

STREAM INVENTORY REPORT

Soda Spring Gulch

INTRODUCTION

A stream inventory was conducted from October 18 to October 19, 2011 on Soda Spring Gulch. The survey began at the confluence with Little North Fork and extended upstream 0.3 miles.

The Soda Spring 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 Soda Spring 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

Soda Spring Gulch is a tributary to Little North Fork, tributary to South Fork Albion River, tributary to Albion River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Soda Spring Gulch's legal description at the confluence with Little North Fork is T16N R16W S21. Its location is 39.2352 degrees north latitude and 123.6433 degrees west longitude, LLID number 1236422392353. Soda Spring Gulch is an intermittent stream according to the USGS Elk 7.5 minute quadrangle. Soda Spring Gulch drains a watershed of approximately 0.4 square miles. Elevations range from about 195 feet at the mouth of the creek to 950 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 a private logging road off Flynn Creek Road.

METHODS

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

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

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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 Soda Spring 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". Soda Spring 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 Soda Spring Gulch, embeddedness

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was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Soda Spring 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Soda Spring 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 Soda Spring 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

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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 Soda Spring Gulch. In addition, underwater observations were made at 10 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

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

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

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- 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 October 18 to October 19, 2011 was conducted by A. Blessing, R. Spencer, and B. James (WSP). The total length of the stream surveyed was 1,756 feet.

Stream flow was not measured on Soda Spring Gulch.

Soda Spring Gulch is a G4 channel type for the entire length of the survey, 1,756 feet. 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 56 to 58 degrees Fahrenheit. Air temperatures ranged from 61 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 45% flatwater units, 45% pool units, 6% dry units, and 5% riffle units (Graph 1). Based on total length of Level II habitat types there were 74% flatwater units, 22% pool units, 3% dry units, and 2% riffle units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were step run units, 42%; mid-channel pool units, 32%; and plunge pool units, 11% (Graph 3). Based on percent total length, step run units made up 71%, mid-channel pool units 15%, and plunge pool units 4%.

A total of 29 pools were identified (Table 3). Main channel pools were the most frequently encountered at 76% (Graph 4), and comprised 80% 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. Five of the 29 pools (17%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 29 pool tail-outs measured, 28 had a value of 1 (96.6%); one had a value of 2 (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

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rating of 0, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 28 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 29. Scour pools had a mean shelter rating of 25 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover type in Soda Spring Gulch. Graph 7 describes the pool cover in Soda Spring Gulch. Undercut banks are 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 97% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 3% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Soda Spring Gulch was 99%. One percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 6% and 94%, respectively. Graph 9 describes the mean percent canopy in Soda Spring Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 100%. The dominant elements composing the structure of the stream banks consisted of 94% sand/silt/clay, and 6% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 79% of the units surveyed. Additionally, 16% of the units surveyed had grass as the dominant vegetation type, and 6% had deciduous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 10 sites for species composition and distribution in Soda Spring Gulch on October 24, 2011. The water temperature taken during the sampling period of 1323 hours to 1347 hours was 54 degrees Fahrenheit. Air temperatures ranged from 58 to 62 degrees Fahrenheit. The sites were sampled by I. Mikus and M. Groff (DFG).

The survey sites yielded one age 1+ steelhead/rainbow trout (SH/RT).

The following chart displays the information yielded from these sites:

2011 Soda Spring 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									
10/24/11	1	004	Pool	129	0	1	0	0	0
	2	011	Pool	302	0	0	0	0	0
	3	013	Pool	379	0	0	0	0	0

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	4	015	Pool	415	0	0	0	0	0
	5	018	Pool	454	0	0	0	0	0
	6	020	Pool	485	0	0	0	0	0
	7	025	Pool	557	0	0	0	0	0
	8	027	Pool	598	0	0	0	0	0
	9	029	Pool	618	0	0	0	0	0
	10	031	Pool	672	0	0	0	0	0

DISCUSSION

Soda Spring Gulch is a G4 channel type for the entire length of the survey, 1,756 feet. 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 October 18 to October 19, 2011 ranged from 56 to 58 degrees Fahrenheit. Air temperatures ranged from 61 to 66 degrees Fahrenheit. This is a suitable 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 74% of the total length of this survey, riffles 2%, and pools 22%. Five of the 29 (17%) 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 log structures that will increase or deepen pool habitat is recommended.

All of the 29 pool tail-outs measured had embeddedness ratings of 1 or 2. 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 29 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools is 28. The shelter rating in the flatwater habitats is 9. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Soda Spring Gulch. Undercut banks are 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.

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The mean percent canopy density for the stream was 99%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 99% and 100%, 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) Soda Spring 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. The channel is a G4 for the entire length of the survey, 1,756 feet.
138	0006.00	Log debris accumulation (LDA) #01 contains one piece of large woody debris (LWD) and measures 3.5' high x 4' wide x 10' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from silt to gravel and measures 5' wide x 20' long x 1' deep. No fish were observed above the LDA.
219	0008.00	LDA #02 contains two pieces of LWD and measures 3' high x 8' wide x 4' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 10' wide x 10' long x 2' deep.
289	0011.00	LDA #03 contains one piece of LWD and measures 2.5' high x 6' wide x 4' long. Water does not flow through the LDA. Retained sediment ranges from sand to gravel and measures 6' wide x 10' long x 2' deep.
438	0018.00	There is a 3.5' high plunge over root mass and woody debris. May be the site of an old road crossing.

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566	0025.00	LDA #04 contains one piece of LWD and measures 5' high x 6' wide x 4.5' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 3' wide x 10' long x 1' deep.
589	0027.00	There is a 1.2' high plunge over root mass and woody debris.
689	0033.00	LDA #05 contains one piece of LWD and measures 3.5' high x 8' wide x 10' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 3' wide x 5' long x 1' deep.
1352	0053.00	LDA #06 contains two pieces of LWD and measures 5.5' high x 10' 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 6' wide x 12' long x 2' deep.
1508	0056.00	There is a 5.6' high plunge over LDA #07.
1520	0057.00	LDA #07 contains three pieces of LWD and measures 7' high x 12' wide x 3' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 6' wide x 10' long x 3' deep.
1717	0065.00	End of survey due to possible end of anadromy. There is a 9' high plunge over root mass with no jump pool below it. Above the barrier there is a series of 1' high to 2' high plunges over 30 feet.

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: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

Latitude: 39:14:07.0N

Longitude: 123:38:32.0

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
4	0	DRY	6.2	14	57	3.2									
29	4	FLATWATER	44.6	45	1294	73.7	3.1	0.4	0.6	99	2870	40	1154		9
29	29	POOL	44.6	13	378	21.5	5.4	0.8	1.5	68	1980	65	1896	58	28
3	2	RIFFLE	4.6	9	27	1.5	2.0	0.1	0.1	14	41	1	4		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
65	35				1756					4892			3055		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

Latitude: 39:14:07.0N

Longitude: 123:38:32.0W

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 (%)
3	2	LGR	4.6	9	27	1.5	2	0.1	0.1	14	41	1	4		0	96
2	0	RUN	3.1	24	47	2.7										
27	4	SRN	41.5	46	1247	71.0	3	0.4	0.9	99	2672	40	1074		9	99
21	21	MCP	32.3	12	261	14.9	5	0.7	2.1	61	1276	51	1075	45	28	99
1	1	STP	1.5	41	41	2.3	5	0.7	2	195	195	156	156	136	40	100
7	7	PLP	10.8	11	76	4.3	6	1.1	2.2	73	510	95	666	87	25	99
4	0	DRY	6.2	14	57	3.2										

Total Units
65

Total Units Fully Measured
35

Total Length (ft.)
1756

Total Area (sq.ft.)
4694

Total Volume (cu.ft.)
2975

Table 3 - Summary of Pool Types

Stream Name: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

Latitude: 39:14:07.0N

Longitude: 123:38:32.0W

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
22	22	MAIN	76	14	302	80	5.1	0.7	67	1470	49	1083	29
7	7	SCOUR	24	11	76	20	6.3	1.1	73	510	87	609	25

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
29	29	378	1980	1692

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

Stream Name: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

Latitude: 39:14:07.0N

Longitude: 123:38:32.0W

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
21	MCP	72	5	24	13	62	3	14	0	0	0	0
1	STP	3	0	0	0	0	1	100	0	0	0	0
7	PLP	24	0	0	6	86	1	14	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
29	5	17	19	66	5	17	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Dry Units: 4

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

Latitude: 39:14:07.0N

Longitude: 123:38:32.0W

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
3	2	LGR	0	0	0	0	0	0	0	0	0
3	2	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
2	0	RUN									
27	4	SRN	4	13	49	3	8	0	0	25	0
29	4	TOTAL FLAT	4	13	49	3	8	0	0	25	0
21	21	MCP	37	30	25	7	0	0	2	0	0
1	1	STP	10	40	20	30	0	0	0	0	0
7	7	PLP	46	29	9	9	0	0	9	0	0
29	29	TOTAL POOL	38	30	20	8	0	0	3	0	0
65	35	TOTAL	34	28	24	7	1	0	3	3	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Dry Units: 4

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

Latitude: 39:14:07.0N

Longitude: 123:38:32.0W

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
3	2	LGR	0	0	100	0	0	0	0
2	0	RUN	0	0	0	0	0	0	0
27	4	SRN	0	0	100	0	0	0	0
21	21	MCP	14	10	67	5	5	0	0
1	1	STP	0	100	0	0	0	0	0
7	7	PLP	0	14	86	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

Latitude: 39:14:07.0N

Longitude: 123:38:32.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
99	94	6	0	99	100

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.

Stream Name:	Soda Spring Gulch	LLID:	1236422392353	Drainage:	Albion River		
Survey Dates:	10/18/2011 to 10/19/2011	Survey Length (ft.):	1756	Main Channel (ft.):	1756	Side Channel (ft.):	0
Confluence Location:	Quad: ELK	Legal Description:	T16NR16WS21	Latitude:	39:14:07.0N	Longitude:	123:38:32.0W

STREAM REACH: 1									
Channel Type: G4			Canopy Density (%): 98.7				Pools by Stream Length (%): 21.5		
Reach Length (ft.): 1756			Coniferous Component (%): 93.7				Pool Frequency (%): 44.6		
Riffle/Flatwater Mean Width (ft.): 2.8			Hardwood Component (%): 6.3				Residual Pool Depth (%):		
BFW:			Dominant Bank Vegetation: Coniferous Trees				< 2 Feet Deep: 83		
Range (ft.): 4 to 9			Vegetative Cover (%): 99.5				2 to 2.9 Feet Deep: 17		
Mean (ft.): 7			Dominant Shelter: Undercut Banks				3 to 3.9 Feet Deep: 0		
Std. Dev.: 2			Dominant Bank Substrate Type: Sand/Silt/Clay				>= 4 Feet Deep: 0		
Base Flow (cfs.): 0.0			Occurrence of LWD (%): 22				Mean Max Residual Pool Depth (ft.): 1.5		
Water (F): 56 - 58			Air (F): 61 - 66		LWD per 100 ft.:		Mean Pool Shelter Rating: 28		
Dry Channel (ft): 57			Riffles: 0						
			Pools: 5						
			Flat: 4						
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 97 Sm Cobble: 3 Lg Cobble: 0 Boulder: 0 Bedrock: 0									
Embeddedness Values (%): 1. 96.6 2. 3.4 3. 0.0 4. 0.0 5. 0.0									

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

Latitude: 39:14:07.0N

Longitude: 123:38:32.0W

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	2	2	5.7
Sand / Silt / Clay	33	33	94.3

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	5	6	15.7
Brush	0	0	0.0
Hardwood Trees	4	0	5.7
Coniferous Trees	26	29	78.6
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 1

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

StreamName: Soda Spring Gulch

LLID: 1236422392353

Drainage: Albion River

Survey Dates: 10/18/2011 to 10/19/2011

Confluence Location: Quad: ELK

Legal Description: T16NR16WS21

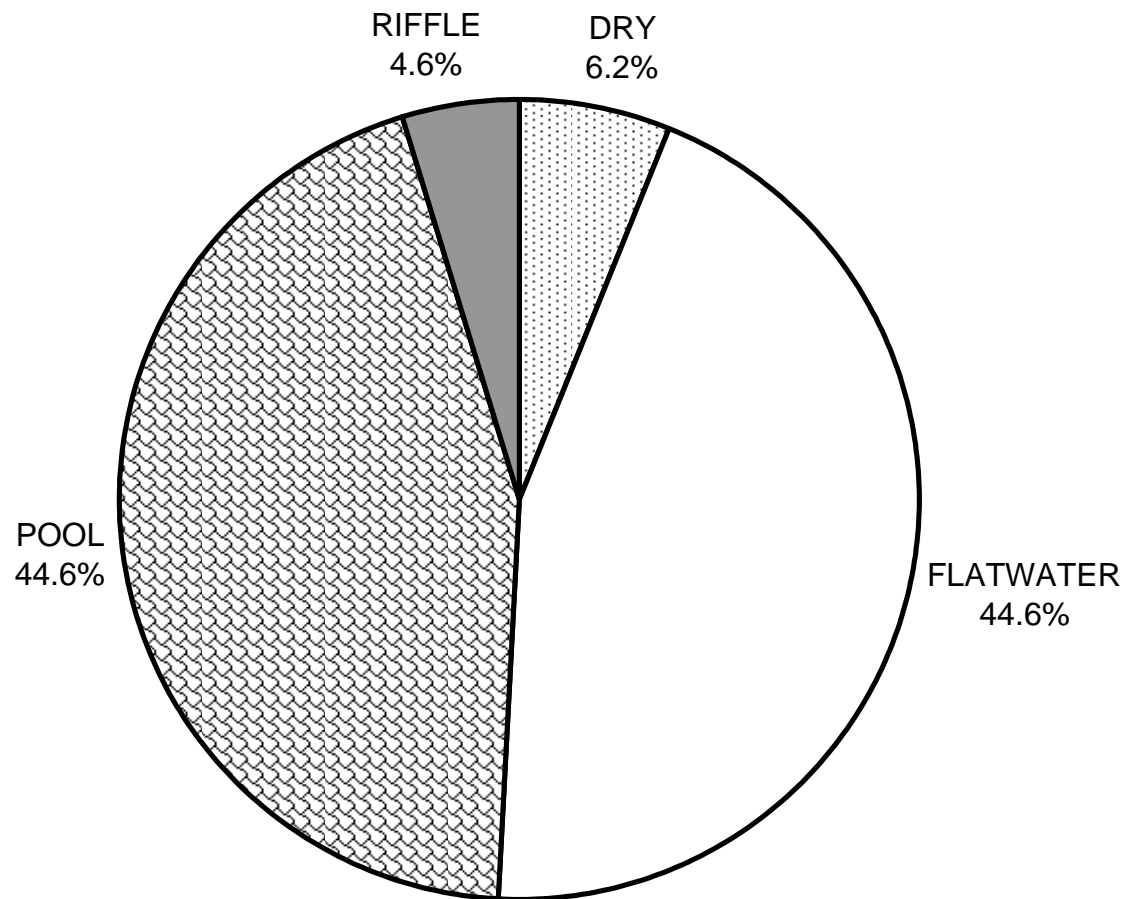
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Longitude: 123:38:32.0W

	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)	0	4	38
SMALL WOODY DEBRIS (%)	0	13	30
LARGE WOODY DEBRIS (%)	0	49	20
ROOT MASS (%)	0	3	8
TERRESTRIAL VEGETATION (%)	0	8	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	3
BOULDERS (%)	0	25	0
BEDROCK LEDGES (%)	0	0	0

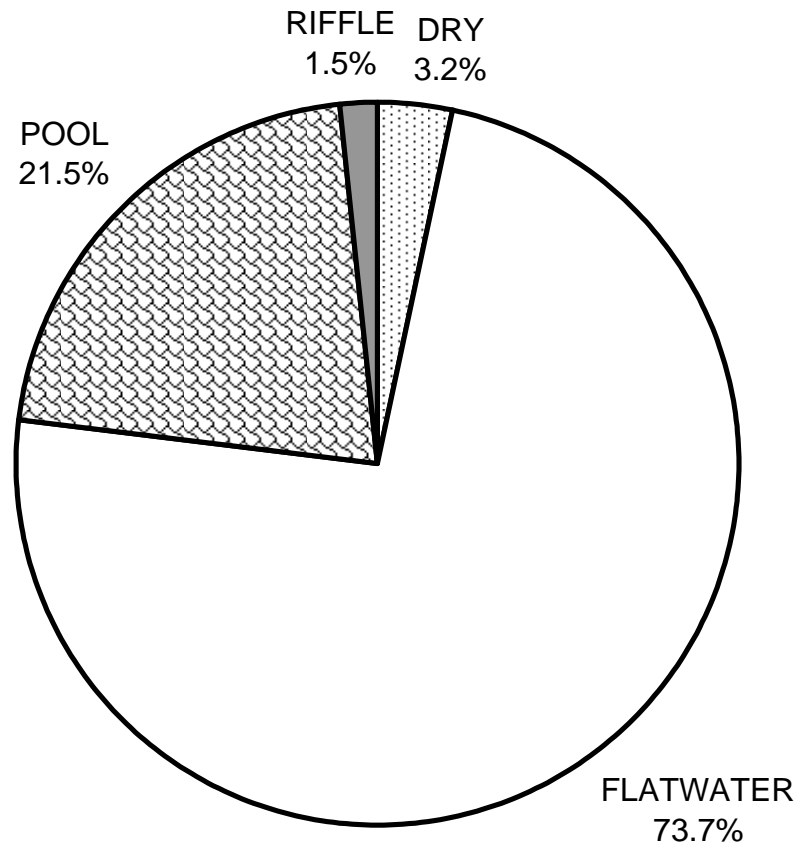
SODA SPRING GULCH 2011

HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

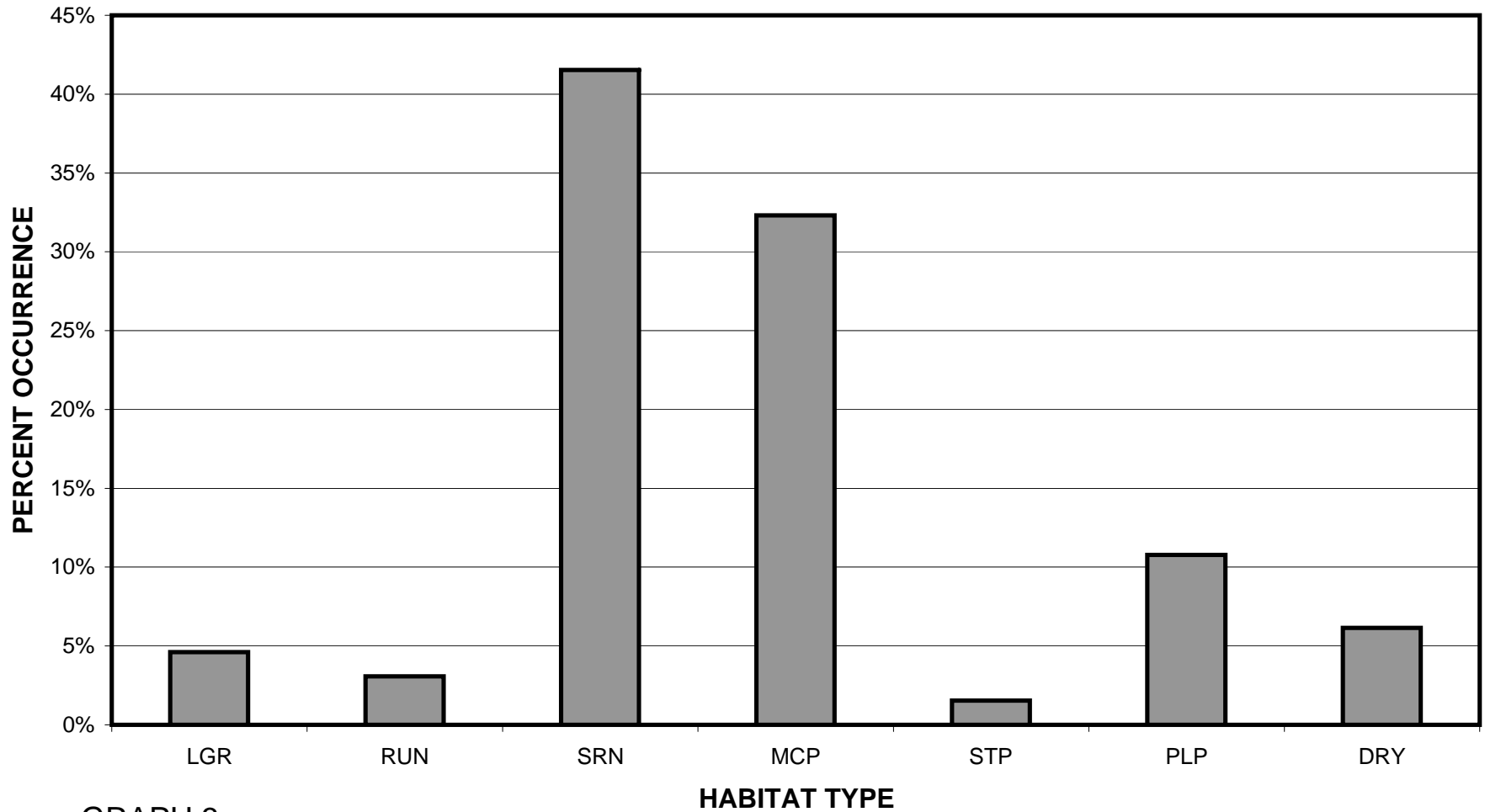
SODA SPRING GULCH 2011
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

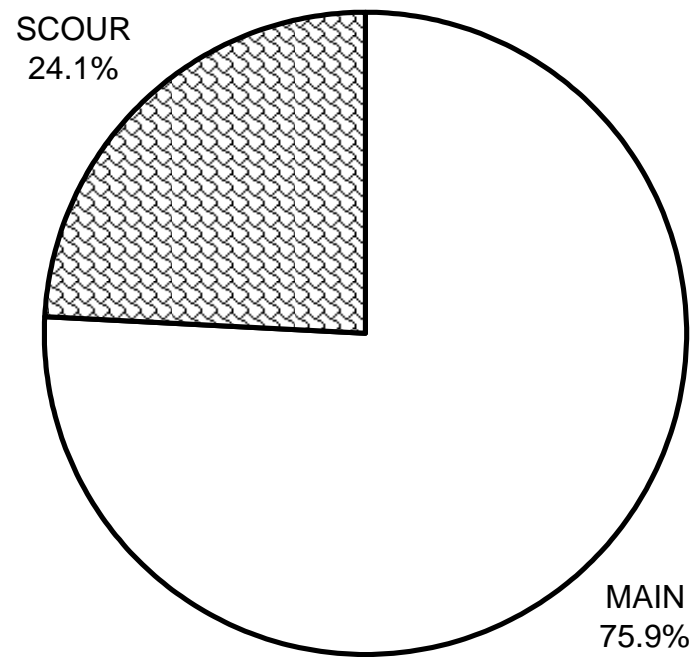
SODA SPRING GULCH 2011

HABITAT TYPES BY PERCENT OCCURRENCE



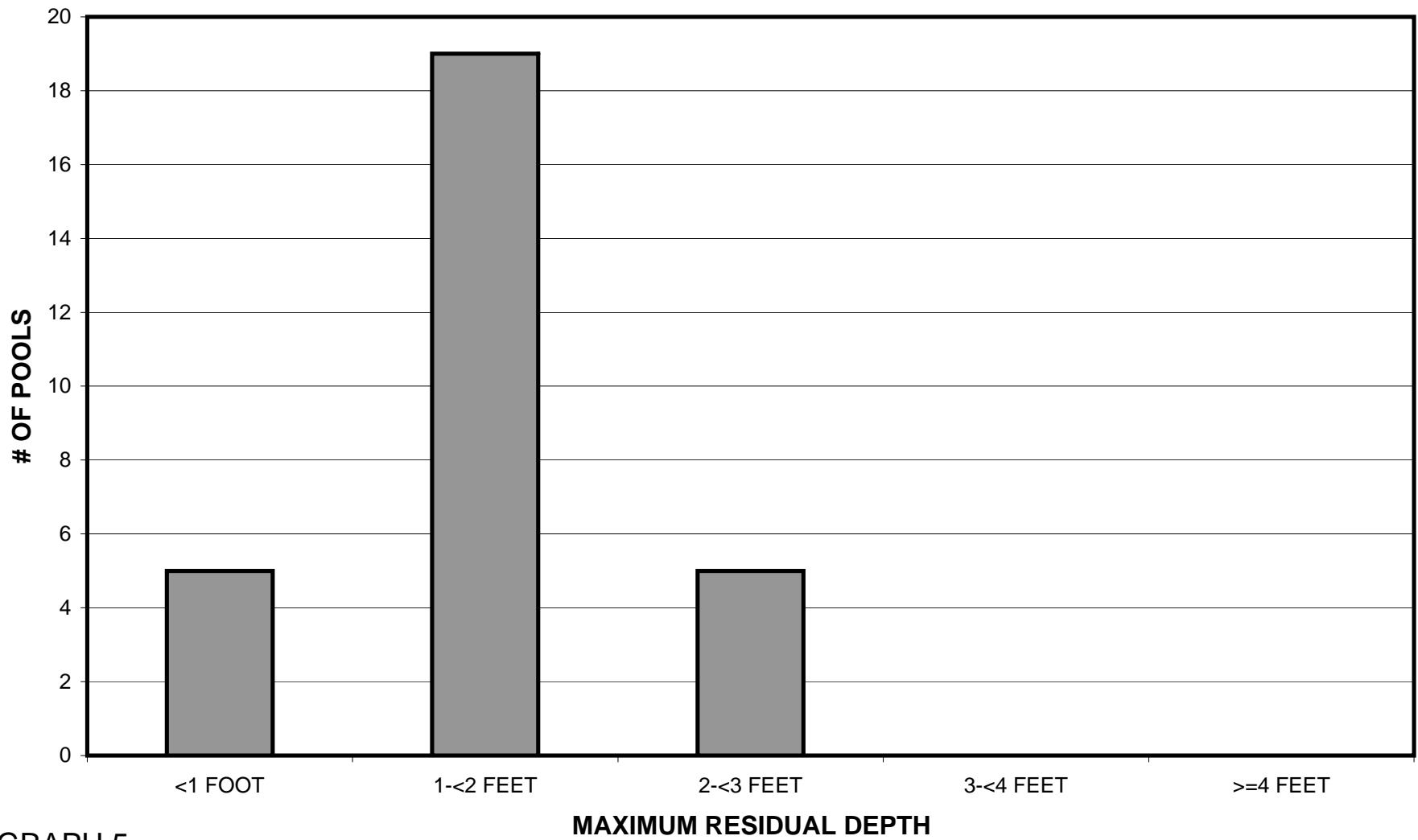
GRAPH 3

**SODA SPRING GULCH 2011
POOL TYPES BY PERCENT OCCURRENCE**



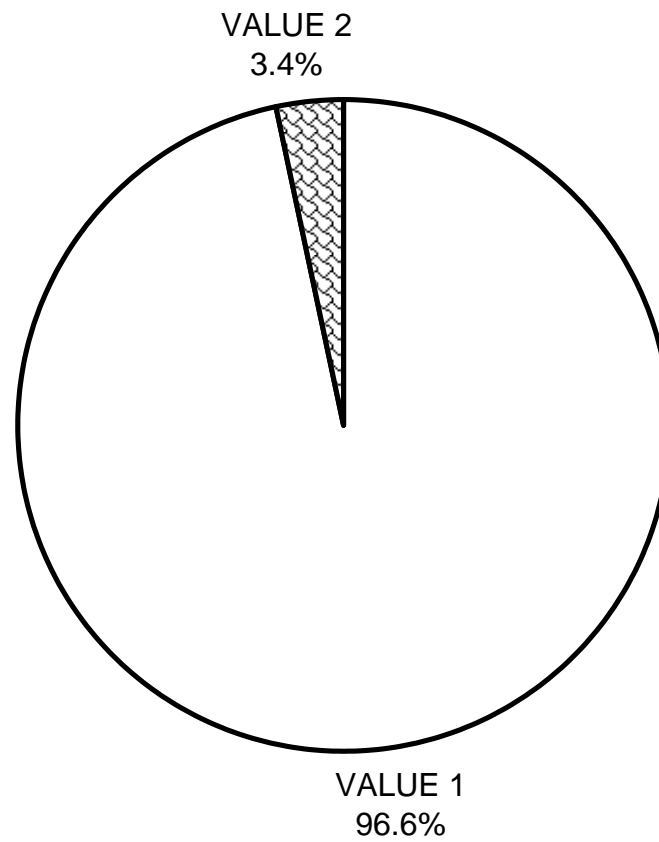
GRAPH 4

SODA SPRING GULCH 2011 MAXIMUM DEPTH IN POOLS



GRAPH 5

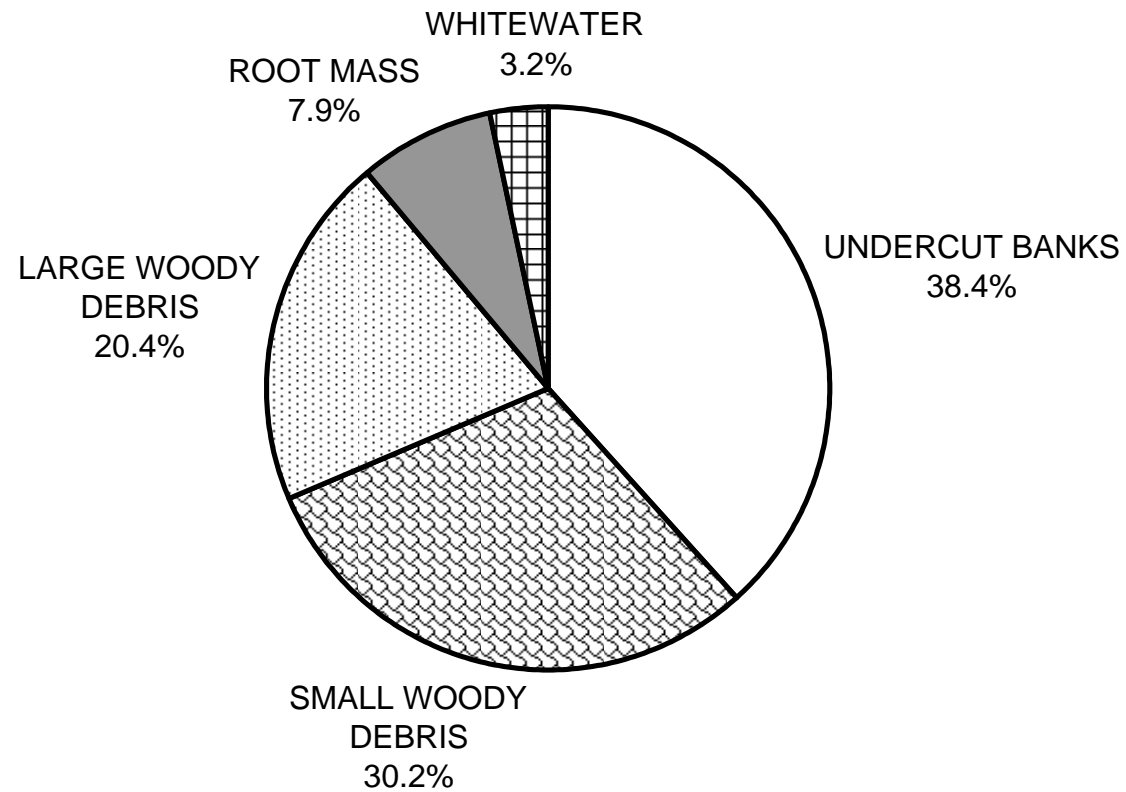
SODA SPRING GULCH 2011 PERCENT EMBEDDEDNESS



GRAPH 6

SODA SPRING GULCH 2011

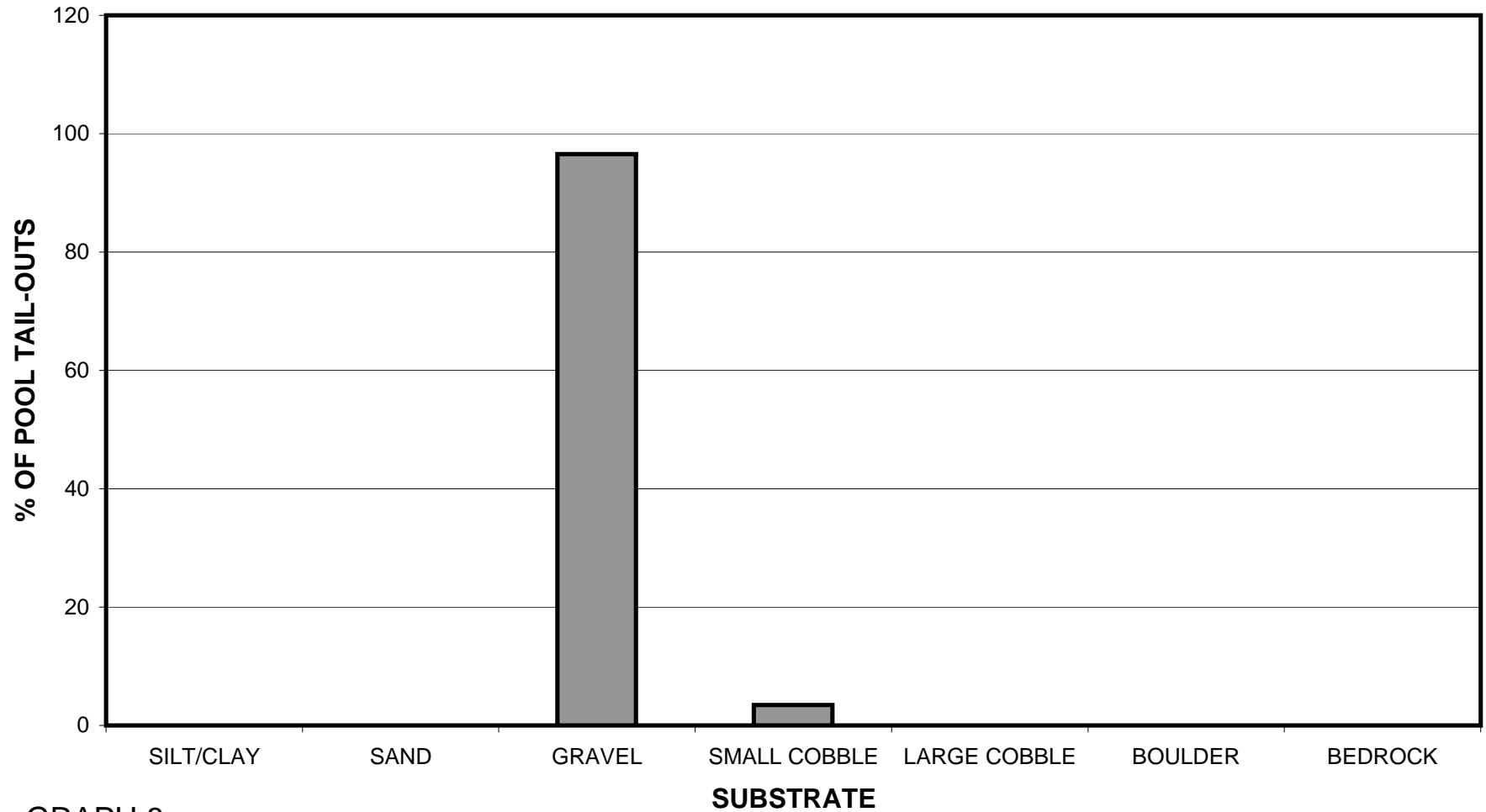
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

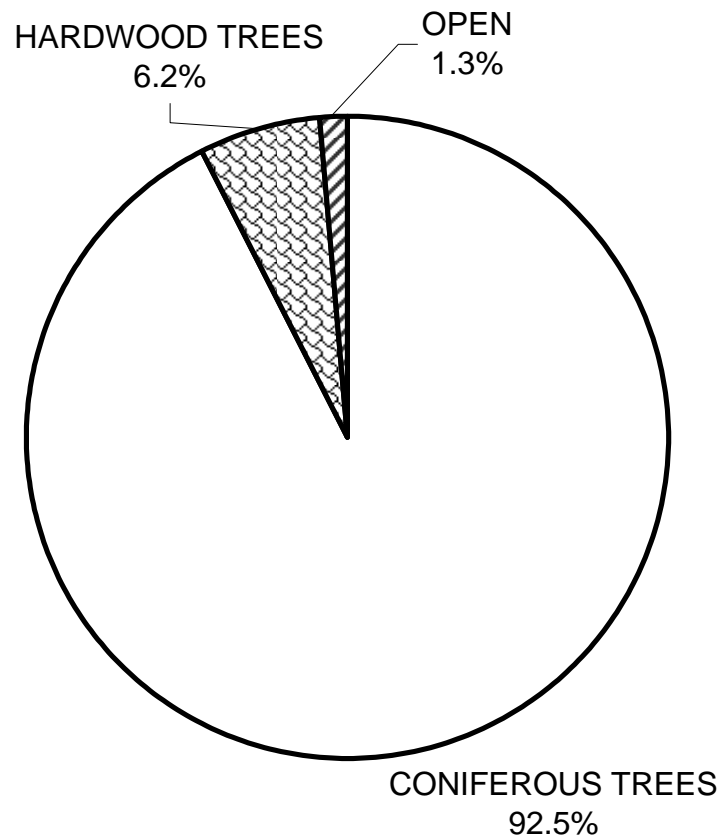
SODA SPRING GULCH 2011

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



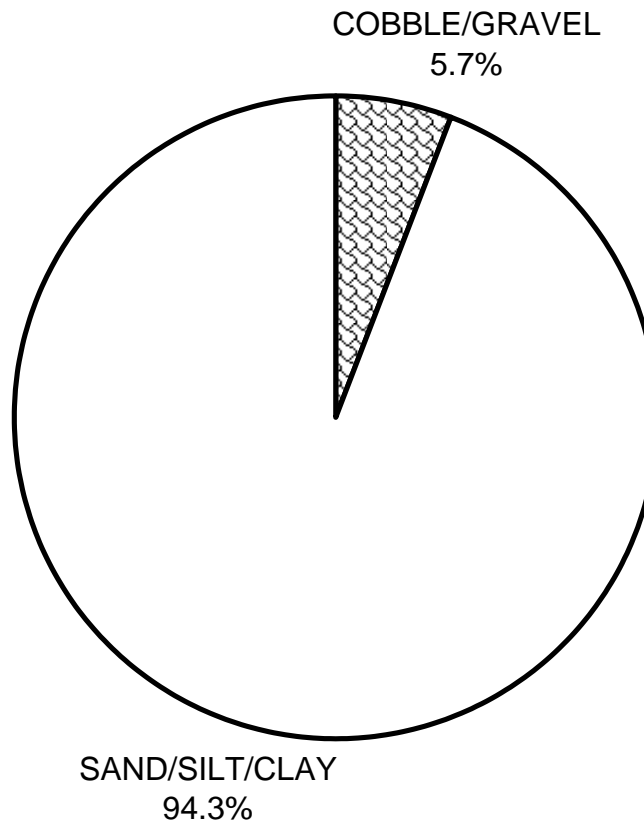
GRAPH 8

SODA SPRING GULCH 2011 MEAN PERCENT CANOPY



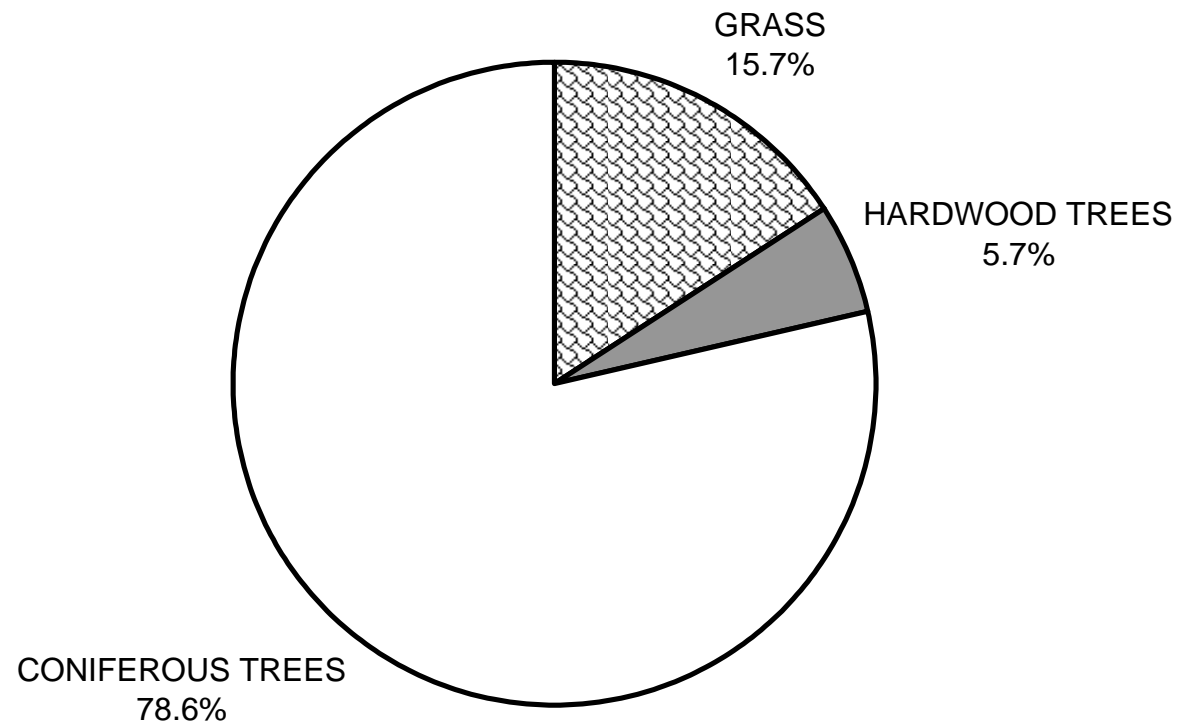
GRAPH 9

SODA SPRING GULCH 2011
DOMINANT BANK COMPOSITION IN SURVEY REACH



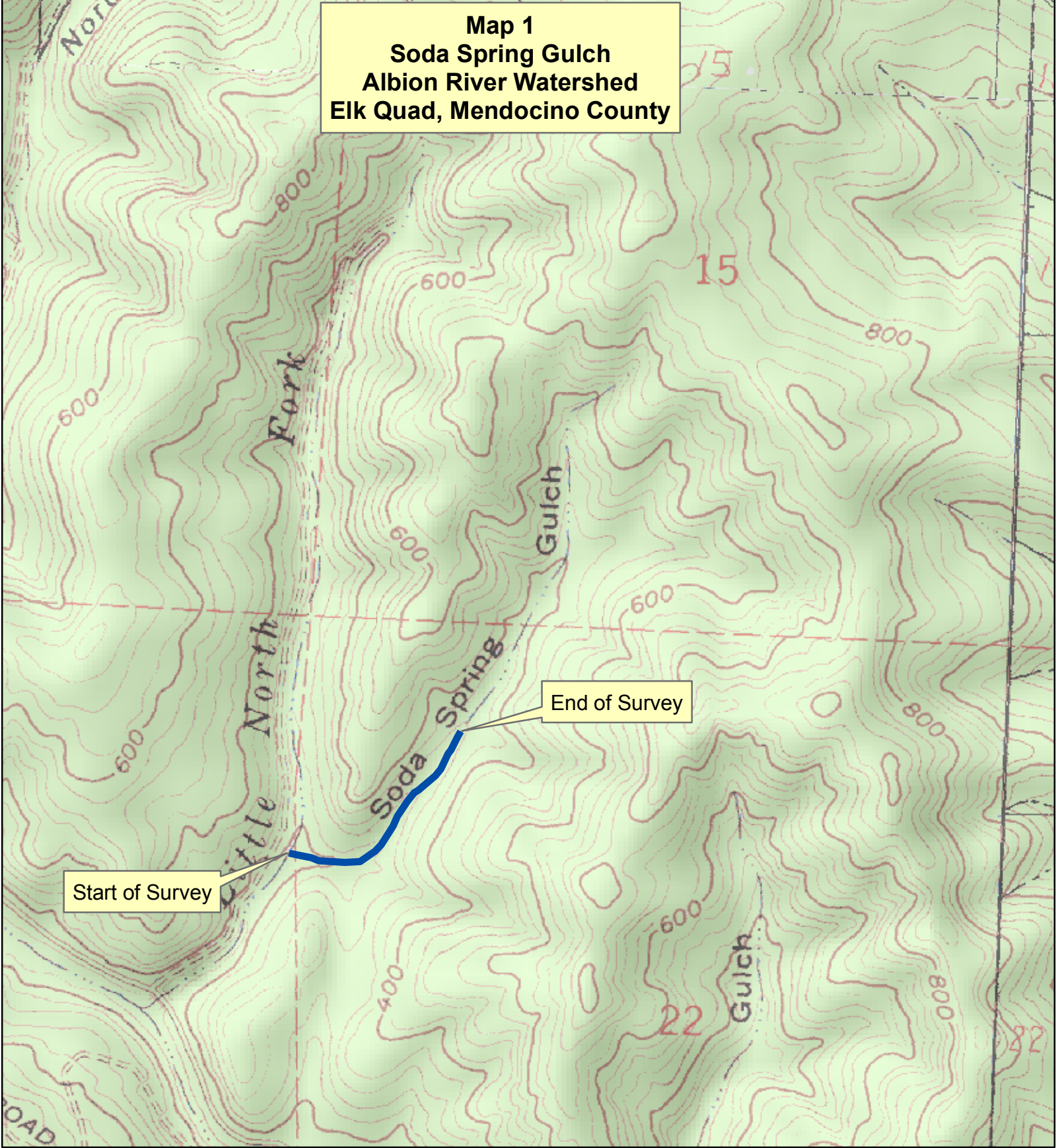
GRAPH 10

SODA SPRING GULCH 2011
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Map 1
Soda Spring Gulch
Albion River Watershed
Elk Quad, Mendocino County



Legend

— Reach 1, G4 Channel Type

0 700 1,400 Feet

