# Spatially Explicit Predictors of Indicators of Water Quality: Example from Wadeable Streams in the U.S

by
Mostafa A. Shirazi and Marc Weber

## ABSTRACT

The Environmental Protection Agency (USEPA) in collaboration with the States is assessing and reporting on the condition of surface waters in the United States using synoptic surveys and consistent field collections of water quality indicators (WQI). The survey is a probability-based design, such that inferences about all surface waters can be drawn from the sampled sites using minimal assumptions. We produced spatially explicit predictions of WQI for non-sampled locations, using the Wadeable Stream Assessment dataset (1392 WSA sites and 451 least impacted reference sites) and two sets of independent predictors: the U.S. Natural Resources Conservation Service Dataset (STATSGO, and SSURGO) (which described the watersheds of these sites by their soil characteristics (SC)), and the U.S. Geological Survey's National Land Cover Database (NLCD) (which further defined the land-use (LC) of the watersheds). The predictors statistically defined a non-sampled site as a nearest neighbor to one or two WSA sites. We used the mean WQI from the WSA neighbor sites as a prediction value of one or more WQI for the non-sampled site, and a model that used the remaining WQI as co-predictors, along with the SC and LC, calculated the error of each prediction. The standard errors were measured relative to the national mean of each WQI, and they were substantially below the spatial variability (stndv/mean) of the observed data for the WSA dataset, which was <100% for six WQI and 100% to 440% for 11 of the 17 WQI, but the prediction error for the dataset was <50% for 10 indicators, and 50% to 135% for the remaining seven WQI. The predicted WQI of 900 Level IV Ecoregions was compared with reference sites, which displayed regions of potential water quality and water quality vulnerability in the conterminous U.S.

Keyword: Water Quality, Probability Survey, Indicators, Conditional Probability Model, Spatial Prediction, Soil Map Unit, Watershed Soils, SSURGO, STATSGO