

# **STREAM INVENTORY REPORT**

## **South Fork Usal Creek**

### INTRODUCTION

A stream inventory was conducted from July 18, 2006 to July 27, 2006 on South Fork Usal Creek. The survey began at the confluence with Usal Creek and extended upstream 3.4 miles. Stream inventories and reports were also completed for one tributary to South Fork Usal Creek.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in South Fork Usal Creek.

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

South Fork Usal Creek is a tributary to Usal Creek, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). South Fork Usal Creek's legal description at the confluence with Usal Creek is T23 R18. Its location is 39.8436 north latitude and 123.8280 west longitude, LLID number 1238281398435. South Fork Usal Creek is a second order stream and has approximately 3.2 miles of blue line stream according to the USGS Hales Grove 7.5 minute quadrangle. South Fork Usal Creek drains a watershed of approximately 8.0 square miles. Elevations range from about 30 feet at the mouth of the creek to 2,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is primarily owned and is managed for timber production. Vehicle access exists via private road (M&M Road) from State Route 1.

### METHODS

The habitat inventory conducted in South Fork Usal Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries Commission (PSMFC) Fisheries Technicians that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

### SAMPLING STRATEGY

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

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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 South Fork Usal Creek 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". South Fork Usal Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

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### 5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In South Fork Usal Creek, 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 unsuited 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 South Fork Usal Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

### 7. Substrate Composition:

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

### 8. Canopy:

Stream canopy density was estimated using modified handheld spherical densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In South Fork Usal Creek, 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 South Fork Usal Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

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### 10. Large Woody Debris Count:

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

### 11. Average Bankfull Width:

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

## DATA ANALYSIS

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

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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for South Fork Usal Creek 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

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- 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 July 18, 2006 to July 27, 2006, was conducted by J. Caldwell and J. Beck (PSMFC). The total length of the stream surveyed was 18,160 feet with an additional 209 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.0 cfs on July 31, 2006.

South Fork Usal Creek is an F4 channel type for the entire 18,369 feet of the stream surveyed. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 59 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 73 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% pool units, 34% riffle units, 22% flatwater units, and 2% dry units (Graph 1). Based on total length of Level II habitat types there were 43% riffle units, 34% flatwater units, 19% pool units, and 4% dry units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 33%; mid-channel pool units, 31%; and step run units, 13% (Graph 3). Based on percent total length, low gradient riffle units made up 43%; step run units 24% and mid-channel pool units 15%.

A total of 92 pools were identified (Table 3). Main channel pools were the most frequently encountered at 82% (Graph 4), and comprised 88% 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. Fifty-three of the 92 pools (58%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 92 pool tail-outs measured, 37 had a value of 1 (40.2%); 52 had a value of 2 (56.5%); 3 had a value of 3 (3.3%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst.

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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 16, flatwater habitat types had a mean shelter rating of 20, and pool habitats had a mean shelter rating of 45 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 66. Main channel pools had a mean shelter rating of 40 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in South Fork Usal Creek. Graph 7 describes the pool cover in South Fork Usal Creek. 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 90% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 10% of pool the tail-outs.

The mean percent canopy density for the surveyed length of South Fork Usal Creek was 94%. Six percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 77% and 23%, respectively. Graph 9 describes the mean percent canopy in South Fork Usal Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 95%. The dominant elements composing the structure of the stream banks consisted of 100% sand/silt/clay (Graph 10). Hardwood trees were the dominant vegetation type observed in 72% of the units surveyed. Additionally, 28% of the units surveyed had coniferous trees as the dominant vegetation

## **DISCUSSION**

South Fork Usal Creek is an F4 for the entire 18,369 feet of the stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days July 18, 2006 to July 27, 2006, ranged from 59 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 73 degrees Fahrenheit. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 34% of the total length of this survey, riffles 43%, and pools 19%. Fifty-three of the 92 (58%) pools had a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structure that will increase or deepen pool habitat is recommended.

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Eighty-nine of the 92 pool tail-outs measured had embeddedness ratings of 1 or 2. Three of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

All of the 90 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 was 45. The shelter rating in the flatwater habitats was 20. 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 South Fork Usal Creek. Large woody debris is the dominant cover type in pools followed by small woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 94%. 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 95%, 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) South Fork Usal Creek 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) 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.
- 4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from large wood. Adding high quality complexity with woody cover in the pools is desirable.

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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 confluence with Usal Creek.
66	0003.00	Bridge at the top of the unit.
1385	0015.00	Small debris accumulation at top of unit.
1594	0017.00	Log debris accumulation (LDA) at top of unit.
2446	0025.00	There is a bridge at 28' into unit.
3959	0040.00	Left bank tributary enters 19' into unit.
6108	0069.00	Small LDA at top of unit.
6240	0071.00	LDA covering most of unit with associated left bank erosion.
6264	0072.00	Small LDA halfway into unit.
6390	0074.00	Culvert enters on left bank.
7112	0084.00	There is a road on left bank.
7170	0085.00	Bridge at 120' into unit.
7324	0086.00	Right bank tributary 50' into unit.
7625	0090.00	LDA 47' into unit.
8213	0097.00	Step pool created by LWD.
8339	0100.00	LDA at top of unit.
8461	0102.00	LDA at top of unit.
8660	0104.00	Small mud slide on right bank.
9106	0114.00	Left bank tributary enters at 355' into unit.

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9813	0119.00	Right bank erosion with associated LDA.
9813	0119.00	LDA 20' into unit with associated right bank erosion.
10008	0123.00	Right bank erosion 85' into unit.
10340	0124.00	LDA 83' into unit.
10702	0128.00	Right bank tributary enters at top of unit.
11106	0137.00	Left bank tributary.
11223	0141.00	Right bank erosion.
11250	0142.00	LDA at 252' into unit.
11563	0144.00	Left bank tributary enters 34' into unit.
12422	0154.00	LDA with associated left bank erosion at top of unit.
12740	0159.00	Left bank tributary enters at 20' into unit.
12740	0159.00	LDA at top of unit.
12782	0160.00	Very large LDA at top of unit.
12932	0161.00	Channel dry for 69 feet.
13721	0172.00	LDA over much of the unit.
13781	0174.00	There is an LDA at beginning of unit.
13902	0175.00	There is left bank erosion.
14018	0177.00	Left bank tributary enters at 121' into unit.
14772	0185.00	LDA at 50' into unit.
15635	0193.00	There is a 5' foot bedrock cascade at top of pool.
16291	0200.00	Left bank tributary enters unit at 276'.
16291	0200.00	There is a right bank erosion 30' into unit, 30' x 15' x 40'.
17482	0209.00	Ten foot plunge is a possible barrier.

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17769	0214.00	Left bank mudslide 60' into unit, 30' x 10' x 15'.
17769	0214.00	LDA at top of unit.
17970	0215.00	LDA throughout unit.
18160	0218.00	End of survey due to possible 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: South Fork Usal

LLID: 1238281398435 Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

Latitude: 39:50:37.0N

Longitude: 123:49:41.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
4	0	DRY	1.8	196	783	4.3									
49	7	FLATWATER	22.3	128	6250	34.0	13.6	0.6	1.5	1641	80406	1000	48992		20
92	91	POOL	41.8	37	3403	18.5	12.5	1.0	2.2	479	44087	680	61882	538	45
75	6	RIFFLE	34.1	106	7933	43.2	10.2	0.4	0.7	614	46078	253	18975		16
<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>		
220	104				18369					170570			129848		

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

Stream Name: South Fork Usal

LLID: 1238281398435

Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

Latitude: 39:50:37.0N

Longitude: 123:49:41.0W

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 (%)
73	5	LGR	33.2	108	7883	42.9	11	0.4	1	728	53118	300	21883		4	94
2	1	CAS	0.9	25	50	0.3	4	0.4	0.8	48	96	19	38		90	93
7	2	POW	3.2	132	925	5.0	12	0.5	1.2	1075	7525	538	3763		15	95
13	2	RUN	5.9	77	1000	5.4	17	0.7	2.5	2064	26829	1245	16188		5	93
29	3	SRN	13.2	149	4325	23.5	12	0.6	1.7	1736	50354	1144	33190		33	92
1	1	TRP	0.5	18	18	0.1	8	1.7	2.6	144	144	259	259	245	40	91
68	68	MCP	30.9	40	2708	14.7	13	1.0	4.4	537	36510	771	51650	604	42	94
6	5	STP	2.7	47	283	1.5	8	0.8	2.4	381	2286	419	2514	345	23	96
3	3	LSL	1.4	25	75	0.4	12	0.8	2.2	293	880	313	940	248	105	98
1	1	LSR	0.5	19	19	0.1	8	0.5	1.3	137	137	123	123	68	50	96
13	13	PLP	5.9	23	300	1.6	13	1.3	3.8	310	4032	472	6142	395	59	96
4	0	DRY	1.8	196	783	4.3										85

Total Units  
220

Total Units Fully Measured  
104

Total Length (ft.)  
18369

Total Area (sq.ft.)  
181910

Total Volume (cu.ft.)  
136689

**Table 3 - Summary of Pool Types**

Stream Name: South Fork Usal

LLID: 1238281398435

Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

Latitude: 39:50:37.0N

Longitude: 123:49:41.0W

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
75	74	MAIN	82	40	3009	88	12.5	1.0	521	39080	581	43015	40
17	17	SCOUR	18	23	394	12	12.4	1.1	297	5049	350	5951	66

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
92	91	3403	44128	48966

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

Stream Name: South Fork Usal

LLID: 1238281398435

Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

Latitude: 39:50:37.0N

Longitude: 123:49:41.0W

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
1	TRP	1	0	0	0	0	1	100	0	0	0	0
68	MCP	74	0	0	28	41	30	44	9	13	1	1
6	STP	7	1	17	3	50	2	33	0	0	0	0
3	LSL	3	0	0	1	33	2	67	0	0	0	0
1	LSR	1	0	0	1	100	0	0	0	0	0	0
13	PLP	14	0	0	5	38	4	31	4	31	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
92	1	1	38	41	39	42	13	14	1	1

Mean Maximum Residual Pool Depth (ft.): 2.2

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

Stream Name: South Fork Usal

LLID: 1238281398435

Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Dry Units: 4

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

Latitude: 39:50:37.0N

Longitude: 123:49:41.0W

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
73	6	LGR	0	50	40	0	0	0	0	10	0
2	1	CAS	0	10	80	0	0	0	0	10	0
75	7	TOTAL RIFFLE	0	42	48	0	0	0	0	10	0
7	2	POW	0	0	0	0	0	0	0	100	0
13	2	RUN	0	25	15	20	40	0	0	0	0
29	3	SRN	13	20	15	20	7	0	0	25	0
49	7	TOTAL FLAT	6	16	11	14	14	0	0	39	0
1	1	TRP	0	20	30	50	0	0	0	0	0
68	67	MCP	4	15	56	13	1	0	0	7	3
6	6	STP	7	11	33	2	0	0	3	34	11
3	3	LSL	3	8	85	0	3	0	0	0	0
1	1	LSR	0	15	0	85	0	0	0	0	0
13	13	PLP	7	13	64	10	0	0	5	2	0
92	91	TOTAL POOL	4	14	56	13	1	0	1	8	3
220	105	TOTAL	4	16	52	12	2	0	1	10	3

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

Stream Name: South Fork Usal

LLID: 1238281398435

Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Dry Units: 4

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

Latitude: 39:50:37.0N

Longitude: 123:49:41.0W

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
73	5	LGR	0	0	40	60	0	0	0
2	1	CAS	0	0	0	100	0	0	0
7	2	POW	0	0	0	50	0	50	0
13	2	RUN	0	0	100	0	0	0	0
29	2	SRN	0	0	0	50	50	0	0
1	1	TRP	0	0	100	0	0	0	0
68	68	MCP	0	4	57	35	1	1	0
6	6	STP	0	17	33	17	0	33	0
3	3	LSL	0	33	33	33	0	0	0
1	1	LSR	0	0	100	0	0	0	0
13	12	PLP	0	8	67	8	17	0	0

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

Stream Name: South Fork Usal

LLID: 1238281398435

Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

Latitude: 39:50:37.0N

Longitude: 123:49:41.0W

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Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
94	23	77	0	97	95

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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 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: South Fork Usal

LLID: 1238281398435

Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

Latitude: 39:50:37.0N

Longitude: 123:49:41.0W

**Mean Percentage of Dominant Stream Bank Substrate**

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	0	0	0.0
Boulder	0	0	0.0
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	104	104	100.0

**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	0	1	0.5
Hardwood Trees	80	69	71.6
Coniferous Trees	24	34	27.9
No Vegetation	0	0	0.0

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: South Fork Usal

LLID: 1238281398435

Drainage: Rockport

Survey Dates: 7/18/2006 to 7/27/2006

Confluence Location: Quad: HALES GROVE

Legal Description: T000R000S00

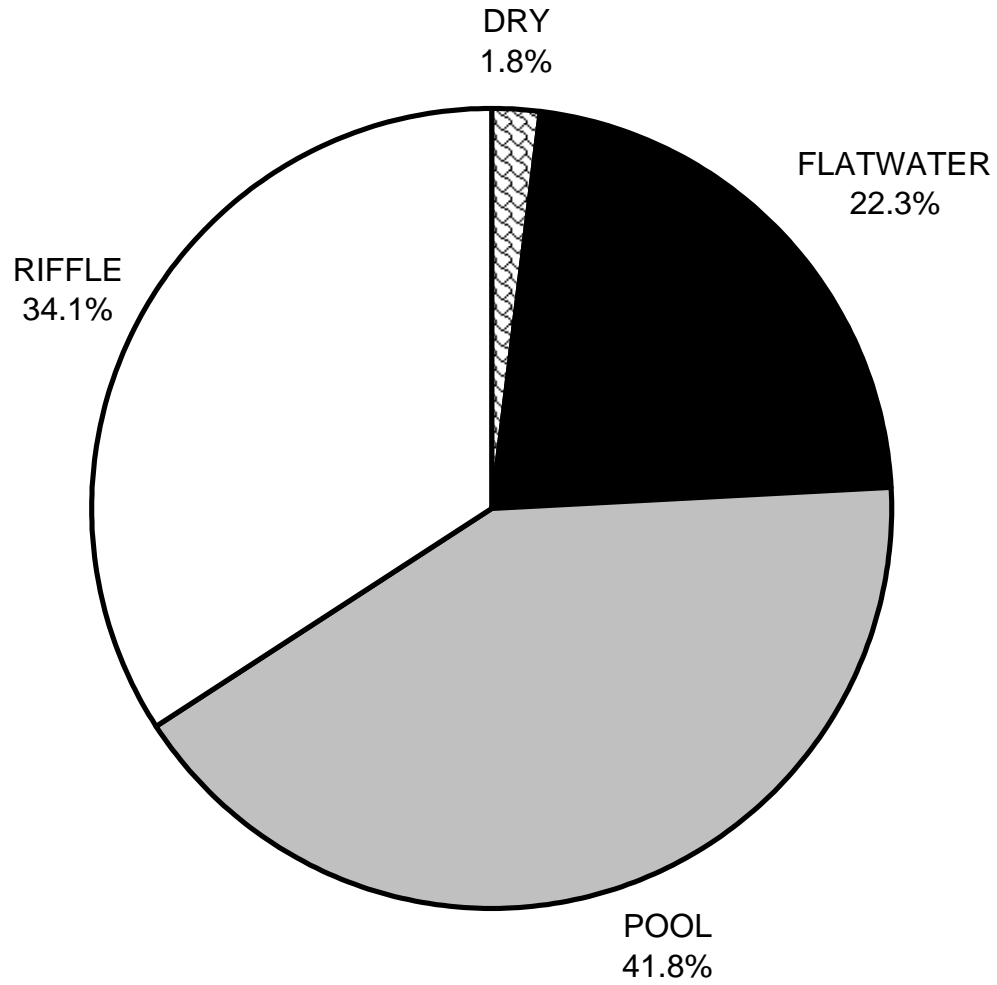
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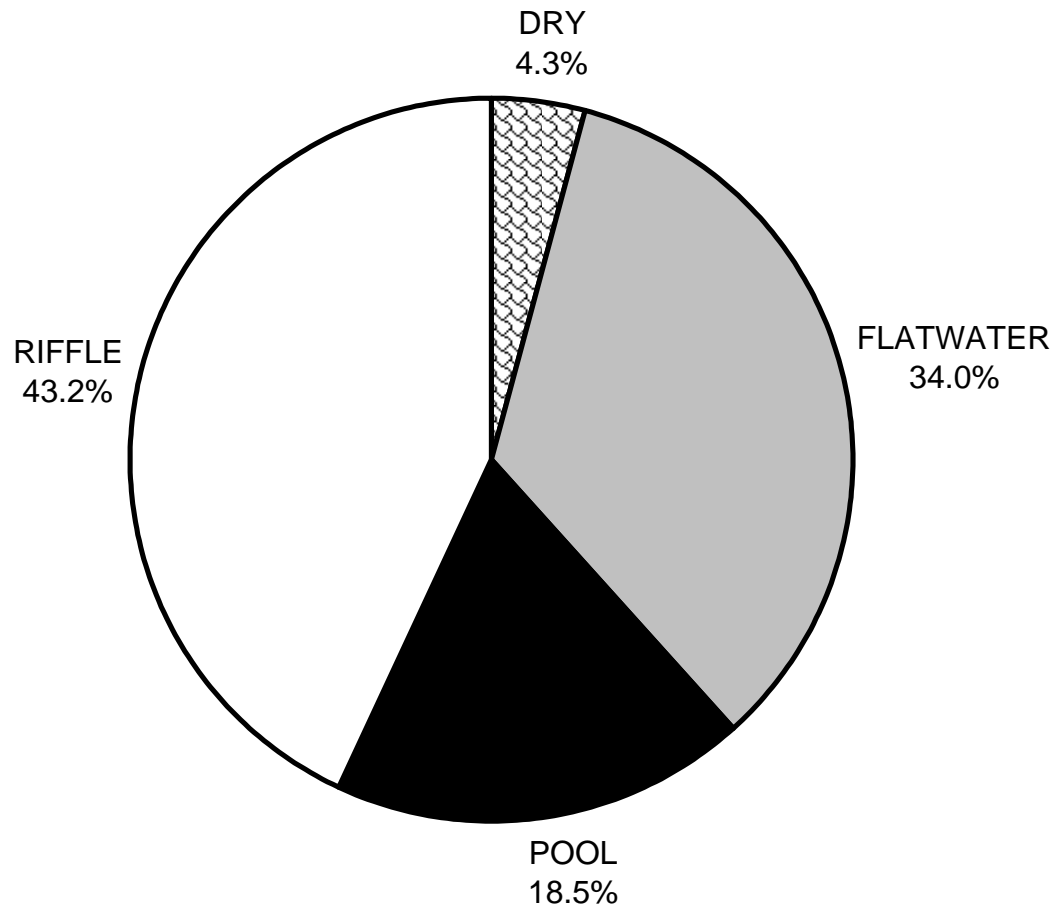
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	6	4
SMALL WOODY DEBRIS (%)	42	16	14
LARGE WOODY DEBRIS (%)	48	11	56
ROOT MASS (%)	0	14	13
TERRESTRIAL VEGETATION (%)	0	14	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	1
BOULDERS (%)	10	39	8
BEDROCK LEDGES (%)	0	0	3

# SOUTH FORK USAL 2006 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

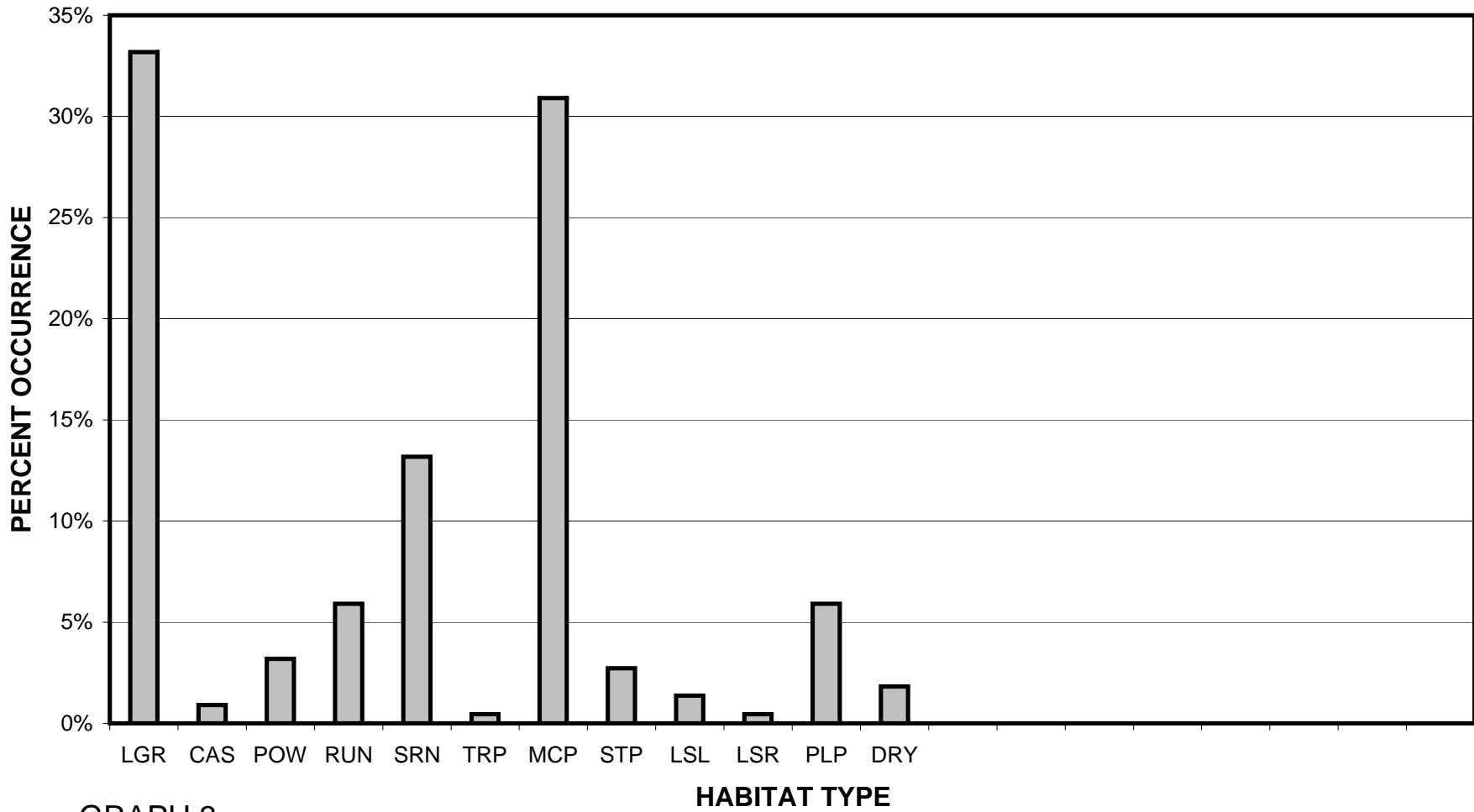
# SOUTH FORK USAL 2006 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

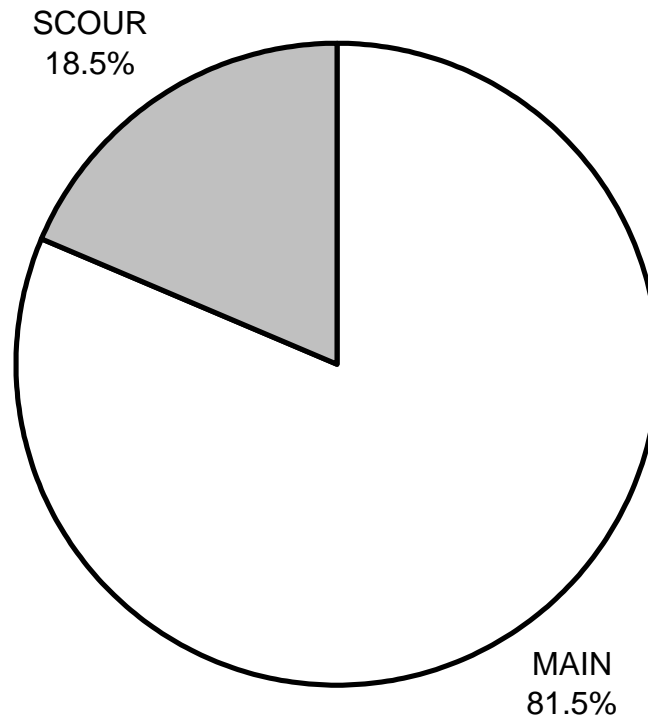
# SOUTH FORK USAL 2006

## HABITAT TYPES BY PERCENT OCCURRENCE



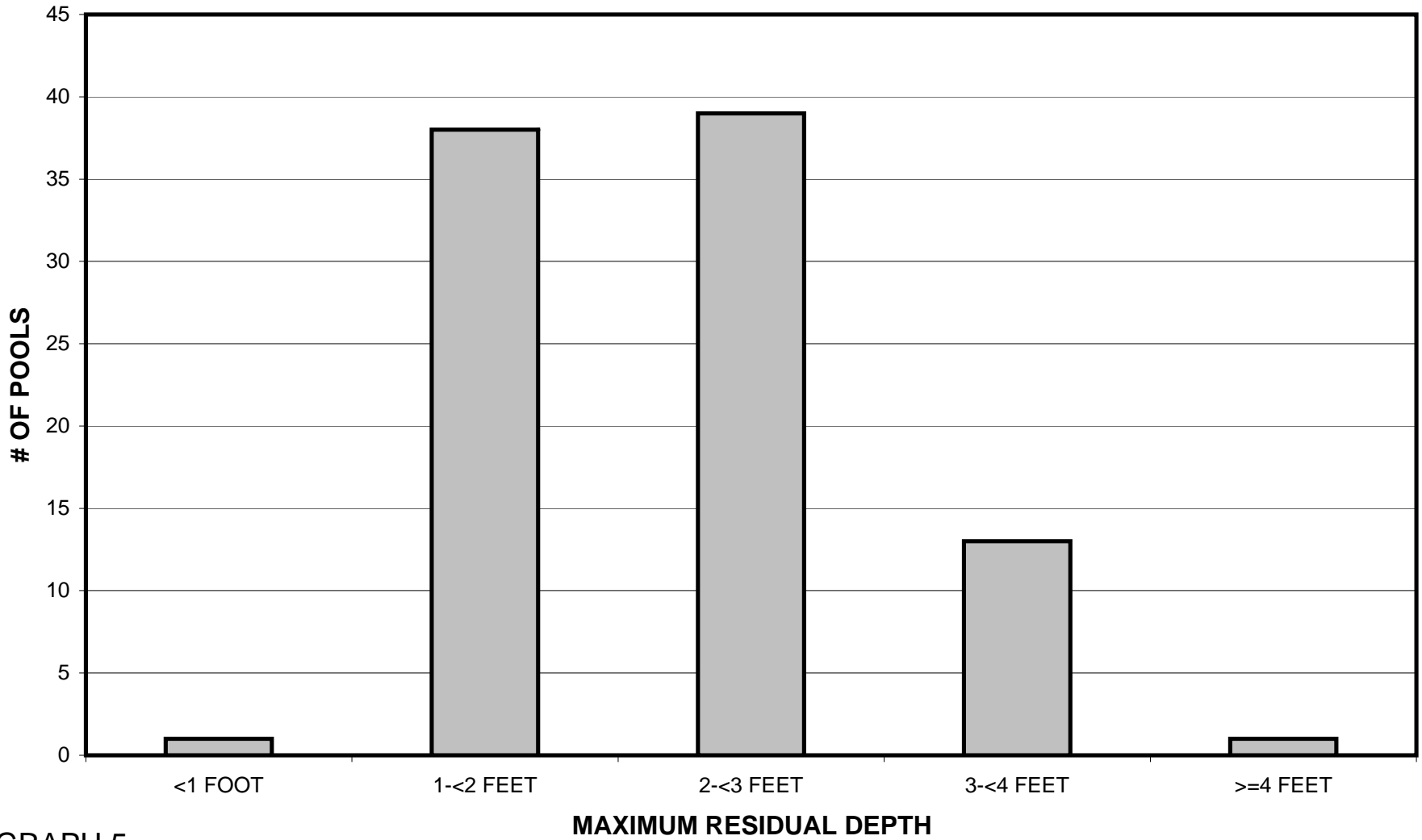
GRAPH 3

**SOUTH FORK USAL 2006  
POOL TYPES BY PERCENT OCCURRENCE**



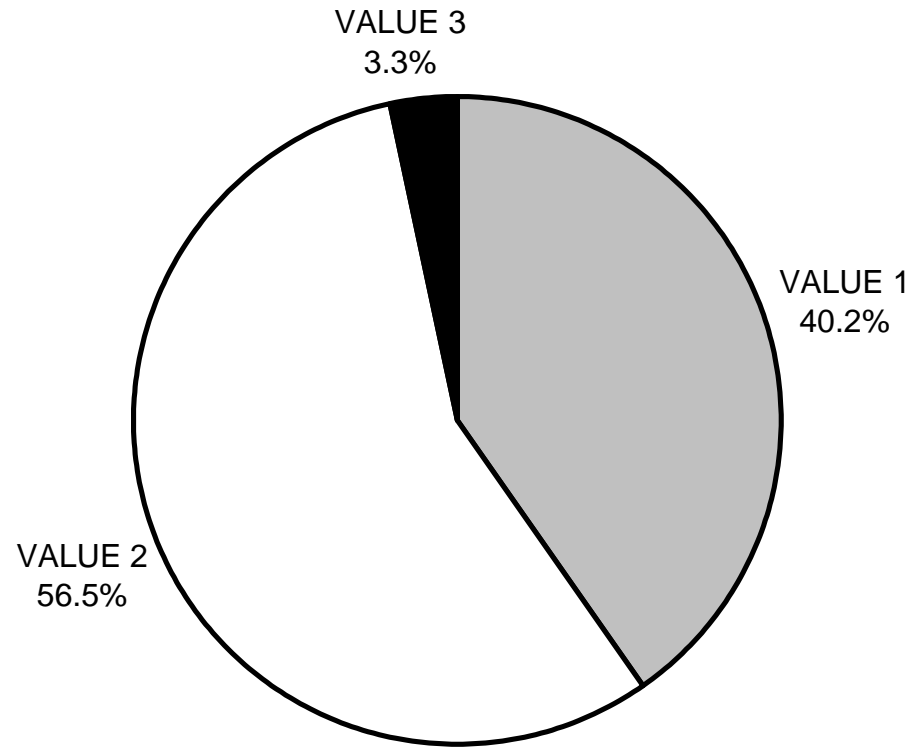
GRAPH 4

# SOUTH FORK USAL 2006 MAXIMUM DEPTH IN POOLS



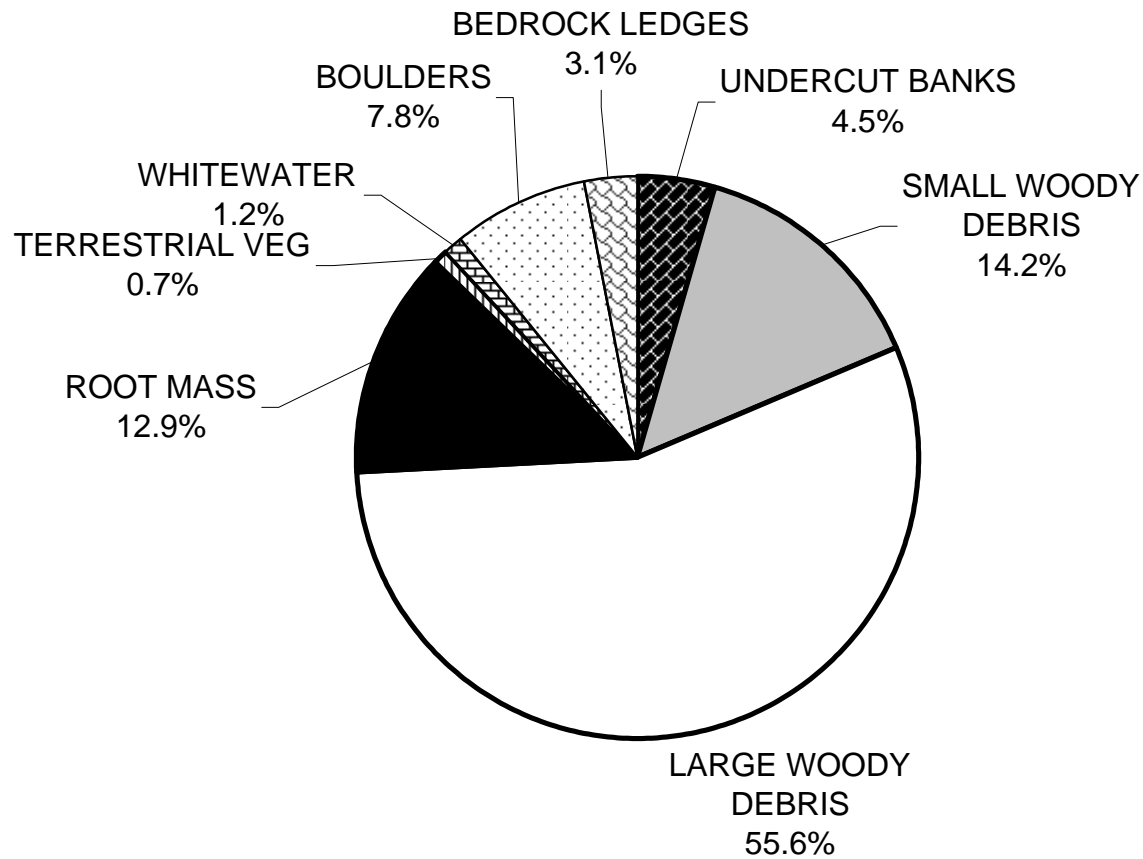
GRAPH 5

# SOUTH FORK USAL 2006 PERCENT EMBEDDEDNESS



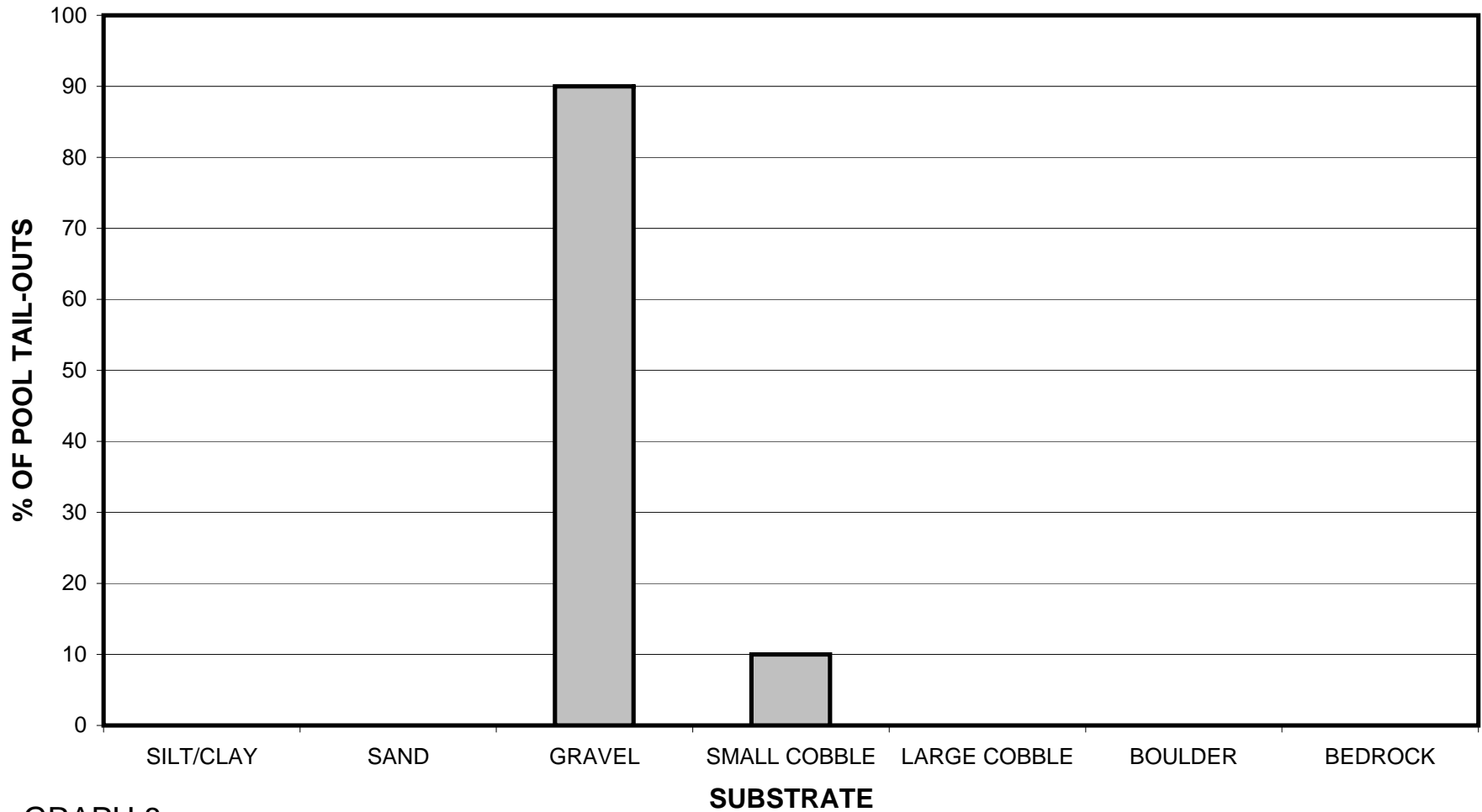
GRAPH 6

# SOUTH FORK USAL 2006 MEAN PERCENT COVER TYPES IN POOLS



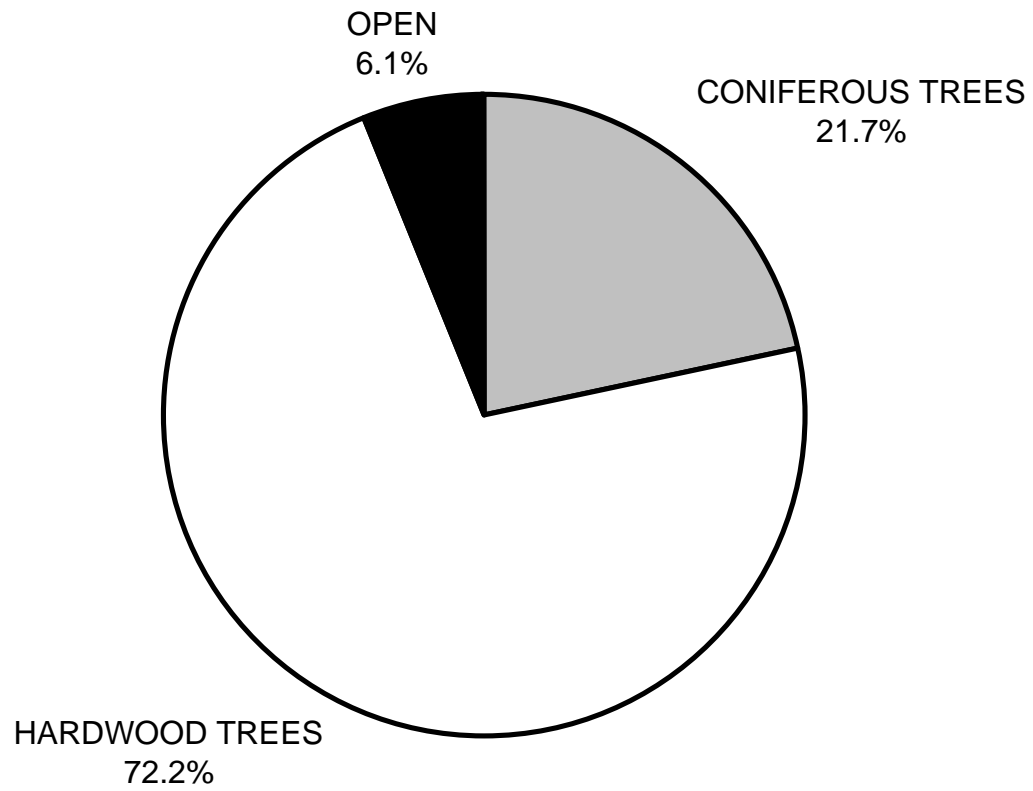
GRAPH 7

# SOUTH FORK USAL 2006 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



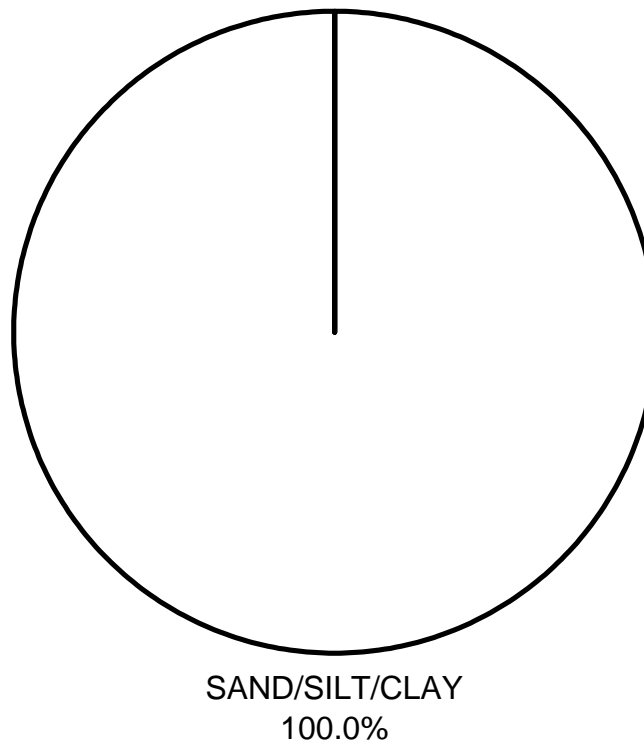
GRAPH 8

# SOUTH FORK USAL 2006 MEAN PERCENT CANOPY



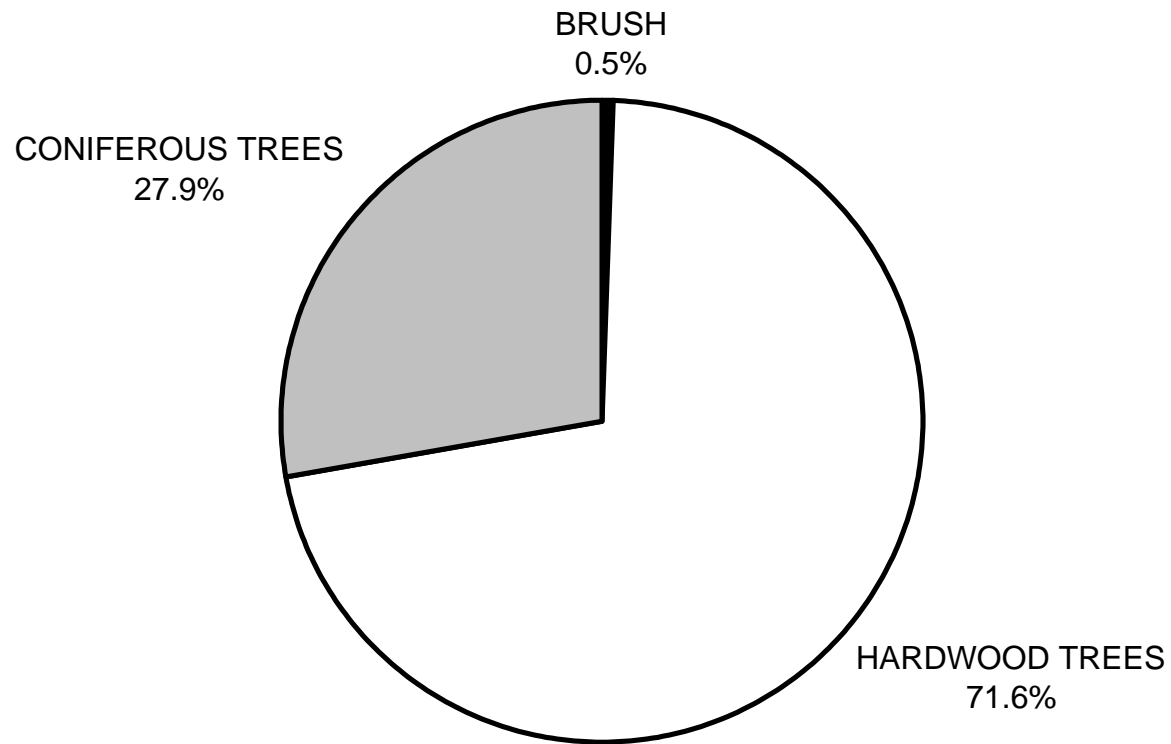
GRAPH 9

**SOUTH FORK USAL 2006  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



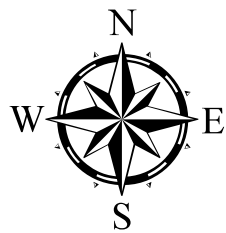
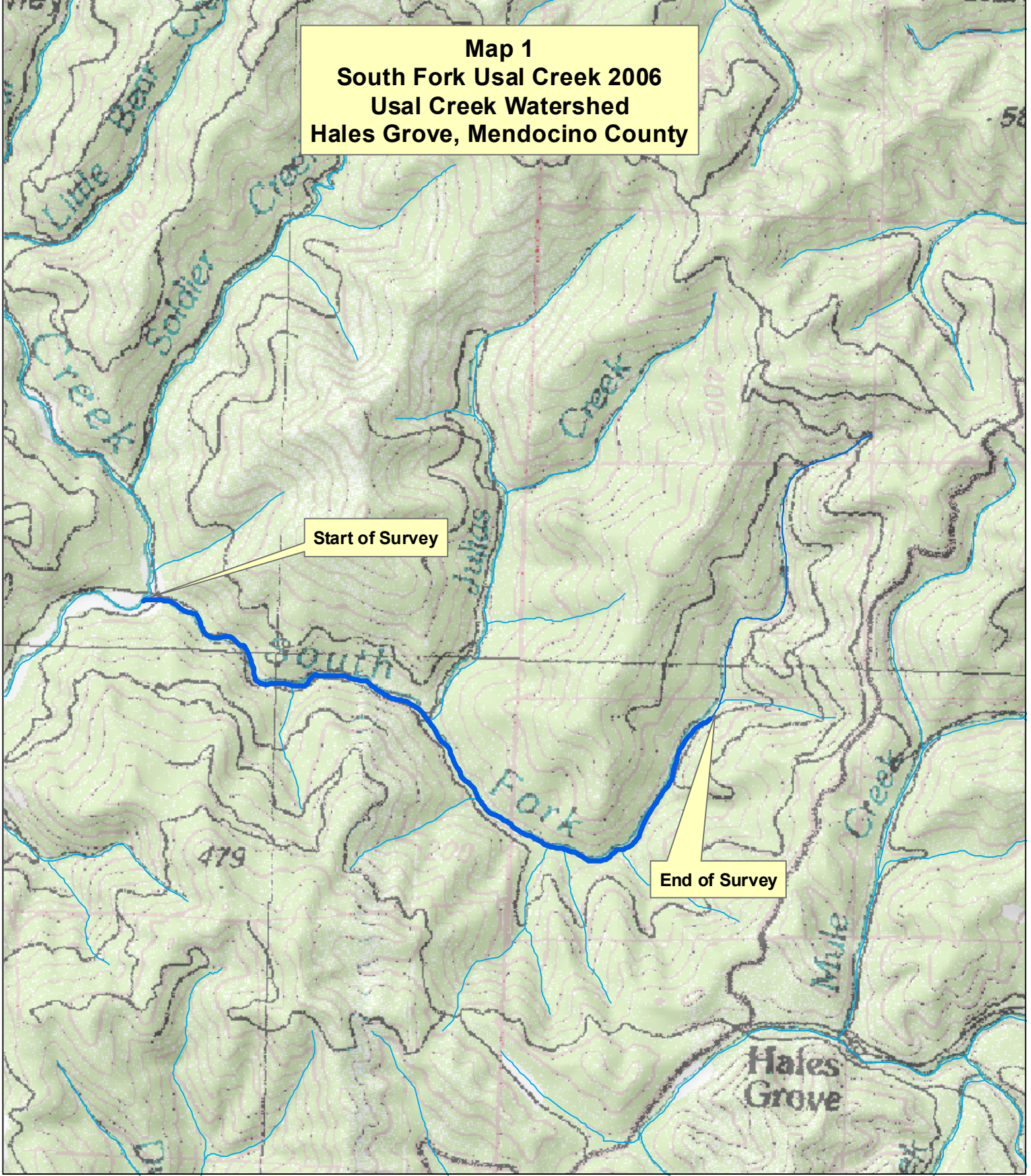
GRAPH 10

**SOUTH FORK USAL 2006  
DOMINANT BANK VEGETATION IN SURVEY REACH**




GRAPH 11

**Map 1**  
**South Fork Usal Creek 2006**  
**Usal Creek Watershed**  
**Hales Grove, Mendocino County**



**Legend**

 South Fork Usal Creek Survey

0      2,100      4,200 Feet  
