STREAM INVENTORY REPORT

Grasshopper Creek

INTRODUCTION

A stream inventory was conducted July 29, 2003 on Grasshopper Creek. The survey began at the confluence with Buckeye Creek and extended upstream 609 feet.

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

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

WATERSHED OVERVIEW

Grasshopper Creek is a tributary to Buckeye Creek, a tributary to South Fork Gualala River, tributary to the Gualala River, which drains to the Pacific Ocean. It is located in Sonoma County, California (Map 1). Grasshopper Creek's legal description at the confluence with Buckeye Creek is T10N R14W S1. Its location is 38°44′29.7″ north latitude and 123°22′2.4″ west longitude. Grasshopper Creek is a first order stream and has approximately 21,732 feet of blue line stream according to the USGS Annapolis 7.5 minute quadrangle. Grasshopper Creek drains a watershed of approximately 3.15 square miles. Elevations range from about 275 feet at the mouth of the creek to 2,330 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 approximately 7.2 miles south of Gualala at Annapolis Road. The stream is accessed by following Annapolis Road from Sea Ranch, east to Soda Springs Road. Follow Soda Springs Road for approximately 1 mile to a gravel road. Follow signs to Soda Springs Reserve for approximately 1.9 miles to Kelly Road. Follow Kelly Road west 1.2 miles to Franchini Creek culvert crossing. On foot follow Franchini Creek to the confluence with Buckeye. The mouth of Grasshopper Creek is approximately 250 upstream of Franchini Creek.

METHODS

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

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the 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 Grasshopper Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) at 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 (1985 rev. 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 (1988). 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". Grasshopper Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean

wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Grasshopper 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 particle size, bedrock, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide 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. 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 Grasshopper 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 Grasshopper 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 evergreen or deciduous 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 Grasshopper 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.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 1.0.37, 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:

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of shelter by habitat types
- Summary of dominant substrates by habitat types
- Summary of fish habitat elements by stream reach

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

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools
- Percent embeddedness estimated in pool tail-outs
- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 29, 2003, was conducted by H. Kleeb and S. Thompson (WSP/AmeriCorps). The total length of the stream surveyed was only 609 feet due to a 15 waterfall followed by a 7 foot waterfall near the mouth.

Stream flow was estimated to be 0.2 cfs during the survey period

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Grasshopper Creek is B1 channel type for the entire 609 feet of the stream surveyed. B1 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, have a very stable plan and profile, stable banks, and bedrock-dominant substrates.

Water temperatures taken during the survey period ranged from 60° to 65° Fahrenheit. Air temperatures ranged from 73° to 81° Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 39% riffle units, 39% flatwater units, and 23% pool units (Graph 1). Based on total length of Level II habitat types there were 40% riffle units, 49% flatwater units, and 11% pool units (Graph 2).

Seven Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 23%; step runs, 15%; and low-gradient riffles, 15% (Graph 3). Based on percent total length, step runs made up 26%, runs 24%, and high-gradient riffles 19%.

A total of three pools were identified (Table 3). Main channel pools were the most frequently encountered, at 67%, and comprised 55% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Two of the three measured pools (67%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the three pool tail-outs measured, all three had a value of 5 (100%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

Riffle habitat types had a mean shelter rating of 27, flatwater habitat types had a mean shelter rating of 23, and pool habitats had a mean shelter rating of 17 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 30. Main-channel pools had a mean shelter rating of 10 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Grasshopper Creek. Graph 7 describes the pool cover in Grasshopper Creek. White water is the dominant pool cover type followed by boulders.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Bedrock was the dominant substrate observed in 100% of pool tail-outs.

The mean percent canopy density for the surveyed length of Grasshopper Creek was 46%. The mean percentages of evergreen and deciduous trees were 6% and 40%, respectively with 54% of the canopy open. Graph 9 describes the mean percent canopy in Grasshopper Creek.

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For the stream reach surveyed, the mean percent right bank vegetated was 38%. The mean percent left bank vegetated was 49%. The dominant elements composing the structure of the stream banks consisted of 56% bedrock, 25% sand/silt/clay, and 19% cobble/gravel (Graph 10). Brush was the dominant vegetation type observed in 38% of the units surveyed. Additionally, 31% of the units surveyed had deciduous trees as the dominant vegetation type, and 19% had grass as the dominant vegetation (Graph 11).

DISCUSSION

Grasshopper Creek is a B1 channel type for the entire 609 feet of stream surveyed. The suitability of B1 channel types for fish habitat improvement structures is as follows:

The water temperatures recorded during the survey period ranged from 60° to 65° Fahrenheit. This is an unsuitable range for salmonids. 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 49% of the total length of this survey, riffle 40%, and pool 11%. The pools are relatively deep, with two of the three (67%) measured pools having a maximum 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 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.

None of the three pool tail-outs measured had embeddedness ratings of 1, 2, 3 or 4. All three 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. Sediment sources in Grasshopper Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Three of the 3 pool tail-outs measured had bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter for flatwater was 23. The mean shelter rating for pools was 17. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, white water and bedrock ledges contribute a small amount. 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 46%. In general, revegetation projects are considered when canopy density is less than 80%.

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The percentage of right and left bank covered with vegetation was low at 38% and 49%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic trees species, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Due to the bedrock waterfalls near the mouth of the stream, access for migrating salmonids is an ongoing potential problem or nearly impossible.

2) Active and potential sediment sources need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

3) Increase the canopy on Grasshopper Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

4) The limited water temperature data available suggest that maximum temperatures are above 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.

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	Start of survey at the confluence with Buckeye Creek.
206	0003.00	Out of area of influence.
448	0008.00	Approximately 10 pieces of large wood around pool.
478	0009.00	15’ high bedrock waterfall. Dry side channel offers potential access during higher flows.
490	0010.00	Gradient increases.
590	0013.00	7’ high bedrock waterfall.

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609	0013.00	End of survey.

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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]	

Grasshopper Creek

TABLES AND GRAPHS

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

Stream Name: Grasshopper Creek Drainage: Gualala River

Survey Dates: 7/29/2003 to 7/29/2003

Confluence Location: Quad: ANNAPOLIS Legal Description: T10NR14WS01 Latitude: 38:44:30.0N Longitude: 123:22:02.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Percent 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	2	FLATWATER	38.5	60	301	49.4	6.5	0.5	1.2	281	1403	146	731		23
3	3	POOL	23.1	22	66	10.8	16.3	1.4	2.4	293	878	495	1485	444	17
5	3	RIFFLE	38.5	48	242	39.7	9.7	0.4	1.0	123	616	52	174		27

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
13	8	609	2895.967	2390.563

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Grasshopper Creek Drainage: Gualala River

Survey Dates: 7/29/2003 to 7/29/2003

Confluence Location: Quad: ANNAPOLIS Legal Description: T10NR14WS01 Latitude: 38:44:30.0N Longitude: 123:22:02.0W

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 (%)
2	1	LGR	15.4	49	98	16.1	17	0.4	0.9	190	381	76	152		80	87
1	0	HGR	7.7	113	113	18.6										
2	2	CAS	15.4	16	31	5.1	6	0.3	1.1	90	179	29	29		0	15
3	1	RUN	23.1	48	145	23.8	7	0.3	1.1	147	441	44	132		30	62
2	1	SRN	15.4	78	156	25.6	6	0.6	1.2	414	828	248	497		15	25
2	2	TRP	15.4	18	36	5.9	16	1.2	2.7	209	419	283	567	253	10	49
1	1	PLP	7.7	30	30	4.9	18	1.8	2.7	459	459	918	918	826	30	

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
13	8	609	2706.6	2294.8

Grasshopper Creek

Summary of Pool Types

Name: Grasshopper Creek Drainage: Gualala River

Dates: 7/29/2003 to 7/29/2003

Location: Quad: ANNAPOLIS Legal Description: T10NR14WS01 Latitude: 38:44:30.0N Longitude: 123:22:02.0W

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
2	MAIN	67	18	36	55	15.5	1.2	209	419	253	506	10
1	SCOUR	33	30	30	45	18.0	1.8	459	459	826	826	30

Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
3	66	877.8	1331.76

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

Stream Name: Grasshopper Creek Drainage: Gualala River

Survey Dates: 7/29/2003 to 7/29/2003

Confluence Location: Quad: ANNAPOLIS Legal Description: T10NR14WS01 Latitude: 38:44:30.0N Longitude: 123:22:02.0W

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
2	TRP	67	0	0	1	50	1	50	0	0	0	0
1	PLP	33	0	0	0	0	1	100	0	0	0	0

Total Units	Total 1 Foot Max Resid. Depth	< Total 1 Foot % Occurrence	< 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
3	0	0	1	33	2	67	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 2.4

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Grasshopper Creek Drainage: Gualala River

Survey Dates: 7/29/2003 to 7/29/2003 Dry Units: 0

Confluence Location: Quad: ANNAPOLIS Legal Description: T10NR14WS01 Latitude: 38:44:30.0N Longitude: 123:22:02.0W

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
2	1	LGR	0	20	0	0	20	0	10	50	0
1	0	HGR									
2	2	CAS	0	0	0	0	0	0	0	0	0
5	3	TOTAL RIFFLE	0	7	0	0	7	0	3	17	0
3	1	RUN	0	10	0	0	10	0	0	80	0
2	1	SRN	0	20	0	0	0	0	0	60	20
5	2	TOTAL FLAT	0	15	0	0	5	0	0	70	10
2	2	TRP	0	0	0	0	0	0	35	35	30
1	1	PLP	0	20	20	0	10	0	40	10	0
3	3	TOTAL POOL	0	7	7	0	3	0	37	27	20
13	8	TOTAL	0	9	3	0	5	0	15	34	10

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Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Grasshopper Creek Drainage: Gualala River
Survey Dates: 7/29/2003 to 7/29/2003 Dry Units: 0
Confluence Location: Quad: ANNAPOLIS Legal Description: T10NR14WS01 Latitude: 38:44:30.0N Longitude: 123:22:02.0W

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
2	1	LGR	0	0	100	0	0	0	0
1	0	HGR	0	0	0	0	0	0	0
2	0	CAS	0	0	0	0	0	0	0
3	1	RUN	0	0	100	0	0	0	0
2	1	SRN	0	0	0	0	0	0	100
2	2	TRP	0	0	100	0	0	0	0
1	1	PLP	0	0	0	100	0	0	0

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Grasshopper Creek Drainage: Gualala River
Survey Dates: 7/29/2003 to 7/29/2003 Survey Length (ft.): 609 Main Channel (ft.): 609 Side Channel (ft.): 0
Confluence Location: Quad: ANNAPOLIS Legal Description: T10NR14WS01 Latitude: 38:44:30.0N Longitude: 123:22:02.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

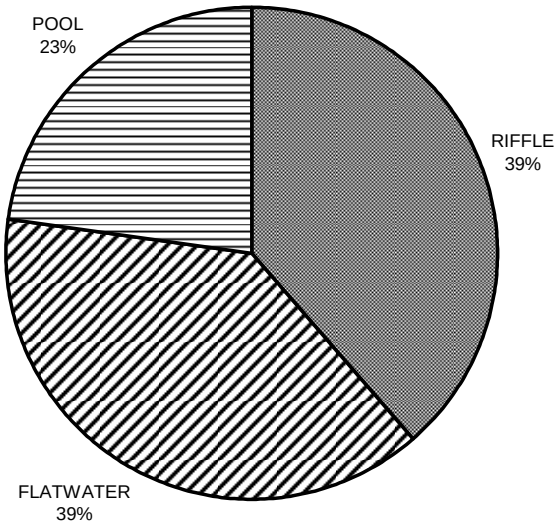
Channel Type: B1
Reach Length (ft.): 609
Riffle/Flatwater Mean Width (ft.): 8.4
BFW:
Range (ft.): 30 to 30
Mean (ft.): 30
Std. Dev.: 0
Base Flow (cfs.): 0.2
Water (F): 60 - 65 Air (F): 73 - 81
Dry Channel (ft): 0

Canopy Density (%): 46
Coniferous Component (%): 13
Deciduous Component (%): 87
Dominant Bank Vegetation: Brush
Vegetative Cover (%): 49
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Bedrock
Occurrence of LWD (%): 2
LWD per 100 ft.:
Riffles: 2
Pools: 6
Flat: 0

Pools by Stream Length (%): 11
Pool Frequency (%): 23
Residual Pool Depth (%):
< 2 Feet Deep: 33
2 to 2.9 Feet Deep: 67
3 to 3.9 Feet Deep: 0
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 2.4
Mean Pool Shelter Rating: 17

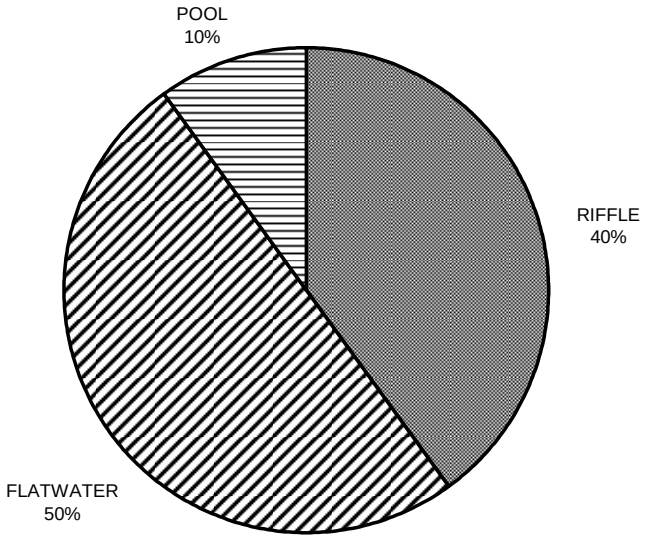
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 0 Sm Cobble: 0 Lg Cobble: 0 Boulder: 0 Bedrock: 100
Embeddedness Values (%): 1. 0 2. 0 3. 0 4. 0 5. 100

GRASSHOPPER CREEK
HABITAT TYPES BY PERCENT OCCURRENCE



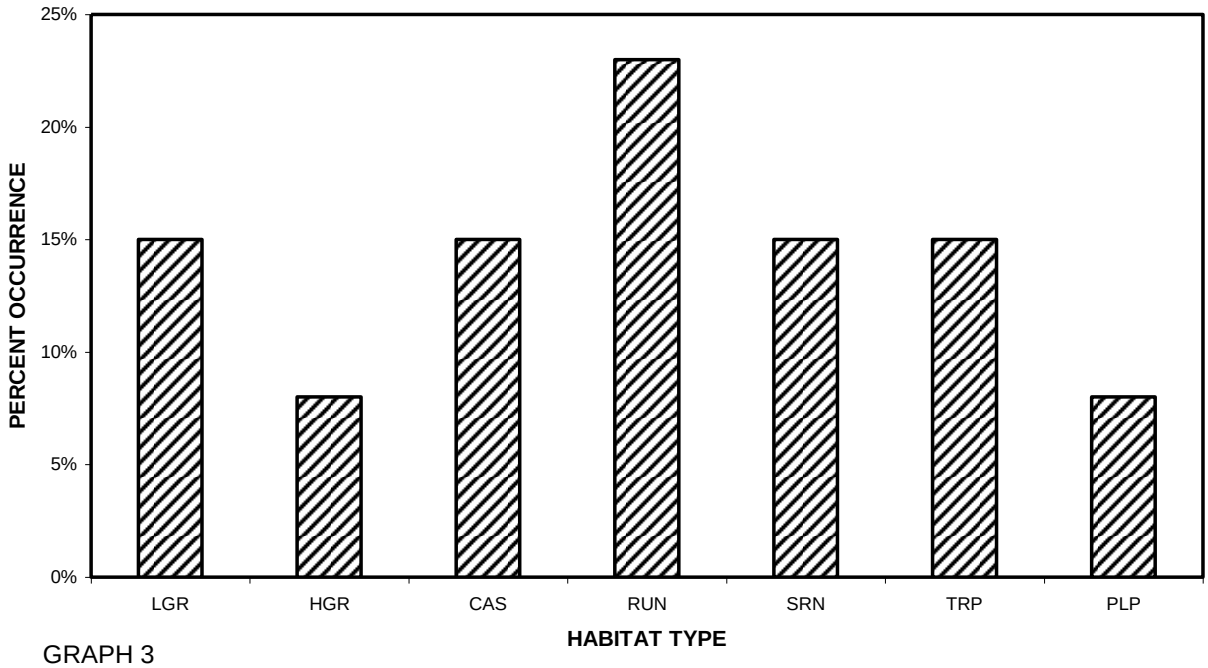
GRAPH 1

GRASSHOPPER CREEK
HABITAT TYPES BY PERCENT TOTAL LENGTH



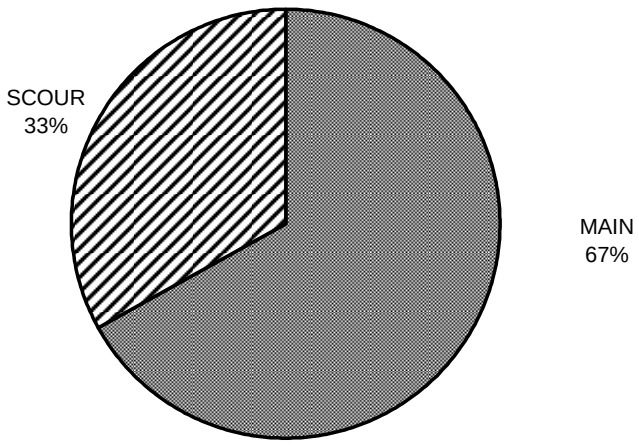
GRAPH 2

GRASSHOPPER CREEK
HABITAT UNIT TYPES BY PERCENT OCCURRENCE

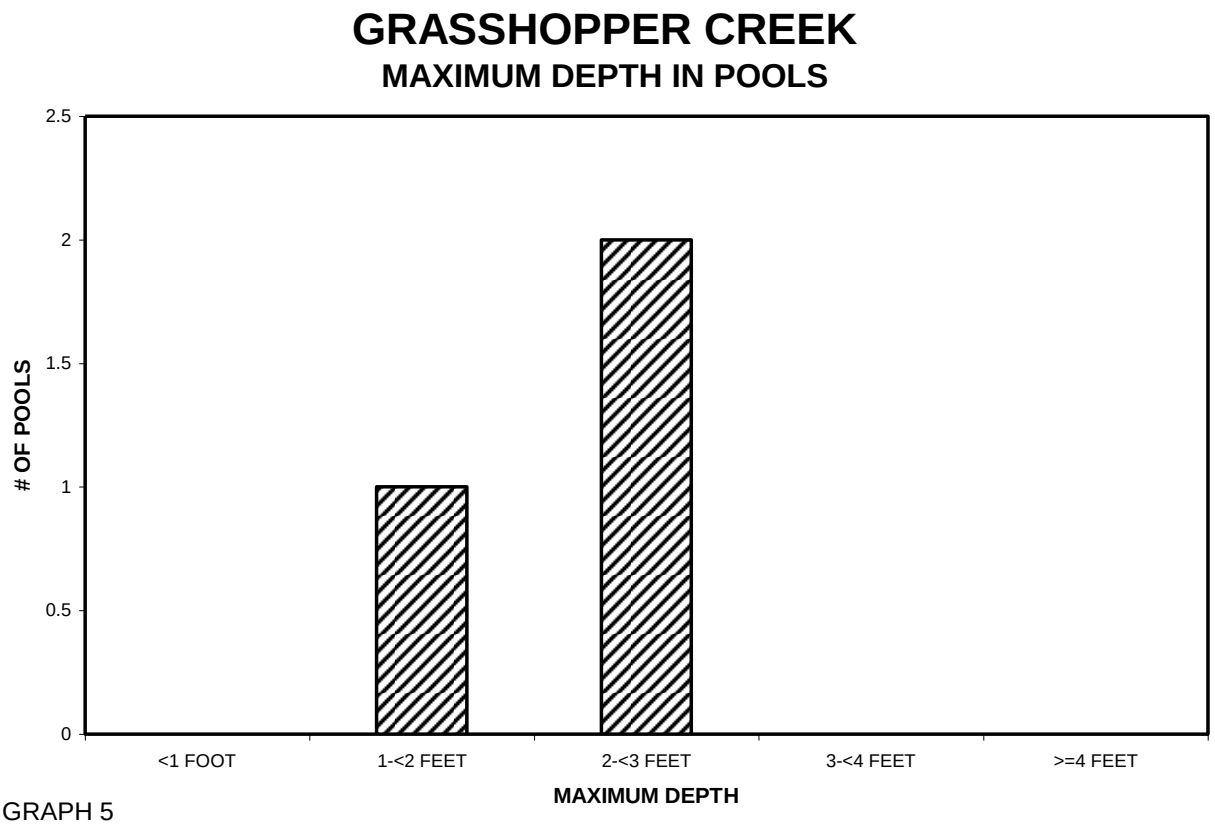


GRAPH 3

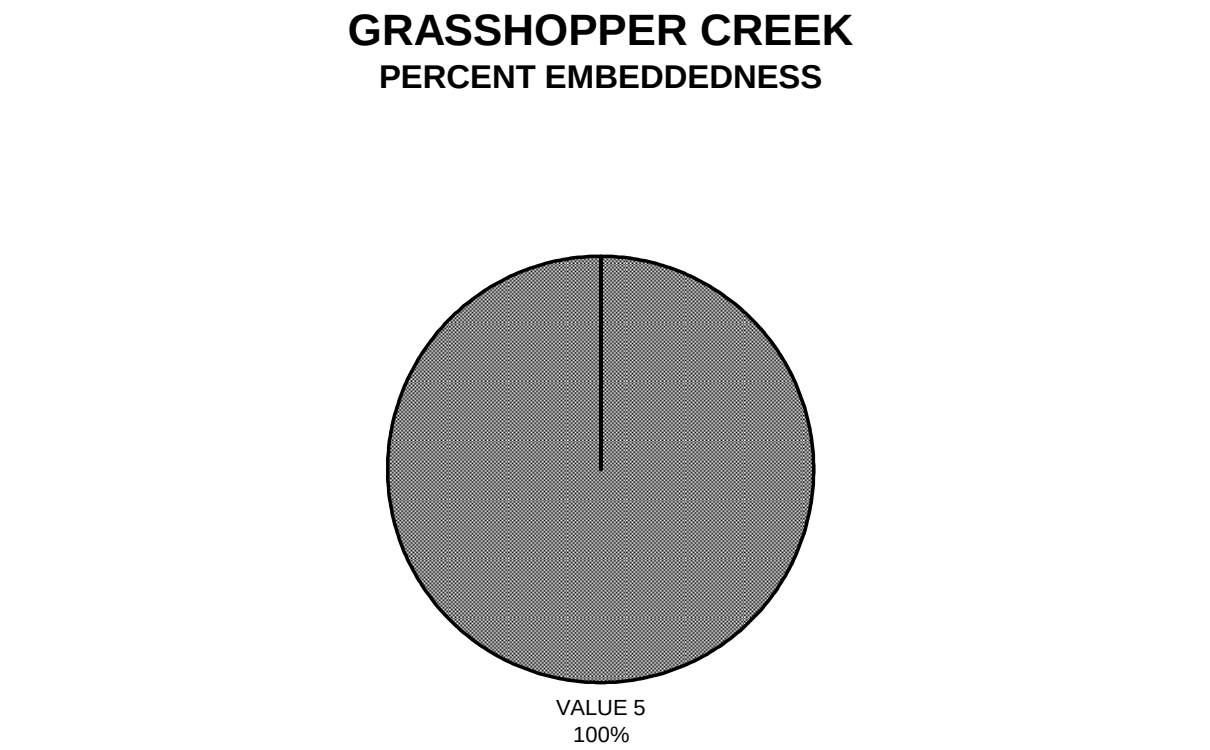
GRASSHOPPER CREEK
POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

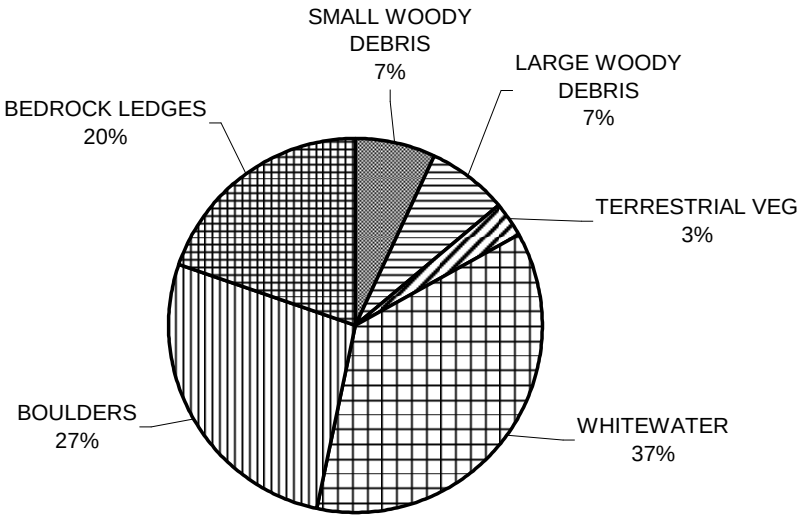


GRAPH 5



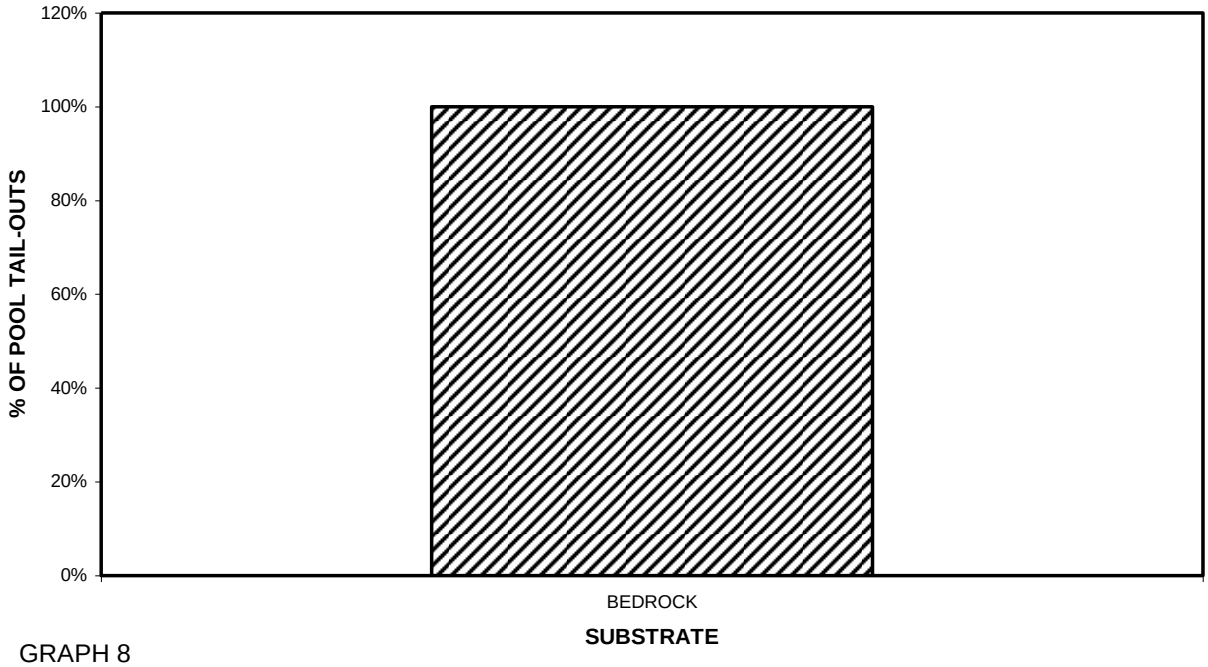
GRAPH 6

GRASSHOPPER CREEK
MEAN PERCENT COVER TYPES IN POOLS



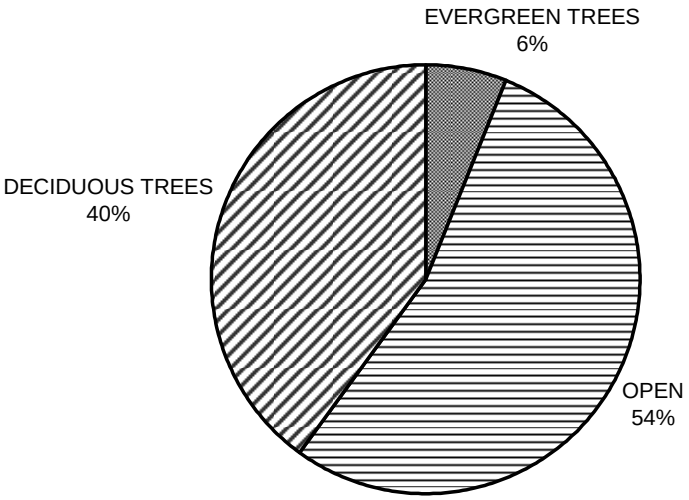
GRAPH 7

GRASSHOPPER CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



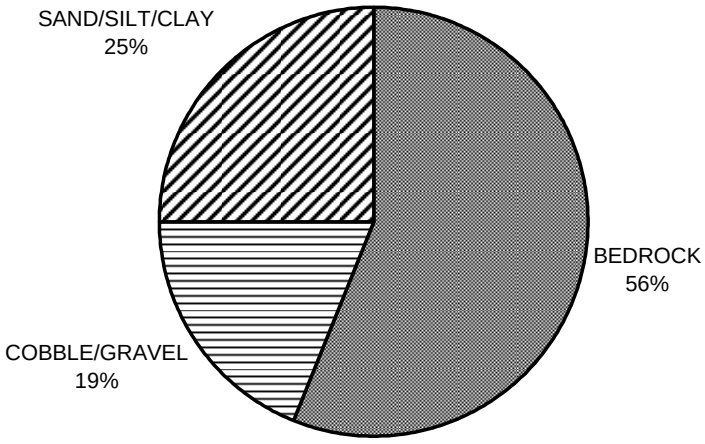
GRAPH 8

GRASSHOPPER CREEK
MEAN PERCENT CANOPY



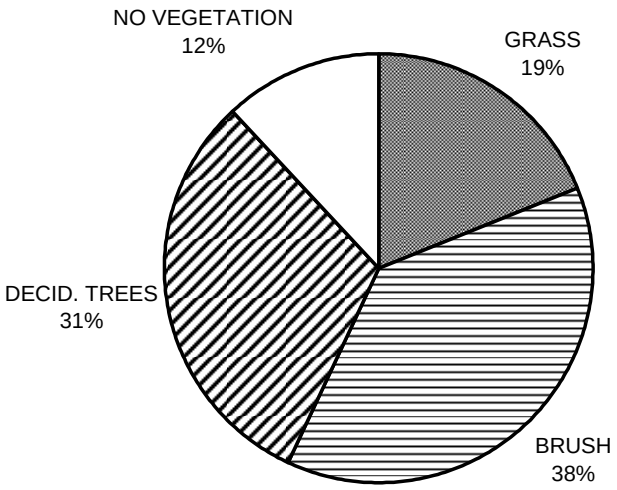
GRAPH 9

GRASSHOPPER CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



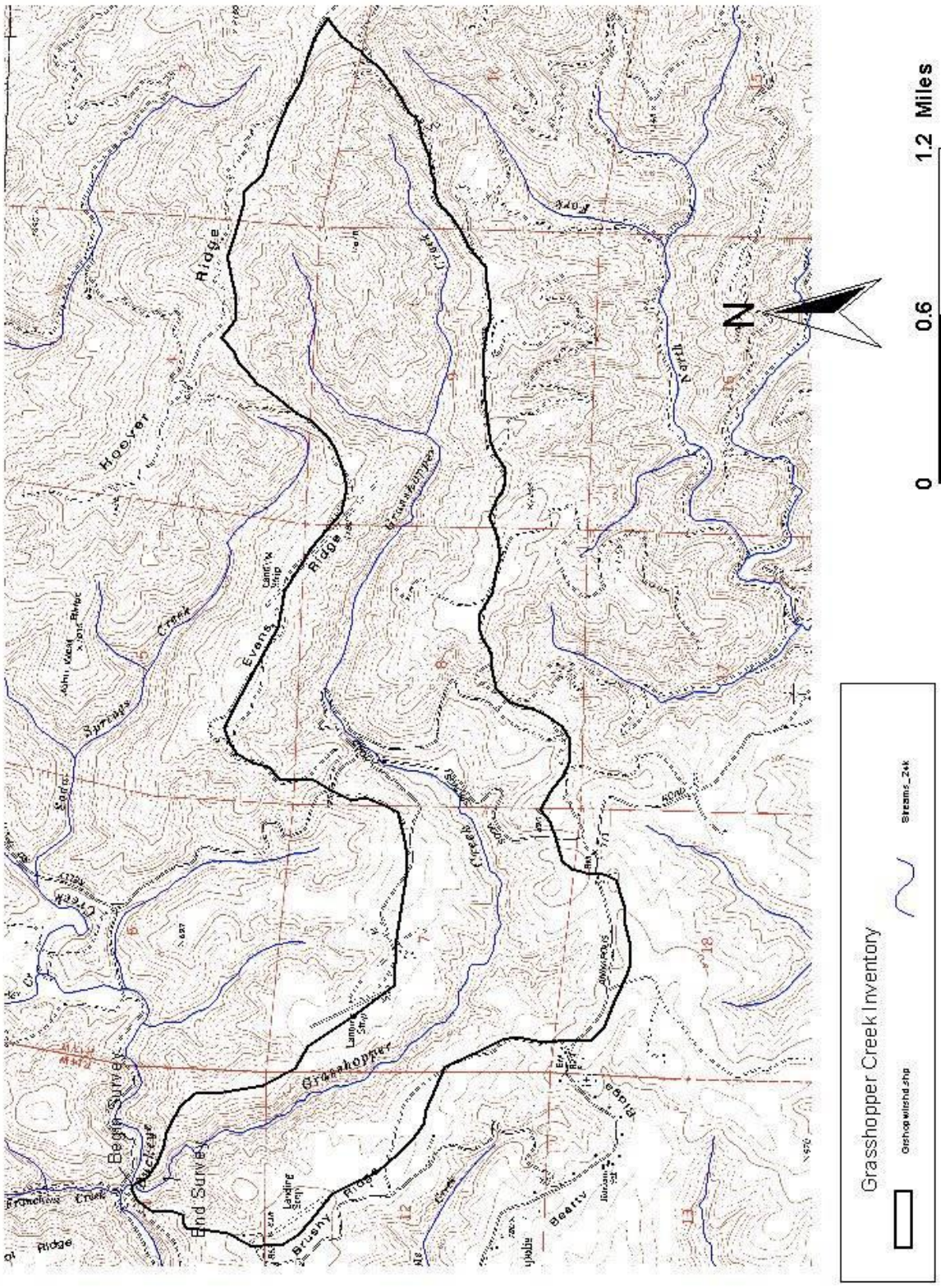
GRAPH 10

GRASSHOPPER CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Grasshopper Creek



MAP 1. Map of Grasshopper Creek showing the stream habitat inventory reach and watershed boundary.

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