

STREAM INVENTORY REPORT

Dewarren Creek

INTRODUCTION

A stream inventory was conducted from July 16 to July 25, 2013 on Dewarren Creek. The survey began at the confluence with the North Fork Noyo River and extended upstream 2.1 miles.

The Dewarren 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 Dewarren 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 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

Dewarren Creek is a tributary to the North Fork Noyo River, tributary to the Noyo River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). Dewarren Creek's legal description at the confluence with the North Fork Noyo River is T19N R15W S29. Its location is 39.4764 degrees north latitude and 123.5536 degrees west longitude, LLID number 1235524394765. Dewarren Creek is a first order stream and has approximately 0.9 miles of blue line stream according to the USGS Northspur 7.5 minute quadrangle. Dewarren Creek drains a watershed of approximately 2.0 square miles. Elevations range from about 580 feet at the mouth of the creek to 1,670 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Irmulco Road, seven miles west of Willits, CA.

METHODS

The habitat inventory conducted in Dewarren Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Wildlife (CDFW) personnel that conducted the inventory were trained in standardized habitat inventory methods by the CDFW. This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail

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crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

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 Dewarren 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". Dewarren 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 Dewarren 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 not suitable for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is classified according to a list of nine cover types. In Dewarren 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. The shelter rating is then calculated for each fully-described habitat unit by multiplying shelter value and percent 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 Dewarren 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 Dewarren 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 Dewarren Creek. In addition, underwater observations were made at 14 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.19, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Wildlife. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type
- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

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Graphics are produced from the tables using Microsoft Excel. Graphics developed for Dewarren 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 July 16 to July 25, 2013 was conducted by M. Groff, I. Mikus, and B. Leonard (CDFW). The total length of the stream surveyed was 10,903 feet.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.1 cfs on July 16, 2013.

Dewarren Creek is an F4 channel type for 7,616 feet of the stream surveyed (Reach 1) and an A4 channel type for 3,287 feet of the stream surveyed (Reach 2). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates. A4 channels are steep, narrow, cascading, step-pool, high energy debris transporting channels associated with depositional soils, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 55 to 58 degrees Fahrenheit. Air temperatures ranged from 53 to 68 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% riffle units, 32% flatwater units, 28% pool units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 40% riffle units, 35% flatwater units, 24% pool units, and 1% dry units (Graph 2).

Eleven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffle units, 30%; run units, 21%; and mid-channel pool units 17% (Graph 3). Based on percent total length, low gradient riffle units made up 30%, step run units 19%, and mid-channel pool units 17%.

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A total of 109 pools were identified (Table 3). Main channel pools were the most frequently encountered at 61% (Graph 4), and comprised 71% 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. Fifteen of the 109 pools (14%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 109 pool tail-outs measured, 51 had a value of 1 (47%); 39 had a value of 2 (36%); 18 had a value of 3 (17%); one had a value of 5 (1%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed not suitable for spawning due to inappropriate substrate such as bedrock, log sills, boulders, or other considerations.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 0, flatwater habitat types had a mean shelter rating of 2, and pool habitats had a mean shelter rating of 8 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 12. Main channel pools had a mean shelter rating of 6 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in Dewarren Creek. Graph 7 describes the pool cover in Dewarren Creek. Undercut banks are 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 95% of the pool tail-outs. Small cobble was the next most frequently observed dominant substrate type and occurred in 4% of the pool tail-outs.

The mean percent canopy density for the surveyed length of Dewarren Creek was 98%. Two percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 54% and 46%, respectively. Graph 9 describes the mean percent canopy in Dewarren Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 98%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 91% sand/silt/clay, 8% cobble/gravel, and 1% bedrock (Graph 10). Brush was the dominant vegetation type observed in 42% of the units surveyed. Additionally, 30% of the units surveyed had coniferous trees as the dominant vegetation type, and 26% had deciduous trees as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Survey teams conducted a snorkel survey at 14 sites for species composition and distribution in Dewarren Creek on September 9, 2013. The sites were sampled by B. Leonard and M. Groff (CDFW).

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In Reach 1, which comprised the first 7,616 feet of stream, 14 sites were sampled. The reach sites yielded 12 young-of-the-year (YOY) steelhead/rainbow trout (SH/RT), seven age 1+ SH/RT, three age 2+ SH/RT, 38 YOY coho salmon, and three age 1+ coho salmon.

The following chart displays the information yielded from these sites:

2013 Dewarren Creek underwater observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: F4 Channel Type									
09/09/13	1	094	Run	3,013	0	0	0	15	0
	2	140	Pool	4,528	6	1	0	11	1
	3	155	Pool	4,938	5	2	1	8	2
	4	159	Pool	5,002	0	1	1	2	0
	5	166	Pool	5,202	0	0	0	0	0
	6	168	Pool	5,233	0	0	0	0	0
	7	180	Pool	5,553	0	0	0	1	0
	8	183	Pool	5,679	0	0	0	1	0
	9	202	Pool	6,162	0	1	0	0	0
	10	204	Pool	6,209	1	1	1	0	0
	11	207	Pool	6,267	0	0	0	0	0
	12	211	Pool	6,405	0	1	0	0	0
	13	217	Pool	6,543	0	0	0	0	0
	14	220	Pool	6,607	0	0	0	0	0

DISCUSSION

Dewarren Creek is an F4 channel type for the first 7,616 feet of stream surveyed and an A4 channel type for the remaining 3,287 feet. The suitability of F4 and A4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. A4 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey days July 16 to July 25, 2013 ranged from 55 to 58 degrees Fahrenheit. Air temperatures ranged from 53 to 68 degrees Fahrenheit. This is a suitable water temperature range for salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

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Flatwater habitat types comprised 35% of the total length of this survey, riffles 40%, and pools 24%. Fifteen of the 109 (14%) pools had a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended.

Ninety of the 109 pool tail-outs measured had embeddedness ratings of 1 or 2. Eighteen of the pool tail-outs had embeddedness ratings of 3 or 4. One of the pool tail-outs had a rating of 5, which is considered not suitable 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.

One hundred eight of the 109 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 8. The shelter rating in the flatwater habitats is 2. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by small woody debris in Dewarren Creek. Undercut banks are 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 98%. Reach 1 had a canopy density of 97% and Reach 2 had a canopy density of 99%. The percentage of right and left bank covered with vegetation was 98% and 97%, respectively.

RECOMMENDATIONS

- 1) Dewarren 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 undercut banks. Adding high quality complexity with woody cover in the pools is desirable.
- 4) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

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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 at the confluence with the North Fork Noyo River. The channel is an F4.
237	0010.00	Remnants of bridge posts in channel.
487	0017.00	An erosion site on the left bank measures 30' long x 10' high and is contributing fine sediment to the channel.
711	0024.00	Remnants of bridge posts in channel.
1851	0062.00	Tributary #01 enters on the right bank. It contributes approximately 10% to Dewarren Creek's flow. The water temperature of the tributary was 54 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 56 degrees Fahrenheit. The slope of the tributary is approximately 2%. There is a root wad barrier 200 feet upstream from the mouth, above which the channel goes dry. Coho were observed in the tributary.
2101	0068.00	Woody debris is accumulating on an alder that has fallen in to the channel.
2755	0090.00	A logging road crosses the channel. The crossing is a 14' wide x 53' long x 6.6' high railcar bridge with a wood beam surface. Both banks are bare below the bridge for approximately 6' high x 14' wide and are contributing fine sediment to the channel.
3039	0096.00	An erosion site on the right bank measures 8' high x 90' long and is contributing fine sediment to the channel.
3436	0102.00	An erosion site on the right bank measures 8' high x 30' long and is contributing fine sediment to the channel.
3519	0106.00	An erosion site on the left bank measures 35' long x 10' high and is contributing fine sediment to the channel.
4340	0135.00	An erosion site on the right bank measures 50' long x 8' high and is contributing fine sediment to the channel.
4528	0141.00	Site of old road crossing.

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- 4918 0155.00 Log debris accumulation (LDA) #01 contains two pieces of large woody debris (LWD) and measures 3.5' high x 20' wide x 2' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 10' wide x 30' long x 1' deep. There is a 2.6' high plunge over the LDA; the water is currently flowing underneath the mass of the LDA. Fish were observed above the LDA.
- 5233 0169.00 Left bank erosion site measures 60' long x 7' high and is contributing fine sediment to the channel.
- 5940 0193.00 Tributary #02 enters on the right bank. It contributes approximately 35% to Dewarren Creek's flow. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 56 degrees Fahrenheit. The slope of the tributary is approximately 3%. The tributary is accessible to salmonids, but no fish were observed.
- 6153 0202.00 There is a 1.8' high plunge over log.
- 6246 0207.00 LDA #02 contains six pieces of LWD and measures 4' high x 14' wide x 8' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 6' wide x 10' long x 1.5' deep. Fish were observed above the LDA.
- 6530 0217.00 Fish observed. Remnants of burned railroad trestle on right bank.
- 6644 0224.00 LDA #03 contains four pieces of LWD and measures 4.5' high x 17' wide x 5' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 6' wide x 20' long x 2' deep. The water is currently flowing through the sediment accumulated upstream of the LDA, not over the LDA. Fish were observed above the LDA.
- 6854 0234.00 Tributary #03 enters on the left bank. It contributes approximately 20% to Dewarren Creek's flow. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 56 degrees Fahrenheit. The slope of the tributary is approximately 4%. The channel is narrow and choked with debris and there is not much flow. The tributary is accessible to salmonids, but no fish were observed.
- 6904 0237.00 Fish observed.
- 7194 0253.00 Tributary #04 enters on the left bank. The first 20 feet are dry, and then the channel is intermittently dry. The water temperature of the tributary was 56 degrees Fahrenheit; the water temperature downstream and upstream of the tributary was 57 degrees Fahrenheit. The slope of the

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tributary is approximately 7%. The channel is narrow and there are multiple debris accumulations. There is also logging hardware in the tributary.

7366	0259.00	Left bank erosion site measures 20' long x 8' high and is contributing fine sediment to the channel.
7591	0266.00	Fish observed.
7616	0267.00	The channel changes from an F4 to an A4.
8063	0283.00	Fish observed.
8291	0293.00	The water is flowing underneath a 3' diameter log embedded in the channel.
8345	0295.00	Right bank seep.
8567	0307.00	There is a 3' high plunge over a log. The water is currently flowing through the sediment upstream of the log.
8673	0313.00	A 3' diameter log lies perpendicular to the channel. On the left bank side of the channel there is a dry 5' high plunge over the log into a pool. The water is currently flowing on the right bank side of the channel, beneath the log, along a high gradient riffle.
8730	0317.00	Dry right bank tributary.
8974	0329.00	Left bank seep.
9165	0335.00	Dry left bank tributary.
9285	0339.00	There is a 4' high plunge over woody debris.
9506	0347.00	There is a 4.2' high plunge over log.
9591	0352.00	Dry left bank tributary.
9917	0363.00	Dry right bank tributary. An erosion site on the left bank measures 17' long x 8' high and is contributing fine sediment to the channel.
10024	0366.00	There is a 2.5' high plunge over log.
10260	0376.00	LDA #04 contains four pieces of LWD and measures 4' high x 22' wide x 14' long. Water flows through the LDA and there are no visible gaps in it. Retained sediment ranges from silt to gravel and measures 6' wide x 40' long x 3' deep. There is a 4' high plunge over the LDA; the water

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is currently seeping through the sediment upstream of the LDA. Fish not observed above the LDA.

- | | | |
|-------|---------|--|
| 10383 | 0380.00 | There is a 1.5' high plunge over log. |
| 10537 | 0384.00 | There is a 3' high plunge over log. |
| 10683 | 0385.00 | There is a 2.5' high plunge over sediment. |
| 10742 | 0387.00 | There is a 4' high plunge over small woody debris and sediment. |
| 10812 | 0392.00 | There is a 4' high plunge over boulders and woody debris. |
| 10842 | 0393.00 | There is a 3.5' high plunge over small woody debris. |
| 10891 | 0395.00 | End of survey at 8' high plunge. The roots from redwood trees (live tree on left bank, stump on right bank) have grown in to the channel and accumulated sediment, creating an 8' high plunge. The channel is dry upstream of the plunge for approximately 60 feet. Not many pools were encountered in the last 3,500 feet of the survey. The last fish was observed around Habitat Unit #284, approximately 2,780 feet downstream of the end of survey point. |

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: Dewarren Creek

LLID: 1235524394765 Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Confluence Location: Quad: SHERWOOD PEAK Legal Description: T19NR15WS29 Latitude: 39:28:35.0N Longitude: 123:33:09.0W

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
5	0	DRY	1.3	23	116	1.1									
127	11	FLATWATER	32.2	30	3832	35.1	5.5	0.4	0.8	149	18928	60	7659		2
109	109	POOL	27.6	24	2570	23.6	8.2	0.8	1.5	193	21083	185	20167	155	8
154	18	RIFFLE	39.0	28	4385	40.2	4.8	0.1	0.4	106	16331	15	2304		0
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
395	138				10903					56341			30130		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Dewarren Creek

LLID: 1235524394765

Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Confluence Location: Quad: SHERWOOD PEAK Legal Description: T19NR15WS29 Latitude: 39:28:35.0N Longitude: 123:33:09.0W

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 (%)
118	11	LGR	29.9	27	3223	29.6	6	0.1	0.6	119	14025	15	1798		0	98
36	7	HGR	9.1	32	1162	10.7	3	0.1	0.6	86	3093	15	523		0	98
82	8	RUN	20.8	21	1733	15.9	6	0.4	1.1	155	12677	66	5398		3	97
45	3	SRN	11.4	47	2099	19.3	4	0.3	0.9	134	6039	46	2051		0	99
67	67	MCP	17.0	27	1819	16.7	8	0.8	3	223	14934	215	14416	179	6	97
4	4	CRP	1.0	21	83	0.8	8	0.7	1.7	166	665	152	610	126	5	99
11	11	LSL	2.8	14	159	1.5	9	0.6	2.3	130	1428	91	1006	73	24	99
13	13	LSR	3.3	24	309	2.8	7	0.8	1.9	168	2183	155	2016	128	10	98
4	4	LSBk	1.0	19	76	0.7	6	0.6	1.8	128	513	107	428	84	4	98
10	10	PLP	2.5	12	124	1.1	10	1.0	2.7	136	1360	169	1691	155	7	97
5	0	DRY	1.3	23	116	1.1										99

Total Units
395

Total Units Fully Measured
138

Total Length (ft.)
10903

Total Area (sq.ft.)
56917

Total Volume (cu.ft.)
29937

Table 3 - Summary of Pool Types

Stream Name: Dewarren Creek

LLID: 1235524394765

Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR15WS29

Latitude: 39:28:35.0N

Longitude: 123:33:09.0W

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
67	67	MAIN	61	27	1819	71	8.1	0.8	223	14934	179	12009	6
42	42	SCOUR	39	18	751	29	8.2	0.7	146	6149	116	4854	12

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
109	109	2570	21082	16863

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

Stream Name: Dewarren Creek

LLID: 1235524394765

Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Confluence Location: Quad: SHERWOOD PEAK Legal Description: T19NR15WS29 Latitude: 39:28:35.0N Longitude: 123:33:09.0W

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
67	MCP	61	2	3	54	81	10	15	1	1	0	0
4	CRP	4	0	0	4	100	0	0	0	0	0	0
11	LSL	10	0	0	10	91	1	9	0	0	0	0
13	LSR	12	0	0	13	100	0	0	0	0	0	0
4	LSBk	4	0	0	4	100	0	0	0	0	0	0
10	PLP	9	0	0	7	70	3	30	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
109	2	2	92	84	14	13	1	1	0	0

Mean Maximum Residual Pool Depth (ft.): 1.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Dewarren Creek

LLID: 1235524394765

Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Dry Units: 5

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR15WS29

Latitude: 39:28:35.0N

Longitude: 123:33:09.0W

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
118	11	LGR	0	0	0	0	0	0	0	0	0
36	7	HGR	0	0	0	0	0	0	0	0	0
154	18	TOTAL RIFFLE	0	0	0	0	0	0	0	0	0
82	8	RUN	0	73	27	0	0	0	0	0	0
45	3	SRN	0	0	0	0	0	0	0	0	0
127	11	TOTAL FLAT	0	73	27	0	0	0	0	0	0
67	67	MCP	37	32	28	0	2	0	0	0	0
4	4	CRP	35	65	0	0	0	0	0	0	0
11	11	LSL	5	40	55	0	0	0	0	0	0
13	13	LSR	56	32	4	9	0	0	0	0	0
4	4	LSBk	80	0	20	0	0	0	0	0	0
10	10	PLP	19	24	58	0	0	0	0	0	0
109	109	TOTAL POOL	35	33	29	1	1	0	0	0	0
395	138	TOTAL	34	35	29	1	1	0	0	0	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Dewarren Creek

LLID: 1235524394765

Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Dry Units: 5

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR15WS29

Latitude: 39:28:35.0N

Longitude: 123:33:09.0W

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
118	11	LGR	0	0	91	9	0	0	0
36	7	HGR	0	0	86	14	0	0	0
82	8	RUN	0	0	100	0	0	0	0
45	3	SRN	0	0	100	0	0	0	0
67	67	MCP	0	6	93	0	0	1	0
4	4	CRP	0	0	100	0	0	0	0
11	11	LSL	0	9	91	0	0	0	0
13	13	LSR	0	0	100	0	0	0	0
4	4	LSBk	0	0	100	0	0	0	0
10	10	PLP	0	20	80	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Dewarren Creek

LLID: 1235524394765

Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR15WS29

Latitude: 39:28:35.0N

Longitude: 123:33:09.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
98	46	54	0	98	97

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Dewarren Creek LLID: 1235524394765 Drainage: Noyo River
 Survey Dates: 7/16/2013 to 7/25/2013 Survey Length (ft.): 10903 Main Channel (ft.): 10903 Side Channel (ft.): 0
 Confluence Location: Quad: SHERWOOD PEAK Legal Description: T19NR15WS29 Latitude: 39:28:35.0N Longitude: 123:33:09.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4	Canopy Density (%): 97.3	Pools by Stream Length (%): 31.1
Reach Length (ft.): 7616	Coniferous Component (%): 38.1	Pool Frequency (%): 33.8
Riffle/Flatwater Mean Width (ft.): 5.5	Hardwood Component (%): 61.9	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Brush	< 2 Feet Deep: 84
Range (ft.): 8 to 21	Vegetative Cover (%): 97.6	2 to 2.9 Feet Deep: 14
Mean (ft.): 14	Dominant Shelter: Small Woody Debris	3 to 3.9 Feet Deep: 1
Std. Dev.: 3	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.1	Occurrence of LWD (%): 17	Mean Max Residual Pool Depth (ft.): 1.5
Water (F): 56 - 58 Air (F): 53 - 68	LWD per 100 ft.:	Mean Pool Shelter Rating: 9
Dry Channel (ft): 0	Riffles: 1	
	Pools: 5	
	Flat: 2	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 96 Sm Cobble: 4 Lg Cobble: 0 Boulder: 0 Bedrock: 0		
Embeddedness Values (%): 1. 45.6 2. 37.8 3. 16.7 4. 0.0 5. 0.0		

STREAM REACH: 2

Channel Type: A4	Canopy Density (%): 98.8	Pools by Stream Length (%): 6.1
Reach Length (ft.): 3287	Coniferous Component (%): 67.2	Pool Frequency (%): 14.7
Riffle/Flatwater Mean Width (ft.): 4.2	Hardwood Component (%): 32.8	Residual Pool Depth (%):
BFW:	Dominant Bank Vegetation: Coniferous Trees	< 2 Feet Deep: 95
Range (ft.): 4 to 13	Vegetative Cover (%): 97.4	2 to 2.9 Feet Deep: 5
Mean (ft.): 9	Dominant Shelter: Large Woody Debris	3 to 3.9 Feet Deep: 0
Std. Dev.: 2	Dominant Bank Substrate Type: Sand/Silt/Clay	>= 4 Feet Deep: 0
Base Flow (cfs.): 0.1	Occurrence of LWD (%): 15	Mean Max Residual Pool Depth (ft.): 1.4
Water (F): 55 - 57 Air (F): 58 - 68	LWD per 100 ft.:	Mean Pool Shelter Rating: 5
Dry Channel (ft): 116	Riffles: 4	
	Pools: 10	
	Flat: 6	
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 95 Sm Cobble: 0 Lg Cobble: 0 Boulder: 5 Bedrock: 0		
Embeddedness Values (%): 1. 52.6 2. 26.3 3. 15.8 4. 0.0 5. 5.3		

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Dewarren Creek

LLID: 1235524394765

Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Confluence Location: Quad: SHERWOOD PEAK

Legal Description: T19NR15WS29

Latitude: 39:28:35.0N

Longitude: 123:33:09.0W

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	2	1	1.1
Boulder	0	0	0.0
Cobble / Gravel	10	12	8.0
Sand / Silt / Clay	126	125	90.9

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	1	0	0.4
Brush	53	63	42.0
Hardwood Trees	40	43	30.1
Coniferous Trees	41	32	26.4
No Vegetation	3	0	1.1

Total Stream Cobble Embeddedness Values:

2

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

StreamName: Dewarren Creek

LLID: 1235524394765

Drainage: Noyo River

Survey Dates: 7/16/2013 to 7/25/2013

Confluence Location: Quad: SHERWOOD PEAK

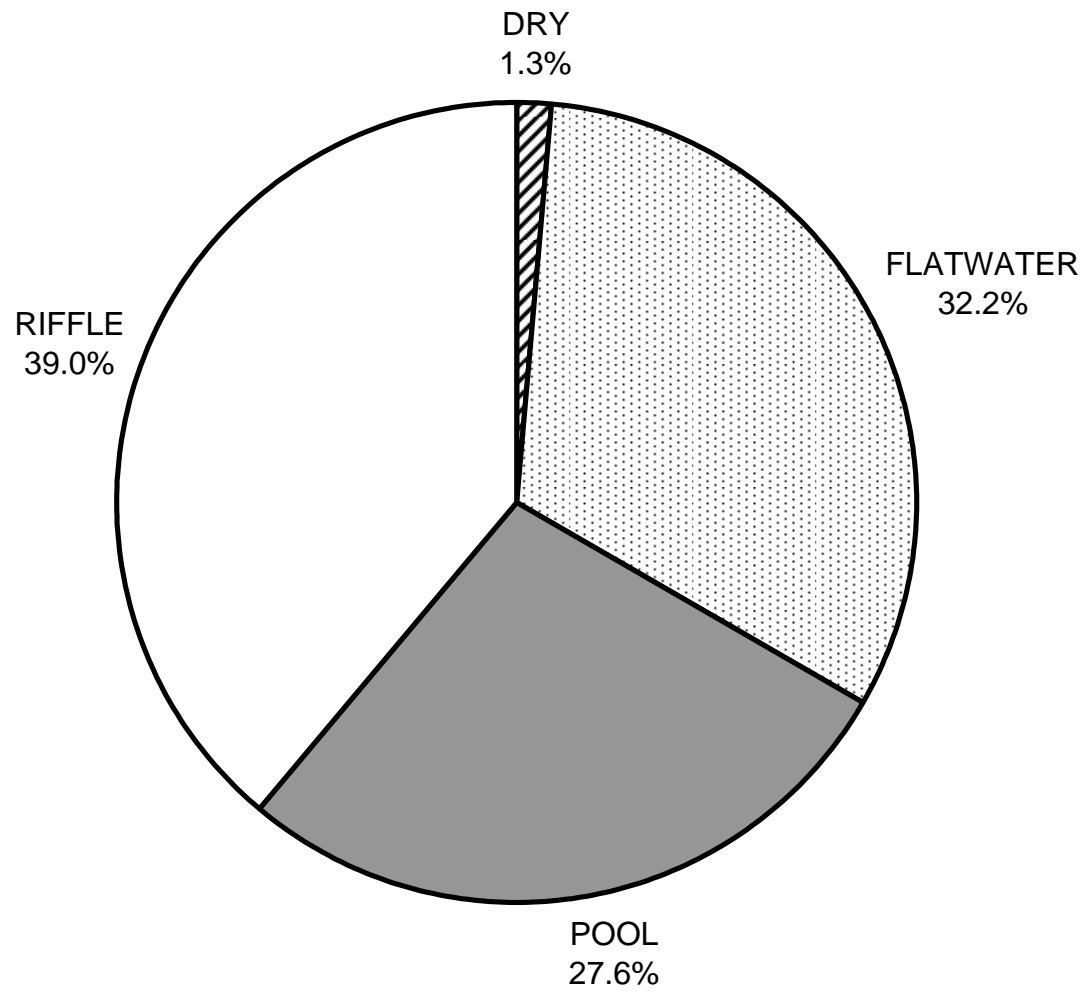
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Longitude: 123:33:09.0W

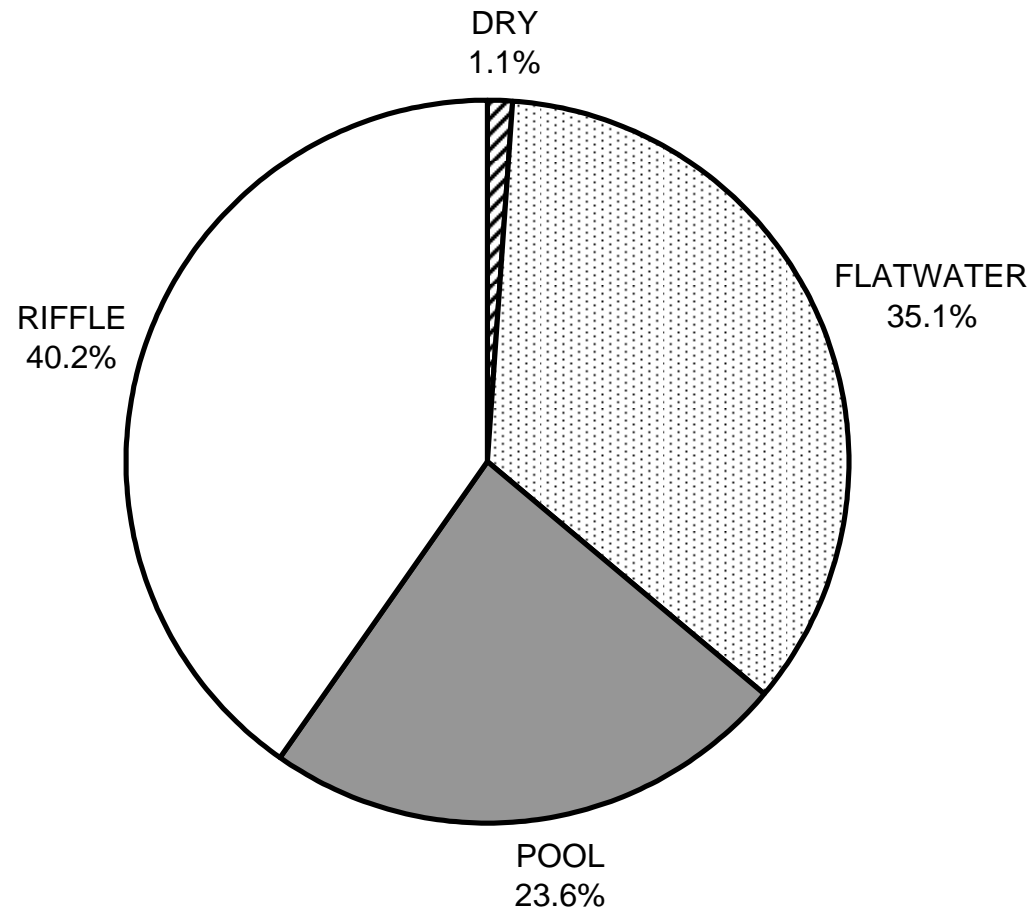
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	35
SMALL WOODY DEBRIS (%)	0	73	33
LARGE WOODY DEBRIS (%)	0	27	29
ROOT MASS (%)	0	0	1
TERRESTRIAL VEGETATION (%)	0	0	1
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	0	0	0
BEDROCK LEDGES (%)	0	0	0

DEWARREN CREEK 2013 HABITAT TYPES BY PERCENT OCCURRENCE



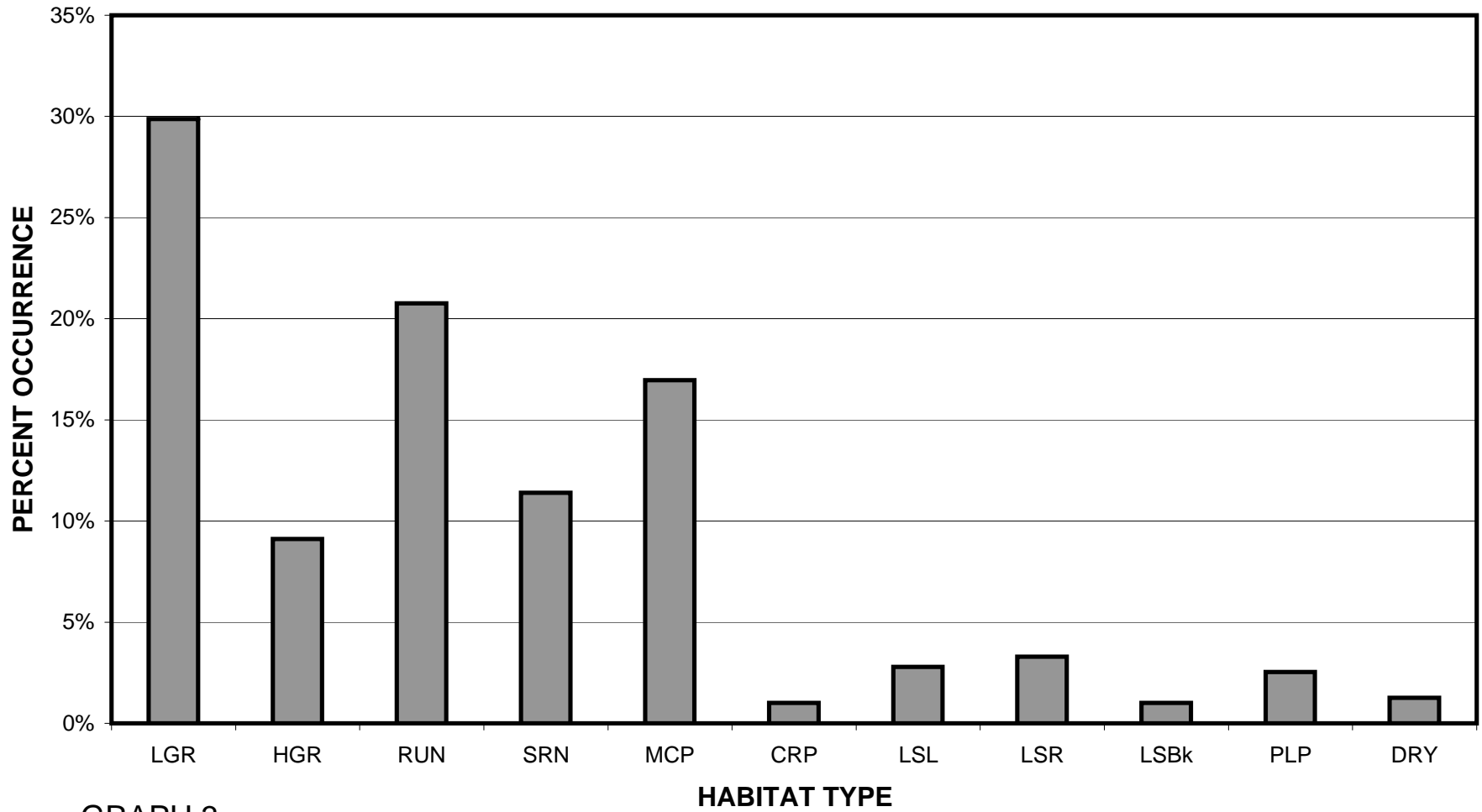
GRAPH 1

DEWARREN CREEK 2013 HABITAT TYPES BY PERCENT TOTAL LENGTH



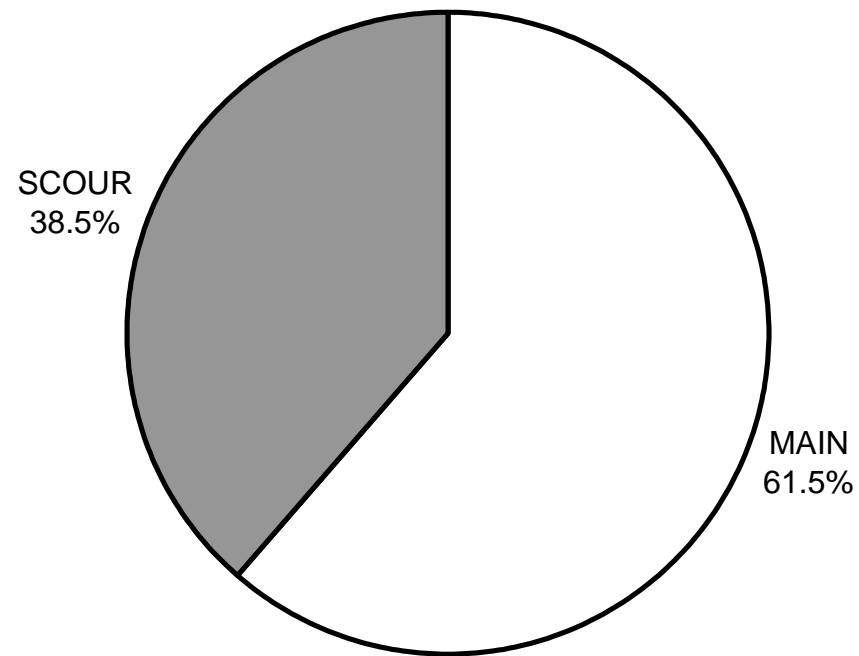
GRAPH 2

DEWARREN CREEK 2013 HABITAT TYPES BY PERCENT OCCURRENCE



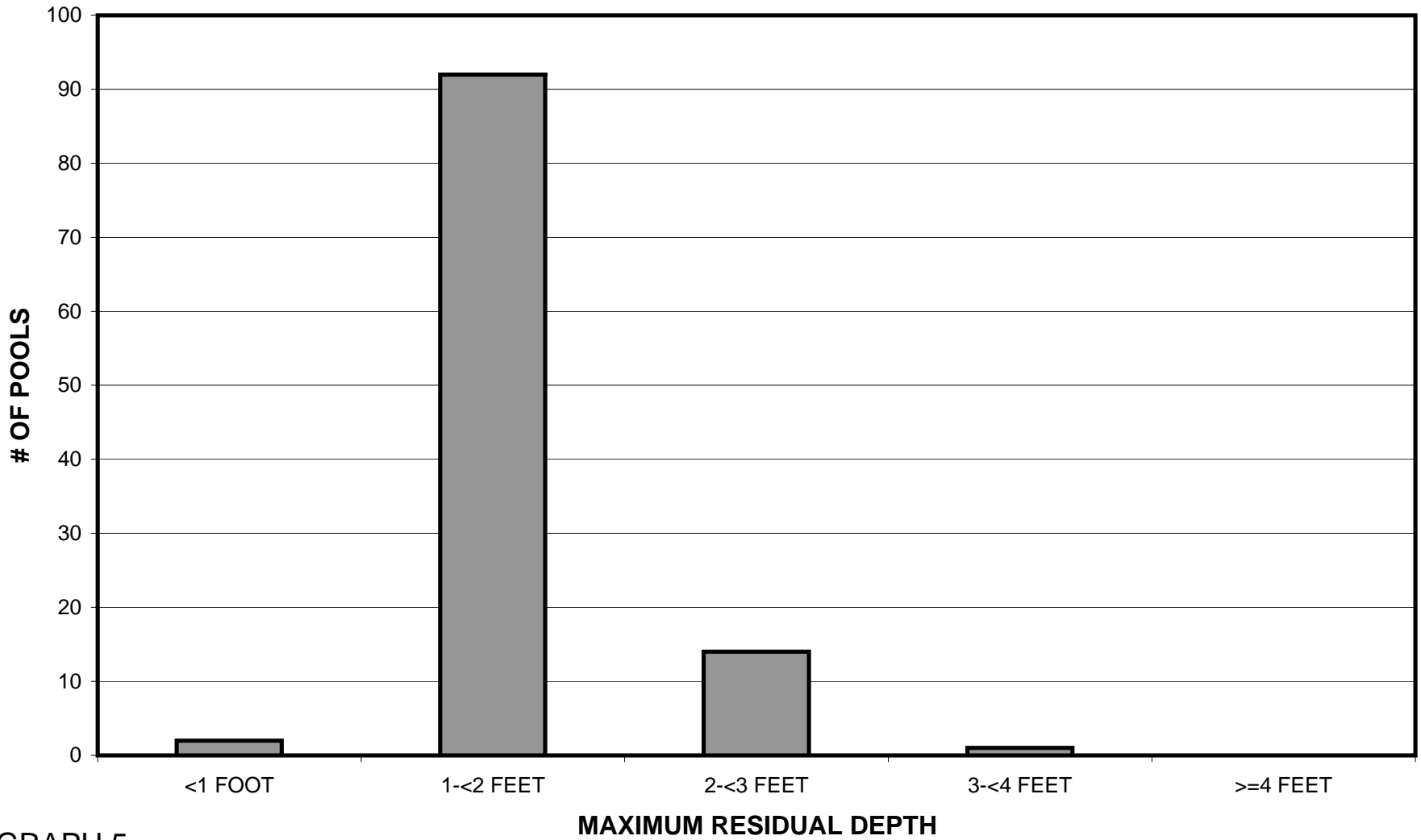
GRAPH 3

DEWARREN CREEK 2013 POOL TYPES BY PERCENT OCCURRENCE



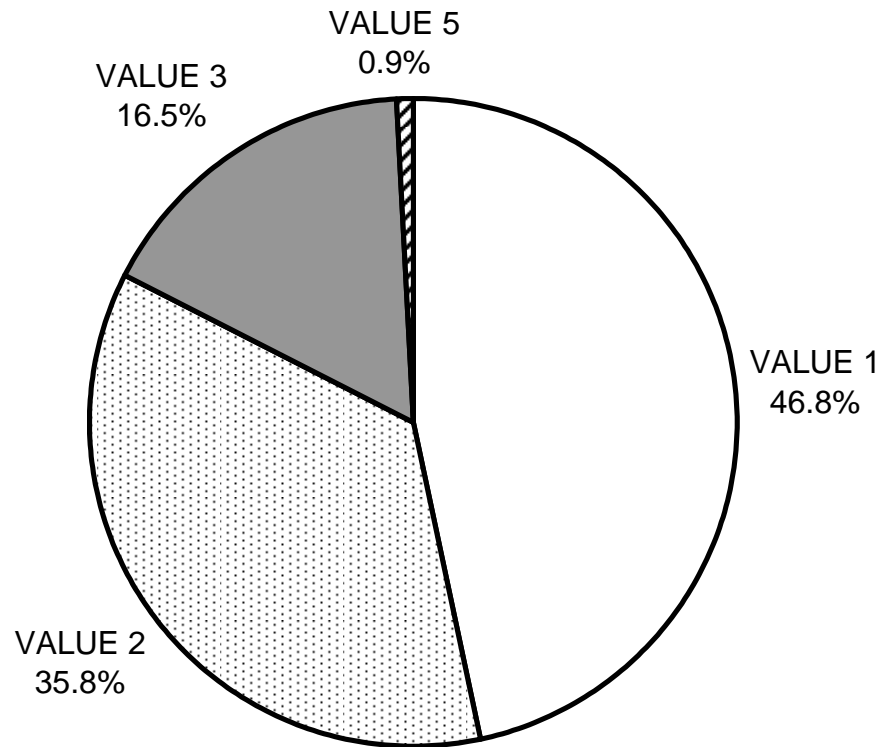
GRAPH 4

DEWARREN CREEK 2013 MAXIMUM DEPTH IN POOLS



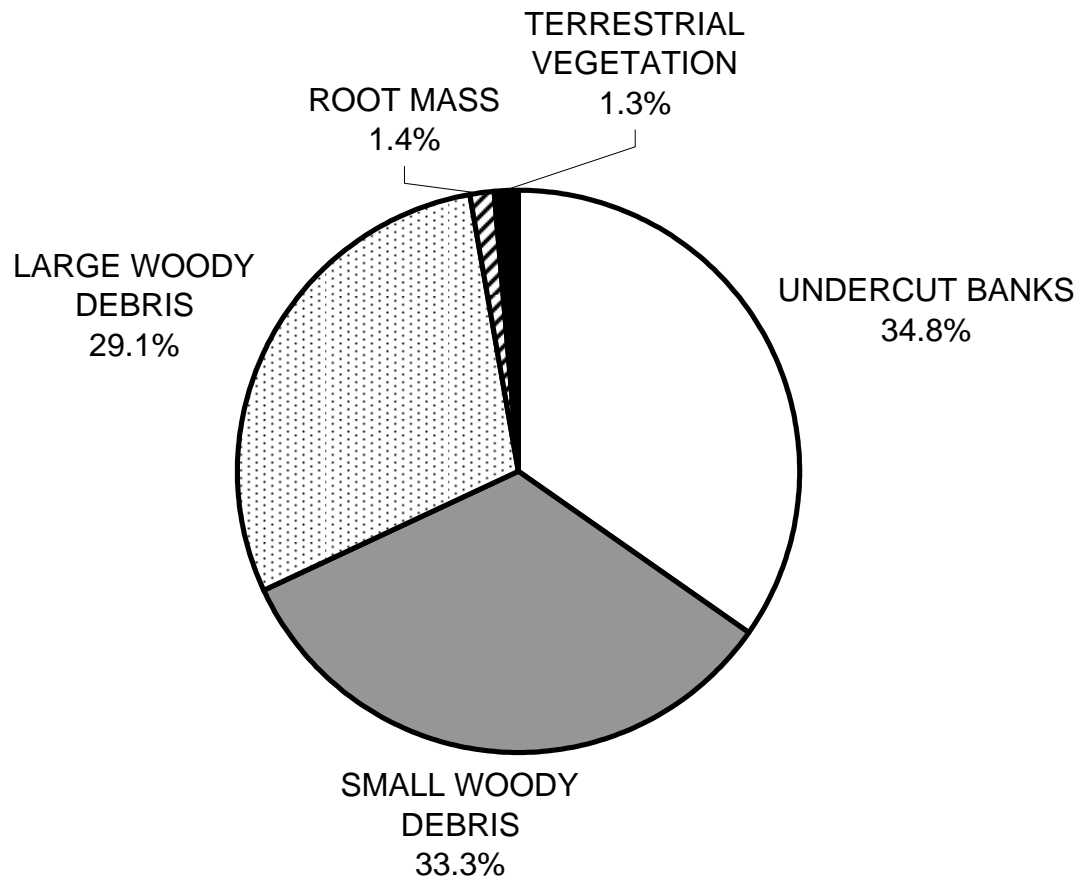
GRAPH 5

DEWARREN CREEK 2013 PERCENT EMBEDDEDNESS



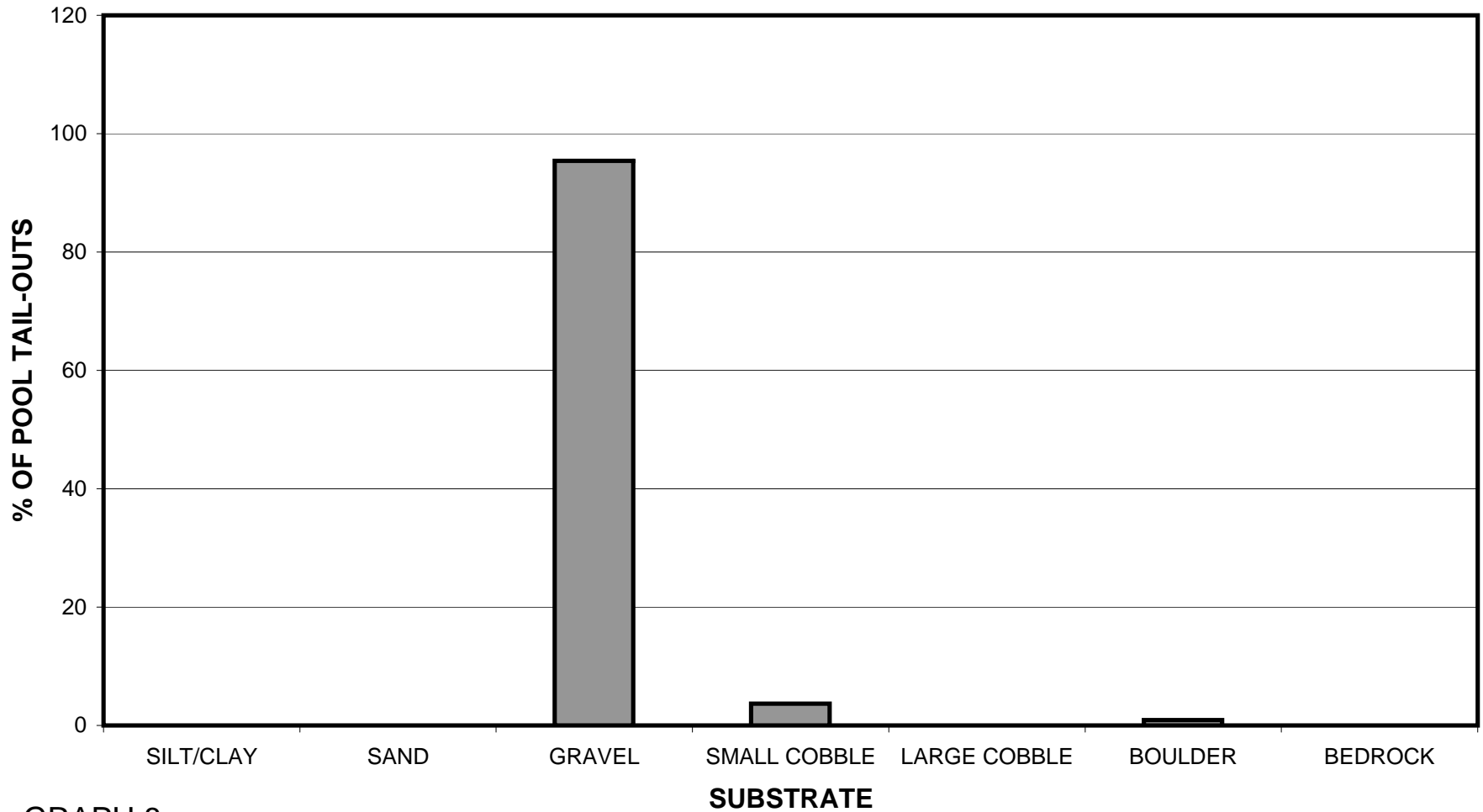
GRAPH 6

DEWARREN CREEK 2013 MEAN PERCENT COVER TYPES IN POOLS



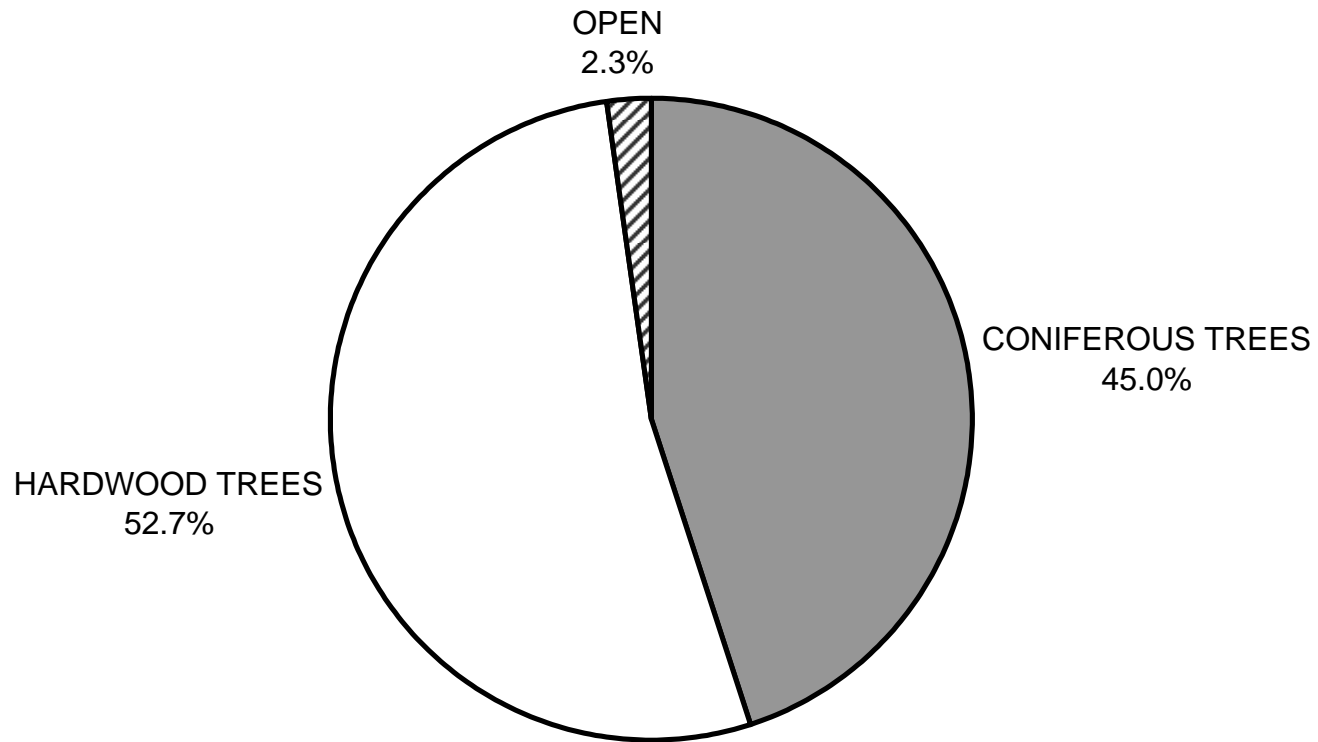
GRAPH 7

DEWARREN CREEK 2013 SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



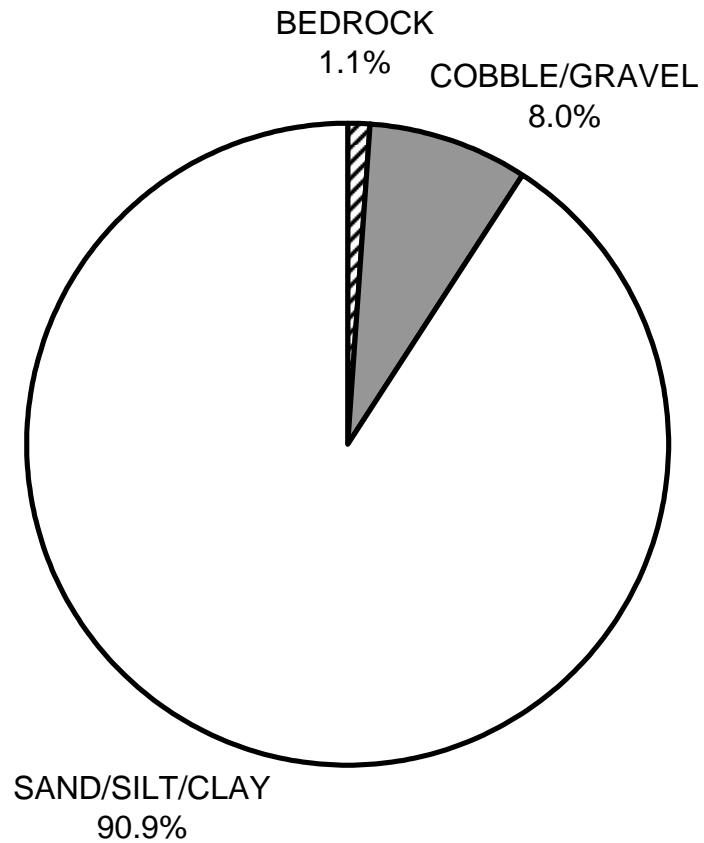
GRAPH 8

DEWARREN CREEK 2013 MEAN PERCENT CANOPY



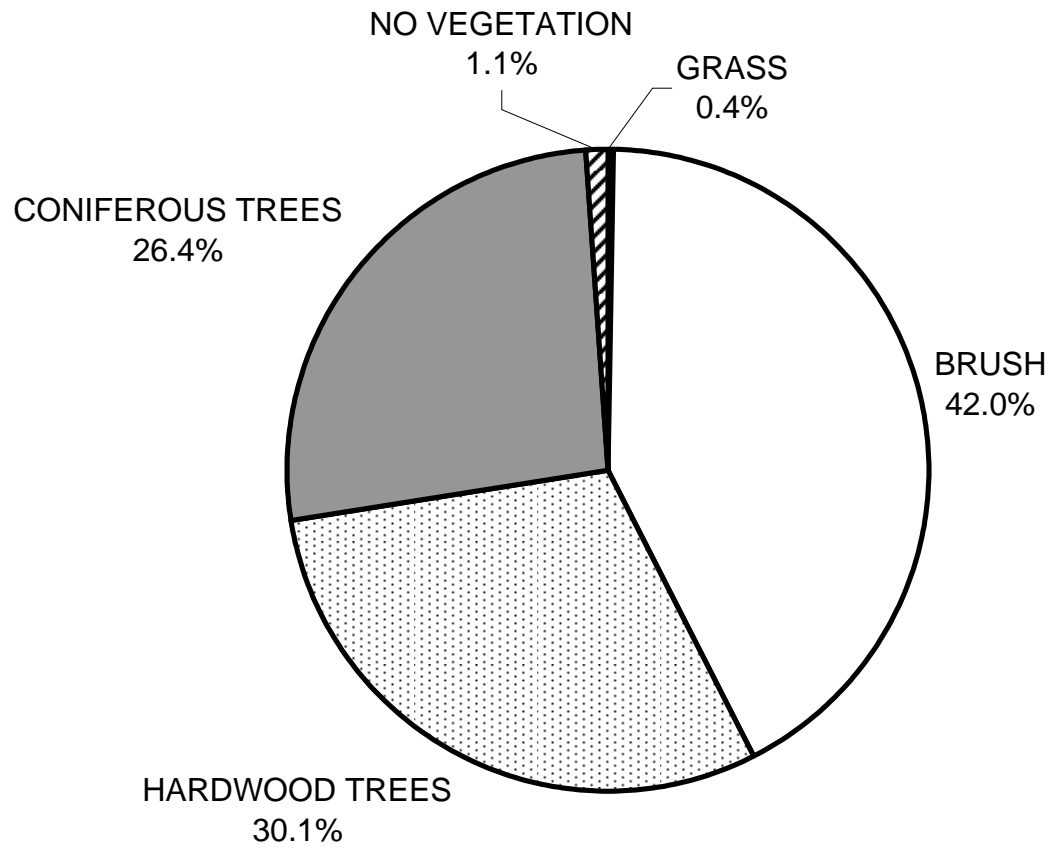
GRAPH 9

DEWARREN CREEK 2013 DOMINANT BANK COMPOSITION IN SURVEY REACH



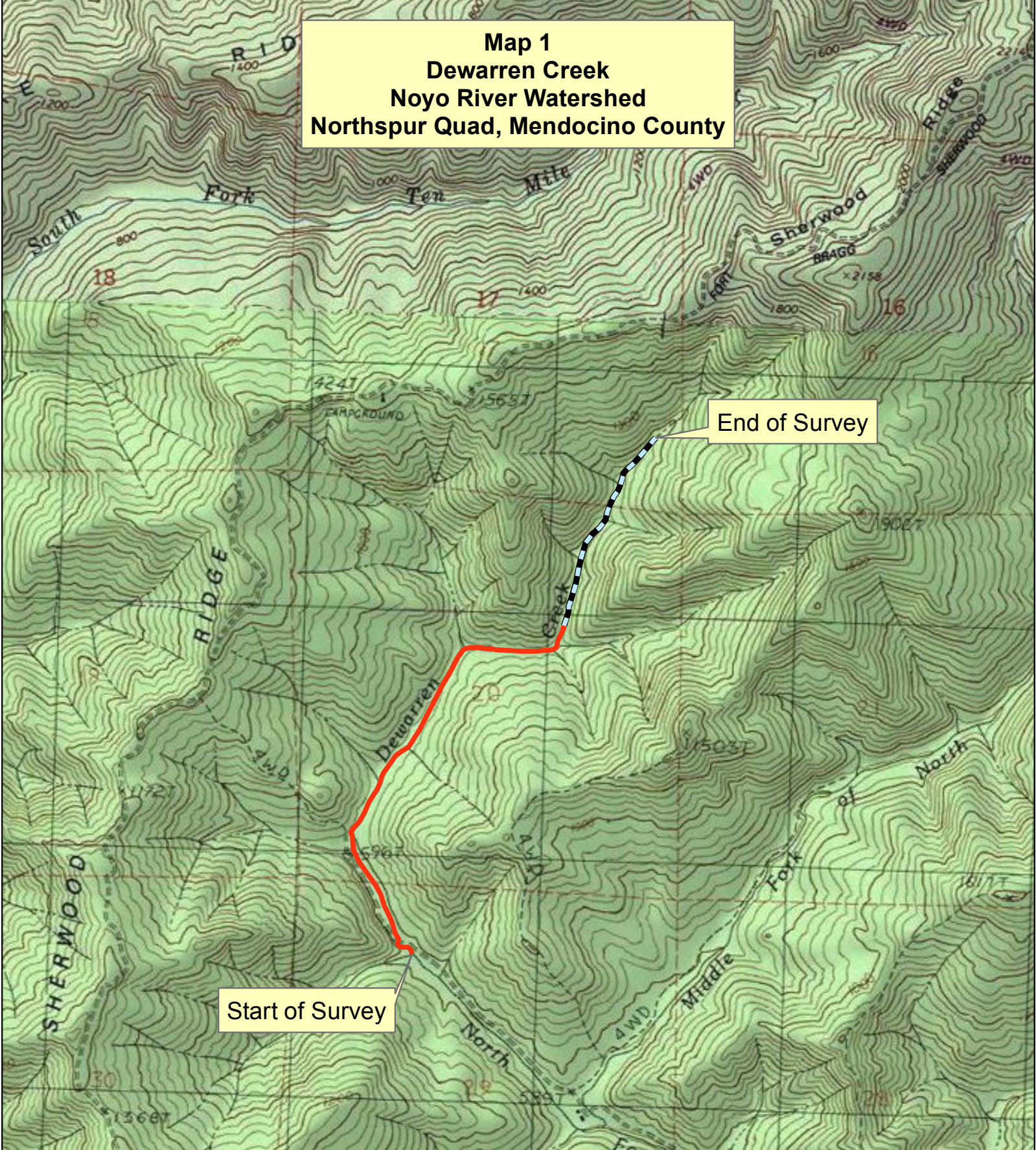
GRAPH 10

DEWARREN CREEK 2013 DOMINANT BANK VEGETATION IN SURVEY REACH



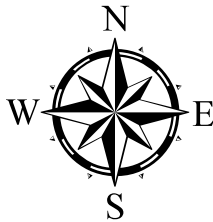
GRAPH 11

**Map 1
Dewarren Creek
Noyo River Watershed
Northspur Quad, Mendocino County**



Start of Survey

End of Survey



- Reach 1, Channel Type F4
- - - Reach 2, Channel Type A4

