



CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

STREAM INVENTORY REPORT

Albion River

INTRODUCTION

A stream inventory was conducted from August 25 to September 2, 2015 on the Albion River. The survey began 6.7 miles upstream from the confluence with the Pacific Ocean, and extended upstream 6.5 miles to the confluence with North Fork Albion River.

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 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 Chinook salmon, coho salmon, and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

The Albion River drains to the Pacific Ocean and is located in Mendocino County, California (Map 1). The Albion River's legal description at the confluence with the Pacific Ocean is T16N R17W S28. Its location is 39.2269 degrees north latitude and 123.7692 degrees west longitude, LLID number 1237687392265. The Albion River is a third order stream and has approximately 17.3 miles of blue line stream according to the USGS Albion 7.5 minute quadrangle. The Albion River drains a watershed of approximately 43.5 square miles. Elevations range from sea level at the mouth of the river to 800 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production, rangeland, and rural development. Vehicle access exists via Comptche-Ukiah Road, west of Comptche, CA.

METHODS

The habitat inventory conducted in the Albion River 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 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

California Department of Fish and Wildlife

field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in 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:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". 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 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.

California Department of Fish and Wildlife

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 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 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 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

California Department of Fish and Wildlife

(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 the Albion River. In addition, underwater observations were made at five 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 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 AT THE END OF THE REPORT ***

The habitat inventory of August 25 to September 2, 2015 was conducted by M. Groff, D. Lam, and I. Mikus, (CDFW). The total length of the stream covered was 69,565 feet. The first 35,450 feet of the Albion River were not surveyed due to the size of the river and tidal influence. The data presented in this report represent only the length of the Albion River actually surveyed.

Stream flow was not measured on the Albion River.

The first 35,450 feet of the Albion River were not surveyed and the channel type is unknown (Reach 1). Above the unsurveyed section, the Albion River is an F4 channel type for 9,176 feet of the stream surveyed (Reach 2), an F1 channel type for 9,333 feet of the stream surveyed (Reach 3), an F4 channel type for 11,799 feet of the stream surveyed (Reach 4), and an F1 channel type for 3,807 feet of the stream surveyed (Reach 5). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. F1 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with bedrock-dominant substrates.

Water temperatures taken during the survey period ranged from 58 to 64 degrees Fahrenheit. Air temperatures ranged from 50 to 72 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 41% flatwater units, 29% pool units, 21% dry units, and 9% riffle units (Graph 1). Based on total length of Level II habitat types there were 47% flatwater units, 45% pool units, 6% dry units, and 2% riffle units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 24%; run units, 24%; and dry units, 21% (Graph 3). Based on percent total length, mid-channel pool units made up 39%, step run units 26%, and run units 18%.

A total of 84 pools were identified (Table 3). Main channel pools were the most frequently encountered at 82% (Graph 4), and comprised 87% 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. Sixty-two of the 84 pools (74%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 84 pool tail-outs measured, 50 had a value of 1 (59.5%); 14 had a value of 2 (16.7%); one had a value of 3 (1.2%); 19 had a value of 5 (22.6%) (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.

California Department of Fish and Wildlife

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 7, flatwater habitat types had a mean shelter rating of 15, and pool habitats had a mean shelter rating of 12 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 14. Main channel pools had a mean shelter rating of 12 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Large woody debris is the dominant cover type in the Albion River. Graph 7 describes the pool cover in 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 63% of the pool tail-outs. Bedrock was the next most frequently observed dominant substrate type and occurred in 25% of the pool tail-outs.

The mean percent canopy density for the surveyed length of the Albion River was 94%. Six percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 24% and 76%, respectively. Graph 9 describes the mean percent canopy in the Albion River.

For the stream reach surveyed, the mean percent right bank vegetated was 99%. The mean percent left bank vegetated was 98%. The dominant elements composing the structure of the stream banks consisted of 87% sand/silt/clay, 11% bedrock, 2% boulders, and 1% cobble/gravel (Graph 10). Coniferous trees were the dominant vegetation type observed in 75% of the units surveyed. Additionally, 22% of the units surveyed had hardwood trees as the dominant vegetation type, and 4% had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at five sites for species composition and distribution in the Albion River on September 23, 2015 (Table A). The sites were sampled by I. Mikus and M. Groff (CDFW).

In Reach 2, two sites were sampled starting approximately 37,709 feet from the confluence with the Pacific Ocean and continuing upstream 3,849 feet. The reach sites yielded one young-of-the-year (YOY) steelhead trout (SH), three age 1+ SH, 67 YOY coho salmon, and 55 stickleback.

In Reach 3, one site was sampled starting approximately 50,677 feet from the confluence with the Pacific Ocean and continuing upstream 94 feet. The reach site yielded three YOY SH, 22 YOY coho salmon, and eight stickleback.

In Reach 4, one site was sampled starting approximately 55,181 feet from the confluence with the Pacific Ocean and continuing upstream 96 feet. The reach site yielded one YOY SH, one age 1+ SH, and 18 YOY coho salmon.

In Reach 5, one site was sampled starting approximately 69,089 feet from the confluence with the Pacific Ocean and continuing upstream 65 feet. The reach site yielded 31 YOY coho salmon,

California Department of Fish and Wildlife

and two crayfish.

During the survey, the upper-most observation of juvenile coho salmon occurred at 39.263 degrees north latitude, 123.608 degrees west longitude, approximately 13.1 miles upstream from the confluence with the Pacific Ocean.

Table A. Summary of results for a fish composition and distribution survey within the Albion River, 2015.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	Steelhead Trout			Coho Salmon		Additional Aquatic Species Observed
					YOY	1+	2+	YOY	1+	
Reach 2: F4 Channel Type										
09/23/15	1	027	Run	37,842	1	0	0	37	0	STB
09/23/15	2	070	Pool	41,691	0	3	0	30	0	STB
Reach 3: F1 Channel Type										
09/23/15	3	146	Pool	50,771	3	0	0	22	0	STB
Reach 4: F4 Channel Type										
09/23/15	4	174	Pool	55,277	1	1	0	18	0	
Reach 5: F1 Channel Type										
09/23/15	5	287	Run	69,154	0	0	0	31	0	CF

Species Abbreviations: CF=Crayfish; STB=Stickleback (Unidentified Species)

DISCUSSION

The Albion River is an unknown channel type for the first 35,450 feet of stream surveyed, an F4 channel type for the next 9,176 feet, an F1 channel type for the next 9,333 feet, an F4 channel type for the next 11,799 feet, and an F1 channel type for the remaining 3,807 feet. The suitability of F4 and F1 channel types for fish habitat improvement structures is as follows: F4 channels are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. F1 channels are good for bank-placed boulders and fair for single wing-deflectors and log cover.

The water temperatures recorded on the survey days August 25 to September 2, 2015 ranged from 58 to 64 degrees Fahrenheit. Air temperatures ranged from 50 to 72 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 64 degrees Fahrenheit, if sustained, is near the threshold stress level for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 47% of the total length of this survey, riffles 2%, and pools 45%. Sixty-two of the 84 (74%) pools had a maximum residual depth greater than three feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined

California Department of Fish and Wildlife

to have a maximum residual depth of at least three 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.

Sixty-four of the 84 pool tail-outs measured had embeddedness ratings of 1 or 2. One of the pool tail-outs had embeddedness ratings of 3 or 4. Nineteen 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 the Albion River should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Fifty-eight of the 84 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 12. The shelter rating in the flatwater habitats is 15. 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 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 94%. Reach 2 had a canopy density of 94%, Reach 3 had a canopy density of 93%, Reach 4 had a canopy density of 94%, and Reach 5 had a canopy density of 96%. The percentage of right and left bank covered with vegetation was 99% and 98%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

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 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) Suitable size spawning substrate on the Albion River is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

California Department of Fish and Wildlife

- 3) 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.
- 4) 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	The first 35,450 feet of the Albion River were not surveyed due to tidal influence and the size of the river. The channel type in this section is unknown.
35450	0002.00	Start of surveying. The channel is an F4.
41162	0066.00	South Fork Albion River (Tributary #01) enters on the left bank. It is dry at the mouth. The water temperature of the tributary was 59 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 59 degrees Fahrenheit. For more information, see the 2013 South Fork Albion River Stream Habitat Inventory Report. A logging road crosses the channel. The crossing is an 18' wide x 89' long x over 20' high railcar bridge. Boulder rip-rap lines each bank under the bridge. There is bare soil above the rip-rap on the right bank and a corrugated metal abutment on the left bank.
41996	0076.00	Anchored large woody debris (LWD) structure on the right bank.
42172	0080.00	Anchored LWD structure on the right bank.
42516	0082.00	Anchored LWD structure on the right bank.
42909	0088.00	Anchored LWD structure on the right bank.
43559	0096.00	Anchored LWD structure on the left bank.
44626	0102.00	The channel changes from an F4 to an F1.
45058	0107.00	Kaisen Gulch (Tributary #02) enters on the right bank. It contributes approximately 10% to the Albion River's flow, but the first 10' feet were

California Department of Fish and Wildlife

dry. The water temperature of the tributary was 58 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 60 degrees Fahrenheit. For more information, see the 2013 Kaisen Gulch Stream Habitat Inventory Report.

45339	0108.00	LWD structure anchored to the right bank.
46084	0111.00	Anchored LWD structure on the right bank.
46382	0112.00	Anchored LWD structure on the left bank.
46763	0114.00	Anchored LWD structure on the right bank.
48269	0129.00	Right bank armored with boulder rip-rap for approximately 30' long x 20' high.
50307	0143.00	Notched log cabled perpendicular to flow on top of bedrock.
53959	0164.00	The channel changes from an F1 to an F4.
54644	0171.00	Railroad Gulch (Tributary #03) enters on the left bank. It was dry at the mouth for the first 30 feet, then intermittently flowing. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 60 degrees Fahrenheit. For more information, see the 2011 Railroad Gulch Stream Habitat Inventory Report. A logging road crosses the channel. The crossing is an 18' wide x 88' long x over 20' high railcar bridge with a log abutment on the right bank.
56746	0191.00	LWD anchored to the right bank. Tom Bell Creek (Tributary #04) enters on the right bank. It was dry at the mouth. The water temperature downstream and upstream of the confluence with Tom Bell Creek was 61 degrees Fahrenheit. For more information, see the 2012 Tom Bell Creek Stream Habitat Inventory Report.
57497	0197.00	LWD anchored to the left bank.
60563	0222.00	Right bank seep.
61540	0232.00	Left bank seep.
62188	0236.00	Anchored LWD structure on the left bank.
62674	0239.00	Log debris accumulation (LDA) #01 contains approximately 55 pieces of LWD and measures approximately 8' high x 40' wide x 126' long. Flow may be subsurface through the LDA and there are visible gaps in it. The LDA is not retaining sediment. Fish were observed above it.

California Department of Fish and Wildlife

64642	0253.00	Boulder rip-rap armors the right bank for approximately 300' long x 20' high.
64869	0254.00	LWD structure armored to the left bank.
65758	0262.00	The channel changes from an F4 to an F1. USGS gauging station on the right bank.
67674	0277.00	Anchored LWD on the right bank.
69006	0286.00	Anchored LWD structure on the right bank.
69358	0290.00	End of survey at confluence with North Fork Albion River. North Fork Albion River (Tributary #05) enters on the right bank. It contributes approximately 40% to the Albion River's flow. Flow was subsurface at the mouth and intermittent for the first approximately 40 feet. The water temperature of the tributary was 61 degrees Fahrenheit; the water temperature downstream and upstream of the confluence was 60 degrees Fahrenheit. The slope of the tributary is less than 2%.

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.

California Department of Fish and Wildlife

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]	

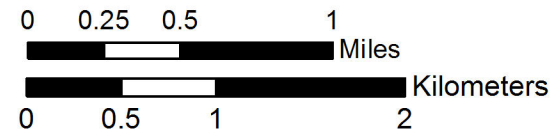
Map 1 Albion River Watershed Albion Quad, Mendocino County



Start of Survey
*River Mile 6.71

End of Survey
River Mile 13.14

- Reach 2: F4 Channel Type
- Reach 4: F4 Channel Type
- Reach 3: F1 Channel Type
- Reach 5: F1 Channel Type
- Albion River



*River Mile indicates distance from the Pacific Ocean

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

Stream Name: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS11

Latitude: 39:13:35.0N

Longitude: 123:46:07.0

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
61	0	DRY	21.2	33	2033	6.0									
117	20	FLATWATER	40.6	137	16047	47.2	12.9	0.7	1.5	1658	193954	1595	186585		15
2	0	NOSURVEY		17788	35576										
84	84	POOL	29.2	180	15161	44.6	22.3	1.9	3.8	4112	345375	8652	726779	8296	12
26	6	RIFFLE	9.0	29	748	2.2	4.4	0.2	0.4	84	2192	16	413		7
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
290	110				69565					541522			913777		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS11

Latitude: 39:13:35.0N

Longitude: 123:46:07.0W

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 (%)
12	3	LGR	4.2	33	400	1.2	4	0.1	0.7	114	1372	19	223		13	91
10	2	HGR	3.5	27	271	0.8	6	0.2	0.7	73	734	19	190		0	94
4	1	BRS	1.4	19	77	0.2	1	0.1	0.3	16	64	2	6		0	88
5	2	GLD	1.7	259	1296	3.8	24	1.4	2.5	5908	29540	7773	38864		0	97
68	12	RUN	23.6	88	5979	17.6	13	0.7	2.2	1161	78974	988	67168		18	93
44	6	SRN	15.3	199	8772	25.8	8	0.6	2.1	1234	54281	749	32971		13	96
69	69	MCP	24.0	192	13224	38.9	22	2.0	9.6	4381	302283	9456	652480	9082	12	94
9	9	LSL	3.1	139	1251	3.7	22	1.6	6.1	3071	27638	5277	47493	4933	20	91
2	2	LSR	0.7	104	207	0.6	26	1.5	3.6	2651	5301	3861	7721	3861	10	90
4	4	LSBk	1.4	120	479	1.4	19	1.3	4.8	2538	10153	4771	19086	4518	3	94
61	0	DRY	21.2	33	2033	6.0										93
2	0	NS		17788	35576											

Total Units
290

Total Units Fully Measured
110

Total Length (ft.)
69565

Total Area (sq.ft.)
510341

Total Volume (cu.ft.)
866202

Table 3 - Summary of Pool Types

Stream Name: Albion River							LLID: 1237687392265			Drainage: Albion River			
Survey Dates: 8/25/2015 to 9/2/2015													
Confluence Location:		Quad: MATHISON PEAK		Legal Description: T16NR16WS11		Latitude: 39:13:35.0N		Longitude: 123:46:07.0W					
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
69	69	MAIN	82	192	13224	87	22.5	2.0	4381	302283	9082	626640	12
15	15	SCOUR	18	129	1937	13	21.7	1.5	2873	43092	4679	70187	14

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

Stream Name: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS11

Latitude: 39:13:35.0N

Longitude: 123:46:07.0W

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
69	MCP	82	0	0	0	0	15	22	24	35	30	43
9	LSL	11	0	0	0	0	4	44	3	33	2	22
2	LSR	2	0	0	0	0	0	0	2	100	0	0
4	LSBk	5	0	0	1	25	2	50	0	0	1	25

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
84	0	0	1	1	21	25	29	35	33	39

Mean Maximum Residual Pool Depth (ft.): 3.8

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Dry Units: 61

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS11

Latitude: 39:13:35.0N

Longitude: 123:46:07.0W

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
12	3	LGR	0	0	0	0	100	0	0	0	0
10	2	HGR	0	0	0	0	0	0	0	0	0
4	1	BRS	0	0	0	0	0	0	0	0	0
26	6	TOTAL RIFFLE	0	0	0	0	100	0	0	0	0
5	2	GLD	0	0	0	0	0	0	0	0	0
68	12	RUN	3	41	20	0	23	13	0	0	0
44	6	SRN	0	32	44	0	4	20	0	0	0
117	20	TOTAL FLAT	1	37	31	0	15	16	0	0	0
69	69	MCP	23	18	24	2	13	15	0	3	2
9	9	LSL	9	25	63	0	3	0	0	0	0
2	2	LSR	0	48	48	0	5	0	0	0	0
4	4	LSBk	0	0	0	0	100	0	0	0	0
84	84	TOTAL POOL	19	20	31	1	13	12	0	2	2
2	0	NS									
290	110	TOTAL	16	22	30	1	14	13	0	2	1

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Dry Units: 61

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS11

Latitude: 39:13:35.0N

Longitude: 123:46:07.0W

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
12	3	LGR	0	0	100	0	0	0	0
10	2	HGR	0	0	0	50	0	0	50
4	1	BRS	0	0	0	0	0	0	100
5	2	GLD	0	0	100	0	0	0	0
68	12	RUN	0	0	83	0	0	0	17
44	6	SRN	0	0	67	0	0	0	33
69	69	MCP	0	6	88	0	0	0	6
9	9	LSL	0	0	100	0	0	0	0
2	2	LSR	0	0	100	0	0	0	0
4	4	LSBk	0	0	75	0	0	0	25

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS11

Latitude: 39:13:35.0N

Longitude: 123:46:07.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
94	76	24	0	99	98

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Survey Length (ft.): 69565

Main Channel (ft.): 69565

Side Channel (ft.): 0

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS11

Latitude: 39:13:35.0N

Longitude: 123:46:07.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: NA

Reach Length (ft.): 35450

Riffle/Flatwater Mean Width (ft.):

BFW:

Range (ft.): 44 to 44

Mean (ft.): 44

Std. Dev.: 0

Base Flow (cfs.): 0.0

Water (F): 60 - 60

Air (F): 64 - 64

Dry Channel (ft): 0

Canopy Density (%):

Coniferous Component (%):

Hardwood Component (%):

Dominant Bank Vegetation:

Vegetative Cover (%): 0.0

Dominant Shelter:

Dominant Bank Substrate Type:

Occurrence of LWD (%):

LWD per 100 ft.:

Riffles:

Pools:

Flat:

Pools by Stream Length (%): 0.0

Pool Frequency (%): 0.0

Residual Pool Depth (%):

< 2 Feet Deep:

2 to 2.9 Feet Deep:

3 to 3.9 Feet Deep:

>= 4 Feet Deep:

Mean Max Residual Pool Depth (ft.):

Mean Pool Shelter Rating:

Pool Tail Substrate (%): Silt/Clay:

Sand:

Gravel:

Sm Cobble:

Lg Cobble:

Boulder:

Bedrock:

Embeddedness Values (%): 1.

2.

3.

4.

5.

0.0

STREAM REACH: 2

Channel Type: F4

Reach Length (ft.): 9176

Riffle/Flatwater Mean Width (ft.): 12.8

BFW:

Range (ft.): 30 to 55

Mean (ft.): 43

Std. Dev.: 5

Base Flow (cfs.): 0.0

Water (F): 59 - 63

Air (F): 53 - 66

Dry Channel (ft): 1561

Canopy Density (%): 93.6

Coniferous Component (%): 66.6

Hardwood Component (%): 33.4

Dominant Bank Vegetation: Coniferous Trees

Vegetative Cover (%): 99.5

Dominant Shelter: Small Woody Debris

Dominant Bank Substrate Type: Sand/Silt/Clay

Occurrence of LWD (%): 15

LWD per 100 ft.:

Riffles: 3

Pools: 2

Flat: 2

Pools by Stream Length (%): 36.3

Pool Frequency (%): 16.0

Residual Pool Depth (%):

< 2 Feet Deep: 0

2 to 2.9 Feet Deep: 13

3 to 3.9 Feet Deep: 31

>= 4 Feet Deep: 56

Mean Max Residual Pool Depth (ft.): 4.3

Mean Pool Shelter Rating: 28

Pool Tail Substrate (%): Silt/Clay: 0

Sand: 0

Gravel: 94

Sm Cobble: 6

Lg Cobble: 0

Boulder: 0

Bedrock: 0

Embeddedness Values (%): 1.

87.5

2.

12.5

3.

0.0

4.

0.0

5.

0.0

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 3

Channel Type: F1	Canopy Density (%): 92.9	Pools by Stream Length (%): 55.9
Reach Length (ft.): 9333	Coniferous Component (%): 89.1	Pool Frequency (%): 43.5
Riffle/Flatwater Mean Width (ft.): 9.7	Hardwood Component (%): 10.9	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 0
Range (ft.): 25 to 35	Vegetative Cover (%): 99.5	2 to 2.9 Feet Deep: 19
Mean (ft.): 29	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 37
Std. Dev.: 4	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 44
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 19	Mean Max Residual Pool Depth (ft.): 4.0
Water (F): 58 - 64 Air (F): 52 - 71	LWD per 100 ft.:	Mean Pool Shelter Rating: 9
Dry Channel (ft): 98	Riffles: 1	
	Pools: 2	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 48 Sm Cobble: 4 Lg Cobble: 0 Boulder: 0 Bedrock: 48		
Embeddedness Values (%): 1. 40.7 2. 11.1 3. 0.0 4. 0.0 5. 48.1		

STREAM REACH: 4

Channel Type: F4	Canopy Density (%): 93.7	Pools by Stream Length (%): 37.6
Reach Length (ft.): 11799	Coniferous Component (%): 76.4	Pool Frequency (%): 27.6
Riffle/Flatwater Mean Width (ft.): 10.3	Hardwood Component (%): 23.6	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 0
Range (ft.): 22 to 36	Vegetative Cover (%): 98.4	2 to 2.9 Feet Deep: 26
Mean (ft.): 29	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 37
Std. Dev.: 4	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 37
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 25	Mean Max Residual Pool Depth (ft.): 3.7
Water (F): 58 - 61 Air (F): 50 - 72	LWD per 100 ft.:	Mean Pool Shelter Rating: 11
Dry Channel (ft): 329	Riffles: 0	
	Pools: 3	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 70 Sm Cobble: 11 Lg Cobble: 15 Boulder: 0 Bedrock: 4		
Embeddedness Values (%): 1. 70.4 2. 22.2 3. 3.7 4. 0.0 5. 3.7		

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 5

Channel Type: F1	Canopy Density (%): 95.6	Pools by Stream Length (%): 57.1
Reach Length (ft.): 3807	Coniferous Component (%): 71.6	Pool Frequency (%): 48.3
Riffle/Flatwater Mean Width (ft.): 8.5	Hardwood Component (%): 28.4	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 7
Range (ft.): 21 to 36	Vegetative Cover (%): 95.9	2 to 2.9 Feet Deep: 50
Mean (ft.): 29	Dominant Shelter: Undercut Banks	3 to 3.9 Feet Deep: 29
Std. Dev.: 6	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 14
Base Flow (cfs.): 0.0	Occurrence of LWD (%): 10	Mean Max Residual Pool Depth (ft.): 2.9
Water (F): 60 - 60 Air (F): 63 - 64	LWD per 100 ft.:	Mean Pool Shelter Rating: 5
Dry Channel (ft): 45	Riffles: 0	
	Pools: 2	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 43 Sm Cobble: 0 Lg Cobble: 7 Boulder: 0 Bedrock: 50		
Embeddedness Values (%): 1. 42.9 2. 21.4 3. 0.0 4. 0.0 5. 35.7		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Confluence Location: Quad: MATHISON PEAK

Legal Description: T16NR16WS11

Latitude: 39:13:35.0N

Longitude: 123:46:07.0W

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	12	12	10.9
Boulder	4	0	1.8
Cobble / Gravel	1	0	0.5
Sand / Silt / Clay	93	98	86.8

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	4	4	3.6
Hardwood Trees	30	18	21.8
Coniferous Trees	76	88	74.5
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Albion River

LLID: 1237687392265

Drainage: Albion River

Survey Dates: 8/25/2015 to 9/2/2015

Confluence Location: Quad: MATHISON PEAK

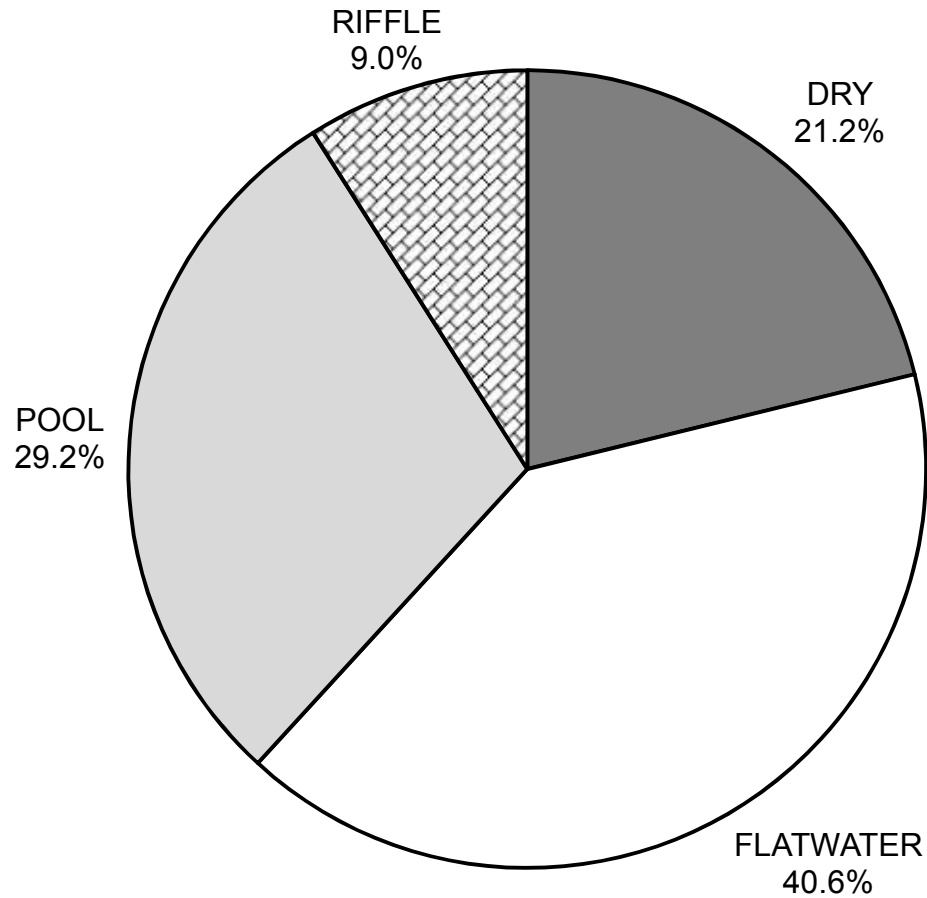
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Longitude: 123:46:07.0W

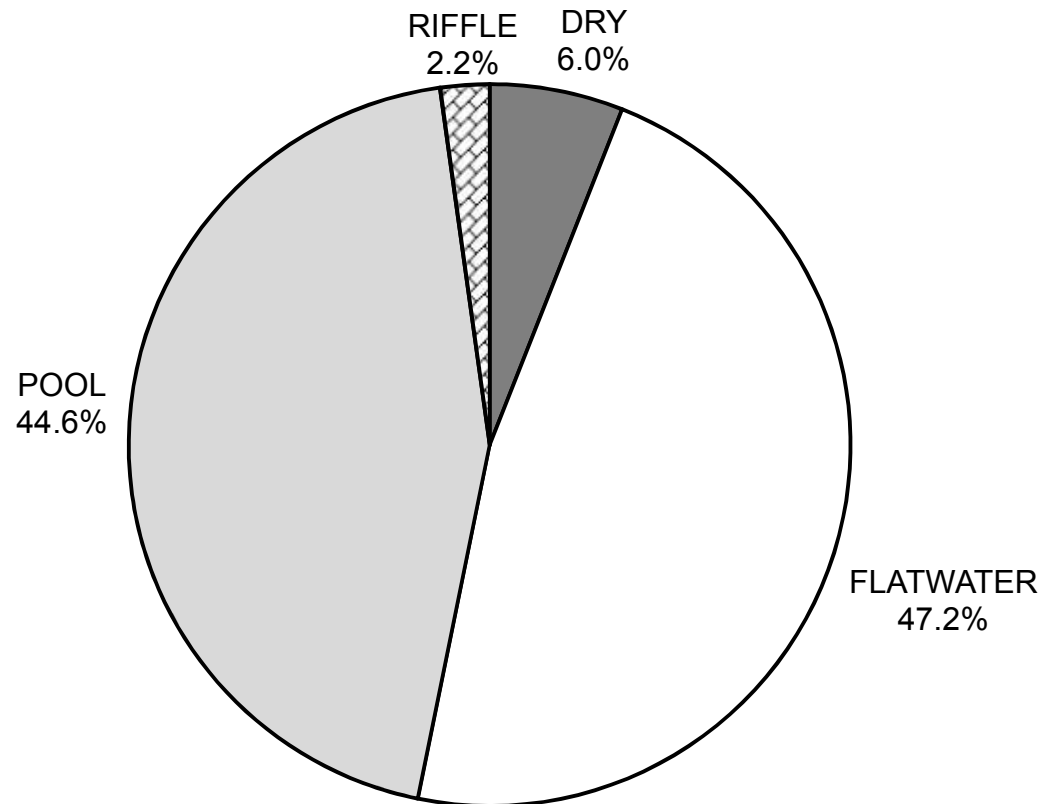
	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)	0	1	19
SMALL WOODY DEBRIS (%)	0	37	20
LARGE WOODY DEBRIS (%)	0	31	31
ROOT MASS (%)	0	0	1
TERRESTRIAL VEGETATION (%)	100	15	13
AQUATIC VEGETATION (%)	0	16	12
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	2
BEDROCK LEDGES (%)	0	0	2

ALBION RIVER 2015 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

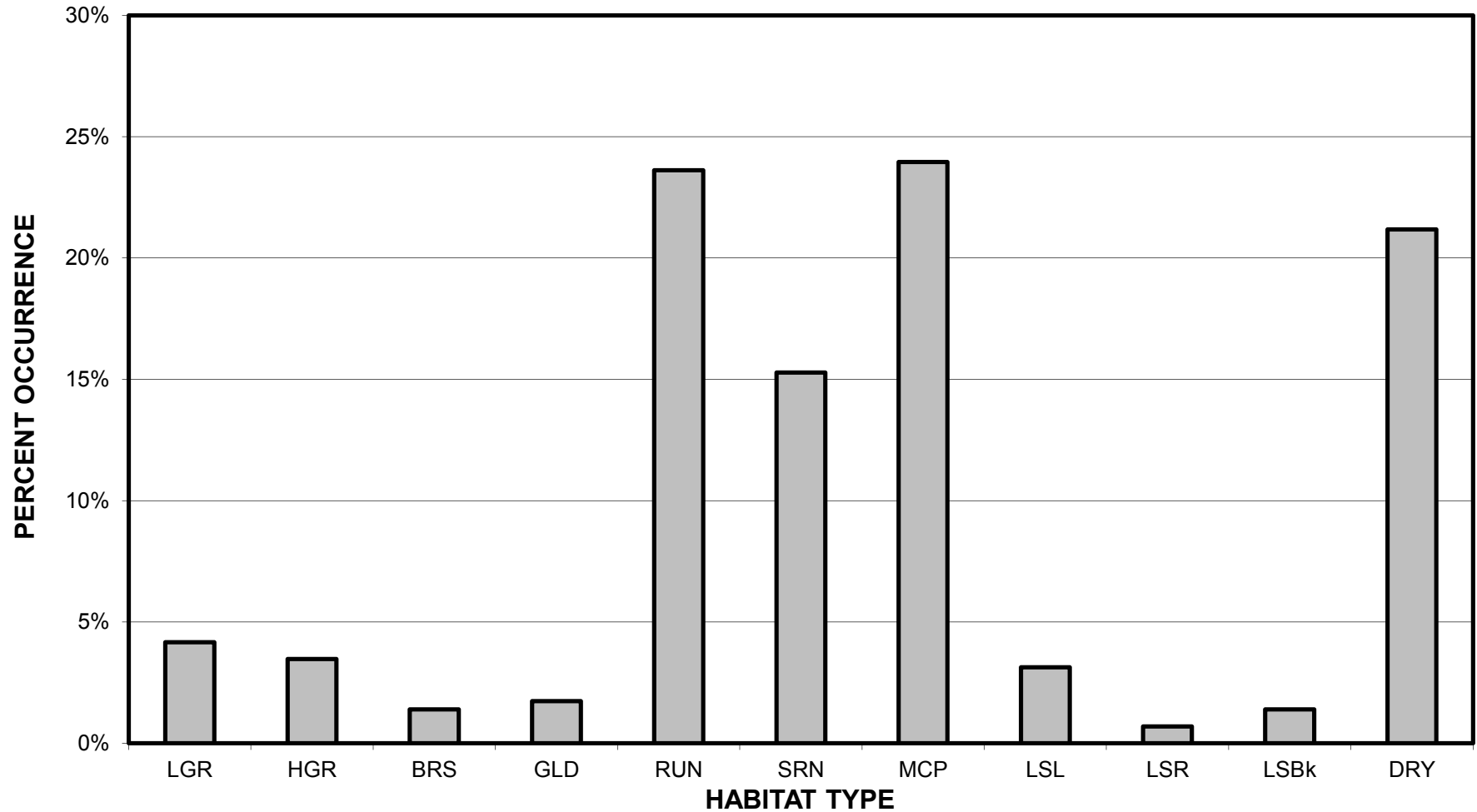
**ALBION RIVER 2015
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

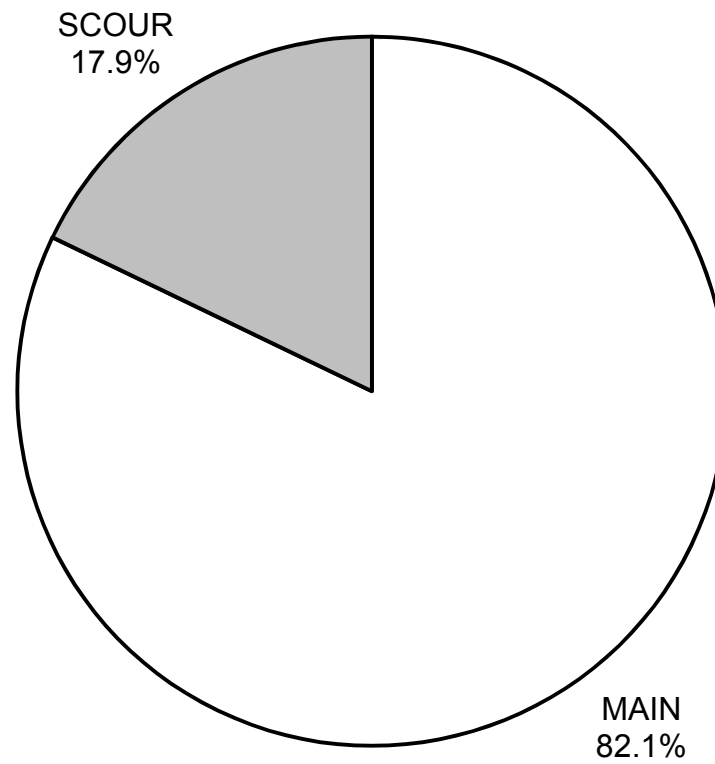
ALBION RIVER 2015

HABITAT TYPES BY PERCENT OCCURRENCE



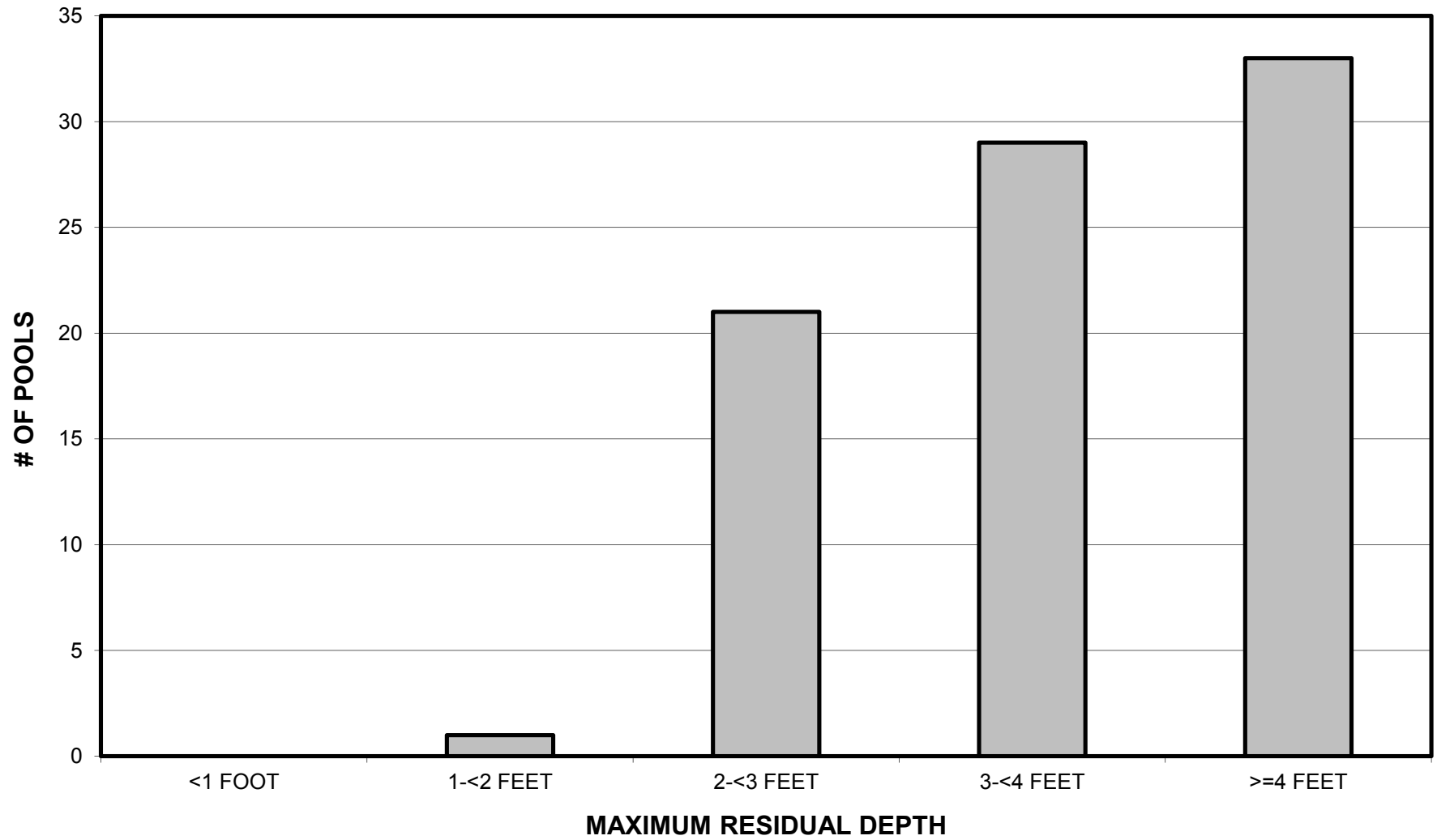
GRAPH 3

**ALBION RIVER 2015
POOL TYPES BY PERCENT OCCURRENCE**



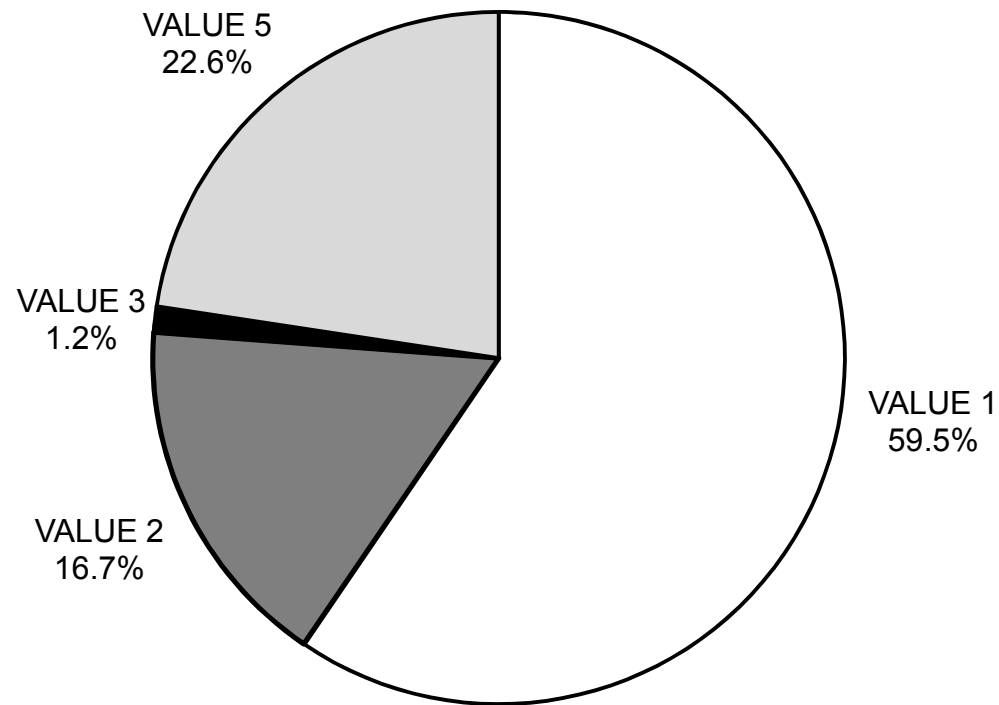
GRAPH 4

ALBION RIVER 2015 MAXIMUM DEPTH IN POOLS



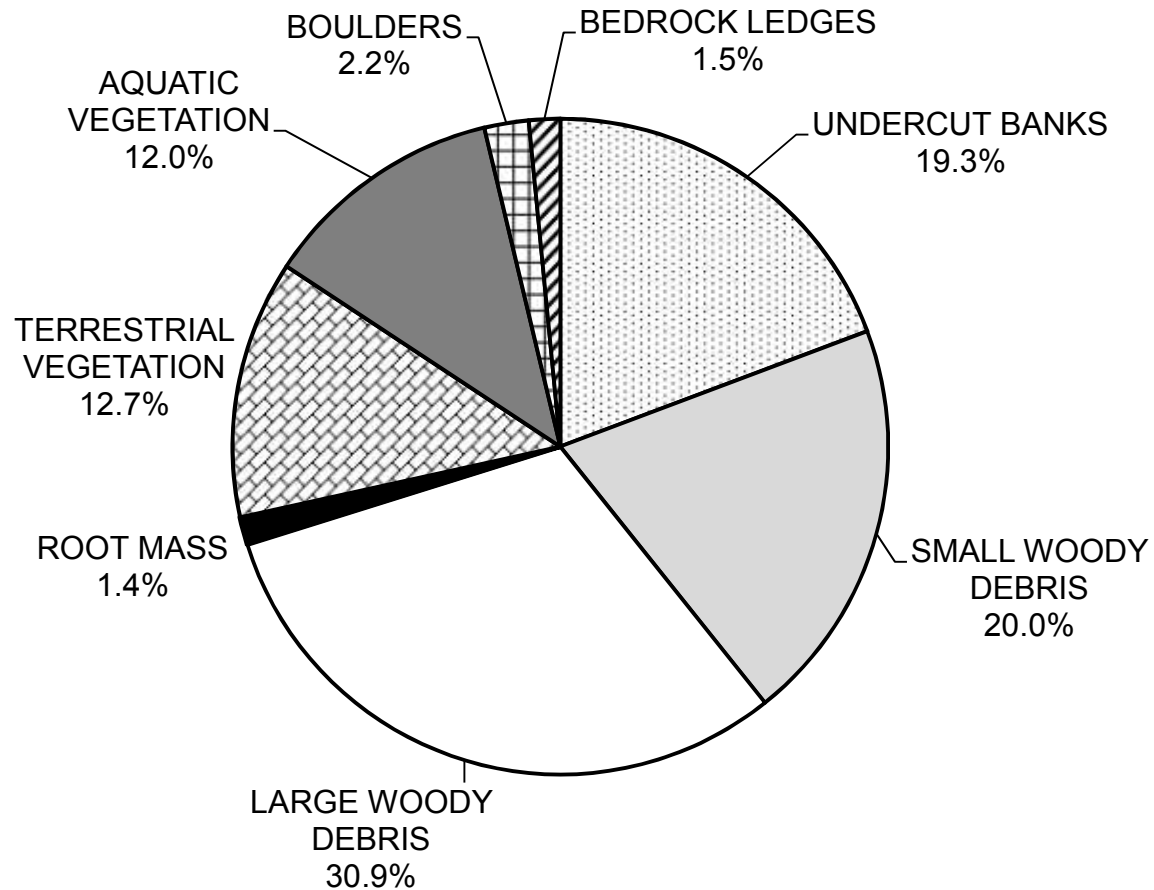
GRAPH 5

ALBION RIVER 2015 PERCENT EMBEDDEDNESS



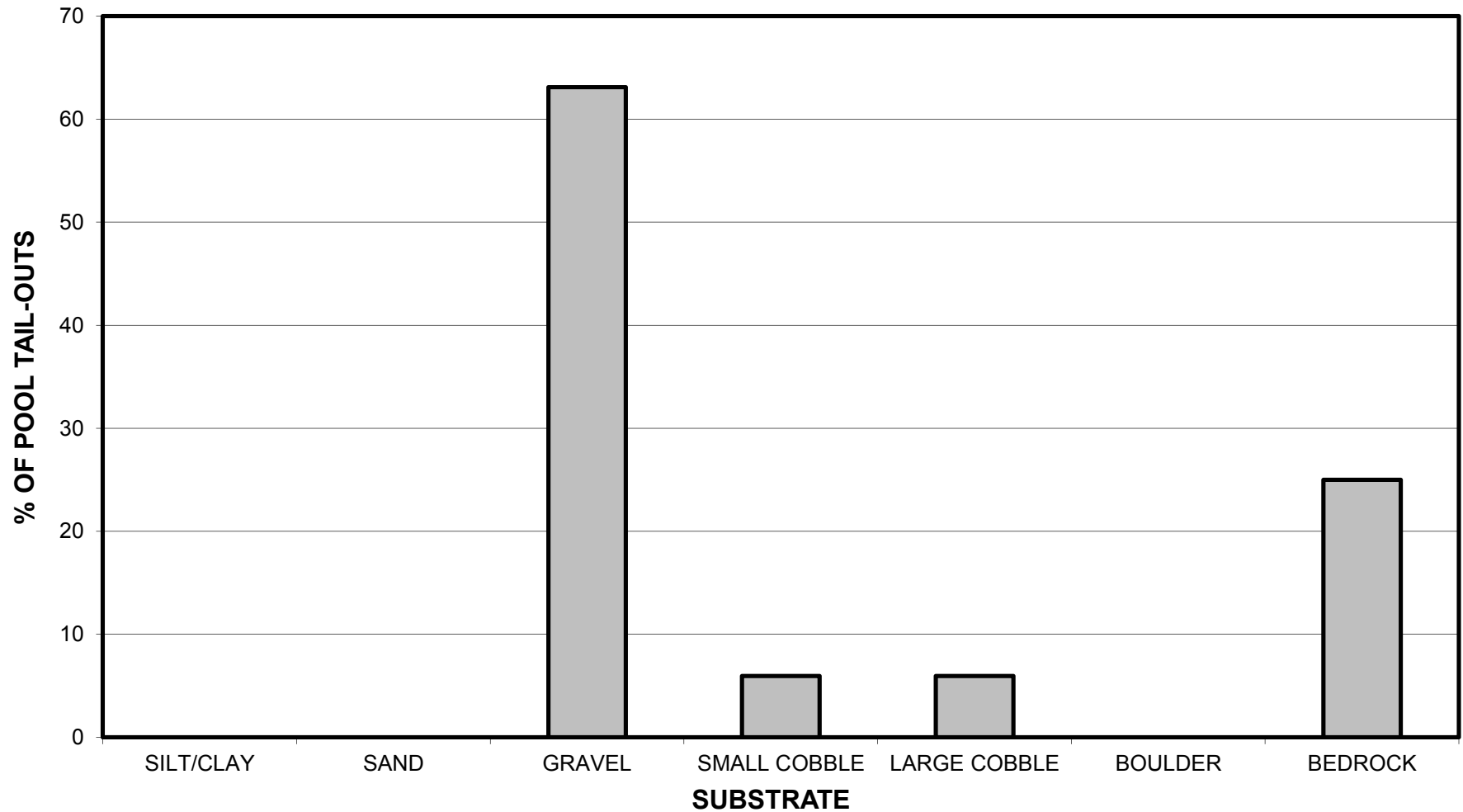
GRAPH 6

ALBION RIVER 2015 MEAN PERCENT COVER TYPES IN POOLS



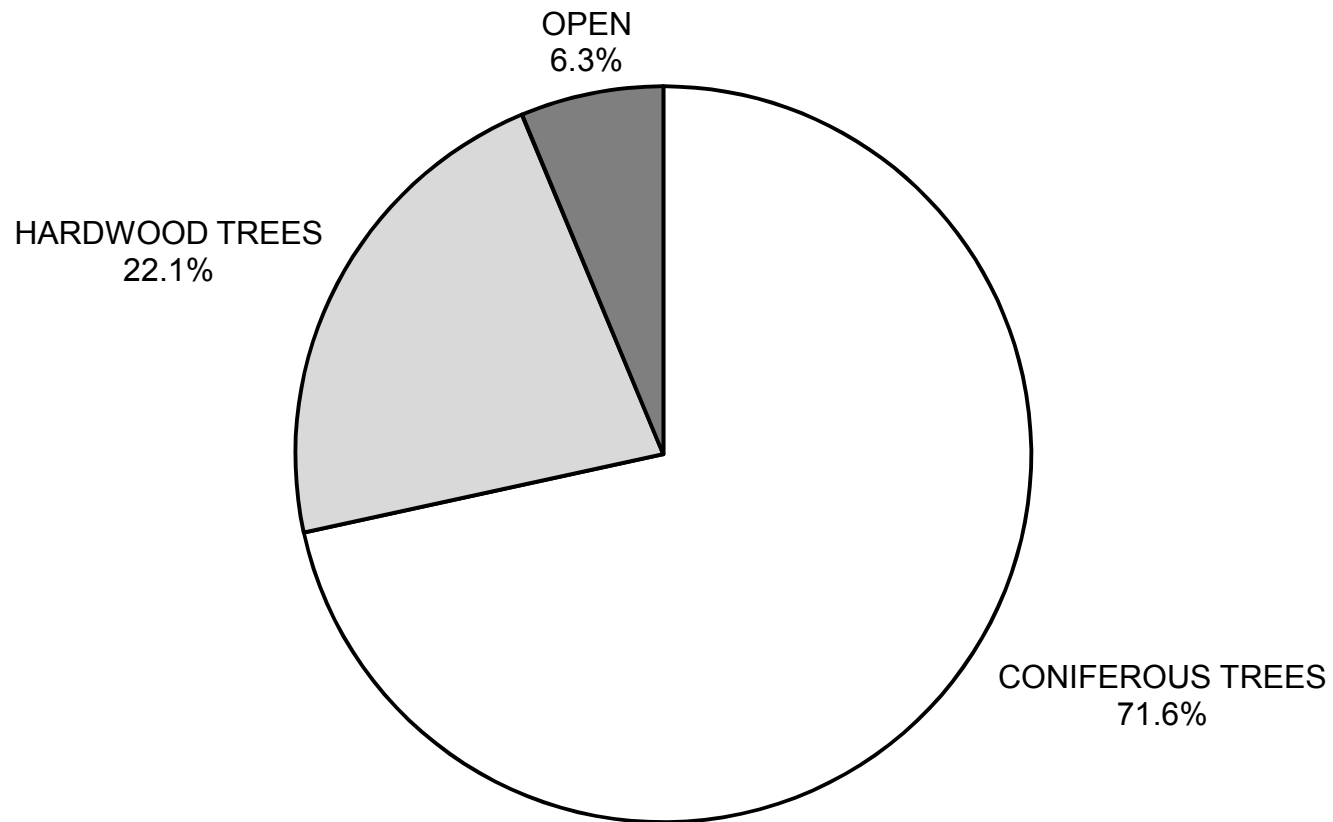
GRAPH 7

ALBION RIVER 2015
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



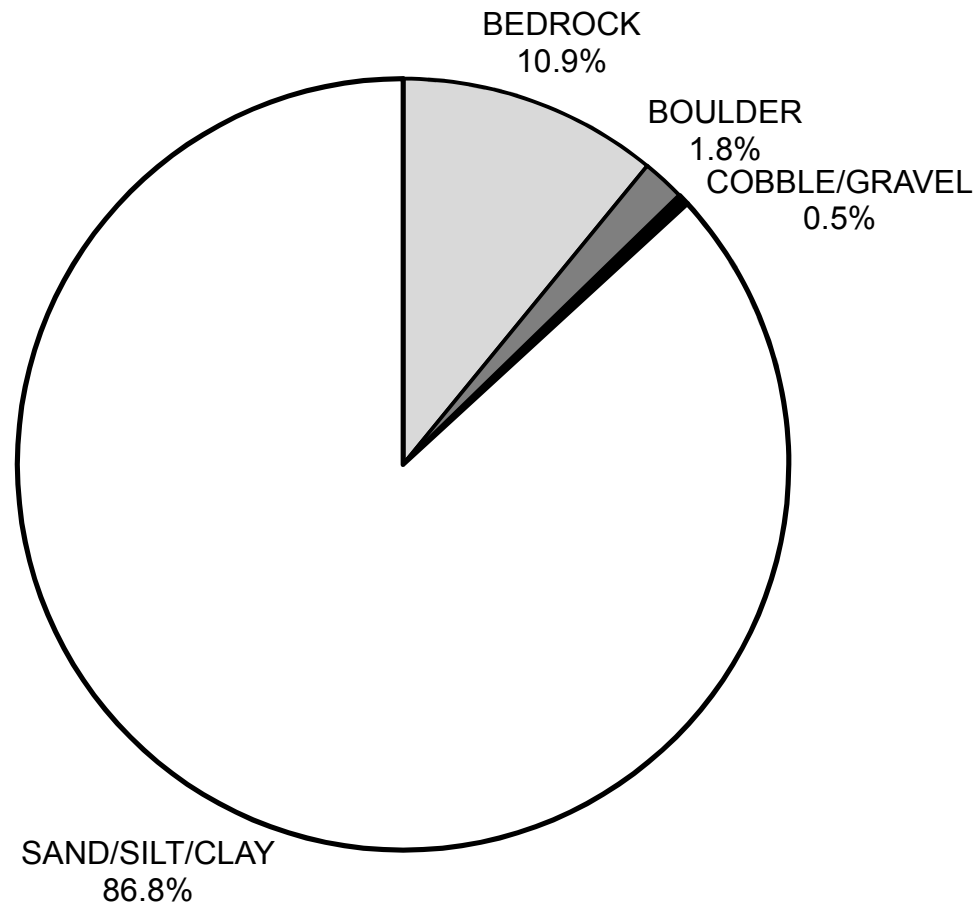
GRAPH 8

ALBION RIVER 2015 MEAN PERCENT CANOPY

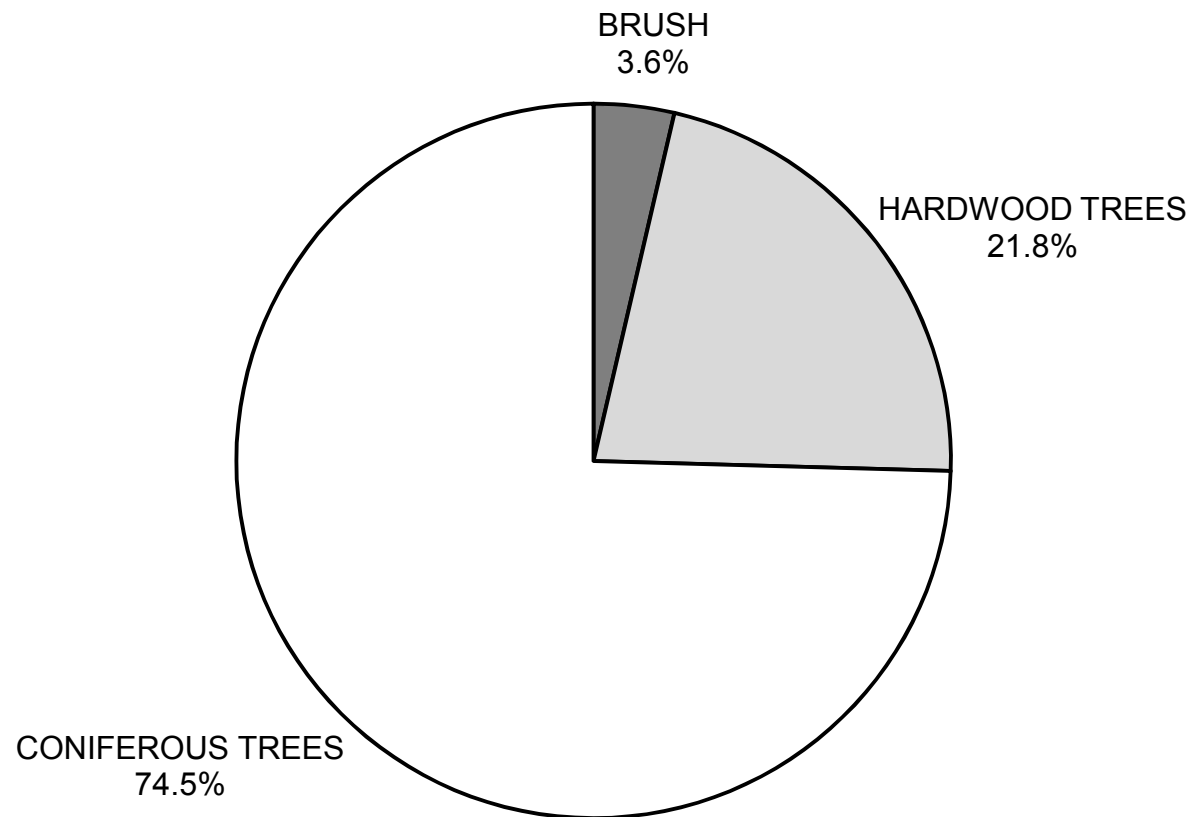


GRAPH 9

ALBION RIVER 2015
DOMINANT BANK COMPOSITION IN SURVEY REACH



ALBION RIVER 2015
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11