

UNSTABLE LANDFORMS

Washington State Forest Practices

Board Meeting

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Forest Practices Division

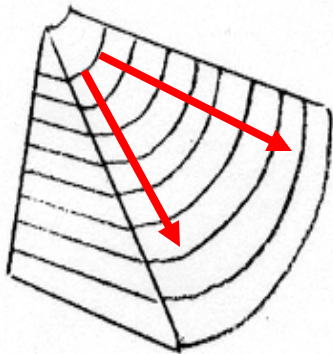
Which landforms are relevant to slope in-stability?

- * Any landform that is steep and convergent
- * Deep-seated landslides

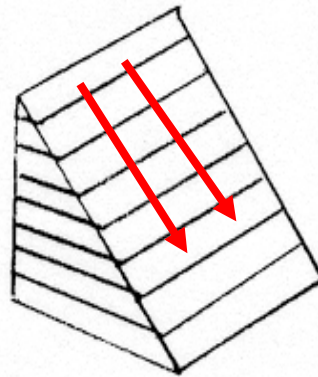
Slope geometry (curvature) affects water runoff, infiltration, and groundwater flow

1.] SLOPE CONFIGURATION

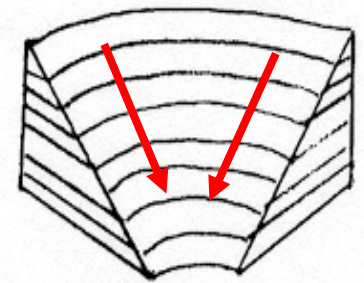
a.) Divergent (more stable)



b.) Planar



c.) Convergent (less stable)



Unstable Landforms

Forest Practices Board Manual

Section 16

- Bedrock hollows
- Convergent headwalls
- Inner gorges
- Toes of deep-seated landslides
- Groundwater recharge areas of glacial deep-seated landslides
- Outer edges of meander bends

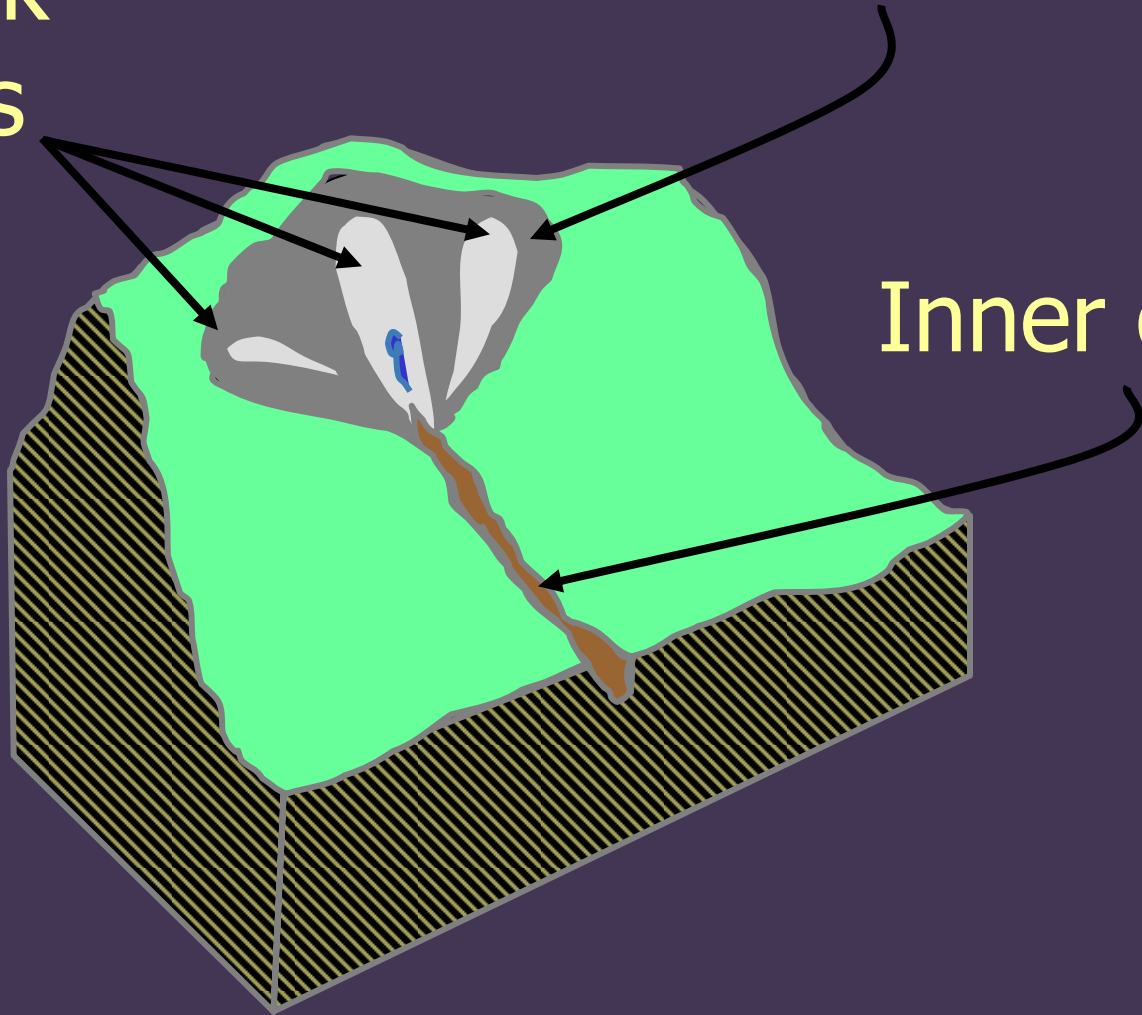
(E)

Any areas containing features indicating the presence of potential slope instability which *cumulatively* indicate the presence of unstable slopes

Bedrock
hollows

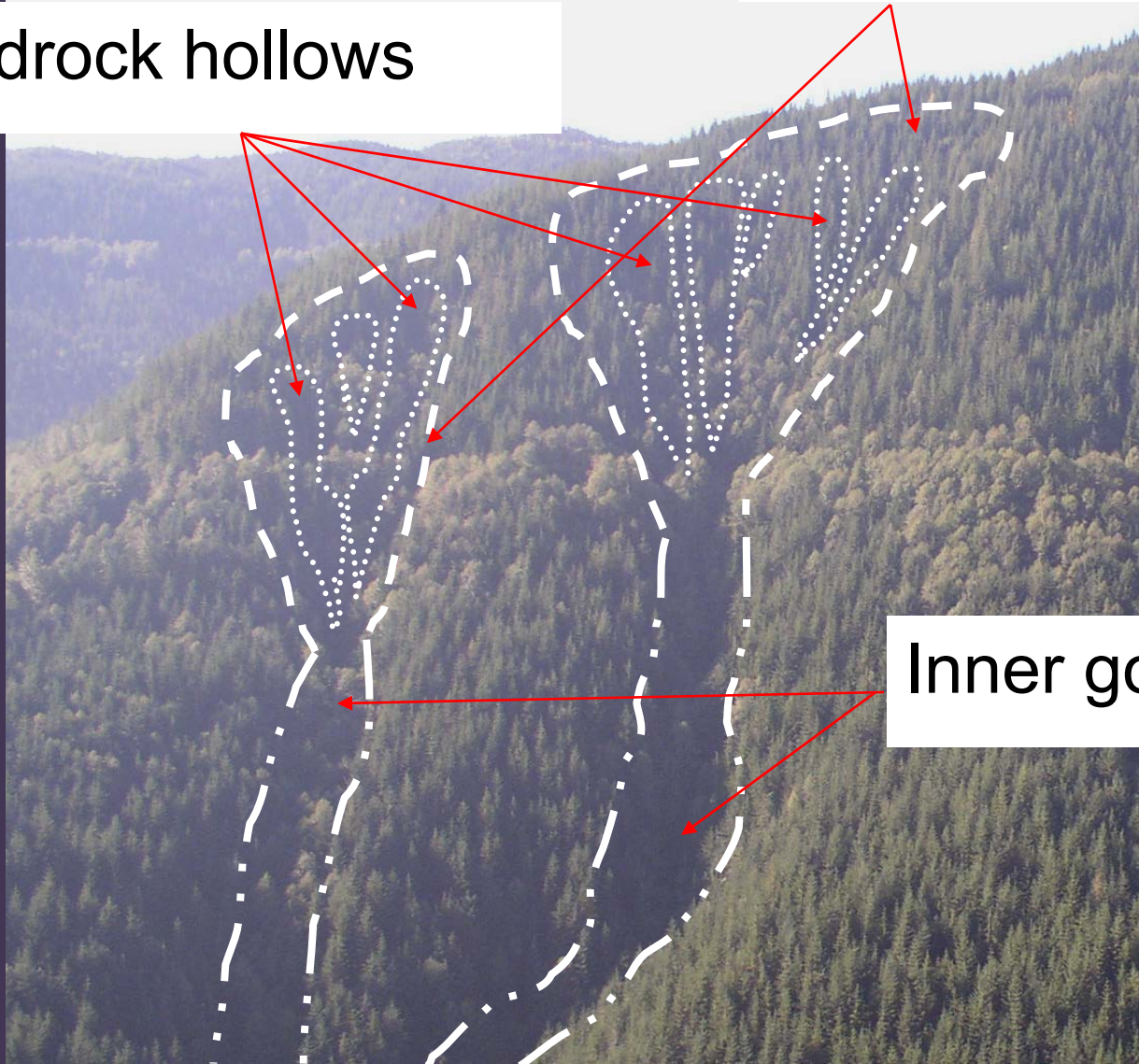
Convergent headwall

Inner gorge



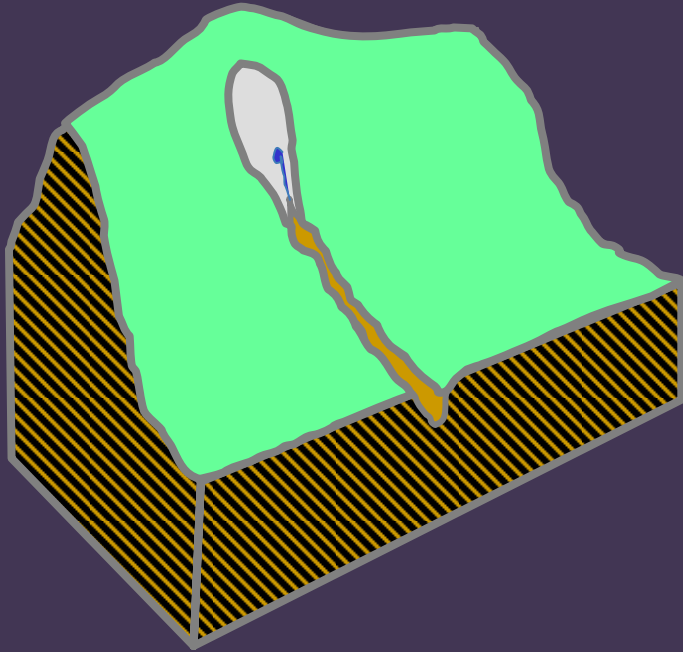
Convergent headwalls

Bedrock hollows



Inner gorges

Bedrock hollows



- Can be 75-200 ft wide, narrowing downslope to 30-60 ft or much smaller
- Unchannelized unless recently evacuated
- May contain seeps, springs, or be dry
- Convergent across the slope



Convergent headwalls



Inner Gorges



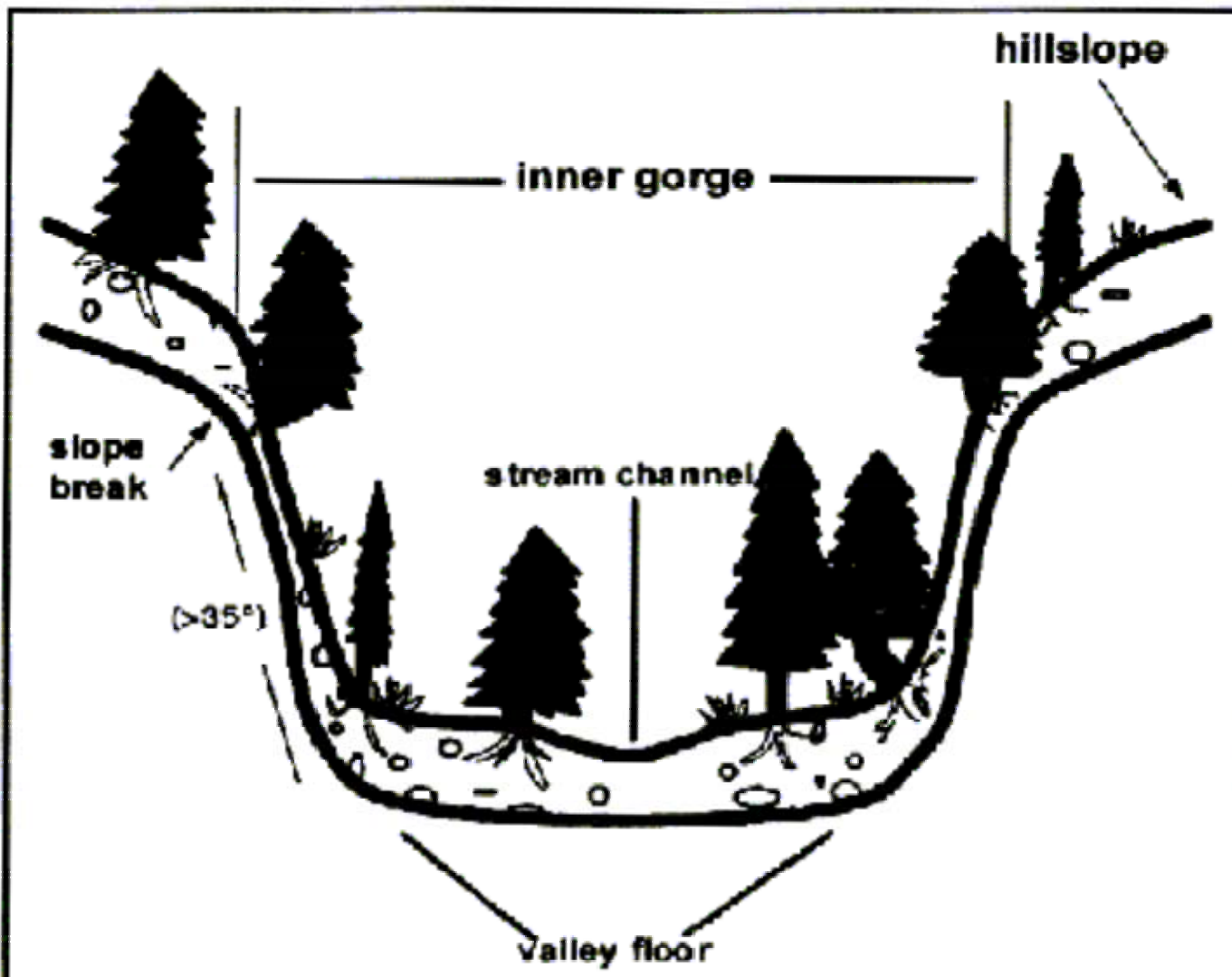


Figure 14. An inner gorge. This view emphasizes the abrupt steepening below the break-in-slope.





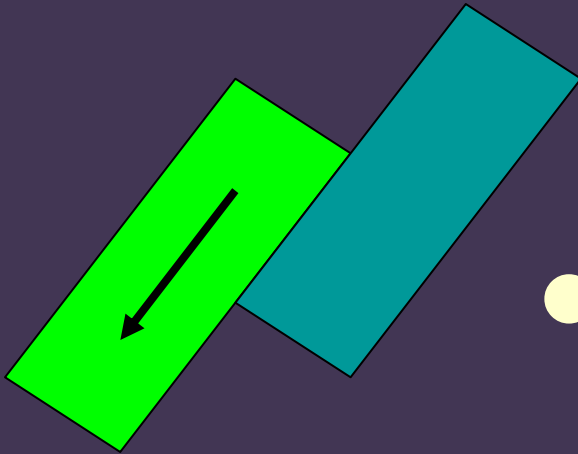
Deep-seated Landslides



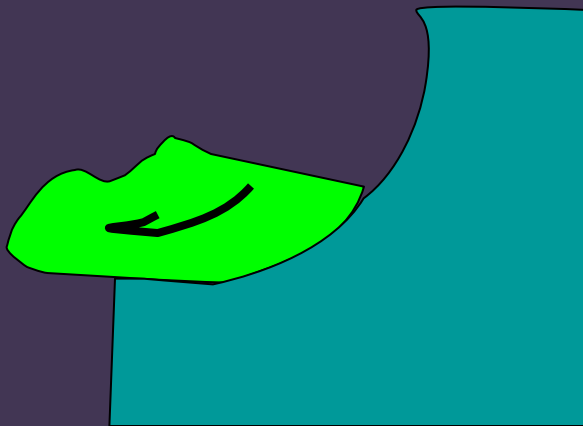
Deep vs. shallow

- Deep = below the rooting depth of trees
- Shallow = within the rooting depth of trees

2 Kinds of Deep-seated Landslide Movement

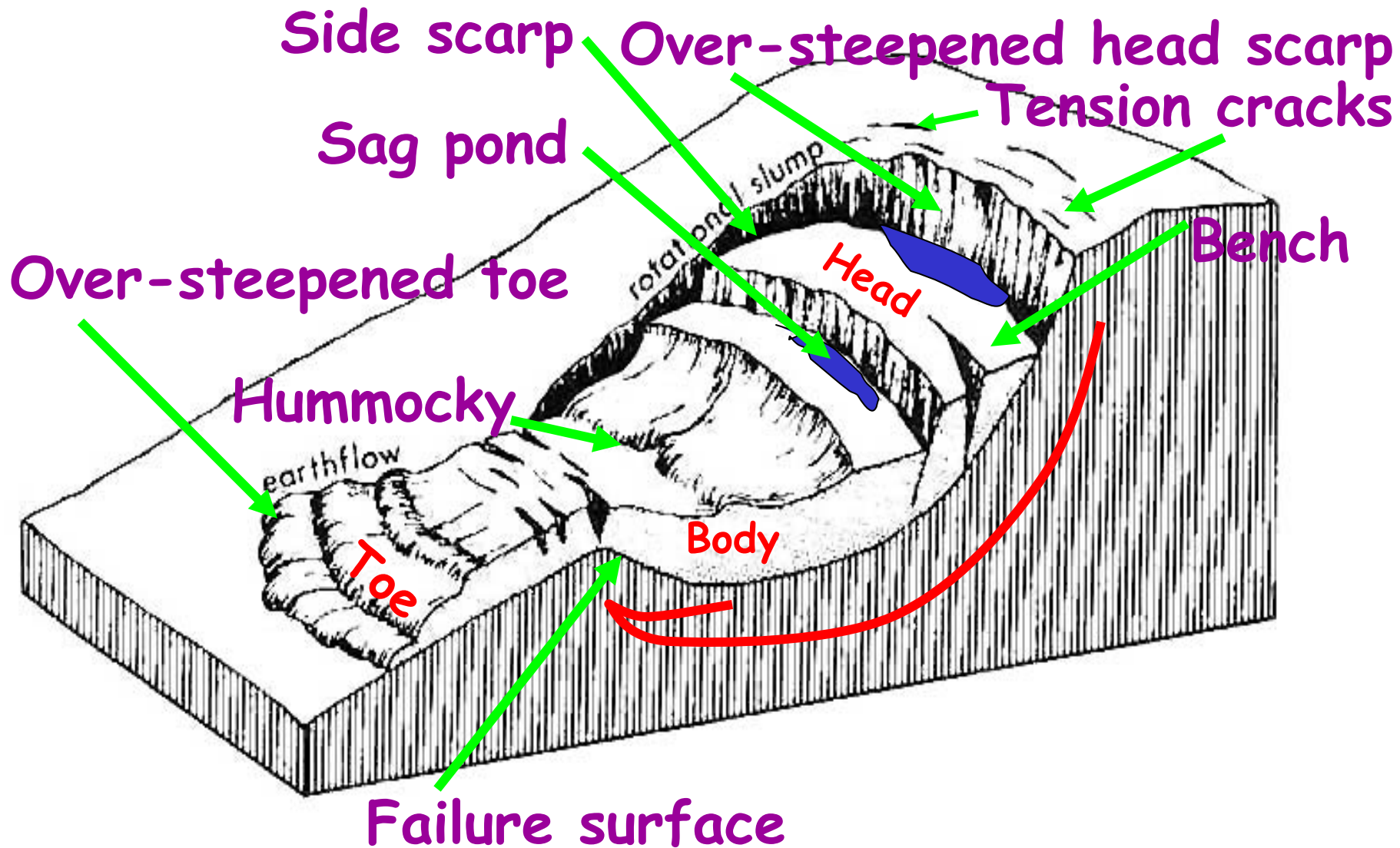


- Translational



- Rotational

Rotational deep-seated landslide

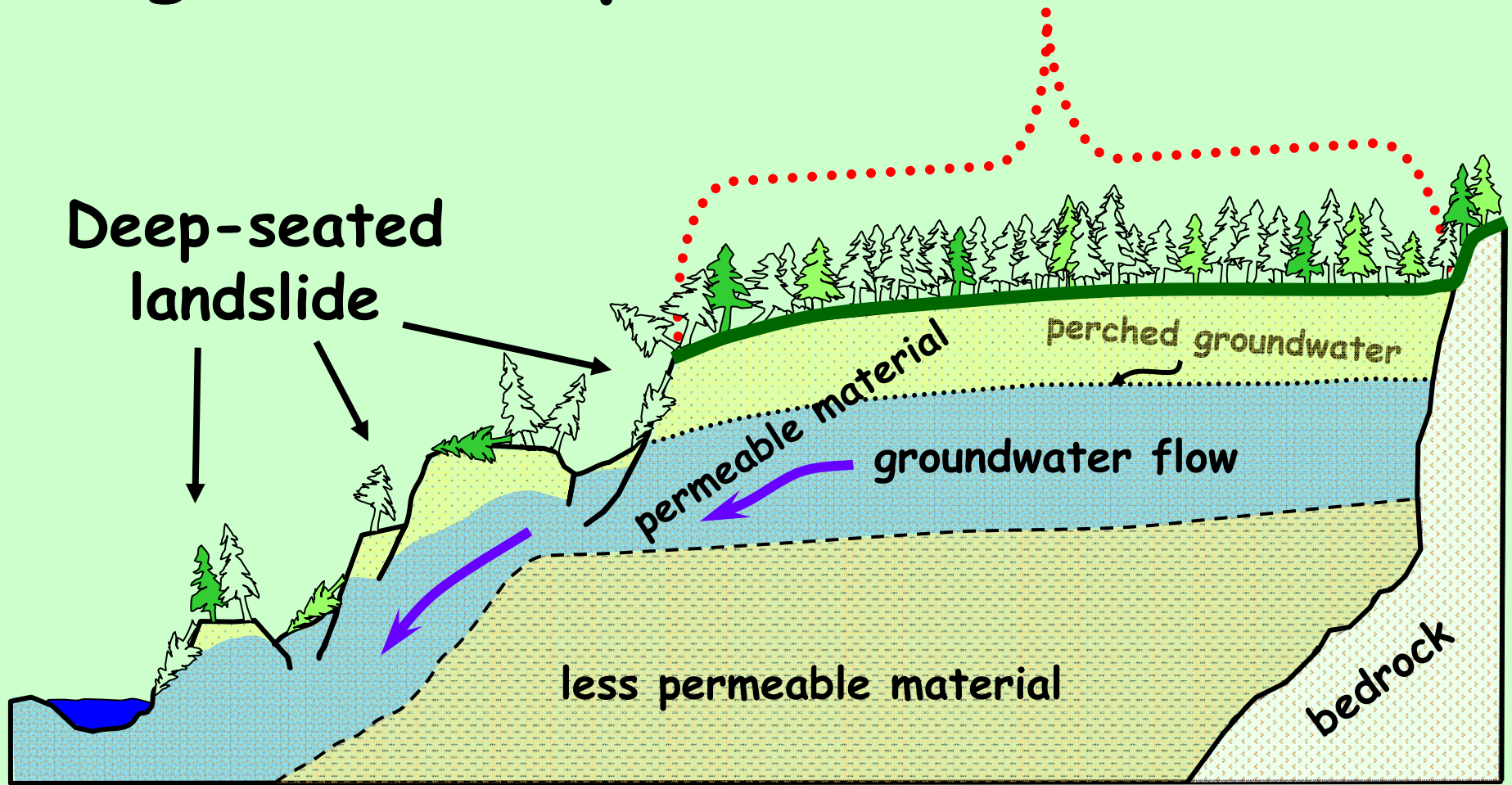


Groundwater recharge
areas of glacial deep-
seated landslides

- * Land up-gradient that can contribute subsurface water to a deep-seated landslide in glacial sediments

- * Assumes a likelihood of subsurface water flow along perching layers in glacial strata

Groundwater recharge area of a glacial deep-seated landslide





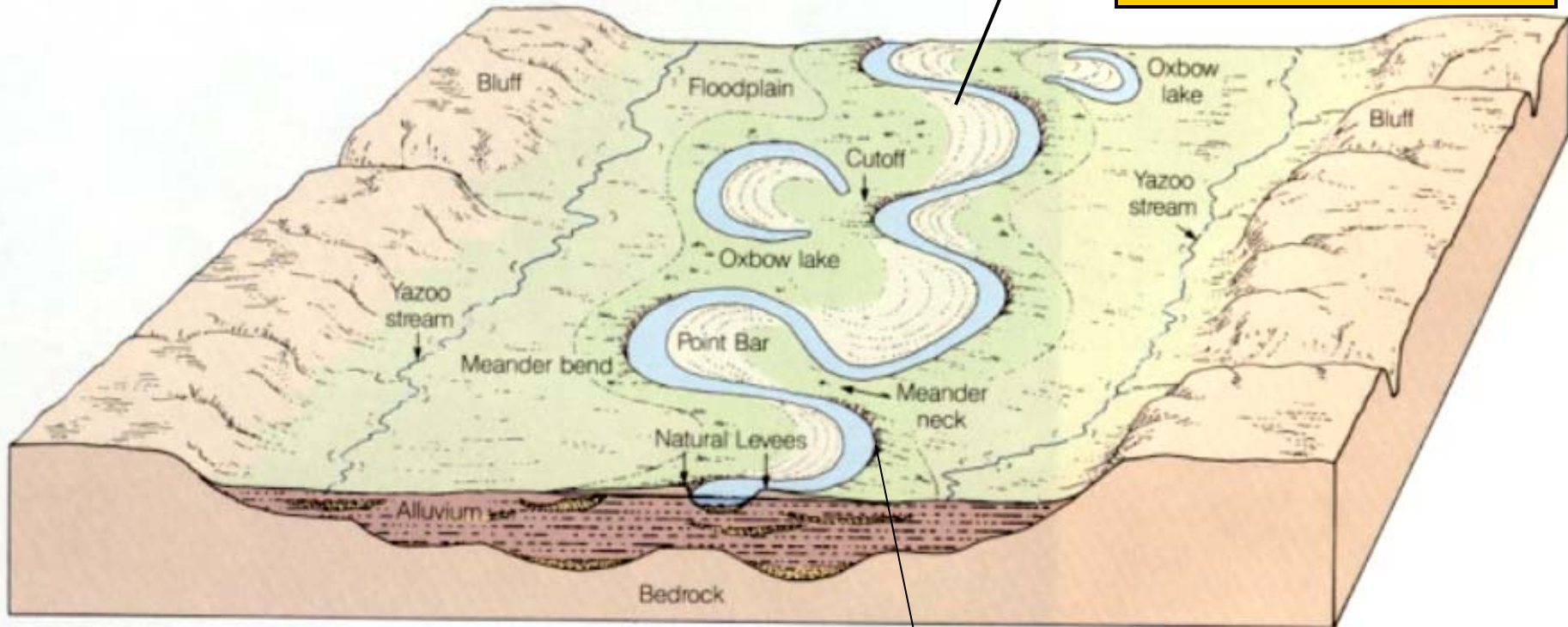
Outer edges of meander bends



Outer edges of meander bends
along valley walls or high
terraces of an unconfined
meandering stream

A typical low gradient meandering stream....

Deposition occurs on the inside of meanders



Erosion occurs on the outside of meanders

(E)

Any areas containing features indicating the presence of potential slope instability which *cumulatively* indicate the presence of unstable slopes.

WAC 222-16-050 (1)(d)(i)(E)