CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Miller Creek

Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 2001

INTRODUCTION

A stream inventory was conducted during the summer of 2001 on Miller 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 Miller 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

Miller Creek, located in Sonoma County, California, is a tributary to the Russian River (see Miller Creek map, page 2). The legal description at the confluence with the Russian River is T10N, R9W, S20. Its location is 38°42'18.2" N. latitude and 122°53'2.7" W. longitude. Year round vehicle access exists from Highway 128 at the levee

Miller Creek and its tributaries drain a basin of approximately 5.43 square miles. Miller Creek is a third order stream and has approximately 4.6 miles of blue line stream, according to the USGS Geyserville and Jimtown 7.5 minute quadrangles. Summer flow was not measured due to low-flow conditions. Elevations range from about 190 feet at the mouth of the creek to 2247 feet in the headwaters. The upper watershed is oak woodland, with considerable patches of open grassy areas. The riparian canopy in the upper watershed is mostly alder, with some bay and willow. Live oak, valley oak, and a few redwoods are present up on the stream's upper banks. In the lower watershed there are large expanses of vineyards and no riparian canopy. Near the headwaters of the stream, there is a 1.5 acre on-stream reservoir. The watershed is entirely privately owned and is managed primarily for vineyard development, with some dispersed residential development. The California Natural Diversity Database lists the occurrence of foothill yellow legged frog (*Rana boylii*) a sensitive species in the Miller watershed. Miller creek is a historic steelhead stream.
Salmonid fish species historically present include steelhead trout (*Oncorhynchus mykiss*).

METHODS

The habitat inventory conducted in Miller 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 Bob Coey, 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 Miller 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 standard flow measuring equipment, if available. In some cases flows are estimated. Flows are also measured or estimated at major tributary confluences.

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 (1998). 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.

3. Temperatures:

Water and air temperatures, and time, are measured by crew members with hand-held thermometers and recorded at each tenth unit typed. Temperatures are measured in 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. De-watered units are labeled "DRY". Miller 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 unit lengths were measured. The first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (Length, Mean Width, Mean Depth, Maximum Depth and Pool Tail Crest Depth). All measurements are in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Miller 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), 76 - 100% (value 4). "Not suitable" (value 5) is assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, absence of particulate substrate (e.g. 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Miller Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. Thus, shelter ratings can range from 0-300, and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

In all fully measured habitat units, dominant and sub-dominant substrate elements are visually estimated using a list of seven size classes: Silt/Clay, Sand, Gravel, Small Cobble, Large Cobble, Boulder, and Bedrock.

8. Canopy:

Stream canopy density is estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual (1998). Canopy density relates to the amount of stream shaded from the sun. In Miller 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. Finally, the total canopy over each habitat unit is visually divided into evergreen and deciduous, and the estimated percentages are recorded.

9. Bank Composition and Vegetation:

Banks may be composed primarily of (1) Bedrock, (2) Boulders, (3) Cobble/Gravel, or (4) Silt/Clay/Sand, and may be covered predominantly with (5) Grass, (6) Brush, (7) Deciduous Trees, (8) Coniferous Trees, or (9) No Vegetation at all. These factors influence the ability of stream banks to withstand winter flows. For each fully measured habitat unit in Miller Creek, the dominant Bank Composition Type and Vegetation Type of both the right and left banks were chosen from the options above. Additionally, the percentage of vegetal coverage was estimated and recorded for each bank.

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 following 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 Miller 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:

The Department of Fish and Game conducted stream surveys of Miller Creek in October 1958 and August 1974.

On Oct. 20, 1958, the creek was completely dry. On October 27, there was 0.19 cfs flow, and water temp was 53°F at 1350 hrs. No fish were observed.

At the time of the August 1974 survey flow was intermittent, and where there was flow average width was 6", average depth was 2", and flow was <0.1 cfs. Overall, the substrate was composed of 60% boulders, 20% cobble, and 20% sand and gravel. In pools: 70% boulders, 20% sand and gravel, 5% cobble, and 5% silt. In riffles: 50% boulders, 30% cobble, 15% sand and gravel, and 5% silt. The few spawning areas present were highly silted. In high flows, there would be many good pools with adequate shelter. A barrier to fish migration existed 2 miles from mouth. The creek was considered marginal at best in providing habitat for salmonids.

HABITAT INVENTORY RESULTS

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

The habitat inventory of 7/3/2001 to 7/5/2001, was conducted by J. Smith, and C. Sangiacomo (CDFG). The total length of the stream surveyed was 15,607 feet with an additional 242 feet of side channel.

Stream flow was not measured on Miller Creek.

Miller Creek is an F3 channel type for 15,607 feet of the stream surveyed (Reach 1). F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates.

Water temperatures taken during the survey period ranged from 61 to 72 degrees Fahrenheit. Air temperatures ranged from 62 to 100 degrees Fahrenheit

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of *occurrence* there were 51% dry units, 12% flatwater units, 35% riffle units, 2% pool units, (Graph

1). Based on total *length* of Level II habitat types there were 85% dry units, 3% flatwater units, 11% riffle units, and 0.1% pool units (Graph 2).

Forty-nine Level IV habitat types were identified (Table 2). The most frequent habitat types by percent *occurrence* were 51% Dry units, 12% Run units, 35% Low Gradient Riffle units, and 2% Mid-Channel Pool units (Graph 3). Based on percent total *length*, 85% Dry units, 3% Run units, and 11% Low Gradient Riffle units.

A total of one pool was identified (Table 3). This one pool was a Main Channel pool and therefore comprised 100% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. No pools had a residual depth of three feet or greater (Graph 5). The one pool assessed in Miller Creek had a residual depth of greater than one foot and less than two feet.

The depth of cobble embeddedness was estimated at pool tail-outs. One pool tail-out was measured and had a value of 1, (Graph 6). On this scale, a value of 1 indicates the best spawning conditions.

Shelter rating was not measured or calculated on Miller Creek.

Table 6 summarizes the dominant substrate by habitat type. Five of 17 Low-Gradient Riffles surveyed were fully measured. The dominant substrate in three of these five riffles was gravel (60%). Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was observed in the one pool tail-out measured.

The mean percent canopy density for the surveyed length of Miller Creek was 24%. The mean percentages of hardwood and coniferous trees were 14% and 9%, respectively. Seventy-six percent of the canopy was open. Graph 9 describes the mean percent canopy in Miller Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 50%. The mean percent left bank vegetated was 53% (Table 9). The dominant elements composing the structure of the stream banks consisted of 7% bedrock, 50% boulder, 43% cobble/gravel, (Graph 10). Additionally, 50% of the units surveyed had hardwood trees as the dominant vegetation type, and 29% had coniferous trees as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

There is no record of juvenile surveys having been performed on Miller Creek in 2001, due to inadequate staffing.

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

ADULT SURVEYS:

There is no record of adult surveys or carcass surveys having been performed on Miller Creek, according to DFG current and historical records.

DISCUSSION

Miller Creek is an F3 channel type for the entire 15,607 feet of the stream surveyed (Reach 1). The suitability of F3 channel types for fish habitat improvement structures is as follows:
F3 Channel Types are good for bank-placed boulders; single and opposing wing deflectors, and fair for plunge weirs, boulder clusters, channel constrictors and log cover.

The water temperatures recorded on the survey days 7/3/2001 to 7/5/2001, ranged from 62 to 72 degrees Fahrenheit. Air temperatures ranged from 62 to 100 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 3% of the total length of this survey, riffles 11%, and pools 0%. The pools are relatively shallow, with the one pool measured having a maximum residual depth less 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 third order streams, a primary pool is defined to have a maximum residual 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. 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.

The one pool tail-out measured had embeddedness ratings of 1 or 2. None of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered 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 Miller Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The one pool tail-out 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 not measured, nor was the shelter rating in the flatwater habitats. A pool shelter rating of approximately 100 is desirable. 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 24%. Reach 1 had a canopy density of 23.8%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 50% and 53%, 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.

GENERAL MANAGEMENT RECOMMENDATIONS

Miller 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 Miller 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.

4) 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.

5) 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.

6) If riparian areas are not improved in Miller Creek, temperatures should be monitored to determine if they are having a deleterious effect upon juvenile salmonids.

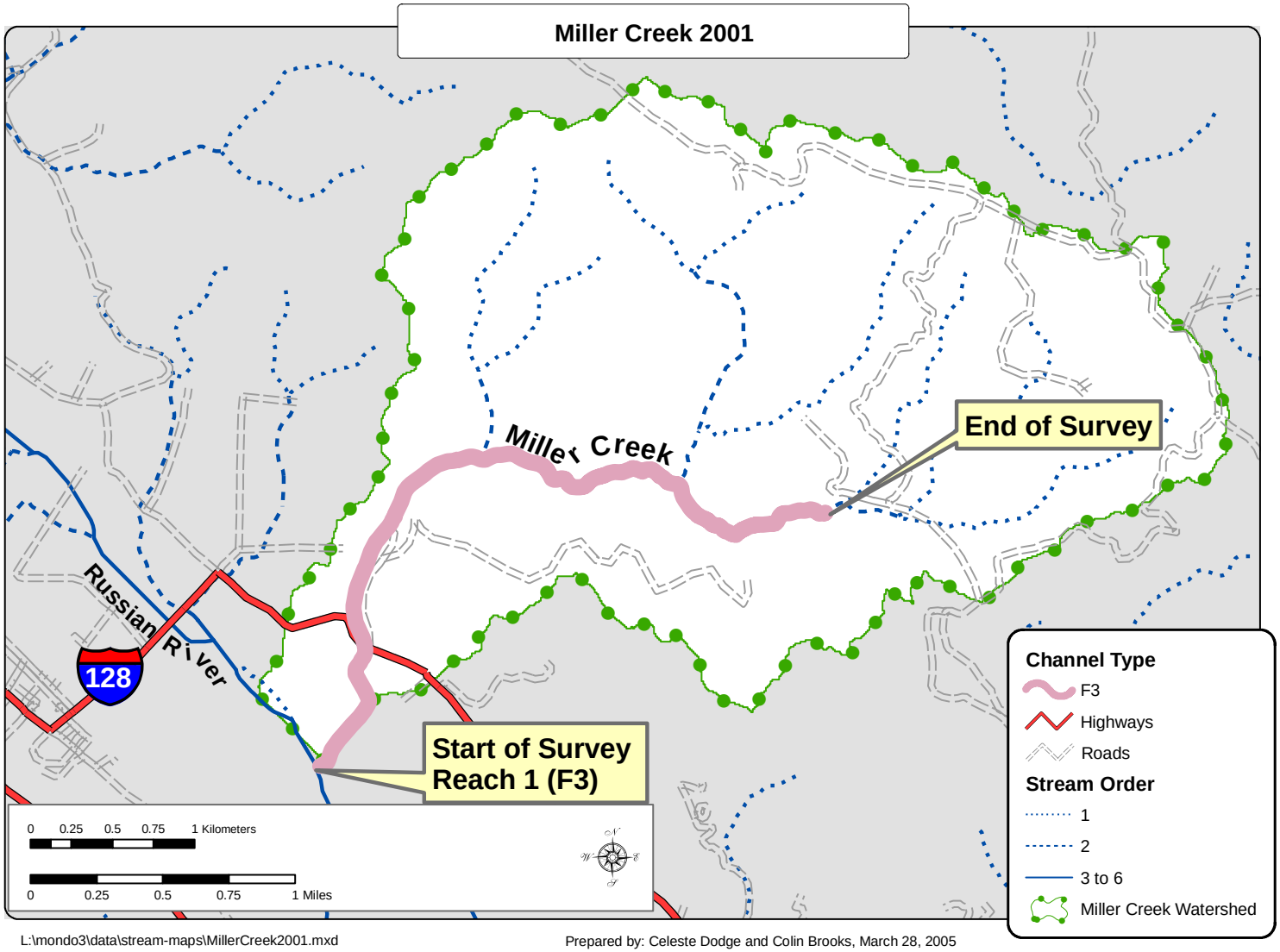
COMMENTS AND LANDMARKS

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

Miller Creek

Position (ft.)	Habitat Unit #	Comments:
9000	0002.00	Fewer than 10 roach. Wet road crossing.
9693	0007.00	HOBO Temp in this unit.
9890	0008.00	Wet road crossing.
12693	0022.00	Dry trib LB 100' into unit.
14447	0041.00	Dry trib LB 10' into unit.
14702	0042.00	Spring LB 15' into unit. Wet road crossing 450' into unit. Dry trib 575' into unit.
15590	0045.00	End of survey – (14' waterfall).

APPENDIX A: MAP



Appendix B: Tables

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

Stream Name: Miller Creek

LLID: 1228841387050

Drainage: Russian River - Middle

Survey Dates: 7/3/2001 to 7/5/2001

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:42:18.0N Longitude: 122:53:03.0W

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
25	0	DRY	51.0	540	13507	85.2									
6	1	FLATWATER	12.2	87	522	3.3	7.0	0.3	0.9	402	2411	121	723		
1	1	POOL	2.0	17	17	0.1	14.0	0.9	1.3	238	238	214	214	214	
17	5	RIFFLE	34.7	106	1803	11.4	4.2	0.3	0.7	297	5052	90	1536		

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
49	7	15849	7701	2473

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Miller Creek

LLID: 1228841387050 Drainage: Russian River - Middle

Survey Dates: 7/3/2001 to 7/5/2001

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:42:18.0N Longitude: 122:53:03.0W

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 (%)
17	5	LGR	34.7	106	1803	11.4	4	0.3	1.2	297	5052	90	1536			27
6	1	RUN	12.2	87	522	3.3	7	0.3	0.9	402	2411	121	723			21
1	1	MCP	2.0	17	17	0.1	14	0.9	1.3	238	238	214	214	214		0
25	0	DRY	51.0	540	13507	85.2										

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
49	7	15849	7701	2473

Table 3 - Summary of Pool Types

Stream Name: Miller Creek LLID: 1228841387050 Drainage: Russian River - Middle

Survey Dates: 7/3/2001 to 7/5/2001

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:42:18.0N Longitude: 122:53:03.0W

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
1	1	MAIN	1	17	17		14.0	0.9	238	238	214	214	

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
1	1	17	238	214

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

Stream Name: Miller Creek LLID: 1228841387050 Drainage: Russian River - Middle

Survey Dates: 7/3/2001 to 7/5/2001

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:42:18.0N Longitude: 122:53:03.0W

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
1	MCP	100	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
1	0	0	1	100	0	0	0	0	0	0

Mean Maximum Residual Pool Depth (ft.): 1.3

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Miller Creek LLID: 1228841387050 Drainage: Russian River - Middle

Survey Dates: 7/3/2001 to 7/5/2001 Dry Units: 25

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:42:18.0N Longitude: 122:53:03.0W

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
17	5	LGR	0	0	60	20	0	20	0
6	1	RUN	0	0	100	0	0	0	0
1	1	MCP	0	0	100	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Miller Creek LLID: 1228841387050 Drainage: Russian River - Middle

Survey Dates: 7/3/2001 to 7/5/2001

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:42:18.0N Longitude: 122:53:03.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
24	41	59	18	50	53

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: Miller Creek LLID: 1228841387050 Drainage: Russian River - Middle

Survey Dates: 7/3/2001 to 7/5/2001

Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:42:18.0N Longitude: 122:53:03.0W

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	1	0	7.1
Boulder	4	3	50.0
Cobble / Gravel	2	4	42.9
Sand / Silt / Clay	0	0	0.0

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	0	1	7.1
Brush	0	0	0.0
Hardwood Trees	4	3	50.0
Coniferous Trees	2	2	28.6
No Vegetation	1	1	14.3

Total Stream Cobble Embeddedness Values: 1

Appendix C: Fish Habitat Inventory Summary

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Miller Creek LLID: 1228841387050 Drainage: Russian River -
Survey Dates: 7/3/2001 to 7/5/2001 Survey Length (ft.): 15849 Main Channel (ft.): 15607 Side Channel (ft.): 242
Confluence Location: Quad: GEYSERVILLE Legal Description: T000R000S00 Latitude: 38:42:18.0N Longitude: 122:53:03.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F3
Reach Length (ft.): 15607
Riffle/Flatwater Mean Width (ft.): 4.7
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs):
Water (F): 0 - 72 Air (F): 62 - 100
Dry Channel (ft.): 13307

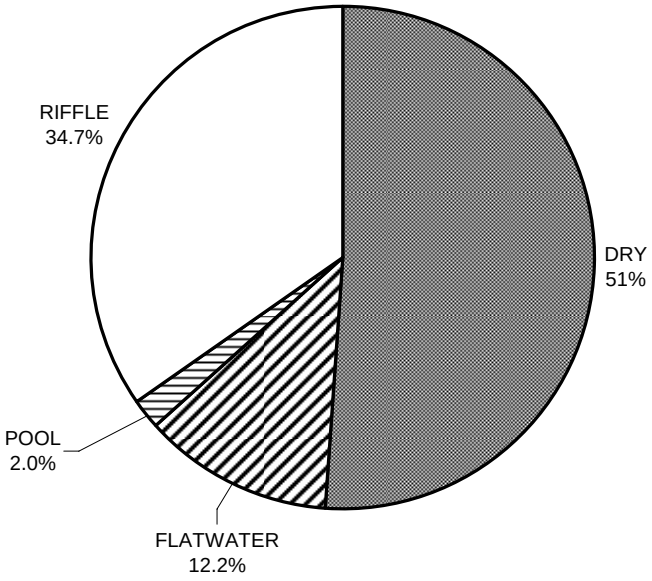
Canopy Density (%): 23.8
Coniferous Component (%): 41.4
Hardwood Component (%): 58.6
Dominant Bank Vegetation: Hardwood Trees
Vegetative Cover (%): 51.4
Dominant Shelter:
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 0.1
Pool Frequency (%): 2.1
Residual Pool Depth (%):
< 2 Feet Deep: 100.0
2 to 2.9 Feet Deep: 0.0
3 to 3.9 Feet Deep: 0.0
>= 4 Feet Deep: 0.0
Mean Max Residual Pool Depth (ft.): 1.3
Mean Pool Shelter Rating:

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 100. Sm Cobble: 0.0 Lg Cobble: 0.0 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 100.0 2. 0.0 3. 0.0 4. 0.0 5. 0.0

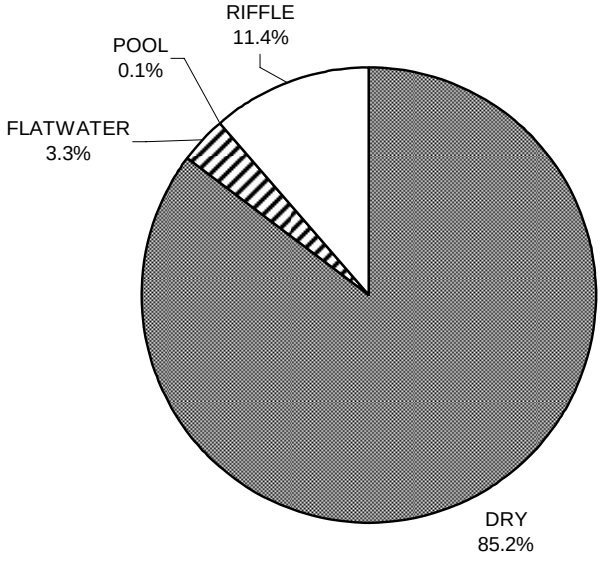
Appendix D: Graphs

MILLER CREEK 2001
LEVEL II HABITAT TYPES BY PERCENT OCCURRENCE



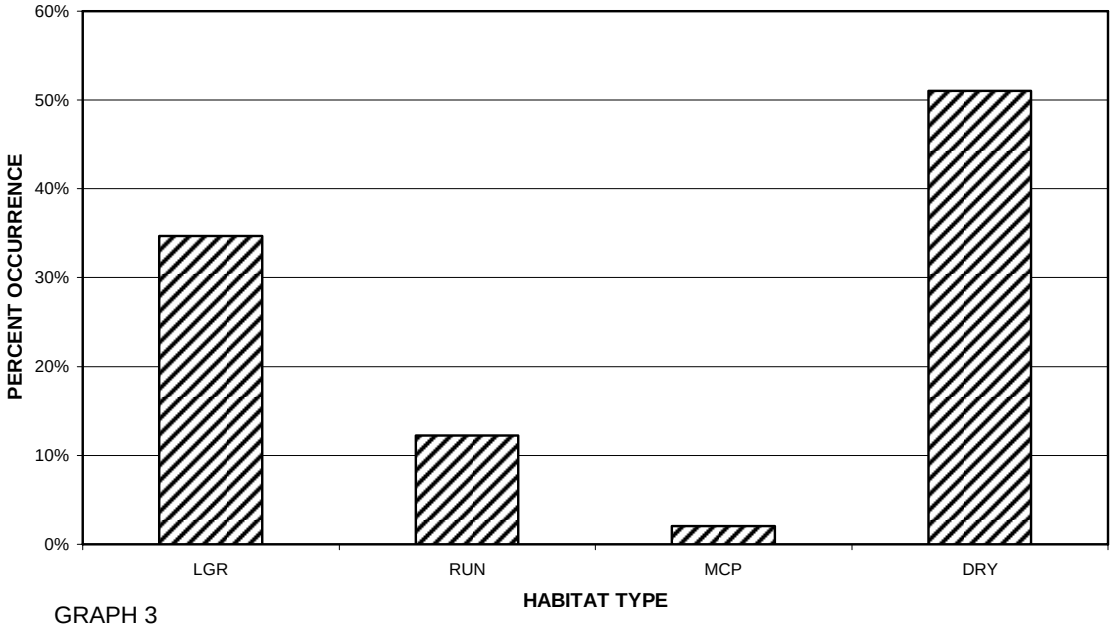
GRAPH 1

MILLER CREEK 2001
LEVEL II HABITAT TYPES BY PERCENT TOTAL LENGTH



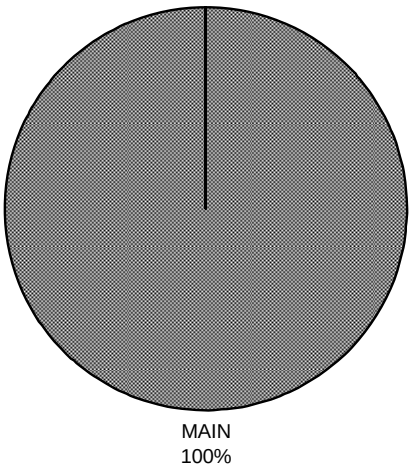
GRAPH 2

MILLER CREEK 2001
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE



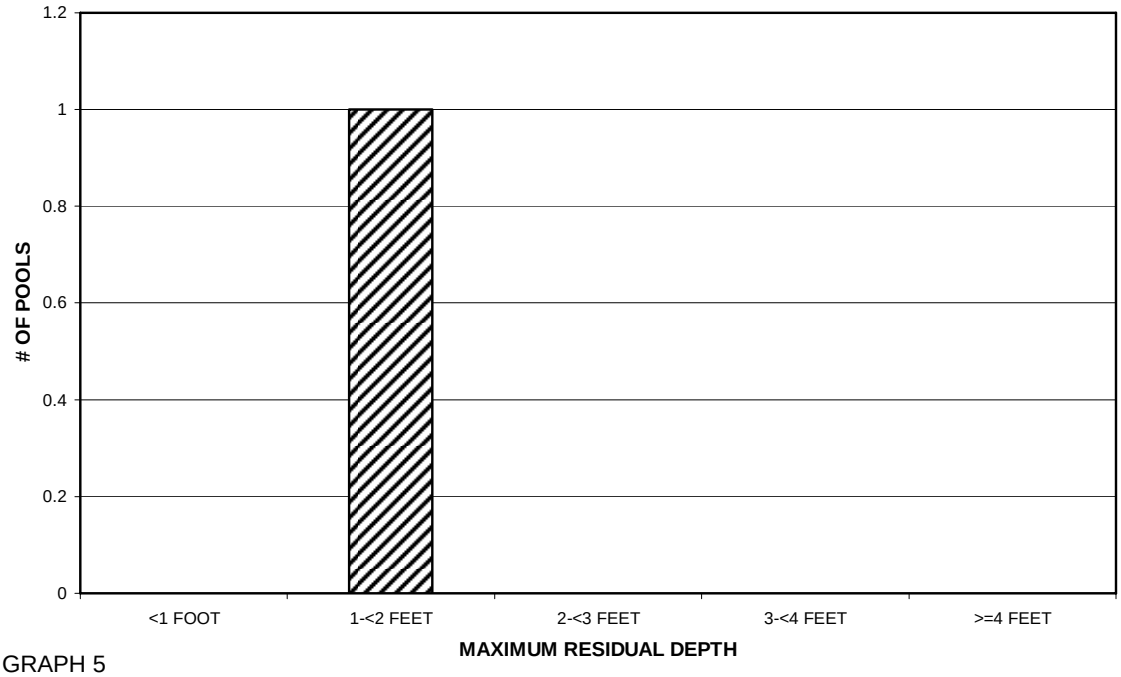
GRAPH 3

MILLER CREEK 2001
LEVEL I POOL TYPES BY PERCENT OCCURRENCE



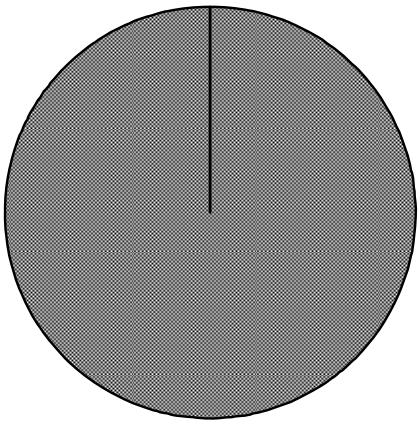
GRAPH 4

MILLER CREEK 2001
MAXIMUM DEPTH IN POOLS



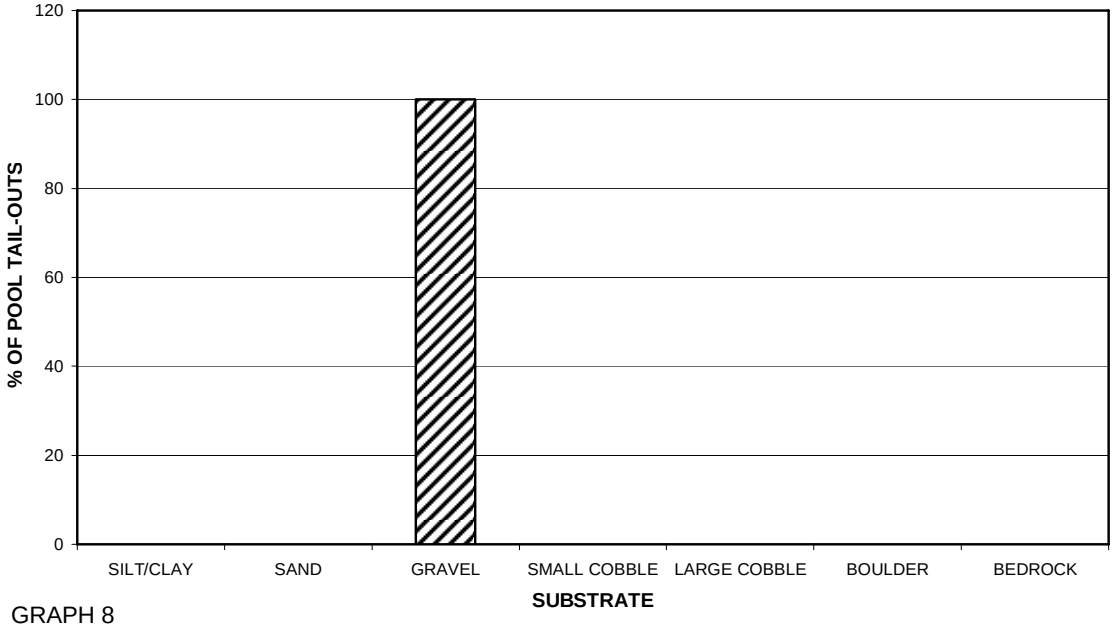
GRAPH 5

MILLER CREEK 2001
PERCENT EMBEDDEDNESS



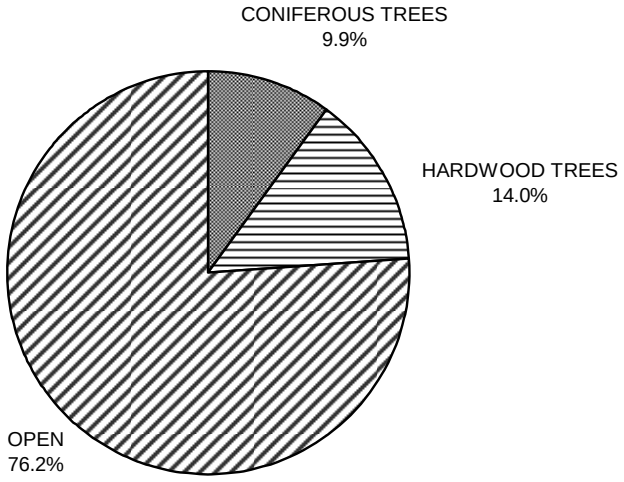
GRAPH 6

MILLER CREEK 2001
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



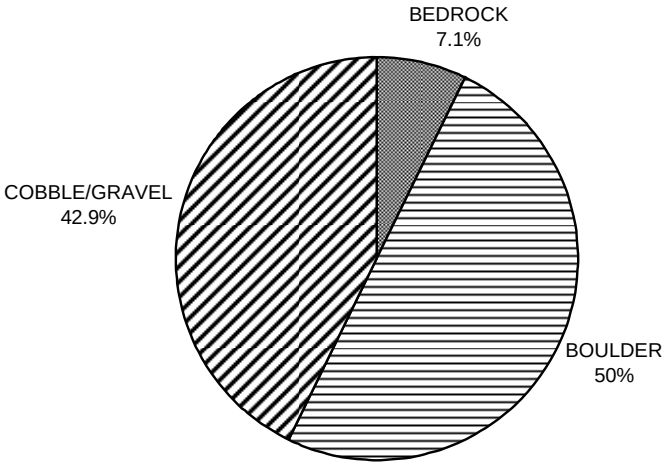
GRAPH 8

MILLER CREEK 2001
MEAN PERCENT CANOPY



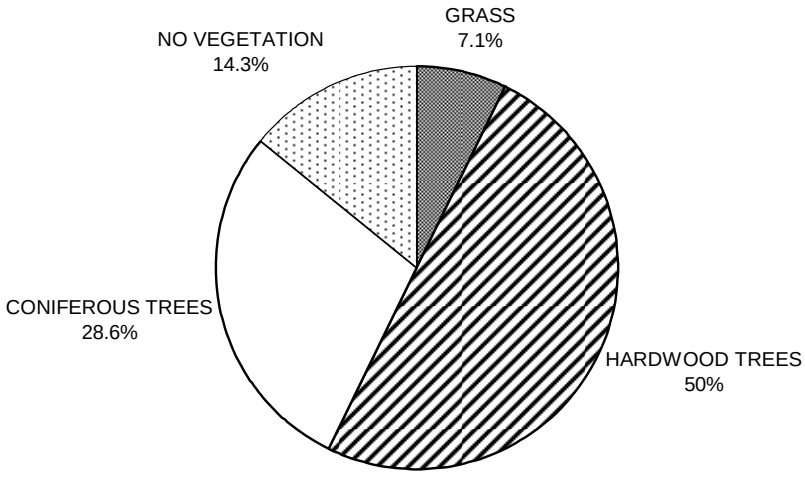
GRAPH 9

MILLER CREEK 2001
DOMINANT BANK COMPOSITION



GRAPH 10

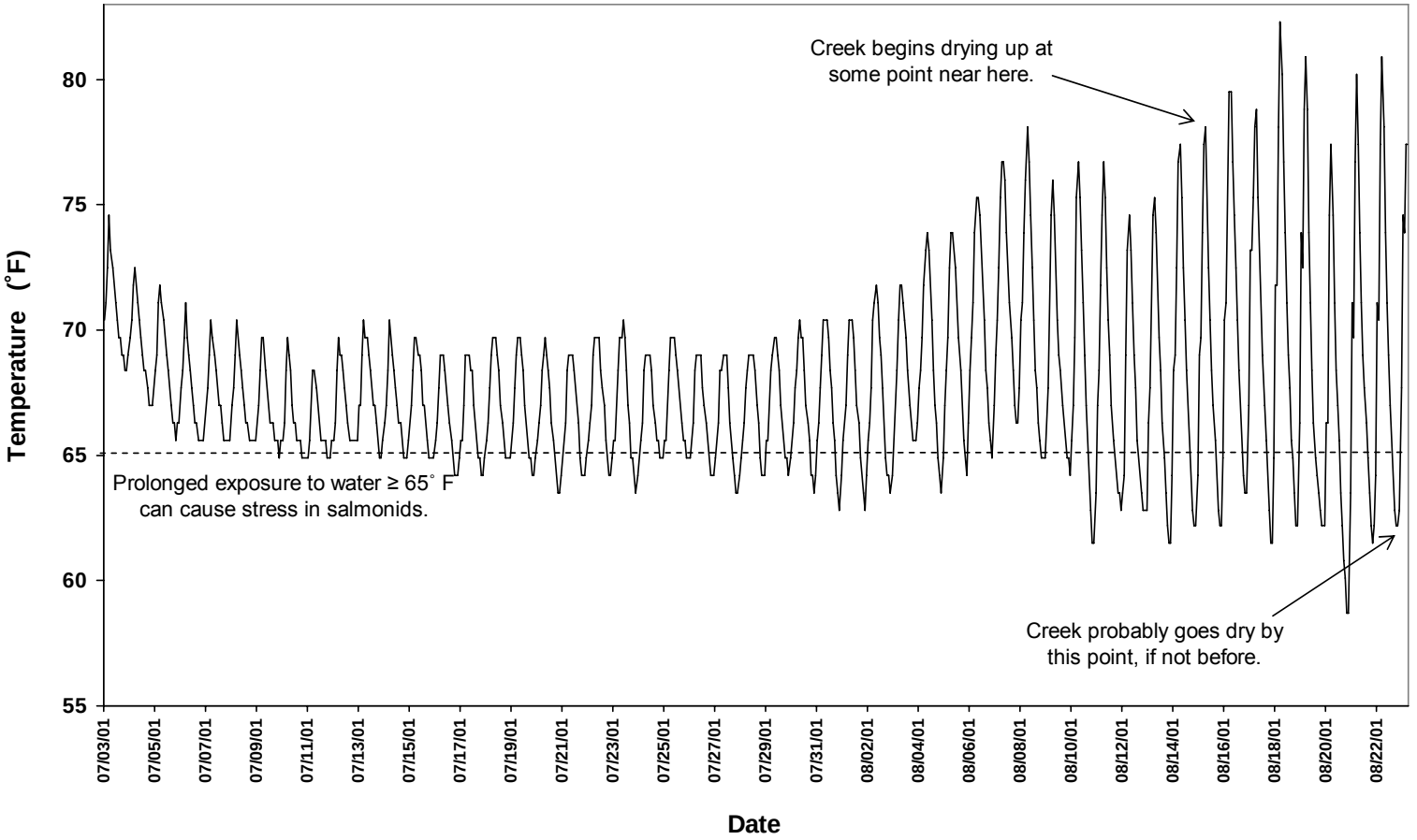
MILLER CREEK 2001
DOMINANT BANK VEGETATION



GRAPH 11

APPENDIX E:

Miller Creek Water Temperatures



Watershed Hydroid **437** Miller Creek

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:
Miller Creek	1228841387050	Sonoma

Tributary to Russian River
Tributary to
Tributary to

Location: **T:** 10N **R:** 09W **S:** 20 **Latitude:** 38.705053232197 **Longitude** 122.884110295707

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: 3

Note: Stream order is by Strahler method, recorded in CDF-NCWAP "nchydro1" 1:24k streams layer.

Total Length: 4.60 Miles (7.41 Km)

Note: Length is for the USGS blue-line 1:24,000 stream.

Drainage Area: 1407 Hectares; 3476 Acres; 5.43 sq. mi.

Elevations: Mouth: 190 feet; Headwaters: 2247 feet

Note: Headwaters elevation is the highest elevation found in the watershed.

Lakes in Watershed: Number: 1 Surface area: 0.003 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	3476.1
0.00 %	0.00 %	0.00 %	100.00 %

Note: Source for owneship 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:
139.45 acres	1902.24	44.47	223.16	0.00
4.1 %	54.7 %	1.3 %	6.4 %	0.0 %

Shrub:	Herbaceous:	Barren/rock:	Water:
10.03	1146.40	0.00	9.11
0.3 %	32.9 %	0.0 %	0.3 %

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

Watershed HydroId **437** Miller Creek

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

Quad Name	USGS Code
JIMTOWN	38122F7
GEYSERVILLE	38122F8

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

Scientific Name	Common Name
Rana boylii	foothill yellow-legged frog

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Sulphur Creek	111426	Middle Russian River	0.27
Geyserville	111425	Middle Russian River	99.73