Quantifying Sediment Loading due to Stream Bank Erosion in Impaired and Attainment Watersheds in Chittenden County, VT Using Advanced GIS and Remote Sensing Technologies

Co-PIs: Leslie A. Morrissey, Assoc. Prof., RSENR/UVM and
Donna Rizzo, Assoc. Prof., CEMS/UVM

Collaborators: Don Ross (PSS/UVM) and Carolyn Alves (USDA NRCS)

Project Summary – January 2010

Stream erosion is one of the most important yet least understood nonpoint sources of sediment and phosphorus (P) threatening the impairment of surface water quality and aquatic habitats within the Lake Champlain basin. High spatial and temporal variability and the difficulties of quantifying erosion rates at watershed scales, however, have severely limited understanding the role and relative contribution of stream bank erosion to water quality degradation. Previous research has not provided the quantitative basis required to weight the importance of stream bank erosion relative to other sediment and P sources at watershed scales or the information needed to address within watershed variability in stream bank erosion over time.

To address these issues, we are quantifying the sediment loads mobilized by stream bank erosion over the past decade (1999-2008) in 15 Chittenden County watersheds by combining very high spatial resolution aerial and satellite imagery, LIDAR-derived elevation data, advanced digital image processing, GIS analyses (e.g. flow accumulation modeling) and field sampling. The research will develop an automated approach to quantify sediment loading to streams due to channel migration.

Our preliminary results indicate that both Allen and Indian Brooks are dynamic streams whose planform has continuously changed over the period of study and also demonstrate that remote sensing offers the potential to map and monitor these changes throughout the watershed consistently and at relatively low cost. A preliminary estimate of soil volume loss for all erosion features along these streams was calculated (Table 1) although final estimates and estimation of sediment loading are awaiting completion of on-going laboratory analyses on soil samples collected in 2009.

Table 1. Summary statistics for lateral channel migration over time along the entire lengths of Allen and Indian Brooks.

Stream	Stream Length (km)	Number of reaches	Lateral migration range/feature (m)	Number of erosion features	Erosion volume range/feature (m^3)
Allen Brook	20	12	2.5-49	71	0 - 446
Indian Brook	27	19	2.3 - 59	111	0 - 317