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Natural Resources

Peter Goldmark - Commissioner of Public Lands

Southern Willapa Hills Retrospective Study

Background

Methods

Findings

Conclusions and Recommendations

Background

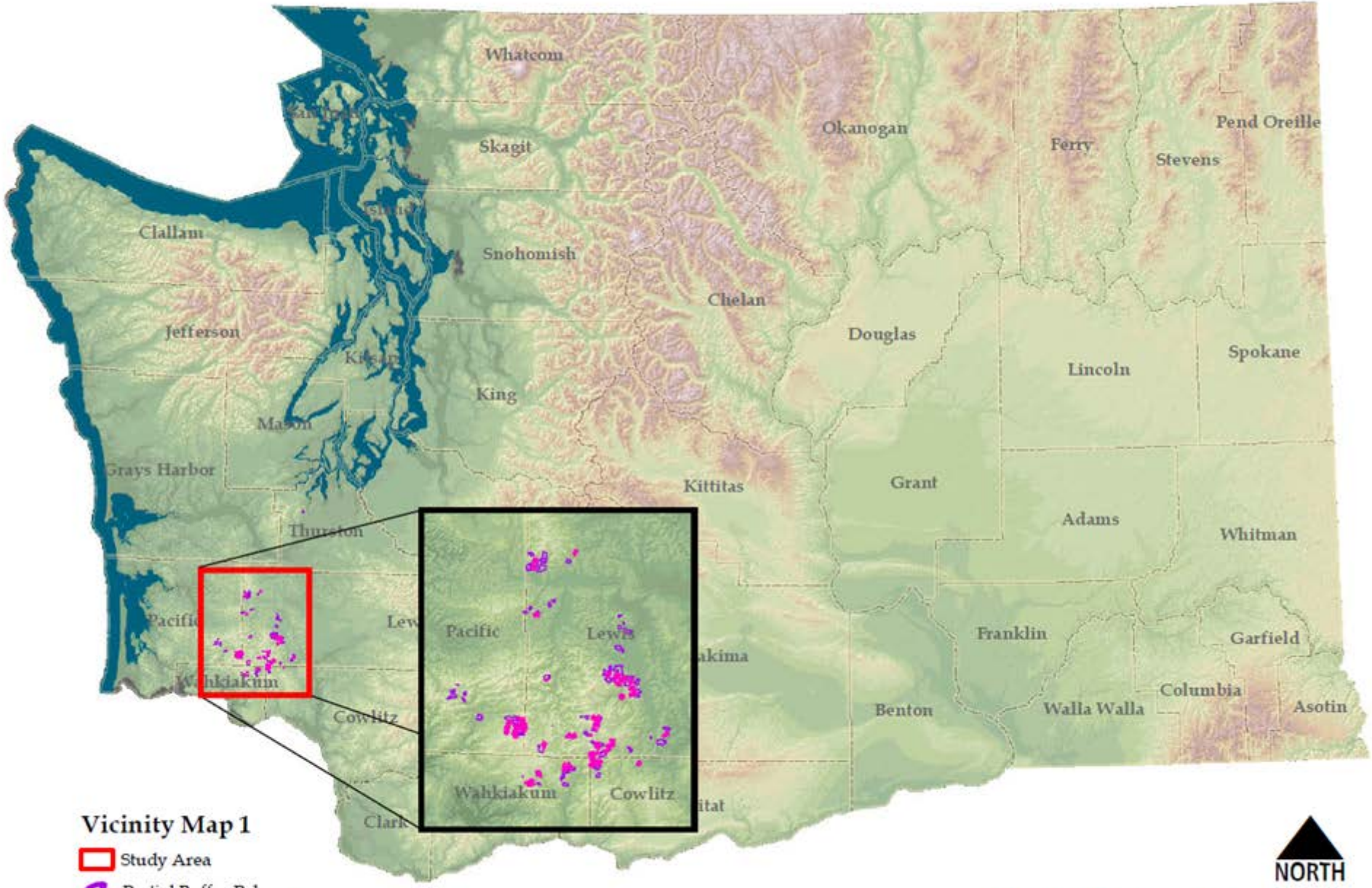
- A 2007 storm event in the Willapa Hills of SW Washington
- Many landslides delivered debris and sediment to typed waters
- Some landslides initiated in approved Forest Practices Application (FPA) areas

Background

- In February 2008 the Forest Practices Board asked whether current Forest Practices rules were:
  - Followed in harvest units; and
  - Unstable features were buffered.

Background

- CMER UPSAG conducted “The Mass Wasting Effectiveness Monitoring Project: An examination of the landslide response to the December 2007 storm in Southwest Washington”
- The Mass Wasting Study contended that 50 percent of the study area harvested since 2001 contained at least one partially harvested rule-identified landform (RIL)
- RIL harvests seemed inconsistent with FP rules because harvest is restricted on RILs


Whatcom
Skagit
Okanogan
Ferry
Pend Oreille
Stevens
Clallam
Snohomish
Chelan
Douglas
Jefferson
Lincoln
Spokane
King
Mason
Grays Harbor
Kittitas
Grant
Adams
Whitman
Thurston
Pacific
Lewis
Franklin
Garfield
Wahkiakum
Cowlitz
Benton
Columbia
Walla Walla
Asotin
Clark
Vicinity Map 1
Study Area
Partial Buffer Polygons
Selected FPAs
1:2,250,000
NORTH
Southern Willapa Hills Retrospective Study
Forest Practices Division
Department of Natural Resources

Willapa Hills study

- Forest Practices program decided to conduct the Willapa Hills study to:
  1. Examine whether FPAs contained harvested RILs
  2. If so, examine how the processing of the FPAs addressed those RILs

Rule-identified Landform (RIL)

- Defined in WAC 222-16-050(1)(d)
- Areas that contain similar slope characteristics
  - Primarily related to mass wasting potential
- Based on:
  - slope angle
  - slope shape
  - delivery potential to public resource
  - threats to public safety
  - geology

Rule-identified Landform (RIL)

- Convergent landforms steeper than 70%
  - Bedrock hollow, inner gorge, convergent headwall
- Toes of deep-seated landslides steeper than 65%
- Outer edges of meandering streams
- Glacial recharge areas of deep-seated landslides
- Other (cumulatively indicate presence of unstable slopes)

Willapa Hills study

- Study reviewed December 2007 landslides within FPAs in the southern Willapa Hills
- Only reviewed FPAs approved and harvested between July 1, 2001 and December 1, 2007

Objectives of Willapa Hills Study

- Verify if landslides initiated within a RIL
- Determine if harvest had occurred within a RIL
  - If so, was harvest governed by a geotechnical report or an approved watershed analysis (WSA) mass wasting prescription in accordance with FP rules
- Evaluate the justification for harvest on the RILs

Willapa Hills study

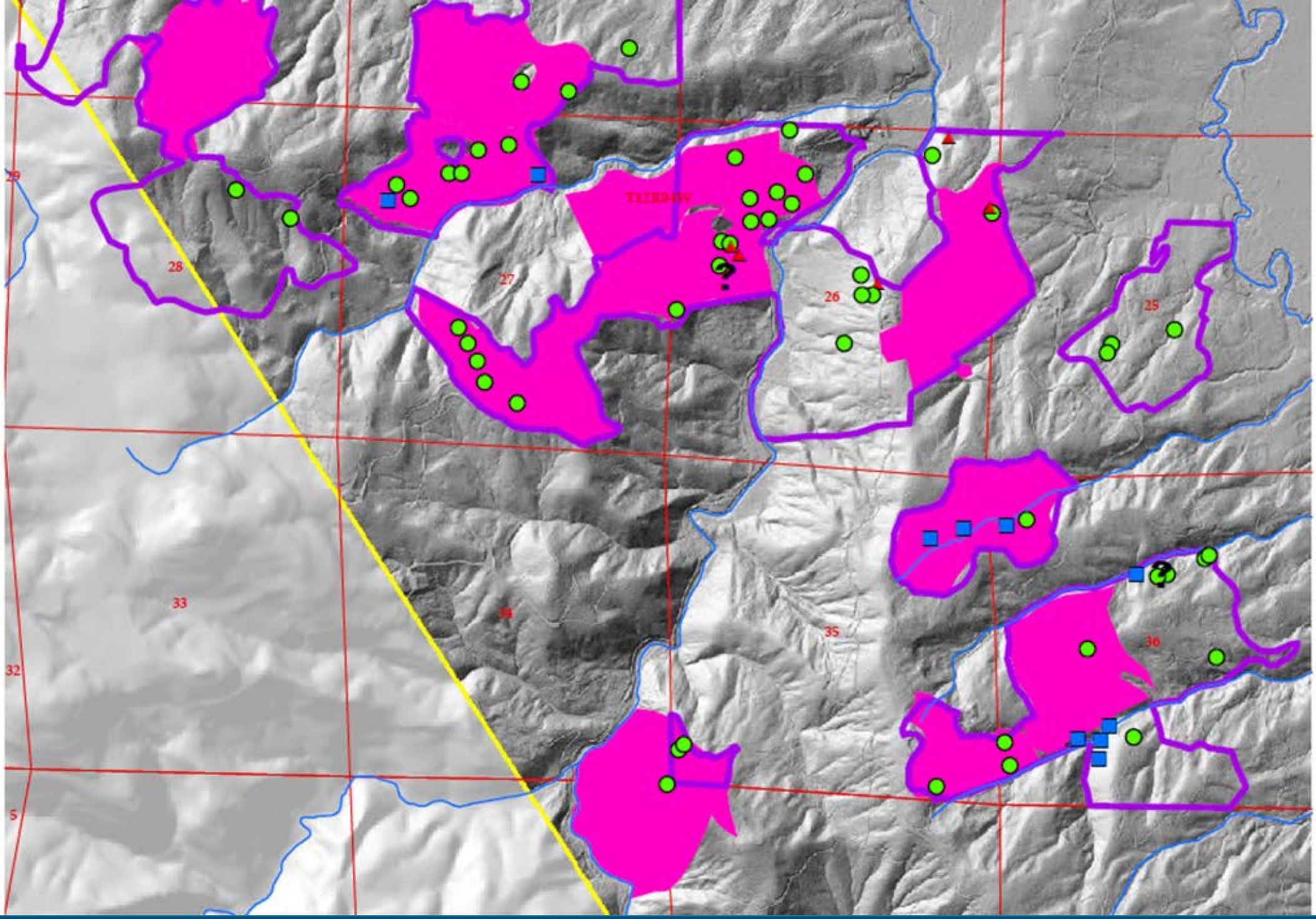
- Tools to locate potential RILs
  1. Landslide GIS data points from the Mass Wasting Effectiveness Study
  2. Pre- and post-storm aerial imagery
  3. Landform modeling from Lidar where available
  4. Field review conducted by a DNR geologist with LEG credentials and an Forest Practices forester

Willapa Hills study

- Remote sensing indicated 103 landslides located within harvested portions of 37 approved FPAs
- All 103 were visited by a Forest Practices forester and a DNR Licensed Engineering Geologist (LEG)

FPA selection

- Timber harvest FPAs approved and harvested between July 1, 2001 and December 1, 2007
- FPAs that overlapped Mass Wasting Effectiveness Study Partial Buffer polygons
- FPAs with non-road related landslides that resulted from the 2007 storm



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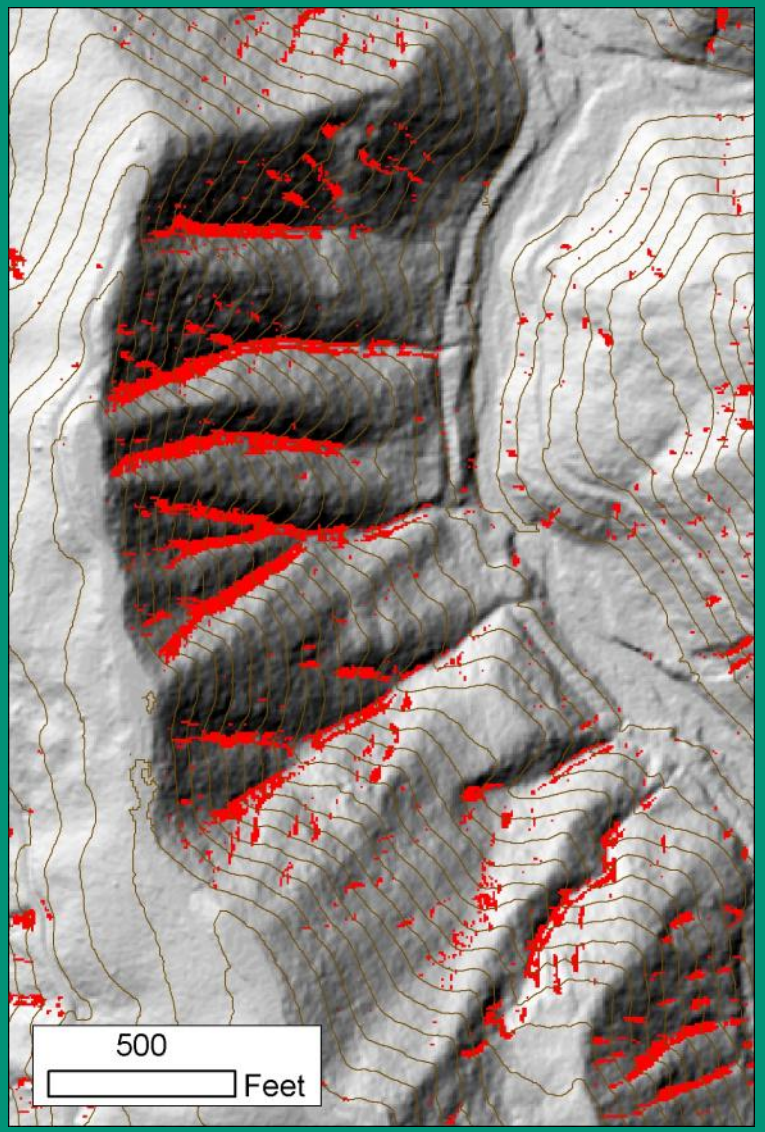
Remote sensing

- Lidar coverage over 28 percent of study area
- GIS tool Lidar derived slope stability model used to remotely identify potential RILs
  - Field verification
- No Lidar – aerial imagery and field verification



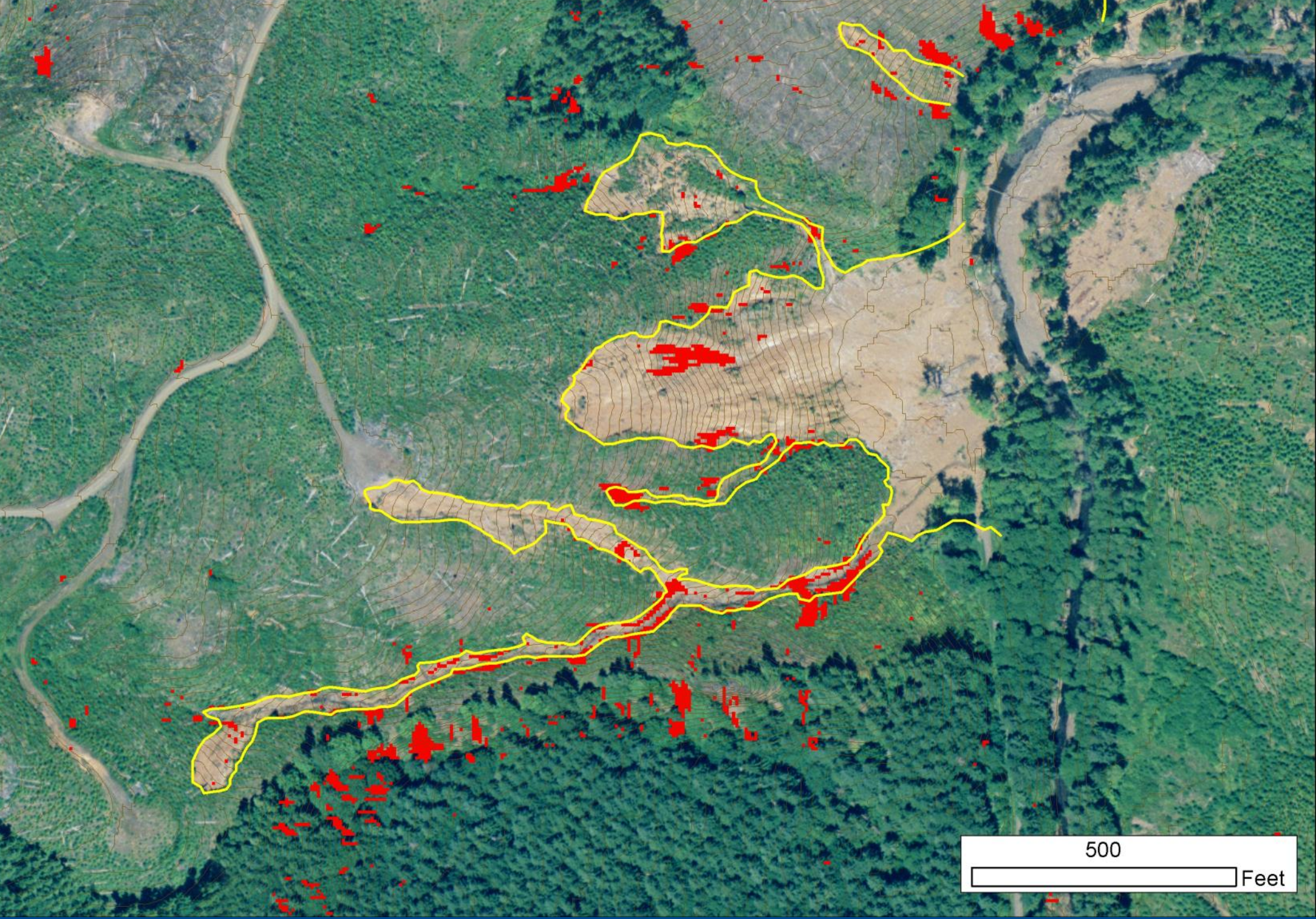
FPA Documentation Review

- Determine existence of a geotechnical report
- Determine that FPAs were located within an approved mass wasting prescriptions in WSA
- Identify the scientific basis for harvest on RIL

Field Review

- August 13 to September 26, 2012
- At each landslide an LEG documented:

  geology, surrounding slope form, and likely landslide initiation point
- LEG estimated presence, likelihood, or probable type of “pre-landslide” RIL that existed before the 2007 storm*



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Analysis

Data collection and analysis included the following:

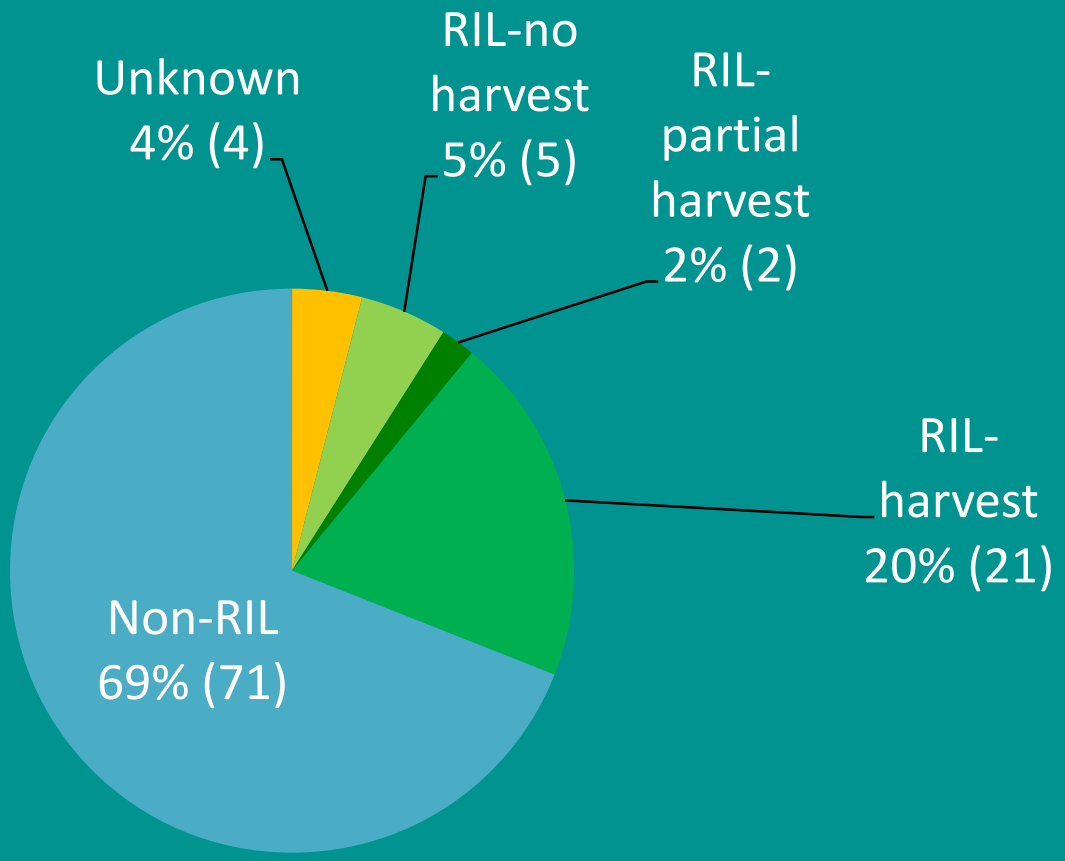
- Presence of probable RIL
- Type of probable RIL
- Presence and type of timber harvest
- Presence of associated geotechnical report and WSA prescriptions
- Presence of explanation for RIL harvest

Challenges

Data collection challenges:

- Five years after the storm (perishable data):
  - Additional landslide movement/ravel
  - Vegetation growth
- Slope measurements adjacent to landslide

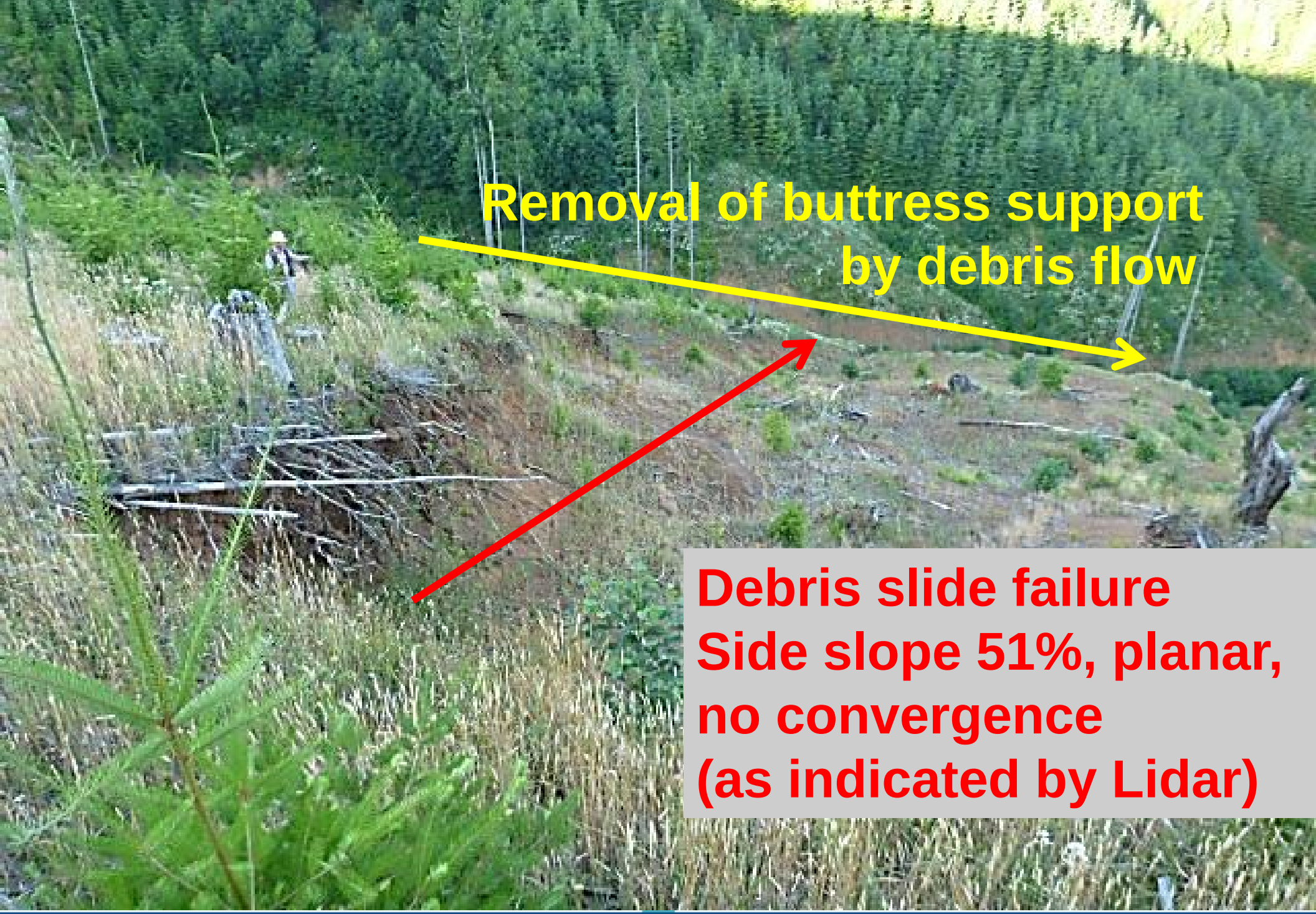
Landform and harvest type prior to failure

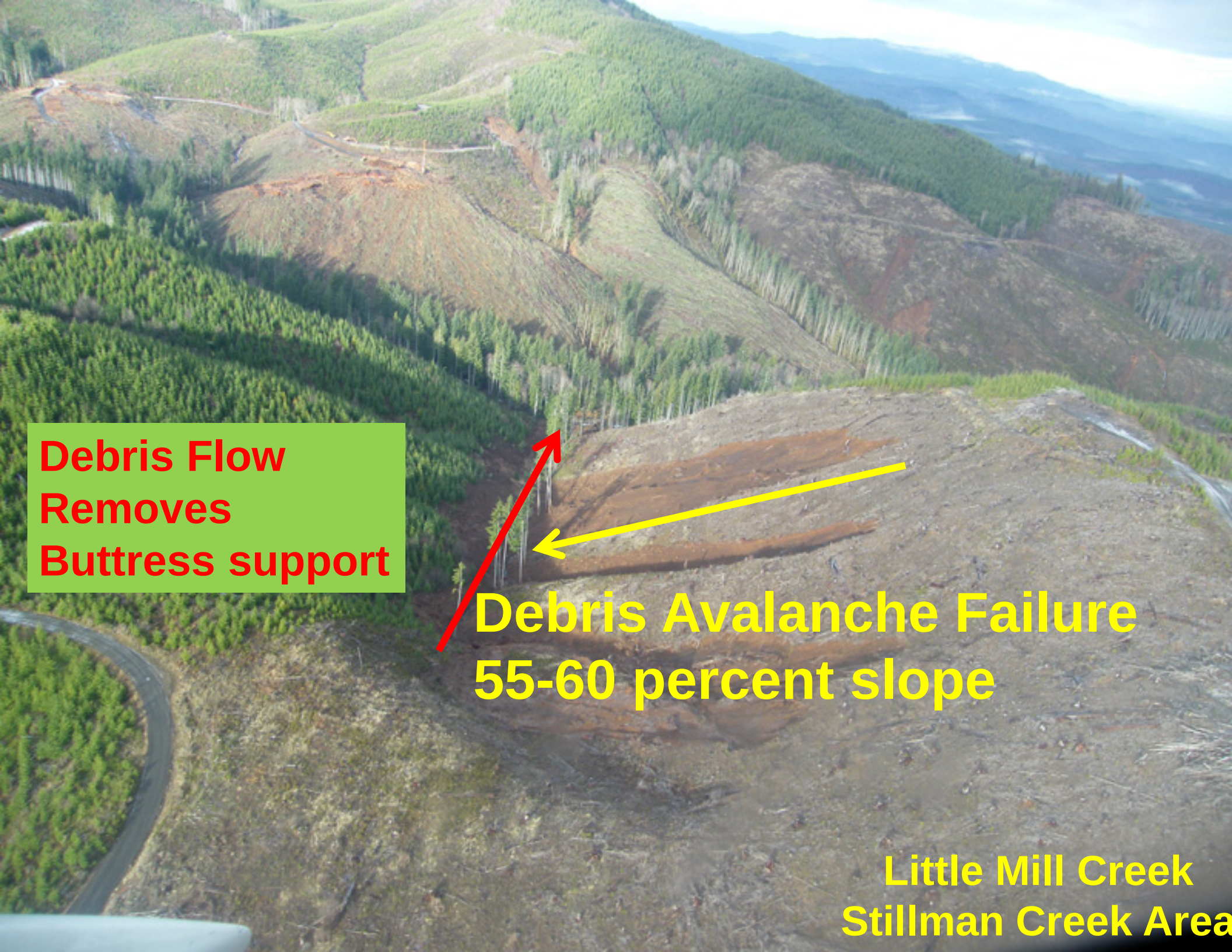


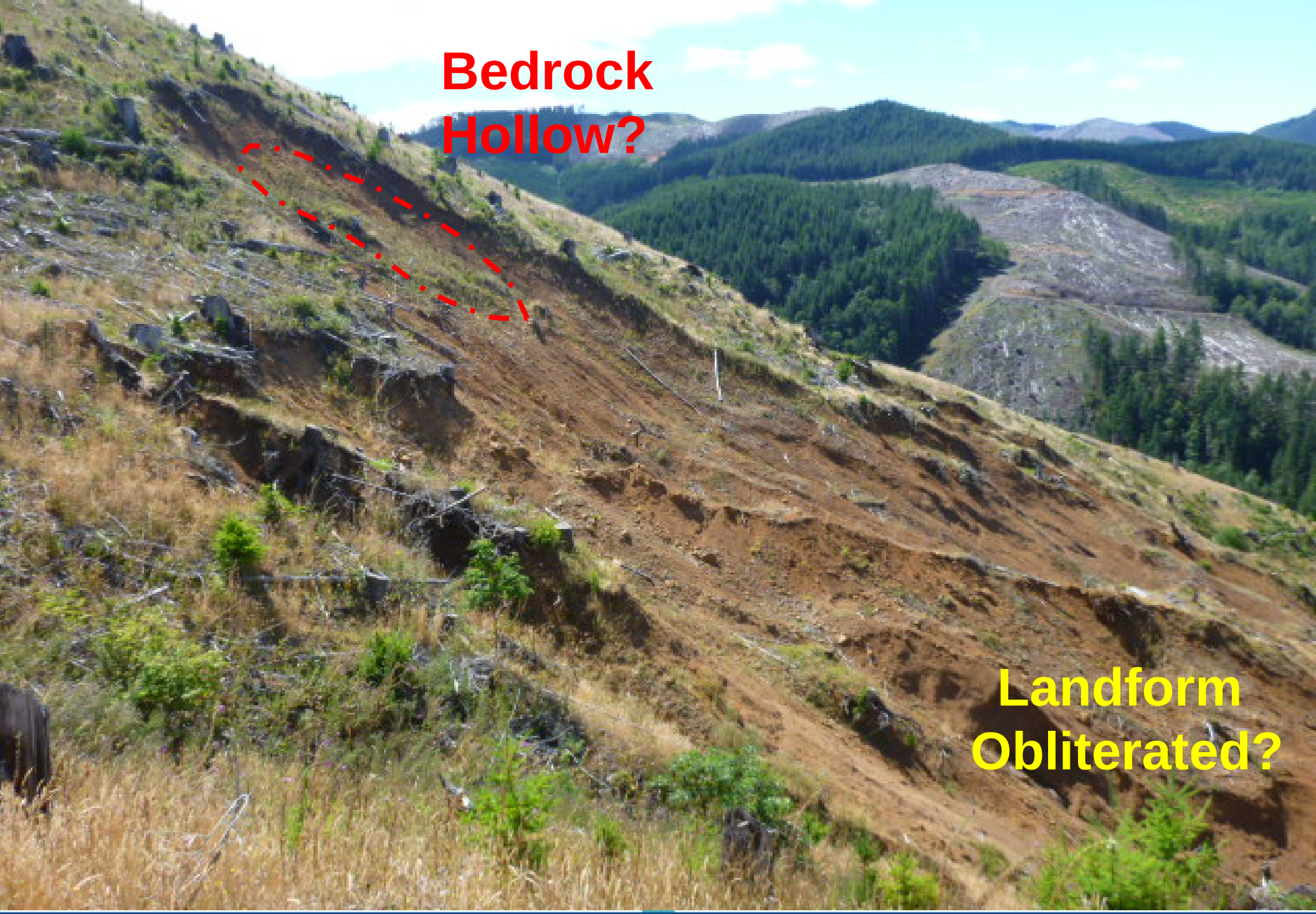
n=103

Landslide initiation areas

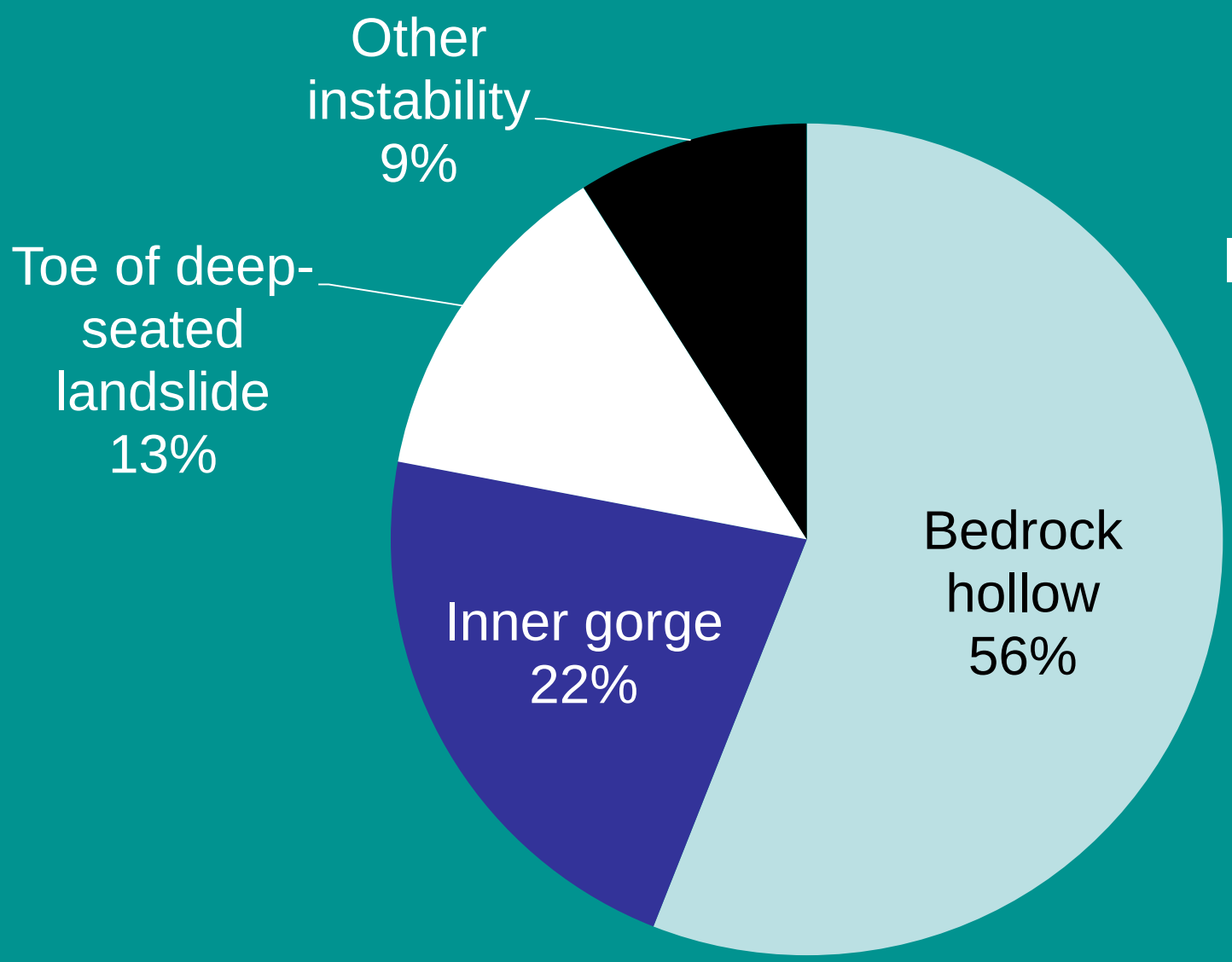
- 71 landslides from "non-RILs" (buttress support was removed, measuring)
- 4 landslides unknown
- 28 landslides from probable RILs
  - no harvest on 5
  - partial harvest on 2
  - 21 harvested


Removal of buttress support
by debris flow
Debris slide failure
Side slope 51%, planar,
no convergence
(as indicated by Lidar)


Debris Flow
Removes
Buttress support
Debris Avalanche Failure
55-60 percent slope
Little Mill Creek
Stillman Creek Area


Bedrock Hollow?
Landform Obliterated?

RIL type for harvested landslides originating in probable RILs



There were no glacial deep-seated landslides In the Willapa Hills Study

n=23

Findings

- FPA file documentation showed that of the 23 landslides:
  - 22 were harvested following mitigated measure of a geotechnical report and/or approved WSA mass wasting prescriptions
  - 1 RIL landslide was in an FPA processed as if a RIL was not present

Findings- WSAs

- Of 23 landslides initiating from a probable RIL with harvest
  - 19 occurred in FPAs under approved WSA mass wasting prescriptions (rescinded Aug 2013)

Take Away Findings/Conclusions for FP Program

- Confirmed that the FP Program processed FPAs that contain potentially unstable slopes in accordance with FP Rules

Findings

- FP rules were followed
  - Geotechnical reports required for processing were obtained
  - RILs were identified
  - Harvest on unstable slopes was governed according to FP rules - by either a geotechnical report or approved WSA mass wasting prescriptions

Recommendations

- We found that the quality of some maps in the FPA files were illegible
  - The Forest Practices program purchased 6 new scanners in fiscal year 2012 to achieve high resolution copies.
  - Qualified experts encouraged to submit a report electronically in concurrence with FPA

Recommendations

- Remote identification of potential RILs is extremely challenging in areas where Lidar was not available
- We recommend that DNR work with stakeholders to gain funds to purchase Lidar (Work with the Puget Sound consortium where possible)

Southern Willapa Hills Retrospective Study

Full report available at the following web address:

http://www.dnr.wa.gov/Publications/fp_willapa_hills_final_report.pdf

QUESTIONS?

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