National Cooperative Soil Survey Newsletter

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In This Issue—

Editor's Note

Issues of this newsletter are available at http://soils.usda.gov/. Under the Soil Survey tab, click on Partnerships, then on NCSS Newsletters, and then on the desired issue number.

You are invited to submit articles for this newsletter to Jenny Sutherland, National Soil Survey Center, Lincoln, Nebraska. Phone—(402) 437–5326; FAX—(402) 437–5336; email—jenny.sutherland@lin.usda.gov. ■

Land Potential Knowledge System—LandPKS

Jon Hempel, Director of the National Soil Survey Center (NSSC), represented USDA–NRCS at the Land Potential Knowledge System (LandPKS) Workshop in Windhoek, Namibia, June 24 through July 4. LandPKS is a USAID-funded project facilitated by the USDA Agricultural Research Service. Dr. Jeffrey Herrick, research soil scientist at the Jornada Experimental Range in Las Cruces, New Mexico, is the principal investigator for the project. The pilot project for LandPKS is focused in Namibia and Kenya.

LandPKS utilizes mobile phone applications and analytical cloud computing, along with digital soil mapping data and global positioning systems, to assign the potential of the land as defined explicitly and dynamically under changing soil and climatic conditions.

LandPKS will allow farmers, development organizations, extension workers, and national governments to collect, share, access, and apply the best available knowledge and information about the management of the land and soil at field, catchment, regional, and national scales.

The system has the following key capacities to assist with long-term food security while protecting biodiversity and other ecosystem services across the international community:

- ***Globalize*** access to local and scientific knowledge and information about land potential for everyone interested in sustainable land management,
- ***Identify*** and ***deliver*** the knowledge and information relevant to each type of land or soil to anyone with a mobile phone, and

- ***Connect*** people with others who have similar types of lands and management challenges.

The workshop included facilitated meetings and demonstrations of LandPKS applications in the field. The meetings allowed participants to provide input and feedback for the continued development and improvement of the data collection process using smart phones. A diverse group of individuals from government organizations, universities, nongovernmental organizations, and the private sector attended the workshop.

One of the primary applications of LandPKS is the *Land Info Application,* which is a smart phone app available for the android operating system. This application is constructed to provide primary soils information at a given site and is designed for data collection by both scientific and non-scientific individuals. The collected information is housed in a centralized database. It becomes part of an information system that identifies management considerations for sites having similar vegetation, soils, and climatic conditions.

A second application is the *Land Cover Application,* which is also a smart phone app available for the android operating system. This application is designed to document ground cover, vegetation height, plant density, and vegetation gap size.

Both the *Land Cover* and *Land Info* applications will be programmed and available for the iOS by the end of 2015.

The LandPKS concept has tremendous potential for helping NRCS assist with sustainable land management across the globe. By using crowd sourcing to build natural resource information, NRCS has unlimited potential for documenting detailed information on soil, vegetation, and other natural resources. LandPKS allows this wealth information to be easily shared throughout the global community.

Information exchange within the international community through a distribution system such as LandPKS strengthens the soil science and soil conservation communities. It provides a means for sharing technology and information not only from the United States to other countries but also from other countries to the United States. NRCS conservation programs and the U.S. soil survey program have abundant resources that can improve other such programs throughout the world. Building international relationships in soil science, soil conservation, and related areas also strengthens professional relationships and helps to improve programs in the United States and other countries. ■

Symposium for International Year of Soils in Madrid

At the invitation of the Spanish Soil Science Society, Michael Robotham, National Leader for Technical Soil Services, represented the USDA–NRCS Soil Science Division as one of the featured speakers at a symposium in Madrid, Spain. The symposium was focused on the International Year of Soils and co-sponsored by the Ramon Areces Foundation.

During this mid-April visit, Robotham engaged in extensive and wide-ranging discussions with soil scientists and senior leadership from academia and government. They discussed ongoing and proposed soil survey activities, soil data analysis, and information development and the use of soils data to inform land management in Catalonia and potentially throughout Spain.

The majority of Robotham's time in Spain was spent in the field and in discussions with scientists from the Catalonia Provincial Ministry of Agriculture and the University of Lleida, which is the principal agricultural university in the region. Lleida is in the Ebro Valley in central Catalonia. The Ebro Valley is a sedimentary basin bounded by

The IYS discussion panel answering questions from the audience on April 17 at the International Year of Soils symposium in Madrid. Michael Robotham is third from left. Fellow panel members (from left) are moderator Jaume Boixedera, Antonio Martinez Cortizas, and Edoardo Costantini. Photo courtesy of Jaume Porta, Spanish Soil Science Society.

three mountain ranges: the Pyrenees to the north, the Iberian southwest ridge to the south, and the Catalan Coastal Range to the east. As a consequence, the valley has an extremely arid climate. The valley has annual rainfall between 300 and 400 mm and very high insolation and evapotranspiration (1,000 to 1,500 mm per year). Soils in the basin are primarily derived from sedimentary fill materials, including lutites, sandstones, limestones, and gypsum, as well as unconsolidated alluvial and lacustrine deposits. Although less common, loess deposits are also present throughout the valley (Boixadera et al., 2014).

Traditional agriculture in this area was dominated by dryland cultivation of winter annuals, largely wheat and barley, and cultivation of drought-adapted tree crops, primarily olives. Development of extensive irrigation infrastructure began in the years following World War I, intensified in the 1940s and 1950s, and continues today. As a result, there is an increasingly diverse mix of agriculture production, including fruits and vegetables, to supplement traditional olive and cereal-crop based systems. In recent years, interest has grown in soil and water conservation activities, including increased irrigation efficiency and increased use of improved management practices, such as conservation cover.

Olive tree orchard with the traditional management practice of clean tillage between tree rows.

Olive tree orchard with conservation cover near Lleida, Spain.

"Building these international relationships in soil science and soil conservation and related areas, with a variety of partners, facilitates technical exchange and strengthens professional relationships and capacity to build stronger programs in the United States and other countries," said Robotham. "The ongoing collaborative efforts between the Soil Science Division and its Spanish counterparts build upon a long tradition of collaboration between Spanish soil scientists and NCSS members on a variety of important soil-related issues."

Reference

Boixadera, J., et al. 2014. Loess and soils in the eastern Ebro Basin. Quaternary International 30:1–20. ■

Soil profile from the Ebro Valley in central Catalonia. Parent material is loess over limestone.

National Soil Survey Center Partners with Children's Museum

In an effort to continue spreading the word about the importance of soil, staff members from the Charles E. Kellogg Soil Survey Laboratory reached out to the Children's Museum of Lincoln, Nebraska, with an offer to help with the museum's summer camp program. A perfect opportunity occured when the museum scheduled its popular weeklong summer camp entitled "Melt, Mix, Dabble & Draw." Because using soil as a medium for creating art is nothing new to many of the Kellogg lab technicians, the camp provided a chance to combine both art and science. Hands-on, fun activities were used to deliver the message that soil is an important natural resource. Leading the day-long learning experience were Lab Technicians Michelle Etmund, Patty Jones, Cindy Stuefer-Powell, Jennifer Ingham, Janis Lang, Crystal Schaecher, and Dianne Hooper and Earth Team Volunteer Victoria Riech.

Thirty-three children signed up for the camp, which included making "grass critters" (topiaries), soil crayons, and soil paintings and using "binocular" microscopes to see what lives in the soil. The day was capped off with a visit to the Denney Federal Building for an up-close view of what NRCS does. Later in the afternoon, the campers crawled through the Soil Tunnel to get a look at and feel for what goes on below the soil surface. The campers also watched a soil critter video and received several take-away items, such as coloring books, bookmarks, and stickers, to reinforce the learning experience. The campers ranged in age from 6 to 9 years.

This outreach project was part of the ongoing effort by the National Soil Survey Center to promote soil science and increase awareness during the "2015 International Year of Soils." Center employees have also visited numerous elementary schools and participated in the citywide Science Fair. They plan to make an appearance at the upcoming Nebraska State Fair. "Making children aware, at an early age, about the importance of soil as a natural resource contributes to the long-term goal of protecting our environment," said Jon Hempel, Director of the National Soil Survey Center. "Soil is our only non-renewable resource, making our efforts on its behalf even more vital." ■

A great time was had, as seen on the face of one enthusiastic camper.

NRCS Assists with UConn's Fourth Annual Natural Resource Conservation Academy

By Marissa Theve, soil scientist, NRCS, Tolland, Connecticut.

From July 12 through 18, students from high schools across Connecticut had an opportunity to participate in the Natural Resource Conservation Academy (NRCA) program at the University of Connecticut—Storrs. Twenty-four participants were selected from the more than 40 applicants from cities and towns in every county in the State. Directed by Extension Educator Laura Cisneros, the program has both educational and entertainment appeal. Each day included not only valuable lessons in the basics of natural resources but also some form of recreational team-building activity. For students, the week looked like this:

Sunday: Orientation and ropes course
Monday: GIS, GPS, and orienteering
Tuesday: Watersheds, water quality, and BBQ
Wednesday: Fish, wildlife, forestry, and campfire
Thursday: Fish, wildlife, soils, and insect black-lighting
Friday: Final project and ice cream social
Saturday: Presentations and closing ceremony

During the soils portion on the afternoon of Thursday July 16, students took part in comprehensive field practicums related to soil morphology and soil quality. Participants were then shown a demonstration of a soil infiltration simulator with samples from a no-till/cover crop field, a continuously plowed field, an area of unmanaged grass, an area of compacted turf, and a nearby, unmanaged side slope.

Although the week of hands-on training and team building is over, the students will continue with a 7-month service project in their own schools and communities. Student projects will culminate with poster presentations at the Connecticut Conference on Natural Resources at UConn in March of 2016.

Interestingly, the funding for this project came from an anonymous donor. The donor approached Dr. John Volin, head of UConn's Department of Natural Resources and the Environment, with the question, "If you had $20,000 to $50,000 for the Natural Resources Department for up to 10 years, what would you do with it?" Dr. Volin worked with his department, extension staff, and others to develop the plan for NRCA. He proposed the idea, and sure enough, he made it happen.

NRCS Soil Scientists Lisa Krall and Marissa Theve and UConn Soil Scientist Dawn Pettinelli ran three simultaneous field workshops on soil morphology and mapping, land cover and drainage, and soil color and soil texture. Earth Team Volunteers Sarah MacDonald and Iredia Ohenhen prepared supplies, helped with demonstrations, and assisted in

NRCS Soil Scientist Marissa Theve hands samples off to NRCA student participants.

NRCS Soil Scientist Marissa Theve and Earth Team Volunteer Sarah MacDonald talk to the NRCA students about the importance of soil health in relation to their snacks.

coordinating the workshops. This was the fourth year of NRCS participation, and the agency currently plans to assist in next year's NRCA program. NRCS hopes to encourage more students throughout the State to gain an interest in sustainable agriculture and soil science as they consider their future careers.

For more photos and information, visit the academy website at http://nrca.uconn.edu/. ■

Soil Science Division Region 2 Hosts HACU Intern

By Phil Smith, MLRA soil survey leader, NRCS, Hanford, California. Photos by Phil Smith and Edwin Dunkinson, Earth Team volunteer, Davis, California.

The Soil Science Division Region 2 (SSR–02) Office in Davis, California, hosted one of the three student interns that worked for NRCS during the summer of 2015. The National Internship Program of the Hispanic Association of Colleges and Universities (HACU) provided an opportunity for Rafael Ortiz Vazquez, graduate student at University of Puerto Rico–Mayagüez, to work at the Hanford, California, MLRA Soil Survey Office. The internship served as a great opportunity for the Soil Science Division to conduct outreach and recruit talent for the future workforce.

Upon arriving at the airport in Sacramento, Rafael was greeted by Hanford MLRA Soil Survey Office staff and started his 10-week internship in California's Great Central Valley. During the first week, Rafael assisted the soil survey team with the sampling of three pedons in the Sacramento-San Joaquin River Delta. The pedon sampling work was for the MLRA 16–California Bay Delta Soil Systems Study. The study is designed to collect necessary laboratory characterization data for proposed benchmark soils. It will also provide the necessary input parameters for the Agricultural Policy Environmental Extender (APEX) model for the West Regional Modeling Unit's

Conservation Effects Assessment Project (CEAP) in the Bay Delta Watershed.

During the 3 days of sampling, Rafael assisted with detailed soil profile descriptions following the standards outlined in the "Field Book for Describing and Sampling Soils, Version 3.0." The work provided Rafael an opportunity to learn the protocol of the Kellogg Soil Survey Laboratory (KSSL) for sampling soils as he assisted with the collection of bulk soil samples and intact clods for bulk density measurements. Upon returning to the office in Hanford, Rafael assisted with sample organization, packaging, and labeling. As Rafael gained hands-on experience, his diligent assistance provided a huge contribution to the project, saving MLRA staff many hours of work.

Figure 1.—HACU Soil Scientist Intern Rafael Ortiz Vazquez helps excavate a soil pit for sampling the Kingile series in the California Delta on June 16th.

Preparing the soil samples and data forms for shipment to the KSSL gave Rafael the opportunity to learn about the National Soils Information System (NASIS). Rafael's first NASIS assignment was to enter site and pedon data into the database for each pedon that he had helped describe and sample. Entering information from the Delta descriptions, Rafael became proficient in working with the database's site and pedon tables. This experience was enhanced when Rafael completed his next assignment, creating the site and pedon entries for the 31 taxonomic unit descriptions (TUDs) of the Soil Survey of Eastern Stanislaus Area, California. Rafael also used ArcGIS to derive latitude and longitude coordinates of TUD site locations and to create map-unit-extent maps for the Hanford Soil Survey Office's Soil Data Join Recorrelation projects.

Figure 2.—Following the "KSSL Soil Sample Submission Protocol," Rafael labels and prepares bulk density clods for shipment to Lincoln.

In addition to his work in the soil survey office, Rafael broadened his experiences in California through other soils-related activities. On two occasions he was able to work with the Hanford NRCS Field Office and gain a sense of how USDA–NRCS "puts conservation on the ground." Twice he went to the field with the rangeland management specialist to inspect NRCS-funded conservation practices on private grazing lands. Rafael also participated in the annual field tour

Figure 3.—Regional Director Dr. Cynthia Stiles meeting the Delta sampling team in Rio Vista, California. From left: HACU Intern Rafael Ortiz, Soil Scientist Genevieve Widrig, Pathways Recent Graduate/Soil Scientist Andrew Paolucci, MLRA Soil Survey Leader Phil Smith, Regional Director Dr. Cynthia Stiles, and Pathways Interns Brandon Bland (University of Arkansas at Pine Bluff) and Chris Kubicki (Montana State University).

of the California Forest Soils Council and the Professional Soil Scientists Association of California. This tour gave Rafael a broad perspective of soils in the nearby Sierra Nevada Mountains.

Hosting a student intern through the HACU National Internship Program was a beneficial and rewarding experience for everyone involved. Rafael learned about many aspects of the soil survey program in Region 2. The Region 2 Office and the Hanford MLRA Soil Survey Office recognized Rafael's talents and enthusiasm as he plans to pursue a soil science career with the agency.

On August 20, in appreciation for all Rafael's hard work, the Hanford MLRA Soil Survey Office, along with the Hanford Field Office and Farm Service Agency, hosted a barbeque lunch to celebrate the 10 great weeks of Rafael's internship. On August 22, Rafael returned to Puerto Rico to continue his studies at the University of Puerto Rico in Mayagüez. ■

Sampling Tidal Marsh Soils in the New Jersey Meadowlands

By Marissa Theve, soil scientist, USDA–NRCS, Tolland, Connecticut.

Tidal marshes provide important habitat and shoreline stabilization and act as a buffer between upland areas and open water. They sequester significant amounts of carbon and are areas of high biomass production. Once considered unproductive land in need of "reclamation," these areas have only recently been appreciated for the full extent of their ecosystem services. Current NRCS surveys identify 86,786 hectares (214,454 acres) of tidal marsh in New Jersey, a little more than 4 percent of the State's land area. About 93 percent of the currently mapped area is salt marsh; the remaining 7 percent is freshwater tidal marsh. According to the recently completed NRCS initial

soil survey, salt marsh currently makes up 1,569 hectares (3,878 acres), or 2 percent of the land area, of New York City. Efforts to restore tidal marsh by the U.S. Fish and Wildlife Service, the National Park Service, the New York City Department of Parks and Recreation (NYCDPR), and others are ongoing in numerous locations in New Jersey and New York City.

From April 29th through May 1st, the soils staff of NRCS–New Jersey, with assistance from the soil survey staff of Tolland, Connecticut (12–TOL), and personnel from the Department of Earth and Environmental Sciences at Brooklyn College, sampled tidal marsh soils in the New Jersey Meadowlands for analyses at the Kellogg Soil Survey Laboratory. The sampling was the first phase of a New Jersey-New York City project to collect characterization data for tidal marsh soils in a cooperative effort with NRCS partners, including Meadowlands Environmental Research Institute, Barnegat Bay Partnership, and New York City Department of Parks and Recreation. The project initiates long-term monitoring of tidal marsh properties at sites where the cooperators have established sediment elevation tables (SETs) and collected supplemental site information.

The collection of this data will help to clarify, narrow, and justify map unit ranges for future and ongoing projects. Only limited characterization (laboratory) data has been collected for salt- or freshwater-marsh soils. Such data is needed to accurately depict the properties of these soils in NRCS's database, to provide reliable resource inventory information, and to deliver dependable interpretations and ratings for use and management. The data will help in understanding the depositional and pedological processes, both anthropogenic and natural, in these areas and will provide baseline information for long-term monitoring of soil change. The data will also allow for an estimation of carbon stocks in the marshland as part of a city-wide inventory.

Profile of Ipswich soil at Riverbend Marsh in the Meadowlands (photo by Rob Tunstead).

Most of the map units in the New Jersey tidal marsh areas are complexes containing two or more major soil series or components. There was little interest in differentiating series in the marshes when most of these areas were surveyed. Characterization data from these sites will provide the foundation for evaluating tidal marsh mapping and future map unit refinement as NRCS moves toward digital and raster-based mapping. The three Meadowlands sites included pedons of the Westbrook series (loamy, mixed, euic, mesic Terric Sulfihemists) and the Ipswich series (euic, mesic Typic Sulfihemists). They were sampled in cooperation with the Meadowlands Environmental Research Institute (MERI), which serves as the scientific and technological arm of the New Jersey Meadowlands Commission. Staff from MERI provided plenty of background (and anecdotal) information on the area as well as transportation to and from the sampling sites. Dr. Francisco Artigas proved to be an ideal cooperator.

Danielle Wagner of Brooklyn College, Dr. Francisco Artigas of MERI, Dr. Hermine Huot of Brooklyn College, Marissa Theve, and Rob Tunstead examine a 1-meter core sample at the Riverbend Marsh along the Hackensack River in the New Jersey Meadowlands.

Further sampling in 2015 is planned for six SET sites in New York City and three sites on Barnegat Bay. The SET sites in NYC are managed by NYCDPR in the Bronx, Brooklyn, Queens, and Staten Island. The Ipswich and Pawcatuck series are mapped in these areas. Because NYCDPR personnel are active in marsh restoration, they are especially interested in participating in the sampling event. The sites on Barnegat Bay are monitored by the Barnegat Bay Partnership and the Partnership for the Delaware Estuary. These locations are all mapped as a complex of Appoquinimink soils (fine-silty, mixed, active, nonacid, mesic Thapto-Histic Sulfaquents), Transquaking soils (euic, mesic Typic Sulfihemists), and Mispillion soils (loamy, mixed, euic, mesic Terric Sulfihemists). A subaqueous soil survey of Barnegat Bay is currently in progress. The survey is led by Rob Tunstead, MLRA leader from the soil survey office at Hammonton, New Jersey (3-HAM).

Future sampling will target freshwater tidal marshes along the Delaware River, where sediment elevation tables are monitored by the Partnership for the Delaware Estuary. These sites are mapped as a complex of the Mannington soils (fine-silty, mixed, active, nonacid, mesic Thapto-Histic Hydraquents) and Nanticoke soils (fine-silty, mixed, active, nonacid, mesic Typic Hydraquents).

The tidal marsh floods twice a day, offers no protection from the sun or wind, is home to several types of insect pests, and can be difficult to traverse due to the boot-sucking substrate and the density of vegetation. The soils are messy to describe and sample and often have an oppressive sulfide odor, and the soil profile is almost always beneath the water table. In addition, these soils are commonly in an area with many contaminants. Yet to some soil scientists, this is a fascinating and attractive environment. ■

Backcountry Field Review and Sampling Trip: Sequoia and Kings Canyon National Parks

A field review and sampling trip was conducted by NRCS Region-2 soil scientists, ecological site specialists, and National Park Service (NPS) archaeological technicians during a 9-day backcountry trip in the Sequoia-Kings Canyon National Parks (SEKI) Soil Survey Area (CA792). The project is funded by the NPS Soil Resource Inventory and is administered by the Pacific Soil Survey Regional Office under Dr. Cynthia Stiles in Davis, California. This is the fourth field season of the survey. One more year is scheduled to complete the fieldwork.

Participants on the trip were: Soil Scientists Cathy Scott (CA792 project leader), Juliet Baker, Andy Paolucci, and Tyler Witkowski (Pathways Recent-Graduate Program from Fergus Falls, MN) from the NRCS MLRA Soil Survey Office in Sonora, California; Ecological Site Specialists David Evans (NRCS, Sonora, California) and Marchel Munneke (Pyramid Consulting, Strawberry, California); NPS Archeological Technicians Keith Hamm and Brian Heisinger based out of Ash Mountain, California; and Soil Data Quality Specialist Jennifer Wood from the NRCS Region-2 Office in Davis, California.

The trip occurred in the southern part of the survey area, west of Shepherd Pass, with work occurring between 10,500 and 12,500 feet in elevation (fig. 1). The soil-forming factors in this glacial landscape include southern latitudes, high elevations, and granitic lithology. The soils developed largely from colluvium, glacial till, or slope wash that rests on glacially scoured granite. The soils seen on this trip mostly had sandy-skeletal particle-size classes (cobbly to bouldery loamy sands and sands) with weak soil development. Thick surface layers that are rich in organic matter occur where dense mats of *Carex filifolia* establish in gently sloping, stable positions that collect colluvium, till, and slope wash in bedrock pockets and joints. Seasonal water

Figure 1.—Crew members entering the park on Shepherd Pass. From left: Cathy Scott, Marchel Munneke, Keith Hamm, and Jennifer Wood.

tables can develop where surface water perches on dense till on moraines and over bedrock in pockets and joints. Meadow soils develop in alluvium from reworked glacial till and are very poorly drained to moderately well drained due to water tables.

Sampling equipment was brought in by mule trains so that laboratory characterization could be performed on the higher-elevation soils in the southern part of the survey area. Ash-influenced soils have been found at the higher elevations in the northern part. Samples taken in the southern part will help to determine the extent of volcanic ash. This information will help in understanding the geologic history and landscape evolution of the Sierra Nevada Mountains. Due to the abundance of large rock fragments in the glacial till covering much of the area, large holes have to be dug by hand. Material needs to be excavated to depths of 1.5 to 2 meters before the soil processes in these deposits can be understood (fig. 2). For instance, dense and compacted glacial till can concentrate and perch water at various depths on these glacial moraine landforms (fig. 3). There are also numerous sites where soils capable of supporting trees and forb communities developed in cracks and depressions in the bedrock. An impressive amount of organic matter and mineral materials has accumulated in these sites (fig. 4).

At the time of the trip, the major streams and rivers were still flowing despite an almost total lack of snowpack during the last winter and a historically low snowpack for the last 4 years (fig. 5). While hiking from worksite to worksite, the participants had time to ponder the source of the water—which was seemingly vast bedrock reservoirs in the surrounding mountains. Soils serve to absorb water from rain and snow by slowing surface flow and directing it to bedrock reservoirs. Because of warming atmospheric temperatures and the possibility that more water will be supplied in the form of rain rather than snow, the ability of soils to absorb water for storage could become increasingly important.

Figure 2.—Juliet Baker and Cathy Scott on a ground moraine excavating a sandy-skeletal soil that has dense till at a depth of 120 centimeters.

Figure 3.—A profile with dense till at a depth of 120 cm. The till restricts roots and concentrates water flow laterally through the soil.

Figure 4.—Shallow to very deep soils developed in bedrock fissures.

The result of all this work will, of course, be a rich database provided to the parks and available to the public via Web Soil Survey. The database will provide researchers and managers with a spatially defined set of data that describe the properties and processes of the soils. Hydrologic processes, natural-hazard management, cultural resources, plant- and animal-habitat-suitability, and biogeochemical cycles are all topics about which improved soils information can help in natural resources management in the parks. Staff from the regional office and MLRA soil survey offices are experimenting with a variety of digital soil mapping techniques to ensure consistency in the application of the soil mapping models being developed for the parks. The data and techniques developed for this survey will assist with MLRA soil survey update work in MLRA 22A (Sierra Nevada Mountains), which includes Yosemite National Park, Devils Postpile National Monument, many U.S. Forest Service forests, the Tahoe Basin, and large areas of private land. Understanding subsurface processes is critical to management of the natural resources of the Sierra Nevada Mountains, which serve as the foundation of the 7th largest economy in the world. ■

Figure 5.—Summer flows of water from snowless mountains.

Oregon Society of Soil Scientists Summer Tour—Painted Hills Unit

By Meghan Krueger, NRCS soil scientist, Region 2, Vale, Oregon, and Eastside Director of the Oregon Society of Soil Scientists.

This year's summer tour by the Oregon Society of Soil Scientists (OSSS) was a journey through time on the rangelands of Wheeler County, Oregon.

On a hot July day, members of the OSSS rallied amongst sagebrush, discussed soils and geology, swam in the John Day River, and met with friends old and new. OSSS is a not-for-profit society dedicated to fostering professionalism and advancing the profession of Soil Science. The society welcomes a diverse membership, including NRCS teammates, professors, students, and others. Digging deep for adventure with roots of inquisition, OSSS gathers biannually to blossom.

Blue Mountain Island Arc meets North America, and the accreted aftermath is Oregon! Remnant seafloor fossils are preserved in shale on the south slope shown in figure 1, highlighted with a blue star. An ammonite was found while we were there. We were lucky to have found the shale, because the purple sage, bluebunch wheatgrasss, and bitterbrush masked the geologic phenomena as if nothing happened. Note the drainage between the shale slope and the adjacent slope in the foreground.

Figure 1.—1st stop: 100 million years ago, Cretaceous Period.

The drainage marks the junction between the fossil-laden shale slope and the adjacent slope, which is comprised of Gable Creek Conglomerate. Although the area in figure 2 is also disguised by purple sage, bluebunch wheatgrass, and bitterbrush as if it were no big deal, the Gable Creek Conglomerate is hardened debris from a gigantic Cretaceous sea-going flood. The image shows a close up of the Gable Creek outcrop. Conglomerate colluvium, which is hard-to-traverse, rounded, river-gravel quartzite is hypothesized to have traveled all the way from the Ancient Bitter Root Mountains of Montana! The span of 100 to 80 million years ago is a lot to fathom.

Figure 2.—80 million years ago, Cretaceous Period Gable Creek Conglomerate outcrop.

University of Oregon Professor of Geology and summer tour keynote speaker Dr. Greg Retallak, seen in the foreground of figure 3, shared his research findings. The beautifully red paleosol is rhyolite colluvium—gone Oxisol during the tropical days of the late Eocene. Rhyolite is a silica-rich volcanic rock.

Figure 3.—40 million years ago, Eocene.

Figure 4.—Last but not least, the infamous Painted Hills Unit.

Figure 4 shows the tour group in the foreground and the Painted Hills Unit in the background. The time-capsule hills display red stripes of Oxisols and the lighter colors that formed during the cooling, drying climates of the Oligocene as time progressed. As time continues to progress, the next generation soaks up love for natural science. See the youngsters? They rocked it!

The OSSS summer tour was fruitful. It included good times, informative discussions, and an action-oriented Board of Directors meeting to lead OSSS into the future. Special thanks to Gabby Coughlin and Kurt Moffitt of Redmond, Oregon, Major Land Resource Area office for sharing your mapping arena and to Greg Retallak for the geology intrigue.

For further information, go to www.oregonsoils.org. ■

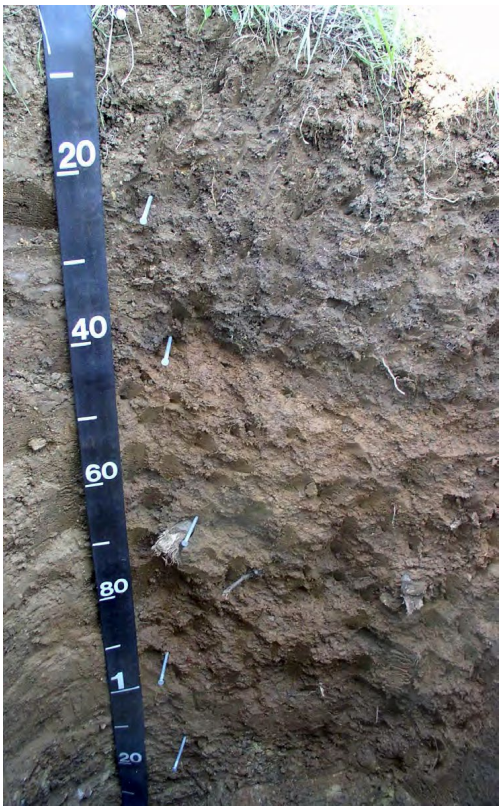
Soil Survey Supplement Captures Expert Knowledge

By Kit Paris, soil data quality specialist, NRCS, Davis, California.

The business of producing traditional soil survey manuscripts has long past. Due to the cost of printing and the needed investment of long hours to produce traditional hard-copy reports, the focus has changed to producing databases and digital map products. The Web Soil Survey was created to fill the need to distribute and publish soil survey information. It has worked quite well, except that a lot of knowledge gained by studying landscapes and soils has not been accessible.

The expert knowledge gained during the course of a soil survey project went missing from the realm of publication. The soil scientists who work the fields, mountains, plains, and rivers gathering soils information know more about the soil landscape in a particular area than anyone else alive. But the databases and digital maps do not convey this knowledge. Missing from the publication of soil survey data is the information and scientific knowledge gained through the extensive study of soil landscapes.

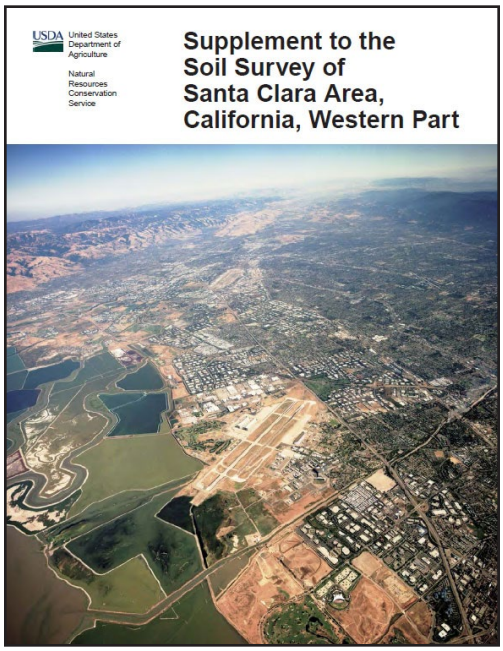
A landscape of Montavista and Togasara soils from the supplement.



A profile of a Montavista soil from the supplement.

The narrative sections that were formerly included with the soil survey reports provided important insights and support to the vast amount of data that is served by the Web Soil Survey. These sections included important discussions about the formation of the soils, explanations of the landscape and physiography of the area, and a description of how the survey was made. They have been dearly missed by and pointedly inquired about from users of soil surveys.

Through cooperation between the National Soil Survey Center in Lincoln, Nebraska, and Bill Reed and Kit Paris of the Pacific Regional Soil Survey Office in Davis, California, a publication product was developed to address this missing information. Dubbed the "Supplement to the Soil Survey of Santa Clara Area, California, Western Part," this document provides information not available through Web Soil Survey or SSURGO databases. It contains narrative descriptions of the physiography, geology, relief, climate, drainage, and formation of the soils in the survey area and includes applications of the soil survey for the urban environment. In addition, it provides the taxonomic descriptions of the soils and photographs of soil profiles and landscapes.



The cover of the supplement.

This supplement is posted in the list of published soil surveys: http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=CA. It provides an outlet for the expert knowledge of soil scientists and another way to further the goal of educating the public about soils and soil survey. ■

Nondiscrimination Statement

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