

Northeast Regional National Cooperative Soil Survey Conference

Elizabethtown, PA

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# **Solifluction Expression on Mountain Foothslopes of the Ridge and Valley**

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# Solifluction

also known as *soil fluction* or *soil creep*, is a type of mass wasting where waterlogged soil slowly moves downslope over impermeable material. It can occur in any climate where the ground is saturated by water, though it is most often found in periglacial environments where the ground is permanently frozen (permafrost). A term often used for deposits formed under periglacial conditions is [Gelifluction](#).

<http://encyclopedia.thefreedictionary.com/solifluction>

# Examples of Solifluction



Gros Morne, Newfoundland

[http://www.uwsp.edu/geo/faculty/ritter/images/lithosphere/periglacial/GSC\\_solifluction\\_lobe\\_Gros\\_Morne\\_small.jpg](http://www.uwsp.edu/geo/faculty/ritter/images/lithosphere/periglacial/GSC_solifluction_lobe_Gros_Morne_small.jpg)



Siberia

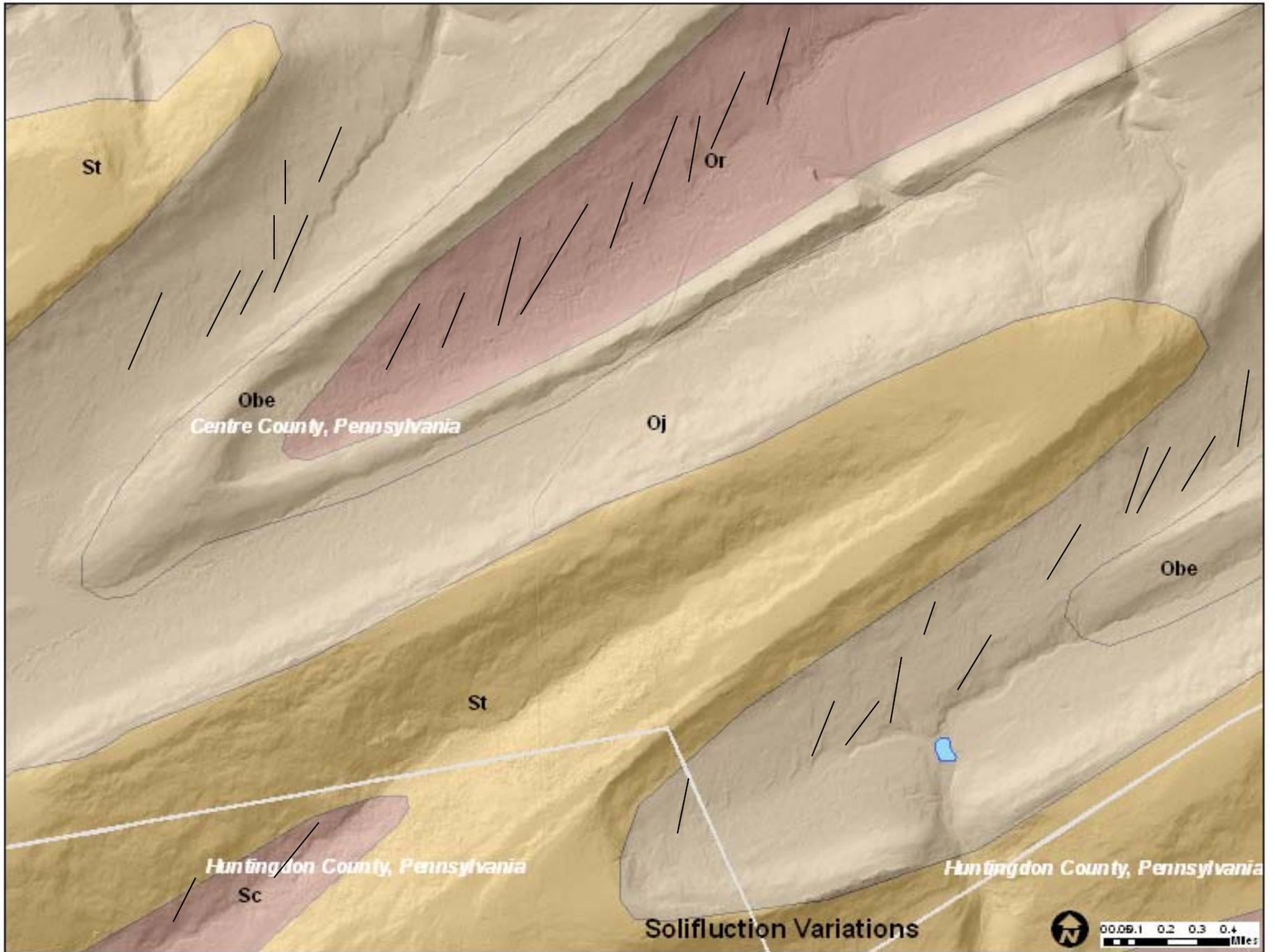
[http://www.fettes.com/cairngorms/images/solifluction\\_siberia.jpg](http://www.fettes.com/cairngorms/images/solifluction_siberia.jpg)

# Pennsylvania Example



# String Lobe Solifluctions are Everywhere

- **Appear in just about every footslope position below a significant steep ridge**
- **Always in colluvial material**
- **Appear to be better expressed (150 to 300 meters long by 2 to 8 meters high) in loamy-skeletal family classes**
- **Best expression is achieved on slopes between 15 and 35 percent.**



St

Or

Obe

Centre County, Pennsylvania

Oj

Obe

St

Huntingdon County, Pennsylvania

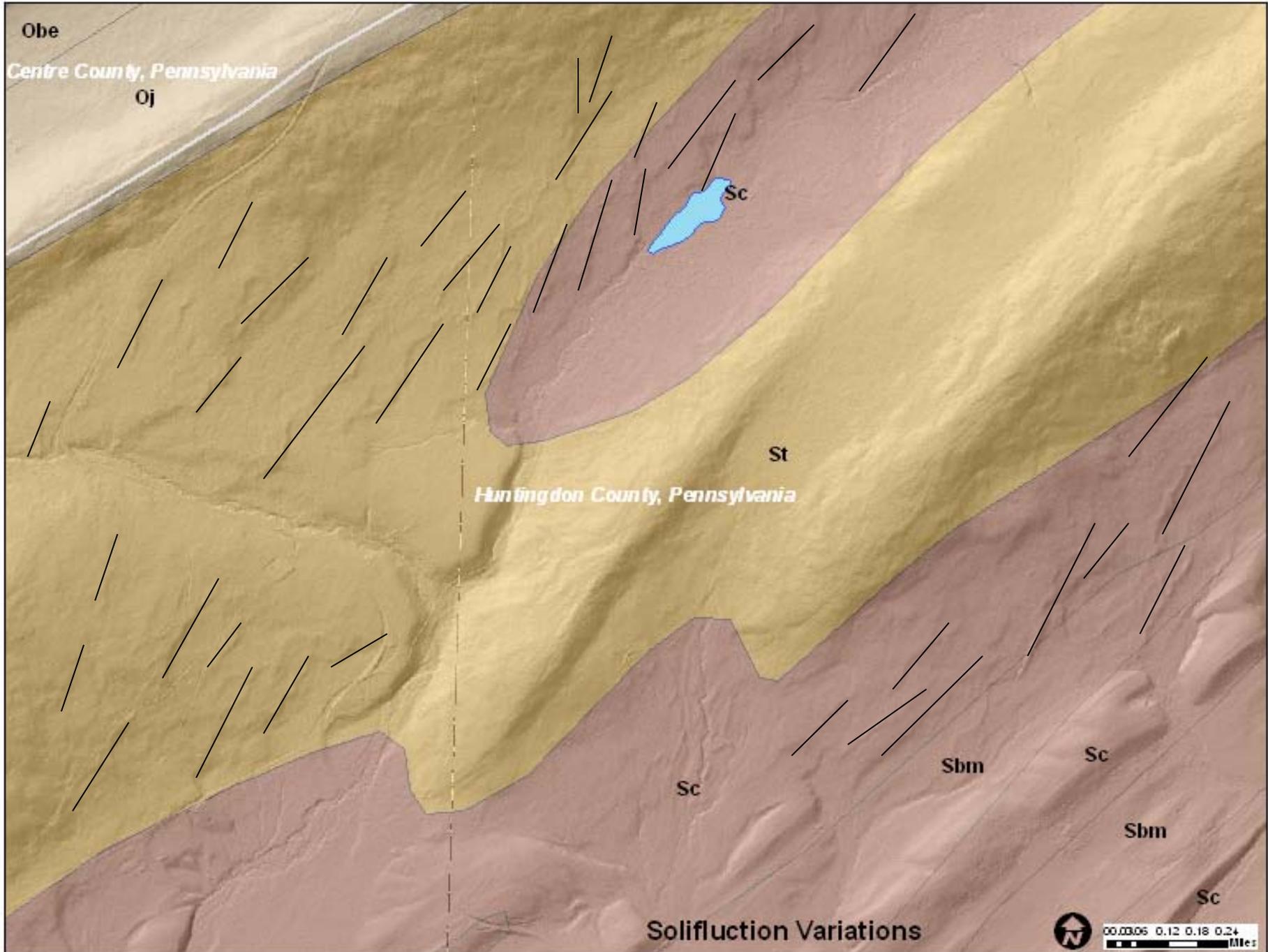
Sc

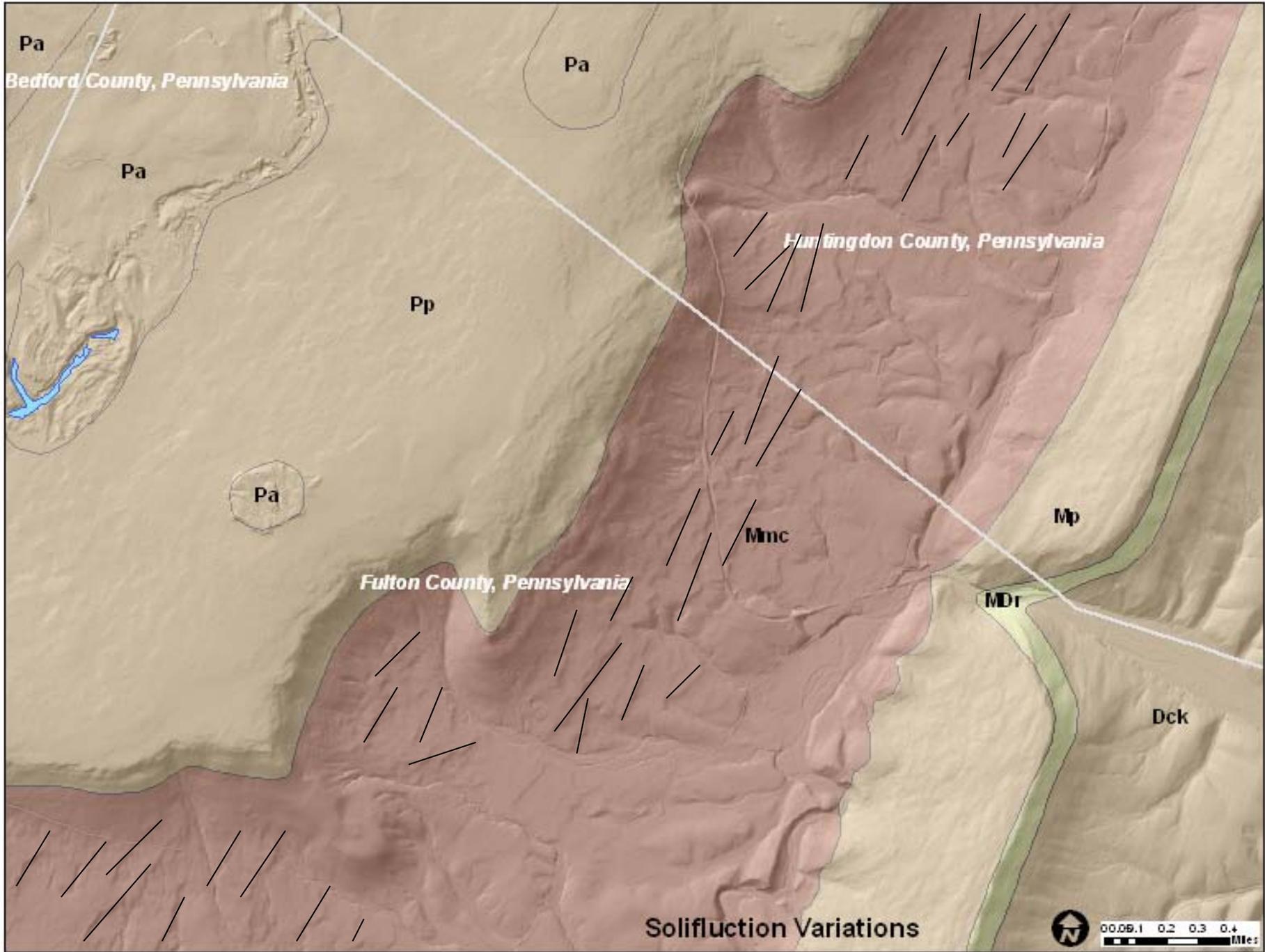
Huntingdon County, Pennsylvania

Solifluction Variations



0.0 0.1 0.2 0.3 0.4 Miles





Pa  
Bedford County, Pennsylvania

Pa

Pa

Pp

Huntingdon County, Pennsylvania

Pa

Mnc

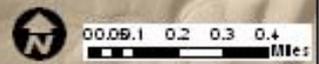
Mp

Fulton County, Pennsylvania

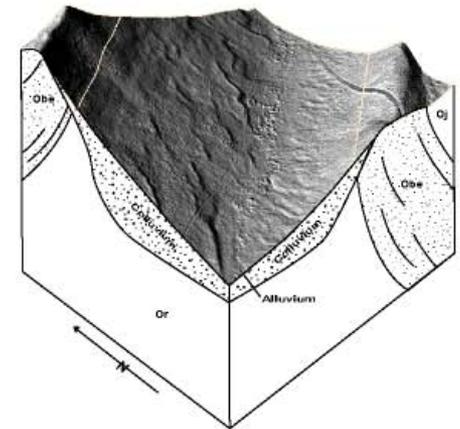
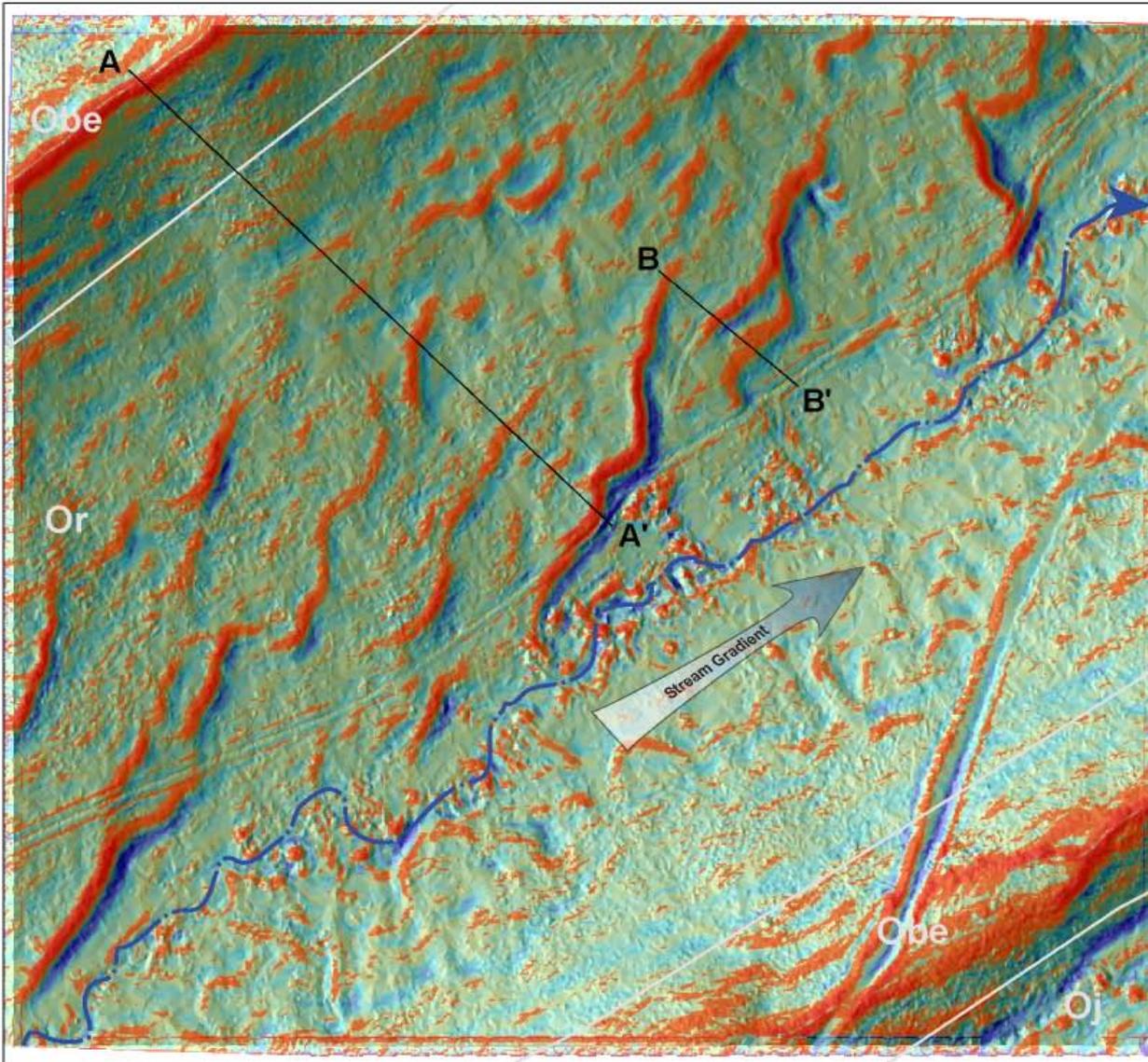
MDr

Dck

Solifluction Variations

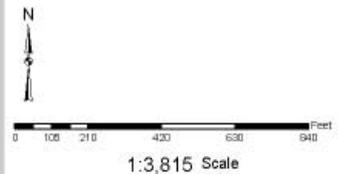
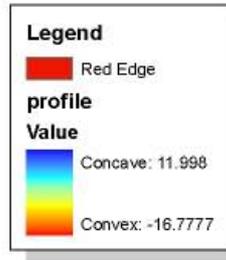


# Solifluctions on Southern Slope of Tussey Mountain, Centre County, Pennsylvania

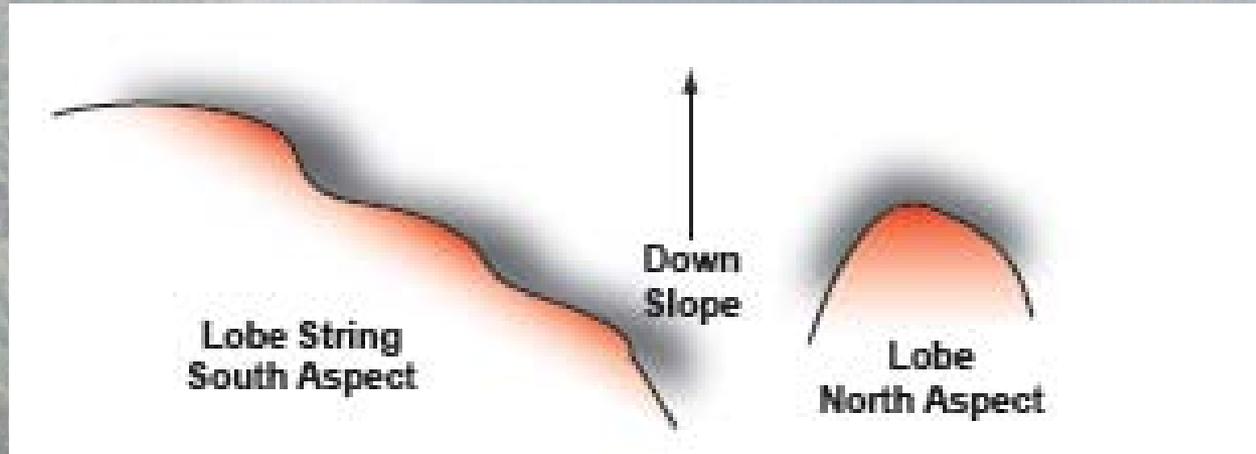


**Geology**

Oj – Juniata Formation; Sandstone, siltstone, and shale  
 Or – Reedsville Formation; Shale, siltstone, and black shale with some sandstone  
 Obe – Bald Eagle Formation; Sandstone, siltstone, shale, and some conglomerate



# Solifluction Lobe Shapes



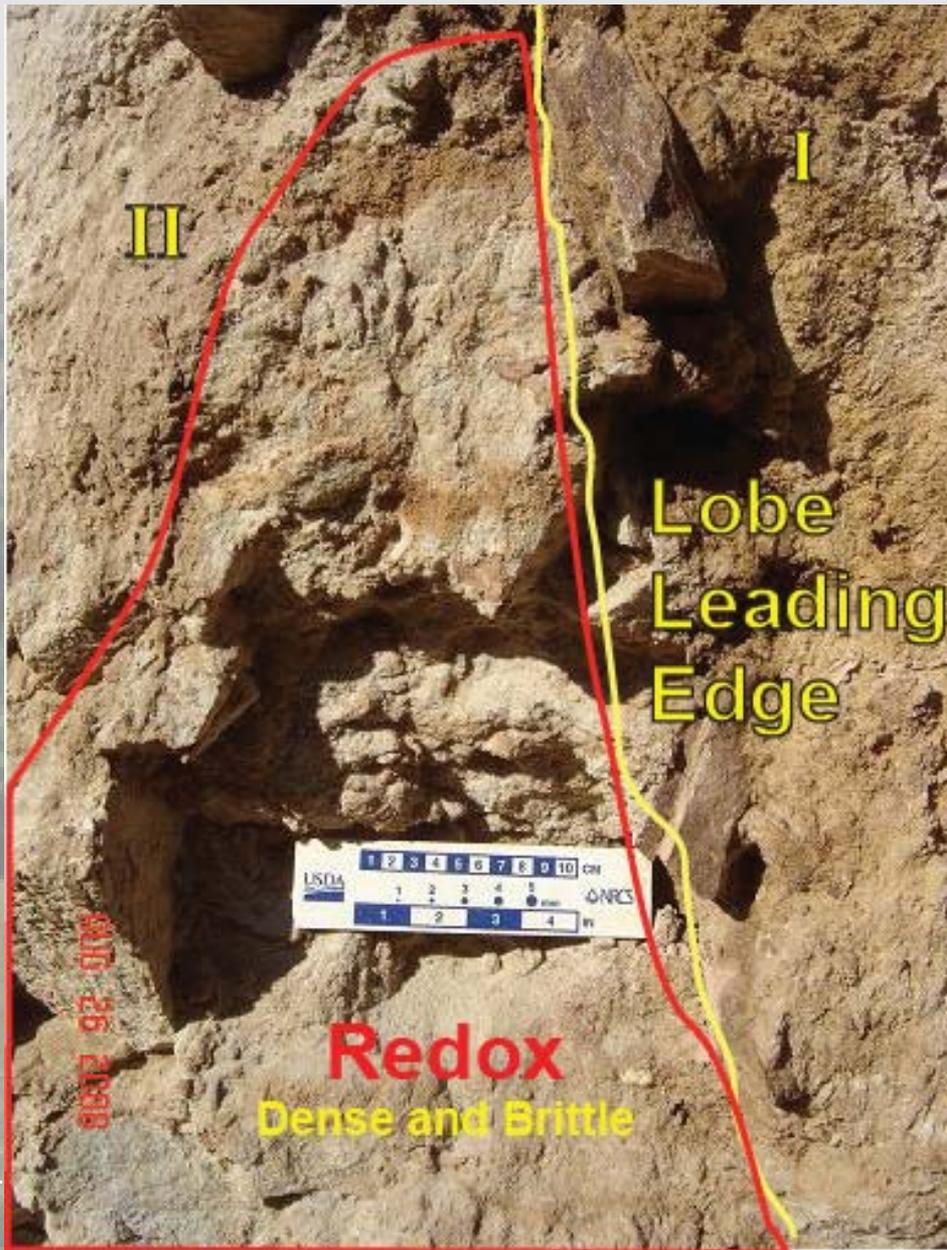
- The leading edges of the lobes are extremely stony
- There appears to be no fragipan development
- There is a wet weather spring at the lowest point of each large string lobe, but not always apparent with the typical crescent shaped lobe.
- Fragipan development improves upslope from the leading edges of both lobes.

# Lobe Internal Structure



Solafluction Lobe Impact Zone

← Slope



Lower Zone of Lobe Impact

- The rock fragments are oriented at the leading edge of the lobe.
- Dense and brittle soil showing redox is at the impact zone of the lobe.
- There is no prisms noted, nor is the dense zone continuous within the profile of the slope.



AUG 11 2008

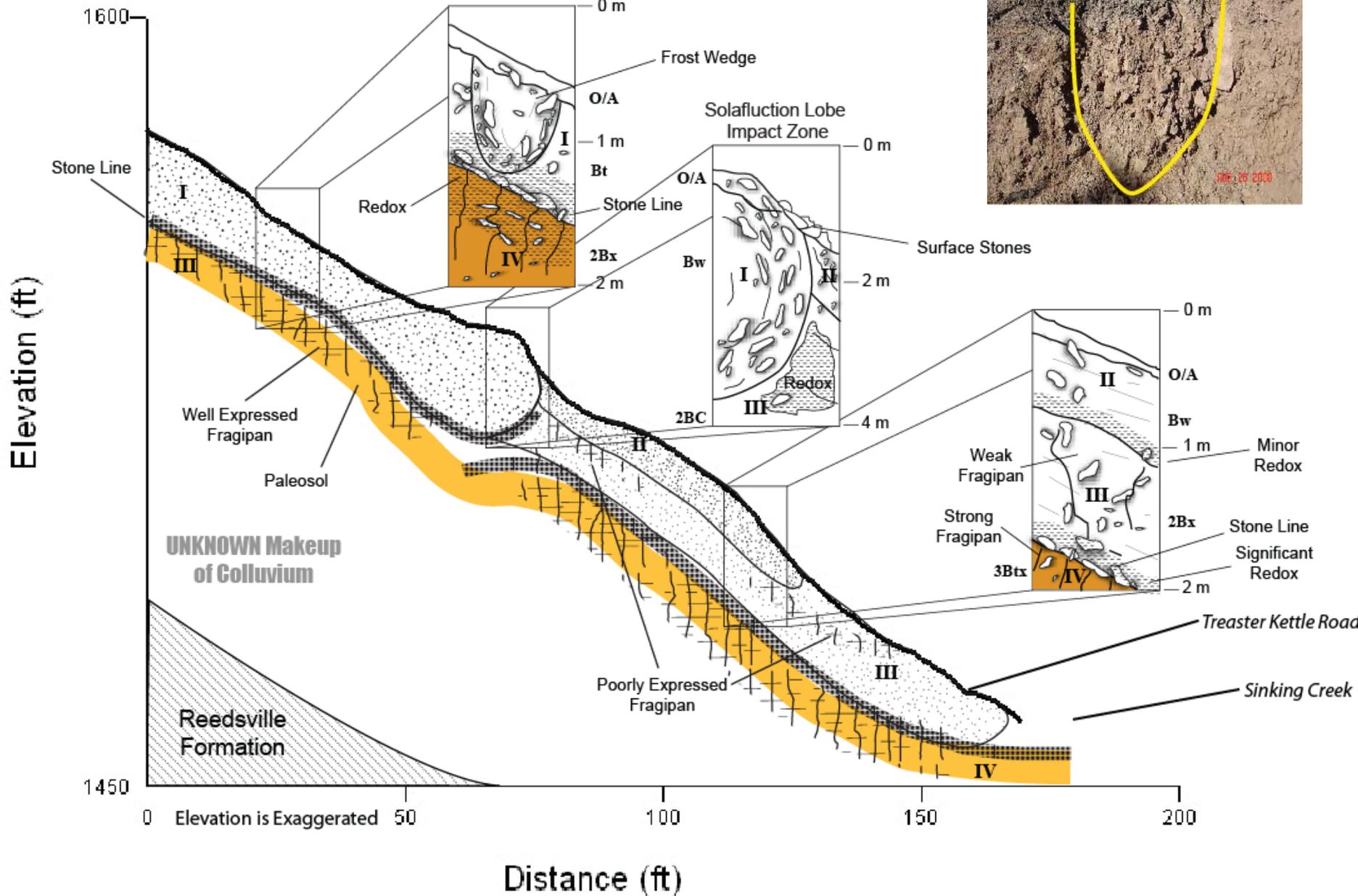


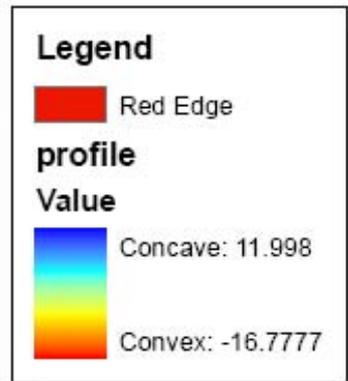
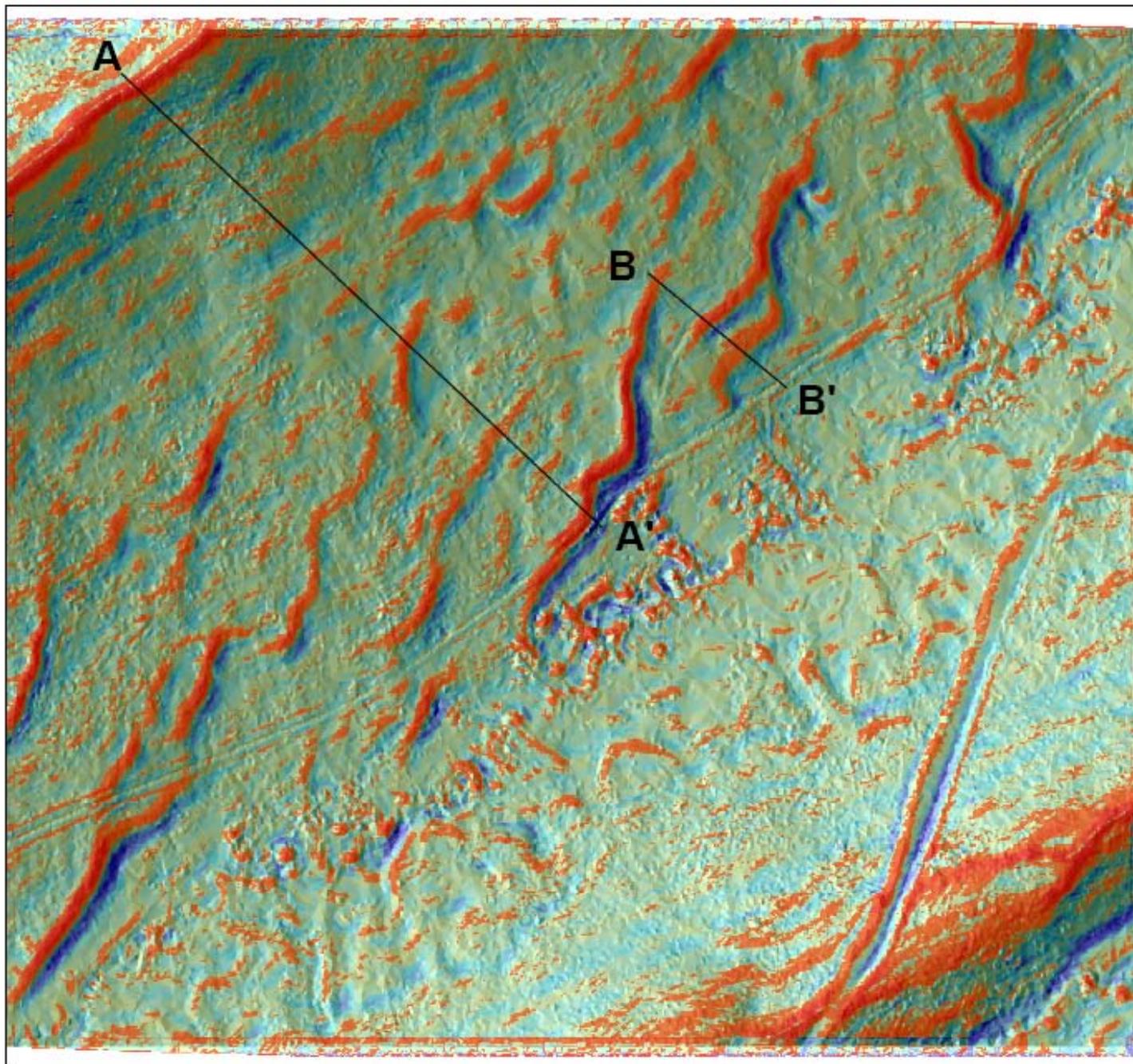
AUG 26 2008



# Solafluction Profile

Crosssection B-B'







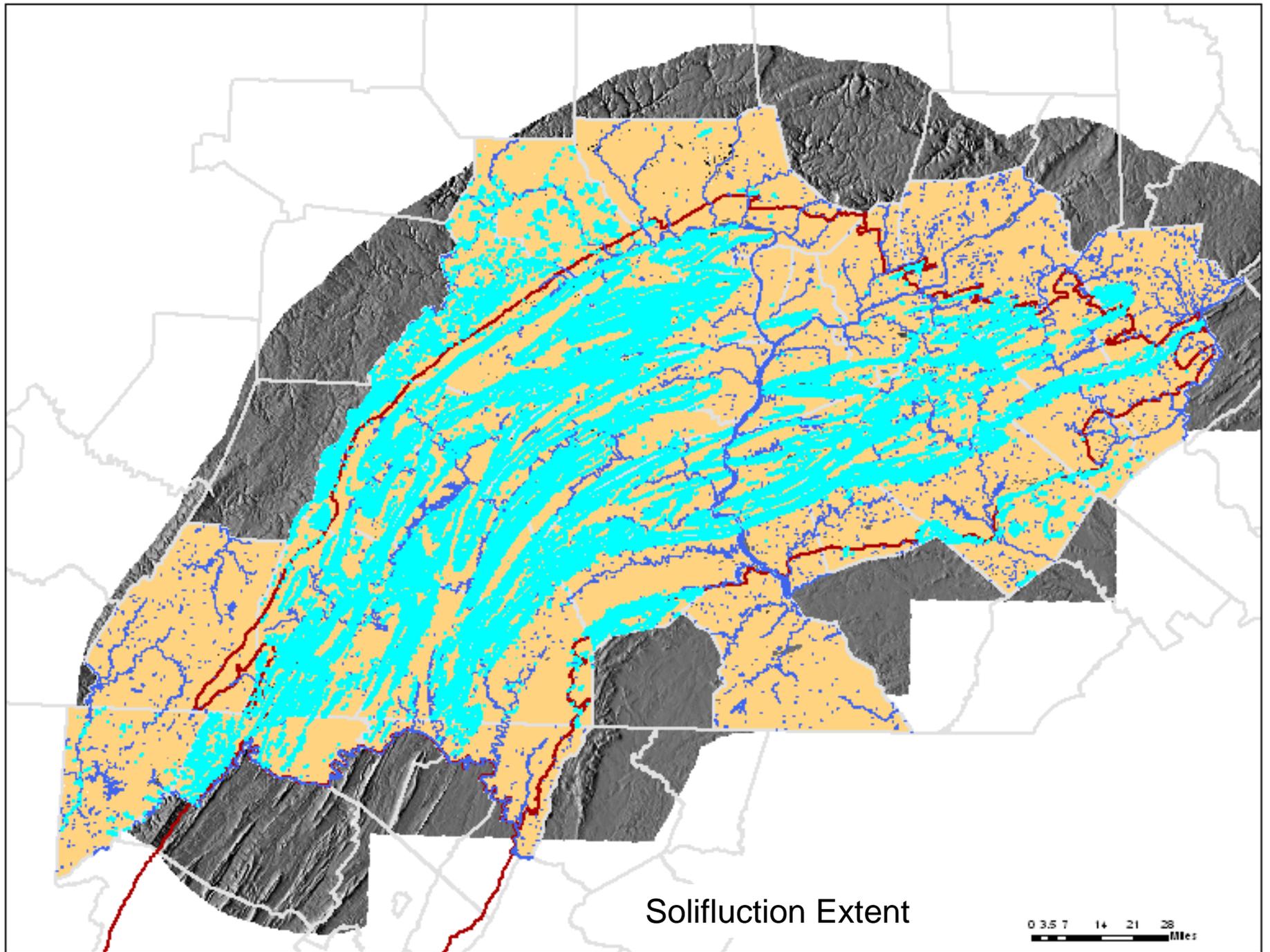


# Facts

- **Large String Lobes occur on southern aspect slopes**
- **Have an orientation of SSW-NNE [about 28° w/ SD 13°] (Marsh, 1998)**
- **Largest lobes occur in Loamy-skeletal material**
- **Internal rock fragments appear to be oriented and layered, supporting the theory of mass movement of super-saturated soil.**
- **Fragipan expression is tied to the internal structure of the solifluction lobe.**
- **Solifluction structure and stratigraphy seem to dictate internal water flow making the hydrologic functionality of these side slopes more complex than previously thought.**
- **Historic soil survey mapping is missing these structures.**

# Formation Hypothesis

- Due to a significant warming (possibly from the morning sun) the permafrost melted causing super-saturation of the soil material
- The material flowed down slope in a consistency of “Funnel Cake batter”.
- When the leading edge of the lobe encountered resistance, the soil material dewatered quickly causing an increasing buildup of soil.



Solifluction Extent

0 3.5 7 14 21 28 Miles

# What to Do?

- **With increasing availability of LiDAR data, these lobe strings and crescents can be located and mapped.**
- **How do we visualize these features?**
- **It is quite possible that these features are not relegated to the Ridge and Valley and might be anywhere a periglacial climate existed.**