USGS NSF GRIP Opportunity

USGS Center:	Upper Midwest Environmental Sciences Center
Project Title:	Estimating trends in river and stream water temperature using improved statistical models
Project Hypothesis or Objectives:	Interest in the effects of climate change will continue to spur efforts to model changes in river and stream temperatures. Such changes may have important effects on aquatic organisms. A challenge is that statistical efforts should not rely on standard linear models when water temperatures span intermediate values and either low or high values (<5 °C or >25 °C). This is because of nonlinearities, and because water temperature distributions become less variable and asymmetric as water temperatures approach low and high values. These concerns are commonly addressed using a published model that requires air temperature as a covariate. However, investigators interested in trends in historic water temperature will typically not adjust for air temperature. Further, the published model does not permit adjustment for time and date of sampling—which adjustments may be required when estimating trends using historical water temperature data (which may not have been obtained at regular time or date intervals). The objective of this project is to develop models of river and stream water temperature that address nonlinearity, distributional, time and date concerns, and which don't require air temperature data.
Duration:	8 months (a summer and semester)
Internship Location:	La Crosse, WI
Area of Discipline:	Hydrology, statistics, physics, ecology, fisheries
Expected Outcome:	The project will develop one or more statistical regression methods for estimating water temperature means and trends with or without air temperature, when water temperatures include values less than 5 °C or more than 25 °C, with or without aggregation (as, say, weekly means), and with or without correction for time of sampling. The intern will benefit from helping develop the methods, and from coauthoring one or more publications. The USGS will benefit because the regression methods may be used by USGS and other

	investigators to better estimate trends in river and stream temperatures and, in turn, effects on aquatic organisms.
Special skills/training Required:	Familiarity with statistical distributions, regression and time series models, and statistical or mathematical software (e.g., MATLAB, R or SAS). Familiarity with hydrology or meteorology will be helpful.
Duties/Responsibilities:	The intern will help develop statistical models of water temperature that address the substantive and statistical concerns mentioned above. Models will be developed using hydrological and statistical considerations, and evaluated using statistical or mathematical software and both simulated and observed data. The intern will have the opportunity to share findings with partner agencies and the scientific community.
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