Scott Hamshaw – 2013 Student Research Conference Abstract

Over 1,000 river miles in Vermont are either impaired or stressed by excessive sedimentation. The higher streamflows and incised river channels have resulted in increased bed and bank erosion. As the climate in Vermont is expected to feature increased higher precipitation events and winter rainfall, the potential for increased sediment loading from erosion processes is high and is a major concern for water resource planners and scientists. Typical sediment monitoring comprises periodic sampling during storm events and is often limited to gauged streams with flow data. Continuous turbidity monitoring enhances our understanding of river dynamics by offering high-resolution, temporal measurements to better quantify the total sediment loading occurring during storm events. New complex systems tools that mimic learning patterns of the human brain, known as artificial neural networks, have been effective at predicting flow in small, ungauged rivers using local climate data. This study advances this technology by also predicting the suspended sediment concentration.

This study deploys the first distributed network of continuous turbidity sensors (DTS-12) in Mad River Watershed, located in Central Vermont. The Mad River and five tributaries were selected as a test bed because more than 7 years of Total Suspended Sediment data are available (USGS, VTANR), it represents a range of watershed characteristics, and because a 3-D Distributed-Hydrology-Soils-Vegetation Model (DHSVM) model of this watershed is currently under development. Periodic sampling during storm events enables turbidity versus SSC relationships to be established. Sub-watersheds with monitored turbidity also have hourly precipitation and temperature data. The real-time turbidity data are used to train and test the artificial neural networks. Accurate quantification of the suspended sediment using this new complex systems technology helps managers in prioritizing mitigation projects to reduce impacts of sediment loading.