

STREAM INVENTORY REPORT

Anderson Creek

INTRODUCTION

A stream inventory was conducted from September 23 to October 21, 2008 on Anderson Creek. The survey began at the confluence with Indian Creek and extended upstream 2.3 miles.

The Anderson 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 Anderson Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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

WATERSHED OVERVIEW

Anderson Creek is a tributary to Indian Creek, tributary to South Fork Eel River, tributary to Eel River, tributary to Pacific Ocean located in Mendocino County, California (Map 1). Anderson Creek's legal description at the confluence with Indian Creek is T24N R18W S07. Its location is 39.9464 north latitude and 123.8991 west longitude, LLID number 1238979399465. Anderson Creek is a first order stream and has no miles of blue line stream according to the USGS Bear Harbor 7.5 minute quadrangle. Anderson Creek drains a watershed of approximately 4.3 square miles. Elevations range from about 830 feet at the mouth of the creek to 1,400 feet in the headwater areas. Mixed hardwood and mixed conifer forests both forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production. Vehicle access exists via Highway 101, exit Piercy (Road 271), and travel north on 271, turn left on Dimmick Road. Access is through private roads with locked gates.

METHODS

The habitat inventory conducted in Anderson Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Watershed Stewards Project/AmeriCorps (WSP) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). 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

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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.

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 Anderson 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:

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". Anderson 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.

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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 Anderson Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited 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 Anderson 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 densimeters as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Anderson 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 Anderson 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.

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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 Anderson Creek. In addition, underwater observations were made at four 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 Game. 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

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Graphics are produced from the tables using Microsoft Excel. Graphics developed for Anderson Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of September 23 to October 21, 2008, was conducted by B. Quaglieri and J. Braren (WSP). The total length of the stream surveyed was 12,086 feet with an additional 83 feet of side channel.

Stream flow was not measured on Anderson Creek.

Anderson Creek is an F3 channel type for 11,191 feet of the stream surveyed (Reach 1) and an E4 channel type for 978 feet of the stream surveyed (Reach 2). F3 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with cobble-dominant substrates. E4 channels are low gradient, meandering riffle/pool streams with low width/depth ratios and little deposition. They are very efficient and stable with a high meander width ratio and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 46 to 52 degrees Fahrenheit. Air temperatures ranged from 44 to 58 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% pool units, 35% flatwater units and 22% riffle units (Graph 1). Based on total length of Level II habitat types there were 47% flatwater units, 42% pool units and 11% riffle units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 27%; step run units, 24%; and low gradient riffle units, 16% (Graph 3). Based on percent total length, step run units made up 37%, mid-channel pool units 25%, low gradient riffle units 9%, run units 9%.

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A total of 90 pools were identified (Table 3). Main channel pools were the most frequently encountered at 67% (Graph 4), and comprised 67% 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. Forty-nine of the 90 pools (54%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 90 pool tail-outs measured, 58 had a value of 1 (64.4%); 26 had a value of 2 (28.9%); 6 had a value of 5 (6.7%) (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 unsuited 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 1, flatwater habitat types had a mean shelter rating of 11, and pool habitats had a mean shelter rating of 23 (Table 1). Of the pool types, the backwater pools had the highest rating with a mean shelter rating of 75, followed by scour pools with a mean shelter rating of 32 and main channel pools had a mean shelter rating of 17 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Bedrock ledges are the dominant cover type in Anderson Creek. Graph 7 describes the pool cover in Anderson Creek. Bedrock ledges are 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 most dominant substrate type observed in 47% of the pool tail-outs. Small cobble was the next most dominant substrate type observed in 40% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Anderson Creek was 97%. Three percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 52% and 48%, respectively. Graph 9 describes the mean percent canopy in Anderson Creek.

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 57% sand/silt/clay, 31% bedrock, 11% cobble/gravel and 2% boulder (Graph 10). Deciduous trees were the dominant vegetation type observed in 68% of the units surveyed. Additionally, 22% of the units surveyed had coniferous trees as the dominant vegetation type, and 4% had brush as the dominant vegetation type (Graph 11).

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BIOLOGICAL INVENTORY RESULTS

Four sites were snorkeled for species composition and distribution in Anderson Creek on October 30, 2008. Water temperatures taken during the survey period of 1100 to 1235 ranged from 48 to 48 degrees Fahrenheit. Air temperatures ranged from 47 to 52 degrees Fahrenheit. The sites were sampled by J. Braren (WSP) and I. Mikus (DFG).

In reach 1, which comprised the first 11,108 feet of stream, 2 sites were sampled. The reach sites yielded 11 young-of-the-year steelhead/rainbow trout and 34 coho.

In reach 2, 2 sites were sampled starting approximately 11,191 from the confluence with Indian Creek and continuing upstream 978 feet. The reach sites yielded 4 young-of-the-year SH/RT and 11 coho.

The following chart displays the information yielded from these sites:
2008 Anderson Creek underwater observations.

Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
Reach 1: F3 Channel Type									
10/30/08	1	008	4.2	458	30	0	11	0	0
10/30/08	2	180	4.2	10,434	4	0	0	0	0
Reach 2: E4 Channel Type									
10/30/08	1	196	5.1	11,462	5	0	1	0	0
10/30/08	2	210	5.2	12,169	6	0	3	0	0

DISCUSSION

Anderson Creek is an F3 channel type for the first 11,191 feet of stream surveyed and an E4 channel type for the remaining 978 feet surveyed. The suitability of F3 and E4 channel types for fish habitat improvement structures is as follows: F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors and fair for plunge weirs, boulder clusters, channel constrictors and log cover. E4 channel types are good for bank-placed boulders and fair for opposing wing-deflectors.

The water temperatures recorded on the survey days September 23 to October 21, 2008 ranged from 46 to 52 degrees Fahrenheit. Air temperatures ranged from 44 to 58 degrees Fahrenheit. To make any conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

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Flatwater habitat types comprised 47% of the total length of this survey, riffles 11%, and pools 42%. The pools are relatively deep, with 49 of the 90 (54%) pools having a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width.

Eighty-four of the 90 pool tail-outs measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4. Six 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.

Seventy-eight of the 90 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 was 23. The shelter rating in the flatwater habitats was 11. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by bedrock ledges in Anderson Creek. Bedrock ledges are the dominant cover type in pools followed by boulders. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 97%. Reach 1 had a canopy density of 97.2%, reach 2 had a canopy density of 95.5%. The percentage of right and left bank covered with vegetation was 99% and 98%, respectively.

RECOMMENDATIONS

- 1) Anderson Creek should be managed as an anadromous, natural production stream.
- 2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.
- 3) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from bedrock ledges. Adding high quality complexity with woody cover in the pools is desirable.
- 4) 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.

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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	001.00	The survey began at the confluence with Indian Creek. It is an F3 channel type.
3180	0055.00	There are a lot of old railroad rails in the creek retaining sediment.
4263	0074.00	Tributary #01 enters from the right bank. It is contributing an estimated 3% of the flow to Anderson Creek. The temperature of the tributary is 50 degrees Fahrenheit. Anderson Creeks' temperature downstream of the confluence is 50 degrees Fahrenheit and upstream is 52 degrees Fahrenheit. For the first 100' of the tributary is not accessible to fish. While the slope is only 12% there is a 30' cascade the mouth with large woody debris (LWD) blocking passage. There are no fish present.
5454	0095.00	Tributary #02 enters from the right bank. It is contributing a negligible flow to Anderson Creek. The temperature of the tributary is 50 degrees Fahrenheit. Anderson Creeks' temperature downstream of the confluence is 48 degrees Fahrenheit and upstream is 50 degrees Fahrenheit. For the first 100' of the tributary the slope is 55%. There are no fish present.
5524	0096.00	There are old rails spanning banks at an angle over head.
6337	0113.00	There are old rails overhead which have created a log debris accumulation (LDA #01). LDA#01 measures 6' high x 30' wide x 9' long consisting of 2 pieces of large woody debris (LWD). There is no visible flow through the LDA and no visible gaps. Sediment being retained ranges from silt to small cobble and measures 21' wide x 34' long x 4' deep. There are fish upstream.
6894	0122.00	Tributary #03 enters from the right bank. It is contributing an estimated 1% of the flow to Anderson Creek. The temperature of the tributary is 52 degrees Fahrenheit. Anderson Creeks' temperature downstream of the confluence is 52 degrees Fahrenheit and upstream is 52 degrees Fahrenheit. For the first 150' of the tributary the slope is 13%. There are no fish present.
7118	0129.00	Tributary #04 enters from the right bank. It is contributing a negligible flow to Anderson Creek. The temperature of the tributary is 52 degrees

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Fahrenheit. Anderson Creeks' temperature downstream of the confluence is 52 degrees Fahrenheit and upstream is 52 degrees Fahrenheit. For the first 40' the tributary flow is subsurface. The slope of the tributary for the first 200' is 11%. There are no fish present.

8654	0154.00	Tributary #05 enters from the right bank. It is contributing a negligible flow to Anderson Creek. The temperature of the tributary is 52 degrees Fahrenheit. Anderson Creeks' temperature downstream of the confluence is 52 degrees Fahrenheit and upstream is 52 degrees Fahrenheit. For the first 200' of the tributary the slope is 26%. There are no fish present.
9059	0158.00	LDA#02 measures 8' high, 32' wide and 31' long consisting of 8 pieces of large woody debris (LWD). There is visible flow through the LDA and though there are no visible gaps. Sediment being retained is primarily silt and measures 7' wide x 14' long x 2' deep. There are fish upstream.
9605	0169.00	Tributary #06 enters from the right bank. It is contributing an estimated 1% of the flow to Anderson Creek with an estimated 0.25 cfs. The temperature of the tributary is 52 degrees Fahrenheit. Anderson Creeks' temperature downstream of the confluence is 51 degrees Fahrenheit and upstream is 52 degrees Fahrenheit. For the first 100' of the tributary the slope is only 17%. The substrate of tributary for the first 100' is primarily bedrock. There are no fish present.
9670	0171.00	Tributary #07 enters from the right bank. It is contributing an estimated 1% of the flow to Anderson Creek. The temperature of the tributary is 51 degrees Fahrenheit. Anderson Creeks' temperature downstream of the confluence is 46 degrees Fahrenheit and upstream is 46 degrees Fahrenheit. For the first 40' of the tributary the slope is only 17%. There are no fish present.
10968	0188.00	LDA#03 measures 9' high x 24' wide x 86' long consisting of 5 pieces of large woody debris (LWD). There is visible flow through visible gaps in the LDA. Sediment being retained primarily consists of silt and measures 10' wide x 15' long x 1' deep. There are fish upstream.
11207	0192.00	The LDA#04 measures 25' high x 6' wide x 5' long consisting of 5 pieces of large woody debris (LWD). There is visible flow through the LDA and though there are no visible gaps. Sediment being retained ranges from silt to gravel and measures 11' wide x 7' long x 3' deep; as well as a few large boulders. Water flows subsurface upstream of LDA#04. There are fish upstream. The channel type changes from a F3 to and E4.

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12000	0205.00	LDA#05 measures 6' high x 22' wide x 21' long consisting of 5 pieces of large woody debris (LWD). There is visible flow through the LDA, though there are no visible gaps. No sediment is being retained.
12023	0210.00	Young of the year and 1-2 year old salmonids have been observed through out the length of the entire survey.
12086	0210.00	End of survey due to extensive drive to access points and increasingly long hike into creek. Only access points are between habitat units 060 and 070.

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]	

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

Stream Name: Anderson Creek

LLID: 1238979399465 Drainage: Eel River - South Fork

Survey Dates: 9/23/2008 to 10/21/2008

Confluence Location: Quad: BEAR HARBOR Legal Description: T24NR18WS07 Latitude: 39:56:47.0N Longitude: 123:53:52.0W

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
73	11	FLATWATER	34.8	78	5695	46.8	10.2	0.5	1.1	800	58375	392	28604		11
90	90	POOL	42.9	56	5076	41.7	15.3	1.3	2.3	869	78180	1636	147252	1306	23
47	11	RIFFLE	22.4	30	1398	11.5	6.6	0.3	0.7	128	6027	43	2040		1
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
210	112				12169					142582			177896		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Anderson Creek

LLID: 1238979399465

Drainage: Eel River - South Fork

Survey Dates: 9/23/2008 to 10/21/2008

Confluence Location: Quad: BEAR HARBOR

Legal Description: T24NR18WS07

Latitude: 39:56:47.0N

Longitude: 123:53:52.0W

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 (%)
34	5	LGR	16.2	32	1093	9.0	7	0.2	0.8	166	5655	44	1486		2	98
6	2	HGR	2.9	34	201	1.7	6	0.2	0.6	118	710	22	132		0	96
7	4	BRS	3.3	15	104	0.9	6	0.5	2	86	599	54	376		0	97
2	2	POW	1.0	72	143	1.2	12	0.6	1.4	803	1605	432	864		13	99
20	3	RUN	9.5	54	1089	8.9	12	0.7	1.6	671	13424	455	9108		23	98
51	6	SRN	24.3	88	4463	36.7	9	0.4	1.4	863	44007	347	17677		4	97
57	57	MCP	27.1	53	3017	24.8	16	1.4	6	886	50524	1828	104178	1486	17	97
3	3	STP	1.4	132	396	3.3	11	1.0	3.9	1556	4669	2534	7601	1911	18	98
3	3	CRP	1.4	37	111	0.9	14	1.4	4.2	512	1536	974	2923	814	37	98
10	10	LSL	4.8	54	539	4.4	15	1.0	2.9	775	7753	1161	11611	859	49	96
3	3	LSR	1.4	69	208	1.7	14	1.0	2.7	964	2893	1187	3560	826	10	96
13	13	LSBk	6.2	60	779	6.4	13	1.3	3.7	807	10496	1313	17070	1032	24	98
1	1	BPB	0.5	26	26	0.2	12	0.6	1.5	309	309	309	309	185	75	98

Total Units
210

Total Units Fully Measured
112

Total Length (ft.)
12169

Total Area (sq.ft.)
144180

Total Volume (cu.ft.)
176895

Table 3 - Summary of Pool Types

Stream Name: Anderson Creek

LLID: 1238979399465

Drainage: Eel River - South Fork

Survey Dates: 9/23/2008 to 10/21/2008

Confluence Location: Quad: BEAR HARBOR

Legal Description: T24NR18WS07

Latitude: 39:56:47.0N

Longitude: 123:53:52.0W

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
60	60	MAIN	67	57	3413	67	16.1	1.4	920	55193	1507	90424	17
29	29	SCOUR	32	56	1637	32	13.7	1.2	782	22678	928	26921	32
1	1	BACKWATER	1	26	26	1	12.0	0.6	309	309	185	185	75

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
90	90	5076	78180	117531

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

Stream Name: Anderson Creek

LLID: 1238979399465

Drainage: Eel River - South Fork

Survey Dates: 9/23/2008 to 10/21/2008

Confluence Location: Quad: BEAR HARBOR

Legal Description: T24NR18WS07

Latitude: 39:56:47.0N

Longitude: 123:53:52.0W

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
57	MCP	63	3	5	19	33	21	37	5	9	9	16
3	STP	3	0	0	2	67	0	0	1	33	0	0
3	CRP	3	0	0	2	67	0	0	0	0	1	33
10	LSL	11	0	0	6	60	4	40	0	0	0	0
3	LSR	3	0	0	2	67	1	33	0	0	0	0
13	LSBk	14	0	0	6	46	5	38	2	15	0	0
1	BPB	1	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
90	3	3	38	42	31	34	8	9	10	11

Mean Maximum Residual Pool Depth (ft.): 2.3

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Anderson Creek

LLID: 1238979399465

Drainage: Eel River - South Fork

Survey Dates: 9/23/2008 to 10/21/2008

Dry Units: 0

Confluence Location: Quad: BEAR HARBOR

Legal Description: T24NR18WS07

Latitude: 39:56:47.0N

Longitude: 123:53:52.0W

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
34	5	LGR	0	50	0	0	0	0	0	50	0
6	2	HGR									
7	4	BRS									
47	11	TOTAL RIFFLE	0	50	0	0	0	0	0	50	0
2	2	POW	8	10	0	0	0	0	0	63	20
20	3	RUN	27	18	48	0	0	0	0	7	0
51	6	SRN	0	19	0	0	5	0	1	69	6
73	11	TOTAL FLAT	11	17	16	0	2	0	1	47	7
57	57	MCP	7	18	14	5	0	0	0	25	31
3	3	STP	0	10	12	0	0	0	5	43	30
3	3	CRP	20	23	20	20	0	0	0	17	0
10	10	LSL	9	29	56	1	2	0	1	2	0
3	3	LSR	2	52	25	22	0	0	0	0	0
13	13	LSBk	7	14	11	0	1	0	0	19	48
1	1	BPB	0	50	30	0	0	0	0	20	0
90	90	TOTAL POOL	7	20	19	5	0	0	0	21	28
210	112	TOTAL	7	20	18	4	1	0	0	24	25

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Anderson Creek

LLID: 1238979399465

Drainage: Eel River - South Fork

Survey Dates: 9/23/2008 to 10/21/2008

Dry Units: 0

Confluence Location: Quad: BEAR HARBOR

Legal Description: T24NR18WS07

Latitude: 39:56:47.0N

Longitude: 123:53:52.0W

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
34	5	LGR	0	0	40	60	0	0	0
6	2	HGR	0	0	50	0	0	50	0
7	3	BRS	0	0	0	0	0	0	100
2	2	POW	0	0	100	0	0	0	0
20	3	RUN	0	0	33	67	0	0	0
51	6	SRN	0	0	67	33	0	0	0
57	57	MCP	2	19	53	12	7	0	7
3	3	STP	0	0	67	0	33	0	0
3	3	CRP	0	33	67	0	0	0	0
10	10	LSL	10	20	50	20	0	0	0
3	3	LSR	33	0	33	33	0	0	0
13	13	LSBk	0	15	62	15	0	0	8
1	1	BPB	0	0	100	0	0	0	0

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Anderson Creek LLID: 1238979399465 Drainage: Eel River - South Fork
 Survey Dates: 9/23/2008 to 10/21/2008 Survey Length (ft.): 12169 Main Channel (ft.): 12086 Side Channel (ft.): 83
 Confluence Location: Quad: BEAR HARBOR Legal Description: T24NR18WS07 Latitude: 39:56:47.0N Longitude: 123:53:52.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F3	Canopy Density (%): 97.2	Pools by Stream Length (%): 40.6
Reach Length (ft.): 11108	Coniferous Component (%): 44.5	Pool Frequency (%): 41.1
Riffle/Flatwater Mean Width (ft.): 8.3	Hardwood Component (%): 55.5	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Hardwood Trees	< 2 Feet Deep: 43
Range (ft.): 20 to 33	Vegetative Cover (%): 97.9	2 to 2.9 Feet Deep: 35
Mean (ft.): 8	Dominant Shelter: Boulders	3 to 3.9 Feet Deep: 10
Std. Dev.: 12	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 11
Base Flow (cfs.):	Occurrence of LWD (%): 15	Mean Max Residual Pool Depth (ft.): 2.3
Water (F): 46 - 52 Air (F): 44 - 58	LWD per 100 ft.:	Mean Pool Shelter Rating: 22
Dry Channel (ft): 0	Riffles: 1	
	Pools: 2	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 42 Sm Cobble: 44 Lg Cobble: 8 Boulder: 0 Bedrock: 6		
Embeddedness Values (%): 1. 65.8 2. 27.8 3. 0.0 4. 0.0 5. 6.3		

STREAM REACH: 2

Channel Type: E4	Canopy Density (%): 95.5	Pools by Stream Length (%): 54.3
Reach Length (ft.): 978	Coniferous Component (%): 73.9	Pool Frequency (%): 61.1
Riffle/Flatwater Mean Width (ft.): 9.3	Hardwood Component (%): 26.1	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 64
Range (ft.): 20 to 36	Vegetative Cover (%): 99.5	2 to 2.9 Feet Deep: 27
Mean (ft.): 13	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 15	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 9
Base Flow (cfs.):	Occurrence of LWD (%): 24	Mean Max Residual Pool Depth (ft.): 2.0
Water (F): 49 - 50 Air (F): 56 - 58	LWD per 100 ft.:	Mean Pool Shelter Rating: 27
Dry Channel (ft): 0	Riffles: 5	
	Pools: 5	
	Flat: 1	
Pool Tail Substrate (%): Silt/Clay: 9 Sand: 0 Gravel: 82 Sm Cobble: 9 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 54.5 2. 36.4 3. 0.0 4. 0.0 5. 9.1		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Anderson Creek

LLID: 1238979399465

Drainage: Eel River - South Fork

Survey Dates: 9/23/2008 to 10/21/2008

Confluence Location: Quad: BEAR HARBOR

Legal Description: T24NR18WS07

Latitude: 39:56:47.0N

Longitude: 123:53:52.0W

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	34	35	30.8
Boulder	2	2	1.8
Cobble / Gravel	10	14	10.7
Sand / Silt / Clay	66	61	56.7

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	1	0.4
Brush	2	6	3.6
Hardwood Trees	78	75	68.3
Coniferous Trees	28	22	22.3
No Vegetation	4	8	5.4

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Anderson Creek

LLID: 1238979399465

Drainage: Eel River - South Fork

Survey Dates: 9/23/2008 to 10/21/2008

Confluence Location: Quad: BEAR HARBOR

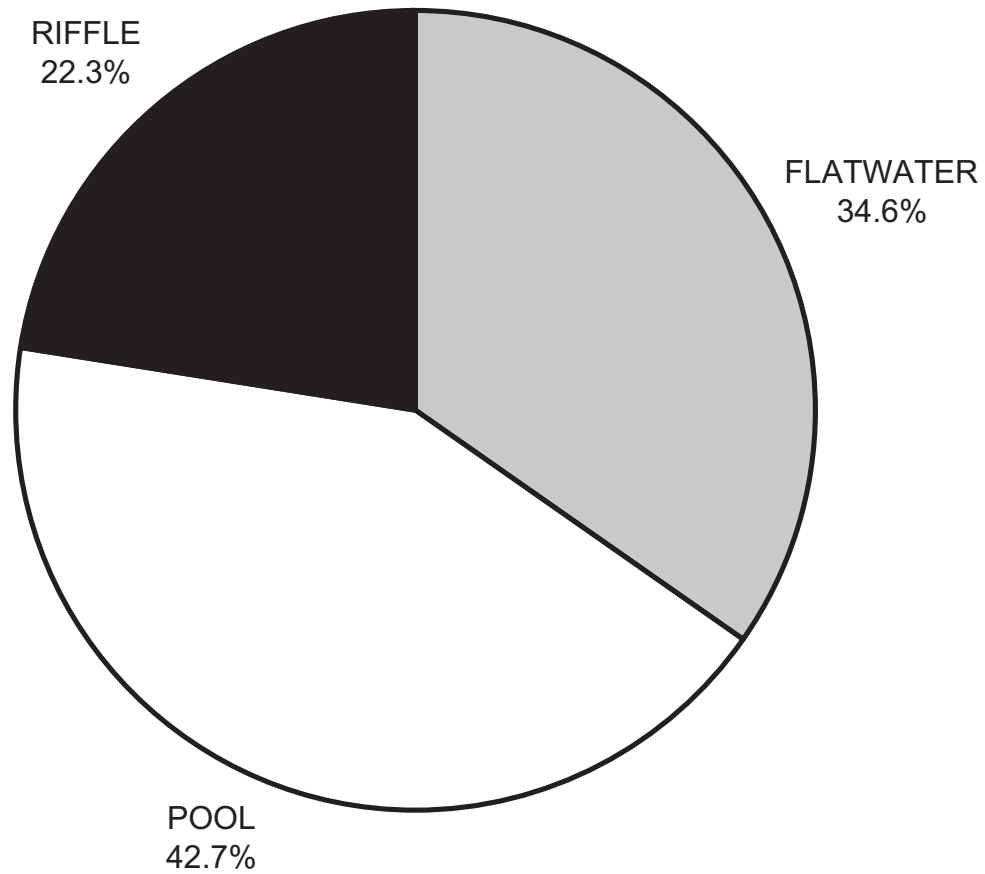
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Longitude: 123:53:52.0W

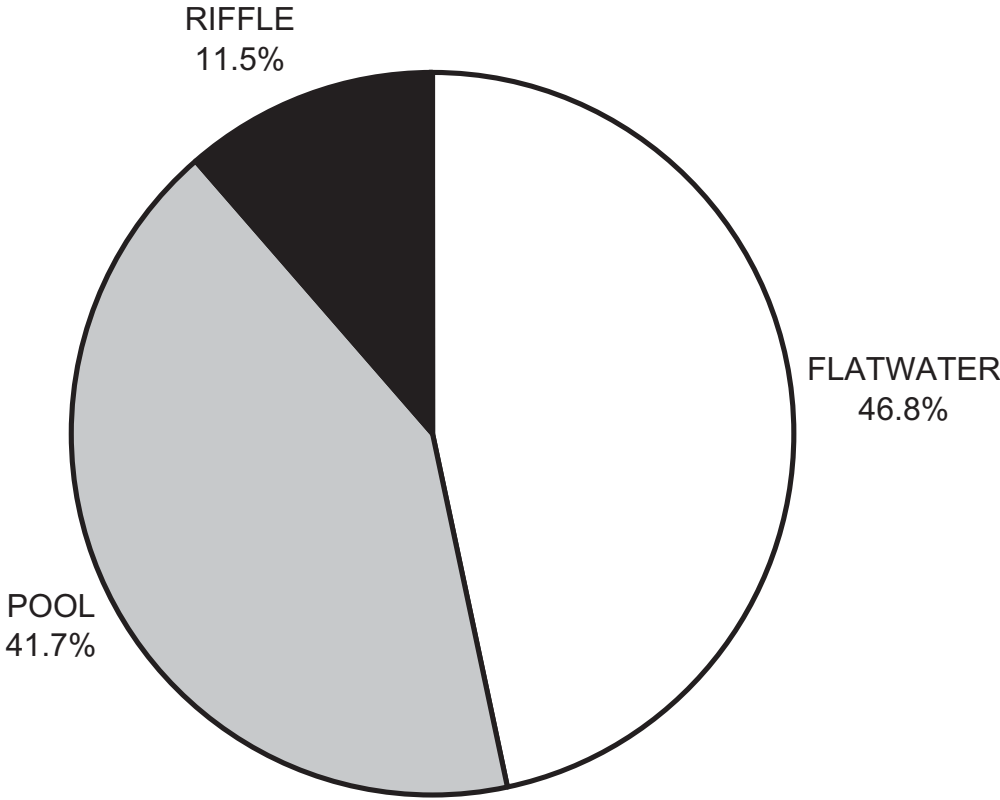
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	11	7
SMALL WOODY DEBRIS (%)	50	17	20
LARGE WOODY DEBRIS (%)	0	16	19
ROOT MASS (%)	0	0	5
TERRESTRIAL VEGETATION (%)	0	2	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	1	0
BOULDERS (%)	50	47	21
BEDROCK LEDGES (%)	0	7	28

ANDERSON CREEK 2008 HABITAT TYPES BY PERCENT OCCURRENCE



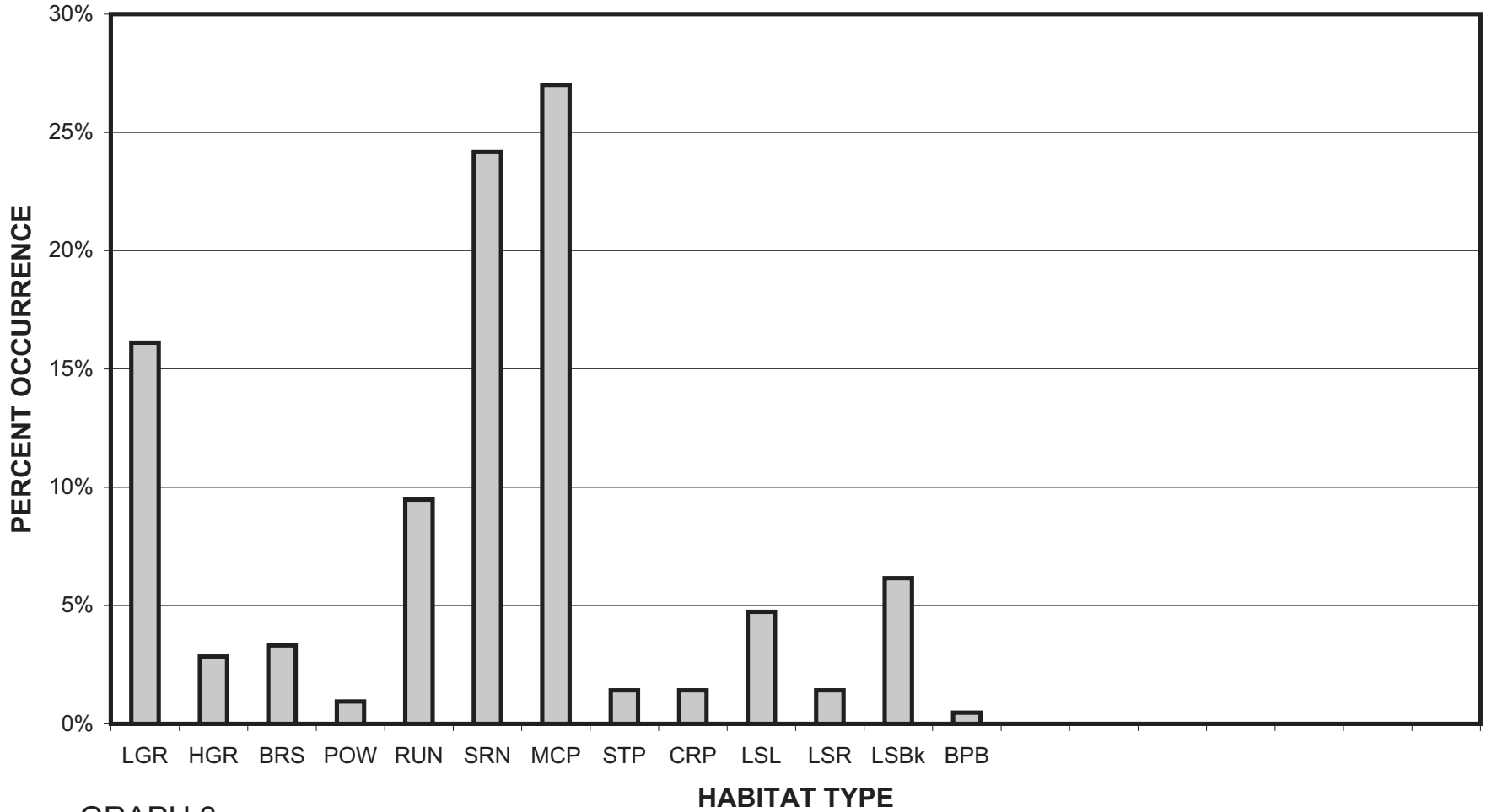
GRAPH 1

**ANDERSON CREEK 2008
HABITAT TYPES BY PERCENT TOTAL LENGTH**



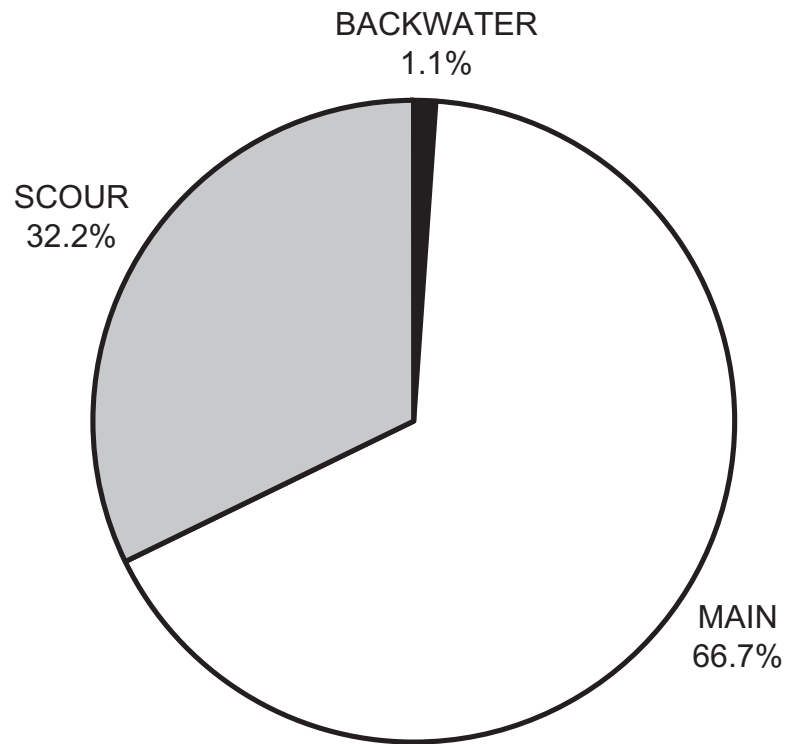
GRAPH 2

ANDERSON CREEK 2008 HABITAT TYPES BY PERCENT OCCURRENCE



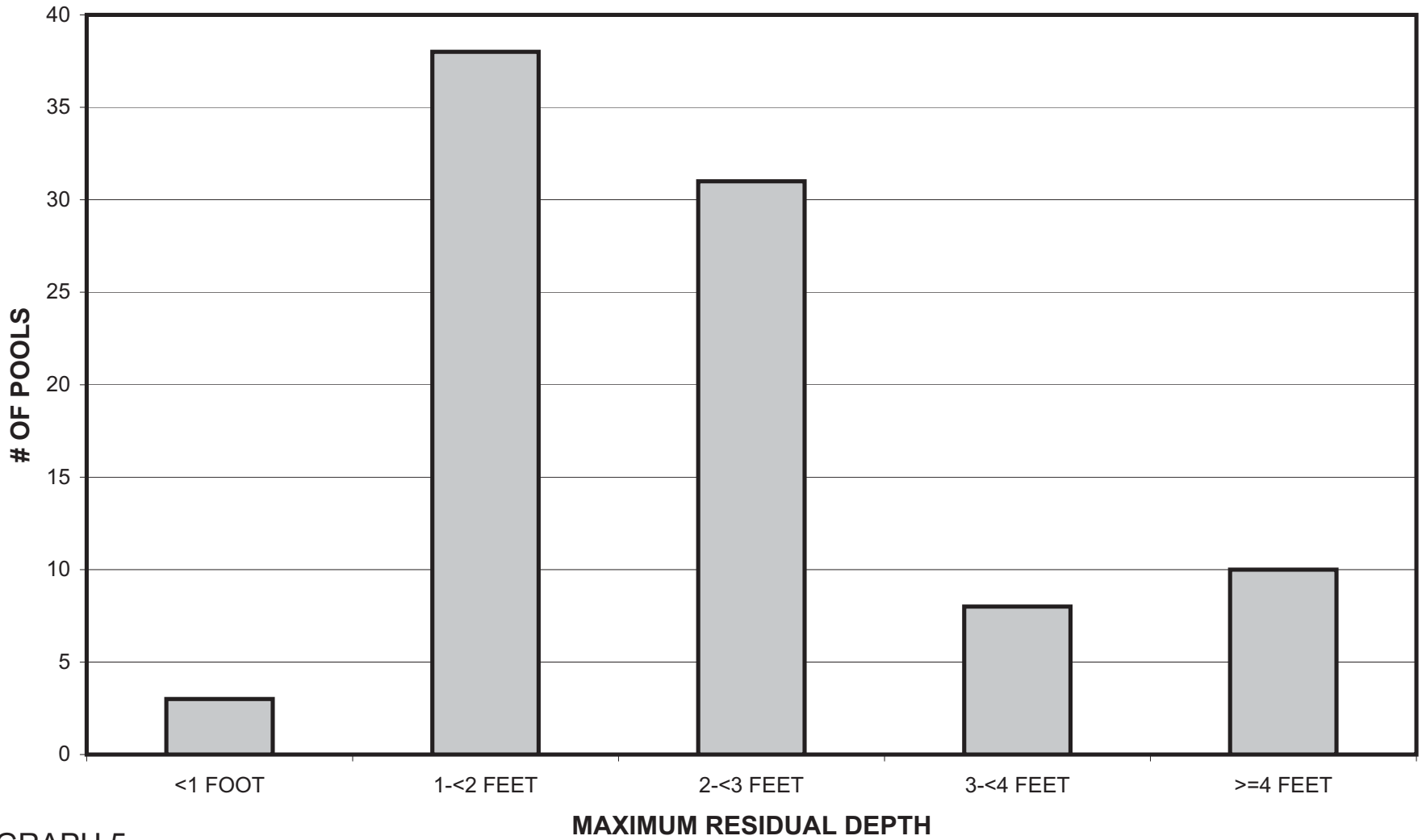
GRAPH 3

ANDERSON CREEK 2008 POOL TYPES BY PERCENT OCCURRENCE



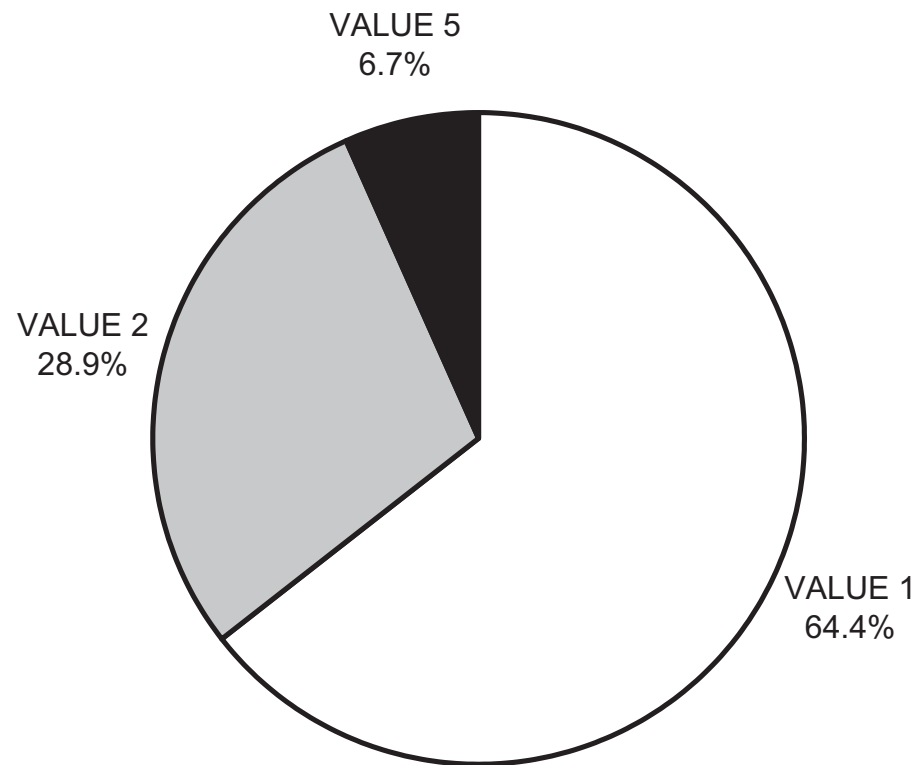
GRAPH 4

ANDERSON CREEK 2008 MAXIMUM DEPTH IN POOLS



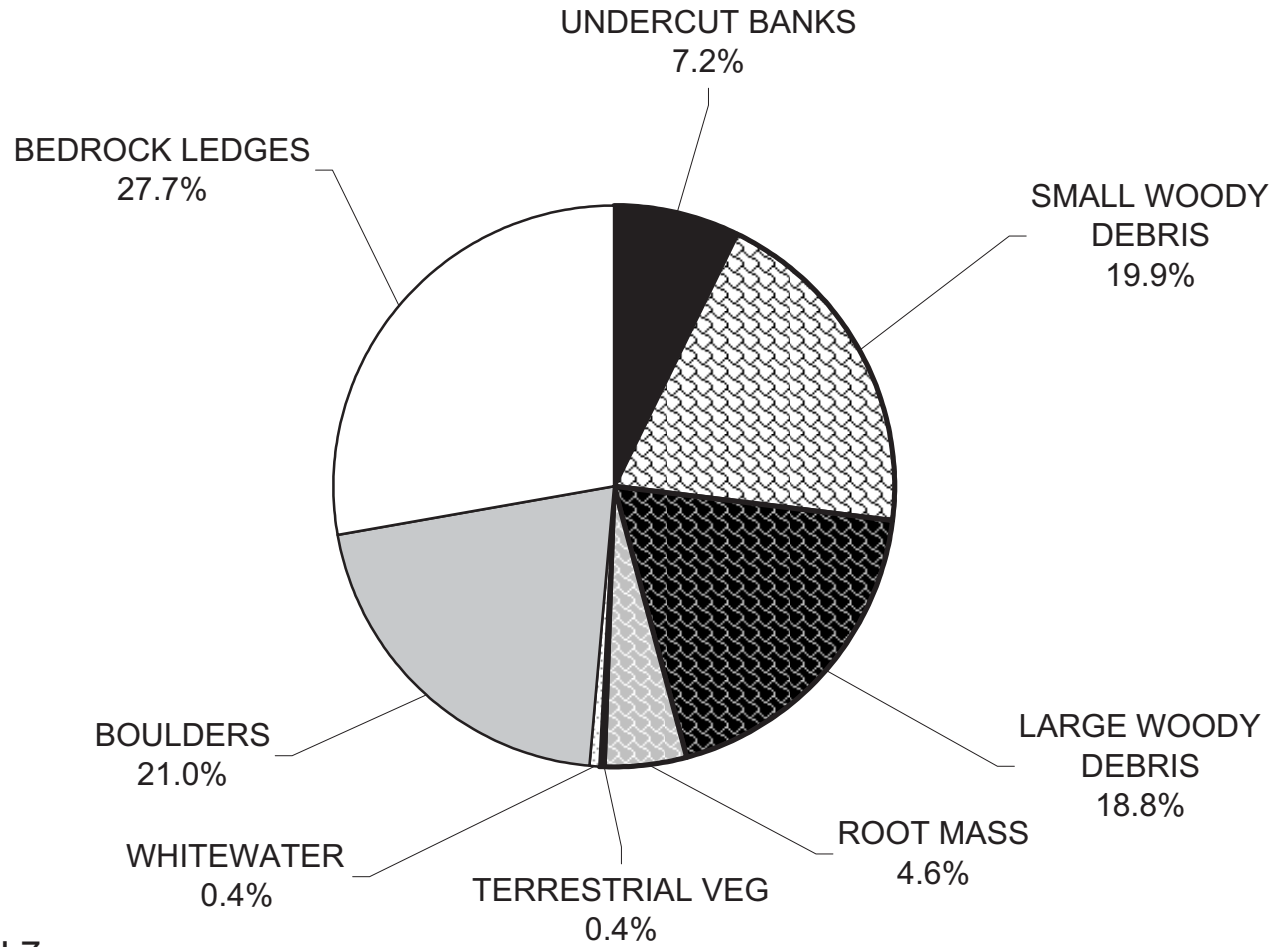
GRAPH 5

ANDERSON CREEK 2008 PERCENT EMBEDDEDNESS



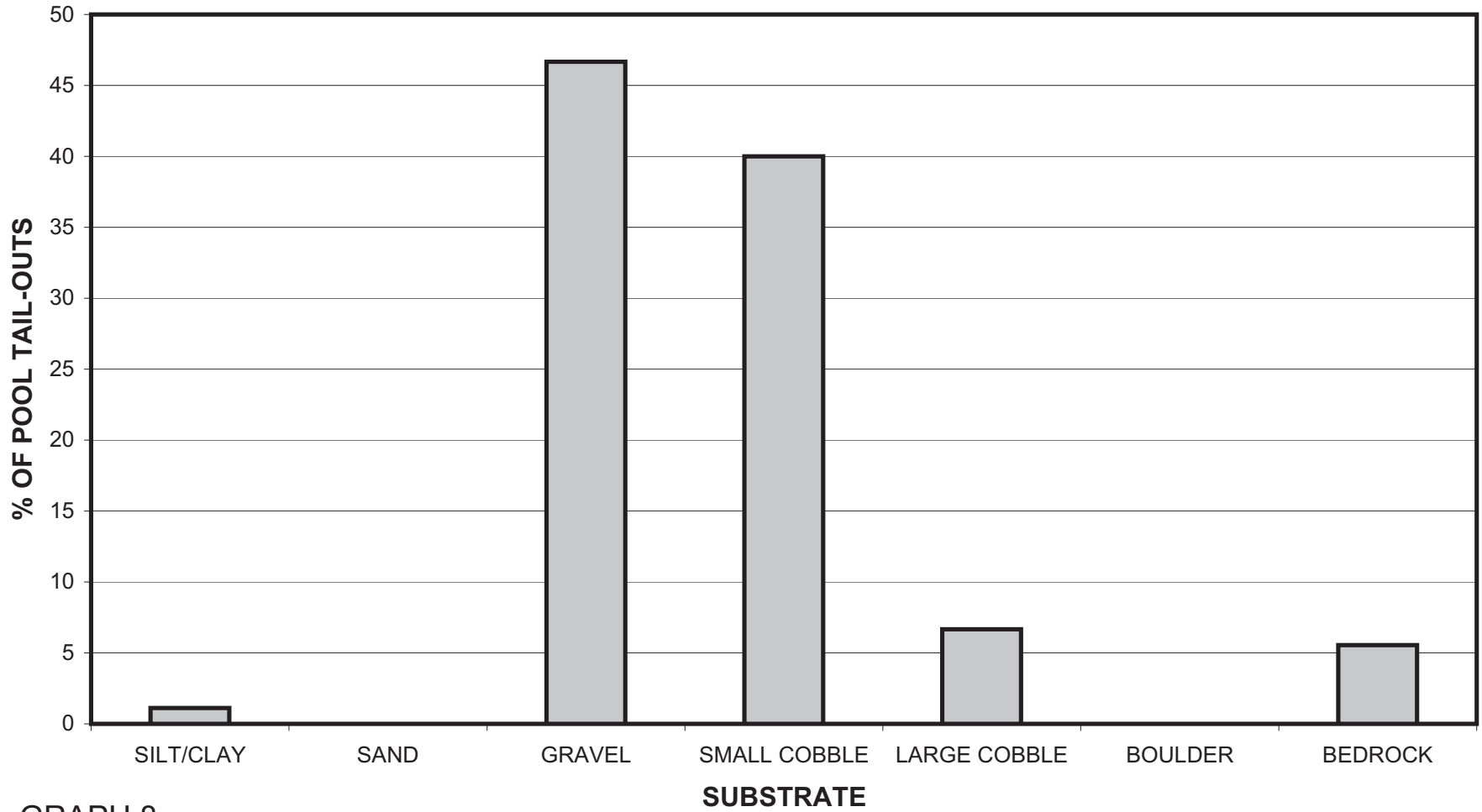
GRAPH 6

ANDERSON CREEK 2008 MEAN PERCENT COVER TYPES IN POOLS



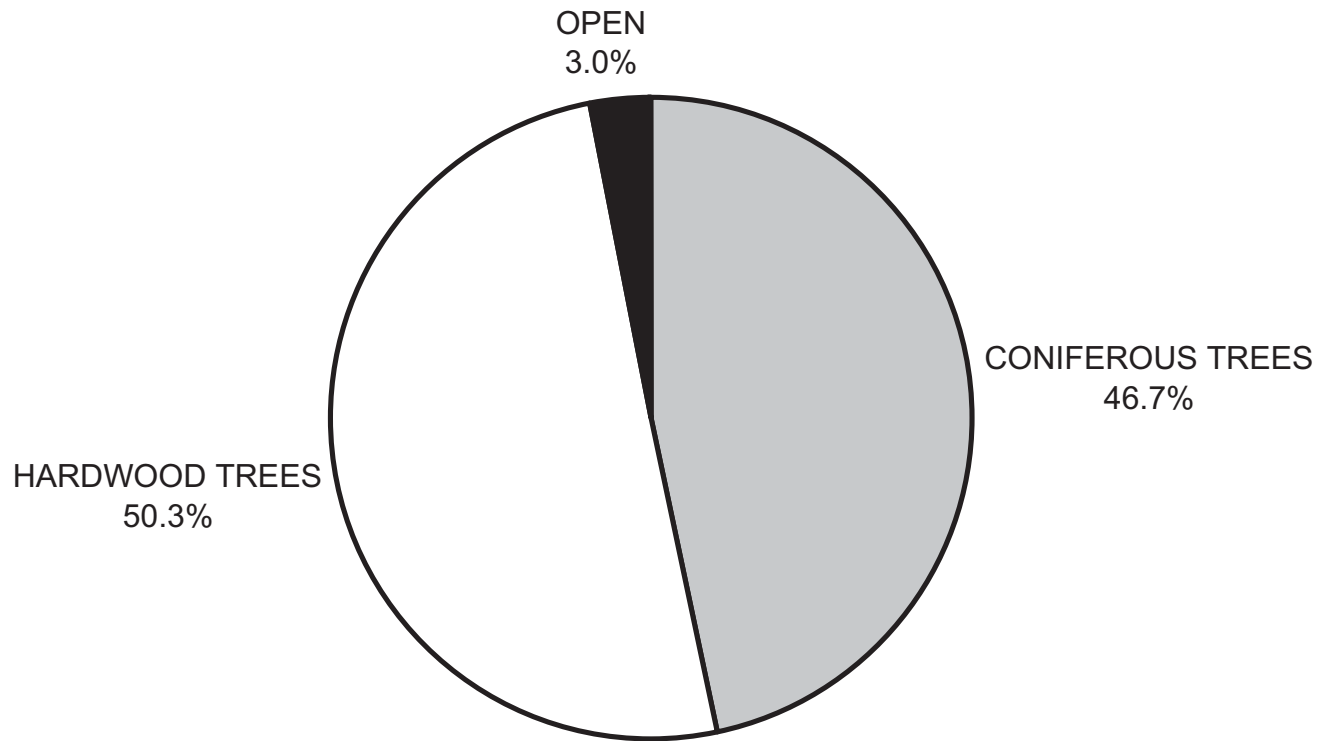
GRAPH 7

ANDERSON CREEK 2008 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



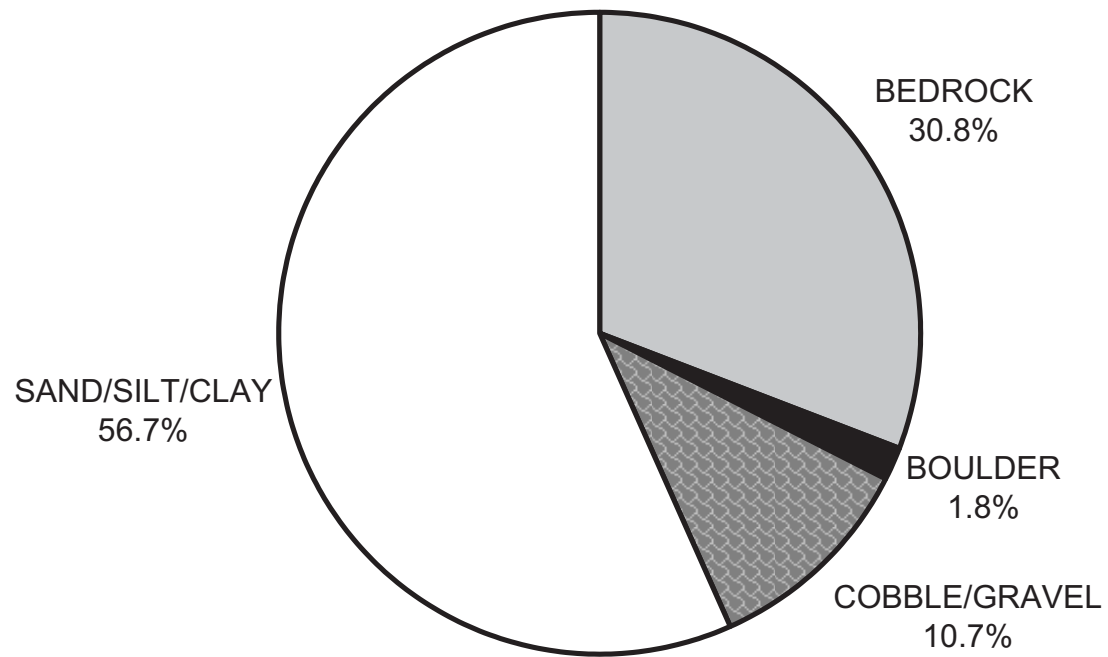
GRAPH 8

ANDERSON CREEK 2008 MEAN PERCENT CANOPY



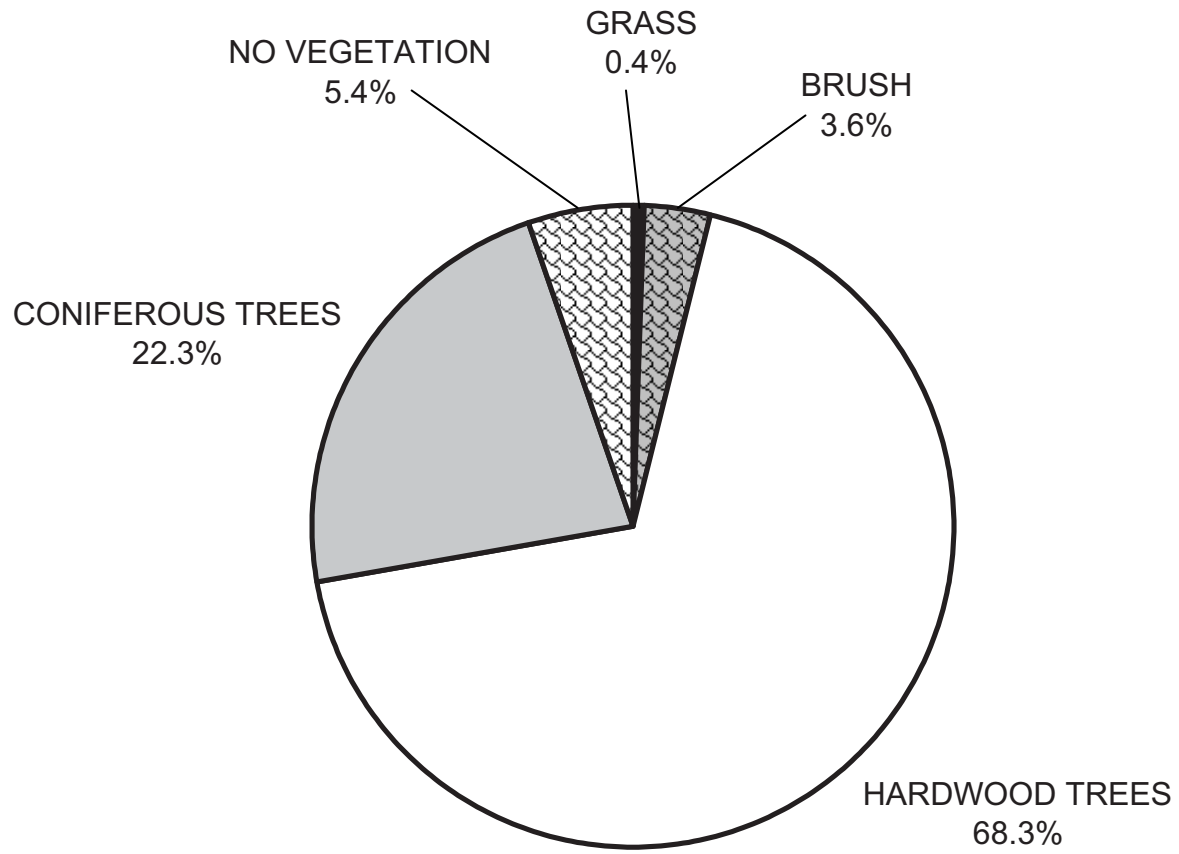
GRAPH 9

**ANDERSON CREEK 2008
DOMINANT BANK COMPOSITION IN SURVEY REACH**



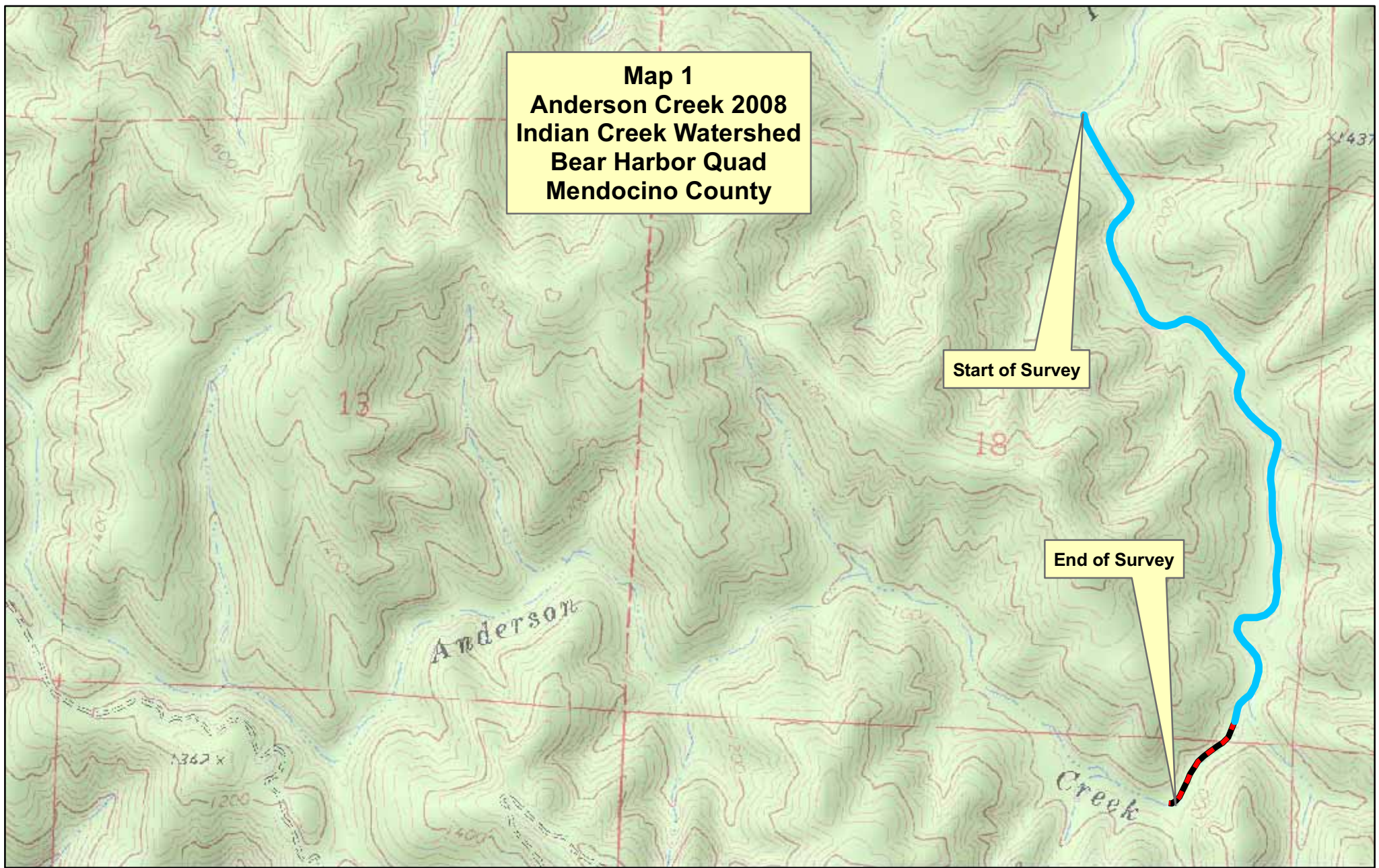
GRAPH 10

ANDERSON CREEK 2008 DOMINANT BANK VEGETATION IN SURVEY REACH





GRAPH 11

**Map 1
Anderson Creek 2008
Indian Creek Watershed
Bear Harbor Quad
Mendocino County**



Legend

-  Reach 1, F3 Channel Type
-  Reach 2, E4 Channel Type

