Summary of the Unstable Slopes Rule Group

Special FPB Meeting
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Purpose of Strategy

Inform the FP HCP Goal:

To prevent forest practices from increasing or accelerating mass wasting beyond the naturally occurring rates.

Inform Rule Group Objectives and Targets

Resource Objectives:

- **Sediment**: Provide clean water and substrate . . . by minimizing . . . the delivery of management-induced coarse and fine sediment to streams . . .

Performance Targets:

- **Road-related**: Virtually none triggered by new roads, *and a* favorable trend on old roads.

- **Timber harvesting–related**: No increase over natural background rates from harvest on a landscape-scale on high-risk sites.

The Rule Group Strategy

- Implement an unstable-landform identification program; then

- Implement mass wasting effectiveness monitoring and validation programs to assess the effectiveness of landform recognition and mitigation at various scales.

Unstable Slopes Rule Group Critical Questions	Program Names	Task Type
What screening tools can be developed to assist in the identification of potentially unstable landforms that minimize the omission of potentially unstable landforms?	Unstable Landform Identification	Rule Tool
Does harvesting of the recharge area of a glacial deep-seated landslide promote its instability?	Glacial Deep-Seated Landslides	Rule Tool
Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard? How does the rate of landsliding on managed lands compare to an estimate of the natural (background) rate? Are the forest practices unstable-landform rules effective at reducing the rate of management-induced landsliding at the landscape scale? Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units? Does windthrow on mass wasting buffers (leave areas) increase mass wasting?	Mass Wasting Effectiveness Monitoring	Effectiveness
What levels of cumulative sediment inputs are harmful to aquatic resources at the basin scale?	Mass Wasting Validation	Intensive

Unstable Landform Identification Program

Program Strategy:

- Provide screening tools to identify areas containing potentially unstable slopes to improve our ability to avoid them.

  Program consists of five projects that provide statewide information on the distribution of unstable landforms.

Unstable Landform Identification Program - Rule Group Critical Questions	Project Names	Status
What screening tools can be developed to assist in the identification of potentially unstable landforms that minimize the omission of potentially unstable landforms?	Shallow Rapid Landslide Screen for GIS Project	Westside complete – Eastside on hold awaiting LHZ
	Technical Guidelines for Geotechnical Reports Project	Complete
	Regional Unstable Landforms Identification Project (RLIP)	Complete
	Landform Hazard Classification System and Mapping Protocols Project	Complete
	Landslide Hazard Zonation Project	Completed 2 of three phases – on hold

Shallow Rapid Landslide Screen for GIS Project

- First two phases developed a GIS screen of modeled slope stability based on DEM topography on Westside.

- Third phase would identify models for mapping the Eastside - on hold awaiting completion of LHZ Project.

Technical Guidelines for Geotechnical Reports Project

- Developed technical guidelines for geotechnical reports for the SEPA review process.

- Identifies analytical tools and techniques for different projects and scales.

Landform Hazard Classification System and Mapping Protocols Project

- Developed <u>protocol</u> for mapping landslides and potentially unstable landforms, leading to the assignment of hazard.

- Used for implementing the LHZ Project.

Landslide Hazard Zonation (LHZ) Project

- Phase 1: Mass wasting modules from completed watershed analyses and information on unstable landforms compiled in a GIS database - used as a screening tool in the FPA process.

- Phase 2: Mass wasting modules from incomplete watershed analyses were finished and added to the database; or were rejected.

- Phase 3: Protocol was being implemented for a list of priority watersheds.

  13 of the 22 priority Watershed Administrative Units were completed.

Regional Unstable Landforms Identification Project (RLIP)

- CMER worked with TFW cooperators in each DNR region to identify unstable landforms not meeting statewide descriptions.

- Used as interim screen for <u>deep-seated landslides</u> by identifying lithologies and areas that promote them.

- Results used by DNR for classifying FPAs, and incorporated into the work of the LHZ team.

UPSAG considers the **Unstable Landform Identification Program** to have satisfied the requirements of the critical question.

Recommendations for Addressing Gaps:

- As LIDAR becomes broadly available, develop an updated shallow rapid screening tool.

- The unfinished LHZ WAUs should be addressed when adequate funding is reestablished.

Glacial Deep-Seated Landslides Program (Rule Tool)

Program Strategy: To develop science, tools, and/or guidance for assessing the resource impact potential of deep-seated landslides in glacial sediments resulting from changes in groundwater hydrology during and after timber harvest in the landslide recharge area.

Glacial Deep-Seated Landslides Program	Project Names	Status
Does harvesting of the recharge area of a glacial deep-seated landslide promote its instability?	Model Evapo-Transpiration in Deep-Seated Landslide Recharge Areas Project	Complete
	Evapo-Transpiration Model Refinement Project	Potential
	Landslide Classification Project	Potential
	Groundwater Recharge Modeling Project	Potential
	Board Manual Revision Project	Potential

Model Evapo-Transpiration in Deep-Seated Landslide Recharge Areas Project

- Analytical model developed to assess evapo-transpiration changes due to timber harvest. Model neither validated or used due to a general lack of required input data.

Evapo-Transpiration Model Refinement Project

- Would use fine-scale meteorological data to validate or refine the evapo-transpiration model and develop materials to facilitate its application.

  UPSAG does <u>not</u> recommended pursuing this project - essential scientific uncertainties unlikely to be resolved.

Landslide Classification Project

- Would categorize common stratigraphic and geomorphic situations among deep-seated landslides in glacial sediments to hypothetically evaluate situations most sensitive to changes in groundwater from upslope harvest.

  UPSAG recommends that this project <u>not</u> be pursued. It may be more attractive if it includes an empirical evaluation of movement of active landslides where harvest occurred in the recharge area.

Groundwater Recharge Modeling Project

- Would use groundwater modeling to determine if parts of the groundwater recharge zone are most influential to landslides.

  Modeling should focus on common and probably sensitive situations as identified by the Landslide Classification Project.

Board Manual Revision Project

- Revise the BM (16) to describe deep-seated landslides at risk and intensity of study required.

  Base on the expertise of geologists with extensive experience with deep-seated landslides.

Recommendations for Addressing Program Gaps:

- Focus near-term research on making *empirical* determinations of the degree to which:

  (1) cumulative winter evapo-transpiration is significant, (2) vegetation conversion affects winter evapo-transpiration, and (3) groundwater storage levels are changed.

Mass Wasting Effectiveness Monitoring Program

Assess the degree forest practices rules prevent or avoid increases in land sliding beyond natural background levels.

Program Strategy: (1) evaluate the effectiveness of identifying unstable slopes for applying prescriptions (avoidance or mitigation); and (2) evaluate effectiveness at two scales, the landscape and site scale.

Mass Wasting Effectiveness Monitoring Program Rule Group Critical Questions	Project Names	Status
Are unstable landforms being correctly and uniformly identified and evaluated for potential hazard?	Unstable Slope Criteria Project	Proposed
Are the forest practices unstable slopes rules reducing the rate of management-induced landsliding at the landscape scale? Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units?	Mass Wasting Effectiveness Monitoring	Complete
How does the rate of landsliding on managed lands compare to an estimate of the natural (background) rate? Are the forest practices unstable-landform rules effective at reducing the rate of management-induced landsliding at the landscape scale? Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units?	Mass Wasting Landscape-Scale Effectiveness Monitoring	Proposed
Does windthrow on mass wasting buffers (leave areas) increase mass wasting?	Mass Wasting Buffer Integrity and Windthrow Assessment	On hold

Unstable Slope Criteria Project: An Evaluation of Hillslopes Regulated under Washington Forest Practices Rules

- Evaluate degree landforms described in the unstable slopes rules identify unstable areas with a high probability of impacting public resources.

Mass Wasting Effectiveness Monitoring Project

- Compared landslide rates among five harvest treatments and five road treatments following the 2007 storm.

  Study intended to answer : "Are the forest practices unstable slopes rules reducing the rate of management-induced landsliding at the landscape scale?" <u>and</u>

  "Are the mass wasting prescriptions and mitigation measures effective in preventing landslides from roads and harvest units?"

Mass Wasting Landscape-Scale Effectiveness Monitoring Project

- Project to evaluate trends in the number and volume (or area) of landslides over time.

  Would include FP HCP–managed lands and other forestlands under no or less extensive management.

Mass Wasting Buffer Integrity and Windthrow Assessment Project

- Project to test the effect of windthrow in mass wasting leave areas on overall landslide rates.

  Status: Policy requested integrating windthrow questions into other CMER projects.

Mass Wasting Validation Program (Intensive)

Program Strategy: No program strategy has been developed.

Mass Wasting Validation Program Rule Group Critical Questions	Project Names
What levels of cumulative sediment inputs are harmful to aquatic resources at the basin scale?	No projects have been developed