

1997 RNSP REDWOOD CREEK SUMMER STEELHEAD TROUT SURVEY

DATES: August 4, 5, 6, 7, 1997

LOCATION: Redwood Creek, Humboldt County, California
Lacks Creek - river km 45.3 downstream to Hayes Creek at 'cold pool' (Redwood National Park) - river km 7.5

DISTANCE: 37.8 km (23.5 miles) [35% of the 108 km long Redwood Creek mainstem]

FLOWS: Gaging Station: Orick (California Department of Water Resources)
Start of Survey: <17cfs End of Survey: <17 cfs

DIVERS: David Anderson*, Cara Arguello*, Bill Falvey*, Rick Wallen*, Don Baldwin*, Judi Friedman, Shawn Eckart, Carolyn Meyer* (Volunteer), Leonel Arguello (Vegetation Management Branch), and Juliana Finucane (Student Conservation Association)
(* Indicates person with prior Redwood Creek summer steelhead survey experience)

METHOD: Visual observation by diving with mask and snorkel, and full wetsuit or surfsuit (Roelofs 1983). Survey proceeded in the downstream direction.

ACCESS: Lacks Creek at Stover Ranch on Redwood Valley Road; Panther Creek at K&K road via Simpson Timber Company; Coyote Creek in via the Bald Hills/Coyote Creek roads and hike Simpson rehabbed road to mouth; hike/snorkel/swim and camp on river between Coyote Creek and Tom McDonald Creek; Tom McDonald in via West Side Access road and M Line to mouth; Bond Creek in via Westside Access Road to C-Line and on Forty-four Creek horse trail and Redwood Creek trail, and downstream of Hayes Creek out Redwood Creek trail to Redwood Creek trailhead.

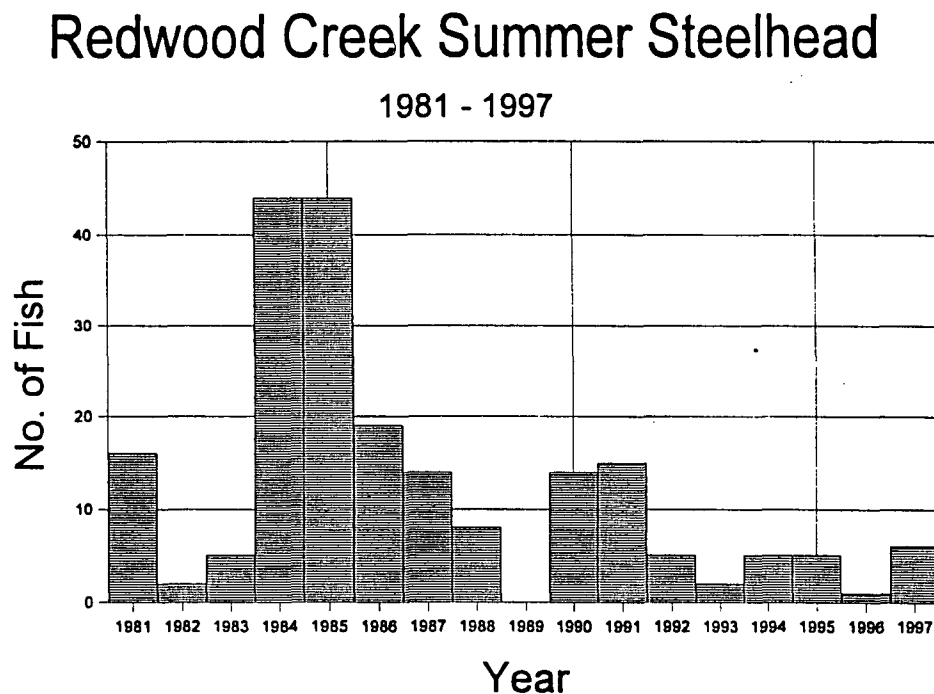
ITINERARY:	8/4 Lacks Creek to Panther Creek Anderson, Baldwin, Eckart, Friedman	6.15 km
	8/4 Panther Creek to Coyote Creek C. Arguello, Falvey, Wallen	3.65 km
	8/5 Coyote Creek to Copper Creek Anderson, Baldwin, Eckart, Friedman	4.50 km
	8/6 Copper Creek to End of Gorge Anderson, Baldwin, Eckart, Friedman	5.40 km
	8/7 End of Gorge to Tom McDonald Creek Anderson, Baldwin, Eckart, Friedman	6.20 km
	8/6 Tom McDonald Creek to Bond Creek Meyer, L. Arguello	4.20 km
	8/7 Bond Creek to downstream Hayes Cr. C. Arguello, Falvey, Finucane	7.7 0 km

NUMBER OF ADULT SUMMER STEELHEAD TROUT OBSERVED IN 1997: 6
TOTAL NUMBER OF ADULT SUMMER STEELHEAD TROUT (SSHD) OBSERVED WITHIN THE INDEX SECTION (LACKS CREEK TO TOM MCDONALD CREEK - 16.1 miles): 6

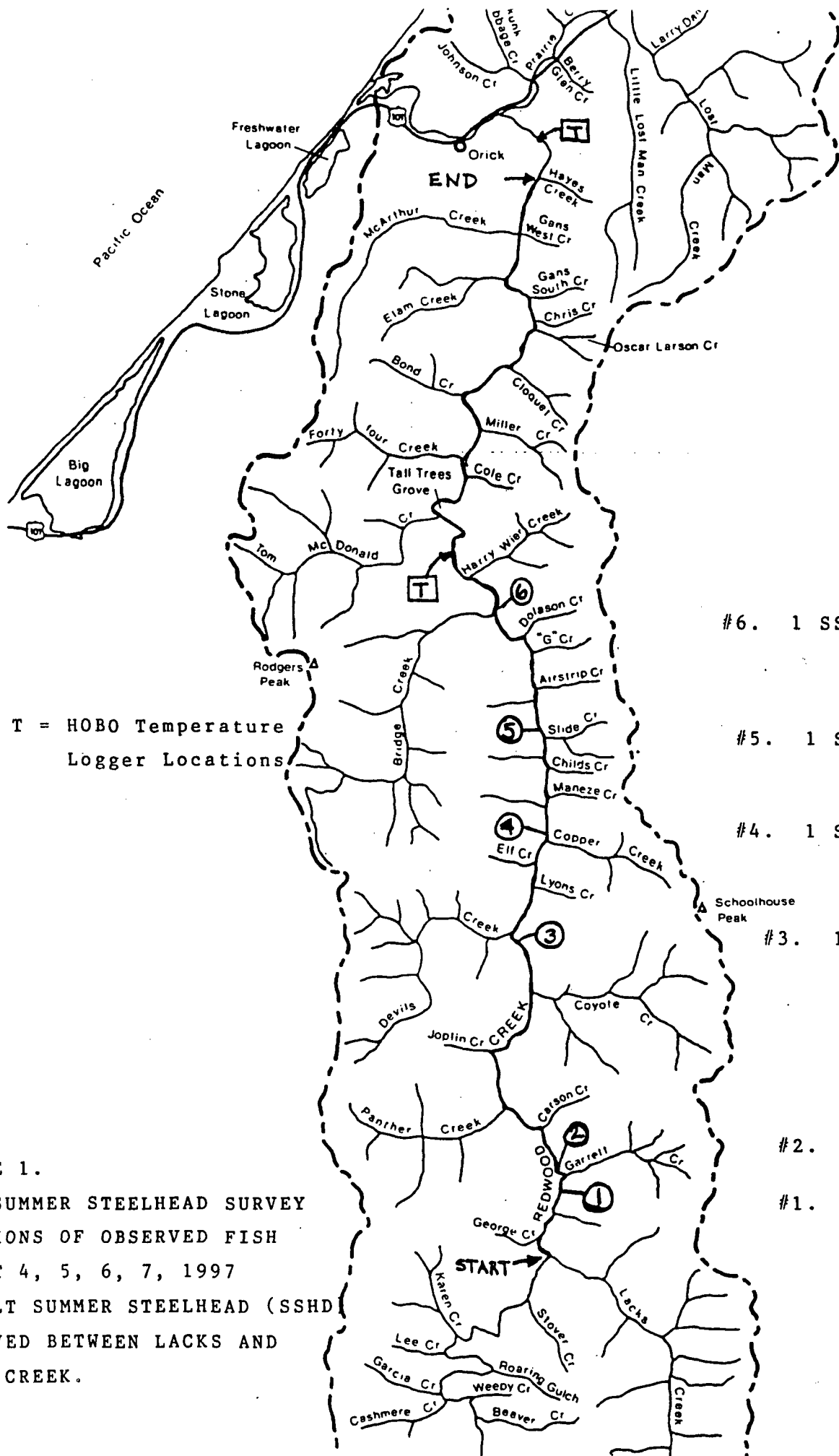
SUMMER STEELHEAD TROUT (*Oncorhynchus mykiss*)

This is the 17th consecutive summer steelhead trout survey of Redwood Creek, the first was in 1981. All six adult summer steelhead (>16.5 inches) observed in 1997 were in the index reach from Lacks Creek to Tom McDonald Creek (Figure 1). This year's count in the index reach was higher than last year's one fish, but generally the population appears to be declining over time and the cohort strength of 1984 and 1985 waning (Figure 2 and Appendix I).

Figure 2. Numbers of summer steelhead observed each summer since 1981 on a 25.9 km reach of Redwood Creek, Humboldt County, California.



All adult fish were observed in pools in association or in combination with some sort of cover/structure; bedrock ledges, boulders, and large woody debris (LWD). Of the six adults observed, one was associated with a pool into which a tributary entered, and three were in pools below tributaries, Coyote, Slide, and Bridge Creeks (Table 1.) Past data from Redwood Creek show the majority of summer steelhead are observed in pools, and where a deep pool and inflow of cooler water from a tributary occur together (Anderson 1993). Thirteen 'half pounder' steelhead (smaller immature sea-run steelhead returning after less than one year in the ocean) and 18 coastal cutthroat trout were also observed (Table 2). Distribution of all summer steelhead, half pounder steelhead and cutthroat trout tended to be in the upper and mid reaches of the survey reach.



T = HOBOTemperature
Logger Locations

#6. 1 SSHD

#5. 1 SSHD

#4. 1 SSHD

#3. 1 SSHD

#2. 1 SSHD

#1. 1 SSHD

FIGURE 1.
1997 SUMMER STEELHEAD SURVEY
LOCATIONS OF OBSERVED FISH
AUGUST 4, 5, 6, 7, 1997
6 ADULT SUMMER STEELHEAD (SSHD)
OBSERVED BETWEEN LACKS AND
HAYES CREEK.

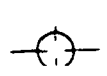
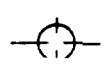


Table 1. Results of the 1997 Redwood Creek summer steelhead survey, including date observed, location on report map, number of steelhead, estimated length of fish (inches), habitat description, and USGS and UTM map coordinates.

Date	Map Location	No. of SSHD	Est. Length (inches)	Habitat Description
8/04	1	1	>16.5"	In pool with boulder and LWD. Pool 6'D x 40'W x 80'L. Tributary entering pool with 9.5°C water at 1155. Pool temperature 21.5°C at 1203. Only saw glimpse of fish. (T8NR3Esec18, UTM 426100E 4547500N).
8/04	2	1	25"	Hidden under boulder in pool. Pool 3'D x 40'W x 300'L. Pool temperature 24.0°C at 1521. (T8NR3Esec18, UTM 425900E 4547850N).
8/05	3	1	20"	Fish between rocks at bottom of pool. Pool 9'D x 35'W x 300'L and 23°C at 1527. (T9NR2Esec34, UTM 422250E 4552700N).
8/06	4	1	18"	In first pool below Coyote Creek in crack of boulder. Pool 4'D x 30'W x 150'L and 19.5°C at 1000. (T9NR2Esec22, UTM 421700E 4555550N).
8/06	5	1	20"	In pool below Slide Creek pool under log. Pool 2.5'D x 20'W x 200'L and 23.5°C at 1527. (T9NR2Esec16, UTM 420650E 4558050N).
8/07	6	1	20"	In first pool below Bridge Creek under bedrock ledge of rock face. Pool 8'D x 45'W x 75'L and 21.0°C at 1144. (T9NR2Esec7, UTM 417700E 4560500N).

WATER DISCHARGE

Water flow (at Orick gaging station located downstream of the confluence of Prairie Creek at Redwood Creek) during the survey was less than 17 cfs.

WATER TEMPERATURE

Mainstem Redwood Creek - Water temperatures 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. Water temperatures measured in Redwood Creek ranged from 19.0°C (at 0900, 0940, and 1050 on three separate days) to 24.0°C (at 1521) during the 1997 survey (Table 3).

Table 2. Numbers of adult summer steelhead (>16.5"), half-pounder steelhead, coastal cutthroat trout; and other fish and wildlife observed during the 1997 summer steelhead survey of the mainstem Redwood Creek., Humboldt County, California. (Used previous years format of beginning and ending points).

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	2	2	8	Juvenile garter snakes, kingfisher, dipper
	Panther to Coyote Creek	0	2	2	Suckers, sculpin
	Coyote to Copper Creek	1	5	3	Suckers, sculpin, osprey, kingfisher, mergansers, bull elk
	Copper to Pig Pen Prairie	1	3	2	Beaver sign, bear prints, bandtailed pigeons, kingfisher, mergansers
	Pig Pen Prairie to Bridge Creek	1	0	1	Suckers, mergansers, mountain lion killed deer
	Bridge to Tom McDonald Creek	1	1	2	Great blue heron
	Tom McDonald to Bond Creek	0	0	0	No fish over 10" seen
	Bond Creek to Hayes Creek	0	0	0	-----
Total		6	13	18	

Two HOBO recording temperature loggers were placed mid-depth in the current of Redwood Creek, one upstream of Tom McDonald Creek and one in lower Redwood Creek upstream of the Redwood Creek trailhead. They recorded water temperatures every 48 minutes from July 10 to September 8, 1997 on Redwood Creek upstream of Tom McDonald Creek, and from August 8 to October 6, 1997 at lower Redwood Creek near the trail head (Figure 3). Water temperatures at the upper and lower locations paralleled the same trend. Maximum and minimum, and mean water temperatures recorded at the upstream location were 23.9°C and 16.7°C, mean 20.1°C; and at the lower location, 24.4°C and 13.7°C, mean 18.7°C. Daily fluctuations were on the order of 7°C at the lower site and 5°C at the upper site. Average temperature for the period August 8 through September 8 when the probes were recording the same period was 19.9°C at the upper site and 19.4°C at the lower site. Even though their average was similar, it was both hotter and cooler at the lower Redwood Creek site than the upstream site.

Tributaries - Temperatures of water entering Redwood Creek from the east and westside tributaries during the survey ranged from 9.0°C (an unnamed westside tributary) to 19.5°C (the eastside tributary Garrett Creek). Water temperatures of all tributaries were cooler than the corresponding temperature of mainstem Redwood Creek measured at the same time. Westside tributaries were usually cooler than eastside tributaries, a pattern repeated in past surveys. The mean water temperatures of westside temperatures was 14.2°C (n = 18, std. dev. = 2.0°C, and range 9.0 to 16.5°C), and the mean water temperature of eastside tributaries was 15.8°C (n = 12, std. dev. = 1.7°C, and range 14.0 to 19.5°C).

Water temperatures from Prairie Creek, a relatively undisturbed old growth watershed in the Redwood Creek basin were recorded every 48 minutes with a HOBO temperature logger from July 31 to September 29, 1997. Prairie Creek, the largest eastside tributary, enters lower Redwood Creek north of the town of Orick. Prairie Creek water temperatures were lower than both Redwood Creek locations, and ranged from 13.0 to 17.4°C with a mean of 15.3°C between July 31 and September 29, 1997 (Figure 3). For comparison, its highest temperatures approached lower Redwood Creek's coldest temperatures, and were considerably cooler than the upper Redwood Creek location.

Fishery Effects - The 1997 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 were 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. The occurrence of summer steelhead in Redwood Creek in pools associated with or close to tributary cold water sources may indicate that the mainstem as a whole is too warm, and it is these cooler water refugia that are the only suitable habitat for adult summer steelhead holding over the summer in Redwood Creek. For Redwood Creek summer water temperatures to decrease, the canopy will have to be reestablished, and remaining canopy protected.

The Northern California coastal steelhead ESU (evolutionary significant unit) which includes Redwood Creek has been proposed for federal threatened listing (NMFS 1996). The National Marine Fisheries Service concluded the Northern California steelhead ESU is not presently in danger of extinction, but is likely to become endangered in the foreseeable future. They noted summer steelhead abundance is very low and estimated a -3.0% per year trend in total escapement for Redwood Creek summer steelhead (Busby, et al. 1996). A listing decision due in August of 1997 has been delayed six months.

Table 3. Water and air temperatures (°C) measured during the 1997 Redwood Creek summer steelhead trout survey. Locations are listed south to north. Alignment refers to tributary watershed position: E = Eastside, W = Westside, and REDW = mainstem Redwood Creek.

LOCATION	ALIGNMENT	1997 DATE	TIME	TEMPERATURE °C	
				WATER	AIR
Redwood Creek (upstream of Lacks Cr.)	REDW	8/04	0910	19.5	
Lacks Creek	E	8/04	0905	16.5	23.5
George Creek	W	8/04		Dry at mouth	
Redwood Creek (upstream of unnamed tributary)	REDW	8/04	1051	21.0	
Unnamed Tributary	W	8/04	1051	9.0	
Redwood Creek	REDW	8/04	1130	21.0	
Redwood Creek (upstream of unnamed tributary)	REDW	8/04	1155	21.5	
Unnamed Tributary	W	8/04	1155	9.5	
Redwood Creek (1 Summer Steelhead)	REDW	8/04	1203	pool 21.5	
Redwood Creek (upstream of Garrett Cr.)	REDW	8/04	1505	23.5	
Garrett Creek	E	8/04	1505	19.5	
Redwood Creek (1 Summer Steelhead)	REDW	8/04	1521	pool 24.0	
Redwood Creek (upstream of Panther Cr.)	REDW	8/04	1701	24.0	
Panther Creek	W	8/04	1701	16.0	
Redwood Creek (upstream of Panther Cr.)	REDW	8/04	0940	19.0	
Panther Creek	W	8/04	0940	14.0	
Redwood Creek (upstream of unnamed tributary)	REDW	8/04	1050	19.0	
Unnamed tributary	W	8/04	1050	14.0	
Redwood Creek (upstream of Joplin Cr.)	REDW	8/04	1125	20.0	
Joplin Creek	W	8/04	1125	15.0	
Redwood Creek (upstream of Coyote)	REDW	8/04	1430	22.5	
Coyote Creek	E	8/04	1430	17.0	
Redwood Creek (upstream of Coyote Cr.)	REDW	8/05	1335	21.0	25.0
Coyote Creek	E	8/05	1335	17.5	
Redwood Creek (1 Summer Steelhead)	REDW	8/05	~	pool 23.0	
Redwood Creek (upstream of Devils Cr.)	REDW	8/05	1550	23.5	
Devils Creek	W	8/05	1550	15.5	
Redwood Creek (upstream of Lyons Cr.)	REDW	8/05	~	23.5	
Lyons Creek	E	8/05	~	17.0	

LOCATION	ALIGNMENT	1997 DATE	TIME	TEMPERATURE °C	
				WATER	AIR
Elf Creek	W	8/05	~	Dry at mouth	
Redwood Creek (upstream of unnamed tributary)	REDW	8/05	1815	22.0	
Unnamed tributary (downstream of Elf Creek)	E	8/05	1815	14.5	
Redwood Creek (upstream of unnamed tributary)	REDW	8/05	1830	22.0	
Unnamed tributary	W	8/05	1830	15.0	
Redwood Creek (upstream of Copper Cr.)	REDW	8/05	1850	22.0	
Copper Creek	E	8/05	1850	Dry at mouth	
Redwood Creek (upstream of Copper Cr.)	REDW	8/06	0900	19.0	17.5
Copper Creek	E	8/06	0900	Dry at mouth	
Redwood Creek (1 Summer Steelhead)	REDW	8/06	1000	19.5	
Redwood Creek (upstream of unnamed trib)	REDW	8/06	1140	21.0	
Unnamed tributary	W	8/06	1140	15.5	
Redwood Creek (upstream of unnamed trib)	REDW	8/06	1300	21.5	
Unnamed tributary	W	8/06	1300	15.5	
Redwood Creek (upstream of Slide Creek)	REDW	8/06	1515	23.5	
Slide Creek	E	8/06	1515	17.0	
Redwood Creek (1 Summer Steelhead)	REDW	8/06	1527	pool 23.5	
Redwood Creek (upstream of unnamed trib)	REDW	8/06	1635	23.0	
Unnamed tributary	E	8/06	1635	15.5	
Redwood Creek (upstream of unnamed trib)	REDW	8/06	1830	22.5	
Unnamed tributary	W	8/06	1830	15.0	
Redwood Creek	REDW	8/07	1000	19.5	
G Creek	E	8/07	~	Dry at mouth	
Dolason Creek	E	8/07	~	Dry at mouth	
Redwood Creek (upstream of Bridge Cr.)	REDW	8/07	1130	21.5	
Bridge Creek	W	8/07	1130	16.5	
Redwood Creek (1 Summer Steelhead)	REDW	8/07	1144	pool 21.0	
Redwood Creek (upstream of Emerald Cr.)	REDW	8/07	1228	22.0	
Emerald Creek	E	8/07	1228	Dry at mouth 16.0 upstream	
Redwood Creek (upstream of unnamed tributary)	REDW	8/07	1245	21.5	
Unnamed Tributary	W	8/07	1245	14.0	
Redwood Creek (upstream of Tom McDonald Cr.)	REDW	8/07	1350	23.0	

LOCATION	ALIGNMENT	1997 DATE	TIME	TEMPERATURE °C	
				WATER	AIR
Tom McDonald Creek	W	8/07	1350	16.0	
Redwood Creek (upstream of Tom McDonald Cr.)	REDW	8/06	1011	21.0	
Tom McDonald Creek	W	8/06	1011	14.0	
Redwood Creek (upstream of Cole Cr.)	REDW	8/06	1153	22.0	
Cole Creek	E	8/06	1153	14.0	
Redwood Creek (upstream of Forty Four Cr.)	REDW	8/06	1225	21.0	
Forty Four Creek	W	8/06	1225	14.0	
Redwood Creek (upstream of Miller Cr.)	REDW	8/06	1531	23.5	
Miller Creek	E	8/06	1531	14.5	
Redwood Creek (upstream of Bond Cr.)	REDW	8/06	1452	22.25	
Bond Creek	W	8/06	1452	14.0	
Redwood Creek (upstream of Bond Cr.)	REDW	8/07	0940	19.0	
Bond Creek	W	8/07	0940	13.0	
Redwood Creek (upstream of unnamed tributary)	REDW	8/07	1008	19.5	
Unnamed tributary	W	8/07	1008	13.5	
Redwood Creek (upstream of Oscar Larson Cr.)	REDW	8/07	1120	20.5	
Oscar Larson Creek	E	8/07	1120	14.0	
Redwood Creek (upstream of Chris Creek)	REDW	8/07	1130	19.5	
Chris Creek	E	8/07	1130	14.0	
Redwood Creek (upstream of Elam Cr.)	REDW	8/07	1210	21.0	
Elam Creek	W	8/07	1210	14.0	
Redwood Creek (upstream of McArthur Cr.)	REDW	8/07	1340	22.0	
McArthur Creek	W	8/07	1340	14.0	

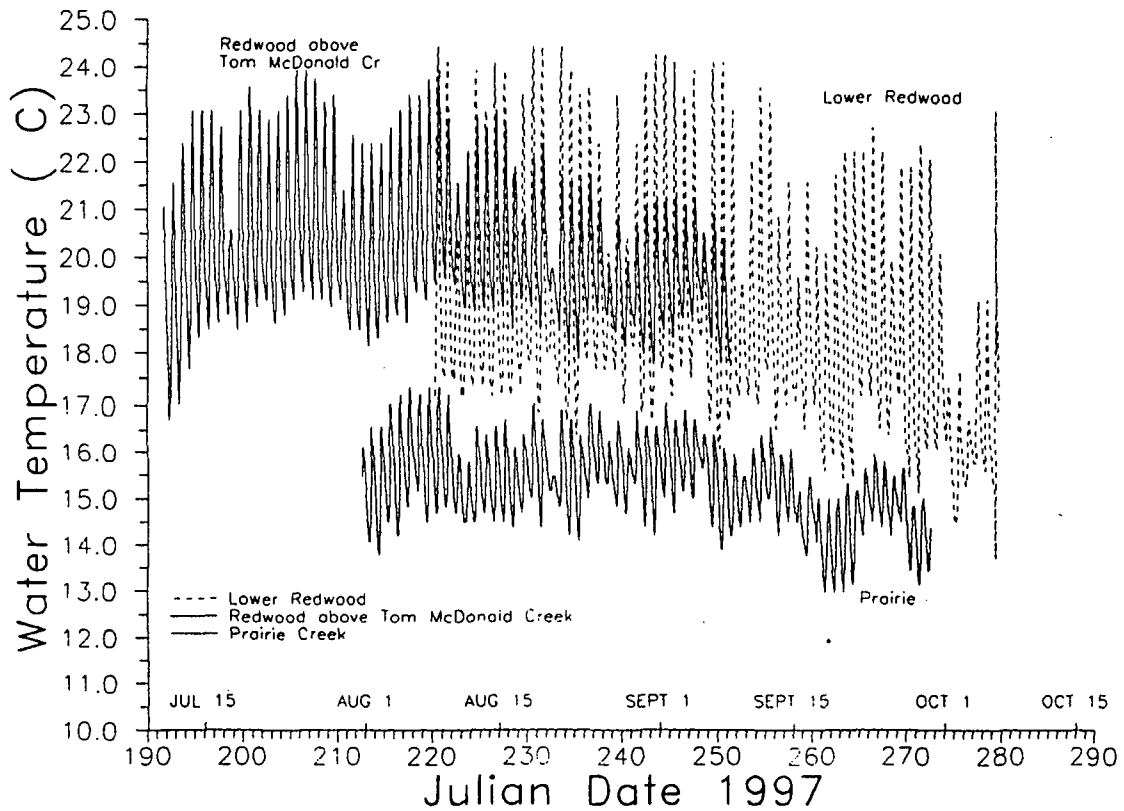


Figure 3. Mainstem Redwood Creek water temperatures ($^{\circ}\text{C}$) from HOBO temperature loggers located upstream of Tom McDonald Creek and upstream of the lower Redwood Creek trailhead parking lot and Prairie Creek water temperatures from a HOBO temperature logger located at the Wolf Creek bridge. Temperature loggers recorded water temperature every 48 minutes in the current below the surface of the water from July 10 through September 8, 1997 at the mid-Redwood Creek site, August 8 through October 6, 1997 at the lower Redwood Creek site, and from July 31 through September 29, 1997 at Prairie Creek.

Literature Cited

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Report Prepared by: David G. Anderson - Fishery Biologist,
Redwood National and State Parks, Orick, California.
November 1997

Appendix I.

Numbers of Summer Steelhead Trout (SSHD) observed 1981 through 1997 and survey dates in the 16.1 mile index section 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 ^a	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 ^b	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

^a Survey from Stover Creek to Emerald Creek, 14 miles, covering most of index section and best pool habitat.

^b Survey from Lacks to Bridge Creek, minus Garret to Panther Creek, a total of 11.1 miles. Covered best pool habitat.