Influence of Catchment Properties on Stability of Frozen Debris Lobes

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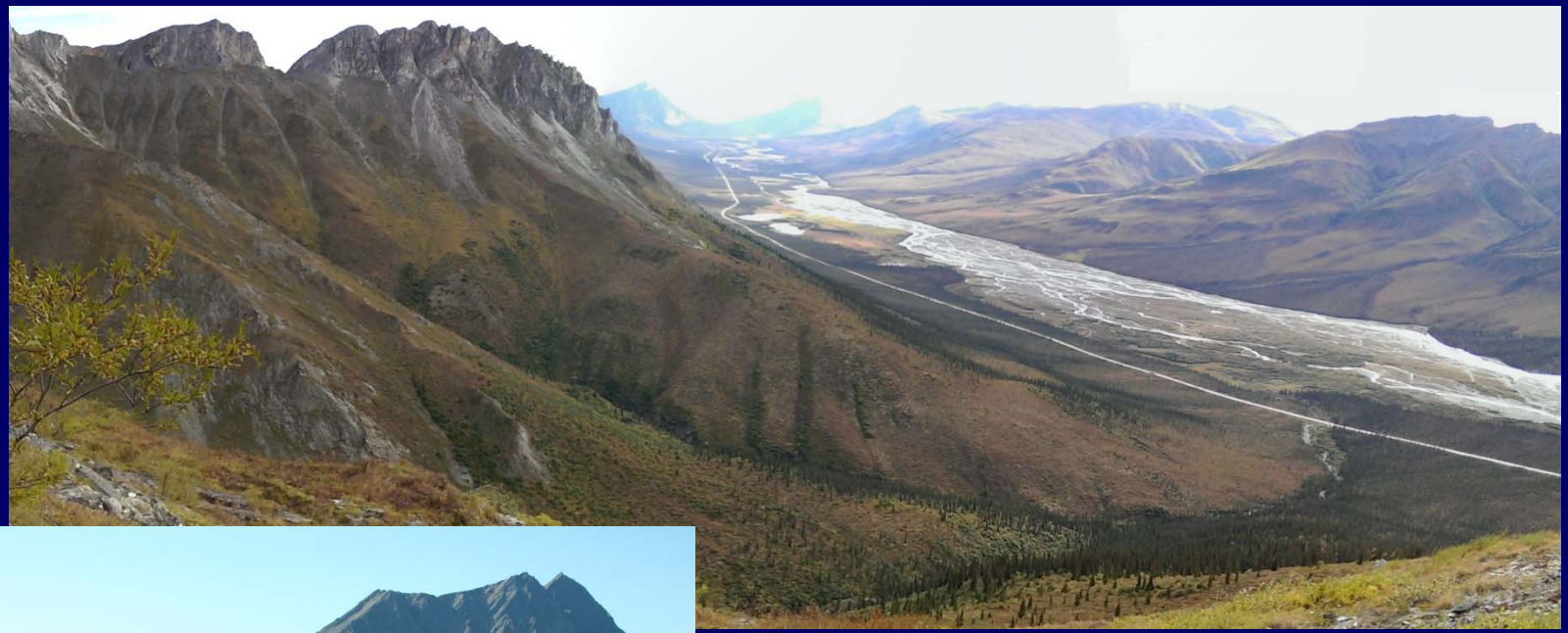
Overview

- Frozen debris lobes in the Dietrich River Valley, southcentral Brooks Range
- Justification
- Catchments with and without lobes
- Sediment movement factors
- Sediment stabilization factors
- Summary

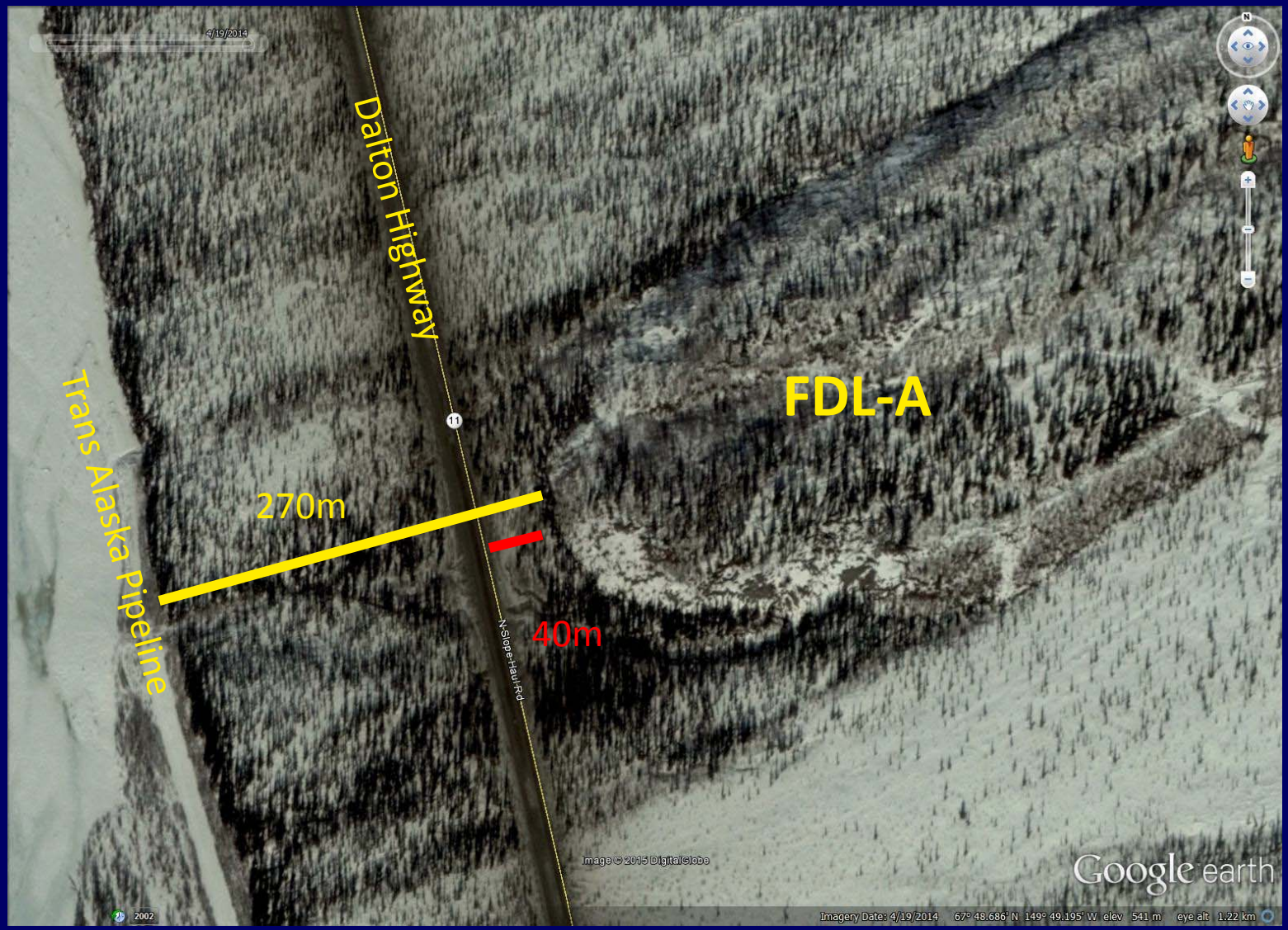
Frozen debris lobes

Why are these features here? Why are they not in all catchments?
What creates their dynamic nature?

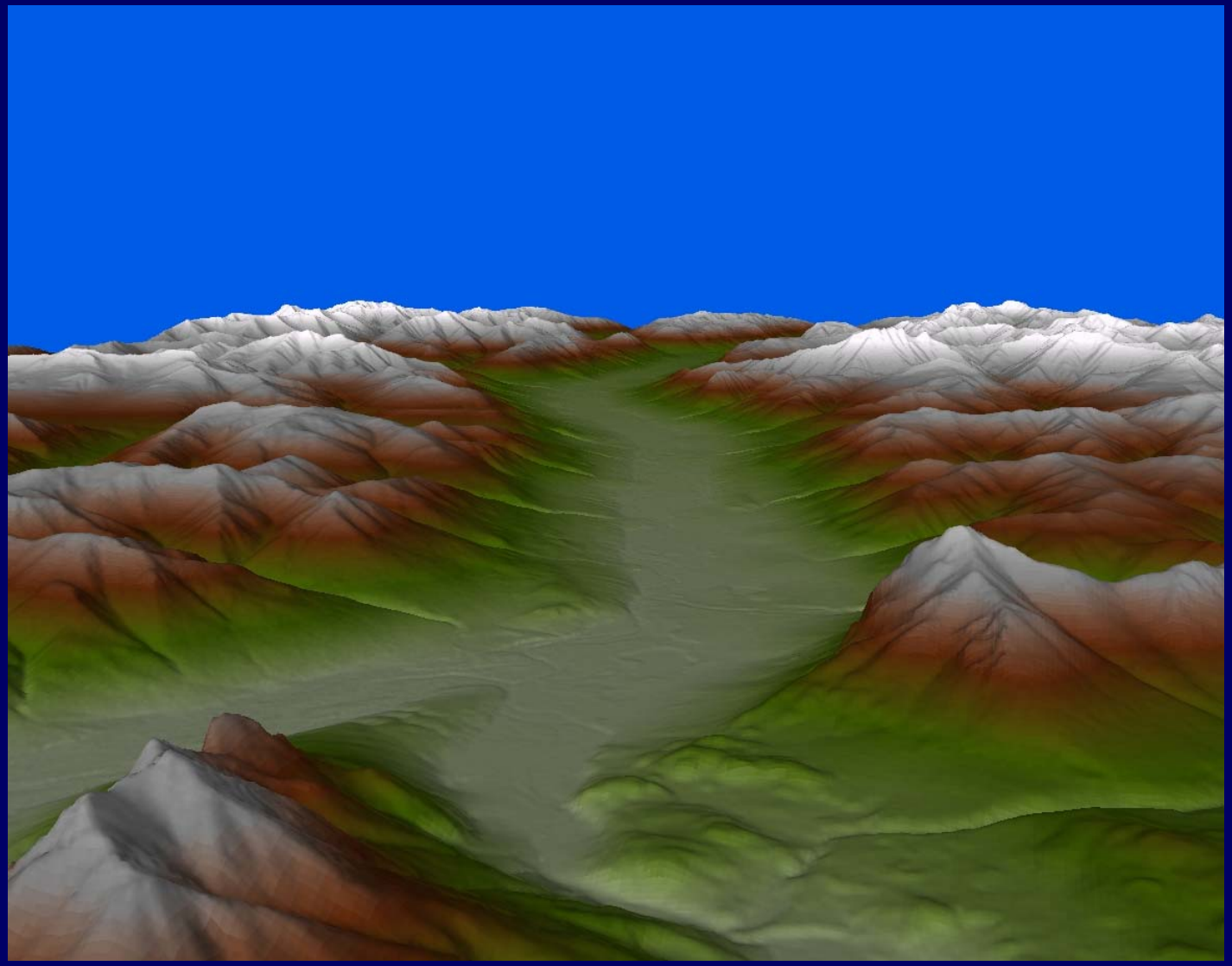
Catchments without lobes



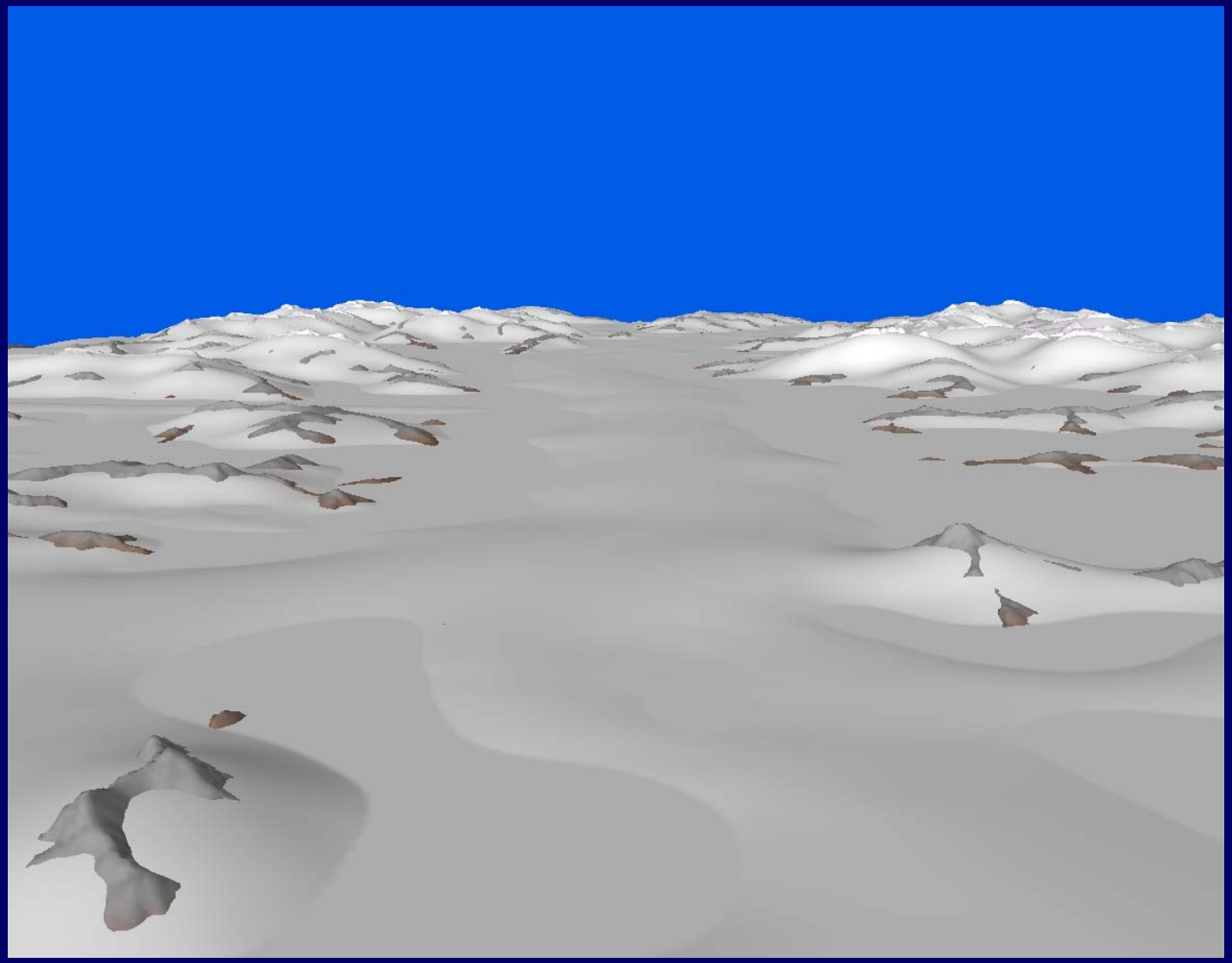
This is why we need to know more



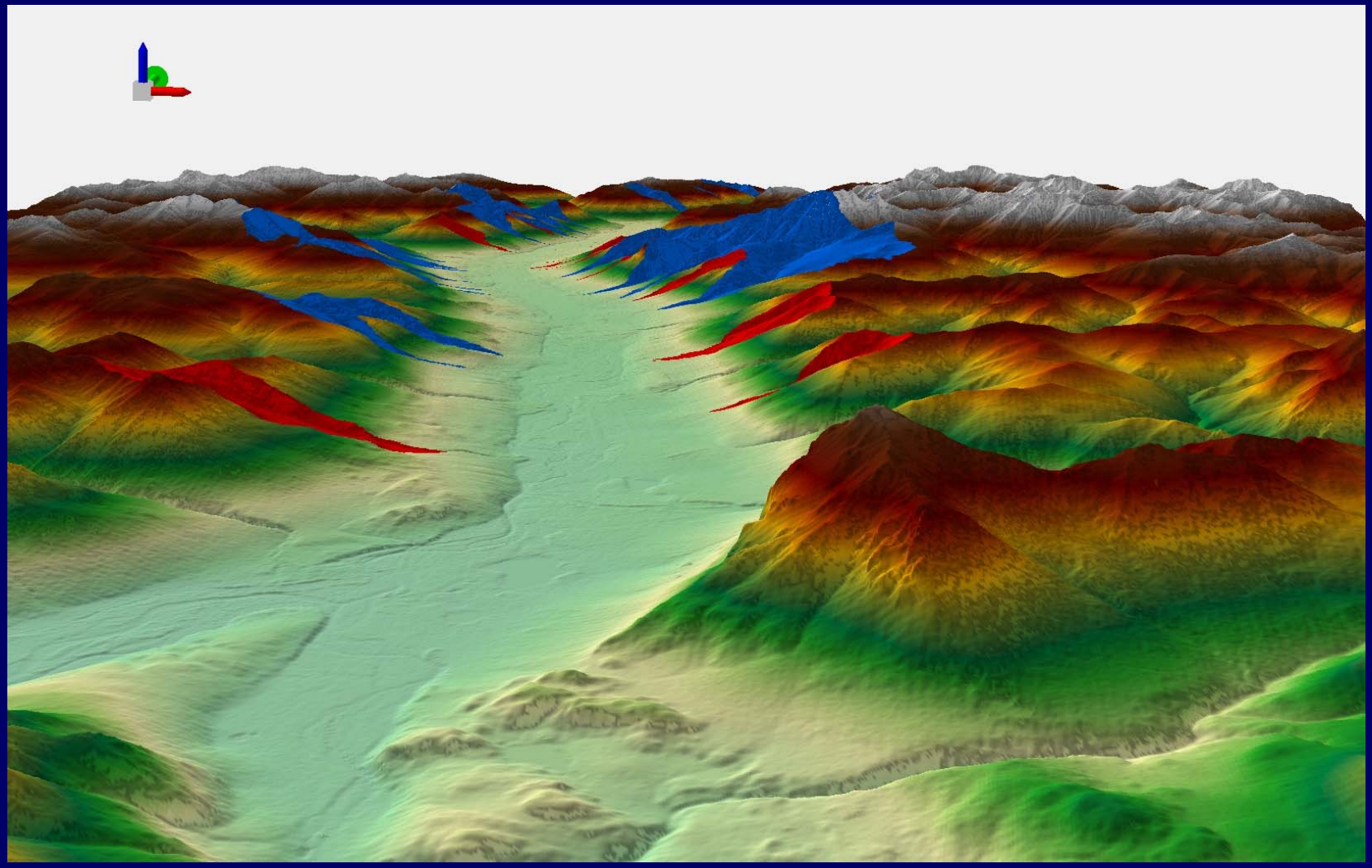
Dietrich River valley



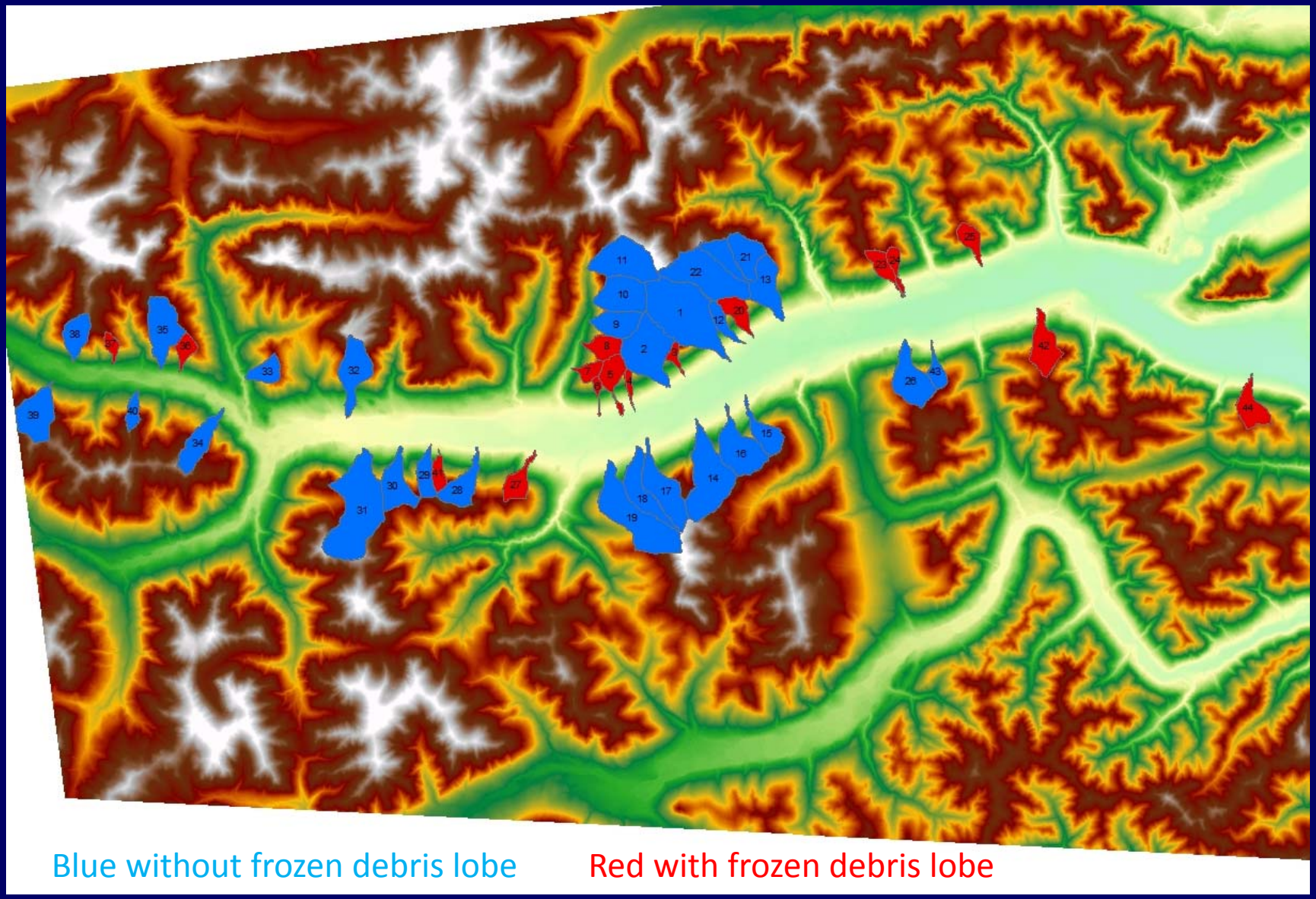
Glacier-filled Dietrich River valley



Catchments draining into the valley

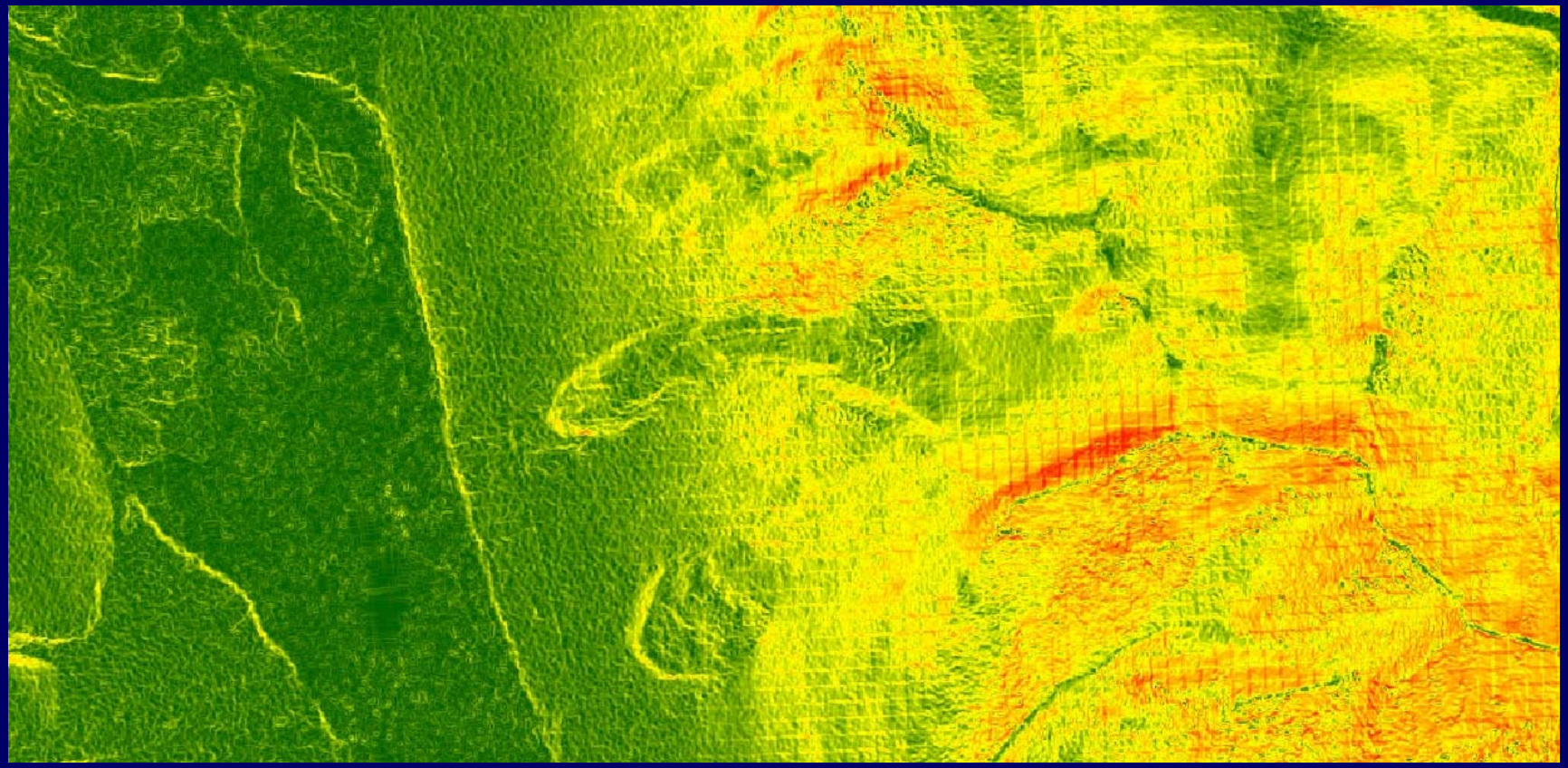


Catchments

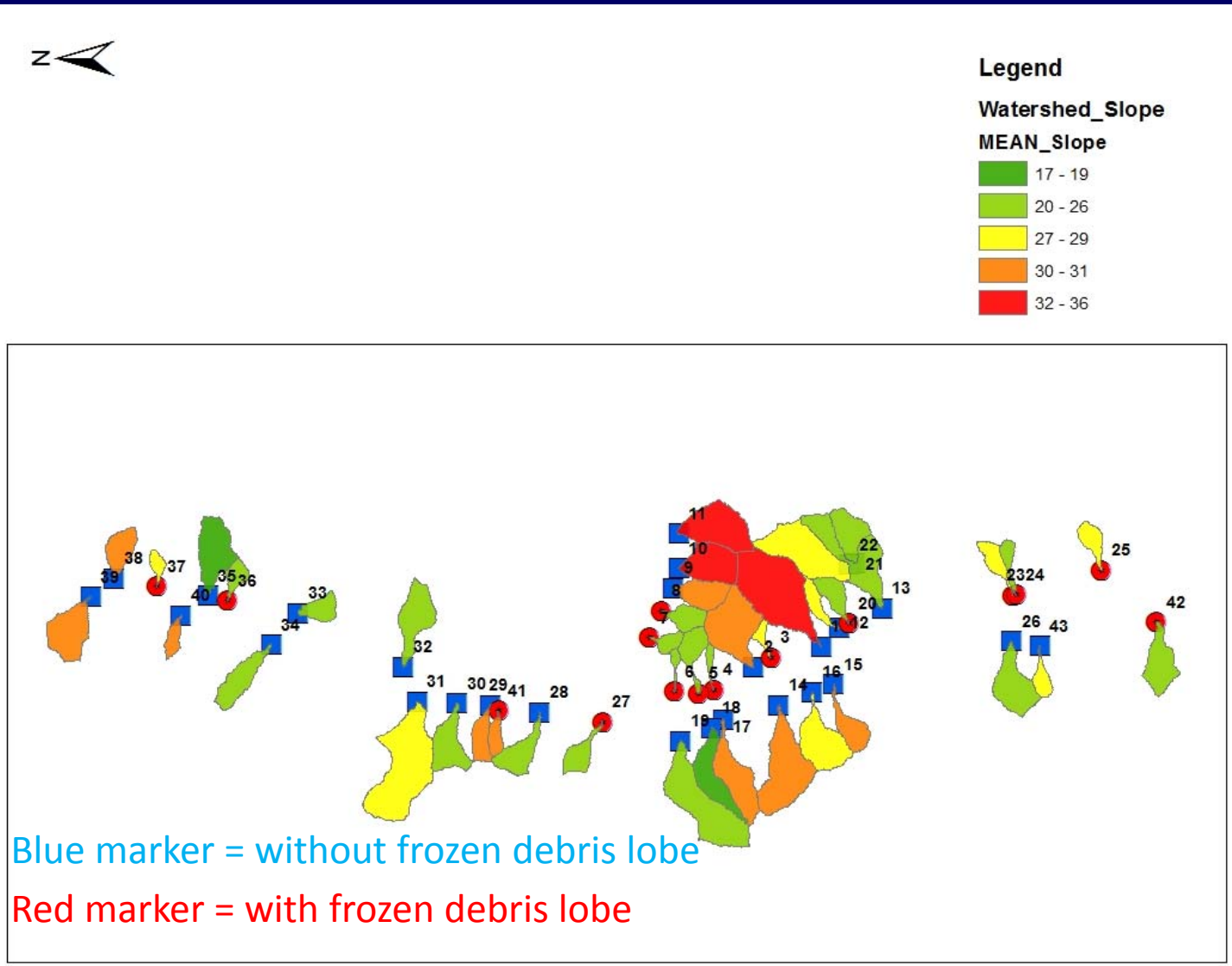


Blue without frozen debris lobe Red with frozen debris lobe

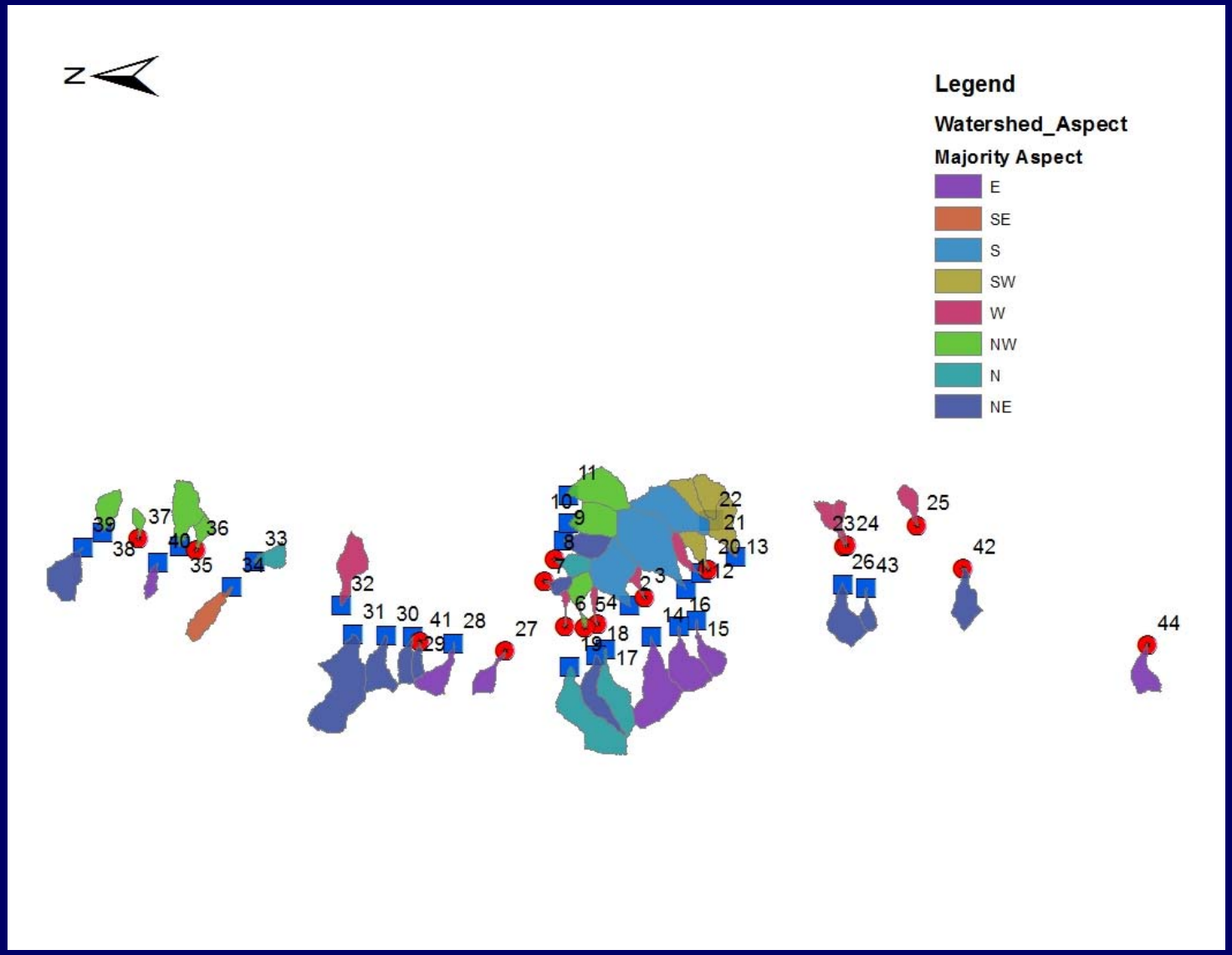
Slope and sediment movement



Slope comparison



Aspect: Vegetation and permafrost

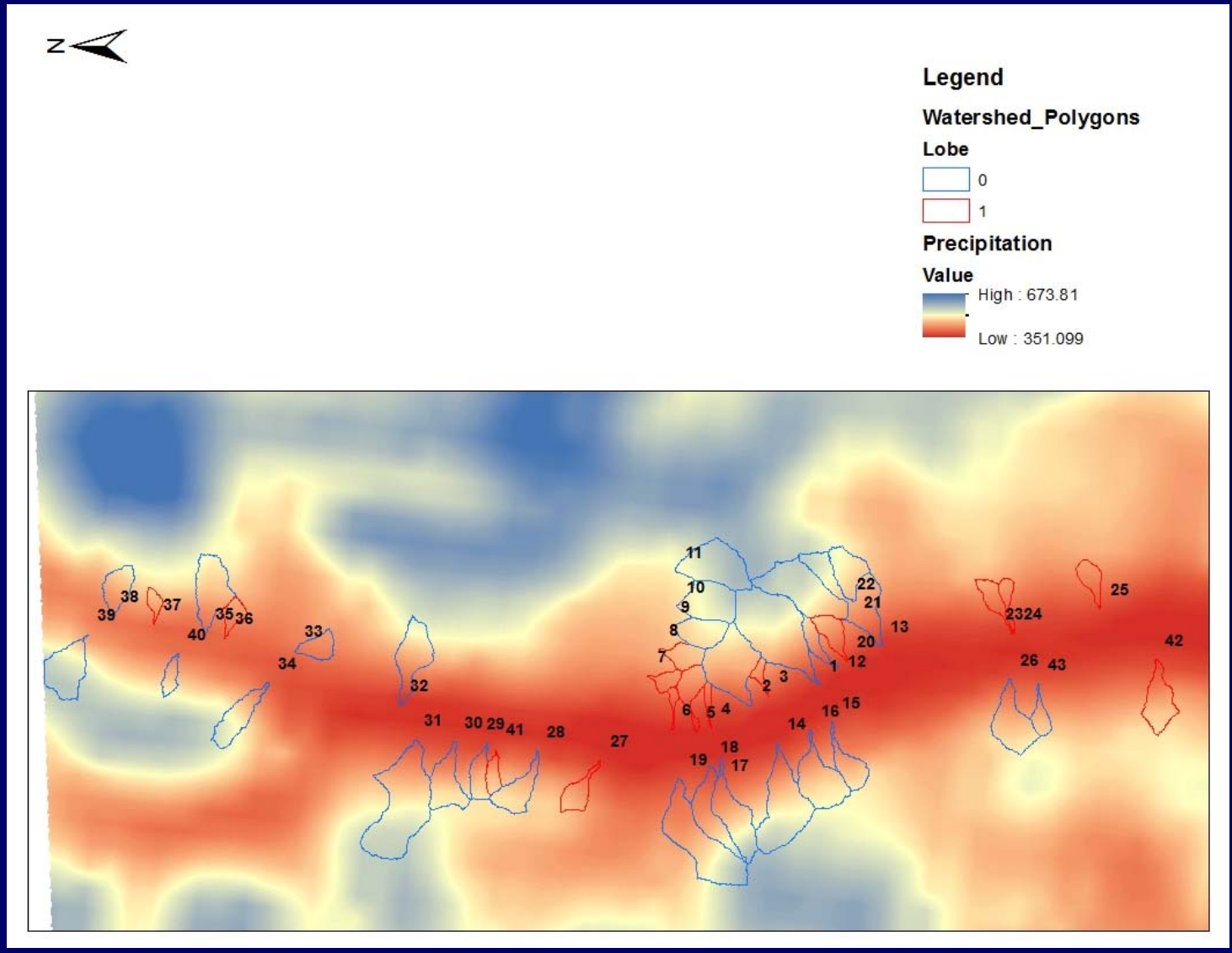


North- versus south-facing slopes

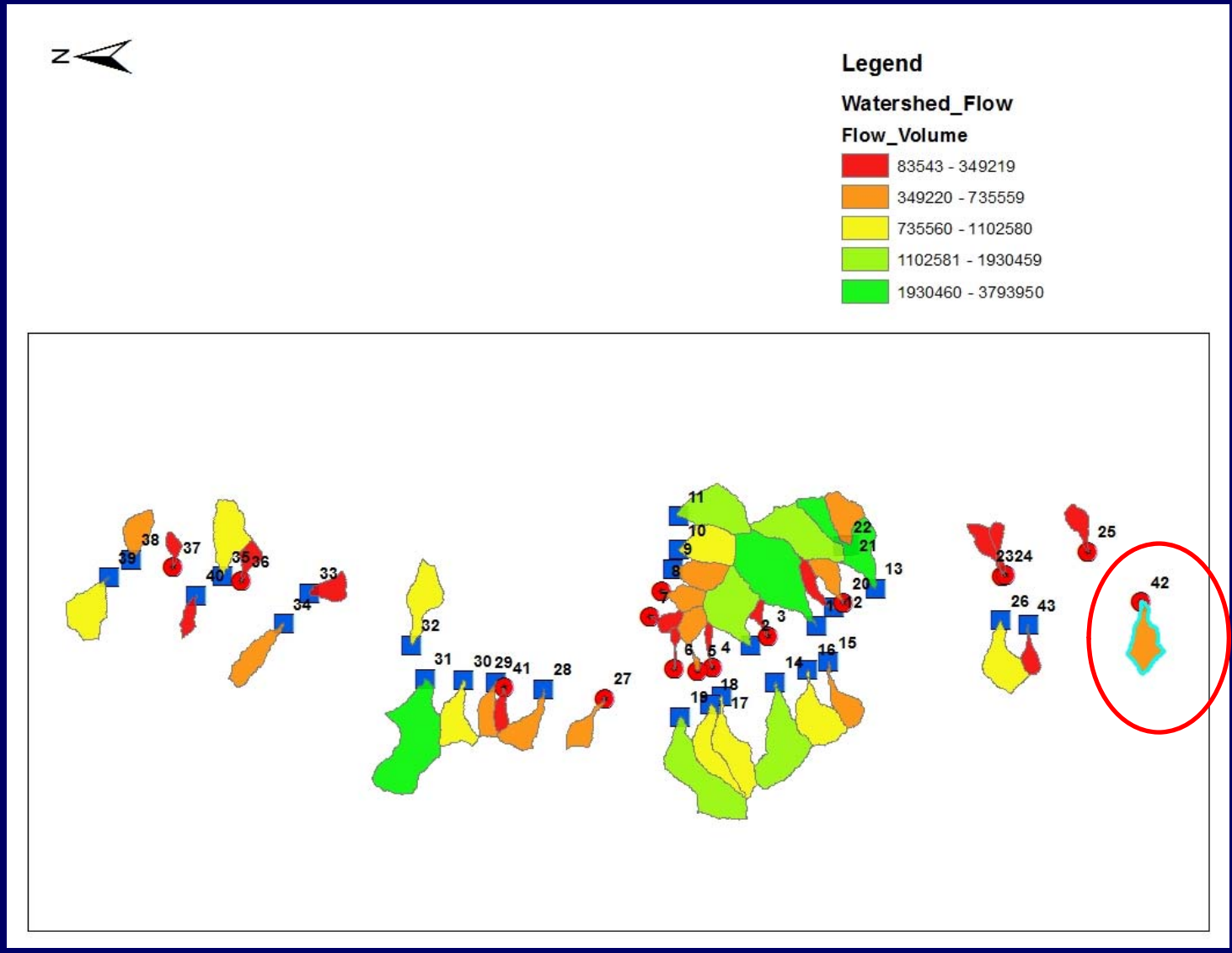
South-facing

North-facing

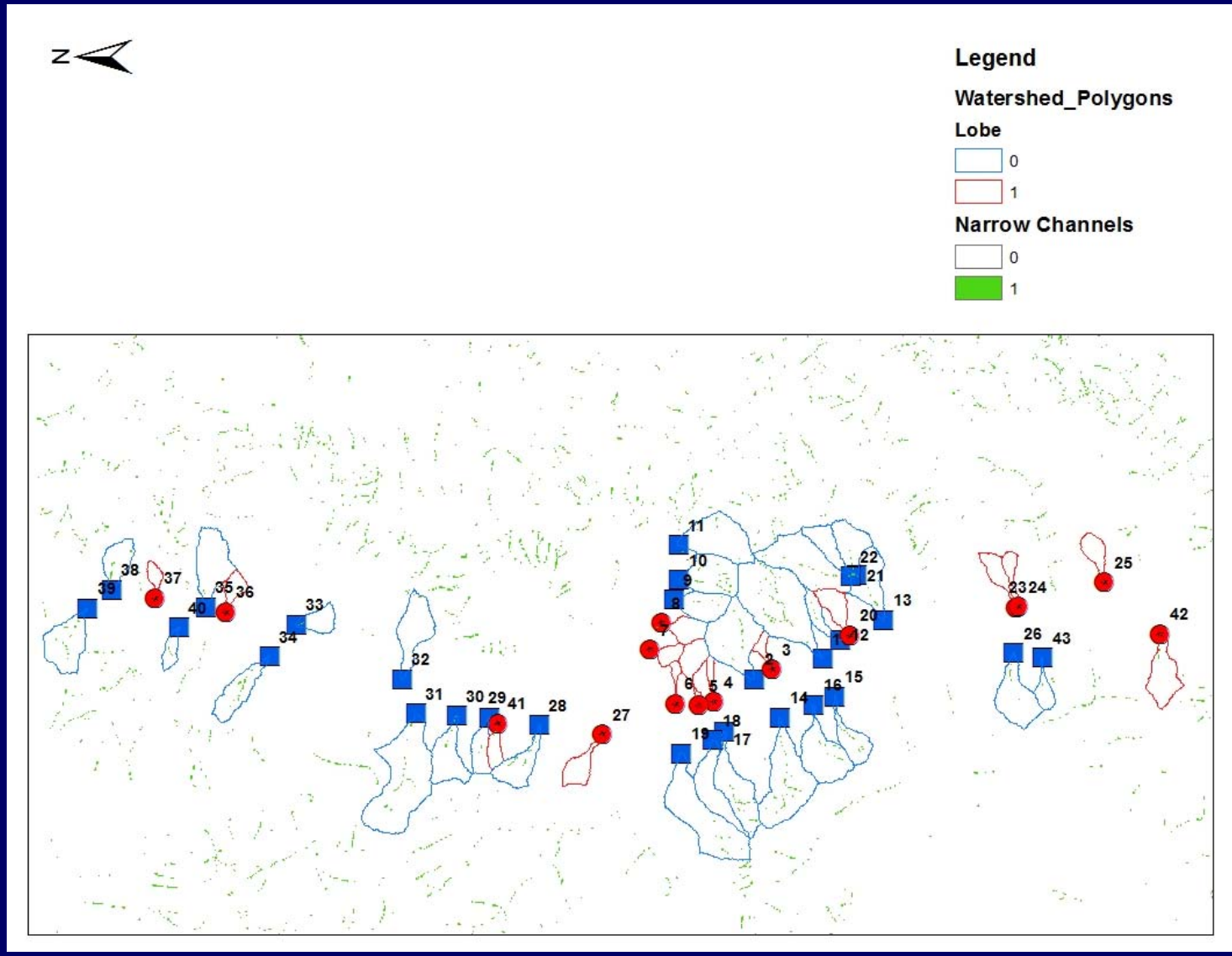
Annual precipitation



Annual discharge



Channel morphology



Summary

- Catchments without lobes
  - Steeper slopes
  - Higher elevation
  - Greater discharge
- Catchments with lobes
  - Medium slopes with a break in slope where upper part of lobe starts
  - Sediment stabilization through vegetation and permafrost

Summary

- What will likely destabilize frozen debris lobes?
  - Loss of vegetation
  - Warmer ground
  - Warmer climate
  - Loss of permafrost
  - Wetter climate (warmer ground and lubrication of the shear zone)
  - Anthropogenic increase in slope

The expected result

Current frozen debris lobe in transition


Thank you for your attention.
Questions?
We would like to thank the State of Alaska, US-DOT, and Alyeska for their support of this research.