STREAM INVENTORY REPORT

Maple Creek

INTRODUCTION

A stream inventory was conducted from June 3 to June 20, 2008 on Maple Creek. The survey began at the confluence with Mad River and extended upstream 3.8 miles.

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

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

WATERSHED OVERVIEW

Maple Creek is a tributary to Mad River which drains to the Pacific Ocean, located in Humboldt County, California (Map 1). Maple Creek's legal description at the confluence with Mad River is T04N R03E S06. Its location is 40.7645° north latitude and 123.8888° west longitude, LLID number 1238876407647. Maple Creek is a third order stream and has approximately 31.7 miles of blue line stream according to the USGS Korbel 7.5 minute quadrangle. Maple Creek drains a watershed of approximately 15.6 square miles. Elevations range from about 320 feet at the mouth of the creek to 3,200 feet in the headwater area. Douglas fir and mixed hardwood forest dominates the watershed. The watershed is primarily privately owned and is managed for timber production and rangeland. Vehicle access exists via 101 to 299 east. Exit at Blue Lake Blvd. Blue Lake Blvd. will become Korbel Road and then Maple Creek Road as you pass the Simpson mill. Follow Maple Creek Road across the North Fork Mad River towards the town of Maple Creek. Follow Maple Creek Road for approximately 30 minutes and turn right on Butler Valley Road, stopping at Maple Creek crossing.

METHODS

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

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 Maple Creek to record measurements and observations. There are eleven components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Maple 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 Maple Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Maple 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 Maple Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

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

10. Large Woody Debris Count:

Large woody debris (LWD) is an important component of fish habitat and an element in channel forming processes. In each habitat unit all pieces of LWD partially or entirely below the elevation of bankfull discharge are counted and recorded. The minimum size to be considered is twelve inches in diameter and six feet in length. The LWD count is presented by reach and is expressed as an average per 100 feet.

11. Average Bankfull Width:

Bankfull width can vary greatly in the course of a channel type stream reach. This is especially true in very long reaches. Bankfull width can be a factor in habitat components like canopy density, water temperature, and pool depths. Frequent measurements taken at riffle crests (velocity crossovers) are needed to accurately describe reach widths. At the first appropriate velocity crossover that occurs after the beginning of a new stream survey page (ten habitat units), bankfull width is measured and recorded in the appropriate header block of the page. These widths are presented as an average for the channel type reach.

BIOLOGICAL INVENTORY

Fish presence was observed from the stream banks in Maple Creek. In addition, underwater observations were made at 9 sites using techniques discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

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

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

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

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

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

The habitat inventory of June 3 to June 30, 2008 was conducted by B. Leonard and M. Westersund (WSP). The total length of the stream surveyed was 19,811 feet with an additional 1,629 feet of side channel.

Stream flow was measured near the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 3.11 cfs on July 14, 2008.

Maple Creek is an F4 channel type for 3,303 feet of the stream surveyed (Reach 1), and a C4 channel type for 18,137 feet of the stream surveyed (Reach 2). F4 channel types are entrenched meandering riffle/pool channels on low gradients with high width/depth ratios, very stable with boulder-dominant substrates. C4 channels are meandering point-bar, riffle/pool, alluvial channels with broad well defined floodplain on low gradients and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 48 to 61 degrees Fahrenheit. Air temperatures ranged from 45 to 66 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 44% pool units, 38% flatwater units, 18% riffle units (Graph 1). Based on total length of Level II habitat types there were 60% flatwater units, 28% pool units and 12% riffle units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pool units, 33%: step run units, 26%: and low gradient riffle units, 16% (Graph 3). Based on percent total length, step run units made up 49%, mid-channel pool units 21%, and low gradient riffle units 11%.

A total of 92 pools were identified (Table 3). Main channel pools were the most frequently encountered at 76% (Graph 4), and comprised 76% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Nineteen of the 91 measured pools (21%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 91 pool tail-outs measured, 46 had a value of 1 (50.5%); 41 had a value of 2 (45.1%); 4 had a value of 3 (4.4%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst.

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 14, flatwater habitat types had a mean shelter rating of 13, and pool habitats had a mean shelter rating of 29 (Table 1). Of the pool types, main channel pools had the highest mean shelter rating of 30. Scour pools had a mean shelter rating of 22 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Root mass is the dominant cover type in Maple Creek. Graph 7 describes the pool cover in Maple Creek. Root mass 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 and small cobble are the dominant substrate type, each observed in 42% of the pool tail outs.

The mean percent canopy density for the surveyed length of Maple Creek was 83%. Seventeen percent of the canopy was open. Of the canopy present, the mean percentages of hardwood and coniferous trees were 93% and 7%, respectively. Graph 9 describes the mean percent canopy in Maple Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 96%. The mean percent left bank vegetated was 97%. The dominant elements composing the structure of the stream banks consisted of 51% cobble/gravel, 29% sand/silt/clay, 13% bedrock, and 8% boulder (Graph 10). Deciduous trees were the dominant vegetation type observed in 82% of the units surveyed. Additionally, 8% of the units surveyed had brush as the dominant vegetation type, 5% had coniferous as the dominant vegetation type, and 4% had grass as the dominant vegetation type. (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Nine sites were snorkel surveyed for species composition and distribution in Maple Creek on August 6, 2008. Water temperatures taken during the electrofishing period of 0827 to 1250 ranged from 54 to 57 degrees Fahrenheit. Air temperatures were 58 degrees Fahrenheit. The sites were sampled by B. Leonard (WSP), M. Westersund (WSP) and T. Tollefson (DFG).

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In reach 1, which comprised the first 3,303 feet of stream, 4 sites were sampled. The reach sites yielded 130 young-of-the-year steelhead/rainbow trout (SH/RT), 7 age 1+ SH/RT, 0 age 2+ SH/RT, 1 coho salmon and 3 Chinook salmon.

In reach 2, 5 sites were sampled starting approximately 9,853 feet from the confluence with the Mad River and continuing upstream 12,952 feet. The reach sites yielded 150 young-of-the-year SH/RT, 10 age 1+ SH/RT, 3 age 2+ SH/RT, 6 coho salmon and 9 Chinook salmon.

The following chart displays the information yielded from these sites:

2008 Maple Creek underwater observations.

Date	Site #	Hab. Unit #	Hab. Type	Approx. Dist. from mouth (ft.)	Coho	Chin.	SH/RT		
					YOY	YOY	YOY	1+	2+
Reach 1: F4 Channel Type									
08/06/08	1	016	4.2	1,034	0	0	30	3	0
08/06/08	2	019	4.2	1,168	0	2	35	3	0
08/06/08	3	021	3.3	1,434	0	0	40	0	0
08/06/08	4	022	4.2	1,498	1	1	25	1	0
Reach 2: C4 Channel Type									
08/06/08	5	093	4.2	8,460	0	2	35	1	1
08/06/08	6	118	4.2	12,228	1	0	20	1	0
08/06/08	7	146	4.2	15,111	1	0	25	5	0
08/06/08	8	186	4.2	19,607	2	3	30	1	1
08/06/08	9	189	4.2	19,786	2	4	40	2	1

DISCUSSION

Maple Creek is an F4 channel type for the first 3,303 feet of stream surveyed and a C4 channel type for the next 18,137 feet. The suitability of F4 and C4 channel types for fish habitat improvement structures is as follows: F4 channel types are good for bank-placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover. C4 channel types are good for bank placed boulders and fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover.

The water temperatures recorded on the survey days June 3 to June 30, 2008 ranged from 48 to 61 degrees Fahrenheit. Air temperatures ranged from 45 to 66 degrees Fahrenheit. To make any 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 60% of the total length of this survey, pools 28% and riffles 12%. The pools are relatively shallow, with 19 of the 91 (21%) pools having a maximum residual depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In third and fourth order streams, a primary pool is defined to have a maximum residual depth of at least 3 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.

Eighty-seven of the 91 pool tail-outs measured had embeddedness ratings of 1 or 2. Four 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 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.

Seventy-six of the 91 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 was 29. The shelter rating in the flatwater habitats was 13. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by root mass in Maple Creek. Root mass 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 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 83%. Reach 1 had a canopy density of 76.8%, Reach 2 had a canopy density of 84.7%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 96% and 97%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Maple Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) 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 in the pools is from root mass. Adding high quality complexity with woody cover in the pools is desirable.

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	001.00	Start of survey at the confluence with the Mad River. The channel type is an F4.
138	0004.00	Butler Valley Road Bridge crosses 13 feet into the unit. It is a concrete bridge that is 85' long x 20' wide x 25' high.
386	0008.00	Out of the Mad River influence.
1168	0019.00	Tributary #01 enters from the left bank. While it is flowing, the contribution to Maple Creek seems to be negligible. The temperature of the tributary as well as upstream and downstream of the confluence on Maple Creek is 54 degrees Fahrenheit. The slope is measured with a clinometer to be 100% and deemed inaccessible to fish.
2240	0035.00	Tributary #02 enters from the right bank. The contribution to Maple Creek is estimated to be 1%. The temperature of the tributary is 51 degrees Fahrenheit. Maple Creek is 52 degrees Fahrenheit upstream of the confluence and 50 degrees Fahrenheit downstream of the confluence. For the 100' explored the slope is 50% and no fish are present.
3020	0044.00	The left bank is eroding. From bankfull it extends 30' upslope and 40' long.
3068	0045.00	Log Debris Accumulation (LDA) #01 is 8' high x 32' wide x 15' long consisting of 7 pieces of large woody debris (LWD). Sediment being retained measures approximately 10' wide x 62' long x 2' deep and ranges in size from silt to large cobble. Water is flowing through visible gaps. There are fish upstream.

3493	0046.00	Reach 1 ends and reach 2, a C4 channel type, begins.
3949	0052.00	Maple Creek is braided through this unit.
5249	0067.00	LDA #02 is 6' high x 45' wide x 14' long and consists of 13 pieces of LWD. Sediment being retained measures 18' wide x 70' long x 3' deep and ranges in size from sand to small cobble. Water is flowing through visible gaps. There are fish upstream.
6516	0076.00	LDA #03 is 10' high x 70' wide x 57' long consisting of 20 pieces of LWD. Sediment being retained measures 15' wide x 55' long x 2' deep and ranges in size from silt to large cobble. Water is flowing through visible gaps. There are fish upstream.
7708	0090.00	Davis Creek, tributary #03, enters from the left bank. The contribution to Maple Creek is estimated to be 5%. The temperature of the tributary is 52 degrees Fahrenheit. Maple Creek is 49 degrees Fahrenheit upstream of the confluence and 51 degrees Fahrenheit downstream of the confluence. For the 300' explored the slope is 3%. Salmonids are present.
9602	0092.00	Tailer Train Road Bridge crosses over the creek. It is 4.6' high x 75' long x 8' wide and made of metal. Also a footbridge made of wood & metal measuring 9.5' high x 55' long x 4' wide crosses the creek.
12263	0109.00	Maple Creek Road Bridge crosses over the creek. It is 12' high x 60' long x 25' wide and made of metal & concrete.
14858	0144.00	LDA #04 is 13' high x 42' wide x 47' long consisting of 4 pieces of LWD. Sediment being retained measures 20' wide x 50' long x 2' deep; ranging in size from sand to small cobble. Water is flowing through visible gaps. There are fish upstream.
15509	0149.00	Tributary #04, enters from the left bank. The contribution to Maple Creek is estimated to be 1%. The temperature of the tributary is 52 degrees Fahrenheit. Maple Creek is 54 degrees Fahrenheit upstream of the confluence and 54 degrees Fahrenheit downstream of the confluence. For the 50' explored it does not appear to be accessible to fish.
19212	0182.00	There is a land slide in the middle of habitat unit. It is roughly 140' long and 80' tall and is contributing mostly gravel and fines with some boulders.
19463	0185.00	Tributary #05 enters from the right bank. The contribution to Maple Creek is estimated to be 5%. The temperature of the tributary is 53

		degrees Fahrenheit. Maple Creek is 59 degrees Fahrenheit upstream of the confluence and 54 degrees Fahrenheit downstream of the confluence. For the 100' explored the slope is 2%. Salmonids are present.
19786	0189.00	End of survey due difficult access to the creek. Not the end of the anadromous reach.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

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

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Mean Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating
79	14	FLATWATER	37.6	162	12826	59.8	17.9	0.9	1.7	2408	190221	1870	147758		13
1	0	NOSURVEY	0.5	67	67	0.3									
92	92	POOL	43.8	66	6058	28.3	20.7	1.1	2.6	1348	123996	2229	202807	1449	29
38	8	RIFFLE	18.1	66	2489	11.6	19.6	0.7	1.1	1078	40967	686	26055		14

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
210	114	21440	355184	376620

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

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 (%)
34	6	LGR	16.2	69	2349	11.0	20	0.6	1.6	1214	41260	751	25545		15	73
4	2	HGR	1.9	35	140	0.7	18	0.8	1.2	672	2687	489	1955		10	85
1	1	GLD	0.5	53	53	0.2	16	2.2	3.2	848	848	1866	1866		5	71
23	5	RUN	11.0	95	2193	10.2	21	0.9	3.7	3682	84693	2747	63184		17	92
55	8	SRN	26.2	192	10580	49.3	16	0.7	3	1806	99347	1323	72762		12	86
1	1	TRP	0.5	60	60	0.3	15			855	855				10	93
69	69	MCP	32.9	66	4568	21.3	21	1.1	8.8	1392	96016	2389	164832	1578	31	84
1	1	CRP	0.5	13	13	0.1	15	1.2	2.2	195	195	390	390	234		90
7	7	LSL	3.3	69	484	2.3	22	0.9	4.4	1571	10995	2211	15480	1318	58	78
12	12	LSBk	5.7	69	830	3.9	19	1.1	4.3	1161	13933	1685	20221	1036	4	84
1	1	LSBo	0.5	27	27	0.1	15	1.0	1.7	405	405	608	608	405	30	92
1	1	PLP	0.5	76	76	0.4	21	0.4	1.7	1596	1596	1277	1277	638	20	70
1	0	NS	0.5	67	67	0.3										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
210	114	21440	352830	368118

Table 3 - Summary of Pool Types

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

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
70	70	MAIN	76	66	4628	76	20.9	1.1	1384	96871	1578	108893	30
22	22	SCOUR	24	65	1430	24	19.9	1.0	1233	27124	1043	22935	22

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
92	92	6058	123995	131829

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

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

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
69	MCP	76	1	1	17	25	37	54	6	9	8	12
1	CRP	1	0	0	0	0	1	100	0	0	0	0
7	LSL	8	0	0	1	14	4	57	0	0	2	29
12	LSBk	13	0	0	1	8	8	67	2	17	1	8
1	LSBo	1	0	0	1	100	0	0	0	0	0	0
1	PLP	1	0	0	1	100	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
91	1	1	21	23	50	55	8	9	11	12

Mean Maximum Residual Pool Depth (ft.): 2.6

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008 Dry Units: 0

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

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
34	6	LGR	5	0	2	0	0	0	8	85	0
4	2	HGR	0	5	23	0	0	0	3	70	0
38	8	TOTAL RIFFLE	3	2	9	0	0	0	6	80	0
1	1	GLD	0	0	0	0	0	0	0	0	100
23	5	RUN	3	30	11	8	0	0	1	45	3
55	8	SRN	6	8	9	12	12	0	3	50	1
79	14	TOTAL FLAT	5	14	9	10	7	0	2	45	9
1	1	TRP	0	0	0	0	0	0	5	0	95
69	68	MCP	12	16	21	30	5	0	0	9	7
1	0	CRP									
7	6	LSL	9	18	48	11	2	0	0	7	7
12	12	LSBk	17	11	6	16	0	0	1	21	27
1	1	LSBo	0	50	0	0	0	0	0	50	0
1	1	PLP	0	45	45	10	0	0	0	0	0
92	89	TOTAL POOL	12	16	21	26	4	0	1	11	10
1	0	NS									
210	111	TOTAL	10	15	19	22	4	0	1	19	9

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008 Dry Units: 0

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

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
34	6	LGR	0	0	33	17	17	33	0
4	2	HGR	0	0	0	0	0	100	0
1	1	GLD	0	100	0	0	0	0	0
23	5	RUN	0	0	20	60	0	20	0
55	8	SRN	0	0	0	50	0	50	0
1	1	TRP	0	100	0	0	0	0	0
69	68	MCP	3	50	35	12	0	0	0
1	1	CRP	0	100	0	0	0	0	0
7	6	LSL	0	50	50	0	0	0	0
12	11	LSBk	0	27	64	9	0	0	0
1	1	LSBo	0	0	100	0	0	0	0
1	1	PLP	0	0	0	100	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
83	7	93	0	96	97

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

Open units represent habitat units with zero canopy cover.

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008 Survey Length (ft.): 21440 Main Channel (ft.): 19811 Side Channel (ft.): 1629

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F4
Reach Length (ft.): 3068
Riffle/Flatwater Mean Width (ft.): 20.0
BFW:
Range (ft.): 27 to 48
Mean (ft.): 34
Std. Dev.: 8
Base Flow (cfs.): 3.1
Water (F): 49 - 58 Air (F): 50 - 59
Dry Channel (ft): 0

Canopy Density (%): 76.8
Coniferous Component (%): 6.2
Hardwood Component (%): 93.8
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 97.2
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Bedrock
Occurrence of LWD (%): 10
LWD per 100 ft.:
Riffles: 0
Pools: 2
Flat: 1

Pools by Stream Length (%): 30.7
Pool Frequency (%): 39.6
Residual Pool Depth (%):
< 2 Feet Deep: 11
2 to 2.9 Feet Deep: 67
3 to 3.9 Feet Deep: 6
>= 4 Feet Deep: 17
Mean Max Residual Pool Depth (ft.): 3.0
Mean Pool Shelter Rating: 31

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 0 Gravel: 67 Sm Cobble: 28 Lg Cobble: 0 Boulder: 6 Bedrock: 0

Embeddedness Values (%): 1. 27.8 2. 61.1 3. 11.1 4. 0.0 5. 0.0

STREAM REACH: 2

Channel Type: C4
Reach Length (ft.): 16743
Riffle/Flatwater Mean Width (ft.): 17.9
BFW:
Range (ft.): 33 to 58
Mean (ft.): 42
Std. Dev.: 8
Base Flow (cfs.): 3.1
Water (F): 48 - 61 Air (F): 45 - 66
Dry Channel (ft): 0

Canopy Density (%): 84.7
Coniferous Component (%): 9.6
Hardwood Component (%): 90.4
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 96.5
Dominant Shelter: Root masses
Dominant Bank Substrate Type: Cobble/Gravel
Occurrence of LWD (%): 19
LWD per 100 ft.:
Riffles: 1
Pools: 3
Flat: 1

Pools by Stream Length (%): 27.8
Pool Frequency (%): 45.1
Residual Pool Depth (%):
< 2 Feet Deep: 27
2 to 2.9 Feet Deep: 52
3 to 3.9 Feet Deep: 10
>= 4 Feet Deep: 11
Mean Max Residual Pool Depth (ft.): 2.5
Mean Pool Shelter Rating: 28

Pool Tail Substrate (%): Silt/Clay: 0 Sand: 1 Gravel: 36 Sm Cobble: 45 Lg Cobble: 10 Boulder: 7 Bedrock: 1

Embeddedness Values (%): 1. 56.2 2. 41.1 3. 2.7 4. 0.0 5. 0.0

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

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	16	13	12.8
Boulder	11	6	7.5
Cobble / Gravel	49	66	50.9
Sand / Silt / Clay	37	28	28.8

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	7	3	4.4
Brush	8	11	8.4
Hardwood Trees	92	93	81.9
Coniferous Trees	6	6	5.3
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

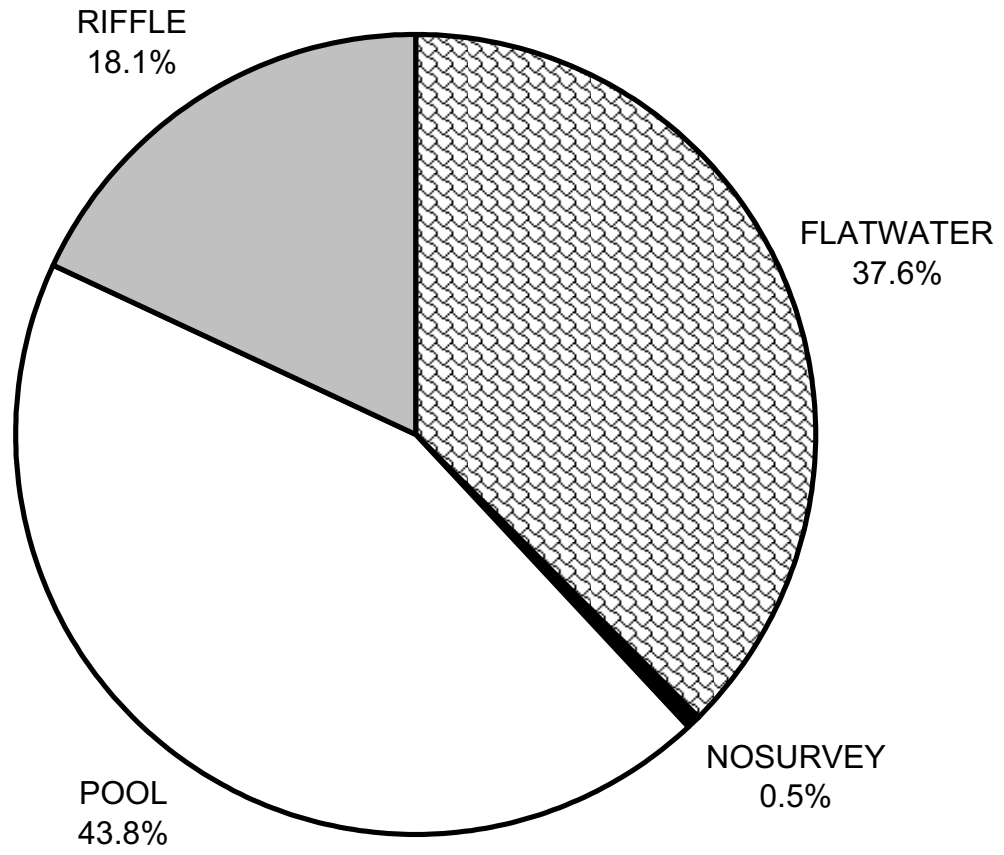
StreamName: Maple Creek LLID: 1238876407647 Drainage: Butler Valley

Survey Dates: 6/3/2008 to 6/30/2008

Confluence Location: Quad: Korbel Legal Description: T04NR03ES06 Latitude: 40:45:53.0N Longitude: 123:53:15.0W

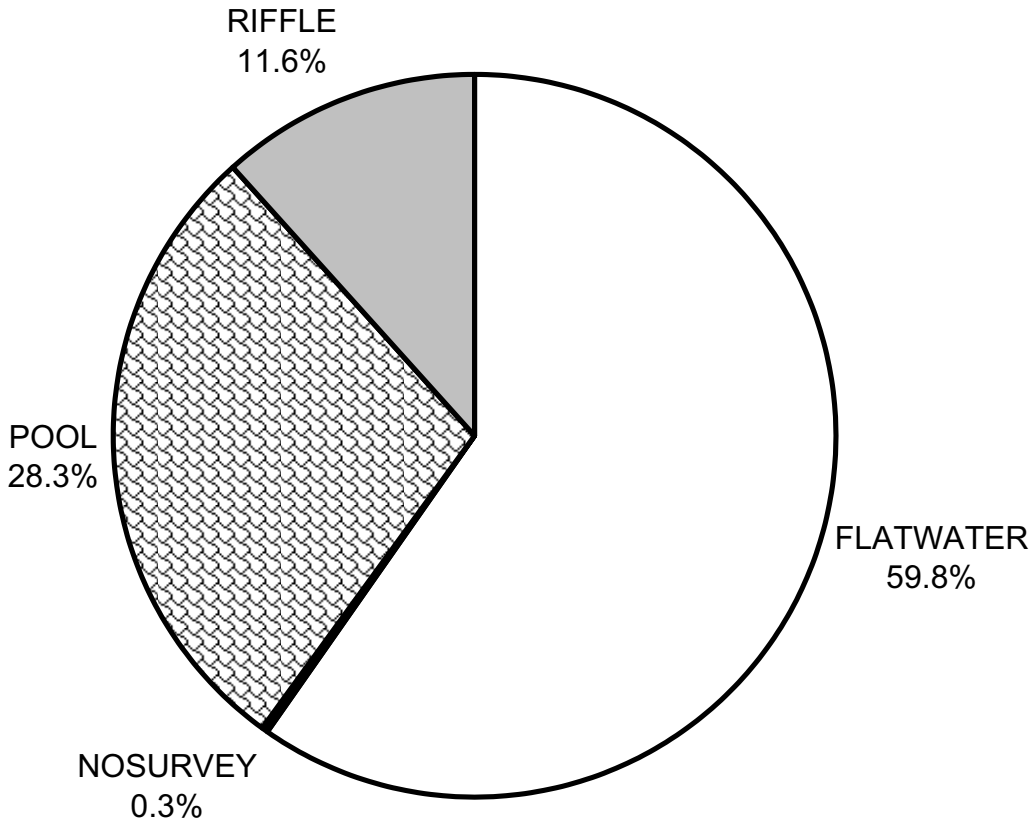
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	3	5	12
SMALL WOODY DEBRIS (%)	2	14	16
LARGE WOODY DEBRIS (%)	9	9	21
ROOT MASS (%)	0	10	26
TERRESTRIAL VEGETATION (%)	0	7	4
AQUATIC VEGETATION (%)	0	0	0
WHITEWATER (%)	6	2	1
BOULDERS (%)	80	45	11
BEDROCK LEDGES (%)	0	9	10

MAPLE CREEK 2008
HABITAT TYPES BY PERCENT OCCURRENCE



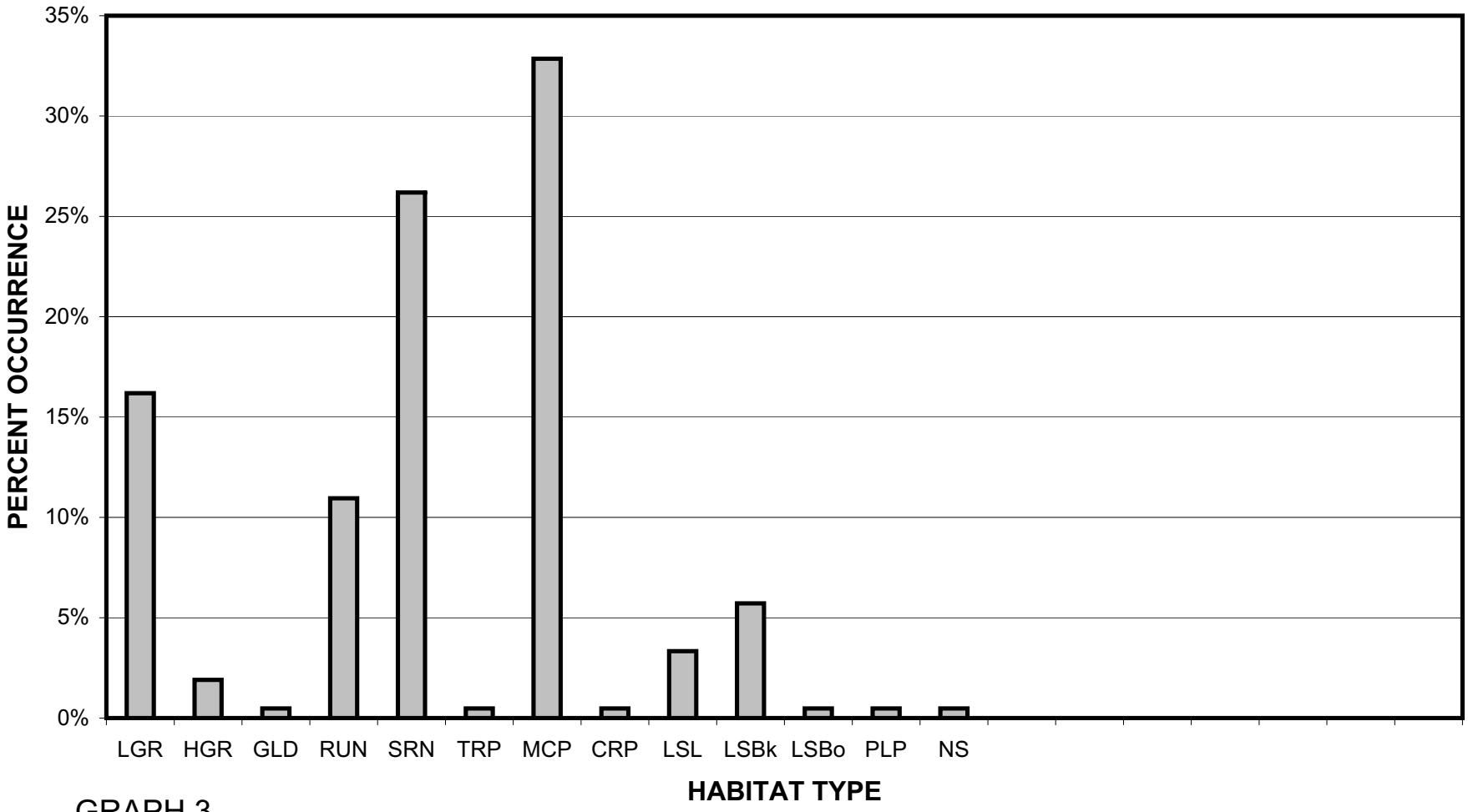
GRAPH 1

MAPLE CREEK 2008
HABITAT TYPES BY PERCENT TOTAL LENGTH



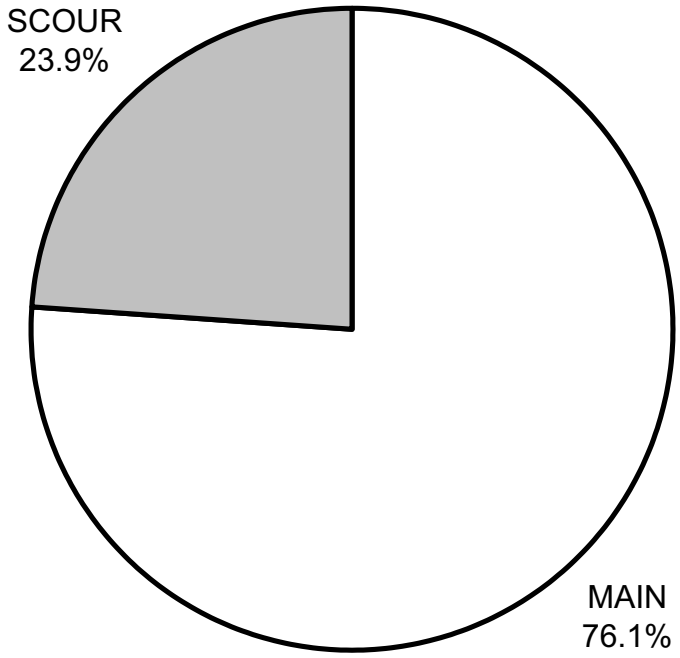
GRAPH 2

MAPLE CREEK 2008
HABITAT TYPES BY PERCENT OCCURRENCE



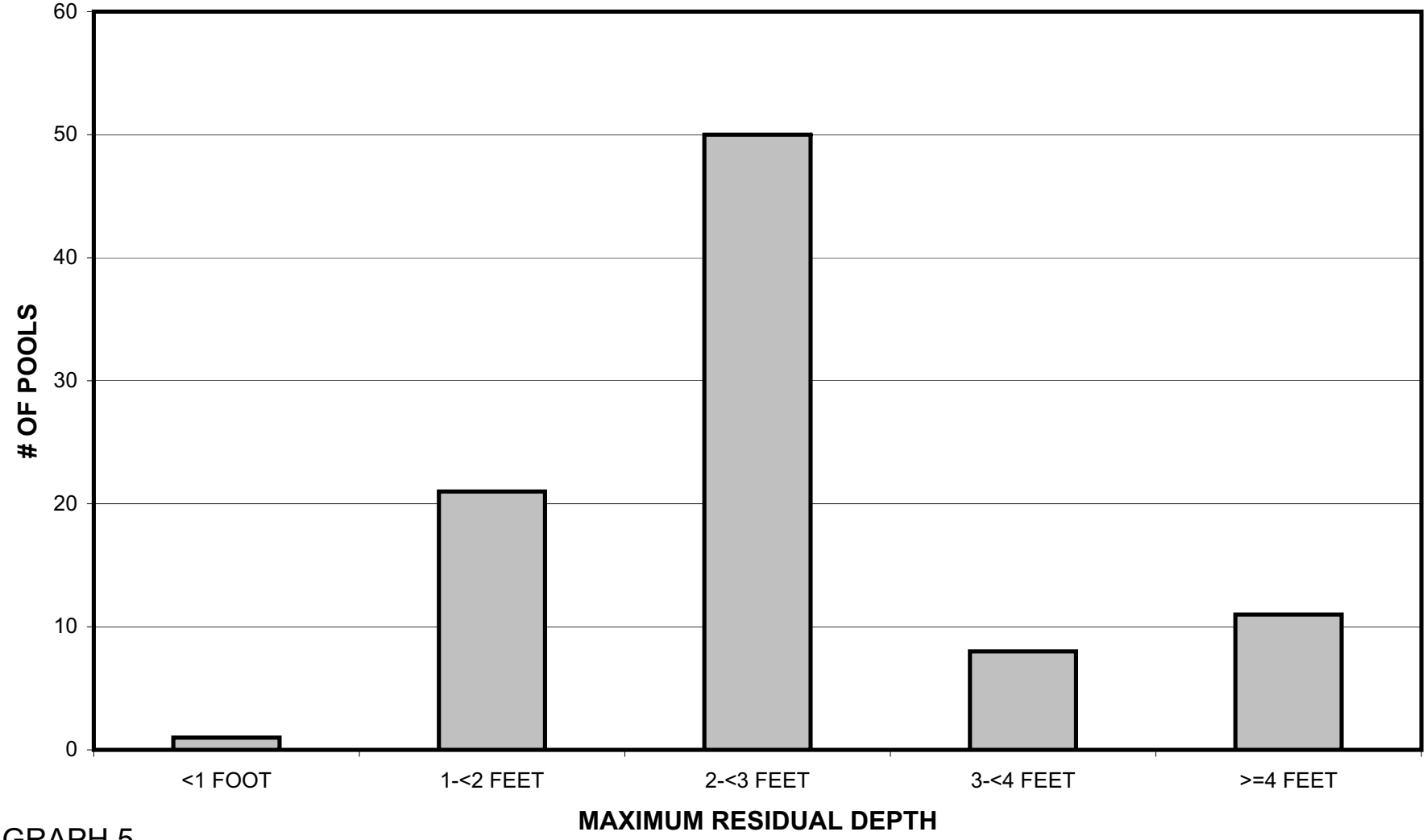
GRAPH 3

MAPLE CREEK 2008
POOL TYPES BY PERCENT OCCURRENCE



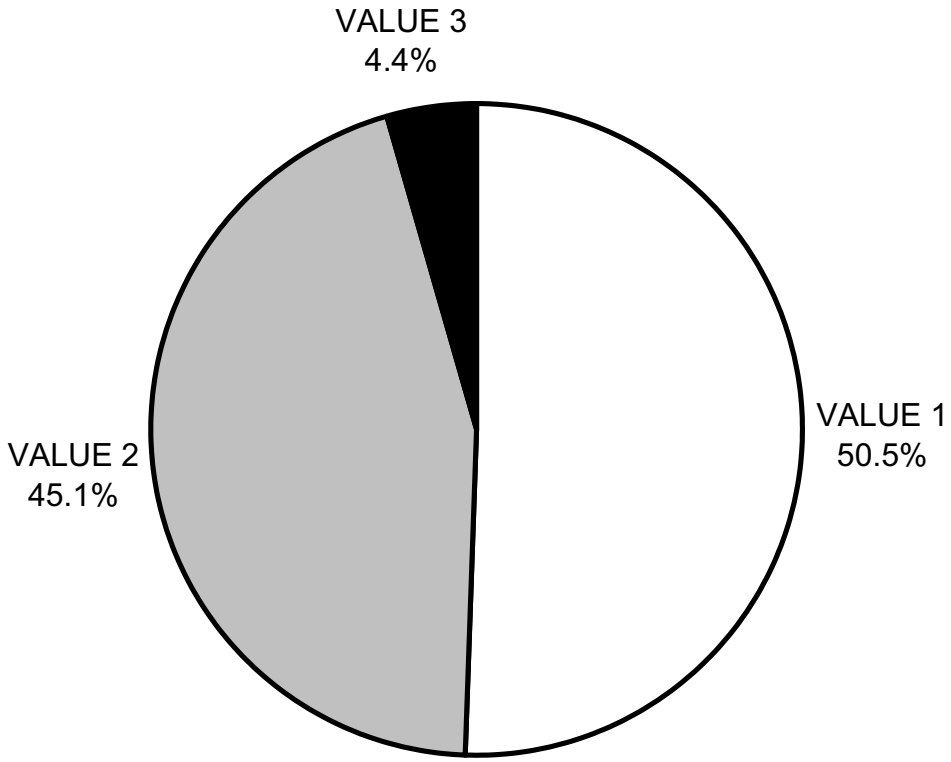
GRAPH 4

MAPLE CREEK 2008
MAXIMUM DEPTH IN POOLS



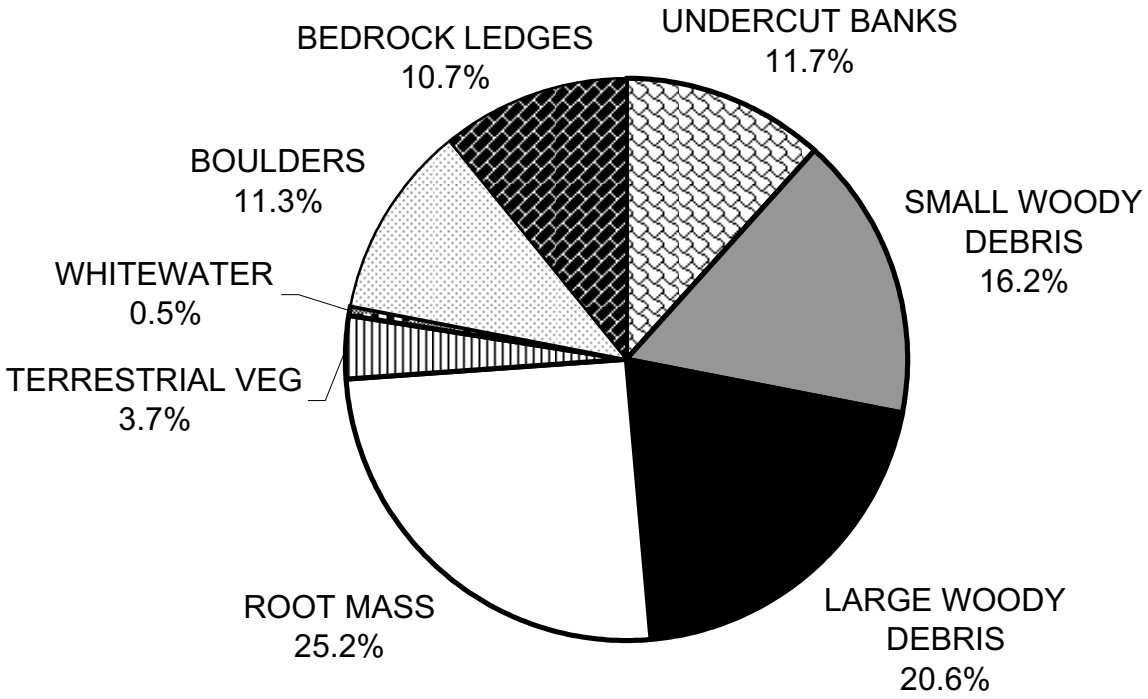
GRAPH 5

MAPLE CREEK 2008
PERCENT EMBEDDEDNESS



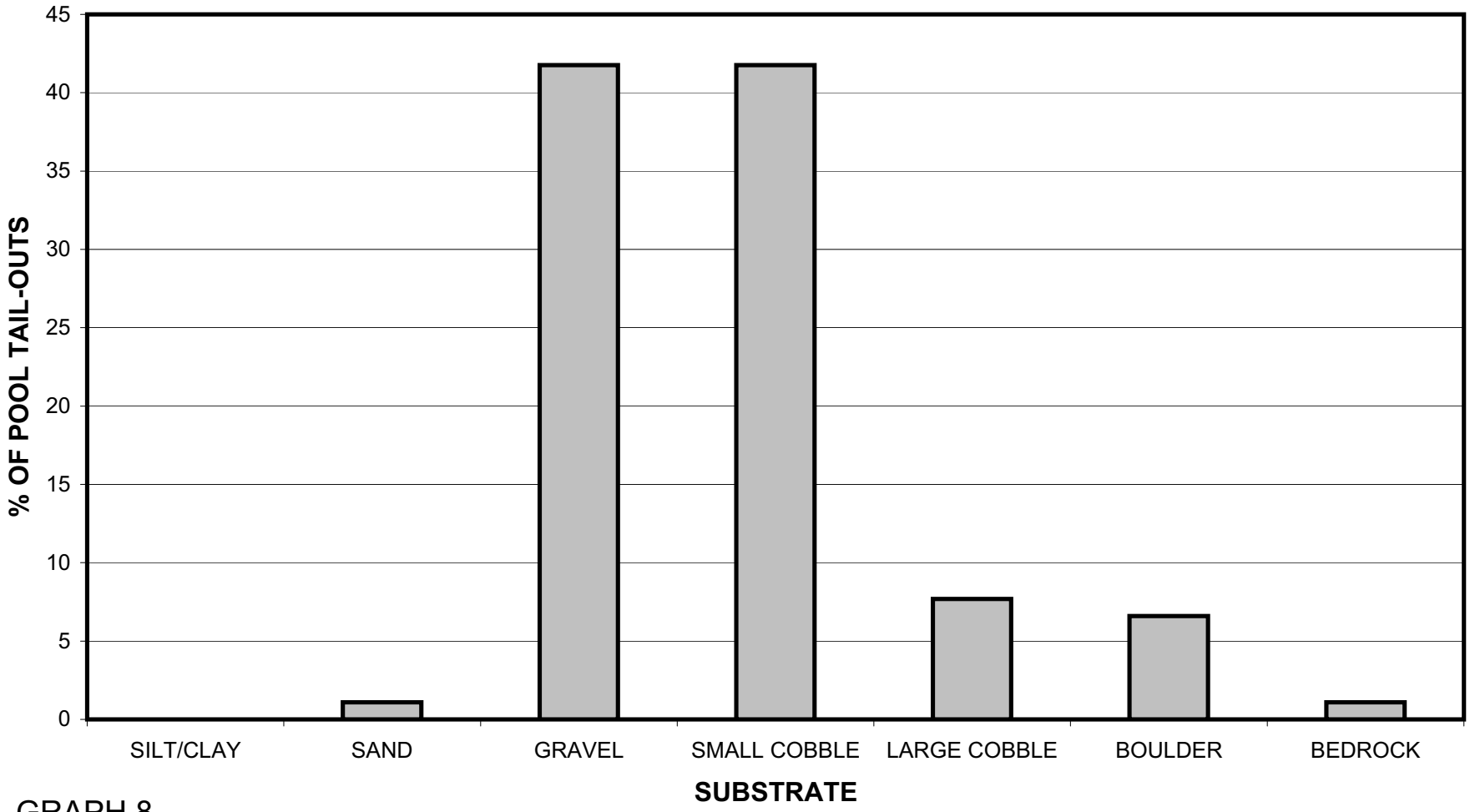
GRAPH 6

MAPLE CREEK 2008
MEAN PERCENT COVER TYPES IN POOLS



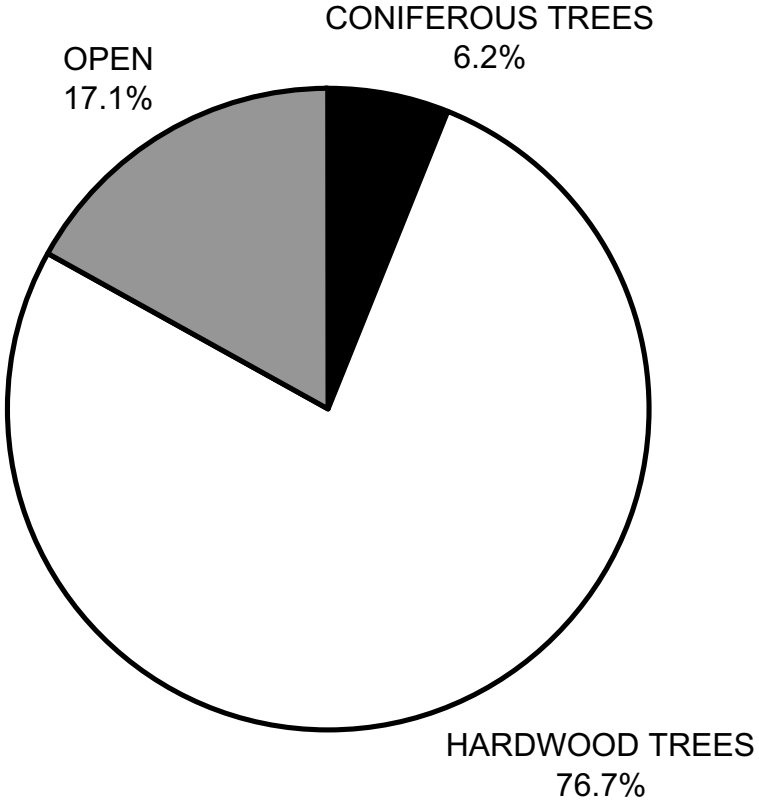
GRAPH 7

MAPLE CREEK 2008
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



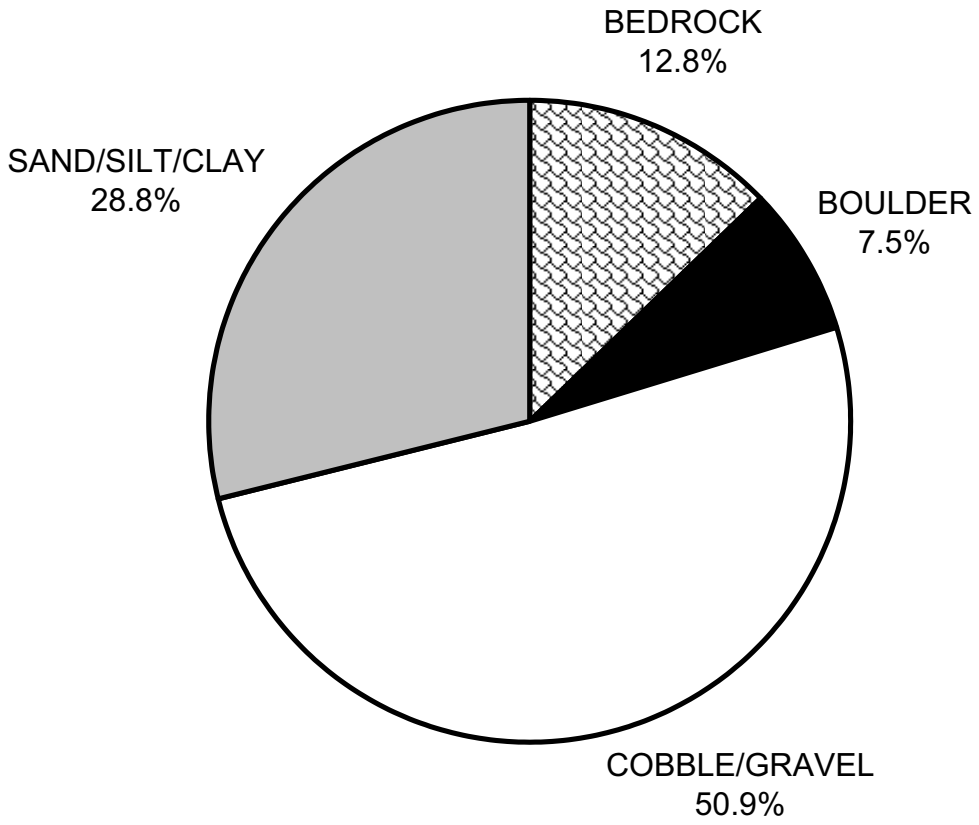
GRAPH 8

MAPLE CREEK 2008
MEAN PERCENT CANOPY



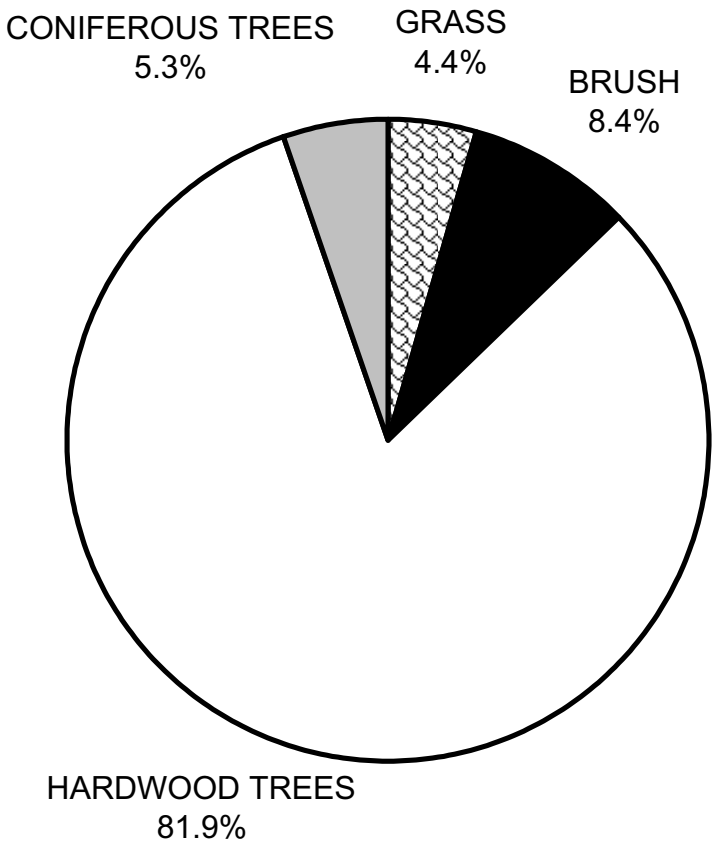
GRAPH 9

MAPLE CREEK 2008
DOMINANT BANK COMPOSITION IN SURVEY REACH

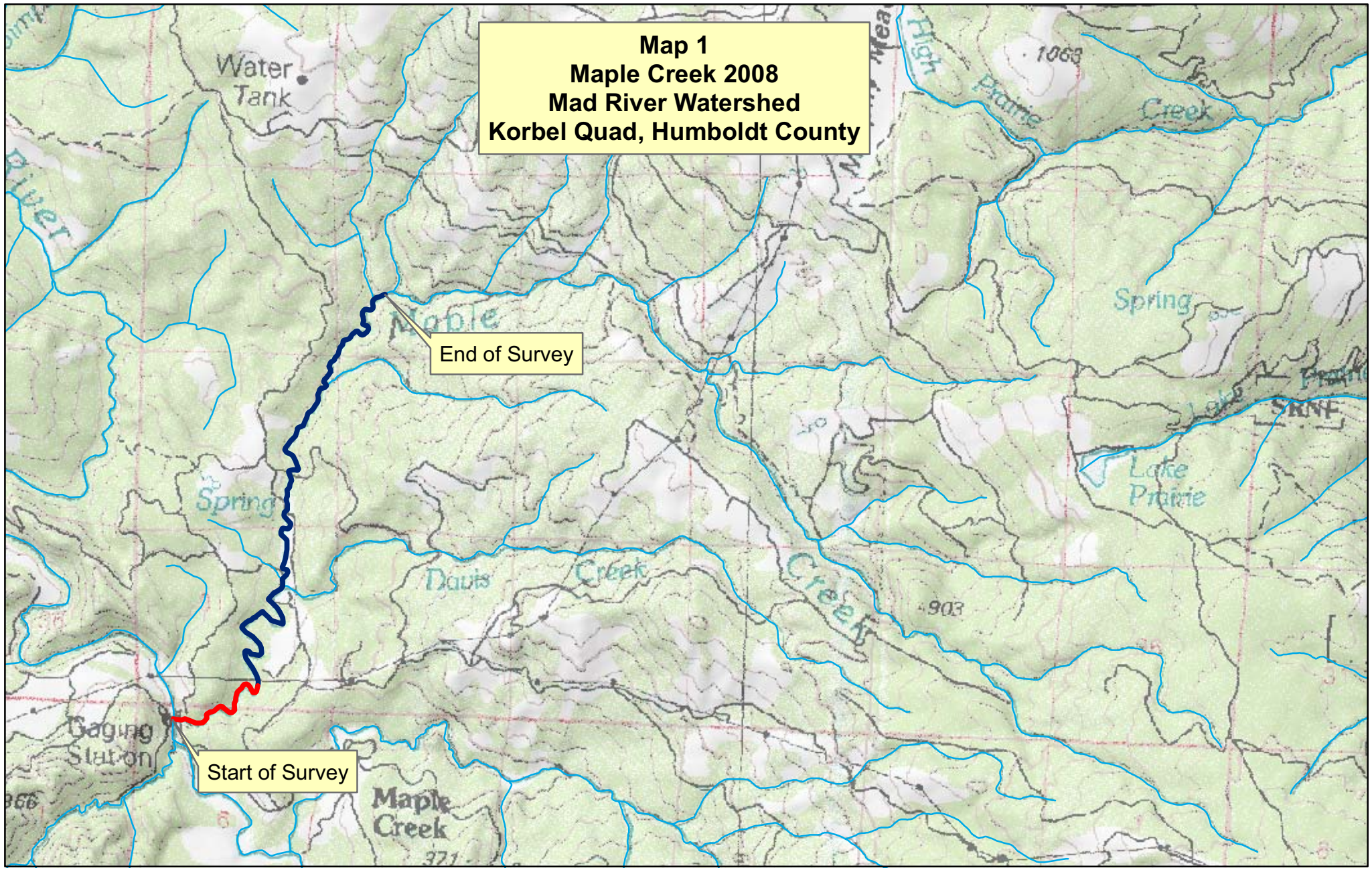


GRAPH 10

MAPLE CREEK 2008
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11


Map 1
Maple Creek 2008
Mad River Watershed
Korbel Quad, Humboldt County
End of Survey
Start of Survey
Water Tank
High Prairie Creek
Maple Spring
Spring
Davis Creek
Lake Prairie
Gaging Station
Maple Creek
1063
903
371
N
W
E
S
Legend
Reach 1, F4 Channel Type
Reach 2, C4 Channel Type
0
3,000
6,000 Feet
RESOURCES AGENCY
CALIFORNIA
DEPARTMENT FISH & GAME