80th SWCS International

ANNUAL CONFERENCE

Conservation Coast to Coast

August 3–6, 2025 | Costa Mesa, California

SOIL AND WATER CONSERVATION SOCIETY

ABSTRACT BOOK

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SYMPOSIA PRESENTATIONS

MONDAY, AUGUST 4

SYMPOSIA SESSION DESCRIPTIONS AND AGENDA

Conservation Innovation Grants (CIG) Showcase
10:30 AM – 5:00 PM
The USDA Natural Resources Conservation Service (NRCS), in conjunction with SWCS, will host the 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 an overview of the CIG program and three themed panels. The first panel is an introduction and highlights the variability of the CIG program, the second panel explores innovations in irrigation management, and the last panel covers innovative conservation approaches for soil health.

This showcase runs from 10:30 AM to 5:00 PM on Monday, August 4. Following the showcase, CIG project posters will be included in the poster presentation session held in the poster display area of the exhibit hall from 5:00 PM to 7:00 PM.

Session 1 Title: Innovative Conservation Approaches – Highlights from the Conservation Innovation Grants Program
Location: Balboa Bay on Banquet 2 Level
Time: 10:30 AM – 12:00 PM

Moderator: *Mark Micozzi, Chickasaw Nation*

Presentation 1: The Juniper Evaluation Tool, An Interactive Dashboard for Managing Juniper Vulnerability within the Chickasaw Nation Treaty Territory – *Mark Micozzi, The Chickasaw Nation Office of Natural Resources*

The expansion of juniper species, mainly eastern red cedar (Juniperus virginiana), in Oklahoma has become a significant issue, affecting millions of acres of land. This rapid spread has been exacerbated by historical fire suppression policies that disrupted natural fire regimes, which previously kept juniper tree populations in check. The unchecked growth of juniper trees results in various economic and environmental problems, including reduced land productivity, lower land values, increased wildfire risks, increased removal costs and potentially diminished water quality and long-term aquifer recharge. To combat these negative impacts, the Chickasaw Nation (CN) has undertaken a proactive approach to managing cedar infestation by promoting appropriate best management practices (BMPs) for soil health and water quality improvements. To further assist this effort, funding from the Natural Resources Conservation

Service Conservation Innovation Grants program enabled the CN to develop a juniper species distribution model and decision support tool, called the Juniper Evaluation Tool (JET). This tool provides estimates of juniper cover, as well as other important landcover metrics, that helps prioritize areas for juniper management and removal. This project aims to provide landowners with knowledge necessary to effectively manage their land and prevent further juniper encroachment. These local actions will help deliver positive regional impacts to CN streams, lakes and aquifers, and potentially provide an expanded JET that can be applied in other parts of Oklahoma and nationally. This presentation will highlight the deliverables of the project, the model methodology, and a brief demonstration of the JET along with some examples.

Presentation 2: Trialing dietary interventions to mitigate enteric methane emissions in dairy cattle – *Juan Tricarico, Dairy Management, Inc.*

The project leveraged insights from on-farm trials, expert advisor surveys, and other relevant stakeholders to understand barriers to adoption of feed management practice standard (Conservation Practice Standard (CPS) 592) and inform NRCS to support its enhanced adoption for enteric methane mitigation. The on-farm trials conducted in the project confirmed that adoption of feed management practices such as feed additives or supplements could provide production and environmental benefits, creating an opportunity for additional revenue generation on farm. However, high variability in production benefits suggests that financial incentives should be available to dairy producers to derisk the adoption of feed management practices. In addition, this high variation in production benefits and the cost of practice implementation should be considered while setting incentive payment rates. Preferred sources of financial support among farmers and feed advisors were NRCS, dairy companies, and consumers. In addition to the uncertainty regarding the economic benefit of these practices, lack of publicly available evidence on the effectiveness of the practices, impact on animal health, and lack of access to technical support were identified as barriers to adoption. Therefore, there must be increased investment in offering financial and technical assistance, conducting more research and generating scientific evidence to eliminate key adoption barriers. Awareness about CPS 592 could be raised by providing training and education opportunities for farmers and feed advisors. A simple feed management plan template, tailored to a specific objective, was created in this project to encourage increased adoption of CPS 592 among feed advisors. In addition, a Conservation Stewardship Program (CSP) enhancement was developed in the project, which could be an opportunity to generate additional income for dairy farmers, leading to enhanced adoption of the feed management standard and practices.

Session 2 Title: Innovations in Irrigation Management
Location: Balboa Bay on Banquet 2 Level
Time: 1:30 PM – 3:00 PM

Moderator: Bianca Moebius-Clune, American Farmland Trust

Presentation 1: High Clearance Robotic Irrigation Impacts on Soybeans and Corn Yield and Nutrient Application – *Andrew Klopfenstein, The Ohio State University*

This collaborative project between The Ohio State University, Iowa State University, and 360YieldCenter intends to demonstrate the in-season application of commercial and animal nutrient sources and water application as a unified strategy to reduce nutrient losses while improving profitability with increased grain yields. A new and innovative high-clearance robotic irrigator (HCRI) is being used to apply liquid-phase nutrients in-season beyond all stages of row crops. Replicated strip trials of Fall, Spring, and in-season application will occur using the HCRI (e.g., 360 RAIN Robotic Irrigator, Figure 1). The in-season application consists of traditional N and P application rates as well as reduced rates to take advantage of better matching nutrient availability to crop needs during the growing season. Data were collected to verify nitrate-nitrogen leaching loss using liquid swine manure as a nutrient source in Iowa, while total and dissolved reactive phosphorus losses with both runoff and leaching using commercially available nutrients were collected in in Ohio. Secondly, as climate shifts result in water scarcity during critical crop growth stages, robotic irrigation water applications will be used to meet the crop needs. Higher crop yields are anticipated via precision water management. Results will be discussed from the Ohio portion of the study for 2023 and 2024 cropping seasons.

Presentation 2: 360Rain and the Future of Manure: A Robotic Approach to Emissions Reduction and Nutrient Management – *Dr. Kapil Arora, Iowa State University*

Methane emissions from manure storage significantly contribute to the livestock industry's carbon footprint. While various manure management strategies are used to reduce greenhouse gas (GHG) emissions on farms, such as anaerobic digestion and composting, many of these strategies are cost-prohibitive for small-to-medium-sized farms. Strategic manure application timing to limit GHG emissions is a practical, scalable option to reduce methane production in manure storage.

Similarly, Nitrogen (N) application timing is crucial in balancing crop productivity and environmental sustainability. While fall applications are typical among Iowa corn producers due to favorable field conditions, they pose a high risk of N loss through denitrification, volatilization, and leaching. Spring and in-season sidedress applications offer improved nitrogen use efficiency (NUE) by aligning N availability with crop demand.

Here, we look at and discuss how new tools, such as Robotic Irrigation using the 360Rain, can improve management for N and C while also providing water when crops are most sensitive. We'll discuss current research results and summarize potential opportunities to put this technology into farmers' hands and how this could shape the future of livestock manure management.

Presentation 3: Boots on the Ground: Enhancing Extension for Nitrogen and Irrigation Management in California – *Dr. Shellabarger, University of California Davis*

We present results from the Nitrogen and Irrigation Initiative (NII) program evaluation led by project partners at UC Davis. This analysis summarizes the accomplishments and challenges experienced by an extension program of the University of California and California Department of Food and Agriculture to improve grower management of nitrogen and irrigation. Through the program, extension staff engage with growers through educational meetings and on-farm consultations. As part of program evaluation, we assess inputs, activities, outputs, learning, and planned behavior change through the use of advisor post-consultation reports, grower meeting surveys, and key informant interviews with NII staff, external partners, and program participants. We find challenges regarding program inputs; particularly staff incentives, capacity, and coordination, although these improved over time. The program conducted 84 educational events and 472 consultations, covering a range of topics across all program counties. These activities reached over 3,000 participants in California's Central Valley and Central Coast, ranging from farms under 100 acres to over 5,000 acres. Meeting participants reported high levels of learning, and advisors reported high receptiveness to their advice among their consultation clients. Most meeting survey respondents reported learning, which improved upon their already-implemented practices. Additionally, many meeting participants report plans to adopt new practices, particularly if they attended an NII-hosted event rather than an externally hosted event with a guest NII-affiliated speaker. We find that institutional affiliation is complex. The NII serves a valuable role as part of a broader ecosystem of educational and advising services, each of which are especially suited to serving a unique population.

Session 3 Title: Innovative Practices for Soil Health
Location: Balboa Bay on Banquet 2 Level
Time: 3:30 PM – 5:00 PM

Moderator: Bianca Moebius-Clune, American Farmland Trust

Presentation 1: Successes, Challenges, and Recommendations for Implementing a 5-year Cover Crop CIG – *Dr. Michelle Perez and Aysha Tapp Ross, American Farmland Trust*

American Farmland Trust wrapped up the final year of data collection in their 5-year On-Farm Soil Health Demonstration Trial (SHDT) Conservation Innovation Grant (CIG) project addressing the effects of cover crop implementation on soil health, economic, and social indicators titled, "Conquering Cover Crop Challenges from Coast to Coast." AFT developed this SHDT effort to address the low national cover crop adoption rate (5%), by identifying, evaluating, supporting, and showcasing farmer-driven transitions to improving soil health through the adoption of cover crops or modification of cover crop management. The project included 15 producers in five states, either adding cover crops alone or in combination with no-till, nutrient management, or compost application. In some cases, the producers wanted to test unique cover crop termination strategies. Every year, AFT and the farmers compared the treatment fields or plots to the management in the control. Please consider attending AFT's symposium on Wednesday, August 6, at 8:30a, for an in-depth and detailed presentation on the soil, economic, and social results.

As part of this showcase, AFT will discuss the successes and challenges in implementing their first large-scale CIG project scanning multiple regions. AFT will present a set of guidelines they developed for future on-farm demo trial implementation addressing farmer recruitment, trial design, and farmer communication. These guidelines are now being used for new national and regional projects, including a new SHDT CIG biochar project awarded in 2023. Additionally, AFT will discuss the difficulties in observing changes in soil health indicators over the short, 5-year standard period of CIG SHDTs given many practices do not show positive soil health effects for over 5 years. There will be opportunities for audience members to provide their own input and recommendations for improving the effectiveness of SHDT's through CIG or other grant options. Presentation 2: Hemp4Soil: Quantifying the Soil Health and Carbon Sequestration Benefits of Industrial Hemp and Regenerative Farming Practices – *Tim Almond, Heartland Industries*

As climate change accelerates, the need for fast, scalable, and natural-based solutions is more urgent than ever. While reforestation remains a key long-term mitigation strategy, the decades it takes to reach maturity limits its immediacy. Hemp offers a powerful alternative. Industrial hemp is a carbon-negative crop capable of sequestering 1.63 metric tons of CO_2 per metric ton harvested—approximately four times more efficient than tree planting.

Launched in partnership with farmers across ten states, the Hemp4Soil project is a USDA-aligned, three-year field study quantifying the soil health and carbon sequestration impacts of hemp grown for fiber using regenerative practices. The study engages 10 farms, including underserved/EQIP producers, and ~100 acres, comparing regenerative vs. conventional plots using advanced soil testing (Haney, PLFA, POXC, Total Organic Carbon) and remote sensing carbon readings.

Preliminary findings reveal higher microbial diversity, increased organic matter, and enhanced carbon retention in regenerative hemp plots. Notably, reduced input needs—pesticides, fertilizers, and irrigation—were also observed. A comparative analysis of two farms underscores these benefits: Farm A (regenerative) outperformed Farm B (conventional) in nearly every key soil metric.

This presentation will share key learnings, including year-over-year trends, satellite-supported carbon monitoring, and economic viability insights – including the status of target market applications for Industrial Hemp. These findings provide valuable evidence for policymakers, conservationists, key stakeholders seeking sustainable material solutions and growers, supporting industrial hemp as a proven Climate Smart Agriculture solution that generates a viable material for sustainable product advancement. We invite collaboration to scale this promising pathway toward ecological and economic resilience.

Presentation 3: Enhance soil health and water conservation for cover cropping systems in drought region through organic amendments applications – *Sutie Xu, University of California, Davis*

Despite of the known benefits of cover crops, its adoption is limited in regions with low water availability and short growing season. Management strategies aiming to increase soil organic matter, nutrients, and water conservation, can be considered in cover cropping systems to enhance the ability of soils in supporting field crop productions. Organic amendment, such as manure application, can directly add organic material and nutrients to the soils, and may also facilitate the formation of soil aggregates and increase microbial biomass. Another organic material, biochar, a carbon-rich material produced from the pyrolysis of biomass with strong absorption properties, has been recognized for its potential to improve water retention and reduce nutrient loss. The feasibility of these practices and their impacts on soil and water dynamics in cover crop systems under drought conditions, however, are still yet to be studied. In this study, experimental site was initiated in South Dakota in 2022, and treatments included no cover crop vs. cover crop comparisons, and with or without manure or biochar applications. Field crops were planted on the same plots after the cover crop year. Soils were collected every year to measure organic carbon, nutrients, and microbial biomass, and soil water was monitored using moisture sensors. Meanwhile, a greenhouse incubation experiment was conducted to measure CO_2 and N_2O emissions using the Li-Cor 8100 Opaque chamber. Results showed that both labile carbon and microbial biomass carbon were increased by organic amendments, although the most advantage treatments varied with the soil parameters and sampling years. Cover crops reduced soil moisture during the growing season but improved moisture conservation after terminated, especially when combined with soil amendments. Microbial activities in soils added cover crop residues and organic amendments were enhanced, shown as greater N_2O and CO_2 emissions in the incubation study.

Senior Mentors: Connect and Grow
Location: Laguna Beach on Banquet 1 Level
Time: 10:30 AM – 12:00 PM

Moderator: Cheryl Simmons, ACES Employee and NRCS Volunteer

ARCSE helps members keep up to date with the USDA Natural Resources Conservation Service, its progress and its partners, including SWCS and with each other. Events planned by ARCSE representatives are a strong and active part of our network.

Sub-Topic 1: Connecting and growing across generations of Conservationists (ARCSE Leadership)

Sub-Topic 2: The Association of Retired Conservationist Employees (ARCSE) Framework Plan for NRCS States to develop their own "NRCS Mentor Plan" (Craig Derickson and Becky Fletcher)

Sub-Topic 3: Informal Connections and Collaborations – Coffee with SR Conservationists (speed mentor session) Presenter leads remain at the table while participants move every 5-10 minutes

The Land Broken by the Plow: A Look at Conservation on the Plains
Location: Laguna Beach II on Banquet 1 Level
Time: 10:30 AM – 12:00 PM

Moderator: Peter Tomlinson, Kansas State University

The US Great Plains extends across 400 million acres from Canada to the panhandle of Texas. Before the plow this region was known for its wide spread grass lands, wind and climate extremes. The potential productivity of the plains soil coupled with mechanization of agriculture lead to extensive cultivation of the region thorough the 1920, followed by drought and the ensuing dust bowl of the 1930s. Since the 1930s conservation practices have been critical to protecting the soil resources of the plains and sustaining agricultural production. As agriculture faces the grand challenge of feeding the world, conservation practices that protect against water and wind erosion remain central to protecting the soils of the great plains. The benefits and challenges of current conservation practices will be examined.

Career Development Jumpstart Workshop
Location: Laguna Beach III on Banquet 1 Level
Time: 10:30 AM – 12:00 PM

Moderator: Brandon Bell, Syngenta North America

Are you ready to take your career to the next level? Join us for an engaging and interactive Career Development Jumpstart Workshop designed to help you unlock your full potential and chart a course for professional success.

In this dynamic session, you'll:

- Discover powerful strategies to identify your unique strengths and passions
- Learn how to align your career goals with your personal values and aspirations
- Develop a clear and actionable career development plan
- Gain insights into effective networking and personal branding techniques
- Explore strategies for continuous learning and skill development in today's rapidly evolving job market

Whether you're just starting your career journey, looking to make a career change, or aiming for that next big promotion, this workshop will provide you with the tools and motivation to jumpstart your professional growth.

Our experienced facilitators will guide you through practical exercises, group discussions, and self-reflection activities, ensuring you leave with a renewed sense of purpose and a roadmap for your career success.

Don't miss this opportunity to invest in your future and take control of your career trajectory.

Tillage, Water, and Wind Erosion: Weather Pattern Variability and Conservation Management
Location: Laguna Beach I on Banquet 1 Level
Time: 1:30 PM – 3:00 PM

Moderator: Madhav Dhakal, Mississippi State University

This is a joint Soil and Water Conservation Society (SWCS) and Soil Science Society of America (SSSA) special symposium focusing on how tillage and erosion (water and wind) are impacted by variability in weather patterns, and the resultant challenges for conservation management. The symposium is designed for four, 15-minute oral presentations, to be followed by a 30-minute roundtable discussion with symposium presenters as well as additional national leaders from USDA ARS and USDA NRCS. Discussion ideas generated from this symposium will be used to assist planning for the 2026 International Soil Conservation Organization meeting.

Presentation 1: Impacts of cover cropping and tillage on soil health and root-zone water quality in cotton and sorghum production systems

Authors: Madhav Dhakal[1,3]*, Martin A. Locke[1], Krishna N. Reddy[2], Matthew T. Moore[1], R. Wade Steinriede, Jr.[1], and L. Jason Krutz[3]

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[2]USDA-ARS Crop Production Systems Research Unit, Stoneville, MS 38776
[3]Mississippi Water Resources Research Institute, Mississippi State University, Mississippi State, MS 39762

Root-zone water quality plays a crucial role in soil nutrient cycling, soil health, and pollutant transport from agricultural land. Conservational management practices such as cover cropping and minimum tillage can influence water quality by altering soil properties. A field study was conducted to compliment USDA's Long-Term Agroecosystem Research (LTAR) to evaluate water quality parameters under cover cropping systems [CC (Austrian winter pea, Pisum sativum) and no-cover (NC)] and soil health indicators in both cover cropping and tillage [conventional tillage (CT) and no-tillage (NT)] systems from 2019 to 2021 in cotton (Gossypium hirsutum) and sorghum (Sorghum bicolor) production systems. Soil samples from depths, 0-5, 5-10, and 10-20 cm were collected to determine extracellular enzyme activities of fluorescein diacetate (FDA), acid phosphatase (AP), β-glucosidase (BG), β-N-acetyl-glucosaminidase (NAG), and aryl sulfatase (AST) and CN ratio. Root-zone water samples were collected below 90-cm soil depth using suction-cup lysimeters following 54 rainfall events (> 6 mm) throughout the cover crop and cash crop seasons to quantify ammonium-N (NH_4^+–N), nitrate-N (NO_3^-–N), nitrite-N (NO_2^-–N), phosphate-P (PO_4^{3-}–P), and total dissolved organic carbon (TDOC) concentrations. In 2021, the CT-CC treatment consistently showed greater FDA, AP, BG, and NAG activities, i.e., 182, 2744, 1123, and 382 µ moles kg-1 hr-1, respectively in 0-5 cm depth, compared to NC treatments (CT-NC and NT-NC average = 149, 2069, 880, and 275 µ moles kg-1 hr-1, respectively). The AST activity in the same depth was greater in NC treatments (214 µ moles kg-1 hr-1) than in CC treatments (182 µ moles kg-1 hr-1). Cover cropping under CT increased the

total C content in the surface soil (0-5 cm) by 11% over CT-NC, whereas CC had no impact on total soil C under NT practices. However, the CN ratio remained stable across the treatments over the three-year study period. Concentrations of NO3−–N and TDOC were different at the vegetative stage of the pea, with CC treatment being smaller than NC. The NO2−–N, NH4+–N, and PO43−–P concentrations were not affected by CC treatment during winter. Nitrogen fertilization in cotton and sorghum significantly increased concentrations of NH4+–N and PO43−–P with CC treatment having lower concentrations than NC. Cover cropping tended to increase TDOC concentrations in the root-zone, especially in cotton. Overall, results demonstrated that CCs can improve soil health under CT than in NT. In contrast, CCs in NT can improve the root-zone water quality by reducing the leaching of NH4+–N and PO43−–P concentrations.

Presentation 2: Windblown sediment flux magnitudes across rangeland ecological states: insights from the National Wind Erosion Research Network

Authors: Brandon Edwards*, Nick Webb, Justin Van Zee, Ericha Courtright, Brad Cooper, and Beth Newingham

Over the last few decades, the rangeland community has increasingly recognized important linkages between wind erosion and vegetation community composition and structure, but there is a significant lack of physical evidence in the literature to support quantifying how the frequency and magnitude of wind erosion and dust emissions vary with ecological state and respond to land use, management, and ecosystem change. In response, the National Wind Erosion Research Network (NWERN) was launched by USDA Agricultural Research Service (ARS) as part of the Long-Term Agroecosystem Research (LTAR) network in 2014 to provide robust, standardized, ground-based monitoring of aeolian sediment transport, meteorological data, and vegetation conditions across land cover types and uses. Here, 10 years on, we present trends in observed sediment fluxes from seven rangeland NWERN sites and discuss how transport rates, a key indicator of wind erosion risk, relate to standard indicators of vegetation community and structure. By comparing observed fluxes across ecological states and meteorological conditions, we highlight potential impacts of disturbance and state changes on wind erosion rates and dust emissions from rangelands.

Kegs 4 Conservation
Location: Banquet 1 Level Laguna Beach II
Time: 1:30 PM – 3:00 PM

Moderator: Glenn Cole, Agroecology + Innovation Matters

Kegs 4 Conservation comes from Charlie Cole, an international award-winning Brewmaster and current Conservation Planner with the Agroecology + Innovation Matters partnership program from the Illinois Department of Agriculture and NRCS. Charlie received his education in brewing and malting sciences through St. Louis University, University of Vermont, San Diego State University, and University of Wisconsin-Madison, earning a professional certificate from each institution while spending a rewarding career at eight Illinois breweries. His passion for the art and science of beer and a lifelong love for conservation and sustainability evolved into a deep curiosity for the agricultural connection of the crops that make up the final product and a drive to create a more engaging outreach experience.

Promoted by the tagline: "Not Your Grandfathers Field Day", this presentation is a fun and informal education on the agricultural history of beer, how beer is "grown" before it is brewed, and innovations related to conservation and sustainability in both the agriculture and beer brewing industries. It's packed with trivial facts and stories, attendee participation opportunities, and humor for an overall engaging experience. This work has been supported by SWCS, Illinois Association of Conservation Districts, and National Wildlife Federation.

Emerging Leaders Lightening Talks: Insights and Impact
Location: Laguna Beach III on Banquet 1 Level
Time: 1:30 PM – 3:00 PM

Authors: Soil and Water Conservation Society Emerging Leaders

This session is led by members of the 2025 Class of the SWCS Emerging Leaders Program. These leaders will deliver lightning presentations sharing their experiences, lessons learned, and the impact of their conservation events. From innovative events to community-building initiatives, each presenter will provide insights into their work and its significance in the conservation field. The session will also include an interactive question and answer section, allowing attendees to engage directly with these early-career professionals. Don't miss this opportunity to be inspired by the next generation of conservation leaders and discover how they are making a difference.

Innovating Conservation Technical Assistance: Policy Insights, Public-Private Partnerships, and Practitioner Priorities
Location: Laguna Beach I on Banquet 1 Level
Time: 3:30 PM – 5:00 PM

Moderator: Rachel Owen, Soil and Water Conservation Society

The Soil and Water Conservation Society's Science and Policy Committee has advanced critical initiatives over the past year to bridge science, policy, and on-the-ground conservation efforts. This session will highlight key findings from the 2024 SWCS Policy Membership Poll, which revealed strong member consensus on priorities for federal funding and workforce support for Conservation Technical Assistance (CTA).

A focal point of the discussion will be the role of public-private partnerships in scaling CTA delivery. We will explore successful collaborations between federal agencies, non-governmental organizations, and local entities that have driven landscape-scale conservation initiatives. These partnerships have proven instrumental in addressing critical environmental challenges, such as soil health improvement, habitat restoration, and climate change mitigation. By leveraging diverse expertise and resources, these collaborations have significantly amplified the impact of federal investments in conservation. The session will showcase how innovative funding mechanisms and cooperative agreements have enabled the implementation of cutting-edge conservation practices across large areas, benefiting both agricultural productivity and ecosystem health.

The session will also explore policy recommendations emerging from the committee, including proposals to streamline NRCS hiring, enhance equity in conservation outreach, and preserve Inflation Reduction Act funds for CTA. Attendees will gain actionable insights into how interdisciplinary collaboration—spanning agencies, NGOs, and private landowners—can address workforce shortages, accelerate adoption of climate-smart practices, and sustain momentum for science-based conservation policy.

Emerging Leaders Alumni Feature
Location: Laguna Beach II on Banquet 1 Level
Time: 3:30 PM – 5:00 PM

Authors: Soil and Water Conservation Society Emerging Leader Alumni

Led by alumni of the 2024 Class of the SWCS Emerging Leaders Program (ELP), this session will delve experience through a guided dialogue. These early-career professionals will reflect on their program experiences, share how participation has influenced their leadership development, and discuss how they've continued to engage with SWCS as alumni. From hosting conservation events to taking on leadership roles in chapters and committees, their stories highlight the program's lasting impact. The session will include open discussion and opportunities for audience Q&A, offering valuable insights for those interested in leadership development, conservation workforce support, or future participation in the program and the ELP Alumni Network.

Using Cover Crops To Add Biological Diversity to California Agriculture and Landscape
Location: Laguna Beach III on Banquet 1 Level
Time: 3:30 PM – 5:00 PM

Moderator: Keith Berns, Green Cover Seed

California may be the most biological diverse states in the nation. However, years of farming and conventional management have led to the loss of much of the biological diversity agriculture on the farms, the vineyards, the orchards and the landscapes. This session will show how creative and innovative people are bringing both plant and microbial diversity back through the creative use of cover crops. We will look at three areas:

- Cover crops in perennial crops (trees and vines)
- Cover crops for grazing lands
- Cover crops to transform nonfunctional turf into regenerative landscapes that save water, build healthy soil, and help cool cities

TUESDAY, AUGUST 5

SYMPOSIA SESSION DESCRIPTIONS AND AGENDA

CEAP Showcase
10:30 AM – 5:00 PM

The Conservation Effects Assessment Project-Watershed Assessment Studies (CEAP-WAS) was initiated in 2003 to quantify the measurable environmental effects of conservation practices and develop the science base for managing agricultural landscapes for environmental quality. CEAP has grown to include 26 active projects including watershed studies assessing conservation practices and implementation and several special projects that include legacy nutrients, ephemeral gully erosion, as well as the development and assessment of conservation tools and models. Please join USDA's Natural Resources Conservation Service (NRCS) and Agricultural Research Service (ARS) and university CEAP scientists to celebrate 20+ years of CEAP and learn and discuss the many CEAP-WAS assessments conducted across the United States. This year's meeting will take place as a CEAP Showcase within the Annual SWCS meeting on Tuesday, August 5th, and feature three oral sessions and a poster session on Monday, August 4th, and Tuesday, August 5th, with presentations ranging in topics from CEAP Watersheds in CA, Water quality and conservation in CEAP watersheds, and Identifying sediment sources to focus conservation in CEAP watersheds. Please join us in celebrating 20+ years of CEAP!

Session 1 Title: CEAP Watersheds in California: Surface and Groundwater Interactions
Location: Balboa Bay on Banquet 2 Level
Time: 10:30 AM – 12:00 PM

Moderator: Hoori Ajami, University of California-Riverside

Presentation 1: Quantifying Water Balance Dynamics Under Uncertainty in Irrigation and Pumping Estimates in Managed Agroecosystems

Authors: Juan S. Acero Triana[1], Hoori Ajami[1], Giorgos Kourakos[2], Thomas Harter[2], Ray G. Anderson[3], Dong Wang[4]

[1]University of California, Riverside; [2]University of California, Davis; [3]USDA Agricultural Research Service, US Salinity Laboratory, Riverside, CA;[4]USDA Agricultural Research Service, Parlier, CA

California's agricultural industry is the largest in the USA, with annual sales valued at ~$60 billion in 2023. Groundwater, a critical resource for this success, has been extensively used since the early 1900s to overcome surface water shortages. Groundwater extraction accounts for ~40% of water withdrawals in normal years and up to ~60% during droughts. However, decades of unregulated use prior to the 2014 Sustainable Groundwater Management Act (SGMA) have led to severe groundwater depletion, land subsidence, and salinity issues, particularly in the San Joaquin Valley (SJV). While SGMA requires local agencies to manage groundwater sustainably by addressing overpumping impacts, accurate estimates of irrigation depths, groundwater withdrawals, and water use efficiency are not available at the sub-county level, making hydrologic assessment and prediction for decision-making more uncertain. In this study, we evaluate the uncertainty effects of irrigation amount, water use efficiency and pumping rates in the shallow and deep valley aquifers of the SJV's Kaweah River Watershed (KRW) using ParFlow, an integrated surface-subsurface hydrologic model. Preliminary results across multiple scenarios show a significant decrease in the depth-to-water table error (~32%) when water withdrawals from multiple depths are accounted for using well screen probability distributions, combined with a 20% increase in water use efficiency. Our modeling results can be used as a decision-support tool to formulate sustainable and effective groundwater management practices in highly managed agroecosystems.

Presentation 2: Influence of Organic Amendment Management on Carbon and Nitrogen Dynamics Under Agricultural Managed Aquifer Recharge (Ag-MAR)

Authors: Wenyi Cui[1], Tiantian Zhou[2], Elad Levintal[3], Cristina Prieto Garcia[1], Isaya Kisekka[1,4], Helen E. Dahlke[1]

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Agricultural Managed Aquifer Recharge (Ag-MAR) is a promising approach to replenish groundwater storage while supporting agricultural sustainability. However, it faces challenges including mitigating nitrate contamination in underlying aquifers and negatively impacting nutrient conditions for crop growth in the subsequent growing season. Addressing these issues requires integrated strategies combining organic amendments, irrigation management strategies, and advanced modeling tools to balance water conservation with effective nitrogen use. This study explores the influence of organic amendments and nitrogen fertilizer management scenarios on soil carbon and nitrogen dynamics during Ag-MAR and the subsequent growing seasons. Using the Decision Support System for Agrotechnology Transfer (DSSAT), we simulated multi-year simulations (2021–2023) incorporating various crops and amendment scenarios under California conditions. Organic amendments, including corn and bell pepper residues, compost, and manure, were tested at different application rates to assess their effects on nitrogen mineralization, denitrification, nitrate leaching, and soil organic matter (SOM) dynamics. Initial results highlighted that organic amendments significantly increased nitrate availability during the post-flooding growing season, suggesting potential reductions in synthetic fertilizer use. Reduced nitrogen fertilization scenarios highlighted opportunities to balance crop productivity and nitrate nitrogen leaching risks. In addition, compost application

notably influenced soil organic carbon and soil organic nitrogen decomposition rates over the simulation period. These findings highlight the importance of organic amendment management to enhance nitrogen cycling and sustainable agricultural practices in Ag-MAR systems.

Presentation 3: Field Scale Assessment of Conservation Practices Effectiveness in Mitigating Nitrate Leaching to Groundwater in the Central Valley

Authors: [1,2]Kisekka, I., F. Ogunmokun[1], D. McMenomey[1], C. Bonfil[1], F. Nicolas[3], I. Raij-Hoffman[4], H. Dahlke[1], O. Dahan[5], and T. Harter[1]

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Nitrate contamination of groundwater is a major problem worldwide, including in the United States. Innovative monitoring techniques are needed to assess the effectiveness of conservation practices, e.g., adaptive nitrogen management, irrigation nitrogen credit, data-driven irrigation scheduling, and winter cover cropping etc. The goal of the Central Valley field scale assessment CEAP project is to assess the effectiveness of conservation practices using three approaches of nitrate leaching monitoring, including i) deep vadose-zone monitoring system (VMS), ii) groundwater monitoring, and iii) field-scale nitrogen mass balance assessments. Three sites with a VMS have been established in the Central Valley for three major crops, including processing tomatoes, citrus, and almonds. In this presentation, I will also present results from integrated modeling of conservation practices effectiveness using the APEXMOD framework that links the vadose zone to groundwater at the field scale. We showed that the deep VMS technology was able to detect deep percolation and nitrate leaching following heavy rainfall from atmospheric rivers in the winter. The field mass balance approach provided results comparable to those of the VMS but with larger uncertainty. Through modeling we show that stacking of conservation practices can reduce nitrate leaching by more than 90%. Additional years of monitoring are needed to confirm if conservation practices adopted at these field sites reduce nitrate leaching to groundwater.

Presentation 4: Data discrepancies and uncertainty in agricultural nitrogen leaching estimation

Authors: Baibaswata Bhaduri[1], Kenneth Miller[2], Giorgos Kourakos[1], Thomas Harter[1]

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Agriculturally dominated groundwater basins across the globe have undergone groundwater overexploitation and excessive fertigation in the past several decades, causing severe groundwater nitrate contamination. Modelling the transport and fate of nitrates in groundwater thus plays a crucial role in the decision making of the agricultural industry and regulatory agencies. Nitrate mass balances are commonly used to estimate potential nitrate leaching. Yet, subject to multiple sources of relevant land use and land practices data, such estimates can be highly uncertain. Here, we explore these uncertainties for one of the largest and agriculturally most diverse North American groundwater aquifer systems, the Central Valley (CV) of California.

The model used for our study is CV–GNLM (Groundwater Nitrogen Loading Model). It is a mass balance-driven model to estimate the legacy N leaching from mid-20th century to present, in 15-year aggregated intervals, using Agricultural Commissioner's Reports from CDFA (California Department of Food and Agriculture) as a source of acreage and crop production, and fertilization estimates based on averaging USDA census data and California Agricultural Cost and Return Studies. We validated this model against the benchmark CV-SWAT (Soil Water Assessment Tool), which is a more robust and computationally expensive physics-based model, focused on current conditions. It relies on land use and soil survey data to estimate a robust farm specific N leaching estimate driven by management practices and daily climatic conditions. Field scale fertilizer applications and crop yield information used in CV-SWAT are reported directly by growers to nutrient management cooperatives (Agricultural Water Quality Coalitions) in the form of INMP (Irrigation and Nitrogen Management Plan) summary reports. We observed a large mismatch in the nitrogen leaching estimated from these two models. The mismatch across these models highlights the driving role of fertilization and harvest data in model outcomes, whether highly simplified or physically complex: CV-GNLM successfully reproduces CV-SWAT results when using the mass balance element data used as input to CV-SWAT.

Importantly, the discrepancies raise concern about data consistency across sources published by the same agency or across cooperating organizations and the ability to forecast/estimate N losses to the environment, regardless of model platform, whether at the regional, national, or global scale. To explore the uncertainty that arises from such input data discrepancy, we inspected and aggregated the fertilizer and harvest data from 5 different data sources, namely CDFA, USDA Survey and Census, UC Davis Cost & Return Studies, and INMP, across the years 2018-2022, and ran different scenarios of CV-GNLM – 2020 using their various fertilizer-harvest combinations. The resulting N leaching estimates vary over a large range for the principal crops grown across the Central Valley. We further observed that the nitrogen leaching is usually much higher when we include the application of dairy manure (especially for field crops).

Session 2 Title: Water Quality and Conservation in CEAP Watersheds
Location: Balboa Bay on Banquet 2 Level
Time: 1:30 PM - 3:00 PM

Moderator: Lisa Duriancik, USDA NRCS

Presentation 1: Impacts of Sugarcane and Flooded Rice Crop Rotation on Water Quality within the Everglades Agricultural Area

Authors: Xue Bai, Donghyeon Kim, Young Gu Her, Samuel J. Smidt, Yuncong Li, Donald Meals, Jehangir Bhadha

In the Everglades Agricultural Area (EAA) of South Florida, over 50,000 acres of fallow sugarcane land is available during the summer for rice production with no starter fertilizer (N, P, K) applied. However, the impact of rice cultivation on discharge loads is not fully understood. In this study, the effect of conservation crop rotation associated with sugarcane and flooded rice cultivation on water quality in the EAA was evaluated by conducting experiments on fields with different crop rotation systems, including three-year rice-sugarcane-sugarcane (RSS), sugarcane-rice-sugarcane (SRS), continuous sugarcane (SSS) and virgin land. Water quality concentrations including total phosphorus (TP), soluble reactive P (SRP), total nitrogen (TN), total organic carbon (TOC) and total suspended solids (TSS) are being used as part of the assessment. Preliminary results indicate that crop rotation significantly influences TOC, NH_4^+, TP, and SRP levels in both groundwater and ditch water. In groundwater, TOC concentrations in RSS and SRS farmlands are lower compared to other systems. Meanwhile, the levels of NH_4^+, TP, and SRP are lower than those in virgin land but show no significant differences compared to continuous sugarcane fields. In ditch water, TP and SRP levels were lowest in RSS fields. Moreover, water quality parameters varied significantly among groundwater, ditch, and canal water, with nutrient concentrations generally being higher in groundwater than in ditch and canal water. Rainfall events also impacted water quality in ditches and canals, with TOC, TN, and NO_3^- levels significantly decreasing during the wet season compared to the dry season. The water quality dataset has been integrated with the water quantity using agro-hydrological model (i.e., SWAT-MODFLOW RT3D), and provided acceptable accuracy in predicting groundwater levels and qualities observed in the study fields. Future study will focus on quantifying the nutrient transport between the fields and ditches/canals through subsurface flow and its interaction with crop rotations.

Presentation 2: Characterizing, Quantifying, and Modeling the Sources and Transport of Legacy Phosphorus

Authors: Ryan T. Bailey, Colorado State University; Zaichen Xiang, Colorado State University; Salam Abbas, Colorado State University; Michael White, USDA ARS; Cathleen J. Hapeman, USDA ARS

Legacy phosphorus (P) is present in groundwater, soils, stream beds, stream banks, reservoirs, and lakes. Determining the sources and movement of legacy P is critical to understanding agriculture impacts on stream water quality and assessing the effectiveness of conservation practices on reducing nutrient loads to the watershed ecosystem. The effects of agriculture on stream water quality cannot be determined without understanding the watershed lag time and significance of legacy P loads at multiple scales. To quantify groundwater lag time and to characterize legacy P sources and movement, the Legacy P project leverages the USDA Watershed Lag Time Project (WLTP) which uses MESA, a degradation product of the commonly used herbicide metolachlor, and exploits the 2010 enantiomeric ratio change in formulation as a temporal marker. The isomeric ratio changes serve as an indicator of groundwater age and can elucidate the dominant groundwater transport pathways from fields to discharge points, e.g., channels, for nutrients such as P. To provide spatio-temporal characterization of P fate and transport in a watershed system, we present a P groundwater transport module for the watershed modeling code SWAT+, which uses the groundwater flow module gwflow as the flow simulator, to provide pathways for P transport. The gwflow module accounts for major spatial and temporal sources and sinks of P, including leaching, irrigation, point source loadings, and sorption. The module also tracks groundwater flow pathways in space and time (i.e., particle tracking) and estimates the time required for groundwater from each point in the aquifer to reach a surface water discharge point. These results will be compared to MESA enantiomeric dating data, to ensure that the model provides the correct groundwater travel times. Results will be used to understand the time required for legacy P to move through the watershed and the time for streams to respond to land use practices. The method is shown for two watersheds with P contamination: Choptank River Watershed (Delaware, Maryland) and Big Sunflower River Watershed (Mississippi).

Presentation 3: Topographic and Hydrologic Controls on Legacy Phosphorus in the CEAP Choptank River Watershed

Authors: Maryam Foroughi, University of Maryland; Gregory W. McCarty, USDA ARS; W. Dean Hively, USGS; Cathleen J. Hapeman, USDA ARS; Zacharias J. Smith, USDA ARS; Alexia Bertholon, University of Maryland; Ruby Dessiatoun, University of Maryland; Lisa F. Duriancik, USDA NRCS

Phosphorus (P) management remains a significant challenge in agricultural watersheds, particularly those with a legacy of intensive manure applications. The Choptank River CEAP watershed on the Delmarva Peninsula (MD, DE), which drains into the Chesapeake Bay, contains legacy soil P from historical dairy and poultry manure applications that elevated soil P levels beyond crop needs, contributing to persistent P export to aquatic ecosystems. This study investigated the relationships between topography, soil P distribution, and landscape properties influencing legacy P movement in a low-relief watershed. It is hypothesized that water-mediated transport moves dissolved and particulate P to poorly drained lowlands and depressional areas, where engineered drainage systems accelerate P-enriched water export via overland or tile flow. As part of the USDA Legacy P project, 105 soil samples (0–5 and 5–15 cm depths) and 14 ditch sediment samples were collected across five topographic openness classes from a farm with over a century of dairy manure application. Results showed average available P concentrations of 218 and 179 mg kg^{-1} at 0–5 and 5–15 cm depths, respectively, with legacy areas exhibiting concentrations approximately 100 mg kg^{-1} higher. Soil P was positively correlated with clay content and negatively correlated with topographic openness, with depressional areas showing higher P concentrations due to likely P transport from higher elevations. Hydrologic and landscape properties, influenced by a legacy of pastureland use, played a critical role in shaping P distribution, while engineered drainage systems enhanced rapid P movement through channelized overland and tile flow. Although topographic parameters alone were not strong predictors of soil P, a Random Forest model demonstrated the potential for identifying critical soil properties affecting P fate across agricultural landscapes. By identifying critical P source areas and understanding the processes governing P transport, targeted management strategies can be implemented to mitigate P loss and improve water quality in the Chesapeake Bay watershed. These findings provide essential insights for developing landscape models and guiding effective P management in low-relief agricultural watersheds.

Presentation 4: Use of Land Use Specific Hydrological Tracers for Assessing Dynamics of Cropland Nitrogen within the Mississippi Basin

Authors: Gregory W. McCarty[1], Alexia M. Bertholon[2], Ruby S. Dessiatoun[2], Cathleen J. Hapeman[1], John K. Bohlke, Clifford P. Rice[1], Zacharias J. Smith[1], W. Dean Hively[4], Lisa F. Duriancik[5]

[1]USDA, Agricultural Research Service, Beltsville, Maryland, USA; [2]School of Engineering, Department of Civil and Environmental Engineering, University of Maryland, College Park, Maryland, USA; [3]U.S. Geological Survey (USGS), Reston Stable Isotope Laboratory, Reston, Virgina, USA; [4]USGS, Geological Survey, Lower Mississippi-Gulf Water Science Center, Beltsville, Maryland, USA; [5]USDA, Natural Resources Conservation Service, Beltsville, Maryland, USA

The Mississippi River Basin is the largest drainage basin in the United States. Cropland production of corn (*Zea mays* L.) and soybean (*Glycine max* L.) is the dominant source of agricultural nitrogen (N) in waters within the basin. Excess N in hydrological systems can lead to conditions that are detrimental to water quality. The prevalent preemergent herbicide metolachlor used in corn/soybean production is metabolized to metolachlor ethane sulfonic acid (MESA) and metolachlor oxanilic acid (MOXA) via a common intermediate. MESA and MOXA are stable and highly soluble in soil water and behave similarly to nitrate-N. Studies in streams and small watersheds demonstrated that MESA and MOXA could be utilized as conservative hydrological tracers for cropland nitrate-N. However, performance in larger watersheds and river basins was unknown. In this study, over 10 years of concentration and flux data for metolachlor, MESA, MOXA, and nitrate-N were analyzed with cropland cover and additional watershed characteristics using samples from 28 Mississippi River Basin watersheds and subwatersheds that are or were part of the USGS National Water Quality Assessment (NAWQA). Strong correlations were found between MESA and MOXA at various observational scales indicating that both tracers were conserved and exhibited very similar transport properties at larger scales of observation. This study demonstrated the utility of a multi-tracer approach for understanding watershed lag-times and cropland N fate from small streams to larger river basins.

Session 3 Title: Identifying Sediment Sources to Focus Conservation in CEAP Watersheds
Location: Balboa Bay on Banquet 2 Level
Time: 3:30 PM - 5:00 PM

Moderator: Allen Thompson, University of Missouri

Presentation 1: Refining the Soil Vulnerability Index: Impact of Annual and Seasonal Precipitation Patterns on Simulated Sediment Yields Across U.S. Watersheds

Authors: Quang Phung, Allen Thompson, Ryan McGehee, and Claire Baffaut

The Soil Vulnerability Index (SVI) was developed by the USDA Natural Resources Conservation Service (NRCS) to assess inherent vulnerability of cropland soils to surface runoff. In this study, sediment yield was simulated using modern rainfall characteristics (1994-2023) in SWAT+ for 67 HUC8 watersheds distributed across the continental U.S. east of the Rocky Mountains. Results for continuous corn management indicate that studied HUC8 watersheds with summer (Apr-Sep) precipitation equal to or exceeding winter (Oct-Mar) precipitation exhibited sediment yields similar in magnitude to those estimated within the Ohio, Mississippi, and Tennessee River basins, the original study area for SVI development. This similarity can also be observed when considering watersheds receiving less than 1240 mm of annual precipitation, suggesting that both the original study area and areas with lower-precipitation or summer-dominant precipitation produce comparable sediment yield distributions across SVI classes. However, a notably different pattern emerged among HUC8s characterized by higher annual precipitation (≥1240 mm) or a negative precipitation relationship (summer precipitation < winter precipitation). In these conditions, sediment yields increased substantially, particularly for the Moderately High and High SVI classes. While the High class, already identified as the most vulnerable, requires no additional classification adjustments, the Moderately High class in these higher-precipitation or winter-dominant environments produced sediment yields equivalent to or exceeding those found in the High class of the original study area. This finding suggests that the Moderately High class in such conditions may warrant reclassification into a High vulnerability category. These results underscore the importance of considering both total annual precipitation and its seasonal distribution when assessing sediment yield vulnerabilities. Our ongoing research aims to refine the SVI threshold values for annual precipitation, erosion index, and seasonal relationships to enhance classification accuracy.

Presentation 2: CEAP Special Project: Impacts of conservation practices to reduce soil loss from ephemeral gullies within CEAP Watersheds

Authors: Ron Bingner, USDA, ARS, NSL, Oxford, MS; Robert Wells, USDA, ARS, NSL, Oxford, MS; Henrique Momm, MTSU, Murfreesboro, TN; Eddy Langendoen, USDA, ARS, NSL, Oxford, MS; Martin Locke, USDA, ARS, NSL, Oxford, MS; Joshua Faulkner, U. of VT, Burlington, VT; Lisa Duriancik, USDA, NRCS, Beltsville, MD

While the impact of conservation practices on croplands has reduced sheet and rill soil erosion by approximately 30% between 1982 and 2017, as shown in the 2017 National Resource Inventory (NRI), there is limited nationwide information on how these practices have reduced other sources of soil erosion, such as from ephemeral gullies (EG). Controlling soil erosion from all sources is critical for the Natural Resources Conservation Service (NRCS) to develop effective conservation management plans that provides sustainable soil resource and crop production strategies for farmers. A Conservation Effects Assessment Project (CEAP) Special Project on assessing the impact of conservation practices on sources of soil erosion within several CEAP watersheds has been ongoing since 2021. This project has studied EG erosion (EGE) within the CEAP watersheds of Maryland, Mississippi, Vermont and Ohio by assessing the impacts of conservation practices on EGE reduction and examined other conditions that were favorable in producing EGE, such as topography and soil characteristics. The Annualized AGricultural Non-Point Source (AnnAGNPS) watershed management and pollution model was used to quantify sediment loads from sheet and rill and EG erosion before and after actual conservation practices were implemented. While grassed waterways are commonly used to control EGE, their widespread use can impact crop production. The study found that targeted placement of riparian buffers can provide an effective means of controlling EG formation. Soil samples were also collected from each study site to assess soil property effects, particularly soil erodibility, on EG formation and soil loss. Databases describing climate, practices, and runoff and sediment observations of the study sites were also developed. This project provides critical information needed to identify appropriate and effective soil erosion conservation practices, while targeting their placement to soil erosion sources. In addition, erosion prediction technologies will be enhanced and applied to evaluate the impact of conservation practices on EGE and quantify the amount of soil saved from the entire system.

Presentation 3: CEAP Special Project ‘Watershed Legacy Sediment Assessment’: Sedimentation Status of USDA Watershed Program Reservoirs

Authors: Eddy Langendoen, USDA, ARS, NSL, Oxford, MS; Maby Gavilian Abanto, Louisiana State University, Baton Rouge, LA; Kory Konsoer, Louisiana State University, Baton Rouge, LA; Lisa Duriancik, USDA, NRCS, Beltsville, MD

Identifying the causes and implementing appropriate solutions for excessive sediment loading has proven challenging because a multitude of natural and anthropogenic factors influence erosion and sediment delivery. In agricultural landscapes, an increasing body of literature is demonstrating that fluvial channel erosion can also be a dominant sediment source and high sediment loadings are better explained by recruitment of anthropogenic (i.e., legacy) sediment from floodplains or impoundments than from cultivated lands. Hence, improving our ability to identify and document the sources of sediment within watersheds is essential to helping us design and implement effective restoration and conservation strategies within watersheds, including within the stream network itself, and to address sediment sources, including legacy (or historical) sources of sediment. The CEAP Special Project entitled “Watershed Legacy Sediment Assessment” was funded beginning Fiscal Year 2023 with the following goals: (1) assess and enhance tools to identify legacy sediment; (2) characterize legacy sediment erosion and delivery processes within select CEAP study watersheds; (3) enhance process understanding of nitrogen and phosphorus remobilization in legacy sediment for more effective restoration strategies; and (4) develop a national inventory and analysis of small reservoir sedimentation rates. Expected outcomes of the Special Project are: (1) better representation of legacy sediment in models; (2) improved understanding of the potential for conservation practices to improve water quality by mitigating legacy sources of nitrogen, phosphorus, and sediment; and (3) USDA conservation practices and programs become more effective at producing watershed outcomes. Since the start of the project, activities have primarily focused on goal 4, which aims to build a comprehensive database of sedimentation rates of USDA Watershed Program reservoirs. This database will be used to develop regional and national relationships between reservoir sedimentation rate and associated climate, geography, topography, soil, land use, and other watershed and reservoir parameters. Currently, 11,687 watersheds that drain into reservoirs of about 11,800 dams listed in the NRCS National Inventory of Dams (NID) have been delineated and the above-mentioned parameters have been derived at resolutions ranging from 10 m to 4 km. The locations of 2,300 dams were corrected; the error of incorrect NID dam locations averaged 608 m and was as large as 258 km. A database of 533 historic USDA Watershed Program reservoir sedimentation surveys documented in SCS-34 data sheets has been compiled and complemented with 22 contemporary sedimentation surveys of reservoirs in Mississippi, Oklahoma, Texas, and Wisconsin. These reservoir sedimentation data are currently being used to develop draft regional and national relationships between small reservoir sedimentation rates and climate, geography, topography, land use, soils, and reservoir geometry.

Presentation 4: Leveraging Riverscape Models to Address Sediment Challenges in the Mississippi River Basin

Authors: Patrick Belmont, Janice Brahney, Joe Wheaton, Jordan Gilbert, Philip Bailey, Zhen Xu, Lauren Herbine, Shelby Sawyer

Sediment plays a vital role in river ecosystems, but human activity has modified hydrologic processes and accelerated erosion, disrupting sediment transport and deposition. These changes have caused significant physical, chemical, and biological harm. Predicting and addressing impacts of changes in hydrology and excessive sediment loading are complicated by considerable spatial and temporal variability, non-linearity in hydrologic and geomorphic processes, diverse sediment sources, and limited monitoring data. In agricultural landscapes, excessive sediment has often been attributed to field practices; however, recent research highlights fluvial channel erosion as a potentially dominant source. Better informing conservation and restoration practices in agricultural watersheds therefore requires an understanding of both in-field and in-stream processes.

This project applies two distinct approaches to addressing these challenges. First, we developed a geochemical sediment fingerprinting database, compiling existing sediment geochemistry data across the Mississippi River Basin. Second, we developed and implemented a comprehensive landscape-scale geomorphic mapping toolbox utilizing the best available topographic and hydrographic data as well as spatial analysis to classify the diverse geomorphic environments throughout the basin.

Key results include the development and deployment of a suite of riverscape network models throughout the entire Mississippi River Basin and the contiguous United States. Over 120,000 model outputs were produced at the HUC 10 scale, encompassing more than 8 million miles of riverscapes. We will showcase how these datasets enable researchers and practitioners to address sediment challenges effectively at scales ranging from local site planning to national assessments. By integrating geomorphic mapping, sediment fingerprinting, and riverscape modeling, this work provides a robust framework for advancing sediment management, conservation, and ecological restoration across extensive watersheds.

Leaning into Innovation and Disruption to Shape the Future of Conservation
Location: Laguna Beach I on Banquet 1 Level
Time: 10:30 AM – 12:00 PM

Moderators: Brandi Murphy and Casey Gathje, Women in NRCS (WiN)

Innovations are important in getting more conservation on the ground with less effort, time and expense. Biocontrols (such as using predators & pathogens for pest control), Drone Utilization (for inventory and assessment of resources), and Precision Agriculture (timing, rate, and placement of fertilizers) may increase efficiency of conservation in the future. However, innovations can disrupt the processes and methods that conservationists are familiar and comfortable using. Research can show promising results, but it can still take time before a new innovation is widely adopted, often there is hesitation by leadership, and also there can be resistance from conservationists changing from familiar work flow to foreign ideas. In this Symposium you can listen to end users share how early adoption of these technologies helped improve their conservation planning because they overcame their mindset barriers, acted experimentally, and held to purpose while finding space for these methods in Conservation application.

This conversation is of particular importance as the federal workforce is being reduced, and cooperative grants are being cancelled, leaving less people to plan and install conservation measures. There will be time incorporated for discussion among the panelists and also questions from the audience.

Roots So Deep Episode 1 Streaming
Location: Laguna Beach III on Banquet 1 Level
Time: 10:30 AM – 12:00 PM

Author: Peter Byck, Roots So Deep You Can See the Devil Down There

Roots So Deep (you can see the devil down there) is a captivating documentary series that follows a group of farmers and scientists exploring how regenerative grazing can rebuild soil health, increase resilience to drought, and combat climate change. With humor, heart, and a deep respect for the land, the series dives into the tensions and connections between tradition and innovation in American agriculture. Directed by Emmy-nominated filmmaker Peter Byck, *Roots So Deep* invites viewers into an honest conversation about the future of farming—above and below the surface.

Conservation Policy Roundup
Location: Laguna Beach I on Banquet 1 Level
Time: 1:30 PM – 3:00 PM

Moderator: Tom Stein, American Farmland Trust

Provide an overview of leading conservation policy initiatives and results in California and at the national level through a panel with policy professionals from various organizations.

Leveraging Comprehensive Outreach Strategies to Bolster Impact of Multi-Stakeholder Partnerships
Location: Laguna Beach II on Banquet 1 Level
Time: 1:30 PM – 3:00 PM

Moderator: Helen VanBeck, American Farmland Trust

The Midwest Team of American Farmland Trust (AFT) works across the Midwest region to engage farmers, farm advisors, and policy makers on initiatives which protect farmland, promote the adoption of conservation practices, and support farm viability in a changing climate. This symposium will highlight lessons learned from a variety of AFT's programs related to stakeholder engagement through intentional, data-informed outreach strategies. The Midwest team will share insights on how to work collaboratively through multi-stakeholder partnerships to reach new audiences, ensure consistent messaging, encourage unified action, and evaluate the effectiveness of outreach and engagement efforts. Following a series of short presentations on AFT's leadership in three innovative Midwest programs, session attendees will be led through a unique, interactive discussion to identify shared challenges and apply successful outreach strategies to their own work. This session will recognize the collective knowledge and expertise of all who attend and encourage attendees will be encouraged to share their learnings through discussion on their experience in outreach and stakeholder collaboration.

Using Great Lakes to Gulf to Inform Conservation in the Mississippi River Watershed
Location: Laguna Beach I on Banquet 1 Level
Time: 3:30 PM – 5:00 PM

Moderator: Laura Kammin, National Great Rivers Research and Education Center
Authors:

Great Lakes to Gulf (GLTG) is a recently upgraded interactive website that provides curated nutrient-focused water quality information about the Mississippi River and its tributaries. The site includes easy access to federal, state, and regional water quality information. GLTG standardizes and distills a massive amount of complex water quality data from across geographies to focus on nitrogen and phosphorus concentrations and related parameters. These data have been used to calculate twenty-year trends (2000-2020) in nitrogen and phosphorus concentrations and loads at more than 200 monitoring stations throughout the basin. These trends can be related to geospatial data layers such as location of conservation practices, amount of fertilizer use, HUC8 nitrate loading predictions, and cropscape frequency data. The site also provides an information hub of state efforts to improve water quality, including each of the 12 main stem states' nutrient reduction plans and measures of progress. Collectively, this information can help track the effectiveness of nutrient reduction efforts and inform future directions and locations for conservation in the Mississippi River Basin.

This session will demonstrate the sites' key features. Two organizations will present case studies on how they used the information in GLTG to help guide their conservation activities related to nutrient reduction in the Mississippi River Basin.

Roots So Deep Episode 2 Streaming
Location: Laguna Beach III on Banquet 1 Level
Time: 3:30 PM – 5:00 PM

Author: Peter Byck, Roots So Deep You Can See the Devil Down There

Roots So Deep (you can see the devil down there) is a captivating documentary series that follows a group of farmers and scientists exploring how regenerative grazing can rebuild soil health, increase resilience to drought, and combat climate change. With humor, heart, and a deep respect for the land, the series dives into the tensions and connections between tradition and innovation in American agriculture. Directed by Emmy-nominated filmmaker Peter Byck, *Roots So Deep* invites viewers into an honest conversation about the future of farming—above and below the surface.

WEDNESDAY, AUGUST 6

SYMPOSIA SESSION DESCRIPTIONS AND AGENDA

Agroecosystem Modeling for Conservation and Atmosphere Assessment
Location: Laguna Beach I on Banquet 1 Level
Time: 8:30 AM – 10:00 AM

Moderator: Javier M. Osorio Leyton, Texas A&M University

EPIC (Environmental Policy Integrated Climate), APEX (Agricultural Policy / Environmental Extender), and SWAT (Soil and Water Assessment Tool) are a suite of multi-scale agroecosystem models developed in Temple, Texas, since the early 1980s. APEX and SWAT are key models for the CEAP (Conservation Effects Assessment Project) Cropland and Watershed assessments. Over the decades, the USDA (United States Department of Agriculture), NRCS (Natural Resources Conservation Service), ARS (Agricultural Research Service), and Texas A&M have supported and led the field data collection, model development, evaluation, and application in collaboration with scientists worldwide. The EPIC, APEX, and SWAT models share many consistent processes and are designed to address various issues ranging from the field level to watershed and national scales. They have been extensively utilized by the USDA and others worldwide to quantify the impacts of management and conservation practices on agricultural ecosystems.

These models have primarily focused on the ecological impacts of management and conservation practices but not on carbon (C) and nitrogen (N) cycling into the atmosphere, such as NH3 and trace gas N2O and CH4 emissions. Despite having numerous management and conservation practice options and sophisticated nutrient cycling processes, including pesticide and salt fate and transport, the models lack CH4 emission modeling and advanced N2O emission estimation. Many conservation practices supported by the USDA, such as nutrient management practices, cover crops, tillage practices, tree planting, and livestock management practices, aim to sustain and sequester soil organic carbon (SOC) and reduce nutrient loss as well as CH4 and N2O emissions. To better understand and measure the impacts of these practices, efforts are underway to improve and evaluate EPIC, APEX, and SWAT with enhanced C-N cycling pathways from soil and water and nitrogen deposition from the atmosphere.

This symposium will focus on the planned and ongoing research activities and results related to model enhancement, evaluation, and application. We will present EPIC and APEX modeling results and evaluations with enhanced N-inhibitor and biochar processes. Research results from integrated EPIC and atmospheric modeling will demonstrate how agriculture affects nitrogen cycling in the atmosphere and how nitrogen deposition from the atmosphere, combined with all anthropogenic nitrogen emissions, affects agricultural soil nitrogen cycling. Preliminary results on parameterization improvement for APEX perennial vegetation will be demonstrated. Current research results and applications of SWAT with enhanced carbon cycling (SWAT-C) will be presented. Lastly, we will demonstrate applications of geospatial and machine-learning methodologies to enable process-based modeling in data-scarce environments, supporting decision-making for sustainable resource management

Lessons Learned from Four Years of Cover Crop Adoption and Measured Soil Health, Economic, and Social Indicators from 15 CIG On-Farm Demo Trials in California, Kentucky, New York, Massachusetts, & Connecticut
Location: Laguna Beach II on Banquet 1 Level
Time: 8:30 AM – 10:00 AM

Moderator: Aysha Tapp Ross, American Farmland Trust

After 4 years of cover crop application, American Farmland Trust's 5-year On-Farm Soil Health Demonstration Trial (SHDT) Conservation Innovation Grant (CIG) project, "Conquering Cover Crop Challenges from Coast to Coast" is coming to an end. AFT developed this CIG SHDT effort to address the low national cover crop adoption rate (5%), by identifying, evaluating, supporting, and showcasing farmer-driven transitions to improving soil health through the adoption of cover crops or modification of cover crop management. The project included fifteen producers in five states, either adding cover crops alone or in combination with no-till, nutrient management, compost application, or unique termination strategies, and annually further adapting these new practices and comparing them to their standard management (control). In 2022 AFT shared the lessons learned from the first year of cover crop implementation at the SWCS Denver Conference. Now, with four years of data under our belt, we have analyses, challenges, and more lessons learned to share with the conservation community.

AFT collaborated with the following producers:

- 4 California (almond, grape, vegetable)
- 4 Kentucky (row crops)
- 2 Connecticut (dairy)
- 1 Massachusetts (dairy)
- 4 New York (row crop, dairy)

We will share data and lessons learned regarding:

- Changes in soil health using the indicators from the In-Field NRCS Soil Health Assessments and Cornell Soil Health Laboratory's Comprehensive Assessment of Soil Health
- Partial budget economic analysis using field operations data to compare the benefits and costs observed on treatment vs. control plots
- Social indicators survey data from producer surveys as well as field day exit surveys used to explore farmer motivations and barriers for using soil health practices and track intentions for maintaining the use of these practices over the long term.
- Farmer recruitment and communication throughout a long-term project
- Lessons learned from the use of roller crimping in various regions, harvesting of cover crops for forage, and other lessons learned about how farmers can successfully implement and adapt practices during transitions to improved soil health management systems.

Title: Roots So Deep Episode 3 Streaming
Location: Laguna Beach III on Banquet 1 Level
Time: 8:30 AM – 10:00 AM

Authors: Peter Byck, Roots So Deep You Can See the Devil Down There

Roots So Deep (you can see the devil down there) is a captivating documentary series that follows a group of farmers and scientists exploring how regenerative grazing can rebuild soil health, increase resilience to drought, and combat climate change. With humor, heart, and a deep respect for the land, the series dives into the tensions and connections between tradition and innovation in American agriculture. Directed by Emmy-nominated filmmaker Peter Byck, *Roots So Deep* invites viewers into an honest conversation about the future of farming—above and below the surface.

Updates from Diverse Corn Belt: Reimagining Agricultural Diversity
Location: Laguna Beach I on Banquet 1 Level
Time: 10:30 AM – 12:00 PM

Moderator: Emily Usher, Purdue University

The Midwestern Corn Belt's longstanding focus on corn and soybean production has cemented its role in the social, economic, and political landscape of the Midwest. However, this system faces growing challenges from climate change, volatile commodity prices, market shifts, and declining rural economies. Research suggests that increasing agricultural diversity could strengthen agronomic, economic, and social resilience in the region. The USDA-NIFA-funded Diverse Corn Belt (DCB) project explores these possibilities by engaging a broad spectrum of stakeholders to identify viable pathways for diversification across Indiana, Illinois, and Iowa. This session will share three+ years of findings from DCB, emphasizing farmer perspectives on market policy changes needed to make diversification viable. Additionally, we will share market insights from across the supply chain as well as biophysical research results about how diverse agricultural systems can impact the landscape. Attendees will engage in thoughtful discussions on the policy and market limitations of the current agricultural system, costs and benefits of diversification, and actionable pathways to a more resilient future.

Attendees will gain a better understanding of risks of the current agricultural system and opportunities for diversification, learn insights from farmers and other supply chain participants on the practical and economic impacts of diversification, and explore resources and strategies needed to support regional diversification plans. Join us as we advance conversations on creating a more resilient, sustainable, and diverse Corn Belt!

What's the Dirt about Biochar?
Location: Laguna Beach II on Banquet 1 Level
Time: 10:30 AM – 12:00 PM

Moderator: Tom Stein, American Farmland Trust

Biochar can be a powerful tool in the soil health and climate-smart toolbox for agriculture. And while long practiced in certain indigenous communities, its use in mainstream farm production systems has been limited with lots of uncertainties and opportunities ahead with potential synergies in forestry, energy, wildfire resilience, and soil, water, and nutrient management.
In this session, panelists will share a broad overview of some of the opportunities, challenges, latest research, and support tools and resources to inform use of biochar in agricultural systems, including best management practices and research findings through on-farm trials, decision support tools to support on-farm use, technical and financial assistance resources to support practice implementation, professional development/training resources to learn more, and supply chain and sourcing perspectives. Panel will include diverse representation and perspectives from scientists, practitioners, and manufacturers.

Roots So Deep Episode 4 Streaming
Location: Laguna Beach III on Banquet 1 Level
Time: 10:30 AM – 12:00 PM

Authors: Peter Byck, Roots So Deep You Can See the Devil Down There

Roots So Deep (you can see the devil down there) is a captivating documentary series that follows a group of farmers and scientists exploring how regenerative grazing can rebuild soil health, increase resilience to drought, and combat climate change. With humor, heart, and a deep respect for the land, the series dives into the tensions and connections between tradition and innovation in American agriculture. Directed by Emmy-nominated filmmaker Peter Byck, *Roots So Deep* invites viewers into an honest conversation about the future of farming—above and below the surface.

ORAL

PRESENTATIONS

MONDAY, AUGUST 4

ORAL PRESENTATION DESCRIPTIONS AND AGENDA

Subject: Conservation Models, Tools, and Technologies
Location: Newport Beach I on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Building A Conservation Concierge

Author: Robert Dawes (The Commons)*

The complexity of accessing conservation assistance poses a significant barrier to farmer participation in conservation programs, ultimately limiting the adoption of critical practices that enhance environmental quality. Navigating program requirements, understanding eligibility criteria, and identifying funding opportunities can be time-consuming and overwhelming for farmers and conservation professionals alike. Utilizing Artificial Intelligence (AI) to inform a decision support tool offers a transformative solution to streamline these processes, overcome barriers, and enable much broader adoption of conservation practices across agricultural landscapes.

A key feature of this tool is its ability to align available funding opportunities with conservation needs. The system identifies relevant federal and non-federal funding programs, such as those offered by the USDA Natural Resources Conservation Service (NRCS) and state or private grants, that can support conservation implementation. By providing a prioritized list of conservation options tailored to the specific needs and characteristics of a farm, the tool empowers farmers and agricultural professionals to make informed decisions about conservation investments. The system also generates a preliminary draft of application materials, significantly reducing the administrative burden associated with program enrollment.

Beyond individual farmers, this tool is designed to serve conservation professionals, technical service providers, and agricultural advisors who play a critical role in connecting farmers to resources and programs. By improving the efficiency of enrollment in conservation management practices, the tool supports the goals of accelerating adoption and achieving meaningful environmental outcomes at scale.

In addition to simplifying the application process, the AI system fosters a more strategic approach to conservation planning. By enabling stakeholders to evaluate multiple conservation scenarios and outcomes, the tool ensures that investments are directed toward the highest-impact practices. This level of precision not only maximizes the environmental return on investment but also strengthens the relationship between conservation programs and the agricultural community by demonstrating clear and tangible benefits.

We anticipate that this tool will revolutionize the way conservation assistance is delivered, reducing barriers for farmers and increasing the accessibility and efficiency of conservation programs. Ultimately, it will help bridge the gap between farmers and the resources they need to implement sustainable practices, driving progress toward a more resilient and environmentally sustainable agricultural landscape. Participants will come away from the presentation with a strong understanding of concise workflows that AI integration can support as well as gain access to tools and approaches that integrate AI into conservation decision making.

CEAP-Grazing Land: Conservation Insights from Eastern Pastures to Western Range

Authors: Carrie-Ann Houdeshell (USDA-NRCS); Brandon Edwards, New Mexico State University

The Conservation Effects Assessment Project on Grazing Land (CEAP-GL) led by the United States Department of Agriculture's Natural Resources Conservation Service (USDA-NRCS) is a collaborative effort with the USDA's Agricultural Research Service (ARS) and many universities and non-governmental organizations. The goals of CEAP-GL are to provide models, data and resources to improve conservation on pasturelands, grazed forests and rangelands. This symposium will focus on four topics ranging from: a pastureland ecological model; effects of cattle on water quality in southeastern ponds; land managers dealing with invasive grasses in the Northern Great Plains; using large monitoring datasets to manage western rangelands. There will be four, 15-minute oral presentations with a Q&A period after each speaker.

Determining the Effect of Conservation Practices on Ephemeral Gully Erosion With USDA's AnnAGNPS Watershed Pollution Model

Authors: Henrique Momm (Middle Tennessee State University)*, Racha ElKadiri (Middle Tennessee State University); Ron Bingner (USDA-ARS); Robert Wells (USDA-ARS); Katy Moore-Freeman (Middle Tennessee State University)

Conservation management plans (CMP) to reduce soil erosion non-point source pollution within agricultural watersheds have often focused only on addressing sheet and rill erosional sources (S&R). Practices implemented within fields as part of a CMP are designed to reduce the soil from being eroded and to trap sediment before leaving a field and contributing to downstream sediment loads. Conservation agencies have recognized that ephemeral gully (EG) sources can significantly contribute to a watershed's overall sediment load and, therefore, requiring an assessment of the effectiveness of conservation practices in reducing sediment loads from EG sources. Currently, this is a significant challenge because ephemeral gully erosion can be a threshold-based process triggered by a unique set of integrated climatic, topographic, soil, and management conditions. Variations in any one of these factors can alter EG erosion responses to conservation practices, both within and across watersheds. In this study, the USDA Annualized Agricultural Non-Point Source (AnnAGNPS) watershed pollutant model was utilized to evaluate and quantify the effectiveness and impact of conservation practices to control EG erosion across various landscapes contained within four watersheds located in Maryland, Vermont, and Ohio in USA, each with unique physical characteristics and climate regimes. EG initiation points within the watersheds were determined at different time periods using an algorithm combining GIS-based topographic analysis with visual verification from aerial photographs. Evaluations were conducted at multiple time points in each watershed (Choptank watershed in Maryland: 1990, 1992, 1998, 2011, 2013, and 2017, Lake Champlain watersheds in Vermont: 2008, 2009, 2011, 2012, 2014, 2016, 2018, 2021, and Western Lake Erie Base watershed in Ohio: every other year from 2009 to 2023). The type and location of actual conservation practices were obtained from high-resolution aerial photographs at the end of the growing season. Scenarios were developed with and without conservation practices to represent the upper and lower boundary conditions describing their impact on soil erosion, respectively. Simulation results revealed differences in the dominate sediment source across these watersheds. Similarly, the percentage of sediment load reduction for each source (S&R and EG) varied across watersheds, with VT yielding the least reduction and MD the highest reduction in sediment loads from EG sources. Farming practices and extreme rainfall events contributed to the difference in sediment reduction performances. This effort demonstrates the need to understand the impact of conservation practices on erosional sources and strategically targeting conservation practices to develop effective and site-specific CMPs.

Stem Water Potential Model Integrating Soil, Weather, Plant, and Remote Sensing Data

Author: Abdelmoneim Mohamed (UC Cooperative Extension)*

The recurring droughts in California coupled with the need to comply with the Sustainable Groundwater Management Act (SGMA) are expected to reduce the amount of water available for almond production -the major irrigated crop in California. Improved water use efficiency of almonds can be achieved through plant-based irrigation scheduling by measuring stem water potential (SWP) as one of the water stress indicators. This approach effectively controls the amount of irrigation and timing based on plant response to environment and soils. SWP measurement typically occurs at midday using a pressure chamber which is considered the most accurate tool for plant water status. Measuring SWP in the field with a pressure chamber is laborious, and leaf removal for the measurement can impact young tree development, therefore, not widely adopted within the almond industry. Most existing studies focus on the relationship between soil and weather, but the plant component, the most important one, was often missing. Since the goal of irrigation is to affect the plant directly, a plant-based indicator is essential to assess whether the water application is adequate and if the timing is appropriate (i.e., not too early or too late). To address this gap, this study aimed to develop a user-friendly SWP model that utilizes freely available actual evapotranspiration (ET) data from the OpenET platform alongside soil moisture content measurements. By installing a single soil moisture sensor in a representative area of an orchard, growers can estimate SWP and tailor irrigation strategies in accordance with what trees actually feel. Empirical mixed models demonstrated acceptable SWP predictions for almonds grown on different soil types. If widely adopted, this model could facilitate site-specific irrigation scheduling, leading to more efficient water use and increased profitability. More data inputs will further improve the model’s precision and applicability for California’s almond industry.

Subject: Soil Health Resources, Indicators, Assessment, and Management
Location: Newport Beach II on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

A Novel Approach to Factor Soil Health into the Farmland Appraisal Process

Author: Lucas Chamberlain (Delta Institute)*

Midwestern farmers may improve their soil health and local water quality by adopting soil conservation practices such as cover crops or no-till, but many require financial incentives to do so. Farmers may be incentivized to adopt these practices if building soil health can demonstrably increase the value of their land. To do so, soil health must be valued as a property characteristic and a replicable process to incorporate soil health into commonly accepted appraisal practices must be created. However, no real estate appraisal approaches currently exist to empirically assess the value ($/acre) of soil health.

In 2024, Delta Institute, in partnership with rural appraisers and soil scientists, tested a proof-of-concept approach to factor soil health into the farm real estate appraisal process in Illinois and Michigan. These Pilot Programs resulted in a scalable and replicable methodology for appraisers to incorporate measurements of soil health into the farmland appraisal and valuation process across the Midwest. In total, 15 farms were appraised using this novel appraisal approach.

The Project Team not only successfully created a replicable soil sampling methodology and "soil health index" to be utilized in future appraisals but also determined that the Sales Comparison Approach is best suited for incorporating soil health into the land valuation process at scale. The results of this Pilot Program also contribute empirical evidence that suggests land management has a significant effect on soil health.

The Pilot Programs showed that while soil health was able to be analyzed as a potential adjustment within the Sales Comparison Approach, at the moment, appraisers lack the baseline data required to identify and isolate any quantifiable market reactions to soil health. From this, the Project Team concludes that limited information on the return on investment of building soil health for farmers operating budgets may prevent the institutional adoption of this novel appraisal methodology and have created a "missing market" for soil health in land valuation. Here, we see that the next steps should be to fill the gaps of this "missing market" by further building market evidence of the value of soil health.

For soil health to become a standardized metric and soil conservation practices to become widely-adopted on farms across the Midwest, Delta will build upon the findings of our Pilot Programs to compile and demonstrate in-depth market evidence to raise awareness of the value and return on investment of building soil health to farmers and appraisers, resolve bottlenecks in the soil testing industry, and actualize the proof of concept into a viable appraisal approach. Expanding partnerships to and building consensus among lending organizations and agricultural banks has the potential to catalyze our efforts and open pathways for Midwestern farmers to invest in the stewardship of their land and pay dividends for future generations.

A Peer Cohort Approach to Soil Health Management Planning in New England

Author: Caro Roszell (American Farmland Trust)*

Conservation Planning Activities (CPAs) and Design and Implementation Activities (DIAs) are focused conservation plans contracted by the Natural Resources Conservation Service and completed by NRCS-certified third-party Technical Assistance Providers (TSPs). In theory, CPAs and DIAs provide producers with more extensive and specialized technical support than may otherwise be available from NRCS field office staff when demand outstrips local capacity. In practice, regional TSP availability can be a limiting factor for contracting and implementing the CPA/DIA planning process. Available TSPs may also lack lived experience with the client's specific type of farming, limiting the precision and applicability of their technical assistance. To address these limitations, American Farmland Trust offers an innovative approach to the completion of Soil Health Management Plans (SHMP 116) and Soil Health System Designs (SHSD 162). In our model, an AFT staff person certified as a TSP for 116/162 leads cohorts of farmers through the planning process together over the course of a year, teaching producers to complete many of the planning tasks themselves through a series of projects and worksheets. Producers learn to conduct visual assessments of soil health and identify resource concerns, to use Web Soil Survey and the Electronic Field Office Technical Guide, and to read Conservation Practice Standards, among other skills. Guest lectures from subject matter experts, field walks, and opportunities for peer feedback, discussion, and engagement enhance the experience for producers and provide community building opportunities. While challenging, the benefits of this approach go beyond the development of soil health plans; participants report greater fluency in the sometimes opaque language of conservation planning, and the ability to be more effective participants in the conservation planning process. This presentation will discuss the overall approach, program design, and lessons learned running our first four cohorts (two diversified vegetable producer cohorts and two livestock cohorts) with forty farmers across two states.

Aggregate Stability by Image Analysis: A Free, Locally Relevant, and Scalable Tool

Authors: Elizabeth Rieke (Soil Health Institute)*; Nathaniel Looker (Soil Health Institute); Jennifer Bower (Soil Health Institute); Cristine Morgan (Soil Health Institute)

Aggregate stability is a commonly used indicator of soil health because improvements in aggregate stability are related to reduced erodibility and improved soil-water dynamics. During the past 80 to 90 years, numerous methods have been developed to assess aggregate stability. However, most traditional methods require specialized equipment and are labor intensive. Recently, Slakes, a free smartphone app was created by the Soil Health Institute in conjunction with the University of Sydney. The app calculates an aggregate stability index before and after being submerged in water for 10 minutes. Use of the app only requires a smartphone, three air-dried soil aggregates, two clear plastic dishes, tap water, and a smartphone mount. Slakes is currently available for free download in the Google Play and Apple app stores. Additionally, the Soil Health Institute has developed a high throughput analog of the Slakes app for use in commercial laboratories, SlakeItEasy. SlakeItEasy allows laboratories to efficiently capture images before and after the 10-minute submersion period and process the images using R code, made freely available in the Soil Health Institute GitHub repository. These tools open doors for low-cost research, connecting non-scientists with soil health, and enable agricultural stakeholders to measure and monitor improvements in soil function with improvements in management.

Soil C Recovery Time After Long-term Crop Residue Removal

Author: Humberto Blanco (University of Nebraska-Lincoln)*

Excessive crop residue removal for off-farm uses can lead to a reduction in soil C in the long term. Restoring the lost soil C is crucial for soil and water conservation, and maintenance of soil ecosystem services. This leads to this question: how long would it take for soil C to recover to the initial C level after the cessation of crop residue removal? This question has not been fully answered as most previous studies focused on crop residue removal effects, and not on soil recovery time. We measured changes in soil C over two years after the suspension of 10 yr of corn residue removal at 5 rates (0, 25, 50, 75, and 100%) in a rainfed no-till continuous corn system in a silty clay loam in eastern Nebraska. After 10 yr, residue removal at 100% and 75% reduced soil C concentration from 24.890 to 20.560 g kg-1, while residue removal at ≥50% reduced soil C stock from 12.322 to 10.337 Mg C ha-1 (0.198 Mg C ha-1 yr-1) in the 0-5 cm depth compared with no removal. After residue removal cessation, we planted winter rye cover crops in all except the 0% removal plots. Results showed that after 1 year of residue removal cessation and cover crop introduction, soil C concentration and stocks did not significantly differ among the treatments although the residue removal plots numerically tended to have lower soil C. In year 2, like in year 1, soil C concentration and stocks did not differ among treatments, and the numerical trends among treatments were similar. The study results indicate that soil C can rapidly recover to initial levels after excessive corn residue removal ends, when cover crops are added in this environment.

Subject: Water Resource Assessment and Management
Location: Newport Beach III on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Conservation Counts: 20 Years of Building Urban and Rural Partnerships for Targeted Watershed Improvement

Authors: Josh Balk (Iowa DNR)*

In an ever-changing environment, addressing water quality issues can be a moving target. For two decades now, the Dry Run Creek Watershed Improvement Project in Cedar Falls, Iowa has adapted to not only implement beneficial conservation practices but to thrive in building lasting partnerships throughout its diverse landscape. These targeted efforts are to address two state designated water quality impairments, including a lack in diversity and quantity of aquatic creatures as well as high levels of bacteria, among other local priority issues. Primarily targeting urban stormwater runoff with connected impervious surfaces as well as stream sedimentation from soil erosion, this has created partnership opportunities with landowners from many different walks of life. Through these efforts, measurable progress is being made in the overall health of the watershed. Scopes have expanded to integrate community volunteers, climate mitigation practices, habitat improvement, and more. This presentation will focus on the accomplishments of the watershed project, the challenges along the way, plans for the future, as well as actionable steps that can be replicated elsewhere to achieve similar goals. We all live in a watershed and we all have a role to play.

Evaluation of SCS-Curve Number Method to Enhance Runoff Estimation Across Tillage Practices for Conservation Planning

Author: Umar Javed (South Dakota State University)*

The Soil Conservation Service Curve Number (SCS-CN) method is a cornerstone for estimating runoff in watershed models (e.g., SWAT, HEC-HMS, HSPF, AGNPS) and USDA-NRCS engineering designs, playing a critical role in hydrologic assessments for conservation planning. While CNs are influenced by land use, soil type, and slope, their accuracy under practices that improve soil infiltration has been underexplored. This study evaluated the SCS-CN method's accuracy for conventional, vertical, and no-till systems in a HUC-12 watershed in eastern South Dakota, USA. Using a novel approach, soil moisture probes (120 cm depth divided at 10 cm intervals) were deployed in 46 locations across 23 fields with a common soil series (Nora-Crofton complex). Changes in volumetric soil moisture after rain events were used to estimate runoff proportions and derive event-based CN values during the 2021–2023 growing seasons. Comparisons with "textbook" CNs from TR-55 tables revealed discrepancies: measured CNs were lower, particularly under no-till and vertical till practices (~74 vs. ~84 for textbook values). Hydrologic soil group (HSG) classifications also differed, with field-based HSGs often being more permeable (B or C vs. textbook C or D). The rainfall-runoff relationship model for validation showed strong accuracy for conventional till (R^2=0.72, RMSE=0.27, MAE=0.19) and no-till (R^2=0.69, RMSE=0.18, MAE=0.11). Findings highlight the need to integrate tillage-specific CN adjustments into conservation planning to improve runoff estimation and water management structure designs. By preventing overdesign and reducing costs, these refinements ensure more effective conservation strategies and reinforce the role of reduced tillage in sustainable watershed management.

Grafting Education and Action: Jumpstarting Edge of Field Practice Adoption in the Eastern Cornbelt

Authors: Seth Harden (The Nature Conservancy)*, Danielle Randles (The Nature Conservancy)

Indiana is a nationwide leader in the adoption of cover crops and other in-field practices. This is a result of decades of interagency cooperation and consistent messaging to farmers. The Nature Conservancy is now leading an effort to apply those same principles to edge-of-field (EoF) practice adoption in the Midwest. Using the foundational document Leading at the Edge: A Roadmap to Advance Edge of Field Practices in Agriculture published by SWCS, TNC, and the Meridian Institute, as a guide TNC is working with a multi-sector partnership to ground-truth the findings. In 2024, TNC launched an EoF demonstration network on 5 working farms across central Indiana. These on-farm demonstration sites provide opportunities for education, economic case studies, and monitoring in the White and Wabash River Basins, both in the top-tier of nutrient contributing watersheds to the Gulf of Mexico. Simultaneously, TNC was awarded $15.75M to launch the 5-Year Wabash River RCPP project in Indiana and Illinois. The RCPP project will employ ACPF modeling to site practices, batch-and-build to improve installation efficiency, and extensive use of TSPs. The RCPP includes a collaboration of eighteen partners including ag retail, state agencies, ADMC, and 15 SWCDs.
Blending demonstration and implementation efforts will allow for constant calibration of messaging and strategy at a watershed scale driving larger collective impact for adoption rates and environmental outcomes. This session will highlight the innovative, yet evidence based technical assistance solutions to increasing edge-of-field practice adoption. These lessons learned will be universal and will be immediately useful to session attendees.

Involving Hispanic Farmworkers in Irrigation Distribution Uniformity Assessments: The Benefits of Bilingual Technical Assistance

Author: Miguel Garcia (Napa RCD)*

Ensuring that irrigation systems deliver water accurately and efficiently is critical for water conservation. One of the most effective ways to achieve this is by assessing irrigation distribution uniformity. For the past decade, the Napa RCD has provided free technical assistance to evaluate the distribution uniformity of drip irrigation systems in vineyards. These assessments give farmers a clear understanding of their irrigation system's performance and actionable recommendations for improvement.

A key component of these evaluations is direct engagement with irrigators, who manage these complex systems daily. In Napa, the majority of irrigators are Hispanic farmworkers for whom English is a second language. Engaging them in Spanish not only fosters a more comfortable and effective exchange of information but also provides invaluable insights that might otherwise be overlooked by vineyard managers that are not fluent in Spanish. Farmworkers develop extensive knowledge of the irrigation systems they operate, making their input essential in identifying system strengths and weaknesses.

Beyond improving data collection, involving Hispanic farmworkers in the evaluation process empowers them as active participants in decision-making. To reinforce this, distribution uniformity reports are prepared in Spanish and shared with the farmworkers, ensuring they are informed about recommendations and best practices. This collaborative approach promotes a culture where all stakeholders have access to the same information and a voice in system improvements.

Building on the success of this initiative, Napa RCD has expanded its efforts by organizing Spanish-language workshops to train irrigators in conducting their own distribution uniformity tests and exploring key topics related to soil health and its role in irrigation water management. These workshops introduce fundamental soil health concepts, such as water movement and retention, to enhance their understanding of efficient irrigation practices. Empowering farmworkers to perform their own evaluations has also helped prioritize technical assistance needs. The ultimate goal is to encourage vineyard managers to involve irrigators not only in maintaining optimal irrigation system performance but also in developing efficient irrigation schedules, recognizing their expertise as an integral part of water management decision-making.

The next phase of this project, in addition to continuing these TA services, is to conduct a detailed assessment of the implementation of recommended improvements. While anecdotal evidence from farmworkers suggests positive outcomes, we aim to measure how these efforts translate into tangible water conservation benefits. By fostering an inclusive, bilingual approach, we seek to enhance both irrigation efficiency and the role of farmworkers in sustainable water management.

Subject: Resilient Agriculture
Location: Huntington Beach on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Covering Ground: Enhancing Soil Health through Interseeding in Late-Season Vegetables

Author: Gladys Adu Asieduwaa (University of Maine)*; Rachel Schattman (University of Maine); Jason Lilley (University of Maine Cooperative Extension)

Due to the short growing seasons in Northern New England, late-season vegetables are often harvested too late, making it impossible to establish a cover crop after harvest, and before winter causing farmers to leave their soils bare over the harsh winter months. The bare soils become susceptible to erosion, nutrient leaching, and weed growth, making them unsuitable for the next growing season. Therefore, in my research, I address this challenge faced by vegetable farmers in our region by evaluating the effectiveness of interseeding cover crops in these late-season vegetables to promote soil health. Results from a preliminary survey conducted by the University of Maine Extension about cover cropping practices in Maine showed that 77.8% of respondents struggle with "late season cash crops coming out too late," hindering cover crop planting. Across three years (2022-2024), I have conducted replicated field trials to investigate best management practices for interseeding cover crops into standing-late-season vegetables with an additional sociological survey to be conducted in Spring 2025 on the logistical constraints related to the adoption and utilization of interseeding cover crops among Northeast farmers. Factors investigated include the effects of planting timing, methods, and cover crop species on cabbage and sweet corn yield, cover crop biomass, weed biomass, soil moisture, and soil nitrate and ammonium. In addition to my research-farm-based replicated trials, I worked with collaborating farms to carry out practical demonstrations of interseeding cover crops in diverse late-season fields using several production approaches and available equipment. This research was conducted to provide evidence-based recommendations to farmers in the Northeast region who interseed or intend to interseed cover crops over their late-season vegetables now or in the future. The findings from my study highlight that the time (early, mid, or late) at which cover crops are planted is crucial as optimal interseeding at specific growth stages of cash crops leads to substantial cover crop biomass without adversely affecting crop yield. Likewise, annual variations in environmental factors such as precipitation patterns are critical components affecting cash crop and cover crop yield dynamics. My presentation targets a diverse audience, including farmers, professionals, researchers, students, and extension officers. It will encourage individuals interested in conservation, climate-smart agriculture, cover cropping, soil health, and sustainable agriculture, along with policymakers and stakeholders supporting sustainable farming practices, to attend, providing informative content relevant to agriculture-related topics. The knowledge acquired from my presentation will be key in addressing challenges related to agriculture, climate change, and food systems, particularly in the Northeast.

Crop Management Matters: Feedstock Production Practices Drive Biofuel Sustainability

Author: Salvador Ramirez II (USDA-ARS)*; Marty Schmer (USDA-ARS); Virginia Jin (USDA-ARS); Robert Mitchell (USDA-ARS)

Diverse aviation fuel production pathways will be needed to meet the growing demand of sustainable aviation fuels. A burgeoning fuel production pathway for sustainable aviation fuels is the cultivation of sustainable bioenergy feedstocks, such as corn (Zea mays L.) and switchgrass (Panicum virgatum L.), in the United States Midwest. The sustainability of these feedstocks depends on agricultural management, as well as matching bioenergy crops to landscape capabilities. A life cycle assessment was conducted using long-term data from one of the oldest bioenergy-specific field experiments in North America. This long-term field trial called 9804 was established in 1998 in eastern Nebraska and compared the productivity and sustainability of corn and switchgrass bioenergy systems under different harvest strategies and nitrogen (N) fertilizer rates on marginally productive cropland. Crop yields, soil nitrous oxide emissions, and changes in soil organic carbon stocks from 9804 were used in the LCA to account for direct impacts of management while the EcoInvent inventory (v. 3.10) and GREET was used to model upstream, indirect, and overall impacts of sustainable aviation fuel production. Both bioenergy feedstock and SAF sustainability was driven by changes in SOC during the crop production phase. Using measured data from long-term studies in LCA will more accurately capture the overall environmental impacts for the aviation sector.

Effect of Regenerative Management Practices on Soil Chemical Properties, Enzyme Activity and Microbial Respiration in Southern California Vineyard Soils

Authors: Michael Schmidt (USDA-ARS George E. Brown Jr. Salinity Laboratory)*; Nydia Celis (USDA-ARS George E. Brown Jr. Salinity Laboratory); Elia Scudiero (University of California, Riverside); Ray Anderson (USDA-ARS George E. Brown Jr. Salinity Laboratory); Greg Pennyroyal (Wilson Creek Winery)

The Temecula Valley American Viticultural Area covers a semi-arid wine grape growing region of Southern California predicted to become hotter and drier in the future, further stressing irrigation water resources and crops. Regenerative management may bolster soil resilience to climate change through enhanced soil health resulting from increased soil microbial activity and soil organic matter (SOM). However, efficacy of regenerative management in semi-arid growing regions where SOM accrual is often poor is not well documented. We compared soil chemical properties and microbial activities key to regenerative strategies between a vineyard managed under regenerative practices (i.e., cover cropping and no-till) and a conventionally managed vineyard to better understand the impact of these practices in semi-arid vineyard systems. Soil sampling implemented gamma spectrometry to optimally capture soil variability between plots. Soils were subject to laboratory chemical and biochemical analyses after collection. Our results indicate a significant favorable response of several key soil chemical parameters to regenerative management, including: soil organic carbon, total nitrogen, active soil carbon and cation exchange capacity. Regenerative soil management also resulted in significant increases in soil glucosidase and phosphatase activities linked to C and P cycling, respectively, relative to conventional management. Soil incubations showed greater CO2 fluxes and evolution rates in

soils under regenerative management relative to conventional soils. These results overall highlight the potential of regenerative management practices to promote biological activity and SOM accumulation, supporting use of regenerative management as a tool for enhancing soil health in semi-arid vineyard soils. Future work will focus on better understanding microbial community structures and monitoring soil health through conversion to regenerative management. This presentation will be relevant to growers and vineyard managers across California and the West interested in soil sustainability.

Phytoremediation as a Conservation Approach to Improve Soil Health of Contaminated Agricultural Lands and Produce Biofuel Feedstock

Authors: Oleksandra Tryboi (Strategic Conservation Solutions)*

Productive soil is necessary for agriculture to supply the world with sufficient food. At the same time, there are areas with soil that are contaminated and not suitable for food production but can still be used to produce biomass that can serve as a feedstock for biofuel production. Growing biomass crops on contaminated lands for phytoremediation and biomass production has several limitations, namely the type and level of contamination and crop suitability. According to known research results, phytoremediation may be applicable for the remediation of metals, pesticides, solvents, explosives, crude oil, PAHs, and landfill leachates.
Although there are significant areas of contaminated lands, there is no common approach to the characterization of contaminated lands subject to phytoremediation, which makes it difficult to assess the potential of contaminated lands subject to phytoremediation and further biomass potential for biofuel production.

This study, performed within the Horizon2020 project CERESiS, aimed to develop a classification of contaminated lands that, according to existing open trials, can be phytoremediated with certain energy crops.

The general approach for classifying contaminated lands subject to phytoremediation is based on the developed definition of contaminated land that distinguishes contaminated and polluted lands based on the levels of contamination, considering the applicability of phytoremediation. A list of energy crops suitable for phytoremediation of inorganic and organic contaminants was prepared based on available open research information and project trials.

The developed classification of contaminated lands can help in the decision-making process when choosing certain energy crops species for phytoremediation as it links contaminated land type with an activity that caused the contamination, defines main contaminants of concern, and shows types of energy crops that were already used for phytoremediation of similar sites.

Subject: Conservation Models, Tools, and Technologies
Location: Newport Beach I on Banquet 1 Level
Time: 1:30 PM- 3:00 PM

Dairy Conservation Navigator: A Decision Support Tool for Conservation Planning

Author: Lisa McClintock (Dairy Management Inc.)*

Effective conservation planning in dairy systems requires clear, science-based guidance tailored to farm-specific conditions. However, navigating conservation programs, funding opportunities, and practice selection can be challenging for farmers and advisors. The Dairy Conservation Navigator was developed to streamline this process by providing a centralized, user-friendly platform that synthesizes technical guidance, funding options, and practice comparisons. This session is relevant for conservation professionals, dairy advisors, researchers, and policymakers looking to enhance conservation adoption through decision-support tools.

CONTRIBUTIONS TO SCIENCE AND SOCIETY
The Dairy Conservation Navigator was developed with input from over 70 experts using a rigorous content curation and vetting process to ensure accuracy and usability. Information was sourced from technical experts, government programs, and industry initiatives and then reviewed by conservation scientists and dairy professionals. By organizing complex conservation information into an accessible format, the tool enhances decision-making, reduces barriers to implementation, and facilitates the adoption of practices that improve water quality, soil health, and greenhouse gas mitigation. The platform represents a step forward in bridging scientific research with on-farm action by aligning conservation priorities with practical, real-world applications.

The tool includes:
+ Learning Hub: Dive into a library of science-based materials, including slide decks, handouts, and videos. Access free short courses on topics like environmental modeling, carbon markets, and water conservation, developed in collaboration with industry experts.
+ Filterable Practices and Technologies List: Easily identify and compare both proven and emerging practices with a filterable database.
+ Practical Insights into Options: Explore detailed summaries of over 80 practices, with insights on economic impacts, management considerations, funding opportunities, and environmental benefits. Content is enhanced with videos, images, and links to further technical resources.

NEXT STEPS AND FUTURE ADAPTATION
As conservation priorities evolve, the Dairy Conservation Navigator is being continuously updated to reflect emerging research and practices, and new financial incentives. Future adaptations include expanding the tool's geographic scope, integrating feedback from users, and improving interactive features to better support conservation planning. Collaboration with extension specialists, sustainability experts, and policy stakeholders will be key to refining the tool and increasing its impact. Attendees will gain insight into how decision-support tools like

the Dairy Conservation Navigator can be leveraged to enhance conservation adoption in dairy systems and beyond**.**

Nutrient Tracking Tool (NTT): A Farm Decision-Making Tool for Water Quality/Quantity, Soil Carbon Sequestration, and Crop Production Assessment

Author: Ali Saleh (Tarleton)*
The Nutrient Tracking Tool (NTT) is a user-friendly web-based program developed by Texas

Institute for Applied Environmental Research (TIAER) staff. NTT estimates nutrient (nitrogen and phosphorus), sediment losses, soil carbon sequestration, and crop yield from fields (or small watershed) and regional managed under a variety of cropping patterns and management practices through its linkage to the Agricultural Policy Environmental eXtender (APEX). It also accesses USDA-NRCS's Web Soil Survey (or user input) and PRISM soil, and weather information. NTT provides producers, government officials, and other users with a fast, efficient, and a common method of estimating the nitrogen and phosphorus credits generated from implemented Best Management Practices (BMPs) at the field and (small watershed) levels. The generated credit can be used for water quality/quantity trading, as well as other water quality and quantity programs. In addition, a new version of NTT (NTT-RE) provides the researches and educators an easy-to-use interface to access the APEX files and program. The information obtained from the tool can help producers to determine the most cost-effective conservation practice alternatives for their individual operations and provide them with more advantageous options to reduce the water contaminant while optimizing their crop production. During this presentation the latest version of NTT and its latest capabilities will be described.

Predicting the Economic Outcomes of Soil Health Practices With a User-Friendly Predictive Soil Health Economic Calculator

Authors: Meng Li (American Farmland Trust)*; Chellie Maples (American Farmland Trust); Aysha Tapp Ross (American Farmland Trust); Bonnie McGill (American Farmland Trust); Robert Ellis (American Farmland Trust); Ben Wiercinski (American Farmland Trust); Michelle Perez (American Farmland Trust)

Farmers are increasingly turning to soil health practices, such as no-till, cover crops, and nutrient management, to enhance sustainability and climate resilience. However, widespread adoption remains hindered by a critical knowledge gap: limited information on the economic viability of these practices. To address this challenge, American Farmland Trust (AFT) is developing the Predictive Soil Health Economic Calculator (P-SHEC), an innovative tool integrating soil science and economic analysis to predict the long-term economic impacts of transitioning to soil health systems. This tool will be a valuable resource for conservation professionals to engage with row crop farmers about soil health practices, and for farmers to gain a deeper understanding of the potential economic impacts these practices may have on their farm.

Our method uses a partial budget analysis to estimate the annual change in net income resulting from investments in machinery, labor, inputs, and learning associated with transitioning from conventional to soil health practices. Additionally, we incorporate multiple national datasets, including USDA-NASS crop statistics, geographic soil survey data, PRISM climate data, and COMET-Planner soil carbon data, to predict the long-term yield and subsequent yield revenue impacts of soil health practices. We have developed machine learning models to quantify the impact of different soil health practices on soil organic matter (SOM) and its relationship to crop yields. These relationships serve as the foundation for predicting 10-year net income changes for major commodity row crops—including corn, soybean, wheat, cotton, sorghum, barley, tobacco, oats, peanuts, and sugar beets—across 41 US states.

Packaged as a publicly accessible web application, the P-SHEC tool enables our target audience of farmers, conservation professionals, and various other stakeholders to compare soil health management scenarios through easy-to-understand tables and interactive visualizations for informed decision-making, planning, and research purposes. Looking ahead, we plan to enhance the tool's capacity to quantify yield resilience under extreme weather events such as drought, heat, and excessive water. This expanded functionality will offer stakeholders a more comprehensive assessment of the long-term economic impacts of soil health management systems. Furthermore, this research contributes to the emerging literature on the effects of improving soil health on crop yield and yield resilience. We plan to release the tool in the Fall of 2025 alongside comprehensive reports outlining technical details of the methods and practical user guidelines.

The Juniper Evaluation Tool: An Interactive Dashboard for Managing Juniper Vulnerability Within the Chickasaw Nation Treaty Territory

Authors: Mark Micozzi *(the Chickasaw Nation); Justin Baker (Aqua Strategies, Inc.)

The expansion of juniper species, mainly eastern red cedar (Juniperus virginiana), in Oklahoma has become a significant issue, affecting millions of acres of land. This rapid spread has been exacerbated by historical fire suppression policies that disrupted natural fire regimes, which previously kept juniper tree populations in check. The unchecked growth of juniper trees results in various economic and environmental problems, including reduced land productivity, lower land values, increased wildfire risks, increased removal costs and potentially diminished water quality and long-term aquifer recharge. To combat these negative impacts, the Chickasaw Nation (CN) has undertaken a proactive approach to managing cedar infestation by promoting appropriate best management practices (BMPs) for soil health and water quality improvements. To further assist this effort, funding from the Natural Resources Conservation Service Conservation Innovation Grants program enabled the CN to develop a juniper species distribution model and decision support tool, called the Juniper Evaluation Tool (JET). This tool provides estimates of juniper cover, as well as other important landcover metrics, that helps prioritize areas for juniper management and removal. This project aims to provide landowners with knowledge necessary to effectively manage their land and prevent further juniper encroachment. These local actions will help deliver positive regional impacts to CN streams, lakes and aquifers, and potentially provide an expanded JET that can be applied in other parts of Oklahoma and nationally. This presentation will highlight the deliverables of the project, the model methodology, and a brief demonstration of the JET along with some example use cases.

Subject: Cultivating Conservation Technical Assistance, Community, and Networks
Location: Newport Beach II on Banquet 1 Level
Time: 1:30 PM - 3:00 PM

Advancing Soil Health Management through Farmer-to-Farmer Outreach

Authors: Heidi Peterson (Sand County Foundation)*; Haleigh Summers (Sand County Foundation); Nikki D'Adamo-Damery (Sand County Foundation); Sam Kwakye (Sand County Foundation); Greg Olson (Sand County Foundation)

Thirty farmers across Minnesota and Wisconsin were engaged in a three-year, on-farm demonstration that integrated peer-to-peer learning with the introduction of soil health management and precision agriculture technology. Collaborating farmers were paired with a neighboring farmer based on whether they had already implemented (AI farmer) or not yet implemented (NYI farmer) soil health management into their operation. Real-time soil moisture and temperature sensors were installed in each paired field to empower them with more confidence to effectively make in-season management decisions and observe, with below-ground data, how soil health management can benefit their longer-term farm management strategy toward a more resilient system.

Farmer collaborators were surveyed before and after the project to determine how their involvement in peer-to-peer outreach increased their knowledge of and comfort communicating about soil health and precision agriculture changed during the project. Results suggest that AI farmers are generally more engaged in outreach events and more comfortable sharing their farming experience with an audience. However, after the project, NYI farmers reported an increased comfort level with engagement and outreach participation, as well as using precision agriculture. During the project, 30% of NYI farmers adopted cover crops, while other NYI farmers reported considering adopting cover crops or reducing tillage in the future. In addition to studying the effects of soil health management on soil water storage and climate resilience, an emergent outcome of this study was a pattern of nuanced differences in knowledge and communication of those who currently use and are not yet using soil health management. Understanding these nuances could help the design of messaging to promote soil health.

Engaging Communities to Protect Critical Waterways in Indiana and Arizona

Authors: Jill Reinhart, Nina Mason Pulliam Charitable Trust

A recent national USDA Prospective Customer Survey reveals that underserved customers are unaware of the technical and financial assistance available to them, and face barriers in accessing assistance. USDA’s Natural Resources Conservation Service (NRCS) has been working to reach underserved producers through Conservation Outreach Cooperative agreements since 2022. Working with organizations that underserved customers know and trust has opened doors to reach all landowners and land users. These trusted partners have helped identify and overcome barriers to awareness and participation. Projects have included local hands-on training and demonstration programs, mentoring programs, increased technical assistance, and networking approaches.

Through these 255 agreements, the Outreach and Partnerships Division has gleaned lessons learned to overcome common barriers to participation. This presentation will share barriers identified, and successful approaches to overcoming these barriers. Successful projects will be highlighted, including examples of outreach approaches and quantified outcomes. Ensuring that all producers can engage with services offered by local, state and federal conservation programs takes extra effort and partnership building. Conference attendees will learn how to increase awareness of conservation assistance and overcome the barriers to utilizing this assistance.

Farmers Leading the Way: Enhancing Soil Health and Water Quality Through Peer Networks

Authors: Haleigh Summers (Sand County Foundation)*; Allisen Freihage (Dubuque County Watersheds); Shelby Leick (American Farmland Trust)

In recent years, farmers have been actively promoting soil health, climate resilience, and farm profitability through formal peer networks. These networks typically have an administrative coordinator and are defined by a regional boundary. For some, they operate within a local watershed and are working to achieve water quality improvement goals. Agricultural and conservation partners can accelerate progress towards achieving watershed (or other regional boundary) goals by supporting flexible and customized financial incentives that are led by the farmer networks.

Since 2016, Wisconsin's state agriculture department has invested over $7,200,000 into the Producer-Led Watershed Protection Grant (PLWPG) program, which currently supports 47 producer-led groups. In 2024, Sand County Foundation secured a USDA Regional Conservation Partnership Program (RCPP) award to further advance farmer-led groups in Wisconsin, and to initiate similar peer groups in watersheds across Illinois and in Dubuque County, Iowa. This initiative enables farmer-led groups to apply conservation practices through locally designed financial incentives to farmer peers in their watersheds, furthering the capacity of technical assistance dollars. The variety of conservation practices and structure of financial incentives are unique and tailored according to the goals and preferences of each group, but each group will prioritize water quality improvement through enhanced soil health, continuous living cover, and retention of nutrients on farmland.

This presentation will highlight the preliminary success resulting from this partnership to advance farmer-led initiatives in the Midwest. We will share examples of the innovative conservation implementation driven by these farmer-led groups and profile approaches to improve water quality at the local watershed scale.

Working Effectively with Livestock Producers

Author: Thomas Shea (National Grazing Lands Coalition)*

Communication is key to the success of conserving our soil and water resources. Working Effectively with Livestock Producers (WELP) is a communication course focused on training technical service providers to work and communicate effectively with livestock producers for conservation goals.

The WELP courses aim to enable students to assist livestock producers more effectively through improved communication skills and knowledge of applied resource conservation on grazing lands and livestock operations.

Participation enhances students' understanding of livestock operations and the economic effects of conservation decisions. The skills gained within this four-day course will improve communication about grazing lands, client needs, and applications related to Farm Bill programs.

Students will work directly with consultants of varied disciplines and livestock producers of different types and scales. Generational and personality differences between clients and students are discussed. Multiple scenarios are reviewed during the course, and solutions to challenging situations are presented. Participants also engage in group-based planning exercises to develop communication strategies that can be used in the field.

The National Grazing Lands Coalition has promoted ecologically and economically sound stewardship of grazing lands from Hawaii to Guam through scientifically based conservation and livestock management.

In a 15-minute presentation, we will provide evidence of the effectiveness of this critical course and the fact that conservation groups, such as Ducks Unlimited and the Natural Resource Conservation Service (NRCS), are using the course information as practical tools for technical assistance providers and conservation planners.

Subject: Conservation in Organic, Specialty, Small-Scale, or Urban Agriculture/Social Sciences Informing Conservation
Location: Newport Beach III on Banquet 1 Level
Time: 1:30 PM - 3:00 PM

Leveraging Diverse Plant Combinations to Enhance Nutrient Regeneration in Barren Urban Soils: A Small-Scale Gardening Approach

Authors: Prajawal Bhosale (University of Sydney)*; Rahul Biswas (University of California San Francisco)

Soil regeneration is critical for restoring fertility in barren or degraded urban red soils. This study explores the effectiveness of paired plant combinations commonly available in households—fenugreek and aloe vera, wheatgrass and basil, tomato and potato, aloe vera and wheatgrass, and basil and fenugreek—on improving soil health. Using 15 cm pots filled with low-nutrient soil, the experiment evaluates key soil parameters, including nitrogen, phosphorus, and potassium (NPK) levels, pH, electrical conductivity, organic matter content, and moisture retention, on a weekly basis as the plant combinations grow. The plant pairs were strategically selected based on their complementary ecological roles, such as nitrogen fixation, organic matter contribution, and root diversity. By incorporating the fast-growing wheatgrass and basil pair alongside the others, the study broadens its scope to test the short-term potential of diverse species for soil regeneration. In preliminary results, we found that pairs with aloe vera showed the highest increase in potassium levels after one week, more than doubling compared to the initial state (Day 1). All other combinations reduced potassium levels compared to Day 1. Wheatgrass and aloe vera provided the highest phosphorus increase, nearly doubling its level compared to Day 1, followed by aloe vera + fenugreek and wheatgrass + basil. Potato + tomato and aloe vera + fenugreek were the only combinations that exhibited an increase in nitrogen levels. The results of this study aim to identify effective plant combinations using common household plants for small-scale soil restoration and urban gardening practices, contributing to sustainable solutions for degraded environments.

Mechanical Development for Organic No-Till Soybean Production in Japan

Authors: Masakazu Komatsuzaki (Ibaraki University)*

In an environmentally harmonious and sustainable production system, combining no-till cultivation with the use of cover crops is essential for optimizing organic soybean yield, enhancing soil carbon sequestration, and reducing greenhouse gas emissions while minimizing the use of chemical fertilizers and pesticides. In upland farming in the Kanto region, we confirmed that the combination of no-till cultivation and cover crops using conventional soybean varieties is effective in carbon sequestration, yield improvement, and enhancing agricultural work efficiency. Furthermore, through mechanization demonstration trials at a university farm, we conducted mechanized organic soybean cultivation utilizing no-till and cover crops. These trials revealed that even without chemical fertilizers and pesticides, or under organic farming conditions, organic soybean yields comparable to conventional cultivation could be achieved.

The Ontario Soil Network: How Behavioral Change Can Drive Adoption

Authors: Paige Allen (Ontario Soil Network)*

Over the past 30 years, Ontario has witnessed a declining trend in the environmental health of agricultural farmland and its impact on surrounding ecosystems. These findings are the basis for programming to support farmers to adopt practices that improve soil health, water quality, wildlife conservation, and secure the productivity potential of agricultural landscapes. While researchers and government have defined the key best management practices to sustain our soils, it is up to farmers to implement them. Currently, we have lots of strategies in place: cost-share incentive programs, knowledge transfer pathways and some of the best academic institutions in North America. However, we know that a farmer's decision to implement and maintain a soil health BMP is complex. Farmers are influenced by many factors, including agronomic, economic, and social drivers, such as relationships with their peers.
The Ontario Soil Network (OSN) is a peer-to –peer farmer network that takes a unique approach to specifically addressing the social factor of the adoption process. The OSN developed from a feasibility and sociology study looking at how to better support 'soil-first' farmers to influence the industry by examining the impacts that increases in knowledge, confidence and motivation had on action. From that feasibility study the OSN has developed into an organization offering a suit of unique programming focused on developing networks, farmer mentors, and contributing to the long-term adoption of environmentally and financially sustainable agricultural practices.

The Ontario Soil Network seeks to make a meaningful impact on the landscape by continuing to grow a network developed by and for farmers to work towards the implementation and long-lasting adoption of soil health BMP's. The OSN connects and supports farmers across the province by offering training, access to resources and research, and networking opportunities. Farmers tap into the power of the network to meet with and learn from other soil health farmer-mentors, use the resources of the network, and bring them back to their communities to support lasting adoption.

The OSN's model of engaging farmers offers insights into how we can operate farmer-centered programming that leverages the social factors associated with adoption and allows for long term behavioural change to occur.

Voices from the Field: Insights from the 2024 Conservation Practitioner Poll

Authors: Arbuckle, J.*; Delong, Catherine; Lindahl, Clare; Morris, Chris

The 2024 Conservation Practitioner Poll was a survey of conservation practitioners from across six Upper Mississippi River Basin states. Conducted through a partnership between the Soil and

Water Conservation Society and Iowa State University Extension, the poll collected data on conservation practitioner (CP) perspectives on ways that conservation delivery processes and programs might be made more efficient. The survey, distributed to 1,864 practitioners, had an 18% response rate. Key findings include the need for increased technical assistance capacity, and streamlined application, ranking, and contracting processes. Results also highlighted the importance of building long-term relationships with farmers and landowners to effectively implement conservation practices, concerns about personal safety, and the challenges of communicating with farmers about climate-smart agriculture. The survey also centered on factors that contribute to job satisfaction and dissatisfaction among CPs. Overall, the findings underscore the critical role of conservation practitioners in shaping effective conservation policies and practices, and the need for continued support and resources to enhance their work.

Subject: On the Frontier of Conservation in the West/Conservation in Organic, Specialty, Small-Scale, or Urban Agriculture
Location: Newport Beach I on Banquet 1 Level
Time: 3:30 PM - 5:00 PM

Adaptation of Warm Season Cover Crops to the Arid Southwestern Unites States

Authors: Margaret Smither-Kopperl (NRCS)*; Jim Thomas (USDA NRCS); Christopher Bernau (USDA NRCS)

Use of warm season cover crops requires some irrigation water in arid regions and this limits implementation in cropping systems. However, their use provides multiple benefits including increased infiltration, erosion reduction, weed suppression, nitrogen fixation and cycling, and improvements in soil health. The purpose of this study was to evaluate the adaptation of commercially available cultivars and varieties of annual warm season cover crop species to the southwestern U.S. at Plant Materials Centers (PMC) in Tucson, AZ (AZPMC), Lockeford, CA (CAPMC), and Fallon, NV (NVPMC) in 2021, 2022, and 2023. Species evaluated included legumes: cowpea (Vigna unguiculata) and sunn hemp (Crotalaria juncea), and eight varieties (five species) of millets: Japanese millet (Echinochloa esculenta), Proso millet (Panicum milaceum), hybrid pearl millet (Pennisetum glaucum), foxtail millet (Setaria italica), and browntop millet (Urochloa ramosa). Characteristics evaluated were germination rate, canopy cover, height, disease and insect resistance, 50% bloom date, aboveground biomass production, and forage quality. In Arizona, supplemental irrigation was not applied, while total precipitation received during the study in 2021 and 2022 was 10.4, and 3.8 inches respectively. In California, total irrigation water applied during 2021, 2022, and 2023 was 4.8, 6.7, and 6.0 inches respectively, while total precipitation over the previous winter and spring was 10.0, 17.0, and 32.0 inches. In Nevada, three inches of flood irrigation were applied one week prior to planting, and again two weeks and four weeks after planting. The performance of the three cowpea cultivars, Chinese Red, Iron & Clay, and Red Ripper were not significantly different at each of the three locations. Sunn hemp consistently had greater height and dry matter in above ground biomass at the AZPMC and the CAPMC. In Nevada, sunn hemp grew well in year one but had stand failures in year two and three. Leafy 22 and Tifleaf 3 hybrid pearl millets performed better than the other millets at all three locations, with significantly more canopy cover at 90 days after planting and higher biomass production. At the CAPMC on a fine sandy loam soil with good water holding capacity, plant height and biomass production for all species increased from 2021 to 2023 in tandem with increased winter precipitation. The millets species all performed well at all PMCs apart from Japanese millet, which performed poorly at the AZPMC and NVPMC. All cowpea varieties and Leafy 22 and Tifleaf 3 hybrid pearl millets performed very well as warm season cover crops at all locations. Sunn hemp and most of the other millets had more variable performance, though predictably did better with increased irrigation or precipitation. Warm season cover crops, specifically millets, cowpeas and sunn hemp have great potential for expanded use in arid climates.

Soil Biodiversity in California Agriculture: Framework and Indicators for Soil Health Assessment

Authors: Margaret Smither-Kopperl (NRCS)*

Soil health is based upon soil biodiversity, the interconnected 'social' network of numerous species of living organisms that contribute to soil functioning. However, measuring soil biodiversity is a complex task, with a wide variety of possible indicators, and methodologies that are evolving with recent technological advances. The recent report prepared by the Belowground Biodiversity Advisory Committee (BBAC) convened by the California Department of Food and Agriculture (CDFA) focuses on how best to assess soil biodiversity in the context of working lands. Comprehensive assessment of soil biodiversity involves measurements of organism abundance, identity, and functional diversity or traits, ideally in tandem with measurements of soil processes, as well as interactions among organisms. Soil biodiversity and soil processes vary in space and time due to factors like location, climate, vegetation, and land management practices. In California's diverse landscapes, external pressures from land-use change, increasing temperatures, droughts and floods, and certain agricultural practices threaten the biotic networks that underpin the delivery of soil's many ecosystem services. The report considers current and future challenges faced by California agricultural producers, policy makers, governing agencies, and related stakeholders. Monitoring soil biodiversity and its relationship to ecosystem multifunctionality is not a simple task, there is no one-size-fits-all approach, and therefore feedback from multiple stakeholders is needed to arrive at valuable, interpretable, practical, and reliable soil biodiversity indicators for working lands.

Effect of Regenerative Management Practices on Soil Chemical Properties, Enzyme Activity and Microbial Respiration in Southern California Vineyard Soils

Authors: Michael Schmidt (USDA-ARS George E. Brown Jr. Salinity Laboratory)*; Nydia Celis (USDA-ARS George E. Brown Jr. Salinity Laboratory); Elia Scudiero (University of California, Riverside); Ray Anderson (USDA-ARS George E. Brown Jr. Salinity Laboratory); Greg Pennyroyal (Wilson Creek Winery)

The Temecula Valley American Viticultural Area covers a semi-arid wine grape growing region of Southern California predicted to become hotter and drier in the future, further stressing irrigation water resources and crops. Regenerative management may bolster soil resilience to climate change through enhanced soil health resulting from increased soil microbial activity and soil organic matter (SOM). However, efficacy of regenerative management in semi-arid growing regions where SOM accrual is often poor is not well documented. We compared soil chemical properties and microbial activities key to regenerative strategies between a vineyard managed under regenerative practices (i.e., cover cropping and no-till) and a conventionally managed vineyard to better understand the impact of these practices in semi-arid vineyard systems. Soil sampling implemented gamma spectrometry to optimally capture soil variability between plots. Soils were subject to laboratory chemical and biochemical analyses after collection. Our results indicate a significant favorable response of several key soil chemical parameters to regenerative

management, including: soil organic carbon, total nitrogen, active soil carbon and cation exchange capacity. Regenerative soil management also resulted in significant increases in soil glucosidase and phosphatase activities linked to C and P cycling, respectively, relative to conventional management. Soil incubations showed greater CO_2 fluxes and evolution rates in soils under regenerative management relative to conventional soils. These results overall highlight the potential of regenerative management practices to promote biological activity and SOM accumulation, supporting use of regenerative management as a tool for enhancing soil health in semi-arid vineyard soils. Future work will focus on better understanding microbial community structures and monitoring soil health through conversion to regenerative management. This presentation will be relevant to growers and vineyard managers across California and the West interested in soil sustainability.

Subject: Outreach, Education, and Community Engagement
Location: Newport Beach II on Banquet 1 Level
Time: 3:30 PM - 5:00 PM

East River Recreational Trail: A Collaborative Approach to Ecological Restoration + Community Impact

Authors: Paul Marston (ISG)*

The East River Recreational Trail, a 10-mile regional amenity that connects five communities in the Green Bay area of Wisconsin, highlights many of the challenges and opportunities communities face managing public space around surface water resources. The East River's watershed has been greatly altered since European settlement which has resulted in persistent flooding, debris accumulation, and habitat degradation that has limited access to the vital trail that follows it's banks. Through the East River Recreational Trail Master Plan, experts from the public and private sector collaborated to align ecological restoration needs in the riparian corridor with improving access to recreational assets.

This session will dive into the East River Recreational Trail Master Plan, which aims to address these challenges while delivering social, environmental, and economic benefits. Attendees will learn collaborative strategies to enhance trail resilience, improve water quality, and promote long-term investment. These strategies execute on a vision outlined in precedent plans to transform this recreational trail into a symbol of community and ecological renewal, fostering a space where people and nature can coexist and thrive.

Nutrient Management Planning and Outreach Strategies with Underserved Producers

Author: Harol Gonzalez and Anel Trujillo (American Farmland Trust)*

Socially disadvantaged farmers lack linguistically and culturally appropriate extension services to support enhanced nutrient management and irrigation efficiency. Investment in nutrient management and irrigation efficiency often requires the financial resources and confidence that adopting these practices will bring financial returns. Many socially disadvantaged farmers with whom American Farmland Trust (AFT) works, lack the record keeping skills and financial literacy needed to adopt nutrient management and irrigation efficiency practices. However, nutrient and irrigation management changes can provide economic benefits that are vital to the viability of small farm operations.

Farmers need support to comply with regulations, which often come with costs and require technical know-how. AFT delivers technical assistance in the primary languages of many socially disadvantaged farmers in California. AFT and partners statewide are working to provide much-needed technical resources and financial assistance to farmers speaking multiple languages such as Spanish, Hmong, and Punjabi.

AFT and partners provide nutrient management and irrigation efficiency technical assistance (TA) – coupled with supportive business TA, record keeping, and practice adoption cost analyses skills. These programs are designed to help socially disadvantaged farmers overcome nutrient management and irrigation efficiency practice adoption risk thresholds at greater rates, and be able to reap the agronomic, environmental, and economic benefits from doing so. We offer outreach activities such as bilingual workshops, radio interviews, field days, and meetings one to one with farmers and published articles.

Outdoor Recreation as a Conservation Tool: Lessons Learned from a Canoe Marathon

Author: Zach Bates (Gladwin Conservation District)*

As conservation leaders, we understand the importance and long-term impact of our careers. Yet, despite tireless efforts to protect our natural resources, much of the public remains disconnected from the value of our work. Bridging this gap and fostering community support and enthusiasm for conservation requires meeting people where they are. There is a lot to gain from creating opportunities for the public to engage with conservation in ways that feel relevant and personal. In doing this, we can begin to create an intrinsic connection between conservation and community. Outdoor recreation offers a powerful and natural partnership to develop this connection.

This is exactly what we are working to achieve in Gladwin County, Michigan. The Inaugural 2025 Gladwin County River Race of Two Cities Canoe Marathon took place on May 23-24, featuring a 12.5-mile canoe race on the Cedar River from Gladwin City Park to Beaverton's Ross Lake Park. Just a few short years ago, this stretch of river was unnavigable due to downed trees and debris. Through the efforts of the Gladwin Conservation District and local partners, it has been restored into a thriving, accessible waterway that balances recreation with ecological health. This transformation has helped spark county-wide investment in natural resources and outdoor recreation in a historically small, rural, and underserved community.

Today, the Cedar River is becoming a hub for outdoor recreation, surrounded by campgrounds, small businesses, and growing community investment. The cities of Gladwin and Beaverton are leading the charge with projects like The Trail of Two Cities and park improvements, fostering economic and social development. Meanwhile, the Gladwin Conservation District is reclaiming land around Gladwin City Park through a habitat restoration project focused on removing invasive species and enhancing native ecosystems.

The Gladwin County River Race of Two Cities represents more than a competition, it is a celebration of conservation in action. By integrating outdoor recreation with environmental stewardship, this event exemplifies how communities can come together to create a sustainable future.

Regenerative Agricultural Curriculum for the High School Classroom: Do we Reach the Next Generation of Conservationists and Regenerative Agriculturalists?

Author: Kinzie Reiss (American Farmland Trust)*

With nearly half of US farmers nearing retirement age, farmland ownership will continue to turnover at significant rates in the next decades, creating new land stewardship opportunities for younger generations. Just two percent of Americans are currently involved in production agriculture, but there are an estimated 1,000,000 agricultural educations students being taught by over 13,000 agricultural instructors nationwide. American Farmland Trust ("AFT") realized a need for a regenerative agriculture curriculum and convened an advisory council of technical experts for the development for high school teachers and students.

Using the expertise of AFT staff, NRCS and extension professionals and soil health successful farmers, a six-week regenerative agriculture and soil health curriculum was created. In the 2024-2025 school year, the curriculum was piloted in nine schools in Kansas and Ohio. Teachers received the curriculum and over $500 worth of materials at field days last summer and were asked for their feedback. More teachers will be trained on the curriculum, and after receiving feedback post instruction, the curriculum will be widely disseminated in 2026. AFT hopes to encourage collaboration among the conservation community to build upon this work for the next generation- allowing them to not only fill the boots of retiring farmers but also address the challenges of reversing climate change and regenerating the land. The target audience for this presentation is any resource professional wishing to inspire the next generation to improve conservation efforts, both in their community and nationwide.

Subject: Water Resource Assessment and Management
Location: Newport Beach III on Banquet 1 Level
Time: 3:30 PM - 5:00 PM

Onion Response to Irrigation Stress in Oregon

Authors: Udayakumar Sekaran (Oregon State University)*; Karthik Karuppanan (Oregon State University); Vigneshwaran Raja (Oregon State University)

This study evaluated the impact of irrigation stress on onion yield, plant health, water application, and soil health parameters. Full irrigation treatments (T1-T4) applied less water compared to deficit irrigation treatments (T5–T12), which required higher water volumes. Skipping irrigation between July 1 to 15 for either 3 or 4 days (T5, T6, T9, and T10) significantly reduced onion yields compared to skipping irrigation during July 16 to 31 (T7, T8, T11, and T12). Additionally, treatments with a 3- or 4-day stress period in July required more water for plant recovery than standard irrigation schedules, emphasizing the importance of maintaining a proper irrigation schedule. However, if irrigation stress is necessary, applying it during July 16 to 31 and following it with higher irrigation levels can result in yields similar to those achieved with no stress irrigation. Onion yields varied significantly among treatments, particularly for larger size categories (Jumbo, Colossal, and Super Colossal). Treatments with frequent irrigation and mulching, such as T1 (Standard irrigation with mulching) and T3 (20 cb threshold, 6-hour intervals with mulching), achieved the highest yields. Conversely, prolonged irrigation stress without mulching (T6 and T10) resulted in significantly lower yields, especially for larger onions. Soil health parameters were also influenced by irrigation practices, with T3 showing the highest microbial activity, soil respiration, and phosphorus availability, indicating enhanced soil health under optimum irrigation with mulching.

Optimizing Water Efficiency: A Performance Analysis of Wheel Line Sprinkler Irrigation in Small and Medium Farm

Author: Maziyar Vaez Roudbari (Utah State University)*

Small and medium-family farms are vital to U.S. food systems and agricultural variety. Small and medium-sized farms in the American Intermountain West have widely used the wheel line (side roll) irrigation system due to its affordability and simplicity. The lack of irrigation automation, research, and innovation in wheel-line irrigation systems leads to inefficient water use, higher labor costs, and reduced profitability. The study is being conducted at the Utah State University (USU) Greenville and Kaysville Farms using wheel line sprinkler irrigation system equipped with traditional impact sprinklers and two alternative sprinkler technologies including Nelson R33-NV and Senninger Xcel-Wobbler replicated in a randomized complete block design. The irrigated crops are alfalfa hay and annual small grain hay. Sprinkler performance is being evaluated using catch can tests. Each plot also has a profile of time domain reflectometry (TDR) soil moisture sensors at six different depths for use in estimated evapotranspiration and overall application efficiency. In addition to sprinkler performance and crop production, labor

requirements associated with the use of solar-powered, remote controlled wheel line movers are being recorded and compared to conventional, hydrostatic movers. By increasing the effectiveness of time and resource use, we seek to improve the profitability and resource use efficiency of small and medium irrigated farms.

Two-Stage Ditch Designs: Integrating Water Quality, Ecological Function, and Flood Resiliency

Authors: Bailey Bocchino (ISG)*

Farmers in the Midwest have historically faced water management challenges in order to cultivate the lands. More recently, they have been faced with the challenges of changing climate with increasing frequency and intensity of rain events. In response, much of the lands and natural watercourses have been altered and channelized. Drainage ditches are typically constructed as trapezoidal channels with limited access to its floodplain. While these systems can be hydraulically effective, there are limited considerations for sediment transport, habitat, or water quality.

This presentation will illustrate an alternative approach to the "typical" drainage ditch, with the incorporation of natural channel design concepts through implementation of Two Stage or Multi-stage ditches. Two-stage ditches provide a more stable and natural design for drainage ditches that consider hydraulics as well as sediment transport. These considerations have made tremendous improvements to the local habitat and water quality and reduce ditch maintenance costs.

ISG will showcase multiple case studies of real-world examples of effective implementation of two-stage ditches on drainage systems in the upper Midwest emphasizing the collaboration and approach among multiple stakeholders including landowners, drainage authorities, SWCDs, and stage agencies. Project background and design consideration will be discussed and the application of natural channel design drawing on the research and data collection that has been completed on two-stage ditches in the Midwest. The case studies will highlight successes as well as challenges such as public perception and funding.

Unveiling the Secrets of Saturated Buffers

Authors: Ehsan Ghane (Michigan State University)*; Yousef AbdalAal (North Carolina State University)

Better understanding of the hydrology and nitrate loading mechanisms of saturated buffers (SBs) is crucial for enhancing their effectiveness in reducing nitrate loss from subsurface drainage discharge. Commonly used multi-chamber control structures of saturated buffers (SB) allow for controlled drainage (CD) in addition to its main purpose of buffer flow (BF). However, prior studies have reported the stacked effect of CD and BF as a singular unit of SB system. The objective of this study was to evaluate the hydrology and nitrate load performance of the individual CD and BF components as well as the entire SB system. We conducted a paired-field approach using two on-farm sites from June 2019 to September 2024 in southeast Michigan. One field was continuously under free drainage, and the other was under free drainage during the calibration period and under SB mode during the treatment period. The evaluation revealed statistically significant reductions in drainage discharge (43.1% annually) and nitrate load (83.4% annually) of the entire SB system compared to free drainage. Notably, the CD component emerged as the primary contributor to these reductions, with average annual percentages of 44.1% for drainage discharge and 82.6% for nitrate load. Conversely, the BF component's contribution to nitrate load reduction compared to free drainage was minimal (0.9% annually). The poor performance of the BF component was attributed to backflow of water coming from the distributor pipe into the control structure due to shallow weir management (weirs closer to the ground). However, deep weir management (weirs at 30 cm from ground surface) effectively eliminated backflow, while providing better BF nitrate load removal, emphasizing the importance of weir management strategies. In conclusion, this study shows that CD plays a significant role in the water-quality contribution of an SB system and underscores the importance of weir management for enhancing nitrate load removal.

TUESDAY, AUGUST 5

ORAL PRESENTATION DESCRIPTIONS AND AGENDA

Subject: Conservation Economics and Policy
Location: Newport Beach I on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Evaluating Economics of Soil Health through Regional, On-Farm Experiences

Authors: Jessica Kelton (Soil Health Institute)*; Dianna Bagnall (Soil Health Institute); Emily Ball (Soil Health Institute); Jared Conner (Soil Health Institute); Archie Flanders (Soil Health Institute); Cristine Morgan (Soil Health Institute)

Soil health improvement can contribute to improved environmental conditions beneficial to cotton production including minimized erosion, improved water infiltration, increased nutrient availability and reduced disease pressure. Soil health management systems (SHMS) include practices that minimize soil disturbance, maximize diversity, increase plant residue on the soil surface and maintain a living root system in the soil. However, soil health practices can have variable impacts on farm economics due to several reasons including farmer experience, cash crop(s) being grown, and climate. Additionally, traditional economic analysis can be difficult to apply to on-farm conditions. To account for regional and on-farm differences, a partial budget analysis approach was utilized to calculate changes in net farm income with the implementation of SHMS. Using this methodology, over 150 farmers in 23 states have been interviewed to collect management data for use in the analyses. Reports indicate variability in changes in net return by region and cropping system both in the level of change to net return and drivers of these changes. This documented variability underscores the need for continued economic analysis for regionally relevant results to support decision making for farmers considering adoption of SHMS.

Innovative Financing: The Conservation Acceleration Fund

Author: Kaitie Hartmann (Great Outdoors Foundation)*

Conservation and water quality are of more importance now than perhaps ever before, and fortunately, there has never been more engagement or momentum around these critical issues. Over the course of its existence, the Great Outdoors Foundation has played a role in numerous creative problem-solving efforts, and expediting and maximizing voluntary conservation practices on private land is no different.

Historically, one of the greatest barriers to implementation is funding. If there was a way to unlock previously untapped public dollars via gap financing, the state of Iowa, and beyond, could see a wave of water quality improvement unlike ever before. Enter the Conservation Acceleration Fund (CAF), a dynamic funding mechanism designed to activate key conservation initiatives via strategic investments.

In 2024 alone, the Conservation Acceleration Fund leveraged more than $28 million in funding for voluntary on-land conservation infrastructure. For its private investors, ROI was massive with an 8:1 public-to-private match. For technical partners, the CAF acted as catalyst capital, maximizing public dollars to advance water quality strategy. This equated to more than 50 activated projects across the state of Iowa, a model that is both scalable and replicable across the United States.

Jen Cross, Vice President of Strategic Partnerships at the Great Outdoors Foundation, shares how the Conservation Acceleration Fund, and other innovative forms of creative conservation financing, can expedite the pace and scale of conservation efforts in markets across the country.

Key Takeaways from a Soil Health Risk Model for Policymakers, Lenders, and Insurers

Authors: Aria McLauchlan (Land Core)*

Pioneering farmers and conservationists have shown many benefits of building soil health – both on farm and beyond - yet adoption of soil health-focused conservation practices remains low in much of U.S. agriculture. Important barriers limiting farmers' adoption include upfront costs and uncertainties about how practices will work out on their land.

Furthermore, while it's generally understood that soil health practices can mitigate agricultural production risk (primarily by increasing resilience to flooding and drought), the institutions that price risk, such as lenders and insurers, do not yet recognize these risk reduction benefits or return this value to farmers.

However, a significant opportunity exists for financial institutions and policymakers to assess the risk reduction associated with soil health practice implementation and build that into finance models. This could unlock unprecedented market-based funding mechanisms, and even lead to incentives like a "Good Soil Discount," to help producers invest in conservation practices that can de-risk their operations.

In this presentation, Aria McLauchlan, co-founder of Land Core, a 501c3 with a mission to advance soil health policies and programs, shares key takeaways from their groundbreaking work building an actuarially-sound, predictive model of the risk reduction associated with specific soil-health practices.

The project is aimed at creating the economic rationale for stakeholders to create policies and financial incentives, such as lower rate loans or discounted insurance, to producers adopting these risk-reducing practices, helping with the often cost-prohibitive adoption of these soil health practices for US producers.

Join to learn more about:

- The project's academic research, led by a multidisciplinary team at UC Berkeley, Rice University, & University of Arkansas, detailing the impacts of soil-health practices on production and economic risk;
- How conservation research and accompanying decision-making tools are assisting private-sector stakeholders in developing appropriate policies, pricing, and meaningful economic incentives for producers;
- Lessons learned from a partnership with a leading Farm Credit System cooperative, Compeer Financial (with $35 billion under management);
- How new research, tools and cross-sector partnerships can inform and strengthen public policy decision-making for crop insurance and related risk management tools in the Farm Bill, at USDA, and beyond; and
- Opportunities for technical assistance and conservation professionals to utilize economic data in serving producer demand for support in transitioning to soil-health management systems.

Tribal Land Stewardship Policy

Authors: Carly Griffith Hotvedt (Indigenous Food and Agriculture Initiative)

As sovereign nations, Tribal Nations have the opportunity engage in land stewardship and conservation activities from a governance perspective. This session will discuss land stewardship policy opportunities through a Tribal governance lens including the development of Tribal Conservation Districts and the creation of Agricultural Resource Management Plans.

Subject: Conservation Models, Tools, and Technologies
Location: Newport Beach II on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Estimation of Soil Erosion in Arid Areas Using 137Cs Technique: Case Study in Syria

Authors: Zouheir Massri (https://www.shahbaagri.com/)*; A Aba (Atomic Energy Commission of Syria (AECS)); Fares Asfary (Atomic Energy Commission of Syria (AECS)); Mohsen Makhlouf (Atomic Energy Commission of Syria (AECS)); Alois Klewinghaus (ICARDA)

Syria is an arid and semi-arid region prone to land degradation. Soil erosion by wind and water erosion poses a significant environmental threat and impacts vast areas of the country. However, data on erosion rates in arid regions like Syria remains scarce. When available, it is often derived from small-scale experimental plots, making it highly specific to local conditions, rainfall patterns, and measurement duration.

The fallout radiotracer ^{137}Cs, which has been deposited globally due to nuclear bomb tests, quickly binds to soil particles. This property makes the ^{137}Cs technique valuable for quantitatively assessing medium-term soil redistribution and erosion rates caused by wind and water. In Syria, this method was used in a natural (uncultivated) and cultivated dryland of Khanasser Valley, a degraded marginal steppe zone.

A grid-based soil sampling method was used on cultivated and uncultivated plains and slopes across four sites. The spatial and vertical distribution of ^{137}Cs was assessed along nine transects (20 m × 60–450 m). The ^{137}Cs inventories at the reference site varied from 2170 to 2341 Bq m^{-2}, with about 50% of the total inventory linked to the Chernobyl fallout.

The Mass Balance Model 2 (MBM2) and the Diffusion and Migration Model were utilized to convert ^{137}Cs measurements into soil erosion rates.

Results indicated that erosion rates on uncultivated slopes varied between 1.3 and 4.2 t ha^{-1} yr^{-1}, whereas cultivated lands faced significantly higher erosion, ranging from 23.2 to 27.9 t ha^{-1} yr^{-1}. Significantly, contour hill cultivation minimizes erosion compared to uphill-downhill cultivation along the slope. The spatial distribution of ^{137}Cs closely correlated with soil redistribution in the contour, uphill, and downhill cultivation.

A calibration curve linking soil erosion rates to ^{137}Cs loss percentages was established, enabling more precise future applications of this technique in similar environments. Additionally, this data aids in estimating total soil loss since 1950, highlighting the critical extent of soil erosion in a fragile dryland ecosystem.

Irrigation Efficiency Tools to Enhance Water Conservation in Orchards

Authors: Paul Lum (American Farmland Trust)*

The American Farmland Trust developed an economic quantification tool that estimates the costs of adopting advanced irrigation system practices. The "Advance Irrigation Cost Calculator for California Orchards" is a decision-support tool used by orchard farmers to guide their purchases of advanced irrigation equipment to enhance water conservation, crop production, and financial sustainability.

The Calculator was developed in partnership with the Almond Board of California (ABC) and with support from a USDA-NRCS California Conservation Innovative Grant. The tool is based on the ABC's Almond Irrigation Continuum, a comprehensive manual of orchard irrigation practices. The calculator provides the estimated costs for five irrigation water management categories:

- Orchard water requirements (evapotranspiration monitoring)
- Irrigation system performance monitoring
- Applied water monitoring
- Soil moisture status monitoring
- Plant-water status monitoring

Drought, water scarcity and implementing water saving methods is a critical concern for California farmers and by providing growers with estimates of the cost and benefits of practice adoption, farmers can make informed financial decisions about system purchases and levels of irrigation management.

To demonstrate Calculator's application and effectiveness, AFT prepared a case study to assess economic and environmental outcomes of a San Joaquin Valley almond farmer who used the tool and upgraded his irrigation system. We will share the findings and farmer experience with the conservation community.

Navigating Grazing Practices: Economic, Forage, Soil, and Seasonal Considerations

Authors: Chellie Maples (American Farmland Trust)*; Ben Wiercinski (American Farmland Trust)

More and more, producers and conservation professionals are searching for scientific evidence regarding the outcomes associated with the adoption of production practices that improve soil health and reduce carbon emissions. Producers are particularly interested in understanding how these practices will impact their economic performance. To fill this gap in soil health resources, American Farmland Trust has created a series called "A Farmer's Guide to Soil Health Economics" that explore and synthesize the economic literature on soil health practice adoption using practical terms. Our latest additions to this series focus on cattle grazing practices and our presentation will provide relevant information to cattle grazers and conservation professionals who assist them.

In our series of four Farmers' Guides to Grazing, relevant scientific literature is synthesized into easy to read 2-page guides that highlight the economic, forage and soil health outcomes from transitioning from conventional to rotational grazing practices in beef cattle production systems. We have summarized over 70 peer-reviewed studies into concise summaries with key-takeaways. These new grazing guides make complex economic and environmental scientific findings accessible, helping conservation professionals and producers overcome common barriers to engagement, such as information overload or overly technical content.

In the presentation, we will outline the key findings from each of the four Farmers' Guides to Grazing: (1) the economic consideration of rotational grazing, the forage and soil considerations of rotational grazing, (2) the forage and soil considerations of rotational grazing, (3) seasonal grazing considerations, and (4) and considerations for grazing cover crops.

Farmers' Guides to Grazing can help empower conservation professionals and producers to base their initiatives and decisions on scientific evidence, leading to better-informed decision-making and effective soil health management. The guides can be used as resources in one-on-one technical assistance discussions and with larger groups at field days and workshops. Attendees will not only leave the presentation with copies of the guides but a better understanding of how to talk to grazers about the costs and benefits of various grazing practices.

Using Technology to Increase Efficiency and Accuracy in Ag Carbon Programs

Authors: Laura Shutack (ESMC); Thayer Tomlinson (ESMC)

How can our community ensure that agricultural carbon & ecosystem services market programs work for both farmers and project partners? One way is to reduce the time and expense requirements of on-site data collection by bringing in technology for data collection, advanced modeling, remote sensing and AI to help quantify field level greenhouse gas emissions.

ESMC launched the Eco-Harvest program in 2022 and since that time, has both developed internal technology and partnered with technology providers to increase efficiency and accuracy of data collection in projects. This presentation will highlight lessons learned from piloting approaches to data collection.

Laura Shutack, Senior Manager for Program Operations, will present on ESMC's journey developing a programmatic measurement, monitoring, reporting and verification (MMRV) platform for Eco-Harvest projects. She will also highlight ESMC's collaboration with technology provider HabiTerre in 2023 where they piloted advanced modeling and remote sensing technology to quantify field-level greenhouse gas emissions and the results to date. This pilot has resulted in a long-term collaboration for increased modeling and remote sensing.

Additionally, Laura will present on ESMC's collaboration with Ag Growth International on a project covering 60,000 acres in southwestern KS where farmers are using passive uplink connection tools on farm machinery to streamline data collection. She'll discuss farmers' reactions to these technological innovations – and provide an assessment of what has been most effective.

Attendees will gain a better understanding of how technology can support the success of ag carbon & ecosystem services market programs and where the field is moving.

Subject: Social Sciences Informing Conservation
Location: Newport Beach III on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Exploring On-Farm Green Ammonia Production: Farmers' Views on an Innovative Fertilizer Technology

Authors: Anikka Fife (University of Maryland Center for Environmental Science)*; Matthew Houser (University of Maryland Center for Environmental Science)

The application of nitrogen (N) fertilizer in agricultural systems across the globe has dramatically increased yields. However, the production of synthetic N releases non-trivial amounts of greenhouse gas emissions due to the use of carbon intensive fuels, and the widespread loss of N fertilizer from agricultural systems contributes to climate change and water quality degradation. On-farm "Green Nitrogen" is a technological advancement that is emerging in the sustainable sector of fuel and fertilizer. These units, which can be located on a single farm and serve as an farm-specific "fertilizer factory" have the potential to reduce emissions associated with N fertilizer production, and could support improvement to farm management practices that would reduce N loss to the environment. At the same time, on-farm N production could promote management that accelerates agricultural N pollution, such as higher N application rates. Like other "green" technologies, green nitrogen's impact on agricultural production and its ecosystem benefits depends on how it is implemented and managed. While adoption of on-farm green ammonia remains limited globally, there is a pressing need to understand if and how key agricultural stakeholders will use this emerging, potentially transformative technology.

As a social science study, behavioral analysis of farmers and regional agronomists can help influence the implementation of green technological solutions for agriculture policies and technical design. This study offers introductory insight into these key stakeholders' views of green nitrogen technology and the potential management implications of adoption, drawing on qualitative data from a focus-group session of Maryland row-crop farmers, commodity groups, and agronomist advisors. Maryland serves as an important location for such an analysis due to its implications in Chesapeake Bay nitrogen load reduction efforts. The presentation will include a summary of a stakeholder workshop listening session that took place in March of 2024 that included 14 participants. The impressions that were provided throughout the listening session were categorized into major themes to establish potential challenges and opportunities associated with on-farm green nitrogen production including farmers' perceptions of possible risks associated with the adoption of on-farm green nitrogen units, the management barriers that may arise for farmers or decision makers if the technology were to be adopted, and the potential motivations that exist for farmers to adopt the technology. Finally, the presentation will address the future of the research and the need to better assess this technology through a cross-regional study of farmers' views regarding green nitrogen.

Influences on the Adoption of Soil Health Practices in Vermon

Authors: Alissa White (American Farmland Trust)*

Improvements in soil health can lead to synergistic benefits for both farmers and the environment. However, despite decades of incentives, education and encouragement from farming, conservation and sustainable agriculture communities, soil health practices remain underutilized. The body of research dedicated to understanding this adoption gap and the influences on conservation decisions by farmers reveals that influences on adoption of soil health practices are context dependent. Thus, local research is needed to improve the approach and efficacy of conservation incentive programs dedicated to increasing the adoption of soil health practices. In this study, we utilized statewide survey data from Vermont to identify influences on soil health practice adoption among farmers in the state. To reduce overfitting, we used principle component analysis to identify new indices associated with farm operation characteristics, capacity and site context. Multiple regression analysis then demonstrates the way these dimensions influence the adoption of soil health practices in Vermont. We find that operational characteristics limit the adoption of some practices but not others. Notably, experience with soil health testing emerges as an important element of farmers' capacity, alongside knowledge and financial capacity, and together they make up an influential factor predicting the adoption of some soil health practices.

One Size Does Not Fit All: Exploring Farmers' Mindsets on Cover Crops to Inform Outreach

Authors: Maria Teresa Tancredi (University of Georgia)*; Jennifer Thompson (University of Georgia)

In the face of climate change, diminishing resources, and the world's growing population, there is a need for agriculture to be more sustainable, efficient, and resilient. Research shows that practices like cover crops can help meet these needs, but their use in the U.S. remains limited. According to the 2022 U.S. Census of Agriculture, in most counties, cover cropped acres represent 15 % or less of total cropland. In this context, we used Q Methodology to explore commodity farmers' perspectives on cover crops in the Northeast, Southeast, and Midwest U.S. regions of the United States. By investigating farmers' mindsets on cover crops, we aim to provide useful information for the creation of adoption outreach materials addressing farmers' needs, beliefs, and priorities. This presentation, intended for all outreach professionals, discusses how our research can help inform conservation practitioners' constant efforts to promote adoption.

Between February 2022 and March 2023, we conducted semi-structured interviews with over 80 farmers across nine states in the Northeast, Southeast, and Midwest US. During those interviews, farmers completed a Q Methodology card-sorting activity in which they ranked statements on cover crops and commodity agriculture in a fixed grid spanning from "Least Like My View" to "Most Like My view". Each completed grid, called a Q sort, represents the point of view of an individual participant. Through factor analysis, Q sorts with high correlations (i.e.,

grids that present a similar ranking of the statements) were clustered together to represent a mindset. While placing the statements in the grid, farmers were asked to share with researchers whether they agreed with the statements and why. We drew on this interview data to provide context and insight into farmers' viewpoints. This information was integral to the interpretation of each mindset, while also serving to ground truth the correctness of the analysis.

The results of our research show the presence of distinct mindsets influencing farmers' views of agriculture and cover crops. While past research has attempted to identify and isolate the factors influencing adoption (i.e., perceived benefits, barriers, and motivations), this project provides farmers' holistic perspectives on cover crops by grounding their decision to adopt (or not) in their specific contexts. Our analysis reveals that different approaches to cover crops exist even among adopters farming in the same regions, highlighting why "one-size-fits-all" outreach efforts might have failed to generate higher rates of adoption. Consequently, we expect that these insights will help inform the creation of targeted messages supporting increased and successful cover crop adoption.

Exploring the ESG reporting: A Bibliometric Literature Review and Future Research Agenda

Authors: Hicham Chbihi Kaddouri (My Ismail University)*

Sustainability reporting has attracted a lot of attention during the past several decades. However, bibliometric analysis on this topic remains limited. This paper aims to advance our understanding of ESG reporting, to cluster and map academic literature connected with ESG reporting and to attempt to give a research agenda for future research. We undertake a bibliometric analysis review of the current literature to discover present and future research directions of ESG reporting. In this study, the authors used datasets from the Web of Science (WoS) database, covering 869 research papers from 2014 to 2024 and using the Bibliometrix package also known as "Bibliometrix 3.0" or "Biblioshiny". Bibliometric analysis offers a comprehensive overview of a certain field, such as authorship trends, geographical spread, research importance, influential authors and publications, new concepts, and emerging ideas. The paper highlighted the current state-of-the-art research on ESG reporting and offers directions for future research to bridge the research gap.

Subject: Cultivating Conservation Technical Assistance, Community, and Networks
Location: Newport Beach I on Banquet 1 Leve
Time: 1:30 PM - 3:00 PM

Batch and Builds: Cultivating Community for More Efficient Conservation Adoption

Author: Rachael Millage (ISG, Inc.)*

In the past 10 years, edge-of-field conservation adoption has increased exponentially. The largest contributing factor—using the batch-and-build method for design and implementation. This unique system for implementing conservation is centered on cultivating and fostering conservation through a community-based strategy. The benefits of using this approach include strengthening networks and communities through conservation, as well as creating efficiencies and eliminating redundancies for technical assistance providers. In this presentation, the presenter will highlight how the batch-and-build process works, community benefits as a result of the program, and input from a technical assistance provider's perspective. In 2022, batch and build efforts in Iowa successfully increased edge-of-field implementation efforts by 650%. Starting as a model implemented by a county in central Iowa, the batch and build approach has been successfully adopted by an agricultural retailer, and efforts are being made to succesfully spread the model to other states as well. Persistent hurdles to implementation and how these are being overcome will be discussed, with some shared success stories included.

Building a Network of Farmers and Technical Specialists Across the Cotton Belt

Authors: Emily Ball (Soil Health Institute)*; Dianna Bagnall (Soil Health Institute); Jessica Kelton (Soil Health Institute); Jared Conner (Soil Health Institute); Cristine Morgan (Soil Health Institute)

Soil health management systems (SHMS) include practices that minimize soil disturbance, maximize diversity, increase plant residue on the soil surface, and maintain a living root system in the soil. For long-term success of practices like cover crops and reduced- or no-till, growers must also receive adequate education and resources that fit their individual farms. To meet this need, the U.S. Regenerative Cotton Fund (USRCF) was launched in 2021 as a Soil Health Institute (SHI) initiative, backed by private funders including the Ralph Lauren Corporate Foundation, Walmart Foundation, and others. Operating across 10 states in the U.S. Cotton Belt, USRCF aims to empower growers and their trusted advisors with the tools, information, and networks necessary to implement SHMS effectively. Through this initiative, soil health educators partner with local technical specialists and farmer mentors to provide locally relevant production practices, technical assistance, economic insights, and guidance from experienced producers to ensure long-term success when adopting SHMS.

Cultivating Change: Advancing Conservation Outreach through Behavioral Insights

Authors: Adam Reimer (National Wildlife Federation)*

Expanding the adoption of conservation agriculture practices requires not only technical and economic tools but an understanding of behavior change dynamics. Applying lessons learned from decades of social and behavioral science research has the potential to significantly improve conservation programming and outreach. But significant challenges exist to implementing behavior-change focused efforts, including connecting disparate research, policy, and outreach communities. National Wildlife Federation has launched a new Growing Outreach Institute to help bridge these gaps. The Institute's mission is to serve as a convener, to facilitate collaborative work to improve conservation outreach and engagement with agricultural producers, landowners, and other community members. The Institute is intended to serve as a hub for current information and resources about effective conservation outreach, as well as a coordinator of innovation and research on outreach approaches. This presentation will feature insights from the first Growing Outreach conference held in August 2024, including a roadmap to improve outreach developed collaboratively with conference participants. Major recommendations from this work include improving training and professional development opportunities for conservation professionals who work with agricultural audiences, increasing research on engagement strategies that achieve conservation outcomes, and supporting peer-to-peer networks through training and evaluation research. In addition, this talk will also share opportunities for contributing to ongoing Institute efforts.

How a Virtual Meet-Up Series is Building Community for Conservation Professionals

Authors: Amanda Gumbert (University of Kentucky)*; Jenny Seifert (University of Wisconsin-Madison)

Peer learning can be a powerful tool for building community, especially among conservation professionals, who often otherwise feel isolated in their roles. In this presentation, we will first explore the science behind peer learning to demonstrate why it is a critical tool to support the success of conservation professionals. Then, we will share insights from a peer learning approach we facilitate to build capacity in watershed management, called Life Hacks over Lunch: A Virtual Meet-up Series for Watershed Professionals. This "hack-a-thon" style event series has been running since Fall 2021 and has gained a loyal following. Watershed coordinators, agency personnel, and other conservation professionals from across multiple states meet up to use collective knowledge to address challenges and share ideas. We'll share some of the "why" behind its design and what we've learned through our evaluations that can inform how to support peer learning among conservation professionals.

Subject: Outreach, Education, and Community Engagement/On the Frontier of Conservation in the West
Location: Newport Beach II on Banquet 1 Level
Time: 1:30 PM - 3:00 PM

Beneficial Uses of Treated Produced Water for Agriculture

Authors: Joseph Burke (Texas A&M AgriLife Research)*; Katie Lewis (Texas A&M AgriLife Research)

Texas is the leading oil and gas producers in the United States, but sustaining the energy sector requires large amounts of freshwater. In 2022, hydraulic fracturing in the Texas Permian Basin required seven barrels of water to generate one barrel of oil. Currently, there are only two options for contaminated which returns to the surface: deep-well injection or surface tank storage. Due to recent advances in filtration and desalinization technology, cleaning this contaminated water has become more economical. Our project examines how treated produced water from energy exploration can be used for irrigated agriculture in semi-arid regions of Texas. Discussion will include methods for water treatment and filtration, risks associated with treated produced water ground applications, and opportunities for expanding agricultural resiliency in semi-arid and arid regions with energy exploration.

Field-Level Assessment of Conservation Practices for Reducing Nitrate Leaching Beneath the Root Zone

Authors: Floyid Nicolas (Oregon State University)*

Nitrate contamination from non-point agricultural sources poses a significant risk to groundwater quality in intensively farmed regions worldwide. To address this issue, the California State Water Resources Control Board introduced the Central Valley-wide Salt and Nitrate Management Plan (CV-SNMP) to mitigate nitrate leaching into groundwater. This study utilizes the Agricultural Policy/Environmental eXtender (APEX) model to assess the effectiveness of various conservation practices in a processing tomato field, focusing on reducing nitrate leaching below the root zone and mapping spatial variability in nitrogen leaching at the field scale. The evaluated conservation practices include micro-irrigation technologies, nitrogen credits (NC) for irrigation, winter cover crops (CC), and high-frequency, low-concentration (HFLC) fertigation. Model calibration resulted in coefficient of determination (R^2) values of 0.97, 0.75, 0.84, and 0.62 for yield, evapotranspiration (ET), nitrogen uptake, and nitrogen leaching, respectively. The root mean square error (RMSE) values were 1600.0 kg/ha for yield, 14.8 mm for ET, 38.0 kg/ha for nitrogen uptake, and 35.5 kg/ha for nitrogen leaching, indicating an adequate goodness of fit of the model. Model validation was performed for yield using average yield data from two counties (Yolo and Solano)—the R^2 values were 0.85 and 0.60, while the RMSE values were 2500 kg/ha and 7070 kg/ha for Yolo and Solano counties, respectively. Integrating the gridded soil data into the model effectively captured spatial variations in nitrogen leaching across the field. For conservation practices, subsurface drip irrigation reduced nitrate leaching by 90% compared to furrow irrigation. The combination of several conservation practices, such as irrigation NC, winter CC, and HFLC, further reduces N leaching by more than 95%. The APEX model effectively generated field-scale nitrogen leaching maps for row-crop agriculture using high-resolution gridded soil data, which can enhance site-specific management. The simulated conservation practices substantially reduce nitrate leaching below the root zone without compromising crop yield, suggesting a need for more in-field data collection and implementation of this modeling framework as user-friendly decision support systems to improve decision-making for enhancing groundwater quality.

Legacy Effects of Nitrogen and Cover Crop Management in a Northeast Kansas Cropping System

Authors: Alexis Correira (Kansas State University)*; Peter Tomlinson (Kansas State University); Kraig Roozeboom (Kansas State University); DeAnn Presley (Kansas State University)

No-till cropping systems revolutionized agriculture in the Great Plains, reducing erosive soil loss and evaporative water loss. However, cover crops have been introduced at much lower rates in the region, and there is a lack of robust, long-term research in the region to support or ease farmers' hesitancy toward adding them to their cropping systems. Our long-term cover crop study in northeastern Kansas was established in 2007 and managed consistently under rainfed no-till and cover crops. Five different nitrogen application rates were applied to the main grass crop each year (grain sorghum from 2007-2020, corn from 2020-2023) as well. We predict that the consistent use of cover crops in conjunction with no-till will result in differing quantities of inorganic nitrogen throughout the soil profile. In 2020-2023, deep core samples (0-90cm) were collected in the fall just before or after cover crop planting, and shallow samples (0-30cm) were collected in the spring after cover crop termination and before corn planting. Results from this long-term study may help farmers and other decision makers understand the future outlook of their management strategies after introducing a cover crop beyond the first couple of years. Intensifying cropping systems with cover crops generally comes with soil health and ecosystem benefits, but the altered nutrient dynamics and potential water risks that come with them must be considered and thoroughly assessed so to provide accurate information to producers in more moisture-limited regions.

Subject: Water Resource Assessment and Management
Location: Newport Beach III on Banquet 1 Level
Time: 1:30 PM - 3:00 PM

Exploring Methods for Quantifying BMP Effectiveness for Reducing Pollution in North Dakota Impaired Waterbodies

Authors: Emilee Novak (North Dakota Department of Environmental Quality)*

Mitigation of nonpoint source pollution through the implementation of best management practices (BMPs) is a high priority goal of North Dakota's Nonpoint Source Pollution Management Program (supported with CWA Section 319 funding). Quantifying BMP effectiveness presents a challenge, given that these prescriptions are often done at different spatial scales and are subject to vary over time. To confidently assess the performance of BMP implementation in pollutant reduction campaigns, it is imperative to acquire some measure of success, or lack thereof, often through monitoring. These data can be used for generalized trend analysis or more specific statistical modeling and hot spot mapping. Each of these tools have a place in creating a conservation narrative and driving future implementation work.

Investigating seasonal Nitrate and Orthophosphate Losses in Surface vs. Subsurface Drainage in Northwest Minnesota

Author: Murad Ellafi (University of Minnesota)*

Nitrogen and Phosphorus are essential yet limiting nutrients for crop production in the Midwest, USA. However, losses of these nutrients from agricultural fields present considerable environmental and economic concerns, mainly via subsurface drainage, which has become a rapidly common practice to enhance productivity. This study investigates nutrient loss dynamics in a 24-hectare field in Crookston, Minnesota, divided equally between surface-only and combined surface-subsurface drainage systems. Under a three-year rotation of soybean, wheat, and sugarbeet, the field provided daily water samples from both drainage types over three growing seasons (2022–2024). The analysis focused on nitrate and orthophosphate concentrations in relation to drainage type and rainfall intensity. Initial results reveal nitrate concentrations in surface drainage systems were at least three times higher during the spring, while in summer, higher nitrate levels were observed in combined drainage systems. Orthophosphate levels, meanwhile, showed a slight increase (10–30%) in surface drainage, except in July and August 2023. Peaks in orthophosphate concentration in surface drainage, ranging from 0.18–0.98 mg L-1, were consistently observed in April and October. This study provides insights into nutrient management strategies to mitigate nutrient losses and their impact on water quality.

Performance Evaluation of a Dual-Chamber Pumped Woodchip Bioreactor: E. coli Removal, Denitrification, and Greenhouse Gas Emissions

Authors: Taylor Vroman (Iowa State University)*; Michelle Soupir (Iowa State University); Alex Buseman (Iowa Soybeans); Lindsey Hartfiel (UW-Madison Discovery Farms)

Denitrifying woodchip bioreactors are a best management practice to reduce nitrate–nitrogen (NO3–N) loading to surface waters from agricultural subsurface drainage. Woodchip bioreactors are novel technology in that these systems treat water with excess nutrient loads at a higher rate than traditional practices within a smaller physical footprint. This study focuses on a dual-chamber pumped denitrification bioreactor system, evaluating its performance across three metrics: greenhouse gas production (nitrous oxide, carbon dioxide, and methane), nitrate removal efficiency, and E. coli removal capabilities. While effectiveness of woodchip bioreactors in nitrate reduction is well-established, their ability to remove E. coli is underexplored. Pumped bioreactor systems are currently being studied to extend the use of traditional, subsurface drainage limited bioreactors. Pumped systems enable the treatment of excess nitrate from nearby surface water bodies, addressing limitations in conventional bioreactors when drainage is constrained by low water availability. Studying the ability to remove E. coli along with nitrate is essential for enhancing system effectiveness and efficiency. This analysis aims to identify how factors such as temperature and flow rate influence system performance, defined by E. coli removal, nitrate removal, and greenhouse gas production. This provides insights to optimize overall operational efficiency.

Insights on Kentucky Stream Restoration Methodology and Implementation from Industry Professionals

Authors: Noah Lane, University of Kentucky

Nature-based solutions (NBS) is an encompassing toolbox that supports multiple ecosystem services across the Mississippi River basin and beyond. Stream restoration is a common practice in this toolbox and is implemented through various regulatory, incentive-based, and voluntary measures. Stream restoration primarily addresses water quality through erosion reduction and improved nutrient cycling; water quantity through increased storage and connection to the flood plain; and species abundance and richness through instream and riparian features that provide habitat, increase dissolved oxygen, and reduced water temperature. Traditional methods of stream restoration focused on channel stabilization and involved the use of rigid, hard-scape methods. But as concern for environmental impacts and water quality have increased, advocacy for the use of NBS in water resources have become more prevalent. This has inspired new methods and practices for water resource management that aim to restore degraded streams and waterways using natural processes that resemble conditions found in areas unimpacted by urban development, commonly referred to as reference reaches. In the state of Kentucky, there are currently no set guidelines for how to perform restorations and published information on state-specific procedures is scarce. To address this, an interview series was conducted with industry professionals from academic, administrative, consulting,

and construction positions to assess what restoration procedures are currently being used in Kentucky and to document their personal insights on the state of the industry and increase restoration success rates. This presentation focuses on the quantified results that could be used to develop Kentucky-specific guidance materials by emphasizing commonalities among professionals' methods, identifying flaws in the current industry structure, and what improvements could be made to correct them.

Subject: Social Science Informing Conservation
Location: Laguna Beach III on Banquet 1 Level
Time: 3:30 PM- 5:00 PM

Digging into Cover Crop Incentives: Ag and Conservation Professionals' Program Perception

Authors: Michaela Lubbers (University of Georgia, Department of Crop & Soil Sciences); Jennifer Jo Thompson (University of Georgia Center for Invasive Species & Ecosystem Health)

Cover crops offer many benefits to farms—and thereby farmers—including decreased soil erosion, improved soil health, and a reduction in costly inputs. These benefits can lead to broader societal gains, such as carbon sequestration and improved soil and water quality. Yet, only about 5% of U.S. cropland is currently cover cropped.

To increase cover crop adoption, state and federal governments, alongside private conservation and agricultural organizations, have developed financial incentive programs. To better understand the strengths and weaknesses of these programs, we conducted semi-structured interviews in late 2023 and early 2024 with eight conservation agriculture professionals working in the public sector, including with NRCS, Cooperative Extension, and non-profits.

Using thematic analysis, we identified key themes in the data, capturing commonalities in what practitioners have experienced when working with farmers using cover crop incentive programs.

First and foremost, demand for incentive funding outstrips supply. Practitioners viewed farmers’ frustration with being consistently unfunded as a barrier that spreads through social networks, discouraging other interested farmers from applying.

This lack of funding goes beyond direct payments to farmers—it also contributes to understaffing in organizations that offer technical support. The shortage of knowledgeable, accessible advisors to help implement cover crops leads to lower adoption.

Third, program inflexibility and administrative burden have created a mismatch between farmers’ needs and the programs designed to serve them. This adds further tension to the system. As the traditional institutions of conservation agriculture become less effective, farmers’ confidence in the system erodes.

Broadly, we found a widening gap between how the system should work and how it currently operates, resulting in less effective support for conservation.

Given the current political environment, this “death by a thousand cuts” is likely to further erode trust among farmers—unless we come together to think through a new approach.

We invite farmers, outreach specialists, and other conservation practitioners to attend our session and share feedback based on their experience and expertise. How do we bridge the gap and develop a conservation agricultural system that effectively supports farmers, a sustainable food system, and each other?

Promoting Persistent Conservation Behavior through Scope Expansion

Authors: Robyn Wilson (Ohio State)*; Naseem Dillman-Hasso (Ohio State)

Persistent conservation behaviors must be understood and encouraged to promote a more sustainable and resilient future. However, there is evidence that people (including farmers) who value conservation are not taking action, and even those engaging in conservation are not doing so consistently. Much research focused on overcoming such value-behavior or intention-behavior gaps has tried to bring future benefits of action (and risks of inaction) closer to the individual, supposedly reducing psychological distance. These approaches yield mixed results and are not easily extrapolated to new situations. Instead of trying to bring the distant benefits of something like cover crops closer, we focus on expanding regulatory scope, or widening the range of considerations that farmers account for in their decisions and behaviors to include further off outcomes and possibilities. Through this framework, we assess the relationship between regulatory scope and existing conservation behavior and identify how regulatory scope manipulations influence energization and future intentions. We seek to understand if farmers who have broader scope have engaged in and are more likely to engage in more conservation behaviors, and if scope expansion can increase persistent action. Through a combination of cross-sectional surveys and experiments across a variety of contexts, the results provide guidance for a new class of mindset-based interventions that encourage individuals to transcend the “me in the here and now” in decision-making processes, a common barrier to engaging in behaviors with short-term costs but long-term gains.

Tracking Progress Toward Persistence in the Pilot Watershed Program

Authors: Heather Craska (The Ohio State University)*; Robyn Wilson (The Ohio State University)

Lake Erie has long struggled with harmful algal blooms (HABs), largely driven by nutrient runoff from agricultural lands. Modeling studies identify pathways to nutrient reduction and improved water quality, but there are no empirical success stories at the watershed scale. To address this, we received funding for a pilot program in Ohio’s western Lake Erie Basin to increase enrollment of conservation acres from 30% to 70%, the threshold needed for water quality improvements. The program will then measure the impact of this watershed-scale increase in conservation acres on soil health and water quality. However, achieving these goals hinges on understanding and addressing the behavioral barriers. While financial incentives are common in programs aimed at promoting conservation practices, they are insufficient and often fail to establish long-term adoption. To prevent this, the Pilot Watershed Project uses an “agglomeration bonus” which combines a financial incentive with motivational strategies. As more farmers enroll, both individual payments and community benefits increase, encouraging widespread participation. In addition, common barriers to adoption are completely removed through increased technical assistance, access to equipment and higher than normal payments for practices even without the agglomeration bonus. A control watershed, receiving only the community benefit, is being monitored for comparison. We will share results from the first two years of the program using a mixed methods approach. Annual panel surveys track changes in reported behaviors, motivations, and perceptions within and between the treatment and control watersheds, while semi-structured interviews with farmers provide deeper insight into farmer experiences. We expect change over time in motivations, perceptions and behaviors will be more rapid in the treatment than in the control watershed. We also expect that the qualitative data will help identify what aspects of the program are driving the success. The findings of the research will provide government and conservation agencies with insight into developing similar programs that encourage more rapid and long-term change.

The Effects of Collective Trauma on Farmer Conservation Behavior

Authors: Chris Morris (Iowa State University)*; J. Arbuckle (Iowa State University)

Collective trauma refers to psychological effects that are experienced by a group of people in response to shared traumatic conditions. Farmers represent a unique population that is chronically exposed to potentially traumatic events and conditions particular to the agricultural industry. Farming communities in Iowa have experienced significant drought, the farm crisis of the 1980s, declining rural communities, high levels of debt, and financial stress caused by boom-and-bust markets and increasing dependence on inputs such as fertilizer and pesticides. These potentially traumatic experiences can have long-lasting effects on farmer well-being as well as on-farm decision making. This study examines the effects of collective trauma on farmer decisions and potential subsequent effects on sustainability outcomes. It utilized quantitative data from the Iowa Farm and Rural Life Poll (IFRLP) survey, an annual survey of Iowa farmers. The survey asked farmers about their experiences with potentially traumatic farming experiences, as well as the presence of common symptoms of trauma and any coping mechanisms they may have employed. Analysis examined relationships between potentially traumatic experiences and conservation adoption. The study also conducted in-depth semi-structured interviews with farmers and farmer-oriented behavioral health experts to qualitatively investigate how collective trauma affects individual farmers, their families, and their farming communities, and in particular how it might impact farm management decisions and sustainability outcomes. Results from the analysis of both survey and interview data will be presented, focusing on the relationships between collective trauma and conservation adoption behavior. Possible implications of these results regarding how to potentially improve conservation policy and technical assistance to increase conservation adoption will also be discussed.

Subject: Outreach, Education, and Community Engagement
Location: Newport Beach I on Banquet 1 Level
Time: 3:30 PM- 5:00 PM

Cultivating Community P(ART)nerships for Conservation Success

Author: Jessica Gordon (Izaak Walton League)*

Involving the community is at the heart of grassroots campaigns. Understanding that maintaining existing and engaging new community partners are the keys to any successful campaign, partners can help to coordinate messaging, share resources, amplify voices and platforms, and prevent project stagnation. Coordinated partnerships can also open the door to further community engagement through art projects and art installations. With a little bit of creativity, this art can engage partners who are not already at the table and can also promote environmental awareness in sometimes unlikely places. Two projects that will be discussed in this presentation are “Paint the Plow” and a story of the Upper Mississippi River National Wildlife and Fish Refuge.

In 2018, the Izaak Walton League of America (IWLA) launched program called “Salt Watch,” which is a nation-wide community science program monitoring local waterways for road salt pollution and advocating for smarter road salting practices. Fall of 2023, IWLA staff led a “Paint the Plow” program in partnership with the local County’s Department of Transportation (DoT). The DoT provided eleven snowplow blades to schools, partner organizations, scout troops, and IWLA chapters to paint smart salt messaging on the plows. This project helped to create more awareness around the impacts of road salt pollution. It also helped to elevate the DoT’s standing, that although the DoT does use road salt in the winter, they are trying to balance public safety and environmental protection.

Conversely, 2024 was the 100th anniversary of the Upper Mississippi Wildlife and Fish Refuge. Because the founder of the Izaak Walton League, Will Dilg, was also instrumental (with the help of some grassroots organizing) in the establishment of the refuge, we made it a priority to celebrate with the US Fish and Wildlife Service. IWLA and USFWS, with the leadership and assistance of The National Mississippi River Museum and Aquarium in Dubuque, Iowa, created a fascinating exhibit featuring historical artifacts from IWLA HQ and USFWS. This exhibit has been highly successful.

IWLA also commissioned a local storyteller to create a program based on the life and accomplishments of Will Dilg. Presenting history in an engaging format at a variety of venues is a bold strategy for this space and lends itself to the forward thinking of our staff. It is unique partnerships like these that can cultivate the community buy in to propel your projects forward.

This presentation is for everyone at any knowledge or experience level. Particularly focused on audience members who are looking to create awareness about pollution or an environmental issue through creative art outlets and experiences or individuals interested in grassroots campaigns. Next steps for both projects discussed in this session are to continue raising awareness about conservation initiatives and to expand such initiatives to other regions of the United States through partnerships.

Needs Based Conservation Virtual Education

Authors: Lee Riley (University of Arkansas System Division of Agriculture Cooperative Extension Service)*; Mike Daniels (University of Arkansas System Division of Agriculture Cooperative Extension Service); Rita Watson (University of Arkansas System Division of Agriculture Cooperative Extension Service); Julie Robinson (University of Arkansas System Division of Agriculture Cooperative Extension Service)

Arkansas' Conservation Partnership (ACP) consists of several local, state, and federal agencies with a conservation or environmental research directive. The partnership includes agencies like Natural Resource Conservation Service (NRCS), Association of Conservation Districts, and University of Arkansas System Division of Agriculture (UADA). In 2019 the ACP conducted an ACP conservation training needs and methods assessment among partner agencies. When asked, only 9.7% of survey respondents marked that they always feel like they have the skill set/knowledge base needed to address producers' conservation objectives. Forty-three (43) percent of respondents stated that they sometimes or seldom feel like they have the skill set/knowledge base needed to address producers' conservation objectives. In the same survey, when asked what conservation topics you would most like to learn about, the most frequent responses were Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), Conservation Reserve Program (CRP), National Water Quality Initiative (NWQI), EPA's Nonpoint Source Pollution Program (Section319), Wetland Reserve Program (WRP), and Regional Conservation Partnership Program (RCPP). When asked what electronic method of training do you find most beneficial, 50% of respondents listed webinars, 30% listed videos (YouTube), and 17% preferred online courses. From this needs assessment the Arkansas Conservation Partnership Webinar Series was born. Thanks in large part to the success of UADA's past efforts on the Soil & Water Conservation Virtual Field Trip Series, grant funding was secured through AR NRCS to allow the Virtual Field Trip team to produce the ACP Webinar Series. To date 11 webinars have been produced in-house by the UADA's team, with content experts from ACP agencies focusing on topics identified in the needs assessment. Live participants have direct interaction via a question-and-answer segment with the content experts. Videos are shared directly with an email list and/or uploaded to YouTube for those that can't participate live.

The Importance of Farmer Outreach in National Water Quality Initiative (NWQI) Watershed Projects

Author: Sarah Reilly (TNC)*

While National Water Quality Initiative (NWQI) projects area a great way to encourage increased conservation practice adoption, they do not provide funding for outreach and education around the program or practices. Without programmatic outreach, producers may not know about the options available to them and how to access the program. Utilizing unique and varied approaches to messaging, from targeted online advertisements to strategically placed billboards and more, the Upper White River – Muncie Creek NWQI program in Indiana received increased interest and numerous program sign-ups. This session will cover the importance of outside funding for outreach, managing diversified partnerships, and the need for creative thinking to get the word out about conservation programs.

Virtual Farmer-to-Farmer Engagement: Is it Working?

Authors: Jenny Seifert (University of Wisconsin-Madison Division of Extension)*; Samuel Pratsch (University of Wisconsin-Madison Division of Extension); Amanda Gumbert (University of Kentucky Cooperative Extension Service); Beth Baker (Mississippi State University Extension Service)

Virtual farmer engagement methods have been gaining more traction in the past few years, particularly in the conservation space. Because of the newness of the virtual environment to farmer engagement, there is much to be learned about how to do it successfully and how well it meets goals such as knowledge sharing and community building. Little research to date has evaluated virtual farmer-to-farmer learning methods. Given the potential for virtual engagement to expand outreach capacities, along with the eventual rise of a digital native generation of farmers, it is important to gain a better understanding of the ways it is working or not.

This presentation will share evaluation results from two farmer engagement approaches that facilitated peer learning in a virtual environment to build farmer leadership and farmer networks for conservation. The first is Good Idea Shop Talks, a virtual meet-up series for farmers that encourages peer problem-solving and practical knowledge transfer to attract participation from both conservation-practice adopters and non-adopters. The second approach is Good Idea Mini-Grants, which supported teams of farmers and farm advisors to implement edge-of-field practices and share their experiences with other farmers through the production of a video or podcast. The mini-grant teams also received training related to opinion leadership. Both the Shop Talks and Mini-Grants are offshoots of One Good Idea, an online clearinghouse of videos and podcasts featuring farmers sharing their experiences implementing conservation practices, with the goal of increasing practice adoption through farmer-to-farmer learning. One Good Idea won the 2024 Conservation Innovation Award, and the Shop Talks and Mini-Grants are continuing to expand how the platform serves farmers.

The evaluation results, generated through participant surveys and interviews, will include the effectiveness of these approaches at building community, strengthening factors that lead to conservation practice adoption, and boosting participants' capacities to influence peer farmers to adopt conservation practices. Preliminary results indicate Good Idea Shop Talks are reaching non-adopters, enhancing motivation and confidence to do conservation practices, and increasing a sense of community among participants. Full analyses of the Shop Talks and Mini-

Grants will be completed by the conference. The results can inform future efforts to develop virtual farmer engagement opportunities to foster peer learning that could contribute to an increase in conservation practice adoption.

Subject: Resilient Agriculture
Location: Newport Beach II on Banquet 1 Level
Time: 3:30 PM- 5:00 PM

Climate-Smart Agriculture in Action: A Progress Report from South Carolina

Author: Lacy Barnette (Clemson University)*

As one of the USDA Partnership for Climate-Smart Commodities Projects, the Climate-Smart Grown in SC pilot project examines and verifies the benefits of implementing research-based conservation (climate-smart) practices through technical assistance, on-farm measurements, and incentive payments. Two years into the five-year project timeline, this progress report will highlight science communication with middle adopters, field observations, and key measurements. This presentation will focus on the leafy green commodity of the project which strategically included incorporating small farms and historically significant crops. Incentivized conservation practices include cover crops, reduced tillage, and mulching which were not widely adopted by vegetable producers prior to this project. In addition to the incentives, the project educates about the practices and provides technical assistance to farmers. Currently, 78 farms in South Carolina are producing leafy greens with one or more of the practices. More than 48% of the acreage is implementing two practices and about 40% is implementing all three practices.

A critical component of this pilot project is not just to increase the acreage using conservation practices during the project timeline but to provide support for lasting adoption and develop greater interest and adoption. Science communication plays a key role in building program interest and creating farmer support. Practice impacts and measurement results must be communicated in a way that is useable and meaningful to encourage long-term adoption after the incentive period ends. Every farmer received technical support in planning for implementation and an improvement plan to maximize the benefits of the chosen practices on their land. The program is at maximum capacity and has a waitlist. Many of the enrolled farmers have never been involved in a research project, and some have not previously worked with Extension. This has been an opportunity to leverage the interest to educate about conservation practices in an approachable way including farm visits, field days, and both in-person and virtual workshops. Noteworthy observations seen in the field so far include decreased damage from sand abrasion with cover crops, improved soil moisture and temperature regulation allowing for better germination rates during hot, drought conditions, and reduced ponding in areas of the field that notoriously hold water. Additionally, carbon and nitrogen concentrations and ratios are being measured and discussed as an indicator of soil health. These results have led to decreased nitrogen inputs in some fields and have facilitated greater discussions about altering inputs due to the implementation of conservation practices. This session will benefit conservation professionals wanting to reach beyond the early adopters, value the importance of science communication, or are interested in conservation practice implementation in horticulture systems.

Practices “Formerly Known as Climate-Smart": Potential Conservation Benefits from the New USDA Advancing Markets for Producers initiative

Authors: Jennifer Tillman (American Farmland Trust)*; Michelle Perez (American Farmland Trust); Robert Parkhurst (Sierra View Solutions)

This talk will be different from the one conference participants may have seen in the preliminary program. We had intended to present the results of a survey of project leaders to answer this question, “Environmental co-benefits: How are the USDA Partnerships for Climate-Smart Commodities (PCSC) projects pursuing them?” With the cancellation of the PCSC program, we have had to pivot. Given the opacity and uncertainty surrounding the new “Advancing Markets for Producers” initiative which has replaced the PCSC, we see urgent need and opportunity to produce a series of blogs to inform USDA and members of Congress about the many different types of conservation and economic benefits that could be realized from practices formerly known as “climate smart.”

Conservation professionals interested in re-learning the soil health, water quality, wildlife habitat, and many other benefits associated with “climate-smart practices” should attend this session.

As we write this new abstract, the American Farmland Trust, in partnership with Sierra View Solutions, are on the verge of publishing the first of hopefully three blogs. To ensure that the baby is not thrown out with the bathwater, we reviewed the six categories of resource concerns addressed by NRCS’s conservation practices – Soil, Water, Air, Plant, Animal, and Energy (SWAPA-E) – and 47 sub-categories. We then used still publicly available data from the PCSC website to identify the top 10 most popular practices selected by the original 135 PCSC projects, assuming that some to most of them will re-apply. We analyzed how the top 10 practices address the SWAPA-E concerns and the related conservation and economic benefits of those practices.

By August 2025, we will have conducted our research, compared it to the NRCS SWAPA-E framework, analyzed the data, and written multiple articles summarizing our findings. In our presentation, we will share results of our research revealing the top conservation practice codes identified by PCSC projects, the geographic distribution of the practices, and the conservation and economic benefits of those practices based on the SWAPA-E framework.

The results of this project will contribute to science and society by demonstrating interest in conservation benefits and showing how practices that were identified to support climate goals can simultaneously have positive impacts on producer economics and the environment, from water to wildlife. We will likely recommend additional guidance and recommendations USDA can implement through the AMP initiative, so projects are aware of tools and resources to estimate a variety of conservation benefits in the future.

Economic Analysis of Drainage Water Recycling Systems: Costs, Benefits, and Next Steps

Authors: Bailey Bocchino (ISG)*

Drainage water recycling (DWR) is an emerging practice that promises to increase yields, improve climate resiliency, and reduce downstream nutrient losses in cropping systems. However, greater implementation is hindered by a lack of comprehensive economic analysis. Our study aims to fill this gap by estimating the costs and potential benefits of implementing DWR systems. We developed scenarios to represent what we considered may be a common configuration for a DWR system (64.7 ha field, 607 ha catchment area, and storage for 100 to 150 mm for the irrigated area). Our analysis considered design, planning, site development, storage construction, and irrigation system costs. We are also evaluating ongoing operational expenses and potential benefits, including crop production improvements and water quality outcomes. Preliminary results indicate that initial investment costs for DWR systems range from $489,000 (retrofitted storage and center pivot irrigation) to $1,359,250 (greater excavation and subsurface drip irrigation), depending on site conditions and system configuration. These findings will be complemented by estimates of long-term economic benefits to producers and public water quality improvements. This comprehensive economic analysis will provide crucial information for farmers and landowners considering investments in supplemental irrigation. Additionally, it will inform government agencies, NGOs, and other stakeholders about the potential returns on investments in DWR for water quality benefits. Our research contributes to a better understanding of DWR economics, potentially increasing funding and accelerating the adoption of this promising agricultural practice.

What is the (Real) Rate of Soil Health Practice Adoption? Making Sense of Three Data Sources

Authors: Bonnie McGill (American Farmland Trust)*; W. Dean Hively (US Geological Survey); Laila Puntel (University of Nebraska, Lincoln); John Shriver (Regrow); Alison Thieme (USDA ARS); Daniel Manter (USDA ARS); Jennifer Moore (USDA ARS)

Conservation stakeholders looking to quantify the impact of soil health practices on croplands often face challenges in interpreting practice adoption data due to inconsistencies among data sources. Similarly, environmental modeling efforts can yield different outputs based on their estimated rates of practice adoption. To help make sense of different adoption data sources, we compared county-level adoption data for winter cover crops, no-till, and reduced tillage in three areas of the United States with contrasting climates, production systems, and relevance to authors' ongoing research: central Illinois (IL), southern IL, and western New York (NY). We used ANOVAs to compare adoption data available for 2015 to 2022 from the Operational Tillage Information System (OpTIS, based on remote sensing), US Census of Agriculture (based on farmer response to a survey), and, specifically in Illinois, the Illinois Soil Conservation Transect Survey (a roadside survey). The magnitude of differences between the datasets was dependent upon the practice and geographic location. For example, there were more instances of agreement between OpTIS and Transect tillage data (2015, 2017, and 2018) in central IL compared to southern IL. Averaged across regions in Illinois, differences between 2017 OpTIS and AgCensus tillage data were relatively small (less than 2.5 percentage points on average), but up to an average of 35 percentage points in western NY. There was less variability and smaller differences between OpTIS and AgCensus WCC data in Illinois compared to western NY. AgCensus tended to report lower WCC adoption for Illinois and greater adoption in western NY compared to OpTIS. Differences between the datasets were attributed to definitional inconsistencies for reduced tillage and no-till, and how cover crop data were acquired. For example, the AgCensus asks if a cover crop was planted, regardless of performance, whereas OpTIS and Transect evaluate the presence of a standing cover crop. Data sources also differed by calendar and crop years and the type of cropland assessed (corn, soybean, or all cropland). We offer three recommendations to improve interpretation and consistency: (1) Clarify different uses for different data; (2) Initiate a consensus-building process to harmonize definitions and methodologies; (3) Develop public practice adoption data products at field and national scales. Such a research effort would help improve data access and utility for evidence-based conservation decision-making by organizations and enhance the accuracy of environmental models that rely on adoption data as input.

Subject: Soil Health Resources, Indicators, Assessment, and Management
Location: Newport Beach III on Banquet 1 Level
Time: 3:30 PM - 5:00 PM

Long-Term Soil pH Changes in Southwestern North Dakota

Author: Larry Cihacek (North Dakota State University)*

Soil acidification has been increasing in many parts of North Dakota, including Major Land Resource Area 54 (MLRA 54) – the Rolling Shale Plain of southwestern North Dakota. We have accessed archived soil samples collected at known sites during 1991-1992 and again in 2010. We resampled 11 of the previously sampled georeferenced sites in 2023. These sites are paired with undisturbed grassland and long-term cropland sites on the same or similar soil series. Most soils originally ranged in pH between 6.0 and 7.5 in the original sampling. We have observed that (long-term (30 years) land use intensification in croplands contributes to increased soil acidity in the top 30 cm of soil depth beginning in the 1992–2010 time frame (as compared to grasslands). Additionally, new soil profile descriptions show a change in the depth of Ap horizons compared to the 1992 soil description. This suggests that the soil pH trend might be related to soil profile changes. We have also observed that the pH change have intensified between the 2010 and 2023 resampling. We hypothesized that long-term no-till combined with crop mix changes requiring greater N fertilizer use along with surficial application of N fertilizers may, in part, be responsible for the lowering of soil pH in this region. Further research is needed to identify the extent of soil acidification across the state and to develop strategies to reduce ad mitigate its effects on crop production.

Quantifying Changes in Soil Redoximorphic Feature Expression

Authors: Colby Moorberg (Kansas State University)*; Melanie Earl (Kansas State University); Chelsea Duball (Grand Valley State University); Sydney Love (Kansas State University); Bess Hudson (Grand Valley State University); Hayley Owen (Kansas State University); Avion Brown (Kansas State University)

Accurate descriptions of soil redoximorphic features are critical to wetland delineations and other interpretations. However, changes in redoximorphic features following exposure of soils to oxygen can complicate field descriptions of soils. We conducted this study to document color changes in soil matrixes and redoximorphic features as a function of time-since-excavation. To accomplish this, we conducted shallow soil profile descriptions in hydric and adjacent non-hydric soils in wetland ecological sites in the north central US. Soil color was measured using Munsell Color Charts by two individuals, a Munsell Capsure device, a Nix Spectro 2 Spectrometer, and the LandPKS app immediately after each soil sample was collected along with redox feature percentage and contrast. Soil color evaluation was repeated after 15-min, 30-min, 1-hr, 2-hr, 24-hr, and 7-d. Soil color descriptions at each time interval were also evaluated for the presence of field indicators of hydric soils. Differences in soil color and redox feature expression across color measurement method and time-since-excavation will be presented. This study highlights the importance of accurate tools and time considerations in identifying hydric soils.

Soil Health Needs Assessment in a Global Agricultural Technology Company: Insights from a Mixed-Methods Approach

Author: Casey Olechnowicz (Purdue University)*; Elsie Assan (Purdue University); Jean Haley (Haley Consulting Services); Linda Prokopy (Purdue University)

There is increasing interest from agricultural stakeholders in improving soil health on agricultural lands to enhance agricultural livelihoods, food security, and ecosystem services. Multinational agricultural organizations play a critical role in these efforts by providing agricultural products, technical expertise, resources, and training to growers and stakeholders. Our research group collaborated with a leading global agricultural technology company which has recently made a significant investment in a soil health vision which includes collaborative efforts by soil scientists and agricultural experts to leverage advances in soil science and technology to deliver cost-effective solutions for growers worldwide. As part of a needs assessment to help guide an upskilling program for soil health within this organization, we conducted extensive interviews (n=69) with the organization's employees to understand the current state of soil health perspectives, knowledge, and engagement within the company. This included examining potential benefits, barriers, and general concerns about the proposed upskilling initiative. As part of a mixed-methods approach, these interview findings informed the development of an internal soil health needs survey, which leveraged employees' expectations, values, knowledge, and organizational culture to assess training needs. The findings of the needs assessment are being used to help align this organization's soil health-related upskilling and farmer engagement programs with results around needs, expectations, and values. The findings have broad implications for agricultural organizations with an interest in adopting soil health. They provide insight into upskilling needs from employee perspectives and help identify learning strategies for implementing in-house training across a complex global organization.

Summarizing Cropping System Diversity Across U.S. Regions

Authors: Steven Wallander (USDA Economic Research Service)*

Cropping systems can range from simple monoculture – planting the same crop year-after-year on the same field – to complex rotations that incorporate a wide range of crop types in a synergistic sequence. Diverse crop rotations have the potential to reduce weed and pest pressure, to reduce farm financial risk, and to improve soil health. Nonetheless, there is very limited research on the drivers of adoption of different cropping systems. One reason for this is that most field-level data on farm production comes from single-year surveys. This study uses a recently developed dataset, the USDA Crop Sequence Boundaries (CSBs), to examine field level adoption of crop mixes across the entire continental United States. The CSB's are derived from the USDA Cropland Datalayer (CDL) by stacking multiple eight years CDL and applying machine learning to estimate the most likely field boundaries (i.e.: the zones of uniform crop management). The CSB dataset allows for detailed analysis of cropping mixes and rotations as well as examination of how factors such as field size and location drive variation in cropping systems. The CSB data used in this study is from 2023. We analysis crop mixes on 9 million fields covering 310 million acres (125 million hectares) of cropland. The analysis is repeated for 3,4,6, and 8 year time windows. For the 6-year time window, there are 6,267 unique crop mixes. While this represents an enormous amount of complexity that can be difficult to succinctly summarize, U.S. crop is dominated by a relatively limited numbers of cropping systems. A corn-soybean mix is the most common, occurring on 31 percent of acres. Regional differences are dramatic. The Lake States and the Midwest predominantly feature one of four crop mixes: corn-soy, corn-soy-winter-wheat, corn-soy-fallow, or continuous corn. New England Western States predominantly feature four cropping mixes: winter-wheat-fallow, alfalfa, corn-alfalfa, or hay (non-alfalfa). Some cropping systems are most prominent in single states: continuous winter wheat is 36 percent of acreage in Oklahoma, cotton-peanuts is 27 percent of acreage in Georgia, orchards are 40 percent of acreage in California, continuous cotton is 18 percent of acreage in Texas, corn-soy-small-grains are 5 percent of acreage in Delaware, soy-spring-wheat-oilseeds are 11 percent of acreage in North Dakota. Four crop mixes within the six-year window are rare. Preliminary results suggest some influence of field size on diversification, though work is underway to confirm that this is not due to greater classification noise on smaller fields.

WEDNESDAY, AUGUST 6

ORAL PRESENTATION DESCRIPTIONS AND AGENDA

Subject: Adaptive Management of Conservation Efforts/Cultivating Conservation Technical Assistance, Community, and Networks
Location: Newport Beach I on Banquet 1 Level
Time: 8:30 AM – 10:00 AM

Edge-of-Field Sulfate Runoff Loss Dynamics from Designated Arkansas Discovery Farms

Author: James Burke (University of Arkansas)*

Stewardship of field-applied and soil-inherent nutrients is crucial to any agricultural production system. Field-applied nutrient losses via mechanisms such as surface runoff pose challenges to the efficacy concerning Arkansas agriculture. While studies regarding nutrient runoff losses have principally been focused on nitrogen (N) and phosphorus (P), research about the fate of secondary macronutrients lost in surface runoff such as sulfur (as sulfate, SO42-) have been less studied. In May 2022, the Arkansas Discovery Farms Program (ADF) commenced research gauging the concentrations and land area losses of sulfate-sulfur (SO4-S) present in edge-of-field runoff samples from 8 ADF locations. These ADF sites represent a wide array of agricultural systems ranging from row crop farming to forage production, along with livestock and poultry operations. Mean concentration losses ranged from 1.9 milligrams per liter (mg L-1) to 36.5 mg L-1 for Stuttgart and Light, respectively, while mass loading losses ranged from 0.1 pounds per acre (lb. ac-1) to 5.5 lb. ac-1 for Wedington and Light, respectively. Statistical analysis of data generated from edge-of-field runoff samples by ADF location and water year (2022, 2023 and 2024) showed that two row crop farms in Light and Dumas and one forage operation in Elkins, had significantly higher SO4-S concentrations when contrasted with the other ADF sites in all water years. Statistical analysis of SO4-S loads by land area demonstrated that Light had significantly greater loads in water years 2022 and 2024 while Elkins had numerically higher loads in water year 2023. Statistical analysis of total runoff per acre revealed that Newport was significantly greater than all other ADF locations in water years 2022 and 2024. In addition, transitional differences were observed between the other ADF sites in each individual water year regarding SO4-S concentrations and loads. This underscores the impact of how variety in farm management approaches can affect SO4-S runoff dynamics. These results have facilitated an awareness of the behavior of SO4-S in edge-of-field runoff resulting from the form of agriculture practiced as well as the crop grown throughout a growing season.

Building a Resilient Indiana

Author: Meg Leader (Indiana Association of Soil & Water Conservation Districts)*

In FY24 the Indiana Association of Soil and Water Conservation Districts, with the support of Indiana NRCS and the Indiana State Soil Conservation Board, started Resilient Indiana: Technical Assistance for SWCDs (RITA). RITA is a five-year program with the goal of providing three benefits to Indiana:

Workforce Development – to target and train young professionals with the intention of instilling in them the desire to continue this work

Capacity Building – to make staff available to individual SWCDs that can assist with program implementation and provide more services to local communities

Technical Assistance – to deliver timely professional technical assistance, training and outreach related to reduced soil erosion, improved soil health, improved water quality and quantity, and enhanced wildlife habitat

Meg Leader, RITA Director, will be joined by a few of the first cohort of RITA Techs and Leslie Fisher, Benton County SWCD staff, to discuss RITA's first year and future plans.

More information is available at: https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/indiana/news/building-a-resilient-future

Increasing Agriculture Conservation Practices through Ag Retail Partnerships

Author: Michael Watercutter (American Farmland Trust)*; Kinzie Reiss (American Farmland Trust)

American Farmland Trust (AFT) and Mercer Landmark an ag retailer in Northwest Ohio, was awarded a grant from the National Fish and Wildlife Foundation to fund a Conservation Agronomist position within Mercer Landmark region to promote in field sustainable practices.

Over the past 3 years, the project has made great progress in awareness on cover crops, reduced tillage and carbon program opportunities. In partnership with Truterra, over 62,000 acres have been mapped into Truterra's My Portal system for program opportunities Mercer Landmark customers can look at and enroll fields for incentives around crop rotation, cover crops, reduced tillage, and nitrogen use efficiency. One program that has been very successful has been the Mercer Sustain Wheat program, where Mercer Landmark farmers have brought in over 1.4 million bushels of sustainably raised wheat where they have gotten a per bushel incentive for. With having a Conservation Agronomist on board to help educate and promote sustainable farming, the project increased cover crop sales 4X over the last two seasons and brought more funding opportunities to help pay for starting up a new conservation practice on the farm. This project between Mercer Landmark and AFT, has been beneficial for both organizations. AFT has been able to partner with a trusted advisor in Mercer Landmark to spread awareness directly to farms on conservation and protection of American farmland work by AFT. Mercer Landmark has benefited from having an in-house expert on soil health, cover crops and sustainable program opportunities for their farmers.

AFT and Mercer Landmark hope this project shows that having an expert on staff at a local ag retailer helps farmers understand sustainable farming practices they can use to benefit their farm and show other ag retailers across the US, see the benefits of having a Conservation Agronomist can bring to them.

Subject: On the Frontier of Conservation in the West
Location: Newport Beach I on Banquet 1 Level
Time: 8:30 AM – 10:00 AM

Evaluating Bioretention: Green Stormwater Infrastructure Solutions in California

Author: Laura Bates (UW-Madison)*

Stormwater runoff, defined as rainwater that flows over impervious surfaces, is both an under-harnessed groundwater resource and a leading contributor to water body impairments due to the number of pollutants it can transport. One widely successful strategy to capture and treat stormwater runoff is to implement Green Stormwater Infrastructure (GSI): engineered green spaces to enhance the overall environmental quality of an urban landscape. GSI projects, particularly bioretention systems, capture and treat stormwater runoff through infiltration and plant absorption before it reaches receiving bodies of water. To operate efficiently, GSI systems require specific maintenance procedures, as well as clear communication between design engineers, maintenance staff, managers and the general public. The purpose of this study is to evaluate the performance, implementation and maintenance processes of approximately fifty bioretention areas in Santa Clara County. The bioretention areas in this study were evaluated by observing current site conditions and measuring infiltration rates, as well as conducting interviews of municipal and facilities staff to determine the processes and challenges for GSI design, inspection, and maintenance. The results of this study showed that 26% of sites fell within the acceptable infiltration rate range of 5 to 10 inches per hour. Additionally, Kruskal-Wallis and Pearson's Chi Squared Contingency tests unveiled that larger site designs and the use of California native perennial bunch grasses were positively associated with acceptable infiltration rates. Inductive coding and thematic analysis revealed a widespread enthusiasm for properly designing and maintaining bioretention sites between interviewees, but a general information disconnect between facilities, maintenance staff, and public knowledge. This research will help contribute to future GSI design and maintenance considerations for local municipal and facilities staff, such as the use of larger bioretention ponds over smaller designs and planting more bunch grass vegetation.

Recognizing Potential Cultural Resources in Conservation Worksites and Mitigating Potential Damage

Authors: Bernadette Mills (MNR)*; Alexandra Baranowski (NRCS)

Cultural resources are the building blocks of a nation's history and heritage. Unlike natural resources, cultural resources are nonrenewable; once they disappear they are gone forever along with a piece of our history. It is imperative, then, that we start treating the preservation of cultural resources not as a hindrance but as an integral component of broader conservation efforts.

In Kansas, 98% land is privately owned, only 3% of that has been archaeologically surveyed and of that 3% the majority of it is in Eastern Kansas. Western Kansas has the least surveyed land in the state despite being the richest in culturally significant artifacts.

Over the last 4 years, NRCS has hired 15 archaeologists to meet federal conservation requirements and address these shortcomings. Working in tandem with the State Historic Preservation Office (SHPO) and tribal partners, these archaeologists are committed to the conservation of these cultural resources.

It is NRCS Kansas policy to avoid the disturbance of cultural resources when possible and to practice minimal disturbance when avoidance is not possible. These policies may seem counterintuitive. After all, how is leaving something in the dirt contributing to its conservation? The land itself is often the best preserver. When the land is not actively eroding away, culturally significant artifacts and sites stay covered, protecting them from human and natural deterioration. By working with natural resource conservation professionals, cultural resource specialists can preserve this nation's history. This presentation will show you how to recognize potential sites and mitigate damage that could be otherwise caused by implementing conservation practices unawares.

Restoring Watersheds in Piñon/Juniper Dominated Community Landscapes

Authors: Thomas Es(West Latir Ditch Association)*; Tim Keesey (TCK Ecological)

The 2022 Calf Canyon/Hermits Peak Fire was the largest and most destructive wildfire in the history of New Mexico. The fire burned 341,471 acres and destroyed at least 903 structures. There is ample evidence that the density of piñon/juniper within stands has increased as well as the total area occupied by woodlands, resulting in decreased grasslands and increasing fire severity (Pieper 1977, Pieper et al. 1987, Little 1977, Springfield 1976, West et al. 1975 and West 1984).

In the aftermath of the 2022 fire, the West Latir Ditch Association (WLDA), an Acequia and Special District of the State of New Mexico, became proactive in the acquisition of funds to restore its watershed and protect the community from wildfire. The watershed provides irrigation water for its parciantes. Over the last year, WLDA and partner landowners have acquired over $9,000,000 to implement landscape scale forest & watershed restoration treatments in the El Rito/Latir community.

WLDA's goals for this initiative include reducing wildfire risk for local communities, capturing more water for irrigation, and improving wildlife habitat. Treatments include mastication, hand crew thinning and plowing of sagebrush plots, and seeding with perennial grasses.
This presentation will discuss project implementation, and lessons learned regarding implementation complexities encountered when working within and adjacent to rural residential development, with many private and public entities.

Sharing these lessons learned with other communities and organizations is important as the scale and magnitude of piñon/juniper expansion is immense. With limited resources, communities are going to need to be as efficient as possible to increase acres treated to protect communities and watersheds from the devastating effects of high burn severity wildfire.

Adaptation of Warm Season Cover Crops to the Arid Southwestern Unites States

Authors: Margaret Smither-Kopperl (NRCS)*; Jim Thomas (USDA NRCS); Christopher Bernau (USDA NRCS)

Use of warm season cover crops requires some irrigation water in arid regions and this limits implementation in cropping systems. However, their use provides multiple benefits including increased infiltration, erosion reduction, weed suppression, nitrogen fixation and cycling, and improvements in soil health. The purpose of this study was to evaluate the adaptation of commercially available cultivars and varieties of annual warm season cover crop species to the southwestern U.S. at Plant Materials Centers (PMC) in Tucson, AZ (AZPMC), Lockeford, CA (CAPMC), and Fallon, NV (NVPMC) in 2021, 2022, and 2023. Species evaluated included legumes: cowpea (Vigna unguiculata) and sunn hemp (Crotalaria juncea), and eight varieties (five species) of millets: Japanese millet (Echinochloa esculenta), Proso millet (Panicum milaceum), hybrid pearl millet (Pennisetum glaucum), foxtail millet (Setaria italica), and browntop millet (Urochloa ramosa). Characteristics evaluated were germination rate, canopy cover, height, disease and insect resistance, 50% bloom date, aboveground biomass production, and forage quality. In Arizona, supplemental irrigation was not applied, while total precipitation received during the study in 2021 and 2022 was 10.4, and 3.8 inches respectively. In California, total irrigation water applied during 2021, 2022, and 2023 was 4.8, 6.7, and 6.0 inches respectively, while total precipitation over the previous winter and spring was 10.0, 17.0, and 32.0 inches. In Nevada, three inches of flood irrigation were applied one week prior to planting, and again two weeks and four weeks after planting. The performance of the three cowpea cultivars, Chinese Red, Iron & Clay, and Red Ripper were not significantly different at each of the three locations. Sunn hemp consistently had greater height and dry matter in above ground biomass at the AZPMC and the CAPMC. In Nevada, sunn hemp grew well in year one but had stand failures in year two and three. Leafy 22 and Tifleaf 3 hybrid pearl millets performed better than the other millets at all three locations, with significantly more canopy cover at 90 days after planting and higher biomass production. At the CAPMC on a fine sandy loam soil with good water holding capacity, plant height and biomass production for all species increased from 2021 to 2023 in tandem with increased winter precipitation. The millets species all performed well at all PMCs apart from Japanese millet, which performed poorly at the AZPMC and NVPMC. All cowpea varieties and Leafy 22 and Tifleaf 3 hybrid pearl millets performed very well as warm season cover crops at all locations. Sunn hemp and most of the other millets had more variable performance, though predictably did better with increased irrigation or precipitation. Warm season cover crops, specifically millets, cowpeas and sunn hemp have great potential for expanded use in arid climates.

Subject: Soil Health Resources, Indicators, Assessment, and Management
Location: Newport Beach III on Banquet 1 Level
Time: 8:30 AM – 10:00 AM

Carbon Mineralization, Nitrogen Cycling and Ph Change Under Varying Nitrogen Fertilizers in Semi-Arid Soil Series

Authors: Arjun Kafle (Texas A&M AgriLife Research)*; Katie Lewis (Texas A&M AgriLife Research and Texas Tech University)

Nitrogen is one of the most challenging nutrients to manage in an agricultural production system due to its complex and multiple loss pathways. Further, fertilizer induced gas emissions, nitrate availability and soil acidification are some critical aspects while considering nutrient management but are rarely known and understood. Also, Texas High Plains, which covers most cotton production areas in the state, rely heavily on synthetic nitrogen fertilizers. With distinct soil types in the region, the fertilizers choice varies but growers still raise questions about finding appropriate fertilizers for their soil. Hence, this study was targeted to investigate how different nitrogen sources and rates can influence carbon mineralization, nitrogen dynamics and pH of two soil series of Texas High Plains. A 42-day incubation study was conducted at Texas A&M AgriLife Research at Lubbock using two soil series; Amarillo fine sandy lam and Acuff loam which were treated with three nitrogen fertilizers sources: UAN, CN-9, UCAN23 at three rates: 50, 100, and 150 lb/acre including a control. Carbon dioxide respiration was measured at 1d, 3d, 7d, 21d, 42d after fertilizer application, where nitrogen (nitrate and ammonium), pH and EC were assessed in the last four sampling events (3d, 7d, 21d, 42d) as destructive sampling. From our findings, we expect to find out that, with varying fertilizer source and rate, the reactions in different soil series will bring variation in soil chemical properties, giving proper guidelines in nutrient management to producers and landowners. This will explore whether fertilizers choice and rate greatly impact environmental and agricultural sustainability in Texas High Plains.

Impact of Biochar and Nano-Biochar Amendments on Pigment Concentrations and Oxidative Stress in Lettuce Grown on Heavy Metal-Contaminated Soils

Authors: Doris Akachukwu (Michael Okpara University of Agriculture, Umudike)*; Izabela Josko (Institute of Plant Genetics, Breeding and Biotechnology, Faculty of Agrobioengineering, University of Life Sciences, Lublin); Monika Raczkiewicz (Marie-Curie Skłodowska University); Philippa Ojimelukwe (Michael Okpara University of Agriculture, Umudike); Patryk oleszczuk (Marie Curie-Skłodowska University)

Human nutrition and health are often compromised by the consumption of nutrient-poor food crops grown on soils contaminated with heavy metals, organic toxicants, and industrial wastes. This study evaluated the pigment (chlorophyll and carotenoid) concentrations and oxidative stress parameters of lettuce (Lactuca sativa) grown on heavy metal-polluted soils amended with biochar and nanobiochar. Biochars (b-BC) were produced from rice husks (RH), palm bunch

(PB) and sewage sludge (SSL) at pyrolysis temperatures of 500 and 550oC. Nano-biochars (n-BC) were produced from the resulting b-BCs through ball milling. All analysis were determined on leaf fresh weight basis. Heavy metal-contaminated soil was treated with 2% of each b-BC and n-BC respectively. Three-week-old seedlings of lettuce were cultivated on the amended soils for seven weeks. The chlorophyll a and b concentrations of lettuce treated with b-BC-RH (211.54±14.15 µg g-1, 85.63±15.78 µg g-1) and n-BC-RH (229.84±8.99 µg g-1, 93.96±6.34 µg g-1) were higher ($p < 0.05$) than the control (polluted and unamended soil – 153.22±8.58 µg g-1, 62.51±2.52 µg g-1), however, the chlorophyll a value for lettuce from the unpolluted and unamended soil (251.60±9.06 µg g-1) was higher than all the other groups ($p < 0.05$). The carotenoid content of lettuce from RH, SSL and PB-amended soils was higher, except for that of SSL3CO2 which was significantly lower than the control. Malondialdehyde (MDA) contents of RH (b-BC – 13.87±0.59 nmol g-1, n-BC – 29.21±0.67 nmol g-1); SSL3 (b-BC – 29.71±0.41 nmol g-1, n-BC – 12.31±0.54 nmol g-1) and SSL3CO2 (14.27±0.50 nmol g-1, 18.30±0.29 nmol g-1) groups were significantly ($p < 0.05$) higher than control, however, the value for the unpolluted and unamended soil was lower than all the groups. The SOD results of all the treatment groups were similar to that of the control. The high chlorophyll and carotenoid concentrations in the vegetables grown on biochar-treated soils indicate enhanced photosynthetic ability and higher nutritional quality, possibly induced by the biochar. However, the high MDA levels suggest that vegetables are undergoing some oxidative stress. Therefore, monitoring biochar use is necessary to ensure their quality and safety for human nutrition.

Impact of Manure Application Method and Residue Cover on Soil Loss and Nitrogen and Phosphorus Mobilization in Runoff and Infiltrate Across Multiple Manure Products and Application Rates

Authors: Carlos Irias, Juan Carlos Ramos Tanchez, Greivin Dainner Fernandez Benavides, Rishi Prasad, Tibor Horvath, and Quirine M. Ketterings

Manure management is essential for crop production, soil conservation, nutrient dynamics, and water quality. Research is needed to evaluate the impact of application method and residue cover on soil, N, and P loss in runoff and infiltration across manure products and application rates.

Controlled indoor rainfall simulations (4 replications) assessed (i) manure application method (surface vs. incorporation) and (ii) residue cover (bare soil, 40-50%, 80-90%). For application method, raw manure, separated liquids, dissolved air flotation (DAF) solids, and Sedron solids were applied at 60 kg P/ha. For residue cover, raw manure was applied at 0, 20, 40, and 60 kg P/ha. Rainfall events occurred 1, 2, 3, and 4 weeks after application.

For liquids, manure reduced soil loss regardless of application method. For solids, only Sedron reduced soil loss, independent of application method. Incorporation of liquids reduced P loss but increased N loss; Sedron showed similar trends. No impact was observed for DAF.

Bare soil resulted in the highest soil loss. Residue itself reduced soil loss, but manure addition reduced soil loss regardless of residue level. Residue cover did not affect N and P loss in runoff or infiltration.

In summary, incorporation reduced P loss but increased N loss for some but not all the products, while residue cover reduced soil loss only when no manure was applied. Results highlight tradeoffs among soil, P, and N loss driven by application method, residue cover, and manure product. Future P loss assessment tools should account for these interactions when setting application limits.

Impact of Simulated Grazing in Cover Cropping Systems on Soil Properties

Authors: Kaushik Adhikari (Texas Agrilife Research and Extension Center)*; Joseph Burke (Texas AgriLife Research and Extension Center); Katie Lewis (Texas AgriLife Research and Extension Center); Paul DeLaune (University of Arkansas)

Cover crops are commonly used in semi-arid regions to reduce soil erosion. However, cover crop adoption has been limited in the Texas High Plains because they have not been optimized. Due to Texas' cattle production, there is growing interest by crop producers to integrate grazing into their operations, and cover crops could play an integral role in achieving this role while providing an additional income source. A simulated grazing trial with cover crops was conducted over two years to elucidate changes in soil properties. The study was arranged as a randomized complete block design (RCBD) with four replications. The treatments consisted of Rye (R, Secale cereale L.), Sweet clover (SC, Melilotus officinalis (L.) Lam.), Winter pea (WP, Pinsum sativum), three cover crops combined (R/SC/WP), and a fallow control. Grazing was simulated by manually clipping herbage mass (DM) at a 5 cm height from half of each plot in mid-March 2023 and 2024. The whole plot was terminated in mid-May of 2023 and 2024 by clipping the biomass at the soil surface. At each termination point, cover crop biomass was collected from one linear meter row in two places within each plot. The biomass was dried at 60°C for 72 h and analyzed for carbon and nitrogen. Soil samples were collected 30, 60, and 90 days after the mid-May termination at depth (0-10, 10-30, and 30-60 cm). The soil samples were air-dried, ground to pass a 2 mm sieve, and analyzed for inorganic nitrogen (nitrate, NO_3^-; ammonium, NH_4^+), permanganate oxidizable carbon (POXC), and soil organic carbon (SOC). Discussion of results will explore the impact of cover cropping and simulated grazing on the abovementioned parameters.

Subject: Outreach, Education, and Community Engagement
Location: Newport Beach I on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Agrovolo, The Drone That Listens To The Land

Author: Ismael De Lara (Purdue University)

A vertical takeoff landing (VTOL) drone with a flying-wing design capable of multi-spectral index analysis for crop-monitoring, soil health, and aerial mapping. Utilizing a raspberry pi based-imaging system our project is capable of real-time analysis. This project serves as a prototype for a low-cost, accessible drone for all regardless of existing infrastructure to bring precision agriculture to all at an affordable price.

Building Stormwater Resilience through Flood Mitigation and Community Engagement

Authors: Kelly Herfendal (ISG)*

Community engagement is central to identifying vulnerabilities and crafting solutions that reflect local needs and values as communities face increasing climate-related challenges. This presentation explores the importance of integrating community input into stormwater management and flood mitigation strategies to build long-term resilience of municipal assets.

Can Pheasants and Agriculture Coexist in the Midwest?

Authors: Todd Higgins (MU Extension)*

Agricultural practices have had a significant impact on pheasant populations in the Midwestern United States for decades. Land clearing for row crops within the pheasant home range has removed habitat for nesting, chick rearing, and winter survival. Agronomic practices can both decrease and increase pheasant habitat and food sources. Farm raised pheasants often suffer from internal parasite problems and can release high quantities of parasite eggs upon release into the wild, infecting wild birds and reducing survivability for both species. The impacts of habitat fragmentation and mitigation strategies for reducing habitat fragmentation in the agricultural Midwest will be presented. The importance of knowing which agricultural practices most impact the pheasant population, how they impact pheasants, and when they are most impactful can, when properly managed, result in improved habitat conditions for pheasants in the Midwest. Best management practices for sustaining and improving pheasant habitat and raising pheasants will be presented. Implementing the farm management practices and land management concepts presented increase the opportunities for improved game bird habitat throughout the upper Midwest, with an emphasis on pheasant habitat. Improving pheasant habitat may result in greater opportunities for economic returns to producers and rural communities by attracting more game bird hunters interested in hunting who will pay for the privilege of hunting on the land with the improved habitat.

Making Waves in Southern Minnesota Lake Stewardship

Authors: Paul Marston (ISG)*

Minnesota's Nonpoint Priority Funding Plan seeks to restore lakes that are nearly meeting water quality standards, protect high-quality lakes from becoming impaired, and improve water resources for public health. Lakes in Southern Minnesota are largely ignored due to lacking alignment with the Plan's funding priorities. The lakes are typically shallow, have a large watershed to lake ratios draining an intensely agricultural landscape, are infested with invasive species, and exceed water quality standards. Despite these significant challenges, ISG is advancing lake management approaches to shine the spotlight on these ignored lakes, help them qualify for Plan funding, and advance restoration goals.

Recognizing the lack of citizen stewardship and the need to improve aquatic health and recreational outcomes, ISG hosted a conference for citizens to acquire basic lake ecology knowledge, learn strategies from industry experts and local implementers, and start developing lake management plans. Since hosting the second conference in April 2024, ISG has recognized an increase in participant attendance and knowledge, excitement about lake management opportunities, and awareness of implementation efforts that benefit local resources.

Evaluation and interview results with participants, as well as initiatives that have been completed or planned due to their involvement, will be shared during this presentation. Attendees will learn proven methods for increasing citizen stewardship and lake restoration knowledge with a focus on funding, monitoring, watershed, and lake management techniques.

Subject: Resilient Agriculture
Location: Newport Beach II on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Compost is the Cure: Applying the Solution of Organic Matter

Authors: Joel Kramer (Resource Conservation District of Greater San Diego County)*; Kirthana Pisipati (Resource Conservation District of Greater San Diego County)

As farmers struggle to adapt to harsher conditions, they are meanwhile left with the burden of healing the soil. San Diego County growers are particularly exposed to heat waves, drought and wildfire. Compost is the cure. In the peri-urban context of Southern California, an excess of organic waste is now available for on-farm application. Sequestering carbon in the soil while improving water infiltration and nutrient transfer, compost satisfies the need to mitigate and adapt in one fell swoop. As technical assistance providers to farmers in the San Diego region, the Resource Conservation District and partners have surveyed baseline conditions, connected producers to funding and monitored the effect on soil organic matter. The results are clear: more than any other practice, compost has the potential to rapidly transform soil composition, quality and water retention. Despite this glut of material and obvious benefits, the economics of accessing compost remain a barrier to implementation. This presentation will first explore the baseline conditions observed in San Diego's sandy loam soils across multiple geographic subregions. Next, technicians will present the results of monitoring compost application across annuals, perennials and rangelands through the California Healthy Soils Program. Paired with reduced tillage, mulching and hedgerows, soil stewardship can transform a farm from fragile to resilient. Lastly, presenters will discuss innovative programs to make compost more accessible to the average producer. Everyone is stepping up to make compost more accessible. Governments are funding their climate action plans, restaurants are offering climate neutral meals to generate grant fund and producers are engineering blowers to rapidly deliver precious humus to steep slopes. Responsible consumers can support agricultural producers to stewards the soil against all odds and close the loop on both waste and weather.

Cover Crop Effect on Greenhouse Gas Emissions and Global Warming Potential in Furrow-Irrigated Corn in Mississippi

Author: Diego Della Lunga (University of Arkansas)*

The effect of cover crop in corn systems on greenhouse gases (GHG) is characterized by complex and dynamic processes, with contrasting results from previous studies. The objective of the study was to assess the effect of cover crop treatment [i.e., cover crop (CC) and no-cover crop (no-CC)], on GHGs (i.e., CO2, CH4, and N2O) emissions and global warming potential (GWP). Gas sampling was conducted through an automatic system that measured GHGs every day during the 2024 growing season in a furrow-irrigated corn field in Mississippi. Only CO2 emissions differed ($P< 0.05$) by cover crop treatment, with soil respiration ~30% greater under CC than No-CC due to the organic substrate for microbial activity from cover crop residues.

Methane, N_2O, and GWP emissions ranged from -0.22 to 0.30 kg CH_4 ha-1 season-1, 5.53 to 7.28 kg N_2O ha-1 season-1, and 12888 and 15053 kg CO_2 eq. ha-1 season-1 under No-CC and CC respectively. The role of cover crop as a climate-smart practice needs to be evaluated with soil and plant parameters and cannot be limited to the cash crop season. The beneficial effect of cover crop on soil physical and chemical parameters most likely outweighs a predictable increase in GHGs.

Deep Soil Carbon Storage Across a Range of Pedogenic, Climatic, and Management Variations in Southeastern US Agricultural Lands

Authors: Sindhu Jagadamma (University of Tennessee)*; Eeswaran Rasu (University of Tennessee); Patricia Lazicki (University of California Cooperative Extension)

Soil organic carbon (SOC) improves soil health and several vital ecosystem services, ultimately boosting crop production. In agricultural soils, both biophysical and management variables control SOC storage by influencing the balance between carbon input and its turnover, and the degree of their influence may vary along the soil depth. However, research on SOC storage has traditionally focused on the surface soil layers (15-30 cm), resulting in a significant gap in understanding the interaction of drivers of SOC storage beyond this depth. To address this gap, we collected soil samples from 24 unique operational crop and pasture farms across three different Major Land Resource Areas (MLRAs) namely MLRA 128 (East Tennessee), MLRA 122 (Middle Tennessee), and MLRA 134 (West Tennessee), representing a range of soil, climate and management differences and quantified SOC concentration, bulk density, and SOC stock at 0-5, 5-15, 15-30, 30-45, and 45-60 cm depths. Biophysical variables such as normalized difference vegetation index (NDVI) and relevant climatic variables were derived from remotely sensed data. Management variables were assigned qualitative scores for each farm based on field surveys. Overall, SOC accumulation varied by MLRA, decreasing from east to west Tennessee. SOC stock was significantly higher in the top two depths (i.e., 0-5 cm and 5-15 cm) and decreased with depth. Management practices showed significant variations in SOC stock, and these variations were prominent in shallow compared to deep soil layers. Well-managed pasture, rotational grazing, and long-term no-till practices led to higher SOC storage compared to other managed systems. In addition, drivers for SOC storage varied between topsoil (0-15 cm) and deep soil (30-60 cm) in crop and pasture systems. In crop-based systems, NDVI, clay content, precipitation, and residue incorporation were dominant in topsoil, while clay content and residue incorporation became important in deep soil. In pasture systems, precipitation and NDVI were the key drivers in both soil depths, with grazing intensity also contributing to SOC stock in the topsoil. Our results underscore the importance of managing residue in crop systems and grazing intensity in pasture systems to favor SOC accumulation. Future research could involve collecting similar data from a broader geographical extent to enable accurate modeling of SOC stock in top and deep soil from significant drivers.

Resources for an Uncertain Future: Climate Entities across U.S. Public Universities

Authors: Myranda Hentges (University of Kentucky)

Resilience, adaptation, and mitigation in the face of climate change are prominent areas of focus for research and action across both public and private sectors. Addressing such a multifaceted challenge involves numerous stakeholders and interconnected components, including government agencies, non-profits, private companies, and academic institutions. Universities, with their established infrastructure, skilled personnel, and commitment to community impact at various levels- local, national, and global – are uniquely positioned to play a leading role in these efforts. Over recent decades, universities have responded to climate-related challenges by creating various types of climate entities: centers, laboratories, consortia, hubs, institutes, networks, and collaborative groups. These entities often work with external agencies to secure funding or foster partnerships that promote awareness and understanding of climate change impacts. However, the complexity of this active and crowded space often leads to lack of awareness or understanding regarding the diverse missions, roles, organizational structures, and connections among these entities. To address this, a comprehensive inventory of university-based climate organizations in the United States is being developed. This resource enables a detailed comparative analysis of their missions, organizational frameworks, and funding approaches. This will enhance public awareness of existing resources and clarify the trajectories of research and implementation efforts. Additionally, this will provide valuable insights for universities looking to establish their own climate-focused entities, offering guidance on efficient start-up strategies, effective collaborations, and sustainable funding mechanisms. Ultimately, this initiative aspires to elevate the impact of research and outreach in climate mitigation and adaptation, fostering a society better equipped to confront the challenges of climate change.

Subject: Adaptive Management of Conservation Efforts/Cultivating Conservation Technical Assistance, Community, and Networks
Location: Newport Beach III on Banquet 1 Level
Time: 10:30 AM - 12:00 PM

Assessment of Nitrogen Mineralization Dynamics Under Tillage and Drainage Practices in Sugarbeet Fields, Northwest Minnesota

Author: Murad Ellafi (University of Minnesota)*

Nitrogen and Phosphorus are essential yet limiting nutrients for crop production in the Midwest, USA. However, losses of these nutrients from agricultural fields present considerable environmental and economic concerns, mainly via subsurface drainage, which has become a rapidly common practice to enhance productivity. This study investigates nutrient loss dynamics in a 24-hectare field in Crookston, Minnesota, divided equally between surface-only and combined surface-subsurface drainage systems. Under a three-year rotation of soybean, wheat, and sugarbeet, the field provided daily water samples from both drainage types over three growing seasons (2022–2024). The analysis focused on nitrate and orthophosphate concentrations in relation to drainage type and rainfall intensity. Initial results reveal nitrate concentrations in surface drainage systems were at least three times higher during the spring, while in summer, higher nitrate levels were observed in combined drainage systems. Orthophosphate levels, meanwhile, showed a slight increase (10–30%) in surface drainage, except in July and August 2023. Peaks in orthophosphate concentration in surface drainage, ranging from 0.18–0.98 mg L-1, were consistently observed in April and October. This study provides insights into nutrient management strategies to mitigate nutrient losses and their impact on water quality.

What's the Name of That Stream?: Iowa's Approach to Stream Signage

Author: Miranda Haes (Iowa Department of Natural Resources)*

Have you ever driven over a bridge or been atop a watershed ridge line and wondered where you were or what the name of the stream is that you just drove over? Well, in Iowa we thought there was something we could do about that. Stream and watershed boundary signage provides connection to place and education for those that live in, near, or travel through watersheds and the streams that flow through them. This presentation will provide the steps in which the Iowa Department of Natural Resources - Water Quality Improvement Section Non Point Source Team took to provide funding to counties and entities that were interested in labeling their tributaries and watershed boundaries throughout the state. Other topics addressed in this presentation will show examples of signage and their impact as well as lessons learned and possible next steps. Interested participants would be anyone who lives in a watershed!

Furrow Irrigated Long-Term No-Till and Conventional-Till Soil Evaluation in the Mid-South, United States

Author: Partson Mubvumba (USDA)*

Despite being environmentally harmful, conventional tillage's (CT) importance under furrow irrigation for ridge-making (RM) and furrow maintenance (FM) cannot be overemphasized. No-till (NT) practices' soil health and sustainable production benefits are well documented. The Lower Mississippi Delta (LMD) region's 70% land is furrow irrigated. Therefore, skepticism over NT synergy with furrow irrigation standard practices hinders NT adoption. RM and FM are crucial for judicious surface water application for row crop production and expediting drainage following precipitation to curb flash flooding and avert undesirable water logging conditions. The impact of adopting a long-term NT practice compared to the CT prevalent in the LMD region was evaluated from 2019 to 2022. NT increased soil total nitrogen, organic matter, organic sulfur, magnesium, calcium, cation exchange capacity, and stored soil water compared to CT during four years of soybean production following 11 years under corn. Phosphatase enzyme activity was 27% higher under NT than CT in the top 10 cm depth. NT and CT had no significant differences in wet aggregate stability and soybean yields. The loss in nutrients observed under CT in the top 10 cm manifests the impact of disturbing the surface soil and exposing it to denudation processes and consequent nutrient losses. CT developed a 5-cm thick plow pan at 10 cm depth. This was possibly due to the excess land preparation operations count, 83% higher for CT than NT for the 4-year study period. NT adoption coupled with shallow occasional FM operations is a viable conservation practice under furrow irrigation.

POSTER PRESENTATIONS

Poster Number 1

Benefits of Conservation Management Practices on Claypan Soils

Authors: Kristen Veum (USDA-ARS); Divya Kandanool (USDA-ARS); Claire Baffaut (USDA–ARS)*; Lori Abendroth (USDA-ARS); Curtis Ransom (USDA-ARS); Adam Schreiner-McGraw (USA-ARS); Ken Sudduth (USDA-ARS)

Intensive agronomic production has degraded fragile claypan soils over the past century, leading to negative environmental and agronomic impacts. Conservation management practices, including reduced tillage, increased rotational diversity, cover crops, upland buffers, and perennialization, have been proposed and implemented to reduce and possibly remediate the degradation. The objective of this analysis was to assess the impact of conservation management practices on runoff, water quality, and soil health. The conservation practices listed above have demonstrated soil health and water quality benefits. Specifically, the perennial vegetation in upland buffers produces above- and below-ground biomass that can reduce runoff, dissolved nutrients, and veterinary antibiotics in runoff. Further, adoption of reduced tillage with increased crop rotational diversity and cover crops in annual row crop systems can improve soil health, even after decades of soil degradation.

Subject: CEAP Showcase Poster

Poster Number 2

Developing Geospatial Tools to Identify Landscape Opportunities for Phosphorus Traps; Agricultural Conservation Planning Framework (ACPF) Enhancement Project

Authors: Sarah Porter (USDA/ARS)*; Chad Penn (USDA/ARS), Lisa Duriancik (USDA/NRCS), David James (Iowa State University), Brent Dalzell (USDA/ARS)

Managing the loss of Dissolved Reactive Phosphorus (DRP) from agricultural landscapes is important for preventing adverse water quality outcomes such as eutrophication. Managed crop rotations that draw down soil test P (STP) levels serve to eliminate the P source; however, appreciable DRP is lost over that time period. P removal structures can immediately trap dissolved P that is lost from fields during the long-term drawdown process, thereby making them an ideal stacked practice. Practice implementation, however, has largely been hindered by an inability to identify where in the landscape filters will be most effective. In addition to a lack of data on field-scale STP, the identification of hydrologically active areas can be subjective and difficult to map across watersheds with diverse management systems, soils, and terrain.

Three designs for P-removal structures are being developed for use within the Agricultural Conservation Planning Framework (ACPF) and include: subsurface, blind inlet, and surface filters. Hydrologically active areas are identified within Hydrologic Unit Code - 12 watersheds using detailed flow routing of Light Detection and Ranging (LiDAR) elevation data, while the ACPF tile-drainage estimation procedure can predict the dominant (surface vs. subsurface) flow pathway. Land characteristics upstream of each site provide the opportunity to rank sites by their potential for DRP loss. Organic matter and soil texture, for example, influence the likelihood of DRP loss through subsurface drains. Water quality monitoring data from Conservation Effects Assessment Project (CEAP) sites prioritize watersheds with greater DRP losses. Criteria for each P-trap design will be applied in a variety of CEAP watersheds. Combined with water quality monitoring data, outputs provide an opportunity for practice implementation that can improve water quality and allow for the effectiveness of P-traps to be monitored in different landscapes.

Subject: CEAP Showcase Poster

Poster Number 3

Examining Manure and Crop Rotation Effects on Nutrient Loading in Southern Idaho using the SWAT Model

Authors: Galen Richards (University of Idaho)*

In agricultural regions with large livestock populations, manure is often applied at high rates to nearby cropland, benefiting regional producers by reducing inorganic fertilizer use and manure transportation costs while enhancing nutrient recycling. However, when livestock density is high and available cropland is limited, this practice can lead to nutrient overapplication and environmental losses. Physically based agricultural models, such as the Soil and Water Assessment Tool (SWAT), are valuable for assessing the long-term environmental impacts of annual nutrient applications. SWAT is particularly well-suited for agricultural landscapes in irrigated regions due to its built-in irrigation routines. In this study, the SWAT model was used to simulate annual manure applications at rates of 26 and 52 Mg ha^{-1} across two crop rotations and four irrigation scenarios over a 19-year period. Two long-term manure studies in southern Idaho informed refinements to crop nutrient uptake, soil phosphorus partitioning, and organic nitrogen mineralization routines in the model. At the highest manure application rate, Olsen P concentrations exceeded 100 mg kg^{-1} in the top 30 cm of soil within three years and reached 300 mg kg^{-1} within 12 years. Average NO_3-N losses ranged from 15 to 188 kg ha^{-1} yr^{-1}, depending on crop rotation and manure rate. This research highlights a unique application of the SWAT model in a semi-arid region, leveraging its capabilities to simulate irrigation, manure applications, and crop rotations.

Subject: CEAP Showcase Poster

Poster Number 4

Evaluating Adoption of Intensified Forage Systems Effects on Water, Soil, and Nutrient Retention Under Variable Precipitation Cycles of the Southern Plains

Authors: Ann Marie Fortuna (USDA-ARS)*

Agriculture in the Southern Plains (SP) is driven in part by the timing and quantity of precipitation. Variable precipitation often reduces the potential for diversifying forage crops and limits prevailing grazing systems. Incorporating mixed cool-and warm-season cover crops can potentially reduce forage shortages, enhance ground cover as well as reduce sediment and nutrient losses. This study assessed forage intensification’s effects on water, soil, and nutrient retention under the variable weather conditions existing in the SP. Using the Agricultural Policy/Environmental eXtender (APEX) model, summer and winter forage crop rotation systems in grazed and hayed watersheds were simulated and compared to tilled winter wheat (Triticum aestivum L.) on 1.6 ha watersheds in El Reno, OK. Categories of wet, dry, and average precipitation years were simulated using ~100-yr of measured data (https://www.mesonet.org). Droughts of 30–90 days were also simulated and are common throughout the year. The mixed forage cover crops in APEX were represented using the dominant crop in the forage mixtures measured for 6-years. Biomass of cool season forages was >50% winter wheat and ~50-25% triticale (Triticum x Secale). The dominant crop in summer forage mixtures was 70-90% sorghum sudangrass (Sorghum bicolor L.). Winter wheat followed sorghum sudangrass frequently during the 30-years simulated (1997-2006). Results demonstrated that intensified alternative warm- and cool-season forages, grazed or hayed, enhanced water, soil, and nutrient retention compared to prevailing tilled winter wheat. No-till winter wheat-sorghum rotations with multiple harvests increased retention of water by 16.4%, soil by 10.8%, nitrogen by 11.4%, and phosphorus by 9.6%, compared to tilled winter wheat with a single harvest. Conversely, multiple grazing operations improved water retention (15.9%) but resulted in increased soil and phosphorous losses (5.9% and 14.9% respectively) whereas changes in nitrogen losses were marginal. The benefits of intensified systems were more pronounced in dryer years (annual rainfall totals below the 25th annual precipitation percentile) compared to wet years (above the 75th percentile), emphasizing their potential for improving drought resilience and environmental stewardship. These findings offer valuable insights for policymakers, farmers, and stakeholders to promote sustainable agricultural practices, enhance productivity, and mitigate soil and nutrient-related environmental impacts in the SP. USDA is an equal opportunity provider and employer

Subject: CEAP Showcase Poster

Evaluating Conservation Practice Effects at the Watershed- and Field-Scales in the Lake Champlain Basin of Vermont

Authors: Joshua Faulkner (University of Vermont)*; Harrison Myers (University of Vermont); Nisha Nadkarni (University of Vermont); Berdakh Utemuratov (University of Vermont); Amasha Withana (University of Vermont); Eric Roy (University of Vermont)

Agricultural phosphorus contributions to water quality degradation are a significant concern within the Lake Champlain Basin (LCB) of Vermont. A paired-watershed Conservation Effects Assessment Project (CEAP) Watershed study was initiated in 2019 to evaluate the effects of agricultural conservation within the LCB. Continuous flow data, baseflow, and storm event nutrient concentrations have been collected in three agriculture-dominated tributaries since early 2020. The study transitioned out of the calibration period into the treatment period in early 2023. An updated analysis of water quality data collected will be presented. In addition to the watershed-scale study, an associated CEAP Stacked Practices and Innovative Phosphorus Removal project was initiated at the field-scale in 2021. The study has been evaluating the 'stacking' of multiple conservation practices at the field-scale, using a paired-watershed study approach. This study has also been evaluating performance of phosphorus removal technologies at the edge-of-field. Results of surface and subsurface monitoring from study fields will be presented, as well as updated performance data for the phosphorus removal structures.

Subject: CEAP Showcase Poster

Poster Number 6

Investigating Groundwater-Surface Water Interactions and Quality Impacts of Crop Rotation Between Flooded Rice and Sugarcane Using the SWAT+ Modeling Framework

Authors: Young Gu Her (Department of Agricultural and Biological Engineering / Tropical Research and Education Center, Institute of Food and Agricultural Sciences, University of Florida)*; Donghyeon Kim (University of Florida); Bai Xue (University of Florida); Noel Manirakiza (University of Florida); Jehangir Bhadha (University of Florida)

The rotation of sugarcane and flooded rice in the Everglades Agricultural Area (EAA) offers notable benefits, such as improved soil conservation and enhanced crop productivity. However, its effects on water quality, particularly nutrient loading to downstream water bodies under subsurface water management, remain insufficiently understood. This study investigates these impacts using two modeling approaches: SWAT-MODFLOW-RT3D, which integrates agro-hydrological, groundwater, and reactive transport models, and SWAT+, an advanced framework designed to better capture groundwater-surface water interactions. As part of the USDA-NRCS Conservation Effects Assessment Project (CEAP), conducted by the University of Florida's Institute of Food and Agricultural Sciences (IFAS) at the Everglades Research and Education Center (EREC), hydrological data, including soil water content, the levels of groundwater and canal surface water, and nutrient concentrations, were collected using soil moisture sensors, groundwater monitoring wells, and routine water sampling and analysis to capture spatiotemporal variations in water quality and their mechanisms. SWAT-MODFLOW-RT3D was first used to simulate nutrient transport through subsurface flow and its interactions with irrigation and drainage practices. SWAT+, a newer modeling tool, was then employed to further explore the dynamics of groundwater recharge, surface water flow, and their effects on nutrient loads. Both modeling approaches demonstrated acceptable accuracy in reproducing observed data, including soil moisture, groundwater levels, and nitrate concentrations. Preliminary results revealed that crop rotation increased groundwater recharge, particularly from June onwards, leading to elevated groundwater levels. Nitrate loading was closely linked to the hydraulic gradient between groundwater in the fields and surface water in ditches and canals, with subsurface irrigation practices playing a critical role. The comparison of SWAT-MODFLOW-RT3D and SWAT+ highlighted key differences in their ability to capture nutrient transport and hydrological processes, informing improvements in model performance and applicability. The findings underscore the potential for optimizing water and fertilizer management to reduce nutrient runoff while maintaining crop productivity. This research offers actionable insights for scaling results to the entire EAA and advancing sustainable water quality management in agricultural landscapes.

Subject: CEAP Showcase Poster

Using Redox Potential as Proxy for Organic Soil Conservation Associated to Flooded Rice Cultivation Within the Everglades Agricultural Area of South Florida

Authors: Noel Manirakiza (University of Florida)*; Suraj Melkani (University of Florida); Xue Bai (University of Florida); Yang Lin (University of Florida); Abul Rabbany (University of Florida); Allan Bacon (University of Florida); Michael Andreu (University of Florida); Jehangir Bhadha (University of Florida)

Redox reactions play a crucial role in preserving organic soils by controlling microbial activities associated with soil organic matter (OM) mineralization. Draining organic soils of the Everglades Agricultural Area (EAA) of South Florida has historically altered the redox conditions, accelerating aerobic microbial activity and enhancing OM mineralization, which contributed to soil loss commonly referred to as “soil subsidence”. While flooded rice cultivation has been adopted as a rotational crop with sugarcane to mitigate soil loss, limited information exists on its effectiveness in conserving soil loss in the region. This study investigates the dynamics of redox potential and microbial activity associated with OM mineralization under flooded rice cultivation, aiming to assess its role in mitigating soil loss in the EAA. We hypothesized that flooded rice cultivation could conserve soil by shifting soil conditions to anaerobic, thereby reducing aerobic microbial activity linked to OM mineralization.

In-situ Aqua Troll soil sensors were installed in the field before planting rice to monitor redox potential and dissolved oxygen, allowing us to track shifts in soil redox conditions throughout the flooded rice growing period. Topsoil samples (0–15 cm) were collected before planting and during the flooded rice growing period to analyze microbial activities related to OM and nutrient mineralization, including β-1,4-glucosidase, β-N-acetylglucosaminidase, alkaline phosphatase, and aryl sulfatase. The study observed distinct shifts in soil redox conditions: aerobic conditions prevailed prior to flooding, anaerobic to moderately anaerobic conditions developed during the flooded rice period, and back to aerobic conditions after field drainage at harvest. These changes were associated with reductions in microbial activity linked to OM and nutrient mineralization during the flooded rice growing period compared to pre-planting samples. These findings highlight the potential of flooded rice cultivation as a conservation crop rotation practice for conserving organic soils within the EAA.

Subject: CEAP Showcase Poster

Poster Number 8

Water Quality Measurements Across Various Flow Paths in a Restored CEAP Wetland

Authors: Peter Hartsough (Univ of California--LAWR)*

Restored wetlands represent an important component of NRCS conservation programs and as such, as part of the Conservation Effects Assessment Project (CEAP). This project, funded under the Watershed Assessment Studies, focuses on the water quality effects and benefits of NRCS wetland restorations. Working on a surface water quality project in California's Central Valley (CCV) can be a tricky proposition, with recent years fluctuating between multi-year drought, where there was little water to measure, to wet El Niño years, when any water quality signal is wiped out by excess precipitation and water quality is dominated by mud and silt. Despite these challenges, we have established an interesting field experiment at two restored wetlands in the northern portion of the CCV, near the confluence of the Sacramento and American Rivers. One restoration is on a 3000 acre privately held property that is managed for waterfowl. A second restoration is on a 711 acre property adjacent to the Sacramento-San Joaquin Delta that is also managed for waterfowl. Both properties have been participating in NRCS wetlands programs for multiple years. We instrumented both sites with water quality sensors situated along multiple flow paths within the wetlands. These in situ sensors were supplemented with monthly grab samples along the same flow paths. Although it is early in the experiment, we present here several time series and document water quality along these flow paths. We show sensitivity to pumping time and amount as well as length of flow paths. We also show seasonal changes across the wet winter to dry summer season. These data will eventually be used as calibration data for water quality models, including SWAT.

Subject: CEAP Showcase Poster

Poster Number 9

Accelerating Silvopasture Adoption Through ASSETS

Authors: Leif Gonzales-Kramer (Working Trees)*

Project Goal: The “Partnerships Accelerating Silvopasture Adoption & Carbon Sequestration through Emerging Markets and Technologies (or “ASSETS Partnership'') represents a collaborative effort between Virginia Tech (VT), Appalachian Sustainable Development (ASD), and Working Trees (WT) to rapidly accelerate the adoption of silvopasture across the Eastern US and establish this practice as a mainstream, lucrative, climate smart agricultural system.

Project Background: Pasture owners in many states, particularly smaller cow-calf operations, typically lose money in a given year, with these farms facing tight margins and volatile commodity markets. Silvopasture, the intentional integration of forage, livestock, and trees, produces significant production benefits (tree fodder, improved forage, etc.) and can improve a producer’s bottom line. However, adoption is low and ASSETS has identified four reasons why this is the case: insufficient silvopasture technical guidance, limited knowledge of and access to financing, uncertain economic impacts, and social factors and values.

Innovative Approach: The ASSETS Partnership is seeking to address the above barriers by enabling silvopasture projects to generate carbon revenue to provide greater economic incentives for producers to implement silvopasture. WT has built an innovation for measuring silvopasture carbon stocks: a mobile app that uses the camera and lidar in a producer's smartphone to accurately measure carbon sequestered in silvopasture systems. Prior to this tech, verification costs were so high that only large landowners could generate enough carbon revenue to cover it. This technology enables pastureland owners of any size to tap into emerging carbon markets.

Role of Participating Partners:

- WT is a climate-tech startup that will coordinate activities related to enabling silvopasture projects to generate carbon revenue from the carbon market, with an emphasis on technical development.
- Virginia Tech (VT) is a land-grant university with world-class research experience. VT will lead the research component of this project, conducting interviews, surveys, measurements, etc, and then synthesizing these findings into scientific papers and reports.
- ASD is a non-profit that creates sustainable food systems in Appalachia and will provide technical assistance to producers, and lead Farm Tours and outreach events.

Anticipated Project Results and Key Deliverables

- Plant 500+ acres of silvopasture carbon projects in the states of VA, NC, and TN

- Complete tech platform that seamlessly connects carbon buyers with silvopasture carbon producers, enabling all eligible silvopasture producers to generate carbon revenue

Predicted Impact to Conservation

Silvopasture will rapidly scale across the Eastern US, reforesting millions of acres of land while increasing its economic productivity. This practice will also improve the climate resiliency of thousands of family farms while improving their bottom lines.

Subject: CIG Showcase Poster

Biocarbon-Enhanced Dairy Manure Management Demonstration for Enhanced Water Quality

Authors: Eunsung Kan (Texas A&M AgriLife Research Center)*; James Muir (Texas A&M AgriLife); Jeff Brady (Texas A&M AgriLife); Paul DeLaune (Texas A&M AgriLife); Edward Osei (Tarleton State University); Kartik Venkataraman (Tarleton State University); Caitlyn Cooper-Norris (Texas Tech); Jennifer Spencer (Texas A&M AgriLife); Kimberly Wellmann (Tarleton State University)

Our project focuses on developing a biochar-assisted phytoremediation system to enhance water quality following nutrient contamination from dairy manure application. Firstly, surface-modified biochar (calcium-functionalized biochar, Ca-BC) was prepared and evaluated for its adsorption capacities for nitrogen, phosphate, antibiotics, and E. coli. Laboratory experiments and analyses indicated that Ca-BC exhibited significantly higher removal capacities for reactive phosphorus (P), tetracycline antibiotics, and E. coli pathogens compared to pristine biochar (BC) and commercial activated carbon. Field experiments (microplots) were conducted under various conditions, including different biochar types (pristine BC and Ca-BC), soils (sandy and sandy loam), crops (forage, grain, and energy crops), manure application, and tillage/no-tillage practices. From the three-year-long field demonstration, several key results were observed:

1. Ca-BC reduced phosphorus, antibiotics, and microbial contaminants (e.g., coliform bacteria) in the soil.
2. Ca-BC application promoted more diverse microbial communities, particularly those involved in carbon (C) and nitrogen (N) cycles.
3. Ca-BC application increased soil carbon concentrations beyond the direct carbon contribution from BC itself.
4. The impacts of Ca-BC on forage yields and nutrient values were negligible.
5. Antibiotic and E. coli levels in the soil were reduced to trace levels.

In addition to the microplot experiments, the application of Ca-BC and BC to the infiltration water in the microplots notably reduced carbon, phosphorus, antibiotics, and E. coli levels, with more pronounced effects observed in plots with tillage and manure applications. Detailed statistical analyses and correlations among soil, water, plant, and biochar parameters in the field plots are ongoing.

Overall, the outcomes from this project clearly demonstrate the benefits of applying Ca-BC to dairy manure-applied forage fields. These benefits include effectively reducing nutrients, emerging contaminants, and microbial pathogens in both soil and water. Furthermore, Ca-BC application highlights its cost-effectiveness and sustainability, particularly under optimal operating conditions (e.g., a single application of 5 tons of BC/ha combined with manure application and minimal chemical fertilizer use). This approach is readily applicable to manure-applied fields with similar environmental conditions (e.g., semi-arid climates, sandy loam/clay soils, and forage-grain-energy crops). With additional analysis and investigation, BC application could potentially be extended to fields under various conditions.

Subject: CIG Showcase Poster

Poster Number 11

Field Indicators of Hydric Soil in Interdunal Wetlands of the Great Bend Sand Plains

Authors: Colby Moorberg (Kansas State University)*; Sydney Love (Kansas State University); Melanie Earl (Kansas State University); Hayley Owen (Kansas State University); Avion Brown (Kansas State University)

Interdunal wetlands provide critical ecosystem services related to wildlife habitat and regional hydrology. However, problems with identifying field indicators of hydric soils (FIHS) may hinder enrollment of these wetlands in conservation programs in Major Land Resource Area (MLRA) 79 – the Great Bend Sand Plains in central Kansas which includes the Quivira National Wildlife Refuge, a Ramsar wetland of international importance. Our objective was to conduct a survey of FIHS in this MLRA to determine if FIHS development was being limited and to identify which FIHS were most prevalent. We surveyed 44 interdunal wetlands across four dune fields in the spring and summer of 2024. Surveys entailed examining a 30-cm deep soil profile at the edge of each interdunal wetland, describing soil morphology, and identifying any FIHS present. The FIHS identified were confirmed using the US Army Corps of Engineers automated data sheets. The most common indicators include S5 – Sandy Redox, S6 – Stripped Matrix, F3 – Depleted Matrix, F6 – Redox Dark Surface, F8 – Redox Depression, and A11 – Depleted Below Dark Surface. We conclude that FIHS were functioning as intended and were well-expressed in MLRA 79. We recommend training on FIHS identification among local conservation professionals to support future interdunal wetland delineation and enrollment in wetland conservation programs.

Subject: CIG Showcase Poster

High Clearance Robotic Irrigation for In-Season Nutrient Management

Authors: Kapil Arora (Iowa State University)*; Jake Willsea (Iowa State University); Andrew Klopfenstein (Ohio State University); Daniel Andersen (Iowa State University); Scott Shearer (Ohio State University); Justin Koch (360 Yield Center); Venkatesh Ramarao (Ohio State University); Jojn Fulton (Ohio State University); Elizabeth Hawkins (Ohio State University); Nowell Moore (360 Yield Center); Matthew Helmers (Iowa State University); Kelvin Leibold (Iowa State University)

Applying liquid-phase nutrients in-season beyond V4 stages of corn using a newly and innovatively designed high-clearance robotic irrigator has not been researched. This collaborative project between The Ohio State University, Iowa State University, and 360 RAIN intends to demonstrate in-season application of commercial and animal nutrient sources along with water application as a unified irrigation strategy to reduce nutrient losses while improving profitability with increased corn yields.

Two years of replicated strip trials with three treatments of Fall, Spring, and In-season application have occurred with robotic irrigation using 360 RAIN Robotic Irrigator. In-season application consisted of traditional N and P application rates as well as reduced rates to take advantage of better matching nutrient availability to corn needs. Measurements were made for dissolved reactive phosphorus losses with both runoff and leaching using commercially available nutrients.

Secondly, as climate shifts result in water scarcity during critical stages of crop growth, robotic irrigation water applications were used to meet the crop needs. Corn yields were measured to evaluate the impact of this proposed strategy.

Second year field data for both Ohio and Iowa is currently being analyzed and will be presented in the poster. Results will demonstrate that high-clearance robotic irrigation, a climate-smart technology, improves profitability while reducing negative environmental impacts.

Subject: CIG Showcase Poster

Poster Number 13

Increasing Drought Resiliency in Maui County Through the Use of Cover Crops

Authors: Rosemary Gutierrez Coarite (University of Hawaii at Manoa)*

Climate change in Maui County has increased both the frequency and duration of drought events. Reduced water availability threatens agricultural viability across the county, particularly in the prime diversified agricultural area of Upcountry Maui, the most surface water dependent water system in the state. Management of soil moisture in crops is key to increasing drought resilience and critical to the future of this district and the county at large.

Cover crops are increasingly being used for their ability to improve soil health, increase soil organic matter and nutrient availability, and increase soil water holding capacity. This project aims to increase on-farm water use efficiency on agricultural lands through the combined use of cover crops and conservation management, and demonstrates cost-effective solutions that can be used by growers.

This project includes research trials on both individual cover crop species and cover crop blends, as well as on-farm trials. The first phase of research trials assessed the biomass production, canopy cover, drought tolerance and soil moisture impact of 19 potential cover crops within three functional groups (grasses, legumes, and non-legume broadleaves) under irrigated and drought conditions. The top performing grasses were sorghum and pearl millet, with dry biomass equivalents in non-irrigated treatments of 6.359 Kg/A and 5.902 Kg/A in the summer trial and 1.742 Kg/A and 1.646 Kg/A in the winter trial, respectively. Top legumes were sunn hemp and cowpea, producing dry mass equivalents of 2.286 Kg/A and 540 Kg/A in the summer trial and 949 Kg/A and 714 Kg/A in the winter trial, respectively. Top non-legume broadleaves were brown mustard and daikon, producing 1.916 Kg/A and 1.633 Kg/A in the summer trial and 1.317 Kg/A and 1.687 Kg/A in the winter trial, respectively.

In the second research trial, the top 2 cover crops in each functional group were combined into all possible 3-species blends to assess their performance and impacts on soil moisture.
On-farm demonstration trials will assess how cover crops can be used as part of a larger management plan including conservation tillage, no-till methods and/or intercropping and how these strategies together impact soil moisture dynamics for the subsequent cash crop.

Subject: CIG Showcase Poster

Poster Number 14

On-Farm Evaluation of Site-Specific Nitrogen Management Technologies in the U.S.: Lessons Learned

Authors: Guillermo Balboa (University of Nebraska)*; Pablo Paccioretti (University of Nebraska); JOe Luck (University of Nebraska); Taylor Lexow (University of Nebraska); Adam Leise (University of Nebraska)

The Nebraska on Farm Research Network (NOFRN, https://on-farm-research.unl.edu/) is a nationally recognized program in the United States of America that aims to answer farmers' questions in farmers' fields. Over the last 10 years, the network conducted an average of 80 experiments per season focusing on a variety of topics. Over 45% of the on-farm experiments involve any type of precision agriculture tool. From 2021 to 2024, through a Conservation Innovation Grant (USDA), a set of cutting-edge technologies for managing nitrogen in maize and wheat were evaluated to determine the value of the technologies and promote adoption among farmers in Nebraska and beyond. Technologies included crop models, remote sensor-based methods, fertigation, biological and inhibitors, among others. A total of 120 on-farm trials were conducted. On top of the on-farm research design, researchers conducted several data collection protocols (i.e., soil sampling, drone imagery, crop biomass, and tissue analysis) to better understand each technology. This poster will summarize the main findings by technology evaluated and the impact of the Project on farmers' participation in adopting the practices being assessed. All new technologies were tested in an on-farm setup and contrasted the technology with the farmer's current management. The analysis focuses on yield, partial profits, and nitrogen use efficiency while implementing techniques like meta-analysis and geostatistical analysis. In summary, findings show that the use of sensor-based approaches to determine variable nitrogen rate for corn allowed to reduce the N rate by an average of 38kg Nha-1 with no yield penalty. This means that each unit of nitrogen applied as a fertilizer using remote sensing technology was producing more grain. In the case of crop models studies showed that nitrogen rate can be reduced with no yield penalty. Overall results show that precision agriculture based methods can help improve nitrogen productivity, potentially reducing the environmental impact of this nutrient.

Subject: CIG Showcase Poster

Poster Number 15

On-Farm Soil Health Trials in Utah

Authors: Matt Yost (Utah State University)*; Jenae Dean (Utah State University); Tony Richards (Utah Department of Agriculture and Food); Kristy Davis (UACD); Madelyn Kunzler (Utah State University)

Data on impacts of soil health practices in the Intermountain West is lacking. To fill this need, on-farm CIG soil health trials were established on 16 farms in Utah in 2023. Trials included a diverse set of cropping systems to represent Utah's agriculture - including grain, forage, vegetable, pasture, and related farms and ranches. Soil health practices implemented at the farms include combinations of cover crops, reduced tillage, livestock integration, rotational grazing, interseeding, and double-cropping. Baseline soil health was measured in 2023. Soil health practices were implemented for 2023 and 2024 and soils were sampled again. Crop yield and forage quality data for two years will be presented and shows that crop yields can be maintained and sometimes improved with soil health practices. Furthermore, early indicators of soil health changes will be presented.

Subject: CIG Showcase Poster

Poster Number 16

Scaling the Kentucky Climate-Smart Cereal Rye Cover Crop Initiative

Authors: Brian Brandt (American Farmland Trust)*

American Farmland Trust's (AFT) Scaling the Kentucky Climate-Smart Cereal Rye Cover Crop Initiative project builds upon the successful Kentucky Commercial Rye Cover Crop Initiative (KCRCCI), an innovative pilot program and model to advance the widespread adoption of both traditional cover crops and revenue-generating double crops. The proposed project catalyzes the adoption of cereal rye as a cover crop and double crop in rotation with corn and soybean cash crop systems to increase farmer profitability, environmental resilience, and rapidly scale on-farm conservation practices that achieve ecosystem services of climate change adaptation and mitigation, water quality and conservation, and air quality.

The goals of the Scaling the Kentucky Climate-Smart Cereal Rye Cover Crop Initiative project are three-fold, as follows:

Goal 1: Increase cereal rye cover crop adoption in Kentucky by 3,000 acres and 40 producers, including 8 Historically Underserved (HU) producers, by reducing social barriers and taking advantage of soil health and economic benefits from adopting new and innovative cover cropping strategies within corn and soybean cash crop rotations.

Goal 2: Evaluate cereal rye market opportunities and efficiencies, quality concerns, and end-user motivations for purchasing climate smart cereal grains, with a particular focus on global spirits brands and bourbon distilleries. The proposed project will enhance cereal rye market opportunities via outreach to potential buyers in Kentucky interested in sourcing rye from local farmers in lieu of imported rye.

Goal 3: Adapt existing cost-share program pricing structures to an incentive structure that adequately compensates producers to levels that increase participation on the part of HU producers, reduces risks for farmers unable to access adequate crop insurance for rye, creates a revolving programmatic fund that is paid for by existing participant farmers and paid to new enrollee farmers.

This proposed project builds upon an existing producer network to incentivize both the adoption of cover cropping by producers and the purchase of climate-smart grains by distilleries, spirits companies, brewers, bakers, and other potential buyers.

Subject: CIG Showcase Poster

Poster Number 17

The Future of Farming: Increasing Adoption of Conservation Practices Among Alabama Row Crop Farmers

Authors: Rishi Prasad (Auburn University)*; Audrey Gamble (Auburn University); Brenda Ortiz (Auburn University); Michelle Worosz (Auburn University); Leah Duzy (Auburn University)

The Future of Farming project started in 2020-2021 to showcase conservation practices on Alabama Farms. Our project builds upon two main philosophies: “Seeing is Believing,” and “Learning by Doing.” We utilized a systems approach to demonstrate to farmers the benefits of cover crops for improving soil health, smart irrigation technologies to conserve water, and combined practices to improve water- and nutrient- use efficiency. The project established three demonstration farms located in the north, central, and south regions of Alabama, in partnership with Alabama farmers. Two watersheds were identified in each demonstration farm and were instrumented with edge-of-the-field water quality monitoring systems to demonstrate the benefit of covering crops and adopting smart irrigation for runoff losses of nutrients. The nitrogen (N) budget was also developed to understand the N cycling and losses in the farmer’s business-as-usual cropping system at the demonstration farm. Another feature of the project was establishing a farmer learning site. We utilized these learning sites to communicate the findings of the project and learn the barriers and limitations to the adoption of cover crop systems and smart irrigation practices. Within the project, we also offered cover crop incentive programs to increase the adoption of cover crops in row crop farms. The farmers worked directly with the Future of Farming team to develop a cover crop plan that addressed resource concerns and cropping systems specific to the participating farmer. Key findings from the project will be presented.

Subject: CIG Showcase Poster

Effect of No-Tillage System on Crop Production, Soil Carbon Storage and Greenhouse Gas Emissions in Soybean–Wheat Rotation

Authors: Daitianshu Xu (Tokyo University of Agriculture and Technology)*

To evaluate the potential of the regenerative agriculture practice in maintaining both crop productivity and environmental sustainability, a field experiment combining tillage methods, cultivation systems, and biochar application was conducted in an organic soybean-wheat rotation system at a site with over 20 years of no-tillage research. Three tillage methods were moldboard plow tillage (MP, depth 27 cm), rotary tillage (RT, depth 15 cm), and NT. Three cultivation systems were low-density wheat (LW, 50kg/ha), low-density wheat intercropped with hairy vetch (HV), and high-density wheat (HW, 100kg/ha). Half of plots had biochar application (B, 8t/ha) and the other half no biochar application (NB). The study evaluated productivity, soil organic carbon (SOC) stock and soil greenhouse gas (GHG, including CH_4, N_2O and CO_2) emissions of this system, and calculated net global warming potential (GWP).
The results of this study indicate the following: (1) Under the NT treatment, the biomass and yield of organic soybeans are not lower, even significantly higher than those under tillage treatments. In contrast, wheat biomass and yield perform poorly under NT but are significantly enhanced under MP treatment, suggest that wheat is less adaptable to no-tillage than soybean. (2) The application of biochar significantly increased the SOC content and SOC stocks. SOC content and stocks in the shallow soil layer is higher under NT treatment compared to tillage treatment, but in the deeper soil layer, SOC content is higher under tillage treatment, and no significant difference in SOC stocks was observed between NT and tillage in the 0-30 cm soil layer. This confirms that under long-term NT, SOC tends to accumulate in shallow layers. (3) NT treatment exhibited reduced annual cumulative N_2O emissions and, with its lower net CO_2 flux due to the accumulation of SOC stocks, resulting in a lower net GWP compared to tillage. The NT-WH-B combination contributed the lowest net GWP. This implies that NT farming system has the potential to mitigate the trend of climate change.

Subject: Conservation in Organic, Specialty, Small-Scale, or Urban Agriculture

Poster Number 19

Sustainable Cultivation Management of Head Cabbage Utilizing Unused Local Resources – Effects of Green Manure and Compost Application on Soil Properties and Yield

Authors: Shoji Watanabe (KK.LEAF)*

With the recent surge in chemical fertilizer prices, there is an increasing demand for the establishment of stable and sustainable fertilizer resources. This study evaluates the effectiveness and economic feasibility of utilizing compost derived from unused local resources for the cultivation of head cabbage (Brassica oleracea var. capitata). The compost materials used were horse manure and food waste. In addition to composts made from these individual materials, a hybrid compost combining both was also tested and compared to chemical fertilizers. Furthermore, the introduction of Crotalaria (Crotalaria juncea) and Sorghum (Sorghum bicolor) as green manure was examined to assess their contributions to soil improvement and cabbage yield through nitrogen and carbon supply.

The cultivation trials were conducted from 2021 to 2025 at the International Field Agricultural Research Center of the Faculty of Agriculture, Ibaraki University in Japan. The experimental fertilizers used included horse manure compost, food waste compost, hybrid compost (a mixture of horse manure and food waste compost), and chemical fertilizer (control). Treatment plots were established with application rates of 12.5 kg-N/10a, 25 kg-N/10a, 50 kg-N/10a, and a no-fertilizer control. Each treatment plot was further subdivided into three groups: one with Crotalaria, one with Sorghum, and a bare soil control (fallow area).

Cabbage yield was measured, and yield per unit area was calculated. Based on these values, sales revenue and gross income were estimated and compared across treatments. The green manure biomass was measured to estimate the amount of nitrogen and carbon incorporated into the soil through plowing, and its contribution to soil improvement was evaluated. Soil samples were analyzed for available nitrogen content to determine nitrogen supply before and after fertilization.

Although cabbage yield decreased in the third year due to poor initial seedling growth caused by high temperatures, in other years, most treatment plots achieved an average yield comparable to the national standard. Considering the slow-release nature of organic fertilizers, a treatment plot with double the conventional fertilization rate was established. The results indicated that yield could be maintained or even increased to levels same or higher than those with conventional fertilization rates, demonstrating economic feasibility even when fertilizer costs were considered. Furthermore, in plots with green manure and compost application, available nitrogen levels increased after application, suggesting their role as a long-term nitrogen source.

Subject: Conservation in Organic, Specialty, Small-Scale, or Urban Agriculture

Poster Number 20

Assessing Soil and Water Dynamics in Utility-Scale Solar Farms: A Field-Based Approach

Authors: Luis Mier Valderrama (Virginia Tech)*

Utility-scale solar (USS) installations rapidly expand in Virginia under the Virginia Clean Economy Act (VCEA), which mandates 100% carbon-free electricity by 2050. While USS reduces carbon footprints, their effects on soil erosion, water runoff, and long-term land productivity remain understudied. A key limitation of previous modeling efforts has been the reliance on historical or empirical runoff data rather than in-situ measurements. This project addresses that gap by integrating comprehensive field-based data to improve model accuracy, with a focus on long-term soil and water quality changes over the ~30–35-year lifespan of solar farms. Special attention is given to the mid-development stage—land clearing, stabilization, and revegetation—which has been a major concern for stormwater management and sediment control.

Research is being conducted at four USS sites across Virginia, with two additional sites in development. Each site includes multiple sub-catchments, both within panel areas and in undeveloped controls, where storm-event runoff and water quality samples are collected. Soil and vegetation data are gathered along transects at different development stages, measuring infiltration, aggregation, bulk density, and permeability.

We are comparing site-specific runoff data with regulatory tools, particularly the Virginia Runoff Reduction Method (VRRM) and its Total Phosphorus (TP) and Total Nitrogen (TN) runoff factors, as well as curve number (CN) assignments from TR-55 and the Chesapeake Assessment Scenario Tool (CAST). In the long term, these data will calibrate models like HEC-HMS for hydrologic simulations and System Dynamics Modeling (SD) in Vensim to improve stormwater predictions across various site conditions. Preliminary findings include effective CN calculations for monitoring locations using the VRRM approach and comparing modeled vs. observed nutrient loading from paneled areas. These efforts aim to enhance USS stormwater management and inform future siting and design practices.

Subject: Conservation Models, Tools, and Technologies

Poster Number 21

Spatially Precise Inputs via Precision Agriculture Tools Improves Environmental Quality

Authors: Amanda Ashworth (USDA ARS)*

The use of precision agriculture tools like tractor guidance (TG) improves production efficiencies by reducing overlaps and gaps and consequently reducing environmental impacts from over-applying fertilizers and herbicides in agricultural systems. However, the relationships between terrain attributes (slope, field shape irregularities, pass length), drivers experience level (0–1, 2–3, 6+ yr), and system (farm size, crop type, etc.) impact efficiency gains for precision agriculture tools are lacking. Therefore, in a series of studies, authors tested these factors by comparing TG (where a predefined field path was followed) and without TG (manually driven). Studies found that operator experience level (for non-TG comparison) was inversely related to TG- driven efficiency gain improvements and that overlaps increased with increasing field irregularities (6 to 11% field area), shorter pass lengths (2 to 19m2), greater slope (17 to 53m2), and roughness index (13 to 38m2) per grid cell. In addition, TG was profitable and led to farm level carbon equivalent (CE) emission savings of 15.7, 3.5, and 9.6 Mg for cotton, soybean, and ‘Mixed’ operations, respectively. These results highlight CE savings that are i) crop specific; ii) scale dependent; and iii) equipment/input-use specific. Overall, auto-guidance systems on tractors leads to more targeted nutrient and input applications, which leads to more sustainable production of food.

Subject: Conservation Models, Tools, and Technologies

Poster Number 25

Strategic Integration of Energycane in South Florida for Bioenergy Feedstock Production and Water Quality Benefits

Authors: Colleen Zumpf (Argonne National Laboratory)*; Jules Cacho (Argonne National Laboratory); Bradford Kasberg (Argonne National Laboratory); John Quinn (Argonne National Laboratory); Ricardo Lesmes-Vesga (University of Florida); Hardev Sandhu (University of Florida); Cristina Negri (Argonne National Laboratory)

To grow the U.S. bioeconomy and produce domestic, cost-competitive biofuels and bioproducts, there is an increased need for low-cost, high-quality biomass sources. Biomass production systems using perennial bioenergy crops can be designed to have multiple economic and environmental benefits when production is targeted on underproductive and fallow land or when placed in strategic landscape positions to address specific environmental risks. Florida has a high capacity for biomass production and can benefit from the growth of alternative crop production systems to help address economic, human health, and environmental concerns caused by nutrient loss, soil subsidence, and citrus greening. Energycane, a high-fiber sugarcane cultivar, is a prime perennial bioenergy crop candidate for Florida as it has greater biomass production capacity compared to other bioenergy crops in the region, in addition to other advantages (e.g., more extensive root system and longer lifespan than sugarcane cultivars bred for sugar production).

The presented research focuses on modeling the production of energycane in Florida as an alternative management practice for underproductive and fallow lands and its impact on water quality (nutrient and sediment loads) and quantity (flow). The Watershed Assessment Model (WAM) was used to model changes in water quality and quantity when energycane is grown as either buffers along in-field canals of sugarcane fields or as large-scale monoculture on underproductive shallow soils (e.g. high risk of soil subsidence) or fallow land (such as due to citrus greening) as compared to current land use practices. A combination of the S2, S6, and S7 watersheds within the Everglades Agricultural Area (EAA) was selected as an example watershed. The model calibration uses both publicly available datasets and field-based measurements from a field trial located within the target watershed. Results from the model will be used to generate estimates of water quality and quantity-based ecosystem systems benefits and the potential economic value for use in a technoeconomic analysis and the development of a market transformation plan. This work supports a larger project titled Evaluating Energycane for Bioenergy and Sustainable Agricultural Systems (EC-BioSALTS) that aims to evaluate the biomass productivity and quality, and ecosystem services of energycane on underproductive and fallow lands and identify pathways for integrating sustainable energycane production into local and regional economic systems.

Subject: Conservation Models, Tools, and Technologies

Poster Number 23

Soil Texture and Seasonal Changes in Soil Structure Control Deep Percolation and Nitrate Leaching Risk in an Irrigated Cropping System

Authors: Meghan Robinson (Montana State University)*; W. Adam Sigler (Montana State University); Clain Jones (Montana State University); Kent McVay (Montana State University); Jasmine Neupane (University of Missouri-Columbia

Water is the primary limiting resource for crop production in semi-arid climates, and water management is critical for sustainable agriculture. Nitrogen is commonly the second most limiting input for crop production. Reactive nitrogen in soil is readily converted to nitrate, which is susceptible to leaching with deep percolation. Soil water management is an important mechanism for controlling water and nitrogen use efficiency and is particularly relevant in irrigated systems where quantity and timing of supplemental water application are decided by producers. We are interested in understanding how soils, weather, and irrigation management impact deep percolation and nitrate leaching risk. We are conducting research with cooperating producers growing small grains on clay loams, seed potatoes on silt loams, and spring wheat on sandy loams at four sites in Montana. Sites are under center pivots managed by cooperating producers and have soil moisture sensors at 15, 30, and 90 cm, and suction lysimeters at 30 and 60 cm. We are using Hydrus 1D to estimate deep percolation. Results suggest that both soil texture and structure control deep percolation, which prompted us to develop a metric based on volumetric soil water content to quantitatively characterize deep percolation potential across sites. Structured clay loam soils have the highest deep percolation risk, sandy loams are intermediate, and silt loam soils produce the lowest deep percolation. In the clay loam soils, seasonal tilling disrupts soil structure and then the formation of surface cracks during wetting-drying cycles re-establishes structure, after which soil water moves to depth much more readily. Soil nitrate concentrations peak after fertilization and the timing relationship between nitrate concentration and deep percolation dictates leaching loss. Work to quantify timing and magnitude of nitrate leaching and alternate irrigation scenarios to reduce losses is forthcoming as we calibrate Hydrus 1D water flux models for study fields.

Subject: On the Frontier of Conservation in the West

Poster Number 24

Ecosystem Services, Entrepreneurship and Technical Assistance of Perennial Bioenergy Crops

Authors: Bradford Kasberg (Argonne National Laboratory)*

The adoption of perennial bioenergy crops for use within the bioeconomy is needed to scale up biofuel production to achieve the goals established by the U.S. Department of Energy (DOE). Stakeholders across the supply chain have a myriad of concerns regarding the adoption of these novel crops. A tool developed at Argonne provides insight into such decision-making, and engagement with stakeholders interested in the bioeconomy was conducted to refine the tool and simultaneously generate a stronger understanding of the perceived opportunities and barriers of perennial bioenergy crops across the supply chain. This technical assistance directly responds to the DOE Bioenergy Technology Office's (BETO) priorities of building a bioenergy economy and supporting rural socioeconomic and environmental benefits.

Stakeholder engagement and technical assistance were conducted alongside our project partner, American Farmland Trust (AFT). With AFT we identified priority stakeholder engagement areas within the Midwest and analyzed the current status of the bioeconomy within the study area. Stakeholders across the bioeconomy supply chain were reached via a combination of virtual and in-person workshops and webinars as well as one-on-one technical assistance with farmers and landowners. Further, the project created a Midwest Bioenergy Crop Coalition to carry on the conversations of policies and technical assistance required to encourage adoption of perennial bioenergy crops for the bioeconomy. Workshops and technical assistance also focused on refining Argonne's tools to better meet the needs of stakeholders of the bioeconomy, enhancing Argonne's analytic toolkit.

Landowner and farmer stakeholder feedback suggests they would prefer to engage with a bioeconomy similar in structure to existing agricultural markets and production patterns. Small-scale, on-farm biomass use is not of interest due to the complexity of upkeep and initial investments required. Consequently, multi-year contracts in which the harvest and distribution are similar to conventional methods are most appealing. The targeted application of bioenergy crops within marginal farmland subfields, rather than whole field conversion, is received positively due to the potential environmental benefits and risk-reduction associated with maintaining conventional crops in higher-yielding segments of the landscape. 'Mid-market' biomass uses for bioenergy crops, such as animal bedding or conversion into biomass materials, is another important step in scaling up for biofuel processing, as they require less feedstock and create platform which expands the familiarity of these crops and supply chains for the Midwest agricultural community. Geospatial tools have been identified as useful tools for such land-use decision-making but require more precise valuation assessments that are easy to use and integrate into existing farm mapping and other management tools.

Subject: Outreach, Education, and Community Engagement

Poster Number 25

Equipping Tomorrow's Conservation Workforce: Our Year in the SWCS Emerging Leaders Program

Authors: SWCS Emerging Leaders

This poster presents an overview of the Soil and Water Conservation Society's Emerging Leaders Program (ELP), designed to support early-career professionals in developing leadership skills relevant to the conservation field. The program includes structured learning modules, networking opportunities, and applied conservation event planning. The poster highlights program content and key outcomes, including measurable impacts from participant-led conservation events. By showcasing the accomplishments of current and past participants, this poster demonstrates how the ELP builds professional capacity and fosters community engagement among the next generation of conservation leaders

Subject: Outreach, Education, and Community Engagement

Poster Number 26

Urban Reforestation Through Reforest the Bluegrass

Authors: Brendan Campbell (Lexington-Fayette Urban County Government)*

Reforest the Bluegrass is an annual volunteer tree planting event that was founded in 1999. As a recent college graduate, I started working for the City of Lexington’s Department of Environmental Quality as an Event Coordinator. I have been tasked with planning this event that has become a long-standing tradition for many local residents. Through the SWCS Emerging Leaders program, I have navigated the challenges of newfound leadership while planning this event.

Reforest the Bluegrass was started as a stormwater quality project and has been responsible for planting over 200,000 trees on hundreds of acres across Fayette County. Many of those acres are within parks that used to be farmland. Reforest the Bluegrass has 26 years of stories to share with those who are looking for a land management tool that can help bring their community together. Stories about connecting community organizations with one another, along with local residents. Stories about providing streams with a buffer that had been completely lost.

Volunteers can have an enormous impact on their local environment. Through tools like i-Tree, we are able to share these impacts with participating volunteers and sponsors. Impacts such as stormwater infiltration and carbon sequestration provided by the trees planted.
This poster presentation will present the impacts that volunteers and the event have on the local environment and community. With helpful tips and tools for replication by other entities, along with my experience in the SWCS Emerging Leaders program.

Subject: Outreach, Education, and Community Engagement

Poster Number 27

World Soil Day Contest: Empowering Communities Through Extension-Driven Creative Engagement in Soil Conservation

Authors: Jemila Chellappa (University of Idaho)*

Extension services play a pivotal role in bridging scientific research and community action, a fact brilliantly showcased by our World Soil Day 2024 art contest under the theme "Measure, Monitor, Manage." Designed as an extension outreach initiative and an outcome of the Emerging Leaders Program at the Soil and Water Conservation Society (SWCS), the contest aimed to inspire creative expressions of soil health and conservation among community members of all ages. Driven by the innovative spirit of emerging leaders, the event reinforced the critical role of soils in sustainable agriculture, food security, biodiversity, and climate resilience.

In partnership with local extension offices—particularly the UI Extension Offices and Canyon County Extension—we invited participants to submit photographs, sketches, or paintings that captured their visions of soil stewardship. The contest featured three age-specific categories: Young Creators (ages 8–10), Junior Conservationists (ages 11–17), and Adult Artists (ages 18 and up). Each submission included the artist's name, age category, and a brief description (up to 50 words) connecting their creative work to broader soil conservation themes.

Over the course of a month, the contest attracted a vibrant array of artworks that vividly illustrated the intricate connections between soil health and environmental sustainability. A panel of local experts, including extension educators, evaluated the entries based on creativity, thematic relevance, and clarity of message. This outreach effort reached 80 participants from the Southern Districts of Idaho, with the majority of entries submitted by youth highlighting the engagement of our future environmental stewards. Winners in each category were honored on World Soil Day, December 5th, with gift cards and certificates, and their works were proudly showcased at the UI Extension Offices across our region. In celebrating our soils, this event underscored the urgent need to appreciate and protect the foundation of sustainable agriculture, food security, biodiversity, and climate resilience.

Overall, this initiative not only deepened community engagement with soil conservation but also demonstrated the transformative power of art-based outreach in environmental education. By leveraging the trusted platform of extension services, the contest sparked dialogue, raised awareness, and inspired proactive stewardship of soil resources. Our experience shows that innovative, participatory approaches can effectively mobilize communities toward sustainable soil management and long-term environmental resilience.

Subject: Outreach, Education, and Community Engagement

Poster Number 28

Carbon Dynamic in Regenerative Cotton Systems of the Semi-Arid Texas Plains

Authors: Nicholas Boogades (Texas A&M AgriLife)*; Christopher Cobos (Texas A&M University); Joseph Burke (Texas A&M AgriLife Lubbock); J. Wayne Keeling (Texas A&M AgriLife Lubbock); Katie Lewis (Texas A&M AgriLife Lubbock)

Sustainability and climate change mitigation are recent focuses for agricultural producers and researchers as society begins to look at every industry through the lens of a climate conscious magnifying glass. The agricultural sector is unique however, as agricultural production systems and soils that support them can act either as carbon (C) sinks or sources depending on management practices. The Texas High Plains, a semi-arid region responsible for a quarter of annual U.S. cotton production, is challenged with providing an environmentally conscious cotton crop to its domestic fashion industry which requires not only sustainably produced cotton, but in larger amounts than ever before. To meet this goal, the region must develop alternative cotton cropping systems that benefit sustainability by sequestering C. Increased soil C in these systems will reduce negative environmental impacts while increasing resiliency by providing increased water storage, soil stability and slow-release nutrients. Regenerative agricultural practices are thought to benefit C sequestration however, this has not been evaluated in semi-arid cotton production. Our goal is to evaluate how regenerative practices impact C dynamics by measuring the relationship between C inputs, soil organic c (SOC) and soil C pool distribution. Here, we compared two regenerative practices: no-till cotton with rye cover (NT CC) and no-till cotton-wheat-fallow rotation (CWF), to the regional standard practice of conventionally tilled cotton with winter fallow (Conv). In 2024, NT CC increased CO_2 emissions compared to Conv while the CWF did not. Although NT CC increased CO_2 emissions, both NT CC and CWF significantly increased SOC in the upper soil profile, compared to Conv, 14 years after implementation. When considering the CO_2 intensity associated with cotton lint production in each system, NT CC resulted in twice as many lbs CO_2 emitted per lbs cotton lint yield produced, compared to both Conv and CWF, which were not different from each other. Each regenerative system has their benefits and drawbacks from an agronomic, environmental, and economic perspective. Further research from this project, and from the region as a whole should investigate the role of marginal SOC increases in providing a more sustainable cotton production system, and determine economic sustainability factors for regenerative practices assessed here.

Subject: Resilient Agriculture

Poster Number 29

Soil Water Conservation in Regenerative Semi-Arid Cotton Agroecosystems

Authors: Christopher Cobos (Texas A&M AgriLife Research)*; Nicholas Boogades (Texas A&M AgriLife Research); Joseph Burke (Texas A&M AgriLife Research); Wayne Keeling (Texas A&M AgriLife Research); Katie Lewis (Texas A&M AgriLife Research)

Water availability and sustainability are essential to the continued agricultural production of the U.S. Great Plains. The Southern High Plains (SHP), located in the semi-arid southern portion of the Great Plains, produces approximately 30% of the U.S. annual cotton production. The continued unsustainable withdrawal of the Ogallala Aquifer for irrigation, paired with the potential increase in annual mean temperature due to climate change puts the future agricultural viability of the region at risk. Our objective was to evaluate the water dynamics of regenerative agricultural cotton cropping systems in semi-arid environments compared to conventional cotton agroecosystems. Conserving water inputs throughout the year can slightly offset the decreasing irrigation availability in deficit-irrigated semi-arid systems, potentially increasing the success and sustainability of regenerative practices. Our research was conducted at the Agricultural Complex for Advanced Research and Extension Systems in Lamesa, TX. At this site, we evaluated three different cropping systems: continuous cotton with a winter fallow and conventional tillage (CT), continuous cotton with a winter rye cover crop and reduced tillage (CC), and a cotton-wheat rotation with an 11-month fallow between wheat harvest and cotton planting with reduced tillage (CW). Cropping systems were deficit-irrigated at two different irrigation levels, base (60% ET replacement) and low (30% ET replacement). Soil moisture measurements were collected every two weeks from May 2022 to September 2024 with a field-calibrated neutron probe. Results indicate greater soil water conservation in both CC and CW compared to CT from 2022-2024 with increased cotton lint yields in 2022, 2023, and 2024 with CW systems.

Subject: Resilient Agriculture

Poster Number 30

Utilizing Cover Crops via USDA Partnerships for Climate-Smart Commodities

Authors: Oleksandra Tryboi (Strategic Conservation Solutions)*

Partnerships for Climate-Smart Commodities Program (PCCP) provides financial support to the awarded projects for implementing climate-smart practices in line with conservation practice standards (CPS). CPS340 Cover Crop practice is planned to be implemented in 93 projects out of the total projects awarded. These 93 projects cover all the US States and territories and are involved in producing 79 major commodities. Total Federal funding for these projects is $2.43 billion. Two rounds of Cover Crop Survey were conducted in 2023 and 2024 to better understand cover crop planting intentions. As a result of the Survey, we received responses from 47% of all projects, with 21.5% providing a total estimate of acreage for cover crops in their projects. As the Projects mainly cover more than one state, the states with the highest number of projects utilizing cover crops (CPS340) are in the Midwest, with Missouri, Iowa, Minnesota, and Kansas at the top of the list. The PCCP is expected to result in over 11.3 million additional acres of cover crops throughout the program's timeline.

60% of those projects that provided acreage also provided a breakdown by year for their estimates. According to this, the peak demand for cover crop seeds can be expected in the 3rd (2,349,709 acres) and 4th (2,247,703 acres) years of the PCCP program's 5-year projects' timeline (although some projects have a 3-4-year timeline for farmers).

Although seven seed companies are involved in the projects as leaders or partners, most survey respondents answered that they did not have a cover crop/conservation seed provider, making it unclear whether the set goals would be reached.

The survey results will help predict the demand for cover crop seeds in future years, avoiding a cover crop seed shortage. The results will also be helpful in informing about those projects interested in cooperating with cover crop seed providers.

Subject: Resilient Agriculture

Poster Number 31

Community Satisfaction as a Measure of Conservation Efficacy and Social Sustainability

Authors: Aaron Harp (Sustainable Rangelands Roundtable - University of Wyoming); Kristie Maczko (Sustainable Rangelands Roundtable - University of Wyoming)*; David Taylor (Sustainable Rangelands Roundtable - University of Wyoming)

Community satisfaction uses a place-based concept, geographically bounded by locality, to tie a community to its natural environment. Community satisfaction research incorporates local environmental conditions as they relate to attachment. To explore these relationships and values, we used a social survey of households in four Major Land Resource Areas in Kansas, New Mexico, Oklahoma and Texas to establish the association between attachment, satisfaction and social capital and attitudes toward the local environment, with measures of specific knowledge concerning recovery of the Lesser Prairie Chicken (Tympanuchus pallidicinctus). The primary purpose of this project was to determine to what extent, if any, do attitudes about the local environment in general, conservation, ranching/agriculture, and a local species (the LPC) specifically affect community attachment, satisfaction and social capital? A secondary question revolves around whether strong opinions and values for conservation, ranching, and species management engender more support for benefits of conservation and conservation programs supporting land management activities such as brush removal, prescribed burning, and prescribed grazing. We examined the average county population for 2020 through 2023 for each MLRA. The MLRAs were sampled proportionally, and the total sample size is estimated using a recent return rate of 18% for mixed method electronic and mail surveys conducted by the University of Wyoming Survey and Analysis Center. Hierarchical linear modeling, or multilevel modeling is applied to the data in order to capture individual attitudes and attributes that are clustered within larger social structures (Flaherty and Brown, 2010; Keske, et al., 2017). This approach differentiates individual effects from attributes and attitudes from community level and geographical attributes of communities. Research results show that local people who know what conservation and management programs are being used in their area are also well integrated into their communities. This research can provide a roadmap for how to educate local communities about ongoing efforts for conservation and sustainable ranching. It provides a benchmark about how social life and values in rural communities can include the management of rangelands for sustainable beef production and species habitat conservation. It can provide insight into how to best partner with local communities in conservation, management, and recovery efforts. More broadly, this project contributes to understanding of how community attachment, satisfaction and social capital are related to individuals' knowledge of and attitudes toward the local rangeland environment. It provides a solid step toward a larger research effort to integrate local ecological knowledge into the study of rural agricultural communities.

Subject: Social Sciences Informing Conservation

Poster Number 32

Examining Group-Level Variations in the Adoption of Conservation Agriculture: The Role of Macrostructures, Microstructures, and Individual Attributes

Authors: Maliha Muhtasim (The Ohio State University)*

Conventional intensive agricultural systems in the U.S. are widely recognized to generate complex environmental impacts, which in turn can lead to stagnant or declining economic productivity. Conservation agriculture, as defined by crop rotation, cover cropping, and reduced tillage practices, can mitigate these environmental and economic impacts. Adoption rates of conservation agriculture differ, and understanding what drives conservation behavior among farmers has been a major focus of past literature. Studies have identified individual characteristics, ranging from demographic factors, values, beliefs, identities, and experiences, as powerful variables that shape conservation behavior. However, a gap remains in the existing literature, as very few studies have empirically examined the broader decision context in which farmers make their choices. Recent studies are increasingly emphasizing the importance of understanding how environmental behavior is shaped by the interaction between this broader decision context and individual decision-makers. The current study uses multilevel modeling to examine how macro-level factors (natural, socio-economic, political, and institutional) interact with micro-level factors (farm characteristics) and individual farmer attributes to influence the adoption of conservation agricultural practices in farms across Midwestern U.S. states. Expected findings include differential influence of individual attributes based on external conditions, cross-level interactions affecting adoption decisions, and regional clustering in conservation behavior. These insights will inform practitioners in developing context-specific policies and interventions that contribute to creating an environment conducive to greater adoption of conservation practices.

Subject: Social Sciences Informing Conservation

Poster Number 33

Aligning Farmers' Perceptions of Soil Productivity With Soil Health Test Results in Bahiagrass Pastures of Florida

Authors: Swarnali Mahmood (University of Florida)*; Jose Dubeux (University of Florida); Yang Lin (University of Florida)

Pasture farmers are increasingly interested in adopting soil health testing to guide their management practices. However, it remains unclear whether soil health tests are indicative of farmers' personal evaluation of soil, which could have a significant impact on their farm management decisions. Thus, it is important to understand how farmers' perceptions match soil health tests so that the value of soil health testing can be strengthened as a meaningful guide for management decisions. As bahiagrass is the most widely produced perennial grass in Florida pastures, we selected 20 farms with bahiagrass pastures in six counties under the Northeast district of UF/IFAS Extension Administration. At each farm, we requested the farmers to identify their most (MP) and least productive (LP) fields, totaling 40 fields, along with identifying the reason behind their perceptions: nutrient deficiency, water logging, and/or soil compaction concerns. We collected surface soil (0-15 cm) samples from nine spots within each field, thoroughly mixed within field samples as a composite sample, and tested the soils for a set of common soil health indicators. Among the group of farmers with concerns of nutrient deficiency, Mehlich-3 extractable P and Fe concentrations were higher in the MP than in the LP fields (paired t-tests, $p < 0.05$), while these differences were not statistically significant in farmers without nutrient deficiency concerns. Our linear models show that the percent change in soil organic matter, mineralizable carbon, and water-extractable organic carbon between the MP and LP fields are significantly predicted by the group of farmers with nutrient concerns ($p<0.1$, $p<0.05$, and $p<0.1$ respectively). Similarly, the percent change in pH between the MP and LP fields is significantly predicted by the group of farmers with soil concerns ($p<0.05$). These results indicate that farmers have a strong understanding of their land. In fields where farmers suspect nutrient deficiencies, the data confirm deficiencies in P and Fe. Moreover, it appears that carbon may play a partial role in explaining these perceived nutrient deficiencies.

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

Poster Number 34

Do Soil Enzymes Respond to Cover Crop and Phosphorus Fertilizer Rate

Authors: Molly Kane (Kansas State University)*; Peter Tomlinson (Kansas State University); DeAnn Presley (Kansas State University); Nathan Nelson (Kansas State University); Amber Pasket (USDA-ARS); Jessica Grunberg (GDM)

Understanding how cover crops and phosphorus (P) fertilization influence soil biological activity is essential to creating more sustainable farming practices. P fertilization can result in phosphorus runoff which can lead to environmental problems such as eutrophication. Managing P not only includes fertilizer inputs but also biological p cycling and availability. Soil enzyme activity such as β-glucosidase, N-Acetyl-β-glucosamindase, and acid and alkaline phosphatase are used as biological soil health indicators. During 2023, soil samples from the surface 5 cm were collected from the 18 watersheds at the Kansas Agricultural Watershed Field Laboratory. The Kansas Agricultural Watershed project consisted of a 2X3 factorial plot arrangement replicated three times in a randomized complete block design, managed as a corn – soybean crop rotation. The treatments included three levels phosphorus fertilization: no phosphorus (NP), build and maintain (BAM), and sufficiency (SUF), as well as two levels of cover crop: no cover crop (NC) and with cover crop (CC). Soil samples were taken four times throughout the growing season: after cover crop termination, before corn planting, 30 days after planting, and after harvest. The soil samples were used to analyze soil enzyme activities of β-glucosidase, N-Acetyl-β-glucosamindase, and acid and alkaline phosphatase that were determined colormetrically. Statistical analysis was performed using SAS PROC mixed procedure in SAS version 9.4. The main effect of cover crop presence resulted in greater soil enzyme activity compared to treatments with no cover crop for all enzymes analyzed at $\alpha=0.05$. There was no significant difference between the phosphorus fertilizer treatments (NP, BAM, and SUF). These findings indicate that cover crops positively influence the measured soil enzymes suggesting increased microbial activity and potential to cycle nutrients such as P.

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

Poster Number 35

Effects of Cropland Management on Soil Carbon in the Flint Hills

Authors: Isaac Nelson (Kansas State University)*

Management is crucial in influencing soil carbon dynamics, which is key to maintaining sustainable intensification and working toward a carbon-neutral agriculture industry. Sustainable practices, such as crop rotation, cover cropping, and reduced tillage can enhance soil organic carbon storage by improving aggregation, biological activity, and nutrient availability. These practices not only boost soil fertility but can increase carbon sequestration, potentially offsetting greenhouse gas emissions. This research focuses on highlighting the impact of various agricultural management techniques on soil organic carbon and collecting different soil health measurements (Aggregate Stability, ACEP, PLFA) in the Flint Hills of Kansas. Accurate and contextualized measurements give the best insight into where and how we can store more carbon and create more sustainable farmland. Adopting sustainable practices with better-understood carbon measurements allows better implementation of incentives and reflects the current environmental quality of the soil more accurately.

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

Poster Number 36

Persistence of No-Till Benefits for Soil Organic Carbon and Enzyme Activity in Semi-Arid Croplands

Authors: Engil Pereira, The University of Texas Rio Grande Valley

In Corpus Christi, Texas, a long-term field trial established in 2011 was used to evaluate the effects of conventional versus no-tillage practices on soil health indicators in a dryland cotton–sorghum rotation. The site, characterized by Victoria clay (45% clay, 38% silt, 17% sand) and a semi-arid climate, provides a unique opportunity to assess soil responses under climate and water stress. In 2023, we found that no-till systems generally led to greater soil organic carbon (SOC), increased water-stable aggregates, and enhanced beta-glucosidase activity compared to conventional tillage. Sorghum plots consistently showed higher SOC and enzyme activity than cotton plots. This study continues in 2024 by reassessing the same parameters in rotated crop plots to determine temporal consistency in tillage and crop effects. Preliminary 2024 findings align with 2023 results, indicating that no-tillage practices may enhance carbon sequestration and biological activity even in challenging environments. These insights have critical implications for promoting soil health and long-term sustainability in semi-arid dryland systems, and they provide data-driven support for recommending no-till practices to producers across South Texas.

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

Poster Number 37

The Effects of Soil Health Management Practices on Soil Organic Carbon Persistence and Accrual in Vineyards

Authors: Sarah Brickman (UC Davis)*

Soil health management practices can provide vineyards with a win-win sustainability solution: simultaneous climate change adaptation and mitigation. Cover crops, reduced/no-tillage, livestock integration, and compost application can all increase soil organic carbon (SOC), which prevents carbon (C) from being released into the atmosphere and accelerating climate change. However, SOC is a dynamic soil property, so it's crucial to understand not just how the total C pool changes in response to soil health management, but also how C is allocated between the mineral-associated carbon (MAOC) and particulate organic carbon (POC) fractions. While MAOC can remain in the soil for decades to centuries, POC has a mean residence time of a few years to decades, making MAOC a more stable form of soil C. Thus, our study aims to examine the effects of cover crops, reduced/no-tillage, livestock integration, and compost application, adopted alone or in combination, on total SOC, MAOC, and POC concentrations in vineyards. In summer 2023 and 2024, we collected soil samples from 0-40 cm at 24 vineyard blocks in Napa County, California. The vineyard blocks reflect a gradient of soil health management practice adoption, with each site utilizing from one to four practices. We hypothesize that total SOC concentrations will increase with the number of soil health management practices adopted in the surface soil depths (0-20 cm), while the relative allocation of C between MAOC and POC will vary with the kinds of practices utilized. We expect that sites that implement reduced/no-tillage will have a greater proportion of POC, since the lack of cover crop residue incorporation into the soil slows the decomposition of plant material. Our results will support vineyard managers in assessing the extent to which their soil conservation strategies act as a natural climate solution while providing direct improvements in soil health.

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

Poster Number 38

Understanding the Impact of Conservation Agricultural Practices on the Eroded Soils of the Palouse Region

Authors: Gagandeep Kaur, Washington State University; Clark Neely, Washington State University; Haly Neely, Washington State University; Gabriel LaHue, Washington State University; Deirdre Griffin LaHue, Washington State University; Kevin Murphy, Washington State University; Brandon Gerrish, Texas A&M AgriLife Extension

The Palouse is a unique dryland agricultural area in the northwestern United States characterized by rolling hills and steep slopes. The Palouse soils are one of the most erodible soils in the United States. Additionally, soil acidification, low moisture availability, and decreasing soil organic matter content are other challenges to agricultural productivity in this region. These soil conservation challenges are further expected to aggravate with the ongoing climate change. Therefore, it is crucial to incorporate soil management practices that enhance long term agricultural sustainability in the Palouse region. Conservation agricultural practices that include minimum soil disturbance, permanent soil cover, and diversification are proposed to improve soil health. This study aimed to apply conservation principles to enhance soil health and crop nutritional quality. The research trial is conducted at Palouse Conservation Farm Station in Pullman, WA (mean annual precipitation of 533 mm and soil pH<5) from 2021-2025. Crop rotation includes winter wheat-spring barley-spring peas crop rotation and the treatments are Conventional till + no lime + no residue (CT-NL-NR), No-till + lime + no residue (NT-L-NR), No-till + lime + residue (NT-L-R), No-till + no lime + no residue (NT-NL-NR), and No-till + no lime + residue (NT-NL-R). Soil samples are collected in the fall each year after crop harvest to analyze physical, chemical, and biological soil parameters. Soil cores (120 cm depth) are collected using a Hydraulic Giddings probe and the samples are analyzed for macronutrients, soil pH, and organic matter content. Crops are analyzed for grain and biomass yield, grain test weight, and protein content. The grain protein content for all three crops was estimated using an Infratec Grain analyzer. The results indicated that soil pH is highly stratified in 0-7 cm soil depth. Lime application increased soil pH as compared to no lime application treatment increasing soil pH from less than 5 to 6.1. The further results from this study will associate soil health with crop nutritional quality and provide insight into the role of conservation agriculture practices in enhancing agricultural sustainability.

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

Poster Number 39

Using Quantitative Color Sensor Measurements to Predict Soil Carbon in Forested Wetlands in the Region of Northern Virginia, USA

Authors: Changwoo Ahn (George Mason University)*

In the era of global climate change, scientists and managers are faced with various complex ecological problems of which understanding often requires rigorous environmental assessment and monitoring. Often in the form of smartphones that can be paired with low-cost sensors, these novel methods have opened up data collection to a larger share of the population outside of trained scientists with applications including environmental outreach and citizen science. We explored the potential use of a quantitative color sensor, the Nix, to predict carbon contents and stocks in the top layer of forested wetland soils. Nix–carbon correlation analysis revealed strong relationships between L (lightness), X (a virtual spectral variable), R (additive red), and KK (black) and log-transformed TC (Ln[TC]; $|r| = 0.70$; $p < 0.01$ for all). Simple linear regressions were conducted to identify how well these four final Nix variables could predict soil carbon. Using all color measurements, about 50% of Ln(TC) variability could be explained by L, X, R, or KK ($p < 0.01$), yet with higher predictive power obtained for Coastal Plain soils ($0.55 < R2 < 0.65$; $p < 0.01$). Regression model strength was maximized between Ln(TC) and the four final Nix variables using simple linear regressions when color measurements observed at a specific depth were first averaged ($0.66 < R2 < 0.70$; $p < 0.01$). While further study is warranted to investigate Nix applicability within various soil settings, these results demonstrate potential for the Nix and its soil color measurements to assist with rapid field-based assessments of soil carbon in forested wetlands.

Subject: Water Resource Assessment and Management

Poster Number 40

Building Better Wetlands: Nitrogen Reduction And Phosphorus Sequestration of Constructed Wetlands Receiving Tile Drained Waters from Agricultural Systems in the Midwestern United States

Authors: Krista Kirkham (The Nature Conservancy)*; David Kovacic (University of Illinois Urbana-Champaign); Mike Wallace (University of Urbana-Champaign); Jill Kostel (The Wetlands Initiative); Jacob Berkowitz (US Army Corps of Engineers); Christine VanZomeren (US Army Corps of Engineers); Maria Lemke (The Nature Conservancy)

Wetlands provide valuable ecosystem services and many economic benefits to communities. Unfortunately, much of the original wetland habitat in the United States has been lost. In Illinois, over 90% of original wetland acreage has been converted for urbanization and agriculture. Approximately 39% of Illinois' agricultural acres are tile-drained, emphasizing the importance of edge-of-field practices to help reduce nutrient contributions to the Gulf of Mexico.

The Nature Conservancy, University of Illinois Urbana-Champaign, and the Franklin Family have partnered since 2005 on the 101-hectacre Franklin Research and Demonstration Farm (FRDF) in Lexington, IL. This farm showcases various agricultural conservation practices, including sequential constructed wetlands that represent 3%, 6%, and 9% of farm drainage areas. Twelve years of water quality analysis demonstrate that the wetlands removed an average of 15%-57% of nitrate-nitrogen and 32%-95% of dissolved phosphorus loadings from tile drainage waters. Since the phosphorus (P) cycle lacks an atmospheric removal pathway, the capacity of wetlands to sequester P often decreases over time as the availability of soil sorption sites declines. US Army Corp of Engineers soil scientists evaluated the P sorption capacity of the FRDF treatment wetlands and found that the wetlands sequestered P, with water soluble P displaying significant decreases in sequential treatment cells (61.0 – 81.7% reduction). Soil P sorption capacity increased in the direction of treatment water flow as anticipated but varied significantly between treatment wetlands with soils ranging from P sinks to potential P sources.

Although this research and similar work by partners show that constructed wetlands that receive tile drainage water are effective at reducing nitrate-nitrogen and dissolved phosphorus levels, adoption of wetlands as an agricultural conservation practice in Illinois is low. Over the past several years, The Nature Conservancy and The Wetlands Initiative have worked with landowners and farmers in Illinois to install small, constructed wetlands for cropland drainage treatment under USA Farm Bill programs. Our objectives were to support landowner outreach while improving wetland engineering, operation and maintenance, and water quality monitoring. Our long-term goal is to support conservation professionals and landowners that install constructed wetlands to ensure wetland functionality and longevity, thereby increasing landowner acceptance of this cost-effective, multi-beneficial practice.

Poster Number 41

Microbial Communities as a Pathway to Improved Woodchip and Corncob Bioreactor Design and Performance

Authors: Taylor Vroman (Iowa State University)*; Michelle Soupir (Iowa State Univserity); Adina Howe (Iowa State University); Lorien Radmer (Iowa State University); Lillian Chiang (Iowa State University)

The export of nutrients from agricultural fertilizers through subsurface tile drainage contributes to water quality degradation and poses environmental risks at both local and global scales. Woodchip bioreactors are an emerging edge-of-field technology designed to enhance denitrification processes by facilitating microbial interactions with a carbon-enriched environment, thereby achieving nitrate removal from agricultural runoff. Their effectiveness has been proven in many studies, although variable results with respect to performance indicators have been observed. This study serves the purpose of synthesizing the current state of the science in terms of the microbial community, its impact on the consistency of bioreactor performance, and its role in the production of potential harmful by-products including greenhouse gases, sulfate reduction, and methylmercury. This study used six upflow column systems to simulate bioreactors under controlled conditions for the evaluation of microbial community structure, greenhouse gas emissions, and water chemistry dynamics. Three columns contained woodchips, while the other three used corncobs as carbon substrates. The systems operated over six months at hydraulic retention times (HRTs) of 8 and 16 hours. Results indicate that corncobs outperformed woodchips in nitrate removal at the 8-hour HRT but generated higher carbon dioxide emissions. Variations in NO_3-N, NO_2-N, and total organic carbon (TOC) concentrations were observed. Weekly DNA extractions from carbon media and effluent samples revealed distinct microbial community profiles that correlate with observed greenhouse gas production and water chemistry parameters. We performed DNA extractions on weekly corncob, woodchip, and water samples to target specific denitrification and nitrous oxide emission genes (nirS, nirK, nozI nozII), along with 16S and ITS genes, in qPCR analysis. Future analysis will investigate denitrifying gene presence to inform the development of optimized bioreactors that maximize nitrate removal efficiency while minimizing greenhouse gas emissions.

Subject: Water Resource Assessment and Management

Poster Number 42

Using Limited Rainfed Yield Data for Management Zone Delineation and Optimizing Soybean Irrigation Strategies in Tennessee

Authors: Shuhua Xie (University of Tennessee, Knoxville)*

Uniform irrigation practices often lead to waterlogging or insufficient water distribution. To address this, management zones (MZs) are used to divide fields into sub-areas with similar characteristics, allowing for tailored irrigation strategies that improve yield and water-use efficiency. However, robust MZ delineation typically requires extensive datasets, which many producers lack. This study evaluates the feasibility of using limited rainfed yield data alongside soil attributes - electrical conductivity (ECa) and ground penetrating radar (GPR) - to delineate MZs and optimize irrigation strategies for soybean in Tennessee.

The study used one year of rainfed yield data to compare its influence on irrigated soybean yield with ECa and GPR data by covariate analysis. K-means was applied to delineate MZs based on these attributes, followed by a two-year irrigation experiment testing different strategies: three irrigation initiation stages (R1, R3, R5), two application rates (1.0 and 1.5 in/wk), and a rainfed control.

Results showed a strong correlation ($r = 0.8$) among the three attributes. Rainfed yield significantly influenced irrigated soybean yield ($p < 0.05$) in both years, while GPR showed no significant effect in either year, and ECa was only significant in the first year. Clustering based on rainfed yield achieved the highest performance (silhouette score = 0.7), identifying two MZs. In the first MZ, characterized by more sandy soils, early irrigation (R1) at a higher rate (1.5 in/wk) increased soybean yield by 133% in the first year and 26% in the second year compared to rainfed conditions. In contrast, the second MZ, with more silt loam soils, showed reduced irrigation benefits: an 18% yield increase in the first year and no increase in the second year. These findings demonstrate that limited rainfed yield data can effectively delineate MZs and guide tailored irrigation strategies to improve soybean productivity while addressing field spatial variability.

Subject: Water Resource Assessment and Management