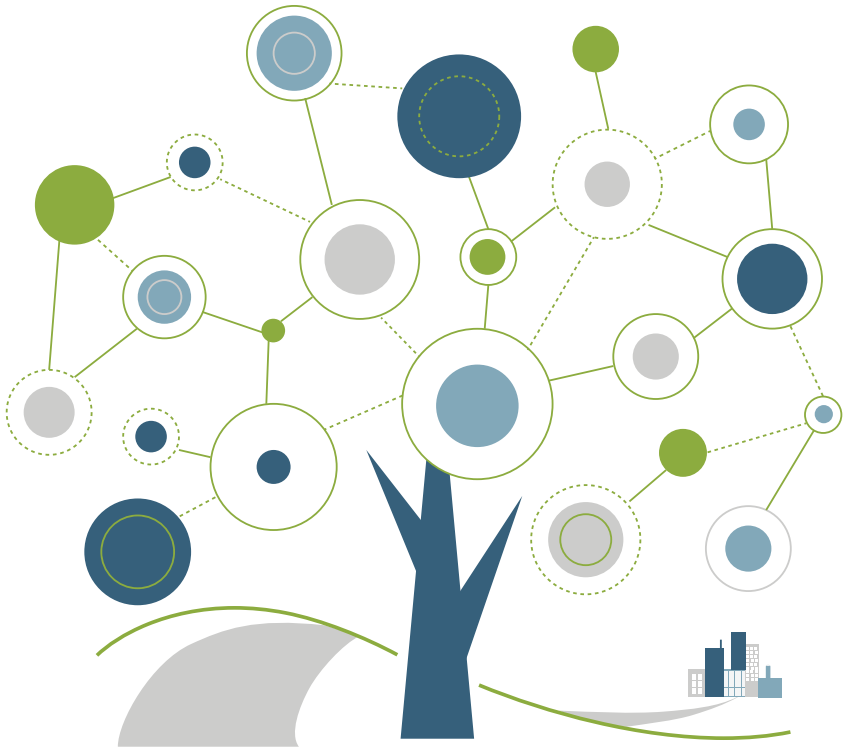

CONSERVATION CONNECTIONS

Creating Pathways to Sustainability

SWCS 72nd International Annual Conference

ABSTRACT BOOK

Presented by

SOIL AND WATER CONSERVATION SOCIETY

July 30 – August 2, 2017

Monona Terrace Convention Center

Madison, Wisconsin

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CONSERVATION CONNECTIONS

Creating Pathways to Sustainability

SYMPOSIA PRESENTATIONS

SOIL AND WATER CONSERVATION SOCIETY®

Monday, July 31
Symposia Session Descriptions and Agendas

Development of the Runoff Risk Advisory Forecast 10:30 a.m. – 12:00 p.m., Hall of Ideas E
Moderator: Mark Jenks, Wisconsin Department of Agriculture, Trade, and Consumer Protection

Concerns about nutrient loadings leading to algal blooms and hypoxic zones in the Great Lakes and the Gulf of Mexico have increased the interest in tools that facilitate achievement of nutrient reduction goals, especially in agricultural settings. Edge-of-field data collected in Wisconsin have demonstrated that the timing of nutrient applications on farm fields can have a significant influence on nutrient loading to streams. This presentation will examine the development of Wisconsin's Runoff Risk Advisory Forecast (RRAF), which was created as a decision support tool to help farmers and nutrient applicators decide if "today is a good day to spread."

The first generation RRAF used hydrologic model output provided by the National Weather Service North Central River Forecast Center to assess the risk of runoff in over 200 watershed basins with an average area of 301 square miles. Model output examines forecast precipitation, temperature, soil moisture content, snow accumulation, and individual basin characteristics. The results are displayed on a website that is updated multiple times daily and provides the ability to examine risk levels 5 to 10 days out, depending on the season. Wisconsin is preparing to launch the second generation of the RRAF which significantly reduces the scale of the model from the 301 square mile basins down to a 4 kilometer x 4 kilometer grid forecast area, bringing the model and its forecasts a little "closer to home" for our users. An eventual Phase 3 will explore the use of a national water model to generate output needed for the forecasting tools. Other Great Lakes states with similar water quality concerns have expressed interest in expanding the RRAF for use in their own states.

Does the RRAF have an influence on nutrient application decisions? The session will cover our strategy and initial data collected on the social science evaluation of the use of the RRAF, including where future examinations of this important question are headed.

Presentation 1: Background on the Development of the RRAF in Wisconsin – *Sara Walling, Wisconsin Department of Agriculture, Trade, and Consumer Protection*

Presentation 2: Edge-of-Field Data in Wisconsin: How Data Are Used to Demonstrate Need for and Validation of a Runoff Risk Advisory Tool – *Todd Stuntebeck, US Geological Survey*

Presentation 3: Technical Discussion: How the Model Works, What Information Is Provided from National Weather Service Forecast Models, and How the Models Are Validated – *Dustin Goering, National Weather Service North Central River Forecast Center*

Presentation 4: Evaluating the Wisconsin RRAF: Past, Present, and Future – *Amber Saylor Mase, University of Wisconsin Extension*

Presentation 5: Challenges Discovered in the Use of a Runoff Risk Advisory Tool and Where Things Are Likely to Head in the Future – *Mark Jenks, Wisconsin Department of Agriculture, Trade, and Consumer Protection*

Demonstration Farm Networks: Conservation Partnerships and Information Transfer
10:30 a.m. – 12:00 p.m., Hall of Ideas F
Moderator: Aaron Heilers, Blanchard River Demonstration Farms

Utilizing funding made available from the US Environmental Protection Agency through the Great Lakes Restoration Initiative (GLRI), the USDA Natural Resources Conservation Service entered into partnership agreements with the Great Lakes Commission to establish a Demonstration Farm Network in Wisconsin and with the Ohio Farm Bureau Federation to establish a Demonstration Farm Network in Ohio. The purpose of the farms is to demonstrate the best leading-edge conservation practices to reduce phosphorus and sediment entering Green Bay on Lake Michigan and Maumee Bay on Lake Erie. The networks will publicly highlight the most effective conservation systems for these areas. Utilizing the right combination of traditional conservation practices and new technologies, the networks will be able to produce viable, sustainable economic and environmental results. The challenges and benefits encountered in establishing the conservation partnerships needed to develop the demonstration farm networks and information dissemination strategies will be highlighted during this symposium. Attendees will have the opportunity to provide input through focused discussion, and compiled comments will be made available after the conclusion of the meeting.

Presentation 1: Conservation Partnerships

Presentation 2: Farm to Basin Information Transfer

Helping Farmers Adapt to Extreme Weather and Variable Climate
10:30 a.m. – 12:00 p.m., Hall of Ideas G
Moderator: *Dan Dostie, USDA-NRCS*

Extreme weather and other impacts from a variable climate have already occurred and are expected to continue increasing challenges for agriculture and natural resource stewardship on the farm and surrounding regions. To help educators, conservationists, and agricultural producers address these challenges, USDA's Climate Hubs released the report "Adaptation Resources for Agriculture, Responding to Climate Variability and Change in the Midwest and Northeast" in October of 2016. Resources released include an Adaptation Workbook, a regional menu of Adaptation Strategies and Approaches, and four On-farm Examples. Presenters will share how the materials were developed and engage the audience in a sped up version of using them. The Adaptation Workbook is modeled after one developed by the US Forest Service, while Adaptation Strategies and Approaches emerged from literature review by scientists, specialists, and producers. Conservation professionals and producers tested concepts and translated them into practical information including lists of example adaptation tactics and four examples of using the workbook for farming systems in the region. We conclude that these resources help agricultural producers make climate-informed decisions necessary to achieve production, profit, and stewardship outcomes. The workshop method used to deliver these new resources engages participants in understanding a complex controversial topic and successfully applying adaptation concepts. The USDA report serves as a template for all other regions of the United States to summarize potential climate effects, organize contingent adaptation responses, and develop examples of applying the workbook framework.

Integrating Perennial and Cover Crops into Annual Crop Systems for Multiple Benefits
1:30 a.m. – 3:00 p.m., Hall of Ideas E
Moderator: *Gregory McIsaac, University of Illinois*

Soil and water degradation associated with agricultural production largely and ultimately stems from converting perennial prairie, wetland, savannah, and forest communities to annual row crops. Reduction of soil cover, shorter growing seasons, and smaller root systems of annual crops often lead to loss of soil and organic matter, release of greenhouse gases, and emission of soil nutrients to both surface and groundwater. While there are many available BMPs, such as nutrient management and conservation tillage, that can reduce negative impacts of annual row crop production, perennial crops and cover crops often produce multiple benefits because of similarities to the perennial vegetation that shaped and protected soils. In this session, speakers will present information on the (1) history and scale of land conversion from perennial vegetation to annual row crops, (2) benefits and opportunities of incorporating perennial and cover crops into annual row crop systems, and (3) ways to overcome barriers to adoption.

Presentation 1: Introductory Comments Outlining the Scale of Land Conversion to Row Crops, the Resulting Problems, and Recent Research on the Benefits of Perennial Crops – *Gregory McIsaac, University of Illinois*

Presentation 2: Effects of Increased Crop Rotation Diversity in Iowa on Weed Control, Aquatic Toxicity, and Economics – *Matt Liebman, Iowa State University*

Presentation 3: Multifunctional Landscapes: Site Characterization, Field-Scale Design, Watershed Outcomes, and Economics of Incorporating Biomass Production into an Agricultural System – *Cristina Negri, Argonne National Laboratory*

Presentation 4: The Potential for Water Quality Benefits from a New Perennial Grain Crop: Intermediate Wheatgrass – *Jacob Jungers, University of Minnesota*

Presentation 5: Overcoming Barriers to Adoption by Expanding our Scale of Consideration: Examples from Crop Insurance and Conservation Programs – *Michelle Wander, University of Illinois at Urbana Champaign*

18th Annual SWCS-SSSA Joint Symposium: The Nutrient Uptake and Outcome Network (NUOnet)
1:30 p.m. – 3:00 p.m., Hall of Ideas F
Moderator: *Jeffrey Strock, University of Minnesota*

The 18th Annual Joint Soil and Water Conservation Society–Soil Science Society of America (SWCS-SSSA) Symposium will be held at the 2017 SWCS annual meeting in Madison, Wisconsin, and at the 2017 SSSA annual meeting in Tampa, Florida. Previous joint symposia have been very successful and contributed to the development of special issues, research editorials, features, books, and/or other significant technology transfer efforts. The title of the 18th joint SWCS-SSSA symposium is "The Nutrient Uptake and Outcome network (NUOnet)." The topic of conservation databases is of very high interest to members of the SWCS and SSSA, and it is important for maintaining food security. Developing a national nutrient management database network and other related databases is a programmatic goal of the USDA Agricultural Research Service. This symposium is occurring at a key time when both societies are considering how to handle publication of databases in journal articles, as well as looking for other potential ways for scientists to publish their databases. Reduction of off-site transport of nutrients from agricultural landscapes via atmospheric, surface, and/or leaching pathways for nutrient loss is a great challenge. Implementing a nutrient management database network to facilitate data archiving and retrieval at a national level will increase the availability of information to users, will contribute to team efforts to evaluate the potential positive impacts of best management practices, and will be useful to users interested in calibrating and validating new tools and software systems. Additionally, NUOnet could facilitate identifying the connections between nutrient management and other key areas such as soil biology and health, and human and animal health. This joint symposium will continue the tradition of cooperation between these professional societies and help bring together scientists, conservation practitioners, and other national and international cooperators.

Presentation 1: Data Stewardship Perspectives from the Crop Nutrition Industry – *Tom Bruulsema, International Plant Nutrition Institute*

Presentation 2: Critical Infrastructure to Promote Data Synthesis into Evidence-Based Nutrient Management – *Sylvie M. Brouder, Purdue University*

Presentation 3: Toward a Sustainable Future Food System: The Need for Integrated Data across Multiple and Diverse Disciplines – *John Finley, USDA-ARS*

Presentation 4: The Potential of the Nutrient Uptake and Outcome Network (NUOnet) to Contribute to Soil and Water Conservation – *Jorge A. Delgado, USDA-ARS*

Metz Lateral Conservation Project: How 15 Local, State, Federal, Nonprofit, Corporate, Agriculture, and Private Contributors Collaborated to Reconstruct a Stream to the Benefit of Both Agricultural Production and Conservation
1:30 p.m. – 3:00 p.m., Hall of Ideas G
Moderator: *Carrie Parmenter, Posey County SWCD*

Creating a stream that satisfies the needs of agricultural production, conservation, and drainage is a challenge that soil and water conservationists have been fighting for decades. One of the biggest challenges is getting all the partners to agree on an appropriate approach and securing funding for the project.

This presentation will focus on how the local soil and water conservation districts partnered with Clean Water Indiana, Lake and River Enhancement, the Indiana Department of Environmental Management, The Nature Conservancy, USDA Natural Resources Conservation Service, Posey County Drainage Board, Posey County Surveyor, landowners, farmers, construction contractors, and Vectren Energy to secure funding and create a stable stream system that addresses the needs of the partners. The presenters will discuss successful alliances and difficulties that were faced in coordinating a project of this magnitude while working with a diverse group of private and public partners.

Even though all partners agreed that the ditch needed to be stabilized, there were varying opinions on the proper method. In the end, the two-stage ditch design was selected as the appropriate design to address multiple resource concerns simultaneously. Choosing a location was another hurdle when dealing with differing priorities. Metz Lateral was targeted due to the water quality impairments. It is also a legal drain and is close to a roadway, giving the area high visibility for outreach purposes. After the location and design were agreed upon, the original partnership encountered difficulties when the design team concluded that the depth at the mouth of the lateral and head cutting could jeopardize the integrity of the two-stage ditch. To address this complication, new partners were brought in and the project expanded to provide a comprehensive solution for the entire lateral instead of just installing a two-stage ditch.
The final product is a conservation showcase that demonstrates how agriculture and conservation can coexist when lasting partnerships are established.

Presentation 1: The Whys and Hows of the Metz Lateral Conservation Project – *Carrie Parmenter, Posey County SWCD*

Presentation 2: The Two-Stage Ditch Design – *Scott Wagner, USDA-NRCS*

Presentation 3: The Function and Positive Impacts of the Two-Stage Ditch – *Brad Smith, The Nature Conservancy*

Update on the Agricultural Conservation Planning Framework: New Tools, Training Resources, and Watershed Engagement Efforts
3:30 p.m. – 5:00 p.m., Hall of Ideas E
Moderator: Mark Tomer, USDA-ARS

Efforts to improve water quality outcomes for agriculture have recently focused on small (HUC12) watersheds. The Agricultural Conservation Planning Framework (ACPF) provides a set of precision conservation planning tools designed to facilitate conservation planning in small watersheds through landowner participation. The conceptual planning approach first emphasizes practices that improve soil health on a watershed-wide basis, then provides multiple choices for placing a variety of structural and vegetative practices that control, trap, and treat water flows within and below fields on a site-specific basis. Riparian assessment and mapping tools are also included. The ACPF comprises an ArcGIS toolbox that identifies options for conservation practice placements by applying topographic, hydrologic, soils, and land use criteria to customized high resolution databases, now available for >7,000 HUC12 watersheds in the Midwest. The results provide a menu of conservation options, allowing local farm producers the discretion to select preferred practices and locations, and providing information to help identify key riparian management opportunities in a watershed. The ACPF toolbox has been applied in watershed planning efforts in five states. Further information can be found at www.northcentralwater.org/acpf. This symposium will provide an update on new tools, training resources being developed (Panel 1), present watershed case studies (Panel 2), and conclude with a summary of lessons learned through interviews with conservation planners and producers who are applying ACPF results in watershed planning.

Presentation 1: ACPF Updates – *Mark Tomer, USDA-ARS; Ann Lewandowski, University of Minnesota; Lyn Kirschner, USDA-NRCS*

Presentation 2: Watershed Case Studies – *John Sloan, Great Rivers Research and Education Center; Karl Gesch, Iowa Soybean Association; Joe Magner, University of Minnesota; Jessica Nelson, Minnesota State University*

Presentation 3: Synthesis and Lessons Learned – *Pranay Ranjan, Purdue University*

Landscape Conservation Cooperatives (LCCs) Facilitate Networks for Large-Scale, Multisector Conservation Planning
3:30 p.m. – 5:00 p.m., Hall of Ideas F
Moderator: Gwen White, Tallgrass Prairie LCC

The Landscape Conservation Cooperatives (LCCs) are 22 stakeholder-driven, regional networks that convene partners, develop tools, and provide integrated science-based information about the implications of climate and other stressors for the long-term sustainability of natural and cultural resources. Stakeholders jointly develop shared, landscape-level conservation objectives and inform strategies based on a shared scientific understanding. Processes and tools facilitate the exchange of applied science to guide and coordinate implementation and evaluation of effective, large-scale conservation strategies that meet shared objectives. For large conservation collaborations involving multiple regions, the LCC Network coordinates strategic design and investment of conservation actions across the continent and into seascapes along the coasts. Examples of landscape-scale conservation planning and implementation processes and tools will include the following: assessing how habitat conservation, habitat restoration, and agricultural landscapes can interact to maintain and enhance water resources in the desert Southwest; spatial design of key agricultural conservation practices for wildlife, bioenergy, and water quality in the Mississippi Basin/Gulf Hypoxia Initiative; tools for planning aquatic connectivity and coastal wetlands in eastern Michigan and western Lake Erie; increasing connectivity for wildlife dispersal and aquatic integrity in productive agricultural working lands across large geographies in the northwest states and southwest Canada; grassland restoration tools and drylands farming in Texas and Oklahoma; habitat-based conservation planning for the lower Mississippi region; and a multistate Southeast Conservation Adaptation Strategy. The session will solicit interactive feedback from the audience to provide direction for refining tools and identifying additional needs for research and management of conservation planning across large landscapes.

Presentation 1: Ecosystem Services as Part of the Southeast Conservation Adaptation Strategy – *Cynthia Kallio Edwards, Wildlife Management Institute*

Presentation 2: Science and Decision-Making Tools to Maintain Water Resources for Multiple Benefits in Irrigated Arid Landscapes – *Matthew R. Grabau, Desert Landscape Conservation Cooperative*

Presentation 3: Habitat-Based Conservation Planning in the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative – *Todd Jones-Farrand, Gulf Coastal Plains and Ozarks LCC*

Presentation 4: Mississippi Basin/Gulf Hypoxia Initiative: Precision Conservation Blueprint v1.5 – *Gwen White, Tallgrass Prairie Landscape Conservation Cooperative*

A Tool and Recognition for Resource Stewardship
3:30 p.m. – 5:00 p.m., Hall of Ideas G
Moderator: Bill Berry, NACD
Presenters: Angela Biggs, USDA-NRCS; Aaron Lauster, USDA-NRCS; Martin Adkins, USDA-NRCS; Whitney Forman-Cook, NACD

USDA Natural Resources Conservation Service (NRCS) has introduced the Resource Stewardship Evaluation Tool nationally in 2017. The voluntary conservation planning tool helps producers assess their stewardship of air quality, water quality and quantity, soil health, and wildlife habitat and develop plans to reach stewardship thresholds for these natural resources concerns. NRCS and the National Association of Conservation Districts (NACD) are cooperating in efforts to promote this new tool and provide recognition for farmers and ranchers who use it. This symposium will provide updates on new uses for the tool and share information about recognition programs and private sector engagement. It will also focus on how the tool is part of the larger effort to revitalize and equip the 21st century conservation planning process.

Tuesday, August 1
Symposia Session Descriptions and Agendas

Conservation in the Next Farm Bill: Overview and Opportunities for Change
10:30 a.m. – 12:00 p.m., Hall of Ideas E
Presenters: Alyssa Charney, National Sustainable Agriculture Coalition; Sanaz Arjomand, American Farmland Trust

Since the first farm bills of the 1930s, conservation has been a major component of American federal agricultural policy. Every five years, the farm bill expires and is updated—proposed, debated, and passed by Congress, and then signed into law by the President; this presents both the opportunity to strengthen conservation programs and the challenge of protecting existing conservation gains. The current farm bill, The Agricultural Act of 2014, was signed into law in February of 2014 and is set to expire in September of 2018. There will be significant opportunities over the course of the next year to weigh in and influence the fate of the next farm bill, and thus now is the time to be informed and engaged regarding opportunities for sustainable agriculture policy.
This session will build on the preceding farm bill plenary session, beginning with a brief overview and focusing for the majority of the time on a more granular, programmatic level. In the overview, presenters from the National Sustainable Agriculture Coalition (NSAC) and American Farmland Trust (AFT) will give their reading of the political landscape and anticipated farm bill timeline, as well as an overview of the budget process and budget implications and debates presented by the farm bill. Specific topics to be addressed by experts on the panel include the following: working lands conservation (including the Environmental Quality Incentives Program and the Conservation Stewardship Program), easement programs (including the Agricultural Conservation Easement Program), partnership programs (including the Regional Conservation Partnership Program), links between conservation and crop insurance, and organic agriculture. Program implementers will also be present to help with the question and answer portion of the session.

Measuring Nonpoint Source Nutrient Reductions to the Mississippi River
10:30 a.m. – 12:00 p.m., Hall of Ideas F
Moderator: Katie Flahive, US Environmental Protection Agency

The Mississippi River/Gulf of Mexico Hypoxia Task Force (HTF) is a collaboration of 5 federal agencies, 12 state agricultural and environmental agencies, and the National Tribal Water Council. The HTF develops and implements workable solutions to reduce nutrient input into the Mississippi and Atchafalaya River Basin (MARB) and the hypoxic zone in the northern Gulf of Mexico. The HTF has a challenging goal of 20% nutrient reduction by 2025 and 45% nutrient reduction by 2035 to reduce the size of the hypoxic zone to less than 5,000 square kilometers. States implement unique nutrient reduction strategies while federal agencies provide support through financial, technical, and other measures. Collaboration with diverse stakeholders and partners in the MARB is key to achieving the HTF goals.

These partnerships drive progress on several fronts, including measuring point source nutrient reduction progress. Nonpoint source (NPS) metrics are complex because of the scale and scope of NPS pollution in the MARB and disparate data sources. Thus, in 2016, the HTF developed a private-public partnership consisting of the HTF, pilot states, SERA-46 (multistate research and extension committee of 12 land grant universities), and a private foundation to support the development of NPS measures. Each entity has a stake in the success of the collaboration and project outcomes, as they all have shared or similar goals for nutrients in the MARB. The HTF is distinctly interested in working with private entities, including agricultural industry and nongovernmental organizations to ensure that reductions across the HTF states are accounted for collectively in the MARB.

This symposium will explore the role of this public-private partnership in a large scale environmental challenge, as well as the potential of new partners to engage in current efforts. It will introduce the key players in the partnership, discuss roles in the group, identify the objectives of the collaboration, and identify opportunities to symposium participants for their involvement.

Presentation 1: Overview of Partnership, Mississippi River Basin Goals, and Tracking Progress – *Katie Flahive, US Environmental Protection Agency; Moira McDonald, Walton Family Foundation*

Presentation 2: State Perspective, Need for Nonpoint Source Reporting – *Matt Lechtenberg, Iowa Department of Agriculture and Land Stewardship; Julie Harrold, Indiana State Department of Agriculture*

Presentation 3: Development Team Perspective – *Laura Christianson, University of Illinois; Reid Christianson, University of Illinois*

Presentation 4: Future Involvement by Other Stakeholders – *Rebecca Power, University of Wisconsin; Amanda Gumbert, University of Kentucky*

Assessment in the Great Lakes: Informing More Effective Conservation and Management
10:30 a.m. – 12:00 p.m., Hall of Ideas G
Moderator: Lisa Duriancik, USDA-NRCS

Nutrient and sediment loading from agricultural landscapes and other sources has been highlighted as one of the drivers of harmful or nuisance algal blooms and hypoxia affecting the Great Lakes. In the Great Lakes region and elsewhere, there is strong interest in assessing the agricultural sources of nutrients and sediments and documenting the effects of conservation practices and programs on water quality and soil health. Related efforts focus on utilizing those insights to provide an adaptive management approach to conservation. Currently, there is a wide variety of on-going assessment in the Great Lakes region, including field work to collect data on both water quality and soil health as well as development of models that translate field results to the watershed or basin scale. Field work and sampling occur at several spatial and temporal scales: in-field soil health assessment to relate to water quality data; edge-of-field water quality monitoring; long-term, watershed-scale water quality monitoring and assessment; and longer-term, basin-wide modeling. Developing linkages across various scales in a more complementary and effective way remains a challenge, even in a region with extensive data, extensive coordination, and collaboration under efforts such as the Great Lakes Restoration Initiative, Great Lakes Water Quality Agreement and its Annexes, Collaborative Partnerships, etc. Presentations will highlight work being conducted in agricultural systems at multiple and increasing scales, the findings and conservation insights from the assessments, and how the work builds on related efforts.

Presentation 1: Insights on Conservation and Management from Edge-of-Field Research and Assessment in Ohio – *Kevin King, USDA-ARS*

Presentation 2: Lake Erie, Phosphorus, and Microcystin: Is it Really the Farmer's Fault? – *Douglas R. Smith, USDA-ARS*

Presentation 3: Dominant Mechanisms for Nutrient Delivery across Nested Headwater Watersheds in the Western Lake Erie Basin – *Mark Williams, USDA-ARS*

Presentation 4: Assessing Vulnerability of Lake Erie Landscapes to Soil Erosion: Modelled and Measured Approaches – *Natalie Feisthaurer, Agriculture and Agri-Food Canada*

Presentation 5: Thinking Outside the Lake: How Might Lake Erie Nutrient Management Efforts Benefit Streams? – *Scott Sowa, The Nature Conservancy*

Presentation 6: Linking Field and Watershed Processes in the SWAT Model for the Next Conservation Effects Assessment Project (CEAP) National Cropland Assessment – *Jeff Arnold, USDA-ARS*

Meta-Review of Barriers and Motivations for Farmers to Adopt Conservation Practices
1:30 p.m. – 3:00 p.m., Hall of Ideas E
Moderator: Linda Prokopy, Purdue University

This symposium will present results from an ongoing review and meta-analysis of 35 years (1982 to 2017) of quantitative and qualitative social science research papers that have examined motivations of and barriers to adoption of soil and water conservation best management practices (BMPs) in US agriculture. The proposed study will update and greatly expand on previous work that has reviewed BMP adoption. This meta-analysis (1) reviews all appropriate studies published during the timeframe, (2) accommodates a number of advances in this field of study such as the growth of qualitative research with farmers, and (3) focuses on both barriers to and motivations for adoption.

All US studies found in the peer-reviewed literature, theses/dissertations, and grey literature since the early 1980s were reviewed for potential inclusion in this meta-analysis and review. Papers were identified through database literature searches and snowball sampling from the reference sections of each reviewed paper. The project investigators employed vote-count meta-analysis methods to identify patterns and trends in the literature.

The speakers will very briefly discuss the study's methodology and then spend the rest of the panel discussion presenting study findings and discussing implications for conservation outreach and education. In addition to the study authors, experts in the conservation field will participate in the panel to help discuss implications of this landmark study.

Presentation 1: Thirty-Five Years of Conservation Adoption Studies: What Have We Learned? – *Linda Prokopy, Purdue University*

Presentation 2: Generating 10,000+ Rows of Data! – *Kristin Floress, US Forest Service*

Presentation 3: Making Sense of 10,000+ Rows of Data – *J. Arbuckle, Iowa State University*

Presentation 4: Barriers to Conservation Adoption: Evidence from Qualitative Research – *Sarah Church, Purdue University; Pranay Ranjan, Purdue University*

Presentation 5: What Does this Mean for Technology Transfer? – *Linda Prokopy, Purdue University*

Presentation 6: Agency and NGO Perspectives – *Jimmy Bramblett, USDA-NRCS; Katie Flahive, US Environmental Protection Agency; Moira McDonald, Walton Family Foundation*

Presentation 7: Next Steps – *Kristin Floress, US Forest Service*

Soil Health Management Systems: Examples from across the United States
1:30 p.m. – 3:00 p.m., Hall of Ideas F
Moderator: Jennifer Kucera, USDA-NRCS

Soil health management systems (SHMS) are developed and implemented to improve soil function and thereby increase the agronomic, economic, and environmental sustainability of working lands. The USDA Natural Resources Conservation Service is promoting four soil health improving principles. The principles, which should be adjusted to meet regional variability and cropping system needs, are to (1) minimize disturbance, (2) maximize soil cover, (3) maximize diversity, and (4) maximize the presence of living roots throughout the year. Soil health management systems seek to achieve the principles through a combination of practices that optimize the diversity and functioning of soil organisms. Healthy soil ecosystems improve overall soil function because of the influence the diversity of organisms have on the creation of soil organic matter and stable aggregates, improved water infiltration, increased water-holding capacity and internal nutrient cycling, and by promoting plant community resilience. Although implementing a single management practice may slow soil degradation, optimization of soil function and its benefits is best achieved through the synergistic impacts of multiple practices that target the four principles. This symposium will provide examples of successful SHMS across the United States under a variety of soil and climate conditions. Topics will include soil health management systems for row crops, adaptive nutrient management, grazing management, and specialty crops.

Presentation 1: Building a Soil Health Management System for Row Crops – *Barry Fisher,* USDA-NRCS

Presentation 2: Utilizing Cover Crops to Improve Nutrient Management and Soil Health – *Jim Hoorman, USDA-NRCS*

Presentation 3: Regenerating Soil Health with High Density, Short Duration Grazing – *Justin Morris, USDA-NRCS*

Presentation 4: Implementation of Soil Health Principles for Organic Farming Systems – *Z. Kabir, USDA-NRCS*

Partner-Ships Can Sail
1:30 p.m. – 3:00 p.m., Hall of Ideas G

Moderator: Carrie Vollmer-Sanders, The Nature Conservancy
Presenters: Leslie Fisher, Benton County Indiana SWCD; Sally Flis, The Fertilizer Institute; Peyton Harper, The Fertilizer Institute; Kris Johnson, The Nature Conservancy

It has been said that "Partner-ships are the only ships that don't sail." There are many partnerships in agriculture and conservation that can disprove this myth.

During this session, learn how nature's soil and water connection brings partners together to advance science, test solutions, and move solutions to a scale that can impact the Great Lakes or Gulf of Mexico. Not all partnerships are built on a strong foundation. When growing food, soil and water are the foundation. It is the connection with soil, water, and nutrients that has brought The Fertilizer Institute, The Nature Conservancy, government agencies, and agribusinesses together to ensure we are producing food responsibly.

During this session you will learn about the soil and water connection and how we can influence nutrients staying in the soil to grow crops. This information has informed the models and outreach materials about how we can reach our water quality goals. Reducing fertilizer rate is not the only way to decrease offsite loss of nutrients, even though this might be the easiest way to model an improvement to water quality.

Expanding partnerships to include government agencies to increase the adoption of conservation and agronomic practices is happening in Indiana. You'll learn how this public-private partnership is beginning to work together to transform a watershed. This type of partnership can be replicated all over. Learn how this and other partnerships began and are prospering.

The National Water Quality Initiative: Partnerships, Monitoring, and Measuring Success
3:30 p.m. – 5:00 p.m., Hall of Ideas E
Moderator: James Kilgo, US Environmental Protection Agency

In 2012, the USDA Natural Resources Conservation Service (NRCS) launched the National Water Quality Initiative (NWQI), in collaboration with the US Environmental Protection Agency and state water quality agencies, to increase voluntary conservation practices in small, high-priority watersheds. Watersheds are selected by NRCS state conservationists in consultation with state water quality agencies and NRCS state technical committees. Currently, 197 NWQI watersheds receive NRCS-dedicated financial assistance from the Environmental Quality Incentives Program (EQIP).

NWQI accelerates voluntary, private lands conservation investments to improve water quality through a targeted approach, focusing on conservation systems with the greatest benefit. Analyses show a four-fold increase of acres treated with core water quality practices with NWQI compared to EQIP alone. Average annual funding for conservation practices increased more than 200% in watersheds with NWQI, and twice as many producers were provided assistance in NWQI watersheds.

NWQI promotes greater coordination between states, NRCS, and others managing nonpoint sources. Feedback indicates roughly 60% of states reported improving partnerships as a result of the NWQI; 45% reported that work done will lead to collaboration beyond NWQI watersheds.

States also assess progress through in-stream monitoring in a subset of NWQI watersheds using Clean Water Act Section 319 or other funds to determine if conditions related to nutrients, sediments, or livestock-related pathogens changed in the watershed, and whether changes can be attributed to conservation systems.

The session will open with an overview of the program and transition into a local case study, utilizing reporting metrics to highlight the overall success. The audience can interact with panelists to gain a better understanding of NWQI and learn how important partnership building and monitoring are to overall success of current and future projects.

Presentation 1: An Overview of the NWQI – *Erica Larsen, US Environmental Protection Agency*

Presentation 2: The NWQI from the State's Perspective – *Matt Otto, USDA-NRCS; Corinne Johnson, Wisconsin Department of Natural Resources*

Presentation 3: Highlighting the Successes, Challenges and Lessons Learned through Collaborative Work in a 12-Digit HUC, NWQI Watershed – Big Green Lake (040302010902) – *Charlie Marks, Green Lake Sanitary District; Stephanie Prellwitz, Green Lake Association; Paul Gunderson, Green Lake County Land Conservation Department; Caleb Zahn, USDA-NRCS*

Public–Privative Conservation Partnerships Promote Conservation in Arkansas that Empower Environmental Stewardship among the Agricultural Community: Fostering Success and Overcoming Challenges
3:30 p.m. – 5:00 p.m., Hall of Ideas F
Moderator: Teri Nehls, USDA-NRCS

The strengths and benefits of establishing strong partnerships for conservation in Arkansas is recognized by federal, state, and local agencies; university and research institutions; and nonprofit organizations within the state. The diversity of these conservation partnerships compliments the mission of each organization while strengthening the group as a whole. Emphasizing the importance of conservation and reducing impacts on natural resources is uniquely supported by each partner through financial assistance, technical expertise, and labor. Arkansas's uniquely diverse agricultural landscape is comprised of row crops (soybeans, corn, cotton, rice, and specialty crops) and extensive poultry and livestock production; it is critical to the state's economic well-being, while its role in ecosystem resilience has gained attention in the recent decade. Arkansas has an extensive surface water system that drains into the Mississippi River about 700 miles north of the Gulf of Mexico. Thus, a goal of Arkansas's conservation partnerships includes protection of the state's natural resources and agricultural viability, concurrent with reduction of the gulf's hypoxic zone. Arkansas is a leader in conservation and partnership programs with the greatest amount of Mississippi River Basin Initiative acreage and edge-of-field monitoring. The state is also one of the main areas for the Wetland Reserve Program and is highly competitive for Conservation Innovation Grants. Although Arkansas has unique characteristics, including underserved agricultural producers, the state's successes and experiences in conservation partnerships are an example for others to increase the extent of successful conservation. This symposium will describe the breadth and depth of conservation partnerships that were established over the last decade, present case studies of conservation implementation, detail how innovative outreach programs were used to promote science-based solutions, and discuss how challenges were addressed.

Presentation 1: Overview of Edge of Field Water Quality Monitoring Partnerships in Arkansas – *Brittany Singleton, University of Arkansas*

Presentation 2: Is It About the Credit or the Success? – *Debbie Moreland, Arkansas Association of Conservation Districts*

Presentation 3: No One Can Do It Alone: The Role of NRCS in Working with Partners to Increase the Awareness and Benefits of Implementing Conservation on Agricultural Operations – *Teri Nehls, USDA-NRCS*

Presentation 4: Partnerships Empower the Arkansas Discovery Farm Program – *Mike Daniels, University of Arkansas*

Presentation 5: Translating Discovery Farm Discoveries to Stakeholders – *Andrew Sharpley, University of Arkansas*

Presentation 6: Partnering with Producers as Research Collaborators – *Michele Reba, USDA-ARS*

Presentation 7: From the Field to the Spreadsheet: Laboratory Analyses and Quality Control – *Jennifer Bouldin, Arkansas State University Ecotoxicology Research Facility*

Transitioning to a Landscape Perspective in Agriculture: Implications for Policy, Farmers, Soil Health, and Water Quality
3:30 p.m. – 5:00 p.m., Hall of Ideas G
Moderator: John Wiener, University of Colorado
Presenters: Gary Bentrup, USDA/US Forest Service Agroforestry Center; Gretchen Sassenrath, Kansas State University; Richard Cruse, Iowa State University; Dennis Todey, USDA Midwest Climate Hub

Neighbors and collaborators across multiple farms and interlocking sets of agricultural enterprises (e.g., sequenced production, ranching, and irrigated farming; dairy and feed and waste management) may have greater opportunity than ever to cooperate. The economic risks shown in 2012 and in 2016 were averted by cost coverage. But farmer and landowner goals of family succession and stewardship have too often been frustrated.

Literally from the ground up, soil conservation and restoration are the starting point for safely moving away from the increasing risks of commodity monocultures in the industrial style. The risks to soil from weather extremes and changes are sharply increasing. Fortunately, increasingly solid knowledge demonstrates the potential for improved long-term economic and agricultural resilience, with diversified and strategic farming systems, incorporating risk management in transition. As market and political volatility increase along with weather extremes and variability, now is the time for considering the role of landscape scales and interlocking collaborative enterprises. The panel will set the stage and then discuss the social and policy responses available, with each other and the audience.

This panel brings extraordinary expertise to bear, in soils and agronomy, weather and climate impacts and information, farming systems and plant physiology, and agricultural innovation and adoption, in short talking points and then discussion and interaction with the SWCS audience on questions including (1) stimulating progress toward conserving soils and farmers (and the practices in between); (2) averting further destruction of the productive capacity; (3) recapturing the stability of diversified farming systems; (4) safely organizing more efficient use of landscapes and functional farming areas; and (5) making economic transition away from high-input and high-leakage systems.

Wednesday, August 2
Symposia Session Descriptions and Agendas

Leadership for Midwestern Watersheds: Applying Lessons Learned to Effect Landscape-Scale Change
8:30 a.m. – 10:00 a.m., Hall of Ideas E
Moderator: Craig Ficenec, Sand County Foundation

Since 2011, Leadership for Midwestern Watersheds (LMW) has hosted seven events bringing together watershed project directors and other stakeholders to compare notes and share lessons learned about watershed projects. The range of projects is diverse, but all are in agriculturally dominated watersheds where nutrient and sediment loading is a primary concern. LMW strives to develop a "community of practice"—a group of conservation practitioners who know how to improve water quality through projects applied at a watershed scale. LMW meetings focus on specific subjects essential to successful watershed projects, such as engaging farmers, focusing resources for greatest impact, measuring results, and scaling up lessons learned.

In this symposium, we will profile three case studies of collaboration in specific watersheds of the Corn Belt. Each will describe how local practitioners are reaching across jurisdictions to leverage technical and financial resources that amplify their impact. Presentations will emphasize both successes and challenges in their attempts to build these alliances.

We will structure this symposium as a condensed version of a typical LMW event. In the interactive spirit of LMW meetings, concise presentations will be followed by actively facilitated discussions among all in attendance, with presenters joining separate breakout groups. Participants who are involved with watershed projects are expected to actively share their experiences, and all are encouraged to join the conversation.

The LMW program and this SWCS symposium are sponsored by Sand County Foundation, American Farmland Trust, Iowa Soybean Association, and the North Central Region Water Network.

Presentation 1: The Upper Macoupin Creek Watershed Partnership – *Kris Reynolds, American Farmland Trust*

Presentation 2: Yahara WINS: All Hands on Deck for Water Quality – *Dave Taylor, Madison Metropolitan Sewerage District (MMSD)*

Presentation 3: Urban-Ag Partnerships: Middle Cedar Partnership Project (MCPP) – *Todd Sutphin, Iowa Soybean Association*

Opening Acres to Conservation: Women Landowners and Producers
8:30 a.m. – 10:00 a.m., Hall of Ideas F
Moderator: Jean Eells, Women Food and Agriculture Network
Presenters: Jennifer Filipiak, American Farmland Trust; Rebecca Fletcher, USDA-NRCS

Evaluation results from a seven state national Conservation Innovation Grant projects show women to be excellent conservation partners when we adopt outreach methods they find interesting and appealing. The Women Caring for the Land[SM] methodology effectively helped women understand soil health concepts and motivated them to take an action to improve conservation on their land. Three state panelists will share what worked, what didn't, and how they're keeping the focus on conservation with women landowners whether the topic is soil health or wetlands or watersheds. Participants will interact with the methodology in this symposium.

New work emerging addresses women landowners living and working in large urban centers, who own rural land but are unlikely to attend a conservation meeting in a rural area. The next generation of women landowners is inheriting land they haven't been on in decades or is managing from a distance on behalf of elderly relatives, and is extremely difficult to reach this audience with conservation assistance. They face great challenges of understanding conservation options and accessing the services that match their needs. We will share our early experiences with this new project.

Women own or co-own a significant amount of land across the United States but have been left out of conservation outreach unintentionally. Because women tend to rent their land at higher rates, it's essential they understand how their decisions as a landowner can influence and support conservation efforts by their tenants. Many women's agriculture programs omit conservation topics, but we've honed a methodology that breaks through that barrier and gets positive results.

Increasing the Implementation of Conservation Practices through Farmer-Led Watershed Organizations
10:30 a.m. – 12:00 p.m., Hall of Ideas E
Moderator: Rachel Rushmann, Department of Agriculture, Trade and Consumer Protection (DATCP)

The challenge of getting farmers to implement soil and water conservation practices is taking a new direction in Wisconsin with the development of a new state-supported Producer-Led Watershed Protection Grant Program. The focus of the program is to provide state funding to producer-led organizations willing to lead conservation efforts in their watersheds. Producer-led groups have increased the use of conservation in the state by offering incentive programs to farmers to try new practices and by participating in research that provides site-specific information on the environmental and economic benefits of the various practices. These groups also provide farmer-to-farmer outreach and education by hosting field days, conferences, workshops and trainings.

Fourteen producer-led groups received funding from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) in 2016, and eleven producer-led groups were awarded 2017 funding. Producer-led groups vary by number and size of member farms, organizing structures, conservation goals and activities, and kinds of collaborations within their communities. The DATCP program manager and farmer group leaders will share experiences of four watershed groups, including each's goals and objectives, strategies, challenges and successes, and conservation impacts so far. The variety of these four groups will illustrate how the program's flexible design has generated widely differing approaches to conservation innovation, uses of technology, and community relationships, and how they can change over time.

Overall goals of the program include the development of a statewide farmer network where farmers can share innovative and effective conservation practices with other farmers throughout the state. Producer-led groups have proven thus far to be an effective approach at increasing the adoption of conservation practices in the state, in turn improving Wisconsin's soil and water quality.

Presentation 1: The Wisconsin Producer-Led Watershed Protection Grant Program – *Rachel Rushmann, DATCP*

Presentation 2: Achieving Success with Farmers in an Adaptive Management Watershed Program – *Jeff Endres, Yahara Pride Farms*

Presentation 3: Improving Surface and Groundwater Quality in a High Density Livestock Watershed – *Don Niles, Peninsula Pride Farms*

Presentation 4: Making Connections with Watershed End-Users and On-Farm Research – *Michael Dolan, Farmer-Led Watershed Group in Iowa County; Ken Schroeder, Farmers of the Mill Creek Watershed Council and University of Wisconsin-Extension*

Evaluating the Soil Vulnerability Index (SVI): An Index to Characterize Inherent Vulnerability of Croplands to Runoff and Leaching
10:30 a.m. – 12:00 p.m., Hall of Ideas F
Moderator: Sapana Lohani, University of Missouri

Soil erosion and nutrient loss from surface runoff and subsurface flows are critical problems for croplands in the United States. Assessing cropland vulnerability to runoff and leaching is needed for watershed or regional land use and land management planning and conservation resources allocation. The USDA Natural Resources Conservation Service proposed the Soil Vulnerability Index (SVI) to identify cropland that is inherently vulnerable to runoff and leaching. The SVI for runoff is derived using a combination of soil hydrologic group, slope, and K-factor (soil erodibility factor), while SVI for leaching uses all of these and whether the soil is classified as organic. The goal of this symposium is to share and discuss the results of SVI evaluation across different physiographic and hydrogeomorphic regions within the United States. Eleven Conservation Effects Assessment Project (CEAP) watersheds ranging from 6 to 1,048 km^2 were selected for the project. Results from SVI evaluation on each of these watersheds will be presented and follow-up discussion will be moderated. The symposium will be a 90-minute session. Thirteen 5-minute-long, flash-talk presentations are planned, one for each watershed, overall presentations of SVI, and statistical analysis of SVI spatial distribution and nutrient load data. The symposium is expected to discuss the potential use and limitations of SVI for categorizing soils based on inherent vulnerability to runoff and leaching. The audience can expect to learn about this simple index that can assist in identifying the most vulnerable areas, which may be in need of improved conservation and management efforts.

Presentation 1: General Introduction on Soil Vulnerability Index – *Lisa Duriancik, USDA-NRCS*

Presentation 2: Soil Vulnerability Index: How Does It Work? – *Claire Baffaut, USDA-ARS; Allen Thompson, University of Missouri-Columbia*

Presentation 3: Soil Vulnerability Index Assessment in Delta Water Management Research Center Watershed, Arkansas – *Niroj Aryal; Michele Reba, USDA-ARS*

Presentation 4: Soil Vulnerability Index Assessment in South Fork of the Iowa River Watershed and the Walnut Creek Watershed, Iowa – *Mark Tomer, USDA-ARS*

Presentation 5: Soil Vulnerability Index Assessment in Little River Experimental Watershed, Georgia – *David Bosch, USDA-ARS*

Presentation 6: Soil Vulnerability Index in Mark Twain Lake Watershed, Missouri: The Restrictive Layer Effect – *Claire Baffaut, USDA-ARS*

Presentation 7: Soil Vulnerability Index Assessment in Upper Big Walnut Creek Watershed, Ohio – *Kevin King, USDA-ARS*

Presentation 8: Application of SVI to a Historically Eroded Landscape – Goodwin Creek Watershed in Mississippi – *Ron Bingner, USDA-ARS*

Presentation 9: Soil Vulnerability Index Assessment in WE-38, Pennsylvania – *Peter Kleinman, USDA-ARS*

Presentation 10: Application of Soil Vulnerability Index to the Choptank River Watershed in Maryland – *Gregory McCarty, USDA-ARS*

Presentation 11: Soil Vulnerability Index Assessment in Beasley Lake Watershed, Mississippi – *Martin Locke, USDA-ARS; Lindsey Yasarer, USDA-ARS; Ron Bingner, USDA-ARS*

Presentation 12: Soil Vulnerability Index Assessment in Cedar Creek, Indiana – *Mark Williams, USDA-ARS*

Presentation 13: Comparing SVI Spatial Distribution with Nutrient Load Data in the Mark Twain Watershed in Missouri – *Sapana Lohani, University of Missouri-Columbia*

CONSERVATION CONNECTIONS

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ORAL PRESENTATIONS

SOIL AND WATER CONSERVATION SOCIETY®

An Assessment of Agroforestry's Role in Adapting Agriculture to Climate Change

Authors: Gary Bentrup*, USDA National Agroforestry Center; Michele Schoeneberger, USDA National Agroforestry Center; Toral Patel-Weynand, USDA U.S. Forest Service

Abstract: A scientific assessment was conducted to evaluate the potential for agroforestry to help adapt agriculture and agricultural lands to threats from climate variability and change. This recently released report entitled Agroforestry: Enhancing Resiliency in U.S. Agricultural Landscapes under Changing Conditions will provide technical input to the National Climate Assessment and can serve as a framework for using agroforestry as a climate-smart agricultural strategy in the U.S. The agroforestry assessment included participation from more than 50 scientific experts from the Forest Service, other federal and state agencies, research institutes, and universities across the U.S., as well as input by scientists from Canada and Mexico. Based on expert input and information gleaned from over 1000 citations, this document represents the first-ever synthesis on agroforestry as a mechanism to provide climate change mitigation and adaptation services. The report also evaluates the social, cultural, and economic aspects of agroforestry and the capacity of agroforestry systems to provide multipurpose solutions. In addition, the report presents eight U.S. regional overviews as well as international overviews from Canada and Mexico to provide a comprehensive North American perspective and understanding of agroforestry's strengths and limitations. This presentation will provide a summary of key findings and information gaps identified from this assessment. To illustrate real world activities and impacts, brief case studies of how agroforestry has reduced threats and enhanced resiliency will also be presented.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**denotes primary author and subject area*

Associated Barriers to Federal Conservation Programs on Indian Lands: Is There a Solution?

Authors: Michael Johnson*, University of Arizona; Laura Lopez-Hoffman, University of Arizona

Abstract: Since time immemorial the Hopi people of Northeastern Arizona have been using agriculture conservation techniques that predate western agriculture science. The Hopi Tribe's Office and Range Management and Individual Hopi ranchers and farmers attempted to participate in the USDA's NRCS Environmental Quality Incentives Program (EQIP). Unfortunately, out of the 49 EQIP contracts initially signed only 2 were completed. Our talk will outline some of the barriers associated with participating in federal conservation programs like EQIP and offer solutions and insights to problems associated with Indian tribes to successfully participate in EQIP. One example of a solution can be found in our "Hopi/NRCS Best Practices Manual" which I compare and contrast traditional Hopi agricultural conservation practices with those practices found in the NRCS Field Office Technical Guide. This is done in hopes that Hopi and other Indigenous tribes will have their traditional ecological knowledge verified in the field of conservation related to soil and water management and be recognized for techniques and conservation practices western science has been taking credit for less than 200 years.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**denotes primary author and subject area*

Conservation Tillage, a South African Perspective to Optimize Water Harvesting for Crop Production

Authors: Josias Hoffman*, Stellenbosch University

Abstract: Grain production in South Africa is practiced in two very different climatic zones. In the Western Cape, grain crops are produced in a winter rainfall area, while in the interior of South Africa, in a summer rainfall area. Conservation tillage practices are more commonly used in the winter rainfall area. This paper will discuss the possible reasons why these practices are not widely used in the summer rainfall area. Conservation tillage practices (minimum and no tillage) with different levels of soil disturbance, were carried out in the winter and summer rainfall areas to examine its effect on the soil water balance. Sites with a range of different soil textures were selected for the study. Wheat, canola and maize were grown in crop rotation. Grain, total dry matter yields, water use efficiency, rainfall use efficiency and rainfall storage efficiency were determined for each season. Results showed that the soil together with climate have the largest influence on yield. The rainfall storage efficiency of the different soils in the different areas had the highest effect on the yield and economics of the tillage practice. The level of soil disturbance between minimum tillage and no tillage did not have a significant effect on yield at the winter rainfall sites due to the occurrence of rainfall during the growing season. In the summer rainfall areas the effect of the level of soil disturbance on yield was significant. The soils of the interior are prone to compaction and this is why farmers do not practice no tillage but rather an adapted form of minimum tillage practice.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**denotes primary author and subject area*

Evaluating the Benefits of 'Biochar' on Soil Quality While Determining Its Effect on 'Soil Carbon Sequestration: A Pathway to Sustainability

Authors: Mohammad Golabi*, University of Guam

Abstract: The impact of soil erosion and sedimentation on the 'Soil Carbon' dynamics and soil carbon conversion into carbon dioxide (CO_2) and its emission into the atmosphere as a greenhouse gas is not adequately studied. Soil erosion can have a severe depletion effect on Soil Organic Carbon pool on eroded soils as compared with un-eroded soils. Soil erosion can also have a major impact on the global carbon cycle and must be considered while assessing the global 'C' budget in relation to the overall GHG emission into the atmosphere. In this regards, a considerable amount of carbon dioxide emissions can be prevented via land based management and by implementing carbon 'Sequestration' practices thus reducing the effect of carbon dioxide (CO_2) on climate change. Therefore, adoption of any conservation practices that retains the organic carbon in the soil hence reducing the risks of carbon loss into the atmosphere in the form of CO_2 emission must be considered seriously. Additionally, adoption of practices such as the application of 'Biochar' as a soil amendment that may effectively 'Sequester' the carbon in the soil biota must also be considered in order to reduce the amount of CO_2 coming off the soil upon soil surface disturbances. Toward these goals, we are evaluating the conservation tillage practices not only for soil erosion control but also for evaluating the effect of soil carbon storage (Carbon Sequestration) on these severely eroded soils of southern Guam. We are also evaluating the effect of 'Biochar' application not only as soil amendment but also for improving the carbon storage capacity of these soils as a soil carbon 'Sequestration' technique. In this presentation we will report the result of the conservation management including the land application of 'Biochar' on the dynamics of soil carbon content and the soil storage capacity under different conservation practices on these severely eroded soils of southern Guam.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**denotes primary author and subject area*

Exploration of the use of Enhanced Treatment Wetlands to Manage Both Dediment and Nutrients in Agricultural Runoff in Wisconsin

Authors: Nicole Van Helden*, The Nature Conservancy; Jeremy Freund, Outagamie County

Abstract: In this two-speaker oral presentation, Nicole Van Helden of The Nature Conservancy (TNC) will present the results of a report, based on a review of scientific literature and expert interviews, entitled the "Exploration of the Use of Treatment Wetlands as a Nutrient Management Strategy in Wisconsin." Treatment wetlands (i.e., man made wetland systems with a primary purpose of pollutant reduction) provide one strategy for nutrient management/reduction, but there remains a wide range of unanswered questions. Numerous variables influence the effectiveness of a treatment wetland to reduce phosphorus and nitrogen. Utilizing the best available recommendations from the report, Outagamie County, TNC, University of Wisconsin-Green Bay, and U.S. Geological Survey have designed, built and are monitoring a treatment wetland capturing surface and subsurface drainage from an agricultural field in northeast Wisconsin. A second treatment wetland will be constructed in 2017. Jeremy Freund from Outagamie County Land Conservation Department will briefly highlight the design, construction and initial monitoring of the first treatment wetland constructed and lessons learned to date.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**denotes primary author and subject area*

Soil and Yield Changes by Cover Crops on a Corn-Soy Bean Rotation

Authors: Clark Gantzer, University of Missouri; Ranjith Udawatta*, University of Missouri; Shibu Jose, University of Missouri

Abstract: Cover crops use for enhanced environmental and production benefits is expanding. The objective of this study was to quantify changes in soil carbon, nutrients, and crop yields on a corn-soybean rotation in North Central Missouri. The study was conducted at the Chariton Cover Crop Soil Health Farm, and consisted of cover crop (CC) and no-cover crop treatments established in 2012. Soil samples from the surface 15 cm were collected in 2013, 2015, and 2017 in a grid design and analyzed for soil carbon and nutrients. Crop yields were determined with a yield monitor. Soil organic carbon in the CC treatment increased from 2.3% in 2013 to 3.6% in 2017. Soil organic carbon did not change in the control treatment. Soil in the CC plots were slightly less acidic in 2017 as compared to 2013. Bray-1 phosphorus values increased from 7.5 ppm in 2013 to 26 ppm in 2017 for the CC treatment, and were only 17 ppm in the control treatment. Soil potassium concentration increased slightly from 120 ppm to 136 ppm. Corn yields in the CC and control treatments were 207 versus 192 bu ac-1 in 2014. Despite drought induced crop failures in 2012 and 2013, study results showed increasing soil carbon, nutrient, and crop yields with cover crops. This study suggests that cover crop can be used to improved soil conditions, and crop yields on corn/soybean rotations on degraded soils.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**denotes primary author and subject area*

Tillage and Cover Crop Impacts on Runoff and Soil Health of Diary Forage Production Systems

Authors: Francisco Arriaga*, University of Wisconsin-Madison; Laura Adams, University of Wisconsin-Madison; Michael Bertram, , University of Wisconsin-Madison

Abstract: Dairy is an important agricultural sector in Wisconsin. Typical dairy forage production systems include corn silage and alfalfa as feed. Erosion risks are greater with silage production given the low residue cover left after harvest. Further, manure is commonly applied to fields after silage harvest. Use of cover crops and no-tillage in these systems have the potential to enhance soil health and reduce environmental impacts. Six management systems that include a cover crop [no cover (NC), cereal rye (CC) and cereal rye harvested (CCH)] and two tillage [no-tillage (NT) and chiseling (CT)] were compared. No significant differences in total yield between these systems were found. This suggests that using no tillage and rye as a cover crop, or harvesting the cover crop in the spring, are potential management options without affecting total yields. A rainfall simulator was used in June 2016 to compare management systems. Runoff from soil under corn silage production in no-tillage and with a cover crop produced significantly less runoff (57%) and sediment (77%) compared to the other systems. Total runoff volumes and greater P losses (9%) were observed in conventional till plots regardless of cover crop presence. Overall, alfalfa had the lowest runoff and P losses. Differences between management systems were less noticeable in October 2016 when rainfall simulations were repeated. Soil health parameters will be linked to runoff losses and management systems. Cover crops and no-tillage thus far seem like viable management alternatives for dairy forage production.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**denotes primary author and subject area*

Watershed-Based Fisheries Development in Uttarakhand Himalayas, India

Authors: Muruganandam Muthiah*, ICAR, India/SDSU, SD, USA

Abstract: Composite carp culture and paddy-fish culture practiced under Integrated Watershed Management (IWM) programs yielded 4.5 t ha-1 year-1 and 0.6 t ha-1 year-1, respectively in Garhwal Himalayas. An empirical projection on water harvesting potential based on published information indicated that about 52,662 ha-m of rainwater can be harvested even if 10% of the total catchment area and the reported rate of 1 ha-m water yield from every 10 ha of catchment in Dehradun (Uttarakhand) are considered, which would produce a total of 1,18,490, 59,245 and 23,698 t additional fish per annum at 50%, 25% and 10% of the experimentally observed average fish production rate (4.5 t ha-m-1), respectively. Considering the existing limited assured irrigation facility and land constraints, paddy-fish culture can be integrated in at least 5% (14,411 ha) of the total paddy fields (2,88,225 ha) present in Uttarakhand, which would produce about 4,300 t of additional fish at 50% (i.e., 300 kg ha-1) of the production achieved in experiments. Accounting all nominal fish production potential of 30,532-34,420 t including the present fish production range of 2,534-6,422 t year-1 would not meet the empirically estimated demand of 41,127 t for 50% of the >7 years-old fish consumers based on average recommended consumption rate of 200 gm per individual per week and leave a deficit of 6707-10,595 t annually. The present highest production level of 6422 t in Uttarakhand is over 6 times lower than the demand of 50% of fish consumers in the State. The existing or projected demand can be met by either increasing the area of production from 10% to 20% of harvested water or by increasing the production potential to 20% of the observed production. An inclusive proposal for IWM programs covering fisheries and aquatic biology has been discussed in the paper.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

**denotes primary author and subject area*

A Multi-Agent-Based Model of Multifunctional Agricultural Landscapes Using Genetic Algorithms

Authors: Seth Soman*, Northwest Missouri State University; Steven Kraft, SIUC

Abstract: The spatial pattern of land uses emerging from individual farmer decisions determines the mix of agricultural commodities and regulatory ecosystem services produced by agricultural landscapes. An agent-based model developed here shows that the use of multiple agents with varying economic and conservation objectives, optimized using genetic algorithms, is superior to a single profit-maximizing agent using linear programming in predicting land use decisions under varying land characteristics, policies, crop prices, and antecedent land uses. This modeling structure, where feedbacks are primarily temporal rather than spatial, is thus highly applicable in assessing the economic and ecological impacts of prices and policies in other agricultural landscapes where farmers' land use decisions are made independently. A baseline and an ethanol scenario with high crop prices are evaluated to illustrate this applicability. The agent-based model developed here shows that the use of multiple agents with varying objectives is superior to a single profit-maximizing agent in predicting land use decisions under varying land characteristics, policies, and crop prices. This modeling structure is highly applicable to other agricultural landscapes where the independence of individual farmers both minimizes spatial contagion effects and introduces landowners with varying objectives. Given these positive characteristics, a multi-agent model can be used to analyze the multifunctional nature of agriculture in providing a suite of commodity (primarily provisioning) and non-commodity (primarily regulating) ecosystem services under varying policy scenarios.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

**denotes primary author and subject area*

Challenges to Adopt BMPs to Reduce Nitrate Leaching and Soil Erosion While Improving Farm Economics

Authors: Mohammad Khakbazan*, Agriculture and Agri-Food Canada; Yefang Jiang, Agriculture and Agri-Food Canada; John Huang, Agriculture and Agri-Food Canada ; Judith Huang, Agriculture and Agri-Food Canada; Keith Fuller, Agriculture and Agri-Food Canada

Abstract: Conventional potato production contributes little crop residue to the soil and involves significant tillage operations and chemical inputs which may result in leaching or/and runoff of excess nutrients and degradation of soil resources, including reduced top soil and diminished soil organic matter. Conventional potato production has relied on high levels of soil disturbance (e.g. fall moldboard ploughing) in the fall which leaves the soil surface exposed to erosion until spring, and then multiple tillage passes in the spring to prepare the seedbed. A 6-yr (2010-2016) tillage study was initiated in 2010 at three sites on Prince Edward Island. The potential impacts of postponing the ploughing of the forage in a barley–forage (mix of red clover and timothy)–potato rotation from fall to spring on reducing nitrate leaching and soil erosion and improving farm economics was evaluated. A budgeting technique including return and risk of return of postponing fall ploughing to spring was used to evaluate the impacts on farm economics. Results indicated that the practice of delaying the ploughing of forages did not change potato yield or quality, but reduced leaching losses from autumn ploughed plots by 16 kg N ha-1 year-1 (20 to 61%) (Jiang et al. 2015). Edwards et al. (1998) had previously demonstrated a reduction in soil erosion of 7.8 Mg ha-1 year-1. Reduced soil erosion and nitrate leaching could potentially increase farm income by $130 to $250 ha-1 year-1. However, despite the potential increase in farm profitability potato growers were reluctant to adopt this BMP due to significant uncertainty and risk associated with this practice. Poor seedbed preparation, increased incidence of weeds, insects and diseases, increased large clods and plant debris at harvest, wet and slow-to-warm soil conditions in spring, additional labour and time constraints during the spring seeding period with its unpredictable weather, were some of the challenges mentioned by potato producers.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

**denotes primary author and subject area*

Cost-Benefit Analysis of a Water Project in Arkansas with the Kaldor-Hicks Criterion

Authors: Kuatbay Bektemirov*, University of Arkansas; Eric Wailes, University of Arkansas

Abstract: This paper examines the Bayou Meto Basin Project which will rely on pumping water from the Arkansas River to sustain irrigated agriculture and conserve groundwater in Central Arkansas. The implementation of this project is essential to sustain irrigation in parts of five counties that are included in the Bayou Meto Basin. This is a highly productive area for both agriculture and waterfowl. However, the groundwater supply is declining rapidly and the only other source besides this project is runoff farm water captured in on-farm reservoirs. Crop yields and the agribusinesses of the area that have interest in crop production will be adversely impacted as irrigation declines. Continued degradation of the wildlife habitat also will occur without the project. The research design incorporates the Kaldor-Hicks Tableau format and the traditional cost benefit analysis to comprehensively display the project's economic and financial effects on the Arkansas' economy. Cost-benefit analysis of the Bayou Meto Project is conducted to expand upon an economic assessment of the on-farm analysis conducted by the Army Corps of Engineers. We have updated assessment of the on-farm costs and benefits as well as estimated the direct and total economic benefits of improving the wildlife habitat. When the direct spending benefits of duck hunting and wildlife watching are added to the direct benefits to the crop sector, the calculated cost-benefit ratio for the Bayou Meto Project increased significantly. There are clear environmental benefits to be gained as well as crop sector benefits. The Kaldor-Hicks criterion is the commonly-used efficiency standard that enables its extension to decision contexts beyond the conventional efficiency evaluation, particularly with respect to distribution of benefits. This study finds that the project will provide significant economic and environmental benefits to sustain irrigated agriculture and wildlife habitat in the project area.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

**denotes primary author and subject area*

Costs and Benefits of Cover Crops: An Econometric Analysis on Cash Crop Yield in Central and Northeastern Indiana Farms

Authors: Stephen Lira*, Purdue University Department of Agricultural Economics; Dr. Wallace Tyner, Purdue University Department of Agricultural Economics; Shanxia Sun, Purdue University Department of Agricultural Economics

Abstract: While there is growing evidence of the agronomic and environmental benefits that cover crops can provide, including reducing erosion, increasing soil nitrogen content, and weed control, reliable long-term economic information on cover crop use is minimal. The lack of economic studies and information on cover crop use is a common reason why farmers choose not to adopt cover crops. To perform economic analysis on the benefits and costs of cover crops, we gathered data from farmers from Central and Northeastern Indiana in corn-corn or corn-soybean rotations. We obtained data from both cover crop and non-cover crop farmers. They were asked to provide five years of data on their fields, their cash crop management and yield, their cover crop use, and demographic information. This information, combined with monthly precipitation and daily temperature data by county, was then econometrically analyzed to determine the yield differences between cover cropped and non-cover cropped fields, as well as to determine other significant yield-determining factors. In the presentation, all statistically relevant results from the analysis will be included. The results from this study, since they are conducted over the long-term on farmer managed fields, should be more credible to farmers and allow them to make better-informed decisions about their use of cover crops.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Documenting and Communicating the Economic Benefits of Soil Health Management Practices

Authors: Rui Chen*, Datu Research; Rich Duesterhaus, NACD

Abstract: The conservation agriculture practices of cover crop and no-till have been recognized as important tools for soil health management. Since 2014, the National Association of Conservation Districts (NACD) and Datu Research have collaborated to document and communicate the economic benefit of cover crops and/or no-till for farmers, and to advance the adoption of soil conservation practices. NACD has built a nationwide network of Soil Health Champions, comprising 150 farmers who will share their soil health success stories farmer to farmer. At the same time, Datu Research has conducted an in-depth analysis of the partial budgets of four Soil Health Champions to demonstrate the economic costs and benefits for farmers. The effort traced multi-year budget changes, including planting, termination, fertilizer application, yield, and other factors. Thanks to cover crops and/or no-till, all four case study farmers saved erosion-related repairs in the range of $0.09/acre to $10.49/acre, while three farmers experienced significant reduction of fertilizer that saved from $10.91/acre to $40.84/acre. This joint presentation will feature data from the case study research findings on the economic cost and benefits of soil conservation practices, and share progress made in the building of the Soil Health Champions Network.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Estimating Farm-Level Change in Farm-Level Conservation Compliance Incentives

Authors: Roger Claassen*, USDA Economic Research Service; Tara Wade, North Carolina A&T University; Vince Breneman, Economic Research Service; Ryan Williams, USDA Economic Research Service

Abstract: Conservation Compliance links eligibility for many agriculture-related benefits (including commodity, crop insurance, and conservation programs) to conservation. Farmers who fail to meet Highly Erodible Land Conservation (HELC) or Wetland Conservation (WC) requirements could become ineligible for benefits. The Agricultural Act of 2014 altered benefits subject to Compliance by ending Direct Payments, creating "shallow loss" programs, and re-linking crop insurance premium subsidies to Compliance. To estimate farm-level change in benefit subject to Compliance due to 2014 Farm Act changes, we combine National Resources Inventory data with USDA administrative data on more than 200,000 farming operations. The change in payments are estimated for several crop price scenarios. • In aggregate, we estimate that benefits subject to Compliance under the 2014 Farm Act are similar to what they would have been under an extension of the 2008 Farm Act. • At the farm-level, however, there could be big changes. Depending on crop prices, 25-65 percent of land subject to HELC is located on farms where benefits are estimated to decline under the 2014 Act; 10-39 percent are on farms where the estimated decline is more than 25 percent. • Crop insurance premium subsidies are an important Compliance incentive. If crop insurance premium subsidies were not subject to Compliance, 40-84 percent of land subject to HELC would be located on farms where benefits are estimated to decline under the 2014 Act; 18-77 percent are on farms where the estimated decline is more than 25 percent. Farms experiencing large declines in benefits subject to Compliance may reconsider meeting HELC or WC requirements. If the link between Compliance and crop insurance premium subsidies is reconsidered in the 2018 Farm Act, the reduction in benefits subject to Compliance—the incentive for meeting HELC and WC requirements—could be severely diminished.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Estimating the Impact of Conservation Compliance on Soil Erosion Rates Between 1982 and 2012

Authors: Maria Bowman*, USDA Economic Research Service; Roger Claassen, USDA Economic Research Service

Abstract: Annual erosion has been declining on cultivated cropland since 1982, when USDA's Natural Resources Conservation Service first developed national estimates of wind and water erosion using the National Resources Inventory (NRI). One contributing factor to this decline was "Conservation Compliance" provisions implemented between 1985 and 1995, which require farmers to adopt soil conservation practices on highly-erodible cropland in order to be eligible for federal payment programs (such as direct or conservation payments). The role of Highly Erodible Land Compliance (HELC) in soil erosion reduction cannot be easily identified because soil erosion also declined on land not subject to HELC. This suggests that soil erosion would have been reduced without HELC. We use data from the NRI and other data sources to estimate the impact of HELC on changes in erosion between 1982-1997 and 1997-2012 using regression and nearest-neighbor matching methods. Regressions suggest that HELC had a statistically significant impact on reducing erosion on highly-erodible cropland between 1982 and 1997. For NRI points that were in cultivated cropland in 1982 and 1997, highly-erodible for water, and had FSA base acres, being located in a field designated as HEL was estimated to reduce erosion by an additional 1.93 tons/acre. Being designated as highly erodible also significantly reduced predicted erosion on land highly erodible for wind during the same period. Early results from nearest-neighbor matching support results from the regressions. For NRI points in cultivated cropland that was highly erodible for water and had FSA base acres, being designated as highly-erodible contributed to an estimated reduction in erosion of 1.52 tons/acre in 1997 when compared to 1982. Thus, two econometric methods suggest that HELC played a large and statistically significant role in reducing erosion rates on cropland highly-erodible for water and subject to HELC provisions.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Groundwater Pumping Policy to Limit Economic Damages from Land Subsidence

Authors: Kelly Cobourn*, Virginia Tech

Abstract: Groundwater pumping is the foremost contributor to land subsidence, which generates economic costs worldwide and in diverse areas of the United States, from the Santa Clara Valley of California to the Coastal Plain of Virginia. These costs arise in large part as changes in topographic gradients and relative sea level rise lead to an increase in the frequency and severity of flooding, which generates property damage. Though land subsidence has long been recognized as problematic, few studies have estimated the associated economic damages. As a result, little information exists to guide policymakers in developing efficient groundwater pumping policies to mitigate these costs. We estimate the damages associated with an increase in the frequency of flooding due to groundwater pumping-induced land subsidence. We focus our analysis on the southern Chesapeake Bay region of Virginia, which has seen the highest rate of land subsidence on the east coast of the United States. We use detailed spatial data on aquifer characteristics (e.g., sediment compressibility and thickness), groundwater levels, housing values, and population density to develop a hydro-economic simulation model that tracks land subsidence, changes in flood zone designations, and corresponding losses in property values across space and time. We demonstrate that the damages from subsidence vary across space as a function of aquifer and housing characteristics (confining unit thickness, density, and value). As a result, spatially differentiated groundwater pumping policies outperform uniform pumping policies, reducing the costs of limiting land subsidence. The optimal spatial pattern of pumping restrictions also differs when policy targets the economic costs of land subsidence, rather than land subsidence itself. This result highlights the importance of considering the interaction of hydrologic and socio-economic characteristics when designing policies to limit the damages caused by groundwater extraction.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Salinas Valley 2020 - A Perfect (Regulatory) Storm

Authors: Kay Mercer*, KMI; Abby Taylor-Silva, GSA

Abstract: The Salinas Valley is unique. The Mediterranean climate enables 220,000 irrigated acres to produce 60% of lettuce and 50% of broccoli and celery grown in the U.S, as well as other diverse crops. Intensive agricultural production is the main source of jobs and revenue. Greater than 85% of total water and >95% of irrigation water uses are from groundwater with few surface water deliveries. The community collaboratively manages water supply with infrastructure, recharge, recycling, and conservation. This has buffered drought impacts. Recently, other issues have emerged (e.g., water quality, nitrate-contaminated drinking water, water rights, flow, and species protection). Many of these issues have developed in isolation within separate agencies. All will collide in 2020 to create a perfect "regulatory" storm under four regulatory actions: 1) The precedential Irrigated Lands Regulatory Program will be adopted in 2020 and will possibly include individual grower monitoring, reporting, practice verification, and anti-degradation policy implementation, 2) The Sustainable Groundwater Management Act requires submission of a Groundwater Sustainable Plan (GSP) in 2020. Negotiations may involve extraction curtailments and likely will be contentious, 3) Under court decree, by 2020, Monterey County must write a Habitat Conservation Plan for aquatic endangered species, which will involve strong disagreement on resource management, and 4) State Water Board is enforcing the Human Right to Water Act with the threat of Cleanup and Abatement Orders. By 2020, growers will provide treatment and/or permanent replacement of nitrogen-contaminated drinking water. Salinas Valley growers have a long history of innovating to overcome challenges. These colliding issues, occurring simultaneously, may cumulatively exceed Agriculture's capacity to engage meaningfully or respond sufficiently. Also, concerns remain about growers' long-term sustainability as regulatory fees and burdens mount.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Who Will Farm the Land?

Authors: Laura Paine*, Dairy Grazing Apprenticeship; Joe Tomandl III, Dairy Grazing Apprenticeship

Abstract: Over the next twenty years, millions of acres of farmland are likely to change hands as aging farmers retire. An estimated 70% of those farmers have no succession plan in place to transfer their farm business to a new operator. What will happen to those acres? Current trends suggest that ownership of a large proportion of this land will transfer to non-farmers or be consolidated into larger operations. At the same time, access to land is one of the most significant barriers to beginning farmers getting started. Dairy Grazing Apprenticeship (DGA) provides a means of solving both these problems. DGA matches up experienced dairy graziers with beginning farmers through a two-year, work-based training program that can lead to farm transfer. Through formal Apprenticeship, a beginning farmer can gain not only the education and experience needed to manage a profitable dairy operation, but the opportunity to build equity and potentially work into an ownership situation. More than 90 Master Dairy Graziers in eight states are approved to train DGA Apprentices. In addition to retiring dairy graziers seeking a successor, many participants are mid-career farmers who are growing their businesses by buying additional farms and replicating relatively small herd operations using their trained Apprentices as managers. These operations are not only profitable but environmentally sound, utilizing perennial pastures and forage crops as their primary source of feed. In the Great Lakes region alone, dairy farming and the pastures and forage crops they require keep perennial cover on nearly four million acres of land. As these acres change hands in the coming years, DGA provides an opportunity to maintain and increase the soil health, water quality and wildlife habitat benefits perennial pastures provide.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Environmental Benefits of Organic Systems

Authors: Ben Bowell*, Oregon Tilth

Abstract: Do organic farming systems provide environmental benefits or is organic production just about marketing? Confusion persists about organic practices, and some believe that organic systems have less demonstrable environmental benefits than conventional systems. This workshop on the environmental benefits of best practices in organic systems will lead to a better understanding of organic farming impacts. The presentation will include data from six long-term organic comparison trials in the US and published meta-analysis examining organic. It will also cover National Organic Program (NOP) guidance related to natural resources. Join this workshop to learn about four categories of environmental benefits: water quality, biodiversity, soil, energy and climate change. Well-managed organic systems rely mainly on slow-release forms of nutrients which reduce the risk of nutrient runoff and leaching. Enhanced soil structure, water infiltration, and better nutrient retention also reduce the risk of groundwater pollution. Organic systems are intended to enhance biodiversity at several levels. A variety of seeds and breeds are preferred for their greater resistance to diseases, climate and pests. The maintenance and planting of natural areas within and around organic fields and the absence of chemical inputs create suitable habitats for wildlife. Soil building practices such as crop rotations, cover crops, organic fertilizers and minimum tillage are central to organic practices. These practices replenish soil organic matter, feed soil life, reduce erosion, improve soil structure, and enhance nutrient cycling and water retention. By using legumes, compost, and other organic materials instead of synthetic fertilizer, organic farms can avoid substantial CO_2 emissions related to synthetically fixed nitrogen. Additionally, many organic farming practices increase the return of carbon to the soil, thus removing CO_2 from the atmosphere and mitigating global warming.

Track: 2017 General Conference Theme Submissions

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

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Organic Livestock and Conservation

Authors: Ben Bowell*, Oregon Tilth

Abstract: The USDA National Organic Program (NOP) drafted the "Organic Livestock and Poultry Practices" rule in 2016 with the stated purpose of creating greater consistency in organic livestock and poultry practices. Among other issues, the NOP addresses living conditions and outdoor access requirements in the proposed rule which is expected to be finalized in early 2017. Current USDA organic regulations state that organic livestock must have year round access to the outdoors. The proposed rule adds that at least 50% of outdoor access area must be soil based (vegetative cover is encouraged) and creates minimum outdoor stocking densities for poultry. The new emphasis on soil-based outdoor access will likely create soil and water resource concerns. Many of the larger-scale operations do not currently meet this standard and may have a limited amount of land. Organic producers must simultaneously meet the natural resource and biodiversity requirements of the regulation. Many organic livestock producers will need support as they work to meet outdoor access requirements and "maintain or improve the natural resources of the operation, including soil and water quality." Join this workshop to learn about the new rule and how to support conservation on organic livestock operations. It will include information on relevant USDA Natural Resource Conservation Service (NRCS) programs and practices. The topic is timely and important. The NOP believes the Organic Livestock and Poultry Practices regulation will have a large impact on the organic livestock industry. If producers cannot meet the requirements, they may surrender their organic certification and potentially market under another label—such as cage-free—which does not require outdoor access and focus on the impacts to natural resources.

Track: 2017 General Conference Theme Submissions

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

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Overview of NRCS Conservation Information Exchange with Cuba

Authors: Lillian Woods*, USDA-NRCS; Linda Scheffe, USDA-NRCS; John Tiedeman, USDA-NRCS; Maxine Levin, USDA-NRCS; Chayla rowley, NRCS

Abstract: A historic collaboration took place between the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) and Cuba during Dec. 2016. This presentation will provide an overview of the effort to learn more about resource conservation issues and solutions in tropical area. NRCS utilizes the natural resource conservation expertise of employees to partner with foreign governments on resource conservation issues. This will add to knowledge based of other tropical areas such as the Caribbean and Pacific Island Areas. During the trip, the USDA team met with Ministry of Agriculture (MINAG) staff of Soils and Fertilizers, Irrigation and Drainage, and Agroforestry Departments, as well as researchers from the Soils Institute, Agricultural Engineering Institute, municipal and provincial technical experts of MINAG, cooperatives and producers in the Havana Province. The group exchanged information, publications, presentations, and engaged in open discussions on many aspects of natural resource conservation, including soil conservation, soil management, agroforestry and irrigation. Field visits were made to numerous sustainable land area demos, farms and cooperatives to discuss challenges and advances in urban and organic agriculture as well as conservation practices and sustainable farming systems. This presentation will cover the findings and overall implications of the exchange for international natural resource conservation, future collaboration activities identified and the next steps USDA will take to follow up. Interactions with Cuban scientists opens up new opportunities for learning and improving soil conservation, agroforestry, and irrigation methods for tropical areas. This presentation will share the lessons learned through the Cuba information exchange.

Track: 2017 General Conference Theme Submissions

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

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A Comparative Modeling Study of Soil Water Dynamics with Different Pedotransfer Functions

Authors: Sara Acevedo*, Pontificia Universidad Católica de Chile; Cristina Contreras, Pontificia Universidad Católica de Chile; Natalia Nieto, Pontificia Universidad Católica de Chile; Francisco Lira, Pontificia Universidad Católica de Chile; Carlos Bonilla, Po

Abstract: Most of the hydrological models depend on soil physical properties and reliable hydraulic characteristics for predicting soil water dynamics accurately. Because of this, a reliable description of the soil water retention curve (SWRC) is required when simulating soil-related phenomena, including the soil moisture dynamics (SMD) and water balance (WB). However, in many field studies, direct measurement of soil hydraulic properties is impractical in time and expensive in cost. Thus, pedotransfer functions (PTF) have been used to predict the fitting parameters of the SWRC and applied them in models such as HYDRUS-1D, a freeware model coupled with Rosetta, a PTF that predicts the SWRC parameters. Depending on the Rosetta model, an increasing number of known soil parameters are required: particle size distribution, bulk density, field capacity (FC), and wilting point (WP). Therefore, this study tested the HYDRUS-1D model coupled with Rosetta when the available data is scarce or when the missing data is predicted with different PTFs (specifically FC and WP). With this purpose, a series of HYDRUS 1D + Rosetta annual simulations were conducted for seven non-fine textured soils from Central Chile using actual soil and climate data. Four available Rosetta models and three different PTFs for predicting FC and WP were tested. SMD and WB computed with actual soil data were used as a control. The WB analysis showed that models based on basic data tends to underestimate the actual evapotranspiration, and the free drainage was overestimated with these models. On the other hand, the best WB estimates were found when the FC and WP data were used with the PTFs instead of using only the Rosetta functions. Finally, this study demonstrates that coupling of PTFs to Rosetta provides an improvement on the SMD and WB estimation with HYDRUS-1D in non-fine textured soils.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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A Method to Assess Field Management Effects on Snowmelt Runoff Volume for Field-Scale Runoff Risk Evaluation Tools

Authors: Laura Good*, Dept. of Soil Science, University of Wisconsin-Madison; Anita Thompson, University of Wisconsin-Madison; John Panuska, University of Wisconsin-Madison; Zach Zopp, University of Wisconsin-Madison

Abstract: The Wisconsin P Index (WPI) is a field-scale agricultural runoff phosphorus risk evaluation tool used in Wisconsin both for nutrient management planning and for assessing potential phosphorus reductions from projects designed to curb runoff losses from agricultural systems. The model estimates average annual phosphorus mass runoff loss for a field accounting for soil, topography, soil test phosphorus, crop, and tillage, as well as manure and fertilizer phosphorus amendments. Runoff volume is a critical part of the model, driving estimates of dissolved phosphorus losses from soil and amendments. Winter (snowmelt and runoff from rain on frozen soil) and non-winter (rainfall on non-frozen soil) are calculated using different methods due to differences in runoff mechanisms. Up until now, the WPI has estimated field-scale winter runoff volume with an empirical method based on watershed-scale average runoff volume. Using in-field over-winter monitoring records from more than 170 site years, we developed an innovative method combining an energy balance approach with adjustments to the runoff curve number to estimate winter runoff. The new method factors in field soil and management and produces estimated winter runoff volumes that fit well with observed field runoff data. Particularly relevant to Wisconsin is that the model accounts for the much greater observed propensity for over-winter runoff from monitored fields established in alfalfa compared to those in row crops.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Alfalfa Interseeded into Silage Corn can Enhance Productivity and Soil and Water Conservation

Authors: William Osterholz*, University of Wisconsin - Madison; Mark Renz, University of Wisconsin - Madison; John Grabber, USDA Agricultural Research Service

Abstract: Alfalfa and corn silage are widely planted for dairy forage production systems throughout the northern regions of the USA, accounting for about 0.8 and 1.9 million hectares per year, respectively. Much of this area could benefit from strategies to reduce soil erosion and nutrient losses. Because these crops are frequently grown in rotation, alfalfa could be interseeded at corn planting to serve as a dual-purpose crop for providing groundcover during silage corn production and forage during subsequent growing seasons. However, frequent stand failure of the interseeded alfalfa due to competition from the corn has been a major obstacle to implementing this system. Recent studies from Wisconsin demonstrated that properly timed foliar application of the plant growth regulator prohexadione-calcium to select alfalfa varieties can improve the survival of alfalfa interseeded into silage corn by up to 300%. When successfully established, interseeded alfalfa produced 200% greater forage yields in its first production year compared to conventionally spring-seeded alfalfa. Preliminary estimates of interseeded alfalfa success rates, corn and alfalfa yields, and PHD application costs suggest that the interseeded alfalfa system could improve net returns of producers by about 30% ($26 per acre per year) compared to a conventional system of silage corn followed by spring seeded alfalfa. Other studies suggest significant improvements in soil and water conservation: interseeded alfalfa reduced runoff of nitrogen by 35%, phosphorus by 40%, and soil erosion by 62%, and also reduced concentrations of nitrate susceptible to leaching losses in silage corn compared to the conventional system. While additional work is needed to refine the interseeded alfalfa system, the observed improvements in crop yields and soil and water conservation are powerful incentives for continuing development of reliable silage corn-interseeded alfalfa production systems for use on farms in the northern USA.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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An Enhanced Field-Scale Conservation Management Planning Approach for Watershed-Scale Erosion Assessments

Authors: Henrique Momm*, Middle Tennessee State University; Ron Bingner, United States Department of Agriculture - Agricultural Research Service; Laura Burbano, MTSU; Seth Dabney, United States Department of Agriculture - Agriculture Research Service

Abstract: Watershed-scale simulation technology is designed to generate estimates of sediment loads that originate in fields and are then routed downstream. This technology allows for quantification of the impact of individual and/or integrated management practices throughout the watershed. An example of this technology is the Annualized Non-Point Source watershed pollutant load model (AnnAGNPS). In AnnAGNPS, the watershed is subdivided into basic modeling units (fields) in which all spatially and temporally varying physical parameters are assumed to be homogeneous. This simplification is needed to provide estimates at the watershed scale within a reasonable amount of time for data preparation and program execution. Conversely, the Revised Universal Soil Loss Equation, Version 2 (RUSLE2) erosion model can estimate sediment yield at the field scale with enhanced capabilities in describing field variations of farming management, topography, and soil properties. In this study, we evaluated an integrated approach involving both models for enhanced characterization of individual fields while accounting for the watershed-wide integrated intra fields effect when routing sediment loads through the watershed. The identification of critical sediment load producing fields throughout the watershed can be initially performed using AnnAGNPS. Using GIS-based methods, these targeted fields can be described by multiple scenarios of RUSLE2 representative profiles analyzed based on various management, landscape, and combined management-landscape conditions. These RUSLE2 scenarios can then be integrated into AnnAGNPS watershed simulations to quantify the overall effect of enhanced field characterization on sediment loads at the field and watershed scales. Methods for identification of critical sediment producing areas using integrated RUSLE2 and AnnAGNPS models can be used to support the development and evaluation of conservation management plans impacting the watershed.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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An Open Source GIS-based Decision Support System for Watershed Evaluation of Best Management Practices

Authors: HUI SHAO*, University of Guelph; Wanhong Yang, University of Guelph; John Lindsay, University of Guelph; Yongbo Liu, University of Guelph; Zhiqiang Yu, Civica Infrastructure; Anatoliy Oginskyy, Alberta Agriculture and Forestry

Abstract: Economic costs, water quantity/quality benefits, and cost effectiveness of agricultural best management practices (BMPs) at a watershed scale are increasingly examined using integrated economic-hydrologic models. However, these models are typically complex and not user-friendly for examining the effects of various BMP scenarios. In this study, an open source GIS-based decision support system (DSS), named the Watershed Evaluation of BMPs (WEBs), was developed for creating BMP scenarios and simulating economic costs and water quantity/quality benefits at farm field, subbasin and watershed scales. This DSS or WEBs interface integrated a farm economic model, the Soil and Water Assessment Tool (SWAT), and databases within Whitebox GAT, an open source GIS software. The interface has four components including information, scenario, model, and display, which are the four steps taken by users to organize input data, design BMP scenarios, run models, and conduct results analysis. The DSS was applied to the 14.3-km2 Gully Creek watershed, a coastal watershed in southern Ontario, Canada that drains directly into Lake Huron. BMPs for evaluation included conservation tillage, nutrient management, cover crop, and water and sediment control basin. In addition to assessing economic costs, water quantity/quality benefits, and cost effectiveness of BMPs, the DSS can be also used to examine prioritized BMP types/locations and corresponding economic and water quantity/quality tradeoffs in the study watershed based on environmental targets or budget constrains. Further development of the DSS including interface transfer to other watersheds and scale-up to large river basins are also discussed.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Cover Crop Effect on Weed Management: A Meta-Analysis

Authors: Sarah Carlson*, Practical Farmers of Iowa; Alisha Bower, Practical Farmers of Iowa

Abstract: Anecdotally, corn and soybean farmers in the Upper Mississippi Basin who have integrated cover crops into their rotations observe changes in weed populations on their farms. To substantiate and quantify this reported impact we collected published literature about cover crop affect on weed control in corn and soybean crops in MN, WI, MI, IA, IL and IN. We will present results from our meta-analysis, investigating if cover crop use as well as characteristics such as varieties, planting dates, seeding densities, and termination methods affect the density and biomass of weeds present in corn and soybeans and yields of the main commodity crop.

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Subject Area: Conservation Models, Tools, and Technologies

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Developing a Place-Based Tool for Evaluating the Water Quantity and Quality Effects of Wetland Loss and Restoration Scenarios at a Watershed Scale

Authors: Wanhong Yang*, University of Guelph; Yongbo Liu, University of Guelph; HUI SHAO, University of Guelph

Abstract: Watershed hydrologic modelling is increasingly being applied to examine water quantity and quality effects of wetlands. Typically semi-distributed hydrologic models such as SWAT lump individual wetlands in a subbasin into a hydrogically equivalent wetland to simulate wetland effects. Complementary to this approach, the purpose of this study is to develop a placed-based tool that characterizes individual wetlands and evaluate wetland effects at site, field, farm, and watershed scales. The placed tool is developed based on the Integrated Modelling for Watershed Evaluation of BMPs (IMWEBs) developed under Agriculture and Agri-Food Canada's Watershed Evaluation of BMPs program from 2009 to 2013. The IMWEBs model is a cell-based, fully distributed hydrological model including climate, interception, evapotranspiration, runoff, interflow, groundwater, plant growth, sediment, nutrient cycle (N and P), channel flow and water quality processes. A wetland module is developed within IMWEBs model to characterize wetland attributes (area, depth, volume), water balance, sediment, and water quality processes. An open source GIS interface is also developed for pre- and post-processing of the IMWEBs wetland model. The model is applied to the 250-km2 Broughton's Creek watershed in south-western Manitoba in Canada. As a representative prairie watershed, the Broughton's Creek watershed experienced considerable historical wetland losses. The modelling of historical and existing wetlands shows that wetland losses have significantly increased peak discharge, and sediment and nutrient exports from landscapes to streams. The modelling of wetland restoration scenarios shows that the water quantity and quality benefits of retaining and/or restoring individual wetlands have significant variations across the landscape. The place based tool has the potential to be used in wetland conservation program for prioritizing and targeting highly effective wetlands for retention and restoration.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Developing a Reactive Nitrogen Model for Canadian Agricultural Land

Authors: Jingyi Yang*, Agriculture and Agri-Food Canada; Craig Drury, Agriculture and Agri-Food Canada

Abstract: Global reactive N has increased over the last century to sustain global demand for food, fiber and energy crops by the production of synthetic fertilizers as well as planting of legume crops which biologically fix atmospheric nitrogen. Increases in reactive N, however, have resulted in detrimental effects on ecosystems and human health. For example, N gas emissions cause smog (NH_3) and global warming (N_2O), while nitrate N losses by leaching and runoff cause eutrophication of fresh waters and contamination of drinking water. A reactive N model is being developed to estimate the annual reactive N cycle for Canadian agricultural land using an mass balance approach at a soil landscape polygon scale. The N inputs include fertilizer N, biological N fixation, N deposition and N mineralization from previous organic residues. The N output contains crop N removal as human food, animal feed, N losses from gaseous forms including N_2O and NH_3, and leaching and runoff of NO_3-. Several national databases were used as inputs of the model. The land use database is derived from the agricultural census (crop area, livestock, tillage); soil data were obtained from Canadian Soil Information System; weather data were from Canadian weather framework, and yield data were from Statistics Canada. Fertilizer N data were obtained from both provincial agriculture and Canadian fertilizer industry. The preliminary result showed that fertilizer N, biological N fixation and N deposition to Canadian farmland increased by 2.1, 1.7 and 1.2 times, respectively, while N removal by crop production only increased by 1.4 times from 1981 to 2011. Regional differences were significant. Fertilizer N losses from ammonia (NH_3) emissions increased by 2.4 times and NO_3- leaching losses increased by 3.0 times during this period. Management practices have to be developed and/or implemented to reduce the economic and environmental losses associated with increases in reactive N in Canadian farmland.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Development of Remote Sensing Techniques to Map Drainage Tiles in the Prairie Pothole Region of Iowa

Authors: James Giglierano*, Wisconsin DOA

Abstract: Previous research in the Midwest indicated that agricultural drainage tiles could be mapped through traditional remote sensing techniques. Photo-interpretation of color infrared aerial photographs could be used to map tiles 2 to 3 days after a 1 inch rainfall or more. This scenario was extensively tested between 2012 to 2015 in the Prairie Pothole Region (PPR) of Iowa by staff and students at the Iowa Geological and Water Survey and Iowa State University GIS Facility. Results from several flights over target areas in the PPR showed that optimal conditions there were more stringent, and required a 10 day rainfall accumulation of more than 4" in order to completely saturate the soil profile. After waiting 3 to 4 days for stream levels to recede, the effects of tile drainage became visible at the land surface and were easily photographed from the air with 1 meter or better color or color-infrared imagery. The chance of occurrence of these >4 inch rainfall periods in the spring is small in any one year for a particular target area. Arranging for aerial coverage in advance was not difficult, though planes were not be always available on one or two day notice when actual conditions were met. In addition, identifying where local soil moisture conditions were optimal was extremely challenging using rainfall accumulation databases and models available on the Internet from NOAA and university researchers. Overall, this effort showed that tile mapping projects are possible over a multi county area in the PPR, but 2 to 5 years may be required to fully cover all areas within the project area of interest due to local variations in rainfall patterns, aircraft availability and other unforeseen circumstances. A photo-interpretation guide for identifying and mapping tile patterns was also assembled during this project.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

**denotes primary author and subject area*

Enhanced Topographic Analysis Tools for Watershed Assessment of Integrated Conservation Management Practices

Authors: Ron Bingner*, United States Department of Agriculture - Agricultural Research Service; Henrique Momm, Middle Tennessee State University; Yongping Yuan, USEPA; Robert Wells, USDA-ARS; Jurgen Garbrecht, USDA-ARS; Fred Theurer, USDA-NRCS (Retired); Martin Lo

Abstract: Assessments of conservation practices as part of a watershed management strategy requires a good understanding of the integrated components describing the watershed and the applied practices. A vital ingredient of understanding these components involves the characterization of landscape topography, which can be very tedious without quality elevation data and adequate technology to effectively analyze the data. The Topographic PArameteriZation tool (TOPAZ) has become one of the standards for automatic analysis of digital landscape topography that has been used around the world for many years in support of watershed hydrologic modeling. Additional capabilities have been developed and integrated into TOPAZ to produce the tool TOPAGNPS for further landscape characterization in support of the USDA-ARS Annualized Agricultural Non-Point Source (AnnAGNPS) watershed model. These additional features in TOPAGNPS enable the analysis of integrated location information and properties for use in AnnAGNPS of potential ephemeral gullies, riparian buffers, wetlands, and additional AnnAGNPS watershed attributes. Further enhancements of TOPAGNPS include the reduction of minimum elevation raster grid cell sizes from 1 m to 0.1 m, full 64-bit operating system capability providing faster program execution and larger DEM size analysis capabilities, creation of additional ASCII raster grid and report files for use in standard GIS technology, multiple methods to describe outlet locations, integration of multiple programs into a single executable for ease of use, and many more capabilities. Examples of the application of these components for use in identifying landscape features used in integrated conservation practice design for USDA CEAP watersheds will be provided in this study. Utilization of TOPAGNPS with AnnAGNPS provides watershed management planners with automated topographic analysis tools to assess the integrated impacts of conservation practices on watershed water quality.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Evaluating Edge-of-Field Water-Quality Monitoring Techniques: Relating Data Quality to Long-Term Monitoring Costs

Authors: David Owens*, USGS; Matt Komiskey, USGS; Mari Danz, USGS; Chad Toussant, USGS; Kevin O'Donnell, EPA

Abstract: The Great Lakes Restoration Initiative (GLRI) was developed to accelerate efforts to protect and restore the quality of Great Lakes waters. One focus of GLRI is to increase implementation of agricultural conservation practices and to document resultant water-quality changes. Edge of field (EOF) can be an effective scale to quantify changes because of their small size and relatively rapid response to conservation practices. However, lack of standardization in techniques and cost considerations can make it difficult to select an effective monitoring approach that simultaneously meets data objectives and fits budgetary constraints over time. As part of the GLRI initiative, the U.S. Geological Survey, in partnership with the Environmental Protection Agency and the Natural Resources Conservation Service, established two identically instrumented EOF monitoring stations in distinctly different landscapes/agricultural settings to evaluate a variety of approaches to quantify water quality. One station was located in the Lower Fox River watershed, Wisconsin, the second in the Maumee River watershed, Ohio. Both stations utilized a pre-rated 2.5 ft H flume to measure discharge and were equipped with auto samplers to collect runoff samples. Three samplers were triggered using sample-pacing algorithms commonly used in EOF monitoring (time-based discrete, time-based flow composite, and volume-based flow composite). In addition, innovative techniques (depth-integrated sampler arm, real-time water-quality meter, and time-lapse photography) were also used to improve study results. An evaluation of the measured concentrations and computed loads from three years of data collection for each sampling technique will be reviewed. As part of the review, a discussion of potential issues with each technique and general impact on long-term monitoring costs will be addressed.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Improving Information and Data to Manage and Protect U.S. Agricultural Resources

Authors: Alice Sorensen*, American Farmland Trust; Jennifer Dempsey, American Farmland Trust; David Theobald, Conservation Science Partners

Abstract: It is essential to understand fundamental changes in the rates and patterns of broad land use classes, especially lands used for crops, pasture, range, and woodlands associated with farms at a national level to better manage and protect the nation's agricultural resources. Quantifying these patterns at meaningful resolutions (~30 m) requires a fusion of inventory and remotely-sensed data. American Farmland Trust, Conservation Science Partners and the USDA Natural Resources Conservation Service partnered to complete detailed maps of broad agricultural land use classes for the conterminous US. We harmonized land uses classes to be consistent with the National Resources Inventory data and built on other existing land cover data products to produce detailed maps of the loss of farm and ranchland between 1982 and 2012 (every five years), including validation directly against USDA NRCS NRI data. We also estimated the loss of croplands on prime soils historically to urban expansion. Based on SSURGO soils data, we have lost 9 percent of our prime soils to urban expansion. But if we assume that urban areas historically were settled in fertile soil areas, this loss could be as high as 18 percent. These data will help inform policies and programs at the federal, state levels and support land-use decisions at the local level. We then analyzed the fate of our most valuable farmland over the last two decades, identifying it by prioritizing variables related to the land's resiliency, productivity and versatility. Although our ultimate goal for this research is to identify and conserve our most valuable farm and ranchlands for future generations, we recognize the importance of simultaneously conserving biodiversity. We were also able to map grasslands of environmental importance that we should try to conserve by identifying grasslands and pastureland near areas being managed for wildlife that had high levels of natural diversity in vegetation types and landform/soils.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Improving Soil Health through Conservation Management of Claypan Soils in Southeast Kansas

Authors: Gretchen Sassenrath*, Kansas State University; Jerry Hsiao, Kansas State University; Stacey Kulesza, Kansas State University; Vladimir Alarcon, Universidad Diego Portales

Abstract: A particular challenge for crop production in southeast Kansas is the shallow topsoil, underlain with a dense, unproductive clay layer. Adoption of conservation management practices has been slow; erosion continues to reduce the productive capacity of fields in this high-rainfall area. This research explores within-field variability of soils, soil biochemical activity, vegetation and topography in farm production fields, with an end towards increasing adoption of conservation management and reducing topsoil loss. Yield and plant growth information were collected at harvest. Soil electrical conductivity was measured to delineate in-field soil variability and depth to claypan. Plant canopy development was analyzed using high resolution NAIP imagery. Surface curvature was calculated to delineate changes in vegetation with elevation and potential erosion rates. Analysis of the DEM revealed areas within fields that held water and areas of high potential runoff where soil loss was more likely to occur. Targeting these areas for conservation management practices may provide the greatest benefits to slow water runoff from the field and keep topsoil and nutrients on the field. Transitioning to conservation management practices such as reduced tillage and use of cover crops has been shown to improve the soil microenvironment and enhance the long-term sustainability of the agronomic production system.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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NutrientStar: Elevating New Research Standards and Transparency on Performance of Fertilizer Management Tools and Models

Authors: Karen Chapman*, Environmental Defense Fund; Thomas Morris, University of Connecticut

Abstract: Farmers face many choices when it comes to fertilizer inputs - choices that can have both positive and negative economic and environmental impacts. Many products and technologies (henceforth called tools) are available that may improve farmers' fertilizer management while also reducing nitrogen or phosphorus losses to the environment. Farmers, consumers and food companies are greatly interested in the potential these tools might have to increase profitability and reduce the environmental consequences of fertilizer use in food production. However, little data exists in the public domain detailing the potential benefits and drawbacks to farmers from choosing certain fertilizer management tools. The data that does exist is often limited in scope and lacks sufficient accompanying metadata to evaluate the tools. Furthermore, the absence of a common set of minimum data requirements and protocols in agronomy research prohibits meaningful comparisons and analyses of the conditions where the tools might perform best. The NutrientStar program, created by Environmental Defense Fund in collaboration with leading agronomy scientists, aims to address these current shortcomings by: 1) performing literature searches to compile existing research about fertilizer management tools and sharing that information publicly; 2) engaging agribusinesses and companies to embrace greater transparency in data collection and sharing; 3) conducting on-farm, replicated strip trials to collect and publish data on fertilizer management tools, and; 4) engaging with stakeholders and the academic community to establish minimum data requirements and protocols for efficient and effective evaluations of these tools. This presentation will share the status of data collection on fertilizer management tools, describe what is being done to enhance the body of data on the performance of the tools now and in the future, and show how NutrientStar will present the results of the assessments once data is available.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Predicting Nitrogen Retention in Managed Forest Agroecosystems

Authors: Brian Strahm*, Virginia Tech

Abstract: Nitrogen is one of the primary constraints to the productivity of agroecosystems. As a result, nitrogen fertilization is a common practice. Yet, the efficiency and widespread adoption of fertilization is limited by uncertainty in the fate of added nitrogen, including retention and partitioning within the ecosystem. Here we synthesize information from region-wide fertilization experiments across three managed forest agroecosystems: Douglas-fir (Pseudotsuga menziesii) in the US Pacific northwest, loblolly pine (Pinus taeda) in the US southeast, and radiata pine (Pinus radiata) in New Zealand. Results indicate that soil chemical properties, like the quantity and type of secondary minerals, relate to the retention of nitrogen. Such interactions can lead to an increased residence time of added nitrogen that are expected to lead to increased plant uptake and reduced leaching losses. Further, stand-level properties, like patterns in the natural abundance of nitrogen stable isotopes, characterize the openness of the ecosystem nitrogen cycle. Such measures relate to ecosystem nitrogen retention and could be further used to scale predictions of nitrogen dynamics in response to nitrogen additions. Collectively, such ecosystem properties can serve as important management tools to identify landscapes that are sensitive to nitrogen additions, thereby improving the economic efficiency and environmental sustainability of nutrient management forest agroecosystems.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Preparing for Long-Term Stewardship: A Dual Approach

Authors: Benjamin Shorofsky*, Delta Institute

Abstract: Illinois has over 1 million acres of land conserved by federal, state, local, and non-profit conservation groups. Traditionally the burden of stewardship has fallen on governments and public agencies. As budgets become constrained, we are starting to see this model change with Land Trusts and other non-profits shouldering more of the stewardship burden. By addressing insufficient and inconsistent funding for stewardship through the implementation of a long-term, scalable financing strategy, the Illinois conservation community can overcome the constraints of the current funding cycle and chart a new path forward. Funded by the Grand Victoria Foundation, the Delta Institute, the Natural Land Institute, and the Illinois Environmental Council spent the last year and a half researching, investigating, and analyzing potential models that could provide that new direction for conservation land trusts in our state and beyond. In the end, we believe the solution presented, The Dual Approach Framework, addresses practitioner needs while being flexible and adaptable with changing policy. This strategy is built around the adoption of two key approaches: 1. Creating formalized regional partnerships that can optimize resources and capacity 2. Building an agricultural working lands investment cooperative that will promote sustainable practices while creating a steady flow of annual returns This presentation will present our research and engagement strategies, an overview of our funding mechanism analysis, and finally present the Dual Approach and how we are moving it forward in the Midwest.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Status of Water Harvesting Structures for Fish Farming: A Focus from Shiwaliks, India

Authors: Muruganandam Muthiah*, ICAR, India/SDSU, SD, USA; Steven Chipps, Professor and Unit Leader, USGS Coop. Fish and Wildlife Research Unit, Department of Natural Resource Management, 1390 College Avenue, South Dakota State University, Brookings, SD 57007, USA

Abstract: Realizing the importance of effective Water Harvesting Structures (WHS) or farm ponds for rainfed agriculture and prevailing interfaces over their design features between farmers, water conservationists and aquaculturists, a diagnostic survey was conducted on the status and prevailing problems of WHS developed by various agencies under watershed management programmes in Shiwalik and north-western Himalayan region to accommodate fish farming. Extensive watershed management programmes executed in Shiwaliks and north-western Himalayas have created numerous WHS, but without active consideration for fish farming in them. All of the randomly selected 18 WHS for the present survey had been leased for fish farming by the concerned Watershed Society or Water Use Association (WUA) initially for few years, which produced 0.6-1.5 (average of 0.8) t of fish ha-1 year-1. Subsequently within 2-13 years after construction of WHS, fish farming was either discontinued or practiced irregularly due to one or other reasons, pointing out that the harvested water is not effectively used for fish farming in the region. Technical, social and extension related problems, viz. prevalence of inappropriate WHS or ponds, functioning of the Watershed Society, support facilities provided and execution of inadequate or excessive water conservation interventions in watersheds were major causes for non-performance or failure of WHS or ponds for accommodative fish farming, which need categorical resolution at various levels of Integrated Watershed Management (IWM) programmes.

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Subject Area: Conservation Models, Tools, and Technologies

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The Franklin Research and Demonstration Farm: A Case Study for the Value of Demonstration Farms for Water Quality Science, Soil Health, and Outreach

Authors: Krista Kirkham*, The Nature Conservancy; Maria Lemke, The Nature Conservancy; Ashley Maybanks, The Nature Conservancy; Jackie Kraft, McLean County Soil and Water District, Illinois; Kent Bohnhoff, Natural Resources Conservation Service; David Kovacic, Uni

Abstract: On-farm demonstration sites have tremendous value for agricultural conservation outreach and research. The Nature Conservancy and the University of Illinois have partnered for over 10 years with the Franklin Family in Lexington, IL on the Franklin Research and Demonstration Farm. The Farm showcases various in-field and edge-of-field agricultural conservation practices, including constructed wetlands that are monitored for water quality research. The overall goals of the Franklin Farm are: 1) determine the effectiveness of constructed wetlands in reducing nutrient concentrations in tile runoff; 2) determine what wetland/watershed ratio is needed for significant reductions in nutrients; 3) serve as demonstration site for agricultural conservation practices; and 4) determine the effectiveness of cover crops in sequestering nitrogen and improving soil health. Nine years of wetland research at a farm scale (~250 acres) has demonstrated wetland to watershed ratios of 3% to 9% can remove an average of 12% to 48% of nitrate nitrogen and 62% to 73% of orthophosphorus loadings, respectively. Since 2005, the Franklin Research and Demonstration Farm has hosted nearly 100 tours to agricultural agencies, universities, legislators, and local farmers and landowners, and has been highlighted in local, state, and national presentations and media outlets. In 2011, cover crops were seeded to a 15-acre wetland drainage area of the Franklin Farm as a demonstration project, and have continued and expanded through 2016 to determine their impact to soil organic matter, field surface cover, and nutrient loss from tile drainage. The Franklin Research and Demonstration Farm has proven to be an invaluable resource for conservation demonstration and education.

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The StreamStats Web Application of the U.S. Geological Survey, v4

Authors: Hans Vraga*, United States Geological Survey; Kernell Ries, United States Geological Survey

Abstract: Hans Vraga: Information Technology Specialist, USGS; 706-648-5670; hvraga@usgs.gov Kernell G. Ries III: Hydrologist, USGS, 443-498-5617; kries@usgs.gov The U.S. Geological Survey's StreamStats program, v4, is an interactive web application (https://streamstats.usgs.gov) that can provide soil and water conservation practitioners with information they can use in their daily work. StreamStats users can locate and select USGS data-collection stations on the map in the user interface and obtain previously computed streamflow statistics and basin characteristics, as well as descriptive information. Users can select any location along a stream and obtain the drainage-basin boundary, basin characteristics, and estimates of streamflow statistics. Due to separate state implementation, the information that is available for the streamgages and for user-selected sites varies among the states. Examples of the more than 800 basin characteristics are: drainage area, stream slope, mean annual precipitation, and percentages of various land uses and soil types. Examples of the more than 2,500 streamflow statistics include: the 1-percent (100-year) flood, the mean flow, and the 7-day 10-year low flow. The drainage-basin boundaries obtained from StreamStats can be saved in a variety of formats, with the characteristics and streamflow statistics included as attributes. The statistical information also can be printed or saved in tab-delineated files. In addition, StreamStats v4 allows users to obtain land-surface distances and elevation profiles. It also includes several tools that use stream-network navigation to determine paths of flow between selected points on the land surface and a stream, as well between points on streams, and also to identify and obtain information for points of interest along streams, such as streamgages and dams. This presentation will provide a description of StreamStats and discuss plans for future enhancements.

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Web-Based Preventative Blowing and Drifting Snow Control Decision Tools

Authors: Dean Current*, University of Minnesota CINRAM; Diomy Zamora, University of Minnesota Extension; Gary Wyatt, University of Minnesota Extension

Abstract: Blowing and drifting snow on Minnesota's roadways is a transportation efficiency and safety concern. Establishing standing corn rows, living and structural snow fences or proper grading during road construction improves driver visibility, road surface conditions, and has the potential to lower costs of road maintenance as well as crashes attributed to blowing and drifting snow. These snow control solutions can also provide environmental benefits including carbon sequestration and avoidance of carbon emissions of snow removal operations. In recent years, the Minnesota Department of Transportation (MnDOT) has paid farmers to establish snow control practices to protect identified snow problem roadways. Using public funds to pay landowners to establish snow control practices, which benefit the public and reduce MnDOT winter operating costs, needs to be justified. In 2012, our snow fence research team created a Microsoft Excel cost benefit payment calculator to estimate payments for farmers that included consideration of safety and snow removal cost savings to the public and the transportation agency. Our 2014 project translated the Excel tool to a web based tool that can be used on laptops, smart phones and tablets. Outreach programs are being conducted to inform transportation agencies of this tool and the cost benefit analysis it offers. Initial outcomes include transportation authority cost savings and increased public safety. In previous years our team developed a living snow fence design tool which is used by conservation and transportation professionals to plan and design living snow fences. In 2015, a web site was established to offer both the cost benefit tool plus the living snow fence design tool to agency staff and professionals. The web site is: www.snowcontroltools.umn.edu

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WEPP Model Enhancements for NRCS Use

Authors: Dennis Flanagan, USDA-ARS NSERL; Anurag Srivastava*, Purdue University; Jim Frankenberger, USDA-ARS NSERL; Joel Poore, USDA-NRCS; Norm Widman, USDA-NRCS

Abstract: The USDA-Water Erosion Prediction Project (WEPP) model has been developed over the past 20+ years as a process-based soil erosion prediction tool, to ultimately replace empirically-based technologies such as the Universal Soil Loss Equation (USLE). In the past 3 years, the USDA-Agricultural Research Service (ARS) National Soil Erosion Research Laboratory (NSERL) has been working with the USDA-Natural Resources Conservation Service (NRCS) on implementation efforts for WEPP in that agency. These efforts include development of new web-based interfaces for hillslope profile and watershed erosion predictions, linkage of the interfaces with NRCS databases for soils, land management, and operations, and updating of national climate station parameters for over 2700 locations in the U.S. with more recent and temporally-consistent information. This presentation will highlight the current status of this project, provide details on the new WEPP web-based interface, and describe some of the enhancements to the model and its ability to simulate common agricultural soil conservation practices. Additionally, results of some comparisons between WEPP model erosion predictions and those from the Revised Universal Soil Loss Equation version 2 (RUSLE2) will be presented and discussed. Major changes in how WEPP estimates effectiveness of conservation practices, in particular contouring, will be discussed. Current indications are that WEPP for hillslope profile applications will be implemented by NRCS sometime in 2017. Development of a targeted web-based watershed WEPP tool is also underway, with testing and implementation beginning sometime in 2018 or later.

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Communicating the Importance of Public Investment in Conservation to Elected Officials: Using Site Tours and Effective Messaging as Best Management Practices

Authors: Ashley Maybanks*, The Nature Conservancy; Krista Kirkham, The Nature Conservancy; Kenna Mulligan, The Nature Conservancy; Jackie Kraft, McLean County Soil and Water District, Illinois; Susan Donovan, The Nature Conservancy; Maria Lemke, The Nature Conserv

Abstract: Across the United States, funding from federal and state programs continues to be one of the most successful avenues for large-scale conservation efforts in agricultural and natural areas. Federal programs such as the Conservation Reserve Program (CRP) and the Land and Water Conservation Fund (LWCF) help protect millions of acres across the country. In Illinois, state programs such the Natural Areas Acquisition Fund (NAAF) and the Open Space Land Acquisition and Development Fund (OSLAD), help protect thousands of additional high quality natural areas and open space. Promoting the effectiveness of these programs on improving soil health, water quality, and wildlife habitat is critical for establishing long-term return on investment for producers, landowners, and taxpayers. The Nature Conservancy's government relations team in Illinois has been working for several years to foster relationships with federal and state legislators in order to promote positive attitudes towards conservation in agricultural, urban, and natural settings. Site visits to conservation areas and demonstration farms are a key element in communicating the importance of conservation to legislators and their staff. Using polling data to determine which messages will be best received by a wide audience is another effective outreach strategy. Data collected by a bi-partisan team of Fairbank, Maslin, Maullin, Metz & Associates and Public Opinion Strategies offers recommendations on effective messaging to multiple external audiences to build support for conservation. Informing our elected officials about the success of these programs, demonstrating specifically how public investment can positively impact issues at a local scale, should be critical to any comprehensive outreach strategy to encourage further support of these programs.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

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Construction Stormwater Activities by the Alabama Chapter, Still Going Strong after 15 Years

Authors: Earl Norton*, Norton & Associates

Abstract: The Alabama Chapter of SWCS prepared a vision plan in 2000 that provided the basis for a state-wide erosion and sediment control program that has continued since implementation began in 2001. The program has prepared and maintained the technical Handbook for erosion and sediment control that is recognized in the state's non-point source construction stormwater program managed by the Alabama Department of Environmental Management. Related educational activities have evolved and include Field Days and seminars. Additional technical materials produced include a pocket Field Guide containing Handbook details and a Brochure describing the importance of protecting the aquatic environment from sediment and turbidity. The program has developed and succeeded with the support of partners that have a vested interest in water quality and stormwater management and because of strong leadership provided by the Alabama SWCS Chapter. An overview of the activities will explain how the program was initiated and how it evolved. The presentation will describe how the Alabama SWCS chapter has benefitted as non-members participate in various educational activities sponsored and co-sponsored by the Chapter and consider attending future SWCS events and becoming SWCS members. The technology that the program provides is applied to the landscapes of Alabama and the citizens and the environment benefit. The information about the various activities has positive implications for other SWCS chapters. Earl Norton, CPESC, CPAg, CCA Natural Resources Consultant, Auburn, AL Erosion and Sediment Control Program Coordinator, Alabama Soil and Water Conservation Committee earl_norton@yahoo.com 334.728.4107
229 words

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Effect of Crop Residue Management on Grain Yield and Soil Properties in Minnesota

Authors: Jodi DeJong-Hughes*, University of Minnesota Extension; Aaron Daigh, NDSU ; Abbey Wick, NDSU Extension

Abstract: Soil erosion from agricultural lands results in an irreversible loss in soil productivity and continues to be a source of sediments to surface waters. However, keeping the previous crop's residues on the soil surface until the following crop canopy closes will effectively reduce the loss of soil to erosion. To maintain an adequate cover of the soil surface with crop residues for reducing soil losses, producers can minimize or localize the aggressiveness and number of tillage operations. Minnesota crop producers have been quick to realize the advantages of reducing tillage on their lands; which include improved water infiltration and less soil and nutrients leaving the field. However, producers remain concerned about the potential for lower grain yields due to cooler and wetter soil conditions commonly perceived with reducing tillage. This perception limits many producers from adopting reduced-tillage systems across much of Minnesota. Tillage implements vary in the amount of crop residue they incorporate or leave on the soil surface. This affects how the soil dries and warms during the cool spring months, how much soil is exposed to wind and water erosion, and ultimately the crop's grain yield. Most producers cannot afford to buy multiple tillage implements to use on the numerous soil series they farm. Therefore, to address the question of which tillage implement works best for different soil conditions in Minnesota, the University of Minnesota has conducted tillage research over the past 40 years. With few exceptions, results show little differences, if any, in grain yields among different tillage systems even though large differences are observed in the amount of crop residue left in the field to protect the soil. This is good news for both Minnesota farmers and waterways.

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Subject Area: Outreach, Education, and Community Engagement

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Evaluation of the Effectiveness of a USDA Southeast Regional Climate Hub (SERCH) Climate Threat Email Alert System

Authors: Sarah Wiener*, USDA Southeast Regional Climate Hub; Steven McNulty, USDA Forest Service; Nils Peterson, North Carolina State University

Abstract: Research is needed to evaluate delivery methods for climate and weather information to land management audiences, including assessments of efficacy, potential improvements, and key information brokers. We began addressing this need by creating and evaluating a location-specific email alert triggered by the ARS Cattle Heat Stress Forecast. Cooperative Extension and USDA FSA and NRCS staff with state or district/county jurisdictions were sent an example alert when their location was forecast to experience heat stress, that invited participants to share and subscribe to the alert. Individuals from this pool of potential participants were then sent a survey asking about their use of the alert, use of climate/weather data, beliefs on climate change, and demographics. Data were also collected on alert opens, subscriptions, and sharing. Only 21% (n=977) of those receiving the alert opened it, but there were 4,722 alert views, indicating a high level of sharing. Subscriptions included 404 self-subscribes and 239 referrals (643 total). We found no statistically significant associations between alert use and age, gender, or climate change ideology among survey respondents (n = 659), suggesting minimal demographic impacts on efficacy of messaging. Recipients who used the alert to make a decision were more likely to share it (p=0.003), indicating that personal experience with the alert encourages sharing. USDA field office staff shared the alert the most, while USDA state staff shared it the least, indicating that increased relationship-building with state-level staff is imperative to SERCH's success. Results suggest a two-fold communication strategy could be more effective for organizations (e.g., SERCH) with large audiences but small staff. The two elements are: (1) mass electronic communications that are tailored and shareable; and (2) relationships with information brokers in pre-existing networks who provide access and credibility.

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Subject Area: Outreach, Education, and Community Engagement

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Farmer Nutrient Management Decision Making: Three-State Case Study

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

Abstract: Water quality problems across the United States have refocused attention on nutrient management – or the 4Rs as they are known in the fertilizer industry. As a first line of defense, nutrient management is critical to reduce off-site nutrient losses, while maintaining optimum crop growth. Farmer networks have been introduced as a farmer-learning strategy, which may lead to changes in farmer fertilizer decision-making especially related to nitrogen. To better understand nutrient decision making relative to placement, source, rate, and timing (the 4Rs) and farmer networks, we interviewed 105 farmers in 3 states (30 in Missouri, 30 in North Carolina, and 45 in Ohio) using semi-structured, in-person interviews. Additionally, we collected quantitative information through a short survey that focused on demographics, ranking, and preference questions. After interviews were recorded, transcribed, and analyzed using coding and textual analysis, a statistical analysis was completed with the quantitative information. Both quantitative and qualitative information were then combined. Nutrient decision-making strategies suggested a definite regional context, as well as individual and operational strategic differences, often based on farmer preferences. Farmer networks had little effect on farmer nitrogen decision making; 70% of the time farmers in the network maintained their current rates. Ultimately, understanding nutrient delivery relative to states and even regions within states, as well as a deep knowledge of farm communities will be required to help the private and public sectors deliver more effective nutrient management programs.

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NRCS Technical Soil Services: Highlights and Future Directions

Authors: Michael Robotham*, USDA-NRCS; Pamela Thomas, USDA-NRCS; Kamara Holmes, USDA-NRCS

Abstract: Technical soil services is the umbrella term used by the Natural Resources Conservation Service to encompass the range of soil-related information and technical assistance provided by agency staff, largely soil scientists, to internal and external customers. In order to better understand the amount and types of assistance being provided, NRCS began an internal reporting process in Fiscal Year (FY) 2011, but it was not required for Soil Science Division employees until FY2013. This presentation will summarize the technical soil services provided nationwide for the past four years (FY2013-FY2016) and how the types of assistance provided and the number of customers have changed over time. The presentation will also examine predicted changes in customer demands for technical soils services in the future and will outline proposed agency activities designed to improve the delivery of technical soil services to a larger and increasingly diverse audience.

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Subject Area: Outreach, Education, and Community Engagement

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Partnerships for Monarch and Pollinator Conservation

Authors: Alex Echols*, Sand County Foundation

Abstract: Conservation Models, Tools and Technologies Recovery of monarch butterflies will require landscape-scale action involving a variety of partners. Management to enhance monarch populations can also advance a variety of conservation objectives such as pollinator recovery, biodiversity, water quality, soil health and improved farm economic viability. Recovery of the eastern monarch population will depend principally on habitat enhancement on private agricultural lands. There is no single institution that can act alone to achieve recovery. Instead, a coalition of parties will need to act across thousands of miles to meet monarch lifecycle needs. Sand County Foundation is working with private landowners, farmer groups, agricultural input suppliers, scientists and government agencies to improve habitat from the southern range of monarchs in the US through the core breeding area in the Upper Midwest. We propose a symposium that includes presentations from landowners – represented by Leopold Conservation Award winners, commodity and farm groups, rights of way managers, agricultural industry representatives, scientists and government officials. Discussion will focus on the role of each institution and strategies to implement sufficient conservation actions to preclude listing by the June 2019 deadline. The symposium will cover: • The unique life cycle features of monarchs that pose critical conservation challenges • Actions that can be taken to provide habitat enhancement • Strategies to implement these actions on a large scale

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Productive Buffers and Educational Programs in Minnesota

Authors: Gary Wyatt*, University of Minnesota Extension; Diomy Zamora, University of Minnesota Extension; Dean Current, University of Minnesota CINRAM

Abstract: In 2015, Governor Mark Dayton signed the Minnesota Buffer Law. This law designates an estimated 110,000 acres of land for water quality using buffer strips statewide. The law establishes new perennial vegetation buffers from 16.5 feet to 50 feet along rivers, streams, and ditches. The Minnesota Board of Water and Soil Resources (BWSR) is the lead agency for implementing the MN Buffer Law. County Soil and Water Conservation Districts (SWCDs) are the local contact agency for farmers and landowners. http://bwsr.state.mn.us/buffers/ A Buffer Science and Design Symposium was created and hosted by University of Minnesota faculty to review past and current research on buffers and how they affect water quality. This symposium reached many conservation professionals which will be implementing this buffer law. A University of Minnesota Extension fact sheet was also created to offer several buffer planting options which could be profitable and productive in a buffer strip. Some cost share programs may not allow products to be sold from the buffer if it is still under the terms of the contract. Haying to hazelnuts and much more are reviewed in this fact sheet. On the web at: www.extension.umn.edu/environment/agroforestry/ This session will review the educational programs being conducted to educate professionals and landowners about possible buffer options for their land.

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Subject Area: Outreach, Education, and Community Engagement

**denotes primary author and subject area*

Purdue Rainscaping Education Program: Utilizing Experiential Learning and Leveraging Partnerships to Support Community Rain Garden Education and Implementation

Authors: Kara Salazar*, Purdue University / IL IN Sea Grant; John Orick, Purdue University; Laura Esman, Purdue University; Jane Frankenberger, Purdue University ; Rosie Lerner, Purdue University ; Kris Medic, Purdue University

Abstract: Rainscaping includes the use of sustainable landscape design and management practices at household and community scales to prevent polluted runoff from reaching water bodies by directing stormwater to be absorbed by plants and soils. The Purdue Rainscaping Education Program provides training and resources on practices that can be installed in a residential setting or small scale public spaces project. The Purdue Extension program focuses on community awareness and education for rain garden planning, installation, and maintenance for Purdue Master Gardeners, conservation agencies and organizations, stormwater professionals, and landscape companies and consultants. Participants are encouraged to attend as community teams to support implementation of public education programs and provide technical assistance for homeowners or small scale public projects upon completion of the training. The workshop model consists of fifteen hours of instruction in five training modules held over two or five days. The workshops include flipped classroom instruction, online learning, experiential training activities, field techniques, and field trips to community rainscaping projects. Participants receive hands-on experience through creation of a demonstration rain garden with community partners in a public space. Additionally, the program places emphasis on connecting participants to local and state resources and partners to support successful community projects tailored to local needs. A customized website and associated database tracks state-wide rain garden installation projects and calculates related ecological benefits such as reduction in stormwater runoff. This presentation will provide a program overview, describe program development and implementation with the interdisciplinary Extension team, share lessons learned, and best practices for experiential learning and community deployment with local partners.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**denotes primary author and subject area*

Soil Connections: Creating Pathways for Future Scientists

Authors: Emily Fuger*, ASA, CSSA, SSSA

Abstract: Introducing students in grades K-12 to soil science and facilitating a greater interest in the subject is integral to securing the next generation of soil scientists. The Soil Science Society of America (SSSA) has invested in a significant outreach effort to reach the educators of students in this age group in order to raise awareness of soil as a critical resource and a captivating career field. The SSSA K-12 committee is charged with increasing interest and awareness of soil science as a scientific pursuit, as well as a viable career choice. The committee also provides resources that integrate information about soil science into traditional grade-level sciences, such as biology, chemistry, physics, and earth science. Activities of the committee are grouped into four main areas; learning modules and lesson plans, website development, books and materials, and partnership activities. Professional and student members of SSSA are directly involved with K-12 initiatives through committee participation, local events, materials reviews and project development.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**denotes primary author and subject area*

ThinkWater: A case study in Innovation and Success in Systems-Thinking Based Water Education

Authors: Jeremy Solin*, UW Extension

Abstract: ThinkWater is a national movement of educators, students, managers, stewards, scientists, and citizens who think and care deeply about water. They know that future water security and sustainability starts with deeper learning, understanding, and caring, and that true understanding and behavior change requires more than new information. That's where systems thinking comes in. Systems thinking is a discipline based on four simple rules—making distinctions and recognizing systems, relationships, and perspectives (DSRP). These rules are useful for everyone from the aspiring water learner to the advanced water scientist to understand and solve complex water problems involving environmental, economic, social, and political stakes. As we say, the next big thing in water education, research, and extension isn't water, it's thinking. ThinkWater has generated a host of resources including online trainings, concepts and paradigms, instructional materials, software, and a community forum for water thinkers. ThinkWater is a USDA NIFA funded campaign based at University of Wisconsin Extension in partnership with Cabrera Research Lab. ThinkWater has developed extensive resources for youth water education and is now developing and implementing resources and programs for adult and community education. ThinkWater also has an extensive research and evaluation agenda to determine the effectiveness of programmatic efforts. During the presentation, we'll highlight the systems thinking framework on which ThinkWater is built and share key strategies and resources ThinkWater is using to build the movement of water thinkers. Findings of research exploring effective strategies to deliver systems thinking education and research will be highlighted. Participants will gain new tools and resources to enhance their water and other natural resources-based education and research programs. Participants will also learn about ways to partner with ThinkWater.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**denotes primary author and subject area*

Vegetative Windbreaks for Poultry Farms

Authors: Gary Wyatt*, University of Minnesota Extension; Diomy Zamora, University of Minnesota Extension; Dean Current, University of Minnesota CINRAM

Abstract: In 2015, Avian Flu infested hundreds of poultry barns in Minnesota resulting in the loss of over 5 million birds. In the summer of 2016, our Extension Agroforestry team was invited to be a part of a multi-faceted Avian Flu grant sponsored by the Minnesota Department of Agriculture. Our team was to develop a plan to evaluate vegetative windbreaks planted at turkey barn facilities to determine if these vegetative structures can prevent the transmission of flu viruses. The research team has conducted a literature review of vegetative windbreaks as it relates to turkey disease control. Surveys are being tabulated to determine the benefits or challenges of windbreaks near turkey barns, setback distances, tree and shrub species, etc. The survey groups were farmers w/ and w/o windbreaks and SWCD/NRCS staff in the region. Other tasks of the grant include; monitoring mammals and birds at selected turkey barn sites, creating educational fact sheets, videos and teaching modules to inform farmers and the industry of the best management practices to use windbreaks near turkey barns. This session will review the data collected and materials developed for poultry growers and SWCD/NRCS staff to assist in windbreak plantings around these livestock barns.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**denotes primary author and subject area*

Weather Observers

Authors: Duane Friend*, University of Illinois Extension

Abstract: A Weather Observer course, the first of its kind, was developed and has been used in several University of Illinois Extension offices. The intent of the course is to teach participants basic weather processes, climate change processes, and provide training for a state/national volunteer precipitation monitoring program. The complete program employs 3 weather seminars (2-3 hours each), plus one session for the CoCoRaHS (Community Collaborative Rain, Hail and Snow) volunteer monitoring program. In the climate variability seminar, a discussion takes place on climate models showing an increased probability of extreme weather events, in particular extreme precipitation Effects on soils and erosion rates are discussed. Evaluations from the program showed that participants increased their knowledge of basic weather processes and climate variability. To the question on whether the course had changed their opinion on climate variability, one response was " Yes. I knew very little about climate change before, and (now) I have confidence in knowing what I am explaining to others". Another responded "Yes, it is much more imminent to address. I thought it was a political battle." The program is designed to fit local needs, and has been presented as a one session seminar, which does not include the volunteer training.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

**denotes primary author and subject area*

Climate Change Beliefs, Risk Perceptions, and Use of Climate and Weather Tools: Reporting Evidence from a National FSA and NRCS Employee Survey

Authors: Rachel Schattman*, USDA Northeast Climate Hub; Gabrielle Roesch-McNally, USDA Northwest Climate Hub; Sarah Wiener, USDA Southeast Regional Climate Hub; Meredith Niles, University of Vermont; Mary Carey, USDA Farm Service Agency; Lynn Knight, USDA NRCS

Abstract: Relevance: The Farm Service Agency (FSA) and Natural Resource Conservation Service (NRCS) field staff are in a unique position to support land managers adapt to climate change. It is likely that there is substantial variance in knowledge and understanding about climate change among FSA field staff. Our study documents (a) knowledge about climate change that FSA and NRCS field staff possess, and (b) the degree to which field staff are comfortable or confident supporting farmers to address climate-related risks. Methods: Two survey instruments were designed to capture field staff beliefs related to climate change and their professional use of climate and weather information. The questionnaire was based, in part, on an instrument developed by the "Useful to Usable" study. We surveyed over 10,000 FSA staff, and we will survey over 8,000 NRCS staff using a similar, modified version of the survey questionnaire. Predicted results: We completed the FSA survey on Jan 2, 2017 (response rate = 43%), and will begin the NRCS survey in the coming weeks. We predict: (1) that there will be significant regional variation between climate beliefs reported by survey respondents in both NRCS and FSA groups, (2) there will be less correlation between survey respondent region and use of weather-information, as weather is a less politicized and more widely familiar concept; (3) that some sources of climate and weather information are more commonly used than others. Our contribution to science and society: To better support land managers to become more responsive and resilient to the challenges posed by climate change, USDA field staff must be well versed in utilizing weather- and climate- information. To design effective and impactful professional development opportunities that focus on climate change, FSA and NRCS management must first know what their field staff believe about the causes and consequences of climate change, and what weather and climate-support tools staff already use.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**denotes primary author and subject area*

Combining Societal Acceptance and Biophysical Drivers of Conservation Practices to Improve Water Quality in Multi-Use Landscapes

Authors: Zhao Ma*, Purdue University; Sara McMillan, Purdue University; Rachel Scarlett, Purdue University; Jenn Domenech, Purdue University

Abstract: Effective control of nonpoint source (NPS) pollution is critical for both long-term health of freshwater ecosystems and the socioeconomic welfare of human communities. Previous research has focused primarily on water quality management through implementation of best management practices to reduce NPS pollution from agricultural and urban land uses. However, there is a critical need to incorporate individual property owners' willingness to adopt conservation practices to more accurately quantify the cumulative water quality improvement potential at the watershed scale. Our study integrates water quality data and hydrological models with human-dimensions data from a household survey to assess the biophysical potential and social acceptance of conservation practices for improving water quality. We focus on the East Branch–Little Calumet River watershed and the Trail Creek watershed in Northwest Indiana. Our preliminary modeling results show that current N, P, sediment, and E. coli loading from the two watersheds to Lake Michigan are unevenly distributed across five resident groups (urban residential, suburban residential, rural residential, small agricultural, medium/large agricultural). The two agricultural groups and the suburban residential group exhibit higher loads of all simulated pollutants. Resident willingness to adopt conservation practices that reduce pollution loading also varies across groups. Residents tend to underestimate their own impacts on water quality and attribute more water pollution responsibility to other resident groups. These results will allow us to project different groups' willingness to adopt conservation practices onto the watershed and to calculate the resulting reduction of pollution loading to Lake Michigan. Our results can be used to help watershed managers and planners to better identify, prioritize and implement conservation practices with the highest water quality improvement potential and social acceptance.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**denotes primary author and subject area*

Leveraging Crop Advisers to Deliver Agricultural Conservation Advice and Increase the Adoption of Conservation Practices

Authors: Linda Prokopy*, Purdue University; Francis Eanes, Purdue University; Brian Bulla, Appalachian State; Pranay Ranjan, Purdue University; Ajay Singh, Purdue University; Mary Fales, TNC; Benjamin Wickerham, TNC

Abstract: Nonpoint source (NPS) pollution from agricultural land uses continues to pose one of the most significant threats to water quality in the U.S., with measurable impacts across local, regional, and national scales. The impact and influence of targeted conservation efforts are directly related to the degree to which farmers are familiar with and trust the entities providing the information and/or outreach. Recent research suggests that farmers consistently rank independent and retail-affiliated crop advisors (CAs) as among the most trusted and influential sources for agronomic information, but little is understood about whether they are willing to provide advice on the use of practices which conserve soil and water, and if so, whether they will be influential. We present survey (n=1,540) and interview (n=34) data from farmers and CAs in Michigan's Saginaw Bay (Lake Huron) watershed to explore these questions. Results suggest that farmers do not expect CAs to integrate conservation advice into the services they currently provide, but are generally open to such a change and would find their advice to be credible and influential. Likewise, CAs see themselves as willing, if underutilized, conduits of information regarding conservation practices and programs. We discuss these results, along with perceived barriers and opportunities to CAs partnering with traditional conservation agencies to enhance the impact of voluntary conservation programs. We close with suggestions for what alternative agricultural conservation paradigms could look like.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

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Public Perceptions and Attitudes about Water Resource Issues following Extended Drought

Authors: Diane Boellstorff*, Texas A&M AgriLife Extension Service; Drew Gholson, Texas A&M AgriLife Extension Service; Scott Cummings, Texas A&M AgriLife Extension Service

Abstract: Texas A&M AgriLife Extension Service facilitated two random sample surveys of Texans to evaluate citizen awareness, attitudes and willingness to act on water issues. The first survey was conducted in 2008 during a relatively mild drought which intensified through 2009-2012 when much of the state endured exceptional drought. The original survey was re-issued to another random sample of Texans in 2014 and represents an opportunity to investigate changes in public attitudes following extended exposure to municipal drought contingency plans and restrictions, and water conservation educational programs. Texans were asked to indicate the level of importance of 16 water resource issues. The three issues considered important or very important were clean drinking water, clean rivers and lakes, and clean groundwater and there were no significant differences between responses for 2008 and 2014, except for respondents' indications of the importance of water for municipal use and within state transfer/sale of water rights (both $p < 0.02$). Between 2008 and 2014, there was a significant difference in Texans' evaluation of surface water quality with more respondents indicating they believe surface water quality is good, but deteriorating; poor; or they have no opinion/don't know ($p<0.05$). Respondents in 2014 indicated that they knew or suspected that nitrate and phosphate fertilizers and pesticides affect either surface or groundwater quality in their area. However, 2014 respondents also indicated that industry, oil wells and mining, and new suburban development were most responsible for existing pollution problems in rivers and lakes. Finally, there was no difference between 2008 and 2014 responses regarding the most important actions that should be taken to protect water resources with improving water quality monitoring to detect pollution (92%), residential water conservation (91%) and educating municipal officials (90%) considered very important or important by respondents.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**denotes primary author and subject area*

Reducing Phosphorus Loading to Lake Erie: Closing the Efficacy Gap Among Future Adopters

Authors: Robyn Wilson*, Ohio State; Wendong Zhang, Iowa State University; Elena Irwin, Ohio State University; Noel Aloysius, Ohio State University; Jay Martin, Ohio State University

Abstract: Non-point source runoff from agricultural production is impairing coastal ecosystems and related services across the globe. This degradation is projected to worsen with climate change in the upper Midwest, as more intense rains transport more nutrients downstream. To combat these problems, agricultural best management practices (BMPs) have been advocated, but voluntary farmer adoption has proven insufficient to date. Using the western Lake Erie Basin as a model ecosystem, we conducted a mail survey of conventional corn-soybean farmers to develop a farmer decision-making model of BMP adoption. Results indicate that the biggest factor predicting current or future adoption of recommended best practices is confidence in one's ability to implement the practice and a a belief in the practice's ability to reduce nutrient loss and improve water quality. For example, increasing perceived efficacy by just 50% from baseline levels doubles the likely adopters for cover crops, and almost doubles adopters for subsurface placement of fertilizer. We use a spatially-explicit coupled human-natural systems model to evaluate the likelihood of achieving the targeted 40% reduction in phosphorus loading to Lake Erie through a combination of incentive payments and efficacy-building outreach and education targeting these particular practices in the western Lake Erie basin.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

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Role of Evaluation in Decision Making and Program Improvement: Case Study of a Volunteer Stream Monitoring Program

Authors: Amulya Rao Ponna Vishweshwer*, University of Wisconsin-Extension; Vikram Koundinya, University of Wisconsin-Extension; Peggy Compton, University of Wisconsin-Extension

Abstract: Water Action Volunteers (WAV), a stream monitoring program, is a statewide program for Wisconsin's citizens who want to learn about & improve the quality of streams & rivers in the state. The program is coordinated by the WI Department of Natural Resources & the University of Wisconsin-Extension. We will provide an overview of the WAV program's evaluation, which is being conducted with two goals: 1) Inform decisions related to the program's sustainability 2)Identify ways in which WAV can provide better service to its volunteers. This evaluation employs qualitative data collection methods such as interviews. A purposive sample of 10-12 people was selected by program administrators because their familiarity with the program & its audience ensures representation from all stakeholders. By presenting this case study, we will demonstrate the important role evaluation plays in decision making & program improvement. To meet these goals, this evaluation was designed using Fitzpatrick et al.'s (2004) management- & participant-oriented evaluation approaches. Stakeholders such as volunteers, program coordinators, & Advisory Board members are involved in this evaluation. This participatory approach ensures that diverse perspectives are engaged in decision making. Decision makers were a part of the evaluation team throughout the project & helped design the evaluation. A participant-oriented approach ensures that better service will be provided to the program volunteers, a key program audience. A management-oriented approach will guide program administrators to make important decisions to ensure the sustainability of the program, and will also increase the probability of the program achieving its objectives. Similar evaluation strategies can be used to inform decision making & program improvement. Reference:Fitzpatrick, J.L., Sanders, J.R., & Worthen, B.R. (2004).Program evaluation. Alternative approaches & practical guidelines (3rd ed.).Pearson Education Inc., Boston,MA 02116.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**denotes primary author and subject area*

So You Did a Workshop – What Did You Really Accomplish?

Authors: Brian MacGowan*, Purdue University; Linda Prokopy, Purdue University

Abstract: Countless natural resources workshops, field days and other educational programs are put on each year for farmers, woodland owners and others. Often times these programs are designed on the information-deficit model where the reason why landowners are not doing something is because they aren't aware of a problem or lack the knowledge how to solve it. But what are we really accomplishing with educational programs? We used a mixed-methods approach to investigate the role an 8-week forestry short course plays in forest management decisions by woodland owners. During 2016, we mailed surveys to 296 participants from 13 classes held in 2007-15. Adjusting for bad addresses, we received a 188 usable responses (65.5% response rate). The average course participant was 62 years old and owned 80.3 acres of woodlands for 26.3 years on average, but almost half (49%) owned row crops. Fifty-five percent had a management plan for their woodlands and 92 percent were male. Seventy-seven percent agreed to some extent that management of their woodlands improved because of what they learned from the course. We also conducted interviews with a random subset of respondents during the winter of 2016-17. We asked them about their experience with the course and how it informed their management decisions and actions. We specifically asked them about using the services of a professional forester, improving a new or existing management plan, harvesting timber, and controlling invasive plants. We discuss the extent to which the course played in these decisions and interacted with their knowledge base prior to the course, past educational experiences, and how landowners get connected with professional advice. While educational programs vary in terms of clients and format, our results provide insights in the role of educational programs in facilitating better land management.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

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Understanding Barriers to Adoption of Conservation Practices on Rented Cropland

Authors: Pranay Ranjan*, Purdue University; Linda Prokopy, Purdue University; Sheila Reddy, The Nature Conservancy; Randal Dell, The Nature Conservancy; Francis Eanes, Purdue University; Seth Harden, The Nature Conservancy; Yuta Masuda, The Nature Conservancy; C

Abstract: Managing for soil health requires a multi-year planning horizon, yet much of the cropland in the United States is rented using single-year leases. As per a recent USDA report, approximately 39% of farmland in the contiguous 48 states is rented, and up to 80% of rented farmland is owned by non-operating landowners. In the Upper Mississippi River Basin—a major source of nutrient pollution—non-operating landowners own more than 60% of farmland. Many of these landowners implement lease arrangements with tenant farmers, which disincentivize adoption of conservation practices that could improve soil health, water quality, and land values. In addition, landowners may be unaware of the potential benefits or consequences of conservation practices. Our understanding of attitudes and behaviors of non-operating landowners and tenant farmers, and barriers to adoption of conservation practices on rented croplands, remains thin. With the goal of filling this research gap, we present findings from interviews conducted with non-operating landowners, tenant farmers, and farm managers in Indiana, Illinois and Iowa. Results from this study will further our understanding of the implications of landowner-tenant relationship for adoption of conservation practices on rented cropland. We will also discuss our findings in the light of current agricultural conservation policy, in particular, the potential consequences of insurance and conservation cost-share policies on landowner-tenant decision-making.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

**denotes primary author and subject area*

Active and Labile Measures of Soil Carbon and Nitrogen in Wisconsin Grain and Dairy-Based Cropping Systems

Authors: Matt Ruark*, University of Wisconsin-Madison; Greg Richardson, University of Wisconsin-Madison; Amber Radatz, University of Wisconsin-Extension; Erica Olson, University of Wisconsin-Extension; Kevan Klingberg, University of Wisconsin-Extension; Francisco

Abstract: Active carbon, measured as permanganate oxidizable carbon (POXC), and mineralizable pools of carbon and nitrogen, measured via incubations and reported as potentially mineralizable carbon (PMC) and nitrogen (PMN), are valued measures of soil health. Previous work has shown a positive relationship with yield and can be sensitive indicators to soil change due to management, in contrast to soil organic matter. The University of Wisconsin Discovery Farms® used a survey approach in three watersheds in Wisconsin to establish baseline values for these measures, to evaluate how differences in management (tillage, crop rotation, manure use) affected the values, and to evaluate the relationship between the values and yield. Preliminary research indicates that the values are not strongly correlated to each other indicating that the pools of C and N that are measured are not the same pools that are extracted different ways. Additional laboratory and statistical analysis will reveal the sensitively of these measures to management across grain and dairy-based production systems and if there is a universal relationship between single measures and productivity.

Track: 2017 General Conference Theme Submissions

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

**denotes primary author and subject area*

Crop Residue Removal and Cover Crops Impacts on Soil Health, Water Storage and Soybean Yield

Authors: Kopila Subedi, SDSU; Brianna Wegner, USDA; Shikha Singh, SDSU; Sandeep Kumar*, South Dakota State University; Shannon Osborne, USDA; Thandi Nleya, SDSU

Abstract: In the North Central region of USA there is limited information available about the adopting cover crops and maintaining the maximum level of crop residue. This study was conducted to better understand the role of crop residue and cover crop on soil properties and soil water dynamics. The study was conducted in USDA-ARS North Central Agricultural Research Laboratory, located at Brookings, South Dakota. Residue removal treatments that include low residue removal (LRR) and high residue removal (HRR) were established in 2000. In 2005 cover crop treatments which include cover crops (CC) and no cover crops (NCC) were integrated. Data from this study showed the LRR treatment resulted in lower bulk density by 9 % and soil penetration resistance by 25 % on 0 - 5 cm depth. Residue removal treatment significantly impacted SOC concentration on surface depth by 22%. This study showed that the better soil structure and high SOC concentration enhance soil hydrological properties. The LRR significantly increased soil water infiltration by 22 – 66%. Similarly, cover crops increased infiltration by 27 – 82%. Significant impact of crop residue was observed on water retention where $p < 0.05$. Furthermore, LRR and CC treatments increased the soil moisture content on the surface 0 - 5 cm depth. However, the trend was not always significant. The CC treatment significantly impact on soybean yield by 14% and water use efficiency by 13%. This study answered most common concern of the producers for the widely adoption of cover crops and maximum retention of crop residue.

Track: 2017 General Conference Theme Submissions

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

**denotes primary author and subject area*

Determining Acceptable Levels of Crop Residue Removal for Crop Yields and Erodibilit

Authors: DeAnn Presley*, Kansas State University

Abstract: Crop residue removal must be evaluated to assess the susceptibility of soil loss on wind erosion-prone soils such as those of the central Great Plains, USA. Two experiments will be summarized in this presentation. A long-term experiment began in 2009 and continues to the present. The experiment is conducted at one rainfed and one irrigated location, on small plots, under continuous corn. Yield and soil organic matter data will be presented. In the second experiment, six on-farm trials were conducted from 2011 to 2013 determined the effects of crop residue removal at increments of 0, 25, 50, 75, and 100% removal on soil wind erosion parameters. The field measured soil properties were included as input parameters into the Single-event Wind Erosion Evaluation Program (SWEEP), a sub-model of the Wind Erosion Prediction System. SWEEP predicted the wind velocity that initiated wind erosion as well as soil loss under each crop residue removal level at a wind velocity of 13 m s-1 for three hours. The total amount of estimated soil lost in three hours ranged from ≈2 to 25 Mg ha-1, and the tolerable soil loss for these soils was 11.2 Mg ha-1. Fifty percent crop residue removal appears sustainable from a wind erosion perspective for all sites, while 75% residue removal caused simulated wind erosion at three out of six sites, reinforcing the need for site-by-site evaluation of the potential amount of crop residue that may be harvested while minimizing erosion and maintaining crop yield potential.

Track: 2017 General Conference Theme Submissions

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

**denotes primary author and subject area*

Developing Criteria for Soil Health Interpretations--Science of Interpretations

Authors: Maggie Payne*, USDA NRCS; Robert Dobos, USDA-NRCS; Shawn McVey, USDA-NRCS; Lindsay Hodgman, USDA-NRCS; Diane Stott, USDA-NRCS; Jennifer Kucera, USDA-NRCS; Maxine Levin, USDA-NRCS

Abstract: Soil survey data is now available in raster and vector formats for almost all of the United States. This robust dataset is a useful tool in land use planning especially with the use of unique and area-specific soil interpretations. Soil interpretations are designed to take soil survey information and present it in an easily understandable and useful format in order to predict soil behavior for specified soil uses and under specified soil management practices. Creating soil interpretations for soil health poses unique challenges due to the dynamic nature of the soil attributes that are used to assess soil health. Interpretations can assist in making predictions such as identifying soils with the highest potential to accumulate and store carbon or soils that would most benefit from specific cover crops. There are many interpretations that can be made based on soil survey data that can tell the user about the potential for improving soil health and other indicators of healthy soil. We will explore the building of criteria, thresholds, and potential of these soil interpretations for Soil Health.

Track: 2017 General Conference Theme Submissions

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

**denotes primary author and subject area*

Development of a Dynamic Soil Property and Soil Health Database for Soil Survey

Authors: Skye Wills*, USDA-NRCS; Micheal Robotham, USDA-NRCS; Candiss Williams, USDA-NRCS; David Hoover, USDA-NRCS

Abstract: Soil information provided by soil survey supports land use and management decisions across a wide range of users. Precision agriculture, conservation tools and soil quality or health assessment all rely on soil information for planning and reference purposes. Current soil survey information is limited in that it does not fully capture for use and management data. The information provided by traditional soil survey is based on the concept of inherent soil properties. That is, soil properties that do not change with land use and management. Dynamic soil properties (DSPs), conversely, are known to change with land use and management. DSPs include properties that are indicative of soil health including soil biological markers and structural characteristics. This presentation will provide an overview of current efforts to enhance soil survey databases with comprehensive information on DSPs and soil health. A comprehensive soil health database will include metadata and relational links between samples and spatial features such as soil map units, land use and management units. Metadata includes information about current and past land use and management practices. Relational information includes associations between individual samples by location, depth, fields, farms, land use, management practices and other pertinent information. The combination of detailed soil sample data with metadata and spatial features will allow for: 1) improved reference information for indicators of soil health, 2) better prediction and assessment of soil management practices and 3) the evaluation of soil health indicators and ecosystem services. New database development should allow for joint data collection and use by multiple stakeholders from conservationists and scientists to land managers and owners.

Track: 2017 General Conference Theme Submissions

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

**denotes primary author and subject area*

Effects of Long-Term Cattle Manure Application on Soil Health under a Corn-Soybean Rotation of Two Locations in Eastern South Dakota

Authors: Ekrem Ozlu*, University of Wisconsin-Madison; Sandeep Kumar, South Dakota State University; Francisco Arriaga, University of Wisconsin-Madison

Abstract: Manure is an excellent agricultural practice to enhance soil organic carbon (SOC) accumulation and improve soil hydrological properties that are crucial for crop production and hence soil quality. However, an optimum rate of manure application is very important to avoid any environmental impacts. Therefore, there is need to identify a recommended rate of manure application based on phosphorus (P) and nitrogen (N) content to reduce negative soil properties. This study was conducted to assess the long-term impacts of manure and inorganic fertilizer rates on some soil quality indicators such as SOC, total nitrogen (TN), carbon stock, bulk density (BD) and soil water retention (SWR) under a corn (Zea mays L.)-soybean (Glycine max L.) rotation system at two long-term sites located in Eastern South Dakota. Study treatments included: three manure [P-based recommended manure application rate (P), N-based recommended manure application rate (N), nitrogen-based double of recommended manure application rate (2N)], two fertilizers [recommended fertilizer (F) and high fertilizer (HF)], and a control (CK)]. Soil samples were collected from 0-10, 10-20, 20-30 and 30-40 cm depths, and intact cores from 0-10 and 10-20 cm depths in four replicates in 2015 after 13 years of treatment establishment to analyze selected soil quality indicators. Manure applied at the high rate (2N) significantly increased SOC and TN for every studied depth increment from 0-40 cm compared to that of inorganic fertilizer at either site. Average manure application reduced the BD by 17% compared to those inorganic fertilizer applications at 0-10 cm depths at on site. Water infiltration (qs) increased by 49 to 75% with manure application compared to inorganic fertilizer in both sites. Overall, manure improved soil properties compared to that of inorganic fertilizer, however, further research is needed to monitor the water quality and environmental impacts.

Track: 2017 General Conference Theme Submissions

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

**denotes primary author and subject area*

Identifying the Most Suitable Soil Health Assessment Metric Across Different Soil Textures

Authors: Ross Wilson*, Ausable Bayfield Conservation Authority

Abstract: The health of agricultural soils has long been recognized as critical for the long-term sustained production of food, fibre and energy for a growing world population. However, the overall health of soils is difficult to ascertain, with subjective/qualitative metrics contrasting with quantitative metrics. Different methods for the same metric results in additional confusion. Standardization of the metrics and methods are required to help evaluate the actual status of soil health and to evaluate changes in soil health due to changes in soil management. A project was initiated to evaluate the suitability of several soil health metrics across four different textured soils. The Ausable Bayfield watersheds on the Southeast shore of Lake Huron was the project region due to the "recent" glacial landscape which left behind a wide variety of soil types in a small geographic area. Soil types were divided by texture into 4 classes: clay, dominantly finer loam, dominantly coarser loam, and sand. Eight soil health metrics were assessed on four farms in each soil type and compared to the same eight soil health metrics assessed on a benchmark soil (same texture), such as a fence row or forested site. The eight soil health metrics include: aggregate stability, infiltration rate, bulk density, total porosity, organic matter, topsoil depth, resistance to penetration, and Total Carbon Accumulation per hectare. Results suggest that all of soils under agricultural production were substantially poorer than the benchmark soils from the fencerow/forest that have never been cultivated. Some metrics were more sensitive than others, showing greater differences between the cultivated and their respective benchmark soils. Also, some of the metrics showed similar patterns as other metrics, although this observation was not universal.

Track: 2017 General Conference Theme Submissions

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

**denotes primary author and subject area*

Impacts of Grazing and Manure Management on Soil Phosphorous and Water Quality in the Buffalo National River Watershed

Authors: James Burke*, University of Arkansas; Timothy Glover, University of Arkansas; Cory Hallmark, University of Arkansas Extension Service; Mike Daniels, University of Arkansas; Andrew Sharpley, University of Arkansas

Abstract: Elevated levels of soil phosphorous (P) from applications of poultry manure can have potentially damaging effects on watershed health and stability. Excess nutrient infiltration into streams via runoff and other transport mechanisms have been found to severely impair aquatic life and decrease aesthetic qualities. We are monitoring the impacts of a permitted Concentrated Animal Feeding Operation near Mount Judea, on water quality in the Buffalo River Watershed, Arkansas, the Nation's first designated Scenic River. Swine slurry from the farm is applied to agricultural fields adjacent to Big Creek, a tributary of the Buffalo River. This manure is utilized as a fertilizer source for local forage and cattle operations. Geo-referenced grid-soil sampling (0.5-acre grid) was conducted on three fields abutting Big Creek in 2014 and 2016. Two fields have received swine slurry since 2013 and one field, not yet permitted, receives mineral fertilizer to maintain forage production. Surface (0 – 4 inch) and subsurface (to refusal) samples were collected each year at 160 sites. Statistical analysis using a paired t-test at p = 0.05 showed that the surface soil P of only one field receiving swine slurry significantly increased from 2014 to 2016. It was determined that the cause for this significant increase in P content was due to an area of the field that was primarily used by cattle to congregate as well as the field receiving a slurry application in early 2016. Since then the producers of this operation have been consulted and have agreed to periodically change the location of hay bales used as supplementary feed and adopt rotational grazing in order to reduce the disturbance and accumulation of P in that area of the field. Intensive soil and water P monitoring and adaptive conservation practices are needed to ensure the water quality of Big Creek and the Buffalo National River continues to be protected.

Track: 2017 General Conference Theme Submissions

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

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Interpretive Applications of Soil Survey Data and Properties for Soil Health: Process Modelling Options

Authors: Maxine Levin*, USDA-NRCS

Abstract: Maxine J Levin, Diane E. Stott, Brandon Smith, Candiss O. Williams and Jennifer Moore-Kucera Soil health management and assessment has the potential to improve crop performance and reduce risk by increasing soil resiliency. Soil Health with soil testing for crop and field may be the best insurance that a crop will be successful and produce a harvest with the highest potential and most long-term sustained yield possible. Soil as a medium for crop growth can have many limitations that are integral with the inherent material, its past use and management, and its intended use. The National Cooperative Soil Survey database for the USA gives generalized estimations of inherent properties. It rarely addresses the dynamic soil properties of fertility, soil biology, surface structure and aggregation from management and properties derived from poor management, compaction or erosive degradation (USDA-NRCS, 2016). By making use of Soil Testing and Soil Health assessments, the grower will be able to use the best management practices based on the current state of dynamic soil properties and have the knowledge for potential regenerative management systems that improve degraded environments. The Agricultural Policy/Environmental eXtender (APEX) model was developed for use in whole farm/small watershed management. With the use of process modelling and the addition of soil fertility and soil health assessments as validation points, it would be possible to ascertain potentials and thresholds for Soil Health indicators that will be helpful in the selection of management strategies as well as show outcomes for environmental improvement and cost/profit ratios. APEX modelling in NRCS has been corporately used to quantify benefits of conservation practices for water quality, leaching and erosion. The same model could be considered to evaluate conservation practices for soil health improvements and outcomes.

Track: 2017 General Conference Theme Submissions

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

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Interseeding Cover Crops and Corn Stover Harvest: Soil and Crop Response

Authors: Humberto Blanco*, University of Nebraska-Lincoln; Michael Sindelar, University of Nebraska-Lincoln; Charles Wortmann, University of Nebraska; Gary Kreikemeier, Producer

Abstract: Corn stover is an important forage for beef production and is a biofuel feedstock. Excessive stover removal is not recommended, especially for fields with moderate and high potential for erosion, and may lead to reduced soil organic C and nutrient availability. Aerial sowing of a cover crop before harvesting corn grain and stover is one of the practices that could offset adverse effects of stover removal on soils and crop production. We studied the impacts of stover baling with and without aerially intersown winter rye cover crop on soil erosion potential, soil properties, and subsequent corn yields in a farmer's field under irrigated strip till continuous corn on a sandy loam in the Platte River valley of the western Corn Belt from 2013 to 2016. Corn grain harvest was in early October as high moisture corn. Stover removal averaged across the three years was 74% and was completed by mid October. Rye cover crop biomass yield ranged from 0.2 to 3.4 t ac-1. Dry soil aggregate properties were determined as indicators to assess the soil's susceptibility to wind erosion with sampling in spring before planting corn. Cover crop had no significant effect on geometric mean diameter of dry soil aggregates and wind erodible fraction (<0.84 mm aggregates) in any year but there was a trend for increased geometric mean diameter and reduced erodible fraction under cover crop. Corn stover baling reduced geometric mean diameter and increased wind erodible fraction by 0, 27 and 37% in the first, second and third year, respectively. Cover crop and stover removal did not affect soil compaction, water content, sorptivity, soil organic C, particulate organic matter, and nutrients. Corn yield was not affected by treatments. Overall, stover removal at high rates is likely to result in increased wind erosion but the added soil cover provided by the winter rye cover crop could partly offset the effect of stover removal on wind erosion potential for this sandy loam soil.

Track: 2017 General Conference Theme Submissions

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

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National Commodity Crop Productivity Index and Soil Health

Authors: Maxine Levin, USDA-NRCS; Robert Dobos*, USDA-NRCS

Abstract: Robert Dobos and Maxine J. Levin The National Commodity Crop Productivity Index(NCCPI) is a method of arraying the soils of the United States on the basis of their inherent ability to foster the production of commodity crops. The system uses soil, site, and climate data found in the soil survey database to perform its determinations. Most of the soil properties used by the system are not modified by management. However, some properties, such as organic carbon content, pH, bulk density, and hydraulic conductivity can be profoundly altered by management, which can have either a positive or negative impact on soil productivity. Based on this premise, we will explore the NCCPI as a potential index also for soil health in commodity crop systems.

Track: 2017 General Conference Theme Submissions

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

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Soil Organic Carbon Changes and Other Soil Properties Impacted by Crop Rotational Diversity Under No-Till Farming in Northern Great Plains, USA

Authors: Abdullah Alhameid*, South Dakota State University; Ekrem Ozlu, University of Wisconsin-Madison; Saroop Sandhu, University of Florida; Sandeep Kumar, South Dakota State University

Abstract: Soil organic carbon (SOC) is critical for the development and maintenance of productive and healthy soils. Adopting agriculture practices such as diverse cropping systems and no-till (NT) farming can be beneficial for building SOC and hence improving various physical and hydrological properties of soils. The present study was conducted to assess the impact of crop rotational diversity on SOC, and soil physical and hydrological properties. The long-term study established in 1991 at Beresford, South Dakota and included no-till with 2-yr rotation (NT2), no-till with 3-yr rotation (NT3), no-till with 4-yr rotation (NT4), conventional-till with 2-yr rotation (CT2), conventional-till with 3-yr rotation (CT3) conventional-till with 4-yr rotation (CT4). Crop rotations systems included 2-yr (maize (Zea mays L)-soybean (Glycine max L); MS), 3-yr (maize–soybean–wheat (Triticum aestivum L); MSW), and 4-yr (maize–soybean–wheat–oat; MSWO) (Avena sativa L.). Soil samples were collected from the maize phase of each rotation in 2014 and 2015. Soil samples were collected from four depths (0- to 7.5-, 7.5- to 15-, 15- to 30-, and 30- to 60-cm) after crop harvest, and analyzed for SOC, total nitrogen (TN), bulk density (ρb), water aggregate stability (WAS), and light fractions of carbon and nitrogen (LFOC, LFON), soil penetration resistance (SPR), soil water retention (SWR), pore size distribution and water infiltration (qs). Data showed that after 23 years, the 4-yr rotation significantly increased SOC concentrations up to 30-cm in both tillage systems compared to less complex cropping systems, which subsequently decreased the bulk density and SPR. Moreover, results showed increases in all other parameters when NT system associated with complex cropping system increased SWR, pore size distribution and water infiltration. Data from this study revealed that long-term use of diverse crop rotations under NT system in South Dakota, USA improved SOC concentrations and other soil properties.

Track: 2017 General Conference Theme Submissions

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

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The How & Why of Utilizing Street Trees for Stormwater Management

Authors: Jeremy Bailey*, GreenBlue Urban

Abstract: Drainage problems arising from increasing levels of urbanization have exacerbated the limitations of conventional surface-water drainage measures. Street trees can be essential components to the management of stormwater in urban areas. Like their woodland forest equivalents, urban trees direct precipitation into the ground through trunk flow and absorb rainfall through their roots – making them an invaluable sustainability asset in the urban environment. Traditional drainage systems for surface water runoff have been designed to transfer rainwater from where it has fallen to either a soak-away or a watercourse as rapidly as possible. This method increases the risks of flooding, environmental damage, and urban diffuse pollution; since runoff water usually carries contaminants including oils, heavy metals, pesticides, fertilizers, chemicals and other urban matter. Urban tree pit systems effectively and sustainably mitigate these challenges. Sustainable urban drainage is about combining stormwater management with urban tree planting design. They significantly reduce the velocity and flow rate of surface water runoff in urban areas and contributes towards meeting the required discharge rates, while filtering out harmful pollutants and contaminants carried in surface water, preventing particles in the water from passing through but allowing the water to be discharged into surrounding subsoil and absorbed by the trees' root system, or into a specially designed flow-control chamber positioned on the outfall of the tree pit.

Track: 2017 General Conference Theme Submissions

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

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Update on an NRCS Project to Strengthen the Science of Soil Health

Authors: Michael Robotham*, USDA-NRCS; Bianca Moebius-Clune, USDA-NRCS; David Lindbo, USDA-NRCS; Terrell Erickson, USDA-NRCS

Abstract: In 2016, the Natural Resources Conservation Service (NRCS) implemented an integrated, collaborative project to strengthen the science behind soil health activities in the agency as well as to contribute to the overall science behind soil health. The project has five major components: 1) literature review, 2) meta-analysis of available soil-health related data from completed and ongoing projects, 3) development of an integrated database for soil health indicators (dynamic soil properties) and associated metadata, 4) implementation of a network of locations for soil health assessment and monitoring on agriculturally important soils and landscapes nationwide representing diverse management systems, and 5) the development of field-based data collection, assessment and evaluation tools, standards, and related technologies, including citizen science approaches. Taken together, these efforts will facilitate the interpretation of soil health indicators for use by producers, will support the quantification of management impacts on agronomic, economic and environmental outcomes, and will contribute to more effective science-based field-level implementation of soil health management systems. This presentation will provide an overview of the project including initial project outputs, ongoing activities and proposed future efforts as well as opportunities for collaboration.

Track: 2017 General Conference Theme Submissions

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

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Using a Soil Geomorphic (Soil-Systems) Approach to Inform Soil Health Assessment

Authors: Michael Robotham*, USDA-NRCS; Philip Schoeneberger, USDA-NRCS; Zamir Libohova, USDA-NRCS; Doug Wysocki, USDA-NRCS; Curtis Monger, USDA-NRCS; Skye Wills, USDA-NRCS

Abstract: General consensus exists in the scientific community regarding the need for rigorous field-based studies that quantitatively assess soil health indicators across soil landscapes and diverse management systems to determine locally relevant ranges and thresholds for interpretation purposes. This consensus is reflected in a growing body of publications in refereed journal articles, book chapters, extension notes, etc. based on studies throughout the US that examine one or more soil properties considered to be soil health indicators. The large majority of these studies, however, are site-based with results applicable to a field or farm. As a result, the ability to extrapolate conclusions to broader areas is limited. We propose the adoption of an approach that uses soil-geomorphic principles, Soil Taxonomy, and the entire soil survey paradigm to extrapolate site specific results to soil systems across larger areas. This presentation will outline the overall soil-geomorphic (soil-systems) framework and focus on its potential application to soil health assessment using a set of pilot soil-landscapes as examples.

Track: 2017 General Conference Theme Submissions

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

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Using Soil Survey Data to Inform Soil Health Inventory and Assessment

Authors: Maxine Levin*, USDA-NRCS

Abstract: Traditional soil survey is grounded in a soil-landscape model that identifies spatially contiguous map units at a farm scale (typically 1:24000) and estimates "representative values" for soil properties at the component level. Soil classification, especially US Soil Taxonomy which was developed in concert with soil survey, focuses on using soil properties and morphological characteristics such as sub-surface diagnostic horizons to define taxonomic groups. The primary goal of the soil survey/soil classification paradigm is to provide standard, largely categorical, information for farm scale management. In contrast, soil health has focused interest on dynamic soil properties defined as properties that can be changed through management at human time scales – months, years, or decades. This presentation will use specific examples from completed, ongoing, and proposed projects to show how soil survey information can be used to inform and support soil health inventory and assessment in at least three ways: 1) Identifying the dynamic soil properties that are most likely to be of interest or import; 2) Providing expected natural ranges of the magnitude of dynamic soil properties; and 3) Providing a framework through which results from site-specific assessments of the effects of management practices or suites of management practices can be extrapolated beyond specific locations. Additional potential applications of soil survey data and information to soil health-related projects will also be discussed.

Track: 2017 General Conference Theme Submissions

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

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What Are the Most Pressing Water Issues Facing the U.S.? Perceptions of Federal Government Staff

Authors: Sarah Church*, Purdue University; Linda Prokopy, Purdue University; Mike O'Neill, University of Connecticut

Abstract: Water is critical to social and ecological function. Competing demands for water resources – drinking water, habitat, irrigation, hydrological function – and the contribution of multiple sectors to the its degradation is compounded by the uncertainty of the impact of a changing climate. Researchers across the United States seek to find solutions to a diversity of water issues, from lab and field based solutions to the consideration of human dimensions. Our team is analyzing the impacts and effectiveness of United States Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA) Water Portfolio projects between the years 2001 and 2013 (NIFA Water Portfolio Synthesis.) One component of this synthesis is an analysis of water priorities that will lead to water funding priority recommendations. In this presentation we report the results of a Delphi survey administered in two phases (n=35, n=21) to federal agency water experts in which we prioritized, through consensus, a list of 40 previously identified water issues. Water issues related to climate change were identified as top priorities, as were water quality issues due to excess nutrients. In addition to presenting federal water expert defined critical water issues, we will discuss additional elements seen as important aspects of NIFA's future funding strategies; the inclusion of all or some of the following elements through project structure or explicit project outcomes: interdisciplinary teams, stakeholder collaboration, data sharing, education/extension/outreach as part of project outcomes. Future outputs of this research will include the identification of gaps between the critical water issues reported here with what NIFA has funded in the past, while also informing the efficacy and success of future NIFA funded projects through project structure and design.

Track: 2017 General Conference Theme Submissions

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

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Atrazine Transport Through a Soil-Epikarst System: Hydrology and Impacts of Agriculture

Authors: Bob Lerch*, USDA-ARS; Chris Groves, Western Kentucky University; Ben Miller, US Geological Survey; Jason Polk, Western Kentucky University

Abstract: Row crop and livestock production contaminate soils and groundwater of the karst aquifer systems within south-central Kentucky's Pennyroyal Plateau. In this study, we investigated the transport of atrazine from field application to the epikarstic drainage system beneath a field with active row-crop farming. The study site is a shallow karst system fed by internal drainage within an ~1 ha sinkhole recharge area. Roughly 3 m of soil overlie the St. Louis Limestone at the site, and the sinkhole contains the entrance to Crumps Cave and an epikarst drain (Waterfall 1,WF1) which was monitored for atrazine concentrations from Jan 2011 to May 2012. Atrazine was applied to the field in early March, but concentrations at WF1 did not increase above winter background levels for nearly two months when atrazine levels abruptly increased from ~1 ug/L to 39 ug/L. Dealkylated metabolite to parent ratios (DMPR) were >20:1 during the winter prior to spraying, demonstrating evidence of previous atrazine application and degradation, then decreased to <1:1 in the spring as parent atrazine was transported through the epikarst, followed by a linear increase through the summer and fall to >10:1. The seasonal DMPR pattern corresponded with changes in soil temperature and the specific conductivity of the water at WF1. These data support the hypothesis that a combination of sorption and degradation in the soil column above the epikarst controlled the transport of atrazine and its dealkylated metabolites, resulting in delayed atrazine transport following application and continual transport of the weakly sorbed metabolites to the epikarst aquifer. Management practices that generally improve soil quality, leading to increased retention and degradation of herbicides, and the use of strongly sorbed, non-persistent herbicides would improve groundwater quality in this region.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

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Bargaining for Recharge: An Analysis of Cooperation and Conjunctive Surface Water-Groundwater Management

Authors: Kelly Cobourn*, Virginia Tech

Abstract: Recent negotiations between surface water and groundwater users in Idaho highlight a potential mechanism to resolve costly conflict that has arisen in many areas of the U.S. where surface and groundwater resources are hydraulically connected. In these areas, groundwater pumping reduces the surface water flows available for diverse uses as well as the flows essential to support ecosystem health. Hydraulic connectivity is widespread, yet the policies that govern surface and groundwater use rarely reflect the physical interdependencies between the two. Developing centralized policy to mediate these disputes has proven politically contentious, leading to long delays in reaching a resolution, while resource depletion and resulting damages continue unabated. We examine the potential for decentralized bargaining between water users to resolve such conflict. We do so by developing an economic game-theoretic model of cooperative bargaining that we parameterize numerically to simulate conditions in the Eastern Snake River Plain. We compare the bargaining outcome with: 1) the status quo, non-cooperative approach to groundwater pumping reductions under current water policy, and 2) the socially optimal level of pumping reductions, which incorporates the benefits of water use to both user groups and the ecosystem. We demonstrate that bargaining leads to lesser, but longer-lived, groundwater pumping restrictions than those that occur under the status quo. The distribution of pumping reductions over time thus creates the potential for both types of water users to benefit economically from reduced groundwater pumping. However, the bargaining agreement does not necessarily attain the socially optimal level of pumping reductions. We identify the set of conditions under which water agencies may be justified in intervening in the form of centralized policy versus those in which resources are better invested in supporting negotiations between water users.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

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Developing a "Measurement and Evaluation Plan" (MEP) for an RCPP Water Quality Project

Authors: Michelle Perez*, American Farmland Trust; Jennifer Filipiak, American Farmland Trust

Abstract: While more conservation work is done through watershed projects under the Regional Conservation Partnerships Program (RCPP), project managers struggle with how to measure and report on the environmental, social, and economic outcomes of their projects' conservation practices. Measuring landscape-scale outcomes like improved water quality requires: significant technical and financial resources to develop a credible monitoring program, sufficient time, and cooperation from the weather. Other field scale environmental indicators of success may be easier to track and report. The American Farmland Trust (AFT) and our federal, state, local, and watershed partners in the 2017 Upper Macoupin Creek (UMC) Illinois RCPP project are developing a Measurement and Evaluation Plan (MEP) tailored to the technical expertise and tools available to the partnership. We will define and track indicators of success, develop a budget to carry out the plan, and implement it. The MEP will be completed in Spring 2017. Selected indicators and available results will be shared at the SWCS Meeting, including: (1) social indicators from recent farmer surveys (e.g., understanding watershed issues, conservation adoption, & willingness to change, etc.), (2) economic indicators (e.g., profitability, partial budget analysis, etc.), (3) in-field agronomic-environmental indicators (e.g., Soil Conditioning Index, Corn Stalk Nitrate Test, etc.), and (4) an instream monitoring program. In addition to helping our project measure success, we hope this plan will aid managers of other water quality projects by helping them decide if they can use similar metrics, develop similar evaluation plans, and marshal the technical expertise and financial resources they need to carry out their plans. In so doing, we hope other RCPP project managers will be able to report on their outcomes, further demonstrating the effectiveness of targeting and the partnership-based approach to conservation of the RCPP program.

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Subject Area: Water Resources Assessment and Management

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Evaluating the Role of Hydraulic Residence Times on Denitrification and GHG Emissions in Woodchip Bioreactors

Authors: Emily Martin*, Iowa State University; Morgan Davis, Iowa State University; Michelle Soupir, Iowa State University; Thomas Moorman, USDA-ARS; Thomas Isenhart, Iowa State University; Natasha Hoover, Iowa State University

Abstract: Nutrient enrichment of Iowa's water bodies is one of the most critical issues the state is currently facing. Intensive farming and nutrient application in the Midwest coupled with extensive subsurface tile drainage networks has led to excessive nitrate entering surface waters. Woodchip bioreactors are well demonstrated as a cost effective edge-of-field practice to remove nitrate from subsurface drainage. The goal of the project is to evaluate the role of woodchip bioreactors on the removal of nitrate and the potential production of greenhouse gases (GHG) from an agricultural tile line before discharge to surface waters. The objectives of the study are (1) to determine the effect of hydraulic residence time (HRT) on nitrate removal; (2) to evaluate the impact of influent nitrate concentration on bioreactor performance; and (3) to monitor GHG emissions through the woodchip bioreactor surface and in the dissolved state. Experiments were conducted in nine parallel pilot scale bioreactors (20 ft long × 4 ft wide, constructed in 2014) located at the Agricultural Engineering Research Farm near Ames, Iowa. The pilot scale system was designed for HRT control, and for the experiments, the three reactors were set at HRTs of 2 hours, 8 hours, or 16 hours. Samples were collected at the inlet, at two points in the bioreactor, and at the outlet. Samples were analyzed for TOC, NO_3¬-, NH_4+, and N_2O solutes and N_2O, CH_4, and CO_2 in the gaseous phase. The experimental design of the pilot scale system provides a unique opportunity for experimental control, and to inform future design of woodchip bioreactors.

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Subject Area: Water Resources Assessment and Management

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Field Evaluation of a Passive Sampler for Soluble Nitrogen and Phosphorous: Performance Comparison to Grab and Continuous Sampling

Authors: Niroj Aryal*, USDA-ARS DWMRU ORISE; Michele Reba, USDA-ARS; Philip Moore, USDA-ARS

Abstract: Excess nutrients including nitrogen and phosphorous in the drainage water is a major concern in the agricultural watersheds. Monitoring nitrogen and phosphorous is crucial for the sustainable planning and management of the water resources both from agro-economic and environmental perspectives. Water quality monitoring is typically carried out by grab sampling method which provides a concentration of a pollutant at a certain point of time and may not be representative of the average concentration. However, these are used as averages to compute loadings to water resources. Alternatively, in-situ continuous monitoring requires extensive labor and higher capital, operation, and maintenance cost. In contrast, passive sampling may be more accurate than grab sampling and less labor-intensive than in-situ continuous monitoring. The relatively new passive sampler-"sorbi cells" measures average concentration of pollutants over a period of time (weeks/months). Monitoring using sorbi cells could be reliable, economical and less labor intensive, however, requires evaluation under field conditions. Sorbi cells were deployed to monitor nitrate and phosphate in ditch/surface drained systems in the Lower St-Francis Basin in Poinsett County and Little River Ditches Basin in Mississippi County in Arkansas in May 2015. Both sites are Conservation Effect Assessment Project (CEAP) locations. Sorbi cells were sampled weekly during May-Sep 2015 and every two weeks from December 2016. Soluble nitrate and phosphate were analyzed in the laboratory. The results of sorbi cells were compared with that from weekly grab sampling and continuous measurement at the same locations for nitrate and from grab sampling for phosphate. Preliminary results showed that the performance of passive sampler was comparable to grab for phosphorous, but under-predicted the nitrate concentration. The research results could improve nutrients monitoring in water to estimate pollutant loads.

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Subject Area: Water Resources Assessment and Management

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Food Wastewaste Treatment and Water Conservation Using Radiation Ionization and Co-Digestion Process

Authors: Seung Lim*, Korea Atomic Energy Research Institute; Tak-Hyun Kim, Korea Atomic Energy Research Institute

Abstract: The performance of refractory organic matter and solid removal in food waste by gamma irradiation and co-digestion process was studied. To investigate the effects of ionization on the removal of refractory organic matter and solids, the results from gamma irradiation and the co-digestion process were compared to those from a co-digestion process. Food waste was oxidized by hydroxyl radicals, and the specific methane yield was 366 mL CH_4/g VS. The methane composition was 82%. A wasted activated sludge(WAS)/food waste co-digestion and a swine manure/food waste co-digestion processes were developed for the treatment of refractory organic matter and solids in food waste. The average and maximum removal efficiencies of the refractory organic matter were 92.2% and 94.9% using WAS/food waste co-digestion. The average and maximum removal efficiencies of the solids were 70.8% and 75.3%. The average and maximum methane yields were 87.5% and 92.0%. The average and maximum removal efficiencies of the refractory organic matter were 95.0% and 96.4% using WAS/food waste co-digestion. The average and maximum removal efficiencies of the solids were 89.3% and 94.0%. The average and maximum methane yield were 92.0% and 95.2%. The performance of gamma irradiation and the co-digestion process was superior to that of the co-digestion process alone (10-20%). This implies that food waste can be efficiently co-digested through gamma irradiation. In addition, radiation ionization and co-digestion process is reliable to conserve water resource.

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Historical Analysis of Agroenvironmental Conditions and Management Strategies in the Lower Mississippi River Basin

Authors: Lindsey Yasarer*, United States Department of Agriculture - Agricultural Research Service

Abstract: The Lower Mississippi River Basin (LMRB) is a 2-digit HUC watershed that extends from Cairo, Illinois to the Gulf of Mexico, encompassing unique ecosystems and prime farmland in Missouri, Arkansas, Tennessee, Mississippi, and Louisiana. The majority of the watershed lies within the Mississippi Alluvial Plain and the Southeastern Plains ecoregions, and approximately 40% of the land area is cultivated. The landscapes and waterscapes that encompass the LMRB are being studied as part of a wider network of agricultural systems and watersheds within the United States, the USDA-ARS Long Term Agroecosystem Research (LTAR) Network. One of the goals of the LTAR Network is to study long-term trends in natural resources and environmental impacts of managed agricultural systems. To set the baseline for these long-term studies, efforts are underway to understand agricultural patterns of the past half-century in the LMRB, to evaluate trends, and to tease out lessons that this historical data can provide. Data sources include, but are not limited to, agricultural census data, land-use and soil geospatial datasets, aerial and remote sensing imagery, and hydrology and water quality data available in the region. This analysis will help expand current understanding of past and present social, natural, and physical processes occurring across the landscape, which will contribute to successful management of this diverse agroecosystem.

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Subject Area: Water Resources Assessment and Management

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Instream Legacy Phosphorus within an Agricultural Dominated Watershed, Wisconsin

Authors: Kyle Minks*, Dane County Land and Water Resources Department ; John Reimer, Dane County Land and Water Resources Department

Abstract: Legacy phosphorus (P) within stream beds can delay improvements to water quality, potentially undermining current conservation practices or calling for stricter land management strategies. To address this concern, we explore the mobility of P legacy in the streambed sediments at the study site of Dorn Creek, WI. The Dorn Creek watershed is an agriculturally dominated watershed located on the northern side of Lake Mendota in Dane County Wisconsin. Dane County Land and Water Resources Department has been assisting agricultural producers with conservation implementation for over 30 years. During this time, more than 60% of all the farmsteads and 90% of all the cropland acres in the watershed have adopted conservation practices to reduce soil and nutrient runoff. Despite these conservation efforts, obtaining pollution load reductions established by the Total Maximum Daily Load (TMDL) have not been achieved. Nevertheless, P loads established by the TMDL reflect both current and remobilized legacy P sources from the watershed. Specifically we evaluate the contributions of retained and remobilized P in streams that may be considered an additional P source for TMDL allocations in watersheds. The results show that the stream sediments alone produce concentrations above state water quality standards. With the aid of age dating using radioisotopes, we suggest the time lag that might delay the water quality response in Dorn Creek due to legacy P sources. Finally, we apply the knowledge gained from this study to aid in the development of best management strategies to mitigate the negative impacts of legacy P.

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Is It Working? A Look at the Changing Nutrient Practices in the Southern Willamette Valley's Groundwater Management Area

Authors: Susanna Pearlstein*, ORISE Post-Doc at EPA; Jana Compton, U.S. EPA; Alan Henning, U.S. EPA; Donna Schmitz, Benton Soil & Water Conservation District; John Selker, Oregon State University; Eldridge Audrey, Oregon Department of Environmental Quality; J. Ren

Abstract: Groundwater nitrate contamination affects thousands of households in the southern Willamette Valley and many more across the Pacific Northwest. The southern Willamette Valley Groundwater Management Area (SWV GWMA) was established in 2004 due to nitrate levels in the groundwater exceeding the human health standard of 10 mg nitrate-N L-1. Much of the nitrogen inputs to the GWMA comes from agricultural nitrogen use, and thus efforts to reduce N inputs to groundwater are focused upon improving N management. Previous work in the 1990s in the Willamette Valley by researchers at Oregon State University determined the importance of cover crops and irrigation practices and made recommendations to the local farm community for reducing nitrogen (N) leaching. We are currently re-sampling many of the same fields studied by OSU to examine the influence of current crops and nutrient management practices on nitrate leaching below the rooting zone. This study represents important crops currently grown in the GWMA and includes four grass fields, three vegetable row-crop fields, two peppermint and wheat fields, and one each of hazelnuts and blueberries. New nutrient management practices include slow release fertilizers and precision agriculture approaches in some of the fields. Results from the first year of sampling in 2014 show nitrate leaching is lower in some crops like row crops grown for seed and higher in others like perennial rye grass seed when compared to the 1990s data. We will use field-level N input-output balances in order to determine the N use efficiency and compare this across crops and over time. The goal of this project is to provide information and tools that will help farmers, managers and conservation groups quantify the water quality benefits of management practices they are conducting or funding.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

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Missing the Water Before the Well Runs Dry: the Impacts of High Capacity Wells on Wisconsin Calcareous Fens

Authors: David Bart*, University of Wisconsin-Madison; Steven Loheide, University of Wisconsin Madison; Eric Booth, University of Wisconsin-Madison; Thomas Bernthal, Wisconsin Department of Natural Resources

Abstract: As the number of high capacity well (HCW) applications rises in WI, managers and planners must understand their impacts on high-quality, groundwater-fed wetlands if they are to be sited in an environmentally responsible manner. Calcareous fens are groundwater-dependent, high-quality wetlands that are home to a large number of specialist and rare species, and therefore are likely to be impacted by nearby HCWs. Here we present preliminary results of a study comparing floristic quality in fens within the area of influence of HCWs (impacted) with non-impacted fens in the central sands, near Madison, and in the interlobate, glaciated region of SE WI. Initial results suggest that hydrologic and floristic impacts are not uniformly realized within or among fens. Overall, on a fen level weighted Floristic Quality Index (WFQI), weighted mean Coefficient of Conservatism (WCC), and native-species richness were significantly lower in impacted compared to non-impacted fens, while weedy/invasive-species richness and the degree of invasion (DI) were higher in impacted fens. Most rare and specialist species were not found in impacted fens, even when recorded from the site prior to impact. On a plot level, indicators of consistent groundwater influence including saturated soils, upward groundwater hydraulic gradients, and high electrical conductivity predicted higher WFQI, WCC, native-species richness, and the probability of occurrence of rare, specialist, and highly conservative species. Indicators of lower groundwater influence predicted higher DI and chance of finding several weedy and invasive species. While our study is ongoing, our data to date suggest that HCW-impacted fens are lower quality, less diverse, and more invasible than non-impacted fens.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

**denotes primary author and subject area*

Observing Soil Loss and Soil Re-Deposition under Unobstructed Field Conditions

Authors: YP Hsieh*, Florida A&M University; Glynnis Bugna, Florida A&M University

Abstract: Quality soil erosion field data, which is critical for the verification and calibration of soil erosion models, has been difficult to come by due to technical reasons. We present here a simple and sensitive mesh-pad sampling method that can quantify both soil loss and soil re-distribution in a field under unobstructed runoff conditions. We apply the method to a 7.3 ha peanut-cotton cropping farm in Grand Ridge, FL. The main slope (1-4 %) of the field is about 210 m long. We show that the amount of soil re-deposition was 50-150 times of the soil loss from the slope. The corresponding organic matter, nitrogen, phosphorous and silt and clay contents of the lost soil, however, were 20.9%, 21%, 17.6% and 14.2%, respectively, of the total amounts re-deposited on the slope. The amounts of soil loss predicted by a SWAT model were 10-20 times greater than our observed values. Soil erosion process was quite heterogeneous, as shown by the mesh-pad method, even on a seemingly uniform cultivated field. Soil erosion models need to be verified and calibrated in order to improve their performance.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

**denotes primary author and subject area*

Phosphorus Export from Artificially Drained Fields Across the Eastern Cornbelt

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

Abstract: Agricultural phosphorus (P) management has re-emerged as a priority concern across the Eastern Cornbelt (ECB) due to increasing trends in dissolved P loading from Western Lake Erie tributaries. This study quantified the magnitude and variability of P loss from subsurface-drained fields, and evaluated the contributions of surface runoff and subsurface drainage to edge-of-field (EOF) water and P export. EOF monitoring was conducted on 38 fields in Ohio representative of soil and management practices commonly found across the ECB. EOF P losses from subsurface-drained agricultural fields were dependent upon rainfall patterns and antecedent conditions with 40% of subsurface load and 50% of surface load occurring during rainfall events greater than 30 mm (20% highest-volume events). P concentrations were greater in surface runoff than in subsurface discharge, but P loading was typically greater from subsurface drains than from surface runoff due to a higher volume of discharge occurring as subsurface discharge than as surface runoff. Under current management, P losses from agricultural lands met recommended P loading targets for Western Lake Erie about 50% of the time. These results are promising for agricultural lands to meet P load reduction targets through applying a suite of fertilizer and water management strategies.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

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Reservoir Sedimentation Rates in the Little Washita River Experimental Watershed, Oklahoma

Authors: Daniel Moriasi*, USDA ARS; Jean Steiner, USDA ARS; Patrick Starks, USDA ARS; Alan Verser, USDA ARS

Abstract: The Washita River Basin (WRB) was one of eleven pilot watershed projects selected for construction of flood control reservoirs around the country as a result of the Flood Control Act of 1936. These reservoirs were implemented to prevent and manage soil erosion and flooding. A total of 45 reservoirs were installed between 1969 and 1982 in the Little Washita River Experimental Watershed (LWREW) within the WRB. Evaluation of these reservoirs fits into the goal of the Conservation Effects Assessment Project (CEAP) to quantify the environmental benefits of conservation practices. Over time, these reservoirs have lost water holding capacity due to sedimentation whose rates depend on land use changes and climate variability. In this study, we measured sedimentation rates for 12 reservoirs which were selected to represent dominant land uses within the watershed. Bathymetric surveys were carried out using a state-of-the-art acoustic profiling system. Bathymetry data were processed and the current water volumes were computed using ArcGIS. Reservoir sediment volumes since impoundment were determined as the difference between reservoir capacity at impoundment and the current capacity. Reservoir sediment volumes were normalized by the contributing area and divided by the number of years to determine rates. Results indicated that sedimentation rates varied from 181 m3/km2/year to 873 m3/km2/year. Future work seeks to determine topographic, landuse, soils, and climate factors that significantly influence reservoir sedimentation rates in the LWREW.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

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Role of Land Use/Land Management in Affecting Future Outcomes of Water Quality

Authors: Melissa Motew*, University of Wisconsin-Madison; Eric Booth, University of Wisconsin-Madison; Stephen Carpenter, University of Wisconsin-Madison; Christopher Kucharik, University of Wisconsin-Madison

Abstract: Eutrophication is a major problem in watersheds where excessive non-point source pollution of phosphorus (P) occurs. Factors that affect P cycling and transport, such as climate and land use/land management (LULM), are changing rapidly, making future freshwater resources uncertain. Long-term scenarios can help facilitate understanding of future uncertainty. When coupled with biophysical models, scenarios can help to quantify a range of possible outcomes as well as identify important mechanisms controlling the provisioning of ecosystem services. Using a set of biophysical models, we simulated four scenarios (yahara2070.org) for the Yahara Watershed of Wisconsin in order to generate four contrasting pathways of climate and LULM out to the year 2070. We then evaluated the effectiveness of various LULM practices used in the scenarios in terms of P loading to the Yahara lakes and lake water quality conditions (total P concentration and Secchi depth). A comparison of water quality outcomes among the scenarios showed a range of responses, and indicated that LULM practices have an important role in driving outcomes. Preliminary analyses indicated that the most important mechanisms controlling water quality included 1) surface soil P concentration resulting from the ongoing balance of soil P inputs and outputs, and 2) susceptibility to erosion. Further analyses will seek to characterize the most important factors that contribute to soil P status and erosion, including land cover type, harvest rate, and application of fertilizer and manure. Using the four contrasting climates of the Yahara2070 scenarios, we will also identify beneficial practices that may be robust to future climate, and conversely those practices that may be consistently harmful under future climate. We tentatively conclude that local decision-making concerning the management of P will have a critical effect on freshwater resources in the future, as mediated through soil P status and mitigation of erosion.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

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Sustainability of Stormwater BMP's – How to Ensure BMP's are Sustainable

Authors: Charles Eaton*, CME Associates, Inc

Abstract: Storm water Best Management Practices (BMPs) are typically chosen based on site constraints, construction cost and design requirements available through local or state guidelines. Rarely is the sustainability and cost of maintenance by the cities, towns, and private parties who will eventually own and maintain these BMPs considered. In this segment I will discuss the challenges often faced by municipalities after the installation of a BMP and how the sustainability of these BMP's can be ensured with the adoption of new guidelines, practices, and designs. Case studies of local projects provide a real-life view of storm water management challenges and practical measures implemented to resolve these issues. This seminar will discuss the following: • Limitations of the typical process in which BMPs are chosen and approved by a municipal commission or board. • Typical BMP failures. • Costs associated with maintenance. • Designs that reduce BMP maintenance costs and create sustainability. • Review of a sample BMP design ordinance for public works. • Retrofits of existing BMPs. • Tips for successful BMP installation. 1. With newer and more stringent MS4 and NPDES regulations, stormwater BMP's must be made sustainable through economically viable maintenance. If BMP's are too expensive or difficult to maintain, they will not be maintained and will not be effective. Cities, towns and private owners must find a way to maintain stormwater BMP's more efficiently and at reduced costs or the BMP's will fail. 2. Sustainability results of stormwater BMP's gained from years of experience as a Town Engineer for various towns in various states. Case studies and a typical economic sample are presented. 3. Through the enactment of municipal design ordinances and coordination with public works/property owners, stormwater BMP's can be made sustainable. 4. Sustainable BMP's will ensure cleaner water, reduced flooding, and natural stormwater patterns in the future.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

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Water Management Issues and Opportunities – Lessons from Colorado

Authors: Bethany Reinholtz*, GDS Associates, Inc.

Abstract: Anyone with a well that has gone dry or relying on annual snowpack for water knows of the issues with properly managing water to make every drop count. We will share lessons learned and opportunities found to increase water conservation efforts on farms while working with CO producers and organizations. In many areas of the US and around the world, water scarcity has become a top issue and will continue to increase as a top concern as we see more wells go dry, battles over water rights increase, and farmers struggling to survive and carry on the agriculture tradition as a direct result of a limited water supply that is expected to continue decreasing. As the program implementers and through calculations required for production of Ag Energy Management Plans, we regularly see irrigation wells drilled into fresh water aquifers once yielding 2400 GPM, now struggling to supply 400 GPM. Furthermore, excess amounts of energy is being consumed by original, oversized equipment not properly designed for the drastically declining wells. Furthermore, additional water transfer from ditches or ponds is necessary to compensate for the lacking of ground water. Recognition of the dire situation can be witnessed by farmer's reluctance to invest in energy conservation practices. They see annual reductions in the water table and realize these systems may run dry before seeing a payback on investment or the useful life of energy saving improvements. Sadly, we have seen farmers less enthusiastic about passing the family farm onto the next generation for fear of limited economic prosperity. However, many opportunities are available to producers to conserve energy, reduce water use, and help sustain what is available for future generations with potential water savings of 25% or more. The presentation will explore local issues, technological opportunities, social changes and other barriers to implementation necessary to make these opportunities an option for farmers now and into the future.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

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Enlisting Conservation Districts to Accelerate Participation in Environmental Markets: Lessons From the Field

Authors: Brian Brandt*, American Farmland Trust

Abstract: Water Quality Trading continues to emerge as one strategy to achieve water quality goals in certain settings. The National Association of Conservation Districts (NACD) and American Farmland Trust (AFT) are cooperating in a Conservation Innovation Grant designed to accelerate and expand participation of farmers and private-land managers in environmental markets by fully engaging Soil and Water Conservation Districts (SWCDs) across the nation as key market intermediaries. To engage and empower SWCDs, NACD and AFT have completed an effort to analyze and summarize the experiences of 10 SWCDs involved in several different environmental markets and have prepared a business case for SWCD involvement in environmental markets. The business case includes development of model criteria, funding needs, and recommendations for districts interested in engaging in ecosystem markets. The project includes developing and distributing a handbook that outlines an educational/engagement approach and includes materials (PowerPoint presentations, fact sheets, supporting materials) for use by SWCDs, their state associations, NACD and partners. Workshop participants will learn about key findings from case studies. In addition, we will share key aspects of the business case that Conservation Districts might find most helpful

Track: Benefits and Challenges of Public and Private Conservation Partnerships

Subject Area:

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Farm Advisor Networks and Sustainable Nitrogen Management

Authors: Adam Reimer*, Michigan State University

Abstract: Nitrogen is a crucial input in modern crop production systems, but nitrogen fertilizer application is also linked with water pollution and greenhouse gas emissions. While fertilizer management has improved in recent decades, farmer adoption of many nutrient management conservation practices still lags. Research has demonstrated the importance of agricultural advisors, especially private sector advisors, in influencing farmer application decisions. This presentation will detail results from mixed methods social science research (surveys and producer interviews) that highlight the role of advisors in farmer decision making. Based on this ongoing research, a multi-disciplinary team of researchers based in Michigan have started dialogue on improving nitrogen management with a group of diverse stakeholders in the Corn Belt region. Known as the Nitrogen Roundtable, this effort reflects a renewed public-private partnership motivated to improve system-level efficiency while addressing producer needs for this critical nutrient.

Track: Benefits and Challenges of Public and Private Conservation Partnerships

Subject Area:

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Forming a Strong Private-Public Partnership without Compromising Your Own Identity

Authors: Jodi DeJong-Hughes*, University of Minnesota Extension; Abbey Wick, NDSU Extension

Abstract: Forming partnerships among agencies, institutions and industries combines resources to produce and share science-based practical information that can be applied on-farm. The sharing of this information is a critical step for on-farm implementation of any practice, in our case, conservation based. There is power with a carefully thought out, diverse team. Adding different stakeholders to your team builds on the knowledge, strengthens the focus, and helps create a more robust educational outreach program. How do you approach new entities, how do you define the benefits for each group and not lose your identity in the process? Two soil scientists from the University of Minnesota Extension and North Dakota State University Extension have formed such a partnership. We have expanded this philosophy to all of our Extension programming to include farmers, Ag industry, Government agencies (NRCS, SWCD), media, and commodity groups. Even successful alliances have a few bumps in the road. This session will discuss the strategies and guidelines used to form these partnerships and how to manage challenges that may arise.

Track: Benefits and Challenges of Public and Private Conservation Partnerships

Subject Area:

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Practical Applications of Conservation Social Science in the Adoption of Best Management Practices Related to Soil Health – Lessons Learned and Processes Looking Forward

Authors: Lisa Holscher*, Conservation Cropping Systems Initiative

Abstract: The 498% increase of Indiana crop acres planted to cover crops between 2011 and 2016 is an indicator of the success of collaborative partnerships in the state. Key to these collaborations is the Indiana Conservation Partnership (ICP). Conceived in the 1980's during an era of turf battles and tightening funding, each of the nine agencies of the ICP brings its strengths and its funding, its resources and approach to supporting conservation agriculture. Dedicated to a unified message of conservation—manifested in the soil health and systems approach focus of CCSI—the ICP provides technical, financial and educational assistance to each other's staffs as well as to the Indiana agricultural community. The challenge of working across multiple agencies and organizations will be discussed along with the application of EM Rogers Diffusion of Innovation theory at field office levels to develop the social networks that have been key to identifying programmatic and support needs to further conservation adoption. These dynamic social networks have allowed greater collaboration with groups such as the Nutrient Management/Soil Health Group, INField Advantage, and others. Practical application of research and survey results such as the Iowa Farm and Rural Life Poll and the Purdue University Natural Resources Social Science lab group in furthering collaborative conservation efforts will also be discussed.

Track: Benefits and Challenges of Public and Private Conservation Partnerships

Subject Area:

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The challenges, benefits, and opportunities in using various partnerships to maximize the effectiveness of agricultural efficiency programs

Authors: Bethany Reinholtz*, GDS Associates, Inc.

Abstract: In 1999, the Public Service Commission (PSC) of Wisconsin mandated Focus on Energy, a statewide energy efficiency and renewable energy program, which covers about 90% of electric and natural gas customers in the state. Until 2012 the program had a specialized agriculture program to better access agricultural operations. Due to the remote locations of many farms and rural atmosphere, an effective strategy of utilizing private and public partnerships where integral components in making the program work. In 2008 the NRCS piloted Agriculture Energy Management Plans as a new offering to producers through the NRCS-EQIP program. The program was offered in select states starting in 2009 and was offered as a nationwide program starting in 2011. Since the time of the program started there have been changes, challenges, and benefits to both contractors assisting with program implementation (TSPs) and producers. In 2014, the Colorado Energy Office (CEO) piloted an energy efficiency program targeted at assisting dairy and powered irrigation. The full scale, state wide program is now in year 2 and offers free ASABE Tier 2 energy audits to dairies, greenhouses, and powered irrigators. Qualified TSP and energy advisors assist producers with evaluation, decision making, and implementation of recommended measures in the energy audits. The program leverages relationships with key stakeholders including equipment dealers, trade associations, utilities and coops, to aid in accessing producers. A primary objective of the program is to assist producer sign-up for cost share funding sources including; USDA-REAP, NRCS-EQIP, the CDA ACRE3 program, and CEO secured RCPP funding. This presentation will discuss the benefits and challenges of trying to work with multiple stakeholders in both the public and private sector, local, state, and federal grant programs and one on one assistance with the producers to move from an energy audit report through implementation of recommendations.

Track: Benefits and Challenges of Public and Private Conservation Partnerships

Subject Area:

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"As If You Were There" a Virtual Network of Demonstration Sites Featuring Climate-Informed Practices in Agriculture and Forestry

Authors: Erin Lane*, USDA Northeast Climate Hub

Abstract: Before adopting a new practice or making an operational change, farmers and foresters often want to first see the new technique in action. As climate change uniquely impacts all managed lands in both rural and urban settings, technology-transfer and knowledge sharing can help to convey new ideas and techniques. Innovative demonstration strategies can help us do so more effectively than ever before. The USDA Northeast Climate Hub has collaborated with USDA and land grant partners in our region to develop a virtual network of field demonstration sites. This network showcases a variety of climate change adaptation and mitigation strategies that have been implemented across public and private lands in the Northeast. This web-based network is interactive so that users can "visit" the sites from their own computer, tablet, or mobile phone. The virtual network showcases key practices on existing on-the-ground farm and forest sites using innovative 3600 photography and videos. We will present about our production process in the field, show some examples of the final product and talk about how this is being used as a learning tool specific to climate adaptation. The virtual demonstrations serve as educational experiences that we hope will generate greater interest and understanding about climate change issues, and a larger appreciation and respect for those addressing them. The "As If You Were There" demonstration sites bridge viewers directly into climate adaptation strategies used in agriculture and forestry, as well as general climate change concepts. Field visits are a powerful teacher, and virtual field trips can achieve similar results, but with a broader reach. In order to engage more people in climate informed decision-making, this project immerses users into digital field 'visit' that feels as if you were there.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

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Adaptive Management, Conservation Measures and Their Impact on Sustainabiity of a Nebraska Farm

Authors: Michael Kucera*, USDA-NRCS

Abstract: Adaptive management, conservation measures, and their impact on soil resiliency to counter extreme weather variability on the author's Nebraska farm will be detailed. Climate over the past 25 years in this region is characterized by drought, heavy rainfall events, as well as highly variable rainfall and temperature patterns. . This farm was used as an example in the USDA Midwest/Northeast Climate Hub workbook "Adaptation Resources for Agriculture". The adaptive management iterative process described in the workbook will be described as a method that can be used to guide farmer's management decisions when there is a high level of climate uncertainty. The presentation will also provide details on how conservation measures utilized over the past 25+ years have improved water use efficiency, fertilizer efficiency, and sustained yields during dry periods.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

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Apocalyptic Erosion Control: Sustainable Soil Strategies Under Drought and El Nino Conditions

Authors: MIchael Harding*, Michael V. Harding

Abstract: In the Western United States, the contradictions inherent in two climatic extremes – drought and El Niño - exacerbate soil erosion issues and produce a deadly confluence: wildfires and accelerated erosion and flooding. El Niño conditions generally result in above-average rainfall and greater vegetative growth. In droughty conditions, this increase in biomass can result in more intense burns of dormant or dead vegetation and thereby accelerated erosion due to changes in the physical, chemical and biological properties of soil. Research has shown that as burn intensity increases, so does the time that it takes for a watershed to recover its normal hydrologic function. As a result - with population growth and expansion of communities into the urban interface - the risk of flooding and air quality impacts that affect human health and safety, as well as community infrastructure, may be prolonged for many years following the incidence of wildfire. There are some commonalities associated with preparing for and remediating the soil, water and air quality impacts of drought or El Niño conditions; all appear to be related to long term planning for sustainable solutions for soil erosion.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

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Impact of Extreme Precipitation Events on Edge-Of-Field Surface Runoff in Wisconsin and Minnesota

Authors: Timothy Radatz*, Discovery Farms

Abstract: Large precipitation events are increasing nationwide, especially in the Upper Midwest. These large precipitation events have the potential to increase agricultural non-point source losses by increasing surface runoff. This presentation will examine how much these large storm events impact edge-of-field surface runoff at farm fields in Minnesota and Wisconsin. Discovery Farms in Wisconsin and Minnesota is a farmer led effort organized and established to gather field-scale information to quantify the environmental impact of a variety of farming enterprises. The mission of the program is to collect water quality information under real-world conditions to support better farm management decisions. The program has monitored surface runoff at the edge-of-field from 2004 to 2015 in diverse agricultural landscapes throughout the two states. In total, 28 sites have been monitored on 19 farms resulting in 138 site-years of data. The monitoring has been conducted on dairy, beef, swine, and grain farming enterprises, with corn, soybean, alfalfa, sugarbeet, wheat, and pasture crops. Runoff volume and sediment, phosphorus, dissolved phosphorus, nitrate, total Kjeldahl nitrogen, and ammonia losses were monitored along with precipitation characteristics. There are typically two time periods for surface runoff in Wisconsin and Minnesota: snowmelt and rainfall driven runoff in the spring to early summer. On average, 54% of the annual runoff occurs during snow melt and 46% occurs during the growing season. There have been over 2000 surface runoff events monitored. A few runoff events delivered a large proportion of the total losses. The largest 10% of the runoff events contributed greater than 90% of the total sediment loss and greater than 65% of the total phosphorus and nitrogen losses. This presentation will evaluate how extreme precipitation events effect these large runoff events and potential outcomes if these extreme precipitation events increase in magnitude and frequency.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

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Mississippi River Could Leave Illinois Farmland Stranded

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

Abstract: The receding floodwaters of the Mississippi River in January, 2016 left behind barren sand dunes on southern Illinois farmland. Large sand deposits up to 1.3 m deep covered nearly 800 ha of farmland south of Miller City, Illinois in the Dogtooth Bend peninsula. Rainfall almost three times above average in November and December, 2015 over Missouri set in motion record flooding with the Cape Girardeau river gage breaking the 1993 record at 14.8 m and led to the breaching of Len Small levee on January 2, 2016. Floodwaters cut deep craters as they poured through the breach at mile marker 34, scouring the landscape and then followed an old meander channel across the narrow neck of Dogtooth Bend peninsula to reconnect with the Mississippi River at mile marker 15. Levee breaches and land scouring are not new events for this region, occurring in 1993, 2011, and 2016; and there is high likelihood these farmlands will experience similar events in the future. Each event deepens the meander channel when the floodwaters take a 4.6 km shortcut and threaten to permanently reroute the Mississippi River leaving Dogtooth Bend peninsula an island. This would result in land owners and farmers of 6,000 ha in the Dogtooth Bend area no longer having road access to their land if the Mississippi River re-aligns naturally. And, in some cases the land use would likely shift from agriculture to other uses.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

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Sidedress N for Corn Reduced n20 Emissions and Drainage Nitrate Concentration in Increasingly Wet Springs

Authors: peter scharf*, university of missouri

Abstract: Various lines of evidence point to increasingly wet springs in the central U.S., including an analysis of rainfall maps since 1900 that will be presented. Nitrate in soil can be lost through leaching or denitrification in wet springs. This can limit crop yield while transferring nitrous oxide to air and nitrate to water where they have undesirable effects. Our objective was to compare nitrous oxide flux and nitrate concentrations in drainage water for two contrasting N fertilizer management approaches: 1) all N applied preplant at a rate of 140 lb N/acre; and 2) all N applied when corn was knee-high (stage V7) at a variable rate based on crop sensors. After 3 years, nitrous oxide flux was 50% lower and drainage nitrate concentration was 25% lower with sensor-based sidedress application of N. Total N use was the same with both approaches, but corn yield was increased by 13 bushels/acre using sensor-based sidedressing of N. Wet springs in 2 of the 3 years resulted in N loss to air and water.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

**denotes primary author and subject area*

Tillage Reduced Soil Carbon in 5 Years in a Corn-Soybean Rotation

Authors: peter scharf*, university of missouri

Abstract: Weather extremes increase erosion risk. Already erosion has reduced topsoil thickness over much of the farmed land in the U.S. and the world. Finding ways to preserve topsoil despite weather extremes is crucial to future food production. Our objective was to evaluate the effect of tillage, cover crop, and nitrogen (N) fertilizer management on soil C and N. Two experiments (corn-corn and corn-soybean rotations) were initiated in 2011 and terminated in 2015. Treatments were factorial combinations of tillage (no-tillage vs chisel-disk), cover crop (no cover vs rye), and N management (0 N, 140 lb N/acre preplant, or sidedress N based on crop sensors). Soil C and N were measured to 2-foot depth in one quarter of plots in spring 2011 and in all plots in fall 2015. After 5 years, tillage had reduced soil C by 0.03% C to 2 feet relative to no-till in the corn-soybean rotation. This is likely due to erosion that occurred in tilled plots in a 5-inch rainfall in early April 2014, resulting in deep gullies down the chisel plow tracks. Soil C was not affected by cover crop or by N management in either rotation, or by tillage in the continuous corn rotation. A rye cover crop helped to maintain soil organic N in both rotations relative to no cover crop.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

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Winter Wheat Yields from North Central Texas to North Dakota as Affected by Climate Change

Authors: B. Stewart*, West Texas A&M University

Abstract: Global, state, regional, and local annual average temperature measurements clearly show that the planet is becoming warmer. An upward trend began about 1980 and has become increasingly more pronounced since about 2000. Temperature is a major factor for crop production and rising temperatures make some areas more productive while making other areas less productive. This also affects soil properties that determine soil and water conservation. This paper looks at winter wheat yields from north central Texas to North Dakota to determine the effect of increasing temperatures. Since the late 1900s, the 5-year moving averages of farmer yields as reported by USDA have trended downward for north central Texas and Oklahoma, remained mostly steady for Kansas, increased some in Nebraska, and increased sharply in South Dakota and North Dakota. Although all of the reasons are not clearly understood, preliminary analysis of data for heading dates indicate that winter wheat cultivars in the Southern Great Plains are heading about two weeks earlier than in the early 1950s. This has the effect of shortening the growing season, and it is well understood that wheat yields in water deficient areas are affected most by the amount of growing season precipitation. Shortening the growing season in the Southern Great Plains means that there will be less rainfall during the grain filling stage which is in June for much of the Southern Great Plains that also the time of highest probability of rainfall. Thus, even in years of normal rainfall amounts, earlier heading has the effect of reducing the growing season rainfall. Strategies for adapting to climate change in these areas will also be presented.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

**denotes primary author and subject area*

Assessing Soil Health and Forage Productivity with Rotational Grazing and Winter-Hay Feeding Strategies for Grazed Pastures in Northwest Arkansas

Authors: Lawrence Berry*, University of Arkansas; Andrew Sharpley, University of Arkansas

Abstract: Privately owned grazing and rangeland is the largest private lands use category covering around 27% of the total land acreage in the lower 48 states according to USDA. During the winter, when forage stops growing, rotational grazers are often forced to feed hay, which can add substantial fertility to a pasture. However, nutrient management plans do not currently credit hay has an input. This project examined the impact of rotation grazing and rolled out or ring fed winter hay on soil health as estimated by the Haney Soil Health Tool and forage productivity. Averaged across 240 acres, the soil health metric trebled between 2013 and 2015 (6.9 to 19.9). The manner in which hay bales are fed during the winter months, influenced the distribution of nutrients, soil quality, and both forage quality and quantity. Use of a high-resolution multispectral camera mounted to an unmanned aerial system provided rapid, accurate spatial variability of pasture productivity, which will aid producers to more effectively manage grazed pastures.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

**denotes primary author and subject area*

Can ecological practices mitigate floods and droughts? Pairing meta-analysis with a hydrologic model to understand soil water impacts

Authors: Andrea Basche*, Union of Concerned Scientists; Marcia DeLonge, Union of Concerned Scientists

Abstract: Increased rainfall variability is well documented in the historic record and is predicted to intensify with future climate change. Managing both excess water in periods of heavy rain and lack of water in periods of inadequate precipitation will continue to be a challenge. Improving soil resiliency through increased water storage is a promising strategy to combat effects of both floods and droughts. The goal of this research is to quantify to what extent conservation and ecological practices can improve key indicators of soil hydrology on both a field and landscape scale. A meta-analysis project including approximately 130 studies of field experiments evaluated the impact of various conservation practices, ranging from no-till to the inclusion of perennial crops to improved livestock grazing management. This analysis found that on average that these changes to agricultural management significantly improved water infiltration rates. In particular, when perennial practices were compared to annual practices, half of the experiments analyzed increased infiltration rates to those greater than a two inch rainfall event, dramatically increasing the soil's ability in those locations to absorb rainfall during extreme events. This meta-analysis further found that practices which promote continuous living cover (including perennial grasses, agroforestry and cover crops) increased soil porosity and the water retained at field capacity by 4-15%. A novel modeling experiment is evaluating how these improvements in soil hydrology would translate into water savings on a regional scale using a case study in the state of Iowa. Results will be presented from both the meta-analysis and hydrology modeling research to better quantify how field scale soil improvements translate into landscape scale water benefits, including reduced runoff in wet years and increased soil water storage in dry years.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

**denotes primary author and subject area*

Conservation Practice Effectiveness and Application for Water Quality Improvements in Agricultural Subwatersheds of the Mackinaw River, Illinois, USA

Authors: Maria Lemke*, The Nature Conservancy; David Kovacic, University of Illinois Urbana-Champaign; Michael Wallace, University of Illinois Urbana-Champaign; Miran Day, California Polytechnic State University; Williaim Perry, Illinois State University; Rick Twa

Abstract: The Mackinaw River is a major tributary of the Illinois River, which feeds into the Mississippi River. This 740,000-acre watershed contains some of the most productive agricultural land in the nation, and plays a key role in the livelihood of farmers and the Illinois economy. Urban development and row-crop agriculture have stressed freshwater resources, leading to habitat loss and reduced water quality. Our research has shown that surface water oriented conservation practices are not enough to improve water quality in these tile-drained, agricultural watersheds and has led to subsequent research testing effectiveness of infield and edge-of-field practices to reduce nonpoint source runoff. Several strategies include: (1) watershed-scale monitoring of wetland effectiveness, (2) working with the agricultural community to modify nitrogen (N) application practices, and (3) watershed mapping of tile drainage to strategically implement conservation practices. Nine years of site-scale data from wetlands show up to 50% reduction of nitrate-N from field drainage tiles. In a parallel paired watershed project, we are measuring effectiveness of constructed wetlands at the 2,000 to 10,000-acre watershed scale. From 2012 to 2015, we worked with a Farmer Network in a 43,000-acre drinking water supply watershed to address N management practices. During that time, the % of participants that applied 80-100% fall N declined and those that applied 80-100% spring N increased. Current efforts include working with the agricultural community to move 3000 acres from fall to spring N applied. University partners have used LiDAR, GIS and aerial infrared data to estimate tile drainage patterns in the 43,000-acre watershed and map locations for conservation practices. Science and continued development of partnerships are providing the necessary tools to develop and apply sustainable, conservation-based solutions to improve water quality and diversity in this agricultural watershed.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

**denotes primary author and subject area*

Determining the Impact of Best Management Practices in the Great Lakes Priority Watersheds with Field-Scale SWAT Models and Edge-of-Field Monitoring Data

Authors: Katherine Merriman*, USGS; Amy Russell, USGS

Abstract: The Great Lakes Restoration Initiative (GLRI) aims to address many challenges facing the Great Lakes. One such challenge is harmful algal blooms, which are widely attributed to phosphorus runoff from agricultural lands. The USDA–NRCS supplies financial and/or technical assistance to producers to install or implement best management practices (BMPs) to lessen the negative effects of agriculture to water quality. Additional funding has been provided by GLRI through USDA–NRCS to increase BMP density on selected, small-scale subbasins within the Great Lakes Priority Watersheds. In this study, Soil and Water Assessment Tool (SWAT) models were built and calibrated for small subbasins (<50.5 mi2) within Michigan, Ohio, and Wisconsin, where higher levels of GLRI-funded BMPs were installed. BMPs funded by GLRI or other USDA-NRCS programs were identified from the USDA-NRCS National Conservation Planning (NCP) database and differentiated by program. Agricultural management practices for fields with and without BMPs were characterized based on discussions with county-level NRCS staff. The SWAT models were calibrated to daily, water quality loads at downstream watershed outlets; and models also incorporated data from tile and edge-of-field monitoring sites. Differences in nutrient loading were assessed for different scenarios of BMPs (GLRI vs. non-GLRI; planned vs. applied) from the NCP database, while it should be noted the BMPs represented in this modeling effort does not represent the full level of conservation activity present in the watersheds – other BMPs are present that are not represented in the models. Model results from BMP scenarios indicate that large investments in BMPs are required for substantial changes in nutrient loads at the small-scale subbasin. Additionally, the Wisconsin Demonstration Farms network is involved with the effort to determine field-level effectiveness of BMPs with participating producers using the Wisconsin SWAT model.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Development of MU's Soil Health Website: Providing Regional Data For Realistic Goals

Authors: Ray Wright*, UMC South Farm Research Center; Tim Rienbott, UMC South Farm Research Center; Bob Pierce, UMC School of NaturalResources; Kerry Clark, UMC Rural Sociology Department

Abstract: The University of Missouri Agriculture Experiment Station has research centers located in several specific regions across the state to support research and provide extension information to Missouri citizens. These centers hosts several farmer focused field days each year as part of the land grant system. This interaction with the state's farming community provides us a clear view of issues that impact Missouri's farmers. With the increasing interest in soil health issues by farmers across the state, we realized a need for an information system that could allow farmers to make realistic soil health goals for their farms based on regional information as they adopted soil health practices. During the field days we invited farmers to participate in our study by bringing in soil samples where we conducted "on the spot" active carbon measurements. We also gathered general agronomic information and obtained permission on several region specific farms to conduct more detailed soil tests including PFLA , bulk density, aggregate stability and water infiltration. The overall reaction to this study by our attendees was very enthusiastic. The information gathered resulted in the development of an interactive data base that represents both regional and state wide soils data. This database can be populated with future data from ongoing soils collections and continue to promote sound soil health goals.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Ensuring the Effectiveness of Agricultural Best Management Practices: a Pilot Project in the Chesapeake Bay watershed

Authors: Alisha Mulkey*, MD Department Agriculture; Jason Keppler, Maryland Department of Agriculture

Abstract: Current restoration efforts for the Chesapeake Bay watershed mandate a timeline for Maryland to reduce its load of nutrients and sediment from the agricultural landscape before 2025. Achievement of the water quality goals are closely monitored by a multi-interest Chesapeake Bay Partnership and include a new requirement for strengthening verification of Best Management Practice (BMP) implementation. Under this newly established protocol, Chesapeake Bay states must outline and establish assurance measures to regularly re-verify the existence and benefits of BMPs in order to receive continuing credit toward their water quality goals. Consequently, the Maryland Department of Agriculture along with its partner Soil Conservation Districts developed a BMP Verification Pilot Project during fall 2016 to evaluate a proposed re-verification methodology. Five Maryland Soil Conservation Districts were selected and paired with a trained Verifier independent of the Soil Conservation District staff. The Verifier's objectives were reviewing conservation file records, visiting and evaluating BMPs according to an established protocol, and reporting evaluation findings to the Soil Conservation Districts and the Maryland Department of Agriculture's Program Manager. As of December 1, the Verifier's had evaluated approximately 900 individuals BMPs. Initial evaluation results show that greater than 67% of BMPs are still installed and maintained on the landscape providing verifiable water quality benefits for the Chesapeake Bay. Findings will be presented to the Chesapeake Bay Partnership to demonstrate Maryland's ongoing commitment to agricultural conservation. Moving forward, the Maryland Department of Agriculture is refining the methodology in order to expand the program across the state during 2017. Concurrent efforts to incorporate enhanced technologies and data analysis techniques for greater process improvement and efficiency are also underway.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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How Field Scale Strategies Can Build Toward Landscape Level Change: Linking Watersheds to Increase Continuous Living Cover Across the Upper Midwest

Authors: Aaron Reser*, Green Lands Blue Waters

Abstract: Statement of relevance: Agriculture in the Midwest needs significantly more Continuous Living Cover (CLC) farming to meet water quality standards, increase resilience to weather extremes, moderate swings in farmer profitability, and to achieve other local, regional and national goals. The goals require landscape level interventions in addition to field-scale changes. In CLC farming systems, use of summer row crops, winter annual crops, and perennial crops keep farm fields covered and rooted in place continuously throughout the year. The Green Lands Blue Waters Watershed Initiative is a Midwest network of practitioners in ag. watersheds united around a goal: increasing CLC on the landscape. Methods: The Initiative is a regional community of practice network. Practitioners have significant field scale and watershed level expertise. The Initiative links these individuals as a regional network through monthly phone calls, presentations and other events and projects. Results: The Initiative has created an effective peer to peer learning community, increased practitioner awareness of tools and resources for use on the ground (for ex. mapping and modeling tools for farmer engagement, cropping system calculators, methods for assessing conservation attitudes), and built cohesion around a shared regional vision for CLC. Future predicted results include increasing awareness and adoption of CLC cropping systems- shifting the dominant narrative- and more effective tracking of landscape-scale changes across the region. Contributions to science and society: The Initiative provides a working model of a practitioner network exploring: Why is working at a watershed level important? How can it be done effectively? How can a network lead to larger scale significance? As the network increases adoption of CLC farming, wide societal benefits can include improved water quality and soil health, weather resilience, and farmer profitability.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Linking Agricultural Practices to Water Quality Improvement: The Importance of Scale in Accurately Characterizing N & P Loads Delivered to Streams.

Authors: William Crumpton*, Iowa State University; Matthew Helmers, Iowa State University

Abstract: The Science Assessment for the Iowa Nutrient Reduction Strategy estimated potential reductions in nitrogen and phosphorous loads that could be achieved by a wide range of in-field and edge-of-field practices. These estimates were based on a careful review of the published research on the effectiveness of various practices and their potential applicability. However, most of this research was conducted at plot and field scale and Science Assessment highlighted the critical need for studies at larger scales in order to more accurately assess water quality impacts of alternative practices. Nutrient loads at field and sub-field scale can differ substantially from loads actually delivered to surface waters due to varying effects of field to stream transport. In addition, nutrient loads at larger watershed scales can differ substantially from delivered loads due to the effects of in-stream processes (for example, the effects of bed and bank erosion and phosphorous exchange with stream sediments). The most appropriate scale for assessing agricultural loads to surface water is the scale at which the load is actually delivered. For the extensively tile-drained landscapes of Iowa, that scale is typically a few hundred to a few thousand acres. The work reported here focuses on measured N and P loads actually delivered to surface waters in Iowa's tile-drained landscapes and in relation to land use and management. In addition to better characterizing loads at delivery scale, this research aims to improve the predictability of practice performance, improve the understanding of practice uncertainty, and facilitate the validation of load reduction tools developed to evaluate progress toward nonpoint source load reduction.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Linking Plot, Field, and Watershed Runoff and Water Quality in Goodwater Creek Experimental Watershed

Authors: Fessehaie Ghidey*, USDA-Agricultural Research Services; Claire Baffaut, USDA-ARS; Bob Lerch, USDA-ARS; John Sadler, USDA-ARS

Abstract: Most water quality studies are conducted at the plot, field, or watershed scale; however, studies that integrate the three scales provide information to scale results obtained at one scale to a greater area. The objective of this study was to analyze runoff and water quality measured (1997-2001) from plot, field and watershed scales located within Goodwater Creek Experimental Watershed (GCEW), an agricultural area located in the Northeast Missouri. Two cropping systems were studied at plot and field scales: CS1 was a mulch-till corn-soybean rotation with all inputs incorporated and CS2 was a no-till corn-soybean rotation with herbicide and P surface-applied and N injected. Atrazine, NO_3-N and dissolved Phosphorus (P) losses in runoff were measured from replicated 0.34 ha plots, two fields (F1 (34.4 ha) under CS1 and F2 (7.8 ha) under CS2), and 7262 ha watershed (W1). Throughout the study period, 1.0, 1.3, 3.1, 4.0, 3.4% of total atrazine applied, 16.4, 7.6, 15.6, 4.1, 13.1% of the total N applied, and 1.2, 3.3, 2.0, 6.2, 8.2% of the total P applied to CS1, F1, CS2, F2, and W1 were lost to surface runoff, respectively. Analysis of daily unit area runoff and water quality losses using frequency distribution curves, temporal distributions, flow duration curves, and results from process based models will be used to compare and link plot, field, and watershed losses and identify processes that affect the transport of herbicides and nutrients at these three scales.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Minnesota Clean Water & Land Legacy: Is the Water Getting Cleaner?

Authors: Joe Magner*, University of Minnesota

Abstract: In 2008, the citizens of Minnesota voted to raise their sales tax despite the recent scare in the economy via the sub-prime lending fiasco. Thirty-three percent of the sales tax revenue from the Legacy amendment is allocated to the Clean Water Fund. Those funds may only be spent to protect, enhance, and restore water quality in lakes, rivers, and streams and to protect groundwater from degradation. This presentation will describe the process of rolling out a systematic watershed approach to addressing water quality in Minnesota. Prior to 2008, only a small fraction of surface water was assessed for compliance with the 303(d) provision of the Clean Water Act. The Minnesota Pollution Control Agency (MPCA) developed a plan to assess 81 major watersheds over ten years with a focus on biological monitoring. Additional flow gages were created across the state to meet the demands of the TMDL. Research and development suggested the need for a "stressor identification" process to link water quality back to landscape management. With this tool in 2013, the Clean Water Accountability Act was created requiring the MPCA to develop Watershed Restoration and Protection Strategies (WRAPS). WRAPS have used by local units of government to excess implementation funds to apply conservation. The MN Board of Water and Soil Resources (BWSR) has developed a policy of "prioritize, target and measure" to better ensure Legacy funds get used to protect waters meeting standards or restore impaired waters. This effort is now being rolled out as One Watershed One Plan. We have learned that watersheds are complex and clean water comes slowly, given climate change.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Nutrient Loss Reduction Potential of Drainage Water Recycling Systems in the Midwest Based on Pond Size

Authors: Benjamin Reinhart*, Purdue University; Jane Frankenberger, Purdue University

Abstract: The installation of subsurface tile drainage throughout much of the Midwest has been used to bolster crop production and provide suitable farming conditions during periods of excess moisture. Management of these drainage systems has become a focus area for conservation, both locally and regionally, as high levels of nutrients lost through tile drains to downstream surface waters have jeopardized the quality of public water sources. Practices which are able to reduce subsurface drainage volumes can provide opportunities to mitigate the environmental impact of agricultural tile drainage. Drainage water recycling is the practice of capturing water drained from fields during high-flow periods, storing it in a pond or reservoir, and irrigating it onto crops later in the season. Nutrient loss reduction of this practice is largely based on the volume of drained water that is recycled onto the crops through irrigation rather than flowing into downstream water, and this volume depends on total pond storage volume. This presentation will examine the potential flow and nutrient reduction for various pond sizes for sites across the Midwest. Storing drained water within the landscape could increase the sustainability of water for agriculture by reducing downstream nutrient loading in tile-drained landscapes.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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NWQI Pilot Project – Connecting On-Farm Conservation Efforts to Watershed Scale Assessments to Benefit Water Quality

Authors: Dee Carlson, USDA/NRCS; Martin Lowenfish*, USDA/NRCS

Abstract: The National Water Quality Initiative (NWQI) began in 2012 as a collaborative effort between NRCS, EPA and state water quality agencies to accelerate voluntary conservation for water quality in priority small agricultural watersheds. A major focus of the Initiative is to demonstrate that focused implementation of conservation practices can lead to meaningful progress on water quality goals. While a watershed plan is a requirement for inclusion in NWQI, many of the initial NWQI watersheds lack watershed plans at the scale or level of detail necessary to inform placement of on-farm conservation efforts for greatest water quality benefit. This may be one factor contributing to the absence of positive water quality trends in many of the NWQI watersheds. This presentation will provide an overview of the NWQI pilot project that was initiated in FY 2017, in partnership with EPA. The project goal is to develop watershed-scale assessments during the pilot period sufficient to guide future investments in on-farm planning and conservation efforts to increase water quality improvements. Support is provided to develop watershed assessments that identify vulnerable acres within small watersheds (HUC12), and to develop outreach strategies to increase treatment on these acres. Each watershed will track: 1) implementation on critical acres, and 2) a set of water quality metrics specific to each watershed. Data will be compared to determine whether there has been a significant increase in implementation on vulnerable acres in pilot watersheds, compared to regular NWQI watersheds. Water quality metrics will be analyzed for positive trends over time. Use of watershed-level assessments to locate conservation on the critical acres should result in an increase in positive trends in local water quality metrics in NWQI pilot watersheds. It is expected that this will lead to improvements in in-stream water quality in a shorter timeframe in pilot watersheds.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Performance Based Conservation: Scaling Innovative Approaches for Healthy Watersheds

Authors: Ryan Smith*, Delta Institute; Olga Lyandres, Delta Institute

Abstract: Functioning ecosystems perform services, such as providing healthy food and clean water, and regulating the climate system, that are critically important to society yet rarely factored into traditional economic markets or policies. Therefore, allocating resources for their protection and restoration is challenging without quantifying their ecological,social,and economic values. To shift the paradigm and assign ecological and economic value to more sustainable land management, Delta Institute has piloted Pay-for-Performance (PfP) and trading programs in the Great Lakes region that support integrated valuation of a wide range of ecosystem services, in particular, reducing soil and nutrient losses. Delta Institute has partnered with government, agricultural,and conservation organizations to develop and test PfP models in the Milwaukee River watershed in Wisconsin and in the Saginaw Bay watershed in Michigan. This marks a shift from a pay-for-practice approach to creating incentives for conservation systems that lead to measurable environmental and landscape improvements. The Pay-for-Performance paradigm allows us to value the multiple benefits of pollution reduction and land stewardship activities, as well as to identify and prioritize implementation of the most cost-effective practices. Delta Institute will discuss innovative and collaborative approaches as part of the PfP projects to create scalable frameworks to reduce nutrient loading and improve water quality. Through the PfP pilots, we have been able to identify the needed verification tools, outreach strategies and monitoring needs that are key for long term sustainable agriculture land management and improved environmental outcomes.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Simulating Critical Source Areas Across Scales Using Watershed Mode

Authors: Margaret Kalcic*, Ohio State University; Rebecca Muenich, University of Michigan; Yu-Chen Wang, University of Michigan; Anna Apostel, Ohio State University; Awoke Teshager, University of Michigan; Jay Martin, Ohio State University; Donald Scavia, Universi

Abstract: Watershed models are powerful tools for simulating water quality impacts of agricultural practices at large and small scales. The Soil and Water Assessment Tool (SWAT) can estimate critical source areas—either fields or subwatersheds—contributing nutrients and sediments to streams, rivers, and lakes. Yet the validity of these estimates depends on detailed input data on land management and validation against measured data at comparable scales to the critical source areas. Over time we have improved land management assumptions in SWAT models for major watersheds draining to Lake Erie's western basin. We are analyzing the changes to predicted critical source areas at a field and subwatershed level, and testing the sensitivity of the model to improved land management inputs. We also compared field-level results from the calibrated model to those of the model with data from farm surveys, and find that fields simulated with surveyed land management practices have far greater variability in nutrient export than subwatersheds. This suggests field-level targeting of conservation should yields greater water quality improvement at the watershed outlet than a focus on the subwatersheds with highest simulated loading.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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Soil Erosion Impacts on Soil Water Storage Capacity and Flooding Potential

Authors: Bhavna Sharma, Iowa State University; Bradley Miller, Iowa State University; Richard Cruse*, Iowa State University

Abstract: For many Midwestern soils, water tables are shallow – within inches to a few feet of the soil surface, depending on recent precipitation and topographical position. Unsaturated soil above the water table can absorb and store rainfall, at least temporarily. The amount of water storage potential is dependent on soil porosity, soil water content and depth of the soil column above the water table. Soil lost due to soil erosion reduces net depth of this column across a broad area, thus reducing the storage capacity for infiltrating water which increases surface runoff risk and downstream flooding potential. The lost water storage capacity associated with soil erosion and resulting thinning of the soil column above the water table has yet to be investigated. The objective of this study is to determine the potential impact of past soil erosion and soil loss on flooding in Iowa. This study indicates historical soil erosion and resulting lost water storage capacity in agricultural fields has aggravated flooding in Iowa and likely much of the Midwest United States. Further, understanding that one ton of medium textured soil typically has pore space volume equivalent to that of about 93 gallons of water, estimated lost storage capacity and increased flooding potential associated with recent soil loss estimates will be given.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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The Daily Erosion Project: Hillslope to Regional Scale Estimates of Erosion

Authors: Brian Gelder*, Iowa State University; Richard Cruse, Iowa State University; Daryl Herzmann, Iowa State University; David James, USDA-ARS; Timothy Sklenar, Iowa State University

Abstract: The Daily Erosion Project is the multi-state expansion of the Iowa Daily Erosion Project, a near real-time estimate of precipitation, soil detachment and erosion, and runoff at the HUC12 watershed level. The Daily Erosion Project uses the WEPP (Water Erosion Prediction Project) erosion model in conjunction with NexRAD precipitation and county level wind speed, temperature, and solar radiation data, complex hillslopes derived from 3 meter, hydrologically enforced elevation models, variable hillslope soil properties from the USDA SSURGO soils database, the USDA ARS Ag Conservation Planning Framework (ACPF) field boundary and rotation database, and remotely sensed residue cover data from Landsat to estimate tillage practices. Model weather data is updated every night and new estimates are available by 7 AM every morning. Implementation of DEP required developing a new method for parameterizing WEPP hillslopes from these inputs based on randomly selecting a number of hillslopes per watershed and averaging the results. The DEP provides a unique ability to examine erosion both at the subfield, or hillslope, level as well as at much larger watershed and regional scales. We will summarize the temporal and spatial patterns found in results from estimating erosion on more than 400,000 hillslopes in over 3500 watersheds across Iowa, Kansas, Minnesota, Missouri, Nebraska, and Wisconsin for every storm from 2008 through 2015. Some HUC12 watersheds experience 10 year average rates greater than 10 tons/ac-yr with individual hillslopes averaging even higher. Generally, regional erosion trends are defined by the precipitation and topography as well as the cultural management trends of tillage and crop rotation.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

**denotes primary author and subject area*

The Effectiveness of Vegetative Buffers for Reducing Phosphorus Losses from Agricultural Runoff in Northern Climates

Authors: Jason Vanrobaeys*, Agriculture and Agri-Food Canada

Abstract: Vegetative buffers are often promoted as a means to improve water quality in agricultural regions. However, much of the evidence to support their effectiveness has come from warm regions dominated by rainfall driven runoff. In 2015, a study was initiated at Agriculture and Agri-food Canada's Morden Research and Development Centre in Manitoba to assess the performance of vegetative buffers to reduce phosphorus (P) levels in runoff. Three vegetative buffer strips along with three adjacent crop strips were established in drainage channels within a cropped field. Each 20 meter long strip was equipped with a weir or an embankment and outlet pipe to collect runoff samples as they entered and exited each strip. Between October 2015 and October 2016, samples were collected for 20 runoff events, 12 were produced by pumping or releasing water from holding ponds, 7 resulted from rainfall, and 1 from snowmelt. The samples were analyzed for total phosphorus (TP), dissolved phosphorus (DP), and total suspended solid (TSS) concentrations. Soil and vegetation samples were also collected within each strip in the fall of 2015 and in the spring and fall of 2016 and analyzed for P content. The change in P concentration in runoff water entering and leaving the vegetative buffers and crop strips will be presented and key factors affecting buffer performance will be discussed. Implications for designing and managing buffers to treat agricultural runoff in this climate will be explored.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

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The Role of Field and Stream Assessment in Evaluating Phosphorus and Fine Sediment Sources and Sinks in Agricultural Watersheds

Authors: Rebecca Carvin*, U.S. Geological Survey; Laura Good, Dept. of Soil Science, University of Wisconsin-Madison; Faith Fitzpatrick, U.S. Geological Survey, Wisconsin Water Science Center; Jasmeet Lamba, Auburn University, AL

Abstract: We have characterized sources, sinks and field-to-outlet transport pathways of sediment, particulate phosphorus (P) and dissolved P for two small agricultural watersheds in Wisconsin's unglaciated region and two in the glaciated region. These watersheds were monitored at their outlets as part of long-term projects aimed to improve water quality through targeted conservation practices. The Wisconsin P Index was used to estimate relative P loads and the Revised Universal Soil Loss Equation, version 2 was used to estimate relative sediment loads from agricultural land for the targeted approach. Through channel assessments, sediment fingerprinting, and sediment budgeting, we identified gaps in tools for quantifying particulate P and fine sediment sources from ephemeral channel and bank erosion. Results from sediment budgets and fingerprinting studies indicate that a substantial portion of suspended sediment (30-40%) and by association sediment-bound P at watershed outlets comes from stream banks. Temporal variations in the proportion of sources for suspended sediment and phosphorus also were observed. In one watershed median in-stream total P loads from February through April were about 60% higher than the median load observed October through January and about 40% higher than the median load observed May through September. Additionally, the contribution of sediment-bound P in fine-grained streambed sediment originating from streambanks was highly spatially variable, with proportions varying within the watersheds in both regions from 0 to 100 percent. The results from these studies demonstrate that (1) in-channel sources and sinks need to be considered along with upland conservation strategies in management plans for reducing nutrient loads in streams and (2) Wisconsin's May through October concentration-based monitoring protocol for identifying phosphorus-impaired streams does not include the season when phosphorus loads are likely highest.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

**denotes primary author and subject area*

The Viability of Growing Shrub Willow as Bioenergy Buffer on Intensively Managed Agricultural Fields of U.S. Midwest

Authors: Julian Cacho*, Argonne National Laboratory

Abstract: Mitigating impacts of climate change and meeting food, feed, fiber and energy needs of future population require innovative management of finite land and water resources. Increase use of biofuels and other low-carbon energy sources to displace a large amount of fossil fuel consumption is one of the solutions to decrease future greenhouse gas emissions and thereby mitigate climate change impacts. Primary reliance on cellulosic bioenergy feedstocks produced from marginal lands is critical to expand the social and environmental viability of biofuels. In the U.S. Midwest, riparian buffers constitute most of the marginal lands. Fertile soils and favorable climate in this region make agricultural production highly profitable, and hence, abandoned and idle lands are very limited. However, this comes at an environmental cost, in the form of excess nitrate nitrogen leaching to downstream receiving water bodies, which causes water quality impairment. A fast growing bioenergy crops can be grown strategically along the riparian buffers of intensively managed agricultural fields of the U.S. Midwest to meet biomass needs, help achieve local and national nutrient reduction goals, and provide other environmental benefits. Here, we report the first harvest productivity and impacts on soil health, water quantity and quality, and greenhouse gas emissions of shrub willow grown as bioenergy buffer on a continuous cornfield in Fairbury, IL, U.S.A.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

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Cover Crop Influence on Soil Quality under Corn-Soy Bean Rotation

Authors: Lalith Rankoth*, University of Missouri ; Ranjith Udawatta, University of Missouri; Clark Gantzer, University of Missouri; Shibu Jose, University of Missouri; Chathuri Weerasekara, University of Missouri; Kristen Veum, USDA-ARS

Abstract: Improved soil quality and soil productivity lead to enhanced ecosystem services including crop yields and farm economics. Cover crops (CC) grown during the fallow periods add organic matter to soil while providing a better rhizosphere for soil microbes. The objective of the study was to determine the influence of cover crops and no-till planting under corn-soybean rotation on soil quality parameters including soil enzymatic activity, nutrients, and chemical properties. The study was conducted on two farms with cover crop and no cover crop treatment watersheds in Knox and Linn counties in 2016 and 2017. Cover crops were established in 2012 and continued. Soil pH, CEC, Soil organic matter, Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg) were measured for 0-10, 10-20, and 20-30 cm depths on three transects. Three replicate positions were sampled in each transect covering the watershed. Soil microbial enzymes; β-glucosidase, glucosaminidase, dehydrogenase and FDA were also measured. Soil organic matter percentage and N content were greater on watersheds with cover crops at 10cm depth. However, in the Knox county field, soil P, K, Ca and Mg levels were higher in the watershed without cover crops. Findings from this study will help in identifying the effects of cover crops on soil quality under no-till Corn-Soybean rotation in mid Missouri.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

*denotes primary author and subject area

Cover Crop Influence on Soil Water Dynamics under Corn-Soy Bean Rotation

Authors: Lalith Rankoth*, University of Missouri ; Ranjith Udawatta, University of Missouri; Clark Gantzer, University of Missouri; Shibu Jose, University of Missouri

Abstract: Soil moisture plays an important role in plant growth. Cover crops are being promoted for soil conservation and soil improvement by increasing soil organic matter, moisture and fertility and reducing soil erosion. Cover crop growth during fallow period can also affect soil water dynamics by using plant available water and reducing soil evaporation. This study was conducted at the Chariton County, Cover Crop Soil Health (CCSH) Research and Demonstration Farm, Missouri with the objective of quantifying the effects of cover crops on soil water dynamics under corn-soybean rotation system. Four watersheds were used for the study; two with cover crops and two without, as the control. Initial cover crop establishment was done in 2012. Volumetric soil water content was estimated at 15 minute intervals by Waterscout SM100 soil moisture sensors (Spectrum Technologies) in four depths (10, 20, 30 and 40cm) at 12 locations per watershed. Analysis of variance and least significant difference (LSD) mean separation procedures of data showed significantly ($p < 0.05$) higher soil moisture availability for the period of May 2016 to September 2016 in the watersheds managed with cover crops compared to the control. The difference between the treatments were not significant during the winter months of 2015. Results of the study will help determine the effects of cover crop growth on soil water dynamics under corn-soybean rotation in mid Missouri and to develop a better cover crop management plan.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

*denotes primary author and subject area

Cover crop mix seeding rate calculator for the systematic development and evaluation of cover crop mixes

Authors: Paul Salon*, USDA-NRCS; Phillip Rivera, USDA-NRCS

Abstract: There is increasing interest by farmers in planting cover crop mixes. It is important that species in mixtures do not outcompete each other, so that each species can provide the maximum potential benefit. We developed an excel cover crop calculator that can be used to plan mixes and test them across multiple conditions. Using adaptive management, competition factors can be adjusted to improve the effectiveness of the calculator. The competition factor is a percentage multiplied against a set monoculture rate which determines the seeding rate in lb/ac for each species. The competition factor is subjectively determined using plant characteristics. The cover crop mix is constructed by first selecting the purpose. Based on the purpose each species is rated excellent to poor and is given an associated competition factor. After entering the species the purpose can be changed which will automatically change the seeding rate. Additional species can be selected or removed during this process to further refine the mix for its purpose. Plants are grouped into categories so that when similar species are planted in the mix their corrected rates are reduced by the number of species in that group. There is a way to modify the rates based on establishment methods. Output from the calculator includes: 1) the seeding rate in lb/ac and seeds/ft2 for each species, and 2) percent by lb/ac and seeds/ft2 for the mix. This calculator is designed to be transparent so that species ratings and competition factors can be modified for different regions and new purposes. Species and exact costs can be easily added and adjusted.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

*denotes primary author and subject area

Helping Farmers and Forest Land Managers Adapt to Extreme Weather and Variable Climate

Authors: Dan Dostie*, USDA NRCS

Abstract: Extreme weather and variable climate are increasing challenges for agriculture, forestry, and natural resource stewardship nationally and globally. In 2013 USDA recognized that climate science and adaptation responses were not making it to the field fast enough and created a network of Climate Hubs to translate the latest information into usable forms. While farmers, ranchers and forest land managers are in need of tools, information and best management practices that can enable them to maintain or increase production, profit, and stewardship in light of a changing climate, researchers need feedback on how to best respond to challenges and opportunities in face of deep uncertainty. This poster describes the experience of three USDA Climate Hubs – the Northeast, Midwest, and Northern Forests collaborating to develop the "Adaptation Resources for Agriculture Workbook," a compilation of information about climate change considerations and responses. An interagency team of authors from the U.S. Forest Service, Natural Resources Conservation Service, and the Agricultural Research Service reviewed climate change science literature and translated it into easy to understand guidance for on-farm decision-making across the region. Key resources to support the workbook include a summary of effects of climate change on agriculture and ecosystem services, a menu of potential adaptation strategies and approaches for responding. Several workshops with field practitioners were held to test the workbook's usefulness at helping farmers in the real-world adjust their practices or even transform their operations ("adapt") to meet challenges or develop opportunities. As a result of the workshops, four examples of farms using the workbook illustrate how row crop, confined dairy, and grazing operations in the region are adapting.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

*denotes primary author and subject area

Measuring and Improving Nitrogen Use Efficiency with 40 Wisconsin Farmers

Authors: Amber Radatz*, University of Wisconsin-Extension; Abigail Augarten, University of Wisconsin-Extension; Matt Ruark, University of Wisconsin-Madison; Erica Olson, University of Wisconsin-Extension; Kevan Klingberg, University of Wisconsin-Extension

Abstract: In 2016, the University of Wisconsin Discovery Farms Program (UWDF) began measuring Nitrogen Use Efficiency (NUE) with 40 farmers. The study farms include livestock and grain systems, tillage and no till practices and a variety of soil and landscape conditions. Corn fields harvested as silage and grain are included in the study. Each study site is sampled five times during the growing season through routine, PPNT, PSNT, and post harvest soil samples and whole plant tissue samples are collected prior to harvest. After two years, trends are emerging regarding nitrogen cycling in Wisconsin systems. Complicating factors like manure and alfalfa make calculating and comparing NUE across farms or across regions difficult. However, some trends are emerging related to tillage practices, crop rotation, soil type and manure management. NUE values for fields that sourced nitrogen from both manure and fertilizer tended to be lower than fields that exclusively applied fertilizer, due to higher overall nitrogen application rates in manured fields. Fields in rotation with alfalfa or soybean had distinct nitrogen benefits. In 2017 (year 3), UWDF will enroll another 100 fields in the NUE program for a 3 year total of 250 field sites on over 40 Wisconsin farms.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

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Topographic Controls on Groundwater Nitrogen dynamics with Grass and Poplar Vegetated Riparian Buffers under Cattle Grazing

Authors: Ranjith Udawatta*, University of Missouri; Niranga Wickramarathne, University of Missouri; Bob Lerch, USDA-ARS; Fengjing Liu, Lincoln University

Abstract: Nitrogen (N) pollution of water resources has been a major problem for years, causing contaminated water supplies and harmful effects on aquatic and human. The main objective of this study was to measure topographic controls and buffer effect, on nitrate (NO_3-N) and total N (TN) transport in groundwater. The experimental design consisted of two adjacent rotationally grazed watersheds with Menfro silt loam (fine silty, mixed superactive, mesic Typic Hapludalfs). Land cover in one watershed was tall fescue (Festuca arundinacea Schreb.), red clover (Trifolium pretense L.), and lespedeza (Kummerowia stipulacea Maxim.) and the other one had the same pasture composition with four rows of poplar trees (Populus tremula L.) at the foot slope. In each watershed, a transect of wells was installed across a catena sequence. Groundwater samples were collected weekly from wells and analyzed for NO_3-N and TN concentrations. Nitrate and TN concentrations in each landscape positions were in the order summit > mid slope >> foot slope. At the foot slope, mean concentrations were 0.06 mg L-1 NO_3-N and 0.28 mg L-1 TN compared to mean concentrations at the summit and mid-slope of >2.5 mg L-1 NO_3-N and ~3 mg L-1 TN. NO_3-N concentrations at foot slope wells were 0.03 mg L-1 in the agroforestry buffer and 0.09 mg L-1 in the grass buffer treatment. Mean TN concentrations were 0.37 mg L-1 in the agroforestry buffer and 0. 32 mg L-1 in the grass buffer treatment. Results indicated that denitrification was the reason for the extremely low NO_3-N concentrations in the foot slope wells and the uptake of NO_3-N by deep roots of poplar trees may have further reduce NO_3-N in groundwater compared to the grass buffer treatment.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

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Urban Agriculture and Informal Wastewater Irrigation: Farmers Adaptation to Changing Water Quality of Akaki River Addis Ababa, Ethiopia

Authors: Biruk Bogale*, City Govornment of Addis Ababa Kirkos Sub City Woreda 02 Administration Office

Abstract: Informal wastewater irrigation contributes 60% of major and 90% of leafy vegetable to Addis Ababa's food basket. Despite its benefits, farmers are challenged with a deteriorating water quality of the Akaki River in the past 40 years. The main objectives of the study were to assess and analyse major on-farm wastewater hazard reduction adoptions and determinants that affect farmers' behaviour of adoption choice. A field survey of a randomly selected 60 urban farmers, a secondary data on water quality parameters and a field experiment were used in order to collect necessary data for the study. Results of the study reveal that about 41.67% of interviewed farmers use on-farm wastewater hazard intervention measures. The major on-farm adoption measures in the study area are simple filtration (15%), safer application (less contaminating irrigation methods (10%), crop restriction (8.33%), and irrigation cessation (8.33%).In order to evaluate the possibility of adopting new measures a field experiment was made by constructing a simple on-farm sedimentation pond(dugout) and results show that the levels of BOD, COD, TSS, faecal coli form could be reduced by 85.39%, 72.5% and 68.23% and 88 % (about 1 log unit) respectively. The marginal analysis result shows the following factors significantly (p=0.005) affects farmers' choice of low-cost on-farm measures in informal wastewater irrigation: Farming experience, education of a household head and household size. Therefore; incentives on land tenure and, further research on wastewater hazard reduction capacity of current adoption measures, support for enhancement of education system and establishment of farmers experience sharing centres are essential in order to increase the adoption of wastewater hazard intervention measures at farm level. Key words: Urban agriculture, informal wastewater irrigation, adoption, determinants ,multinational-logit, marginal effect.

Track: 2017 General Conference Theme Submissions

Subject Area: Adaptive Management of Conservation Efforts

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Reclaimed and Renewed: Delavan's Ann Street Corridor

Authors: Lynn Scherbert*, Ayres Associates; Mark Wendorf, City of Delavan

Abstract: With the help of conservation economic policies and guidance from Ayres Associates, the City of Delavan received over $5.5 million in grants, loans, and regulatory support to clean up contamination and alleviate severe stormwater flooding issues along the Ann Street corridor. Nearly a century of manufacturing and commercial operations contaminated soil and groundwater with petroleum, chlorinated solvents, heavy metals, and PCBs. Contamination combined with frequent flooding during storms endangered local water quality and hindered redevelopment in the corridor. The City's goal was to stimulate redevelopment in the area by remediating soil and groundwater contamination and alleviating severe stormwater flooding issues that plagued the corridor. Funds from U.S. EPA assessment and cleanup grants along with the Wisconsin Department of Natural Resources Green Space and Public Facilities Grant allowed the City to remove hazardous substances, demolish dilapidated structures, remediate soil and groundwater, construct a water quality basin, and add green space. The economic incentives these conservation policies provide encouraged developers to consider the redevelopment of the Ann Street corridor in place of "clean" areas outside of or on the fringes of Delavan. Ayres Associates assessed hazardous materials, investigated soil and groundwater contamination, and completed remedial action on nearly 14 acres that spanned 12 individual properties. More than 200,000 square feet of buildings were demolished, soil with metal and PCB concentrations above risk-based health standards was removed, and three soil vapor extraction systems remediated five commingled groundwater contamination plumes. Economic policies that provide economic incentive to redevelop contaminated properties for beneficial reuse, along with collaboration among regulatory authorities, the City, and private parties, resulted in the successful redevelopment of the Ann Street corridor.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Social and Economic Characteristics of Public Lands Ranchers in the United States

Authors: Kristie Maczko*, Sustainable Rangelands Roundtable - University of Wyoming; Brianne Lind, Sublette County Conservation District; John Tanaka, University of Wyoming Agricultural Experiment Station

Abstract: Reliable information documenting social and economic characteristics of public land ranchers is needed to help land managers and policy makers understand ranchers' economic and social diversity, as well as the variations among their operations, and their contributions to their local communities. To obtain this information, a national survey was administered in 2015, mirroring in part a previous survey conducted in the late 1990s. Cluster analysis was used to determine different rancher groups, and the rancher groups were then compared to one and other, and previous survey results, to identify sources of income, type and numbers of livestock, values that keep ranchers ranching, and participation in community organizations. Data analyses sought to evaluate similarities and differences among the groups of ranchers, and potential responses/reactions to policy changes impacting grazing permits, upon which many western ranchers rely as part of their overall operations. At the national level, data from a random sample of 1,911 public land ranchers were analyzed and 6 distinct groups of public land ranchers were identified across the United States. These groups include operations with less than 100 head of livestock, diversified agricultural ranchers, family cattle ranchers, corporate ranchers, sheep ranchers, and cattle and sheep ranchers. Positive and negative issues affecting ranchers were also evaluated. High beef prices were the biggest benefit to ranching operations, and federal regulation and policy were the biggest threat to ranching on public lands. Rancher groups are diverse, and can be classified into different groups based on attributes including values, income, livestock numbers, education, labor sources, type of operational organization, and others. Rancher groups respond differently to federal lands grazing policies. This information should be considered when developing conservation programs, making policy or land management changes.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Economics and Policy

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Effects of Agroforestry on Pollinators and Crop Pollination: A Systematic Review

Authors: Gary Bentrup*, USDA National Agroforestry Center; Judy Wu-Smart, 2. Department of Entomology, University of Nebraska-Lincoln, Lincoln, NE

Abstract: Addressing pollinator health includes enhancement of habitat within our agricultural landscapes. Additionally, it includes constructing drift barriers for reducing pesticide exposure. One promising approach is agroforestry. Agroforestry is the integration of woody and herbaceous plants into crop and animal farming systems to create productive and healthy agricultural operations and lands. Although put in place to meet other objectives, agroforestry practices (i.e., hedgerows, riparian buffers, alley-cropping) can be managed to include pollinator services. This poster summarizes the scientific literature on the benefits and potential trade-offs of agroforestry practices to support pollinator conservation within temperate regions. Agroforestry offers sources of pollen and nectar, particularly when other sources may be scarce, resin for honey bees to form propolis, as well as stable nesting and larval habitat in these frequently-disturbed landscapes. Research indicates these practices can significantly reduce pesticide drift. However, emerging evidence also suggests nectar and pollen in agroforestry plantings can become contaminated by neonicotinoids through non-target drift. Research, initiated by the authors and others, is examining how these multipurpose plantings can be better designed to strategically combine pollinator habitat and drift barrier functions. Merging current knowledge with developing research is yielding solutions to conserve and expand pollinator populations on agricultural lands.

Track: 2017 General Conference Theme Submissions

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

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Equipment development for limited resource small and urban conservation farming systems

Authors: Ted Kornecki*, USDA-ARS, National Soil Dynamics Laboratory

Abstract: The number of local urban farms is on the rise as these farms produce fruit and vegetables for local farmers' markets. This increase is due to a consumer demand for healthy and fresh locally grown produce. These farms usually own small walk-behind tractors with interchangeable attachments. Because agricultural production must be sustainable, producers adopt no-till farming practices with cover crops. A typical cover crop grown in the Southern US is cereal rye providing benefits such as reduced runoff and soil erosion, increased infiltration and water holding capacity, increased soil organic carbon, decreased soil compaction and better weed control. To optimize these benefits, cover crops must be terminated at the appropriate growth stage and managed properly to avoid planting problems. Small scale no-till equipment such as roller/crimper, no-till drill, and no-till transplanter have been developed to reduce hand labor while increasing efficiency. To evaluate effectiveness of these devices, a replicated field test was initiated in 2016 at the USDA-ARS in Central Alabama by planting a cereal rye cover crop utilizing an experimental powered coulter drill compatible with BCS 853 tractor. The three pieces of equipment will be evaluated as a system used for no-till vegetable cropping starting with planting rye by no-till active coulter planter, then terminating the rye by powered roller/crimper, and finally transplanting seedlings for a spring cash crop with a no-till transplanter. Hiwassee sandy loam and Davidson clay soils were selected to determine the performance of these developed tools under different conditions. Data has shown that a PTO driven experimental powered roller/crimper is as effective as full size rollers/crimpers. Preliminary testing has showed that the powered coulter drill generated effective seed emergence (82%) for optimum cover biomass. Based on the initial field testing, the no-till transplanter for walk-behind tractors performed as anticipated.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

NRCS Conservation Information Exchange with Cuba and Implications for Soil Management/Interpretations

Authors: Linda Scheffe*, USDA-NRCS; John Tiedeman, USDA-NRCS; Chayla Rowley, USDA-NRCS; Jeromy McKim, USDA-APHIS; Lillian Woods, USDA-NRCS; Sascha Dixon, USDA-NRCS; Maxine Levin, USDA-NRCS; Cathy Seybold, USDA-NRCS

Abstract: The intent of the USDA-NRCS visit to Cuba during December 2016 trip was to exchange information regarding soil conservation, management and irrigation. Field visits were made to various sustainable land area demos and several organic and urban agriculture farms. There were excellent exchange discussions about soil management, soil conservation, agroforestry, irrigation and drainage, as well as soil survey, conservation delivery and building sustainable farming systems. Discussion included conservation issues and opportunities Cuba is facing and also the advances made in urban and organic agriculture with biofertilizers, vermiculture, biopesticides, energy conservation and surface irrigation. Due to the drastically reduced availability of chemical inputs, Cuba replaced them with locally produced, and in most cases biological, substitutes. This has included biopesticides (microbial products) and natural enemies to combat insect pests, resistant plant varieties, crop rotations and microbial antagonists to combat plant pathogens, and better rotations and cover cropping to suppress weeds. Scarce synthetic fertilizers were supplemented by biofertilizers, earthworms, compost, other organic fertilizers, animal and green manures, and the integration of grazing animals. NRCS' unique model approach for soil survey and conservation/watershed planning for sustainable agriculture was received very well by the Cuban counterparts. Initial recommendations were discussed for future follow-up between NRCS and the Cuban Ministry of Agriculture, including soil management/interpretations. Further discussion of future collaboration will be made with NRCS leadership and technical disciplines as well as partners. During this poster presentation, solicitation of input from partners will be made as to further exchange opportunities.

Track: 2017 General Conference Theme Submissions

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

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A Plot Study on the Effect of Water Erosion on Tillage Erosion

Authors: sheng li*, aafc

Abstract: Soil erosion is a global environmental issue causing soil degradation on cultivated lands. It has been reported that both water and tillage erosion can occur in cultivated fields. As a result, there may be interactions between these two erosion processes. For instance, a water erosion event can create rills or ephemeral gullies. The size, position and shape of these channels may affect the amount of tillage erosion. However, no study has been carried out to quantify such interactions. In this study, a plot experiment was carried out in Fredericton, New Brunswick to determine the effect of water erosion on tillage erosion. More specifically, the experiment was designed to investigate the effect of water erosion-induced channels on soil translocation by tillage. Tillage translocation was determined by measuring the movement of tracers incorporated into the plot. Three types of plots were used to represent three levels of water erosion: flat surface (no water erosion); with a 10 cm by 10 cm channel (medium water erosion) and with a 20 cm by 20 cm channel (high water erosion). Three tillage directions were tested: upslope, downslope and contour tillage. The results indicate that the forward soil movement under downslope tillage is the longest (around 16 cm), whereas that under upslope tillage is the shortest (around 10 cm). More importantly, we found that with an increase in channel size (i.e., water erosion), soil translocation by tillage increased in both forward and lateral directions, indicating a positive interaction between water and tillage erosion, i.e., water erosion increased tillage erosion.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

*denotes primary author and subject area

Application of the Daily Erosion Project (DEP) in Northeast China

Authors: Xuewen Chen*, Iowa State University; Richard Cruse, Iowa State University; Brian Gelder, Iowa State University; Xingyi Zhang, Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences

Abstract: Measuring soil erosion across broad geographical areas is very challenging and arguably unrealistic. Thus obtaining soil erosion estimates through modeling soil surface processes is critical for quantitatively evaluating land degradation and is regarded as a frontier domain in the soil science discipline. One of the most recent research developments in this area, the Daily Erosion Project (DEP), estimates near real time hill slope sheet and rill erosion across large geographical areas using a process based soil erosion model, WEPP, and a suite of remotely sensed model inputs. These geographic information system input layers include digital elevation models, field level land use and management from various publically available databases and LANDSAT imagery, soil type from electronic soils databases, and precipitation estimates from Next-Generation Weather RADAR (NEXRAD). Daily processing of WEPP using these and other inputs results in daily estimates of hill slope water runoff, soil detachment, and hill slope sediment loss. As the first daily soil erosion estimation system, DEP has been applied successfully in Midwest USA. Northeast China has many similarities with the modeled Midwest area - similar latitude, soil, crop, management, weather and topographic relief and both areas have serious soil erosion problems. Thus, the current study is based on the prospective application of DEP in Northeast China, covering 25 towns (total land area approximates 4667 square kilometers, each town is approximately 150-200 square kilometers) in Hailun County, which is located in the central Mollisol zone, Heilongjiang Province, Northeast China. Critical remotely sensed inputs are being evaluated for DEP model suitability. Evidence suggests that DEP can be successfully implemented to estimate daily hill slope soil erosion in Northeast China.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

*denotes primary author and subject area

Commodity Based Assessment of Soil Erosion Risks at the national scale for Canada

Authors: sheng li*, aafc

Abstract: Soil erosion is one of the major natural hazards that threat the agriculture sustainability of Canada. A Soil Erosion Risk Indicator (SoilERI) has been developed to evaluate the risk of water, wind and tillage erosion and the combined effect of these three erosion processes at the national scale for Canada. The SoilERI was established on the spatial framework of the national soil database of Canada and calculates erosion rates for each Soil Landscape of Canada (SLC) polygon, the base unit for the Canadian soil database. Since the SLC is biophysically based, challenges remain to use this information to guide management or policy. In this study, we extended the original SoilERI model to include commodity information. We chose four cropland's types (Corn, Forage, small grains and Potato) and examined how much (area percentage) these cropland lands were associated with lands that has different soil erosions classes (tillage, water, wind, and The Soil Erosion Risk Indicator), these assessments are provided in provincial bases of Canada for the years 2001, 2006, and 2011. Overall, water and tillage erosions were found highly active in most of the Canadian soils comparing to wind erosion which was considered to be active only in the Prairie Provinces. Potato production demonstrated the highest soil erosion risks among all commodities examined. However, the risk level has dramatically decreased in most areas of Canada over the past 20 years.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Cover crops: A sink but not always a source of nitrogen

Authors: Giovani Preza Fontes, Kansas State University; Peter Tomlinson*, Kansas State University; Kraig Roozeboom, Kansas State University; Dorivar Ruiz Diaz, Kansas State University

Abstract: Growing cover crops (CCs) in rotation with cash crops has become popular in recent years for their many agroecosystem benefits, such as influencing nutrient cycling and reducing nutrient loses. This study aimed to (i) determine the long-term effects of no-till with CCs and varying N rates on subsequent sorghum [Sorghum bicolor (L.) Moench] yield, (ii) estimate a nitrogen fertilizer replacement value for the cover crops and, (iii) quantify soil nitrate and nitrous oxide losses throughout the cropping system. Field experiments have been ongoing since 2007 with focused sampling during the 2014-15 and 2015-16 growing season in a three-year no-till winter wheat (Triticum aestivum L.) – sorghum – soybean [Glycine max (L.) Merr] rotation. Fallow management consisted of a chemical fallow (CF) control plus four cover crops and double-crop soybean (DSB) grown after wheat harvest. Nitrogen fertilizer was subsurface banded at five rates (0, 45, 90, 135, and 180 kg ha-1) after sorghum planting. On average, late-maturing soybean (LMS) provided N required for maximum economic grain yield when compared to the other CCs and CF with 0-N application. Crimson clover (Trifolium incarnatum L.),DSB, and daikon radish (Raphanus sativus L.) had similar or negative effects on sorghum yield and had no N replacement value. Sorghum-sudangrass (SS) (Sorghum bicolor var. sudanese) significantly reduced grain yield even at higher N rates and had the lowest N fertilizer replacement value. Cover crops reduced nitrous oxide emissions by 65% during the fallow period when compared to CF; however, DSB and SS increased emissions when N was applied during the sorghum crop, indicating that N fertilization might be the overriding factor. Overall, these results show that CC selection and N fertilizer management are critical to having a beneficial impacts on sorghum productivity and nitrous oxide emissions in a no-till cropping systems.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Impact of Seasonal and Short-Term Manure Application Decisions on Phosphorus Loss in Runoff

Authors: peter vadas*, usda-ars

Abstract: Agricultural phosphorus (P) management is a research and policy issue due to P loss from fields and water quality degradation. Better information is needed on the risk of P loss from dairy manure applied in winter or when runoff is imminent. We used the SurPhos computer model and 108 site-years of weather and runoff data to assess the impact of these two practices on dissolved P loss. Model results showed winter manure application can increase P loss by 2.5 to 3.6 times compared to non-winter applications, with the amount increasing as the average runoff from a field increases. Increased P loss is true for manure applied any time from late November through early March, with a maximum P loss from application in late January and early February. Shifting manure application to fields with less runoff can reduce P loss by 3.4 to 7.5 times. Delaying manure application when runoff is imminent can reduce P loss any time of the year, and sometimes quite significantly, but the number of times that application delays will reduce P loss is limited to only 3-9% of possible spreading days, and average P loss may be reduced by only 15% for winter-applied manure and 6% for non-winter applied manure. Overall, long-term strategies of shifting manure applications to low runoff seasons and fields can potentially reduce dissolved P loss in runoff much more than compared to near-term, tactical application decisions of avoiding manure application when runoff is imminent.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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Migration of Landfill Contaminants towards Groundwater System: Prediction and Simulation

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

Abstract: Background: Despite its ability to assess the mechanisms of contaminant transport, a groundwater flow model can provide useful information on various remedial alternatives for hazardous waste sites, concentration reduction, mass fluxes, and travel times. Methodology and Objective: In this concern, the Finite difference groundwater models VISTAS and MODFLOW were used to predict and simulate travelling time between a fractured subsurface geological formation and migrating leachate underneath a proposed landfill site in western Peninsular of Malaysia. Using natural hydrologic features (three small rivers) as boundary conditions, the groundwater flow model was calibrated based on observed groundwater levels at a total of 8 piezometers. Results: As a weathered granitic material, the hydraulic conductivity of local soil was measured in the range of 10-7 to 10-6 m/s with a decrease trend towards depth. The model was satisfactorily calibrated with a percentage error of 4.81e-5 for the total water balance. Results showed that in transient simulation the leachate will continue flowing up to 25 years (i.e. 9125 days) before reaching the river water downstream, which in turn represents simulation to the total landfill operation period. The contaminant, on the other hand, will travel a few meters from the landfill within the first 5 years of operation (i.e. Phase 1) and will continue travelling away from the landfill depending on the continuity level of both generation and injection of the leachate into the aquifer underneath landfill. Conclusion: Since the leachate will eventually reach both rivers at east and west sides of the proposed landfill, the construction and the maintenance of a perimeter drains surrounding the landfill site will minimize the spreading of the leachate underneath the site and control the surface runoff from the tipping area. The depth of the proposed drain should consider the landfill operation level and the thickness of the first geological layer.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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NUTRIENT TRACKING TOOL* – A USER-FRIENDLY TOOL FOR EVALUATION THE WATER QUALITY AND QUANTITY AS AFFECTED BY VARIOUS AGRICULTURAL MANAGEMENT PRACTICES

Authors: Ali Saleh*, Tarleton state university

Abstract: The Nutrient Tracking Tool (NTT) is a user-friendly web-based computer program that estimate nutrient (nitrogen and phosphorus) and sediment losses from fields managed under a variety of cropping patterns and management practices. The NTT includes a user-friendly web-based interface and is linked to the Agricultural Policy Environmental eXtender (APEX) model. It also accesses USDA-NRCS's Web Soil Survey to obtain field, weather, and soil information. NTT provides producers, government officials, and other users with a fast and efficient method of estimating the nutrient, sediment losses, and crop production under different conservation practices regimes at the farm-level. The information obtained from NTT can help producers to determine the most cost-effective conservation practice(s) to reduce the nutrient and sediment losses while optimizing the crop production. Also, the recent version of NTT has been developed for those courtiers without access to national databases, such as soils and weather. The NTT also has been designed as easy to use APEX interface. During this presentation the latest version of NTT will be described and demonstrated. Key Words: Nutrient Tracking Tool, nitrogen, phosphorus, credits, forestry, farm, NTT, water quality trading, nutrient management, conservation practices

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

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The Use of Model to Determine the Influence of Ecological Variables on Soil Organic Carbon Sequestration in Derived Savanna Soils of Southwestern Nigeria

Authors: Joseph Aruleba*, Ekiti State University; Oluwatoyin Adeosun, Federal Polytechnic, Ado-Ekiti

Abstract: The need to study factors influencing the carbon sequestration is important for the enhancement of soils to act as a natural sinks to mitigate the climate change challenges. The objective of this study is to determine the influence of ecological variables on the stock of carbon using a stepwise regression model. The study was carried out at Itapaji, a farming community in the derived savanna zone in Ekiti North Senatorial District.. The site covered about 10 ha which was divided into two locations of 5 ha each. At each location, two distinct topo sequences were identified and delineated into upper slope, middle slope and valley bottom. A profile pit was dug at each topographical land type, 12 profiles were dug in the site, their locations and coordinates were determined using Global Positioning System (GPS). Soil samples were collected from the identified horizons and the profiles were described following standard method. Data obtained were analyzed using stepwise multiple regression analysis with the aid of SPSS 17.0 software package. A model that identifies the significant ecological variables that explained increased variability in the SOC sequestration of the study area was developed as: Y=8.60 + 2.25LUT- 0.20 LT -0.81BD + 5.69 N + 0.55Fe + 0.23Al (for location A) and Y=0.69 + 0.38 LUT + 2.11 LT -0.92BD + 11.01N + 0.89Fe – 0.23Al (for location B). The model results are expected to be a guide for predicting SOC storage in different soil types with similar land types, ecological conditions and vegetation types. It is recommended that management practices such as cover crop, residue retention, zero tillage, appropriate use of fertilizer, long fallow period, controlled bush burning, and appropriate management technique suitable for different topographic land type will enhance SOC sequestration in the study area.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

*denotes primary author and subject area

Where is the Oak Ecosystem in Models for Corn Belt Conservation?

Authors: Craig Maier*, Tallgrass Prairie and Oak Savanna Fire Science Consortium; Greg Nowacki, Eastern Region, US Forest Service; James Miller, Department of Natural Resources & Environmental Sciences, University of Illinois at Urbana-Champaign; Pauline Drobney,

Abstract: The terms "wetland," "grassland," and "forest" have been used frequently in the contexts of agroecosystem conservation and ecosystem services in recent proceedings of the Soil and Water Conservation Society annual conference. In contrast, the absence of conservation information about oak savannas or oak woodlands is notable. Once abundant in the Corn Belt Region, these formerly open ecosystems now tend to be closed-canopy forests lacking in biological diversity and ecological function. Under current conditions, ecological thresholds have been surpassed to the point that many woodlots are not suitable for oak ecosystem restoration. Over the past several decades, expertise in identifying and restoring oak ecosystems has greatly increased. We know oak savanna and woodland restoration can be successful when: 1) sites with adequate restoration potential are identified (e.g., remnant populations of ground flora still exist); 2) invasive species are controlled; 3) canopy thinning occurs to provide openness; and 4) recurrent fire is applied under an appropriate prescription for the site. Professional observations and research from oak ecosystems across the eastern United States have shown that thinning and burning can: improve herbaceous diversity and cover - which may contribute to water quality goals by reducing runoff delivered to adjacent croplands or directly to waterways; improve habitat for many rare, threatened, and endangered plant and animal species - many of which are found only in these habitats; as well as increase pollinator diversity and abundance. Translating research and knowledge from the field of ecological restoration to the soil and water conservation community is a key short-term goal, and restorations on private lands provide an important bridge. Research gaps include: incorporating oak restoration into farm- to watershed-level conservation models; and cost-benefit analysis comparing inputs and outcomes for oak ecosystems, grasslands, and wetlands.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

*denotes primary author and subject area

WQIag-A tool of multiple applications

Authors: Harbans Lal*, USDA

Abstract: WQIag - Water Quality Index for Runoff from Agricultural Field is a qualitative, multivariate metric that ranks the combined impact of soil and site characteristics, climate, and management practices on the quality of runoff water exiting as surface runoff from agricultural fields with different conservation scenarios. It employs site-specific information with professional judgment and scientific literature to rank site characteristics and management factors that include: Field Characteristics and Soil factors, Nutrient Management factors, Tillage Management factors, Pest Management factors, Irrigation/Tile drainage management, and conservation practices. The tool developed by the National Water Quality and Quantity Team of the NRCS/USDA located at the West National Technology Support Center, Portland, OR has been used for variety of applications by different state, federal and non-profit organizations. It will also provide a definition of "Index" & its common usages, elaborate on the complexity of Water Quality (WQ) parameters and how the concept of indices has been used in expressing WQ (Water Quality Indices -WQIs), field factors and management components and how they have been integrated into a single WQIag value along with an on-site live demonstration of the tool. Applications of the tool by different agencies including NRCS within its National Water Quality Initiative program, Minnesota Department of Agriculture (MNDA) for its water quality certification program, Idaho National Lab of the US Department of Agriculture (USDOE) for spatial analysis for crop management alternative for feedstock for alternative energy sources, Western Riverside County Agriculture Coalition (WRCAC) San Jacinto, CA with its CIG project "Developing and Piloting a Water Quality Trading (WQT) Program for Agricultural Operators in the San Jacinto River Watershed", etc. will be outlined with some concluding remarks and future plans.

Track: 2017 General Conference Theme Submissions

Subject Area: Conservation Models, Tools, and Technologies

*denotes primary author and subject area

Dairy Grazing Apprenticeship Trains the Next Generation of Conservation Farmers

Authors: Laura Paine*, Dairy Grazing Apprenticeship; Joe Tomandl III, Dairy Grazing Apprenticeship

Abstract: Both the problems and the solutions to reducing environmental impacts of agriculture are well known. Consistent and widespread adoption of conservation practices by farmers has always been the greatest barrier to achieving measurable improvement. Dairy Grazing Apprenticeship brings a fresh approach to addressing this challenge by using formal Apprenticeship to train the next generation of farmers in environmentally friendly practices. Apprenticeship is a time-honored system of teaching best practices in the skilled trades. For over a century, carpenters and electricians have learned their trades by working alongside experienced Masters. Why not farmers? Farming is a skilled trade and one that provides two vital services: production of food and stewardship of land and natural resources. Dairy Grazing Apprenticeship, the first in the nation formal Apprenticeship for farming, trains beginning dairy farmers in the conservation-based practice of managed grazing. Registered with the U.S. Department of Labor, this comprehensive, two-year program places Apprentices on working dairy farms to learn from experienced graziers all aspects of managing a profitable, environmentally sound dairy operation. Currently operating in eight states in the Upper Midwest and Great Lakes region, DGA has more than 90 Master Dairy Graziers approved to hire aspiring farmers to learn their trade. As aging dairy farmers near retirement, this program can help transition thousands of family-scale dairy farms in the region to the next generation, maintaining perennial forages on the landscape and contributing to a resilient, diverse dairy economy.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

*denotes primary author and subject area

IPM Institute Partnering with Ag Retailers, Growers and Landowners for Resource Management and Water Quality

Authors: Anna Gudjonsdottir*, IPM Institute

Abstract: The Partnership for Ag Resource Management has been working with ag retailers and other partners to reduce phosphorus inputs into the Great Lakes, thereby reducing harmful algal blooms that have plagued Lake Erie in recent years. To do this, we have been surveying ag retailers in the Great Lakes Basin to promote and track sales of beneficial products and services that keep ag inputs on cropland and out of our waterways. Longitudinal data were analyzed using both descriptive statistics and linear regression from the 5 years that this survey has been taking place. Increasing trends of some best management practices (BMPs) have been observed, including variable rate technology and cover crops. We have identified BMPs that ag retailers can offer and still remain profitable, such as foliar P feeding and gypsum application. This work is critical to activate ag retailers as sustainability and stewardship leaders in the effort to improve water quality. It also allows us to leverage the trust-filled relationship between ag retailers and their customers to improve both water quality and nutrient management.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

*denotes primary author and subject area

Soil Health Economic Case Studies: Two New York State Farmers' Experiences

Authors: Florence Swartz*, NRCS

Abstract: One source of information often cited by producers when considering adopting a change to their operation is the experience of other farmers. The closer to home these examples are, the more influential they become. Furthermore, while many studies have been published describing the benefits of conservation practices that enhance soil health, most only hint at the potential economic effects of adopting these practices. To fill this need, we sought to develop case studies for farmers within New York who have been successful in adopting soil health practices on their farms. The goal for these studies was to perform a partial budgeting economic analysis comparing the before treatment condition with the after treatment condition focusing on variables that changed as a result of implementing soil health practices. We have now completed two such case studies in upstate New York that show how soil health practice can be integrated into conventional dairy operations. In both cases, the farmers provided detailed descriptions of their own experiences as they moved from conventional tillage to no-till while incorporating cover crops into their crop rotations. We collected economic data and used partial budgeting to calculate how these practices affected farm net income. In both cases, adopting soil health practices improved not only the health of the soil resource, but the farm's net income as well. We used these results to create two-page summaries of each study for distribution at soil health workshops within New York State. The summaries have also been posted to the New York Natural Resource Conservation Service Soil Health web page and Field Office Technical Guide. So far, the studies have been well received at soil health workshops and we hope that having this kind of information available to agricultural producers will encourage them to look for similar opportunities for improving soil health on their own land.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

*denotes primary author and subject area

The Power of Partnerships: Creating Opportunities for Conservation at the Watershed Scale

Authors: Adrienne Marino*, The Nature Conservancy; Maria Lemke, The Nature Conservancy; Krista Kirkham, The Nature Conservancy; Ashley Maybanks, The Nature Conservancy; Joan Brehm, Illinois State University; Miran Day, California Polytechnic State University; Davi

Abstract: For more than 25 years, The Nature Conservancy (TNC) has been working to advance conservation on agricultural lands in the Mackinaw River watershed in central Illinois. This watershed is heavily tile-drained and representative of many row-crop dominated watersheds in the Corn Belt region. Partnerships are critical to our program's current and future success. Relationships with the McLean County Soil and Water Conservation District (SWCD), Natural Resources Conservation Service (NRCS), the City of Bloomington (City), agribusinesses, and local producers help our team build credibility within the agricultural community. We meet regularly with a local agricultural advisory group (AAG) to better understand opportunities and barriers related to implementing management practices. With the understanding that producers often seek advice from their seed and fertilizer suppliers, we are partnering with a crop consultant to transition producers from fall to spring nitrogen application. Academic collaborators are developing watershed maps that estimate the environmental, economic, and agronomic impacts of different land management scenarios, and that identify areas where certain practices may be most effective. A watershed-wide survey of agricultural producers is provides new information about current management practices and further informs our outreach strategies. Farmer outreach led by SWCD includes one-on-one interactions, newsletters, field days, and coordination of our AAG to promote participation in conservation programs. Partnering with City staff contributes to source water protection projects that benefit downstream drinking water quality. All of these strong and strategic partnerships complement TNC's efforts to demonstrate the ecological effectiveness of conservation practices, and to develop sustainable financing strategies for watershed-scale implementation of nutrient management practices.

Track: 2017 General Conference Theme Submissions

Subject Area: Outreach, Education, and Community Engagement

*denotes primary author and subject area

Is Laser Diffraction PSA an Appropriate Method for Measuring Soil Aggregate Stability?

Authors: Krista Marshall, University of Wisconsin- Madison; Edward Boswell*, University of Wisconsin-Madison; Nick Balster, University of Wisconsin-Madison

Abstract: Soil aggregate stability, a key component of soil structure, is a commonly measured indicator of soil health. The traditional aggregate stability method is limited to assessment of only the macroaggregate size fraction (250 µm), and adjustments to testing equipment to account for different soil types is limited. In this study, we investigate an alternative method for aggregate stability assessment using a laser diffraction particle size analyzer (PSA). In contrast to traditional methods, laser diffraction PSA provides aggregate stability data from a 2,000 to 0.04 µm continuum, allows for corrections due to soil texture, and has several user-definable parameters. Samples were collected from silt loam soils under agricultural and restored prairie management at the Pope Farm Conservancy Verona, WI, USA and analyzed for aggregate stability using both traditional and laser diffraction PSA. We will present correlations between laser diffraction PSA and traditional methods as well as summarize additional data provided by laser diffraction PSA for detailed quantification of soil aggregate stability.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

An Ecological Approach to Nutrient Management for Soil Health

Authors: Zahangir Kabir*, USDA-NRCS

Abstract: Over the last several decades, standard agricultural practices have led to accelerated soil erosion and loss of organic matter and natural fertility. The advent of new understandings about how these practices impact the soil biology and how it interacts with soil physical and chemical characteristics has led to new ways of implementing soil conservation practices. Soil health is a new paradigm that looks at the soil as a living breathing ecosystem that supports many critical ecosystem services such as producing crops, regulating water flow, storage and filtration, nutrient cycling and storage, and improved resilience to extreme weather events, among others. A sustainable soil ecosystem can be achieved by using multiple nutrients sources including cover crops, organic amendments, and crop rotation. As part of a soil health management system, it is helpful to assess the nutrient reservoirs that are accessed through microbial and plant mediated processes, allowing for more tailored nutrient inputs. The application of soil health principles with diverse nutrient sources for long-term nutrient management will be discussed in this poster based on Drinkwater and Snapp (2007) proposed nutrient management model and the USDA-NRCS soil health principles.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Conservation behaviors in family farm businesses

Authors: Sheila Hanson*, University of North Dakota

Abstract: Research about conservation behaviors is typically focused upon the motivation of individuals; however, in a family farm business, which involves the intersection of the family and the family business, there are multiple actors who play a role in both the family and the business. Due to the influence of various actors in a family farm business, there is a gap in the literature addressing the complexity of perspectives in a family business on conservation practices. Gaining an understanding of both systems (family and family business) is relevant to understanding motivation, decision-making, and conservation in family farm businesses. Sustainable Family Business Theory (SFBT), rooted in family systems theory, family social science, and small business literature, gives recognition to both the family system and the business system within a family business. A key premise of SFBT is that the health of a family business arises from both business success and family functioning. Remarkably, individuals in either system may affect parts of both systems. Though one landowner may be the key decision-maker, he/she is influenced by other family members and decisions may be made jointly. Further, family systems influence future generations, so there is a transgenerational impact. The current work draws upon the results of research based on multi-informant data (i.e. parents and adult children) in family farm businesses. The contrast between a family business who made a long-term decision transition to organic is contrasted with a family farm business who continued with traditional practices. The purpose of this effort is to highlight the importance of family relationships in making family business decisions about conservation and socially responsible practices. This research makes an important contribution towards explaining how multiple actors in family farm businesses converge on a triple bottom-line (people, planet, and profit) to sustain family farm businesses over time.

Track: 2017 General Conference Theme Submissions

Subject Area: Social Sciences Informing Conservation

*denotes primary author and subject area

Disease Risks And Mitigation Strategies for Minimum Tillage Wheat

Authors: Steven Savage*, CropLife Foundation

Abstract: No-till and other minimum tillage farming systems are widely recognized as desirable from an agricultural sustainability perspective. They can provide a range of ecosystem services, promote overall soil health, and can provide positive economic outcomes with regard to water-use-efficiency and yield stability/potential. The adoption of such systems, though significant, can be constrained by various capital investment requirements, social/informational gaps, and by enhanced economic risks – particularly during the transition from tillage-based farming. One important risk factor is that crop residues on the soil surface increase the inoculum potential for several plant diseases, and the residues can also influence moisture and temperature conditions that favor plant infection. Addressing this risk is critical for the expansion of minimum tillage. This presentation is based on a survey of wheat disease experts from the US and Canada focusing on how tillage decisions influence disease risks in wheat, and what risk mitigation strategies have been developed to improve farmer outcomes for minimum tillage conversion. Based on published literature and personal interviews there are indeed significant, disease-related challenges for minimum tillage in wheat. Viable risk-mitigation options vary depending on the disease in question, the geographic region, seasonal weather conditions, and the subclass of wheat. Documented mitigation options include: strategic crop rotations, selection of cultivar genetics, forecasting models, seed treatment fungicides, foliar fungicides, seed quality, fertilizer placement/timing, timing of weed/cover control to avoid a "green bridge" phenomenon. These examples highlight the importance of public, private and grower innovation/investment in order to enable this sustainable farming practice.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Diversification of the Corn-Soybean Rotation for Improved Sustainability

Authors: Walter Riedell*, USDA, ARS; Shannon Osborne, USDA

Abstract: Highly specialized cash-grain production systems based upon corn-soybean rotations under tilled soil management are common in the northwestern U.S. Corn Belt. This study, initiated in 1997, determined if diversification of this ubiquitous corn-soybean rotation affected soil characteristics and crop productivity under no-till soil management. The effects of corn-soybean (C-S), corn-soybean-spring wheat (C-S-W), or corn-soybean-oat/pea hay-alfalfa-alfalfa (C-S-O/P-A-A) rotations on soil bulk density, organic C sequestration, and residual soil nitrate-N as well as on corn and soybean yield productivity and seed protein were investigated. The C-S-O/P-A-A rotation reduced soil bulk density (1.37 g/cm3) compared to C-S (1.48 g/cm3) when measured prior to the corn phase. Soil C sequestration rates were 142 kg C/ha/year for C-S, 33 for C-S-W, and 253 for C-S-O/P-A-A. Residual nitrate-N prior to corn was about 38 kg/ha for C-S-O/P-A-A and about 27 kg/ha for the other rotations. Prior to soybean, residual nitrate-N was about 129 kg/ha for C-S-O/P-A-A and about 65 kg/ha for the other rotations. For corn, diversification of the C-S rotation with C-S-O/P-A-A increased grain yield (+9%) and increased seed protein (+6%). Diversification with wheat (C-S-W) increased corn yield (+10%) but had no effect on seed protein. For soybeans, diversification of the C-S rotation with C-S-O/P-A-A increased yield (+9%) and seed protein (+3%). Diversification with wheat (C-S-W) also increased soybean yield (+3.5%) but had no effect on seed protein. Thus, diversification of the C-S rotation with C-S-O/P-A-A increased soil quality as well as corn and soybean grain yield and seed protein. In contrast, diversification with C-S-W only increased corn and soybean grain yield. These data elucidate how soil and crop management can improve the sustainability of agricultural systems to meet the demand for increased productivity while maintaining or improving the soil resource.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Effects of Biomass Crops, Agroforestry Buffers and Grass Buffers on Soil Hydraulic Properties Compared to Row Crop Management

Authors: Salah Alagele*, University of Missouri; Stephen Anderson, University of Missouri; Ranjith Udawatta, University of Missouri

Abstract: Biomass crops as well as agroforestry buffer and grass buffer practices provide diversified productivity and ecosystem services. They may also improve soil hydraulic properties relative to conventional grain crop management systems. This study examined the effects of conservation buffer systems (biomass crops, agroforestry buffers, grass buffers, and row crops) on soil hydraulic properties for a claypan soil, Putnam silt loam (fine, smectitic, mesic Vertic Albaqualf). The experimental watersheds for this project were located at the Greenley Memorial Research Center in northeastern Missouri. Samples were collected from a no-till corn (Zea mays L.)-soybean [Glycine max (L.) Merr.] rotation established in 1991, with agroforestry and grass buffers established in 1997, and biomass crops established in 2012. Six replicates of intact soil cores (76-mm diam. by 76-mm long) were taken from the 0 -10, 10 – 20, 20 – 30, and 30 – 40 cm depths to determine saturated hydraulic conductivity (Ksat), soil water retention, bulk density, and pore size distributions. Results showed that soils under agroforestry buffers and biomass crops had lower bulk density values than the row crop treatment. Trends also showed higher saturated hydraulic conductivity for the agroforestry buffer and biomass crops compared with the row crop treatment. These results indicate that conservation systems can significantly enhance soil hydraulic properties compared with row crops, particularly in eroded claypan landscapes; these approaches have remarkable importance in addressing challenges of soil and water conservation.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Fostering Soil Health in North Dakota

Authors: Susan Samson-Liebig*, USDA-NRCS

Abstract: "Fostering Soil Health in North Dakota" S.E. Samson-Liebig1, W. Bott1, J. Fuhrer1, H. Weiser1, W. Duckwitz1, M.A. Liebig2, and A. Wick3 1USDA-NRCS, ND; 2USDA-ARS, Mandan, ND; 3NDSU, Fargo, ND Numerous demonstration projects have been initiated throughout North Dakota to increase producer awareness about alternative cropping systems utilizing no-till, diverse cropping systems and rotations, cover crops, and grazing techniques to improve soil health and address resource concerns such as increased salinity, poor water infiltration rates, depleted soil fertility, and lack of soil biological diversity. Compost and compost teas, in conjunction with cover crop cocktails, have been evaluated to determine their effects on soil health and crop yield. In addition to the demonstration projects, researchers continue to quantify benefits and drawbacks associated with cover crop use in cropping and grazing systems, and update/improve cover crop decision aids. Also, various assessment tools and methods are being employed to evaluate soil biological, physical, and chemical properties along with implementation of soil health building principles. A vigorous soil health awareness campaign continues through workshops, shop/café talks, field tours, and various outreach methods targeting producers, the urban sector, and youth. This poster will highlight on-going soil health activities in North Dakota as well as key findings from various demonstrations projects.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Hydrocarbon Status of Soil as Ecological and Genetic Indicator

Authors: Alexander Gennadiyev*, Moscow State University Faculty of Geography; Yuriy Pikovsky, Moscow State University Faculty of Geography; Andrey Zhidkin, Moscow State University Faculty of Geography; Maria Smirnova, Moscow State University Faculty of Geography; Timur Koshovskii, Moscow State University Faculty of Geography, Kovach R.G, Moscow State University Faculty of Geography

Abstract: Hydrocarbon status of soil (HSS) is its specific property, expressed in certain set of hydrocarbon compounds, which exist in soils in different physical forms. The characteristics of HSS include: a) the amount and composition of hydrocarbon gases in soil air; b) the total content and composition of bitumoid (the substances, extracted from soil with the neutral organic solvent): 3) the composition and the concentration levels of individual hydrocarbon compounds as a part of bitumoid (polycyclic aromatic hydrocarbons and normal alkanes, etc.). The study of HSS acquires the practical relevance in connection with the wide spread occurence of hydrocarbons in the environment, global processes of extraction, transportation and use of hydrocarbons, wide spread of forest and peat fires. Research of HSS can provide a new knowledge about methods of monitoring of the environmental and productive soil quality, as well as counteract their degradation. On the basis of field and laboratory research within the seven key sites the modifications of HSS, caused by specific combinations of natural and anthropogenic factors, were revealed. It was found that all the studied soils of the natural landscapes are characterized by low content of bitumiods, which concentrations does not normally exceed 50 mg/kg, and polycyclic aromatic hydrocarbons (PAH), the amounts of which seldom exceed 0.01 mg/kg. The study of soils in technogenic-modified landscapes showed two types of formation of technogenic HSS. The injection type is characterized by a high content of both PAH and bitumoids throughout the soil profile, while the atmosphere-sedimentation type was distinguished by near-surface accumulation in soils mainly polyarenes, including carcinogenic benzo(a)pyrene.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Impact of Maize Hybrids with Enhanced Nitrogen Use Efficiency on Soil Nitrogen Depletion in Sub-Saharan Africa

Authors: Heather Pasley*, Purdue University; Jill Cairns, CIMMYT; James Camberato, Purdue University; Tony Vyn, Purdue University

Abstract: Intensive agriculture with minimal fertilizer and organic inputs has led to the continued mining of soil nutrients in Sub-Saharan Africa, hindering the continent's ability to realize its own green revolution and to feed a growing population. Over the last 30 years, averaged across the continent, soil nitrogen (N) has been depleted at a rate of 22 kg N/ha. Continuous corn cropping systems with irregular rainfall patterns and limited fertilizer and organic matter inputs in Kenya and Zimbabwe have exacerbated this degradation such that the depletion rate may be as high as 48 kg N/ha. One potential solution for increasing yield while minimizing further depletion is to plant maize hybrids with enhance nitrogen use efficiency (HNUE). Our study contrasted these hybrids developed by CIMMYT as part of their Improved Maize for African Soils initiative with local commercial hybrids (COMM) in three sites: Kiboko and Embu, Kenya and Harare, Zimbabwe for 5 to 9 seasons at 4 fertilizer rates ranging from 0 kg N/ha to 160 kg N/ha. Hybrids were planted continuously on the same plots. There were no significant differences in grain yield among hybrids, but average yields increased with each N fertilizer addition ($p<0.01$). At all sites, following the 2015 harvest, soil inorganic and total N was determined to a depth of 90 cm to determine the impact of the hybrids on the soil N reserves. In Harare, significantly higher levels of inorganic N were found in plots where COMM hybrids were planted than in those of HNUE hybrids ($p<0.001$). There was no fertilizer N rate effect on the soil N pools for HNUE hybrids, but for COMM hybrids, the soil nitrate (NO_3^-) pool increased incrementally when 40 kg N/ha and 80 kg N/ha were applied ($p<0.01$). There were no hybrid effects on organic matter or total soil N concentrations. This study shows that in N depleted soils, hybrid selection may impact soil N pools in the rooting zone beyond any changes that result from fertilizer addition alone.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Increasing Labile Carbon and Nitrogen Pools in Wisconsin Agricultural Soils Requires a Change in System, Rather than Practice.

Authors: Kalyn Diederich*, University of Wisconsin Madison Soils Department; Kavya Krishnan, University of Wisconsin Madison Soils Department; Erin Silva, University of Wisconsin Madison-Department of Pathology ; Matt Ruark, University of Wisconsin-Madison

Abstract: Labile soil carbon (C) and nitrogen (N) dynamics are key variables in soil health assessments and are critical for soil ecosystem services. Understanding these dynamics will provide insight into how seasonality and farm management practices within forage and dairy cropping systems influence soil C and N. The objective of this research is to study the effects of six different long-term cropping systems on potentially mineralizable nitrogen (PMN), permanganate oxidizable carbon (POxC), and potentially mineralizable carbon (PMC); indicators of labile C and N pools. These labile pools were evaluated using incubation and chemical extraction methods at two soil depths and five times during the growing season at the Wisconsin Integrated Cropping Systems Trial. Preliminary results indicate POxC and PMN were greater in the forage-based systems (FBS) compared to the grain-based systems (GBS), and that FBS had mineralizable N pools steadily replenished throughout the growing season until September. GBS experienced a significant decrease in PMN mid-season (a key point in plant growth), and had significantly lower POxC values in the beginning of the growing season. PMC analysis is currently underway. The significant differences in these biological indicators of soil health metrics between GBS and FBS are likely due to reduced soil disturbance, frequent manure additions, and the incorporation of a perennial legume phase in the FBS. Since management practice shifts within a cropping system (GBS/FBS) in the context of this study were not enough to affect labile pools, system changes such as complete tillage reduction combined with annual cover cropping is required.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Linking Soil Health and Water Quality in the Great Lakes Region

Authors: Kevin Fermanich*, University of Wisconsin Green Bay; Ronald Turco, Purdue University; Mathew Dornbush, University of Wisconsin Green Bay; Molly Meyers, University of WI - Green Bay; Greg Lawrence, USGS; Lisa Duriancik, USDA NRCS

Abstract: Agriculturally dominated river systems impact the quality of water entering the Great Lakes. Beginning in 2012, the USGS, NRCS and local partners began monitoring sediment and nutrient export in surface and tile runoff from select farm fields in four priority watersheds of the Great Lakes. The aim of the edge-of-field (EoF) program is to document the impacts of nutrient management and cropland strategies for reducing downstream nutrient and sediment loads. The focus of this project is to create a robust dataset of soil health at EoF sites and to connect field-scale soil health parameters with the water quality leaving these fields. We are working across 14 EoF monitoring sites located in Wisconsin, Michigan, Indiana, Ohio, and New York. Baseline soil sampling began in 2016 and will be completed in 2017. We are investigating relationships among microbial properties (e.g. soil microbial biomass, diversity, and activity), general soil structure (e.g. bulk density, soil aggregate structure, soil water holding capacity, soil texture, and infiltration rates), soil resources (e.g. soil organic matter, reactive carbon, soil C, soil N, WEP, and Bray P), and exported resources (e.g. water-exported total P, soluble P, total N, and total C). The large-scale nature of this project will allow us to evaluate the strength of these relationships across distinct management histories, soil types, parent materials, and climates. This work focuses on the pre-establishment and early post-establishment phases of Best Management Practices (BMPs) at EoF sites. We will use changes in soil biology, biochemical responses, and key soil physical qualities as early predictors of critical changes needed within field systems, and demonstrate to producers why these are important. This five year project will provide fundamental knowledge about the linkages among field management, soil health and water quality.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Runoff and Sediment Yield from Strong Storms on Sloping Laterite Soils Producing Sugarcane

Authors: changhong yu*, Iowa State University; Richard Cruse, Iowa State University; jiuhao li, South China Agricultural University

Abstract: Laterite is the zonal soil in China's southernmost tropical rain forest and monsoon forest region. Typhoons are the dominant source of precipitation in the laterite region; this brings very strong storms and very high risk for land and soil degradation. In recent years, much sloping wasteland was developed for farming in the laterite region, further elevating soil erosion potential. The soil parent material is granite, basalt and sea sediments much of which is easily weathered. Weathering of this parent material produces coarse grains with loose structure and little erosion resistance. These combined factors aggravate an already serious soil erosion situation, amplifying environmental problems, and challenging sustainable development. In this paper, effects of rainfall intensity and cropping practices on runoff and sediment yield from sloping laterite soils was studied using rainfall simulation. The results showed that the Horton model explains much of the variation in infiltration rate on sugarcane cropped laterite slopes. The time effect for cumulative sediment yield on sugarcane cropped laterite slopes follows a second degree polynomial function. Both runoff and sediment yield have a linear relation with rainfall intensity and leaf area index. A sugarcane crop can delay runoff initiation, enhance soil infiltration capacity, reduce runoff intensity, and ultimately reduce soil erosion. Compared with the bare sloping land, the average sediment yield was reduced 12.1, 33.0, 58.2, 65.0% with sugarcane seedling, tillering, elongation, and mature crop stages.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Short-Term Effects of Grazing and Plant Species Composition on Soil CO_2 Efflux in Southwest Wisconsin

Authors: Marissa Miller*, University of Wisconsin-Platteville; Andrew Cartmill, University of WIsconsin-Platteville; Dennis Busch, University of Wisconsin-Platteville; Randy Mentz, University of Wisconsin-Platteville; Donita Cartmill, University of Wisconsin-Platt

Abstract: Grazing systems are geographically extensive and play an important role in climate feedback because they provide perennial cover, release and absorb carbon dioxide (CO_2), and store large quantities of carbon (C). Here we explore the initial role that grazing and plant species composition (pasture improvement) has on soil CO_2 efflux. Changes in plant productivity (grazing) and species composition may alter the belowground physical and chemical conditions, the C supply to the soil, and the structure and activity of the microbial communities, thus influencing C release from the soil. In this ongoing study, soil CO_2 efflux and soil temperature and moisture were collected biweekly from unfrozen ground in improved and unimproved grazed pastures from May 2016 to present. In general, soil CO_2 efflux varied with the seasons and increased with increasing soil temperature and decreased with increasing volumetric water content in both the improved and unimproved grazed pastures. Initial findings indicate that, at least in the short term, soil CO_2 efflux was greater from the improved pastures, suggesting that changes in plant species mixture may drive soil CO_2 efflux from these systems.

Track: 2017 General Conference Theme Submissions

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

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Soil organic matter, bulk density, and aggregate stability- important indicators of soil health

Authors: Maxine Levin, USDA-NRCS; Steven Campbell*, USDA NRCS; Steve Peaslee, USDA NRCS; Cathy Seybold, USDA-NRCS; Lindsay Hodgman, USDA-NRCS

Abstract: Steven Campbell, Cathy Seybold, Steve Peaslee, Maxine J. Levin and Lindsay Hodgman. Work is being done to use important indicators of Soil Organic Matter, Bulk Density and Aggregate Stability in soil survey to provide useful information to clients in the realm of Soil Health. The USDA Natural Resources Conservation Service has taken spatial, aggregated data of these 3 indicators and converted into interpretive maps. They are being displayed publically through reports in the web soil survey. Soil organic matter influences the physical, chemical, and biological properties of soils far more than suggested by the relatively small proportion of the total soil that it occupies. The organic fraction influences plant growth through its influence on soil properties, and water, nutrient, and biological dynamic processes. It contributes to soil aggregation, nutrient cycling, increased porosity and decreased bulk density. Through the improvements in soil structure, water infiltration, drainage, and storage rates increase. Soil organic matter has a high capacity to adsorb and exchange cations, is important to pesticide binding. Bulk density is an indicator for soil compaction and root restriction. Even though bulk density varies with soil texture, it is a dynamic soil property that changes based on soil management practices that affect organic matter, soil structure, and porosity. It influences water movement in the soil, root growth and penetration, and seed germination. Aggregate stability refers to the ability of soil aggregates to resist disintegration when disruptive forces associated with tillage and water or wind erosion are applied. Stable soil aggregates result in increased water infiltration and storage in the profile, reduced erosion, and soil structure.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Soil Survey Interpretation: Fragile Soil Index

Authors: Cathy Seybold*, USDA-NRCS; Linda Scheffe, USDA-NRCS

Abstract: Fragile soils are those that are most vulnerable to degradation. They are easily degraded (low resistance) and are highly susceptible to erosion with low resilience. They are characterized as having low organic matter contents, low water-stable aggregates, and low or no soil structure. Fragile soils are generally located on sloping ground, have sparse plant cover, and tend to be in arid and semiarid regions. A Fragile Soil Index to be used in Web Soil Survey for conservation and watershed planning can assist in identifying soils and areas with greater vulnerability to degradation. Indicators were chosen based on these characteristics and those available within the National Soil Information System (NASIS) database. Indicators are organic matter content (surface horizon), soil structure (surface horizon), rooting/soil depth, vegetation cover, slope, and aridity. Aridity is defined as an index developed by De Martonne (1926), which uses temperature as a proxy for evapotranspiration: Aridity = mean annual precipitation/(MAAT + 10). Indicator data are converted to relative values ranging from 0 to 1 using scoring curves. The standardized scores are then weighted and summed to produce index values ranging from 0 to 1, with an index value of 1 being the most fragile. Interpretation rating classes are 'not fragile', 'slightly fragile', 'moderately fragile', 'fragile', 'very fragile', and 'extremely fragile'. Interpretation ratings are produced for mapunit components and are generally aggregated to the mapunit. Identification of fragile soils will highlight the need to protect them from degradation (through conservation efforts). Degradation can result in the loss of an array of important ecosystem services.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

The Impact of Mixed Species Cover Crops on Soil Health Indicators in Alaska

Authors: Cory Cole*, NRCS

Abstract: Alaska's extreme climate and growing conditions task farmers with unique challenges found nowhere else in the world. This project will fulfill the need to document changes in Alaska soil health by demonstrating the benefits that a cover crop mixture has on chemical, physical, and biological properties in an Alaskan soil. Project was conducted at the Alaska Plant Materials Center in Palmer, Alaska. For five growing seasons a two, four, and six species cover crop mixture will be planted in a one, two, and three-year rotation with an Alaska variety potato crop. Multiple parameters will be measured including, but not limited to bulk density, resistance, biological assessments, and the soil health nutrient tool. In addition, data will be collected for cover crop biomass production and commodity crop yield. The project has undergone only one year of study on extensively farmed soils of presumed poor quality. Preliminary sample analysis displayed bacteria dominant soils with poor structure, poor water holding capacity and low nutrient values. We expect aspects of physical, chemical, and biological properties to improve over time, with greatest impact occurring in the six species mix. Results from the trial will be used to develop Alaska NRCS Soil Health Assessment cards. We intend to identify key biological, physical, and chemical soil indicators relevant to assessing Alaska Soil Health across the state. Members of the local community are welcome to attend annual field days emphasizing soil indicators and management for soil health. The project will provide data that can assist in agricultural soil management decisions. A summary of findings will be published and made available to the public.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

The Use of FGD Gypsum to Improve Soil Quality and Crop Yield

Authors: Richard Wolkowski*, University of Wisconsin

Abstract: Many by-product materials are recycled by land application as a nutrient source or soil amendment as an alternative to landfilling. One such material FGD gypsum, which is derived from coal-burning powerplants as part of a S emission reduction program. This material will supply calcium and sulfur to crops and often claims are made that it will improve soil quality parameters such as infiltration, bulk density, and aggregation. Replicated on-farm studies were conducted over two years at a total of 22 sites in northeast and northern Wisconsin to evaluate the application of FGD gypsum with respect to its ability to improve soil quality measurements and yield in the year of application. Rates of 0, 1120, 2240, and 4480 kg/ha were surface broadcast after planting corn or soybean. Soil quality measurements were taken near the end of the growing season. Soil samples were taken from the upper 5 cm of soil at 30 and 90 days after application and were tested for dissolved reactive phosphorus. Standard yield measurements were obtained at maturity. Overall there were few measurable effects of FGD gypsum on soil quality parameters in the year of application. Corn yield was not affected by FGD gypsum application, whereas soybean yield yield was increased at one site. Several of the sites showed lower dissolved reactive phosphorus. This study showed application of FGD gypsum had neither a beneficial nor detrimental effect on soil quality or crop yield in the year of application. This application did show that the material could lower the dissolved reactive phosphorus in the soil surface, thereby reducing the phosphorus lost in runoff.

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

Using Soil Tests to Track Nutrient Trends in Corn-Soybean Cropping Systems

Authors: Larry Cihacek*, North Dakota State University

Abstract: Soil testing has long been utilized to manage nutrient requirements in corn-soybean cropping systems. However, growers generally utilize soil test recommendations for the immediate growing season and usually do not use them to evaluate long term trends in nutrient status. This work shows soil tests for corn production recommendations over nearly 20 years of soil testing on a production farm. In one instance, a heavily manured field had a Bray #1-P test of 72 ppm P shortly after manure applications ended. Twenty three years later (2008), the soil test P had dropped to 9 ppm in spite of annual applications of 38 kg P/ha showing an annual average reduction of slightly more than 2.5 ppm P over the time period. Another evaluation of six fields using regression analysis over a 13 to 15 year time period showed an annual decrease of 11.3 ppm K. This illustrates a draw-down of phosphorus (P) and potassium (K) over time due to a high level of management and yields in spite of efforts to compensate nutrient offtake in grain with normal fertility practices. These techniques are useful in developing comprehensive nutrient management plans and illustrate what is happening in portions of the Corn Belt to soil test levels (International Plant Nutrition Institute, 2015).

Track: 2017 General Conference Theme Submissions

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

*denotes primary author and subject area

A Comparison of Nutrient Losses from Agricultural Activities in Two Physiographic Regions of North Carolina

Authors: Deanna Osmond*, NC State University; Daniel Line, NC State University; Wesley Childres, NC State University

Abstract: North Carolina is divided into 17 river basins; two of these basins (Neuse and Tar-Pamlico) are considered nutrient impaired. Agricultural activities often cause a significant portion of the nitrogen (N) and/or phosphorus (P) loads simply due to the large land area. Both the Neuse and the Tar-Pamlico River Basins represent two physiographic regions: coastal plain and piedmont. The coastal plain region is flatter, receives more rainfall, and has sandier-textured soil than the piedmont. Not only do the physiographic regions vary but so to do the agricultural systems, which can affect N and P loads from agricultural lands. Three-paired catchments have been monitored in a coastal plain watershed for two years and four-paired catchments have been monitored in the piedmont region for eight years. Flow and N and P concentrations data have been collected in all watersheds, along with land use information and rainfall. Although lower N concentrations in discharge were measured in the coastal plain catchments relative to the piedmont catchments, total N loads were about the same (~7 lb ac-1 yr-1) since flow was greater in the coastal plain than the piedmont. Total P loads, however, were higher from piedmont pastures (~ 2.2 lb ac-1 yr-1) than either piedmont (<0.4 kg ha-1 yr-1) or coastal plain (0.9 lb ac-1 yr-1) cropped fields. Conservation practices (N management) on cropland in the piedmont did not affect nutrient loads in discharge. However, conservation practices (fencing and nutrient management) on pastured fields reduced total P by 45% and total N by 30%.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

*denotes primary author and subject area

An Innovative Assessment of Runoff Time for Small Watersheds: A Better Method in Estimating a "ToC"

Authors: Ken Kagy*, Gwinnett County

Abstract: Time of Concentration Assessment for Small Watershed Runoff: A Better Method in Estimating a Time of Concentration. This presentation explores a fundamental technique used in all hydrology evaluations. The presentation assesses standard methods in hydrology used to estimate the time it takes storm water to runoff for a specific watershed. The presentation compares manning's sheet flow coefficients with watershed impervious surface, rational method coefficients, and NRCS's soil curve numbers. Time of concentration graphs are created to demonstrate how watershed characteristics effect the concentration of storm water runoff. These comparisons employ common empirical equations used in time computations for storm water surface runoff. References are made to recent modifications stipulated for velocity equations in NRCS's National Engineering Handbook Chapter 15. A discussion will relate the effects basic watershed characteristic to the time of concentration values. The presentation attempts to standardize the watershed runoff coefficients applied among other time of concentration equations. The evaluations will produce comparisons of empirical equations with conventional time of concentration estimations. A new concept is presented for estimating the time of concentration in small watersheds. Innovative equations are created to simplify the "ToC" calculation.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

*denotes primary author and subject area

Advancing Drainage Water Storage to Improve the Resiliency and Environmental Performance of Drained Agricultural Lands

Authors: Benjamin Reinhart*, Purdue University; Jane Frankenberger, Purdue University

Abstract: Drained lands, which include some of the most productive lands in the world, can experience both water excess and water deficit within a year. Storing drained water within the landscape could increase the sustainability of water for agriculture, particularly as intense rainfall and prolonged summer drought are expected to increase under future climate change. A team of researchers and extension specialists from nine states are currently working towards a vision of transforming the process of designing and implementing agricultural drainage to include storage through the use of controlled drainage, saturated buffers, and drainage water recycling (i.e. capture, storage, and reuse). Field research data from 34 experimental drainage sites from across the U.S. Corn Belt have been used to build a database to support synthesis and modeling across the region to determine economic and environmental impacts of drainage water storage. Results from this effort will extend the strategies and tools to agricultural producers, the drainage industry, watershed managers, agencies, and policy makers, and educate the next generation of engineers and scientists to design drainage systems that include storage in the landscape.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

*denotes primary author and subject area

Phosphorus Leaching in Fine-Textured Soils: Effect of Fertilizer Placement

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

Abstract: Quantifying the impacts of 4R nutrient stewardship on water quality in tile-drained landscapes is critical for the attainment of nutrient load reductions across the U.S. Midwest. In this study, we focus on the effect of fertilizer placement on phosphorus (P) leaching. Elevated P concentrations in drainage water from no-till fields have been hypothesized to be the result of broadcast fertilizer application and P bypassing the soil matrix via preferential flow paths, while incorporating fertilizer either through tillage or injection may increase soil-fertilizer contact and, as a result, reduce the likelihood of P transport to tile drains. To evaluate the effect of fertilizer placement on P leaching, we conducted a rainfall simulation experiment on four fields in the Western Lake Erie Basin. Dissolved reactive P (DRP), particulate P (PP), and stable water isotopes of oxygen and hydrogen were measured from water collected in 24 pan lysimeters (60 cm below soil surface; 6 pan lysimeter per field) during 90 min rainfall simulations. Three fertilizer placement treatments (broadcast/no-till, broadcast/till, and injection) were evaluated at each field, with an application rate of 50 kg P ha-1 across all treatments. Results of this study will enhance our understanding of the role of fertilizer placement on P leaching and also provide detailed information on the flow paths (preferential vs. matrix) that transport P under these management scenarios.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

*denotes primary author and subject area

Novel Bioreactor Designs to Enhance Nutrient Removal

Authors: Lori Krider*, University of Minnesota; Bruce Wilson, University of Minnesota; Joe Magner, University of Minnesota

Abstract: Serious water quality issues are caused by the transport of excess nutrients in agricultural runoff to aquatic systems. Novel bioreactor designs are needed to address the reduced treatment abilities of traditional woodchip bioreactors under high flow and low temperature conditions found during the springtime in the Upper Midwest. This includes the innovative use of various media combinations to enhance the quality of microbial environments and support larger bacterial populations. A specifically designed testing apparatus was constructed to mimic springtime air and water temperatures in a controlled laboratory setting. A large-scale experiment of a multi-media bioreactor, including wood chips, walnut shell biochar, and a fibrous plastic matrix made from recycled bottles (called Brotex) was conducted over the span of 12 weeks. This experiment measured nutrient removal for two treatments (with and without Brotex), under two residence times, and three temperature phases. This system was designed to support larger populations of denitrifying bacteria and elevate nutrient removal under minimal hydraulic residence times and reduced temperature scenarios. Data is currently being analyzed and the results will be shared at this poster presentation. Highly effective bioreactor designs could reduce the size and cost of this BMP in the field and treat agricultural drainage water under a wider range of environmental conditions.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

*denotes primary author and subject area

Water Resource Management Collaboration through the Regional Conservation Partnership Program

Authors: Jan Marie Surface*, USDA NRCS

Abstract: Over the past three years, USDA Natural Resources Conservation Service's (NRCS) Regional Conservation Partnership Program (RCPP) has funded sixteen projects for over $75 million to address water resource concerns utilizing the watershed authorities in the Watershed Protection and Flood Prevention Act (Public Law 83-566). These 16 RCPP projects leverage partner and NRCS investments to reach common conservation goals on a regional or watershed scale. The authorities in PL 83-566 are broad in scope and include: watershed protection, flood mitigation, water quality improvements, soil erosion reduction, rural, municipal and industrial water supply, irrigation water management, sediment control, fish and wildlife enhancement, and hydropower. A wide range of projects have been funded through RCPP to-date. For example, the Little Otter Creek multipurpose reservoir in Missouri will provide a long-term raw water supply, increased outdoor recreation opportunities and facilities, and reduced flood damages to crops and infrastructure as well as install wildlife and habitat management practices around the fringe of the reservoir. The Red River of the North Flood Prevention Plan will focus on reducing flooding in North Dakota, South Dakota, and Minnesota. The Upper Columbia Irrigation Enhancement Project will fund irrigation efficiency improvements to permanently increase instream flows critical for salmon habitat in Washington. The West Fork White River Project will reduce sediment and nutrients in the primary drinking water source for 420,000 residents in Northwest Arkansas. The Lower Grand River Project will use innovative designs to revitalize 2.5 miles of the river flowing through Grand Rapids Michigan. Each project funded through RCPP using PL 83-566 will develop a physically, environmentally, socially, and economically sound watershed project plan that will include required National Environmental Policy Act and economic documentation.

Track: 2017 General Conference Theme Submissions

Subject Area: Water Resources Assessment and Management

*denotes primary author and subject area

Discourse around nutrients problem in western basin of Lake Erie

Authors: Bereket Negasi Isaac*, University of Waterloo

Abstract: In this paper a critical social science perspective is employed to asses and better understand governance process in the reduction of nutrient runoff from two watersheds in the western basin of Lake Erie: The Thames and the Maumee. A modified social-ecological systems framework is used to identify discourse (dominant narrative) of actors and their coalitions regarding the nature of and solutions to the nutrient problem as well as key institutions that affect the achievement of reduction targets. Interview data and document analysis show that, with some overlap, two discourses feature prominently especially on what needs to be done regarding the nutrient problem that has been the main cause of eutrophication in Lake Erie. The first one is a technocratic discourse of curbing (including reclaiming) phosphorus runoffs through technological and economic instruments reminiscent of the ecological modernization approach to environmental protection. The second one is a 'soft approaches' discourse that focuses on behavioural/value change by farmers, rethinking the current structure of the agro-industry, and addressing the upstream-downstream disconnect. The implications of such divergent discourses among actor groups for the effectiveness of the 20% interim reduction target by 2020 from 2008 levels that has been adopted as a policy commitment by the province of Ontario and the state of Ohio are analyzed and explained.

Track: Benefits and Challenges of Public and Private Conservation Partnerships

Subject Area:

*denotes primary author and subject area

Impacts on Predicted WEPP Runoff and Soil Loss from Use of the Updated 2015 CLIGEN Database Compared to the Existing 1995 Database

Authors: Anurag Srivastava*, Purdue University; Dennis Flanagan, USDA-ARS NSERL; Bernard Engel, Purdue University; Jim Frankenberger, USDA-ARS NSERL

Abstract: CLIGEN, a stochastic weather generator, is used in the Water Erosion Prediction Project (WEPP) model for runoff and soil loss predictions. CLIGEN generates daily estimates of precipitation depth and its characteristics (time to peak, peak intensity, and storm duration), maximum and minimum temperatures, solar radiation, dew point temperature, and wind speed and direction for a single location based on long-term observed weather data. The existing database (1995 release) was derived from weather records through 1992. To evaluate the impact of more recent weather, we updated the CLIGEN database (2015 version), using a consistent 40 years of NCDC climate records (1974–2013) as opposed to inconsistent years of record in the 1995 database. Continuous (100-yr) WEPP (v2012.8) simulations were conducted for 1600 locations across the US using the stochastically generated climate for a fallow-tilled management, Miami silt loam soil, and a 22.1 m long – uniform 9% hillslope profile. Changes in average annual precipitation, maximum and minimum temperatures, and WEPP-predicted runoff and soil loss with both databases were evaluated. Comparison of average annual precipitation between the 2015 and 1995 databases showed increasing precipitation trends across most of the US, except in the northwest and southeast, where there were decreases. The range of changes in maximum average annual temperatures were quite low (-0.6 to +0.6 deg C), compared to changes in minimum temperatures ranging from -0.5 to +1.5 deg C. WEPP-predicted average annual runoff values were generally greater from the 2015 database at most locations in the US because of higher predicted precipitation. Changes in WEPP-predicted average annual soil loss generally followed the predicted changes in average annual runoff. Understanding the impact of updated CLIGEN climate on runoff and soil loss from this study will help stakeholders and policymakers make informed decisions for conservation planning and managements.

Track: Extreme Weather and Its Impact on Conservation

Subject Area:

*denotes primary author and subject area

Subsurface Drip Irrigation (SSDI)–Application for Northeast Colorado corn silage production.

Authors: Joseph Schultz*, GDS Associates, Inc.

Abstract: After assisting the Colorado Agricultural Energy Efficiency Program, one thing is evident, water is a rare and regionally valuable commodity. Furthermore, the complexity of water rights and water districting has made the implementation of water conservation on Colorado's landscape challenging. Farm producers regularly share their concerns of limited groundwater and seasonally variable surface water availability, recognizing that the future of agriculture for much of the Central Plains and Western landscape is dependent on improved water management and conservation. The science and application of sub-surface drip irrigation (SSDI) is long proven and seeing an increase in system scale and size. Producers often show reserve in implementing SSDI due to high installation costs and uncertainty of how it may be managed or applied to their current farming systems. However, a Yuma, Colorado dairy felt that the risk of uncertainty outweighed the investment. In the summer of 2015, the dairy completed the installation of and immediately recognized the benefits of SSDI on a continuous corn silage acreage for their 2000 head dairy operation. Benefits of SSDI over the traditional center pivot system included significant increase in corn tonnage yield, more efficient and reduced nutrient applications, and increased land/irrigation coverage. The poster presentation will discuss the application of SSDI in an intensively managed corn silage production system. The system has effectively reduced tillage, incorporated cover crops and maximized manure application to assist the farm's nutrient management plan, while overcoming concerns of compaction from heavy harvest and manure application traffic. Lastly, financial benefits of the system including energy, nutrient application, water efficiency, and land use will be displayed to provide viewers reference to the benefit/cost of implementing SSDI.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

*denotes primary author and subject area

Comparing measurements of labile nitrogen and carbon soil fractions to assess soil health on Wisconsin farms

Authors: Greg Richardson*, University of Wisconsin-Madison; Greg Richardson, University of Wisconsin - Madison; Matt Ruark, University of Wisconsin-Madison; Erin Silva, University of Wisconsin Madison- Department of Pathology ; Amber Radatz, University of Wiscons

Abstract: Improved understanding of soil health measurements may identify opportunities to improve biological nutrient cycling and reduce nutrient losses from farm fields. The relationships between soil health measurements, field characteristics and management practices have not been widely investigated across working farms, particularly not in Wisconsin. This research takes a survey-based approach to identify if and how measures of labile carbon (C) and nitrogen (N) – as permanganate oxidizable carbon (POxC), potentially mineralizable carbon (PMC) and potentially mineralizable nitrogen (PMN) – respond to variations in both management and site characteristics across six watersheds in Wisconsin. Approximately 250 soil samples were collected in total from over 40 farms in spring of 2015, 2016 and 2017, before corn planting. Data will be analyzed to identify relationships between labile C and N pools, site characteristics (e.g. slope, soil texture, SOM), and management practices (e.g. crop rotation, tillage, cover crops) using linear regression, multivariate analysis and regression tree analyses. Preliminary analysis suggests that tillage and manure application did not affect median POxC and PMN values, reflecting the importance of site specific co-variates in understanding the relationship between management and soil health. Findings from this study will highlight the degree at which certain management practices can improve biological nutrient cycling and reducing fertilizer input requirements across varied landscapes in Wisconsin.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

*denotes primary author and subject area

Elevated spring turbidity values in Bayou Chene, Louisiana: Causes and Consequences

Authors: Durga Poudel*, University of Louisiana at Lafayette

Abstract: The Bayou Chene in southwestern Louisiana first appeared on the 303(d) list of impaired water bodies in 1999. The suspected causes of impairment were organic enrichment and low DO. We started water quality sampling in this watershed in June 2012 and we are still continuing. This project involved weekly water quality monitoring to generate surface water quality data from 10 sampling locations in the watershed. Field parameters such as surface water temperature, turbidity, pH, conductivity, and DO were determined in the field using a YSI Sonde and water samples were collected for laboratory determination of water chemistry. The primary land use in the watershed is agriculture, particularly rice, pasture lands, crawfish production, and soybeans. Drainage waters from agricultural fields have a significant impact on water quality in this watershed. The lower end of Bayou Chene is affected by tidal flux from the Gulf of Mexico and occasionally experiences reverse flows. Highly elevated spring turbidity and corresponding suspended solid values were observed. Dissolved oxygen values decline starting spring and continue to decline through the summer months. In order to understand the sources for elevated Spring turbidity values, we started tracking sources of turbid waters in the watershed. We are suspecting two main agricultural activities contributing to this elevated spring turbidity: 1) Water leveling, 2) "Mud rutting" or "Mudding in ruts". Water control structures in the bayou were other items identified, which could have affect on water quality by holding turbid waters in place for an extended period. Surface runoff from the landscape appeared to be another reason for elevated Spring turbidity.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

*denotes primary author and subject area

Stream Habitat Restoration in Carroll County, New Hampshire

Authors: Nels Liljedahl*, NRCS

Abstract: Stream Habitat Improvements for Water Quality and Wildlife Habitat. Brook Trout Habitat Restoration – Inventory/Assessment and Implementation Large woody debris is an important structural and functional component of stream ecosystems that positively influences geomorphic processes, transport and storage of organic materials, fish and aquatic invertebrate habitats, and linkages between terrestrial and aquatic systems. For two centuries, clearing woody debris and straightening rivers and streams in the Northeast occurred to drive timber. Prior to 1970, large woody debris also was believed to have negative effects on fisheries by blocking upstream migration and depleting oxygen levels in streams. Consequently, stream fisheries habitat in the region has been negatively affected, and the full potential of most streams to support healthy brook trout populations has not been attained Scope of Work: Over the past six years,Natural Resources Conservation Service has collaborated with the ,Tin Mountain Conservation Center NH Fish & Game, Trout Unlimited, US Forest Service, the Conservation Fund, Plymouth State College, and many volunteers to enhance native eastern brook trout habitat on sixteen miles of first order streams in Carroll County, NH. Baseline data on stream characteristics and fish populations prior to and after wood addition treatment have been monitored annually since, and results have documented the benefit of treatments to native brook trout populations. Past work on other sub-watersheds in Carroll County indicate that wood additions result in increased trout abundance, size, and total biomass. Wood additions appear to increase the number/depth of pools in sub-watersheds providing refugia for trout during increasingly warmer summers and harsh winters and provide effective places to hide from predators. Coarse woody material additions made today by the work will influence trout habitat and water quality for at least the next 15-20 years.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

*denotes primary author and subject area

Water Ambassadors Program (WAP): A pilot program of education on the hydrologic cycle and watershed issues targeted at students in public and private schools in the United States Virgin Islands

Authors: christina chanes*, University of the Virgin Isalnds

Abstract: The United States Virgin Islands (USVI) is a small territory east of Puerto Rico that consists of three main islands, St. Thomas, St. Croix, and St. John, and a few smaller, mostly unpopulated islands. A significant proportion of the USVI draws their water from cisterns that collect rooftop water. Others depend on groundwater sources. Everyone must purchase water purified in reverse osmosis when there are no other sources. The majority live on St. Croix and St. Thomas. St. John and Water Island have smaller populations. St. Thomas has one of the busiest tourism industries in the Caribbean (Allen 1992) with more than 2 million visitors annually in recent years (USVI BER 2012) that also impact the water resources. Because of their small size, surface water supplies are low to nil and the availability of groundwater supplies are restricted. Most residents rely on gathering rainwater from their personal rooftop into cisterns that they themselves maintain. In addition, streams only flow for short periods after rainfall, are nearly dry for the rest of the year and are heavily impacted by roads and erosion from poor construction practices. All of these forces place great stress on natural hydrologic systems in the Territory on all islands. Since 2015, WAP trained Cooperative Extension Service staff at the University of the Virgin Islands who delivered lessons to youth on hydrologic processes, watershed protection, extended the existing network of climate recording stations from five to 17 and created an interface for collecting map data on hydrologic conditions as a Citizen Science project. In the past year, 600 youth and 20 educators participated in the program. The youth presented to professors, EPA program evaluators along with other industry professionals and to the community at large while being exposed to STEM careers and higher education pathways. Youth also tested water from their home to learn about water quality and compared their results.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

*denotes primary author and subject area

Watershed Wide Impacts from Local Erosion and Sedimentation

Authors: Corey Kooken*, TRC Environmental

Abstract: Where does all of the eroded soil go? While it may not seem like a small construction project can make an impact, thousands are going on every day, without erosion and sedimentation best management practices all of that eroded soil can be transported via stormwater to streams and wetlands which eventually discharge into the larger watershed. Sedimentation in larger waterbodies will create deltas that continue to grow if it isn't managed. Deltas that arise where previously existed just a discharge point for a stream or river changes the functionality of both waterbodies, these changes in function affect the water quality, ecosystems and biota inhabiting those systems. Small-changes in either direction can make a large impact on the watershed over time. The examples in this presentation will illustrate how small scale erosion and sedimentation problems affect the watershed, aquatic ecosystems and communities and how regulatory compliance mitigates them through properly chosen, installed and maintained best management practices.

Track: Field to Watershed: Connecting Local Scale Influence with Larger Scale Significance

Subject Area:

*denotes primary author and subject area

CONSERVATION CONNECTIONS

Creating Pathways to Sustainability

CIG SHOWCASE

SOIL AND WATER CONSERVATION SOCIETY®

Conservation Innovation Grants (CIG) Showcase
10:30 a.m. – 5:00 p.m., Hall of Ideas H
Moderator: Melleny Cotton, *USDA-NRCS*

The USDA Natural Resources Conservation Service (NRCS), in conjunction with SWCS, will again host the Conservation Innovation Grants (CIG) Showcase at the SWCS annual conference. Since 2004, CIG has supported the development of innovative natural resource conservation approaches and technologies on working lands. This year's showcase includes project presentations, a CIG economics breakout session, and a CIG stakeholder feedback session. The project presentations highlight exciting work currently underway by CIG grantees. The economics breakout session explores ways to better incorporate economic considerations into CIG projects and proposals. The stakeholder feedback session, hosted by CIG staff, is a forum for interested stakeholders to provide input on all aspects of the CIG program.

This showcase runs from 10:30 a.m. to 5:00 p.m. on Monday, July 31. Following the showcase, CIG project posters are included in the poster presentation session held in the poster display area of the Exhibit Hall from 5:00 p.m. to 7:00 p.m.

Presentation 1: USDA-NRCS Conservation Innovation Grant Economic Workshop (10:30 a.m.)

Presentation 2: CIG Stakeholder Listening Session (1:30 p.m.)

Presentation 3: Improving Soil Health and Water Dynamics in Deficit-Irrigated Agriculture (2:15 p.m.)

Presentation 4: Field Stewards: Building a Private Market for Water Quality and Conservation (2:35 p.m.)

Presentation 5: Managing Cover Crops in High Tunnels for Fertility and Soil Health (3:35 p.m.)

Presentation 6: Demonstrating Grains in Nitrogen Use Efficiency in Wisconsin Farming Systems (3:55 p.m.)

Presentation 7: Locally Led On-Farm Soil Health Management Demonstrations (4:15 p.m.)

Presentation 8: Monarch Habitat Establishment in Agriculture Landscapes (4:35 p.m.)

Improving Soil Health and Water Dynamics in Deficit-Irrigated Agriculture

USDA-NRCS Conservation Innovation Grant Award

Authors: P.B DeLaune, P. Mubvumba, K.L. Lewis, and J. Foster. 1Texas A&M AgriLife Research – Vernon, 2Texas A&M AgriLife Research – Lubbock, and 3Texas A&M AgriLife Research - Beeville

Abstract: Continuous tillage and monoculture cropping systems coupled with increased demand for water resources among various entities has led to critical sustainability thresholds in semi-arid cropping systems. Healthy soils help optimize inputs and maximize nutrient and water use efficiencies. We evaluated the following strategies on soil health and stored soil water: including five tillage options – 1) Conventional tillage; 2) Strip tillage; 3) No-till; 4) No-till with a wheat cover crop; and 5)

No-till with a mixed species cover crop; and two cropping systems – 1) Continuous cotton; and 2) Cotton/Sorghum rotation. The tillage treatments have been in place since 2008, except strip-tillage that was implemented in 2011. Stored soil moisture has been shown to be significantly lower for cover crops treatments at the time of termination ahead of cotton planting. However, stored soil moisture did not differ among treatments entering planting season. Furthermore, no-till treatments, with and without cover crops, had slightly higher stored soil moisture toward the end of the growing season. This potentially indicated higher water use efficiency in conservation tillage systems compared to conventional tillage. Among cropping systems, a sorghum/cotton rotation is more water efficient that a continuous cotton system. Adding sorghum as a rotational crop also led to measurable increases in water extractable organic carbon compared to the continuous cotton system.

Field Stewards: Building a Private Market for Water Quality and Conservation

USDA-NRCS Conservation Innovation Grant Award

Authors: Charlene Brooks, Conservation Marketplace Midwest, Program Administrator and Jim Klang, Conservation Marketplace Midwest, Board Member (Kieser & Associates LLC, Senior Project Engineer)

Abstract: Field Stewards is a corporate supply chain sustainability program for livestock feed inputs. The program development is being funded by grants from the NRCS CIG and McKnight Foundation. Sustainability programs address concerns from the consumer's increasing awareness that their purchased products may have used production methods that harm their own environmental and social values. Food processors are responding to emerging consumer pressures by seeking effective methods to provide environmental and social accountability. However, many meat processors face the challenge that the largest potential for water quality impacts stem from the animal feed production, not the livestock operation itself. Animal feed is often grown by producers who are not directly connected to the meat processor. In addition, the crop commodity market structure doesn't provide effective methods to track where each bushel of feed came from as it arrives at the livestock operation. Recognizing these accountability barriers, Field Stewards provides a cost-effective solution.

This program offers third party certified/verified row crop acres that achieve a high level of water quality protection. In current Field Stewards pilot tests, purchased third party verified certificates provide five dollar per acre payments to qualified farmers. The certificates provide buyers an offset opportunity for the potential of an impact occurring in the actual feed production chain. In addition, Field Stewards allows farmers to participate in compatible programs, stacking the incentives, so more farmers desire to achieve the same high conservation standards. One such program is the Minnesota's Water Quality Certification Program (MWQCP). Minnesota's Department of Agriculture runs MAWQCP, in which farms that reach the high standard for water quality protection are provided 10 years of regulatory relief from new rules.

In 2015 and 2016, GNP Company was the first to purchase certificates from farmers.

Managing Cover Crops in High Tunnels for Fertility and Soil Health

USDA-NRCS Conservation Innovation Grant Award

Author: Liz Perkus, Masters student (agroecology) at University of Minnesota

Abstract: High tunnels are a season extension technology used by farmers around the world. They allow an earlier spring growing season, a later fall growing season, and, in some climates, year round production. Intensive production in high tunnels can degrade soil health. This presentation will cover

management techniques for using cover crops in high tunnels, what nitrogen credit farmers can expect from a few select cover crops, and how cover cropping can conserve soil health in high tunnels.

Demonstrating Gains in Nitrogen Use Efficiency in Wisconsin Farming Systems

USDA-NRCS Conservation Innovation Grant Award

Authors: Amber Radatz*, Abigail Augarten, Matt Ruark, Kevan Klingberg, Todd Prill

Abstract: In 2015 the University of Wisconsin Discovery Farms program began working with farmers on a three year Conservation Innovation Grant to evaluate their current nitrogen management practices using Nitrogen Use Efficiency (NUE) calculations. This project has demonstrated to farmers and consultants the tools necessary to have a solid justification that supports how and why nitrogen is applied. Farmers have been able to determine if they can improve their efficiency by altering nitrogen rates, timing or placement. The range of NUE values in Wisconsin varies from ranges presented in the literature in other states because of manure and perennial legumes used in the cropping systems. In total, 121 fields in 6 regions of Wisconsin have been evaluated. The project farms are located in geographic clusters so that comparisons can be made among farms with similar soils and landscapes. Fields were harvested as either corn grain or corn silage, but included a variety of N sources, cover crop usage, tillage practices, and crop rotations. Farmers provide information on their inputs and agronomic practices and UW Discovery Farms conducts routine soil samples, plant available nitrogen soil (pre-

plant, pre-sidedress, post-harvest) tests, and measures yield and nitrogen content of the harvested material. To calculate NUE, partial factor productivity and partial nutrient

Locally Led On-Farm Soil Health Management Demonstrations

USDA-NRCS Conservation Innovation Grant Award

Author: Jason Warren; Soil and Water Conservation Extension Specialist

Abstract: Agriculture in the Southern Great Plains is highly diverse due to highly diverse soil types as well as the temperature and rainfall gradients in this region. Furthermore, close inspection will find a great deal of variation in how owe progressive farmers achieve successful operations through the use of soil health promoting practices such as no-till, crop rotations, and cover crops. As such, there is simply no one size fits all approach in this region. However, it is hard for State level specialist to identify potential practices that have a likelihood of successful outcome as well as potential for producer adoption for such a diverse landscape. Therefore, this project focused on developing county (local) level collaboration between the Extension service, conservation districts, NRCS, and producers to identify potential soil health promoting practices and establishing on farm demonstrations of these practices.

These demonstrations primarily focused on the utilization of cover crops in our production systems and included their use in irrigated production of the Oklahoma Panhandle, dryland corn-soybean production in the more humid NE OK region as well as various locations evaluating cover crops in rotation with wheat. In addition to the extensive on-farm demonstration program great effort was made to provide extensive training for producers, conservation district, NRCS, and extension personnel on the use of cover crops, crop rotation and soil health assessment. We also made significant headway in developing a soil health assessment framework for the Southern Great Plains.

Monarch Habitat Establishment in Agricultural Landscapes

USDA-NRCS Conservation Innovation Grant Award

Author: Seth Appelgate, MS

Abstract: The monarch butterfly (*Danaus plexippus*) is one of the most recognized and treasured insects in North America. During the past decade, the eastern population of monarchs has declined more than 80%. Monarch habitat loss in the summer breeding zone is a major contributor to this alarming decline. In order to aid the recovery of the monarch, it is necessary to undertake a large-scale effort to reestablish habitat throughout the monarch summer breeding zone. Our project aims to establish diverse plantings of native prairie plants in order to provide monarch habitat. Our team has developed a robust native seed mix which will be beneficial to monarchs and many pollinators. The seed mix, "Monarch Seed Mix – High Diversity,"contains grasses, three milkweed species, and a variety of wildflowers which bloom throughout the entire growing season.

Monarch habitat has been established at 21 agricultural sites across Iowa in order to test establishment success in various landscapes. Data is being collected at all sites throughout the summers of 2016-2018 to assess monarch utilization and vegetative changes. Field data from 2016 indicated that most sites are dominated by non-native cool season grasses with very few forbs. Monarch utilization of the sites was limited in 2016.

A monarch habitat establishment 'best practices' guide is being developed and modified as our team continues its data collection, analysis, literature review, and discussions with subject matter experts. The final content will be informed by our experiences and our data analysis.