



## CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

### STREAM INVENTORY REPORT

#### Corner Creek

#### INTRODUCTION

A stream inventory was conducted May 23rd to May 24th, 2016 on Corner Creek. The survey began at the confluence with Lawrence Creek and extended upstream 0.4 miles.

The Corner Creek 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 Corner Creek. 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

Corner Creek is a tributary to Lawrence Creek, tributary to Yager Creek, tributary to Van Duzen River which drains to the Pacific Ocean, located in Humboldt County, California (Map 1). Corner Creek's legal description at the confluence with Lawrence Creek is T03N R02E S30. Its location is 40.6186° north latitude and -123.9897° west longitude, LLID number 1239896406186. Corner Creek is a first order stream and has approximately 2.7 miles of blue line stream according to the USGS Hydesville 7.5 minute quadrangle. Corner Creek drains a watershed of approximately 2.2 square miles. Elevations range from about 561 feet at the mouth of the creek to 1850 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 36 just east of the town of Hydesville.

#### METHODS

The habitat inventory conducted in Corner Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project (WSP) members and California Department of Fish and Wildlife (CDFW) personnel 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

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field form page, one is randomly selected for complete measurement. Surveyors also take photos to document general habitat conditions (Appendix II).

### 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 Corner 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 hand level, hip chain, tape measure, and a stadia rod.

#### 3. Temperatures:

Water and air temperatures are measured and recorded at every tenth habitat unit using a hand-held thermometer. Both temperatures are taken in degrees (°) Fahrenheit and the time of the measurement is also recorded. Air temperatures are recorded within one foot of the water surface, while water temperatures are recorded (where possible) in flowing water within the habitat unit.

#### 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". Corner 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.

#### 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 Corner 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 unsuitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

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### 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 Corner 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. 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Corner 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 Corner 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.

### 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

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(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 Corner Creek. In addition, underwater mask and snorkel 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 2.0.18, 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 Corner 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
- 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 IN APPENDIX I \*

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The habitat inventory of May 23 to May 24, 2016, was conducted by Ryan Bernstein, Alejandra Camacho (WSP), Silvia Gwozdz, Brian Starks, and David Kajtaniak (CDFW). The total length of the stream surveyed was 2,357 feet with an additional 30 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 1.22 cfs on May 25, 2016.

Corner Creek is a B4 channel type for 2,387.00 feet of the stream surveyed (Reach 1). B4 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 51° to 60° Fahrenheit. Air temperatures ranged from 52° to 68° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 37% riffle units, 33% flatwater units, and 30% pool units (Graph 1). Based on total length of Level II habitat types there were 46% flatwater units, 35% riffle units, and 19% pool units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 21%; mid-channel pool units, 20%; and step run units, 19% (Graph 3). Based on percent total length, step run units made up 37%, low gradient riffle units made up 19%, and high gradient riffle units made up 16%.

A total of 24 pools were identified (Table 3). Main channel pools were the most frequently encountered at 75% (Graph 4), and comprised 78% 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. One of the 19 pools (5%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 21 pool tail-outs measured, 5 had a value of 1 (23.8%); 8 had a value of 2 (38.1%); 4 had a value of 3 (19%); and 4 had a value of 5 (19%) (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 2, flatwater habitat types had a mean shelter rating of 16, and pool habitats had a mean shelter rating of 41 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating of 61. Main Channel pools had a mean shelter rating of 32 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Graph 7 describes the pool cover in Corner Creek. Undercut banks are the dominant pool cover type followed by boulders.

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Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the most dominant substrate observed in 43% of pool tail-outs. Boulders were 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 Corner Creek was 96%. Four percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 60% and 40%, respectively. Graph 9 describes the mean percent canopy in Corner Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 62% sand/silt/clay, 22% boulder, and 16% cobble/gravel (Graph 10).

### BIOLOGICAL INVENTORY RESULTS

A survey team conducted a mask and snorkel survey at 10 sites for species composition and distribution in Corner Creek on June 6, 2016 (Table A). Air and water temperatures were taken at 1122. Air temperature was 70.7° Fahrenheit while water temperature was 57.2° Fahrenheit. The sites were sampled by David Lam, Sylvia Gwozdz, and Kori Roberts (CDFW).

In Corner Creek, 10 sites were sampled. The sites yielded 16 young-of-the-year (YOY) steelhead trout (SH), 9 age 1+ SH, and 2 Coastal/California Giant Salamander (CGS).

During the survey, the upstream-most observation of steelhead occurred at 40.6195° degrees north latitude, -123.9960° west longitude, approximately 1,727 feet upstream from the confluence with Lawrence Creek. No coho salmon were observed during the biological inventory.

Table A. Summary of results for a fish composition and distribution survey within Corner Creek, June 6, 2016.

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+	
06/06/16	1	005	Pool	98	9	1	0	0	0	CGS
	2	010	Pool	263	6	0	0	0	0	
	3	031	Pool	795	0	4	0	0	0	CGS
	4	036	Pool	983	1	0	0	0	0	
	5	041	Pool	1077	0	0	0	0	0	
	6	043	Pool	1111	0	1	0	0	0	
	7	048	Pool	1215	0	1	0	0	0	
	8	053	Pool	1409	0	1	0	0	0	
	9	057	Pool	1478	0	0	0	0	0	
	10	061	Pool	1727	0	1	0	0	0	

Species Abbreviations: CGS=Coastal/California Giant Salamander

## DISCUSSION

Corner Creek is a B4 channel type for 2,387 feet of the stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is as follows: B4 channels are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover.

The water temperatures recorded on the survey days May 23 to May 24, 2016, ranged from 51° to 60° Fahrenheit. Air temperatures ranged from 52° to 68° Fahrenheit. This is a suitable water temperature range for salmonids. However, 60° Fahrenheit, if sustained, is near the threshold stress level 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 46% of the total length of this survey, riffles 35%, and pools 19%. One of the 19 (5%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Thirteen of the 21 pool tail-outs measured had embeddedness ratings of 1 or 2. Four of the pool tail-outs had embeddedness ratings of 3 or 4. Four 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.

Eleven of the 21 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 41. The shelter rating in the flatwater habitats is 16. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in Corner Creek. Undercut banks are the dominant cover type in pools followed by boulders. 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 96%. The percentage of right and left bank covered with vegetation was 97% and 97%, respectively.

## RECOMMENDATIONS

Corner Creek 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 Corner Creek. Keep in

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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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from undercut banks. Adding high quality complexity with woody cover in the pools is desirable.
- 2) Suitable size spawning substrate on Corner Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.
- 3) 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 confluence with Lawrence Creek.
98	0005.00	Bridge #1 is the crossing for Palco Road, and is 12.1' high x 22' wide x 20' long. It is an automobile bridge (made of metal) and is not a barrier to salmonids.
263	0010.00	Salmonid young-of-the-year (YOY) observed.
431	0016.00	There is a 4 inch pvc pipe with no fish screen.
1727	0061.00	A 1+ salmonid observed.
2094	0072.00	Channel starts to get steeper. Gradient higher. Potential end of coho habitat.
2289	0080.00	End of survey due to a cascade which is the end of anadromy. Creek branches into multiple channels and cascades extends for over 1,000 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 }

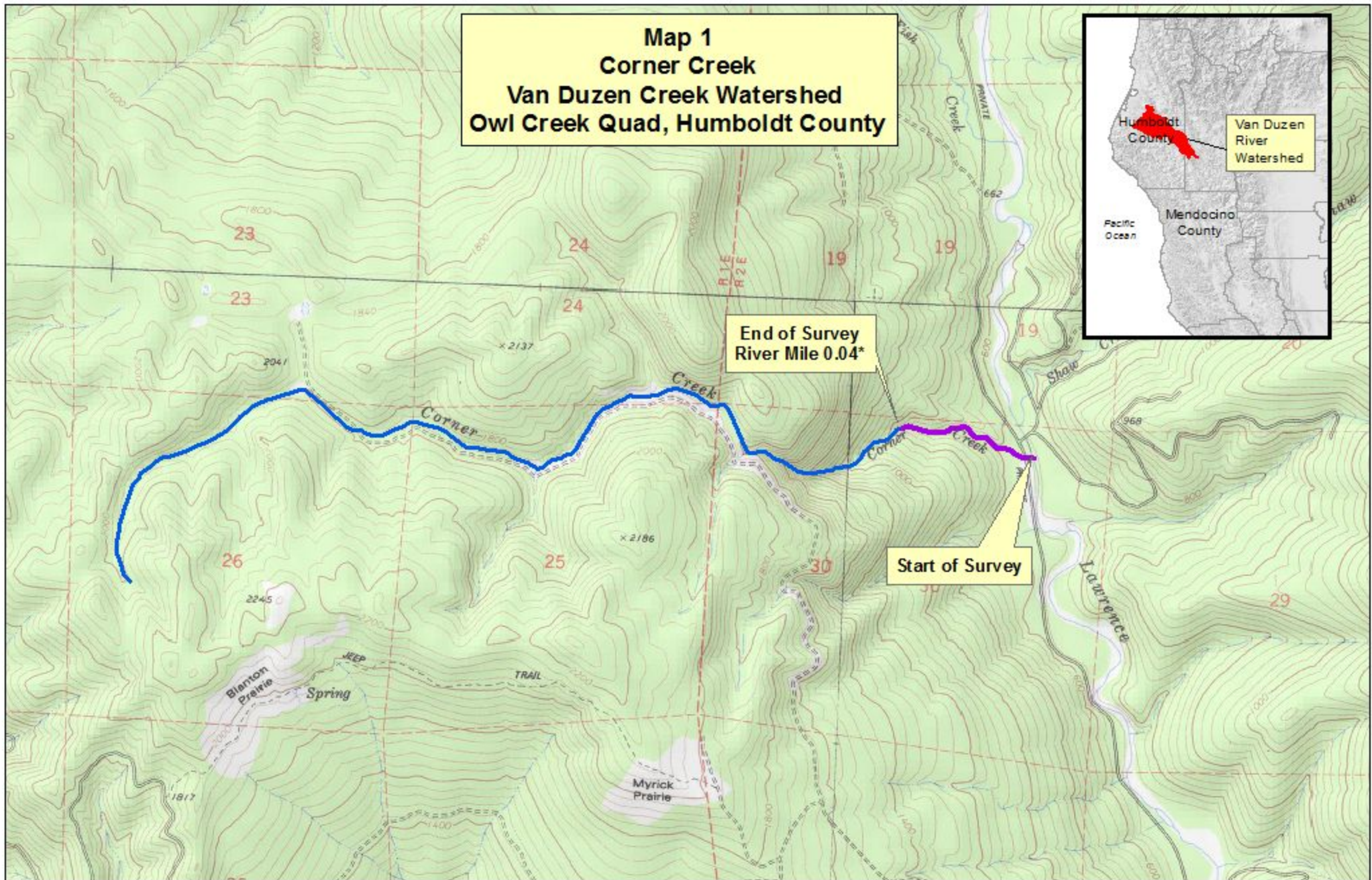
### BACKWATER POOLS

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}

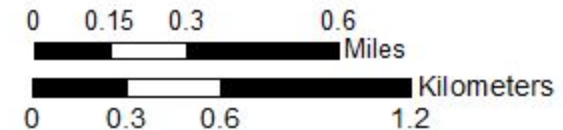
## ADDITIONAL UNIT DESIGNATIONS

Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

**Map 1**  
**Corner Creek**  
**Van Duzen Creek Watershed**  
**Owl Creek Quad, Humboldt County**



— Reach 1: B4 Channel Type — Corner Creek



\*River Mile indicates distance from confluence with Lawrence Creek

# **APPENDIX I**

## **TABLES AND GRAPHS**

**Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types**

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 5/24/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T03NR02ES30

Latitude: 40:37:07.0N

Longitude: 123:59:23.0

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
27	9	FLATWATER	33.3	40	1089	45.6	11.1	0.8	1.2	289	7796	185	4449		16
24	20	POOL	29.6	19	461	19.3	12.0	0.4	1.3	208	4981	205	4677	112	41
30	3	RIFFLE	37.0	28	837	35.1	9.7	0.5	1.2	204	6128	125	3747		2
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
81	32				2387					18905			12873		

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

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 5/24/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T03NR02ES30

Latitude: 40:37:07.0N

Longitude: 123:59:23.0W

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 (%)
17	1	LGR	21.0	27	462	19.4	12	0.4	1	144	2448	58	979		0	99
13	2	HGR	16.0	29	375	15.7	8	0.6	1.5	234	3047	159	2061		3	97
12	4	RUN	14.8	18	210	8.8	11	0.9	1.5	180	2157	159	1907		14	97
15	5	SRN	18.5	59	879	36.8	11	0.8	1.9	376	5639	212	2542		19	99
16	12	MCP	19.8	20	316	13.2	11	0.4	1.9	203	3243	214	3135	114	30	94
2	2	STP	2.5	22	45	1.9	12	0.5	1.6	255	510	233	465	137	45	98
1	1	LSL	1.2	14	14	0.6	7	0.2	1.1	93	93	84	84	19	25	98
1	1	LSBo	1.2	17	17	0.7	10	0.4	1.3	85	85	102	102	34	70	99
4	4	PLP	4.9	17	69	2.9	16	0.4	2	258	1031	224	895	147	68	99

Total Units  
81

Total Units Fully Measured  
32

Total Length (ft.)  
2387

Total Area (sq.ft.)  
18253

Total Volume (cu.ft.)  
12170

Table 3 - Summary of Pool Types

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 5/24/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T03NR02ES30

Latitude: 40:37:07.0N

Longitude: 123:59:23.0W

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
18	14	MAIN	75	20	361	78	11.4	0.4	210	3782	117	1961	32
6	6	SCOUR	25	17	100	22	13.6	0.4	202	1209	98	492	61
Total Units	Total Units Fully Measured			Total Length (ft.)					Total Area (sq.ft.)		Total Volume (cu.ft.)		
24	20			461					4992		2453		

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

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 5/24/2016

Confluence Location: Quad: HYDEVILLE

Legal Description: T03NR02ES30

Latitude: 40:37:07.0N

Longitude: 123:59:23.0W

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
11	MCP	58	2	18	9	82	0	0	0	0	0	0
2	STP	11	0	0	2	100	0	0	0	0	0	0
1	LSL	5	0	0	1	100	0	0	0	0	0	0
1	LSBo	5	0	0	1	100	0	0	0	0	0	0
4	PLP	21	0	0	3	75	1	25	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
19	2	11	16	84	1	5	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3



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

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 5/24/2020

Dry Units: 0

Confluence Location:

Quad: HYDESVILLE

Legal Description: T03NR02ES30

Latitude: 40:37:07.0N

Longitude: 123:59:23.0W

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
17	2	LGR	0	0	0	0	0	0	0	0	0
13	4	HGR	0	0	52	0	0	0	0	48	0
30	6	<b>TOTAL RIFFLE</b>	0	0	50	0	0	0	0	50	0
12	4	RUN	57	0	33	0	0	0	3	7	0
15	4	SRN	33	12	12	0	0	0	30	13	0
27	8	<b>TOTAL FLAT</b>	45	5	22	0	0	0	17	11	0
16	12	MCP	47	4	10	0	0	0	21	18	0
2	2	STP	15	5	20	0	0	0	50	10	0
1	1	LSL	0	0	70	0	0	0	0	30	0
1	1	LSBo	0	0	0	0	0	0	0	100	0
4	4	PLP	0	10	29	3	0	0	20	38	0
24	20	<b>TOTAL POOL</b>	28	5	18	1	0	0	21	27	0
81	34	<b>TOTAL</b>	32	5	20	0	0	0	20	23	0



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

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 5/24/2016

Dry Units: 0

Confluence Location: Quad: HYDESVILLE

Legal Description: T03NR02ES30

Latitude: 40:37:07.0N

Longitude: 123:59:23.0W

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
17	1	LGR	0	0	0	0	100	0	0
13	3	HGR	0	0	0	0	0	100	0
12	4	RUN	0	0	75	0	0	25	0
15	5	SRN	0	0	20	0	40	40	0
16	12	MCP	0	0	83	0	0	17	0
2	2	STP	0	0	50	0	0	50	0
1	1	LSL	0	0	0	0	100	0	0
1	1	LSBo	0	100	0	0	0	0	0
4	4	PLP	0	0	50	0	25	25	0

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

Stream Name: Corner Creek LLID: 1239896406186 Drainage: Van Duzen River  
Survey Dates: 5/23/2016 to 5/24/2016  
Confluence Location: Quad: HYDESVILLE Legal Description: T03NR02ES30 Latitude: 40:37:07.0N Longitude: 123:59:23.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
96	40	60	0	97	97

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

Open units represent habitat units with zero canopy cover.

**Table 8 - Fish Habitat Inventory Data Summary**

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 5/24/2016

Survey Length (ft.): 2387

Main Channel (ft.): 2357

Side Channel (ft.): 30

Confluence Location: Quad: HYDEVILLE

Legal Description: T03NR02ES30 Latitude: 40:37:07.0N

Longitude: 123:59:23.0W

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

Channel Type: B4

Canopy Density (%): 96.4

Pools by Stream Length (%): 19.3

Reach Length (ft.): 2357

Coniferous Component (%): 40.5

Pool Frequency (%): 29.6

Riffle/Flatwater Mean Width (ft.): 10.7

Hardwood Component (%): 59.5

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Coniferous Trees

&lt; 2 Feet Deep: 95

Range (ft.): 18 to 44

Vegetative Cover (%): 97.2

2 to 2.9 Feet Deep: 5

Mean (ft.): 28

Dominant Shelter: Undercut Banks

3 to 3.9 Feet Deep: 0

Std. Dev.: 6

Dominant Bank Substrate Type: Sand/Silt/Clay

&gt;= 4 Feet Deep: 0

Base Flow (cfs.): 1.2

Occurrence of LWD (%): 15

Mean Max Residual Pool Depth (ft.): 1.3

Water (F): 51 - 60 Air (F): 52 - 68

LWD per 100 ft.:

Mean Pool Shelter Rating: 41

Dry Channel (ft): 0

Riffles: 4

Pools: 11

Flat: 2

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 43 Sm Cobble: 10 Lg Cobble: 19 Boulder: 24 Bedrock: 5

Embeddedness Values (%): 1. 23.8 2. 38.1 3. 19.0 4. 0.0 5. 19.0

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

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 5/24/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T03NR02ES30

Latitude: 40:37:07.0N

Longitude: 123:59:23.0W

**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	9	5	21.9
Cobble / Gravel	4	6	15.6
Sand / Silt / Clay	19	21	62.5

**Mean Percentage of Dominant Stream Bank Vegetation**

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	0	0	0.0
Brush	0	4	6.3
Hardwood Trees	9	12	32.8
Coniferous Trees	22	15	57.8
No Vegetation	1	1	3.1

**Total Stream Cobble Embeddedness Values:** 3

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

Stream Name: Corner Creek

LLID: 1239896406186

Drainage: Van Duzen River

Survey Dates: 5/23/2016 to 6/24/2016

Confluence Location:

Quad: HYDESVILLE

Legal Description: T03NR02ES30

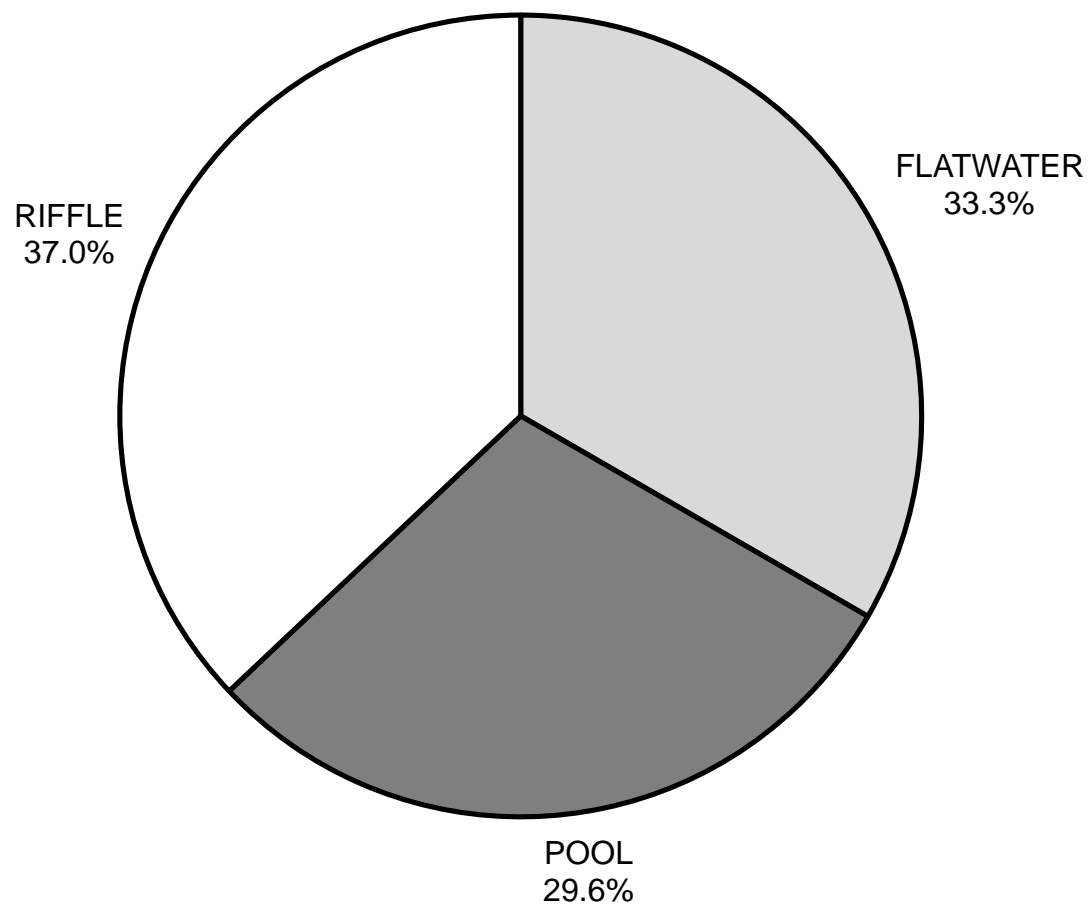
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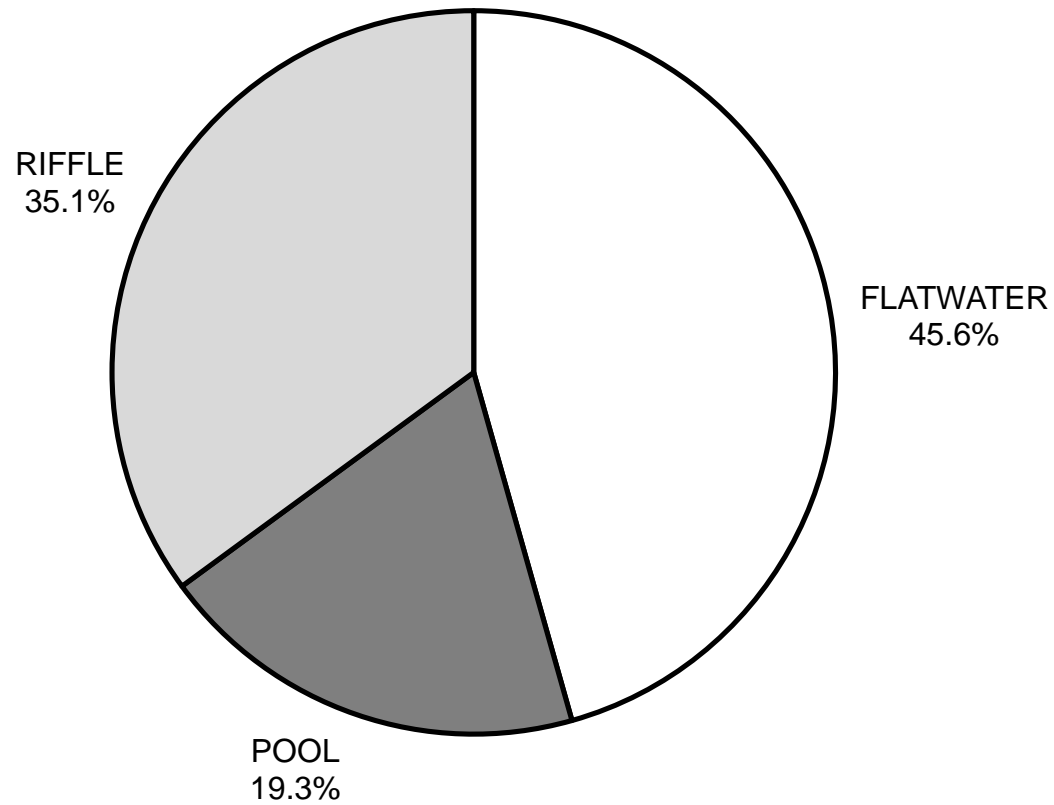
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS (%)	0	45	28
SMALL WOODY DEBRIS (%)	0	5	5
LARGE WOODY DEBRIS (%)	50	22	18
ROOT MASS (%)	0	0	1
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITewater (%)	0	17	21
BOULDERS (%)	50	11	27
BEDROCK LEDGERS (%)	0	0	0

**CORNER CREEK 2016**  
**HABITAT TYPES BY PERCENT OCCURRENCE**



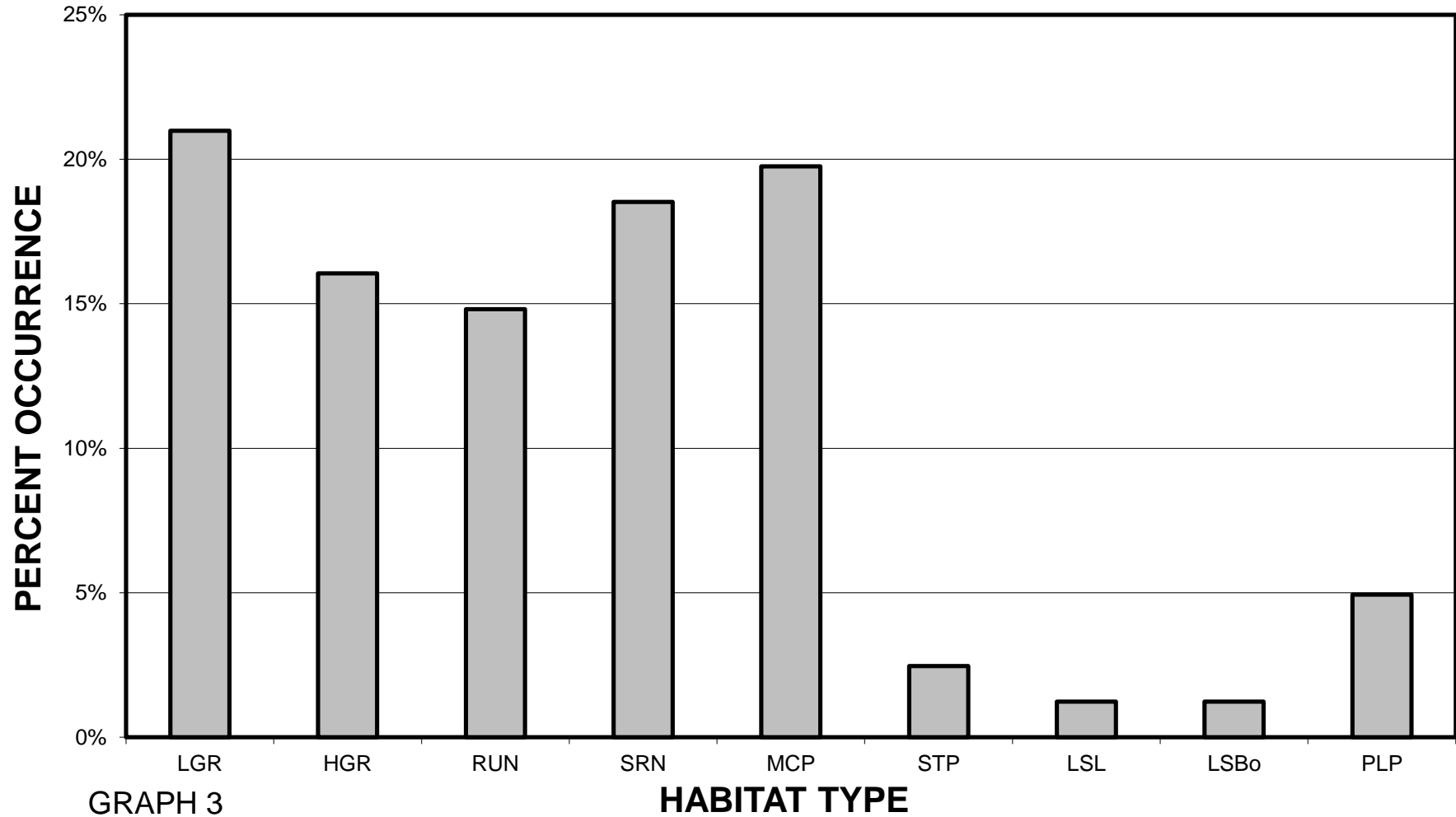
GRAPH 1

**CORNER CREEK 2016**  
**HABITAT TYPES BY PERCENT TOTAL LENGTH**



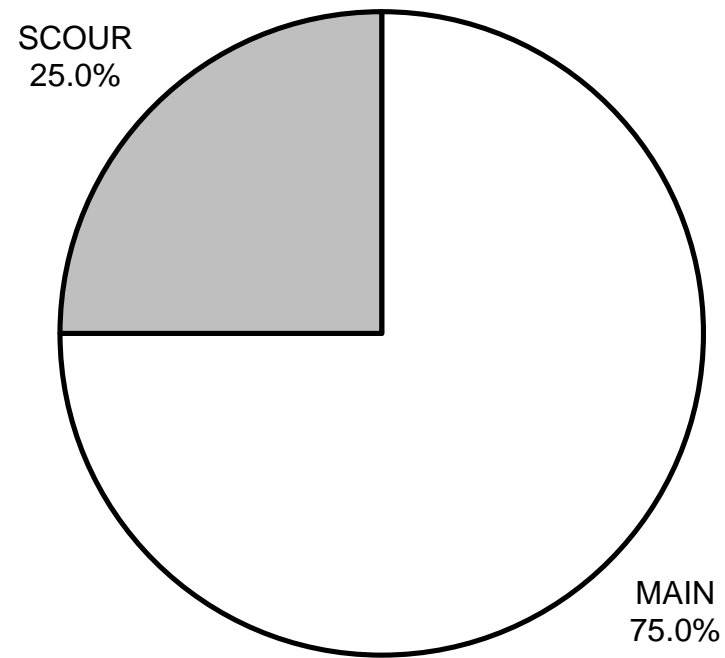
GRAPH 2

**CORNER CREEK 2016**  
**HABITAT TYPES BY PERCENT OCCURRENCE**



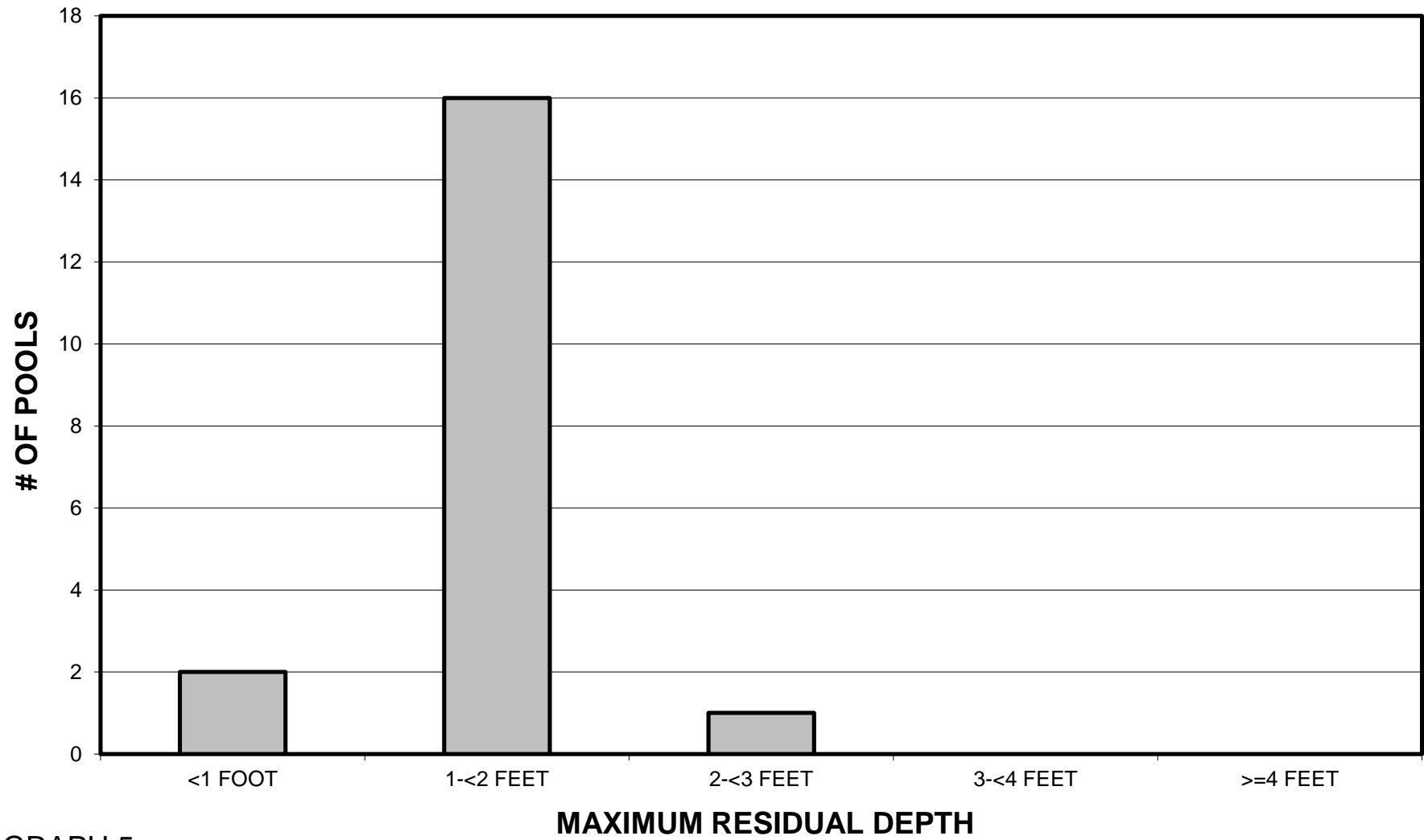


**CORNER CREEK 2016  
POOL TYPES BY PERCENT OCCURRENCE**



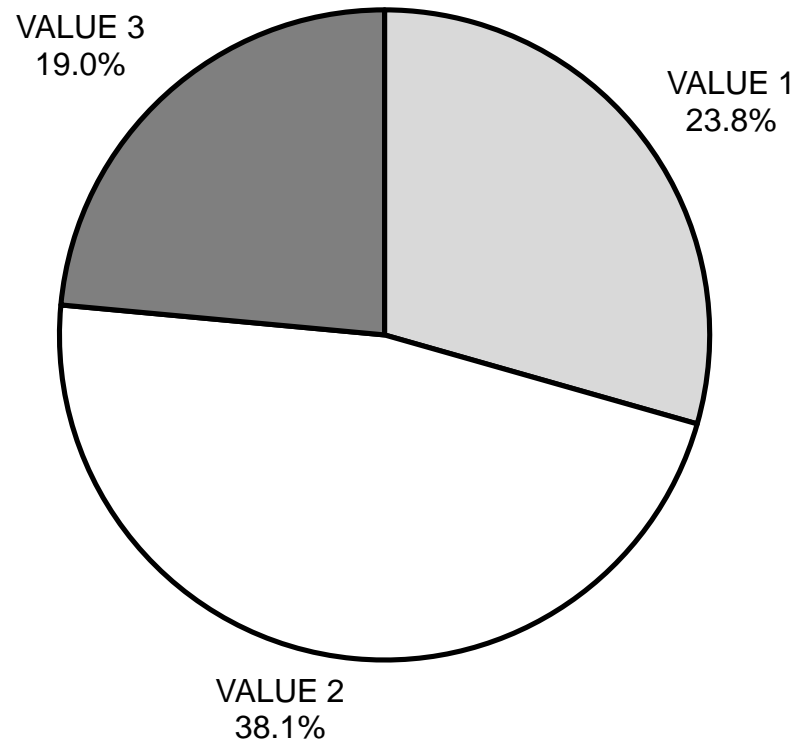
GRAPH 4

**CORNER CREEK 2016  
MAXIMUM DEPTH IN POOLS**



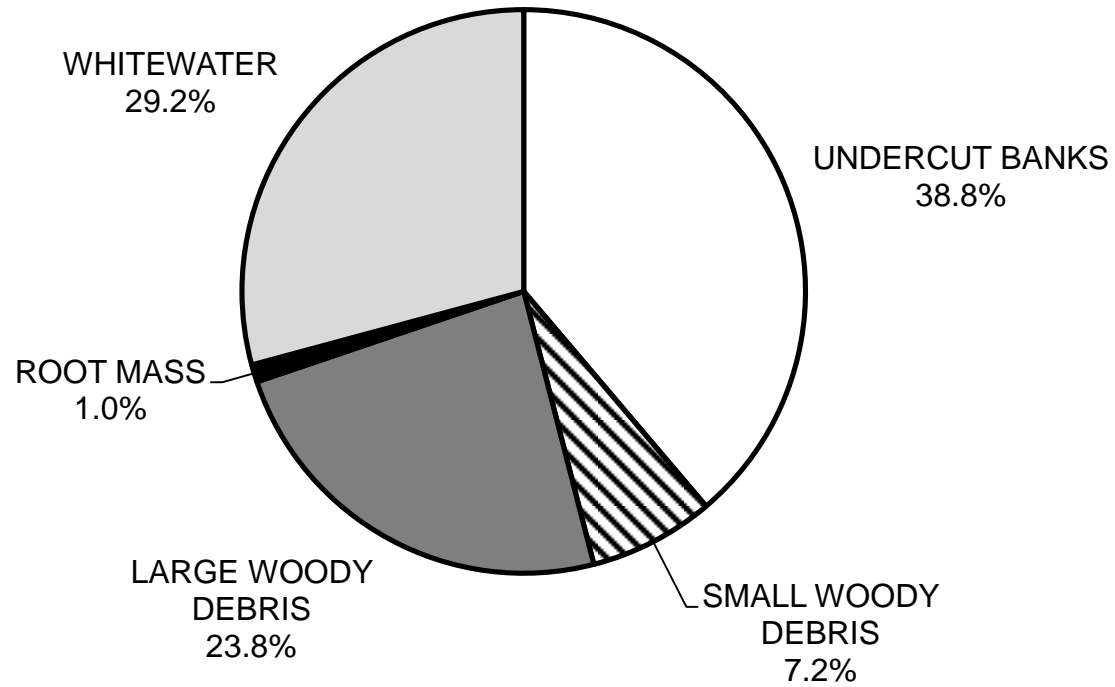
GRAPH 5

# CORNER CREEK 2016 PERCENT EMBEDDEDNESS



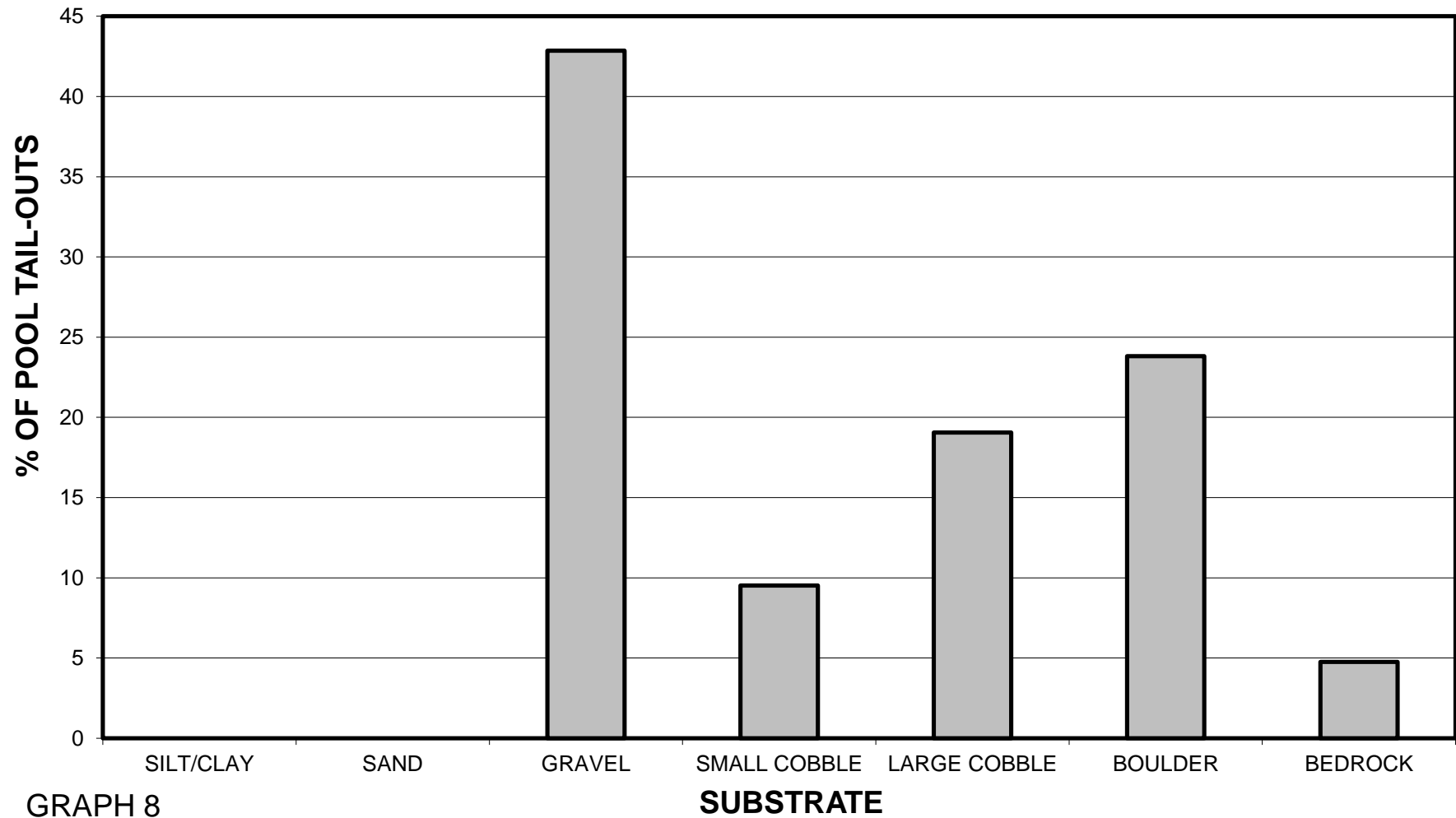
GRAPH 6

# **CORNER CREEK 2016 MEAN PERCENT COVER TYPES IN POOLS**

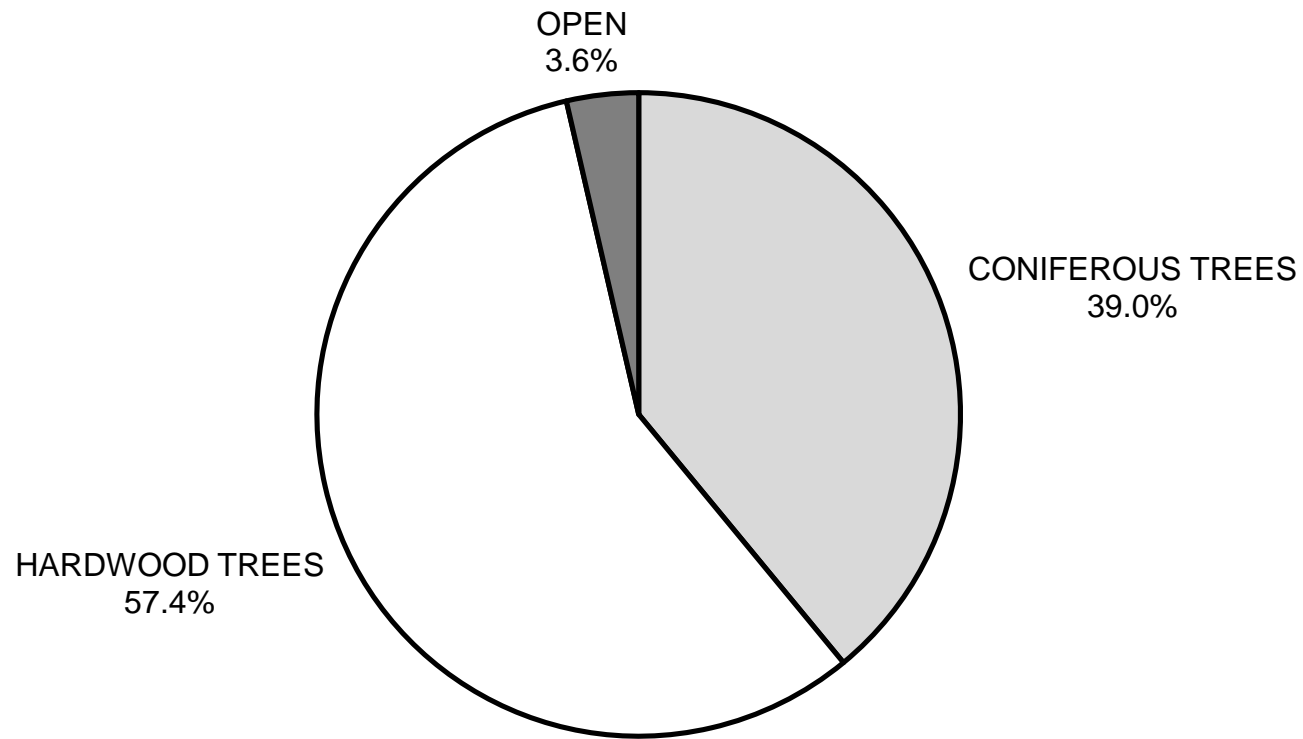


GRAPH 7

**CORNER CREEK 2016**  
**SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**

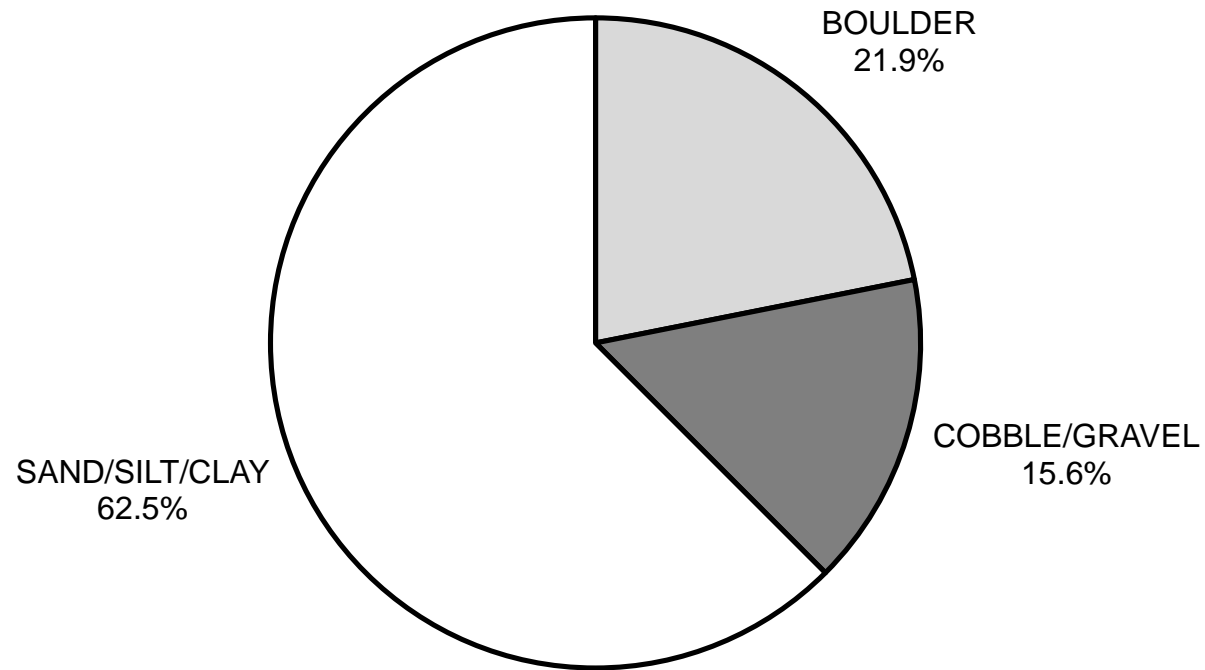


# CORNER CREEK 2016 MEAN PERCENT CANOPY



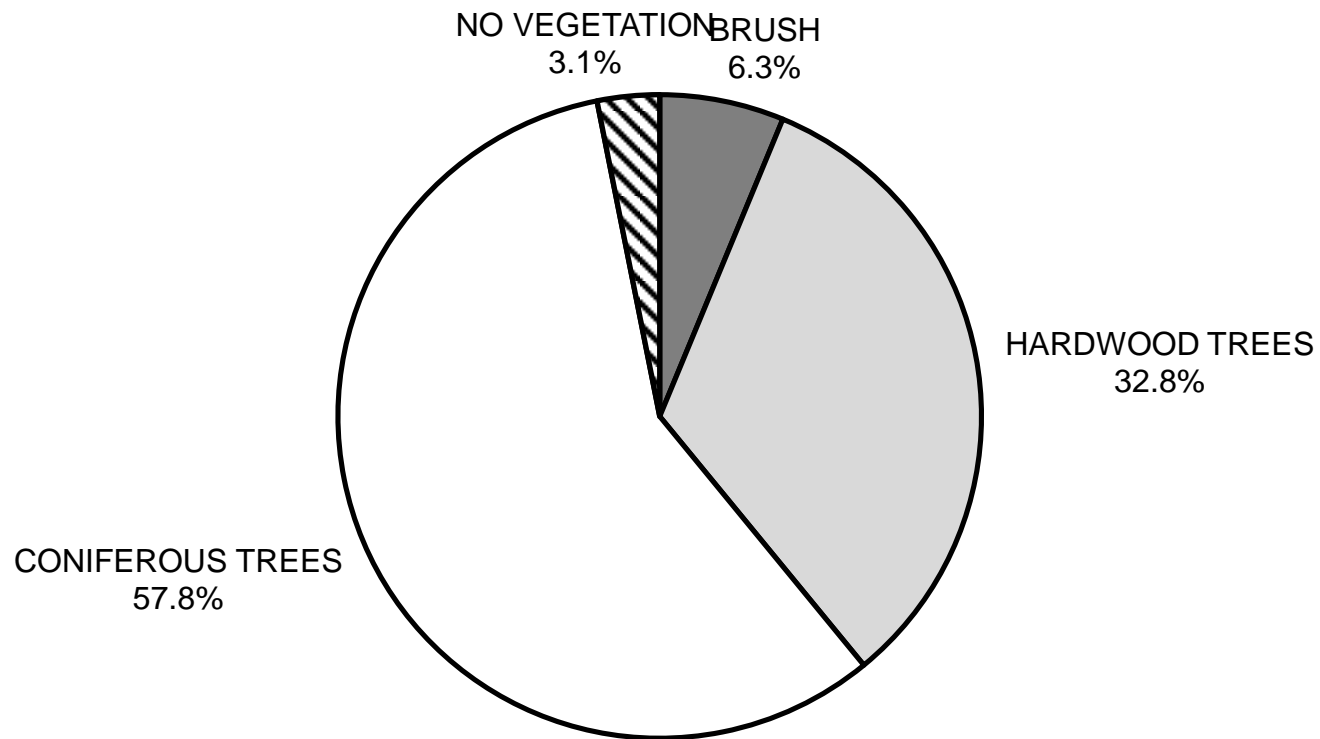
GRAPH 9

**CORNER CREEK 2016  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

# CORNER CREEK 2016 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11



## **APPENDIX II**

# **STREAM INVENTORY PHOTOS**



Photo 1. Lower Corner Creek (photo taken 5/24/2016).



Photo 2. End of survey (Habitat Unit # 80). Channel splits into multiple channels and  $>10\%$  gradient occurs for more than 1,000 feet (photo taken 5/24/2016).