

STREAM INVENTORY REPORT

Virgin Creek

INTRODUCTION

A stream inventory was conducted from June 17, 2008 to June 18, 2008 on Virgin Creek. The survey began at the confluence with Pacific Ocean and extended upstream 1.7 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Virgin Creek.

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

Virgin Creek is a tributary to the Pacific Ocean, located in Mendocino County, California. Virgin Creek's legal description at the confluence with Pacific Ocean is T19N R17W S31. Its location is 39.4714 north latitude and 123.8042 west longitude, LLID number 1238028394715. Virgin Creek is a 1st order stream and has approximately 2.9 miles of blue line stream according to the USGS Fort Bragg 7.5 minute quadrangle. Virgin Creek drains a watershed of approximately 4.2 square miles. Elevations range from sea level at the mouth of the creek to approximately 320 feet in the headwater areas. Mixed hardwood and conifer forest dominates the watershed. The watershed is primarily privately owned and is managed for recreation and is subdivided for private housing. Vehicle access exists via Airport Road off of Highway 1.

METHODS

The habitat inventory conducted in Virgin Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The Pacific States Marine Fisheries Commission (PSMFC) Fisheries Technicians and 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 embeddedness. Habitat unit types encountered for the first time are measured for all the

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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 Virgin 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". Virgin Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Virgin Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26

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- 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed 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 Virgin Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Virgin 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 Virgin Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is

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

11. Average Bankfull Width:

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

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

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

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length

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HABITAT INVENTORY RESULTS

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

The habitat inventory of June 17, 2008 to June 18, 2008 was conducted by D. Wright (PSMFC) and J. Johnson (WSP). The total length of the stream surveyed was 8,816 feet. The first 2,150 feet of stream was not surveyed due to the presence of a coastal lagoon and lack of landowner access permission. The data included in this report is for the 6,666 feet actually surveyed.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.2 cfs on June 23, 2008.

Virgin Creek is an unknown channel type for the first 2,150 feet of stream that was not surveyed (Reach 1), and an F5 channel type for the remaining 6,666 feet of the stream surveyed (Reach 2). F5 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and sand-dominant substrates.

Water temperatures taken during the survey period ranged from 50 to 57 degrees Fahrenheit. Air temperatures ranged from 45 to 58 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% flatwater units, 47% pool units and 10% riffle units (Graph 1). Based on total length of Level II habitat types there were 51% flatwater units, 45% pool units, and 5% riffle units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 27%; run units, 26%; and step run units, 16% (Graph 3). Based on percent total length, step run units made up 26%, run units 25%, and mid-channel pool units 23%.

A total of 46 pools were identified (Table 3). Main channel pools were the most frequently encountered at 67% (Graph 4), and comprised 70% 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. Twenty-nine of the 46 pools (63%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 46 pool tail-outs measured, 2 had a value of 1 (4.3%); 7 had a value of 2 (15.2%); 6 had a value of 3 (13%); 15 had a value of 4 (34.8%); 16 had a value of 5 (32.6%) (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 30, flatwater habitat types had a mean shelter rating of 64, and pool habitats had a mean

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shelter rating of 30 (Table 1). Of the pool types, the backwater pools had highest mean shelter rating at 180. Main channel pools had a mean shelter rating of 25 and scour pools had a mean shelter rating of 17 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Terrestrial vegetation is the dominant cover type in Virgin Creek. Graph 7 describes the pool cover in Virgin Creek. Terrestrial vegetation 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. Bedrock was the dominant substrate observed in 35% of the pool tail-outs. Sand was the next most frequently observed dominant substrate type and occurred in 31% of pool the tail-outs.

The mean percent canopy density for the surveyed length of Virgin Creek was 91%. Nine percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 69% and 31%, respectively. Graph 9 describes the mean percent canopy in Virgin Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 79%. The mean percent left bank vegetated was 79%. The dominant elements composing the structure of the stream banks consisted of 85% sand/silt/clay, 13% bedrock, and 2% boulder (Graph 10). Brush was the dominant vegetation type observed in 89% of the units surveyed. Additionally, 6% of the units surveyed had grass as the dominant vegetation type, 2% had deciduous trees as the dominant vegetation type, and 2% had coniferous trees as the dominant vegetation type (Graph 11).

DISCUSSION

Virgin Creek is an unknown channel type for the first 2,150 feet of stream that was not surveyed (Reach 1), and an F5 channel type for the remaining 6,666 feet of the stream surveyed (Reach 2). The suitability of F5 channel types for fish habitat improvement structures is as follows: F5 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days June 16 to June 18, 2008, ranged from 50 to 57 degrees Fahrenheit. Air temperatures ranged from 45 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.

Flatwater habitat types comprised 51% of the total length of this survey, riffles 5%, and pools 45%. Twenty-nine of the 46 (63%) pools had a maximum residual depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing large wood structures that will increase or deepen pool habitat is recommended.

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Nine of the 46 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-one of the pool tail-outs had embeddedness ratings of 3 or 4. Sixteen 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 Virgin Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty of the 46 pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 30. The shelter rating in the flatwater habitats was 64. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by terrestrial vegetation in Virgin Creek. Terrestrial vegetation 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 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 91%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 79% and 79%, 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

- 1) Virgin 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 terrestrial vegetation. 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.
- 5) Suitable size spawning substrate on Virgin Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

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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	0001.00	Start of survey approximately 2,150 feet above the confluence with the Pacific Ocean, at the Highway 1 culvert.
2151	0002.00	Begin full sampling of habitat.
2223	0004.00	Salmonid young-of-the-year (YOY) observed.
2331	0006.00	There is a left bank failure with small trees in water and considerable sand and mud.
2386	0007.00	There is a small debris block with small sediment buildup.
2462	0009.00	There is a log debris accumulation (LDA #01) that has sediment retention.
2674	0012.00	There is a bridge crossing with a large sediment deposit.
2975	0017.00	There is a small wood debris blockage and sediment buildup.
3148	0021.00	There is a build up of 2 x 4's and other fence material.
3387	0025.00	There is an erosion site on the left bank. Channel type was taken at this location.
3657	0028.00	LDA #02 is at this unit. Salmonid YOY were observed.
3780	0029.00	There is an unnamed tributary (tributary #01) on the right bank.
4123	0032.00	There is a small dam retaining sediment.
4417	0035.00	There is a bridge crossing over the creek.
4470	0037.00	There is a small wood dam retaining some sediment.
4983	0042.00	There is a large amount of sediment.
5591	0050.00	There is a large amount of sediment. A salmonid 1+ was observed.
5817	0051.00	There is a bridge crossing.

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6324	0059.00	There is a considerable amount of sediment build up in this unit.
6627	0065.00	LDA #03 is 5.2' high x 11.7 wide x 7' long and consist of 6 pieces of large wood. Water is flowing through but there are no visible gaps. Sediment retention is 7.8' wide x 12' long x 2' deep and ranges from sand to gravel. Fish were seen above.
6789	0068.00	There is an old bridge crossing.
7581	0082.00	Salmonid YOY and 1+ were observed.
7761	0084.00	Airport Road culvert is located at this unit with its bottom rusted through on the upstream side. Culvert looks like it needs replacement. Salmonid 1+ were observed.
8041	0087.00	There is a small log dam.
8171	0089.00	There is a small waterfall that is a possible fish barrier.
8185	0090.00	Salmonid YOY were observed.
8242	0092.00	There is a waterfall measuring 9' high with a water depth of 0.5' below. It is a possible fish barrier.
8296	0093.00	There is sediment build up from an LDA measuring 1' high x 4' long x 4' wide.
8422	0094.00	There is a perched culvert (culvert #03) with no leaping capacity for fish moving upstream.
8493	0097.00	LDA #04 is 4.7' high x 10' wide x 7.5' long and consists of 4 pieces of large wood. Water is flowing through but there are no visible gaps. Sediment retention is 6' wide x 10' long x 4' deep and consists of sand. Fish were not seen above.
8816	0098.00	End of survey. There have been no fish observed upstream of the waterfall, for the past 378 feet. There have been multiple LDAs and stretches of dry sandy streambed.

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: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

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
41	15	FLATWATER	42.3	82	3366	50.5	8.3	0.6	1.4	546	22399	388	15889		64
1	0	NOSURVEY		2150	2150										
46	46	POOL	47.4	65	2972	44.6	9.5	0.9	2.4	584	26885	852	39209	667	30
10	2	RIFFLE	10.3	33	328	4.9	9.0	0.3	0.8	205	2050	62	615		30
Total Units	Total Units Fully Measured			Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)			
98	63			8816						51333		55713			

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

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 (%)
7	2	LGR	7.1	22	155	2.3	9	0.3	0.8	205	1435	62	431		30	97
3	0	HGR	3.1	58	173	2.6										87
25	10	RUN	25.5	67	1664	25.0	8	0.6	2.6	541	13526	396	9890		86	95
16	5	SRN	16.3	106	1702	25.5	9	0.6	2	557	8909	371	5943		8	87
26	26	MCP	26.5	59	1536	23.0	9	0.9	3.6	531	13806	756	19648	586	22	88
5	5	STP	5.1	109	543	8.1	10	1.2	5.5	883	4414	1463	7314	1153	44	85
1	1	CRP	1.0	76	76	1.1	10	0.7	1.4	758	758	834	834	531	10	70
4	4	LSL	4.1	44	174	2.6	9	0.8	3.1	400	1598	443	1772	364	15	99
1	1	LSR	1.0	39	39	0.6	10	0.9	2.2	333	333	433	433	300	10	100
4	4	LSBk	4.1	55	219	3.3	9	0.8	3.2	479	1917	562	2246	436	26	95
3	3	PLP	3.1	53	158	2.4	11	0.8	3.5	538	1614	665	1996	518	13	95
2	2	DPL	2.0	114	227	3.4	11	1.7	4.1	1222	2444	2483	4965	2064	180	63
1	0	NS	1.0	2150	2150											

Total Units
98

Total Units Fully Measured
63

Total Length (ft.)
8816

Total Area (sq.ft.)
50755

Total Volume (cu.ft.)
55472

Table 3 - Summary of Pool Types

Stream Name: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

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
31	31	MAIN	67	67	2079	70	9.2	1.0	588	18220	677	20989	25
13	13	SCOUR	28	51	666	22	9.7	0.8	478	6220	430	5584	17
2	2	BACKWATER	4	114	227	8	11.3	1.7	1222	2444	2064	4129	180
Total Units	Total Units Fully Measured				Total Length (ft.)				Total Area (sq.ft.)			Total Volume (cu.ft.)	
46	46				2972				26885			30702	

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

Stream Name: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

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
26	MCP	57	0	0	13	50	11	42	2	8	0	0
5	STP	11	0	0	0	0	2	40	1	20	2	40
1	CRP	2	0	0	1	100	0	0	0	0	0	0
4	LSL	9	0	0	1	25	2	50	1	25	0	0
1	LSR	2	0	0	0	0	1	100	0	0	0	0
4	LSBk	9	0	0	2	50	1	25	1	25	0	0
3	PLP	7	0	0	0	0	2	67	1	33	0	0
2	DPL	4	0	0	0	0	1	50	0	0	1	50
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
46			0	0	17	37	20	43	6	13	3	7

Mean Maximum Residual Pool Depth (ft.): 2.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Dry Units: 0

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

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
7	1	LGR	0	0	0	0	100	0	0	0	0
3	0	HGR									
10	1	TOTAL RIFFLE	0	0	0	0	100	0	0	0	0
25	5	RUN	8	14	16	0	62	0	0	0	0
16	2	SRN	0	0	15	0	85	0	0	0	0
41	7	TOTAL FLAT	6	10	16	0	69	0	0	0	0
26	26	MCP	15	12	9	2	63	0	0	0	0
5	5	STP	8	22	10	0	52	0	0	4	4
1	1	CRP	0	10	40	20	30	0	0	0	0
4	4	LSL	8	20	33	0	35	0	0	5	0
1	1	LSR	10	0	0	40	50	0	0	0	0
4	4	LSBk	25	13	3	0	60	0	0	0	0
3	3	PLP	3	13	7	0	77	0	0	0	0
2	2	DPL	0	45	55	0	0	0	0	0	0
46	46	TOTAL POOL	13	15	13	2	56	0	0	1	0
1	0	NS									
98	54	TOTAL	11	14	13	2	59	0	0	1	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Dry Units: 0

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

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
7	2	LGR	0	50	0	0	0	0	50
3	0	HGR	0	0	0	0	0	0	0
25	10	RUN	0	80	10	0	0	0	10
16	5	SRN	20	60	0	0	0	0	20
26	26	MCP	12	62	12	0	4	0	12
5	5	STP	20	40	0	0	0	0	40
1	1	CRP	0	100	0	0	0	0	0
4	4	LSL	25	75	0	0	0	0	0
1	1	LSR	100	0	0	0	0	0	0
4	4	LSBk	0	100	0	0	0	0	0
3	3	PLP	0	100	0	0	0	0	0
2	2	DPL	50	50	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
91	31	69	0	79	79

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: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Survey Length (ft.): 8816

Main Channel (ft.): 8816

Side Channel (ft.): 0

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1									
Channel Type: NA		Canopy Density (%):				Pools by Stream Length (%): 0.0			
Reach Length (ft.): 2150		Coniferous Component (%):				Pool Frequency (%): 0.0			
Riffle/Flatwater Mean Width (ft.):		Hardwood Component (%):				Residual Pool Depth (%):			
BFW:		Dominant Bank Vegetation:				< 2 Feet Deep:			
Range (ft.): to		Vegetative Cover (%): 0.0				2 to 2.9 Feet Deep:			
Mean (ft.):		Dominant Shelter:				3 to 3.9 Feet Deep:			
Std. Dev.:		Dominant Bank Substrate Type:				>= 4 Feet Deep:			
Base Flow (cfs.):		Occurrence of LWD (%):				Mean Max Residual Pool Depth (ft.):			
Water (F): 0 - 0		Air (F): 0 - 0		LWD per 100 ft.:		Mean Pool Shelter Rating:			
Dry Channel (ft): 0		Riffles:		Pools:					
		Flat:							
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: F5		Canopy Density (%): 90.5				Pools by Stream Length (%): 44.6			
Reach Length (ft.): 6666		Coniferous Component (%): 31.5				Pool Frequency (%): 47.4			
Riffle/Flatwater Mean Width (ft.): 8.4		Hardwood Component (%): 68.5				Residual Pool Depth (%):			
BFW:		Dominant Bank Vegetation: Brush				< 2 Feet Deep: 37			
Range (ft.): 5 to 18		Vegetative Cover (%): 79.2				2 to 2.9 Feet Deep: 43			
Mean (ft.): 12		Dominant Shelter: Terrestrial Veg.				3 to 3.9 Feet Deep: 13			
Std. Dev.: 5		Dominant Bank Substrate Type: Sand/Silt/Clay				>= 4 Feet Deep: 7			
Base Flow (cfs.): 0.2		Occurrence of LWD (%): 13				Mean Max Residual Pool Depth (ft.): 2.4			
Water (F): 50 - 57		Air (F): 45 - 58		LWD per 100 ft.:		Mean Pool Shelter Rating: 30			
Dry Channel (ft): 0		Riffles: 0		Pools: 5					
		Flat: 2							
Pool Tail Substrate (%): Silt/Clay: 0		Sand: 30	Gravel: 24	Sm Cobble: 11	Lg Cobble: 0	Boulder: 0	Bedrock: 35		
Embeddedness Values (%): 1. 4.3		2. 15.2	3. 13.0	4. 34.8	5. 32.6				

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Confluence Location: Quad: FORT BRAGG

Legal Description: T19NR17WS31

Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

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	7	9	12.7
Boulder	1	2	2.4
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	55	52	84.9

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	6	2	6.3
Brush	53	59	88.9
Hardwood Trees	2	1	2.4
Coniferous Trees	2	1	2.4
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 4

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

StreamName: Virgin Creek

LLID: 1238028394715

Drainage: Noyo River

Survey Dates: 6/17/2008 to 6/18/2008

Confluence Location: Quad: FORT BRAGG

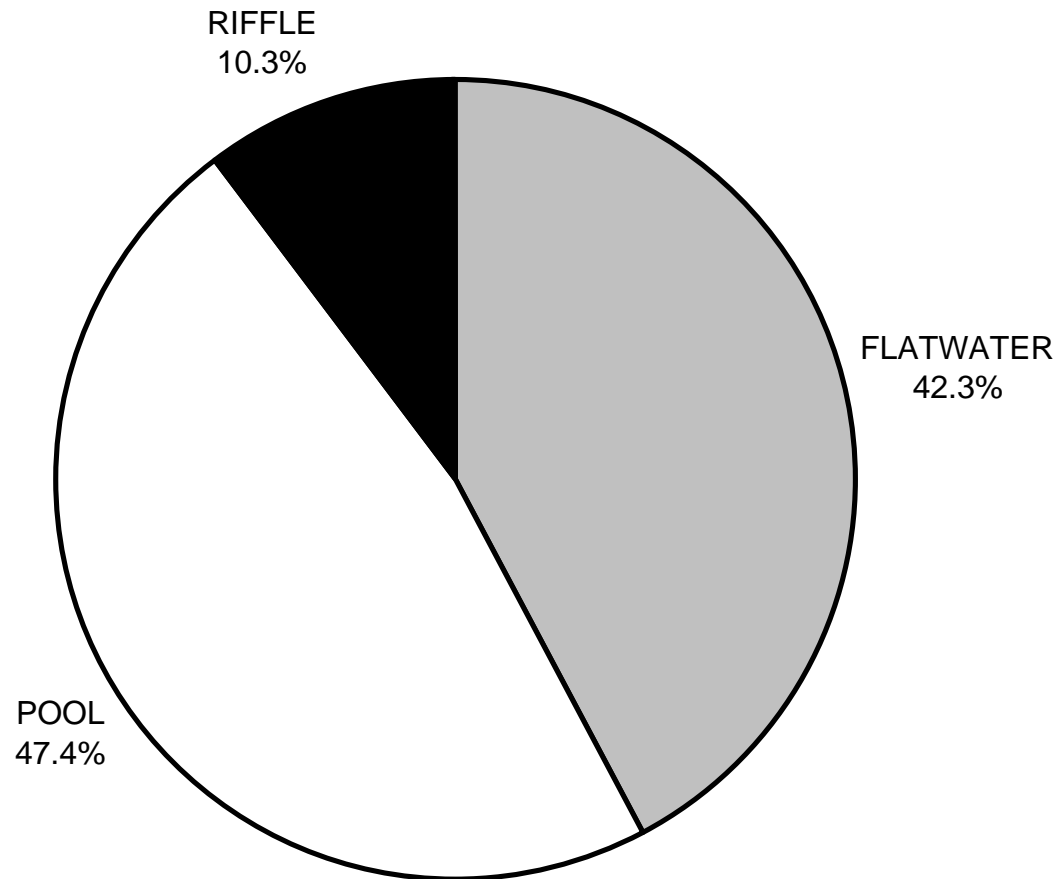
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Latitude: 39:28:17.0N

Longitude: 123:48:10.0W

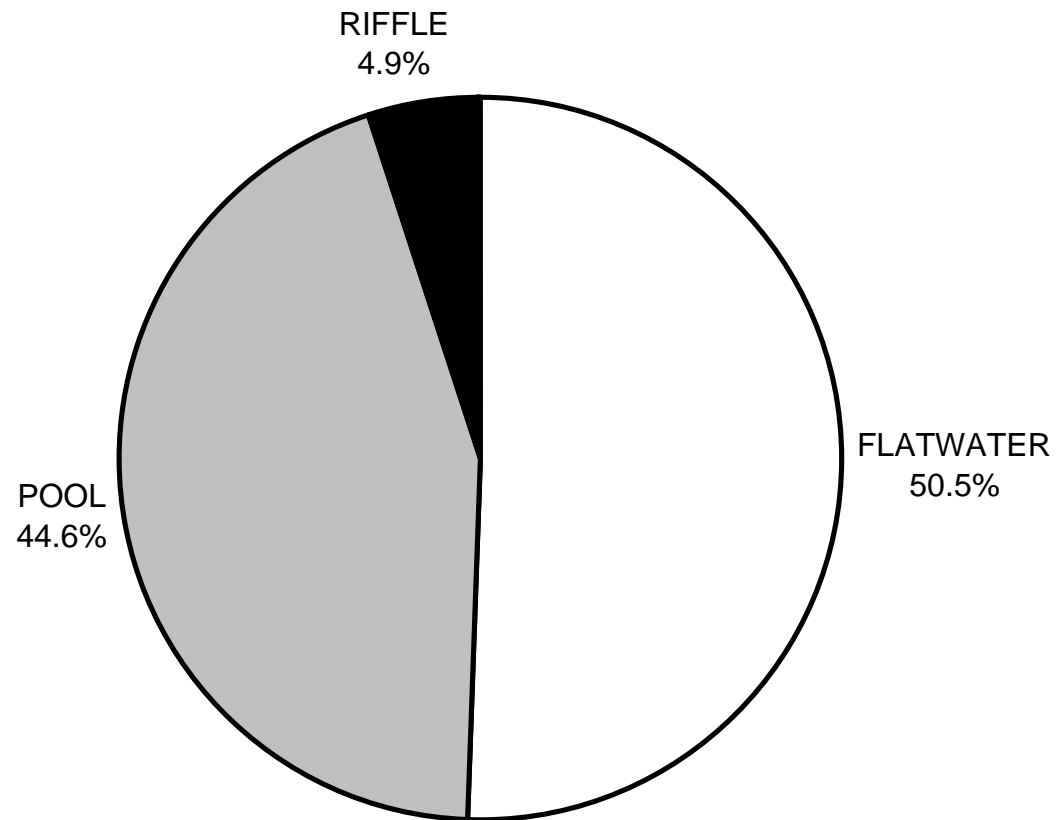
	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)	0	6	13
SMALL WOODY DEBRIS (%)	0	10	15
LARGE WOODY DEBRIS (%)	0	16	13
ROOT MASS (%)	0	0	2
TERRESTRIAL VEGETATION (%)	100	69	56
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	1
BEDROCK LEDGES (%)	0	0	0

VIRGIN CREEK 2008
HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

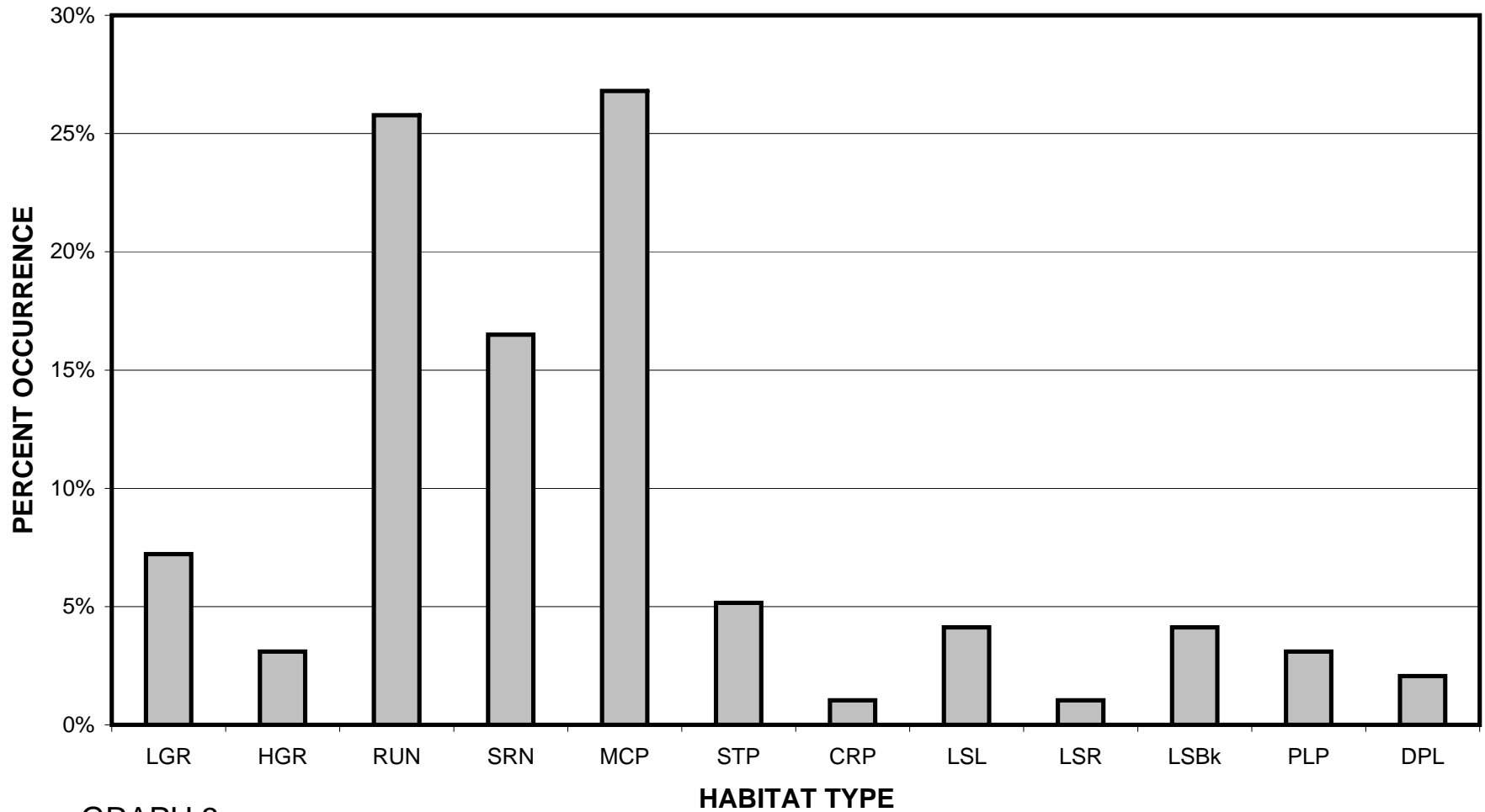
VIRGIN CREEK 2008
HABITAT TYPES BY PERCENT TOTAL LENGTH



GRAPH 2

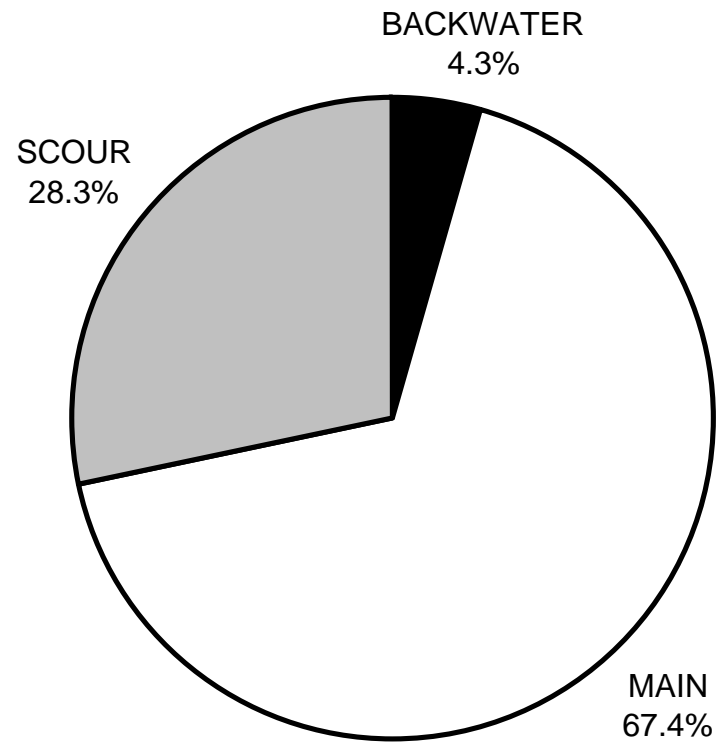
VIRGIN CREEK 2008

HABITAT TYPES BY PERCENT OCCURRENCE



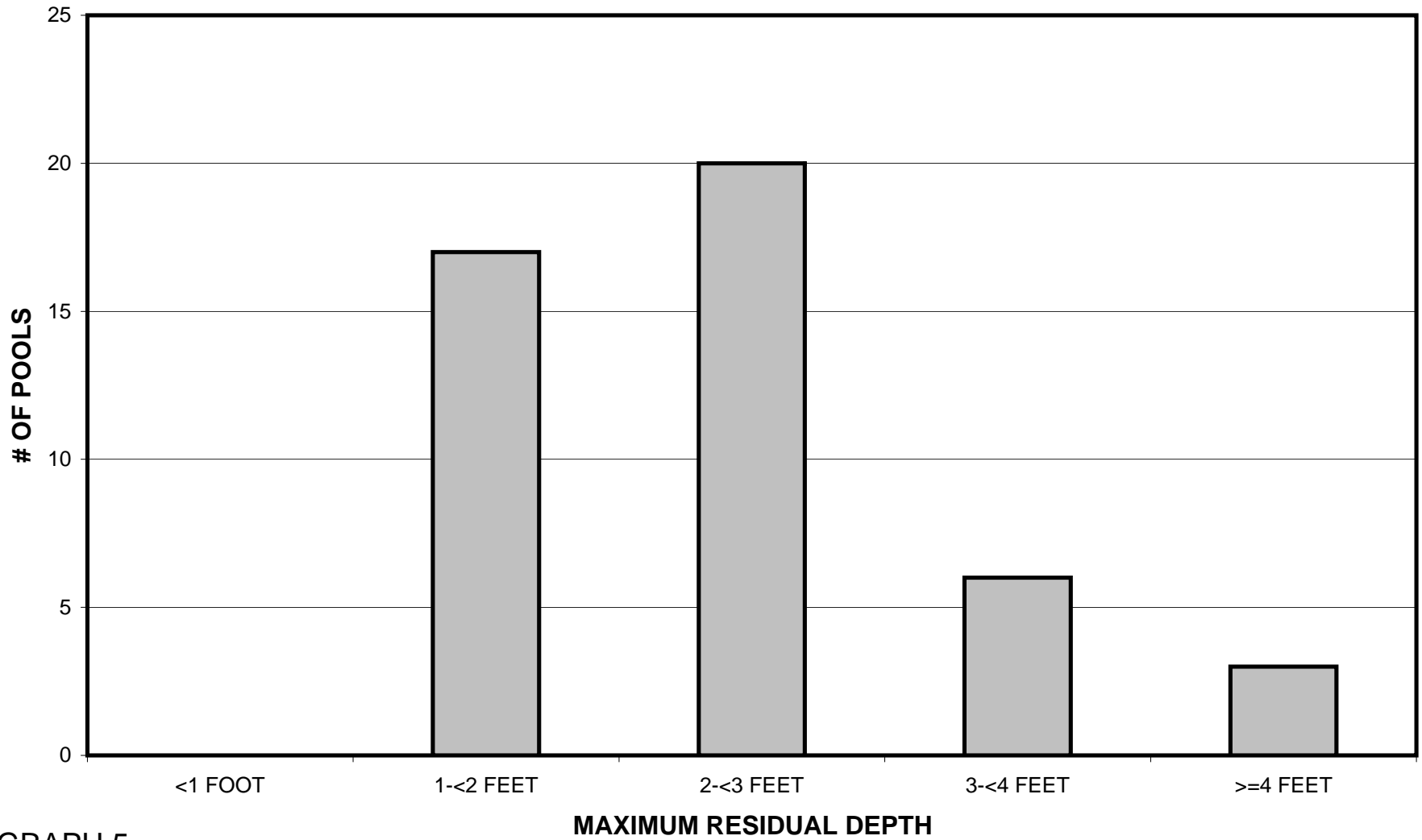
GRAPH 3

VIRGIN CREEK 2008 POOL TYPES BY PERCENT OCCURRENCE



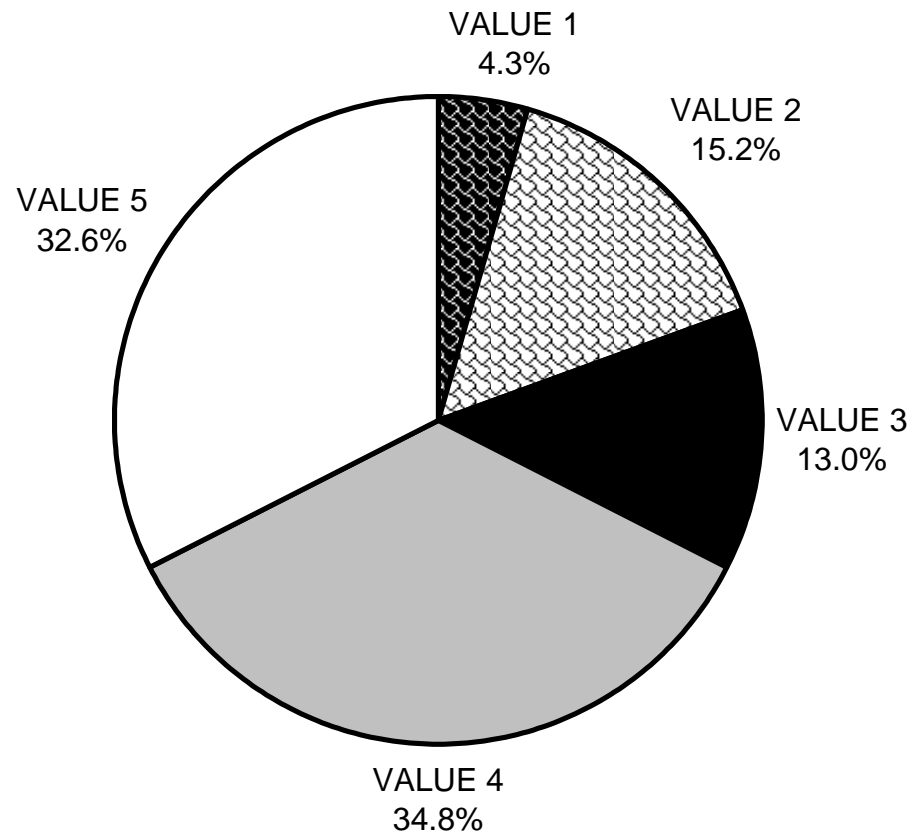
GRAPH 4

VIRGIN CREEK 2008 MAXIMUM DEPTH IN POOLS



GRAPH 5

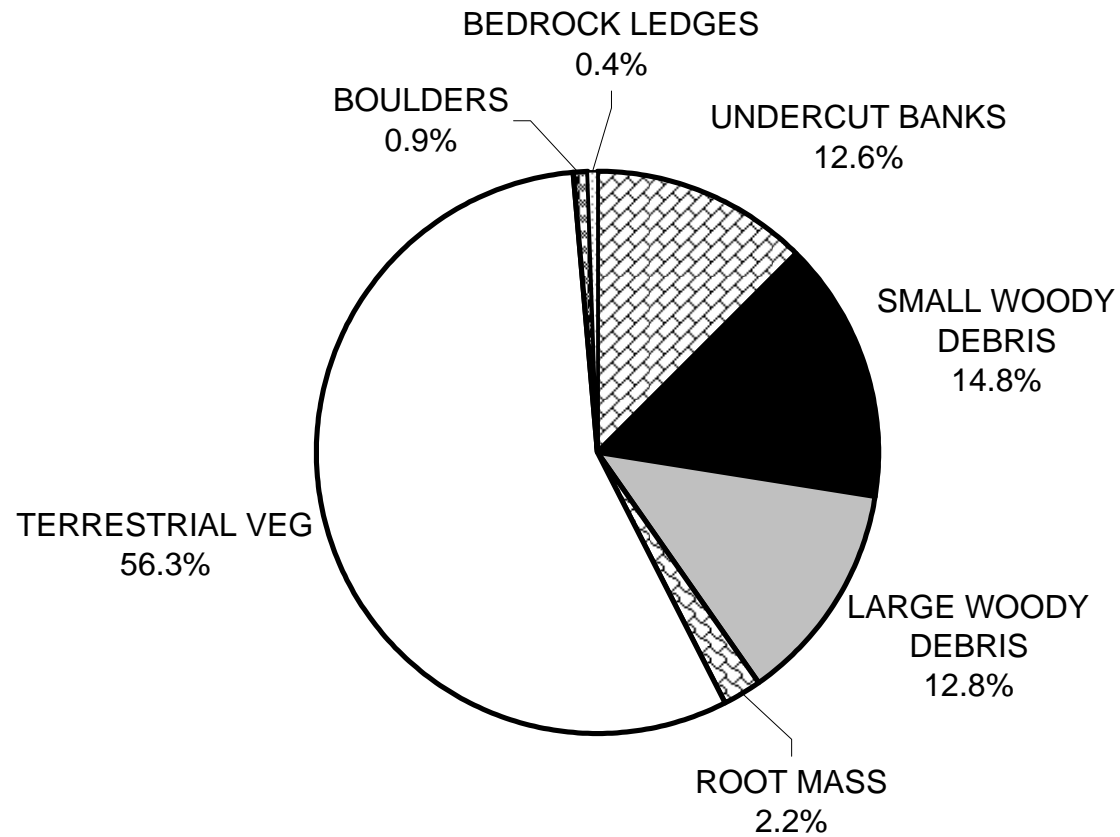
VIRGIN CREEK 2008 PERCENT EMBEDDEDNESS



GRAPH 6

VIRGIN CREEK 2008

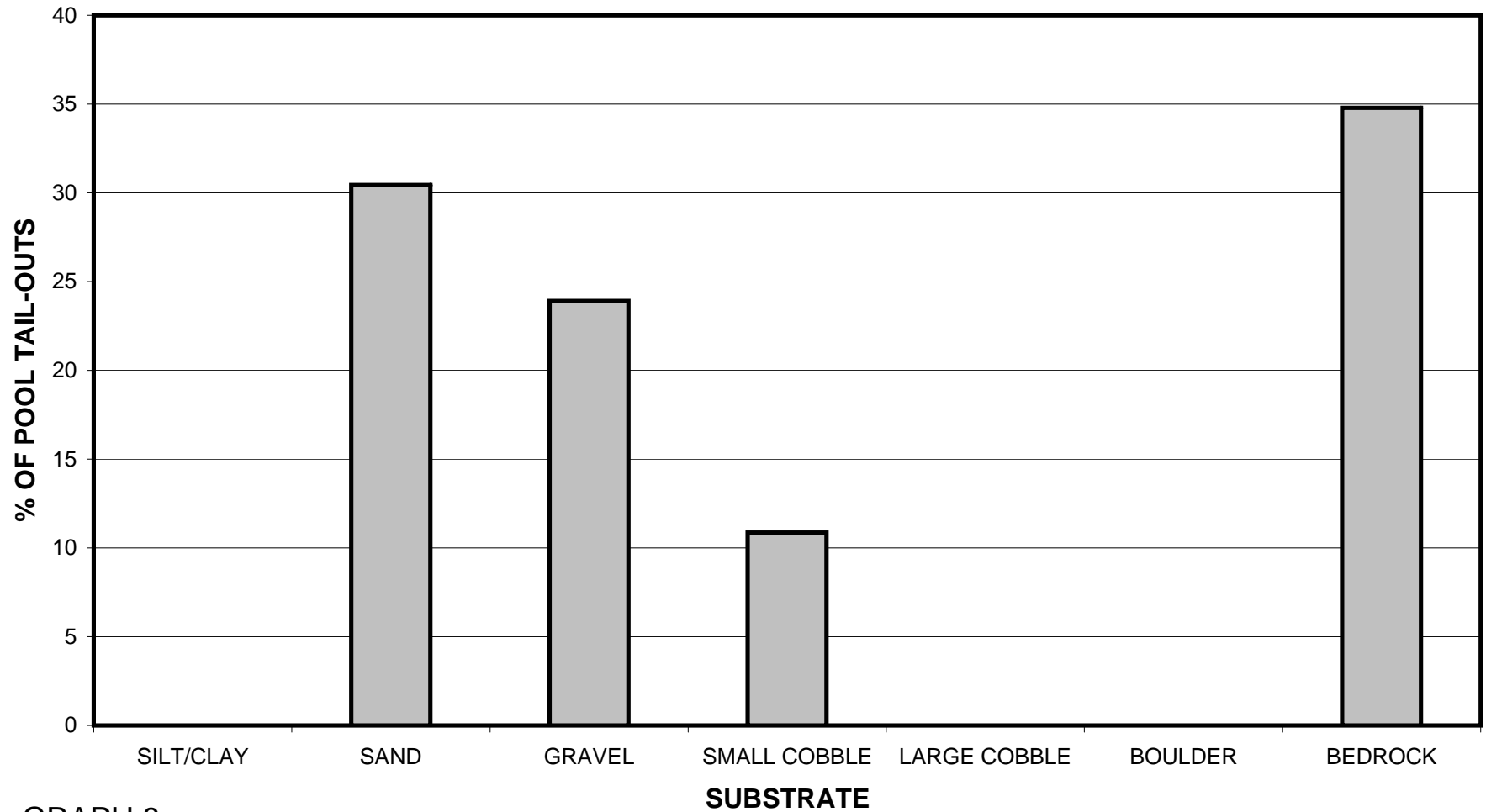
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

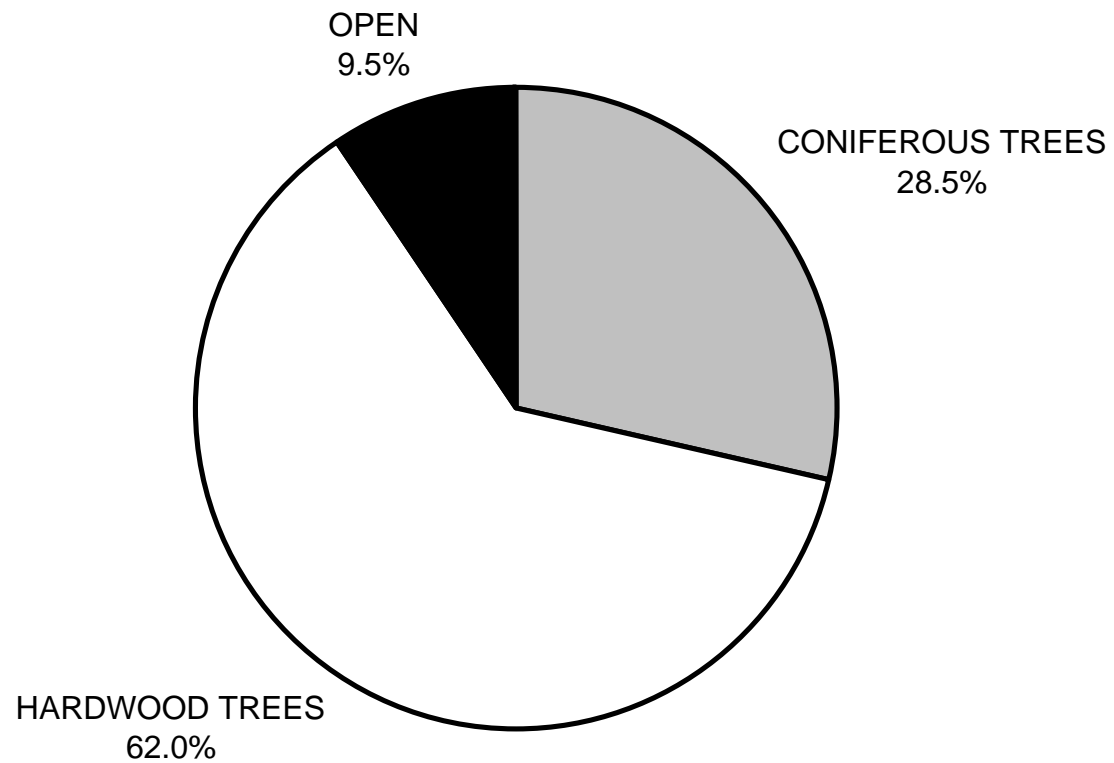
VIRGIN CREEK 2008

SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



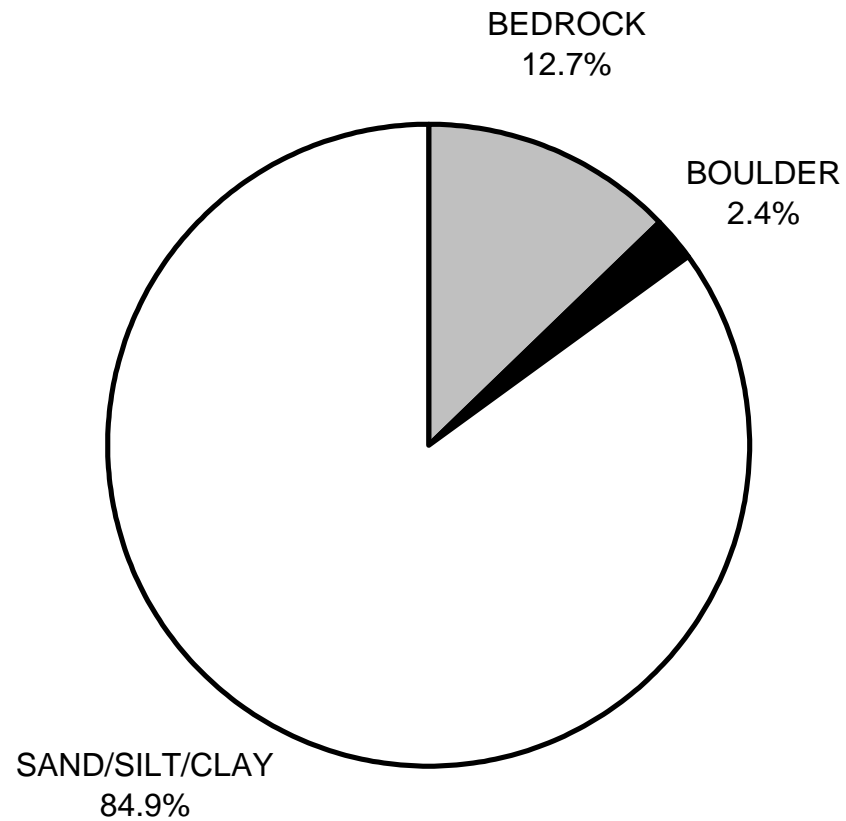
GRAPH 8

**VIRGIN CREEK 2008
MEAN PERCENT CANOPY**



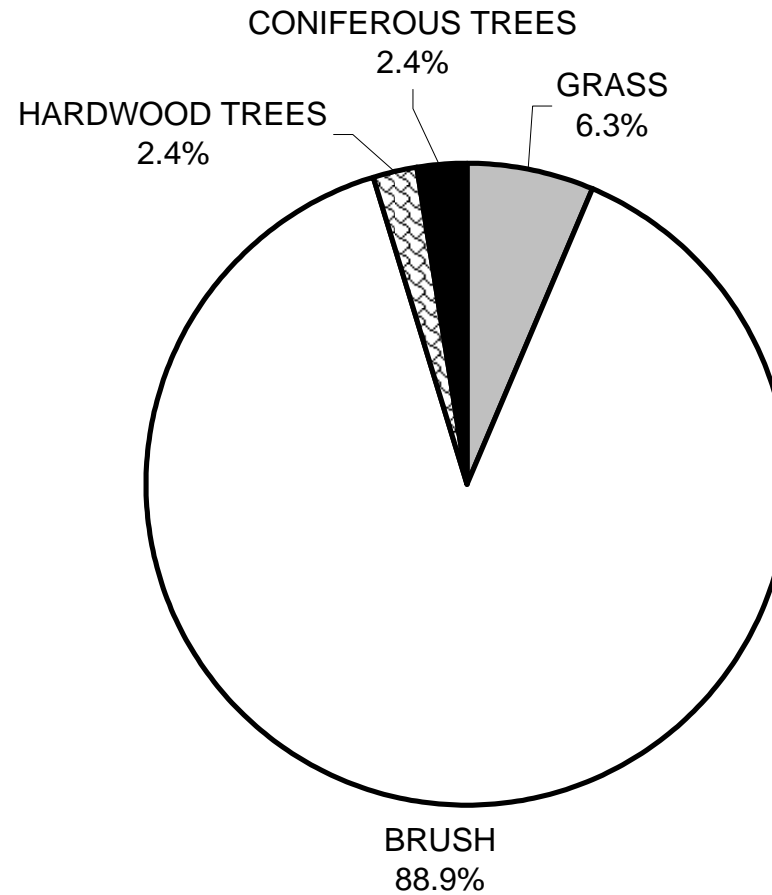
GRAPH 9

VIRGIN CREEK 2008
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

**VIRGIN CREEK 2008
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

Map 1
Virgin Creek
Virgin Creek Watershed
Fort Bragg Quad, Mendocino County

Start of Survey

End of Survey

Virgin Creek

Fort Bragg Airport

Grave Beld Hill 2

Bald Hill

ROAD

PUDDING CREEK

1

2

3

4

5

6

31

32

33

36

37

T19 N

T18 N

44

60

120

160

200

240

280

320

360

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440

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560

600

640

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760

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880

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1000

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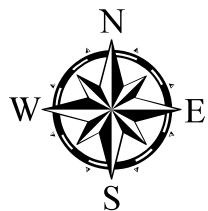
14680

14720

14760

14800

End of Survey



 Reach 1, Not Surveyed
 Reach 2, F5 Channel Type

A horizontal number line with 10 tick marks, labeled 1 through 10.



RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH & GAME