CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Anderson Gulch

INTRODUCTION

A stream inventory was conducted on June 3, 2015 on Anderson Gulch. The survey began at the confluence with South Fork Big River and extended upstream 0.3 miles.

The Anderson 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 Anderson 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 Chinook salmon, 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

Anderson Gulch is a tributary to South Fork Big River, tributary to Big River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Anderson Gulch's legal description at the confluence with South Fork Big River is T16N R15W S11. Its location is 39.2553 degrees north latitude and 123.5102 degrees west longitude, LLID number 1235090392554. Anderson Gulch is a second order stream and has approximately 1.6 miles of blue line stream according to the USGS Comptche 7.5 minute quadrangle. Anderson Gulch drains a watershed of approximately 0.9 square miles. Elevations range from about 340 feet at the mouth of the creek to 1,000 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production, rangeland, and recreation. Vehicle access exists via Comptche-Ukiah Road, southeast of Fort Bragg.

METHODS

The habitat inventory conducted in Anderson Gulch follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Wildlife (CDFW). The 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 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 Anderson 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 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". Anderson 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 Anderson Gulch, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Anderson Gulch, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. The shelter rating is then calculated by multiplying the qualitative shelter value by the percent of the unit covered. 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 Anderson 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 Anderson 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 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 Anderson Gulch. In addition, underwater observations were made at seven 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 2.0.18, 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 Anderson Gulch include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

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

The habitat inventory of June 3, 2015 was conducted by J. Murphrey and J. Lee (WSP). The total length of the stream surveyed was 1,774 feet.

Stream flow was too low to measure on Anderson Gulch.

Anderson Gulch is an A4 channel type for all 1,774 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 53 to 54 degrees Fahrenheit. Air temperatures ranged from 58 to 61 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 46% riffle units, 28% flatwater units, and 26% pool units (Graph 1). Based on total length of Level II habitat types there were 46% riffle units, 35% flatwater units, and 20% pool units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 29%; mid-channel pool units, 25%; and step run units, 19% (Graph 3). Based on percent total length, low gradient riffle units made up 34%, step run units 28%, and mid-channel pool units, 18%.

A total of 17 pools were identified (Table 3). All of the pools encountered were main channel pools.

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Five of the 17 pools (29%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 17 pool tail-outs measured, seven had a value of 1 (41%); seven had a value of 2 (41%); three had a value of 5 (18%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. Additionally, a value of 5 was assigned to tail-outs deemed unsuitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 1, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 20 (Table 1).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Anderson Gulch. Graph 7 describes the pool cover in Anderson 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 65% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 24% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Anderson Gulch was 97%. Three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 15% and 85%, respectively. Graph 9 describes the mean percent canopy in Anderson Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 98%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 58% bedrock, 36% cobble/gravel, 4% sand/silt/clay, and 2% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 80% of the units surveyed. Additionally, 10% of the units surveyed had hardwood trees as the dominant vegetation type, and 10% had brush as the dominant vegetation type (Graph 11)

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at seven sites for species composition and distribution in Anderson Gulch on June 4, 2015 (Table A). The sites were sampled by I. Mikus and M. Groff (CDFW).

The reach sites yielded one age 1+ steelhead trout, one salamander, and three crayfish.

Table A. Summary of results for a fish composition and distribution survey within Anderson Gulch, 2015.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	Steelhead Trout			Coho Salmon		Additional Aquatic Species Observed
					YOY	1+	2+	YOY	1+	
Reach 1: A4 Channel Type										
06/04/15	1	004	Pool	98	0	0	0	0	0	CGS, CF
	2	006	Pool	129	0	0	0	0	0	
	3	009	Pool	178	0	1	0	0	0	
	4	012	Pool	234	0	0	0	0	0	
	5	015	Pool	306	0	0	0	0	0	CF
	6	018	Pool	358	0	0	0	0	0	
	7	024	Pool	489	0	0	0	0	0	

Species Abbreviations: CGS=Coastal/California Giant Salamander. CF= crayfish.

DISCUSSION

Anderson Gulch is an A4 channel type for the entire length of the survey. A channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey day June 3, 2015 ranged from 53 to 54 degrees Fahrenheit. Air temperatures ranged from 58 to 61 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 35% of the total length of this survey, riffles 46%, and pools 20%. Five of the 17 (29%) 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.

Fourteen of the 17 pool tail-outs measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4. Three of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead.

Fifteen of the 17 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 20. The shelter rating in the flatwater habitats is 5. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Anderson 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.

The mean percent canopy density for the stream was 97%. The percentage of right and left bank covered with vegetation was 98% and 98%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

Anderson Gulch should be managed as an anadromous, natural production stream. Recommendations for potential habitat improvement activities are based on target habitat values suitable for salmonids in California's north coast streams. Considering the results from this stream habitat inventory, factors that affect salmonid productivity and CDFW's professional judgment, the following list prioritizes habitat improvement activities in Anderson Gulch. Keep in mind, watershed and stream ecosystem processes, land use alterations, changes in land ownership, and other factors could potentially change the order of these recommendations or create the need to remove/add recommendations in the future.

1) 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 three to five 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.

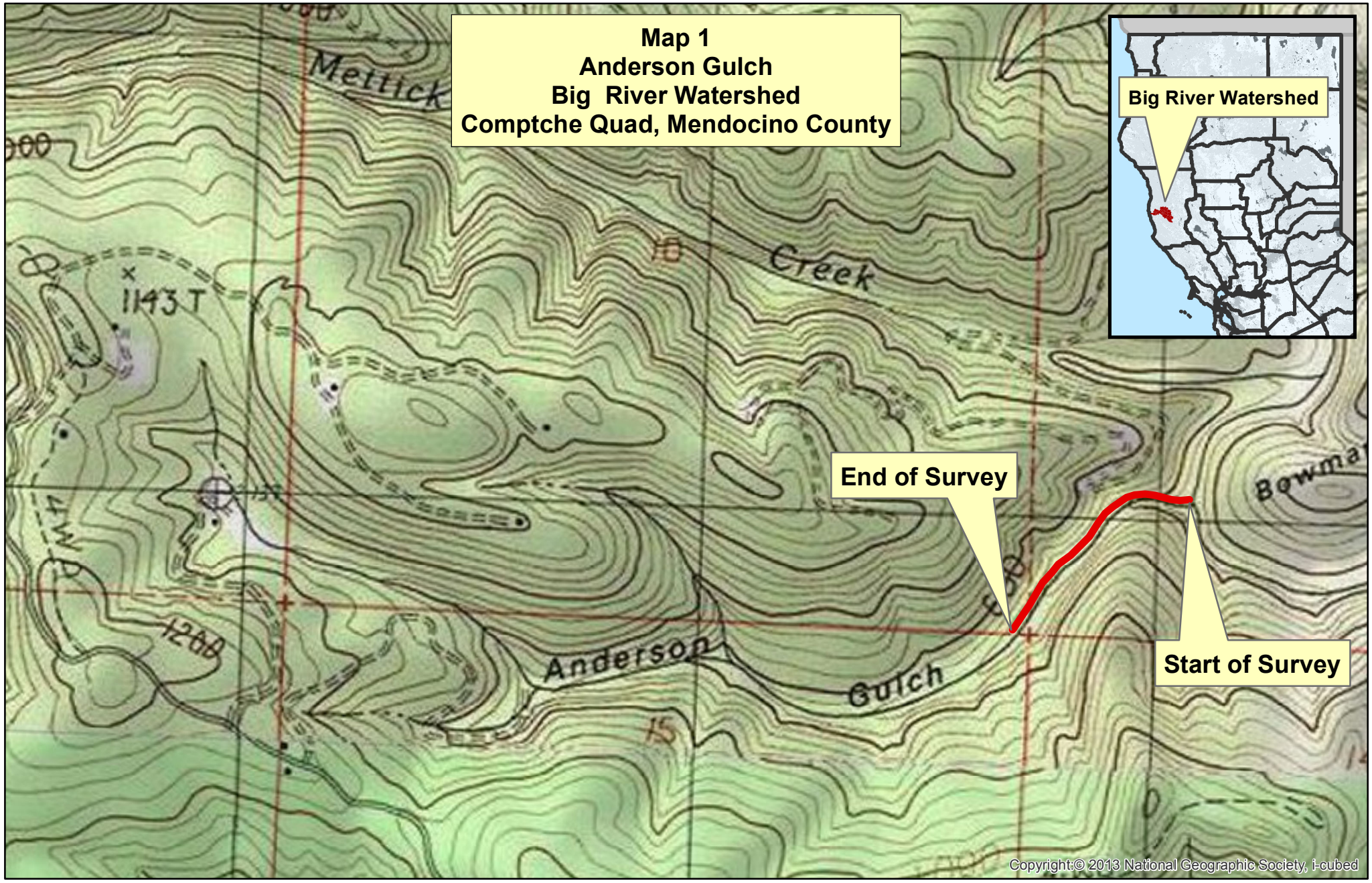
Position (ft):	Habitat unit #:	Comments:
0	0001.00	Start of survey at the confluence with South Fork Big River. The channel is an A4 for the entire length of the survey.
234	0013.00	5' high x 14' long bedrock sheet.
1750	0065.00	End of survey at 13' high x 24' long bedrock chute. There is a large LDA, approximately 100' long, above the bedrock chute formed by a historic dam. There is no jump pool below the bedrock.

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.

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]	


Map 1
Anderson Gulch
Big River Watershed
Comptche Quad, Mendocino County
Big River Watershed
End of Survey
Start of Survey
Mettick
Creek
1143 T
Anderson
Gulch
Bowman
4WD
1268
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N
W
E
S
A4 Channel Type
0
0.125
0.25
0.5
Miles
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Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0

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
18	3	FLATWATER	27.7	34	613	34.6	3.5	0.4	0.9	59	1057	22	389		5
17	17	POOL	26.2	21	349	19.7	7.2	0.6	1.5	135	2292	109	1858	91	20
30	5	RIFFLE	46.2	27	812	45.8	5.4	0.2	0.5	104	3110	22	672		1

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
65	25	1774	6459	2918

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

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 (%)
19	2	LGR	29.2	32	602	33.9	5	0.3	0.7	91	1724	27	517		3	98
5	2	HGR	7.7	22	111	6.3	5	0.2	0.4	119	597	24	119		0	96
6	1	BRS	9.2	16	99	5.6	7	0.1	0.9	98	588	10	59		0	97
6	2	RUN	9.2	18	110	6.2	4	0.4	0.9	60	358	24	143		3	96
12	1	SRN	18.5	42	503	28.4	3	0.3	0.9	57	684	17	205		10	96
16	16	MCP	24.6	20	317	17.9	7	0.6	3	134	2140	110	1766	93	20	97
1	1	STP	1.5	32	32	1.8	5	0.4	1.2	152	152	91	91	61	10	98

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
65	25	1774	6243	2901

Table 3 - Summary of Pool Types

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

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
17	17	MAIN	100	21	349	100	7.2	0.6	135	2292	91	1545	20

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
17	17	349	2292	1545

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

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

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
16	MCP	94	6	38	5	31	4	25	1	6	0	0
1	STP	6	0	0	1	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
17	6	35	6	35	4	24	1	6	0	0

Mean Maximum Residual Pool Depth (ft.): 1.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015 Dry Units: 0

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

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
19	2	LGR	0	0	0	0	0	0	0	100	0
5	2	HGR	0	0	0	0	0	0	0	0	0
6	1	BRS	0	0	0	0	0	0	0	0	0
30	5	TOTAL RIFFLE	0	0	0	0	0	0	0	100	0
6	2	RUN	0	0	0	0	0	0	0	100	0
12	1	SRN	0	0	0	0	0	0	40	60	0
18	3	TOTAL FLAT	0	0	0	0	0	0	20	80	0
16	16	MCP	26	21	13	1	0	0	14	20	6
1	1	STP	0	5	0	0	0	0	90	5	0
17	17	TOTAL POOL	24	20	12	1	0	0	19	19	5
65	25	TOTAL	20	17	10	1	0	0	18	30	4

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015 Dry Units: 0

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

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
19	2	LGR	0	0	100	0	0	0	0
5	2	HGR	0	0	100	0	0	0	0
6	1	BRS	0	0	0	0	0	0	100
6	2	RUN	0	0	50	50	0	0	0
12	1	SRN	0	0	100	0	0	0	0
16	16	MCP	13	19	63	0	0	0	6
1	1	STP	0	0	0	0	0	0	100

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
97	85	15	0	98	98

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015 Survey Length (ft.): 1774 Main Channel (ft.): 1774 Side Channel (ft.): 0

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: A4
Reach Length (ft.): 1774
Riffle/Flatwater Mean Width (ft.): 4.7
BFW:
Range (ft.): 7 to 15
Mean (ft.): 11
Std. Dev.: 3
Base Flow (cfs.): 0.0
Water (F): 53 - 54 Air (F): 58 - 61
Dry Channel (ft): 0

Canopy Density (%): 96.6
Coniferous Component (%): 84.6
Hardwood Component (%): 15.4
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 97.6
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Bedrock
Occurrence of LWD (%): 7
LWD per 100 ft.:
Riffles: 3
Pools: 4
Flat: 1

Pools by Stream Length (%): 19.7
Pool Frequency (%): 26.2
Residual Pool Depth (%):
< 2 Feet Deep: 71
2 to 2.9 Feet Deep: 24
3 to 3.9 Feet Deep: 6
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.5
Mean Pool Shelter Rating: 20

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 65 Sm Cobble: 24 Lg Cobble: 0 Boulder: 0 Bedrock: 12

Embeddedness Values (%): 1. 41.2 2. 41.2 3. 0.0 4. 0.0 5. 17.6

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

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	13	16	58.0
Boulder	1	0	2.0
Cobble / Gravel	9	9	36.0
Sand / Silt / Clay	2	0	4.0

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	3	2	10.0
Hardwood Trees	2	3	10.0
Coniferous Trees	20	20	80.0
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

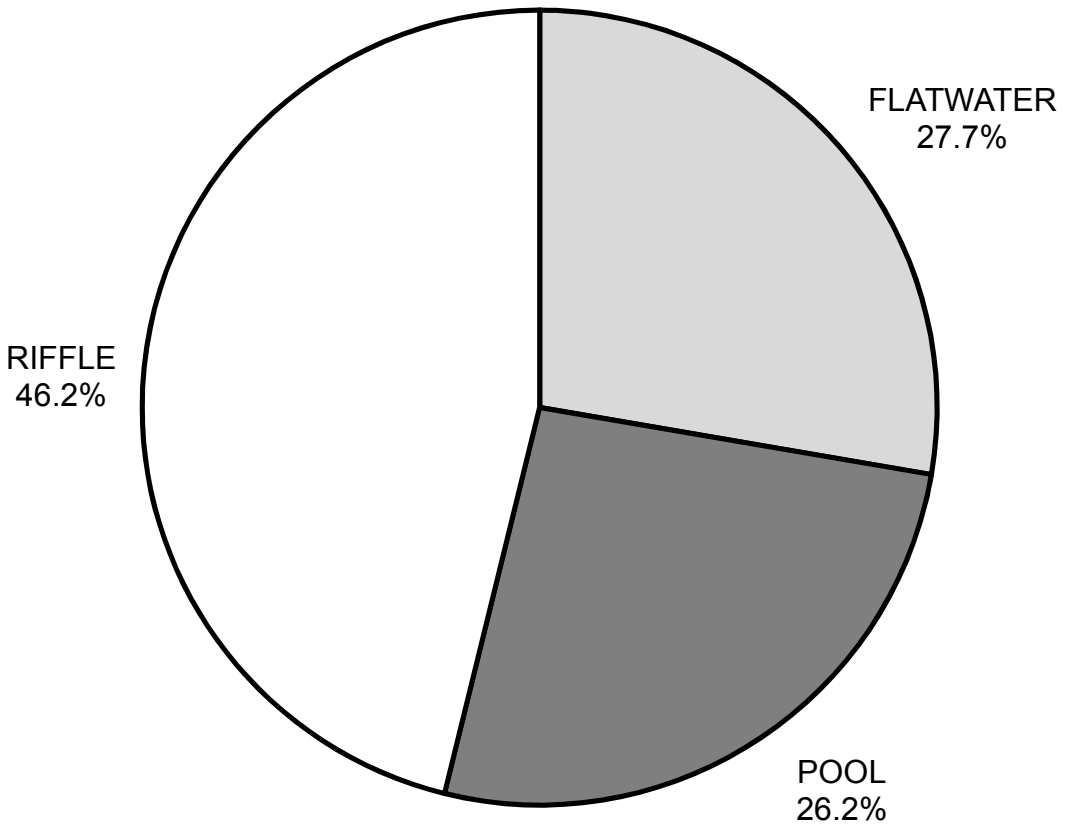
StreamName: Anderson Gulch LLID: 1235090392554 Drainage: Big River

Survey Dates: 6/3/2015 to 6/3/2015

Confluence Location: Quad: COMPTCHE Legal Description: T16NR15WS11 Latitude: 39:15:19.0N Longitude: 123:30:32.0W

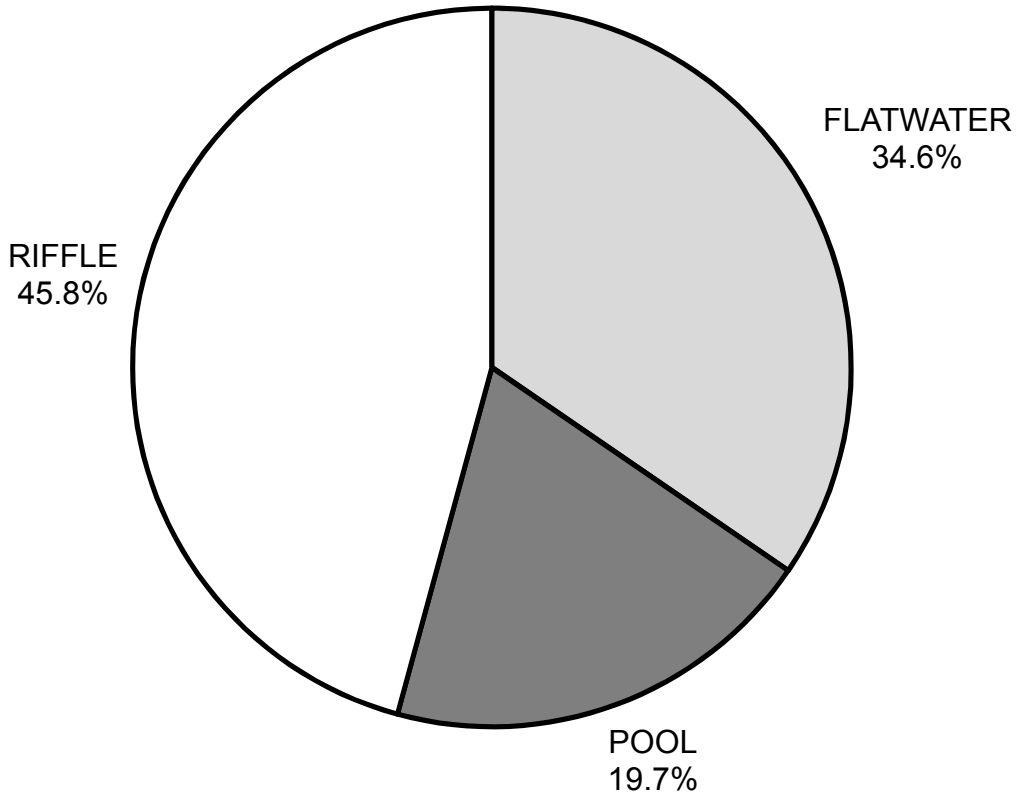
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	24
SMALL WOODY DEBRIS (%)	0	0	20
LARGE WOODY DEBRIS (%)	0	0	12
ROOT MASS (%)	0	0	1
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	20	19
BOULDERS (%)	100	80	19
BEDROCK LEDGES (%)	0	0	5

ANDERSON GULCH 2015
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

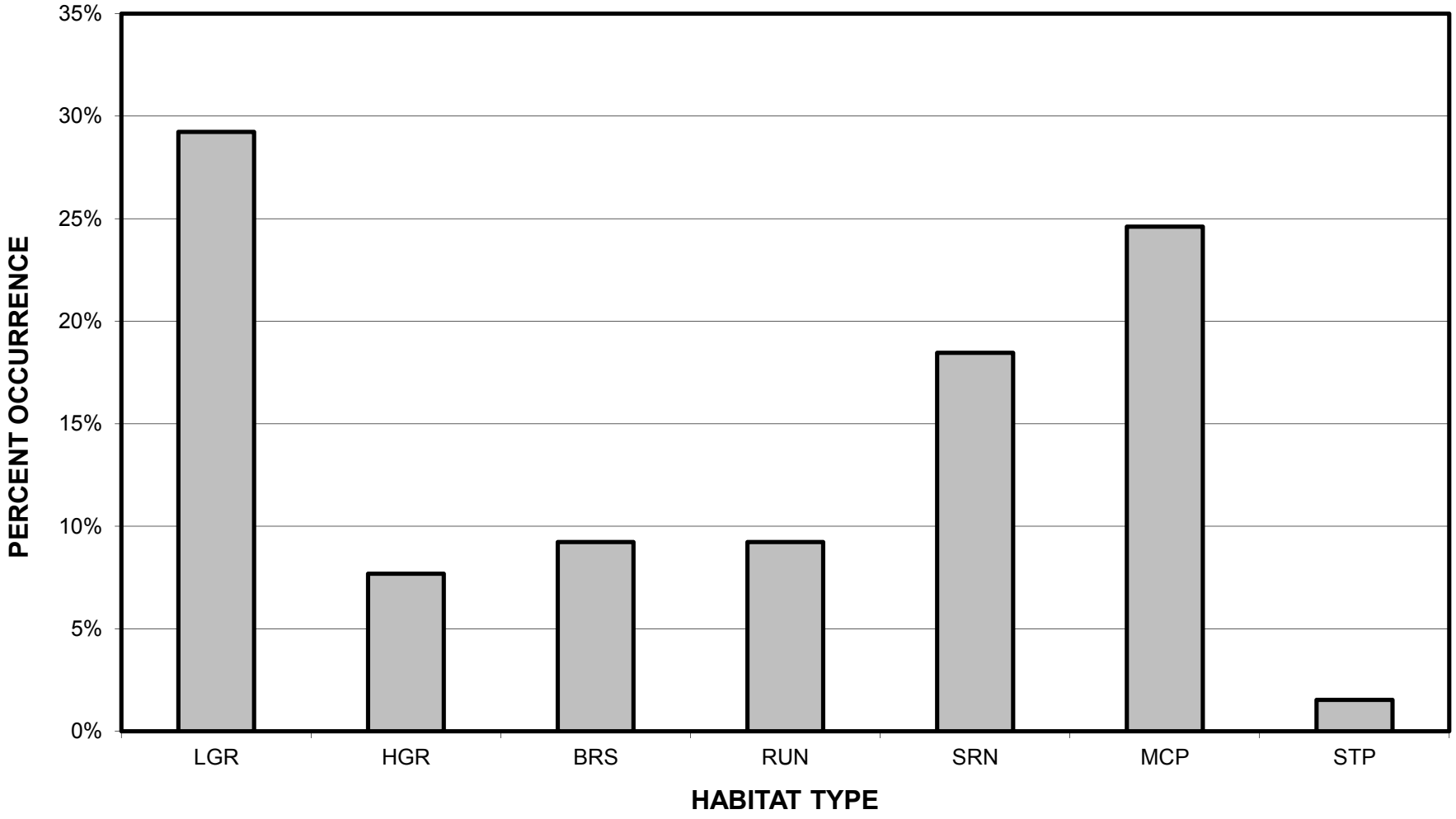
ANDERSON GULCH 2015
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

ANDERSON GULCH 2015

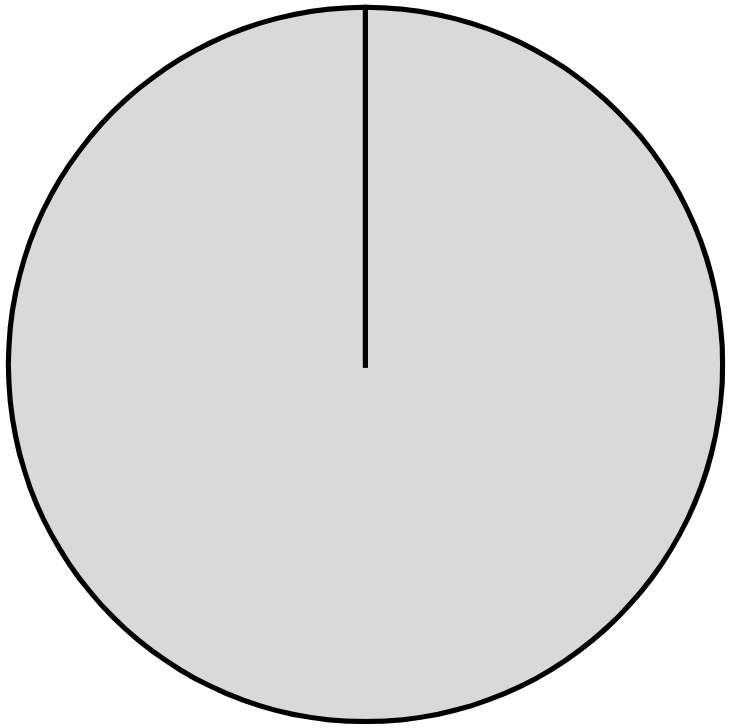
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 3

ANDERSON GULCH 2015

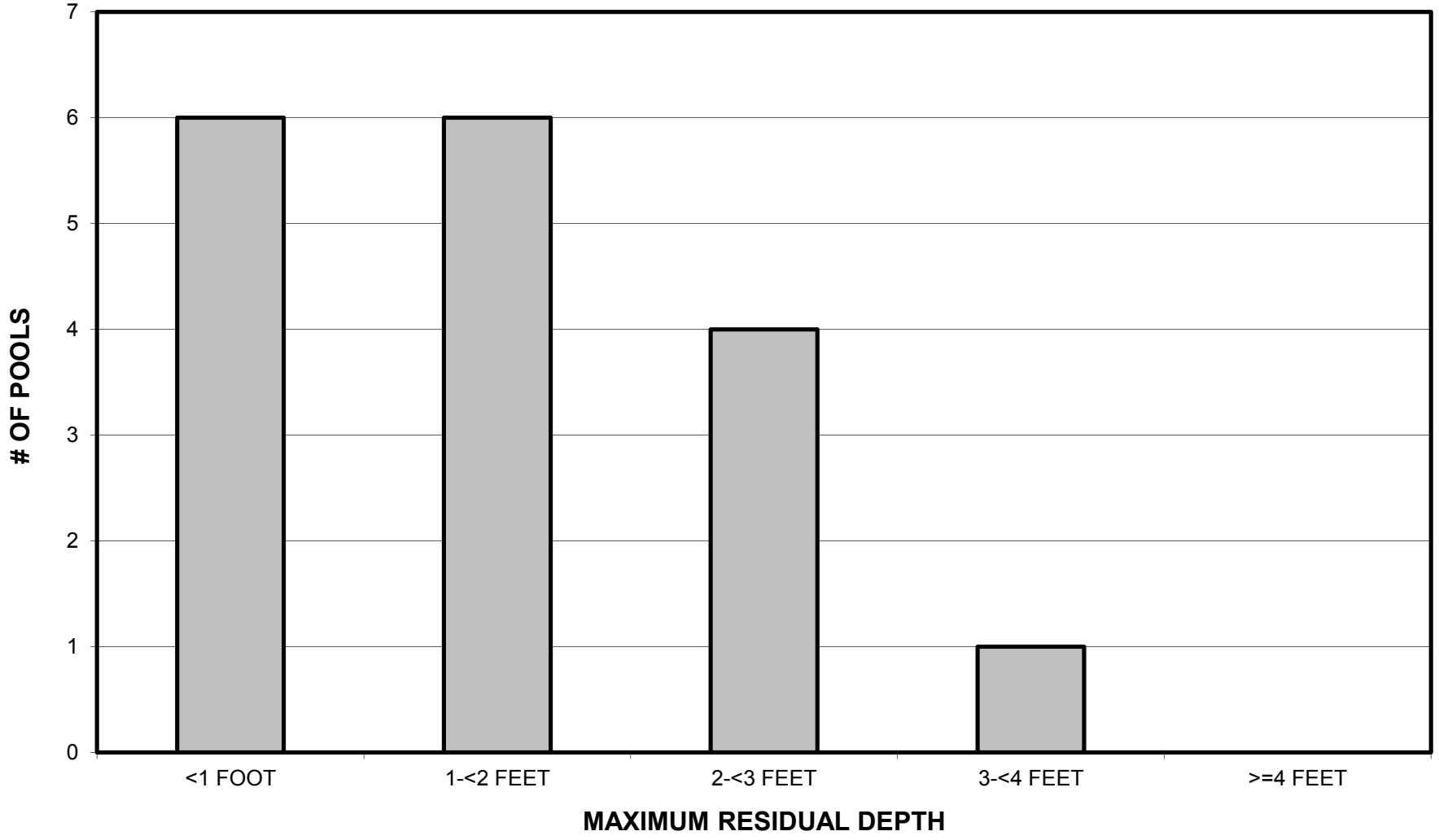
POOL TYPES BY PERCENT OCCURRENCE



GRAPH 4

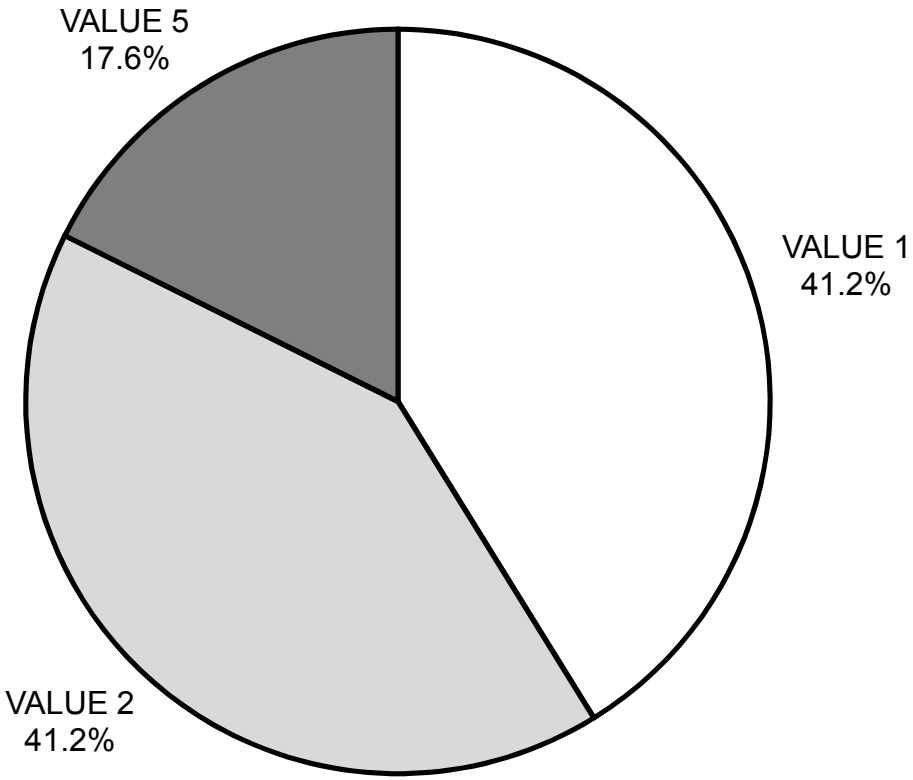
ANDERSON GULCH 2015

MAXIMUM DEPTH IN POOLS



GRAPH 5

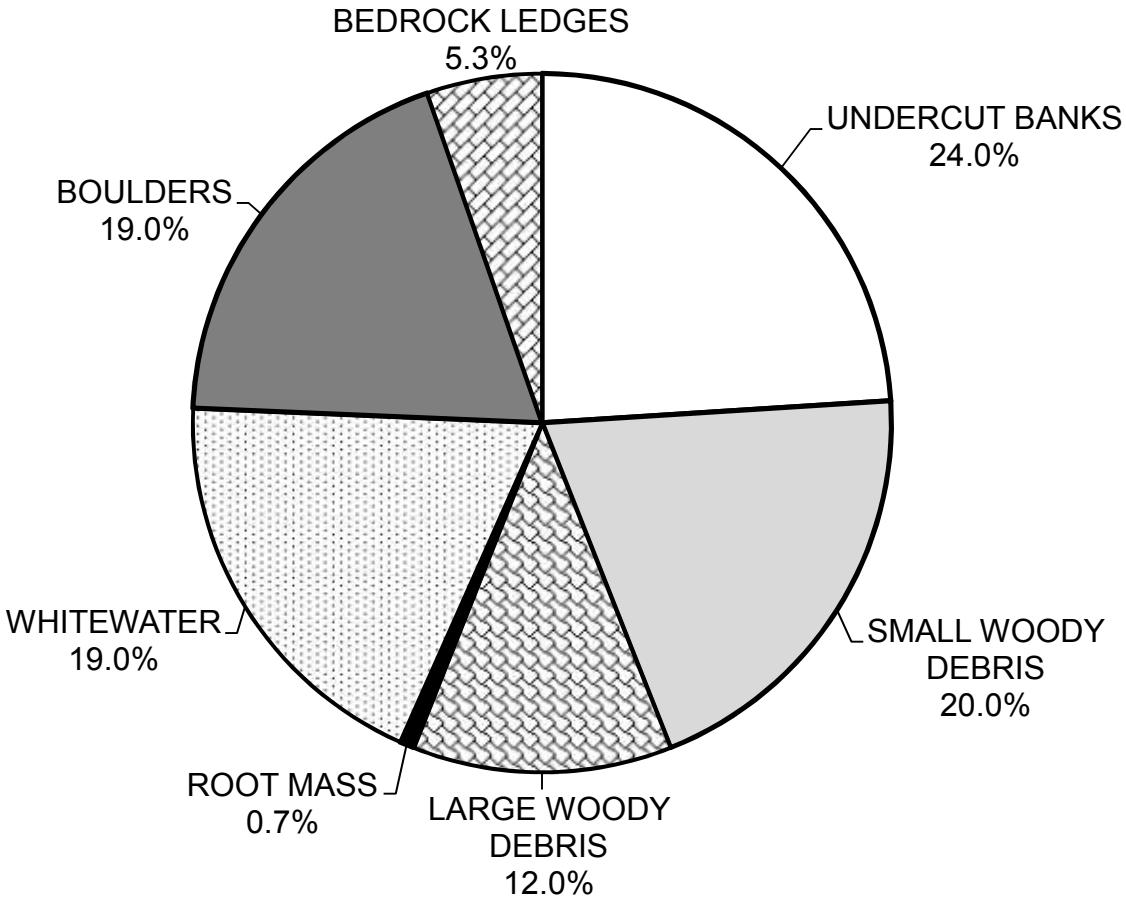
ANDERSON GULCH 2015
PERCENT EMBEDDEDNESS



GRAPH 6

ANDERSON GULCH 2015

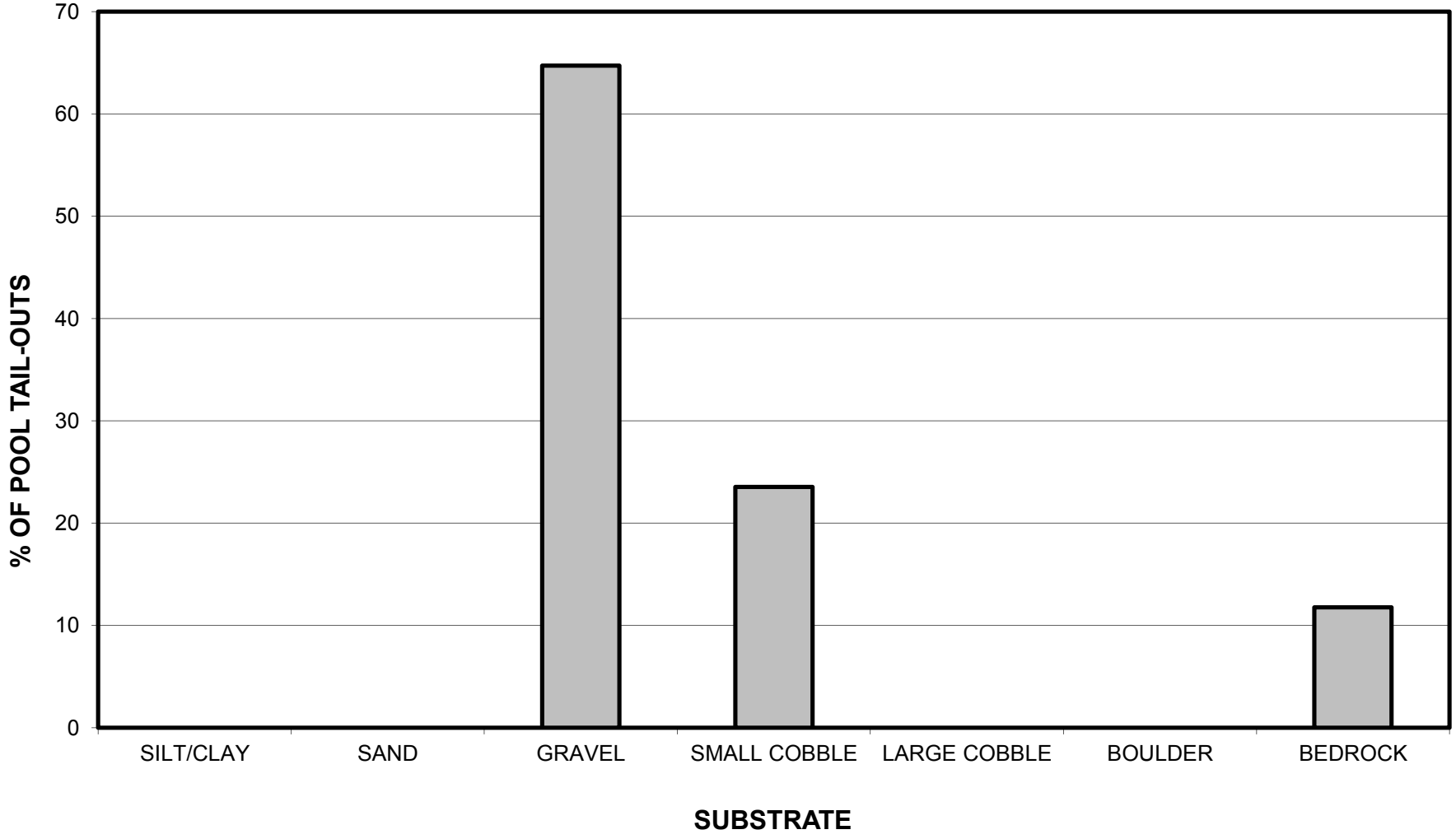
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

ANDERSON GULCH 2015

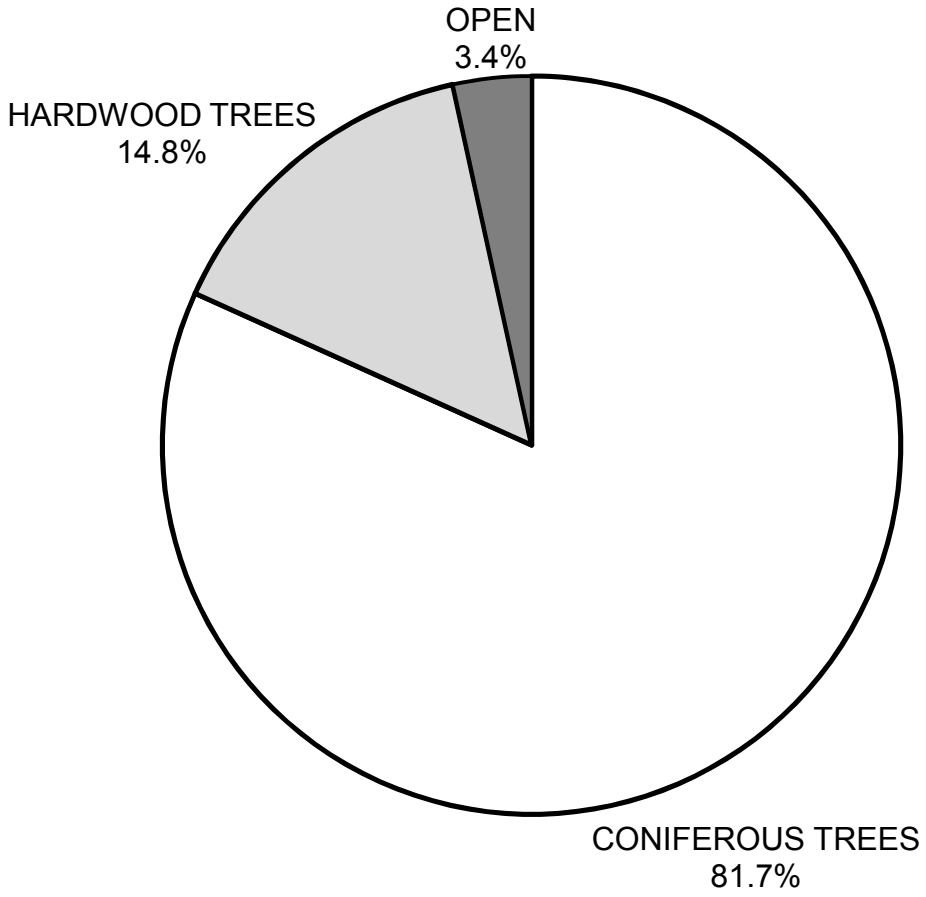
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



GRAPH 8

ANDERSON GULCH 2015

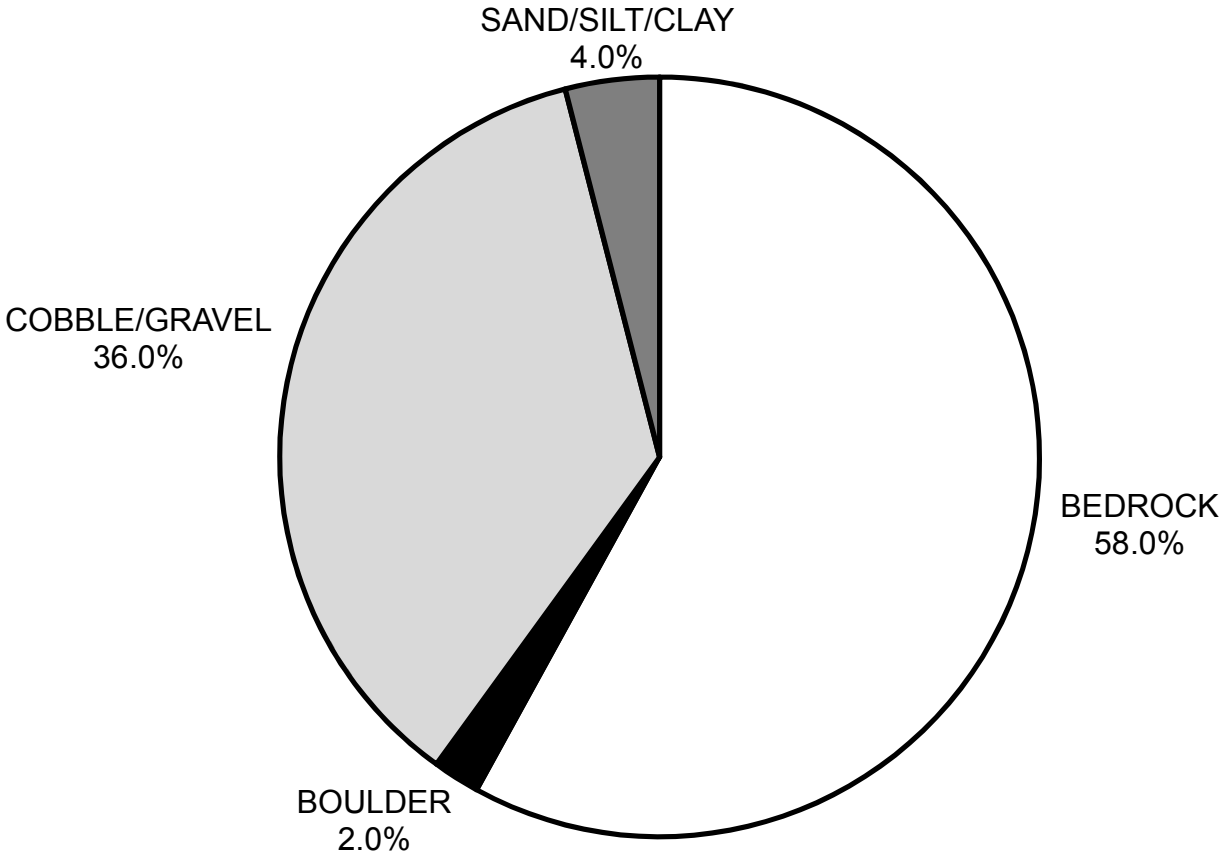
MEAN PERCENT CANOPY



GRAPH 9

ANDERSON GULCH 2015

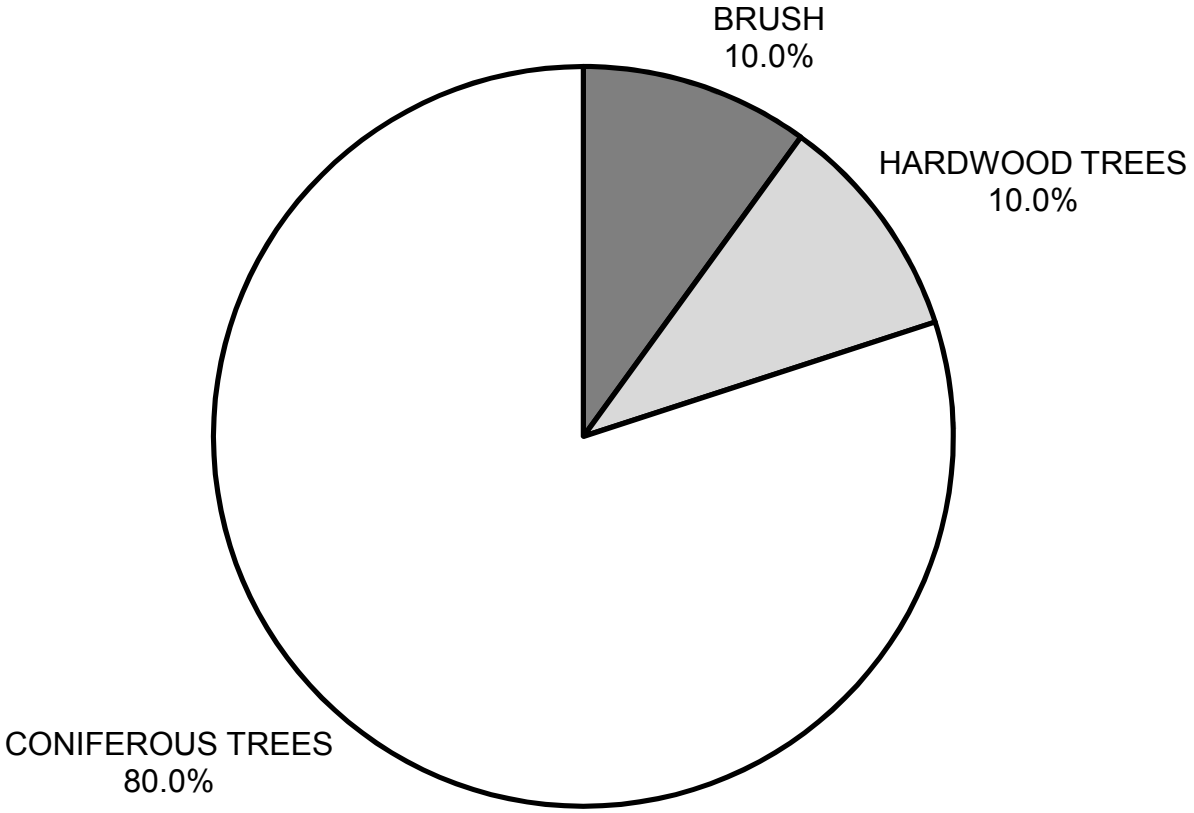
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

ANDERSON GULCH 2015

DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11