SPAWNING SURVEY OF THE

GARCIA RIVER

1998-1999

Prepared by

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for the

Mendocino County Resource Conservation District

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ABSTRACT

Spawning surveys were conducted in the Garcia River watershed during the winter of 1998-1999. Eighteen miles within the upper Garcia River and 12 of its tributaries were surveyed between early December and the end of March. There were 58 individual surveys, totaling 83 survey miles. No live coho salmon *(Onchorhynchus kisutch)* or coho salmon carcasses were observed. A total of 165 redds were counted for an average of 2 redds per mile of stream. There were also 81 live fish observed, presumably all steelhead *(Onchorhynchus mykiss),* for an average of 1 live steelhead for each survey mile. A total of seven steelhead carcasses were tagged. The highest densities of live steelhead were located in Pardaloe Creek, followed by Horace's Cabin Creek. The highest densities of redds were in Horace's Cabin Creek, followed by Flemming Creek. Compared to the two past spawning surveys conducted in 1995-96 and 1996-97, this year's steelhead run appeared to be somewhat lower in both Pardaloe and Mill Creek. The South Fork steelhead counts were similar to those observed in surveys conducted in 1989-1990 and 1996-97 but were considerably better than observed in 1990-1991.

INTRODUCTION

In 1996 the Mendocino County Resource Conservation District (MCRCD) contracted with the California Department of Forestry and Fire Protection (CDF) to develop and implement a long-term instream monitoring plan for the Garcia River watershed. The Garcia River Instream Monitoring Plan (IMP) was completed in early 1998 (Euphrat et al., 1998) and since that time the MCRCD has been implementing elements of that Plan. One elements of the IMP was the continuation of spawning surveys in the Garcia River watershed.

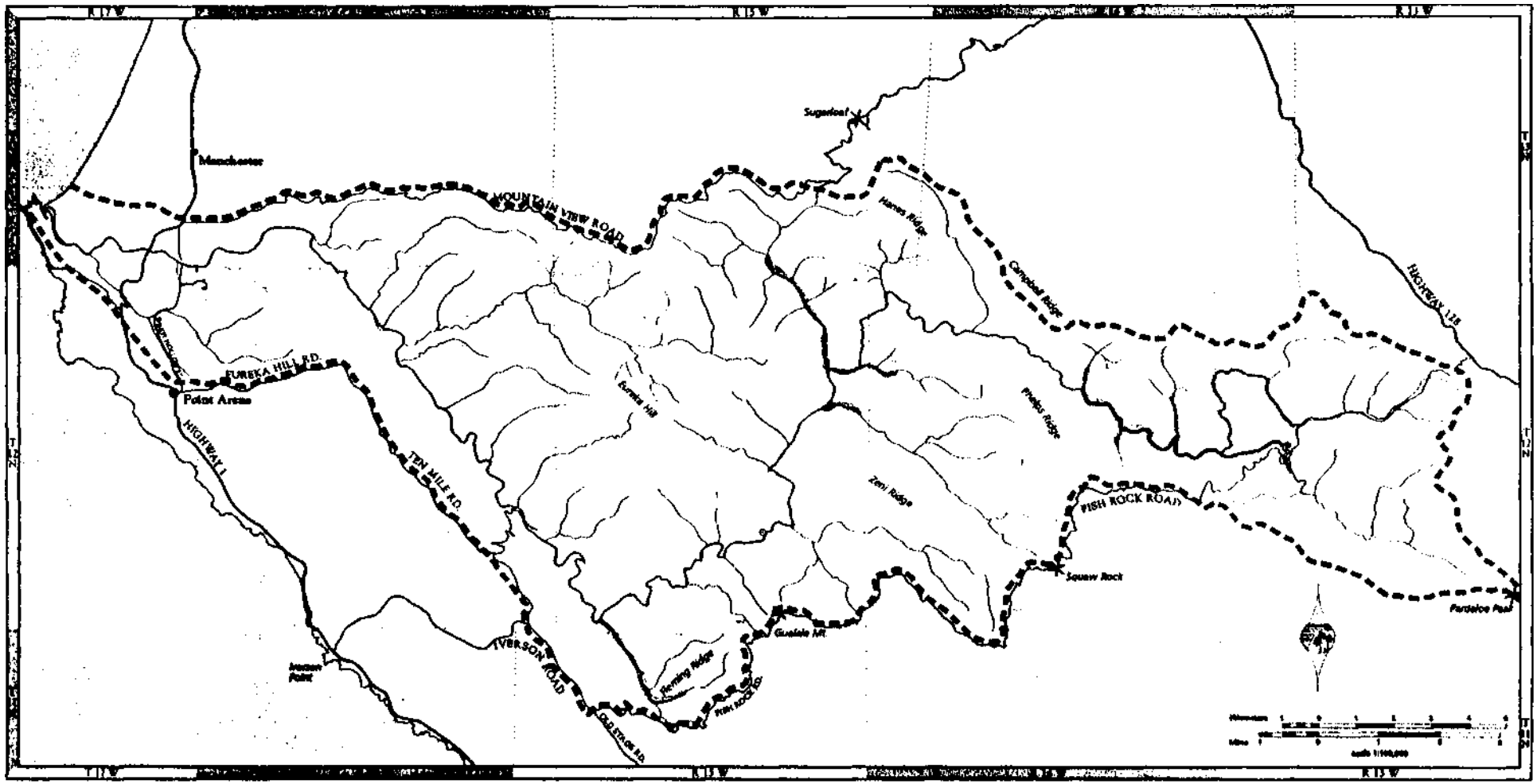
This report summarizes the results of a spawning survey that was carried out in Garcia River watershed during the winter of 1998-1999. The earliest spawning survey known to occur in the Garcia River watershed was conducted in 1998-1990 and was limited to the South Fork Garcia. The purpose of that survey was primarily to determine whether coho salmon planted by the Department of Fish & Game in 1987 had returned to spawn. Since

that time, two other spawning surveys were conducted in the winters of 1995-1996 and 1996-1997. The current and previous surveys were conducted by the Salmon Trollers Marketing Association, with CDF funding the most recent work. This survey was conducted from December 1998 through March 1999. Due to some property owners not allowing access, some important spawning streams in the Garcia River watershed were not surveyed this year, including Signal Creek, the North Fork, and the upper portions of Inman and Whitlow Creeks. Several areas surveyed this year had not previously been surveyed. Indices of abundance for the steelhead run were made and compared to prior survey years.

METHODS

Eleven areas of the Garcia River were targeted for spawning surveys. These included the South Fork*, Mill*, Pardaloe*, Bluewaterhole*, Lee, East End, Inman, Stansbury and Horace's Cabin Creeks, as well as Rolling Brook and the mainstem Garcia River* (see attached map). Streams listed above with an asterisk were the key areas targeted for surveys. Other areas were surveyed when practical or when conditions suggested that spawning activity may be expected. The surveys on targeted stream reaches were anticipated to occur on a seven to ten day survey interval if stream flow and other factors indicated that spawning activity was likely.

Two-person survey teams recorded the number of live adult salmonids observed, and measured and tagged any salmonid carcasses encountered. Fish carcasses were tagged with numbered jaw tags whenever a jaw was present and all tails were hole punched. All salmonid redds were marked by attaching flagging to an adjacent streamside branch. The length and width of each redd was recorded on data forms and the date and size of the redd was recorded on flagging. Surveyors recorded the time, as well as stream and air temperature at the upper and lower end of each survey reach. Surveyors also estimated stream visibility and recorded flow information.



Garcia River Watershed

Mendocino County, California

1998-1999 Spawning Survey

Map source materials: USGS 1:100,000 topopgraphic quadrangle Point Arena, Calwater Hydrologic Planning Unit maps. Garcia River Watershed Enhancement Plan work site Maps, Blue Waterhole. Stansbury subbasin restoration project location map, local Informants.

Legend

- Garcia River
- creeks
- highway
- paved roads
- secondary roads
- watershed boundary
- peaks
- landmarks (Eureka Hill)
- towns
- ownership boundaries
- Township & Range
- survey areas

Rixanne Wehren
Cartographer

RESULTS

The length of each survey reach by tributary as well as the total survey miles (the total distance walked by surveyors) for two periods, December-January and February-March, is displayed in Table 1. Additionally, the number of live fish, redds and tagged carcasses are shown in his table. Approximately 18 miles of the Garcia River watershed were surveyed during the winter of 1998-1999. Survey miles totaled 21 in the early period, December-January, and 37 in the latter period. No live or dead coho salmon were observed during the most recent survey and all live fish, carcasses, and redds, are believed to have been due to spawning steelhead. There were no redds or live fish observed during the entire month of December in any area surveyed in the Garcia River basin. Low flow conditions existed from mid-December through mid-January and it wasn't until rains in mid-January occurred that any spawning activity was noted.

There were 16 and 65 live adult salmonids observed in the early and late periods, respectively, averaging 1 live steelhead per survey mile. A total of 60 redds were counted in the early period and 116 counted in the latter period, resulting in an average of 2 redds per stream mile. A total of seven steelhead carcasses were tagged this season. Fork lengths of the only two steelhead carcasses complete enough to measure were 77 and 80 cm. The highest number of live fish were observed in Mill and Pardaloe Creeks. The highest number of redds were observed in Mill Creek followed by the South Fork. Table 2 provides the densities of both live fish and redds in survey areas. The highest density of live fish was in Pardaloe Creek followed by Horace's Cabin Creek, while the greatest density of redds was in Horace's Cabin Creek followed by Flemming Creek. There were relatively few live fish observed in the South Fork compared to other areas, even though there was a relatively high density of redds. The three carcasses found in the South Fork was the highest number found in any tributary stream. The lack of any live fish observations in the South Fork was unexpected considering the relatively high number of

Table 1 The length of survey reaches, total number of miles surveyed, number of surveys, number of live fish, number of redds and number of tagged carcasses during 1998-99 survey. Data is separated into early (December-January) and late (February-March) periods. Lower portion of table gives the number of live fish per survey mile and redds per reach mile for the two periods.

	Reach Len(mi)	Survey Miles		Number of Surveys		Number Live Fish		Number of Redds		Tagged Steelhead
		Dec-Jan	Feb-March	Dec-Jan	Feb-March	Dec-Jan	Feb-March	Dec-Jan	Feb-March	
Bluewaterhole Creek	2.2	3.8	2.5	2	1	2	1	9	1	2
East End Creek	0.25	0.25	0	1	0	0		1		0
Flemming Creek	0.27	0.54	1.6	2	6	0	1	0	6	0
Horace's Cabin Creek	0.33	0.68	1.4	2	4	2	2	4	10	0
Inman Creek	1.1	1.1	21	1	2	0	1	0	1	0
Lee Creek	08	0	1.6	0	2	0	0		0	0
Mainstem Sec 1	3.1	4.9	6.2	3	3	2	1	16	4	0
Mainstem Sec 3	1	1		1	0	0	0	0		0
Mill Creek	3.4	6.8	17	2	5	1	18	10	33	1
Pardaloe Creek	1.5	3	7.5	2	5	9	39	13	20	1
South Fork	2	6	10	3	5	0	0	6	27	3
Stanbury Creek	0.75	0	0.75	0	1	0	0		0	0
Unnamed Creek	0.2	0	0.2	0	1	0	0		0	0
Whitlow Creek	1	2	2	2	2	0	2	1	3	0
Total	17.9	30.07	52.85	21	37	16	65	60	105	7

Table 2 Density of live fish and redds in Garcia River tributaries in early and late periods in 1998-99 Surveys

	Live Fish/Survey Mile		Redds/ Reach Mile	
	Dec-Jan	Feb-March	Dec-Jan	Feb-March
Bluewaterhole Creek	0.5	0.4	4.1	0.5
East End Creek	0.0		4.0	
Flemming Creek	0.0	0.6	0.0	22.2
Horace'* Cabin Creek	2.9	1.4	12.1	30.3
Inman Creek	0.0	0.5	0.0	0.9
Lee Creek		0.0	0.0	0.0
Mainstem Sec 1	0.4	0.2	5.2	1.3
Mainstem Sec 3			0.0	
Mill Creek	0.1	1.1	2.9	9.7
Pardaloe Creek	3.0	5.2	8.7	13.3
South Fork	0.0	0.0	3.0	13.5
Stanbury Creek		0.0		0.0
Unnamed Creek		0.0		0.0
Whitlow Creek	0.0	1.0	1.0	3.0
Average	0.5	1.2	3.7	6.3

redds and carcasses documented. Bluewaterhole Creek had the second highest number of carcasses at 2. Additional information regarding the number of live steelhead, redds and carcasses by weekly periods for each stream surveyed is provided in Appendix 1.

The number of redds, by size category and month, is shown for 8 of the surveyed streams in Table 3. This table also shows the mean redd size, total number of redds observed, and total redd area. It is likely that some redds, primarily on the larger tributaries, may have been obscured before surveyors could examine those areas, due to an extended high-flow periods. Survey redd counts in Bluewaterhole, Mill, and Pardaloe Creek as well as sections of the mainstem were most likely effected by these flow conditions. In early March, under flow conditions too high for surveys to be conducted, 4 steelhead were observed spawning together along the margin of the mainstem Garcia while crews driving along Hollowtree Logging Road. When that same section of stream was surveyed ten days later, under lower flow conditions, only a single redd was located in that entire survey reach and no redd was identifiable at the previously observed spawning site .

Areas surveyed this year that were not surveyed in any prior year include sections of the mainstem Garcia River, Horace's Cabin Creek, Lee Creek, Bluewaterhole Creek, Whitlow Creek, East End Creek, Stansbury Creek, and an unnamed tributary. Two areas, Horace's Cabin Creek and the section of the mainstem Garcia River between Horace's Cabin Creek and a point about 1 mile upstream of East End Creek proved to be particularly important spawning areas. Little spawning habitat was found in either Stanbury, East End, or Lee Creeks. Each of these tributaries can be characterized as high gradient, bouldery streams. The upper reaches of Stansbury Creek were not surveyed however and could contain lower gradient areas suitable for salmonid spawning. Only a single spawnable site was located in East End Creek and none were noted in Stansbury Creek's lower 3/4 mile. A couple of spawnable sites were located in Lee Creek but no evidence of spawning was noted. The landowner living along Lee Creek stated that he has not observed fish spawning in the creek in recent years. An unnamed tributary upstream of East End Creek had some good spawning areas but the stream quickly

Table 3 Number of Redds by Size (Sq. M) Category in Garcia River in 1998-99

Redd Area (Sq.M)	Bluewaterhole Creek			Flemming Creek			Horace's Cabin Creek			Mainstem Garcia River		
	January	February	March	January	February	March	January	February	March	January	February	March
0-1							3	1				
1.1 - 2	2				2				1		2	
2.1 - 3						2	1		1	5	1	
3.1 - 5	4		1		1			2		9		1
5.1 - 7	2											
7.1 - 9												
9.1 - 11	1									2		
11.1 - 15												
15.1 - 20												
Average (Sq.M)	4.5		3.4		2.4	2.7	1 .2	20	1.9	43	1.9	3.5
Number*	9	0	1	0	4	2	4	7	3	16	3	1
Total Area (Sq. M)	40.3		34		95	5.5	4.9	14.1	5.8	68.2	5.7	3.5

Redd Area (Sq.M)	Mill Creek			Pardaloe Creek			South Fork Garcia River			Whitlow Creek			Total
	January	February	March	January	February	March	January	February	March	January	February	March	All Streams
0-1		4	2		1			3			2		16
1.1 -2	3	4	6	5	2	3		6	1	1		1	43
2.1 -3	4	3	4	2		3	2	7					35
3.1 -5	2	4	2	3	2	3	3	3	4				44
5.1 -7	1	1	2	3		2			1				12
7.1 - 9													3
9.1 - 11								1					1
11.1 - 15		1			1								2
15.1 - 20													0
Average (Sq.M)	2.6	3.1	2.5	3.4	3.9	3.4	3.2	2.5	3.7	1.5	0.6	1.9	3.0
Number*	10	17	16	13	6	14	6	21	8	1	2	1	165
Total Area (Sq. M)	26.1	53.3	40.5	44.1	23.2	47.7	19.0	52.5	29.5	1.5	1.0	1.9	501.2

became impassable due to log and debris jams, and quite soon thereafter, became too steep for fish passage.

DISCUSSION

A comparison of steelhead spawning activity for five Garcia River tributaries, including data from past spawning surveys, is provided in Table 3. (Neilson et al. 1990, Maahs, M. 1996, Maahs, M 1997). These data illustrate that the number of steelhead in Mill and Pardaloe Creeks were higher than in the other Garcia River tributaries. Results for this survey indicates that fewer steelhead spawned in Pardaloe and Mill Creeks this past year than during the winters of 1995-1996 or 1996-1997. For the South Fork, each survey year, except 1990-1991, found similar levels of steelhead spawning activity. It is interesting to note that, in this survey and previous surveys, there were relatively few live steelhead observations in the South Fork in comparison to redds observations.

The total absence of any coho salmon being observed in the surveyed reaches of the Garcia River watershed is alarming, although not unexpected. No coho salmon were observed in South Fork Garcia River surveys in 1989-90 or 1990-91, nor in the Garcia River tributaries surveyed in 1995-1996. Coho salmon did spawn in 1996-1997 in three Garcia River tributaries and adult coho returning from that year should be expected to return in 1999-2000.

Table 4 Comparison between number of steelhead carcasses, redds per reach mile, live fish per survey mile and peak live counts of steelhead in Garcia River tributaries in 1989-90 through 1998-99.

Year	Steelhead Carcass Count	Feb-March Redd Density	Feb-March Live Fish/Mi	Peak Live Counts
		SOUTH FORK		
1989-90	1	16.5	0.7	3
1990-91	0	1.0	0	0
1996-97	1	12	0.5	4
1998-99	3	14	0	0
		MILL CREEK		
1995-96	2	14	2.6	10
1996-97	0	14.3	4.3	39
1998-99	1	9.7	1.1	9
		PARDALOE CREEK		
1995-96	2	14	9	22
1996-97	0	24.3	4.2	33
1998-99	1	13.3	5.2	15
		INMAN CREEK		
1995-96	0	2	0	0
1996-97	0	1.7	0	0
1998-99	0	0.9	0.5	1
		SIGNAL CREEK		
1995-96	0	8.3	0.4	3
1996-97	0	3.1	0.6	2

REFERENCES

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APPENDIX 1 Number of live steelhead, redds and steelhead carcasses by week in the Garcia River and its tributaries observed during 1998-99 spawning surveys.

Stream	December 1st	December 2nd	January 2nd	January 3rd	January 4th	February 1st	February 2nd	February 3rd	February 4th	March 1st	March 2nd	March 3rd	March 4th
LIVE STEELEAD													
Bluewaterhole Cr.			0		2							1	
East End Creek					0								
Fiemming Creek		0		0	0		0	1		0			0
Horace's Cabin Cr	0				2	1				0	0		1
Inman Creek					0				0		1		
Lee Creek									0	0			
Mainstem Sec 1	0				2	0				1	0		
Mainstem Sec 3			0										
Mitt Creek	0				1	1	9			2		5	1
Pardaloe Creek	0				9	1	15			11		5	7
South Fork	0	0		0			0	0		0		0	
Stanbury Creek										0			
Unnamed Creek										0			
Whitlow Creek			0		0					2	0		
REDDS													
Bluewatertiole Cr.			0		9							1	
East End Creek					1								
Fiemming Creek		0		0		2	0	2		0			2
Horace's Cabin Cr.	0				4	7				0	2		1
Irvnan Creek					0				0		1		
tee Creek									0	0			
Mainstem Sec 1	0				16	3				0	1		
Mainstem Sec 3			0										
Mill Creek	0				10	13	4			9		7	0
Pardaloe Creek	0				13	5	1			1		10	3
South Fork	0	0		6		14	4	2		4		3	
Stanbury Creek										0			
Unnamed Creek										0			
Wruttow Creek			0		1					3	0		
STEELHEAD CARCASSES													
Bluewaterhole Cr.			0		1							1	
East End Creek					0								
Fiemming Creek		0		0	0		0	0		0			0
Horace's Cabin Cr.	0				0	0				0	0		0
Inman Creek					0				0		0		
Lee Creek									0	0			
Mainstem Sec 1	0				0	0				0	0		
Mainstem Sec 3			0										
Mill Creek	0				0	0	0			0		0	1
Pardaloe Creek	0				0	0	0			0		1	0
South Fork	0	0		0	0		0	3		0		0	
Stanbury Creek										0			
Unnamed Creek										0			
Whitlow Creek			0		0					0	0		