4. Government Project Description:

This study serves to assess the thermal tolerances of juvenile chinook salmon in the Lower Yuba River, near Marysville, CA. In order to place the thermal tolerances of juvenile chinook salmon into an ecological perspective it is imperative to understand the spatial and temporal patterns of fluvial temperature. Traditionally, temperature has been measured at a few points along the bank of a river using data loggers and sensors that require manual downloading of the data. This has yielded an understanding of longitudinal temperature gradients. However, in shallow gravel/cobble rivers in the Dry-Summer-Subtropical climate there is spatial complexity in both topography and water residence time. This yields considerable heterogeneity in temperature across the channel. Critical temperature conditions may not be revealed by longitudinal temperature sampling. Alternative techniques have involved using fiber optic networks or thermal imaging, which both are expensive. Neither adequately samples temperature through space and time to address the thermal exposures of juvenile salmonids. Fiber optic temperature networks sample temperature along a single cable, and do not sample cross-channel areas effectively. Further, they use tremendous power, and can only be deployed for a limited duration, usually a few days. Assessment using thermal imaging provides one spatially detailed map of surface temperature, but cannot be repeated frequently through time.

The purpose of this study is to develop and implement a temperature sensing methodology that adequately assesses the temperatures experienced by juvenile salmonids. In order to meet this goal, the methodology must sample the totality of the river reach of interest, including backwater and off-channel areas, both laterally and longitudinally. Data must extend multiple years to capture diverse flow and flood events. Sampling must be sufficiently frequent to capture diel fluctuations in temperature. Additionally, the sampling must be flexible and extensible so that sensors can be moved or added when the river changes. Finally, given the proposed density of sensors, a method for remotely accessing the data is far more practical than manually downloading the data from loggers.