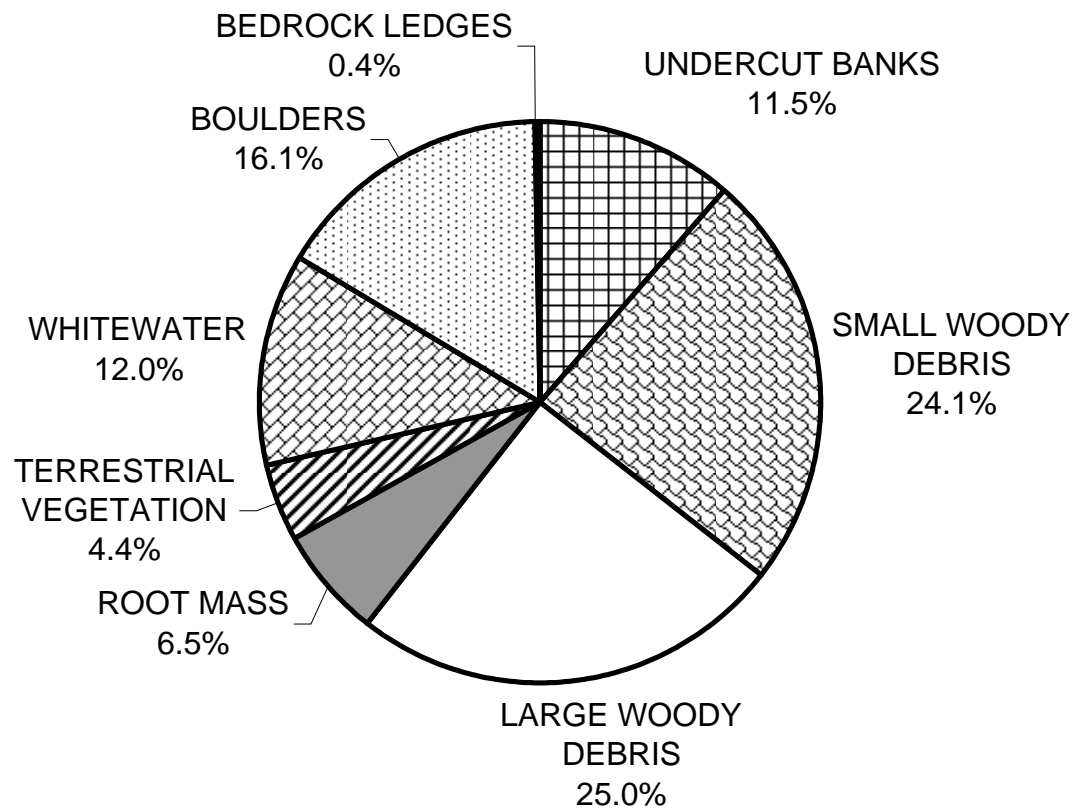
# BIG GULCH 2012 PERCENT EMBEDDEDNESS



GRAPH 6

# BIG GULCH 2012

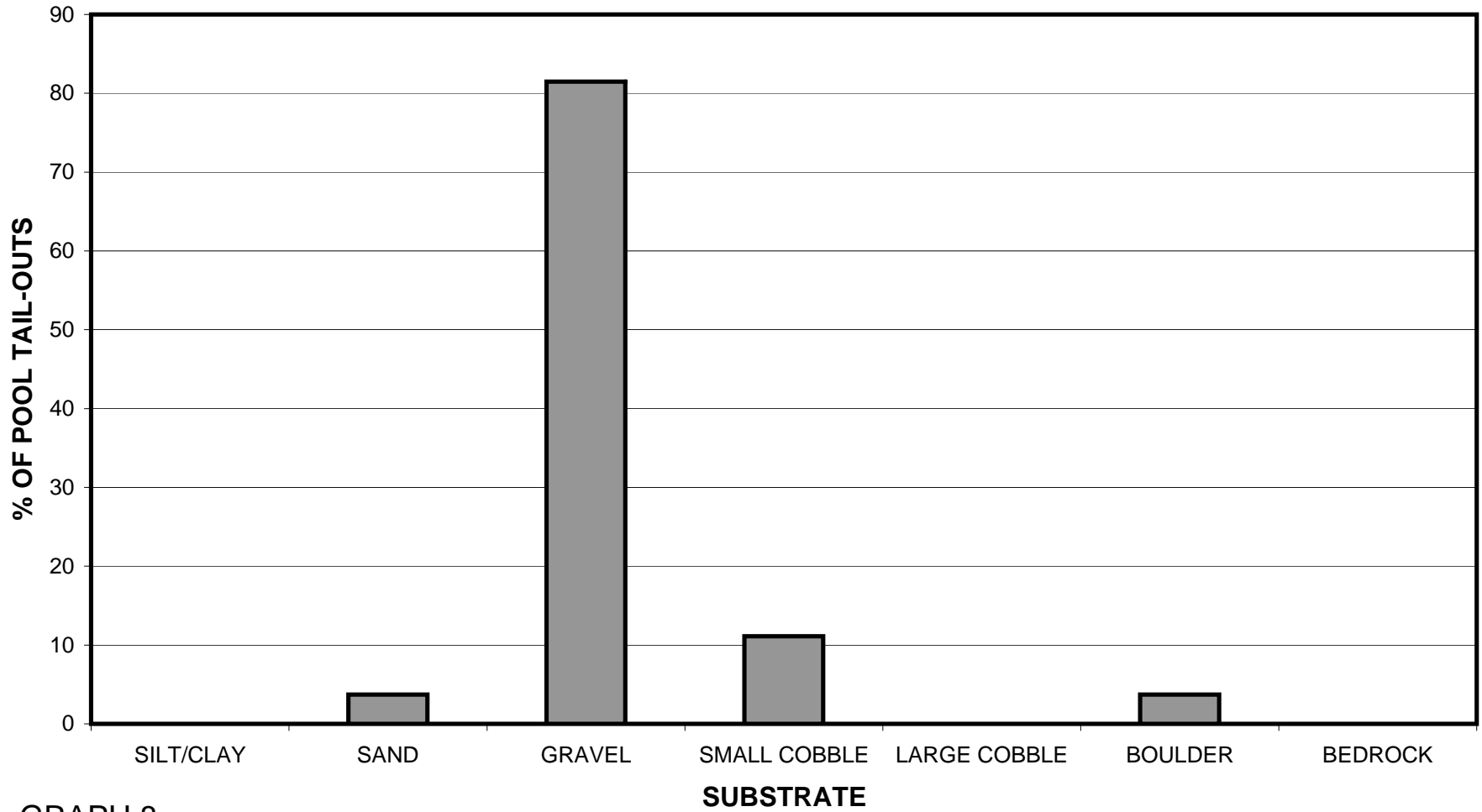
## MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

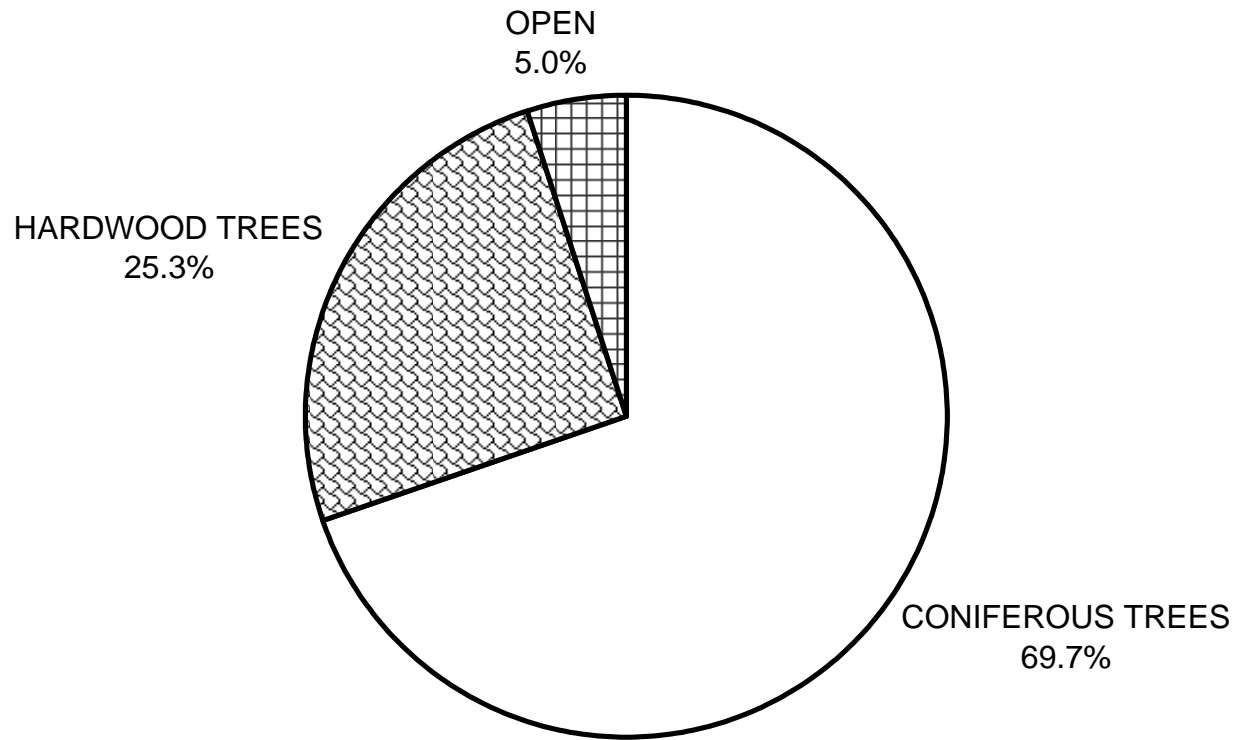
# BIG GULCH 2012

## SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



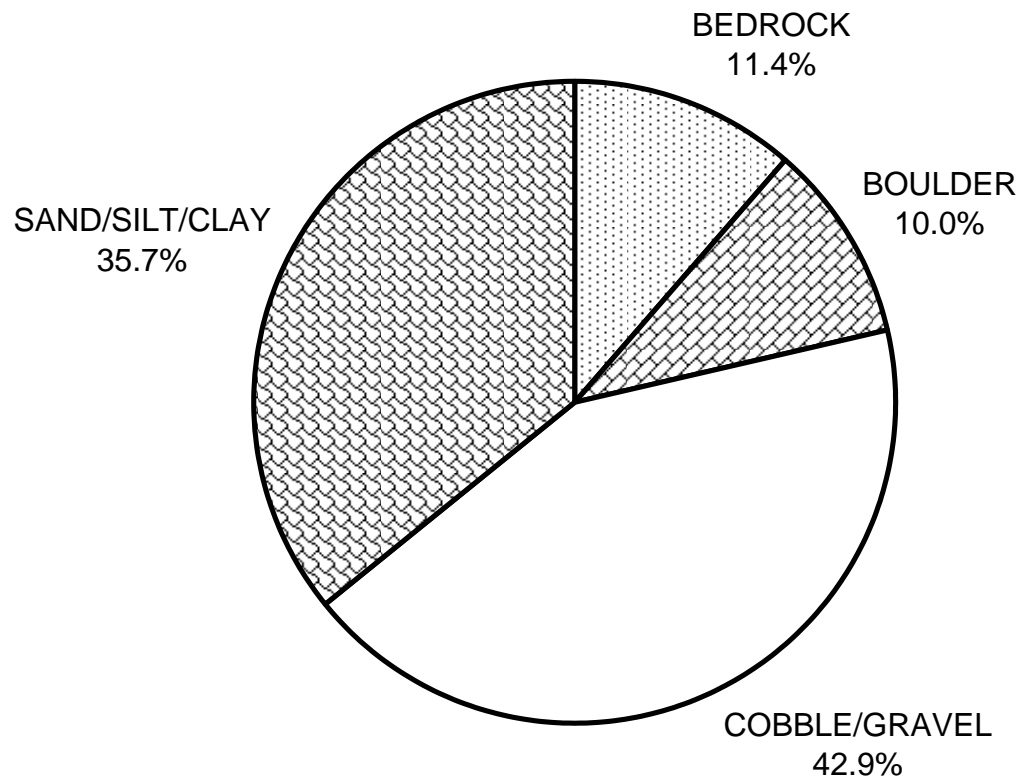
GRAPH 8

# BIG GULCH 2012 MEAN PERCENT CANOPY



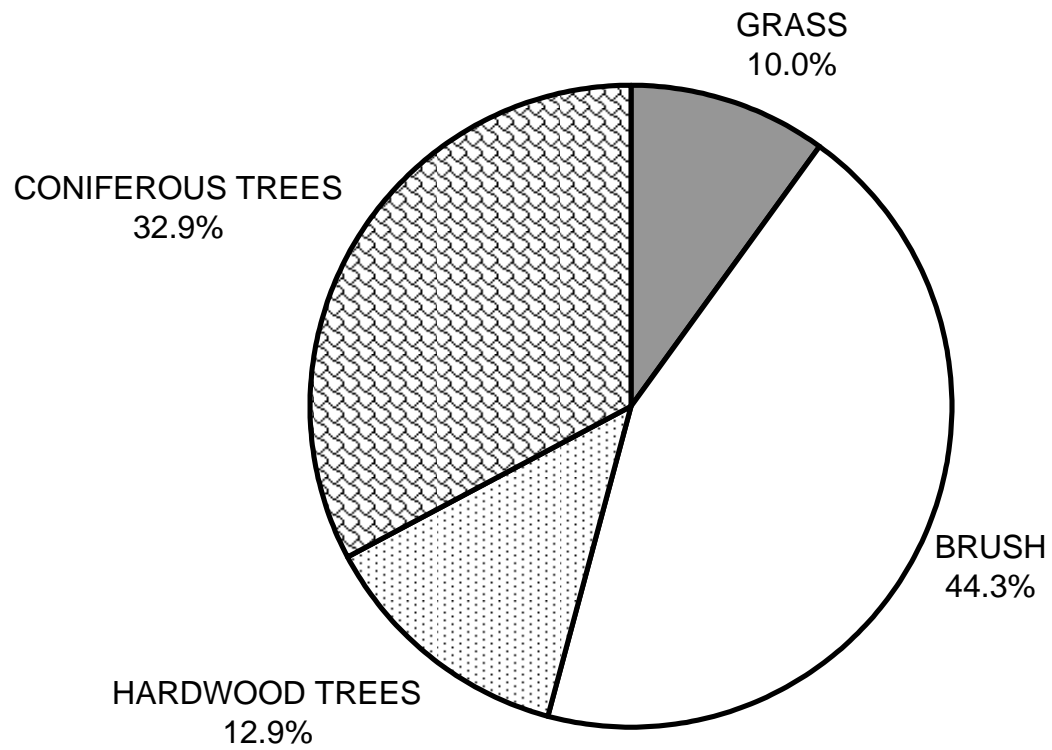
GRAPH 9

**BIG GULCH 2012**  
**DOMINANT BANK COMPOSITION IN SURVEY REACH**



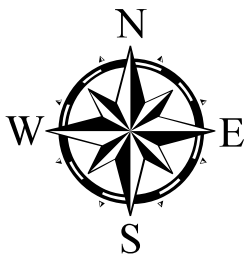
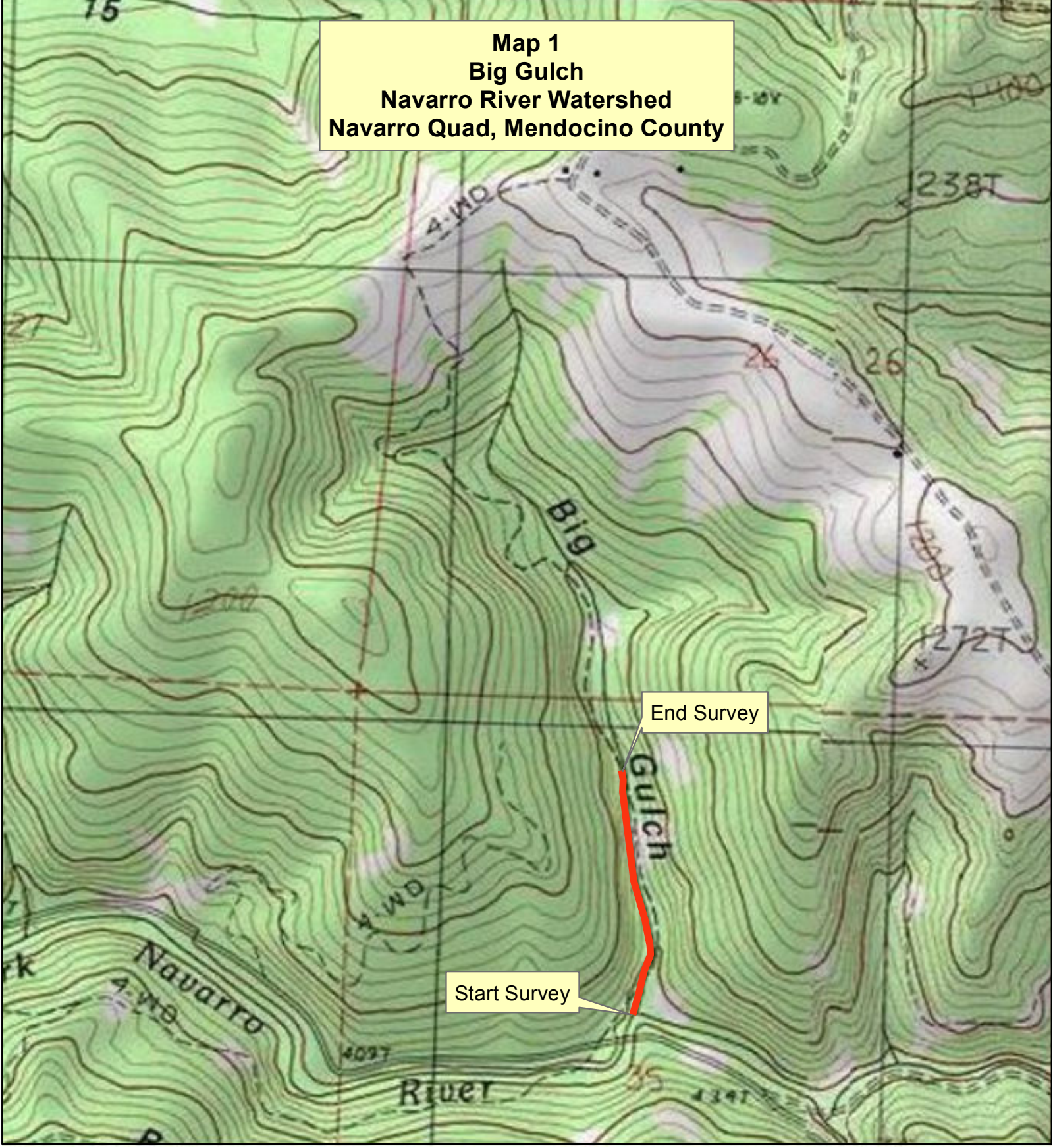
GRAPH 10

# BIG GULCH 2012 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

**Map 1**  
**Big Gulch**  
**Navarro River Watershed**  
**Navarro Quad, Mendocino County**



 Channel Type A4

