STREAM INVENTORY REPORT

McMullen Creek

INTRODUCTION

A stream inventory was conducted from June 24 to June 30, 2003 on McMullen Creek. The survey began at the confluence with Noyo River and extended upstream 2.1 miles.

The McMullen 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 McMullen Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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

WATERSHED OVERVIEW

McMullen Creek is a tributary to the Noyo River, tributary to the Pacific Ocean River, located in Mendocino County, California (Map 1). McMullen Creek's legal description at the confluence with Noyo River is T18N R14W S7. Its location is 39°25′52″ north latitude and 123°27′34″ west longitude. McMullen Creek is a first order stream and has approximately 5,581 feet of solid blue line stream and 11,394 feet of dashed blue line stream and 2,932 feet of dashed blue line stream according to the USGS Burbeck 7.5 minute quadrangle. McMullen Creek drains a watershed of approximately 2.8 square miles. Elevations range from about 528 feet at the mouth of the creek to 2,585 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 Higway 20 at Irmulco Road, approximately six miles east of Willits, California. From Irmulco Road follow Shake City Road north Soper-Wheeler and Mendocino Redwood Logging Company gates. Through locked gates, follow the main haul road east to McMullen Creek and Noyo River confluence.

METHODS

The habitat inventory conducted in McMullen Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998). The California Department of Fish and Game Scientific Aid and the Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Member 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 McMullen 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". McMullen 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 McMullen 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 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 McMullen 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 McMullen 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 McMullen 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.

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 McMullen Creek. In addition, three sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following seven 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 McMullen 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

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HABITAT INVENTORY RESULTS

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

The habitat inventory of June 24 to 30, 2003, was conducted by S. Sellars (WSP/Americorps) and B. Budnick (DFG). The total length of the stream surveyed was 11,104.5 feet with an additional 32 feet of side channel.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.27 cfs on July 8, 2003.

McMullen Creek is a B3 channel type for the 9,269.5 feet and an A3 for 1,835 feet of the stream surveyed. B3 channels are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools; very stable plan and profile, stable banks and cobble-dominant substrates. A3 channels are steep, narrow, cascading, step-pool streams with high energy/debris transport associated with depositional soils, and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 52 to 62 degrees Fahrenheit. Air temperatures ranged from 58 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, 36% pool units, and 18% flatwater units (Graph 1). Based on total length of Level II habitat types there were 65% riffle units, 15% pool units, and 14% flatwater units (Graph 2).

Fifteen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low-gradient riffles, 43%; mid-channel pools, 23%; and runs, 17% (Graph 3). Based on percent total length, low-gradient riffles made up 65%, runs 13%, and mid-channel pools 8%.

A total of 76 pools were identified (Table 3). Main-channel pools were the most frequently encountered, at 70%, and comprised 63% 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. Fifteen of the 74 measured pools (20%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 75 pool tail-outs measured, 0 had a value of 1 (0%); 15 had a value of 2 (20%); 32 had a value of 3 (43%); 11 had a value of 4 (15%); and 17 had a value of 5 (23%) (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 3, flatwater habitat types had a mean shelter rating of 13, and pool habitats had a mean shelter rating of 25 (Table 1). Of the pool types, the backwater pools had the highest mean shelter rating at 40. Scour pools had a mean shelter rating of 27 and main-channel pools had a mean shelter rating of 24 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut banks are the dominant cover types in McMullen Creek. Graph 7 describes the pool cover in McMullen Creek. Undercut banks are the dominant pool cover types 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 65% of pool tail-outs while small cobble and large cobble were the next most frequently observed substrate type, each at 11%.

The mean percent canopy density for the surveyed length of McMullen Creek was 93%. The mean percentages of evergreen and deciduous trees were 90% and 3%, respectively with 7% of the canopy open. Graph 9 describes the mean percent canopy in McMullen Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 27%. The mean percent left bank vegetated was 25%. The dominant elements composing the structure of the stream banks consisted of 99% sand/silt/clay and 1% cobble/gravel (Graph 10). Evergreen trees were the dominant vegetation type observed in 81% of the units surveyed. Additionally, 17% of the units surveyed had brush as the dominant vegetation type, and 1% had grass as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Three sites were electrofished for species composition and distribution in McMullen Creek on July 8, 2003. Water temperatures taken during the electrofishing period 13:00 to 15:00 was 60 degrees Fahrenheit. The air temperature was 77 degrees Fahrenheit. The sites were sampled by S. Monday, B. Budnick, and J. Crews (DFG). Coho salmon were the only salmonid species observed. Other species observed included Pacific giant salamander (PGS) and frog species (Table A).

Site 1 was located approximately 50 feet from the confluence with Noyo River. The site yielded one young of the year coho salmon and one Pacific giant salamander.

Site two was located approximately 100 feet above the confluence with Noyo River. The site yielded 2 young of the year coho salmon, 1 unidentified frog and 1 Pacific giant salamander.

Site three was located approximately 150 feet above the confluence with Noyo River. The site yielded 1 young of the year coho salmon, 1 unidentified frog and 1 Pacific giant salamander.

The following chart displays the information yielded from these sites:

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2003 McMullen Creek electrofishing observations.

Date	Survey Site #	Habitat Unit #	Habitat Type	Approx. Dist. from mouth (ft.)	SH/RT			Coho	
					YOY	1+	2+	YOY	1+
Reach 1: B4 Channel Type									
07/08/03	1	2	4.2	50	0	0	0	1	0
07/08/03	2	4	4.2	181	0	0	0	2	0
07/08/03	3	12	4.2	520	0	0	0	1	0

DISCUSSION

McMullen Creek is a B4 channel type for 9269.5 feet and an A3 for 1,835 feet of stream surveyed. The suitability of B4 and A3 channel types for fish habitat improvement structures is as follows: B4 channel types are excellent for low-stage plunge weirs, boulder clusters, single and opposing wing-defectors, and log cover. A3 channel types are good for bank-placed boulders and fair for plunge weirs, opposing wing-deflectors, and log cover.

Water temperatures taken during the survey period ranged from 52 to 62 degrees Fahrenheit. Air temperatures ranged from 58° to 78° Fahrenheit. Recorded water temperatures below 60 degrees Fahrenheit are suitable 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.

Riffle habitat types comprised 65% of the total length of this survey, pools 15%, and flatwater 14%. The pools are relatively shallow, with only 15 of the 74 (20%) 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Fifteen of the 75 pool tail-outs measured had embeddedness ratings of 1 or 2. Forty-three of the pool tail-outs had embeddedness ratings of 3 or 4. Seventeen of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in McMullen Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty-nine of the 75 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter for flatwater was 13. The mean shelter rating for pools was 25. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by undercut banks in all habitat types. Additionally, large woody debris contributes 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 93%. Reach 1 had a canopy density of 93% while reaches 2 had a canopy density of 94%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 27% and 25%, 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) McMullen Creek should be managed as an anadromous, natural production stream.

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) Where feasible, 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 is from undercut banks. Adding high quality complexity with log and root wad cover 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) There are several log debris accumulations present on McMullen Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

7) 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 Noyo River.
181	0004.00	Salmonid young-of-the-year (YOY), frogs, and salamanders observed.
418	0011.00	Box culvert under railroad is 8' high x 8' wide x 90’ long. It has a concrete bottom and the downstream end has 2' of gravel.
505	0012.00	Culvert at pool tail.
571	0015.00	Vertical erosion at the bend on the left bank.
655	0016.00	There is good shelter, undercut bank and terrestrial vegetation.
1151	0023.00	Salmonid yoy observed.
1637	0032.00	Channel type taken; B3.
2488	0049.00	Salmonid yoy observed.
2559	0050.00	At 46’ into this unit there is a log bridge that is 4.5’ high x 19’long x 15’wide.
3050	0067.00	Log debris accumulation (LDA) at 68’.
3339	0072.00	LDA with large woody debris (LWD) and small woody debris (SWD) accumulated near the end of the pool.
4413	0095.00	Bank failure brought large trees down.
5191	0111.00	LDA at 14’ consists of 4 pieces of LWD and SWD and is 5’ high x 20’wide x 10’ long. It is not retaining sediment.
6162	0122.00	Three foot plunge from and LDA that is retaining 5.5’ of sediment.
6206	0124.00	Right bank tributary at 81’. At 80’ there is left bank erosion that is 30’ high x 50’ long. There is an LDA at 80’ with accompanying left bank

		erosion for approximately 35'. There is a low flowing right bank tributary at 81' which enters through a 1.6' diameter culvert with a 3' plunge.
6410	0127.00	Large rootwad in channel. Dry left bank tributary within unit.
6537	0132.00	LDA at the beginning of unit consisting of 6 pieces of LWD and SWD. Retaining fine sediment. The dimensions are 4' high x 20' wide x 10' long.
6613	0134.00	At 168' there is a logging road bridge high above creek. At 74' into unit there is a left bank tributary that is surveyable and has a water temperature of 57 degrees F.
7035	0135.00	Plunge pool over LDA. The LDA is retaining 4.5' of sediment.
7068	0137.00	There are 9 pieces of LWD that are greater than 20' partly embedded in right bank and partly over the pool. These have collected 8 pieces of SWD, which are retaining 4' of sediment above the pool. The water flows subsurface.
7091	0138.00	There are roads on the left and right banks.
7144	0140.00	Road ends and becomes a trail at this point.
7277	0142.00	One salmonid 1+ observed, first fish observed of the day and the last one observed in the survey.
7402	0144.00	Right bank vertical erosion at this point.
7953	0148.00	One foot plunge over LWD.
7987	0150.00	One foot plunge over LWD.
8175	0153.00	One foot plunge over 3 pieces of LWD retaining 2.5' of sediment.
8414	0162.00	LDA at 30' is 14' high x 16' wide x 38' long and consists of approximately 10 pieces of LWD.
8536	0164.00	LDA at 86'consists of approximately 10 pieces of LWD is 5' high x 11' wide x 8' long.
9260	0175.00	High gradient tributary on the right bank at the beginning of the unit, many pieces of LWD and other debris. The water in the tributary has a temperature of 58 degrees.

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9269	0176.00	Significant increase in gradient, channel-type changes to A3.
9300	0178.00	Road crosses over creek at 153' into unit.
9668	0180.00	Waterfall at 120' into unit is 4' high. LDA consisting of 10 pieces of LWD and other SWD is 15' long.
10037	0182.00	Vertical erosion on most of the left bank for several units.
10102	0183.00	There is a spring on the right bank contributing a significant amount of water.
10110	0184.00	There is an LDA at 51' into the unit which is 28' long x 22' wide x 12' high.
10268	0185.00	There is a tributary on the right bank at the end of the unit.
10501	0189.00	LDA is 20' long x 14' wide x 6' high.
10540	0191.00	There are private property signs on both sides of creek.
10562	0192.00	LDA is 2' high x 8' wide x 16' long and consists of 4 pieces of LWD and SWD.
10689	0195.00	LDA is 4' high x 16' wide x 8' long.
10713	0196.00	There are two LDAs within this unit. The first is at 28' into the unit and is 5' high x 10' wide x 6' long and it consists of 11 pieces of LWD. The second is at 88' into the unit and is 4' high x 15' wide x 12' long and includes 9 pieces of LWD.
10901	0202.00	LDA creating a 3.2' plunge retaining gravel.
11027	0207.00	There is an 8' plunge over a nearly vertical jump.
11104	0211.00	End of survey. Beyond this point there is an LDA above which the channel becomes steeper and clogged with boulders and logs.

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]	

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TABLES AND GRAPHS

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

Stream Name: McMullen Creek　　Drainage: Noyo River

Survey Dates: 6/24/2003 to 6/30/2003

Confluence Location: Quad: BURBECK　　Legal Description: T18NR14WS07　　Latitude: 39:25:52.0N　　Longitude: 123:27:34.0W

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
1	1	CULVERT	0.5	87	87	0.8	8.0	1.0	1.5	696	696	696	696		0
4	0	DRY	1.9	95	380	3.4									
39	7	FLATWATER	18.3	40	1571	14.1	6.9	0.6	1.2	300	11716	206	8035		13
1	0	NOSURVEY	0.5	106	106	1.0									
76	76	POOL	35.7	23	1713.5	15.4	9.0	0.8	1.5	198	15075	214	15810	160	25
92	12	RIFFLE	43.2	79	7279	65.4	7.6	0.3	0.6	437	40187	183	16881		3

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
213	96	11136.5	67674.44	41421.94

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: McMullen Creek Drainage: Noyo River

Survey Dates: 6/24/2003 to 6/30/2003

Confluence Location: Quad: BURBECK Legal Description: T18NR14WS07 Latitude: 39:25:52.0N Longitude: 123:27:34.0W

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 (%)
91	11	LGR	42.7	80	7271	65.3	8	0.3	1.2	476	43297	200	18208		4	92
1	1	CAS	0.5	8	8	0.1	2	0.1	0.3	8	8	1	1		0	98
36	6	RUN	16.9	39	1393	12.5	7	0.7	1.4	311	11192	228	8226		13	94
3	1	SRN	1.4	59	178	1.6	6	0.3	1.5	238	713	71	214		10	95
49	49	MCP	23.0	18	886	8.0	9	0.8	3.1	170	8326	185	8875	137	22	93
2	2	CCP	0.9	23	46	0.4	8	0.6	2.1	194	387	216	432	144	20	95
2	2	STP	0.9	72	144	1.3	6	0.9	1.6	408	816	158	158	130	75	93
9	9	CRP	4.2	36	322	2.9	8	0.8	2.3	306	2750	323	2906	239	19	95
6	6	LSR	2.8	35	211	1.9	8	0.9	2.2	293	1755	354	2122	257	40	100
6	6	PLP	2.8	12	73	0.7	11	1.0	2.5	137	824	186	1118	164	27	90
1	1	BPR	0.5	23	23	0.2	8	0.7	1.3	173	173	173	173	121	70	97
1	1	BPL	0.5	9	9	0.1	5	0.3	0.7	45	45	27	27	14	10	98
4	0	DRY	1.9	95	380	3.4										95
1	1	CUL	0.5	87	87	0.8	8	1.0	1.5	696	696	696	696		0	89
1	0	NS	0.5	106	106	1.0										100

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
213	96	11136.5	70981.53	43154.8

Table 3 - Summary of Pool Types

Stream Name: McMullen Creek Drainage: Noyo River

Survey Dates: 6/24/2003 to 6/30/2003

Confluence Location: Quad: BURBECK Legal Description: T18NR14WS07 Latitude: 39:25:52.0N Longitude: 123:27:34.0W

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
53	53	MAIN	70	20	1076	63	9.0	0.8	180	9529	137	7011	24
21	21	SCOUR	28	29	606	35	9.1	0.9	254	5329	222	4670	27
2	2	BACKWATER	3	16	32	2	6.3	0.5	109	218	67	134	40

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
76	76	1713.5	15075.25	11814.88

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

Stream Name: McMullen Creek Drainage: Noyo River

Survey Dates: 6/24/2003 to 6/30/2003

Confluence Location: Quad: BURBECK Legal Description: T18NR14WS07 Latitude: 39:25:52.0N Longitude: 123:27:34.0W

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	65	4	8	37	77	6	13	1	2	0	0
2	CCP	3	1	50	0	0	1	50	0	0	0	0
1	STP	1	0	0	1	100	0	0	0	0	0	0
9	CRP	12	0	0	6	67	3	33	0	0	0	0
6	LSR	8	0	0	3	50	3	50	0	0	0	0
6	PLP	8	0	0	5	83	1	17	0	0	0	0
1	BPR	1	0	0	1	100	0	0	0	0	0	0
1	BPL	1	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
74	6	8	53	72	14	19	1	1	0	0

Mean Maximum Residual Pool Depth (ft.): 1.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: McMullen Creek Drainage: Noyo River

Survey Dates: 6/24/2003 to 6/30/2003 Dry Units: 4

Confluence Location: Quad: BURBECK Legal Description: T18NR14WS07 Latitude: 39:25:52.0N Longitude: 123:27:34.0W

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
91	11	LGR	18	8	0	0	4	0	0	16	0
1	1	CAS	0	0	0	0	0	0	0	0	0
92	12	TOTAL RIFFLE	16	7	0	0	3	0	0	15	0
36	6	RUN	10	23	16	24	4	6	0	0	0
3	1	SRN	0	0	0	0	0	0	0	100	0
39	7	TOTAL FLAT	9	20	14	21	4	5	0	14	0
49	49	MCP	23	15	27	14	0	0	1	17	0
2	2	CCP	0	25	18	13	0	25	18	3	0
2	2	STP	5	5	88	0	0	0	0	3	0
9	9	CRP	64	6	3	1	17	0	1	8	0
6	5	LSR	4	20	0	75	1	0	0	0	0
6	6	PLP	17	9	23	20	0	0	10	21	0
1	1	BPR	85	0	0	15	0	0	0	0	0
1	1	BPL	0	100	0	0	0	0	0	0	0
76	75	TOTAL POOL	25	15	23	17	2	1	2	14	0
1	1	CUL	0	0	0	0	0	0	0	0	0
1	0	NS									
213	95	TOTAL	23	14	19	15	2	1	2	14	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: McMullen Creek Drainage: Noyo River

Survey Dates: 6/24/2003 to 6/30/2003 Dry Units: 4

Confluence Location: Quad: BURBECK Legal Description: T18NR14WS07 Latitude: 39:25:52.0N Longitude: 123:27:34.0W

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
91	11	LGR	0	0	64	18	18	0	0
1	1	CAS	0	0	0	0	0	100	0
36	6	RUN	0	0	33	67	0	0	0
3	1	SRN	0	0	100	0	0	0	0
49	10	MCP	0	0	60	30	10	0	0
2	2	CCP	0	0	100	0	0	0	0
2	2	STP	0	0	0	100	0	0	0
9	5	CRP	0	0	40	0	60	0	0
6	5	LSR	20	0	60	20	0	0	0
6	2	PLP	0	0	50	0	50	0	0
1	1	BPR	0	100	0	0	0	0	0
1	1	BPL	0	0	100	0	0	0	0

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: McMullen Creek
Drainage: Noyo River
Survey Dates: 6/24/2003 to 6/30/2003
Survey Length (ft.): 11136.5 Main Channel (ft.): 11104.5 Side Channel (ft.): 32
Confluence Location: Quad: BURBECK
Legal Description: T18NR14WS07 Latitude: 39:25:52.0N Longitude: 123:27:34.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

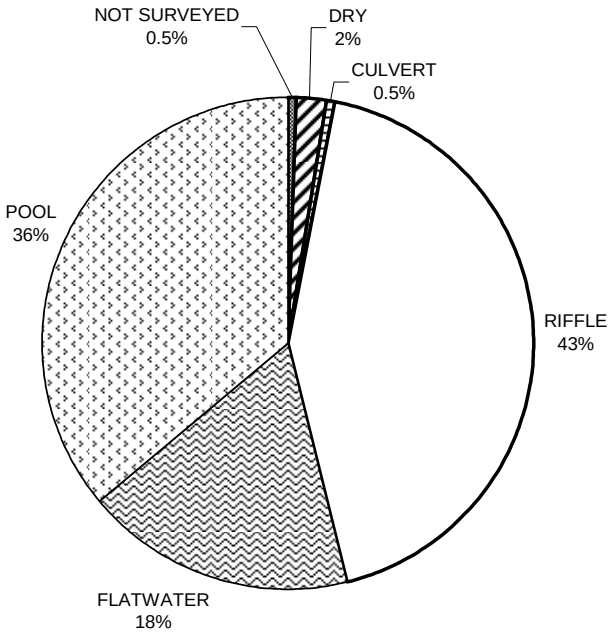
Channel Type: A3
Reach Length (ft.): 11104.5
Riffle/Flatwater Mean Width (ft.): 7.3
BFW:
Range (ft.): 0 to 17
Mean (ft.): 10
Std. Dev.: 4
Base Flow (cfs.): 0.3
Water (F): 52 - 62 Air (F): 58 - 78
Dry Channel (ft): 380

Canopy Density (%): 93
Coniferous Component (%): 97
Deciduous Component (%): 3
Dominant Bank Vegetation: Evergreen Trees
Vegetative Cover (%): 74
Dominant Shelter: Undercut Banks
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 20
LWD per 100 ft.:
Riffles: 1
Pools: 5
Flat: 1

Pools by Stream Length (%): 15
Pool Frequency (%): 35
Residual Pool Depth (%):
< 2 Feet Deep: 79
2 to 2.9 Feet Deep: 19
3 to 3.9 Feet Deep: 1
>= 4 Feet Deep: 0
Mean Max Residual Pool Depth (ft.): 1.5
Mean Pool Shelter Rating: 25

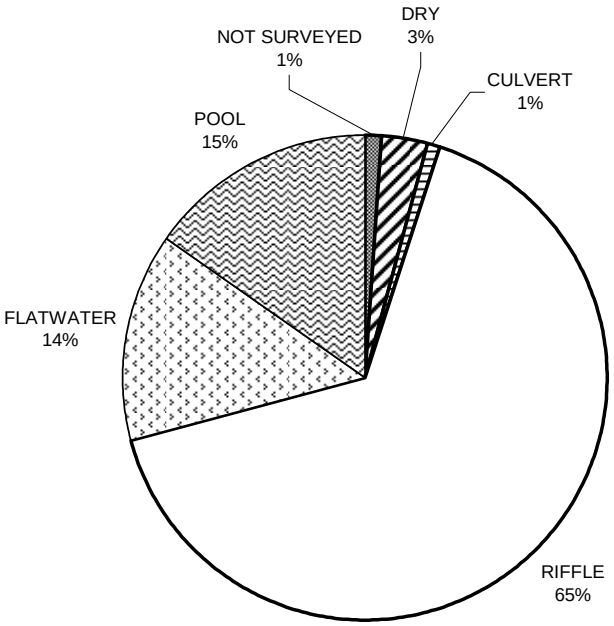
Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 65 Sm Cobble: 15 Lg Cobble: 15 Boulder: 0 Bedrock: 5
Embeddedness Values (%): 1. 0 2. 20 3. 43 4. 15 5. 23

MCMULLEN CREEK
HABITAT TYPES BY PERCENT OCCURRENCE



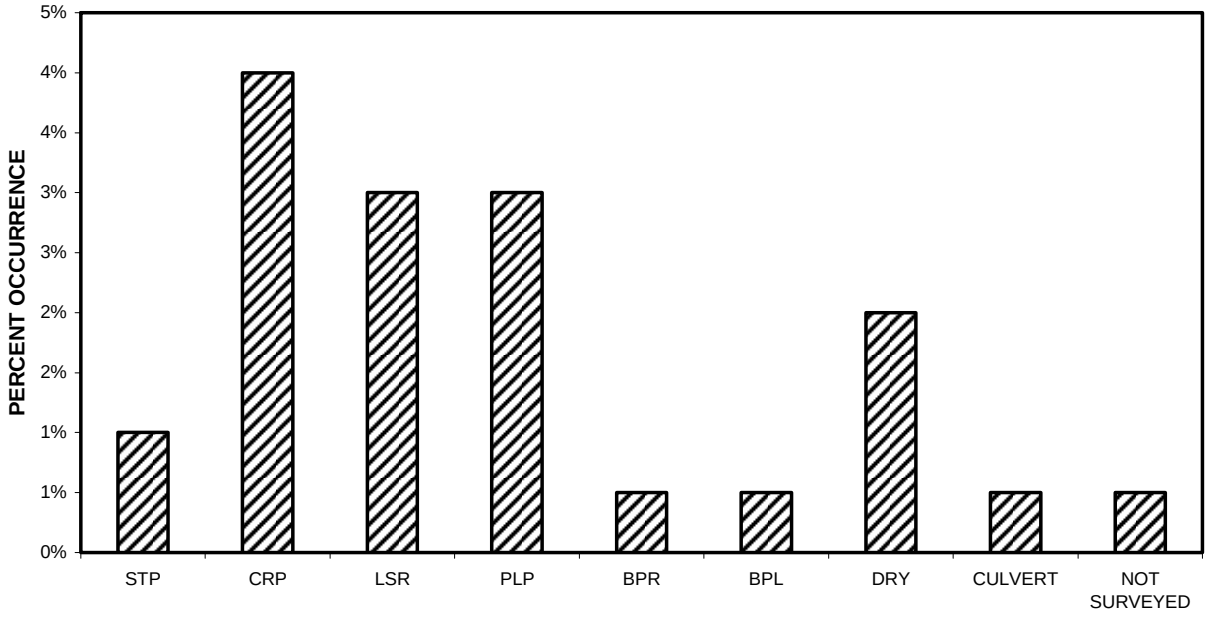
GRAPH 1

MCMULLEN CREEK
HABITAT TYPES BY PERCENT TOTAL LENGTH



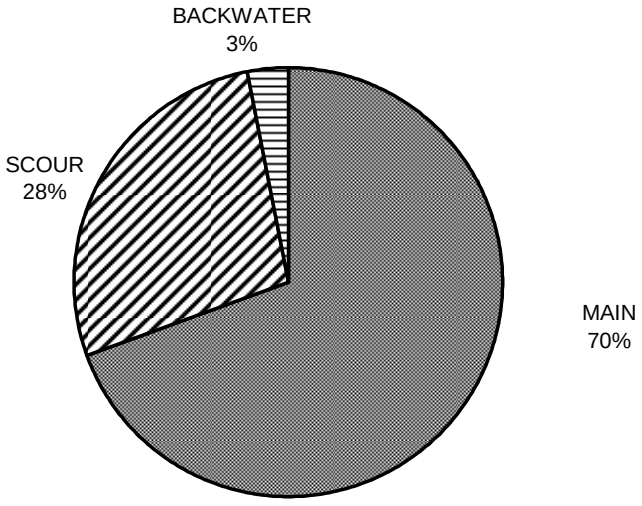
GRAPH 2

MCMULLEN CREEK
HABITAT UNIT TYPES BY PERCENT OCCURRENCE

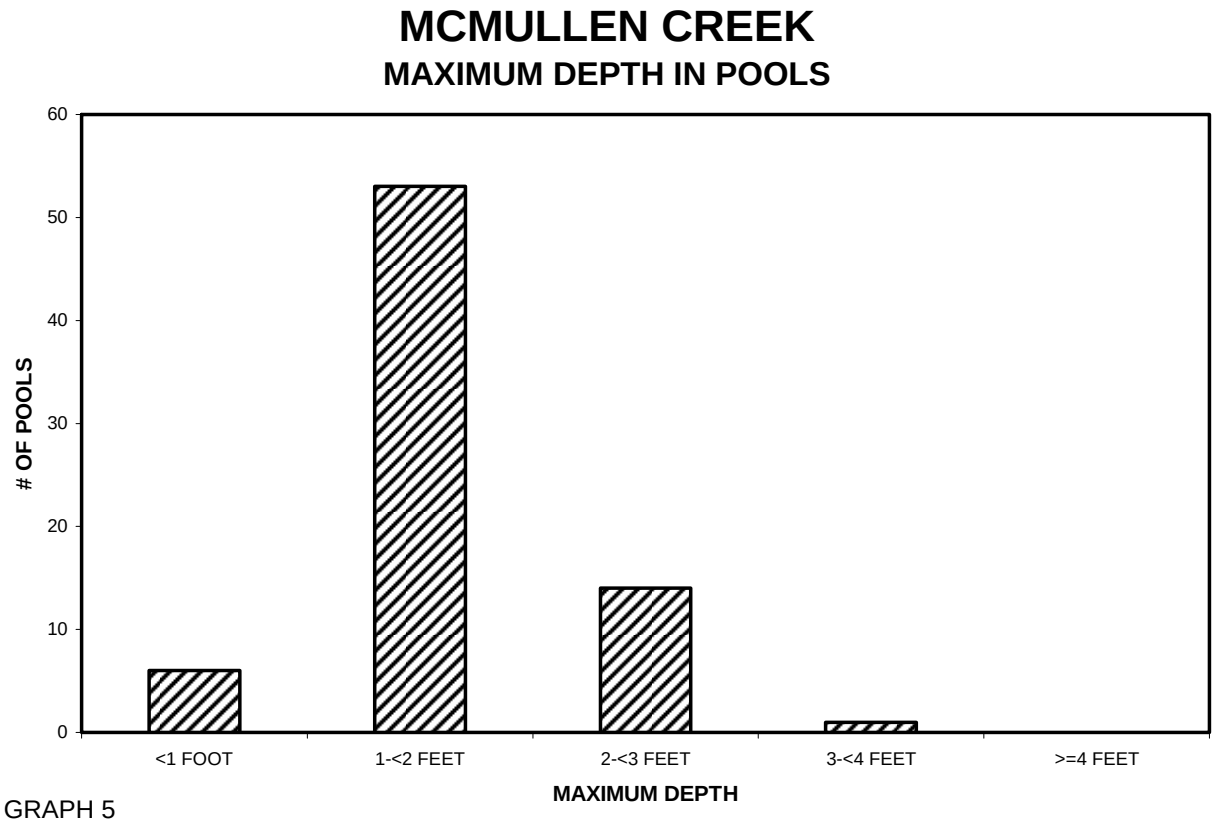


GRAPH 3

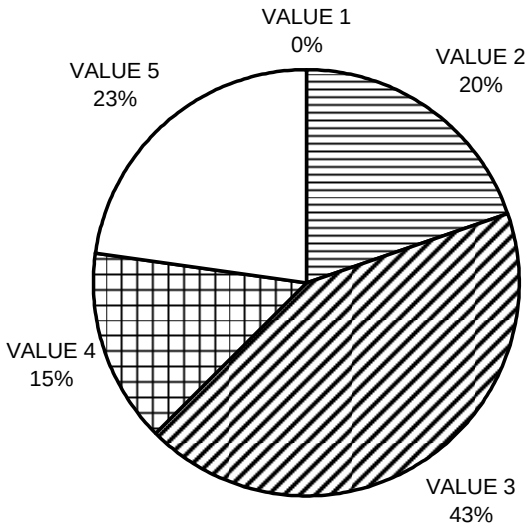
MCMULLEN CREEK
POOL HABITAT TYPES BY PERCENT OCCURRENCE



GRAPH 4

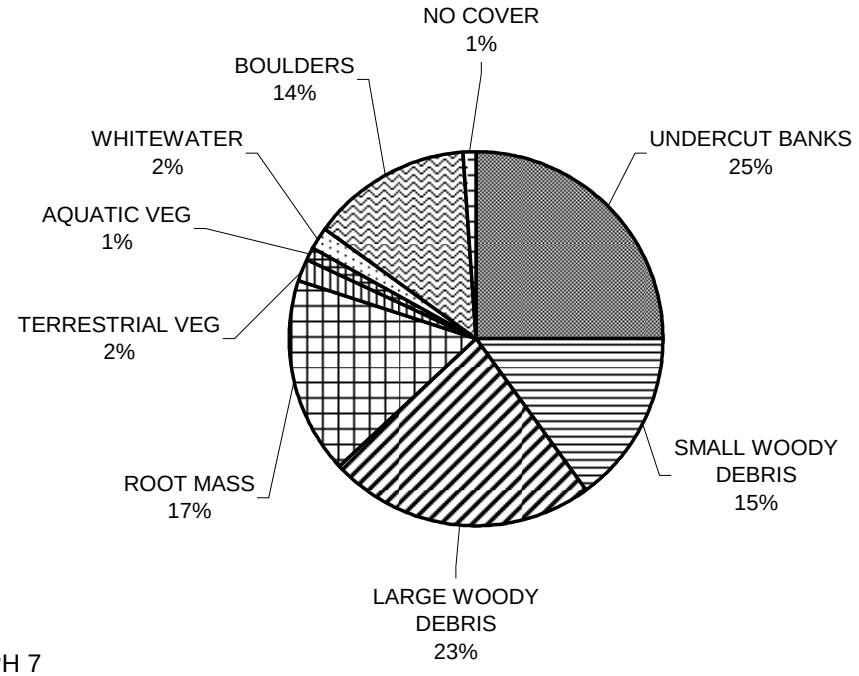


GRAPH 5



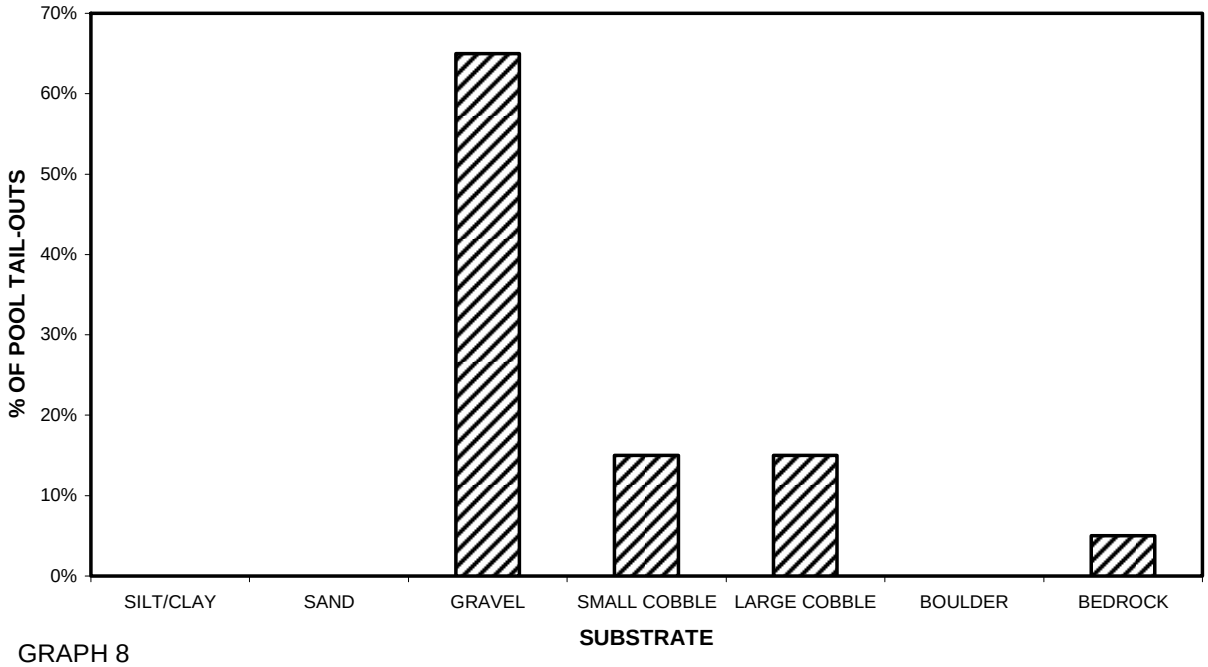
GRAPH 6

MCMULLEN CREEK
MEAN PERCENT COVER TYPES IN POOLS



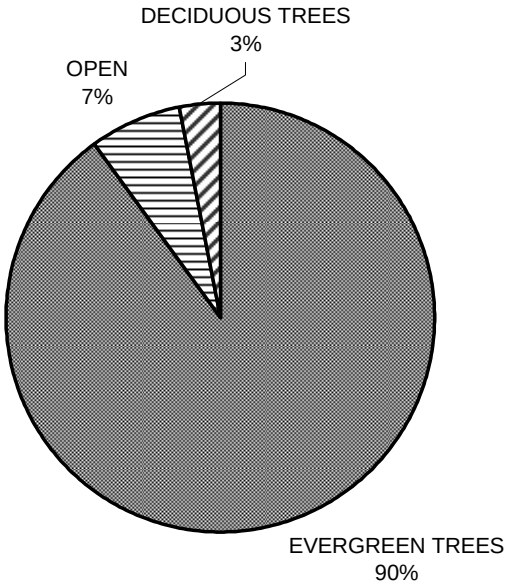
GRAPH 7

MCMULLEN CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



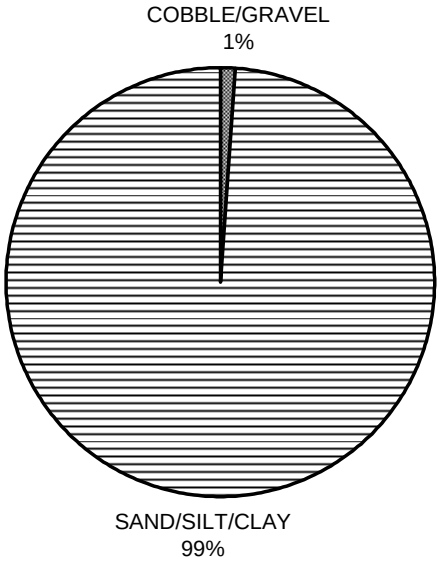
GRAPH 8

MCMULLEN CREEK
MEAN PERCENT CANOPY



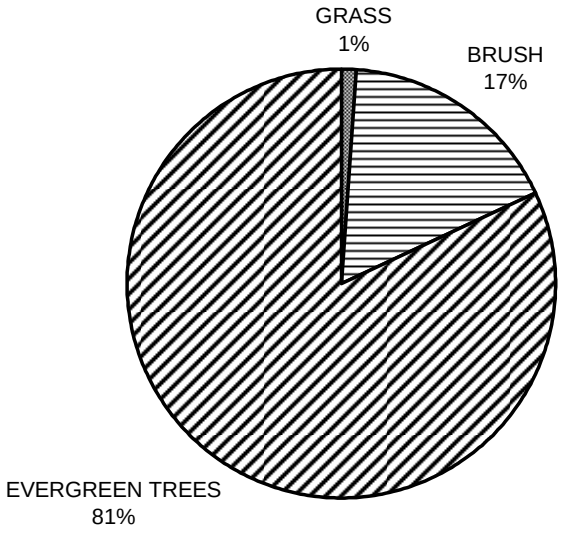
GRAPH 9

MCMULLEN CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



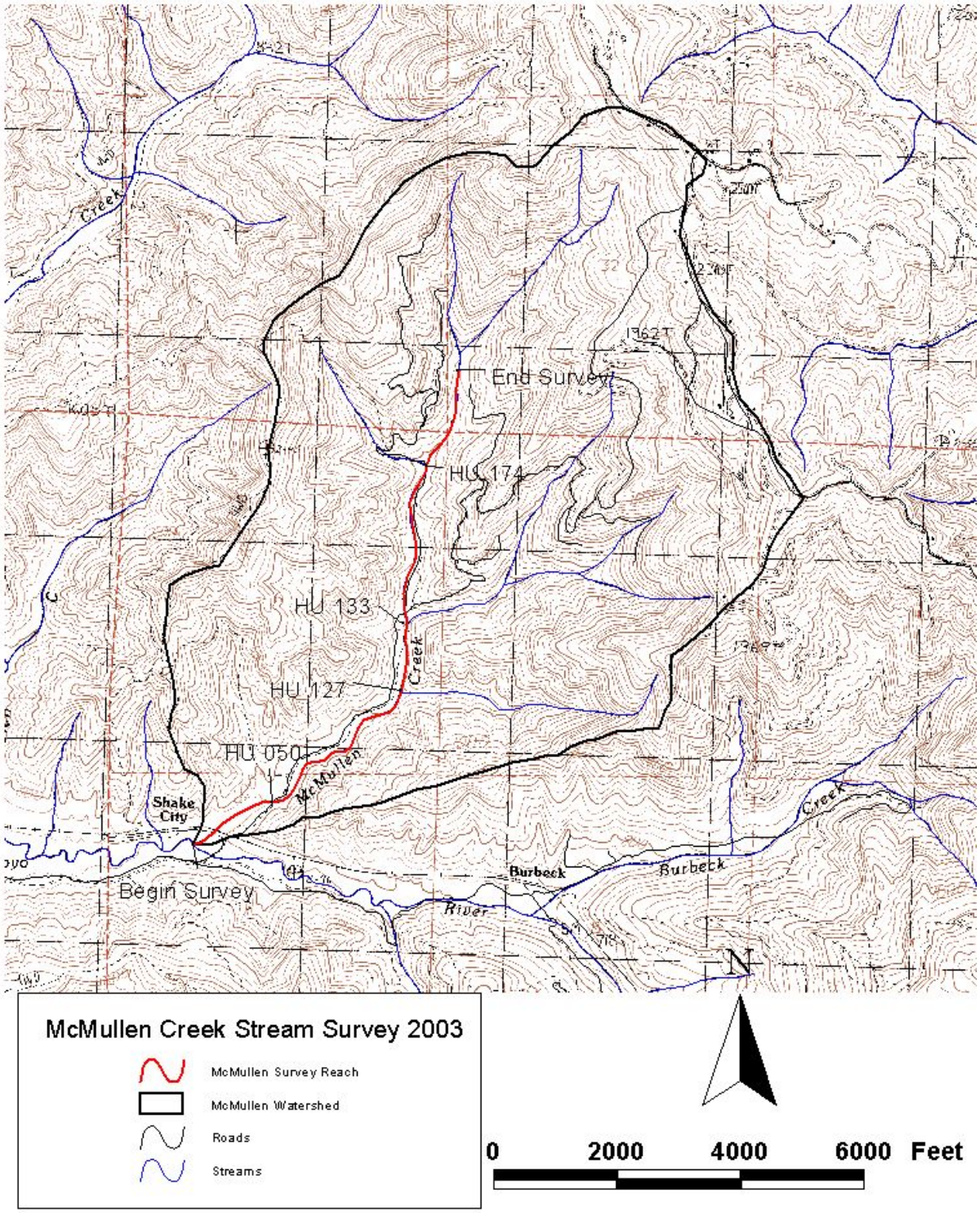
GRAPH 10

MCMULLEN CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

McMullen Creek



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