



SN 90569

### 2001 RNSP REDWOOD CREEK SUMMER STEELHEAD TROUT SURVEY

**DATES:** July 31, August 1, 2, 6, 7, & 8, 2001

**LOCATION:** Redwood Creek, Humboldt County, California  
Mainstem reach from Lacks Creek - river km 46.525 to Hayes Creek (Redwood National Park) - river km 8.425.

**DISTANCE:** 38.1 km (23.7 miles) [35 % of the 108-km (67.1-mile) long Redwood Creek mainstem]

**FLOWS:** Gaging Station: Orick (California Department of Water Resources)  
Start of Survey: 19cfs End of Survey: 13cfs (Range: 12 to 19 cfs)

**DIVERS:** David Anderson<sup>1</sup>, Baker Holden<sup>1</sup>, Kyle Max<sup>1</sup>, Keith Bensen<sup>1</sup>, Terry Hines, Jeanne Mayer, Ben Littlefield, and David Hines. (<sup>1</sup>Person with prior summer steelhead diving experience on Redwood Creek.)

**METHOD:** Visual observation by diving with mask and snorkel, and surf wet suit (Roelofs 1983).  
Survey proceeded in the downstream direction.

**ACCESS:** Lacks Creek via Stover Ranch on Redwood Valley Road; Panther Creek at K&K road via Simpson Timber Company at Korbel; Coyote Creek in via the Bald Hills/Coyote Creek roads and hike along rehabbed road to mouth; hike/snorkel and camp on river two nights between Coyote Creek and Tom McDonald Creek, out via Tall Trees Trail to C-Line Road; Tom McDonald in via C-Line Road to Tall Trees Trail; Bond Creek in via A-9 road and hike road extension to Redwood Creek trail; and downstream of Hayes Creek out Redwood Creek trail to Redwood Creek lower trailhead parking lot.

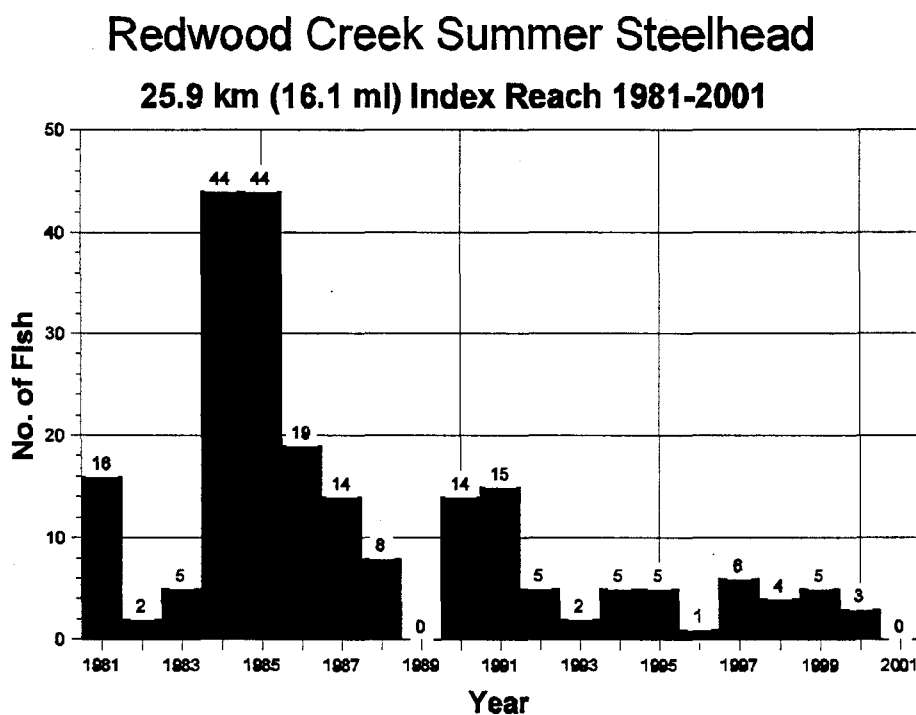
ITINERARY:	Date	Survey Reach	Distance	SSHD No.
	8/08	Lacks Creek to Panther Creek <i>Anderson, Max, Mayer</i>	6.01 km	0
	8/08	Panther Creek to Coyote Creek <i>Holden, Bensen, Littlefield</i>	3.76 km	0
	7/31	Coyote Creek to downstream of Copper Creek <i>Anderson, Holden, Max, T. Hines</i>	5.49 km	0
	8/01	Downstrm of Copper Creek to upstream of G Creek <i>Anderson, Holden, Max, T. Hines</i>	4.70 km	0
	8/02	Upstrm of G Creek to Tom McDonald Creek <i>Anderson, Holden, Max, T. Hines</i>	5.98 km	0
	8/07	Tom McDonald Creek to Bond Creek <i>Anderson, Holden, Max, Bensen, D. Hines</i>	4.42 km	1
	8/08	Bond Creek to Hayes Creek <i>Anderson, Holden, Max, Bensen</i>	7.73 km	0

**TOTAL NUMBER OF ADULT SUMMER STEELHEAD TROUT OBSERVED IN 2001: 1**  
(NUMBER OF ADULT SUMMER STEELHEAD TROUT (SSHD) OBSERVED WITHIN THE INDEX SECTION (LACKS CREEK TO TOM McDONALD CREEK - 16.1 miles): 0).

## SUMMER STEELHEAD TROUT (*Oncorhynchus mykiss*)

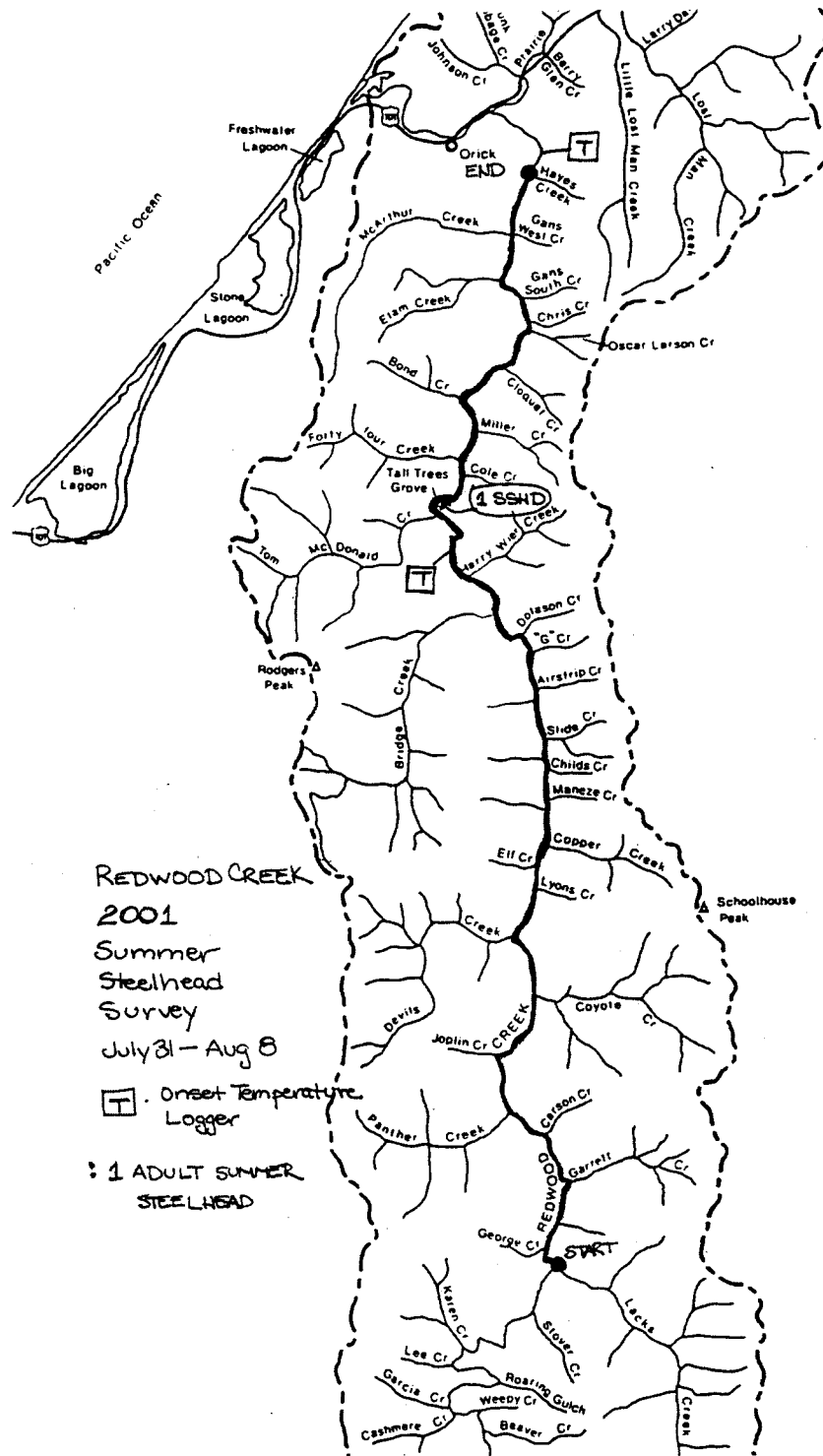
Year 2001 was the 21st consecutive summer steelhead trout survey of Redwood Creek, the first was 1981. One adult summer steelhead (steelhead  $\geq 16.5$  inches), six 'half-pounder' steelhead (smaller immature sea-run steelhead returning after less than one year in the ocean), and 170 coastal cutthroat trout (*O. clarki*) were observed in a mainstem survey reach from Lacks Creek to Hayes Creek (Figure 1 and Table 1). The one adult was observed immediately downstream of the index reach (Lacks Creek to Tom McDonald Creek). The number of adult steelhead within the index reach has declined over time (Figure 2 and Appendix I).

Figure 2. Numbers of summer steelhead observed each summer since 1981 on a 25.9 km (16.1 mile) index reach of Redwood Creek (Lacks Creek to Tom McDonald Creek), Humboldt County, California.



The one adult summer steelhead was observed in a pool downstream of Tom McDonald Creek with cover and structure from rock ledges and a stump (Table 2). Past data from Redwood Creek show the majority of summer steelhead are observed in pools, and pools associated with the inflow of cooler water from tributaries (Anderson 1993).

Though outside of our survey reach, the CDFG North Coast Watershed Assessment Program reported their stream habitat survey crews saw four summer steelhead, all greater than 24", in Redwood Creek upstream of Minor Creek on August 24 (Steve Cannata – Fishery Biologist, personal communication). No surveys were done specifically for summer steelhead upstream of our reach this year.



REDWOOD CREEK  
 2001  
 Summer  
 Steelhead  
 Survey  
 July 31 - Aug 8

☐ . Onset Temperature  
 Logger

○ : 1 ADULT SUMMER  
 STEELHEAD

Figure 1. Location of the one adult summer steelhead observed during the 2001 snorkel survey of Redwood Creek, Humboldt County, California. Survey was between Lacks Creek and Hayes Creek from July 31 to August 2 and August 6 to 8, 2001.

Table 1. Numbers of adult summer steelhead ( $\geq 16.5''$ ), 'half-pounder' steelhead, coastal cutthroat trout, other fish and wildlife observed, and miscellaneous notes during the 2001 summer steelhead survey of mainstem Redwood Creek, Humboldt County, California. Survey conducted July 31 through August 8, 2001 by Redwood National and State Parks and covered 38.1 km (23.7 miles) [35% of the 108 km (67.1 mile) long Redwood Creek mainstem]. (Stream reaches are broken out to reflect past reported reaches. These original reaches were based on access points, the majority of which no longer accessible by vehicle.)

Redwood Creek Mainstem Stream Reach		No. of Summer Steelhead Adults	No. of Half Pounders	No. of Cutthroat Trout	Other Fish and Wildlife Observed
I N D E X  R E A C H	Lacks to Panther Creek	0	0	6	Juvenile steelhead, resident steelhead, lamprey ammoeocytes, adult yellow legged frogs, tadpoles, rough skinned newt (dead), garter snake, dippers, belted kingfisher, stellers jay, mold, and river otter (2).
	Panther to Coyote Creek	0	0	4	Not reported.
	Coyote to Copper Creek	0	0	3	Resident steelhead, schools of king salmon juveniles, sculpin, rough skinned newt, western aquatic garter snake, belted kingfisher, dippers, red-tailed hawk, Black crowned night heron, and deer (2).
	Copper to Pig Pen Prairie (Slide Cr)	0	3	10	Juvenile steelhead, resident steelhead, king salmon juveniles, piedbill grebe, wood ducks (5), mergansers (45), sandpipers, belted kingfisher, and a bear.
	Pig Pen Prairie (Slide Cr) to Bridge Creek	0	1	11	King salmon juveniles, three spine stickleback, western toad tadpoles, yellow legged frogs mergansers (15), sandpipers, marbled murrelets (59 detections).
	Bridge to Tom McDonald Creek	0	0	12	Juvenile steelhead and osprey.
	Tom McDonald to Bond Creek	1	2	12	Suckers (75-100), three spine stickleback, western toad, and pacific giant salamander larvae (dead).
Bond Creek to Hayes Creek	0		112*	Coho juvenile (dead), sculpin, yellow legged frogs, sandpipers, great blue heron, mergansers (14), osprey (1), elk (30 adults, 10 calves), and hikers/campers (9).	
Total		1	6	170	
* Majority of cutthroat, 53, were in last large pool before Hayes Creek.					

Table 2. Results of the 2001 Redwood Creek summer steelhead survey, including date observed, number of adult steelhead, estimated length of fish (inches), habitat description, and river kilometer and UTM map coordinates.

2001 Date	No. of SSHD	Est. Length (inches)	Habitat Description
8/07	1	17-18"	In pool immediately below confluence of Tom McDonald Creek opposite the Tall Trees Grove. Fish under stump. Rocks on bank with ledges. Pool dimensions 33' W x 250' L x 7'D. Water temperature 19.5°C at 9:44 am. (20.25 River km) [UTM 456500N 041500E].

### WATER DISCHARGE

Water flow (measured at Orick gaging station located downstream of the confluence of Prairie Creek at Redwood Creek) during the six day survey ranged from 12 to 19 cfs, beginning at 19 cfs on July 31 and ending at 13 cfs at the end of the survey on August 8, 2001.

### WATER TEMPERATURE

Water temperatures (°C) were measured with a hand held thermometer below the water surface in the main current of Redwood Creek and tributaries. At each tributary, the mainstem Redwood Creek temperature was measured upstream of the tributary.

Mainstem Redwood Creek - Water temperatures measured during the 2001 survey in Redwood Creek ranged from 15.5°C (8/08/01 at 10:15am) to 24.0°C (8/08/01 at 2:29pm) (Appendix II).

Two Onset TidBit recording temperature loggers were placed mid-depth in the current of Redwood Creek within the park. One was located upstream of Tom McDonald Creek/Tall Trees Grove (UTM 0415985E 4561454N) and the other in lower Redwood Creek upstream of the trailhead (UTM 0413685E 4572015N) (Figure 1). They recorded temperature every 1-hour from June 13 through October 25, 2001 at the site upstream of Tom McDonald Creek and from June 11 through October 25, 2001 at the lower Redwood Creek site. Maximum, minimum and average water temperatures recorded at the upstream location were 24.2°C, 11°C, and 18.1°C, respectively. At the lower site, maximum, minimum, and average water temperatures were 22.1°C, 11.8°C, and 16.8°C, respectively. The lower site had larger daily fluctuations than the upstream site but the upper site was warmer for longer periods of time (Table 3). Redwood Creek water temperatures remained high June through September, peaking in August (Table 3 and Figure 3).

Tributaries - Temperatures of water entering Redwood Creek from the east and westside tributaries during the survey ranged from 9.5°C (Panther Creek) to 19.5°C (Copper Creek) (Appendix II). Water temperatures of **all** tributaries were cooler than the corresponding temperature of mainstem Redwood Creek **measured at the same time**.

Westside tributaries were significantly cooler ( $p < 0.01$ ) than eastside tributaries; a pattern repeated in all past summer steelhead surveys. However, below the Tall Trees Grove, east and

westside tributaries were generally the same at 13 to 14°C. The mean water temperature of westside tributaries was 13.1°C (n = 15, std. dev. = 1.4°C) and temperatures ranged from 9.5 to 15°C. The mean water temperature of eastside tributaries was 14.5°C (n = 17, std. dev. = 1.6°C) and temperatures ranged from 13.0 to 19.5°C.

Table 3. Percent of time mainstem water temperature (°C) exceeds or equals temperature value at two locations on Redwood Creek, Humboldt County, California, during June through October 2001. Temperatures recorded by Onset Tidbit temperature loggers.

Month YR 2001	Redwood Creek Above Tall Trees Grove														
	Percent of Time Temperature (°C) Exceeds or Equals Value														
	≥11	≥12	≥13	≥14	≥15	≥16	≥17	≥18	≥19	≥20	≥21	≥22	≥23	≥24	≥25
June 13-30	100	100	100	100	100	90.0	59.6	39.0	25.1	10.0	1.0	0.0	0.0	0.0	0.0
July 1-31	100	100	100	100	100	100	98.8	87.0	61.4	44.5	25.1	9.5	0.8	0.0	0.0
August 1-31	100	100	100	100	100	100	100	95.2	72.0	38.4	22.2	10.6	2.2	0.3	0.0
September 1-30	100	100	100	99.9	96.8	84.7	53.6	34.2	17.5	10.0	5.0	1.8	0.0	0.0	0.0
October 1-25	100	96.9	87.6	57.2	36.5	15.8	5.5	3.1	1.4	0.0	0.0	0.0	0.0	0.0	0.0
June 13 – Oct 25	100	99.4	97.7	92.2	87.7	79.9	66.8	55.6	38.3	22.8	12.2	5.1	0.7	0.1	0.0
Month YR 2001	Lower Redwood Creek														
	Percent of Time Temperature (°C) Exceeds or Equals Value														
	≥11	≥12	≥13	≥14	≥15	≥16	≥17	≥18	≥19	≥20	≥21	≥22	≥23	≥24	≥25
June 11-30	100	100	100	97.8	81.3	49.0	34.0	21.9	14.6	3.0	0.0	0.0	0.0	0.0	0.0
July 1-31	100	100	100	100	99.6	71.1	45.2	31.0	22.7	14.0	5.0	0.0	0.0	0.0	0.0
August 1-31	100	100	100	100	99.9	83.6	48.1	28.6	19.2	11.4	5.9	0.3	0.0	0.0	0.0
September 1-30	100	100	100	98.5	87.8	50.7	32.8	22.1	14.9	8.2	2.5	0.0	0.0	0.0	0.0
October 1-25	100	99.7	95.6	79.7	56.1	29.6	18.4	12.0	6.8	2.4	0.0	0.0	0.0	0.0	0.0
June 11 – Oct 25	100	99.9	99.2	95.7	86.6	58.8	36.7	23.8	16.1	8.5	3.0	0.1	0.0	0.0	0.0

Fishery Effects - The 2001 year summer water temperatures are not an anomaly. Similar temperatures and trends have been recorded in past summer steelhead surveys and temperature monitoring. Water temperatures in Redwood Creek are high for salmonid fish, above the preferred temperature range reported by Reiser and Bjornn (1979) for steelhead of 7.3 to 14.6°C. Yoshiyama et. al (1993) reports summer steelhead are found in water temperatures ranging from 10 to 15°C, "with a sustained upper limit of 20°C", and that they can occur in temperatures as high as 27°C for short periods of time. A California Department of Fish and Game (CDFG) funded study of mortality of angler caught and released summer steelhead reported increased summer steelhead mortality with increased water temperature, a 10 percent mortality at 21°C and 35 percent at 24°C (Taylor and Barnhart 1997). Though only the reach downstream of Bond Creek on Redwood Creek is open to catch-and-release fishing, any incidental post-angling mortality on holding and migrating fish would be significant to the small Redwood Creek summer steelhead population. The CDFG in their 1996 Steelhead Restoration and Management Plan for California recommended "adjustment of angling seasons should be considered to limit catch-and-release angling to cooler water periods when hooking mortality is less" (McEwan and Jackson 1996). Based on that recommendation, the mainstem of Redwood Creek should be

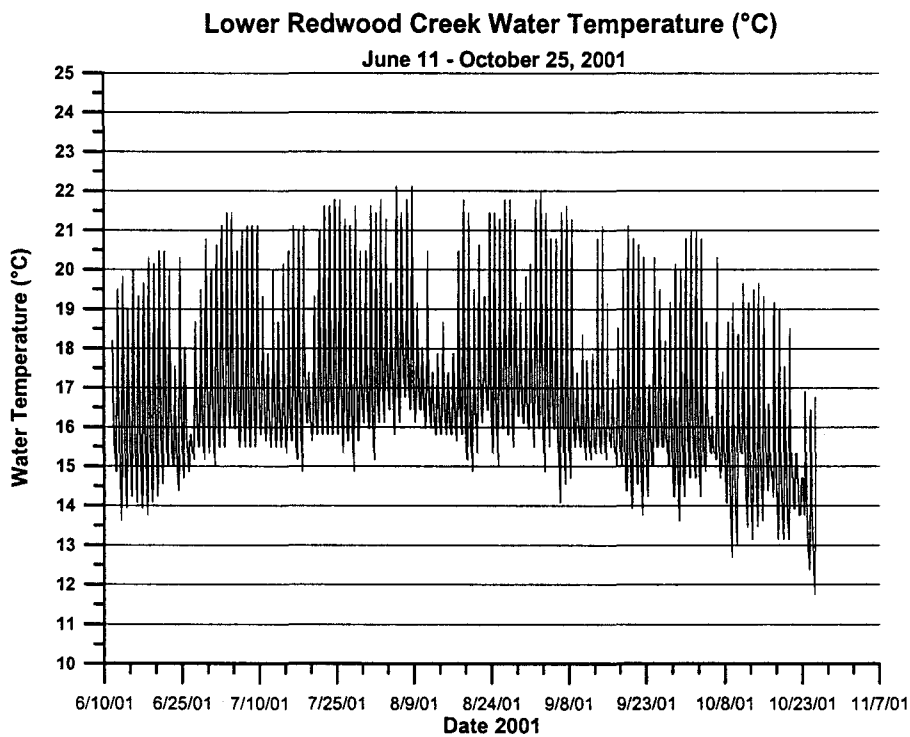
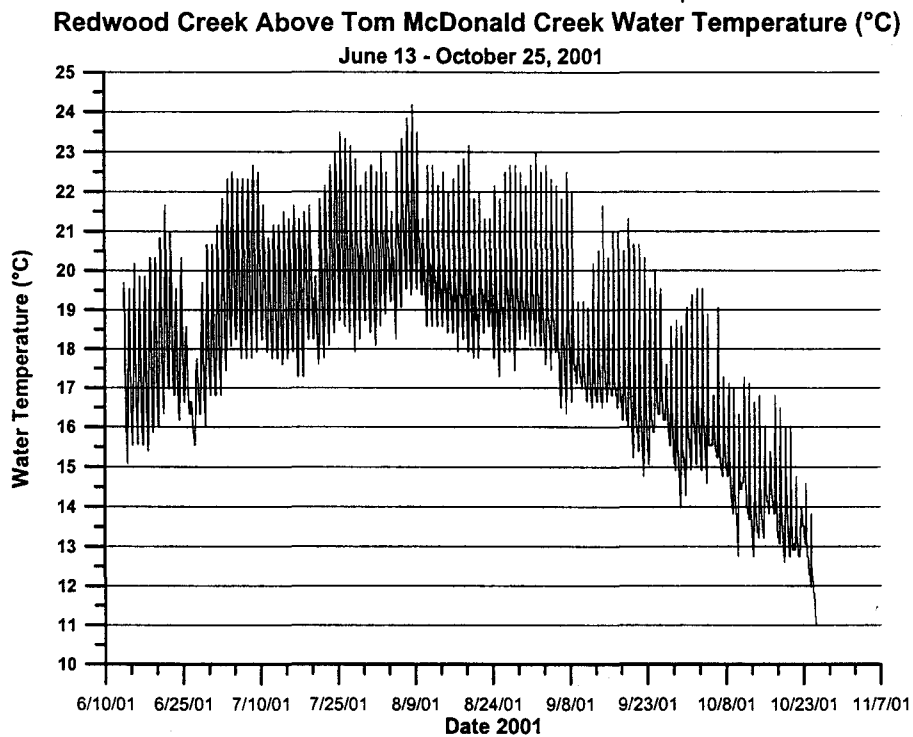


Figure 3. Mainstem Redwood Creek water temperatures (°C) from Onset TidBit temperature loggers located upstream of Tom McDonald Creek and upstream of the lower Redwood Creek trailhead parking lot. The loggers recorded water temperature every 1-hour in the current below the surface of the water from June 13 through October 25, 2001 at the site upstream of Tom McDonald Creek, and June 11 through October 25, 2001 at the lower Redwood Creek site.

closed to fishing during high water temperature periods. For Redwood Creek summer temperatures to decrease, the streamside canopy will have to be reestablished, and remaining canopy protected, particularly conifers.

Steelhead within the Northern California coastal steelhead ESU (evolutionary significant unit), which includes Redwood Creek, were federally listed by the National Marine Fisheries Service (NMFS) as threatened in June 2000.

#### REFERENCES

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#### PERSONAL COMMUNICATION

Steve Cannata- Fishery Biologist, CDFG North Coast Watershed Assessment Program, Fortuna, California.

Report Prepared by: David G. Anderson - RNSP Fishery Biologist  
(707) 464-6101 x 5271 david\_g\_anderson@nps.gov  
Redwood National and State Parks, Orick, California.  
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Appendix I. Numbers of Summer Steelhead Trout (SSHD) observed 1981 through 2001 and survey dates in the 25.9-km (16.1-mile) index reach of Redwood Creek from Lacks Creek to Tom McDonald Creek, Humboldt County, California.

Year	No. of Summer Steelhead	Survey Dates
1981	16	8/10 - 13
1982 <sup>a</sup>	2	10/12 & 14
1983	5	8/22 - 25
1984	44+	8/08 - 10
1985	44+	8/20 - 22, 9/4
1986	19+	8/25 - 27
1987	14	7/14 - 16
1988	8	7/26 - 28
1989 <sup>b</sup>	0	7/31, 8/01 - 02
1990	14	7/31, 8/01 - 03
1991	15	8/05 - 08
1992	5	8/03 - 06, 10
1993	2	8/02 - 05, 09
1994	5	8/01 - 04
1995	5	7/24 - 27
1996	1	8/05 - 08
1997	6	8/04 - 07
1998	4	7/27 - 30
1999	5	8/2-10
2000	3	8/1 - 09
2001	0	7/31, 8/01-02, 08
<sup>a</sup> Survey from Stover Creek to Emerald Creek, 14 miles, covering most of index section and best pool habitat. <sup>b</sup> Survey from Lacks to Bridge Creek, minus Garret to Panther Creek, a total of 11.1 miles. Covered best pool habitat.		

Appendix II. Water and air temperatures (°C) measured during the 2001 Redwood Creek summer steelhead trout survey. Locations are listed south to north. Redwood Creek (upstream) refers to water temperature measurement taken upstream of the tributary listed below. UN refers to unnamed tributary, WS to westside or ES to eastside, and number to river kilometer measured from the mouth of Redwood Creek. Alignment refers to tributary watershed position: East = Eastside, West = Westside, and REDW = mainstem Redwood Creek.

Location	Alignment	Date	Time	Temperature °C	
				Water	Air
Redwood Creek (upstream)	REDW	8/8/01	8:55 AM	19.5	
Lacks Creek	East	8/8/01	8:55 AM	16.0	
Redwood Creek (upstream)	REDW	8/8/01	9:39 AM	19.0	
UN WS 45.70	West	8/8/01	9:39 AM	13.0	
Redwood Creek (upstream)	REDW	8/8/01	11:07 AM	20.0	
UN ES 44.381	East	8/8/01	11:07 AM	14.0	
Redwood Creek (upstream)	REDW	8/8/01	12:02 PM	21.0	
Garrett Creek	East	8/8/01	12:02 PM	16.5	
Redwood Creek (upstream)	REDW	8/8/01	2:29 PM	24.0	
UN ES 41.775	East	8/8/01	2:29 PM	15.0	
UN ES 41.244	East	8/8/01		DRY	
Redwood Creek (upstream)	REDW	8/8/01	3:25 PM	23.5	
Panther Creek	West	8/8/01	3:25 PM	13.0	
Redwood Creek (upstream)	REDW	8/8/01	10:15 AM	15.5	
Panther Creek	West	8/8/01	10:15 AM	9.5	
Redwood Creek (upstream)	REDW	8/8/01	12:05 PM	16.0	
Joplin Creek	West	8/8/01	12:05 PM	10.5	
Redwood Creek (upstream)	REDW	8/8/01	3:00 PM	18.0	
Coyote Creek	East	8/8/01	3:00 PM	13.0	
Redwood Creek (upstream)	REDW	7/31/01	11:30 AM	18.5	20.0
Coyote Creek	East	7/31/01	11:30 AM	--	20.0
Redwood Creek (upstream)	REDW	7/31/01	12:41 PM	20.0	
UN ES 35.7384	East	7/31/01	12:41 PM	14.0	
Redwood Creek (upstream)	REDW	7/31/01	1:53 PM	18.0	
Devils Creek	West	7/31/01	1:53 PM	13.5	
Redwood Creek (upstream)	REDW	7/31/01	3:11 PM	21.0	
Lyons Creek	East	7/31/01	3:11 PM	15.0	
Redwood Creek (upstream)	REDW	7/31/01	4:33 PM	22.0	
Elf Creek	West	7/31/01	4:33 PM	13.0	

Location	Alignment	Date	Time	Temperature °C	
				Water	Air
Redwood Creek (upstream)	REDW	7/31/01	4:40 PM	21.5	
UN WS 32.527	West	7/31/01	4:40 PM	13.5	
Redwood Creek (upstream)	REDW	7/31/01	5:11 PM	22.0	
Copper Creek	East	7/31/01	5:11 PM	19.5	
Redwood Creek at UN ES 31.2723	REDW	7/31/01	6:42 PM	22.0	
Redwood Creek at UN ES 31.2723	REDW	8/1/01	10:20 AM	17.5	
Redwood Creek (upstream)	REDW	8/1/01	11:24 AM	19.0	
UN WS 30.380	West	8/01/01	11:24 AM	13.0	
Redwood Creek (upstream)	REDW	8/1/01	2:14 PM	20.5	
Slide Creek	East	8/1/01	2:14 PM	14.5	
Redwood Creek at UN ES 26.6504	REDW	8/1/01	5:40 PM	21.0	
Redwood Creek at UN ES 26.6504	REDW	8/2/01	9:20 AM	18.0	
Redwood Creek (upstream)	REDW	8/2/01	9:52 AM	--	
G Creek	East	8/2/01	9:52 AM	13.0	
Redwood Creek (upstream)	REDW	8/2/01	10:02 AM	19.0	
Dolason Creek	East	8/2/01	10:02 AM	13.5	
Redwood Creek (upstream)	REDW	8/2/01	10:45 AM	19.5	
Bridge Creek	West	8/2/01	10:45 AM	15.0	
Redwood Creek (upstream)	REDW	8/2/01	11:30 AM	19.5	
Emerald Creek	East	8/2/01	11:30 AM	13.5	
Redwood Creek (upstream)	REDW	8/2/01	2:05 PM	20.5	
Tom McDonald Creek	West	8/2/01	2:05 PM	15.0	
Redwood Creek (upstream)	REDW	8/6/01	9:26 AM	20.0	19.5
Tom McDonald Creek	West	8/6/01	9:26 AM	13.5	19.5
Redwood Creek (upstream)	REDW	8/6/01	11:21 AM	19.5	
Cole Creek	East	8/6/01	11:21 AM	13.5	
Redwood Creek (upstream)	REDW	8/6/01	11:40 AM	20.0	
Fortyfour Creek	West	8/6/01	11:40 AM	13.0	
Redwood Creek (upstream)	REDW	8/6/01	1:05 PM	20.5	
Miller Creek	East	8/6/01	1:05 PM	14.0	
Redwood Creek (upstream)	REDW	8/6/01	1:45 PM	21.5	
Bond Creek	West	8/6/01	1:45 PM	13.0	
Redwood Creek (upstream)	REDW	8/7/01	9:15 AM	18.5	
Bond Creek	West	8/7/01	9:15 AM	13.0	
Redwood Creek (upstream)	REDW	8/7/01	9:41 AM	19.0	

Location	Alignment	Date	Time	Temperature °C	
				Water	Air
UN WS 15.6936	West	8/7/01	9:41 AM	13.5	
Redwood Creek (upstream)	REDW	8/7/01	10:15 AM	18.5	
Cloquet Creek	East	8/7/01	10:15 AM	14.0	
Redwood Creek (upstream)	REDW	8/7/01	11:18 AM	19.5	
Oscar Larson Creek	East	8/7/01	11:18 AM	14.0	
Redwood Creek (upstream)	REDW	8/7/01	11:26 AM	19.5	
Chris Creek	East	8/7/01	11:26 AM	14.0	
Redwood Creek (upstream)	REDW	8/7/01	1:24 PM	21.0	
Elam Creek	West	8/7/01	1:24 PM	13.5	
Redwood Creek (upstream)	REDW	8/7/01	2:17 PM	20.5	
McArthur Creek	West	8/7/01	2:17 PM	14.0	
Redwood Creek (upstream)	REDW	8/7/01	3:32 PM	21.5	
Hayes Creek	East	8/7/01	3:32 PM	DRY	