National **C**ooperative **S**oil **S**urvey **Newsletter**

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In This Issue—

Editor's Note

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You are invited to submit stories for this newsletter to Pattie West, National Soil Survey Center, Lincoln, Nebraska. Phone—402-437-5334; FAX—402-437-5336; email—pattie.west@lin.usda.gov.

A Different Kind of Sand

By Susan Southard, national liaison to the National Park Service, Natural Resources Conservation Service, National Soil Survey Center

In memory of Goro Uehara, 1928-2012, Professor of Soil Science, University of Hawaii

While helping the National Park Service across the country learn about soil survey information, I have visited some parks and have written about many. Recently, I visited the 800-acre Manzanar National Historic Site (Manzanar NHS) in the Owens Valley of California. Manzanar was established as a park in 1992. Meeting local park staff is one way I become familiar with the soils of a park and learn their management issues. As I drove to the park, I recalled a book I read years ago, *Escape from Manzanar*, by Jeanne Watasuki Houston. After I visited the park, one particular chapter in Houston's book entitled "A Different Kind of Sand" had new meaning to me.

When I mention Manzanar to coworkers, the usual response is, "What's that?" For background, Manzanar was a Japanese internment camp, or "war relocation center," in eastern California (fig. 1). It held 10,000 people of Japanese heritage between 1942 and 1945. The majority of the internees were American citizens from the Los Angeles area. Manzanar is the best preserved of 10 such camps, which collectively housed 120,000 internees in the years after the bombing of Pearl Harbor. Most of the internees at the remote desert outpost of Manzanar were urban business owners or truck farmers who had to sell, rent, or abandon all their property before being escorted under military guard to the camps.

Years before WWII, starting in 1913, a human-induced source of loess south of Manzanar was being created by exposing the alkaline lakebed of Owens Lake. The Los Angeles Department of Water and Power had recently gained control of water rights to the Owens Valley. Owens Lake was drained by the utility department using a system of diversions from the Owens River and its tributaries. The water supply was sent to southern California. The newly exposed salt-rich lakebed generated manmade loess that was carried both north and south on turbulent winds funneled through Owens Valley (Reheis, 2011). The Sierra Nevada to the west and the White-Inyo Range and Coso Range to the east surround Owens Valley (fig. 2) and determine

Figure 1.—Sign near the entrance to the park.

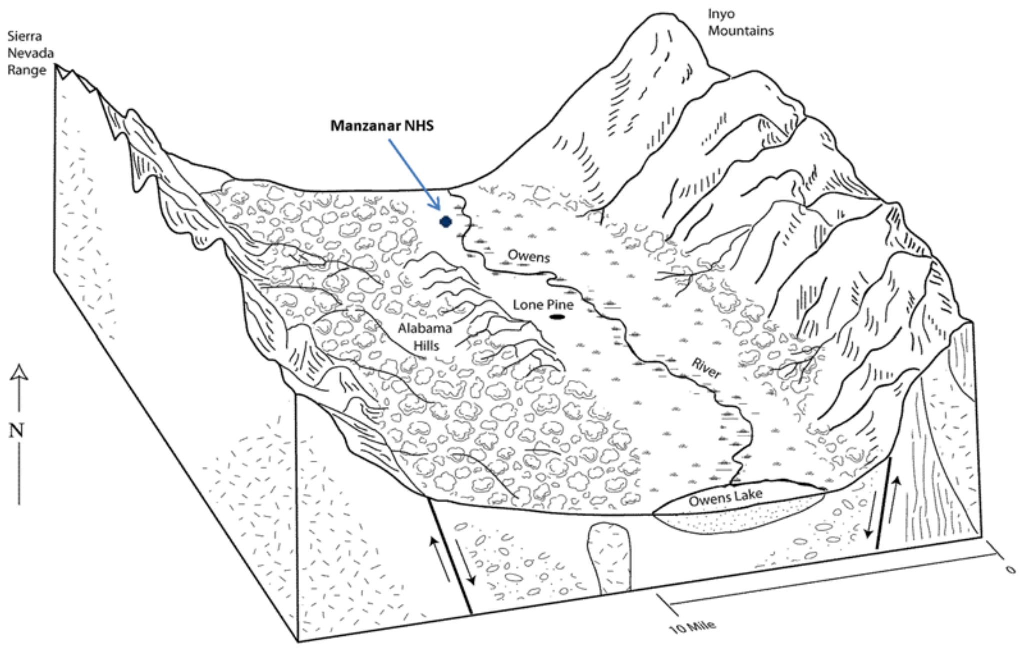

Figure 2.—Stylized model of the landscape surrounding Manzanar National Historic Site (adapted from the county soil survey report). Manzanar lies in the rain shadow of the Sierra Nevada and is north of Owens Lake.

its dry climate and strong wind patterns. This alkaline manmade loess, or PM10, was composed of a variety of minerals, including those derived from sodium chloride, sodium sulfate, sodium bicarbonate, and sodium carbonate. Internees at the Manzanar war camp described a frustrating and incessant “fine white dust” or “a different kind of sand” that got in their food and water. Internees have described breathing, eating, and sleeping in sand and flourlike dust. It became an all-consuming factor of daily life at Manzanar. When an internee would arise in the morning, a thick outline in dust of his or her body was left on the cot—so even nighttime offered no respite from gritty conditions.

The soil survey of the area identifies most of the soils surrounding Manzanar NHS as being highly susceptible to wind erosion because of a loamy sand surface layer. In the soil survey data, the soils were assigned a wind erodibility group of 2, which is the second highest group. Locally windblown sand was due to construction projects within the camp. As the fresh lumber used to construct the hastily built barracks dried, gaps in walls and floorboards let more and more penetrating sand and dust consume interior living and sleeping quarters.

In order to sustain the camps, the United States War Department brokered a deal with L.A. Water and Power to divert some water to Manzanar for irrigation and household uses. Soon the internees had bumper crops of fresh fruits and vegetables and barnyards full of hogs and chickens, and they became self-sustaining (fig. 3). The

Figure 3.—The famous photographer Ansel Adams visited Manzanar war camp and captured a portfolio of images of camp life. (Library of Congress image LC-A35-4-M-31 Lot # 10479-1)

alluvial Mollisols and Entisols in the area became excellent agricultural soils once they were drained and irrigated. In addition, the internees built a series of six Japanese meditation gardens that offered them refuge from the harsh realities of life behind barbed wire and fences (fig. 4).

I have discovered that Manzanar still struggles with soil and water issues today. Existing water law stipulates that if L.A. Water and Power does not use all the water in the diversions, they lose the rights to it. Releasing water from the diversions, by the letter of the law, uses it. Consequently, during periods of high mountain runoff, Manzanar NHS has been flooded by purposely released water from diversions on the alluvial fans above the park (fig. 5). All of the soils in Manzanar formed in granitic alluvium and have low cohesiveness. Emergency water releases have resulted in breached and eroded meditation gardens built on and from these highly erodible soils (fig. 6). Other cultural resources, such as rock-lined root cellars, have been buried by sediment carried by water releases.

Hopefully, the soils information recently compiled and interpreted from existing soils data will help park managers preserve their cultural and natural resources (fig. 7). My experience at Manzanar NHS demonstrates how important our soil survey information is for teaching others about the role soils play in our lives and in helping us understand

Figure 4.—The mess hall Japanese meditation garden was created from local well rounded rocks (in left foreground) and angular rocks (in background) that were hauled from nearby mountains. Japanese meditation gardens offered respite from the realities of living in a war camp.

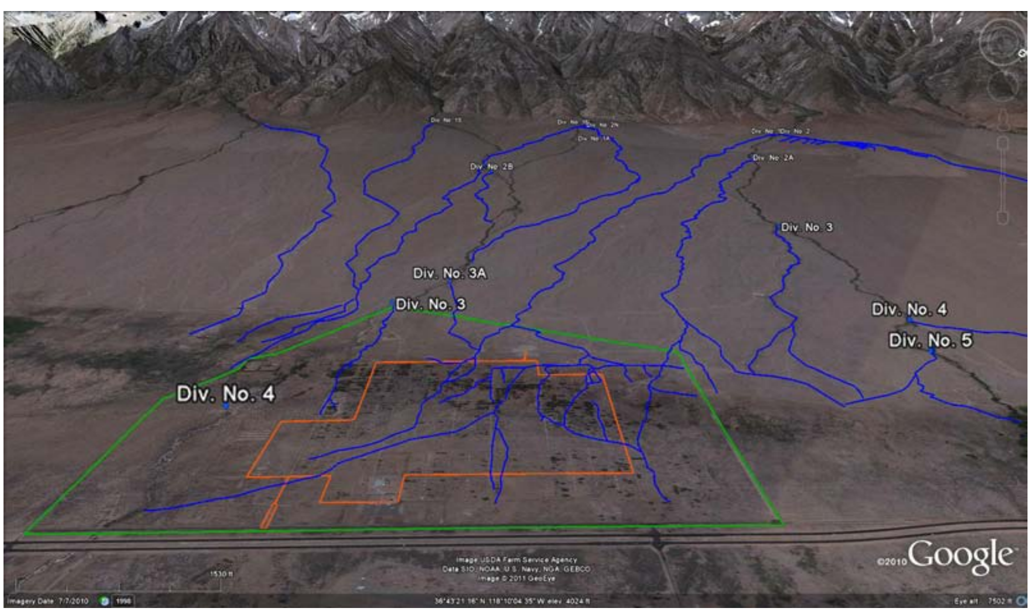

Figure 5.—A system of water diversions (blue lines) has altered the hydrology of all the soils in Manzanar NHS. Green lines represent the park boundary, and red lines show a park auto tour route. (Google Earth, 2011, and personal communication with NPS, 2011. Diagram provided by NPS with Google Earth image)

Figure 6.—Gullies form easily in highly erodible soils as a result of overland water flow, as shown here by an eroded hospital meditation garden.

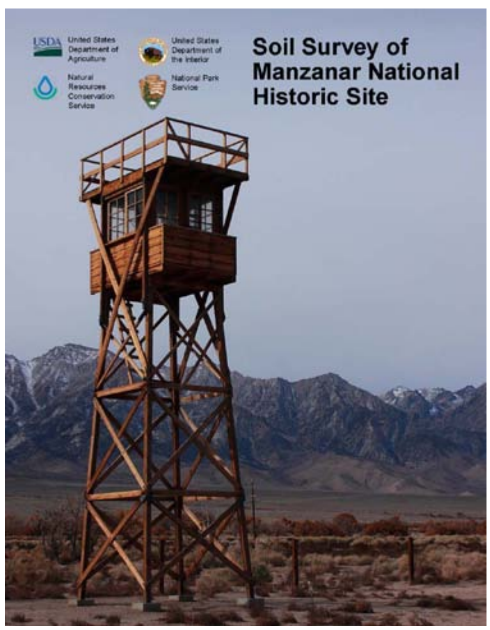

Figure 7.—The NPS reconstructed the Manzanar guard tower on the eastern edge of the park. The tower is depicted on the cover of the recently produced soil survey of Manzanar National Historic Site. Ansel Adams was prohibited from photographing the guard towers during his visit to Manzanar in 1943.

the past. As a final note, in 1965, Ansel Adams donated his images of Manzanar to the United States Library of Congress. In a letter to the Library he wrote: "The purpose of my work was to show how these people, suffering under a great injustice, and loss of property, businesses and professions, had overcome the sense of defeat and dispair [sic] by building for themselves a vital community in an arid (but magnificent) environment…. All in all, I think this Manzanar Collection is an important historical document, and I trust it can be put to good use." I hope I have helped put it to good use by sharing this story with you.

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Fire Recovery Marked with Open House

By Linda Greene, ACES enrollee, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska

The National Soil Survey Center's Processing/Receiving Section hosted an open house for its newly renovated facility on February 9. Larry Arnold, supervisor of Processing/Receiving, opened wide the doors and welcomed NSSC staff members to see what 3 months of cleanup, repair, and replacement had accomplished. During the entire recovery process, Arnold and his staff kept things going with little or no interruption to their mission, which was an admirable accomplishment.

The renovation was necessitated by a tragic fire on May 24, 2011. An old oven malfunctioned and overheated, causing flames to shoot out and burn ceiling tiles. Three fire sprinklers quickly activated and extinguished the fire, but a considerable amount of water covered the floor and the hallway, leaving quite a mess of soot, water, and soil samples. The fire also damaged the controls on two adjacent ovens as well as ceiling installation and wiring. Fortunately, there were no injuries. ■

Before the renovation

After the renovation

Collaborative Wetland Restoration Evaluation Project Between Virginia Tech University and the National Soil Survey Center

From Soil Survey Division, "Weekly Report," January 25, 2012

Wes Tuttle, geophysical soil scientist, NSSC, made a presentation to the North Carolina Soil Science Society on the campus of North Carolina State University on January 17 and 18, 2012. The presentation, "Effects of Soil Properties on Electromagnetic Meter Values," was the result of collaborative work between Dr. John Galbraith, Associate Professor, Crop and Soil Environmental Sciences, Virginia Tech University, and the NSSC. Electromagnetic induction tools were used to assess changes in soil properties across a manmade wetlands restoration site, the Cedar Run Wetlands Bank site, in Prince William County, Virginia. Collaborative projects such as this are beneficial for yielding much-needed information to support research projects and for fostering partnerships between governmental agencies and colleges and universities, especially as wetland restoration and carbon sequestration become increasingly important issues. ■

Lab Dedication Scheduled for June

By Linda Greene, ACES enrollee, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska

It's official. The National Soil Survey Center will officially dedicate its laboratory to Dr. Charles E. Kellogg. The dedication ceremony, which currently is in the initial planning stage, is scheduled for early June. Dr. Charles E. Kellogg is considered to be one of the most influential soil scientists and is responsible for many of the innovations and forward-thinking ideas for which the profession is currently known. The laboratory's new name will be "The Dr. Charles E. Kellogg Soil Survey Laboratory." More information will be forthcoming in a future issue of the NCSS newsletter. ■

Evaluation of Unique *Serpentine Barrens* Soils in Pennsylvania

By Jim Doolittle, research soil scientist, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska

Serpentinite rock outcrops occur in portions of southeastern Pennsylvania and north-central Maryland. Serpentinite is a green ultramafic rock that is low in silicon and high in magnesium and iron. Soils that formed over serpentinite have low Ca/Mg ratios, are low in essential nutrients, and have high concentrations of trace metals (nickel and chromium) that are toxic to many plant species. These distinctive chemical properties support unique plant communities, which contain few species that are common with the species found in the surrounding forests. Known as *serpentine barrens*, these areas support prairie grasses, greenbrier, and pitch pines as the dominant communities.

In southeastern Pennsylvania, the Chrome soils have been mapped on serpentine barrens. The Chrome series (fine, mixed, superactive, mesic Typic Hapludalfs) has been proposed for designation as a rare or unique soil, and its taxonomic classification is being reexamined. Areas of Chrome soils have an uncommon mineralogy and are suspected to have relatively high levels of magnetic susceptibility.

Little is known about the magnetic susceptibility of most soils. Magnetic susceptibility is the ratio of the magnetization of a material to the strength of an applied magnetic field. The magnetic properties of soils reflect the presence of ferromagnetic minerals, such as maghemite, magnetite, titanomagnetite, siderite, pyrrhotite, hematite, and ilmenite. In most areas, soils are assumed to be nonferromagnetic and have very low levels of magnetic susceptibility. Lithologic, pedogenic, and anthropogenic factors influence the magnetic susceptibility of soil.

Although magnetic susceptibility is commonly measured with a magnetometer, electromagnetic induction (EMI) sensors can be used as a surrogate to infer levels of magnetic susceptibility. Magnetic susceptibility affects both the in-phase (metal detection) and quadrature (apparent conductivity) components of the EMI response, but it is measured by the in-phase (IP) component. Magnetic susceptibility influences all EMI data to some extent, but in most soils the effects are generally small. In areas of serpentinite rocks and residuum, however, the effects of magnetic susceptibility are suspected to be high.

A project has been initiated by the soils staffs in Maryland, New Jersey, and Pennsylvania and the Research and Laboratory Staff at the National Soil Survey Center to characterize and map differences in soil mineralogy and trace metals in areas of Chrome soils. The purpose of this project is to better understand the distribution of the Chrome soils and to support designation of the Chrome series as a “rare or unique” soil in Pennsylvania.

The first step of this project was to complete an EMI survey across an area that includes soils that formed over serpentinite rock. Because of its speed, ease of use, depth of exploration, resolution of subsurface features, and immediate response, this continuous recording and noninvasive geophysical tool offers significant advantages to soil investigations. The EMI survey was conducted over areas of Chrome (ChC2) and Glenelg (GgB) soils in Chester County, Pennsylvania (MLRA 148—Northern Piedmont). The Glenelg soils (fine-loamy, mixed, semiactive, mesic Typic Hapludults) formed in residuum derived from micaceous schist. An image with the outline of the survey area is shown in figure 2.

Figure 3 displays plots showing the spatial apparent conductivity (EC_a, left-hand plot) and in-phase (IP, right-hand plot) patterns across the study site. The soil boundary line has been digitized from Web Soil Survey data. In general, most of the area that is mapped as Chrome soils has higher apparent conductivity (EC_a) but lower in-phase (IP) values than areas mapped as Glenelg soils; however, areas of

Figure 1.—Distinct chemical properties of serpentinitic soils sustain unique plant communities.

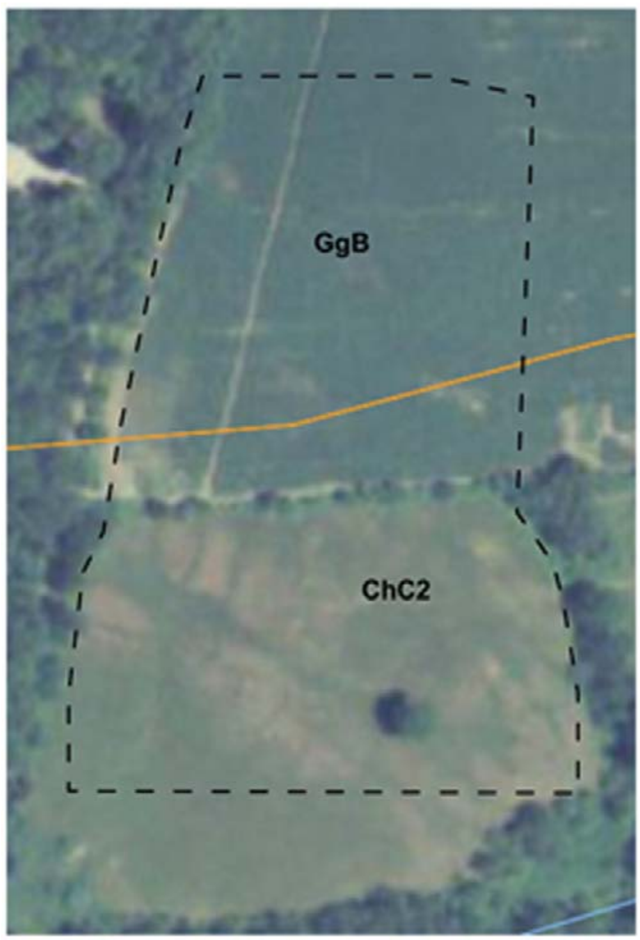


Figure 2.—This soil map shows the survey area in Chester County, Pennsylvania.

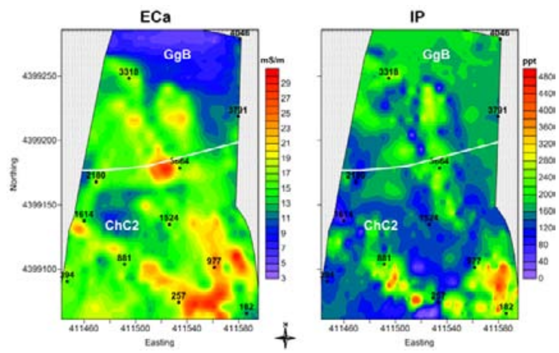


Figure 3.—Spatial EC_a (left) and in-phase (right) data are shown in these plots of the study site in Chester County, Pennsylvania.

Chrome soil are pockmarked by small isolated areas of exceedingly high EC_a and IP values, which are not so evident in areas mapped as Glenelg soils. In figure 3, short-range differences in lithology and mineralogy are believed to be the principal factors responsible for the more prominent spatial patterns. Linear patterns evident in the plot of EC_a and also (but to a lesser degree) in the plot of IP data are believed to reflect seams of dissimilar lithology and mineralogy.

Figure 4.—John Chibirka (resource soil scientist, Leesport, Pennsylvania) collects grab samples for trace metals analysis in an area of Glenelg soil.

Based on the EMI data, 12 optimal sampling points were identified (see numbered points in figure 3) using the ESAP (ECe Sampling, Assessment, and Prediction) software's "Respond Surface Sampling Design" (RSSD) program. The ESAP-RSSD program is a prediction-based sampling approach that is designed to reduce the number and optimize the location of sampling points based on the observed magnitudes and spatial locations of the raw EMI data.

The researchers returned to the site, and the location of each sampling point was indentified and flagged in the field. At each sampling point, small grab samples were collected for the 0- to 30-cm and 30- to 60-cm depth intervals (fig. 4). These samples were shipped to the New Jersey NRCS State Office in Somerset, New Jersey, for analysis. Richard Shaw and his staff will analyze the samples using a handheld Olympus Innov-X XRF analyzer (fig. 5).

The handheld XRF analyzer has the capability of measuring up to 79 elements, but it has been commonly used by soil scientists to measure the concentrations of 15 to 20 trace metals associated with urban soil contamination. Soils that formed in serpentine have elevated levels of chromium, iron, magnesium, and nickel. These elements will be measured with the XRF in an attempt to differentiate the serpentinitic from nonserpentinitic soils. ■

Figure 5.—Richard Shaw (state soil scientist, Somerset, New Jersey) uses a portable Olympus Innov-X XRF analyzer to measure trace elements in a pit in Manhattan's Ft. Washington Park.

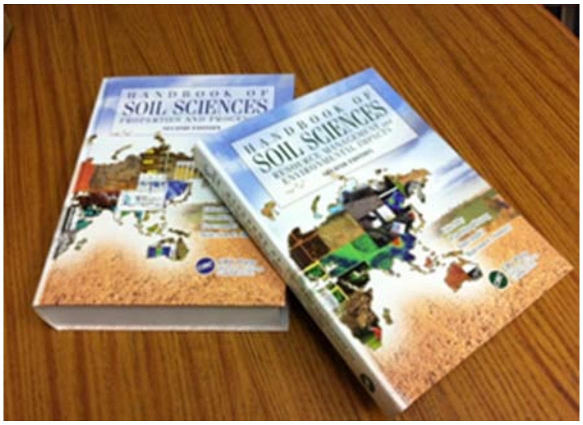
Antarctic Soil and Climate Data Collection

From Soil Survey Division, “Weekly Report,” January 31, 2012

During the period from January 5 to 25, 2012, Dr. Cathy Seybold from the National Soil Survey Center traveled to New Zealand and the McMurdo Sound region of Antarctica. In Antarctica, data were collected from and maintenance was carried out on eight long-term soil-climate stations. One new station was installed at an elevation of about 900 m on the east side of Bull Pass above the Wright Valley (fig. 1), and the soil (fig. 2) was described and sampled for standard lab characterization. Each climate station measures atmospheric parameters and soil parameters that extend from the active layer (seasonally thawed layer) into the permafrost. Recorded measurements are made on an hourly basis. For the last 12 years, NRCS personnel have been part of a collaborative effort with Landcare Research and the University of Waikato in New Zealand to better understand the fundamental properties and mechanics of cold and frozen desert soils. The research being conducted by this project will determine the impacts of climate change on the soil active layer and upper permafrost. The data provide needed baseline information that will help us understand coastal ecosystems and active layer dynamics that exist along the Victoria Land coastline in the McMurdo Sound region. The data are also used in the development of a robust spatial environmental domains classification of this same region. Here in the United States, information resulting from this trip will aid NRCS in understanding cold and dry soils and their monitoring and can have implications for coping with global climate change. The data will be processed and made available to the public and cooperating scientists via the internet (http://soils.usda.gov/survey/smst/antarctica/index.html). Selected results will be summarized and published in appropriate technical journals and will make up a master’s thesis for Holly Goddard of the University of Waikato in New Zealand. ■

Figure 1.—Soil-climate station installed (January 2012) at about 900 m on a ridge above the Wright Valley of the McMurdo Dry Valleys in Antarctica.

Figure 2.—Soil profile sampled at the newly installed soil-climate station. The soil is classified as a sandy-skeletal, mixed, hypergelic Typic Anhyorthel.



Soil Survey Division Staff Members Contribute to Recently Published *Handbook of Soil Sciences*

From Soil Survey Division, "Weekly Report," November 30, 2011

The second edition of *Handbook of Soil Sciences*, a comprehensive reference on the discipline of soil science, has recently been published. The two-volume handbook assembles the core knowledge from all fields within soil science and serves as a valuable reference for professionals from many fields seeking factual reference information on and better understanding of soil science principles and practices. The first edition of the handbook, published in 1999, was widely recognized as one of the best sources of information on all aspects of soil science, as evidenced by sales of more than 5,000 copies nationally and internationally. Contributions to the handbook were from leaders in each field within soil science. Current and past Soil Survey Division staff who contributed to the second edition of the handbook include Bob Ahrens, Dick Arnold, Jim Doolittle, Hari Eswaran, Jim Fortner, Zamir Libohova, Alan Price, Paul Reich, Philip Schoeneberger, Chris Smith, Arlene Tugel, Larry West, and Doug Wysocki. ■

Soil Correlation Training Conducted at NSSC

From Soil Survey Division, "Weekly Report," January 31, 2012

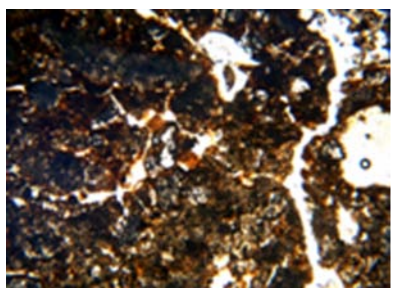
Mild winter weather welcomed 18 soil scientists attending the Soil Correlation course this week in Lincoln, Nebraska. Soil scientists from NRCS and cooperators from the Forest Service and the Arkansas Highway Department represented 11 states during the week-long training. Thor Thorson, Chad Remley, and Dena Marshall, soil data quality specialists in Oregon, Kansas, and Kentucky, respectively, served as instructors along with Joe Chiaretti, Paul Finnell, Shawn McVey, and Mike Wilson, soil scientists at the NSSC in Lincoln, Nebraska.

The course covers current procedures and philosophy in map unit design, soil correlation, and soil classification. Soil correlation enables the National Cooperative Soil Survey to consistently produce a quality soil survey product across the country. Soil correlation begins with the first observation in the field and is complete when certification of the map unit is completed in NASIS. The soil scientist follows guidelines for documentation and correlation outlined in the "National Soil Survey Handbook." *Soil Taxonomy*, the Soil Classification database, and other tools are key components in the process. ■

National Soil Survey Center Continues Assistance to Iraqi Scientists

From Soil Survey Division, "Weekly Report," January 31, 2012

Staff members of the National Soil Survey Center (NSSC), representing the Soil Survey Laboratory, Soil Survey Research, and Soil Survey Standards branches, recently provided remote assistance to Iraqi soil scientists. In April of 2011, scientists from Iraq traveled to the U.S. to participate in a 2-week training and technical exchange conducted at the NSSC in Lincoln, Nebraska. The visiting scientists went home with the intent of reviving the soil survey resource program in Iraq and maintaining information exchange with NRCS specialists that is critical to their efforts. Part of the exchange involves comparing the results of laboratory analyses between the NSSC's soil survey laboratory and Iraqi soil laboratories. The visitors brought samples of calcareous and gypsiferous soils from Iraq. Standard characterization data on such soil properties as particle-size distribution, water content, carbonate and gypsum content, trace metals, and mineralogy were generated for the Iraq soils in both the U.S. and Iraqi labs. The results of comparable lab analyses were analyzed to identify potential questions or issues for future collaboration. A detailed report, interpreting the characterization data and identifying some possible diagnostic horizons for taxonomic classification, was provided to the Iraqi scientists along with photomicrographs of the thin sections. This assistance will continue in the future as the Iraqis work to rebuild the agricultural sector of their country. ■



Thin sections of soil horizons were observed with optical microscopy procedures for the purpose of documenting the micromorphology of the Iraq soils in relation to known desert soils of the Middle East and United States.

The Art and Science of Block Diagrams

By Pattie West, editor, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska

An interesting and informative article by Sam Indorante, soil scientist/project leader, Carbondale MLRA Soil Survey Office, Carbondale, Illinois, was featured in the recent edition of *Soil Survey Horizons* celebrating 75 years of the Soil Science Society of America (Fall 2011). The article explores the history and importance of the soil-landscape block diagram in teaching the fundamentals of soil science. "If I had just one picture to show and to explain what I do as a soil scientist, I would choose a 1950s or 1960s era soil-landscape block diagram that included sketches of the soils," writes Indorante in the summary of his article.

Indorante was inspired in part by communications with Dr. Frederick F. Peterson, probably best known for his 1981 publication *Landforms of the Basin & Range*

Province Defined for Soil Survey, Nevada Agricultural Experiment Station Technical Bulletin 28. In addition, primarily as a result of the influence of Dr. Robert V. Ruhe, the study of soil landscapes was emphasized at Iowa State University, where Indorante spent his undergraduate days. Another book, *The Principal Soils of Iowa* (Oschwald and others, 1965; see citation in Indorante's article), gave Indorante an early awareness of the power of block diagrams in illustrating the complex relationships between soils and landscapes.

Indorante's article, "The Art and Science of Soil-Landscape Block Diagrams: Examples of One Picture Being Worth More Than 1000 Words," is in *Soil Survey Horizons*, Volume 52, Number 3, pages 89–93. Several examples of historical block diagrams are included in the article, including this one:

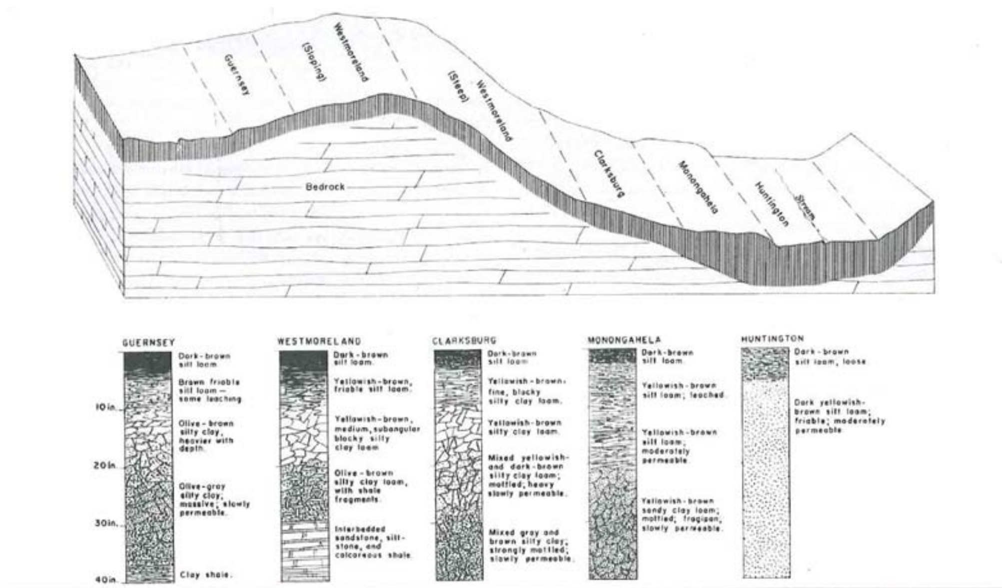


Fig. 3. The block diagram portion of this figure emphasizes the parent material portion of the soil-landscape relationships. Note the differences in profile properties exhibited in the characteristic profiles. From the Soil Survey of Marshall County, West Virginia (Beveridge and Patterson 1960).

Speaking of Block Diagrams...

From Soil Survey Division, "Weekly Report," January 31, 2012

This week, staff from the National Soil Survey Center and Major Land Resource Area Regional Office 15 (MO–15, Auburn, Alabama) significantly expanded the Soil Survey Division's online collection of block diagrams. The number of diagrams was increased from 1,034 to 1,683. The diagrams are reproductions from published surveys and are indexed in a searchable spreadsheet. Most of the diagrams illustrate relationships among soil, landscape, and geologic materials. The spreadsheet is available online at http://soils.usda.gov/education/training/job_aids.html#graphics. Work is in progress to add another 1,000 diagrams to the collection before the end of the fiscal year. ■

50 Years and Counting

By Linda Greene, ACES enrollee, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska

On August 21, 2011, H. Raymond "Ray" Sinclair marked his 50th anniversary with NRCS. Currently working as a soil scientist at the National Soil Survey Center in Lincoln, Nebraska, Ray is responsible for furnishing technical soils information to local, state, and Federal agencies, universities, consultants, agricultural businesses and organizations, and individuals.

Ray joined the agency after graduating from the University of Illinois in 1961. During the years that followed, his career took him to Illinois, Vermont, Michigan, Indiana, and Nebraska. His in-depth experience includes 16 years as state soil scientist in Indiana.

Ray is married and has 5 children, 13 grandchildren, and 2 great-grandchildren. He enjoys good health and doesn't appear to be ready to slow down just yet. ■

NSSC on Twitter

The National Soil Survey Center has joined the social networking craze with its presence on Twitter. The NSSC hopes to increase awareness by providing the most current information about conservation and the work being done at the center.

Join the growing list of followers at USDA_NRCS_NSSC.