



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003NY33G

Title: An Assessment of New Advances in Low Streamflow Estimation and Characterization

Project Type: Research

Focus Categories: Drought, Water Use, Non Point Pollution

Keywords: Risk Assessment, GIS Geographic Information Systems, Watershed Hydrology, Statistical Hydrology, Regional Hydrology

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Federal Funds: \$154058.00

Matching Funds: \$154589.00

Congressional District: 25

Principal Investigators: Kroll, Chuck (SUNY ESF)

Abstract: Low streamflow estimates are needed to issue and/or renew National Pollution Discharge Elimination System (NPDES) permits, plan water supply, hydropower, and irrigation systems, design cooling-plant facilities, site treatment plants and sanitary landfills, and determine waste-load allocations. Lowflows are also used to make decisions regarding interbasin transfers of water and allowable basin withdrawals, and for assessing the impact of prolonged droughts on aquatic ecosystems. Knowledge of low streamflows is important for water quality management, where low streamflows provide the necessary dilution of non-point source and point source pollution discharges, and water quantity management, where low streamflows greatly influence water use policy. With the National Drought Policy Act of 1998, the US Congress indicated the need for a coordinated drought management plan, as well as a systematic and permanent process to address droughts. Unfortunately, there is no agreed upon methodology for estimating low streamflow statistics in the United States, and the current methods for estimating low streamflow statistics are primarily based on techniques recommended for flood frequency analyses. The proposed project will address this deficiency.

Methods: By combining recent advances and new methods in both physical and statistical hydrology

with Geographic Information System mapping techniques, we will improve our ability to estimate low flow statistics in riverways throughout the United States. This project will address at-site low streamflow characterization, where a historic streamflow record from a gauged river site is utilized, and the estimation of low streamflow statistics at ungauged river sites. This project continues from a recently completed national assessment of low streamflow characterization and estimation methodology. Using three distinct study regions with a high density of gauged river sites and available ancillary information such as digital information regarding watershed hydrogeologic properties, we will perform a rigorous statistical comparison of competing low streamflow estimation techniques. This comparative analysis will include bootstrap and jackknife simulations and analytical statistical comparisons of existing and proposed methodologies. Methods investigated will include estimators of low streamflow statistics at intermittent river sites, trends in low streamflow series due to urbanization and climate variation, and regional regression and baseflow correlation analyses. With our findings we will develop a template of lowflow analyses with which one could perform a regional lowflow assessment in any region of the United States.

Objectives: The objectives of this research are to:

- 1) perform an extensive low streamflow characterization at gauged river sites within each study region;
- 2) create a spatially-explicit digitally-derived watershed characteristic database;
- 3) examine the development of low streamflow regional regression models for ungauged quantile estimation;
- 4) explore baseflow correlation estimators as an alternative to regional regression;
- 5) perform a rigorous statistical comparison between regional regression and baseflow correlation estimators; and
- 6) create a template with which one could perform a regional low streamflow analysis in any region of the United States.

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