

Historical Perspectives and Future Needs in the Development of the Soil Series Concept



Dylan E. Beaudette, USDA/NRCS Soil Science Division, Sonora, CA, Eric C. Brevik, 291 Campus Dr., Dickinson State University, Dickinson, ND, and Samuel J. Indorante, USDA/NRCS Soil Science Division, DuQuoin, IL

Past

- The soil series concept was formally introduced into the U.S. soil survey in 1903 as a way to relate soils being mapped in one area to the soils of other areas.
- Several classification systems have been used over this time; the soil series has been the only category to appear in all of them.
- When Soil Taxonomy was being developed in the 1950s and 60s end users made it clear they did not want the soil series tampered with.
- The Miami series provides a great example of the history of soil series in the United States
- The Miami series was first established in 1900, making it one of the oldest series in the U.S.
- In 1904 the Miami series was mapped over an area that extended from the state of New York in the east, to North Dakota in the west, and south to Mississippi (Figure 1).
- The original Miami series included soils that today are classified as Alfisols, Mollisols, and Inceptisols.
- As more information was gathered and series definitions were refined, several new series were created out of the Miami Series (Figure 2).
- Today the distribution and extent includes Indiana, southern Michigan, central and northern Illinois, southeastern Wisconsin, and western Ohio (Figure 3).
- While still a series of large extent, the area mapped as Miami is much smaller than in the past. This is a result of increased knowledge of soil forming factors and soil properties allowing for finer subdivisions of units classified.

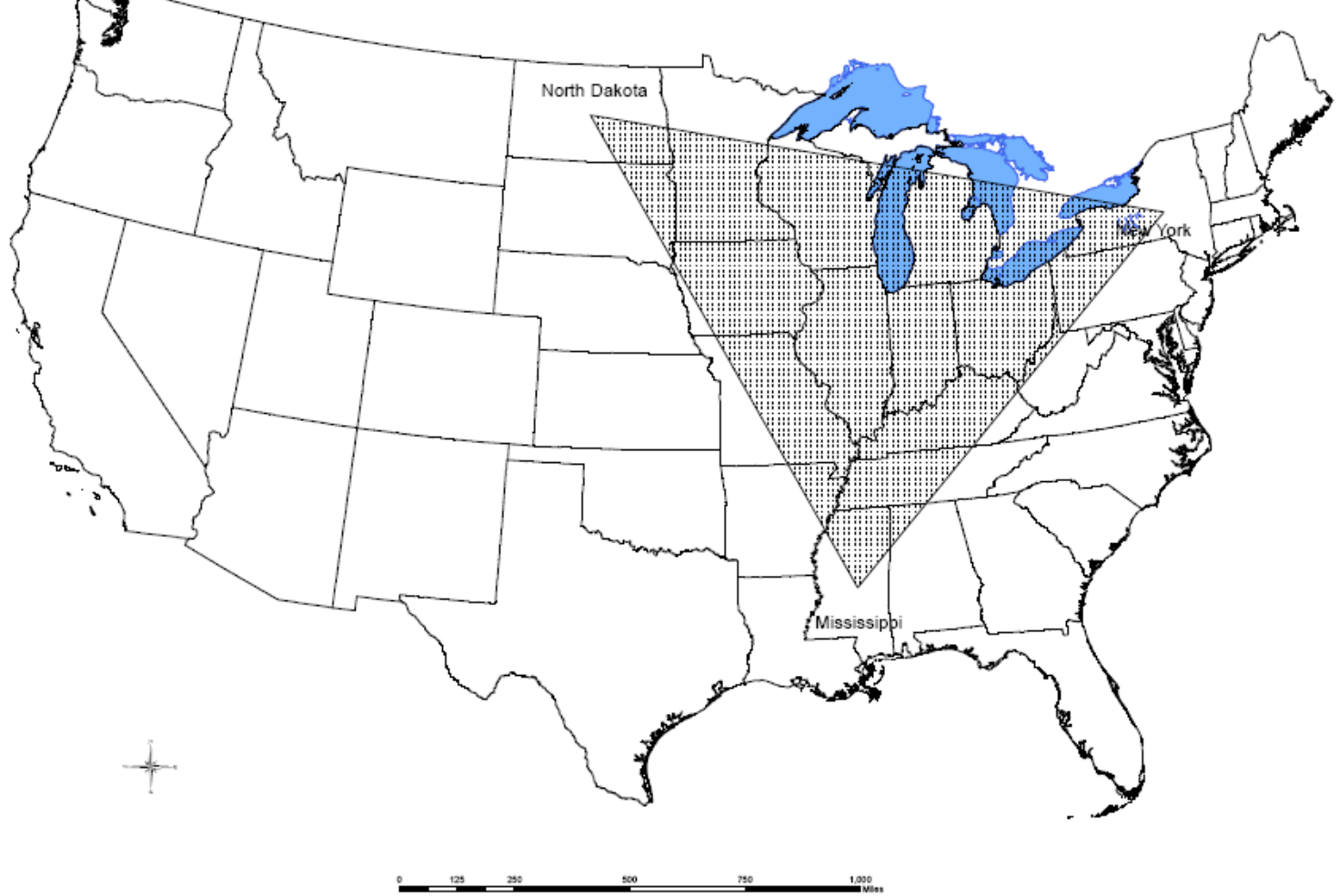


Figure 1. The geographic distribution of the Miami series in 1904.

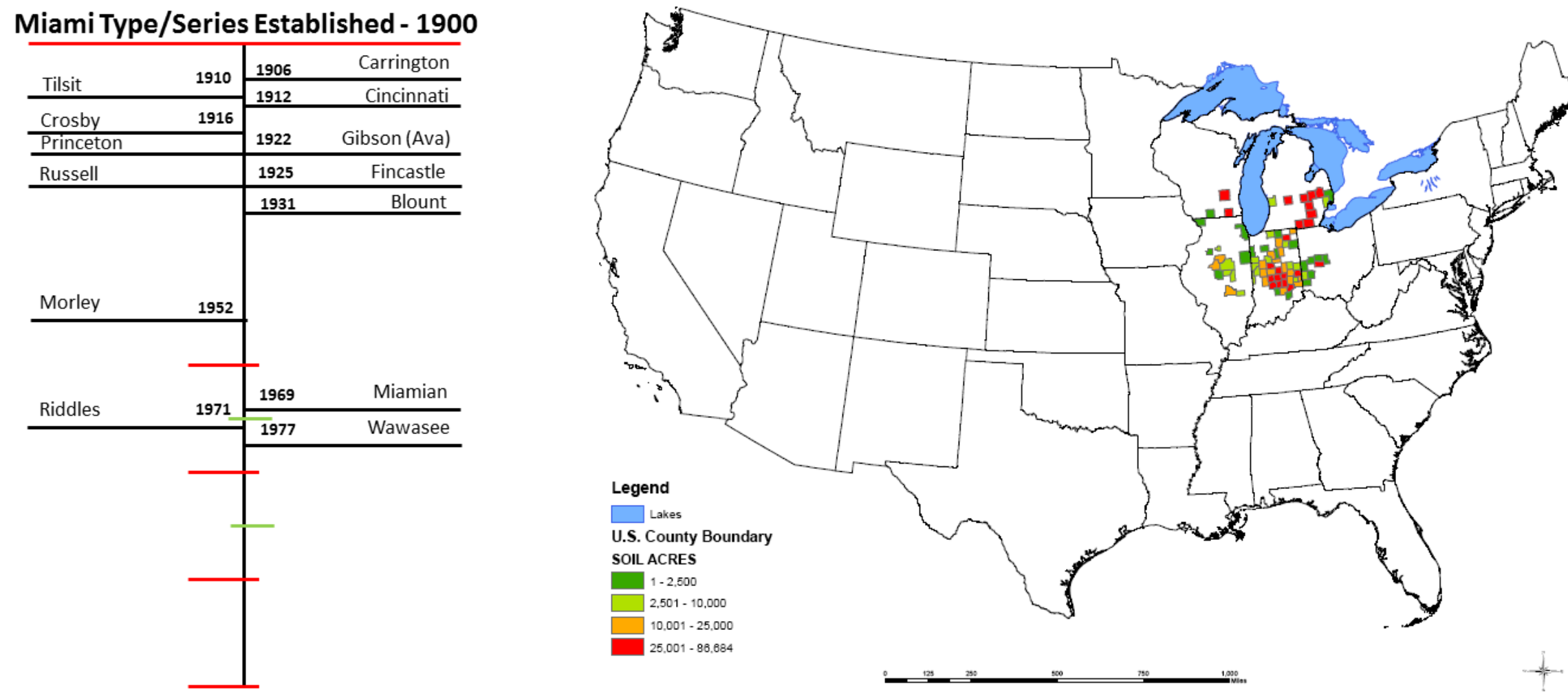
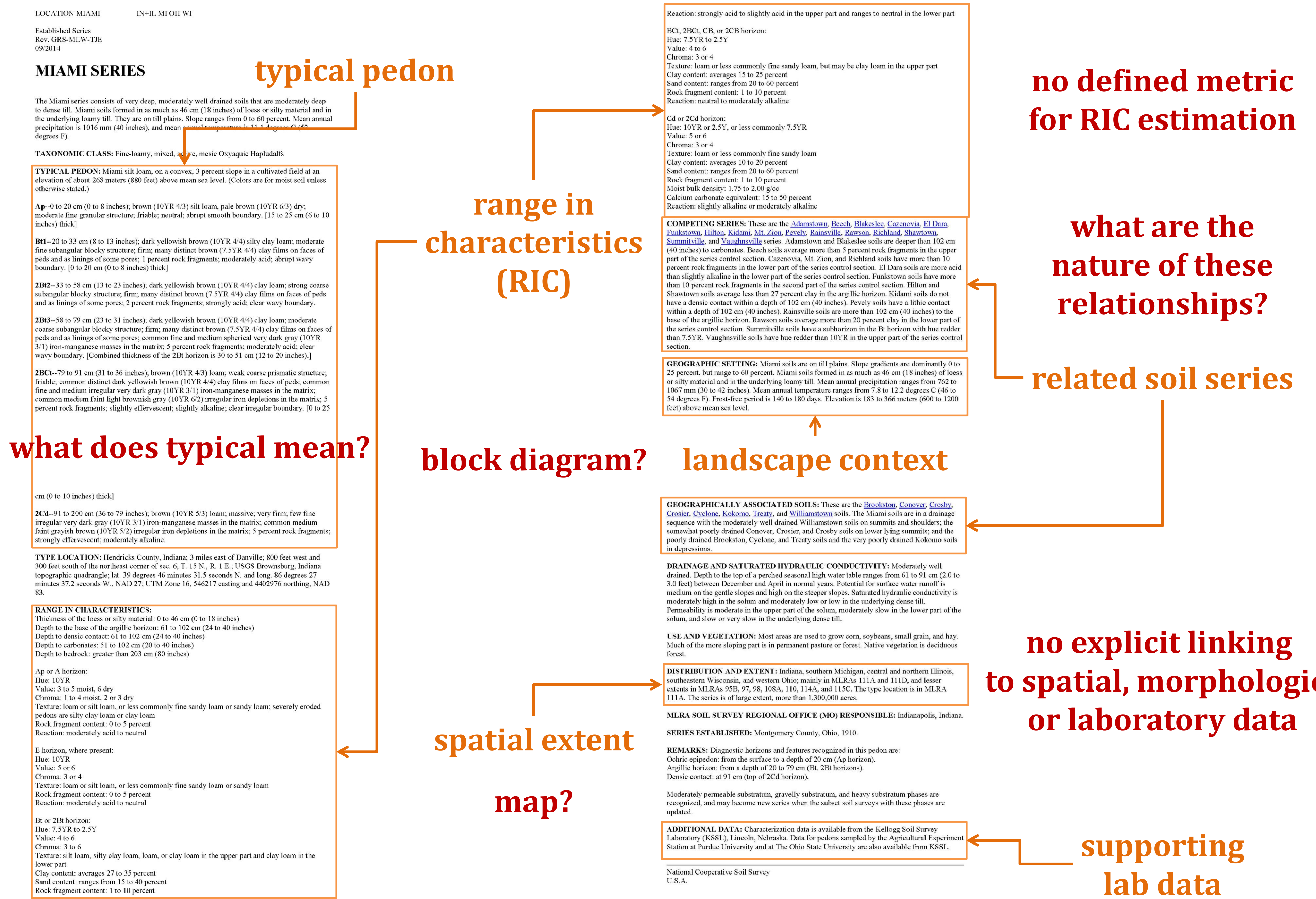


Figure 2. New series created in the state of Indiana out of the original Miami series.

Figure 3. The geographic distribution of the Miami series in 2014.

Present

- Below is a the current Official Series Description (OSD) for the Miami Series (circa 09/2014).
- It contains detailed typical pedon information, ranges in characteristics, and associated information on other series, settings etc. Since the 1960's the OSD has been relatively static in form and in the kinds of information supplied.
- There is a need for: a more quantitative analysis and presentation of soils data, a visual presentation of soil series/landscape relationships, pertinent information that will provide a better means of developing and refining soil series concepts, and spatial analysis/representation of soil series concepts.



- manually edited and stored as plain text file
- format is mostly standardized but not machine-readable
- qualitative and descriptive summaries

OSD is essentially a static reference tool

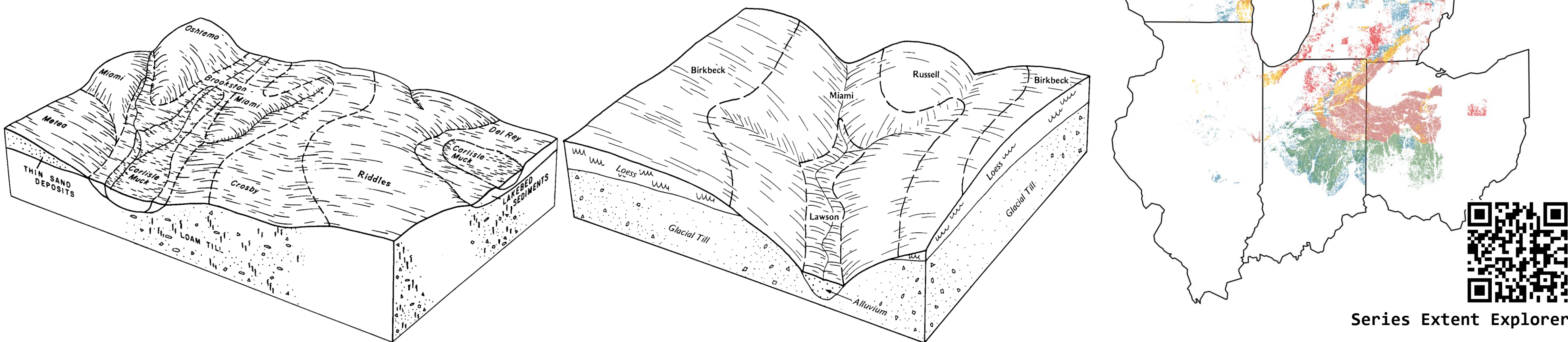
Future

We propose a *data-driven* alternative to the current OSD, that provides along with the classic narrative:

- descriptive text and block diagram highlighting soil-landscape relationships
- geographic context in the form of interactive maps
- graphic representation of relationships between soil series
- data-driven, probabilistic representation of “most-likely” horizonation
- data-driven representation of range in characteristics based on quantiles
- quantitative measure of “similarity” to related soil series

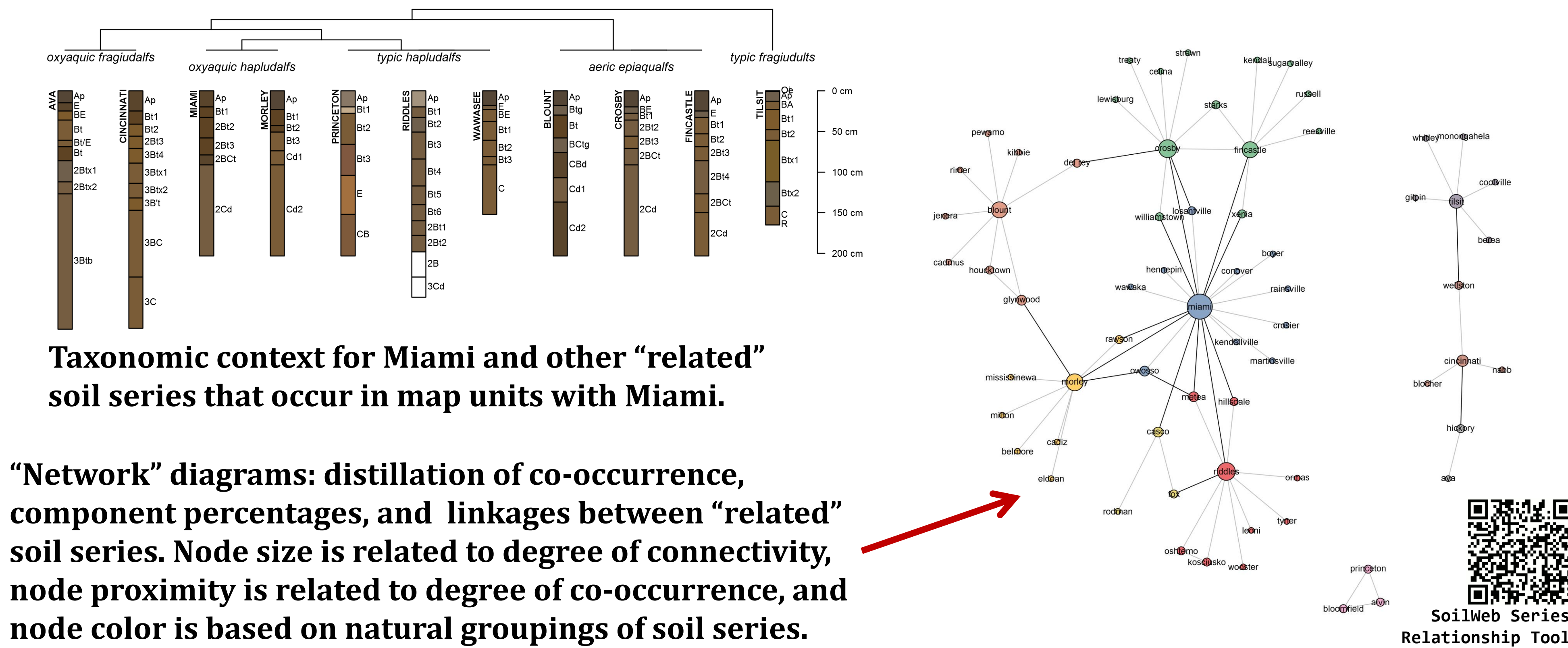
... in human *and* machine-readable formats.

Proposed elements for the Miami soil series might look like:



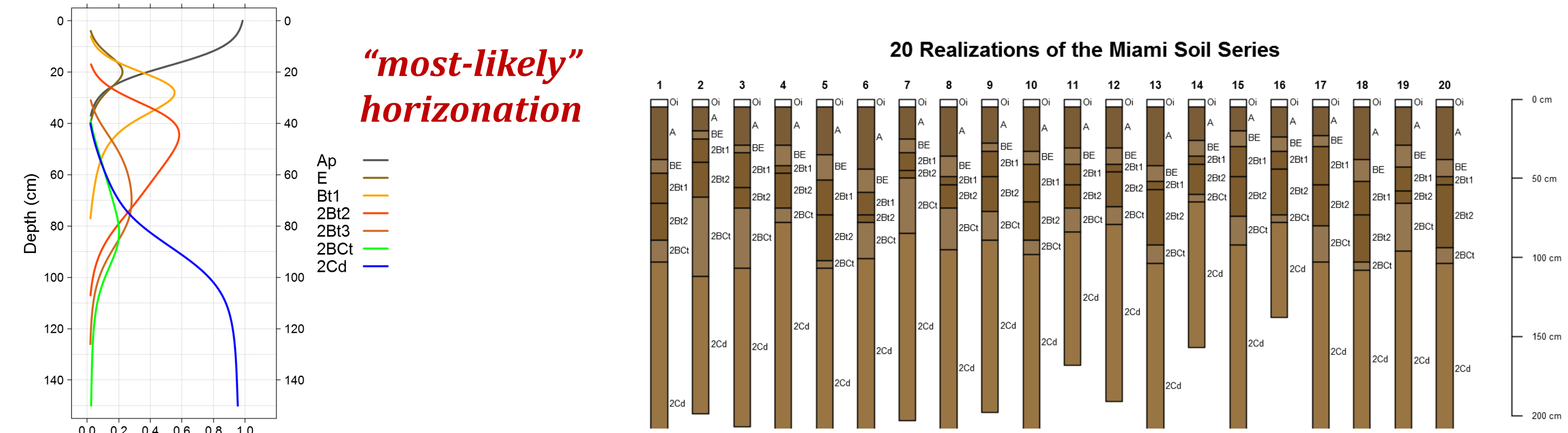
Classic block diagrams from all available sources; indexed and searchable.

Interactive soil series extent maps.

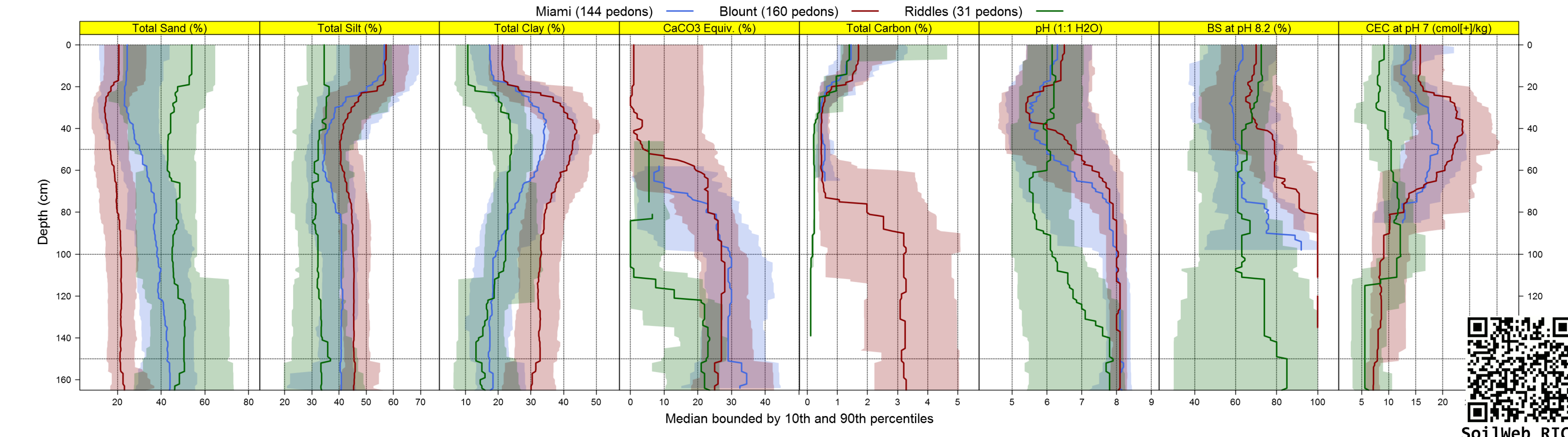


Taxonomic context for Miami and other “related” soil series that occur in map units with Miami.

“Network” diagrams: distillation of co-occurrence, component percentages, and linkages between “related” soil series. Node size is related to degree of connectivity, node proximity is related to degree of co-occurrence, and node color is based on natural groupings of soil series.



Data-driven, probabilistic representation of horizonation based on correlation of horizon designations. Simulated profiles convey a realistic sense of expected variation within the Miami series concept.



Data-driven representation of spread and central tendency of key soil properties based on quantiles and evaluated along regular depth slices. These representative depth functions can be used to (quantitatively) describe similarity between related soil series.

These tools are available today, however, the database required to support our proposed “reboot” of soil series usage and presentation is not. Development of this database and delivery system will require technical skill, regional pedologic expertise, and many hours of correlation. It is our belief that the proposed system will foster a better understanding of soil series concepts, support consolidation of the existing 24,000+ series, and communicate a realistic sense of soil variability.

Apply these methods to your data with AOP!