

LONG-TERM SEDIMENT TRANSPORT TRENDS IN ILLINOIS WATERSHEDS

Laura Keefer, Fluvial Geomorphologist, Illinois State Water Survey, Champaign, IL, lkeefe@illinois.edu; Misganaw Demissie, Director, Illinois State Water Survey, Champaign, IL, demissie@illinois.edu; Rich Allgire, Hydrologist, Illinois State Water Survey, Carbondale, IL, rallgire@illinois.edu; and David Crowder, Hydraulic Engineer, NOAA-National Marine Fisheries Service, Santa Maria, CA, david.crowder@noaa.gov

Abstract The Illinois State Water Survey (ISWS) has been collecting long-term suspended sediment data at 15 sites throughout the State of Illinois. This unique data collection program was established in WY1981 to provide a means for investigating and quantifying long-term trends that may be occurring in Illinois watersheds. This trend analysis used data collected from WY1981 through WY2005. All stations, except one ISWS station, are located at USGS streamflow stations where the stage-discharge relationships were used to compute sediment loads for each station. Using the 25 years of suspended sediment-discharge data, annual and composite suspended-sediment discharge relationships were developed using least squares regression and the Ferguson (1986) log-transformation bias correction factor. These sediment-discharge relationships were then used to estimate annual loads and annual mean sediment-concentrations at each station for all water years having a complete discharge record. Three Kendall τ trend analyses were then conducted to determine what, if any, temporal trends in annual mean discharge, annual load, and annual mean concentration were occurring at each station.

Average annual suspended sediment loads, yields, and mean concentrations varied substantially at the 15 stations. Long-term sediment yields and concentrations were closely related and were generally greater for stations in the Galesburg Plain physiographic region located in west-central Illinois. The total amount of sediment transported at a station greatly varied and dependent on the mean annual discharge and average suspended sediment concentration of the stream. Sediment yield estimates provide information that can be used to help identify watersheds that might benefit the most from the implementation of watershed management practices designed to reduce sediment loads.

Trend analyses conducted using Kendall τ coefficients suggest that mean annual discharge decreased during WY1981-2005 at six of the 15 stations. Kendall τ analyses showed mean annual load and mean annual sediment concentration decreased at 11 of the 15 stations. At 5 of the 15 monitoring stations, discharge, sediment load, and sediment concentration decreased. At six stations, Kendall τ results suggest sediment load and concentration are decreasing but no significant change in discharge occurred during that timeframe. Further investigation into causal relationships between the observed trends and other controlling factors, such as land use, climate, and surface geology, are in progress. The data collected by this ISWS program continues to provide valuable baseline data on sediment transport rates throughout Illinois. It is anticipated that this data will be extremely helpful in monitoring and documenting the success of sediment-reduction programs being proposed and implemented throughout Illinois.