

Redwood

National Park

National Park Service
US Department of the Interior

2006 REDWOOD CREEK SUMMER STEELHEAD SURVEY



Fish and Wildlife Branch
September 2015

Cover Photos: (Taken during 2006 Summer Steelhead Survey)
Top Left: Snorkeling on Redwood Creek
Top Right: Redwood Creek Coastal Cutthroat Trout
Middle Left: Summer Steelhead Carcass
Middle Right: National Park Service Snorkelers
Bottom: School of Suckers on Redwood Creek

2006 RNSP REDWOOD CREEK SUMMER STEELHEAD SURVEY

DATES: July 25, 26, 27, 31 (Tuesday – Thursday and Monday) and August 1, 2 (Tuesday - Wednesday), 2006

LOCATION: Redwood Creek, Humboldt County, California
Mainstem reach from Lacks Creek (Stover Ranch) - 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: 32 cfs End of Survey: 21 cfs

DIVERS: David Anderson¹, Baker Holden¹, Terry Hines¹, Kyle Max¹, Kelley Breen², Jeannie Mayer¹, Cara McGary, Dan Biteman (¹Person with prior summer steelhead diving experience on Redwood Creek or ² other rivers). Recorders: Heather Brown and Dan Biteman

METHOD: Visual observation by diving 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; Panther Creek via Green Diamond Resource Company K&K road at Korbel; Coyote Creek via Green Diamond Resource Company K&K road and hike down Redwood Creek to Coyote Creek; hike/snorkel and camp on river three days/two nights to reach summer bridge downstream of Tom McDonald Creek at Tall Trees Grove, summer bridge in or out via trail to 44 horse camp. Drive out C-12/A9-9/West Side Access; Cloquet Creek in or 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:	<i>Date</i>	<i>Survey Reaches</i>	<i>Distance</i>	<i>SSHD No.</i>
	8/02	Lacks Creek to Panther Creek <i>Anderson, Hines, McGary, Recorder - Biteman</i>	6.02 km	3+1 dead
	8/02	Panther Creek to Coyote Creek <i>Holden, Breen, Mayer, Recorder - Brown</i>	3.76 km	2
	7/25	Coyote Creek to Copper Creek <i>Anderson, Hines, Max, and Breen</i>	4 .62 km	5
	7/26	Copper Cr to upstrm of Dolason Cr <i>Anderson, Hines, Max, and Breen</i>	6.86 km	9
	7/27	Upstrm of Dolason Cr to Tall Trees Summer Bridge <i>Anderson, Hines, Max, and Breen</i>	5.95 km	0
	7/31	Tall Trees Summer Bridge to Cloquet Creek <i>Anderson, Holden, Breen, Mayer, Breen McGary Recorder - Biteman</i>	4.73 km	0
	8/01	Cloquet Creek to downstrm of Hayes Creek <i>Anderson, Holden, Hines, Mayer, Biteman, Recorder -Brown</i>	6.92 km	1

TOTAL NUMBER OF ADULT SUMMER STEELHEAD TROUT OBSERVED IN 2006: 20 & 1 Dead
(Number of Adult Summer Trout Observed with the Index Section - Lacks to Tom McDonald Cr-16.1 miles: 19 & 1 Dead)

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, 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 January 2006.

Summer 2006 was the 26th 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 kilometers downstream through Green Diamond Resource Company timber lands into Redwood National and State Parks at a location downstream of Hayes Creek. Originally, the survey was from Lacks Creek to Tom McDonald Creek, but it was expanded downstream of Tom McDonald Creek to a point downstream of Hayes Creek in 1992.

In 2006, twenty live and one dead adult summer steelhead (steelhead ≥ 16 inches), seven 'half-pounder' steelhead (smaller immature sea-run steelhead returning after less than one year in the ocean), and 115 coastal cutthroat trout (*O. clarki*) (cutthroat ≥ 10 inches) were observed in the mainstem survey reach (Table 1).

The summer steelhead were all observed in 14 pools (Table 2). Six of the pools, accounting for nine fish, were associated with tributaries, four at westside tributaries (Joplin and Devils Creeks, and two unnamed tributaries) and two at eastside tributaries (Garrett and Copper Creeks). Past data from Redwood Creek show the majority of summer steelhead are observed in pools, and pools associated with the inflow of cooler water from tributaries (Anderson 1993). Of the 20 live fish observations, nine were solitary fish, one each of four and three fish congregations, and two observations of two fish each. Estimated fish lengths ranged from 16 to 28 inches.

Most all fish were found in the upper half of the survey (Figure 1). Downstream of G Creek, only one summer steelhead was seen, at lower Redwood Creek downstream of Elam Creek.

Summer steelhead numbers over time are presented in Figure 2 and Appendix I.

Table 1. Numbers of adult summer steelhead ($\geq 16''$), 'half-pounder' steelhead, and coastal cutthroat trout, and aquatic and other wildlife observed during the 2006 summer steelhead survey of mainstem Redwood Creek, Humboldt County, California. Survey conducted on six days, July 25 to August 2, 2006 from Lacks Creek to downstream of Hayes Creek, 38.9 km 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 and Other Wildlife Observed
O R I G I N A L I N D E X R E A C H Lacks to Panther Creek 8/2/2006	3 + 1 dead	2	13	Threespine stickleback, Resident Steelhead, Dead Suckers and sculpin, Dead 1+ steelhead, Pacific Giant Salamanders (16 dead & 1 live), Belted Kingfisher, Great Blue Heron, American Dipper, Mallard hen, Spotted Sandpiper, Common Merganser, Turkey Vulture, Stellar Jays, Tracks: Raccoon, Otter, Bear, Deer and fawn.
Panther to Coyote Creek 8/2/2006	2	1	11	Pacific Giant Salamanders (13 dead), Dead Threespine stickleback, sculpin, and juvenile steelhead. Sucker, Yellow-legged frogs, American Dipper, Spotted Sandpiper, Stellar Jays, Brown Creeper, Chestnut-backed Chickadee, Common Raven, Golden-crowned kinglet, Pacific-slope flycatcher, Huttons Vireo, Bear and 2 cubs, Deer tracks
Coyote to Copper Creek 7/25/2006	5	1	6	Resident Steelhead, Pacific Giant Salamanders (2 dead), 1+ Steelhead (7 dead), Dead Sculpin, <i>Juga</i> snail, Limnephilid case caddisfly nymphs, Belted Kingfisher, Spotted Sandpiper, American Dipper, Redtailed Hawk, Tracks: Deer, Elk, Bear, Mountain Lion, Raccoon.
Copper to Pig Pen Prairie (Slide Cr) 7/26/2006	8	0	3	Pacific Giant Salamander (1 dead), Marbled Murrelets (2 at 6:05 am), Vaux Swift, Belted Kingfisher, Mergansers (6), California Quail, Mallard chicks, Beaver.
Pig Pen Prairie (Slide Cr) to Bridge Creek 7/26 & 27/2006	1	1	10	Suckers, Sculpin, Beaver lodge, Varied Thrush, Marbled Murrelets, Western Toads (juveniles), Green Heron, Vauxs Swift, Stellars Jay, Four campers.
Bridge to Tom McDonald Creek 7/27/2006	0	2	13	Threespine Stickleback, Suckers
Tom McDonald to Bond Creek 7/27 & 31/2006	0	0	21	Dead Sculpin, Suckers, Yellow-legged Frog, Mallards, Two Hikers, Tracks: Elk, Deer.

Redwood Creek Mainstem Stream Reach		No. of Summer Steelhead Adults (≥16")	No. of Steelhead Half Pounders	No. of Cutthroat Trout (≥ 10")	Aquatic and Other Wildlife Observed
Bond Creek to downstream of Hayes Creek 7/31 & 8/1/2006		1	0	37	Steelhead juvenile (dead), Threespined Stickleback (adults and juveniles), Sculpin (2 dead), Suckers, Western Toad and Yellow-legged Frog tadpoles, Yellow-legged Frog adults, Tree Frog, Stellar's Jay, Pacific Slope Flycatcher, Chestnut-backed Chickadee, American Dipper, Spotted Sandpiper, Vaux's Swift, Belted Kingfisher, Common Raven, Osprey, California Sister (butterfly) Tracks: Elk, Deer. Four people (campers/hikers).
Total		20 +1 dead	7	115	



Mainstem Redwood Creek Pool (RNP 2006)

Table 2. Date, location (river kilometer and UTM coordinates), number and estimated fork length (inches) and habitat description of adult summer steelhead trout observed in the 2006 snorkel survey of mainstem Redwood Creek. (Letters in parentheses in the river km refer to locations on map of Figure 1).

Date	River KM	No. of SSHD	Est. Length (inches)	Habitat Description
8/2/2006	~45.25 (a)	1 Dead	18"	Partially decomposed dead summer steelhead in pool. (UTM 426100E 4546670N)
8/2/2006	43.40 (b)	3	28" 2 @ 18"	Large persistent pool at confluence of Garrett Creek. Pool dimensions: 75 m Long x 25 m Wide x 4 m Deep. Larger fish among submerged branches at bank's edge. Redwood Creek water temperature 18.0°C at 12 noon. Garrett Creek 15°C (UTM 426090E 4548110N)
8/2/2006	38.95 (c)	2	24" 18"	Fish in pool at confluence of Joplin Creek. Pool dimensions: 30 m L x 10 m W x 14 ft D. Fish in open water and then spooked to under bedrock ledge at bottom of pool. Second smaller fish under rock at 11 ft depth. In pool with one halfpounder steelhead and 13" cutthroat. Redwood Creek water temperature 16.5°C at 11:45 am. Joplin Creek 13.0°C (UTM 422850E 4550250N)
7/25/2006	36.30 (d)	2	16" 24"	Pool dimensions: 200 m L x 40 ft W x 4 ft D. Fish found under rock at 4 ft depth. Redwood Creek water temperature 25°C at 1:20 pm. (UTM 422840E 4552460N)
7/25/2006	34.90 (e)	1	24"	Fish in pool at confluence of Devils Creek. Pool dimensions: 75 m L x 40 ft W x 8 ft D. Fish was under rock then spooked. Redwood Creek water temperature 25°C at 3:11pm. Devils Creek temperature 16.5°C. (UTM 421830E 4553185N)
7/25/2006	34.45 (f)	1	22"	Fish in pool spooked to hold between two large rocks through which the stream is flowing. Pool dimensions: 100 m L x 20 ft W x 6 ft D. Redwood Creek water temperature 24.5°C at 3:59 pm. (UTM 421890E 4553675N)
7/25/2006	33.15 (g)	1	18"	Fish spooked in 2.5 feet of water. Pool dimensions: 350m L x 60 ft W x 2-2.5 ft D. Redwood Creek water temperature 25.0°C at 5:05pm. (UTM 421750E 4554840N)
7/26/2006	31.90 (h)	1	16-17"	In second pool below Copper Creek confluence. Pool dimension: 150m L x 60 ft W x 4 ft D. Redwood Creek water temperature 20.5°C at 9:00 am. (UTM 421675E 4555960N)
7/26/2006	31.60 (i)	1	17"	In pool with a beaver and 15" cutthroat. Pool dimensions: 75m L x 40 ft W x 8 ft D. 9:36am observation. (UTM 421465E 4556150N)
7/26/2006	31.10 (j)	4	22" 24" 26" 28"	In persistent deep pool known as Queen's Hole. Fish spooked to under log and along boulder. Pool dimensions: 100m L x 60 ft W x 12 ft D. Redwood Creek water temperature 21.0°C at 10:21 am. (UTM 421240E 4556475N)

Date	River KM	No. of SSHD	Est. Length (inches)	Habitat Description
7/26/2006	30.75 (k)	1	16"	Fish in about 3 ft of water under rock. Pool dimensions: 350 m L x 10 ft D. Redwood Creek water temperature 21.5°C at 10:50 am. (UTM 421275E 4556800N)
7/26/2006	29.85 (l)	1	25"	Fish in pool under boulder at bottom substrate in 8' of water. (Pool known as George's 9 Hole as nine summer steelhead occurred here before.) Pool dimensions: 50m L x 80 ft W x 10 ft D. Pool downstream of UNWS29.85 tributary. Tributary 16.5°C at 11:23 am. Redwood Creek water temperature 22.0°C at 11:23am. (UTM 420825E 4557490N)
7/26/2006	26.68 (m)	1	16"	Fish under LWD digger log. Pool dimensions: 125m L x 30 ft W x 4 ft D. UNWS26.60 confluence in same pool. Tributary water temperature 17.0°C and Redwood Creek at 24.0°C at 5:50 pm. (UTM 419170E 4559840N)
8/1/2006	11.10 (n)	1	28"	Fish under LWD at 3.5 ft of water. Pool dimensions: 150 m L x 30m W x 8 ft D. Redwood Creek water temperature 19.0°C at 1:22 pm. (UTM 414251E/4568615N)
Summer Steelhead Total		20 Live and 1 Dead		

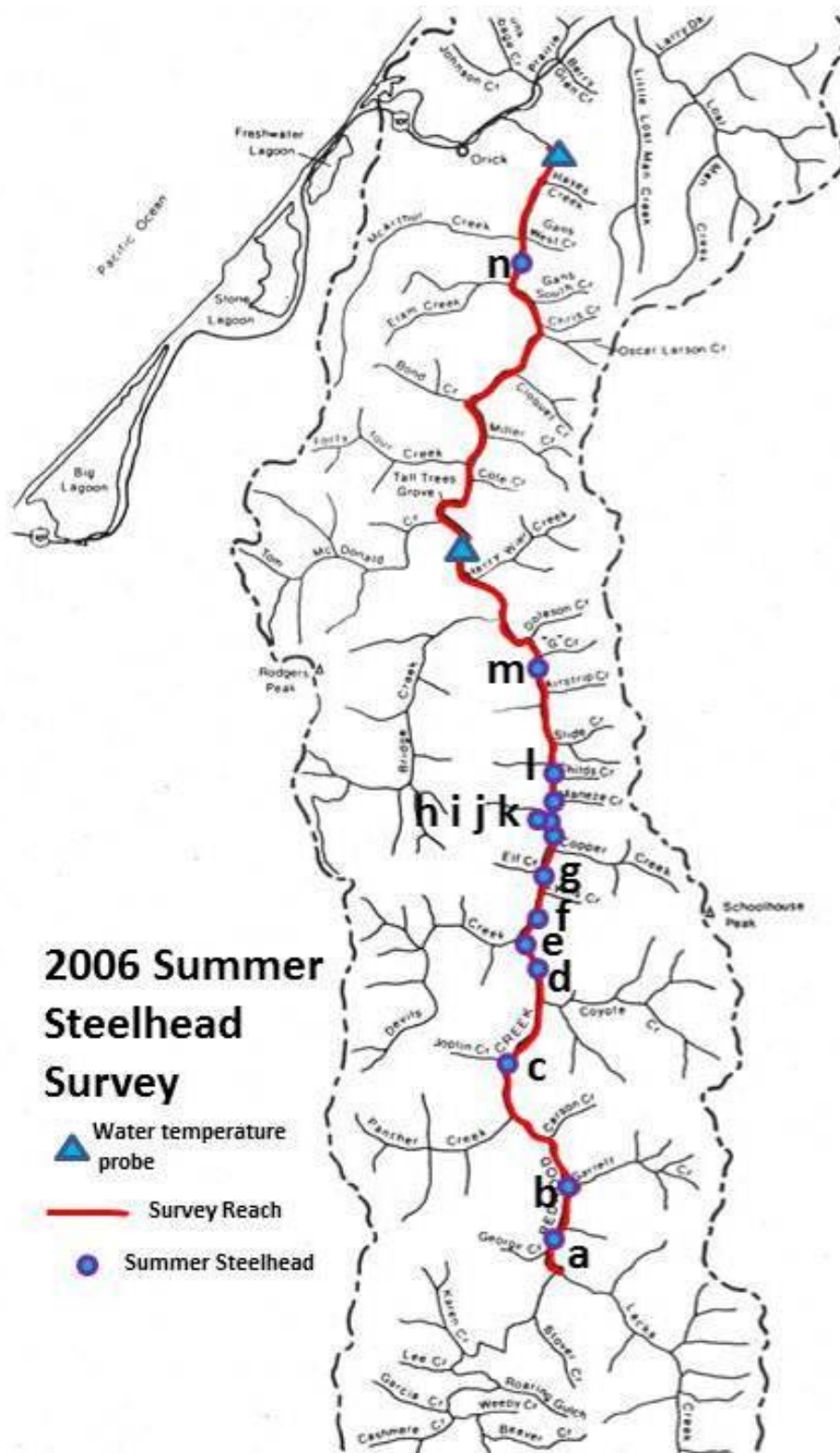


Figure 1. Location of adult summer steelhead observed during the 2006 snorkel survey of Redwood Creek, Humboldt County, California. Survey was between Lacks Creek to downstream of Hayes Creek from July 25 to 31 and August 1 and 2, 2006.

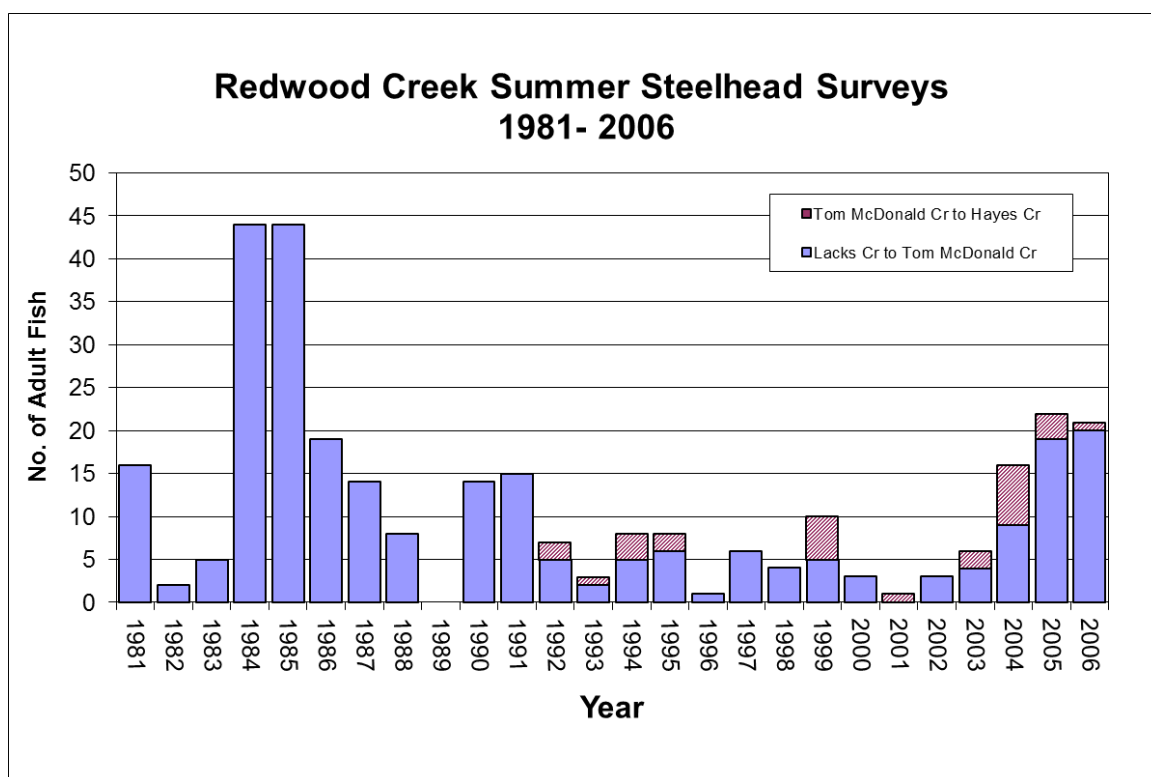


Figure 2. Numbers of summer steelhead observed each summer since 1981 on the 25.9 km index reach of Redwood Creek (Lacks Creek to Tom McDonald Creek), Humboldt County, California and expanded 13.0 km downstream reach (Tom McDonald Creek to downstream of Hayes Creek.) The survey was expanded in 1992.

WATER DISCHARGE

Water flow measured at the Orick gaging station located downstream of the confluence of Prairie Creek at Redwood Creek between July 25 and August 2 ranged between 32 and 21 cfs. These flows were similar to what is normally experienced during the annual sampling period (last week of July/first week of August). Previous years, 2004 - 2000 for example, Redwood Creek flow ranged from 77 to 12 cfs, with last year, 2005, flow was between 118 and 83 cfs. It did not rain during the survey.

WATER TEMPERATURE

Water temperature ($^{\circ}\text{C}$) was 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 confluence. Temperature loggers also recorded Redwood Creek mainstem water temperature at two sites.

Mainstem Redwood Creek - Redwood Creek water temperatures measured during the 2006 survey ranged from 16.5°C (as late as 11:38am) to 25.5°C (1:59 pm) (Appendix II).

Onset™ recording temperature loggers were placed mid-depth in the current of mainstem Redwood Creek within the park (and the snorkel survey reach) at two locations. They recorded temperature at one-hour intervals from June to October 2006.

A temperature logger (Temp Pro S/N 779114) was located upstream of Tom McDonald Creek/Tall Trees Grove at 22.05 river kilometer (UTM 416018E 4561458N NAD27) between June 1 and October 3. Maximum and minimum water temperatures were 25.5°C and 13.8°C, respectively (Figure 3). The average water temperature was 18.4°C (Std. dev. 2.3°C). For the period July 1 through August 31, the warmer period of the summer, the average water temperature was 19.8°C, the maximum 25.5°C, and the minimum 16.2°C. During the July 1 - August 31 period, the water temperature was at or greater than 18°C 85.3 percent of the time. The average water temperature for June was 17.6°C; for July, 20.3°C; for August, 19.3°C; and for September, 16.8°C.

The second temperature logger (TempPro S/N 761043) was located in lower Redwood Creek upstream of the Redwood Creek trailhead at 7.65 river kilometer (UTM 413706E 4572011N NAD27) between June 1 and October 2. Maximum and minimum water temperatures recorded were 23.4°C and 13.7°C, respectively (Figure 4). The average water temperature was 17.3°C (Std. dev. 1.9°C). For the period July 1 through August 31, the warmer period of the summer, the average water temperature was 18.0°C, the maximum 23.4°C, and the minimum 15.1°C. During the July 1 - August 31 period, the water temperature was at or greater than 18°C 36.6 percent of the time. The average water temperature for June was 16.7°C; for July, 18.1°C; for August, 17.8°C; and for September, 16.9°C.

Redwood Creek Tributaries - Water temperatures of 51 east and westside tributaries entering Redwood Creek measured during the survey ranged from 11°C to 20°C (Appendix II). Water temperatures of all tributaries were cooler than the corresponding temperature of mainstem Redwood Creek measured at the same time.

Mean temperature of the westside tributaries was slightly cooler than eastside tributaries; a pattern repeated in all past summer steelhead surveys. The mean water temperature of westside tributaries was 14.3°C (n = 32, std. dev. = 2.3°C) and temperatures ranged from 11°C (one unnamed tributary at 39.99km) to 18°C (two unnamed tributaries at 27.76 and 28.24 km). The mean water temperature of eastside tributaries was 14.8°C (n = 19, std. dev. = 2.9°C) and temperatures ranged from 12.0°C (five lower basin tributaries - Chris, Cole, Miller and Oscar Larson Creeks and an unnamed tributary at 10.37 km) to 20.0°C (Copper Creek).

The 2006 year summer water temperatures are similar to temperatures and patterns have been 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.

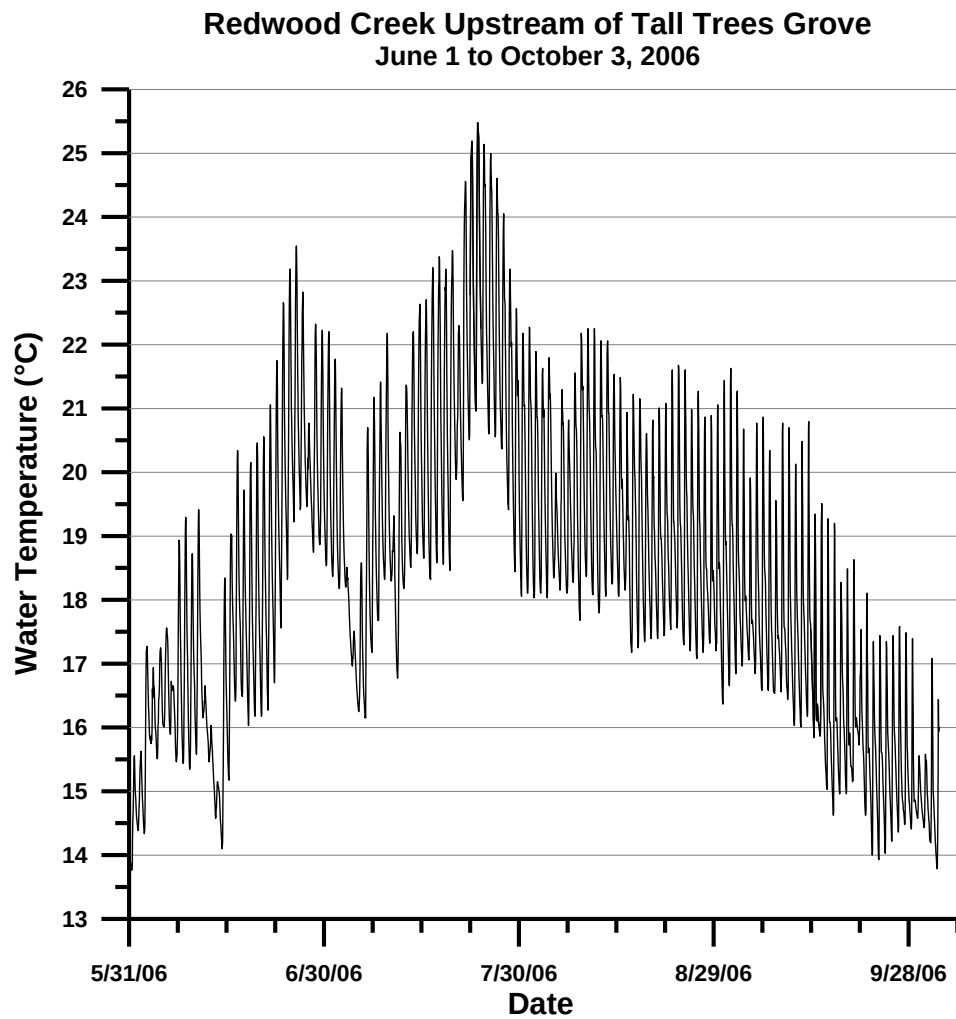


Figure 3. Mainstem Redwood Creek water temperatures (°C) from Onset Temp Pro temperature logger located at 22.05 river km, upstream of Tom McDonald Creek/Tall Trees Grove. The logger recorded water temperature every 1-hour in the current below the surface of the water from June 1 through October 3, 2006.

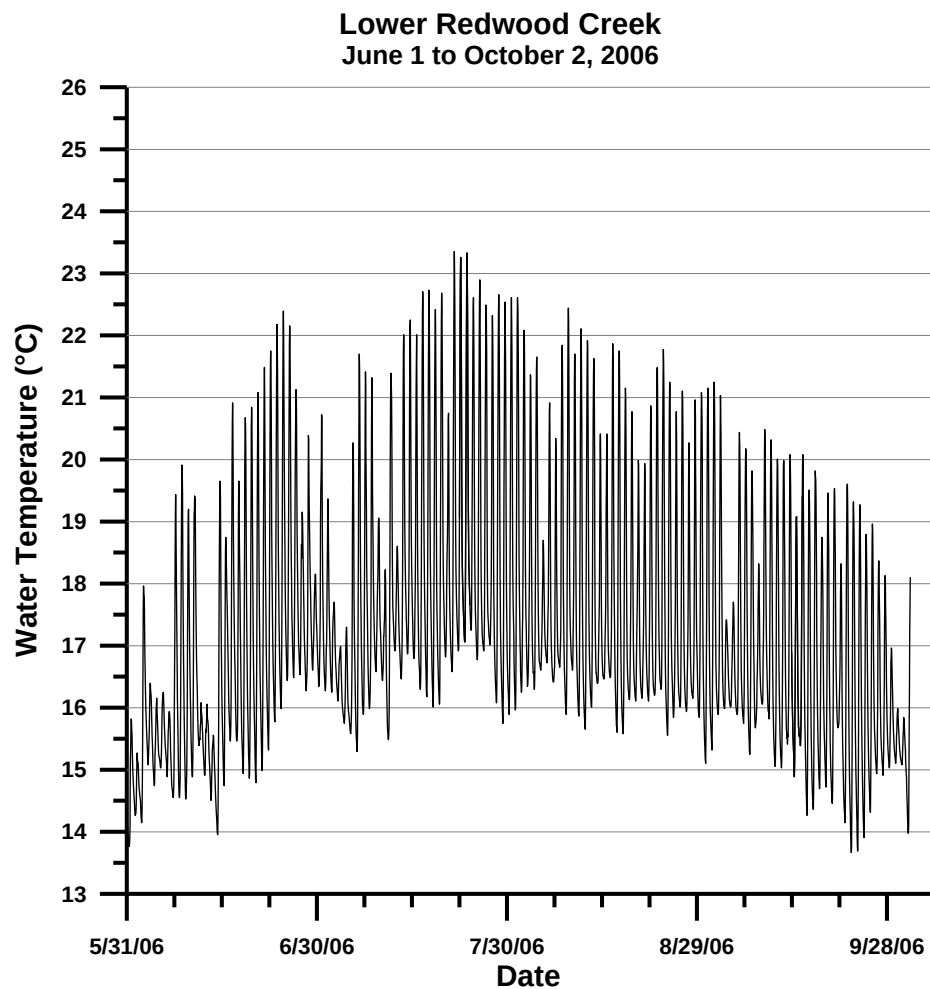


Figure 4. Mainstem Redwood Creek water temperatures (°C) from Onset TempPro temperature logger located at 7.65 river km, upstream of the lower Redwood Creek trailhead parking lot. The logger recorded water temperature every 1-hour in the current below the surface of the water from June 1 through October 2, 2006.

REFERENCES

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- 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 2006 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	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	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

2006	19 (+ 1 dead)	20 (+ 1 dead)	Lacks Cr to Downstream of Hayes Cr (38.9)	7/25-27 & 31, 8/1- 2/2006
^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				

Appendix II. Water temperatures (°C) measured during the 2006 Redwood Creek summer steelhead trout survey from July 25 to August 2. 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 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. SSHD = Temperatures at summer steelhead locations.

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)
Redwood Creek (upstream)	REDW	8/2/2006	8:29 AM	16.5
Lacks Creek	East	8/2/2006	8:29 AM	14.0
Redwood Creek (upstream)	REDW	8/2/2006	9:16 AM	17.0
George Creek	West	8/2/2006	9:16 AM	12.0
Redwood Creek (upstream)	REDW	8/2/2006	10:54 AM	17.0
UN ES 44.38	East	8/2/2006	10:54 AM	13.0
Redwood Creek (upstream)	REDW	8/2/2006	12:00 PM	18.0
Garrett Creek	East	8/2/2006	12:00 PM	15.0
Redwood Creek (upstream)	REDW	8/2/2006	3:04 PM	19.5
Carson Creek	East	8/2/2006	3:04 PM	13.0
Redwood Creek (upstream)	REDW	8/2/2006	4:00 PM	21.0
UN WS 41.372	West	8/2/2006	4:00 PM	14.0
Redwood Creek (upstream)	REDW	8/2/2006	4:08 PM	20.0
UN WS 41.X	West	8/2/2006	4:08 PM	14.0
Redwood Creek (upstream)	REDW	8/2/2006	4:37 PM	22.0
Panther Creek	West	8/2/2006	4:37 PM	14.0
Redwood Creek (upstream)	REDW	8/2/2006	10:05 AM	17.5
Panther Creek	West	8/2/2006	10:05 AM	12.0
Redwood Creek (upstream)	REDW	8/2/2006	10:52 AM	18.0
UN WS 39.90	West	8/2/2006	10:52 AM	11.0
Redwood Creek (upstream)	REDW	8/2/2006	11:10 AM	17.0
UN WS 39.52	West	8/2/2006	11:10 AM	12.5
Redwood Creek (upstream)	REDW	8/2/2006	11:27 AM	17.0
UN WS 39.16	West	8/2/2006	11:27 AM	12.5
Redwood Creek (upstream)	REDW	8/2/2006	11:38 AM	16.5
Joplin Creek	West	8/2/2006	11:38 AM	13.0
Redwood Creek 38.95 km (SSHD)	REDW	8/2/2006	11:45 AM	16.5
Redwood Creek (upstream)	REDW	8/2/2006	2:25 PM	19.0
UN WS 36.97	West	8/2/2006	2:25 PM	14.0
Redwood Creek (upstream)	REDW	8/2/2006	2:41 PM	19.0
Coyote Creek	East	8/2/2006	2:41 PM	15.0
Redwood Creek (upstream)	REDW	7/25/2006	12:00 PM	23.5

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)
Coyote Creek	East	7/25/2006	12:00 PM	19.0
Redwood Creek 36.30 km (SSHD)	REDW	7/25/2006	1:20 PM	25.0
Redwood Creek (upstream)	REDW	7/25/2006	1:59 PM	25.5
UN ES 35.714	East	7/25/2006	1:59 PM	17.0
Redwood Creek (upstream)	REDW	7/25/2006	3:11 PM	25.0
Devils Creek	West	7/25/2006	3:11 PM	16.5
Redwood Creek 34.45 km (SSHD)	REDW	7/25/2006	3:59PM	24.5
Redwood Creek 33.15 km (SSHD)	REDW	7/25/2006	5:05 PM	25.0
Redwood Creek (upstream)	REDW	7/25/2006	5:41 PM	25.0
Elf Creek	West	7/25/2006	5:45 PM	16.5
Redwood Creek (upstream)	REDW	7/25/2006	5:55 PM	25.0
UN WS 32.527	West	7/25/2006	5:55 PM	17.5
Redwood Creek (upstream)	REDW	7/25/2006	6:16 PM	25.0
Copper Creek	East	7/25/2006	6:16 PM	20.0 (subgravel)
Redwood Creek 32.11 km	REDW	7/26/2006	8:40 AM	20.5
Redwood Creek 31.90 km (SSHD)	REDW	7/26/2006	9:00 AM	20.5
Redwood Creek 31.10 km (SSHD)	REDW	7/26/2006	10:21 AM	21.0
Redwood Creek 30.75 km (SSHD)	REDW	7/26/2006	10:50 AM	21.5
Redwood Creek (upstream)	REDW	7/26/2006	11:23 AM	22.0
UN WS 29.85	West	7/26/2006	11:23 AM	16.5
Redwood Creek (upstream)	REDW	7/26/2006	12:13 PM	22.0
UN WS 29.63	West	7/26/2006	12:13 PM	17.0
Redwood Creek (upstream)	REDW	7/26/2006	2:23 PM	24.0
Slide Creek	East	7/26/2006	2:23 PM	18.0
Redwood Creek (upstream)	REDW	7/26/2006	2:44 PM	24.0
UNWS 28.75	West	7/26/2006	2:44 PM	17.0
UN WS 28.243	West	7/26/2006	3:10 PM	18.0
Redwood Creek (upstream)	REDW	7/26/2006	3:43 PM	24.0
UN WS 27.80	West	7/26/2006	3:43 PM	18.0
UN WS 26.912	West	7/26/2006	5:34 PM	17.0
Redwood Creek (upstream)	REDW	7/26/2006	5:50 PM	24.0
UN WS 26.68	West	7/26/2006	5:50 PM	17.0
Redwood Creek (upstream)	REDW	7/26/2006	6:15 PM	24.5
UN ES 26.374	East	7/26/2006	6:15 PM	19.5
Dolason Creek	East	7/26/2006	6:40 PM	18.5 (subgravel)
Redwood Creek (upstream)	REDW	7/27/2006	8:22 AM	21.0
UN WS 25.25	West	7/27/2006	8:22 AM	15.5
Redwood Creek (upstream)	REDW	7/27/2006	9:25 AM	21.0
Bridge Creek	West	7/27/2006	9:25 AM	15.0

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)
Redwood Creek (upstream)	REDW	7/27/2006	10:32 AM	21.0
Emerald Creek	East	7/27/2006	10:32 AM	15.5 (subgravel)
Redwood Creek (upstream)	REDW	7/27/2006	10:52 AM	21.0
UN WS 22.861	West	7/27/2006	10:52 AM	15.0
Redwood Creek (upstream)	REDW	7/27/2006	12:40 PM	22.0
Tom McDonald Creek	West	7/27/2006	12:40 PM	16.5
Redwood Creek (summer bridge) 19.3 km	REDW	7/27/2006	1:35 PM	23.0
Redwood Creek (summer bridge) 19.3 km	REDW	7/31/2006	9:56 PM	18.0
Redwood Creek (upstream)	REDW	7/31/2006	10:40 AM	17.5
Cole Creek	East	7/31/2006	10:40 AM	12.0
Redwood Creek 18.23 km	REDW	7/31/2006		17.5
Redwood Creek (upstream)	REDW	7/31/2006	11:10 AM	18.5
Fortyfour Creek	West	7/31/2006	11:10 AM	12.0
Redwood Creek (upstream)	REDW	7/31/2006	11:30 AM	18.0
UN ES 17.65	East	7/31/2006	11:30 AM	12.5
Redwood Creek (upstream)	REDW	7/31/2006	11:42 AM	18.0
Miller Creek	East	7/31/2006	11:42 AM	12.0 (subgravel)
Redwood Creek (upstream)	REDW	7/31/2006	1:26 PM	20.0
Bond Creek	West	7/31/2006	1:26 PM	12.0
Redwood Creek (upstream)	REDW	7/31/2006	1:46 PM	18.0
UN WS 15.31	West	7/31/2006	1:46 PM	12.0
Redwood Creek (upstream)	REDW	7/31/2006	2:16 PM	21.0
UN WS 14.70	West	7/31/2006	2:16 PM	12.0
Redwood Creek (upstream)	REDW	7/31/2006	2:28 PM	21.0
Cloquet Creek	East	7/31/2006	2:28 PM	13.0
Redwood Creek 14.57 km	REDW	8/1/2006	10:05 AM	18.0
Redwood Creek (upstream)	REDW	8/1/2006	10:37 AM	18.0
UN WS 13.806	West	8/1/2006	10:37 AM	12.0
Redwood Creek (upstream)	REDW	8/1/2006	11:03 AM	17.5
Oscar Larson Creek	East	8/1/2006	11:03 AM	12.0
Redwood Creek (upstream)	REDW	8/1/2006	11:17 AM	18.5
Chris Creek	East	8/1/2006	11:17 AM	12.0
Redwood Creek (upstream)	REDW	8/1/2006	11:23 AM	18.5
UN WS 12.90	West	8/1/2006	11:23 AM	12.0
Redwood Creek (upstream)	REDW	8/1/2006	11:47 AM	19.0
Gans South Creek	East	8/1/2006	11:47 AM	12.5 (subgravel)
Redwood Creek (upstream)	REDW	8/1/2006	12:57 PM	21.0
UN WS 11.717	West	8/1/2006	12:57 PM	12.0

Mainstem and Tributaries	Alignment	Date	Time	Water Temperature (°C)
Redwood Creek (upstream)	REDW	8/1/2006	1:02 PM	20.0
Elam Creek	West	8/1/2006	1:02 PM	12.0
Redwood Creek 11.10 km	REDW	8/1/2006	1:22 PM	19.0
Redwood Creek (upstream)	REDW	8/1/2006	2:09 PM	20.5
UN ES 10.37	East	8/1/2006	2:09 PM	12.0
Redwood Creek (upstream)	REDW	8/1/2006	2:14 PM	20.5
McArthur Creek	West	8/1/2006	2:14 PM	12.5
Redwood Creek 7.65 km	REDW	8/1/2006	3:38 PM	22.0 (hobotemp)