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An assessment of landslide potential in Cape Breton Highlands National Park: a GIS approach

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Landslides are common in Nova Scotia, particularly within the highly incised river valleys of the Cape Breton Highlands (CBH) and occur as complex slides, slumps, debris flows, and skinflows. These landslides have resulted in the modification of habitat and may pose considerable risk as both industrial and recreational use of this region intensifies. Research in the CBH focuses on a) investigating the morphology of these slides and the temporal and spatial constraints on their formation and b) constructing a GIS to assess the risk potential of other sites within the CBH.

Thin-skinned landslides most commonly occur on south-facing slopes that exceed 34° at the interface between bedrock and the overlying colluvium. These landslides are complex events, which begin as thin translational slides that evolve quickly into debris flows. Failure has previously been attributed to the presence of steep slopes in incised valleys where colluvium directly overlies bedrock. We note that specific hydrological and stratigraphic conditions may be instrumental in the initiation of slope failure. In our investigations, highly compacted, impermeable clay-rich lodgement till was exposed on the slide scar and continues to act as both a barrier to surface water drainage and a conduit for groundwater flow. The colluvium/till boundary is the primary glide plane during initial failure. The activation zone was bounded by bedrock exhibiting low primary porosity in which occasional fracture associated seeps and springs were noted. We surmise that redirected surface and ground water accumulated at the colluvium/till interface within the activation zone producing an effective glide plane for initial translational movement.

Preliminary results from image analysis indicate that areas of both abnormally stressed vegetation and exposed bedrock are associated with known landslide sites. Site observations, vector and raster datasets, including Landsat TM and Radarsat satellite imagery, and aerial photographs of the region will be integrated to produce a landslide risk assessment Geographic Information System (GIS) database for the region. This GIS database will enable more specific and detailed analysis and advanced statistical modelling of landslides for the purpose of creating a landslide hazard prediction model that will be applied to other sites in eastern Canada to help influence present and future land-use applications.