Disaggregation of Soil Class Polygon Maps to Produce Continuous Soil Property Raster Maps using Digital Soil Mapping Techniques

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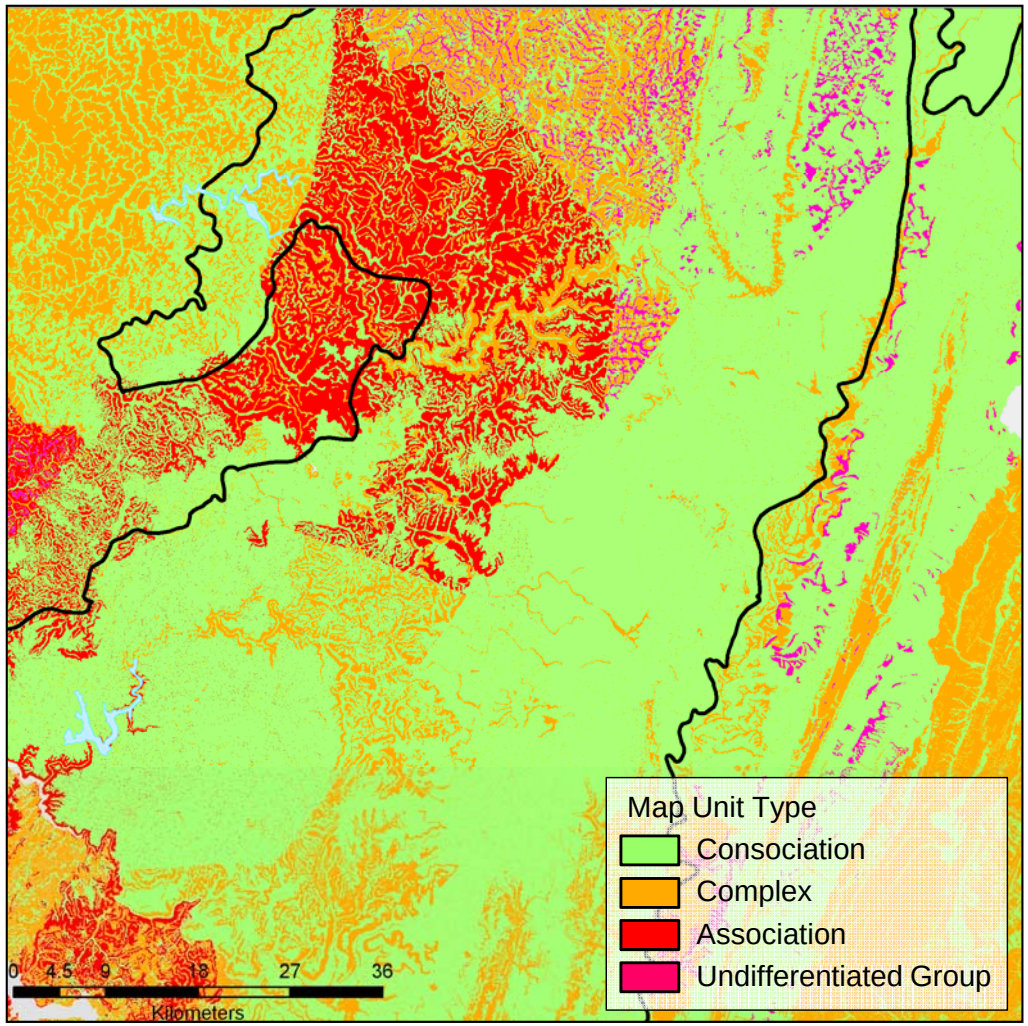
Mapping Soil Properties

- **SSURGO databases are produced and maintained independently**
  - Different vintages
  - Different scales
  - Different mapping concepts
  - Different soil components
  - Different tabular data

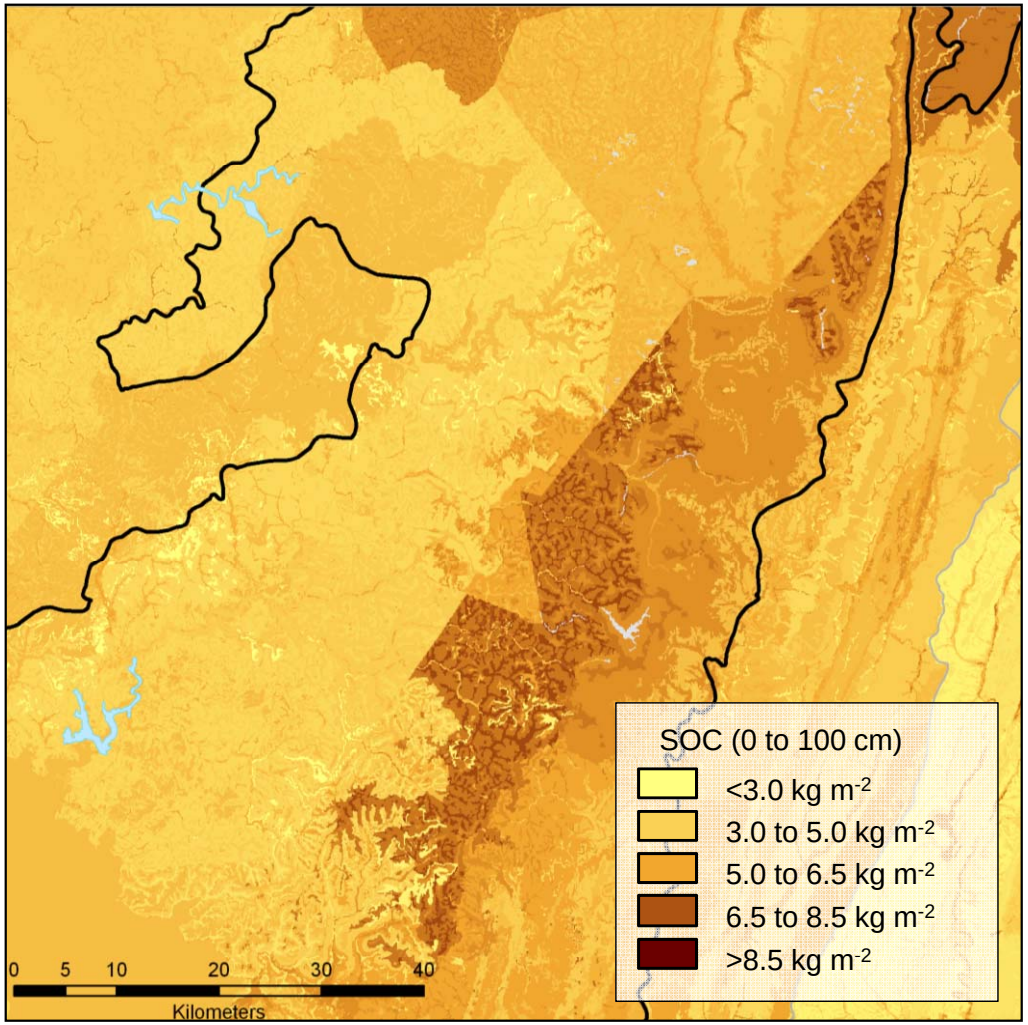


Mapping Soil Properties

- **Component composition of map units**
  - "Homogeneous" map units with one component as 100% composition
  - Component sum less than 100%
  - Components designated as "Other soils"

Mapping Soil Properties

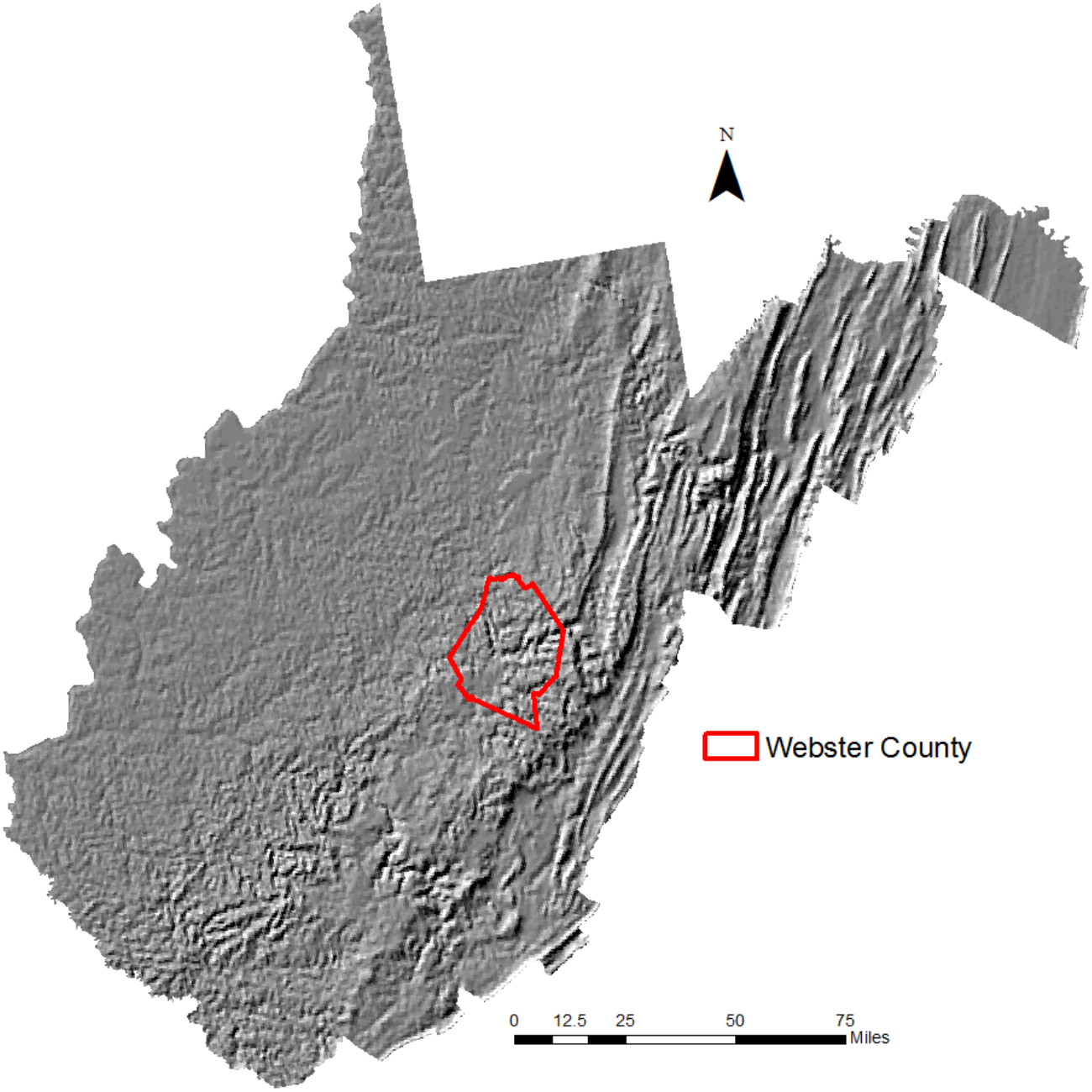
- **Artificial boundaries in the data associated with geopolitical boundaries**
  - Discontinuities in map unit composition
  - Discontinuities in soil property data



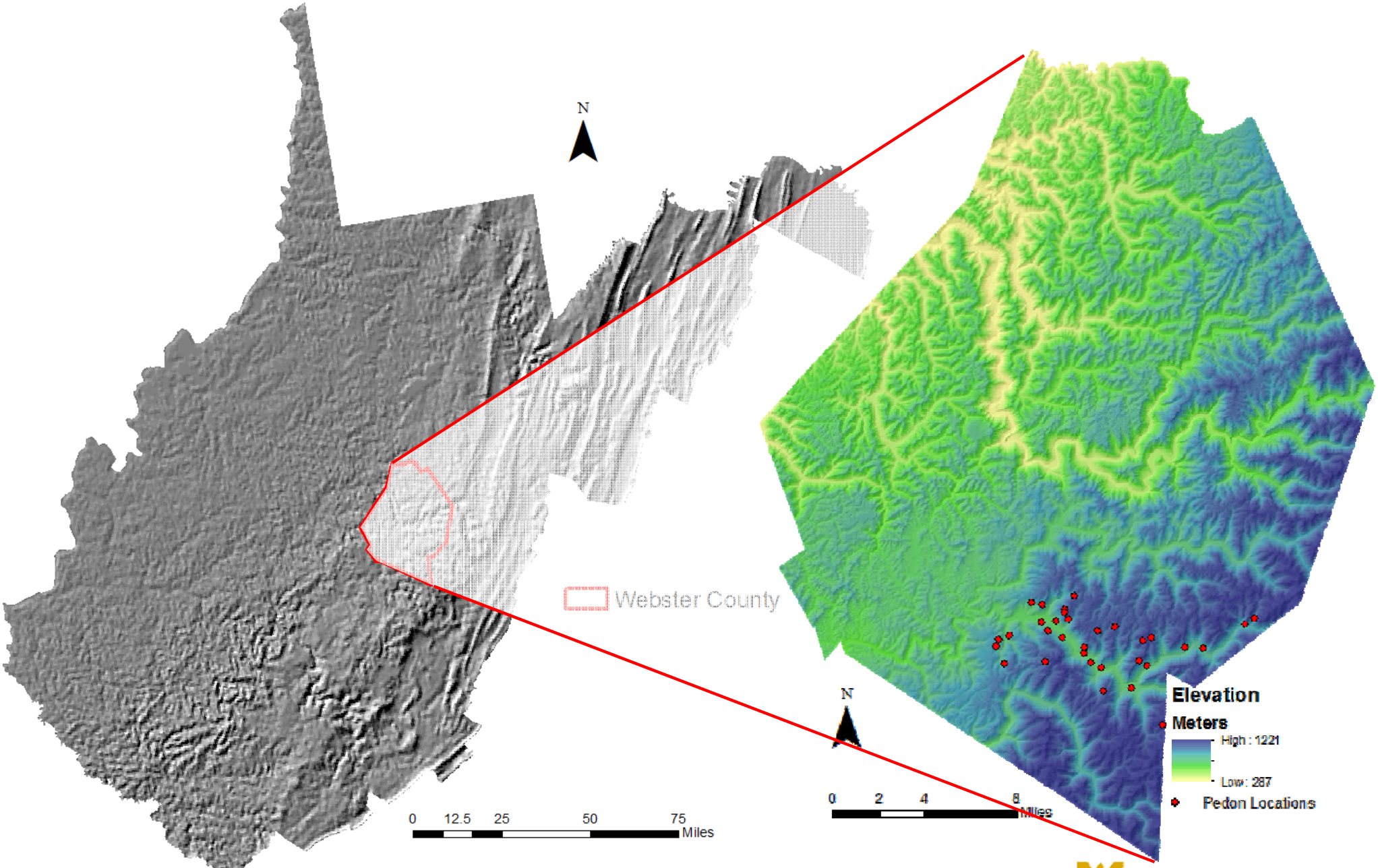
Two Examples

- Disaggregation of multi-component map units and estimation of SOC
- Disaggregation of all map units and validation of predicted soil component

Study Area

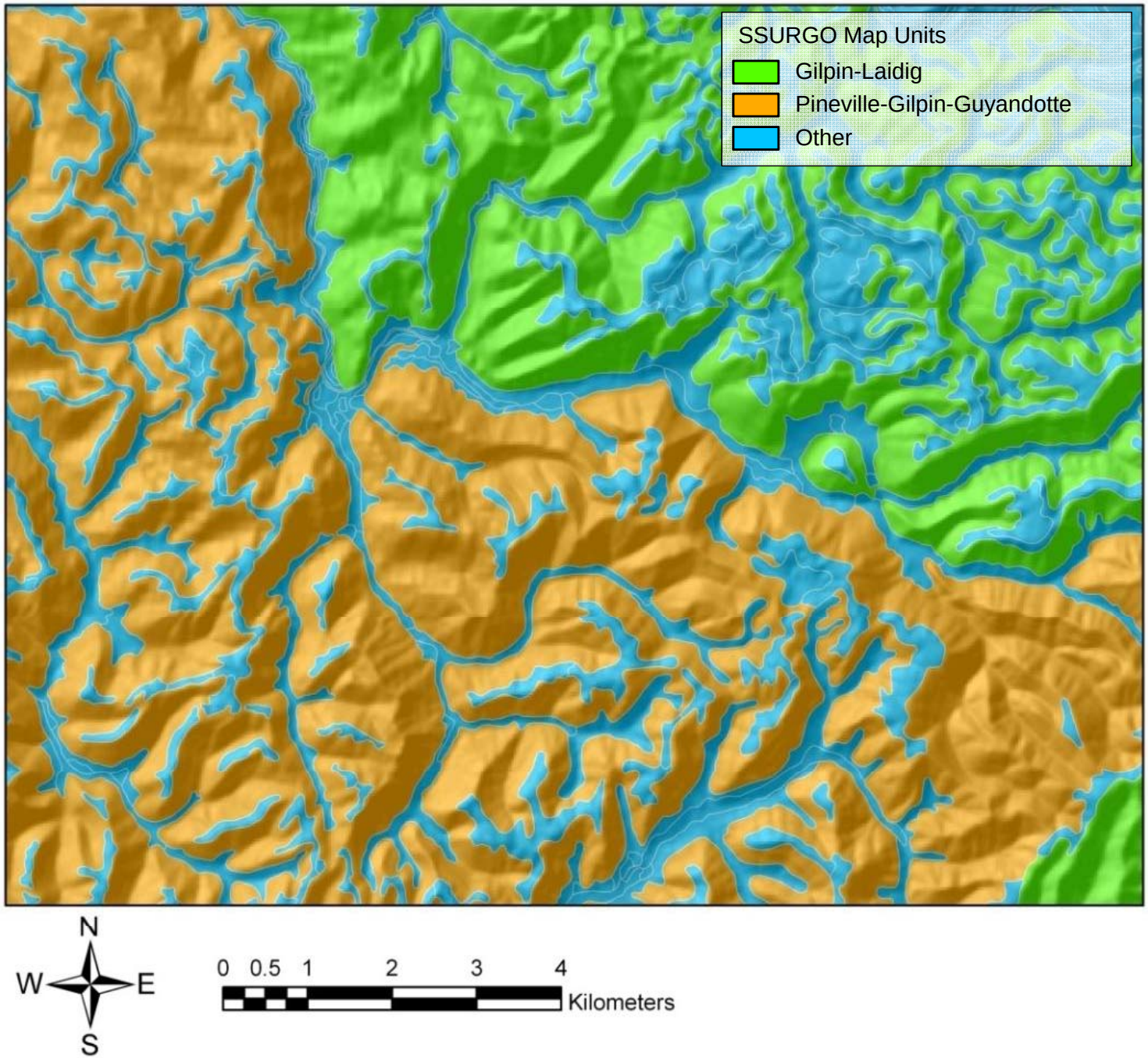


Study Area

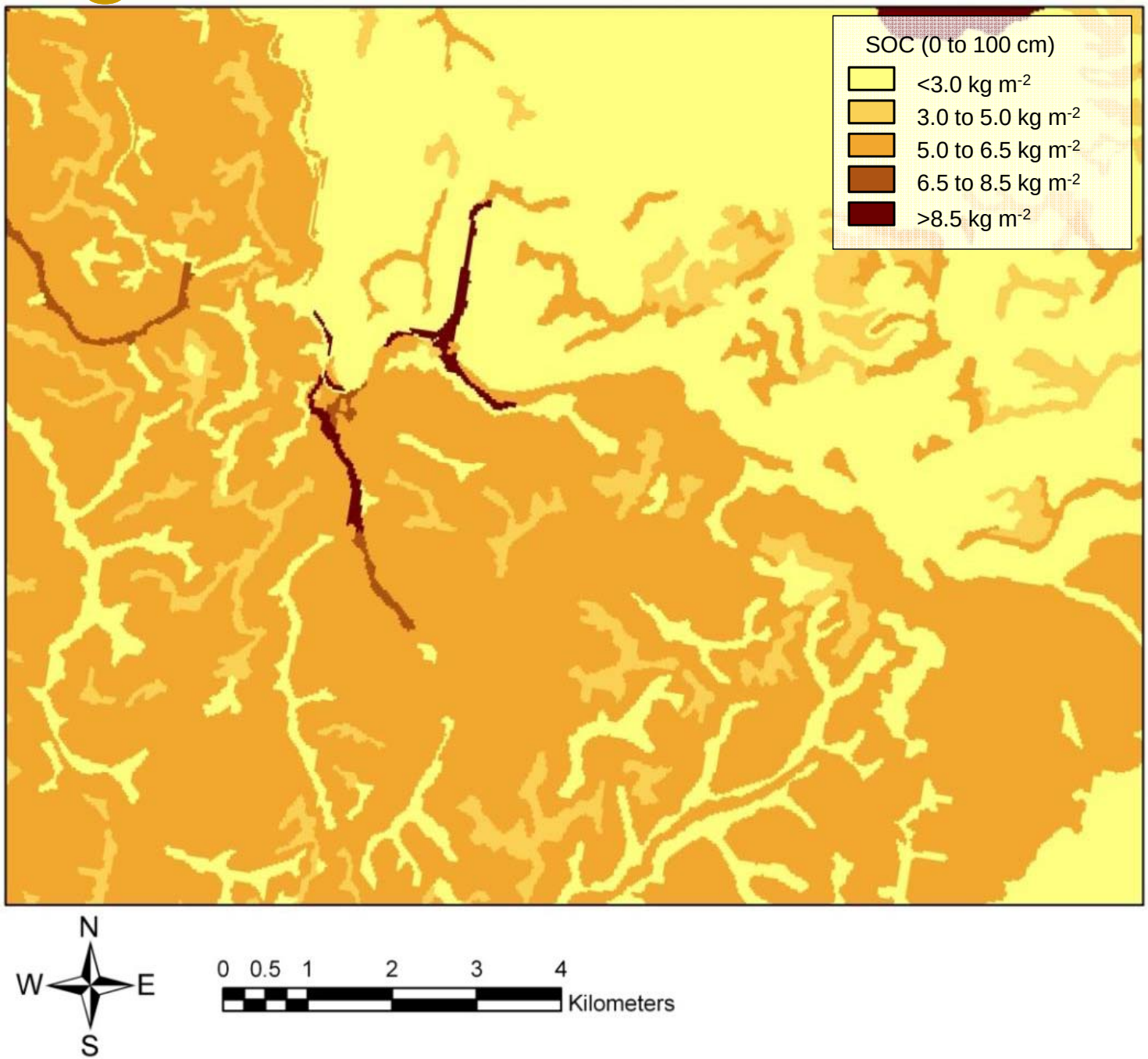

N
Webster County
0 12.5 25 50 75
Miles
N
0 2 4 8
Miles
Elevation
Meters
High : 1221
Low : 287
Pedon Locations

Allegheny Plateau and Mountains

Map Units—SSURGO



Soil Organic Carbon—SSURGO



Soil Survey Documentation

United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the West Virginia Agricultural and Forestry Experiment Station and the United States Department of Agriculture, Forest Service

Soil Survey of Webster County, West Virginia

ordination symbol is 5R in areas of the Pineville soil and 4R in areas of the Gilpin soil.

PLF—Pineville-Gilpin-Guyandotte association, very steep, extremely stony

This map unit consists of very deep and moderately deep, well drained soils on mountain side slopes in the western half of the county. Slopes are long, and the landscape is deeply dissected by numerous drainageways. The unit is about 35 percent Pineville and similar soils, 25 percent Gilpin and similar soils, and 15 percent Guyandotte and similar soils. Typically, the Pineville soil is on middle and lower side slopes and in south-facing coves; the Gilpin soil is on convex, upper and middle side slopes; and the Guyandotte soil is in north-facing coves and on the upper and middle, north-facing side slopes. Stones that are 10 to 24 inches in diameter cover 3 to 15 percent of the surface of the unit. Slope generally ranges from 35 to 70 percent.

Typically, the surface layer of the Pineville soil is very dark brown channery loam about 5 inches thick. The subsoil extends to a depth of about 50 inches. The upper 31 inches is yellowish brown channery loam. The lower 14 inches is yellowish brown very channery loam. The substratum is yellowish brown very channery loam about 15 inches thick.

Typically, the surface layer of the Gilpin soil is very dark grayish brown silt loam about 2 inches thick. The subsoil is yellowish brown channery silt loam about 24 inches thick. The substratum is yellowish brown channery silt loam about 10 inches thick. Sandstone bedrock is at a depth of about 36 inches.

Typically, the surface layer of the Guyandotte soil is black and very dark grayish brown channery silt loam about 19 inches thick. The subsoil is dark yellowish brown very channery silt loam about 36 inches thick. The substratum is dark yellowish brown extremely channery loam about 10 inches thick.

Included with these soils in mapping are the well drained Laidig soils on foot slopes and the lower side slopes; the well drained Dekalb soils on ridgetops, shoulder slopes, and nose slopes; and the well drained Craigsville soils and the somewhat excessively drained Potomac soils at the mouth of hollows and on narrow flood plains. Also included are small areas of rock outcrop on ridgetops and side slopes, areas of soils on ridgetops where the slopes are less than 35 percent, small areas of soils that are 40 to 60 inches deep over bedrock on shoulder slopes and side slopes, and small areas in coves and drainageways and below rock outcrops where more than 15 percent of the surface is covered with stones and boulders. Inclusions make up about 25 of the unit.

The available water capacity is moderate or high in the Pineville soil, moderate in the Gilpin soil, and low to high in the Guyandotte soil. Permeability is moderate in the subsoil of the Pineville and Gilpin soils and moderate and moderately rapid in the subsoil of the Guyandotte soil. Runoff is very rapid on all three soils. Natural fertility is medium. Unless the soils have been limed, the Pineville soil is very strongly acid or strongly acid, the Gilpin soil is extremely acid to strongly acid, and the Guyandotte soil is very strongly acid to neutral in the surface layer and very strongly acid to moderately acid in the subsoil and substratum. The depth to bedrock is more than 60 inches in the Pineville and Guyandotte soils and is 20 to 40 inches in the Gilpin soil.

Most areas of these soils are used as woodland. A few have been cleared of trees and are used as pasture.

These soils are not suited to cultivated crops or hay and are difficult to manage for pasture. The slope and the stones limit the use of farm machinery. The very severe hazard of erosion in unprotected areas and overgrazing in pastured areas are the major management concerns. Proper stocking rates that help to maintain desirable grasses and legumes and a rotation grazing system are the major management needs in pastured areas.

The potential productivity is moderately high for trees on these soils. Plant competition is a management concern. Intensive management is needed to keep undesirable plants from competing with native plants and planted seedlings. Site preparation following harvest and the establishment of new forest cover as soon as possible help to control plant competition. Seedling mortality is a management concern on the Guyandotte soil and on south aspects of the Pineville and Gilpin soils. Planting healthy seedlings that have a well developed root system and planting the seedlings in a timely manner in order to benefit from spring rains reduce the seedling mortality rate.

The slope is a severe limitation affecting the operability of equipment and the construction of haul roads, skid roads, and log landings on these soils. Building haul roads and skid roads in the included areas of the less sloping soils helps to overcome the slope. Rock outcrop hinders construction in some areas. The formation of ruts is a severe limitation on haul roads, skid roads, and log landings unless the

Soil Survey Documentation

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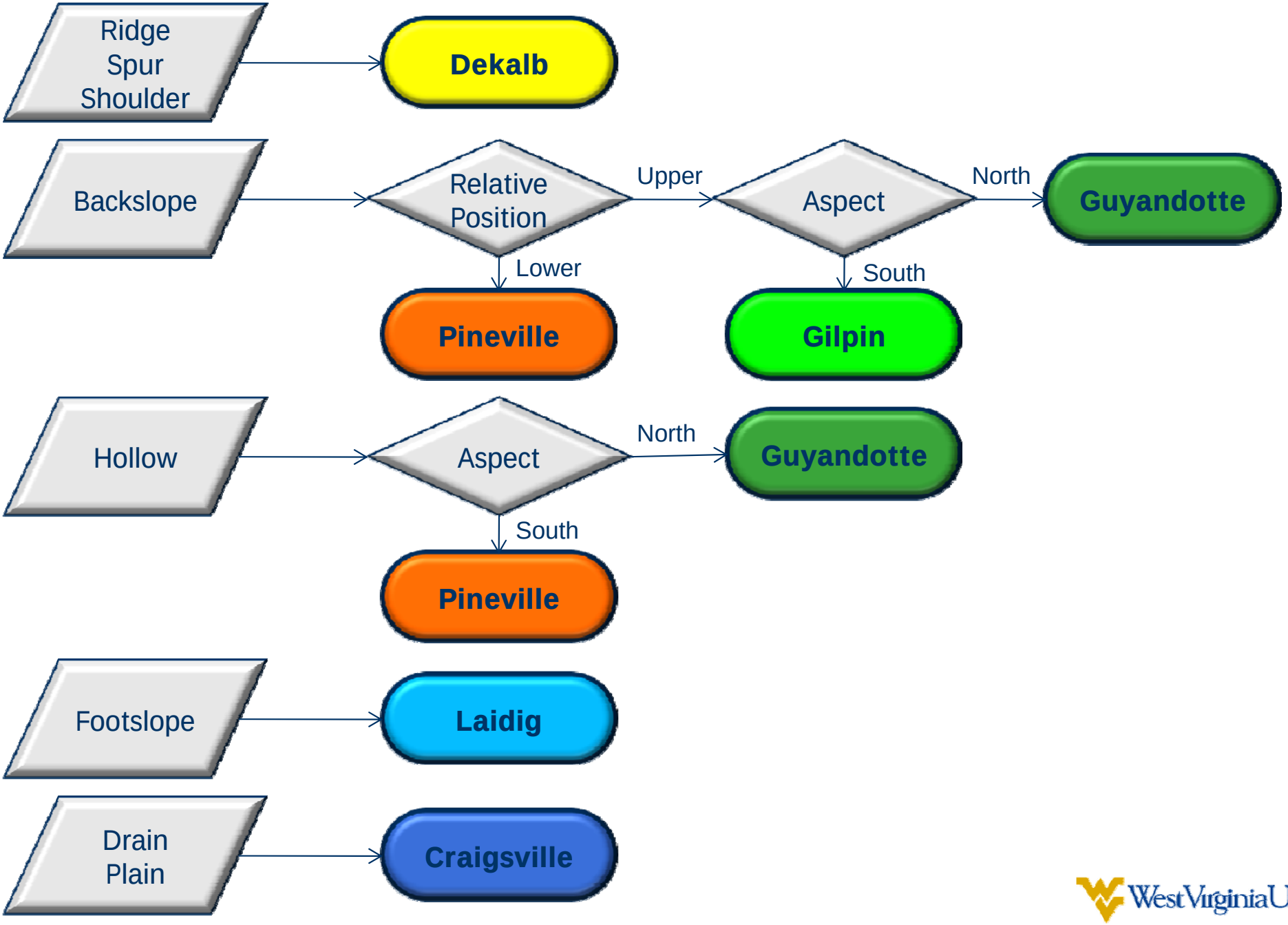
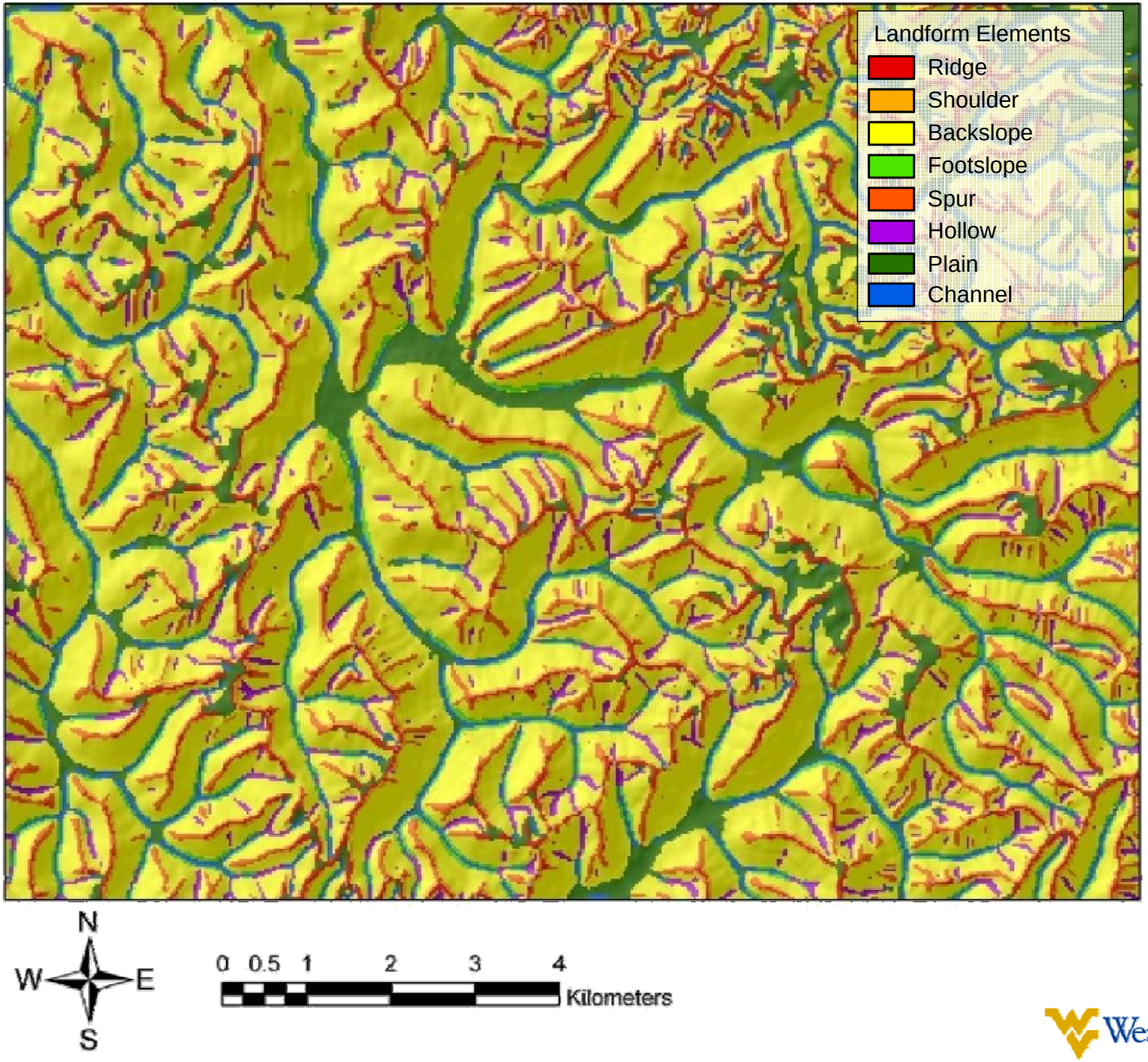
Included with these soils in mapping are the well drained Laidig soils on foot slopes and the lower side slopes; the well drained Dekalb soils on ridgetops, shoulder slopes, and nose slopes; and the well drained Craigsville soils and the somewhat excessively drained Potomac soils at the mouth of hollows and on narrow flood plains.

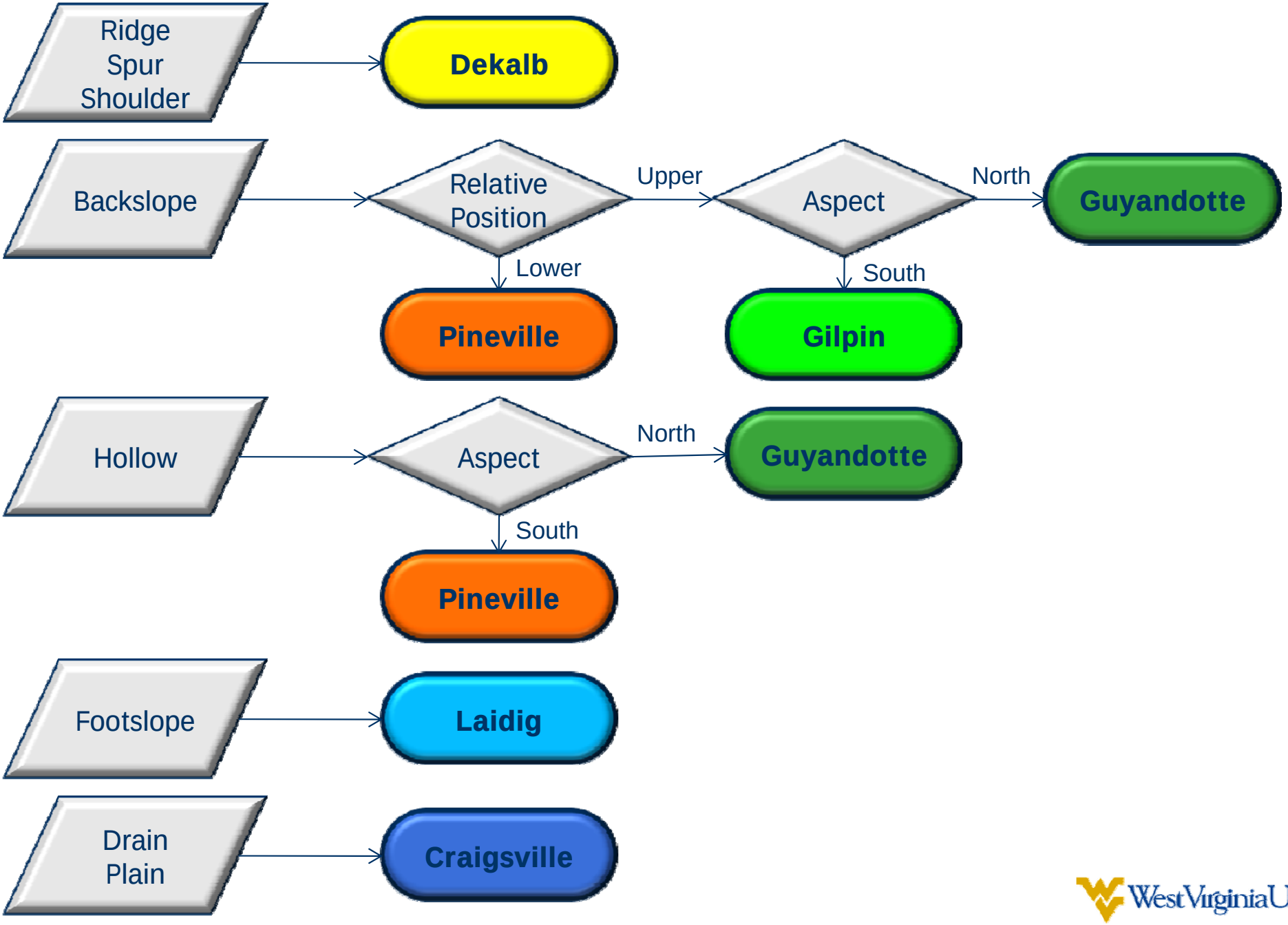
Spatial Disaggregation



Landform Classification



Spatial Disaggregation



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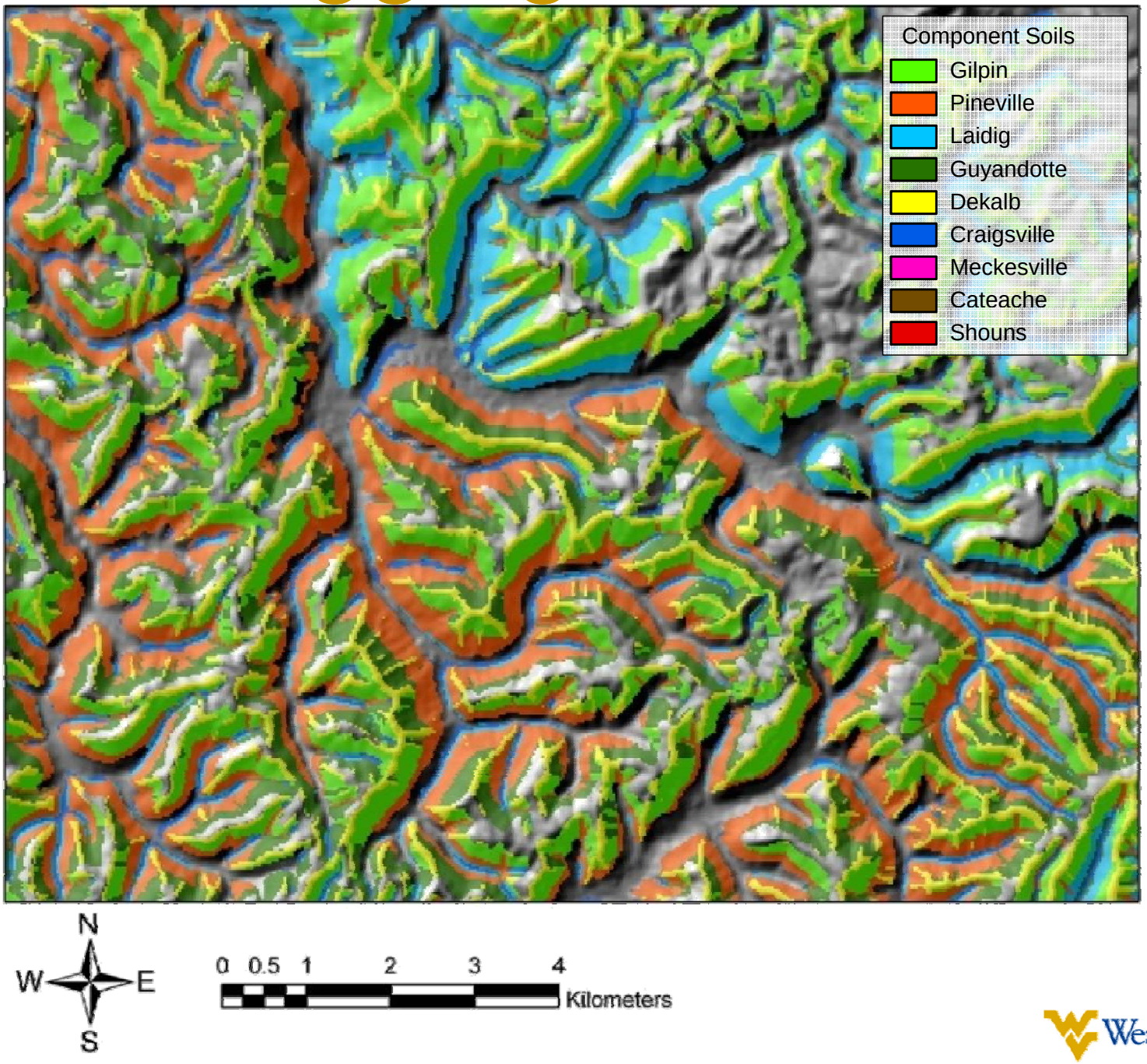
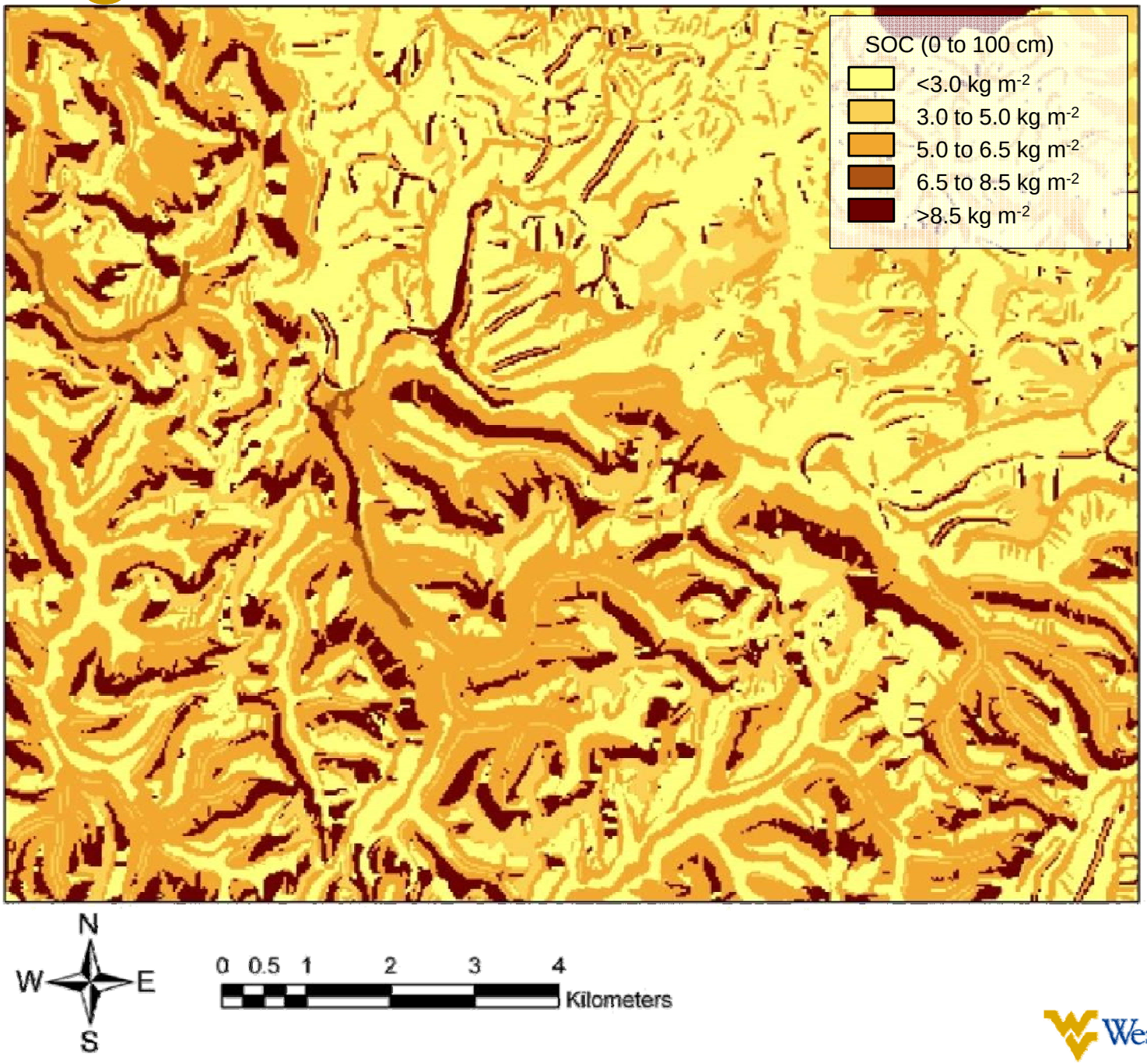


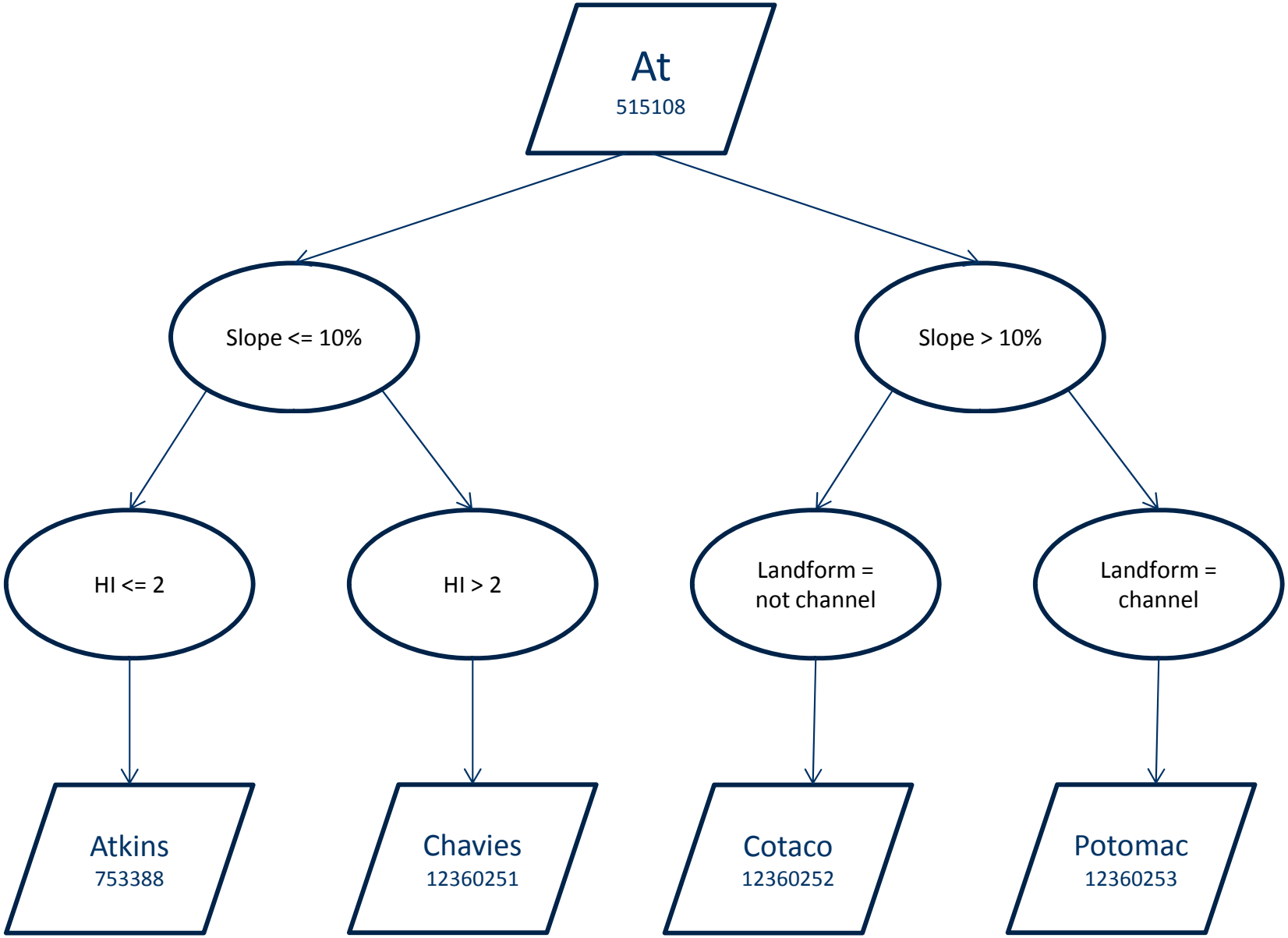
Soil Organic Carbon



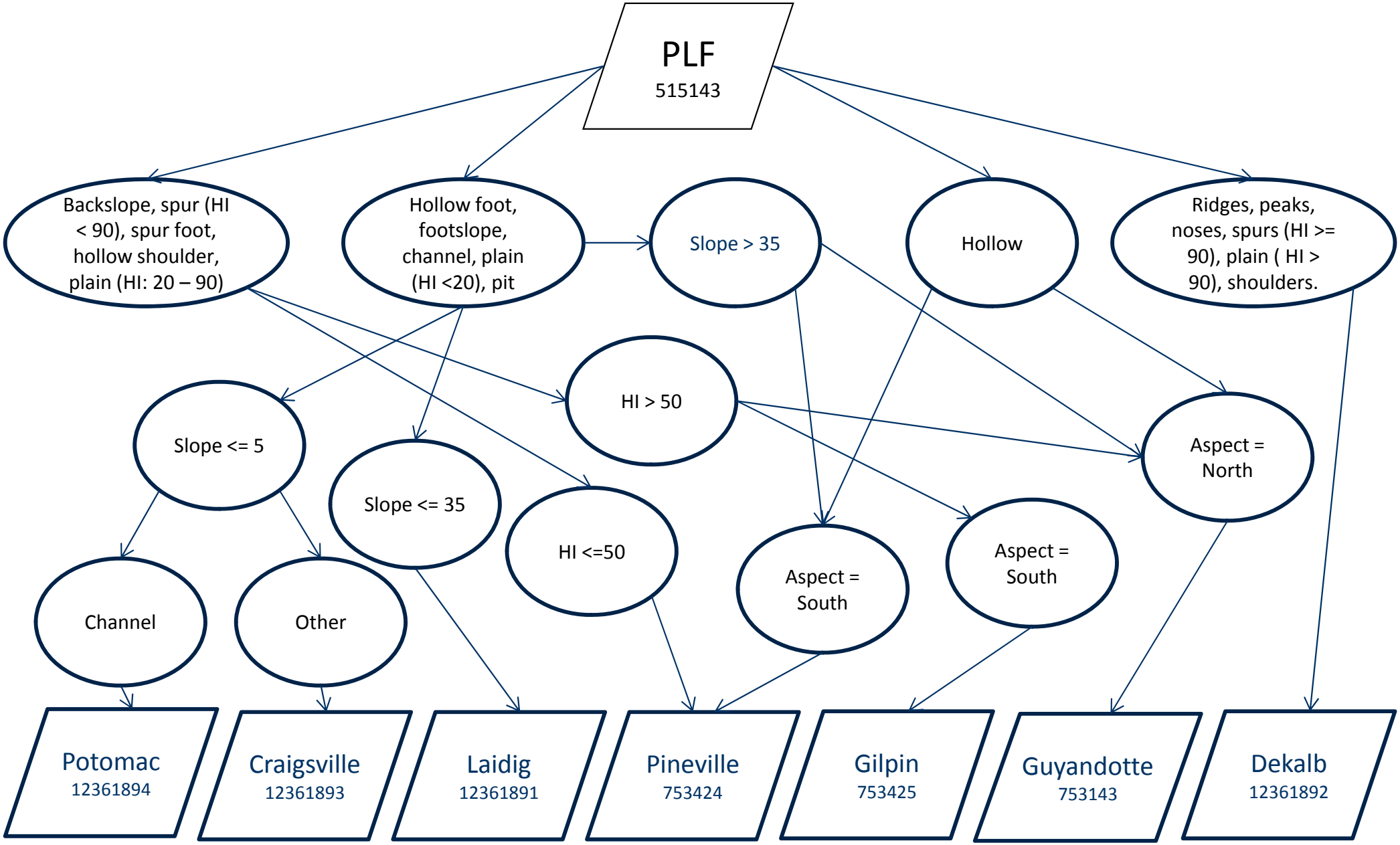
Issues

- Choosing appropriate methods for landform classification
- Assigning soil property values to unnamed component soils
- Disaggregation of all map units
- Validating results using observed pedon data

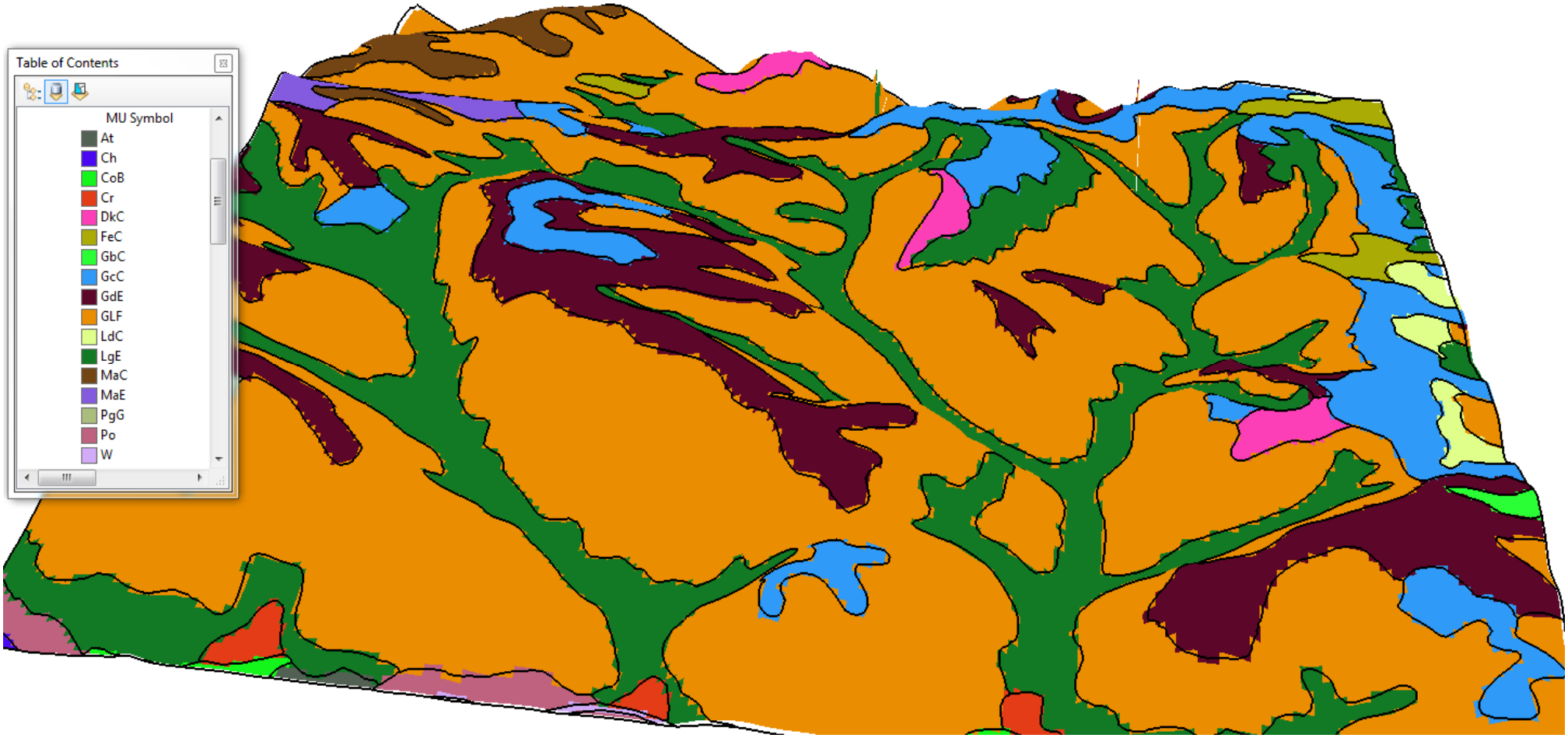
Spatial Disaggregation



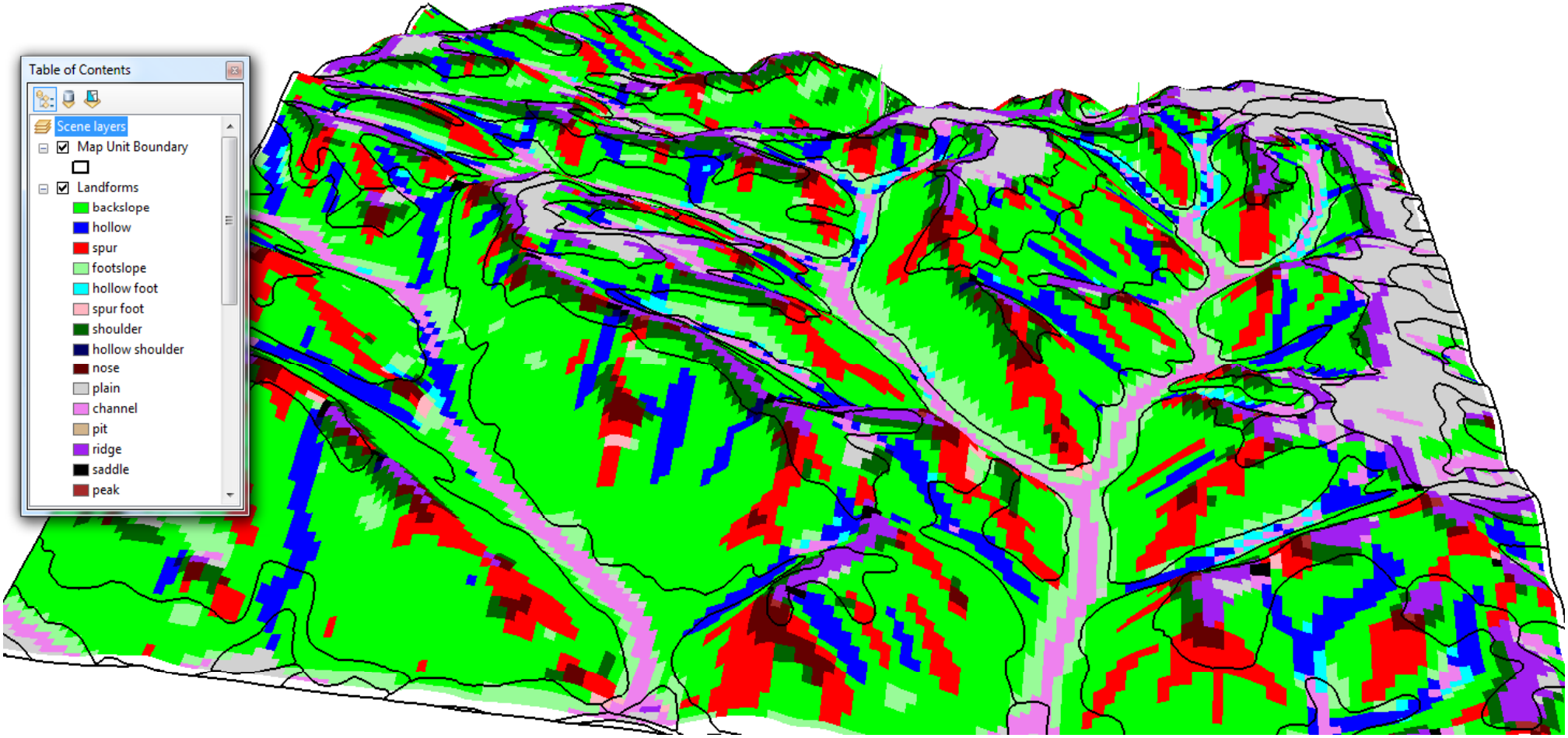
Spatial Disaggregation



Soil Map Units—SSURGO



Landform Classification



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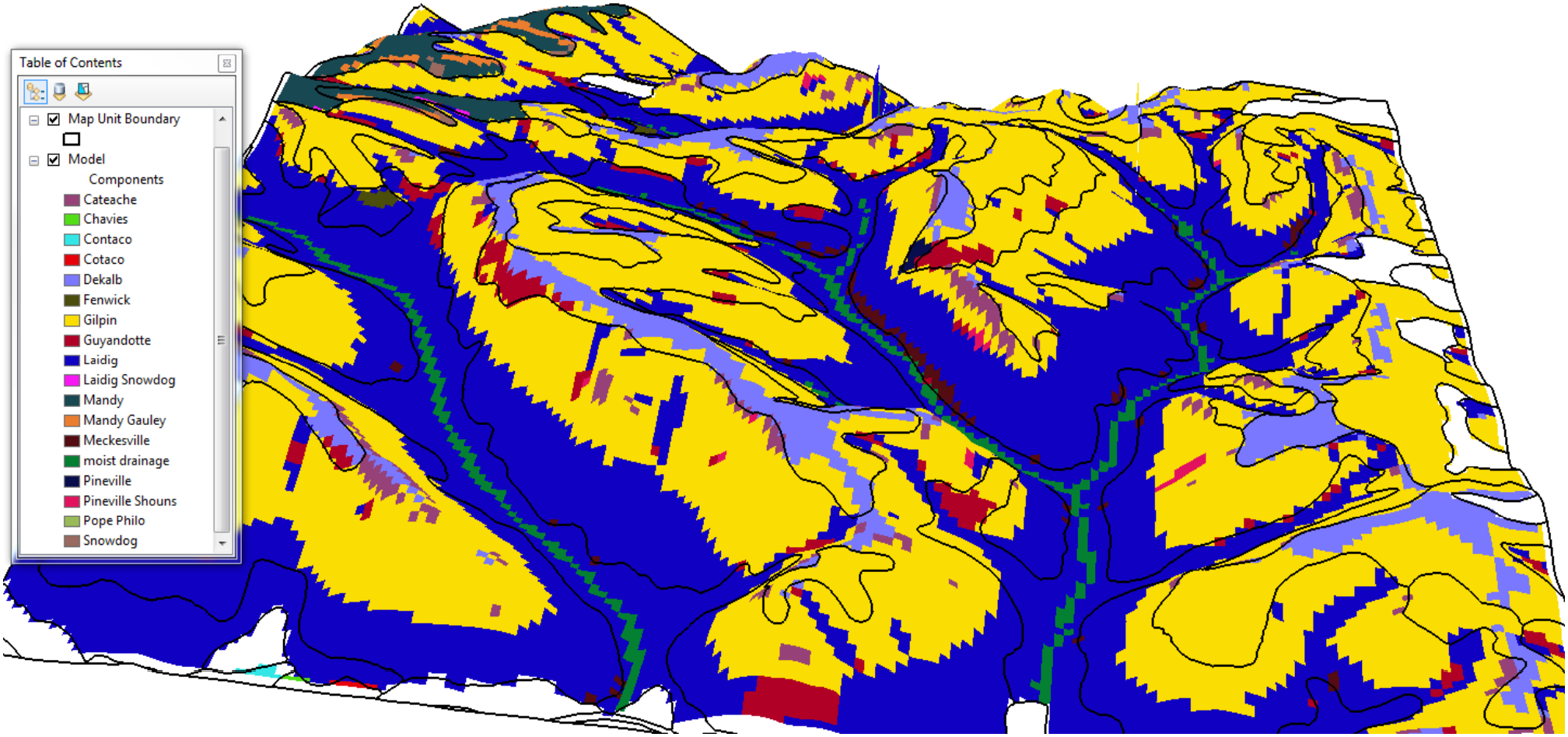

Validation

- 32 pedons
  - Stratified random sample across entire watershed
  - Pits excavated to 140 cm or bedrock

- Only 6 of the 32 pedons fit a series
  - 18 of the 32 pedons fit a series family

Validation

- Only five pedons match predicted component (16%)
- Nine pedons match at family level (28%)
  - subgroup + particle size family
- Have increased agreement at higher level taxa
  - 31% of great groups
  - 47% of suborders
  - 59% of particle size family

Summary

- Component (soil series) range of characteristics were too narrow to encompass many observed pedons
- Published landscape relationships in text did not match observed soils
- Fragipans over-mapped
  - 2 observed, 11 predicted
  - Only one match
- Moderately deep soils over-mapped
- Lithic soils under-mapped