



## **CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE**

### **STREAM INVENTORY REPORT**

#### **Price Creek**

#### INTRODUCTION

A stream inventory was conducted from June 20 to July 7, 2017 on Price Creek. The survey began at the confluence with Eel River and extended upstream 6.7 miles.

The Price 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 Price 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 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. This report was finalized in April, 2018.

#### WATERSHED OVERVIEW

Price Creek is a tributary to the Eel River, which drains to the Pacific Ocean, located in Humboldt County, California (Map 1). Price Creek's legal description at the confluence with Eel River is T02N R01W S27. Its location is 40.5283° north latitude and -124.1623° west longitude, LLID number 1241592405280. Price Creek is a second order stream and has approximately 8.5 miles of blue line stream according to the USGS Ferndale 7.5 minute quadrangle. Price Creek drains a watershed of approximately 13.2 square miles. Elevations range from about 15 feet at the mouth of the creek to 1,900 feet in the headwater areas. Hardwood and mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Hwy 101 to Blue Slide Road to Price Creek Road.

#### METHODS

The habitat inventory conducted in Price 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 CDFW. This inventory was conducted by a two-person team.

#### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and

their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and 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. Surveyors also take photos to document general habitat conditions, significant features (landslides, potential barriers, etc.), and end of survey (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 Price 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". Price 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 Price 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.

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 Price 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 Price 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 Price 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 (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 Price Creek. In addition, underwater mask and snorkel observations were made at 11 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 Price 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 \*

The habitat inventory of June 20 to July 7, 2017 was conducted by Joshua Gruver (CCC), Ryan Bernstein (CDFW), Angela Cruz, and Sydney Stewart (WSP). The total length of the stream surveyed was 35,264 feet.

A stream flow measurement 1.99 cfs was recorded on June 29, 2017 near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter.

Price Creek is an F3 channel type for 19,487 feet of the stream surveyed (Reach 1), a B2 channel type for 9,956 feet of the stream surveyed (Reach 2), and an F4 channel type for 5,821 feet of the stream surveyed (Reach 3). F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with cobble-dominant substrates. B2 channels are moderately entrenched, moderate gradient, riffle dominated channel with infrequently spaced pools, very stable plan and profile, stable banks, and boulder-dominant substrates. F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 55° to 64° Fahrenheit. Air temperatures ranged from 60° to 74° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 38% flatwater units, 33% riffle units, 29% pool units, and 1% no-survey units (Graph 1). Based on total length of Level II habitat types there were 60% flatwater units, 23% riffle units, and 16% pool units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 30% low gradient riffle units, 28% mid-channel pool units, and 24% run units (Graph 3). Based on percent total length, step run units made up 33%, run units 27%, and low gradient riffle units 22%.

A total of 169 pools were identified (Table 3). Main channel pools were the most frequently encountered at 98% (Graph 4), and comprised 98% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Fifty-one of the 169 pools (30%) had a residual depth of two

feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 169 pool tail-outs measured, 85 had a value of 1 (50.3%), 40 had a value of 2 (23.7%), 30 had a value of 3 (17.8%), and 14 had a value of 5 (8.3%) (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 3, flatwater habitat types had a mean shelter rating of 5, and pool habitats had a mean shelter rating of 13 (Table 1). Of the pool types, scour pools had the highest mean shelter rating of 20. Main channel pools had a mean shelter rating of 13 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Price Creek. Graph 7 describes the pool cover in Price Creek. Small woody debris is the dominant pool cover type followed by boulders.

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 69% of pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 20% of pool tail-outs.

The mean percent canopy density for the surveyed length of Price Creek was 78%. Twenty-two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 88% and 12%, respectively. Graph 9 describes the mean percent canopy in Price Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 97%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 90% sand/silt/clay, 5% cobble/gravel, 3% bedrock, and 1% boulder (Graph 10). Deciduous trees was the dominant vegetation type observed in 66% of the units surveyed. Additionally, 27% of the units surveyed had brush as the dominant vegetation type, and 4% had grass as the dominant vegetation type (Graph 11).

## BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a mask and snorkel survey at 11 sites for species composition and distribution in Price Creek on August 23, 2017 (Table A). The sites were sampled by Ryan Bernstein (CDFW) and Chris Tevini (CCC).

In Reach 1, which comprised the first 19,487 feet of stream, 10 sites were sampled. The reach sites yielded 156 YOY steelhead trout (SH), 42 age 1+ SH, 10 age 2+ SH, 1,100+ stickleback (STB), and 700+ Sacramento pikeminnow (SPM).

In Reach 3, one site was sampled approximately 34,778 feet from the confluence with Eel River. The reach sites yielded two YOY steelhead trout (SH).

During the survey, the upstream-most observation of juvenile steelhead trout occurred at 40.5150° northlatitude, -124.2385° west longitude, approximately 34,778 feet upstream from the confluence with Eel River (Map 1). No coho salmon (COHO) or Chinook salmon (CHIN) were observed during the biological inventory.

Table A. Summary of results for a fish composition and distribution survey within Price Creek, August 23, 2017.

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: F3 Channel Type										
08/23/17	1	11	Pool	448	20	14	4	0	0	SPM
	2	14	Pool	573	40	3	2	0	0	SPM
	3	18	Pool	727	15	0	0	0	0	SPM, STB
	4	20	Pool	1,029	12	0	1	0	0	SPM, STB
	5	23	Pool	1,114	20	10	3	0	0	SPM, STB
	6	27	Pool	1,341	10	0	0	0	0	SPM, STB
	7	33	Pool	1,598	4	6	0	0	0	SPM, STB
	8	37	Pool	1,968	3	1	0	0	0	SPM, STB
	9	40	Pool	2,000	12	0	0	0	0	SPM, STB
	10	46	Pool	2,404	20	10	0	0	0	SPM, STB
Reach 3: F4 Channel Type										
08/23/17	11	583	step run	35,107	2	0	0	0	0	

Species abbreviations: SPM = Sacramento pikeminnow; STB = Stickleback

## DISCUSSION

Price Creek is an F3 channel type for the first 19,487 feet of stream surveyed, a B2 channel type for the next 9,856 feet, and an F4 channel type for the next 5,821 feet. The suitability of F3, B2, and F4 channel types for fish habitat improvement structures is as follows: F3 channels are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover. B2 channels excellent for plunge weirs, single and opposing wing-deflectors, and log cover. F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days June 20 to July 7, 2017 ranged from 55° to 64° Fahrenheit. Air temperatures ranged from 60° to 74° Fahrenheit. These are suitable water temperatures 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 60% of the total length of this survey, riffles 23%, and pools

16%. Fifty-one of the 169 (30%) 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 structures that will increase or deepen pool habitat is recommended.

One hundred twenty-five of the 169 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty of the pool tail-outs had embeddedness ratings of 3 or 4. Fourteen 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.

One hundred fifty-one of the 169 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 13. 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 small woody debris in Price Creek. Small woody debris is the dominant cover type in pools followed by boulders. Log and rootwad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 78%. Reach 1 had a canopy density of 76%, Reach 2 had a canopy density of 78%, and Reach 3 had a canopy density of 80%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 97% and 96%, 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

Price 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 Price Creek. 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) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from small woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 2) The limited water temperature data available suggest that maximum temperatures are

within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

- 3) Increase the canopy in Reaches 1 and 2 on Price Creek by planting appropriate native vegetation and preferably coniferous species like redwood and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

#### 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 Eel River. Channel type is a F4. Channel type cross-section location is at Habitat Unit (HU) #106.
320	0009.00	Bridge #1 is the crossing for Blue Slide Road and is 35' high x 30' wide x 85' long. It is an automobile bridge (made of metal) and is not a barrier to salmonids.
448	0012.00	Tributary #1 enters on the left bank. It contributes to approximately 0% of Price Creek's flow. The water temperature of the tributary was 61° Fahrenheit, the water temperature downstream of the confluence was 61° Fahrenheit, and the water temperature upstream of the confluence was 61° Fahrenheit. The slope of the tributary is ~1%. The tributary is accessible to salmonids. Fish were not observed in the tributary.
2013	0040.00	Bridge #2 is the crossing for Price Creek Road and is 20' high x 23' wide x 44' long. It is an automobile bridge (made of metal) and is not a barrier to salmonids.
4852	0090.00	Man-made pool with large pump and ladder. Appears to lead to pasture land.
6905	0118.00	Bridge #3 is the crossing for Price Creek Road and is 16.9' high x 22' wide x 65' long. It is an automobile bridge (made of concrete) and is not a barrier to salmonids. Concrete slabs in creek bed.

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10446	0165.00	Bridge #4 is the crossing for Price Creek Road and is 24' high x 23' wide x 63' long. It is an automobile bridge (made of concrete) and is not a barrier to salmonids.
13676	0222.00	Bridge #5 is the crossing for Price Creek Road and is 16' high x 20' wide x 42' long. It is an automobile bridge (made of metal) and is not a barrier to salmonids.
14601	0234.00	Tributary #2 enters on the left bank. It contributes to approximately 1% of Price Creek's flow. The water temperature of the tributary was 59° Fahrenheit, the water temperature downstream of the confluence was 59° Fahrenheit, and the water temperature upstream of the confluence was 59° Fahrenheit. The slope of the tributary is ~1%. The tributary is accessible to salmonids. Fish were not observed in the tributary.
16919	0279.00	Rip rap present along banks.
19981	0325.00	Drainage culvert (RB) observed. YOY observed.
21527	0350.00	Tributary #3 enters on the right bank. It contributes to approximately 2% of Price Creek's flow. The water temperature of the tributary was 57° Fahrenheit, the water temperature downstream of the confluence was 57° Fahrenheit, and the water temperature upstream of the confluence was 57° Fahrenheit. The slope of the tributary is 1.5%. The tributary is accessible to salmonids. Fish were not observed in the tributary.
21823	0358.00	Bridge #6 is the crossing for Price Creek Rd and is 7.5' high x 9.5' wide x 33' long. It is an automobile bridge (made of metal) and is not a barrier to salmonids.
23254	0388.00	There is a 1.3' plunge at the top of this unit. It is not a barrier to salmonids.
24021	0402.00	Tributary #4 enters on the right bank. It contributes to approximately 2% of Price Creek's flow. The water temperature of the tributary was 57° Fahrenheit, the water temperature downstream of the confluence was 57° Fahrenheit, and the water temperature upstream of the confluence was 57° Fahrenheit. The slope of the tributary is 1%. The tributary is accessible to salmonids. Fish were not observed in the tributary.
24037	0403.00	Channel type changes to a B2 at Habitat Unit (HU) #403. Channel type cross-section location is at HU #423.

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25280	0416.00	Bridge #7 is the crossing for an unnamed road and is 8.8' high x 10' wide x 46' long. It is an automobile bridge (made of wood and metal) and is not a barrier to salmonids.
26088	0421.00	Tributary #5 enters on the right bank. It contributes to approximately 2% of Price Creek's flow. The water temperature of the tributary was 55° Fahrenheit, the water temperature downstream of the confluence was 55° Fahrenheit, and the water temperature upstream of the confluence was 55° Fahrenheit. The slope of the tributary is 1%. The tributary is accessible to salmonids. Fish were not observed in the tributary.
28256	0454.00	Tributary #6 enters on the left bank. It contributes to approximately 1% of Price Creek's flow. The water temperature of the tributary was 56° Fahrenheit, the water temperature downstream of the confluence was 56° Fahrenheit, and the water temperature upstream of the confluence was 56° Fahrenheit. The slope of the tributary is 1%. The tributary is accessible to salmonids. Fish were not observed in the tributary.
28314	0455.00	There is a 2' plunge at the top of this unit. It is not a barrier to salmonids.
28508	0462.00	Landslide observed (RB).
28939	0472.00	7' plunge observed from LDA.
29159	0477.00	Tributary #7 enters on the right bank. It contributes to approximately 0% of Price Creek's flow. The slope of the tributary is 1%. The tributary is not accessible to salmonids due to it being dry. Fish were not observed in the tributary.
29627	0484.00	Channel type changes to a F4 at Habitat Unit (HU) #484.
31556	0525.00	Log debris accumulation (LDA) #1 is 6' high x 34' wide x 10' long and contains 32 pieces of large woody debris (LWD). Water flows through the LDA and there are visible gaps in it. Sediment is being retained in the approximate dimensions of 14' wide x 12' long x 1' deep. The sediment ranges in size from silt to gravel. The LDA is a possible barrier to salmonids. Fish were observed above the LDA.
32221	0542.00	There is a 1' log plunge into a 3' pool at the top of this unit. It is not a barrier to salmonids.

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33399	0555.00	There is a 1' log plunge into a 3' pool at the top of this unit. It is not a barrier to salmonids.
35052	0587.00	LDA #2 is 15' high x 85' wide x 1,000' long and contains 250 pieces of LWD. Water flows through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 60' wide x 80' long x 2.5' deep. The sediment ranges in size from silt to gravel. The LDA is a possible barrier to salmonids as major landslide spans width of channel for over 1,000'. Fish were not observed above the LDA.
35237	0589.00	Tributary #8 enters on the right bank. It contributes to approximately 1% of Price Creek's flow. The water temperature of the tributary was 57° Fahrenheit, the water temperature downstream of the confluence was 57° Fahrenheit, and the water temperature upstream of the confluence was 57° Fahrenheit. The slope of the tributary is 1%. The tributary is accessible to salmonids. Fish were not observed in the tributary.
35247	0590.00	End of survey due to major landslide/LDA accumulation spanning width of channel. Total length was not measured due to restricted access from debris. It is at least 1,200' long and the width varies from 30' to 100'. There is a large volume of sediment collecting behind the debris. Landslide is still unstable with trees precariously balancing on slope.

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.

REPORT CONTACT INFORMATION

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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 - Rootwad 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 - Rootwad 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** **Price Creek** **Lower Eel River Watershed** **Fortuna Quad, Humboldt County**



**End of Survey**  
**\*River Mile 6.67**

**\*River Mile 6.59**

**Start of Survey**

**Lower Eel River Watershed**

Price Creek

Humboldt County

Mendocino County

Pacific Ocean



- Reach 1: F3 Channel Type
- Reach 2: B2 Channel Type
- Reach 3: F4 Channel Type
- Price Creek

● Last observed juvenile steelhead trout

0 0.25 0.5 1 Miles

0 0.5 1 2 Kilometers



# **APPENDIX I**

## **TABLES AND GRAPHS**

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

Stream Name: Price Creek

LLID: 1241592405280

Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017

Confluence Location: Quad: FERNDALE

Legal Description: T02NR01WS27

Latitude: 40:31:41.0N

Longitude: 124:09:33.0

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
225	22	FLATWATER	38.1	94	21091	59.8	11.3	0.5	0.9	1079	242780	498	112160		5
3	0	NOSURVEY	0.5	50	150	0.4									
169	169	POOL	28.6	34	5802	16.5	12.5	0.8	1.9	441	74491	516	87133	417	13
193	17	RIFFLE	32.7	43	8221	23.3	11.6	0.4	0.7	494	95425	172	33143		3
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
590	208				35264					412696			232436		

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

Stream Name: Price Creek

LLID: 1241592405280

Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017

Confluence Location: Quad: FERNDAL

Legal Description: T02NR01WS27

Latitude: 40:31:41.0N

Longitude: 124:09:33.0W

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 (%)
177	15	LGR	30.0	43	7696	21.8	11	0.4	1.2	476	84174	164	29049		3	75
16	2	HGR	2.7	33	525	1.5	14	0.4	0.7	636	10176	229	3661		5	68
144	15	RUN	24.4	65	9381	26.6	12	0.5	2.1	995	143225	458	65890		7	81
81	7	SRN	13.7	145	11710	33.2	10	0.6	2	1260	102052	586	47479		0	82
164	164	MCP	27.8	34	5603	15.9	12	0.8	6.8	437	71587	509	83399	411	13	78
2	2	STP	0.3	42	84	0.2	14	0.6	1.8	516	1033	447	895	321	20	67
3	3	PLP	0.5	38	115	0.3	17	1.3	2.9	624	1871	947	2840	794	20	90
3	0	NS	0.5	50	150	0.4										

Total Units  
590

Total Units Fully Measured  
208

Total Length (ft.)  
35264

Total Area (sq.ft.)  
414116

Total Volume (cu.ft.)  
233212

**Table 3 - Summary of Pool Types**

Stream Name: Price Creek

LLID: 1241592405280

Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017

Confluence Location: Quad: FERNDALE

Legal Description: T02NR01WS27

Latitude: 40:31:41.0N

Longitude: 124:09:33.0W

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
166	166	MAIN	98	34	5687	98	12.4	0.8	437	72620	410	68108	13
3	3	SCOUR	2	38	115	2	17.0	1.3	624	1871	794	2382	20
Total Units	Total Units Fully Measured			Total Length (ft.)				Total Area (sq.ft.)		Total Volume (cu.ft.)			
169	169			5802				74491		70490			

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

Stream Name: Price Creek

LLID: 1241592405280

Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017

Confluence Location: Quad: FERNDAL

Legal Description: T02NR01WS27

Latitude: 40:31:41.0N

Longitude: 124:09:33.0W

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
164	MCP	97	11	7	105	64	28	17	16	10	4	2
2	STP	1	0	0	2	100	0	0	0	0	0	0
3	PLP	2	0	0	0	0	3	100	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
169	11	7	107	63	31	18	16	9	4	2

Mean Maximum Residual Pool Depth (ft.): 1.9

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

Stream Name: Price Creek

LLID:1241592405280 Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017 Dry Units: 0

Confluence Location: Quad: FERNDAL Legal Description: T02NR01WS27 Latitude: 40:31:41.0N Longitude: 124:09:33.0W

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
177	15	LGR	0	67	17	17	0	0	0	0	0
16	2	HGR	0	100	0	0	0	0	0	0	0
193	17	TOTAL RIFFLE	0	82	9	9	0	0	0	0	0
144	14	RUN	8	82	0	0	8	0	0	2	0
81	6	SRN	0	0	0	0	0	0	0	0	0
225	20	TOTAL FLAT	8	81	0	0	8	0	0	3	0
164	164	MCP	18	33	7	3	1	0	4	32	3
2	2	STP	0	10	0	0	0	0	50	40	0
3	3	PLP	7	0	33	0	0	0	50	10	0
169	169	TOTAL POOL	19	32	7	1	1	0	5	32	3
3	0	NS									
590	206	TOTAL	18	34	7	1	1	0	4	30	3

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

Stream Name: Price Creek

LLID: 1241592405280

Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017

Dry Units: 0

Confluence Location: Quad: FERNDALE

Legal Description: T02NR01WS27

Latitude: 40:31:41.0N

Longitude: 124:09:33.0W

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
177	15	LGR	0	33	20	33	13	0	0
16	2	HGR	0	0	0	50	50	0	0
144	15	RUN	0	40	20	20	20	0	0
81	6	SRN	0	0	33	33	33	0	0
164	164	MCP	2	46	29	15	6	1	0
2	2	STP	0	50	0	0	0	50	0
3	3	PLP	0	33	67	0	0	0	0

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

Stream Name: Price Creek

LLID: 1241592405280

Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017

Confluence Location: Quad: FERNDALE

Legal Description: T02NR01WS27

Latitude: 40:31:41.0N

Longitude: 124:09:33.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
78	12	88	3	97	96

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: Price Creek

LLID: 1241592405280

Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017

Survey Length (ft.): 35264

Main Channel (ft.): 35264

Side Channel (ft.): 0

Confluence Location: Quad: FERNDAL

Legal Description: T02NR01WS27 Latitude: 40:31:41.0N

Longitude: 124:09:33.0W

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

Channel Type: F3

Canopy Density (%): 76.4

Pools by Stream Length (%): 18.3

Reach Length (ft.): 19487

Coniferous Component (%): 11.2

Pool Frequency (%): 25.5

Riffle/Flatwater Mean Width (ft.): 13.2

Hardwood Component (%): 88.8

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Brush

&lt; 2 Feet Deep: 54

Range (ft.): 28 to 82

Vegetative Cover (%): 92.8

2 to 2.9 Feet Deep: 26

Mean (ft.): 43

Dominant Shelter: Small Woody Debris

3 to 3.9 Feet Deep: 15

Std. Dev.: 11

Dominant Bank Substrate Type: Sand/Silt/Clay

&gt;= 4 Feet Deep: 5

Base Flow (cfs.): 2.0

Occurrence of LWD (%): 3

Mean Max Residual Pool Depth (ft.): 2.2

Water (F): 56 - 64 Air (F): 60 - 74

LWD per 100 ft.:

Mean Pool Shelter Rating: 12

Dry Channel (ft): 0

Riffles: 0

Pools: 1

Flat: 0

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 77 Sm Cobble: 22 Lg Cobble: 1 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 46.9 2. 30.9 3. 22.2 4. 0.0 5. 0.0

**STREAM REACH: 2**

Channel Type: B2

Canopy Density (%): 78.1

Pools by Stream Length (%): 14.9

Reach Length (ft.): 9956

Coniferous Component (%): 6.0

Pool Frequency (%): 32.7

Riffle/Flatwater Mean Width (ft.): 12.1

Hardwood Component (%): 94.0

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Hardwood Trees

&lt; 2 Feet Deep: 85

Range (ft.): 17 to 63

Vegetative Cover (%): 100.0

2 to 2.9 Feet Deep: 11

Mean (ft.): 37

Dominant Shelter: Boulders

3 to 3.9 Feet Deep: 4

Std. Dev.: 9

Dominant Bank Substrate Type: Sand/Silt/Clay

&gt;= 4 Feet Deep: 0

Base Flow (cfs.): 2.0

Occurrence of LWD (%): 3

Mean Max Residual Pool Depth (ft.): 1.5

Water (F): 55 - 60 Air (F): 60 - 73

LWD per 100 ft.:

Mean Pool Shelter Rating: 12

Dry Channel (ft): 0

Riffles: 0

Pools: 1

Flat: 0

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 51 Sm Cobble: 23 Lg Cobble: 4 Boulder: 23 Bedrock: 0

Embeddedness Values (%): 1. 49.1 2. 17.0 3. 11.3 4. 0.0 5. 22.6

## Summary of Fish Habitat Elements By Stream Reach

### STREAM REACH: 3

Channel Type: F4	Canopy Density (%): 80.5	Pools by Stream Length (%): 13.1
Reach Length (ft.): 5821	Coniferous Component (%): 20.4	Pool Frequency (%): 31.8
Riffle/Flatwater Mean Width (ft.): 5.8	Hardwood Component (%): 79.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 83
Range (ft.): 18 to 67	Vegetative Cover (%): 100.0	2 to 2.9 Feet Deep: 11
Mean (ft.): 36	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 6
Std. Dev.: 13	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 2.0	Occurrence of LWD (%): 10	Mean Max Residual Pool Depth (ft.): 1.5
Water (F): 59 - 60 Air (F): 62 - 67	LWD per 100 ft.:	Mean Pool Shelter Rating: 16
Dry Channel (ft): 0	Riffles: 0	
	Pools: 2	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 80 Sm Cobble: 11 Lg Cobble: 3 Boulder: 0 Bedrock: 6		
Embeddedness Values (%): 1. 60.0 2. 17.1 3. 17.1 4. 0.0 5. 5.7		

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

Stream Name: Price Creek

LLID: 1241592405280

Drainage: Eel River - Lower

Survey Dates: 6/20/2017 to 7/7/2017

Confluence Location: Quad: FERNDAL

Legal Description: T02NR01WS27

Latitude: 40:31:41.0N

Longitude: 124:09:33.0W

**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	6	8	3.4
Boulder	4	2	1.4
Cobble / Gravel	13	9	5.3
Sand / Silt / Clay	185	189	89.9

**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	7	9	3.8
Brush	56	57	27.2
Hardwood Trees	139	136	66.1
Coniferous Trees	2	1	0.7
No Vegetation	4	5	2.2

**Total Stream Cobble Embeddedness Values:** 2

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

StreamName: Price Creek

LLID: 1241592405280    Drainage: Eel River-Lower

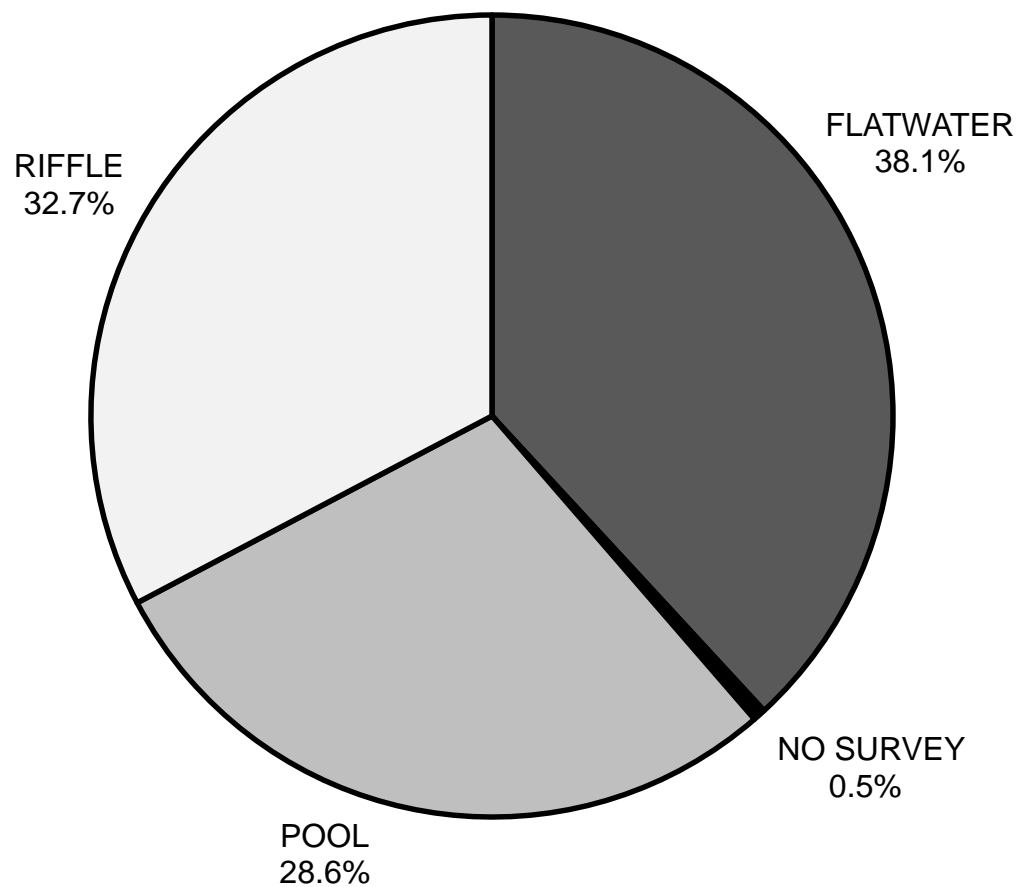
Survey Dates: 6/20/2017 to 7/7/2017

Confluence Location:    Quad: FERNDALE    Legal Description: T02NR01WS27    Latitude: 40:31:41.0N    Longitude: 124:09:33.0W

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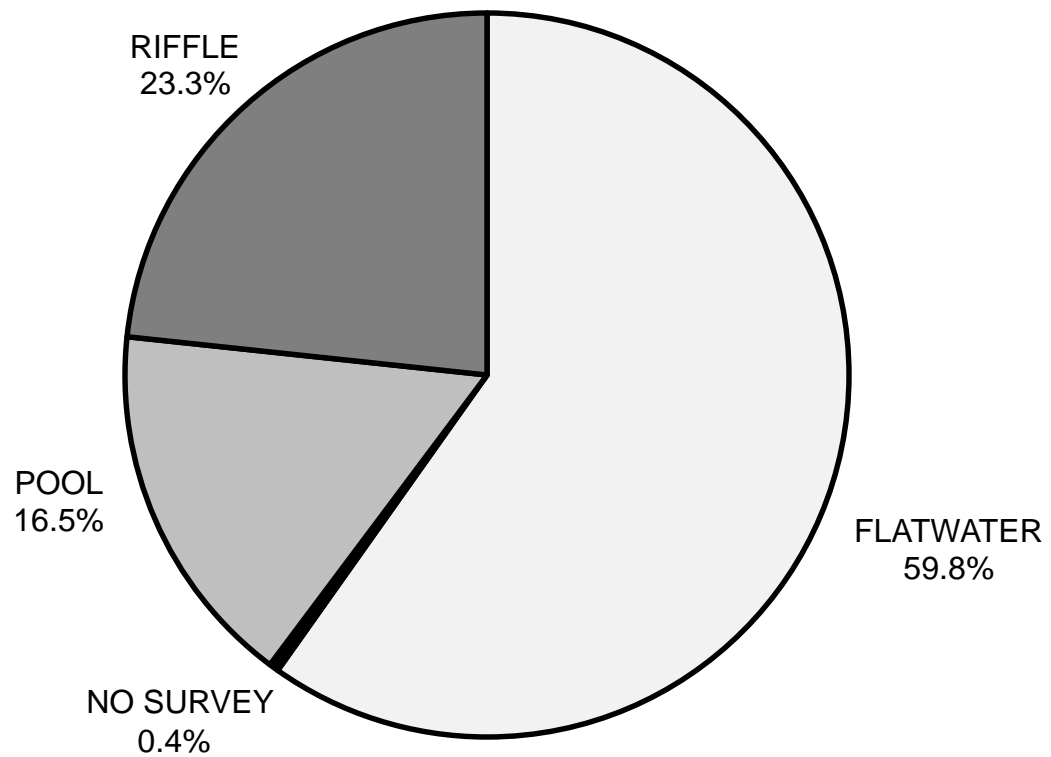
	<b>Riffles</b>	<b>Flatwater</b>	<b>Pools</b>
UNDERCUT BANKS(%)	0	8	19
SMALL WOODY DEBRIS (%)	82	81	32
LARGE WOODY DEBRIS (%)	9	0	7
ROOT MASS (%)	9	0	1
TERRESTRIAL VEGETATION (%)	0	8	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	5
BOULDERS (%)	0	3	32
BEDROCK LEDGES (%)	0	0	3

**PRICE CREEK 2017  
HABITAT TYPES BY PERCENT OCCURRENCE**



GRAPH 1

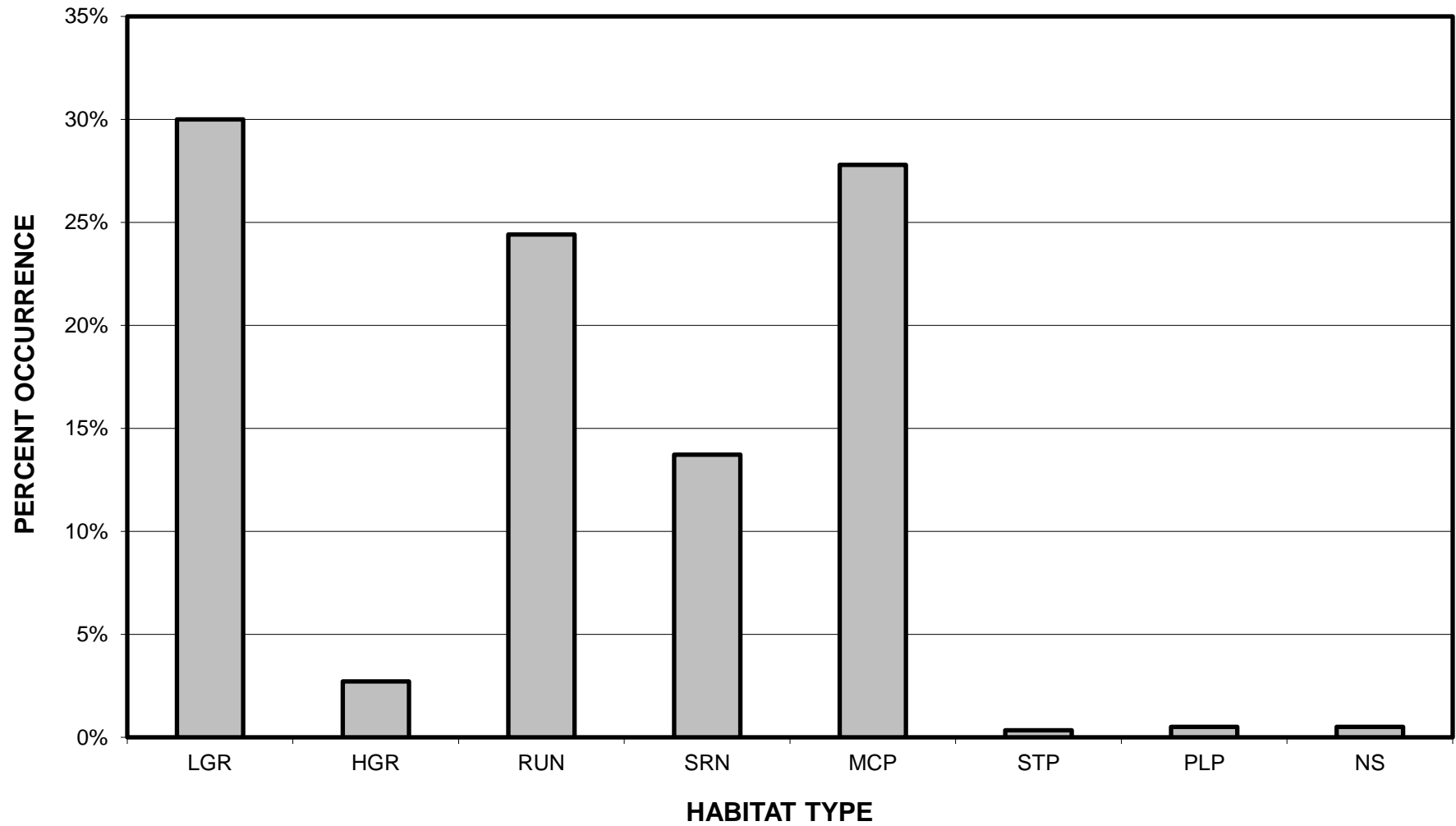
**PRICE CREEK 2017  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

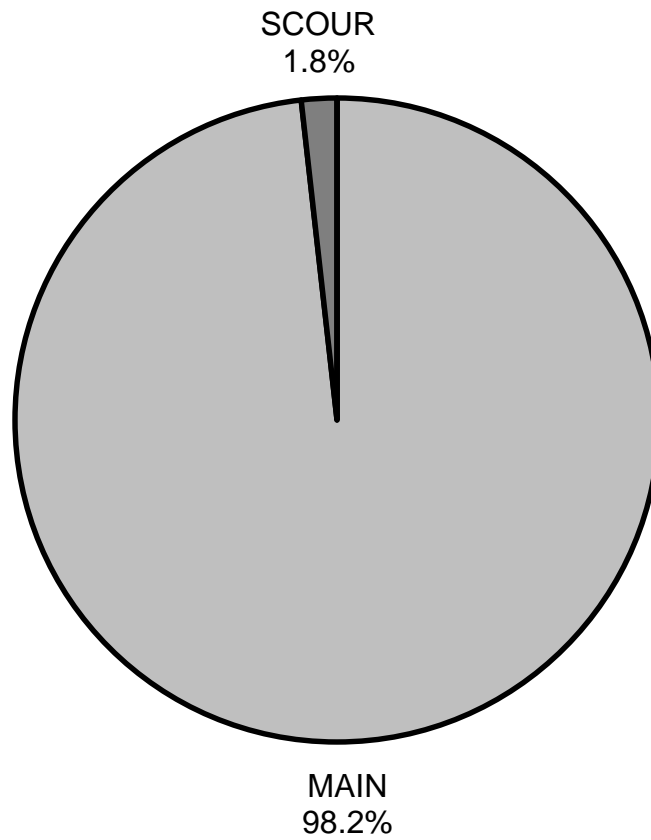
# PRICE CREEK 2017

## HABITAT TYPES BY PERCENT OCCURRENCE



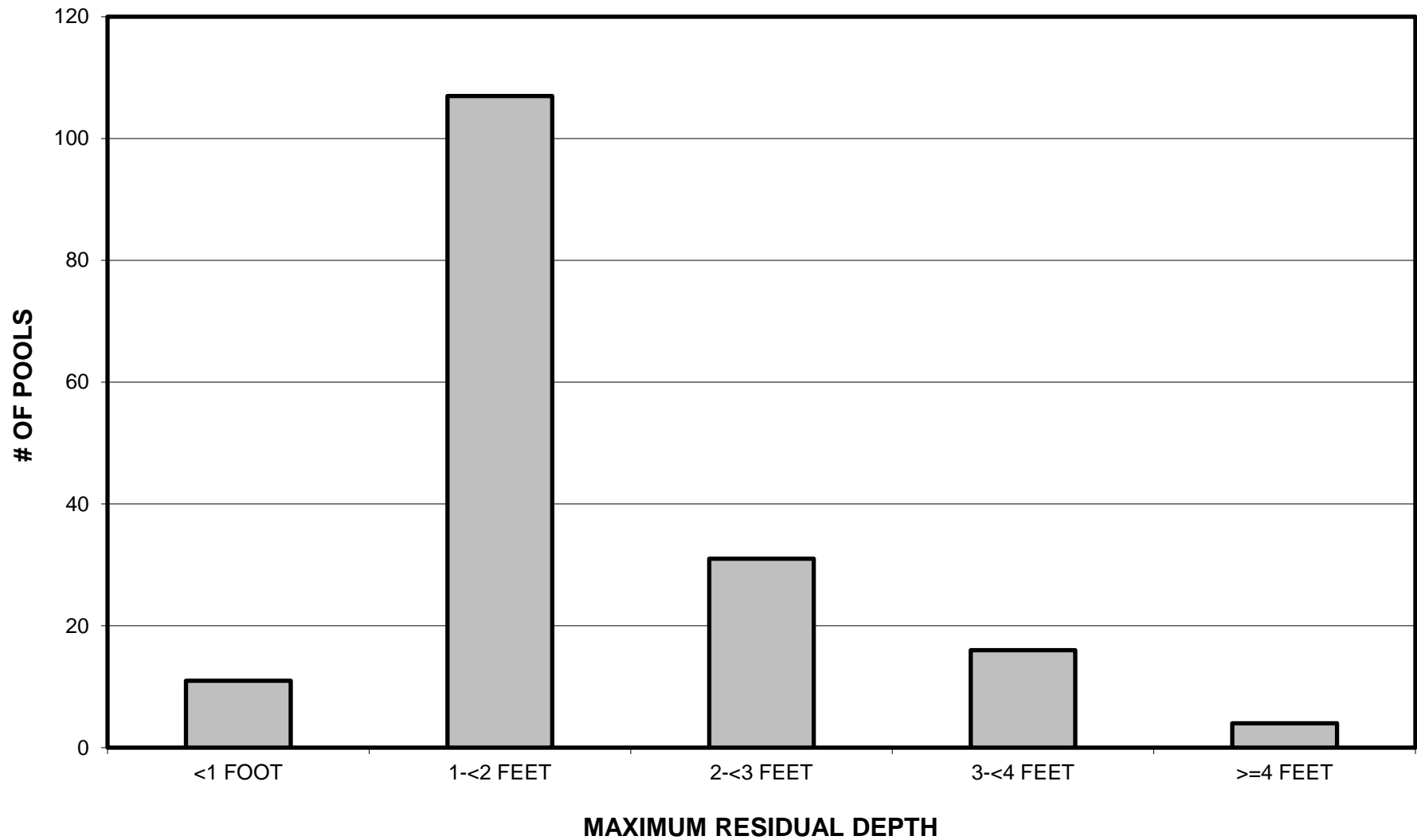
GRAPH 3

**PRICE CREEK 2017**  
**POOL TYPES BY PERCENT OCCURRENCE**



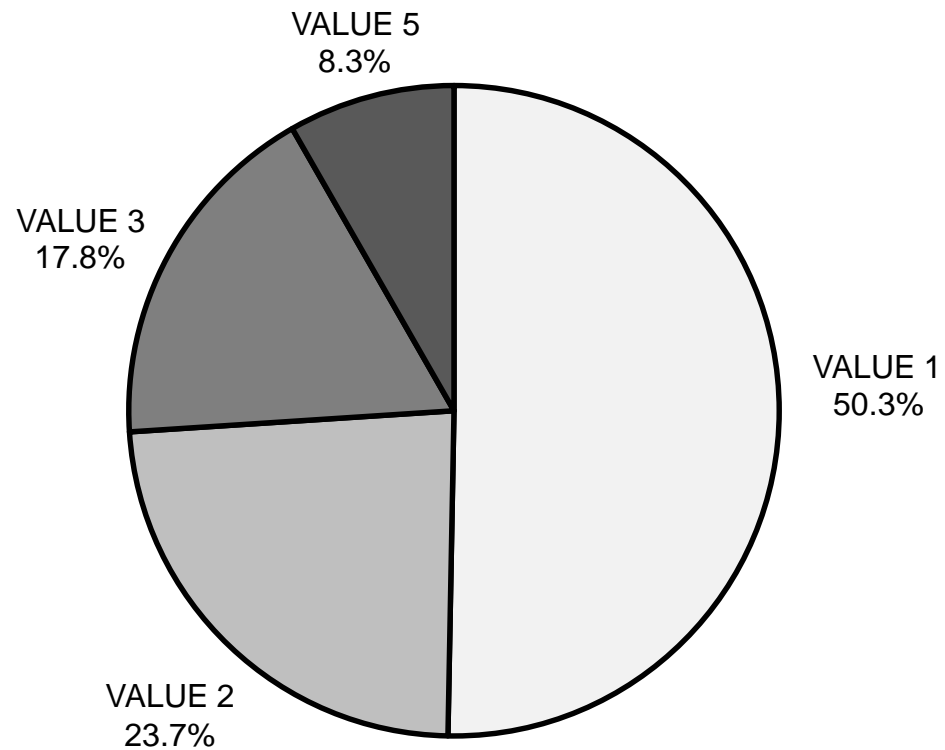
GRAPH 4

# PRICE CREEK 2017 MAXIMUM DEPTH IN POOLS



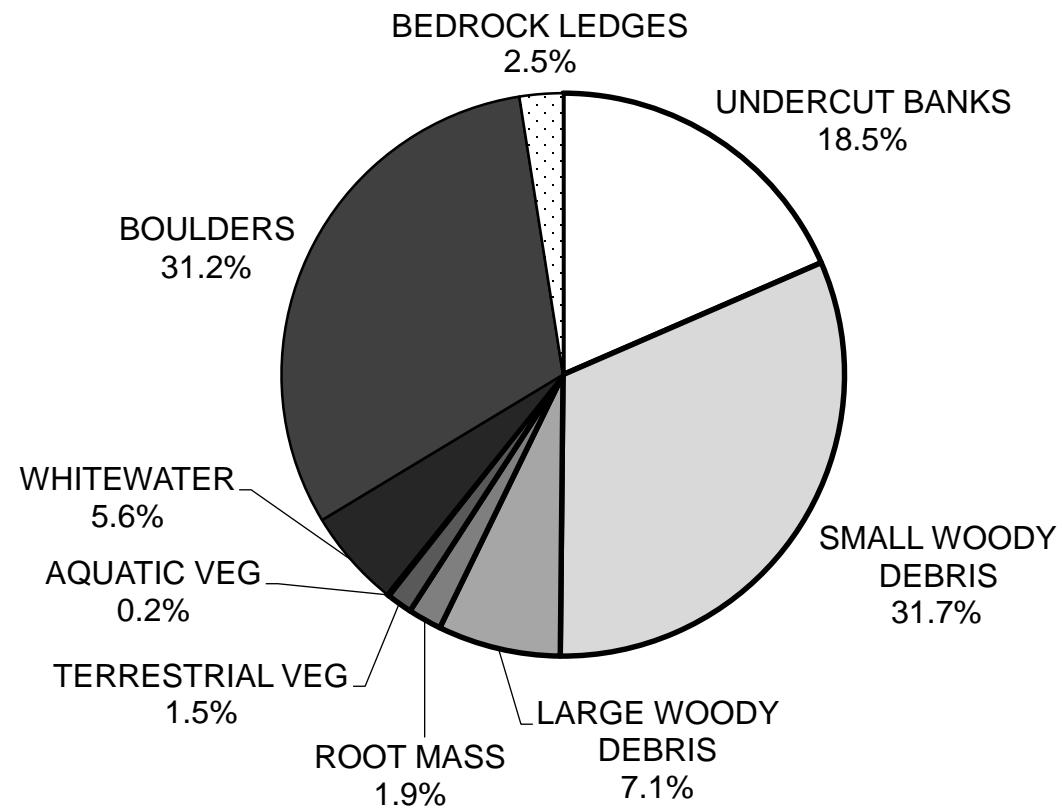
GRAPH 5

# PRICE CREEK 2017 PERCENT EMBEDDEDNESS



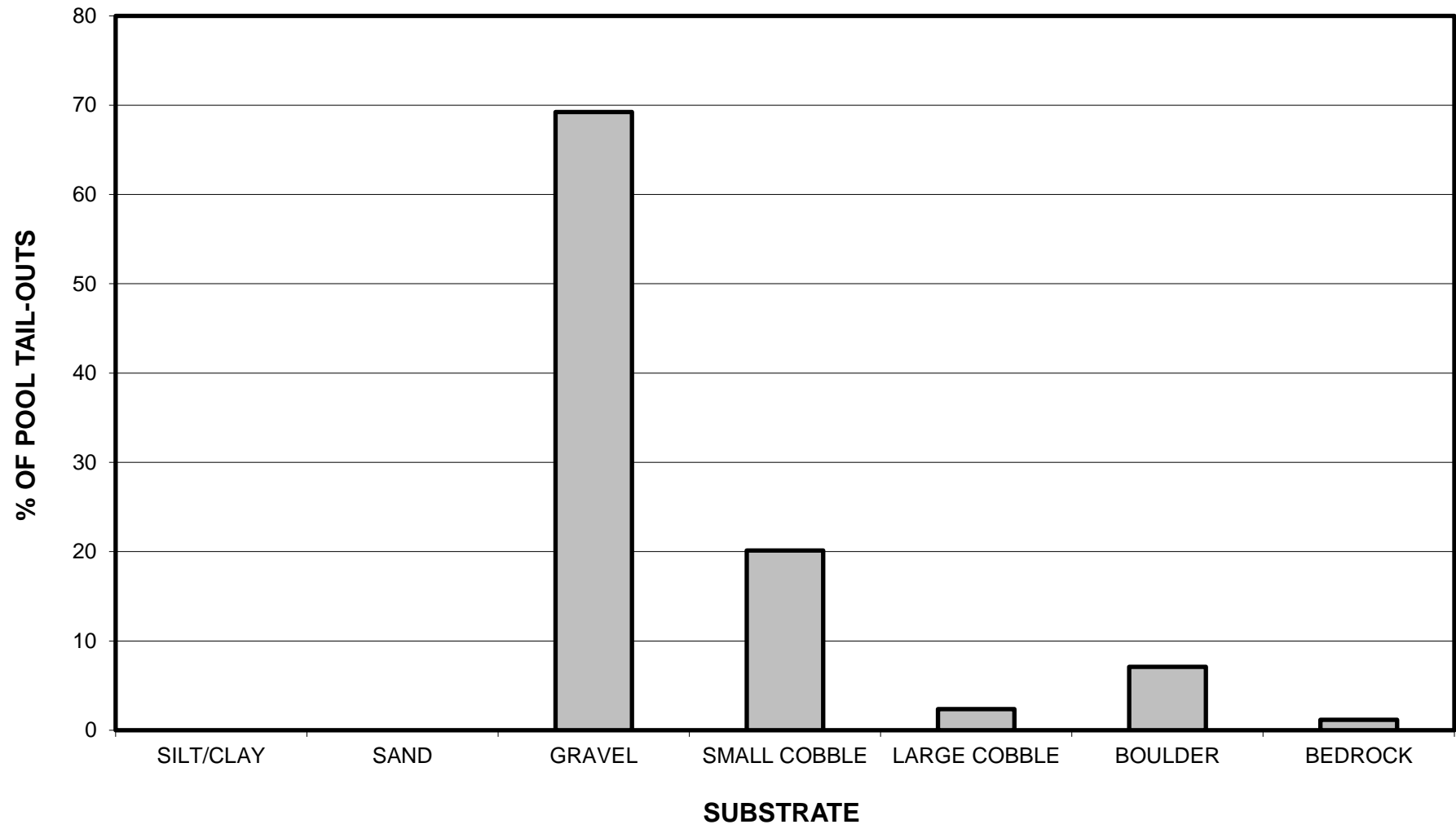
GRAPH 6

# PRICE CREEK 2017 MEAN PERCENT COVER TYPES IN POOLS



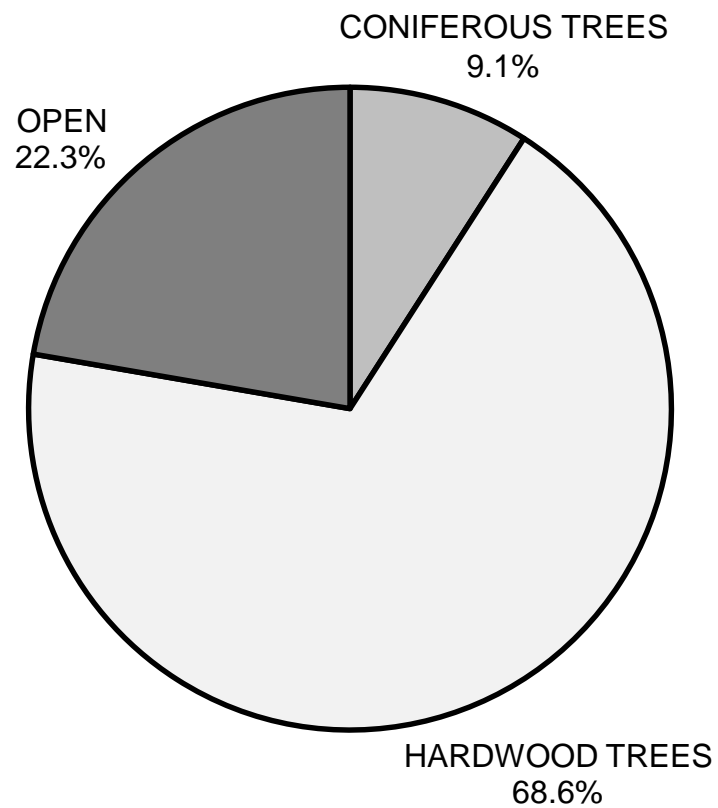
GRAPH 7

**PRICE CREEK 2017**  
**SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



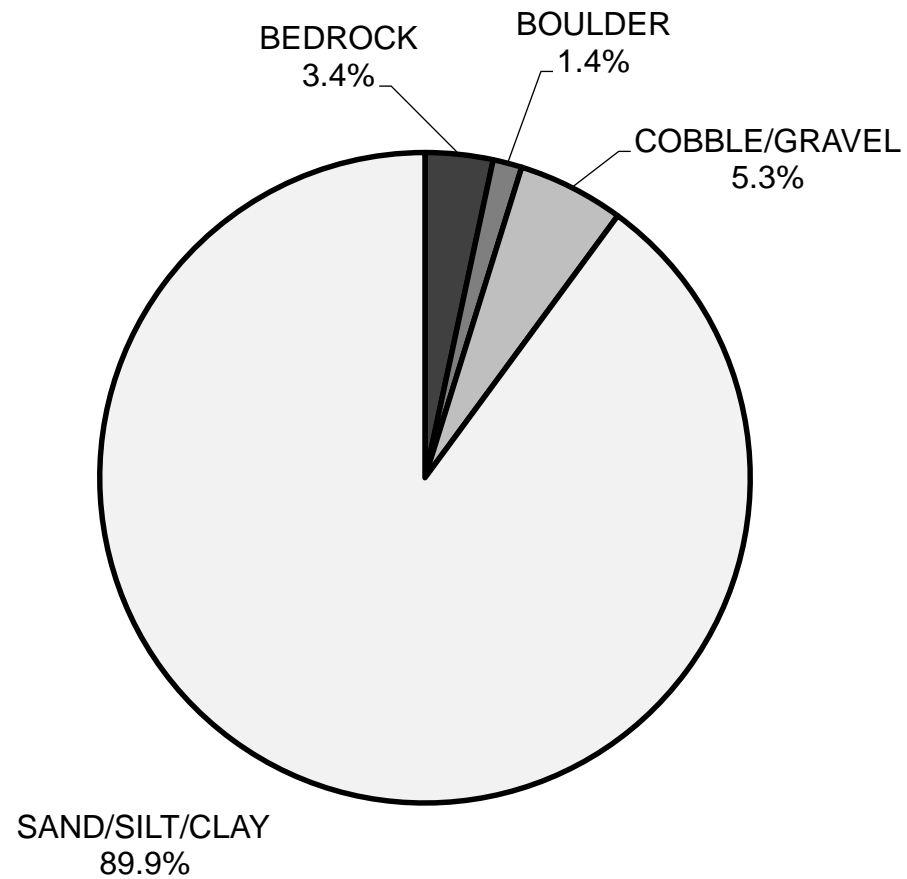
GRAPH 8

# PRICE CREEK 2017 MEAN PERCENT CANOPY



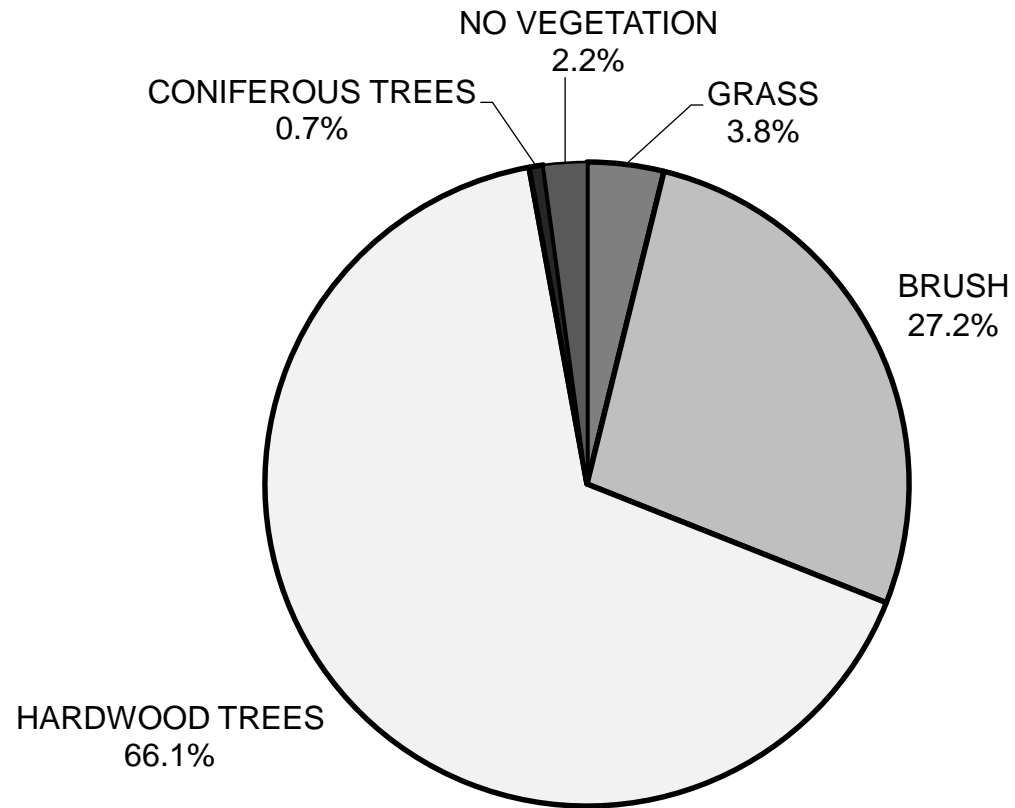
GRAPH 9

**PRICE CREEK 2017**  
**DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**PRICE CREEK 2017**  
**DOMINANT BANK VEGETATION IN SURVEY REACH**



## **APPENDIX II**

# **STREAM INVENTORY PHOTOS**



Photo 1: Run unit near the start of survey. (Photo taken 6/20/17)



Photo 2: Landslide and large debris accumulation. (Photo taken 6/22/17)



Photo 3: End of survey due to major landslide and large debris accumulation, 35,230' upstream from start of survey. (Photo taken 7/7/17)