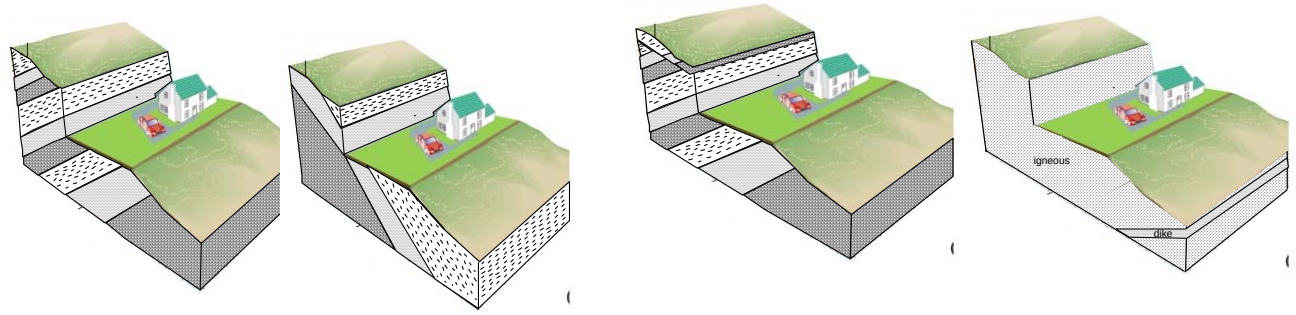
KEY

GEOL 103 Writing Assignment 5: Mass Wasting

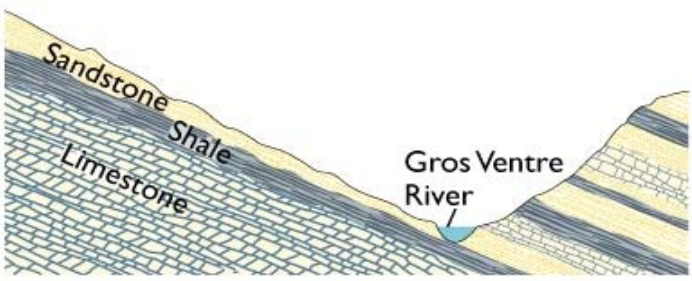
Name ___**KEY**_____ Lab section: Monday or Tuesday (circle one)
To be counted, must be turned in by Friday November 1.

1) Which home(s) would you rather buy? Why?
I don't know about you, but I'd rather buy A or D. The slope behind A should be relatively stable because the rocks dip away from the slope. The slope behind D should be relatively stable because the slope is composed of igneous rock which doesn't seem to be faulted or jointed. The slope behind B is set to fail because the rocks dip toward the slope. The slope behind B is set to fail because although the rocks dip away from the slope, a fault plane dips toward the slope. Note that in all case, the very steep artificial cut of the slope could lead to dangerous rockfall.

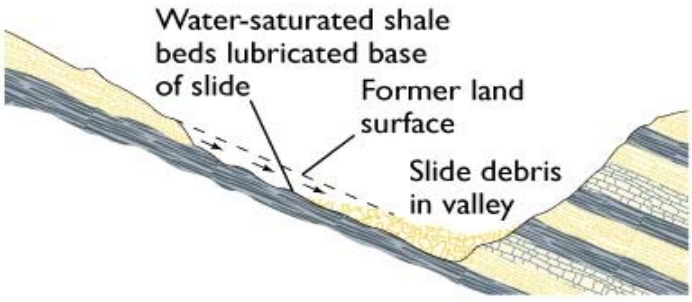


A B C D

2) Examine the sketch of the 1925 Gros Vente ("grow vant") landslide, and refer to your book.
A. How did the structural geology and the rock types influence the likelihood of a slide?
The rocks dip to the right, and left-most slope failed because the dip parallels the slope. The right-most slope did not fail because these rocks dip away from the slope.
The contact between the sandstone and shale provided a surface along which the sandstone could easily slide.



(a) Before slide



(b) After slide

B. How did water affect this slide? Consider both rainfall/snowmelt and the location of the river.
Rainfall and snowmelt lubricated the base of the slide (sandstone/shale interface). The sandstone could also slide easily once the "toe" of the slope was eroded by the river.
C. Why did the slide move left-to-right (in the sketch) as opposed to in and out of the page or right-to-left?
See answer for 2A (relationship between dip of rocks and the slope angle).

D. How and why did the landslide eventually cause a flood?
Debris from the slide dammed the Gros Ventre river. Once water spilled over this dam, it quickly began to erode the unconsolidated rubble, causing the dam to catastrophically fail and flooding to occur downstream.

3) How should mass wasting play into human decision making? What about construction of roads, dams, businesses and homes? Cutting of forests on steep slopes? Zoning? Insurance?
We should avoid building in areas prone to slope failure, especially catastrophic failure, because the costs in lives and money can be avoided by doing so. Taking this step requires education of the public and policymakers. Land use regulations and zoning could prevent building in the wrong places. Cutting of forests or creating steep slopes can destabilize slopes, and the extent depends on the geology of a particular site. Insurance companies could adjust rates based on the potential for slope hazards.

4) The role of water in mass wasting is somewhat complex. How can water reduce the likelihood of downslope movement? How can water increase the likelihood of downslope movement? What is angle of repose, and how does it vary with water content?
If water does not saturate pores between grains, it can bind grains together by surface tension. If a fairly wet sediment dries out, it can become less stable (e.g., if a sand castle dries out). If a sediment becomes to wet, slopes can fail due to lubication as pore pressure (a term we haven't worried about) gets too high.
Angle of repose is the steepest angle that unconsolidated material naturally rests. Very wet sediment angle < slightly wet sediment angle < very wet sediment angle.

5) How does angle of repose vary with grain shape?
More angular fragments increase the angle of repose.

6) How does steepness of slope affect mass wasting? Why must some slopes be very steep before much mass movement occurs?
In unconsolidated material, the steeper the slope, the greater the risk for mass wasting, all other factors being equal. In consolidated materials, there is little mass wasting most of the time, but joints and faults can increase the likelihood, and earthquakes can act act triggers. When steep consolidated material is wasted, it is rapid and dangerous.

7) What conditions are needed for a mudflow to form?
Unconsolidated fine particles and water from rain or snowmelt. Volcanic eruptions in high altitude mountains covered with ash under snow often produce rapid snowmelt and the resulting mudflows are called lahars.

8) What evidence would suggest that a mountainous area had undergone recent landslides?
Poorly vegetated scars where the slide turned loose. Deposits of fine to very coarse or mixed particle size material at the base of the slope where the flow lost energy.

9) What role do earthquakes play in the occurrence of landslides?
Earthquakes are commonly triggers, providing the energy the cause a slope to fail.