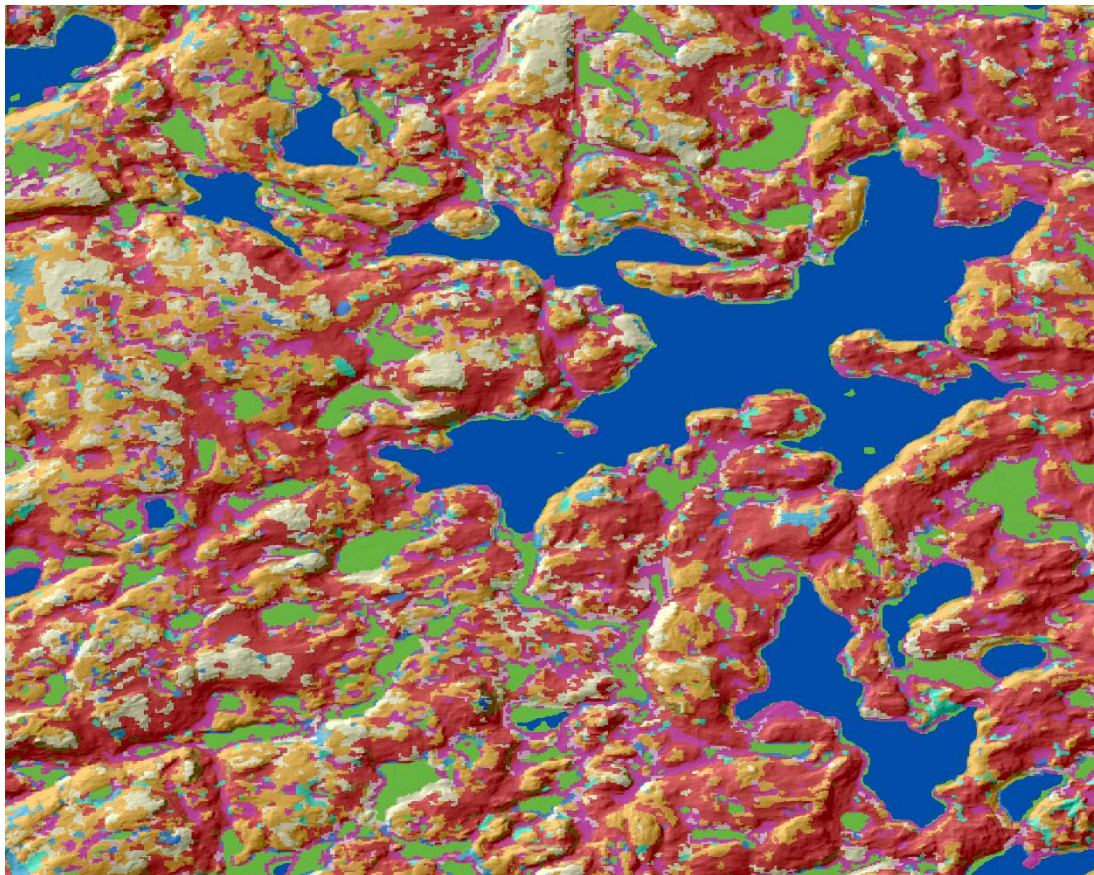
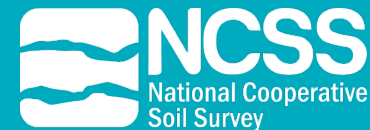




United States Department of Agriculture



Soil Science Division
Natural
Resources
Conservation
Service



Digital Soil Mapping Focus Team

April 24, 2019

Natural
Resources
Conservation
Service

nrcs.usda.gov/

DSM Focus Team

Team charges

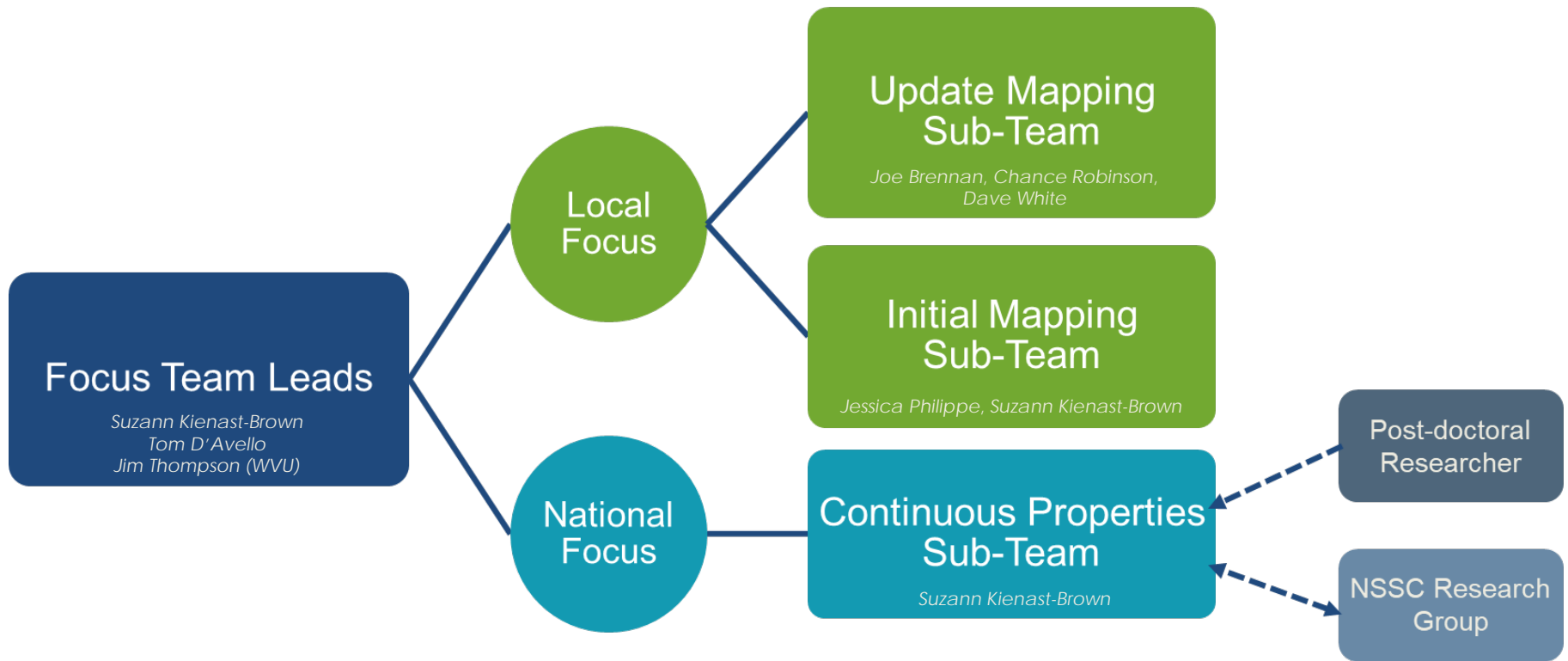
- Coordinate DSM activities across the Division
- Identify training needs
- Identify needs to update standards and propose solutions
- Initiate annual field weeks to investigate soil-landscape relationships in selected project areas
- Assemble existing data
- Identify gaps
- Produce raster-based soil data and information

DSM Focus Team

Framework

- Standards
 - NSSH Part 648 published June 2018
- Training
 - DSM curriculum
- Support
 - Sub-teams
 - Field weeks
- Delivery
 - Raster Soil Surveys
 - gNATSGO

DSM Focus Team



DSM Focus Team

Training

- DSM curriculum fully implemented in FY19
- *Introduction to DSM*
 - Four sessions (2 classroom, 2 distance)
 - 90 participants
- Future courses
 - Correlation workshop
 - Advanced Digital Soil Mapping
- DSM Field Week as applied training

DSM Field Weeks combine modeling and training activities with field-based investigation



DSM Training Curriculum

Foundational Prerequisites (taken in the following order)

1. Spatial Analyst Workshop
2. Statistics for Soil Survey, Part 1
3. Intro to Digital Soil Mapping

DSM Field Week

- Prerequisites
 - All 3 foundational prerequisites
- Commitment from local soil survey office

Advanced Courses

Digital Soil Mapping with ArcSIE

- Prerequisites
 - All 3 foundational prerequisites

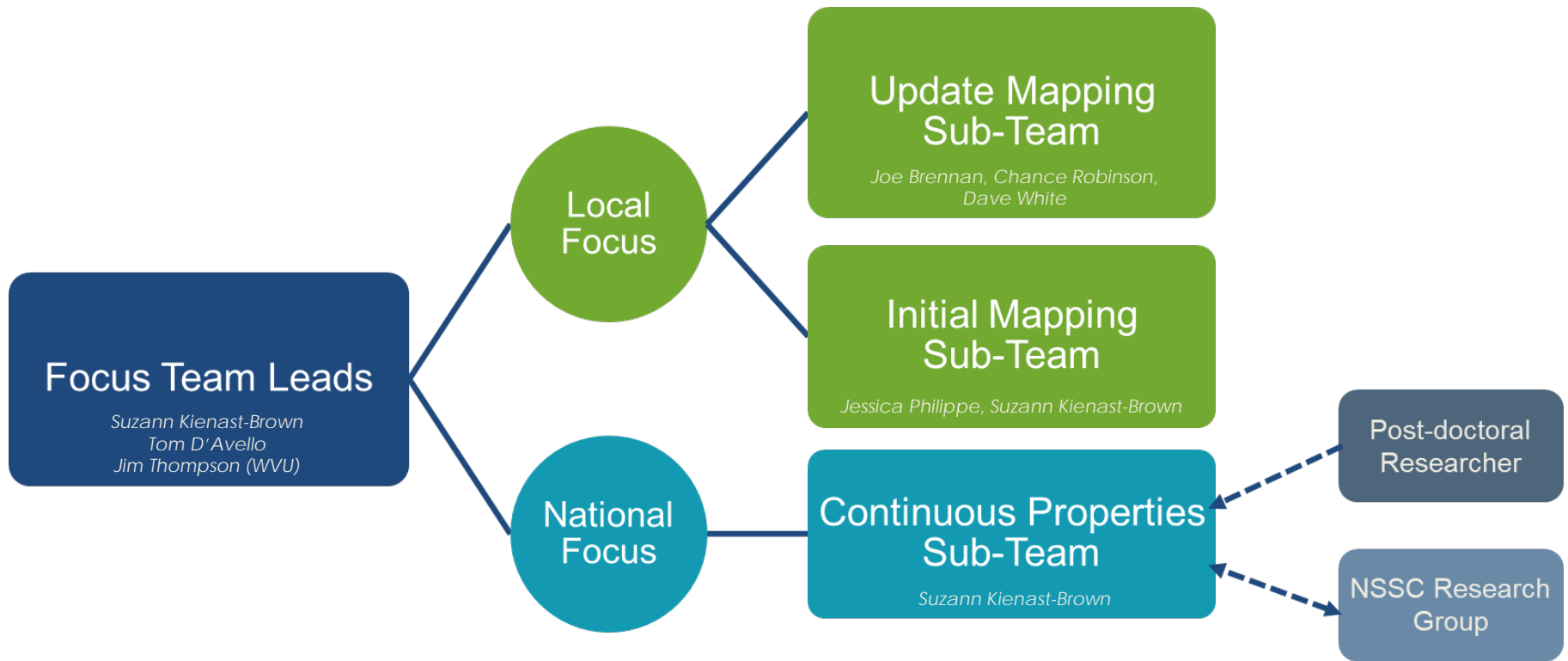
Statistics For Soil Survey, Part 2

- Prerequisites
 - Statistics for Soil Survey Part 1

Remote Sensing for Soil Survey Applications

- Prerequisites
 - All 3 foundational prerequisites
 - Intro to Digital Remote Sensing (available on-line from Michigan State University)

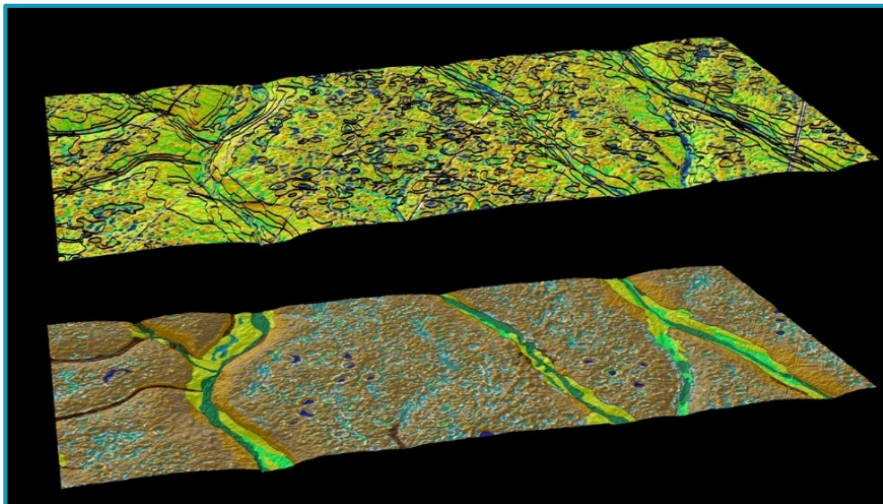
DSM Focus Team



DSM Focus Team

Support

- Update Mapping Sub-Team
 - Led by Joe Brennan, Chance Robinson, Dave White
 - Meeting monthly since July 2018
 - MLRA update projects and related discussion
 - All welcome to join the discussion



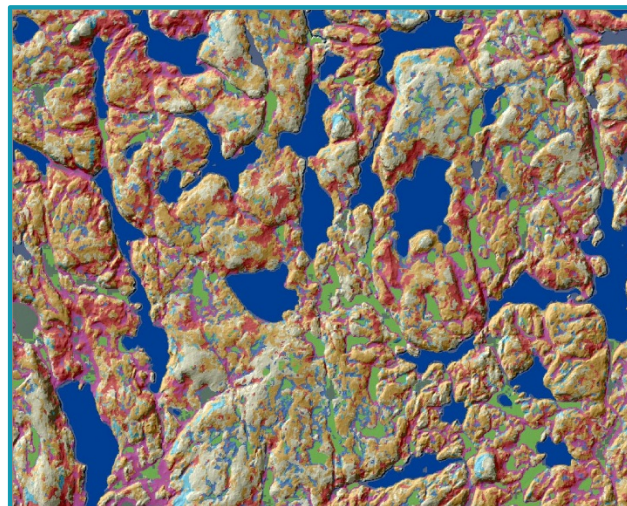
SSURGO lines draped over Multipath Topographic Wetness Index (top); Raster Soil Survey & gSSURGO data (bottom) defining variability in Ecological Sites across the landscape following an update in the Northern Black Glaciated Plains of North Dakota

DSM Focus Team

Support

- Initial Mapping Sub-Team
 - Led by Jessica Philippe and Suzann Kienast-Brown
 - Meeting monthly since February 2019
 - Initial mapping projects and related discussion
 - All welcome to join the discussion

Final modeled classes for a portion of the Boundary Waters Canoe Area Wilderness eventually correlated to NASIS map units and published as part of MN629



- Deep dry till
- Deep wet till
- Dysic organic
- Euic organic
- Lacustrine
- Mod deep and shallow wet till
- Mod deep dry till
- Shallow dry till
- Very shallow till
- Water

DSM Focus Team

2019 Goals

- Update and Initial Mapping Sub-Teams
 - Continue to build engagement
 - Combine monthly discussions – DSM Practitioner Discussion
 - Job aids to support new NASIS project milestones
 - Mentors for ongoing projects
 - Training and support for AK projects

DSM Focus Team

Support

- Properties Sub-Team
 - 14 members from NCSS; led by Suzann Kienast-Brown
 - Meeting bi-weekly since May 2018
 - National coverage continuous soil properties
 - Shared interest and vision
 - Methodology
 - Product
 - Delivery



Continuous Soil Property Stack

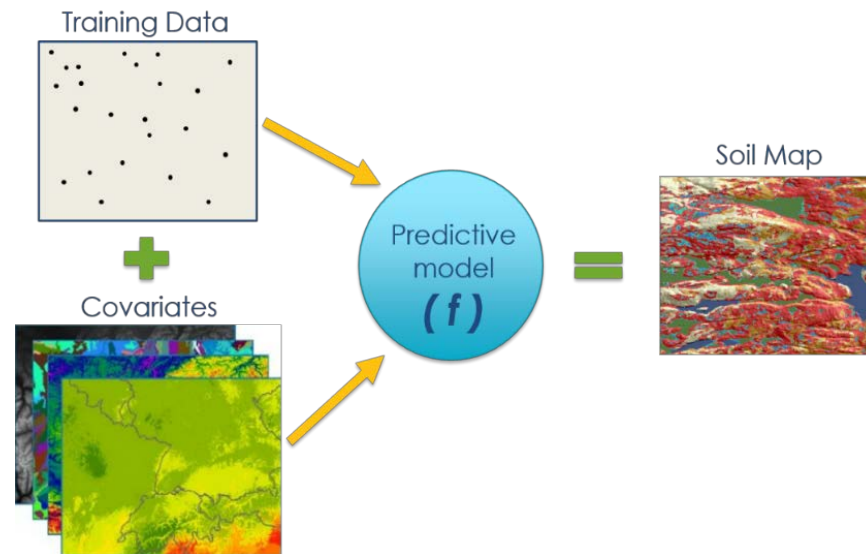
Foundation for the future

- Next generation of soil information products
 - Replace existing GlobalSoilMap, ISSR-800
- Nationwide coverage of continuous soil properties
- *A complete, consistent, correct, comprehensive, and current inventory of the soil resources of the United States*
- Flexible and relevant raster-based product
 - Interpretation of soil physical, chemical, and biological properties
 - Meet internal and external customer needs
 - Local to national resource concerns

Continuous Soil Property Stack

DSM methodology

- Pedon data (w/reliable property measurements)
- Environmental raster data (covariates)
- Regression techniques
- Continuous property raster



Continuous Soil Property Stack

Progress

– Properties Sub-Team

- Data – 30m covariates (CONUS)
 - 25 terrain derivatives
 - 20 spectral derivatives
 - Geomorphons (landform)
- Computing options – FTW
 - Analysis/storage/access
- Funding to WVU/NMSU to support post-doc
 - Collaborate closely with sub-team
 - Technically competent and task-oriented
 - Position advertised and closed
 - Interviews April 2019

Continuous Soil Property Stack

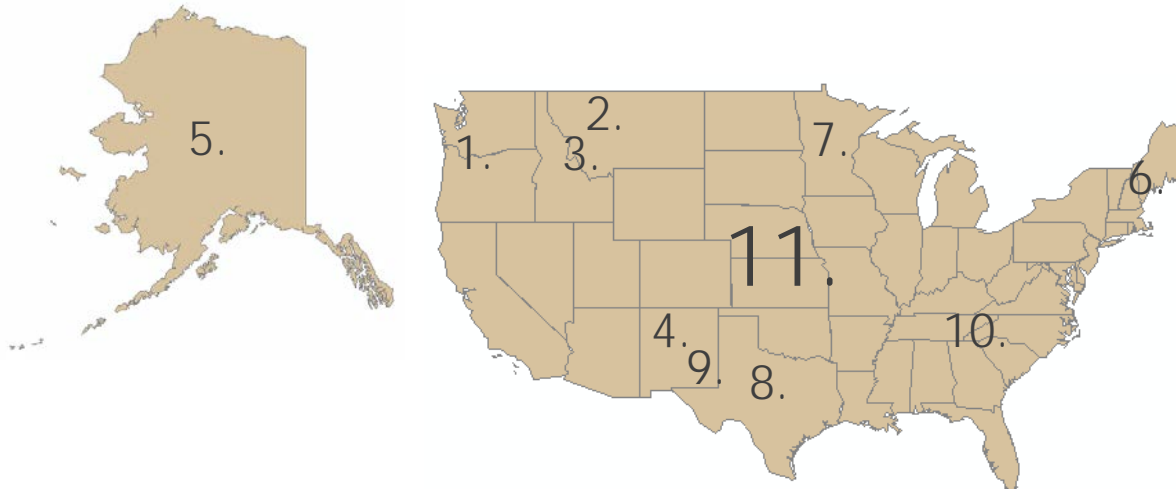
2019 Goals

- Properties Sub-Team
 - Post-doc in place
 - Complete 2018 field week project
 - Generate a subset of property layers in 2019 (CONUS)
 - Establish in-house computing solution
 - Data storage and sharing
 - Analysis
 - Explore interpretations with test dataset

DSM Focus Team

Current projects

1. Cascades region, WA and OR (USFS, NMSU, USGS, SSR 1)
2. Bob Marshall Wilderness, MT (USFS, NMSU, SSR 4)
3. Salmon-Challis NF, ID (SSR 1&4, USFS)
4. Rio Puerco, NM (BLM, NMSU, SSR 8, NRCS-NM)
5. Alaska (Yukon Flats; UMinn, SSR 13)
6. White Mountain NF, NH and ME (USFS, SSR 12)
7. MLRA 90 and MLRA 102 update projects (SSR 10)
8. MLRA 84 update projects (SSR 9)
9. MLRA 42 update projects (SSR 8)
10. 2018 Field Week project – MLRA 130B update – GRSM (NPS, SSR 6)
11. Nationwide continuous soil properties (SPSD, USFS, USGS, Universities)



DSM Focus Team

Delivery

- Vision for public facing web delivery (like WSS)
 - Capabilities - direct interaction for users
 - Define area of interest
 - Generate reports and interpretations
 - Download data
 - » Subset areas
 - » Nationwide

DSM Focus Team

Delivery

- Soil information portal
 - User: “I want to...” or “My question is...”
 - Portal: “Then you need...”
 - SSURGO
 - STATSGO
 - gSSURGO
 - gNATSGO
 - Point data
 - Continuous soil property grids (SOLUS)

DSM Focus Team

Communication

- Webinar series
- SSD Weekly Updates
- NCSS Newsletter
- Website
 - Links to basic DSM resources, standards, training, webinars, sub-team activities
- Conferences
 - 2019 Global Workshop on Digital Soil Mapping and GlobalSoilMap
 - NCSS
 - SWCS
 - SSSA
- Map of the Month: May 2019

DSM Focus Team

2019 Workshop DSM/GSM

- Over a dozen countries
- Focus Team members
 - Suzann Kienast-Brown
 - Jim Thompson (WVU)
 - Colby Brungard (NMSU)
- Best Oral Presentation award
 - *Soils2026 and Digital Soil Mapping – Foundation for the Future of Soils Information in the United States*



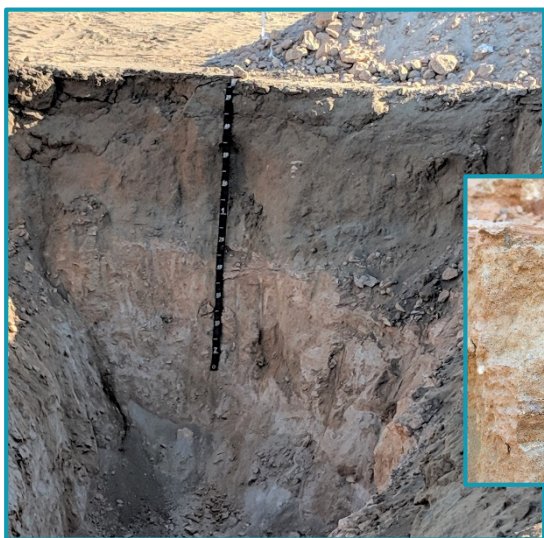
DSM Focus Team

2019 Workshop DSM/GSM

- Advances, challenges, common themes discussed
 - Emphasis on incorporating fundamental pedology
 - Apprehension toward DSM
 - France, the Netherlands, Australia all trying to institutionalize DSM in national soil survey programs
 - Machine and deep learning
 - Global vs. regional models
 - 2D vs. 3D modeling for depth predictions of continuous soil properties
 - Effective communication and use of uncertainty

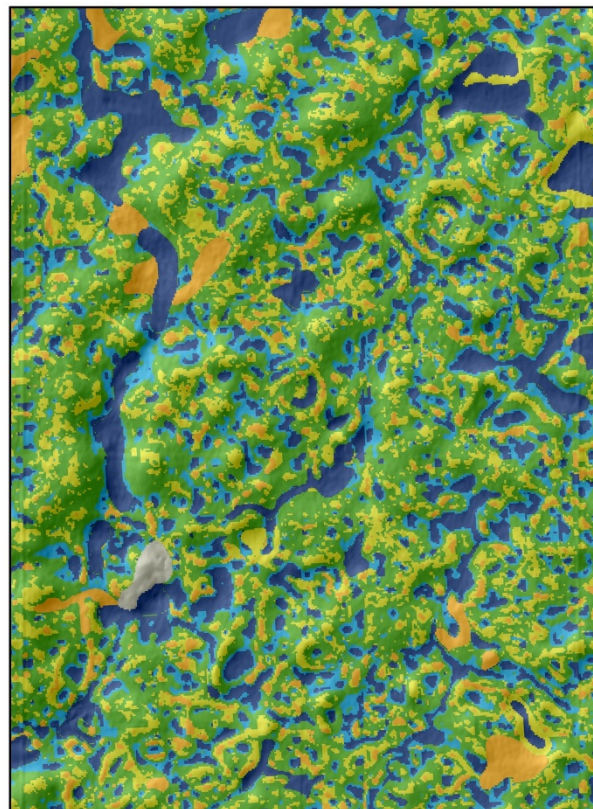
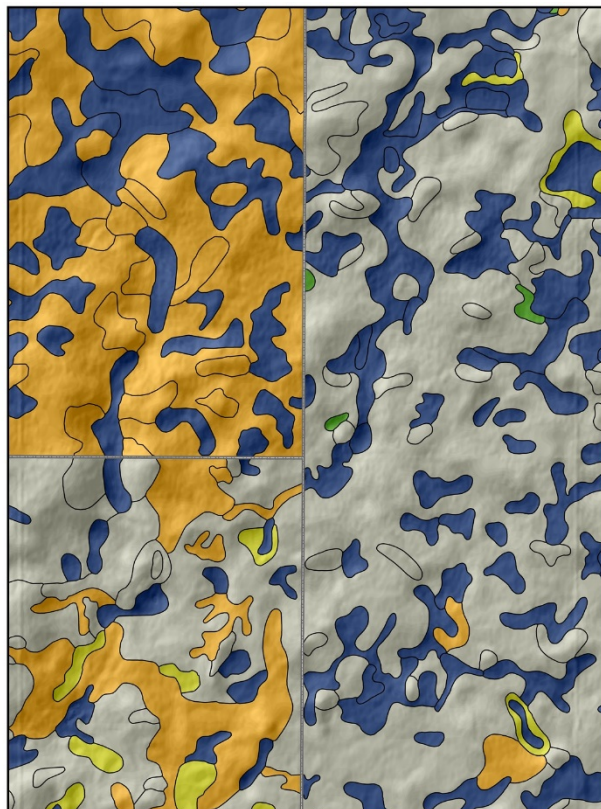


2019 Workshop DSM/GSM



DSM Focus Team

Map of the Month – May 2019



Soil Survey Updates & Raster Mapping

Water Table Depth Annual – Minimum

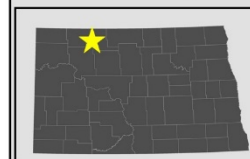
The shallowest depth to a wet soil layer (water table) at any time during the year expressed as centimeters from the soil surface, for components whose composition in the map unit is equal to or exceeds 15%.

Rating (centimeters)

- 0 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 200
- >200

0 2000 4000
feet

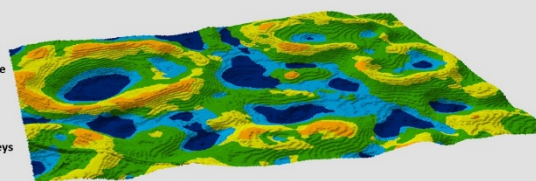
Albers Equal Area Projection



Raster Soil Survey: See More – Know More

Raster Soil Surveys are the next generation of soil information as soil survey evolves from polygon-based to a pixel or raster-based data format. With raster maps, soils can be represented with more spatial detail, while providing the same type of information about soil properties and ratings. Raster Soil Surveys can be generated from both soil survey update and initial mapping projects. The map on the left represents inconsistencies in soil properties and ratings commonly apparent as published soil survey reports (such as the three North Dakota county surveys pictured) are converted into the digital soil survey geographic database (SSURGO) currently found on Web Soil Survey. The same area is represented on the right after an update soil survey project was completed that combined Raster Soil Survey products with updated soil survey information from SSURGO. The contrast in the consistency and detail in the water table information in these two maps is striking. Information on water table depth is critical to many customers interpretive needs from agronomic to building site development.

NRCS Soil Scientists continuously update soil survey products through a cycle of inventory and assessment, data collection, synthesis, review and recertification. Raster soil surveys complement traditional scale-dependent soil survey information by depicting soil types, properties, and ratings at higher resolution. These updates generate seamless data, and investigate soil properties and soil-landscape relationships in pursuit of data that is complete, consistent, correct, comprehensive, and current.



DSM Focus Team

Fundamental pedology

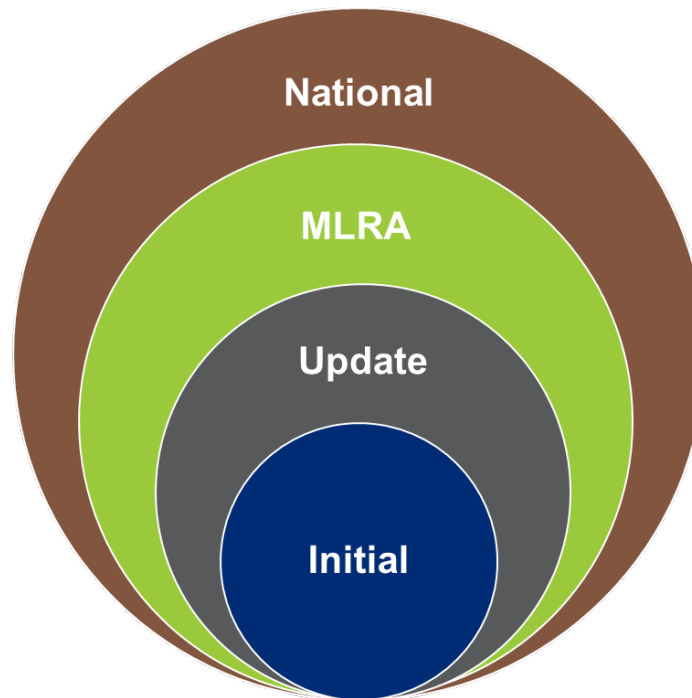
- **Knowledge** of the soil resource as a natural body
 - Existing and newly acquired
 - **Field component**
- Latest technological resources
 - Applied adaptively throughout process
 - In **combination** with soil knowledge



DSM Focus Team

Foundation

- Same tools and approaches are scalable and cross-informative



DSM – Foundation for the Future

