Quality Assurance Project Plan

Objectives of study: Temperature data was collected during a long term study designed to estimate the abundance of juvenile salmon and steelhead smolts emigrating from upper and middle Redwood Creek. We collect temperature data during the migration period to possibly detect any influence upon salmon and steelhead trout migration. The location of the probes for all study years was:

Latitude: : N 40.988
Longitude: W 123.851

Methods used to sample water temperatures included operating Optic StowAway Temperature Probes, which were programmed to determine stream temperatures every hour, or half hour. The probes were deployed in March or April, and operated through late July or August, depending upon study year.

The probes were set in the stream behind the smolt trap in water depths that ranged from 3 – 12 ft, depending upon stream discharge and the natural decrease in stream discharge over time. Probes were placed into a pvc container with holes (to ensure adequate ventilation) so that direct sunlight would not interfere with the accuracy of data.

Laboratory analysis: Temperature probes were taken to the office and downloaded into my PC computer. Downloaded data was then exported to Microsoft Access to determine average, minimum, and maximum stream temperature per day, and then exported to Microsoft Excel for data storage, and graphing purposes.

Data Management: Michael Sparkman (CDFG) is the data manager, and the data was validated by comparing measurements of each probe to a second probe that was also deployed at the same time as the first probe. For each period of data collection, data from both probes was very similar, with less than 0.2 °C differences. Uncertainty of each probe was guaranteed to be $\pm$ 0.1 °C according to Optic StowAway literature.

Quality Assurance and Quality Control Requirements: Two probes per year were used, and allowed for direct comparisons of data. Data was found to be very consistent among probes. I also reviewed the average values by day to see if any changes > 2 °C occurred from one day to the next. I found that this did not occur.

Certification of quality assurance, etc: I, Michael Sparkman, certify that the submitted data is accurate to the best of my knowledge and ability.

Personnel Training: Deploying and later analyzing stream temperature data is straightforward, and relatively easy. I have been deploying these same type of temperature probes in other streams as well (Two years on the nearby, Mad River).

Credentials: I have a BS in Fisheries and an MS in Natural Resources from Humboldt State University, Arcata, CA. I have been a CDFG Fisheries Biologist for the past 9 years, and specialize in conducting studies on salmon and steelhead trout, often in relation to stream temperatures.

Lethal Stream Temperatures in late July

Numerous 0+ juvenile steelhead trout were observed dead in the stream and trap live box beginning July 23, 2006 (Figure 26). Stream temperatures in the afternoon during the fish kill ranged from 28 – 29.5 °C (82.4 – 85.1 °F), with the highest maximum temperature (29.5 °C or 85.1 °F) and the greatest 24 hr average (25.4 °C or 77.7 °F) occurring on July 24, 2006 (Figure 26). From July 23 – July 25, 2006 lethal stream temperatures occurred from about 2 – 7 pm (Figure 26). Although the far majority of mortalities were for 0+ steelhead trout, several older juvenile steelhead trout (1+ and 2+) were also killed near the trap site. On July 25, 2006 I conducted a delayed mortality test for 0+ steelhead trout (n = 50) from 11:00 – 17:00 (duration of 6.0 hrs) to investigate influences of stream temperature on survival (Table 33). Only 36% of the 0+ steelhead trout survived (Table 33). Dissolved oxygen concentrations (mg/l) in the livecar (used for holding fish) and the stream during the experiment ranged from 8 – 10 mg/l.

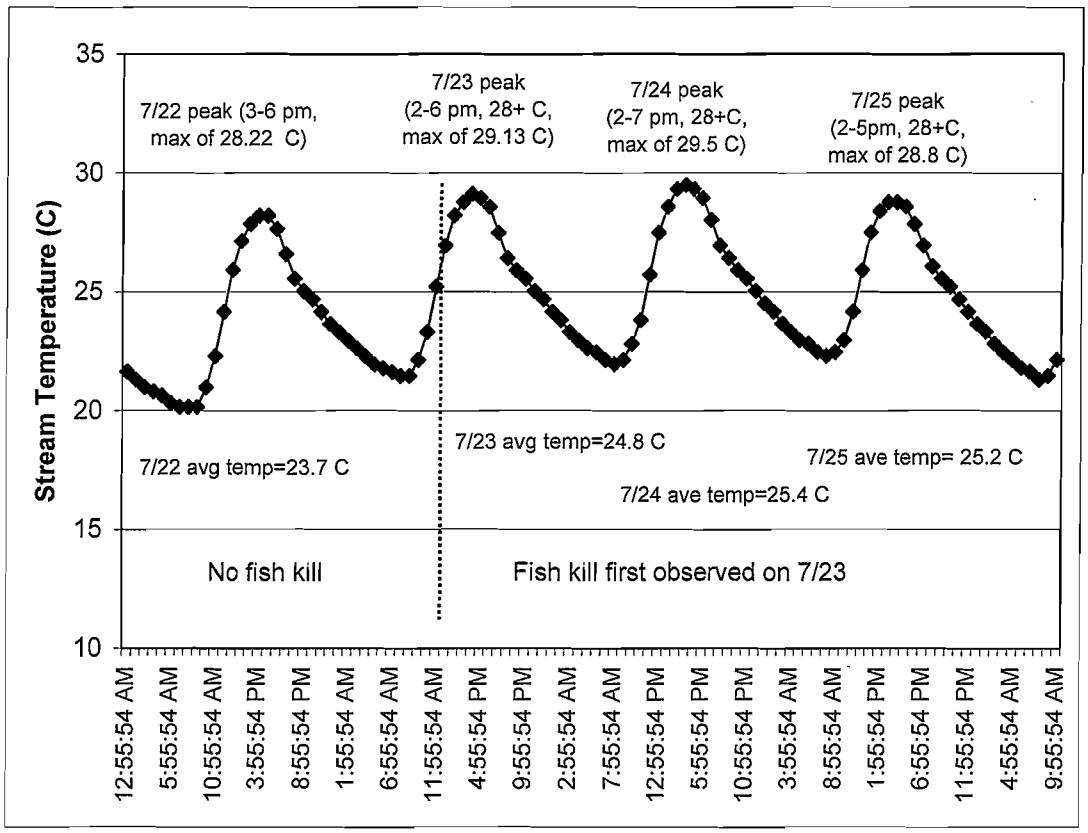

Figure 1. Hourly stream temperatures (Celsius) before and during juvenile steelhead die offs in upper Redwood Creek, Humboldt County, CA., 2006.

Table 1. 0+ steelhead trout delayed mortality test results, upper Redwood Creek, Humboldt County, CA., 2006.

0+ Steelhead Trout Delayed Mortality Test Results					
	Test		Average Water		
Date	Duration (hrs)	n	Temperature (°C)	Morts/total	Percent Mortality
6/12-6/13	24	30	15.1	0/30	0.00
6/21-6/22	24	30	17.8	0/30	0.00
7/20-7/21	24	29	21.9	0/29	0.00
7/25-7/25	6	50	26.4	32/50	64.00