Soil Surveys & Interpretation

NCERA-003 (2009-2014)

The Importance of Soil Surveys

Most life on Earth depends on soil—the layers of organic matter and minerals along the planet's surface that provide a nutrient-rich medium for plant growth, water storage and purification, and a habitat for decomposers. Because of the important roles soil plays, and because soil is incredibly reactive to human disturbances, soil survey information is necessary for land and natural resource management at all scales. Many local and global environmental concerns, such as erosion, crop productivity, sustainability, biodiversity, and climate change, are intricately linked to soil quality and processes. To address these issues, soil survey information must be robust, reliable, and useful to a broad range of users—especially those who may have limited knowledge about soils and soil science. Useful soil survey information requires skilled scientists and modern technology to collect and interpret the data. However, numbers of soil scientists and resources have declined recently. Furthermore, as a relatively new field, soil science often shifts focus, making coordination and communication even more essential so that scientists can stay on top of priority issues and best practices.

Updating soil survey information for eroded fields during and after restoration is important. In the bottom photo, an NCERA-003 scientist stands in a deep soil erosion gully in a soybean field and prepares to measure it with a soil auger.

Multistate Committee Forms to Coordinate and Improve Soil Surveys

Multistate Research and Extension Committee NCERA-003 guides the collection and interpretation of soil survey information. Drawing on the diverse expertise of scientists from universities across the U.S., the group is uniquely qualified to weigh in on national priorities and refine national directives to suit specific regional needs. Along with their individual teaching, extension, and research responsibilities, members work together to provide essential coordination and support for organizations, such as the National Cooperative Soil Survey (NCSS, an organization of federal, state, and local agencies and partners with a public mandate for inventory, use, and management of soil resources) and the Natural Resources Conservation Service (NRCS). For these organizations, NCERA-003 members identify research and education needs, coordinate soil survey research and design, and evaluate soil survey practices and tools. NCERA-003 members also provide scientific and technical expertise for developing improved systems for storing, retrieving, analyzing, and disseminating soil survey information.

Committee's Research and Guidance Has Had Multifaceted Impacts

CHANGING & IMPROVING SOIL SCIENCE

By identifying research gaps, developing new research methods, and encouraging multidisciplinary research, NCERA-003 has **broadened the scope and resolution/scale of soil science research**. Multidisciplinary research at a wider variety of scales has led to **improved soil sampling and modeling that better represent a wider range of soil characteristics and processes.** The committee's coordination has also fostered more cooperative research projects, **minimizing duplicative studies and activities and using important time, money, and labor resources more efficiently.** The group's work has also **increased awareness of the importance of soil science.** Members of the committee have **trained the next generation of soil scientists, ensuring that they have a wider range of skills and perspectives than their predecessors so that they can meet society's needs.** In particular, the group directed new NRCS approaches for training employees in field soil survey techniques and soil judging.

INCREASING KNOWLEDGE

Outreach efforts have **improved understanding among key soil survey information users and decision-makers**, particularly about the relevance of soil survey scale and resolution and the importance of the soil resource and its interactions with landscape processes, water, and living organisms.

EASING ACCESS TO MORE RELIABLE, USEFUL DATA

NCERA-003 has modernized and organized the Soil Survey Information database, **easing access to more robust and reliable data, helping users make smart land use decisions in a timely manner.** For example, NCERA-003 combined soil survey information, so that one data set can be used in many different ways and easily transferred between different computer systems and applications. The

committee has also made databases more robust, adding thousands of new soil profiles and associated soil characterization data to the USDA National Soil Survey Lab's (NSSL) Soil Characterization database and incorporating Agricultural Experiment Station and university data into the National Soil Survey database, so that **users can access the specific information they need to manage their land.** The team has also addressed technical problems before data are entered and **reduced concerns about the integrity of data.**

INFLUENCING LEGISLATION

As a committee with diverse expertise, NCERA-003 has collectively **influenced a wide range of legislation and policies**, and members have even provided expert witness testimony in hearings and lawsuits. For example:

- NCERA-003 findings and recommendations, including the need to update the soil survey after every levee breach and subsequent flooding event, were presented during testimony by Ken Olson at the Mississippi River Commission/U.S. Army Corps of Engineers hearing in New Madrid, MO, on March 23, 2015.
- NCERA-003 members have screened soil damage analyses as part of a federal lawsuit brought by 140 New Madrid floodway farmers over the extent and cost of soil damage as a result of floodway use.
- Discussions with NCERA-003 members have prompted the NRCS to shift research focus to include rapid carbon assessment, salinity, soil quality, and laboratory soil carbon analyses.
- As a result of the NCERA-003 committee's persistent work, the NRCS has changed both the approach and the documentation of eroded soils in the NCSS program.
- NCERA-003 convinced the NRCS to reopen negotiations with the USGS to cooperate in a national geochemical landscape initiative that will provide in-depth soil information.

ADDRESSING ENVIRONMENTAL PROBLEMS

The efforts of NCERA-003 have **given the field of soil science a better position and resources to effectively address environmental concerns.** For example, NCERA-003 has offered valuable advocacy and guidance that has **influenced remediation approaches and levee management decisions in areas affected by flooding.** Data collected by the group has been used to support crop yield and biomass estimates and has **improved models that better predict yield within the context of changing climate.** These crop yield and biomass data have also been useful in **identifying suitable soils for bioenergy production.** Many states and counties also **used crop yield and biomass estimates to inform accurate land appraisals and assessments.**

Want to know more?

NCERA-003 was supported, in part, through USDA's National Institute of Food and Agriculture by the Multistate Research Fund established in 1998 by the Agricultural Research, Extension, and Education Reform Act (an amendment to the Hatch Act of 1888) to encourage and enhance multistate, multidisciplinary research on critical issues that have a national or regional priority. For more information, visit *http://ncra.info/*.

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This Impact Summary was compiled and designed by Sara Delheimer.

Papers & Presentations

- Members have issued publications, reports, and *Soil Horizons* articles.
- The group's first soil carbon sequestration paper, published in *Soil Science Society of American Journal* was downloaded 3,500 times in 11 months (most papers gets 153 downloads in a life time).
- The group's second soil carbon sequestration paper, published in the *Journal of Soil and Water Conservation*, was the 7th most downloaded for four months straight.
- NCERA-003 members delivered an influential presentation on classification of human-impacted soils at 18th World Congress of Soil Science that prodded other countries to include human-impacted/eroded soils in their classification systems.
- As a result of active support by NCERA-003 members and NRCS cooperation, the Smithsonian Soils Exhibit opened in 2008 for 18 months with specific information on the benefits of soil survey information. This exhibit introduced the field of soil science to over 1 million visitors each year.
- Workshops, training sessions, courses, and online training sessions have been conducted for students (including K-12).
- The committee sponsored and co-organized the Soil Carbon and Greenhouse Gas Dynamics in Agricultural Land symposium. The symposium gave policymakers the information they needed to develop a soil carbon cap and trade credit program.

Corn roots in healthy soil. Photo by Ron Nichols/NRCS.