Mass Movement Geohazards

Occurs when material such as rock, debris, and soil moves downslope.

EXTENTS	CONSEQUENCE
LOCAL-REGIONAL	MODERATE-HIGH

TYPE	DURATION	SEASONALITY	WARNING TIME	LIKELIHOOD
SHOCK	MINUTES-MONTHS	FALL-SPRING	DAYS	LIKELY

About the Hazard

These are powerful events that can occur suddenly and without warning, damaging a range of assets including buildings, roads, and utility infrastructure. Mass movement geohazards occur on a spectrum based on how quickly material is transported, the size of material, and the water content of the mass movement. Mass movement geohazards are primarily driven by local hydroclimate processes (intense or prolonged rainfall, rapid snowmelt, freeze-thaw cycles) or geophysical events (earthquakes). The likelihood of triggering rainfall patterns is influenced by large-scale climate conditions. The susceptibility of a slope failure is modulated by watershed physical characteristics (slope steepness, geology, soil properties), land use and changes (especially deforestation or post-wildfire conditions), and infrastructure and extractive modifications (like access roads or mine pits).

What We Assessed

In the study area, SLR Consulting identified and assessed hazards related to unstable slopes. Four hazard areas (HAs) were delineated, which represent similar conditions within a geographic area and include a buffer zone beyond the observed areas of instability. The four HAs were: **rockfall, rock-topple, coastal slides** and **slope instabilities within drainage networks**. Each HA was delineated using specific modelling and analysis techniques, which were used as the basis to understand areas of terrain stability concern.

Areas of stability change due to climate change were assessed based on professional judgement and understanding of interactions with projected climate (e.g., increased extreme precipitation and temperatures).

Recent Past | Current | Future | Far Future

Challenges

- The desktop analysis was not ground-truthed; therefore, maps should be considered approximate only.
- The hazard areas shown are not likely to occur simultaneously, nor do they represent secondary or tertiary effects from geohazard initiation.
- Geohazards are influenced by natural climate variability, which can obscure the effects of long-term climate change, as well as human-caused effects that may alter the natural state of stability.

Mapping Results

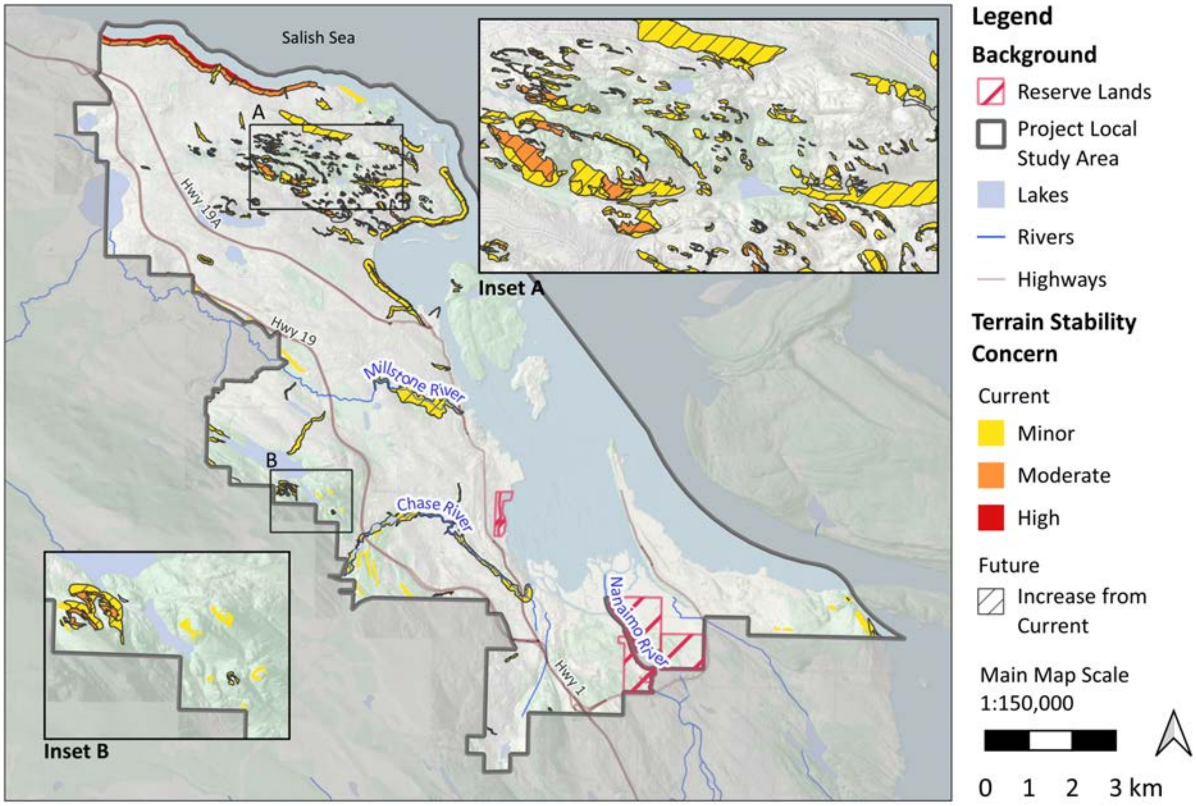
The map shows areas of minor, moderate, and high likelihood of mass movement initiation (stability concern) based on the 5-class terrain stability classification system in BC. For the recent past conditions, 453 ha were of minor likelihood. These areas may require specific management practices to reduce the likelihood of instability initiation. There was 102 ha of area with moderate likelihood, which require detailed assessment and management. Insets A and B provide more details on a couple of minor and moderate stability areas of concern.

Along the north coastal area, a 32 ha stretch of area was associated with a high likelihood of instability, due to coastal slides that include ongoing retrogressive landsliding (see top portion of the map). These areas are unsuitable for development without further site-specific analysis and mitigation measures.

Climate Change Trends (2050s)

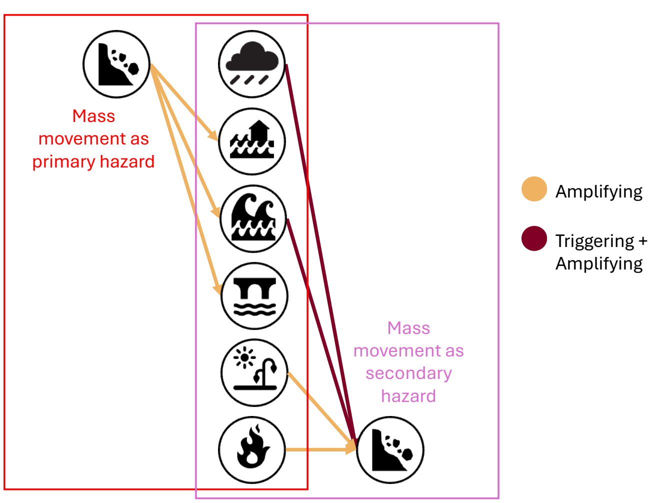
- Areas where the stability concern is likely to increase are shown with hatching in the above map.
- All four HAs are affected by climate change due to a combination of increasing precipitation, temperature, wind (potentially), and sea levels in the project area.
- Debris slides and retrogressive earth flows are likely to increase in areas already prone to this geohazard, and potentially in a small amount of new areas.
- Debris slides in coastal areas are even more sensitive to climate change due to the additional effects of sea level rise.
- Slope instabilities in drainage networks (e.g., along the banks of the Millstone and Chase Rivers) are likely to increase, leading to more slope failures during extreme precipitation events.

In the next 5-10 years, the above trends are likely to apply, meaning that this hazard is trending toward increased frequency of events occurring.



Interactions with Other Hazards

Mass movement geohazards amplify and coincide with riverine flooding (e.g., by damming rivers or adding sediment), coastal flooding (e.g., through coastal erosion from sea level rise and storm surges, and by triggering local tsunamis), and stormwater flooding (e.g., by blocking drainage). Mass movement geohazards are primarily triggered, amplified, and coincided by extreme precipitation. Coastal flooding (wave erosion) and riverine flooding (bank erosion) can also trigger and coincide with mass movements. Wildfire and drought amplify the susceptibility to future mass movement geohazards.



Emergency Management Considerations

- Due to its strong linkages with precipitation, mass movement geohazard potential could potentially increase during La Niña events, whose forecasting can be used to track upcoming hazard potential (see Provincial resource discussed in Section 9 Recommendations)[31].
- Emergency managers should prepare for an early and rapid response (e.g., evacuation) to imminent or active mass movement failures.
- Emergency preparedness planning may necessitate establishment of more widespread real-time monitoring networks and development of weather-related thresholds (e.g., rates and/or totals of rainfall) above which mass movements are likely.

31 The ENSO index is based on long-term average conditions, and it does not mean that an extreme precipitation event cannot occur during an El Niño phase.