Geologic Mapping with Lidar: Examples of Deep-seated Landslides and Faults from the Summit Lake Quadrangle (and Others)

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Division of Geology and Earth Resources

New mapping technology is becoming increasingly available, particularly in the urban areas of western Washington, that enable accurate digital mapping of fault scarps, landslides, and other geologic features for which a synoptic view is necessary for accurate identification. LiDAR (Light Detection and Ranging) allows for accurate imaging of topography by digitally removing the forest cover (virtual deforestation) demonstrated in the next slide.

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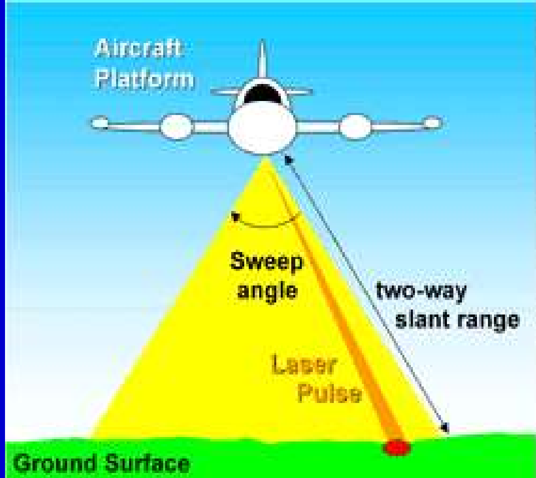
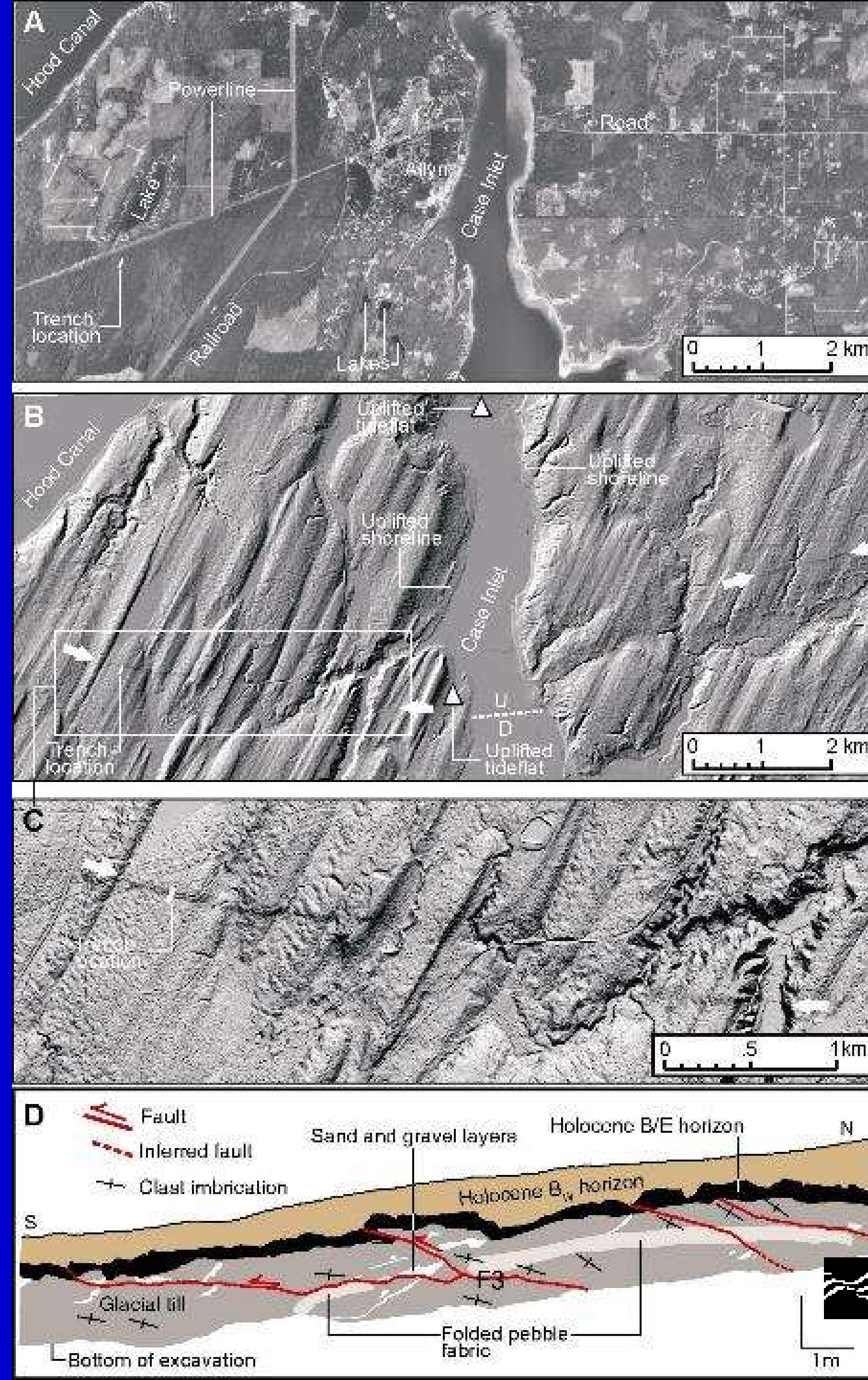


In order to assess faults, we need to use new technologies to locate faults and dig trenches to expose them for study



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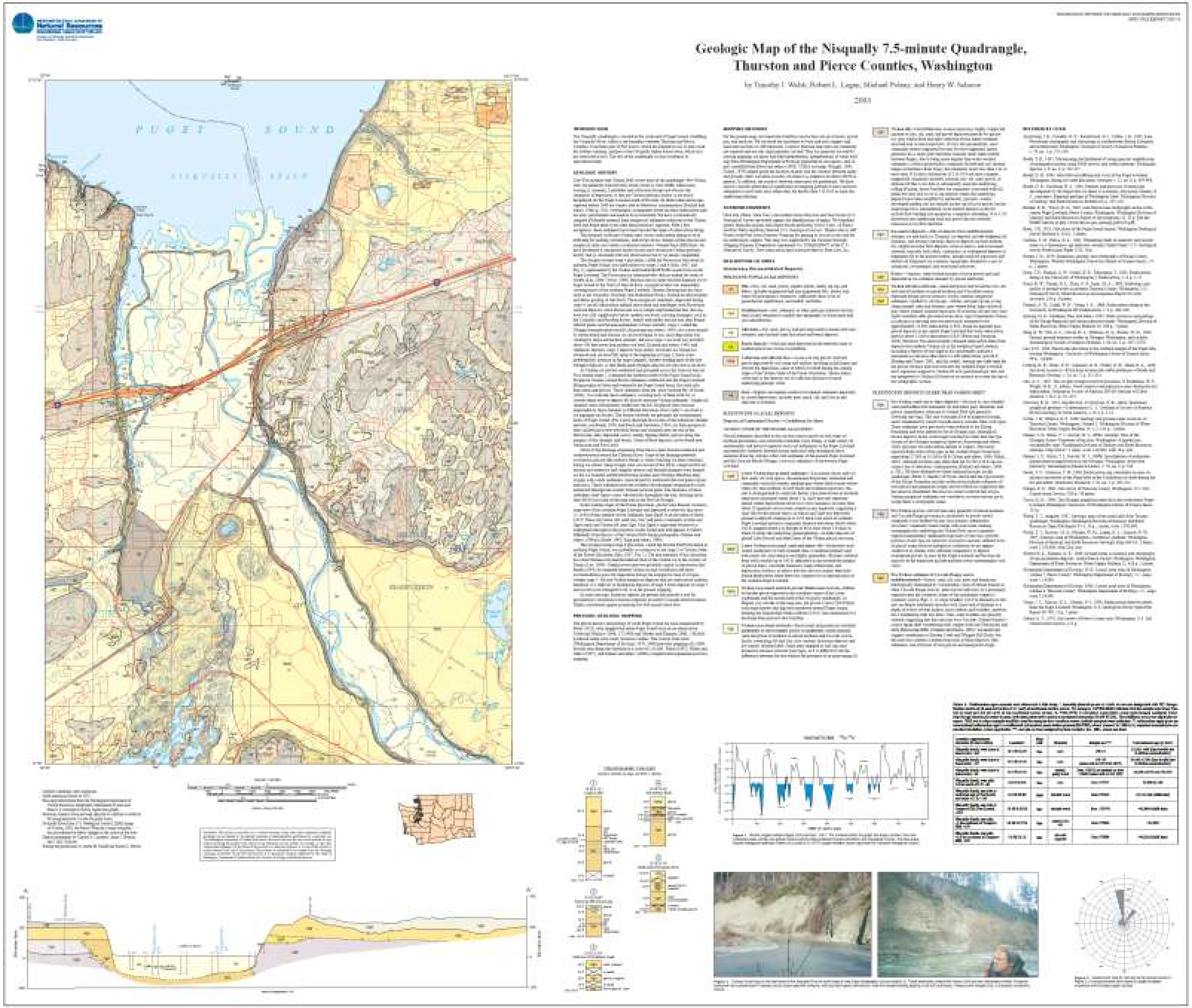
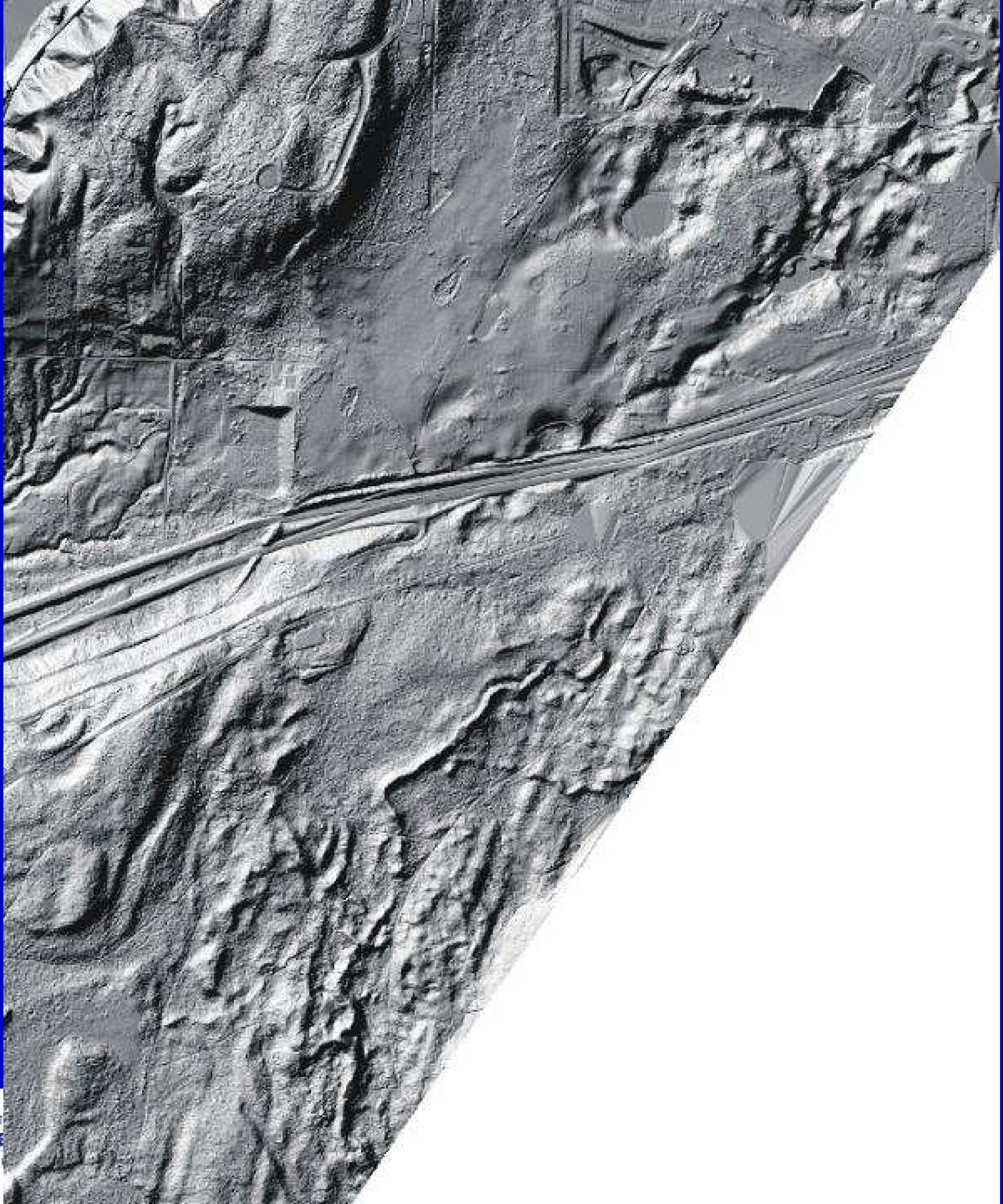

Geologic Map of the Nisqually 7.5-minute Quadrangle,
Thurston and Pierce Counties, Washington
by Timothy J. Walsh, Robert L. Logan, Michael Polenz, and Henry W. Schasse
2003



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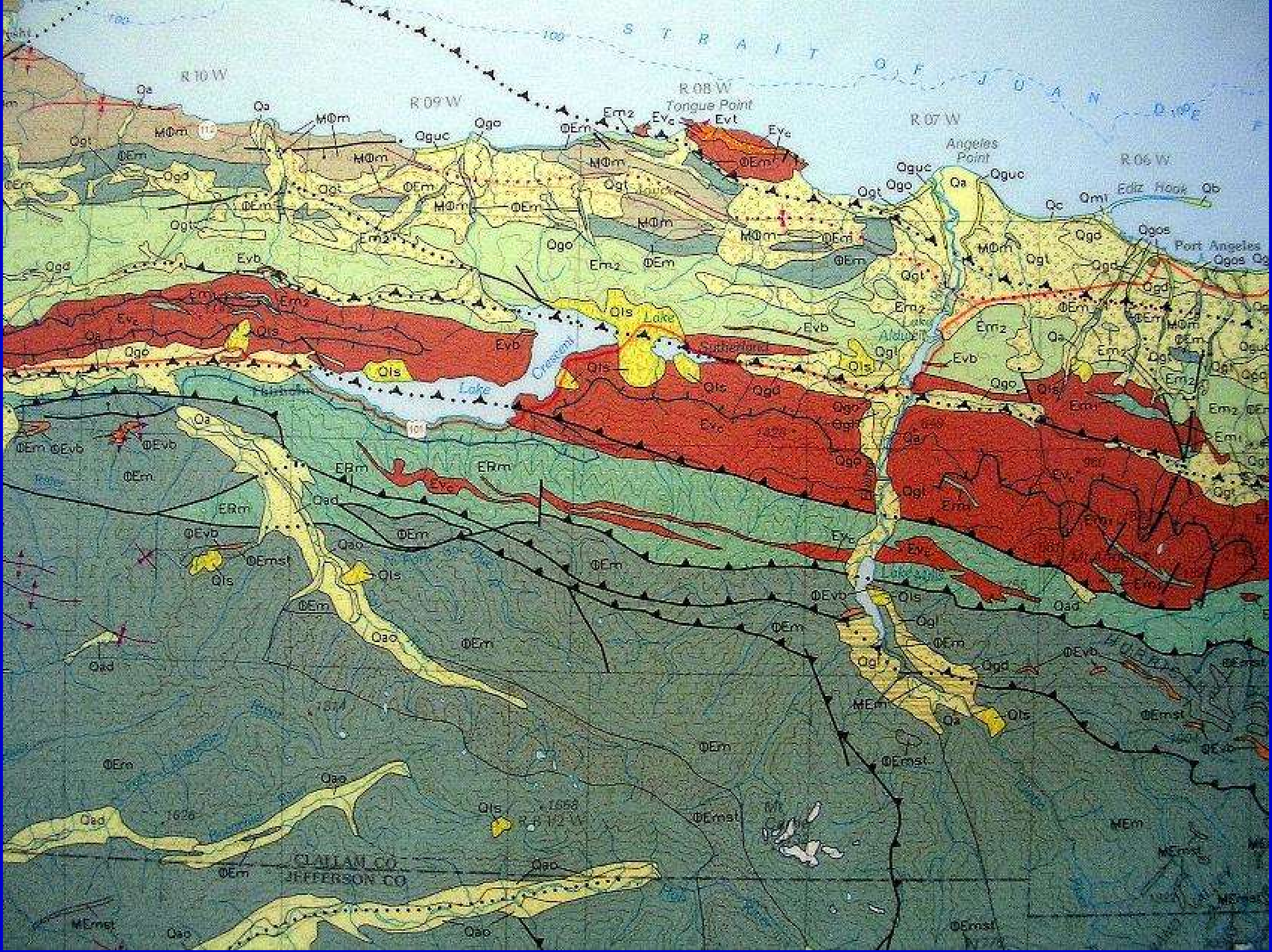
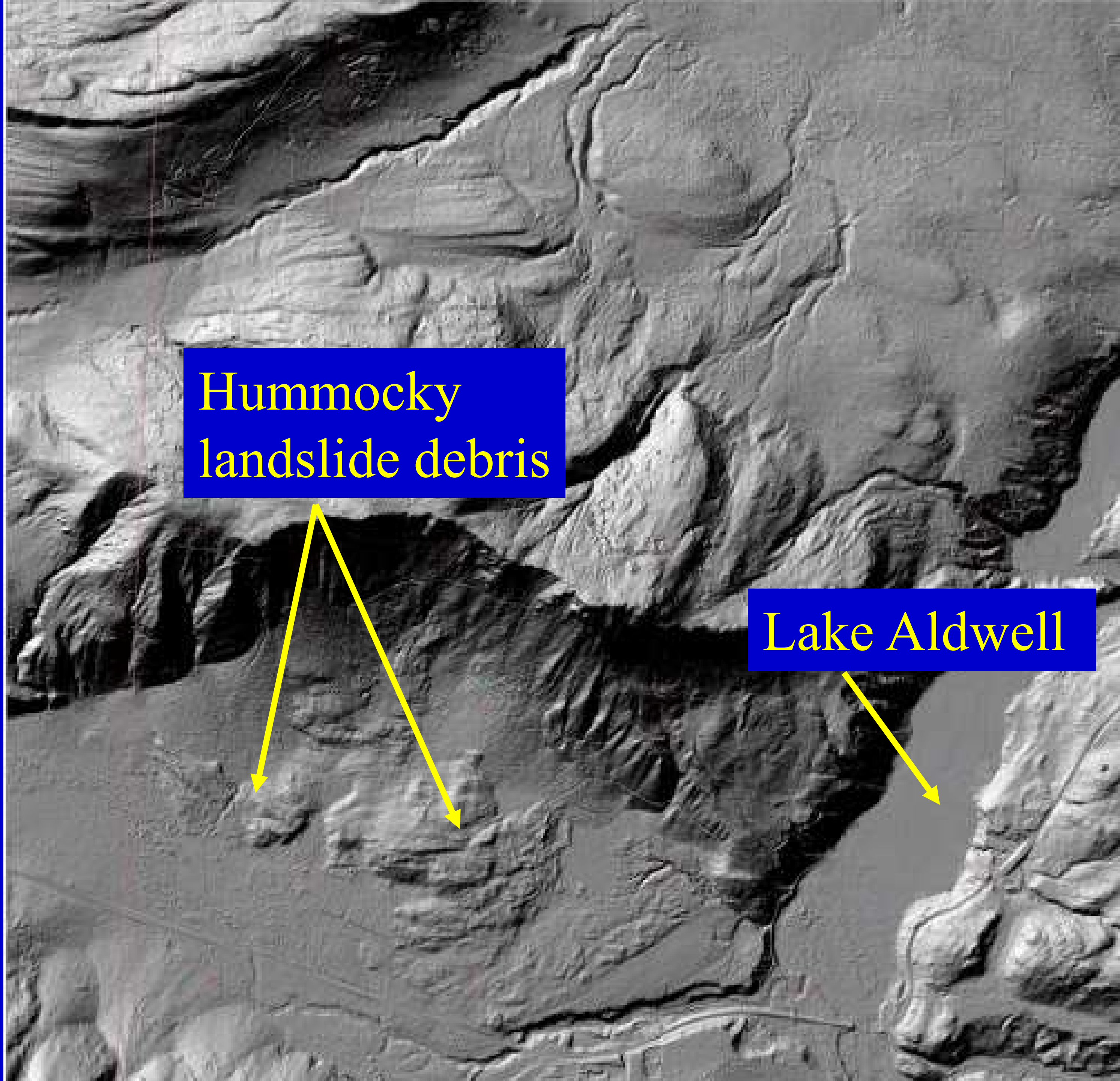

S T R A I T O F J U A N D E F
R 10 W
R 09 W
R 08 W
Tongue Point
R 07 W
Angeles Point
R 06 W
Ediz Hook
Port Angeles
Lake
Crescent
Lake
Sutherland
Lake Aldwell
CLALLAN CO
JEFFERSON CO

This LiDAR Image shows a large landslide that was not recognized in previous geologic mapping



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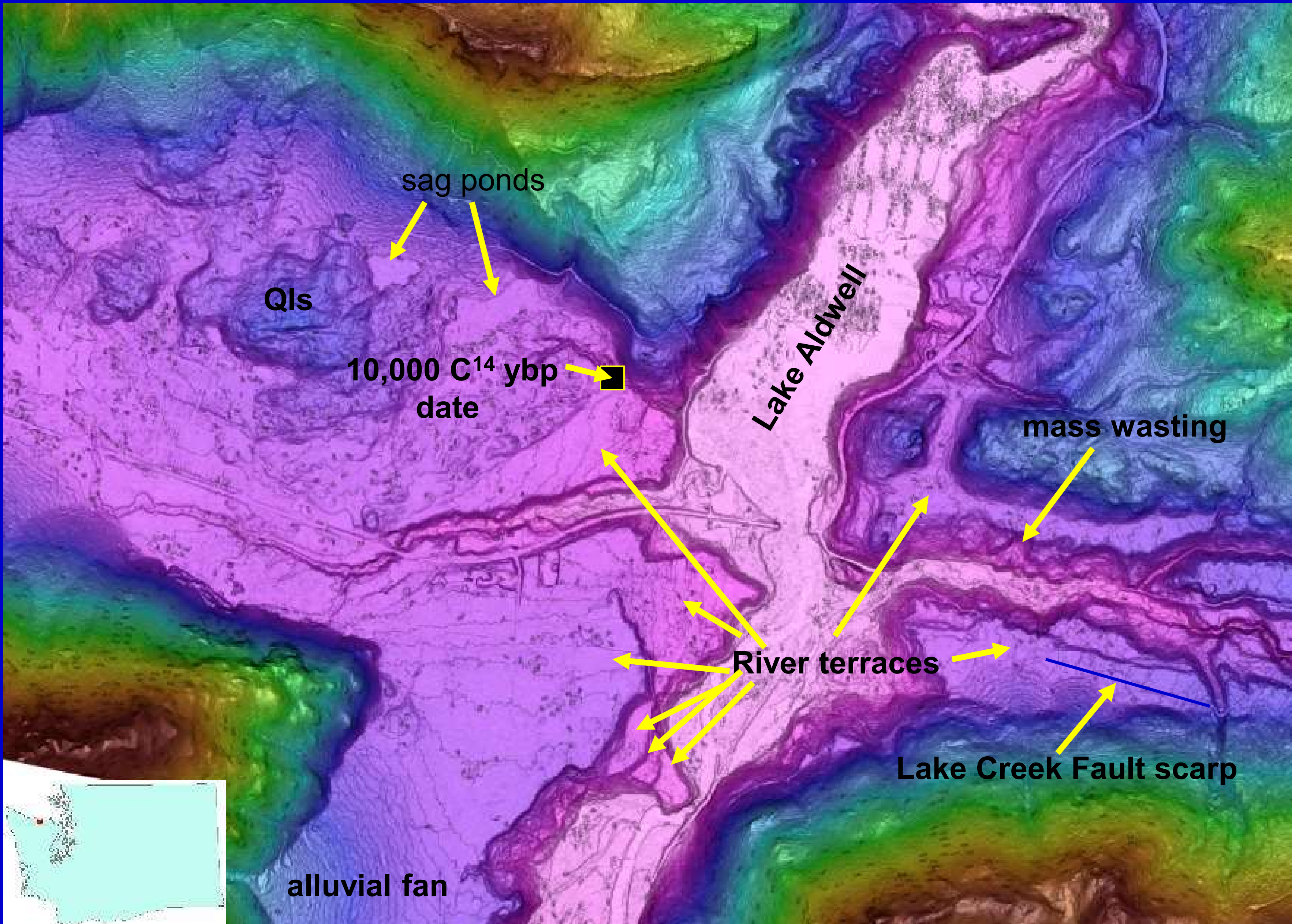
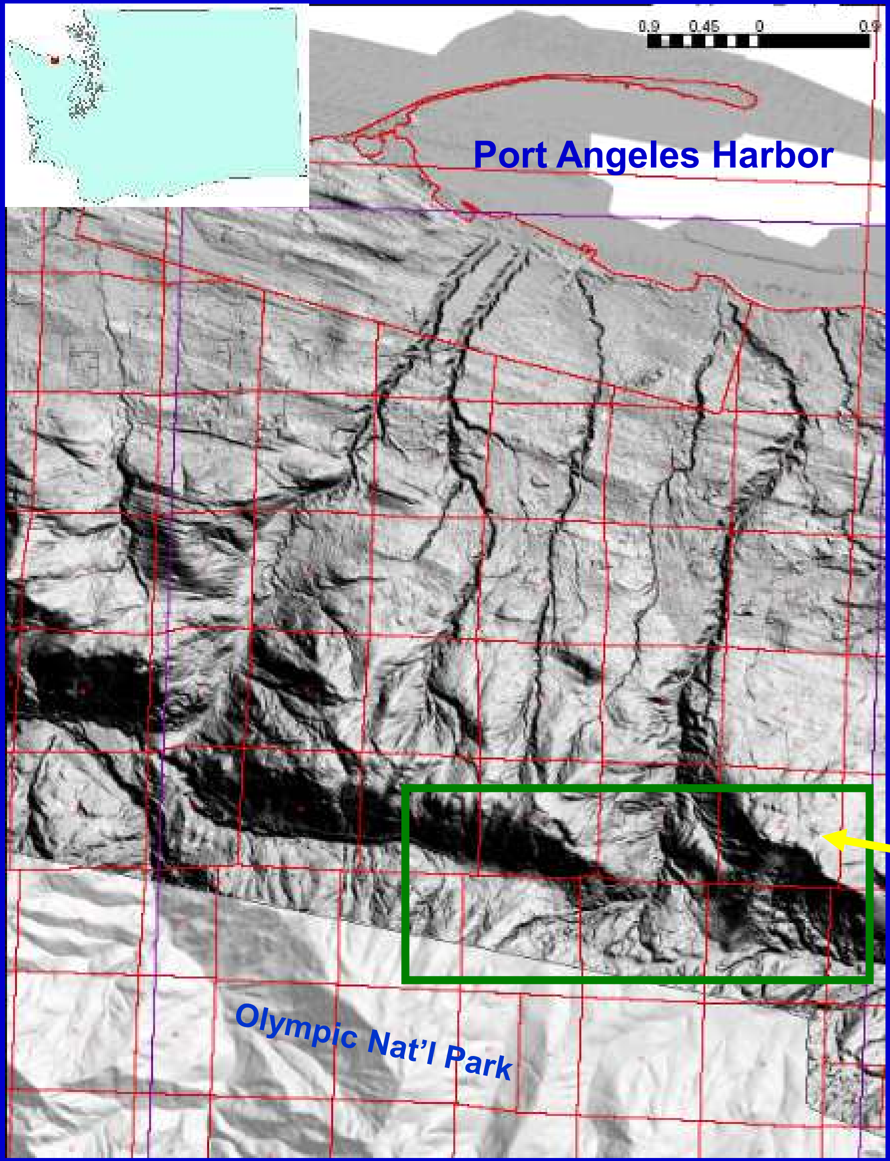
Geologic Mapping – Landscape Evolution



Geologic Mapping – Quaternary Faults



LiDAR hillshade image for Port Angeles area

Area in next slide

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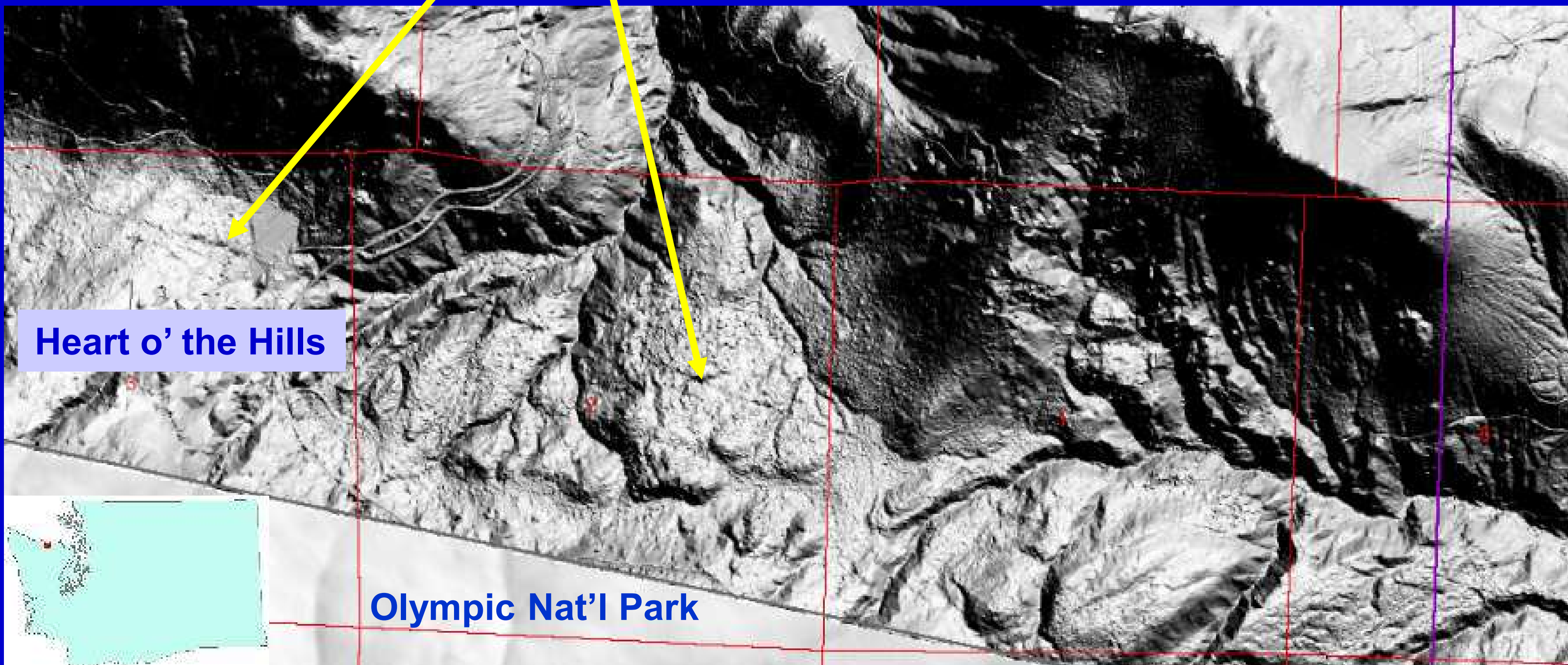
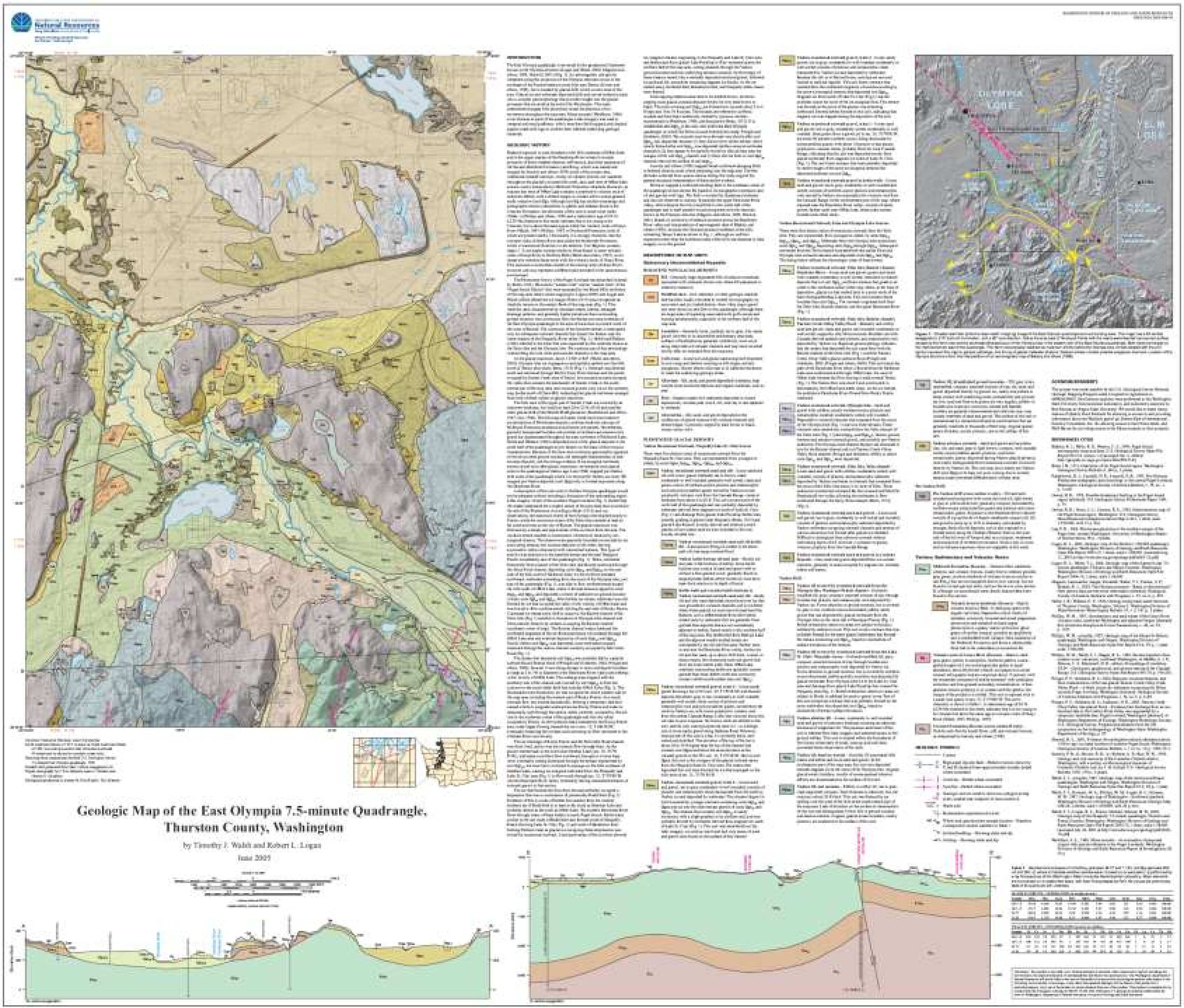
Geologic Mapping – Quaternary Faults

Holocene Fault Scarp – Lake Creek Fault




Geologic Map of the East Olympia 7.5-minute Quadrangle, Thurston County, Washington

by Timothy J. Walsh and Robert L. Logan

June 2005

One of these terraces is littered with andesitic boulders, such as these at "Stonehenge", along State Route (SR) 7 about 1.5 mi south of SR 702, were deposited by the great Tanwax Creek-Ohop Valley late-glacial flood (From Pringle, Goldstein, and Anderson)

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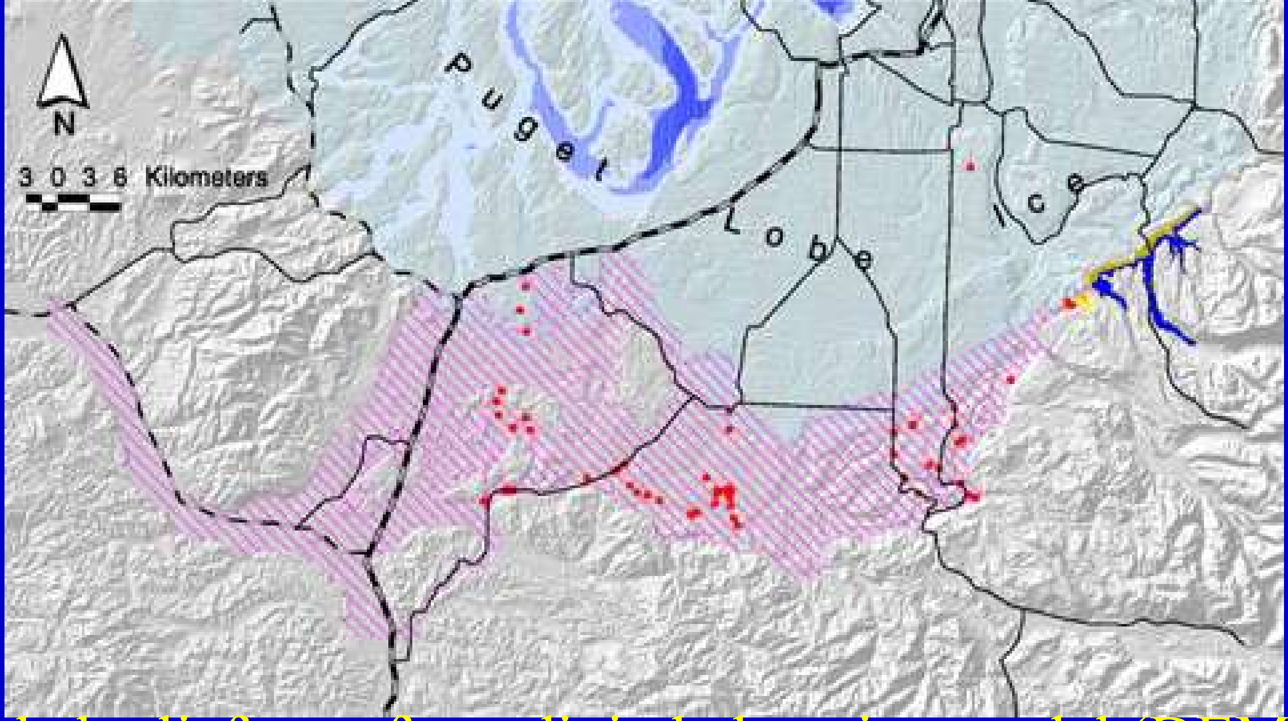

This shaded relief map from digital elevation model (DEM) shows the approximate path of the Tanwax Creek-Ohop Valley late-glacial flood. Water draining from glacial lake Carbon, which was impounded against the receding Puget Lobe of the Vashon Glacier, triggered a large landslide (yellow) that temporarily blocked the flow. This impounded water quickly breached the landslide dam and carried andesite boulders from the landslide along in the flood. Small pink dots show the location of some of the andesite and granodiorite boulders (From Pringle, Goldstein, and Anderson)

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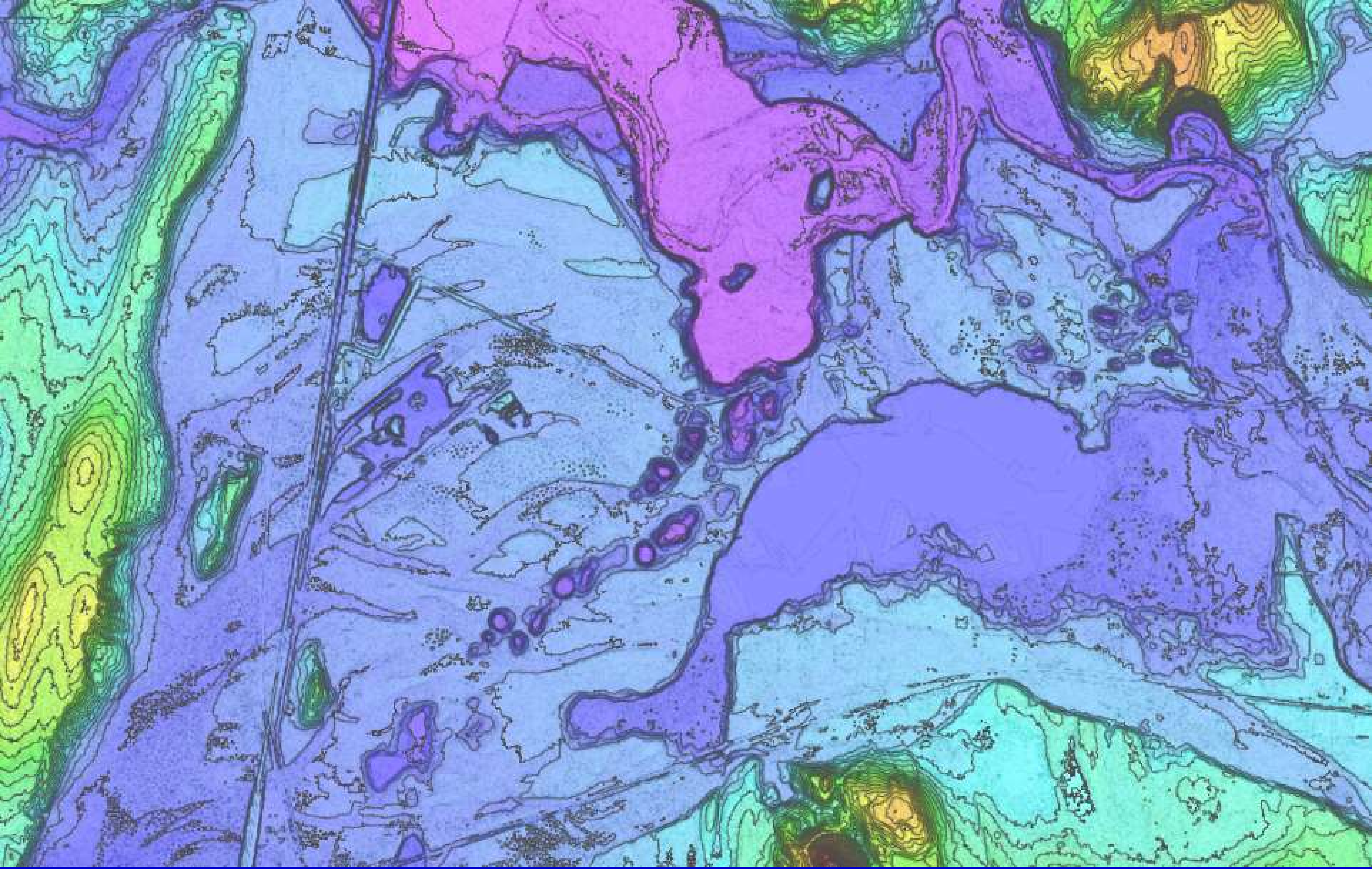

Note that Mima Mounds on this map are confined to the terrace underlain by deposits of the Tanwax Flood—stay tuned

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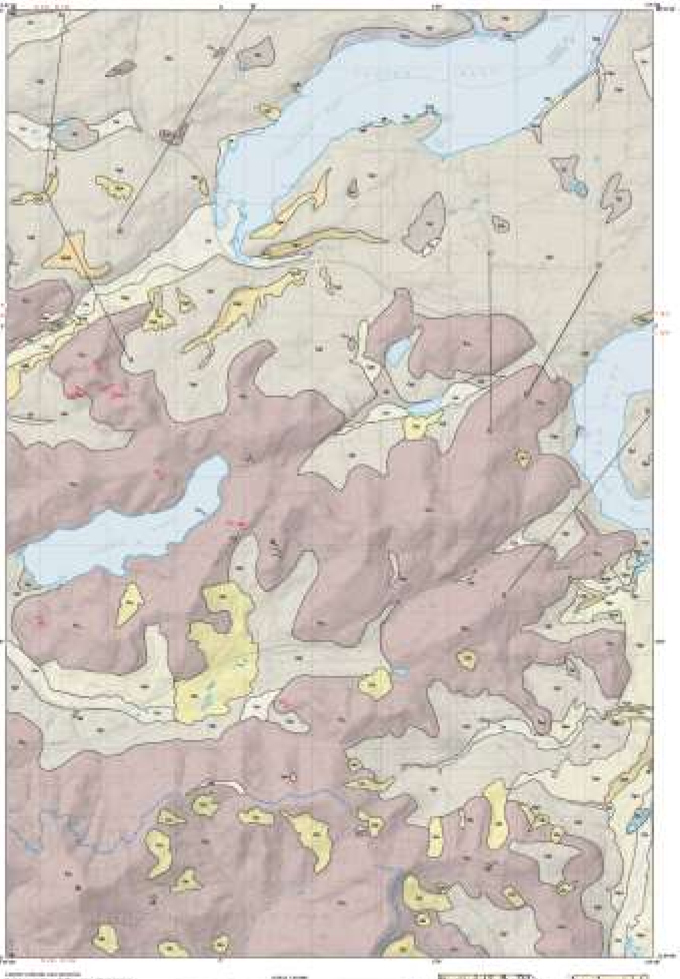
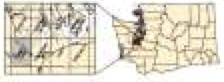


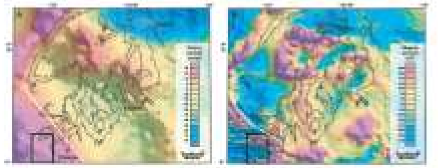


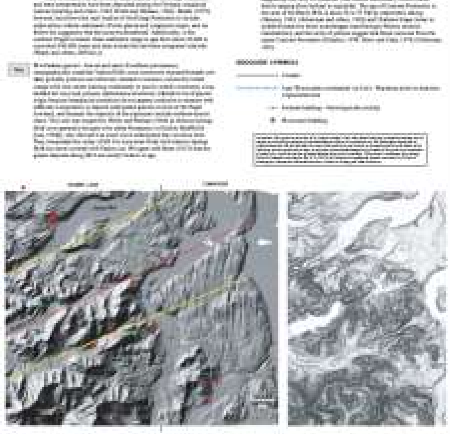
Geologic Map of the Summit Lake 7.5-minute Quadrangle, Thurston and Mason Counties, Washington

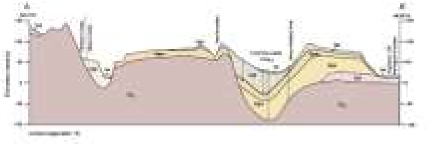
by Robert L. Logan and Timothy J. Walsh

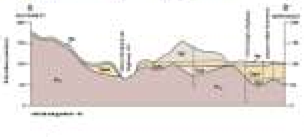
June 2004

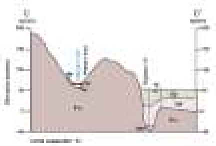
INTRODUCTION

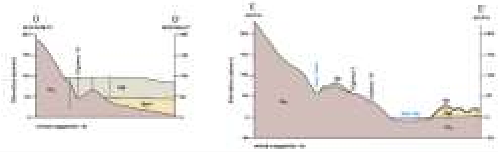


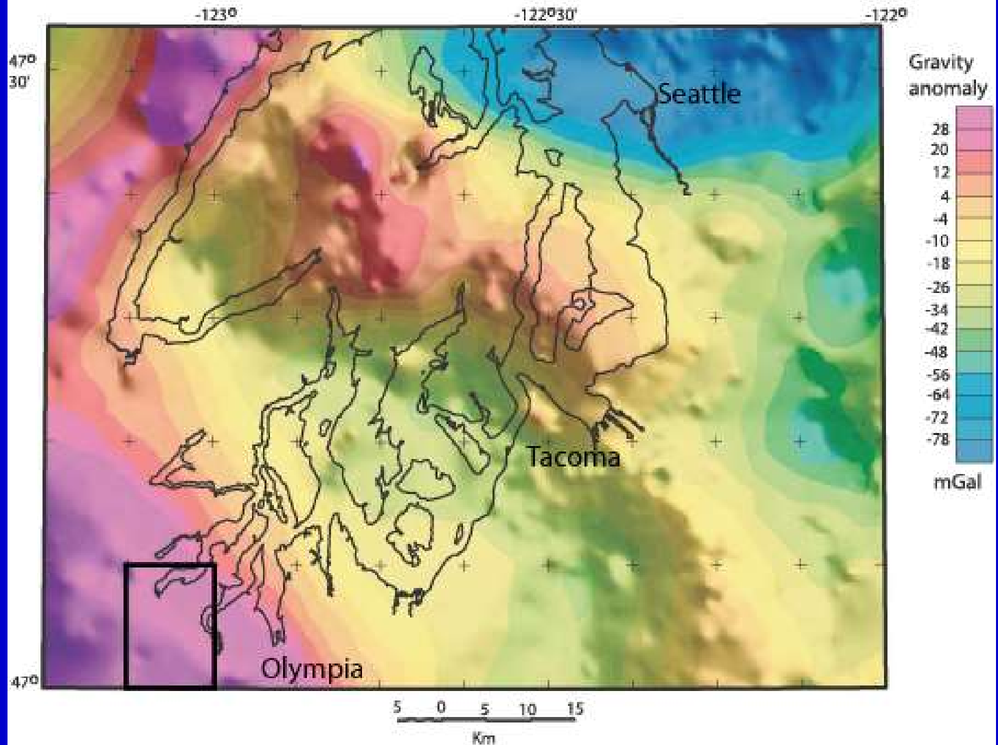








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-122°
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47°
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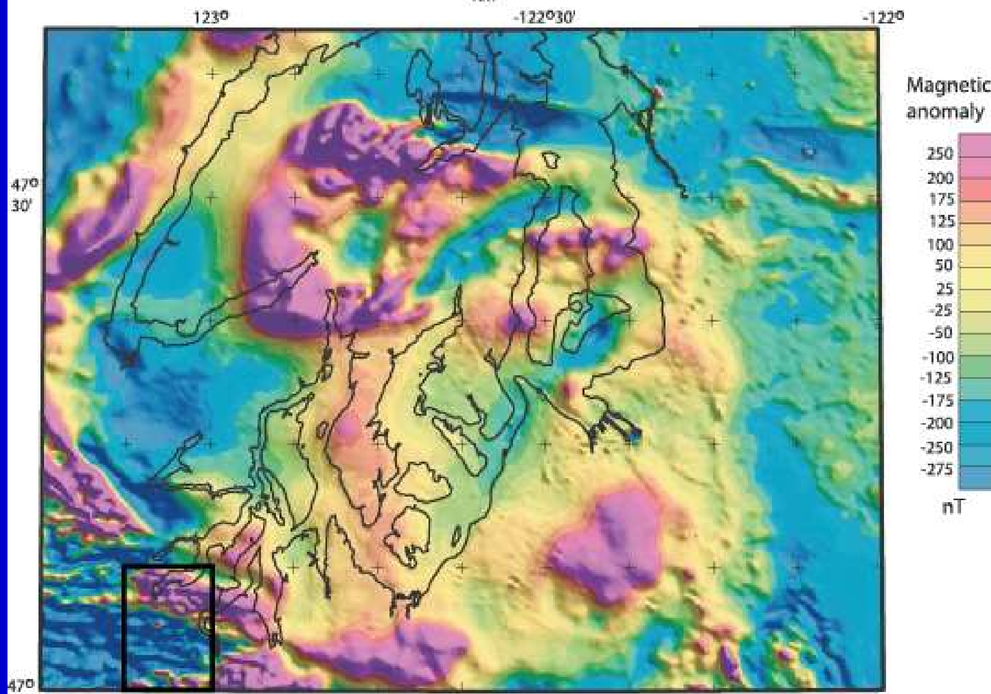
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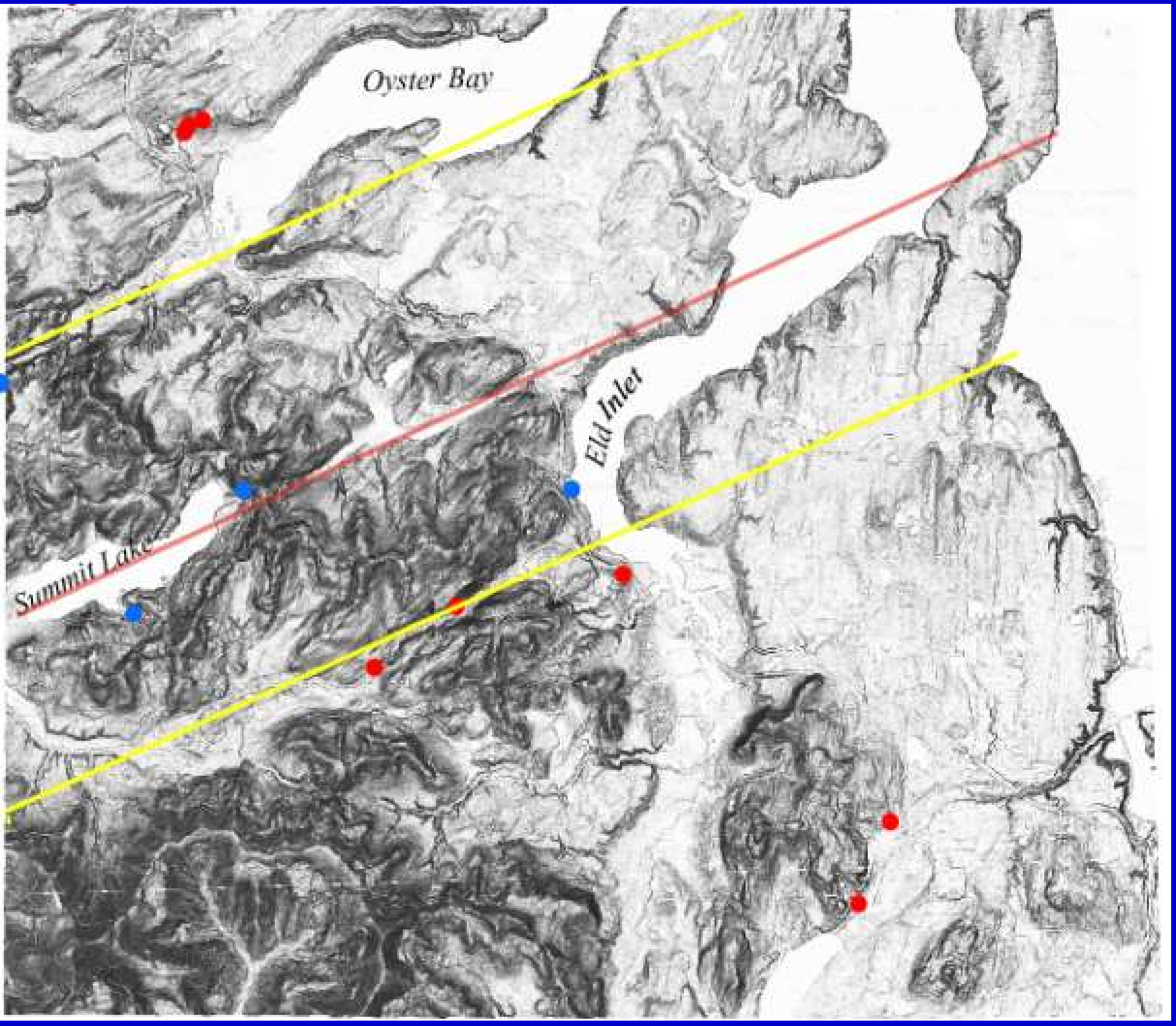

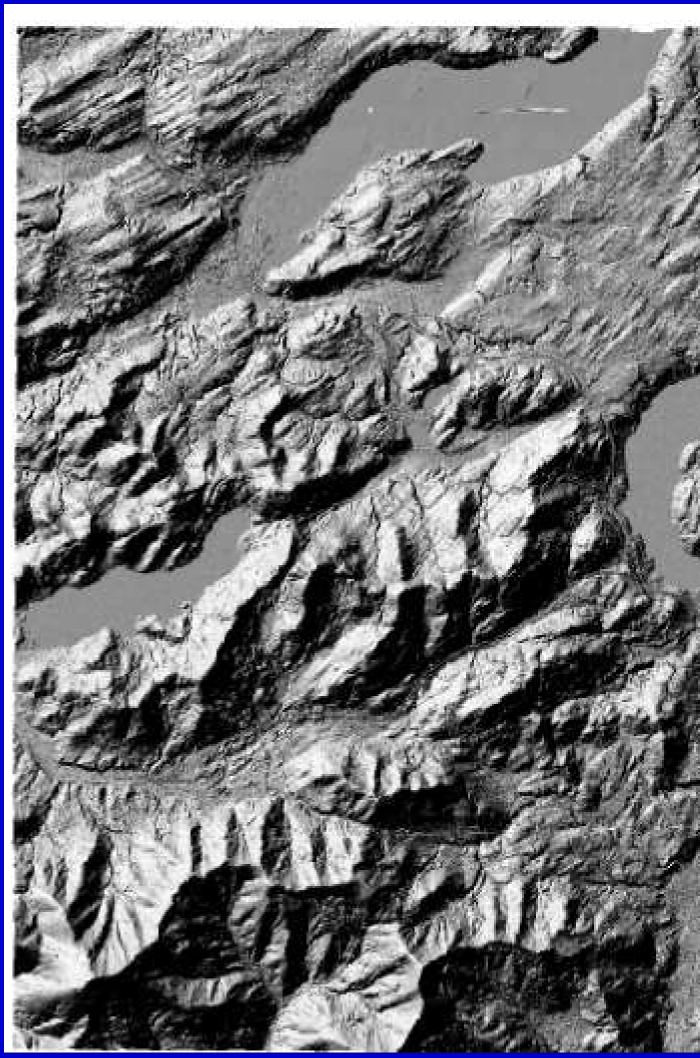

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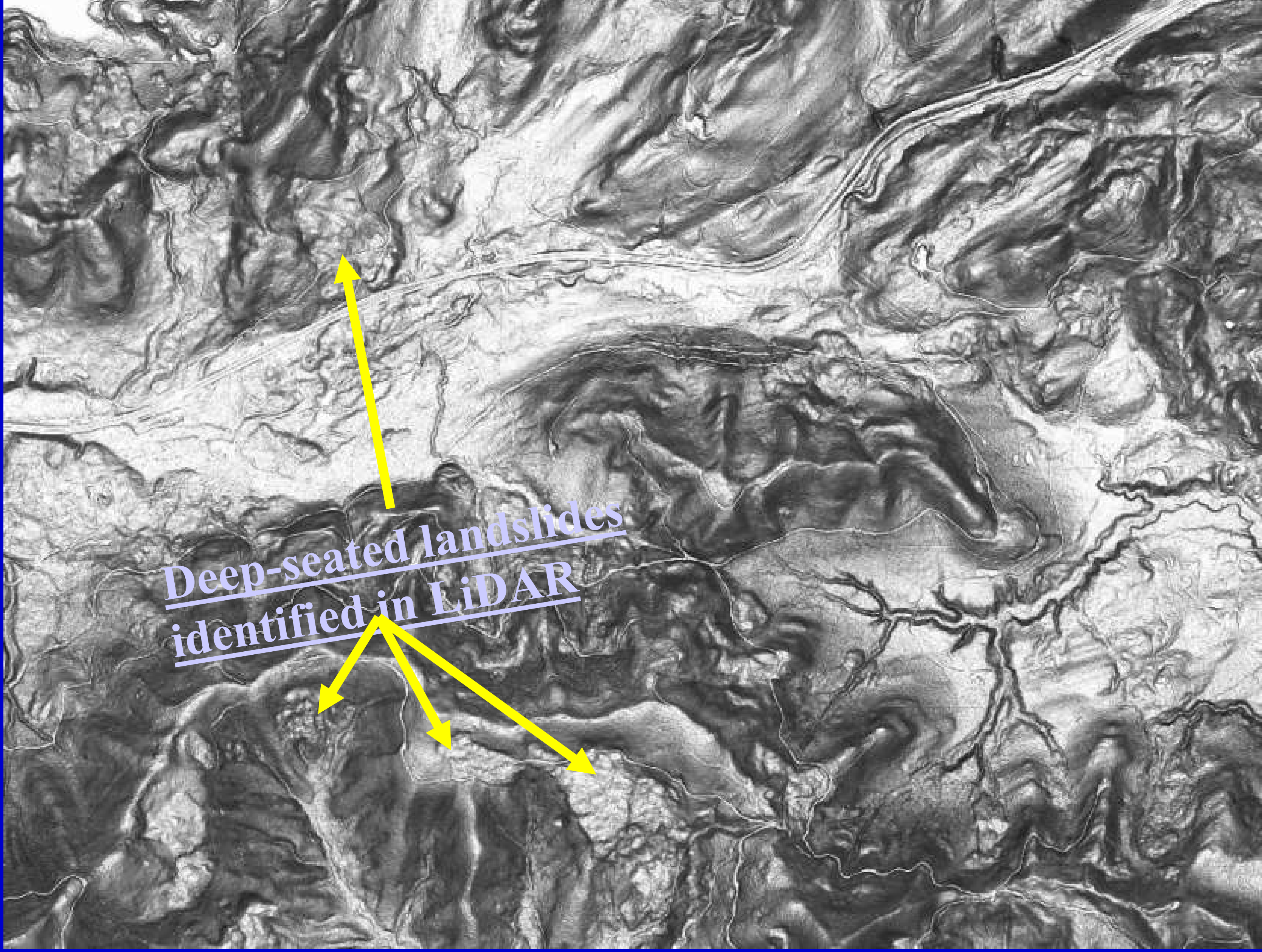

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LiDAR vertical hillshade image of Black Hills west of Olympia showing deep-seated landslides