

**CMER/Policy Interaction Framework Prospective Six Questions**  
**Deep-Seated Landslide Research Strategy: Landslide Mapping & Classification**  
**Project**

**Presented to CMER on August 25<sup>th</sup>, 2020**

**Type of Product in Review:**

**Prospective Answers:**  Charter  Scoping Document  Study Design

**Retrospective:**  Completed Pilot/Study Phase  Completed Final Study Report

**Brief Description:** This is a scoping document to outline the research objectives and preferred approach for the mapping and classification of deep-seated landslides (DSLs) in Western Washington (Projects 4.5 & 4.6 of the Deep-Seated Landslide Research Strategy). There are four research alternatives that are differentiated by spatial extent and landslide type (glacial deep-seated landslides (GDSLs) and/or bedrock deep-seated landslides (BDSLs)). The study described herein will provide the foundation for subsequent work within the Deep-Seated Landslide Research Strategy.

**1. Does the study inform a rule, numeric target, Performance Target, or Resource Objective?**

The Landslide Mapping & Classification Project will develop a protocol to identify DSL classes that may better inform rules, numeric targets, Performance Targets and Resource Objectives. For example, answers to two Rule Group critical questions “Can relative levels of response to forest practices be predicted by key characteristics of GDSLs and/or their groundwater recharge areas?” and “Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard?” are dependent on the baseline data produced by this project that will inform the subsequent research presented in the Strategy.

**2. Does the study inform the Forest Practices Rules, the Forest Practices Board Manual guidelines, or Schedules L-1 or L-2?**

While this project by itself is unlikely to directly change the Forest Practices Rules, because its inference will be empirical in nature, it may inform the policy interpretation of the unstable slopes rules. This project will develop the protocol and identify landslide classes that may inform the CMER Work Plan Unstable Slopes Rule Group 5.5 and the Forest Practices Board Manual 16. The project addresses the Schedule L-1 Priority Effectiveness Monitoring and Research directive that states “Develop a screen for deep-seated landslides.” It begins answering additional questions posed by the Forest Practices Board and Policy in the 2016 Proposal Initiation (WFPB 2016).

**3. Was the study carried out pursuant to CMER scientific protocols?**

Yes, this scoping document has been developed as the next step in the implementation of the Deep-Seated Landslide Strategy (Projects 4.5 & 4.6), a document previously approved by CMER and Policy

(CMER 2018). A summary showing the four study alternatives, as detailed in the scoping document, is provided below (Table 1).

**Table 1.** Alternatives as defined by landslide type and spatial extent.

Spatial Extent	Counties	GDSL	GDSL & BDSL
4-county	Whatcom, Snohomish, King, Pierce	Alt. 1	
4-county	Whatcom, Snohomish, King, Pierce		Alt. 2
9-county	Whatcom, Skagit, Snohomish, King, Pierce, Lewis, Kitsap, Clallam, Jefferson	Alt. 3	
9-county-plus-Gorge	Whatcom, Skagit, Snohomish, King, Pierce, Lewis, Kitsap, Clallam, Jefferson, and areas of the Columbia River Gorge		Alt. 4

#### 4. What does the study tell us?

The project will provide a classification of DSLs inferred to represent a range of landslide attributes, possible trigger mechanisms, and activity levels that may provide empirical inference, and will aid future work to quantify potential susceptibility to natural and forest practice triggers. This effort will provide the framework needed to pursue additional related projects as described in the Strategy. In particular, this information will allow us to better understand the influence of forest practices on DSL activity, and guide our future modeling and monitoring efforts.

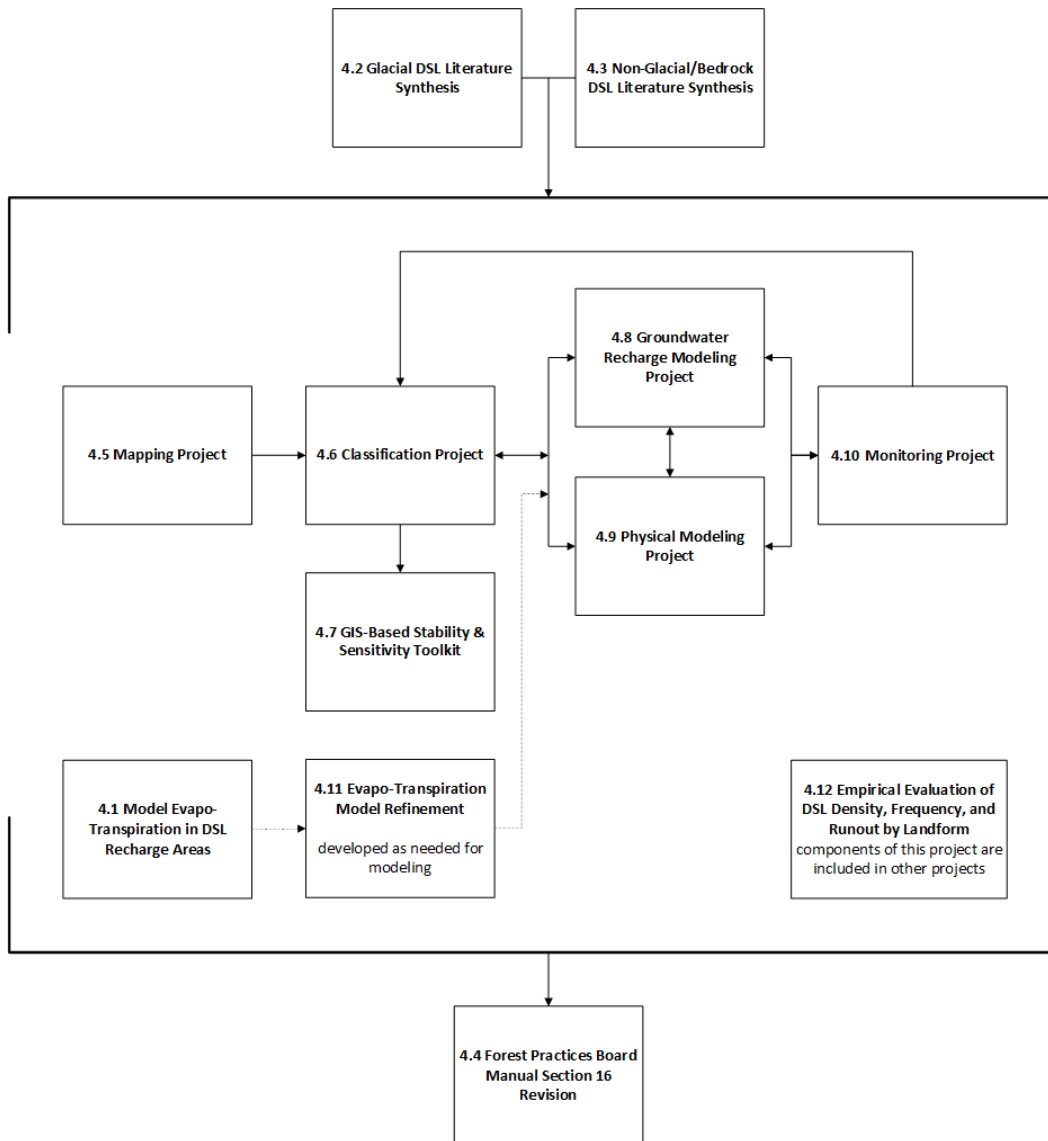
#### What does the study not tell us?

This project by itself will not provide quantitative evidence about the influence of forest practices on landslide reactivation. The mechanistic and hydrologic details of the influence of forest practices on different classes of DSLs will only be illuminated in future research as described in the Strategy.

#### 5. What is the relationship between this study and any others that may be planned, underway, or recently completed?

This is the next step in the implementation of the Strategy (Projects 4.5 & 4.6). There are at least four projects in the Strategy that will be developed based on the results of this project (Figure 1).

Other ongoing and completed studies that have a relationship with this study include Unstable Slope Criteria Evaluation and Development Project, Mass Wasting Prescription-Scale Effectiveness Monitoring (completed; Stewart et al. 2013), and Literature Syntheses of the Effects of Forest Practices on 1) Glacial Deep-Seated Landslides and Groundwater Recharge, and 2) Non-Glacial Deep-Seated Landslides and Groundwater Recharge (both completed; Miller 2016, Miller 2017).



**Figure 1:** Conceptual linkage of the projects presented in the Deep-Seated Landslide Strategy.

**6. What is the scientific basis that underlies the rule, numeric target, Performance Target, or Resource Objective that the study informs? How much of an incremental gain in understanding do the study results represent?**

Geologists have a good understanding of individual landslides and how they function. However, there are no published studies that explicitly evaluate the differences and similarities between DSL classes and the direct relationship between landslide classes and the forest management activities that may affect landslide sensitivity. This work is a critical step towards a better understanding of this relationship.

**References:**

Cooperative Monitoring, Evaluation and Research Committee (CMER), (March 19) 2018. Deep-Seated Landslide Research Strategy. Upslope Processes Scientific Advisory Group. 40 pp.

Miller, D. 2016. Literature Synthesis of the Effects of Forest Practices on Glacial Deep-Seated Landslides and Groundwater Recharge. Prepared for the Upslope Processes Scientific Advisory Group Cooperative Monitoring, Evaluation, and Research Committee. 139 pp.

Miller, D. 2017. Literature Synthesis of the Effects of Forest Practices on Non-Glacial Deep-Seated Landslides and Groundwater Recharge. Prepared for the Upslope Processes Scientific Advisory Group Cooperative Monitoring, Evaluation, and Research Committee. 105 pp.

Stewart, G., J. Dieu, J. Phillips, M. O'Connor, C. Veldhuisen, 2013, The Mass Wasting Effectiveness Monitoring Project: An examination of the landslide response to the December 2007 storm in Southwestern Washington; Cooperative Monitoring, Evaluation and Research Report CMER 08-802; Washington Department of Natural Resources, Olympia, WA. 138 pp.

Washington Forest Practices Board (WFPB). 2016. Proposal Initiation for Unstable Slopes. February 2, 2016 Board Motion to request adaptive management program review of unstable slopes issues not near resolution through the board manual stakeholder group and those needing either more science or rule making. Olympia, WA. 195 pp.