

STREAM INVENTORY REPORT

Unnamed Tributary to Middle Fork Ten Mile River

INTRODUCTION

A stream inventory was conducted on October 17, 2012 on an unnamed tributary to Middle Fork Ten Mile River. The survey began at the confluence with Middle Fork Ten Mile River and extended upstream 0.3 miles.

The objective of the habitat inventory was to document the habitat available to anadromous salmonids in the unnamed tributary.

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

The unnamed tributary is a tributary to Middle Fork Ten Mile River, a tributary to Ten Mile River, which drains to the Pacific Ocean. It is located in Mendocino County, California (Map 1). The unnamed tributary's legal description at the confluence with Middle Fork Ten Mile River is T20N R16W S33. Its location is 39.5466 degrees north latitude and 123.6503 degrees west longitude, LLID number 1236489395466. The unnamed tributary is an intermittent stream according to the USGS Dutchmans Knoll 7.5 minute quadrangle. The unnamed tributary drains a watershed of approximately 0.5 square miles. Elevations range from about 170 feet at the mouth of the creek to 600 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 Georgia-Pacific Industrial Road, north of Fort Bragg.

METHODS

The habitat inventory conducted in the unnamed tributary 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 crest (measured in the thalweg), dominant substrate composing the pool tail crest, and

Unnamed Tributary to Middle Fork Ten Mile River

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 the unnamed tributary 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". The unnamed tributary 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.

Unnamed Tributary to Middle Fork Ten Mile River

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In the unnamed tributary, 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 the unnamed tributary, 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 the unnamed tributary, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In the unnamed tributary, 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.

Unnamed Tributary to Middle Fork Ten Mile River

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.

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

Graphics are produced from the tables using Microsoft Excel. Graphics developed for the unnamed tributary 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

Unnamed Tributary to Middle Fork Ten Mile River

- 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 October 17, 2012 was conducted by R. Spencer and C. Tiffany (CDFW). The total length of the stream surveyed was 1,355 feet.

Stream flow was not measured on the unnamed tributary to Middle Fork Ten Mile River.

The unnamed tributary is an A4 channel type for the entire length of the survey, 1,355 feet. 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 52 to 54 degrees Fahrenheit. Air temperatures ranged from 50 to 53 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 33% riffle units, 28% flatwater units, 28% pool units, and 12% dry units (Graph 1). Based on total length of Level II habitat types there were 41% dry units, 27% flatwater units, 20% riffle units, and 13% pool units (Graph 2).

Nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 26%; low gradient riffle units, 20%; and step run units, 16% (Graph 3). Based on percent total length, dry units made up 41%, step run units 20%, and low gradient riffle units 14%.

A total of 17 pools were identified (Table 3). All of the pools encountered were main channel pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. One of the 17 pools (6%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 17 pool tail-outs measured, 14 had a value of 1 (82%); three had a value of 2 (18%); (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.

Unnamed Tributary to Middle Fork Ten Mile River

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 2, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 37 (Table 1).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in the unnamed tributary. Graph 7 describes the pool cover in the unnamed tributary. Small woody debris is the dominant pool cover type followed by large 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 76% of the pool tail-outs. Silt/clay and bedrock were the next most frequently observed dominant substrate types; each occurred in 12% of the pool tail-outs.

The mean percent canopy density for the surveyed length of the unnamed tributary was 99%. One percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 38% and 62%, respectively. Graph 9 describes the mean percent canopy in the unnamed tributary.

For the stream reach surveyed, the mean percent right bank vegetated was 93%. The mean percent left bank vegetated was 96%. The dominant elements composing the structure of the stream banks consisted of 46% cobble/gravel, 26% bedrock, 26% sand/silt/clay, and 2% boulders (Graph 10). Coniferous trees were the dominant vegetation type observed in 72% of the units surveyed. Additionally, 17% of the units surveyed had deciduous trees as the dominant vegetation type, and 9% had brush as the dominant vegetation type (Graph 11).

DISCUSSION

The unnamed tributary to Middle Fork Ten Mile River is an A4 channel type. A4 channels are generally not suitable for fish habitat improvement projects.

The water temperatures recorded on the survey day, October 17, 2012, ranged from 52 to 54 degrees Fahrenheit. Air temperatures ranged from 50 to 53 degrees Fahrenheit. This is a good water temperature range for salmonids. To make any conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 27% of the total length of this survey, riffles 20%, and pools 13%. One of the 17 (6%) 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.

Unnamed Tributary to Middle Fork Ten Mile River

All of the 17 pool tail-outs measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4. None 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.

Thirteen of the 17 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 37. The shelter rating in the flatwater habitats is 9. 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 the unnamed tributary. Small woody debris is the dominant cover type in pools followed by large 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 99%. The percentage of right and left bank covered with vegetation was 93% and 96%, respectively.

RECOMMENDATIONS

- 1) The unnamed tributary 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.

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 Middle Fork Ten Mile River. The channel is an A4 for the entire length of the survey. |
| 247 | 0019.00 | There is an 8' long bedrock sheet with 50% slope. |
| 272 | 0023.00 | There is a 233' long dry section. |

Unnamed Tributary to Middle Fork Ten Mile River

- 603 0030.00 Log debris accumulation (LDA) #01 contains four pieces of large woody debris (LWD) and measures 5' high x 11' wide x 6' long. Water does not flow through the LDA; the channel is dry above it. There are visible gaps in the LDA. Retained sediment ranges from sand to small cobble and measures 15' wide x 40' long x 5' deep. Fish were not observed above the LDA.
- 947 0050.00 There is a 127' long dry section. LDA #02 contains one piece of LWD and measures 6' high x 9' wide x 1' long. Water flows does not flow through the LDA; the LDA is in a dry unit. There are visible gaps in the LDA. Retained sediment ranges from silt to large cobble and measures 20' wide x 40' long x 6' deep.
- 1145 0054.00 There is a 1.5' high plunge over LWD.
- 1350 0061.00 End of survey. The gradient increases to 10%. The channel is full of LWD and SWD. There are multiple LDAs and the channel goes dry.

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.

Unnamed Tributary to Middle Fork Ten Mile River

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: 1236489395466

LLID: 1236489395466 Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Confluence Location: Quad: DUTCHMANS Legal Description: T20NR16WS33 Latitude: 39:32:48.0N Longitude: 123:38:56.0

| 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 |
|--------------------|-----------------------------------|--------------|------------------------|-------------------|---------------------------|------------------|------------------|------------------|----------------------|----------------------------|-------------------------------|----------------------|---------------------------------|---------------------------------|---------------------|
| 7 | 0 | DRY | 11.5 | 79 | 551 | 40.7 | | | | | | | | | |
| 17 | 4 | FLATWATER | 27.9 | 21 | 365 | 26.9 | 3.5 | 0.3 | 0.5 | 46 | 775 | 12 | 211 | | 9 |
| 17 | 17 | POOL | 27.9 | 10 | 169 | 12.5 | 4.9 | 0.5 | 1.0 | 50 | 843 | 35 | 590 | 27 | 37 |
| 20 | 7 | RIFFLE | 32.8 | 14 | 270 | 19.9 | 3.6 | 0.2 | 0.4 | 21 | 411 | 4 | 87 | | 2 |
| Total Units | Total Units Fully Measured | | | | Total Length (ft.) | | | | | Total Area (sq.ft.) | | | Total Volume (cu.ft.) | | |
| 61 | 28 | | | | 1355 | | | | | 2029 | | | 888 | | |

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: 1236489395466

LLID: 1236489395466

Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS33

Latitude: 39:32:48.0N

Longitude: 123:38:56.0W

| Habitat Units | Units Fully Measured | Habitat Type | Habitat Occurrence (%) | Mean Length (ft.) | Total Length (ft.) | Total Length (%) | Mean Width (ft.) | Mean Depth (ft.) | Max Depth (ft.) | Mean Area (sq.ft.) | Estimated Total Area (sq.ft.) | Mean Volume (cu.ft.) | Estimated Total Volume (cu.ft.) | Mean Residual Pool Vol (cu.ft.) | Mean Shelter Rating | Mean Canopy (%) |
|---------------|----------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|------------------|-----------------|--------------------|-------------------------------|----------------------|---------------------------------|---------------------------------|---------------------|-----------------|
| 12 | 3 | LGR | 19.7 | 16 | 189 | 13.9 | 4 | 0.2 | 0.4 | 38 | 450 | 9 | 109 | | 3 | 98 |
| 4 | 1 | HGR | 6.6 | 13 | 52 | 3.8 | 2 | 0.1 | 0.2 | 11 | 42 | 1 | 4 | | 0 | 100 |
| 2 | 1 | CAS | 3.3 | 8 | 16 | 1.2 | 3 | 0.1 | 0.3 | 5 | 10 | 0 | 1 | | 0 | 100 |
| 2 | 2 | BRS | 3.3 | 6 | 13 | 1.0 | 4 | 0.1 | 0.8 | 8 | 16 | 1 | 2 | | 3 | 98 |
| 7 | 2 | RUN | 11.5 | 13 | 92 | 6.8 | 3 | 0.4 | 0.7 | 36 | 252 | 12 | 84 | | 10 | 98 |
| 10 | 2 | SRN | 16.4 | 27 | 273 | 20.1 | 4 | 0.3 | 0.5 | 55 | 552 | 13 | 128 | | 8 | 100 |
| 16 | 16 | MCP | 26.2 | 10 | 161 | 11.9 | 5 | 0.5 | 2.5 | 51 | 820 | 36 | 583 | 28 | 39 | 99 |
| 1 | 1 | STP | 1.6 | 8 | 8 | 0.6 | 3 | 0.1 | 0.4 | 23 | 23 | 7 | 7 | 2 | 5 | 98 |
| 7 | 0 | DRY | 11.5 | 79 | 551 | 40.7 | | | | | | | | | | 100 |

Total Units
61

Total Units Fully Measured
28

Total Length (ft.)
1355

Total Area (sq.ft.)
2165

Total Volume (cu.ft.)
918

Table 3 - Summary of Pool Types

Stream Name: 1236489395466

LLID: 1236489395466

Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS33

Latitude: 39:32:48.0N

Longitude: 123:38:56.0W

| 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 |
|---------------|----------------------|--------------|------------------------|-------------------|--------------------|------------------|------------------|---------------------------|--------------------|-------------------------------|---------------------------------|-------------------------------------|---------------------|
| 17 | 17 | MAIN | 100 | 10 | 169 | 100 | 4.9 | 0.5 | 50 | 843 | 27 | 455 | 37 |

| Total Units | Total Units Fully Measured | Total Length (ft.) | Total Area (sq.ft.) | Total Volume (cu.ft.) |
|-------------|----------------------------|--------------------|---------------------|-----------------------|
| 17 | 17 | 169 | 843 | 455 |

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

Stream Name: 1236489395466

LLID: 1236489395466

Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS33

Latitude: 39:32:48.0N

Longitude: 123:38:56.0W

| 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 |
|---------------|--------------|------------------------|---------------------------------|-----------------------------|-----------------------------------|-------------------------------|-----------------------------------|-------------------------------|-----------------------------------|-------------------------------|----------------------------------|------------------------------|
| 16 | MCP | 94 | 8 | 50 | 7 | 44 | 1 | 6 | 0 | 0 | 0 | 0 |
| 1 | STP | 6 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Total Units | Total < 1 Foot Max Resid. Depth | Total < 1 Foot % Occurrence | Total 1< 2 Foot Max Resid. Depth | Total 1< 2 Foot % Occurrence | Total 2< 3 Foot Max Resid. Depth | Total 2< 3 Foot % Occurrence | Total 3< 4 Foot Max Resid. Depth | Total 3< 4 Foot % Occurrence | Total >= 4 Foot Max Resid. Depth | Total >= 4 Foot % Occurrence |
|-------------|---------------------------------|-----------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|----------------------------------|------------------------------|
| 17 | 9 | 53 | 7 | 41 | 1 | 6 | 0 | 0 | 0 | 0 |

Mean Maximum Residual Pool Depth (ft.): 1

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: 1236489395466

LLID: 1236489395466

Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Dry Units: 7

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS33

Latitude: 39:32:48.0N

Longitude: 123:38:56.0W

| Habitat Units | Units Fully Measured | Habitat Type | Mean % Undercut Banks | Mean % SWD | Mean % LWD | Mean % Root Mass | Mean % Terr. Vegetation | Mean % Aquatic Vegetation | Mean % White Water | Mean % Boulders | Mean % Bedrock Ledges |
|---------------|----------------------|--------------|-----------------------|------------|------------|------------------|-------------------------|---------------------------|--------------------|-----------------|-----------------------|
| 12 | 3 | LGR | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 70 | 0 |
| 4 | 1 | HGR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1 | CAS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 2 | BRS | 0 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 7 | TOTAL RIFFLE | 0 | 53 | 0 | 0 | 0 | 0 | 0 | 47 | 0 |
| 7 | 2 | RUN | 0 | 60 | 0 | 0 | 40 | 0 | 0 | 0 | 0 |
| 10 | 2 | SRN | 0 | 55 | 0 | 0 | 0 | 0 | 0 | 45 | 0 |
| 17 | 4 | TOTAL FLAT | 0 | 58 | 0 | 0 | 20 | 0 | 0 | 23 | 0 |
| 16 | 16 | MCP | 0 | 48 | 21 | 11 | 0 | 0 | 8 | 9 | 3 |
| 1 | 1 | STP | 0 | 50 | 0 | 0 | 0 | 0 | 0 | 50 | 0 |
| 17 | 17 | TOTAL POOL | 0 | 48 | 20 | 11 | 0 | 0 | 8 | 11 | 3 |
| 61 | 28 | TOTAL | 0 | 50 | 14 | 7 | 3 | 0 | 5 | 18 | 2 |

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: 1236489395466

LLID: 1236489395466

Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Dry Units: 7

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS33

Latitude: 39:32:48.0N

Longitude: 123:38:56.0W

| Habitat Units | Units Fully Measured | Habitat Type | % Total Silt/Clay Dominant | % Total Sand Dominant | % Total Gravel Dominant | % Total Small Cobble Dominant | % Total Large Cobble Dominant | % Total Boulder Dominant | % Total Bedrock Dominant |
|---------------|----------------------|--------------|----------------------------|-----------------------|-------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------|
| 12 | 3 | LGR | 0 | 0 | 67 | 33 | 0 | 0 | 0 |
| 4 | 1 | HGR | 0 | 0 | 0 | 100 | 0 | 0 | 0 |
| 2 | 1 | CAS | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 2 | 2 | BRS | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 7 | 2 | RUN | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 2 | SRN | 0 | 0 | 50 | 50 | 0 | 0 | 0 |
| 16 | 16 | MCP | 44 | 0 | 38 | 0 | 0 | 13 | 6 |
| 1 | 1 | STP | 0 | 0 | 0 | 0 | 0 | 0 | 100 |

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: 1236489395466

LLID: 1236489395466

Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS33

Latitude: 39:32:48.0N

Longitude: 123:38:56.0W

| Mean Percent Canopy | Mean Percent Conifer | Mean Percent Hardwood | Mean Percent Open Units | Mean Right Bank % Cover | Mean Left Bank % Cover |
|---------------------|----------------------|-----------------------|-------------------------|-------------------------|------------------------|
| 99 | 63 | 38 | 0 | 93 | 96 |

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: 1236489395466 LLID: 1236489395466 Drainage: Rockport
 Survey Dates: 10/17/2012 to 10/17/2012 Survey Length (ft.): 1355 Main Channel (ft.): 1355 Side Channel (ft.): 0
 Confluence Location: Quad: DUTCHMANS Legal Description: T20NR16WS33 Latitude: 39:32:48.0N Longitude: 123:38:56.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

| | | |
|--|---|---|
| Channel Type: A4 | Canopy Density (%): 99.0 | Pools by Stream Length (%): 12.5 |
| Reach Length (ft.): 1355 | Coniferous Component (%): 62.5 | Pool Frequency (%): 27.9 |
| Riffle/Flatwater Mean Width (ft.): 3.5 | Hardwood Component (%): 37.5 | Residual Pool Depth (%): |
| BFW: | Dominant Bank Vegetation: Coniferous Trees | < 2 Feet Deep: 94 |
| Range (ft.): 13 to 26 | Vegetative Cover (%): 94.4 | 2 to 2.9 Feet Deep: 6 |
| Mean (ft.): 20 | Dominant Shelter: Small Woody Debris | 3 to 3.9 Feet Deep: 0 |
| Std. Dev.: 6 | Dominant Bank Substrate Type: Cobble/Gravel | >= 4 Feet Deep: 0 |
| Base Flow (cfs.): 0.0 | Occurrence of LWD (%): 11 | Mean Max Residual Pool Depth (ft.): 1.0 |
| Water (F): 52 - 54 Air (F): 50 - 53 | LWD per 100 ft.: | Mean Pool Shelter Rating: 37 |
| Dry Channel (ft): 551 | Riffles: 1 | |
| | Pools: 11 | |
| | Flat: 6 | |
| Pool Tail Substrate (%): Silt/Clay: 12 Sand: 0 Gravel: 76 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 12 | | |
| Embeddedness Values (%): 1. 82.4 2. 17.6 3. 0.0 4. 0.0 5. 0.0 | | |

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: 1236489395466

LLID: 1236489395466

Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Confluence Location: Quad: DUTCHMANS

Legal Description: T20NR16WS33

Latitude: 39:32:48.0N

Longitude: 123:38:56.0W

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 | 6 | 8 | 25.9 |
| Boulder | 1 | 0 | 1.9 |
| Cobble / Gravel | 13 | 12 | 46.3 |
| Sand / Silt / Clay | 7 | 7 | 25.9 |

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 | 1.9 |
| Brush | 3 | 2 | 9.3 |
| Hardwood Trees | 6 | 3 | 16.7 |
| Coniferous Trees | 17 | 22 | 72.2 |
| No Vegetation | 0 | 0 | 0.0 |

Total Stream Cobble Embeddedness Values: 1

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

StreamName: 1236489395466

LLID: 1236489395466

Drainage: Rockport

Survey Dates: 10/17/2012 to 10/17/2012

Confluence Location: Quad: DUTCHMANS

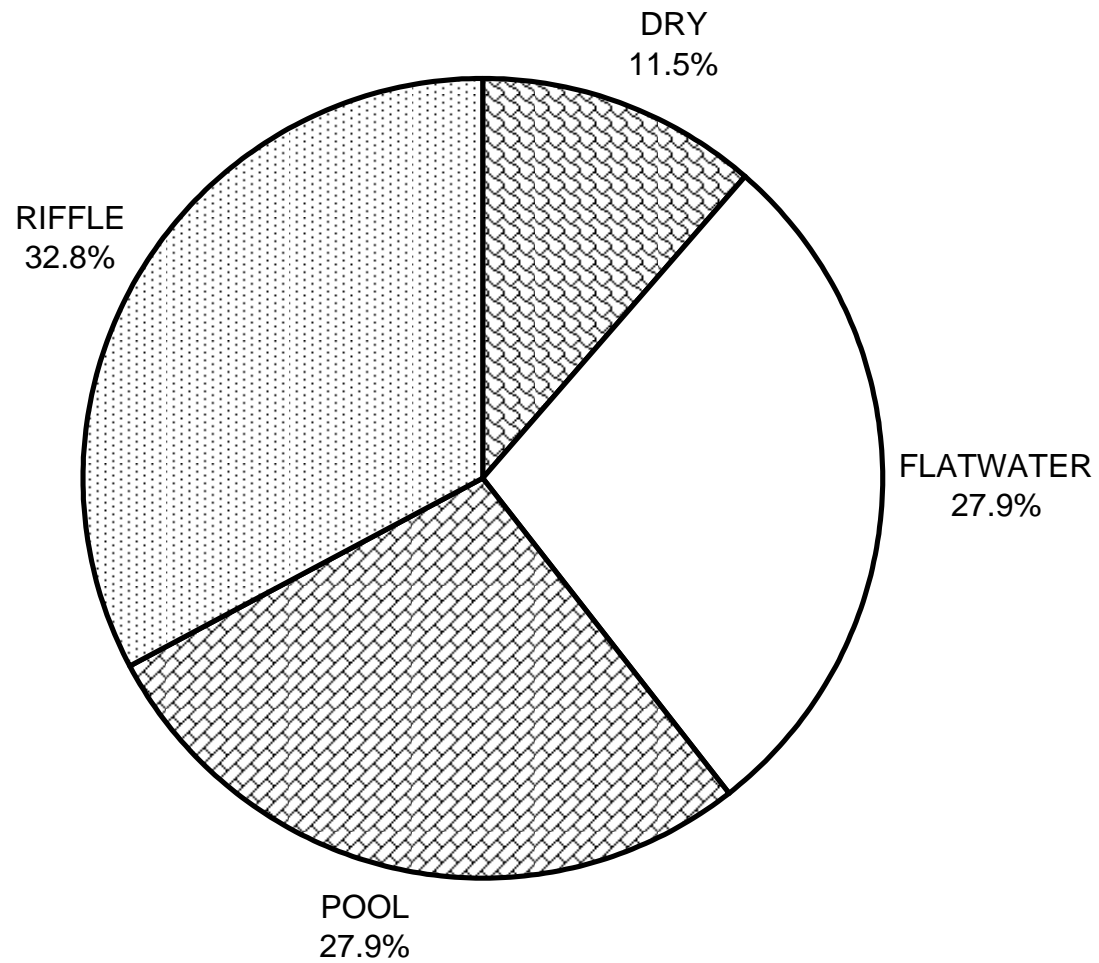
Legal Description: T20NR16WS33

Latitude: 39:32:48.0N

Longitude: 123:38:56.0W

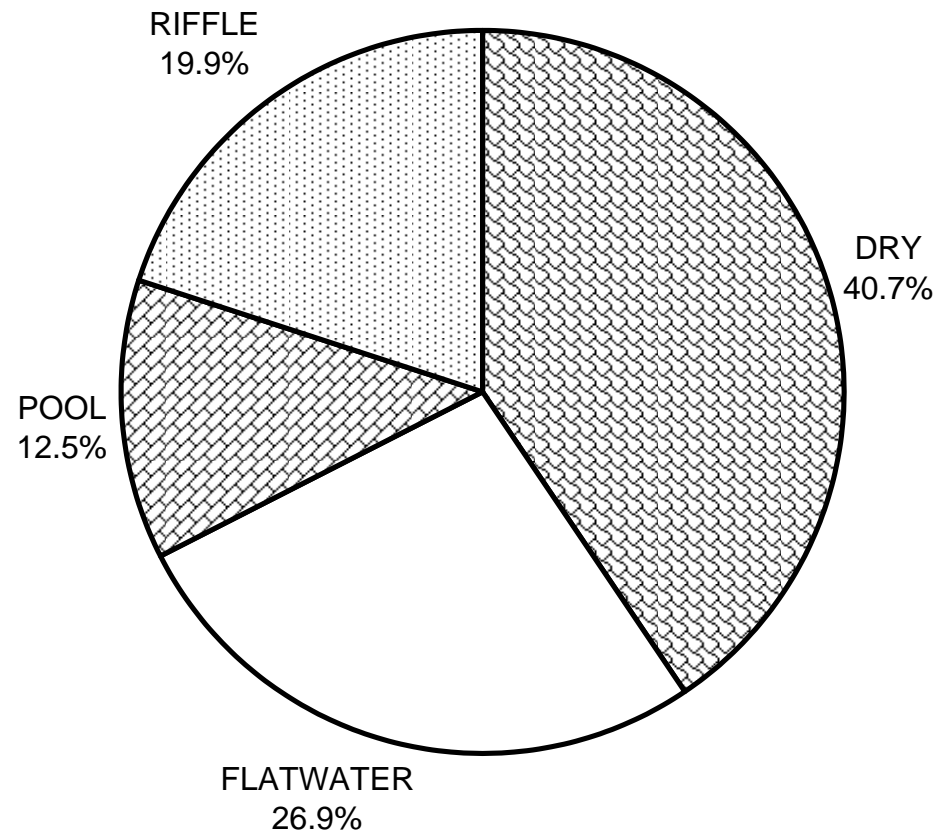
| | Riffles | Flatwater | Pools |
|----------------------------|----------------|------------------|--------------|
| UNDERCUT BANKS (%) | 0 | 0 | 0 |
| SMALL WOODY DEBRIS (%) | 53 | 58 | 48 |
| LARGE WOODY DEBRIS (%) | 0 | 0 | 20 |
| ROOT MASS (%) | 0 | 0 | 11 |
| TERRESTRIAL VEGETATION (%) | 0 | 20 | 0 |
| AQUATIC VEGETATION (%) | 0 | 0 | 0 |
| WHITEWATER (%) | 0 | 0 | 8 |
| BOULDERS (%) | 47 | 23 | 11 |
| BEDROCK LEDGES (%) | 0 | 0 | 3 |

Unnamed Tributary to Middle Fork Ten Mile River 2012 HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 1

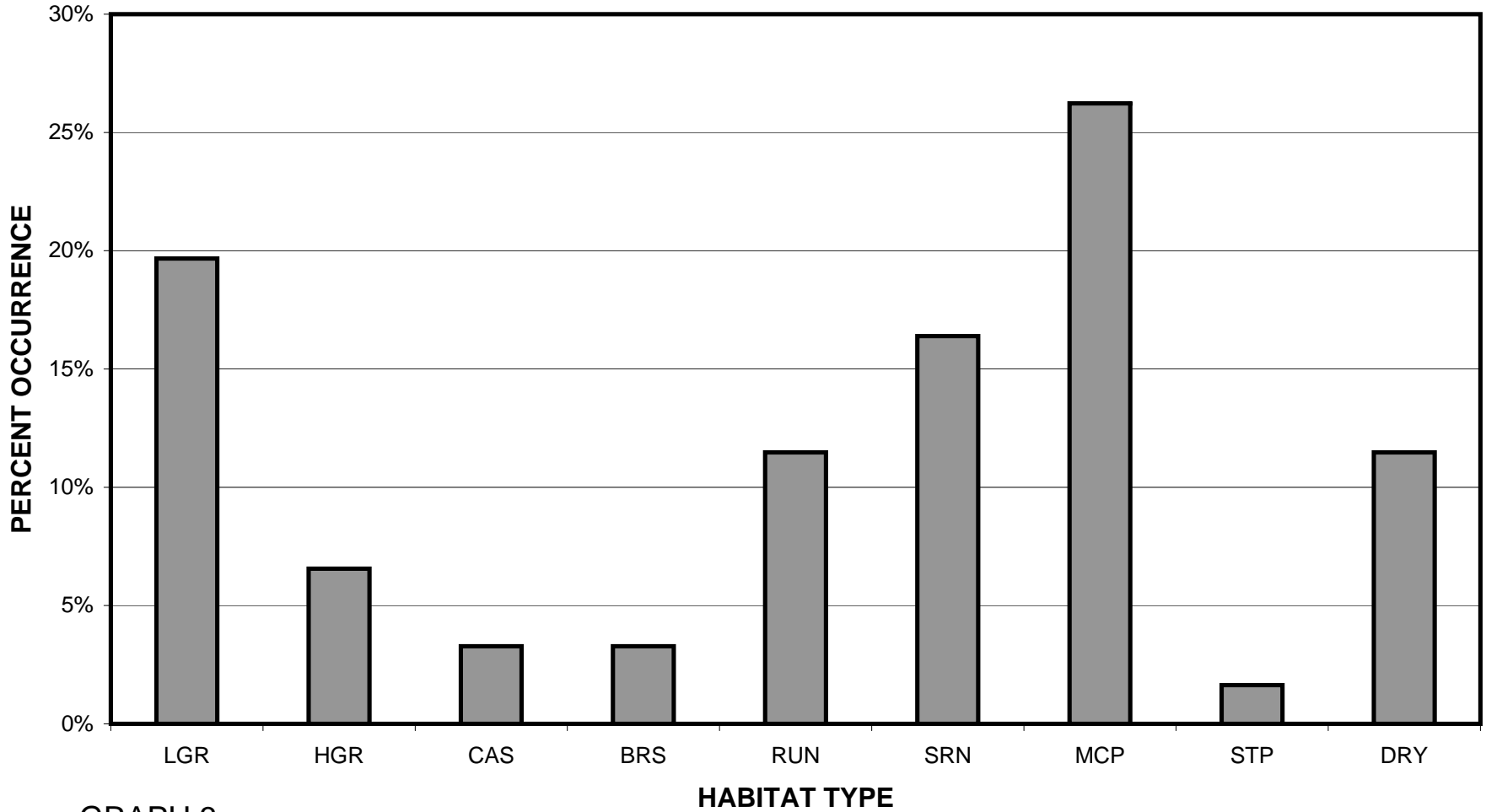
**Unnamed Tributary to Middle Fork Ten Mile River 2012
HABITAT TYPES BY PERCENT TOTAL LENGTH**



GRAPH 2

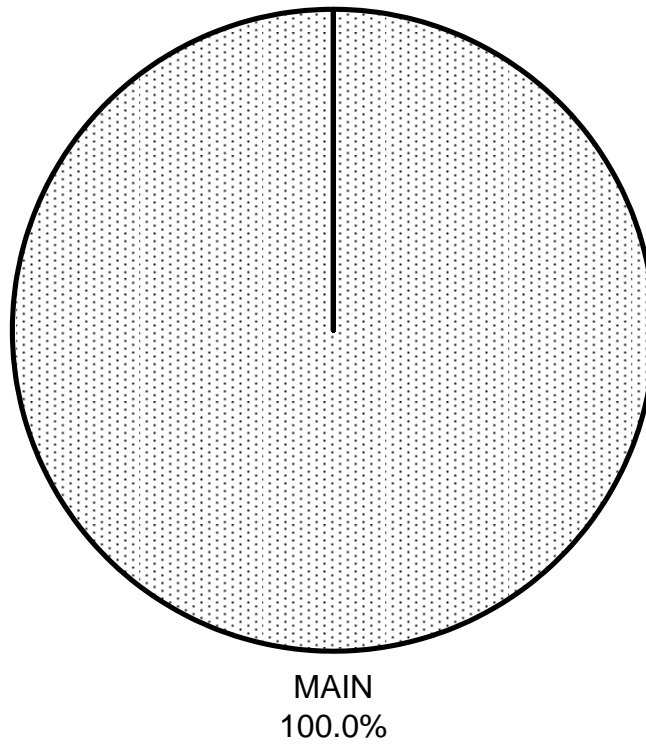
Unnamed Tributary to Middle Fork Ten Mile River 2012

HABITAT TYPES BY PERCENT OCCURRENCE



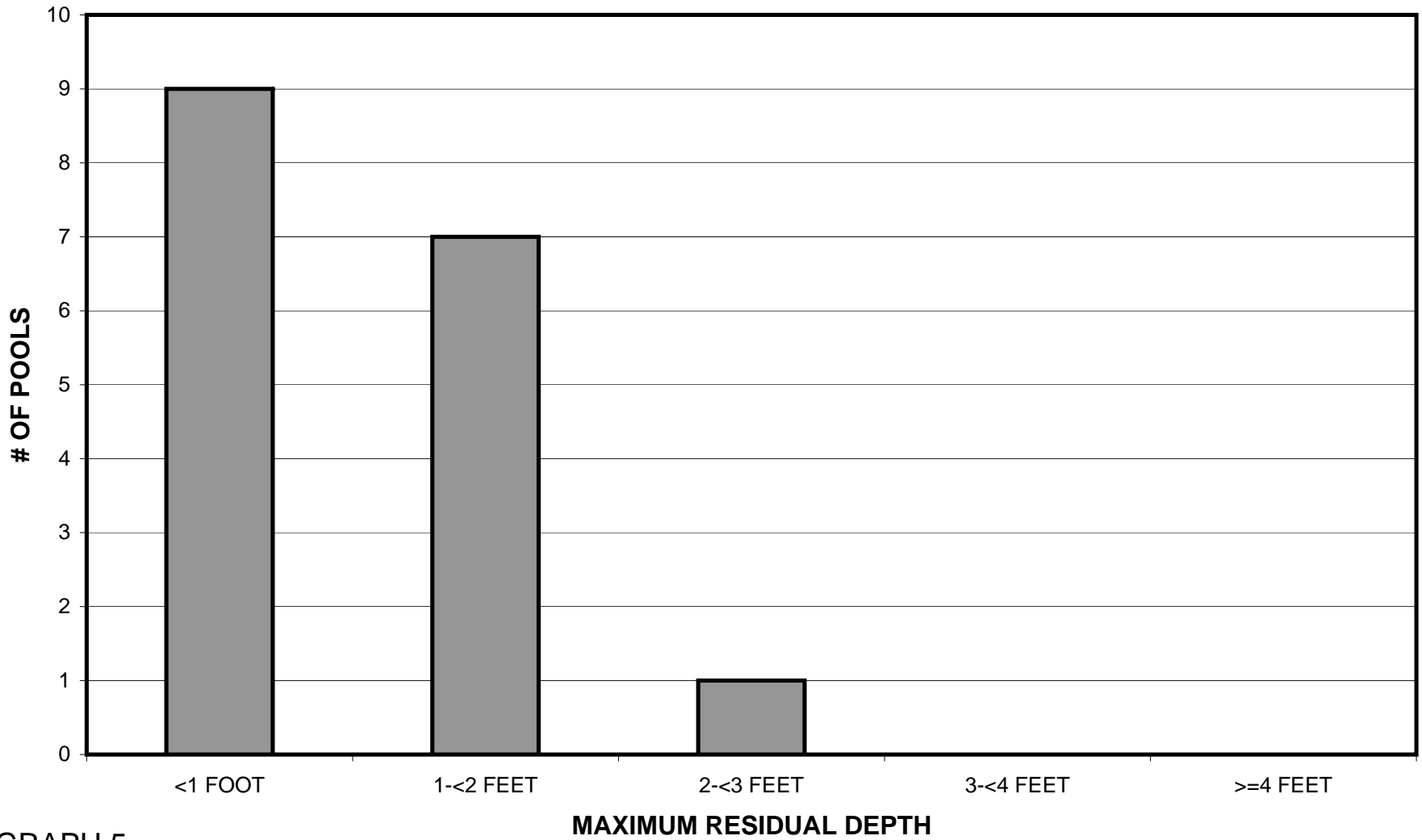
GRAPH 3

**Unnamed Tributary to Middle Fork Ten Mile River 2012
POOL TYPES BY PERCENT OCCURRENCE**



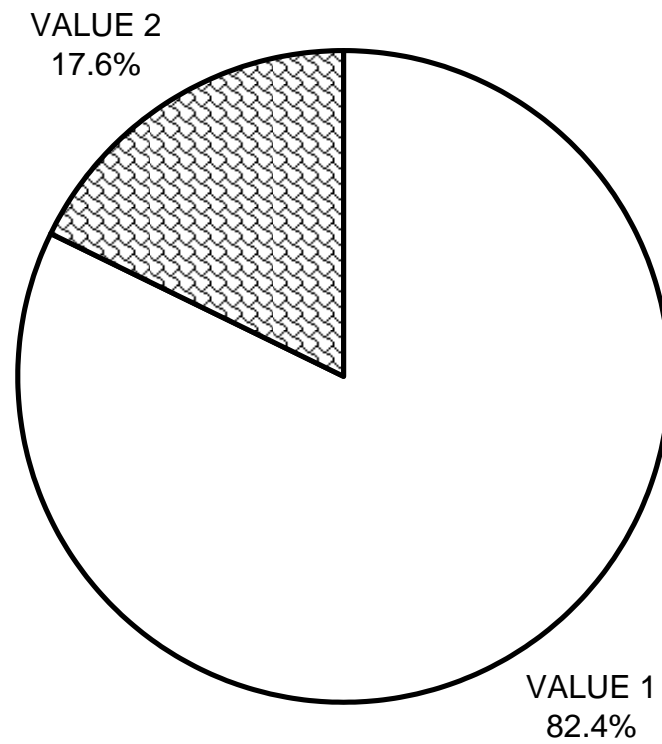
GRAPH 4

Unnamed Tributary to Middle Fork Ten Mile River 2012 MAXIMUM DEPTH IN POOLS



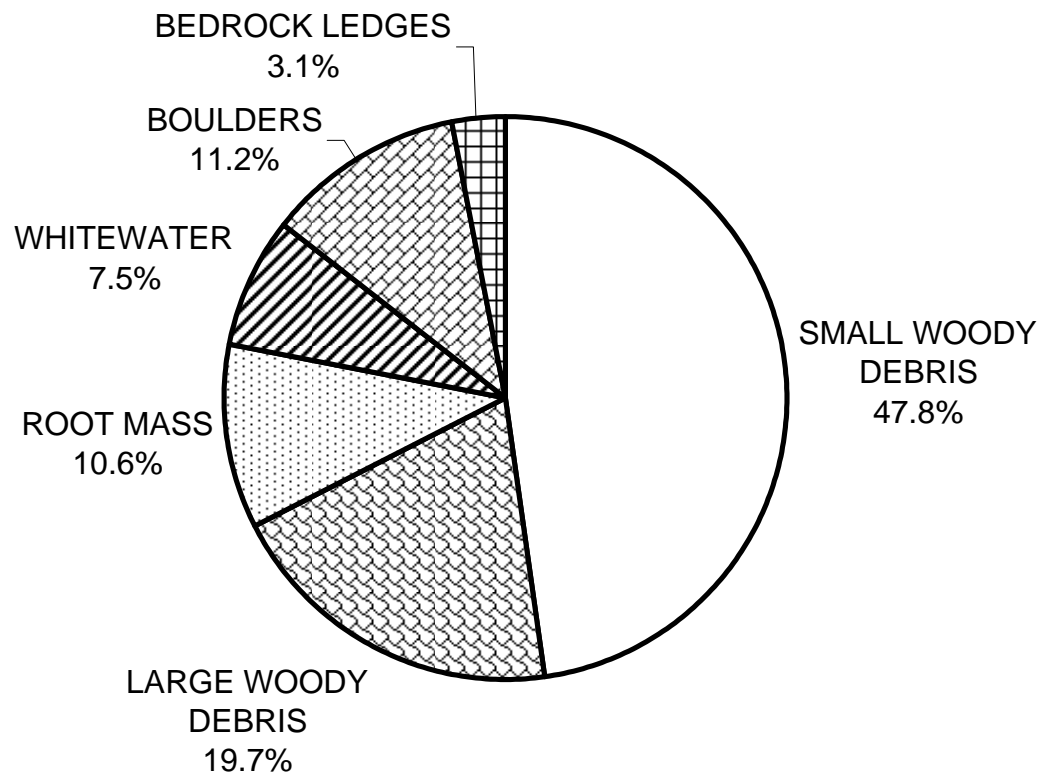
GRAPH 5

Unnamed Tributary to Middle Fork Ten Mile River 2012 PERCENT EMBEDDEDNESS



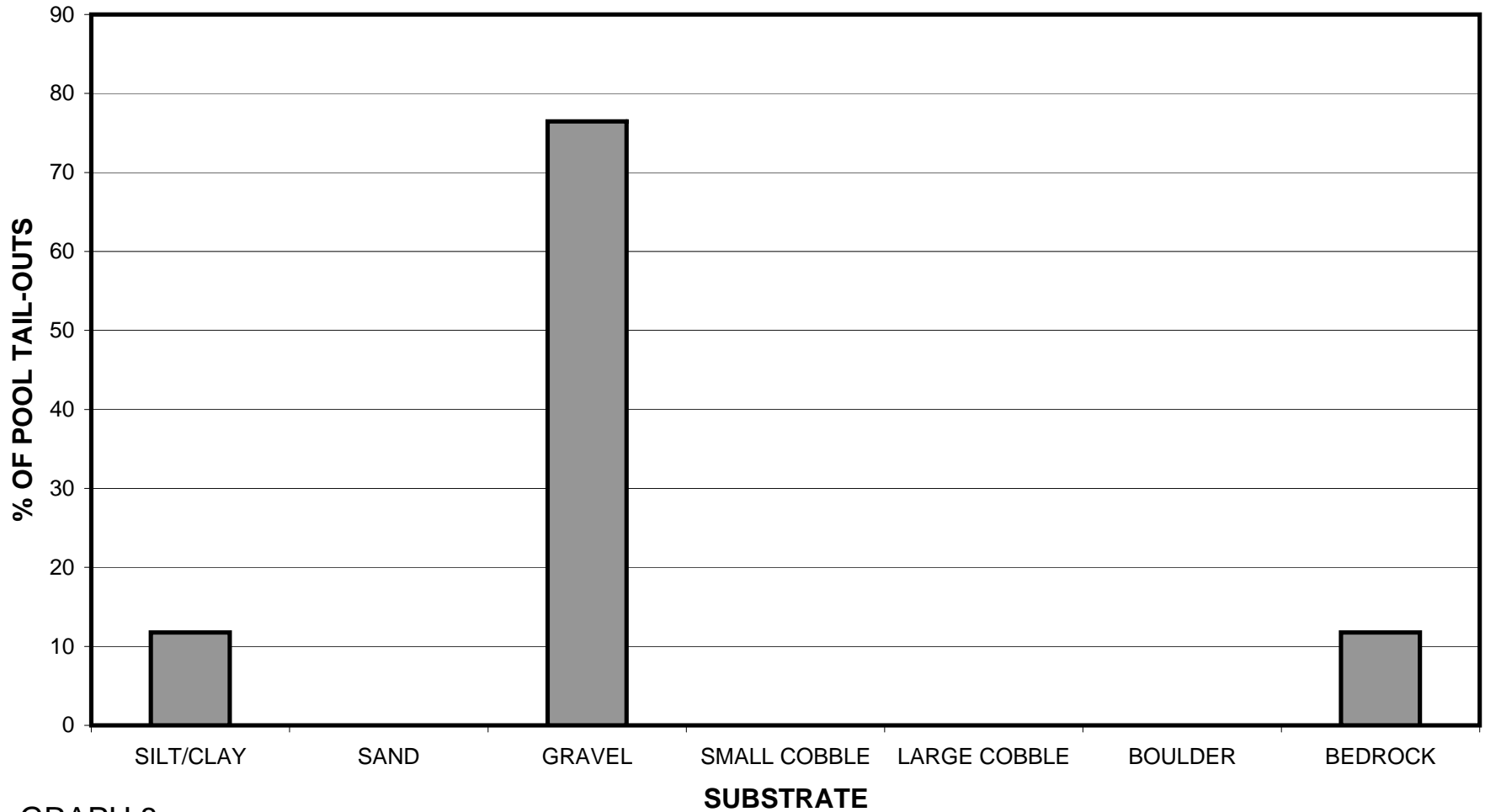
GRAPH 6

Unnamed Tributary to Middle Fork Ten Mile River 2012 MEAN PERCENT COVER TYPES IN POOLS



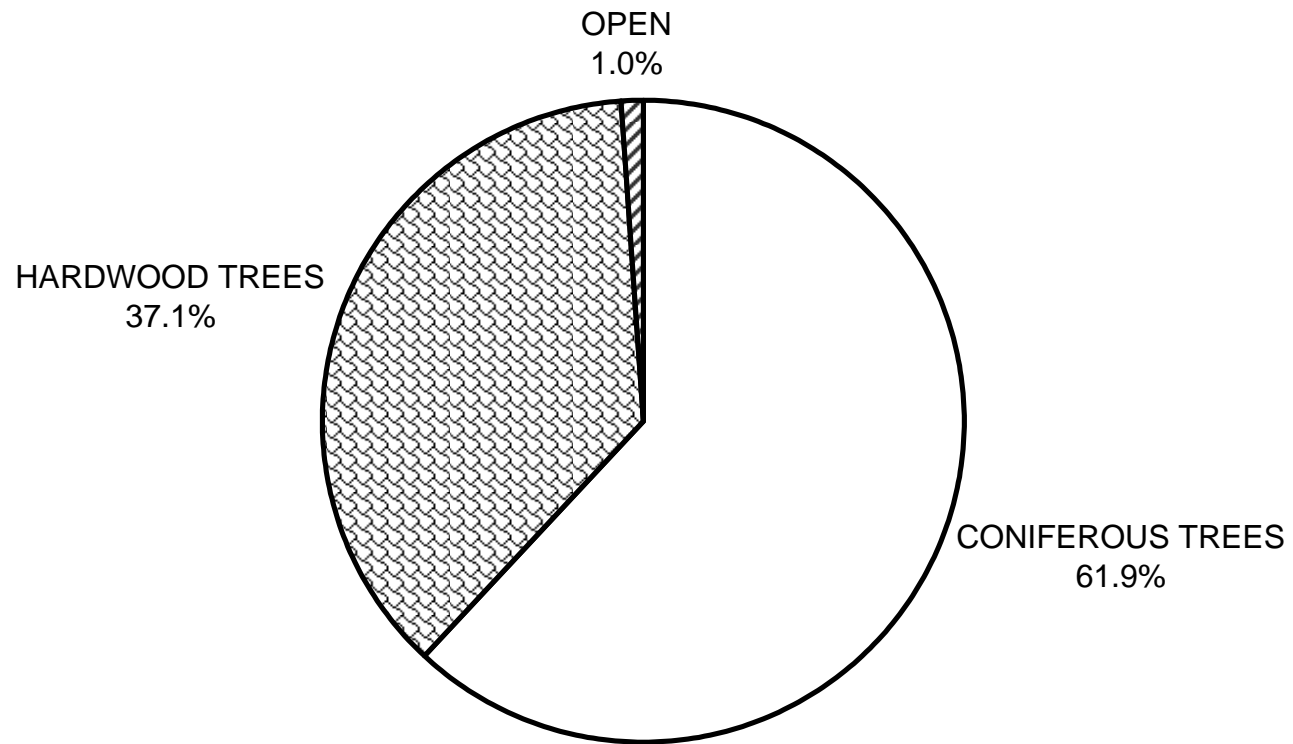
GRAPH 7

**Unnamed Tributary to Middle Fork Ten Mile River 2012
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



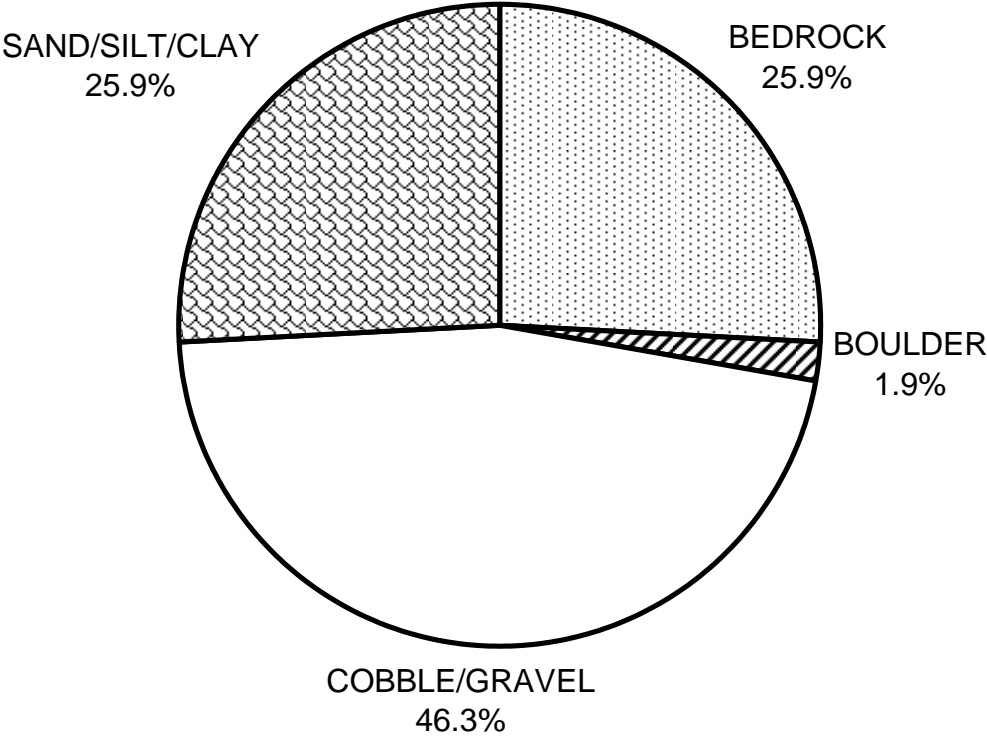
GRAPH 8

**Unnamed Tributary to Middle Fork Ten Mile River 2012
MEAN PERCENT CANOPY**



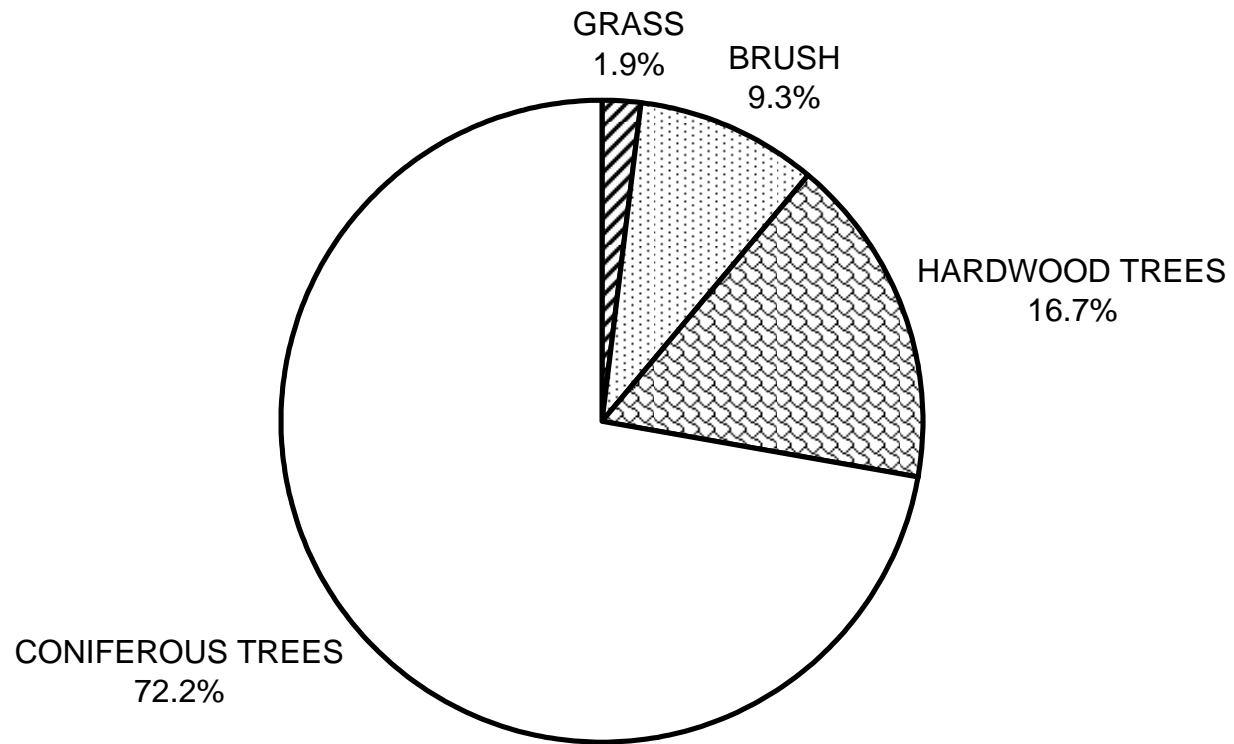
GRAPH 9

**Unnamed Tributary to Middle Fork Ten Mile River 2012
DOMINANT BANK COMPOSITION IN SURVEY REACH**



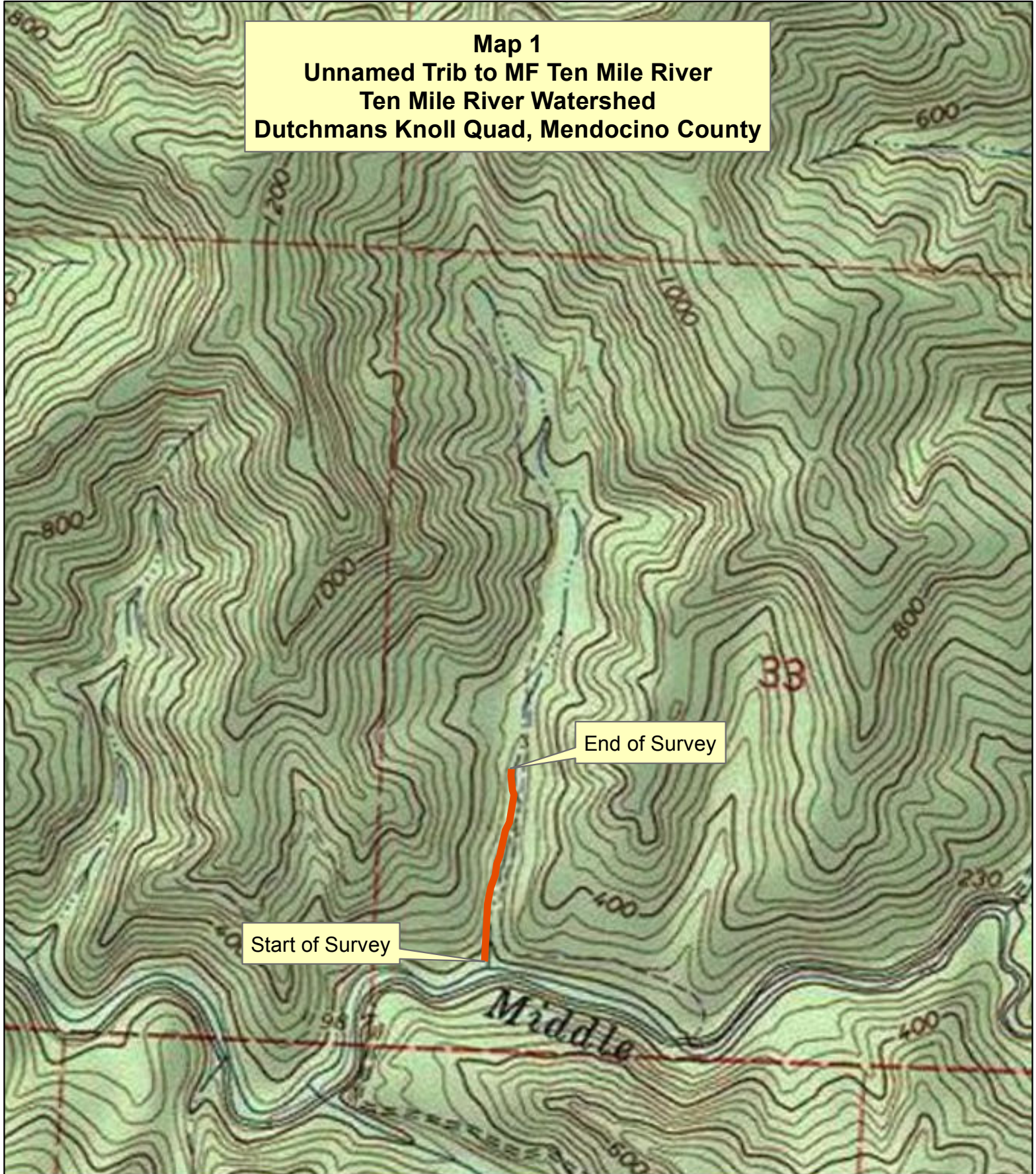
GRAPH 10

**Unnamed Tributary to Middle Fork Ten Mile River 2012
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

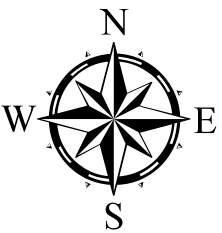
Map 1
Unnamed Trib to MF Ten Mile River
Ten Mile River Watershed
Dutchmans Knoll Quad, Mendocino County



Start of Survey

End of Survey

Middle



— A4 Channel Type

