CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT

Alder Creek

Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 1999

INTRODUCTION

A stream habitat inventory was conducted during the summer of 1999 on Alder Creek. The objective of the inventory was to document the amount and condition of available habitat to fish and other aquatic species with an emphasis on anadromous salmonids in Alder Creek.

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

Alder Creek, located in Sonoma and Mendocino counties in California, is a tributary to Squaw Creek, which in turn flows into Big Sulphur Creek, a tributary of the Russian River (see Alder Creek map, Appendix A). The legal description at the confluence with the Squaw Creek is T11N, R9W, S4. Its location is 38°50'4" N. latitude and 122°52'1.7" W. longitude. Year round vehicle access exists from Highway 101 east of Cloverdale on Geysers Road.

Alder Creek and its tributaries drain a basin of approximately 3.1 square miles. Alder Creek is a second order stream and has approximately 3.74 miles of blue line stream, according to the USGS Asti, and The Geysers 7.5 minute quadrangles. Summer flow was measured as approximately 2.25 cfs in Habitat Unit #60. Elevations range from about 1020 feet at the mouth of the creek to 3415 feet in the headwaters. Hardwood forest dominates the watershed on the southwest side of Alder Creek and shrub dominates the watershed on the northwest with some herbaceous areas in the lower third of the watershed. The watershed is owned primarily by private parties.

Salmonid fish species currently present include steelhead trout (*Oncorhynchus mykiss)* which is listed as threatened on the federal and state endangered species lists.

METHODS

The habitat inventory conducted in Alder 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.

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 Alder 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. Refer to the Big Sulphur Creek Stream Inventory Report for discussion of specific methods used.

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 were 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. 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:

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 temperatures every 1.5 hours, 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. Alder 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 were in feet to the nearest tenth. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a hip chain and a stadia rod.

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 Alder 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). Additionally, a rating of "not suitable" (value 5) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, 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 Alder 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:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully measured habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes which are defined in the California Salmonid Stream Habitat Restoration Manual.

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 Alder Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the top 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 Alder Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation, including downed trees, logs and rootwads, was estimated and recorded.

DATA ANALYSIS

Data from the habitat inventory form are entered into 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
- 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 Alder 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

HISTORICAL STREAM SURVEYS

The Department of Fish and Game conducted a survey of Alder Creek in October 1968, according to a reference in a 1968 stream report on Squaw Creek. However, neither the data nor the report is available for reference. The only data obtainable from this Squaw Creek report includes two locations of natural fish barriers on Alder Creek. In 1999, Rainbow Trout were observed above the second barrier, a 22' impassable waterfall. The only other historical information available for Alder Creek includes a 1976 fish length histogram, in which 84 Rainbow Trout were observed, averaging 92.4 mm.

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 20, 1999 and July 23, 1999 was conducted by Morgan Knechtle and Aaron Fairbrook (CDFG). The survey began at the confluence with Squaw Creek and extended up Alder Creek to a waterfall. The total length of the stream surveyed was 2908 feet, with an additional 36 feet of side channel.

Flow was estimated to be 2.25 cfs during the survey period.

The surveyed section of Alder Creek has one channel type: G1.

G1 channel types are characterized as well entrenched "gully" step-pool channels with a low width/depth ratio, a moderate gradient (2-4%) and a predominantly bedrock substrate.

Water temperatures ranged from 56°F to 60°F. Air temperatures ranged from 60°F to 82°F. Summer water temperatures were also measured using a remote temperature recorder placed in a pool (see Temperature Summary graphs, Appendix E). A recorder placed under a bridge in three feet of water recorded temperatures every two hours from June 30 through September 27, 1999. The highest temperature recorded was 72°F in June and the lowest was 56°F in June and July. The mean of the daily highs was 66°F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of ***occurrence*** there were 47% pool units, 38% riffle units, 15% flatwater units, and 0% dry streambed units. Based on total ***length*** there were 40% pool units, 39% riffle units, 22% flatwater units, and 0% dry streambed units (Graph2).

Seventy-five habitat units were measured and 19% were completely sampled. Twelve Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent ***occurrence*** were high gradient riffles at 24%, mid-channel pools 13%, step pools 12% and plunge pools 11%. By percent total ***length***, high gradient riffles made up 27%, step pools 12%, step runs 6%, and runs 9% (Graph 3).

Thirty-six pools were identified (Table 3). Main Channel pools were most often encountered at 53%, and comprised 72% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Four of the 36 pools (75%) 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. Pool types had the highest shelter rating at 39. Flatwater and riffle had the lowest rating with 16 and 17, respectively. (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 44, main channel pools rated 51, and backwater pools rated 0 (Graph 4).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter type was boulders at 50%, followed by white water 31%, bedrock ledges 16%, and small woody debris 1%. Table 5 describes the pool shelter in Alder Creek.

Table 6 summarizes the dominant substrate by habitat type. Only one habitat unit consisted of low gradient riffles. The dominant substrate for this unit was not recorded.

No mechanical gravel sampling was conducted in 1999 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 35 pool tail-outs measured, twelve had a value of 1 (34%); nine had a value of 2 (26%); eleven had a value of 3 (31%); and three had a value of 4 (9%). On this scale, a value of one is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs. Table 8 describes percent embeddedness by reach.

The mean percent canopy density for the stream reach surveyed was 75%. The mean percentages of deciduous and evergreen trees were 21% and 79%, respectively. Table 7 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 33% and the mean percent left bank vegetated was 52%. For the habitat units measured, the dominant vegetation types for the stream banks were: 63% evergreen trees, 9% grass, 9% brush, 9% deciduous trees and 9% bare soil (Graph 11). The dominant substrate for the stream banks were: 44% bedrock, 34% cobble/gravel, 16% boulder and 6% silt/clay/sand (Graph 10).

BIOLOGICAL INVENTORY

No biological inventories of Alder Creek have been undertaken.

During the habitat inventory, no anadromous salmonids were observed upstream of unit 76, 2908 feet above the confluence with Squaw Creek, where a 22' high waterfall appears to impede further passage. Resident rainbow trout were observed above this fish barrier.

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

DISCUSSION

Alder Creek has one channel type: G1 (2908 ft.). According to the DFG Salmonid Stream Habitat Restoration Manual, G1 channel types are fair for log cover.

The water temperatures recorded on the survey days July 20, 1999 and July 23, 1999 ranged from 56°F to 60°F. Air temperatures ranged from 60°F to 82°F. These temperatures, if sustained, are below the threshold stress level (65°F) for salmonids.

Summer temperatures measured using a remote temperature recorder placed in a pool ranged from 56° to 72°F. The Temperature Summary graph shows that for much of the summer (July through August) the watershed exhibited temperatures near the optimal for salmonids.

Pools comprised 39% of the total length of this survey. By definition, a primary pool in a order stream has a maximum depth of at least three feet, occupies at least half the width of the low flow channel, and is at least as long as the low flow channel is wide. In Alder Creek, the pools are relatively shallow, 11% having a maximum depth of at least three feet. These pools comprised 30% 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.

A pool shelter rating of approximately 80 is desirable. The mean shelter rating for pools was 36. The relatively small amount of pool shelter that now exists is being provided predominantly by boulders (50%), followed by white water (31%), bedrock ledges (16%), and small woody debris (1%). Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, creates rest areas protected from main flow water velocity, and divides territorial units to reduce density-related competition.

Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. Fourteen of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 34% had a rating of 1.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, and because of fine sediment capping the redd and preventing fry emergence. In Alder Creek, sediment

sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 75%. This is adequate, since 80 percent is considered desirable. As air temperatures are high in this geographic area, it is recommended that banks denuded of riparian vegetation be considered for revegetation with native riparian plants.

GENERAL MANAGEMENT RECOMMENDATIONS

Alder 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 Alder Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The non-anadromous 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) Spawning gravels on Alder Creek are limited to relatively few reaches. Structures to decrease channel incision and recruit spawning gravel (using gravel retention structures), should be installed to trap, sort and expand redd distribution in the stream.

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.

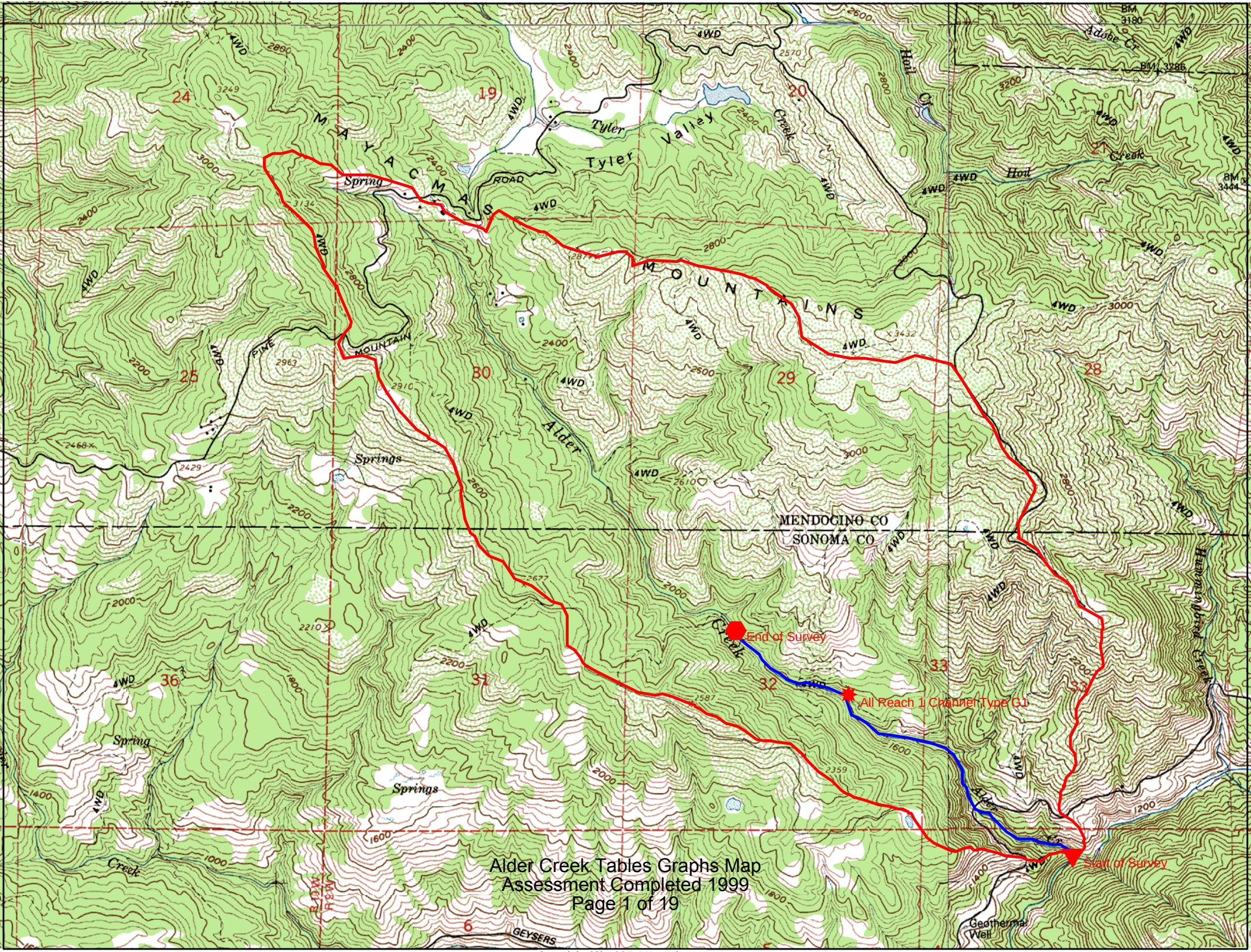
6) Alder Creek would benefit from the utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.

ALDER 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.

HABITAT UNIT #	DISTANCE UPSTREAM	COMMENTS
1	8	CONFLUENCE START
3	48	FISH OBSERVED
6	228	CHANNEL TYPE CHANGE
7	302	BRIDGE CROSSING 4' CLEARANCE, LENGTH 32'
10	530	CHANNEL CHANGE
11	605	CHANNEL TYPE DONE
20	1299	CHANNEL CHANGE
26	1566	CHANNEL TYPE DONE
32	1867	LEFT BANK EROSION
38	2229	SMALL SPRING INLET
39	2271	E.F. SPOT
46	2573	YELLOW - LEGGED FROG LF. BANK
47	2608	LF. BANK GULLY TRIB. SMALL
59	3318	DRY TRIB. RT. BANK BELOW BRIDGE #2
65	3502	E.F. SPOT
66	3660	EROSION LF. BK., BARB WIRE FENCE IN CREEK
73	3950	E.F. SPOT
78	4292	CAMP CR0SSING
89	4802	LF. BK. TRIB./EROSION/CULVERT?
98	5186	PIPE EMBEDDED/EXPOSED LF. BK. EROSION
99	5248	END OF UNIT, ACCUMULATION OF LG. WOODY DEBRIS

		COMPACTED
107	5550	LF. BANK CULVERT FAILURE, ROAD BLOWN OUT, IMPASSABLE
111	5729	CHANNEL TYPE DONE
112	5991	XNG. LF./RT. BANK
113	6026	TRIB. RT. BANK; BLOWOUT LF. BANK
119	6335	CHANNEL TYPE BEGINS HERE
136	7263	END OF UNIT UPSTREAM, 12" DIAM. DRAIN PIPE RT. BANK
146	7546	RT. BANK SPRING
152	7755	RT. BANK ERODING
158	7885	DRY TRIB. LF. BANK
162	8090	MASSIVE LWD/SWD JAM
166	8229	RT. BANK FOOT TRAIL TO TOP
171	8583	TRIB. AT END OF STEP RUN
174	8663	RT. BANK EROSING BADLY
190	9246	E.F. SPOT
194	9384	LEFT BANK EROSION
204	9631	E.F. SPOT?
207	9736	LARGE LOG LF. BANK, IN STREAM
215	9961	E.F. SPOT
238	10808	YELLOW-LEG FROG
247	11066	RT. BANK SM. SPRING
287	12584	E.F. SPOT (2 LARGE, 6" FISH)
309	13170	LF. BANK EROSION
312	13222	TRIB. ON LF. BANK WATER TEMP. 68, 5' MAX. W; RT. BANK TRIB. IS BIGGER
315	13307	SM. FISH. STEELHEAD SWIMUPS?
316	13346	STEELHEAD SWIMUPS
333	13984	CREEK SPLITS HERE; LF. TRIB. VERY STEEP (65 DEG.) BEDROCK CASCADE; RT. TRIB. LESS STEEP, BOULDER/BEDROCK
335	14131	LARGE BOULDER/LOG ACCUMULATION AT END OF UNIT;.



APPENDIX B: TABLES

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

Stream Name: Alder Creek

LLID: 1228671388344

Drainage: Russian River - Middle

Survey Dates: 7/20/1999 to 7/23/1999

Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	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
11	11	FLATWATER	14.5	58	635	21.6	6.1	0.6	1.2	343	3769	209	2300		16
36	35	POOL	47.4	32	1162	39.5	10.6	0.7	2.0	303	10915	352	12310	221	39
29	29	RIFFLE	38.2	40	1147	39.0	8.8	0.5	1.0	340	9866	174	5043		17

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
76	75	2944	24550	19654

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Alder Creek

LLID: 1228671388344

Drainage: Russian River - Middle

Survey Dates: 7/20/1999 to 7/23/1999

Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

Habitat Units	Units Fully Measured	Habitat Type	Habitat Occurrence (%)	Mean Length (ft.)	Total Length (ft.)	Total Length (%)	Mean Width (ft.)	Mean Depth (ft.)	Max Depth (ft.)	Mean Area (sq.ft.)	Estimated Total Area (sq.ft.)	Mean Volume (cu.ft.)	Estimated Total Volume (cu.ft.)	Mean Residual Pool Vol (cu.ft.)	Mean Shelter Rating	Mean Canopy (%)
1	1	LGR	1.3	17	17	0.6	7	0.2	0.3	119	119	24	24			
18	18	HGR	23.7	45	806	27.4	9	0.5	1.3	371	6681	184	3309		16	72
7	7	CAS	9.2	39	273	9.3	9	0.6	1.8	393	2750	232	1626		20	61
3	3	BRS	3.9	17	51	1.7	9	0.2	0.8	106	317	28	84			83
7	7	RUN	9.2	42	294	10.0	6	0.6	1.4	251	1755	165	1157		20	86
4	4	SRN	5.3	85	341	11.6	6	0.6	1.3	503	2014	286	1143		10	80
10	10	MCP	13.2	26	261	8.9	11	0.9	4.7	278	2779	417	4174	306	23	77
9	9	STP	11.8	64	580	19.7	9	0.5	2.6	492	4425	490	4413	264	27	74
3	3	LSBk	3.9	21	64	2.2	9	0.5	2.5	185	555	194	582	113	10	70
5	5	LSBo	6.6	13	67	2.3	9	0.8	2.6	112	561	126	630	71	67	82
8	7	PLP	10.5	20	161	5.5	12	0.9	3.3	245	1963	310	2479	198	56	83
1	1	DPL	1.3	29	29	1.0	22			574	574					50

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
76	75	2944	24493	19622

Table 3 - Summary of Pool Types

Stream Name: Alder Creek LLID: 1228671388344 Drainage: Russian River - Middle

Survey Dates: 7/20/1999 to 7/23/1999

Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

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
19	19	MAIN	53	44	841	72	10.1	0.7	379	7204	286	5435	25
16	15	SCOUR	44	18	292	25	10.5	0.8	189	3022	138	2215	56
1	1	BACKWATER	1	29	29		22.0		574	574		0	

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
36	35	1162	10801	7649

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

Stream Name: Alder Creek LLID: 1228671388344 Drainage: Russian River - Middle

Survey Dates: 7/20/1999 to 7/23/1999

Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

Habitat Units	Habitat Type	Habitat Occurrence (%)	< 1 Foot Maximum Residual Depth	< 1 Foot Percent Occurrence	1 < 2 Feet Maximum Residual Depth	1 < 2 Feet Percent Occurrence	2 < 3 Feet Maximum Residual Depth	2 < 3 Feet Percent Occurrence	3 < 4 Feet Maximum Residual Depth	3 < 4 Feet Percent Occurrence	>= 4 Feet Maximum Residual Depth	>= 4 Feet Percent Occurrence
10	MCP	29	0	0	4	40	4	40	1	10	1	10
9	STP	26	1	11	6	67	2	22	0	0	0	0
3	LSBk	9	1	33	1	33	1	33	0	0	0	0
5	LSBo	14	0	0	3	60	2	40	0	0	0	0
8	PLP	23	1	13	1	13	4	50	2	25	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
35	3	9	15	43	13	37	3	9	1	3

Mean Maximum Residual Pool Depth (ft.): 2

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Alder Creek LLID: 1228671388344 Drainage: Russian River - Middle

Survey Dates: 7/20/1999 to 7/23/1999 Dry Units: 0

Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

Habitat Units	Units Fully Measured	Habitat Type	Mean % Undercut Banks	Mean % SWD	Mean % LWD	Mean % Root Mass	Mean % Terr. Vegetation	Mean % Aquatic Vegetation	Mean % White Water	Mean % Boulders	Mean % Bedrock Ledges
1	0	LGR									
18	13	HGR	0	0	0	0	0	8	34	57	0
7	6	CAS	0	2	0	0	0	0	22	77	0
3	0	BRS									
29	19	TOTAL RIFFLE	0	1	0	0	0	6	30	63	0
7	5	RUN	0	0	0	0	8	0	30	62	0
4	3	SRN	0	0	0	0	0	0	3	97	0
11	8	TOTAL FLAT	0	0	0	0	5	0	20	75	0
10	9	MCP	0	3	0	0	0	0	14	56	28
9	9	STP	0	1	0	0	0	0	44	52	3
3	1	LSBk	0	0	0	0	0	0	10	90	0
5	5	LSBo	0	0	0	10	0	0	3	57	30
8	8	PLP	0	1	0	0	0	0	56	32	11
1	0	DPL									
36	32	TOTAL POOL	0	1	0	2	0	0	31	50	16
76	59	TOTAL	0	1	0	1	1	2	29	58	9

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Alder Creek LLID: 1228671388344 Drainage: Russian River - Middle

Survey Dates: 7/20/1999 to 7/23/1999

Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
75	79	21	0	33	52

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: Alder Creek LLID: 1228671388344 Drainage: Russian River - Middle

Survey Dates: 7/20/1999 to 7/23/1999

Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

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	12	2	43.8
Boulder	3	2	15.6
Cobble / Gravel	1	10	34.4
Sand / Silt / Clay	0	2	6.3

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	1	2	9.4
Brush	2	1	9.4
Hardwood Trees	2	1	9.4
Coniferous Trees	9	11	62.5
No Vegetation	2	1	9.4

Total Stream Cobble Embeddedness Values: 2

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

StreamName: Alder Creek LLID: 1228671388344 Drainage: Russian River - Middle

Survey Dates: 7/20/1999 to 7/23/1999

Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	0
SMALL WOODY DEBRIS (%)	1	0	1
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	0	2
TERRESTRIAL VEGETATION (%)	0	5	0
AQUATIC VEGETATION (%)	6	0	0
WHITEWATER (%)	30	20	31
BOULDERS (%)	63	75	50
BEDROCK LEDGES (%)	0	0	16

Appendix C - Fish Habitat Inventory Data Summary

Stream Name: Alder Creek LLID: 1228671388344 Drainage: Russian River -
Survey Dates: 7/20/1999 to 7/23/1999 Survey Length (ft.): 2944 Main Channel (ft.): 2908 Side Channel (ft.): 36
Confluence Location: Quad: ASTI Legal Description: T11NR09WS04 Latitude: 38:50:04.0N Longitude: 122:52:02.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: G1
Reach Length (ft.): 2908
Riffle/Flatwater Mean Width (ft.): 8.1
BFW:
Range (ft.): to
Mean (ft.):
Std. Dev.:
Base Flow (cfs): 2.25
Water (F): 56 - 60 Air (F): 60 - 82
Dry Channel (ft.): 0

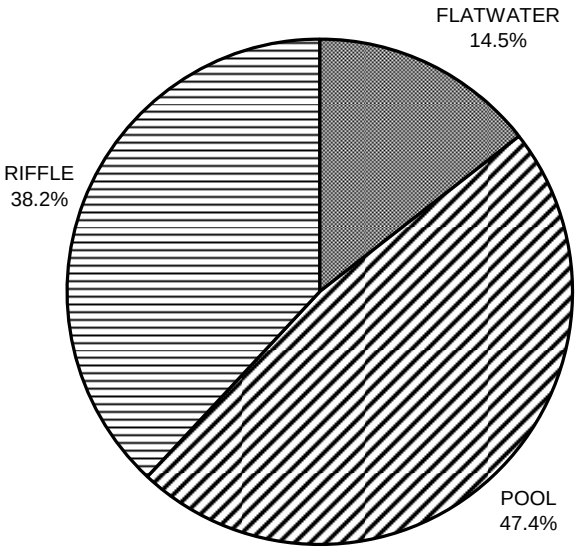
Canopy Density (%): 75.5
Coniferous Component (%): 78.7
Hardwood Component (%): 21.3
Dominant Bank Vegetation: Coniferous Trees
Vegetative Cover (%): 42.5
Dominant Shelter: Boulders
Dominant Bank Substrate Type: Bedrock
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles:
Pools:
Flat:

Pools by Stream Length (%): 40.0
Pool Frequency (%): 48.0
Residual Pool Depth (%):
< 2 Feet Deep: 51.4
2 to 2.9 Feet Deep: 37.1
3 to 3.9 Feet Deep: 8.6
>= 4 Feet Deep: 2.9
Mean Max Residual Pool Depth (ft.): 1.95
Mean Pool Shelter Rating: 39

Pool Tail Substrate (%): Silt/Clay: 0.0 Sand: 0.0 Gravel: 77.1 Sm Cobble: 17.1 Lg Cobble: 5.7 Boulder: 0.0 Bedrock: 0.0
Embeddedness Values (%): 1. 34.3 2. 25.7 3. 31.4 4. 8.6 5. 0.0

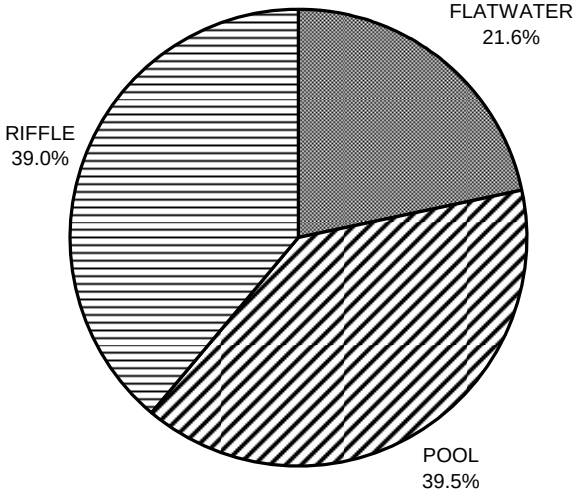
APPENDIX D: GRAPHS

ALDER CREEK 1999
HABITAT TYPES BY PERCENT OCCURRENCE



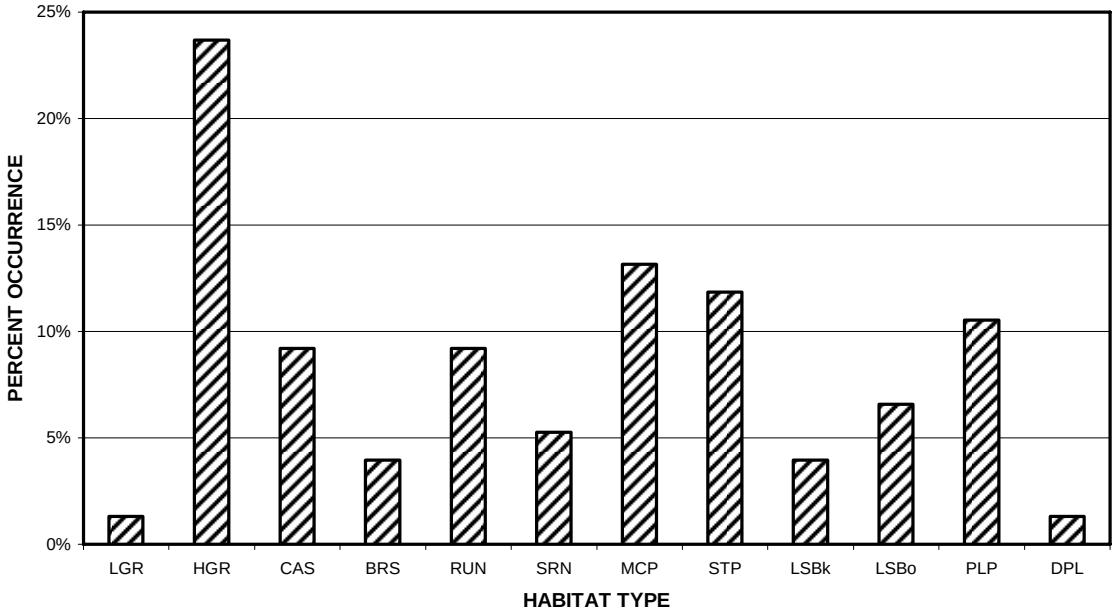
GRAPH 1: Level II habitat types by percent occurrence

ALDER CREEK 1999
HABITAT TYPES BY PERCENT TOTAL LENGTH



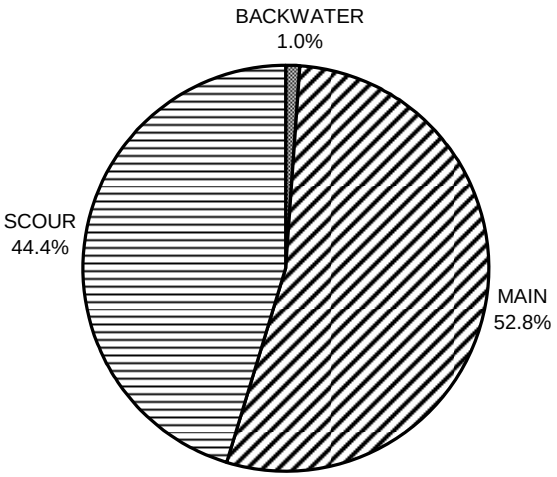
GRAPH 2: Level II habitat types by percent total length

ALDER CREEK 1999
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE



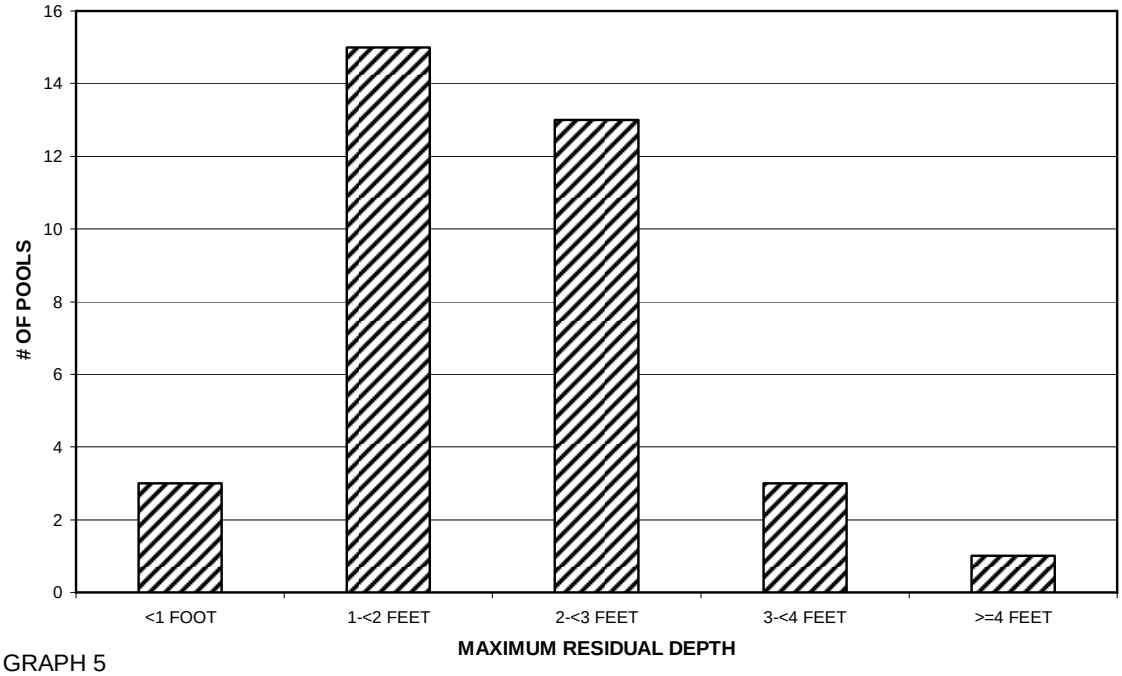
GRAPH 3: Level IV habitat types by percent occurrence

ALDER CREEK 1999
POOL TYPES BY PERCENT OCCURRENCE



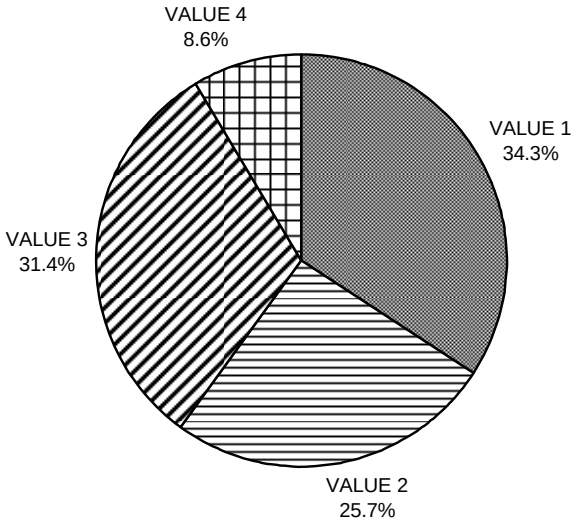
GRAPH 4: Level I pool types by percent occurrence

ALDER CREEK 1999
MAXIMUM DEPTH IN POOLS



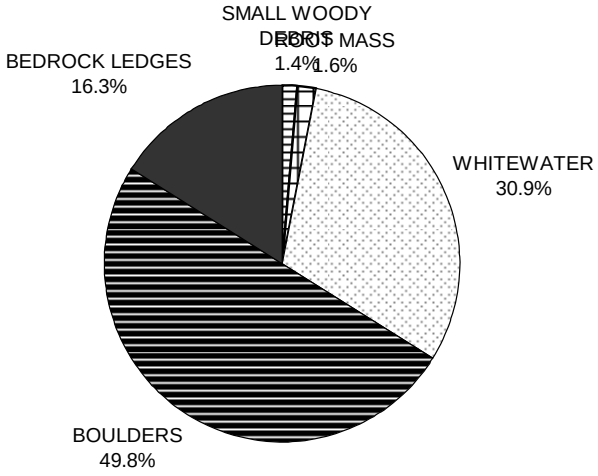
GRAPH 5

ALDER CREEK 1999
PERCENT EMBEDDEDNESS



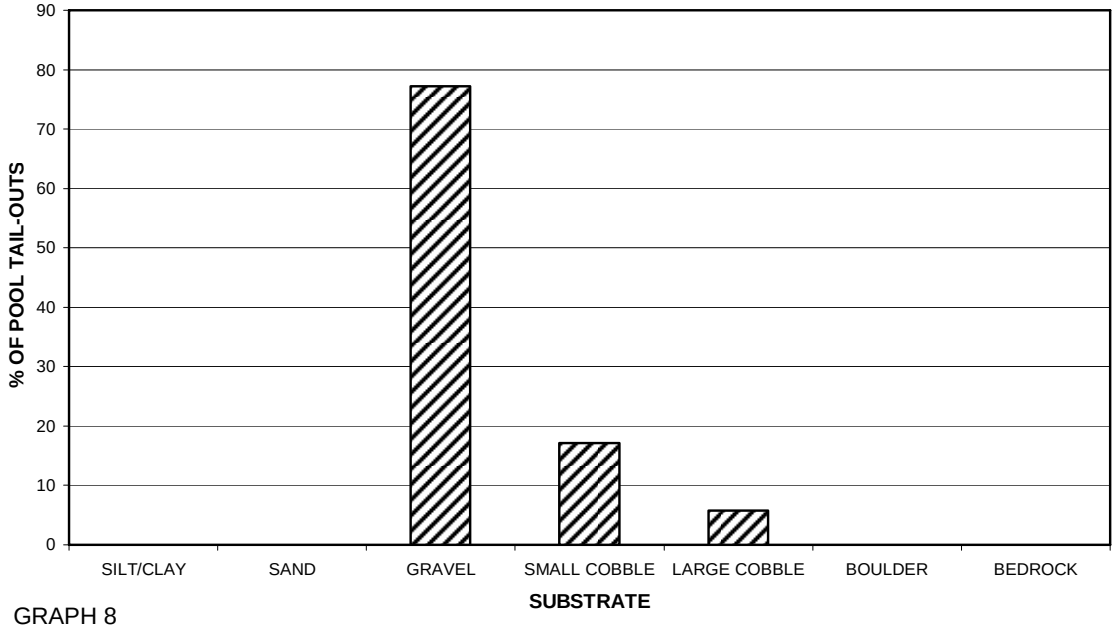
GRAPH 6

ALDER CREEK 1999
MEAN PERCENT COVER TYPES IN POOLS



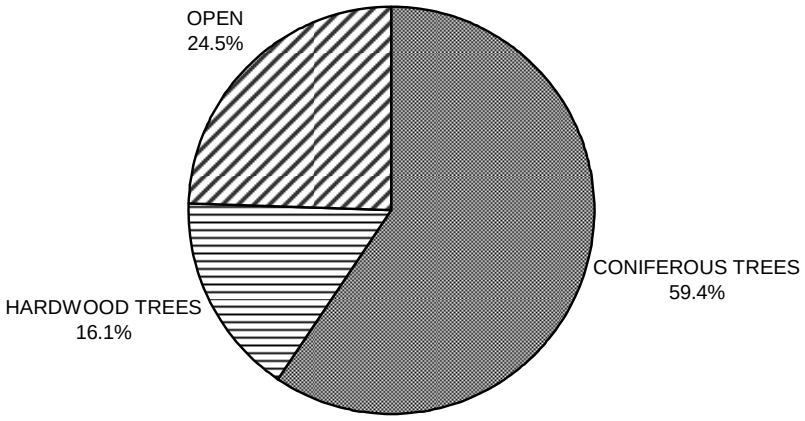
GRAPH 7

ALDER CREEK 1999
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



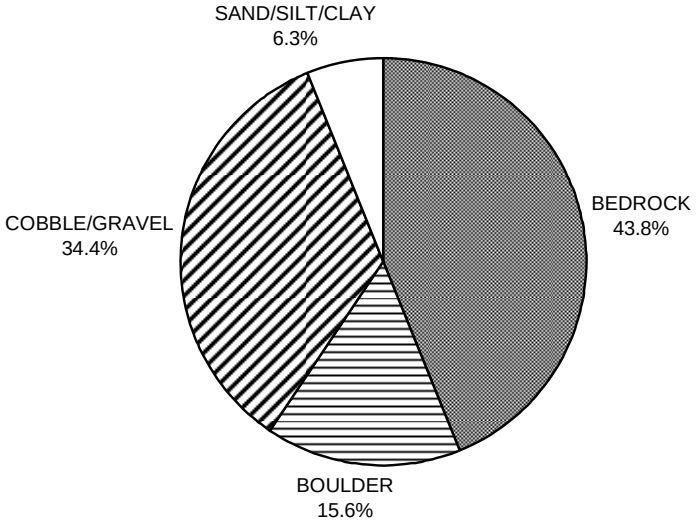
GRAPH 8

ALDER CREEK 1999
MEAN PERCENT CANOPY



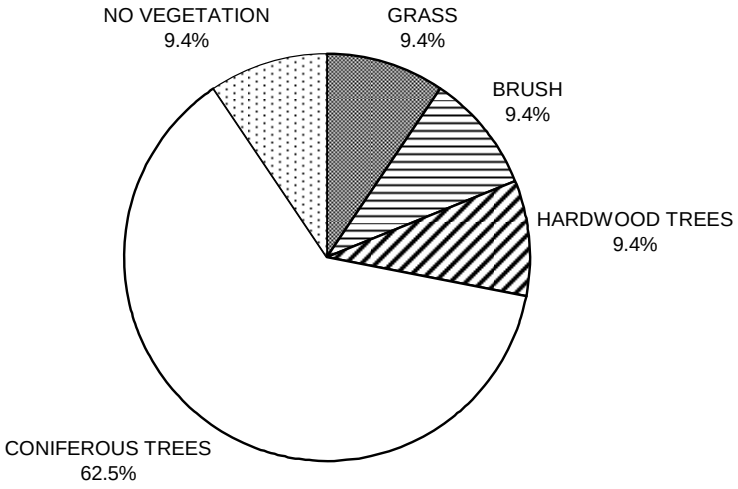
GRAPH 9

ALDER CREEK 1999
DOMINANT BANK COMPOSITION IN SURVEY REACH



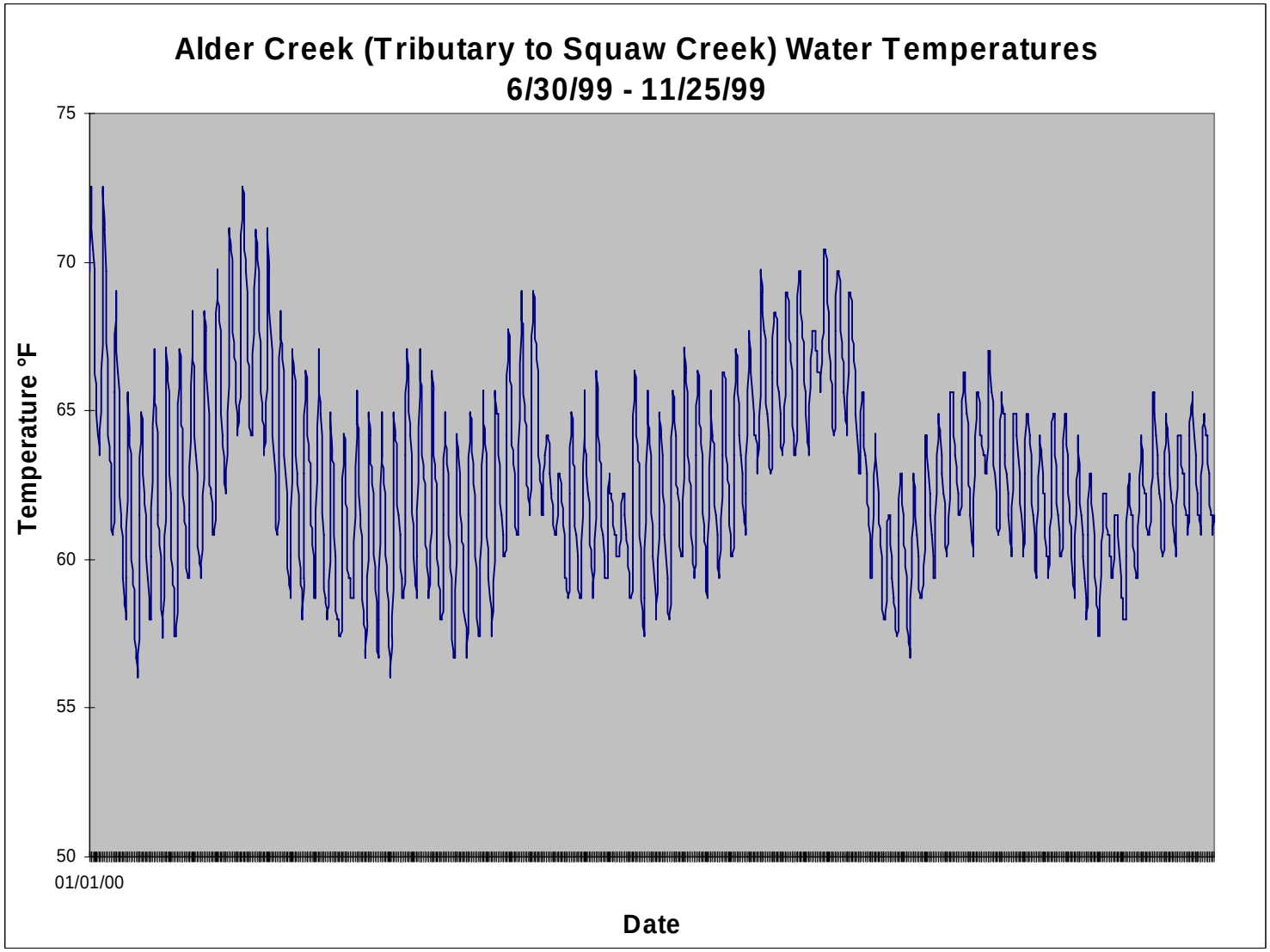
GRAPH 10

ALDER CREEK 1999
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Appendix E


Alder Creek (Tributary to Squaw Creek) Water Temperatures
6/30/99 - 11/25/99
Temperature °F
75
70
65
60
55
50
01/01/00
Date

Watershed Hydroid **401** Alder Creek (Big Sulphur Creek)

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:	Tributary to
Alder Creek (Big Sulphur Creek)	1228671388344	Mendocino/Sonom	Squaw Creek
			Big Sulphur Creek
			Russian River

Location: **T:** 11N **R:** 09W **S:** 4 **Latitude:** 38.8344688572479 **Longitude** 122.867143932592

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: 2 **Total Length:** 3.74 Miles 6.02 Km

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

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

Drainage Area: 833 Hectares; 2058 Acres; 3.21 sq. mi.

Elevations: Mouth: 1014 feet; Headwaters: 3415 feet

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

Lakes in Watershed: Number: 0 Surface area: 0 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	2058.3
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:
7.10 acres	798.14	2.93	0.00	0.00
0.3 %	38.8 %	0.1 %	0.0 %	0.0 %

Shrub:	Herbaceous:	Barren/rock:	Water:
1166.33	83.24	0.00	0.00
56.6 %	4.1 %	0.0 %	0.0 %

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
THE GEYSERS	38122G7
ASTI	38122G8

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

Scientific Name	Common Name
Oncorhynchus mykiss irideus	steelhead-central California coast esu

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Ukiah	111431	Upper Russian River	0.18
Sulphur Creek	111426	Middle Russian River	99.82