



CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Blanton Creek

INTRODUCTION

A stream inventory was conducted from May 25 to June 6, 2016 on Blanton Creek. The survey began at the confluence with Yager Creek and extended upstream 0.7 miles.

The Blanton 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 Blanton 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 and 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

Blanton Creek is a tributary to Yager Creek, which is a tributary to Van Duzen River, which is a tributary to the Eel River, and is located in Humboldt County, California (Map 1). Blanton Creek's legal description at the confluence with Yager Creek is T02N R01E S12. Its location is 40.576° north latitude and 124.009° west longitude, LLID number 1240093405764. Blanton Creek is a first order stream and has approximately 1.4 miles of blue line stream according to the USGS Hydesville 7.5 minute quadrangle. Blanton Creek drains a watershed of approximately 3.3 square miles. Elevations range from about 398 feet at the mouth of the creek to 1420 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 Blanton Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Wildlife (CDFW) personnel and Watershed Stewards Project/AmeriCorps (WSP) members that conducted the inventory were trained in standardized habitat inventory methods by the 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

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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 Blanton Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

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". Blanton 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 Blanton Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26

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- 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Blanton Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Blanton 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 Blanton 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

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twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

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

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Blanton 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 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and 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 Blanton 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

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- 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 May 25 to June 6, 2016 was conducted by Alejandra Camacho (WSP), Ryan Bernstein (WSP), Emily Moloney (WSP), and Silvia Gwozdz (CDFW). The total length of the stream surveyed was 3,841 feet with an additional 189 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.35 cfs on June 6, 2016.

Blanton Creek is a B4 channel type for 4,030.00 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 54° to 58° Fahrenheit. Air temperatures ranged from 54° to 70° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% riffle units, 37% flatwater units, 23% pool units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 43% flatwater units, 33% riffle units, 24% pool units, and 1% dry units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 28%; mid-channel pool units, 19%; and step run units, 16% (Graph 3). Based on percent total length, step run units made up 26%, low gradient riffle units 22%, and mid-channel pool units 20 %.

A total of 40 pools were identified (Table 3). Main channel pools were the most frequently encountered at 90% (Graph 4), and comprised 89% 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. Eighteen of the 40 pools (45%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 40 pool tail-outs measured, 13 had a value of 1 (32.5%); 16 had a value of 2 (40%); 11 had a value of 3 (27.5%);

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(Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable 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 11, flatwater habitat types had a mean shelter rating of 6, and pool habitats had a mean shelter rating of 56 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 59. Scour pools had a mean shelter rating of 26 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Blanton Creek. Graph 7 describes the pool cover in Blanton Creek. Large 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 68% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 12% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Blanton Creek was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 57% and 43%, respectively. Graph 9 describes the mean percent canopy in Blanton Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 100%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 42% cobble/gravel, 33% sand/silt/clay, 20% boulder, and 4% bedrock. (Graph 10).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a mask and snorkel survey at 10 sites for species composition and distribution in Blanton Creek on June 7, 2016. The sites were sampled by Alejandra Camacho (WSP), Emily Moloney (WSP), and Brian Starks (CDFW).

In reach 1, which comprised the first 4,030 feet of stream, 10 sites were sampled. The reach sites yielded 47 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), 1 age 1+ SH/RT, 1 cutthroat trout, 19 YOY coho, and 1 1+ coho.

During the survey, the upstream-most observation of juvenile coho salmon and steelhead occurred at 40.57954° north latitude, -124.01237° west longitude, approximately 1,515 feet upstream from the confluence with Yager Creek.

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Table A. Summary of results for a fish composition and distribution survey within Blanton Creek, June 7, 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+ | |
| Reach 1: B4 Channel Type | | | | | | | | | | |
| 6/7/16 | 1 | 4 | Pool | 96 | 1 | 0 | 0 | 0 | 0 | |
| | 2 | 7 | Pool | 136 | 3 | 0 | 0 | 4 | 0 | |
| | 3 | 9 | Pool | 182 | 4 | 0 | 0 | 3 | 3 | |
| | 4 | 13 | Pool | 290 | 1 | 0 | 0 | 1 | 0 | |
| | 5 | 26 | Pool | 715 | 4 | 0 | 0 | 3 | 0 | |
| | 6 | 34 | Pool | 926 | 11 | 0 | 0 | 5 | 0 | |
| | 7 | 40 | Pool | 1075 | 7 | 0 | 0 | 1 | 0 | CT-C |
| | 8 | 44 | Pool | 1187 | 7 | 0 | 0 | 0 | 0 | |
| | 9 | 47 | Pool | 1274 | 2 | 0 | 0 | 2 | 1 | |
| | 10 | 58 | Pool | 1515 | 7 | 1 | 0 | 0 | 0 | |

Species Abbreviations: CT-C=Coast Cutthroat Trout

DISCUSSION

Blanton Creek is a B4 channel type for the first 4,030 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is as follows: B4 channel types 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 25, 2016 to June 6, 2016 ranged from 54° to 58° degrees Fahrenheit. Air temperatures ranged from 54° to 70° 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 43% of the total length of this survey, riffles 33%, and pools 24%. 18 of the 40 (45%) 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Twenty-nine of the 40 pool tail-outs measured had embeddedness ratings of 1 or 2. Eleven of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of

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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. Sediment sources in Blanton Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-two of the 40 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 56. The shelter rating in the flatwater habitats is 6. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by large woody debris in Blanton Creek. Large woody debris is 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 98%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 100% and 97%, 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

Blanton 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 Blanton 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) 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.
- 2) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from Large Woody Debris. Adding high quality complexity with woody cover in the pools is desirable.

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- 4) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.
- 5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.
- 6) Suitable size spawning substrate on Blanton Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.
- 7) There are several log debris accumulations present on Blanton Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

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 Yager Creek. The first 5' of the creek is a very steep riffle. Channel type is a B4. Channel type cross-section location is at HU# 106. |
| 114 | 0007.00 | There is a log structure and left bank boulder structure. |
| 160 | 0009.00 | There is a log weir structure with a 1 foot plunge. |
| 207 | 0011.00 | Bridge #1 is the crossing for Road 9, and is 15' high x 20.5' wide x 46' long. It is an automobile bridge made of metal and is not a barrier to salmonids. |
| 255 | 0013.00 | There is a 1.5' plunge over the remains of an old bridge. |
| 290 | 0014.00 | There is a 1' plunge at the top of the unit. |
| 320 | 0016.00 | There is a log structure in this unit. |
| 373 | 0018.00 | There is a log structure in this unit. |

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| | | |
|------|---------|--|
| 421 | 0019.00 | Start of side channel. |
| 570 | 0024.00 | There is active erosion on the left bank, it measures 50' long x 10' high. |
| 602 | 0025.00 | There is active erosion on the right bank, it measures 20' long x 8' high. |
| 688 | 0026.00 | There is a boulder structure in the left bank. |
| 753 | 0029.00 | There is active erosion on the left bank, it measures 150' long x 15' high. It extends through the next 6 units. |
| 901 | 0034.00 | There is a boulder weir at the top of the pool. Salmonid young-of-the-year (YOY) are present. |
| 964 | 0036.00 | There is a log weir in the unit. |
| 1007 | 0038.00 | There is a log weir in this unit. |
| 1152 | 0044.00 | There is a log and boulder weir in this unit. |
| 1248 | 0047.00 | There is an accumulation of LWD with a deep pool underneath. |
| 1274 | 0048.00 | Erosion on the left bank begins here and extends for 545', ending at habitat unit 72. |
| 1493 | 0058.00 | There is a log weir in this unit. |
| 1627 | 0062.00 | There is erosion on the left bank sliding into creek, approximately 10' long x 10' high. |
| 1639 | 0063.00 | There is LWD in the mid channel causing a 3.3' plunge. There is a secondary channel on the right bank through boulders. |
| 1729 | 0070.00 | There is a massive landslide on the left bank, with vegetation sliding into the channel. |
| 1741 | 0071.00 | The channel is completely obstructed by vegetation and downed trees. |
| 2772 | 0117.00 | Log debris accumulation (LDA) #1 is 7' high x 42' wide x 25' long and contains 12 pieces of large woody debris (LWD). Water flows through the LDA and there are no visible gaps in it. Sediment is being retained in the approximate dimensions of 41' wide x 37' long x 6' deep. The sediment is mostly gravel. The LDA is a possible barrier to salmonids. Fish were not observed above the LDA. |

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| | | |
|------|---------|---|
| 2791 | 0118.00 | The gradient lessens here, with the substrate becoming gravel and cobble again. |
| 2921 | 0122.00 | There is a complex, habitat forming log jam here. |
| 3093 | 0129.00 | Tributary #1 enters on the left bank. It contributes to approximately 6 % of Blanton Creek's flow. The water temperature of the tributary was 55 degrees Fahrenheit, the water temperature downstream of the confluence was 57 degrees Fahrenheit, and the water temperature upstream of the confluence was 58 degrees Fahrenheit. The slope of the tributary is 15.8 %. Fish were not observed in the tributary. |
| 3691 | 0158.00 | There is a log jam at the top of this unit. |
| 3781 | 0163.00 | There are big boulders with cobble and wood and a high gradient here. |
| 3841 | 0164.00 | End of survey due to a high gradient bedrock cascade, approximately 24' tall. |

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 } |

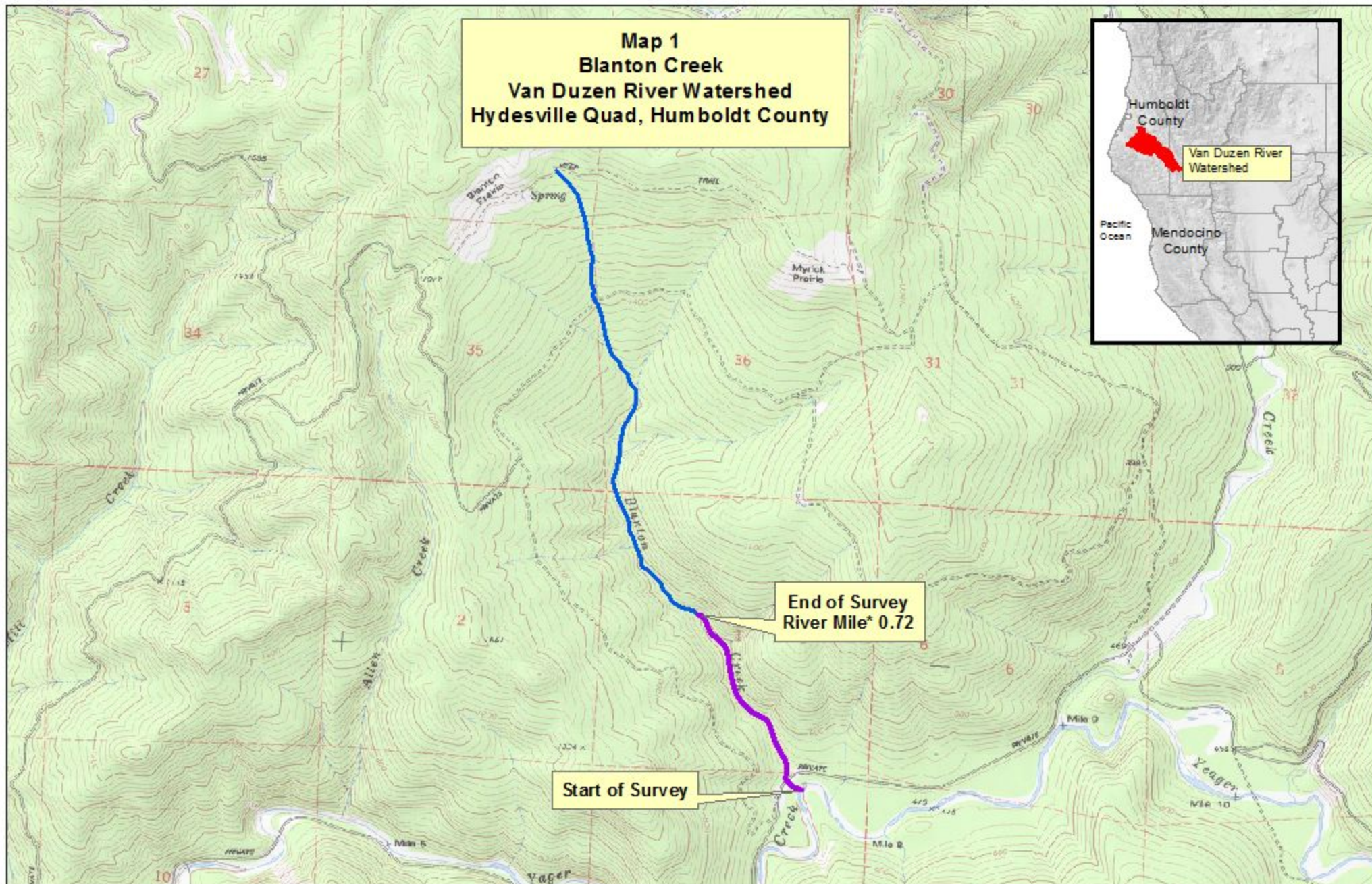
BACKWATER POOLS

| | | | |
|----------------------------------|-------|-------|-------|
| 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} |

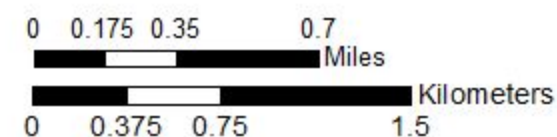
ADDITIONAL UNIT DESIGNATIONS

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

Map 1
Blanton Creek
Van Duzen River Watershed
Hydesville Quad, Humboldt County



- Reach 1: B4 Channel Type
- Blanton Creek



APPENDIX I

TABLES AND GRAPHS

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

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0

| 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 |
|---------------|----------------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|------------------|----------------------|---------------------|-------------------------------|----------------------|---------------------------------|---------------------------------|---------------------|
| 1 | 0 | DRY | 0.6 | 24 | 24 | 0.6 | | | | | | | | | |
| 65 | 9 | FLATWATER | 37.1 | 27 | 1723 | 42.8 | 8.4 | 0.5 | 1.1 | 158 | 10292 | 91 | 5927 | | 6 |
| 40 | 40 | POOL | 22.9 | 24 | 952 | 23.6 | 13.2 | 0.8 | 1.9 | 291 | 11649 | 322 | 12865 | 251 | 56 |
| 69 | 8 | RIFFLE | 39.4 | 19 | 1331 | 33.0 | 7.6 | 0.4 | 0.9 | 71 | 4885 | 31 | 2141 | | 11 |
| Total Units | Total Units Fully Measured | | | | Total Length (ft.) | | | | | Total Area (sq.ft.) | | | Total Volume (cu.ft.) | | |
| 175 | 57 | | | | 4030 | | | | | 26826 | | | 20932 | | |

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0W

| 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 (%) |
|---------------|----------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|------------------|-----------------|--------------------|-------------------------------|----------------------|---------------------------------|---------------------------------|---------------------|-----------------|
| 49 | 6 | LGR | 28.0 | 18 | 887 | 22.0 | 8 | 0.3 | 0.8 | 69 | 3365 | 22 | 1084 | | 14 | 97 |
| 19 | 1 | HGR | 10.9 | 23 | 434 | 10.8 | 8 | 0.8 | 3 | 134 | 2554 | 108 | 2043 | | 0 | 98 |
| 1 | 1 | CAS | 0.6 | 10 | 10 | 0.2 | 2 | 0.4 | 0.9 | 20 | 20 | 8 | 8 | | 0 | 95 |
| 37 | 6 | RUN | 21.1 | 19 | 695 | 17.2 | 6 | 0.5 | 1.6 | 116 | 4305 | 64 | 2370 | | 6 | 98 |
| 28 | 3 | SRN | 16.0 | 37 | 1028 | 25.5 | 13 | 0.6 | 1.6 | 242 | 6785 | 145 | 4071 | | 7 | 96 |
| 34 | 34 | MCP | 19.4 | 23 | 793 | 19.7 | 13 | 0.8 | 3.3 | 289 | 9820 | 325 | 11055 | 255 | 62 | 97 |
| 1 | 1 | CCP | 0.6 | 24 | 24 | 0.6 | 7 | 0.6 | 1.2 | 143 | 143 | 114 | 114 | 86 | 10 | 100 |
| 1 | 1 | STP | 0.6 | 29 | 29 | 0.7 | 9 | 1.0 | 2.3 | 248 | 248 | 298 | 298 | 248 | 10 | 99 |
| 2 | 2 | LSBo | 1.1 | 24 | 49 | 1.2 | 24 | 0.8 | 1.7 | 241 | 482 | 201 | 402 | 177 | 13 | 100 |
| 2 | 2 | PLP | 1.1 | 28 | 57 | 1.4 | 17 | 0.7 | 2.5 | 478 | 956 | 498 | 996 | 335 | 40 | 100 |
| 1 | 0 | DRY | 0.6 | 24 | 24 | 0.6 | | | | | | | | | | |

Total Units
175

Total Units Fully Measured
57

Total Length (ft.)
4030

Total Area (sq.ft.)
28677

Total Volume (cu.ft.)
22441

Table 3 - Summary of Pool Types

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0W

| 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 |
|---------------|----------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|---------------------------|--------------------|-------------------------------|---------------------------------|-------------------------------------|---------------------|
| 36 | 36 | MAIN | 90 | 24 | 846 | 89 | 12.4 | 0.8 | 284 | 10211 | 250 | 9009 | 59 |
| 4 | 4 | SCOUR | 10 | 27 | 106 | 11 | 20.3 | 0.7 | 360 | 1438 | 256 | 1023 | 26 |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
|-------------|----------------------------|--------------------|---------------------|-----------------------|
| 40 | 40 | 952 | 11649 | 10032 |

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

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0W

| 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 |
|---------------|--------------|------------------------|---------------------------------|-----------------------------|-----------------------------------|-------------------------------|-----------------------------------|-------------------------------|-----------------------------------|-------------------------------|----------------------------------|------------------------------|
| 34 | MCP | 85 | 1 | 3 | 18 | 53 | 13 | 38 | 2 | 6 | 0 | 0 |
| 1 | CCP | 3 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | STP | 3 | 0 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 |
| 2 | LSBo | 5 | 0 | 0 | 2 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | PLP | 5 | 0 | 0 | 0 | 0 | 2 | 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 |
|-------------|---------------------------------|-----------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|
| 40 | 1 | 2 | 21 | 52 | 16 | 40 | 2 | 5 | 0 | 0 |

Mean Maximum Residual Pool Depth (ft.): 1.9

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Dry Units: 1

Confluence Location:

Quad: HYDEVILLE

Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0W

| 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 |
|---------------|----------------------|---------------------|-----------------------|------------|------------|------------------|-------------------------|---------------------------|--------------------|-----------------|-----------------------|
| 49 | 6 | LGR | 0 | 2 | 62 | 0 | 0 | 0 | 2 | 33 | 0 |
| 19 | 1 | HGR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | CAS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 69 | 8 | TOTAL RIFFLE | 0 | 3 | 61 | 0 | 0 | 0 | 3 | 33 | 0 |
| 37 | 6 | RUN | 14 | 0 | 0 | 14 | 0 | 0 | 14 | 59 | 0 |
| 28 | 3 | SRN | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 76 | 0 |
| 65 | 9 | TOTAL FLAT | 9 | 0 | 0 | 9 | 0 | 0 | 16 | 65 | 0 |
| 34 | 34 | MCP | 17 | 5 | 47 | 6 | 0 | 0 | 7 | 19 | 0 |
| 1 | 1 | CCP | 0 | 0 | 85 | 0 | 0 | 0 | 0 | 15 | 0 |
| 1 | 1 | STP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 2 | 2 | LSBo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 2 | 2 | PLP | 5 | 0 | 55 | 5 | 0 | 0 | 35 | 0 | 0 |
| 40 | 40 | TOTAL POOL | 14 | 4 | 44 | 6 | 0 | 0 | 8 | 24 | 0 |
| 175 | 57 | TOTAL | 13 | 4 | 41 | 5 | 0 | 0 | 8 | 29 | 0 |

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Dry Units: 1

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0W

| 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 |
|---------------|----------------------|--------------|----------------------------|-----------------------|-------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------|
| 49 | 6 | LGR | 0 | 0 | 17 | 17 | 33 | 33 | 0 |
| 19 | 1 | HGR | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 1 | 1 | CAS | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 37 | 6 | RUN | 0 | 17 | 67 | 0 | 0 | 17 | 0 |
| 28 | 3 | SRN | 0 | 0 | 0 | 0 | 33 | 67 | 0 |
| 34 | 34 | MCP | 0 | 32 | 53 | 6 | 3 | 6 | 0 |
| 1 | 1 | CCP | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 1 | 1 | STP | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 2 | 2 | LSBo | 0 | 0 | 50 | 0 | 0 | 50 | 0 |
| 2 | 2 | PLP | 0 | 0 | 50 | 0 | 0 | 50 | 0 |

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Confluence Location: Quad: HYDESVILLE

Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0W

| Mean Percent Canopy | Mean Percent Conifer | Mean Percent Hardwood | Mean Percent Open Units | Mean Right Bank % Cover | Mean Left Bank % Cover |
|---------------------------|----------------------------|-----------------------------|-------------------------------|-------------------------------|------------------------------|
| 98 | 43 | 57 | 0 | 100 | 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.

| | | |
|---------------------------------------|--------------------------------|---------------------------|
| Stream Name: Blanton Creek | LLID: 1240093405764 | Drainage: Van Duzen River |
| Survey Dates: 5/25/2016 to 6/6/2016 | Survey Length (ft.): 4030 | Main Channel (ft.): 3841 |
| | | Side Channel (ft.): 189 |
| Confluence Location: Quad: HYDESVILLE | Legal Description: T02NR01ES12 | Latitude: 40:34:35.0N |
| | | Longitude: 124:00:33.0W |

| | | | | | | | | | | |
|------------------------------------|--------------|----------|------------|---------------|---------------|-------------------------------|--------------------|--|-------------------------------------|------|
| STREAM REACH: 1 | | | | | | | | | | |
| Channel Type: | B4 | | | | | Canopy Density (%): | 97.6 | | Pools by Stream Length (%): | 23.6 |
| Reach Length (ft.): | 3841 | | | | | Coniferous Component (%): | 43.0 | | Pool Frequency (%): | 22.9 |
| Riffle/Flatwater Mean Width (ft.): | 8.0 | | | | | Hardwood Component (%): | 57.0 | | Residual Pool Depth (%): | |
| BFW: | | | | | | Dominant Bank Vegetation: | Hardwood Trees | | < 2 Feet Deep: | 55 |
| Range (ft.): | 8 | to | 41 | | | Vegetative Cover (%): | 98.6 | | 2 to 2.9 Feet Deep: | 40 |
| Mean (ft.): | 24 | | | | | Dominant Shelter: | Large Woody Debris | | 3 to 3.9 Feet Deep: | 5 |
| Std. Dev.: | 7 | | | | | Dominant Bank Substrate Type: | Cobble/Gravel | | >= 4 Feet Deep: | 0 |
| Base Flow (cfs.): | 0.4 | | | | | Occurrence of LWD (%): | 31 | | Mean Max Residual Pool Depth (ft.): | 1.9 |
| Water (F): | 54 - 58 | Air (F): | 54 - 70 | | | LWD per 100 ft.: | | | Mean Pool Shelter Rating: | 56 |
| Dry Channel (ft): | 24 | | | | | Riffles: | 5 | | | |
| | | | | | | Pools: | 13 | | | |
| | | | | | | Flat: | 4 | | | |
| Pool Tail Substrate (%): | Silt/Clay: 0 | Sand: 0 | Gravel: 68 | Sm Cobble: 13 | Lg Cobble: 13 | Boulder: 8 | Bedrock: 0 | | | |
| Embeddedness Values (%): | 1. 32.5 | 2. 40.0 | 3. 27.5 | 4. 0.0 | 5. 0.0 | | | | | |

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Confluence Location: Quad: HYDEVILLE

Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0W

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 | 3 | 2 | 4.4 |
| Boulder | 16 | 7 | 20.2 |
| Cobble / Gravel | 21 | 27 | 42.1 |
| Sand / Silt / Clay | 17 | 21 | 33.3 |

Mean Percentage of Dominant Stream Bank Vegetation

| Dominant Class of Vegetation | Number of Units Right Bank | Number of Units Left Bank | Total Mean Percent (%) |
|---------------------------------|-------------------------------|------------------------------|---------------------------|
| Grass | 0 | 0 | 0.0 |
| Brush | 0 | 1 | 0.9 |
| Hardwood Trees | 27 | 31 | 50.9 |
| Coniferous Trees | 30 | 25 | 48.2 |
| No Vegetation | 0 | 0 | 0.0 |

Total Stream Cobble Embeddedness Values: 2

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

Stream Name: Blanton Creek

LLID: 1240093405764

Drainage: Van Duzen River

Survey Dates: 5/25/2016 to 6/6/2016

Confluence Location: Quad: HYDESVILLE

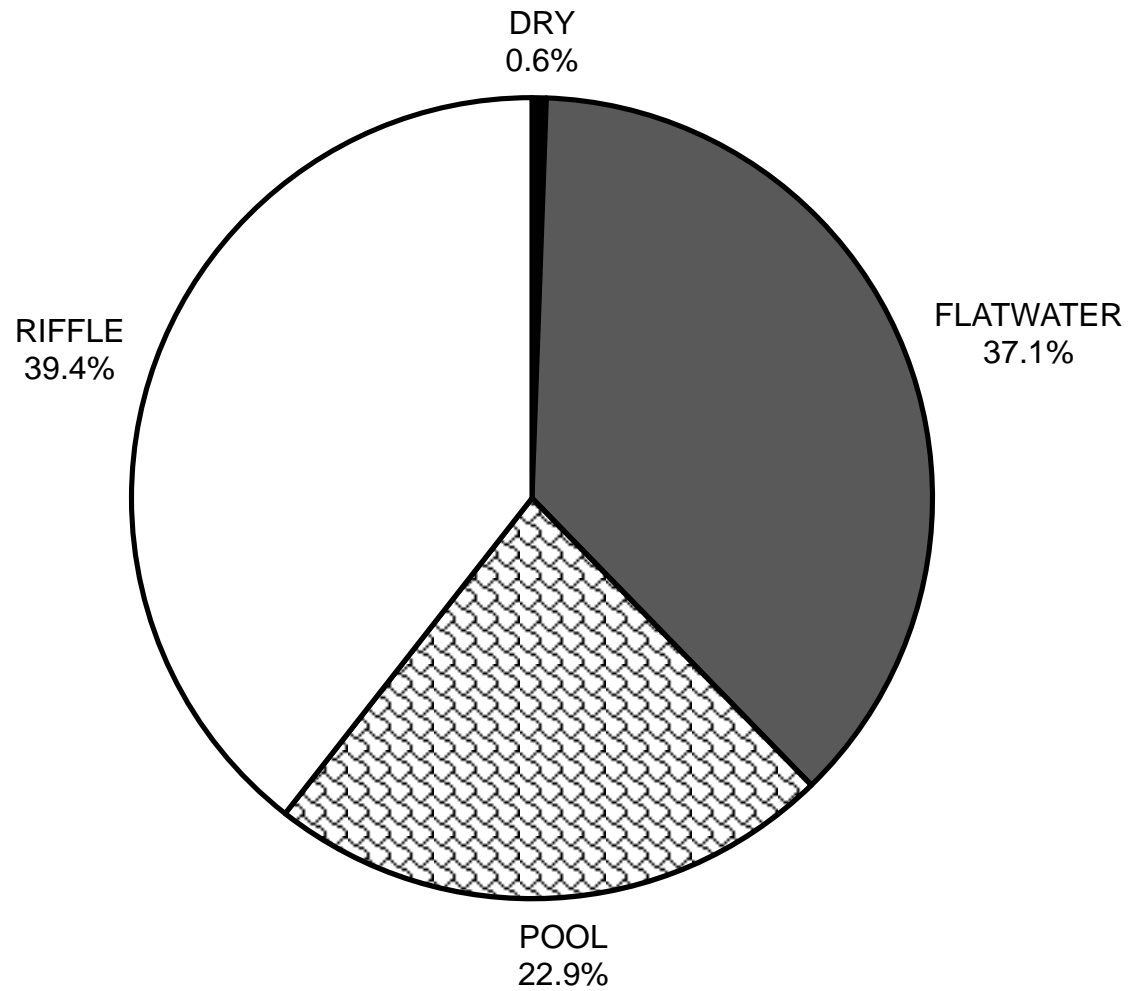
Legal Description: T02NR01ES12

Latitude: 40:34:35.0N

Longitude: 124:00:33.0W

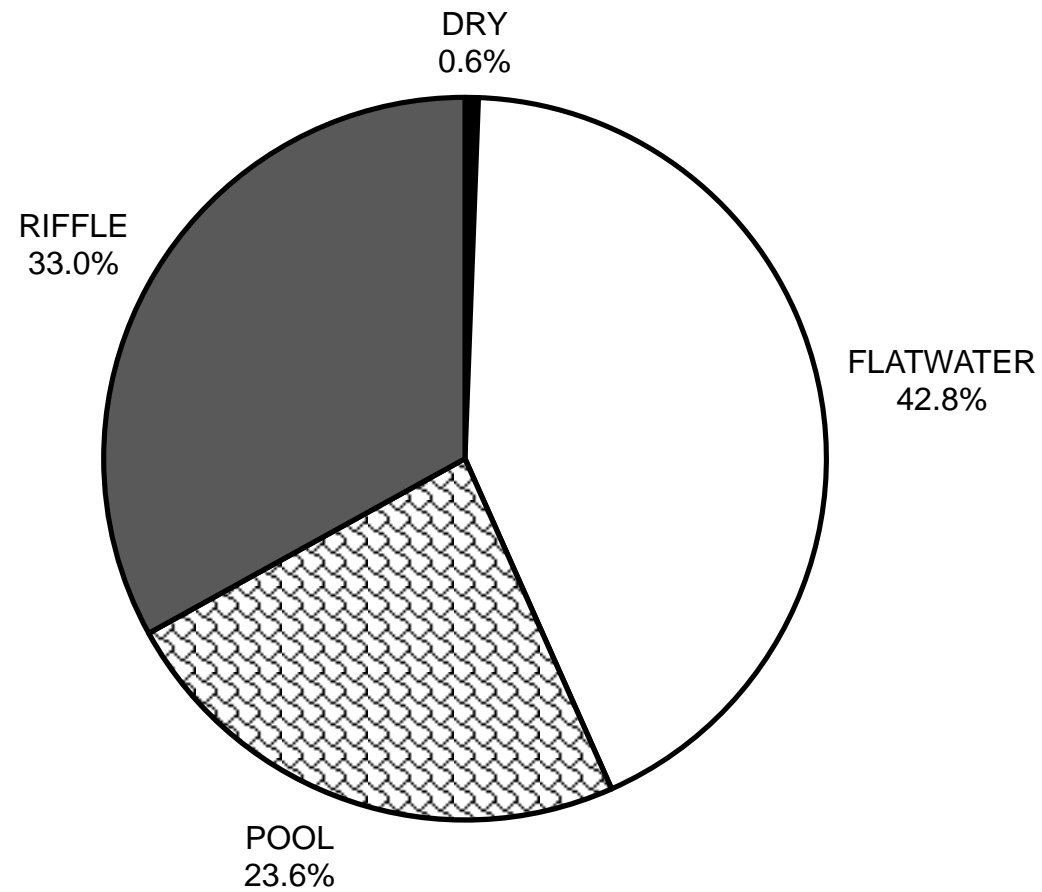
| | Riffles | Flatwater | Pools |
|----------------------------|----------------|------------------|--------------|
| UNDERCUT BANKS (%) | 0 | 9 | 14 |
| SMALL WOODY DEBRIS (%) | 3 | 0 | 4 |
| LARGE WOODY DEBRIS (%) | 62 | 0 | 44 |
| ROOT MASS (%) | 0 | 10 | 5 |
| TERRESTRIAL VEGETATION (%) | 0 | 0 | 0 |
| AQUATIC VEGETATION (%) | 0 | 0 | 0 |
| WHITewater (%) | 3 | 16 | 9 |
| BOULDERS (%) | 32 | 65 | 24 |
| BEDROCK LEDGES (%) | 0 | 0 | 0 |

BLANTON CREEK 2016 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

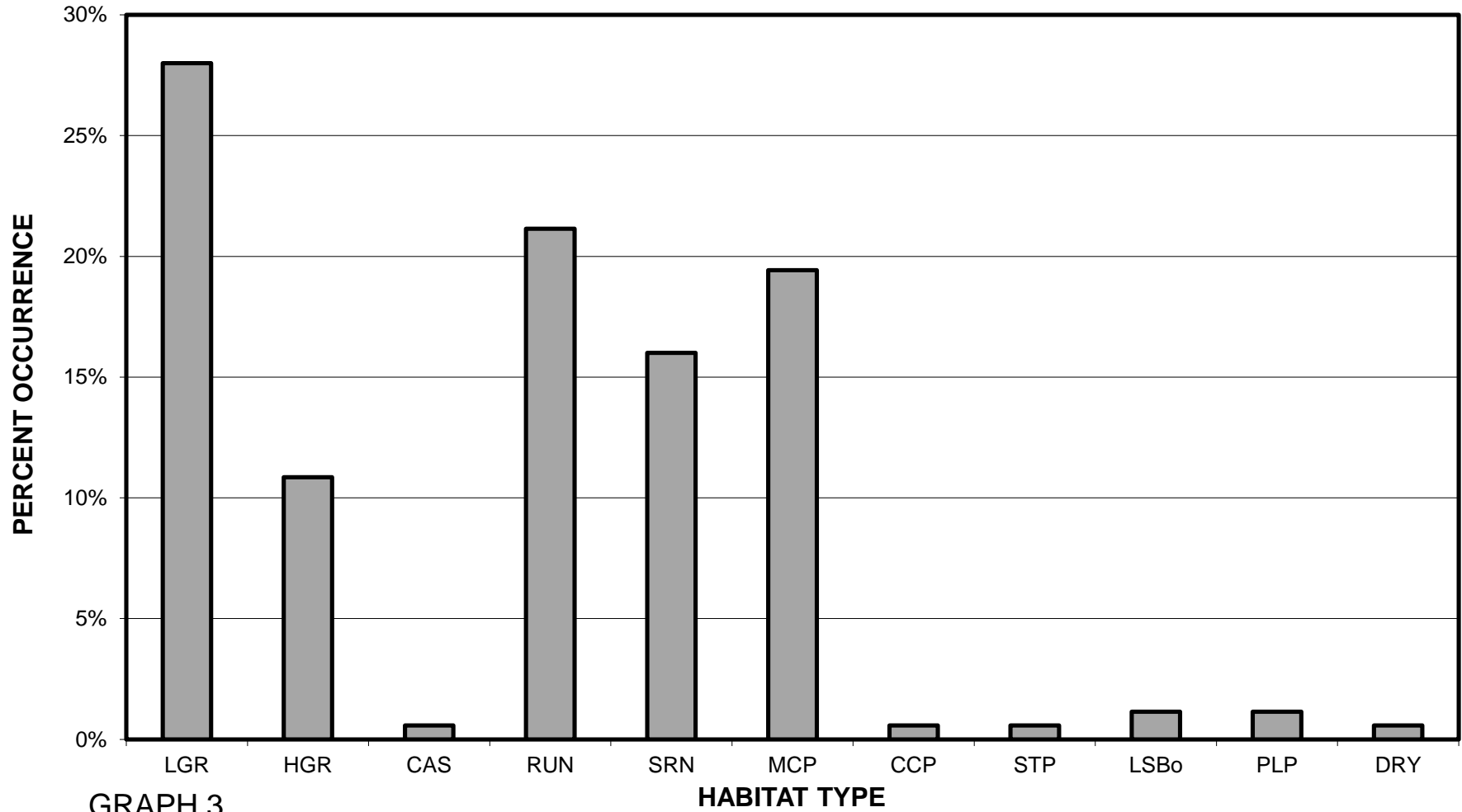
BLANTON CREEK 2016 HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

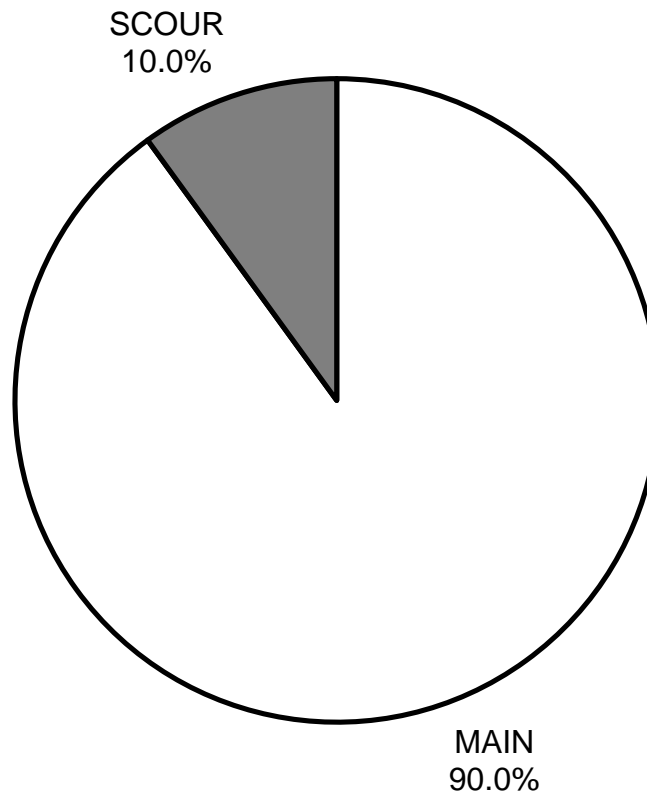
BLANTON CREEK 2016

HABITAT TYPES BY PERCENT OCCURRENCE



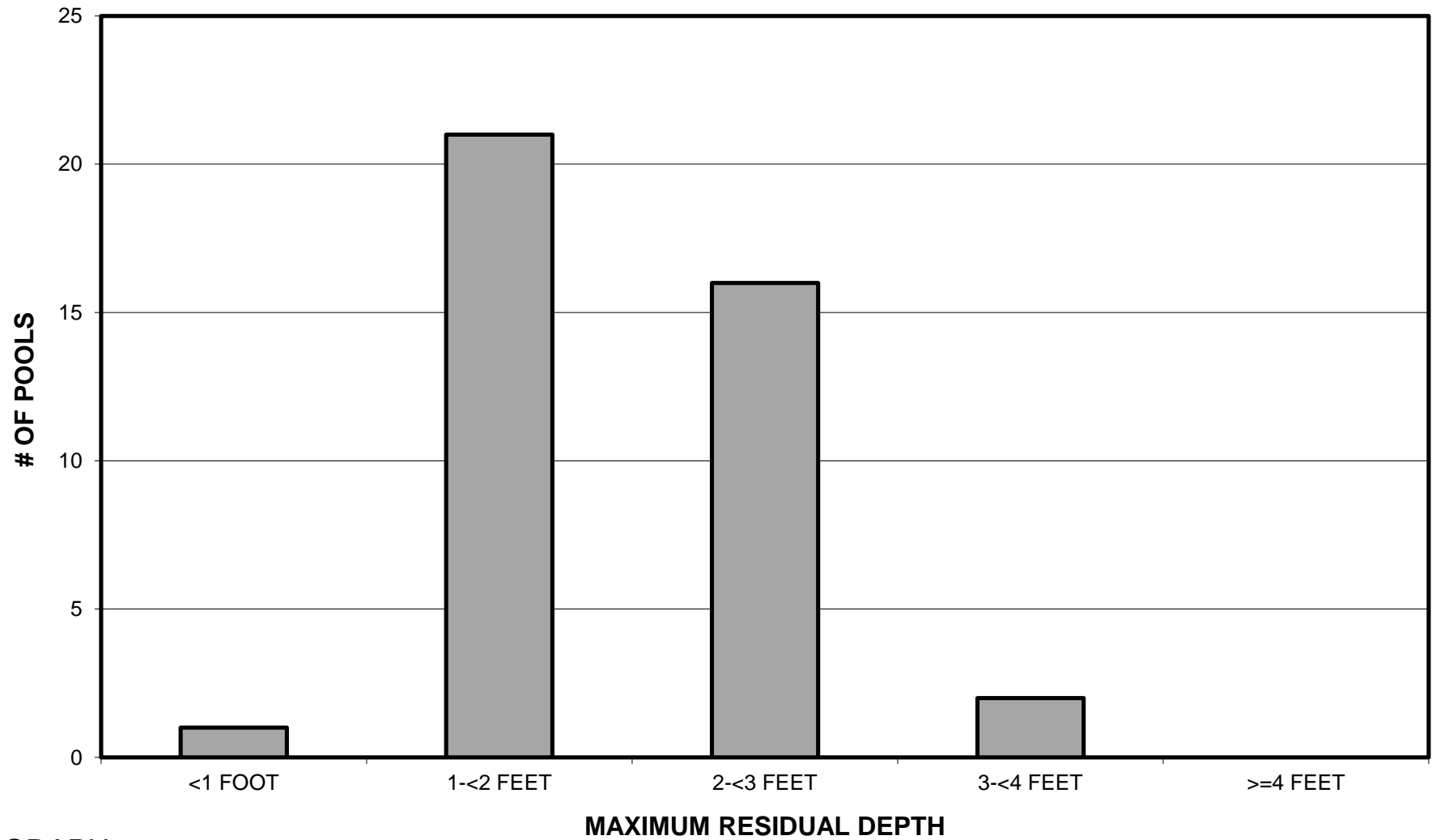
GRAPH 3

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



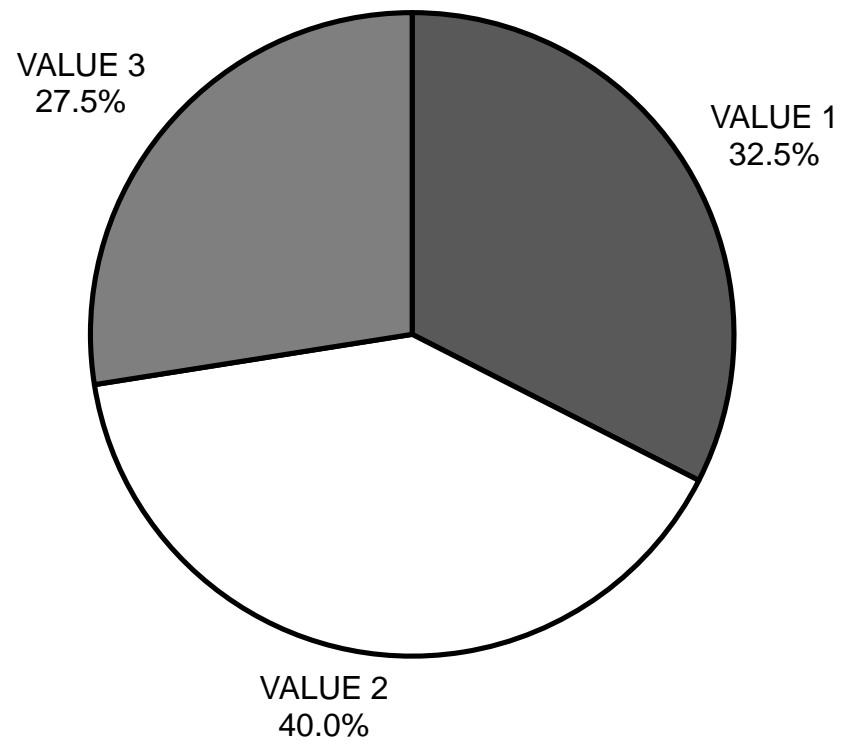
GRAPH 4

BLANTON CREEK 2016 MAXIMUM DEPTH IN POOLS



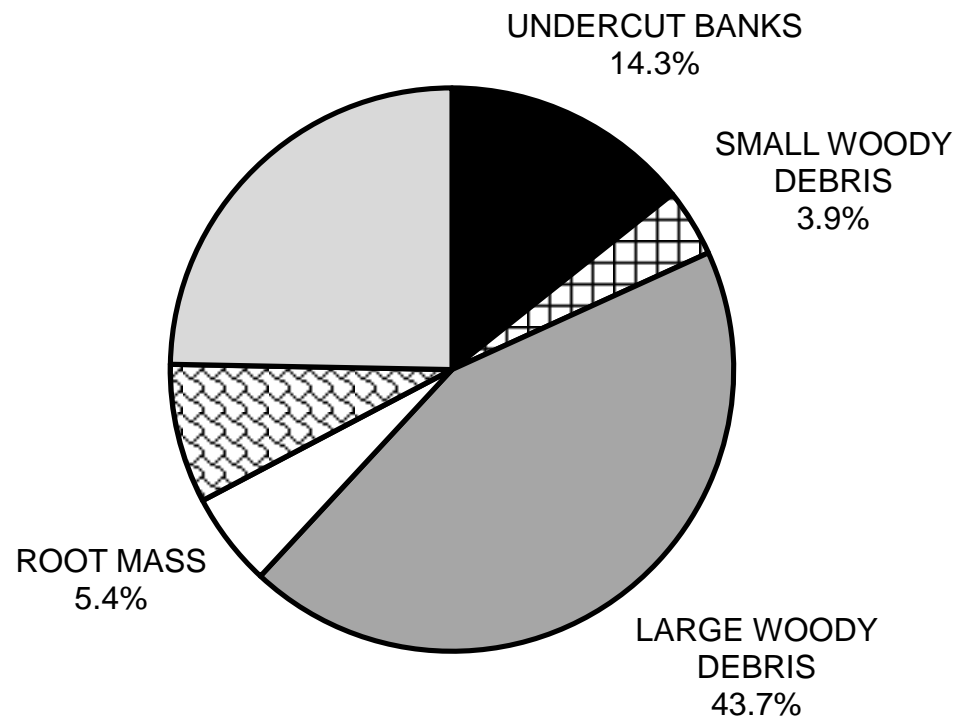
GRAPH 5

BLANTON CREEK 2016 PERCENT EMBEDDEDNESS



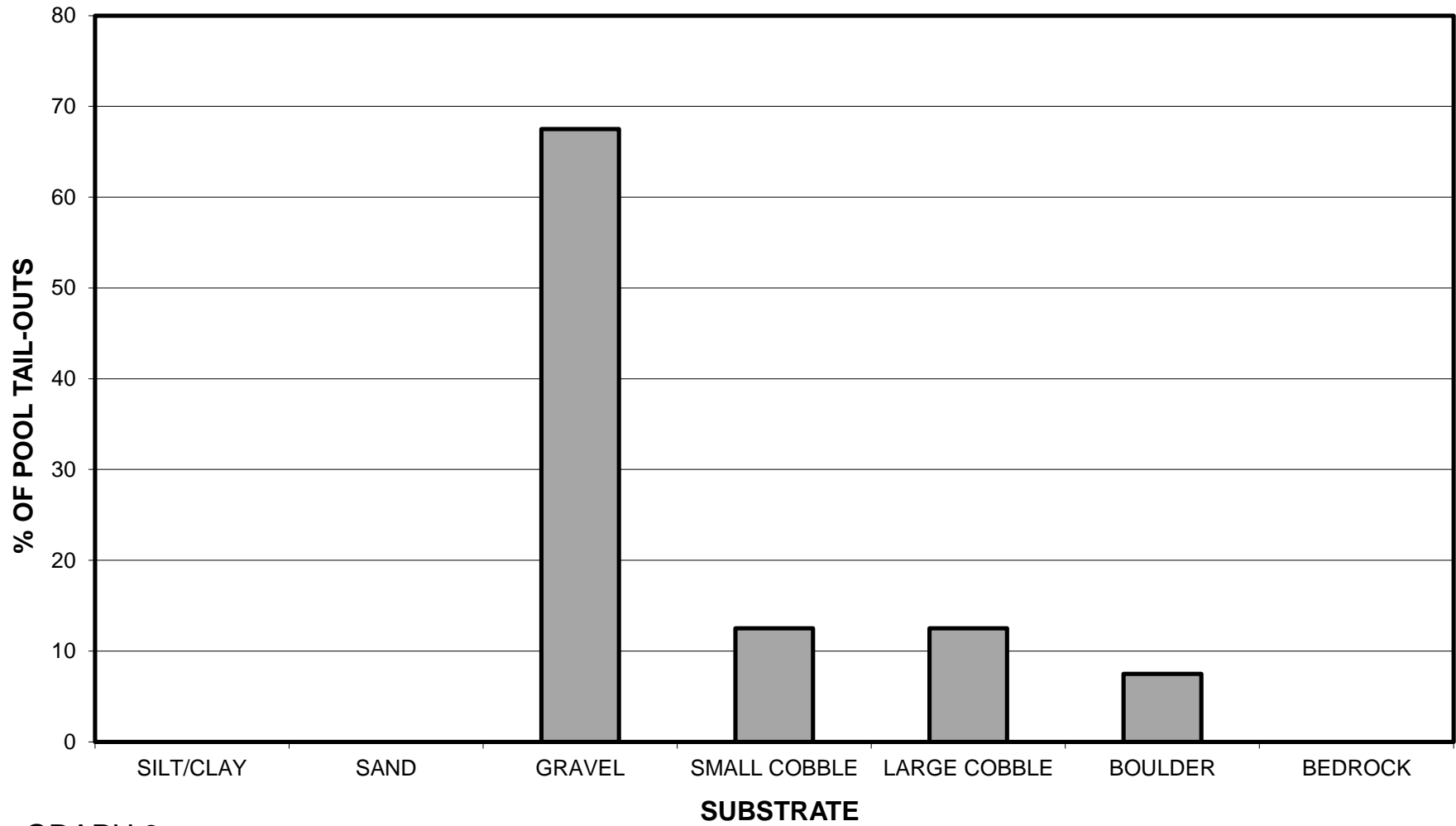
GRAPH 6

BLANTON CREEK 2016 MEAN PERCENT COVER TYPES IN POOLS



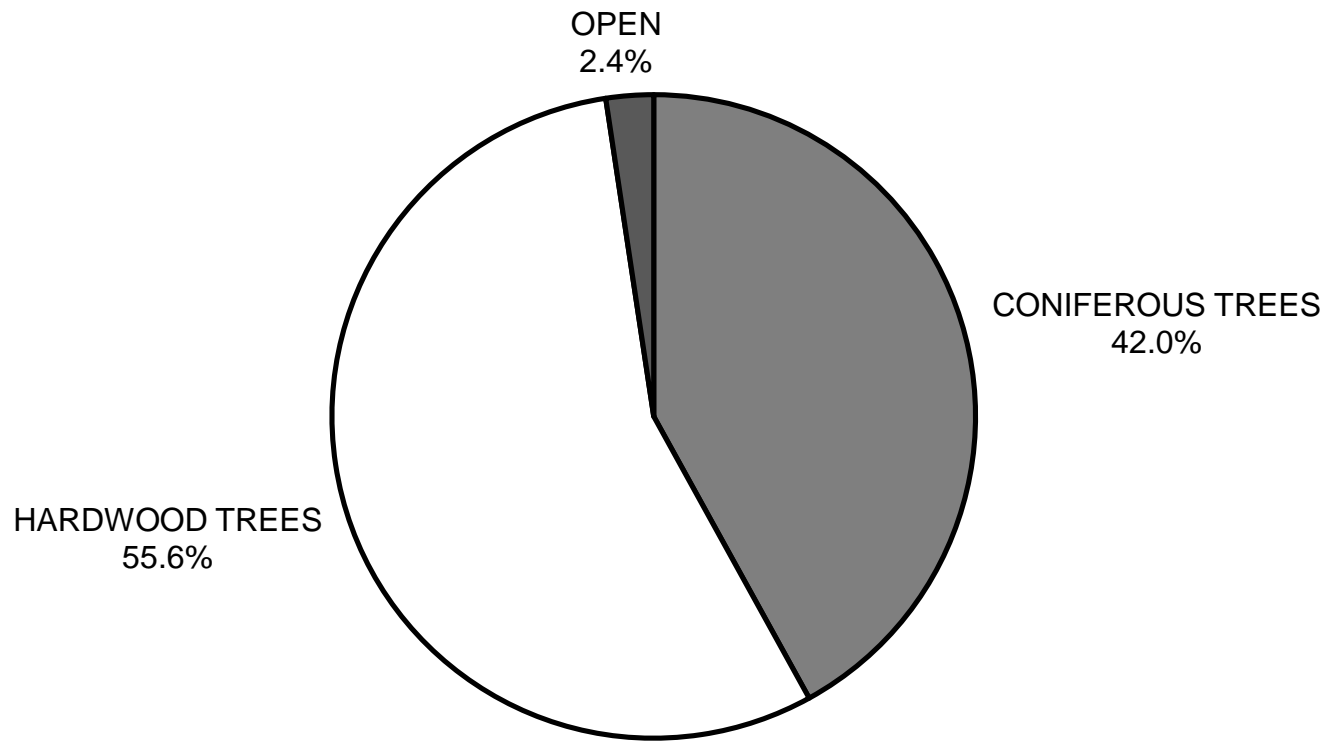
GRAPH 7

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



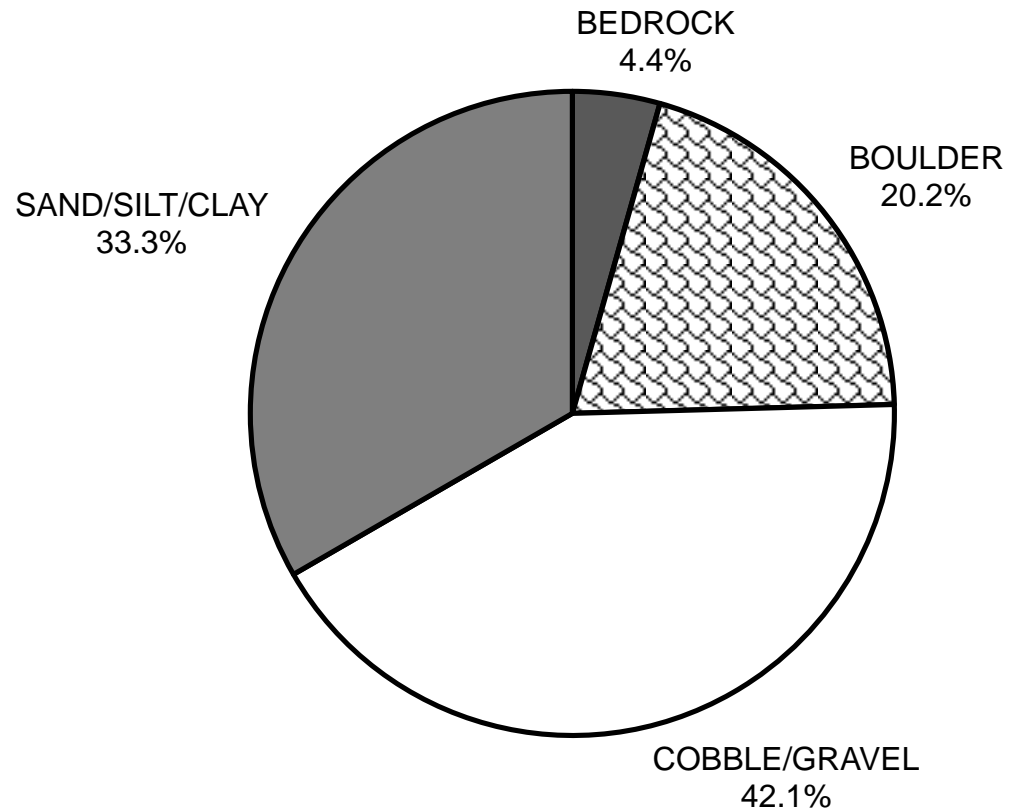
GRAPH 8

BLANTON CREEK 2016 MEAN PERCENT CANOPY



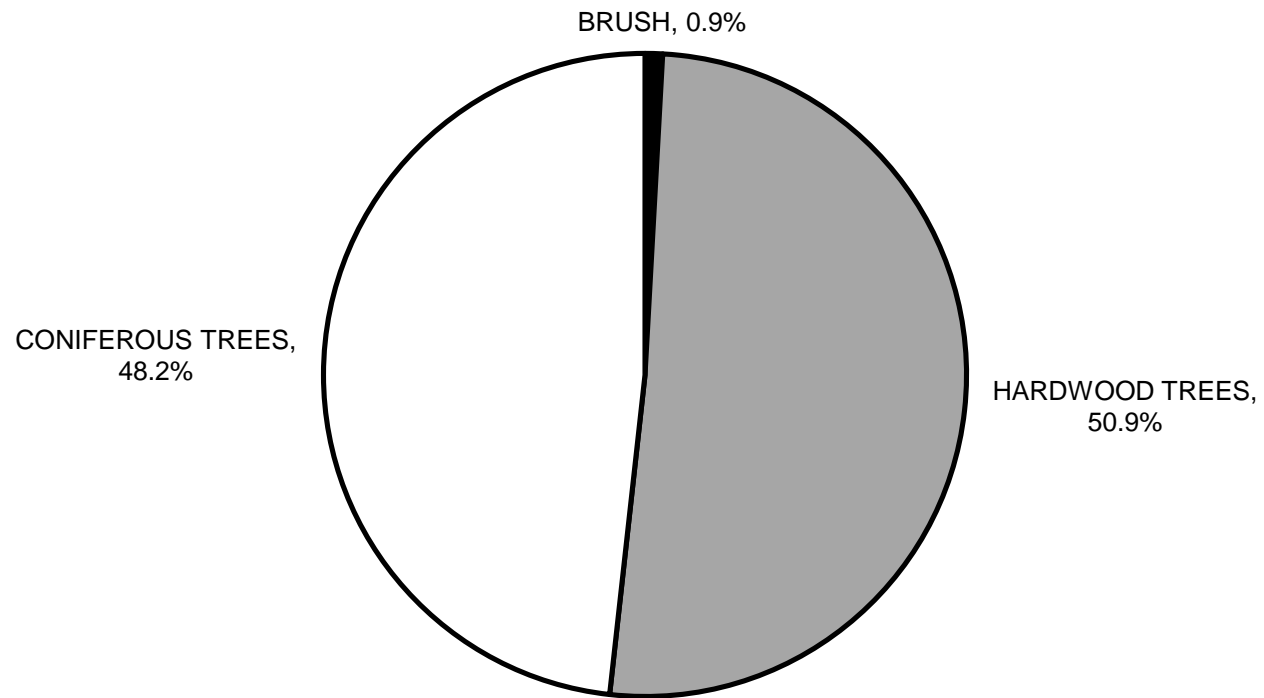
GRAPH 9

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



GRAPH 10

BLANTON CREEK 2016 DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

APPENDIX II

STREAM INVENTORY PHOTOS



Photo 1: LDA at habitat unit # 117. Emily Moloney pictured. (Photo taken 5-31-16)



Photo 2: End of survey at habitat unit # 164 at a bedrock chute and boulder cascade. The entire barrier is approximately 24' high. Emily Moloney pictured. (Photo taken 6-6-16)