



CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Unnamed Tributary to the Albion River

INTRODUCTION

A stream inventory was conducted June 16 to June 21, on an Unnamed Tributary to the Albion River. The survey began at the confluence with Albion River and extended upstream 0.6 miles.

The Unnamed Tributary to the Albion River 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 Unnamed Tributary to the Albion River. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

The unnamed tributary flows to the Albion River, which drains to the Pacific Ocean, located in Mendocino County, California (Map 1). Unnamed Tributary to the Albion River's legal description at the confluence with Albion River is T16N R17W S13. Its location is 39.2511° north latitude and -123.7100 west longitude, LLID number 1237100392512. Unnamed Tributary to the Albion River is a first order stream and has approximately .87 miles of blue line stream according to the USGS Mathison Peak 7.5 minute quadrangle. Unnamed Tributary to the Albion River drains a watershed of approximately .4 square miles. Elevations range from about 19 feet at the mouth of the creek to 409 feet in the headwater areas. Redwood forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production and rangeland. Vehicle access exists via Highway 1 to Little River Airport Road, south of Mendocino.

METHODS

The habitat inventory conducted in Unnamed Tributary to the Albion River follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al. 1998). The Watershed Stewards Project (WSP) members and California Department of Fish and Wildlife (CDFW) personnel that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. The inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the

parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement. 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 Unnamed Tributary to the Albion River 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". Unnamed Tributary to the Albion River 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 Unnamed Tributary to the Albion River, 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 Unnamed Tributary to the Albion River, 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 Unnamed Tributary to the Albion River, 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 Unnamed Tributary to the Albion River, 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 Unnamed Tributary to the Albion River. In addition, underwater mask and snorkel observations were made at 20 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 Unnamed Tributary to the Albion River 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 16 to June 21, 2016, was conducted by Brian Starks (CDFW), Amidia Frederick, and Alejandra Camacho (WSP). The total length of the stream surveyed was 3,096 feet with an additional 236 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.079 cfs on June 23, 2016.

Unnamed Tributary to the Albion River is a G4 channel type for 2,423 feet of the stream surveyed (Reach 1) and an A4 channel type for 909 feet of the stream surveyed (Reach 2). G4 channels are entrenched “gully” step-pool channels on moderate gradients with low width /depth ratios and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 52° to 57° Fahrenheit. Air temperatures ranged from 51° to 68° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 34% flatwater units, 34% riffle units, 27% pool units, 2% dry units, 2% unsurveyed units, and 1% unsurveyed marsh units (Graph 1). Based on total length of Level II habitat types there were 51% flatwater units, 24% riffle units, 20% pool units, 2% dry units, 2% unsurveyed marsh units, and 1% unsurveyed units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low-gradient riffle units, 32%; mid-channel pools, 24%; and step run units, 18% (Graph 3). Based on percent total length, step run units made up 37%, low gradient riffles 22%, and dry units 18%.

A total of 45 pools were identified (Table 3). Main channel pools were the most frequently encountered at 87% (Graph 4), and comprised 90% 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. Six of the 45 pools (13%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 45 pool tail-outs measured, 27 had a value of 1 (60%); 6 had a value of 2 (13.3%); 4 had a value of 3 (8.9%); and 8 had a value of 5 (17.8%) (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 21, flatwater habitat types had a mean shelter rating of 21, and pool habitats had a mean shelter rating of 50 (Table 1). Of the pool types, the main channel pools had a mean shelter rating of 50 and scour pools had a mean shelter rating of 54 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in Unnamed Tributary to the Albion River. Graph 7 describes the pool cover in Unnamed Tributary to the Albion River. Large woody debris is the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 84% of pool tail-outs. Silt/clay substrate type was the next most frequently observed dominant substrate type and occurred in 7% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Unnamed Tributary to the Albion River was 97%. Three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 19% and 81%, respectively. Graph 9 describes the mean percent canopy in Unnamed Tributary to the Albion River.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 100%. The dominant element composing the structure of the stream banks was 100% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 56% of the units surveyed. Additionally, 35% of the units surveyed had coniferous trees as the dominant vegetation type, and 7% had grass as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

A survey team conducted a mask and snorkel survey at 10 sites for species composition and distribution in Unnamed Tributary to the Albion River on September 14, 2016 (Table A). Water temperatures taken during the survey period of 0902 to 1107 measured 51° Fahrenheit. Air temperatures were 51° Fahrenheit. The sites were sampled by Brian Starks and Chad Moura (CDFW).

In Reach 1, which comprised the first 2,423 feet of stream, 10 sites were sampled. The reach sites yielded 1 young-of-the-year (YOY) steelhead trout (SH), 10 coho salmon, 5 Chinook salmon, and 8 unidentified species.

During the survey, the upstream most observation of coho salmon and steelhead trout occurred at 39.2523° north latitude, -123.7111° west longitude, approximately 451 feet upstream from the confluence with the Albion River. YOY Chinook salmon were observed at 39.2534° north latitude, -123.7115° west longitude, approximately 817 feet upstream from the confluence with the Albion River.

California Department of Fish and Wildlife

Table A. Summary of results for a fish composition and distribution survey within Unnamed Tributary to the Albion River, September, 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: G4 Channel Type										
09/14/16	1	005	Pool	135	0	0	0	9	0	
	2	014	Pool	451	1	0	0	1	0	CHIN (1), UKN (7)
	3	025	Pool	692	0	0	0	0	0	CHIN (3)
	4	040	Pool	817	0	0	0	0	0	CHIN
	5	043	Pool	874	0	0	0	0	0	UKN
	6	047	Pool	931	0	0	0	0	0	
	7	055	Pool	1048	0	0	0	0	0	
	8	061	Pool	1151	0	0	0	0	0	
	9	067	Pool	1233	0	0	0	0	0	
	10	079	Pool	1367	0	0	0	0	0	

Species Abbreviations: CHIN=Chinook Salmon

DISCUSSION

Unnamed Tributary to the Albion River is a G4 channel type for the first 2,423 feet of stream surveyed and an A4 channel type for the next 909 feet. The suitability of G4 and A4 channel types for fish habitat improvement structures is as follows: G4 channels are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover. A4 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days June 16 to June 21, 2016, ranged from 52° to 57° Fahrenheit. Air temperatures ranged from 51° to 68° 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 51% of the total length of this survey, riffles 24%, and pools 20%. Six of the 45 (13%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Thirty-three of the 45 pool tail-outs measured had embeddedness ratings of 1 or 2. Four of the pool tail-outs had embeddedness ratings of 3 or 4. Eight 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.

Sediment sources in Unnamed Tributary to the Albion River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-eight of the 45 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 50. The shelter rating in the flatwater habitats is 21. 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 Unnamed Tributary to the Albion River. Large woody debris is the dominant cover type in pools followed by small woody debris. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

The mean percent canopy density for the stream was 97%. Reach 1 had a canopy density of 97% and Reach 2 had a canopy density of 92%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 99% and 100%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

Unnamed Tributary to the Albion River 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 Unnamed Tributary to the Albion River. 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 large woody debris. Adding high quality complexity with woody cover in the pools is desirable.
- 2) Pools are disconnected or sections of the stream are dry/subsurface. Streamflow should be monitored to determine if it is limiting for salmonids.
- 3) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for three to five years.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate

and taken from the beginning of the survey reach.

Position (ft.):	Habitat unit #:	Comments:
0	0001.00	Start of survey. A clear connection with Albion could not be found. Channel type is a G4. Channel type cross-section location is at Habitat Unit (HU) #53.
360	0010.00	This is very much still within the Albion River floodplain.
451	0014.00	Start of side channel.
546	0014.03	The area is very marshy. Stream is meandering through a wide floodplain.
570	0017.00	There is a 0.7' plunge at the top of the pool.
629	0022.00	There are dry patches (wet soil) in this unit.
692	0025.00	The stream is now entering the redwoods and leaving the marsh habitat. The typical gravel substrate and riparian habitat have returned.
942	0037.01	Water flows under large woody debris (LWD).
942	0037.03	Water flows under LWD.
961	0040.00	This unit flows over a large root wad which fully covers the pool. The substrate of the entire pool is exclusively wood.
1151	0051.00	Log debris accumulation (LDA) #1 contains 6 pieces of large woody debris (LWD) and measures 4' high x 11' wide x 8' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 8' wide x 21' long x 2' deep. Fish were not observed above the LDA. The LDA is a possible barrier to salmonids as there are a few gaps where large fish may have trouble getting through even with high flow. The complexity of structure could still pose a problem for juvenile and adult salmonids even in high flows where water flows over LDA.
1221	0056.00	Gradient increases, and channel becomes even more entrenched.
1253	0059.00	Right bank erosion is contributing LWD to the creek. LDA #2 contains 3 pieces of LWD and measures 4' high x 8' wide x 3' long. Water does not flow through the LDA and there are no visible gaps in it. Retained sediment ranges from sand to gravel and measures 10' wide x 22' long x 3' deep. Fish were not observed above the LDA. There is a 4' plunge into a shallow pool that could pose as a barrier. One large log forms the main

California Department of Fish and Wildlife

barrier while recruiting more LWD. LDA extends into mostly dry side channel (11' long), and is still a complete blockage.

1308	0064.00	There is a 2.5' high x 4' long "bedrock sheet" over LWD.
1323	0065.00	There is a 1' plunge.
1332	0066.00	This pool is a series of pools separated by plunges.
1367	0069.00	There is a 2.5' plunge.
1380	0070.00	Possible channel change occurs as the stream becomes less entrenched and has a lower gradient.
1514	0076.00	The creek narrows.
1533	0078.00	There is a 1.5' plunge.
1739	0092.00	There is seepage on the right bank and 2' plunge.
1804	0097.00	There is a 1.5' plunge.
1932	0106.00	LDA #3 contains 6 pieces of LWD and measures 7' high x 9' wide x 6' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 5' wide x 4' long x 1' deep. Fish were not observed above the LDA. LDA is a possible barrier to salmonids as there are 2 levels of plunges with minimal pools. Several log spilled in channel. Flows through and under, but two 1' plunges through small spaces cause possible barrier.
2094	0109.00	LDA #4 contains 5 pieces of LWD and measures 4.5' high x 12' wide x 2' long. Water flows through the LDA and there are visible gaps in it. Retained sediment ranges from sand to gravel and measures 10' wide x 15' long x 2' deep. Fish were not observed above the LDA. LDA is a possible barrier to salmonids as there is a 4' plunge over a complete blockage of the channel.
2248	0114.00	LDA #5 contains 6 pieces of LWD and measures 5' high x 11' wide x 2' long. Water flows through the LDA and there no visible gaps in it. Retained sediment ranges from sand to gravel and measures 7' wide x 13' long x 2' deep. Fish were not observed above the LDA. There is a 3.5' plunge into shallow water that could be a significant barrier to adult and juvenile salmon. Channel leading up to LDA is very choked with debris.
2357	0117.00	LDA # 6 contains 5 pieces of LWD and measures 5' high x 13' wide x 3' long. Water does not flow through the LDA and there are no visible gaps

in it. Retained sediment ranges from sand to gravel and measures 9' wide x 13' long x 3' deep. Fish were not observed above the LDA. LDA is a possible barrier to salmonids as the whole channel is blocked with a 3.5' plunge with a dry area above it.

2488	0121.00	Channel type changes to an A4 at Habitat Unit (HU) # 121. Channel type cross-section location is at HU#124.
2573	0126.00	There is a 2' plunge over LWD.
2679	0135.00	There is a 1.5' plunge.
2799	0143.00	A dry tributary on the left bank.
2912	0147.00	There is a root-wad engulfing the channel.
2978	0150.00	There is erosion on the right bank measuring 20' long x 10' high.
3079	0156.00	End of survey due to impassable LDA after sustained high gradient. Since approximately HU #56 the gradient has been fairly steep. There have also been many plunges and 6 LDA's in that part of the stream. Pools have been infrequent, though the ones measured have often had spawnable tail-outs and good depth. No fish have been seen for the entire survey. The final LDA (#7) is one old growth log approx. 30' long and 3' in diameter laying in the channel parallel to flow. This creates a 6' jump from one side of the channel to the other. It is unlikely that a salmonid would be able to cross. There is very little space for swimming, much less jumping throughout all of unit 156. LDA # 7 contains 1 piece of LWD and measures 6.5' high x 3' wide x 14' long. Water flows through the LDA and there are visible in it. Retained sediment ranges from sand to gravel and measures 4' wide x 14' long x 3' deep. Fish were not observed above the LDA. The LDA is a possible barrier to salmonids, as described above.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE

Low Gradient Riffle	(LGR)	[1.1]	{ 1 }
High Gradient Riffle	(HGR)	[1.2]	{ 2 }

CASCADE

Cascade	(CAS)	[2.1]	{ 3 }
Bedrock Sheet	(BRS)	[2.2]	{24}

FLATWATER

Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}

MAIN CHANNEL POOLS

Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}

SCOUR POOLS

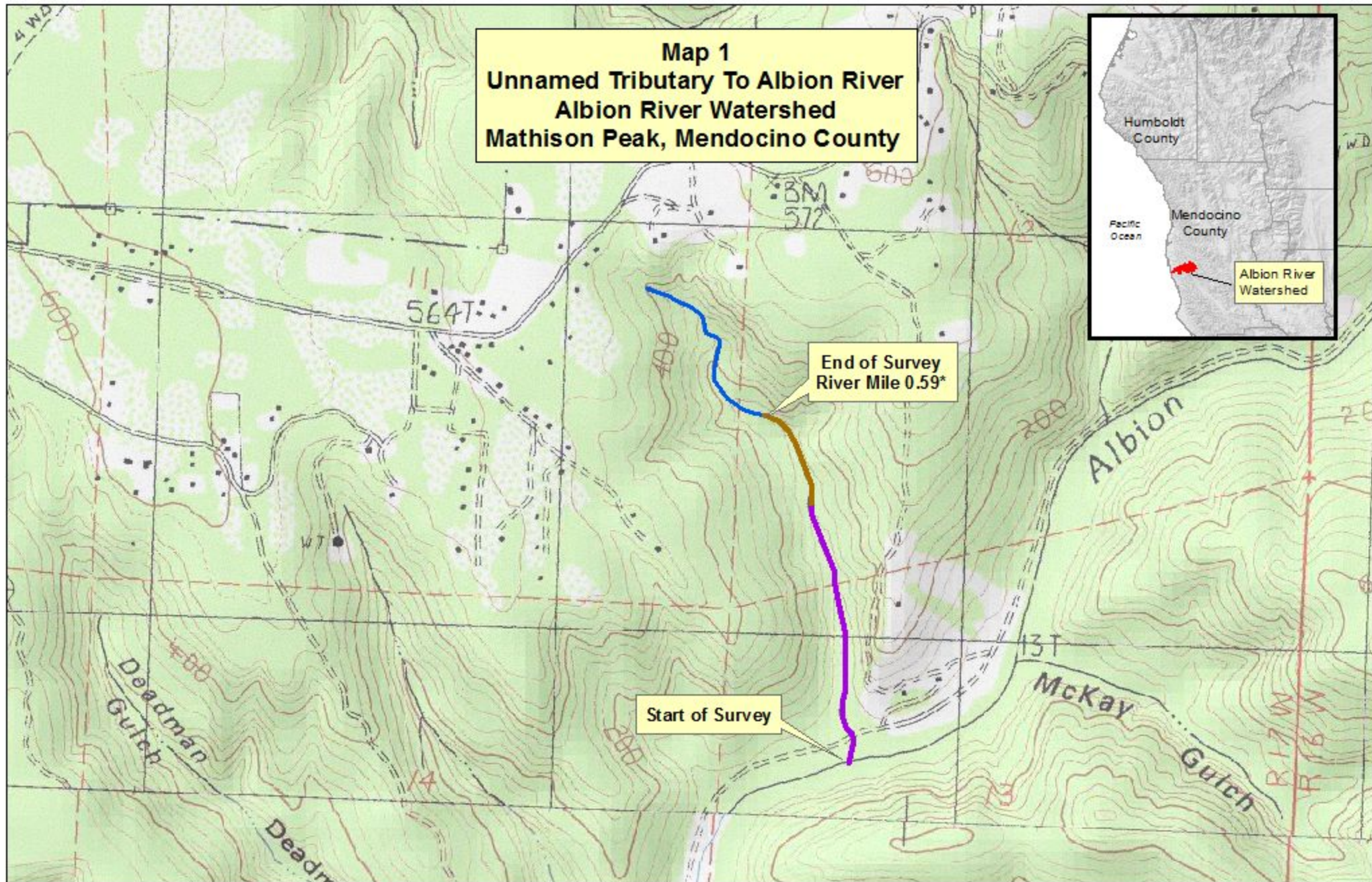
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }

BACKWATER POOLS

Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}

ADDITIONAL UNIT DESIGNATIONS

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



- Reach 1: G4 Channel Type
- Unnamed Trib To Albion
- Reach 2: A4 Channel Type



*River Mile indicates distance from confluence with Albion River

APPENDIX I

TABLES AND GRAPHS

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

Stream Name: 1237100392512

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
4	0	DRY	2.4	18	71	2.1									
56	11	FLATWATER	33.9	30	1707	51.2	4.0	0.4	0.8	104	5832	50	2804		21
3	0	NOSURVEY	1.8	10	30	0.9									
1	0	NOSURVEY_	0.6	60	60	1.8									
45	45	POOL	27.3	15	661	19.8	6.2	0.7	1.5	91	4101	90	4036	75	50
56	7	RIFFLE	33.9	14	803	24.1	3.4	0.2	0.5	57	3188	13	736		21
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
165	63				3332					13122			7575		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: 1237100392512

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

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 (%)
53	5	LGR	32.1	14	730	21.9	4	0.2	0.5	52	2754	10	534		10	98
3	2	HGR	1.8	24	73	2.2	3	0.3	0.9	69	208	21	62		50	91
27	7	RUN	16.4	17	461	13.8	4	0.5	2.1	78	2109	58	1574		30	96
29	4	SRN	17.6	43	1246	37.4	4	0.3	0.8	150	4341	36	1035		5	96
39	39	MCP	23.6	15	592	17.8	6	0.7	2.8	95	3688	94	3673	79	50	97
3	3	CRP	1.8	13	39	1.2	5	0.7	1.9	65	195	51	154	45	55	100
1	1	LSL	0.6	21	21	0.6	9	0.9	1.7	189	189	189	189	170	40	95
1	1	LSR	0.6	4	4	0.1	4	0.8	2.1	14	14	11	11	11	50	100
1	1	PLP	0.6	5	5	0.2	3	0.5	1.2	15	15	9	9	8	70	89
4	0	DRY	2.4	18	71	2.1										
3	0	NS	1.8	10	30	0.9										
1	0	MAR	0.6	60	60	1.8										

Total Units
165

Total Units Fully Measured
63

Total Length (ft.)
3332

Total Area (sq.ft.)
13514

Total Volume (cu.ft.)
7241

Table 3 - Summary of Pool Types

Stream Name: 1237100392512

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

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
39	39	MAIN	87	15	592	90	6.4	0.7	95	3688	79	3064	50
6	6	SCOUR	13	12	69	10	5.2	0.7	69	413	54	322	54

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
45	45	661	4101	3387

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

Stream Name: 1237100392512

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

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
39	MCP	87	2	5	32	82	5	13	0	0	0	0
3	CRP	7	1	33	2	67	0	0	0	0	0	0
1	LSL	2	0	0	1	100	0	0	0	0	0	0
1	LSR	2	0	0	0	0	1	100	0	0	0	0
1	PLP	2	0	0	1	100	0	0	0	0	0	0

Total Units	Total < 1 Foot Max Resid. Depth	Total < 1 Foot % Occurrence	Total 1< 2 Foot Max Resid. Depth	Total 1< 2 Foot % Occurrence	Total 2< 3 Foot Max Resid. Depth	Total 2< 3 Foot % Occurrence	Total 3< 4 Foot Max Resid. Depth	Total 3< 4 Foot % Occurrence	Total >= 4 Foot Max Resid. Depth	Total >= 4 Foot % Occurrence
45	3	7	36	80	6	13	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Unnamed Trib to Albion

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Dry Units: 4

Confluence Location:

Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

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
53	6	LGR	0	0	0	0	100	0	0	0	0
3	2	HGR	0	60	40	0	0	0	0	0	0
56	7	TOTAL RIFFLE	0	20	14	0	66	0	0	0	0
27	7	RUN	14	10	23	0	53	0	0	0	0
29	4	SRN	0	50	0	0	50	0	0	0	0
56	11	TOTAL FLAT	11	17	18	0	52	0	0	0	0
39	39	MCP	15	24	53	0	5	0	0	3	0
3	2	CRP	75	25	0	0	0	0	0	0	0
1	1	LSL	0	0	50	0	50	0	0	0	0
1	1	LSR	10	90	0	0	0	0	0	0	0
1	1	PLP	85	0	0	0	15	0	0	0	0
45	44	TOTAL POOL	19	25	48	0	6	0	0	2	0
3	0	NS	0	0	0	0	0	0	0	0	0
1	0	MAR	0	0	0	0	0	0	0	0	0
165	62	TOTAL	17	23	41	0	17	0	0	2	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: 1237100392512

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Dry Units: 4

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

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
53	5	LGR	20	0	80	0	0	0	0
3	2	HGR	0	0	50	50	0	0	0
27	7	RUN	43	14	43	0	0	0	0
29	4	SRN	25	0	75	0	0	0	0
39	39	MCP	8	23	67	0	0	3	0
3	3	CRP	0	0	100	0	0	0	0
1	1	LSL	100	0	0	0	0	0	0
1	1	LSR	100	0	0	0	0	0	0
1	1	PLP	100	0	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: 1237100392512

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
97	81	19	0	99	100

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: 1237100392512

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Survey Length (ft.): 3332

Main Channel (ft.): 3096

Side Channel (ft.): 236

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

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

Channel Type: G4

Canopy Density (%): 97.8

Pools by Stream Length (%): 22.9

Reach Length (ft.): 2187

Coniferous Component (%): 80.3

Pool Frequency (%): 29.2

Riffle/Flatwater Mean Width (ft.): 3.9

Hardwood Component (%): 19.7

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Brush

< 2 Feet Deep: 86

Range (ft.): 4 to 14

Vegetative Cover (%): 99.5

2 to 2.9 Feet Deep: 14

Mean (ft.): 6

Dominant Shelter: Large Woody Debris

3 to 3.9 Feet Deep: 0

Std. Dev.: 3

Dominant Bank Substrate Type: Sand/Silt/Clay

>= 4 Feet Deep: 0

Base Flow (cfs.): 0.1

Occurrence of LWD (%): 33

Mean Max Residual Pool Depth (ft.): 1.5

Water (F): 52 - 57 Air (F): 51 - 68

LWD per 100 ft.:

Mean Pool Shelter Rating: 51

Dry Channel (ft): 64

Riffles: 2

Pools: 13

Flat: 3

Pool Tail Substrate (%): Silt/Clay: 9 Sand: 6 Gravel: 80 Sm Cobble: 0 Lg Cobble: 3 Boulder: 0 Bedrock: 3

Embeddedness Values (%): 1. 60.0 2. 17.1 3. 2.9 4. 0.0 5. 20.0

STREAM REACH: 2

Channel Type: A4

Canopy Density (%): 92.1

Pools by Stream Length (%): 11.7

Reach Length (ft.): 909

Coniferous Component (%): 85.7

Pool Frequency (%): 22.2

Riffle/Flatwater Mean Width (ft.): 3.0

Hardwood Component (%): 14.3

Residual Pool Depth (%):

BFW:

Dominant Bank Vegetation: Brush

< 2 Feet Deep: 90

Range (ft.): 6 to 12

Vegetative Cover (%): 98.8

2 to 2.9 Feet Deep: 10

Mean (ft.): 8

Dominant Shelter: Large Woody Debris

3 to 3.9 Feet Deep: 0

Std. Dev.: 2

Dominant Bank Substrate Type: Sand/Silt/Clay

>= 4 Feet Deep: 0

Base Flow (cfs.): 0.1

Occurrence of LWD (%): 49

Mean Max Residual Pool Depth (ft.): 1.4

Water (F): 54 - 54 Air (F): 64 - 68

LWD per 100 ft.:

Mean Pool Shelter Rating: 47

Dry Channel (ft): 7

Riffles: 4

Pools: 27

Flat: 10

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 100 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 0

Embeddedness Values (%): 1. 60.0 2. 0.0 3. 30.0 4. 0.0 5. 10.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: 1237100392512

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

Mean Percentage of Dominant Stream Bank Substrate

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	0	0	0.0
Boulder	0	0	0.0
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	63	63	100.0

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	6	3	7.1
Brush	36	34	55.6
Hardwood Trees	3	0	2.4
Coniferous Trees	18	26	34.9
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: Unnamed Trib to Albion

LLID: 1237100392512

Drainage: Albion River

Survey Dates: 6/16/2016 to 6/21/2016

Confluence Location:

Quad: MATHISON PEAK

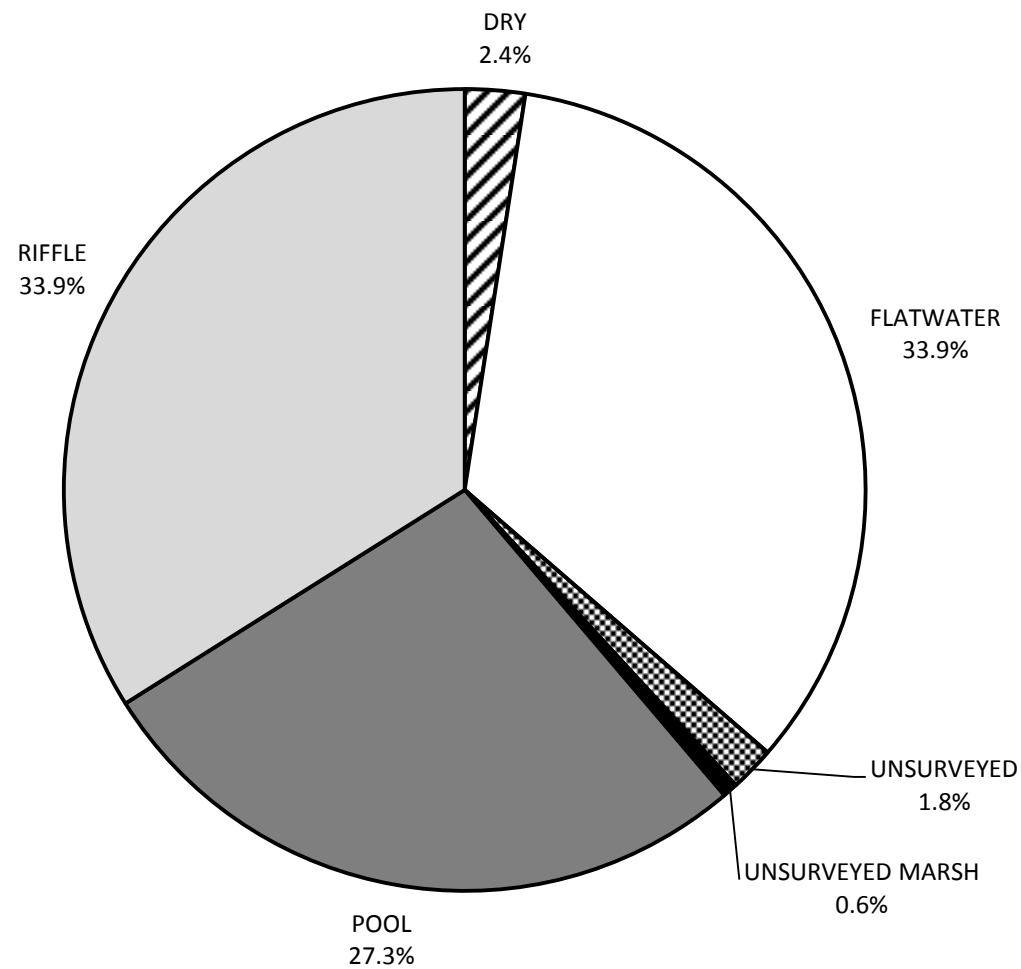
Legal Description: T16NR17WS13

Latitude: 39:15:04.0N

Longitude: 123:42:36.0W

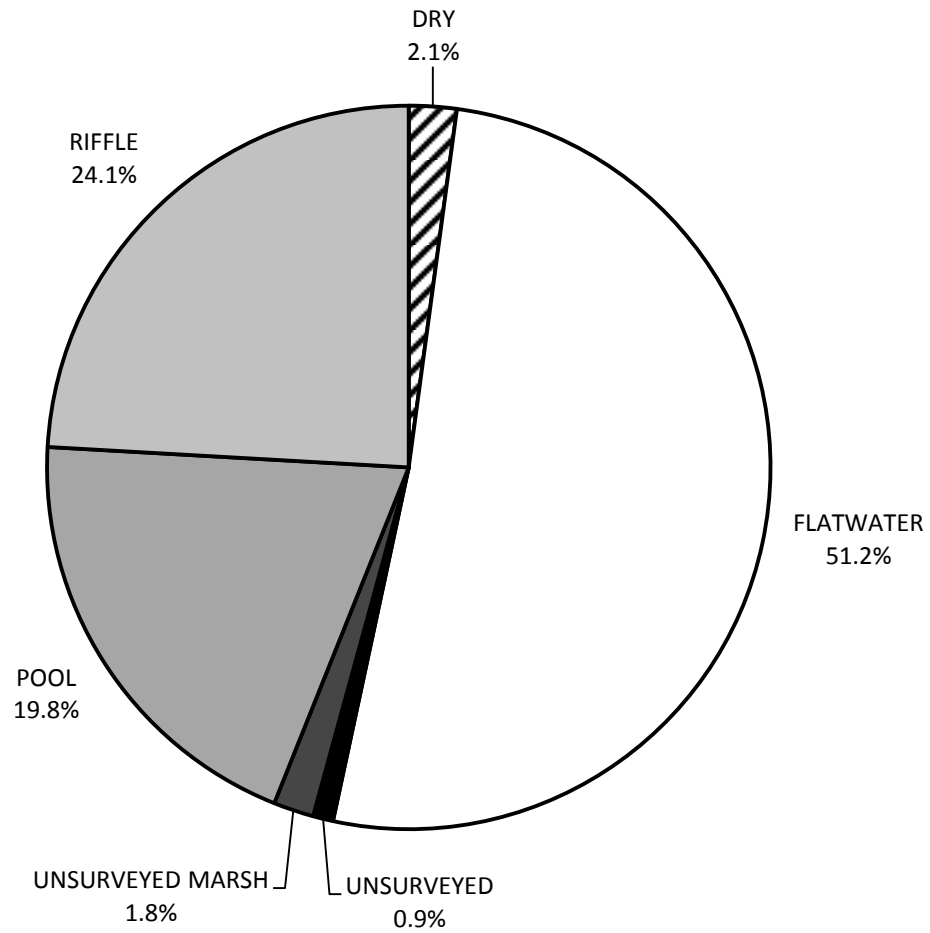
	Riffles	Flatwater	Pools
Undercut Banks (%)	0	11	19
Small Woody Debris (%)	20	18	25
Large Woody Debris (%)	14	19	48
Root Mass (%)	0	0	0
Terrestrial Vegetation (%)	66	52	6
Aquatic Vegetation (%)	0	0	0
Whitewater (%)	0	0	0
Boulders (%)	0	0	3
Bedrock Ledges (%)	0	0	0

UNNAMED TRIBUTARY TO THE ALBION RIVER 2016 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

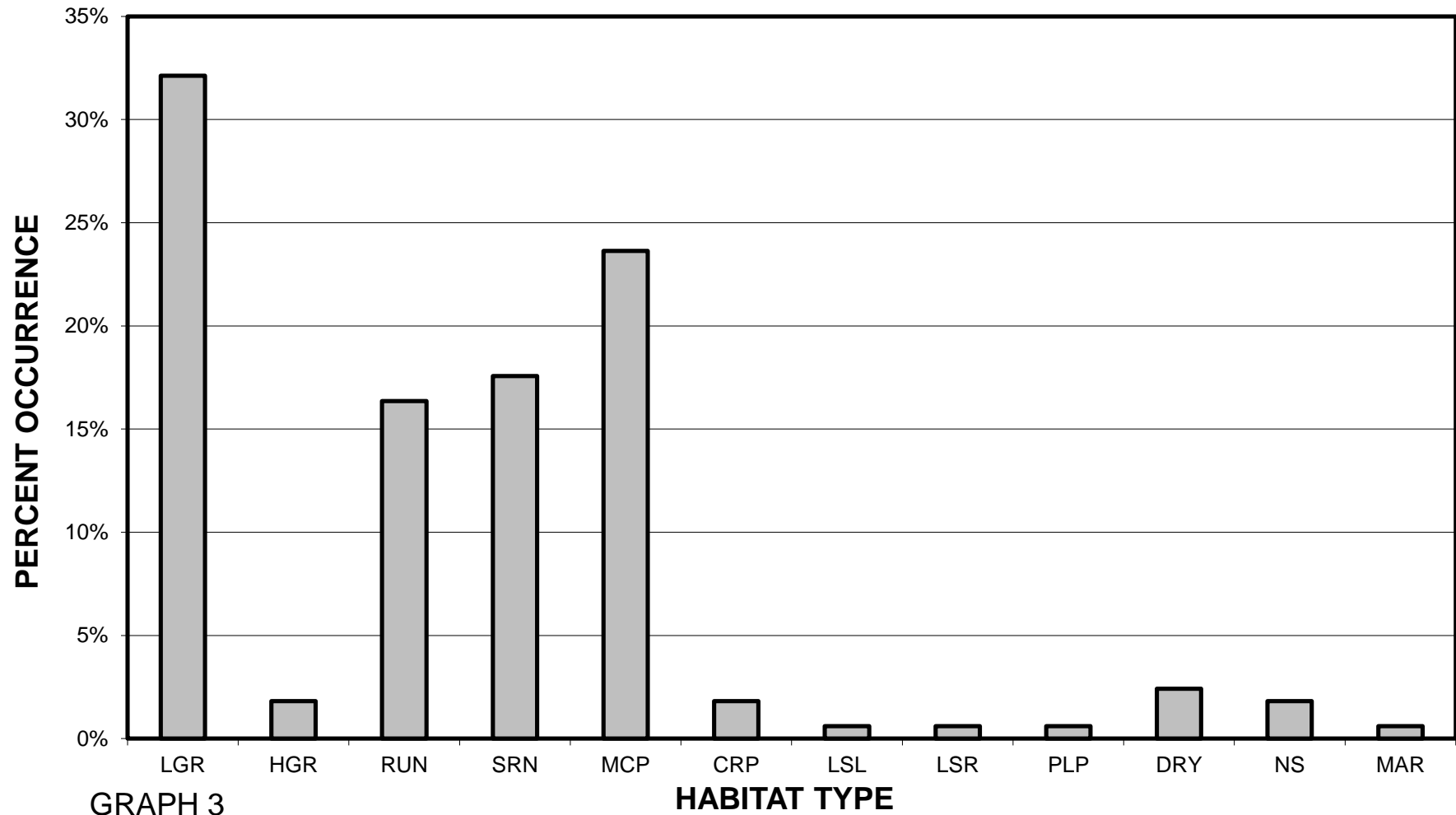
**UNNAMED TRIBUTARY TO THE ALBION RIVER 2016
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

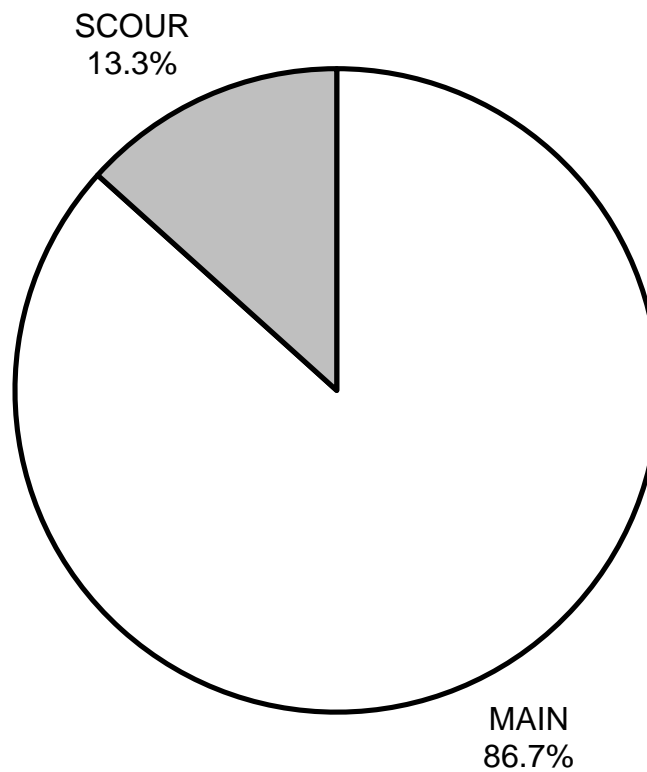
UNNAMED TRIBUTARY TO THE ALBION RIVER 2016

HABITAT TYPES BY PERCENT OCCURRENCE



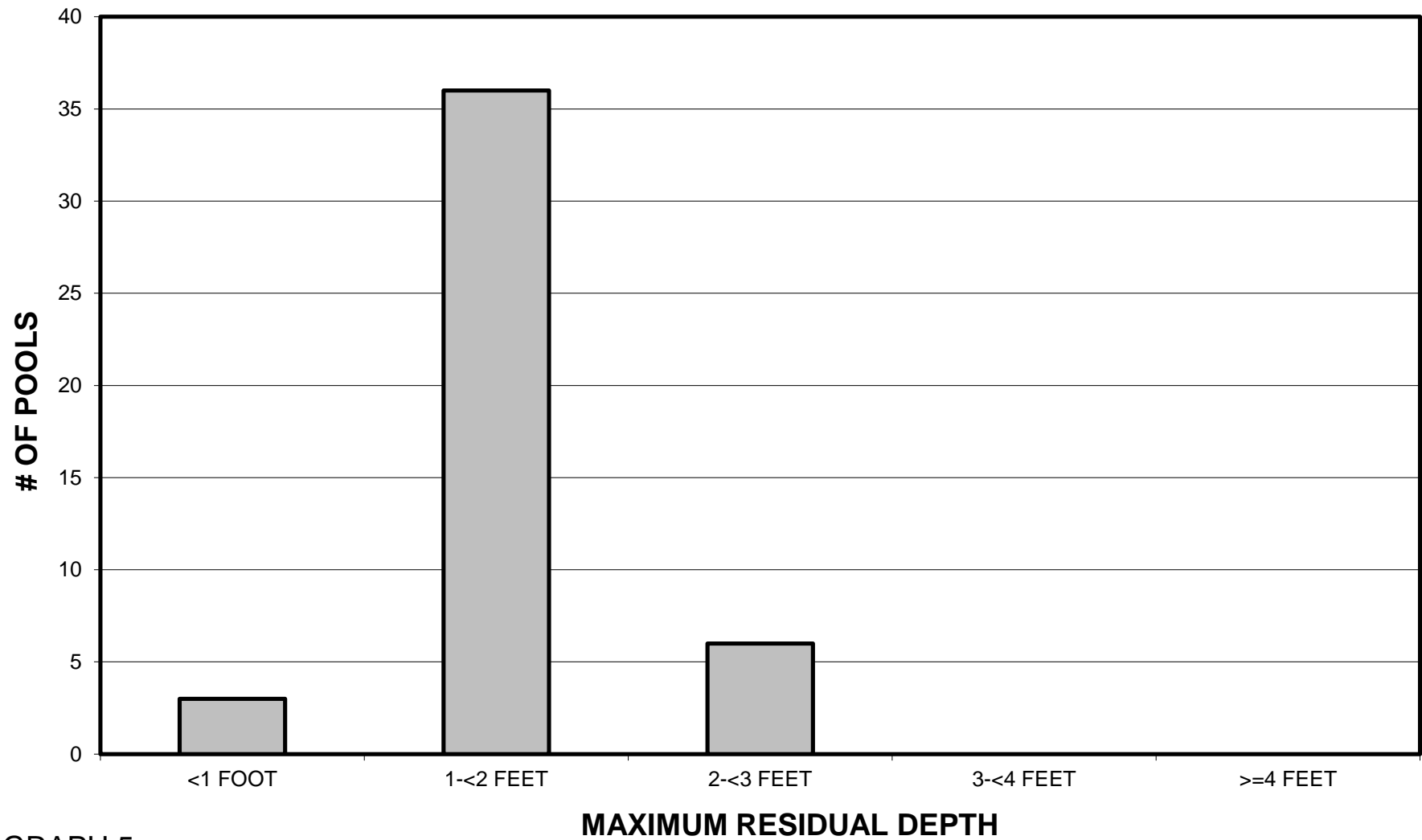
GRAPH 3

**UNNAMED TRIBUTARY TO THE ALBION RIVER 2016
POOL TYPES BY PERCENT OCCURRENCE**



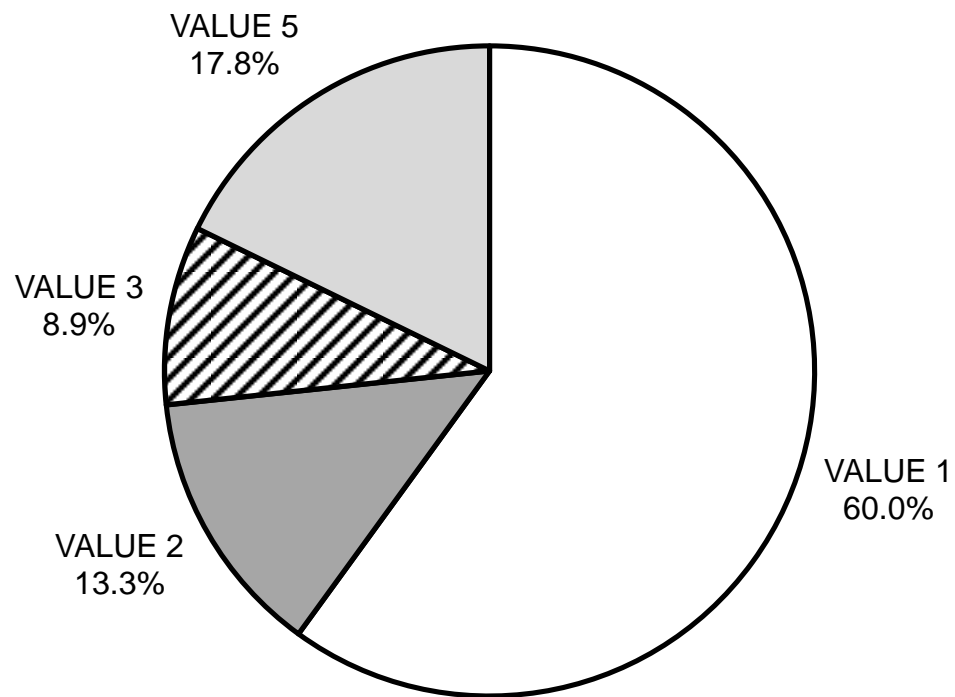
GRAPH 4

UNNAMED TRIBUTARY TO THE ALBION RIVER 2016
MAXIMUM DEPTH IN POOLS



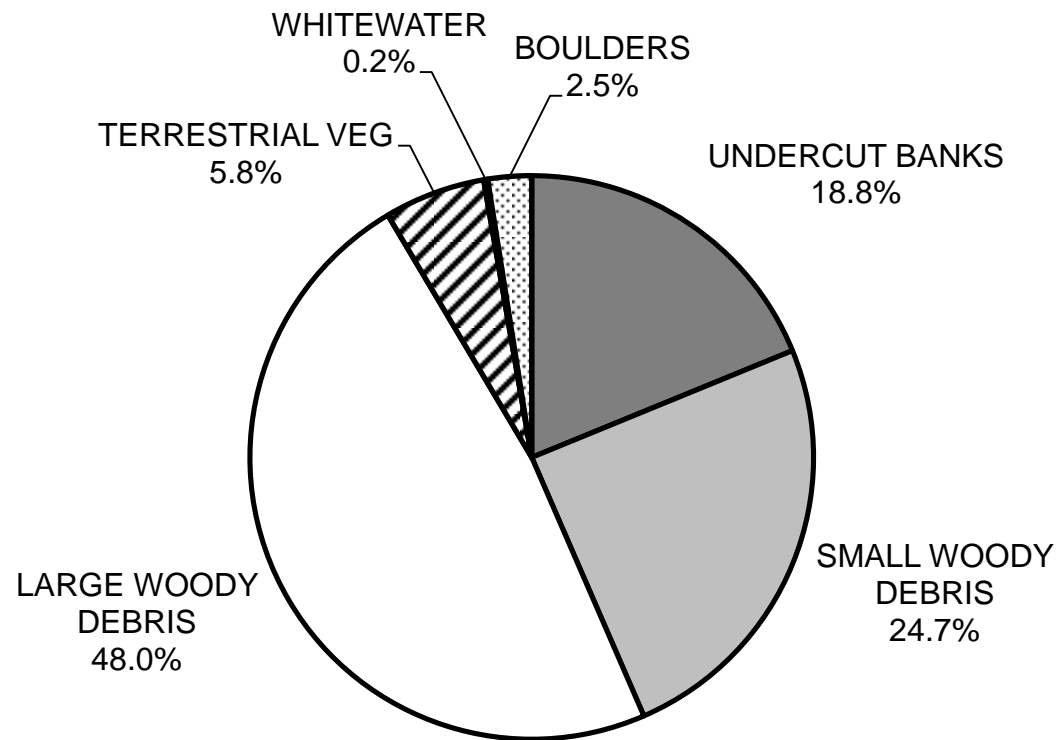
GRAPH 5

UNNAMED TRIBUTARY TO THE ALBION RIVER 2016 PERCENT EMBEDDEDNESS



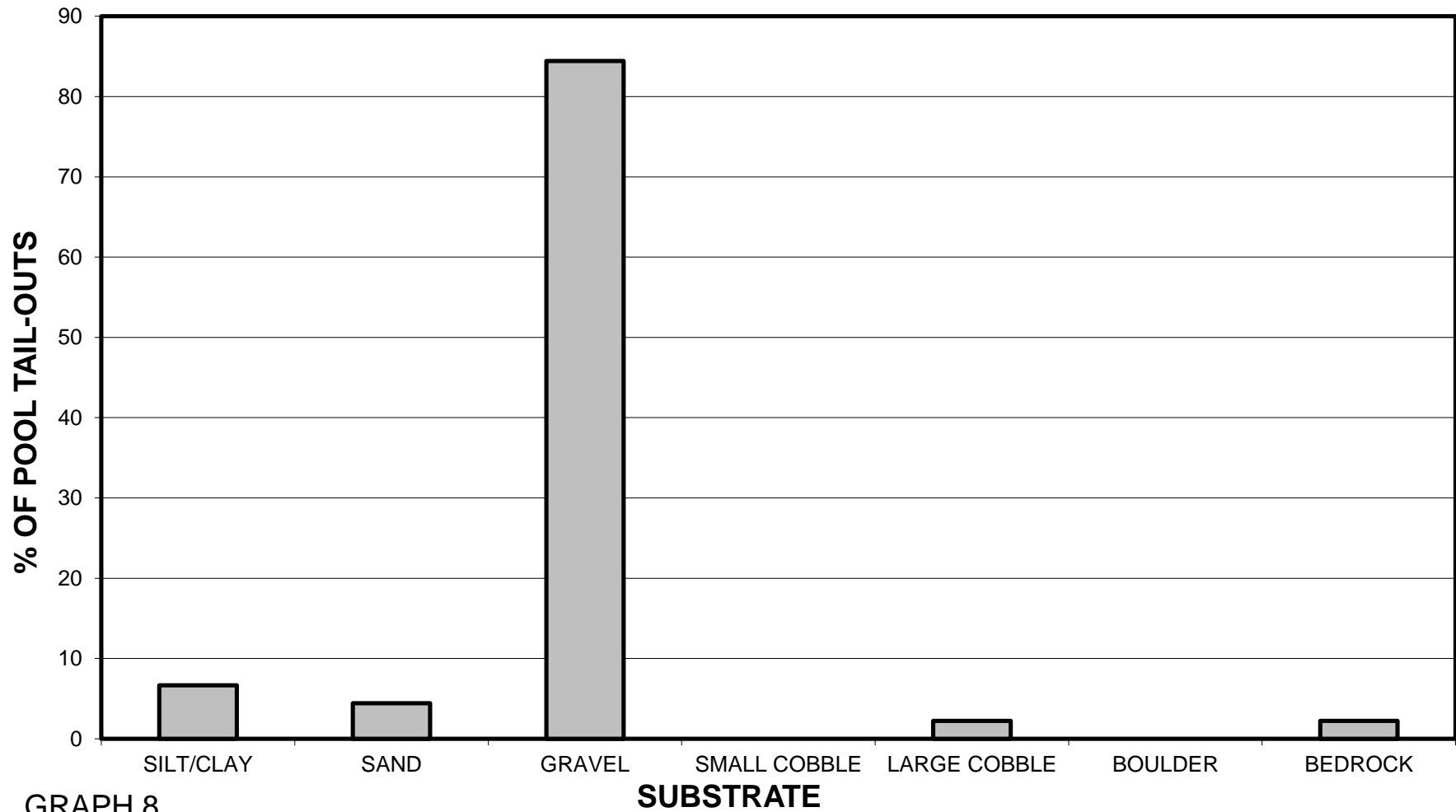
GRAPH 6

UNNAMED TRIBUTARY TO THE ALBION RIVER 2016 MEAN PERCENT COVER TYPES IN POOLS



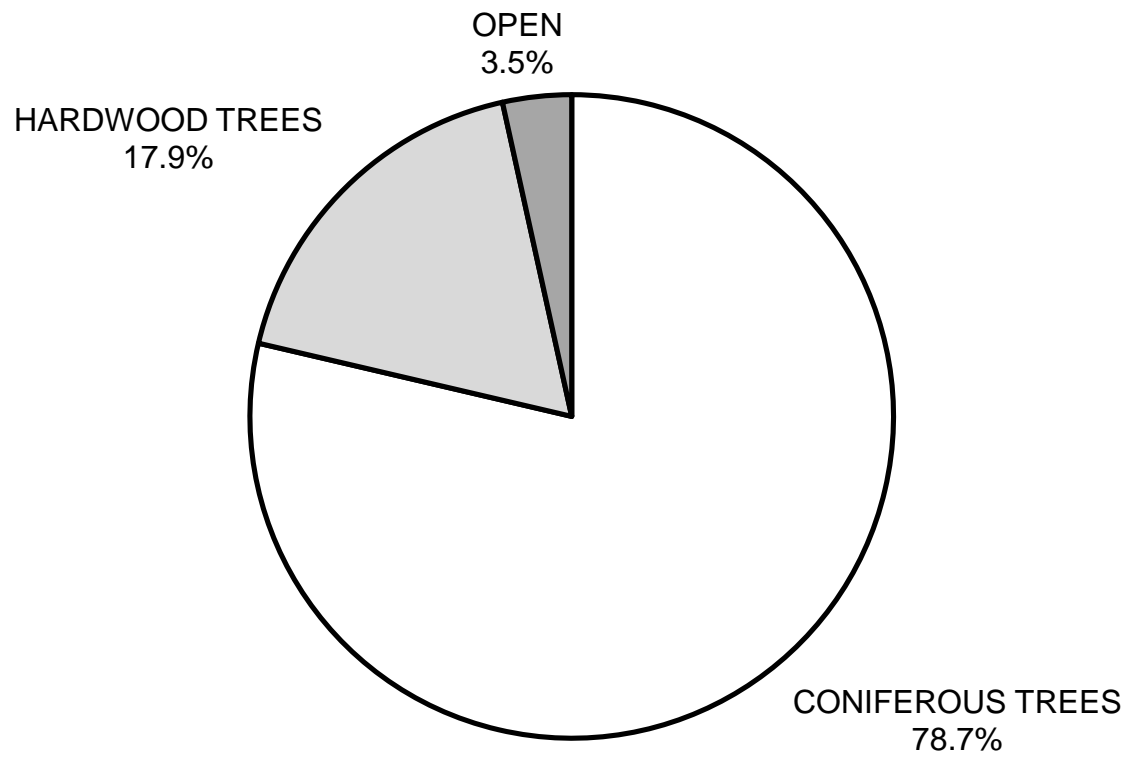
GRAPH 7

UNNAMED TRIBUTARY TO THE ALBION RIVER 2016 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



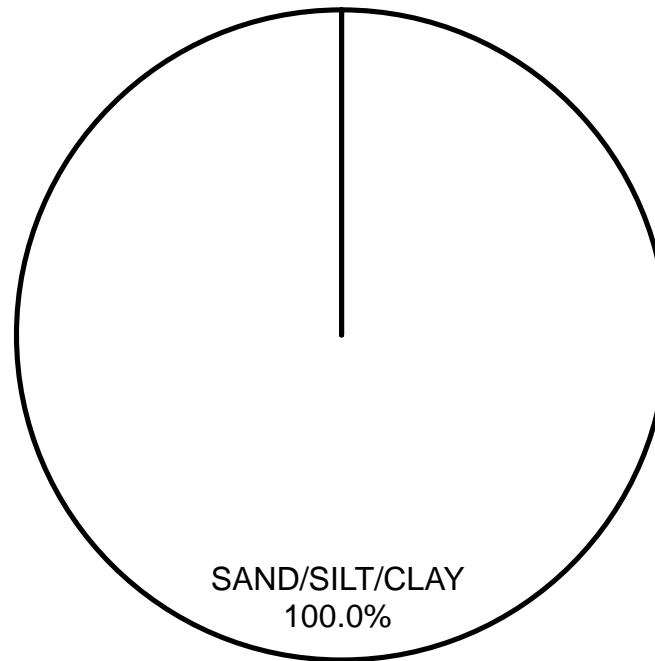
GRAPH 8

**UNNAMED TRIBUTARY TO THE ALBION RIVER 2016
MEAN PERCENT CANOPY**



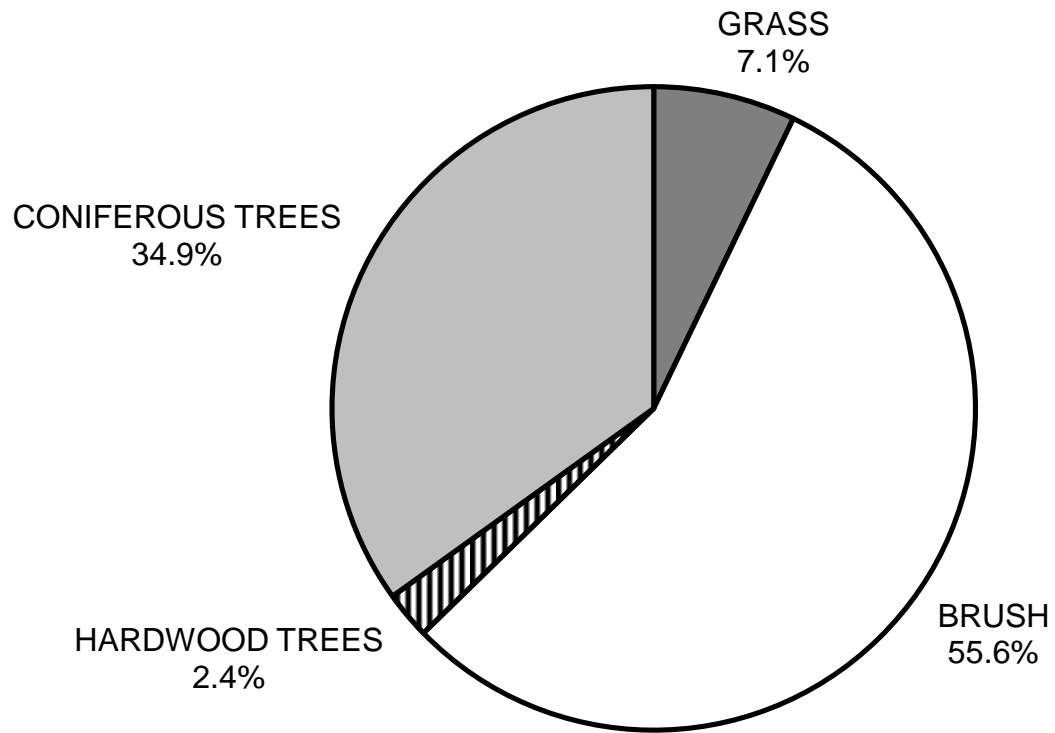
GRAPH 9

**UNNAMED TRIBUTARY TO THE ALBION RIVER 2016
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**UNNAMED TRIBUTARY TO THE ALBION RIVER 2016
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

APPENDIX II

STREAM INVENTORY PHOTOS

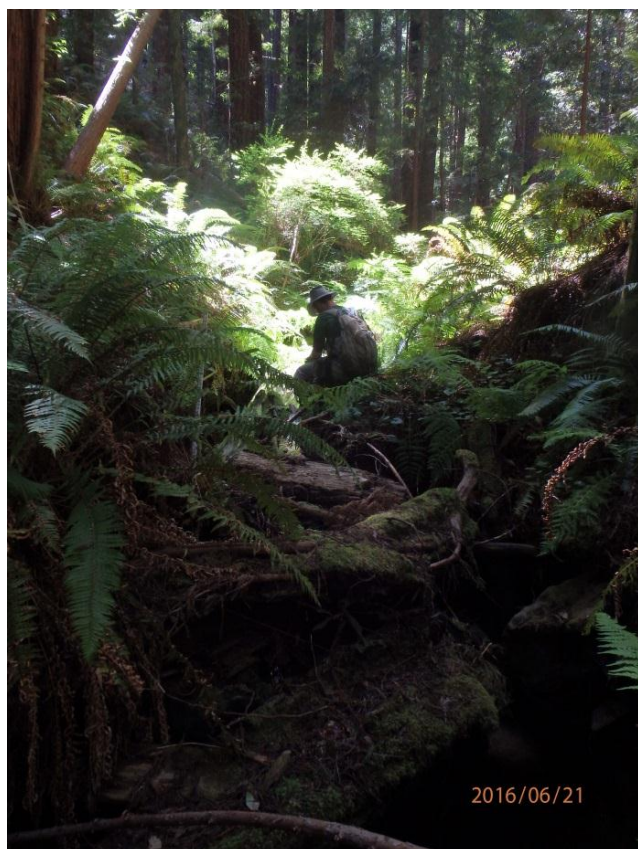


Photo 1: End of survey at habitat unit #156. Brian Starks pictured sitting on LDA barrier. (Photo taken 6-21-2016)



Photo 2: End of survey, looking downstream from above the LDA barrier at habitat unit #156. (Photo taken 6-21-2016)



Photo 3: LDA at habitat unit #156, end of survey. Brian Starks pictured. (Photo taken 6-21-2016)