

Assignment 4 – Landslides (Mass Wasting)

Student Questions Spring 2024

In this assignment, you will Google Earth and a little bit of Excel to investigate landslides. Remember to use the desktop version of Google Earth and Excel, don't use the website version.

Assignment Rules:

- All answers must be in complete sentences and written in your own words to receive credit. Questions involving screenshots do not need complete sentences.
- Screenshots/images need to be your own work.
- Due by 3/20, uploaded to Canvas via Turnitin

Rules Acknowledgement **(3 pts)**:

1. Before beginning the assignment, acknowledge that you know the rules of the assignment as listed above. Type "I understand answers need to be written in my own words and in full sentences to receive credit, except for values in tables. I also know screenshots/images need to be my own"

Part 1: Oso, Washington Landslide

At 10:37 AM on March 23, 2014, a hillside on the north bank of the North Fork Stillaguamish River, near the town of Oso, Washington, collapsed in a large landslide. The landslide is the deadliest in U.S. history, and the amount of material that moved would cover approximately 600 football fields 10 feet deep. You can read the [detailed USGS report here](#). You can view this landslide on Google Earth by searching for the coordinates 48°16'57"N 121°50'53"W. Use the historical imagery button to see what the area looked like in 7/2013 compared to 4/2014.

2. What do you see on the pre-landslide Google Earth image from 7/2013 that would suggest a future landslide might occur at this site? **(5 pts)**
3. Based on the difference between the 7/2013 image and the 4/2014 image, what was the area of rock/regolith that moved during this landslide (in km² and mi²)? Note, you're not measuring the extent of the area affected by the landslide, only the area where rock/regolith came from on the north bank. **(3 pts)**
4. Take a screenshot of the 4/2014 view and annotate the head scarp. Paste your annotated image below. **(4 pts)**
5. Discuss the cause of this landslide. **(5 pts)**
6. What role did liquefaction play in this landslide? **(4 pts)**
7. View this [USGS computer model](#) of the landslide. There are two simulations shown in this video, one modeled on the actual events and one modeled if the rock/sediment was

less porous. Describe the differences in the modeled landslides between the two simulations. **(6 pts)**

- 8.** Have other landslides occurred in this area? If so, when and where? **(5 pts)**
- 9.** Was anything done to mitigate against future landslides at this site or elsewhere in Washington? If so, what measures were taken or considered? **(5 pts)**
- 10.** Besides the USGS site I gave you, what are your sources of information? **(4 pts)**

Part 2: Google Earth Interpretations

Head to the following coordinates in Google Earth. Based on your observations at each location, have landslides occurred in these areas before? Use screenshots from Google Earth and annotations to help highlight your observations. Discuss the evidence you see in the imagery (historical imagery not needed).

- 11.** Coordinates: 34° 8'21.61"N 73°43'49.59"E (zoom out to an eye altitude of about 6 km) **(5 pts)**
- 12.** Coordinates: 34°24'28"N 73°28'08"E (zoom out to an eye altitude of about 3 km) **(5 pts)**
- 13.** Coordinates: 39°10'07"N 107°50'54"W (zoom out to an eye altitude of about 9 km) **(5 pts)**

Similar to the previous few questions, look up these coordinates in Google Earth. For each location, discuss the landslide hazard and explain your reasoning. You can use screenshots and annotations to help you explain.

- 14.** Coordinates: 33°46'0.31"N 118°25'21.08"W (zoom in to an eye altitude of about 500 m, hold shift and pan the image up/down to get a 3D sense) **(5 pts)**
- 15.** Coordinates: 22°59'18.66"S 43°14'56.63"W (zoom in to an eye altitude of about 150 m, hold shift and pan the image up/down left/right to get a 3D sense) **(5 pts)**

Part 3: Other Landslides

Download the Excel file of catastrophic landslides from 1900-2000. Determine the frequency of the causes, very similar to what you did for VEIs in the volcano assignment.

- 16.** What was the most frequent cause of these catastrophic landslides? **(5 pts)**
- 17.** Create a graph that displays this data and paste it below. You have creative control over the type of graph and how to display the data. **(6 pts)**
- 18.** On a global scale, what is the recurrence interval of these catastrophic landslides? **(5 pts)**

- 19.** What is the recurrence interval of catastrophic landslides in the United States? **(5 pts)**
- 20.** Head to this [USGS website](#) which is a record of landslides in the United States. The colored dots and polygons on this map represent actual landslides that have taken place. Notice that the central part of the U.S. from Texas to North Dakota does not have many landslides reported. Discuss why that is. **(5 pts)**
- 21.** Discuss why the Pacific coast of the U.S. has had more landslides than the Atlantic and Gulf coasts. **(5 pts)**