National Cooperative Soil Survey Newsletter

February 2014
Issue 66

In This Issue—

Editor's Note

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

You are invited to submit 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.

Available Grants

NRCS provides funding opportunities for agriculturalists and others through various programs. The Conservation Innovation Grants (CIG) program is a voluntary program intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection in conjunction with agricultural production. Under CIG, funds from the Environmental Quality Incentives Program are used to award competitive grants to non-Federal governmental or nongovernmental organizations, Tribes, or individuals.

CIG enables NRCS to work with other public and private entities to accelerate technology transfer and adoption of promising technologies and approaches to address some of the Nation's most pressing natural resource concerns. CIG will benefit agricultural producers by providing more options for environmental enhancement and compliance with Federal, State, and local regulations. NRCS administers CIG.

Funding Opportunity—National Competition

Funds for the 2014 CIG will be awarded through a two-phase nationwide competitive grants process that will include (1) a pre-proposal process and (2) a full proposal process. The full proposal process will only be open to applicants whose pre-proposal applications are selected by NRCS. Both phases are described in the announcement, but only pre-proposals are being solicited at this time.The application period will close on **March 7, 2014.**

For more information go to: http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/home/?cid=nrcs143_008205. ■

2014 NCSS Northeast Cooperative Soil Survey Conference, White Mountain National Forest

The 2014 NCSS northeast regional conference will be held Monday, June 23, through mid-day Thursday, June 26. NRCS staff in New Hampshire and Vermont are working together with Plymouth State University, the Society of Soil Scientists of Northern New England, and the U.S. Forest Service (USFS) to host what promises to be a memorable event.

Figure 1.—Ongoing soil survey and resource inventory projects and ecosystem research in New Hampshire's White Mountains, along with scenic beauty, provide great opportunities for a dynamic conference.

The conference theme is "Forest, Soils and Ecosystems," and New Hampshire's White Mountains are a most apropos setting. The location offers opportunities to learn from long-term forest ecosystem research for which the detailed study of soils and water movement is integral. The ongoing soil survey of the White Mountain National Forest (WMNF) affords the opportunity to observe and discuss the applications of state-of-the-art mapping and inventory tools and project integration of land typing and ecological site descriptions.

To maximize benefit from these resources, two field days are planned. On June 24, the first field day, participants will visit the Hubbard Brook Ecosystem Study, where long-term ecological research is conducted within the USFS's 3,160-hectare Hubbard Brook Experimental Forest. The onsite research has resulted in some of the most extensive and longest continuous databases on the hydrology, biology, geology, and chemistry of a forest and its associated aquatic ecosystems.

Featured will be current research, such as “Landform Controls on Hydrologic Flowpaths and Pedogenesis Explain Solute Retention and Export from Pedon to Catchment Scales.” The research explores relationships between hydrology and soil development that can provide valuable information for managing forests and stream-water quality. Five soil functional units have been mapped and characterized with unique morphology, ground-water regimes, and chemistry based on over 175 soil pits, an extensive ground-water monitoring network of recording wells, and detailed terrain analysis from LiDAR. The day will begin with presentations on the project followed by landscape and soil pit observations.

NRCS and USFS staff will facilitate the field session on June 25. The two agencies have entered a partnership to develop a coordinated approach to natural resource inventories on WMNF by integrating initial soil survey, land type phase mapping, and ecological site inventory. Conference participants will receive an overview of the 20,000-acre project area, review the methods used for soils and vegetation data collection, and discuss challenges and achievements in undertaking a project of this nature.

The WMNF project will result in improved cooperation and technology transfer between NRCS and USFS on the national forest. An important outcome will be the building of USFS terrestrial ecological units (specifically land type phases) along with NRCS soil survey map units and ecological sites. Gains in overall efficiency will be achieved as staff members from each agency work together to collect site and soil data, develop mapping protocols, and share expertise.

The conference will provide direction, knowledge of hydropedological systems, and resource inventory methodologies applicable to current and future National Cooperative Soil Survey products. ■

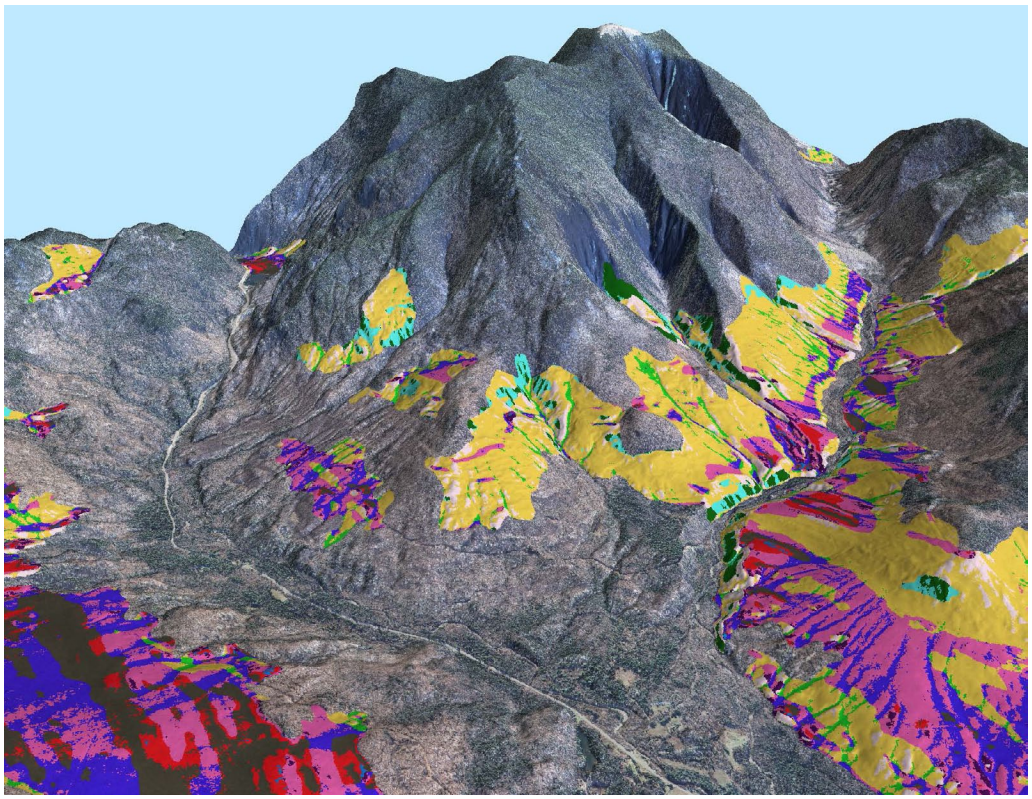


Figure 2.—Raster soil class map displayed over high-resolution elevation model and true color orthophotograph of soils that formed in lodgement till. This map illustrates the use of LiDAR and ArcSIE for Terrestrial Ecological Unit and Ecological Site Inventories.

2014 NCSS Southern Regional Cooperative Soil Survey Conference, Jackson, Tennessee

The 2014 NCSS Southern Regional Cooperative Soil Survey Conference will be held on June 23 to 26 at the University of Tennessee's West Tennessee Research & Education Center (http://west.tennessee.edu/) in Jackson, Tennessee. The conference's planning committee invites you to West Tennessee's home of rockabilly and transported parent materials. Nearby hotel accommodations have been arranged at the Double Tree Inn (731–664–6900). The cohosts for the conference include Dr. Paula Gale (pgale@utm.edu), University of Tennessee at Martin; Dr. Don Tyler (dtyler@utk.edu), University of Tennessee Agricultural Research; and Doug Slabaugh (doug.slabaugh@tn.usda.gov), Natural Resources Conservation Service. Please contact any of the hosts for more information.

The conference theme is "Soil Science—Partnerships for Ecological Deliverables and Sustainability (PEDS)." This theme will flow throughout the conference, and contributions to the theme are welcome. Major topics to be addressed include modernizing soil interpretations for changing needs and land use pressures, ecological inventory and sustainable ecosystems and services, soil health and climate change adaptation for managing the biosphere, and modern GIS tools and applications for improving soil interpretations. Poster presentations that address these topics are encouraged.

The registration desk will open at 8:00 am on June 23, and the conference will begin at 1:00 pm. Sessions on Monday will include overviews and introductions to the main topics along with initial discussions of regional issues and priorities for users of soil survey information. A social mixer and poster display will be hosted on Monday evening at the Double Tree Inn in Jackson. To encourage student contributions and participation in the conference and poster session, scholarships will be provided (contact any of the hosts for further information.)

Figure 1.—West Tennessee Research and Education Center.

The agenda on Tuesday, June 24, will include meetings of the following committees: Soil Interpretations, Soil Taxonomy & Standards, New Technology, Subaqueous Soils, Research Priorities, and Ecological Site inventory. A short tour of soil issues and research at the West Tennessee Research & Education Center is planned for Tuesday evening.

Wednesday, June 25, will feature a field technical tour highlighting ecological site studies on the tributaries of the Mississippi River in the Silty Uplands MLRA (134); no till, soil health, and mixed cover crops studies on the UT Milan Research and Education Center (where there will be a picnic lunch); and a tour of soil artifacts of the New Madrid Earthquake. The day will culminate in a late afternoon tour and dinner on Reelfoot Lake, the largest natural lake in Tennessee.

The conference will conclude early afternoon on Thursday, June 26, following committee reports, a luncheon banquet, and a business meeting.

The registration fee is $150 through May 31, 2014. Onsite or late (after May 31, 2014) registration will be $200. The registration cost for students is $50, and a limited number of student scholarships will be available. Please contact the hosts for further information. The registration fee includes access to all presentations, technical tours, and conference materials. It also includes the evening social on Monday, lunch on Tuesday, lunch and dinner during the tour on Wednesday, and the closing luncheon banquet on Thursday. ■

The Role of NRCS in Climate Change

By Michael A. Wilson, Acting National Leader of Climate Change, and David W. Smith, Acting Deputy Chief, Soil Science and Resource Assessment, and Agency Point of Contact for Regional Hubs.

Climate change can be considered the brewing caldron of science, politics, economics, and big business. The basic concepts initially seem simple to grasp, but it is really a complex, interwoven science and finding a definitive answer can be complicated. Answers vary on scales ranging from site-specific to global. Who can attest that a recent drought, polar vortex, or strong hurricane was caused by climate change or was just a normal event? It is important to recognize that weather and climate are two different things, i.e., a single weather episode is not sufficient evidence to prove or disprove climate change. Climate is defined as long-term patterns of weather over seasons and years.

Not all the scientific evidence about climate change perfectly agrees. The quest for scientific truth is a mixture of measured data, speculations of future scenarios, and multiple models that forecast the future. A big question is the future direction of the human race. One pessimistic climate change scenario describes continued global population growth and a regional variation in per capita economic growth, while one optimistic scenario describes a world where global population decreases overall and there are reductions of material intensity and more resource-efficient, globally sustainable technologies (Nakicenovic et al., 2000; NOAA, 2013a). And while a large amount of money is being spent to prove whether or not climate change is occurring, there is also a large amount being spent to disprove it (Brulle, 2013).

Where is the planet headed? And if global warming is indeed occurring, who is to blame? Evidence shows that ecological degradation is the result of human industrialization. Selles (2013) studied ecological accountability by country and economic class. His results show that industrial nations have the greatest consumption of natural resources and greatest impact on the environment. The United States is one of the countries topping the list. It ranks second in natural resource consumption and aggregate ecological degradation. Thus, the industrial revolution has spurred a high per capita income for some countries but the lifestyle benefits come at a global ecological price. It is debatable whether or not a completely industrialized world is necessary or will bring people a better life. For example, in China many people have a good life but their cost of living and environmental footprint are comparably less. If humans are responsible for climate change problems and can do something to reverse the trends, it is our responsibility to act.

Statements about climate change are based on measured physical and biogeochemical data, remote sensing, and information derived from paleoclimatic reconstruction. Also, while it is still debated, there is overwhelming evidence that the climate of the earth is changing. The facts are documented in multiple publications (IPCC, 2013b; NOAA, 2013a; Science, 2013). The IPCC panel (IPCC, 2013a) concludes:

> *"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased."*

Impacts on Agriculture

Increased atmospheric CO_2 has been linked to gradual increases in global temperature and may be responsible for the observed increase in climatic variability across regions (e.g., more frequent severe weather events, longer periods of drought, and longer periods of heat stress). One fact is known: trends in climate and annual

weather extremes vary by region. For example, the 2012 NRCS Vulnerability and Assessment Plan (http://www.usda.gov/oce/climate_change/adaptation/USDA_Climate_Change_Adaptation_Plan_FULL.pdf) states that, as climate changes, there will be greater flood potential (increased precipitation frequency, duration, amount, and intensity) in the East and Midwest and water supply challenges (more frequent droughts) in the Southern Plains and Southwest. If the climate continues to warm, there will be impacts on plant adaptability, insect activity, disease prevalence, and energy requirements for agricultural practices, such as irrigation and dairy production. Climate change will alter ecosystem functions, thus impacting agricultural production.

Responsibility of the Federal Government

Federal employees have a responsibility to safeguard U.S. citizens by planning proactively. Early in his first term (October 2009), President Obama signed Executive Order 13514 (Federal Leadership in Environmental, Energy, and Economic Performance) with a goal of establishing "an integrated strategy towards sustainability in the Federal Government and to make reduction of greenhouse gas emissions a priority for Federal agencies." Recently, as part of the President's Climate Action Plan (http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf) and Executive Order 13653 "Preparing the United States for the Impacts of Climate Change" (http://www.gpo.gov/fdsys/pkg/FR-2013-11-06/pdf/2013-26785.pdf), Federal agencies are increasing steps to confront issues related to climate change, including updating Climate Change Adaptation Plans. The 2014 NRCS plan, written by an 11–member team (representing the Soil Science and Resource Assessment, Science and Technology, Management, and Programs Deputy Areas as well as the regional conservationists' offices), was recently completed and discusses the current status of climate change activities in NRCS.

NRCS Activities

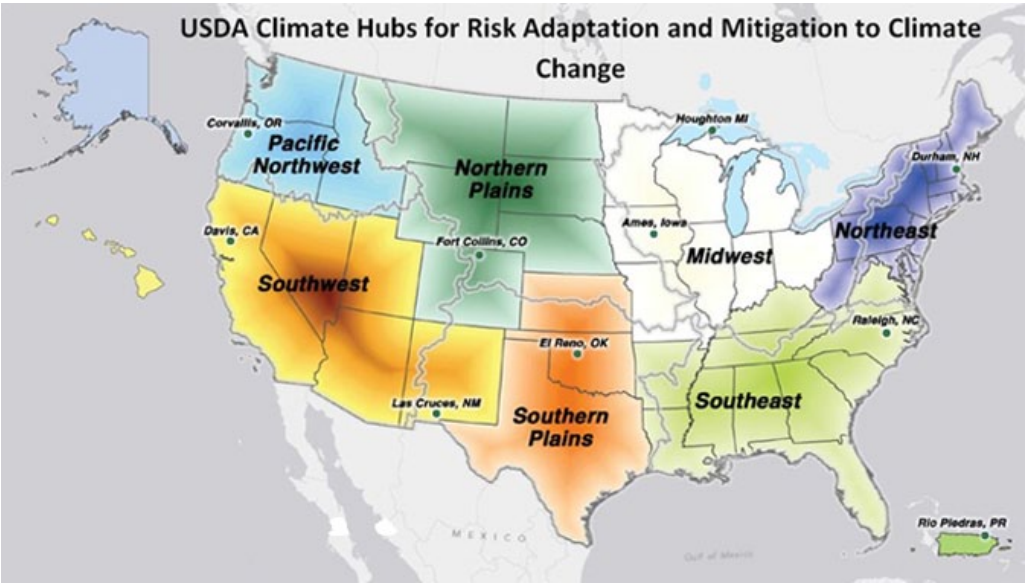
NRCS is already addressing potential impacts of climate change through a number of ongoing activities in both mitigation and adaptation. The brilliant aspect about NRCS climate change activities is that they include steps to conserve and improve agricultural soils and to show farmers and ranchers how to be better stewards of the land. These measures reflect the cornerstone of NRCS goals that have existed for more than 75 years.

Current NRCS efforts focus on documenting and assessing the status of the Nation's natural resources, updating technical guidance, and implementing a variety of adaptation and mitigation strategies that will assist landowners adjusting to climate-related impacts. Many of NRCS's ongoing efforts focus on ways to maintain land cover, increase soil carbon, and improve soil quality in order to create more resilient soils that can adapt and recover from weather extremes. A subset of current activities that relate to climate change include the National Soil Health Campaign, Landscape Conservation Initiatives, Conservation Practice Standards, Carbon Management Evaluation Tool (COMET), Conservation Innovation Grant (CIG) program, Conservation Effects Assessment Project (CEAP), Snow Survey and Water Supply Forecasting Program, and Ecological Site Information. The National Soil Health Campaign encourages practices (including cover cropping, no till, and crop rotation) that increase soil carbon and improve soil structure. The NRCS National Water and Climate Center supports the Snow Survey and Water Supply Forecasting Program as well as the Soil Climate Analysis Network (SCAN). These monitoring sites and data analyses are critical to drought assessment, water supply forecasting, energy management for irrigation scheduling, commodity crop predictions, and ecological site planning in western States. They are also part of the soil moisture network that is a cornerstone of the newly initiated National Drought Resilience Partnership.

Climate change education will continue to be a key priority. Four courses have been developed by NRCS staff and are available in AgLearn or on a publicly accessible website. Two more courses are in development. NRCS employees need to understand climate change basics. They also need to be fully aware of the potential climate change impacts in their region and strategies for addressing associated resource concerns, increasing system resiliency, and recognizing potential transformations. Variability in physiography, production systems, and potential climate change impacts across the country will require training that focuses on recognition of issues on a regional or ecosystem basis.

USDA Regional Climate Hubs

On February 5, 2014, Secretary of Agriculture Vilsack announced the establishment of seven USDA Regional Hubs for Risk Adaptation and Mitigation to Climate Change with the primary purpose to "translate science and research into information to farmers, ranchers, and forest landowners on ways to adapt and adjust their resource management" (http://usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2014/02/0016.xml). NRCS, the Agricultural Research Service, and the U.S. Forest Service are the lead agencies with the primary role of connecting farmers, ranchers, soil and water conservation districts, and other public sectors to advances in climate change research and applications. In addition to technology transfer, NRCS conservationists and soil scientists will actively participate in determining important research directions and activities in each Regional Climate Hub by evaluation of production systems under credible climate change scenarios. They can then identify land use alternatives, land management systems, and conservation priorities necessary to protect natural resources in the face of climate change.



Conclusion

Evidence is clear that the climate is changing. This change may be reflected by increasing temperatures or decreasing rainfall within regions as well as more extreme weather events. It is the responsibility of NRCS to help citizens prepare for possible climatic events or unavoidable transformations in agriculture. NRCS will continue to work with private landowners in helping them protect their natural resources and to protect the economic security of these farmers and ranchers.

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Soil Survey Field and Laboratory Manual

The new USDA “Soil Survey Field and Laboratory Methods Manual” is now available online (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/research/lab/guide/). The manual, also known as Soil Survey Investigations Report No. 51 (SSIR–51), serves as a standard reference for soil sampling strategies and assessment techniques. The methods manual provides detailed descriptions of the standard methods used for the collection of soil, water, plants, and other biological materials. The manual also provides detailed descriptions of analyses for the field or field-office setting.

SSIR–51 is a companion manual to the “Kellogg Soil Survey Laboratory Methods Manual” (SSIR–42). SSIR–51 serves as a reference for the field scientist, and SSIR–42 serves as a reference for the laboratory analyst. Both manuals are “how-to” guides. Their respective methods follow the same format and cover many of the same kinds of analyses. The use of the standard operating procedures in these manuals ensures continuity in the analytical process. ■

Mapping Soil Habitat for *Coccidioides*

By Robert R. Dobos, soil scientist, National Soil Survey Center, Lincoln, Nebraska.

Valley fever, or coccidioidomycosis, is caused by the soil-borne fungi *Coccidioides immitis* and *Coccidioides posadasii,* which are endemic to the southwest United States and a few places in Central and South America (fig. 1). In most people, the symptoms of the disease range from none at all to mild cold- or flu-like conditions. Some people, however, contract the disseminated form of the disease, which can kill. Data from the CDC (2012) show that the number of reported cases of valley fever has increased rapidly in recent years (fig. 2). Several reasons are given: (1) more people may be exposed to the disease because of increased travel to the endemic areas, (2) changes in climatic patterns may be altering the growth and distribution of the fungus, and (3) the mechanisms of how the disease is detected and reported have recently changed (CDC, 2012).

Figure 1.—Distribution of *Coccidioides* spp. (Fisher et al., 2007).

According to Kolivras et al. (2001), the life cycle of fungus consists of saprophytic and parasitic phases. The saprophytic phase lives in soil as entangled mycelia and hyphae. The hyphae grow and mature to produce generally rectangular arthrospores. The arthrospores are 1.5 to 4.5 microns in width and 5 to 30 microns in length. These spores move easily in air currents. The parasitic phase occurs in nature under dry, dusty conditions when a host mammal inhales airborne arthrospores. The fungus in this phase grows as spherules that mature and burst, releasing endospores that can grow into new spherules in the host lungs, inducing valley fever (Kolivras et al., 2001).

According to Maddy (1957), the most common habitat for *Coccidioides* spp. is the "Lower Sonoran Life Zone." This corresponds to the climate of south-central Arizona, where the mean July temperature is about 32 degrees C, the mean January temperature is about 10 degrees C, and the annual rainfall is about 23 cm (Maddy, 1958). Egeberg et al. (1964) found that high temperatures and salinity in the soil surface layers have the effect of enhancing *Coccidioides* spp. while inhibiting its competitors. In order

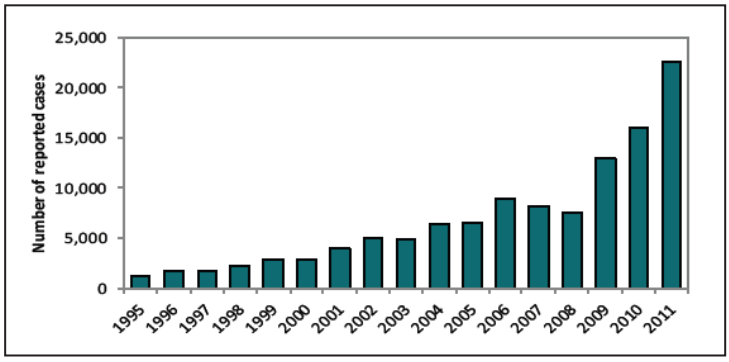

Figure 2.—Reported U.S. cases of valley fever, 1995 to 2011.

to grow and reproduce, the fungus needs soil that is moist then dry and hot (Kolivras et al., 2001). Soils containing substantial amounts of organic matter, such as animal burrows or human middens, are also favorable to *Coccidioides* spp. (Egeberg and Ely, 1956). Fisher et al. (2007) report that *Coccidioides immitis* is found primarily in the central valley of California (hence "valley fever") and that *Coccidioides posadasii* occurs in the endemic areas outside of California. This suggests that the fungus has evolved separate xeric and non-xeric forms. This is significant when considering the timing of wetting and drying cycles needed for the fungus to grow.

Many prior maps of endemic areas are based on testing cattle (Maddy et al., 1960) or people for reactivity to coccidioidin (an antigen derived from a fungus of the genus *Coccidioides*) and not based on the presence of the fungi in soil. The objective of the current study is to use the soil survey database to identify areas that are potential habitat for this soil-borne fungus. This approach will allow habitat mapping at spatial resolutions far finer than ever before possible. It will allow habitat considerations to be targeted in the planning stage of any soil-disturbing activity and proactive measures taken. Dust-control methods can be applied when and where needed. Mapping is determined by the following conditions:

- The mean annual precipitation (about 230 mm) and air temperature (about 20 degrees C) found in the Lower Sonoran Life Zone are used as the optima for habitat. For xeric areas, the rainfall can be somewhat higher and the temperature somewhat lower.
- Southerly slope aspect, moderate slope gradient, and low surface albedo are used to better capture extreme soil surface temperature effects.
- Electrical conductivity of more than 4 dS/m, soil reaction of at least pH 8.0, or the presence of gypsum in the upper 30 cm of the soil are used to indicate an environment high in soluble salts. These soil conditions agree well with those observed by Lauer et al. (2012) in a study in Kern County, California.
- The soil must have some organic matter and water storage for the saprophytic phase to grow.

Soil components fitting all of these specifications, at least marginally, are considered by the model as possible habitat for the fungus. Variation in rainfall and temperature from year to year can increase or decrease the range of *Coccidioides* spp. (Kolivras et al., 2001). The fungal spores can travel long distances, remain dormant for long periods of time, and then grow when the weather is suitable (Fisher et al., 2007). These conditions have been modeled using the fuzzy system module of the NASIS database. The results are exported from NASIS (Soil Survey Staff, 2014) and mapped using gSSURGO (Soil Survey Staff, 2013). See figure 3.

The distribution of *Coccidioides* spp. in soils is known to be spotty because of the relationships between soil attributes and climatic conditions over time (Kolivras et al., 2001). Figure 3 shows that the soil parameters themselves are unevenly distributed even if the temporal variations in temperature and rainfall are not considered. Figure 4 shows the predicted distribution of possibly endemic areas at a finer spatial resolution for the State of Arizona. The map indicates that a relatively small portion of the land area is highly likely to be optimal habitat for *Coccidioides* spp. Yellow areas on the map may be habitat when certain weather conditions exist and where local variations in salinity, water content, and heat loading create hot spots of suitable habitat. Climate change could force areas that are not currently warm enough across the heat threshold while at the same time rendering some areas too hot or dry for the fungus to survive.

It must be remembered, however, that the areas that are indicated as habitat are only the source areas for the spores and that the spores can travel long distances with the wind. In addition, disturbances such as earthquake-induced landslides in endemic areas (e.g., the 1994 Northridge earthquake in California) can cause spores to become airborne and cause outbreaks of valley fever well outside of the endemic areas

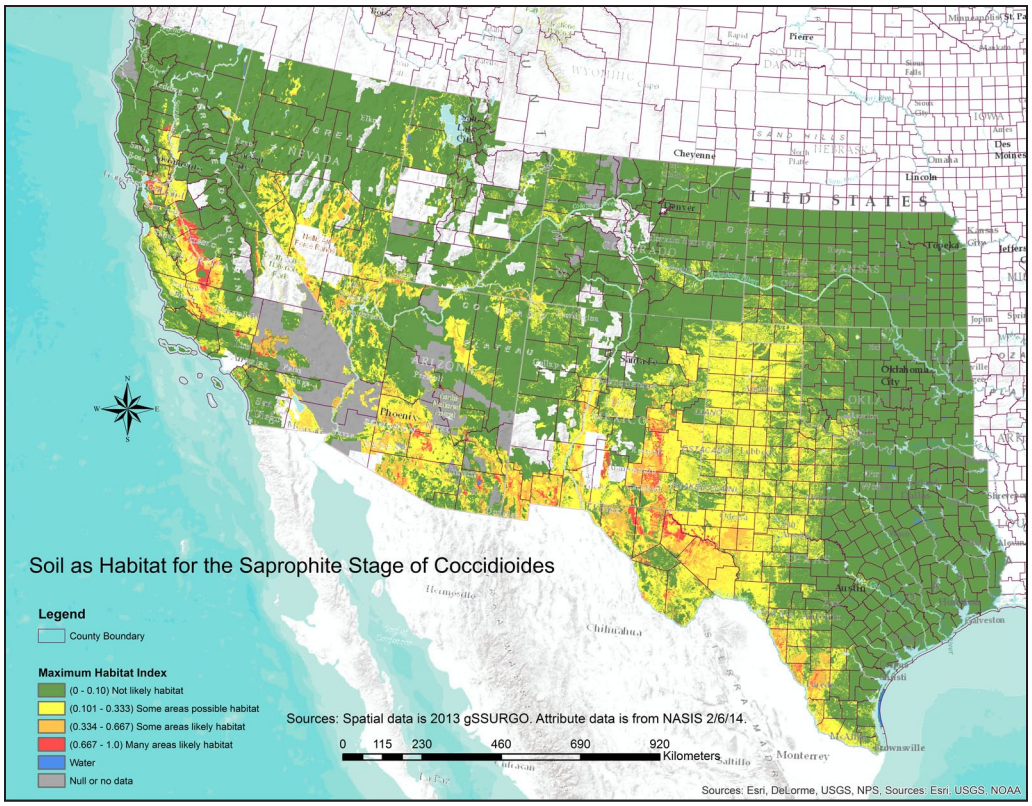

Figure 3.—Distribution of *Coccidioides* spp. habitat in the southwestern U.S.

(Jibson, 2002). Because the spores can also be carried on clothing and vehicles, cases of the disease can occur in unexpected places, such as Atlanta, Georgia (Albert and Sellers, 1963). All odd cases and events aside, most cases of valley fever are seen in the highly endemic areas.

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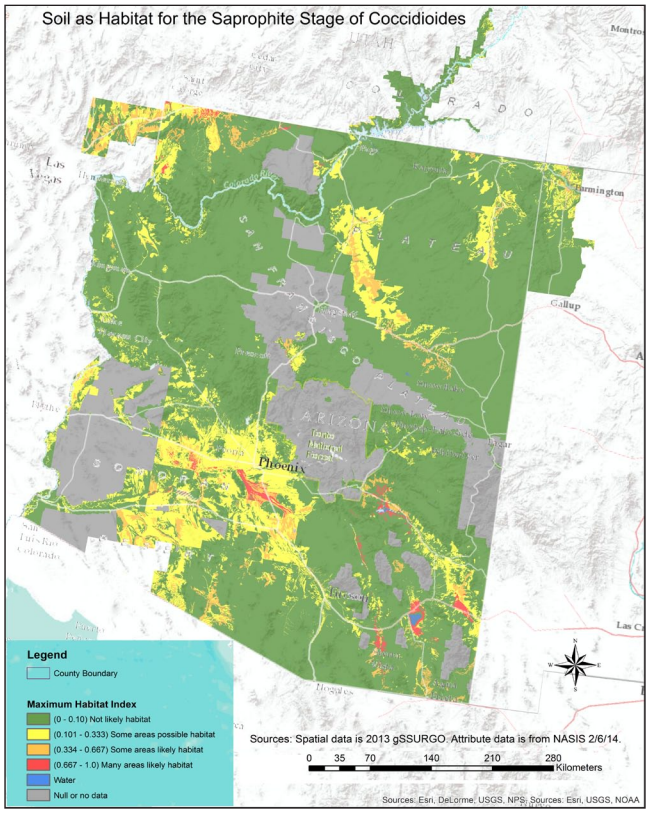

Figure 4.—Distribution of *Coccidioides* spp. habitat in Arizona.

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Using Ground-Penetrating Radar to Improve the Understanding of Soil-Landscape Relationships

By Mike England, soil scientist, USDA-NRCS, Onalaska, Wisconsin.

Information on the internal structures, composition, and dimensions of soil horizons and stratigraphic layers improves our understanding of soil landscape and health relationships. Recently, soil scientists from NRCS and the University of Wisconsin completed a detailed study assessing the spatial variability of soil properties across erosional and depositional surfaces on an outwash plain in Dane County, Wisconsin. Ground-penetrating radar (GPR) and detailed soil observations were used to assess differences in soil structural features, such as the thickness of surface layers and eolian deposits and the depth to subsoil and outwash deposits (2C horizon). The objective of this study was to relate differences in these properties to soil loss resulting from intensive tillage practices.

Forty-seven closely-spaced GPR traverses (total length of about 11.75 miles) were completed across the study area last summer (fig. 1, left), providing a very large data set. The radar data were processed and studied, and the depths to various soil horizons and stratigraphic layers were measured. The soil scientists, under the direction of Dr. Alfred Hartemink, later returned to this area to describe and sample soils along a transect line that had been identified using GPR (fig. 1, right).

Within the study area, relationships between soil health, properties, and landscapes have been strongly altered by soil erosion related to agricultural activities. The study area contains very deep soils that formed in loess over glacial outwash and are classified as Typic Eutrocrepts (Salter, SeB) and Aquollic Hapludalfs (Hayfield, HaA) on the upper slopes and Endoaquolls (Marshan, Mc) on the lower slopes (fig. 2, left). GPR data revealed that the soils are underlain by not only varying thicknesses of eolian and outwash deposits but also by till at unexpectedly shallow depths. Based on over 39,500 radar measurements, the depth to till ranged from 1.8 to 7.2 feet and averaged 4.3 feet across the landscape.

This study revealed that soils on summits and shoulders have been degraded and much of the surface layers and subsoil eroded. Due to soil erosion that occurs in

Figure 1.—NRCS Soil Scientist Mike England examines a radar profile recorded on his GPR control unit. Based on radar interpretations, a traverse line was identified and a limited number of soil pits were excavated, described, and sampled to provide the hard data used to verify interpretations.

Figure 2.—A soil map (A) of the study area from the Web Soil Survey and an aerial photograph (B) with an interpreted plot of the depth to till classes overlain within the study area.

these landscape positions, the surface horizons consist of former subsoil materials. Moving downslope across this landscape, the soil materials that eroded from higher-lying positions have been deposited over preexisting glacial drift and outwash deposits on footslopes and toeslopes. Soils become progressively deeper to till on footslopes and toeslopes (fig. 2, right). On the lowest portion of this landscape, the accumulation of surface soil materials, which have been eroded from higher slope positions, has resulted in thick, dark surface horizons. Intense cultivation has accelerated the rates of erosional and depositional processes across the landscape and affected soil texture, structure, organic matter content, available water capacity, and other properties associated with soil health and productivity. The information gained from this study will be used to make land use decisions that limit soil degradation, improve soil health, and help sustain agriculture. ■

NRCS Improves Soils Data for Growing Customer Base

On January 14, 2014, the USDA Natural Resources Conservation Service (NRCS) updated soil data for each of the 3,265 soil survey areas mapped during the last 118 years. This massive effort took 15 months of programming. The many databases were moved to a new data structure and all software was updated to provide more efficient and cost-effective systems for future soil survey enhancements. The spatial (soil polygons) and tabular (physical and chemical properties) data for all soil survey areas are available free of charge from Web Soil Survey (WSS) at http://websoilsurvey.nrcs.usda.gov/app/. This site is the most widely used website for accessing soil information used to make important land use decisions. This is the first major update of software and data since WSS came online in August 2005.

The updating has enhanced customer service, upgraded all software and databases, improved spatial data, and provided a complete suite of soil interpretations. In addition, the Agency will refresh soil data each October, thereby providing assurance to customers that they are using static, versioned, and official soils data in support of land use decisions.

Improvements to the spatial data include a complete spatial soil survey boundary layer and a map unit polygon layer with no gaps or overlays within the Continental United States. This is a major accomplishment in the Agency's goal to move to a truly seamless SSURGO (Soil Survey Geographic) spatial database. The National Soil Survey Center's GIS and digitizing unit staffs improved the quality assurance procedures and applications to eliminate spatial errors. Customers can now be assured that soils information is complete for use in spatial analysis.

The soils data now includes the first set of soil survey major land resource area (MLRA) update projects. This "harmonization" effort is the initial phase of the soil survey update process. The map units are evaluated on a regional scale. Commonalities are identified so that the more than 100 years of data can be brought to a common standard, improving soil data quality. This update process allows soil data to flow seamlessly across political boundaries, such as county and State boundaries. State soil scientists exported 3,265 soil surveys to the Web Soil Survey. Each soil survey now contains a full complement of national interpretations, giving users the ability to analyze interpretations regionally, on a multi-state basis, or across the United States.

The 53rd Congress originated the soil survey in the Agricultural Appropriations Act of 1896 for the purpose of inventorying the agricultural lands of the United States. That soil inventory became important during the Dust Bowl days of the 1930s, when the Soil Conservation Service needed soils information to improve conservation efforts to decrease soil erosion. The NRCS soil survey program has met the demands of an ever-changing customer base and adapted to ever-changing technology by historically providing an initial inventory of agricultural lands to currently maintaining a massive soil spatial and attribute database that no other country possesses. NRCS is committed to delivering science-based soils information to help people be good stewards of the Nation's soil, water, and related natural resources.

Every month more than 180,000 users access the Web Soil Survey, resulting in the creation of more than 20,000 printable soil survey reports and more than 75,000 individual soil property/interpretation reports. In addition, more than 25,000 soil survey data exports are downloaded, making the Web Soil Survey the most frequently used USDA website. The systems that make up the Web Soil Survey required updating to improve the end product. Customers now have new spatial and updated tabular soils data at their disposal. This gives the customer better tools for making their resource assessments and conservation plans.

Web Soil Survey now provides a tool to track updates for specific soil survey areas. Individuals interested in this feature can go to Web Soil Survey, click on “Subscribe” in the menu bar, and follow the online directions.

Individuals interested in soil-related issues may subscribe to topics using a free subscription service called GovDelivery. Click here to go to GovDelivery and choose the topics of interest. Individuals can e-mail inquiries to soilshotline@lin.usda.gov for assistance with GovDelivery and Web Soil Survey.

Web Soil Survey customers can click on the “Contact Us” link in Web Soil Survey to get assistance from the Soils Hotline, a state soil scientist, or a local NRCS office. ■

Soil Data Join Recorrelation—Northern Great Plains Soil Survey Regional Office (SSR–5)

Soil Data Join Recorrelation (SDJR) is NOT an initiative to reduce the number of map units or data mapunits by just combining map units that have the same or similar names. It is designed to be first and foremost an evaluation of map units across an MLRA. Based upon the evaluation, a new map unit will be established for the MLRA that represents those map units that had the same or similar names AND the same concept and similar properties and, based on those similarities, have similar interpretations. The properties evaluated should be more than just the physical and chemical properties. They should also include geomorphic properties and features that are central to the concept of the map unit and used to predict what map units occur on what part of the landscape. The following figures illustrate some before and

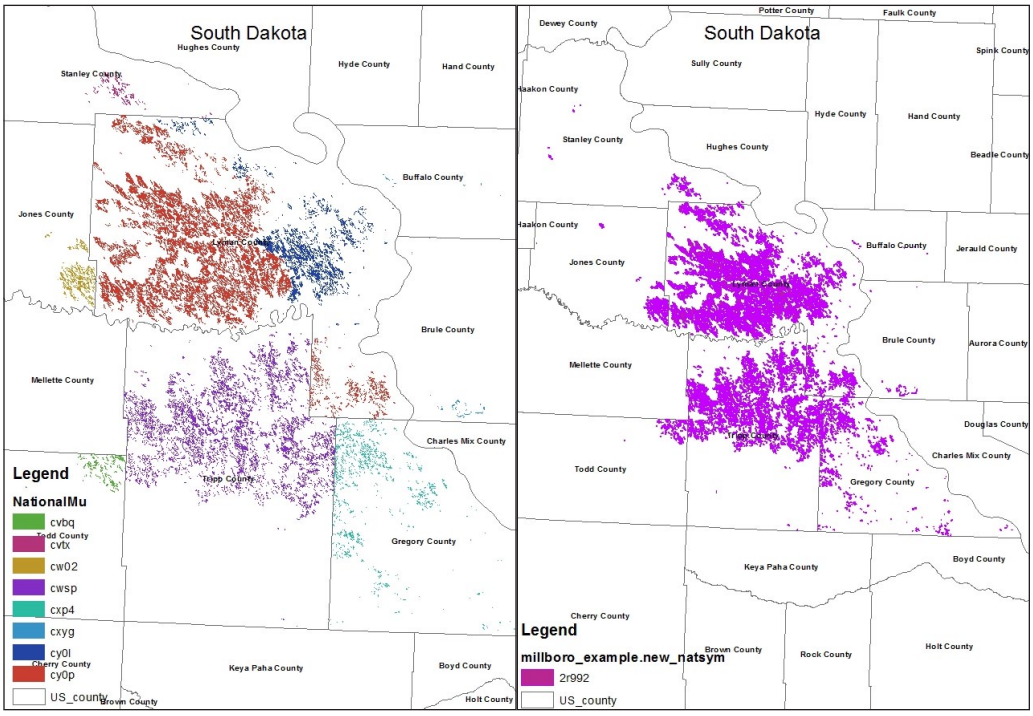

Figure 1.—National map unit symbols for selected soils before (left) and after (right) SDJR.

after effects of SDJR projects using SSURGO and gSSURGO. Changes in NASIS are presented to the public and used by the field office staff through the SSURGO data.

Figure 1 shows the most obvious difference with SDJR is use of a national map unit symbol. This symbol is now available in Web Soil Survey and will also be incorporated into SSURGO. It is available in the gSSURGO database as part of the mupolygon attribute table.

Figure 2 shows map unit name changes after SDJR evaluation and project completion. In Lyman County, South Dakota, both a silty clay loam surface and a silty clay surface were mapped on similar slopes for the Millboro series. Although the distribution in the county appears uniform and the map unit descriptions had different inclusions, the evaluation suggested that these map units were not easily distinguishable in the field and had similar properties and interpretations.

Figure 3 shows changes in slope gradient by weighted average for all components. In the SSURGO muaggatt table, the weighted average of the RV slope for all components of the map unit is a data element. The table contains many weighted average properties for a map unit. This figure illustrates the importance and effects of minor components on map unit concept and population and on some of the aggregated SSURGO properties. The differences are due to minor components that were different in each non-MLRA survey area. The map units are Millboro silty clay, 3 to 6 percent slopes.

Figure 4 shows the National Commodity Crop Productivity Index (NCCPI) that has the highest value among corn and soybeans, small grains, or cotton (weighted average) for major earthy components. Values range from .01 (low productivity) to .99 (high productivity). Earthy components are those soil series or higher level taxa that can support crop growth (Dobos et al., 2012). Major components are those soil components in which the majorcompflag (in the SSURGO component table) is checked “Yes.” The differences before SDJR are related to differing layer thickness

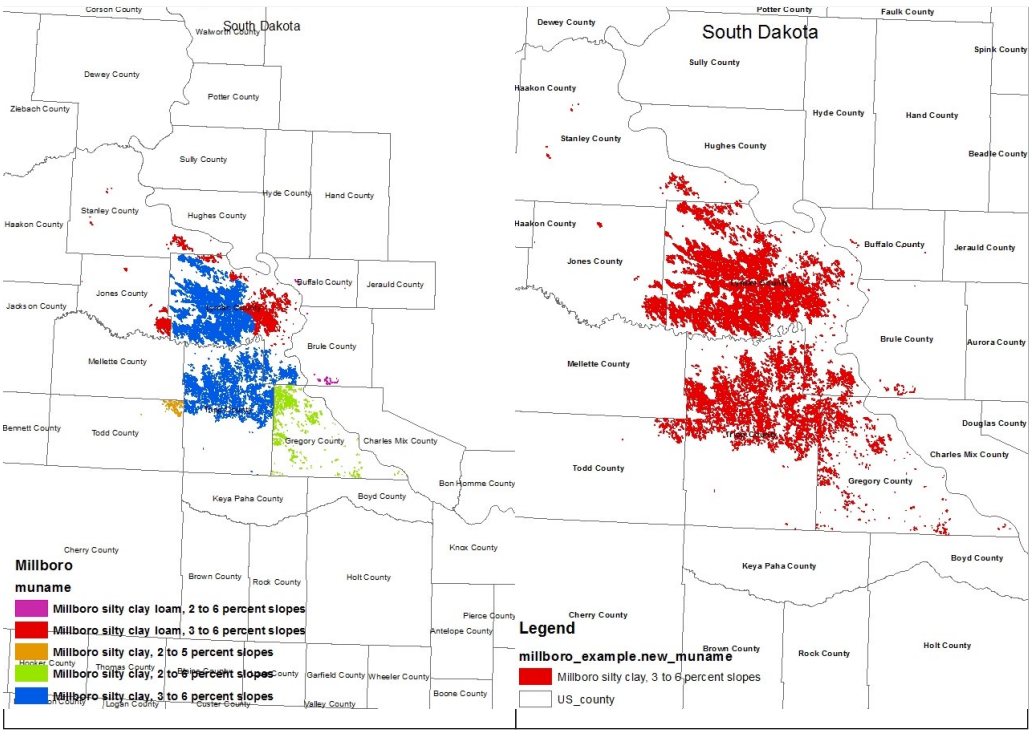

Figure 2.—Map unit names for selected soils before (left) and after (right) SDJR.

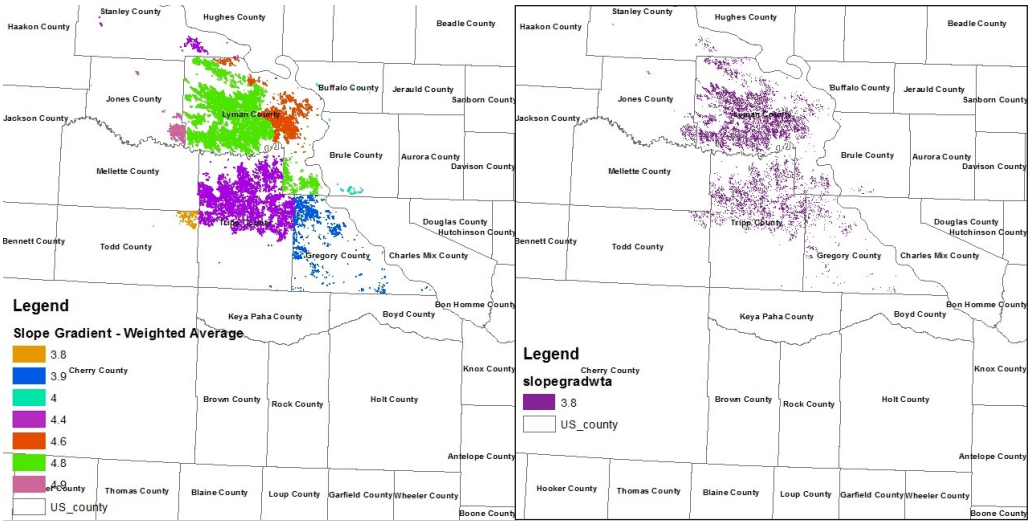

Figure 3.—Slope gradient by weighted average of all components for selected soils before (left) and after (right) SDJR.

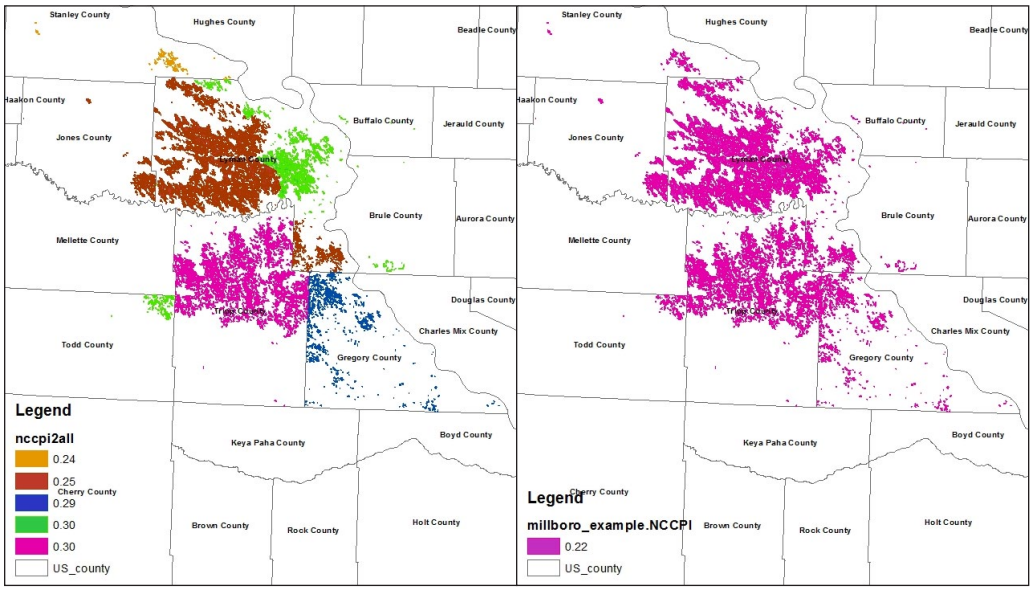

Figure 4.—National Commodity Crop Productivity Index for selected soils before (left) and after (right) SDJR.

and not necessarily differing physical or chemical properties. For this MLRA, the small grains model returned the highest NCCPI value.

Figure 5 shows available water storage (AWS) at depths of 0 to 150 cm by weighted average for all components of the map unit. AWS is the volume of water available to plants that the soil, to a depth of 150 centimeters, can store. It is reported as the weighted average of all components in the map unit and is expressed as centimeters of water. AWS is calculated from AWC (available water capacity), which is commonly estimated as the difference between the water contents at 1/10- or 1/3-bar (field capacity) and 15 bars (permanent wilting point) tension and adjusted for salinity and fragments. This is another illustration of the influence minor components can have on aggregated properties of a map unit.

Reference

Dobos, R.R., H.R. Sinclair, Jr., and M.P. Robotham. 2012. National Commodity Crop Productivity Index (NCCPI) user guide, version 2. USDA, Natural Resources Conservation Service. (ftp://ftp-fc.sc.egov.usda.gov/NSSC/NCCPI/NCCPI_user_guide.pdf) ■

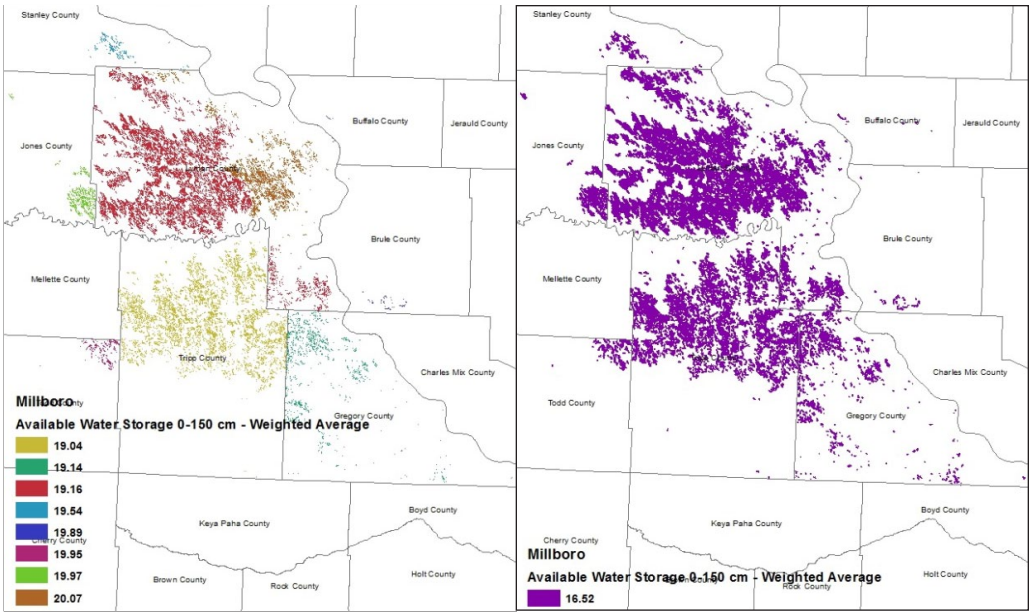

Figure 5.—Available water storage for selected soils before (left) and after (right) SDJR.

Pete Biggam Retires from the National Park Service

Pete Biggam, National Park Service (NPS) soil program manager, retired after 34 years of Federal service on January 3, 2014. Since 1999, Pete was responsible for allotting 19 million dollars to the Natural Resources Conservation Service (NRCS) for reimbursable agreements for National Cooperative Soil Survey (NCSS) projects on Federal park lands. Those reimbursable projects included 55 parks, ranging in diversity from the 6-million-acre Denali National Park in Alaska to the 11,000-acre Gauley River National Recreation Area in West Virginia. In addition to serving as the NPS Soils Program Manager, Pete served as chair of the NCSS Federal Lands Advisory Group and chair of the NCSS National Soil Interpretations Advisory Group. He was recognized with the National Cooperative Soil Survey Cooperator Achievement Award in 2006 and as a National Cooperative Soil Survey Million Acre Mapper in 2009.

Pete began his career in Gooding, Idaho. He worked as a SCS/NRCS soil scientist in Utah, Oregon, and Colorado before taking the manager position in 1999.

Pete says that in looking back over the years, he realizes, like the lyrics to “Truckin” (by the Grateful Dead),“what a long, strange trip it’s been” and what a great time he has had over the years working with great folks involved in NCSS. He feels good that even though “I got my chips cashed in, I’ll keep truckin, like the do-dah man, together, more or less in line, I’m gonna just keep truckin’ on.”

He plans to stay involved with soil science by participating in the Colorado Native Plant Master and Master Gardener Programs hosted by Colorado State University Extension Service. He also plans to work on his golf game, which he says remains a challenge. He and his wife plan to stay in the Conifer, Colorado, area. ■

Developing Soil Judging Contests in North Dakota

By Lance Duey, 2013 Professional Soil Classifiers Association of North Dakota President and senior MLRA soil scientist, Devils Lake MLRA Soil Survey Office, North Dakota.

College students often participate in various programs, such as soil judging, offered by universities in order to obtain experience necessary to compete in today's agricultural workplace. Formalized programs to gain such experiences are rare for students with Soil Science and Natural Resource majors in North Dakota. For example, there have been no organized collegiate soil judging programs in North Dakota since the early 1990s. To meet this need, the Professional Soil Classifiers Association of North Dakota (PSCAND), soil scientists with the North Dakota Natural Resources Conservation Service (ND NRCS), and faculty from North Dakota State University (NDSU) developed a program to help jump-start a collegiate soil judging program for North Dakota.

During the 2012 PSCAND Annual Business Meeting, a motion was passed to promote soil judging as an opportunity for students to see and study soils through direct field experience. This comes in response to the lack of field experience students are showing when entering the agricultural work force in both government and private sectors. In addition, there is a fast-growing need for individuals with knowledge and experience in agriculturally related fields to meet the needs of the NRCS National Soil Health and Land Management Initiatives that are being addressed on local and national levels. 2013 PSCAND President Lance Duey helped form a soil judging committee that would develop a plan for sparking interest from tribal colleges, 2-year colleges, and 4-year universities for a soil judging program. Letters were sent to 13 agricultural-based schools, and 7 of these schools indicated interest.

To help secure needed tools for this endeavor, Dr. Abbey Wick, Assistant Professor of Soil Health—Extensions, North Dakota State University, took the lead in securing a North Dakota SARE Grant. The grant money was used to purchase the equipment students required to compete in a contest. A total of 10 soil judging kits were assembled so that participating schools would receive supplies, such as Munsell color books, clinometers, acid bottles, and clipboards. The SARE Grant also required a follow-up evaluation from every student.

Numerous teleconferences with participating schools and the Soil Judging Committee led PSCAND, ND NRCS, and NDSU to host a Soil Field Day to strengthen interest among students and instructors in a future soil judging program/contest. September 19 and 20, 2013, marked the first "Soil Judging Field Day" at the Burleigh County Soil Conservation District (SCD) Farm in Menoken. Attendees included 86 students and 10 advisors from 5 colleges and universities. Activities included educating students in identifying general soil chemical, physical, and biological characteristics. The students were rotated through stations to develop skill sets, experience describing open soil pits, and discuss the soil judging process. To handle this number of students, the morning session focused on developing skill sets and information about soil health and the afternoon session focused on use of the skill sets in the soil pits. The students were rotated between three open soil pits, where they learned how to complete a soil description form similar to what would be used in a contest.

The path of developing a collegiate soil judging program in North Dakota remains uncertain but promising. Results from the SARE Grant evaluations were summarized by Dr. Abbey Wick. The conclusion was that students are interested in soils but may not have enough education to compete in a contest. A majority of the students were in their second year of their undergraduate programs and predominantly (more than 90 percent) from farming and ranching backgrounds. This same group of students anticipated a career in farming/ranching after graduation. After attending the field day,

Soil Judging Field Day at the Burleigh County Soil Conservation District (SCD) Farm in Menoken, North Dakota.

there was a 22 percent increase in knowledge for site characterization, a 24 percent increase in field skills, and a 15 percent increase in agronomy knowledge. A follow-up survey on how skills learned during the field day were applied to production operations and educational programs will be completed in spring of 2014. Over 70 percent of those that attended in 2013 were also interested in attending a similar field day in 2014. Ideas on how to address the concerns voiced by students and professors about a North Dakota soil judging program were discussed during the 2013 Annual PSCAND Business Meeting in November. PSCAND, ND NRCS, and NDSU will continue to pursue this endeavor through continuous contact with interested schools. ■

Teaching Soils by Mapping Soil Parent Materials—A Success Story Called "Isee"

By Sharon Whitmoyer Waltman, soil scientist, National Soil Survey Center, NRCS.

The very successful Purdue University **I**ntegrated **S**patial **E**ducation **Ex**perience (a.k.a. "Isee") is expanding beyond Indiana as "Isee2." I collaborated in the initial Isee2 Workshop on November 3, 2013, in Tampa, Florida. The objective of the Isee2 project is to develop the ability of students to use digital maps to learn: (1) how and why soils and landscapes vary spatially at scales ranging from individual fields to counties, States, and, ultimately, globally; and (2) how the spatial distribution of soils and landscapes impacts the distributions of land use and environmental and ecosystem services at various scales.

In the original Isee project (http://isee.purdue.edu), Dr. Darrell Schulze and his Purdue University colleagues found that soil parent material maps derived from NRCS gridded soil survey geographic databases (gSSURGO) are effective tools for teaching introductory soils and pedology students about the soils of Indiana. These teachers shared Isee lesson worksheets to teach concepts on soil orders, parent materials, and soil organic matter in the classroom and in the field using mobile electronic devices.

The Isee2 project expands this work to include the States of Wisconsin (Dr. Alfred Hartemink), Illinois (Drs. Robert Darmody and Jennifer Fraterrigo), Ohio (Dr. Brian Slater), West Virginia (Dr. James Thompson), Kentucky (Dr. Tasos Karathanasis), and Texas (Dr. Cristine Morgan). For NRCS's Soil Science Division, this project brings a renewed focus to regional (upscaled) soil parent material concepts and many opportunities for interaction of NSSC and SSR staff with researchers in these States.

During the workshop, the investigators discussed details of this 3-year-long USDA National Institute of Food and Agriculture (NIFA) Higher Education Challenge (HEC) Grant Project (http://cris.nifa.usda.gov/cgi-bin/starfinder/0?path=fastlink1.txt&id=anon&pass=&search=R=58307&format=WEBFMT6NT). An early draft of a Wisconsin soil parent material map was presented, and methods were reviewed by David Evans, University of Wisconsin PhD candidate. Discussions also included connections with the GLOBE program (http://globe.gov). Dr. Sam Indorante, NRCS soil scientist (Illinois), also attended and provided valuable insights. An Isee2 workshop is scheduled for May to review progress. It will be held at Purdue University, West Lafayette, Indiana. Research Soil Scientists Dr. Douglas Wysocki and Dr. Philip Schoeneberger from the National Soil Survey Center are providing input to this project. For details please contact sharon.waltman@wv.usda.gov. ■

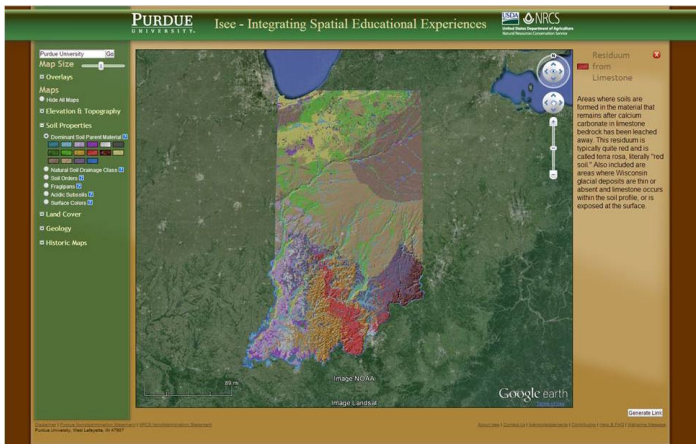

Figure 1.—Screenshot of Isee website with Indiana soil parent materials derived from gSSURGO. Legend categories are explained when viewer clicks on legend boxes.

NRCS Retirements

Mike Golden

Micheal Golden, Deputy Chief for Soil Survey and Resource Assessment, retired on January 3, 2010, after nearly 40 years of service with USDA–NRCS, the National Cooperative Soil Survey, and the Soil Science Division. Mike dedicated himself to the profession and, after spending 8 years as the Soil Science Division Director, became Deputy Chief. Under his leadership, the Soil Survey Program made great advances domestically and internationally. Many areas of technology, including remote-sensing, digital soil mapping, online information delivery (Web Soil Survey), and database development, flourished under Mike's leadership. Mike's passion for soil science, his warm demeanor, and his pleasant nature will be missed in the soil science community.

Mike plans to retire to his home ranch in Oklahoma and will be a "gentleman" rancher. Mike can be contacted at MGolden603@aol.com.

Mike Golden and his wife Betty. Mike recently retired from the position of Deputy Chief for Soil Survey and Resource Assessment.

Cam Loerch

Cameron “Cam” Loerch retired from Federal service with the Natural Resources Conservation Service after a 38-year career in soil survey on January 3, 2014.

After taking his mother’s advice to take the civil service skills-and-aptitude test while a student at the University of Nebraska, Cam was offered a part time job as a photographic aid with Soil Conservation Service at the Cartographic Unit. Over the next 38 years, Cam’s career took him from Nebraska, to Utah, to West Virginia, to Alabama, to Colorado, and finally back to Nebraska in 2005 to serve as state soil scientist.

In 2010, Cam was selected as the National Leader for the Soil Survey Standards Branch at the National Soil Survey Center (NSSC). During the past 6 months, Cam served in the capacity of Acting National Leader for Soil Survey Research and Laboratory Branch at NSSC.

Throughout his journeys, Cam shared his life with his wife Teri and raised two sons. He now reaps the joys of three fine grandchildren.

Cam can be very proud of the many accomplishments he has made with SCS/NRCS and has been able to touch many people along the way. He now looks forward to applying lessons learned and his energies to what the future holds for him. Cam can be reached at cloerch@mindspring.com.

Cam Loerch, recently retired from the position of National Leader for the Soil Survey Standards Branch.

Joe Chiaretti

Joe Chiaretti, soil scientist and soil taxonomy specialist, retired from Federal service with the Natural Resources Conservation Service on January 10, 2014. During his career as a soil scientist, he served two Federal agencies (Bureau of Land Management and Soil Conservation Service/NRCS) at five regular duty stations (Socorro, Shiprock, and Santa Fe, New Mexico; Reno, Nevada; and Lincoln, Nebraska) and three temporary detail stations (Jasper, Florida; Big Timber, Montana; and Gallup, New Mexico).

In 1998, after 19 years of mapping, he moved from New Mexico to Reno, Nevada, to become a soil data quality specialist at the former MLRA regional office. He performed quality assurance on soil surveys in the Great Basin region for almost 11 years and found his permanent home in the West.

In 2008, he was selected for the lead soil taxonomy position on the Soil Survey Standards staff at the National Soil Survey Center (NSSC). Joe represented the NSSC and was a spokesman for soil taxonomy both nationally and internationally.

Joe can be very proud of the many accomplishments he made in his career as a soil scientist. He can be contacted at biglitljoe@sbcglobal.net.

Joe leaves us with the poem "Benedicto," written by one of his favorite authors, Edward P. Abbey (1927–1989).

"Benedicto …

May your trails be crooked, winding, lonesome, dangerous, leading to the most amazing view. May your mountains rise into and above the clouds. May your rivers flow without end, meandering through pastoral valleys tinkling with bells, past temples and castles and poet's towers into a dark primeval forest where tigers belch and monkeys howl through miasmal and mysterious swamps and down into a desert of red rock, blue mesas, domes and pinnacles and grottos of endless stone, and down again into a deep vast ancient unknown chasm where bars of sunlight blaze on profiled cliffs, where deer walk across the white sand beaches, where storms come and go as lightning clangs upon the high crags, where something strange and more beautiful and more full of wonder than your deepest dreams waits for you beyond that next turning of the canyon wall."

Joe Chiaretti, recently retired from the position of soil scientist and soil taxonomy specialist.

Rebecca Burt

Rebecca Burt retired from Federal service with the Natural Resources Conservation Service after 28 years of service.

Dr. Burt worked at the National Soil Survey Center for most of this time and focused her efforts in the areas of soil chemistry, physics, and geochemistry. She was the author of the Soil Survey Information Manual (SSIR No. 45, 1995) and served as technical editor for all versions of the Soil Survey Laboratory Methods Manual (SSIR No. 42; 1989, 1992, 1996, 2004, 2014). Her contributions were significant in scope: she wrote some of the methods; was responsible for the review process encompassing additions, corrections, and consistency of other methods; and provided leadership in the assemblage of the document.

She was well known for her work internationally, including a year spent in Iraq assisting the Provincial Reconstruction Teams with numerous soil-related activities. Dr. Burt will continue to pursue work with the international community, focusing on efforts in developing countries. ■

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