Why did the 2014 Oso Landslide happen?

PHOTO BY TED S. WARREN /THE ASSOCIATED PRESS; GRAPHIC BY THE SEATTLE TIMES

Image credit: Seattle Times http://old.seattletimes.com/flatpages/local/interactivebeforeandafterthehighway530mudslide.html

Where did the 2014 Oso Landslide happen?

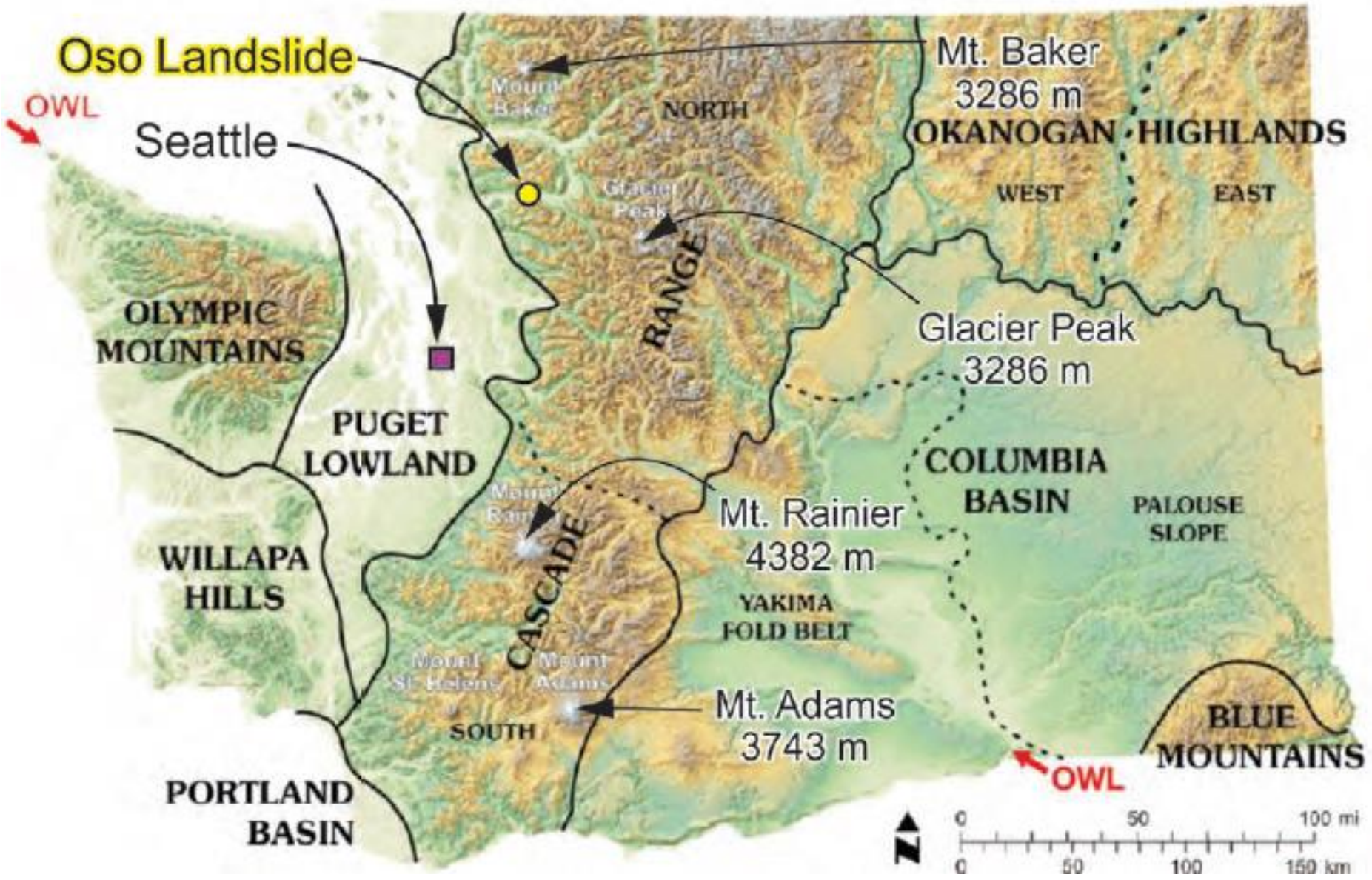

Image source: http://www.dnr.wa.gov/Publications/ger_geol_map_washington_pagesize.pdf

Image source: http://ttnewsflash.com/wp-content/uploads/2014/03/Sbohomish-County-landslide.jpg

Topographic Map of Oso Landslide Area and surrounding Geography

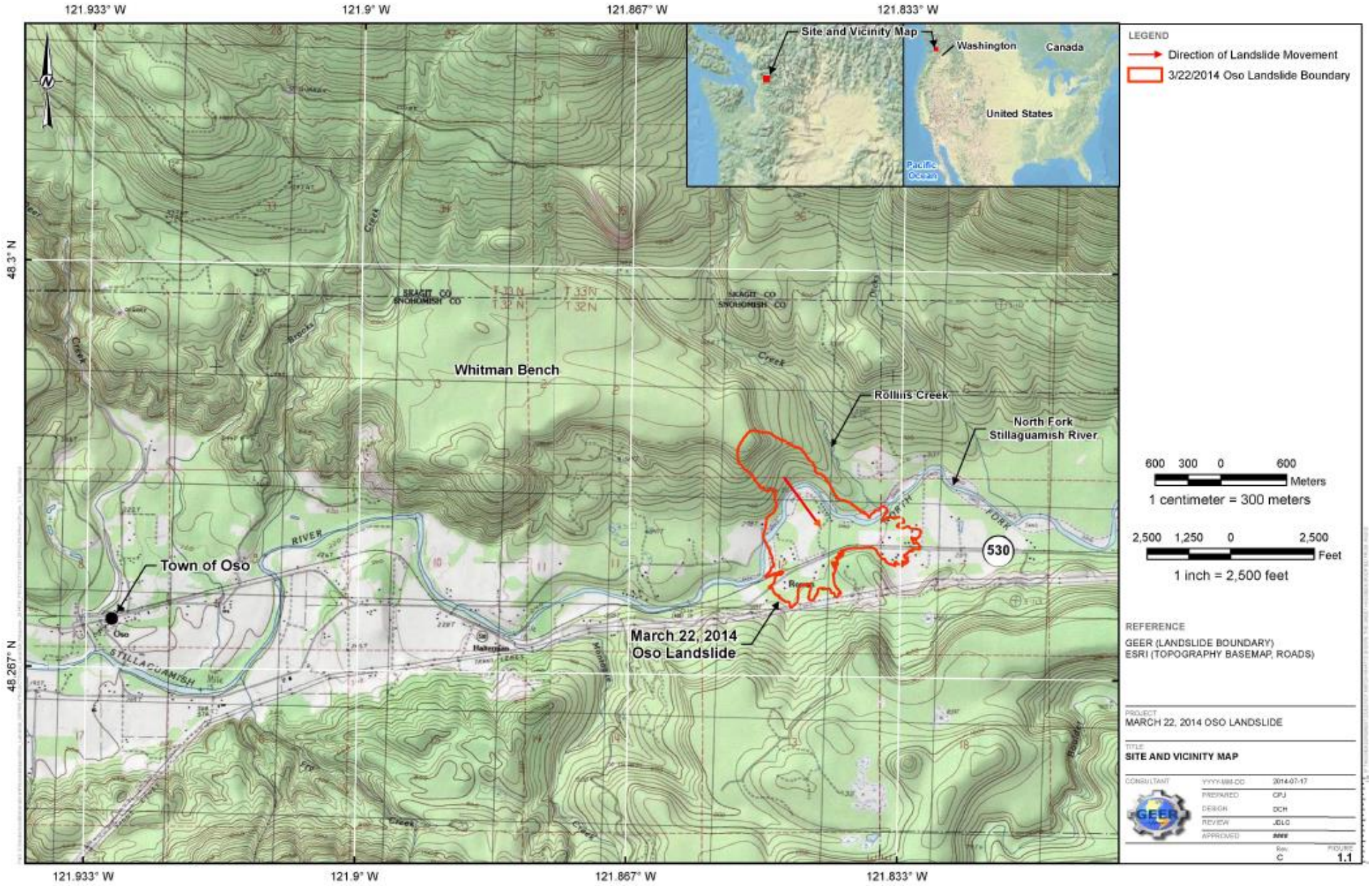

Image source: http://snohomishcountywa.gov/DocumentCenter/View/18180

Aerial photos over Steelhead Haven near Oso, WA

PHOTO: U.S. DEPARTMENT OF AGRICULTURE

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PHOTO: WASHINGTON DEPARTMENT OF TRANSPORTATION

Landslide January 25, 2006: After heavy rain, a big slide of about 900 feet of soil crashes into the river, creating flooding that threatens homes. Emergency workers scramble to create a new channel for the river, saving the neighborhood by walling it off with 400 feet of heavy rocks.

Landslide March 22, 2014: The hill falls away after heavy rain, releasing millions of cubic yards of earth. Waves of mud, described as 25 feet high, roll for nearly a mile — across the river, through the Steelhead Haven neighborhood and onto Highway 530.

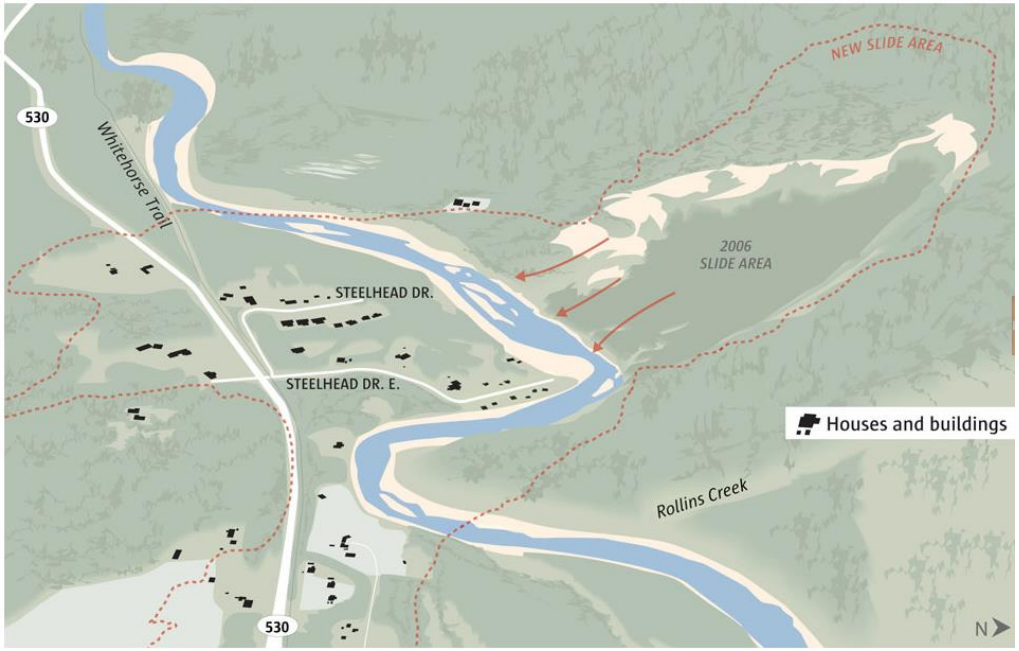


Image and information credits:
Seattle Times *http://old.seattletimes.com/flatpages/local/interactivebeforeandafterthehighway530mudslide.html*
Seattle Times *http://projects.seattletimes.com/2014/building-toward-disaster/*

Average Precipitation for March: 1981 - 2010

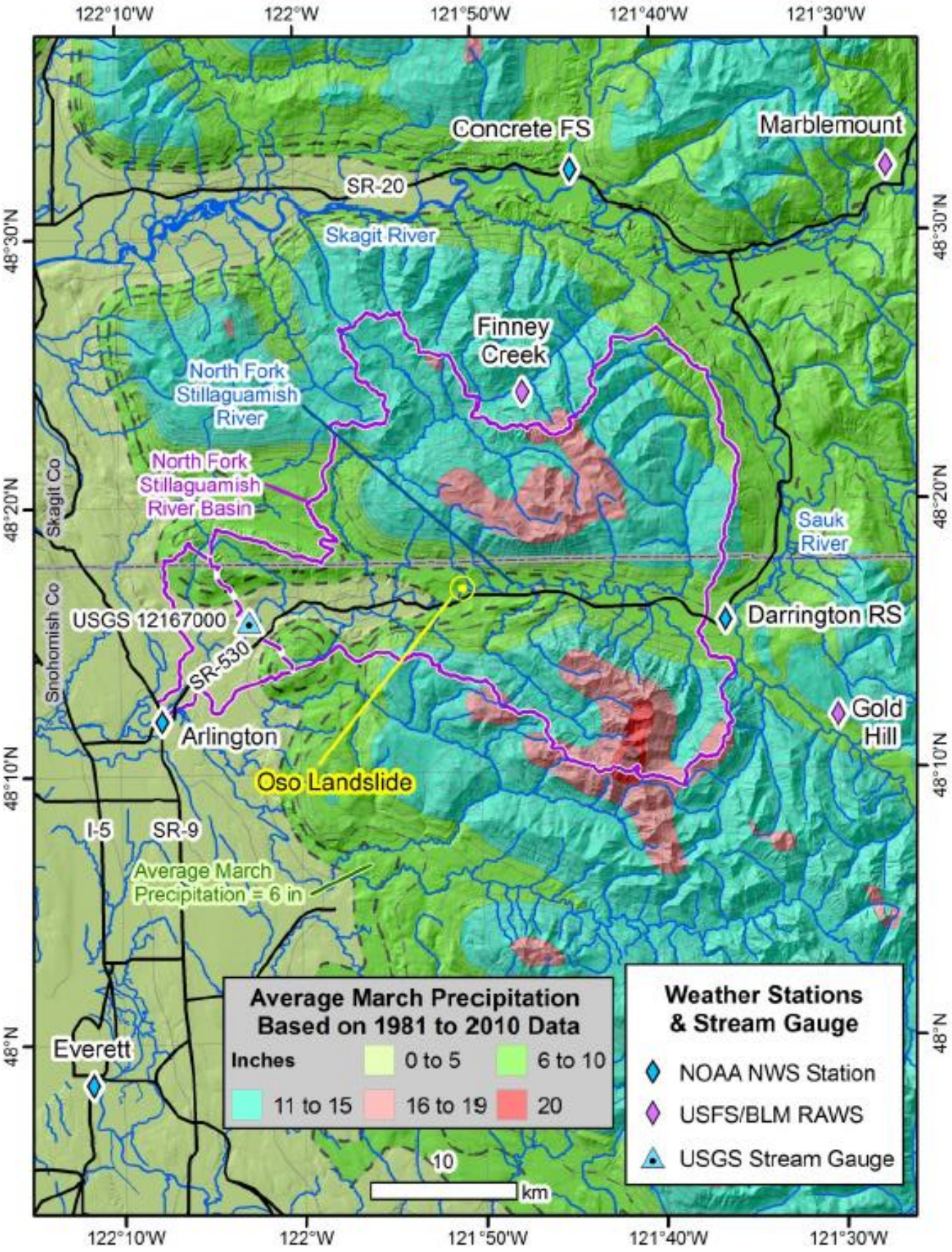
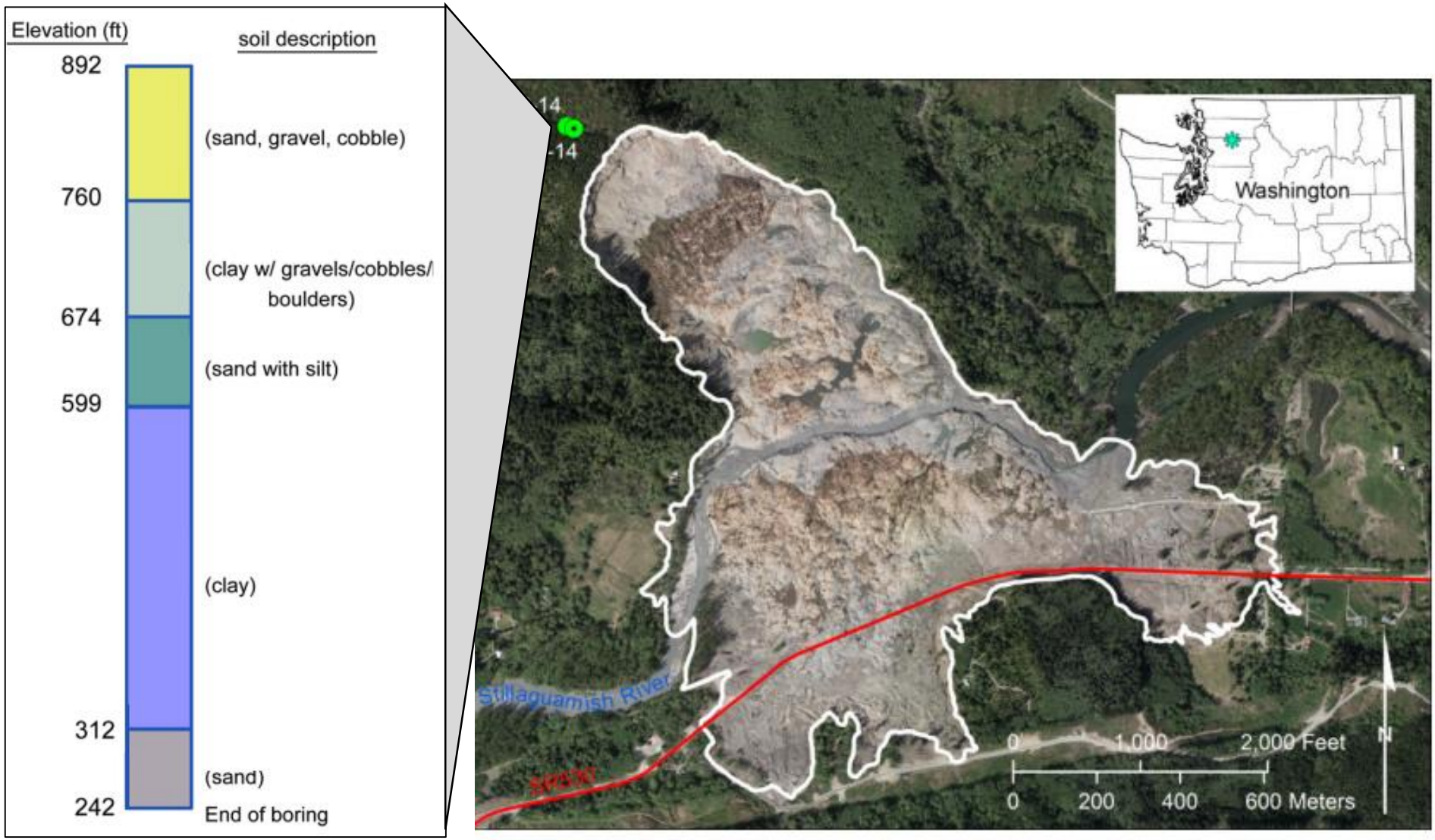


Image source: http://snohomishcountywa.gov/DocumentCenter/View/18180

Soil Profile near the 2014 Oso Landslide



The diagram, left, shows layers of soil in the hill. The photo, right, shows a map with an outline of the 2014 Oso landslide and the dots to the north show where scientists took the sample. Scientists bored a deep hole using special machines to gather a core sample. This sample has layers of soil. This diagram shows the thickness of each layer and describes the kinds of soil they found.

Modified from source: http://pubs.usgs.gov/of/2015/1089/pdf/ofr20151089.pdf

USGS Aerial Photo of Oso Landslide with Zoom-ins

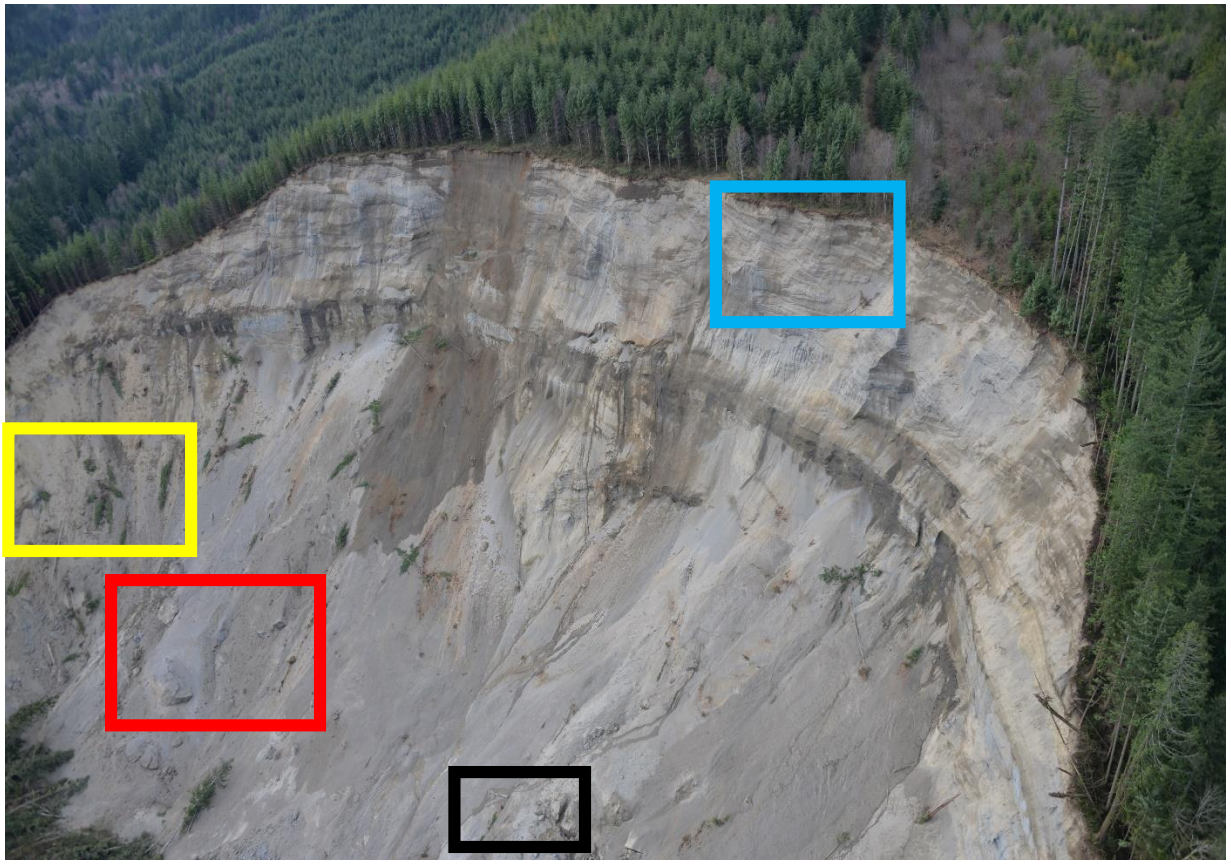


Image source: http://gallery.usgs.gov/images/03_26_2014/jne5HTs22B_03_26_2014/large/DSC_2347.JPG

How would you describe the soil?

Do you see any gravel, sand, humus, or clay?

No slope (flat)

Image source: http://sevenhillslake.com/construction%20stormwater%20runoff%20041003%202.jpg

Shallow slope

Image source: http://bit.ly/1pHuW9H

Steep slope

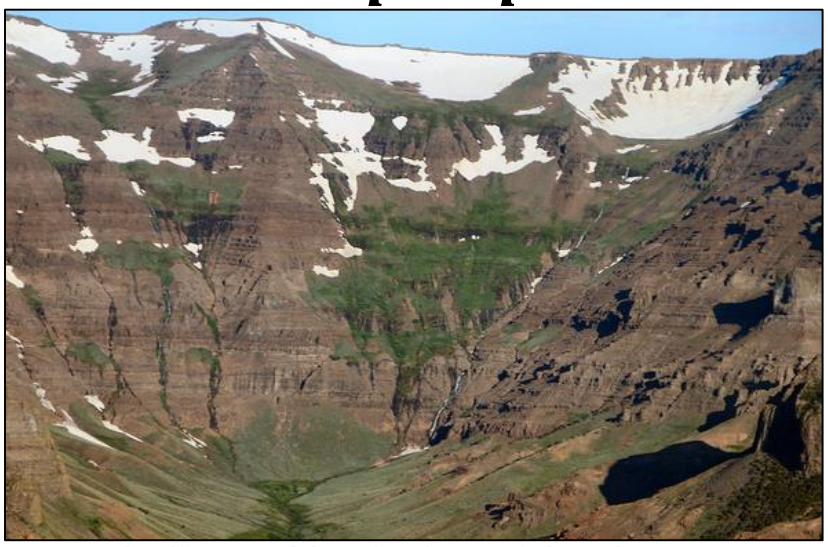
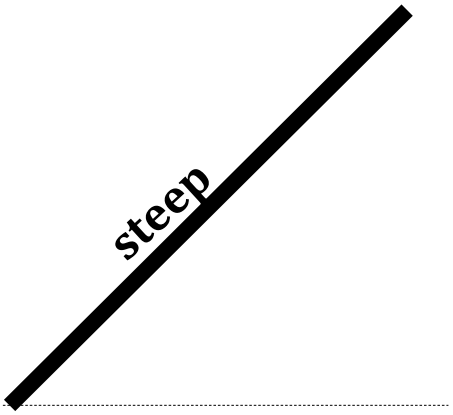
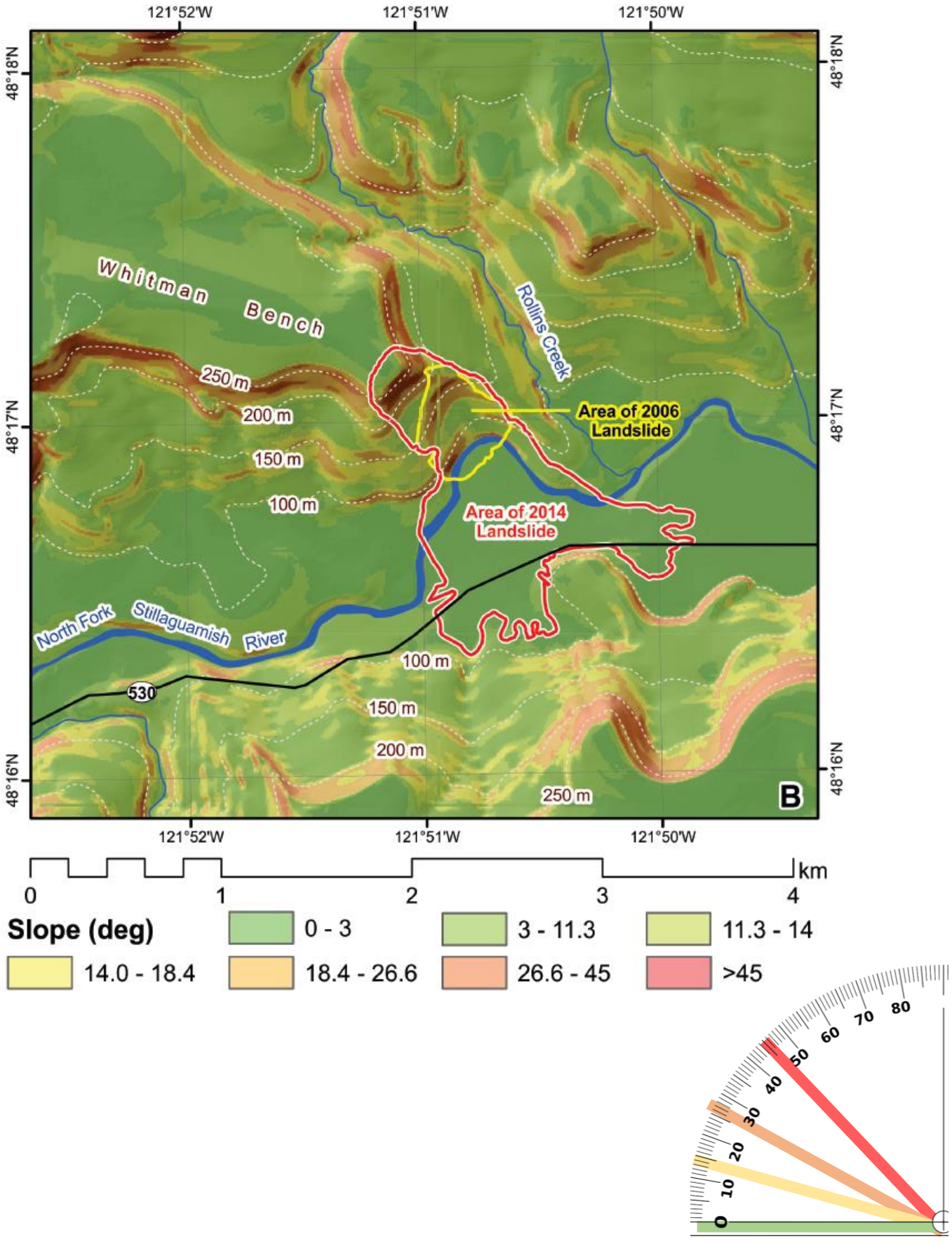
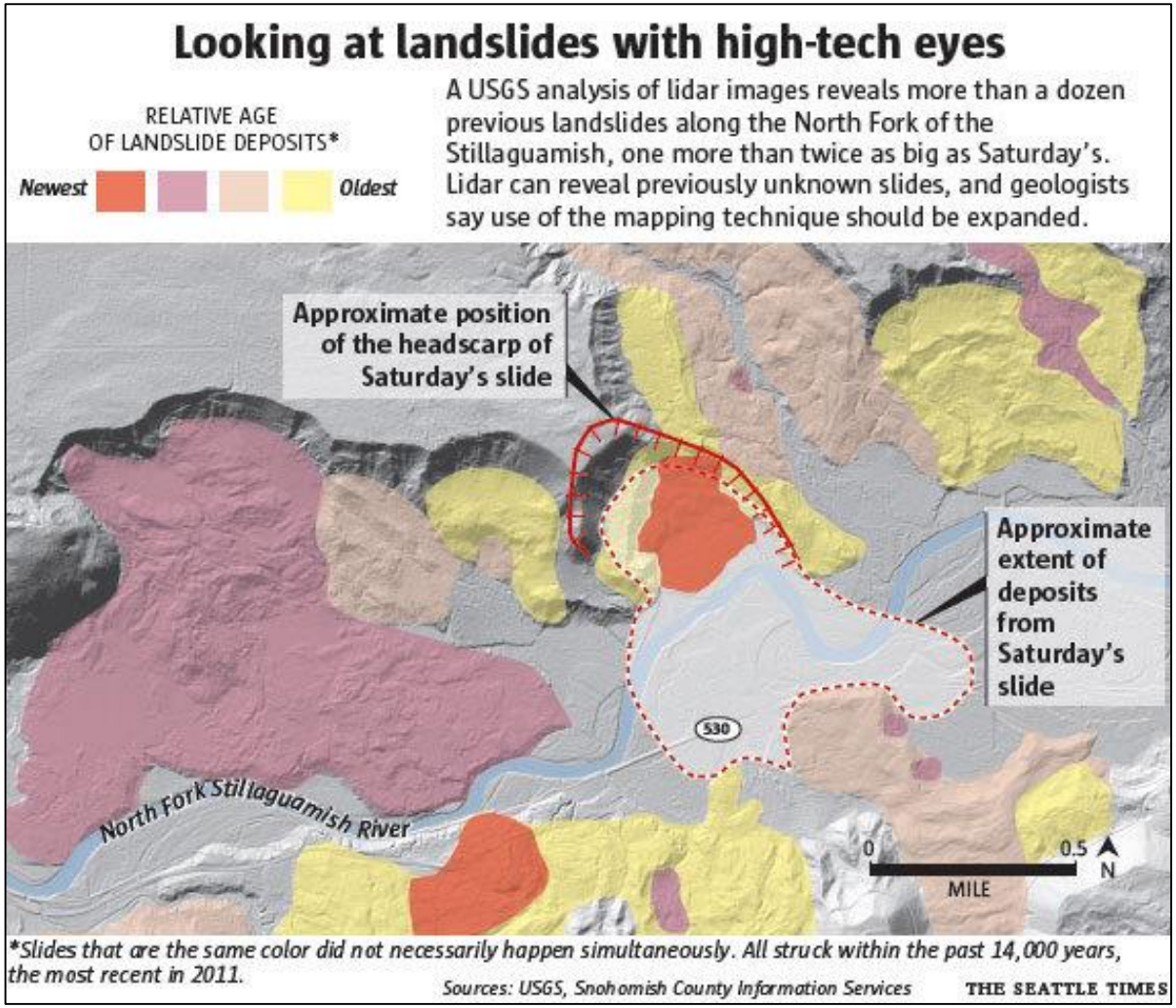


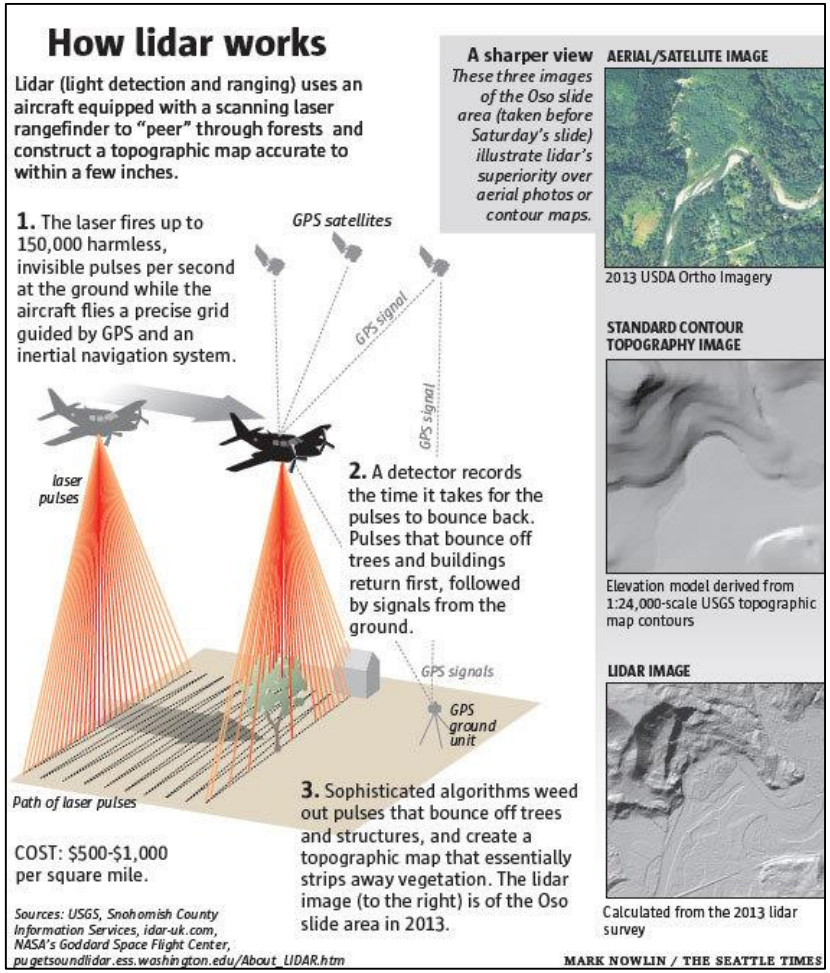
Image source: http://farm7.staticflickr.com/6196/6090477852_d3e0416b10_z.jpg



Slopes in Areas around Oso Landslide







Teacher note: This map is not referenced in the lesson guide; however, it does show how this region has had landslides over time and how scientists collected this data. Include this map in a lesson if it makes sense to do so.

Source of Images: http://old.seattletimes.com/html/localnews/2023244512_mudslidelidarxml.html