EVALUATION OF STREAMBANK STABILITY

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The erosion of streambanks constitutes a significant nonpoint source of pollution to the streams and lakes in Vermont. Extensive agriculture has resulted in stripping of riparian vegetation and soil impregnation with nutrients such as nitrogen and phosphorus. With over 7000 miles of waterways in Vermont these nutrient deposits represent a significant source of water pollution. This research examines what makes some banks stable and other banks fail over both time and changing river and groundwater conditions. The goal is to develop a reliable quantitative model of streambank slope stability. To develop such a model, quantitative and semi-quantitative approaches are adopted. The quantitative approach utilizes an in-depth geotechnical analysis incorporating measured soil strength parameters, water levels, bank geometries and failure processes. The semi-quantitative approach is similar; however, the soil strength parameters are empirically correlated to index properties. Since the summer of 2006, reaches of two streams in the Lake Champlain Basin have been selected for the study. Eight cross-sections on each stream reach, some on the verge of failure and some marginally stable, were surveyed and subsurface investigations were performed. Several boreholes were augered at each of these sites to determine the soil profiles and obtain soil samples. In-situ borehole shear tests were performed at these sites to determine soil's shear strength parameters; laboratory shear strength tests were also performed. One cross-section on each reach was instrumented with several groundwater wells, tilt switches and rain gages. Preliminary analysis of the measurements from this instrumentation indicated that they are working properly. The soil shear strength properties determined in the laboratory compared fairly well with those determined from the borehole shear tests. Methods for evaluating effects of grass roots on soil's strength and erodibility of soils in the banks are currently being developed. A stream bank stability evaluation model will be developed and validated using the above data.