

**CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT**

Martin Creek

Report Revised April 14, 2006

Report Completed 2005

Assessment Completed 2001

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Martin Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish and other aquatic species with an emphasis on anadromous salmonids in Martin Creek. The objective of the biological inventory was to document the presence and distribution of salmonids and other aquatic 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

Martin Creek, located in Sonoma County, California, is a tributary to Barnes Creek which flows into Brooks Creek, a tributary of the Russian River (see Martin Creek map, Appendix A). The legal description at the confluence with the Barnes Creek is T9N, R8W, S33. Its location is 38°35'13" N. latitude and 122°45'20" W. longitude. Year round vehicle access exists from Highway 101 near Healdsburg, to Chalk Hill Rd. to Spurgeon Rd.

Martin Creek and its tributaries drain a basin of approximately 2.29 square miles. Martin Creek is a third order stream and has approximately 4.31 miles of stream, almost entirely intermittent, according to the USGS Healdsburg and Mark West Spring 7.5 minute quadrangles. Martin has no major tributaries. Summer flow was measured as approximately 0.018 cfs at approximately 1529 feet from the mouth, on July 6, 2001. Elevations range from about 233 feet at the mouth of the creek to 1280 feet in the headwaters. Oak woodland forest dominates the watershed, as well as the upper riparian zone, but there are zones of grassland throughout. Also, low-mid watershed has mixed conifer/hardwood zones as well as agricultural zones. The lower riparian zone, which is dominated by willow and bay laurel, is owned primarily by private landowners. The upper watershed, from the largest reservoir upstream to the headwaters, is primarily owned by an academy of sciences. The lower watershed is managed for various small enterprises, including a nursery, equestrian stables and some vineyard development. The upper watershed is managed for open forest land as well as some cattle grazing. There are no sensitive plants listed from the CNPS Inventory and DFG's Natural Diversity Database within Martin Creek watershed.

METHODS

The habitat inventory conducted in Martin Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The AmeriCorps Volunteers 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 and was supervised by Derek Acomb, Russian River Basin Planner (DFG).

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 (1998). This form was used in Martin Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

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. Temperatures are also recorded using remote temperature recorders which log temperature at set intervals, 24 hours/day.

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". Brooks 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 Brooks Creek, embeddedness was visually 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 Brooks 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 visually 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 Brooks 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 visually 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 Brooks 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 stream inventory is used to determine fish species present and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, and 3) electro-fishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual (1998).

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed by CDFG. This program processes and summarizes the data, and produces the tables and appendices.

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

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

HISTORICAL STREAM SURVEYS:

There is no record of stream surveys conducted by the Department of Fish and Game on Martin Creek prior to this year.

HABITAT INVENTORY RESULTS

The habitat inventory of Martin Creek, June 20, 2001 - June 25, 2001, was conducted by M. Shugars (DFG), M. Terry (DFG) and D. Mitchel (DFG), with supervision and analysis by California Department of Fish and Game (DFG). The survey began at the confluence with Barnes Creek and extended up Martin Creek to a 30+ foot waterfall below a man made dammed lake. The total length of stream surveyed was 7955 feet, with an additional 16 feet of side channel.

A flow of 0.018 cfs was measured on July 6, 2001 at habitat unit #020, approximately 1300' above survey start with a Marsh-McBirney Model 2000 flowmeter.

This section of Martin Creek has one reach with one distinct channel type: from the mouth to 7939 feet a F3.

F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly cobble.

Water temperatures ranged from 60°F to 76°F. Air temperatures ranged from 70°F to 94°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of *occurrence* there were 36.4% Flatwater units, 29.5% Pool units, 26.1% Dry units and 8.0% Riffle units. Based on total *length* there were 59.6% Dry units, 19.8% Flatwater units, 13.7% Pool units and 6.9% Riffle units (Graph 2).

Of the eighty-eight habitat units, which were measured, 43% were completely sampled. Fourteen Level IV habitat types were identified. The data is summarized in Table 2. By percent total *length*, Dry at 26.1%, Run at 18.2%, Glide at 18.2% and Bedrock Sheet at 6.8%. The most frequent habitat types by percent *occurrence* were Dry at 26%, Run at 18%, Glide at 18% and Lateral Scour Pool - Bedrock Formed at 10%. (Graph 1)

Twenty-six pools were identified (Table 3). Lateral Scour Pool - Bedrock Formed pools were

most often encountered at 10% (Graph 3), and comprised 36% of the total length of pools.

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Eight of the 25 pools (32%) had a depth of three feet or greater (Graph 5).

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. Pools rated 10 (Table 1). Of the pool types, Corner Pool rated 75, Backwater Pool - Boulder Formed rated 10, Trench Pool rated 5, Plunge Pool rated 5, Mid-Channel Pool rated 5, Lateral Scour Pool - Root Wad Enhanced rated 5, Lateral Scour Pool - Boulder Formed rated 5 and Lateral Scour Pool - Bedrock Formed rated 5 (Table 2).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were Undercut Banks at 72%, Bedrock at 10%, Terrestrial Vegetation Root Mass at 7% each and Boulders at 3%. Graph 7 describes the pool shelter in Martin Creek.

Table 6 summarizes the dominant substrate by habitat type. In the one Low-Gradient Riffle surveyed, the dominant substrate was: Small Cobble.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the twenty-six pool tail-outs measured, four had a value of 1 (16%), nine had a value of 2 (36%) and thirteen had a value of 3 (48%). Riffles rated a five are unsuitable substrate type for spawning. On this scale, a value of one is best for fisheries. Table 8 describes percent embeddedness by reach. Small Cobble was the dominant substrate observed at pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 57%. The mean percentages of deciduous and evergreen trees were 63% and 37%, respectively. Graph 9 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 43% and the mean percent left bank vegetated was 43% (Table 7). For the habitat units measured, the dominant vegetation types for the stream banks were: 38% Brush, 29% Deciduous Trees, 21% Evergreen Trees and 12% Grass (Graph 11). The dominant substrate for the stream banks were: 37% Bedrock, 34% Cobble & Gravel and 28% sand silt and clay (Graph 10).

DISCUSSION

Martin Creek has one reach: 7939 feet a F3.

According to the DFG Salmonid Stream Habitat Restoration Manual, F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must

include protection for any unstable banks.

The water temperatures recorded on the survey days June 20, 2001 - June 25, 2001 ranged from 60°F to 76°F. Air temperatures ranged from 70°F to 94°F. If sustained, water temperatures above 65°F are beyond the threshold stress level for salmonids.

It is unknown if this thermal regime is typical. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and/or more extensive biological sampling conducted.

Pools comprised 14% of the total length of this survey. In third order streams a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. In Martin Creek, the pools are relatively deep with 32% having a maximum depth of at least three feet. These pools comprised 12% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 10. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by Undercut Banks at 72%, Bedrock at 11% and Terrestrial Vegetation at 7%. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The one low gradient riffle measured (100%) had either gravel or small cobble as the dominant substrate. This is generally considered fair for spawning salmonids.

Fifty percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 15% had a rating of 1. Cobble embeddedness measured to be 25% or less (a rating of 1) is considered best for the needs of salmon and steelhead.

The mean percent canopy for the survey was 54%. This is a low percentage of canopy, since 80 percent is generally considered desirable. Cooler water temperatures are desirable in Martin Creek. Elevated water temperatures could be reduced by increasing stream canopy. The large trees required for adequate stream canopy would also eventually provide a long term source of large woody debris needed for instream shelter and bank stability.

However, the riparian buffer is thin or nearly absent in areas with equestrian access. Vineyard development within the riparian corridor could all lead to less stream canopy and channel incision causing bank erosion and higher water temperatures.

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On October 18, 2001, a biological inventory was conducted in Martin Creek to document the fish species composition and distribution at one location. This site was single-pass electro-fished using one Smith Root Model 12 electro-fisher. Fish from this site were counted by species and returned to the stream. A random sample of fish was selected from this reach, and tissues were taken from each year class of salmonids for genetic analysis. Air temperatures ranged from 81° to 90° F and water temperatures ranged from 58° to 60° F.

The inventory of Site 1 started at the mid-channel pool at the confluence with Barnes Creek and ended approximately 1000 feet upstream. In mid-channel pool and scour pool habitats, at least 4 steelhead (ranging from young of year to 3+ year old) were observed along with, at least 60 sculpin, 21 bullfrogs, 19 crayfish, 7 suckerfish and 2 sunfish.

During the habitat inventory, no salmonids were observed upstream of unit #89, 8045 feet above the confluence with Barnes Creek, where a dammed reservoir appears to impede further passage.

A summary of historical and recent data collected appears in the table below.

Table 1. Species Observed in Historical and Recent Surveys			
YEARS	SPECIES	SOURCE	Native/Introduced
2001	Sculpin	DFG	N
2001	Roach	DFG	N
2001	Sacramento Sucker	DFG	N
2001	Steelhead	DFG	N
2001	Crayfish	DFG	N
2001	Sunfish	DFG	N
2001	Bullfrog Larvae	DFG	I

There is no record of hatchery stocking or fish rescue/transfer operations in Martin Creek.

ADULT SURVEYS:

Due to inadequate staffing levels, no spawner/carcass surveys have been conducted on Martin Creek.

GENERAL MANAGEMENT RECOMMENDATIONS

Martin Creek should be managed as an anadromous, natural production stream.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1. Increase the canopy on Martin Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reach above the survey section should be assessed for planting and treated as well, since water temperatures throughout are effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.
2. Map sources of upslope and in-channel 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. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.
3. There are sections where the stream is being impacted from cattle trampling the riparian zone. Alternatives should be explored with the grazier and developed if possible.
4. Access for migrating salmonids is an ongoing potential problem in Martin Creek therefore, fish passage should be monitored, and improved where possible.
5. Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion. In some areas the material is at hand.
6. Where feasible, design and engineer pool enhancement structures to increase the number of pools in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

7. Martin Creek would benefit from the utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.

MARTIN CREEK SURVEY COMMENTS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

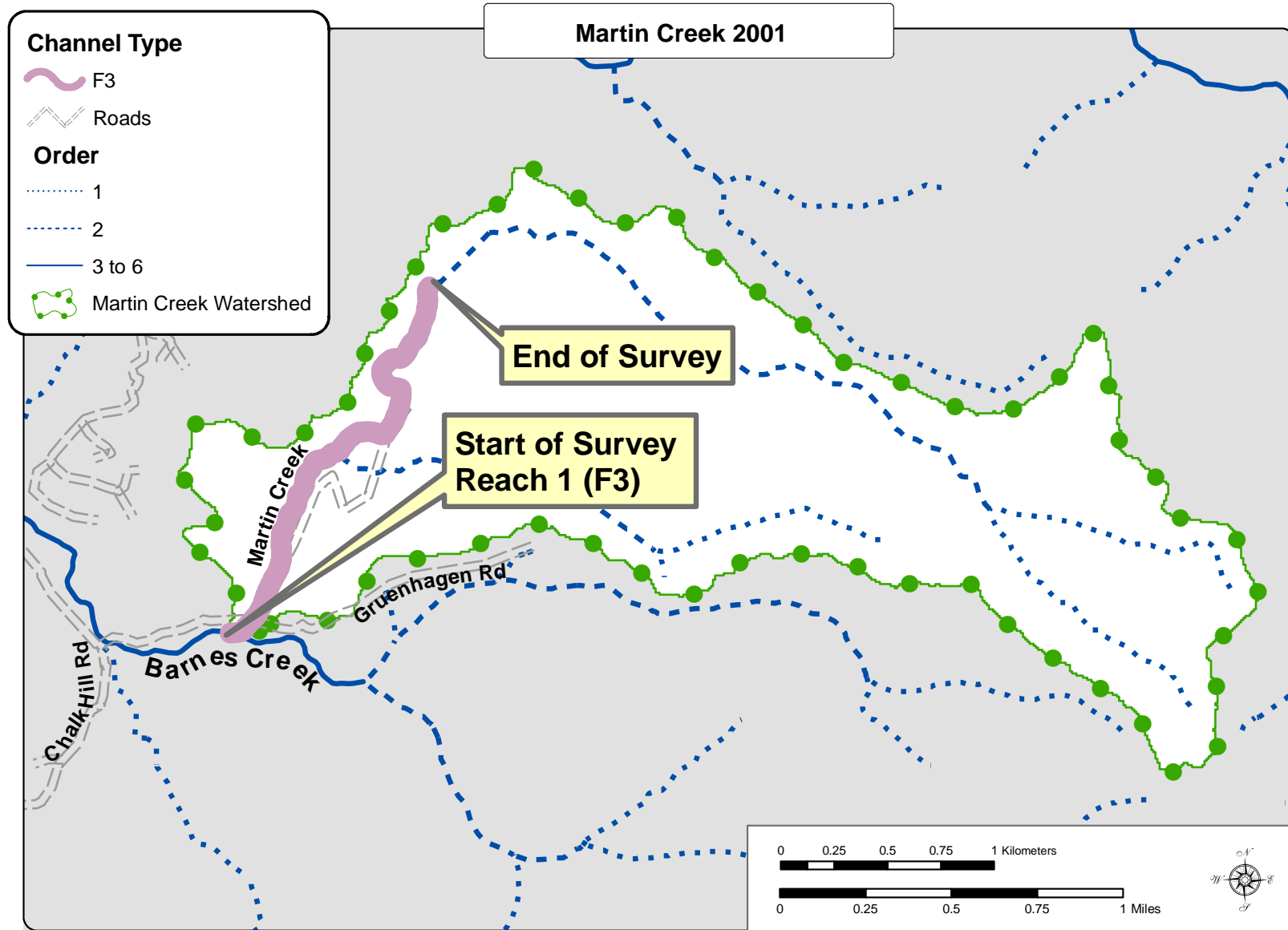
Martin Creek

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	68 degrees at the mouth of Barnes.
174	0003.00	Bridge/Culvert: see form.
279	0005.00	WP #021
644	0010.00	At the end of this unit, there is a dry trib that enters on the right bank through a culvert. WP #016 (10 habitat units)
704	0011.00	WP #017 - culvert (LB).
739	0012.00	Erosion on the left bank.
794	0013.00	Dry trib on the right bank (too small to survey).
909	0014.00	Large woody debris fallen into and around creek. Average length is 25'. Average diameter is 2.5'.
1002	0015.00	Dry trib on right bank (small). Property fencing on left bank.
1029	0016.00	Dry trib on right bank.
1159.6	0019.00	Large pepperwood tree fallen across stream, but is not obstructing flow.
1331.6	0024.00	Property fence runs across creek.

1376.6	0025.00	Dry trib on left bank.
1399.6	0026.00	One 0+ steelhead - first fish.
1427.6	0027.00	Optimal pool!
1510.6	0029.00	WP # 019
1711.6	0035.00	Dry trib on right bank. Possible tree planting/orchard on left bank.
1965.6	0037.00	Dry trib on right bank.
2101.6	0040.00	Units # 040-089 may not have been channel type F3. There were no sufficient habitat units to perform a channel type procedure.
2196.6	0041.00	2" fish in stream with no ID available.
2461.6	0043.00	There are many sculpin in this unit.
2830.6	0047.00	There may be 5-10 salmonids that are 2" long.
2897.6	0048.00	Left bank eroded.
3161.6	0049.00	30-50 salmonids - This is a good place for fish rescue. Water temp at confluence with dry trib (left bank) is 65 degrees. WP#023.
3432.6	0054.00	Many salmonids: 1-2" long. Wp #024: see debris form.
3537.6	0057.00	Right bank erosion at 200'. 30' from ground level to the top. Wet road at 275'.
3823.6	0058.00	Bedrock is more like compacted silt/clay.
3847.6	0059.00	WP #025: Tributary.
4514.6	0068.00	Small gully on right bank from run off. Small fish in pool.

4544.6	0069.00	WP #026.
5181.6	0076.00	Gully on the left bank at 180' into the unit.
5452.6	0077.00	WP #001: Trib with pool on left bank, 58 degrees. Not sufficient habitat. WP #002: Bridge #2 at 489'. 10" culvert underneath the bridge. At 555' there is a suspended pipe across the creek. There is a dry trib at 597' on the right bank. At 985' there is a 1' culvert on the right bank about 6' above the creek. At 1045' there is a culvert on the left bank approximately 5' above the creek. WP #003: Bridge #3 at 1087', covered. At 1111' there is a 1' culvert 12' up on the left bank. WP #004: Bridge #4/culvert at 1220'.
6802.6	0079.00	WP #005: Bridge #5 at 785'.
7914.6	0089.00	WP #007: Dam/Lake, end of survey.

APPENDIX A: MAP



L:\mondo3\data\stream-maps\MartinCreek2001.mxd

Prepared by: Celeste Dodge and Colin Brooks, March 24, 2005

APPENDIX B: TABLES

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

Stream Name: Martin Creek

LLID:

1227555385870

Drainage:

Russian River - Middle

Survey Dates: 6/20/2001 to 6/25/2001

Confluence Location:

Quad: HEALDSBURG

Legal Description: T09NR08WS33

Latitude: 38:35:13.0N

Longitude: 122:45:20.0W

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
23	0	DRY	26.1	206	4742	59.6									
32	12	FLATWATER	36.4	49	1575	19.8	6.6	0.5	0.9	228	7281	129	4144		0
26	26	POOL	29.5	42	1087.6	13.7	9.3	1.6	2.6	378	9816	801	20016	660	10
7	3	RIFFLE	8.0	79	550	6.9	5.0	0.5	0.8	402	2811	230	1613		
Total Units	Total Units Fully Measured				Total Length (ft.)					Total Area (sq.ft.)			Total Volume (cu.ft.)		
88	41				7954.6					19908			25773		

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Martin Creek

LLID:

1227555385870

Drainage: Russian River - Middle

Survey Dates: 6/20/2001 to 6/25/2001

Confluence Location: Quad: HEALDSBURG

Legal Description: T09NR08WS33

Latitude: 38:35:13.0N

Longitude: 122:45:20.0W

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 (%)
1	1	LGR	1.1	24	24	0.3	4	0.2	0.3	96	96	19	19			45
6	2	BRS	6.8	88	526	6.6	6	0.6	1.4	554	3326	336	2016			55
16	9	GLD	18.2	39	624	7.8	7	0.6	1.4	196	3132	137	2188			50
16	3	RUN	18.2	59	951	12.0	6	0.3	1	323	5165	108	1724		0	54
2	2	TRP	2.3	78	156	2.0	4	2.3	4.1	370	740	829	1657	792	5	73
7	7	MCP	8.0	40	278	3.5	13	1.2	3.2	545	3814	1049	7340	697	5	74
1	1	CCP	1.1	14	14	0.2	8	0.8	1.9	112	112	101	101	90		85
2	2	CRP	2.3	40	80	1.0	10	3.2	6.9	400	800	1383	2766	1303	75	56
1	1	LSR	1.1	31	31	0.4	7	0.9	1.5	206	206	227	227	186	5	65
9	9	LSBk	10.2	44	392	4.9	8	1.5	5	338	3042	627	5646	578	5	71
1	1	LSBo	1.1	42	42	0.5	7	1.6	1.9	294	294	529	529	470	5	90
2	2	PLP	2.3	40	79	1.0	10	1.8	3.6	350	699	875	1750	749	5	65
1	1	BPB	1.1	16	16	0.2	7			109	109				10	
23	0	DRY	26.1	206	4742	59.6										42

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
88	41	7954.6	21536	25963

Table 3 - Summary of Pool Types

Stream Name: Martin Creek

LLID:

1227555385870

Drainage: Russian River - Middle

Survey Dates: 6/20/2001 to 6/25/2001

Confluence Location: Quad: HEALDSBURG

Legal Description: T09NR08WS33

Latitude: 38:35:13.0N

Longitude: 122:45:20.0W

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
10	10	MAIN	38	45	448	41	11.0	1.4	467	4666	655	6549	5
15	15	SCOUR	58	42	624	57	8.3	1.7	336	5041	664	9960	13
1	1	BACKWATER	4	16	16	1	7.0		109	109		0	10
Total Units	Total Units Fully Measured				Total Length (ft.)				Total Area (sq.ft.)			Total Volume (cu.ft.)	
26	26				1087.6				9816			16509	

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

Stream Name: Martin Creek

LLID:

1227555385870

Drainage: Russian River - Middle

Survey Dates: 6/20/2001 to 6/25/2001

Confluence Location:

Quad: HEALDSBURG

Legal Description:

T09NR08WS33

Latitude: 38:35:13.0N

Longitude: 122:45:20.0W

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	8	0	0	0	0	0	0	1	50	1	50
7	MCP	28	0	0	5	71	1	14	1	14	0	0
1	CCP	4	0	0	1	100	0	0	0	0	0	0
2	CRP	8	0	0	1	50	0	0	0	0	1	50
1	LSR	4	0	0	1	100	0	0	0	0	0	0
9	LSBk	36	0	0	4	44	2	22	2	22	1	11
1	LSBo	4	0	0	1	100	0	0	0	0	0	0
2	PLP	8	0	0	0	0	1	50	1	50	0	0

Total Units

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
25	0	0	13	52	4	16	5	20	3	12

Mean Maximum Residual Pool Depth (ft.): 2.6

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Martin Creek

LLID:

1227555385870

Drainage:

Russian River - Middle

Survey Dates: 6/20/2001 to 6/25/2001

Dry Units: 23

Confluence Location: Quad: HEALDSBURG

Legal Description: T09NR08WS33

Latitude: 38:35:13.0N

Longitude:

122:45:20.0W

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
1	0	LGR									
6	0	BRS									
7	0	TOTAL RIFFLE									
16	0	GLD									
16	1	RUN	0	0	0	0	0	0	0	0	0
32	1	TOTAL FLAT	0	0	0	0	0	0	0	0	0
2	1	TRP	100	0	0	0	0	0	0	0	0
7	3	MCP	67	0	0	0	33	0	0	0	0
1	0	CCP									
2	1	CRP	100	0	0	0	0	0	0	0	0
1	1	LSR	0	0	0	100	0	0	0	0	0
9	4	LSBk	76	0	0	0	0	0	0	0	24
1	1	LSBo	100	0	0	0	0	0	0	0	0
2	2	PLP	50	0	0	0	0	0	0	20	30
1	1	BPB	100	0	0	0	0	0	0	0	0
26	14	TOTAL POOL	72	0	0	0	7	0	0	3	11
88	15	TOTAL	67	0	0	0	7	0	0	3	10

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Martin Creek LLID: 1227555385870 Drainage: Russian River - Middle
 Survey Dates: 6/20/2001 to 6/25/2001 Dry Units: 23
 Confluence Location: Quad: HEALDSBURG Legal Description: T09NR08WS33 Latitude: 38:35:13.0N Longitude: 122:45:20.0W

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
1	1	LGR	0	0	0	100	0	0	0
6	1	BRS	0	0	0	0	0	0	100
16	9	GLD	67	0	0	22	11	0	0
16	3	RUN	33	0	0	33	33	0	0
2	2	TRP	0	0	100	0	0	0	0
7	4	MCP	50	0	25	0	0	25	0
1	1	CCP	100	0	0	0	0	0	0
2	2	CRP	50	0	0	0	0	0	50
1	1	LSR	0	0	0	0	100	0	0
9	4	LSBk	0	0	0	0	25	0	75
1	1	LSBo	0	0	0	0	0	0	100
2	2	PLP	0	0	0	0	0	0	100
1	1	BPB	0	100	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Martin Creek LLID: 1227555385870 Drainage: Russian River - Middle
 Survey Dates: 6/20/2001 to 6/25/2001
 Confluence Location: Quad: HEALDSBURG Legal Description: T09NR08WS33 Latitude: 38:35:13.0N Longitude: 122:45:20.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
57	36	64	0	43	43

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 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Martin Creek

LLID:

1227555385870 Drainage: Russian River - Middle

Survey Dates: 6/20/2001 to 6/25/2001

Confluence Location: Quad: HEALDSBURG Legal Description: T09NR08WS33 Latitude: 38:35:13.0N Longitude: 122:45:20.0W

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	13	15	36.8
Boulder	1	0	1.3
Cobble / Gravel	12	14	34.2
Sand / Silt / Clay	12	9	27.6

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	3	6	11.8
Brush	15	14	38.2
Hardwood Trees	11	11	28.9
Coniferous Trees	9	7	21.1
No Vegetation	0	0	0.0

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Martin Creek

LLID:

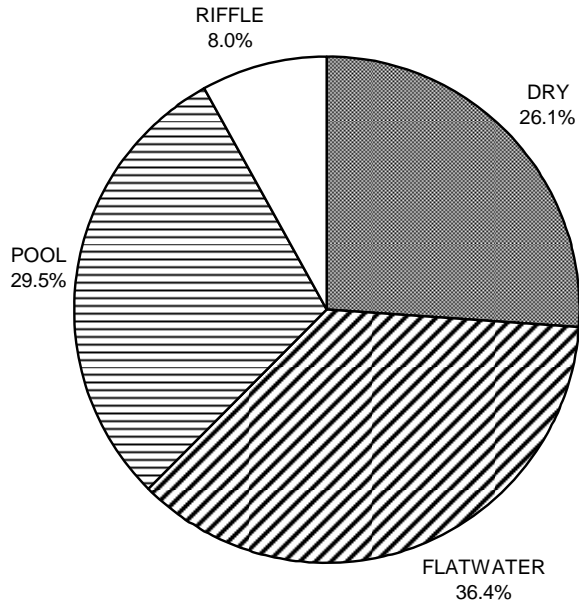
1227555385870 Drainage: Russian River - Middle

Survey Dates: 6/20/2001 to 6/25/2001

Confluence Location: Quad: HEALDSBURG Legal Description: T09NR08WS33 Latitude: 38:35:13.0N Longitude: 122:45:20.0W

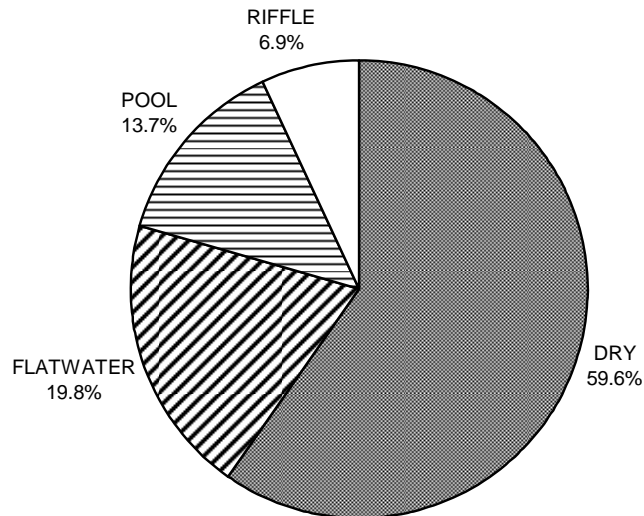
	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)		0	72
SMALL WOODY DEBRIS (%)		0	0
LARGE WOODY DEBRIS (%)		0	0
ROOT MASS (%)		0	7
TERRESTRIAL VEGETATION (%)		0	7
AQUATIC VEGETATION (%)		0	0
WHITEWATER (%)		0	0
BOULDERS (%)		0	3
BEDROCK LEDGES (%)		0	11

Appendix D:
MARTIN CREEK 2001
LEVEL II HABITAT TYPES BY PERCENT OCCURRENCE



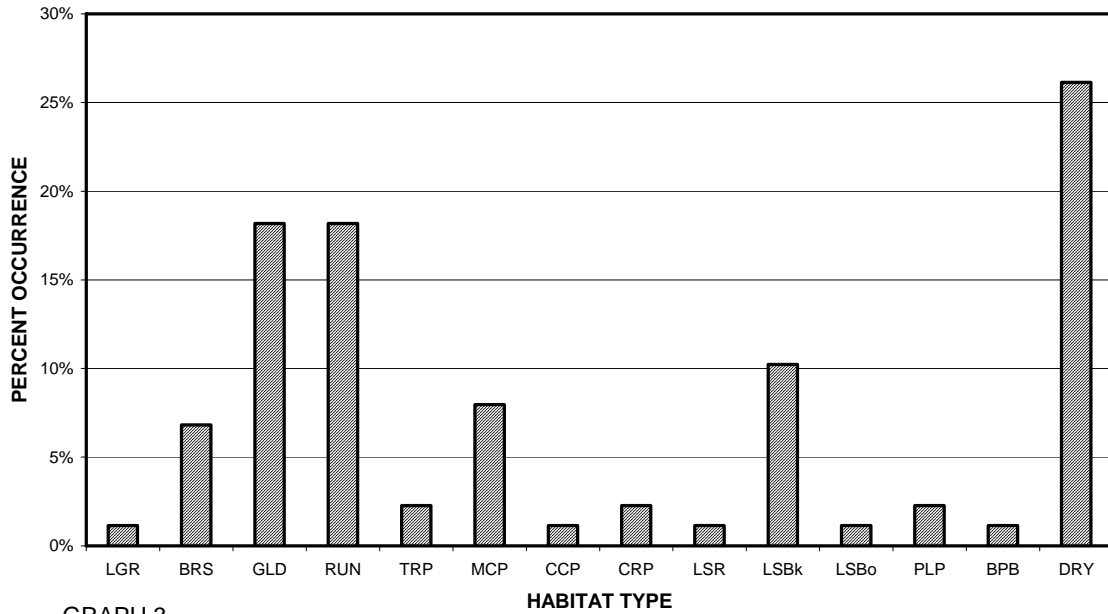
GRAPH 1

MARTIN CREEK 2001
LEVEL II HABITAT TYPES BY PERCENT TOTAL LENGTH



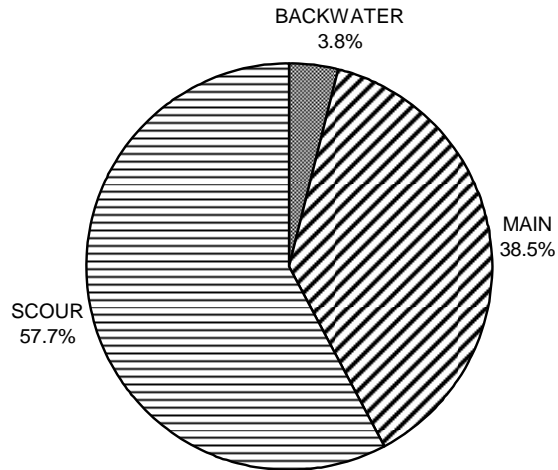
GRAPH 2

**MARTIN CREEK 2001
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE**



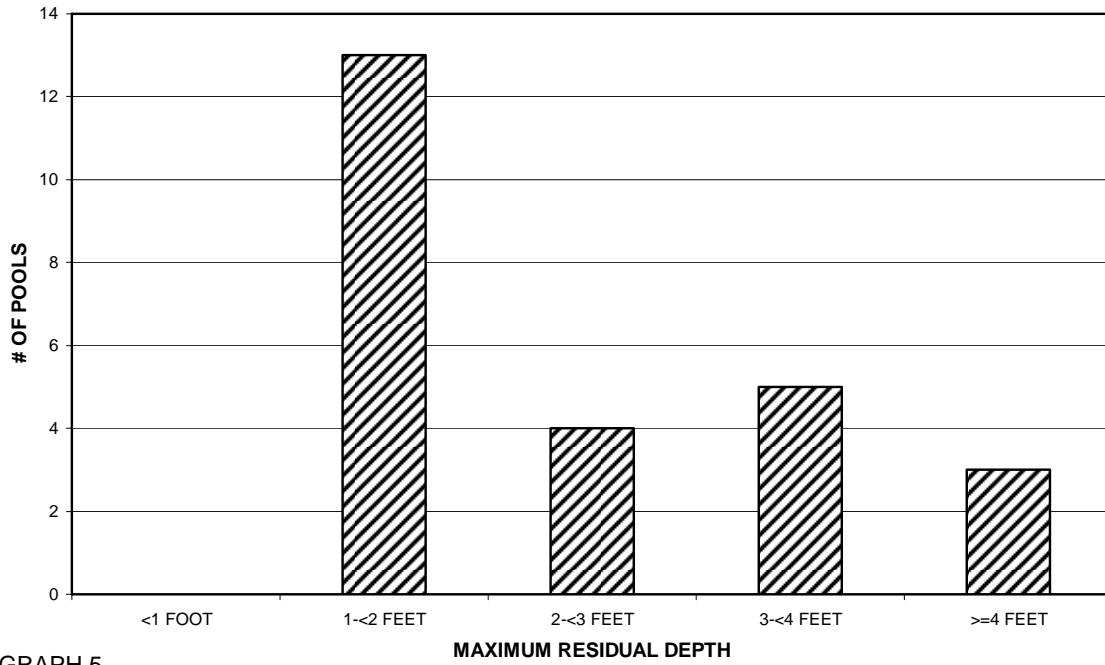
GRAPH 3

**MARTIN CREEK 2001
LEVEL I POOL TYPES BY PERCENT OCCURRENCE**



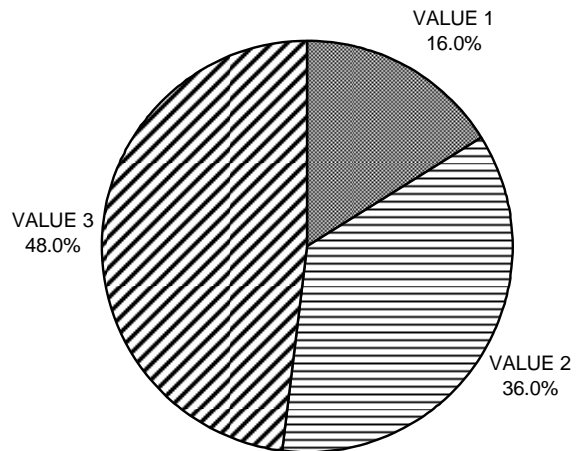
GRAPH 4

**MARTIN CREEK 2001
MAXIMUM DEPTH IN POOLS**



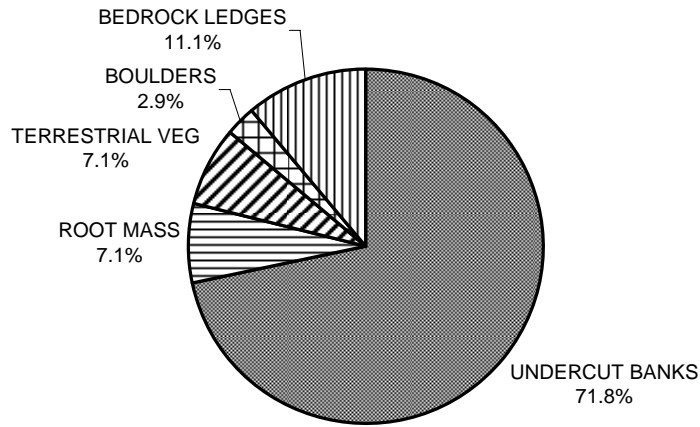
GRAPH 5

**MARTIN CREEK 2001
PERCENT EMBEDDEDNESS**



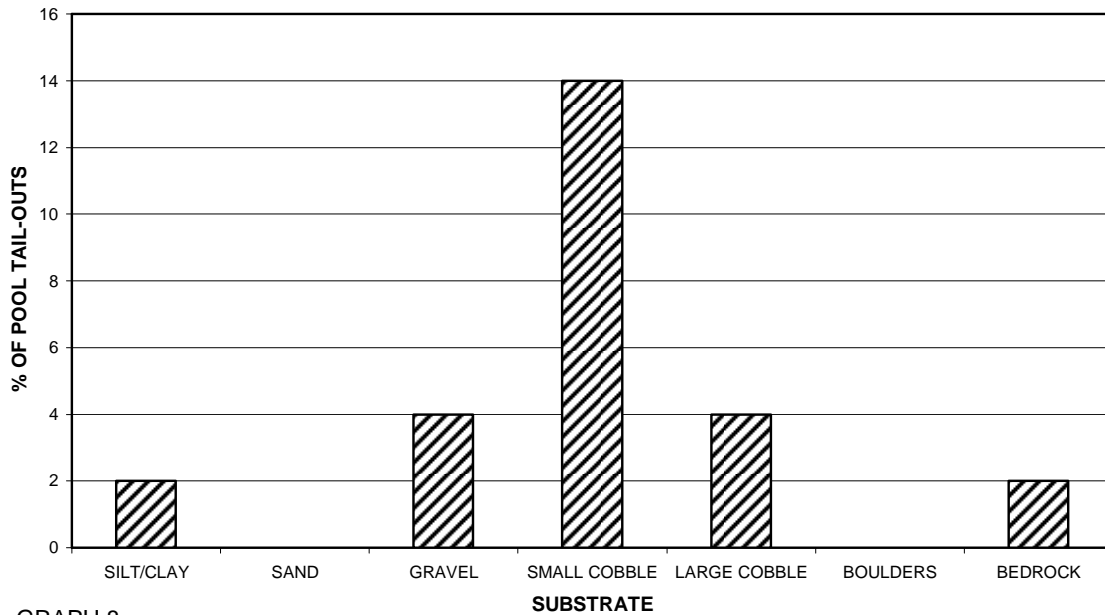
GRAPH 6

**MARTIN CREEK 2001
MEAN PERCENT COVER TYPES IN POOLS**



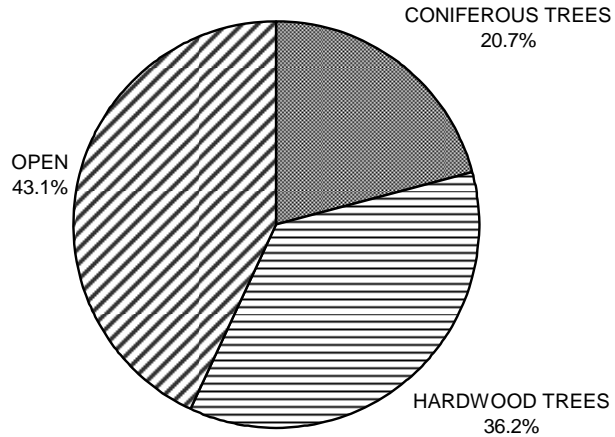
GRAPH 7

**MARTIN CREEK 2001
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS**



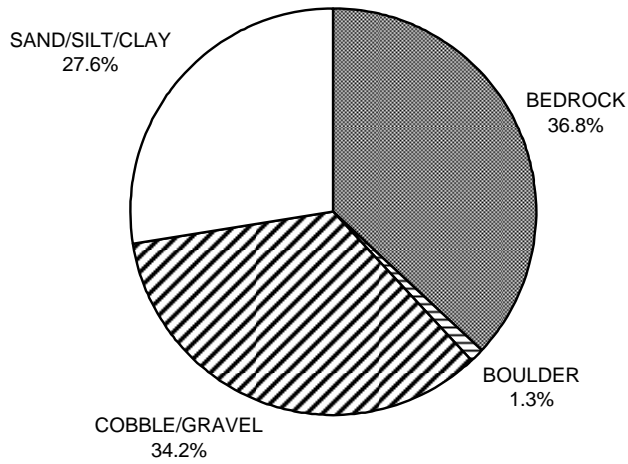
GRAPH 8

**MARTIN CREEK 2001
MEAN PERCENT CANOPY**



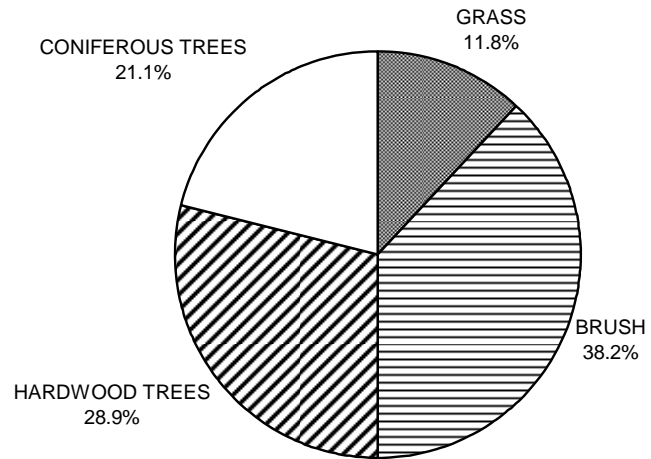
GRAPH 9

**MARTIN CREEK 2001
DOMINANT BANK COMPOSITION IN SURVEY REACH**



GRAPH 10

**MARTIN CREEK 2001
DOMINANT BANK VEGETATION IN SURVEY REACH**



GRAPH 11

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:	Tributary to	Barnes Creek
Martin Creek	1227555385870	Sonoma	Tributary to	Brooks Creek
			Tributary to	Russian River
Location:	T: 09N	R: 08W	S: 33	Latitude: 38.5870494882997
				Longitude 122.75557157725

Hydrologic Boundary Delineation: Watershed boundaries were delineated using the Watershed Point tool in ArcHydro, running under ArcMap 8.3 (ArcInfo version). A 1:24k stream network was "burned" into the underlying DEM to enforce hydrologic routing.

Aerial Photos (Source): For Mendocino County watersheds, 1993 USGS DOQQs are available in the Teale Albers, NAD27 projection. For Sonoma County watersheds, 2000 County-created orthophotos in the State Plane, NAD83 projection are also available.

Stream Order: <u>3</u>	Total Length:	4.31 Miles	Note: Length is for the USGS blue-line 1:24,000 stream.
Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nhydro1" 1:24k streams layer.		6.94 Km	

Drainage Area:	594 Hectares
	1468 Acres
	2.29 sq. mi.

Elevations:	Mouth:	<u>233</u> feet
	Headwaters:	<u>1529</u> feet
	Note: Headwaters elevation is the highest elevation found in the watershed.	

Lakes in Watershed: Number: 1 Surface area: 0.009 sq. mi.
 Note: Source for lakes data is the USGS-DFG 1:100k lakes layer "lakes.shp"

Fish Species (as indicated by historical salmonid streams layer created by Bob Coey): Steelhead

Ownership, for the watershed, in acres (and % of total watershed):

Federal:	State:	Local:	Private:
0.0 acres	0.0	0.0	1468.2
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for ownership data is 2002 DFG-CCR "ccr_public_lands.shp" GIS layer.

Major Land Uses in the Watershed, in acres (and % of total watershed)

Mixed hardwood/conifer:	Hardwood:	Conifer:	Agriculture:	Urban:
6.79 acres	1148.10	0.00	70.42	0.00
0.5 %	78.2 %	0.0 %	4.8 %	0.0 %
Shrub:	Herbaceous:	Barren/rock:	Water:	
0.00	237.22	0.00	5.25	
0.0 %	16.2 %	0.0 %	0.4 %	

Note: Land use areas were calculated using the 1994 CDF-USFS "Calveg" GIS layer.

USGS 7.5' Topographic Quads completely or partially in the watershed:

Quad Name	USGS Code
MARK WEST SPRINGS	38122E6
HEALDSBURG	38122E7

Endangered/Threatened/Sensitive Species: (California Natural Diversity Database, May 5, 2003 version)

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Mark West	111423	Middle Russian River	0.07
Geyserville	111425	Middle Russian River	99.93