

**THE DEVELOPMENT OF AN ENSO-BASED STREAMFLOW  
MODEL FOR THE ILLINOIS RIVER WATERWAY**

An Abstract of a Thesis  
Presented to the  
Department of Geography  
Western Illinois University

In Partial Fulfillment  
of the Requirements for the Degree  
Master of Arts

By  
Michael William Egner  
May 2009

## **Abstract**

The work presented in this thesis details the creation and validation of an ENSO-based model to predict streamflows of the Illinois River Waterway. Data used in the thesis are gathered from governmental agencies of the Climate Prediction Center, Earth System Research Laboratory, National Climatic Data Center, and United States Geological Survey. The primary statistical analyses used in this thesis are outlier removals, t-tests, autocorrelations, data smoothing/filtering, and cross-correlations. These statistical results are used to construct the model for the Illinois Waterway. Cross-correlations between ENSO indices and discharges are computed and examined since streamflows change at separate points in relation to ENSO changes. As expected, streamflow changes lag behind changes in an ENSO index. An equation with the highest goodness-of-fit value is chosen to create the waterway model and has variables of ENSO index, climate, and streamflow with time lags. The time lags that are selected for the model equation, representing the waterway, are based on cross-correlation coefficients most deviated from zero. Another equation, derived over the Iowa River, was used to yield streamflows for the Illinois Waterway and was compared to the model equation in this thesis. The equation derived in this thesis is better suited for the Illinois Waterway.