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Editor's Note

Issues of this newsletter are available at <http://soils.usda.gov/>. Under Quick Access, click on NCSS, then on Newsletters, and then on the desired issue number.

You are invited to submit stories 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.



2013 National Cooperative Soil Survey Conference

The biennial National Cooperative Soil Survey (NCSS) Conference will be held June 16 to 21, 2013, at Annapolis, Maryland. The conference will be hosted by the University of Maryland at College Park and supported by the Natural Resources Conservation Service, the U.S. Forest Service, the Mid-Atlantic Association of Professional Soil Scientists, the Soil Science Society of America, and the National Association of Consulting Soil Scientists. NRCS personnel supporting the conference include soil survey staff from Raleigh, North Carolina; Morgantown, West Virginia; and Annapolis, Maryland. The conference is an opportunity for U.S. and international representatives from cooperating universities, governmental agencies, and the private sector to meet and address issues of concern to soil science and to the National Cooperative Soil Survey. The theme of the 2013 conference is “Soil Survey—Planning for Soil Health in the Critical Zone.” Soil scientists from the University of Maryland and USDA–NRCS in Maryland and Delaware are planning two field tours associated with the meeting—Sunday, June 16, to western Maryland and Wednesday, June 19, to eastern Maryland (Eastern Shore). The conference agenda, online registration, contact information, and information regarding committees and accommodations are available at http://soils.usda.gov/partnerships/ncss/conferences/2013_national/index.html.

The NCSS national conference convenes on odd-numbered years to develop solutions to issues of concern to the National Cooperative Soil Survey. The regional conferences are held on even-numbered years. The conference locations are selected by the conference

steering teams, whose members are representatives of the NCSS. The location of the national conference is rotated through the four established regions of the NCSS as dictated by regional and national bylaws. The national conference is hosted by local or regional cooperators, and NRCS facilitates the agenda in consultation with local and national members. The regional conferences follow a similar convention between States. NRCS, as leader of the Federal part of the NCSS, also provides facilitation and coordination to the yearly partnership effort. Participants of the National Cooperative Soil Survey include representatives from the 1862 land-grant universities, experiment stations, NRCS, USFS, BLM, BIA, EPA, USFWS, SSSA, National Association of Consulting Soil Scientists, the 1890 land-grant universities, and western tribal colleges. Other interested foreign and domestic groups, such as lead scientists from Canada, Mexico, and other cooperating countries, are invited to participate. This year, in particular, students are welcome and will be offered discounted registration for full participation in the conference.

Some of the important topics that will be discussed at the conference:

- The role of soil in climate change
- The role of soil surveys in maintaining and improving soil health
- The role of soil in the world's food supplies and security
- The soil processes controlling ecosystem services
- Managing soil for ecological restoration
- Monitoring soils by remote sensing
- Identification and monitoring of soil processes that signify global change ■

Soil and Site Suitability for Viticulture in the United States

By Robert Dobos, soil scientist, Steve Peaslee, GIS specialist, and Tammy Umholtz, visual information specialist, NRCS, National Soil Survey Center, Lincoln, Nebraska.

The wine industry in the United States has experienced remarkable growth in the past 10 years. In order to support this growth, the NRCS Soil Science Division and the National Soil Survey Center have developed a series of tools that use the soil survey database to locate areas that are amenable to a number of wine grape varieties. These tools quantify the suitability of sites for 12 sets of grape varieties, including European *Vinifera*, French-American hybrids, American, and Muscadine grapes.

This article focuses on site suitability for one *Vinifera* variety, Cabernet Sauvignon, in the North Coast region of California (Mendocino, Napa, and Sonoma Counties) and in the Northern Neck of Virginia (Lancaster, Northumberland, Richmond, and Westmoreland Counties). Both of these areas have long-standing wine industries.

The identification of areas suited to wine grapes presents a unique challenge because absolute yield is not the measure of success for a vineyard. Wine grapes do not necessarily require the most productive soils but produce a desirable product where certain soil, site, and climatic characteristics are met. The interaction of climate, soil, geology, topography, and grape variety results in a "terroir" for a vineyard.

How are the best sites selected for growing wine grapes? One first addresses the climate. The goal is to find a climate similar to that where a grape variety originates so the fruit will more fully develop the characteristics associated with its particular variety. A major component of climate is the yearly accumulation of heat, measured as growing degree days (GDD). Growing degree days are used as an indicator of which variety is best adapted to the climate of an area. For example, Chardonnay grapes achieve their best varietal character in a climate supplying up to 2,500 GDD and Cabernet Sauvignon grapes reach maturity with 3,000 to 3,500 GDD. Figure 1 shows the Winkler-Amerine

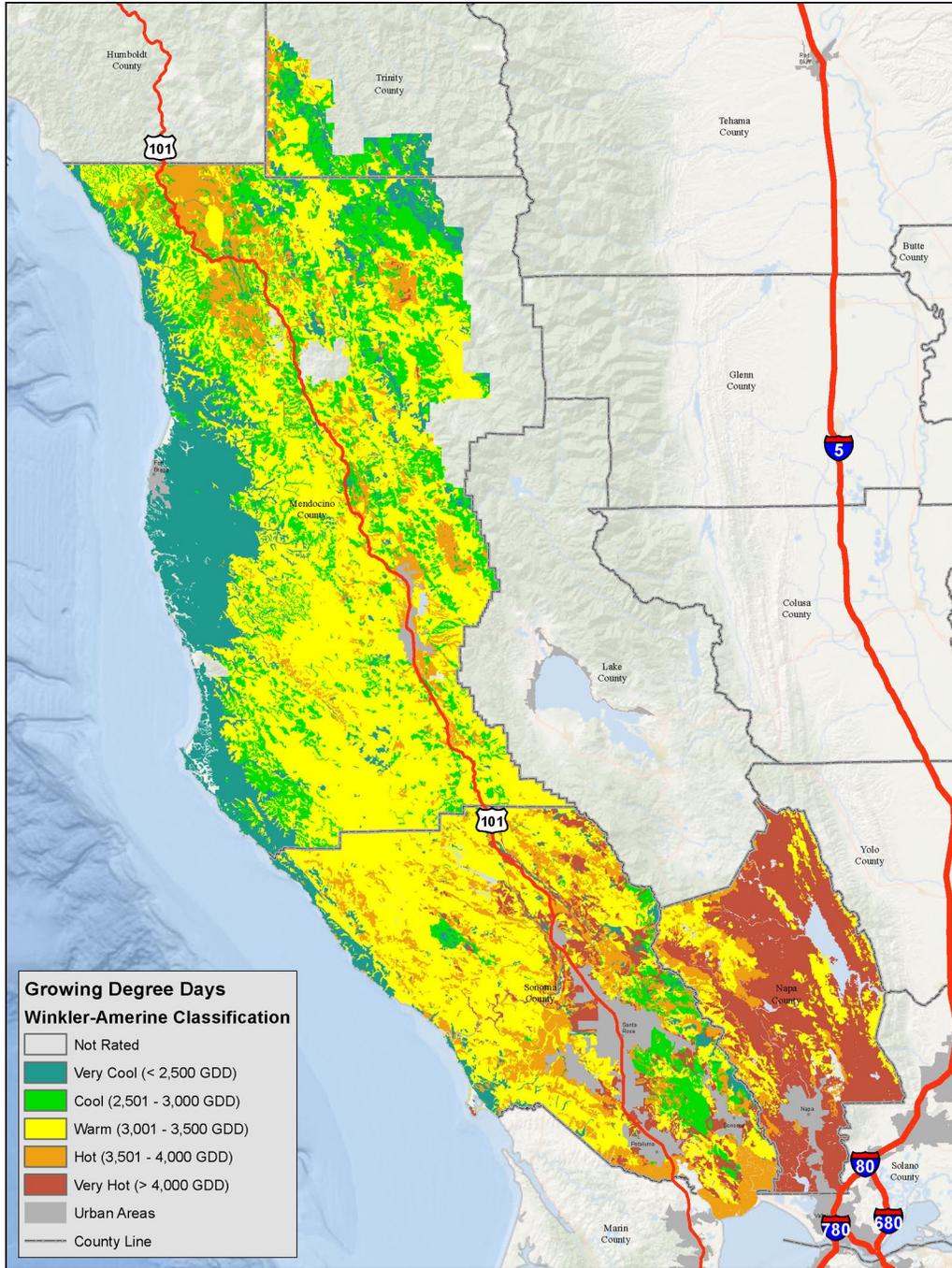


Figure 1.—Growing degree days and the Winkler-Amerine classification in the North Coast region of California.

classification of growing degree days in the North Coast region. Depending on elevation, latitude, and distance to the Pacific, nearly any grape-growing climate can be found in the region. By contrast, the Northern Neck in Virginia has a much narrower range of heat accumulation, 3,500 to 4,500 GDD, which is hot to very hot in the Winkler-Amerine system. Areas near Chesapeake Bay and the Rappahannock River have buffered climates. Interestingly, microclimatic niches can be found in many areas where the larger scale climate is not suitable. Such areas are often sought by vintners.

The soil characteristics required for high-quality *Vinifera* grapes are related mainly to water. Too much water encourages detrimental fungal growth and excessive vine growth. *Vinifera* prefer a soil with near-neutral soil pH, relatively low general fertility, and low water-storage capacity. Table 1 indicates soil properties considered important for vineyard site selection.

Soil Feature	Well Suited	Poorly Suited	Importance
Depth to saturation	> 60 inches	< 20 inches	High
Root zone water-holding capacity	8 inches	> 12 inches	High
Rooting depth	> 40 inches	< 20 inches	High
Slope	5 percent	> 15 percent	High
Flooding or ponding	None	Frequent	High
Frost-free days	220	< 180 or > 260	High
Soil permeability	> 2 inches/hour	< 2 inches/hour	Medium
Soil pH	6.5 to 7.0	> 8.0 or < 5.5	Medium
Soil organic matter	2.0 percent	> 5.0 percent	Medium

Table 1.—Soil and site characteristics for *Vinifera*

The lay of the land is also a consideration in selecting a vineyard site. Sites need to be high enough on the landscape to avoid frost pockets but low enough to avoid wind damage. Some slope gradient is desirable as long as it does not interfere with equipment usage. The direction the slope faces can be important where the growing degree days are marginal because it affects the amount of heat received by the landscape.

The North Coast of California

Vinifera culture was started in California in the 18th century and was established in the North Coast region by the mid-19th century. The region has a diversity of climates due to the ocean, mountains, and bays (fig. 2). Gradients of temperature are found moving up and down the mountains. The degree to which an area has a Mediterranean climate or Marine West Coast climate varies by the area's distance from a large body of water. The better areas for Cabernet Sauvignon grapes have around 3,000 to 3,500 growing degree days per year.

The soils in the North Coast region are as diverse as the climates, which means the possibilities for terroir are endless. The better *Vinifera* soils in the region include Arbuckle, Feliz, Haire, Talmage, Yokayo, and Yolo soils. Generally, areas that are less suited to vineyards are steep or have shallow soils. Some areas that are shown on the maps as being less suited to wine grapes include small areas of better suited land.

The Northern Neck of Virginia

Traditionally, the Northern Neck of Virginia is considered to consist of the counties of Lancaster, Northumberland, Richmond, and Westmoreland. For the purposes of this study, King George and Stafford Counties are also included. The region is rich in American history and has been a site of wine production since the 17th century. Currently, 11 wineries are in the area. The Northern Neck is bordered on three sides

Pedoderm and Pattern Class Workshops at the Jornada

By Brandon T. Bestelmeyer, research ecologist, ARS, and Laura M. Burkett, range technician, ARS.

The USDA–ARS Jornada Experimental Range recently hosted two workshops on pedoderm and pattern class. The first was on December 18th and 19th, 2012, and the second was on February 20th and 21st, 2013. Staff from the Bureau of Land Management, Natural Resources Conservation Service, United States Forest Service, New Mexico State Land Office, and Jornada Experimental Range attended.

Pedoderm and pattern classes (PPCs) comprise three indicators of soil surface processes affecting plant growth and ecosystem function. The pedoderm class (PC) describes the type of material that occurs at the air-soil interface—the “pedoderm,” or upper 3 centimeters of the soil surface. The resource retention class (RRC) classifies the spatial pattern of persistent vascular plants and interpatches that govern resource movement and erosion rates. The soil redistribution class (SRC) uses several surface features, such as pedestals and depositional mounds, to classify the spatial extent and severity of erosion and deposition.

Staff at the Jornada Experimental Range (<http://jornada.nmsu.edu/>) and NRCS developed these new indicators to enable rapid inventory of soil surface attributes that are otherwise difficult to record and typically not represented in inventory datasets. PPCs complement observations of plant community attributes and soil profiles or ecological sites to provide a more complete representation of ecosystem characteristics. In doing so, PPCs provide a readily accessible language for discussing the role of soil surface processes in ecosystems. The classes can be applied by soil scientists and other natural resource professionals conducting extensive field surveys.

The PPCs were designed to be recorded quickly. To serve the needs of those making large numbers of observations across a landscape, the PPCs can be recorded in about 5 minutes once the recorder is proficient with the classes. The individual PPCs integrate observations of several attributes that are treated separately in other indicator systems, such as the Interpreting Indicators of Rangeland Health. Thus, PPCs build on existing knowledge used by natural resource professionals. PPCs do not rely upon qualitative modifiers or knowledge of reference conditions and were developed in rangeland ecosystems where soil redistribution and water limitations are important. They have been applied in desert, grassland, shrubland, and woodland systems in several countries.

PPCs were included in the recent NASIS update. The pedoderm class table was modified to facilitate compatibility with prior fields.

The 2-day workshops introduced the PPCs, the rationale for their development, and their potential uses following the [Field Guide to Pedoderm and Pattern Classes](#). The field portions of the workshops emphasized consistency in class assignments. Data from consistency trials are being used to improve the classifications and training materials. For more information, please contact Laura Burkett, USDA–ARS Jornada Experimental Range, lburkett@nmsu.edu. ■

Korean Soil Scientists Visit the National Soil Survey Center

By Joe Chiaretti, soil scientist, NRCS, National Soil Survey Center, Lincoln, Nebraska.

The National Soil Survey Center (NSSC) was visited by Dr. Kwan-Cheol Song and Dr. Yeon-Kyu Sonn on Friday, November 2, 2012. Dr. Song and Dr. Sonn are representatives of the Republic of Korea’s Rural Development Administration and are national experts in soil classification, soil survey, and soil laboratory analysis.

Although their visit to the NSSC was short, they were still able to spend valuable time with staff that represent the Soil Survey Laboratory, Soil Survey Research, and Soil Survey Standards branches.

The primary discussion topic was the current classification of paddy soils and anthropogenic soils using the USDA Soil Taxonomy. Soil Taxonomy is the official soil classification system in the Republic of Korea. Several hours were spent reviewing the taxonomic classification of some Korean soil series. Also discussed was cooperative work done in the mid-1980s by the Soil Management Support Services, which at that time was funded by the U.S. Agency for International Development. Laboratory data on pedons of the Republic of Korea were accessed from the National Cooperative Soil Survey Soil Characterization Database and used for discussion about properties and classification.

I worked with the visitors in the session devoted to soil classification and was assisted by Dr. Mike Wilson, NSSC research soil scientist. Dr. Song provided recent descriptions of soil series and associated laboratory data for pedons that had been analyzed by the official soil survey laboratory for South Korea. The Korean soil scientists took great pride in relaying the fact that their laboratory uses the methods presented in the "Soil Survey Laboratory Methods Manual" (SSIR 42), which is a principal reference document for NCSS. The Korean visitors were given a tour of the Charles E. Kellogg Soil Survey Laboratory by permanent staff of the laboratory. They greatly enjoyed the tour.

Dr. Song was raised on the Island of Jeju, Korea, site of the upcoming IUSS 20th World Congress of Soil Science, June 8–13, 2014. He is an expert on the volcanic soils of this UNESCO World Natural Heritage site.

The visit of Dr. Song and Dr. Sonn to NSSC benefits the Republic of Korea by improving the taxonomic classification of the soil series of the country. The National Cooperative Soil Survey program may benefit by future improvements to the technical criteria used in classification of anthropogenic soils. ■

Haiti Pilot Soil Survey Capacity Building Initiative

By Charles Kome, soil scientist, NRCS World Soil Resources.

Following the 2010 earthquake in Haiti, President Obama directed Federal agencies to identify ways to contribute toward the recovery and reconstruction effort for a more sustainable future for Haiti. The USDA Natural Resources Conservation Service (NRCS) proposed a "Haiti Pilot Soil Survey Capacity Building Initiative" to improve household incomes through increased agricultural production, improved natural resource management and conservation, and better environmental stewardship.

The proposed initiative will enable experts from NRCS in collaboration with Haitian technical staff to demonstrate the value and benefits of soil survey technology and soil information, including the enhancement of agricultural productivity and conservation planning, community planning, and environmental decision making. The pilot soil survey will demonstrate the technology, its utility, and its relevance for sustainable natural resources management. Furthermore, it will contribute toward building the capacity of the Ministry of Agriculture and related ministries, the University of Haiti, and other institutions to meet the country's long-term goal of improving natural resources conservation, agricultural productivity, land use sustainability, and food security.

By the end of the project, NRCS will have provided training in the management and support of soil survey programs to senior managers at the Haiti Ministry of Agriculture and to staff at the University of Haiti. NRCS will also have provided

training to soil scientists and agronomists on soil survey design, implementation, and interpretation of soil and vegetation data. The training will help develop specialists in soil survey, testing, and interpretation; GIS specialists; soil conservation technicians; and extension agents that can work directly with farmers. The cadre will have the skills to design, conduct, and interpret inventories of soil and vegetation; manage soil databases; prepare management guidelines and protocols for agricultural production; and provide improved extension services to end users.

Specific deliverables of the initiative include:

- A cadre of Haitian managers and technical specialists with the skills to plan, conduct, and interpret soil surveys and vegetation surveys and to disseminate management information and guidance based on the soil surveys. These specialists will be able to develop soil surveys of new areas after the completion of the pilot activity.
- The basic equipment to conduct soil surveys and interpret the findings.
- A demonstration survey of 3,000 hectares (7,400 acres) with soil and vegetation maps (1:25,000 scale), soil descriptions, and information on soil properties at selected observations points. The survey will be conducted at a site where the application of the soil survey information can be demonstrated and will include interpretations for crop use and productivity, erosion hazards, soil degradation (land use capability and limitations), management options, urban development, and other applications.
- Benefits for the estimated 500 farmers that live within the 3,000 hectares of the pilot survey area. Using the improved agricultural extension services and following the soil management recommendations of the soil survey will lead to increased agricultural production and increased household income.
- Findings and recommendations that are available both digitally and on paper. Thematic in nature, they will serve as guidelines for on-the-ground guidance and implementation of agronomic and conservation practices.
- Newly acquired skills, which will enhance future collaborative efforts between Haiti and the United States and will empower the Haitian technicians.

Since the conception of the project, NRCS staff members have conducted three missions to Haiti. The first mission was from May 1 to May 7, 2011. Dr. Thomas Reinsch, national leader for NRCS World Soil Resources, and myself conducted an assessment mission in Haiti to determine if a pilot soil survey should be a national priority at that point in the recovery and reconstruction. We conducted a needs assessment to discover relevant resources and explore possible approaches to train Haitians; to conduct soil inventories; to develop soil information delivery tools for farmers, land owners, policy makers, and other users; and to promote science-based natural resource conservation and environmental stewardship in alignment with Haiti's national agricultural strategic plan.

We visited designated ministry officials, delegates from national institutions, and international organizations engaged in related activities. We went to potential sites for the project to assess the soil and landscape complexity, land use, and accessibility. We discussed strategies for using a participatory approach that would involve as many stakeholders as possible. We interviewed a broad spectrum of individuals and discussed how they could benefit from soil survey information. Our visit to the demonstration farms of the "Watershed Initiative for National Natural Environmental Resources" (WINNER) was particularly informative. The farms are used to train extension agents. We were exposed to typical cultural practices and crop varieties and got a close look at the vegetation and landforms on the landscape.

We were delighted to learn that the Ministry of Agriculture, Comité Interministériel pour l'Administration du Territoire (CIAT), the university, WINNER, and others were willing to contribute time, labor, equipment, and digital maps and to facilitate access

to sampling sites in support of this initiative. There was overwhelming support for the initiation of a soil survey inventory in Haiti with systematic but appropriate soil information delivery tools. It was emphasized that, to be successful, the project must include capacity-building components at major agricultural institutions, the Ministry of Agriculture, and other relevant ministries and agencies.

A few months after our first mission, however, there was a change in government in Haiti and the Minister of Agriculture was replaced. It was necessary to conduct a second planning mission to Haiti, from April 23 to 24, 2012, to confirm the Government of Haiti's (GOH) continued support and approval for the proposed soil survey pilot demonstration and capacity-building initiative. Trip preparation included a series of consultations with personnel at the USDA–NRCS International Programs and Foreign Agricultural Service. The meetings were needed to ensure that the Haiti Soil Survey Pilot Initiative was aligned with USAID mission goals and the Haiti National Agricultural Investment Plan and to gain a better appreciation of lessons learned in the planning and implementing of similar international projects.

During the second mission, we met with the Honorable Minister of Agriculture Hébert Docteur, the Director General of the Ministry of Agriculture Lyonel Valbrun, and Senior Ministry of Agriculture Cabinet Member for Natural Resources Louis Buteau. We held two half-day working sessions with the technical leadership team. Our deliberations focused on the development of a soils information system for Haiti using the USDA–NRCS model. The pilot project will provide a test for USDA–NRCS efforts at international technology transfer using such modern soil survey technologies as digital soil mapping and proximal sensors.

Senior ministry leaders were provided an overview of soil survey, including models for data collection, processing, storage, management, dissemination, and use. We also discussed the resources necessary to implement a soil survey program, such as personnel, equipment, facilities, and transportation. The following specific questions were covered: “What is soil survey?” “Why soil survey?” “Who conducts soil surveys?” and “How do we conduct soil surveys?” Other topics included soil survey publications, soil survey delivery tools, samples of completed U.S. soil surveys and other relevant publications, and expectations for the anticipated Haiti soil survey.

Significant developments from the second mission included the hiring of a project manager for the USAID/USDA Haiti participating agency service agreement; the overwhelming declaration of support for the soil survey pilot project by the new Minister of Agriculture and his subordinates; the ministry's plan to hire more staff, some of whom will be trained to conduct soil survey and develop soils information delivery tools; the creation of a senior, cabinet level position for natural resources conservation; the formation of a leadership team for soil survey; and the selection of two team leaders as national focal points for the soil survey pilot initiative. We also identified potential cooperators, partners, and beneficiaries and outlined their potential roles and responsibilities. Another significant development was the unanimous decision to jointly organize a meeting of potential collaborators and partners. The meeting would outline needed resources, assign roles and responsibilities, determine the location of the pilot, and develop timelines and deliverables of the pilot soil survey.

As a follow-up to the resolutions of the second mission, Dr. Thomas Reinsch, myself, Melvin Westbrook (director for NRCS International Programs Division), and Harold Tarver (Foreign Agricultural Service), in collaboration with Haitian leaders, conducted a stakeholders' workshop in Port au Prince, Haiti, from September 9 to 12, 2012. By this time, a new Minister of Agriculture had been appointed. The purpose of the workshop was to solicit input on multiple aspects of the proposed project, including technical components, objectives, location and scope, methodological approach, roles and responsibilities, budget cost centers, anticipated results, and strategies for the dissemination and utilization of the soil survey information.



Organizers of the stakeholders' workshop with the Haitian Minister of Revitalization.

The stakeholders' workshop was attended by over 90 participants, including the Minister of Agriculture and other ministry staff, faculty from the Department of Agriculture and Veterinary Medicine at the Haiti State University, the Secretary of State for Revitalization in Haiti, the acting director and other representatives from USAID, and representatives from international organizations, agricultural nongovernmental organizations, local farmer associations, and other potential stakeholder and partner organizations.

Because of the success of the workshop and the motivation displayed by the participants, USAID gave FAS and NRCS the green light to revise the project proposal based on recommendations from the stakeholders' workshop and proceed with the finalization of the project agreement for implementation in 2013.

Following the workshop, NRCS revised and resubmitted the proposal to FAS and USAID. We are currently awaiting the transfer of funds from USAID to NRCS before proceeding with the next phase of project implementation. The next phase will include:

1. Arranging a study tour for selected Haitian leaders to the U.S. under the Cochran Fellowship Program,
2. Developing a training agenda for the study tour that satisfies the needs of the participants and the organizers,
3. Preparing position descriptions for detail assignments of NRCS scientists to Haiti for in-country training,
4. Acquiring LIDAR and requisite base maps of the pilot area,
5. Exploring strategies for the use of devices for data collection and dissemination,
6. Preparing for procurement of needed field and office equipment in collaboration with USAID and FAS,
7. Working out details on training design for various phases of the project, and
8. Beginning project implementation.

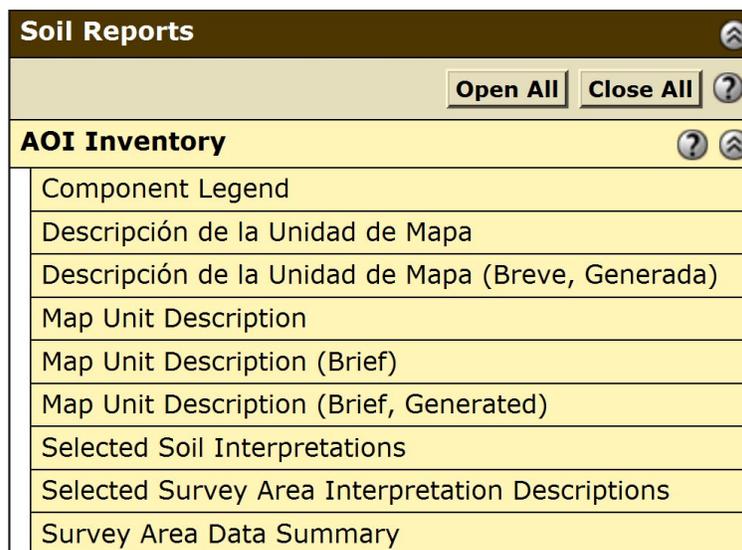
Haiti historically has high rates of erosion and deforestation, a high frequency of floods, and other climatic vulnerabilities, including an average of two major tropical storms or hurricanes annually. The fragility of the physical environment and the pressure of high population on the land make a compelling case for the adoption of conservation practices based on soil survey information. An investment in a soil survey today, accompanied by a paradigm shift in the conservation ethic through national public campaigns among all segments of society, will lay the groundwork for protecting Haiti’s most valuable resources—soils, water, biodiversity, and people. It is clear that the economic benefits for Haiti from a soil survey that is adequately used for conservation and land use planning will exceed the likely costs. ■

Map Unit Descriptions Available in Spanish on Web Soil Survey

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

In an ongoing effort to meet our customers’ needs, NRCS has translated into Spanish the map unit descriptions available as soil reports on the Web Soil Survey. The Web Soil Survey is one of the agency’s primary methods for delivering soil survey data. The translations are produced through scripted programming and are available for every USDA-certified soil survey in the United States. The translations were conducted by bilingual soil scientists across the country.

The Web Soil Survey generates reports of map unit descriptions in tabular and narrative format. The database elements and the template structure were translated for both formats. This project was coordinated by the National Soil Survey Center. The Web Soil Survey is the largest USDA Web outreach site. It receives more than 100,000 visitors a month, and more than 190,000 custom soil survey reports were prepared in 2012. The Web Soil Survey continues to grow in popularity due to its high responsiveness to customer needs and is now prepared to serve an even larger audience through this bilingual effort. ■



AOI Inventory reports are available under the Soil Reports tab after an area of interest has been selected in the Web Soil Survey.

Where the Sun Always Shines: Mojave National Preserve

By Stephen Roecker, soil scientist, NRCS, Victorville, California.

Western lands include some of the last areas in the lower 48 States that lack initial soil mapping. This is especially true in the Mojave and Lower Colorado Deserts (MLRAs 30 and 31). Characterized by hot, dry summers and warm, moist winters, the Mojave is home to iconic animal and plant species, such as the Joshua tree and desert tortoise. It is also home to a few soil scientists (and one rangeland management specialist), located in the soil survey office in Victorville, California. At present, the Victorville staff is in the third year of mapping the soils and ecological sites of Mojave National Preserve (referred to as MOJA by the National Park Service), which covers approximately 1.6 million acres.

Located in the heart of the Mojave Desert, MOJA is 40 miles southwest of Las Vegas and is sandwiched between Interstates 15 and 40. It is a diverse landscape that ranges in elevation from 880 to 7,900 feet; has a geology that includes granitoid, volcanic, and limestone rocks; and includes numerous land surfaces that date back to the Pleistocene. The major landforms of the area vary from large coalescing alluvial fans to playas and active sand dunes, all of which are surrounded by isolated mountain ranges. Due to this diversity, MOJA has been the subject of numerous studies of soil geomorphology and geology. It has two research stations, which host students and researchers from around the world. The stations are run by California State University, Fullerton, and University of California, Riverside. The Victorville staff had a wealth of pre-existing information to review on the soils and geology of the area. The published soil survey of MOJA will aid future research while helping the preserve's staff make sound land management decisions.

An issue of special concern for MOJA is the protection of the desert tortoise (fig. 1), which was listed as a threatened species by the U.S. Fish and Wildlife Service in 1990. Six and a half million acres north and west of the Colorado River were designated as desert tortoise critical habitat (DTCH). Within MOJA, 773,348 acres (approximately half of the survey area) are designated as DTCH. Because desert tortoises spend most of their time below ground, soil scientists have to be alert for signs of tortoise burrows before digging. The MOJA survey crew was required to undergo Desert Tortoise Awareness Training. In addition to this training, a certified biologist is required to clear all soils pits and auger holes prior to excavation. In order to comply with these requirements, the Victorville staff preselected sample locations, either remotely or by field observation, for approval by the MOJA biologist. Although these special requirements do necessitate additional planning and coordination, they help to prevent any tortoise-related issues. Now that the formal consultation has been completed by the U.S. Fish and Wildlife Service, the Victorville staff can slowly begin work in the cleared areas of DTCH.

Given that MOJA is being mapped as third order, remote sensing is commonly used to verify map unit delineations. The Victorville office has a history of experimenting with remote sensing and other digital soil mapping (DSM) techniques. One particular success in this experimentation has been the modeling of mean annual soil temperature (MAST). The raster model makes plain the additive effects of elevation,



Figure 1.—A male desert tortoise crossing Ivanpah Road in the New York Mountains.

aspect, and albedo. MAST is an important variable within the Mojave Desert because it is easily correlated to broad trends in ecological sites, which are used to distinguish soil components. Even though deserts are typically hot and dry, small differences in temperature and moisture can have large impacts on the composition and abundance of vegetation. Within MOJA, the MAST raster model ranges from extreme hyperthermic to mesic (fig. 2). With this model and other DSM techniques, the Victorville staff is striving to bring consistency to the mapping of MOJA soils and ecological sites. The staff looks forward to experimenting with other techniques so they can provide the best possible soils information for MOJA.

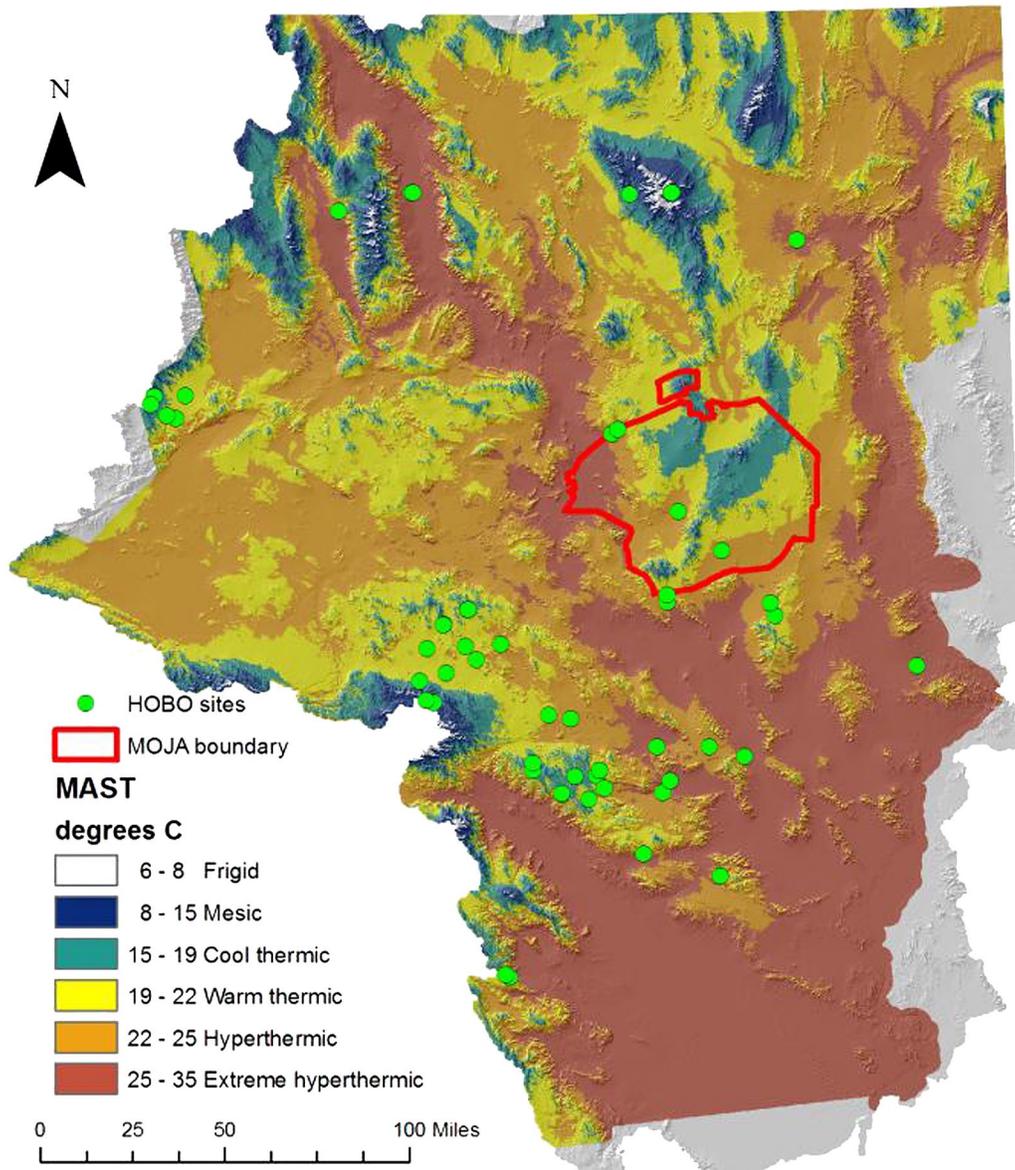


Figure 2. —A digital soil map of mean annual soil temperature for MLRAs 30 and 31.

To date, fieldwork has been completed on approximately 267,000 acres outside of DTCH. It has unearthed an impressive array of soil variability within the preserve to the tune of 21 tentative new soil series. My favorite series name so far is “Vegasglow,” coined by Emily Meirik (fig. 3) for the glow, caused by the lights of Las Vegas, that can be seen in the sky at night within the eastern portion of the preserve. On the first night I saw the glow, while camping in the preserve, I thought the sun was coming up. It was 2 a.m. Another interesting name for a tentative soil series is “Catbob,” named by Genevieve Widrig. The soil has almost 100 centimeters (40 inches) of saprolite that doesn’t meet the definition of a paralithic contact. Although these soils are dry as a bone in summer, they are moist enough in spring that a backhoe can cut through them like butter. No doubt many more unique soils are yet to be found. ■



Figure 3. —On the left, Soil Scientist Emily Meirik on Soda Lake (a dry lakebed). On the right, Soil Scientist Genevieve Widrig in the Soda Mountains.

Global Soil Week

By Jon Hempel, director, National Soil Survey Center, NRCS, Lincoln, Nebraska.

The first Global Soil Week Conference was held in Berlin, Germany, November 18–23, 2012. The conference was hosted by the Institute for Advanced Sustainability Studies in Potsdam, Germany. It was organized as a contribution to the Global Soil Partnership and centered on sustainable management of the soil resource. Global Soil Week will take place each year and include an international, multi-stakeholder conference on soils and their sustainable management.

The conference offered a forum for interactive exchange and dialogue. Stakeholders from science, government, business, and civil society from all across the world shared their soil and land experience and expertise in an effort to develop plans of action for sustainable soil and land management and governance. The first Global Soil Week also provided a platform to initiate follow-up actions on land- and soil-related decisions made at the Rio+20 Sustainable Development Conference.

The Global Soil Week Conference included 11 parallel sessions that dealt with sustainability issues from around the world. The sessions were followed by discussions and brainstorming about how best to move forward. The 11 sessions were:

- **The Soil & Water Nexus for Sustainable Livelihoods**
The main theme of this session was the key role of interactions between water and soil when considering sustainable livelihoods.

- **Ecosystem Services of Soils: Competition & Synergies**
Living soils provide many ecosystem services. Sustaining soils requires a new vision in which soil biodiversity is more consistently integrated into management and policy plans.
- **Soil Security**
The concept of soil security can engage the world about the importance of soil in providing solutions to issues regarding climate change, food security, water, and biodiversity. Soil carbon is the key indicator of soil security and provides a focal point for measurement and monitoring of progress in securing soil.
- **Ecosystem Services for Business**
Soil-derived ecosystem services are essential to livelihoods as well as to businesses. Water cleansing and the production of food are just two examples among many.
- **The Syndrome Perspective: A Focus on Soil Contamination**
Trans-disciplinary research and enforcement develops approaches to manage pressing societal needs. Some have suggested the “syndrome” perspective as a way to describe particular soil-related challenges to sustainable development.
- **Holding Actors Accountable—Instruments for Monitoring and Transparency of Large-Scale Land Acquisitions and Investments. What is in Place, What is to be Developed?**
The purpose of this session was to give impetus to initiatives promoting the accountability of States and the private sector by monitoring and by improving the transparency of large-scale land acquisitions and investments.
- **Greenbelt Movements, Ethiopia’s Tigray Project**
Topsoil continues to be degraded and lost through soil erosion, leading to poor harvests, reduced livestock production, and famine. This situation is exacerbated by climate change. Today’s generation has the responsibility to protect and preserve this precious commodity.
- **Payments for Ecosystem Services**
The concept of payments for ecosystem services has become popular during the last 20 years using an apparently simple rationale, i.e., in certain situations, providing economic incentives instead of regulating economic activities is more effective and efficient in securing and provisioning ecosystem services by rural populations.
- **Raising Soil Awareness**
Raising soil awareness is one of the cornerstones of the EU Soil Thematic Strategy. Without increased awareness of the importance of soils to human well-being, the necessary citizen support will be very difficult to achieve. Democratic consensus is a pre-condition for effective strategies and legislation to protect the soil.
- **Soil Information for Environmental and Societal Sustainability**
Soil information is of outmost importance in answering questions about economic, environmental, and societal sustainability. The session focused on consistent, quality-assessed soil data and information. Dr. Bossio from CIAT opened the session with his presentation “Why Do We Need Soil Information?” based on his experience as a user of soil information.
- **Voluntary Guidelines on Land Governance: Can They Help to Minimize and Address Competition and Conflicts for Natural Resources?**
Addressing current land governance challenges through voluntary guidelines is, at least at first sight, a paradox. How can the injustices embedded in many tenure systems around the world be addressed by a voluntary instrument?

As the NRCS representative, I provided presentations on the Soil Health Initiative in NRCS and the Global Soil Map project. I also provided background information regarding progress of the Universal Soil Classification Working Group in the development of common standards for describing and classifying soils. ■

Retirements at the Soil Science Division

Senior Scientist Chris Smith and Soil Survey Program Manager Paul Benedict both retired on January 3, 2013.

Chris Smith was, until the middle of last year, the National Leader for Technical Soil Services. He then served as the Senior Scientist for the Soil Science Division. He began working for NRCS/SCS in 1974, starting as a student trainee while attending California Polytechnic State University at San Luis Obispo. He spent two summers mapping soils in the San Joaquin Valley and the Douglas Fir-Redwood Belt of Mendocino County. After graduating, he mapped the Mollisols and Vertisols of the Central Coast Ranges in San Luis Obispo County before moving back to the coastal redwoods of Mendocino County. In 1978, he transferred to the Federated States of Micronesia and mapped the Caroline Islands for 2½ years. The complex physical and chemical properties of tropical soils inspired him to return to school to obtain an M.S. and Ph.D. in soil genesis and classification under Dr. Stan Buol at North Carolina State University. His studies had an emphasis on relating pedologic data to inherent soil fertility characteristics. After graduating, he took a position at the National Soil Survey Laboratory in Lincoln, Nebraska, as a research soil scientist. After being at the lab for 1½ years, he accepted the job of state soil scientist in Hawaii. In February 2007, he took the position of National Leader for Technical Soil Services at National Headquarters, where he led the writing of the "Technical Soil Services Handbook." His favorite projects have been work on the Rapid Assessment of Soil Carbon, P Loading Potential, the EPA National Wetlands Condition Assessment, and Soil Health implementation. He was also Chair of the National Technical Committee for Hydric Soils. He spent most of his time at NHQ interacting with other staffs and increasing the prominence of soils activities, data, information, and concerns in NRCS program activities. He is an avid sailor and will continue this addiction as long as he can. Mary Jane, his wife and first mate, has succumbed to this fate. She says it is of her free will and has decorated the interior of the boat to suit her taste. Chris can be reached at csmithsail@aol.com.

Paul Benedict, like Chris Smith, started his career with NRCS/SCS as a student trainee while attending California Polytechnic State University at San Luis Obispo. His first assignment was in Los Banos, California, beginning in March 1978. He went on to work on soil surveys in several lovely and unique California locations (Bishop, Coalinga, Edwards AFB, and Bakersfield), mapping intensive cropland, rangeland, wooded mountains, deserts, and verdant meadows. He became the area soil scientist at Pocatello, Idaho, in 1991. This was one of his favorite jobs (it ended in 1995 due to restructuring). He then moved to the Arkansas State office. He worked there from 1995 to 1999, mostly on wetland appeals and soil survey manuscripts. In 1999, he moved back to California to be the assistant state conservationist for field operations in the brand new area office at Riverside. In 2002, he moved to the Northern Great Plains where he was the MO regional leader at Bismarck, North Dakota. In February 2008, Paul became the Soil Survey Program Manager at National Headquarters. Paul and his wife Delena live near Manassas, Virginia. In retirement, he plans to garden, fish, and tinker on various home improvement projects. He is also preparing for when he becomes a Grandpa in May. ■

Soil Survey of the Llanos Region, Columbia, Using the Digital Soil Mapping Approach

From January 14–18, NRCS Research Soil Scientist Zamir Libohova participated in a workshop organized by the International Center for Tropical Agriculture (CIAT). The workshop took place at CIAT headquarters in Cali, Colombia. The objective of the workshop was to develop a plan of action for determining the influence of soil temperature and moisture regimes on the Oxisols of the Llanos region. One emphasis of the workshop was the use of digital soil mapping (DSM) techniques, in combination with legacy data and local tacit knowledge, to map major soil properties related to physical and chemical characteristics and soil fertility. The CIAT staff is leading an effort to provide expertise in the area of DSM. Dr. Phillip R. Owens, an associate professor at Purdue University who is currently on sabbatical at CIAT, is coordinating this effort along with Dr. Aracelly Castro, the lead soil scientist at CIAT. The CIAT staff is particularly interested in the DSM approach. The USDA–NRCS National Soil Survey Center and Purdue University are among the leaders of this approach in the United States. Approximately 15 local and international scientists/experts and graduate students participated in the workshop.

A series of presentations on DSM methodology and techniques were given by Dr. Owen's team from Purdue University and soil scientists from the National Soil Survey Center. Interested local farmers and stakeholders were interviewed during the field trip to discuss key priorities for the sustainable management of soil resources. The Llanos region is in the central part of Colombia at the foothills of the Andes and occupies approximately 4 million hectares (9.9 million acres). This region supports dominantly savanna vegetation, mostly swamp grasses and sedges (fig. 1a), and tropical forests that are limited to stream corridors and depressions at the lower elevations (fig. 1b). Open grazing of livestock, mostly cattle, is the dominant land use.

The region receives between 1,100 and 4,500 millimeters of rain annually, primarily from May to October. The dry season is characterized by winds. The permanent savanna grasses provide soil protection; however, their disturbance and/or removal (e.g., the introduction of commercial crops) may make the soils vulnerable to wind and water erosion. The region is also being affected by commercial agriculture (e.g., production of oil palm and rice), the draining of wetlands, and the fragmentation of natural ecosystems. Soils in the Llanos region are generally very acidic, low in organic matter, and high in bulk density. Farmers apply between 3 and 6 tons of lime (dolomite limestone) per hectare to correct soil acidity. Unfortunately, because of the high bulk density of the soil and high amounts of precipitation, the lime (which is applied to the surface) is washed away from the field during the rainy season. As a result, applications are needed every 3 to 6 years to maintain higher soil pH values.

During the field trip, the group visited the Corporación Colombiana de Investigación Agropecuaria (CORPOICA) Center in the Llanos region. This center is a state-sponsored extension agency that helps farmers while conserving watersheds, forests, and important native vegetation. The group also visited the farm of Alberto Duran. Mr. Duran provided insight on the struggles of farmers in the region to upscale agricultural production using management styles similar to those used in the U.S. Midwest.

Mr. Duran identified poor soil fertility and limited time periods for planting, fertilizing, and harvesting corn and soybeans (mainly due to rainfall patterns) as two of the major obstacles to the efficient and profitable production of corn and soybeans. Mr. Duran tried to upscale his corn and soybean production to 500 hectares in a 3-year period. This level of production proved too difficult to maintain



Figure 1. —a) An area of the Llanos region (top) dominated by savanna vegetation, mostly swamp grasses and sedges, and b) a dissected landscape in the region (bottom).

due to increasing costs and difficulties in logistics. Mr. Doran planned to use rotations of corn and soybeans and no till. He planted corn for the April-July period but, due to intensive rain during the rainy season, could not harvest the corn and thus could not follow with soybeans. The average sunlight or luminosity during the rainy season is about 4 hours per day, whereas it is 12 hours per day in the U.S. Corn Belt. Planting soybeans in late summer or early fall results in total crop failure because the dry season starts in November. The lack of infrastructure for storing and transporting products to the markets and the lack of government support, such

as subsidies, also hinder the ability of farmers to be competitive in local markets, let alone in international markets. Because local prices are affected by commodity imports from the U.S., which are cheaper due to heavy agricultural subsidies, local productions are discouraged. Mr. Duran’s comment “I can’t fight in a boxing ring with Mike Tyson” summed up the problem many local producers face in the region. Mr. Duran had experimented with raising beef cattle using “mombaza,” “stylothantes,” and “mulato” vegetative grasses in combination with legumes for a balanced diet. Based on his experience, he suggested that the combination of crossbreeding beef cattle based on high-nutrition forages, rotational grazing, and in-farm production and storage of high-nutrition feed (silage, grass hay, legume hay, and molasses) is a management plan better suited to the climate, soil characteristics, and level of infrastructure in the region.

The Llanos region currently has a general soil map at scale of 1:100,000–250,000. A more detailed soil map is needed if intensive agriculture and high-input crops, such as corn and soybeans, are to be introduced. The current general soil polygon map for the Llanos region lacks spatially explicit details on the distribution of key soil properties, such as soil depth, organic matter, texture, pH, and cation-exchange capacity, that are important for efficient agricultural production. The soils in the eastern portion of the Llanos region are dominantly Oxisols (fig. 2a). Psamments (fig. 2b), mostly of eolian origin, and Fluvaquents are of limited extent and are located mainly along major stream tributaries and river banks. The southwest portion of the Llanos region is characterized by dissected landscapes dominated by various gravel and lacustrine deposits (fig. 2c) originating from the Andes during the uplift in the dissected Llanos landscape. Due to high amounts of precipitation and high temperatures, soils in this region are generally highly weathered, are low in nutrients, and require large amounts of lime to neutralize the soil’s acidity.



Figure 2. —a) A typical profile of Oxisols, b) Psamments in the eastern part of the Llanos, and c) gravel and lacustrine deposits originating from the Andes during the uplift in the region.

It was agreed during the meetings that the future detailed soil map for the Llanos region, based on soil-landscape models using digital terrain analysis, would serve as a starting point for further soil investigations, including descriptions of typical soil pedons, and further collection and analyses of soil samples. Dr. Owens' team at Purdue University, Dr. Zamir Libohova from the National Soil Survey Center, Dr. Thomas Reinsch from the Soil Science Division, and CIAT's Lead Soil Scientist Dr. Aracelly Castro are working towards the production of the digital soil map. The team also visited with Anthony J. Gilbert, a representative of the USDA Foreign Agricultural Service currently serving as Agricultural Attaché at the American Embassy in Bogota. Mr. Gilbert expressed great interest in the Llanos DSM project and offered his support. ■

Meeting of the Cold Soil Task Group

The Cold Soil Task Group of the International Union of Soil Sciences Working Group on Universal Soil Classification met in Fairbanks, Alaska, from October 30 to November 1, 2012.

The core members of the Cold Soil Task Group are Sergey Goryachkin (task group chair), Institute of Geography, Russian Academy of Science; Megan Balks, University of Waikato, New Zealand; Jim Bockheim, University of Wisconsin, Madison; Mark Clark (retired), USDA, NRCS, Alaska; Rannveig Anna Guicharnaud, Joint Research Centre, European Commission; Jon Hempel, USDA, NRCS, National Soil Survey Center, Nebraska; Cezary Kabala, Wroclaw University of Environmental and Life Sciences, Poland; Dmitry Konushkov, Russian Academy of Science; Chein Lu Ping, University of Alaska, Fairbanks; Erika Micheli, Szent Istvan University, Hungary; Phillip Owens, Purdue University, Indiana; and Charles Tarnocai, Agriculture and Agri-Food Canada, Ottawa.

The expectations of the workshop, as defined by the group at the beginning of the meeting, were as follows:

1. Define cold soils
2. Outline central Great Soil Groups
 - a) Define properties and ecosystem functions of cold soils that are distinct from those of other soils
 - b) Define diagnostic criteria for cold soils
3. Identify all available data for calculation of data-driven group centroids
4. Describe one unified method for characterizing the morphology of cold soils
5. Capture Arctic, Antarctic, alpine, and boreal differences in the Universal Classification System
6. Address unique situations, such as the depth of permafrost in shallow soils and "ultracontinental" climates
7. Define the meaning of pedon

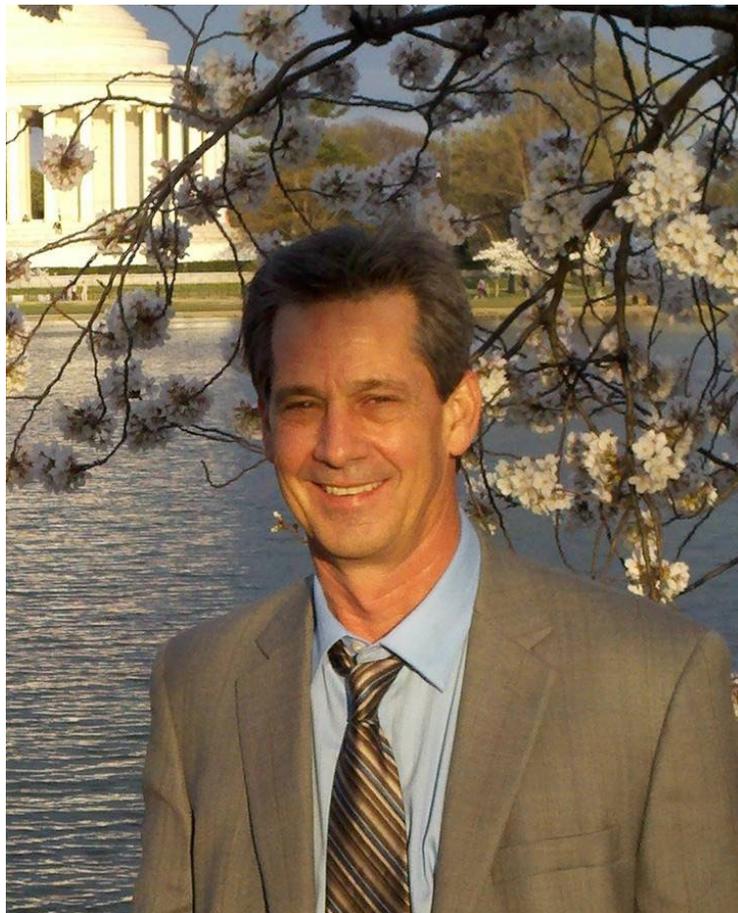
All of the items were discussed throughout the workshop, and either excellent conclusions were produced or further research or development was planned. The full document that outlines all of the plans for moving forward is online at http://soils.usda.gov/technical/classification/Univ_Soil_Classification_System/task_groups.html, under "Expectations and Action Items." ■

New Director of NRCS Soil Science Division

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

David Smith is the new Director of the Soil Science Division. He comes to the position with 34 years of agency experience and most recently served in the dual role of state soil scientist for California and MO leader for the Pacific Southwest MLRA Soil Survey Region (MO-2). From 1995 to 2002, he worked as a member of the agency's Oversight and Evaluation Staff at regional and national offices. During this time, he conducted analyses and reviews of quality of conservation practice applications, quality of technical training, efficacy of accountability systems, EQIP, WRP, and Soil Survey programs. His past experiences include acting deputy state conservationist for 6 months and acting Director of the Soil Survey Division for 1 month.

Smith began his career as a field soil scientist intern in 1978. He mapped soils in six soil survey project areas, served as a soil survey project leader, authored a soil survey report, led the statewide California Soil-Vegetation Survey program under an interagency agreement with the State's Department of Forestry, worked in positions of soil database manager and soil interpretations specialist on the State's soils staff, and became state soil scientist for California in 1992. Smith enters the job of Director of the Soil Science Division with broad-based experience both in the agency and the National Cooperative Soil Survey program and looks forward to the challenges and opportunities of leading the program.



David Smith, new director of the Soil Science Division of NRCS.

Monitoring Soil Climate in Antarctica

Antarctica is the coldest place on earth and has an area of about 5.4 million square miles. About 98 percent of the continent is covered by ice, which averages about a mile thick. The ice-free areas are widely scattered and are located along the Transantarctic Mountains, around the margins of the continent, and in the Antarctic Peninsula. A large ice-free area (about 3,700 square miles) called the McMurdo Dry Valleys is located along the western coast of the Ross Sea. These valleys are not covered by ice primarily because the Transantarctic Mountains block the ice sheet from the polar plateau, thereby keeping the ice from flowing into the valleys. The McMurdo Dry Valleys are extremely arid and are considered cold deserts (fig. 1).

Antarctic soils do not have accumulations of organic matter and are commonly alkaline with wide variations in salinity. The soils formed predominantly as a result of physical weathering and have coarse textures and significant amounts of rock fragments throughout the profile. They display little soil development. The surface is generally armored with a desert pavement comprised of fragments ranging from coarse sands and gravel to boulders (fig. 2). For the last 13 years, NRCS personnel have been part of a collaborative effort with Landcare Research and the University of Waikato of New Zealand to better understand the fundamental properties and mechanics of cold and frozen desert soils in Antarctica.

During the period from December 7 to 24, 2012, Dr. Cathy Seybold from the National Soil Survey Center traveled to the McMurdo Dry Valleys and Ross Sea region of Antarctica to collect data from and carry out maintenance on nine long-term soil climate stations. Four of the stations are located in the McMurdo Dry Valleys, and four are located along the coast (fig. 3). The ninth station is located on Mt. Fleming

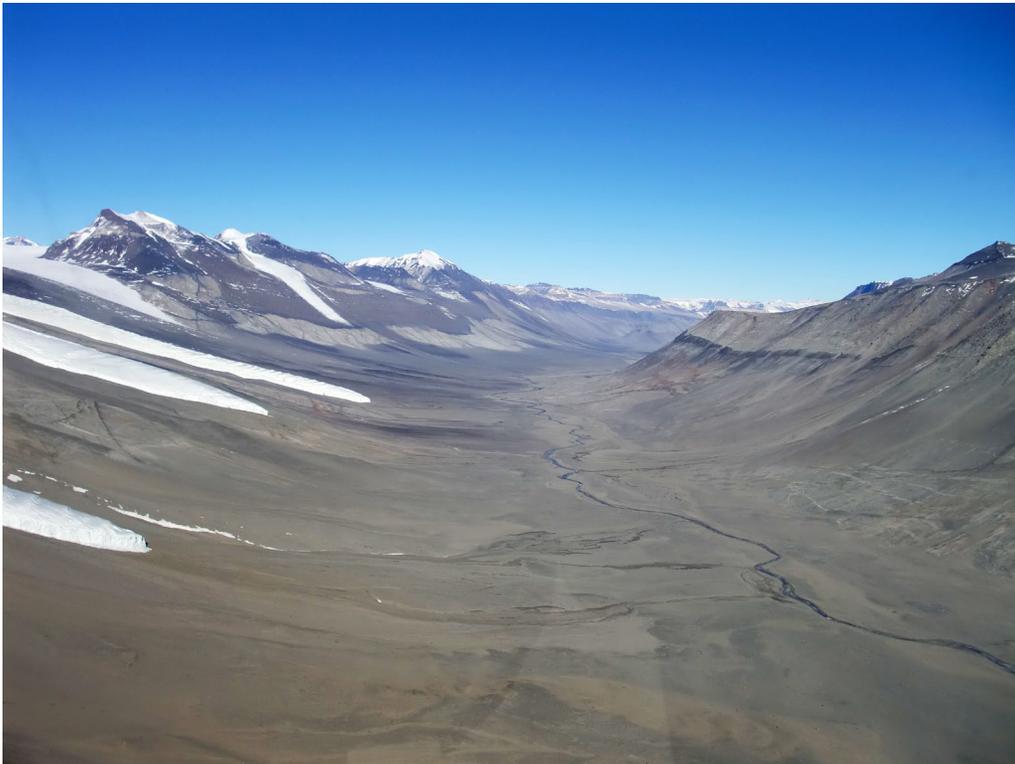


Figure 1.—The Wright Valley, which is one of the McMurdo Dry Valleys in Antarctica.



Figure 2.—Soil climate station at Minna Bluff on strong desert pavement. Mt. Discovery is in the background.

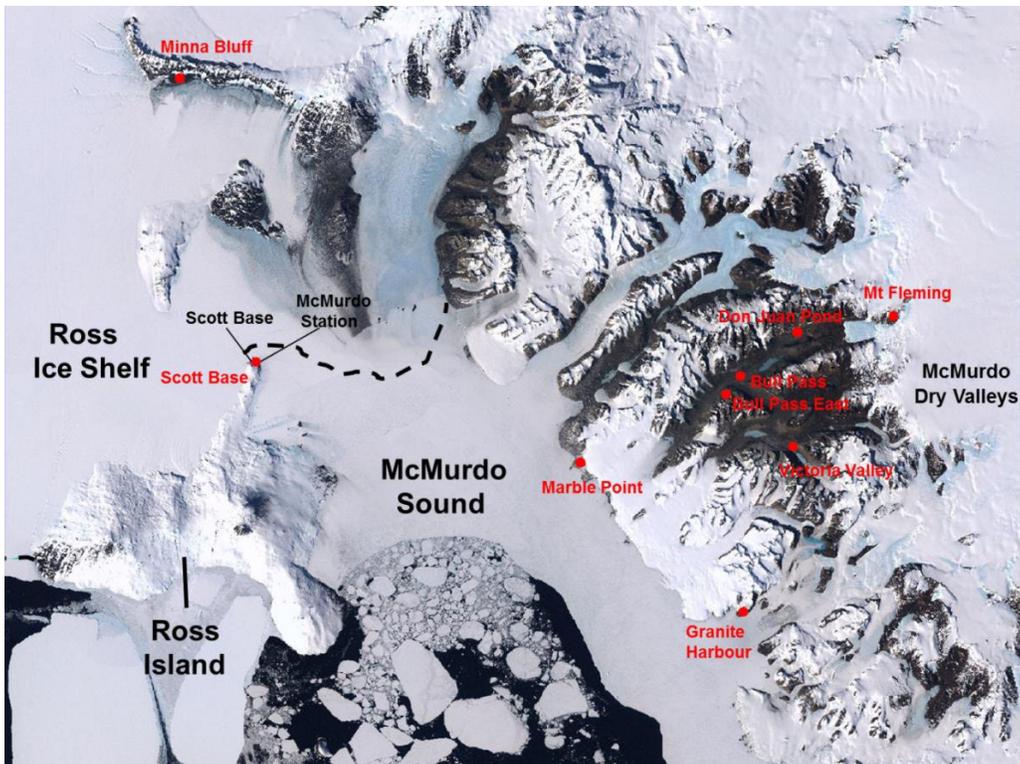


Figure 3.— Landsat image showing the location of the nine soil climate stations. For scale, the distance between Scott Base and Minna Bluff station is about 50 miles.

near the polar plateau. Each climate station measures atmospheric parameters (air temperature, relative humidity, wind speed and direction, and solar radiation) and soil parameters (soil moisture and temperature) that extend from the active layer (seasonally thawed layer) into the permafrost. Measurements are recorded on an hourly basis. The soils at each climate station have been sampled, and the samples have been characterized at the Kellogg Soil Survey Laboratory.

The research being conducted for this project will determine the impacts of climate change on the soil's active layer and upper permafrost. The data provides baseline information that is needed for understanding coastal ecosystems and active layer dynamics along the Victoria Land coastline in the McMurdo Sound region. Data is also being used in the development of a robust spatial environmental domains classification of this same region. In the United States, information resulting from this trip will aid NRCS in understanding cold and dry soils and their monitoring and may have implications for coping with global climate change.

At the climate stations, mean annual air temperatures range from -17 °C to -24 °C, and mean annual soil temperatures range from -14.6 °C to -23.5 °C. The average maximum thaw depth ranges from 5.5 centimeters at Mt. Fleming to greater than 90 centimeters at a protected coastal site. Mean water contents range from 0.013 m³ m⁻³ near the surface in the McMurdo Dry Valleys to 0.33 m³ m⁻³ near the ice-cemented layer at a coastal site.

The soil climate data and metadata (i.e., soil descriptions, soil characterization data, and station records) are available to the public and cooperating scientists at <http://soils.usda.gov/survey/smst/antarctica/index.html>. Climate data can be downloaded by year, or data can be viewed graphically for each sensor by year. The 2012 data has been processed and will soon be posted to the Web site. Data from these climate stations have been summarized and published in several technical journals (Adlam et al., 2010; Aislabie et al., 2004; Aislabie et al., 2006; Balks et al., 2000; Balks et al., 2002; Gugleilmin et al., 2003; Paetzold et al., 2000; Seybold et al., 2009; Seybold et al., 2010; and Wall et al., 2004) and have been included in five theses from collaborators in New Zealand (Aaron Wall, Fiona Shanahun, David Holmes, Leah Adlam, and Holly Goddard).

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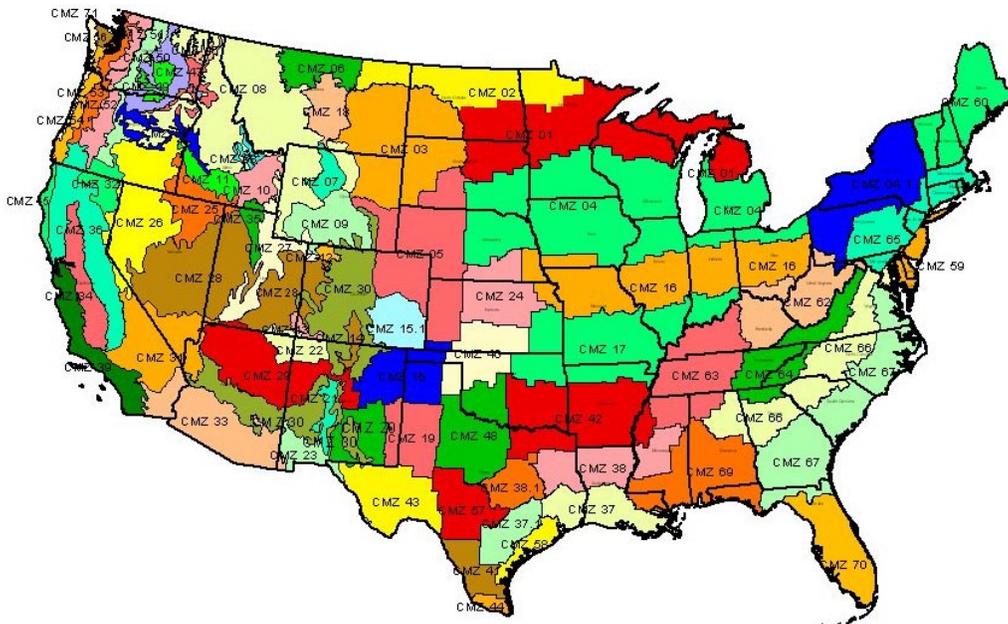
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Integration of the Land Management Operations Database

NRCS staff recently completed and released an update to the national crop and soil management database. Staff included crop management zone leads, state agronomists, and regional agronomists under the leadership of Dr. Linda Scheffe, agronomist on the Soil Interpretations Staff at the National Soil Survey Center.

The database is used in the official NRCS field assessment tools for water erosion and wind erosion—RUSLE2 and WEPS, respectively. Over 35,000 crop management templates were updated. They are representative of cropping and management systems, including energy use. The templates cover 78 crop management zones in the continental U.S., the Caribbean, and Hawaii and the Pacific Basin. New crops, new types of vegetation, and new operations have been added to RUSLE2 and WEPS to further reflect current sustainable management systems, including the production of cover crops and specialty crops. Additional development work is planned for the next few months to provide detailed forage management templates.

The updates will enhance the utility and applicability of RUSLE2 and WEPS for NRCS employees and the wide variety of non-NRCS professionals who regularly use the models to inform land management decisions. The updated management templates will be delivered as cropland and hayland conservation planning templates for the Land Management Operations Database (LMOD). LMOD will be integrated with soil and climate databases to provide a scientifically sound, user-friendly database for use with conservation planning tools. It is intended to allow NRCS employees more time to provide technical assistance and quality service. In addition to the agency's internal customers, numerous external partners, including international partners, have requested support for customizing these databases for special uses. It is anticipated that LMOD will be released for use by NRCS, its partners, and the public by October 1, 2013. ■



Crop management zones.

Soil Classification Excursions Down Under

By Maxine Levin, Soil Science Division, Washington, DC, in collaboration with Joe Chiaretti, National Soil Survey Center, Lincoln, Nebraska; USDA Natural Resources Conservation Service.

As lethal bush wildfires raged through the Australian States of Victoria and Tasmania during January 2013, I was amazed that only a month earlier I had been in some of the same areas, tromping over drying fields of rape seed and admiring Australian landscapes, giant eucalypts, wallabies, and spectacular texture-contrast soils with my colleagues. Along with Joe Chiaretti, I attended two field excursions on soil classification in Australia. The excursions were held between November 25 and December 2, 2012.

The objective of the workshop and excursions was to allow soil scientists from all over the world to share viewpoints regarding classification of soils using the World Reference Base for Soil Resources (WRB). WRB is the international standard taxonomic soil classification system endorsed by the International Union of Soil Sciences (IUSS). It was developed by an international collaboration coordinated by the International Soil Reference and Information Centre (ISRIC) and sponsored by the IUSS and the Land and Water Development Division of the Food and Agriculture Organization of the United Nations (FAO). It replaced the previous FAO system of soil classification. WRB is intended for correlation of national and local systems. The level of detail corresponds to subgroups in USDA Soil Taxonomy (ST) without the soil climate information. WRB is not detailed enough for mapping at scales larger than about 1:200,000. A proposal has been made, however, to couple WRB with substrate information to map at 1:50,000 in regional studies. Soil scientists in Europe and Asia are using WRB to correlate between countries, particularly countries that developed their own national-level classification systems.

Australia asked users of the WRB, Russian, Chinese, and ST systems to join field tours through Victoria and Tasmania to observe and classify some soils of Australia. On the Victoria tour, special emphasis was placed on soils with high textural contrast, high amounts of sodium and magnesium, and a high content of expanding clays. The Tasmania tour had some soils similar to those in Victoria but also featured some soils with low clay activity, low base saturation, high iron content, and high amounts of organic material. Participants compared systems of classification to identify commonality in diagnostic features and to add criteria with specific guidelines to include the unique combination of characteristics of soil in Australia. The Australian soil classification system (ASC) was compared to all systems as a key to distinguish diagnostic criteria that are critical to Australian management systems.

Both excursions were helpful in building international rapport and support for improving soil classification systems. Gorgeous pictures of the landscapes and profiles can be seen at the Web site (<https://sites.google.com/site/soilpanoramas/home>) of our colleague Przemyslaw Charzyński, Ph.D., Torun, Poland.

My purposes for attending these excursions and meetings (I paid my own way using government time) were to learn more about the progress of the WRB system of soil classification and its commonalities with Soil Taxonomy and the Australian system and to provide outreach to the international community as a follow-up to the 2011 and 2012 conferences of the National Cooperative Soil Survey. By taking the tour, I supported activities by the Soil Science Division and IUSS that explore a universal soil classification system. In dialogue with soil scientists who use WRB, I had the opportunity to highlight NRCS approaches to soil survey mapping and application of Soil Taxonomy, particularly from the point of view of interpretation, use, and management. Soil Science Division leadership supports the international dialogue on testing a universal classification system and applying a harmonized system at the international level. I shared database strategies showing that NRCS is the current leader in database management for the soil resource as well as in

educational outreach. I had time to talk about strategies for a universal system based on commonalities of diagnostic criteria. I believe that Soil Taxonomy would also be improved by a field guide that focuses first on collection of all diagnostic features from pit observations and laboratory data. Only after all the diagnostic features are catalogued are we really ready for the classification keys.

Excursion: Victoria

The first excursion was organized by the Australian Society of Soil Science and was conducted in the southern State of Victoria (Melbourne is the State capital). This excursion was designed to test how WRB works for classifying sodic and texture-contrast soils. The 3-day excursion visited four soil pits each day and gave participants an overview of the landscapes, soils, and agriculture of the State. Highlights of the excursion included visits to farms and vineyards on the Mornington peninsula southeast of Melbourne, a visit to the Moonlit Sanctuary Wildlife Conservation Park (where we saw emus, dingoes, koalas, wallabies, and Tasmanian Devils!), a ferry trip across Port Phillip Bay, and an overnight stay at the rustic Warrambeen Landcare Education Centre, where participants were treated to a dinner of locally grown meat and produce and a presentation on the geologic history of southern Australia.

The soils we examined represented either texture-contrast, high sodium content, or both. Some general issues affecting taxonomic classification regarded concerns between the Australian Classification System (ASC) and both the FAO World Reference Base (WRB) and the USDA Soil Taxonomy (ST). These issues (identified by Joe Chiaretti) were:

- The presence and designation of lithologic discontinuities in the soils;
- The origin and recognition of red, iron-rich masses and nodules (plinthite) in the soils;
- The Australian use of the international scale for a break at 20 microns between silt and sand fractions versus the WRB break at 63 microns and the ST break at 50 microns, which results in two sand fractions in the Australian system versus six sand fractions in both WRB and ST;
- The Australian laboratory methods used to measure exchangeable cations, which impact calculation of effective cation-exchange capacity and percent base saturation (operational definitions of several diagnostic horizons and chemical criteria in ST and WRB specify values measured by particular methods that are not used in Australia); and
- The lack of mineralogy data on the total clay fraction (x-ray and thermal analyses) and the finer sand fractions needed to apply criteria for diagnostic horizons (e.g., the ferralic horizon of WRB and oxic horizon of ST) and mineralogy classes (ST).

Excursion: Tasmania

The second excursion was a 4-day preconference tour on the island of Tasmania. The excursion began at Launceston and ended at Hobart. The tour's theme "Soils in the Landscape—Managing Soils for Agriculture and the Environment in Tasmania" combined a wide range of soil and water management issues. The participants observed and classified seven mineral soils and one organic soil in the northern and western parts of the diverse and scenic, southernmost State in Australia. The excursion was conducted from Wednesday, November 28, through Sunday, December 2, 2012.

On Thursday, November 29, the group assembled at the hotel near Launceston and departed on a bus for the Cressy Research and Demonstration Station. In a

paddock (field) at the station, we observed, discussed, and classified an excavated pedon of the sodic Brumby soil. The station is operated by a global seed company under a lease from the Tasmanian government to conduct research, development, and extension. Tasmania is the world's largest producer of opium alkaloids from poppies for the pharmaceutical market. It produces about 50 percent of the world's concentrated poppy straw (CPS) for morphine and related opiates from merely 10.7 percent of the production area. (Concentrated poppy straw is the extracted opiates crystallized out of solution, not the poppy heads, seeds, and stalks.) We saw many fields of poppies but, for regulatory reasons, did not stop near any of the fields. Lunch was at Tamar Ridge Estates. It was followed by a presentation on research into soil properties important for vine vigor and root distribution in Tasmanian soils. The group observed and discussed two very problematic soil cores at the Kayena Vineyard.

On Friday, November 30, the group was taken from Devonport to the Forthside Vegetable Research Station, a center of excellence in research, development, and extension for Tasmania's vegetable industry and associated industries. The station is located on a dissected basaltic plateau. The plateau has many large areas of red, clayey soils named "Ferrosols" in ASC. Ferrosols are Tasmania's most intensively farmed soils. They are critically important to the State's production of crops and animal products. The group observed and classified pedons of the well-developed Burnie and Preston soils. After lunch and a visit to the Wing's Wildlife Park (where we saw more Tasmanian Devils along with baby wombats and adult kangaroos!), the group traveled to the Elliott Research and Demonstration Station. At Elliott, the tour leader discussed soils that are prone to slumping, recommendations for farm dams, and management of intensive dairy waste and runoff.

On Saturday, December 1, the group travelled from Burnie to the Duck River catchment near Smithton to observe, discuss, and classify the drained profile of a Kana soil in a wet pasture. Dr. Rob Fitzpatrick gave an informal discussion of the organic acid sulfate soils that occur locally. We were then driven south to the coastal town of Zeehan for a late lunch. From Zeehan, we went to the west coast to observe an organic soil in the Henty Dunes. We observed, discussed, and classified a profile of an "ocean beach peat" soil that formed in an interdune swamp and is now being eroded by wind and wave action.

On the last day of the tour, the group travelled east from Strahan past the old copper mining town of Queenstown to observe the vegetative damage and soil erosion caused by acid rain from copper smelting. Acid mine drainage and the resulting impacts to water quality were also discussed near Queenstown. A stop was made at the "Wall in the Wilderness" wood sculpture near Derwent Bridge to inform participants of the history of the Tasmanian forestry industry and the intentional extermination of a predatory marsupial (the thylacine, or Tasmanian tiger). Lunch was at a peat bog in the central highlands near Lake Echo. Participants learned about the local uses for peat and were allowed to dig and observe the thick deposits of herbaceous, freshwater peat. For the final leg of the tour, we travelled southeastward through the center of Tasmania and had a discussion on climate, land use, and agriculture.

Joint Australian and New Zealand Soil Science Conference

In addition to attending the workshop and field excursions on the World Reference Base for Soil Resources, I attended a joint conference of the Australian Society of Soil Science and the New Zealand Society of Soil Science. The meetings were held December 2 to 7, 2012, in Hobart, Tasmania, Australia. Included mid-conference was a tour of the old growth forest in the Styx and Derwent Valleys. The Styx Valley is home to giant eucalypts. During the meetings, I focused my efforts on attending

sessions on digital soil mapping, the terroir of Tasmania and Victoria (some of the best red wines in the world are produced in southern Australia), acid sulfate soils (prevalent in coastal Australia and my passion ever since surveying in Baltimore City, Maryland, in the 1980s), and forensic applications (common all over the world).

At the meetings, I also participated as a judge and controller of a pilot international collegiate soil judging contest. The contest was held in Richmond and Hobart, Tasmania. Five teams participated, including more than 40 students and university coaches. The event was intended to encourage the pursuit of soil science as a career. It was so successful that Australia, South Korea, and the U.S. now plan to organize the first international collegiate soil judging contest for the 2014 World Soil Congress in Jeju, Korea. Teams from all over the world, particularly those from developing countries, will be invited to compete. The pilot was based on contests that have been held for over 50 years in the U.S. (since 1961) and was developed through a more-than-2-year collaboration between myself, cooperators from the University of Sydney (Dr. Stephen Cattle and Dr. Alex McBratney), and several U.S. land grant universities (Dr. Cristine Morgan, Texas A&M; Dr. Jim Thompson, West Virginia University; and others).

Because of this trip, I had the opportunity to individually interact with 35 delegates from 10 different countries and to collect information for several future collaborations, both scientific and administrative. I learned a lot about the soils and landscapes of southern Australia and about specific management practices that are specialized to the climate, viticulture (terroir), vegetation, and erosion control of the area. I also learned quite a bit about the structure of the WRB classification system as well as the related keys in USDA Soil Taxonomy. I had the opportunity to discover a tremendous amount about the biodiversity, ecology, geography, agriculture, hydrography, soils, and development of southern Australia. ■

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