

Redwood

National Park

National Park Service
US Department of the Interior



2014 REDWOOD CREEK SUMMER STEELHEAD SURVEY



Fish and Wildlife Branch
September 2015

Cover Photos: (Taken during 2014 survey)

Top Left: Western Pearlshell Mussels on Mainstem Redwood Creek.

Top Right: Adult Redwood Creek Summer Steelhead

Middle Left: Pre-dive Group Picture on Redwood Creek at Panther Creek.

Middle Right: School of Sacramento Suckers on Mainstem Redwood Creek.

Bottom Left: Adult Redwood Creek Summer Steelhead

Bottom Right: RNP Snorkelers on Mainstem Redwood Creek

2014 RNP REDWOOD CREEK SUMMER STEELHEAD SURVEY

DATES: July 28, 29, 30, 31, (Monday - Thursday) & August 4, 5, 6, 2014 (Monday- Wednesday)

LOCATION: Redwood Creek, Humboldt County, California
Mainstem reach from Lacks Creek - river km 46.514 to downstream of Hayes Creek (Redwood National and State Parks) - river km 7.65.

DISTANCE: 38.9 km (24.1 miles) [36 % of the 108-km (67.1-mile) long Redwood Creek mainstem]

FLOWS: Gaging Station: Orick [ORK]
Start of Survey: 34 cfs End of Survey: 27 cfs

DIVERS: David Anderson, Terry Hines, Kyle Max, Alder Gustafson, Joanna DiTommaso (All divers with prior summer steelhead diving experience on Redwood Creek). Recorders: Heather Brown and Susannah Manning

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

ACCESS: Lacks Creek via Stover Ranch on Redwood Valley Road; drive/hike to Panther Creek via K& K on Green Diamond Resource Company; hike/snorkel and camp on river four days/three nights to reach Tall Trees summer footbridge downstream of Tom McDonald Creek; footbridge to Redwood Creek trail to 44 horse camp. Drive out C-12/A9-9/West Side Access. Cloquet Creek in and out via A-9 road and hike road extension to Redwood Creek trail; and downstream of Hayes Creek intercept Redwood Creek trail and hike to lower trailhead parking lot.

ITINERARY:	Date	Survey Reach	Distance km	SSHD No.
	8/6	Lacks Creek to Panther Creek		
		<i>Anderson, Max, Gustafson (Recorder – Brown).....</i>	6.02	1
	7/28	Panther Cr to Below Coyote Cr (36.23 km)		
		<i>Anderson, Hines, Max, & Gustafson.....</i>	4.27	6
	7/29	Below Coyote Cr to Above Pig Pen Prairie (29.85km)		
		<i>Anderson, Hines, Max, & Gustafson.....</i>	6.38	4
	7/30	Above Pig Pen Prairie to Below Bridge Creek (23.47km)		
		<i>Anderson, Hines, Max, & Gustafson.....</i>	6.38	1
	7/31	Below Bridge Cr to Tall Trees Summer Bridge (19.25km)		
		<i>Anderson, Hines, Max, & Gustafson.....</i>	4.12	1
	8/4	Tall Trees Summer Bridge to Cloquet Cr		
		<i>Anderson, Hines, Max, & Gustafson</i>		
		<i>(Recorder – Brown)</i>	4.78	0
	8/5	Cloquet Creek to Downstream of Hayes Creek		
		<i>Anderson, Max, Gustafson, & DiTommaso</i>		
		<i>(Recorder – Manning).....</i>	6.92	2

TOTAL NUMBER OF ADULT SUMMER STEELHEAD TROUT OBSERVED IN 2014: 15

SUMMER STEELHEAD TROUT

Summer steelhead (*Oncorhynchus mykiss*) are an anadromous race of rainbow trout. Their life cycle differs from that of the more numerous winter-run steelhead. Adult summer steelhead ascend the rivers in spring, hold over in deep pools in the summer, and then spawn in winter. Because adult summer steelhead hold in freshwater 8 - 10 months (Roelofs 1983), they are vulnerable to detrimental environmental and human-caused factors including higher water temperatures, low summer flows, decreasing pool depths, predators, and poaching. Steelhead within the Northern California coastal steelhead ESU (evolutionary significant unit), which includes Redwood Creek, were federally listed by NOAA Fisheries as threatened in June 2000 and relisted in 2006.

Summer 2014 was the 34th annual consecutive summer steelhead trout survey of Redwood Creek, the first being 1981. The survey reach began at Lacks Creek at Stover Ranch and proceeded 38.9 km downstream through Green Diamond Resource Company timber lands into Redwood National Park to a location downstream of Hayes Creek. Originally, the survey was from Lacks Creek to Tom McDonald Creek, but it was expanded downstream to downstream of Hayes Creek in 1992.

Fifteen (15) adult summer steelhead (steelhead ≥ 16 inches), two (2) 'half-pounder' steelhead (smaller immature sea-run steelhead returning after less than one year in the ocean), and 221 coastal cutthroat trout (*O. clarki*) (cutthroat ≥ 10 inches) were observed in a mainstem survey reach from Lacks Creek to just downstream of Hayes Creek (Table 1). Thirteen of the 15 summer steelhead were observed within the original index reach, Lacks to Tom McDonald Creeks.

All 15 adult summer steelhead were observed in pools (Table 2). Past data from Redwood Creek show the majority of summer steelhead were observed in pools, and pools associated with the inflow of cooler water from tributaries (Anderson 1993). Eleven observations were solitary fish, and the other two observations were groups of two fish. Estimated fish length ranged from 16 to 25 inches. Fish lengths were estimated by referring to graduated (in inches) leashes that divers used to tow their floating packs when snorkeling.

In 2014, most fish were found in the upper half of the survey, 10 fish at or upstream of Devils Creek. (Figure 1). Two additional fish were in and above the 'gorge', the area downstream of Slide Creek and upstream of where Redwood Creek widens at around river kilometer 27. Past surveys have found most summer steelhead above the 'gorge' in the mid to upper reaches of the survey reach.

Summer steelhead numbers over time are presented in Figure 2 and Appendix I. The numbers of fish are low and appear to be cyclic as to year strength.

Though not a primary species to survey for during the dive, Western Pearlshell (*Margaritifera falcata*) freshwater mussels were observed in seven (7) locations (Appendix II), 132+ individuals counted. Eight (8) locations with beaver (*Castor canadensis*) sign, stripped willow branches and scat, were observed, including one adult beaver (Appendix III). Twelve (12) dead Coastal Giant Salamanders (*Dicamptodon tenebrosus*) were observed in Redwood Creek, all above Copper Creek (Table 1).

Table 1. Numbers of adult summer steelhead ($\geq 16"$), 'half-pounder' steelhead, and coastal cutthroat trout, and aquatic wildlife noted during the 2014 summer steelhead survey of mainstem Redwood Creek, County, California. Survey conducted on seven days, July 28 through August 6, 2014 from Lacks Creek to downstream of Hayes Creek and covered 38.9 km (24.1 miles) of 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 are no longer accessible by vehicle.

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Redwood Creek Mainstem Stream Reach		No. of Summer Steelhead Adults (≥16")	No. of Steelhead Half Pounders	No. of Cutthroat Trout (≥ 10")	Aquatic/Wildlife Observed
ORIGINAL INDEX REACH	Lacks to Panther Creek 8/06/2014	1	1	24	Dead Coastal Giant Salamanders (6), Dead Threespine stickleback (1), Dead steelhead juveniles (2), Sculpin sp., Steelhead residents, Rough-skinned newts (20), Garter Snake, Beaver sign
	Panther to Coyote Creek 7/28/2014	5	0	16	Dead Coastal Giant Salamanders (4), Dead Rough-skinned newt (1), Steelhead residents and juveniles, Chinook juveniles, Sacramento Suckers, Sculpin sp., American Dipper, Kingfisher, Limniphilid caddisfly nymphs, Jugs snails
	Coyote to Copper Creek 7/28 & 29/2014	5	0	33	Dead Coastal Giant Salamanders (2), Dead Cutthroat juveniles (2), Sacramento Sucker, Threespine stickleback, Osprey, Double-crested cormorant, Sandpipers, Crayfish carapace, Beaver sign and one adult
	Copper to Pig Pen Prairie (Slide Cr) 7/29 & 30/2014	0	0	22	Dead juvenile Steelhead (1), Coho juvenile, Sacramento Sucker, Lamprey redds (3), Freshwater mussels, Great Blue Heron, Mergansers (3), Turkey Vulture, Sub adult Mink
	Pig Pen Prairie (Slide Cr) to Bridge Creek 7/30/2014	1	0	21	Dead juvenile Steelhead (1), Dead Sculpin (1), Threespine sticklebacks, Yellow-legged frogs and tadpoles, Freshwater mussels, Mallards, Raccoon, People (3)
	Bridge to Tom McDonald Creek 7/30 & 31/2014	1	1	11	Sacramento Suckers, Freshwater mussels, Marbled Murrelets, Spotted Sandpiper, Mergansers (7)
	Tom McDonald to Bond Creek 7/31 & 8/4/2014	0	0	22	Dead Crayfish (1), Dead Sculpin (2), Chinook juveniles, Sacramento Suckers, Freshwater mussels, Mergansers (8), Dead Common Raven, Otter (1), People (6), C-17 cargo plane low flyover (airspace violation)
	Bond Creek to downstream of Hayes Creek 8/4 & 5/ 2014	2	0	72	Dead Sculpin (8+), Dead juvenile steelhead (1), Resident Steelhead, Sacramento Suckers (100s), Threespine stickleback, Freshwater mussel, Western Toad, Osprey, Spotted Sandpipers, Kingfisher, Stellar Jay, Elk Herd with 8 calves, Beaver sign, People (2)
2014 Total		15	2	221	

Table 2. Date, location (river kilometer and UTM coordinates [NAD83]), number, estimated fork length (inches), and habitat description of adult summer steelhead trout observed in the 2014 snorkel survey of mainstem Redwood Creek, upstream to downstream. (Letters in parentheses in the river km refer to locations on Figure 1 map).

Date 2014	River KM	No. of SSHD	Est. Length (inches)	Habitat Description
SUMMER STEELHEAD				
8/6/2014	42.97 (a)	1	22"	Found under boulder at 3ft deep, but first seen in the open. Pool dimension: ~250m L x 15m W x 9ft D. Redwood Creek water temperature 21.0°C at 1140. (UTM 425673E 4548044N)
7/28/2014	39.80 (b)	1	16"	Found under boulder ledge. Pool dimension: 75m L x 15m W x 7ft D. Tributary at head of pool. Redwood Creek water temperature 20.0°C at 1213. UNWS tributary 12.0°C at 1213. (UTM 423250E 4549535N)
7/28/2014	37.5 (c)	2	18" 20"	Found swimming and then spooked under boulder at 5ft deep. Second fish swam away and was found at base of a boulder at 8ft deep. Pool dimensions: 75m L x 25m W x 15ft D. Redwood Creek water temperature 21.5°C at 1636. (UTM 423250E 4551420N)
7/28/2014	37.0 (d)	1	21"	Fish spooked twice and then found under boulder. Pool dimensions: 300m L. Redwood Creek water temperature 21.0°C at 1724. (UTM 423075E 4551850N)
7/28/2014	~36.85 (e)	1	16"	At head of pool in cascading flow. Pool dimensions: 50m L x 15m W x 4ft D. (UTM 423000E 4551975N)
7/28/2014	36.30 (f)	1	16"	Fish found under boulder ledge at 4ft deep. Pool dimensions: 30m L x 15m W x 4ft D. Redwood Creek water temperature 20.5°C at 1809. (UTM 422840 E 4552450 N)
7/29/2014	35.8 (g)	1	17"	Fish found under log in tail of cascade at head of pool. Pool dimensions: 20m L x 10m W x 5ft D. Redwood Creek water temperature 18.0°C at 0930. (UTM 422580E 4552850N)
7/29/2014	34.92 (h)	2	18" 24"	In pool at confluence of Devils Creek. Fish swimming in pool until spooked. Pool dimensions: 50m L x 15m W x 8ft D. Redwood Creek water temperature 19.0°C and Devils Creek water temperature 14.0°C at 1040. (UTM 421840E 4553165N)
7/29/2014	32.70 (i)	1	16"	Fish found under boulder small large woody debris in 5ft of water. Pool dimensions: 30m L x 15m W x 12ft D. (UTM 421580E 4555220N)
7/30/2014	28.05 (j)	1	25"	Fish found on side of boulder at 4ft depth. Pool dimensions: 75m L x 10m W x 7ft D. Redwood Creek water temperature 19.5°C at 1055. (UTM 419910E 4558810N)

Date 2014 (cont.)	River KM	No. of SSHHD	Est. Length (inches)	Habitat Description
7/31/2014	20.90 (k)	1	16"	Fish found under large rootwad log in 4ft of water. Pool dimensions: 300m L x 20m W x 4ft D. (UTM 415610E 4562220N)
8/5/2014	12.10 (l)	1	20"	Fish found under large log in 4ft of water. Pool dimensions: 250m L x 40m W x 6ft D. Redwood Creek water temperature 19.0°C at 1150. (UTM 414464E 4568441N)
8/5/2014	9.80 (m)	1	22"	Fish found under downed alder tree in 3ft of water just below McArthur Creek. Pool dimensions: 300m L x 30m W x 8ft D. Redwood Creek water temperature 19.0°C and McArthur Creek water temperature 15.0°C at 1413. (UTM 413708E 4570135N)
Summer Steelhead Total		15		



Western Pearlshell (*Margaritifera falcate*) freshwater mussels observed during 2014 Redwood Creek Summer Steelhead Dive. They are found in silt covered sand substrate amongst the boulders armoring the banks, areas protected from high flow scouring.

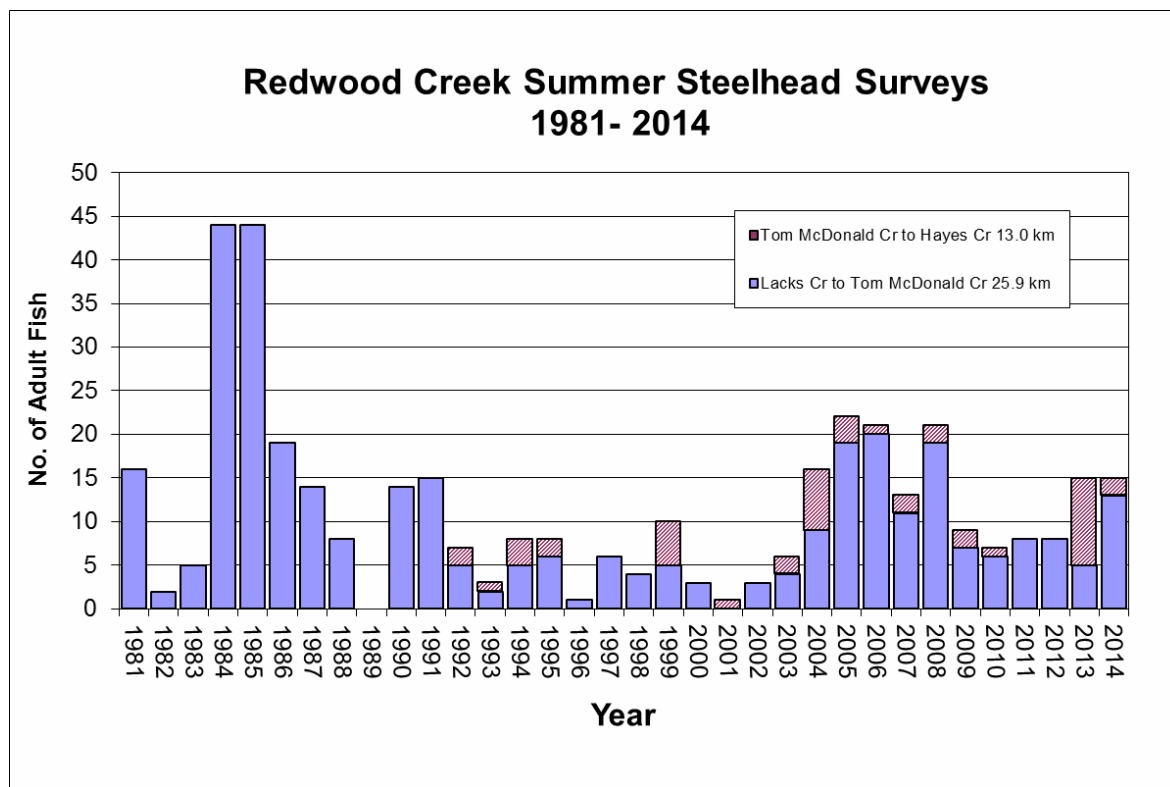


Figure 2. Numbers of summer steelhead observed each summer since 1981 on the original 25.9 km (16.1 mile) index reach Redwood Creek (Lacks Creek to Tom McDonald Creek) and 13.0 km expanded reach (Tom McDonald Creek to downstream of Hayes Creek) Humboldt County, California. The survey was expanded in 1992.

WATER DISCHARGE

Water flow measured at the Orick gaging station located downstream of the confluence of Prairie Creek at Redwood Creek between July 28 and August 6 ranged between 34 and 26 cfs. (This USGS flow data is provisional and subject to revision.)

WATER TEMPERATURE

Temperature loggers continuously recorded Redwood Creek mainstem water temperature (°C) at two sites during the summer. Water temperature of tributaries and mainstem was measured with a hand held thermometer below the water surface during the survey. At each tributary, mainstem Redwood Creek temperature was measured immediately upstream of the tributary confluence.

Mainstem Redwood Creek - Redwood Creek water temperatures hand measured during the 2014 survey ranged from 17.5°C (at 10:00) to 23.0°C (at 15:30) (Appendix IV).

Onset Tidbit recording temperature loggers were placed mid-depth in the current of mainstem Redwood Creek at two locations within the park (in the snorkel survey reach). They recorded temperature at one-hour intervals from late May to October 2014.

A temperature logger (Tidbit S/N 10403067) was located upstream of Tom McDonald Creek/Tall Trees Grove at 22.05 river kilometer (UTM 415930E 4561662N NAD83) between May 22 and October 10. Maximum and minimum water temperatures were 13.4°C and 24.1°C, respectively (Figure 3). The average water temperature was 18.6°C (Std. dev. 2.1°C).

For the period July 1 through August 31, the warmer period of the summer, the average water temperature was 20.5°C, the maximum 24.1°C, and the minimum 17.9°C. The maximum weekly average temperature (MWAT) was 21.2°C, and the maximum weekly maximum temperature (MWMT) was 23.8°C. During the July 1 - August 31 period, the water temperature was at or greater than 18°C 99.9 percent of the time. Average water temperature for May 22 to 31 was 15.7°C; for June, 17.6°C; for July 20.5°C; for August, 20.4°C; for September, 18.2°C; and for October 1 to 6, 16.4°C.

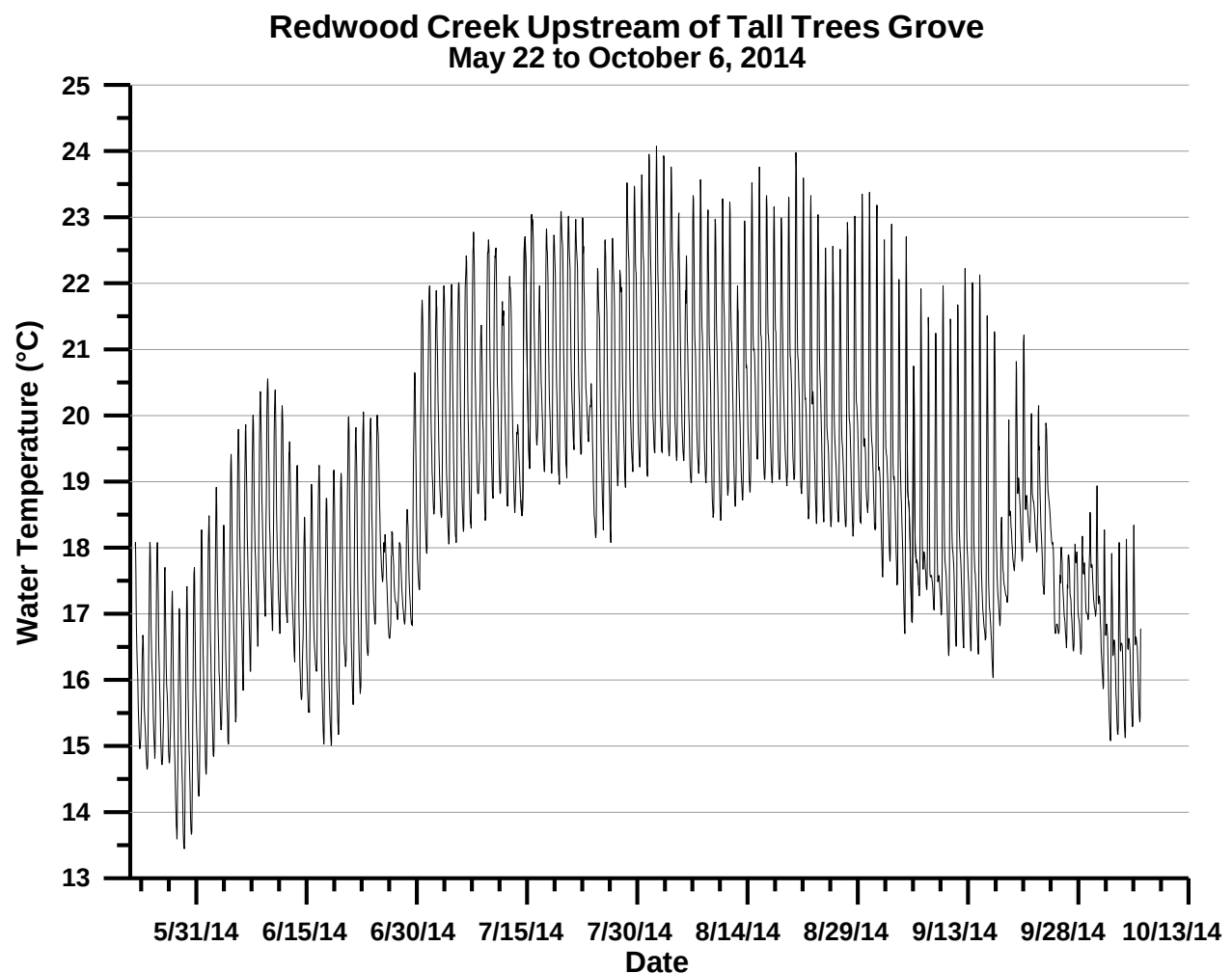


Figure 3. Mainstem Redwood Creek water temperature (°C) from Onset TidBit temperature logger located upstream of Tom McDonald Creek/Tall Trees Grove. The logger situated in the current below the surface recorded water temperature every hour from May 22 through October 6, 2014.

The second temperature logger (Tidbit S/N 9759085) was located in lower Redwood Creek at the end of the survey reach upstream of the Redwood Creek trailhead at 7.65 km (UTM 413639E 4572150N NAD83) between May 29 and October 6. It appears the probe was dewatered between September 10th and the 20th (Figure 4). A rain event on September 24 of about 2.5 inches submerged the probe again. For the period July 1 through August 31, the warmer period of the summer, the average water temperature was 18.8°C, the maximum 22.3°C, and the minimum 16.0°C. The maximum weekly average temperature (MWAT) was 19.3°C, and the maximum weekly maximum temperature (MWMT) was 22.1°C. During the July 1 - August 31 period, the water temperature was at or greater than 18°C 62 percent of the time. Average water temperature for May 29 to 31 was 16.1°C; for June, 17.1°C; for July 18.5°C; for August, 19.0°C; for September, not reported because of dewatered probe; and for October 1 to 6, 17.8°C.

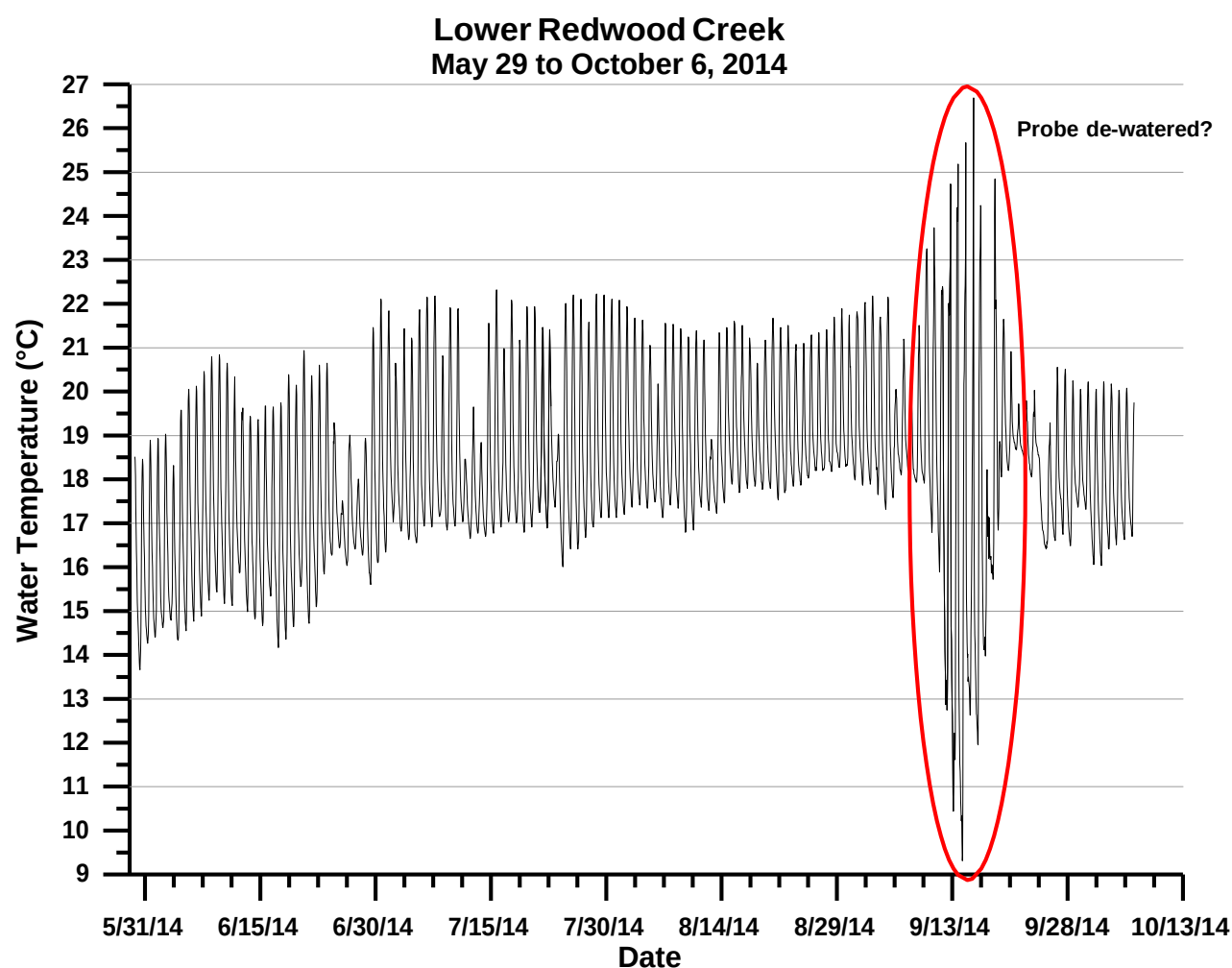


Figure 4. Mainstem Redwood Creek water temperatures (°C) from Onset Tidbit temperature logger located upstream of the lower Redwood Creek trailhead parking lot. The logger recorded water temperature every 1-hour in the current below the surface of the water from May 29 through October 6, 2014.

Tributaries - Water temperatures of 28 westside and 15 east side tributaries of Redwood Creek were measured during the survey. Temperatures ranged 12°C (an unnamed westside tributary at 39.90km) to 17.0°C (two eastside tributaries, Coyote Creek and Copper Creek) (Appendix IV). Water temperatures of all tributaries were colder than the corresponding temperature of mainstem Redwood Creek measured at the same time.

West side tributaries were generally cooler than east side tributaries; a pattern repeated in all past summer steelhead surveys. The mean water temperature of west side tributaries was 14.1°C (std. dev. = 1.1°C) and temperatures ranged from 12.0 °C to 16.0°C. The mean water temperature of east side tributaries was 15.1°C (std. dev. = 1.2°C) and temperatures ranged from 13.0°C to 17.0°C.

The 2014 year summer water temperatures are similar to temperatures and patterns recorded in all past summer steelhead surveys. Water temperatures in mainstem Redwood Creek are high for salmonid fish, above the preferred temperature range reported by Reiser and Bjornn (1979) for steelhead of 7.3°C to 14.6°C.

REFERENCES

- Anderson, D.G. 1993. Status of summer steelhead trout in Redwood Creek, Redwood National Park, California. pp. 1-8. In: Proceedings of the Fourth Conference on Research in California's National Parks, eds. S.D. Viers, T.J. Stohlgren, and C. Schonewald-Cox. Transactions and Proceedings NPS/NRUC/NRTP-93/9. U.S.D.I., National Park Service, Denver, Colorado.
- 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. USDA, Forest Service General Technical Report. PNW-96. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon. 54 pp.
- 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.

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Appendix I. Numbers of summer steelhead trout observed 1981 through 2014 and annual survey dates in the 25.9-km (16.1-mile) index reach (Lacks Creek to Tom McDonald Creek) and expanded survey reaches of Redwood Creek, Humboldt County, California by Redwood National and State Parks personnel and others.

Year	Original Index Reach (Lacks Creek to Tom McDonald Creek) No. of Summer Steelhead	Total Reach Surveyed		Survey Dates
		Total No. of Summer Steelhead	Start to End Points and Distance (km)	
1981	16	16	Beaver Cr to Orick (51.5)	8/10 – 13/81
1982 ^a	2	2	Stover Cr to Emerald Cr (22.5)	10/12 & 14/82
1983	5	7	HWY 299 to Tom McDonald Cr (44.4)	8/22 – 25/83
1984	44+	44+	Index Reach (25.9)	8/08 – 10/84
1985	44+	44+	Index Reach (25.9)	8/20 - 22, 9/4/85
1986	19	19	Index Reach (25.9)	8/25 – 27/86
1987	14	15	1mile downstream of Snow Camp Cr to Tom McDonald Cr (72.7)	7/14 – 16/87
1988	8	8 (6 Spring chinook)	Index Reach (25.9)	7/26 – 28/88
1989 ^b	0	0	Lacks Cr to Bridge Cr (17.9)	7/31, 8/01 – 02/89
1990	14	14	Index Reach (25.9)	7/31, 8/01-03/90
1991	15	15	Index Reach (25.9)	8/05 – 08/91
1992	5 (4 & 1 carcass)	7 (6 & 1 carcass)	Lacks Cr to Hayes Cr (37.8)	8/03 - 06, 10/92
1993	2	3	Lacks Cr to Hayes Cr (37.8)	8/02 - 05, 09/93
		2 ^c	Chezem Rd to Stover Cr (24.75)	8/18, 20, 27/93
		3 ^d	Ayres Cabin to Chezem Rd (14.3)	8/28 & 30/93
		8 Total	76.9 km	
1994	5	8	Lacks Cr to Hayes Cr (37.8)	8/01 – 04/94
		16 ^c	Chezem Rd to Stover Cr (24.8)	8/04-06/94
		3 ^e	HWY299 to Chezem Rd (2.0)	8/15/94
		9 ^d	Bradford Cr to HWY 299 (20.1)	8/13-14/94
		36 Total	84.7 km	

Year (cont.)	Index Reach (Lacks Creek to Tom McDonald Creek) No. of Summer Steelhead	Total Reach Surveyed		Survey Dates
		Total No. of Summer Steelhead in total reach	Begin to End Creeks and Distance (km)	
1995	6 (5 & 1 carcass)	8 (7 & 1 carcass) 8 ^c	Lacks Cr to Hayes Cr (37.8) Chezem Rd to Bair Rd (7.6)	7/24 – 27/95 8/28/95
		2 ^d	Bradford Cr to Ayres Cabin (7.85)	9/02/95
		18 Total	53.25 km	
1996	1	1 21 ^c 1 ^d	Lacks Cr to Hayes Cr (37.8) Chezem Rd to Stover Cr (24.8) Bradford Cr to Chezem Rd (22.1)	8/05 – 08/96 7/31, 8/1, 22/96 8/10-12/96
		23 Total	84.7 km	
1997	6	6 16 ^c 15 ^d	Lacks Cr to Hayes Cr (37.8) Chezem Rd to Stover Cr (24.8) Bradford Cr to Chezem Rd (22.1)	8/04 - 07/97 8/06 – 08/97 8/17, 24, 30/97
		37 Total	84.7 km	
1998	4	4 21 ^d	Lacks Cr to Hayes Cr (37.8) Bradford Cr to Stover Cr (46.9)	7/27 – 30/98 8/24-27, 31/98
		25 Total	84.7 km	
1999	5	10	Lacks Cr to Hayes Cr (38)	8/02-05, 09-10/99
2000	3	3	Lacks Cr to Hayes Cr (38)	8/01-03, 07-09/2000
2001	0	1	Lacks Cr to Hayes Cr (38.1)	7/31, 8/01-02, 07/2001
2002	3	3	Lacks Cr to Hayes Cr (38.1)	7/29-31, 8/ 1, 5, 7/2002
2003	4	6	Lacks Cr to Downstream of Hayes Cr (38.8)	7/29-31, 8/4-6/2003
2004	8 (+ 1 dead)	15 (+ 1 dead)	Lacks Cr to Downstream of Hayes Cr (39.0)	7/27-29, 8/3-5/2004
2005	19	22 (1 sockeye salmon)	Lacks Cr to Downstream of Hayes Cr (38.9)	7/26-28, 8/2-4/2005

Year (cont.)	Index Reach (Lacks Creek to Tom McDonald Creek) No. of Summer Steelhead	Total Reach Surveyed		Survey Dates
		Total No. of Summer Steelhead in total reach	Begin to End Creeks and Distance (km)	
2006	19 (+ 1 dead)	20 (+ 1 dead)	Lacks Cr to Downstream of Hayes Cr (38.9)	7/25-27 & 31, 8/1-2/2006
2007	11	13 (1 sockeye salmon)	Lacks Cr to Downstream of Hayes Cr (38.9)	7/24-26, 30, 31, 8/1/2007
2008	19	21	Lacks to Downstream of Hayes (38.9)	7/28-31, 8/4-6/2008
		9 ^f	Chezem Rd Bridge to Bair Rd Bridge (7.65)	7/28/2008
		6 ^f	Bair Rd Bridge to Beaver Cr (7.4)	7/29/2008
		23 ^f	Beaver Cr to Stover Cr (8.8)	7/30/2008
		59 Total	62.75 km	
2009	7	9	Lacks Cr to Downstream of Hayes Cr (38.9)	7/27-30, 8/3-5/2009
2010	6	7	Lacks Cr to Downstream of Hayes Cr (38.9)	7/26 – 29, 8/2-4/2010
2011	8	8	Lacks Cr to Downstream of Hayes Cr (38.9)	7/26, 27, 8/1-4, 8/2011
2012	8 (7 live & 1 dead)	8 (7 live & 1 dead)	Lacks Cr to Downstream of Hayes Cr (38.9)	7/23-26, 30, 31, 8/1/2012
2013	5	15	Lacks Cr to Downstream of Hayes Cr (38.9)	7/29-31, 8/1, 5-7/2013

2014	13	15	Lacks Cr to Downstream of Hayes Cr (38.9)	7/28-31, 8/4-6/2014
^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. ^c Tom Weseloh – California Trout ^d Matt Smith –North Coast Fisheries Restoration ^e Kirk Cohune ^f Tom Weseloh,- California Trout and Tom Shaw – USFWS-Arcata Office				

Appendix II. Location and number of Western Pearlshell (*Margaritifera falcate*) mussels observed during the 2014 summer steelhead survey of mainstem Redwood Creek.

Date	Location River km	Notes	Sizes	Number
7/29/2015	31.15	Queen's Hole, persistent mussel population	2-3"	10
7/30/2015	~27.61		---	11
7/31/2015	23.20	First pool below Emerald Creek confluence	---	1
8/04/2014	19.08		---	3
8/04/2014	19.05	UTM 415497E/4563005N Large and small mussels	0.5" or less & 1" +	100+
8/05/2015	18.20		---	~6
8/05/2015	~12.1		---	1
Total				132+

Appendix III. Location of beaver sign, scat, stored underwater willow branches, and/or stripped underwater willow branches, and adults observed during the 2014 summer steelhead survey of mainstem Redwood Creek.

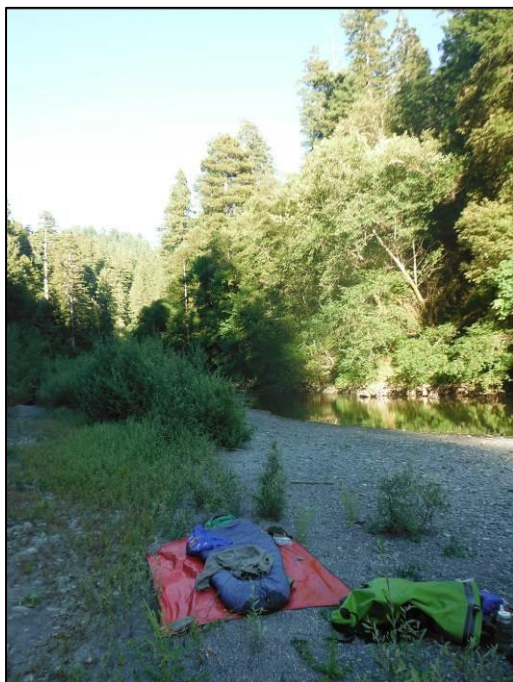
Date	Location River km	Notes
8/06/2014	44.30	Beaver sign
8/06/2014	43.70	Bank lodge
8/06/2014	43.25	Beaver sign
8/06/2014	42.37	Beaver sign
7/29/2014	35.80 – 35.0	Scat and adult beaver
7/29/2014	~33.00	Bank lodge
8/5/2014	13.31	Scat and stripped branches
8/5/2014	9.8 – 7.65	Scat

Appendix IV. Stream water temperatures (°C) measured with a handheld thermometer (0.5°C increments) during the 2014 Redwood Creek summer steelhead trout survey from July 28 to August 6. Locations are listed south to north. Redwood Creek (upstream) refers to water temperature measurement taken immediately upstream of the tributary confluence listed below. UN ES or UN WS refers to unnamed eastside or westside tributary, and the number refers 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 and --- = no data collected. SSHD = Redwood Creek water temperature at summer steelhead location.

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)	Confluence Connection
Redwood Creek (upstream)	REDW	8/06/2014	8:40	19.5	N/A
Lacks Creek	East	8/06/2014	8:40	16.0	Subsurface ~ 10m
Redwood Creek (upstream)	REDW	8/06/2014	9:10	18.5	
George Creek	West	8/06/2014	9:10	13.5	Connected
Redwood Creek (upstream)	REDW	8/06/2014	9:20	18.5	
UN WS 45.60	West	8/06/2014	9:20	13.0	Connected
UN WS 44.381	West	8/06/2014	---	---	Totally dry
Redwood Creek (upstream)	REDW	8/06/2014	11:07	20.0	
Garrett Creek	East	8/06/2014	11:07	16.5	Subsurface ~ 15-20m
Redwood Creek 42.97 SSHD	REDW	8/06/2014	11:40	21.0	
Carson Creek	East	8/06/2014	---	---	Totally dry
Redwood Creek (upstream)	REDW	8/06/2014	14:30	22.0	
UN WS 41.48	West	8/06/2014	14:30	15.0	Connected
Redwood Creek (upstream)	REDW	8/06/2014	14:37	21.5	
UN ES 41.244	East	8/06/2014	14:37	15.0	Subsurface ~ 10m
Redwood Creek (upstream)	REDW	8/06/2014	15:08	20.5	
Panther Creek	West	8/06/2014	15:08	15.0	Connected
Redwood Creek (upstream)	REDW	7/28/2014	11:05	19.5	
Panther Creek	West	7/28/2014	11:05	14.0	Connected
Redwood Creek (upstream)	REDW	7/28/2014	12:13	20.0	
UN WS 39.90	West	7/28/2014	12:13	12.0	Connected
Redwood Creek (upstream)	REDW	7/28/2014	12:45	20.0	
UN WS 39.5221	West	7/28/2014	12:45	16.0	Connected
Redwood Creek (upstream)	REDW	7/28/2014	13:14	20.0	
UN WS 39.25	West	7/28/2014	13:14	15.0	Connected
Joplin Creek	West	7/28/2014	13:33	16.0	Subsurface 5m
Redwood Creek 37.5 SSHD	REDW	7/28/2014	16:36	21.5	
Redwood Creek 37.0 SSHD	REDW	7/28/2014	17:24	21.0	
Redwood Creek (upstream)	REDW	7/28/2014	17:43	21.0	
Coyote Creek	East	7/28/2014	17:43	17.0	Connected
Redwood Creek 36.30 SSHD	REDW	7/28/2014	18:09	20.5	
Redwood Creek 36.23	REDW	7/29/2014	~8:30	18.0	

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)	Confluence Connection
Redwood Creek (upstream)	REDW	7/29/2014	9:14	18.0	
UN ES 35.7384	East	7/29/2014	9:14	13.5	Connected
Redwood Creek 35.80 SSHD	REDW	7/29/2014	9:30	18.0	
Redwood Creek (upstream) 34.92 SSHD	REDW	7/29/2014	10:40	19.0	
Devils Creek	West	7/29/2014	10:40	14.0	Connected
Redwood Creek (upstream)	REDW	7/29/2014	12:45	20.0	
Elf Creek	West	7/29/2014	12:45	13.5	Connected
Redwood Creek (upstream)	REDW	7/29/2014	14:34	21.5	
Copper Creek	East	7/29/2014	14:34	17.0	Connected
Redwood Creek (upstream)	REDW	7/29/2014	16:01	22.0	
UN WS 31.042	West	7/29/2014	16:01	13.5	Connected
Redwood Creek (upstream)	REDW	7/29/2014	16:50	22.0	
UN WS 29.853	West	7/29/2014	16:50	15.0	Connected
Redwood Creek 29.85 km	REDW	7/30/2014	8:37	18.5	
UN WS 29.85	West	7/30/2014	8:52	13.0	Connected
Redwood Creek (upstream)	REDW	7/30/2014	9:37	19.0	
UN WS 29.066	West	7/30/2014	9:37	13.5	Connected
Slide Creek	East	7/30/2014	9:45	14.0	Connected
Redwood Creek (upstream)	REDW	7/30/2014	10:17	19.5	
UN WS 28.243	West	7/30/2014	10:17	13.0	Connected
Redwood Creek 28.05 SSHD	REDW	7/30/2014	10:55	19.5	
Redwood Creek (upstream)	REDW	7/30/2014	11:40	20.0	
UN WS 27.75	West	7/30/2014	11:40	14.5	Connected
UN WS 26.75	West	7/30/2014	13:00	14.0	Connected
Redwood Creek (upstream)	REDW	7/30/2014	15:05	22.0	
Dolason Creek	East	7/30/2014	15:05	16.0	Subsurface 75m
Redwood Creek (upstream)	REDW	7/30/2014	15:30	23.0	
UN WS 25.112	West	7/30/2014	15:30	15.0	Connected
Redwood Creek (upstream)	REDW	7/30/2014	16:00	23.0	
Bridge Creek	West	7/30/2014	16:00	15.5	Connected
Redwood Creek 23.47 km	REDW	7/31/2014	8:46	19.5	
Emerald Creek	East	7/31/2014	9:22	14.5	Subsurface 75m
Redwood Creek (upstream)	REDW	7/31/2014	9:53	20.0	
UN WS 22.861	West	7/31/2014	9:53	13.0	Connected
Redwood Creek (upstream)	REDW	7/31/2014	11:12	20.0	
UN ES 21.40	East	7/31/2014	11:12	15.5	Connected
Redwood Creek (upstream)	REDW	7/31/2014	11:58	21.5	
Tom McDonald Creek	West	7/31/2014	11:58	15.0	Connected
Redwood Creek (near Tall Trees foot bridge) 19.20 km	REDW	8/4/2014	10:02	20.0	
UN ES 19.25	East	8/4/2014	10:18	15.0	Connected
Cole Creek	East	8/4/2014	10:56	14.0	Connected
Redwood Creek (upstream)	REDW	8/4/2014	11:23	20.0	
Fortyfour Creek	West	8/4/2014	11:23	13.5	Connected

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)	Confluence Connection
UN WS 17.95	West	8/4/2014	11:31	13.5	Subsurface Runs along REDW bar
UN ES 17.45	East	8/4/2014	11:45	15.0	Connected
UN WS 17.35	West	8/4/2014	11:53	13.0	Connected
Miller Creek	East	8/4/2014	11:56	13.0	Subsurface at gravel bar
UN WS 16.6281	West	8/4/2014	12:24	14.0	Subsurface at gravel bar
Redwood Creek (upstream)	REDW	8/4/2014	13:39	22.0	
Bond Creek	West	8/4/2014	13:38	13.0	Connected
UN WS 15.80	West	8/4/2014	14:02	14.0	Connected
Redwood Creek (upstream)	REDW	8/4/2014	14:52	21.0	
Cloquet Creek	East	8/4/2014	14:49	15.0	Subsurface ~ 10-15m
Redwood Creek 14.57 km	REDW	8/05/2014	10:00	17.5	
Redwood Creek 12.10 SSHD	REDW	8/05/2014	11:50	19.0	
Redwood Creek (upstream)	REDW	8/05/2014	12:09	19.0	
Elam Creek	West	8/05/2014	12:06	12.5	Connected
Redwood Creek (upstream)	REDW	8/05/2014	14:16	19.0	
McArthur Creek	West	8/05/2014	14:13	15.0	Connected
Redwood Creek 7.65 km	REDW	8/05/2014	15:31	19.5	



River Bar Camping: Sleeping Options on Redwood Creek Dive (2014)