Charles E. Kellogg Soil Survey Laboratory (KSSL)

- SSD Director 1934-71
  - Soil Survey Manual
  - Soil Taxonomy
  - Soil geomorphology teams
  - “Modern Soil Survey”

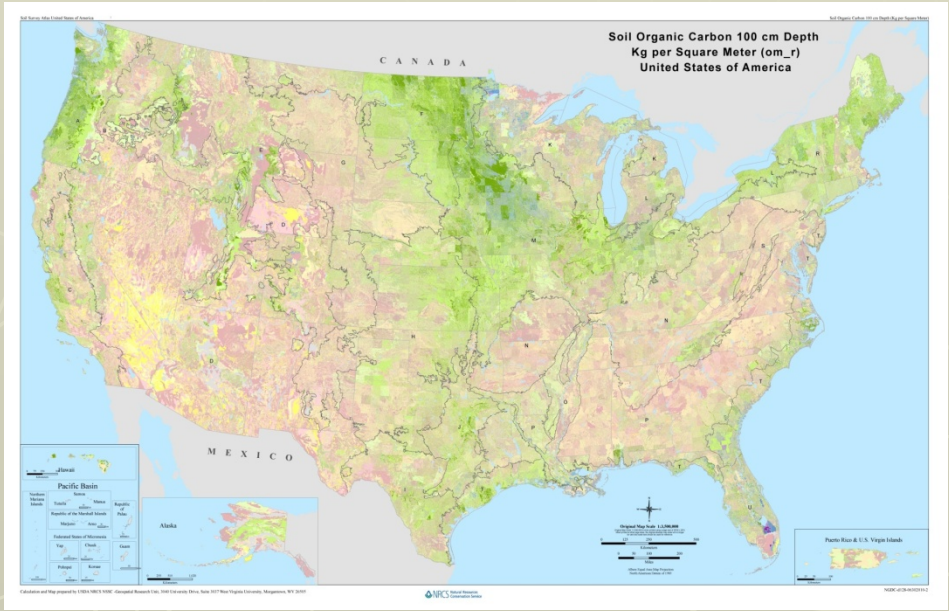
- June 4, 2012 - SSL naming ceremony
  - NC NCSS conference
  - Ann Mills; Deputy Undersecretary Natural Resources and Environment
  - Mike Golden
  - Steven Kellogg (grandson)

Rapid Assessment of U.S. Soil Carbon for Climate Change and Conservation Planning

Larry T. West
National Leader – Soil Survey Research and Laboratory

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

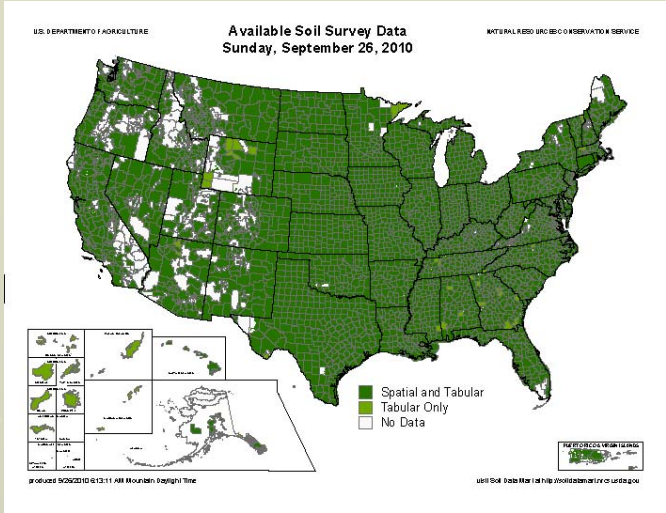
- Objectives
  - Develop statistically reliable estimates of current carbon stocks and the amount that can be practically stored in U.S. soils
    - soil
    - land cover
    - agricultural management
    - ecosystem state
- Quantitative data
  - Conservation planning
  - Decision support tools such as COMET-VR
  - Global carbon accounting
  - Model validation



Two Phases

1. SSURGO calculation
   - Land cover adjustment (L,RV, H)
   - Comparison with pedon data
2. New data collection
   - The gift that keeps on giving

Methods - SSURGO

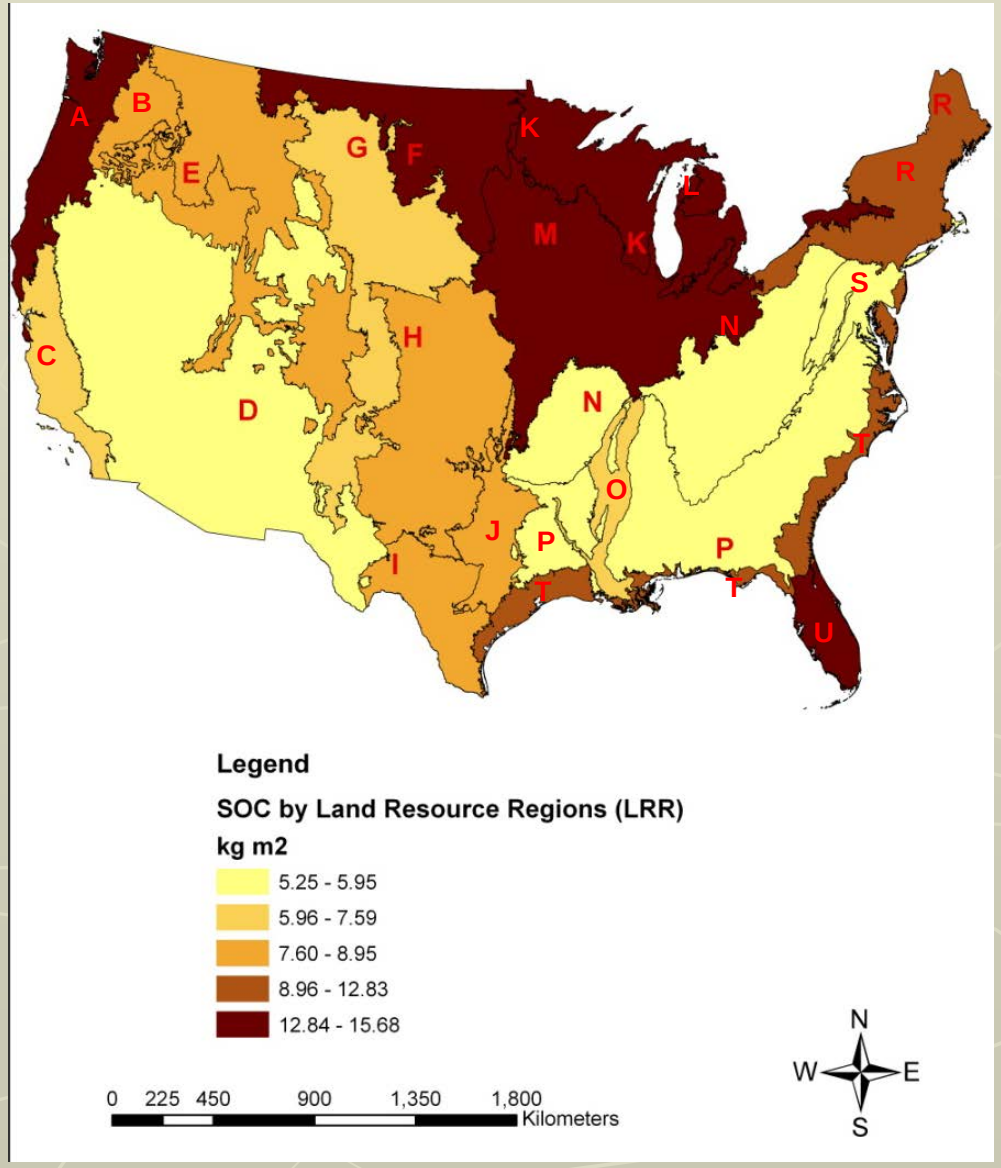


- Component horizon data
  - SOC concentrations
  - Bulk density
  - Coarse fragments
  - C stocks summed to depth of interest
- Map unit data
  - Spatially weighted average for components
  - Corrected to 100% if sum of component percentage <100
- If SSURGO unavailable, STATSGO used

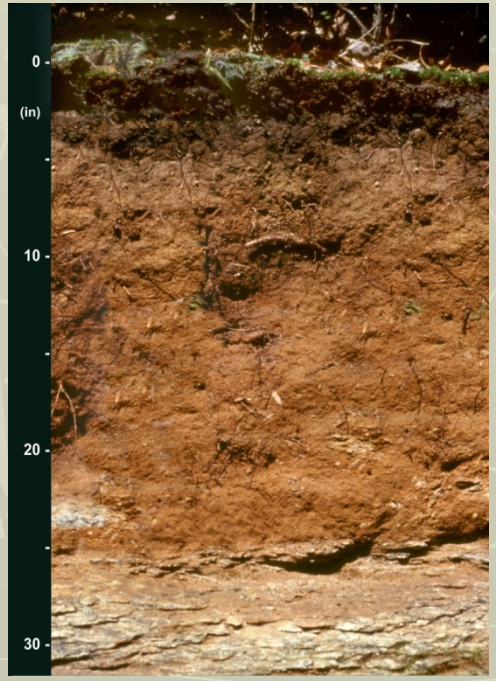
Pedon Data

- Stock calculations from measured data
- Pedon inclusion (3,039 pedons)
  - All data needed for calculations (bulk density)
  - Soil associated with the data is component of map unit

SOC Stocks – LRR Means

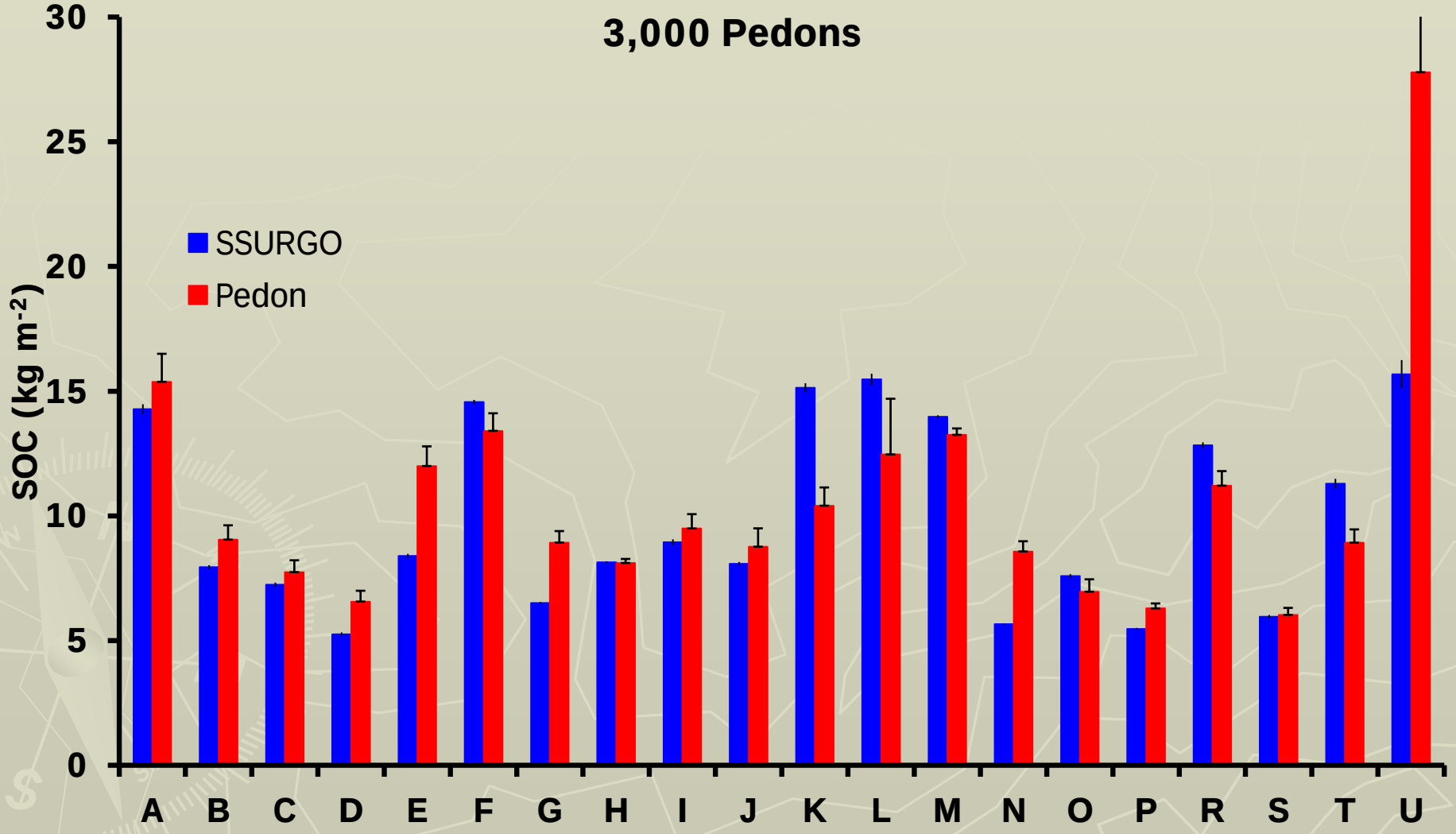


SOC Stocks – More Than Concentration



Change in surface horizon SOC concentration may be lost in stock calculations
100 cm
30 cm?

SOC Stocks, 0-100 cm - LRR Means



Phase 2 Objectives

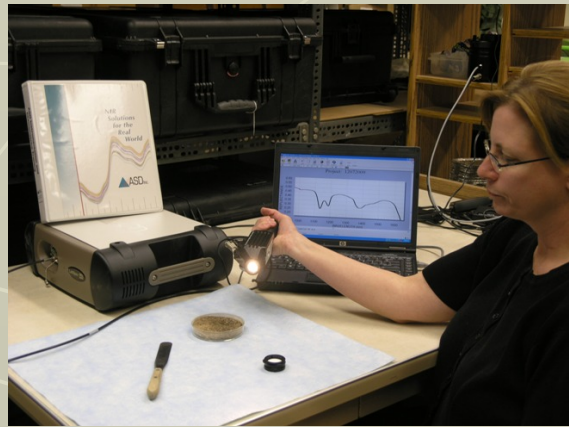
- Enhance SSURGO Database
  - Soil Properties (Soil Groups)
    - Grouping makes soil scientists nervous
- Land covers and ecosystems
  - Cropland
  - Range
  - Pasture
  - Forest
  - Wetlands
  - Limited management data

What Has been Accomplished

- 300+ soil scientists involved
- 22 universities assisting
- 32,500 pedons at 6,500 locations across the country described and sampled in ~16 months
- Data collected for 150,000+ samples
  - ~95% complete
- Additional management data collected
- New technology implemented in 17 MO regions
- **Thanks for all of your help with the project**

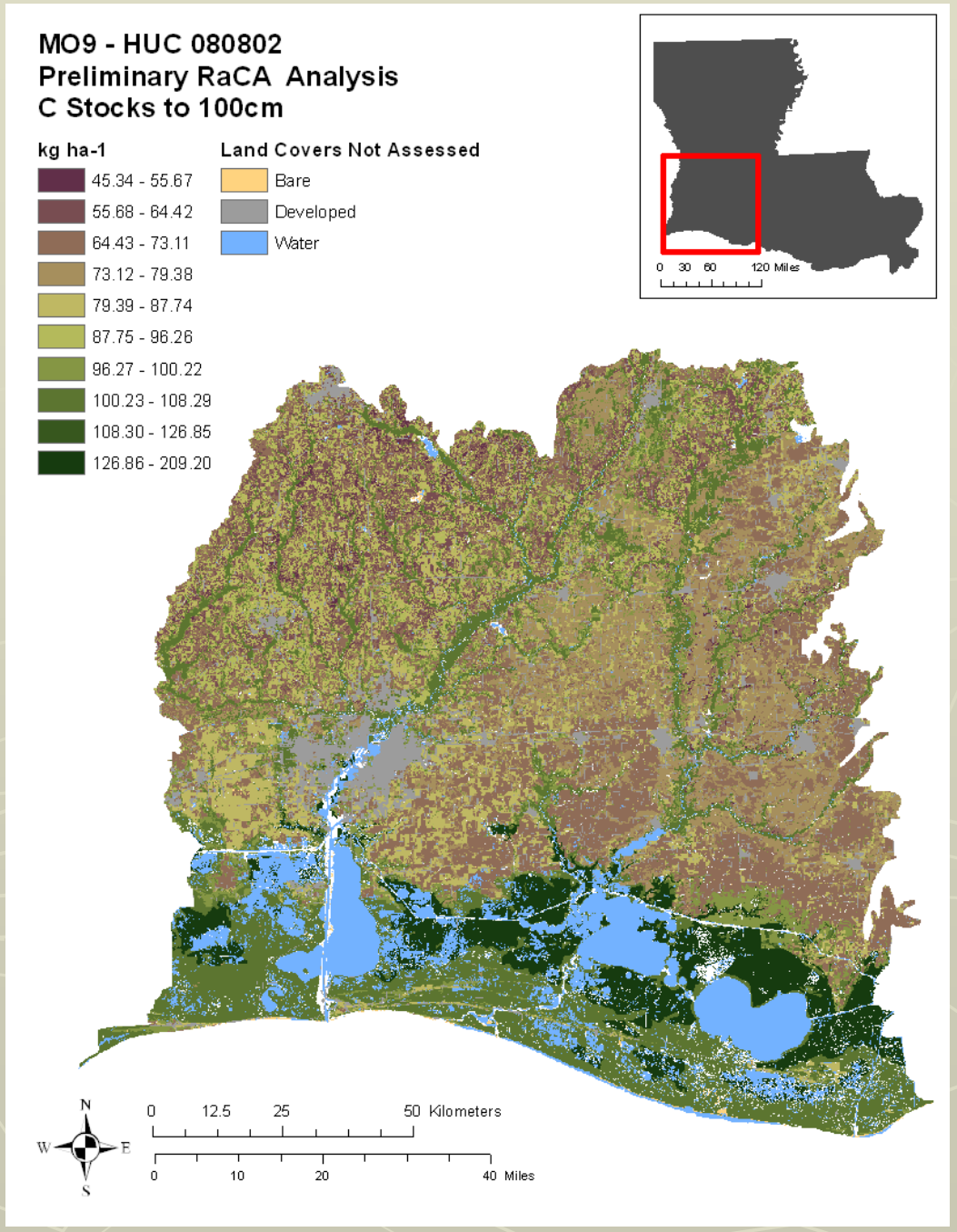
Data Collected

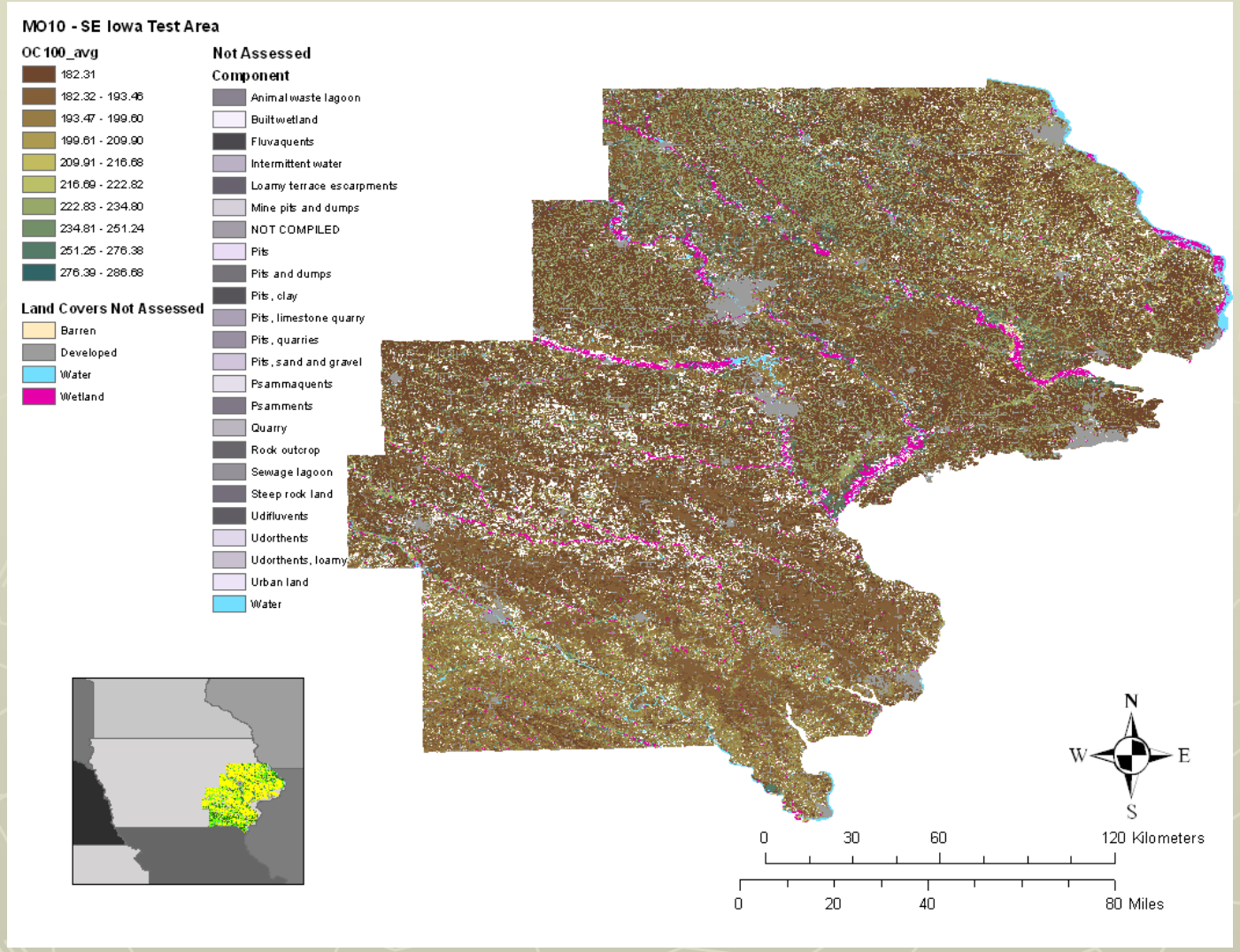
- Site characteristics
- Limited vegetation and management data
  - NRI and CEAP data as supplement
- Pedon description
- Bulk density
  - Measured for horizons to 50 cm
  - PTF developed to predict bulk density for horizons from 0 to 50 cm
    - Textural class
    - Horizon nomenclature
    - Bulk density of overlying horizons
- VNIR spectra

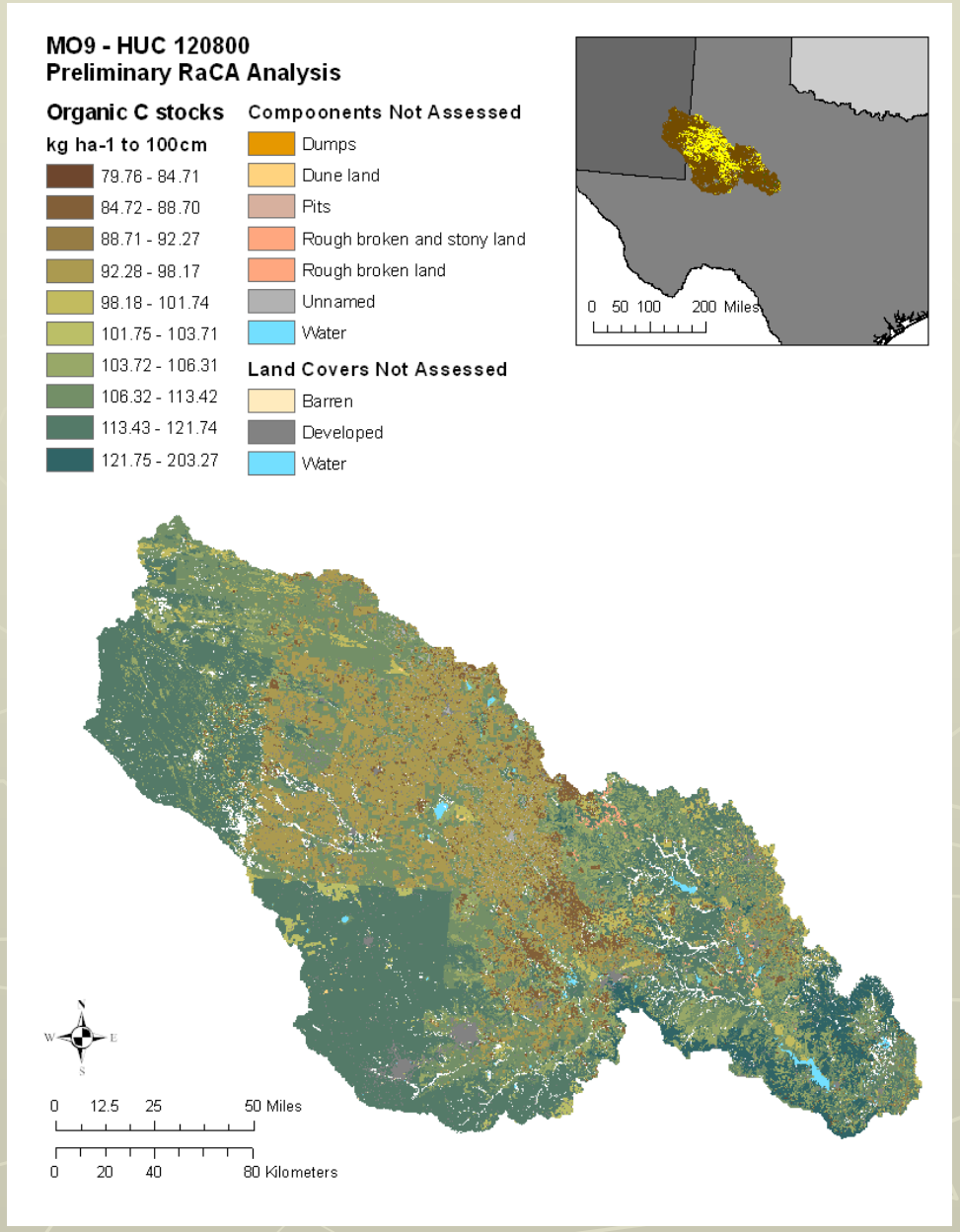


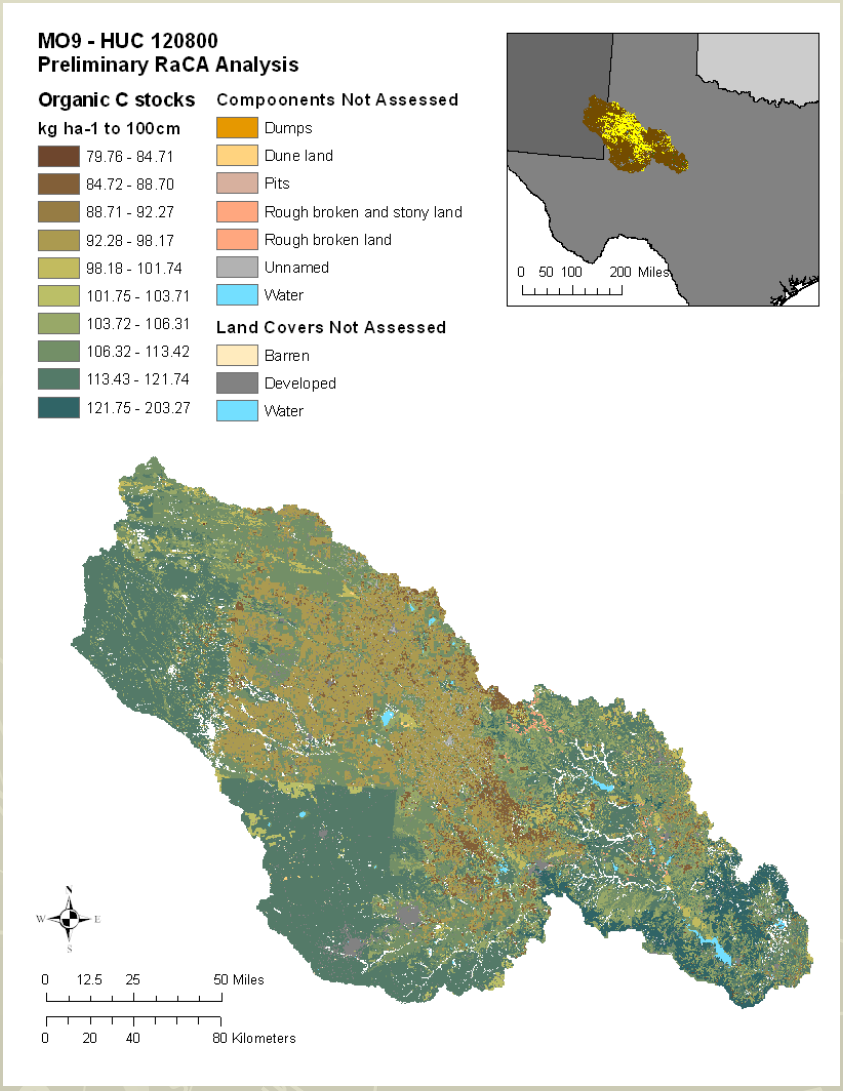
VNIR Spectra

- Models for prediction of total carbon and $CaCO_3$ finalized
- Based on 8,000+ spectra from KSSL sample archive
- Predictive models stratified based on spectral characteristics
  - Goal is to relate stratification to soil properties
    - Clay
    - CEC
    - Fe oxide content
    - Other


MO9 - HUC 080802
Preliminary RaCA Analysis
C Stocks to 100cm
kg ha-1
45.34 - 55.67
55.68 - 64.42
64.43 - 73.11
73.12 - 79.38
79.39 - 87.74
87.75 - 96.26
96.27 - 100.22
100.23 - 108.29
108.30 - 126.85
126.86 - 209.20
Land Covers Not Assessed
Bare
Developed
Water
0 30 60 120 Miles
N
W
E
S
0 12.5 25 50 Kilometers
0 10 20 40 Miles


MO10 - SE Iowa Test Area
OC100_avg
182.31
182.32 - 193.46
193.47 - 199.60
199.61 - 209.90
209.91 - 216.68
216.69 - 222.82
222.83 - 234.80
234.81 - 251.24
251.25 - 276.38
276.39 - 286.68
Land Covers Not Assessed
Barren
Developed
Water
Wetland
Not Assessed
Component
Animal waste lagoon
Built wetland
Fluvaquents
Intermittent water
Loamy terrace escarpments
Mine pits and dumps
NOT COMPILED
Pits
Pits and dumps
Pits, clay
Pits, limestone quarry
Pits, quarries
Pits, sand and gravel
Psammaquents
Psamments
Quarry
Rock outcrop
Sewage lagoon
Steep rock land
Udifluvents
Udorthents
Udorthents, loamy
Urban land
Water
N
W
E
S
0
30
60
120 Kilometers
0
20
40
80 Miles


MO9 - HUC 120800
Preliminary RaCA Analysis
Organic C stocks
kg ha-1 to 100cm
79.76 - 84.71
84.72 - 88.70
88.71 - 92.27
92.28 - 98.17
98.18 - 101.74
101.75 - 103.71
103.72 - 106.31
106.32 - 113.42
113.43 - 121.74
121.75 - 203.27
Compoonents Not Assessed
Dumps
Dune land
Pits
Rough broken and stony land
Rough broken land
Unnamed
Water
Land Covers Not Assessed
Barren
Developed
Water
0 50 100 200 Miles
0 12.5 25 50 Miles
0 20 40 80 Kilometers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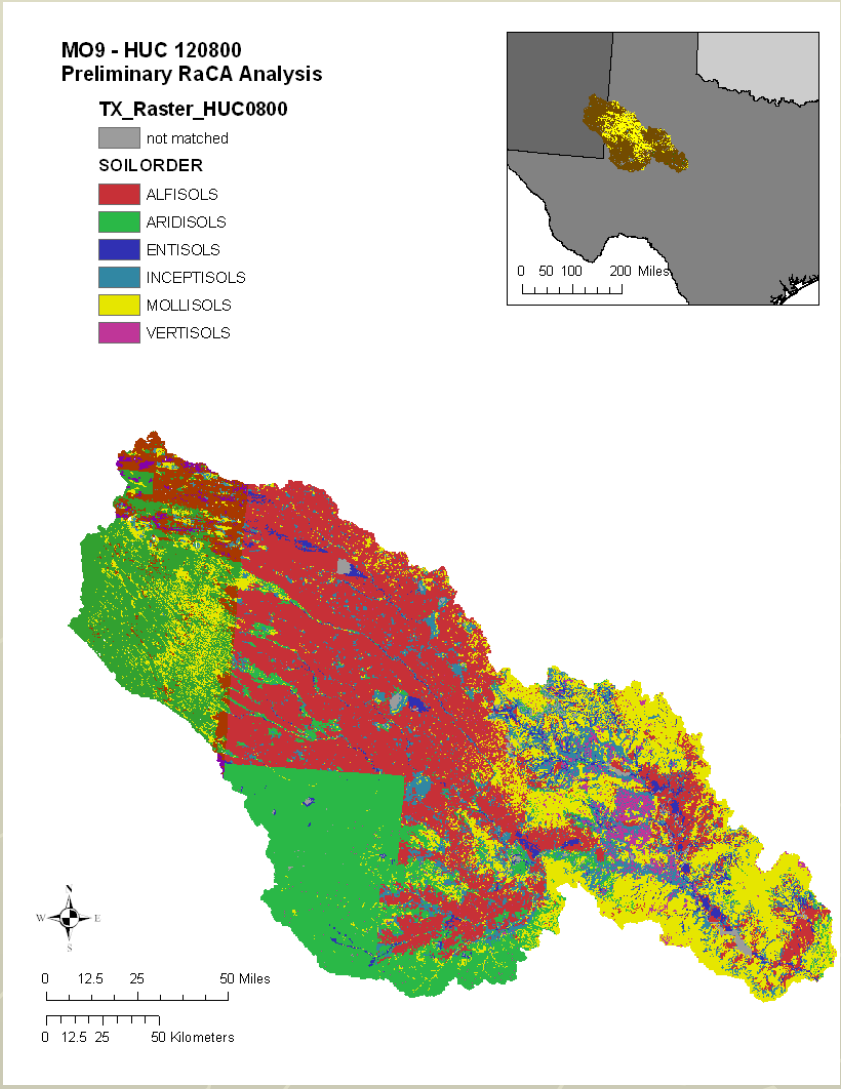
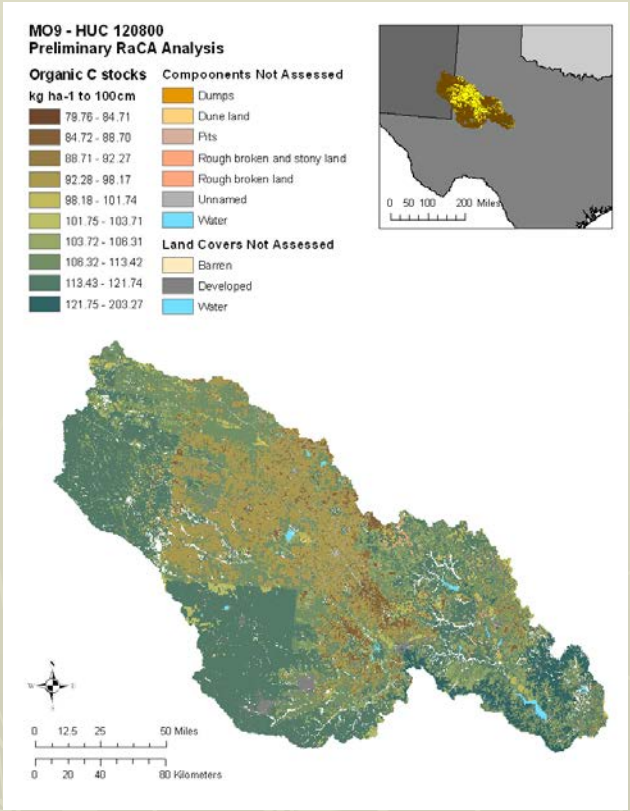

MO9 - HUC 120800
Preliminary RaCA Analysis
TX_Raster_HUC0800
not matched
SOILORDER
ALFISOLS
ARIDISOLS
ENTISOLS
INCEPTISOLS
MOLLISOLS
VERTISOLS
0 50 100 200 Miles
W E S
0 12.5 25 50 Miles
0 12.5 25 50 Kilometers


MO9 - HUC 120800
Preliminary RaCA Analysis
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0 50 100 200 Miles
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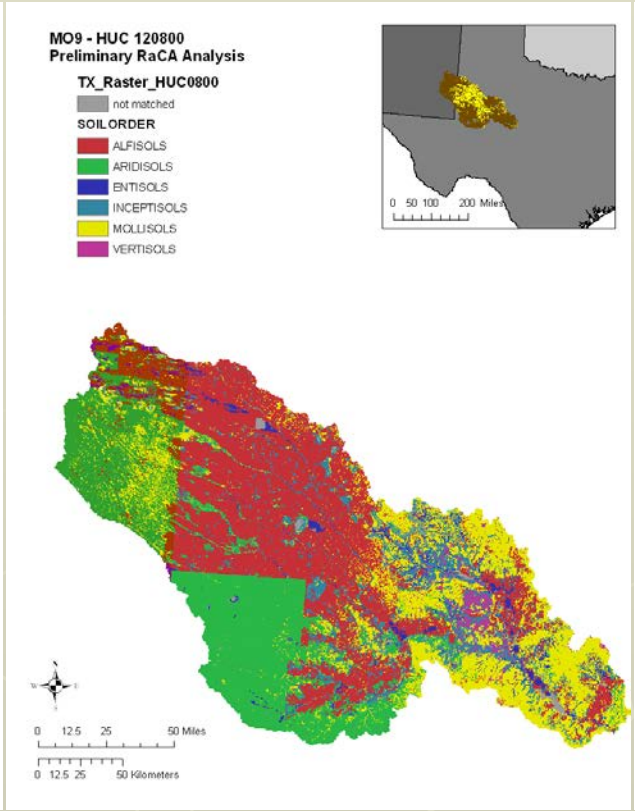
MO9 - HUC 120800
Preliminary RaCA Analysis
TX_Raster_HUC0800
not matched
SOILORDER
ALFISOLS
ARIDISOLS
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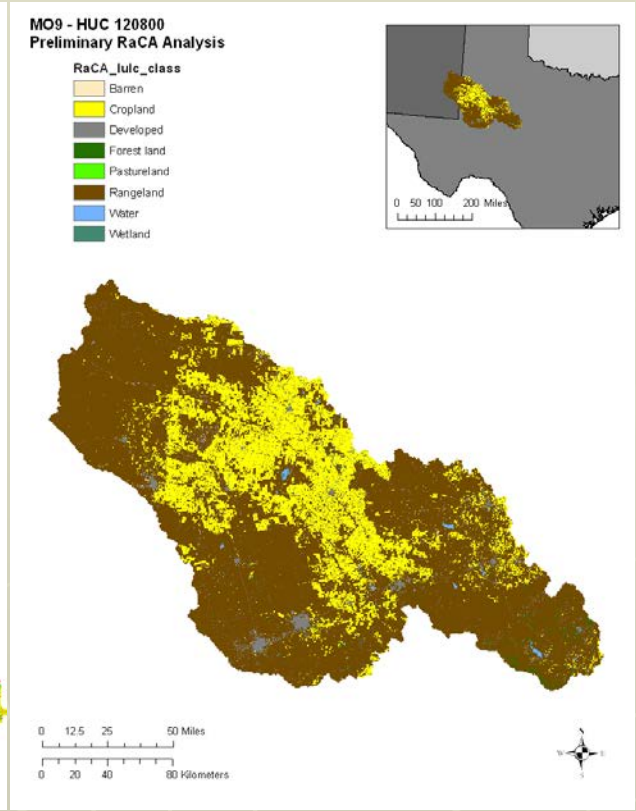
MO9 - HUC 120800
Preliminary RaCA Analysis
RaCA_lulc_class
Barren
Cropland
Developed
Forest land
Pastureland
Rangeland
Water
Wetland
0 50 100 200 Miles
0 12.5 25 50 Miles
0 20 40 80 Kilometers

Timeline to the End

- September 30, 2011 – sampling complete
- March 30, 2012 – sample analysis complete
  - A little late here
- September 30, 2012 – preliminary data analysis complete
  - MO-8 and MO-9 are almost complete
  - Development of protocol to apply to other Mos
    - Plug and chug]
- Additional analyses over longer term

Challenges Remaining

- Data analysis
  - Aggregation by MLRA, state, watershed?
  - Management effects
- Spatial extrapolation of point data
  - SSURGO + land cover
  - Digital mapping techniques
    - Environmental variables
    - Geostatistical extrapolation
- Application to NCSS databases and conservation planning
  - Different data for different land cover and/or management within map unit components?
  - Team being formed to develop methods
    - Looking for volunteers
- AK, PIA, and PR
  - Data collection initiated in 2012

Questions?

Comments?