Providing New Soil Survey Products to the GIS Modeling Community- *Gridded SSURGO*

National Atlas of Ecosystem Services Project

2010 National Cooperative Soil Survey (NCSS) Northeast Regional Meeting
June 8, 2010
Elizabethtown, PA

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Base Maps

Political Boundaries

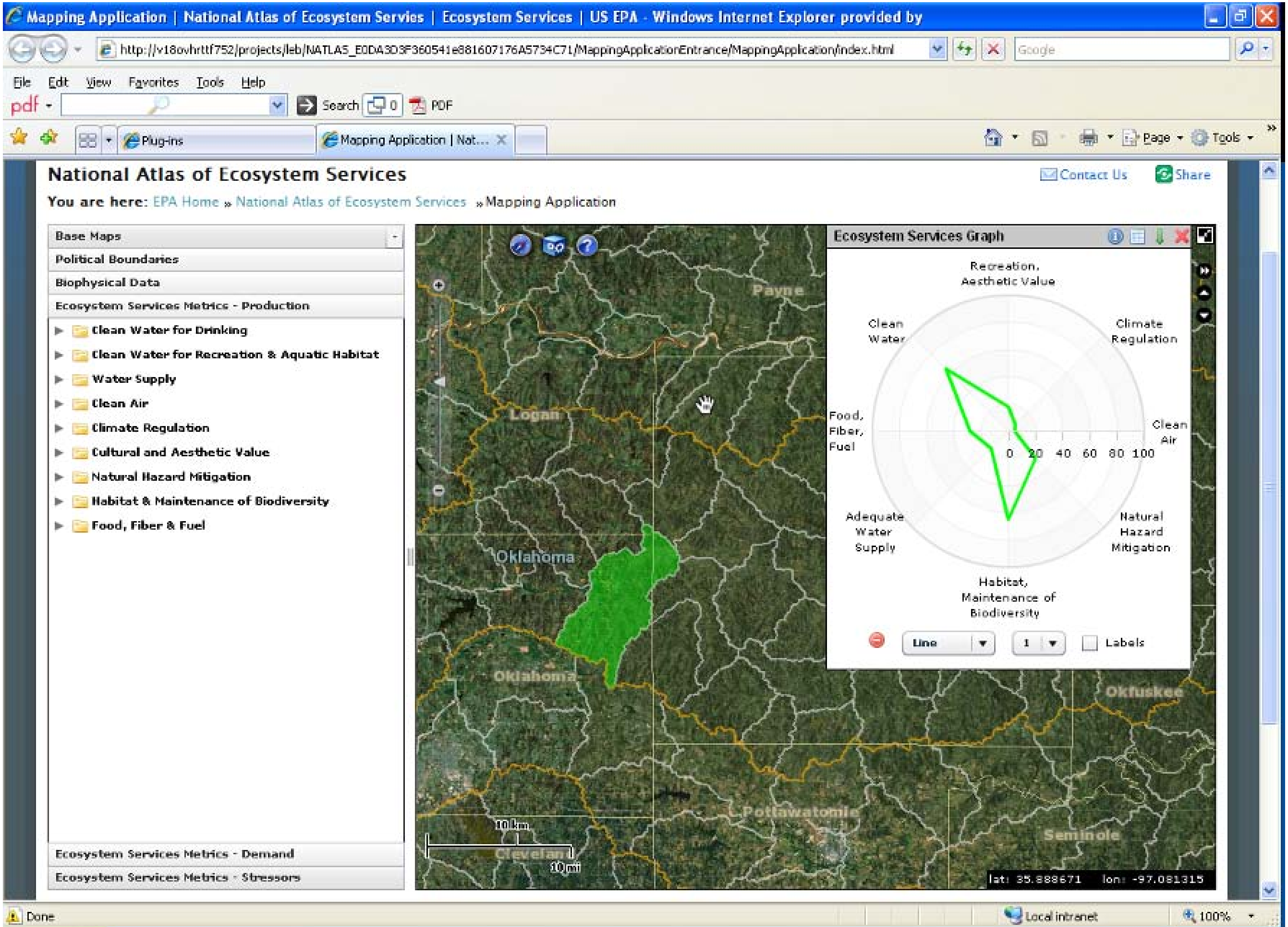
Biophysical Data

Ecosystem Services Metrics - Production

- Clean Water for Drinking
- Clean Water for Recreation & Aquatic Habitat
- Water Supply
- Clean Air
- Climate Regulation
- Cultural and Aesthetic Value
- Natural Hazard Mitigation
- Habitat & Maintenance of Biodiversity
- Food, Fiber & Fuel

Ecosystem Services Metrics - Demand

Ecosystem Services Metrics - Stressors


Mapping Application | National Atlas of Ecosystem Servies | Ecosystem Services | US EPA - Windows Internet Explorer provided by
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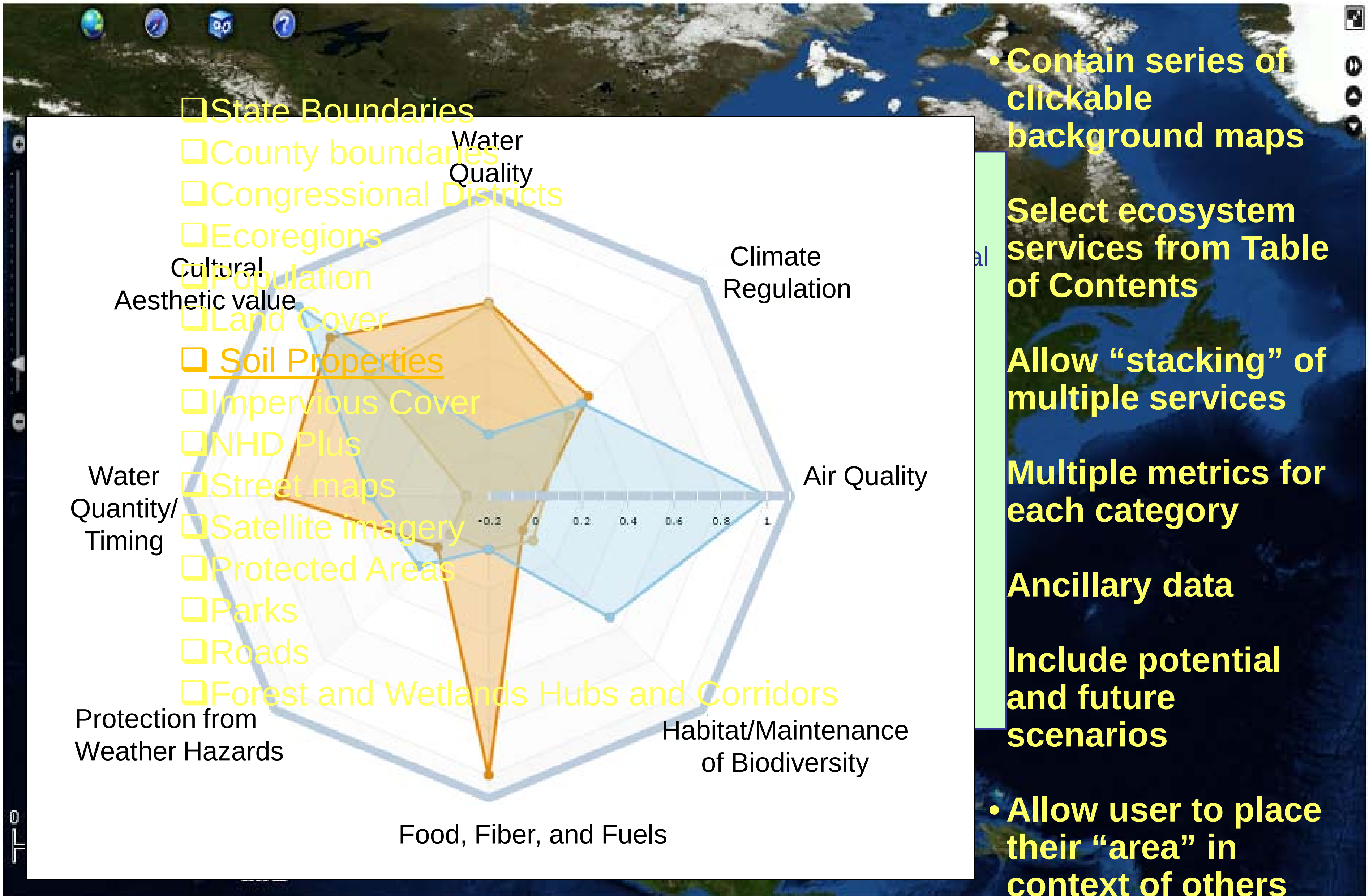
Ecosystem Services Metrics - Demand
Ecosystem Services Metrics - Stressors
Payne
Logan
Oklahoma
Oklahoma
Okfuskee
Pottawatomie
Seminole
Cleveland
10 km
10 mi
lat: 35.888671 lon: -97.081315
Ecosystem Services Graph
Recreation, Aesthetic Value
Clean Water
Climate Regulation
Food, Fiber, Fuel
Clean Air
0 20 40 60 80 100
Adequate Water Supply
Natural Hazard Mitigation
Habitat, Maintenance of Biodiversity
Line
1
Labels
Done
Local intranet
100%

Atlas Vision/Implementation



- **Contain series of clickable background maps**

  Select ecosystem services from Table of Contents

  Allow "stacking" of multiple services

  Multiple metrics for each category

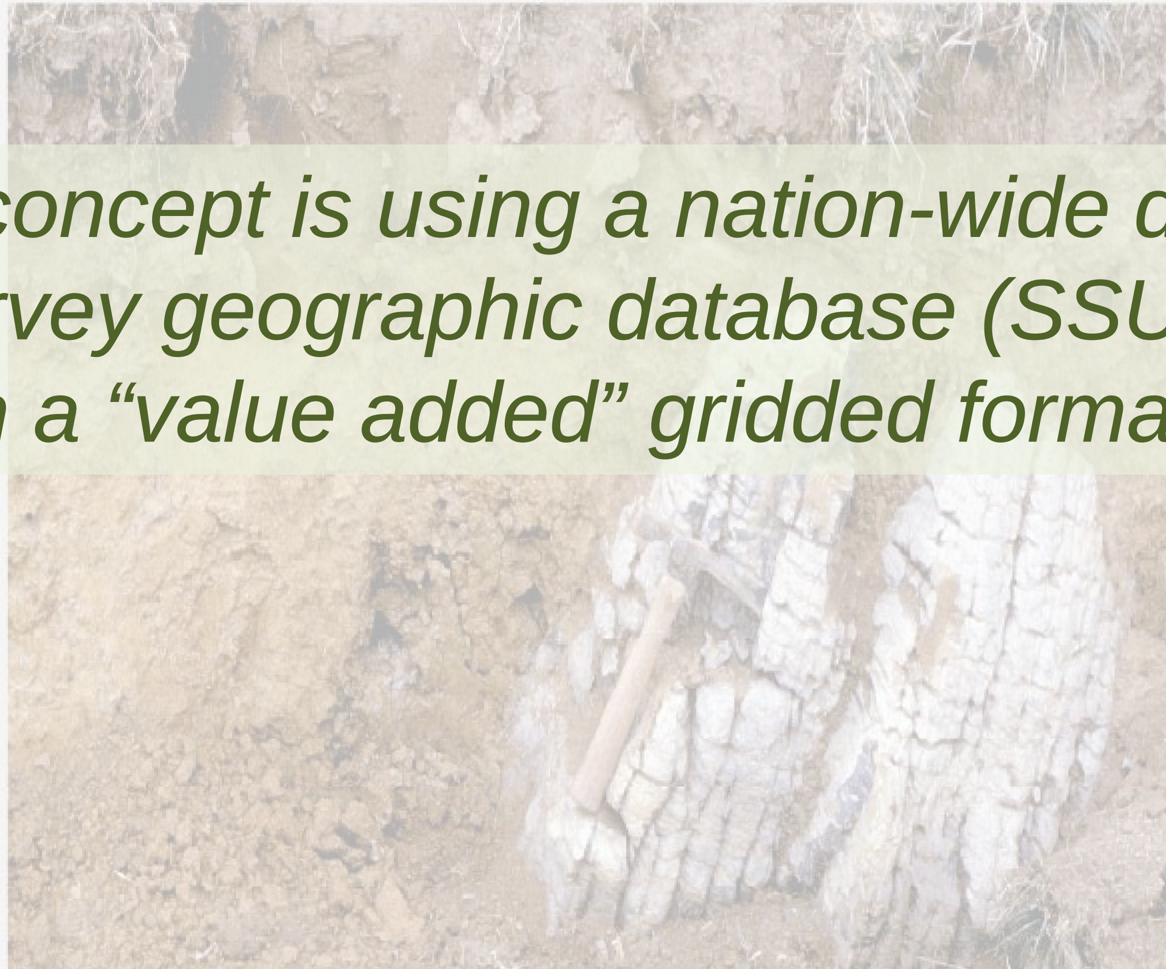
  Ancillary data

  Include potential and future scenarios

- **Allow user to place their "area" in context of others**

Soil Contribution to Atlas – Gridded SSURGO

Deep root zone soils (left) provide greater available water capacity (AWC) than shallow root zone soils (right) Hagerstown soils, Centre Co, PA.



A key concept is using a nation-wide detailed soil survey geographic database (SSURGO) layer in a "value added" gridded format.

Soil Contribution to Atlas – Gridded SSURGO

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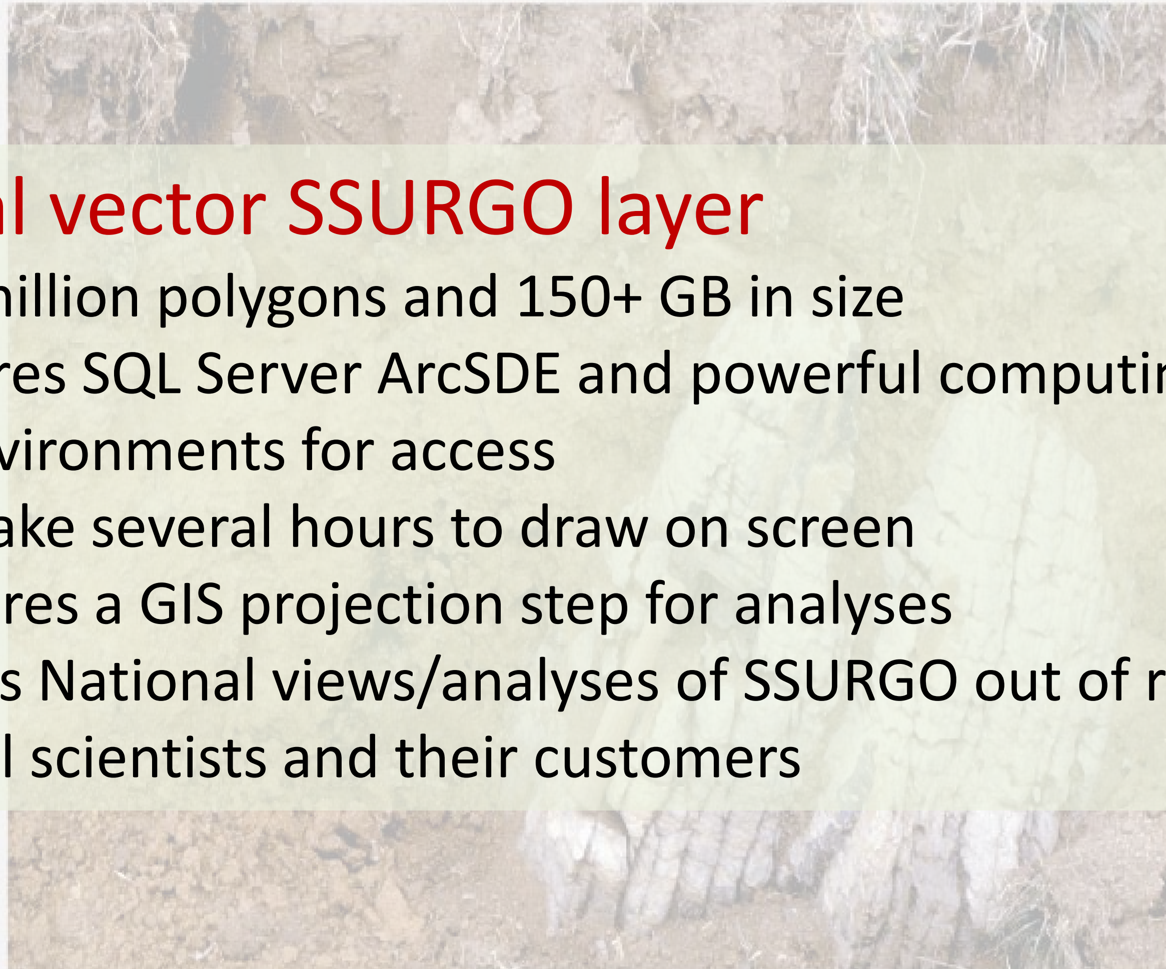

National vector SSURGO layer

- 35+ million polygons and 150+ GB in size
- requires SQL Server ArcSDE and powerful computing environments for access
- Can take several hours to draw on screen
- Requires a GIS projection step for analyses
- Makes National views/analyses of SSURGO out of reach for NCSS soil scientists and their customers

Soil Contribution to Atlas – Gridded SSURGO

Gridded SSURGO

- Is created by a simple GIS technique that “grids” the SSURGO polygon using the mukey (integer)
- Uses a map projection that can be used across Lower 48 states (Albers Equal Area, NAD83)
- Gridded SSURGO resolutions: 10, 30*, 90 or 100 meters (100 meter creates a 1 hectare cell size)
- Is created from an annual or semi-annual Soil Data Mart (SDM) SSURGO snapshot (12/30/2009)
- R&D SSURGO grids prepared by NSSC (Lincoln and Morgantown) to aid in *Rapid Assessment of Carbon and Deepwater Oil Spill*
- *Utilized by USGS EROS Data Center and EPA to prepare the Value added Gridded SSURGO layer with standardized layers*

NRCS

Gridded SSURGO

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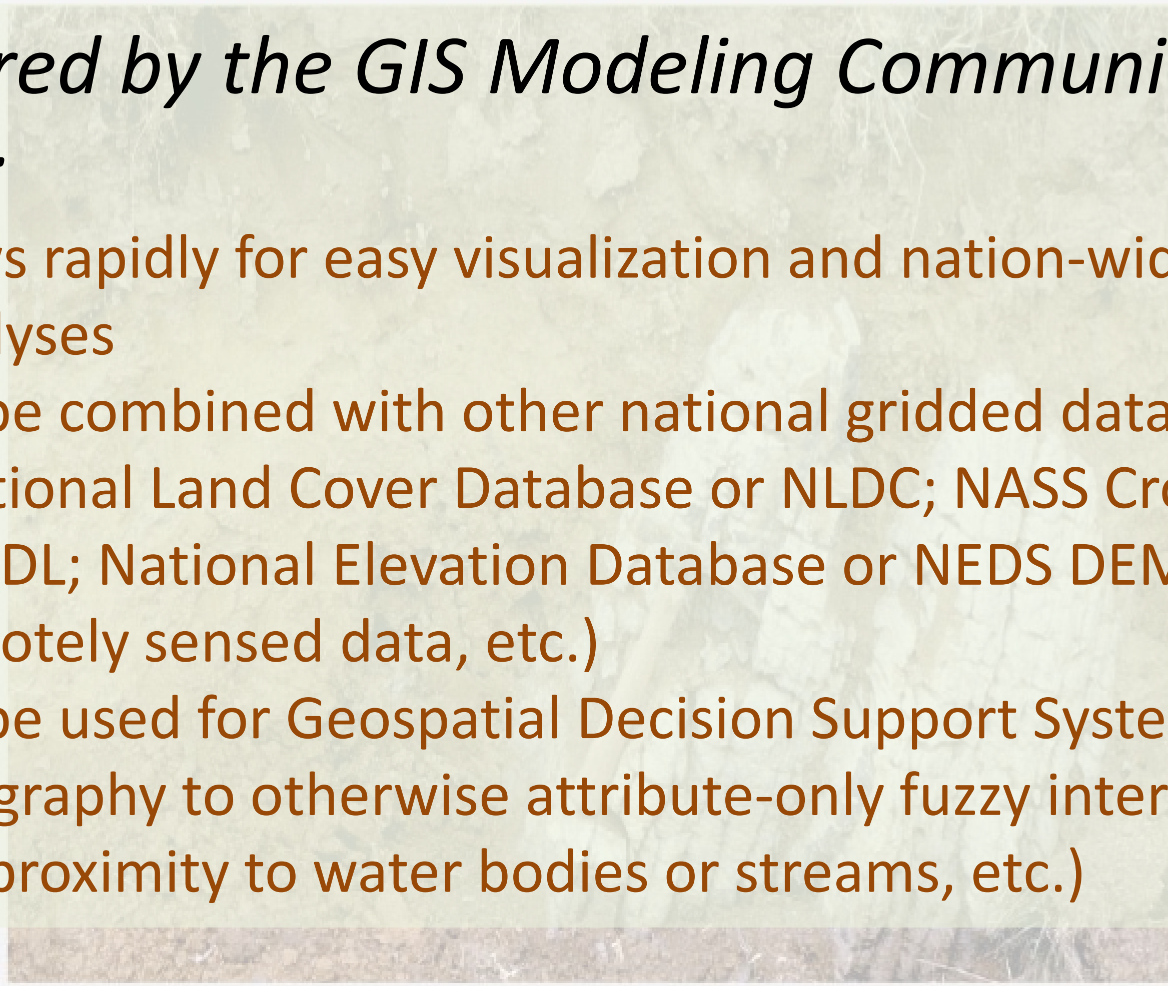
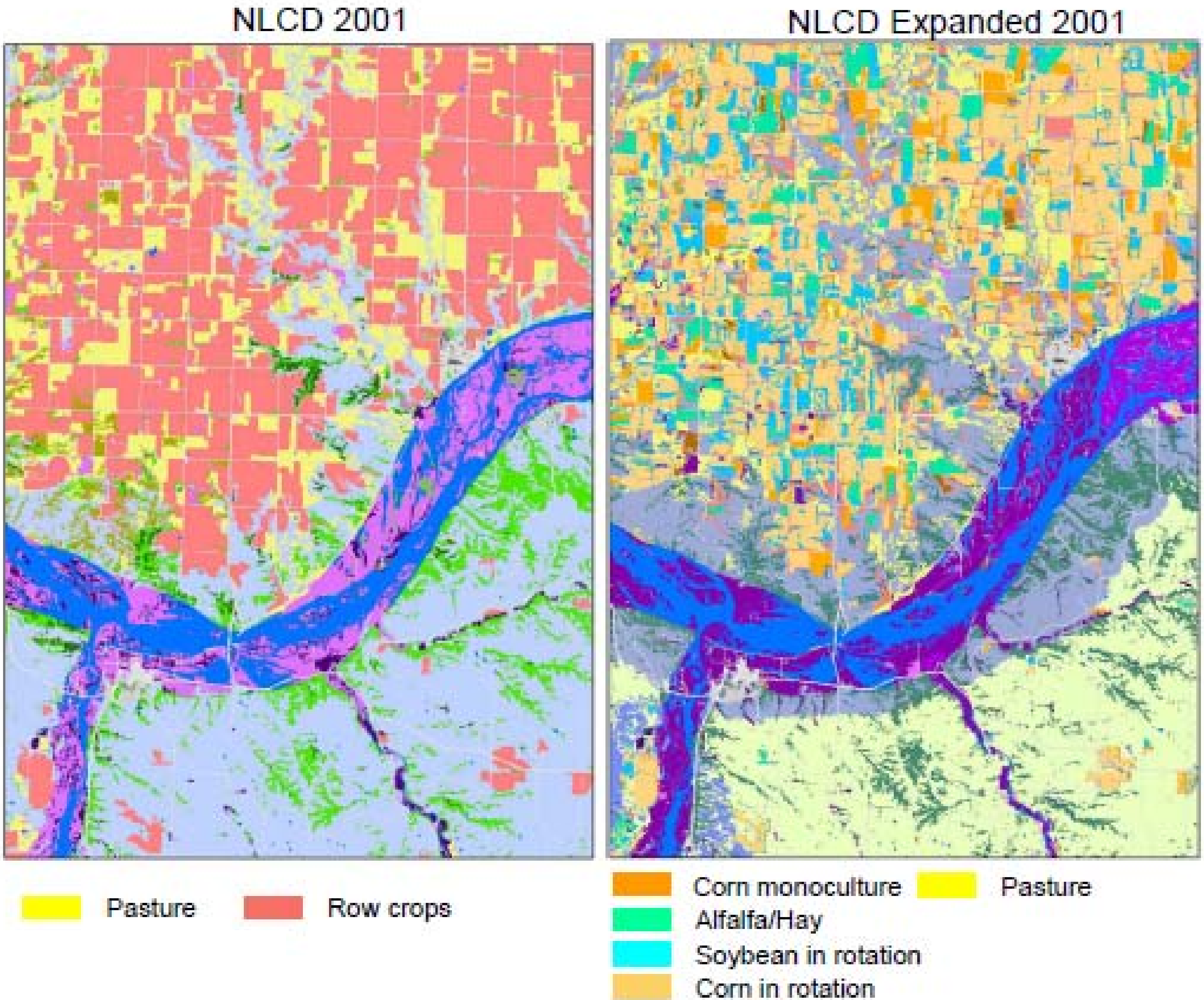


Is preferred by the GIS Modeling Community because:

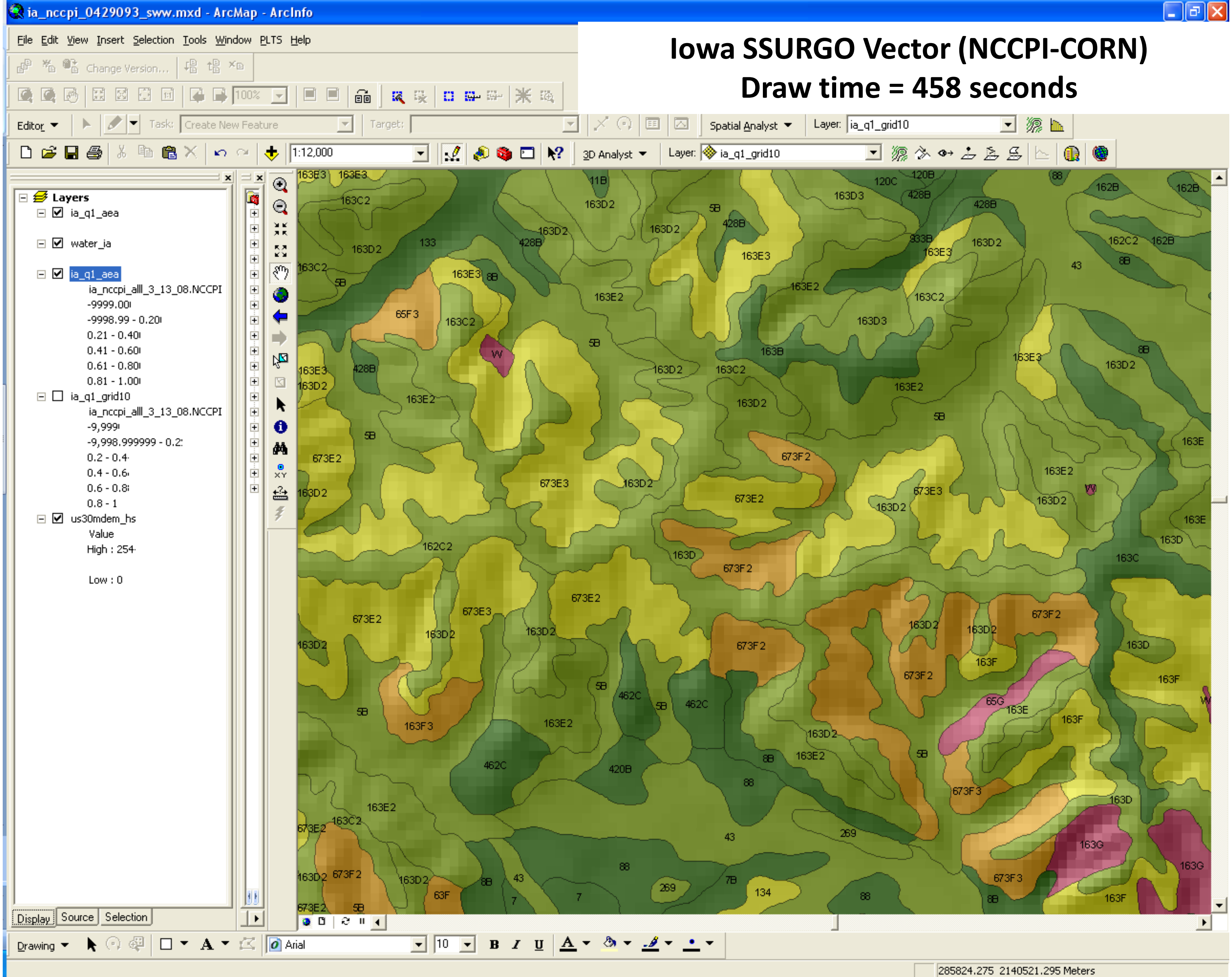
- It draws rapidly for easy visualization and nation-wide GIS analyses
- It can be combined with other national gridded data layers (National Land Cover Database or NLDC; NASS Crop Data Layer or CDL; National Elevation Database or NEDS DEM, other remotely sensed data, etc.)
- It can be used for Geospatial Decision Support Systems (provides geography to otherwise attribute-only fuzzy interps – set rules for proximity to water bodies or streams, etc.)

NRCS

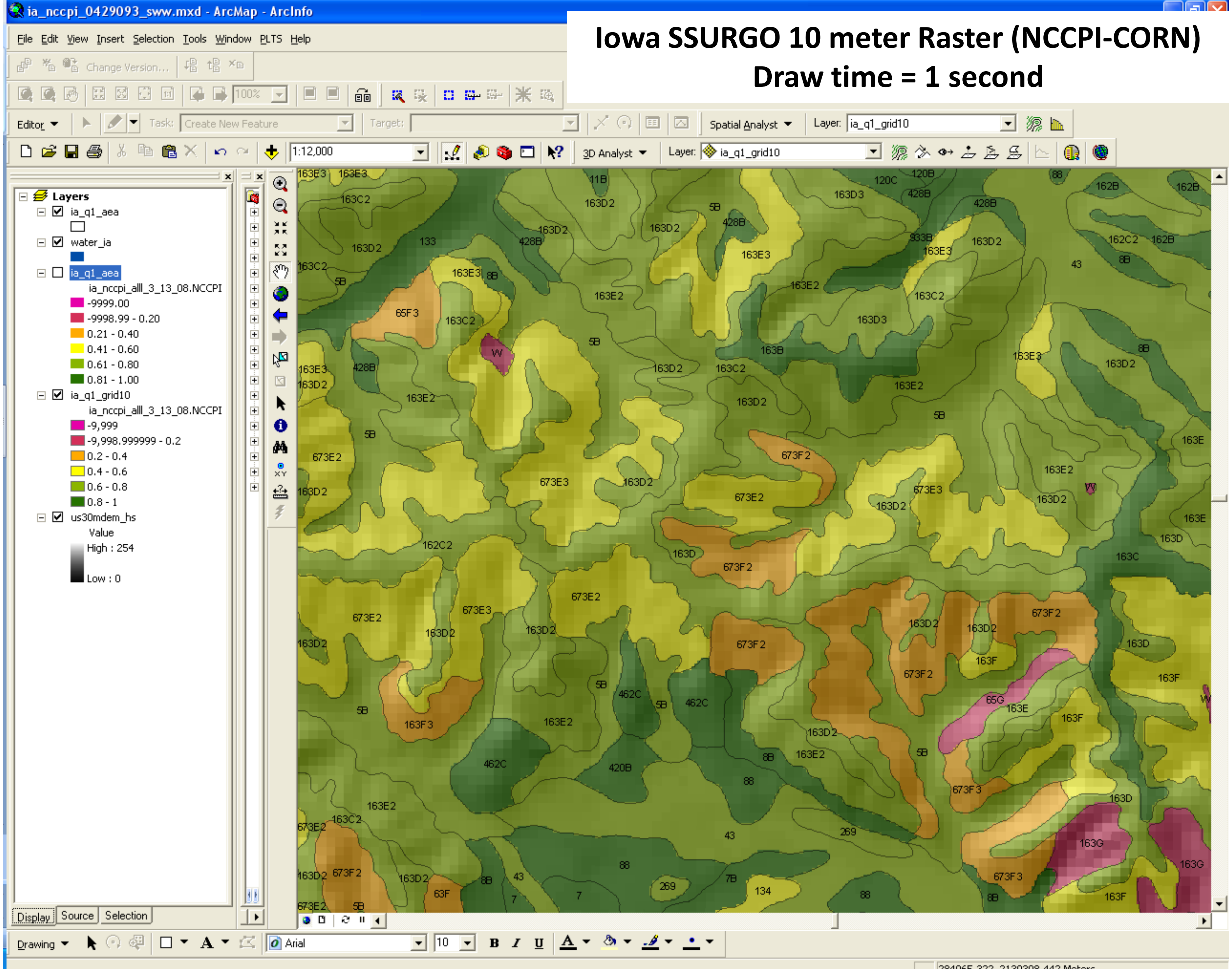
NASS – Crop Data Layer (CDL)

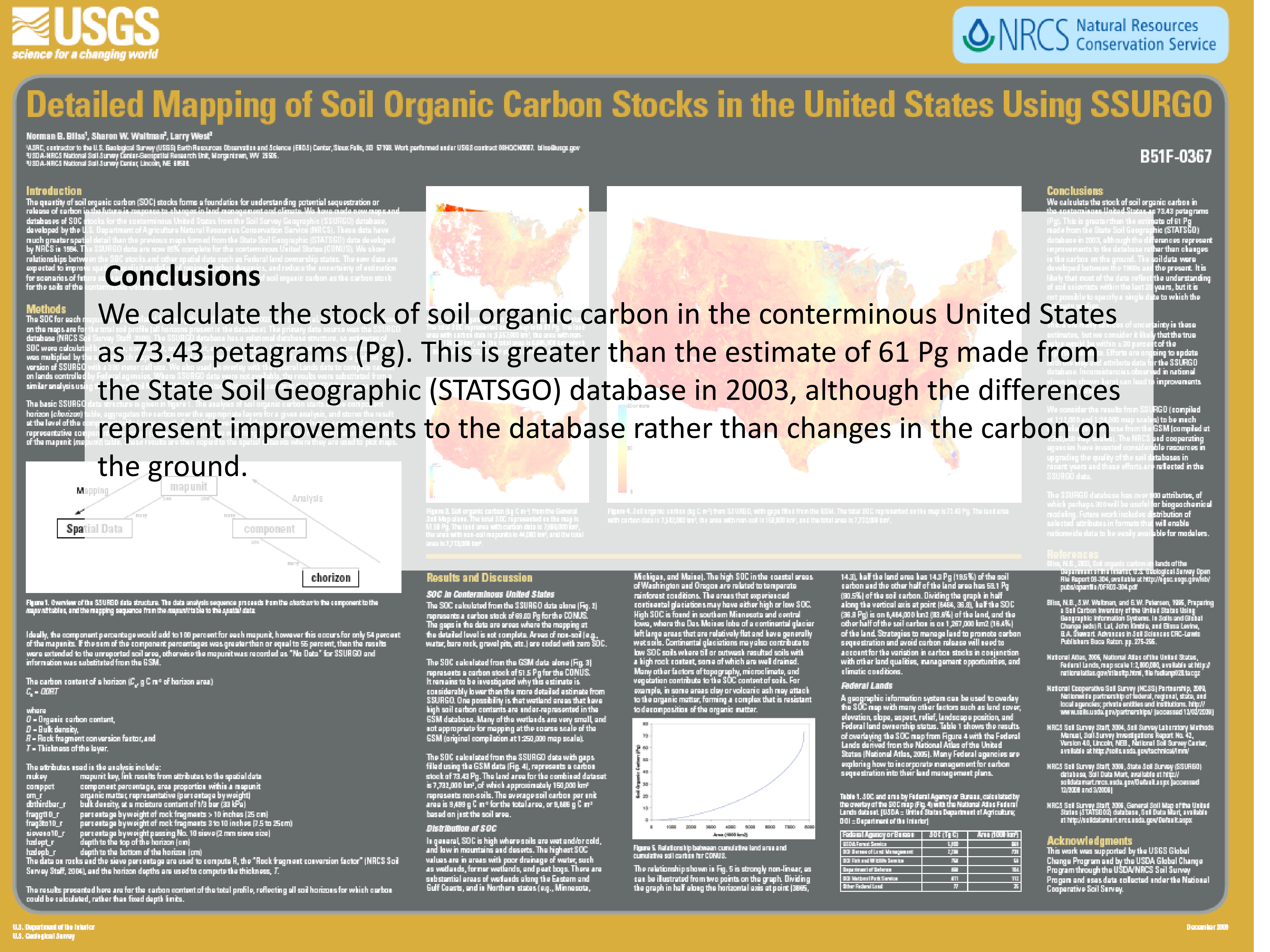


Iowa SSURGO Vector (NCCPI-CORN)
Draw time = 458 seconds



Iowa SSURGO 10 meter Raster (NCCPI-CORN)
Draw time = 1 second

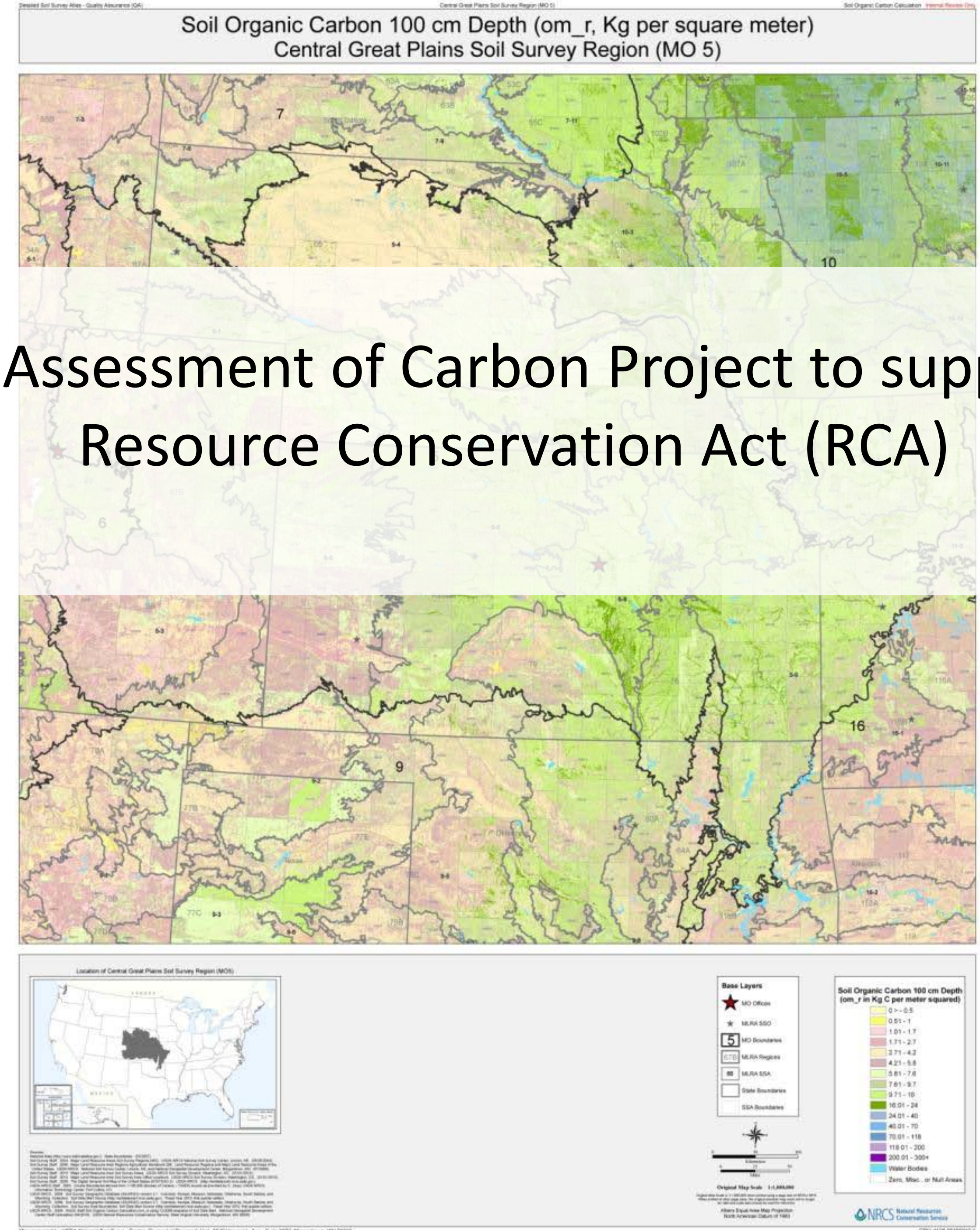




Conclusions

We calculate the stock of soil organic carbon in the conterminous United States as 73.43 petagrams (Pg). This is greater than the estimate of 61 Pg made from the State Soil Geographic (STATSGO) database in 2003, although the differences represent improvements to the database rather than changes in the carbon on the ground.

Rapid Assessment of Carbon Project to support the Resource Conservation Act (RCA)



Gridded SSURGO

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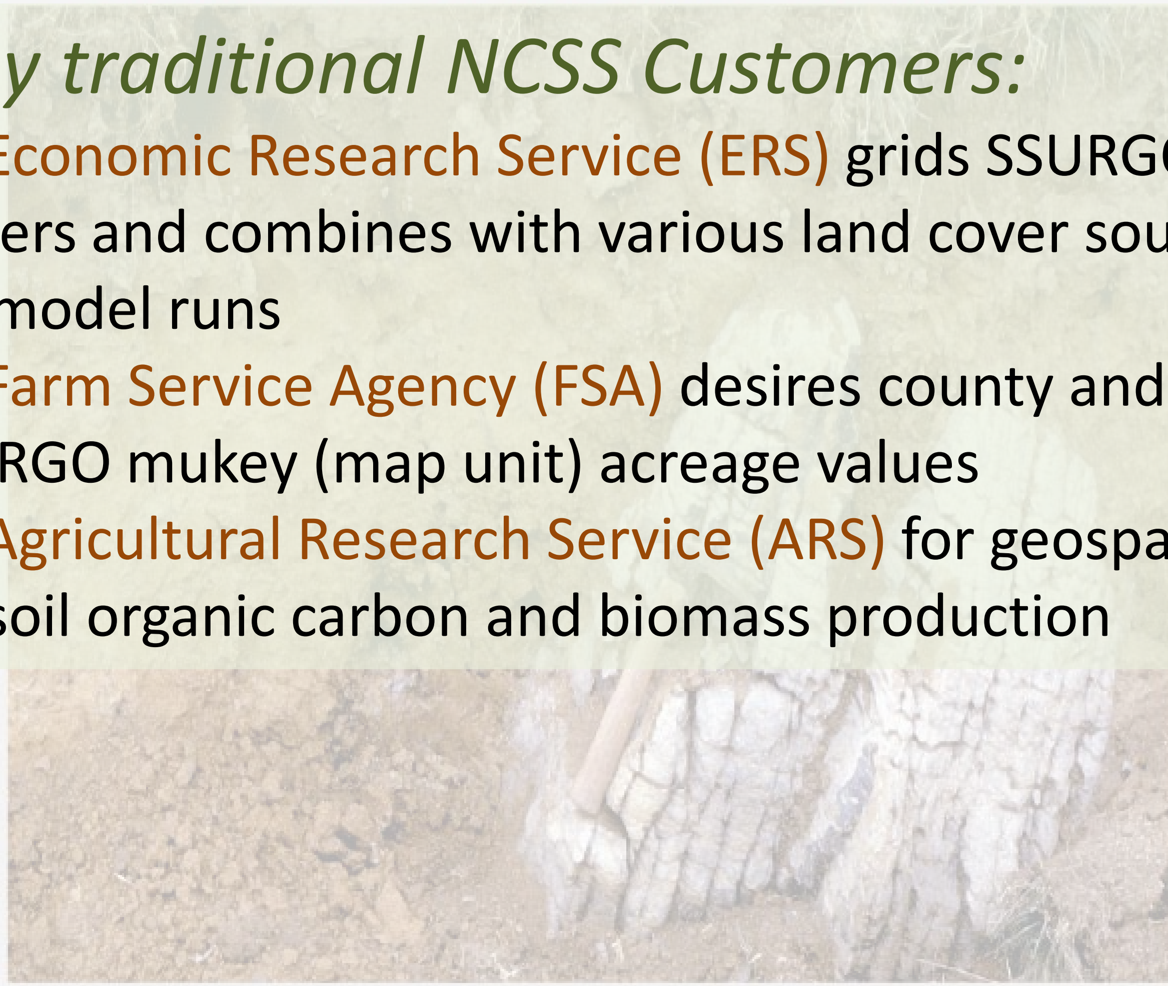

Is used by traditional NCSS Customers:

- USDA Economic Research Service (ERS) grids SSURGO at 30 meters and combines with various land cover sources for Farm Bill model runs
- USDA Farm Service Agency (FSA) desires county and state SSURGO mukey (map unit) acreage values
- USDA Agricultural Research Service (ARS) for geospatial modeling for soil organic carbon and biomass production

NRCS

Gridded SSURGO

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Could be used by relatively new clients

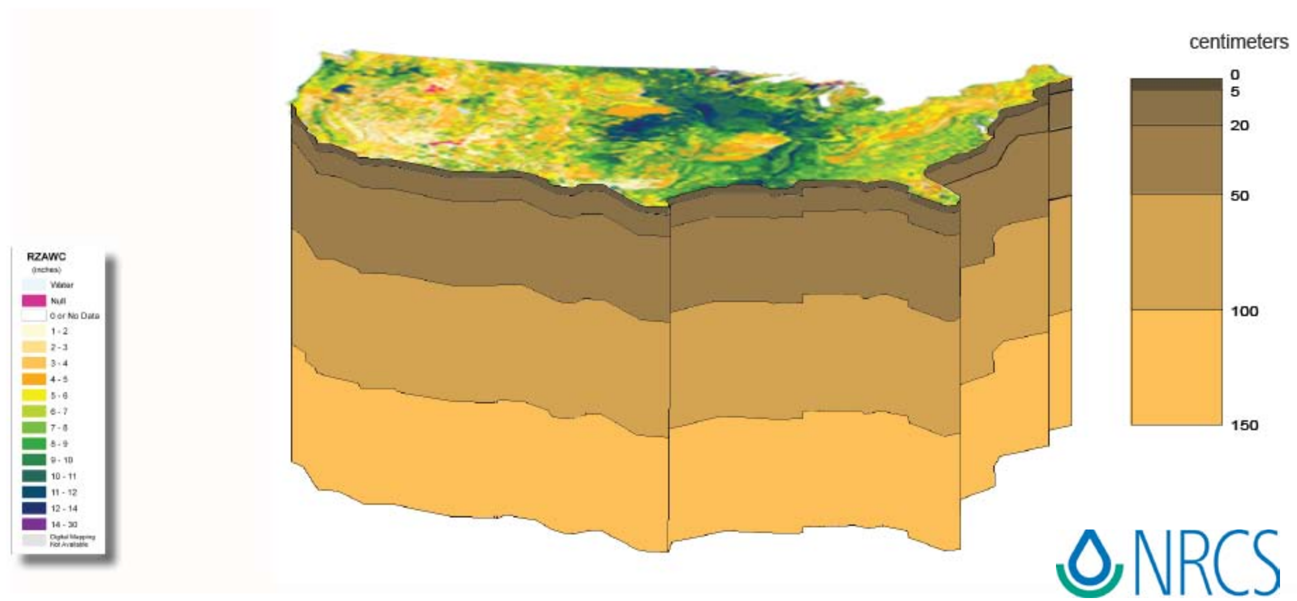
- USDA-NRCS (Conservation Planning Decision Support Systems)
- USDA-NASS (Crop mapping)
- USEPA (ecosystem services)
- USGS-Water Resources (water quality)
- USGS-Mapping Division (GIS data makers/keepers/disseminators)
- University Researchers (carbon, biomass production/ecosystem services)
- Private sector
    - e.g. Monsanto, Syngenta (genotype x environment)

NRCS

The Atlas of Ecosystems Services Gridded SSURGO project takes a similar approach to the successful CONUS-SOIL project (Miller and White, 1997) that created a 3-dimensional soil physical properties geographic database for the Conterminous United States (1 km resolution)
(http://www.essc.psu.edu/soil_info/index.cgi?soil_data&conus)
based upon the USDA-Natural Resources Conservation Service State Soil Geographic Database (STATSGO-Soil Survey Staff,1994).

Fig.4 Gridded SSURGO - Standard Layers Product (5 layers proposed)

Difference would be focus on the detailed soil survey geographic data base called SSURGO (10 or 30 m resolution)rather than the general STATSGO or STATSGO2



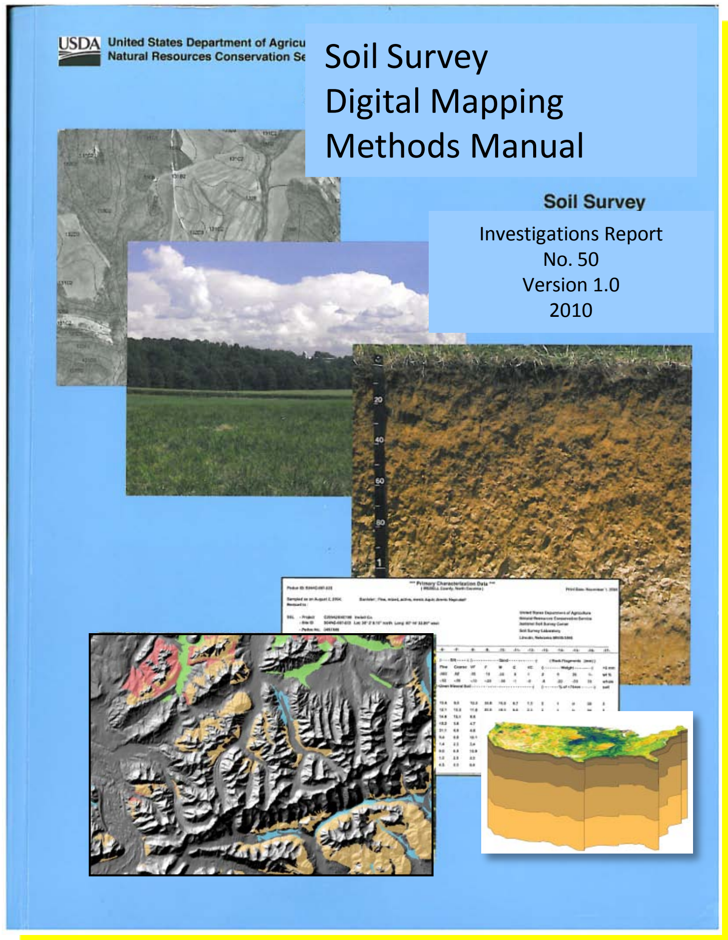
Ecosystem Services Gridded SSURGO

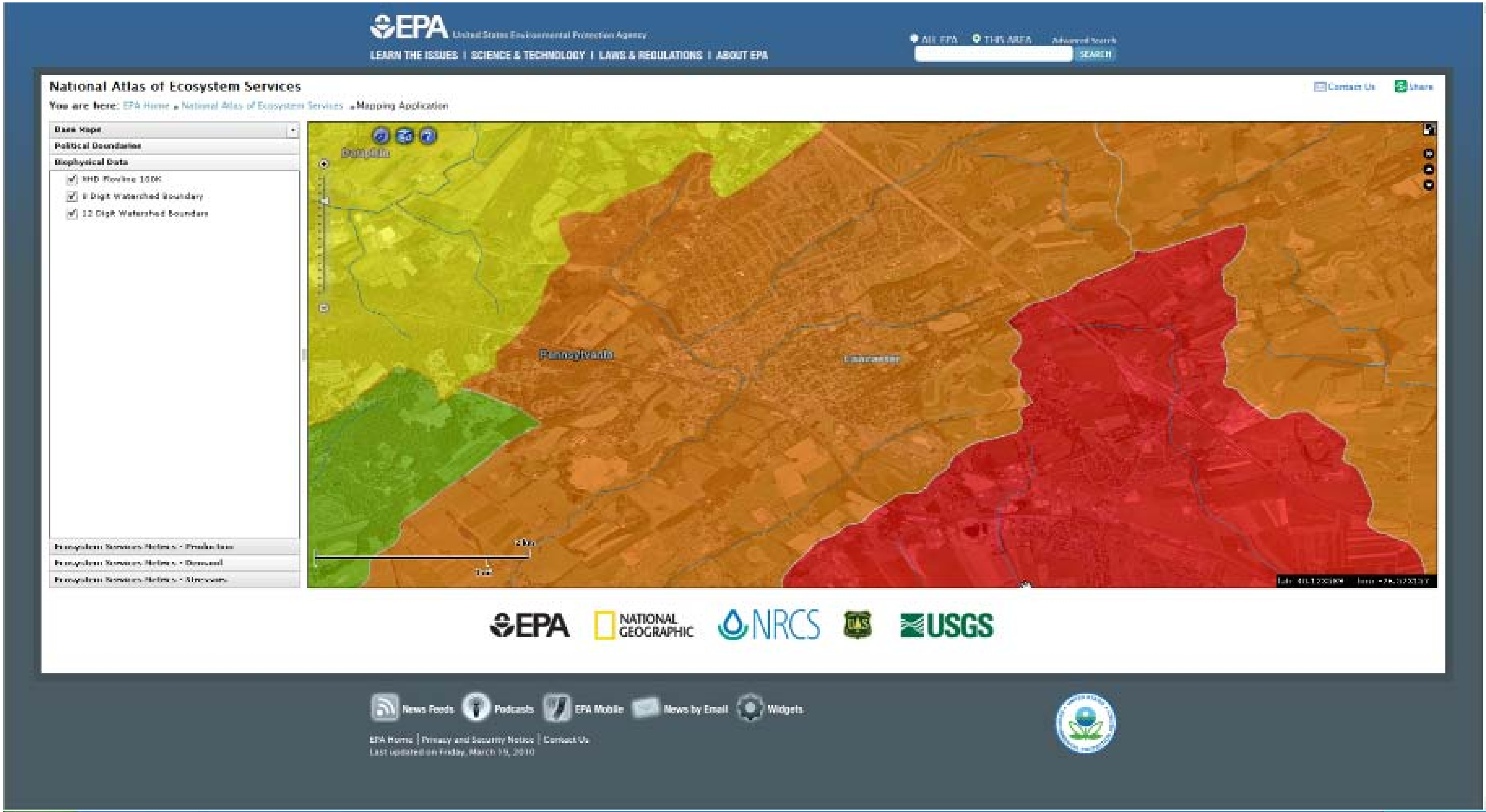
- Proposed summary levels
  - Component Horizon or Standard Layer Level
  - 0-5, 5-20, 20-50, 50-100, 100-150 cm?
    - SOC/SIC and calculation parameters
      - (SOM, rock fragment conversion factor, bulk density…)
    - %S, %Si, %C (fine earth fraction)
    - Rock Fragment Content
    - Soil texture class (e.g. silty clay loam)
    - Restrictive layer presence/absence

Ecosystem Services Gridded SSURGO Themes

- Summary levels
  - Soil Map unit/Component Level (series/phase of series)
    - Component percentage of map unit
    - SOC (Kg per square meter)
    - SIC (Kg per square meter)
    - RZAWC and AWC for reported depth
    - Rooting Depth (crops, trees, range, etc.)
    - Bedrock Depth
    - Reported Depth and others
    - Hydrologic group
    - National Commodity Crop Productivity Index (NCCPI)

NCSS "Best Practices" for Gridded SSURGO Data Summary Methods Documented…





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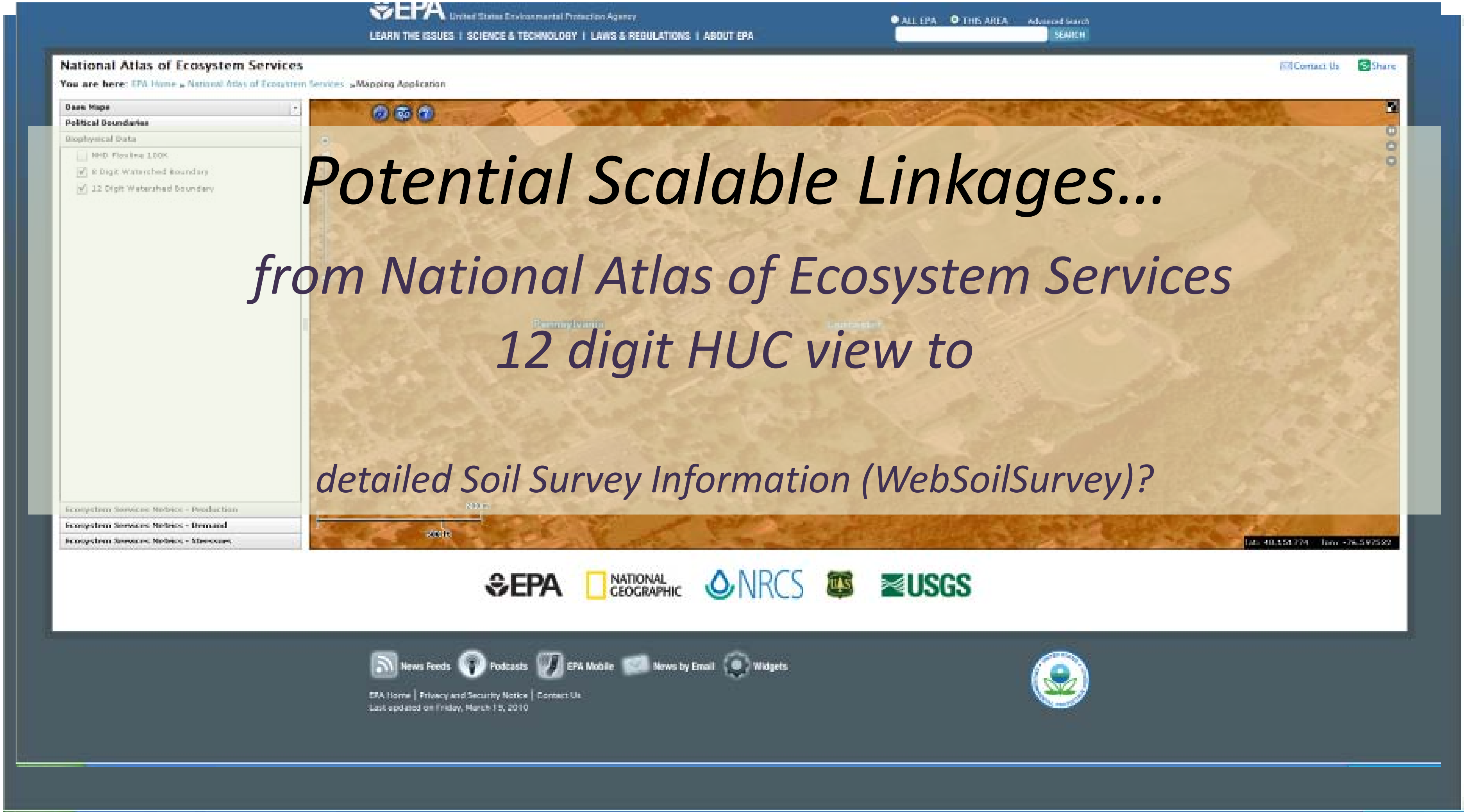
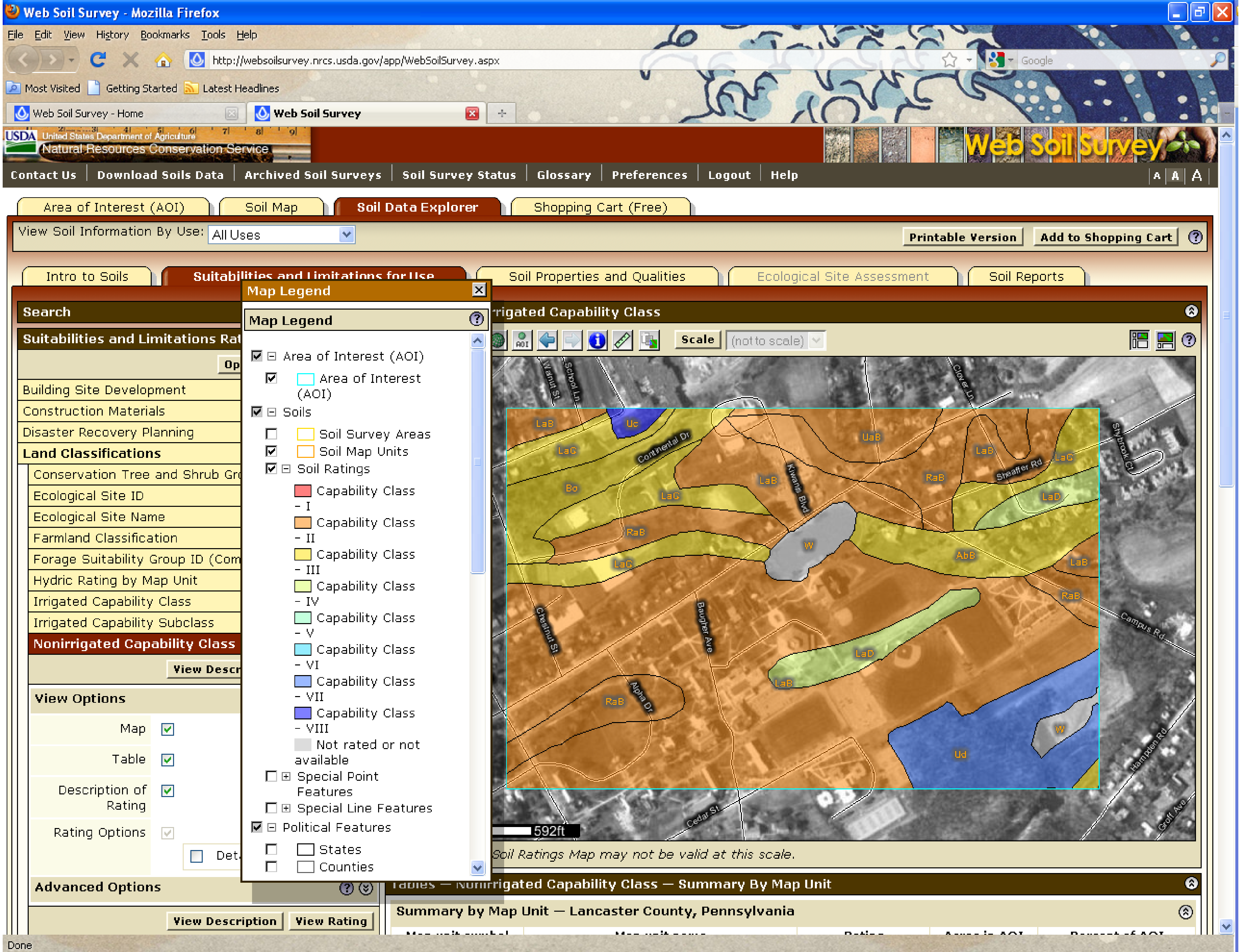
Potential Scalable Linkages…

from National Atlas of Ecosystem Services

12 digit HUC view to

detailed Soil Survey Information (WebSoilSurvey)?

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Web Soil Survey
Contact Us | Download Soils Data | Archived Soil Surveys | Soil Survey Status | Glossary | Preferences | Logout | Help
Area of Interest (AOI)
Soil Map
Soil Data Explorer
Shopping Cart (Free)
View Soil Information By Use: All Uses
Printable Version
Add to Shopping Cart
Intro to Soils
Suitabilities and Limitations for Use
Soil Properties and Qualities
Ecological Site Assessment
Soil Reports
Search
Suitabilities and Limitations Rat
Building Site Development
Construction Materials
Disaster Recovery Planning
Land Classifications
Conservation Tree and Shrub Gr
Ecological Site ID
Ecological Site Name
Farmland Classification
Forage Suitability Group ID (Com
Hydric Rating by Map Unit
Irrigated Capability Class
Irrigated Capability Subclass
Nonirrigated Capability Class
View Options
Map
Table
Description of Rating
Rating Options
Advanced Options
View Description
View Rating
Map Legend
Map Legend
Area of Interest (AOI)
Area of Interest (AOI)
Soils
Soil Survey Areas
Soil Map Units
Soil Ratings
Capability Class - I
Capability Class - II
Capability Class - III
Capability Class - IV
Capability Class - V
Capability Class - VI
Capability Class - VII
Capability Class - VIII
Not rated or not available
Special Point Features
Special Line Features
Political Features
States
Counties
rigated Capability Class
Scale (not to scale)
592ft
Soil Ratings Map may not be valid at this scale.
Tables — Nonirrigated Capability Class — Summary By Map Unit
Summary by Map Unit — Lancaster County, Pennsylvania
Done

- END

What do you get when you provide soils data in the gridded SSURGO format that the client desires?