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| **Project Name** | Unstable Slopes Criteria Project (CWA Project) |
| **Work Plan Critical Question Addressed** | Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard? |
| **Project Elements** | Unstable landform identification, landslide susceptibility of different slopes/landforms |
| **Responsible TWIG*, SAG, and Project Manager** | Project Team: Unstable Slope Criteria/ TWIG<br>SAG: UPSAG<br>Project Manager: Lori Clark<br><br>**The Project Team was formerly organized as a Technical Writing and Implementation Group (TWIG)* |
| **CMER Scientist(s) and Principal Investigator(s)** | Project Team Members: Dan Miller, Ted Turner, Julie Dieu, and Jeff Keck<br><br>CMER Scientist/ Principal Investigator: TBD |
| **Status/Phase** | The Unstable Slopes Criteria Project consists of five distinct projects. approved by Policy in April 2017:<br><br>1. Compare/Contrast Landslide Hazard Zonation (LHZ) Mass Wasting Map Units with RIL (this project will be incorporated into subsequent projects per ISPR review comments).<br>2. Object-Based Landform Mapping with High-Resolution Topography<br>3. Empirical Evaluation of Shallow Landslide Susceptibility and Frequency by Landform<br>4. Empirical Evaluation of Shallow Landslide Runout<br>5. Models to Identify Landscapes/Landslides Most Susceptible to Management<br><br>The Project Team is currently reviewing the draft report for Project 2, Object-Based Landform Mapping with High-Resolution Topography Study. The report is scheduled to be presented to CMER in spring 2023.<br><br>A Study Design that combines the Empirical Evaluation of Shallow Landslide Susceptibility and Frequency by Landform (Project 3) and the Empirical Evaluation of Shallow Landslide Runout (Project 4) will be reviewed by CMER once the landform mapping report is finalized. This Study Design went through concurrent UPSAG/CMER review in August 2022 and was approved by UPSAG in October 2022. The Project 3 & Project 4 Study Design is expected to be approved by CMER in December 2022 and go through ISPR review in the spring of 2023. |
| **Expenditures to Date** | FY22: $33,436<br><br>FY19-FY21 Biennium: $55,052 |
| **Project Timeline** | The project is estimated to continue through 2027:<br>• FY2020 – Completed ISPR review for Project 2 and developed implementation plan.<br>• FY2023 – Continue work on Project 2 and work to complete draft final report.<br>• FY2023 – Develop and complete ISPR review of study plans for Projects 3 & 4.<br>• FY2024 – Initiate work on Projects 3 & 4.<br>• FY2025 – Develop a study plan and initiate ISPR review for Project 5.<br>• FY2026 – Complete work on and develop final reports for Projects 3 & 4, finalize study plans and begin implementation of Project 5.<br>• FY2027 – Completion of work on Project 5.<br>• FY2027/2028 – Development of final report for Project 5. |

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| **Complimentary Project(s) and/or Project Sequencing** | Mass Wasting Effectiveness Monitoring (completed), 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), Mass Wasting Landscape-Scale Extensive Monitoring |

**Project Summary and Purpose**

This project will evaluate the degree to which the "rule-identified" landforms defined in the Forest Practices rules (WAC 222-10-030) identify potentially unstable areas that are likely to impact public resources or threaten public safety. The project will be designed to evaluate the original Forests & Fish Report Schedule L-1 research topic: "Test the accuracy and lack of bias of the criteria for identifying unstable landforms in predicting areas with a high risk of instability" (FFR p. 127). The project replaces the Testing the Accuracy of Unstable Landform Identification Project, based on feedback from Policy at the November 2010 meeting. At that meeting, UPSAG presented two interpretations of the original Forests & Fish Report Schedule L-1 topic and asked for direction as to how to proceed and prioritize efforts. The Project Team (formerly organized as a Technical Writing and Implementation Group, or TWIG) understands that Policy's direction was to evaluate the landslide susceptibility of different slopes/landforms in the interest of evaluating current rule-identified landforms and identifying/characterizing additional potentially unstable landforms**.** The Project Team developed a document that summarizes Best Available Science and proposed alternative approaches for addressing the critical questions; the TWIG's preferred alternative was approved by Policy on April 6, 2017.

**Project Objectives**

The project will be designed to evaluate the landslide susceptibility of different slopes/landforms in the interest of evaluating current rule identified landforms and identifying/characterizing additional potentially unstable landforms.

**Budget***

| Breakdown by Project | | FY22 Budget | FY23 Budget | FY24 Budget | FY25 Budget | FY26 Budget | FY27 Budget | Total Budget |
|---|---|---|---|---|---|---|---|---|
| **Object-based landform mapping** | | $4,840 | | | | | | $4,840 |
| **Shallow landslide susceptibility** | | $50,000 | $100,000 | $10,000 | $10,000 | | | $170,000 |
| **Shallow landslide runout** | | | $50,000 | $10,000 | $10,000 | | | $70,000 |
| **Mgt Susceptibility modeling** | | | | $25,000 | $25,000 | $75,000 | $25,000 | $150,000 |
| **Total TWIG Budget** | | **$54,840** | **$150,000** | **$45,000** | **$45,000** | **$75,000** | **$25,000** | **$394,840** |

* August 10, 2022 Board-approved budget. Funding approved for FY22-FY23. Budget beyond FY23 are estimates only.

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| **Project Name** | Deep-Seated Landslide (DSL) Research Strategy Projects |
| **Work Plan Critical Questions Addressed** | • Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard?<br>• Does harvesting of the recharge area of a glacial deep-seated landslide promote its instability?<br>• Can relative levels of response to forest practices be predicted by key characteristics of glacial deep-seated landslide and/or their groundwater recharge areas? |
| **Project Elements** | Forest practices effects and response levels on deep-seated landslides. |
| **Responsible SAG and Project Manager** | SAG: UPSAG<br>Project Manager: Lori Clark |
| **CMER Scientist(s) and Principal Investigator(s)** | CMER Scientist/ Principal Investigator: TBD<br>Project Team: Julie Dieu, Anne Weekes, Jennifer Parker, Rachel Pirot |
| **Status/Phase** | Strategy approved by CMER (2018)<br>Project components completed to date:<br>4.1 Model Evapotranspiration in Deep-Seated Landslide Recharge Areas<br>4.2 Glacial Deep-Seated Landslide Literature Synthesis<br>4.3 Non-Glacial Deep-Seated Landslide Literature Synthesis<br><br>Currently in Study Design Development:<br>4.5 Deep-Seated Landslide Mapping Objective<br>4.6 Landslide Classification<br><br>Future components:<br>4.7 GIS Toolkit Development*<br>4.8 Groundwater Modeling<br>4.9 Physical Modeling<br>4.10 Landslide Monitoring<br>4.11 Evapotranspiration Model Refinement (as needed for modeling)<br>4.4 Board Manual Revision Project (intermittent process pending direction from the FP Board)<br>**The timing for Project 4.7, GIS Toolkit Development, is contingent upon the timing of the development of Study Design for Projects 4.5/4.6.* |
| **Expenditures to Date** | Expenditures prior to FY23: $151,725 |
| **Project Timeline** | UPSAG is currently developing a study design based on the Policy-approved Scoping Document for the Landslide Mapping and Classification Project (4.5 and 4.6) under the Strategy. The Study Design is anticipated to be provided to CMER for review in spring of 2023. Through the development of projects 4.5 and 4.6, tools will be developed that will inform Project 4.7, GIS Toolkit Development.<br>Strategy implementation will continue to 2029 or beyond. |
| **Complimentary Project(s) and Project Sequencing** | Complimentary Project: Unstable Slopes Criteria Project<br><br>Project Sequencing: Please see the Project Sequencing Budget table below. |

| **Project Summary and Purpose:** |
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| The strategy utilizes the results of the literature reviews for forest harvest effects on glacial and bedrock deep-seated landslides to address key knowledge gaps identified during the literature reviews and to address questions from the Forest Practices Board and Policy regarding the potential effects of forest practices on deep-seated landslides.<br><br>This strategy includes a description of multiple projects, identifies their priority, timeline, sequence, and estimated cost, and describes the relationship between the project and the critical questions. The strategy evaluates the existing CMER deep-seated landslide work plan projects and proposes revisions. |
| **Project Objectives** |
| The objective of the research strategy is to evaluate the potential effects of forest practices on deep-seated landslide processes, to include initiation and transport, and risks to public resources and public safety. This project includes mapping and describing different landslide classes, which are the first steps toward evaluating the potential effects of forest practices. |

**Budget***

* The August 10, 2022 Board-approved budget. Funding approved for FY22-FY23. Budget beyond FY23 are estimates only.

| **Project Description** | **FY 2022** | **FY 2023** | **FY 2024** | **FY 2025** | **FY 2026** |
|---|---|---|---|---|---|
| 4.5/4.6 Landslide Mapping & Classification | | $50,000 | $150,000 | $150,000 | $85,000 |
| 4.7 GIS Toolkit Development** | $25,000 | $35,000 | $25,000 | | |
| 4.8 Groundwater Modeling | | $45,000 | $25,000 | $50,000 | $25,000 |
| 4.9 Physical Modeling | | $45,000 | $25,000 | $50,000 | $25,000 |
| 4.10 Landslide Monitoring | | | | | $65,000 |
| *Total DSL Budget* | *$25,000* | *$175,000* | *$225,000* | *$250,000* | *$200,000* |

** The August 10, 2022 Board-approved budget. Funding approved for FY22-FY23. Budget beyond FY23 are estimates only.*

***The timing for Project 4.7, GIS Toolkit Development, is contingent upon the timing of the development of Study Design for Projects 4.5/4.6. The $25,000 for FY2022 was utilized for LiDAR acquisition to inform DSL projects.*

**Budget, continued**

| **Project Description** | **FY 2027** | **FY 2028** | **FY 2029** | **FY 2030** | **FY 2031** | **FY2032** | **Total** |
|---|---|---|---|---|---|---|---|
| 4.5/4.6 Landslide Mapping & Classification | $50,000 | | | | | | $485,000 |
| 4.7 GIS Toolkit Development | | | | | | | $60,000 |
| 4.8 Groundwater Modeling | $50,000 | $15,000 | | | | | $210,000 |
| 4.9 Physical Modeling | $50,000 | $15,000 | | | | | $210,000 |
| 4.10 Landslide Monitoring | | $160,000 | $200,000 | $200,000 | $200,000 | $100,000 | $925,000 |
| *Total DSL Budget* | *$150,000* | *$190,000* | *$200,000* | *$200,000* | *$200,000* | *$100,000* | *$1,890,000* |