

# **STREAM INVENTORY REPORT**

## **Milk Ranch Creek**

### INTRODUCTION

A stream inventory was conducted during July 16, 2007 to July 25, 2007 on Milk Ranch Creek. The survey began at the confluence with South Fork Eel River and extended upstream 1.5 miles.

The Milk Ranch 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 Milk Ranch 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

Milk Ranch Creek is a tributary to South Fork Eel River, tributary to Eel River which drains to the Pacific Ocean, located in Humboldt County, California (Map 1). Milk Ranch Creek's legal description at the confluence with South Fork Eel River is T5S R3E S24. Its location is 40.0041 north latitude and 123.7778 west longitude, LLID number 1237767400042. Milk Ranch Creek is a first order stream and has approximately 2.4 miles of blue line stream according to the USGS Garberville 7.5 minute quadrangle. Milk Ranch Creek drains a watershed of approximately 2.3 square miles. Elevations range from about 456 feet at the mouth of the creek to 1,400 feet in the headwater areas. Mixed conifer and mixed deciduous forest dominates the watershed. The watershed is entirely privately owned and is managed for rangeland. Vehicle access exists via Highway 101; take the Highway 271/Cooks Valley Exit; go east on Cooks Valley Road/Highway 271. Milk Ranch Creek is due east on the other side of the South Fork Eel River. Other access may be obtained on Road 442d.

### METHODS

The habitat inventory conducted in Milk Ranch Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors 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.

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### SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

### 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 Milk Ranch 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". Milk Ranch 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 Milk Ranch 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 Milk Ranch 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 Milk Ranch 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 Milk Ranch 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 Milk Ranch Creek. In addition, underwater observations were made at 24 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 Milk Ranch 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, 2007 to July 25, 2007, was conducted by I. Mikus, and S. McSmith (DFG). The total length of the stream surveyed was 7,999 feet with an additional 172 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.08 cfs on July 16, 2007.

Milk Ranch Creek is a G3 channel type for 4,085 feet of the stream surveyed (Reach 1), and an A2 channel type for the final 3,914 feet of the stream surveyed (Reach 2). G3 channel types are entrenched “gully” step-pool streams with low width/depth ration on moderate gradient and cobble-dominant substrates. A2 channels types are steep, narrow, cascading, step-pool streams with high energy/debris transport associated with depositional soils and boulder-dominant substrates.

Water temperatures taken during the survey period ranged from 58 to 68 degrees Fahrenheit. Air temperatures ranged from 60 to 78 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 43% riffle units, 32% pool units, 23% flatwater units, 2% dry units, 0.4% no-survey units (Graph 1). Based on total length of Level II habitat types there were 53% riffle units, 25% flatwater units, 17% pool units, 4% dry units, and 0.1% no-survey units (Graph 2).

Thirteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 25% high gradient riffle units, 21% mid-channel pool units, and 17% low gradient riffle units (Graph 3). Based on percent total length, high gradient riffle units made up 31%, low gradient riffle units 22%, and step run units 17%.

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A total of 73 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 71% (Graph 4), and comprised 75% 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-five of the 73 pools (34%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 73 pool tail-outs measured, 13 had a value of 1 (17.8%); 14 had a value of 2 (19.2%); 11 had a value of 3 (15.1%); 12 had a value of 4 (16.4%); 23 had a value of 5 (31.5%) (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 6, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 18 (Table 1). Of the pool types, the scour pools had a mean shelter rating of 31 and the main channel pools had a mean shelter rating of 13 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Milk Ranch Creek. Graph 7 describes the pool cover in Milk Ranch Creek. Boulders are the dominant pool cover type followed by root mass.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in 38% of pool tail-outs, and boulders were observed in 32% of pool tail-outs.

The mean percent canopy density for the surveyed length of Milk Ranch Creek was 79%. Twenty-one percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 86% and 14%, respectively. Graph 9 describes the mean percent canopy in Milk Ranch Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 90%. The mean percent left bank vegetated was 94%. The dominant elements composing the structure of the stream banks consisted of 36% cobble/gravel, 30% boulder, 24% bedrock, and 10% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 71% of the units surveyed. Additionally, 11% of the units surveyed had brush as the dominant vegetation type, 8% had grass as the dominant vegetation, and 7% had coniferous trees (Graph 11).

## **BIOLOGICAL INVENTORY RESULTS**

Twenty-four sites were surveyed by mask and snorkel for species composition and distribution in Milk Ranch Creek on September 26, 2007. Water temperatures taken during the survey period 0925-1315 hours ranged from 56 to 60 degrees Fahrenheit. Air temperatures ranged from 46 to 54 degrees Fahrenheit. The sites were sampled by P. Divine, I. Mikus, and S. McSmith (DFG).

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In reach 1, which comprised the first 4,085 feet of stream, 13 sites were sampled. The reach sites yielded 127 young-of-the-year steelhead/rainbow trout (SH/RT), 14 age 1+ SH/RT and 1 age 2+ SH/RT, and 1 coho.

In reach 2, 11 sites were sampled starting approximately from the confluence with 4,085 ft and continuing upstream 3,914 feet. The reach sites yielded 66 young-of-the-year SH/RT, 9 age 1+ SH/RT, and 1 age 2+ SH/RT.

The following chart displays the information yielded from these sites:

### 2007 Milk Ranch Creek Underwater Observations.

Date	Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
Reach 1: G3 Channel Type									
07/16/07	1	004	4.2	296	1	0	6	0	0
07/16/07	2	008	4.2	499	0	0	2	4	0
07/16/07	3	010	4.2	580	0	0	12	1	1
07/16/07	4	012	4.2	618	0	0	12	3	0
07/16/07	5	025	5.5	1479	0	0	2	2	0
07/16/07	6	028	4.2	1613	0	0	10	0	0
07/16/07	7	037	4.2	1940	0	0	14	1	0
07/16/07	8	053	4.2	2484	0	0	11	2	0
07/16/07	9	055	4.2	2590	0	0	8	0	0
07/16/07	10	056	4.2	2605	0	0	15	0	0
07/16/07	11	068	4.2	3070	0	0	19	1	0
07/19/07	12	086	4.2	3659	0	0	9	0	0
07/19/07	13	097	4.2	3978	0	0	7	0	0
Reach 2: A2 Channel Type									
07/19/07	14	117	4.2	4495	0	0	3	1	0
07/19/07	15	119	4.2	4543	0	0	2	0	0
07/19/07	16	128	5.6	4763	0	0	12	3	0

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Date	Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	Coho		SH/RT		
					YOY	1+	YOY	1+	2+
07/23/07	17	134	4.2	4956	0	0	7	2	0
07/23/07	18	138	4.2	5085	0	0	21	0	0
07/23/07	19	148	4.2	5360	0	0	6	0	0
07/23/07	20	163	5.6	5876	0	0	10	2	1
07/25/07	21	219	4.2	7832	0	0	4	0	0
07/25/07	22	221	4.2	7874	0	0	1	0	0
07/25/07	23	223	5.6	7927	0	0	0	1	0
07/25/07	24	224	5.6	7939	0	0	0	0	0

## DISCUSSION

Milk Ranch Creek is a G3 channel type for the first 4,085 feet of stream surveyed and A2 channel type for the remaining 3,914 feet. The suitability of G3 and A2 channel types for fish habitat improvement structures is as follows: G3 channels are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover. A2 channels are generally not suitable for fish habitat improvement structures. They are high energy streams with stable stream banks, and have poor gravel retention capabilities.

The water temperatures recorded on the survey days July 16, 2007 to July 25, 2007 ranged from 58 to 68 degrees Fahrenheit. Air temperatures ranged from 60 to 78 degrees Fahrenheit. To make any further 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 25% of the total length of this survey, riffles 53%, and pools 17%. The pools are relatively shallow, with only 25 of the 73 (34%) 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. Installing structures that will increase or deepen pool habitat is recommended for Reach 1.

Twenty-seven of the 73 pool tail-outs measured had embeddedness ratings of 1 or 2. Twenty-three of the pool tail-outs had embeddedness ratings of 3 or 4. Twenty-three 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



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salmon and steelhead. Sediment sources in Milk Ranch Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Thirty-four of the 73 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 18. The shelter rating in the flatwater habitats was 9. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in Milk Ranch Creek. Boulders are the dominant cover type in pools followed by root mass. 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 79%. Reach 1 had a canopy density of 76.3%, Reach 2 had a canopy density of 80.7%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was high at 90% and 94%, 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) Milk Ranch 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) In Reach 1, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- 4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover in the pools is from boulders. Adding high quality complexity with woody cover in the pools is desirable.
- 5) 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.
- 6) 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	0001.00	Survey began at the confluence with the South Fork Eel River. The first 100' + was dry.
163	0003.00	There were 50+ young-of-the-year (YOY) salmonids observed in this unit.
296	0004.00	There was erosion on the right bank contributing fines through small cobble, as well as one fir tree.
296	0004.00	There was a 4" pike minnow observed.
499	0008.00	There was right bank erosion contributing silt to small cobble as well as a tree.
971	0019.00	Adult salmonid bones were found on the right bank.
1292	0022.00	There was a left bank slide 20' long x 30' high contributing all types of substrate to the creek.
1995	0039.00	Log debris accumulation (LDA) #1 was made up of six logs. It was 5.3' high, 23' wide and 6' long. It had visible gaps and water was flowing through. It had retained sediment ranging in size from gravel to boulder that measured 3' deep, 15' wide and 20' long. Fish were observed upstream of the LDA.
2590	0055.00	There was a left bank slide measuring 50' high x 20' long contributing silt to gravel to the stream channel.
2680	0060.00	Throughout this habitat unit the channel is braided into 3 trickling channels.
857	0090.00	There was a boulder plunge 1.5' tall at the top of this unit.
3868	0091.00	There was a right bank slide that was 30' long x 90' high. It was contributing mostly gravel and cobbles.
3892	0093.00	There was a boulder plunge measuring 1.2' high.
3931	0095.00	There was a boulder plunge 1.4' high.

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4085	0101.00	The bottom of habitat unit #101 is the beginning of Reach #2, an A2 channel type.
4297	0108.00	The pool was formed by a 1.3' boulder plunge.
4354	0110.00	There was a left bank seep and a nearly dry side channel that begins at this unit.
4384	0111.00	This pool was formed by a 2.2' boulder plunge.
4435	0113.00	This pool had a 2.2' boulder plunger.
4553	0120.00	Dead 5" rainbow trout and live steelhead young-of-the-year observed.
4763	0128.00	This pool was formed by a 9' bedrock plunge.
4789	0129.00	This unit marks the end of the habitat inventory survey conducted in 1993.
4976	0135.00	There was a right bank seep causing a slide that is contributing gravel to the creek.
5053	0137.00	There was a right bank bare cliff contributing silt and gravel.
5482	0151.00	There was a left bank landslide contributing gravel.
5525	0153.00	Tributary #1 entered on the left bank. The tributary had an estimated flow of less than 0.05 cubic feet per second (cfs), and it was contributing to an estimated 10% of Milk Ranch Creek's flow. The temperature of the tributary was 58 degrees Fahrenheit. The temperature of Milk Ranch Creek upstream and downstream of the tributary was 62 degrees Fahrenheit. The tributary was not accessible to fish, as the first 150' had a slope that was greater than 30%. No fish were observed in the tributary.
5680	0158.00	There was a steep cliff on the right bank contributing gravel and cobbles to the stream channels.
5876	0163.00	The boulder plunge at the top of the unit was 2.6' tall.
6225	0175.00	Tributary #2 entered at the top of this unit. The flow was estimated at less than 0.05 cfs. The temperature of the tributary was 62 degrees Fahrenheit. Milk Ranch Creek's temperature upstream and downstream of the tributary was 63 degrees Fahrenheit. The tributary was not accessible to fish and had an estimated slope of greater than 50%. In the 1st 150' no fish were observed.
6329	0178.00	The left bank was dominated by a 60' long x 75' high landslide.

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6329	0178.00	This pool was formed by a 1.7' boulder plunge.
6991	0193.00	There was a left bank slide contributing sediment ranging in size from silt to small cobble, the slide measured roughly 150' long x 100' high.
7091	0197.00	The top of this pool was a 2.8' boulder plunge.
7516	0208.00	The scour pool at this habitat unit had a 3' boulder plunge, and its tail-out flowed under a boulder and trickled through gravel.
7657	0214.00	This unit had a 4.4' boulder plunge.
7700	0216.00	Tributary #3 entered from the right bank and had an estimated flow of less than 0.05 cfs. It was contributing to approximately 5% of Milk Ranch Creek's flow. The temperature of the tributary's water was 58 degrees Fahrenheit. The temperature of Milk Ranch Creek upstream and downstream of the tributary was 62 and 63 degrees Fahrenheit, respectively. The tributary was not accessible to fish due to extreme slope; the first 100' of the tributary had an estimated slope of greater than 60%. No fish were observed in the tributary.
7927	0223.00	There was a 5.1' boulder plunge at the top of this unit.
7939	0224.00	There was a 5.9' boulder plunge at the top of this unit.
7999	0225.00	End of survey due to very high gradient with multiple, greater than 5' plunges. This unit marked the probable end of anadromy. No fish were seen after habitat unit #217. A visual observation revealed a 20' waterfall ~100' upstream of the end of survey. Throughout the survey the stream banks are extremely unstable. The bank substrate includes little silt and is mostly gravels and cobbles. The stream is surrounded by multiple terraces and old side channels, possibly caused by the main channel once being filled in by gravels, cobbles and boulders. Over time the stream seems to have found, or nearly found, its natural bottom, but high unstable banks are still present. The second reach is a fish friendly A-channel, it is steep but still accessible to fish and it includes good spawning areas and quality rearing habitat.

## **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 }

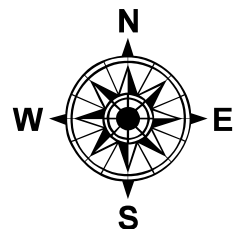
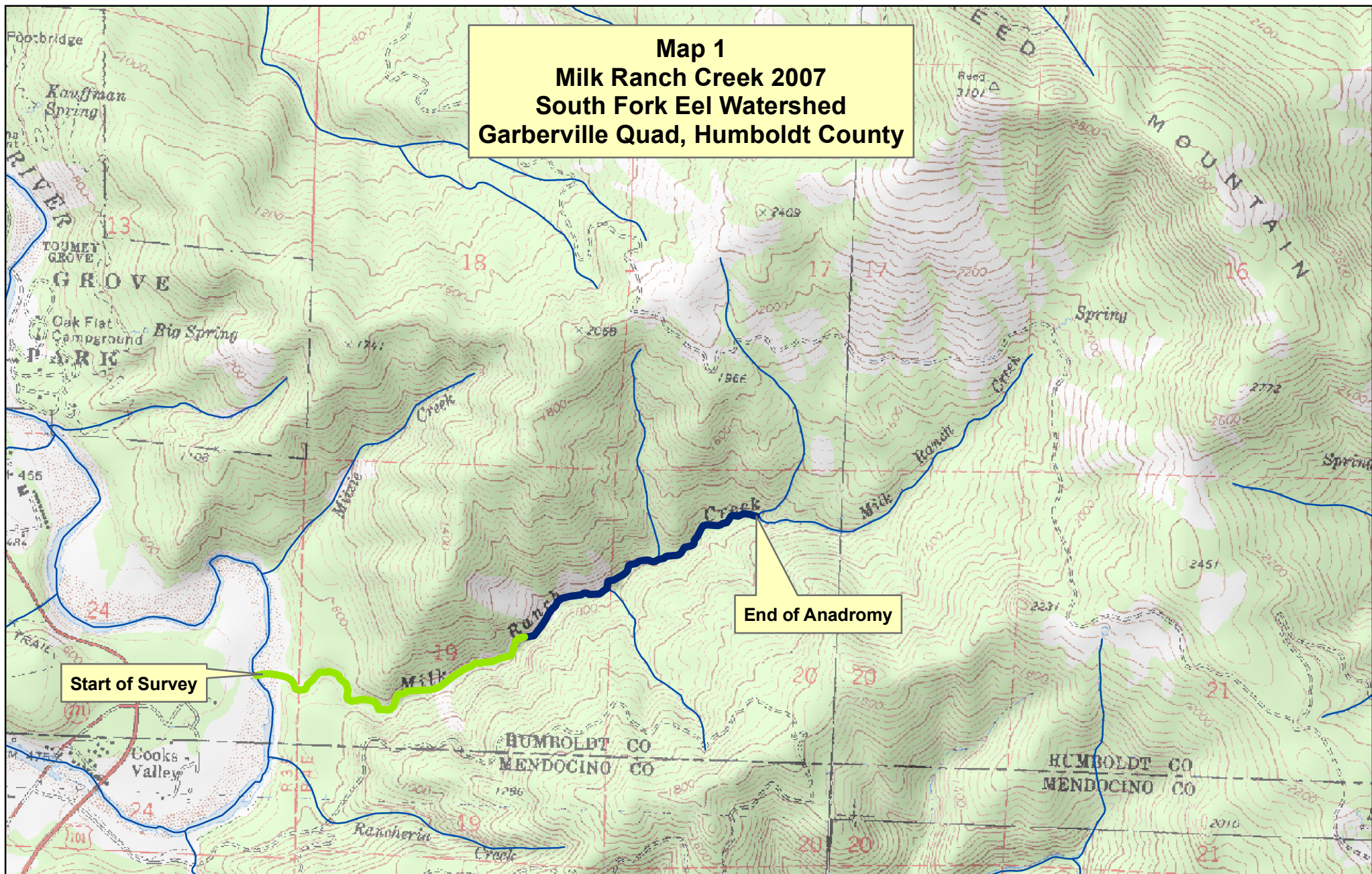
#### BACKWATER POOLS

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]	

**Map 1**  
**Milk Ranch Creek 2007**  
**South Fork Eel Watershed**  
**Garberville Quad, Humboldt County**



**Legend**

- Reach 1, G3 Channel Type
- Reach 2, A2 Channel Type

0 950 1,900 3,800 Feet



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

Stream Name: Milk Ranch Creek

LLID: 1237767400042

Drainage: Eel River - South Fork

Survey Dates: 7/16/2007 to 7/25/2007

Confluence Location: Quad: GARBERVILLE

Legal Description: T05SR03ES24

Latitude: 40:00:15.0N

Longitude: 123:46:36.0

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
4	0	DRY	1.7	80	320	3.9									
54	9	FLATWATER	23.5	39	2080	25.5	8.0	0.5	1.0	317	17129	165	8905		9
1	0	NOSURVEY	0.4	6	6	0.1									
73	73	POOL	31.7	20	1425	17.4	9.9	0.9	1.8	188	13728	252	18386	215	18
98	14	RIFFLE	42.6	44	4340	53.1	8.0	0.4	0.7	123	12087	47	4595		6
Total Units	Total Units Fully Measured			Total Length (ft.)						Total Area (sq.ft.)		Total Volume (cu.ft.)			
230	96			8171						42944		31886			

**Table 2 - Summary of Habitat Types and Measured Parameters**

Stream Name: Milk Ranch Creek

LLID: 1237767400042

Drainage: Eel River - South Fork

Survey Dates: 7/16/2007 to 7/25/2007

Confluence Location: Quad: GARBERVILLE

Legal Description: T05SR03ES24

Latitude: 40:00:15.0N

Longitude: 123:46:36.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
39	4	LGR	17.0	46	1793	21.9	6	0.3	0.6	107	4168	36	1414		1	76
57	9	HGR	24.8	44	2519	30.8	9	0.4	1.3	142	8103	57	3226		9	76
2	1	BRS	0.9	14	28	0.3	2	0.1	0.2	20	40	2	4		0	94
1	1	GLD	0.4	19	19	0.2	10	0.4	0.6	190	190	76	76		0	19
27	3	RUN	11.7	24	648	7.9	8	0.5	1	253	6818	126	3391		0	76
26	5	SRN	11.3	54	1413	17.3	8	0.5	1.6	381	9917	206	5363		16	83
48	48	MCP	20.9	20	946	11.6	10	0.9	3.9	183	8783	214	10288	178	13	80
1	1	CCP	0.4	17	17	0.2	6	0.7	1.4	102	102	82	82	71	10	96
3	3	STP	1.3	34	102	1.2	8	0.7	1.6	235	705	210	631	171	17	76
1	1	LSR	0.4	18	18	0.2	8	0.6	1.1	144	144	101	101	86	20	78
5	5	LSBo	2.2	17	84	1.0	8	0.6	1.3	127	637	93	467	76	23	63
15	15	PLP	6.5	17	258	3.2	13	1.2	6.3	224	3356	455	6818	410	34	85
4	0	DRY	1.7	80	320	3.9										
1	0	NS	0.4	6	6	0.1										

Total Units  
230

Total Units Fully Measured  
96

Total Length (ft.)  
8171

Total Area (sq.ft.)  
42964

Total Volume (cu.ft.)  
31861



Stream Name:	Milk Ranch Creek	LLID:	1237767400042	Drainage:	Eel River - South Fork
Survey Dates:	7/16/2007 to 7/25/2007				
Confluence Location:	Quad: GARBERVILLE	Legal Description:	T05SR03ES24	Latitude:	40:00:15.0N
				Longitude:	123:46:36.0W

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
73	73	1425	13728	15730

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

Stream Name: Milk Ranch Creek

LLID: 1237767400042

Drainage: Eel River - South Fork

Survey Dates: 7/16/2007 to 7/25/2007

Confluence Location: Quad: GARBERVILLE

Legal Description: T05SR03ES24

Latitude: 40:00:15.0N

Longitude: 123:46:36.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
48	MCP	66	2	4	31	65	13	27	2	4	0	0
1	CCP	1	0	0	1	100	0	0	0	0	0	0
3	STP	4	0	0	3	100	0	0	0	0	0	0
1	LSR	1	0	0	1	100	0	0	0	0	0	0
5	LSBo	7	1	20	4	80	0	0	0	0	0	0
15	PLP	21	1	7	4	27	7	47	1	7	2	13

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
73	4	5	44	60	20	27	3	4	2	3

Mean Maximum Residual Pool Depth (ft.): 1.8

**Table 5 - Summary of Mean Percent Cover By Habitat Type**

Stream Name: Milk Ranch Creek

LLID: 1237767400042

Drainage: Eel River - South Fork

Survey Dates: 7/16/2007 to 7/25/2007

Dry Units: 4

Confluence Location: Quad: GARBERVILLE

Legal Description: T05SR03ES24

Latitude: 40:00:15.0N

Longitude: 123:46:36.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
39	4	LGR	0	0	0	0	0	0	0	100	0
57	9	HGR	0	1	0	0	0	0	0	99	0
2	1	BRS	0	0	0	0	0	0	0	0	0
98	14	TOTAL RIFFLE	0	1	0	0	0	0	0	99	0
1	1	GLD	0	0	0	0	0	0	0	0	0
27	3	RUN	0	0	0	0	0	0	0	0	0
26	5	SRN	10	4	0	6	0	0	1	79	0
54	9	TOTAL FLAT	10	4	0	6	0	0	1	79	0
48	48	MCP	3	9	4	7	0	0	0	78	0
1	1	CCP	0	0	0	0	0	0	40	40	20
3	3	STP	0	0	0	0	0	0	0	100	0
1	1	LSR	0	0	0	100	0	0	0	0	0
5	5	LSBo	18	0	0	0	0	0	0	82	0
15	15	PLP	2	1	4	1	0	0	5	81	6
73	73	TOTAL POOL	4	5	3	6	0	0	2	78	2
1	0	NS									
230	96	TOTAL	4	5	3	5	0	0	2	81	1

**Table 6 - Summary of Dominant Substrates By Habitat Type**

Stream Name: Milk Ranch Creek

LLID: 1237767400042

Drainage: Eel River - South Fork

Survey Dates: 7/16/2007 to 7/25/2007

Dry Units: 4

Confluence Location: Quad: GARBERVILLE

Legal Description: T05SR03ES24

Latitude: 40:00:15.0N

Longitude: 123:46:36.0W

Habitat Units	Units Fully Measured	Habitat Type	% Total Silt/Clay Dominant	% Total Sand Dominant	% Total Gravel Dominant	% Total Small Cobble Dominant	% Total Large Cobble Dominant	% Total Boulder Dominant	% Total Bedrock Dominant
39	4	LGR	0	0	0	25	25	50	0
57	9	HGR	0	0	0	0	22	78	0
2	1	BRS	0	0	0	0	0	0	100
1	1	GLD	0	0	0	100	0	0	0
27	3	RUN	0	0	100	0	0	0	0
26	5	SRN	0	0	20	0	60	20	0
48	48	MCP	2	0	48	6	4	27	13
1	1	CCP	0	0	0	100	0	0	0
3	3	STP	0	0	33	0	33	33	0
1	1	LSR	0	0	0	0	100	0	0
5	5	LSBo	0	0	20	20	20	40	0
15	15	PLP	7	0	53	7	0	27	7

**Table 7 - Summary of Mean Percent Canopy for Entire Stream**

Stream Name: Milk Ranch Creek

LLID: 1237767400042

Drainage: Eel River - South Fork

Survey Dates: 7/16/2007 to 7/25/2007

Confluence Location: Quad: GARBERVILLE

Legal Description: T05SR03ES24

Latitude: 40:00:15.0N

Longitude: 123:46:36.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
79	14	86	0	90	94

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.

Stream Name:	Milk Ranch Creek	LLID:	1237767400042	Drainage:	Eel River - South Fork
Survey Dates:	7/16/2007 to 7/25/2007	Survey Length (ft.):	8171	Main Channel (ft.):	7999
				Side Channel (ft.):	172
Confluence Location:	Quad: GARBERVILLE	Legal Description:	T05SR03ES24	Latitude:	40:00:15.0N
				Longitude:	123:46:36.0W

<b>STREAM REACH: 1</b>									
Channel Type: G3			Canopy Density (%): 76.3				Pools by Stream Length (%): 15.2		
Reach Length (ft.): 4085			Coniferous Component (%): 4.2				Pool Frequency (%): 29.0		
Riffle/Flatwater Mean Width (ft.): 7.8			Hardwood Component (%): 95.8				Residual Pool Depth (%):		
BFW:			Dominant Bank Vegetation: Hardwood Trees				< 2 Feet Deep: 83		
Range (ft.): 18 to 48			Vegetative Cover (%): 87.3				2 to 2.9 Feet Deep: 14		
Mean (ft.): 27			Dominant Shelter: Boulders				3 to 3.9 Feet Deep: 3		
Std. Dev.: 9			Dominant Bank Substrate Type: Cobble/Gravel				>= 4 Feet Deep: 0		
Base Flow (cfs.): 0.1			Occurrence of LWD (%): 5				Mean Max Residual Pool Depth (ft.): 1.5		
Water (F): 59 - 68			Air (F): 60 - 72				LWD per 100 ft.:		
Dry Channel (ft): 111			Riffles: 2				Mean Pool Shelter Rating: 13		
			Pools: 3						
			Flat: 1						
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 31 Sm Cobble: 17 Lg Cobble: 21 Boulder: 28 Bedrock: 3									
Embeddedness Values (%): 1. 13.8 2. 31.0 3. 24.1 4. 6.9 5. 24.1									

Channel Type:	A2			Canopy Density (%):	80.9			Pools by Stream Length (%):	19.7		
Reach Length (ft.):	3914			Coniferous Component (%):	22.5			Pool Frequency (%):	33.8		
Riffle/Flatwater Mean Width (ft.):	8.3			Hardwood Component (%):	77.5			Residual Pool Depth (%):			
BFW:				Dominant Bank Vegetation:	Hardwood Trees			< 2 Feet Deep:	55		
Range (ft.):	18	to	56	Vegetative Cover (%):	96.3			2 to 2.9 Feet Deep:	36		
Mean (ft.):	27			Dominant Shelter:	Boulders			3 to 3.9 Feet Deep:	5		
Std. Dev.:	10			Dominant Bank Substrate Type:	Bedrock			>= 4 Feet Deep:	5		
Base Flow (cfs.):	0.1			Occurrence of LWD (%):	0			Mean Max Residual Pool Depth (ft.):	2.0		
Water (F):	58 - 63	Air (F):	60 - 78	LWD per 100 ft.:				Mean Pool Shelter Rating:	22		
Dry Channel (ft):	209			Riffles:	2						
				Pools:	2						
				Flat:	2						
Pool Tail Substrate (%):	Silt/Clay: 2	Sand: 0	Gravel: 43	Sm Cobble: 14	Lg Cobble: 2	Boulder: 34	Bedrock: 5				
Embeddedness Values (%):	1. 20.5	2. 11.4	3. 9.1	4. 22.7	5. 36.4						

**Table 9 - Mean Percentage of Dominant Substrate and Vegetation**

Stream Name: Milk Ranch Creek

LLID: 1237767400042

Drainage: Eel River - South Fork

Survey Dates: 7/16/2007 to 7/25/2007

Confluence Location: Quad: GARBERVILLE

Legal Description: T05SR03ES24

Latitude: 40:00:15.0N

Longitude: 123:46:36.0W

**Mean Percentage of Dominant Stream Bank Substrate**

Dominant Class of Substrate	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Bedrock	24	23	24.5
Boulder	30	27	29.7
Cobble / Gravel	33	36	35.9
Sand / Silt / Clay	9	10	9.9

**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	7	8	7.8
Brush	11	11	11.5
Hardwood Trees	69	67	70.8
Coniferous Trees	4	9	6.8
No Vegetation	5	1	3.1

**Total Stream Cobble Embeddedness Values:** 3

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

StreamName: Milk Ranch Creek

LLID: 1237767400042

Drainage: Eel River - South Fork

Survey Dates: 7/16/2007 to 7/25/2007

Confluence Location: Quad: GARBERVILLE

Legal Description: T05SR03ES24

Latitude: 40:00:15.0N

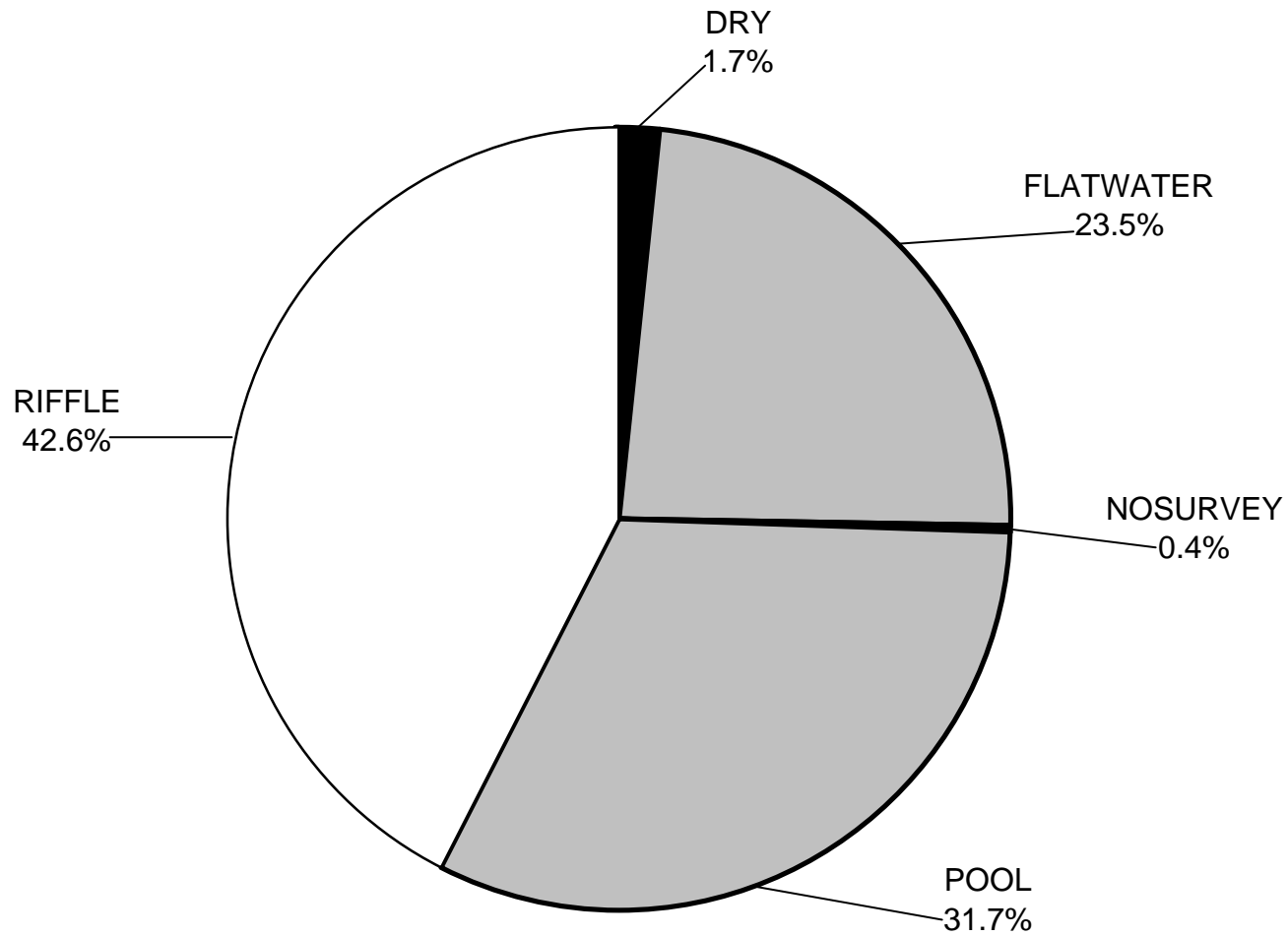
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	Riffles	Flatwater	Pools
<hr/>			
UNDERCUT BANKS (%)	0	10	4
SMALL WOODY DEBRIS (%)	1	4	5
LARGE WOODY DEBRIS (%)	0	0	3
ROOT MASS (%)	0	6	6
TERRESTRIAL VEGETATION (%)	0	0	0
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	0	1	2
BOULDERS (%)	99	79	78
BEDROCK LEDGES (%)	0	0	2

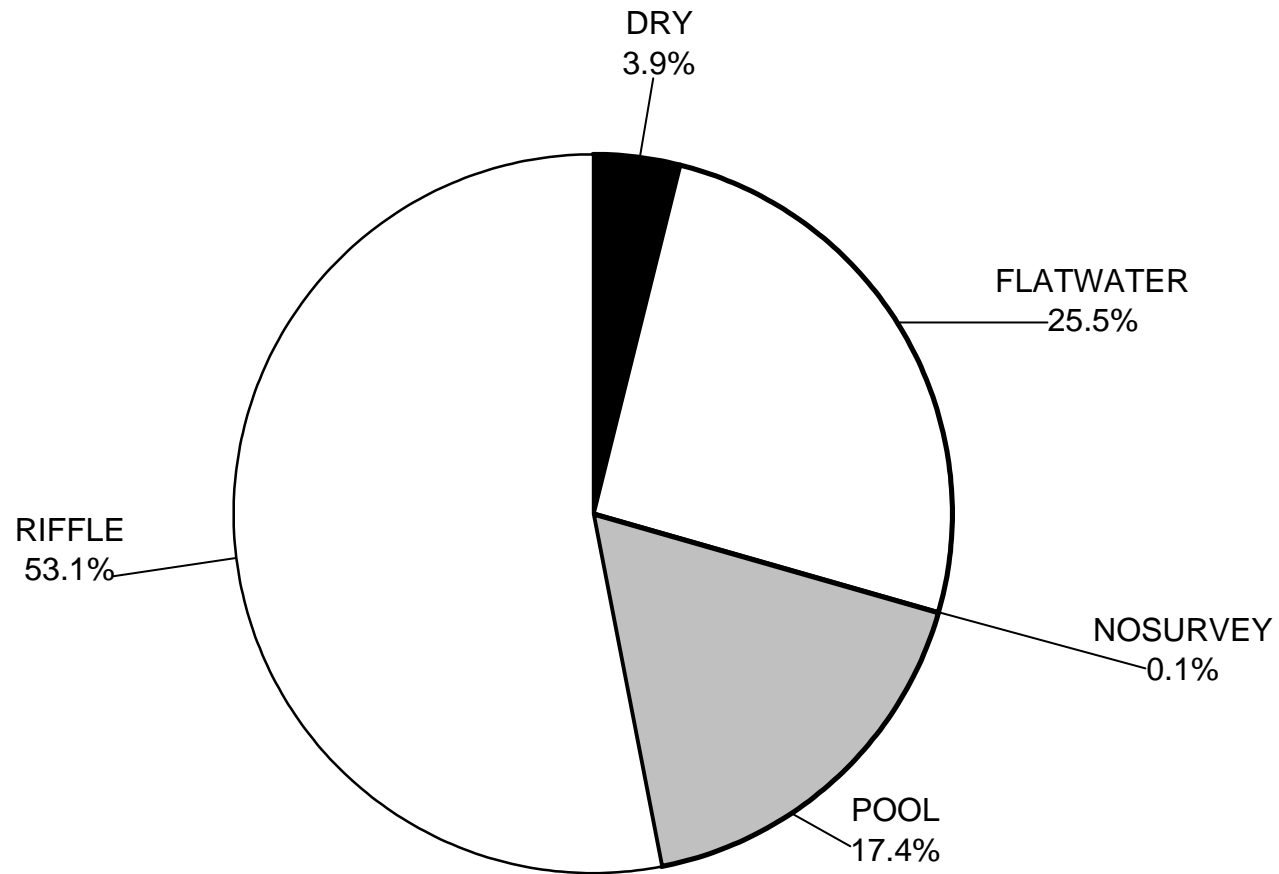


# MILK RANCH CREEK 2007 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

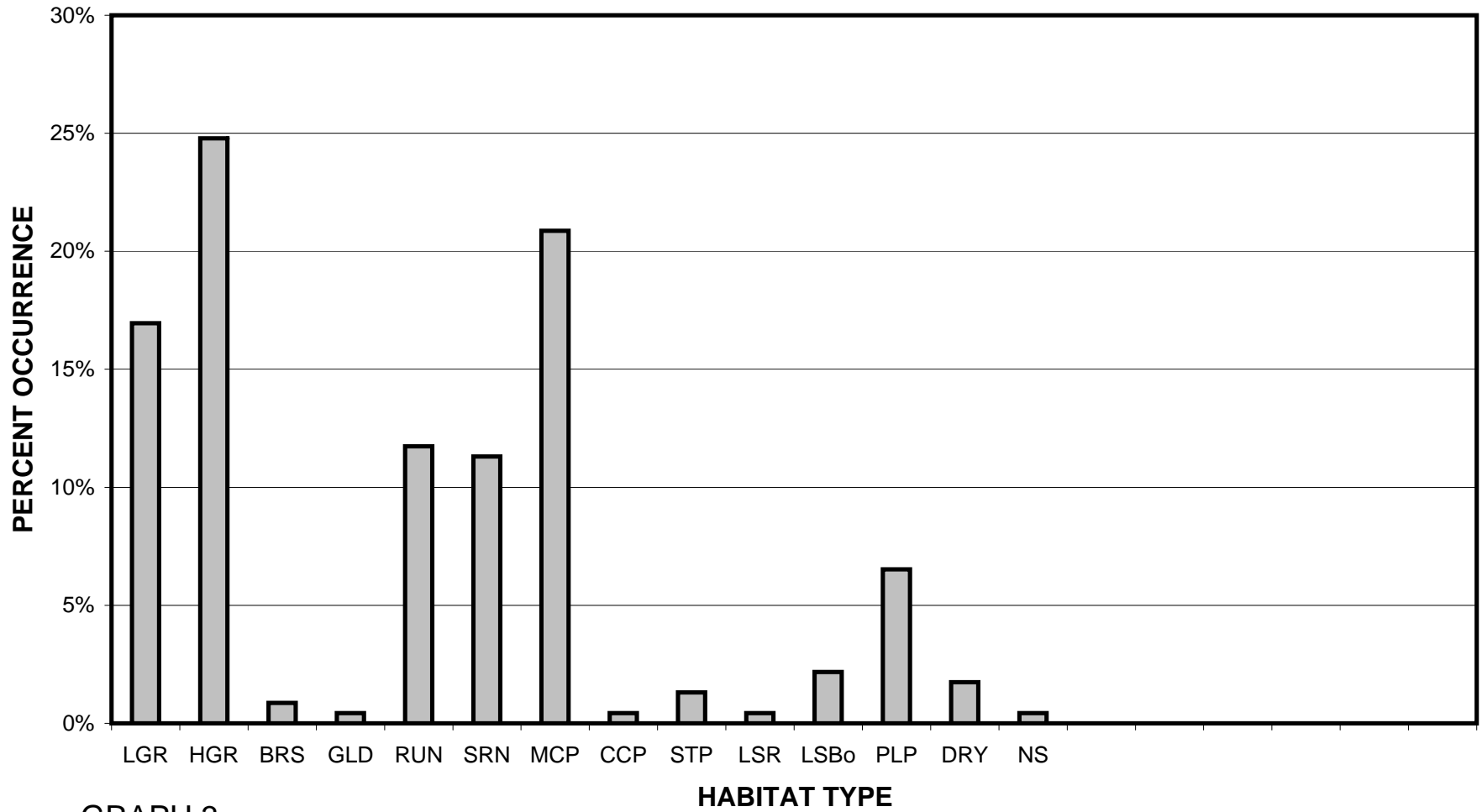
**MILK RANCH CREEK 2007  
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

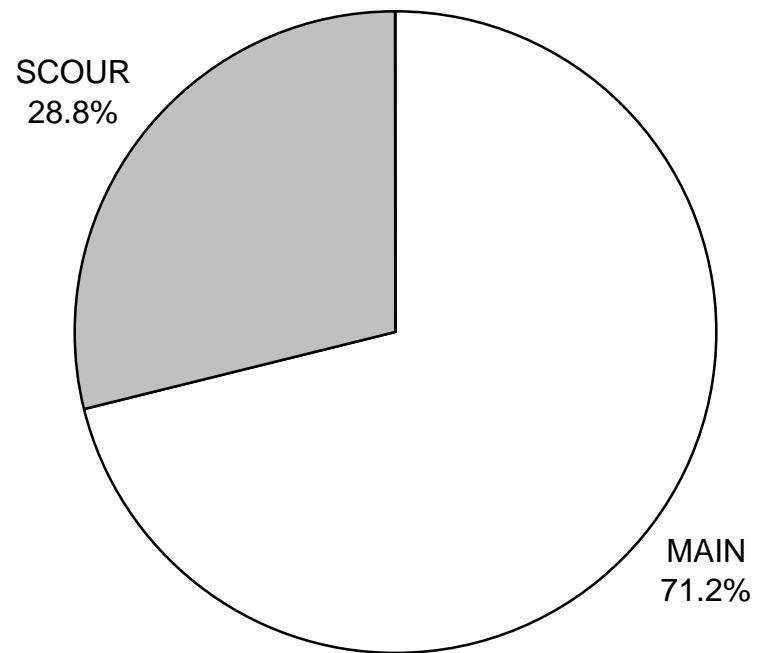
# MILK RANCH CREEK 2007

## HABITAT TYPES BY PERCENT OCCURRENCE



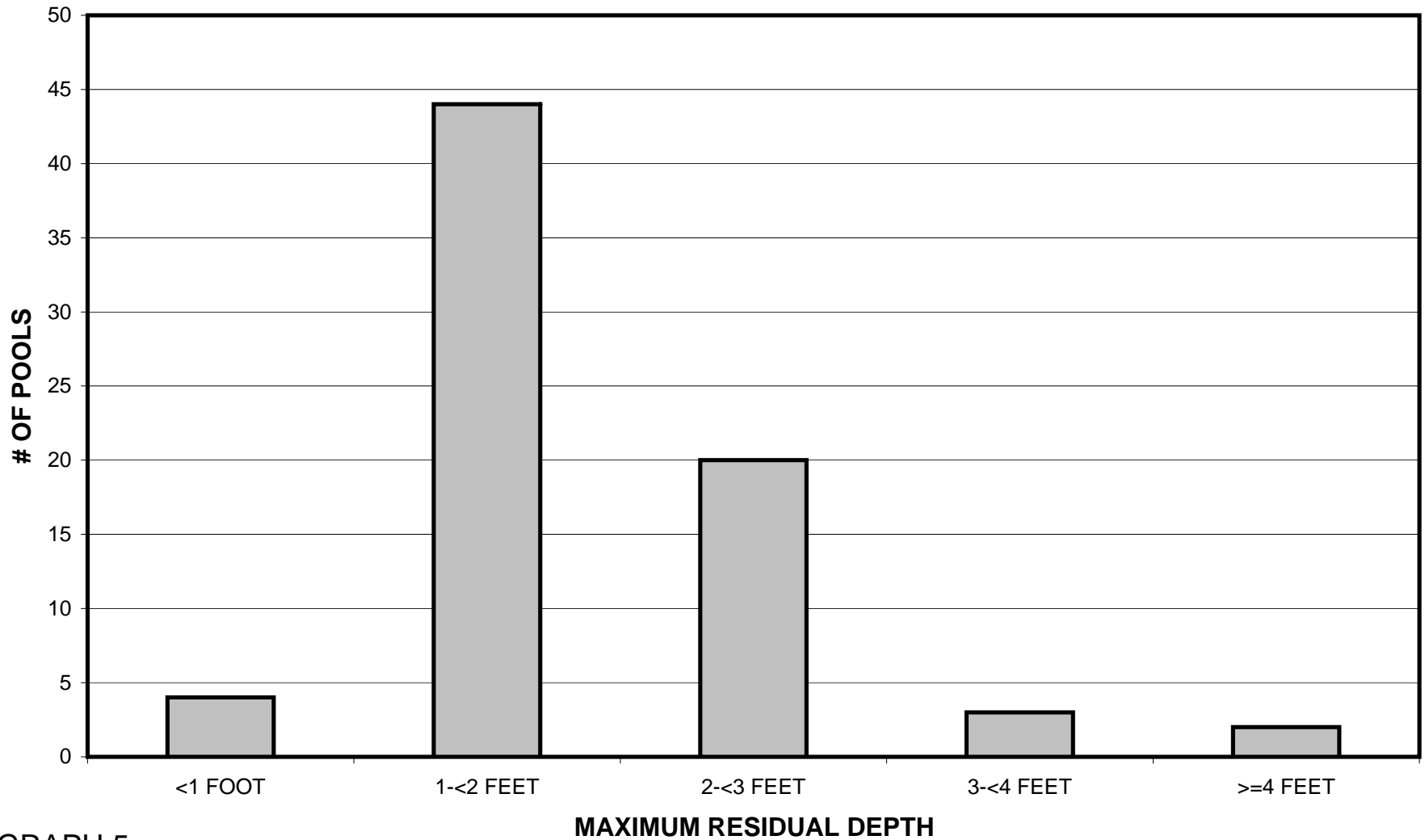
GRAPH 3

**MILK RANCH CREEK 2007  
POOL TYPES BY PERCENT OCCURRENCE**



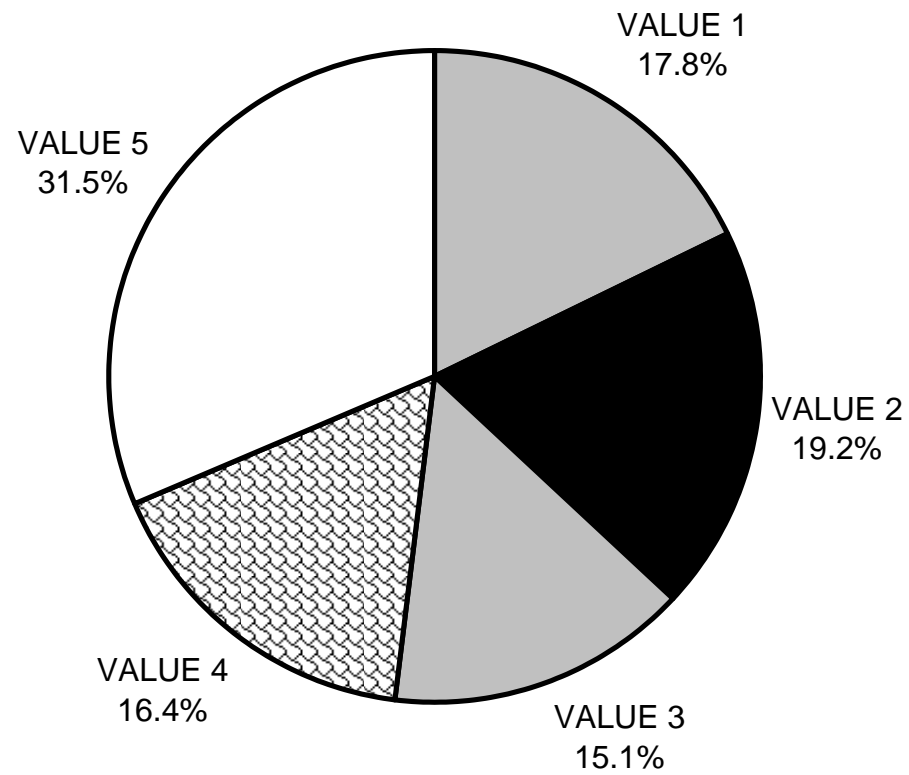
GRAPH 4

# **MILK RANCH CREEK 2007 MAXIMUM DEPTH IN POOLS**



GRAPH 5

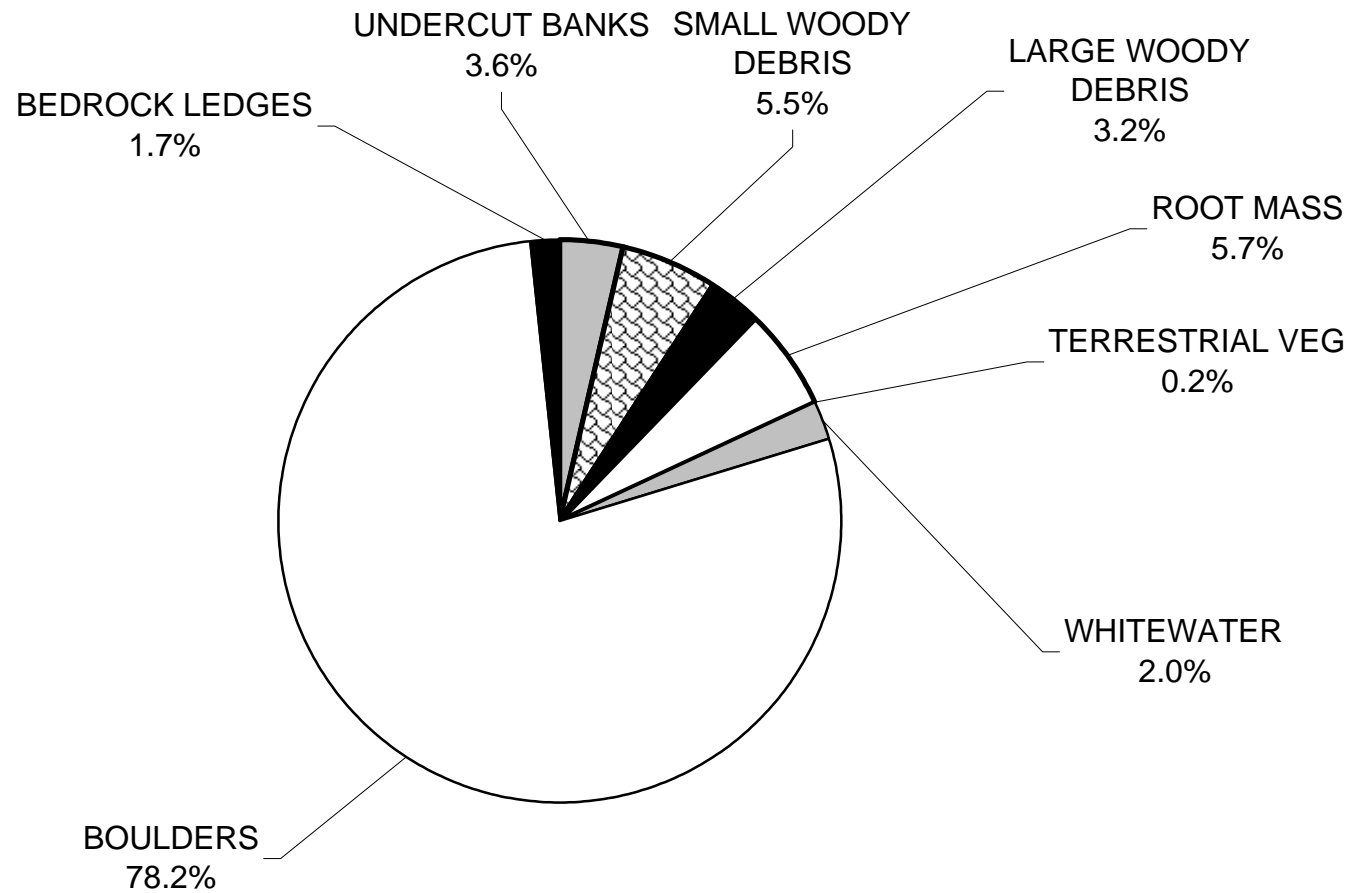
# MILK RANCH CREEK 2007 PERCENT EMBEDDEDNESS



GRAPH 6

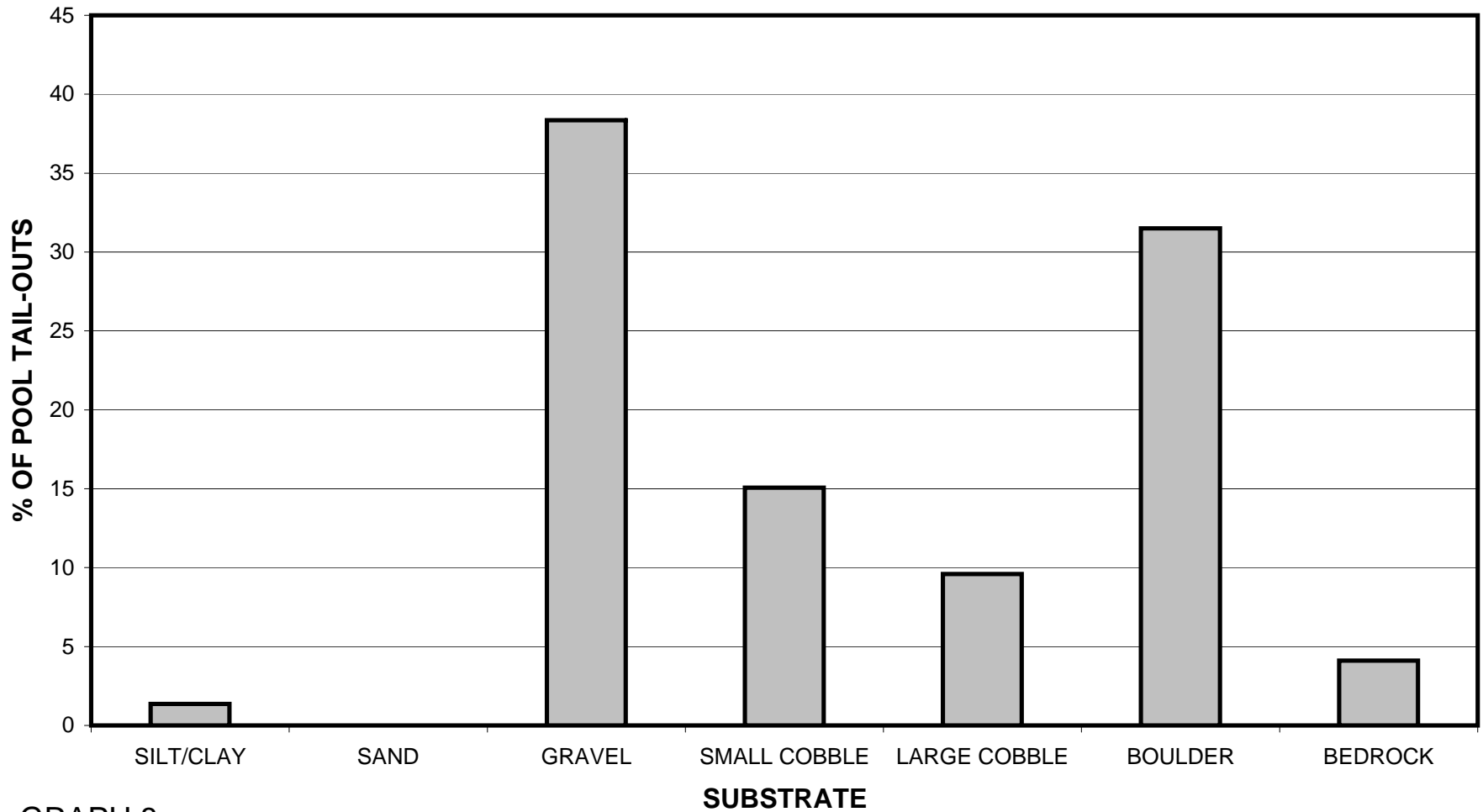
# MILK RANCH CREEK 2007

## MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

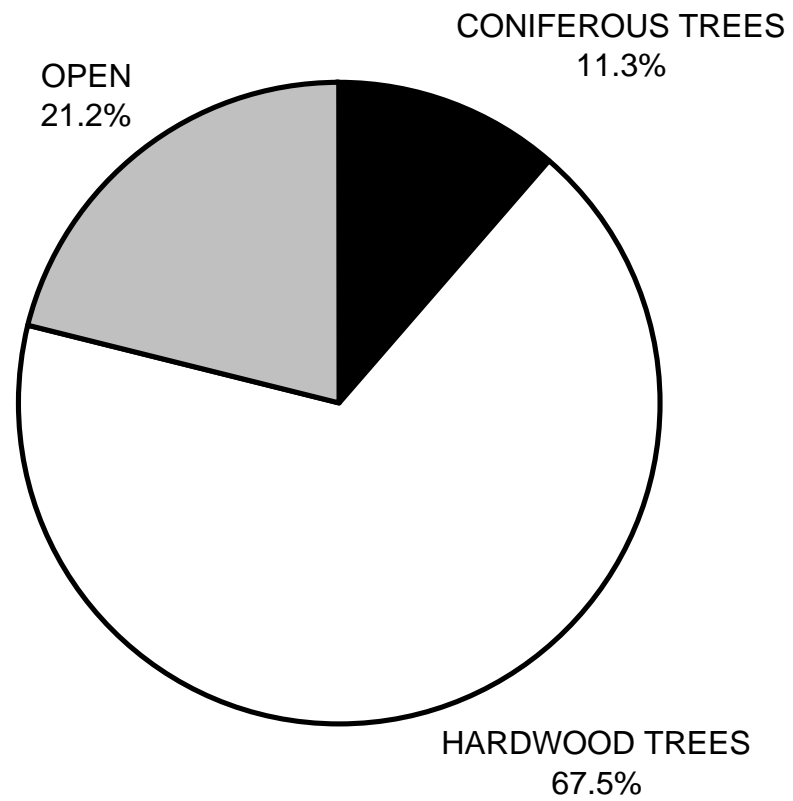
**MILK RANCH CREEK 2007**  
**SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



GRAPH 8

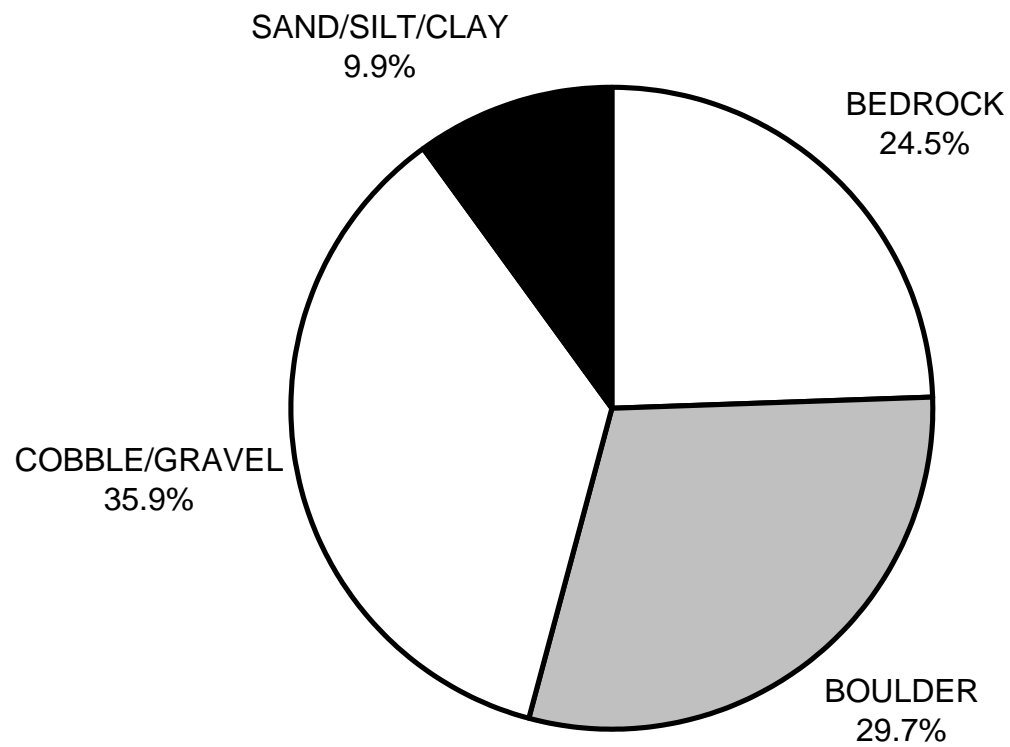


# MILK RANCH CREEK 2007 MEAN PERCENT CANOPY



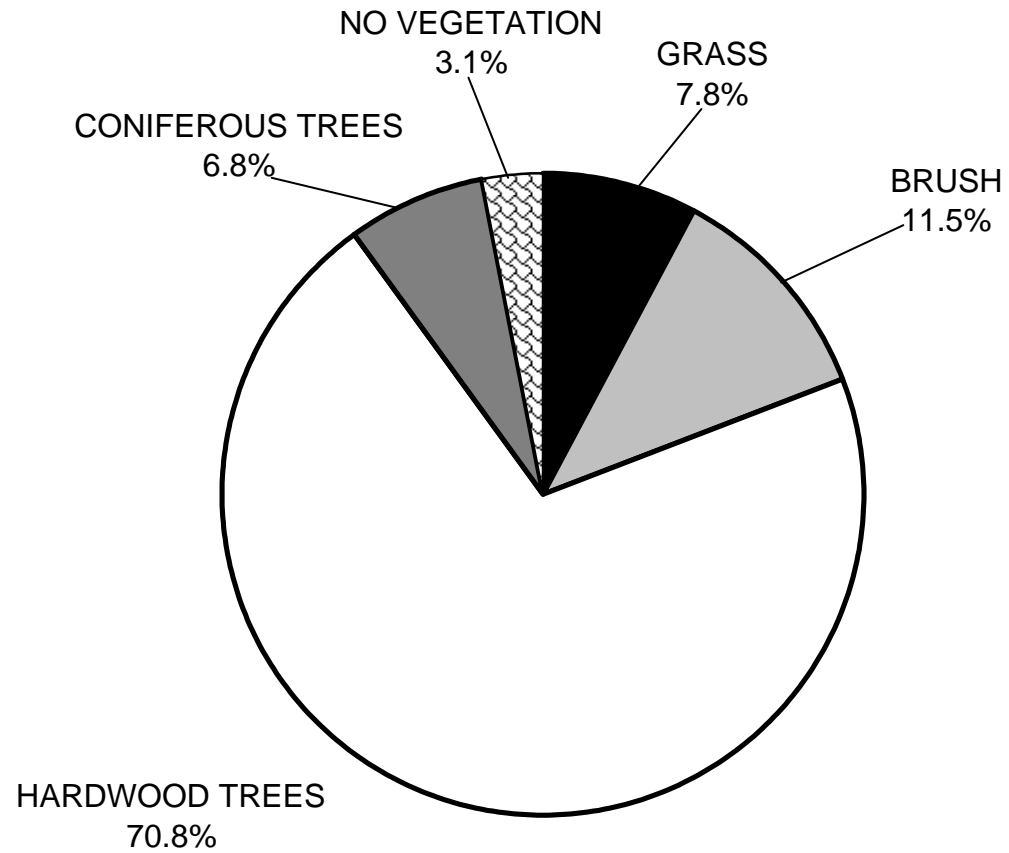
GRAPH 9

**MILK RANCH CREEK 2007  
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**MILK RANCH CREEK 2007**  
**DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11