Rapid Soil Carbon Assessment of the U.S. for Conservation Planning and Model Validation

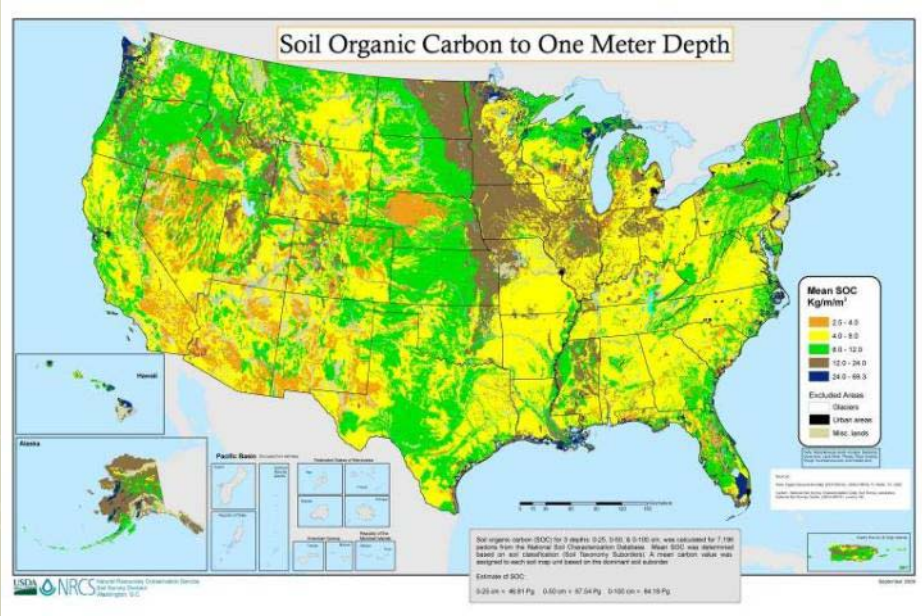
National Cooperative Soil Survey

Why Carbon Data?

- Reliable estimates of the amount of carbon that can be practically stored in soil
  - Soil
  - Land use, ag management systems, ecological site and state
- Need quantitative data
  - Decision support tools such as COMET-VR
  - Carbon cap and trade programs
  - Global carbon accounting
  - Model calibration

Objectives

- Evaluate US soil carbon stocks as effected by
  - Soil
  - Land cover
  - Agricultural management
  - Ecosystem state



- Inventory total and distribution of soil carbon stocks for U.S.

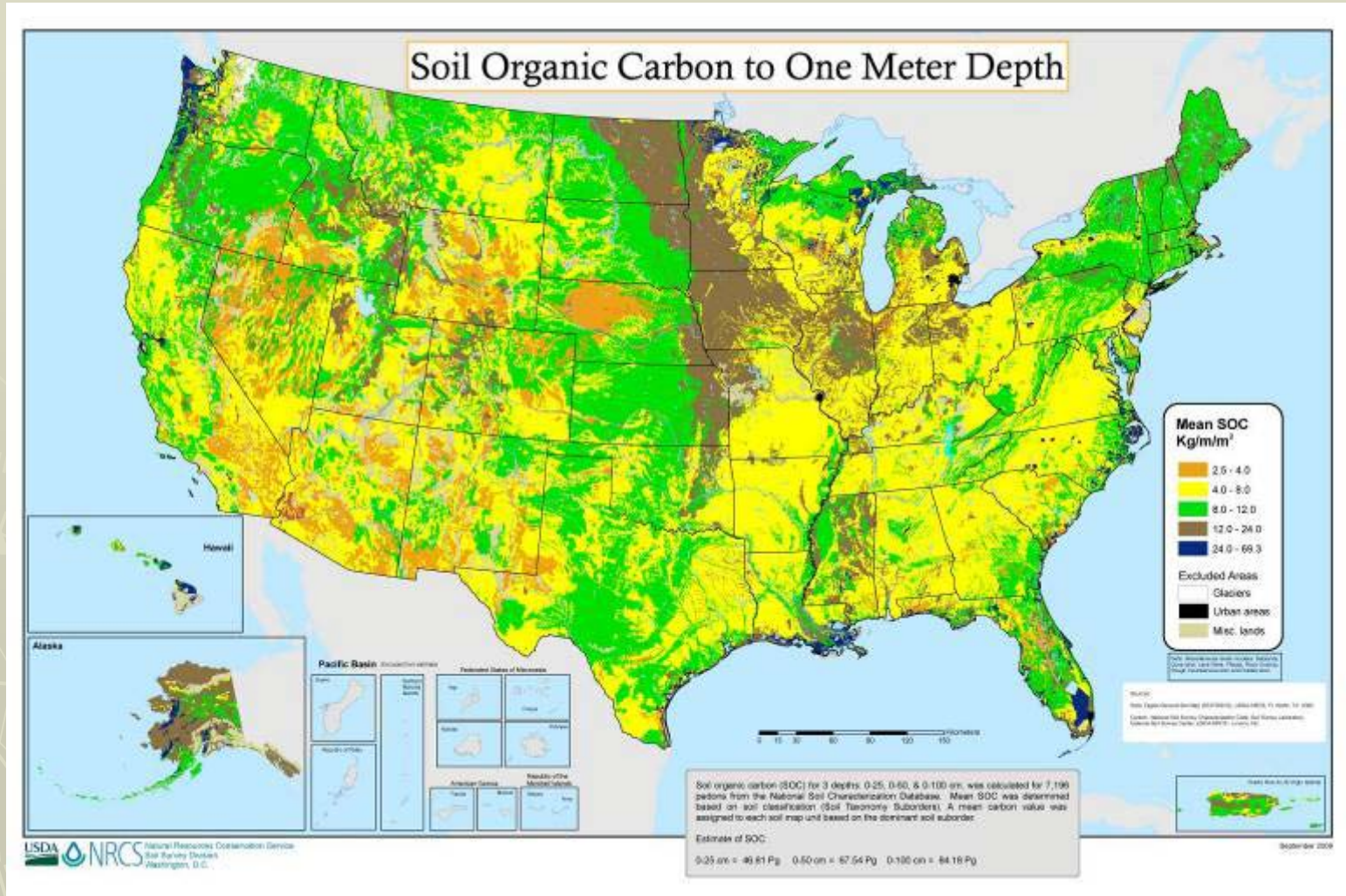
Phase 1

National Soil Carbon Inventory Developed from SSURGO

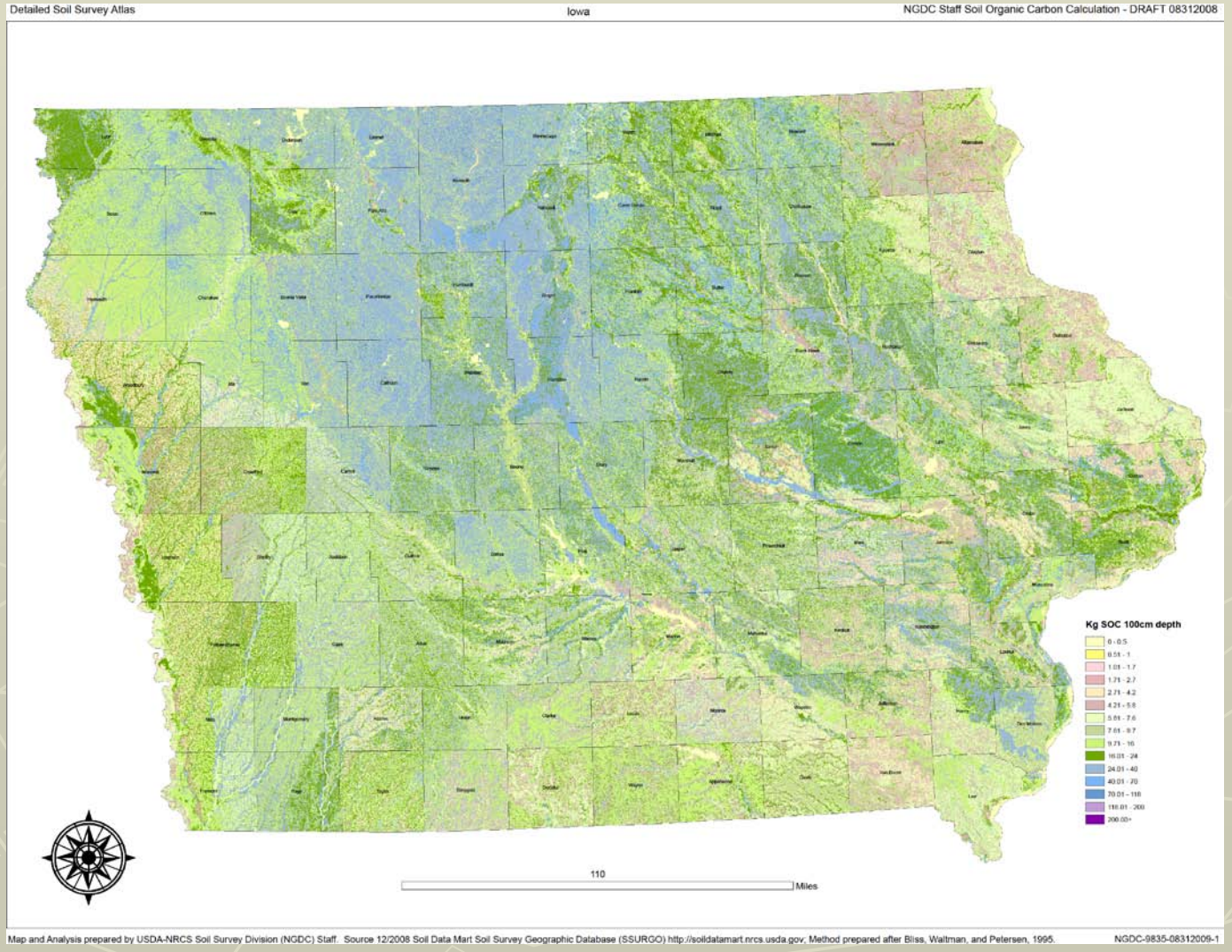
Short-term Product

STATSGO SOC Estimates

1:250,000 scale; published in 2001



SSURGO SC Estimates to 1 m



SSURGO SC Estimates to 1 m

- Not just organic C – will include estimates of inorganic C ($CaCO_3$)
- Adjust organic C and bulk density for land cover data
  - SSURGO – low, representative value (RV), high
  - RV value for “dominant” land use for map unit
  - Adjust carbon stocks based on land cover
- Evaluate estimates with NSSC pedon data

Phase 2

Collection of soil carbon and other data for evaluation of carbon stocks

for benchmark and other important soils

Nationwide Effort

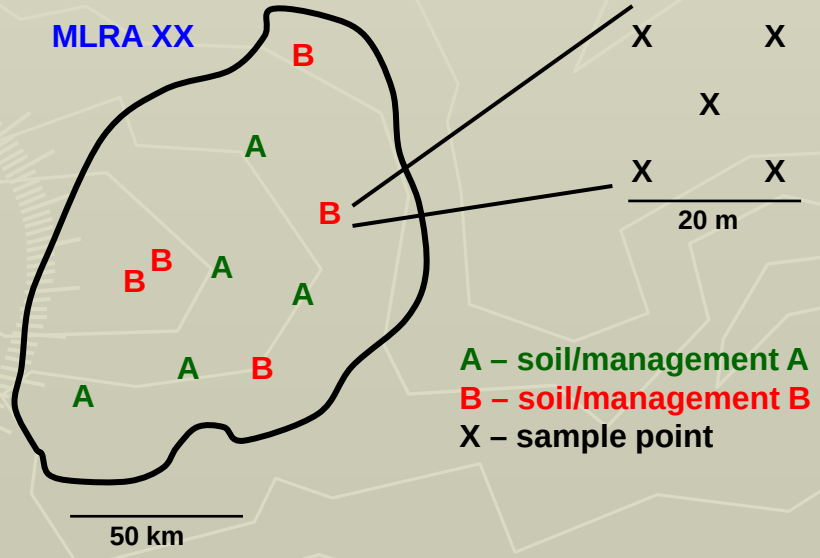
- All land uses and ecosystems
  - Cropland
    - Tillage systems
  - Pasture
  - Range
  - Forest
  - Wetlands
  - Floodplains

Sample Stratification

- Soil
  - Groups based on benchmark and other important soils
    - Similar effect on C dynamics
- Land use/management/ecosystems within soil
  - Steady state conditions
    - End product – not rate

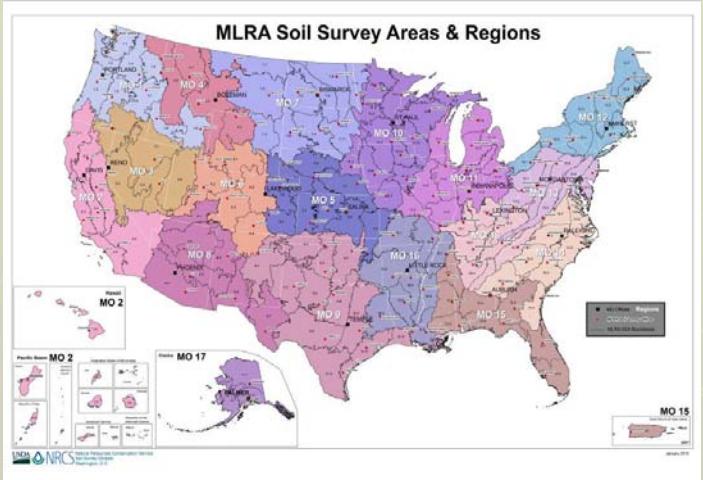
Replication for Statistical Confidence

- NCSS pedon data suggests need about 25 replicates (sample points) per soil-ecosystem combination for 80% confidence in mean
- Clustered sample design
- More replicates for extensive soil groups



How much data can we collect?

- Dispersed analysis
  - 18 MO regions
  - 400 sites/MO
  - ~7,000 sites
    - 1-2 sites per county
  - 35,000 sample points
- ~1,400 soil-land cover combinations
  - 80 per MO region
    - 7 land covers
    - 11 soil groups

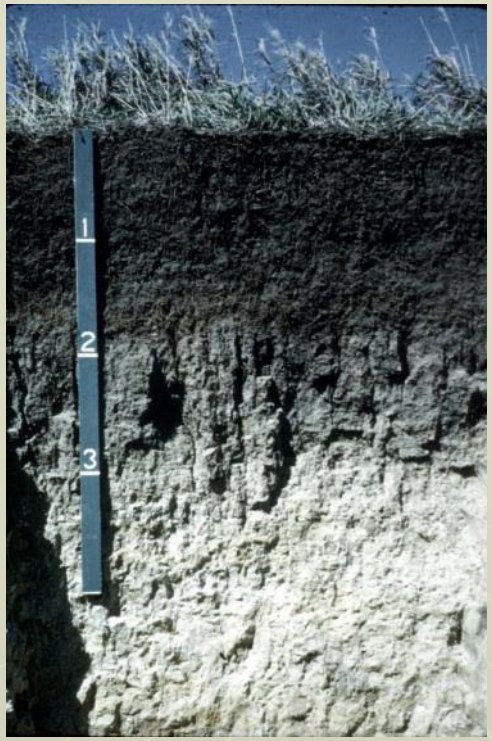


Sites

- Randomized NRI points within appropriate map units
  - Soil group confirmed on site
  - Steady-state ecological state/ management system confirmed
- Site identification being finalized
- May also be used for ESD state and transition model data collection
  - Vegetation
  - Dynamic soil properties

Data Collection

- By horizon to 1 m
  - 0-5 cm surface sample
- Landscape properties
- Soil morphology
- Total and inorganic C
- Bulk density
- Rock fragments
- Dispersed data collection
  - 120-140K samples
  - VNIR



Dispersed Data Collection

- Soil scientists in 18 MO Regions
  - 1 VNIR spectrometer per MO
  - 1-2 soil scientists trained on VNIR and sampling protocol
  - Assistance from other soil scientists in MO
  - Consistency in methods is critical
- NSSC staff
  - VNIR model development
  - Data storage and analysis
  - Training
  - QA

Additional Data

- Want to consolidate as much existing data as possible
  - Specific management effects
  - Rates of change with LULC/management effects
- ARS research sites
- University research sites
- EPA National Wetland Condition Assessment
- Existing pedon data (NCSS database)