

**DOCUMENTATION OF COHO SALMON (*ONCORHYNCHUS KISUTCH*)
IN PINE GULCH CREEK, MARIN COUNTY, CA.**



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A report from the
Coho Salmon and Steelhead Trout Restoration Project



February 2002

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Gregory G. Brown
Brannon J. Ketcham
Point Reyes National Seashore



February 2002

Documentation of Coho Salmon in Pine Gulch, 2001

Gregory Brown
Brannon Ketcham
National Park Service, Point Reyes National Seashore
(415) 464-5192
Brannon_Ketcham@nps.gov

ABSTRACT

Pine Gulch is a 19.8 square km watershed in coastal Marin County, California, and is the primary freshwater input to Bolinas Lagoon. The watershed supports a population of steelhead trout (*Oncorhynchus mykiss*) and it is generally accepted that the watershed supported a native self-sustaining population of coho salmon (*O. kisutch*) into the 1970's. Numerous fish surveys performed by the California Department of Fish and Game, National Park Service (NPS), and others had not detected coho in Pine Gulch since 1968, and it had been presumed extirpated, possibly due to a combination of drought and in-stream damming during the mid 70's.

NPS biologists have conducted comprehensive surveys for juvenile and adult salmonids on Pine Gulch since 1997. During electrofishing surveys in August 2001, several juvenile coho were captured from four locations on the lower 7.5 km of the 12 km mainstem. A follow-up Hankin Reeves type survey was conducted to determine distribution and approximate numbers of coho. Results indicate approximately 538 juvenile coho distributed in two clusters, suggesting they may have originated from more than one redd. Collected tissue samples will be genetically analyzed and may indicate genetic variability of the coho in Pine Gulch Creek, as well as relatedness to coho in adjacent watersheds and other watersheds within the Central California Coast Evolutionarily Significant Unit.



ACKNOWLEDGEMENTS

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For additional copies or information related to this document, please contact Brannon Ketcham, Water Resources and Restoration Branch Chief at (415) 464-5192 or brannon_ketcham@nps.gov.

LIST OF APPENDICES

Appendix A – Habitat, Snorkel, and Electrofishing Survey Results

Appendix B – Electrofishing Log

Appendix C – Genetic Sample Summary Table

BACKGROUND

Pine Gulch is a 19.8 square km watershed in coastal Marin County, California, and is the primary freshwater input to Bolinas Lagoon (map 1). The upper portion (75%) is contained within Point Reyes National Seashore (PRNS) and the Golden Gate National Recreation Area (GGNRA). The lower portion (25%) is privately owned, with organic agriculture the primary land use.

The watershed supports a population of steelhead trout (*Oncorhynchus kisutch*) and it is generally accepted that the watershed supported a native self-sustaining population of coho salmon (*O. mykiss*) into the 1970's. The last documented observation of coho salmon is on file at the Yountville office of the California Department of Fish and Game (CDFG). This visual survey conducted in July of 1968 reads, "coho salmon, 20 fish per 100 foot length of stream." The reasons for extirpation of coho salmon in Pine Gulch are uncertain. It is likely, however, that the drought of the late 1970's coupled with in-stream damming during this period severely depleted multiple year classes and led to unsuitable conditions for continued survival of the species within the Pine Gulch watershed.

National Park Service biologists from PRNS and GGNRA have performed numerous fish surveys on the 12 km mainstem of Pine Gulch since 1997. We conducted a Hankin Reeves survey (Dollof et al, 1993) on the lower 8 km in the fall of 1997, and spawner surveys during the winters of 1997-98 and 2000-01. A downstream migrant pipe trap was run during spring 1999, and in spring 2000 we snorkeled 75 pools along the lower 8.5 km. In summer 2000, 8 index sites were established throughout the lower 8 km of the mainstem for yearly monitoring (table 1). No coho salmon were detected in any of these surveys (with the exception of a partial carcass tentatively identified as an adult female coho in winter 2000-01).

During electrofishing surveys of the index sites in August 2001, several juvenile coho were captured in index sites 2, 3 and 5, and a single coho was captured in index site 1b. To further determine the distribution of juvenile coho in Pine Gulch, and develop a rough population estimate, a modified Hankin-Reeves type survey was conducted in September 2001 (map 2).

Table 1. Index sites on Pine Gulch.

Index Site #	Name/Location	Stream Km	Total Length (m)	# habitat units (2001)
1a	MCOSD (Open Space)	0.3	28	4 pools, 3 riffles
1b	Murch's	0.4	84	2 pools, 2 flatwater, 1 riffle
1c	Weber's	0.7	61	4 pools, 2 riffles
2	Paradise Valley	2.8	83	3 pools, 1 flatwater, 1 riffle
3	Gorge	3.9	74	4 pools, 1 riffle
4	BPUD pasture	5.1	51	2 pools, 1 riffle
5	lower Teixeira	6.8	67	4 pools, 2 riffles
6	upper Teixeira	7.8	78	4 pools, 1 riffle

METHODS

We surveyed approximately 7 km of the Pine Gulch mainstem starting at the top of the dredge pool on Marin County Open Space District land (MCOSD) at stream km 0.3, and continuing upstream to the McCurdy creek confluence at km 7.3. The coho survey was intended to encompass the downstream (index site 1b at km 0.4) and upstream (index site 5 at km 6.8) extents of coho detected during index site surveys. We habitat typed the entire reach and conducted snorkel counts in a subset of the pool units. All index site pools (which had already been electrofished) within the coho survey area were also snorkeled, and the electrofishing results used to calibrate the snorkel counts.

Habitat Typing

Starting at the bottom of the coho survey area and working upstream, we numbered, classified, measured the length, and estimated the average width of each habitat unit. Units were classified as pool (scour pool, backwater pool, plunge pool, or mid-channel pool), flatwater, or riffle. Every fifth pool unit was flagged for snorkeling and several measured widths taken to calibrate the estimated width.

Snorkel Counts

We sampled each of the previously determined pools with a single pass snorkel count, using a dive light to search under vegetation, woody debris, and undercut banks. Only coho were counted but the presence of steelhead and non-salmonid fish were noted, as well as cover, habitat complexity, and general survey conditions.

Electrofishing

Prior to this coho survey, the index sites within the coho survey area had already been sampled using standard multiple-pass depletion electrofishing methods. We isolated each habitat unit with block seine nets, electrofished, and counted, measured, and weighed all fish captured. Population estimates for each unit were made using the computer program *Microfish* (VanDeventer and Platts 1989).

Data Analysis

Survey data were entered into a Microsoft Access database, and from there imported into Microsoft Excel for processing and analysis (Appendix A). All calculations and population estimates were made using methods outlined in Dollof et al (1993).

RESULTS

Habitat Survey

A total of 520 habitat units were identified (248 pool, 83 flatwater, and 189 riffle units). By length, pools comprised 53%, flatwater units 20%, and riffles 27% of the coho survey area (table 2). Habitat composition of the index sites is shown in table 3 for comparison. Correlation between visually estimated and measured surface area of 40 pools was high ($R^2=0.96$) and a calibration ratio of 1.02 was used to correct the estimated surface area of all units (figure 1).

Table 2. Habitat composition of Pine Gulch coho survey area, September 2001

Unit type	total number	%	total length (m)	%	total surface area (m ²)	%
pool	248	48	3755	53	12436	62
flatwater	83	16	1381	20	3927	19
riffle	189	36	1873	27	3884	19
All units	520	100	7009	100	20247	100

Table 3. Habitat composition of Pine Gulch index sites, August 2001.

Unit type	total number	%	total length (m)	%	total surface area (m ²)	%
pool	27	64	414	79	1286	83
flatwater	3	7	43	8	119	8
riffle	12	29	69	13	148	9
All units	42	100	526	100	1553	100

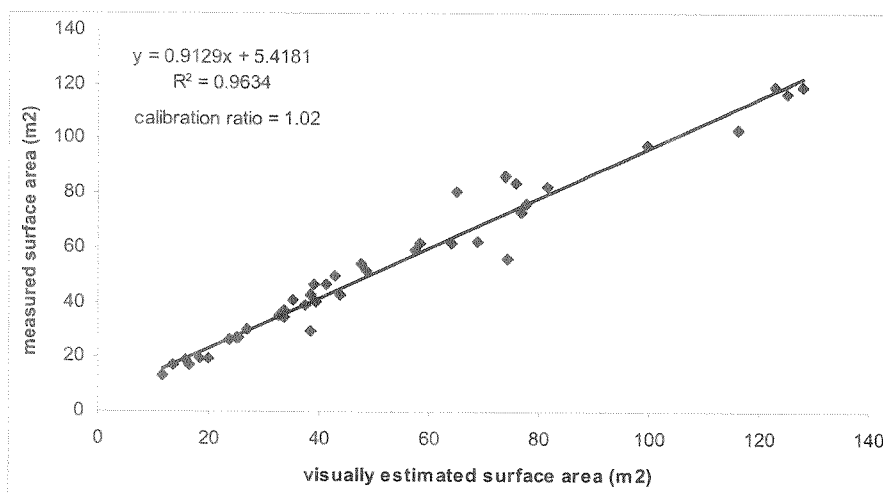


Figure 1. Measured vs. visually estimated surface area of 40 pools; Pine Gulch, September 2001

Snorkel counts

We dove a total of 68 pools, and counted a total of 152 coho in 28 of the pools. Seventeen of the 68 pools had been electrofished in the previous two weeks (Appendix B). *Microfish* population estimates for the electrofished pools were used to calibrate the snorkel counts. Correlation between electrofishing and snorkel counts was low but acceptable ($R^2=0.69$) and a calibration ratio of 1.0625 was used to correct the snorkel counts for all pools (figure 2). Coho densities (by both pool length and surface area), population estimate, and 95% confidence interval were calculated for the coho survey area as a whole (table 4).

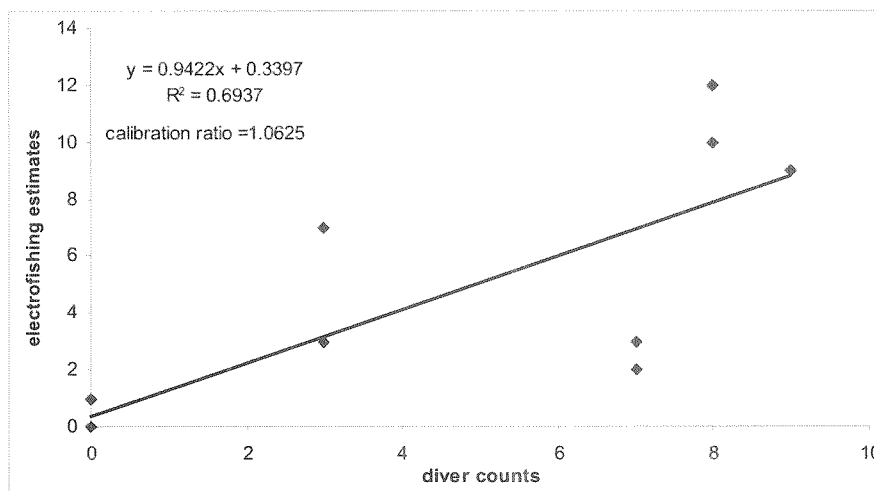


Figure 2. Electrofishing estimates vs. snorkel counts for 17 pools, Pine Gulch, September 2001

Table 4. Coho density and population estimates (assuming continuous distribution); Pine Gulch coho survey area, September 2001

Reach	Avg Coho per pool		Density		Population Estimate	Variance	95% conf. interval
	Original	Calibrated	coho/m	coho/m ²			
All	2.24	2.38	.1475	.0452	589	24104	± 329

Coho observed in the snorkel surveys appeared to be distributed in two clusters, from unit 183 to 293 and from unit 384 to 519 (stream km 2.7 - 4.3 and km 5.7 - 7.3), with a gap in between (figure 3). Based on the uneven distribution of coho in the snorkeled pools, we divided the surveyed area into 4 reaches (table 5) and calculated separate coho densities, population estimates, and 95% confidence intervals for the two reaches in which they were detected (table 6). Using this method we estimated an overall population of 538 (± 349) coho (compared to 589 ± 329 assuming continuous distribution), with most of those occurring in the upper 1.5 km of the surveyed area. Coho densities from snorkeled pools where they were observed ranged from 0.017 to 0.161 coho/m² in reach 2 and from 0.025 to 0.358 coho/m² in reach 4 (based on calibrated surface area and fish #'s). For comparison, coho densities for pools from the index sites where they were found are given in table 7.

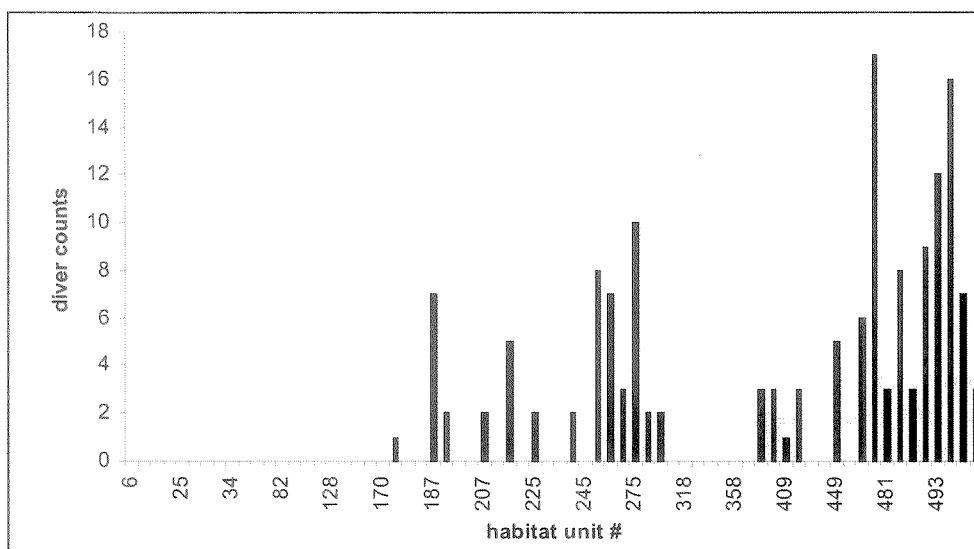


Figure 3. Distribution of coho in snorkeled pools on Pine Gulch, September 2001

Table 5. Summary of coho snorkel counts on Pine Gulch, September 2001

Reach	Habitat Unit #	Location (stream km)	# of Pools			Coho Counted
			Total	Snorkeled	w/ Coho	
1	1-182	0.3 to 2.7	89	21	0	0
2	183-293	2.7 to 4.3	55	22	13	53
3	294-383	4.3 to 5.7	36	7	0	0
4	384-519	5.7 to 7.3	68	18	15	99
			248	68	28	152

Table 6. Coho density and population estimates (assuming clustered distribution); Pine Gulch coho survey area, September 2001

Reach	Avg Coho per pool		Density		Population Estimate	Variance	95% conf. interval
	Original	Calibrated	coho/m	coho/m ²			
2	2.41	2.56	.1482	0.0485	141	4191	± 166
4	5.50	5.84	.4061	0.1186	397	14205	± 379
					538	18396	± 349

Table 7. Coho population estimates and densities from Pine Gulch index sites; August 2001.

Index Site	Unit	Unit Type	Length (m)	Surface Area (m ²)	# Coho	Density	
						co/m	co/m ²
1b	5	scour pool	20.0	64.98	1	0.0500	0.0154
2	1	scour pool	15.6	53.35	1	0.0641	0.0187
	5	scour pool	31.0	104.16	3	0.0968	0.0288
3	2	scour pool	17.5	70.00	10	0.5714	0.1429
	4	scour pool	19.8	83.16	2	0.1010	0.0241
	5	scour pool	19.5	60.06	3	0.1538	0.0500
5	1	scour pool	14.2	30.35	7	0.4930	0.2306
	3	scour pool	18.2	63.70	12	0.6593	0.1884
	4	scour pool	11.6	26.97	3	0.2586	0.1112
	6	scour pool	11.7	48.85	9	0.7692	0.1842

DISCUSSION

The clustered distribution of the juvenile coho observed during snorkel surveys suggests that they may have originated from more than one redd. The partial carcass of an adult female salmonid tentatively identified as a coho was found at km 4.6 during routine spawner surveys in January 2001, just upstream of the lower cluster of juvenile coho observed in reach 2. Tissue samples from this carcass and the juvenile coho captured during electrofishing are undergoing genetic analysis and will hopefully indicate the degree of relatedness among the juveniles, the carcass, and coho from adjacent watersheds (Appendix C).

The observed “gap” in distribution, from km 4.3 to 5.7, coincides with an area affected by cattle grazing in an unfenced pasture adjacent to the creek from km 4.8 to 5.7. There is a noticeable increase in bank erosion and substrate embeddedness, and decrease in riparian cover, adjacent to and downstream of the pasture section. Cattle exclusion through land acquisition is proposed for this area. In cooperation with the Save-the Redwoods League, Point Reyes National Seashore is working to raise the funds for acquisition and protection of 73 acres currently within the Seashore boundary, but owned and managed by the Bolinas Community Public Utilities District. Conversion to NPS ownership would precipitate restoration and management as part of the Natural Zone. Livestock grazing would be eliminated from the property.

Several theories could explain the occurrence of coho in Pine Gulch after so many years of apparent absence:

- Strays: The winter of 2000-01 appeared to be a productive year for a relatively strong year class, and the coho spawning runs in this area were the highest in several years. It is possible that some strays from the adjacent Olema/ Lagunitas or Redwood Creek watersheds managed to successfully spawn in Pine Gulch. If this were the case, then genetic analysis would presumably show a close relation between the carcass and coho from one of the adjacent watersheds. Since any strays involved in spawning may not all have come from the same watershed, the juvenile coho (as offspring of parents from two different watersheds) might show less relatedness to a particular watershed.
- Relict year class: This year class may have survived in Pine Gulch at levels too low for detection, and started to rebound during this favorable year. If so, the year class would have been present as spawners during the winter of 1994-95 and 1997-98, as juveniles during the summer/fall of 1995 and 1998, and as outmigrating smolts during the spring of 1996 and 1999. There have been some unconfirmed anecdotal sightings of coho over the years (winter of 1993-94 and 1996-97) but these would have represented different year classes. At any rate, it seems unlikely that the numerous surveys conducted by NPS since 1997 (including spawner surveys winter 1997-98 and smolt trap spring 1999) would have missed any coho that might have been present. Genetic analysis in this case would probably show less relatedness between the Pine Gulch coho and those from adjacent watersheds.
- Planted coho: We can't discount the possibility that some juvenile coho were planted in Pine Gulch three years ago, and enough survived to return and spawn this year. Any planted coho would likely have come from a limited area within a single watershed, so the Pine Gulch

coho, as their offspring, would show much less genetic diversity than the other two scenarios. Assuming at least two redds and two different spawning pairs in winter 2000-01, at least 4 adult coho would have had to survive and return to spawn. Based on coho survival rates in Sandercock (1991), we can roughly estimate a 1% survival rate for any planted juveniles, so at least 400 young-of-year coho would have to be planted to yield 4 returning adults. The difficulty in capturing and transporting this many fish in an unsanctioned planting effort makes this a much less likely scenario.

Recent spawner surveys conducted this winter have detected a second coho year class in Pine Gulch, represented by a single spawning pair seen in December, 2001. Coincidentally, this pair and their associated redds were located at stream km 6.7, in the same area where the highest densities of juvenile coho were seen the previous summer. At the very least, this indicates the presence of good spawning habitat in this area.

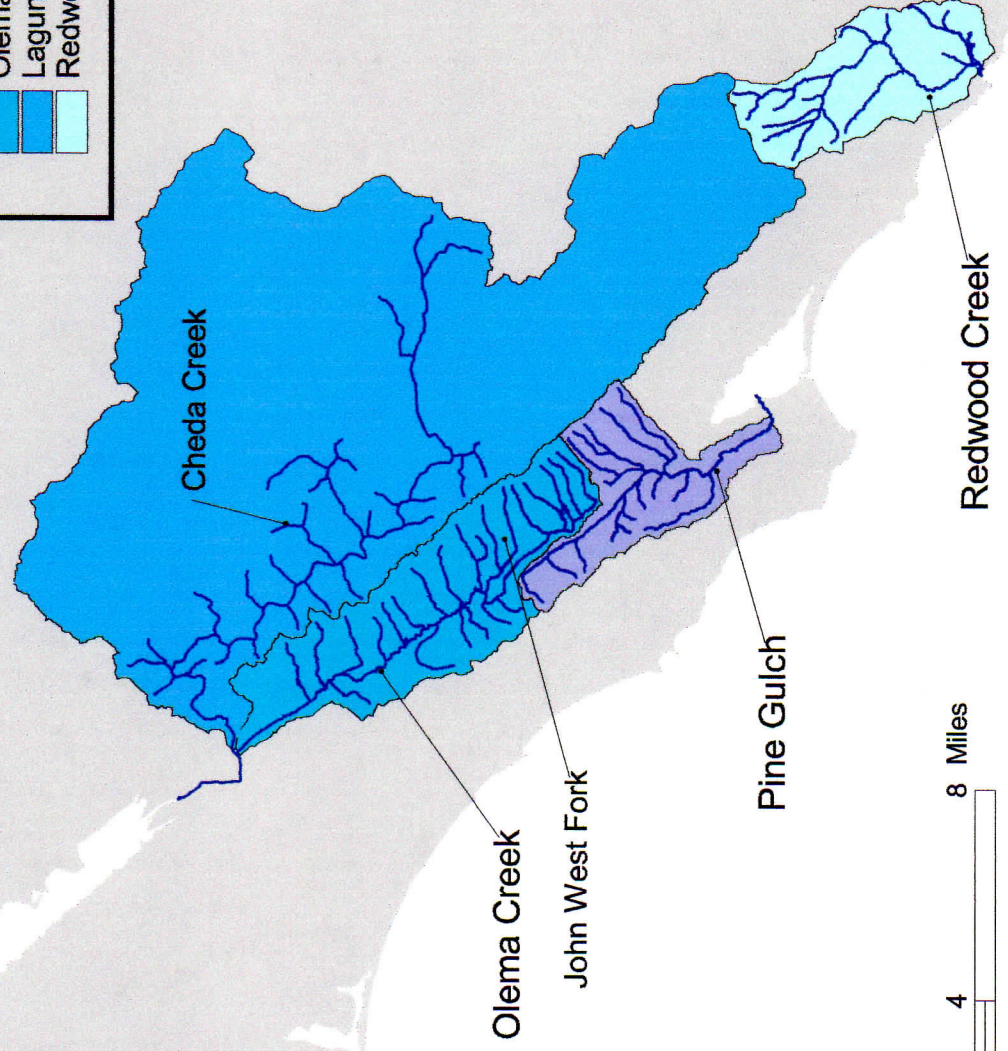
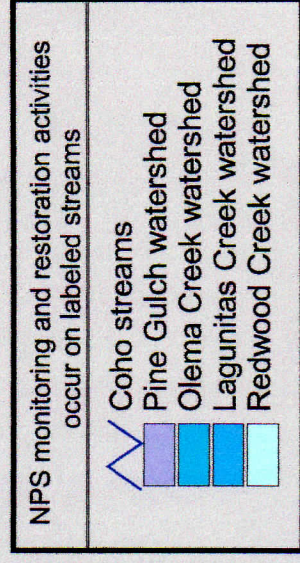
Whether the Pine Gulch coho are the result of spawners straying from the Lagunitas/Olema Creek or Redwood Creek watersheds, or one or more surviving year classes that have managed to escape detection, their presence is significant and will definitely affect future monitoring and management of the watershed.

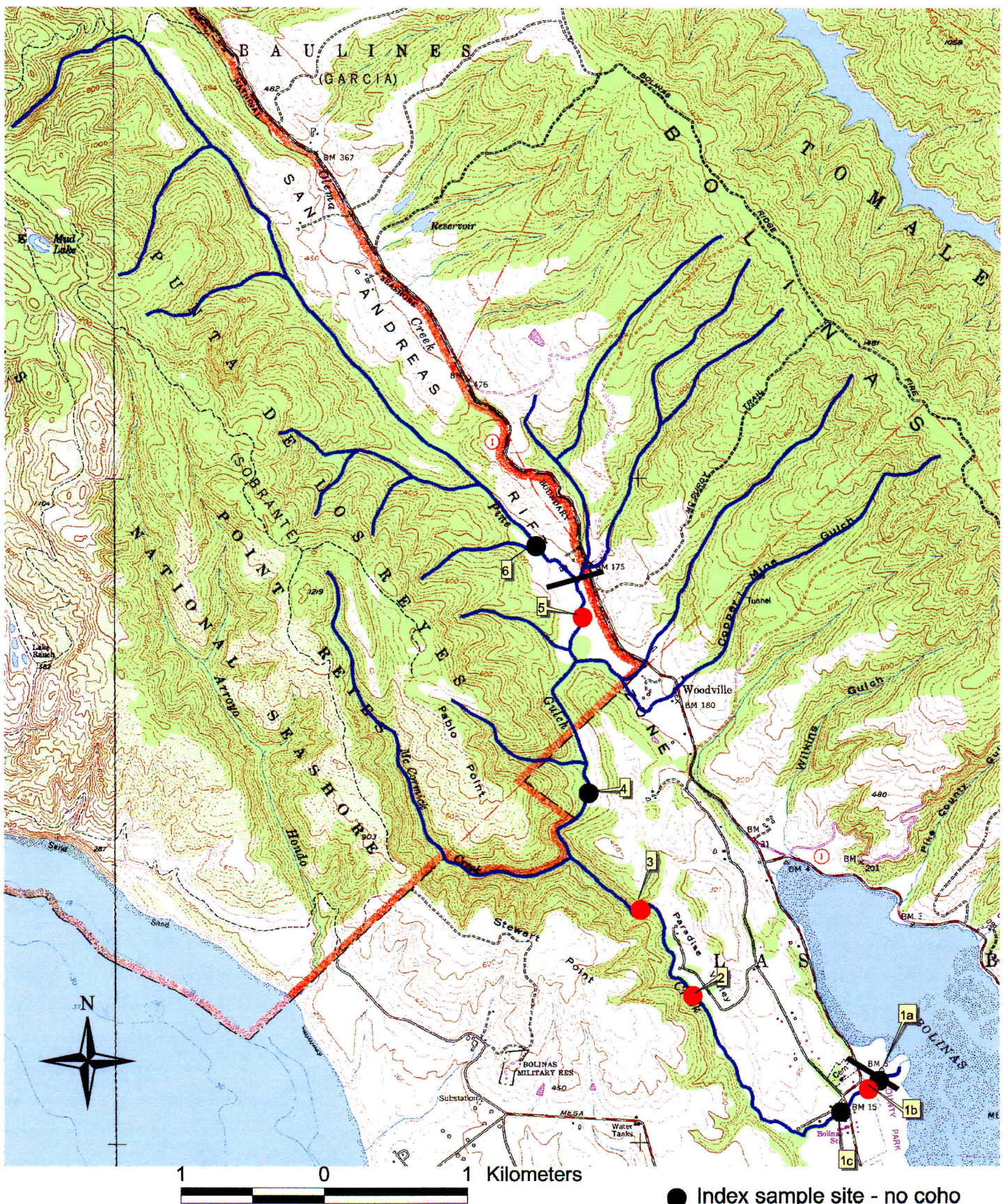
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Map 1

Streams supporting Coho Salmon, Marin County, CA





Map 2. Index site and survey area locations on Pine Gulch; Aug-Sept 2001. (Bolinas 7.5' quad)

Appendix A
Habitat, Snorkel, and Electrofishing Survey Results

Unit Number	Unit Type	Length	Estimated Width	Measured Widths				Surface Area		Depth			Diver	Snorkel Counts			Electrofishing			
				1	2	3	4	Estimated	Measured	Corrected	Crest	Max		Residual	Date	CO	Calibrated CO	CO/m2	SH YOY	CO
1	FW	15.9	2.1					33.39		33.90										
2	R	9.3	0.9					8.37		8.50										
3	SC	2.4	4					96		97.47										
4	FW	23.2	2.5					58		58.89										
5	SC	18.4	3					55.2		56.05										
6	SC	11	3.5	2.3	2.9	2.8		38.5	29.33	39.09		Brown	0	0	0					
7	R	6.7	2					13.4		13.61										
8	FW	28.8	3.25					87.1		88.44	0.07	0.17	0.1	09/05/01	Brown	0	0	0	11	0
9	FW	25.6	3	2.86				76.8	73.22	77.98	0.06	0.32	0.26	09/05/01	Brown	0	0	0	21	0
10	SC	20	3.2	3.08				64	61.6	64.98	0.1	0.57	0.47	09/05/01	Brown	0	0	0	23	11
11	R	3	1					3		3.05										
12	FW	11.3	2.8					31.64		32.13										
13	R	9.6	3					28.8		29.24										
14	FW	6.1	3.7					22.57		22.92										
15	R	12.9	1.8					23.22		23.58										
16	MC	11.7	6					70.2		71.28										
17	FW	10.9	2.2					23.98		24.35										
18	SC	11.5	4.5					51.75		52.54										
19	SC	21.7	3.5					75.95		77.12										
20	R	14.4	2					28.8		29.24										
21	SC	22.1	3					66.3		67.32										
22	FW	17.6	1.5					26.4		26.81										
23	FW	20.2	3.1					62.62		63.58										
24	R	6	0.9					5.4		5.48										
25	SC	14.3	2.81					40.18	40.18	40.18	0.05	0.75	0.7	09/05/01	Brown	0	0	0	23	4
26	R	5.2	1.4	1.2	1.4			6.93		6.93										
27	SC	17.2	3.44					59.17	59.17	59.17	0.06	0.85	0.79	09/05/01	Brown	0	0	0	18	11
28	SC	12.6	2.6	2.6	3.1	2.66		34.52	34.52	34.52	0.19	0.46	0.27	09/05/01	Brown	0	0	0	17	4
29	R	4	1.05	1.15	1.55			5		5										
30	SC	7.6	4	4.1	4.4	4.7	3.6	31.92	31.92	31.92	0.04	0.74	0.7	09/05/01	Brown	0	0	0	6	3
31	FW	20.2	2.1					42.42		43.07										
32	SC	16.8	2.1					35.28		35.82										
33	SC	16.2	1.8					29.16		29.61										
34	SC	17.3	2.8	3.3	2.6	3.1		48.44	51.9	49.18	0.06	0.61	0.55	09/05/01	Brown	0	0	0		
35	R	17.7	2.3					40.71		41.34										
36	FW	22.8	4					91.2		92.60										
37	SC	11.2	3					33.6		34.12										
38	SC	14.1	2.5					35.25		35.79										
39	SC	6.5	5					32.5		33.00										
40	R	4.2	0.7					2.94		2.99										
41	SC	16.4	4					65.6		66.61										
42	FW	17	0.5					8.5		8.63										
43	SC	11.5	3.8					43.7		44.37										
44	R	7.1	2.5					17.75		18.02										
45	FW	17.6	2.5					44		44.68										
46	FW	23	3					69		70.06										
47	R	5.6	2.2					12.32		12.51										
48	FW	14.9	3.2					47.68		48.41										
49	SC	14.6	2.3	2.5	2.1	3		33.58	36.99	34.10	0.05	0.47	0.42	09/05/01	Brown	0	0	0		
50	SC	19.3	2.5					48.25		48.99										
51	R	5.2	0.9					4.68		4.75										
52	SC	18.4	2.9					53.36		54.18										
53	R	9.9	3					29.7		30.16										
54	SC	24.1	3.5					84.35		85.65										
55	SC	4.8	2					9.6		9.75										
56	R	10.8	0.6					6.48		6.58										
57	SC	12.2	5					61		61.94										
58	R	6	4					24		24.37										
59	SC	30.6	3.8	2.65	3	3.8	4.1	116.28	103.66	118.07	0.08	0.55	0.47	09/05/01	Brown	0	0	0		
60	R	15.2	3.5					53.2		54.02										

Unit Number	Unit Type	Length	Estimated Width	Measured Widths				Estimated	Surface Area		Depth	Snorkel Counts		Electrofishing										
				1	2	3	4		Measured	Corrected	Crest	Max	Residual	Date	Diver	CD	Calibrated	CD	COm2	SH	YOY	SH	1+	
61	SC	16.6	5.5					91.3		92.70														
62	R	7.2	1.8					12.96		13.16														
63	SC	23.4	4.8					112.32		114.05														
64	R	5	1.7					8.5		8.63														
65	SC	17.6	3.9					68.64		69.69														
66	R	3	1					3		3.05														
67	SC	18	2.5					45		45.69														
68	R	3	1					3		3.05														
69	SC	12.2	2.2					26.84		27.25														
70	R	12.4	1					12.4		12.59														
71	SC	6.8	3.5					23.8		24.17														
72	R	5.6	0.8					4.48		4.55														
73	SC	15.6	2.1	1.5	1.7	2.4	3.4	32.76	35.1	33.26	0.05	0.4	0.35	09/05/01	Brown	0	0	0	0					
74	R	16.7	1.2					20.04		20.35														
75	SC	11.1	3.4					37.74		38.32														
76	R	11.5	2.1					24.15		24.52														
77	SC	22.1	3					66.3		67.32														
78	R	3.2	1.5					4.8		4.87														
79	SC	9.5	3					28.5		28.94														
80	FW	40.8	3.5					142.8		144.99														
81	R	8	2.5					20		20.31														
82	SC	11.2	3	2.7	3.3	3.2	3.1	33.6	34.44	34.12	0.04	0.76	0.72	09/05/01	Brown	0	0	0	0					
83	FW	24.7	2					49.4		50.16														
84	SC	18.2	3					54.6		55.44														
85	FW	24.2	2.5					60.5		61.43														
86	SC	23.1	3.5					80.85		82.09														
87	FW	4.7	0.5					2.35		2.39														
88	SC	11.1	4					44.4		45.08														
89	R	28.9	1					28.9		29.34														
90	SC	8	3					24		24.37														
91	SC	11.4	4					45.6		46.30														
92	R	12.8	1					12.8		13.00														
93	SC	17.2	4	3.2	4.2	4.1	3	68.8	62.35	69.86	0.05	0.57	0.52	09/05/01	Brown	0	0	0	0					
94	R	1.6	0.5					0.8		0.81														
95	SC	9.6	2.5					24		24.37														
96	R	4.4	1.5					6.6		6.70														
97	SC	5.4	3					16.2		16.45														
98	R	5.3	1					5.3		5.38														
99	SC	5.1	5					25.5		25.89														
100	FW	17.4	2.5					43.5		44.17														
101	SC	9.6	2.5					24		24.37														
102	R	5	0.5					2.5		2.54														
103	SC	10.2	4					40.8		41.43														
104	R	10.8	0.6					6.48		6.58														
105	SC	7.4	2.5	2.3	3	2.6		18.5	19.49	18.78	0.09	0.31	0.22	09/05/01	Brown	0	0	0	0					
106	MC	8.8	2					17.6		17.87														

Unit Number	Unit Type	Length	Estimated Width	Measured Widths				Surface Area		Depth			Stroke Counts		Electrofishing								
				1	2	3	4	Estimated	Measured	Corrected	Crest	Max	Residual	Date	Diver	CO Calibrated	CO Colm2	SH YOY	SH 1+	# Passed	CO	SH YOY	SH 1+
121 FW		22.7	2.5					56.75	72.9	57.62													
122 FW		24.3	3					72.9	74.02														
123 R		26	2.5					65	66	66.00													
124 FW		35.5	6.5					230.75	234.29														
125 SC		13	5					65	66.00														
126 R		6.1	2					12.2	12.39														
127 SC		24.3	3					72.9	74.02														
128 SC		12.5	3.5	3.8	3.5	3		43.75	42.92	44.42	0.15	0.89	0.74	09/05/01	Brown	0	0	0	0				
129 SC		14.7	3					44.1	44.78														
130 R		48	5					240	243.69														
131 FW		20	3					60	60.92														
132 R		15.5	2.5					38.75	39.35														
133 SC		12.8	3.5					44.8	45.49														
134 SC		9.2	3					27.6	28.02														
135 R		16.7	2.5					41.75	42.39														
136 FW		16.1	3					48.3	49.04														
137 BW		10	2					20	20.31														
138 R		16.5	4					66	67.01														
139 SC		8.2	6					49.2	49.96														
140 FW		51.8	5.5					284.9	289.28														
141 FW		20.8	5.5					114.4	116.16														
142 R		8	1.5					12	12.18														
143 SC		13.5	2	2	2.4	2.3		27	30.15	27.41	0.07	0.33	0.26	09/05/01	Brown	0	0	0	0				
144 SC		6.4	7					44.8	45.49														
145 SC		8.7	3					26.1	26.50														
146 R		15	1.5					22.5	22.85														
147 SC		6.8	7					47.6	48.33														
148 FW		11.9	3					35.7	36.25														
149 SC		10.4	4					41.6	42.24														
150 R		4.2	2					8.4	8.53														
151 SC		13	2.5					32.5	33.00														
152 R		20.2	1.5					30.3	30.77														
153 SC		9	1.5	2	1.9	1.7		13.5	16.8	13.71	0.09	0.3	0.21	09/05/01	Brown	0	0	0	0				
154 SC		8	1.5					12	12.18														
155 SC		7.1	3					21.3	21.63														
156 R		26.1	1					26.1	26.50														
157 SC		6.5	2.5					16.25	16.50														
158 FW		26	5.5					143	145.20														
159 SC		17.6	4.5					79.2	80.42														
160 SC		21.2	3.5	2.3	2.1	3.5		74.2	55.83	75.34	0.15	0.45	0.3	09/05/01	Brown	0	0	0	0				
161 R		5.4	1					5.4	5.48														
162 SC		18.8	3.5					65.8	66.81														
163 FW		18.6	1.5					27.9	28.33														
164 SC		19.4	4.5					87.3	88.64														
165 SC		21	4					84	85.29														
166 R		5.8	2					11.6	11.78														
167 SC		9.1	4.5					40.95	41.58														
168 R		5	2					10	10.15														
169 SC		10	3.5					35	35.54														
170 SC		8	2.5	2.7	2.3	2.4		20	19.73	20.31	0.22	0.65	0.43	09/05/01	Brown	0	0	0	0				
171 R		18.2	1					18.2	18.48														
172 SC		12.7	3					38.1	38.69														
173 R		6.8	3					20.4	20.71														
174 SC		25.5	4					102	103.57														
175 R		5	0.7					3.5	3.55														
176 SC		5.3	6					31.8	32.29														
177 R		7.4	1					7.4	7.51														
178 SC		30	2.5					75	76.15														
179 SC		9.9	4					39.6	40.21														
180 R		4.8	0.6					2.88	2.92														

Unit	Unit Number	Type	Length	Estimated Width	Measured Widths				Surface Area		Depth		Diver	Snorkel Counts				Electrofishing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
					1	2	3	4	Estimated	Measured	Corrected	Crest		Max	Residual	Date	CO	Fairbairn	CO	SH	YOY	SH	1+																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	181	SC	11.7	3	3.8	3.2	3.5		35.1	40.95	35.64	0.08	0.65	0.57	09/05/01	Brown	1	1.25	0.035																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							</

Unit Number	Unit Type	Length	Estimated Width	Measured Widths				Surface Area		Corrected	Depth		Date	Diver	Snorkel Counts		Electrofishing				
				1	2	3	4	Estimated	Measured		Crest	Max			Residual	CO Calibrated	CO m2	SH YOY	SH 1+	Date	# Passes
241 FW	24	2.5						60	60.92												
242 R	153	1.25						19.13	19.42												
243 SC	124	4.5						55.8	56.66												
244 FW	55	1.25						6.88	6.88												
245 MC	8	2.5						20	20.31				08/29/01	Fong	0	0	0	7	1		
246 R	3	1.5						4.5	4.57												
247 SC	149	1.75						26.08	26.48												
248 R	254	1.25						31.75	32.24												
249 SC	22.5	3.25						73.13	74.25												
250 FW	20.6	2						41.2	41.83												
251 SC	18.6	4						74.4	75.54												
252 R	8.8	2.75						24.2	24.57												
253 FW	16.2	3						48.6	49.35												
254 SC	18.2	2.5						45.5	46.20												
255 R	10.7	1.5						16.05	16.30												
256 FW	13.1	2						26.2	26.60												
257 R	10.8	2						21.6	21.93												
258 SC	20.3	5						101.5	103.06												
259 R	10.5	1.5						15.75	15.99												
260 SC	7.3	2.75						20.08	20.38												
261 SC	17.5		4						70	70.00	0.04	0.49	0.45	09/06/01	Press	8	10	0.143			
262 R	9.8		2.1	1.7	1.1				16.01	16.01											
263 SC	19.8		4.2						83.16	83.16	0.1	0.8	0.7	09/06/01	Press	7	8.75	0.105			
264 SC	19.5		3.08						60.06	60.06	0.15	0.52	0.37	09/06/01	Press	3	3.75	0.062			
265 SC	12.8	3						38.4	38.99												
266 R	5.4	1.5						8.1	8.22												
267 FW	11.2	3.5						39.2	39.80												
268 SC	11.2	3						33.6	34.12												
269 R	2.4	0.8						1.92	1.95												
270 FW	6.3	2.5						15.75	15.99												
271 R	39	2						78	79.20												
272 BW	5.9	1						5.9	5.99												
273 SC	18.4	3.5						64.4	65.39												
274 R	11.3	3						33.9	34.42												
275 SC	21.7	3	3	4.5	3.9	3.5		65.1	80.83	66.10	0.08	0.45	0.37	09/06/01	Brown	10	12.5	0.189			
276 MC	15.2	2.5						38	38.58												
277 R	2.9	1						2.9	2.94												
278 SC	9	3						27	27.41												
279 R	12.8	1						12.8	13.00												
280 SC	11.6	3.5						40.6	41.22												
281 R	13.2	1.5						19.8	20.10												
282 SC	18.2	3						54.6	55.44												
283 SC	7.3	4						29.2	29.65												
284 R	6.9	1.5						10.35	10.51												
285 SC	8.2	2	2.1	2.2	2			16.4	17.22	16.65	0.12	0.42	0.3	09/06/01	Brown	2	2.5	0.150			
286 R	54.6	2.5						136.5	138.60												
287 SC	29.2	4						118.8	118.59												
288 R	17.1	2.5						42.75	43.41												
289 SC	39.5	5						197.5	200.53												
290 BW	8.7	2						17.4	17.67												
291 R	20.4	2						40.8	41.43												
292 FW	11	1.5						16.5	16.75												
293 SC	20.5	6	4.7	7	5.5	6		123	118.9	124.89	0.07	0.64	0.57	09/06/01	Press	2	2.5	0.020			
294 FW	9.6	2.5						24	24.37												
295 R	9.7	2.5						24.25	24.62												
296 SC	13.3	3						39.9	40.51												
297 R	5.8	2						11.6	11.78												
298 FW	13.4	2.5						33.5	34.01												
299 SC	31.4	3						94.2	95.65												
300 R	23.2	3						69.6	70.67												

Unit Number	Unit Type	Length	Estimated Width	Measured Widths				Surface Area		Depth		Diver	Snorkel Counts		Electrofishing						
				1	2	3	4	Estimated	Measured	Corrected	Crest		Max	Residual	Date	CO	Calibrated CO	CO/m2	SH	YOY	SH
301 SC		44.7	4.5					201.15		204.24											
302 R		19.3	2					38.6		39.19											
303 MC		20.8	3					62.4		63.36											
304 R		2.9	1.5					4.35		4.42											
305 SC		32	4	3.2	3.7	4.1	3.9	128	119.2	129.97	0.06	0.52	0.46	09/06/01	Brown	0	0	0			
306 R		32	3					96		97.47											
307 SC		18.4	3.5					64.4		65.39											
308 R		16.8	3					50.4		51.17											
309 SC		14.5	3.5					50.75		51.53											
310 R		23.3	2.5					58.25		59.14											
311 FW		12.5	2					25		25.38											
312 R		17.2	2.5					43		43.66											
313 SC		16.6	3					49.8		50.56											
314 FW		8.2	2.5					20.5		20.81											
315 SC		11.2	3					33.6		34.12											
316 FW		29.7	3					89.1		90.47											
317 FW		12.8	1.5					19.2		19.49											
318 SC		13	3	3.6	3.5	3.6		39	46.37	39.60	0.08	0.43	0.35	09/06/01	Press	0	0	0			
319 R		4.3	1.5					6.45		6.55											
320 FW		5.8	2					11.6		11.78											
321 R		13.7	1					13.7		13.91											
322 SC		24.8	4					99.2		100.72											
323 R		6.5	2.5					16.25		16.50											
324 SC		16.6	2.5					41.5		42.14											
325 R		9.7	2					19.4		19.70											
326 SC		42.3	3.5					148.05		150.32											
327 R		9.4	2.5					23.5		23.86											
328 SC		7	3					21		21.32											
329 R		5	2					10		10.15											
330 SC		10	2.5	2.7	2.6	2.8		25	27	25.38	0.09	0.58	0.49	09/06/01	Brown	0	0	0			
331 R		16.6	1.5					24.9		25.28											
332 FW		19.5	3					58.5		59.40											
333 R		15.2	1.5					22.8		23.15											
334 SC		29.5	2.5					73.75		74.86											
335 SC		16.7	3					50.1		50.87											
336 R		12.4	2.5					31		31.48											
337 FW		16.6	2					33.2		33.71											
338 R		6.8	1.5					10.2		10.36											
339 SC		18.6	3					55.8		56.66											
340 FW		18.1	2					36.2		36.76											
341 R		3.4	2					6.8		6.90											
342 SC		16.4	3.5					57.4		58.28											
343 FW		11.6	2					23.2		23.56											
344 SC		6.4	6	8	6	6		38.4	42.67	38.99	0.05	0.91	0.86	09/06/01	Brown/Press	0	0	0	13	11	
345 R		15.8	4					63.2		64.17											
346 SC		28.5	3.5	3.2	3.1	4		99.75	97.85	101.28	0.09	0.53	0.44	09/06/01	Brown/Press	0	0	0	44	4	
347 SC		12	2.5					30		30.46											
348 FW		19.2	3					57.6		58.48											
349 R		4.8	3.5					16.8		17.06											
350 SC		18.6	4					74.4		75.54											
351 R		11.3	3.5					39.55		40.16											
352 SC		20.8	4					83.2		84.48											
353 FW		11.6	2					23.2		23.56											
354 FW		13	2.5					32.5		33.00											
355 R		4.8	1.5					7.2		7.31											
356 SC		16.1	3.5					56.35		57.22											
357 R		10.1	1.5					15.15		15.38											
358 SC		13	4.5	7.6	3.7	3		58.5	61.97	59.40	0.1	0.54	0.44	09/06/01	Press	0	0	0			
359 R		11.2	1.5					16.8		17.06											
360 FW		16	2.5					40		40.61											

Unit Number	Unit Type	Length	Estimated Width	Measured Widths				Surface Area		Depth		Date	Diver	Snorkel Counts		SH YOY	SH 1+	Electrofishing	
				1	2	3	4	Estimated	Measured	Crest	Max Residual			CO Calibrated	CO m2			# Passes	CO SH YOY
361 R		23.8	2.5					59.5	60.41										
362 SC		7.4	3					22.2	22.54										
363 R		5	3					15	15.23										
364 SC		32.9	4					131.6	133.62										
365 SC		20.4	3.5					71.4	72.50										
366 R		2.5	2.5					6.5	6.60										
367 FW		4.4	3.5					15.4	15.64										
368 R		23.6	2					47.2	47.92										
369 SC		11.8	3					35.4	35.94										
370 R		4.8	2.5					12	12.18										
371 SC		20.3	2					40.6	41.22										
372 R		6.4	3					19.2	19.49										
373 SC		21.7	3.5		3	3.6	5	75.95	83.91	77.12	0.09	1.1	0.01	09/06/01	Brown	0	0	0	
374 R		7.8	1					7.8	7.92										
375 SC		25.7	3.5					89.95	91.33										
376 R		4	1					4	4.06										
377 SC		9.4	3					28.2	28.63										
378 R		7.2	1.5					10.8	10.97										
379 FW		9	3					27	27.41										
380 SC		8.9	5					44.5	45.18										
381 R		4	1					4	4.06										
382 SC		14.1	1.5					21.15	21.47										
383 R		18	1.5					27	27.41										
384 SC		22.2	3.5		3.5	3.2	3.3	77.7	76.59	78.89	0.11	0.72	0.61	09/06/01	Press	3	3.75	0.048	
385 FW		14.5	3.5					50.75	51.53										
386 R		6.1	1					6.1	6.19										
387 FW		5.2	1.5					7.8	7.92										
388 SC		15.2	3					45.6	46.30										
389 R		7.2	1					7.2	7.31										
390 SC		14.8	3					44.4	45.08										
391 FW		10.5	2					21	21.32										
392 SC		16.9	1.5					25.35	25.74										
393 R		6.8	2.5					17	17.26										
394 SC		11.2	4					44.8	45.49										
395 SC		10.5	3.5					36.75	37.31										
396 R		10.6	2					21.2	21.53										
397 FW		24	1.5					36	36.55										
398 MC		14.3	3		4	3	3.4	42.9	49.57	43.56	0.08	0.64	0.56	09/06/01	Brown	3	3.75	0.086	
399 R		7.2	1					7.2	7.31										
400 SC		8.8	5					44	44.68										
401 R		6.8	2.5					17	17.26										
402 SC		14.1	1.5					21.15	21.47										
403 R		3.9	2					7.8	7.92										
404 FW		30	2.5					75	76.15										
405 R		20.3	2					40.6	41.22										
406 MC		7.2	2					14.4	14.62										
407 R		7.2	0.8					5.76	5.85										
408 FW		6.4	1					6.4	6.50										
409 SC		6.4	2.5		2	3.4	3.6	16	19.2	16.25	0.09	0.42	0.33	09/06/01	Brown	1	1.25	0.077	
410 SC		11.3	1					11.3	11.47										
411 R		8.4	1					8.4	8.53										
412 SC		13	4.5					58.5	59.40										
413 SC		16.5	3					49.5	50.26										
414 R		6.6	1.5					9.9	10.05										
415 SC		19.9	3					59.7	60.62										
416 R		5.9	1					5.9	5.99										
417 SC		25	5		2.6	5.5	5	125	116.5	126.92	0.08	0.71	0.63	09/06/01	Press	3	3.75	0.030	
418 R		5.7	1					5.7	5.79										
419 SC		7.4	4					29.6	30.05										
420 SC		10	3					30	30.46										

Unit	Unit Number	Unit Type	Length	Estimated Width	Measured Widths				Estimated	Surface Area	Depth	Diver	Snorkel Counts		Date	# Passes	CO	SH	YOY	SH 1+
					1	2	3	4		Measured	Corrected	Crest	Max	Residual						
	421 SC		7.2	3.5					25.2	25.9										
	422 FW		12.4	1.5					18.6	18.89										
	423 R		6.1	1					6.1	6.19										
	424 SC		21.2	4.5					95.4	96.87										
	425 R		4.9	0.8					3.92	3.98										
	426 PL		9.2	4.5	6	5.1	4.2		41.4	46.92	42.04	0.08	0.99	0.91	09/06/01	Brown	0	0	0	0
	427 SC		12.7	2					25.4	25.79										
	428 R		6.6	3					19.8	20.10										
	429 SC		19.7	3					59.1	60.01										
	430 R		5.1	0.7					3.57	3.62										
	431 SC		21.2	4					84.8	86.10										
	432 R		7.4	2.5					18.5	18.78										
	433 SC		17.2	5					86	87.32										
	434 FW		11	2.5					27.5	27.92										
	435 R		5.7	2					11.4	11.58										
	436 FW		20.4	3					61.2	62.14										
	437 R		12.6	2					25.2	25.59										
	438 FW		7.6	2.5					19	19.29										
	439 SC		5.8	2	2	2.6	2.3		11.6	13.34	11.76	0.06	0.39	0.33	09/06/01	Brown	0	0	0	0
	440 FW		3.9	0.7					2.73	2.77										
	441 SC		7.7	1.2					9.24	9.38										
	442 R		6.5	1					6.5	6.60										
	443 SC		16.5	5					82.5	83.77										
	444 SC		3.8	3.5					13.3	13.50										
	445 R		1.6	0.8					1.28	1.30										
	446 SC		15.8	2					31.6	32.09										
	447 SC		6.5	3					19.5	19.80										
	448 R		3.2	0.7					2.24	2.27										
	449 SC		9.5	2.5	2.9	2.3	3.1		23.75	26.28	24.11	0.06	0.67	0.61	09/06/01	Press	5	6.25	0.259	
	450 R		4.9	2.5					12.25	12.44										
	451 FW		6.5	2.5					16.25	16.50										
	452 SC		24.7	3					74.1	75.24										
	453 R		3.4	1					3.4	3.45										
	454 FW		9.7	2					19.4	19.70										
	455 R		2.4	1					2.4	2.44										
	456 SC		7.1	1.2					8.52	8.65										
	457 R		2.6	0.5					1.3	1.32										
	458 SC		5.9	1.5					8.85	8.99										
	459 R		9.6	5.5					52.8	53.61										
	460 SC		13.3	3					39.9	40.51										
	461 R		21.1	2					42.2	42.85										
	462 MC		12.5	3	2.7	3.2	3.5		37.5	39.17	38.06	0.07	0.3	0.23	09/06/01	Brown	0	0	0	0
	463 SC		10.6	3					31.8	32.29										
	464 SC		6.7	2					13.4	13.61										
	465 R		6.4	2.5					16	16.25										
	466 SC		12	4.5					54	54.83										
	467 R		5.9	2.5					14.75	14.96										
	468 MC		14.3	2					28.6	29.04										
	469 SC		15.8	2.5	2	2.4	2.7	3.1	39.5	40.29	40.11	0.07	0.42	0.35	09/06/01	Press	6	7.5	0.187	
	470 MC		5.3	4					21.2	21.53										
	471 R		13	2					26	26.40										
	472 SC		13.8	3					41.4	42.04										
	473 SC		15.8	3.5					55.3	56.15										
	474 R		14.9	2.5					37.25	37.82										
	475 SC		13.6	3					40.8	41.43										
	476 R		11.6	3					34.8	35.33										
	477 SC		24.7	3	3.6	3	3.4	4	74.1	86.45	75.24	0.1	0.83	0.73	09/06/01	Press	17	21.25	0.282	
	478 SC		18.2	3.5					63.7	64.86										
	479 SC		16.7	2.5					41.75	42.39										
	480 R		2.9	2.5					7.25	7.36										

Unit Number	Unit Type	Length	Estimated Width	Measured Widths				Surface Area		Depth		Date	Diver	Snorkel Counts		Electrofishing								
				1	2	3	4	Estimated	Measured	Corrected	Crest			Max	Residual	CO	Paired	CO	SH YOY	SH 1+				
481 SC		14.2		2.4	2.3	1.95	1.9		30.35	30.35	12	0.29	09/06/01	Brown	3	3.75	0.124		08/14/01	2	7	6	6	
482 R		4.8		2.5					63.7	63.70	0.11	0.8	0.69	09/06/01	Brown	8	10	0.157		08/14/01	1	0	2	0
483 SC		18.2		3.5					26.97	26.97	0.09	0.51	0.42	09/06/01	Brown	3	3.75	0.139		08/14/01	2	12	5	9
484 SC		11.6		3.3	2	2.5	1.5		6.71	6.71	6.71									08/14/01	2	3	4	6
485 R		6.1		1.1					48.85	48.85	0.04	0.76	0.72	09/06/01	Brown	9	11.25	0.230		08/14/01	1	0	0	0
486 SC		11.7		5.5	3.1	4.3	3.8		54	54.83										08/14/01	2	9	10	11
487 R		18		3					33.6	34.12														
488 FW		11.2		3					4.35	4.42														
489 R		2.9		1.5					13.8	14.01														
490 FW		9.2		1.5					12.5	12.69														
491 SC		5		2.5					8.4	8.53														
492 R		4.2		2					59.04	58.28	0.07	0.9	0.83	09/06/01	Press	12	15	0.257						
493 SC		16.4		3.5	3.7	4.6	3.5	2.5	13.3	13.50														
494 R		3.8		3.5					44.7	45.39														
495 SC		14.9		3					24	24.37														
496 SC		12		2					4.4	4.47														
497 R		2.2		2					19.75	20.05														
498 SC		7.9		2.5					9.15	9.29														
499 R		6.1		1.5					24.08	24.44														
500 FW		10.7		2.25					13.8	14.01														
501 R		6.9		2					30.83	31.30														
502 SC		13.7		2.25					47.58	48.31	0.07	0.72	0.65											
503 SC		17.3		2.75	2.7	4	2.7		24	24.37														
504 R		12		2					75.3	76.46														
505 SC		25.1		3					46.8	47.52														
506 MC		15.6		3					21	21.32														
507 R		12		1.75					29.4	29.85														
508 FW		14.7		2					6.2	6.30														
509 R		6.2		1					10.2	10.36														
510 SC		6.8		1.5					7.35	7.46														
511 R		4.9		1.5					87	88.34														
512 SC		17.4		5					15.75	15.99														
513 R		9		1.75					29.8	30.26														
514 SC		14.9		2					5.18	5.18														
515 R		6.8		0.75					6	6.09														
516 SC		6		1					5	5.08														
517 R		2.5		2					23.81	23.81														
518 SC		6.7		3.5					25.5	25.5														
519 SC		8.5		3	3	3.6	3		27.2	25.89	0.05	0.25	0.2	09/06/01	Brown	3	3.75	0.145						
520 R		5.6		2.25					12.79	12.79														
Totals:		7009						19128.59	20246.93					152	190		51	248	131					

Appendix B
Index Site Electrofishing Log



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Gorge Site Description Stream km 3.9 Electrofishing Date 8/20/2001

Site Name Gorge Index Site Number 3 Unit Number 2

Unit Type LSL Temp °C 13.4 Conductivity (µS/cm) 237

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	627	P16	200	10	28	3	CO 0
Pass 2	620	P16	200	0	0	0	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							

Site Name Gorge Index Site Number 3 Unit Number 3

Unit Type LGR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	235	P16	100	0	0	0	CO 0
Pass 2							SH YOY 0
Pass 3							SH 1+ 0
Pass 4							

Site Name Gorge Index Site Number 3 Unit Number 4

Unit Type LSBk Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	731	P16	200	1	6	12	CO 0
Pass 2	677	P16	200	1	2	1	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Gorge Index Site Number 3 Unit Number 5

Unit Type LSBo Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	618	P16	200	2	8	3	CO 0
Pass 2	512	P16	200	1	3	1	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Lower Teixeira Site Description Stream km 6.8 Electrofishing Date 8/14/2001

Site Name Lower Teixeira Index Site Number 5 Unit Number 1

Unit Type LSR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	714	P16	200	7	6	6	CO 0
Pass 2	545	P16	200	0	0	0	SH YOY 1
Pass 3							SH 1+ 0
Pass 4							

Site Name Lower Teixeira Index Site Number 5 Unit Number 2

Unit Type LGR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	338	P16	100	0	2	0	CO 0
Pass 2							SH YOY 0
Pass 3							SH 1+ 0
Pass 4							

Site Name Lower Teixeira Index Site Number 5 Unit Number 3

Unit Type LSR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	841	P16	200	11	5	8	CO 0
Pass 2	735	P16	200	1	0	1	SH YOY 1
Pass 3							SH 1+ 0
Pass 4							



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Lower Teixeira Index Site Number 5 Unit Number 4

Unit Type LSR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	559	P16	200	2	4	6	CO 0
Pass 2	501	P16	200	1	0	0	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							

Site Name Lower Teixeira Index Site Number 5 Unit Number 5

Unit Type LGR Temp °C 16.1 Conductivity (µS/cm) 231.1

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	112	P16	100	0	0	0	CO 0
Pass 2							SH YOY 0
Pass 3							SH 1+ 0
Pass 4							

Site Name Lower Teixeira Index Site Number 5 Unit Number 6

Unit Type LSR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	639	P16	200	8	9	11	CO 0
Pass 2	633	P16	200	1	1	0	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Murch Site Description Stream km 0.4 Electrofishing Date 8/28/2001

Site Name Murch Index Site Number 1B Unit Number 1

Unit Type GLD Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	614	P16	200	0	9	0	CO 0
Pass 2	485	P16	200	0	2	0	SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Murch Index Site Number 1B Unit Number 2

Unit Type LGR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	27	P16	100	0	0	0	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Murch Index Site Number 1B Unit Number 3

Unit Type GLD Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	372	P16	200	0	19	0	CO 0
Pass 2	306	P16	200	0	2	0	SH YOY 1
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Murch Index Site Number 1B Unit Number 4
Unit Type LSR Temp °C 16.1 Conductivity (µS/cm) 259.3
General Comments gage = 0.80

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	610	P16	200	1	20	11	CO 0
Pass 2	523	P16	200	0	3	0	SH YOY 1
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Open Space Site Description Stream km 0.3 Electrofishing Date 8/28/2001

Site Name Open Space Index Site Number 1A Unit Number 1
Unit Type LSR Temp °C 15.8 Conductivity (µS/cm) 275.4

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	27	P16	200	0	1	0	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Open Space Index Site Number 1A Unit Number 3
Unit Type LSR Temp °C 15.6 Conductivity (µS/cm) 272.1

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	83	P16	200	0	0	0	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Open Space Index Site Number 1A Unit Number 5
Unit Type LSR Temp °C 15.9 Conductivity (µS/cm) 264.1

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	90	P16	200	0	2	0	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Open Space Index Site Number 1A Unit Number 7
Unit Type LSR Temp °C 17.2 Conductivity (µS/cm) 272.4
General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	244	P16	200	0	1	1	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				



Point Reyes National Seashore

CSR Electrofishing Log for Pine Gulch

Site Name Paradise Valley Site Description Stream km 2.8 Electrofishing Date 8/21/2001

Site Name Paradise Valley Index Site Number 2 Unit Number 1
Unit Type LSR Temp °C 15.7 Conductivity (µS/cm) 142.3

General Comments Top end blocked by fallen bay. ADULT SH ~50 CM seen in unit but not captured.

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	678	P16	200	1	11	11	CO 0
Pass 2	599	P16	200	0	2	3	SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Paradise Valley Index Site Number 2 Unit Number 2
Unit Type GLD Temp °C Conductivity (µS/cm)

General Comments split channel LB unit

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	550	P16	200	0	11	5	CO 0
Pass 2	437	P16	200	0	0	0	SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Paradise Valley Index Site Number 2 Unit Number 3
Unit Type GLD Temp °C Conductivity (µS/cm)

General Comments top of unit 1, cut off by fallen bay

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	132	P16	200	0	2	2	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Paradise Valley Index Site Number 2 Unit Number 4

Unit Type LGR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	146	P16	100	0	2	0	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Paradise Valley Index Site Number 2 Unit Number 5

Unit Type LSL Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	1150	P16	200	3	25	22	CO 0
Pass 2	1040	P16	200	0	2	3	SH YOY 0
Pass 3		P16	200				SH 1+ 1
Pass 4		P16	200				



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch



Site Name Upper Teixeira Site Description Stream km 7.8 Electrofishing Date 8/9/2001

Site Name Upper Teixeira Index Site Number 6 Unit Number 1
Unit Type LSR Temp °C 14.3 Conductivity (µS/cm) 169.2
General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	668	P16	200	0	5	8	CO 0
Pass 2	558	P16	200	0	2	0	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							

Site Name Upper Teixeira Index Site Number 6 Unit Number 2
Unit Type LSR Temp °C Conductivity (µS/cm)
General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	337	P16	200	0	2	3	CO 0
Pass 2	323	P16	200	0	0	0	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							

Site Name Upper Teixeira Index Site Number 6 Unit Number 3
Unit Type LGR Temp °C Conductivity (µS/cm)
General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	134	P16	100	0	0	0	CO 0
Pass 2							SH YOY 0
Pass 3							SH 1+ 0
Pass 4							



Point Reyes National Seashore

CSRП Electrofishing Log for Pine Gulch

Site Name Upper Teixeira Index Site Number 6 Unit Number 4

Unit Type LSR Temp °C Conductivity (μS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	378	P16	200	0	3	4	CO 0
Pass 2	419	P16	200	0	0	1	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							

Site Name Upper Teixeira Index Site Number 6 Unit Number 5

Unit Type LSL Temp °C Conductivity (μS/cm)

General Comments New unit this year--not sampled in 2000

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	492	P16	200	0	3	7	CO 0
Pass 2	468	P16	200	0	0	0	SH YOY 0
Pass 3							SH 1+ 0
Pass 4							



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Weber Site Description Stream km 0.7 Electrofishing Date 8/16/2001

Site Name Weber Index Site Number 1C Unit Number 1

Unit Type LSR Temp °C 14.2 Conductivity (µS/cm) 248

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	595	P16	200	0	22	4	CO 0
Pass 2	433	P16	200	0	1	0	SH YOY 1
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Weber Index Site Number 1C Unit Number 2

Unit Type LSR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	72	P16	100	0	0	0	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Weber Index Site Number 1C Unit Number 3

Unit Type LSR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	656	P16	200	0	14	11	CO 0
Pass 2	489	P16	200	0	4	0	SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				



Point Reyes National Seashore

CSRP Electrofishing Log for Pine Gulch

Site Name Weber Index Site Number 1C Unit Number 4

Unit Type LSR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	253	P16	200	0	16	4	CO 0
Pass 2	221	P16	200	0	1	0	SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Weber Index Site Number 1C Unit Number 5

Unit Type LGR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	11	P16	100	0	0	0	CO 0
Pass 2		P16	200				SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Site Name Weber Index Site Number 1C Unit Number 6

Unit Type LSR Temp °C Conductivity (µS/cm)

General Comments

	Time	Setting	Volts	CO	SH YOY	SH 1+	Total Mortality
Pass 1	424	P16	200	0	6	3	CO 0
Pass 2	439	P16	200	0	0	0	SH YOY 0
Pass 3		P16	200				SH 1+ 0
Pass 4		P16	200				

Appendix C
Genetic Sample Summary Table

Coho tissue samples from Pine Gulch (Marin County, California); August 2001.
 Collected by Pt. Reyes Nat'l Seashore staff, (415) 464-5191

Sample ID	Watershed	Stream Name	Reach/Location	Date Collected	Collector	Species	Fork Length (mm)	Weight (g)	Sex	Age	tissue type	# collected
PG01-2	Pine Gulch	Pine Gulch	stream km 6.8	14-Aug-01	JW	CO	65	3.6	Unk	YOY	caudal fin clip	1
PG01-3	Pine Gulch	Pine Gulch	stream km 6.8	14-Aug-01	GB	CO	58	2.1	Unk	YOY	caudal fin clip	1
PG01-4	Pine Gulch	Pine Gulch	stream km 6.8	14-Aug-01	GB	CO	77	5.0	Unk	YOY	caudal fin clip	1
PG01-5	Pine Gulch	Pine Gulch	stream km 6.8	14-Aug-01	GB	CO	76	5.3	Unk	YOY	caudal fin clip	1
PG01-6	Pine Gulch	Pine Gulch	stream km 6.8	14-Aug-01	GB	CO	73	4.3	Unk	YOY	caudal fin clip	1
PG01-7	Pine Gulch	Pine Gulch	stream km 6.8	14-Aug-01	GB	CO	72	3.9	Unk	YOY	caudal fin clip	1
PG01-8	Pine Gulch	Pine Gulch	stream km 6.8	14-Aug-01	JW	CO	76	4.9	Unk	YOY	caudal fin clip	1
PG01-9	Pine Gulch	Pine Gulch	stream km 3.9	21-Aug-01		CO	70	4.2	Unk	YOY	caudal fin clip	1
PG01-10	Pine Gulch	Pine Gulch	stream km 3.9	21-Aug-01		CO	72	4.1	Unk	YOY	caudal fin clip	1
PG01-11	Pine Gulch	Pine Gulch	stream km 3.9	21-Aug-01		CO	72	4.1	Unk	YOY	caudal fin clip	1
PG01-12	Pine Gulch	Pine Gulch	stream km 3.9	21-Aug-01		CO	72	4.4	Unk	YOY	caudal fin clip	1
PG01-13	Pine Gulch	Pine Gulch	stream km 3.9	21-Aug-01		CO	66	3.3	Unk	YOY	caudal fin clip	1
PG01-14	Pine Gulch	Pine Gulch	stream km 3.9	21-Aug-01		CO	68	3.4	Unk	YOY	caudal fin clip	1
PG01-15	Pine Gulch	Pine Gulch	stream km 2.8	22-Aug-01	JW	CO	80	5.9	Unk	YOY	caudal fin clip	1
PG01-16	Pine Gulch	Pine Gulch	stream km 2.8	22-Aug-01		CO	75	4.8	Unk	YOY	caudal fin clip	1
PG01-17	Pine Gulch	Pine Gulch	stream km 2.8	22-Aug-01		CO	70	3.9	Unk	YOY	caudal fin clip	1