Report for 2003NV41B: Quantifying Potential Economic Impacts of Water Quality Modeling Uncertainty for the Lower Truckee River, Nevada

- Conference Proceedings:
  - McKay, W. A., J.J. Warwick, S. Kish, C. Fritsen, and J. Bartlett, 2003. Modeling linkages between groundwater, surface water and periphyton-driven oxygen dynamics in the lower Truckee River, Nevada Fall Meeting of the American Geophysical Union, San Francisco, California, December 8-12.

Report Follows

Problem and Research Objectives:

Tens of millions of dollars are spent annually to treat municipal and industrial (M&I) wastewater within the Truckee River Basin. In the Nevada portion of the watershed, the Cities of Reno and Sparks, in conjunction with their partner Washoe County, jointly operate the Truckee Meadows Wastewater Reclamation Facility (TMWRF). In order to achieve water quality objectives, particularly as they relate to Total Maximum Daily Loads (TMDLs), TMWRF operators are faced with additional infrastructure improvements and/or non-structural watershed improvements (i.e., river restoration) that will cost additional millions of dollars. In addition to the considerable resources expended on wastewater treatment, the Cities, County and State support extensive water quality monitoring activities within the river basin. Currently, there is only a cursory understanding of the relationship between water quality benefits associated with incremental infrastructure improvements (and associated costs) and the information gained from ongoing water quality monitoring (and the costs associated with those activities). The proposed project will help address these issues.

The project scope involves defining conditions in the Lower Truckee River from the input of Truckee Meadows Water Reclamation Facility (TMWRF) effluent at the Steamboat Creek confluence downstream to Marble Bluff Dam. The specific objectives are:

1) Construct an economic model defining costs (including both facilities and operation) associated with various levels of potential treatment
2) Construct an economic model defining costs associated with potential watershed (in-stream and groundwater) monitoring programs
3) Translate economic models into FORTRAN code and integrate with existing water quality modeling program
4) Define expected values and associated uncertainties associated for non-point source loads
5) Define uncertainties associated with water quality modeling predictions
6) Develop Monte Carlo simulation shell around integrated code to predict probabilities of achieving desired in-stream water quality conditions as a function of various investment scenarios

Principal Findings & Significance (year 1):

A long-term dynamic water quality modeling program (WASP5) was modified to correctly deal with relevant data for the study site (Lower Truckee River). The model was successfully calibrated and verified using a robust dataset spanning 528 days. A planned wastewater treatment plant excursion (discharging higher than permitted nutrient levels) had significant impacts on the growth of attached algae, with concomitant increased in predicted diel dissolved oxygen swings. Retiring irrigated lands is also predicted to have a significant impact on local in-stream nutrient concentrations with associated decreases in attached algae biomass.