

Redwood

National Park

National Park Service
US Department of the Interior



2015 REDWOOD CREEK SUMMER STEELHEAD SURVEY



Fish and Wildlife Branch
March 2016

Cover: (2015 survey)
Top Left: RNP Summer Steelhead Snorkelers
Top Right: Western Pearlshell Mussel on Redwood Creek
Middle Left: Adult Summer Steelhead on Redwood Creek
Middle Right: Dead Coastal Giant Salamander Adult
Bottom Left: RNP Snorkeler
Bottom Middle: RNP Snorkeler
Bottom Right: RNP Snorkel crew

2015 RNP REDWOOD CREEK SUMMER STEELHEAD SURVEY SUMMARY

DATES: July 27, 28, 29, 30 (Monday - Thursday) & August 3, 4, 5, 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 Park) - 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: 17 cfs End of Survey: 14 cfs

DIVERS: David Anderson*, Terry Hines*, Kyle Max*, Alder Gustafson*, Joanna DiTommaso*, Brandon Piper, and Sal Amador (*Divers with prior summer steelhead diving experience on Redwood Creek). Recorders: Heather Brown and Joanna DiTommaso.

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 M-11 to Redwood Creek Trail; and downstream of Hayes Creek intercept Redwood Creek Trail and hike to lower Redwood Creek Trailhead parking lot.

ITINERARY:	Date	Survey Reach	Distance km	Summer
				Steelhead No.
	8/5	Lacks Creek to Panther Creek		
		<i>Anderson, Max, Piper (Recorder – Brown).....</i>	6.02	0
	7/27	Panther Cr to Upstream of Devils Cr at km 36.65		
		<i>Anderson, Hines, Max, & Gustafson.....</i>	4.85	2
	7/28	Upstream of Devils Cr to Upstrm of Pig Pen Prairie at km 29.86		
		<i>Anderson, Hines, Max, & Gustafson.....</i>	5.79	1
	7/29	Upstrm of Pig Pen Prairie to Upstrm of Emerald Cr at km 23.27		
		<i>Anderson, Hines, Max, & Gustafson.....</i>	6.59	1
	7/30	Upstrm of Emerald Cr to Tall Trees Summer Bridge at km 19.40		
		<i>Anderson, Hines, Max, & Gustafson.....</i>	3.87	0
	8/3	Tall Trees Summer Bridge to Cloquet Cr		
		<i>Anderson, Max, Piper, Amador</i>		
		<i>(Recorder – DiTommaso)</i>	4.83	0
	8/4	Cloquet Creek to Downstream of Hayes Creek		
		<i>Anderson, Max, DiTommaso, Piper</i>		
		<i>(Recorder – Brown).....</i>	6.92	1

TOTAL NUMBER OF ADULT SUMMER STEELHEAD TROUT OBSERVED IN 2015: 5

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 hotter water temperatures, low summer flows, decreasing pool depths, predators, and poaching. Steelhead within the Northern California Coastal Steelhead Distinct Population Segment, which includes Redwood Creek, were federally listed by NOAA Fisheries as threatened in June 2000 and relisted in 2006.

Summer 2015 was the 35th 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 0.75 km downstream of Hayes Creek. Originally, the survey was from Lacks Creek to Tom McDonald Creek, but it was expanded downstream of Hayes Creek in 1992.

Five adult summer steelhead (steelhead ≥ 16 inches), zero ‘half-pounder’ steelhead (smaller immature sea-run steelhead returning after less than one year in the ocean), and 259 coastal cutthroat trout (*O. clarki*) (cutthroat ≥ 10 inches) were observed in a mainstem survey reach from Lacks Creek to just downstream of Hayes Creek in 2015 (Table 1). All five summer steelhead were observed within the original index reach, Lacks to Tom McDonald Creeks.

All 5 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). One fish was observed in a pool associated with a tributary, Joplin Creek. All observations were solitary fish. Estimated fish length ranged from 17 to 22 inches. Fish lengths were estimated by referring to graduated (in inches) leashes that divers used to tow their floating packs when snorkeling.

In 2015, three fish were found in the upper part the survey, one in the middle, and one in the lower river (Figure 1). Past surveys have found most summer steelhead above the ‘gorge’ (~ river km 29) 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 cohort year strength.

Western Pearlshell Freshwater Mussels - Though not a primary survey species for the dive, Western Pearlshell (*Margaritifera falcate*) freshwater mussels were observed in 16 locations on mainstem Redwood Creek (Appendix II). They are always observed amongst the rocks naturally armoring the banks in deeper water where sand and silt collect, not in gravel beds in the channel.

Beaver – Six locations with beaver (*Castor canadensis*) sign, stripped willow branches and scat, were observed, including a lodge (Appendix III). Four observations may be close enough to represent only two animals.

Table 1. Numbers of adult summer steelhead ($\geq 16"$), 'half-pounder' steelhead, and coastal cutthroat trout, and aquatic wildlife noted during the 2015 summer steelhead survey of mainstem Redwood Creek, County, California. Survey conducted on seven days, July 27 through August 5, 2015 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.)

Redwood Creek Mainstem Stream Reach		No. of Summer Steelhead Adults ($\geq 16"$)	No. of Steelhead Half Pounders	No. of Cutthroat Trout ($\geq 10"$)	Aquatic/Wildlife Observed
O R I G I N A L I N D E X R E A C H	Lacks Creek to Panther Creek 8/05/2015	0	0	29	Coastal Giant Salamanders (7 dead), Rough-skinned newt (1 alive), Threespine stickleback (3 dead), Chinook juveniles, Sacramento sucker juveniles, Garter snake, Beaver sign (scat and chewed branches), Bull Elk
	Panther Creek to Coyote Creek 7/27/2015	2	0	26	Coastal Giant Salamanders (6 dead), Steelhead juveniles, Threespine stickleback, Yellow-legged frogs, Lamprey redds (3), American Dipper, Belted Kingfisher, Juga snails, Limniphilid caddisfly larva, Glossosomatid larvae
	Coyote Creek to Copper Creek 7/27 & 28/2015	1	0	37	Coastal Giant Salamanders (2 dead), Sacramento sucker, Beaver sign, Belted Kingfisher, Mergansers, Freshwater Mussels
	Copper Creek to Slide Creek 7/28 & 29/2015	0	0	30	Coastal Giant Salamanders (0 dead), Rough-skinned newt (1 dead, 1 alive), Freshwater Mussels, Beaver scat
	Slide Creek (Pig Pen Prairie) to Bridge Creek 7/29/2015	1	0	22	Coastal Giant Salamanders (1 dead, 1 alive), Sculpin (1 dead, 1 alive), Sacramento Suckers, Freshwater Mussel, Toad (adult), Mallard Ducks (6), Mountain Lion tracks
	Bridge Creek to Tom McDonald Creek 7/29 & 30/2015	0	0	18	Coastal Giant Salamanders (0 dead), Freshwater Mussels, Blacktailed Deer (doe and fawn), Tent Camp with 2 campers
	Tom McDonald Creek to Bond Creek 7/30 & 8/3/2015	0	0	16	Coastal Giant Salamanders (0 dead), Sacramento suckers, Yellow-legged frog (1 dead) Freshwater Mussels, Otters (1 adult, 2 juveniles), Tents (2), campers (3)
	Bond Creek to downstream of Hayes Creek 8/3 & 4/ 2015	1	0	81	Coastal Giant Salamanders (1 dead), Steelhead juvenile (1 dead) Sacramento suckers, Rough-skinned newt, Freshwater Mussels, Raccoon, Horsehair worms, Hikers (2)
2015 Fish Totals		5	0	259	Coastal Giant Salamander 17 dead

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 2015 snorkel survey of mainstem Redwood Creek, upstream to downstream. (Letters in parentheses in the river km refer to locations on Figure 1 map).

Date 2015	River KM	No. of SSHD	Est. Length (inches)	Habitat Description (Length x Width x Depth)
SUMMER STEELHEAD				
7/27/2015	38.95 (a)	1	18 to 20"	In pool at confluence of Joplin Creek below thermocline in the boulders. First seen in the open. Pool dimensions: 50m L x 15m W x 12ft D. Redwood Creek water temperature 20.0°C at 1220. Joplin Creek 15.0°C, but subsurface at mouth. (UTM 422830E/4550240N)
7/27/2015	37.25 (b)	1	22"	Observed swimming in open water then hid under a rock in 2ft of water. Pool dimensions: 300m L x 20m W. Redwood Creek water temperature 20.0°C at 16:00. (UTM 423230E/4551650N)
7/28/2015	34.25 (c)	1	17"	Observed swimming in open in pool, turned away, then swam back. Pool dimensions: 300m L x 20m W. Redwood Creek water temperature 18.0°C at 16:53. (UTM 421984E/4553825N)
7/29/2015	~25.95 (d)	1	18"	Spooked from under large woody debris (log and root wad). Pool dimensions: 40m L x 20m W x 3ft D. Redwood Creek water temperature 23.5°C at 15:36. (UTM 418725E/4560300N)
8/4/2015	11.20 (e)	1	18"	Fish observed out in open, but pool has much woody debris. Pool dimensions: 200m L x 30m W x 8ft D. Redwood Creek water temperature 17.5°C at 11:50. (UTM 414160E/4568930N)
Summer Steelhead Total		5		



Snorkel break (RNP 2015)

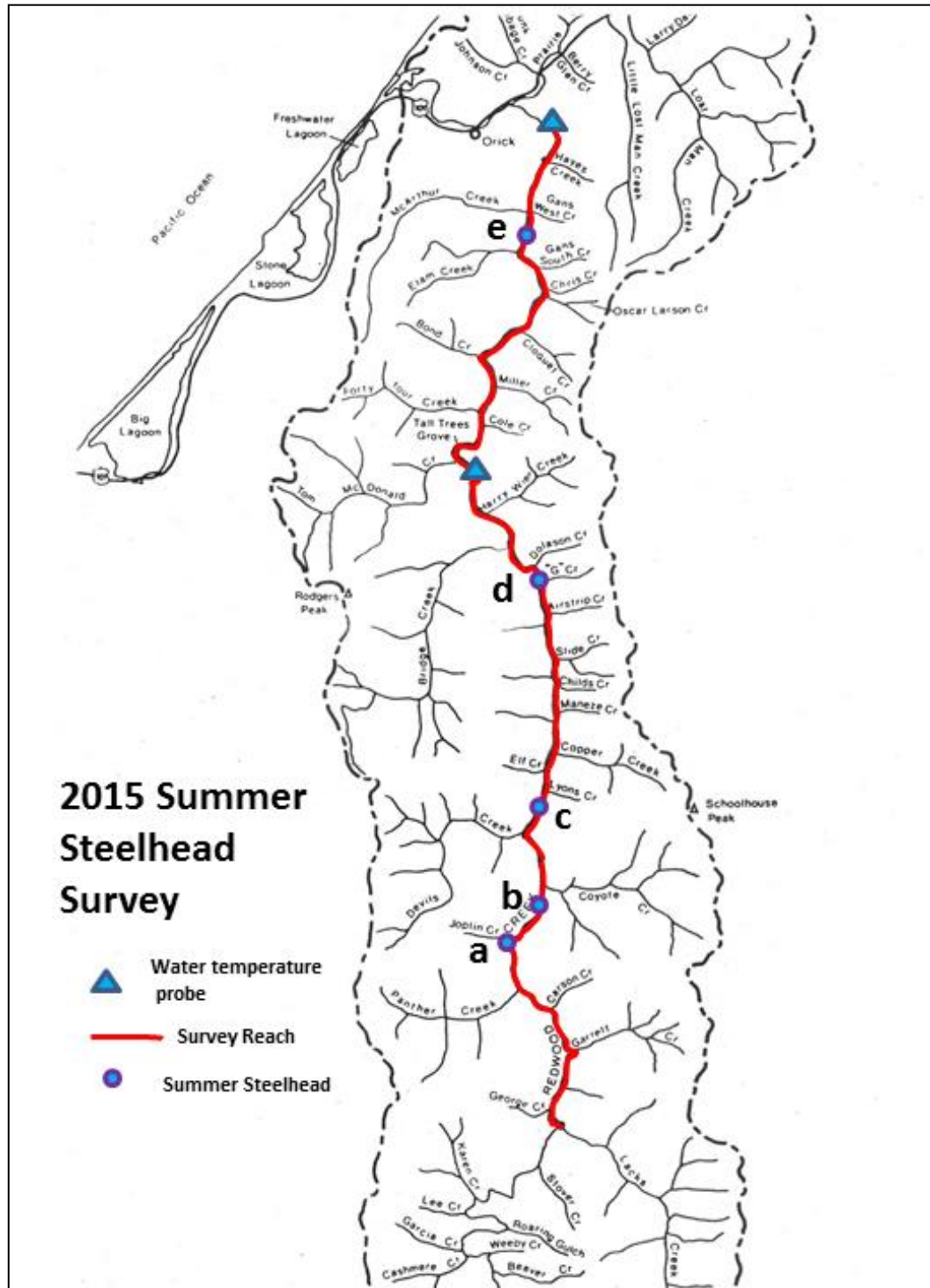


Figure 1. Survey reach and location of the 5 adult summer steelhead observed during the 2015 snorkel survey of Redwood Creek, Humboldt County, California. Survey was between Lacks Creek to downstream of Hayes Creek from July 27 to 30 and August 3 to 5, 2015.

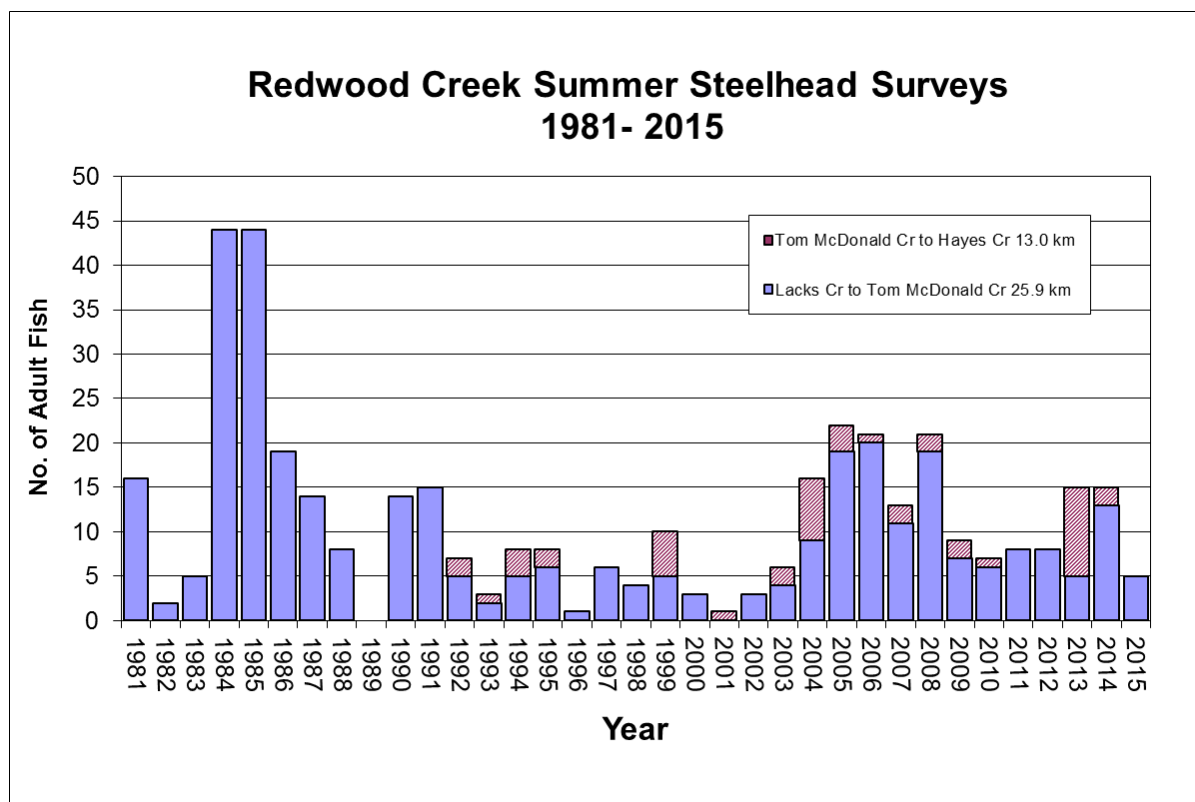


Figure 2. Numbers of summer steelhead observed each summer since 1981 on the original 25.9 km (16.1 mile) index reach Redwood Creek (Lacks Creek to Tom McDonald Creek) and 13.0 km expanded reach (Tom McDonald Creek to downstream of Hayes Creek) Humboldt County, California. The survey was expanded in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

Coastal Giant Salamanders - Seventeen dead Coastal Giant Salamanders (*Dicamptodon tenebrosus*) were observed in mainstem Redwood Creek (Table 1). Based on their size, there were 14 adults and 3 juveniles. Greater numbers were found in the upper reaches of the survey with 13 observed upstream of Coyote Creek. The dead salamanders were observed as solitary individuals, usually on their backs, slightly swollen and covered in fungus. Additionally, one dead Rough-skinned Newt (*Taricha granulosa*) was observed.

Human Influences - Besides seeing tent and hammock campers, hikers, and fire rings, other human artifacts found were about a dozen discarded raw chicken eggs, the glass knob from a bong, and rafting equipment – a raft pump without a handle, an oar, a broken oar, a kayak skirt, and one fingerless rubber glove. Additionally, old choker cable and large pieces of metal were observed protruding from the stream bottom, historical remnants of past logging within the park.

WATER DISCHARGE

Water flow measured at the Orick gaging station located downstream of the confluence of Prairie Creek at Redwood Creek between July 27 and August 5 ranged between 17 and 13 cfs. 2015 was a drought year. (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 as well as recording time of day. 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 2015 survey ranged from 17.0°C (at 09:10) to 24.0 °C (at 17:00), the mean of 43 synoptic measurements during the survey, 19.6°C (Std. dev. 1.3°C) (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 June to late October 2015.

A temperature logger (Tidbit S/N 9759082) was located upstream of Tom McDonald Creek/Tall Trees Grove at 21.75 river kilometer (UTM: (NAD83) 414825E, 4561908N) between June 1 and October 29. Maximum and minimum water temperatures were 13.6°C and 24.9°C, respectively (Figure 3). The average water temperature was 18.7°C (Std. dev. 2.3°C).

For the period July 1 through August 31, the warmest months of the summer, the average water temperature was 20.4°C, the maximum 24.9°C, and the minimum 17.8°C. The maximum weekly average temperature (MWAT) was 21.4°C, and the maximum weekly maximum temperature (MWMT) was 24.0°C. During the July 1 - August 31 period, the water temperature was at or greater than 18°C 99.3 percent of the time. Average water temperature for June was 19.3°C; for July 20.8°C; for August, 20.0°C; for September, 17.7°C; and for October 1 to 29, 15.5°C.

The second temperature logger (Tidbit S/N 9759075) was located in lower Redwood Creek at the end of the survey reach upstream of the Redwood Creek trailhead at ~7.60 km (UTM: (NAD83) 413527E, 4572267N) between June 1 and October 21. The probe was dewatered when retrieved on October 21. A large reach, 2.4 km (1.5 miles) of Redwood Creek, starting upstream of the Prairie Creek confluence was dry except for some small isolated pools. Based on interpretation of the data recorded, the submerged probe data is reported to August 25. Maximum and minimum water temperatures were 14.9°C and 23.6°C, respectively (Figure 4). The average water temperature was 18.5°C (Std. dev. 1.6°C).

For the period July 1 through August 25, the warmer period of the summer, the average water temperature was 19.1°C, the maximum 23.6°C, and the minimum 16.6°C. The maximum weekly average temperature (MWAT) was 20.0°C, and the maximum weekly maximum temperature (MWMT) was 22.9°C. During the July 1 - August 31 period, the water temperature was at or greater than 18°C 75.3 percent of the time. Average water temperature for June was 17.5°C; for July 18.6°C; for August 1 through 25, 19.6°C.

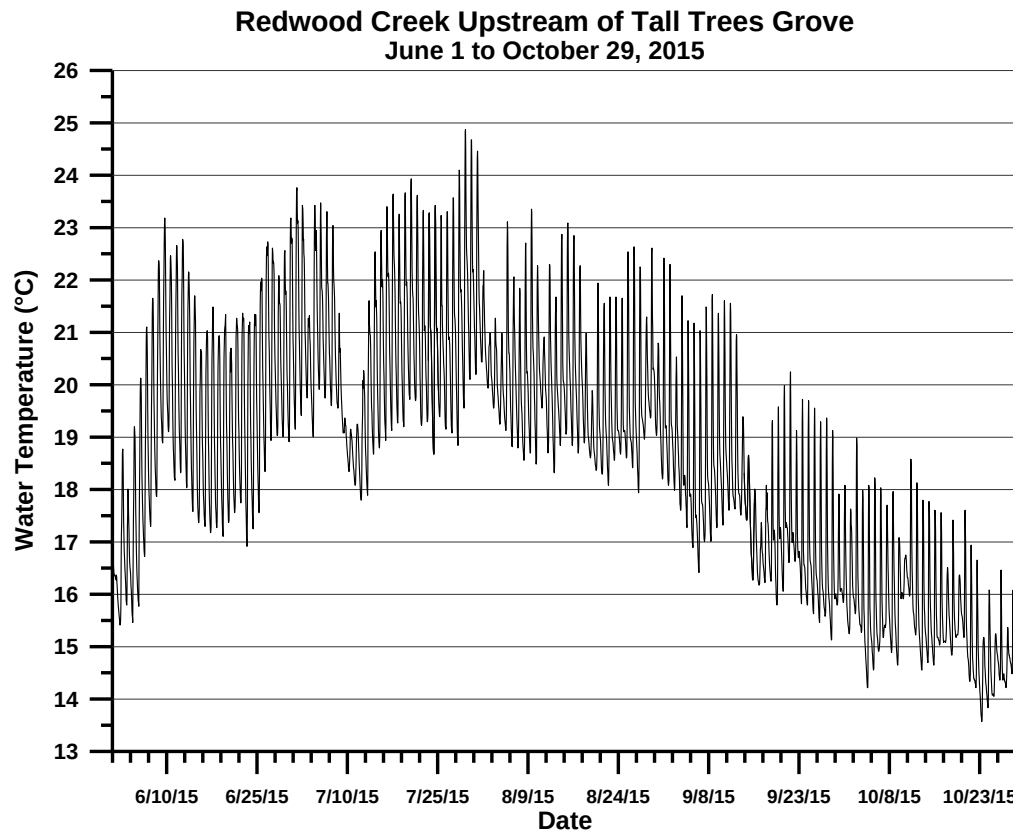


Figure 3. Mainstem Redwood Creek water temperature (°C) from Onset TidBit temperature logger located upstream of Tom McDonald Creek/Tall Trees Grove at river km 21.75. The logger situated in the current below the surface recorded water temperature every hour from June 1 through October 29, 2015.

Tributaries - Water temperatures of 21 westside and 11 east side tributaries of Redwood Creek were measured during the survey. Temperatures ranged from 12.0°C (an unnamed westside tributary at 39.9km) to 18.0°C (eastside tributary Dolason 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 14.5°C (std. dev. = 1.1°C) and temperatures ranged from 12.0 °C to 17.0°C. The mean water temperature of east side tributaries was 15.3°C (std. dev. = 1.3°C) and temperatures ranged from 14.0°C to 18.0°C.

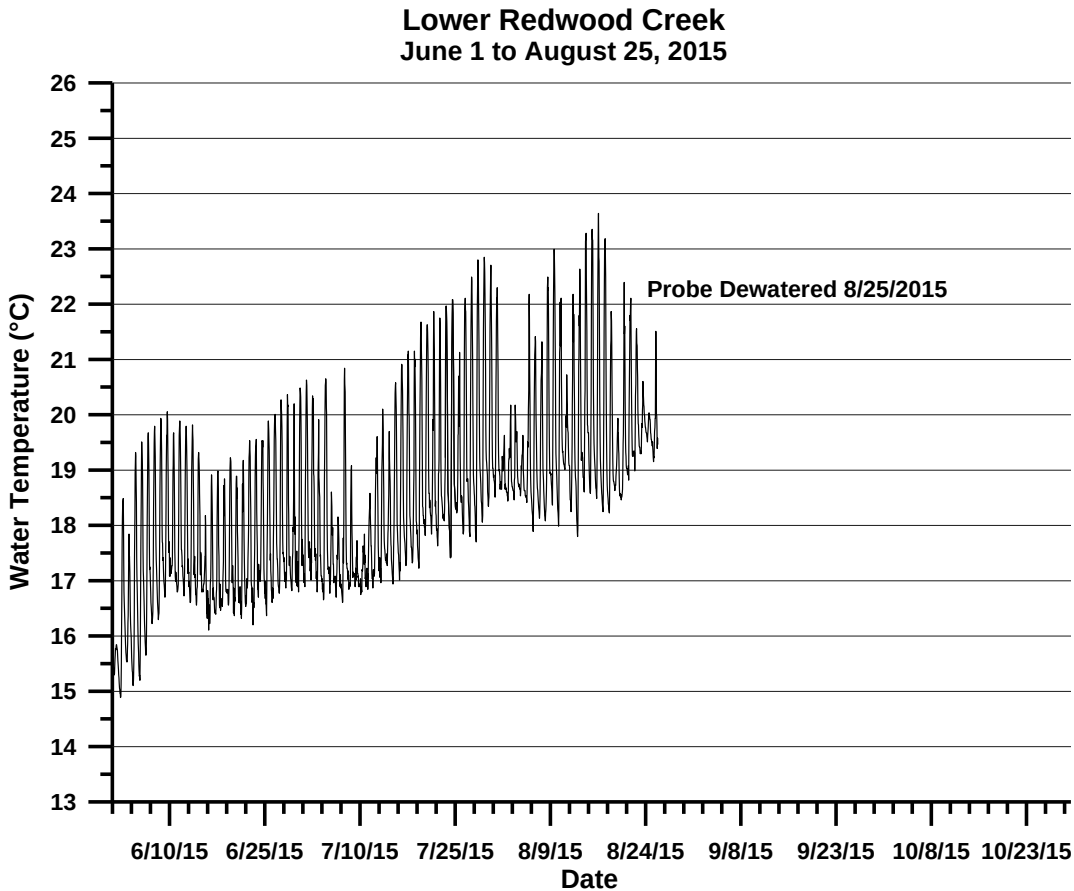


Figure 4. Mainstem Redwood Creek water temperatures (°C) from Onset Tidbit temperature logger located upstream of the lower Redwood Creek Trailhead parking lot at river km ~7.60. The logger recorded water temperature every 1-hour in the current below the surface of the water from June 1 through August 25, 2015 when it was dewatered.

The 2015 year summer water temperatures are similar to temperatures and patterns recorded in all past summer steelhead surveys, even with the drought conditions. A temperature thermocline at depth existed in pools and deep slow runs. The cold water temperature difference was felt when diving down several feet. The thermocline might have been more pronounced this year with the low flow conditions (13 to 17 cfs at Orick) causing reduced mixing. Measured water temperatures in mainstem Redwood Creek were 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

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Dead decaying Coastal Giant Salamander in mainstem Redwood Creek (RNP 2015)

Appendix I. Numbers of summer steelhead trout observed 1981 through 2015 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	Lacks Cr to Hayes Cr (37.8)	7/27 – 30/98
		21 ^d	Bradford Cr to Stover Cr (46.9)	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

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)	
2005	19	22 (1 sockeye salmon)	Lacks Cr to Downstream of Hayes Cr (38.9)	7/26-28, 8/2-4/2005
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

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)	
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
2015	4	5	Lacks Cr to Downstream of Hayes Cr (38.9)	7/28-30, 8/3-5/2015
^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 2015 summer steelhead survey of mainstem Redwood Creek.

Date	Location River km	UTM (NAD83)	Notes	Number
7/28/2015	35.33	422226E/4553081N	Pool	4
7/28/2015	32.15	421580E/4555725N	Pool upstream of Copper Creek	6
7/28/2015	31.15	421270E/4556430N	Queens Hole, same location as past years observations - persistent	12+
7/29/2015	28.00	419860E/4558890N	Upstream of Rocky Gap	1
7/29/2015	27.60	419654E/4559168N	Small mussels ~ 1" in size	9
7/29/2015	26.10	418875E/4560175N	Upstream of G Creek	present
7/29/2015	25.75	418575E/4560450N	Dolason Creek confluence pool	present
7/29/2015	~24.90	---	Upstream of Bridge Creek	present
7/30/2015	~23.15	---	Downstream of Emerald Creek	1
8/3/2015	19.25	415522E/4562846N	Located on east bank	present
8/3/2015	19.05	415516E/4563010N	Located on west bank, numerous	present
8/3/2015	18.90	415488E/4563158N	Located on east bank	present
8/3/2015	18.25	415217E/4563639N	Located on west bank	4
8/3/2015	15.20	414879E/4565921N	---	present
8/4/2015	13.60	415227E/4567317N	---	2
8/4/2015	12.20	414680E/4568473N	---	4

Appendix III. Location of beaver sign, scat, stored and/or stripped underwater willow branches, and lodge, observed during the 2015 summer steelhead survey of mainstem Redwood Creek.

Date	Location River km	Notes
8/5/2015	44.38 - 45.73	Between George Creek and UNES44.38 Creek Scat and chewed branches
7/28/2015	32.80 – 33.65	Between Lyons and Elf Creeks, scat
7/28/2015	32.15	Pool upstream of Copper Creek, scat
7/29/2015	29.25 – 29.85	Upstream of Pig Pen Prairie, scat
7/29/2015	28.95	At Slide Creek, scat
8/4/2015	8.20	413804E/4571697N, lodge

Appendix IV. Tributary and main stem water temperatures (°C) measured with a handheld thermometer (0.5°C increments) during the 2015 Redwood Creek summer steelhead trout survey from July 27 to August 5. 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	8/5/2015	08:38	18.0	
Lacks Creek	East	8/5/2015	08:38	16.0	Dry at mouth (15m from RedwCr)
Redwood Creek (upstream)	REDW	8/5/2015	09:11	18.5	
George Creek	West	8/5/2015	09:11	16.0	Connected
Redwood Creek (upstream)	REDW	8/5/2015	10:38	19.0	
UN WS 44.38	West	8/5/2015	10:38	14.0	Connected
Redwood Creek (upstream)	REDW	8/5/2015	11:29	19.5	
Garrett Creek	East	8/5/2015	11:29	14.0	Dry at mouth (15m from RedwCr)
Redwood Creek (upstream)	REDW	8/5/2015	13:52	20.5	
UN WS 42.1613	West	8/5/2015	13:52	15.5	Connected
UN ES 41.244	East	8/5/2015	---	----	Dry
Redwood Creek (upstream)	REDW	8/5/2015	15:39	20.0	
Panther Creek	West	8/5/2015	15:39	15.0	Connected
Redwood Creek (upstream)	REDW	7/27/2015	10:25	18.5	
Panther Creek	West	7/27/2015	10:25	14.0	Connected
Redwood Creek (upstream)	REDW	7/27/2015	11:30	18.0	
UN WS 39.9	West	7/27/2015	11:30	12.0	Connected
Redwood Creek (upstream)	REDW	7/27/2015	11:45	18.5	
UN WS 39.7728	West	7/27/2015	11:45	14.0	Connected
Redwood Creek (upstream) 38.95 SSHD	REDW	7/27/2015	12:20	20.0	
Joplin Creek	West	7/27/2015	12:20	15.0	Dry at mouth
Redwood Creek 37.25 SSHD	REDW	7/27/2015	16:00	20.0	
Redwood Creek (upstream)	REDW	7/27/2015	16:15	20.0	
Coyote Creek	East	7/27/2015	16:15	16.0	Connected
Redwood Creek 36.65 km	REDW	7/28/2015	09:10	17.0	
Redwood Creek (upstream)	REDW	7/28/2015	10:10	18.0	
Devils Creek	West	7/28/2015	10:10	14.0	Connected
Redwood Creek 34.25 SSHD	REDW	7/28/2015	10:53	18.0	
Redwood Creek (upstream)	REDW	7/28/2015	11:31	18.5	
Lyons Creek	East	7/28/2015	11:31	14.5	Connected
Redwood Creek (upstream)	REDW	7/28/2015	12:20	19.5	

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)	Confluence Connection
Elf Creek	West	7/28/2015	12:20	14.5	Connected
Redwood Creek (upstream)	REDW	7/28/2015	14:22	21.0	
Copper Creek	East	7/28/2015	14:22	17.0	Dry at mouth (Water 15m upstream)
Redwood Creek 29.86 km	REDW	7/29/2015	08:40	20.0	
Redwood Creek (upstream)	REDW	7/29/2015	09:03	19.5	
UN WS 29.85	West	7/29/2015	09:03	15.0	Connected
Redwood Creek (upstream)	REDW	7/29/2015	09:47	20.0	
UN WS 29.066	West	7/29/2015	09:47	16.0	Connected
Redwood Creek (upstream)	REDW	7/29/2015	09:57	20.0	
Slide Creek	East	7/29/2015	09:57	15.0	Connected
Redwood Creek (upstream)	REDW	7/29/2015	15:36	23.5	
Dolason Creek	East	7/29/2015	15:36	18.0	Dry at mouth (Water 50m upstream)
Redwood Creek (upstream)	REDW	7/29/2015	17:00	24.0	
Bridge Creek	West	7/29/2015	17:00	17.0	Connected
Redwood Creek 23.27 km	REDW	7/29/2015	18:07	24.0	
Redwood Creek 23.27 km	REDW	7/30/2015	08:45	20.5	
Redwood Creek (upstream)	REDW	7/30/2015	09:19	20.0	
UN WS 22.5075	West	7/30/2015	09:19	14.0	Connected
Redwood Creek (upstream)	REDW	7/30/2015	09:33	20.5	
UN WS 23.4061	West	7/30/2015	09:33	14.5	Connected
Redwood Creek (upstream)	REDW	7/30/2015	10:44	22.0	
Tom McDonald Creek	West	7/30/2015	10:44	15.0	Connected
Redwood Creek (at Tall Trees foot bridge) 19.40 km	REDW	7/30/2015	12:00	23.0	
Redwood Creek (below Tall Trees foot bridge) 19.30 km	REDW	8/3/2015	09:54	20.0	
Cole Creek	East	---	----	----	Did not see
Redwood Creek (upstream)	REDW	8/3/2015	11:17	19.5	
Fortyfour Creek	West	8/3/2015	11:17	14.5	Connected
Redwood Creek (upstream)	REDW	8/3/2015	---	19.5	
Miller Creek	East	8/3/2015	---	14.5	Not flowing into Redw Cr
Redwood Creek (upstream)	REDW	8/3/2015	12:38	19.5	
Bond Creek	West	8/3/2015	12:38	14.0	Connected
Redwood Creek (upstream)	REDW	8/3/2015	14:34	19.0	
Cloquet Creek	East	8/3/2015	14:34	14.0	Not flowing into Redw Cr
Redwood Creek 14.50 km	REDW	8/4/2015	09:53	18.0	
Redwood Creek (upstream)	REDW	8/4/2015	10:10	18.0	
UN WS 13.806	West	8/4/2015	10:10	14.0	Connected
Redwood Creek (upstream)	REDW	8/4/2015	10:30	18.0	
Oscar Larson Creek	East	8/4/2015	10:30	14.5	Dry at mouth
Redwood Creek (upstream)	REDW	8/4/2015	10:39	18.5	
Chris Creek	East	8/4/2015	10:39	14.5	Connected

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)	Confluence Connection
Gans South Creek	East	8/4/2015	10:59	----	Creek dry > 25m upstream
Redwood Creek (upstream)	REDW	8/4/2015	11:23	18.5	
UN WS 11.85	West	8/4/2015	11:23	13.5	Connected
Redwood Creek (upstream)	REDW	8/4/2015	11:29	18.0	
Elam Creek	West	8/4/2015	11:29	13.0	Connected
Redwood Creek 11.20 SSHD	REDW	8/4/2015	11:50	17.5	
Redwood Creek (upstream)	REDW	8/4/2015	13:07	18.0	
McArthur Creek	West	8/4/2015	13:07	13.5	Connected



Lower Redwood Creek within RNP, Old Growth Redwoods, and Snorkelers (RNP 2015).