Forest Practices Effects on Unstable Landforms

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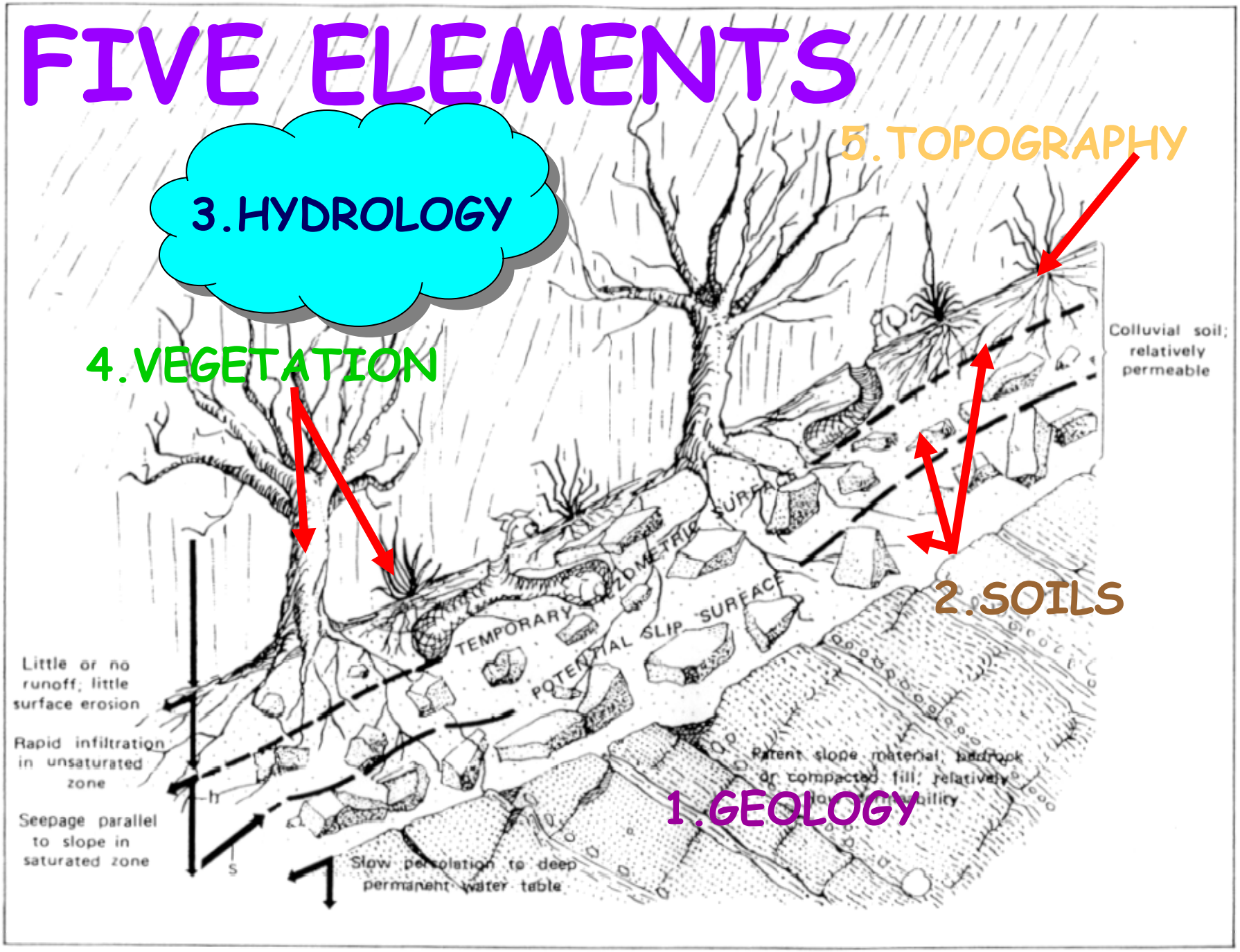
My talk today:

- 5 elements of slope stability
- How tree removal affects shallow landslides
- How roads affect shallow landslides
- Slope Stability Continuum concept
- How tree removal and roads affect deep-seated landslides

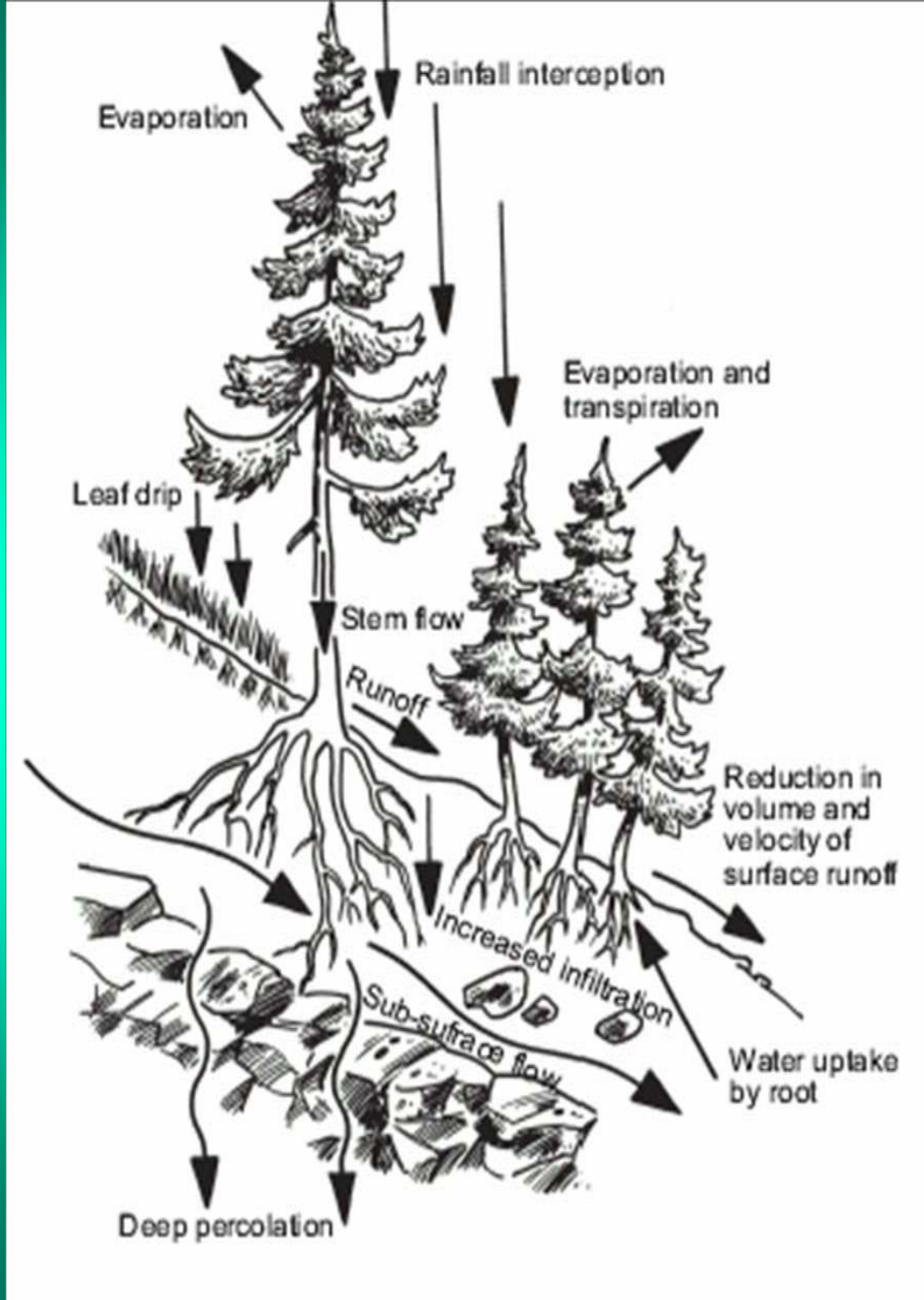
FIVE ELEMENTS



Effects of vegetation shallow rapid landslides

- Vegetation and hydrology (more water can increase landslides on unstable slopes)
- Vegetation and root strength

Vegetation and Hydrology



Rain on snow – mid-elevations

- More snow collects in clearcuts than under mature forest
- Warm tropical storms can bring lots of rain and melt snow on the ground
- Total ground moisture higher - greater landslide risk-with more young clearcuts in the r-o-s zone
- Total stream flow higher - greater flooding risk – with more young clearcuts in r-o-s

Vegetation and Root Strength

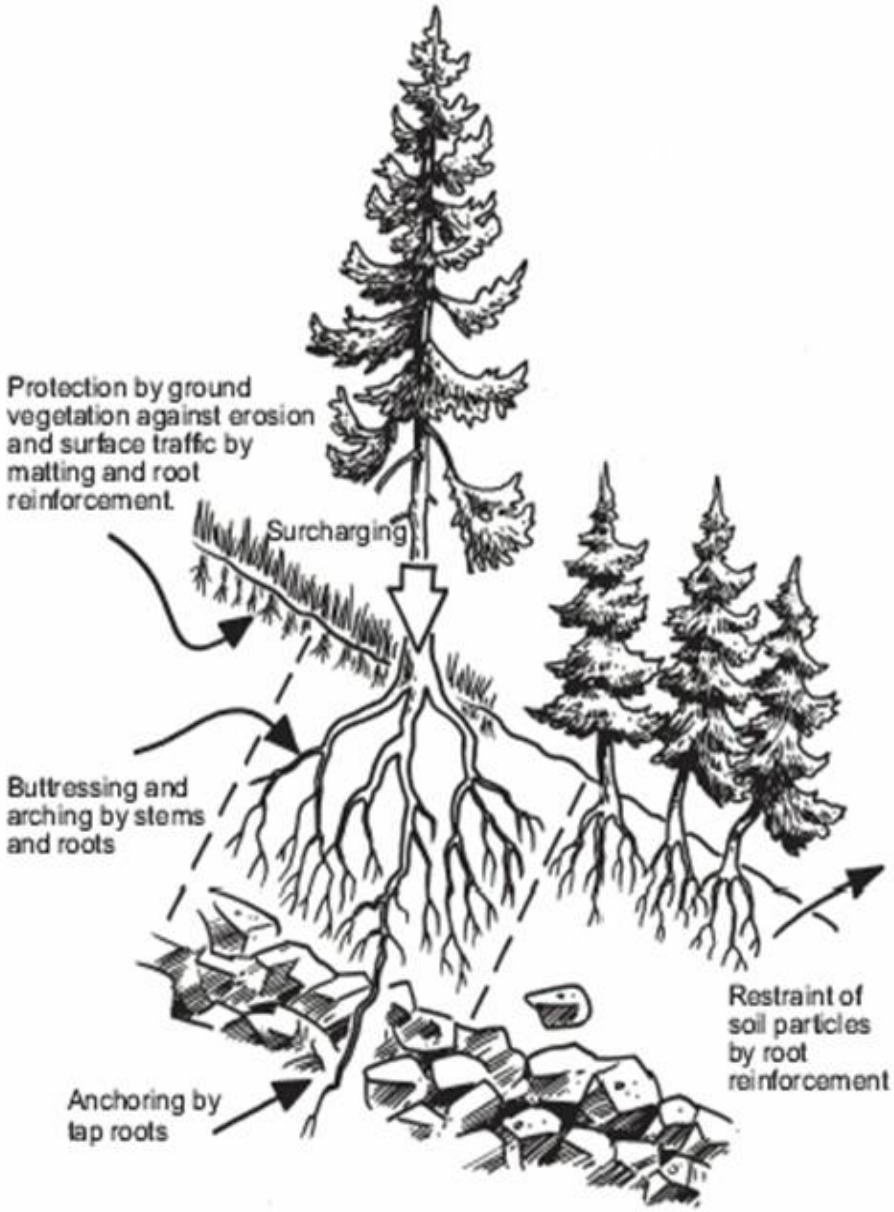
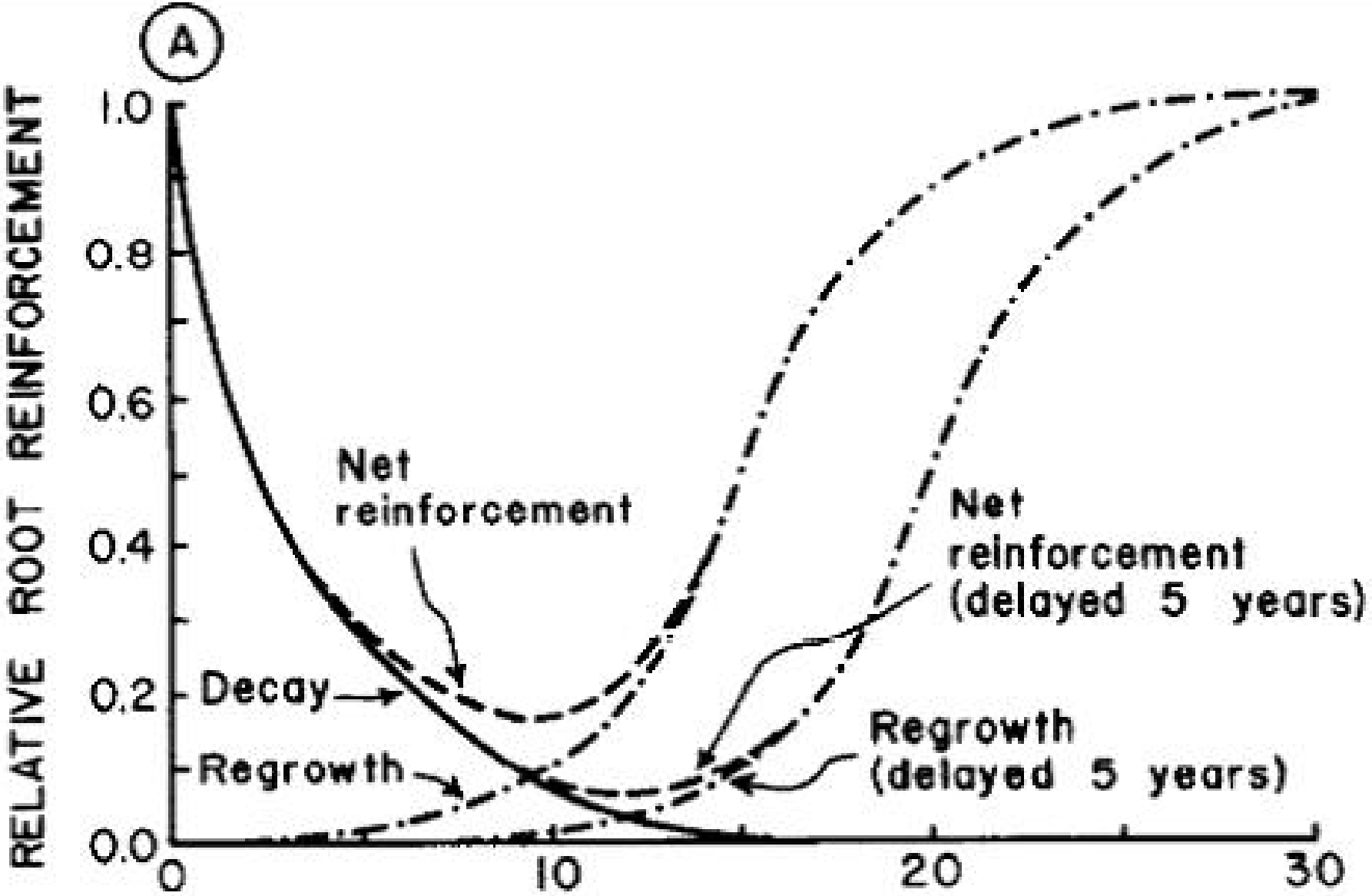


Fig. 4.10 Stabilizing effects of vegetation.


A
RELATIVE ROOT REINFORCEMENT
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
Net reinforcement
Net reinforcement (delayed 5 years)
Decay
Regrowth
Regrowth (delayed 5 years)

(Ziemer, 1981)

- Effects of roads on shallow rapid landlslides
  - Interrupt the slope
  - Water management
  - Materials management

Road profile from Leopold & Dunne

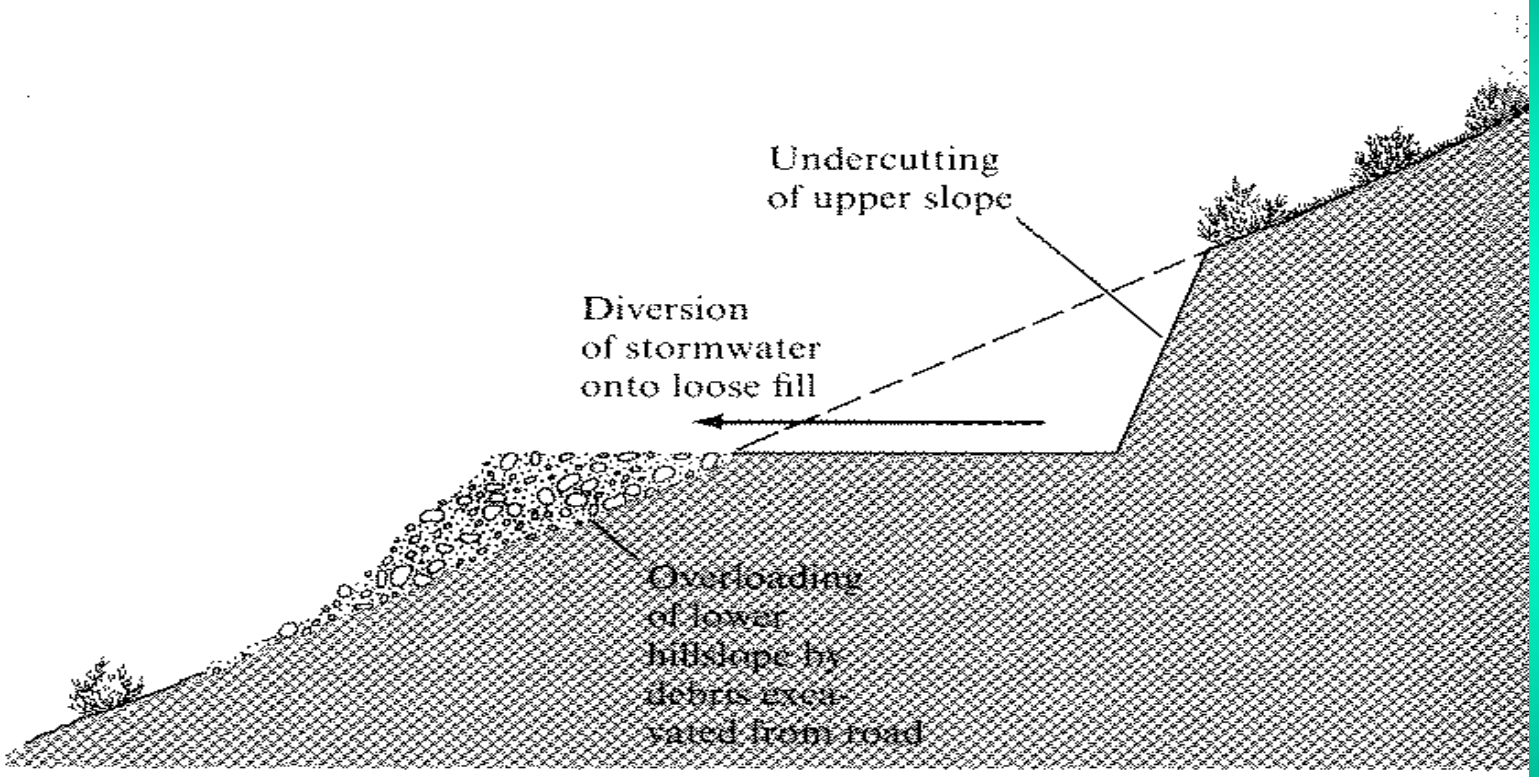
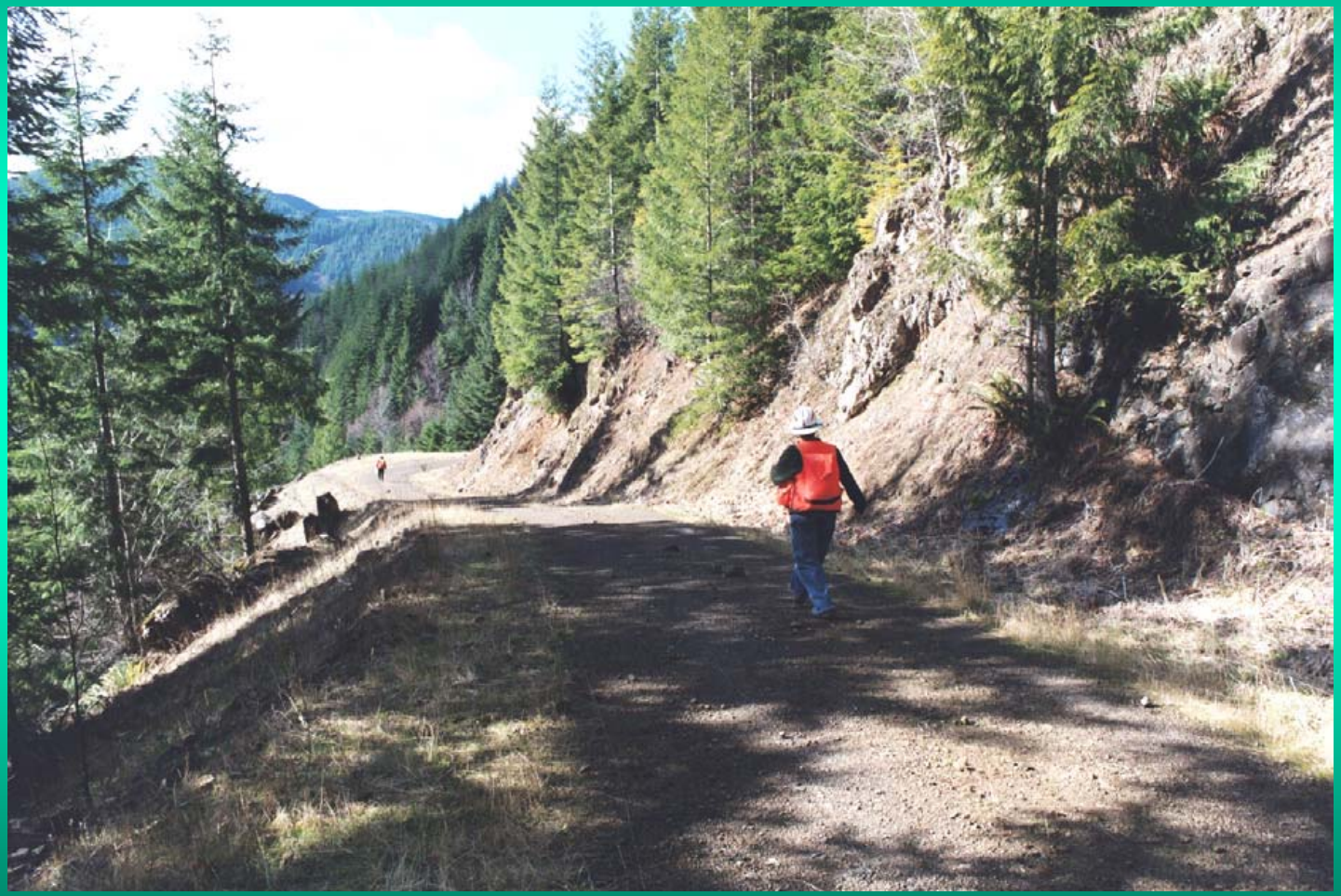


Figure 15-41 Alteration of hillslope stability by road construction.



Slope Stability is a Continuum

- Typical forest practices de-stabilize slopes to some degree
- Slopes that are inherently **stable** can sustain typical forest practices without failure
- Slopes that are inherently **unstable** may fail under typical forest practices
- Thus the CIV special rules for unstable slopes

What about catastrophic events?

- Earthquakes
- Volcanic eruptions
- Fires
- Storms – wind, rain-on-snow, extreme precipitation event

Slope Stability is a continuum

INHERENT STABILITY

Slope steepness and shape

Soil and geologic materials

Vegetation and hydrology interactions

Slope Stability is a continuum

Add to INHERENT STABILITY:

MANAGEMENT ACTIONS

-building roads

-removing trees

Slope Stability is a continuum

Add to INHERENT STABILITY
and MANAGEMENT ACTIONS……

Normal weather events

Extreme events

STABILITY CONTINUUM

(-) STABIITY (+)

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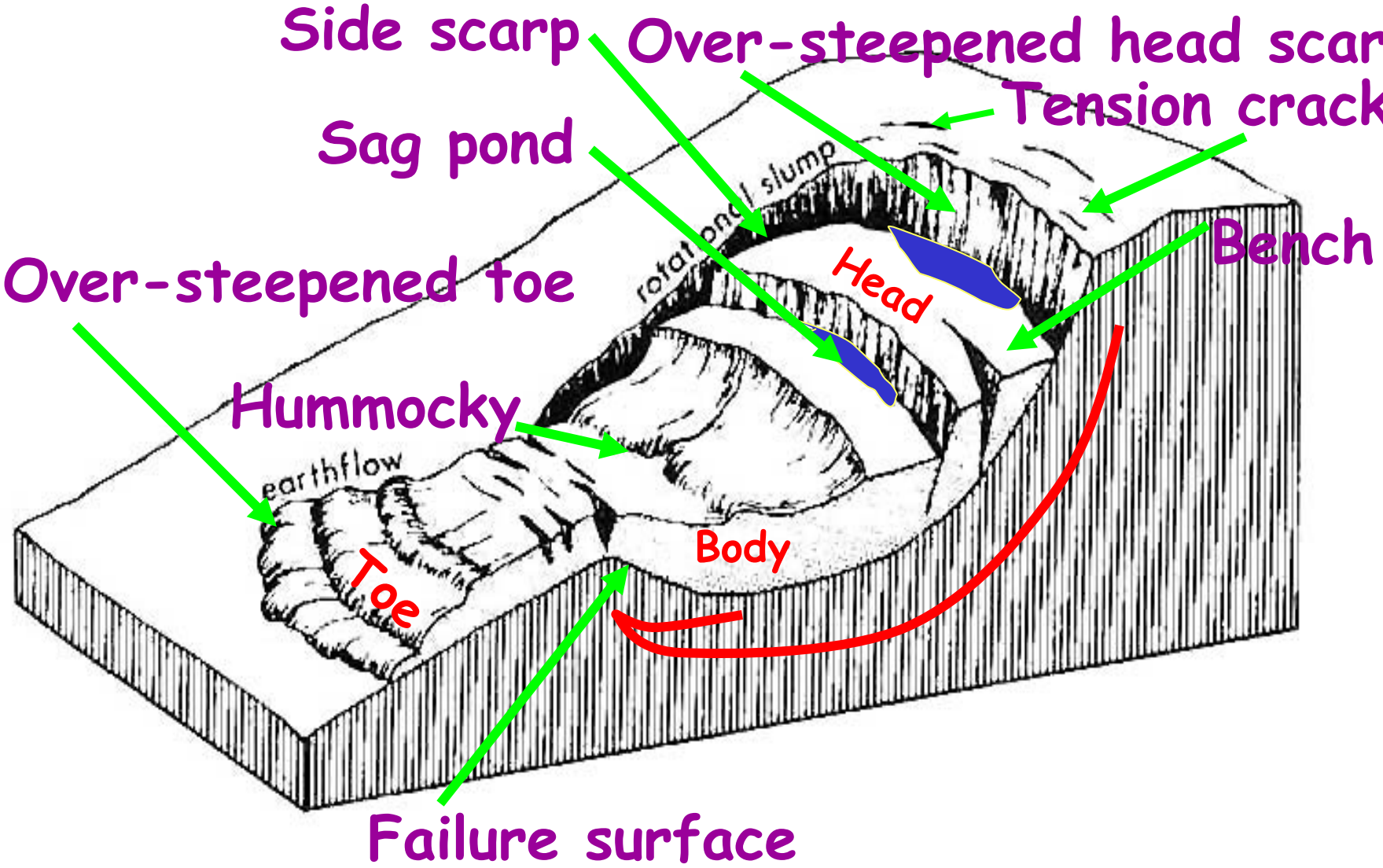
(-) (+)

Rotational deep-seated landslide



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