USDA
United States Department of Agriculture

NCSS
National Cooperative Soil Survey
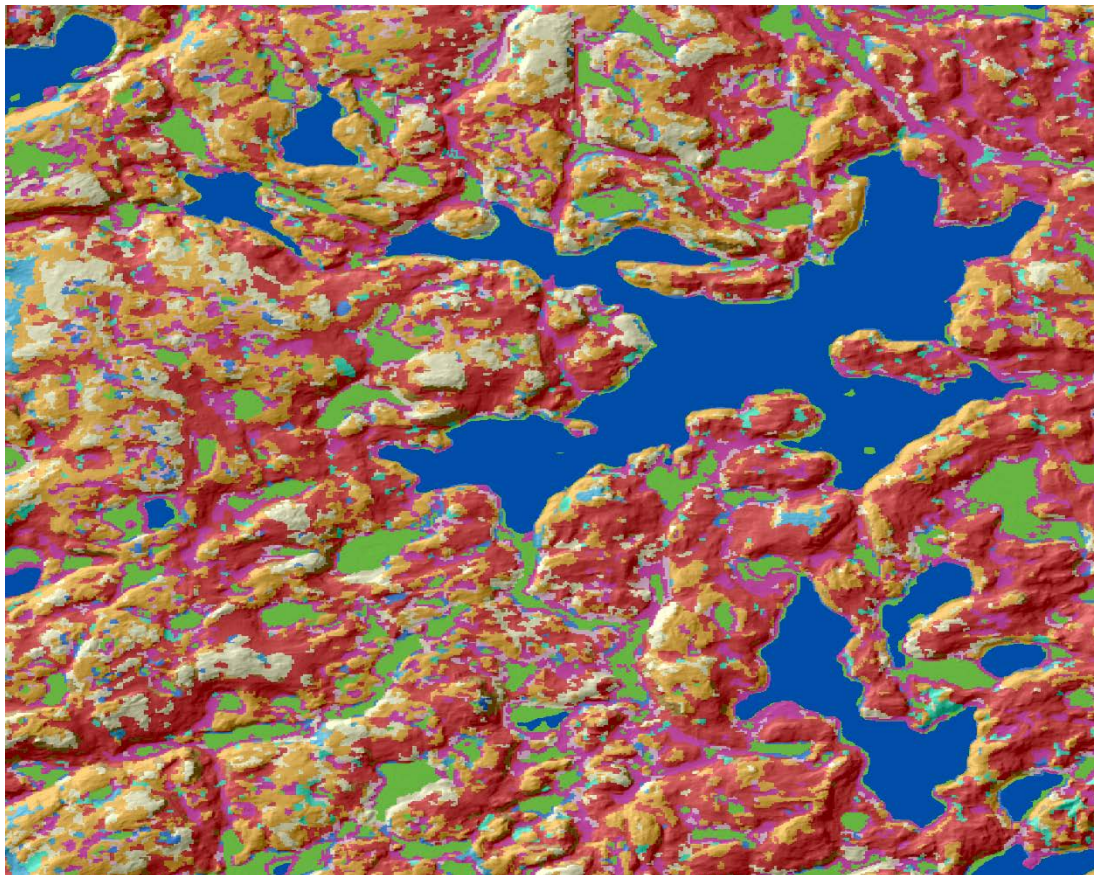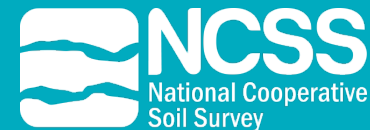
Soil Science Division
Natural Resources Conservation Service

Digital Soil Mapping Focus Team
May 17, 2018

Natural Resources Conservation Service

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SSD Focus Teams

General charges

- Act as liaisons across Division and the National Cooperative Soil Survey (NCSS)
- Provide leadership, guidance, and coordination with their specified area of activity
- Serve as a repository of information in specified area of activity
- Provide a national perspective to regions and teams

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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 DSM project areas
- Assemble existing data
- Identify gaps
- Produce raster-based soil data and information

DSM Focus Team

Team leads

Tom D'Avello

(NRCS Soil Scientist/GIS Specialist – NSSC)

Suzann Kienast-Brown

(NRCS Soil Scientist/GIS Specialist – Region 4)

Jim Thompson

(Professor of Soils and Land Use, WVU)

DSM Focus Team

History

- DSM in SSD
    - Since 2002
        - Roughly 25 soil survey projects
            - » Update and initial
            - » Employed DSM methods to some extent
            - » Various methods
            - » Various products
        - North American Node of *GlobalSoilMap*
        - Roughly 15 soil scientists
            - » Plus NCSS cooperators

DSM Focus Team

Formation

- Raster Workshops initiated March 2015
- February 2016
  - DSM team initiated
- March 2016
  - 3 day brainstorming session
    - Soils information for entire US
    - Think big
    - No sideboards
  - Resulted in vision for Soils2026 and beyond
- January 2017
  - SSD Focus Teams formalized

DSM Focus Team

Unique challenge

- DSM and creation of raster soil products not operational in soil survey activities
  - Build a framework in SSD where one does not currently exist
    - » Standards
    - » Training
    - » Delivery
  - Proven methodology and technology

Unique opportunity

DSM Focus Team

Current activities

– Raster standards

- Focused on product, not process
- NSSH Part 648 to be published soon

– Training

- Teaching the process
- Curriculum identified from existing courses
- New Introduction to DSM course developed and delivered (April 2018)

DSM Focus Team

DSM training curriculum

Foundational Prerequisites Taken in the Following Order:

1. Spatial Analyst Workshop (NRCS-NEDC-000271)
2. Statistics for Soil Survey Part 1 (NRCS-NEDC-000400)
3. Intro to Digital Soil Mapping (NRCS-NEDC-000272)

Digital Soil Mapping with ArcSIE (NRCS-NEDC-000273)

- Prerequisites
  - All 3 foundational prerequisites

Statistics For Soil Survey Part 2 (NRCS-NEDC-000332)

- Prerequisites
  - Statistics for Soil Survey Part 1

Remote Sensing for Soil Survey Applications (NRCS-NEDC-000244)

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

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DSM Focus Team

Current activities

- Raster product delivery
  - gNATSGO for raster class products
    - Database team producing gridded SSURGO/STATSGO
    - Eventually incorporate initial and update raster products
    - Best available class-based data
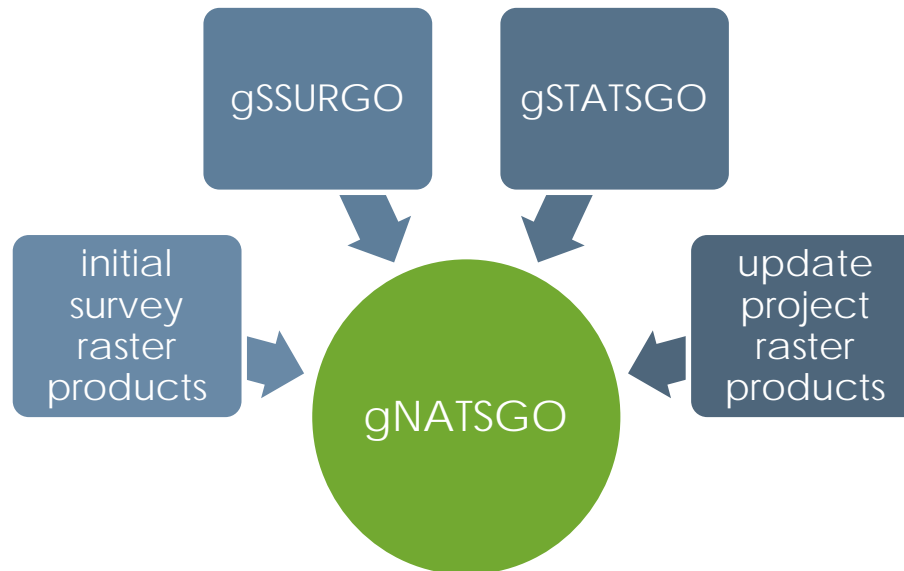
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Current activities

– Raster product delivery

- Future development of online delivery as part of WSS or other interface
  - SSD GIS architecture being evaluated
  - Soil class products and interpretations
  - Continuous soil property products and interpretations

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Current activities

- Projects initiated
  1. Cascades region, WA and OR (USFS, NMSU, USGS)
  2. Bob Marshall Wilderness, MT (USFS, NMSU)
  3. White Mountain NF, NH and ME (USFS)
  4. Alaska (2 potential areas/partners identified; UMinn, ABR)
  5. MLRA 90 and MLRA 102 update projects (NRCS SSR 10)
  6. Nationwide continuous soil properties (USFS, USGS, Universities)
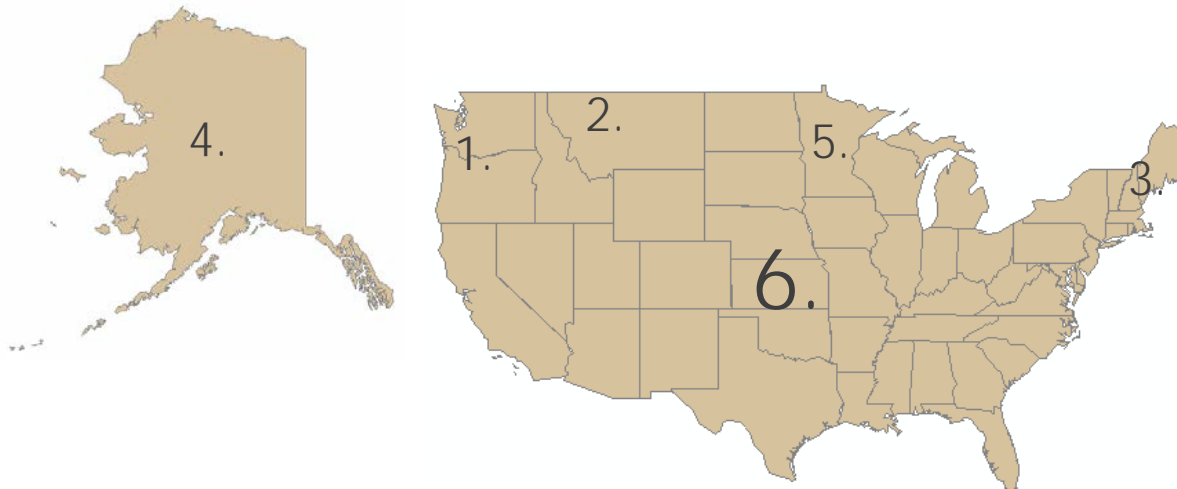
DSM Focus Team

Current activities

– Volunteers/members for sub-teams from NCSS

– Organize sub-teams; set regular meetings and activities

1. Initial mapping projects
2. MLRA update projects
3. National coverage continuous soil properties

DSM Focus Team – Vision

Focus

– Fundamental pedology

- **Knowledge** of the soil resource as a natural body

- Existing and newly acquired

– **Field component**

– Latest technological resources

- Applied adaptively throughout process and in **combination** with soil knowledge

DSM Focus Team – Vision

Foundation

– Same tools and approaches are scalable and cross-informative
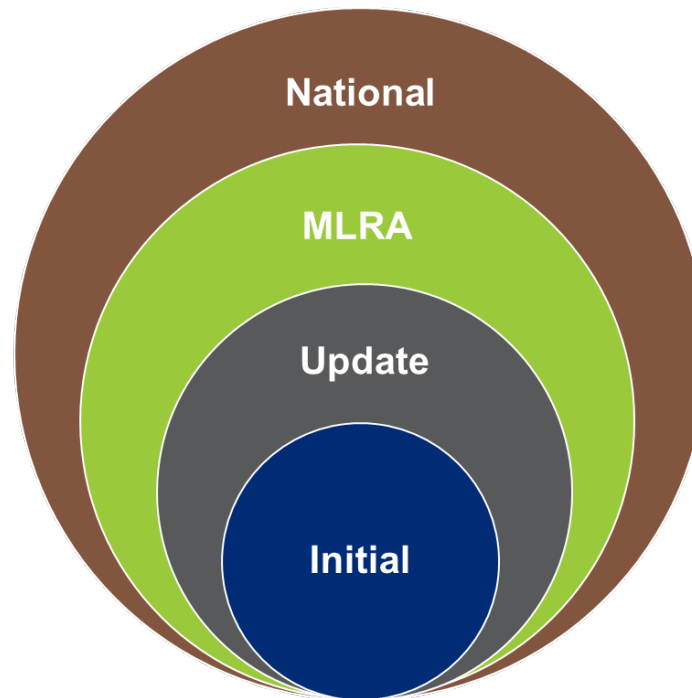
DSM Focus Team – Vision

Support

- Sub-teams for local focus
  - Points of contact, discussion, coordination
    1. Initial mapping
    2. MLRA updates
- Sub-team for national focus
  - Development of methods and products
    3. National coverage continuous soil properties

DSM Focus Team – Vision

Deliverables

- Continuous raster soil properties
- Key soil property layers at depth intervals
  - 0-5cm, 5-15cm, 15-30cm, 30-60cm, 60-100cm and 100-200cm
  - Target soil properties
    1. Total profile depth (cm)
    2. Plant exploitable (effective) soil depth (cm)
    3. Organic carbon (g/kg)
    4. pH (x10)
    5. Sand (g/kg)
    6. Silt (g/kg)
    7. Clay (g/kg)
    8. Gravel (m^3 m^{-3})
    9. ECEC (cmolc/kg)
    10. Bulk density of fine earth (<2mm) fraction (excluding gravel) (Mg/m3)
    11. Bulk density of whole soil (includes gravel) (Mg/m3)
    12. Available water holding capacity (mm)
- Prediction uncertainty

Concept
soil property

0-5 cm
5-15 cm
15-30 cm
30-60 cm
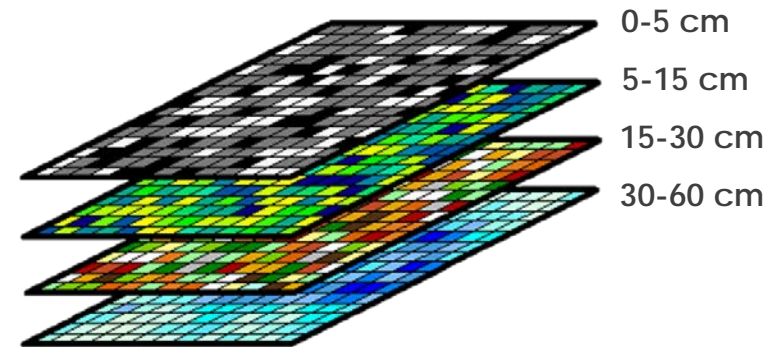
standard depths, properties, and uncertainty requirements based on GlobalSoilMap.net standard 2.4

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DSM Focus Team – Vision

Future deliverables

- Interpretations for management and use
  - The data stack becomes the database
    - Add slope, climate, etc. layers needed for calculating interpretations
- Class data – taxonomic or technical

Iterative process

- Improved annually
  - Additional properties
  - Lower uncertainty

Continuous investigation and improvement

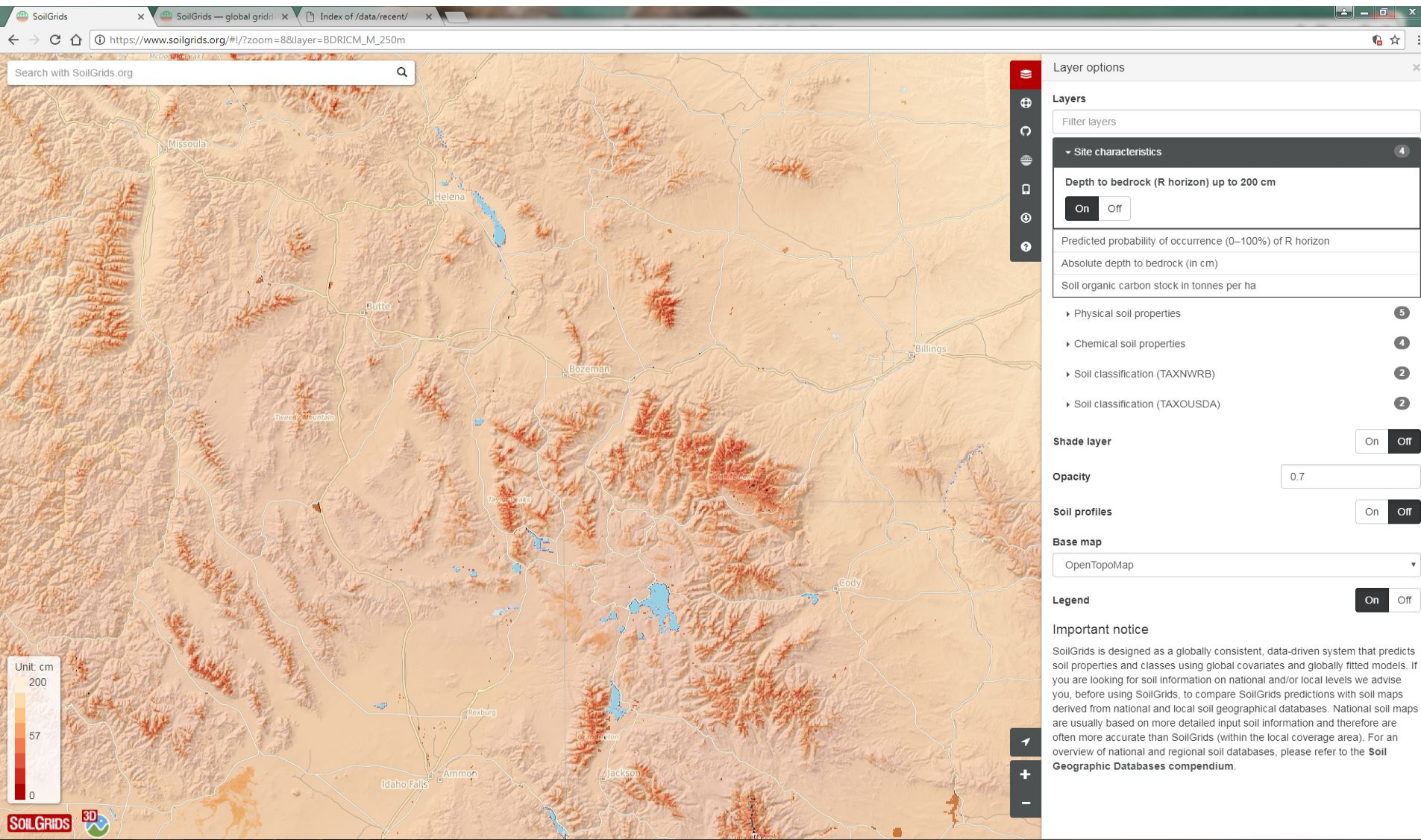# DSM Focus Team – Vision

Proof of concept

– *GlobalSoilMap*

  • STATSGO

– *Soil Grids* (1km, 250m, 100m)

  • Point data

– *Intermediate Scale SSURGO/STATSGO2 Raster Soil Property and Interpretations Map (ISSR)(800m)*

  • SSURGO/STATSGO blend

  • In review

Improved methods and knowledge base

DSM Focus Team – Vision

DSM Focus Team – Vision
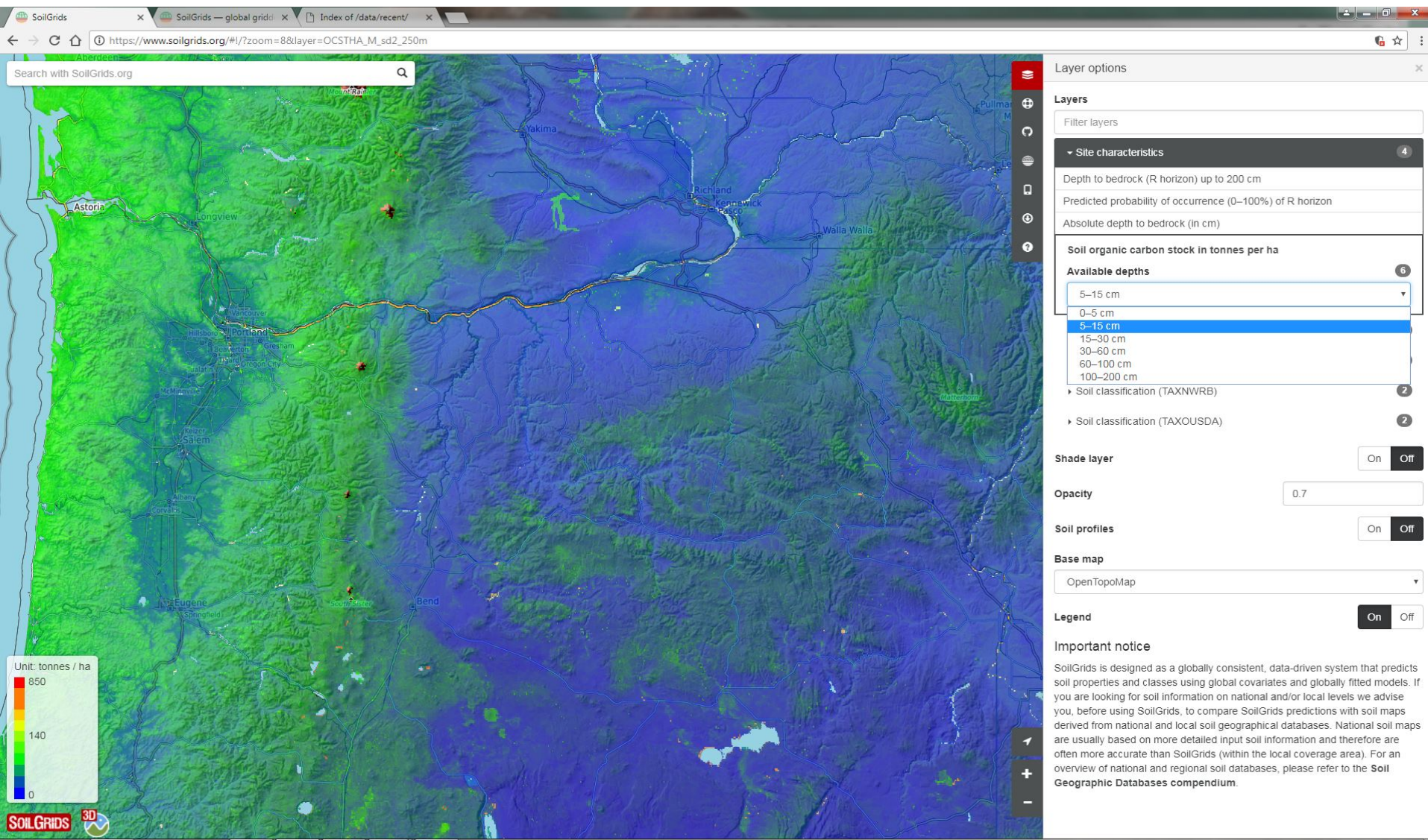
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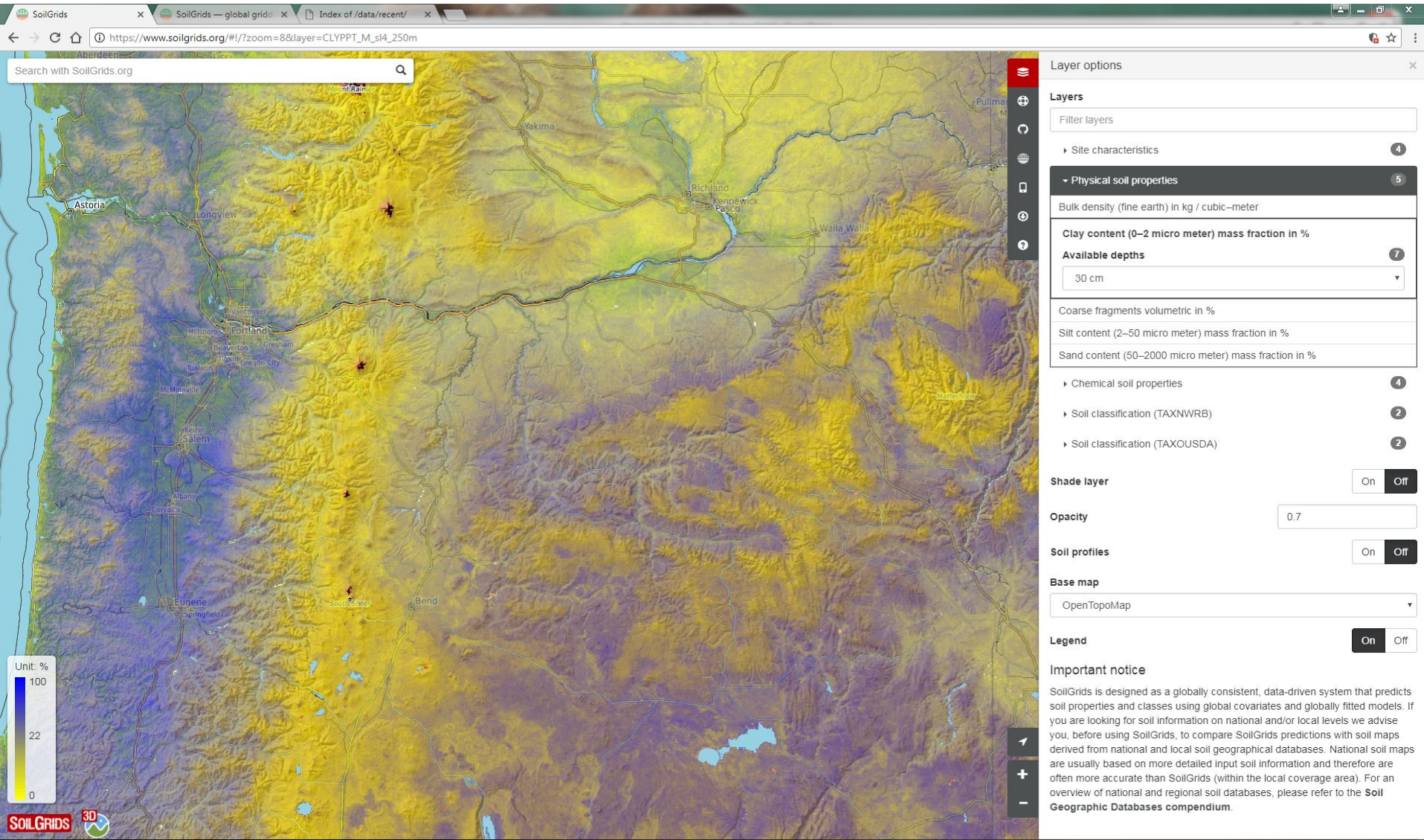
DSM Focus Team – Vision

Benefit

- *A complete, consistent, correct, comprehensive, and current inventory of the soil resources of the United States*
- Flexible and relevant
- Addresses
  - Growing environmental challenges
  - Expanding user needs
  - Multiple scales
- Delivery in a timely manner

Provide the
Best Available Data About Soil Science
to support decision making