73RD SWCS INTERNATIONAL ANNUAL CONFERENCE

CULTURE, CLIMATE, AND CONSERVATION

ABSTRACT BOOK

ALBUQUERQUE CONVENTION CENTER

ALBUQUERQUE, NEW MEXICO

JULY 29–AUGUST 1, 2018

SOIL AND WATER CONSERVATION SOCIETY

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SYMPOSIA PRESENTATIONS

SOIL® AND WATER CONSERVATION SOCIETY

Monday, July 30
Symposia Session Descriptions and Agendas

Conservation Innovation Grants (CIG) Showcase

10:30 AM – 5:00 PM, *Anasazi on Lower Level West Building*

The USDA-Natural Resources Conservation Service (NRCS), in conjunction with SWCS, will again host the Conservation Innovation Grants (CIG) Showcase at the SWCS Annual Conference. Since 2004, CIG has supported the development of innovative natural resource conservation approaches and technologies on working lands. This year's showcase includes three panel presentations that will highlight exciting work currently underway by CIG grantees.

This showcase runs from 10:30 AM to 5:00 PM on Monday, July 30. Following the showcase, CIG project posters will be presented in the poster session held in the poster display area of the Exhibit Hall from 5:00 PM to 7:00 PM.

Introduction: CIG Program Overview and Stakeholder Updates (10:30 AM)
Presenter: *Kari Cohen, USDA-NRCS*

Presentation 1: Innovation Delivery to Historically Underserved Producers (11:00 AM)
Moderator**:** *Edward Henry, USDA-NRCS*

Presentation 2: Water Management for Weather Resilience (1:30 PM)
Moderator: *Hamid Farahani, USDA-NRCS*

Presentation 3: Dairy Waste Technology (3:30 PM)
Moderator: *Steven Rowe, Newtrient*

Professional and Chapter Development Session

10:30 AM – 5:00 PM, *Taos on Lower Level West Building*

New this year, the Professional and Chapter Development Committee has developed sessions for the growth of professionals and chapter leaders. These sessions will help professionals become more effective across the diverse set of fields that serve conservation. You will learn from the experiences, challenges, and successes of other conservation professionals. Sessions on chapter development are relevant not only to SWCS chapters but also to any small organization seeking to have a big impact with minimal staff and budget.

Presentation 1: Website and Social Media Tips for Chapters and Small Organizations – *Lisa Cox, Gem City Fine Foods; Becky Fletcher, USDA-NRCS* (10:30 AM – 11:15AM)

Moderator: *Rob Lawson, USDA-NRCS*

Presentation 2: Field Notes: Brief Career Profiles – *Doug Karlen, USDA-ARS; Micheal Newman-Brooks, City of Chicago; LaKisha Odom, Foundation for Food and Agriculture Research; Jill Wheeler, Syngenta* (11:15 AM – 12:00 PM)

Moderator: *Megan Koppenhafer, Soil and Water Conservation Society Intern*

Presentation 3: Conservation Sales Training: Lessons Learned from the Private Sector – *Catherine DeLong, Soil and Water Conservation Society* (1:30 PM – 2:15 PM)

Presentation 4: Crucial Conversations: A Preview of the Course and Where to Find Local Opportunities to Participate – *Dale Threatt-Taylor, Soil and Water Conservation Society Southeast Region Director* (2:15 PM – 3:00 PM)

Moderator: *Susan Meadows, Soil and Water Conservation Society North Central Region Director*

Presentation 5: Engaging Students and New Professionals in your Chapter – *Robert Knight, Texas A&M University; Alexandra Firth, Mississippi State University; Spencer Pech, Iowa State University* (3:30 PM – 4:15 PM)

Moderator: *Megan Koppenhafer, Soil and Water Conservation Society Intern*

Presentation 6: Building Strong Boards and Board Members – *Jimmy Daukas, American Farmland Trust; Becky Fletcher, USDA-NRCS* (4:15 PM – 5:00 PM)

Moderator: *Cathy McGuire, USDA-NRCS*

Lightning Conversations on the Science and Policy of Conservation

10:30 AM – 12:00 PM, *Acoma/Zuni on Lower Level West Building*

Moderator: *Lindsey Yasarer, USDA-ARS*

In the arena of soil and water conservation, science and policy are often intermingled at the local, regional, and national scales. Communication between scientists, policymakers, and conservationists is critical at this junction between science and policy. This session is meant to ignite a discussion and develop ongoing conversations on the science and policy of conservation. The session is organized in three subsections, followed by a discussion. The first subsection will discuss case studies on the science of soil and water conservation. The focus will then shift to several large-scale regional efforts to synthesize conservation science through projects such as the USDA Agricultural Research Service (USDA-ARS) Long-Term Agroecosystem Research (LTAR) Network, and the Mississippi River Basin/Gulf of Mexico Hypoxia Task Force. The presentations will conclude with a talk that will explore the larger picture of how science and policy are intertwined at the national level. Finally, there will be an open discussion with the audience of all topics explored by the speakers. Each of the speakers will be limited to 10 minutes so that multiple points of view can be shared in a faster format, allowing time for a 10 to 20 minute discussion with the audience.

Presentation 1: The Drive to Improve Water Quality via Conservation Adoption: Who's At the Wheel and Where Are We Headed? – *Andrew Sharpley, University of Arkansas*

Presentation 2: Long-Term Agroecosystem Research (LTAR) and Sustainability: A Shared Process – *Tim Strickland, USDA-ARS*

Presentation 3: USDA Conservation Effects Assessment Project (CEAP): Fifteen Years of Research and Assessment in a Watershed Network – *Martin Locke, USDA-ARS*

Presentation 4: National Nonpoint Source Program: A Catalyst for Water Quality Improvements – *Katie Flahive, US Environmental Protection Agency*

Presentation 5: The Conservation of Mass: How Single Focus Best Management Practices (BMPs) Fail to Address Global Environmental Problems – *Andy Manale, APM and Associates Consulting*

Presentation 6: Synthesizing Science to Inform and Adapt Management, Programs, and Policy: Experience, Insights, and Challenges **–** *Lisa Duriancik, USDA-NRCS*

Rangeland Erosion Processes and Modeling

10:30 AM – 12:00 PM, *Cochiti on Lower Level West Building*

Moderator: *Mark Nearing, USDA-ARS*

Predicting soil erosion is a common practice in rangeland management for assessing the effects of management practices' impacts on sustainability and soil health. Soil loss rates on rangelands are considered one of the few quantitative indicators for assessing soil quality, rangeland health, and conservation practice effectiveness. Both concentrated flow erosion and splash and sheetflow may be active on rangelands, but concentrated flow erosion is particularly effective at detaching and transporting large quantities of soil, water, and dissolved elements. Soil, nutrients, and water are all possible limiting factors for ecosystem productivity in rangelands, and small resource losses can threaten sustainability. This symposium is targeted toward the science and prediction of soil erosion on rangelands, and the development and use of understanding the erosion processes and how they are affected by management and perturbations, such as fire. A specific focus of the symposium will be on the relatively new USDA Rangeland Hydrology and Erosion Model, including the functional development of the model itself as well as experimental work that has gone into development of both the model and our understanding of rangeland erosion processes.

Presentation 1: The Rangeland Hydrology and Erosion Model – *Mark Nearing, USDA-ARS; Mark Weltz, USDA-ARS; Frederick B. Pierson, USDA-ARS; Ken Spaeth, USDA-NRCS*

Presentation 2: Vegetation and Ground Cover Effects on Hydrologic Function in Treated and Untreated Woodlands of the Great Basin – *C. Jason Williams, USDA-ARS*; *Frederick B. Pierson, USDA-ARS; Sayjro K. Nouwakpo, University of Nevada; Osama Z. Al-Hamdan, Texas A&M University-Kingsville; Mark A. Weltz, USDA-ARS*

Presentation 3: Application of the Rangeland Hydrology and Erosion Model Coupled with CLIGEN to Estimate Hillslope Soil Erosion on a Grid Cell Basis – *Mariano Hernandez, USDA-ARS*

Presentation 4: Infiltration and Soil Loss Modeling with the Rangeland Hydrology and Erosion Model on Saline and Sodic Soils – *Sayjro K. Nouwakpo, University of Nevada; Mark A. Weltz, USDA-ARS; Awadis Arslan; Colleen H. Green; Osama Z. Al-Hamdan, Texas A&M University-Kingsville*

Presentation 5: Applications of RHEM in Rangeland Conservation Planning: Policy and Procedure – *Ken Spaeth, USDA-NRCS*; *Mark Weltz, USDA-ARS; Frederick B. Pierson, USDA-ARS; C. Jason Williams, USDA-ARS*

(Continued) 1:30 PM – 3:00 PM, *Cochiti on Lower Level West Building*

Presentation 6: Extending RHEM from Hillslopes to Watersheds and Large Areas with AGWA/KINEROS2 – *David Goodrich, USDA-ARS; Haiyan Wei, USDA-ARS; Mariano Hernandez, USDA-ARS; Ken Spaeth, USDA-NRCS; Mary Nichols, USDA-ARS; Shea Burns, University of Arizona; Phil Guertin, University of Arizona; Carl Unkrich, USDA-ARS*

Presentation 7: Rangeland Hydrology and Erosion Model: Data and Model Services Deployed through the Cloud Services Integration Platform (CSIP) – *George Peacock, Colorado State University; Tim Carney; Gerardo Armendariz, USDA-ARS; Rumpal Sidhu; Gerardo Armendariz, USDA-ARS; Olaf David, Colorado State University*

Presentation 8: Fire Impacts on Rangeland Erosion and Implications for Modeling – *Frederick B. Pierson, USDA-ARS; C. Jason Williams, USDA-ARS*

Presentation 9: A Parametrization Approach to Estimate Erodibility on Undisturbed and Disturbed Rangelands – *Osama Z. Al-Hamdan, Texas A&M University-Kingsville; Frederick B. Pierson, USDA-ARS; Mark Nearing, USDA-ARS; C. Jason Williams, USDA-ARS; Mariano Hernandez, USDA-ARS; Sayjro K. Nouwakpo, University of Nevada; Mark A. Weltz, USDA-ARS; Ken Spaeth, USDA-NRCS; Jan Boll*

Using Ecological Sites and State and Transition Models to Support Objective Based Conservation Planning

1:30 PM – 3:00 PM, *Acoma/Zuni on Lower Level West Building*

Moderator: *Michael Kucera, USDA-NRCS*

Presenters: *Brandon Bestelmeyer, USDA-ARS; Joel Brown, USDA-NRCS; Richard Strait, USDA-NRCS*

Use of Ecological Site Information, Ecological Site Descriptions (ESDs), and State and Transition Models (STMs) in the 9 Step Conservation Planning Process on all land uses will be covered to support objective based conservation planning. ESDs provide land managers the information needed for evaluating land use suitability, response to different management activities or disturbance processes, and ability to sustain productivity over the long term. Integrating ESDs is the most spatially and temporally relevant model for a conservation planner to use for multiple land uses when discussing client objectives, defining resource concerns, conducting inventories, selecting applicable practices/management measures, monitoring effects, and supplying feedback. Site specific use of STMs assure that conservation planners collect, organize, manage, and apply ecologically based conservation planning information. STMs describe a range of resource conditions (e.g., states and phases) and processes (e.g., time, triggers, succession, disturbances, management activities/practices) related to transitions in each land use. Development of hierarchical nested STMs for major land uses and sub-land uses that describe a common range of resource conditions, along with the conservation practices/management systems that can drive a desired resource change, allow the planner to focus on applicable land use(s) that apply. STMs can also be utilized to avoid making common conservation planning mistakes, such as utilizing practices that are not well-suited or applying practices that have negative effect on resource conditions. Transitions between states include information about conservation practices and adaptive management concepts that can achieve desired resource conditions. States and phases are explicitly connected to soil health, soil health indicators, and soil health management systems; and can be utilized across the country on a wide range conditions to guide conservation planning.

Meta-Review of Barriers and Motivations for Farmers to Adopt Conservation Practices

3:30 PM – 5:00 PM, Acoma/Zuni on Lower Level West Building

Moderator: *Linda Prokopy, Purdue University;*

Presenters: *Sarah Church, Purdue University; Ben Gramig, University of Illinois-Urbana Champaign; Pranay Ranjan, Purdue University*

This symposium will present results from a completed review and meta-analysis of 35 years (1982 to 2017) of quantitative and qualitative social science research papers that have examined motivations of and barriers to adoption of conservation practices in US agriculture. The proposed study updates and greatly expands on previous work that has reviewed BMP adoption. This meta-analysis (1) reviews all appropriate studies published during the timeframe, (2) accommodates a number of advances in this field of study such as the growth of qualitative research with farmers, and (3) focuses on both barriers to and motivations for adoption. All US studies found in the peer-reviewed literature, theses/dissertations, and grey literature since the early 1980s were reviewed for potential inclusion in this meta-analysis and review. Papers were identified through database literature searches. The project investigators employed vote-count meta-analysis and qualitative coding methods to identify patterns and trends in the literature. After a brief discussion of the study's methodology, the speakers will present study findings and discuss implications for conservation outreach and education as well as suggestions for future adoption studies. Preliminary results suggest that certain farm and farmer demographics, environmental attitudes, prior experience with conservation practices, and social networks are important determinants of practice adoption.

Carbonomics: The Amazing Economy of the Soil

3:30 PM – 5:00 PM, *Cochiti on Lower Level West Building*

Presenter: *Keith Berns, Green Cover Seed*

Sometimes the best way to understand a complex system is to compare it to other systems that we already understand. Green Cover Seed co-founder Keith Berns does just that in his Carbonomics presentation where he compares the economy of a country to the underground economy of the soil. There are many striking similarities between the economy of a country and the interactions that are occurring in a healthy soil. The economy of the soil is based on solar energy, but it is driven by the interactions between the soil, the plants, and the soil biology. The basics of carbonomics include economics principles such as supply and demand; producers and consumers; currency, cash flow, and capital; infrastructure; and defense. When inputs, soil biology, and production processes are explained in the context of a healthy economic system, farmers can better understand how their management contributes to productive, stable, resilient and efficient croplands.

Tuesday, July 31
Symposia Session Descriptions and Agendas

CEAP: Measuring and Understanding the Effects of Conservation Practices within Watersheds

1:30 PM – 3:00 PM, *Acoma/Zuni on Lower Level West Building*

Moderators: *Daniel Moriasi, USDA-ARS; Lisa Duriancik, USDA-NRCS*

The USDA spends about $5 billion per year on agricultural conservation programs in order to help producers and land owners implement good conservation practices (CPs) and systems on their land. In 2003, the USDA Natural Resources Conservation Service entered into partnership with USDA Agricultural Research Service (ARS) and many other partners to create the Conservations Effects Assessment Project (CEAP) to quantify the environmental effects of CPs and programs and develop the science base for managing the agricultural landscape for environmental quality. Over the last 15 years, research and assessments have been conducted to test the effectiveness of CPs at various spatial scales based on data collected, archived, and analyzed from CEAP watershed studies. Efforts to communicate with scientists, practitioners, and policymakers the findings of CEAP Watersheds on what CPs work and the temporal and spatial scales at which they work in various climatic and land management sites across the country are ongoing. Major findings of the ARS Benchmark CEAP-Watershed Assessment Studies and other watersheds will be presented. The findings will focus on highlighting the measured effects of conservation at different scales, with a particular interest in watershed or sub-watershed effects but to include edge-of-field (EOF) effects. Where measured effects are not able to be highlighted, particularly at larger scales, the results of a review of previously published effects of CPs or modeled results in a given study site will be presented. An evaluation of conservation tools that have been developed by CEAP or validated with CEAP data will also be presented. Other special topics to be presented include papers on (1) quantifying the impact of STEWARDS database data; (2) describing model improvements as a result of CEAP; and (3) discussing the future direction of CEAP in the next decade.

Presentation 1: Introduction: Overview of CEAP Efforts – *Teferi Tsegaye, USDA-ARS*

Presentation 2: Impact of STEWARDS Database Data – *John Sadler, USDA-ARS*

Presentation 3: Improvements of Hydrologic and Water Quality Models Motivated by CEAP – *Ron Bingner, USDA-ARS*

Presentation 4: Conservation Tools – *Linda Prokopy, Purdue University; Pranay Ranjan, Purdue University*

Presentation 5: Lessons Learned from the NIFA-CEAP Synthesis and Other Watershed Studies – *Deanna Osmond, North Carolina State University*

(Continued) 3:30 PM – 5:00 PM, *Acoma/Zuni on Lower Level West Building*

Presentation 6: Summary of Measured Effects at EOF – *Martin Locke, USDA-ARS*

Presentation 7: Summary of Measured Effects at Sub-Watershed/Farm Scale – *Jean Steiner, USDA-ARS*

Presentation 8: Summary of Measured Effects at Watershed-Scale – *Tim Strickland, USDA-ARS*

Presentation 9: Future CEAP Directions – *Lisa Duriancik, USDA-NRCS*

Assessing and Expanding Soil Health for Production, Economic, and Environmental Benefits

1:30 PM – 3:00 PM, *Cochiti on Lower Level West Building*

Moderator: *Wayne Honeycutt, Soil Health Institute*

Soil health is the capacity of a soil to function as a vital, living ecosystem that sustains plants, animals, and humans. Soil health–promoting practices have many benefits to agriculture and the environment, e.g., increase soil organic carbon, which increases a soil's available water holding capacity; reduce soil and nutrient losses to waterways; and reduce greenhouse gas emissions. Lasting improvements in soil health require partnerships with farmers, landowners, food/retail companies, farm organizations, academic institutions, government agencies, water utilities, communities, and environmental groups. However, a holistic approach to enhancing soil health has been elusive because (a) there is no scientific consensus around protocols for assessing soil health and relating measurements to management practices; (b) there are limited data from research and demonstrations to prove the benefits to agricultural production, natural resources, and economic returns, compared to the risks of economic loss in shifting to soil health-enhancing practices; and (c) there have been few assemblies of diverse stakeholders to inform agricultural strategies that support soil health. To overcome these limitations, the Soil Health Institute, the Soil Health Partnership, and The Nature Conservancy are leveraging their missions and capacities, along with resources from the Foundation for Food and Agricultural Research and other organizations. Together, we will overcome barriers to assessments and implementation through a definitive soil health evaluation protocol for different geographic scales, based on quantitative relationships with productivity, economic, and ecosystem service outcomes; by encouraging adoption through on-farm demonstrations and by developing effective communication and outreach strategies for farmers, consultants, educators, government agencies, and public leaders; thus promoting incentives for enhancing soil health and the natural resources upon which we all depend.

Presentation 1: Strategic Approach for Evaluating Soil Health Indicators – *Steve Shafer, Soil Health Institute*

Presentation 2: Scaling Soil Health Research and Farmer Engagement – *Nick Goeser, National Corn Growers Association and Soil Health Partnership*

Presentation 3: Harnessing the Value of Soil Health for Multiple Stakeholders – *Pipa Elias, The Nature Conservancy*

Conservation and the 2018 Farm Bill

3:30 PM – 5:00 PM, *Cochiti on Lower Level West Building*

Presenter: *Alyssa Charney, National Sustainable Agriculture Coalition*

Through programs covering everything from crop insurance for farmers to healthy food access for low income families, from beginning farmer trainings to support for sustainable farming practices, the farm bill sets the course of our food and farming system. Approximately every five years, the farm bill expires and is updated: proposed, debated, and passed by Congress, and then signed into law by the President. The current farm bill, The Agricultural Act of 2014, was signed into law in February of 2014, and is set to expire in September of 2018. The 2018 SWCS meeting falls just before that deadline. Inevitably, there is a lot of uncertainty as to the farm bill status at that point, but this session will provide an important opportunity to update attendees on the process and where things stand for critical conservation priorities. Regardless of whether we already have a new farm bill, or are looking at an extension of the 2014 Farm Bill, there is a lot at stake for conservation in 2019. The National Sustainable Agriculture Coalition (NSAC) will provide an update on the 2018 Farm Bill process and proposals, including a panel that will focus in on the Conservation Title of the farm bill. As part of this symposium, NSAC will provide an update on the process from Washington, DC, as well as an update on conservation program implementation under the 2014 Farm Bill—including programs such as the Environmental Quality Incentives Program (EQIP), the Conservation Stewardship Program (CSP), the Agricultural Conservation Easement Program (ACEP), the Conservation Reserve Program (CRP), and the Regional Conservation Partnership Program (RCPP). The session will frame potential changes in the next farm bill within this analysis and context. NSAC provided well-received farm bill reports and led discussions at the last SWCS meeting, and this presents an opportunity for an update and rigorous discussion on the conservation title of the farm bill.

Wednesday, August 1
Symposia Session Descriptions and Agendas

Southwest US Dust Monitoring and Mitigation Symposium

8:30 AM – 10:00 AM, *Acoma/Zuni on Lower Level West Building*

Moderator: *David P. Brown, Southern Plains Climate Hub*

This symposium will address dust monitoring and mitigation in semiarid agricultural settings, with a focus on the southwestern United States. Participants representing the Natural Resources Conservation Service, the Agricultural Research Service, the USDA Southwest and Southern Plains Climate Hubs, land-grant universities, and other key partners will discuss various aspects of dust monitoring (e.g., National Wind Erosion Research Network establishment) and mitigation (e.g., best practices for land management). The impacts of climate variability and change on existing and projected regional dust generation and air quality will provide the foundation for discussion of interdisciplinary and interconnected impacts, such as changes in water availability, soil quality, and management practice implications for long-term sustainability and resilience. Presentation of dust mitigation recommendations and an update on a new USDA-sponsored draft dust mitigation handbook, organized by production type, will be followed by audience participation and feedback focused on practicable solutions and discussion of future field research and demonstration projects. Relevant audience recommendations and feedback will be incorporated into the final version of the USDA dust monitoring and mitigation handbook.

Presentation 1: Addressing Climate Impacts to Agricultural Production: How Dust Monitoring and Mitigation Aligns with Climate Adaptation Efforts in the United States – *Emile Elias, Southwest Climate Hub*

Presentation 2: Climate and Weather Patterns Associated to Wind Erosion – *David DuBois, New Mexico State Climatologist*

Presentation 3: Potential for Mitigating Wind Erosion in the Sonoran Desert Using Organic Amendments and Microbes to Build Soil Aggregates – *Joseph Blankinship, University of Arizona*

Presentation 4: AERO: A Wind Erosion Modeling Framework with Applications to Monitoring Data – *Brandon L. Edwards, New Mexico State University*

(Continued) 10:30 AM – 12:00 AM, *Acoma/Zuni on Lower Level West Building*

Presentation 5: Characterization of Surface Dust Emission Potential Using a Portable In-Situ Wind Erosion Laboratory (PI-SWERL) for Numerical Modeling Applications – *Nancy E. Parker, US Army Engineer Research and Development Center*

Presentation 6: Rangeland Restoration and Dust Mitigation on the Colorado Plateau – *Stephen E. Fick, USGS Southwest Biological Science Center*

Presentation 7: Wind Erosion Mitigation: A Guide to Understanding USDA's Efforts in Addressing the Concerns with Wind Erosion – *Stephen G. Smarik, NRCS Liaison to Southwest and Southern Plains Climate Hub*

Presentation 8: Feedback Session on Presented Materials, and How These and Other Wind Erosion Concerns Are Considered in Proposed Handbook or Web Page – *David P. Brown, Southern Plains Climate Hub*

Wetlands Conservation in Agricultural Landscapes: Significant Findings and Recent Modeling Advances in CEAP Wetlands

8:30 AM – 10:00 AM, *Cochiti on Lower Level West Building*

Moderator: *David Mushet, US Geological Survey Northern Prairie Wildlife Research Center; Willam Effland, USDA-NRCS*

Presenters: *Sharon Kahara, California Cooperative Fish Research Unit; Owen McKenna, US Geological Survey; James Kiniry, USDA-ARS; Allison Thompson, Oklahoma State University; Greg McCarty, USDA-ARS; Scott McMurry, Oklahoma State University*

The Wetlands Component of the USDA's Conservation Effects Assessment Project (CEAP–Wetlands) is a multiagency effort developing tools and methods to quantify and interpret effects and effectiveness of USDA conservation practices and farm bill programs on services provided by wetland ecosystems in agricultural landscapes. To facilitate CEAP–Wetlands efforts, several regional assessments were conducted across the United States to address knowledge gaps with information needed to inform model development aimed at improving conservation implementation. Conservation decisions affect not just agricultural wetland ecosystems, but also the services that these important ecosystems provide for society. Presenters will highlight key findings from several CEAP–Wetlands regional assessments and discuss the significant contributions of each assessment to an ever-increasing understanding of wetland ecosystems and the provisioning of ecosystem services. CEAP–Wetlands' modeling efforts known as Integrated Landscape Modeling (ILM) provide for the simultaneous evaluation of multiple wetland ecosystem services and are an integral element of CEAP–Wetlands development. Results of CEAP–Wetlands' ILM simulations will be presented and conservation implications discussed. Representatives of land management agencies who implement or evaluate conservation programs or practices and others interested in conservation effects or the methods to quantify conservation program/practice effects on wetland ecosystems will benefit by attending this symposium.

Food and Environmental Security: Developing Joint Solutions

8:30 AM – 10:00 AM, *Taos on Lower Level West Building*

Moderator: *Chris Gross, USDA-NRCS*

The 19th Annual Joint Soil and Water Conservation Society–Soil Science Society of America (SWCS–SSSA) Symposium will be held at the 2018 SWCS Annual Conference in Albuquerque, New Mexico, and at the 2018 SSSA annual meeting in San Diego, California. Previous joint symposia have been very successful and contributed to the development of special issues, research editorials, features, books, and other significant technology transfer efforts. The title of the 19th joint SWCS–SSSA symposium is "Food and Environmental Security: Developing Joint Solutions." Nutrient management and water quality are of very high interest to members of the SWCS and SSSA. Reduction of off-site transport of nutrients from agricultural landscapes via surface and leaching pathways for nutrient loss while maintaining crop production is a great challenge. Row crop production requires regular additions of nitrogen and phosphorus, in addition to other nutrients, to achieve expected yield for maintaining food security. Those nutrients, if over-applied or subjected to heavy precipitation, may enter surface or groundwater and lead to unintended environmental impairment. Excess nutrients in water can lead to eutrophication and hypoxia. This joint symposium aims at bringing together farmers, scientists, conservation practitioners and agricultural industry representatives to discuss practical nutrient management for crop production while trying to meet environmental goals. This joint symposium will continue the tradition of cooperation between these professional societies to facilitate bringing scientists, conservation practitioners, and other national and international partners together.

Presentation 1: Nutrients: Food Security and/or Environmental Security? – *Jorge Delgado, USDA-ARS*

Presentation 2: The Fertilizer Industry Perspective on the Importance of Nutrient Management for Crop Production and Water Quality – *Lara Moody, The Fertilizer Institute*

Presentation 3: Farm Level Nutrient Management to Meet Production and Water Quality Goals – *Tim Radatz, Minnesota Agricultural Water Resource Center/Minnesota Discovery Farms*

Presentation 4: University Nutrient Management Guidelines: Crop Production vs Environmental Quality – *Fabian Fernandez, University of Minnesota*

ORAL PRESENTATIONS

SOIL AND WATER CONSERVATION SOCIETY

A Warning from Vanished Civilizations: The History and Continuing Impact of Walter Lowdermilk's "Conquest of the Land Through 7,000 Years."

Authors: Shelby Callaway*, USDA-NRCS

Abstract: In continuous publication since 1953, Walter C. Lowdermilk's "Conquest of the Land Through 7,000 Years" is the oldest document still regularly produced by the USDA's Natural Resources Conservation Service. Based on Lowdermilk's research and observations in the late 1930s, this short pamphlet argues that anthropogenic soil erosion led directly to the decline and fall of dozens of civilizations throughout the old world. Lowdermilk's work argued human-induced soil erosion was not only a national menace, but also an ancient devourer of entire civilizations. Because it frames the problem of excessive erosion in such brief and evocatively stark terms, this report has endured for over 60 years. This presentation provides a brief history of Lowdermik's travels while researching his most well-known publication and explores how his work was shaped by his experiences investigating soil erosion in a world on the brink of war. Moreover, it examines how subsequent scholars and conservation practitioners have continued to draw upon his work. In particular, focus is placed on the pamphlet's role in continuing efforts to define topsoil as a strategic national resource.

Track: 2018 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**Denotes primary author and subject area*

Adoption Model Analyzing Conservation Policy for Mitigation of Soil and Nutrient Loss in the Red River and Mississippi River Basin

Authors: Naveen Adusumilli*, LSU; Hua Wang, LSU AgCenter

Abstract: Major conservation policies have been pushed as a measure to promote soil health across river basins of the United States. One such policy is the adoption of cover crops as a means to mitigate soil and nutrient loss from agricultural lands and consequently water quality protection in streams and rivers. The nationwide program provided per acre incentives to farmers to adopt cover crops, if adopted for multiple years. While the adoption of such practices is not new among several farmers, the conservation agenda did play a major role in the broader interest among farmers to adopt such practices. While it is well known that adoption of practices is based on more than simple costs and returns, this paper analyzes those independent variables that explain adoption and facilitate to augment adoption among other groups. Findings indicate that that perception of conservation practices plays a significant role in the decision to adopt these practices. The analysis sheds light on the relationship between practices and adoption behavior, useful to tailor conservation policy to reflect individual locales.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

**Denotes primary author and subject area*

Advancing Wetland Restoration with Mapping and Incentives

Authors: Marli Rupe*, VT Dept. of Environmental Conservation

Abstract: In Vermont, as much as 35% of wetlands have been converted to hayland or annual crops, removing the opportunity for flood resiliency and nutrient storage. The Lake Champlain Basin, which is under a phosphorus TMDL, and had serious flooding in 2011, is especially sensitive to the need for both. The VT Dept. of Environmental Conservation (DEC), along with 26 partners, was awarded a $16M RCPP grant in 2015. As part of that grant, DEC has funded mapping of high priority areas for wetland restoration in the basin, and developed a wetlands "calculator" that determines a state-funded incentive payment, above NRCS rates, based on the value of the restoration. Two hundred priority restoration sites were identified, RCPP planners have worked directly with NRCS and with landowners, and in the past year, over $110,000 was provided as an additional incentive payment based on the calculator, resulting in 5 restoration projects that would not have occurred without this additional funding. The State has committed another $700,000 in match towards projects and through RCPP, has developed unique outreach partnerships with dairy coops and lenders, as well as conservation districts and non-profits, to help farmers identify areas appropriate for restoration and receive appropriate compensation based directly on the wetland value of the property. The mapping and wetland incentive calculator are a way to use mapping technology and wetland prioritization criteria to identify the best way to allocate limited resources for the greatest water quality and flood resilience benefits.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

Application of Multiple Approaches to Enhance Conservation at the Mahantango Creek and Choptank CEAP Sites

Authors: Curtis Dell*, USDA-ARS; Tamie Veith, USDA-ARS PSWMRU; Peter Kleinman, USDA-ARS; Erik Hagen, Penn State; Ray Bryant, USDA Agricultural Research Service; anthony Buda, USDA-ARS

Abstract: Substantial research has demonstrated the importance of spatial and temporal consideration in applying management practices for water quality. In particular, effectively placed and designed riparian buffers can provide a final method for reducing water, sediment, and nutrient losses from upslope fields. However, if upslope hydrologic characteristics are not fully captured in the buffer design, trapping effectiveness can vary substantially. Mahantango Creek and Choptank NRCS-CEAP sites continue to work on evaluating riparian. Using a combination of field/site assessments, GIS analysis, and Topo-SWAT simulation modeling, this multi-agency USDA project has revealed that up to 40% of surface runoff is potentially bypassing the riparian buffers. Their findings point to the need to pair riparian buffers with other practices (e.g., grassed waterways, drainage management, saturated buffers). Additionally, Mahantango Creek and Choptank CEAP sites are evaluating an array of real-time water quality sensors. Sensors include optical and laser technologies and ion chromatography. These real-time data are being compared with historical thrice-weekly sampling, and assessed in the context of land management and weather data during the sampling timeframes. Based upon these trials, recommendations will be made regarding sensor arrays that are best suited for agricultural watersheds. Making more frequent water quality sampling feasible, these sensors will in turn improve our understandings of upstream management impacts and help us to better evaluate and improve riparian buffer designs. This work all provides background information and insights that will be fed into comprehensive planning approaches, such as Agricultural Conservation Planning Framework. This framework is being evaluated on the Mahantango Creek CEAP, in collaboration with NRCS and Penn State University, to determine how it performs in northeastern US and to evaluate impacts of changes in conservation planning.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

Assessing Dynamic Soil Properties and Inventorying an Ecological Site on Coastal Plain Soils in Longleaf Pine (*Pinus palustris*) and Pasture Land Cover/Uses

Authors: Daniel Wallace*, USDA NRCS; Skye Wills, USDA-NRCS; Susan Andrews, USDA-NRCS (Retired); Dennis Chessman, USDA-NRCS; Philip Brown, USDA-NRCS; Dee Pederson, USDA-NRCS; Alvin Perez, USDA-NRCS; Michael Sampson, USDA-NRCS; Scott Moore, USDA-NRCS; Arlene Tugel, USDA-NRCS (Retired); Curtis Talbot, USDA-NRCS; Thomas Ward, USDA-NRCS (Retired)

Abstract: Soil health assessment tools that describe dynamic soil properties (DSPs) at time scales relevant to management are needed. DSPs can be housed in ecological site descriptions (ESDs). ESD strength is grouping soil types with similar vegetation, primary productivity, and management needs, so DSPs could be extended across soil maps and made available to land managers. In 2010 Georgia NRCS with national partners assessed DSPs on longleaf pine ecological sites. Comparison study methods were used to sample Tifton and Dothan map unit components in Georgia. Site selection ensured similar initial soil conditions. Contrasting managements were 1. Frequently burned longleaf savannas >80 years old and 2. Cow/calf beef cattle pastures >15 years old. Random sampling of this soils X management intersection (6 longleaf, 6 pasture) allowed for statistical inference. Soil properties were described by horizon with a central pedon sampled for complete characterization. Seven ancillary pits were sampled for dynamic properties to a depth of 50 cm. Quantitative and qualitative vegetative measures included: species composition; plant productivity; and pasture condition scoring or forestry measures. Measured DSPs included soil organic carbon, infiltration, aggregate stability, compaction, earthworms, and β–glucosidase activity. These were compared across and within management systems. Total carbon content of the surface horizons (depth weighted average) was 2.5% in longleaf savanna and 1.4% in pasture. Infiltration in longleaf savanna averaged 55.4 cm/hr and in pasture 6.5 cm/hr. These results demonstrate the power and importance of a comparison study. Measured alone, the 1.4% carbon content in pastures is considered healthy for these soils. However comparison to longleaf shows the possible carbon content is higher, and infiltration values show the benefit of higher carbon. Achieving an inventory of DSPs organized according to ESD could augment conservation planning.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Assessing Soil Erosion with Unmanned Aerial Vehicles for Precision Conservation

Authors: Joby Czarnecki*, Mississippi State University; Anna Linhoss, Mississippi State University; Lee Hathcock, Geosystems Research Institute - Mississippi State University; John Ramirez Avila, Mississippi State University; Timothy Schauwecker, Mississippi State University

Abstract: Despite the increased implementation of conservation practices on the landscape, erosion remains a threat to agricultural sustainability. We used an unmanned aerial vehicle (UAV) to gather aerial images of an eroded drainage channel. We collected UAV images with large overlap between successive images to perform Structure from Motion (SfM) analysis and monitoring of erosion. The goal of this research effort was to determine the limitations to the technology and the accuracy obtainable. We identified control points with quasi-permanent markers, referenced with GPS, and visible in UAV images. We evaluated the accuracy of the SfM surfaces with GPS survey and field measurement. This project demonstrated UAV images are capable of providing spatially-explicit, fine- to medium-temporal scale data. When the need for high accuracy is secondary to identification of eroded areas and periodic review of landscape change in response to practice placement, UAV-based SfM surfaces represent a low-cost, rapid turn-around solution. With a cloud-based, paid processing service, surfaces were generated within 24 hours. The service was simple to use and provided a sharable weblink to a 3D model. We also used a computationally-intensive proprietary software that took more than a week to produce a SfM surface. This is a consideration for users who need highly accurate, frequent collection. In the highly erodible areas, it proved challenging to maintain the markers, which presented challenges for measuring SfM surface accuracy. However, the biggest impediment to accuracy was dense vegetative cover. Precision agriculture was considered one of the two most promising markets for UAV, with the market for delivery of UAV-enabled data and derived products projected to be $82.1B. Precision conservation could also benefit from adoption of this technology. Identifying and quantifying erosion is the first step in a larger journey towards precision placement of conservation practices on the landscape.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Assessing the Impacts of Conservation Practices on Rangeland Health and Ecosystem Services in the Rio Puerco Watershed

Authors: Jeremy Schallner*, New Mexico State University; Amy Ganguli, New Mexico State University; Richard Strait, USDA-NRCS; Nicole Pietrasiak, New Mexico State University

Abstract: The Rio Puerco Watershed (RPW) is a highly dynamic and diverse ecological system that has a long history of anthropogenic alterations. This landscape has been degraded through historic overutilization exacerbated by periods of prolonged drought. At present, the NRCS and BLM use conservation practices, namely prescribed grazing and brush control, throughout the region to improve ecosystem health. Herbicide application serves primarily to decrease brush species while allowing for an increase in herbaceous cover and a decrease in erosion risk. The objectives of this project are to develop a monitoring program to investigate the effects of these conservation practices on the plant and soil biological communities and the hydrology of the RPW. Changes to plant and soil biological communities are being monitored utilizing multiple transects across two herbicide-treated areas and two untreated reference areas. Rangeland health and site potential assessments were made at each transect location to provide an understanding of the variability across the landscape. To examine the impacts to hydrology and soil health, soil sampling points along with six runoff plots and local weather stations were established in the research areas to provide key parameters controlling site potential and erosion risk. The runoff plots employ Upwelling Bernoulli Tubes to measure surface flow. All field measurements will be used to calibrate a Gridded Surface/Subsurface Hydrologic Analysis for the RPW to illustrate the potential impacts at a larger scale. We will demonstrate how integrating and expanding the plot-level measurements to the watershed-scale provides a better understanding of how this system reacts to the conservation practice and can serve as a basis for effective range management decisions. If conservation practices on rangelands within the RPW can decrease potential runoff and sediment load, the improvements would provide valuable resources and ecosystem services across the region.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

Using the Discovery Farms Project to Study the Effectiveness of Vegetated Riparian Buffers on Agricultural Land

Authors: Kedija Awole*, King Conservation District

Abstract: In Washington state, all the major species of salmon are listed under the Endangered Species Act. Salmon are not only one of the major pillars of the region's economy but also an integral part of the culture, identity, religion, and livelihood of the local people for thousands of years. The main cause of salmon decline is habitat loss, largely due to development and farming. Agriculture is also one of the major pillars of the state's economy and a source of sustenance and livelihood for farmers. One of the primary efforts to reverse salmon extinction is planting Vegetative Buffers(VB) in riparian areas, many of which are located on currently farmed lands. Riparian VB planting has thus caused tension between advocates of salmon habitat restoration and advocates of farmland preservation. Farmers are reluctant to take land out of production to plant VB mainly because of economic consequences and perceived lack of benefit. There is a shared concern among farmers and conservation professionals that there is not enough scientific evidence to back the current buffer width regulations and recommendations. King Conservation District (KCD) has recognized this knowledge gap on what buffer widths are needed to provide sound salmon habitat in circumstances where a wider buffer cannot be accommodated. KCD is employing an innovative research model developed by the University of Wisconsin called Discovery Farms. Discovery Farms (DF) research is conducted on farms in collaboration with farmers. KCD will utilize the DF model to monitor the effectiveness of existing buffer practices and to identify the minimum effective buffer widths required to protect salmon habitat without compromising significant agricultural productivity. This farmer-led buffer effectiveness research will provide scientific evidence for policymakers, empower conservation professionals with better knowledge, and enhance farmers' knowledge and interest around riparian buffers on agricultural land.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Building Farmer Efficacy to Promote Conservation Adoption

Authors: Robyn Wilson*, Ohio State; Maggie Beetstra, Ohio State; Olivia Carros, Ohio State

Abstract: Prior research in the western Lake Erie basin indicates that conservation practice adoption may hinge on farmers' beliefs that the recommended practices are effective, and easy to implement. These efficacy-related beliefs are a predictor of adoption across several critical conservation practices related to water quality, including cover crops, subsurface placement of fertilizer, and timing of fertilizer application. Specifically, we find that an individual farmer is up to 10 to 15 times more likely to already have one of these practices in place when their levels of efficacy increase from low to high. Although these findings suggest that building efficacy may be key to increasing future adoption, the results are purely cross-sectional and correlational. We must now work to understanding how to increase these efficacy-related beliefs among the farming population, and assess the extent to which increased adoption actually results from a change in efficacy. To this end, we report the results of several studies aimed at answering these questions. The first is a set of experiments assessing the efficacy-increasing impact of standard forms of communication and outreach. Specifically, we assessed changes in efficacy among individuals 1) attending a field day as part of a demonstration farm network, and 2) viewing a two-minute 4R educational video created by The Nature Conservancy. The results of these two analyses provide evidence of the efficacy-increasing impact of current outreach. The second is a panel survey of farmers assessing their changes in efficacy and practice adoption over time. The results of this study provide evidence among a representative group of farmers if adoption is increasing, and to what extent this change in adoption over time is a function of increased efficacy. The results from each study will be discussed, and recommendations for improving efficacy-building interventions in the future will be discussed.

Track: 2018 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**Denotes primary author and subject area*

CEAP: Effects of Conservation Practices on Soil and Water Resources in the Upper Washita Basin

Authors: Daniel Moriasi*, USDA ARS; Patrick Starks, USDA ARS; Jean Steiner, USDA ARS; John Zhang, USDA ARS; Jurgen Garbrecht, USDA-ARS; Steven Glasgow, USDA NRCS

Abstract: The Conservation Effects Assessment Project (CEAP) was created in 2003 by the USDA Natural Resources Conservation Service in partnership with USDA Agricultural Research Service and many other partners to quantify the environmental effects of conservation practices (CPs) and programs and to develop the science base for managing the agricultural landscape for environmental quality. The Fort Cobb Reservoir Experimental (FCREW) and Little Washita River Experimental watersheds, located within the Upper Washita Basin (UWB) in Oklahoma, are part of the ARS Benchmark CEAP-Watershed Assessment Studies locations. The ultimate goal of this work is to present CPs that have worked and the scale at which they have worked, based on the findings of the research studies that have been carried out in these CEAP and other watersheds within the UWB in the last 15 years. The main factors that affect water resources and soil erosion in the UWB are climate, land use, and red cedar encroachment. The common conservation practices that have been implemented over the years to protect soil and water resources are no-till, riparian buffers, and red cedar removal. A modeling study showed that brush encroachment of a modest 20% into a grassland watershed within the UWB would decrease stream discharge by about 27% of Oklahoma City's current water demand. Another study conducted in the Cobb Creek sub-watershed within the FCREW showed that application of filter strip and riparian buffers reduced sediment delivery to the stream by 72% and 68%, respectively. Details of other implemented CPs on soil and water resources will also be presented.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Changing Water Balances in an Irrigated Watershed Transitioning from Furrow to Sprinkler Irrigation

Authors: David Bjorneberg*, USDA ARS; Anita Koehn, USDA ARS

Abstract: The Upper Snake Rock watershed in southern Idaho has been part of the Conservation Effects Assessment Project (CEAP) since 2005. The 82,000 ha watershed is irrigated with surface water diverted from the Snake River through two main canals and numerous smaller laterals. Since the 1990's, the main conservation practice implemented in this watershed has been conversion from furrow irrigation to sprinkler irrigation; changing from 10% sprinkler irrigation to more than 60% of the watershed. This study will determine if changing irrigation type has affected the amount and timing of the water returning to the Snake River. While sprinkler irrigation allows more precise management of irrigation water, sprinkler irrigation may not improve the overall efficiency in the watershed because of the surface water delivery system.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

Characterization and Evaluation of Riparian Buffers on Sediment Load in Goodwin Creek Watershed

Authors: Henrique Momm*, Middle Tennessee State University; Lindsey Yasarer, United States Department of Agriculture - Agricultural Research Service; Ron Bingner, United States Department of Agriculture - Agricultural Research Service; Robert Wells, USDA-ARS; Roger Kuhnle, USDA-ARS

Abstract: Riparian vegetation in agricultural watersheds, natural or constructed, can impact overland flow by reducing runoff velocity, promoting upstream water ponding, and increasing surface roughness due to above ground vegetation; all of which promote sediment deposition and nutrient filtering. The AnnAGNPS watershed pollution model contains components for estimating sediment load reduction by riparian vegetation at field to watershed scales. The AnnAGNPS riparian buffer component uses spatially distributed information describing riparian vegetation physical characteristics, including width distance between upland and reaches, local slope, vegetation type, and concentrated flow paths through the riparian zone. All of these characteristics are estimated using custom GIS tools with advanced topographic analysis techniques at scales smaller than traditional watershed modeling units of sub-catchments and reaches. Additionally, when runoff concentrates as channels flowing through the riparian zone a “short-circuit” may form and can be modeled as bypassing the capability of riparian vegetation to effectively filter sediment in the flow based on user-defined threshold values. In this study, the AnnAGNPS riparian buffer component was used evaluate the effect of natural riparian vegetation to the total sediment load within the USDA-ARS Conservation Effects Assessment Project (CEAP) Goodwin Creek experimental watershed located in Mississippi, U.S.A. In addition to existing conditions, multiple alternatives considering various levels of conservation management with and without the contribution of riparian vegetation, varying riparian vegetation spatial extent, and short circuits were considered. This framework serves as an effective spatially distributed approach to assessing the impact of riparian buffers on watershed sediment loads and downstream water quality and can be used to support the development and evaluation of conservation management plans impacting the watershed.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

Circular Buffer Strips (CBS): An Innovative Way to Add Ecosystem Services to Irrigated Agriculture

Authors: Sangamesh Angadi*, New Mexco State University; Prasanna Gowda, USDA-ARS; Omololu Idowu, New Mexico State University; Sultan Begna, NMSU; Paramveer Singh, New Mexico State University; Gary Marek, USDA-ARS; Umesh Mathada Rangappa, University of Agril. Sci. Raichur

Abstract: Ogallala aquifer water has converted the southern Great Plains from a dust bowl to a major food producing and exporting region of the US. Water levels in the Ogallala aquifer are declining. Reducing well outputs and pumping quota restrictions from irrigation districts are leading to partial pivots, where a high value crop is grown with full irrigation in major part of the pivot and the remaining area is used for rainfed/minimally irrigated crops. This leads to a water cycle that is less efficient as it cannot conserve high intensity rainfalls and each pivots acts like a hotspot for evaporation. This will increase abiotic stresses (edge effect that kills many crop rows), continue degrading natural resources, decrease productivity and reduce resiliency of agriculture. It will also increase energy dependence of the system as more energy is needed to pump water from greater depth, and more fuel is needed to increase mechanical tillage to conserve soil and water and for increasing input needs. If not addressed, nearly 35% of the irrigated area is expected to be dryland in a few decades. Therefore, a research project has been initiated at Agricultural Science Center at Clovis to use the underutilized part of the partial pivot and rearrange it in the form of multiple circles of native perennial grass buffer strips. The system conserves heavy intensity rainfall, reduce wind and water erosion, improves crop microclimate, reduces evaporative loss of soil moisture, improves system biodiversity, increases net primary productivity of the system and improves resiliency of the irrigated cropping system under uncertain future climate. Although CBS covers part of the pivot, it acts as a perennial cover crop protecting the entire pivot. Results of first year results will be presented.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Common Ground Common Water: Film as a Tool for Shared Understanding of Water Resource Protection

Authors: Sarah Church*, Purdue University

Abstract: Urban residents are generally aware of the impact of stormwater runoff on water quality. Farmers understand that agricultural practices impact water quality. However, research suggests that each group tends to place some amount of blame for water degradation on other users and sectors. There is an apparent disconnect between efforts of cities and efforts of the agricultural community that may contribute to a lack of understanding of each sector's influence on water quality and watershed health. This disconnect may also contribute to a lack of motivation for individual action toward water quality improvement. Such a "blame game" is counter to sustainable food production, and watershed health and restoration efforts. In this talk, I will present and discuss a short film that highlights urban and agricultural best management practices in Northwest Indiana. The film was evaluated through individual interviews and focus groups with municipal water planners, conservation planners, urban residents, and farmers. Preliminary results suggest that participants recognize a need for improved understanding of water quality issues and solutions across sectors. Participants perceive film as a low-cost and efficient way to disseminate the region's water story. Participants were more willing to share the film through social media outlets than during meetings, events, or field days; however, in-person presentations offered a valuable opportunity for social learning. Overall, this research suggests that film is an effective storytelling device and that the film development process broadened participants' conceptualizations of watershed health and willingness to engage with other sectors in water quality awareness efforts.

Track: 2018 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**Denotes primary author and subject area*

Compaction Susceptibility of Select Alabama Kanhapludults

Authors: Abigail Lane*, Auburn University; J.N. Shaw, Auburn University; E.A. Carter, USDA-Forest Service; Tom Gallagher, Auburn University; Thorsten Knappenberger, Auburn University

Abstract: The U.N. categorizes soil compaction as the most important type of physical soil degradation because of the loss of soil productivity and quality, and difficulty of remediation. Subsoil compaction causes great concern because it is rarely economically feasible to remediate. Soils vary in their susceptibility to compaction based on physical, chemical, and morphological properties, and moisture content when dynamic forces are applied. Soil mechanic approaches have developed indices and parameters that describe a soil's behavior upon compaction for largely engineering applications, but little work has related these to soil morphological and pedological measures. Soil surveys and on-site pedological investigations describe soil morphological properties (e.g. horizonation, structure, consistence) that relate soil compaction susceptibility, and we propose a two-fold approach to more fully understand these relationships. In the first study, we are using sensors to measure the pressure transferred through soil with depth throughout trafficking events for select Piedmont soils. Our objective is to relate soil morphological and physical properties (e.g. soil texture, water stable aggregates, atterberg limits) to compactive forces. In the second study, we are developing compression indices and relating these to soil morphological and physical properties for both Piedmont and Coastal Plain soils. The overall goal of these studies is to develop models of soil compaction susceptibility for these Alabama soils. It is anticipated that such an approach could facilitate use of soil surveys for determining areas susceptible to soil degradation.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Comparison of Some Reference Evapotranspiration Equations Under Semiarid Conditions with Limited Climatic Data

Authors: Koffi Djaman, NMSU-ASC Farmington; Michael O'Neill, NMSU-ASC Farmington; Lamine Diop, Université Gaston Berger; Ansoumana Bodian, Université Gaston Berger; Samuel Allen*, New Mexico State University; Komlan Koudahe, ADA Consulting Africa;

Abstract: Reference evapotranspiration (ETo) is an important parameter in hydrological, agricultural and environmental studies. Accurate estimation of ETo helps to improve water management and increase water use productivity and efficiency. While the Penman-Monteith ETo equation enjoys worldwide adoption as one of the most accurate ETo equations, the number of requested climatic variables makes its application very questionable under limited data conditions. The objective of this study was to evaluate the Penman-Monteith ETo equation under limited climatic data and 34 simple ETo equations that request few climatic variables. Five weather stations were considered under the semiarid and dry climate across New Mexico (USA) for the period of 2009-2017. The Penman-Monteith ETo equation showed good performance under missing solar radiation, relative humidity and wind speed and could still be adapted under limited data conditions across New Mexico. However, it tended to underestimate daily ETo when more than one climatic variable data is missing. Among the simple ETo equations, four of the Valiantzas equations, along with the Makkink, Calibrated Hargreaves, Abtew, Jensen-Haise, and Caprio equations, were the best performing ones compared to the Penman-Monteith equation and could be the best alternative ETo estimation methods. These alternative equations could be used by irrigation managers, producers, engineers and university researchers to improve water management across the dry semiarid and arid zone across New Mexico, and could be considered for use in other semiarid areas where both water resources and historical climatic data are limited.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

Connecting Human and Hydrologic Systems to Understand Sustainability of Traditional Irrigation Communities in New Mexico

Authors: Alexander Fernald*, NMSU

Abstract: Traditional irrigation systems in New Mexico called acequias include irrigation ditches and community groups to manage the water in the ditches. This presentation gives an overview of studies that have taken place over the last decade to better understand acequia hydrology and human connectivity. We installed instrumentation to measure water budgets in 3 irrigated valleys in northern New Mexico. We conducted surveys and focus groups to characterize social, economic, and cultural aspects of the communities. Finally, we put together system dynamics models of the coupled human and natural systems to better understand key drivers and possible tipping points of sustainability. We found that human management importantly controlled river hydrology by diverting water from rivers and distributing it to ditches and fields; percolation and groundwater recharge generated return flow to the rivers. Storing water in the floodplain and slowly returning it to the river delayed runoff hydrographs and offered a buffer to earlier runoff caused by warming temperatures. In terms of community longevity, economics alone did not explain why families continued agricultural production, and in fact tradition tied people to the local community and jobs from outside supported continued agriculture. Sense of place was identified as a key feature of community sustainability. Modeling social and hydrological features concurrently revealed community resilience due to community belonging that was potentially countered with vulnerability in the long run by reduced water availability and related reductions in farming, grazing, community cohesion, and moral economy. An important take home message was that water budgets alone did not explain the complexity and importance of water to the acequia communities.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

Conservation Generation: How Young Farmers are Leading in Conservation and Resilience

Authors: Kate Greenberg*, National Young Farmers Coalition; Tiana Baca, New Mexico farmer

Abstract: The Western United States is in the midst of a growing water crisis. Extended drought and a booming population are increasing demand for food and fresh water. In the Colorado River Basin, a seven-state region that produces roughly 85% of U.S. winter produce, demand for water is expected to significantly outpace supply by 2060. Yet another supply-demand gap looms that is equally urgent: the shrinking number of family farmers. Currently, farmers over 65 outnumber those under 35 by a ratio of six to one. If we fail to recruit enough new farmers, we risk furthering the consolidation of our food system, increasing permanent losses of agricultural lands, and losing a generation of water stewards and conservationists. Young farmers in the West are conservation-minded. They are learning to farm under increasingly dry and variable conditions, and are willing to innovate. In this presentation, Kate Greenberg, the Western Program Director of the National Young Farmers Coalition (NYFC), will highlight a number of young farmers and ranchers and the innovative and adaptive water conservation strategies they use on their farms. She will also describe the role NYFC has played to unite young farmers, ranchers and consumers in building a sustainable future for American agriculture.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation in Organic, Specialty, and Small-Scale Agriculture

**Denotes primary author and subject area*

Conservation on Rented Farmland: Developing Effective Outreach for Non-Operating Landowners

Authors: Peggy Petrzelka*, Utah State University; Jennifer Filipiak, American Farmland Trust; Alice Sorensen, American Farmland Trust

Abstract: Those working in the area of agricultural land use know land ownership changes are occurring, and the expanding group of non-operating landowners (NOLs) who lease their land to an operator are a critical group that need more attention. Yet a dedicated research focus on the environmental implications of this type of landowner has only been minimally discussed in the research. In 2017, American Farmland Trust launched a survey of NOLs in 5 USDA Production Regions (10 states total) which have high proportions of rented farmland. Intended to compliment but not replicate the 2014 USDA Tenure, Ownership and Transition of Agricultural Land (TOTAL) data, the foci of the survey included; (1) interest in conservation implementation on the land they lease to an operator, (2) barriers to implementation of soil and water conservation on the land they lease out, (3) interest in varying types of conservation outreach, and (4) aspects of the landlord-operator relationship. In this presentation, we provide descriptive survey results from the first three states surveyed—Iowa, Illinois and Indiana—with a focus on how to use the survey results to begin creating conservation outreach programs to non-operator landowners in the US.

Track: 2018 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**Denotes primary author and subject area*

Conservation Tillage Effects in the Atlantic Coastal Plain: An APEX Examination

Authors: David Bosch*, USDA; Xiuying Wang, Texas A&M University; Jaehak Jeong, Texas A&M University; Luca Doro, Texas A&M University; Jimmy Williams, Texas A&M University; Oliva Pisani, USDA; Dinku Endale, USDA; Tim Strickland, USDA

Abstract: In 2003, the USDA Natural Resources Conservation Service (NRCS) in partnership with several other USDA agencies initiated the Conservation Effects Assessment Project (CEAP). The CEAP goal was to improve the effectiveness of conservation practices and programs by quantifying conservation effects and providing the science and education needed to enrich conservation planning, implementation, management decisions, and policy. This study supports the CEAP effort by utilizing well documented field data in conjunction with the Agricultural Policy/Environmental eXtender (APEX) model. The field study was initiated in 1999 to compare the hydrologic and environmental effects of conservation-tillage to conventional tillage in the Atlantic Coastal Plain region of south central Georgia. Conservation-tillage is an important agronomic practice which has been shown to reduce surface runoff and associated surface transport of sediment and agrichemicals. APEX was developed for use in whole farm/small watershed management. Since the inception of CEAP, APEX has been a key tool used to quantify the impacts of conservation practices. In this study, fourteen years of field data collected at the Georgia site will be used to further evaluate the APEX model and to quantify the long term benefits of implementing conservation-tillage in the Atlantic Coastal Plain region. Project objectives were to 1) develop a calibrated and validated representation of conventional and conservation tillage systems in the Gulf Atlantic Coastal Plain and 2) develop a long term comparison of hydrologic, soil health, and water quality characteristics for conventional and conservation tillage systems. Differences in crop yield, hydrology, sediment transport, nutrient transport, and soil carbon were evaluated. These assessments will support the goal of CEAP by quantifying the impacts of conservation-tillage practices in this region.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Conservation Up and Down: Watersheds, Natural Hazards, Cities and Green Infrastructure

Authors: John Wiener*, U of Colorado

Abstract: Relevance and Need: Changing conditions demand coherent policy, particularly in the West, for management of watersheds, urban interests, and green infrastructure to support soil and water management on range and farmlands. This presentation is a synthesis of research and policy, extending arguments which are available on www.colorado.edu/isb/eb/wiener/ with addition of new hazard mitigation materials that link to water storage. Water scarcity is increasing simultaneously with management difficulty from high intensity precipitation and changing seasonality of flows with lack of additional storage. The wildfire-flood situation is worsening in headwaters, while soil degradation and water quality are worsening in many agricultural areas. Finance for forestry is limited, particularly on public lands, and downstream small and medium scale farms are rapidly being lost to recreational/retirement use, peri-urban land conversion, and large and very large farming operations. The good news is that what is left of small and medium farms and ranches can become substantially more sustainable if transitions can be made to enable survival, stewardship and succession – and what is most needed is available from the cities. Fire and flood sources above cities are finally eliciting some increased urban defense of water supply, and the cost-effectiveness of green infrastructure (e.g. multi-use floodways) is increasingly demonstrated. The last step is multi-purposing of below-city areas for use of excess and unseasonable floodwater for soil and aquifer restoration. Urban bonding matches costs to benefits over time and is the least-cost capital generally available, but coherent basin policy is needed.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

**Denotes primary author and subject area*

Determining Successional Response of Sonoran Desert Rangeland Communities to Increased Fire Disturbance.

Authors: Kristen Meier*, Forest Service; Mark Casillas, US Forest Service; Wayne Robbie, USDA Forest Service

Abstract: The Sonoran Desert is not historically considered a fire adapted ecosystem, characterized as a shrubland with relatively infrequent fire return intervals; however, studies have shown that fire frequency in the Sonoran desert has sharply increased from the 1950s to present day. Increased burn severity and recurring fire can cause a shift from a native shrub dominated system lacking a large grass component to systems with a large non-native grass and forb component. This creates challenges for land managers in the Sonoran desert since the pathways for succession are poorly understood and not well documented for desert systems now dealing with wildfires that are larger, more severe, and more frequent. Terrestrial Ecological Unit Inventory data was used to evaluate recovery and the pattern of succession in desert communities. Complete vegetative composition was collected on tenth acre plots in areas within historic burn perimeters and compared with unburned vegetative communities in plots located in the same ecologic units with no recorded fire activity. Ecologic types are mapped based on a distinct combinations of soil, climate, topography, and vegetation and each unit has an established ecologic site description as a baseline for potential natural vegetation. Indicator Species Analysis using PC-ORD software was used establish compositional differences. Non-metric multidimensional scaling (NMS with Sorenson distance) with PC-ORD showed graphical differences between the burned and unburned sites based on TSF (time since fire) that vegetative community composition. The data suggests that with high severity fire there is less structural and compositional diversity due to an increase in annual or exotic herbaceous species. This data was utilized to validate a state and transition model (STM) that was developed which identifies states, departures, and ecological pathways of succession within this upper Sonoran ecosystem.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

Developing a Construction Stormwater BMP Plan Using a Systems Approach

Authors: Earl Norton*, Alabama Soil and Water Conservation Committee

Abstract: Soil management and protection of water quality are of high importance on construction sites. Commonly referred to as erosion and sediment control, there are important aspects of site development that are critical to effective erosion and sediment control. Effective erosion and sediment control, using what are commonly referred to as best management practices (BMPs), is accomplished when construction at a site has an appropriate combination of practices installed and maintained in the right sequence and at the right time. Although there is no single BMP plan that fits all sites, there are sound principles that should guide development of each plan. In addition to specifying the BMPs, the plan must identify the sequence and timeliness of installing and maintaining the BMPs. When properly installed, the site plan should accomplish the desired erosion control, sediment control, and turbidity level needed at a specific site. This presentation will present principles for plan development that have been proven over the years to accomplish needed erosion and sediment control and turbidity targets. This presentation has positive implications for natural resources specialists that are planning for stormwater protection on construction sites of all kinds, including agricultural sites. The goal of this presentation is to provide technology that benefits the citizens and environment impacted by construction stormwater.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

Effects of Precision Agriculture, Soil Conservation, Nitrogen Rate and Temporal Trends at Farm and Watershed Scale

Authors: Mohammad Khakbazan*, Agriculture and Agri-Food Canada; Alan Moulin, Agriculture and Agri-Food Canada ; John Huang, Agriculture and Agri-Food Canada ; Patsy Michiels, Agriculture and Agri-Food Canada

Abstract: Precision agriculture and soil conservation have the potential to increase crop productivity while reducing environmental impacts. Landform, spatial and temporal variability may affect crop N response and should be considered for precision agriculture. The objective of this study is to evaluate the viability of precision agriculture in improving N use efficiency and profitability at the farm and watershed level in western Canada. Two studies are described at different scales, 1) within and between producer fields, 2) and the watershed scale. In the field scale study, research was conducted with producer's equipment in western Canada during 2014, 2015, and 2016. Seven fields were seeded to canola in 2014. Randomized fertilizer treatments (0, 50, 100, and 150% of soil test recommendations for N) with 4 replicates were located in low, average and high producing zones based on analysis of 3 to 5 years of yield maps. Preliminary results for 2014 show that variable management of N fertilizer had positive effects in some fields, but the effects were not consistent. In the watershed scale study, producer survey data from the South Tobacco Creek (STC) watershed in Manitoba were assessed using GIS and econometric method. A productivity index based on 11-year (2006-2016) moving average yield data for canola and wheat and climate and soil variables was used to delineate five management zones at the watershed scale. Preliminary results for the watershed scale study indicate that both spatial (zone) and temporal (time) variability had effects on crop productivity, but temporal variability had the greater effect. Extreme temporal trends in the past 11 years have caused, on average, $60 ha-1 yr-1 net loss for a wheat-canola cropping system. The results of this study identified the potential for spatial management of N fertilizer, but also found that producers would benefit greatly if they could adopt practices that reduce the negative impacts of extreme temporal variability.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

**Denotes primary author and subject area*

Effects of Setback Distance on the Removal of Manure Constituents in Runoff

Authors: John Gilley*, USDA - ARS

Abstract: Vegetative filter strips located at the bottom of a hillslope have been shown to substantially reduce nutrients and sediment in runoff. Cropland areas could serve a similar function. However, there is little scientifically-derived information available to help identify the setback distances required to effectively reduce the transport of contaminants in runoff. The objective of this study was to determine the effects of setback distance and runoff rate on concentrations and mass transport rates of selected constituents following land application of beef cattle and swine manure to a no-till cropland area. The plots examined during this investigation were 3.7 m across the slope by 4.9, 7.9, 11.0, 17.1 or 23.2 m long. An initial set of rainfall simulation tests were completed to determine background concentrations and mass transport rates of selected constituents. Manure was then applied to the upper 4.9 m of each plot and additional rainfall simulation tests were conducted. A first-order exponential decay function was used to estimate of the effects of setback distance on concentration and mass transport rates in runoff. A setback distance of 12.2 m effectively reduced the concentrations and mass transport rates of selected constituents to background values similar to those measured on the no-manure treatment. Runoff rate was an important variable influencing each the measured constituents with mass transport rates increasing as runoff rate increased.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Enhancing Soil Sustainability and Soil Health in an Integrated Crop-Grazing System

Authors: Larry Cihacek*, North Dakota State University; Songul Senturklu, Canakkale Onsekiz Mart University; Douglas Landblom, North Dakota State University

Abstract: Agriculture in western North Dakota consists of a combination of livestock ranching or small grain crop production. A long-term integrated crop-grazing system study has been ongoing for more than five years. Objectives of this study are to diversify cropping systems dominated by small grains with other crops as well as reduce costs in finishing beef animals by grazing high quality crops rather than all grain. Continuous spring wheat (*Triticum aestivium* L.) is being compared to a 5 season rotation consisting of spring wheat (rotation), winter triticale-hairy vetch (*Triticale hexaploid* Lart.-*Vica villosa* Roth), field pea-barley intercrop (*Pisum sativum* L.-*Hordeum vulgare* L.), mixed species cover crop, corn (*Zea mays* L.) and sunflower (*Helianthus annus* L.) under no-till management. An evaluation of mineral N cycling in spring wheat indicates greater N cycling in the rotation wheat than the continuous wheat. N fertilization rates based on standard soil sampling decreased under both wheat systems but decreased more rapidly for the rotation wheat. An evaluation of water infiltration, wind erodible aggregate fraction (0.84 mm) and water stable aggregates during the very dry 2017 growing season indicated slightly higher water infiltration, greater wind erodible fraction and water stable aggregates in the rotation wheat than in the continuous wheat. We have also observed that an increase of 1% organic matter (OM) can result in nearly 15 ppm N being mineralized across the range of OM levels in this study.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

Evaluating Compaction BMP Effects on Soil Properties and Demonstration of Soil Moisture Monitoring for Compaction Prevention in Heavy Clay Soils of the Northeast

Authors: Joshua Faulkner*, University of Vermont

Abstract: Soil compaction can be a significant yield-limitation and conservation concern due to poor drainage, increased runoff, reduced soil aeration, and decreased root penetration. The compaction problem is common, especially in cool, humid regions with heavy soils, such as the Northeast. To remediate deep compaction, producers often employ deep tillage, or subsoiling, in an effort to loosen soil to reduce bulk density and allow for deeper root penetration and improved percolation of soil water. Management practices that involve less soil disturbance, such as cover cropping, have also been proposed and are being used as approaches to remediate and prevent compaction by improving overall soil health and 'bio-drilling'. This project evaluated mechanical (i.e., deep tillage) and biological (i.e., cover crop mixes) approaches to compaction remediation in pasture/hay and corn silage systems in Vermont over three years. Penetration resistance, soil health, and bulk density were measured. Results highlight the challenges establishing new species in existing forage stands, and question the economic value of deep tillage in sod. Results from corn silage plots show promise, but point to the need for further research. In addition, demonstrating user-friendly and inexpensive on-farm soil moisture monitoring, and its meaningfulness to compaction prevention, is needed by farmers working to improve soil health. This project also established a soil moisture monitoring network in a rotational grazing system that could be remotely monitored by the farmer in real-time to guide herd management for compaction prevention over a two-year period. Observations and experiences will be reported.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Evaluating the Effect of Pasture Type and Grazing Intensity on the Hydrology of Southern Great Plains

Authors: Rewati Niraula*, Tarleton State Univeristy; Ali Saleh, Tarleton State University; Narayanan Kannan, Tarleton State Univeristy; Rajen Bajgain, University of Oklahoma; Prasanna Gowda, USDA-ARS; James Neel, USDA_ARS

Abstract: Grassland ecosystems occupy approximately 40% of the world's land surface and it is one of the largest land cover types in the United States. New forage species are sometimes introduced in native grasslands with the aim of enhancing pasture productivity to feed millions of cattle in the Great Plains of the United States. Water is one of the fundamental resources that drive the growth of grasses. Thus, it is important to understand how the conversion of native grassland to introduced pasture and the intensity of grazing affect the water balance and biomass to ensure both the forage production and water demand are in balance. We used Nutrient Tracking Tool (NTT) which is based on APEX (Agricultural Policy Environmental eXtender) model to assess the effect of native pasture (Little bluestem) and introduced pasture (Old world bluestem) on the hydrology of the Southern Great Plains. We then estimated the effect of grazing intensity on the water fluxes for both the pastures. NTT simulated monthly evapotranspiration (ET) and biomass were validated with the measured data at two USDA-ARS experimental plots near El Reno, Oklahoma for the year 2015 and 2016. Results showed that the long-term average annual hydrologic flux from the introduced pasture were not significantly different with that from the native pasture under the current management conditions. However, with similar management operations (e.g. fertilization rate, grazing intensity), introduced pasture contributes to higher ET and lower runoff compared to native pasture. Results from this study also indicated that increase in intensity of grazing decreases ET and increases runoff for both the pastures.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

Evaluation of Conservation Practices within the Choptank River Watershed in Maryland Using AnnAGNPS

Authors: Ron Bingner*, United States Department of Agriculture - Agricultural Research Service; Ali Sadeghi, USDA-ARS, Hydrology & Remote Sensing Laboratory; Henrique Momm, Middle Tennessee State University; Robert Wells, USDA-ARS; Gregory McCarty, USDA-ARS-HRSL; Dean Hively, Limno Tech; Lindsey Yasarer, United States Department of Agriculture - Agricultural Research Service

Abstract: The development of watershed conservation management plans involves many decisions that affect various aspects of a watershed system, with consequences that are difficult to measure. In addition, the efficient placement of practices throughout a watershed as part of an integrated management plan can be difficult without the use of watershed modeling technology. The objective of this study is to evaluate water quality effects from cover crops and riparian buffers on water, sediment and nutrient loads as part of a comprehensive watershed conservation management plan in the German Branch of the Choptank River Basin in Maryland that is part of the USDA-ARS Benchmark CEAP-Watershed Assessment Study project. The Annualized Agricultural Non-point Source (AnnAGNPS) model was calibrated and validated for flow and N loading using water quality monitoring data from 1991 to 1995 and 2005-2008. Multiple AnnAGNPS simulations were performed to assess the integrated effects of different conservation practices tailored to sediment erosion and nutrient pollutant control. The results show that significant loads are produced from ephemeral gullies as well as overland flow; however, these loads can be significantly reduced using riparian buffers combined with conservation tillage and grassed waterways. The integration of field-scale riparian buffer and ephemeral-gully pollutant loading models with watershed-scale modeling tools provides an approach for decision-making to target conservation management practice placement and to evaluate their integrated effectiveness in reducing pollutant loads.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Evaluation of Forest Silvicultural Treatment Effects on Runoff and Sediment Yield in a Northern New Mexico Forest

Authors: Furkan Atalar*, New Mexico State University; Onur Beyazoglu , General Directorate of Combating Desertification and Erosion; alexander fernald, nmsu; Owen Burney, New Mexico State University; Dawn VanLeeuwen, New Mexico State University; Doug Cram, New Mexico State University

Abstract: Forest thinning practices is one of the fundamental practices for natural resource management. These operations are used to reduce density of forest and provide resiliency to the fire landscape in the southwestern US. While reducing fire risks, these practices increase surface runoff, water availability, and sediment yield during the rainfall events. This study was conducted to evaluate the effects of thinning treatments on runoff and sediment yield in a mixed conifer forest located in northern New Mexico. The four thinning prescriptions (completed in 2005) included replications of a control (non-thinned), innerspace (between slash piles), lop-scatter (slash was scattered and burned), and pile (slash was piled and burned). Each prescriptions were set up with two types of blocks that have gentle slope (% 5) and steep slope (% 20). Rainfall simulations (~16 cm/hr) as both dry and wet run were used to measure runoff and sediment yield in 2015 and 2017. Response variables were time to runoff initiation (TRI), time to peak runoff (TPK), and sediment yield (SY) for this study. Results from this study, although preliminary, TRI shows significant differences for site and time main effect for both dry and wet run. TRI in the pile treatment was particularly greater than in control during dry and wet run. TPK had only significant effect attributed to block for dry run (block 1 = 38.14 min, block 2 = 25.44 min). However, site main effect and site by block by time interaction effect was detected for wet run. TPK for wet run was found to be greater and significantly different under pile treatment (43.81 min) than other treatments. Sediment yield did not differ among the silvicultural opretions for both dry run and wet run based on all data point. According to data in this study, pile treatment appears highly influential on thinning practices in forestry management. This practices might be helpful to evaluate natural resources in regard to the environmental aspect in the future.

Track: Forest Restoration: Research, Policy, and Applied Science of Ecological Restoration across Landscapes and Watersheds

**Denotes primary author and subject area*

Evaluation of Soil Vulnerability Index (SVI) for an Intensively Managed High Desert Irrigation District

Authors: Austin Davis*, University of Missouri - Columbia; Allen Thompson, University of Missouri; Claire Baffaut, USDA-ARS; David Bjorneberg, USDA ARS; Sapana Lohani, Dept. of Biology - University of Reno Nevada

Abstract: The Soil Vulnerability Index (SVI) is an index created for the purpose of rapidly assigning risk categories for runoff and leaching at the field and watershed scale. The SVI was developed for cultivated agricultural lands in humid environments, and is now being evaluated for suitability in other more arid ecosystems. The risk categories are “low”, “moderate”, “moderately-high”, and “high”. The SVI was determined based on USGS digital elevation maps (DEM) and RUSLE2 related soil attributes obtained from SSURGO. Classification relies on various statistical cut-off thresholds for slope and the soil erodibility K-factor, dependent on the hydrologic soil group. The objective of this project is to apply the SVI to the Twin Falls Canal Company Irrigation District in the Upper Snake Rock watershed, which is the first evaluation in the western United States. This is a high desert, sage-brush ecosystem that was converted to farmland around the turn of the 19th century, with surface water withdrawn from the Snake River. All crop production in the area requires irrigation due to the very low annual precipitation, therefore canals provide water from the upstream reservoir. Drainage is also present in the district. Topography in this watershed is mostly flat, and soils are predominantly in hydrologic groups C and D. Despite its efficacy in eastern agricultural watersheds, it remains to be seen if SVI will allow for appropriate differentiation between fields when applied in more homogeneous Western landscapes. Initial results for the region indicate useful distinction for the runoff classification, while for leaching this is less obvious, as there is little spatial variability in the leaching factors.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Factors Affecting Adoption of Cover Crops in US Soybean Production

Authors: Seungyub Lee, University of Missouri; Laura McCann*, Univ. of Missouri

Abstract: Cover crops are an effective practice for improving soil health, and for reducing erosion and nutrient runoff. However, the practice was adopted on less than 9% of cropped farms in 2012 according to the Census of Agriculture. A deeper understanding of cover crop adoption may thus be beneficial. The objective of this study was to identify factors affecting adoption of cover crops using the 2012 USDA Agricultural Resource Management Survey of soybean producers. Of 1,708 farmers, 17% had adopted cover crops. There are four categories of factors that could affect adoption: demographic and farm characteristics, adoption of related management practices or technologies, federal program participation, and region. Our dependent variable is binary, whether cover crops were adopted on the farm or not. Correlation coefficients among independent variables were all less than 0.56 in absolute value. Probit regression results show more educated farmers were more likely to use cover crops, as were full-time farmers. Other significant results were that farmers having larger farms and owning more of the farmed land were more likely to adopt cover crops. The latter implies that farmers will be able to receive the long-term benefits of the practice. Applying more fertilizer and using irrigation were associated with adoption of cover crops, while treating more land for weeds had a negative effect. Farmers having cattle and those using manure were more likely to use cover crops. Farmers using conservation tillage/no-till, renewable energy systems or variable nutrient application rates were more likely to adopt. These practices and technologies may be related to farmers' environmental awareness. Those who have received more federal Environmental Quality Incentive Program or Conservation Stewardship Program payments were more likely to adopt the practice. Compared to the Midwest, farmers in the region including KY, NC TN and VA were more likely to adopt cover crops.

Track: 2018 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**Denotes primary author and subject area*

Farmer Networks and Nitrogen Management Trials in North Carolina

Authors: Deanna Osmond*, NC State University; Rob Austin, NC State University; Shelby Shelton, EDF

Abstract: For the past five years, wheat and corn nitrogen (N) rate trials have been conducted through a farmer network on the coastal plain of North Carolina. We have approximately 100 site-years of data for each crop. Nitrogen rates were based on the grower rate, plus 25%, and minus 25%. Some years, the trials included rates based on Adapt-N. About 60% of the trials for wheat, the lowest N rate was optimum, while 20% of the trials the grower rate was optimum. Almost 75% of the time, the lowest rate was optimum for corn, suggesting that farmers could reduce their N. Additionally, the lowest N rates generally matched recommendations from NC State University. At the optimum rates, the amount of N needed was less than 1 bu per acre and as low as 0.5 in corn and 1.8 bu per acre in wheat. Not surprisingly, N response varied by crop, location, and year. Lastly, a field-scale tool that makes dynamic near real-time N management recommendations, Adapt-N, did not provide better recommendations than the farmer N rates. By reducing N rates, farmers could save money and protect water quality.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Grazing in New Mexico, Then and Now – A Rancher's Perspective

Authors: Tom Sidwell*, New Mexico Cattle Growers' Association

Abstract: A presentation from a New Mexico Rancher. Tom Sidwell is leader in ranching, latest conservation grazing methods and soil health. His talk gives a historic view of NM ranching and its influence on culture and the landscape. The presentation will look at the past and then bring us to the present. Tom uses the latest techniques such as rotational grazing, intensive low impact grazing and regenerative practices to improve soil health, grassland condition while improving grass production. Ranching is more than a business it's a way of life for many New Mexicans one that has been passed down to many generations and is in future of generations to come.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

Identifying and Comparing Climate and Water Quality Quantification Tools To Drive Conservation Practice Adoption

Authors: Michelle Perez*, American Farmland Trust; Kris Reynolds, American Farmland Trust; Jennifer Filipiak, American Farmland Trust; Jimmy Daukus, American Farmland Trust

Abstract: As the conservation community increasingly promotes the adoption of conservation cropping systems (i.e., conservation tillage, cover crops, rotation, and nutrient management) to achieve water quality, soil health, and greenhouse gas (GHG) objectives, they can be hindered by an inability to quantify the effects of such practices for farmers, landowners, and their advisors. Many conservation groups do not know which models or tools to use to: help farmers improve their conservation decision-making, quantify and report on both GHG and water quality outcomes, or assess the potential economic impact of practices on yield or profitability. To address these questions, American Farmland Trust (AFT) has been comparing 19 mostly farmer-facing tools that estimate either or both GHG and water quality parameters to identify the right tools for use in our targeted watershed projects and on-farm field days. We hypothesize that using these tools one-on-one with farmers and including these assessments in presentations before large farmer audiences will improve farmer decision-making. So far, we have found that only a few user-facing tools are currently available to quantify all three desired outcomes: climate, water quality, and economics. One preliminarily conclusion is that conservation groups will have to use multiple tools to conduct both the environmental and economic analyses they desire at different scales (e.g., watershed- and field-scales). Our analysis compares 11 criteria about each tool including: types of conservation practices reflected in the tool, whether the tool is publicly available or proprietary, and an assessment of who is using the tool, for what purpose, and at what scale. This analysis will provide useful information to conservation groups, researchers, corporations, and local, state, and federal conservationists to accelerate adoption of conservation cropping systems, geographically target their limited resources, and document their outcomes.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Identifying Best Management Practices to Reduce Nutrient and Sediment Load Exports: Watershed- vs Field-Scale

Authors: Remegio Confesor*, HEIDELBERG University; Tian Guo, Heidelberg University; Ali Saleh, Tarleton state university; Kevin King, USDA ARS

Abstract: Watershed scale models such as the Soil and Water Assessment Tool (SWAT) are used identify critical source areas (CSAs). SWAT is also used to identify and test the implementation of best management practices (BMPs) in these CSAs and estimate nutrient and sediment load reductions at the outlet of the watershed. While this approach directs the policy makers and stakeholders to the right direction, there is a great challenge in the actual implementation of the BMPs, usually at the field scale level. Farm fields within a watershed are unique from each other because of the differences in their crop rotation, fertilizer rate, timing, application method, soil characteristics, and tillage method, and weather. These variables have great spatial and temporal uncertainties as SWAT input. Thus, the appropriateness BMPs should be verified further at the field level before implementation. This presentation discusses the findings of a field-scale BMP scenario modeling using the Nutrient Tracking Tool (NTT) in northwest Ohio in comparison with the findings of the Maumee watershed SWAT multi-modeling effort. NTT is a web-based frontend of the Agricultural Policy/Environment eXtender (APEX) and was previously calibrated in northwest Ohio. We hypothesize that different suite of BMPs are appropriate and effective in different fields across northwest Ohio. Among the BMPs tested are: 1) cover crop, 2) no-till, 3) no-till and cover crop, 4) half of P rate application, 5) subsurface P application, 6) half of P rate and subsurface p application, 7) no-till and subsurface P application, 8) no-till, subsurface P application, and half P rate application, 9) cover crop, subsurface P application, and half P rate.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Improving Storm Water Quality by Stabilizing Construction Site Soils

Authors: Richard McLaughlin*, NCSU Crop and Soil Sciences

Abstract: The process of land development often generates large areas of exposed soil, often comprised of subsoil materials which have been compacted by equipment traffic. This can result in poor vegetation establishment and high runoff rates, both of which also produce high erosion potential. Correcting soil physical and chemical limitations to plant growth is important as well as protecting the seeds planted and preventing erosion while the plants become established. This presentation will cover the results of numerous studies we have conducted to evaluate soil amendments, tillage, and ground covers for establishing vegetation on steep slopes created during the construction process, mostly in the Piedmont of North Carolina.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

Interpreting Soil Health Dynamics via Improved Quantification of Soil Aggregate Stability

Authors: Ayush Joshi Gyawali*, Virginia Tech; Ryan Stewart, Virginia Tech

Abstract: Aggregate stability is used widely as a soil health parameter, yet current methods to measure this parameter typically lack control in the amount of applied energy and do not correct for soil particle size distributions. Therefore, using aggregate stability to understand soil health practices requires a more consistent and reproducible approach. In this study, we used a split plot design to compare two tillage treatments (no-till (NT) and twice-annual disk tillage (CT)) and cover crop/no cover crop treatments at two sites in Virginia. The treatments were installed in September 2015, and soil samples were subsequently collected in April 2016 and September 2016. Aggregate stability was measured using 1) the traditional wet sieve method (focusing here on the 250-2000 micron fraction) and 2) an innovative "whole distribution" aggregate stability measurement, which uses a laser diffraction machine with four input energy levels (0, 0.5, 1, 5 J cm^{-3}) and applies a correction for particle size distribution. For Site 1, the wet sieving and laser diffraction (with applied energy = 0 J cm^{-3}) methods showed similar patterns for aggregate stability, i.e. NT no cover > CT no cover > NT cover > CT cover, with significant differences seen between "no cover" and "cover crop" treatments ($p < 0.1$). For Site 2, no significant effect of tillage or cover crops on aggregate stability was observed using either method. The proposed laser diffraction method also enabled quantification of aggregate stability as a function of applied energy, with aggregate percentage decreasing as applied energy level increased. Altogether, the "whole distribution" aggregate stability method tested here is an accurate and replicable way of measuring and interpreting soil health dynamics.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Inventory and Monitoring of Tree Resources in Agroecosystems Using High-Resolution Imagery

Authors: Todd Kellerman*, USDA Forest Service National Agroforestry Center; Greg Liknes, USDA Forest Service FIA; Dacia Meneguzzo, USDA Forest Service FIA

Abstract: Windbreaks and narrow riparian corridors are an undercounted tree resource particularly in agricultural landscapes. The national forest inventory in the United States (Forest Inventory and Analysis, U.S. Department of Agriculture) is tasked with monitoring forest land across space and time. This is accomplished using an annualized ground-based survey supported by remote sensing. However, the definition of forest land applied often excludes trees found in agricultural settings. The USDA has formally recognized the need to inventory and monitor agroforestry systems (USDA Agroforestry Strategic Framework, 2011.) To address these challenges, the Forest Inventory and Analysis program and the USDA National Agroforestry Center have partnered to develop methodologies for mapping tree cover using high-resolution 1-m NAIP imagery. The team's primary purpose is to map tree and other land cover over large geographic extents, initially focusing on the central United States (i.e., Great Plains States) where windbreaks and riparian buffers are the most common type of agroforestry practices. Phase two includes deriving ecosystem function of tree cover from the resultant hi-res land cover datasets. This baseline of information as well as monitoring of these resources is needed for wise decision-making in the sustainable management of these systems in the face of changing conditions.

Track: Forest Restoration: Research, Policy, and Applied Science of Ecological Restoration across Landscapes and Watersheds

**Denotes primary author and subject area*

Meeting Goals and Tracking Quantified Progress: An Update on the Hypoxia Task Force

Authors: Katie Flahive*, Environmental Protection Agency; Meg Wiitala, Environmental Protection Agency

Abstract: The Mississippi River/Gulf of Mexico Hypoxia Task Force (HTF) is a partnership of 5 federal agencies, 12 states, and the National Tribal Water Council, who work together collaboratively and voluntarily to support the goals of the task force. The HTF was formed to take on the long-term, large-scale challenge of reducing nutrient loss in the Mississippi/Atchafalaya River Basin (MARB), in order to reduce the size of the hypoxic zone in the northern Gulf of Mexico. The collaboration between states, federal agencies, and tribes has driven progress on several efforts, and the HTF is focused on developing basin wide metrics to use to quantify progress towards the goal. This work is key to understanding in the next few years whether the actions that states and others are taking will allow us to reach our interim target and goal of a 20% reduction in N and P delivered to the Gulf by 2025. No one tool can be perfect for measuring our progress because of the wide variety of factors that influence loading. Thus, the HTF and partners are working to measure basin-wide nutrient reductions at multiple scales through multiple tools, including annual hypoxic zone measurement; water quality and river flow data; statistical and other trend analyses of the data; state, regional, and basin-wide nutrient loading models; nonpoint and point source biennial metrics; and ongoing work by states to quantify progress towards the goal.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Methods to Enhance Irrigation Water Conservation for Vegetable Production in Florida

Authors: Andre Luiz Biscaia Ribeiro da Silva, University of Florida; Lincoln Zotarelli*, University of Florida; Michael Dukes, University of Florida

Abstract: Potato production in Florida has relied on seepage irrigation since 1900. Seepage uses furrows to convey groundwater in the fields, which are surrounded by ditches equipped with retention structures for water table control. Although seepage is economical, seepage has irrigation efficiency smaller than 50% and hence requires large volumes of pumped water. Alternative irrigation methods have been introduced in Florida through governmental cost-share programs since 2011, those methods aim improving in water conservation, however, investigation is still required. The study objectives were to evaluate the use of subirrigation with drain tile (SDT), subsurface drip irrigation for water table control (SDI) and sprinkler as alternative irrigation methods to seepage, and to determine proper N-fertilizer timing and rate strategy for potato in each irrigation method. A factorial RCBD of three N-rates (0, 56 and 112 kg/ha) applied at planting and two N-rates (56 and 112 kg/ha) at emergence and tuber initiation was setup in each irrigation method in 2015 and 2016 in Hastings-FL. Crop evapotranspiration was 257 and 282 mm, while the cumulative rainfall was 184 and 294 mm in 2015 and 2016, respectively. Irrigation maintained a soil moisture between 0.11-0.16 cm^3/cm^3 in the 15 cm soil depth. Total water applied was 295, 144, 125 and 96 mm in 2015 and 287, 194, 165 and 89 mm in 2016 for seepage, SDT, SDI and sprinkler, respectively. There was no interaction between irrigation methods and N-treatments on tuber yield. Total yield averaged 32.2, 37.2, 34.7 and 33.3 Mg/ha for seepage, SDT, SDI and sprinkler, respectively. Marketable yield was 78% of total yield and the highest marketable yield was measured for SDT ≥ SDI ≥ seepage ≥ sprinkler. Applying 56, 112 and 56 kg N/ha at planting, emergence and tuber initiation resulted in similar yield than higher N-rates. Overall, alternative irrigation methods reduced water application in 42-68% and maintained tuber yield compared to seepage.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Microbial Diversity of Locally Derived Effective Microorganisms in Composting Broiler Litter and its Role in Enhancing the Potentiality to Mineralize Nitrogen in Soil and Improve the Nutritional Value of Edamame

Authors: Kishan Mahmud*, University Of Georgia ; Dorcas Franklin, University of Georgia; Laura Ney, University of Georgia; Miguel Cabrera, University of Georgia; Mussie Habteselassie, University of Georgia

Abstract: Freshly applied manure can pose a threat to the environment by increasing ammonia volatilization and P accumulation in soil, if applied according to plant N requirement. An increasingly popular organic amendment is bio-inoculated compost which can be a viable way of recycling wastes. In this study, Broiler litter (BL) was composted with three liquid treatments: a locally derived microbial inoculant (LEMs; predominantly Bacilli, Pseudomonales and Rhizobiales), a Control (BL + well water) and False-LEM. LEM is derived from partially and completely decomposed forest litter (O horizon) and a substrate made of charcoal, molasses, unpasteurized goat milk, semolina and yeast prepared through anaerobic process. F-LEM is the same mixture as LEM except no O horizon. The objectives of the study were: (1) to identify the microbial communities in composted broiler litter before and after treatments, (2) measuring ammonia volatilization during the composting process, (3) to assess the potential nitrogen mineralization (PNM) in soil after applying treated composts (week 1) and pre-flowering of edamame (week 4), and (4) treatment differences in nutrient value of harvested edamame. In both years, presence of Bacilli were most present in LEM and F-LEM mature composted BL. We found a significant reduction in ammonia volatilization from the LEM treated composts in year 1 (22%, $P<0.05$) and in year 2 (18%, $P<0.10$) when compared to Control composts. When compared to baseline PNM in soil was not significantly greater regardless of treatment. In Year 2 only the Control and F-LEM were significantly greater than baseline soil. In Year 3 all treatments were significantly greater than the baseline ($P <0.05$). Near-infrared spectroscopy indicated that the sucrose and ash content of the edamame grown in LEM treated plots in 2016 were significantly greater ($P <0.05$) compared to Control and F-LEM treatments and in 2017 only the sucrose content was greater in LEM beans ($P <0.05$).

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Modeling the Economic Benefit of Water Conservation in Irrigated Agriculture: A Regional Impact Analysis

Authors: Sarah Acquah*, New Mexico State University; Paul Gutierrez, New Mexico State University

Abstract: Water conservation is largely driven by the need to address water supply scarcity and management challenges. Nevertheless, the incentive for increased water conservation in agriculture is crucial as variability in precipitation due to climate change intensifies especially for arid and semi-arid regions. Generally, efficient water conservation policies are believed to be economically rewarding with no or limited in-depth investigations to support such assertions. This study uses IMPLAN to analyze the regional economic impact of agricultural production under flood and drip irrigation technologies. The results are expected to reveal the economic performance of crop production with and without efficient water conservation policy scenarios. In addition, the results will show the inter-relationship between specific crop production and other industries or sectors within the region. Above all, the findings may give reasonable support for increased water conservation efforts among crop farmers and inform the outreach and educational process. Keywords: water conservation, economic performance, Agriculture, irrigation technologies

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

**Denotes primary author and subject area*

Modeling the Nitrogen Balance of Beef Cattle Production

Authors: Narayanan Kannan*, Tarleton State Univeristy; Ali Saleh, Tarleton state university; N Andy Cole, Retd. USDA; Hugh Aljoe, Noble Research Institute

Abstract: A five-year USDA-funded study titled “Resilience and vulnerability of beef cattle production in the Southern Great Plains under changing climate, land use, and markets” is ongoing with the goal of safeguarding and promoting regional beef production while mitigating its environmental footprint. The study is focused on the cow-calf and stocker phases of beef cattle production. Conducting a full Life Cycle Analysis (LCA) is one of the major objectives of the study, in addition to field experiments, extension, outreach, and education. Estimation of resource uses and greenhouse gas emissions are parts of the LCA. A computer model namely Animal Production Life Cycle Analysis Tool (APLCAT) is developed and applied to conduct the LCA on beef cattle production in the study region. The model estimates water use, energy requirements, nitrogen balance, and emissions of enteric methane, manure methane, nitrous oxide, and carbon dioxide. It uses a comprehensive animal feed database based on “Nutrient requirements of beef cattle: The National Academy of Sciences-Engineering-Medicine”. The nitrogen balance of APLCAT is based on a mass balance approach. The model estimates nitrogen intake, fecal, and urine nitrogen excretion based on which fertilizer application decisions can be made. The key strengths of the model are the inclusion of change in forage quality with respect to growing season and inclusion of animal breed to reflect differences in results. Currently, APLCAT is validated with data from a cow-calf farm in Texas. Nitrogen balance results from the validation study will be presented along with more details on the modeling approach.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

Native Warm Season Grasses For Adapting to Climate Change, Improving the Sustainability of Grazing Systems and Improving Water Quality in Tennessee

Authors: Forbes Walker*, University of Tennessee; Pat Keyser, University of Tennessee

Abstract: The livestock industry is important to agriculture and the rural economy in the southeastern United States. Most beef cattle production is on permanent pastures that have a significant impact on the agricultural landscape. In many watersheds pastures also have a significant impact on water quality. Traditionally the forage base has been dominated by cool-season grasses such tall fescue (Festuca arundinacea) and orchard grass (Dactylis glomerata). In recent years, Tennessee has been experiencing more variable rain distribution patterns, with more floods and periodic dry periods, or droughts during the summer months. This has impacted the beef industry in many ways. The University of Tennessee Extension and other partners are working to diversify the forage-base of our pasture systems in Tennessee. Work at the University of Tennessee has demonstrated that the inclusion of native warm season grasses (NWSG), such as Eastern Gamagrass (Tripsacum dactyloides), Big Bluestem (Andropogon gerardi), Little Bluestem (Schizachyrium scoparium) and Indian grass (Sorghastrum nutans) into our forage systems, will not only provide livestock with a valuable forage during the warm summer months, but is an effective tool in managing forages during periodic dry periods and even drought. During intense summer rainfall events, the greater infiltration rates observed under NWSG systems greatly reduces the amount of runoff and thus soil erosion, the potential for local floods, and is another best management practice (BMP) for improving water quality and mitigating against the potential harmful effects of climate change in Tennessee. This presentation will summarize some of the on-going work at UT on promoting these systems in Tennessee. It is supported in part by a USDA NIFA Water for Agriculture grant awarded to the University of Tennessee to study the effects that climate change may have on agricultural production in the Tennessee and Cumberland River Basins in the coming decades.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

New Arkansas Discovery Farm in the Eucha-Spavinaw Watershed Advances Innovative Wastewater and Manure Management for a Full-Time Dairy Operation

Authors: James Burke*, University of Arkansas; Andrew Sharpley, University of Arkansas; Karl VanDevender, University of Arkansas System Division of Agriculture; Mike Daniels, University of Arkansas

Abstract: The disposal of wastewater and manure from dairy operations in northwest Arkansas has been a constant challenge for regional producers. The continued long-term application of fertilizer in the form of cattle manure can lead to an increased risk of nutrient runoff and impairment of receiving waters. The Haak Dairy Farm is a cattle operation located in Benton County, Arkansas. The operation milks up to 140 cows and uses a rotational system of pasture and crops. The farm includes a pre-milking pen, where manure is covered with sawdust and moved to a holding area and a milking parlor, where solids are removed before washing. The resulting mixture is piped to an underground storage tank, where it is then pumped to a concrete settling basin, in order to separate the solid and liquid fractions. The liquid is pumped into a holding trench, with a weir, that allows transport of liquid into a grass interception field located directly below the trench. Manure samples were collected from June 2016 to May 2017 and tested for: percent solids, water extractable phosphorous (WEP), total nitrogen (N), total phosphorus (P) and total potassium (K) in pounds per 1000 gallons (lbs/1000 gal). There were three sampling areas: the settling basin, entrance to the holding trench and an exit area of the trench. Statistical analysis using a student's t-test (P = 0.05) showed no significant differences among all three areas in percent solids and nutrient content. However, there is a numerical trend, which shows that percent solids and nutrient content decrease in the order of: settling basin > trench entrance > trench exit. Although it is early in the monitoring process, the results show that the system is containing the solid fraction and decreasing nutrient transport. Further research such as water infiltration measurements, yearly soil sampling and interception field forage samples will quantify whether this treatment system is an effective tool for wastewater and manure management.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

New Pasture Condition Scoring Tool

Authors: Kevin Ogles*, USDA-NRCS; Steve Woodruff, USDA-NRCS

Abstract: The new Pasture Condition Score Sheet (PCS) and the revised Guide to Pasture Condition Scoring give the pasture manager or the conservation planner a tool with guidance to rate the condition of a the pasture. Pasture here is meant as the land use as defined by NRCS. The new PCS is meant to be more visual, clearer and ideally used on the pastures of any type of grazing system. The PCS has 10 indicators. It would be very rare for any pasture to receive the highest ranking on all 10 indicators. A pasture in very good condition may score low on one or two indicators, but that is only a small portion of the overall score. The PCS tool can be used as a way to monitor any individual pasture at several key times during the grazing season or on the same pasture over several years to record positive or negative changes in pasture condition due to management. The important goal in the development of the new PCS tool was to make sure it gives quality results in assessing the pasture condition while reducing the time needed to rate the 10 indicators. The 10 indicators get rated individually but also interact with other indicators to give an overall view of the pasture condition as well as specific individual problems to address. This tool was also meant to assist NRCS planners in identifying resource concerns that could be addressed by conservation practices. However, PCS was also revised to assist the pasture manager to make improvements through management decisions in a quick but high quality method.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Nitrogen and Phosphorus Accounting in US Food Supply Chain and Potential for Improvement

Authors: YIng Wang*, Innovation Center for US Dairy; Karin Veltman, School of Public Health, University of Michigan; Andrew Henderson, School of Public Health, University of Texas Health Science Center; Olivier Jolliet, University of Michigan

Abstract: This work created national-level N and P budgets for the US, accounting for 9 major sectors (from fertilizer production to waste treatment), examining the role of agriculture, and specifically dairy production, in national nutrient flows, quantifying the effects of dairy on nutrient cycling and associated impacts, and looking across all sectors to identify hotspots and potential improvements in terms of use efficiencies. For N, results show that the combined fertilizer and chemical industry is the major fixer of N2 from air, with an annual fixation of 9,350 kt N/ yr. Agriculture is the second largest sector, with an N2 fixation of 5,156 kt N/yr for US. Agriculture is the largest source of reactive nitrogen emission to air, predominantly due to ammonia emissions of 3,047 kt N from fertilizer application to field crops. Many feedback loops exist in both the dairy food supply chain and the 'non-dairy' food supply chain. For example, 104 kt N is produced as a by-product at the crop-based food industry and fed to the national dairy herd. N-efficiencies range from 71% for the poultry processing industry to 95% for the dairy processing industry. In total 1,203 kt N in synthetic fertilizer is used to produce 445 kt N in milk and 1 kt N in meat (boneless equivalent, veal calves only). Thus, 37% of total N applied with synthetic fertilizer ends up in milk supplied to the processing industry. 'Hotspots' in the dairy food supply chain occur predominantly in the crop production stage and the 'dairy herd' (milk production) stage, suggesting that improvement should focus in particular, on reducing ammonia emissions in manure management systems and at fertilizer and manure application on the field. Scenarios were developed to determine to what extent a) reducing N and P fertilization rate, b) anaerobic co-digestion of dairy manure and food waste, c) no-till cropping practices, or d) reducing consumer waste can contribute to improve nutrient cycling efficiency.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Non-Traditional Partnerships for Watershed Based Agricultural Conservation

Authors: Gavid Gruznski*, The Conservation Fund

Abstract: The Milwaukee River Watershed Conservation Partnership Program (MRWCP) is a coalition of agricultural producers, agribusinesses, state and local government, and land trusts coordinated by Milwaukee Metropolitan Sewerage District MMSD and USDA's Natural Resources Conservation Service (NRCS) Regional Conservation Partnership Program that works with local producers and landowners to keep nutrients in the soil, sediment out of the water, and our agricultural lands working. MRWCP, works closely with landowners and local partners, taking a collaborative approach to agricultural conservation that helps mitigate flooding and stormwater runoff that pollutes the watershed, improve water quality and support better agricultural production. One of the major project under the MRWCP umbrella is the Working Soils® program which is funded by MMSD. Working Soils® supports flood management, with a focus on protecting open space while keeping agricultural lands working. The Working Soils® program works with willing landowners to establish agricultural conservation easements through NRCS's Agricultural Conservation Easements Program (ACEP). With the easement, a landowner sells the rights to develop the land, while maintaining ownership. With easements is established, we work closely with NRCS and landowners to identify concerns related to issues like erosion, flooding, wetland restorations and soil health. This informs a conservation plan that gives landowners a blueprint for best practices, such as cover crop rotation, grass waterways or no-till farming to improve agricultural production, that are best suited for their property's needs. We also help connect them to funding resources or cost share opportunities to put these practices into action.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Nutrient Tracking Tool – A User-Friendly Tool for Evaluation the Water Quality and Quantity as Affected by Various Agricultural Management Practices

Authors: Ali Saleh*, Tarleton State University

Abstract: The Nutrient Tracking Tool (NTT) is a user-friendly web-based computer program and is linked to the Agricultural Policy Environmental eXtender (APEX) model. It also accesses USDA-NRCS's Web Soil Survey and PRISM to obtain field, weather, and soil information. NTT provides producers, government officials, and other users with a fast and efficient method of estimating the nutrient, sediment losses, and atmospheric gases (N_2O, CO_2, and NH_4) emission, and crop production under different conservation practices regimes at the farm-level. The information obtained from NTT can help producers to determine the most cost-effective conservation practice(s) to reduce the nutrient and sediment losses while optimizing the crop production. Also, the recent version of NTT (NTT-RE) has been developed for those countries without access to national databases, such as soils and weather. The NTT-RE also has been designed as an easy to use APEX interface. In addition to providing real-world information on the impact of conservation practices on production and sustainability of agricultural operations, the NTT aids in developing markets where farmers get paid for the water quality benefits they provide. Known as water-quality credit trading, these programs help reduce water pollutants, especially nitrogen and phosphorus, by letting pollution sources in a watershed trade among themselves to find the most cost-efficient way of reducing the nutrients. NTT has been released for public use by USDA office (www.ntt.tarleton.edu). A version of NTT (CBNTT) is also currently being used for trading and other water quality programs in Chesapeake Bay regions. During this presentation the new capabilities of NTT-RE will be described and demonstrated.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Partnerships to Support Conservation with Organic Producers

Authors: Ben Bowell*, Oregon Tilth

Abstract: Professionals working in natural resource conservation across the country are interacting with more organic producers each year as the number of certified organic operations continues to increase. According to USDA NASS, the number of certified organic farms increased 11% from 2015 to 2016 (most recent figures available). Oregon Tilth, an organic certification and education organization, began a partnership with USDA Natural Resources Conservation Service in 2010 to help NRCS increase support for organic producers. Since that time Oregon Tilth has provided training (webinars, workshops, farm tours that cover introduction to organic certification, organic regulations and common organic practices for nutrient management, pest management, buffers and more), developed resources (considerations for implementing NRCS conservation practices in organic systems) and provided technical assistance on organic topics to NRCS staff across the country. This presentation will discuss how this partnership has worked and the opportunities that have been identified. In general, USDA Organic regulations discuss natural resource topics, but often in very broad language and do not provide the tools certifiers need to evaluate conservation practices. NRCS and other conservation professionals have the technical assistance to design and evaluate effective conservation practices. Through this partnership, we have worked to bridge these, translating organic regulations into conservation language and describing conservation support to organic audiences.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation in Organic, Specialty, and Small-Scale Agriculture

**Denotes primary author and subject area*

Phosphorus Stratification and Edge of Field Phosphorus Losses in the Western Lake Erie Basin

Authors: Emily Duncan*, USDA-ARS; Kevin King, USDA ARS; Lindsay Pease, USDA Agricultural Research Service; Mark Williams, USDA ARS; Doug Smith, USDA ARS

Abstract: Harmful and nuisance algal blooms resulting from excess phosphorus (P) have placed agriculture in the spotlight of the water quality debate. Sixty-eight site years of P loading data (surface runoff and tile flow) from 36 fields in Ohio were used to investigate phosphorus stratification in the Western Lake Erie Basin. The sites were categorized by tri state (Michigan, Indiana and Ohio) fertilizer recommendations and by a unit-less 'P stratification' value calculated by dividing the Mehlich-3 phosphorus (M3P) concentration in the top 0-5 cm of soil by the M3P concentration in the lower 5-20 cm. The fields were arbitrarily categorized as low (0-1), medium (1-3), and high (3+) P stratification based on their unit-less P stratification value. The majority of the fields (30) could be classified as "medium" stratification with 2 fields categorized in 'low' and 'high' stratification respectively. Next, regression analysis was conducted for surface runoff and tile flow versus soil test P (STP) at different depths (0-2.5 cm, 2.5-5, 5-10, and 10-20). The strongest relationship (best linear regression fit) corresponded between DRP and TP concentrations in surface runoff and M3P STP in the top three soil sections, followed by DRP concentrations in tile drainage and M3P STP concentrations in the top 0-2.5 cm of soil. Our findings provide further evidence of the relationship between P concentrations measured in surface runoff and STP concentrations, but there is also evidence of a relationship with DRP concentrations measured in tile flow. Additional change point analysis indicated that STP above 39 M3P increased the risk of DRP losses from tile flow.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Planning for Resilience-Hurricane Related Catastrophic Soil Interpretations through National Cooperative Soil Survey Data

Authors: Maxine Levin, USDA-NRCS; Debbie surabian, USDA NRCS; Maggie Payne, USDA NRCS; Richard Reid*, USDA-NRCS

Abstract: As a result of the recent and devastating hurricanes (Harvey and Irma) that have threatened large portions of the Eastern sea board and Gulf States, a greater need has risen for coastal catastrophic-level interpretations of spatial soil survey data for planning with communities and federal programs. There is a tremendous need for the modification of existing interpretations, development of new interpretations, identification and repair of data population issues, and development of new GIS models to better meet customer response needs for catastrophic hurricane related interpretations. Currently, there are 18 Catastrophic Event Response Interpretations related to Hurricanes available through the Natural Resources Conservation Service (NRCS) Web Soil Survey. These interpretations assist users in identifying suitable areas for animal mortality disposal, contaminated plant material isolation, rubble and debris disposal, sites for composting facilities, and suitability for clay liner material. A multidisciplinary team has convened in USDA-NRCS to address modification of existing soil interpretations and development of new soil interpretations such as debris burial, storm surge inundation, coastal erosion, barrier island erosion, potential remediation due to flooding and storm surge for chemical/oil leaching, mosquito habitat risk or habitat suitability, and soil suitability for human health risk of soil-borne respiratory pathogens. Updates of Debris Burial interpretations will be presented as an example of work defined.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

Post-Wildfire Rehabilitation on Federal Lands

Authors: Wayne Robbie, USDA Forest Service; Penny Luehring*, USDA Forest Service; Anna Jaramillo, USDA Forest Service

Abstract: An overview of the types of rehabilitation undertaken by Federal land managers in the Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service, Bureau of Indian Affairs and National Park Service after wildfires. The presentation will focus on (BAER) Burned Area Emergency Response and Emergency Stabilization policy and procedures and include the latest information on treatment effectiveness.

Track: Forest Restoration: Research, Policy, and Applied Science of Ecological Restoration across Landscapes and Watersheds

**Denotes primary author and subject area*

Rebuilding Soil Ecosystems for Improved Productivity in Biosolarized Soils

Authors: Laura Ney*, University of Georgia; Dorcas Franklin, University of Georgia; Miguel Cabrera, University of Georgia; Kishan Mahmud, University Of Georgia ; Brendan Fatzinger, University of Georgia; Mussie Habteselassie, University of Georgia; Kurk Lance, University of Georgia

Abstract: Disinfecting soil through fumigation or solarization can be highly effective in reducing or eliminating crop loss from soil-born pathogens, plant parasitic nematodes and weed competition. Biosolarization creates a combination of biotoxic products from decomposition of organic matter and heat created from solarization and has been proven comparable to methyl bromide in its effectiveness in killing pathogens. While biosolarization offers an organic option for soil pest control and avoids human and environmental health risks associated with chemical fumigants, it still creates broad negative effects on microbial communities. Soils with healthy ecosystems provide sustained biological productivity, promote environmental quality and maintain plant and animal health. Quickly re-establishing microbial communities in disturbed soils can be key in preventing resurgence in disease pressure and in maximizing nutrient use efficiency. The objective of this study is to determine the ability of several amendments to rebuild an active soil ecosystem in biosolarized soils by measuring nematode assemblage structure, microbial biomass and N mineralization in soil and kale quality. The study was conducted using potted kale grown in biosolarized soils. Treatments were bare soil, receiving no nutrient amendment, and soils receiving two different rates of organic, composted broiler litter or a mineral fertilizer. Half of the pots in each treatment received a locally-derived microbial inoculant (LEM). Preliminary results show differences in kale quality. We expect to see similar increases in the size and activity of microbial communities among soils receiving organic amendments and/or LEM. Moving towards agricultural systems that focus on maintaining and improving soil health, means exploring ways of controlling potentially devastating disease and pest pressure without also eliminating the numerous beneficial services provided by the soil's non-pathogenic biological communities.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Reducing Sediment and Nutrient Loadings through River and Streambank Restoration

Authors: Matt Van Eps, Watershed Conservation Resource Center

Abstract: Streambank erosion associated with unstable river systems can contribute excessive amounts of sediment and nutrients loadings within watersheds. For example, approximately 66% of the annual sediment load from the West Fork of the White River (WFWR), a major tributary within the Beaver Lake watershed of northwest Arkansas, is from severe streambank erosion. Restoring unstable streams, such as, the WFWR, not only improves water quality by reducing sediment and nutrient loadings within watersheds, but it also provides multiple benefits to the community by 1) improving the local ecology, 2) creating more recreation opportunities, 3) reducing land loss, 4) protecting infrastructure, and 5) addressing safety concerns. Beginning in 2007, four demonstration projects using natural channel design principles and techniques have been designed and implemented on streams located in Northwest Arkansas. Site selection was based on watershed assessment data, local watershed planning, and/or community needs. The length of stream restored ranged from 1,000 to 1,800 feet with cut-banks ranging 6-16 feet high. The projects are located in both rural areas and urban settings. The sources of federal funding included US EPA 319 grant, administered through the Arkansas Natural Resource Commission, and US EPA Wetland Program Development grant. Streambank erosion rates were monitored to estimate annual erosion rates before and after restoration. Also, streambank samples were collected and analyzed to provide data required to calculate sediment, total phosphorus (TP), and total nitrogen (TN) annual loadings. Sediment and TP load reductions were estimated to range 53 to 3,600 tons/yr and 29 to 3,500 lbs/yr. Each project site had its own set of constraints that had to be addressed as part of the site restoration plan and implementation. All four restoration projects have been successful in reducing sediment and nutrient loadings and improving the local ecology and community.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

Securing Water for and from Agriculture through Effective Community and Stakeholder Engagement

Authors: Kathryn Brasier*, Penn State University; Weston Eaton, Penn State University; Clinton Williams, USDA-ARS; Mark Burbach, University of Nebraska Lincoln

Abstract: National level initiatives intended to address water quality and quantity issues related to agriculture are typically envisioned and conducted by scientists and experts, while farmers, landowners, rural communities, and other stakeholders play less central roles. In this presentation, we discuss a USDA-funded project that aims to develop a collaborative, stakeholder driven model to address water issues both for agriculture and from agriculture. Our project is premised on the notion that water quantity and quality issues can be better solved through a collaborative process where stakeholders, communities, scientists and experts are engaged to identify, investigate and solve water issues on multiple spatial scales. While stakeholder engagement is increasingly seen as a critical strategy to address complex natural resource issues, research on what behavioral and management changes are attained through the process of engagement is limited. Our project is developing 6 study locations in 3 states with differing regulatory structures and experiencing differing water quality and quantity challenges. We are collecting both social and biophysical data in these locations to evaluate the types of impacts and overall effectiveness of stakeholder engagement. The presentation will provide an overview of the project, specifically identifying the core elements of stakeholder engagement we are using in this project, our methodologies for assessing related behavioral changes, and the approaches we have used to manage a large, multi-disciplinary and multi-functional team project.

Track: 2018 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**Denotes primary author and subject area*

Sediment and Nutrient Load Modeling - Quantifying the Effects of Conservation Practices; an Interactive Web-based Management System to Prioritize Practice Placement and Maximize Pollutant Load Reductions

Authors: Jeff Boeckler*, Northwater Consulting

Abstract: Water quality is directly tied to inputs from the contributing watershed. The need to understand the spatial distribution of pollutant loading is essential when faced with limited implementation resources. This is especially true in agriculturally dominated areas where Best Management Practices (BMPs) must be installed in such a way that benefits can be maximized. A watershed plan was recently completed for Lake Springfield, a large water supply reservoir in Illinois. The roughly 4,000 acre reservoir drains almost 170,000 acres; the vast majority in row crop agriculture. The plan details watershed characteristics, nutrient and sediment loading, and site specific BMPs to address water quality. The plan however is only useful if it can be translated into prioritized action on-the-ground. To facilitate this and ensure limited resources are spent effectively, a custom spatially explicit pollution loading model and interactive web-based system was developed for lake and watershed managers. The model is a new, GIS based model called SWAMM or Spatial Watershed and Assessment Model. SWAMM incorporates high resolution landuse data, soils, and rainfall to predict loading for common pollutants at the field/parcel level. A complimentary web system allows managers to navigate the watershed and interact with SWAMM and other plan components. Functionality includes: the ability to view and query location specific loading; ability to navigate to planned BMPs, view and report their expected load reductions; a progress management and tracking dashboard; the ability to trace a custom area and calculate loading for that area, apply a BMP and tabulate predicted load reductions; the ability to view watershed map layers such as streams, imagery, and other custom layers and, the capability to issue user names and passwords in a secure platform. The presentation will highlight key components of the watershed model and plan, and demonstrate functionality of SWAMM and the web-based system.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

Slope-Velocity-Equilibrium and Evolution of Surface Roughness on a Stony Hillslope

Authors: Mark Nearing*, USDA ARS Tucson AZ; Viktor Polyakov, USDA ARS Tucson AZ; Mary NIchols, USDA-ARS Southwest Watershed Resear; Mariano Hernandez, USDA ARS Tucson AZ; Li Li, Univeristy of Arizona; Ying Zhao, University of Arizona

Abstract: Slope-velocity-equilibrium is hypothesized as a state that evolves naturally over time due to the interaction between overland flow and surface morphology, wherein steeper areas develop a relative increase in physical and hydraulic roughness such that flow velocity is a unique function of overland flow rate independent of slope gradient. This study tests this hypothesis under controlled conditions. Artificial rainfall was applied to 2m by 6m plots at 5%, 12%, and 20% slope gradients. A series of simulations were made with two replications for each treatment with measurements of runoff rate, velocity, rock cover, and surface roughness. Velocities measured at the end of each experiment were a unique function of discharge rates, independent of slope gradient or rainfall intensity. Physical surface roughness was greater at steeper slopes. The data clearly showed that there was not a unique hydraulic coefficient for a given slope, surface condition, or rainfall rate, with hydraulic roughness greater at steeper slopes and lower intensities. This study supports the hypothesis of slope-velocity-equilibrium, implying that use of hydraulic equations, such as Chezy and Manning, in hillslope scale runoff models is problematic because the coefficients vary with both slope and rainfall intensity.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Slow-Release and Environmentally Friendly Compost Production with Magnesium and Poultry Waste for Improving Soil Health and Sustainable Crop Production

Authors: Girish Panicker*, Alcorn State University; Charles Weiss, US Army Engineer Research & Development Center

Abstract: Groundwater and surface water supplies are threatened with contamination from numerous sources. One of the most serious sources of non-point pollution is animal waste. Nitrogen contamination of groundwater in the forms of nitrate (NO_3-N) or nitrite (NO_2-N) is a major health concern. Runoff from field crops receiving raw animal manures contributes both nitrogen and phosphorus in surface waters. Composting was done on the farm in aerobic composting tumblers while maintaining optimum moisture in different ratios of fresh poultry manure and gypsum. The composting continued for over 30 days to convert the organic nitrogen and phosphorus to an inorganic compound (ammonium magnesium phosphate hydrate) that is similar to the mineral form of nitrate (struvite) produced naturally in guano deposits. This technique succeeded to produce composted wastes that are three to five times richer in nutrients than conventional compost, and the nitrogen and phosphorus are released slowly from this organically-produced nutrient source. The production of struvite was confirmed through the use of X-ray diffraction analysis of the materials after reaction. This cheap and high quality compost, produced from fresh poultry manure, will have great commercial importance in maintaining soil health and sustainable agriculture because the struvite formed is slow release and will not pollute the groundwater. Presentation will cover step by step production practices on the field and in the lab.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

Smart Solar Siting: Combatting Climate Change While Protecting Farmland

Authors: James Daukas*, American Farmland Trust

Abstract: The goals of combatting climate change and expanding farm conservation can clash without careful planning, policies and processes that engage communities to find optimal solutions. Many states have set ambitious goals for reducing greenhouse gas (GHG) emissions and dramatically increasing the generation of renewable energy—California and New York are committed to meeting half of their electricity demand by 2030 from renewable sources. However, flat, open farm fields, often the most productive farmland, are highly desirable for large, utility-scale solar electric generating facilities. This new pressure compounds the severe “competition for land” between demands for sprawling residential development, expanded local food production, and wildlife habitat preservation. But new research is documenting that states and regions can do more than meet their ambitious solar energy goals on marginal and developed land without sacrificing its productive farmland and sensitive wildlife habitat. This oral presentation will highlight research and projects from California and Northeast states that: - identify the "least conflict lands" or lands preferred for solar siting through multi-stakeholder mapping and analysis; and - evaluate the potential to generate energy from marginal agriculture and developed lands and compare to renewable energy targets. The research highlights the importance of strategic renewable energy siting to mitigate impacts and achieve multiple goals. The solution is smart solar siting that maximizes potential renewable energy while minimizing impact on the most productive farmland and other resources. Thoughtful program and policy design coupled with effective community engagement and technical assistance can accelerate the expansion of renewable energy generation and cut greenhouse gas emissions by guiding siting away from productive farm and forest land that can produce food and sequester carbon.

Track: 2018 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**Denotes primary author and subject area*

Soil Health and Maize Yield Analysis Detects Long-Term Tillage and Cropping Effects

Authors: Marcio Nunes, Cornel; Harold van Es, Cornell Unviersity; Robert Schindelbeck, Cornell; Aaron Ristow*, Cornell University; Matt Ryan, Cornell University

Abstract: The performance of no-till (NT) in temperate regions can be enhanced through the incorporation of other conservation practices such as cover cropping and crop rotations. This study assessed the long-term impacts of continuous NT in comparison to plow-till (PT) management on soil properties and corn (*Zea mays* L.) yields in New York. The effects of tillage were assessed in combination with different cropping systems (24 years corn monoculture vs. 12 years corn monoculture; and with or without interseeded cover crops) on three soil textures: clay loam, loamy sand and silt loam. We measured four soil biological indicators – organic matter (OM), active carbon (ActC), respiration (Resp) and protein (Prot); four soil physical indicators - available water capacity (AWC), water stable aggregation (WSA), penetration resistance (PR) and water infiltration rate (InfRate); soil chemical indicators (plant available nutrients, pH and total N), and corn yield. Soil managed under long-term NT showed the most favorable soil biological, physical and chemical conditions for plant development, with higher levels of OM, Prot, Resp, WAS, total N, P and Zn, and InfRate. Benefits of introducing a grass-legume cover crop mixture into the cropping system were evident after 4 years for OM, Prot, Resp, AWC, Fe and Zn. Cover crop effects were greater under NT than PT, and additive to the NT benefits. On the clay loam soil, the effects of a 6-year interruption of continuous corn production with a perennial grass crop were still discernable with several soil health indicators 12 years after resuming corn production under NT. The better soil conditions under NT resulted in higher corn yields in both the loamy sand and silt loam soils, but not the clay loam. Our study shows that long-term NT can be viable and sustainable in temperate regions, promoting significant improvement in soil health and crop yield, and that these benefits are enhanced when NT is combined with crop rotation and cover crops.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Soil Health Evaluation in Three Texas Rangelands

Authors: Jennifer Moore-Kucera*, USDA-NRCS; Kristie Maczko, Sustainable Rangelands Roundtable - University of Wyoming; Jeff Goodwin, Noble Research Institute

Abstract: Objective: To evaluate a suite of soil health indicators under three different rangeland management systems in northcentral Texas. Approach: Soil samples (0-15cm) were collected in April 2017 from three different rangeland management systems: Ranch 1 (HSHF): high stocking rate and rotation frequency, Ranch 2 (MSMF): medium stocking rate and rotation frequency, and Ranch 3 (LSCG): low stocking rate with continuous grazing. Samples at each ranch were selected using soil maps and expert knowledge to identify locations with similar soil type, landscape position, and climate. Soil samples were shipped within 48 h to Cornell Soil Health Lab for the Comprehensive Assessment for Soil Health (CASH), University of Mo for microbial community composition using phospholipid fatty acid profiling, and, Dr. Haney's lab in Temple, TX for the Soil Health Tool (SHT) Index. Additionally, plant community composition, diversity, and production potential were conducted along each transect. Results: In general, measured soil health differences (SOM, WHC, WEON) were slightly greater in MSMF system compared to LSCG system and the MSMF typically was similar to HSHF, except HSHF had higher 1-d CO2-C. Although sampling locations targeted similar soil types, clay content was an important covariate indicating adjustments for this variable were necessary for proper interpretation of SOM and WHC. SOM and aggregate stability measures were decoupled from each other with the highest SOM ranch having the lowest aggregate stability score. Given that all three ranches were not considered to be in a degraded state, sound grazing management was achieved from a soil health perspective resulting in only subtle differences in a couple of soil health indicators. Future work to explore economic differences and the relationships between vegetation data and soil microbial community composition using molecular tools may reveal further insights and are pending.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

Soil Health Testing and Biological Indicators of Cover Crops in North East Kansas

Authors: Thomas Roth*, Natural Resources Conservation Service

Abstract: In Kansas there is a trend toward planting cover crops to improve soil health and increase biological activity. The majority of research has been confined to the university experiment stations. The Riley County Conservation District has a demonstration project that has planted 20 single species and nine mix plots plus a no treatment plot. The plots have been rotated between a producers fields south of Leonardville, KS. In 2014, 2016, and 2017 15 plots were sampled. In 2014 the samples were sent to a laboratory for soil health testing and biological testing. In 2016 and 2017 the samples were once again sent for testing to the same laboratory and paired samples were sent the soil testing laboratory and Kansas State University for comparison. Both laboratories provided nutrient recommendations. Ten plots had samples clipped for analysis in 2014, 2015, and 2016 to assess the viability of the cover crops to serve as supplemental forage.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Soils Information and Effective Conservation: You Can't have One without the Other

Authors: Michael Robotham*, USDA-NRCS

Abstract: Having access to soils data and information and having the technical expertise available to interpret and appropriately apply that information and key prerequisites to effective conservation planning that address identified resource concerns. In FY2017, over 500 individual NRCS soil scientists reported that they provided over 150,000 hours of technical soils services assistance nationwide. This presentation will go beyond the numbers to highlight a small number of case studies where NRCS soil scientists have worked collaboratively with NRCS field staff and land owner / managers to apply soils data and information to successfully address resource concerns. These vignettes will provide specific examples of how NRCS staff, landowners, and other cooperators can efficiently and efficiently use soils information in their planning and implementation activities. They can also serve as models for how soil scientists, soil conservationists, and other conservation professionals can continue to work together to assist landowners in managing our nation's natural resources.

Track: 2018 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**Denotes primary author and subject area*

Spatial and Temporal Variability of Metal Concentration in Agricultural Fields Downstream from the 2015 Gold King Mine Spill

Authors: Gaurav Jha*, NMSU; David Weindorf, Texas Tech University; Brandon Francis, NMSU; April Ulery, NMSU

Abstract: The Animas and San Juan rivers are an important source of irrigation in northern New Mexico. Concerns regarding the water used in agriculture and for human consumption from the river were raised on August 5, 2015 when three million gallons of heavy metal contaminated water were accidentally released from the Gold King Mine during maintenance operations. The immediate response downstream was to close the irrigation ditches within New Mexico and the Navajo Nation to exclude the water from reaching agricultural fields. In an effort to determine whether metals were flushed out of the river and spread across the watershed, we initiated this monitoring project. The concentrations of nine elements (Al, As, Pb, Cu, Cr, Ca, Mn, Zn, Fe) were determined using Portable X-Ray fluorescence (PXRF) in agricultural fields growing three different vegetation types. Field PXRF measurements were validated on a small number of samples also analyzed with Inductively Coupled Plasma (ICP) spectroscopy. Total concentrations were compared to the U.S. Environmental Protection Agency (EPA) residential screening levels (RSL) in soil. The spatial variability from alfalfa, pasture and vegetable fields and temporal variability for pre- and post-growing seasons were interpolated using Kriging in ArcGIS. Of the nine elements measured, As and Mn concentrations displayed 'hotspots' in the fields where their concentrations exceeded the RSL. The post-growing season analyses are being compared with the pre-growing season concentrations and monitoring will continue for another for two years.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Strategic Rotational Grazing for Improving Soil Health, Water Quality and Forage Productivity in Beef Pastures

Authors: Subash Dahal*, University of Georgia; Dorcas Franklin, University of Georgia; Miguel Cabrera, University of Georgia; Dennis Hancock, University of Georgia; Lawton Stewart, University of Georgia

Abstract: A study was conducted in 10 beef-pastures of Georgia Southern Piedmont to develop a grazing management system which will improve soil health, water quality and forage productivity. In 2015, in-situ soil respiration and potentially mineralizable nitrogen were measured in 18% of randomly selected locations of a 50-m grid ("matrix") of the pastures, as well as specific areas with high cattle activity ("AOIs"). Runoff collectors were installed in dominant watersheds of all pastures. In 2016, "Strategic-rotational" grazing was devised and implemented, in 5 of the pastures, which consisted of several better grazing techniques. During the baseline study, soil respiration was significantly higher in the "matrix" (1256.98 mg CO_2/day/m^2) as compared to the "AOIs" (1047.58 mg CO_2/day/m^2) suggesting an uneven spatial distribution of microbial activity. In 2017, the over seeded exclusions (1417.22 mg CO_2/day/m^2) and non-excluded areas (1333.88 mg CO_2/day/m^2)) were not significantly different in terms of soil respiration suggesting an improvement in soil respiration in the excluded "AOIs". In the baseline, potentially mineralizable nitrogen was significantly higher in the "AOIs" as compared to the "matrix". We expect to see a uniform distribution of potentially mineralizable nitrogen in the" strategic-rotational" pastures. In 2016, in one of the study sites, significantly less hay (17 bales) was required in the "strategic-rotational" pastures as compared to (45 bales) "conventional" pastures. Also, the NDVI images created from satellites data (Sentinel-2) also demonstrated significantly higher overall-biomass of forages in the "strategic-rotational" pastures. We expect to have cleaner water (in terms of nitrate and ammonium) in the "strategic-rotational" pastures as compared to "conventional pastures". While it is still early stage of our research, strategic-rotational grazing practice appears to be rapidly improving the soil health and forage productivity in beef-pastures.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Strategies for Soil and Water Conservation and Sustainable Forage Corn Production in New Mexico: Increasing Cutting Height, Decreasing Row Spacing and Forage Quality Considerations

Authors: Sultan Begna*, NMSU

Abstract: Dairy industry's contribution to New Mexico's agricultural revenues is 40% ($1.3 billion) and vital for the rural economies. Forage corn is the main row crop for dairy but the production system removes most of the vegetation out of field leaving soil exposed to wind and water erosion. Moreover, with corn row spacing of 30", short (3 to 6") stubble/silage cut, and long fallow period makes the system inefficient in conserving soil and water resource and hence unsustainable. We hypothesized that increasing corn cutting height and decreasing row spacing has potential to conserve soil and water, increase forage quality with minimum penalty on forage yield. A two years project supported by NRCS-CIG was initiated in 2017 to examinee and demonstrate this modified forage cropping system and its adaptability to producers as a strategy to improve the production system and resource use and conservation. Specific objectives are: evaluate corn forage cutting height (6" vs. 18") and row spacing (15" vs. 30") effect on forage yield and quality; assess soil quality, soil moisture and wind dynamics under the different cutting height-row spacing treatments. The project was established in spring of 2017 in dairy producer's field near Clovis, NM under a half-circle center pivot irrigation. The area involves seven spans encompassing two corn row spacing, cutting height, and cover cropping (Rye-Austrian winter pea mixture) treatments. Soil quality, forage yield and quality are/will be assessed. Soil and forage samples processing is underway and results including forage yield and microclimate will be ready for discussion at the meeting. With tall stubble, narrow row spacing, and cover crop integration, more plant residue is expected potentially resulting in better soil coverage, improvement in soil conservation and moisture retention, carbon sequestration, and in overall improvement and sustainability of forage corn production and dairy farming systems and rural economies in New Mexico.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Successful Watershed Management: Getting to Scale

Authors: Rebecca Power*, University of Wisconsin; Amulya Rao Ponna Vishweshwer, University of Wisconsin-Extension

Abstract: After decades of experience and research in watershed management, a lot is known about developing and implementing successful watershed initiatives. However, to achieve societally agreed-upon water quality goals, we need strategies for moving from small pockets of success to more comprehensive watershed management systems that can thrive over time and cover larger geographic areas. This presentation will 1) provide some foundational perspectives on “getting to scale” in watershed management in the Upper Midwestern United States; 2) articulate necessary elements of successful, nested watershed management models at local, state, and multistate scales; and 3) discuss strategies for increasing adoption of these necessary elements. Our conclusions draw upon reviews of academic and empirical studies, and the contributions of watershed professionals in the non-government, agency and academic sectors.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

Supporting Biodiversity in Organic Systems

Authors: Ben Bowell*, Oregon Tilth

Abstract: Organic production is continuing to grow: according to USDA NASS, certified organic acres in the US increased 15% from 2015 to 2016 (most recent figures available). As organic production increases, natural resource conservation professionals will have more opportunities to work with these systems. While this growth is occurring, organic certifiers have recently placed an increased emphasis on natural resource and biodiversity. This presentation will discuss how NRCS, conservation districts and others can assist organic producers in conserving natural resources and complying with organic regulation. In 2016, the USDA National Organic Program issued guidance to expand on regulatory language that requires organic operations to "maintain or improve the natural resources of the operations." The guidance discusses a range of topics including soil composition, soil stability, water quality, water quantity, wildlife, native species, and natural areas. Many organic certifiers have since revised their paperwork (Organic System Plans) and increased the importance placed on biodiversity and natural resources in inspections. The guidance and new focus has created many opportunities for conservation agencies and professionals to support organic producers. This presentation will discuss these changes to certification paperwork and processes. The session will focus on the technical support producers are seeking such as how to design buffer areas, increase crop diversity, protect water and riparian areas from livestock, and establish wildlife and pollinator habitat.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation in Organic, Specialty, and Small-Scale Agriculture

**Denotes primary author and subject area*

Supporting Pollinators with Agroforestry Practices

Authors: Gary Bentrup*, USDA National Agroforestry Center; Jennifer Hopwood, Xerces Society for Invertebrate Conservation; Mace Vaughan, Xerces Society for Invertebrate Conservation; Nancy Adamson, Xerces Society for Invertebrate Conservation; RaeAnn Powers, Xerces Society for Invertebrate Conservation

Abstract: Pollinators, especially bees, are facing many threats, from loss of habitat and food resources to pesticide exposure. These threats are often intensified by an ecosystem where pollinator services are often needed – agricultural lands. Agroforestry can play a central role in the creation and conservation of critical pollinator services, especially in organic, specialty, and small-scale agricultural and forest systems. With proper selection of species and design criteria, agroforestry practices can provide pollinator services in addition to other ecosystem goods and services. This presentation summarizes the scientific literature on the benefits and potential issues of using agroforestry to support pollinator conservation and services within temperate regions. Agroforestry practices can offer sources of pollen and nectar, particularly when other sources may be scarce, resin for honey bees to form propolis, and stable nesting and larval habitat in frequently-disturbed agricultural landscapes. Windbreaks and other practices can reduce windspeeds in fields, minimizing the desiccation of floral resources while also allowing pollinators to forage during high wind events that would normally reduce or prohibit foraging. These practices may provide adequate local scale habitats to support short distance foragers and increase crop pollination. When appropriately designed, these practices can help reduce pesticide drift and exposure to pollinators. Emerging research suggests that agroforestry practices might offer more resilient habitats needed to cope with climate change and may enhance landscape connectivity to facilitate pollinator range shifts.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation in Organic, Specialty, and Small-Scale Agriculture

**Denotes primary author and subject area*

Sustainability Training in Agricultural Resource Systems (STARS): A Train-the-Trainer Model for Agriculture and Natural Resources Professionals

Authors: Beth Baker*, Mississippi State University; Leslie Burger, Mississippi State University

Abstract: In the wake of a growing global population, worldwide crop demands are forecasted to increase, requiring agriculture industries to intensify production efforts, which results in additional pressure on natural resources in agricultural regions around the world. This issue is of paramount concern in Mississippi, as agriculture is the leading industry, generating billions of dollars in annual revenue and providing quality of life for producers. Intensive agriculture production also contributes to persistent water quality and soil degradation in the region. Mississippi State University Extension Service faculty, in collaboration with agriculture service providers, and key producers, developed and implemented Sustainability Training in Agricultural Resource Systems (STARS), a multidisciplinary professional development program for agricultural and natural resources (ANR) educators. The program aimed to equip professionals with relevant training and support resources on sustainable agriculture and natural resources conservation, as professionals tasked with serving farmers are often unprepared to assist producers. This program was developed to: (1) Provide instruction on natural resources conservation and sustainable agricultural practices, programs, and tools to Extension Service personnel through workshops and field demonstrations; (2) Test and refine an educational model developed that can be adapted to address professional development needs of a broad spectrum of professionals; (3) Produce internet-ready materials for use by ANR professionals, educators, and producers. Program outcomes include increased ANR agent knowledge and confidence to effectively respond to agricultural clients' needs for information on sustainable agriculture and natural resources practices. This program provides a successful professional development model for a broad spectrum of Extension personnel amongst fluctuating science and policy surrounding conservation practices and programs.

Track: 2018 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**Denotes primary author and subject area*

Targeting Conservation practices in an International Watershed Using PTMApp

Authors: Jason Vanrobaeys*, Agriculture and Agri-Food Canada ; Chuck Fritz, International Water Institute

Abstract: Governments and farmers alike are trying to do more with less. As a result, there is a growing need to ensure that publicly funded conservation practices achieve the desired results. Practices intended to improve water quality in rivers and lakes are no exception and considerable funding has been directed toward increasing their adoption. However, in many cases these practices do not appear to be having the desired effect, especially as you move downstream in a watershed or major river basin. This has stimulated the development and application of new technologies to help understand and predict the impact of conservation practices at a variety of scales. One such tool is PTMApp [Prioritize (P), Target (T), and Measure (M) Application (App)], designed to guide the implementation of practices with the objective of improving water quality in agricultural watersheds. The PTMApp solution and framework assists with prioritizing resources and issues impacting them, targets specific locations for effective conservation practices, and measures or predicts the expected reduction in sediment and nutrient loads. In 2017, government and non-government agencies from the United States and Canada agreed to work together to assemble and harmonize the required input data in the international Roseau River Watershed that straddles the State of Minnesota and Province of Manitoba. This presentation is not a tutorial on how to use the App, instead it will provide insights into how the App works, the methods to harmonize the U.S. and Canadian input data, the challenges faced along the way, and summarize how the application can be used to guide future conservation funding and strategies in this region.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

The Potential of Cover Crops to Alleviate Extreme Weather Events in Agriculture

Authors: Francisco Arriaga*, University of Wisconsin-Madison

Abstract: Extreme weather events have been identified as an increasing risk to crop production in the future. The severity of certain weather events, such as drought and rainfall intensity, has increased in recent years. These fluctuations affect soil functions and plant behavior. Therefore, management strategies need to be identified to help lessen the impact of weather fluctuation on food production. Cover crops can help mitigate some of these effects under certain conditions and environments in the US. For example, above-ground residue produced by cover crops can help reduce erosion risks or serve as a mulch to decrease plant canopy temperatures during hot weather. This presentation will go over the potential benefits and challenges of using cover crops to alleviate extreme weather events in crop production.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

The Unintended Consequences of Rangeland Water-Conservation Structures

Authors: Mary NIchols*, USDA-ARS Southwest Watershed Resear

Abstract: By the 1930's vast areas of the western US were severely degraded and in need of attention to address the problems of overgrazing and erosion. As a result, Congress authorized conservation work including the construction of water storage, distribution, and conveyance structures. Thousands of structures, such as check dams, earthen berms, water spreaders, and contour furrows were built to control water and sediment. However, across most of the western US there was a lack of hydrologic data and technical information available to design soil and water conservation practices. Many of the available conservation practices were untested for use in semiarid areas that are characterized by highly variable rainfall and flash floods, and many structures proved ineffective and subsequently were abandoned. Currently many of these abandoned structures are exacerbating erosion problems. We selected four sites in Arizona, USA where soil and water conservation structures have induced concentrated water flow and gullying, and we analyze these structures to quantify the multi-decadal geomorphic impacts of rangeland soil and water conservation structures. This study emphasizes the unintended legacy impacts of conservation structures and highlights their role as a constraint on contemporary resource management.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

Tillage and Nitrogen Rates Influenced Soil Chemical Properties and Productivity

Authors: Maysoon Mikha*, USDA-ARS; Augustine Obour, Kansas State University; Holman Holman, Kansas State University

Abstract: Reduced tillage (RT) or no-tillage (NT) and reducing fallow frequency have become practices that decrease soil losses from wind erosion and conserve soil water in central and western regions of the USA. This study evaluated soil organic matter (SOM), soil nutrient content (P and K), and sorghum grain yield in 2013 and wheat grain yield in 2014 as influenced by long-term nitrogen (N) fertilizer application at rates of 0, 20, 40 and 60 lb N ac^{-1} and tillage [clean tillage (CT), RT, and NT] in dryland winter wheat–sorghum-fallow (W-S-F) cropping system. Soil organic matter and soil nutrient content (P and K), were evaluated at depth of 0-3 and 3-6 inches. Across tillage and N-rates, SOM was greater at depth of 3-6 inches compared with the 0-3 inches and soil P was significantly greater at the 0-3 inch depth compared with the 3-6 inches depth, but soil K level was not influenced by the specific depth studied. The reduction in soil P was probably related to grain nutrient removal throughout the years without external P input. Grain sorghum yield in 2013 and winter wheat yield in 2014 were increased with increasing N fertilizer rates. In general, nutrient additions, particularly P may eventually be needed in subsequence years to restore soil nutrients and compensate for nutrients removal by sorghum and wheat grain yields.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Toward Operational Remote Sensing of Public Land in Southeastern Arizona

Authors: Philip Heilman*, USDA-ARS SWRC; Guillermo Ponce, USDA-ARS SWRC

Abstract: Rangelands in the West are predominantly managed as public land. The Bureau of Land Management and US Forest Service are the largest land managers in the 11 western states with 42% of the land. Declining budgets and increasing workloads have reduced monitoring of public lands. Public land managers need tools to identify problem areas within allotments, problem allotments, and to recognize and reward lessees providing exemplary stewardship. Remote sensing should be a useful tool, but inherent productivity varies with soil and water dynamics across the landscape. Further, spatial and temporal variability of rainfall will also affect vegetation, so it is difficult to interpret remote sensing products as indicators of management. The method proposed here assumes that more vegetation is better than less, and that the annual maximum value of the Normalized Difference Vegetation Index (maxNDVI) from Landsat adequately represents peak vegetation production from each pixel. We modeled maxNDVI using gridded climate variables, landscape position, aspect, and fire as explanatory variables. Both linear regression (R^2 = 0.46) and Random Forest (R^2 = 0.80) were used to model expected maxNDVI for each Landsat pixel across a 48,500 km^2 area in southeastern Arizona. The interpretation that a higher maxNDVI provides information beyond production was supported by regressing field measured values of canopy cover, basal and litter ground cover, and bare earth against maxNDVI using 164 field observations from a ranch in southeastern Arizona. In all cases the slope was significant at the 0.05 level, though the amount of variability explained was low at 37, 14, and 4 percent, respectively. We anticipate that public land managers can use maps of the difference between the estimated and observed maxNDVI, in conjunction with high resolution aerial photography, by focusing limited field monitoring resources to better understand management impacts, relative to other managers with similar inputs.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author and subject area*

Tree & Shrub Selection Guide for Conservation in the Great Plains

Authors: Gary Bentrup*, USDA National Agroforestry Center

Abstract: The USDA National Agroforestry Center has developed an online plant selection guide to help planners select better species of trees and shrubs to achieve a suite of user-defined conservation purposes. In this tool, over 90 species of trees and shrubs are rated for 14 different conservation purposes in the northern and central Great Plains. Purposes rated in this guide include: 1) alley cropping, 2) aquatic habitat, 3) carbon sequestration, 4) flood protection, 5) native ecosystem restoration, 6) particle drift reduction, 7) pollinator habitat, 8) polluted runoff treatment, 9) streambank stabilization, 10) storm & wastewater treatment, 11) wetland restoration, 12) wildlife habitat, 13) visual aesthetics, and 14) view & noise screen. “Higher-rated” species of trees and shrubs are those that function relatively better than other species for specific purposes. Ratings were developed by considering geographic suitability of each species for 12 different sub-regions and plant characteristics that make a species relatively better (or worse) for each specific conservation purpose. The online guide enables the user to quickly develop a short list of the better species to use which can be refined based on suitability under local site conditions, commercial availability, and availability of locally-adapted cultivars and hybrids. This tool may serve as a template for developing multi-purpose woody plant selection guides for other regions.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Turf Replacement Program Evaluation

Authors: Melissa Matlock*, WMWD

Abstract: Background: Starting in 2009, Western Municipal Water District offered its retail customers an opportunity to participate in a Turf Replacement Program. The Turf Replacement Program was designed to help customers offset the costs associated with converting turfgrass to a climate appropriate landscape. A goal of the Turf Replacement Program was to invest in long-term solutions to reduce overall water use in Western's service area. Results: From 2009-2015, two hundred and twenty-seven (227) retail customers participated in Western's Turf Replacement Program. Before and after analysis was conducted on one hundred and ninety-three (193) of these customers. For one year before starting the program, the average annual water usage was 507.8 HCF (1.17 AF) for the 193 participating customers. For one year after each customer participated, we see an average water usage of 369.3 HCF (.85 AF). This average reduction of water usage per person (138.5 HCF ~ .32 AF) is statistically significant at the .01 level (paired t-test, T=9.797, p<.0001). When comparing the differences in usage between the program participants and the control group (difference in difference approach), we see that the difference in usage (after-before) is statistically significant between the two groups (t-test unequal variances, T= -5.655, p<.0001). We are 99% confident that the difference in water usage among the participants is significantly lower than their neighbors. Conclusion: Using the results of the T-tests, we can determine that the Turf Replacement Program did have a significant impact on water use reduction efforts, achieving the goal of the program with an average water use reduction of 27% per customer.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Updating the Curve Number Method for Rainfall Runoff Estimation

Authors: Richard Hawkins, Emeritus U of Arizona; Tim Ward*, Manhattan College; Donald Woodward, Retired NRCS

Abstract: The USDA Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) curve number (CN) method for estimating runoff depth from rainfall depth is a ubiquitous technique that is used worldwide in a variety of applications. Since the creation of the CN method over 60 years ago, it has undergone numerous analyses on both practical and theoretical grounds. Although originally intended to model runoff depth from rainfall design storms on small agricultural and rangeland watersheds, it has been applied to a wide variety of conditions from green roofs to continental scale river basin runoff. Recently, a joint ASCE-ASABE volunteer work group, comprised of 16 members and co-chaired by the three authors of this presentation, delivered a set of suggested revisions and updates on the CN method to the NRCS. This presentation will summarize the suggested revisions and updates. Included in the presentation are how to determine when the CN method is appropriate for the watershed to be analyzed, techniques for estimating CN values from rainfall and runoff data, and how to apply a different (from the historical CN method version) relationship between initial abstraction, Ia, and CN. The presentation is intended to inform and solicit feedback from the audience on the suggested revisions and updates to this widely used methodology.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

US Military Exemptions from environmental permitting and regulation

Authors: Kurt Smith*, Methodist University

Abstract: The US Military would equal and surpass many of the worlds economies. Yet the are exempt or can gain exemptions from many environmental laws and regulations. The US military has often been one of the largest polluters of our land and water. Exemptions and the ability to gain exemptions exist for the military from the Clean Water Act, The Clean Air Act, the Safe Drinking Water Act, the Endangered Species Act, and the Resource Recovery and Conservation Act to name a few. My paper and oral presentation will explore these exemptions, the reasoning behind them, and will enhance the natural resource professionals understanding of them.

Track: Forest Restoration: Research, Policy, and Applied Science of Ecological Restoration across Landscapes and Watersheds

**Denotes primary author and subject area*

Using Ecological Sites and State and Transition Models on a Nebraska Farm

Authors: Michael Kucera*, USDA-NRCS

Abstract: The use of Ecological Site Information, and State and Transition Models (STMs) in the 9 Step Conservation Planning Process will be discussed on a Nebraska farm. The connection will be made to client objectives and ecological based processes, and results from applying conservation management systems/practices that can be conveyed through STMs. The farm includes range, pasture and crop land uses. STMs apply to all land uses and can detail transitions between states that include information about conservation practices, and adaptive management concepts utilized on the farm that achieved desired resource conditions. The focus will be on STMs for cropland that include states/phases that depict before and after conditions and pathways that detail conservation practices/adaptive management and their impact on soil resiliency to counter extreme weather variability. Impacts of applying a soil health management system will be discussed within the context of a STM and transition pathways that depict effects of changes in management and climate on dynamic soil properties (e.g. soil physical properties, soil organic matter) and productivity.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Using Low Organic Matter Soils to Compare Conventional Soil Organic Carbon Measurements

Authors: Wayne Roper*, North Carolina State University; Deanna Osmond, North Carolina State University; Joshua Heitman, North Carolina State University; Wayne Robarge, North Carolina State University; Michael Wagger, North Carolina State University; Chris Reberg-Horton, North Carolina State University

Abstract: The beneficial ecosystem services provided by soil organic carbon (SOC) make it a major factor in soil health management. Different techniques have been developed to measure SOC, but it remains uncertain how results from different procedures can be compared when making soil management decisions. To compare different procedures for measuring SOC, we used soils from long-term (16-31 yr.) agronomic trials in the coastal plain, piedmont, and mountain regions of North Carolina. The coastal plain and mountain trials included combinations of tillage and management (conventional vs. organic), whereas piedmont trials were configured to evaluate tillage intensity. In total, 84 soils were used in the analysis. Soil was collected from the top 15 cm and homogenized to fit a 2-mm sieve before analysis. Methods used to measure SOC were Walkley-Black (WB), mass loss on ignition (LOI), and automated gas chromatography (AGC). Correlations between SOC measured using different procedures were weak, and less than 30% of the variation could be explained for either correlation ($r2 < 30$). Separate analyses for individual trials did not significantly improve relationships between different procedures. Conversions of SOC measured by one procedure to SOC measured by another procedure could be off by as much as 1.6-2.8 g C kg^{-1}, which is a significant amount for soils with less than 20 g C kg^{-1} (2% SOC). Also, LOI and AGC were more sensitive to differences in agronomic management than WB. It is difficult to compare values of SOC because results from one technique are not predictive of results from another. Our data show that measured effects of tillage and management vary based on procedure. To avoid confusion about how agronomic management affects SOC, continued assessments of SOC should only compare results from a common SOC measurement procedure.

Track: 2018 General Conference Theme Submissions

Subject Area: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author and subject area*

Using the New Farms Under Threat Comprehensive Agricultural Inventory to Inform Policy

Authors: Ann Sorensen*, American Farmland Trust

Abstract: Very few states have the capacity to map and analyze their agricultural resources and even fewer map their relative importance or document agricultural lands converted to development over time. American Farmland Trust and Conservation Science Partners in May 2018 released a comprehensive inventory of the nation's agricultural lands (Farms Under Threat: The State of America's Farmland) and found the conversion of agricultural lands at the national level between 1992 and 2012 averaged 1.5 million acres lost per year. We used land cover/use classes consistent with the National Resources Inventory (NRI) data, augmented with data from several other national databases and validated results directly again NRI data. We assigned values to agricultural land based on productivity, versatility and resilience to support intensive food and crop production to better understand the quality of land lost. Because we also investigated conversion from low-density residential development which other national databases missed and included woodlands associated with farms, we found significantly more conversion than previously thought (via the NRI). We are now analyzing the data within each state and evaluating state policies to protect farms and farmland from unnecessary development. We are also starting to model development and climate change threats out to 2040 to inform the policy and conservation actions of communities so that they are positioned to produce an adequate supply of food, fiber and energy for an expanding population. We will discuss how to use these data and analyses to improve policies targeted at farmland protection, climate change, and conservation. Given the variety of opportunities to extend the analysis of this unique and multi-faceted database, we encourage participants to bring forward ideas and suggestions for additional valuable analyses of Farms Under Threat.

Track: Using Technology to Advance Conservation

**Denotes primary author and subject area*

Water Rights and Fights, Lao PDR Dams on the Mekong River

Authors: Kenneth Olson*, University of Illinois; Lois Wright Morton, Iowa State University

Abstract: The Mekong River is one of the world's most diverse and unique major rivers with a flood pulse that drives an extensive and productive ecological system. However, the capacity of the Mekong River basin to sustain fishery resources and upland and riverbank agriculture that provide food security and livelihoods for the people of Lao PDR is now being compromised by competing economic, ecological, and political interests. Development projects such as dam construction on the Mekong River and tributaries to support a booming hydropower industry are bringing great change to ecological, agricultural and cultural systems in this region. Traditional fishing and agricultural systems are affected when dams submerge narrow floodplains and disrupt the timing and volume of river flows. As a result, dam building on the Mekong River main stem has become a source of uncertainty and unease in local river communities and has led to geographic and national unrest and conflicts. Dams are only one of many threats to the sustainability and resilience of the river. A changing climate, deforestation of uplands, and irrigation needs of a growing population are other difficult issues the governments and peoples of the region must address. As a transboundary river, management decisions by one country inevitably reverberate throughout Southeast Asia. The MRC is a critical institution that all SE Asia countries must respect and re-empower to negotiate and balance the many competing interests. One of the MRC's major tasks will be to mitigate the negative impacts of dam building while realizing the benefits.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

Water Use Efficiency of Winter Canola under Different Limited Irrigation Approaches

Authors: Paramveer Singh*, New Mexico State University; Sangamesh Angadi, New Mexco State University; Sultan Begna, NMSU; Brian Schutte, New Mexico State University

Abstract: Limited water availability is challenging semiarid agriculture all over the world. In the Southern High Plains, declining Ogallala aquifer is threatening sustainability of irrigated agriculture. There is a need to diversify the current cereal dominated cropping system to improve efficiency of using limited water and sustain the Ogallala aquifer longer. Winter canola, is a relatively new broad leaf crop in the region that can offer a number of rotational benefits. The focus of the research was to assess a way of reducing irrigation water application to winter canola that is least harmful to productivity. A split-split experiment with four replications was conducted with pre-season irrigation level as main plots (with or without preseason irrigation simulating empty or full soil profile) and four growth stage based irrigation treatments (Irrigated [Irr], No irrigation at vegetative stage [VStss], No irrigation after flowering [Rstss] and rainfed after establishment [Rfd]) as sub plots. Three canola cultivars (Hekip, Riley and DKW-46-15) were sub-sub-plots. Winter canola seed yield was higher in all pre-irrigated treatments compared to no-pre-irrigated treatments, indicating canola used its tap root to extract soil moisture to help seed yield formation. If canola was pre-irrigated, skipping irrigation at vegetative stage (VStss) reduced seed yield only by 4%, and skipping irrigation after flowering (RStss) reduced seed yield by 32%. If no-pre-irrigation, then Vstss and Rstss reduced seed yield by 42% and 47%, respectively. Surprisingly, Vstss + pre-irrigation recorded 10% higher yield than Irr + no-pre-irrigation. Among cultivars, Hekip was the best yielding cultivar. Among yield components, pods per plant influenced seed yield more than thousands seed weight and seeds per pod. Thus, first year results showed positive effects of pre-season irrigation. Water can be saved by withholding irrigation during vegetative stage, without much yield loss in winter canola.

Track: 2018 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**Denotes primary author and subject area*

Watershed Assessment Modelling to Identify Critical Sources of Pollution and Evaluate Effectiveness of Conservation Management Practices

Authors: Nichole Embertson*, Whatcom Conservation District; Megan Harris, Whatcom Conservation District; Andrew Phay, Whatcom Conservation District; Aneka Sweeney, Whatcom Conservation District

Abstract: Critical watershed assessments allow land managers to create strategic plans and prioritize funding and technical assistance when resources are limited. The Natural Resources Conservation Service (NRCS) National Water Quality Initiative (NWQI) provides a framework for watershed assessment to support long-term watershed planning and prioritize resources. The Tenmile Watershed in the in Whatcom County, WA was selected as a pilot watershed for the NWQI assessment in 2017. The primary objective of the assessment was to identify critical source areas (CSAs) within the watershed that were most susceptible to nutrient, sediment and bacteria export based on physical (terrain) features and land use. Secondary objectives were to model the effectiveness of conservation practices within CSAs and create an outreach plan with social indicators survey for maximum engagement of landowners in the watershed improvement process. NOAA's open-source Nonpoint Source Pollution and Erosion Comparison Tool (OpenNSPECT) was used to identify CSAs. Spatial data representing terrain features, precipitation and land use cover within the watershed were collected, aggregated and input into the model. The model identified CSAs for N, P, pathogens, and sediment, as well as a combined ranking. OpenNSPECT was then used to model the effects of implementation of different conservation practices on pollutant reduction. For example, the implementation of winter cover crops on agricultural fields showed reduction of N and P into the watershed by 92% and 79%, respectively. The social indicators survey highlighted practices with greatest potential for adoption and barriers to others. This assessment process can be used in any watershed to help understand where CSAs are located and how land conservation practices reduce pollutants, helping NRCS and local partners prioritize location and land use (farm, residential, etc) for conservation practice implementation, including cost-share and technical assistance.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Watershed Restoration following Wildfire: A Case Study From the Manzano Mountains, New Mexico

Authors: Cody Stropki*, SWCA Environmental Consultants; Victoria Amato, SWCA Environmental Consultants; David Lightfoot, SWCA Environmental Consultants

Abstract: The Manzano Mountains, located in Central New Mexico, have experienced four large wildfires in recent years which have impacted over 44,000 acres of mixed conifer, ponderosa pine, and piñon-juniper habitats. Three fires occurred in 2007-2008 (Ojo Peak, Trigo, and Big Springs) with the fourth occurring in the summer of 2016 (Dog Head). These large wildfires have altered the landscape of the Manzanos and the associated ecosystems through damage, disruption, and in some cases the complete destruction of the watershed functioning. This talk will focus on the different restoration measures that have already been implemented in stream channels as well as on hillslopes across the different burn scars. A mixture of repeat photography and quantitative data were used to analyze the restoration techniques. The ability to understand the effectiveness of the different restoration techniques whether positive or negative, is critical in gaining insight into the post fire recovery process of watershed functioning across an elevation gradient in a changing climate.

Track: Forest Restoration: Research, Policy, and Applied Science of Ecological Restoration across Landscapes and Watersheds

**Denotes primary author and subject area*

Websim—Cloud-Based Tools for Estimation of Soil Loss for Conservation Planning

Authors: Dalmo Vieira*, USDA - Agricultural Research Service; Brandon Sims, Arkansas State University; Robert Wells, USDA-ARS; Daniel Yoder, University of Tennessee, Knoxville

Abstract: Soil erosion in agricultural fields is highly variable as it is driven by local topographic features that determine how runoff accumulates over the landscape. It is highly desirable, therefore, to have erosion estimates that cover entire fields or farms when planning the type and placement of erosion control measures. Websim is a web portal and a compute resource platform that provides four general services: graphical interfaces including interactive maps; databases, models and data processing tools; and high-performance cloud computing resources. Websim's first application uses the two-dimensional erosion model RUSLER-D to compute rill and interrill erosion and EphGEE as the Ephemeral Gully Erosion Estimator. RUSLER-D is a distributed version of RUSLE2 that computes erosion over a large area by subdividing it into 2D hillslopes using surface drainage, and performing calculations on hundreds of hillslopes simultaneously. Terrain elevation, land use and soil types are inputs retrieved from databases as raster layers. Runoff and sediment loads computed with RUSLER-D are used to determine the development of ephemeral gullies using EphGEE. EphGEE assumes gully channels of rectangular shape that grow with each storm event. Tillage typically refills all gullies. Websim's interface provides maps and imagery that support the definition of the area of interest and the location of crop areas, while the data describing crops and operations are selected from the RUSLE2 database. Websim instantiates pre-configured virtual computers that contain RUSLER-D and EphGEE. Websim also provides tools for visualization and analysis. Detailed maps of soil erosion, including the location of ephemeral gullies, are shown in an interactive map. This application shows how new methodologies can extend both the range of applicability and the usefulness of existing tools. The inclusion of ephemeral gully development, which is not included in RUSLE2, makes erosion estimations more realistic.

Track: 2018 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**Denotes primary author and subject area*

Who Has the Power? – Implications for Conservation Behavior on Rented Farmland

Authors: Pranay Ranjan*, Purdue University; Linda S. Prokopy, Purdue University

Abstract: Prior research in the western Lake Erie basin indicates that conservation practice adoption may hinge on farmers' beliefs that the recommended practices are effective, and easy to implement. These efficacy-related beliefs are a predictor of adoption across several critical conservation practices related to water quality, including cover crops, subsurface placement of fertilizer, and timing of fertilizer application. Specifically, we find that an individual farmer is up to 10 to 15 times more likely to already have one of these practices in place when their levels of efficacy increase from low to high. Although these findings suggest that building efficacy may be key to increasing future adoption, the results are purely cross-sectional and correlational. We must now work to understanding how to increase these efficacy-related beliefs among the farming population, and assess the extent to which increased adoption actually results from a change in efficacy. To this end, we report the results of several studies aimed at answering these questions. The first is a set of experiments assessing the efficacy-increasing impact of standard forms of communication and outreach. Specifically, we assessed changes in efficacy among individuals 1) attending a field day as part of a demonstration farm network, and 2) viewing a two-minute 4R educational video created by The Nature Conservancy. The results of these two analyses provide evidence of the efficacy-increasing impact of current outreach. The second is a panel survey of farmers assessing their changes in efficacy and practice adoption over time. The results of this study provide evidence among a representative group of farmers if adoption is increasing, and to what extent this change in adoption over time is a function of increased efficacy. The results from each study will be discussed, and recommendations for improving efficacy-building interventions in the future will be discussed.

Track: 2019 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**Denotes primary author and subject area*

Wildflower Growth Response to Construction Site Soil Conditions

Authors: Abigail Haselton*, NC State; Shaddy Alshraah, NC State; Richard McLaughlin, NCSU Crop and Soil Sciences; Joshua Heitman, North Carolina State University; Danesha Carley, NC State

Abstract: Reducing the impact of stormwater runoff from roads, roofs, and other impervious surfaces is often achieved through detention basins, constructed wetlands, and similar practices. Another option is to route runoff into vegetated areas to infiltrate at least a portion of the water. While roads are often bordered by grassed areas, there has been increased interest in planting wildflowers in some of those areas as pollinator habitat and for aesthetic appeal. The effect of soil condition on wildflower growth, and conversely, the effect of wildflowers on infiltration into soil, was the subject of this study. Three wildflower species, California poppy (*Eschscholzia californica*), lanceleaf coreopsis (*Coreopsis lanceolate*), and partridge pea (*Chamaecrista fasciculate*), were tested in a greenhouse experiment to determine how their growth responded to compaction. Pots were filled with a sandy loam subsoil, similar to soils found along North Carolina roadsides, and compacted to bulk densities of 1.15 gcm^{-3} and 1.35 gcm^{-3}. The plants were started from seed and harvested on two dates: a common date for all species (39 days) and a second date corresponding to reproductive maturity for each species (75-118 days). At harvest, all above ground and below ground plant parts were collected separately. For comparison, the same plants were also grown in a potting soil mix as an "ideal" condition for growth. Preliminary results indicated that increased bulk density had a slightly positive influence on shoot and root dry mass in one species. Surprisingly, the plants grew more vigorously in the soil than in the potting mix.

Track: 2018 General Conference Theme Submissions

Subject Area: Water Resource Assessment and Management

**Denotes primary author and subject area*

POSTER PRESENTATIONS

SOIL® AND WATER CONSERVATION SOCIETY

Poster Number: 1

Pollinator Habitat Seeding in Susex County, Virginia

Authors: Robert Glennon*, Virginia Tech

Abstract: A Pollinator Habitat Seeding was established in the spring of 2015 in Sussex County, Virginia. The landowners utilized the Conservation Reserve Program administered by the USDA, Farm Service Agency to finance the seeding. A private lands biologist from Virginia Tech serving the clients of the USDA, Natural Resources Conservation Service, designed the seed mixture and recommends management. The buffer was 16 acres in size. The seed mixture was comprised of showy evening primrose, Indian blanket, black-eyed susan, plains coreopsis, lanceleaf coreopsis, wild bergamot, partridge pea, Maximilian sunflower, and bearded beggarticks. The mixture was 11% of each of the species by the numbers of seeds per square foot. The total number of seeds per square foot was 45. The stand has maintained its species balance through two growing seasons. It has never been limed or fertilized, annual weeds were clipped during the first growing season, grass weeds were treated with a grass herbicide early in the second growing season. The landowner mows the stand every March. The stand and the surrounding forests and cropland supports quail, grassland songbirds, and pollinating insects. The poster will present the seed mixture, establishment process, management, and photographs of the stand through the years.

Track: Adaptive Management of Conservation Efforts

**Denotes primary author*

Poster Number: 2

Resistance Is Futile…or Is It? Do Plant-Soil Feedbacks Promote Lehmann Lovegrass to the Detriment of Blue Grama?

Authors: Sherri Buerdsell*, NMSU; Brook Milligan, NMSU; Donovan Bailey, NMSU; Erik Lehnhoff, NMSU

Abstract: Lehmann lovegrass (*Eragrostis lehmanniana*) is an aggressively invasive plant of the southwestern United States. Originally from South Africa, this warm season perennial grass was introduced to North America in the 1930's to revegetate degraded lands, improve rangeland forage quality, and promote soil stabilization after anthropogenic soil disturbances. While the northern Chihuahuan desert has historically been resistant to invasion, lovegrass has recently invaded and increased on parts of the Jornada Experimental Range (LTER-VI) and around Las Cruces, NM. To evaluate the effect of invasion age on Lehmann lovegrass plant-soil feedbacks and interspecific competition between Lehmann lovegrass and blue grama (Bouteloua gracilis), rhizosphere soil samples collected from Lehmann lovegrass stands of various ages were used as inoculum in a greenhouse experiment. The experiment consisted of a conditioning phase where Lehmann lovegrass was grown to allow proliferation of the soil microbiota and a response phase where Lehmann lovegrass and blue grama were grown in competition with a replacement series experimental design. It is predicted that conditioning will result in a competitive advantage for Lehmann lovegrass that is directly proportional to the ratio of Lehmann lovegrass to blue grama plants. This would indicate the potential for Lehmann lovegrass to modify the soil environment as an invasion component that would need to be overcome for ecosystem restoration. The results of this research will increase knowledge of the mechanisms that influence Lehmann lovegrass population expansion and elucidate how Lehmann lovegrass legacy effects may influence restoration success.

Track: Adaptive Management of Conservation Efforts

**Denotes primary author*

Poster Number: 3

Understory Composition of a Restored Longleaf Pine Stand

Authors: Robert Glennon*, Virginia Tech

Abstract: The area of longleaf pine has decreased from 90 million acres to 3 million acres over the past 320 years. There are efforts on multiple fronts to restore longleaf pine in the southeastern United States. The motivation for the restoration is the restoration of the entire ecosystem, which includes an herbaceous understory maintained by prescribed fire and a suite of wildlife species dependent on that herbaceous understory. The typical understory grass throughout the range of the ecosystem is wiregrass (*Aristida stricta*). Southeastern Virginia is north of the range of wiregrass. However, there is a wide variety of grasses, forbs, vines, and shrubs that occur in association with longleaf pine. The grasses include velvet panicgrass (*Dichanthelium scoparium*), variable panicgrass (*Dichanthelium commutatum*), needleleaf rosettegrass (*Dichanthelium aciculare*), purpletop (*Tridens flavus*), broomsedge (*Andropogon virginicus*) and purple lovegrass (*Eragrostic spectabilis*), and hairawn muhly (*Muhlenbergia capillaris*). The forbs include lespedeza (*Lespedeza* spp.) and beggarweed species (*Desmodium* spp.). Vines include muscadine grape (*Vitis rotundifolia*), roundleaf greenbrier (*Smilax rotundifolia*), and poison ivy (*Toxicodendron radicans*). Shrubs include winged sumac (*Rhus copallina*) and scrub oak (*Quercus ilicifolia*). The poster will summarize the results of transects on a forest converted from loblolly pine to longleaf pine with well-drained Uchee loamy sand in Sussex County, Virginia in 2010. The longleaf planting was an effort involving The Nature Conservancy, U.S. Fish and Wildlife Service, USDA, Natural Resources Conservation Service, Virginia Department of Forestry, and Virginia Department of Game and Inland Fisheries.

Track: Adaptive Management of Conservation Efforts

**Denotes primary author*

Poster Number: 4

Upland Bird Habitat Buffer in Sussex County, Virginia

Authors: Robert Glennon*, Virginia Tech

Abstract: An Upland Bird Habitat Buffer was established in the spring of 2014 in Sussex County, Virginia. The landowners utilized the Conservation Reserve Program administered by the USDA, Farm Service Agency to finance the seeding. A private lands biologist from Virginia Tech serving the clients of the USDA, Natural Resources Conservation Service, designed the seed mixture and recommends management. The buffer was 18 acres in size, 120 feet wide and 6,534 feet long around all of the cropland on the property. The seed mixture was comprised of little bluestem, black-eyed susan, plains coreopsis, lanceleaf coreopsis, partridge pea, and Maximilian sunflower. The mixture was 50% little bluestem and 10% of each of the other five species by the numbers of seeds per square foot. The total number of seeds per square foot was 45. The stand has maintained its species balance through four growing seasons. It has never been limed or fertilized and was disked after the second growing season to encourage re-seeding of the annual species. The landowner mows the stand every March. The stand and the surrounding forests and cropland supports quail, grassland songbirds, and pollinating insects. The poster will present the seed mixture, establishment process, management, and photographs of the stand through the years.

Track: Adaptive Management of Conservation Efforts

**Denotes primary author*

Poster Number: 5

Community-to-Farm Organic Waste Utilization

Authors: Emily Creegan*, NMSU

Abstract: Globally, organic materials account for a significant portion of land filled or incinerated waste. Organic waste materials include landscape, animal, human (biosolid) and food waste. Proper compost processing, utilizing organic waste materials, mimics the natural soil organic matter degradation process while reducing potential pathogen loads. Soil organic matter has been shown to increase soil nutrient availability, soil water absorption and retention, and climate change mitigation via soil carbon sequestration. Additionally, diverting organic matter from landfills decreases landfill methane emissions. As a United States Department of Agriculture (USDA) biomass utilization fellow , the focus of this research is centered on developing and analyzing organic waste-to-resource compost programs and assessing biological, program feasibility, and economic modeling parameters. On-farm assessment of the effectiveness of compost program development will account for variability in organic material substrates, community and farm demographics, and regulatory framework. The research will include an economic mass balances and cost-benefit modeling in relation to chemical fertilizer soil management practices and compost program feasibility comparisons. The finished on-farm produced compost product will be integrated into pecan farm soils; soil water availability and soil physical, chemical and biological assessments will be conducted. Extension and case study research will include the development and assessment of the New Mexico State University (NMSU) Skeen Compost Club. The assessment will entail program feasibility, weighing of organic materials diverted from the local landfill, assessment of carbon to nitrogen ratios, and moisture and temperature analyses. A potential addition to the research will include international compost program development feasibility comparisons and analyzation of biomass organic waste substrate availability.

Track: Conservation Economics and Policy

**Denotes primary author*

Poster Number: 6

Economics of Cover Crops on Corn/Soybean Rotations in Minnesota

Authors: William Lazarus, Department of Applied Economics, University of Minnesota; David Wall*, Minnesota Pollution Control Agency

Abstract: Minnesota's 2014 Nutrient Loss Reduction Strategy emphasized the need to dramatically increase cover crop acreages across the state, initially focusing on early-harvest crops while gradually building adoption on grain corn and soybeans. To reach final nutrient reduction goals, Minnesota estimates it will need cover crop success on 60 to 80% of its corn and soybean acres. A recent demonstration project provided insights on the costs and benefits of cover crops on corn grain and soybeans under southeastern Minnesota's climate and soils. Key results included: Erosion concerns justified cover crops on some land even where costs exceeded other benefits. Most producers (9 of 11) reported that cover crops visibly reduced erosion. Cover crops improved soybean yields more than corn, possibly because the cover crop mulch reduced white mold on the soybeans. Soybeans can also be planted before terminating the cover crop, allowing more cover crop growth. One of several scenarios where a cover crop would be profitable ($5/acre) on a corn/soybean rotation is a combination of:

- 5 bushel/acre soybean yield increase due to less white mold
- Soil organic matter increasing 0.1%/year
- Cereal rye cover crop on half of the acres harvested and sold at $60/ton
- 5% yield improvement on 10% of the field due to reduced compaction
- $10/acre reduction in cash costs of erosion repair on 5% of the acres
- No yield reductions from slugs, cereal rye allelopathic effects, cover crop competition for moisture with corn, seed trench closure problems, or delayed main crop planting due to cool soils.

By implementing profitable cover crop scenarios for corn/soybeans, Minnesota could reduce overall Nutrient Strategy implementation costs by more than half the original cost projections.

Track: Conservation Economics and Policy

**Denotes primary author*

Poster Number: 7

Potential Use of Tillage, Crop Residue, and Nitrogen Management for Soil and Water Conservation, Higher Yields, and Increased Economic Returns in Cropping Systems of the Andes

Authors: Jorge Delgado*, USDA-ARS; V. Barrera Mosquera, INIAP; L. Escudero López, INIAP; Y. Cartagena, INIAP; Jeffrey Alwang, Virginia Tech; Richard Stehouwer, Penn State University; Jean Carlos Arévalo, INIAP; Robert D'Adamo, USDA; Juan Domínguez, INIAP; Franklin Valverde, INIAP; Soraya Alvarado Ochoa, INIAP

Abstract: The high-altitude soils of the Andean region of Ecuador are important for the food security in the country. These cropping systems with high slopes and precipitation are susceptible to high rates of soil erosion. We conducted long-term studies and monitored for five years the effects of tillage, crop residue, and nitrogen management on yields and economic returns of these cropping systems. In the initial phase of these studies we found that zero tillage (ZT) increased yields when compared with minimum tillage. In the second phase of the study we found that using nitrogen fertilizer significantly increased yields. Crop residue management had higher yields in one of five studies. Zero tillage (ZT) was the system with the highest economic returns in phase one. In phase two, the addition of nitrogen fertilizer had higher economic returns with ZT and residue removed. These studies show that there is potential to use ZT with nitrogen fertilizer to protect the environment and increase soil and water conservation in this Andean region of South America.

Track: Conservation Economics and Policy

**Denotes primary author*

Poster Number: 8

Linking Chicago's Urban Agricultural Districts: Converting the Englewood Rail Line into a Nature Trail

Authors: Micheál Newman-Brooks*, City of Chicago Department of Planning and Development

Abstract: The 59th Street Line is a former 1.7 mile elevated rail line that will be converted into a multi-use trail to provide open spaces for recreation, transportation and a source of jobs to the residents of Englewood and surrounding communities. It will link several vital projects in Chicago's Urban Agricultural District and fulfill the community's aspirations for a safe, inviting, and peaceful space for all to enjoy. The 59th Street Line is the first phase of a larger loop that will connect to the 49th Street Line in the Back of the Yards neighborhood to the north. The trail has been recommended in a number of City plans and community-driven planning processes, including the New Era Trail completed in 2009, A Recipe for Healthy Places in 2013 and the Green Healthy Neighborhoods Plan in 2014. The trail located at the center of Chicago's Urban Agricultural Districts recently expanding farming operations include Growing Home adjacent to the trail, Eat to Live farms, and Goodness Greeness, a certified organic produce distributor. In addition, several community partners including Urban Pathways, convened by NeighborSpace and Grow Greater Englewood, are developing a plan for urban farmers from around the city to own and farm land in the district and work together through common infrastructure, storage facilities, processing and distribution. With a total of 54 acres of vacant land along the line and a total of 20 acres of land comprising the former rail line, the trail will provide an immediate return to productive use of land as a spur for community investment. As originally envisioned in the Neighborhood Plan, the trail will expand the vision of this urban agriculture district to revitalize the community, provide jobs and recreational opportunities. Our presentation will highlight the sites and design, partners, progress of the project and the projected goals and outcomes of the plan. We will also share the scope of work for Phase II implementation.

Track: Conservation in Organic, Specialty, and Small-Scale Agriculture

**Denotes primary author*

Poster Number: 9

Assessing Wetland Loss Impacts on Watershed Hydrology Using an Improved Modeling Approach

Authors: Ali Sadeghi*, USDA-ARS, Hydrology & Remote Sensing Laboratory; Sangchul Lee, USDA-ARS-HRSL; In-Young Yeo, The University of Newcastle (UoN) EA 127 Engineering A ; Megan Lang, Fish and Wildlife; Gregory McCarty, USDA-ARS-HRSL; Glenn Moglen, USDA-ARS-HRSL; Grey Evenson, ARS; Jeff Arnold, USDA-ARS, Temple, TX

Abstract: Despite the importance of wetland impacts on water cycling, the Chesapeake Bay Watershed (CBW) has experienced significant wetland losses. The resultant environmental degradation has not been fully characterized. Our aim is to assess wetland loss impacts on watershed hydrology for an agricultural watershed within the Coastal Plain of the CBW using the Soil and Water Assessment Tool (SWAT). Two improved wetland modules were used to better represent physical processes and the spatial distribution of riparian wetlands (RWs) and geographically isolated wetlands (GIWs). The baseline wetland condition was determined based on the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) geospatial dataset. The SWAT model coupled with two modules was calibrated and validated against streamflow collected at the watershed outlet. Wetland loss scenarios were applied to compare hydrologic variables between the baseline and wetland loss scenarios. Our results indicate that wetland losses resulted in increasing surface runoff by 9% while decreasing groundwater recharge by 7% in upstream areas. These modifications in water transport mechanisms due to wetland losses led to increased fluctuations in downstream flow response due to extreme flow conditions. These findings demonstrate the hydrologic role of wetlands, supporting the need for ongoing wetland conservation efforts in this region.

Track: Conservation Models, Tools, and Technologies

**Denotes primary author*

Poster Number: 10

Impacts of Selected Summer Cover Crops on Wind Erosion Control

Authors: Bilgi Sarihan, New Mexico State University; Murali Durapuneni, New Mexico State University; Omololu Idowu*, New Mexico State University; Dave Dubois, NMSU; Kulbhushan Grover, New Mexico State University

Abstract: Cover crops can have significant impacts on minimizing soil erosion by wind, which is common in the arid southwest. A study was conducted at NMSU Leyendecker Plant Science Center, Las Cruces, NM, to evaluate the impacts of selected summer cover crops on soil loss during wind erosion events. Four grass species [Japanese Millet (*Echinochloa esculenta*), Perl Millet (*Pennisetum glaucum*), Browntop Millet (*Urochloa ramosa* (L.) Nguyen) and Sorghum-Sudangrass (*Sorghum bicolor* x *S. bicolor* var. sudanese)], were planted as cover crops in randomized strips of 12 m by 3.4 m and replicated four times under two irrigation regimens (full irrigation and deficit irrigation [half the full irrigation]). The cover crops were planted in August 2017 and terminated in November 2017, and sediment traps (Big Spring Number Eight [BSNE]) were installed in the plots, to collect sediment samples transported by the wind. Cover crop growth parameters measured included the plant height, plant population and ground coverage percentage. Soil properties were also measured at the beginning and the end of the cover crop trials. Results show statistical significant effect of grasses on horizontal dust flux (HDF) of the treatment plots, but the irrigation regimen effect was not significant. Sorghum-Sudangrass has significantly lower HDF compared to the rest of the grasses while the HDF from the deficit irrigated plots were not significantly different from the fully irrigated plots. Sediments lost from the plots were also significantly higher from mid-September to mid-October compared to the period from mid-October to mid-November. This study indicate that Sorghum-Sudangrass was the best performer for wind erosion control due to its quick and aggressive growth habit, providing to a quicker ground cover, compared to the other grasses. Also, reducing cover crop irrigation by half, did not reduce the effectiveness of the grasses in controlling soil erosion.

Track: Conservation Models, Tools, and Technologies

**Denotes primary author*

Poster Number: 11

Predictions of Hydrological Modification on a Tropical Wetland

Authors: Bahaaeldin ELWALI*, Jazan University; Ismail Yusoff, University of Malaya (UM); Aboubaker Farag Srat, University of Tripoli

Abstract: Unsaturated zone and near-surface water tables can respond rapidly to rainfall events, causing a highly transient flow system occurs in the near-stream areas. Therefore, in order to obtain reliable estimates of drain flow interactions for Paya Indah Wetland watershed (PIW) in west Malaysia, the surface water flow and the groundwater flow components of the transient flow system need to be accurately quantified. In this context, MIKE SHE modelling system was used to analyze the hydrological and environmental impacts of four (major) different scenarios including an alternative drainage and development schemes leading to the formulation of a Water Management Plan for the PIW. Significant changes in surface water inflow due to land use and extensive groundwater abstraction at Megasteel wells field were incorporated to properly represent the field conditions. The impact of the stressful groundwater abstraction at the Megasteel production wells on the PIW lakes system and the shallow aquifer of the peat layer were investigated. It found that the estimated groundwater volume abstracted by Megasteel represents 8.3% of the effective recharge and the latter represents 18.3% of the total rainfall. Results also reveal that scenario of completion of phase II of Cyberjaya city development plan may result in dropping of groundwater table in the peat layer about 0.1 to 0.5 m depending on how far the location is from the proposed development zone. Whereas, all the sub-scenarios of groundwater abstraction scenario were coincided with the baseline scenario as regards the drop of the groundwater head up to □ 4.0 m below the sea levelKeywords: MIKE SHE modelling software, Groundwater abstraction, Peat-land, Transient flow, Surface and subsurface flow interactions

Track: Conservation Models, Tools, and Technologies

**Denotes primary author*

Poster Number: 12

Spatial Distribution of Plant Available Nitrogen in Conventionally Managed Beef-Pastures of Southern Piedmont, Georgia

Authors: Subash Dahal*, University of Georgia; Dorcas Franklin, University of Georgia; Miguel Cabrera, University of Georgia; Dennis Hancock, University of Georgia; Lawton Stewart, University of Georgia

Abstract: Conventionally managed beef pastures are prone to non-uniform spatial distribution of nitrogen in soil. This study aims to determine the spatial distribution of plant available nitrogen (NH4+ and NO3-) and factors responsible for such distribution. An extensive soil sampling was conducted in 10 beef-pastures (9.31-21.62 hectares) of Georgia Southern Piedmont. Soil samples were taken at 0-5cm, 5-10cm and 10-20cm depths in a 50m grid ("Matrix") as well as specific areas with high cattle activity ("AOI"). Plant available nitrogen was measured using cold KCL extraction procedure. Different pasture management factors (distance to nearest hay, water and tree/shade) and landscape parameters (curvature, slope, aspect, flow direction) were measured using GIS technology. Cow locations were measured using LOTEK GPS collars every 5 minutes. Results suggested significant spatial autocorrelation (p=0.05) in the distribution of plant available nitrogen, at all three soil depths, suggesting uneven spatial distribution. Stepwise variable selection was used to identify the parameters responsible for the uneven distribution of plant available nitrogen. Plant available nitrogen decreased significantly with distance from hay, water or trees at all three depths. Cattle density and the lay of the land also had a significant impact on the distribution. Recursive Partitioning technique was used to select a threshold distance (for Distances to Shade, Water and Hay individually) within which the plant available nitrogen was different than the rest of the sampling locations. In general, plant available nitrogen was significantly higher within 100 m of the hay, shade and water. These results put light on the importance of management factors for uniform distribution of nitrogen in beef-pastures. Although landscape parameters cannot be manipulated easily, strategic placement of hay, portable shades, and waterers can be useful tools for achieving optimum land use for sustainable productivity.

Track: Conservation Models, Tools, and Technologies

**Denotes primary author*

Poster Number: 13

Total Sediment Lead (Pb) Concentrations in a Northwestern New Mexico Irrigation Ditch following the Gold King Mine Spill

Authors: Samuel Fullen, NMSU; Gaurav Jha, NMSU; April Ulery, NMSU; Lois Stanford, NMSU; Dawn VanLeeuwen, New Mexico State University

Abstract: Following the August 5, 2015 Gold King Mine blowout, our team examined downstream metal composition along one irrigation ditch at six locations in Aztec, NM. The ditch was sampled during the irrigation ban, before the blowout's plume reached Aztec. This paper examines total concentration of lead (Pb) in irrigation ditch sediments downstream from legacy mining and asks, "Do Pb total concentrations exceed risk assessment guidelines set by the U.S. Environmental Protection Agency (EPA)?" Sediments were collected every 60 cm along ditch transects perpendicular to flow direction at three depths (0-20, 20-40, and 40-60 cm) using EPA method 5035. Samples were acid digested and analyzed for total metal concentration following EPA methods 3051A and 200.7, respectively. No differences were found in total concentrations of Pb between sampling point locations along the transect. Differences between depths were found for Pb concentrations (p-values of 0.0017), with concentrations decreasing with sample depth. All Pb concentrations were below the 400 ppm EPA guideline. Due to differences in metal concentration with depth, it may be valuable to singularly observe the upper-most sample depth since the surface holds the highest concentrations of Pb. Increasing spacing between sampling points in irrigation ditches from 60 cm to a larger interval across ditch transects to monitor metal concentrations may also save resources without compromising monitoring sensitivity. Examination of other metals reported in the spill (e.g. arsenic) are under current analysis and multi-year sampling will permit us to determine if there are changes in irrigation ditch metal composition related to the GKM spill or legacy mining.

Track: Conservation Models, Tools, and Technologies

**Denotes primary author*

Poster Number: 14

Using Ecological Sites and State and Transition Models in New Mexico to Support Conservation Planning

Authors: Michael Kucera*, USDA-NRCS; Joel Brown, NRCS; Richard Strait, USDA-NRCS

Abstract: Use of Ecological Sites (ESs), and State and Transition Models (STMs) in the 9 Step Conservation Planning Process in a New Mexico setting will be detailed. STMs are used to describe common management activities or disturbance processes and their impact. In New Mexico ESs and STMS are used when discussing client objectives, defining resource concerns, conducting inventories, selecting applicable practices/management measures, monitoring effects and supplying feedback. STMs are used to assure conservation planners collect, organize, manage, and apply ecologically based conservation planning information. STMs describe a range of resource conditions (e.g., states and phases); and processes (e.g., time, triggers, succession, disturbances, management activities/practices) related to transitions in each land use. STMs in New Mexico describe a common range of resource conditions along with the conservation practices/management systems that drive a desired resource change, allowing the planner to focus on measures that can achieve the clients goal. STMs are utilized in New Mexico to avoid making common conservation planning mistakes such as utilizing practices that are not well-suited, or applying practices that have negative effect on resource conditions. Transitions between states include information about conservation practices, and adaptive management concepts that can achieve desired resource conditions. States and phases are explicitly connected to plant communities, resilience to drought and soil health. On-site indicators and expected results from utilizing common management systems in New Mexico can be used for on-site conservation planning decisions.

Track: Conservation Models, Tools, and Technologies

**Denotes primary author*

Poster Number: 15

Building a Foundation for Addressing "Wicked" Water Resources Challenges through Participatory Modeling: Stakeholder Identification and Engagement

Authors: William Hargrove*, The University of Texas at El Paso; Josiah Heyman, The University of Texas at El Paso

Abstract: Our objective was to develop a systematic approach to identifying and classifying water stakeholders and engaging them in a discussion of water futures as a foundation for a participatory modeling project to address the "wicked" water resource problems of the Middle Rio Grande basin. The label "wicked" has been used in the literature to describe problems that are difficult to explain; unique; impossible to plainly define, often because they are the result of other indefinable problems; and have no one true solution. The term "wicked" is relevant to the challenges of climate change and competing demands for water in the region. We identified the major sectors of water users to include: 1) agricultural, 2) municipal, 3) self-supplied industrial users, 4) environmental, and 5) a sector we labeled "social justice", comprised of individuals who lack access to potable water or who represent such individuals. We included stakeholders from both the U.S. and Mexico, and hosted a total of ten stakeholder meetings by sector. Results from stakeholder meetings included: 1) their vision for the future of water; 2) challenges to be overcome; and 3) important research questions that could be addressed using participatory modeling. Four broad themes emerged: 1) quantity, drought, and scarcity; 2) quality/salinization; 3) urbanization; and 4) conservation and sustainability. Each sector also expressed distinctive views regarding the future of water. Agricultural stakeholders had strong feelings of ownership of water rights as part of land ownership and a concomitant sense of threat to those water rights emanating from dwindling supplies and competing demands. The unique contribution of this work is a methodology for identifying, classifying, and engaging all types of stakeholders, enabling us to compare and contrast views of different types of stakeholders. Heretofore, this has been accomplished in "bits and pieces" but never comprehensively and holistically..

Track: Outreach, Education, and Community Engagement

**Denotes primary author*

Poster Number: 16

Moving beyond barriers and scaling up conservation practice adoption

Authors: Catherine DeLong*, Clare Lindahl, Annie Binder, Jody Thompson, Courtney Slagle, Erika Crady, Soil and Water Conservation Society

Abstract: The Soil and Water Conservation Society has four projects focused on removing barriers to conservation practice adoption. While the overall approach and scope differs, each project strives to address a unique conservation barrier. The first project, a Conservation Media Library is a multimedia storing house for conservation photos, videos/drone footage, graphics, factsheets, PowerPoints and other resources. The project addresses the observability and recognition of conservation practices by allowing farmers to "see the practice in action" and giving the media and general public access to beautiful promotional materials to advertise conservation practices. In the second project, the Society has partnered with Iowa State University Extension and Outreach to offer a bi-annual Watershed Academy for watershed coordinators across the state. Watershed coordinators are asked to have many skills: leadership, budgeting, grant management, communication, salespersonship, agronomic and environmental knowledge. The Watershed Academy is working to enhance these competencies and give coordinators the training they need to increase conservation practice adoption. Lastly, the Society has two projects focused specifically on barriers to edge of field practice adoption. The first is a grounded theory approach that surveys conservation professionals including federal and state staff, private organizations and farmers about bottlenecks and barriers to greater edge of field adoption. In the second, the Society is working with a diverse group of partners to understand the design constrictions, contracting limitations and policy barriers to wider adoption of nutrient-removal wetlands.

Track: Outreach, Education, and Community Engagement

**Denotes primary author*

Poster Number: 17

The 1% Challenge: Increasing Soil Organic Matter in Dallas County, Iowa

Authors: Heidi Ackerman*, Iowa SWCS

Abstract: In its inaugural year, the 1% Challenge resulted in 14 producers' pledges to increase their soil organic matter levels by 1% on a total of more than 2,200 acres of farmland. This project, a joint effort between the Dallas Soil and Water Conservation District and the Iowa Natural Resources Conservation Service, seeks to inform, inspire, and support farmers in maintaining and building resilient natural resources in an increasingly volatile climate and agricultural marketplace. Increased soil organic matter levels are expected to improve rainfall infiltration rates, available water holding capacity in the soil, nutrient cycling, microbial populations and activities, and ultimately, profitability from the farm. Local data indicate that producers can increase soil organic matter by 1% over 10 years, where no-till and cover crops are adopted. Other practices promoted through the project include prescribed grazing, mulching, expanded crop rotations, and planting of perennial crops. The 1% Challenge not only provides the information and tools for farmers to adopt change, it also provides farmers with a network of like-minded producers who are on the same journey. This project cultivates a culture of conservation, innovation, and long-term investment.

Track: Outreach, Education, and Community Engagement

**Denotes primary author*

Poster Number: 18

Visualizing Western Soil Properties Using Web Resources

Authors: Robert Flynn*, NMSU; April Ulery, NMSU; James Walworth, Univ Arizona; Jeanne Gleason, NMSU; Joan Davenport, Wash State Univ; Daniel Bloedel, USDA; Barbara Chamberlin, NMSU

Abstract: Experienced extension specialists from the western U.S. collaborated on this multimedia project to help illustrate problems that are often unique to arid zone soils such as salinity and sodicity. Animations and videos were developed to explain soil physical and chemical concepts as well as soil sampling methods and the importance of particular analyses. The videos capture lab and field demonstrations with explanations by extension specialists and can be used to help practitioners and students learn valuable techniques. Topics include sodium adsorption ratio, Olsen bicarbonate phosphorus test, the role of gypsum in managing sodium affected soils and issues related to runoff and infiltration. The standard and time-lapse videos and animations are ideal when time, space or weather limits the use of live demonstrations. The products can be freely accessed on the NMSU You Tube channel, westernsoil.nmsu.edu or from the ScienceofAgriculture.org website. This project was funded by a USDA Western SARE grant #2014-38640-22175.

Track: Outreach, Education, and Community Engagement

**Denotes primary author*

Poster Number: 19

Perceived Barriers to Participation in Federal Conservation Programs

Authors: Laura McCann*, Univ. of Missouri; Roger Claassen, USDA Economic Research Service

Abstract: USDA has several programs to encourage farmers to adopt conservation practices in order to improve water quality and soil health. These programs are voluntary so improved design could improve farmer outreach and increase enrollment of land with greater environmental benefits. Previous research found that perceived transaction costs or "red tape" was a barrier to participation among U.S. soybean farmers (McCann and Claassen 2016). This research examines perceptions of cotton and corn farmers regarding barriers to applying for conservation programs. The data is from the USDA ARMS surveys in 2015 (cotton) and 2016 (corn). Corn data is not directly comparable to soybean data so is presented below. For both cotton and soybean farmers, the main reason for not applying was that they were not aware of environmental problems on the field (46% agree or strongly agree versus 63% for soybean farmers). Another barrier was the perception that government standards make practices more expensive than necessary (42% for cotton farmers agreeing versus 34% of soybean farmers). More cotton farmers agreed that the application process (44% versus 29%) as well as documenting compliance (43% versus 31%) would be too complicated and time consuming. This implies high perceived transaction costs of participating in conservation programs. More cotton farmers also agreed that the payments were not high enough (28% versus 20%) but as with soybean farmers, payment levels do not seem to be the major barrier. For corn farmers response options were Don't know, Not a reason, Minor reason, and Major reason. For all barriers, the most common response was "Not a reason." The most important reason for not applying was a lack of problems on the field (23% major reason), followed at 11% by expensive government standards, red tape, and my offer would not have been accepted. A new question, it was too difficult to obtain technical assistance, did not seem to be important (4% major reason).

Track: Social Sciences Informing Conservation

**Denotes primary author*

Poster Number: 20

Trusting Culture: Examining the Roles of Trust in Social Relationships on Farmer Decision-Making and Conservation Practice Adoption

Authors: Caela O'Connell*, University of Tennessee; Deanna Osmond, North Carolina State University

Abstract: Successful adoption of conservation practices is widely accepted as an optimal outcome for farm and environmental health. Trust, or lack of trust in the professionals and their recommended best management practices and education are often cited as a driving reason that farmers resist the adoption of soil and water conservation practices. This research argues that establishing and improving trust in professionals is less important than establishing and improving intergenerational trust within farm families. This study presents findings from 105 qualitative interviews and quantitative surveys with farmers collected in 2015 and 2016. Analysis across a wide range of decision-making strategies and topics including nutrient management, conservation practice adoption, and general farm financial management demonstrated a surprising bifurcation of social relationships and decision-making. Farmers rely on neighbors, agricultural professions (public and private) and general word of mouth to inform them of changes and opportunities, while the social relationships that ultimate influence decision-making were familial. This bifurcation highlighted as intergenerational gap where younger farmers frequently reported deferring adoption of practices for as long as 30 years until they had full control of the family farm out of respect or to keep the peace. With these data, we argue that greater emphasis should be given to fostering intergenerational trust. In a livelihood that has so long relied on knowledge flowing hierarchically between generations (primarily father to son), the increased exposure to new technology, innovative management techniques, and other adaptive information that younger generations of farmers are being exposed to through college degrees and greater use of technology are being limited by trust and cultures of paternalism. Ultimately, improving the culture of intergenerational trust can and will help farm families adapt to challenges of climate and conservation.

Track: Social Sciences Informing Conservation

**Denotes primary author*

Poster Number: 22

ACC Deaminase Bacteria Abundance and Diversity in Dryland Agricultural Sites of Eastern Colorado

Authors: Daniel Manter*, USDA; Alison Hamm, USDA; Lucretia Sherrod, USDA

Abstract: Bacteria that interact with plant tissues both below and above ground in ways beneficial to plant health are referred to as plant growth-promoting bacteria (PGPB). ACC deaminase producing bacteria (ACC+) are one such class of PGPB that can modulate drought stress by reducing plant ethylene levels resulting in increased lateral root growth. In this paper, we utilized a newly designed set of primers to amplify the acdS gene from soil samples obtained from three sites in eastern Colorado in a wheat-fallow system. Sites differ in potential evapotranspiration (PET) along a north-south gradient (Sterling, Stratton, and Walsh). Both total bacterial (Sterling: 2.0 x 109, Stratton: 1.6 x 109, and Walsh: 2.1 x 108 16S copies g^{-1} soil DW) and ACC+ (Sterling: 1.1 x 107, Stratton: 1.6 x 107, and Walsh: 3.4 x 106 16S copies g-1 soil DW) abundance declined with increasing PET. However, both the proportion and diversity of ACC+ bacteria increased at the driest site suggest the increased importance of ACC+ bacteria under high PET stress.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 23

Adding a Wheat Cover Crop to Improve Soil Physical Properties in North Carolina

Authors: Wayne Roper*, North Carolina State University; Joshua Heitman, North Carolina State University; Deanna Osmond, North Carolina State University; Michael Wagger, North Carolina State University

Abstract: Effectively managing a cover crop within a crop rotation requires proper knowledge of associated changes to soil conditions such as water availability and residue cover while planting the main crops. A long-term agronomic trial in the piedmont region of North Carolina (33 yr.) was modified in 2015 to include comparisons of tillage and cover cropping within a corn and soybean rotation that included no-till, disc, chisel, and moldboard tillage in 2016 and 2017. The wheat cover crop was planted after harvest in fall, and terminated before planting the main crop in spring. Soil water content and bulk density were measured to 15 cm depth, above ground cover crop biomass was measured in mid-April, and crop yields were compared for all treatments. Wheat cover crop biomass ranged from 6559-8308 kg ha^{-1} for treatments in 2016 and declined to 2952-3626 kg ha^{-1} in 2017, likely because of late cover crop planting in 2017. Volumetric soil water content ranged from 20-25 cm^3 cm^3 and was similar among treatments for both years, regardless of cover cropping or tillage. Bulk density was not different among treatments in the first year, but surface bulk density trended lower with reduced tillage intensity in the second year. Average soybean yield in 2016 was greatest from cover-cropped, chisel plowed soil and least from moldboard plowing with no cover. The 2017 corn crop was damaged due to environmental factors, but yield trends were similar among treatments. Changes to the measured soil physical properties associated with cover cropping did not occur during this study. The cover crop did not significantly reduce soil compaction, change water content near the time of planting the main crop, or reduce crop yields compared to soil without cover. We continue to test whether the cover crop has beneficial effects on soil aggregation, water infiltration, and water retention.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 24

Assessment of Contaminated Soil Health Using Polyarenes Ratio as Indicator

Authors: Alexander Gennadiyev*, Moscow State University Faculty of Geography; Andrey Zhidkin, Moscow State University Faculty of Geography; Timur Koshovsky, Moscow State University Faculty of Geography

Abstract: Polycyclic aromatic hydrocarbons (PAHs, polyarenes) are high molecular weight organic compounds containing two or more benzene rings in their structure. The increased interest in PAHs is related to the fact that many of them have carcinogenic and mutagenic activities and present a hazard for soil and human health. At the key site “Noginsky” (taiga landscapes in Russia) the PAHs content and composition were determined in the soils and snow within the zone under influence of plant which was a source of air-born polyarene contamination for the territory. For estimation of hydrocarbon transformation in soils the ratios of individual PAH concentrations, which differ in molecular structure and stability, were used. The most demonstrative results were received from using a ratio between benzo(a)pyrene and pyrene (B/Py). It was taken that the counted ratios of PAH reserves should decrease while conditions are suitable for strong destruction and healthy soils, and should not change in conditions of weak destruction and unhealthy soils. The B/Py ratio in snow did not vary much in all investigated areas of key site. The scatter of confidence interval (25%-75%) for industrial, forest and arable points was between 0,18 and 0,33, which witnesses similar conditions of benzo(a)pyrene and pyrene income. Unlike snow samples, the B/Py ratio varied a lot in soils of different types of land use. Confidence interval of the B/Py ratio was between 0,20 and 0,42 near the source of pollutants, 0,12-0,35 in the suburban forest and 0,05-0,12 on the cultivated crop land. It was concluded, that the B/Py and other ratios witness more healthy soils and faster rates of PAHs degradation on arable lands, mild rates in suburban forest and lowest rates (lowest level of soil health) near the PAH source because of high concentrations of toxic polyarenes that suppress the microbiological factor of their decomposition. The work was supported by the Russian Science Foundation, project no. 14-17-00193.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 25

Ecological Agriculture Application with Winter Flooding

Authors: Alexandra Firth*, Mississippi State University

Abstract: Rice is the staple food for more than half of the world's population and has the ability to support more people per unit of land area than wheat or corn, as rice produces more food energy and protein per hectare than other grain crops. However, with the human population projected to reach 8.5 billion by 2030, there are major concerns about the sustainability of rice production practices because of its major role in consumption of natural resources, resulting in the need to identify sustainable production practices that are economically feasible and minimize adverse environmental effects. This study investigated a potentially sustainable rice production system in the Mississippi Alluvial Valley (MAV) that uses ecological principles to enhance environmental quality and economic gain at the field scale. It was hypothesized that the annual flooding of rice fields to create water bird habitat would benefit soil health, providing agronomic benefits to the farmer. Two sites were selected that applied different management regimes during the winter: conventional fallow fields and winter flooding. Soil microbial diversity and nutrient content were quantified and compared for a measure of overall soil health. Results of the project will be used to determine the profitability of implementing the innovative ecological system. Proof of concept at the field scale will provide a framework for other producers within the MAV to adopt similar management methods, ultimately improving the overall integrity of soil, water, and environmental quality as well as the farmer lifestyle.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 26

Improving the Science behind Soil Health: NRCS-University Collaborative Dynamic Soil Properties (DSP) Studies

Authors: Michael Robotham*, USDA-NRCS; Skye Wills, USDA-NRCS

Abstract: Improving soil health has become a widely promoted goal of agricultural land management both within and outside of NRCS. General principles have been identified (maintain soil cover, maximize living roots, minimize tillage, diversify species over space and time). And the adoption of "Soil Health Management Systems", suites of management practices that are believed to positively impact soil health, is being increasingly promoted by technical professionals in both the public and private sector. However, evidence to support the positive effects of many of these practices remains largely anecdotal. Both private and public sector research to address this issue is ongoing. As part of NRCS efforts to contribute to this process, the agency has entered into collaborative agreements with five (5) universities across the US to begin a set of pilot dynamic soil properties studies. These two-year studies will measure a standard suite of dynamic soil properties that have been identified as potential soil health indicators. Properties will be measured on a multiple management systems on a key soil or soils of agricultural importance to that region. The study will use a replicated, "space for time", design that allow for assessment of the sensitivity of these dynamic soil properties to management changes both across different managements on a given soil and across a suite of important agricultural soils with different mineralogical properties, climate regimes, etc. Since sampling will begin in Spring 2018, this poster will focus on the overall goals of the project, the study design, and plans for future activities.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 27

Nematodes as Indicators of Soil Health

Authors: Laura Ney*, University of Georgia; Dorcas Franklin, University of Georgia; Kishan Mahmud, University Of Georgia

Abstract: Nematodes are often associated with yield loss and plant disease by agriculturists but parasitic nematodes make up only a fraction of the nematode community in soils. Spanning nearly every trophic group, free-living nematodes occupy key positions as primary and intermediate consumers in the soil food web and serve as measures of soil health. In this study, data was collected from soils previously managed for two years with and without LEM (Local effective microorganisms) under an annual ryegrass (*lolium multiflorum*)/fallow rotation receiving swine effluent or under soybean (*Glycine max*)/cereal rye (*Secale cereal*) rotation receiving composted broiler litter amendments. Analysis of nematode community between treatments and systems indicated significant differences in maturity, structure and diversity indices when compared using one-way analysis of variance ($P = 0.0003$, $P < 0.000$, $P < 0.0001$) respectively. Indices developed by ecologists which measure colonizers and persisters, use nematodes to monitor the recuperation of non-agricultural soils. These indices could also be useful tools for measuring the health and resilience of agroecosystems. In our analysis of nematode community structure in soils managed under two different systems, the Enrichment Index (EI) correlated positively with soils that received higher nitrogen inputs and the Structure Index (SI) correlated negatively with soils that were more frequently tilled. This demonstrates the ability of nematode community structure to reflect differences in agricultural soils related to management history. To build tighter relationships between nematode analysis and other soil health indicators we compared nematode community structure to microbial activity, N mineralization and crop productivity. Identification and linkages between these measures indicated the clean and sensitive tool of nematode analysis was useful when monitoring the effect of management practices on soil health and ecosystem services.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 28

Nitrogen Mineralization from Selected No-Till Crop Residues

Authors: Larry Cihacek*, North Dakota State University; Rashad Alghamdi, North Dakota State University

Abstract: Corn (*Zea mays* L.) production in North Dakota has increased over 5-fold between 1997 and 2017. The average growing season ranges from 100 to 135 frost free days. Much of this increase in corn production is due to development of corn varieties with a 75 to 95 day maturity period. Due to the cool climate residue decomposition and nutrient mineralization from these residues is also limited by the short frost free period. In long-term no-till systems, accumulation of up to 8 to 10 Mg of residue have been observed. Soils amended with seven common crop residues from the northern Great Plains (corn, soybean (*Glycine max* L.) winter and spring wheat (*Triticum aestivium* L.), flax (*Linium sativum* L.), winter pea (*Pisum sativum* L.) and forage radish (*Raphnus sativis* L.) are being evaluated in the laboratory for mineralization rate relative to three unamended soils over a 120 day period to mimic a normal growing season. The two crops that are most commonly utilized as a cover crop (winter pea and radish) consistently showed net N mineralization over unamended soil due to a narrow C:N ratio. All other crop residues with a wide C:N ratio showed a net immobilization of N for the 42 days. Net mineralization from the other crops was observed until from 42 days onward. This brings to question if changes are necessary in N management for no-till production in the cooler climates of the northern Great Plains.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 29

Soil Health Interpretations-Using Soil Survey Data to Inform Soil Health Assessment and Conservation Planning

Authors: Diane Stott*, USDA-NRCS; Maxine Levin, USDA-NRCS; Cathy Seybold, USDA-NRCS; Steven Campbell, USDA NRCS; Robert Dobos, USDA-NRCS; Steve Peaslee, USDA NRCS; Wade Bott, USDA.NRCS; jennifer Moore-Kucera, USDA/NRCS

Abstract: Traditional soil survey is grounded in a soil-landscape model that identifies spatially contiguous map units at a farm scale (typically 1:24000) and estimates “representative values” for soil properties at the component level. Soil classification, especially US Soil Taxonomy which was developed in concert with soil survey, focuses on using soil properties and morphological characteristics such as sub-surface diagnostic horizons to define taxonomic groups. The primary goal of the soil survey/soil classification paradigm is to provide standard, largely categorical, information for farm scale management. In contrast, soil health has focused interest on dynamic soil properties defined as properties that can be changed through management at human time scales – months, years, or decades. Creating soil interpretations for soil health poses unique challenges due to the dynamic nature of the soil attributes that are used to assess soil health. Interpretations can assist in making predictions such as identifying soils with the highest potential to accumulate and store carbon or soils that would most benefit from specific cover crops. There are many interpretations that can be made based on soil survey data that can tell the user about the potential for improving soil health and other indicators of healthy soil. We will explore the building of criteria, thresholds, and potential of these soil interpretations for soil health. This presentation will use specific examples from the USDA NRCS soil health Interpretations Team projects to show soil survey information providing a framework to access the potential effects of management practices or suites of Soil Health related management practices that can be extrapolated beyond specific locations. Additional potential applications of soil survey data for conservation planning considering soil health related properties will also be discussed.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 30

Soil Respiration Method Utilizing a Single Cell IRGA

Authors: L.A. Sherrod*, USDA-ARS; R.O. Miller, Agricultural Laboratory Proficiency Program**;** J.A. Delgado, USDA-ARS

Abstract: Soil incubations with subsequent determination of carbon dioxide (CO_2) are common soil assays used to estimate C mineralization rates and active organic C pools. Two common methods used to detect CO_2 in laboratory incubations are gas chromatography (GC) and alkali absorption followed by titration (NaOH). These methods have various strengths and weaknesses that are realized in cost of equipment and analysis time. A new approach makes use of an infrared gas analyzer (IRGA) with a simple single path analysis. This is significantly less costly than a dual channel system. The objectives of this study were (i) evaluate if the IRGA, GC and NaOH methods for CO_2 determination obtain the same concentrations over 4-time periods (1, 3, 10 and 21 day); (ii) how well do these methods correlate to each other across incubation times; (iii) estimate the limit of quantitation (LOQ); and (iv) estimate the concentration of CO_2 and O_2 gases in the chamber headspace that shows respiration suppression. Soil samples were collected from along a catena sequence from 4 cropping systems within 2 field replications (n=24) to obtain a range of labile organic matter. The IRGA method had similar results as GC and NaOH methods with no significant differences by day 21 of the incubation. The GC had the lowest LOQ of 90 followed by 115 and 600 ppm CO_2 for IRGA and NaOH methods respectively. Correlations of GC vs. NaOH, GC vs. IRGA, and NaOH vs. IRGA over the 21 days had R^2 values of 0.93, 0.94, and 0.92 respectively. The headspace CO_2 and O_2 that showed respiratory suppression was 9.1% and 10.9 % respectively. The single cell IRGA system is a rapid and economic estimation of C mineralization and active soil organic C pools.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 31

Soil Respiration Testing Can Help Target How Responsive Soils Are to Organic Amendments

Authors: L.A. Sherrod*, USDA-ARS; R.O. Miller, Agricultural Laboratory Proficiency Program; J.A. Delgado, USDA-ARS

Abstract: New analysis methods that have faster analysis times could be useful in quantify how responsive a soil would be to amendments such as compost. The single cell infrared gas analyzer (IRGA) can measure soil respiration at 150 samples per hour. Fast analysis times allow for more routine testing as the cost per sample would go down. Soil samples (20) from across US States and Canadian Providences collected and used in the Agricultural Laboratory Proficiency Program (ALP) were used in this study to determine if compost additions increased the respiration rates of soils after air drying and then re-wetting soils to 50 percent water filled pore space. Measurement of CO_2 was done 1, 3, 10, and 21 days after rewetting a 30-g sub-sample of the ALP soils with and without compost (1.5-g subsample) and incubating them at 30 degrees C within a 500-ml Wheaton serum bottle with rubber septa and sealing ring. After 21 days of incubations, soils where extracted for NO_3-N and NH_4-N. Respiration rates have shown a response to the compost additions in as little as 24 hours. The responsiveness of the soils to the addition of compost was differential. These results support the simple and fast measurement of soil respiration alone without measurement of mineralization rates would give Producers confidence that their soils would be responsive to the soil health amendments they plan on using.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 32

Streamlining Soil Quality Indicators for Arid and Semi-Arid Cropping Systems

Authors: Mohammed Omer*, New Mexico State University; Omololu Idowu, New Mexico State University; April Ulery, NMSU; Dawn VanLeeuwen, New Mexico State University; Steven Guldan, New Mexico State University

Abstract: Soil quality assessment provides tools for evaluating the sustainability of cropping systems and soil management practices in relation to their long-term environmental impacts on agroecosystems. Multivariate technique of Factor Analysis (FA) was used to identify regionally applicable minimum dataset for soil quality assessment in arid and semi-arid agricultural systems of New Mexico. Crop management systems studied included field and tree crops; and vegetable management systems. Samples were collected from six agricultural land resources area in New Mexico. About thirty potential soil quality indicators were studied, but only ten out of the thirty measurements were included in the FA analysis after the indicators were screened to avoid collinearity and redundancy. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.62, and the average communality was 0.73. FA results after varimax rotation, extracted four component factors with eigenvalues > 1 which explained about 73 % of the variation in the datasets. The first component could be described as soil aggregation component and was composed of mean weight diameter of dry aggregates, dry aggregates of 2- 4 mm in diameter and the clay content. The second component described as soil organic component, included total microbial biomass, permanganate oxidizable carbon and soil organic matter. The third factor component described as salinity/sodicity component, included sodium adsorption ratio and electrical conductivity, while the fourth component described as plant nutrition component, included soil nitrate nitrogen and potassium contents. This study demonstrates the possibility of streamlining soil indicator measurements for the assessment of soil quality in arid and semi-arid agroecosystems.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 33

The Effect of Organic Nitrogen Sources, Crop Rotation, Cover Crops, and Reduced Tillage on Crop Yield Resilience

Authors: Sean Bloszies*, Soil Health Institute; Steve Shafer, Soil Health Institute; Jeanne Reeves, Soil Health Institute

Abstract: Weather variability explains approximately a third of inter-annual crop yield variability globally. Farming practices that build soil organic matter can increase water-holding capacity and may improve crop yield resilience. However, the relationship between soil-conserving management practices and crop yield variation has received little attention. We hypothesized that practices shown to improve soil conservation would contribute to lower inter-annual variability in crop yield. A meta-analyses was conducted to determine the effect of reduced tillage vs. intensive tillage, cover crops vs. fallow, and organic nitrogen (N) vs. inorganic N sources on year-to-year crop yield variability, calculated as coefficient of variation (CV) in yield. Yield variability of corn and wheat receiving organic N sources averaged 87% and 89%, respectively, of that of synthetic N-fertilized corn and wheat. This lower yield variability for organic N-fertilized crops was most apparent in comparison with low rates of inorganic-N fertilization of corn or wheat crops, and when the organic N wheat crop received higher levels of organic amendments. Yield variability was also significantly lower in crop rotation systems compared to their continuous-cropping counterparts. In contrast, tillage reductions were not associated with lower crop yield variability. In fact, inter-annual CVs for no-till corn were 5.4% greater than those of conservation-tillage corn, and harrow-till CVs were 8.3% over those of plow-till crops overall. Yields of cash crops that follow cover crops were just as variable as yields for crops following fallow. Therefore, while tillage and cover crops may help producers reach other goals, they do not make yields less variable over years. On the other hand, crop rotations and organic matter additions can lead to significantly more consistent crop yield. These represent two strategies available to producers who seek to reduce risk to their farm's productivity.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 34

Tracking Changes in Soil Biological Properties and other Soil Health Indicators under Different Management Practices

Authors: Jennifer Moore-Kucera*, USDA-NRCS; Daniel Manter, USDA; Diane Stott, USDA-NRCS; Bianca Moebius-Clune, USDA-NRCS; Veronica Acosta-Martinez, USDA-ARS; Skye Wills, USDA-NRCS

Abstract: Soil health testing is aimed at achieving multiple goals including: understanding soil constraints beyond nutrient limitations and excesses, targeting management practices to alleviate those constraints, measuring soil improvement or degradation from management, improving awareness of soil health, enabling valuation of farmland, and enabling assessment of farming system risk. Soil microbes play a direct role in driving multiple soil chemical and physical processes important for overall ecosystem function, but also have direct and indirect effects on plant productivity and quality. As a result, we suggest that soil conservation and regeneration should focus not only on plant nutrient status and erosion control but also on the status of the soil biological community, its function, and overall soil health. The overall goal of this project is to identify the linkages between soil health management practices (individually and collectively) and soil health indicators on an array of soil samples collected from across the USA under different management practices and inform the next iteration of assessments. Approximately 500 samples were collected from a variety of soil types and climate zones and under a suite of agronomic and rangeland practices. Data were clustered into soil health principle categories (i.e., minimal disturbance, maximum cover, duration of plant growth, and increased biodiversity). Trends and key indicators within the soil health evaluations will be presented.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 35

Visualizing Soil Health Practices across California Landscapes

Authors: Zahangir Kabir*, USDA-NRCS; Jennifer Wood, USDA-NRCS; Steve Hill, USDA-NRCS; Jennifer Moore-Kucera, USDA-NRCS

Abstract: The four soil health principles are i) minimize soil disturbance, ii) maximize diversity, iii) maximize presence of living roots and iv) maximize soil cover with plants and residues; can be generally used in all production systems to improve how soils function. However, the specific practices chosen to implement the principles must be adapted to each production system, climate, ecosystem, and soil to effectively build and maintain healthy, functioning soil. This poster is designed to help people in the field of soil conservation visualize plant communities and ecosystems in different landscapes across a generalized cross-section of California's diverse landscapes, including annual and perennial crops, rangelands and forests. This is an interactive poster where the attendees of the conference will be invited to add their ideas in five categories: i) natural processes, ii) opportunities, iii) human factors, iv) barriers and v) tools that are involved in the field of soil health in a specific area of interest. We propose that this concept can be useful for visualizing the range of soil heath practices or issues across diverse landscapes, at many scales and settings. This visualization tool can be implemented using cross-sections of other states, or any land area. It helps to initiate conversations around soil health, engage a broad audience and allows individuals to interact at their own pace. Information gathered can then be used to guide further local or regional soil health efforts such as management decisions, regional strategic planning and prioritization, identifying training opportunities, or addressing of knowledge gaps in the field.

Track: Soil Health Resources, Indicators, Assessment, and Management

**Denotes primary author*

Poster Number: 37

Evaluating the Potential Utility of Switchgrass (*Panicum virgatum*) for Phytoremediation of Pesticides

Authors: Kathleen Hatch*, USDA-ARS and The University of Missouri-Columbia; Bob Lerch, USDA-ARS; Keith Goyne, Univeristy of Missouri; Cammy Willett, University of Arkansas; Kremer Robert, University of Missouri; Craig Roberts, University of Missouri

Abstract: Herbicide contamination of soil and water can pose a variety of human health risks. However, the use of vegetative filter strips (VFS) can significantly decrease the amount of herbicides entering surface waters through runoff. Strategic implementation of specific grass species within VFS may further enhance degradation of herbicides preventing water contamination. Eastern gamagrass (*Tripsacum dactyloides*), has been shown to produce benzoxazinone (Bx) compounds that enhance degradation of the herbicide atrazine. Additionally, the more versatile switchgrass (*Panicum virgatum*) can also enhance atrazine degradation in soil, but the atrazine degrading phytochemical(s) is unknown. The objectives of this research are to (1) identify switchgrass varieties capable of producing phytochemicals that degrade atrazine (2) identify the phytochemicals responsible for enhanced atrazine degradation, and (3) evaluate the efficacy of these switchgrass varieties under field conditions. Root extracts from eight varieties of switchgrass were reacted with atrazine dissolved in 25% methanol for 16 hours. Atrazine remaining in the reaction vessels was quantified using High Performance Liquid Chromatography (HPLC) with a diode array detector (DAD). Least squares ANOVA was used to compare atrazine concentrations in samples containing root extract+atrazine and control samples (atrazine, only). Three switchgrass varieties degraded between 79% and 85% of atrazine compared to control values. Field experiments will compare atrazine degradation in replicated plots of three varieties of switchgrass; one variety of eastern gamagrass; and bare soil control plots. Final results of this work will identify the phytochemicals in switchgrass responsible for atrazine degradation as well as specific plants for use in VFS where atrazine is commonly applied.

Track: Water Resource Assessment and Management

**Denotes primary author*

Poster Number: 38

Monitoring the Effectiveness and Prioritization of Conservation Practices

Authors: John Clune*, U.S. Geological Survey

Abstract: The loss of soil and nutrients from agricultural land can have adverse effects on the soil productivity of arable fields. The sediment and nutrients that is lost from fields can also contribute to impairments in downstream waterbodies. Limited program resources and deadlines are requiring resource managers to better identify where and what to focus conservation efforts on and track the effectiveness of BMPs to meet water quality standards and total maximum daily loads (TMDLs). A variety of new and innovative tools and techniques will be presented through an overview of USGS studies that have helped to aid resource managers in monitoring the effectiveness and prioritization of conservation practices. Topics will include 1) tracking temporal trends through continuous monitoring of streamflow, water quality (i.e. nitrate sensor) and sampling, 2) developing spatial frameworks such as nutrient watershed scale synoptic sampling or estimating soil erosion rates from landuse, 3.) identifying sources through techniques such as sediment fingerprinting and nitrate isotopic composition, 4.) field scale studies that help understand biogeochemical processes and evaluate restoration of BMPs (i.e. irrigation nutrient uptake) through groundwater flowpath studies and 5.) advances in data visualization and modeling that provide resource managers planning methods to access big data and better drill down to solutions. Incorporating these new and innovative tools will help resource managers to adaptively manage and balance agricultural production and water quality protection.

Track: Water Resource Assessment and Management

**Denotes primary author*

Poster Number: 39

Mapping Tree Resources in the Great Plains Using High-Resolution Imagery

Authors: Todd Kellerman*, USDA Forest Service National Agroforestry Center; Dacia Meneguzzo, USDA Forest Service FIA; Greg Liknes, USDA Forest Service FIA

Abstract: Trees in the Great Plains serve important functions on the landscape yet little information describing their extent and location is readily available in formats that are convenient for resource professionals and decision makers. National forest inventory and natural resource monitoring programs seldom account for these plantings in their official statistics. In addition, most satellite-derived datasets are too coarse to accurately depict small or narrow groupings of trees common in agroforestry practices. Recently, the USDA Strategic Framework included a goal of inventory and monitoring of agroforestry practices. To address this goal, the USDA Forest Service's Forest Inventory and Analysis program and the USDA National Agroforestry Center have developed and implemented an operational land cover mapping process using 1-m aerial photography. This poster will feature both the workflow and the outputs for this mapping process. The workflow relies on a supervised classification procedure and multiple software packages. Selected landscapes from both Nebraska and Kansas will be featured to demonstrate the level of detail available from the output datasets. Because the emphasis is on tree cover, we will illustrate a variety of functions trees play on the landscape, such as windbreaks and riparian buffers. We will also detail the partnerships with agencies and universities in the central Plains that have facilitated such a large mapping effort.

Track: Forest Restoration: Research, Policy, and Applied Science of Ecological Restoration across Landscapes and Watersheds

**Denotes primary author*

Poster Number: 40

The Southwest Fire Science Consortium: An Opportunity in Fire Science and Management

Authors: Doug Cram*, New Mexico State University; Barbara Wolfson, Southwest Fire Science Consortium; Andrea Thode, Northern Arizona University; Alexander Evans, The Forest Stewards Guild; Jose Iniguez, 3USDA Forest Service, Rocky Mountain Research Station; Doland Falk, University of Arizona; Peter Fule, Northern Arizona University

Abstract: The Southwest is one of the most fire-dominated regions of the U.S. We developed a consortium to make fire science in the Southwest more efficient and inclusive, allowing future issues to be addressed from a broader perspective, with more information, more partners, and more accessible resources. With support from the Joint Fire Science Program, we initiated the Southwest Fire Science Consortium to promote communication, build relationships and trust, and to meet the fire knowledge needs of scientists and managers. Fifteen national Fire Science Exchanges now exist across the country. Over the past nine years, the Consortium has provided opportunities for managers, scientists, and policy makers to interact and share science in ways that can effectively move new information to management practices and facilitate new research based on management needs. The Consortium is always looking for new fire science and ways to disseminate that knowledge to the community. The Joint Fire Science Program annually surveys “consumers” (typically managers) and “producers” (typically researchers) of the national fire science exchanges, the results of which show primarily positive feedback and a perceived increase in the use and accessibility of fire science. We will also present results of an internal effectiveness evaluation and share these results.

Track: Forest Restoration: Research, Policy, and Applied Science of Ecological Restoration across Landscapes and Watersheds

**Denotes primary author*

Poster Number: 41

Understory Composition in Southwest Dry Mixed-Conifer Forest in Absence of Contemporary Treatments

Authors: Doug Cram*, New Mexico State University; Pradip Saud, New Mexico State University; Terrell Baker, University of Florida

Abstract: Dry mixed-conifer forests in the Southwest occupy an important ecological and hydrological role in upper watersheds particularly as it relates to soil and water conservation. In the absence of reoccurring fire and silvicultural treatments over the last 50 years, we quantified understory structure and composition on prevailing north and south aspects of a dry mixed-conifer forest in southcentral New Mexico using mixed models and ordination analysis in preparation for an experiment in ecological restoration. Results indicated understory cover on north aspects was characterized by a mosaic of grasses, forbs, cryptogams, and various woody plants while south aspects were characterized by a near homogeneous layer of litter. We will further present ordination results based on species composition and structure between north and south aspects to characterize important biotic and abiotic variables effecting understory vegetation. Understanding contemporary understory structure and composition is important when planning for desired future conditions that are to be achieved through ecological restoration using silvicultural techniques designed to foster resilience including soil and water conservation.

Track: Forest Restoration: Research, Policy, and Applied Science of Ecological Restoration across Landscapes and Watersheds

**Denotes primary author*

Poster Number: 42

Arkansas Discovery Farm as a Platform Conservation Education

Authors: Mike Daniels*, University of Arkansas; Bill Robertson, Univ. of Arkansas; Andrew Sharpley, University of Arkansas; Brittany Singleton, Univ. of Arkansas; Lee Riley, Univ. of Arkansas; Cory Hallmark, University of Arkansas Extension Service

Abstract: Arkansas farmers are under increasing scrutiny with regard to water quality associated with the Gulf of Mexico. In response, the University of Arkansas Division of Agriculture along with its conservation partners launched the Arkansas Discovery Farm program. Discovery Farms are real working farms that have volunteered to conduct edge-of-field sampling of runoff water quality for nutrients and suspended solids. While the data and information is important, the power of the program from an educational perspective is empowerment of farmers to become educators of their fellow farmers. Water issues are highly emotional as they involve many sectors of society. The Discovery farm program provides producers with data from their own farm that provides indicators and insight to environmental performance. The program allow us to test and demonstrate the efficacy of conservation practices for their unique farm and situation. In turn Discovery Farmers have a platform to educate and inform others when they speak at field days, producer meetings and professional conferences. Discovery Farmers have become leaders in promoting conservation and sustainability to other producers. One example of this is the formation of the Arkansas Soil Health Alliance, an organization ran by farmers and for farmers to advance the adoption of soil health practices.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author*

Poster Number: 43

Arkansas Discovery Farm Results for Cotton

Authors: Mike Daniels*, University of Arkansas; Andrew Sharpley, University of Arkansas; Bill Robertson, Univ. of Arkansas; Lee Riley, Univ. of Arkansas; Cory Hallmark, University of Arkansas Extension Service; Brittany Singleton, Univ. of Arkansas

Abstract: Arkansas cotton farmers are under increasing scrutiny with regard to water quality associated with the Gulf of Mexico and sustainability from large retailers who depend on cotton as a raw product. In response, the University of Arkansas Division of Agriculture along with its conservation partners launched the Arkansas Discovery Farm program. Discovery Farms are real working farms that have volunteered to conduct edge-of-field sampling of runoff water quality for nutrients and suspended solids. Runoff quality data has been collected from four field for 5 years from the Stevens farm in Desha County. Results have indicated low nutrient losses with respect to nutrients applied as nitrogen losses averaged about 5% and phosphorus losses averaged 2% of that applied. Additionally, losses are dominated by a few large runoff events generated from heavy rainfall.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author*

Poster Number: 44

Characteristics, Motivations, and Experiences of Agriculture Producers Who Participated in Natural Resources Conservation Service (NRCS) Programs - Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP)

Authors: Kristie Maczko*, Sustainable Rangelands Roundtable - University of Wyoming; Anna Collins, University of Wyoming; John Tanaka, University of Wyoming Agricultural Experiment Station

Abstract: A knowledge gap exists about demographics, motivations, and experiences of participants in EQIP and CSP at a national scale. This study sought to characterize demographics and motivations of EQIP and CSP participants. By understanding who participates, and why, NRCS can determine if they are reaching target demographics, and which groups are participating in smaller numbers than anticipated. Ideally, this would allow NRCS to recruit under-represented groups. To address these information need, a survey was developed in coordination with producers, agency officials, and academic experts. The survey population is producers who implemented NRCS rangeland-related conservation practices from 2006-2015, extracted from NRCS databases to include active contracts as of FY2015. The population provided by NRCS has 40,970 individuals. The sample size was 1,524 with an anticipated response rate of 25% or a target of 381 returned and usable surveys. The survey instrument was sent out as a four-stage mailing. Analyses of responses is ongoing. Survey respondents were asked whether they participated in EQIP, CSP, or Both programs. Demographics and motivations will be compared among program participant groups. Personal characteristics examined include gender, ethnicity, age, education, income level and sources of income. Operation characteristics assessed include commodities produced, acreage, public grazing permits and farm income. Motivations for participating - economic aspects, conservation goals, and the need for regulation compliance - will also be assessed. The survey also inquired about barriers and experiences, which may include lack of understanding, reimbursement payments, or interactions with agency officials. Survey results will contribute to science and society by informing future execution of conservation programs, and, by association, adoption of conservation practices. Optimizing NRCS conservation programs for participants will enhance awareness and adoption.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author*

Poster Number: 45

Distribution of Biological Soil Crusts and Their Influence on Soil Stability in the Rio Puerco Watershed

Authors: Megan Stovall*, NMSU

Abstract: The Rio Puerco Watershed (RPW) has experienced a cascade of disturbance events as a result of historical overgrazing, which eventually shifted the plant community from a grassland to a sagebrush dominated shrubland. Consequences of this change include the sedimentation of the Rio Puerco and Rio Grande rivers and degraded, eroded, low productivity soils throughout the watershed. In response, the RPW has been the focus of management practices such as prescribed cattle grazing and herbicide treatments to reduce shrub cover, increase herbaceous cover, and reduce soil loss. Yet, as for many NM rangelands, there is little information on the importance of biological soil crust (BSC) to soil stability and rangeland health. BSC inhabit the top 1 cm of the soil and possess many features that increase soil stability. Studying BSC's influence on important ecosystem services such as soil stability could deepen our understanding of watershed dynamics. Thus, our objective was to characterize the distribution and diversity of BSC as a function of soil stability across four sampling areas within the RPW. BSC distribution was assessed using the line-point-intercept method and soil surface and subsurface stability were assessed using a soil aggregate stability field kit. Data analysis showed that BSC cover was highly variable across sampling area, averaging at 39% with a range of 0%- 79%. The most abundant crust types found were the less developed algal crusts rather than later successional types such as lichen or bryophyte crusts. Soil surface stability was significantly greater ($p = 0.0002$) than subsurface stability alluding to the importance of soil surface inhabiting BSCs and their influence on soil stabilization. Sampling areas with higher total BSC cover also had higher soil stability values. The effects BSC have on soil stabilization in degraded landscapes such as the RPW demonstrate the importance of representing BSCs as a component of rangeland health.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author*

Poster Number: 46

Erodibility of and Dust Emissions from Bare Soil Surfaces in the North American Southwest

Authors: Robert Van Pelt*, USDA-ARS; John Tatarko, USDA-ARS; Chunping Chang, Hebei Normal University; Rende Wang, Hebei Normal University; Thomas Gill, University of Texas at El Paso

Abstract: Native plant communities throughout the Southwestern United States are subject to increased abiotic stress due to climate change. As native grass cover is replaced by shrubs, more bare soil surface is susceptible to erosion by wind. The dust record for the last 20 years indicates that wind erosion and resultant fugitive dust emissions are increasing over broad areas of the Southwest. We used a Portable In-Situ Wind Erosion Laboratory (PI-SWERL) to assess and compare the erodibility and dust emissions from multiple undisturbed and disturbed soil surfaces in Texas, New Mexico, Arizona, and Colorado. Results of this study will be presented along with recommendations for improved management of these changing ecosystems.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author*

Poster Number: 47

Growth and Performance of Guar (*Cyamopsis tetragonoloba* L.) under Various Irrigation Regimes in Semiarid Region of New Mexico

Authors: Alonso Garcia Jr, New Mexico State University; Kulbhushan Grover*, New Mexico State University; Brian Schutte, New Mexico State University; Blair Stringam, New Mexico State University; Dawn VanLeeuwen, New Mexico State University

Abstract: Southwestern New Mexico is an arid irrigated area with water availability becoming a concern due to decrease in water table. Guar (*Cyamopsis tetragonoloba* L.) is a potential alternative crop that can be grown in the region due to its low water requirements. Guar can be grown as a forage or as a seed crop. Demand of guar gum produced from the guar seeds has been increasing as an additive in oil and gas industry. The objective of this study was to evaluate seed yield attributing characteristics, agronomic and physiological parameters of four guar genotypes under five drip-irrigated water regimes including an early termination of irrigation at flowering with and without application of biogenic silica. The results indicated that the addition of biogenic silica to early termination of irrigation at flowering treatment improved its seed yield, seeds per plant, leaf area index at 75% pod formation and SPAD values of guar at 100% pod formation.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author*

Poster Number: 48

Quantitative Analysis of USDA-NRCS Investments to Support US Dairy Environmental Stewardship Efforts

Authors: Juan Tricarico, Innovation Center for US Dairy; Rajesh Chintala*, Innovation Center for US Dairy; Keira Franz , Strategic Conservation Solutions

Abstract: US dairy industry contributes 977,700 jobs and adds $206.89 billion to the national economy. Moreover, the Innovation Center for U.S. Dairy and USDA renewed a Memorandum of Understanding (MOU) to advance U.S. dairy environmental stewardship demonstrating the long-term voluntary commitment by US dairy farmers to protect shared natural resources. Cost-share programs are valuable tools for public-private investment in natural resources conservation. Alignment between NRCS conservation programs and dairy industry needs for feed and manure management is desired to create opportunities for enrollment by dairy producers to meet shared goals. This study was conducted to quantitatively assess NRCS investments (FYI 2015-16) through the Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP) and evaluate the support they provide for US Dairy environmental stewardship commitments, specifically relating to manure management, nutrient management and feed management. In 2015-2016, dairy farms received 10% of total EQIP financial obligations. This represents 17% of the total EQIP obligations allocated to livestock. NRCS provided major support through EQIP to establish waste storage facilities (313) on dairy farms (provided $40.6 million in assistance over the two-year period) compared to other on-farm conservation practices. Enrollment in NRCS programs for establishing conservation practices on dairy farms was low in some high milk producing states including Idaho, Texas, and New Mexico. Dairy producers across 30 -plus states are using CSP representing 5% of livestock contracts during fiscal years 2015-16. This study found that several potential opportunities exist for NRCS to expand accessibility to the EQIP and CSP programs to support US dairy farmers achieve shared environmental stewardship goals through to manure and feed management practices.

Track: Rangeland Restoration, Health, and Grazing Management: Adapting Conservation Planning for a Changing Climate

**Denotes primary author*

Poster Number: 49

Adapting Cover Crops to Low-Rainfall Eastern Washington

Authors: Leslie Michel*, Okanogan Conservation District

Abstract: Dryland wheat-fallow production areas in the inland Pacific Northwest suffer from widespread soil degradation. Producers have become increasingly interested in cover crops and improved soil health to meet long-term production goals. Cover crops are known to increase microbial activity and aggregate stability and decrease compaction and nitrate leaching in many other agricultural regions. However, cover crops in low-rainfall regions can be challenging and perceived benefits have not been supported by research. A four-year study, funded by a NRCS Conservation Innovation Grant, was initiated in 2015 at 16 direct-seeded sites to determine feasibility and effects of cover crops in large, on-farm trials in low-rainfall wheat-fallow production systems. The trial is arranged in a randomized complete block design. Each farm (site) is considered a replication. Each site has four treatments where cover crops were planted in each of three seasons, the fall, spring, or summer. A nonplanted treatment was considered the control. Cover crop mixes include warm or cool season grasses, legumes, and broadleaf species. Soil samples are pulled annually, in August, for soil moisture, microbial activity, compaction, nutrients, and successive winter wheat yield. Soil gravimetric water content variance from the control varied greatly by year and summer precipitation. Soil ammonium varied across years and treatments. Soil nitrate decreased for all cover crop treatments compared to the control. In grazed plots, ammonium was higher where treated than control. Winter wheat protein, test weight, and moisture were similar among all treatments. Harvest yields of wheat and canola varied greatly by site and county. The project has demonstrated wide variability across sites, seasons, and years with cover crops in wheat-fallow. To date four field days were hosted, totaling over 200 participants. Education has been provided to 2,000 producers and industry professionals on cover crops and soil health.

Track: Using Technology to Advance Conservation

**Denotes primary author*

Poster Number: 50

Adoption of Solar Irrigation Pumps on US Farms: A Multilevel Model Analysis

Authors: Yubing Fan, Texas A&M University; Dong Won Shin, Korea Environment Institute; Laura McCann*, Univ. of Missouri; Seong Park, Texas A&M University

Abstract: Solar irrigation pumps can reduce energy costs and carbon emissions. However, the U.S. adoption rate of solar pumps is less than 1%. Thus to encourage the adoption of solar pumps, investigating and understanding key determinants are essential. We used a multi-level model for a national dataset from the USDA 2013 Farm and Ranch Irrigation Survey. The survey was conducted in January-May of 2014, and the dataset includes 19,272 farms. The dependent variables were adoption of solar and other pumps that do not have direct energy expenses. About 0.74% of farms had adopted solar pumps. More farms used sprinkler (36%) than gravity (25%) and drip (18%) irrigation, and about 21% used more than two types of irrigation systems. Average energy expense was 75 dollars per acre which was greater than average labor costs but above surface water costs. Major barriers to implementing irrigation improvements included investigating improvement is not a priority (22%), cannot finance improvements (18%), not enough to recover implementation costs (14%), and uncertainty about future water availability (14%). Major information sources were extension agents (28%), neighboring farmers (25%), irrigation equipment dealers (20%), private irrigation specialists or crop consultants (18%), and electronic information services (14%). Results indicated 60% of the variability in the adoption of solar pumps was accounted for by state-level factors. At the farm level, adoption of solar pumps was associated with use of more efficient irrigation systems. Adoption also increased with land ownership, federal assistance for irrigation improvements and obtaining irrigation information from extension specialists. Variables decreasing adoption included inability to finance improvements, as well as obtaining information from non-Extension sources. Farmers in the Midwest and Atlantic states were more likely to adopt solar pumps than those in the Plains, controlling for other variables.

Track: Using Technology to Advance Conservation

**Denotes primary author*

Poster Number: 51

Agricultural Conservation Planning Framework (ACPF) Ver. 3: A New Method of Sub-Catchment Delineation to Better Link Upland and Riparian Settings and Enhance Watershed Planning Technologies

Authors: Mark Tomer*, USDA-ARS; Sarah Porter, USDA-ARS; David James, USDA-ARS; Jessy Van Horn, USDA-ARS

Abstract: In watershed planning and modeling applications, it is typical to divide a watershed area into smaller catchments to identify spatial variations in land use, soils and landscapes, and their consequences for hydrologic and water quality. This information can be used to prioritize conservation expenditures within watersheds to achieve the greatest environmental benefits. In virtually all applications, these spatial delineations are made based on tributary streams, using stream confluences as outlets (or pour points) to delineate the catchments. We have developed an approach to further delineate the catchments based on riparian stream lengths, which can enable planners and modelers to evaluate how riparian and upland settings are paired, and better visualize conservation management opportunities for landscapes at a fine-scale. Headwater catchments are first delineated into three sub-catchments, comprising the contributing area above the stream initiation point, and contributing areas on both sides of the stream length. The two stream-side sub-catchments are further divided into riparian sub-catchments, using (nominally) 250-m stream lengths to delineate the contributing area above each riparian length. This enables riparian and upland features, including land use, soils, terrain, and conservation practice placement opportunities to be mapped together with greater spatial detail compared to previous versions of the ACPF. Extending this approach has led to separate (and optional) routines for mapping lakeshores and wide-river environments. We are encouraged by initial results, which convey visualizations of alternative approaches to agroecosystem analysis and conservation management of agricultural landscapes.

Track: Using Technology to Advance Conservation

**Denotes primary author*

Poster Number: 52

Can Spatial Detail on Practice Placement Opportunities in Watersheds Inform Regional Conservation Planning Strategies? Results of a Virtual Multiwatershed Experiment

Authors: Mark Tomer*, USDA-ARS; Jessy Van Horn, USDA-ARS; Sarah Porter, USDA-ARS; David James, USDA-ARS

Abstract: Conservation planning activities need to be efficient because the environmental problems that new conservation efforts are meant to address are broad in scale, and need to be addressed in the near term (10-25 years). Technologies that can inform conservation planning with spatial detail at field and watershed scales have recently become available. However, well considered strategies that leverage these technologies also need to be informed by anticipated opportunities, benefits, and costs at regional scales. We hypothesized that the Agricultural Conservation Planning Framework (ACPF) toolbox, when applied to multiple HUC12 watersheds representing dominant landform regions for Iowa, would show that given suites (or combinations) of practices can be associated with different landform regions. We selected 24 watersheds representing three Major Land Resource Areas (MLRAs) in Iowa, and dominant Agro-Hydrologic Landscapes (AHLs) found within each MLRA. MLRAs are delineated based in part on dominant soil associations, while the AHLs are delineated based on dominant drainage and slope classes of soil map units. The ACPF toolbox was applied to data from each watershed, and conservation practice placement results were compared among regions. The frequencies at which the ACPF placed practices in the fields of the (replicate) watersheds were used as response variables. Results, to be detailed on the poster, suggest that combining the MLRA and AHL landscape classifications may be most useful to inform regional conservation strategies.

Track: Using Technology to Advance Conservation

**Denotes primary author*

Poster Number: 53

Denitrification Bioreactors to Limit Nitrate-Nitrogen Migration

Authors: Michael Aide*, Southeast Missouri State University; Indi Braden, Southeast Missouri State University

Abstract: Nitrogen transport from agriculture production fields raises the specter of environmental degradation of fresh water resources. This report documents nitrate-N, phosphorus and ammonium-N concentrations emanating from a 40 ha controlled subsurface irrigation drainage technology fitted with a denitrification bioreactor to sequester nitrate-N. Water samples were collected weekly during the drainage interval, with subsequent analysis for pH, Ca, Mg, K, Na, SO4, NO_3, NH_4, and other chemical species. Nitrate-N bearing tile drainage effluents range from less than 10 mg NO_3-N/L to excessive levels, depending on the timing of nitrogen fertilization to corn, soil mineralization and heavy rainfall events. The denitrification bioreactor was effective in reducing drainage water nitrate-N concentrations, providing the rate of water flow through the denitrification bioreactor permitted sufficient time for equilibrium to be attained for the nitrate reduction reactions. This edge-of-field technology may dramatically improve downstream water quality and mitigate hypoxia in fresh water supplies.

Track: Using Technology to Advance Conservation

**Denotes primary author*

Poster Number: 54

New Method for Development of Setback Areas on Restrictive Slopes, For West Virginia Nutrient Management Plans

Authors: Bethani Chambers*, West Virginia University

Abstract: Setbacks are best described as distances between pollutant sources and sensitive resources or aquatic ecosystems that require protection. When developing a comprehensive nutrient management plan (CNMP) planners determine treatable acres by removing setback areas within the farmer's individual fields. Setbacks include non-treatable areas that are excluded from a field's treatable acres. These are features such as rock outcrops, trees, and restrictive slopes. Farming in West Virginia occurs routinely in rugged and mountainous terrain increasing the risk of equipment rollovers and subsequent injuries to the operator. The first WV NRCS NM- 590 setback criteria was developed in 2013, which included a requirement that no applications would be made to areas with slopes greater than 30%. This restriction was established to ensure the safe operation of the landowner with his equipment, not for environmental outcomes. It was found that this blanket slope restriction criteria was not being followed by farmers with completed CNMPs. A revised step to the planning process has now been developed to evaluate areas that are previously excluded due to slope. This step improves the likelihood the CNMP will be implemented by the landowner and increases the accuracy of the manure allocation step. This revised setback criteria requires the planner to generate farm maps with identified sloped areas that are 25% or greater and then to review these areas with the landowner. The landowner then designates the non-treatable areas within those identified sloped areas. Having the planner and the landowner collaborate early in the planning process to discuss setback criteria from both an equipment operator safety standpoint and the more typical environmental considerations, improves the landowners understanding of why setbacks are needed, how permanent buffers can supersede a setback requirement, and what buffers or setbacks areas will be avoided with application equipment.

Track: Using Technology to Advance Conservation

**Denotes primary author*

Poster Number: 55

Producer Engagement Using the Agricultural Conservation Planning Framework (ACPF) Toolbox: What Do We Know?

Authors: Pranay Ranjan*, Purdue University; Ajay Singh, California State University-Sacramento; Linda Prokopy, Purdue University

Abstract: Producer engagement is an integral component of conservation planning. Targeted conservation, a novel conservation planning approach that helps site conservation practices to locations with the highest potential for improvement, has garnered widespread support from both conservation planners and producers. Whereas a targeted approach to conservation expedites the conservation planning process, does it also motivate adoption of conservation practices? Keeping this question at the core of our enquiry, in this study, we present findings from semi-structured interviews conducted with 15 producers from four watersheds in the US Midwest. Specifically, we synthesize producers' experiences of working with conservation planners, who were using results from the ACPF toolbox to discuss conservation opportunities on producer's farm. Preliminary results suggest that ACPF results helped producers in both identifying and prioritizing areas of concerns on their farms. Results also highlight the importance of producers' perceiving a sense of ownership in the targeting process, and that the process is flexible and of voluntary nature.

Track: Using Technology to Advance Conservation

**Denotes primary author*

Poster Number: 56

Conservation Best Practices from Day One of a Beginning Farmer's Career

Authors: Justin Chase*, New Entry Sustainable Farming Project; Juliette Enfield, New Entry Sustainable Farming Project

Abstract: For many beginning farmers, the goal to operate within a triple-bottom-line accounting framework (social, environmental, & financial) is now tantamount to simply producing and selling food. This presents many benefits, but it also presents unique challenges - challenges that presently overwhelm many NRCS offices. Today's prospective farmers not only need to learn to grow and raise food, but they now need to understand ecology and conservation best practices. A popular present track involves prospective farmers learning production methods, practicing those methods, accessing land, and then working directly with NRCS Officers to discover best practices and how they may be included in their young farm's operations. This is presently overwhelming many county offices and New Entry Sustainable Farming Project is working to alleviate those demands by teaching innovative conservation best practices from day one of an aspiring farmer's career. With funding provided by CIG, New Entry created a comprehensive, season-long course that teaches aspiring farmers basic production skills while simultaneously presenting sustainable methods, conservation best practices, and whole-farm planning. Many of our students are immigrants or come from socially disadvantaged backgrounds and to address their particular needs we've included lectures and presentations by UMass Extension, NRCS, Mass Dept. of Ag., and FSA loan and grant experts. Completion of the course provides students with 1). Solid training in all aspects of crop production 2). Comprehensive lessons in sustainable farming and innovative conservation best practices, and 3). An introduction to the support organizations and agencies that will be there for them throughout their sustainable farming careers. New Entry's poster will include: 1). The problem the course addresses; 2). How the course solves that problem; 3). Course curriculum; 4). Course partners and presenters, and 5). Images of instruction and specialists' presentations.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 57

Demonstration and Implementation of a Nutrient Management Risk Advisory System for Protection of Water Quality in Runoff Prone Climates

Authors: Nichole Embertson*, Whatcom Conservation District

Abstract: Despite decades of efforts to reduce non-point source nutrient pollution, excessive nutrient losses continue to persist from agricultural lands, contributing to water quality impairment. Wet, temperate and/or humid regions of the United States, such as the Puget Sound region, Great Lakes basin, Chesapeake Bay watershed, and Mississippi River basin, increasingly experience frequent runoff events that transport nutrients, pathogens, and/or sediment from recently applied manure and/or fertilizer nutrients to surface waters. Producers and conservation personnel need easy-to-use, real-time tools to help them identify when and where a runoff event may occur, particularly in areas with recent nutrient application. This project qualitatively compares the strengths of four different current runoff advisory tools: the Runoff Risk Advisory Forecast (WI), Application Risk Management System (WA), Fertilizer Forecaster (PA), and the Saturated Area Forecast Tool (VA), with the goal to develop, corroborate, and implement a Nationally available advisory system and suite of supporting materials that can be implemented in applicable areas throughout the US. By integrating NRCS 590 Nutrient Management needs and the “4Rs” principles, specifically timing and placement, the project hope to aid farmers and conservation personnel in the prevention of excessive nutrient losses from agricultural lands by providing current and short-term forecasts of runoff risks. Producers and conservation personnel can then use this information to change nutrient management strategies and avoid unintended impacts to water quality. Without these types of science based and defensible solutions to guide conservation planners and agricultural producers towards sustainable environmental management, many producers will be subject to increasing regulation, lawsuits, and potential loss of productive farmland.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 58

Demonstration of Pollinator Conservation Practices and a Framework for Regional Implementation on the Southern High Plains

Authors: Scott Longing*, Texas Tech University; Nancy McIntyre, Texas Tech University; Robert Cox, Texas Tech University; Cynthia McKenney, Texas Tech University; Chuck West, Texas Tech University

Abstract: In 2015, we partnered with farmers on the Southern High Plains to initiate demonstrations of conservation practices for pollinators. Along with pollinator habitat demonstrations, on-farm research has involved an assessment of pollinator community structures in relation to local and landscape habitat. A concurrent plant-attractiveness study addressed pollinator visits to 30 different drought tolerant plants available through commercial vendors, with plants ranked according to the total number of pollinators and their taxonomic grouping. Finally, we highlight the importance of understanding specialist pollinators, their habitat resources, and considerations of pollination syndromes and annual growth strategies that influence diverse sweat bee communities on the High Plains. Here, we provide an overview of the results to date for this project and additionally provide a link to a new website devoted to pollinators and the management of their habitat in agricultural lands.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 59

Developing and Piloting a Water Quality Trading Program for Agricultural Operators in the San Jacinto Watershed

Authors: Mark Kieser*, Kieser & Associates, LLC

Abstract: The Western Riverside County Agriculture Coalition (WRCAC), Kieser & Associates, LLC and Tetra Tech, Inc. have been working to develop and pilot a Water Quality Trading (WQT) program for agricultural producers in the San Jacinto Watershed. This effort has been funded by Conservation Innovation Grant (CIG) Number 69-3A75-14-259 through USDA-NRCS. WRCAC member producers have multiple challenges including an arid region, varied soil types, and regulatory requirements for surface and groundwater discharge loading that are still under development. The overall project goal has been to provide cost-effective, flexible and pragmatic water quality compliance approaches for producers while documenting the progress being made on Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Load (TMDL) reduction goals by agricultural producers. While the issues are complex, the project team is developing a science-based adaptive management approach based on a local adaptation of the USDA-NRCS Water Quality Index for Agriculture Runoff (WQIag), field soil testing and increased understanding of local nutrient management practices. Because the WQIag blends the field physical setting with operational choices, it will also be useful for producers who are contemplating operational or crop rotation changes. A Bubble Compliance Approach has been proposed as a way to develop WQT rules and infrastructure. This will allow fields in specific subwatersheds (or bubbles) to average their compliance metric (WQIag) scores to achieve attainment. Final products will include materials to assist WRCAC members with ongoing regulatory compliance as well as a final report documenting the project development process and lessons learned.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 60

Erie Phosphorus Market: Water Quality Crediting in the Western Lake Erie Basin

Authors: Daniel Gold*, Great Lakes Commission

Abstract: Erie P Market project is a Conservation Innovation Grant funded by NRCS to see whether water quality trading may be an additional tool to help address the nutrient pollution problem in the Western Lake Erie Basin. The project developed a Framework that provides a common approach that the three states surrounding Western Lake Erie (Michigan, Ohio and Indiana) can use to certify phosphorus reductions and credit generation, and support all phases of the transaction of buying and selling water quality (specifically phosphorus reduction) credits. The Framework describes who is eligible, where and when trading can occur, and the process for verifying that conservation practices are working to improve water quality. Water quality and agriculture agency directors from those three states signed an MOU in December 2017 agreeing to consult the Framework when pursuing phosphorus trading/crediting in the Western Lake Erie Basin. In spring and summer of 2018, the Framework is being tested through several pilot trades. This poster will highlight the key elements of the Framework, with emphasis on the steps involved in a water quality trading transaction from both seller (e.g., farmer) and buyer perspectives using real-world examples. It will also feature the tools used to calculate phosphorus load reductions from on-farm conservation practices that enable performance-based payments (i.e., payments to farmers based on the amount of phosphorus runoff reduced).

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 61

Evaluating Compaction BMP Effects on Soil Properties and Demonstration of Soil Moisture Monitoring for Compaction Prevention in Heavy Clay Soils of the Northeast

Authors: Joshua Faulkner*, University of Vermont; Juan Alvez, University of Vermont; Josef Gorres, University of Vermont; Kristin Williams, University of Vermont

Abstract: Soil compaction can be a significant yield-limitation and conservation concern due to poor drainage, increased runoff, reduced soil aeration, and decreased root penetration. The compaction problem is common, especially in cool, humid regions with heavy clay soils, such as the Northeast. To remediate deep compaction, producers often employ deep tillage, or subsoiling, in an effort to loosen the soil, to reduce bulk density and allow for deeper root penetration and improved percolation of soil water. Management practices that involve less soil disturbance, such as cover cropping have also been suggested and are being used as approaches to remediate and prevent compaction by improving overall soil health and 'bio-drilling'. This project evaluated mechanical (i.e., deep tillage) and biological (i.e., cover crop mixes 1-3) approaches to compaction remediation in pasture/hay and corn silage systems in two farms in Vermont over three years. Treatments were completely randomized within three blocks. Penetration resistance, soil health, and bulk density were measured. We found statistical differences in compaction alleviation in different depth classes across years ($p \leq 0.001$) however, no differences were found due to treatment effects. Results highlight the challenges establishing new species in existing forage stands and question the economic value of deep tillage in sod. Results from corn silage plots show promise but point to the need for further research. In addition, demonstrating user-friendly and inexpensive on-farm soil moisture monitoring, and its meaningfulness to compaction prevention is needed by farmers working to improve soil health. This project also established a soil moisture monitoring network in a rotational grazing system that could be remotely monitored by the farmer in real-time to guide herd management for compaction prevention over a two-year period. Observations and experiences will be reported.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 62

Evaluating Grazed Crops for Soil Health and Profitability in Dryland Cropping Systems of the Semiarid High Plains

Authors: Meagan Schipanski*, Colorado State University; Kat Caswell, Colorado State University; Courtland Kelly, Colorado State University; Angela Moore, Colorado State University; Joe Brummer, Colorado State University; Steven Fonte, Colorado State University; Lucas Haag, Kansas State University; Sandy Johnson, Kansas State University; Holman Holman, Kansas State University; Ron Meyer, Colorado State University; Augustine Obour, Kansas State University; Wilma Trujillo, Colorado State University; Sarah Ward, Colorado State University

Abstract: Cover crop adoption has been limited in the High Plains where summer fallow remains a dominant practice and soil erosion often exceeds tolerable limits even under no-till management. Due to limited water resources, producers who have adopted cover crops may graze them to maintain profitability. We are collaborating with producers to evaluate the potential of this practice to build soil health while also maintaining productivity and profitability. In 2016 and 2017, cover crop mixtures were planted across 5 farm fields located in the semi-arid High Plains region of western Kansas, eastern Colorado, and southwest Nebraska. Within each field, four replicated treatments of grazed, ungrazed, and fallow areas were established. Fields were strip-grazed primarily in June and July. Stocking rates varied by field. Animals were weighed individually before and after grazing. Forage biomass was sampled at the end of grazing. Soils were sampled at cover crop termination after grazing and at fall wheat planting for moisture to 1.8 m and bulk density in the top 5 cm. Forage production varied across farms and years with an average of 3.2 and 1.5 Mg/ha of dry matter in 2016 and 2017, respectively, that supported an average of 28 days of grazing. Due to regrowth, residue remaining at the end of grazing was similar to residue in ungrazed areas. Grazing did not increase soil compaction and it improved soil aggregation in the top 5 cm relative to fallow areas in both years. Cover crops reduced soil moisture at deeper soil depths below 30cm at wheat planting relative to fallow. These results suggest that cover crops can provide early season forage production for grazing with minimal negative impacts on soil health indicators and some short-term positive effects. Cover crops use water that may affect the next crop yield, but grazing may help offset this yield penalty.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 63

Hydrologic Monitoring to Support NRCS Practice Evaluation and Development in the Great Lakes and Mississippi River Watersheds.

Authors: Dennis Busch*, Water Resources Monitoring Group LLC

Abstract: The United States Department of Agriculture's Natural Resource Conservation Service has supported development of low-cost approaches to edge-of-field runoff monitoring to increase adoption of this practice and promote standardization of monitoring activities. Water Resources Monitoring Group, LLC is currently conducting field tests of monitoring hardware which is designed to address challenges identified in prior testing, enhance the capability of the hardware, and evaluate the new prototype hardware under varying field conditions. Our intent is not only to reduce the cost of hardware associated with edge-of-field monitoring; but also move toward offering a fully integrated intensive monitoring program. An integrated monitoring program will include: turn-key hardware and software solutions that are easy to install and operate, provide standard protocols for installation, operation, and maintenance of equipment; and provide training and education on monitoring methods and procedures to ensure transparent and consistent results across monitoring projects. Furthermore, we are field-testing a modified prototype gauge for use in extensive monitoring programs where the focus is not on collecting data to determine the statistical significance of a conservation practice on water quality, but rather to provide management information to farmers. Studies have shown that farmers prefer quick and simple evaluations that allow them to continually update their evaluations and plans rather than detailed and elaborate testing procedures. Given this information, how do we support wide-spread farmer decision-making on issues that are transparent, such as nitrate and dissolved phosphorus loading to surface and groundwater? We believe low-cost, short-duration, higher uncertainty monitoring and data collection (extensive monitoring) can provide management data to farmers and support NRCS conservation activities, such as Code 590 Nutrient Management and Code 118 Irrigation Management.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 64

Increasing Adoption of Organic Methods by Historically Underserved Producers in Minnesota and Wisconsin through Innovative Outreach, Demonstration and Technology Transfer Strategies

Authors: Laura Hedeen*, Minnesota Food Association / Food Group

Abstract: The purpose of this project is to transfer proven conservation technologies used in organic systems to historically underserved producers in Minnesota and Wisconsin, and assist those producers with implementing conservation practices by addressing land tenure issues and accessing NRCS programs. Historically underserved producers are underrepresented in the growing organic market due to lack of accessible training and insecure land tenure. This project will form a unique collaborative of four community-based organizations across two states to address these issues, bringing together expertise in organic methodologies, training for historically underserved producers, and legal expertise on land tenure issues. The goals of the project are to: 1) Increase the number of historically underserved farmers in MN and WI with organic systems and/or conservation plans in place on their farms (owned or rented land); 2) Educate historically underserved producers about available NRCS programs and assist them with accessing these programs; 3) Educate landowners about the benefits of implementing conservation plans on rented farmland and NRCS programs available to support them; 4) Increase acreage in MN and WI under protection by some sort of conservation plan; and 5) Create land tenure arrangements for historically underserved producers that support their use of organic and other conservation technologies.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 65

Outreach on Grazing Lands to Enhance Economic Analysis (Costs and Benefits) for Conservation Changes

Authors: Monti Golla*, National Grazing Lands Coalition

Abstract: The National Grazing Lands Coalition is conducting a 3-year outreach/education/demonstration project on how a variety of management and conservation practices impact pasture and range productivity, economics, and sustainability. The project is investigating the role economics plays on producer decisions about conservation program participation, and how the design of grazing management systems influences economic performance. Very little information is available reflecting how flexible herd management for rangeland and pastureland operations is linked to soil health, stocking rates, drought response and economic performance. The project database currently contains information from over 80 producers from six regions of the U.S. Participating producers varied considerably in each region, including part vs. full-time, small scale to larger ranching operations and family vs. corporate operations. Data are from new producers as well as those representing multi-generational operations. Some data will be summarized in tabular/graphic form. However, much of the information collected is in text format and will be analyzed using some unique text data analytic procedures. Thus far the project includes responses from 82 producers with a total of 80,376 acres. Respondents indicate on average they manage just less than two thirds of all those acres with conservation in mind. Operations include ones as small as 5 acres and as large as 12,000 acres with the average sized operation consisting of 980 acres. The poster will highlight some of the results that might be of most interest to those attending the SWCS conference, such as soil health and quality. A similar summary for water quality and quantity also will be shared. We anticipate that tying economic information to conservation practices will have a significant impact on financial incentives and influence the adoption of different management/conservation practices in the future.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 66

Quantifying Dynamic Soil Health Effects of Tillage and Cover Crops

Authors: Ayush Joshi Gyawali*, Virginia Tech; Ryan Stewart, Virginia Tech; Mark Reiter, Virginia Tech; Wade Thomason, Virginia Tech

Abstract: Cover crops and reduced tillage practices are being used to improve soil health, but many commonly used indicators of soil health (e.g., soil organic matter) may not respond quickly enough to reveal impacts of different practices. In this study we sought to identify soil health indicators that change on seasonal to annual time-scales, and to determine how those indicators respond across five sites in Virginia. In all five locations, tillage/reduced tillage and with/without cover crop treatments were tested in a split plot design that is now in its third year. “Tilled” plots received disk harrowing to 25 cm in the spring and fall, while “With cover crop plots” received a three-way mixture of barley+clover+radish each fall. Four plots had silage corn as the cash crop, with the fifth planted in tobacco. Preliminary results indicate no-till and cover crops increased microbial carbon and soil aggregate stability, which represent “dynamic” indications of soil health. On the other hand, more inherent properties such as field-saturated hydraulic conductivity did not consistently respond to different management practices. Thus, these results indicate that only certain dynamic soil health indicators will vary over short timescales, making such measures important to include when demonstrating effectiveness of soil health building practices.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 67

Quantifying the Environmental Benefits of Rotational Grazing in the Chesapeake Bay Watershed

Authors: Beth McGee*, Chesapeake Bay Foundation

Abstract: Rotational grazing has multiple environmental benefits including to greenhouse gas mitigation, soil health, and water quality. Collectively, the Chesapeake Bay jurisdictions have committed to implement rotational grazing on over 1.2 million acres by 2025 to help achieve the nitrogen, phosphorus, and sediment pollution reductions called for under the Chesapeake Bay Cleanup plan. To that end, the goal of this Conservation Innovation Grant (CIG) was to increase adoption of this practice in VA, MD and PA, by quantifying and sharing the numerous benefits of converting to more intensive grazing systems, evaluating the potential for market-based incentives, and assessing adoptability. Here we present the results of the assessment of the environmental benefits on seven case study farms. The farms represent different geographies, animal types, and planned grazing intensity. Farm scale models (e.g., COMET-Farm, Chesapeake Bay Nutrient Tracking Tool) were used to estimate greenhouse gas and water quality changes. Soil samples were analyzed by the Cornell Soil Health Lab and included organic matter, wet aggregate stability, and soil respiration. The largest environmental benefits accrued from the conversion of conventional grain operations to pasture-based systems but, the movement from continuous to rotational grazing also resulted in environmental benefits. Detailed results of these analyses will be presented.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 68

Restoring the Gulf: Leveraging Deepwater Horizon Funds with Impact Investment

Authors: Lisa Ferguson*, The Nature Conservancy

Abstract: The Nature Conservancy is developing conservation investment blueprints outlining how Deepwater Horizon Oil Spill Settlements can leverage private capital to improve the pace and scale of conservation in the Gulf of Mexico. Although the Deepwater Horizon Settlement is approximately $20 billion, it is insufficient to address the ongoing threats to nature and people. Rather than serve as a sole funding source, the money can be leveraged with other public and private capital to create impact investments that enhance restoration in the Gulf. This project analyzes potential impact investments in coastal restoration, green infrastructure, sustainable agriculture and sustainable forestry. The final product will be at least three impact investment blueprints that combine Deepwater Horizon money with additional sources of capital, and that can be replicated and scaled across the Gulf, to deliver environmental and financial returns. Blueprint development is taking place in two phases. The first phase was to design multiple business models that address conservation needs while generating revenue. This included assessing conservation priorities, identifying revenues and costs and determining how Deepwater Horizon funding can attract additional capital. Each business model was vetted with internal and external partners, and the four most viable models were advanced to the case study phase. TNC is now testing those models in specific locations in the Gulf to analyze market dynamics, stakeholder partnerships and other factors that will be critical to the models' success. We anticipate this to result in at least three conservation investment blueprints that each describe the conservation opportunity, business model, enabling conditions, sources and uses of funds and financial returns. We hope these blueprints will ultimately help TNC and other stakeholders create replicable, scalable impact investments that benefit nature, people and economies in the Gulf of Mexico.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 69

Water Quality and Soil Health under Fallow Season Cover Crops in Mid-South Row-Crop Production

Authors: Lisa Fultz*, LSU AgCenter; Brenda Tubana, LSU AgCenter; Magdi Selim, LSU AgCenter; James Hendriz, LSU AgCenter; Kenneth Gravois, LSU AgCenter; Donnie K. Miller, LSU AgCenter; Naveen Adusumilli, LSU AgCenter; Albert Orgeron, LSU AgCenter; Paul Price, III, LSU AgCenter; Josh Copes, LSU AgCenter; Donna Morgan, LSU AgCenter

Abstract: Soil health, or the capacity of soil to function as a vital ecosystem and sustain plants, animals, and humans, highlights the importance of soil physical and chemical properties, as well as soil biology. Soils act as filters for water and air, cycle nutrients, and provide physical stability. In response to the growing interest in improving soil health, use of conservation practices like fallow season cover crops has increased significantly. Despite the long history of cover crop success, adoption has been limited in the Mid-South, an area which provides a unique environment and diverse cropping systems highly susceptible to losses due to poorly managed production. In Louisiana, an estimated 95% of croplands remain bare during the fallow period leaving them vulnerable to runoff inducing rainfall. The reliance on frequent tillage and low-residue returning crops has depleted soil organic matter levels and soil nutrients, reduced aggregate stability, and resulted in significant losses of fertile soils. We proposed to promote the use of cover crops in corn, cotton, soybean, and sugarcane production systems across the state of Louisiana. Multiple trials have been initiated on producer's fields allowing for the comparison of soil health, water quality, weed and disease pressure, crop production, and economic impacts between current on-site practices and the introduction of cover crops. From each site, soil samples are collected (0-15 & 15-30 cm) twice annually, cover crop biomass is collected prior to termination, sites are assessed for weed and disease pressure, and information on farmers practices are collected. Additionally, we propose to identify four model farms on which water quality and deep core soil samples will be collected. These on-site demonstrations are further supported by trials at four research stations which, when combined, provide an in-depth investigation of the potential integration of cover crops into Mid-South and Louisiana production systems.

Track: Conservation Innovation Grants Showcase

**Denotes primary author*

Poster Number: 70

SWCS Professional and Chapter Development Committee: Working for You

Authors: Lisa Cox, Wyoming; Erika Crady, SWCS staff liaison; Becky Fletcher, Indiana (Chair); Sharon Hartzold, Illinois; Josh Ketch, Oklahoma; Rob Lawson, Illinois; Shelly Lassiter, Washington; Hida Manns, Ontario; Rex Martin, Missouri; Cathy McGuire, Arizona; Susan Meadows, Indiana and SWCS Board liaison; Dale Threatt-Taylor, North Carolina

Abstract: The Professional and Chapter Development Committee works with SWCS Board Regional Directors to develop the leadership skills of Chapter officers and provide support to local Chapters. Committee members serve as a member of the regional team, working with their respective regional director to ensure better communications between the Society and Chapter leaders. We assist in providing regional training opportunities and we provide resources and tools that help build the capacity of local Chapters.

Track: Professional and Chapter Development

Poster Number: 71

SWCS North Dakota Chapter

Authors: North Dakota Chapter Membership

Abstract: The SWCS North Dakota Chapter shares recent activities and accomplishments within their region.

Track: Professional and Chapter Development