



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

Redwood National and State Parks
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March 11, 2009

Matt St. John, Acting Unit Manager
North Coast Regional Water Quality Control Board
5550 Skylane Boulevard, Suite A
Santa Rosa, CA 95403

Dear Mr. St. John:

The following are Redwood National and State Parks' comments on the Public Review Draft 2008 California 303 (d) and 305 (b) Integrated Report. Redwood National and State Parks support NCRWQCB staff recommendations to continue listing Redwood Creek for temperature and sedimentation/siltation impairment. We are also including additional data supporting the temperature listing for Redwood Creek.

Redwood National and State Parks and the U.S. Geological Survey have been cooperatively monitoring summer water temperatures in Redwood Creek since 1997. A review of our data indicates that over the last ten years, summer water temperatures in Redwood Creek do not support beneficial uses for salmonids. Several local studies support this. First, studies by Welsh et al. (2001) on tributaries of the Mattole River, California, suggest that streams with a Maximum Weekly Maximum Temperature (MWMT) greater than 18.1°C or a Maximum Weekly Average Temperature (MWAT) greater than 16.8°C may restrict presence of juvenile coho salmon. For the last ten years, all MWMT values for mainstem Redwood Creek have exceeded the 18.1°C threshold—the temperature above which Welsh (2001) found no juvenile coho present in streams. Welsh (2001) documented that all of the streams where MWMT was less than 16.3°C or MWAT was less than 14.5°C contained juvenile coho. MWMTs on Redwood Creek have ranged from as low as 20.3° to as high as 28.2°C (see Figure 1). MWAT values show a similar pattern as MWMT. Coho salmon in Redwood Creek and the Mattole River are grouped within the same Evolutionary Significant Unit and should have similar thermal tolerances.

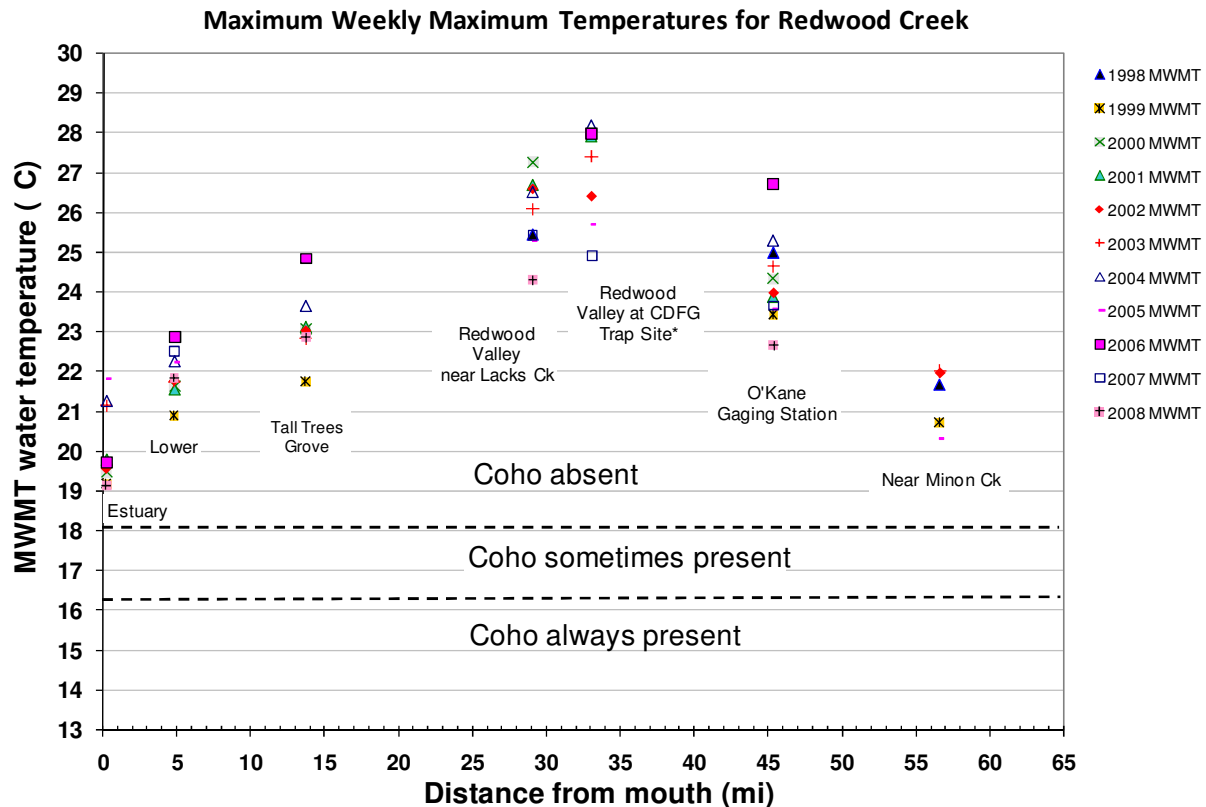


Figure 1. Maximum weekly maximum temperatures (MWMT), 1998 to 2008. Coho salmon (*Oncorhynchus kisutch*) presence and absence thresholds are from studies in the Mattole River by Welsh et al. (2001) (after Madej et al. 2006; updated data in figure to 2008).

In 2006, Sparkman (2007) documented a juvenile fish kill on Redwood Creek for the first time in seven consecutive years of fish trapping at river mile 33 on the creek. Lethal stream temperatures occurred in late July. Numerous dead juvenile salmonids were observed at the California Department of Fish and Game’s trap and in the stream above and below the trap site. Most of the fish killed were 0+ steelhead trout and several older age-class juvenile steelhead trout. Amphibians were also killed, including pacific giant salamander and yellow-legged frogs. On July 23, 2006, stream temperatures during the fish kill ranged from 28.0-29.5°C. During this time period, Sparkman (2007) conducted delayed mortality experiments to determine the influence of stream temperature on 0+ steelhead trout survival. Only 36 percent of the juvenile fish survived the six hour test (Sparkman 2007). He concluded that dissolved oxygen concentrations in the stream were favorable for juvenile survival and “lethal stream temperatures during the afternoon were most likely responsible for the juvenile fish kill.”

In the 2008 Integrated Report, responding to public comments of the abundance of salmonids being produced in Redwood Creek, the Regional Board concluded that the presence of salmonids in Redwood Creek does not equal water quality standard attainment. For some salmonids, specifically age class 1+ and 2+ juvenile steelhead trout, population estimates in Redwood Creek show a significant negative trend over the past eight years (see Figure 2; Sparkman 2007). These steelhead trout smolts are obligate species for summer rearing. They have spent more than one

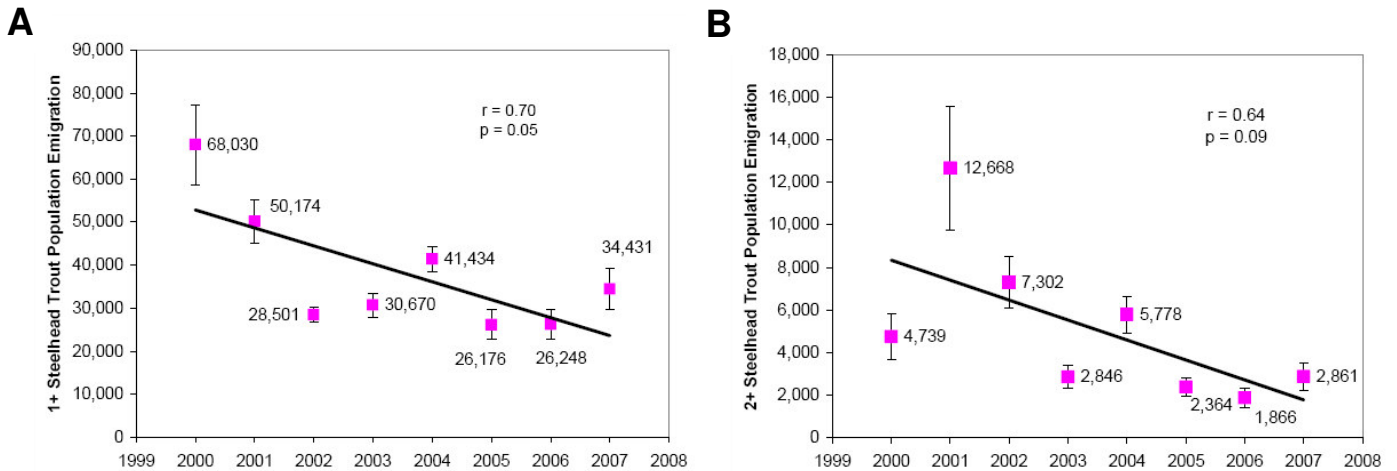


Figure 2. **(A)** 1+ steelhead trout population estimates and **(B)** 2+ steelhead trout population estimates for eight consecutive years, 2000 to 2007, in Redwood Creek. Error bars are 95 percent confidence interval. Numeric values next to box represent the number of individuals. Line of best fit is a regression line with corresponding equation, correlation value (r) and p value (*from Sparkman 2007*).

summer rearing in Redwood Creek and are subjected to summer stream conditions. Elevated water temperatures can decrease growth and increase juvenile mortality (Brett 1979). Stream temperature has been observed to modify the behavior of steelhead trout smolts and juvenile coho. During periods of high stream temperatures, juvenile steelhead trout and juvenile coho in Redwood Creek have been observed using stream margins and cold water seeps as thermal refugia (Sparkman 2004; Ozaki and Anderson 2005). Effects of high stream temperatures on juvenile fish identified by Brett (1979) are likely occurring in Redwood Creek.

Thank you for the opportunity to comment on the Public Review Draft 2008 Integrated Report. If you have any questions or need further information, please contact Vicki Ozaki at (707) 825-5142 or David Anderson (707) 465-7771.

Sincerely,

/s/ Terrence D. Hofstra
(original signature on file)

Terrence D. Hofstra
Chief, Resources Management and Science

cc: Superintendent

References:

- Brett, J.R. 1979. Environmental factors and growth. *in* W.S. Hoar, D.J. Randall, and J.R. Brett, editors. *Fish physiology*, v. 8. Academic Press, New York. pp. 599-675.
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