Development Of GIS-based Soil Mapping Techniques in the PNW

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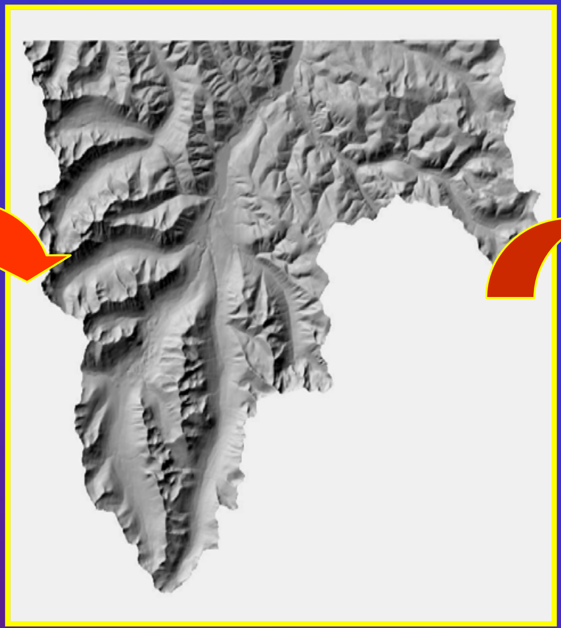
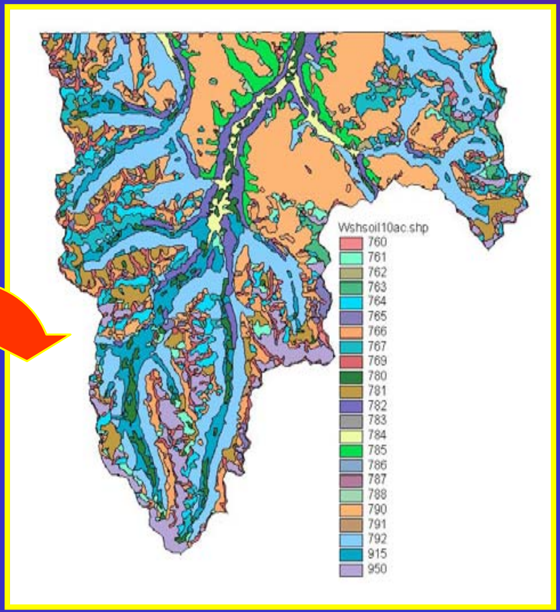
WSU and U of I



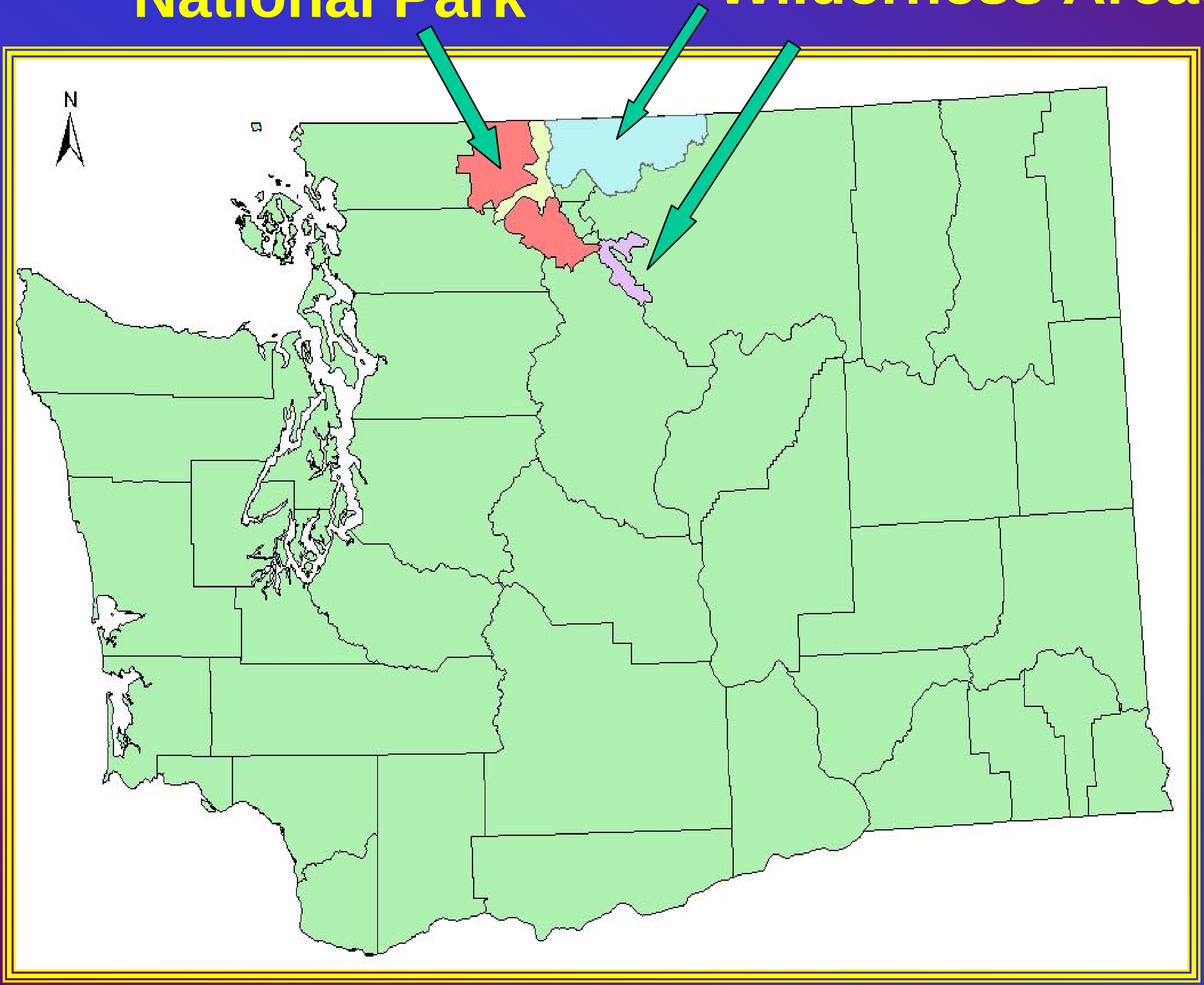


Introduction

- Wilderness areas seldom mapped
  - large investment of time and resources
- Geographic Information Systems (GIS) provide an efficient alternative
- Classic landscape/pedologic concepts incorporated within the framework of modeling platforms

North Cascades National Park

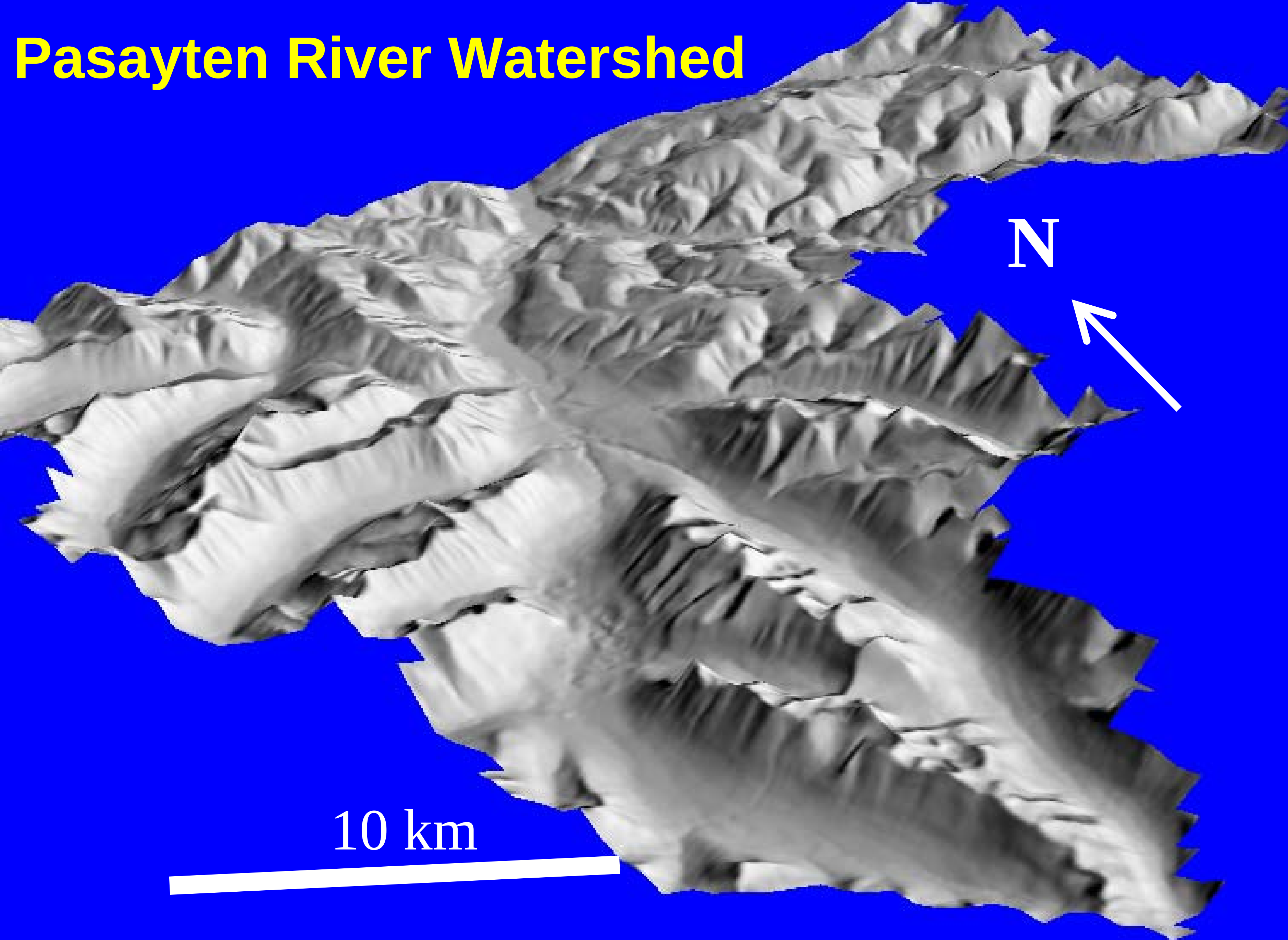
Pasayten and Sawtooth Wilderness Areas



Two Project Areas

- Pasayten and Sawtooth Wilderness Areas
  - Okanogan National Forest
  - Together 254,000 ha (627,000 ac)
  - Project 1998-2002
- Thunder Creek Watershed
  - North Cascades National Park
  - National Park Service
  - Watershed 29,000 ha (72,000 ac)
  - Project 2002-2004

Pasayten River Watershed

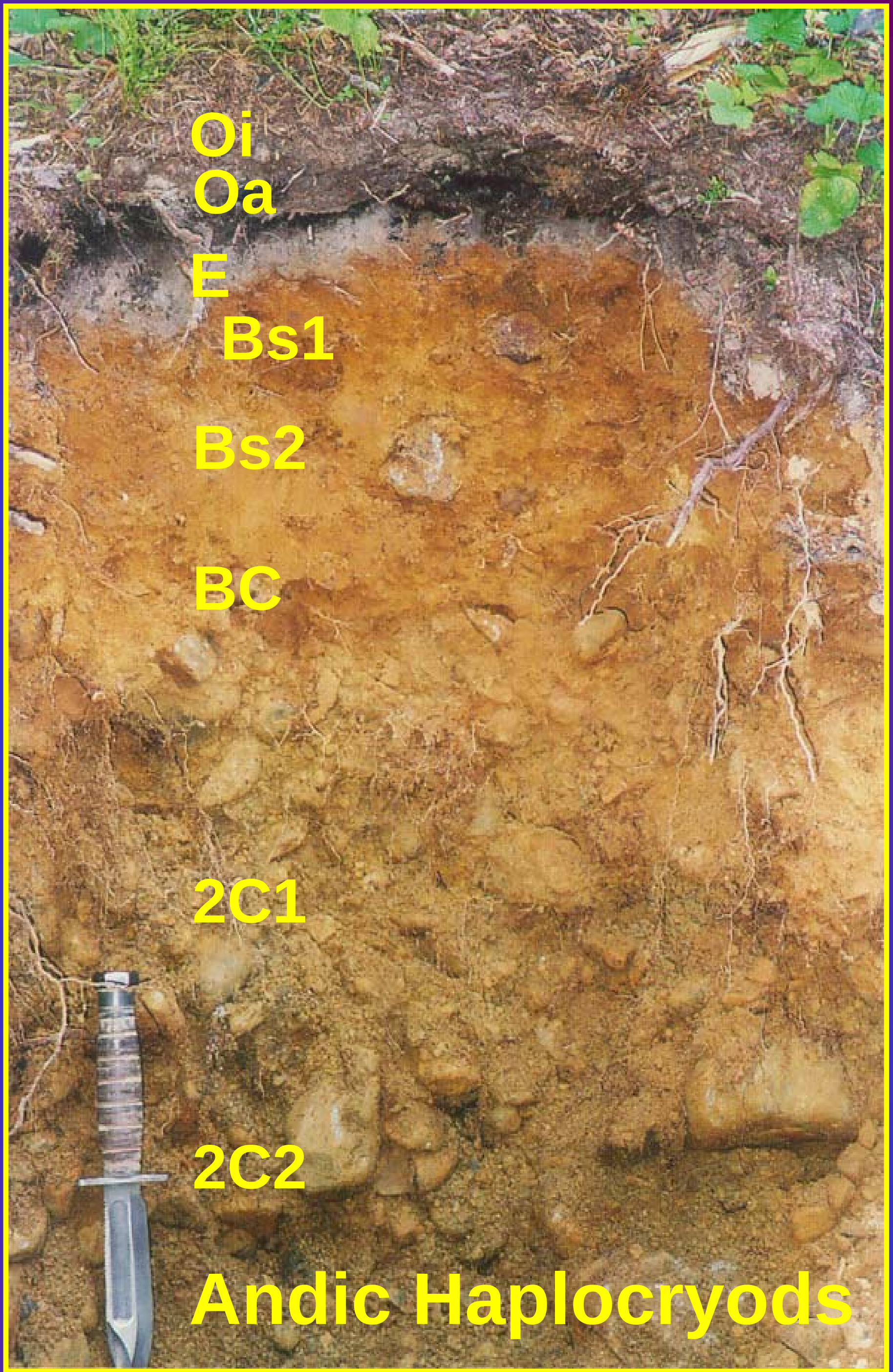


Advantages

- GIS simplifies cartographic techniques
- Automates many traditional survey techniques
- Modeling procedures are documented
- Model is easily distributed and updated
- Results can be incorporated into existing resource management databases

Methods - Pasayten

- Visual inspection of aerial photographs
- > 200 site descriptions, located with Global Positioning Satellite (GPS) receiver
- Samples taken for documentation/lab analysis
- Model based on available GIS data layers and pedologic theories


Oi
Oa
E
Bs1
Bs2
BC
2C1
2C2
Andic Haplocryods


Lithic Dystrocryepts-
Andic Dystrocryepts
Xeric Vitricryands-
Andic Eutrocryepts
Andic Haplocryods-
Typic Vitricryands
Humic Dystrocryepts-
Humic Vitricryands
Rock outcrop-Rubbleland

- Topographic analyses and data construction
  - 30 meter Digital Elevation Model (DEM)
  - primary and secondary terrain attributes
- Iterative process of layer compilation
  - wetness index
  - topographic shape
  - vegetation and landform maps
  - slope, aspect, and elevation

Methods - Pasayten

- Topographic analyses and data construction
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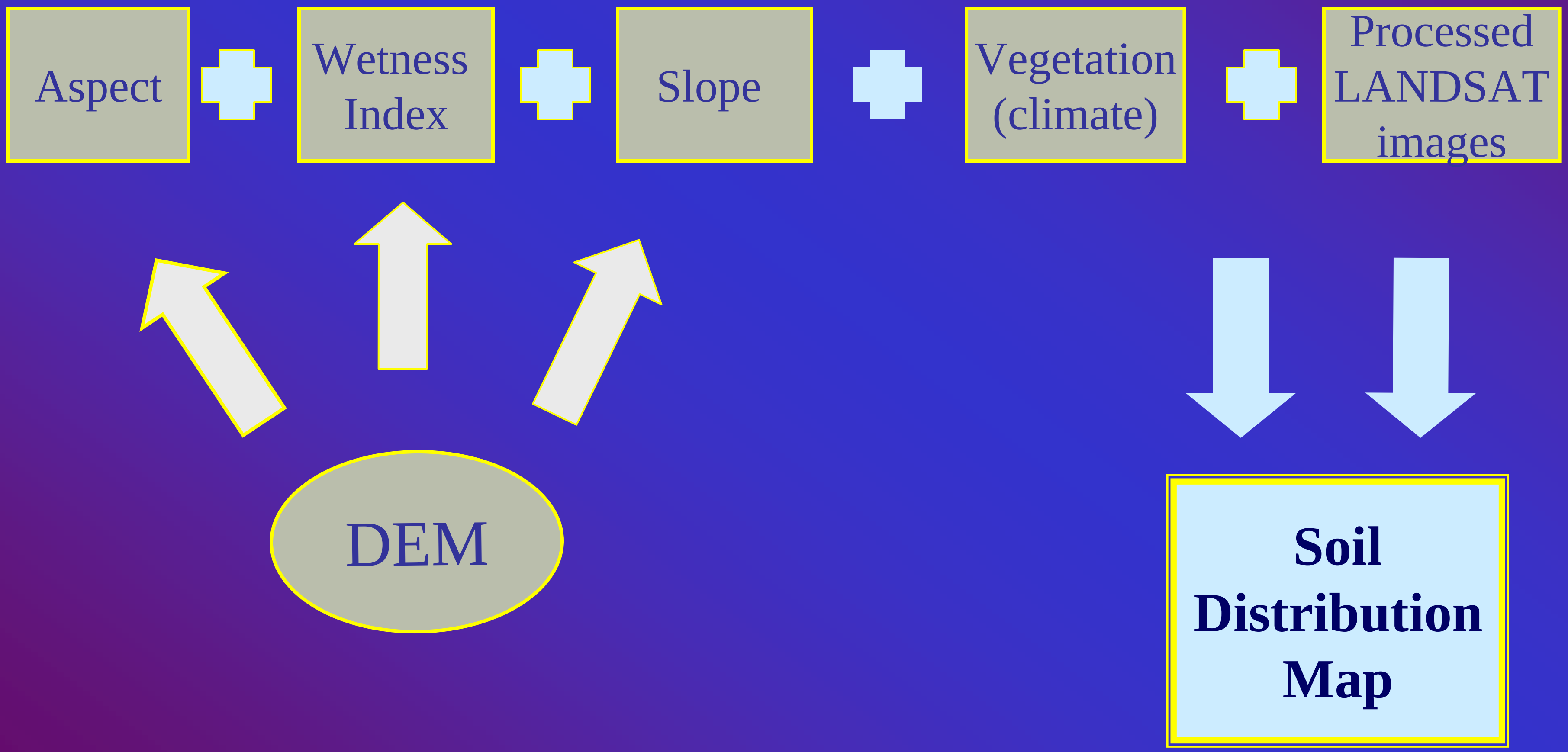
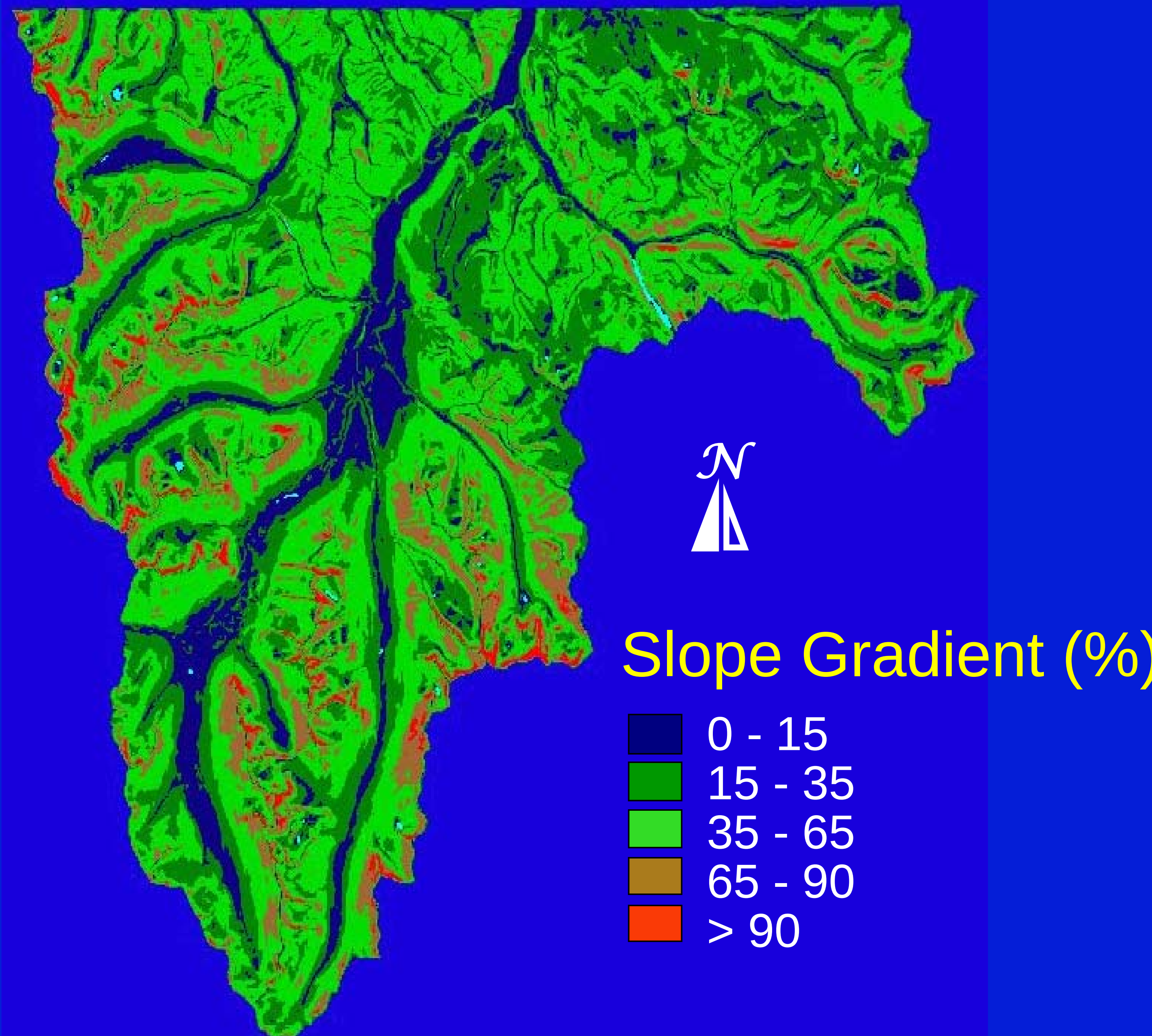
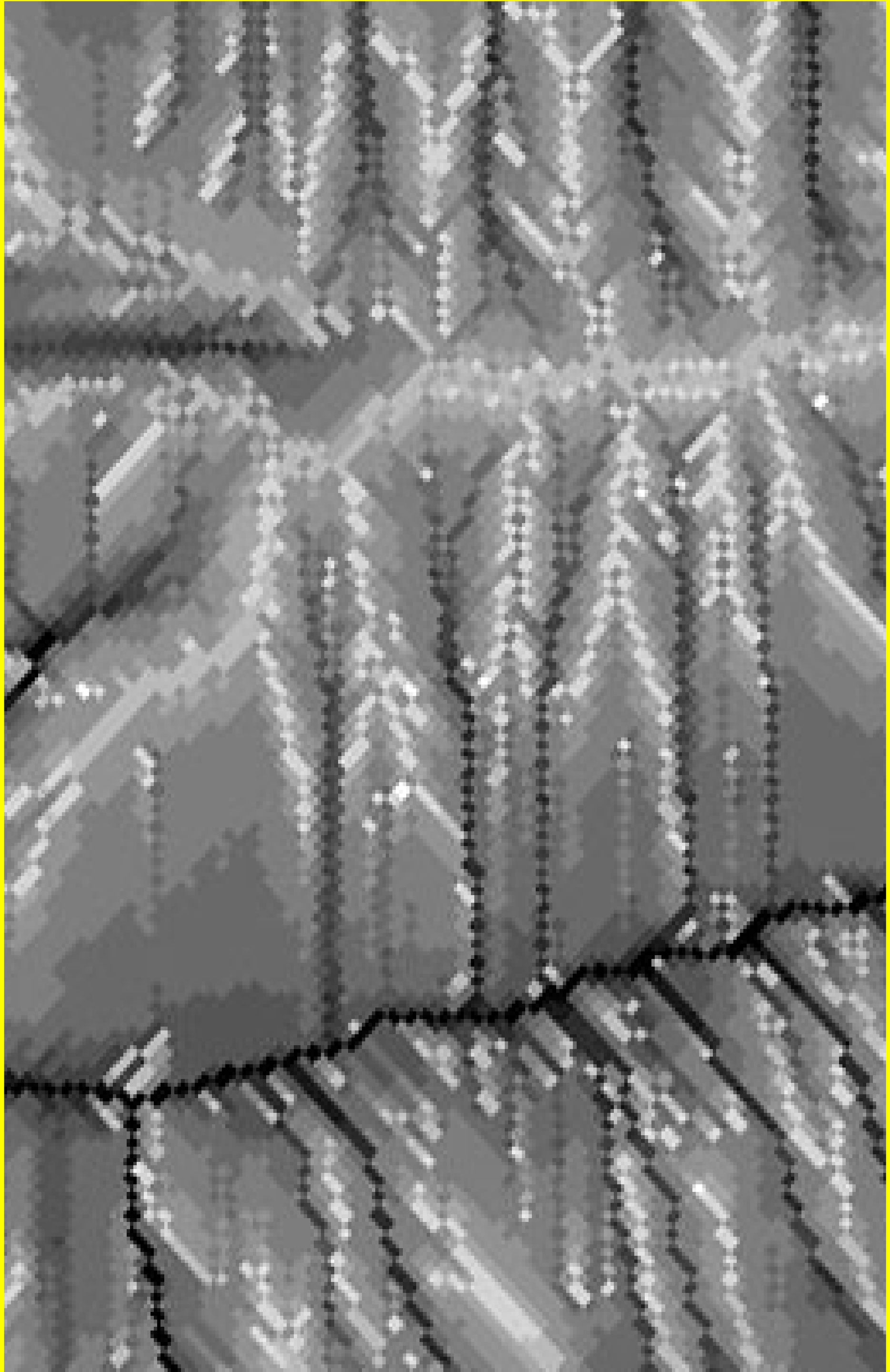
Decision Tree Scheme

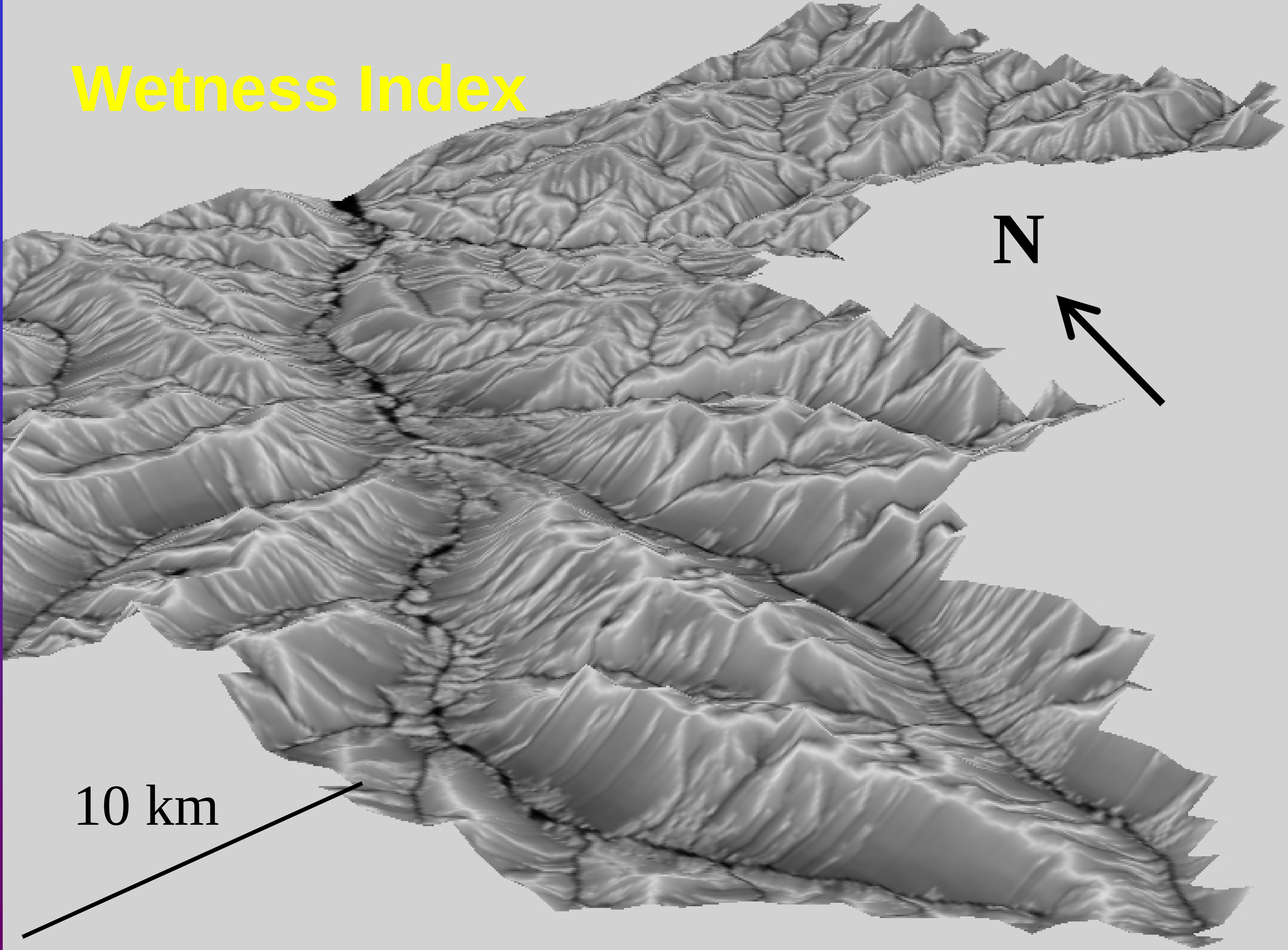


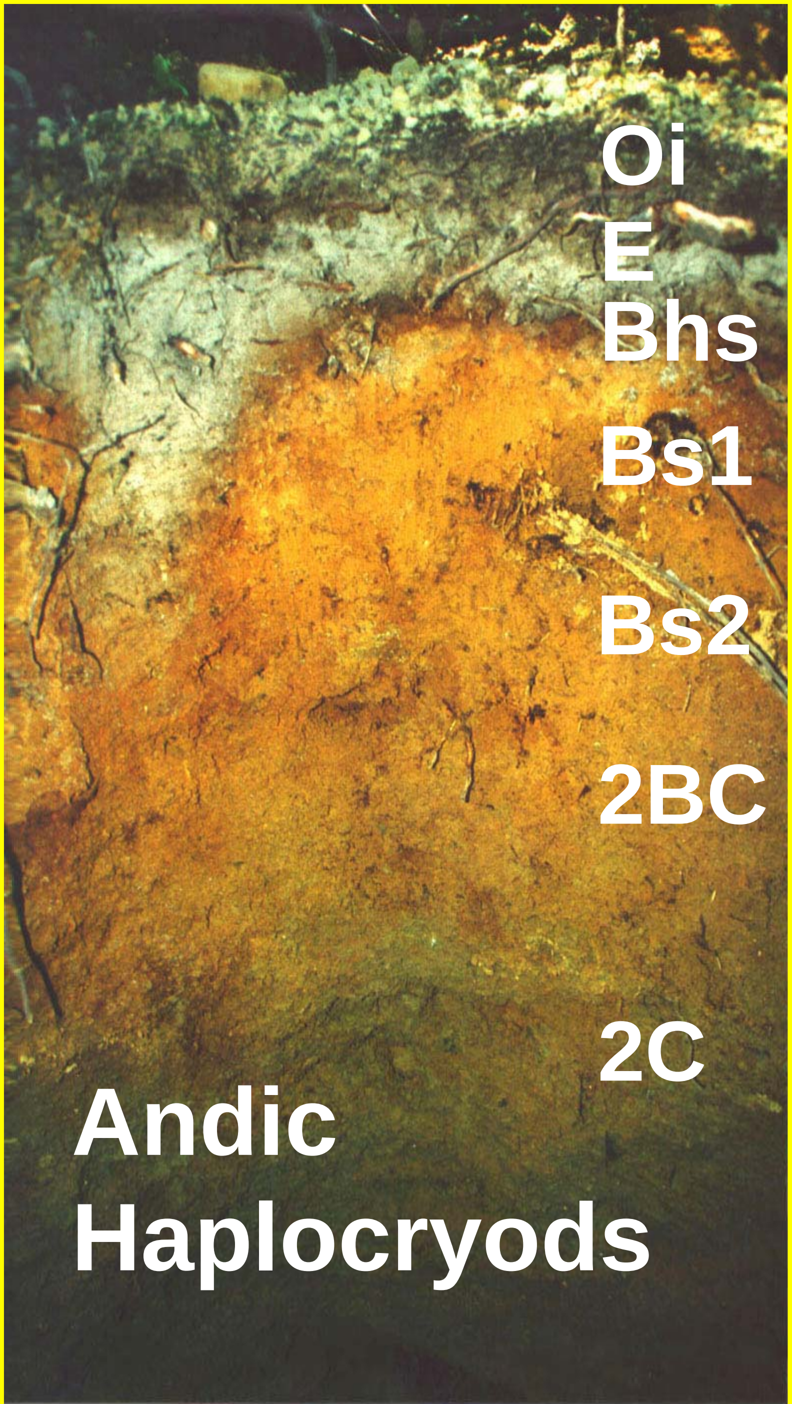

N
Slope Gradient (%)
0 - 15
15 - 35
35 - 65
65 - 90
> 90

Wetness Index



Wetness Index

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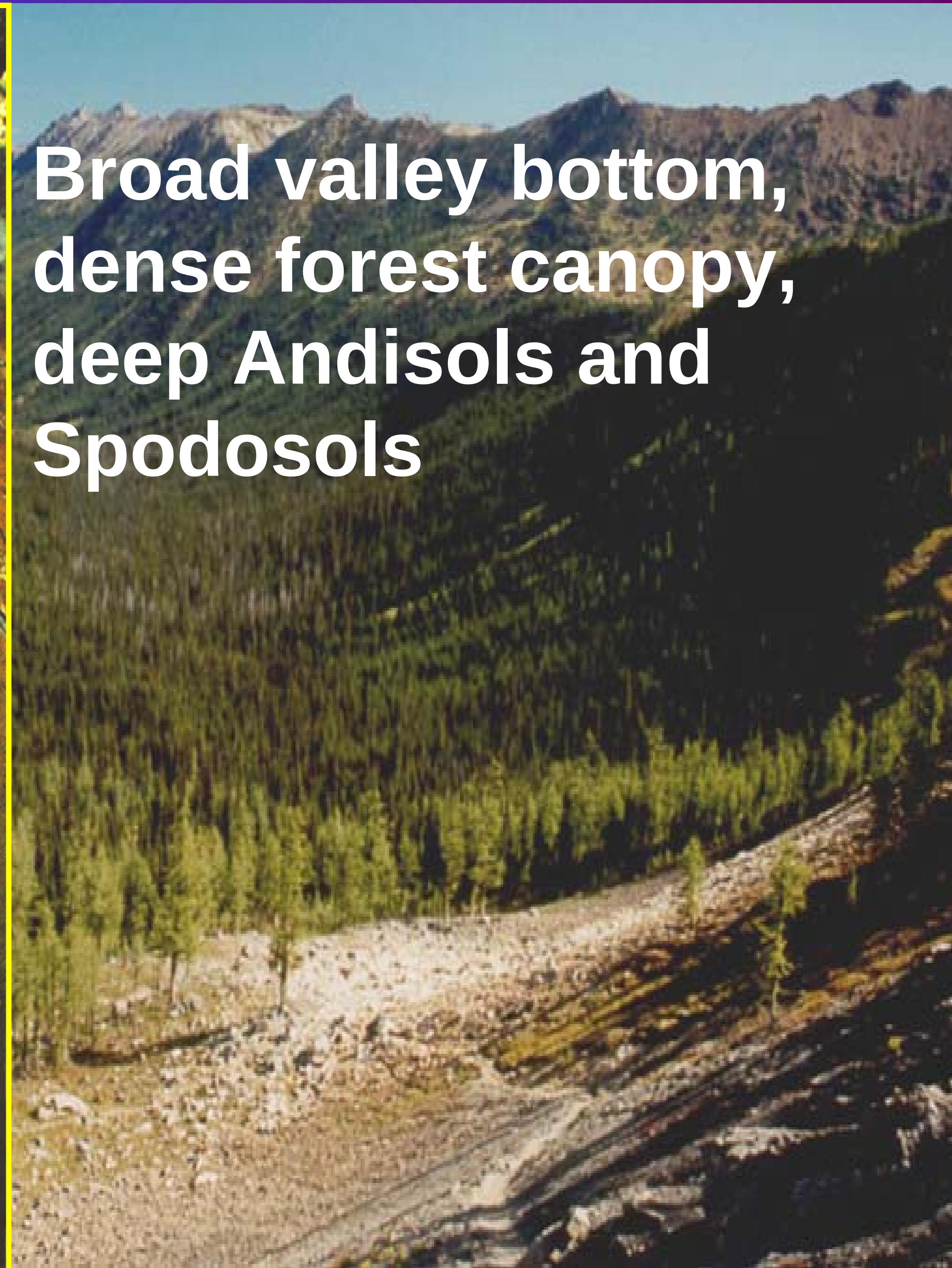
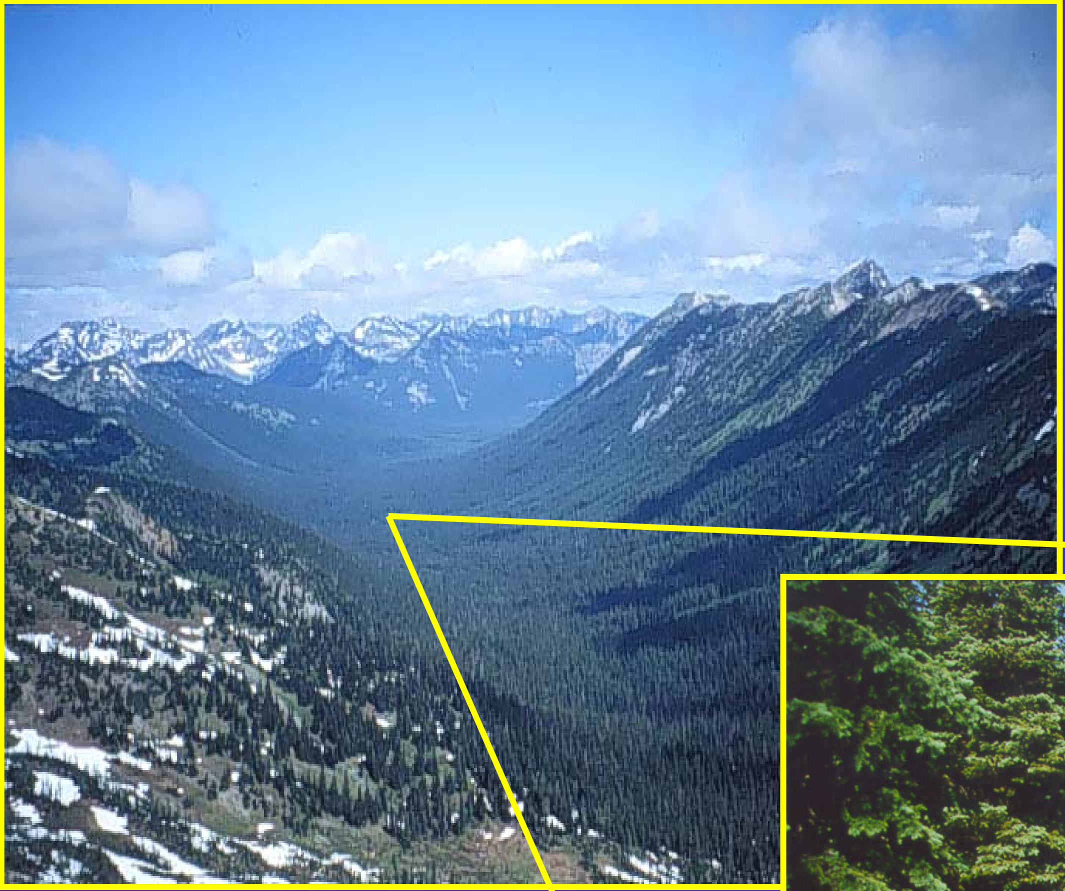
Bhs
Bs1
Bs2
2BC
2C
Andic
Haplocryods


Broad valley bottom,
dense forest canopy,
deep Andisols and
Spodosols

Cryaquepts

Interstratified tephra and fluvial sediments



Interstratified tephra and fluvial sediments

Mixed overland wash 0.5 cm

MSH Wn tephra 0.3 cm

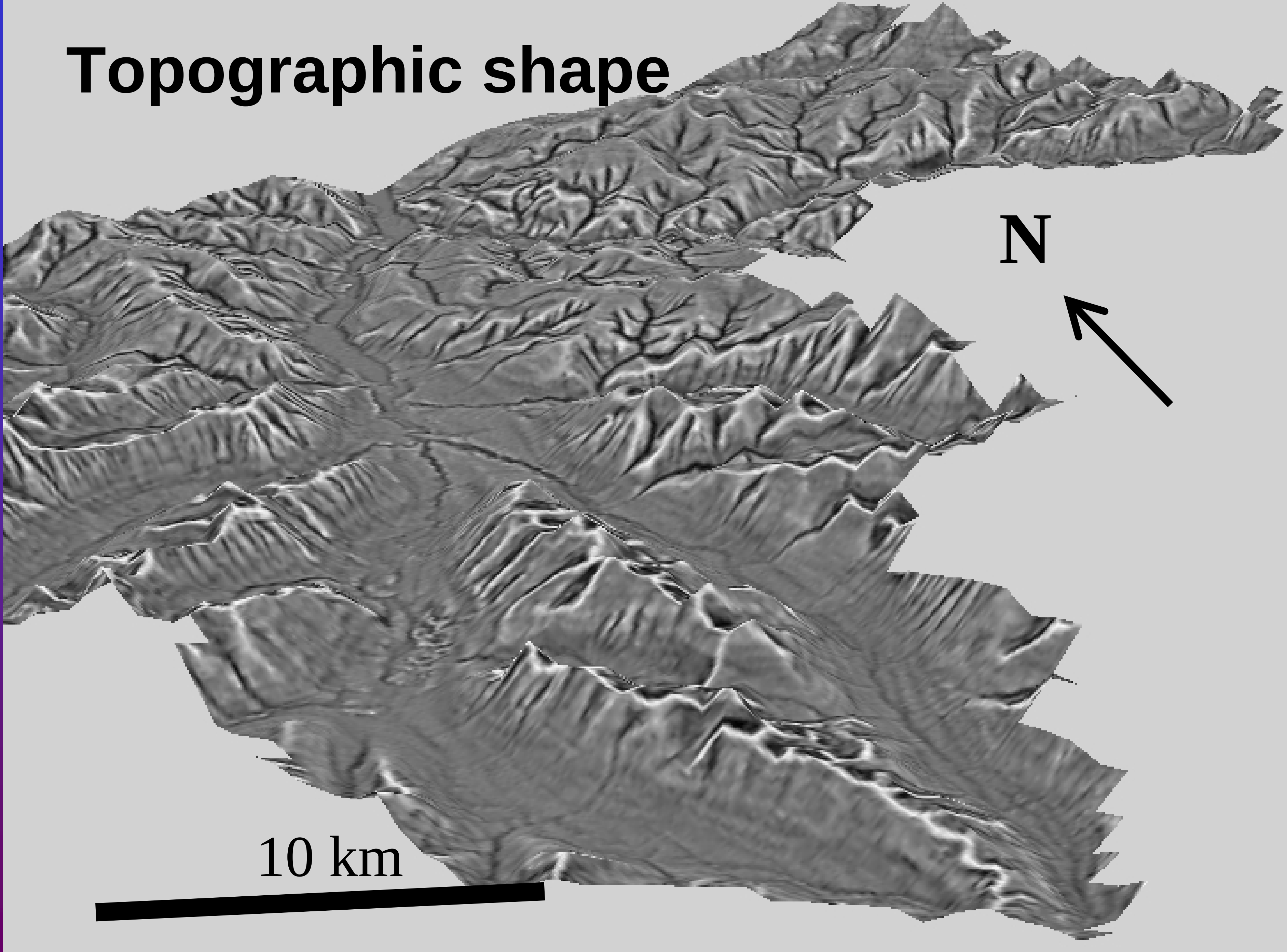
MSH Ye tephra 1 cm

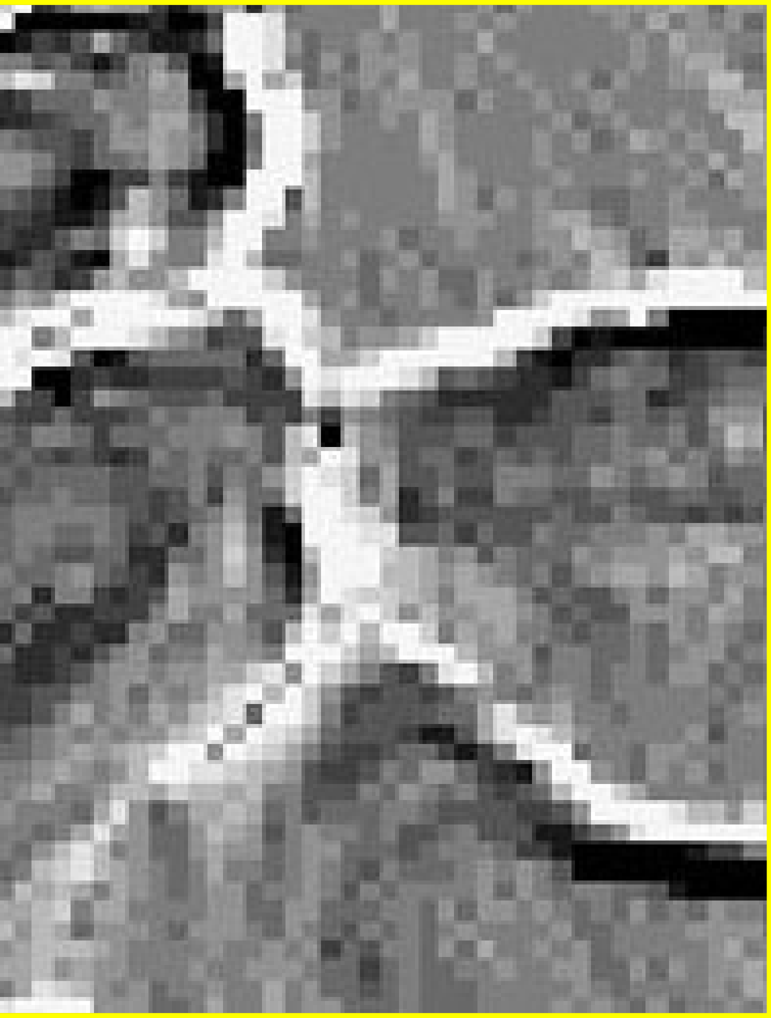
Mazama tephra and silt 5 cm

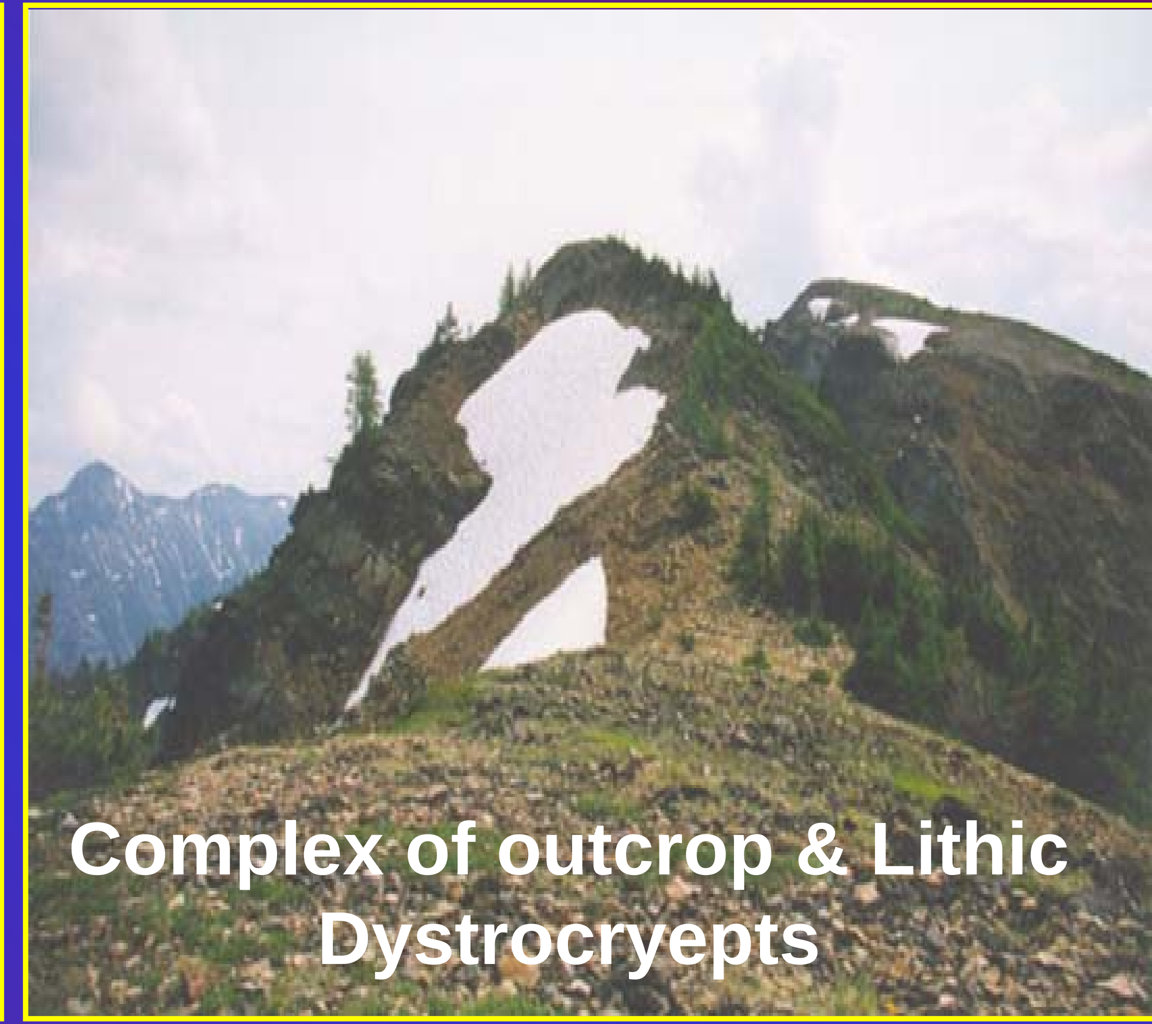
Mazama tephra 7 cm

Fluvial sediments

Topographic shape

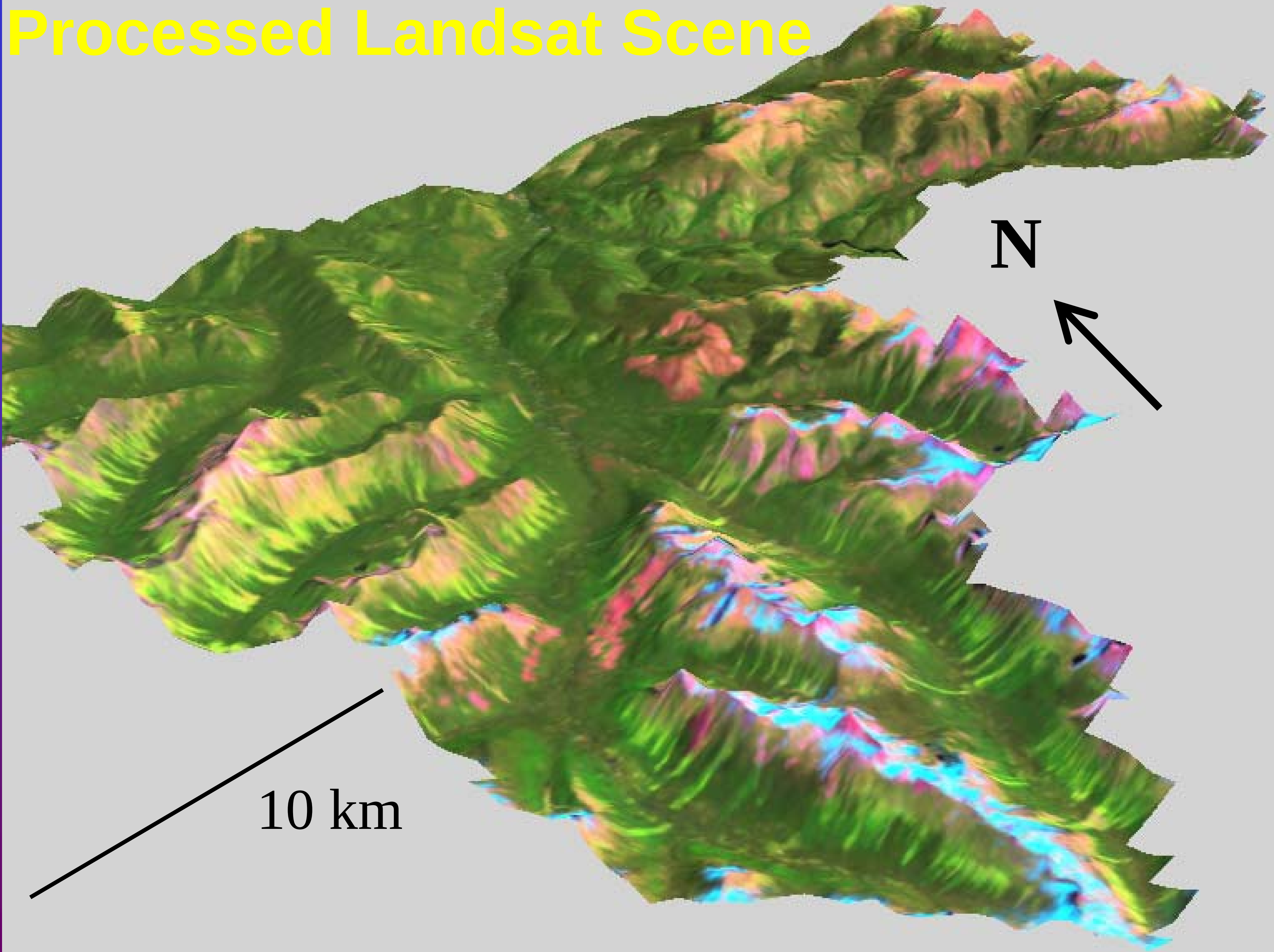




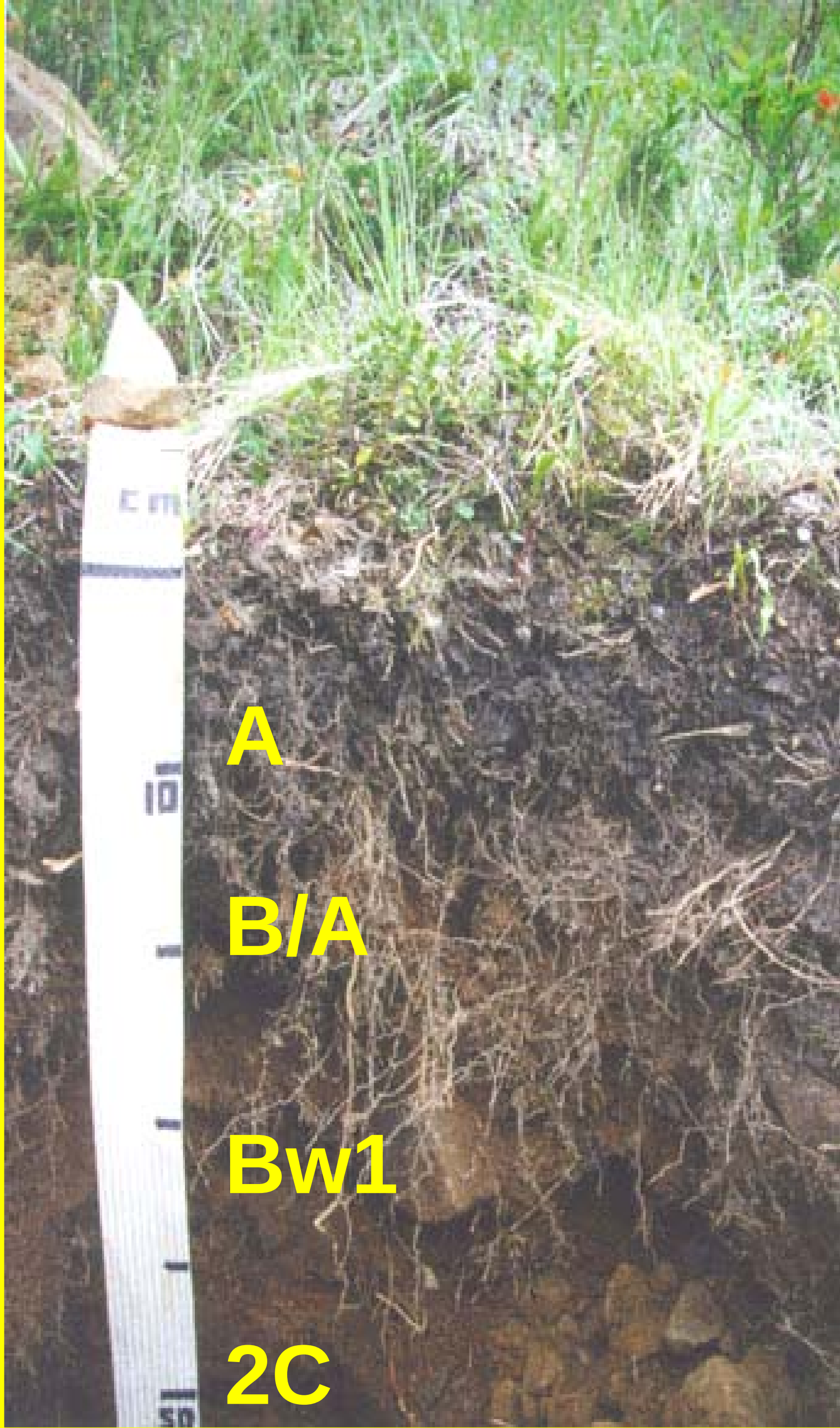


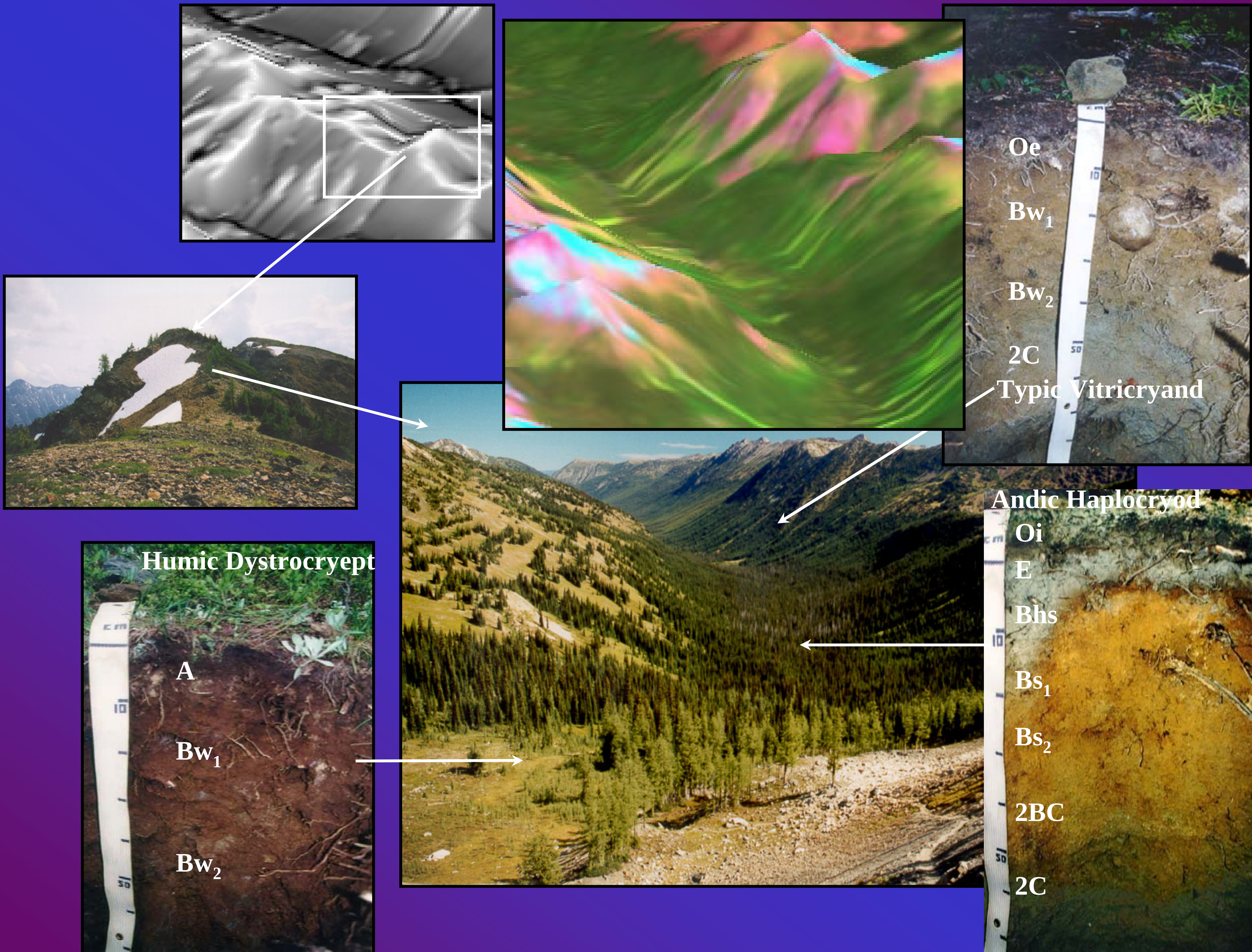
Topographic Shape

Processed Landsat Scene



Avalanche chute - steep backslope, herbaceous ground cover and colluvial Inceptisol




Oe
Bw1
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Typic Vitricryand
Andic Haplocryod
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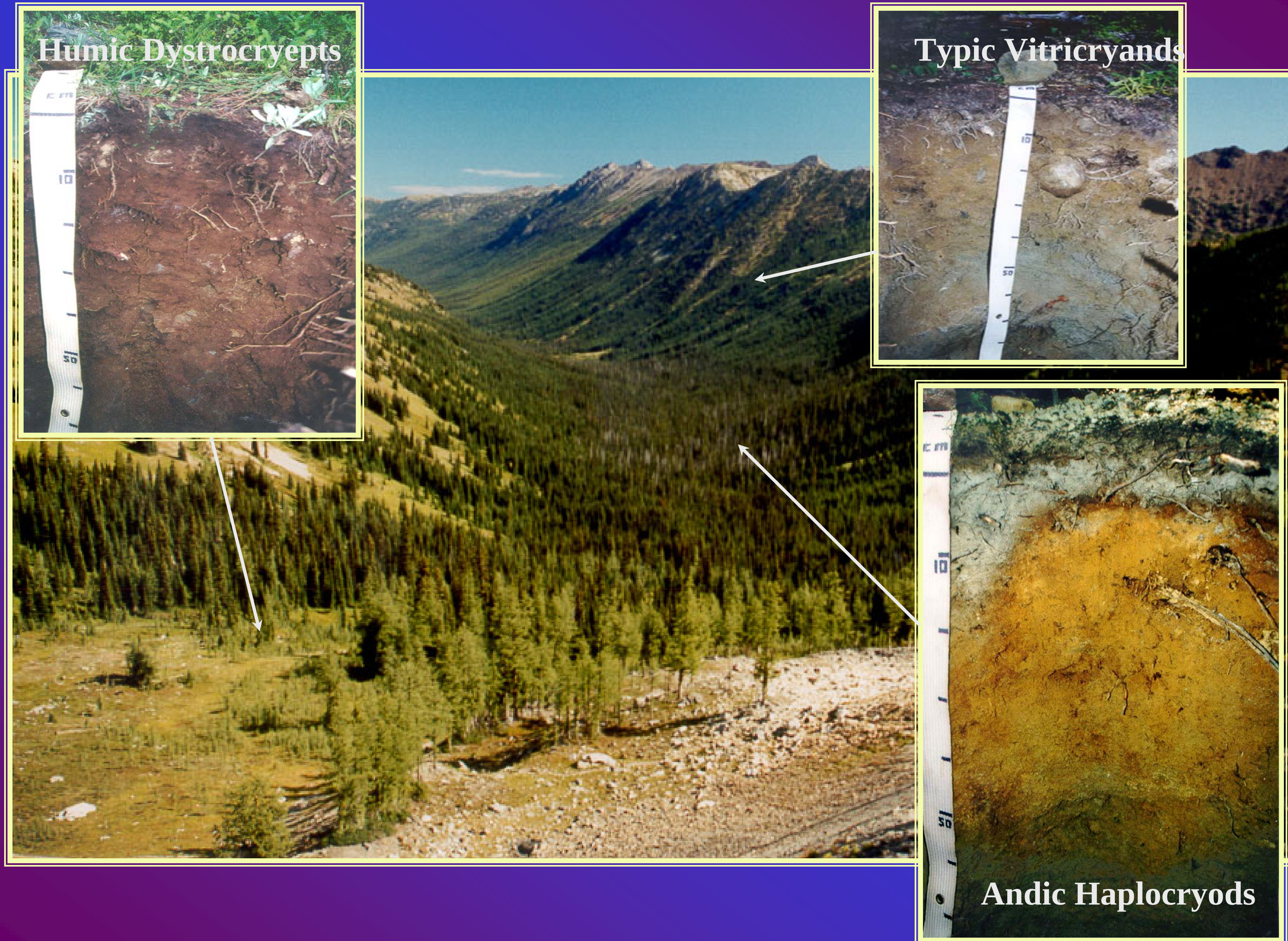
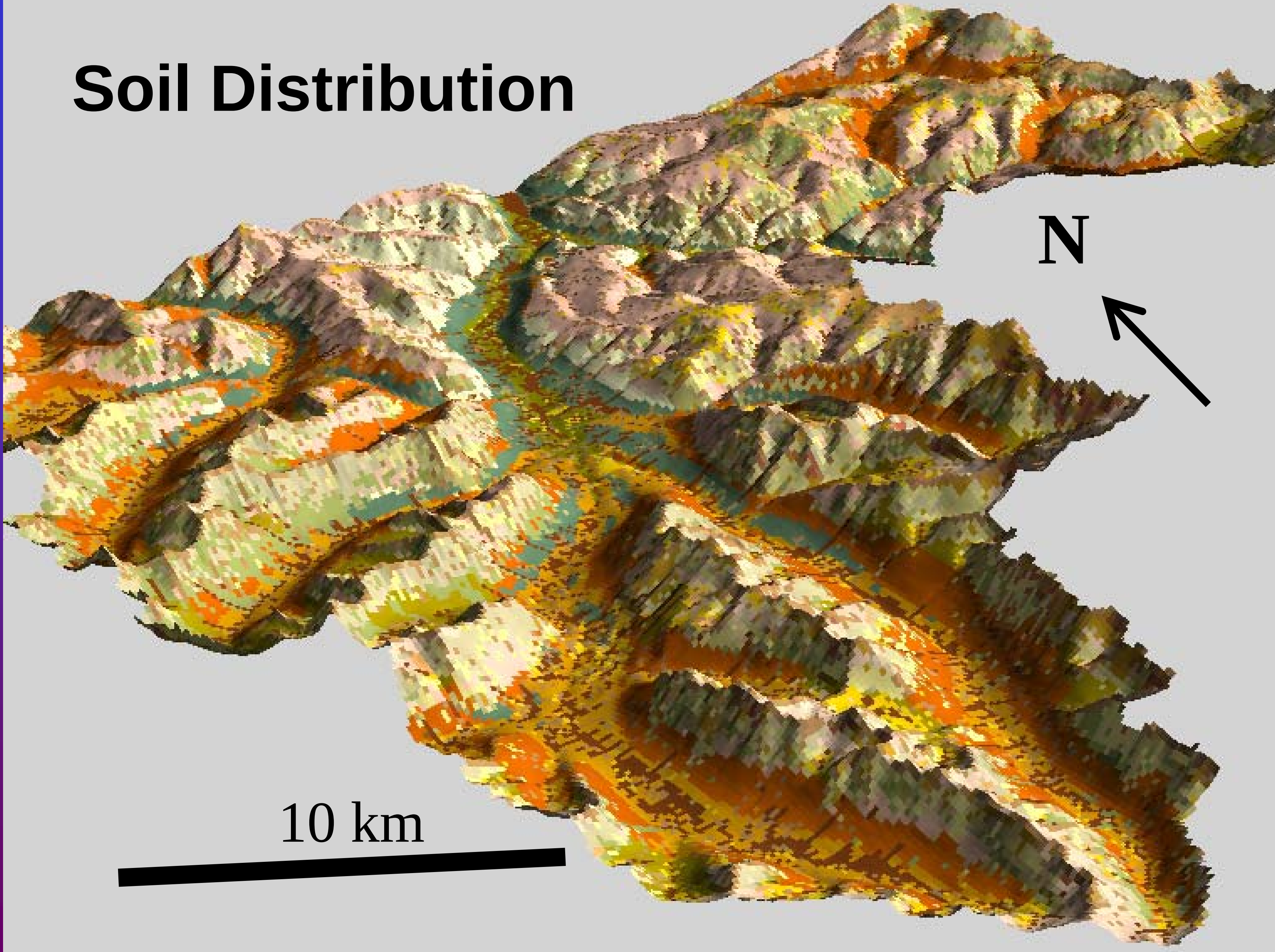
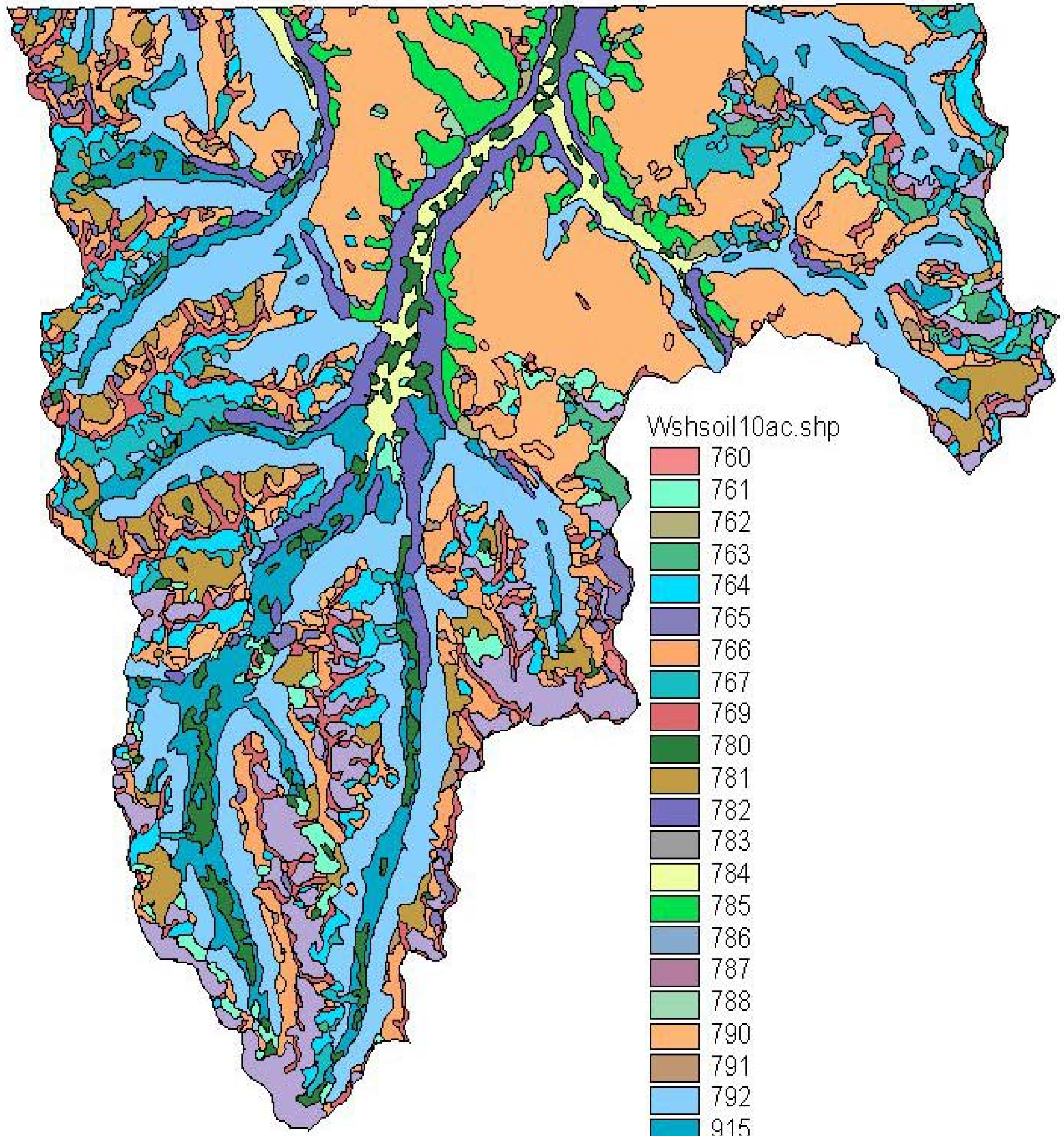

Humic Dystrocryepts
Typic Vitricryands
Andic Haplocryods

Soil Distribution




Wshsoil10ac.shp
760
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780
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783
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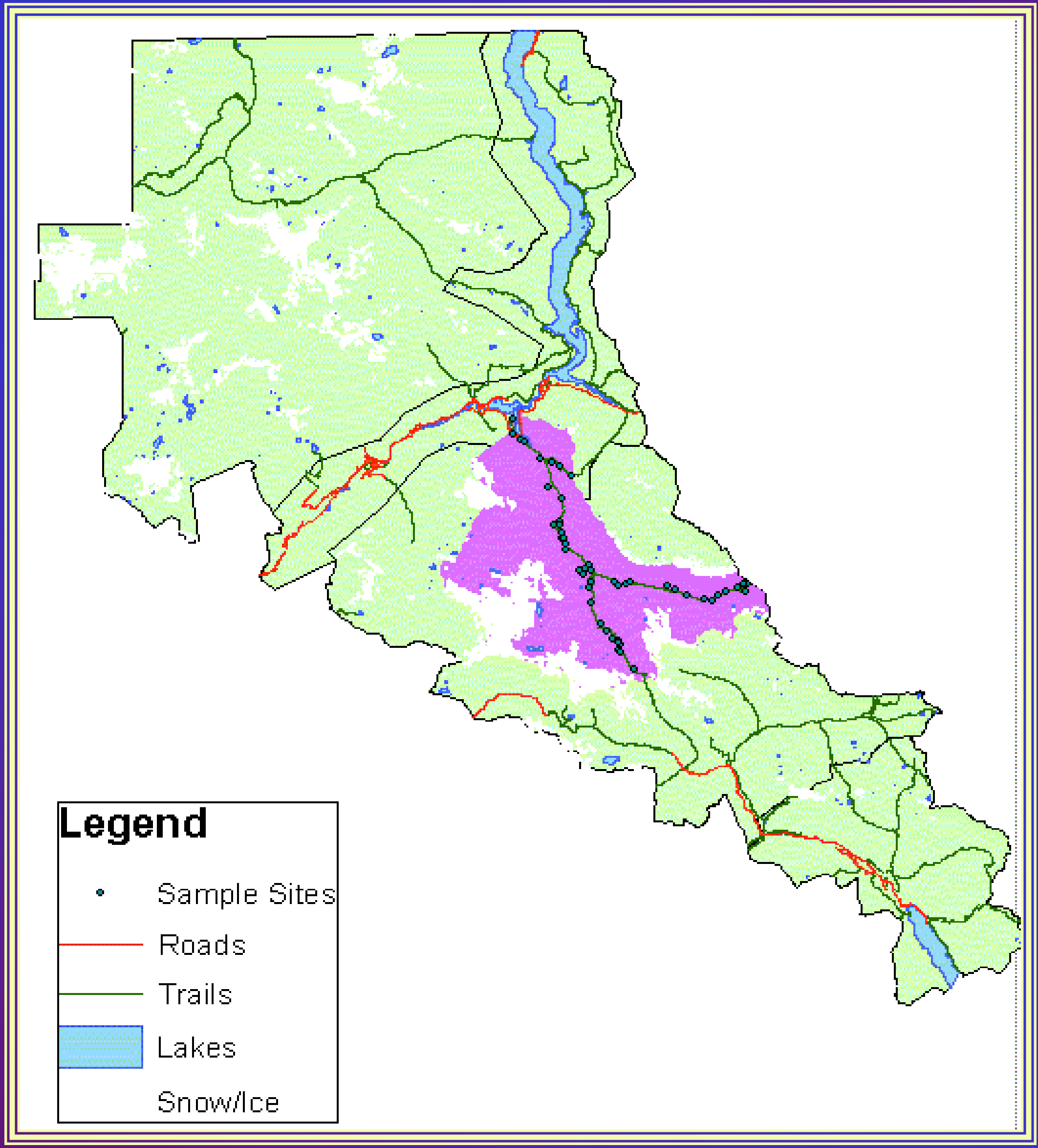
787
788
790
791
792
915
950

Results

- Mix of Andisols, Inceptisols, and Spodosols found
- Remaining wilderness area also mapped
- 80 % agreement with field descriptions
- Soil data layer correlated into current order 2 survey of non-wilderness FS lands

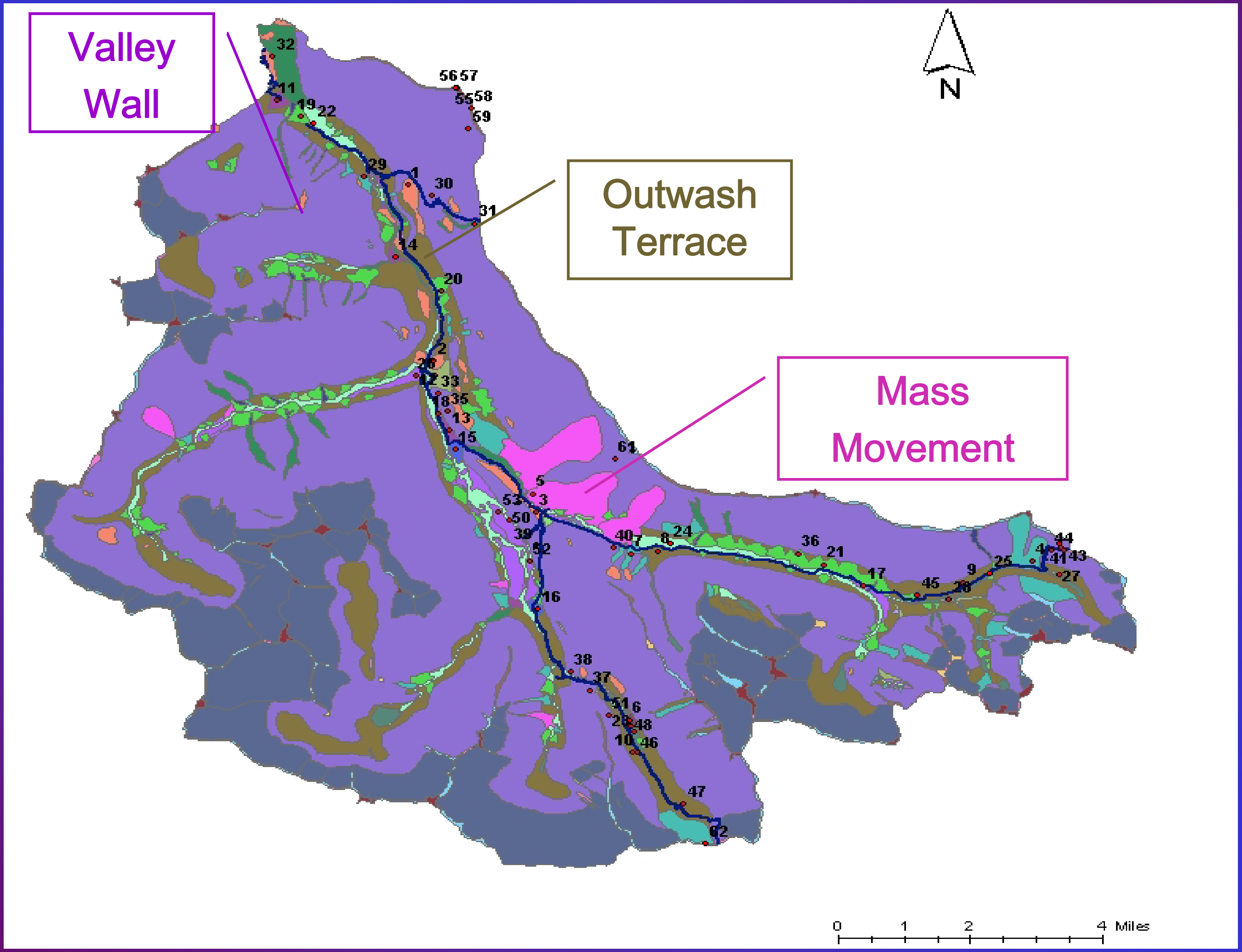
Thunder Creek Watershed



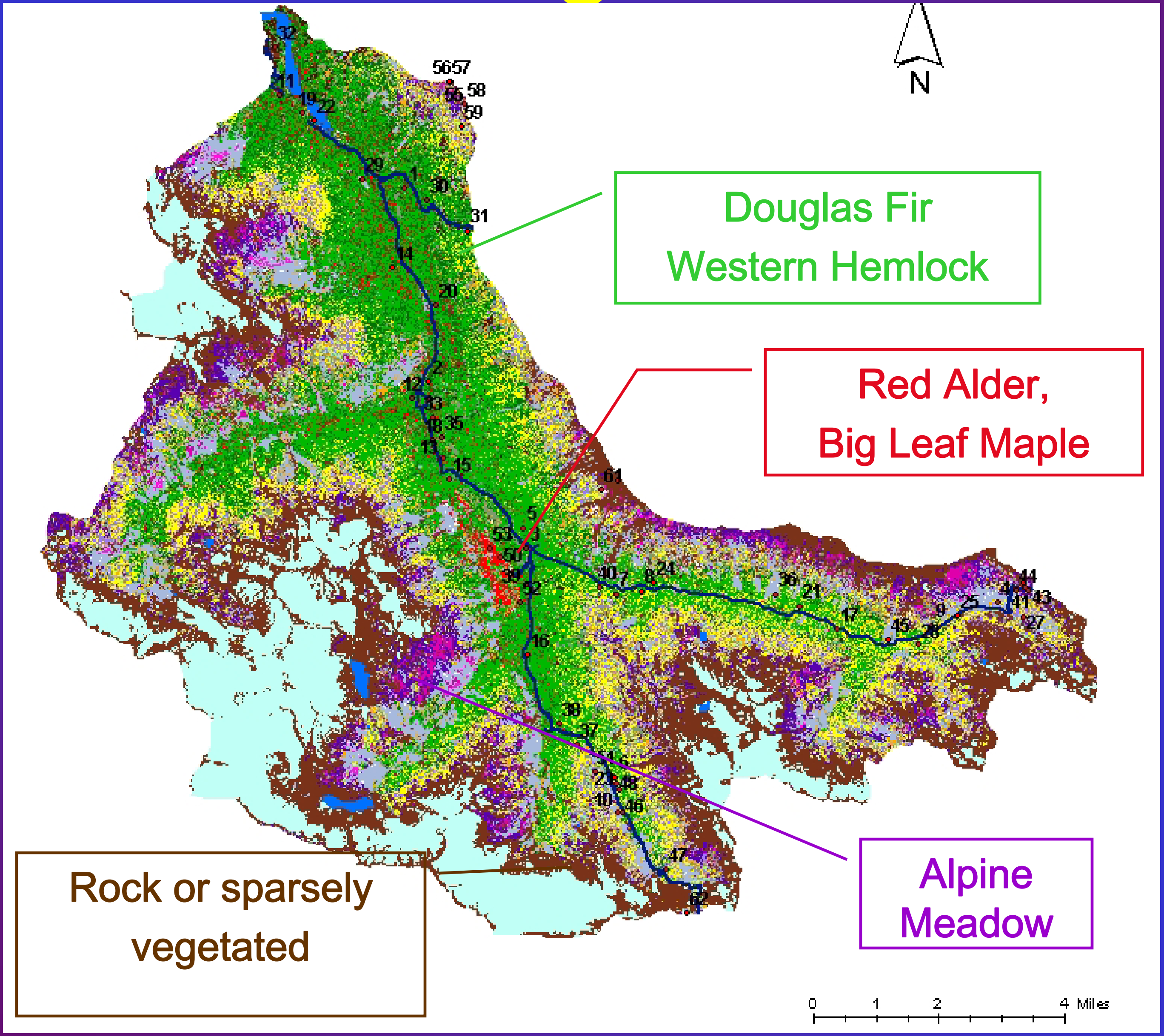
Thunder Creek – More Available Digital Data

- Parent Material - Surficial geology & bedrock
- Organisms –
  - Current Vegetation
  - Potential Natural Vegetation (PNV)
- Climate - Precipitation, Temperature
  - Also predicted by current veg thru indicator species
- Topography - Digital Elevation Model
  - Slope curvature, gradient, aspect, wetness index

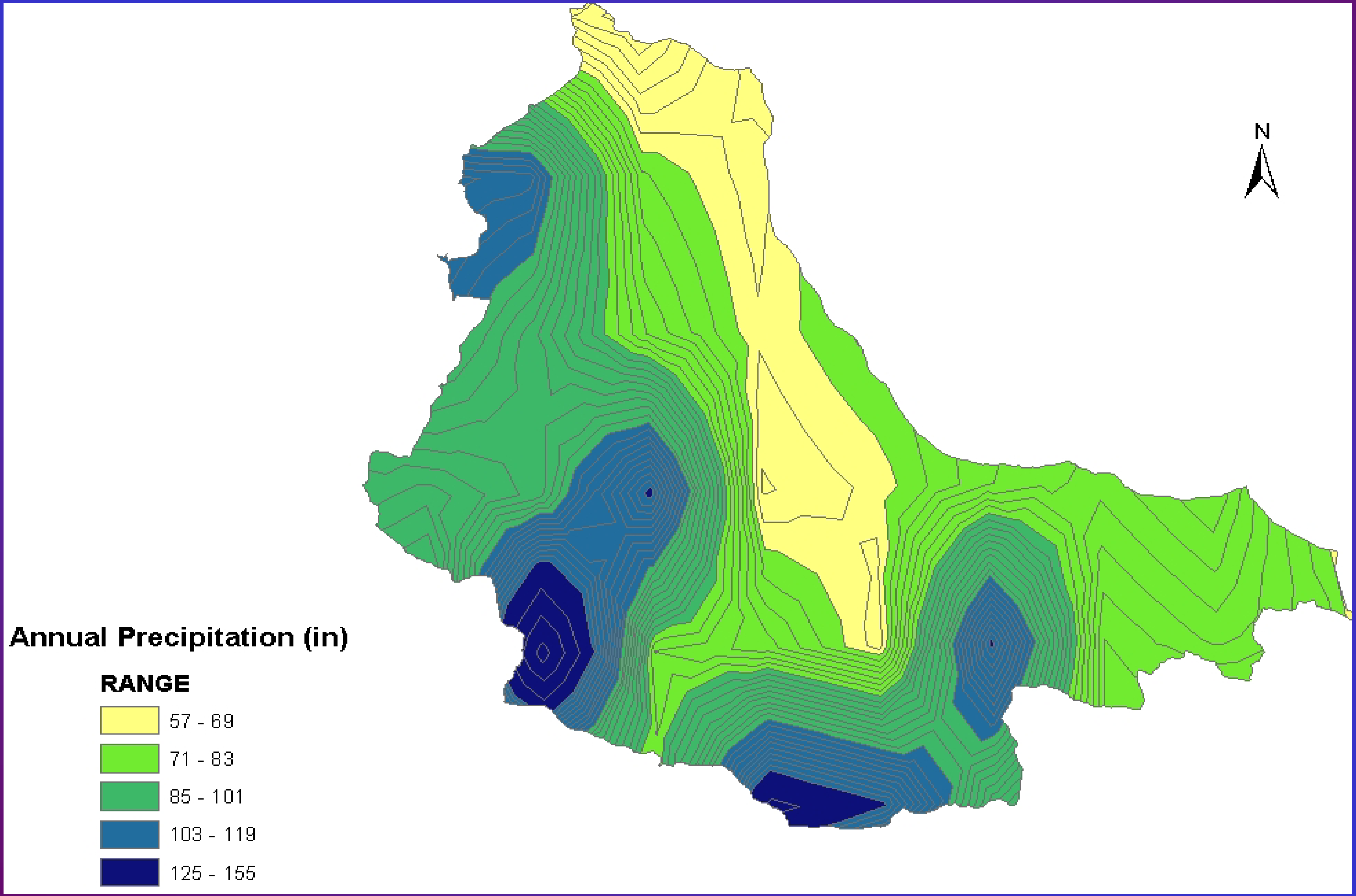
Surficial Geology



Actual Vegetation

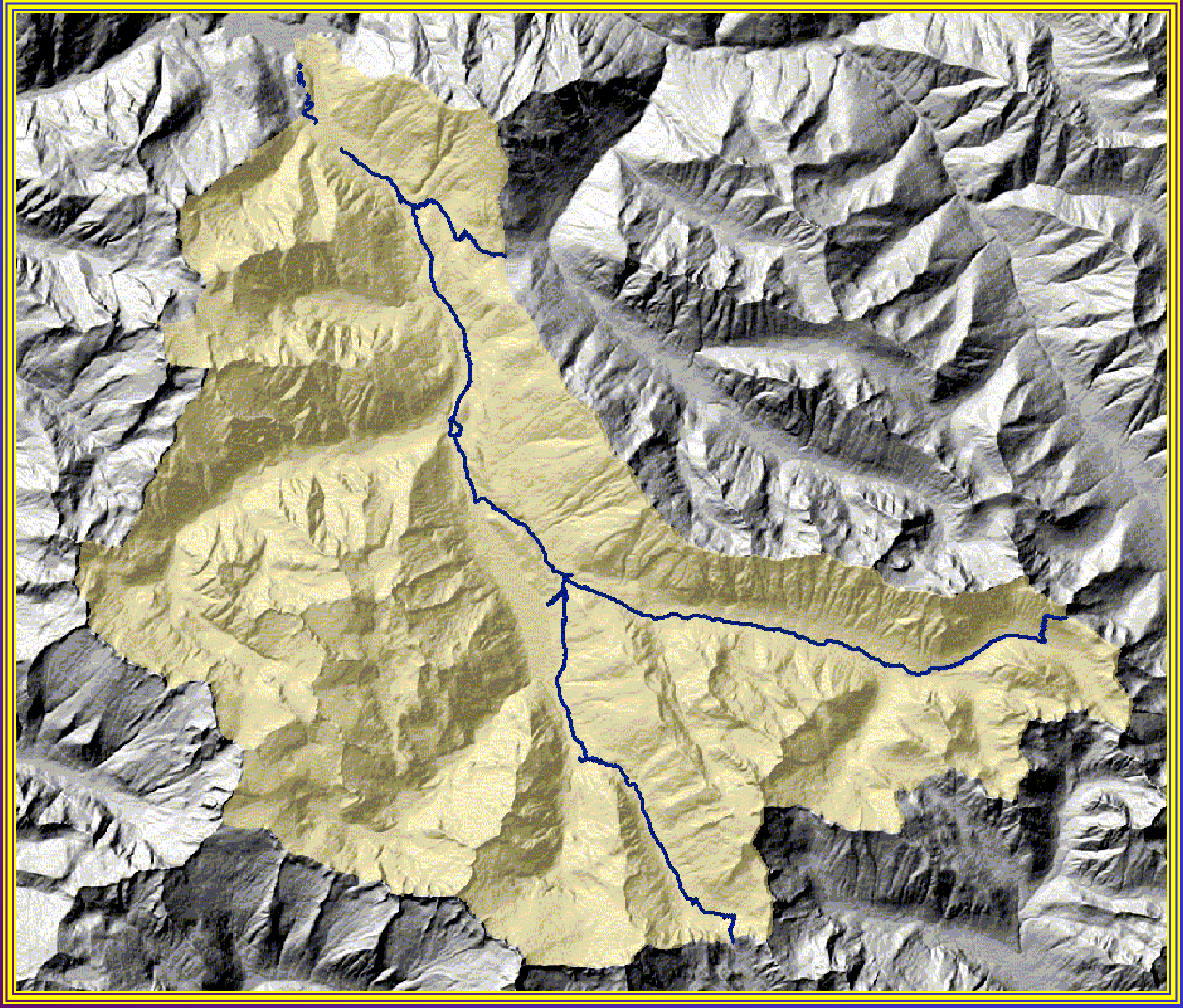


Mean Annual Precipitation (in.)



http://www.wcc.nrcs.usda.gov/water/climate/prism/prism.html

Hillshade from DEM



Conclusions

- GIS modeling very applicable in inaccessible areas
- Modeling conserves time and resources
- More available input data layers will improve map unit delineations
- Expert supervised input extremely valuable
- Data available for management applications