CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Piner Creek
Report Revised June 9, 2006
Report Completed 2005
Assessment Completed 2005

INTRODUCTION

A stream inventory was conducted during 10/18/2005 to 10/20/2005 on Piner Creek. The survey began at the confluence with Santa Rosa Creek and extended upstream 3.7 miles.

The Piner 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 Piner 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

Piner Creek is a tributary to Santa Rosa Creek, is a tributary to Mark West Creek, is a tributary to Russian River, is a tributary to Pacific Ocean, located in Sonoma County, California (Map 1). Piner Creek's legal description at the confluence with Santa Rosa Creek is T07N R08W S16. Its location is 38°26'43.0" north latitude and 122°46'31.0" west longitude, LLID number 1227752384454. Piner Creek is a third order stream and has approximately 3.6 miles of blue line stream according to the USGS Sebastopol 7.5 minute quadrangle. Piner Creek drains a watershed of approximately 8.01 square miles. Elevations range from about 90 feet at the mouth of the creek to 908 feet in the headwater areas. Mixed hardwood/mixed conifer forest dominates the watershed. The watershed is primarily privately owned.

METHODS

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

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail

crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement. All pools except step-pools are fully sampled.

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

1. Flow:

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

2. Channel Type:

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

3. Temperatures:

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

4. Habitat Type:

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

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Piner Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Piner Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Piner Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

10. Large Woody Debris Count:

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

11. Average Bankfull Width:

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

BIOLOGICAL INVENTORY

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 Piner Creek.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.16, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. This program processes and summarizes the data, and produces the following ten tables:

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

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

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

HABITAT INVENTORY RESULTS

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

The habitat inventory of Piner Creek on 10/18/2005 to 10/20/2005, was conducted by D. Acomb (DFG), H. Reese (WSP), S. Phillips (WSP). The total length of the stream surveyed was 19,772 feet.

Stream flow was not measured on Piner Creek.

Piner Creek is an F3 channel type for 12,607 feet of the stream surveyed (Reach 1), and an F6 channel type for 7,165 feet of the stream surveyed (Reach 2).

F3/6 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel and silt/clay, respectively, dominant substrates. .

Water temperatures taken during the survey period ranged from 57 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 70 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 25% riffle units, 56% flatwater units, 11% culvert units, 4% pool units, 4% no survey-marsh units, (Graph 1). Based on total length of Level II habitat types there were 4% riffle units, 86% flatwater units, 4% culvert units, 2% pool units, 4% no survey-marsh units, (Graph 2).

Six Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 24% Low Gradient Riffle units, 39% Glide units, 11% Culvert units, 14% Run units, 1% Bedrock Sheet units, 4% Mid-Channel Pool units, 4% Step Run units, 4% Not Surveyed due to a marsh units, (Graph 3). Based on percent total length, 4% Low Gradient

Riffle units, 70% Glide units, 4% Culvert units, 5% Run units, 2% Mid-Channel Pool units, 11% Step Run units, 4% Not Surveyed due to a marsh units.

A total of three pools were identified (Table 3). Main Channel pools were the most frequently encountered, at 100%, and 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. None of the pools (0%) had a residual depth of three feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the one pool tail-out measured, one had a value of 4 (100%); (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. 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 28 , flatwater habitat types had a mean shelter rating of 4 , and pool habitats had a mean shelter rating of 5 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 5, (Table 3).

Table 5 summarizes mean percent cover by habitat type. Aquatic Vegetation is the dominant cover types in Piner Creek. Graph 7 describes the pool cover in Piner Creek. Terrestrial Vegetation is the dominant pool cover type followed by bedrock ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. A silt/clay substrate type was observed in 100% of pool tail-outs.

The mean percent canopy density for the surveyed length of Piner Creek was 24%. The mean percentages of hardwood and coniferous trees were 95% and 5%, respectively. Seventy six percent of the canopy was open. Graph 9 describes the mean percent canopy in Piner Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 32%. The mean percent left bank vegetated was 43%. The dominant elements composing the structure of the stream banks consisted of 22% bedrock, 49% boulder, 30% sand/silt/clay, (Graph 10). Grass was the dominant vegetation type observed in 72% of the units surveyed. Additionally, 1% of the units surveyed had hardwood trees as the dominant vegetation type, and none had coniferous trees as the dominant vegetation (Graph 11).

DISCUSSION

Piner Creek is a F3 channel type for 12,607 feet of the stream surveyed (Reach 1), a F6 channel type for 7,165 feet of the stream surveyed (Reach 2).

According to the DFG Salmonid Stream Habitat Restoration Manual, F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover.

F6 channel types are good for bank-placed boulders and fair for low-stage weirs, boulder clusters, single and opposing wing deflectors and log cover.

The water temperatures recorded on the survey days 10/18/2005 to 10/20/2005, ranged from 57 to 62 degrees Fahrenheit. Air temperatures ranged from 59 to 70 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 86% of the total length of this survey, riffles 4%, and pools 2%. The pools are relatively shallow, with none of the 1 (0%) pools having a maximum residual depth greater than 3 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second 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.

None of the pool tail-outs measured had embeddedness ratings of 1 or 2. One 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 Piner Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

One of the pool tail-outs had silt, sand, large cobble, boulders or bedrock as the dominant substrate. This is generally considered unsuitable for spawning salmonids.

The mean shelter rating for pools was 5. The shelter rating in the flatwater habitats was 4. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Aquatic Vegetation in Piner Creek. Terrestrial Vegetation is the dominant cover type in pools followed by bedrock ledges. 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 22.8%, Reach 2 had a canopy density of 24.8%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was low at 32% and 43%, 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 RECOMMENDATIONS

Piner 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. Access for migrating salmonids should be assessed at all road crossings. Where needed crossings should be replaced or modified to improve fish passage.

2. Increase the canopy on Piner Creek by planting appropriate native vegetation 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.

3. Piner Creek would benefit from 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.

4. Suitable size spawning substrate on Piner Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

5. Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from root mass. Adding high quality complexity with woody cover is desirable.

6. 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.

7. 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.

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.

Piner Creek

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	Start of Survey: Start at confluence with Santa Rosa Creek
1255	0004.00	General Comment: Flood Control Channel
1494	0005.00	General Comment: Cat tails
1538	0006.00	General Comment: Unidentified fish jumping
2468	0008.00	Structures: Fulton Bridge, Bridge 1
2579	0009.00	General Comment: Live Oaks, unidentified fish
3975	0011.00	General Comment: Fresh water clams, many unidentified fish
5360	0014.00	Structures: Left Bank Double Culvert Contributing Water
5878	0017.00	Structures: Guerneville Road Bridge
6003	0018.00	General Comment: Terrestrial Vegetation is mostly grass, Louisiana Crawfish
7897	0019.00	General Comment: Concrete banks
7897	0019.00	Tributaries: Confluence with Paulin Creek
7928	0020.00	General Comment: Concrete Banks

8019	0022.00	General Comment: Turtle
8631	0026.00	General Comment: left bank erosion site
8691	0027.00	Structures: Valdez Culvert back flooded 2 ft.
8754	0028.00	General Comment: Stirring up lots of silt
10277	0030.00	General Comment: Marlow Road
10379	0031.00	Start of Survey:
10379	0031.00	General Comment: Day 2 Start
11028	0033.00	General Comment: many roach
11678	0036.00	Tributaries: right bank tributary (Coffee Creek?)
12201	0040.00	Structures: make-shift pedestrian crossing
12227	0041.00	General Comment: recently dead mallard in stream
12493	0044.00	General Comment: power lines
12607	0046.00	General Comment: Channel Type Change, Start Reach 2, F6
12607	0046.00	Structures: Railroad Bridge, bridge #3
12627	0047.00	General Comment: 2 unidentified turtles
13368	0049.00	Structures: Coffee Road, Culvert #3
13848	0052.00	Tributaries: confluence with left bank tributary, tributary providing most of the flow
14050	0054.00	General Comment: amount of trash has been steadily increasing since Marlow
14125	0055.00	General Comment: vegetation mowed

14205	0056.00	Structures: concrete sill from utility crossing may be causing pool scour
14294	0057.00	General Comment: Convict Crew cleared vegetation up to bankfull (mow)
14294	0057.00	Structures: right bank culvert
16371	0062.00	General Comment: unidentified minnow
16523	0064.00	General Comment: right bank mowed
17024	0068.00	General Comment: mowed
17386	0069.00	General Comment: mowed, small mouth bass?
17964	0070.00	Structures: Hopper, Culvert #5
18373	0073.00	General Comment: HOBO Temp #3, check unit 10/04/04
18618	0075.00	General Comment: right bank riprap
18618	0075.00	Tributaries: left bank old channel now a tributary
18658	0076.00	General Comment: Arundo in old channel, left bank private property
18848	0077.00	General Comment: almost lost boots in mud, egret
19307	0078.00	Structures: driveway to corporate offices, culvert #6
19362	0079.00	General Comment: employees say otters in Nov/Dec
19412	0080.00	Structures: flows under unmeasured foot bridge
19772	0080.00	End of Survey: End of Survey at top of instream pond next to office complex. Drainage ditch forks (LB) under Highway 101. RB continues straight along fence line. Last several hundred feet have been clay, approximately 0.2-1.1 feet deep.

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.

McCain, M., D. Fuller, L. Decker and K. Overton. 1990. Stream habitat classification and inventory procedures for northern California. FHC Currents. No.1. U.S. Department of Agriculture. Forest Service, Pacific Southwest Region.

Rosgen, D.L., 1994. A Classification of Natural Rivers. Catena, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.

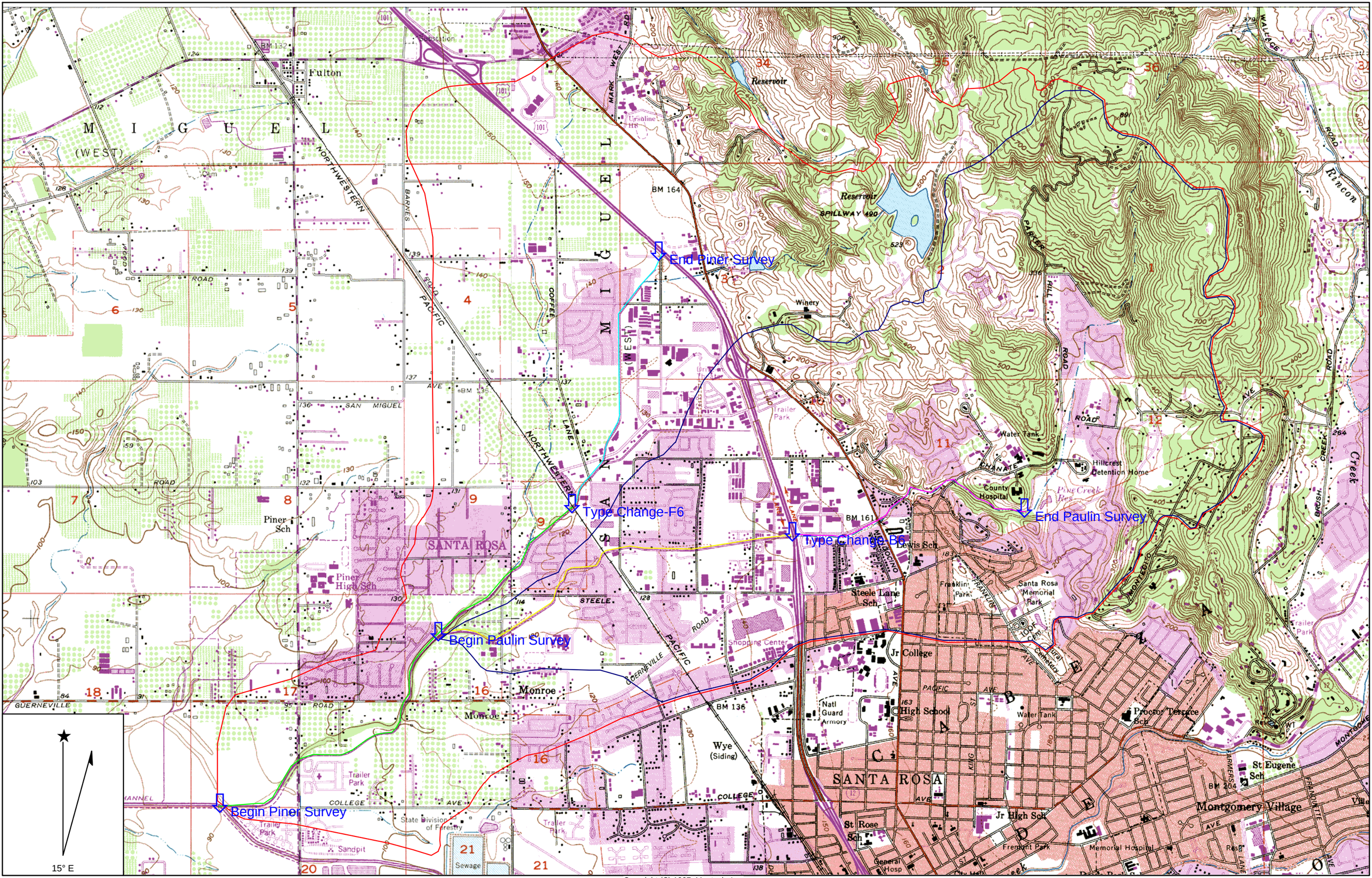


Table 1 - Summary of Riffle, Flatwater, and Pool Habitat Types

Stream Name: Piner Creek LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

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
9	9	CULVERT	11.3	78	706	3.6	19.2	1.2	1.1	1531	13775	1337	12030		1
45	45	FLATWATER	56.3	376	16918	85.6	12.5	1.0	1.7	5348	240638	8406	378255		4
3	1	NOSURVEY_	3.8	285	854	4.3	10.0	1.5	2.2	4590	13770	6885	20655		
3	3	POOL	3.8	163	489	2.5	14.7	0.7	1.5	2916	8748	576	576	336	5
20	20	RIFFLE	25.0	40	805	4.1	6.2	0.4	0.6	232	4639	77	1532		28

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
80	78	19772	281570	413048

Table 2 - Summary of Habitat Types and Measured Parameters

Stream Name: Piner Creek LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

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 (%)
19	19	LGR	23.8	39	741	3.7	6	0.4	1	209	3970	74	1398		31	21
1	1	BRS	1.3	64	64	0.3	11	0.2	0.3	669	669	134	134		0	0
31	31	GLD	38.8	444	13761	69.6	15	1.2	4.5	7144	221473	11810	366108		4	20
11	11	RUN	13.8	87	952	4.8	9	0.4	1.1	694	7631	340	3735		4	42
3	3	SRN	3.8	735	2205	11.2	5	0.7	2	3844	11533	2804	8412			6
3	3	MCP	3.8	163	489	2.5	15	0.7	1.5	2916	8748	576	576	336	5	35
9	9	CUL	11.3	78	706	3.6	19	1.2	2	1531	13775	1337	12030		1	100
3	1	MAR	3.8	285	854	4.3	10	1.5	2.2	4590	13770	6885	20655			12

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
80	78	19772	281570	413048

Table 3 - Summary of Pool Types

Stream Name: Piner Creek LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

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
3	3	MAIN	100	163	489	100	14.7	0.7	2916	8748	336	336	5

Total Units	Total Units Fully Measured	Total Length (ft.)	Total Area (sq.ft.)	Total Volume (cu.ft.)
3	3	489	8748	336

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

Stream Name: Piner Creek LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

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.): 1.5

Table 5 - Summary of Mean Percent Cover By Habitat Type

Stream Name: Piner Creek LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005 Dry Units: 0

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

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
19	8	LGR	0	0	0	0	21	63	0	4	0
1	1	BRS	0	0	0	0	0	0	0	0	0
20	9	TOTAL RIFFLE	0	0	0	0	19	56	0	3	0
31	19	GLD	0	0	0	0	27	37	0	5	0
11	8	RUN	0	0	0	0	39	11	0	12	0
3	0	SRN									
45	27	TOTAL FLAT	0	0	0	0	31	29	0	7	0
3	1	MCP	0	0	0	0	100	0	0	0	0
3	1	TOTAL POOL	0	0	0	0	100	0	0	0	0
9	4	CUL	0	0	0	0	0	25	0	0	0
3	0	MAR									
80	41	TOTAL	0	0	0	0	27	34	0	5	0

Table 6 - Summary of Dominant Substrates By Habitat Type

Stream Name: Piner Creek LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005 Dry Units: 0

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

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
19	19	LGR	32	0	0	0	58	5	5
1	1	BRS	0	0	0	0	0	0	100
31	31	GLD	32	3	0	0	55	6	3
11	11	RUN	18	0	0	0	55	18	9
3	3	SRN	100	0	0	0	0	0	0
3	3	MCP	100	0	0	0	0	0	0

Table 7 - Summary of Mean Percent Canopy for Entire Stream

Stream Name: Piner Creek

LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

Mean Percent Canopy	Mean Percent Conifer	Mean Percent Hardwood	Mean Percent Open Units	Mean Right Bank % Cover	Mean Left Bank % Cover
24	5	95	5	32	43

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

Open units represent habitat units with zero canopy cover.

Table 9 - Mean Percentage of Dominant Substrate and Vegetation

Stream Name: Piner Creek LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

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	17	16	21.7
Boulder	37	37	48.7
Cobble / Gravel	0	0	0.0
Sand / Silt / Clay	22	23	29.6

Mean Percentage of Dominant Stream Bank Vegetation

Dominant Class of Vegetation	Number of Units Right Bank	Number of Units Left Bank	Total Mean Percent (%)
Grass	56	59	75.7
Brush	0	0	0.0
Hardwood Trees	1	0	0.7
Coniferous Trees	0	0	0.0
No Vegetation	19	17	23.7

Total Stream Cobble Embeddedness Values: 4

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

StreamName: Piner Creek LLID: 1227752384454 Drainage: Russian River - Middle

Survey Dates: 10/18/2005 to 10/20/2005

Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

	Riffles	Flatwater	Pools
UNDERCUT BANKS (%)	0	0	0
SMALL WOODY DEBRIS (%)	0	0	0
LARGE WOODY DEBRIS (%)	0	0	0
ROOT MASS (%)	0	0	0
TERRESTRIAL VEGETATION (%)	19	31	100
AQUATIC VEGETATION (%)	56	29	0
WHITEWATER (%)	0	0	0
BOULDERS (%)	3	7	0
BEDROCK LEDGES (%)	0	0	0

Appendix C

Table 8 - Fish Habitat Inventory Data Summary

Stream Name: Piner Creek LLID: 1227752384454 Drainage: Russian River -
Survey Dates: 10/18/2005 to 10/20/2005 Survey Length (ft.): 19772 Main Channel (ft.): 19772 Side Channel (ft.): 0
Confluence Location: Quad: SEBASTOPOL Legal Description: T07NR08WS16 Latitude: 38:26:43.0N Longitude: 122:46:31.0W

Summary of Fish Habitat Elements By Stream Reach

STREAM REACH: 1

Channel Type: F3
Reach Length (ft.): 12607
Riffle/Flatwater Mean Width (ft.): 11.9
BFW:
Range (ft.): 30 to 30
Mean (ft.): 30
Std. Dev.: 0
Base Flow (cfs): 0
Water (F): 57 - 62 Air (F): 59 - 70
Dry Channel (ft.): 0

Canopy Density (%): 22.8
Coniferous Component (%): 1.3
Hardwood Component (%): 98.7
Dominant Bank Vegetation: Grass
Vegetative Cover (%): 41.8
Dominant Shelter: Aquatic Vegetation
Dominant Bank Substrate Type: Boulder
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles: 0
Pools:
Flat: 0

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

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

STREAM REACH: 2

Channel Type: F6
Reach Length (ft.): 7165
Riffle/Flatwater Mean Width (ft.): 8.3
BFW:
Range (ft.): 30 to 30
Mean (ft.): 30
Std. Dev.: 0
Base Flow (cfs): 0
Water (F): 60 - 62 Air (F): 64 - 69
Dry Channel (ft.): 0

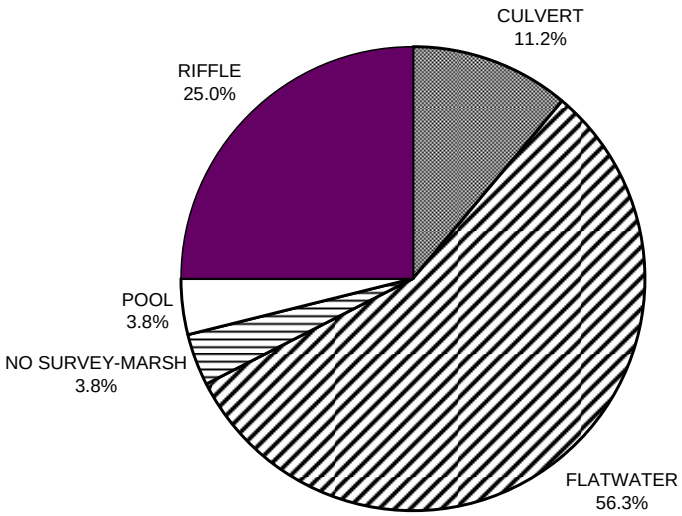
Canopy Density (%): 24.8
Coniferous Component (%): 10.0
Hardwood Component (%): 90.0
Dominant Bank Vegetation: Grass
Vegetative Cover (%): 31.3
Dominant Shelter: Terrestrial Veg.
Dominant Bank Substrate Type: Sand/Silt/Clay
Occurrence of LWD (%): 0.0
LWD per 100 ft.:
Riffles: 0
Pools: 0
Flat: 0

Pools by Stream Length (%): 6.8
Pool Frequency (%): 8.6
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.): 1.5
Mean Pool Shelter Rating: 5

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

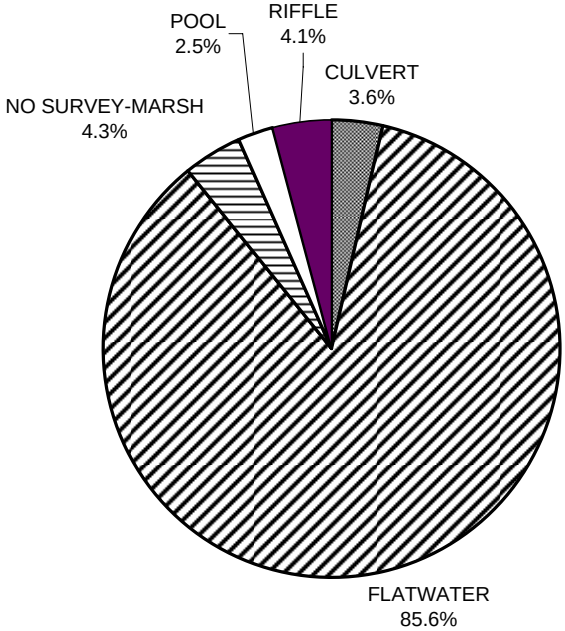
APPENDIX D: GRAPHS

PINER CREEK 2005
HABITAT TYPES BY PERCENT OCCURRENCE



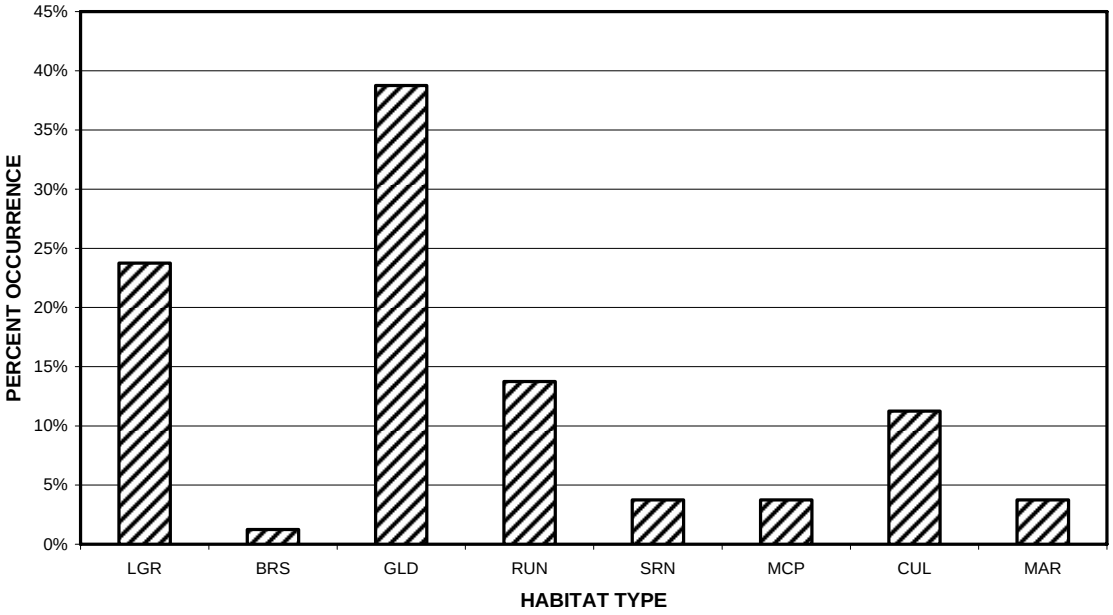
GRAPH 1: Level II habitat types by percent occurrence

PINER CREEK 2005
HABITAT TYPES BY PERCENT TOTAL LENGTH



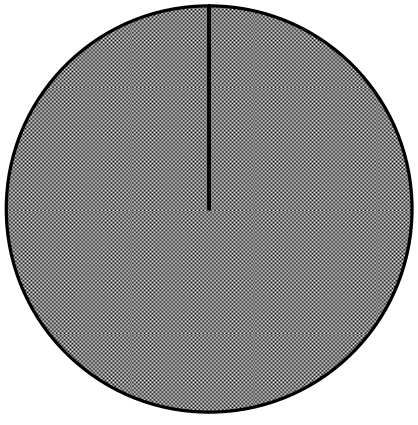
GRAPH 2: Level II habitat types by percent total length

PINER CREEK 2005
HABITAT TYPES BY PERCENT OCCURRENCE



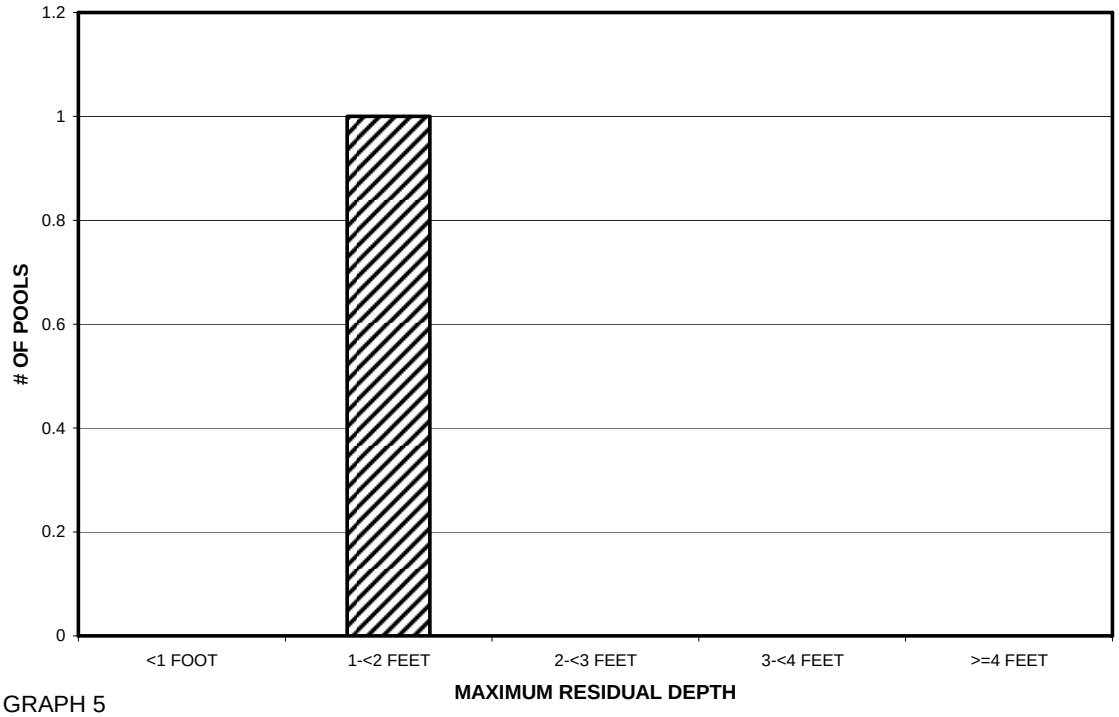
GRAPH 3: Level IV habitat types by percent occurrence

PINER CREEK 2005
POOL TYPES BY PERCENT OCCURRENCE



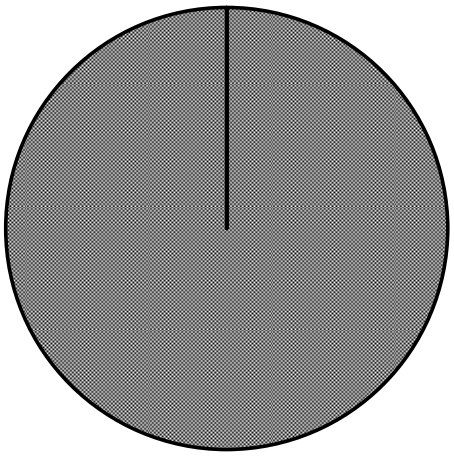
GRAPH 4: Level I pool types by percent occurrence

PINER CREEK 2005
MAXIMUM DEPTH IN POOLS



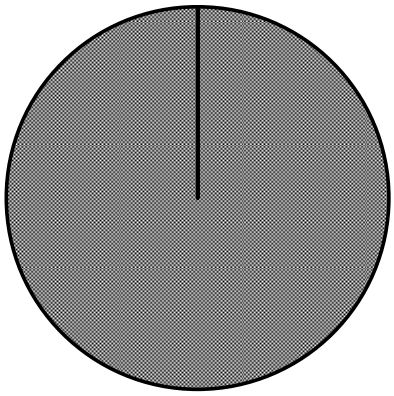
GRAPH 5

PINER CREEK 2005
PERCENT EMBEDDEDNESS



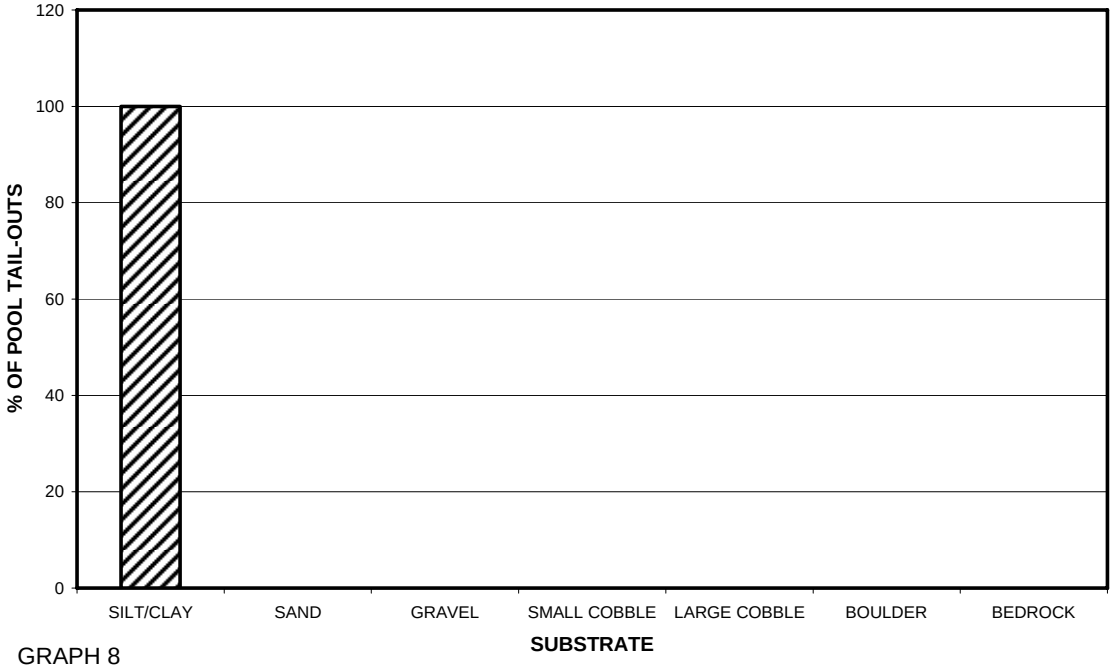
GRAPH 6

PINER CREEK 2005
MEAN PERCENT COVER TYPES IN POOLS



GRAPH 7

PINER CREEK 2005
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS

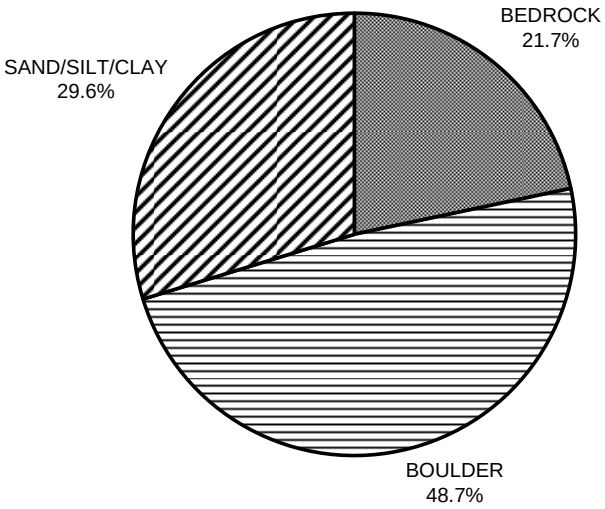


GRAPH 8

PINER CREEK 2005
MEAN PERCENT CANOPY

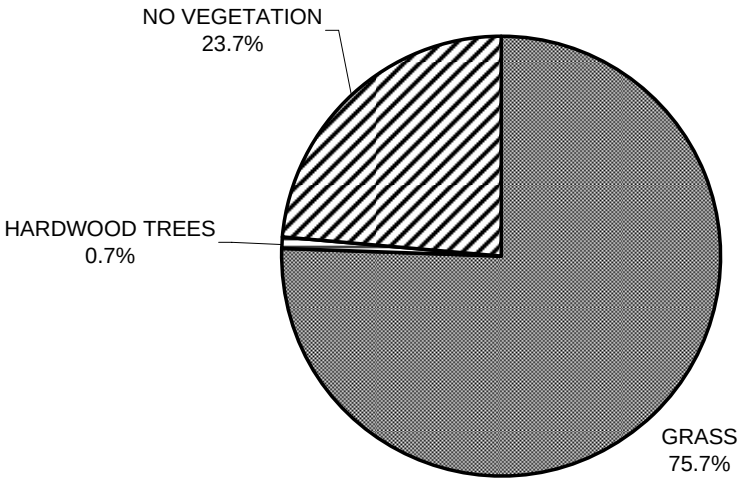
GRAPH 9

PINER CREEK 2005
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

PINER CREEK 2005
DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11

Piner Creek Fish Sampling Station 1 (Pi 1)

Location: confluence with Santa Rosa Creek upstream approximately 500 meters

Sampling Date: July 19, 2005

Sampling Methodology: Electrofishing. Two crews of two biologists leapfrogging upstream. Sampling duration 1952 seconds, combined.

Habitat description: Mixture of riffles and pools. Riffles choked with tules, rubble substrate. Pools approx. 1.5 feet deep and 15 feet wide. Sampling not efficient in pools. Water temperature 20ºC.

Meta Data contact: Shawn Chase, Sonoma County Water Agency,

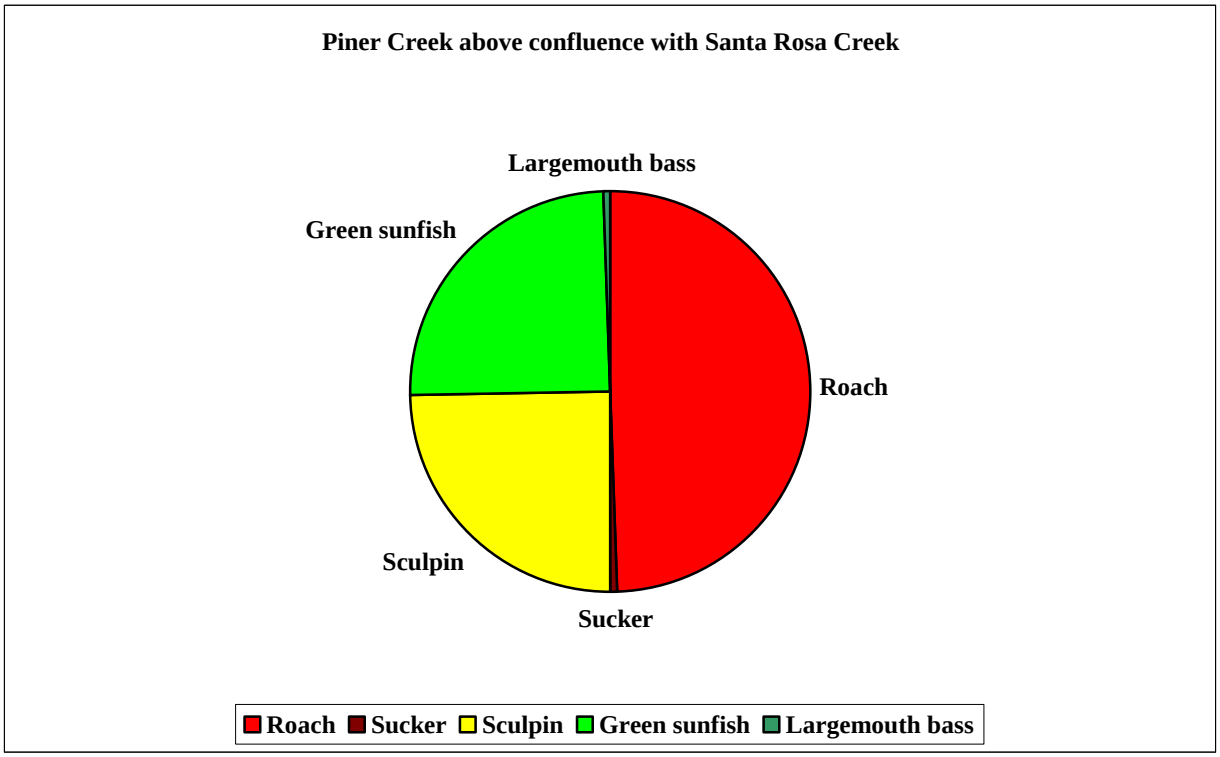
Lengths of fish measured

CA roach	Sac. Sucker	Riffle sculpin	Green sunfish
24	120	41	60
45	157	51	63
47		59	65
48		75	71
50		78	71
50		78	73
55		79	75
57		97	76
61		101	114
62			115
62			117
65			
65			
66			
67			
69			
70			
70			
73			
75			
80			
81			
85			
85			
89			
90			
90			

Piner Creek Fish Sampling Data Courtesy of Sonoma County Water Agency.

Piner Creek Fish Sampling Station 1 (Pi 1)

Relative species composition for fish sampling station Pi 1.



Piner Creek Fish Sampling Data Courtesy of Sonoma County Water Agency.

Piner Creek Station #2 (Pi 2)

Location: Confluence with Paulin upstream to Valdez Road

GPS coordinates: N/A

Sampling Date: September 26, 2005

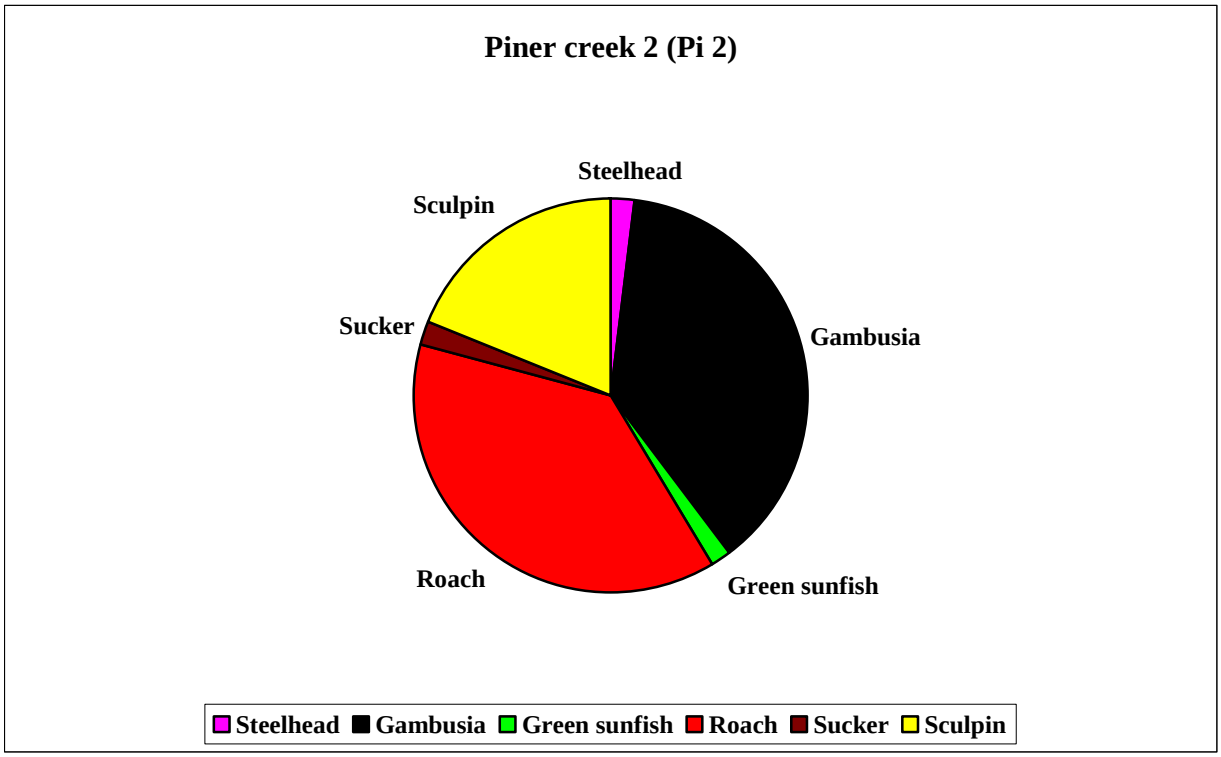
Sampling Methodology: Electrofishing. 1 shocker, 1 netter. Sampling duration 478 seconds,

Habitat description:

Meta Data contact: Shawn Chase, Sonoma County Water Agency.

Fish Captured:

7 steelhead, 3 approximately 100 mm FL, and 4 approximately 75 mm FL.



Percentage composition of fish captured in Piner Creek fish sampling station #2.

Piner Creek Fish Sampling Data Courtesy of Sonoma County Water Agency.

Piner Creek Station #3 (Pi 3)

Location: Piner Creek between Piner Road and Hopper Road

GPS coordinates: N/A

Sampling Date: August 30, 2005

Sampling Methodology: Electrofishing. 1 shocker, 1 netter. Sampling duration 540 seconds,

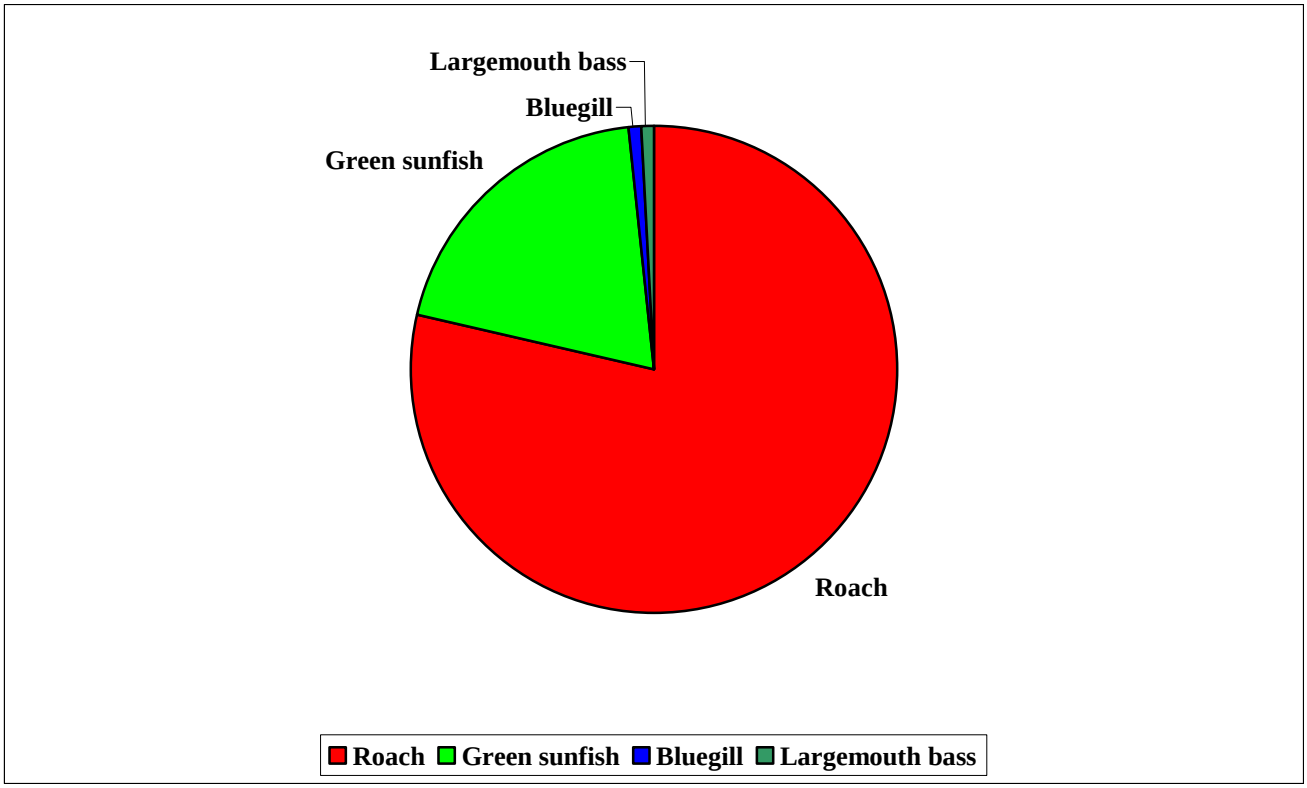
Water temperature 21.1 at 12:35

Habitat description:

Meta Data contact: Shawn Chase, Sonoma County Water Agency.

Fish Captured:

Roach	Bluegill	Green sunfish	Largemouth bass
Very abundant	100	110	155
	100	85	
		85	
		90	
		105	
		95	
		85	
		105	



Percentage composition of fish captured in Piner Creek fish sampling Station #3.

Piner Creek Fish Sampling Data Courtesy of Sonoma County Water Agency.

Piner Creek Station #4 (Pi 4)

Sampled on July 19, 2005 by SCWA

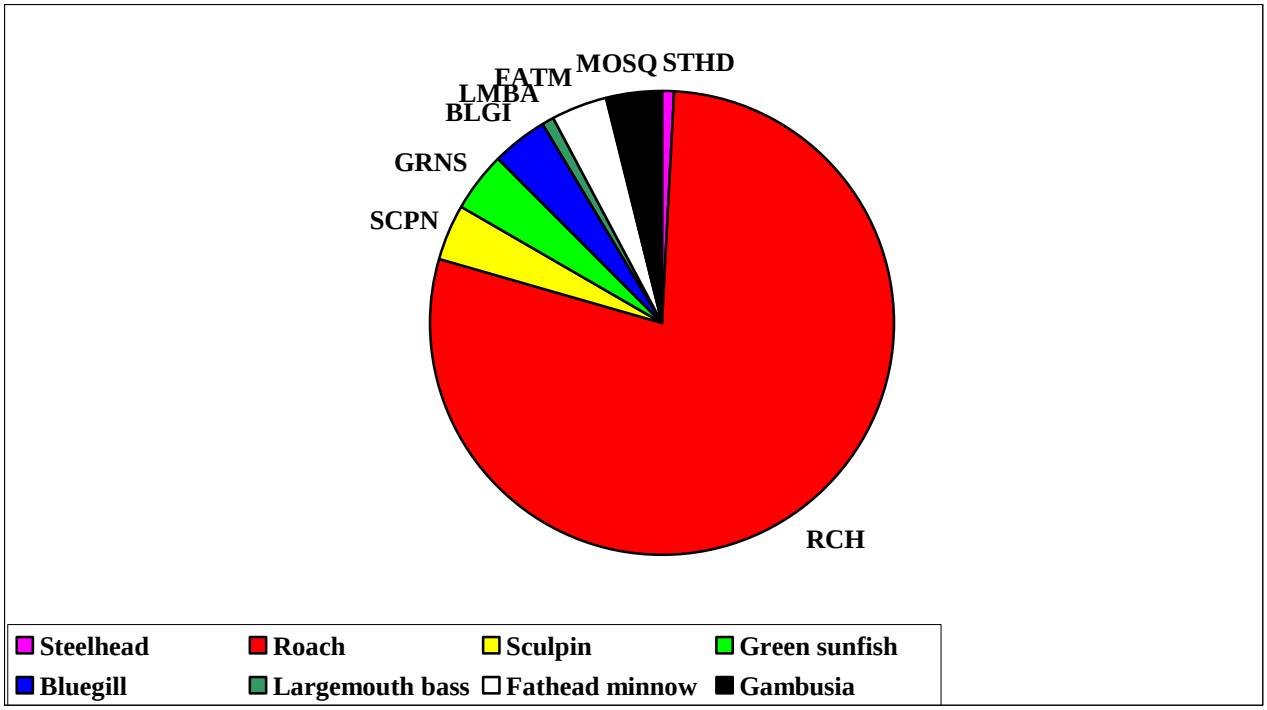
Sampling Methodology: Electrofishing. Two crews. Sampling duration 929 seconds, combined.

Habitat description: Mixture of riffles and pools. Stream channel choked with tules, and filamentous algae. Substrate anaerobic mud. Located near the upstream end of the channel prior to going under HWY 101.

Meta Data contact: Shawn Chase, Sonoma County Water Agency

Lengths

Roach	Sculpin	Bluegill	Green sunfish	Gambusia	Largemouth bass	Steelhead	Fathead Minnow
64	73	84	176	45	98	63	65
52	95		92		84		53
57	84		85				
58							
52							
70							
60							
60							
65							
52							
N/A							



Relative abundance of fish captured in Piner Creek upstream of Hopper Road (Pi 4).

Piner Creek Fish Sampling Data Courtesy of Sonoma County Water Agency.