2006 North Central Region Interpretations Committee
Final Report

Committee Members

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- John Warner, Soil Data Quality Specialist, NRCS, Salina, KS
- Jim Millar, Soil Quality Specialist, NRCS, Huron, SD
- Jeff Deniger, Soil Scientist, NRCS, Aurora, IL
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- Steve Sieler, Assistant State Soil Scientist, NRCS, Bismarck, ND
- Alan Gulsvig, Soil Scientist, NRCS, Devils Lake, ND
- Jeanne Heilig, Soil Scientist, NRCS, Dickinson, ND
- Larry Edland, Soil Data Quality Specialist, NRCS, Bismarck, ND
- Arlene Tugel, Soil Scientist, NRCS, Las Cruces, NM

Committee Charge

In response to the committee charge (**The committee will be charged with identifying what interpretations criteria should we be using to describe the transient nature of soils.),** I mailed a brief survey to each of the committee members to get a feel for how States in the region felt about the adequacy of the existing set of interpretations.

I received feedback from:

National Soil Survey Center (Seybold, Wilson)
North Dakota
Ohio
South Dakota
Illinois
Missouri
Soil Survey Division (Tugel)

Question 1

Do you feel that soil properties and interpretations are adequately presented as is? NASIS offers a range of values and depending on land use, most measured data typically fall within the stated range (agree or disagree).

Most respondents feel that our current set of properties and interpretations are not adequately presented. There is a strong feeling that the data we present has many holes in it and that there is more estimated data than data that has been collected and measured.

Question 2

Do you feel that soil survey property and interpretation tables do an adequate job of explaining the data to users? Should each table be accompanied by a paragraph explaining how the data was collected? Could there be a place in the table to explain variability and transient nature?

Most feel that the tables do a fair job of explaining the data to the user (depending on the user). Most feel that the user really does not care how or where the data was collected. There is a feeling that interpretations that have been developed from many sources of aggregated data should be explained, but on the other hand modelers and researchers need to know how point data was collected before they can assign confidence in using it. It was unanimous that we should explain the variability of certain properties and interpretations dependent on land use. SEE PROPOSALS 1 & 2.

Question 3

Do you feel dual interpretations should be listed for 'drained/undrained', 'irrigated/non-irrigated', 'cultivated/uncultivated', others? Some might argue that a soil could have one set of interps and properties for pasture, another for forest, another for conventional tillage, and a fourth for no-till. The combinations of management practices that effect soil properties are endless.

Most respondents feel that it would be beneficial to list multiple interpretations dependent on land use, however most also agree that the different scenario's are endless. One respondent even feels that within drained or undrained phases, we could have a multiple of interpretations depending on whether the drainage is surface ditch or tile. There have been drainage systems that have benefited the land and others that have ruined the land. Another respondent suggested the need for developing new interpretations such as 'the ability to infiltrate' or 'the ability to sequester carbon'.

When I posed the question, I was thinking that in some cases, there could be one set of interpretations for the soil in it's natural state (e.g.:undrained) that lists all limitations associated with saturation and another set for the altered soil (drained) that would place the water table for all respective interpretations at it's drained depth. Therefore, a soil that is severely limited for application of manure, or septic, etc., might be less limited in its drained state.

Because of the complexity of this issue, I hold off on proposing anything to address this at this time. However, if any committee member wants to help me draft a proposal to recognize these transient differences, you're encouraged to draft a proposal.

Question 4

Which transient properties do think have the biggest impact on interpretations?
I think porosity, structure, and organic matter content have a big impact. These properties can affect available water holding, runoff, infiltration, erosion, Ksat, CEC, K factor, bulk density, etc.

Most everyone listed organic matter as a key transient property. Others listed were structure, pH, aggregate stability, active carbon, POM carbon, salinity, depth to saturation, and porosity. pH was listed for it's effect on herbicide performance and nutrient uptake. The properties selected should be very important to the function of the soil and system of which it is a part.

What I'm wondering is if we can propose a minimum data set of properties we can focus on to collect and then plug the (use dependent) variability into different interpretations to generate different recommendations.

I am attaching an excerpt from a paper by Arnold et. al. that lists various soil properties and the likeliness that they would change over time. One could interpret the table as a list of properties from most transient in nature to least transient. Among the most transient are bulk density, permeability, infiltration, and total porosity. Among the least transient properties is soil texture. Properties that change too rapidly or too slowly should be excluded from a minimum data set.

I'm not ready to propose a minimum data set of properties to focus on, but do plan on discussing the concept at the regional conference.

Question 5

Is it feasable to focus only on benchmark series and then extrapolate that information to all other series?

The response was unanimous that focusing on 'benchmark' soils would be a logical place to start collecting transient soil properties. One response does caution that many of these benchmark series are very extensive and its not uncommon for the data to be extrapolated too far and eventually, through a series of minor tweakings, the original concept becomes too distorted. SEE PROPOSAL #3.

Another place to target sampling is via ecological sites by selecting the most extensive or representative soils from these sites. Hopefully, these would also be benchmark soils, but until lists are updated, we need to set priority on each ecological site also.

Question 6

Do you think that there has been an adequate amount of data collected on benchmark series to explain the transient nature of soils?

Most feel that there is not nearly enough data collected on benchmark series. On the series that do have a good amount of data, most data was collected on the dominant condition. For example, if the soil is typically cultivated, there isn't much data for pasture, range, forest, eroded areas, irrigation, etc. SEE PROPOSAL #3

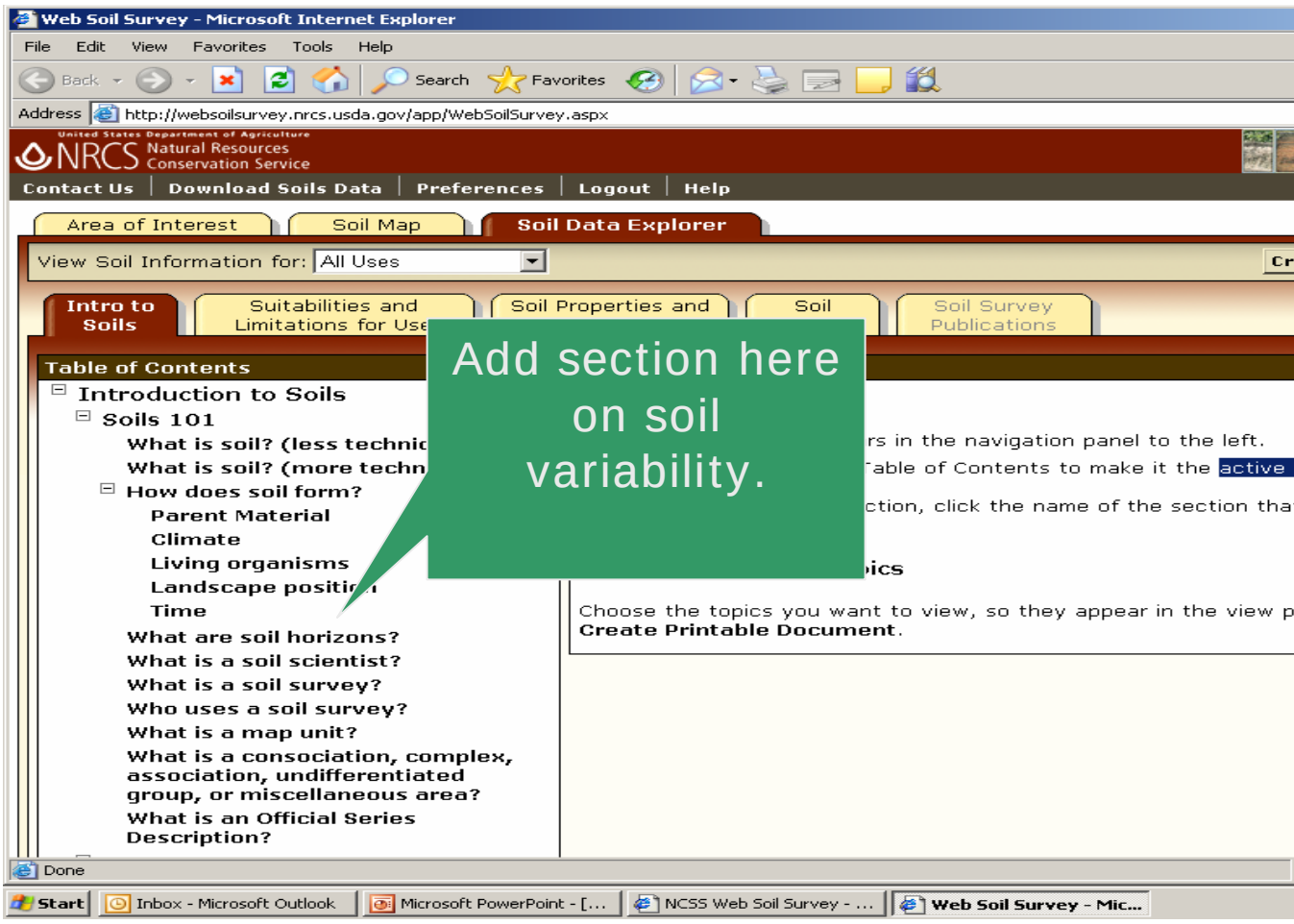
Question 7

What vehicle would you use to explain transient soil properties and interpretations to soil survey users?

The responses range from developing a pre-written material to address the transient nature of soils, to develop separate DMU's for each transient condition, to reports, photos and tables in Web Soil Survey, to simply showing some of the comparisons like the data collected for the Fayette, Harmony, and Marshall series showing variability. These reports could be part of the manuscript and included with pre-written material. SEE PROPOSALS #1,2,3, and 4.

Recommendation #1

- **A pre-written document (concise paper) should be developed to explain spatial, temporal, and man-induced variability of soil properties to the soil survey user. This material would state that the tables in soil surveys generate a representative value based on a typical land use and management for the survey area, but that different management styles and land uses can have a significant impact on soil properties and interpretations (Some soil scientists are not confident that current properties and interpretations have been consistently collected from representative land uses and we should avoid making this statement).**
- **The material should be developed to address regional climate, cropping systems, land use, soils, etc. and be based on availability of information from the NRCS characterization data and observations, and scientific studies. The material should explain derivation of representative values and their limitations, and also provide examples based on measured data.**
- **The National Leader for Soil Interpretations through the NSIAG would be requested to develop this material. The material would be posted on the Web Soil Survey, the Soil Data Mart, and also incorporated into any .pdf soil survey documents. Each soil survey table would have a footnote that would lead the user to this section on soil variability.**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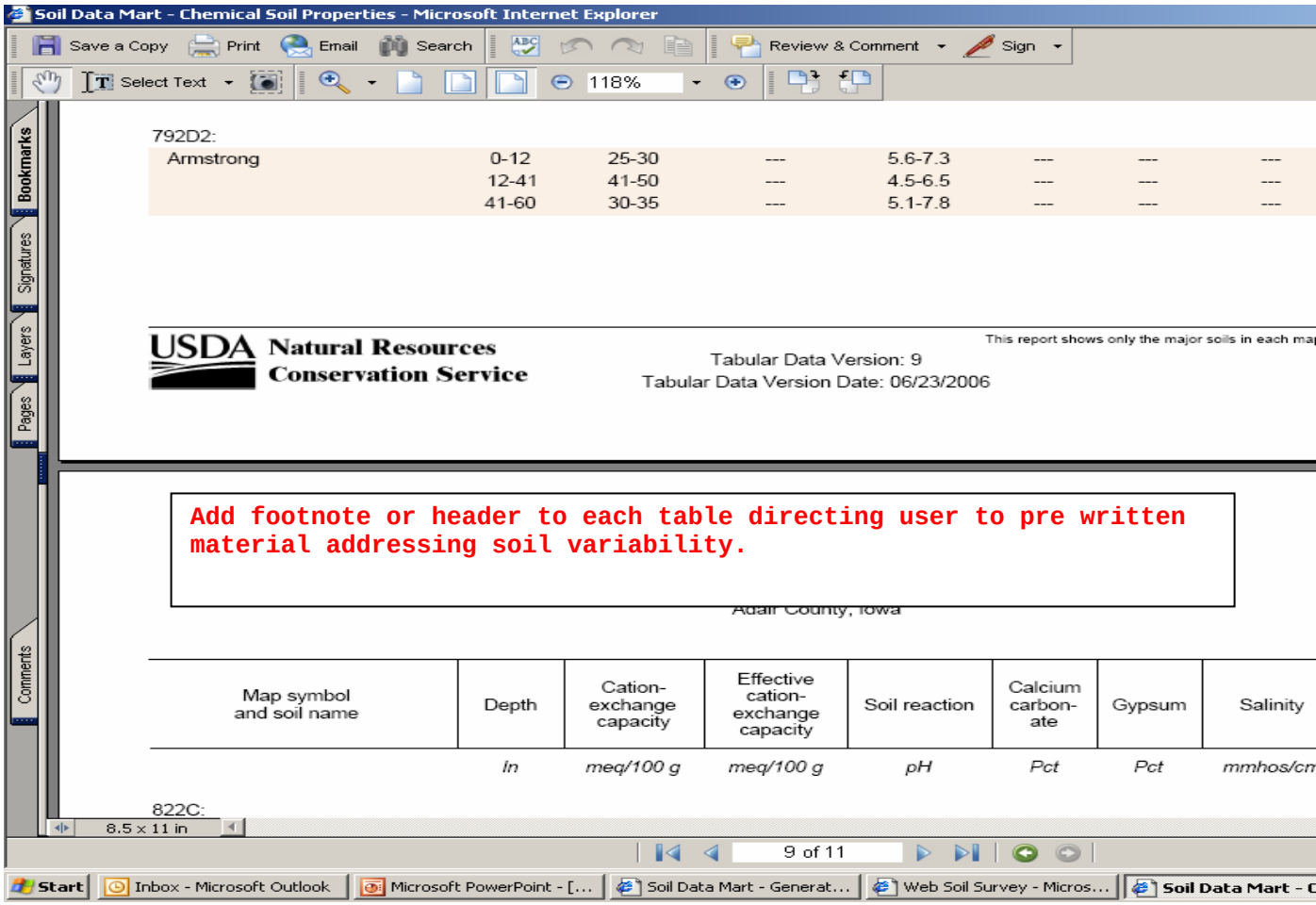

Soil Data Mart - Chemical Soil Properties - Microsoft Internet Explorer

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Armstrong	0-12	25-30	---	5.6-7.3	---	---	---
	12-41	41-50	---	4.5-6.5	---	---	---
	41-60	30-35	---	5.1-7.8	---	---	---

USDA Natural Resources Conservation Service

This report shows only the major soils in each ma

Tabular Data Version: 9
Tabular Data Version Date: 06/23/2006

Add footnote or header to each table directing user to pre written material addressing soil variability.

Adair County, Iowa

Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbon-ate	Gypsum	Salinity
	In	*meq/100 g*	*meq/100 g*	*pH*	*Pct*	*Pct*	*mmhos/cm*

822C:

Recommendation #2

- **A brief explanation of soil properties and interpretations most impacted by land use should be developed to explain the table column and how management may impact it.**

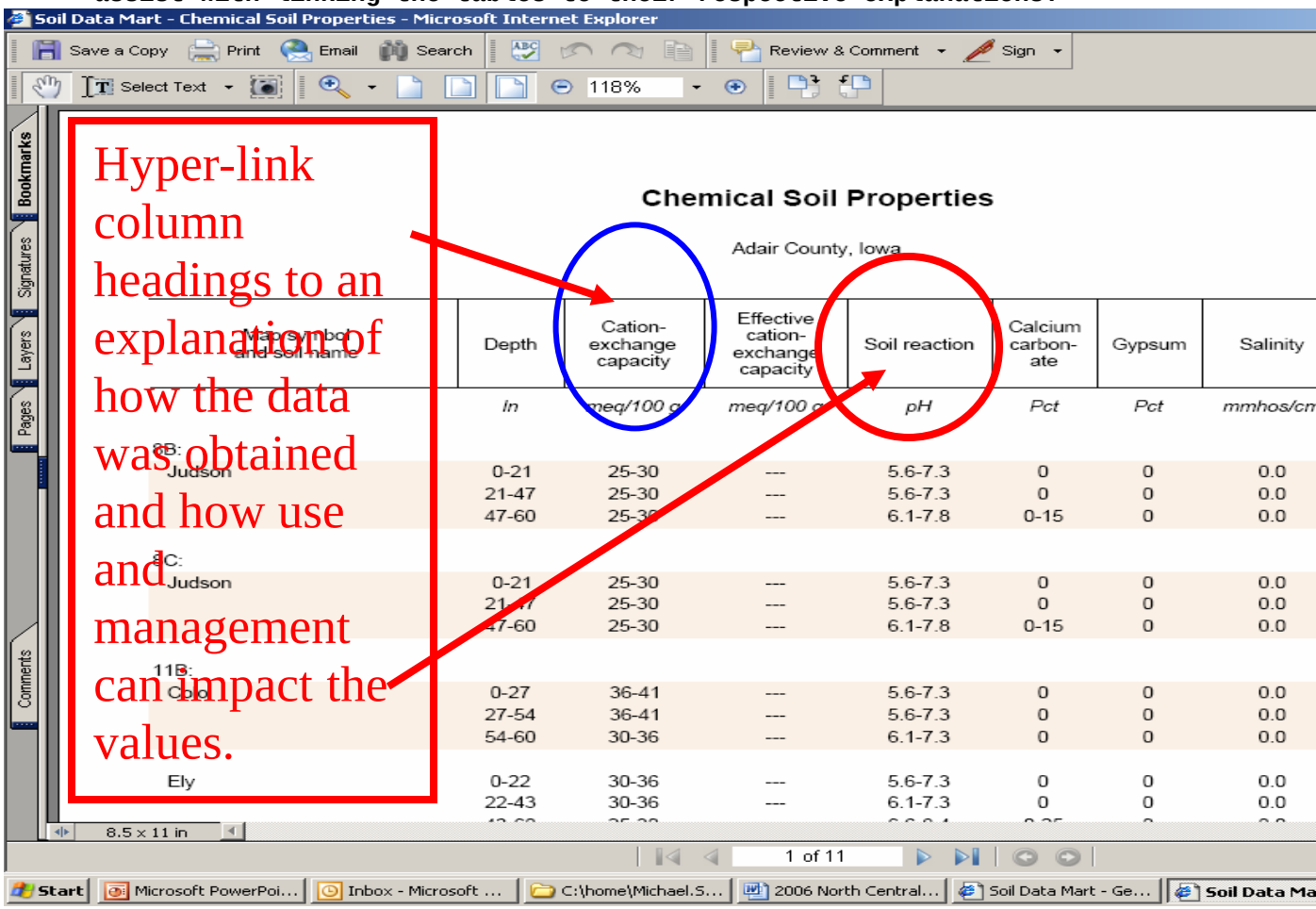
Example:

- **'Organic Matter – The value listed for organic matter is what can be expected under typical (common land use) conditions for that horizon or layer. Organic matter is listed as a percentage of the total soil and can be converted to a weight basis by multiplying by the soil bulk density. Cultivating the soil will lead to organic matter losses through decomposition. Losses will vary depending on original organic content, its distribution throughout the profile, and vegetation. The loss of organic matter results from organic matter oxidation through soil disturbance exceeding organic matter inputs through vegetative growth. Excessive erosion will also lead to organic matter reduction through topsoil removal. Organic matter levels can be increased through irrigation (by the production of more vegetation than would normally be produced under normal climatic conditions), or by changing the type of vegetation normally grown**

to one that has more root mass or remaining plant residue after harvest.'

Example:

- 'Available Water Capacity – Available water capacity is the amount of water a soil can hold for plant use. It is typically recognized as the amount of water held in the soil between field capacity (1/3 bar or 33 kPa) and wilting point (15 bar or 1500 kPa) tension. Soil water at saturation or water held at greater than 15 bar tension is not included. Typically medium textured soils with equal distribution of soil macropores and micropores generally have the greatest available water capacity. Available water capacity is reduced as soil bulk density is increased through soil compaction and destroying soil structure tillage operations, traffic). Management alternatives to increase available water capacity include increasing in soil organic matter thgrough manure additions, adding crop residues, or adopting rotations that include grasses.'
- Each column heading could then be hyperlinked to these explanations. At the top of the table there would be a statement telling the user to click on the column heading for more information.
- The National Leader for Soil Interpretations or NSIAG would be responsible for developing these explanations and maintaining the database. Soil Data Mart and Web Soil Survey programmer's would assist with linking the tables to their respective explanations.



Recommendation # 3

- An aggressive sampling plan of benchmark series is developed under the direction of the National Leader for Investigations. The plan should be developed by an interdisciplinary group. Properties collected would be tailored to local environments, but also part of the minimum data set. Piecing together the management history on any sampling site will be problematic but very important in interpreting results.
- Each State would need to thoroughly review the list of Benchmark Series (and their anthropogenic deviants) and recommend additions or deletions. There are currently 1318 Series with the Benchmark designation.
- First step would be to inventory and analyze any available data that has been collected from SC database, Soil Mechanics Lab, and University labs.
- Ideally, sampling would occur on fields with NRI points merging over twenty years of land use history with lab data.
- Ultimate goal is to develop comprehensive database of properties and interpretations of benchmark series under a variety of land uses.
- The plan also needs to include a national performance measure (goal) that justifies the use of CO-02 funds.
- Utilize (extrapolate) data collected on benchmark series to populate other series.
- List where use dependent data has been collected in the 'Remarks' section of the OSD.

Recommendation #4

- Develop list of properties and interpretations that are affected by other properties.
- Develop validations in NASIS that ensure different properties correspond to each other
- Example: When changing organic matter content for an eroded phase, other attributes such as bulk density, AWC, ksat, CEC, soil pH, etc. also need to be adjusted. Validations would ensure that different properties correspond to each other.

Recommendation #5

- Propose change in NASIS data structure to allow multiple interpretations per data map unit. This currently does not work.
- When user selects 'Alpha Silt Loam', they might be then prompted to select land use in order to obtain most accurate set of properties and interpretations for that map unit and land use.

Recommendation # 6

- Follow up on proposal sent to NSSC over a year ago by South Dakota requesting attributes for Soil Saturation frequency and duration.
- No feedback has been given by NSSC since proposal was submitted.

Recommendation #7

- **The North Central Region Interpretations Committee enthusiastically endorses the Smeck proposal (NCR Research committee recommendation) which proposes an anthropogenic-deviant level within Soil Taxonomy. This proposal would provide a relative seamless avenue for the development of associated interpretations than if the anthropogenic-influenced soils were mapped and classified as another soil series. This proposal would allow more consistent interpretation information and, hopefully, less confusion on the part of the soil survey user.**