National Cooperative Soil Survey Newsletter

August 2013
Issue 64

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Editor's Note

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2013 National Cooperative Soil Survey Conference: Report from the Soil Science Division

By Maxine Levin, Acting Associate Director Soil Survey Program, and Ken Scheffe, Acting Assistant Program Manager, Soil Science Division, NRCS.

The 2013 National Cooperative Soil Survey Conference, co-hosted by the University of Maryland, the NRCS Maryland soils staff, and the Mid-Atlantic Association of Professional Soil Scientists, was held at Annapolis, Maryland, the week of June 16–20, 2013. Dr. Martin Rabenhorst, professor of environmental and science technology, and Dean Cowherd, Maryland assistant state soil scientist, welcomed participants to Annapolis and coordinated conference activities and tours. The conference theme "Soil Survey—Planning for Soil Health in the Critical Zone" was highlighted by the numerous forum presentations on soil health, soil ecosystem dynamics, and global change monitoring. A complete agenda and a list of presentations and reports are available on the NRCS Soils Website.

Dave Smith, Soil Science Division Director, opened the conference and agency report with a vision of "The Future of the U.S. Soil Survey." Mike Golden, Deputy Chief for Soil Science and Resource Assessment, provided an "Update on National Cooperative Soil Survey Accomplishments." Jennifer Sweet outlined the geospatial support of the NGCE to the National Cooperative Soil Survey (NCSS). Stephanie Connolly provided an update on activities of the U.S. Forest Service National Soil Resource Program. Roy Vick moderated a panel discussion on recommendations brought to the national conference from the North-Central, Northeast, South, and West Regional Conferences held in 2012. Dr. Dave Lindbo, North Carolina State University and President of the Soil Science Society of America (SSSA), rounded out the opening session by challenging the NCSS and SSSA in expanding the horizons of soil as an interdisciplinary science.

The NCSS conference included committee meetings and committee forums. Technical forums were conducted in conjunction with committee work. The committees in action for the 2013 NCSS National Conference included:

- Soil and Ecosystem Dynamics Committee; co-chaired by Susan Andrews, NRCS, and Mike Duniway, U.S. Geological Survey;
- NCSS Standards Committee; co-chaired by Dr. John Galbraith, Virginia Tech, and Cameron Loerch, NRCS;
- Interpretations Committee; co-chaired by Dr. Amir Hass, West Virginia State University, and Robert Dobos, NRCS;
- Research Agenda Committee; co-chaired by Nancy Cavallaro, National Institute of Food and Agriculture, and Candiss Williams, NRCS; and
- New Technology Committee; co-chaired by Dr. Phillip Owen, Purdue University, and Dave Hoover, NRCS.

The Tuesday plenary session was led by Dr. Wayne Honeycutt, Deputy Chief for Science and Technology, NRCS, who introduced the conference theme of "Planning for Soil Health" in the critical zone with a history of conservation in the U.S. and a description of the value of healthy soils in sustaining food supplies, clean water, and a healthy ecosystem. Dr. Michelle Wander, University of Illinois, discussed the relationship of soil health in the critical zone to sustainable agriculture, including the need for information on dynamic soil properties and the roles of producers, the agricultural industry, scientific researchers, third-party certifiers, and governments in establishing standards for a safe food supply and sustainable agriculture. Dr. Eugene Kelly, Colorado State University, outlined the need for network level science to address the complex relationships of global change and enable research to expand beyond traditional sites to encompass global systems. Dr. Oliver Chadwick, University of California, Santa Barbara, summarized research of Polynesian agriculture serving as a bioassay of pedogenic thresholds as a function of climate, parent material age, and nutrient-supplying capacity. Dr. Ed Ayres, soil scientist, and Dr. Eve-Lyn Hinckley, staff scientist, National Ecological Observatory Network (NEON), outlined their plans to develop 60 terrestrial sites to monitor environmental changes, including opportunities for partnerships in soils investigations and analyses.

Tuesday afternoon was dedicated to continued committee meetings and forums.

Two technical field tours were provided for participants in conjunction with the conference. The tours are well documented in the "Guidebook for Field Trips." The first tour, which was on Sunday before the conference, visited the Maryland Piedmont region. The first stop of the first tour was on the serpentine barrens along the Eastern piedmont of the United States. Soils that formed from serpentinite were examined, and the effects of this parent material on soil uses and soil health were discussed. It was noted that the first ecological site description for Maryland had been developed for the soils and ecosystems in the serpentinite barrens. The second stop was on the Piedmont near the fall line in Patapsco Valley State Park. The participants examined soils that formed from coastal plain sediments at the base of the fall line and in residuum from crystalline rocks at the top.

The main conference tour, which was on Wednesday, visited the Delmarva Peninsula on Maryland's Eastern Shore. The tour focused on hydrology and soils in late Pleistocene deposits and on the potential impact of climate change and rising sea levels. Stops were made to examine a soil topohydrosequence formed in late Pleistocene dunes of the Parsonsburg Formation, a topohydrosequence of hydric soils along a submerging marsh landscape at Blackwater National Wildlife Refuge, and soils that formed in loess deposits near Chesapeake Bay. Dr. Del Fanning of the University

A soil pit on the main tour for the conference. The tour visited the Delmarva Peninsula on Maryland's Eastern Shore. The soil pits on the tour were deep and wet.

of Maryland demonstrated exploding soil by mixing hydrogen peroxide with an acid sulfate (sulfidic) subaqueous soil from Chesapeake Bay.

The Thursday morning plenary session consisted of a town hall meeting of NCSS partners followed by an international forum. The town hall meeting was convened by David Smith, Soil Science Division Director, to discuss strategic planning for the future of NCSS in light of the recent budget cuts, sequestration, and likely future budget reductions. The recent restructuring of the Soil Survey Program facilitates a scalable program, but reduced funding results in reduced capacity regardless. Top concerns being addressed by the Division include filling field vacancies and increasing communication with partners regarding changes to structure and staffing. A brainstorming session was conducted to examine the levels of interest and influence of stakeholders, to consider technical and societal issues, and to categorize and contemplate the challenges, obstacles, and opportunities facing NCSS in its mission objectives.

Thomas Reinsch, NRCS National Leader for World Soil Resources, led off the international forum. He discussed the Universal Soil Classification project, GlobalSoilMap.net project, and the Global Soil Partnership. Dr. Sonja Ahmed of Columbia University provided an update of recent activities in "Developing Digital Soil Maps of Africa." Eliseo Guerrero of the National Institute of Statistics and Geography in Mexico delivered an overview of "Soil Mapping in Mexico." Dr. John Galbraith of Virginia Tech concluded the international forum by outlining the "Challenges to Sustaining Agriculture Production in Bhutan and Nepal."

The winners of the annual NCSS awards for 2013 were honored at an awards luncheon on Thursday. Lindsay Hodgman received the Soil Scientist of the Year

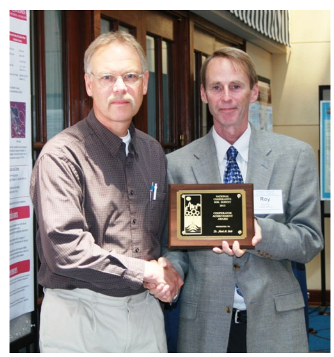
Award; Skip Bell received the NCSS Achievement Award; and Dr. Mark Stolt of the University of Rhode Island received the Cooperator of the Year Award. Retired Director of Engineering Neil Bogner provided the keynote luncheon address. He chronicled the history of the Civilian Conservation Corps in Maryland.

The Thursday afternoon session began with a report on "The International Soil Carbon Network" by Chris Swanston. The summary reports and recommendations of the conference committees rounded out the afternoon and were followed by the conference business meeting. Susan Andrews reported on the activities and recommendations of the Soil and Ecosystems Dynamics Committee. The NCSS Standards Committee report and recommendations were delivered by Cam Loerch. The report and recommendations of the Interpretations Committee were delivered by Robert Dobos. Candiss Williams reported on the recommendations of the Research Agenda Committee. Dave Hoover finished the committee reports session with a report on the recommendations and proposals of the New Technology Standing Committee. ■

2013 NCSS Awards

The National Cooperative Soil Survey partnership presented the annual NCSS awards for 2013 at its national conference in Annapolis, Maryland, on Thursday, June 20, 2013. Lindsay Hodgman received the Soil Scientist of the Year Award, Skip Bell received the NCSS Achievement Award, and Dr. Mark Stolt received the Cooperator of the Year Award.





NRCS Associate Director for Soil Operations Roy Vick presents the 2013 NCSS awards. From left to right, the award winners are Lindsay Hodgman, assistant state soil scientist at the NRCS state office in Orono, Maine; James "Skip" Bell, NRCS soil survey office leader at Morgantown, West Virginia; and Dr. Mark Stolt, professor of pedology and soil environmental science at the University of Rhode Island.

Soil Scientist of the Year Award

The 2013 Soil Scientist of the Year Award went to Lindsay Hodgman, USDA–NRCS. Lindsay is assistant state soil scientist at the NRCS state office in Orono, Maine. She won the award for her cumulative achievement over the last 7 years, particularly as it related to completing the initial soil survey in Maine and to transitioning to the MLRA concept of soil survey.

Lindsay has played a central role in the successes of soil survey in Maine and of the soil survey offices that cover MLRAs 144B and 143. NRCS could not have met the 2010 deadline for completing the initial soil survey (about 2 million acres in the last 4 years) without her excellent assistance in developing and correlating the SSURGO tabular and spatial data. Leading up to the current reorganization of the Soil Science Division, she has been providing support for the Soil Data Join and Recorrelation Initiative in Maine.

Lindsay conducts technical soil services for Maine, including the National Resources Inventory, Highly Erodible Land issues, and the wetland conservation provisions of the Food Security Act. Her expertise at NASIS and ArcGIS maximizes the efficiency and service of resource soil scientist functionality to field offices and clients. Her insights into the details and ramifications of calculating K, T, and hydrologic soil group data have been helpful at the local, regional, and national level. Similarly, she has worked closely with other soil scientists and the Soil Business Branch of the Soil Science Division on issues related to decommissioning the Soil Data Mart. She is totally at ease working in both technical soil services and soil survey. Her work inspires confidence as NRCS employees seek to improve their skills with NASIS and spatial data and apply those skills to the Agency's initiatives and priorities.

NCSS Achievement Award

The 2013 NCSS Achievement Award went to James "Skip" Bell, USDA–NRCS. Skip is the soil survey office leader at Morgantown, West Virginia. He has performed exemplary work for the Soil Survey Program since beginning his career in southern West Virginia in 1980, where he worked on three surveys and completed a mapping detail to Florida. During this time, he also assisted with the Direct/Delayed Response Project (a.k.a. "Acid Rain Project" or "Acid Deposition Project") in West Virginia and Virginia. Skip was promoted to soil survey project leader in the late 1980s when he went to Berkeley and Morgan Counties, West Virginia. Skip authored the soil survey reports for those two counties and started a third (Jefferson County, West Virginia) before being promoted to resource soil scientist for the east area of West Virginia (Moorefield, West Virginia). The resulting soil survey reports are recognized as two of the best in West Virginia. As resource soil scientist, he represented the State as an active member of the Mid-Atlantic Hydric Soils Committee and managed a detailed soil survey update of a 4,800-acre Federal installation at Camp Dawson, West Virginia.

In the winter of 2003, Skip was selected as a soil data quality specialist (SDQS) for the MLRA Soil Survey Region 13 Office in Morgantown, West Virginia. As SDQS, he assisted project offices in MLRAs 127, 147, 149A, 153C, and 153D in Maryland, Delaware, and West Virginia. During this time, he provided quality assurance on at least 14 update projects.

Skip served as SDQS for 4½ years before being selected as soil survey office leader for Soil Survey Office 13–3 in Morgantown, West Virginia. In this current role, he has provided training and supervision for six employees, leading to promotions for all of his staff and to continued collaboration. This speaks volumes for his ability to develop staff both professionally and on a personal level. Over the last few years, Skip has worked closely with the U.S. Forest Service (USFS) and West Virginia University (WVU) to identify Spodisols and spodic properties for ecological site descriptions of high-elevation, red spruce areas in West Virginia. He has worked collaboratively with graduate students from WVU to assist with soil survey projects and to provide assistance for research projects. This collaborative effort has strengthened the cooperative partnership in West Virginia between NRCS, USFS, and WVU.

NCSS Cooperator of the Year Award

The 2013 NCSS Cooperator of the Year Award went to Professor Mark Stolt, University of Rhode Island (URI). As one of the few remaining professors of pedology in the New England region, Mark has been at the forefront of advancing soil science and providing crucial leadership to the NCSS since his arrival at URI in the late 1990s.

At the 2012 Regional Soil Survey Conference in Maine, Mark was the recipient of the Northeast Silver Spade Award for his many years of contribution to the regional and national conferences. His work with subaqueous and hydric soils has enabled advances that would not otherwise have happened, including improvements to the quality and quantity of soil survey products.

Mark's achievements that have led to significant advancements in the Soil Survey Program include the following.

- Mark led the effort to get the Coastal and Marine Ecological Classification System (CMECS) to include a soils component into the system that NOAA will require where Federal funding is provided for mapping. The CMECS was developed over 10 years by a partnership established in Rhode Island. The "Mapping Partnership for Coastal Soils and Sediment" (MapCoast) worked with a non-traditional group of coastal ecologists. Version 3 of CMECS added a 4th component, called the sub-benthic component, which basically consisted of soil taxonomy and traditional soil survey methods.
- Mark developed a new suborder of Entisols ("Wassents") and a new suborder of Histosols for the Keys to Soil Taxonomy, 11th edition, 2010. From 2001 to 2010, Mark spearheaded a movement along the eastern seaboard to develop a system to classify the subaqueous soils that Dr. George Demas initially conceptualized in the 1990s. A system was needed so these soils could be mapped and interpreted by NCSS. Mark chaired the subaqueous soil subcommittee at the regional and national conferences and worked with the committee to systematically develop the classification system, define soil landscapes and parent materials, and develop mapping and laboratory protocols. In 2005, he took a sabbatical to travel the U.S. to provide information about these soils and obtain input from cooperators.
- As a result of Mark's work, NRCS in Rhode Island was able to complete the first SSURGO coastal zone soil survey in 2011 and the first SSURGO freshwater soil survey in 2012. To develop critical soil interrelations, Mark has been advisor for five graduate and doctorate students completing their studies on submerged soils and landscapes. The results of these studies have been incorporated into the soil survey of the Rhode Island coastal zone.
- Mark is the chair of the New England Hydric Soils Technical Committee, a group formed in 1990 to develop regional indicators of hydric soils. This committee consists of over 15 individuals from State government, Federal government, private sector, and universities. The members meet regularly and tour the region to improve the knowledge of wetlands and hydric soils.
- Mark helped with the Rapid Carbon Assessment (RaCA) in Rhode Island. He provided laboratory space for the RaCA liaison, staff, equipment, and the hundreds of boxes of samples (over 7,000 pedons). He entered into a cooperative agreement with the National Soil Survey Center to hire five student assistants for drying, sieving, grinding, and scanning samples and entering the data. Mark also set up an undergraduate study to better calibrate the spectrometer data by comparing the VNIR data with loss-on-ignition carbon analysis.
- Mark has had an exemplary record leading the URI soil judging team. Each year since his arrival, the URI team has improved, leading up to a first place win in the individual contest at the Nationals in 2010 and 2013 and a first place win in the team contest at the Nationals in 2011. Mark also hosts the Northeast Intercollegiate Pedology Tours, Society workshops, and NRCS training sessions, such as the national subaqueous soil workshops. Mark also serves as the president of the Society of Soil Scientists of Southern New England, a professional society that has over 250 members. The society regularly hosts field-and-lecture type workshops that provide soils training to members. ■

Latest NRCS Science and Technology Helps Agriculture Mitigate Climate Change

USDA's Natural Resources Conservation Service (NRCS) has developed the world's largest soil carbon dataset to help producers and planners estimate the impacts of conservation practices on soil carbon levels. USDA is committed to reducing agriculture's carbon footprint and finding modern solutions for environmental challenges.

NRCS Chief Jason Weller said, "It is our obligation to equip landowners with the most up-to-date information and technical assistance so we can mitigate the impacts of climate change and help secure sustainable food production systems for the American people."

Soil has tremendous potential to store carbon. Such storage reduces the levels of carbon dioxide in the atmosphere. Carbon dioxide is one of the leading greenhouse gases contributing to climate change. Storage potential varies among soils, land covers, land uses, and management.

In developing the soil carbon dataset, NRCS soil scientists took 148,000 individual soil samples and evaluated them for carbon content. The dataset of this Rapid Carbon Assessment, or RaCA, serves as a baseline for the amount of carbon each soil type is holding.

"By understanding our soils' current carbon content, we can target the ones with the greatest potential to store additional carbon. Planners can use models (where accuracy is enhanced by RaCA data) to better predict the impact a conservation practice might have on enhancing the soil's carbon content," said Christopher Smith, NRCS soil scientist.

Increasing soil carbon is also the single most important component of soil health, according to Smith.

Several conservation practices, such as conservation crop rotations and planting cover crops, increase carbon storage in soil. These practices take carbon dioxide out of the atmosphere and deposit it into the soil as organic matter. They also reduce erosion and increase water-holding capacity and water infiltration, which increase resiliency to drought, heavy precipitation, and extreme temperatures.

COMET-Farm™ and the Agricultural Policy/Environmental Extender (APEX) are new tools that landowners can use to calculate how much carbon their conservation practices, such as cover crops, can remove from the atmosphere.

COMET-Farm™, developed in a partnership between USDA and Colorado State University, is a free online tool that allows producers to enter information about their farm or ranch management practices and receive general guidance on actions they can take to build carbon in their soil.

APEX, developed in partnership with Texas Agrilife Research, Texas A&M, and USDA's Agricultural Research Service and NRCS, was planned for use by NRCS conservation planners and private technical service providers. This tool can assist NRCS and landowners in properly managing nutrients to keep a balance between soil carbon gains, production goals, and impacts on water quality.

The Rapid Carbon Assessment, COMET-Farm™, and APEX open the door to new possibilities for producers, according to Dr. Adam Chambers, scientist with the NRCS air quality and atmospheric change team in Oregon.

If carbon can be quantified, verified, and then sold into carbon markets, it is "another potential revenue stream for producers," said Chambers.

Chambers indicated that, as of January 1, California began regulating a cap-and-trade carbon credit market for industries. The first State to do so, California is looking for agricultural greenhouse gas emission reduction and carbon sequestration projects to provide offsets into their regulated markets.

“The Rapid Carbon Assessment provided baseline data on how much carbon is in each soil type. COMET-Farm™ can then be used to show how different management practices can increase that soil carbon,” said Chambers, who is guiding the work in environmental markets for the agency through NRCS Conservation Innovation Grants programs.

To find more information on COMET-Farm™, APEX, and the Rapid Carbon Assessment and on how NRCS can help you mitigate climate change, visit your nearest NRCS field office.

USDA makes many efforts to help America’s farmers, ranchers, and forest owners adapt to new challenges caused by a changing climate, including more intense weather events, increased risk of wildfire, and greater prevalence of invasive species. Although assessments regarding the future of agriculture and forestry show that climate change holds challenges in the years ahead, American producers are longtime leaders in innovation, risk management, and adaptation. USDA has supported these efforts for more than a century. It is now developing new tools to help rural America create climate solutions and play a role in President Obama’s comprehensive effort to reduce carbon pollution. More information on USDA’s work is available at http://www.usda.gov/climatesolutions.

USDA’s Natural Resources Conservation Service helps America’s farmers and ranchers conserve the Nation’s soil, water, air, and other natural resources. All programs are voluntary and offer science-based solutions that benefit both the landowner and the environment. ■

RaCA II—Rapid Carbon Assessment in Hawaii

By Mike Kolman, soil survey office leader, NRCS, Kealakekua, Hawaii.

As a continuation of the effort to evaluate carbon stocks in the United States, the soil survey office in Kealakekua, Hawaii, and the University of Hawaii—Manoa (UH–Manoa) have partnered to collect and analyze soil carbon data for the NRCS-sponsored Rapid Carbon Assessment (RaCA) in the State of Hawaii. Support for UH–Manoa to help with collection and processing of the soil samples is provided by an agreement through the Cooperative Ecosystem Studies Units Network. Funding for travel and logistics for the sampling personnel is provided by the USDA National Soil Survey Center (NSSC).

Soil scientists Mike Kolman and Amy Koch from the Kealakekua soil survey office, along with Michelle Lazaro from UH–Manoa, are the primary team members sampling soils this summer. They were trained in RaCA methods by Kari Sever, soil scientist and RaCA coordinator from the soil survey office at Ft. Collins, Colorado (fig. 1). NRCS Earth Team volunteers and UH–Manoa students are providing support in the field and at the UH–Manoa lab (fig. 2).

Figure 1.—Soil sampling at a forest site on Hawaii (left to right): Amy Koch, Michelle Lazaro, Mike Kolman, and Kari Sever.

Soils are being sampled at 48 locations across the Hawaiian Islands (fig. 3) using sampling protocols provided by NSSC. The sampling protocols are the same as those used on the mainland during the first phase of RaCA. Each site consists

Figure 2.—Soil sampling at a range site on Hawaii (left to right): Michelle Lazaro, Earth Team volunteer Alex Beaton, Amy Koch, and Mike Kolman.

of a central pedon and four outer pedons. Bulk density samples are taken for the top 50 centimeters using the scoop, core, or compliant-cavity methods. If new horizons exist, additional grab samples are taken at depths of 50 to 100 centimeters for VNIR analysis. The samples are sent to UH–Manoa, on the Island of Oahu, for further processing and VNIR analysis. The data are being incorporated into summary tables that will be provided to NSSC and other users. The data will be incorporated into the National Soils Information System (NASIS) for use in conservation planning. The data are expected to be particularly valuable for providing information about the effects of conservation practices on soil carbon stocks as users address soil-condition resource concerns and global carbon accounting.

Each site brings new challenges in logistics, terrain, weather, vegetation, and soil conditions. Sites are located on both public and private lands on the Islands of Kauai, Oahu, Maui, and Hawaii. Access to U.S. Federal lands and State of Hawaii lands must be coordinated with other agencies and their land managers. Access requests usually begin with contact by mail or email, followed by a phone call to secure permission and schedule a site visit. Travel between islands is by commercial airlines. Sampling equipment is shipped by air to work locations, and soil samples are shipped by air to

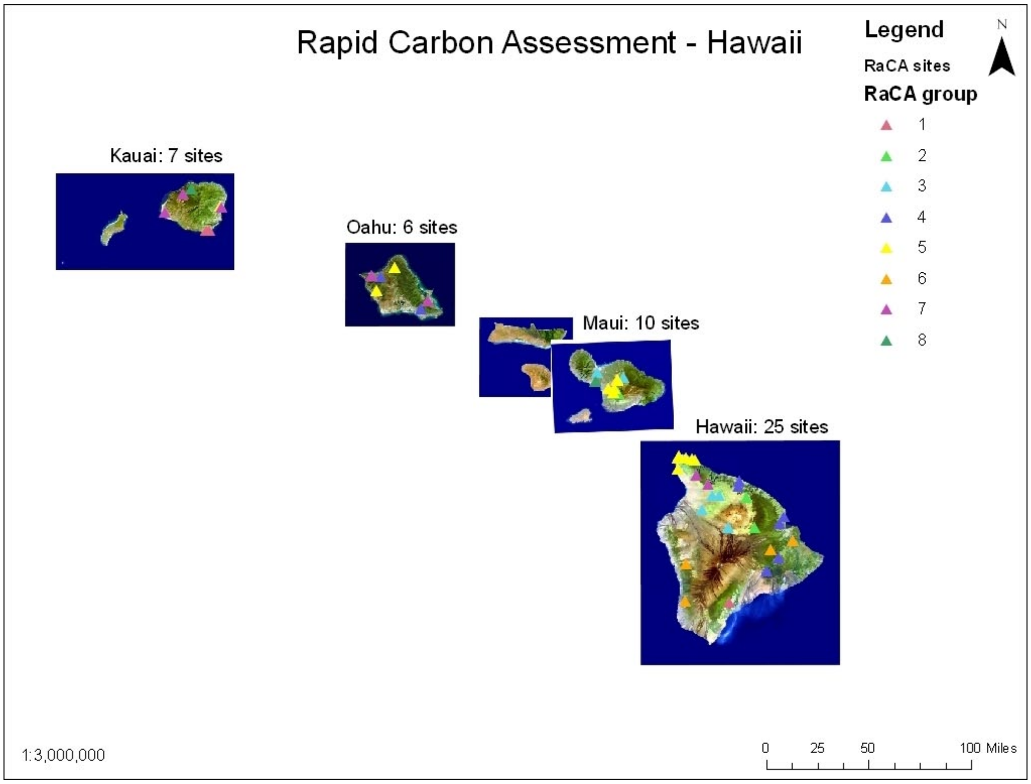


Figure 3.—Map showing the distribution of 48 RaCA sites in the Hawaiian Islands.

the UH–Manoa lab for analysis. All site visits, sample and equipment shipments, plane reservations, and hotel reservations are carefully coordinated to ensure that all sites can be sampled during week-long expeditions to each of the islands.

Among the tropical island landscapes, the team sampled soils on many different landforms, including shield volcanoes, \`a\`a lava flows, pahoehoe lava flows, ash fields, alluvial fans, saddles, ridges, and valleys. With the exception of a couple of rainy days and the period around Tropical Storm Flossie, the weather was mostly pleasant because it was the dry season on most of the islands. For all site locations, the mean annual rainfall ranges from 250 to 4,000 millimeters, elevation ranges from sea level to about 2,133 meters, and mean annual air temperature ranges from 11 to 26 degrees C.

Vegetation at each site varies with the ecosystem and land use. Land covers consist of crops, wetlands, grasslands, dryland forests, and rainforests. The soils that are being sampled represent seven different soil orders: Andisols, Aridisols, Histosols, Inceptisols, Mollisols, Oxisols, and Vertisols. So far, 60 percent of all sites have been sampled on the islands of Hawaii, Maui, and Oahu, and sampling trips are currently being planned for the islands of Maui and Kauai. ■

The Importance of Conducting the Rapid Carbon Assessment (RaCA) Study in the Caribbean Area

By Carmen Santiago, state soil scientist, NRCS, Puerto Rico, and Dr. Erika Marin-Spiotta, University of Wisconsin, Madison.

Land-use change, especially deforestation for agriculture, is the second largest source of carbon dioxide (CO_2) emissions from the terrestrial biosphere to the atmosphere and is a major contributor to anthropogenic climate change and soil fertility decline. Globally, soils can store two to three times more carbon than the atmosphere and all plant vegetation. Understanding how different land uses affect the amount of carbon retained in soils is important for predicting the response of soils to changes in human activities, for quantifying the potential of soils to sequester carbon to help mitigate climate change, and for food security.

Tropical soils play an especially important role in the global carbon cycle because they are typically very deep, cover a large geographic extent, and contain large amounts of carbon. Although tropical regions are experiencing exponential human population growth and increasing demands for land, existing data and scientific understanding of the effects of land use on tropical soils do not represent the diversity of tropical landscapes.

The Caribbean area is a model system to use in studying how interactions between land use and environmental conditions affect soil carbon.

For example, despite its small size (100 miles long by 35 miles wide), Puerto Rico encompasses a wide diversity of climatic regions, ecosystems, and soil types. The large range of soil formation factors in Puerto Rico has contributed to a very high diversity of soil types. Puerto Rico is composed of landforms and geomorphic surfaces that date from Jurassic to mid-Miocene volcanic, metamorphic, and plutonic rocks and that are overlain by younger Oligocene to recent carbonates and other sedimentary rocks. Sierra Bermeja, the oldest formation (approximately 190 million years old), is in the southwestern part of the island. The island’s topography results in climatic conditions that range from perhumid in the northeast rainforest to arid in the southwest dry forest. In Puerto Rico, 10 of the 12 soil orders classified in the USDA soil classification system have been recognized: Entisols, Inceptisols, Histosols, Spodosols, Vertisols, Mollisols, Aridisols, Alfisols, Ultisols, and Oxisols. Only Andisols and Gelisols are missing. Thus, Puerto Rican soils represent an incredible diversity of soil types.

The availability of historical data (aerial photographs, economic and demographic data, and land cover maps) makes the Caribbean area one of the best places in the tropics to study land use. By the late 1800s, more than 90 percent of Puerto Rico and the U.S. Virgin Islands was deforested for agriculture, mostly sugarcane production. Today, the islands are predominantly covered by young to old secondary-growth forest because much of the agricultural land has been abandoned. The diverse mix of land uses in Puerto Rico and the U.S. Virgin Islands, including cropland, pastureland, forest, wetlands, and urban areas, and the detailed soil and climate databases make the Caribbean area a model system for the research and study of soil carbon pools and dynamics.

In the 1990s, two case studies were conducted in Puerto Rico by the University of Puerto Rico–Mayagüez Soil Science Department, the USDA Soil Conservation Service (now the Natural Resources Conservation Service), the NRCS World Soil Resources, and the NRCS Caribbean area office. The main objective of the publication “Organic Carbon Sequestration in the Soils of Puerto Rico—A Case Study of a Tropical Environment” (February 1992) was to document and evaluate the soil carbon status in a tropical environment and to identify subject matter areas for future research. The main objective of the publication “Factors Controlling Carbon Sequestration in Tropical Soils—A Case Study of Puerto Rico” (March 1996) was to present the findings of a study conducted to determine which environmental factors play critical roles in the process of carbon sequestration in tropical soils, using the database of soils from Puerto Rico.

Following are some of the important findings and conclusions of the above-mentioned 1992 and 1996 case studies.

- After 10 years of cultivation, soil carbon declined to 45 percent of that of mature subtropical forest. Soil carbon under continuous cultivation reached a new steady-state where additional losses were no longer possible, regardless of life zone.
- Intensive agricultural management systems in humid tropical climates led to the greatest carbon accumulation rates in soils, especially in systems with grasses and legumes that have abundant root production.
- After 50 years of agricultural abandonment and forest regrowth, soil carbon under secondary forest increased to approximately 94 percent of that of mature forest.
- Soils with aquic moisture regimes averaged nearly twice the content of organic carbon as soils with udic and ustic regimes.
- Soils under forest averaged nearly twice the content of organic carbon as soils used for cropland or grassland.

These previous reports highlighted the need to increase the amount of soil characterization data available for tropical soils and to develop algorithms for the estimation of soil carbon stocks given specific temperature, precipitation, and land use. Such efforts would increase our ability to predict the effects of future land use change and climate change on the potential release or sequestration of carbon from soils. Understanding the effect of environmental variables on soil carbon and interactions with land use would also improve the evaluation of the effectiveness of different management practices on the sustainability of soil resources.

Currently, NRCS Soil Science Division staff in the Caribbean area are working on the second phase of the NRCS Rapid Carbon Assessment (RaCA), which is an effort to inventory soil carbon stocks nationwide. The soil carbon inventory will encompass all land uses and include all major ecosystems. The sites selected for measurement were chosen randomly using USDA–NRCS soil maps and land use data. At each location, soil samples will be collected to measure soil carbon, bulk density, and related measures.

The Caribbean RaCA project will study a total of 30 sites throughout Puerto Rico and the U.S. Virgin Islands. The soil samples will be analyzed in collaboration with Dr. Erika Marin-Spiotta, assistant professor and principal investigator for the Biogeochemistry and Biogeography Lab in the Department of Geography at the University of Wisconsin–Madison.

Dr. Marin-Spiotta is studying the effects of environmental and historical factors on the amount and turnover of organic carbon in tropical soils. The primary research objectives are to:

1. Quantify soil carbon under different land uses across environmental gradients in the Caribbean area in order to determine the role of land use and state factors on soil carbon storage,
2. Evaluate the magnitude and persistence of legacy effects of historical land use on soil carbon over time since conversion across different soil types, and
3. Determine the effect of soil type, climate, and land use on the relative importance of different physical, chemical, and biological processes contributing to carbon sequestration in tropical soils.

Carmen L. Santiago, NRCS state soil scientist, describes the Humatas component of the RaCA site in Las Marías, Puerto Rico, under forest management. Dr. Erika Marin-Spiotta (back), University of Wisconsin, teaches University of Puerto Rico-Mayagüez students Yesmarie Chaparro and Keila Ortiz (not shown) how to fill out the RaCA soil description form.

Through the partnership with the NRCS National Soil Survey Center, Dr. Marin-Spiotta will expand the spatial representation of Caribbean area soils in the Rapid Carbon Assessment (RaCA) project and investigate mechanisms influencing soil carbon response to land use. Maps developed for current and past land use and land cover by the International Institute of Tropical Forestry will be applied to target sites to test for the effect of current and historical human activities on soil carbon content and dynamics across environmental gradients.

The end products of the RaCA project will be:

1. Improved maps and knowledge about the distribution of U.S. soil carbon stocks,
2. An inventory of the effects of soil properties, agricultural management, land use, and ecosystem properties on soil carbon stocks,
3. Soil survey databases, selectable by land use and management, of soil carbon levels and related properties,
4. Data based on land use and management that will help conservation planning by estimating gains or losses of soil carbon from land use and management changes, and
5. A publically accessible soil carbon database for model development and validation. ■

2013 Soil Geomorphology Institute

Drs. Doug Wysocki, Phil Schoeneberger, Zamir Libohova, and Curtis Talbot (NSSC) and Jimmie Richardson (NRCS retiree) conducted the 2013 Soil Geomorphology Institute (SGI) from July 8–26. SGI is an intensive, 3-week training that presents soil landscape concepts and develops field skills essential for conducting soil survey within the MLRA concept and for applying digital soil modeling. SGI training blends scientific principles with field observations in a variety of geomorphic settings. SGI participants examined 20 major “soilscapes,” starting in the loess hills in western Iowa and traveling west to the Vasquez Range in Colorado. Skills gained from SGI improve and facilitate the ability to develop soil survey and ecological site descriptions via science-based digital models with an emphasis on soilscape hydrology. SGI integrates geomorphology, stratigraphy, hydrology, and pedology to promote the understanding of soil patterns and water flow in soilscapes. Participants apply SGI concepts in their respective soil survey area as a post-training project. ■

SGI participants at Scottsbluff, Nebraska. Back row, from left: Doug Wysocki (NSSC), Rachel Stout-Evans (MS), Curtis Talbot (NSSC), Manuel Matos (PR), Nick Butler (ME), Tim White (NE), Jo Parsley (NE), Jon Gustafson (CA), Chris Hatcher (MS), Jim Curtis (MS), Stuart Veith (MT), Brent Clabaugh (NE), Randy Riddle (CA), and Bob Mitchell (MT). Front row, from left: Scott Woodall (NM), Tom Burke (CO), Zamir Libahova (NSSC), Janella Cruz (AZ), Shanna Bernal-Fields (OR), Jim Richardson (ID), Christine Ryan (IL), Philip Schoeneberger (NSSC), Angie Elg (NE), and Dave Vyvain (NE).

SGI participants examining a soil catena in the Sandhills near Whitman, Nebraska.

Basic Soil Survey Field and Laboratory Training

By Shawn McVey, national training coordinator, NRCS, National Soil Survey Center.

Basic soil survey field and laboratory training was held June 4–14 in Lincoln, Nebraska. The 2-week training equipped new soil scientists and ecological site specialists with concepts and techniques to carry out field soil surveys in accordance with NCSS policy and technical guidelines.

This year's session was attended by 20 entry-level soil scientists and ecological site specialists from NRCS, U.S. Forest Service, Bureau of Land Management, and Purdue University. In all, the participants represented 14 States. Employees typically have 6 to 18 months of experience at the time of training.

The training included a mix of classroom activities and field trips as well as a tour of the Kellogg Soil Survey Laboratory. Training started with an exercise about why soil surveys are made, followed by presentations on standards in soil survey and soil classification. Soil descriptions and lab data were used to classify soils according to the "Keys to Soil Taxonomy." Learning how to apply geomorphic and stratigraphic principles when defining soil-landscape relationships trained the participants to identify the most important line on a landscape and to delineate landforms. Soils were examined and described in contexts of transecting to verify map unit composition, typifying pedons, and sampling for laboratory analyses. Small group activities were included to train participants in map unit design and documentation needs. Training ended with participants, divided into small groups, presenting digital and paper soil survey maps prepared by their group. The maps were at orders 2 and 3. This year, the maps were of property owned and managed by the Audubon Society. The training laid a foundation to ensure consistent soil survey techniques and quality products.

The training included over a dozen instructors. In addition to instructors from the National Soil Survey Center, the following individuals assisted as instructors and mentors: Bruce Evans, soil survey office leader, Lincoln, Nebraska; Tony Jenkins, state soil scientist, Bangor, Maine; and Dan Wing, soil data quality specialist, Raleigh, North Carolina. ■

George Teachman, NSSC, provides training in the use of digital pens and CapturX prepared forms to convert handwritten drawings and descriptions into neatly digitized documentation suitable for direct upload into databases and/or as supporting documentation for Farm Bill programs. Data uploads are 2.5 times faster using this technology compared to traditional data entry methods.

Wetland Mapping and the Gridded Soil Survey Geographic Database

By Sharon W. Waltman, soil scientist and spatial data specialist, and Lenore Vasilas, soil scientist, NRCS.

Gridded Soil Survey Geographic (gSSURGO) Database

Reliable and readily accessible geographic information about soil is critical for the estimation of many ecosystem services because the soil is strongly related to the services. For example, the amount of carbon that can be stored in soils impacts climate regulation and controls fertility. The ability of the soil to store precipitation and release water to plants can diminish or amplify the impact of agricultural drought events. The capacity for a riparian buffer or a wetland to mitigate pollutants from runoff and regulate water quality depends on the kinds of soils present. Assessments of ecosystem services, analysis, and modeling are being conducted over such large regions that these efforts require detailed and accessible soils information. On March 1, 2013, the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) began offering a detailed soil survey gridded map product called the Gridded Soil Survey Geographic (gSSURGO) Database to better meet this requirement for detailed soil geographic data.

How is gSSURGO different from SSURGO?

It has:

- *A statewide vector feature class called mupolygon*
- *A statewide raster map layer called MuRaster_10m*
- *A statewide collection of attribute records (which corresponds to mupolygon and MuRaster_10m)*
- *A Common Albers Equal Area projection for each land mass*
- *The addition of a new national “value added look up” or “valu” table database with “ready-to-map” attributes in ESRI file geodatabase format*

In October 2012, NRCS established a new policy to release a single snapshot for both gSSURGO and SSURGO data each fiscal year. SSURGO is the precursor soil mapping database. The fiscal-year-2013 release will be based on a snapshot of the database taken October 15, 2013. First edition (new) soil survey data will continue to be released throughout the fiscal year. The goal is to have the same soil data that is accessed through the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) and the Soil Data Access Facility (http://sdmdataaccess.nrcs.usda.gov/) be available to desktop geographic information systems (GIS).

How do I obtain gSSURGO?

Statewide gSSURGO tiles can be downloaded from the NRCS Geospatial Data Gateway website at http://datagateway.nrcs.usda.gov/.

The national collection of gSSURGO data can be obtained by contacting Rosemary Rivera at the NRCS National Geospatial Center of Excellence. (Email: rosemary.rivera@ftw.usda.gov; phone: 817-509-3371)

The gSSURGO dataset was created for use in national, regional, and statewide resource planning and analysis of soils data, including assessment of landscapes that have wetland soils or have soils with the potential to become wetland soils. The gSSURGO 10-meter-resolution soil raster map layer offers rapid display of soil themes over large land areas. The data is easy to combine with other raster data sources (land cover, terrain data, climate, etc.) in a common equal-area map projection. Ready-to-map attributes include soil organic carbon, available water storage, crop productivity indices, root zone depth, available water storage within the root zone, drought-vulnerable soil landscapes, and potential wetland soil landscapes. For details, go to http://soils.usda.gov/survey/geography/ssurgo/description_gssurgo.html.

Wetland Mapping and gSSURGO

Wetland mappers are familiar with many of the traditional SSURGO attributes that help in the wetland mapping process, including the identification of hydric soils. NRCS has developed local lists of map units using hydric soil criteria (USDA–NRCS, March 2013). The lists identify hydric soils for each county, parish, or soil survey area in the United States. These local lists are available at NRCS state offices, at local NRCS field offices, and from the Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/). They are the preferred sources for hydric soils lists used in making preliminary wetland determinations. These sources represent the most up-to-date information and the official soil survey information for each fiscal year (Federal Register, 2012).

Hydric soils reports from the Web Soil Survey can be used to identify areas that are likely to contain hydric soils. The presence of hydric soils, however, is just one of three parameters needed to identify an area as a jurisdictional wetland for purposes of either the Food Security Act (known as the 1985 Farm Bill) or the Clean Water Act. The presence of a hydric soil by itself does not mean that a site is currently a jurisdictional wetland. Hydric soils lists by themselves do not provide information on non-hydric soils that could be utilized for wetland creation purposes, but a combination of hydric soils data, other soils data, and other resource data can provide a better idea of where a wetland may exist. This combination can also be used to target landscapes for programs intended to restore or create wetlands.

Other SSURGO attribute data that may be helpful to wetland scientists include geomorphic position, parent material, water table depth, drainage class, texture, depth to restrictive layer, flooding frequency, and ponding frequency. These data can be used individually or in combination to assist in identifying areas that may contain hydric soils or soils with the potential to become hydric.

The gSSURGO "MuRaster_10m" raster map layer data can be readily combined with other national, regional, and local raster layers, including the National Land Cover Database (NLCD), the National Agricultural Statistics Service (NASS) Crop

What is the "Wetland mapper companion data package for gSSURGO"?

The Association of State Wetland Managers and the Wetland Mapping Consortium are working with NRCS and NCSS to prepare a prototype "Wetland mapper companion data package for gSSURGO." This package includes a second set of State-specific attribute tables for eight attribute tables. These tables are legend, mapunit, cogeomordesc, cohydriccriteria, comonth, component, cosoilmoist, and cosoiltemp. They are in an ESRI personal geodatabase format. This subset of SSURGO attribute tables attempts to create a small, easy-to-manage set of statewide attributes commonly used by wetland mappers in the desktop GIS environment. These data can be used to better refine the PWSL map into areas that are currently wetlands and those that are not. The data can also be used to more accurately classify wetlands by wetland type, such as hydrogeomorphic class, and to assess wetland functions. See http://aswm.org/ or http://clic.cses.vt.edu/WMC/ for additional information about the gSSURGO companion data package.

Data Layer (CDL), and the National Elevation Dataset (NED) to approximate terrain or land cover conditions.

A GIS analyst can use these combinations of datasets to help identify areas that may contain jurisdictional wetlands and to help identify the functional assessment of those wetlands. In combination with other data, the gSSURGO dataset can also be used to assess areas containing soils that are hydric or have the potential to become hydric but are not currently jurisdictional wetlands. Such identification can help to target areas that may be utilized for programs intended to restore or create wetlands.

For example, the gSSURGO data in combination with the NLCD can be used to identify agricultural fields in areas likely to contain soils that are hydric or that can easily be made hydric (fig. 1). These landscapes could be targeted for wetland restoration or creation because they are easy to manipulate due to a lack of vegetation, they are prior-converted wetlands that are not subject to jurisdiction

Figure 1.—Prior-converted wetland (now cropland as identified by Cultivated Crops—NLCD class 82). This area would be identified as a potential wetland soil landscape that could easily be restored to a functional wetland through destruction of any drainage system, increase in hydrology retained on site, and/or replacement of hydrophytic vegetation.

under the Food Security Act, and/or they have currently functioning hydric soils or the correct conditions to easily create or restore a functioning hydric soil.

Potential Wetland Soil Landscapes (PWSL)

The gSSURGO database provides new themes in a "value added lookup table." One such theme is the potential wetland soil landscapes (PWSL) theme ("pwsl1" attribute). The single pwsl1 attribute uses several data attributes in the SSURGO database to identify areas that contain hydric soils or have the potential to become hydric soils with minimal effort.

The PWSL theme attempts to identify areas that are considered wetlands under the Farm Bill and Clean Water Act, areas that may have been wetlands at one time but have been altered and are no longer wetlands, and areas that were never wetlands but may have the potential (with minimal manipulation) to become wetlands. Mapping the pwsl1 attribute using gSSURGO is a good screening tool for identifying areas that contain wetlands, areas to target for wetland creation or restoration, and areas for further field investigation.

In summary, a site is identified as having the potential to be hydric if it is identified as containing hydric soil. If it is not identified as containing hydric soil or is unranked, then other attributes are examined. These include whether the soil is poorly drained or very poorly drained and whether the local phase includes the terms "drained" (fig. 2), "undrained," "channeled," "protected," "ponded," or "flooded." The pwsl1 attribute

Figure 2.—Non-functioning hydric soils can be found in areas drained by ditches. This site would be identified as a potential wetland soil landscape and could easily be restored to a wetland by filling ditches or plugging outlet pipes.

is reported as a percentage of the soil map unit that meets these criteria. Specific criteria used to derive the potential wetland soil landscapes dataset is provided in "VALU1 Table Outline and Column Descriptions" at http://soils.usda.gov/survey/geography/ssurgo/description_gssurgo.html#value.

Figure 3 is a map of the potential wetland soil landscapes for the conterminous United States. Dark brown colors indicate higher concentrations of potential wetland soil landscape components within the SSURGO map unit. White areas on the map represent areas for which the data are incomplete or unavailable or areas that have zero potential wetland soil landscape components. Water bodies are shown in blue.

The ready availability of a detailed, rasterized soil survey layer (gSSURGO) combined with raster data for land cover, terrain, and climate for large land areas can enhance a wetland scientist's understanding of landscape-scale ecosystem functions and services through time. Additionally, the ready-to-map pwsl1 attribute

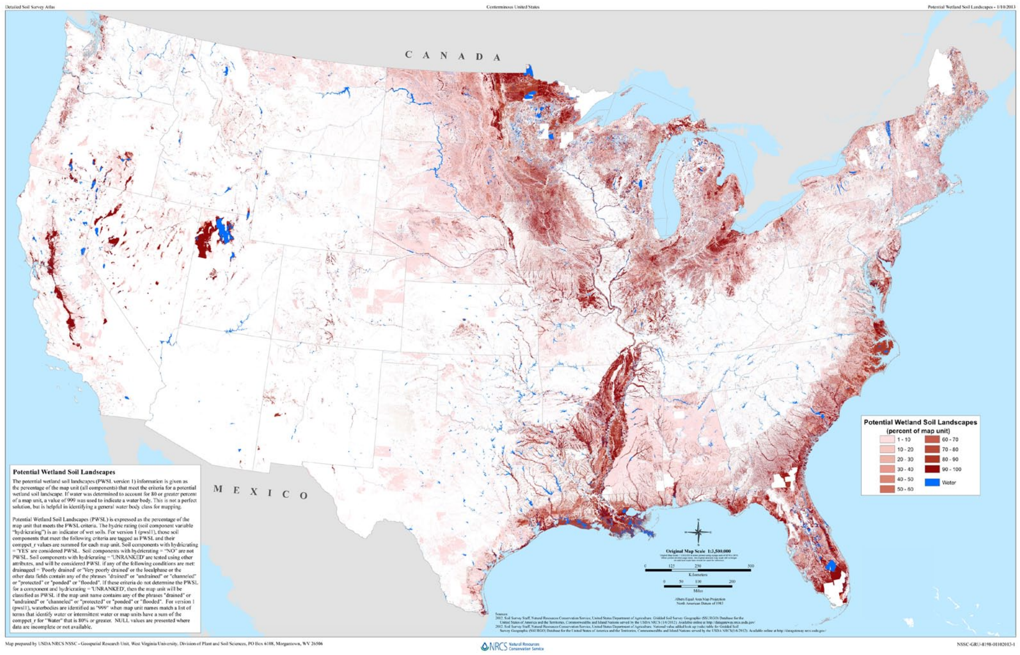


Figure 3.—Map of potential wetland soil landscapes in the conterminous United States based on "pwsl1" attribute for gSSURGO prototype (Soil Data Mart database snapshot taken January 6, 2012). A higher resolution version of this map is available at ftp://ftp-fc.sc.egov.usda.gov/NSSC/SSURGO/conus_potential_wetlands.pdf.

in gSSURGO provides a simple and consistent solution to an otherwise complex query of soil attributes. The attribute saves staff time and resources by screening for soil landscapes where wetlands may presently exist or could be restored or created with minimal manipulation. The gSSURGO raster soils layer is also well suited to application of various GIS simulation models, including those related to wetland mapping.

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There Is Always More to Learn!

By Thomas Nobile, soil and wetland scientist, Environmental Resources, Inc.

Because of changes to plant status and the commonly brief period to observe hydrology, wetland delineation can turn into a soil mapping exercise, especially near the edge of a soil boundary. As a result, scientists need to be particularly aware of soils that present problems involving hydric soil indicators. A recent project in the Mid-Atlantic Coastal Plain area of the Northern Atlantic Slope Diversified Farming Land Resource Region provides an example. Fortunately, despite the challenges of the project, the company was good, the weather was pleasant, and we had cell phone service.

My friend and fellow professional wetland scientist Dave Hardin and I had to drive to the Western Shore of Maryland, across the Bay Bridge and south of Annapolis to a site very near tide. I started in Lewes, Delaware; Dave drove from his office in Easton, Maryland. We had both worked in the area before and knew it could be a head scratcher. If learning something new every day wards off brain issues in later life, then everyone should consider becoming a wetland delineator on the coastal plain.

Dave had asked me to assist with the soils because I am also a certified professional soil scientist. So after catching up, we talked about the site. Our initial thought was that the site was within the horizontal and vertical limits of one of the field indicators for hydric soils (F20: Anomalously Bright Loamy Soil). From the USDA mapping, we knew that the soils likely contained glauconite. Having been in these areas before, I did not think of this as a problem.

Locally, the growing season was a little late and water levels were still at seasonal high levels. In addition, less than 72 hours prior to our visit, a large storm in the area had produced about 2 inches of rain. To make some general soil observations and provide observation points for the water levels, I excavated a number of soil borings in various landscape positions. On the lowest part of the property, hydrophytic plants were dominant, water was just below the soil surface, and hydric soil was described. The field indicator was F6: Redox Dark Surface. Well up the slope, but not horizontally distant, was an upland plant community and the depth to stabilized, free water was recorded at 24 inches. The soil description, however, was still hydric (field indicator A11: Depleted Below Dark Surface). We were lucky to have made the site visit under normal, if not wet, conditions and were able to complete the delineation as planned. This was a case where the three-parameter approach showed its worth.

The description of the “upland” soil, which was described from a pit, is provided below. The soil is similar to the Colemantown series, which is a hydric soil that is mapped onsite.

Depth	Matrix color & extent	Redox	USDA texture	Horizon
In	*(Percent)*			
0–3	10YR 3/1 (100)	NA	Loam	A
3–7	10YR 3/1 (100)	NA	Sandy loam	AE
7–16	10YR 4/2 (60)	7.5YR 4/4, 10YR 4/1	Sandy clay loam	Btg1
16–20	5Y 4/1 (50)	7.5YR 4/4, 10YR 4/3	Sandy clay loam	Btg2
20–24	5Y 4/1 (55)	7.5YR 4/4	Sandy clay loam	Btg3

A nonhydric, glauconitic soil.

The similarity of the “upland” soil to the Colemantown series was surprising. Because of the landscape position, plant community, and hydrology, we had expected the soil to be more similar to the Donlonton series, a somewhat poorly drained to moderately well drained soil. This is when the cell phone came into play. By wonderful luck, both Phil King (NRCS soil scientist) and Al Rizzo (U.S. Fish and Wildlife Service soil scientist) answered their phones. Both are also members of the Mid-Atlantic Hydric Soils Committee (MAHSC) and partners in the National Cooperative Soil Survey. They directed me to the Glossary in Version 7.0 of “Field Indicators of Hydric Soils in the United States.” This is an important document to have for all site visits. Glauconite is described in the Glossary, and the accompanying figure 49 provides some insight into the weathering process. The weathering of sulfides in a glauconitic soil can be mistaken for redox features in a naturally dark matrix. Such a mistake can lead to an incorrect determination of field indicator F6: Redox Dark Surface. To make the correct determination in the field, you need the additional understanding provided by observations of the plants and hydrology under normal conditions, which are not always readily available.

Ongoing work by MAHSC has found, as we did at this site, that soil profiles developed in glauconite can provide both false-positive and false-negative indications of a hydric soil. The committee scheduled a field review to investigate this topic. One initial thought is to consider whether a minimum percent of glauconite is necessary for this problem to develop. If so, can this percentage be readily determined in the field? A report from that MAHSC gathering would be a welcome follow-up to this tale of warning. When in doubt, go back to the definitions and keep digging for more information! ■

Soil Survey Office Projects

By Marissa Theve, soil scientist, NRCS, Connecticut.

Dune Sampling at Cape Cod National Seashore

Donald Parizek, Jacob Isleib, Nels Barrett, and Marissa Theve from the soil survey office in Tolland, Connecticut, traveled to Plymouth and Barnstable Counties, Massachusetts, to sample sandy Hooksan soils. These soils formed in Holocene-aged eolian (windblown) sands that accumulated in the back areas of dunes. The soils of the Hooksan series are currently classified as mesic, uncoated Typic Quartzipsamments. There is, however, some uncertainty as to whether the grains are truly greater than 90 percent resistant minerals/quartz. If they are, the series will retain the "quartzi" designation. If the mineralogy is found to be mixed, the classification will be changed to mesic Typic Udipsamments. Three soil pedons were described and sampled, including two complete pedons on the Cape Cod National Seashore. The sampling was conducted to improve the understanding of the soils and vegetation correlations for future land management objectives. Typical vegetation, as described by ecological site specialist Nels Barrett, included plant inventories of extensive dune lands, pitch pine woodlands, and the enigmatic Beech forest. The soils revealed that some areas of pine woodlands, which accumulate more organic matter than their shrubbier counterparts, and the Beech forest, contained a thin silt layer.

Keeping in mind the current budget climate, the Tolland crew stayed at a local campground and commuted to the seashore for sampling. They stopped along the way to meet the National Park Service staff and briefly discuss future ecological site plans for the region. The team worked with NRCS Resource Soil Scientist Glenn Stanisewski for 2½ days of sampling, resulting in three sampled pedons and two

Nels Barrett, Glenn Stanisewski, Donald Parizek, and Jacob Isleib at a sampling site on the Cape Cod National Seashore.

transects with ecological site data. The samples will be sent to the Kellogg Soil Survey Laboratory in Lincoln, Nebraska, for a full lab analysis.

Post-Active Acid Sulfate Soils

The staff of the soil survey office in Tolland, Connecticut, enlisted the help of Earth Team volunteers Greg Anderson, Michelle Ducharme, and Devin Spector to complete a project on post-active acid sulfate soils in Major Land Resource Area (MLRA) 144A–New England and Eastern New York Upland, Southern Part. The soils in this area formed in Wisconsin-aged glacial till derived from a sulfur-bearing schist bedrock formation called the Brimfield Formation. This highly weatherable, reddish orange bedrock was ground up and smeared into nearby areas during glaciation. When the bedrock and new parent material were subsequently exposed, they oxidized to form sulfuric acid and other acids due to the presence of sulfur-iron compounds (parasesquic mineralogy). The acids leached down over time and left iron compounds in the soil. Water-quality issues related to high iron content in local wells are often associated with the bedrock formation and the soils.

The three series established to describe these soils are Brimfield (shallow to bedrock), Nipmuck (moderately deep to bedrock), and Brookfield (deep to bedrock). The soil scientists and the Earth Team volunteers went to work after a review determined that more field descriptions were needed to meet minimum documentation requirements for the moderately deep Nipmuck series. The team described six Nipmuck locations in a day and a half. Since then, the descriptions have all been entered into the National Soils Information System and are ready for review by the soil survey regional office. ■

Earth Team volunteers Michelle Ducharme (far left) and Devin Spector (far right) assist soil scientists Marissa Theve and Donald Parizek.

Ecological Site Descriptions: Assisting the Nation's Military Mission

By Linda Greene, ACES enrollee, NRCS, National Soil Survey Center.

Assisting the Nation's military mission is not a task the Natural Resources Conservation Service (NRCS) regularly takes up. But in the case of providing ecological site descriptions, NRCS has been on the job. A little more than 10 years ago, the 27,887-acre Camp Bullis Training Site, a subpost of Fort Sam Houston, Texas, needed natural resource guidance to help manage vegetation in support of its training mission. About that same time, NRCS was in the early stages of developing what are now called ecological site descriptions (ESDs). The timing provided a perfect opportunity for both parties. Dusty Bruns, natural resource manager for Camp Bullis (and former NRCS rangeland management specialist), knew the concepts of the ESDs. In 2000, he fostered the first agreement with NRCS to develop the local range site descriptions into ecological site descriptions.

Joint Base San Antonio-Camp Bullis, as it is now called, is a home for military medicine on the outskirts of the 7th largest city in the United States. In addition to field medicine, the mission at the site includes management of endangered species, recreation, watershed protection, resource education, hunting, cultural resources, and realistic training opportunities for troops that do not use tracked vehicles. Parts of Camp Bullis are on the recharge zone of the Edwards Aquifer, which serves as the water source for more than 2 million people.

Not all of the diverse landscapes at Camp Bullis are compatible with all aspects of the camp's mission. For instance, old-growth Ashe's juniper is habitat for the Golden-cheeked Warbler, one of the endangered species at Camp Bullis. Old-growth Ashe's juniper, however, is not hospitable to soldiers training on foot. It is too dense and has too many snags. The dilemma is that the military mission is to not only maintain or improve existing habitat but also to maintain a landscape useable by dismounted personnel. Ashe's juniper is native to some of the ecological sites on Camp Bullis and over time has spread to many other sites. Based on studies, it is much thicker now.

Camp Bullis has a conservation plan with the Alamo Soil and Water Conservation District and has been using NRCS assistance for a long time. Building upon the earlier ESDs, which are correlated to the soils, Lucas Cooksey, senior wildlife biologist, approached NRCS with the idea that a long-term monitoring program was needed. The monitoring would measure progress toward the camp's goals and assist in the evaluation of the many conservation practices being implemented. The state-and-transition models (STM) in the original ESDs were good, but the newer concepts and technology now available to NRCS can help Camp Bullis to meet its mission requirements over the long haul.

A Deep Redland ecological site in near-historic, or reference, condition.

The state-and-transition model is a particularly useful feature of an ecological site description. The STM is a road map to the plant communities that could exist on a particular group of soils, depending on site management or lack of management. Especially helpful are the identification of thresholds within the STM. Simply said, a threshold represents a change in the soils and vegetation that cannot be reversed by such practices as grazing management or prescribed fire. After a threshold has been passed, high-energy-type equipment is needed to restore the ecological community to its previous state. A good ESD describes the milestones and time required for transitions to reach a threshold. Camp Bullis wants to know the milestones so that remedial management can be scheduled in time to maintain a desired plant community.

A multifaceted approach to natural resources management is more important than ever for Camp Bullis. This request could not have come at a better time. According to Mark Moseley, NRCS ecological site specialist and project manager, "The ESD concept has evolved and matured, and now we are in the final stages of a national handbook and are cooperating with many partners. We felt we could parlay the Camp Bullis inventory project into a real-life example of the many ways ESDs can serve landowners. We would also be able to explore these concepts to strengthen and enhance the national guidance. So it all came together with the right folks, right time, and right place."

The first range site concepts and descriptions emerged around 1958. Most were simple documents containing the best science and experiences of the day. Ranchers and NRCS employees were the target audience. The target audience is still the same, but the ESDs have evolved into something that Moseley referred to as "range site descriptions on steroids!" Well crafted and well documented ESDs can serve a greater diversity of landowners with a wider variety of goals than the early range site descriptions. The collection of information for ESDs on Camp Bullis also supports the private landowners of the area.

Before monitoring could be started, a detailed inventory was needed to establish the baseline. This brought Camp Bullis back to the NRCS door. After several consultations between Cooksey, his staff, and NRCS, it was apparent that the camp would not be your average NRCS inventory. Several monitoring elements were needed that were not routine NRCS range inventory work. Examples included 1-hour

David Hinojosa, ecological site specialist, Robstown, Texas, establishing weight units for the composition of vegetation.

fine fuel loading, snags, canopy density, plant diversity, and depth of hydromulched wood chips. Monitoring would also be required for routine elements, such as bare ground, canopy, structure, and annual production. Some creativity was needed to gather information about other elements, including invasive plants, stand densities, height categories, spacing, and species richness. These elements are not recorded in ESDs or in the NRCS national database, but NRCS teams are working to create updated databases. Hopefully, this inventory will encourage enhanced capabilities in the NRCS data system. “Again, timing is everything,” said Moseley. All of this is to help “keep good habitat as good habitat and manage the rest to preserve the mission of Camp Bullis,” he added.

Camp Bullis analyzed its resources and selected 100 geo-referenced points for investigation. A team of range-trained NRCS employees used GPS units to navigate to each point and collected the data specified for the inventory. Photos were taken of each transect. The field data was entered into a customized database for analysis. The outputs from the database were summarized and linked to ArcMap for visual interpretation.

The data is now being analyzed to update the 2000 versions of the ESDs. Moseley explained, “An ESD is also a scientific document that has legal standing. It contains scientific data and interpretations and is updated as new science becomes available.” He made it clear, however, that NRCS is not a regulatory agency. He stressed that the ESDs provide “...the best science available at the time and what ecological processes change as plant communities change. They provide information designed to help the landowner make informed choices—choices designed in the best interest of the land.”

Many tools are available to help landowners evaluate their management choices. Range Health Assessments, for example, quantify the impacts of various land management scenarios.

Camp Bullis has a huge task in maintaining the landscape over time while meeting a diverse military mission. The camp is using many partnerships in the process. The newer ESDs will not only be important tools for the camp but will also serve the greater good through NRCS technical assistance to private landowners.

Moseley emphasized that the ESD development was a collaborative effort that involved more than 30 individuals, all of whom had a significant role in making the project a success. “It’s the day-to-day work of collecting data, creating inventories, or developing databases that contributes to the overall results,” said Moseley. “A finer team of natural resource professionals couldn’t be found anywhere,” he added. “The fact that this project can serve as the template for all other ecological site descriptions says it all.” ■

Latest Version (3.0) of Web Soil Survey

By Linda Greene, ACES enrollee, NRCS, National Soil Survey Center, Lincoln, Nebraska.

The latest version of the Web Soil Survey (WSS 3.0) was recently launched by the USDA’s Natural Resources Conservation Service (NRCS) and can be accessed at http://websoilsurvey.nrcs.usda.gov. This Web-based application provides access to a wealth of free soils information, including soil maps, descriptions of soil properties, and interpretations aimed at helping with land use decisions. The website, originally launched in August 2005, continues to be improved and enhanced to meet the demands of its growing customer base. The site receives several million hits a year.

The first and most noticeable change in WSS 3.0 is that the maximum size for an area of interest has been increased from 10,000 acres to 100,000 acres. The map imagery and map appearance have also been improved and are now based on imagery from Bing. The number of options for changing map properties has been expanded to include soil boundary color, soil boundary thickness, soil label size, and background image shading. In addition, the "identify" tool can now display information about multiple data layers at the same time.

Special line features are now labeled according to the type of line feature. The label is an abbreviation, such as "ESO." The viewer can now use the "identify" tool to see the name of the corresponding feature, such as "Escarpment, nonbedrock."

SSURGO and STATSGO2 data can now be downloaded directly from WSS. The viewer no longer needs to define an area of interest or go to the Soil Data Mart to get these data.

To make things even better, support has been added for data regarding the Pacific Island Area and for map unit line data and point data. The options for tiling printable maps have been improved, and Rich Site Summary (RSS) notifications are now available regarding soil data updates. And most importantly, WSS is now online 24/7, eliminating bothersome downtime. Other minor enhancements have also been added, and more enhancements are planned for future releases.

Since its beginning, the Web Soil Survey has attracted a wide array of online visitors from all over the world. During its first few months the site averaged about 1,000 users per day, and now that number has increased dramatically to about 6,500 per day.

Soil surveys provide critical information for land use decisions, both on the farm and in the city. Whether a developer is looking to build or purchase land or a farmer is considering alternative crops, soil survey data is a critical element in the decision-making process that is necessary for a successful outcome without harming natural resources. Making soil information available on the Web has been a major achievement for NRCS, and the Agency is committed to continuously making the process better and easier for the customer. NRCS is a science-based, USDA Federal agency committed to the preservation of the Nation's natural resources through the use of conservation. ■

Map background imagery for the Web Soil Survey is now provided by Bing. The new imagery is higher quality, is all in color, and has complete coverage.

Nondiscrimination Statement

Nondiscrimination Policy

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To File an Employment Complaint

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To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquires

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).