

Western Ecological Research Center

Publication Brief for Resource Managers

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Assessing Possible Thermal Rearing Restrictions for Juvenile Coho Salmon in Redwood Creek, California

Water temperature is an important physical factor that influences salmonid egg development, juvenile appetite and growth, and fish distribution. Coho salmon, like most salmonids, prefer cool-water rearing and typically reside in a stream for a minimum of one year after hatching. Historically, coho were found throughout most of the 108-km-long mainstem of Redwood Creek, Humboldt County, north coastal California. However, juvenile coho distribution is presently limited to the downstream-most 20 km of the mainstem and a few large low-gradient tributaries.

Redwood Creek is currently listed as temperature- and sediment-impaired under the Clean Water Act because of past timber harvest, removal of riparian vegetation, widespread streamside landsliding, and channel aggradation. The upstream reach of Redwood Creek is beginning to recover from past damage in terms of pool frequency and depth, shading by alders, and adequate spawning gravel size; nevertheless, juvenile coho salmon are absent. In the June issue of the *Canadian Journal of Fisheries and Aquatic Sciences*, USGS scientists Dr. Mary Ann Madej, Christopher Currens, and Julie Yee, with National Park Service colleagues Vicki Ozaki and David Anderson, hypothesized that elevated stream temperatures in the middle river reach constitute a thermal restriction for juvenile coho rearing. The scientists used seven years of in-stream temperature monitoring in conjunction with a thermal infra-red flight to identify warm reaches of Redwood Creek and to compare temperature regimes in coho-bearing and non-coho-bearing river reaches. The scientists discussed in detail trends in maximum and minimum stream temperature and duration of high temperatures along the length of Redwood Creek.

Management Implications:

- Although much upslope road restoration work has been accomplished in the Redwood Creek basin, current riparian conditions along much of Redwood Creek are still degraded and do not provide adequate shading (and thus cooler temperatures) for the stream.
- The lack of large riparian conifers reduces the availability of in-channel wood to scour pools and provide cover and channel complexity, which may also contribute to the limited upstream distribution of coho.
- Besides efforts to control erosion in this watershed, active riparian restoration may be needed to restore the cool thermal regime along warm stretches of Redwood Creek.

Among their conclusions are the following: Redwood Creek, unlike many rivers reported in the literature, reaches its maximum temperature in the middle basin and becomes cooler farther downstream. Coastal fog and old-growth redwood trees in the riparian zone in the lower basin contribute to the cooling trend there. In upper Redwood Creek, the thermal regime has largely recovered from past hot temperatures, and the temperature regime in this non-coho-bearing reach is similar to the downstream coho-bearing reach. In the intervening 50-km-long middle reach, however, summer water temperatures were significantly warmer than the temperatures recommended for coho.

*Madej, M. A., C. Currens, V. Ozaki, J. Yee and D. G. Anderson. 2006. Assessing possible thermal rearing restrictions for juvenile coho salmon (*Oncorhynchus kisutch*) through thermal infrared imaging and in-stream monitoring, Redwood Creek, California. Canadian Journal of Fisheries and Aquatic Sciences 63:1384–1396.*