

Strawberry Creek Fish and Water Quality Sampling Humboldt County, California August 2006 to February 2009

Strawberry Creek restoration is planned for the private lands and Redwood National Park portions of the stream. To help the planning efforts and to determine what fish species are present, Strawberry Creek was sampled by Redwood National and State Parks (RNSP) staff using minnow traps on three dates, May 7 and October 7 of 2008, and February 19, 2009. The south fork of Strawberry Creek was electrofished on October 10, 2008. Water quality was measured on the fish sampling dates and on August 29 and September 27 of 2006, and September 5, 2007.

Location

Strawberry Creek, tributary to Redwood Creek, enters the South Slough of the Redwood Creek estuary, just south of Orick (Figure 1). The trapping sites are low gradient, slow moving water. The water is tannic in color, and except for the waster transfer station lack an over hanging riparian canopy. The exotic reed canary grass (*Phalaris arundinacea*) is the prevalent streamside vegetation at the other sites. Site pictures are presented in Appendix 1.

Listed from the mouth going upstream, the minnow trapping sites are:

1. Mouth of Strawberry Creek with its confluence with the South Slough
2. Humboldt County Waste Transfer Station (upstream side of box culvert/bridge)
3. Highway 101 Bridge (~30 ft upstream of bridge)
4. Hiltons Road culvert (downstream end of culvert)
5. Wooden bridge at the Barlow pasture

An additional site was trapped in the Redwood Creek estuary at the end of the south levee on May 7, 2008.

Methods

Minnow traps (16.5 inches long, 7.4 inches in diameter at the end, with a 1 to 1.5 inch opening in the cone) (Figure 2), one at each location, were baited with cured hot-pink salmonid roe, and placed in the water. The traps rested on the bottom substrate. Traps fished between three to four hours. The traps were retrieved with a fishing line attached to the trap and their contents emptied into a bucket. Fish were identified, counted, and salmonid fork length measured to the nearest millimeter.



Figure 2. Minnow Trap



Figure 1. Strawberry Creek (south of Orick, Humboldt County, California) fish sampling locations (red dots).

Water quality parameters, water temperature (°C), specific conductance (at 25°C), and salinity (‰ [ppt]) were measured with a handheld YSI Model 30 (Salinity/Conductivity/Temperature) meter, and dissolved oxygen (mg/l) was measured with a handheld YSI Model 55 (Dissolved Oxygen/Temperature) meter. Measurements were generally measured at the surface and bottom of the water column.

Results

Fish

Four fish species were captured: coho salmon (*Oncorhynchus kisutch*), steelhead (*O. mykiss*), threespine stickleback (*Gasterosteus aculeatus*), and prickly sculpin (*Cottus asper*). Both coho and steelhead are federally listed as threatened.

Distribution - Juvenile coho and steelhead were captured as far upstream as the Hiltons Road culvert. A total of five coho were captured from the waste transfer station, Highway 101 Bridge, and the Hiltons Road culvert. Fork length ranged from 80 to 122 mm. Based on the coho fork lengths and season when they were captured, they appear to be 1+ fish (except for the 80mm captured in October 2008).

A total of five steelhead were captured at the waste transfer station and Hiltons Road culvert all in February 2009. Fork length ranged between 85 and 182 mm and would be 1+ or older.

Threespine stickleback were captured at all five sites, from the mouth to the wooden bridge at the Barlow pasture, the upper most site. They are the most numerous fish caught in the minnow traps. Prickly sculpin were only captured at the mouth of the creek with the South Slough. Fish data are presented in Appendix 2 and fish pictures in Appendix 3.

E-Fishing of South Fork - On October 7, 2008, a 50 m reach of the south fork of Strawberry Creek upstream of the old SOC road was electrofished. Only two adult red legged frogs were captured, no fish. The specific conductance (at 25°C) was 158 µS and the water temperature was 12.9 °C. Efishing at this site on March 15, 1994 captured pacific giant salamander larvae. We tried efishing Strawberry Creek at the County Transfer Station but the creek was too deep and wide to be effective.

Past sampling - On August 30, 1989, fish identified as either steelhead or cutthroat were efished from the tributary behind the old SOC buildings. They were too small to differentiate. Historically, Strawberry Creek was known as a cutthroat stream.

Water Quality

Before Reed Canary Grass Removal – Prior to the removal of the floating mats of reed canary grass covering the Strawberry Creek channel, dissolved oxygen (mg/l) measured in August and September 2006 at the Hilton Road culvert and Wooden Bridge at Barlow pasture were virtually at zero (See attached December 14, 2006 memo in Appendix 2). Water temperature averaged 11.8°C.

After Reed Canary Grass Removal – After the removal of the floating grass mats from the channel, dissolved oxygen measured on September 5, 2007 increased. It ranged from 3.9 to 5.7 mg/l, at the Hiltons Road culvert and Wooden Bridge at Barlow pasture. Where the channel was still covered with grass at the Highway 101 Bridge, dissolved oxygen was 0.6 mg/l. Water temperature in the open areas ranged between 20.4 and 23.3°C (See attached September 5, 2007 email in Appendix 2).

Subsequent water quality sampling in May 2008 measured dissolved oxygen ranging from 7.5 to 9.9 mg/l at the surface and 7.7 to 8.8 mg/l at the bottom and water temperature ranging from 13.7 to 17.8°C at the surface and 13.6 to 17.9°C at the bottom. It was warmer at the surface at each Strawberry site. Water temperature in October 2008 ranged from 14.5 to 16.5°C. In February 2009, surface dissolved oxygen at the sites ranged from 7.7 to 8.8 mg/l, and at the bottom, 7.0 to 8.6 mg/l. Water temperature differences between the surface and bottom ranged between 0 and 0.2 °C, the mean water temperature at 7.8°C.

No significant salt water intrusion has been measured at the mouth of the Strawberry Creek with the South Slough; the highest specific conductance measured at the mouth was 273µS. The highest salinity measured at any site was 0.1‰.

Water quality in the tributary behind old SOC is consistent with a well aerated, riparian canopy covered stream, dissolved oxygen from 8.9 to 9.5 mg/l and water temperature from 11.6 to 13.1°C in summer and fall.

Conclusion

In its present condition, Strawberry Creek is providing rearing habitat (non-natal rearing habitat) for coho and steelhead. There is no spawning habitat above the Highway 101 bridge and the stream has not been surveyed downstream of the bridge but the juvenile fish probably migrated upstream into Strawberry Creek from the South Slough/estuary. Recent sampling of Humboldt Bay tributaries by Mike Wallace of CDFG has shown that these types of tributaries are rearing sites for coho juveniles. Stream restoration will improve and increase the salmonid habitat of Strawberry Creek.

D.G. Anderson. 2009. Strawberry Creek Fish and Water Quality Sampling, Humboldt County, California: August 2006 to February 2009. Redwood National and State Parks, Orick, California. 14pp.

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(3/2009)

Appendix 1. Strawberry Creek Sampling Location Photos



Mouth and lower channel of Strawberry Creek at South Slough (L) and downstream side of bridge/box culvert at Humboldt County Waste Transfer Station (R) on May 7, 2008 (RNSP).



Upstream of Highway 101 Bridge on May 7, 2008 (RNSP).



Downstream end of Hiltons Road culvert (L) and downstream channel (R) on May 7, 2008 (RNSP).



Wooden bridge sampling site at Barlow pasture (L) and Strawberry Creek channel downstream of wooden bridge through pasture (R) on May 7, 2008 (RNSP).

Appendix 2. Strawberry Creek fish and water quality data (2006 to 2009).

Strawberry Creek Sampling Date: 5/07/2008							
Site No.	Site Description	UTM (NAD27)	Time In	Time Out	Soak time (minutes)	Depth (ft)	Species (Number caught)
EST	Redwood Cr Estuary End of South Levee	408922E 4571486N	1122	1513	231	~ 3.5 ft	Caddisfly larvae
1	Mouth of Strawberry Creek	409635E 4571495N	1145	1529	224	~ 2.5 ft	Threespine stickleback (85) Prickly Sculpin (2)
2	County Transfer Station Bridge	409775E 4570958N	1220	1555	215	~2 ft	Threespine stickleback (7)
3	Highway 101 Bridge	409870E 4570749N	1238	1613	223	~3ft	Coho Salmon (2) 118 mm @ 18.0g, 122 mm @19.6 g Threespine stickleback (1)
4	Hilton's Road Culvert	409936E 4570477N	1253	1648	235	~2 ft	Threespine stickleback (32)
5	Wooden Bridge at Barlow Pasture	410071E 4570241N	1311	1657	226	~1 ft	Threespine stickleback (67) Dragonfly nymph (1) Damselfly nymph (1)
Water Quality							
Site	Time		Depth (ft)	Dissolved Oxygen (mg/l)	Temperature(°C)		
EST	1513	Surface	0	10.4	15.2		
		Bottom	3.5	10.3	15.2		
1	1529	Surface	0	8.9	17.8		
		Bottom	2.2	8.3	15.0		
2	1555	Surface	0	7.5	13.7		
		Bottom	2.7	7.7	13.6		
3	1613	Surface	0	9.9	17.2		
		Bottom	3.3	8.7	14.9		
4	1648	Surface	0	9.6	18.1		
		Bottom	2.1	8.8	17.9		
5	1657	Surface	1.0	7.8	13.7		

Strawberry Creek Sampling Date: 10/07/2008						
Site No.	Site Description	UTM (NAD27)	Time In	Time Out	Soak time (minutes)	Species ((Number caught)
1	Mouth of Strawberry Creek (across from mouth)	409343E 4571475N	1026	1401	215	Threespine stickleback (2) Prickly Sculpin (1)
2	County Transfer Station Bridge	409777E 4570975N	1050	1440	230	none
3	Highway 101 Bridge	409870E 4570747N	1115	1450	215	none
4	Hilton's Road Culvert	409938E 4570476N	1122	1500	218	Threespine stickleback (14) Coho salmon (1) 80mm
5	Wooden Bridge at Barlow Pasture	410079E 4570242N	1130	1525	235	Threespine stickleback (36)
Water Quality						
Site	Time	Temperature (°C)	Specific Conductance (@ 25 °C)	Salinity (‰)		
1	1026	16.5	273 µS	0.1		
2	1050	15.2	178 µS	0.1		
3	1115	14.9	201 µS	0.1		
4	1122	15.1	169 µS	0.1		
5	1130	14.5	180 µS	0.1		

Strawberry Creek Sampling Date: 2/19/2009							
Site No.	Site Description	UTM (NAD83)	Time In	Time Out	Soak time (minutes)	Depth (ft)	Species (Numbers caught)
1	Mouth of Strawberry Creek	409272E 4571675N	1012	1329	197		Threespine Stickleback (1)
2	County Transfer Station	409683E 4571150N	1044	1354	190	~3 ft	Coho salmon – 88 mm Steelhead – 135 mm
3	Highway 101 Bridge	409778E 4570945N	1056	1407	191	~2.5 ft	0 fish Snails (2)
4	Hilton's Road Culvert	409846E 4570664N	1107	1412	185	~2.5 ft	Coho salmon (2) 76 & 112 mm Steelhead (4) 85, 95, 96, & 182 mm
5	Wooden Bridge at Barlow Pasture	409981E 4570438N	1119	1428	189	~ 1 ft	Threespine Stickleback (1)
Water Quality							
Site No.	Time		Depth (ft)	Dissolved Oxygen (mg/l)	Temperature (°C)	Specific Conductance (@ 25 °C)	Salinity (‰)
1	1012	Surface	0	8.2	8.2	77 µS	0.1
		Bottom		8.6	8.1	243 µS	0.1
2	1044	Surface	0	8.0	7.8	61 µS	0.0
		Bottom	3	7.9	7.8	91 µS	0.0
3	1056	Surface	0	7.7	7.5	92µS	0.0
		Bottom	2.5	7.0	7.3	91 µS	0.0
4	1107	Surface	0	8.4	7.6	91 µS	0.0
		Bottom	2.5	8.0	7.5	93 µS	0.0
5	1119	Surface	0	8.8	8.1	89 µS	0.0
		Bottom	1	8.1	7.9	90 µS	0.0



**United States Department of the Interior
California Department of Parks and Recreation**

Redwood National and State Parks
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December 14, 2006

To: Mitch Farro – PCFWWRA
From: David Anderson – Fishery Biologist RNSP
Subject: Dissolved Oxygen measurements in Strawberry Creek, Orick, California –Summer 2006

As a condition of removing the floating mats of reed canarygrass (*Phalaris arundinacea*) from the channel of Strawberry Creek (a tributary to Redwood Creek estuary), dissolved oxygen and temperature measurements were measured at several locations along the project area. The removal area is west of the RNSP boundary at the elk fence to the Hilton Road culvert. A threshold of 2.0 mg/l or above was established in the CDFG 1600 for having a fish biologist on site during grass removal with an excavator.

I took dissolved oxygen (mg/l) and water temperature (°C) readings with a YSI Model 55 meter on August 29, 2006 and September 27, 2006 in the vegetation choked channel. Dissolved oxygen values were very low, below the CDFG 2 mg/l threshold, and indicative of poor salmonid habitat. To check the meter was reading correctly, measurements were taken above the mainstem channel locations at the Strawberry Creek tributary behind the old RNSP South Operations Center (SOC). They showed high readings consistent with a well aerated salmonid bearing stream.

Strawberry Creek Location	Date/Time	Dissolved Oxygen (mg/l)	Water Temperature (°C)
Wood Bridge in Barlow's Pasture			
Wooden Bridge in Barlow's pasture @ 1 foot depth	8/29/2006 @ 4:11 pm	0.04	12.8
Upstream edge of wooden bridge	9/27/2006 @ 1:45 pm	<0.14	10.9
Downstream edge of wood bridge	9/27/2006 @ 1:45 pm	0.09	10.8
Hilton Road Culvert			
Upstream side immediately above culvert	8/29/2006 @ 3:55 pm	1.2	13.6
2 ft upstream of culvert in vegetation	9/27/2006 @ 2:05 pm	0.25	11.4
In standing water <i>inside</i> the culvert (no vegetation) and outside the project area.	9/27/2006 @ 2:05 pm	2.83	11.4
Tributary at Old SOC			
Tributary behind upper parking lot of old SOC	8/29/2006 @ 4:25 pm	9.5	11.8
Upstream side of culvert in front of old SOC buildings	9/27/2006 @ 1:55 pm	8.9	11.6

The reed canarygrass completely covered the channel and formed a thick mat.
If you have any questions, please contact me at (707) 465-7771 or email david_g_anderson@nps.gov
/s/ David Anderson



David G Anderson
09/05/2007 04:23 PM
PDT

To: "pcfwwra" <pcfwwra@reninet.com>
cc: Baker Holden/REDW/NPS, Terry Hines/REDW/NPS, Chris
Heppe/REDW/NPS,
Subject: Re: Next Section is Ready for Your Review

Mitch,

Here are the dissolved oxygen and water temperture numbers for Strawberry Creek, Orick for afternoon today (September 5, 2007). We used the same meter as before (YSI Model 55) and took measurements at the same locations, with the 101 bridge being a new site.

The water at the Barlow pasture bridge was daylighted (open with not a lot of vegetation in the channel.) We could see the muddy substrate. Upstream and downstream of the Hilton Road culvert were covered with the reed canary grass but at the upstream side of the culvert there were small open sites where you could see water flowing. At the downstream 101 bridge site, the water was covered with canary grass.

Site	Time	DO2 (ppm)	H2O Temp °C
Trib behind old SOC flowing water	15:32	9.4	13.1
pasture bridge @Barlows downstream side	15:45	5.7	23.3
pasture bridge @Barlows upstream side	15:49	3.9	21.3
Hilton Rd Culvert downstream side	16:01	5.8	20.4
Hilton Rd Culvert upstream side	16:05	5.4	20.5
HWY 101 northwest side (downstrm side)	16:10	0.6	15.0

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Appendix 3. Fish sampled in Strawberry Creek, Humboldt County, California.



Coho salmon juvenile caught at the Highway 101 sampling site on May 7, 2008 (RNSP).



Steelhead (182 mm fork length) captured at Hiltons Road culvert on February 19, 2009 (RNSP).



Coho salmon captured at Hilton Road culvert on February 19, 2009 (RNSP).



Coho salmon captured at Humboldt Waste Transfer Station box culvert/bridge on February 19, 2009 (RNSP).



Juvenile steelhead captured at the Humboldt County Waste Transfer bridge/box culvert on February 19, 2009 (RNSP).



Threespine stickleback captured at the wooden bridge at Barlow pasture on May 7, 2008 (RNSP).