2010 Accomplishments

Dr. William “Breck” Bowden and project manager Meredith Curling (MS graduate student) from the Rubenstein School of Environment and Natural Resources at the University of Vermont have continued to work with the Vermont Agency of Natural Resources Stormwater Section to collect precipitation and discharge data for a set of small streams throughout the state for which no historical data existed previously. This data will help the state devise permit requirements and develop a better understanding of how to manage stormwater runoff that currently impairs a number of Vermont’s streams. In 2010 Bowden and Curling began a collaborative project with the Vermont and New Hampshire USGS Water Science Center to identify the influences of runoff from large storm events on the equations used to calculate discharge. Ultimately, the collaborators intend to put together guidance that can be used by municipalities to monitor stormwater discharge themselves for permitting, reporting, and investigative purposes.

Dr. Leslie Morrissey from the Rubenstein School of Environment and Natural Resources and Dr. Donna Rizzo from the School of Engineering at the University of Vermont have been working collaboratively to integrate high resolution spatial data from satellite and aircraft sensors with advanced image processing, hydrologic modeling, and field observations to quantify the magnitude of sediment loss due to stream bank erosion over large areas. Their goal is to quantify the sediment loads mobilized by stream bank erosion in 15 Chittenden County, Vermont watersheds over the past decade (1999-2008). During this research they have developed an automated approach to quantify changes in stream channel migration and bank height over time. From this information they quantified sediment loading and identified critical source areas that contribute a disproportionate amount of the total sediment load to streams. This data will be used to indicate the level of instability in local streams, which is an essential components of Stream Geomorphic Assessment protocols recently developed by the Vermont Agency of Natural Resources River Management Program. This project provides data that is essential to quantify the mass of sediment that is introduced into stream channels from bank erosion throughout the Lake Champlain Basin.
Phosphorus loss from stream bank erosion is thought to be a major and underestimated contributor of phosphorus loading to Lake Champlain. In addition, it is well known that there is substantial natural variation in chemical and physical properties of different soils. This is particularly true of riparian areas where Dr. Don Ross and his students in the College of Agriculture and Life Sciences at the University of Vermont have demonstrated that riparian soil phosphorus concentrations varied significantly by soil type, texture (e.g., sand, silt, and clay distribution), and drainage at three riparian sites in the Lake Champlain Basin.

Drainage and texture are the two main factors that determine soil types, which have already been mapped. Ross and his students combined high-order soil mapping with additional soil testing to estimate riparian soil phosphorus inventories at several riparian sites in Chittenden County, Vermont. When coupled with historical measurements of stream bank erosion (e.g., as noted above) the results from this project provide improved estimates of phosphorus mobilized by stream bank erosion, which contributes to a better greater understanding of phosphorus loading to Lake Champlain.

Dr. Jane Hill and her students in the School of Engineering at the University of Vermont have been working with the Vermont Agency of Natural Resources on a project co-funded by the Vermont Water Resources and Lake Studies Center to develop more accurate methods to estimate the amounts of phosphorus in agricultural soils that might migrate to streams and lakes. Phosphorus is a byproduct of agricultural and urban activity that can lead to uncontrolled growth of undesirable algae in lakes. Unsightly and potentially dangerous algal “blooms” have been a problem in some parts of Lake Champlain in recent years, and excess phosphorus is thought to be a critical factor supporting these uncontrolled outgrowths. The new methods are based on enzymes that may reveal the amounts of phosphorus in soil that are potentially biologically available to algae for growth.

Dr. Sarah Lovell Taylor in the Department of Plant and Soil Science and Dr. Alan McIntosh in the Rubenstein School of Environment and Natural Resources and their students at the University of Vermont have been working with the Lintilhac Foundation and Shelburne Farms to demonstrate innovative new ways to manage farm runoff. Shelburne Farms is a not-for-profit operational farm and educational organization whose mission is to serve as a model of environmental stewardship by demonstrating new ecological, practical, and cost-effective remediation strategies that will improve the water quality of runoff to Lake Champlain. With co-funding from the Vermont Water Resources and Lake Studies Center, a bioretention system designed to treat runoff from the dairy barnyard source area is being installed. This project will be used to educate the public about opportunities to improve the health of Lake Champlain through innovative, yet practical, solutions for stormwater management on farms.