

Identification of Geohazards using LiDAR, Nova Scotia¹

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Some geohazards, like abandoned mine openings and karst sinkholes, are subtle features typically obscured by forest cover making effective mapping with aerial photographs or ground-based surveys difficult; without accurate locations of these features problems arise for remediation and land-use planning. With the advent of LiDAR bare-earth imagery, a detailed view of the earth's surface without vegetation is possible, allowing for the identification and systematic mapping of these features. At the historical Montague Gold District in Halifax Regional Municipality, abandoned mine openings can be identified on the LiDAR bare-earth hillshade model. Subtle subsidence features (10 cm) can also be identified that might be used to identify partially collapsed mine workings, although effective identification using this technique would likely require multiple surveys. Similarly, illegal coal-pits — 1-2 m diameter, water-filled holes and associated 1 m mounds of overburden adjacent to them — can be identified at the Sydney Coalfield. The distribution of these surface pits accurately defines the strike of the coal seam in addition to bedding features that may allow for a more detailed and accurate definition of geological boundaries.

In karst terrain, sinkholes can be accurately mapped on the LiDAR bare-earth model and in Antigonish County four types of sinkholes were identified: (1) sinkholes in sub-horizontal gypsum that are overlain by thick clay-rich till, (2) dipping gypsum deposits where sinkholes can be mapped along strike, (3) fault-bounded karst terrain where the 'edge' of karst terrain can be accurately mapped, and (4) incipient sinkholes or features that appear like sinkholes in the initial stages of formation. Proposed land-use planning recommendations include creating buffer zones to limit activities that would significantly alter drainage around sinkholes of flat-lying deposits and along strike of dipping deposits. Where sinkholes have the potential to form, based on bedrock geology or the appearance of incipient sinkholes on the LiDAR imagery, we suggest an on-site assessment prior to construction of new property or roads.

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