Thinking Inside the (Tool) Box: Geomorphometric Analysis for the Soil Survey Update of Potter County, Pennsylvania

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Home improvement is an apt metaphor for a soil survey update. In a house, the living room needs a new coat of paint, the kitchen needs more counter space, and the avocado green linoleum and leaky tile in the bathroom need to be replaced. In a soil survey, new, high-resolution imagery and elevation data are available, map units occur in anomalous places, and the survey is so old it can’t support modern interpretations.

Hammers haven’t changed much over the years, and our tools and techniques aren’t exactly new either. But our architectonic approach to investigating soil series and developing new models for their locations parallels the sequence of planning and construction for home renovation. Each soil survey, like each home, is unique, and the application of tools, raw materials, and skills varies by the job.

Our aim is to explain how we put geospatial analysis tools to the job of designing, building, calibrating, and mapping complex soil-climate-landscape relationships in a soil survey update. The goal of our research is to develop and apply a set of geomorphometric parameters to facilitate the update process. The research was driven by two objectives: (i) to identify mapping inconsistencies in soil-climate-landscape relationships in the original soil survey of Potter County, Pennsylvania, and (ii) to build transportable geomorphometric rules and processes to guide the amendment of those inconsistencies in Potter County and across similar landscapes in Major Land Resource Area 127.

The Blueprint

Potter County is located in north-central Pennsylvania, along the New York border (Fig. 1). Potter County straddles two Major Land Resource Areas (MLRA)—127 (Unglaciated Allegheny Plateau) and 140 (G laciated Allegheny Plateau) (Soil Survey Staff, 2006a,b), at the southernmost border of the Late Wisconsinan glaciation (about 18,000 yr BP; Crowl and Sevon, 1980). The glacial terminus trends northwest to southeast across the county. The northeastern one-third of the county displays characteristic landscapes of the glaciated Allegheny Plateau. The landscapes of the southwestern two-thirds of the county are more characteristic of the deeply incised, unglaciated Allegheny Plateau physiographic region.

The initial soil survey of Potter County was completed in 1953, and was published on a planimetric base in 1955. For this study, we focused on Nolo and Germania soils associated with the unglaciated portion of Potter County. Nolo soils are typically found on plateau summits, while Germania soils are found on strath terraces and alluvial fans in stream valleys. The selection of these two soil series, which represent highly distinctive landforms and topographic extremes in the county, will help guide premapping investigations, correlation, and field update methods, and will be transportable to other associated soils and catena sequences.

In the older soil survey, Nolo soils represented about 954 ha (2300 acres) aggregated across 105 polygons. Nolo soils are classified as fine-loamy, mixed, superactive, mesic Typic Fragiaquults (Soil Survey Staff, 2006b,c). In the Central Appalachians, Nolo soils are mapped on about 40,500 ha (~97,700 acres) across 18 counties in Pennsylvania, Maryland, and West Virginia. It is ecologically significant for their association with...