**TITLE:** Life on the edge: Temperature and flow restrict steelhead productivity in a large Central Valley, California river

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**Abstract:** Steelhead trout (*Oncorhynchus mykiss*) are native to the American River in California’s Central Valley, but because of the Folsom Dam Project are relegated to only the lowermost 37 km of the river. The lower American River provides a very limited amount of moderate gradient habitat for steelhead spawning and rearing, the quality of which is mediated by flow. Perhaps an even more critical limitation to steelhead production is water temperature above the optimum for juvenile steelhead during the summer-to-early-fall rearing period. California Department of Fish and Wildlife has worked with U.S. Bureau of Reclamation and other collaborators since 2001 on specific questions regarding steelhead oversummering relative to temperature, flow, and other manageable habitat attributes on the American River. The overall objectives of this work are to measure changes in distribution, relative abundance, growth, condition, and health of juvenile steelhead in response to temperature and flow conditions during summer-early fall, with recent emphasis on monitoring the effects of extreme drought conditions on steelhead. Associated hypotheses are that: steelhead distribution downstream from Folsom Dam will become more restricted as temperature becomes supraoptimal; growth, condition, and health of steelhead will decrease as temperature becomes supraoptimal; and, consequently, steelhead relative abundance will decrease as temperature becomes supraoptimal. Results to date suggest very high site fidelity of juvenile steelhead such that no upstream shift in distribution occurs in response to worsening thermal conditions. However, as predicted under extreme drought conditions in 2014 and 2015, there was evidence of reduced distribution of steelhead spawning and rearing in downstream areas, where river habitat has consistently supported these functions in the past. Also consist with predictions was an indication of lower juvenile steelhead abundance, as evidenced through relatively low catch rates in sampling, including the loss of steelhead at specific sites over the course of the season. Observations of lower intestinal bacterial disease under protracted high temperature conditions have provided the biological basis for an 18°C daily mean temperature standard to protect American River steelhead. Yet, contrary to our predictions, we did not observe bacterial infection in steelhead under recent drought conditions, nor did we observe a significant decrease in growth or condition. Collaboration with University of California and National Marine Fisheries Service yielded modeling evidence that fast growth and emigration at an early age are adaptive traits for American River steelhead in response to a predominantly supraoptimal thermal regime. Current collaboration with Sacramento State University expands our work to include not only monitoring of drought effects on steelhead, but also the comparative use of side and main channel habitats under variable flow and temperature conditions.