USGS

# WATER RESOURCES RESEARCH GRANT PROPOSAL

TITLE: The Continued Development and Application of Regional Hydro-Climatological Models for the Northeast United States.

DURATION: 9/96 - 8/98

FEDERAL FUNDS REQUESTED:$79,722.

NON-FEDERAL FUNDS PLEDGED: $147,142

PRINCIPAL INVESTIGATOR: Dr. NeiI M. Fennessey, University of Massachusetts-Dartmouth.

CONGRESSIONAL DISTRICT: UMass-Dartmouth is located within the 3rd U.S. Congressional District of Massachusetts.

## STATEMENT OF CRITICAL REGIONAL WATER PROBLEM

Federal, State and regional water resources managers are re-focusing on the watershed as the appropriate framework for the administration of water resources management issues. With an ever greater public participation-stake-holder interest in the decision making process, the utility of traditional regional water resources models is being rapidly eclipsed. Until recently, water resources planning model development efforts focused mainly on the development and application of annual time scale regional mathematical models for estimating flows at ungauged locations. Examples include the "1 in T" year annual maximum daily flood flow and 7Q1O low flow models. Today, many regional water resources management issues of concern require shorter time scale flow estimates including seasonal, monthly and even daily flows at ungauged sites. Examples include: riverine botanical, vertebrate and invertebrate assessments, water supply reservoir firm yield/drought vulnerability analysis, FERC hydroelectric re-license impact assessments and nonpoint source runoff pollution runoff analysis among many, many other areas of interest. The streamflow aspect of the proposed work plan will address the needs of all those who require a daily (or longer time scale) time series of streamflow at a ungauged location in the northeast U.S. Evaporation and evapotranspiration are fundamental to file hydrological cycle yet both are difficult to estimate using widely accepted, physically based and data intensive procedures. Recently, separate mathematical models of both processes were developed. These models accurately approximate the physically based evaporation and evapotranspiration prediction but require only the mean monthly air temperature, site location and elevation as independent variables. For example, a water supply reservoir yield/drought vulnerability analysis requires estimates of the total monthly free-surface evaporation. Currently, only locally applicable pan evaporation estimates are available, a method now widely regarded as unacceptable for predicting lake evaporation. Urban drought water demand management plans typically propose

restricting or banning outdoor lawn and garden watering in periods of supply shortfall. To assess the effectiveness of this strategy, it's necessary to be able to make credible estimates of these potential savings. The temperature based procedure employed by water resources analysts in the northeast U.S. since the late 1940s is now recognized by irrigation specialists as being inappropriate. The regional evaporation and evapotranspiration model application aspect of the proposed work plan will serve to address these specific needs of water resources analysts and managers in the northeast U.S.

**STATEMENT OF RESULTS OR BENEFITS:**

Task One of the proposed work plan is to improve upon an existing procedure to generate daily streamflows at an ungauged location in New England, New York, New Jersey or Pennsylvania. The beneficiaries of this work include any water resources specialist who requires a time series of daily (or longer time scale) streamflow estimates at some ungauged location within these states.

Task Two of the proposed work plan is to generate a series of Geographic Information System based monthly maps and magnetic GIS output files of(a) the mean daily free surface lake or reservoir evaporation and (b) the mean daily reference grass evapotranspiration for the states of Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey and Pennsylvania. The primary beneficiaries of this work will be the water supply reservoir yield evaluation specialists and the urban drought management planners in this region.