

memorandum

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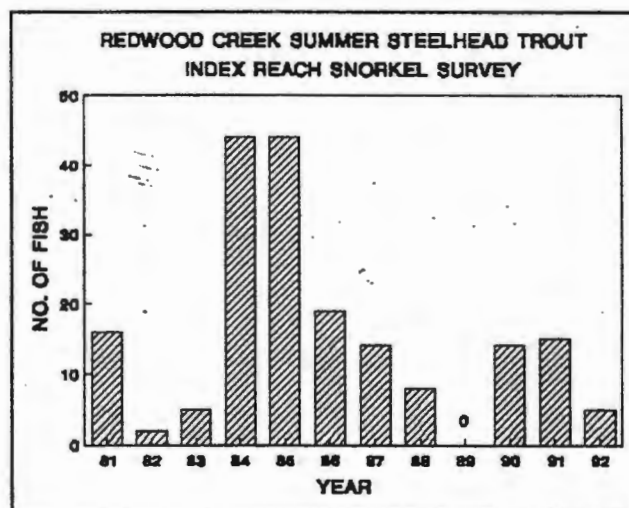
Date: July 21, 1993

To: Fish and Wildlife Ecologist

From: Fishery Biologist

Subject: 1992 Redwood Creek Summer Steelhead (*Oncorhynchus mykiss*) Survey

Attached is the 1992 Redwood Creek summer steelhead survey report. The mainstem of Redwood Creek, between Lacks Creek and Redwood Creek downstream of Hayes Creek, a 37.8 km (23.5 mile) reach, was snorkel surveyed for adult summer steelhead on August 3, 4, 5, 6, 10, 1992. This was an expanded survey downstream, and the 12th consecutive year Redwood Creek has been surveyed for summer steelhead. The total number observed, 7, included one dead fish. Five of the seven fish observed were in the index reach, Lacks Creek to Tom McDonald Creek (Tall Trees Grove-RNP), and included the dead fish. The dead fish, within the index reach, appeared to have been eaten and the skin peeled back and turned inside out by an animal. This year's index count of 5 was lower than that of 1991 at 15, and much lower than the counts of 44+ in 1984 and 1985. All fish were found in pools. A histogram of all survey results follows.



Water temperatures in the mainstem Redwood Creek ranged from 18.5 to 23.5°C during the day. Tributary water temperatures ranged from 13 to 21.5°C, with eastside tributaries warmer than the westside tributaries. This east-west summer temperature pattern has been consistent all years of fisheries studies which started in 1980.

The summer steelhead run on Redwood Creek is not improving, the numbers of fish found in the survey stretch are low, and are an indication of the state of the run. Water quality of the mainstem Redwood Creek is also poor, with temperatures well above the preferred range of steelhead. Also, together, the combined effects of timber harvest (i.e., removal of the forest

cover and road building) and significant storms have deposited large amounts of sediment in Redwood Creek and degraded fish habitat, sediment that has filled in deep pools. Most of the basin is already logged, and vegetative recovery needed to decrease insolation and erosion will be slow. Upstream of the park, better timber-, road-, and erosion-management practices to protect the inner gorge area and riparian canopy are needed to maintain and conserve the remaining habitat. A recent change in the California fishing regulations (effective March 1, 1992) closing the index reach, Lacks to Bridge Creek, to fishing year round is an improvement and will protect steelhead holding in pools during the summer. The change to catch-and-release fishing below Bridge to Prairie Creek on Redwood Creek is also an improvement from previous regulations. Continued monitoring is appropriate, as well as actions to preserve what is left of the run and habitat.

If you have any questions, please contact me.

A handwritten signature in cursive script that reads "David Anderson". The signature is written in dark ink and has a fluid, connected style.

David Anderson
Fishery Biologist

Enclosures

1992 REDWOOD CREEK SUMMER STEELHEAD TROUT SURVEY

DATES: August 3, 4, 5, 6, 10, 1992

LOCATION: Redwood Creek, Humboldt County, California
Lacks Creek - river km 45.3 to downstream of Hayes Creek (Redwood National) river km 7.5

DISTANCE: 37.8 km (23.5 miles)

FLOWS:

Station	Orick	O'Kane (@HWY299)
Start of Survey:	22 cfs	9 cfs
End of Survey:	17 cfs	8 cfs
(data from DWR-Computer Database)		

DIVERS: David Anderson (diver and coordinator), Sabra Steinberg, Michael Port, Kathy O'Siggins, Cara Smith, Carolyn Meyer, Linda Gelphman, Ron Lakey, Sandy Haux, John Cataldo, Martin Canning, Ruth Blyther (VIP), Jeff Dunk (VIP), Tom Weseloh (CalTrout).
(Indicates person with prior summer steelhead survey experience, VIP = Volunteer In the Park)

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

ACCESS: Lacks Creek at Stover Ranch on Redwood Valley Road; Panther Creek and Coyote Creek at K&K road, Simpson Timber Company; Copper Creek on rehabilitated K&K and 1800 road; Slide Creek/Pig Pen Prairie on brushed trail along rehabilitated 2005 Rd at K&K-RNP road; Bridge Creek up creek to trail on M7.5 and on Redwood Creek trail from Otter Camp near Tom McDonald Creek; Tall Trees Grove/Tom McDonald Creek on Westside Access Road at M-Line; Bond Creek on Westside Access Road to C-Line and on Forty four Creek horse trail and Redwood Creek trail; and downstream of Hayes Creek on Redwood Creek trail to Redwood Creek trailhead.

ITINERARY:	8/03	Lacks Creek to Panther Creek Meyer, Port, Lakey	6.15 km	(1 SSHD)
	8/03	Panther Creek to Coyote Creek Anderson, O'Siggins, Haux	3.65 km	(0 SSHD)
	8/04	Coyote Creek to Copper Creek Smith, Steinberg, Blyther, Dunk	4.50 km	(0 SSHD)
	8/04	Copper Creek to Pig Pen Prairie (just south of Slide Creek) Anderson, Haux, Cataldo	3.05 km	(3 SSHD)
	8/05	Pig Pen Prairie to Bridge Creek Anderson, Port, Steinberg, Smith, Canning	4.40 km	(1 SSHD)
	8/06	Bridge Creek to Tom McDonald Creek Smith, Haux, Canning, Cataldo	4.15 km	(0 SSHD)
	8/06	Tom McDonald Creek to Bond Creek Anderson, Lakey, O'Siggins, Gelphman	4.20 km	(0 SSHD)
	8/10	Bond Cr to downstream of Hayes Cr Anderson, Canning, Weseloh	7.7 km	(2 SSHD)

TOTAL NUMBER OF ADULT SUMMER STEELHEAD TROUT (SSHD) OBSERVED IN 1991: 7 (6 Live)

TOTAL NUMBER OF ADULT SUMMER STEELHEAD TROUT (SSHD) OBSERVED IN THE INDEX SECTION (LACKS CREEK TO TOM McDONALD CREEK) : 5 (4 Live, 1 Dead)

SUMMER STEELHEAD

This is the 12th consecutive summer steelhead trout survey of Redwood Creek, the first was in 1981. Seven summer steelhead were observed in this expanded snorkel survey, 5 of which were in the index reach (Figure 1). Of the 7 summer steelhead observed, one was dead. The dead summer steelhead was found downstream of Copper Creek. A 'skin bag' turned inside out was all that remained. Scales were collected from the skin. This year's index count of 5 was less than last year's (1991) 15 count, and much lower than the counts of 44+ in 1984 and 1985 (Table 1).

Table 1. Numbers of Summer Steelhead Trout (SSHD) observed 1981 through 1992 in the 25.9 km (16.1 mile) index section of Redwood Creek from Lacks Creek to Tom McDonald Creek, Humboldt County, California.

Year	No. of SSHD	Survey Dates
1981	16	8/10 - 13
1982	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	0	7/31, 8/1 - 2
1990	14	7/31, 8/1 - 3
1991	15	8/05 - 08
1992	5	8/03 - 06, 10

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

Survey from Lacks to Bridge Creek, minus Garret to Panther Creek, at total of 11.1 miles. Covers best pool habitat.

All fish observed were found in pools (Table 2). One was in a pool with a westside tributary entering it, and one was in the Hayes Creek/Redwood Creek pool, a pool identified as a cold pool in the past. The temperatures of the Hayes Creek cold pool (22°C) and Redwood Creek (23°C) were similar, however. All fish were found singularly.

Mr. Marc Williams of Etna, California submitted a Wildlife Observation Card about an adult otter with three young fishing in the 'gorge' area of Redwood Creek on 8/16 and that it "caught a large fish - summer steelhead?" I requested more information and he wrote the adult otter was pulling the fish upstream and the fish was at least 2/3rd the length of the otter, 20-24 inches. He also observed "several larger salmonids in pools of the lower canyon", but was not sure if they were spring chinook or summer steelhead, but guessed they were chinook because of the spotting on their backs. He stated his initial guess that the otter's catch was a steelhead may be in error. Six spring chinook were observed during the Redwood Creek survey of 1988, the only time they have been found. We observed 1 summer steelhead in the 'gorge' section (Slide Creek to Bridge Creek).

Again, the extent of human disturbance on summer steelhead in the index reach is unknown. Recent changes to protect summer steelhead by California sport fishing regulations (effective March 1, 1992) on Redwood Creek have closed most of the index section from the mouth of Bridge Creek to the mouth of Lacks Creek to

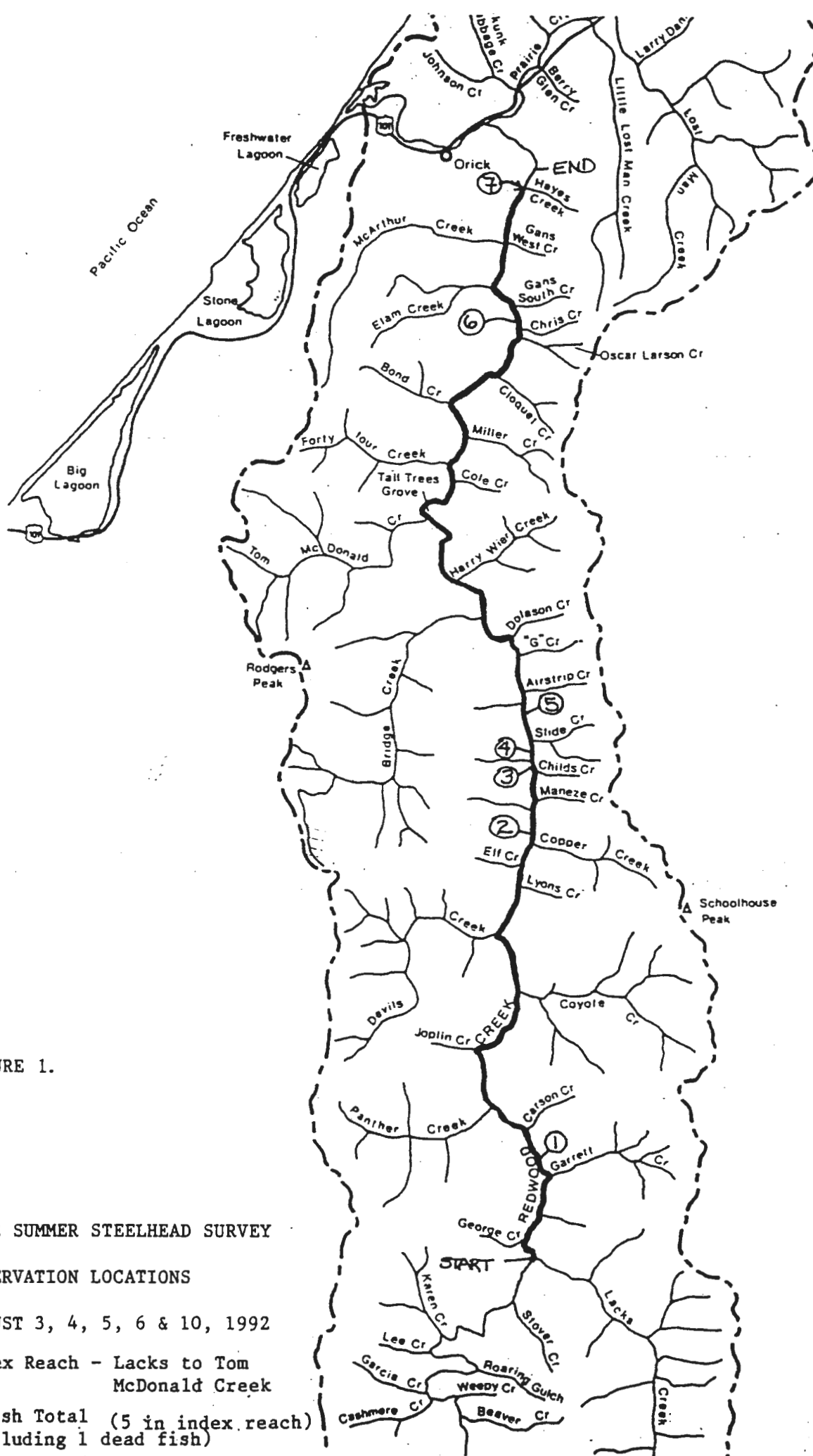


FIGURE 1.

1992 SUMMER STEELHEAD SURVEY

OBSERVATION LOCATIONS

AUGUST 3, 4, 5, 6 & 10, 1992

Index Reach - Lacks to Tom
McDonald Creek

7 Fish Total (5 in index reach)
(including 1 dead fish)

Table 2. Results of the 1992 Redwood Creek summer steelhead survey, including date observed, location on report map, number of steelhead, estimated length of fish (inches), habitat description, and USGS topographical map coordinates.

Date	Map Location	No. of SSHD	Est. Length (inches)	Habitat Description
8/03/92	#1	1	18"	In a pool with a 20' diameter and 4' deep with a gravel substrate. Water temperature at bottom of pool 23.5°C. (T8NR3Esec 18)
8/04/92	#2	1	~24"	DEAD, only a 'skin bag' turned inside out remained. (T9NR2Esec22)
8/04/92	#3	1	22 - 23"	Observed in pool under a large fallen redwood tree functioning as a digger log structure. Fish was at 4' depth. Pool 8'D x 40'W x 105'L. Water temperature 20.5 @ 1440. (T9NR2Esec22)
8/04/92	4	1	24"	Observed under the base of a large boulder (>12'L) and LOD. Pool 10'D x 65'W x 65'L. A small westside trib @ 13°C was entering the pool. Pool water temperature 20.5°C @ 1511. (T9NR2Esec22) This is same exact boulder hiding place where 9 SSHD were observed in mid 1980's.
8/05/92	#5	1	24"	Observed under a rock ledge in a narrow chute 6' deep pool. Pool 6'D x 40'W x 100'L. Water temperature 21.5°C. (T9NR2Esec16)
8/10/92	#6	1	20"	Observed in LOD and brush cover in cooler water @ 21.0°C. Pool/run was 4'D x 30'W x 60'L. (T10NR1Esec12)
8/10/92	#7	1	24"	Observed in the Hayes Creek 'cold pool' on Redwood Creek. Large pool with an extensive undercut bank and much LOD. Water temperature 22.0°C. (T10NR1Esec2)

fishing. The section from the mouth of Prairie to the mouth of Bridge Creek is now catch-and-release, with only artificial lures and barbless hooks allowed. The only fishing observed during the survey was two kids fishing in the Hayes Creek 'cold pool', a section that is catch-and-release only.

Twenty five cutthroat, 21 steelhead identified as 'half-pounders' (small immature sea-run steelhead returning after less than one year in the ocean), and 7 steelhead greater than 12", but not identified as half-pounders or summer

steelhead were observed. Fifteen of the 21 half-pounders were observed between Coyote Creek and Tom Donald and 20 of the 25 cutthroat were observed between Tom McDonald and the end of the survey, downstream of Hayes Creek.

WATER TEMPERATURE

Water flow (at Orick DWR station) during the survey was low 17 to 22 cfs. This was much lower than previous drought year surveys; 1989: 67 to 75 cfs, 1990: 94 to 86 cfs, 1991: 43 to 52 cfs. While snorkeling in some areas such as pools and stream banks we felt colder water on the bottom than on the surface. In a pool downstream of Tom McDonald Creek, the temperature difference between the surface and bottom was 2°C (Table 3). The lower stream flow probably caused less turbulence and mixing of the surface and bottom flow, thus forming more noticeable thermoclines.

Water temperatures in Redwood Creek ranged from 18.5 (at 1021 hr) to 23.5°C (at 1654 hr) (Table 3). The temperatures were generally 18.5 to 21°C in the morning around 1000 hr and increased to 20 to 23.5°C in the afternoon around 1600 hr. Ryan-Peabody thermographs were placed in Redwood Creek upstream of Bridge Creek and at the western RNP boundary in lower Redwood Creek. The thermograph upstream of Bridge Creek also recorded temperatures ranging from 18 to 23°C during the survey period of August 1992. The thermograph in lower Redwood Creek malfunctioned during this period, but in mid-September it recorded temperatures 4°C lower than those of Redwood Creek upstream (Figure 2). It must have been in a cold pool, because when the pool dried up and the thermograph was moved to a nearby pool, the temperatures recorded were similar to those of Redwood Creek upstream. Later in mid-November, the temperature of Redwood Creek decreased to 8.5°C upstream of Bridge Creek and 8.5 to 12°C in lower Redwood Creek.

Temperatures of water entering Redwood Creek from the east and westside tributaries during the survey ranged from 13°C (an unnamed westside tributary at 1455) to 21.5°C (eastside Lyons Creek at ~1500). Tributary water temperatures were cooler than the mainstem Redwood Creek. Westside tributaries were again usually cooler than eastside tributaries, a pattern repeated in past surveys. The mean water temperature of westside tributaries was 14.2°C (n = 20, std. dev. = 0.9°C, and range 13.0 to 17.0°C), and the mean water temperature of eastside tributaries was 16.2°C (n = 18, std. dev. = 2.2°C, and range 14.0 to 21.5°C). Many of the west side tributaries measured were first order streams. 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.

Literature Cited

- Reiser, D.W., and T.C. Bjornn. 1979. Influence of forest and rangeland management on anadromous fish habitat in western North America: Habitat requirements of anadromous salmonids. U.S.D.A., Forest Service General Technical Report. PNW-96., 54 pp. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.
- Roelofs, T.D. 1983. Current status of California summer steelhead (*Salmo gairdneri*) stocks and habitat, and recommendations for their management. Report to U.S. Department of Agriculture, Forest Service Region. 119 pp.

Table 3. Water and Air temperatures (°C) measured during the 1992 Redwood Creek summer steelhead trout survey. Locations are listed south to north. Alignment refers to creek position E = eastside, W = westside, REDW = mainstem Redwood Creek. Bold entries denote temperatures where summer steelhead trout (SSHD) observed.

LOCATION	ALIGNMENT	DATE	TIME	TEMPERATURE °C	
				WATER	AIR
Lacks Creek	E	8/03	1050	18.0	
Redwood Creek (@ Lacks Cr)	REDW	8/03	1050	21.0	
George Creek	W	8/03	1110	13.5	
Redwood Creek	REDW	8/03		21.0	
Unnamed tributary	W	8/03	1150	13.5	
Redwood Creek	REDW	8/03		23.5	
Garrett Creek	E	8/03	1445	19.0	
Redwood Creek	REDW	8/03		23.0	
Redwood Creek (1 SSHD)	REDW	8/03		23.5	
Redwood Creek	REDW	8/03		23.5	
Redwood Cr (upstrm of Panther Cr)	REDW	8/03	1654	23.5	
Panther Creek	W	8/03	1654	15.0	
Redwood Cr (upstrm of Panther Cr)	REDW	8/03	1040	19.5	18.0
Panther Creek	W	8/03	1040	13.5	
Redwood Creek	REDW	8/03		19.5	
Redwood Creek	REDW	8/03	1300	21.5	
Unnamed tributary (upstrm of Joplin Cr)	W	8/03	1314	14.0	
Redwood Creek (upstrm of Joplin Cr)	REDW	8/03	1330	21.5	
Joplin Creek	W	8/03	1330	14.0	
Redwood Creek	REDW	8/03		21.5	
Redwood Cr (upstrm of Coyote Cr)	REDW	8/03	1540	23.0	
Coyote Creek	E	8/03	1540	16.0	
Redwood Creek (@ Coyote Cr)	REDW	8/04	1023	19.0	
Coyote Creek	E	8/04	1023	16.0	
Redwood Creek	REDW	8/04		19.0	
Redwood Creek	REDW	8/04		19.0	
Devils Creek	W	8/04		14.5	
Redwood Creek (@ Devils Cr)	REDW	8/04		20.0	
Redwood Creek	REDW	8/04		19.5	
Unnamed tributary	E	8/04		17.5	
Lyons Creek	E	8/04		21.5	
Elf Creek	W	8/04	1628	14.0	
Redwood Cr (upstrm of Copper Cr)	REDW	8/04	1042	18.5	
Copper Creek	E	8/04	1042	16.5	16.5
Redwood Creek	REDW	8/04	1245	19.0	19.0

LOCATION	ALIGNMENT	DATE	TIME	TEMPERATURE °C	
				WATER	AIR
Redwood Cr (upstrm of unnamed trib)	REDW	8/04	1335	19.5	
Unnamed tributary	W	8/04	1335	13.5	
Redwood Creek (1 SSHD)	REDW	8/04	1440	20.5	
Unnamed tributary	W	8/04	1455	13.0	
Redwood Creek (1 SSHD)	REDW	8/04	1511	20.5	
Unnamed tributary	W	8/04	1528	13.5	
Unnamed tributary	W	8/04	1545	14.0	
Unnamed tributary	W	8/04	1556	14.0	
Unnamed tributary	W	8/04	1624	13.5	
Redwood Creek (@ Pig Pen Prairie)	REDW	8/04	1635	20.0	
Redwood Creek (@ Pig Pen Prairie)	REDW	8/05	1037	19.0	
Slide Creek	E	8/05	1102	14.5	
Redwood Creek (@ Slide Cr pool)	REDW	8/05	1100	19.5	
Redwood Creek (1 SSHD)	REDW	8/05		21.5	
Unnamed tributary	W	8/05		14.0	
Unnamed tributary #1	E	8/05		15.0	
Redwood Creek (@ unnamed trib #1)	REDW	8/05		22.0	
Unnamed tributary	E	8/05	1605	16.0	
G Creek	E	8/05		DRY	
Redwood Creek (@ G Creek)	REDW	8/05		23.5	
Dolason Creek	E	8/05	1652	20.0	
Redwood Creek (upstrm of Bridge Cr)	REDW	8/05	1653	23.0	
Bridge Creek	W	8/05	1658	17.0	
Bridge Creek	W	8/06	1046	15.0	
Redwood Creek (@ Bridge Cr)	REDW	8/06	1046	19.0	
Emerald Creek	E	8/06		14.0	
Redwood Creek (@ Emerald Cr)	REDW	8/06		20.5	
Tom McDonald Creek	W	8/06	1400	15.5	
Redwood Creek (@ Tom McDonald Cr)	REDW	8/06	1400	22.5	
Redwood Creek (upstrm of TMcDonald)	REDW	8/06	1021	18.5	
Tom McDonald Creek	W	8/06	1021	14.0	
Redwood Creek (surface)	REDW	8/06		20.5	
(bottom of pool)				20.0	
Redwood Creek (surface)	REDW	8/06	1309	22.5	
(bottom of pool)				20.5	
Cole Creek	E	8/06	1312	14.0	
Redwood Creek (@ Cole Cr)	REDW	8/06	1312	22.0	
Forty four Creek	W	8/06	1331	14.5	
Redwood Creek (@ Forty four Cr)	REDW	8/06	1331	22.0	
Unnamed tributary #2	E	8/06	1350	16.0	
Redwood Creek (@ unnamed trib #2)	REDW	8/06	1350	22.0	

LOCATION	ALIGN MENT	DATE	TIME	TEMPERATURE °C	
				WATER	AIR
Unnamed tributary	E	8/06	1357	15.0	
Miller Creek	E	8/06	1410	15.0	
Bond Creek	W	8/06	1509	14.5	
Redwood Creek (@ Bond Cr)	REDW	8/06	1509	22.0	
Bond Creek	W	8/10	1038	13.5	18.0
Redwood Creek (@ Bond Cr)	REDW	8/10	1038	19.0	
Cloquet Creek	E	8/10	1142	14.5	
Redwood Creek (@ Cloquet Cr)	REDW	8/10	1142	19.0	
Oscar Larson Creek	E	8/10	1227	14.5	
Redwood Creek (@ Oscar Larson Cr)	REDW	8/10	1227	22.0	
Chris Creek	E	8/10	1237	14.0	
Redwood Cr (downstrm of Chris Cr)	REDW	8/10	1237	22.0	
Redwood Creek (1 SSHD)	REDW	8/10		21.0	
Gans South Creek	E	8/10		DRY	
Redwood Creek	REDW	8/10	1420	22.0	
Elam Creek	W	8/10	1436	14.5	
Redwood Creek (downstrm of Elam Cr)	REDW	8/10	1436	22.0	
McArthur Creek	W	8/10	1518	14.0	
Redwood Creek (@ McArthur Cr)	REDW	8/10	1518	21.0	
Redwood Cr (@ Hayes Creek pool) (1 SSHD)	REDW	8/10		22.0	
Redwood Creek	REDW	8/10	1655	23.0	

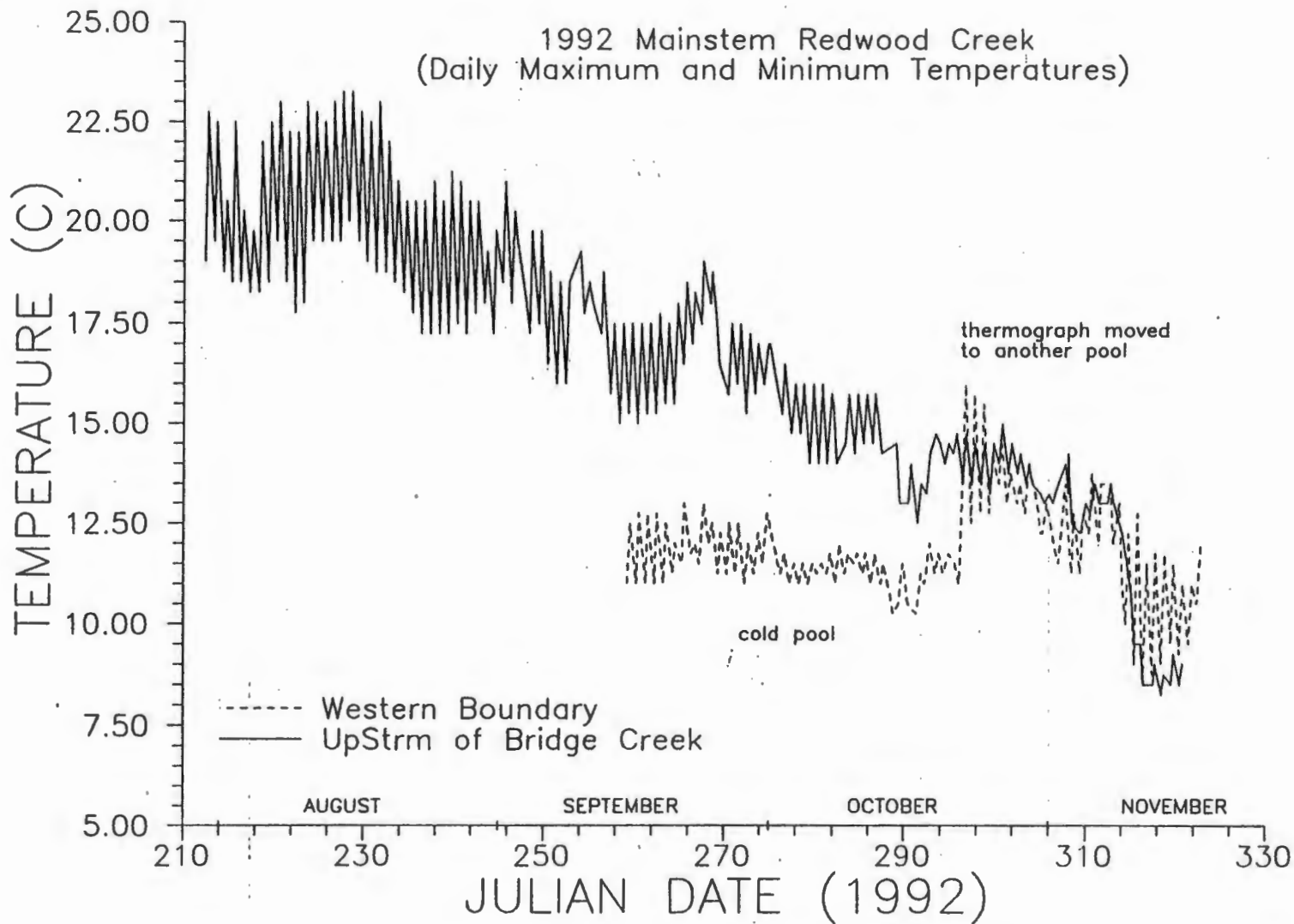


Figure 2. Mainstem Redwood Creek daily maximum and minimum water temperatures ($^{\circ}\text{C}$) during the summer and fall of 1992. Water temperatures measured with Ryan-Peabody paper tape thermographs submerged in the water column at Redwood Creek upstream of Bridge Creek and in lower Redwood Creek at the Redwood National Park boundary.