National Cooperative Soil Survey Newsletter

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Editor's Note

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

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

Upcoming 2019 NCSS National Conference

The 2019 conference will be held June 10 to 13 at the University of Rhode Island Coastal Institute at the Narragansett Bay Campus. The theme is "Charting the Future of Soil and Ecological Sciences."

Participants of the National Cooperative Soil Survey include representatives from the 1862 land-grant universities, experiment stations, NRCS, U.S. Forest Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, Environmental Protection Agency, U.S. Fish and Wildlife Service, National Association of State Conservation Agencies, 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, Asia, Africa, Europe, and Australia, are invited to participate as users of soil surveys. Students and their contributions to the future of soil survey are also welcome.

Conference Highlights

- Aquaculture: Oyster Farming Operation
- Coastal and Riparian Ecosystems
- Field Tour: Coastal Zone Soil Survey and Coastal Erosion
- Fundamental Changes to Soil Taxonomy
- NCSS 120th Celebration
- Urban Soils

You may join the conversation about the conference by tweeting or posting updates to your LinkedIn, Facebook, or Instagram pages. The conference hashtag is #NCSS2019. You may also search social media for this hashtag to

view other online posts about the conference. These social media efforts will help participants network and meet new colleagues prior to and during the conference.

For more information on the conference, visit: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/partnership/ncss/?cid=nrcseprd1431071 ■

VOTE to Revise the NCSS National Conference Bylaws and NSSH Part 602

Voting is now open on the proposed revisions to the NCSS Bylaws and National Soil Survey Handbook, Part 602. Votes will be accepted until the beginning of the Bylaws Review Team meeting at the national conference on June 10 at 2:00 p.m. Please use the following link to vote on the proposal: VOTE HERE to accept or reject the proposed revisions

The period to provide comments on the proposal closed on May 10, and no comments were received. The original announcement and links to all the background documents are available at: https://content.govdelivery.com/accounts/USDANRCS/bulletins/23f5156

The Bylaws Review Team will end the voting at the scheduled team meeting in Rhode Island on June 10 (2:00–3:15 p.m.). An opportunity to join the meeting remotely will be provided on the conference website. A summary of the voting results and survey comments will be provided to the conference during the team report on Thursday, June 13, at 9:30 a.m.

Background

The identified purpose of the NCSS is “to contribute to the general human welfare by promoting the use and understanding of soil resource information and by developing recommendations for courses of action, including national policies and procedures, related to soil surveys and soil resource information.”

Continuity of conference committee efforts and communications between and among conferences is fundamental to attaining objectives. A team, consisting of NRCS and Forest Service staff, refined the NCSS bylaws to facilitate this. The NCSS bylaws and guidance for conducting NCSS conferences are contained in the National Soil Survey Handbook, Part 602, Subpart A and Subpart B.

The team’s initial strategy was to strengthen the Timeline of Activities, in Part 602.15, for steering and standing committee formation, communications, and results. The goal is for committee work to be developed to the point of finalizing recommendations and decisions when the conference convenes.

Delving into the details, the team recognized additional opportunities to facilitate conference objectives and improve clarity by:

- Defining roles and responsibilities,
- Developing a roadmap for conference planning,
- Adapting to institutional realities,
- Streamlining and reducing redundancies, and
- Listing standing committees and their objectives.

The bylaws clearly state that regional bylaws are the responsibility of the regions. However, the proposed changes to the national bylaws, if accepted, would affect the NCSS regional conferences because:

- The revised Timeline of Activities in Part 602.15 is applicable to both national and regional conferences for insuring coordination with national conferences.

- The revisions establish standing committees for the national conference, as well as the same committees for all regional conferences.

The Bylaws Review Team undertook this effort to serve the conference purpose and to improve conference participation, communication, and outcomes.

The NCSS Bylaws Review Team

Al Averill, NRCS, Massachusetts and Vermont State Soil Scientist
John Lane, USFS Watershed and Air Program manager, Juneau, Alaska
Dave Hoover, NRCS, National Soil Survey Center director, Lincoln, Nebraska
Rick Strait, NRCS, New Mexico State Soil Scientist
Jennifer Wood, NRCS, soil data quality specialist, Davis, California
Jennifer Mason, NRCS, MLRA soil survey office leader, Clinton, Tennessee
Debbie Surabian, NRCS, Connecticut State Soil Scientist
Wade Bott, NRCS, North Dakota State Soil Scientist
Cathy McGuire, NRCS, soil survey regional director, Region 8, Phoenix, Arizona
Cory Cole, NRCS, Alaska State Soil Scientist
D'Andre Yancey, NRCS, Arizona State Soil Scientist
Larry Laing, National Soils Program leader, Washington, D.C. ■

Global Digital Soil Mappers Gather in Chile

The 2019 Joint Workshop on Digital Soil Mapping and GlobalSoilMap was hosted by the University of Chile, Santiago, on March 12 to 16, 2019. The workshop brought together an international community of scientists to discuss recent developments in the field of digital soil mapping (DSM), including the GlobalSoilMap project. It began with technical training on the application of R software and Google Earth Engine for data processing and analysis, which are often used to complete a digital soil mapping workflow. The next 3 days were filled with informative and stimulating presentations and discussions on the advances of GlobalSoilMap and digital soil mapping, the existing challenges, and the key research needed to address these challenges. The work plans for the GlobalSoilMap and Digital Soil Mapping working groups of the International Union of Soil Scientists (IUSS) were also discussed.

More than a dozen countries across the globe were represented at the workshop. The United States was represented by members of the National Cooperative Soil Survey and the Digital Soil Mapping (DSM) Focus Team, including Suzann Kienast-Brown (NRCS), Dr. Jim Thompson (West Virginia University), and Dr. Colby Brungard (New Mexico State University).

Figure 1.—Suzann Kienast-Brown and Jim Thompson receive the award for best oral presentation. Also pictured are Monica Antilen (left) and Osvaldo Salazar (right) from the University of Chile.

Suzann Kienast-Brown and Jim Thompson received the “Best Oral Presentation” award for their presentation titled “Soils2026 and Digital Soil Mapping—Foundation for the Future of Soils Information in the United States.” Their presentation consisted of a discussion on the activities of the DSM Focus Team in creating nationwide continuous soil property maps (the next version of GlobalSoilMap for the U.S.) and institutional changes to help make digital soil mapping operational in the NCSS and Soil and Plant Science Division.

Advances, challenges, and common themes were identified as the workshop progressed. The advances included new contributions to GlobalSoilMap from India, China, and the Netherlands and an emphasis on machine and deep learning techniques for prediction of soil classes or properties. The reasons why people are apprehensive about DSM and DSM products and some ways the scientific community can help to overcome their apprehension were discussed. Extensive efforts currently are underway in many countries, including the U.S., France, the Netherlands, and Australia, to integrate DSM into national soil survey programs. Each institution faces similar challenges. Building capacity, developing workflows, communicating DSM advantages, and engaging end users are critical for DSM to become operational in the various national institutions. The challenges identified for research and development include comparison of global models versus regional models, harmonization of predictions among regional models, evaluation of 2D modeling versus 3D modeling for depth predictions of continuous soil properties, and effective communication and application of uncertainties. Many reported that users ignore uncertainty information when provided, generally because they do not know how to interpret it. To overcome this, it was suggested that uncertainties be expressed in terms of risk, which are more easily interpreted. Keep your eye out for interesting advances in these areas in the next couple of years!

Figure 2.—Soil that formed in ignimbrite and has a well developed duripan.

Figure 3.—Laminar cap on the duripan.

The final day included a field trip to the University of Chile, German Greve Silva Experimental Station, just outside of Santiago, in the Rinconada De Maipu Region. Central Chile is part of the Pacific Ring of Fire. It is one of the most active tectonic areas on the planet and has the largest number of active volcanoes in South America. This unique tectonic setting created the second largest mountain chain in the world, the Andes, and an ecological island characterized by a high level of endemism. This island is a biological hotspot for biodiversity conservation. The geographical isolation, Mediterranean climate,

Figure 4.—Area of the University of Chile, German Greve Silva Experimental Station, just outside of Santiago, in the Rinconada De Maipu Region.

Figure 5.—Manuel Casanova describing development of the Fluventic Haploxeroll.

Figure 6.—Marcos Pfeiffer introducing the stratified Typic Xerept.

and fertile soils have allowed for a thriving agricultural industry in this part of Chile.

The group visited three distinctly different soil types and was provided information on soil development and land use in the area. The first soil (classified as a Vitrandic Durixeroll) was a volcanic soil that formed in ignimbrite, and it had a well formed duripan with a laminar cap (see figures 2 and 3).

The second soil (classified as a Fluventic Haploxeroll) was a deep alluvial soil that formed on terraces of the Mapocho River (see figure 5). The upper part of the soil was clay loam and silty clay loam. A textural discontinuity of very sandy material was below the fine textured material at a depth of about 100 centimeters. Redoximorphic features were observed above the very sandy layer, indicating a perched water table in the fine material above the sand. Redoximorphic features were also observed in the lower part of the profile at a depth of about 200 centimeters, indicating that the soil was affected by both surface and ground water.

The third soil (classified as a Typic Xerept) also formed in stratified alluvium on terraces of the Mapocho River (see figure 6). This soil was sandy throughout and had the beginnings of a fragipan at a depth of about 120 centimeters.

After the tour of soils in the area, the group enjoyed a traditional Chilean barbeque at the hacienda on the experimental station grounds. This was an excellent way to end an informative week discussing digital soil mapping! ■

Region 9 Supports Annual National Land and Range Judging Contest

By Jeremy Dennis, NRCS, Stillwater, Oklahoma, Soil Survey Region 9.

The 68th annual National Land and Range Judging Contest brought just under 700 4-H and FFA members, from 34 States, to Oklahoma to compete. The official contest was held on May 2 on land owned by the Cheyenne-Arapaho Tribe at Concho, north of El Reno, Oklahoma, in Canadian County.Participants had 2 days of practice at Lake Arcadia in Oklahoma City to prepare for the contest. The fact that the sites were very muddy didn't slow these kids down one bit. It appears that about everyone came prepared for the most. Two days of wet practice led to a dry and sunny contest day!

Soil scientists from Region 9 and the State of Texas arrived on Monday to assist the Oklahoma staff in preparation for the contest. They also provided onsite technical assistance and officiated during the final contest. On Monday, practice sites were set up for land, range, and homesite judgers and coaches to view and assess the Oklahoma soils. Time was also allotted for the practice pits to be scored.

Tuesday and Wednesday were the practice days when soil scientists and range management specialists assisted the students and coaches as they familiarized themselves with the Oklahoma soils and rangelands at the two practice sites. On Tuesday morning, the coaches were given the answers to the practice pits, enabling them to compare and score the results the students provided during practice. On Wednesday, as the students continued the practice session, a small group of soil scientists led by Steve Alspach, Oklahoma State Soil Scientist, set up the official contest sites. The contest included 16 pits—4 sites with 4 pits at each site.

On Thursday morning, the students were split into groups and the official contest began. The contest was comprised of three events: Land Judging, Range Judging, and Homesite Evaluation. Land judging contestants entered several 1- to 4-foot-deep pits to evaluate the qualities of the soil and determine its potential for agricultural

Figure 1.—Contestants (future soil scientists) make soil determinations during the contest.

Figure 2.—Contestants (future range management specialists) make range determinations at the official site.

production. Range judging contestants visited several rangeland sites to identify plant species and determine the site's value for cattle production and quail habitat. The homesite evaluation event challenged contestants to determine the value of a site for residential development.

A ceremony was held Thursday evening at the National Cowboy and Western Heritage Museum to honor both team and individual winners in each category of competition. Each category included FFA and 4-H awards.

This year the national team championship trophies in Land Judging were awarded to the Tyler FFA Chapter of West Virginia and the North Miami Sr 4-H Club of North Miami, Indiana. National individual championship trophies in Land Judging were awarded to Madison Craven of the Tyler FFA Chapter of West Virginia and Gavin Taylor of the Monroe County 4-H Club of West Virginia.

The national team championship trophies for Homesite Evaluation were awarded to the Hondo FFA of Hondo, Texas, and the Monroe County 4-H Club of West Virginia. National individual championship trophies for Homesite Evaluation were awarded to Preston Twilligear of the Hondo FFA Chapter and Madison Stroud of the McCook County 4-H Club of South Dakota.

The national team championship trophies in Range Judging were awarded to the Hamilton FFA Chapter of Hamilton, Texas, and the Wessington Springs 4-H Club of South Dakota. National individual championship trophies in Range Judging were awarded to Jessica Brown of the Hamilton FFA Chapter of Hamilton, Texas, and Noah Hainy of the Wessington Springs 4-H Club of South Dakota.

Coaches and judges, as well as site preparation assistance, were provided by Region 9 staff and included Soil Scientists Tyler Kemph and Tyson Morley (Altus, Oklahoma); Soil Scientists Jeremy Dennis and Jarred Goedeke and Range Management Specialist Colin Walden (Stillwater, Oklahoma); Steve McGowen, Chris Hobbs, and Justin Morgan (Woodward, Oklahoma); and Soil Scientists Richard Gelnar and John Warner (Salina, Kansas). NRCS Oklahoma State staff included Oklahoma State Soil Scientist Steve Alspach and Resource Soil Scientists Troy Collier, Clay

Salisbury, Jake Boyett, and Carl Woods. Various other agencies and cooperators from Oklahoma participated as well.

Steve Alspach said it very well: “These contestants represent the next generation of farmers, ranchers, conservationists, and land managers. Events like this are as much an opportunity for us to introduce high school students to a potential career with USDA as they are a STEM learning experience.” (STEM is a curriculum focused on the disciplines of science, technology, engineering, and mathematics.) ■

26 Universities Compete at the 2019 National Soil Judging Contest in California

By Soil Survey Region 2 Soil Scientists Randy Riddle (Oxnard, California), Genevieve Landucci (Templeton, California), and Philip Smith (Hanford, California).

The 2019 National Soil Judging Contest was hosted by California Polytechnic State University, San Luis Obispo (Cal Poly) on April 14 to 19. Students from 26 universities travelled to San Luis Obispo after qualifying for the event at regional competitions. With over 200 students participating at this year’s event, longtime coaches thought that this year’s competition had the “largest turnout yet.” The national competition provides students an important and unique opportunity to observe and practice describing soils in a new geographic environment.

The teams spent 6 days on the central coast of California honing their skills as field soil scientists while visiting a variety of soils and landscapes. The four practice locations scattered throughout San Luis Obispo were selected to highlight the diversity of soil types and geologic formations found in the region. As a bonus, students experienced the stunning wildflower blooms at Shell Creek, nationally dubbed the wildflower “superbloom” by media outlets. These flowers are visited by thousands of naturalists, photographers, and artists.

Figure 1.—University of Maryland soil judgers and Dr. Martin Rabenhorst, 2019 Champions, pose with the National Championship trophy.

Figure 2.—University of Nebraska–Lincoln soil judgers, coached by Dr. Judith Turk and Dr. Rebecca Young, took First Place in Group Judging.

The individual contest occurred at Chorro Creek, a university-owned ranch. Three soil pits with different parent materials were reserved for the official contestants. Two additional soil pits were available for non-competing students to continue practicing their skills. Students completed soil profile descriptions independently at these sites during team and individual judging on Thursday, April 18. The group judging contest occurred the following morning at a separate university property named "Poly Canyon," and teams worked collectively to describe two pedons. The festivities wrapped up Friday afternoon with an awards ceremony at Morro Rock, a popular surfing spot in the beach town of Morro Bay.

At the awards ceremony, the University of Maryland walked away victorious as overall national champions for combined team score. Second place went to Virginia Tech, third place went to the University of Nebraska–Lincoln, fourth place North Carolina State University, and fifth place Kansas State University. The University of Nebraska–Lincoln took First Place in Group Judging. The top five individual soil judgers were: (1) Sabrina Vladu, Virginia Tech, (2) Jenna Floyd, West Virginia University, (3) Katie Fross, Kansas State University, (4) Craig Zemetis, Penn State University, (5) Aubrey Wiechecki, University of Maryland, (6) Curtis Murphy, North Carolina State University, (7) Cathlelyn Wang, University of Maryland, (8) Jagger Borth, Kansas State University, (9) Riley Greene, University of Rhode Island, and (10) Samantha Teten, University of Nebraska–Lincoln.

The event was organized by Dr. Gordon Rees and Dr. Daniel Johnson at Cal Poly and was well supported by partners. NRCS Soil Scientists Philip Smith and Randy Riddle served as official judges for the contest and described 26 soil profiles at the practice and contest sites. The Kellogg Soil Survey Laboratory provided physical and chemical analyses for soils at the practice pits. Craig Stubler, Cal Poly soils technician, ran additional particle-size analyses at the university soils lab, and the NRCS Oxnard Soil Survey Office measured calcium carbonate equivalency for the contest soils. Additional outreach and support for contest-day operations was provided by Soil Survey Region 2 staff, including Regional Director Dr. Cynthia Stiles and members of six soil survey offices. Further representation and contest-day support was provided by Soil Science Society of America staff. ■

Figure 3.—First Place Invidividual, Sabrina Vladu, of Virginia Tech. Coach: Dr. John Galbraith.

Murray Ag Students Test Out Soil Health Buckets

By Jason Johnson, public affairs specialist, NRCS, Des Moines, Iowa.

On April 24, 2019, Resource Soil Scientist Julie McMichael (from NRCS office in Atlantic, Iowa) and other local USDA staff provided hands-on training to 14 high school students at a farm north of Murray, a small southern Iowa community. The students were among the many Murray High School students who assembled Soil Health Buckets the past few years for use by Iowa USDA offices and farmers nationwide.

Julie McMichael explains "soiling hankies" and soil health to FFA high school students.

McMichael focused the training on how to use the tools and instruments, comparing soil health and characteristics on pasture, cropland, and gardens. After demonstrating how to use the tools and explaining what they are used for, McMichael allowed the students to try them out for themselves.

The students' agriculture teacher Taylor Clark says she felt it was important for her students to learn more about the basic principles of soil health and how to use the tools in the bucket. "It was nice to get the students out in the field to gain some hands-on experience using the soil health tests," she said.

Clark asked the students to conduct the soils tests and document the results, like science experiments. The class then discussed their results.

In one experiment, the group tested soil phosphate levels by mixing a small amount of soil and water in a cup and dipping a phosphate test strip in the mixture. When the test strip turned a seafoam green color, the students knew the soils were low in phosphorus. "That wasn't really a surprise since southern Iowa soils tend to be more acidic," said McMichael. "We talked about the importance of phosphorus to plant growth and ways a farmer might increase pH levels, including applying lime or fertilizers."

In another experiment, the infiltration test, students measured how fast 1-inch rainfall enters the soil. The students pounded a 3-inch-diameter ring 3 inches into the soil and lined it with plastic wrap, then poured 107 mL (1 inch of water) into the ring. They gently removed the plastic wrap and recorded the amount of time it took the water to infiltrate the soil.

"We found the water infiltrated within a minute on the pasture and in some areas of the cropland," said McMichael. "But we found in some areas of the cropland only some of the water infiltrated and the remainder stayed on the surface, indicating some compaction issues."

Other tools in the Soil Health Buckets include:

- Shovel and trowel
- Thermometer for soil temperature
- Color chart for soil organic matter

- Solvita test (for soil biological activity)
- Nitrate test strips
- Slake test (for soil stability)

McMichael says farmers can learn a lot about their soil by using a spade or shovel and digging a small hole. “Typically, the more earthworms in the soil, the healthier the soil,” she said. “Farmers minimally disturbing the soil with no-till or strip-till, keeping living roots in the soil with cover crops, or extending the crop rotation beyond corn and soybeans typically have a lot of earthworm activity.”

All of Iowa’s NRCS field offices have the Soil Health Buckets and have staff available to provide free soil evaluations for local farmers.

If farmers are interested in purchasing a Soil Health Bucket, they can contact Taylor Clark at tclark@murraycsd.org or call 641-447-2517. ■

Determining the Suitability of Soils for a Subsurface Drip Irrigation System

By Mike Moore, NRCS soil scientist (Fort Morgan, Colorado) and Patricia Cec, NRCS soil conservation technician (Byers, Colorado).

The Price Ranch is a family-owned cattle operation located in eastern Arapahoe County, Colorado. The ranch was established in the late 1800s. John R. Price and his children account for five and six generations, respectively, that now live on the ranch. John raises and maintains a large herd of Red Angus cattle. In addition to the cattle, he farms both dryland and irrigated crops. Alfalfa and corn normally are grown for cattle feed.

The Price Ranch has a long history of working with both the Deer Trail Conservation District and the Natural Resources Conservation Service. Over the years, John, his father, and grandfather have all served as board members for the Deer Trail Conservation District. In addition, Price Ranch has been involved in multiple conservation programs, including the Great Plains Conservation Program in the 1970s, Long-Term Agreement contracts, district grants, and the Environmental Quality Incentive Program (EQIP). Through these cost-share programs, the Prices have installed multiple conservation practices on their ranch.

John has been interested in installing a subsurface drip irrigation system (SDI) for a few years. SDI is ideal for smaller, irregularly shaped fields. These systems tend to be highly efficient and utilize lower pressures and gallons per minute (GPMs) than a standard sprinkler, which in this case is an old side roll sprinkler. The rate of water evaporation when using SDI is very low compared to any other

Figure 1.—Looking down on the flood-plain step from the terrace.

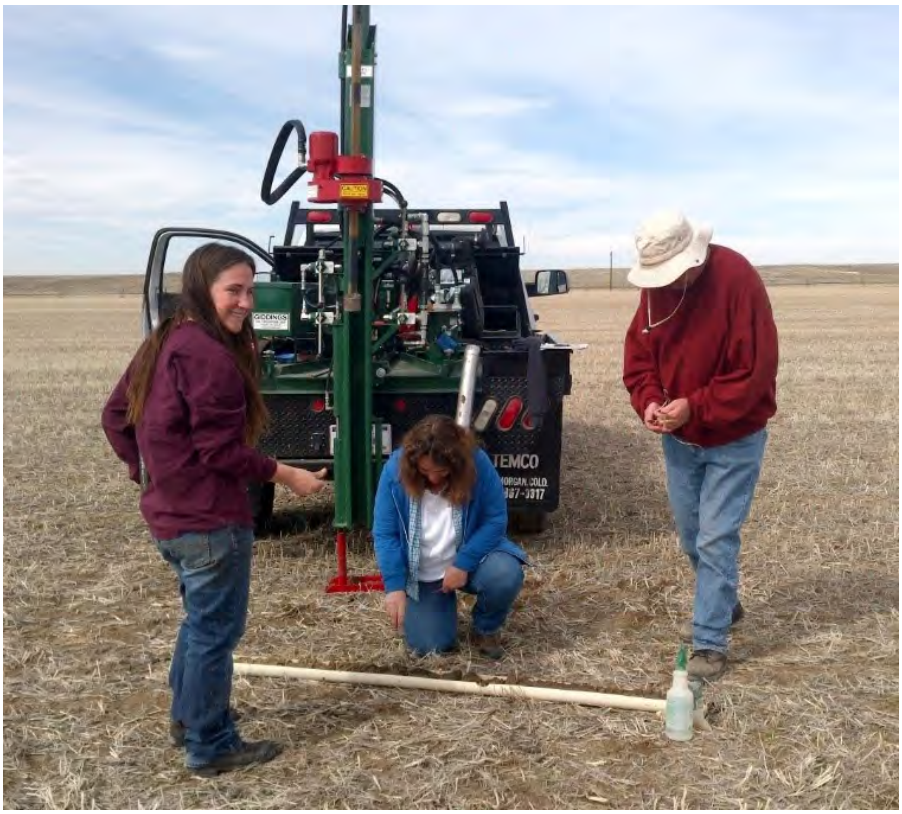

Figure 2.—Jessica Straub, Patricia Cec, and Sammie Molinaro look at a soil core from one of the areas of concern.

irrigation method, which makes SDI a highly effective system for water conservation. Through EQIP the producer will also implement Irrigation Water Management to further enhance the water savings. Finally, John is also hoping to lessen the amount of labor and maintenance that the old irrigation system requires. Depending upon cost, he would like to install a highly automated SDI that he can run from a computer or iPad.

NRCS has answers to questions like John's, and all he had to do was call. Soil Scientist Mike Moore and Soil Conservation Technician Jessica Straub (Fort Morgan Field Office) met up with District Conservationist Sammy Molinaro and Soil Conservation Technician Patricia Cec (Byers Field Office) and visited the site to determine if the soils on location would be suitable for an SDI system.

The NRCS team consulted the soil map and had a few concerns for this location. The first was that part of the field was mapped as a sandy soil: would an SDI system work well in a soil that has a high permeability rate? The second was that the part of the field with the sandy soil also had a frequently flooded rating: would the SDI system be wiped out if this area ever flooded? And lastly, the other part of the field is mapped as a soil that is very high in salts: would adding an SDI system lead to an increase in the amount of salts at the soil surface over time?

Field mapping of the soils for Arapahoe County, Colorado, was conducted from 1958 to 1963 using aerial photography on a 1:24,000 scale. At that time in eastern Colorado, the survey was mapped as an Order 2 survey but the mapping was broader and closer to an Order 3 survey due to land use.

The NRCS team used a Giddings soil probe to pull soil cores from within the areas of concern. Properties that they checked to help determine the potential success of the SDI system in this area included soil type, flooding frequency, permeability, water-holding capacity, salts, and drainage. Once on site, the team determined that this area

is on a terrace landform that is higher on the landscape than the nearby flood-plain step. Based on information supplied by the landowner and on the fact that this area is higher up on a terrace, the NRCS team determined that this area would not have a flood rating. Along with not being flooded, this part of the field also had soils with a lower permeability rate than the sandy soil that is mapped there. The soil cores also showed no presence of salt within the soil profile. The reason that the soil map showed the soil with a high amount of salts was likely due to scale of mapping and the soil lines being overdrawn.

The soils data provided on site by the MLRA soil survey office allowed this project to be moved to the next steps of planning, engineering, and construction. With the assistance of an Air Quality EQIP contract, John Price is finally able to implement the SDI system on his ranch this year. This will be the fifth SDI system that the Byers Field Office has managed through EQIP. One ranch at a time, they are *helping people help the land*. ■

Newburgh Urban Farming Fair Features soilSHOP Event

By Jacob Isleib, resource soil scientist, NRCS, Connecticut.

On Saturday April 27, staff from NRCS, the Agency for Toxic Substances and Disease Registry (ATSDR), and the Urban Soils Institute partnered to host a soilSHOP event at the Newburgh Urban Farming Fair in downtown Newburgh, New York. ATSDR promotes health education and outreach events, called soilSHOPs, to help people learn how to determine if their soil is contaminated with lead and other trace metals and how to reduce exposures to contaminated soil and produce. The name “soilSHOP” stands for Soil Screening, Health, Outreach and Partnership. The Newburgh Urban Farming Fair offered the opportunity for a large group of urban gardeners and farmers to bring soil samples to a centralized event, thereby allowing

Jacob Isleib at the soilSHOP event in downtown Newburgh, New York.

soilSHOP staff to provide results and consultation in an efficient manner. Elena Vaouli and Leah Graziano from ATSDR organized the soilSHOP portion of the fair and provided consultation, along with Mark Maddaloni (retired EPA toxicologist and Cardno Chemrisk senior managing health scientist). George Lozefski (lab manager with the Urban Soils Institute) and I served as pXRF technicians, providing rapid trace metals analysis on site. Although the weather kept threatening to rain and to blow everyone into the Hudson River, the soilSHOP was a great success, with over 100 individual analyses run and used for consultation. It appeared, from conversations with folks who brought in samples, that most were locals living within the city limits of Newburgh and they represented a range of familiarity-levels concerning metals exposure from soils. Elena, Leah, and Mark built an instant rapport when discussing results with participants. It was a great experience to work alongside them and witness their approach to soils outreach from a human-health perspective. The soilSHOP events offer an excellent opportunity for NRCS to assist Federal partners in providing a tangible technical soil service to an often-underserved public in urban areas. ■

Calumet Soils: Soils-Based Green Infrastructure Design

By Kristine Ryan (MLRA soil survey office leader) NRCS, Aurora, Illinois, and David A. Grimley and Andrew C. Phillips (principal research scientists and Quaternary geologists) and Mary Pat McGuire (assistant professor of Landscape Architecture), University of Illinois.

Across the urbanized Calumet region of Chicago, rainwater, rather than soaking into the soil, lands on impervious surfaces and runs off to local waterways or to gray infrastructure (pipes, tunnels, treatments plants, etc.). Exacerbated by increased urbanization and climate change, this flow pattern creates basement backups, street flooding, combined sewer overflows into waterways, and discharges into Lake Michigan. Resolving this coastal problem involves understanding that our urban stormwater challenges result from land cover changes that disrupt natural hydrology by hardening the landscape. To reverse this condition, science-based solutions are needed to restore the lost functioning of the landscape.

Figure 1.—Bob Tegeler (soil survey project leader, retired) providing training to student and professional researchers.

The Aurora MLRA Soil Survey Office staff assisted the lead researchers at the University of Illinois (U of I), including the Department of Landscape Architecture and the Illinois State Geological Survey (ISGS), in the development of a green infrastructure (GI) design project. This collaborative project uses a hydrogeologic basis that taps into ecosystem services provided by anthropogenic soils to

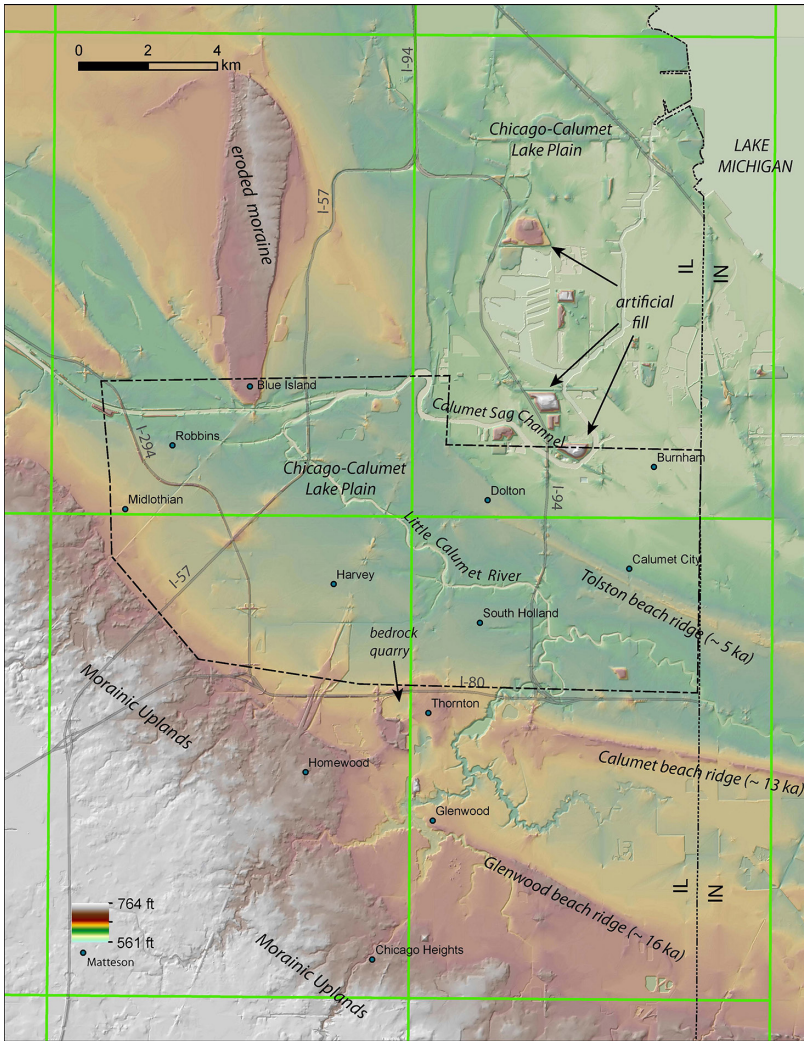

Figure 2.—Communities in the Calumet, Illinois, regional landscape. Map compiled from public data by D. Grimley, Illinois State Geological Survey.

help restore natural stormwater performance and protect the quality of life and property in the region.

Today, there is an increased interest in soils data by urban and regional planning agencies. These agencies want this information in order to promote green infrastructure that can: restore natural function to the regional landscape, compensate for underperforming gray infrastructure, promote onsite benefits, and adapt to climate change. The design research for this project will join scientific data with surface conditions of urban landscapes to generate new performative relationships between stormwater, underlying soils, and areas of recurring flooding. Scientific knowledge is integrated into GI urban design scenarios to produce a regional design approach that can be used to resolve urban flooding and protect adjacent rivers and the Lake Michigan system.

The Aurora MLRA Soil Survey Office completed the initial soil survey of Chicago and Cook County in 2012, combining new (initial) soils data for 300,000 acres with the soils data for 300,000 acres of previously mapped soils in DuPage County and parts of Cook County from the 1979 soil survey. The 2012 survey and its ancillary data (e.g., hillshade maps and surficial geology maps) were used by the Aurora staff

to help the lead researchers in site selection. The Aurora staff recommended locations within their project area based on ease of access and on landforms that would capture the variability of the soils of the Calumet region. Soils that formed on glacial Lake Chicago, ancestral beach ridges, and associated sand dunes were prioritized. These areas represent the dominant soil parent materials in the Calumet region, the materials into which green infrastructure may be built.

Figure 3.—Kristine Ryan and Avery Clark using Amoozemeters, with probe truck in the background.

The Aurora staff worked with U of I and ISGS to analyze what soil properties should be evaluated at the selected sites based on their project goals. It was decided that grain size analysis and saturated hydraulic conductivity (K_{sat}) would be measured, and that data would be used in their GI design modeling for the Calumet and Midlothian municipalities. The methodology directly ties GI site selection and implementation design to the underlying geologic soils and their modeled infiltration capacity.

The Aurora and Springfield MLRA Soil Survey Offices provided equipment and onsite expertise and training. The Aurora staff joined the researchers at the sites and assisted in collecting soil samples with the hydraulic probe. Using a hydraulic probe was a learning opportunity for the researchers. Its use promoted efficiency and provided a better continuous sample compared to that from a soil auger or probe. The soil cores were described according to NRCS standards. Samples were taken back to the university for further examination, detailed descriptions, and analyses. While the soil samples were being pulled and initially described in the field, the Amoozemeters were used to obtain K_{sat} data for each site at two different depths. At each site, the Aurora staff worked with the student researchers (Avery Clark and Piotr Szocinski), training them on sampling and description methods.

Collaboration and field work began in the summer of 2018 and will continue until the end of 2019. NRCS will aid and provide technical expertise for the duration of the project. Additionally, the Aurora staff has been involved in a few outreach and update meetings in Midlothian and Calumet City with the lead researchers to answer questions about soils. Most of the local elected officials and activist community groups are unaware that a soil survey exists for their communities. These meetings are a good way to promote the Soil Survey, explain how Cook County's soil survey can be used to address their resource concerns, and assess the needs of the community. It also is an opportunity to describe how the Aurora staff is improving the urban soil survey by updating the map unit concepts and soils data through ongoing database and field projects. The needs of the planning agencies and partners are revealed through this collaboration, which can help direct future projects. Gaps in the soils data are noted and can be drivers in the development of future field projects that address the resource concerns of the urban community. ■

Low-altitude, oblique photograph of coastal and riverine environment of Connecticut in autumn of 2003 (Long Island Sound Resource Center, http://www.lisrc.uconn.edu/lisrc/catalogimages.asp).

Soil Suitability for Marsh Migration: A Coastal Zone Soil Survey Interpretation for SLAMM

By Debbie Surabian, Connecticut and Rhode Island State Soil Scientist, and Jacob Isleib, resource soil scientist, NRCS.

Upon completion of the newest Sea Level Affecting Marshes Model (SLAMM), Connecticut Sea Grant called on NRCS soil scientists to assist with identifying soil properties and characteristics that would affect suitability of marsh migration.

SLAMM is widely recognized as an effective model to study and predict wetland response to long-term sea-level rise and has been successfully applied in every coastal State. The 2016 version has been updated to include new scenarios of sea-level rise, environmental impacts, and more current elevation data as well as new data output on the effects of storm surge on roads and other infrastructure. With the SLAMM dataset, the Connecticut Department of Energy and Environmental Protection (CT DEEP) wanted a set of environmental variables and associated rules for rating the conservation value of marsh migration areas and areas capable of supporting new or created marsh (resulting from connecting suitable areas to tidal flow). Connecticut Sea Grant was tasked with gathering the data and establishing a rulebase, which includes soils data.

Salt marshes form the interface between subaqueous soils that occur in saltwater and terrestrial soils containing fresh soil water. Coastal saltwater inundation and/or intrusion occurs when saltwater along the coast floods and/or intrudes into the water table of terrestrial soils. This can occur as a surface flood event or at various depths in the soil or underlying geology. It is caused by changing water demands, rising sea levels, occurrence of drought, coastal storm surge, and ground-water extraction as well as other natural and anthropogenic events. The frequency and duration of these events also vary, from pulse events associated with infrequent high-intensity coastal storms to the longer duration saltwater saturation from rising sea levels. As coastal

saltwater moves inland, and salts linger within soils, salt marshes begin to form from the proliferation of distinctive salt-tolerant vegetation. Thus, understanding how salts are differentially retained in terrestrial soils is a key to marsh migration, especially in the early stages.

Research revealed that the retention of salt in soils due to saltwater inundation along the coast is influenced by physical, chemical, and hydraulic properties of soils. These factors are soil texture (represented using percent sand content; Anisfeld, 2016; Broome et al., 1998), water table depth (Hussein and Rabenhorst, 2001; Hussein, 2009), cation-exchange capacity (Hussein and Rabenhorst, 2001), and extractable cation-exchange capacity (Hussein and Rabenhorst, 2001).

Look for the Connecticut and Rhode Island marsh migration soil interpretation to be published on Web Soil Survey in October 2019. The interpretation will be appear even sooner on the Long Island Sound SLAMM II CT ECO map viewer, shortly to be available at http://cteco.uconn.edu/viewers/index.htm. The SLAMM Fact Sheet is available at http://2pywec11qb6ms796h1llfxn1.wpengine.netdna-cdn.com/wp-content/uploads/2015/08/SLAMMFactsheet_07-1.pdf.

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Maine NRCS and the Maine Association of Professional Soil Scientists Collaborate on HSG Procedure for Consultants

By Tony Jenkins, Maine State Soil Scientist, Bangor, Maine.

Background

Most of us are familiar with Hydrologic Soil Group (HSG) ratings for predicting runoff in the process of sizing culverts and bridges—the principal intended use of the rating when it was introduced in the mid-1900s. HSGs are attributed to soil map unit components according to a methodology laid out in the NRCS National Engineering Handbook, Part 630, Chapter 7. If you are not familiar with the rating, the handbook is an excellent place to start, followed by some interaction with civil engineers and hydrologists to see HSG in action. In general, HSG categorizes a soil's inherent ability to take in and hold precipitation in four base classes, from A to D, with A representing well drained sands and the D class including soils, swamps, and concrete. For example, for a given storm event, the peak flow response for a watershed would be higher if the soils were in HSG group C rather than group B.

Figure 1.—Wetland protection setbacks are determined in part by HSG in Maine.

HSG has become important in ways that were probably never envisioned by the soil scientists and engineers that cobbled their nomographic method together for sizing culverts. Today in many, if not most, States, HSG is important for much more than designing water conveyances and crossings. In Maine, HSG is used as a key parameter for siting and sizing stormwater management systems and for determining buffer/setback parameters for activities near streams, ponds, and wetlands (fig. 1). State and municipal regulations have HSG "hard wired" into statutes and rules, as well as referenced in handbooks, guides, and manuals. Many other States have HSG similarly ingrained in regulatory statutes and references. HSG is directly tied to the required treatment areas for stormwater management, buffer sizes, and, in the case of an HSG rating of D, prohibition of certain practices. The economic implications are great. While many of us feel that HSG is widely applied beyond its intent or applicability, the "horse has left the barn," so to speak.

Three soil characteristics determine HSG:

1. Depth to impermeable layer (e.g., densic layer or bedrock)
2. Depth to seasonal high water table (SHWT)
3. Saturated hydraulic conductivity (K_{sat}) of the least transmissive layer (above the impermeable layer)

Each of these three soil characteristics has a high, low, and representative value (RV) in NASIS (National Soil Information System). NASIS uses an algorithm to apply Table 7.1 from the Chapter 7 guidance to attribute a *single* HSG rating to each soil component in the United States. However, the range in characteristics for the HSG parameters within a soil series make it possible for most series to have two or more HSG ratings. This possibility presents issues for consulting soil scientists.

HSG Attribution in Maine

HSG is also the most common product that clients want when they hire a consulting soil scientist. In Maine and most of New England, consulting soil scientists must identify HSGs for sites individually (such as for a specific stormwater management area for a parking lot) or for components of map units, for High Intensity Soil Surveys (HISS) that are conducted for proposed industrial developments, etc. Our NCSS

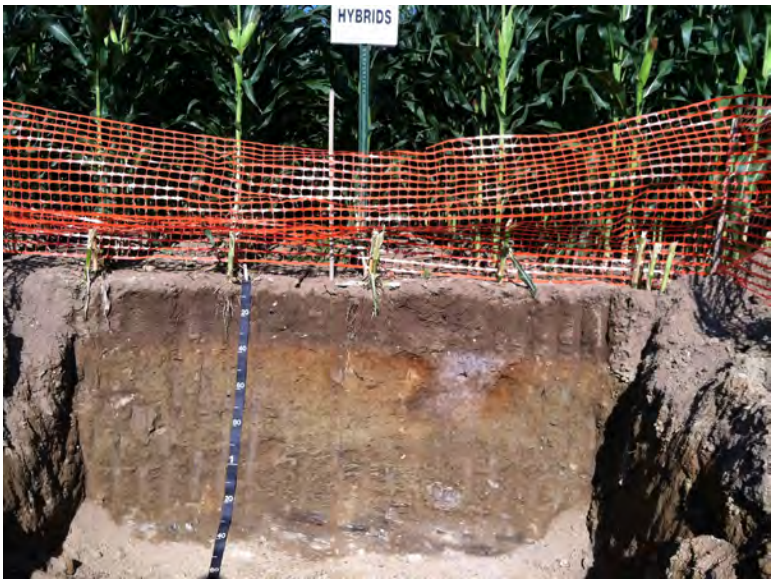

Figure 2.—Maine soil profile with bedrock, densic, and redox features varying across the pit face.

partner, the Maine Association of Professional Soil Scientists (MAPSS), has adopted specific guidance for HISS. Historically, in order to attribute HSG to sites and HISS map unit components, certified soil scientists would assign a soil series (quite often a "variant") and use its HSG from the local soil survey.

The moderately well drained soils of Maine are extensive and quite variable over short distances (fig. 2). A moderately well drained, moderately deep to deep soil can have an HSG of B, C, or D, depending on where the RV values were set in the (now harmonized) NASIS dataset. MAPSS consultants have endured a predictable problem for a long time: they were locked into one HSG as soon as they identified a series.

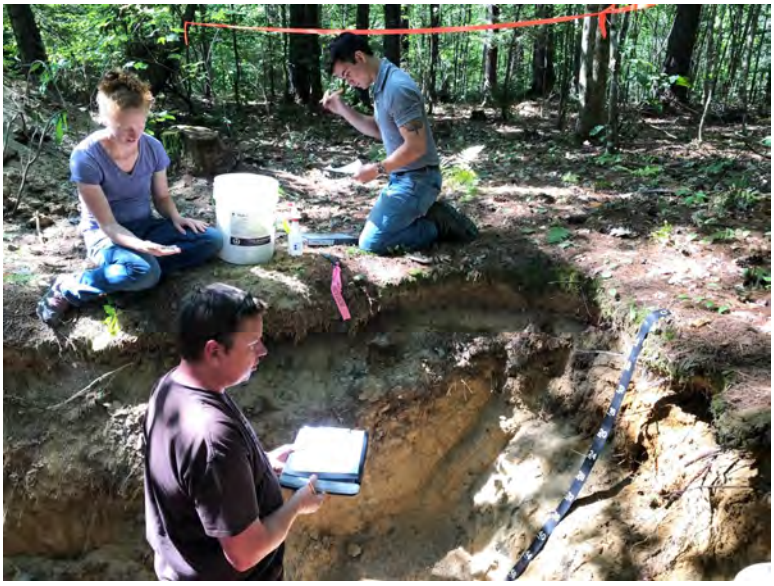

Figure 3.—MAPSS soil scientists describing an Elmwood profile. Photo by Chris Dorion, MAPSS.

This was frustrating, to say the least. A client who wants to simply buffer the runoff from a planned homesite parking lot on what is clearly a good site may be told that they have to move things or enlarge buffers because the published soil series is static with an HSG of D. Note that group D can range from a moderately well drained soil that could produce corn (undrained), to bare rock outcrop, to a peat bog or open water.

MAPSS and NRCS Maine could not fix the issue with the group D rating range, but we could and did enable consulting soil scientists to *attribute HSG directly to their client's soil*. We devised a method that is quite simple—identify a representative pedon (RP), describe it, and use Chapter 7 to assign an HSG. That method entails assigning the depth to impermeable layer and to SHWT directly from the soil morphology of the site or HISS component RP. K_{sat} is assigned using NRCS soil survey information. Specifically, we use the K_{sat} of the most analogous layer of the most analogous component in the published soil survey. Check the link above for details.

In September of 2018, MAPSS and NRCS sponsored a workshop in Orono, Maine, where a variety of soil scientists tested the method on five RPs. We spent a lovely fall morning doing what soil scientists love to do—arguing about soil characteristics (fig. 3)! When the dust settled, we assigned depths for the HSG parameters and the best fit soil series. We used our HSG worksheet (fig. 4) to document the key soil parameters and to enter the series and K_{sat} data for the selected layers. We also noted the official NRCS HSG rating for the series. The results from our workshop pedons illustrate the value of the method quite well. The RPs deviated both up and down the scale from the HSG rating of the published soil survey.

MAPSS 2018 Workshop Soil/Site Hydrologic Group and Connotative Legend Worksheet							
Representative pedon	RP imperme-able layer depth (cm)	RP SHWT depth (cm)	NRCS Soil Survey reference component name	NRCS component HSG data			RP HSG
				NRCS series HSG	NRCS reference layer (bottom depth)	NRCS Ksat RV	
1/ Elmwood	70	56	Elmwood	B	76	28.23	B/D
2/ Nicholville	105	80	Nicholville	C	102	15	B
3/ Peru	75	56	Peru	C/D	66	7.81	C/D
4/ Brayton	49	8	Brayton	D	58	7.8	D
5/ Peru	90	85	Peru	C/D	66	7.81	C

Figure 4.—MAPSS worksheet showing the published series' HSG and the onsite HSG (last column on right).

While the deviations may not seem radical to many readers, consider the following: an HSG of B instead of C can save tens to hundreds of thousands of dollars in stormwater management costs for a development. An HSG of C instead of D can make the difference in whether or not a project can even be allowed to proceed at all. Conversely, look at the Elmwood component on the worksheet in figure 4. The published soil survey indicates an HSG of B, but our pedon had a SHWT at 56 cm, which effectively classed it in group D! That could lead to protection of property and water quality on a site that might have been underprotected by using the rating from the published data. This is not necessarily an indictment of the B rating for Elmwood in the WSS. It is absolutely an illustration of the value of using the onsite soil characteristics to the advantage of the land and land user. This collaboration of NRCS and MAPSS is resulting in tremendous added value to consultants' products and better decision making in land use activities! ■

Passing of Dave Hvizdak

By Jim Turenne, NRCS soil scientist, Warwick, Rhode Island.

NRCS has lost a family member. Dave passed away early February 25, 2019. He died from the cancer he has been battling for the last 3 years. He was considered one of the best soil scientists to work with in Wisconsin and truly topnotch. Dave was passionate about soils and was highly respected around the United States. Up until the week before his death, he was working with the University of Wisconsin–Stevens Point on an agreement between them and NRCS to develop ecological site descriptions. In addition to working in Wisconsin for 28 years, Dave had been regional director and State Soil Scientist in Amhurst, Massachusetts, and had worked briefly in New York.

"I remember sitting at the Bear Paw Cafe in Port Wing while we waited out the rain… but then when it looked like it wasn't going to quit, Dave said something like, 'we do color moist anyway and I've got my hip boots…' We then proceeded out and described a Tawas soil with a peat sampler and screw auger in knee deep water." – Dr. Jacob Prater, University of Wisconsin–Stevens Point

Online obituary: https://www.pedersonvolker.com/notices/David-Hvizdak ■

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