CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Copeland Creek
Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 2001

INTRODUCTION

A stream inventory was conducted beginning July 2 and ending July 18, 2001 on Copeland Creek. The survey began at the confluence with Laguna De Santa Rosa Creek and extended upstream 29,962 feet.

The Copeland Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Copeland Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

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

WATERSHED OVERVIEW

Copeland Creek is a tributary to the Laguna De Santa Rosa, a tributary to Santa Rosa Creek, a tributary to Mark West Creek, a tributary to the Russian River, a tributary to the Pacific Ocean located in Sonoma County, California (Map 1). Copeland Creek's legal description at the confluence with Laguna De Santa Rosa Creek is T6N R8W S22. Its location is 38.3437143356184° north latitude and 122.722324538536° west longitude. Copeland Creek is a third order stream and has approximately 9.06 miles of solid blue line stream according to the USGS Cotati 7.5 minute quadrangle. Copeland Creek drains a watershed of approximately 5.56 square miles. Elevations range from about 89 feet at the mouth of the creek to 2,454 feet in the headwater areas. Herbaceous vegetation, urban area, and hardwood forest dominate the watershed. The watershed is primarily privately owned. Vehicle access exists from Old Redwood Highway (101), south of Santa Rosa, to Highway 116 west. From the junction of Highways 101 and 116, travel west on 116, 0.6 miles to a freeway exit that leads to the mouth of Copeland Creek.

METHODS

The habitat inventory conducted in Copeland Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al., 1998). The Sonoma County Water Agency field crew that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the

survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Copeland Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

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

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

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

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Copeland 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 Copeland 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 Copeland 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 Copeland 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 Copeland Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Copeland Creek. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

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

- Summary of riffle, flatwater, and pool habitat types
- Summary of habitat types and measured parameters
- Summary of pool types
- Summary of maximum pool depths by pool habitat types
- Summary of mean percent cover by habitat type
- Summary of dominant substrates by habitat type
- Summary of fish habitat elements by stream reach

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

- Level II habitat types by % occurrence
- Level II habitat types by % total length
- Level IV habitat types by % occurrence
- Level I pool habitat types by % occurrence
- Maximum depth in pools
- Percent embeddedness estimated in pool tail-outs
- Mean percent cover types in pools
- Substrate composition in pool tail-outs
- Mean percent canopy
- Dominant bank composition in survey reach
- Dominant bank vegetation in survey reach

HABITAT INVENTORY RESULTS

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

The habitat inventory of July 2 to July 18, 2001, was conducted by H. Fett and H. Fantacone of the Sonoma County Water Agency. The total length of the stream surveyed was 29,962 feet with an additional 1,021 feet of side channel.

Stream flow was not measured on Copeland Creek.

Copeland Creek is a C3 channel type for 10,172 feet, a B3 for 10,411 feet, an F3 for 6,762 feet, an A2 for 2,618 feet of the stream surveyed. C3 channels are low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well defined floodplains and cobble-dominant substrates. B3 channel types are moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks and cobble-dominant substrates. F3 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and cobble-dominant substrates. A2 channels are steep, narrow, cascading, step-pool streams, with high energy/debris transport associated with depositional soils and boulder-dominant substrates.

Water temperature taken during the survey period was 60 degrees Fahrenheit. Air temperature was 65 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of *occurrence* there were 26% riffle units, 32% flatwater units, 31% pool units, and 11% dry units (Graph 1). Based on total *length* of Level II habitat types there were 31% riffle units, 21% flatwater units, 7% pool units, and 41% dry units (Graph 2).

Seventeen Level IV habitat types were identified (Table 2). The most frequent habitat types by percent *occurrence* were step runs, 20%; low-gradient riffles, 13%; and high-gradient riffles, 12% (Graph 3). Based on percent total *length*, dry made up 41%, step runs 17%, and high-gradient riffles 17%.

A total of 81 pools were identified (Table 3). Scour pools were the most frequently encountered, at 49%, and comprised 40% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Nineteen of the 81 measured pools (23%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 81 pool tail-outs measured, 64 had a value of 1 (79%); 13 had a value of 2 (16%); one had a value of 3 (1%); and three had a value of 5 (4%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Riffle habitat types had a mean shelter rating of 6, flatwater habitat types had a mean shelter rating of 16, and pool habitats had a mean shelter rating of 25 (Table 1). Of the pool types, the Scour pools had the highest mean shelter rating at 30. Backwater pools and main-channel pools had mean shelter ratings of 26 an 20, respectively (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Copeland Creek. Graph 7 describes the pool cover in Copeland Creek. Boulders are the dominant pool cover type followed by roots.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Small cobble was the dominant substrate observed in 47% of pool tail-outs while large cobble was the next most frequently observed substrate type, at 32%.

The mean percent canopy density for the surveyed length of Copeland Creek was 70%. The mean percentages of evergreen and deciduous trees were 15% and 55%, respectively. Graph 9 describes the mean percent canopy in Copeland Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 71%. The mean percent left bank vegetated was 64%. The dominant elements composing the structure of the stream banks consisted of 8% bedrock, 36% boulder, 49% cobble/gravel, and 8% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 46% of the units surveyed. Additionally, 30% of the units surveyed had grass as the dominant vegetation type, and 16% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Due to inadequate staffing levels, biological inventory surveys were not conducted in Copeland Creek in 2001.

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

DISCUSSION

Copeland Creek is a C3 channel type for 10,172 feet, a B3 for 10,411 feet, an F3 for 6,762 feet, and an A2 for 2,618 feet. The suitability of C3, B3, F3, and A2 channel types for fish habitat improvement structures are as follows: C3 channel types are excellent for bank-placed boulders, good for plunge weirs, boulder cluster, single and opposing wing-deflectors, and log cover. B3 channel types are excellent for plunge weirs, boulder clusters and bank placed boulder, single and opposing wing-deflectors and log cover. F3 channel types are good for bank-placed boulders, single and opposing wing-deflectors; fair for plunge weirs, boulder clusters, channel constrictors and log cover. A2 channel types are generally not suitable for fish habitat improvement structures.

Riffle habitat types comprised 31% of the total length of this survey, flatwater 21%, and pool 7%. The pools are relatively shallow, with only 19 of the 81 (23%) measured pools having a maximum depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Seventy-seven of the 81 pool tail-outs measured had embeddedness ratings of 1 or 2. One of the pool tail-outs had embeddedness ratings of 3 or 4. Three 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 Copeland Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty-eight of the 81 pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter for flatwater was 16. The mean shelter rating for pools was 25. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, roots contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 70%. Reach 1 had a canopy density of 62% while Reaches 2, 3, 4, and 5 had canopy densities of 73%, 64%, 82%, and 83% respectively. 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 71% and 64%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic trees species, in conjunction with bank stabilization, is recommended.

GENERAL RECOMMENDATIONS

Copeland 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.

RECOMMENDATIONS

1. There is at least one section where the stream is being impacted from cattle trampling the riparian zone. Alternatives to limit cattle access, control erosion and increase canopy, should be explored with landowners, and developed if possible.

2. Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

3. Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

4. Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with log and root wad cover is desirable.

5. Increase the canopy on Copeland Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

COMMENTS AND LANDMARKS

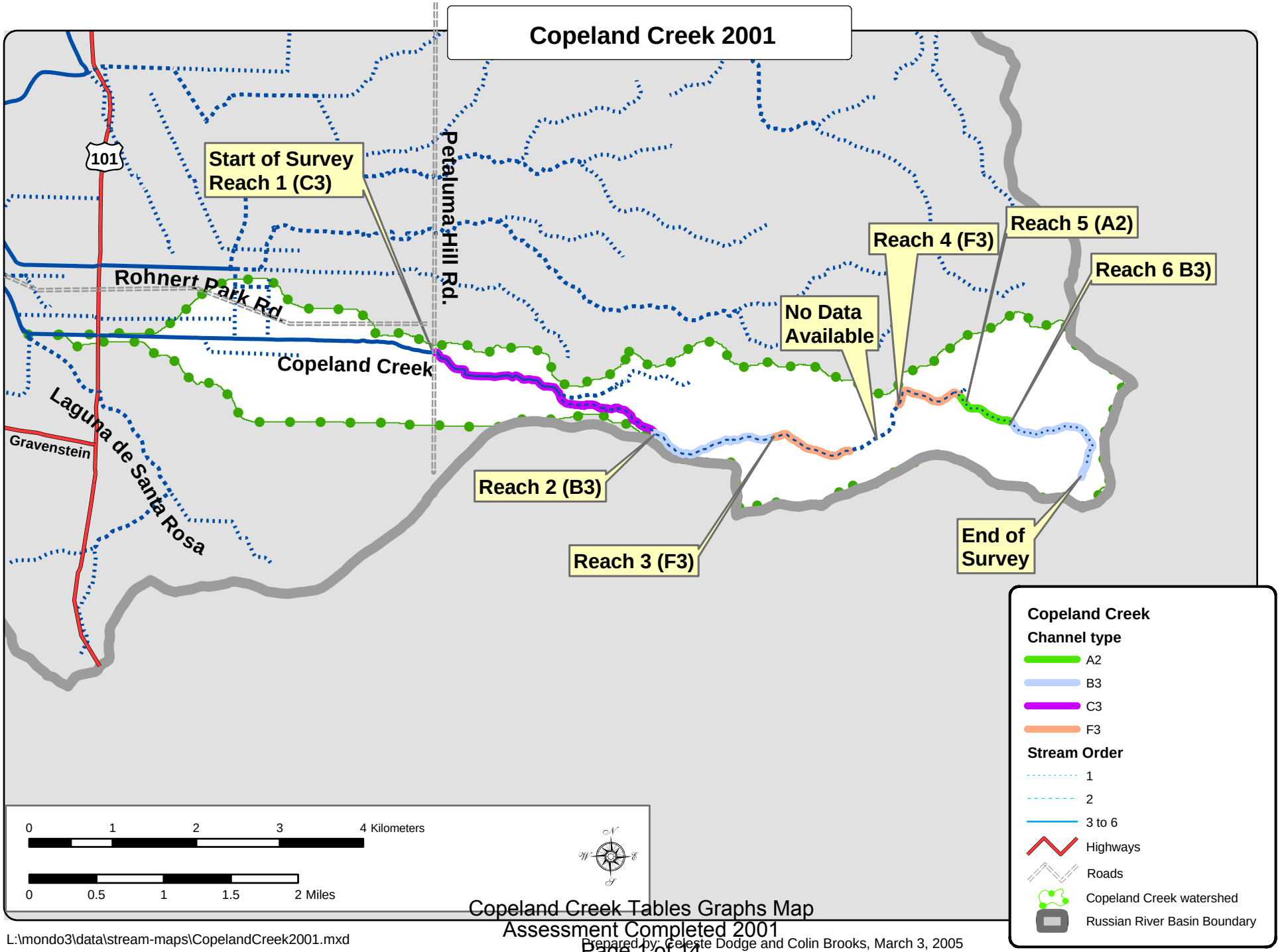
The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey.

0'	Petaluma Hill Bridge>>> START OF SURVEY<< (N38°20'32.3"/W122°40'0.2"); SCWA Restoration Projects.HU #1-#3
6547'	+/- 100 tadpoles
6662'	Presley Rd. Bridge; (N38°20'14.9"/W122°38'49.3")
6812'	Steelhead; Roach; +/- 40 Sculpin; Evidence of cows in creek from here thru HU #071
6948'	SS, Sculpin, +/- 100 fish
6975'	Big white pipe into middle of creek buried under debris extending into next HU as well--6"; evidence of cows in creek
7042'	Evidence of cows in creek throughout this and next 60 HU's; Fish
7122'	Three dead Steelhead
7167'	+/- 30 FISH; R. Bank 11' high
7253'	Steelhead, fish
7294'	Flag N38°20'14.1/W122°38'42.1"
7323'	Fish; Cattle access creek here
7923'	(N38°20'12.3"/W122°38'35.0")
7941'	98' tractor crossing
8201'	Isolated pool
8363'	Frogs (Not Tree Frogs); snake
10106'	(N38°20'03.7"/W122°38'11.5"); Fish; Steelhead
10172'	CHANNEL TYPE CHANGE (C3----->B3); Fish; 2 Steelhead; water temp 80°
10690'	N38°20'1.1"/W122°38'6.5"
10923'	Fish present
10978'	Side channel coming in at 31' on Right
10867'	(N38°19'973"/W122°38'044")
11387'	(N38°19'942"/W122°38'011")
11583'	Side channel coming in at 0' on left
11651'	10' high R Bank oak tree ready to fall in
11777'	Fish Present
11798'	(N38°19'937"/W122°37'920")
11893'	fish present, 10-20
11917'	Right Bank +/- 20' vert
12077'	Steelhead
12241'	R. Bank 5' vertical
12330'	(N38°19'922"/W122°37'836")
12684'	on Right Tributary w/ trickle of water coming in at 3'
12771'	Lichau Rd. Bridge, lots of fish-Steelhead; (N38°19'952"/W122°37'763")
13624'	see erosion sheet-fence hanging 4' off bank running along road
13677'	large cobble dam across creek-Temporary
13813'	L. Bank 15' vertical
13895'	(N38°20'019"/W122°37'601")
14207'	trib on Left side 26' in water temp 60°
14776'	FISH PRESENT; (N38°20'039"/W122°37'428")
16189'	(N38°20'048"/W122°37'177"); CHANNEL TYPE CHANGE(B3-------->F3)
16617'	(N38°20'079"/W122°37'087")
16831'	shelter provided by old culvert pipe - 35%
17189'	(N38°20'022"/W122°37'022")

17325'	water intake pipe 4"
17708'	(N38°19'907"/W122°36'910")
17912'	Foothill Yellow Legged Tadpoles
18048'	Steelhead (multiple)
18072'	tadpoles
18311'	(N38°19'963"/W122°36'821")
18322'	California newt
19049'	Large debris, water underneath
19070'	(N38°19'969"/W122°36'644"); FROGS
19617'	(N38°20'284"/W122°36'187"); See Dam Sheet
19783'	About 5 - 10 Steelhead
19894'	Wood structure on cement, 7" pipe in and out
20102'	Banana Slugs
20221'	(N38°20'374"/W122°36'142")
20580'	4' waterfall
21353'	42' Trib on Right
21508'	(N38°20'303"/W122°35'909")
21817'	111' Trib Left
22129'	Side Channel on Left at 100'; Trib on R 170' (60°)
22448'	tree frogs
22543'	CA Newt
22801'	tree frogs
22951'	Steep Gradient; 10' Waterfalls; CHANNEL CHANGE (F3--------->A2)
24367'	Start of INCREASE IN SEDIMENT
24906'	Substrate- cement from culvert
24936'	most of unit contains the culvert
25019'	tree frogs
25569'	(N38°20'180"/W122°35'248"); CHANNEL TYPE CHANGE(A2---------->B3)
25807'	tadpoles, tree frogs, frogs
25842'	tadpoles
26286'	Inside culvert 130';(N38°20'127"/W122°35'121")
26401'	on left side Trib at 50'(DRY); Cattle in creek
26467'	Frog
26962'	Wet Trib on left at 53'
27241'	Dry Trib on left at 139'
28126'	R. Side Trib at 305' (DRY); Frogs, Yellow Legged
28687'	Tree Frogs
28987'	(N38°19'990"/W122°34'619"); Lots of *Juncus* sp., Dry Trib on Right at 630'
29872'	4" pipe from house into creek by culvert; culvert at 600' for driveway, 13' long caved in for 2' on left; Trib on left at 780' (DRY); >>>>>> END OF CREEK/SURVEY<<<<<<< (N38°19'849"/W122°34'673")

REFERENCES

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



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Copeland Creek Tables Graphs Map
Assessment Completed 2001

Prepared by: Celeste Dodge and Colin Brooks, March 3, 2005

Copeland Creek — Drainage: RUSSIAN RIVER

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES — Survey Dates: 07/02/01 to 07/18/01

Confluence Location: QUAD: COTATI LEGAL DESCRIPTION: T6NR8W LATITUDE:38°20'35" LONGITUDE:123°43'19"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN 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
69	12	RIFFLE	26	140	9630	31	5.9	0.4	309	21304	145	10012	0	6
84	20	FLATWATER	32	78	6544	21	6.0	0.3	260	21871	89	7462	0	16
81	80	POOL	31	26	2102	7	7.7	0.7	191	15459	141	11400	90	25
29	0	DRY	11	438	12708	41	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
263	112	30983	58634	28874

Copeland Creek — Drainage: RUSSIAN RIVER

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS — Survey Dates: 07/02/01 to 07/18/01

Confluence Location: QUAD: COTATI LEGAL DESCRIPTION: T6NR8W LATITUDE:38°20'35" LONGITUDE:123°43'19"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE	MEAN LENGTH	TOTAL LENGTH	TOTAL LENGTH	MEAN WIDTH	MEAN DEPTH	MAXIMUM DEPTH	MEAN AREA	TOTAL AREA EST.	MEAN VOLUME	TOTAL VOLUME EST.	MEAN RESIDUAL POOL VOL	MEAN SHELTER RATING	MEAN CANOPY
#			%	ft.	ft.	%	ft.	ft.	ft.	sq.ft.	sq.ft.	cu.ft.	cu.ft.	cu.ft.		%
35	7	LGR	13	117	4094	13	7	0.4	1.9	400	13998	187	6550	0	4	61
31	3	HGR	12	172	5341	17	5	0.3	1.0	222	6876	86	2652	0	3	67
3	2	CAS	1	65	195	1	5	0.6	1.2	120	360	87	262	0	16	73
2	2	GLD	1	30	60	0	7	0.4	0.7	169	338	56	112	0	15	100
29	10	RUN	11	46	1345	4	6	0.3	1.0	228	6626	92	2667	0	7	61
53	8	SRN	20	97	5139	17	6	0.3	1.2	323	17123	93	4935	0	29	63
1	1	TRP	0	18	18	0	4	1.0	1.6	71	71	71	71	57	2	90
28	27	MCP	11	28	785	3	8	0.7	2.8	210	5886	152	4256	98	19	76
9	9	STP	3	44	397	1	7	0.8	2.7	312	2810	236	2123	149	24	66
1	1	CRP	0	25	25	0	5	0.6	1.3	117	117	70	70	23	20	85
1	1	LSL	0	27	27	0	9	0.5	1.2	231	231	116	116	69	15	80
23	23	LSR	9	24	544	2	6	0.6	2.7	144	3321	89	2051	47	39	90
2	2	LSBk	1	18	35	0	11	0.9	2.0	185	369	177	354	128	10	98
5	5	LSBo	2	14	70	0	9	0.7	1.7	116	582	76	378	46	17	100
8	8	PLP	3	19	148	0	11	1.0	3.5	202	1613	209	1672	159	17	77
3	3	DPL	1	18	53	0	9	0.7	2.2	159	478	107	321	70	26	60
29	0	DRY	11	438	12708	41	0	0.0	0.0	0	0	0	0	0	0	45

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
263	112	30983	60799	28589

Copeland Creek — Drainage: RUSSIAN RIVER

Table 3 - SUMMARY OF POOL TYPES — Survey Dates: 07/02/01 to 07/18/01

Confluence Location: QUAD: COTATI LEGAL DESCRIPTION: T6NR8W LATITUDE:38°20'35" LONGITUDE:123°43'19"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
38	37	MAIN	47	32	1200	57	7.6	0.7	231	8788	170	6468	109	20
40	40	SCOUR	49	21	849	40	7.6	0.7	156	6234	116	4641	73	30
3	3	BACKWATER	4	18	53	3	9.0	0.7	159	478	107	321	70	26

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
81	80	2102	15500	11430

Copeland Creek — Drainage: RUSSIAN RIVER

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES — Survey Dates: 07/02/01 to 07/18/01

Confluence Location: QUAD: COTATI LEGAL DESCRIPTION: T6NR8W LATITUDE:38°20'35" LONGITUDE:123°43'19"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
1	TRP	1	0	0	1	100	0	0	0	0	0	0
28	MCP	35	5	18	16	57	7	25	0	0	0	0
9	STP	11	1	11	7	78	1	11	0	0	0	0
1	CRP	1	0	0	1	100	0	0	0	0	0	0
1	LSL	1	0	0	1	100	0	0	0	0	0	0
23	LSR	28	4	17	16	70	3	13	0	0	0	0
2	LSBk	2	0	0	1	50	1	50	0	0	0	0
5	LSBo	6	0	0	5	100	0	0	0	0	0	0
8	PLP	10	0	0	2	25	4	50	2	25	0	0
3	DPL	4	0	0	2	67	1	33	0	0	0	0

TOTAL UNITS
81

Copeland Creek — Drainage: RUSSIAN RIVER

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE — Survey Dates: 07/02/01 to 07/18/01

Confluence Location: QUAD: COTATI LEGAL DESCRIPTION: T6NR8W — LATITUDE:38°20'35" LONGITUDE:123°43'19"

UNITS MEASURED	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
35	3	LGR	0	17	0	0	0	0	27	57	0
31	2	HGR	0	10	0	0	3	0	3	85	0
3	2	CAS	0	0	0	0	3	0	8	90	0
2	2	GLD	43	23	0	25	0	0	0	10	0
29	7	RUN	4	3	0	0	1	10	2	80	0
53	7	SRN	0	1	0	4	13	10	11	61	0
1	1	TRP	0	0	0	0	0	0	100	0	0
28	25	MCP	3	10	2	0	6	8	10	56	4
9	9	STP	0	11	2	2	1	3	9	73	0
1	1	CRP	0	10	0	40	10	0	0	40	0
1	1	LSL	0	55	0	0	10	0	0	30	0
23	22	LSR	9	6	0	49	14	2	3	18	0
2	2	LSBk	0	3	0	0	0	0	3	95	0
5	5	LSBo	0	4	0	2	1	2	10	81	0
8	8	PLP	10	8	11	0	1	0	0	70	0
3	3	DPL	0	15	0	0	0	0	23	50	12
29	0	DRY	0	0	0	0	0	0	0	0	0

Copeland Creek — Drainage: RUSSIAN RIVER

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE — Survey Dates: 07/02/01 to 07/18/01

Confluence Location: QUAD: COTATI LEGAL DESCRIPTION: T6NR8W — LATITUDE:38°20'35" LONGITUDE:123°43'19"

TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
35	7	LGR	14	0	14	43	0	29	0
31	3	HGR	0	0	0	0	33	67	0
3	2	CAS	0	0	0	50	0	50	0
2	2	GLD	0	0	0	50	50	0	0
29	9	RUN	0	0	0	56	44	0	0
53	7	SRN	0	0	0	29	71	0	0
1	1	TRP	0	0	0	0	0	0	100
28	8	MCP	0	0	0	75	25	0	0
9	3	STP	0	0	0	67	0	33	0
1	1	CRP	0	0	0	100	0	0	0
1	1	LSL	0	0	0	100	0	0	0
23	9	LSR	11	0	0	33	33	22	0
2	1	LSBk	0	0	0	0	100	0	0
5	1	LSBo	0	0	0	100	0	0	0
8	4	PLP	0	0	50	50	0	0	0
3	1	DPL	0	0	0	100	0	0	0
29	0	DRY	0	0	0	0	0	0	0

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Copeland Creek
SAMPLE DATES: 07/02/01 to 07/18/01
STREAM LENGTH: 29962 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: COTATI — Latitude: 38°20'35"
Legal Description: T6NR8W — Longitude: 123°43'19"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1

Channel Type: C3	Canopy Density: 62%
Channel Length: 10172 ft.	Coniferous Component: 3%
Riffle/flatwater Mean Width: 5 ft.	Deciduous Component: 98%
Total Pool Mean Depth: 0.6 ft.	Pools by Stream Length: 4%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 0%
Water: - °F Air: 75 -75 °F	Mean Pool Shelter Rtn: 35
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Root masses
Vegetative Cover: 71%	Occurrence of LOD: 0%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 8870 ft.

Embeddness Value: 1. 100% 2.0% 3. 0% 4. 0% 5. 0%

STREAM REACH 2

Channel Type: B3	Canopy Density: 73%
Channel Length: 6018 ft.	Coniferous Component: 10%
Riffle/flatwater Mean Width: 6 ft.	Deciduous Component: 90%
Total Pool Mean Depth: 0.5 ft.	Pools by Stream Length: 12%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 0%
Water: - °F Air: 65 -75 °F	Mean Pool Shelter Rtn: 31
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 65%	Occurrence of LOD: 1%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 0 ft.

Embeddness Value: 1. 72% 2.24% 3. 3% 4. 0% 5. 0%

STREAM REACH 3

Channel Type: F3	Canopy Density: 64%
Channel Length: 6762 ft.	Coniferous Component: 24%
Riffle/flatwater Mean Width: 6 ft.	Deciduous Component: 76%
Total Pool Mean Depth: 0.8 ft.	Pools by Stream Length: 8%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 0%
Water: - 60 °F Air: 65 -65 °F	Mean Pool Shelter Rtn: 21
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders
Vegetative Cover: 60%	Occurrence of LOD: 2%
Dom. Bank Substrate: Cobble/Gravel	Dry Channel: 844 ft.

Embeddness Value: 1. 89% 2.11% 3. 0% 4. 0% 5. 0%

STREAM REACH 4

Channel Type: A2	Canopy Density: 82%
Channel Length: 2618 ft.	Coniferous Component: 67%
Riffle/flatwater Mean Width: 6 ft.	Deciduous Component: 33%
Total Pool Mean Depth: 1.3 ft.	Pools by Stream Length: 4%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 17%
Water: 60 - 60 °F Air: 65 -65 °F	Mean Pool Shelter Rtn: 13
Dom. Bank Veg.: Deciduous Trees	Dom. Shelter: Boulders

Vegetative Cover: 85%
Dom. Bank Substrate: Cobble/Gravel
Occurrence of LOD: 0%
Dry Channel: 1280 ft.

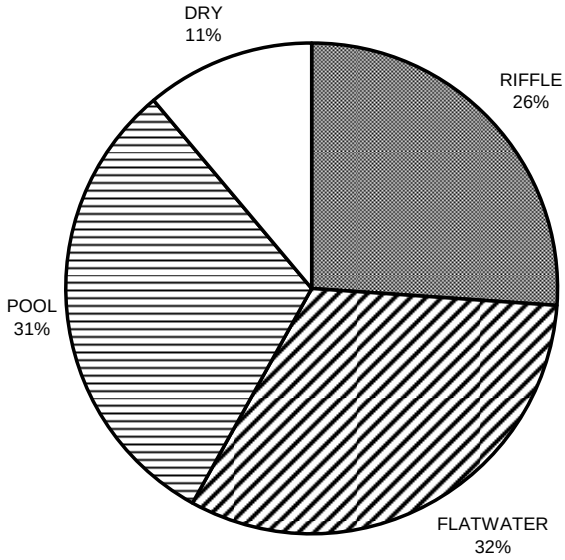
Embeddness Value: 1. 67% 2.33% 3. 0% 4. 0% 5. 0%

STREAM REACH 5

Channel Type: B3
Channel Length: 4393 ft.
Riffle/flatwater Mean Width: 7 ft.
Total Pool Mean Depth: 0.9 ft.
Base Flow: 0.0 cfs
Water: 60 - 60 °F Air: 65 -65 °F
Dom. Bank Veg.: Deciduous Trees
Vegetative Cover: 86%
Dom. Bank Substrate: Cobble/Gravel
Canopy Density: 83%
Coniferous Component: 81%
Deciduous Component: 21%
Pools by Stream Length: 7%
Pools >=3 ft.deep: 13%
Mean Pool Shelter Rtn: 24
Dom. Shelter: Boulders
Occurrence of LOD: 3%
Dry Channel: 975 ft.

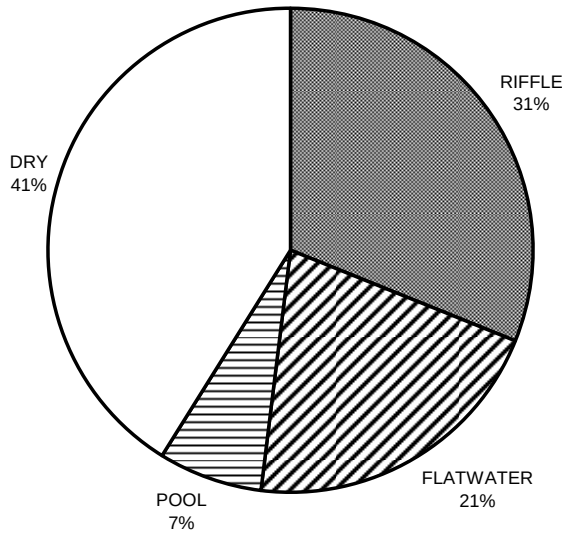
Embeddness Value: 1. 38% 2.25% 3. 0% 4. 0% 5. 38%

COPELAND CREEK
LEVEL II HABITAT TYPES BY PERCENT OCCURRENCE



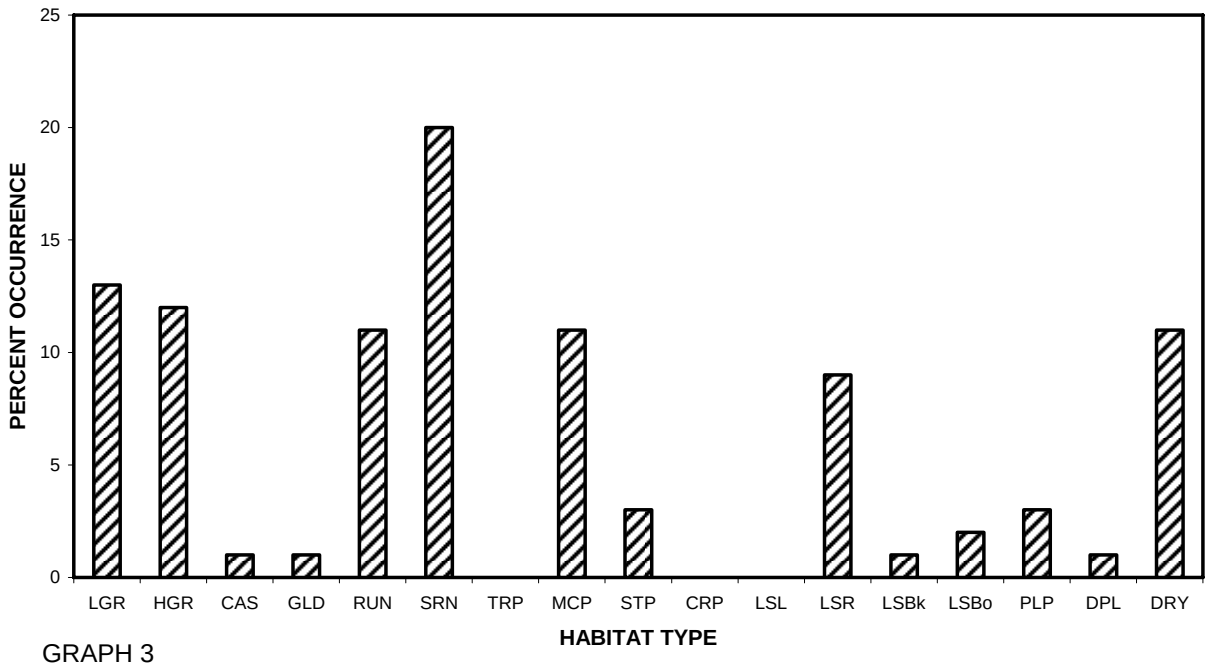
GRAPH 1

COPELAND CREEK
LEVEL II HABITAT TYPES BY PERCENT TOTAL LENGTH



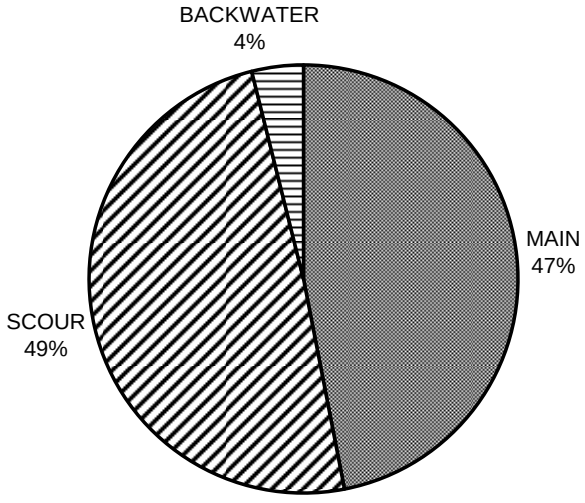
GRAPH 2

COPELAND CREEK
LEVEL IV HABITAT TYPES BY PERCENT OCCURRENCE



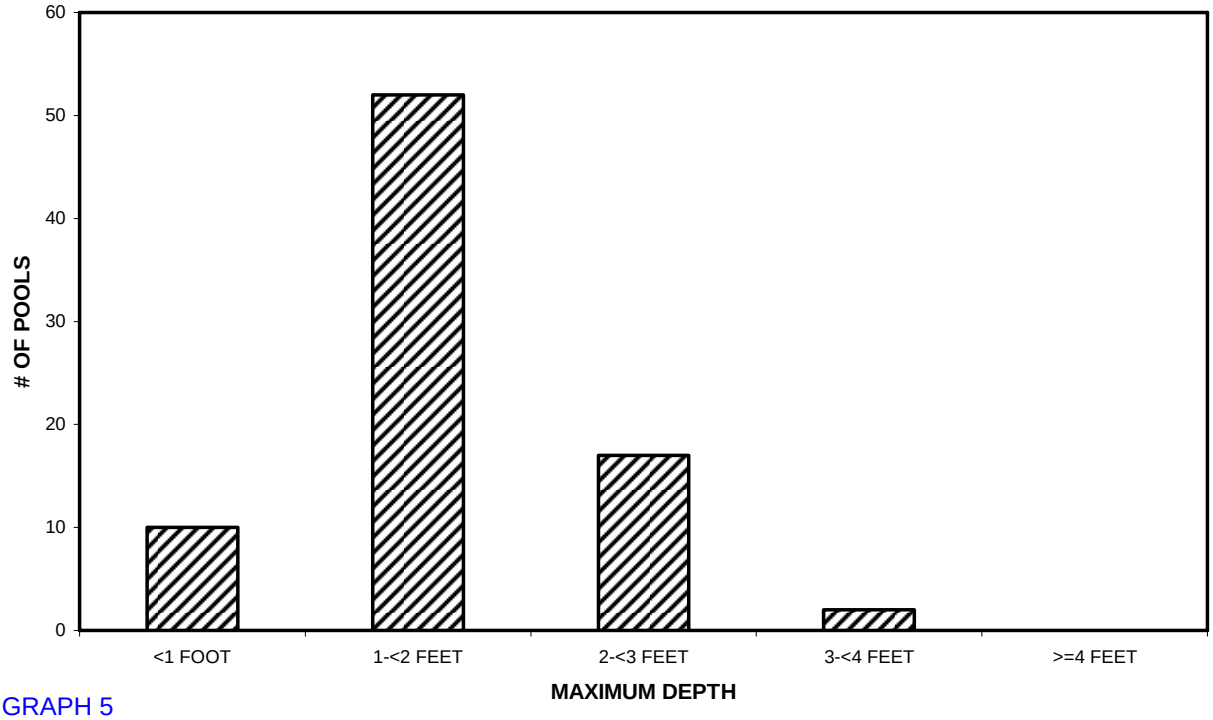
GRAPH 3

COPELAND CREEK
LEVEL I POOL HABITAT TYPES BY PERCENT OCCURRENCE



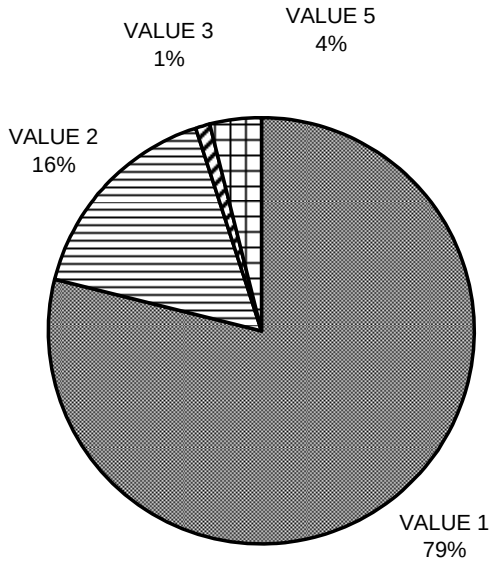
GRAPH 4

COPELAND CREEK
MAXIMUM DEPTH IN POOLS



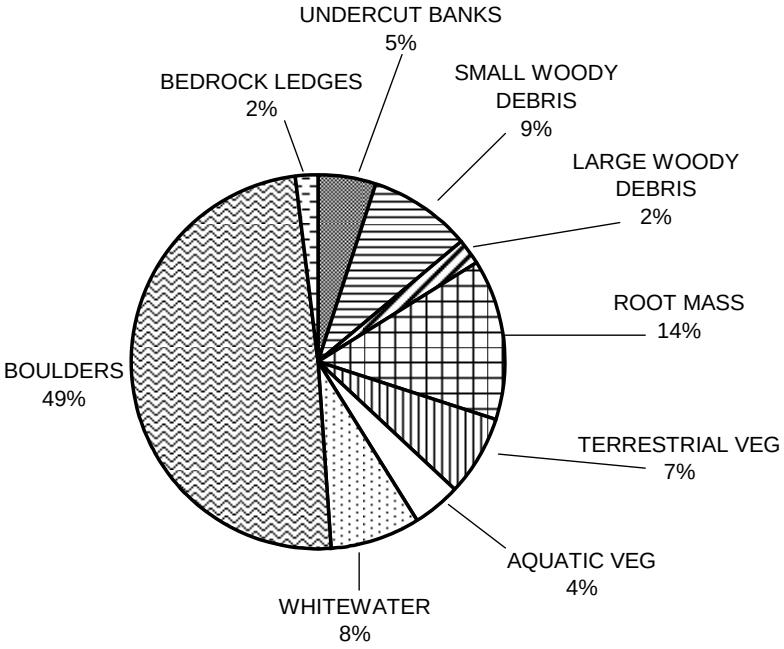
GRAPH 5

COPELAND CREEK
PERCENT EMBEDDEDNESS



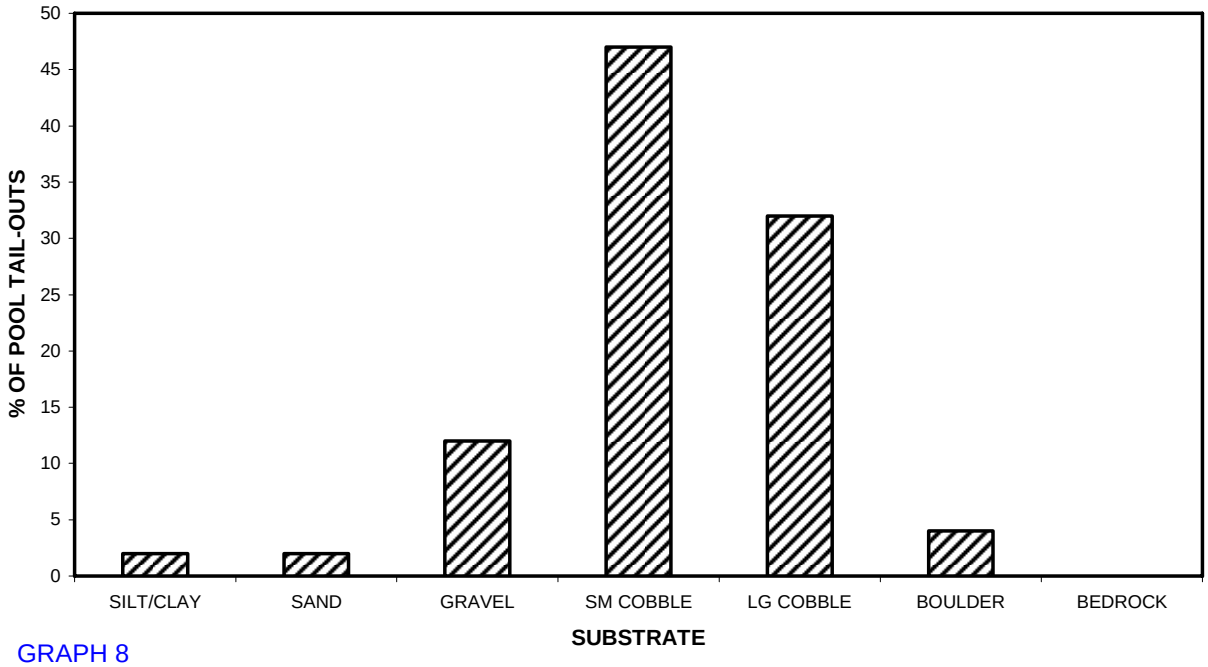
GRAPH 6

COPELAND CREEK
MEAN PERCENT COVER TYPES IN POOLS



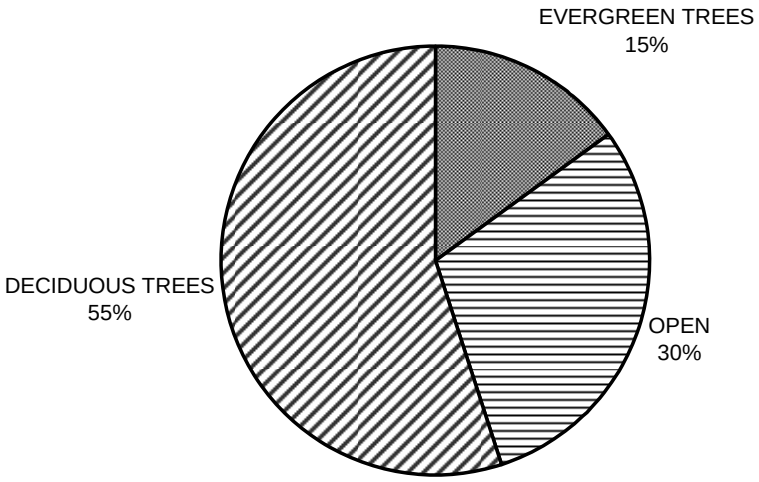
GRAPH 7

COPELAND CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



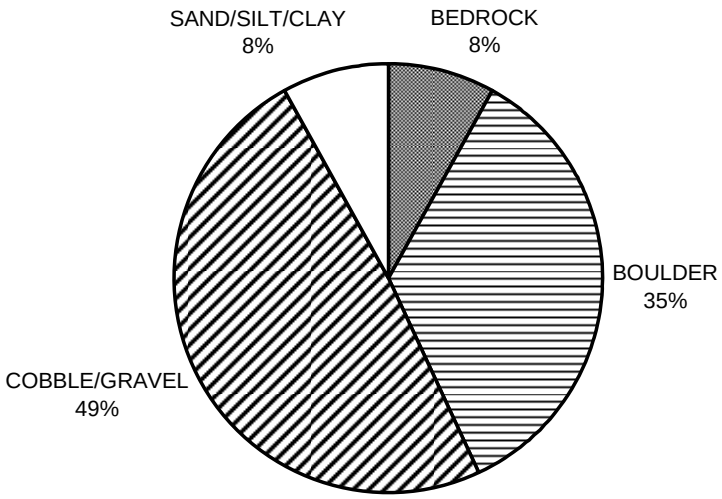
GRAPH 8

COPELAND CREEK
MEAN PERCENT CANOPY



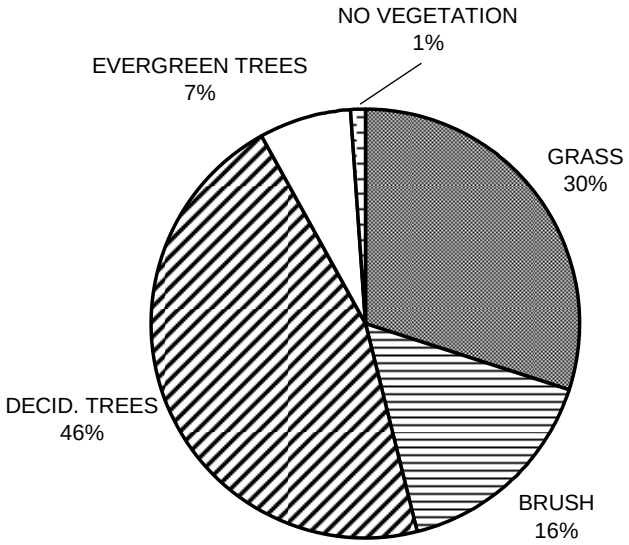
GRAPH 9

COPELAND CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

COPELAND CREEK
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Watershed Hydroid **410** Copeland Creek

Hydrologic Sub-Areas covered by the watershed:

Name:	LLId: (1:24k)	County:
Copeland Creek	1227223383437	Sonoma

Tributary to Laguna De Santa Rosa
Tributary to Mark West Creek
Tributary to Russian River

Location: **T:** 06N **R:** 08W **S:** 22 **Latitude:** 38.3437143356184 **Longitude** 122.722324538536

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 **Total Length:** 9.06 Miles / 14.60 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: 1441 Hectares / 3562 Acres / 5.56 sq. mi.

Elevations: Mouth: 89 feet; Headwaters: 2454 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): None

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

Federal:	State:	Local:	Private:
0.0 acres	213.6	0.3	3347.9
0.00 %	5.90 %	0.00 %	94.10 %

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:
0.00 acres	938.06	3.08	124.94	981.62
0.0 %	26.3 %	0.1 %	3.5 %	27.6 %

Shrub:	Herbaceous:	Barren/rock:	Water:
0.00	1478.76	32.74	0.00
0.0 %	41.5 %	0.9 %	0.0 %

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

Watershed Hydroid **410** Copeland Creek

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

Quad Name	USGS Code
GLEN ELLEN	38122C5
COTATI	38122C6

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

Scientific Name	Common Name
Rana boylii	foothill yellow-legged frog
Rana boylii	foothill yellow-legged frog
Agelaius tricolor	tricolored blackbird
Rana boylii	foothill yellow-legged frog
Rana boylii	foothill yellow-legged frog
Caecidotea tomalensis	Tomales isopod
Caecidotea tomalensis	Tomales isopod
Northern Vernal Pool	Northern Vernal Pool
Legenere limosa	legenere
Emys (=Clemmys) marmorata marmorat	northwestern pond turtle
Hydrochara rickseckeri	Ricksecker's water scavenger beetle
Coccyzus americanus occidentalis	western yellow-billed cuckoo
Leptosiphon jepsonii	Jepson's leptosiphon

Hydrologic Sub-Areas covered by the watershed

Hydrologic Sub-Area Name:	ID code (RBUAS)	Hydrologic Area Name	% of watershed in this HSA
Sonoma Creek	220640	Sonoma Creek	0.01
Santa Rosa	111422	Middle Russian River	0.23
Petaluma River	220630	Petaluma River	0.01
Laguna	111421	Middle Russian River	99.75