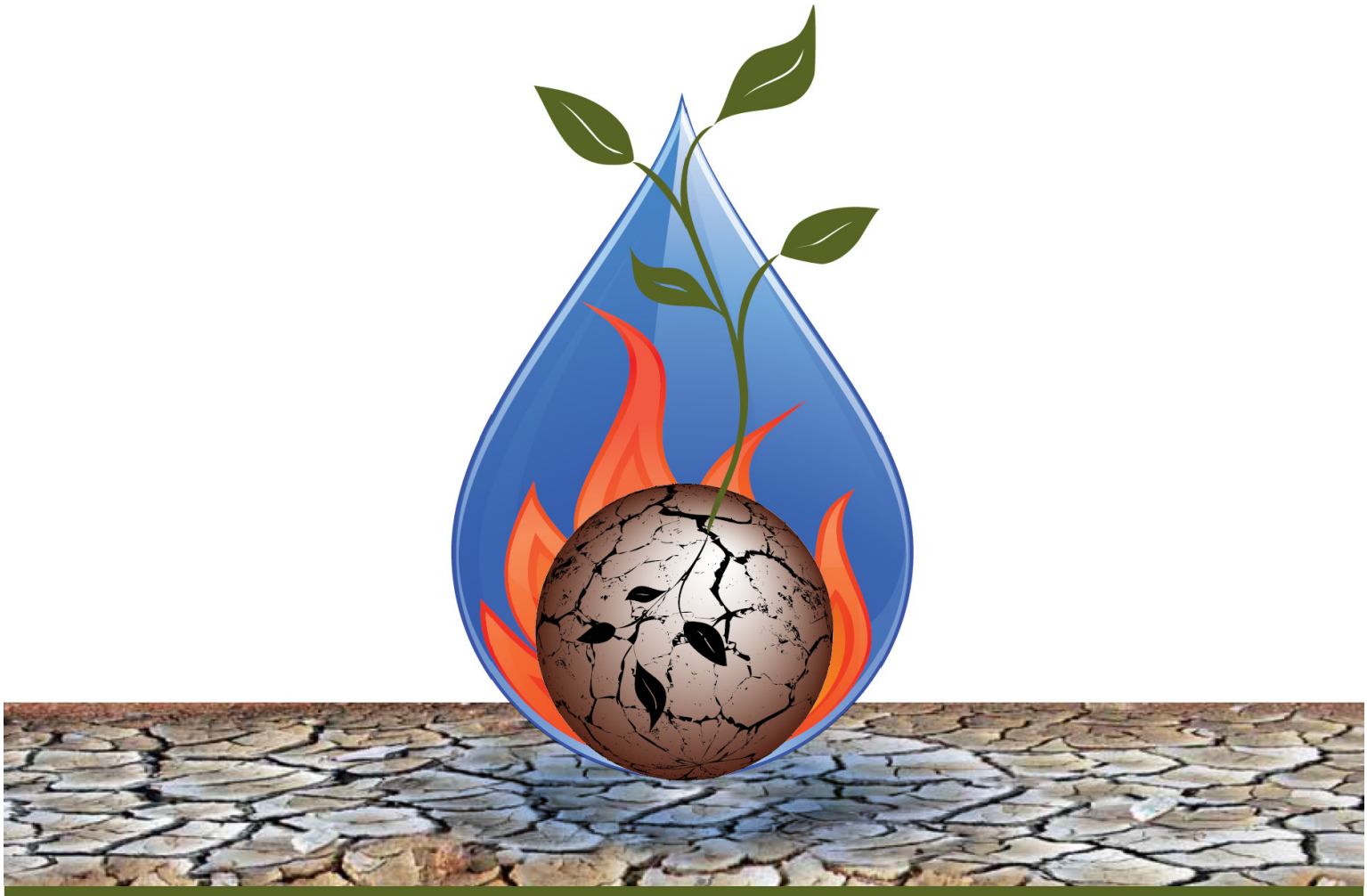
SOIL AND WATER CONSERVATION SOCIETY

RESILIENT LANDSCAPES

Planning for Flood, Drought & Fire

68th International Annual Conference

Reno, NV July 21-24, 2013



2013 Annual Conference Abstract Book

68th SWCS International Annual Conference Abstract Book

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Conference Schedule in Brief

Sunday, July 21, 2013

9:30 AM	JSWC Editorial Board	Tuscany 5
11:00 AM	Registration Opens	Registration Desk
12:00 PM	House of Delegates, State of Society Address, and Regional Roundtable Meetings	Tuscany 10/11
1:00 PM	*Social Indicators in Watershed Management Projects Workshop	Tuscany 1
1:30 PM	*Nitrogen Tools Workshop	Tuscany 3
2:00 PM	Leadership Practices in Today's Dynamic World	Tuscany 2
4:00 PM	Berg and Society Fellows Forum	Tuscany 10/11
6:00 PM	New Members/First Timers Orientation	Tuscany 9
6:30 PM	Welcome Reception	Tuscany 5/6

Monday, July 22, 2013

7:30 AM	Registration Opens	Registration Desk
7:30 AM	Professional Development Committee Meeting	Tuscany 7
8:30 AM	Opening Plenary and Pritchard Lecture	Tuscany 11/12
10:00 AM	Morning Break: Exhibit Hall and Poster Presentations Open	Tuscany D/E/F
10:30 AM	Concurrent Sessions	See Page 25
10:30 AM	NIFA Special Symposium	Tuscany 9 and 11/12
12:00 PM	Lunch Break	On your own
12:00 PM	*ARCSE Lunch and Annual Business Meeting	Oceano Restaurant
1:30 PM	Concurrent Sessions	See Page 26
3:00 PM	ARCSE Board Meeting	Oceano Restaurant
3:00 PM	Afternoon Break	Tuscany D/E/F
3:30 PM	Concurrent Sessions	See Page 27
5:00 PM	Poster and Exhibitor Reception in Exhibit Hall	Tuscany D/E/F
7:00 PM	Silent Auction Ends	Tuscany D/E/F
7:00 PM	NIFA Grants Workshop	Tuscany 9

Tuesday, July 23, 2013

7:30 AM	Registration Opens	Registration Desk
8:00 AM	Tuesday Plenary	Tuscany 11/12
10:00 AM	Morning Break in Exhibit Hall	Tuscany D/E/F
10:30 AM	Concurrent Sessions	See Page 34
12:00 PM	*Awards Luncheon	Tuscany 10
12:00 PM	Lunch Break	On your own
1:30 PM	Concurrent Sessions	See Page 35
3:30 PM	Concurrent Sessions	See Page 36
5:15 PM	SWCS Annual Conference Program Committee	Tuscany 10

Wednesday, July 24, 2013

7:00 AM	*Tour #1 – Perrazzo Watershed and US Forest Service Aspen/Forest Restoration Projects Tour	Valet Parking Area
7:00 AM	*Tour #2 – Mount Rose Summit Snow Survey, Lake Tahoe Conservation District and Forestry Restoration Tour	Valet Parking Area
8:00 AM	*Tour #3 – Eagles and Agriculture Program	Valet Parking Area

*Not included in standard registrations. Additional cost and ticket(s) required to attend.

Conference Presentation Schedule

Monday	10:30 a.m.	10:50 a.m.	11:10 a.m.	11:30 a.m.
Tuscany 1 Symposium	CEAP Rangeland Assessment Symposium: Determining Benefits of Conservation on Western Rangelands – *Arnold King, Texas AgriLife Research*			
Tuscany 9 and 11/12 Symposium	NIFA Special Symposium: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI) – *Mary Ann Rozum, USDA*			
Tuscany 2 Symposium	Conservation Delivery: New Concepts in Conservation Planning – *Cheryl Simmons, USDA NRCS (Conservation Models, Tools and Technology)*			
Tuscany 3 Symposium	OPEN			
Tuscany 4 Concurrent Sessions	Collaborative Approach to Landscape Scale Restoration and Wildfire Mitigation *Tom Esgate, Lassen County Fire Safe Council (Conservation and Environmental Policy and Program Design)*	Conservation, Protection, and Restoration of Critical Lands Using the Clean Ohio Fund *Jerome Iles, Ohio State University Extension (Conservation and Environmental Policy and Program Design)*	Potential for Perennial Crops for Bioenergy Production: Results of a Survey in an Iowa Watershed *Sarah Varble, Southern Illinois University (Conservation and Environmental Policy and Program Design)*	OPEN
Tuscany 5 Concurrent Sessions	Use of Drought Indicators in Decision-Making Process of Drought Management *Ekaterina Altman, University of South California (Adaptation and Mitigation Planning for Drought)*	Greater Quantities of Grain, Cellulosic Biomass and Vegetables are Produced with Less Water and Lower Nutrient Leaching on Highly Permeable Marginal Soil *Alvin Smucker, Michigan State University (Adaptation and Mitigation Planning for Drought)*	OPEN	OPEN
Tuscany 6 Concurrent Sessions	Groundwater Hydrology and Producer Water Use: An Integrated Hyro-Economic Model *Chenggang Wang, Texas Tech University (Agriculture and Conservation Economics)*	Factors Affecting Adoption of Nitrogen Management Technologies *Catharine Weber, University of Missouri (Agriculture and Conservation Economics)*	State Certainty Programs for Landowners and Producers *William Berry, NACD (Conservation and Environmental Policy and Program Design/ Agriculture and Conservation Economics)*	Strategies for Expanding the 4R Initiative: A Survey of Agricultural Retailers and Conservation Districts *Doug Lawrence, Blackwoods Group, Inc. (Outreach, Education and Community Engagement)*

Monday	**1:30 p.m.**	**1:50 p.m.**	**2:10 p.m.**	**2:30 p.m.**
Tuscany 1 Symposium	CEAP Rangeland Assessment Symposium: Regional and Watershed Assessments of Conservation on Rangelands – *Arnold King, Texas AgriLife Research*			
Tuscany 9 and 11/12 Symposium	NIFA Special Symposium: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI) – *Mary Ann Rozum, USDA*			
Tuscany 2 Symposium	Mitigating Drought and Other Impacts of Climate Change through Management to Improve Soil Health and Productivity – *Jorge Delgado, USDA ARS (Adaptation and Mitigating Planning for Drought)*			
Tuscany 3 Symposium	The Next Farm Bill and Implications for Soil and Water Conservation – *Jeremy Peters, American Farmland Trust (Conservation and Environmental Policy)*			
Tuscany 4 Concurrent Sessions	Passive Treatments of Polyacylamide on Turbid Stormwater: Ditch Application Followed by Modified Settling Basin Design *Jihoon Kang, North Carolina State University (Conservation Models, Tools and Technologies)*	The Cost of Cleaner Water: Linking Farmer Incentives to Conservation Outcomes *Lorine Giangola, University of Colorado at Boulder (Conservation Models, Tools and Technologies)*	A Management Tool for Small Community Onsite Wastewater Treatment Systems: The Community System Owner's Guide *Sara Heger, University of Minnesota (Conservation Models, Tools and Technologies)*	OPEN
Tuscany 5 Concurrent Sessions	Protecting the San Francisco River through the Promotion of Community Stewardship in Clifton, Arizona *Berenise Rivera, University of Arizona (Outreach, Education and Community Engagement)*	Stormwater Management Education in Nebraska: Integrating Extension, Teaching and Research *David Shelton, University of Nebraska (Outreach, Education, and Community Engagement)*	The Role of Watershed Management Groups and Key Stakeholders in the Resilience and Sustainability of a Rural Iowa Watershed *Sarah Varble, Southern Illinois University (Outreach, Education and Community Engagement)*	Kansas Extension Education Program on Poultry Litter Utilization and Storage Site Selection to Minimize Impacts on Water Quality *Peter Tomlinson, Kansas State University (Outreach, Education and Community Engagement)*
Tuscany 6 Concurrent Sessions	OPEN			

Monday	3:30 p.m.	3:50 p.m.	4:10 p.m.	4:30 p.m.
Tuscany 1 Symposium	CEAP Rangeland Assessment Symposium: Estimating Rangeland Soil Loss – *Arnold King, Texas AgriLife Research*			
Tuscany 9 and 11/12 Symposium	NIFA Special Symposium: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI) – *Mary Ann Rozum*			
Tuscany 2 Symposium	Mitigating Drought and Other Impacts of Climate Change through Management to Improve Soil Health and Productivity – *Jorge Delgado, USDA ARS (Adaptation and Mitigating Planning for Drought)*			
Tuscany 3 Symposium	OPEN			
Tuscany 4 Concurrent Sessions	Later Summer Native Plant Establishment *Joe Paternoster, DriWater* *(Conservation Models, Tools and Technologies)*	Databases and Tools to Enable Watershed-Scale Conservation Planning within a Regional Context *Mark Tomer, USDA ARS* *(Conservation Models, Tools and Technologies)*	Restoration of the Hayman Burn Area: A Multi-Model Analysis on the Convergence of Ecological Science and Social Values in Post-Fire Restoration *Andrea Hassler, Rocky Mountain Field Institute* *(Conservation Models, Tools and Technologies)*	OPEN
Tuscany 5 Concurrent Sessions	Effect of Land Use on Soil Aggregate Stability under Slash and Burn Cultivation *Austustine Avwunudiaogba, California State University* *(Soil Resources Assessment and Management)*	Wheat and Radish Companion Planting for Forage and Grain in Both Single and Dual-Purpose Wheat in Kansas *Deann Presley, Kansas State University* *(Soil Resources Assessment and Management)*	Bioenergy Crops for Resilient Landscapes: A Design Case Study and Field Experiences *Maria Negri, Agronne National Labratory* *(Soil Resources Assessment and Management)*	Impact of Conservation Practices on Soil Health *Zahangir Kabir, USDA NRCS* *(Biodiversity Conservation Management/Soil Resources Assessment and Management)*
Tuscany 6 Concurrent Sessions	Iowa Soybean Association Cooperative Conservation for Watershed Health – CIG Project Results *Todd Sutphin, Iowa Soybean Association* *(Water Resource Assessment and Management)*	Atrazine Incorporation and Soil Erosion: Balancing Competing Water Quality Concerns for Claypan Soils *Robert Lerch, USDA ARS* *(Water Resource Assessment and Management)*	Denitrifying Bioreactors: Opportunities and Challenges for Managing Offsite Nitrogen Losses *Arthur Gold, University of Rhode Island* *(Water Resource Assessment and Management)*	Using GIS and Field Assessments to Compare Kansas Riparian Woodlands *Charles Barden, Kansas State University* *(Water Resource Assessment and Management)*

Tuesday	**10:30 a.m.**	**10:50 a.m.**	**11:10 a.m.**	**11:30 a.m.**
Tuscany 1 Symposium	OPEN			
Tuscany 9 Symposium	Conservation Activity Planning for TSPs – *Cheryl Simmons, USDA NRCS (Conservation Models, Tools and Technology)*			
Tuscany 2 Symposium	A Living River Approach to Floodplain Management in the Carson River Watershed – *Brenda Hunt, Carson Water Subconservancy District (Conservation and Environmental Policy)*			
Tuscany 3 Concurrent Sessions	Using LiDAR Elevation Data to Advance Local Conservation Work *Ann Lewandowski, University of Minnesota Water Resources Center (Water Resource Research and Outreach in the Upper Midwest)*	Midwest Cover Crops Council: A Regional Collaboration that Works *Dean Baas, Michigan State University Extension (Water Resource Research and Outreach in the Upper Midwest)*	The Conservation Reserve Program Readiness Initiative: Training Impacts and Resources *Rebecca Power, University of Wisconsin-Extension, Madison, Wisconsin (Water Resource Research and Outreach in the Upper Midwest)*	Reducing Nitrate Loads from Tile-Drained Cropland: Options and Outlook *Jane Frankenberger, Purdue University (Water Resource Research and Outreach in the Upper Midwest)*
Tuscany 4 Concurrent Sessions	Effects of Repeated Burning on Soil Nitrogen and Cheatgrass (Bromus Tectorum) Biomass and Reproduction *Rachel Jones, University of Nevada (Invasive Plant Species)*	Post-Fire Land Restoration, Weed Management, and Soil Biology in Northern Nevada *Julie Etra, WBS, Inc. (Invasive Plant Species)*	OPEN	OPEN
Tuscany 5 Concurrent Sessions	Conservation vs. Organic Agriculture with Conventional and Conservation Tillage: Water Quality *Deanna Osmond, North Carolina State University (Water Resource Assessment and Management)*	Leadership for Midwestern Watersheds: Insights from MRBI and other Watershed Project Managers *Michael Baise, American Farmland Trust (Water Resource Assessment and Management)*	Tamarisk Removal for Conservation of Cultural Resources *Beverly Harry, Pyramid Lake Paiute Tribe (Water Resource Assessment and Management)*	Resiliency of Conservation Buffers to Floods and Drought in Iowa and Illinois *Jeff Jensen, Trees Forever (Water Resource Assessment and Management)*
Tuscany 6 Concurrent Sessions	Targeting Forest Management through Fire and Erosion Modeling *William Elliot, Rocky Mountain Res Station (Adaptive Management of Conservation Efforts)*	Perennial Grass Dominance: Creating a Resilient Community in an Exotic Annual Invaded Rangeland *Dan Harmon, USDA ARS (Adaptive Management of Conservation Efforts)*	Enhancing Ecosystem Services: Designing for Multi-Functionality *Gary Bentrup, U.S. Forext Service (Adaptive Management of Conservation Efforts)*	Local Cooperation through Climate Change Data Visualization *Leigh Bernacchi, University of Idaho (Outreach, Education and Community Engagement/ Adaptive Management of Conservation Efforts)*

Tuesday	1:30 p.m.	1:50 p.m.	2:10 p.m.	2:30 p.m.
Tuscany 1 Symposium	Conservation Performance in the Face of a Changing Climate: Improving Conservation Practice Standards and Enhancements to Increase Farm and Resource Resiliency – *Jeff Schahczenski (Conservation and Environmental Policy)*			
Tuscany 9 Symposium	Conservation Activity Planning for TSPs – *Cheryl Simmons, USDA NRCS (Conservation Models, Tools and Technology)*			
Tuscany 2 Symposium	SWCS and CPESC: An Evolving and Productive Partnership – *Earl Norton, Alabama Soil and Water Conservation (Outreach, Education and Community Engagement)*			
Tuscany 3 Symposium	OPEN			
Tuscany 4 Concurrent Sessions	Statistical Model Equivalency to Predict Fecal Indicator Bacteria Densities Enumerated by QPCR and Culture-Based Methods *Rachel Noble, UNC Chapel Hill (Water Resource Assessment and Management/NIFA-Related)*	Surfactant-Facilitated Transport of Cryptosporidium Parvum in Soil *Christophe Darnault, Rensselaer Polytechnic Institute (NIFA-Related)*	Potential Water Benefits of On-Farm Storage Systems *Mary Love Target, Mississippi State University (NIFA-Related)*	Using Vetiver Grass Technology for Preventing Sedimentation at the Shorelines of Guam *Mohammad Golabi, University of Guam (Water Resources Assessment and Management)*
Tuscany 5 Concurrent Sessions	Redox-Specific Biodegradation of Trenbolone Acetate Metabolites *Emily Cole, University of Nevada (Rangeland Conservation and Grazinglands CEAP)*	Fate and Transport of Trenbolone Acetate Metabolites in Range Runoff *Gerrad Jones, University of Nevada (Rangeland Conservation and Grazinglands CEAP)*	Modeling the Impacts of Conservation Practices on Streamflow and Erosion in a Salmon-Bearing Rangeland Watershed: Asotin Creek, Washington *Hakjun Rhee, Washington State University (Rangeland Conservation and Grazinglands CEAP)*	OPEN
Tuscany 6 Concurrent Sessions	Restoration of 2011 Flood Damaged Birds Point - New Madrid Floodway *Kenneth Olson, University of Illinois (Adaptive Management of Conservation Efforts)*	OPEN	The Use of Biochar on Low Organic Matter Soils *Duane Friend, University of Illinois (Adaptive Management of Conservation Efforts)*	Creating Climate-Smart Ag Landscapes through Agroforestry *Gary Bentrup, U.S. Forest Service (Adaptive Management of Conservation Efforts)*

Tuesday	**3:30 p.m.**	**3:50 p.m.**	**4:10 p.m.**	**4:30 p.m.**
Tuscany 1 Symposium	Conservation Performance in the Face of a Changing Climate: Improving Conservation Practice Standards and Enhancements to Increase Farm and Resource Resiliency – *Jeff Schahczenski, NCAT (Conservation and Environmental Policy)*			
Tuscany 9 Symposium	Conservation Activity Planning for TSPs – *Cheryl Simmons, USDA NRCS (Conservation Models, Tools and Technology)*			
Tuscany 2 Symposium	Agriculture and Forestry in a Changing Climate: Adaptation Recommendations – *Jeremy Peters, American Farmland Trust (Adaptive Management of Conservation Efforts)*			
Tuscany 3 Symposium	OPEN			
Tuscany 4 Concurrent Sessions	Assessment of Soil Response to Corn Residue Removal and Grazing *Humberto Blanco, University of Nebraska* *(Soil Resources Assessment and Management)*	Hydrological Response of Intensive Forest Management System in Tropical Rain Forest *Hatma Suryatmojo, Kyoto University* *(Soil Resources Assessment and Management)*	Microbial Biomass Determinations and Some Microbial Quality Indicators for Improving Soil Sustainability *Stella Asuming-Brempong, University of Ghana, Legon* *(Biodiversity Conservation Management/Soil Assessment and Management)*	OPEN
Tuscany 5 Concurrent Sessions	OPEN	Feasibility of Soil Carbon Monitoring for Carbon Credits *Jason Warren, OSU* *(Rangelands Conservation and Grazinglands CEAP)*	Rehabilitation of Cheatgrass Infested Rangelands *Charlie Clements, USDA ARS* *(Rangelands Conservation and Grazinglands CEAP)*	Modeling Grazing Impacts on Soil Erosion with the WEPP Model *William Elliot, Rocky Mountain Res Station* *(Rangelands Conservation and Grazinglands CEAP)*
Tuscany 6 Concurrent Sessions	OPEN			

Conference Workshops

Using Social Indicators in Watershed Management

Sunday, July 21, 1:00 – 5:00 p.m.
Tuscany 4

Instructors/Presenters:
Nicholas Babin, Purdue University; Joe Bonnell, The Ohio State University; Ken Genskow, UW-Madison Department of Urban and Regional Planning

Objectives:
At the end of this session, participants will be able to describe the human dimensions of natural resource management, understand some basic concepts of behavior change, and have the tools to use a framework for using social indicators in nonpoint source management work.

Background:
Working with land owners and managers to find effective and practical solutions to water quality problems is crucial to achieving environmental goals. Social indicators provide information about the social context, awareness, attitudes, capacities, constraints, and behaviors in a watershed or project area. Using social indicators can help resource managers and conservation professionals understand and target audiences, select effective interventions, and evaluate their impacts.

Planned Activities:
- Presentations on the human dimensions of natural resource management and basic concepts of behavior change. (30 minutes)
- Presentation on how social indicators are being used for NPS planning and evaluation (45 minutes)
- Break (15 minutes)
- Hands on work interpreting social data (45minutes)
- Hands on work building a survey using the Social Indicators Data Management and Analysis (SIDMA) tool (60 minutes)
- Open discussion about how to apply workshop content in participants' projects (45 minutes)

Takeaway for Participants:
Participants will receive a course book complete with PowerPoint slides, readings, and sample surveys and data. Participants will also receive a login for the SIDMA web-based tool and will gain experience using the tool for workshop exercises.

Nitrogen Tools

Sunday, July 21, 1:30 – 4:30 p.m.
Tuscany 3

Instructors/Presenters:
Jorge Delgado, USDA ARS; Tibor Horvath, USDA NRCS; Chris Gross, USDA NRCS; Dennis Chessman, USDA NRCS; and Zahangir Kabir, USDA NRCS

Abstract: Reactive nitrogen losses to the environment have been reported to impact ecosystems, contributing to acidification and eutrophication, algae blooms, nitrate contamination of drinking water, and even higher emissions of trace gases such as nitrous oxide, which has been reported to contribute to global climate change. However, nitrogen is an extremely important nutrient, as it contributes to the maximization of crop yields and economic returns for farmers. With continued population growth around the globe, nitrogen will only become more important for future food security. The organizers of this workshop have been part of a collaborative effort to develop nitrogen management tools that can aid in the implementation of conservation practices on the ground to increase nitrogen use efficiency, reduce losses of reactive nitrogen to the environment, and increase economic returns to farmers.

The Nitrogen Index is being used by NRCS personnel in Kentucky and California, and there are other NRCS cooperators interested in the use of the tool. The Nitrogen Index is also being used by university cooperators. Additionally, the tool is being used in other countries such as Mexico and Ecuador. The tool can be used to assess the benefits of conservation practices, reduce nitrogen losses, and increase nitrogen use efficiency. In March of 2013, USDA-NRCS in Kentucky released its new 590 Nutrient Management Standard, and the new Kentucky Nitrogen and Phosphorous Index is referenced in the standard as the official risk assessment tool for Kentucky. The Nitrogen Index can be downloaded from the official USDA-ARS webpage for the tool. The Nitrogen Index can be run in both the English and the metric systems. Additionally, it can be run in the English and Spanish. It will soon have the capability to be run in Portuguese as well.

The Nitrogen Index for Windows XP ® and Windows 7 ®, version 4.5, to be released in the summer of 2013, will have new features, such as a sustainability index, an N_2O index, and a phosphorous index, and also include recommendations for nitrogen fertilizer applications. Users who have a smartphone with the Android™ system can install a version of the Nitrogen Index app on their device and use the app to transfer assessment information from their device to an office computer. As more of such mobile applications are created, they will increasingly contribute to the development of a new "smart agriculture." This workshop will include three hours of training on the Nitrogen Index.

Handouts will be provided to the attendees of the workshop so that they can follow the presenters' examples.

Leadership Practices in Today's Dynamic World

Sunday, July 21, 2:00 – 3:45 p.m.
Tuscany 2

Instructor:
Marlene K. Rebori, University of Nevada

Abstract: The growth and expansion of technology over the last decade has not only forced individuals to be sophisticated in managing the media with which we process and share information, but it has also changed the manner in which we communicate. The practice of leadership through on-the-ground-advocacy is also shifting to a flatter, less hierarchical style. Emerging trends continue to see the rise of the nonprofit sector and their unique ability to be nimble and adaptable in advocating for change. While the Soil and Water Conservation Society has historical roots and is well respected, thriving professions are ones that can adapt to better fulfill their mission and role in society. As a professional association whose mission is to "foster the science and art of natural resource conservation," this workshop will focus on the art of practicing leadership to accomplish change.

Symposium Session Descriptions and Agendas

CEAP Rangeland Assessment Symposium

Arnold King, Texas A&M (TALR)
Monday, July 22, 10:30 a.m. – 5:00 p.m.
Tuscany 1

Session I: 10:30 a.m. to 12:00 p.m.
Determining Benefits of Conservation on Western Rangelands - *Moderator: Mark Weltz, ARS*

Abstract: The Conservation Effects Assessment Project (CEAP) is a multiagency effort to scientifically quantify the environmental benefits of conservation practices used by private landowners participating in US Department of Agriculture (USDA) and other conservation programs. Project findings will guide USDA conservation policy and program development and help farmers and ranchers to make informed conservation choices. These projects address key issues of conservation practice effectiveness on grazing lands, the single largest land type in the United States and critical to the sustainability of the livestock industry; wildlife habitat; unbroken vistas; and clean, available water.

Presentation 1: Conservation Practices Assessment of the Lower Bad River Basin
Presenter: A. Smart, ARS

Presentation 2: Evaluating the Impacts of Conservation Practices on Watershed Health in a Salmon-Bearing Rangeland Watershed: Asotin Creek, Washington
Presenter: Linda Hardesty, ARS

Presentation 3: Assessing Rangeland Watershed Practices in Central Texas
Presenter: Bill Fox, Texas A&M (TALR)

Presentation 4: Grazing Land Conservation Practices and Drought on Southwestern Watersheds
Presenter: Mitchel P. McClaran, ARS

Session II: 1:30 to 3:00 p.m.
Regional and Watershed Assessments of Conservation on Rangelands: Current Capabilities - *Moderator: Tom Gerik, Texas A&M (TALR)*

Abstract: In this symposium we will present several watershed assessment techniques that USDA has developed to address challenges that incorporate ecological concepts and rangeland management practices, use readily available data, and are designed to represent rangeland hydrologic and erosion processes. We will discuss USDA's current capabilities and alternative approaches to assessing the status, health, and potential benefits of conservation on rangeland watersheds through three case studies.

Presentation 1: Conservation Effects Assessment Project Sources and Modeling Design
Presenter: Leonard Jolley, ARS

Presentation 2: Watershed Assessment of Impact of Conservation in Southern Arizona
Presenter: Dave C. Goodrich, ARS

Presentation 3: Assessing the Effect of NRCS Conservation Programs in Arizona on Rangeland Vegetation Using Remote Sensing
Presenter: Philip Heilman, ARS

Presentation 4: A Decade of Advancement in Understanding of Rangeland Hydrology and Erosion and the Effects of Conservation Practices
Presenter: Frederick B. Pierson

Session III: 3:30 to 5:00 p.m.
Estimating Rangeland Soil Loss: Can We Quantify Benefits of Conservation? - *Moderator: Arnold King, Texas A&M (TALR)*

Abstract: In this symposium we will present the status and current capability of Rangeland Hydrology nad Erosion Model (RHEM) for estimating soil erosion and deposition from splash, sheet flow, and concentrated flow erosion. In addition, we will discuss concepts of how RHEM can be used to determine risk of soil erosion from specific return period runoff events and how changes in management through implementing conservation can alter the risk of soil erosion. Finally we will discuss how RHEM can be used to describe rangeland hydrologic processes and enhance Ecological Site Descriptions.

Presentation 1: Rangeland Hydrology and Erosion Model
Presenter: Fred Pierson

Presentation 2: Modeling Soil Erosion Impact of Rangeland Disturbance Using the Rangeland Hydrology and Erosion Model (RHEM)
Presenter: Osama Al-Hamdan

Presentation 3: Estimating Concentrated Flow Erosion and Deposition on Rangelands
Presenter: S. Kossi Nouwakpo

Presentation 4: Eco-hydrology Considerations for Enhancement of Ecological Site Descriptions
Presenter: C. Jason Williams

National Institute of Food and Agriculture (NIFA) Special Symposium: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

Mary Ann Rozum, USDA

Monday, July 22, 10:30 a.m. – 5:00 p.m.
Tuscany 9 and 11/12

Abstract: The USDA NIFA Symposium will include oral reports or "speed science" from active NIFA funded grants in research, extension, and education of water quality and quantity. The poster sessions will include recently awarded grants, as well as the regional grants that will have local descriptions of activities.

Conservation Delivery: New Concepts in Conservation Planning

Cheryl Simmons, USDA NRCS

Monday, July 22, 10:30 a.m. – 12:00 p.m.
Tuscany 2

Abstract: Providing science-based technical assistance to clients is the foundation for successfully carrying out NRCS' mission of helping people help the land. NRCS' on-site assistance to help grazers identify conservation objectives, inventory resource concerns and opportunities, analyze alternatives, and formulate treatments through conservation planning is unique. In general, this technical assistance is documented in 1.6 million conservation plans and 30 million planned practices in NRCS' National Conservation Plan Database.

In 2002, the Farm Bill expanded NRCS' historical field operations to include the development and administration of contracts and easements for financial assistance programs. In addition to providing technical assistance, NRCS field staffs now manage about 400,000 Farm Bill program contracts. With stagnant to decreasing staff numbers, NRCS continued to deliver more programs and more dollars on more acres. In January of 2009, NRCS leadership responded to these concerns by formally initiating the Conservation Delivery Streamlining Initiative, with the purpose to define and implement a more effective, efficient, and sustainable business model for conservation planning and delivering conservation assistance.

The new Conservation Desktop is planned to roll out in 2014 with NRCS Client Gateway, geospatial tools to support participation in programs, GRAS plan, and a revised resource concern list. An overview of some of the new look and feel for conservation planning will be presented with a discussion of what is next in conservation planning.

Mitigating Drought and Other Impacts of Climate Change through Management to Improve Soil Health and Productivity

Jorge Delgado, USDA ARS
Monday, July 22, 1:30 – 5:00 p.m.
Tuscany 2

Abstract: The 14th Annual SWCS-Soil Science Society of America (SSSA) Joint Symposium covers a topic of great importance and interest to both societies. It is clear from recent publications that climate change, specifically extreme events, can significantly impact food security. It is also clear from these publications that conservation agriculture will be essential for improving soil health and soil quality in order to have systems that are resilient to drought, which will be critical in efforts to achieve sustainable food security. NRCS is starting a new initiative on soil health, and this will be important for climate change adaptation. This symposium will also cover limited irrigation since drought and lower precipitation can decrease water availability. This will be important for the western United States in states such as Nevada, where the SWCS meeting will be held. This joint symposium will continue the tradition of cooperation between the two societies and will help to create opportunities to disseminate cutting-edge information to members of both societies. It will also help to "jumpstart" a conversation about the importance of the soil health initiative, especially in current times of extreme events and a changing climate. This is an important topic to cover within the context of the current farm bill, which is still in development. The SWCS and SSSA have always been at the forefront of conservation and soil science, and the topic of this year's SWCS meeting, Resilient Landscapes: Planning for Flood, Drought and Fire, connects with current global issues related to soil and water conservation and sustainability, such as the connections between soil health, drought, and water resources.

Session I

1:30 – 1:35 pm Introductory Remarks
Moderator: Jorge A. Delgado, USDA ARS

1:35 – 1:55 pm Are Our Water Use Policies in Sync with the Reality of a Changing Climate?
Loretta Singletary, University of Nevada, Reno

1:55 – 2:15 pm Potential to Use Limited Irrigation and Conservation Agriculture to Adapt to Drought and Climate Change
Thomas J. Trout, Kendall DeJonge, and Louise Comas, USDA ARS

2:15 – 2:35 pm Differences in Minnesota Endoaquoll Soils as a Result of Subsurface Drainage and Cultivation
Jeffrey S. Strock, Paulo H. Pagliari, Stacey E. Feser, Emily E. Evans, and Mark R. Coulter, University of Minnesota

2:35 – 2:55 pm Unlock the Secrets in the Soil: A Practical Approach to Improve Soil Health in the 21st Century
David Lamm, USDA NRCS

2:55 – 3:00 pm Discussion/Adjourn

Session II

3:30 – 3:35 pm Introductory Remarks
Jorge A. Delgado, USDA ARS

3:35 – 3:55 pm Management Impacts on GHG Emissions in Corn/Soybean Systems
Rodney T. Venterea and John M. Bake, University of Minnesota; USDA ARS

3:55 – 4:15 pm Soil and Water Conservation Practices to Mitigate Drought and Climate Change
Jerry L. Hatfield, John H. Prueger, and Thomas J. Sauer, USDA ARS

4:15 – 4:35 pm Building Soil Health Can Contribute to Climate Change (and Drought) Adaptation and Mitigation
Susan Andrews, USDA NRCS

4:35 – 5:00 pm Panel Discussion with All Presenters

5:00 pm Adjourn

The Next Farm Bill and Implications for Soil and Water Conservation

Jeremy Peters, American Farmland Trust
Monday, July 22, 1:30 – 3:00 p.m.
Tuscany 3

Abstract: Passage of a five-year farm bill continues to be primary focus of agriculture and conservation groups, but timing remains to be uncertain as to when a new bill will be completed.

Many conservation provisions are in play, including some exciting changes in the conservation program toolbox, conservation compliance, and a national sodsaver program. If a five-year bill is passed before the conclusion of the 112th Congress or in the early days of the 113th Congress, focus will immediately shift to USDA rulemaking and how that process will play out.

If a five-year bill is not passed in the near-term, work will begin to reengaging the 113th Congress to craft legislation. Either scenario presents important policy information for SWCS conference attendees.

Conservation Activity Planning for TSPs

Cheryl Simmons, USDA NRCS
Tuesday, July 23, 10:30 a.m. – 5:00 p.m.
Tuscany 9

Abstract: This workshop will provide initial training to become a Technical Service Provider for the Natural Resources Conservation Service (NRCS). It emphasizes the initial steps in the conservation planning process and will touch on developing quality, complete plans on the entire unit; consideration of ecological, economic, and social concerns; on-site assistance; the effects and impacts of planned actions on-site and off-site; and partnership involvement. The course is based on the procedures and guidelines in the 2013 release of the National Planning Procedures Handbook (NPPH) and the supporting technology and tools to carry out the planning process.

The USDA NRCS offers 16 different types of CAPs, including 104; 114 and 154, Nutrient-Pest Management Plans; 122; 124, Energy Headquarters and Energy Landscape Plans; 110, Grazing Plan; 106; 142, Forest Plan and Fish and Wildlife Plans; and 138, Organic Plan CAPS covered in this workshop.

10:30 a.m. – 12:00 p.m.	Introduction to Conservation Planning *Dan Meyerhoff and Cheryl Simmons*
1:30 – 2:15 p.m.	TSP Orientation and Overview of CAPs *Tim Pilkowski, National TSP Team, NHQ*
2:15 – 3:00 p.m.	Break out for CAPS: • Energy; Landscape/Operations– *Kip Pheil, National Energy Team, West National Technology Support Center* • Wildlife and Forestry - *TBA* • Organic – *Sarah Brown, National Organic Team*
3:00 – 3:30 p.m.	Break
3:30 – 4:15 p.m.	Continuation of CAP Breakouts
4:15 – 5:00 p.m.	Work with individuals to provide certification information and, if possible, establish TSP profile

A Living River Approach to Floodplain Management in the Carson River Watershed

Brenda Hunt, Carson Water Subconservancy District
John Cobourn, University of Nevada Cooperative Extension
Steve Lewis, University of Nevada Cooperative Extension
Dominique Etchegoyhen, Legacy Land and Water
Mitch Blum, HDR, Inc.
Tuesday, July 23, 10:30 a.m. – 12:00 p.m.
Tuscany 2

Abstract: The Carson River flows from the Sierra of Alpine County, California 180 miles eastward through rich agricultural valleys and growing urban centers to Churchill County in Nevada's Great Basin desert. The Carson River Coalition (CRC) is a multiagency and citizen's stakeholder group that promotes integrated watershed management. In 2003, CRC members voted protection of the floodplain the most critical message for public outreach. By 2008, the CRC developed a Regional Floodplain Management Plan (RFMP) that was adopted by five counties within the watershed.

The RFMP promotes a "living river" approach that maintains floodplain lands in an open state providing natural low cost flood protection. This approach creates resiliency by keeping structures/infrastructure out of harm's way. It accepts that rivers are dynamic and need room to meander across their floodplains. It also creates resiliency by enhancing groundwater recharge, water quality, and wildlife habitat.

Implementation of the living river approach is in progress. Research ascertained public perceptions of floodplain issues using workshops, surveys, and other means. Preliminary results indicate a lack of public awareness of the ecosystem services provided by undeveloped floodplains. Elements of the floodplain education program recommended by the RFMP have been implemented. A more robust outreach program is currently in development. Mechanisms for supporting agriculture and open space in floodplains are being implemented by the counties and local non-profits. These include transfer of development rights, conservation easements, and public acquisitions. Under FEMA's Cooperating Technical Partner program, a consultant is performing flood hazard mapping and unsteady state modeling to better assess cumulative impacts of land use changes on a watershed scale.

Although many challenges remain to fully implement the RFMP, the CRC's efforts show continued enthusiasm and extraordinary commitment in seeing the plan succeed.

Conservation Performance in the Face of a Challenging Climate: Improving Conservation Practice Standards and Enhancements to Increase Farm and Resource Resiliency

Jeff Schahczenski, NCAT
Tuesday, July 23, 1:30 – 5:00 p.m.
Tuscany 1

Abstract: This symposium will feature speakers who have participated in a three-year Natural Resources Conservation Service (NRCS) National Conservation Innovation grant (CIG) project that led to specific recommendations to better integrate sustainable—including organic—production systems into NRCS programs and procedures, and to make NRCS programs more accessible to sustainable and organic farmers. Project partners worked closely with NRCS to update program components, including dozens of conservation activity standards to increase the resiliency of farming systems and the natural resources upon which they depend. Panelists will present the results of this project in two 90-minute sessions.

Session I - The Conservation Stewardship Program: Rewarding Farmers and Ranchers Who Build and Manage Resilient Systems.

This session will focus on the current limitations of and recent improvements to the Conservation Stewardship Program (CSP) based on the initial results of an ongoing, three-year CIG project. Project partners worked with hundreds of farmers, NRCS personnel, and external experts to develop recommendations to increase the capacity of NRCS to promote resilient farming systems through the CSP. Focal points of the project include the Conservation Measurement Tool's baseline questions and scores, comprehensive conservation planning, and CSP enhancements.

Session II - Improving Conservation Practice Standards to Enhance Resilient Production Systems: Challenges and Opportunities.

The Environmental Quality Incentives Program (EQIP) promotes conservation on farms by offering cost-share to farmers who wish to install conservation practices on their land. Many of these practices are designed to promote incremental improvements on high-efficiency, low-complexity operations. This panel will highlight some of the 41 recommendations made to the NRCS aimed at improving conservation practice standards to support complexity and resiliency in sustainable farming systems.

SWCS and CPESC: An Evolving and Productive Partnership

Earl Norton, Alabama Soil and Water Conservation
Tuesday, July 23, 1:30 – 3:00 p.m.
Tuscany 2

Abstract: The Certified Professional in Erosion and Sediment Control (CPESC) certification came into the world in 1982 under the umbrella of the SWCS and was incorporated in 2001 as CPESC, Inc. It is supported by a volunteer council of regional and area representatives and a paid staff.

CPESC is now an established international certification and recognized by many units of government with laws, ordinances, and regulations designed to minimize the misuse of land and water resources. There are over 4,000 CPESCs over the world with approximately 3,500 CPESCs in the United States. CPESCs work cooperatively on teams with professional engineers, architects, foresters, or other design professions and contractors and compliment the team approach to developing sound resource management plans.

While obvious to leaders of both the SWCS and the CPESC program that each organization can support the other and gain mutual benefits, only the SWCS international organization and a few SWCS chapters have developed activities to gain potential benefits.

The presentation will describe how SWCS chapters benefit as participants in CPESC activities sponsored by chapters become familiar with SWCS and consider attending future SWCS events and becoming SWCS members if they are not members already. CPESCs benefit through such activities by finding opportunities for exams and continuing education in more convenient locations. Looking at a larger picture, the environment benefits as more individuals become CPESCS and as current CPESCs attain their continuing education with all of these CPESCSs providing sound technical support in the management of various landscapes.

Agriculture and Forestry in a Changing Climate: Adaptation Recommendations

Ernie Shea, 25x'25 Alliance
Jeremy Peters, American Farmland Trust
Lois Wright-Morton, Iowa State University
Jerry Hatfield, USDA ARS
Tuesday, July 23, 3:30 – 5:00 p.m.
Tuscany 2

Abstract: Many farmers, foresters, and ranchers throughout the United States are adjusting their operations to reduce the risks associated with increasingly variable and unpredictable weather. In addition, producers are facing unprecedented economic, social, and environmental pressures which require that they balance for multiple outcomes. These challenges include feeding, clothing, housing, and fueling a rapidly growing world, making decisions in increasingly volatile local and global markets, and managing to continually renew and protect soil, water, and air resources.

But farmers, ranchers, and foresters are not solely at the mercy of these trends. Rather, there are many options available to mitigate risks while strengthening production, cutting input costs, and improving the quality of the land — even in the context of weather-related disasters like those experienced in 2011 and 2012. A recent report produced by the 25x'25 Alliance's Adaptation Work Group, entitled "Agriculture and Forestry in a Changing Climate: Adaptation Recommendations," offers various pathways in the areas of research, production systems, risk management, decision tools, and outreach for building a more resilient agriculture and forestry system. The recommendations of the Adaptation Work Group, which is a collaboration of leaders from the agriculture, forestry, business, academic, conservation, and government sectors, were shaped by four overlapping goals: profitability, productivity, stewardship, and self-determination.

Hear about the report and participate in a dialogue on the steps needed to prepare agriculture and forestry for an uncertain future.

Oral Presentation Abstracts

A Management Tool for Small Community Onsite Wastewater Treatment Systems: The Community System Owner's Guide

Authors: Sara Heger*, University of Minnesota

Abstract: With over 25% of America's population being served by septic systems, the need for proper management is a key issue to accelerate adoption of current technologies and improve existing onsite wastewater treatment systems. This project is developing a wastewater decision-making tool for consumers and will transform rural wastewater management by creating the Community System Owner's Guide (CSOG) tool. The University of Minnesota's Onsite Sewage Treatment Program and its national partners are addressing the increased need for education and resource development resulting from EPA's "Voluntary National Guidelines for Management of Onsite and Clustered Wastewater Treatment Systems" (2003). Partnerships in Arizona, Iowa, Michigan, Minnesota, and North Carolina, along with the US EPA, are working together on this project to delivers a nationally relevant and locally customizable interface tool to facilitate the development of CSOGs. This project is bridging the gap between septic system professionals, regulators, and owners through the availability of sound management guidance from the system owner's perspective. This project's primary deliverable is a web-interface that empowers any consultant, engineer, septic professional, facilitator, or even an educated community member to become a CSOG developer and produce an expert-driven and locally-customized manual that outlines the management responsibilities, activities, and frequencies for any cluster soil-based wastewater treatment system in America.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Assessment of Soil Response to Corn Residue Removal and Grazing

Authors: Humberto Blanco*, University of Nebraska; Richard Ferguson, University of Nebraska; Tim Shaver, University of Nebraska; Virginia Jin, USDA-ARS; Charles Wortmann, University of Nebraska; Simon van Donk, University of Nebraska; Aaron Stalker, University of Nebraska

Abstract: Corn residue is rapidly becoming a valuable commodity and is facing many competing uses including 1) soil and water conservation, 2) animal feed, and 3) feedstocks for the second generation of biofuels. Cattle producers are removing corn as silage, baled forage, or by grazing, especially when other forage supply falls short such as due to the prolonged drought. In addition, residue is widely co-fed with distillers grains (co-product from grain ethanol production) for livestock production. At the same time, corn residue is being considered as the top candidate for cellulosic ethanol production. We are using two field-scale experiments of crop residue removal and grazing located in south central and west central Nebraska to assess: 1) the potential soil and environmental impacts of corn residue removal and grazing and 2) the best management practices that can be used to support residue production for livestock and biofuel industries. The experiment in south central NE includes two levels of corn residue removal, irrigation, and N fertilization, and three levels of organic C input (winter cover crops, animal manure application, and control). This experiment provides a unique opportunity to assess if use of cover crops and animal manure application can offset the soil C and nutrients lost with residue removal. The experiment in west central NE includes: light grazing, heavy grazing, residue removal by baling, and control. Preliminary results show that residue removal affected soil organic C dynamics, soil water content, and soil compaction parameters. Currently, we are evaluating changes in soil structural properties (aggregate stability and Proctor compactibility) and hydraulic properties (soil water retention and water infiltration) to comprehensively evaluate risks of soil erosion and overall soil quality following stover removal. Detailed data will be presented and discussed at the meetings.

Subject Areas: Soil Resources Assessment and Management; Adaptive Management of Conservation Efforts; Biodiversity Conservation and Management; Water Resources Assessment and Management

*denotes primary author

Atrazine Incorporation and Soil Erosion—Balancing Competing Water Quality Concerns for Claypan Soils

Authors: Robert Lerch*, USDA-ARS; Chris Harbourt, ; Robert Broz, University of Mo Extension; Teresa Thevary

Abstract: In the U.S. Corn Belt, claypan soils are vulnerable to both erosion and transport of unincorporated herbicides. Thus, there is a need to identify tillage practices that can achieve a balance between herbicide transport and soil erosion for these soils. The objectives of this research were to compare the effect of three tillage systems on sediment and atrazine transport in surface runoff for a claypan soil and to compare their agronomic utility. Tillage treatments were: 1) rotary harrow – atrazine incorporated to ~5cm (RH); 2) no-till without incorporation (NT); and 3) minimum-till - incorporated atrazine to ~10 cm (MT). Three main tillage plots were established for each of the treatments, and two sets of runoff subplots, with three replicates each, were established within the main plots. Runoff was generated with a rainfall simulator at an average rate of 27 mm/ h. Runoff samples were collected at unequal time intervals from 1 to 90 min after runoff initiation, and analyzed for total suspended sediment (TSS) and dissolved-phase atrazine concentrations. The RH treatment had significantly lower TSS concentrations and loads than MT, but it did not significantly increase erosion compared to NT. The RH treatment also had significantly lower atrazine concentrations and relative loads than NT, but not significantly greater atrazine transport than MT. Atrazine relative loads, as a % of applied, were: NT, 22.2%; RH, 10.6%; and MT, 6.4%. The RH treatment also resulted in comparable or better yields and weed control than the other treatments. The RH treatment successfully managed the trade-off between erosion and atrazine transport for a claypan soil and can be used as a best management practice for claypan and related restrictive layer soils.

Subject Areas: Water Resources Assessment and Management; Soil Resources Assessment and Management

*denotes primary author

Bioenergy crops for resilient landscapes: a design case study and field experiences

Authors: Maria Negri*, Argonne National Laboratory; Gayathri Gopalakrishnan, SPace Science Institute; Terry Bachtold, Soil Water Conservation District Livingston Co. IL; Steve John, Agricultural Watershed Intitute; Frederick Iutzi, Illinois Institute for Rural Affairs at WIU; Xiaolan Liu, Illinois Institute of Rural Affairs at WIU

Abstract: Perennial bioenergy crops such as native grasses and woody species have inherently different responses to drought and flooding than row crops. This difference could be exploited to strengthen landscapes to increase their resilience and maintain environmental services and a diversified source of income in a changing climate. In this study, we present a methodological approach developed to design and establish a field trial of bioenergy crops grown in contour strips adjacent to corn. In this design, acreage that is most vulnerable to erosion, drought or flooding is dedicated to suitable bioenergy crops. This bioenergy buffer uses phytoremediation approaches to intercept, contain and reuse nutrients leaching in the subsurface flow from corn, ideally achieving higher nitrogen use efficiency at the field scale. In support of a 15-acre field deployment in central Illinois, various models were used to understand nutrient transport in leachate, simulate runoff, leaching, crop yield, and nitrous oxide production. The modeling included several potential spatial configurations of corn and bioenergy crops. Results from the simulations indicated that the use of energy crops in the landscape could increase total biomass yields on vulnerable land, and substantially reduce both nitrate concentrations in the leachate and nitrous oxide emissions. These results were used to design the ongoing physical field trial on the same field which will validate model results and provide data related to bioenergy crops sustainability metrics. Scaling up to the watershed is in the planning and environmental, agricultural, and economic outcomes and stakeholder acceptance of biomass crops in marginal land are also being explored in other Central Illinois farm trials and watershed projects. During the 2012 drought, grasses planted for bioenergy in these projects were harvested as summer hay, thereby offering producers alternate and flexible end uses and increasing community resilience.

Subject Areas: Soil Resources Assessment and Management; Water Resources Assessment and Management

*denotes primary author

Collaborative Approach to Lanscape Scale Restoriation & Wildfire Mitigation

Authors: Thomas Esgate*, Lassen County Fire Safe Counci

Abstract: Lassen County Fire Safe Council, Inc. (LCFSC) faces the challenges of wildfire impacts on communities and ecosystems in unique ways. They are developing treatment and mitigation plans and implementing projects on a landscape level while integrating ecological and community social values. They are working in broad based partnerships that have resulted in their participation in 4 nationally funded initiatives and which in turn have helped diversify their financial resources that help fund large collaborative projects. Under extreme conditions, which regularly occur in northern California, fires can spot ½ mile or more, leaving only a charred landscape on either side of a fuel break where thinned vegetation survives. This is what has led LCFSC to treat the entire communities on a landscape scale so residents can retain their homes and forests after a wildfire event. Individual homeowner risk/structural ignitability assessments are also incorporated with each project. Working on a landscape scale has connected the council with other watershed and resource groups, which has led them to partner on ecosystem restoration projects on an even broader scale beyond the immediate confines of the local community. These collaborative projects not only reduce wildfire risk, but they are also restoring thousands of acres of imperiled watersheds and critical wildlife habitat.

Subject Areas: Conservation and Environmental Policy and Program Design; Outreach, Education and Community Engagement

*denotes primary author

Conservation, Protection & Restoration of Critical Lands Using The Clean Ohio Fund

Authors: Jerome Iles*, Ohio State University Extension

Abstract: Conservation, Protection & Restoration of Critical Lands Using The Clean Ohio Fund Jerome Iles, The Ohio State University Extension Voters originally approved the Clean Ohio Fund as a statewide ballot initiative in 2000. The 400 million dollars was appropriated over four rounds of funding focused on four separate areas of conservation, preservation and environmental revitalization. In 2008 Ohio voters approved state issue 2 which provided another 400 million in funds to continue funding. The four programs funded by Clean Ohio enhance rural as well as urban areas. The programs and respective agencies that oversee the grant funding for each program are as follows: The Ohio Department of Agriculture Office of Farmland Preservation administers the Clean Ohio Agricultural Easement Purchase Program. This program assists landowners and communities with preserving farmland. The Ohio Public Works Commission administers the Clean Ohio Green Space Conservation Program. These funds allow acquisition of environmentally sensitive areas especially areas such as riparian corridors that protect and enhance water quality. The Ohio Department of Natural Resources administers the Clean Ohio Trail Fund. This funding is targeted toward building regional trail systems that are part of the overall statewide trail plan. The fourth program funded by the Clean Ohio Fund is The Clean Ohio Brownfield Revitalization Program. The Ohio Department of Development's Urban Development's Division and the Ohio Environmental Protection Agency award grants to clean up sites and make them ready for redevelopment. This presentation will focus on the effectiveness of the Clean Ohio Fund to enhance statewide conservation and environmental enhancement efforts as well as the presenter's experience working as a member of their district Natural Resource Assistance Council. The presentation will focus on preserving critical lands using the Clean Ohio Green Space Conservation Program.

Subject Areas: Conservation and Environmental Policy and Program Design; Conservation Models, Tools, and Technologies

*denotes primary author

Conventional vs Organic Agriculture with Conventional and Conservation Tillage: Water Quality

Authors: Deanna Osmond*, NC State University; Josh Edgell; Daniel Line; Greg Hoyt; Erika Larsen; Julie Grossman

Abstract: Little water quality information exists that compares similar organic and conventional systems with the overlay of conservation and conventional tillage. The goal of this research is to measure and model nonpoint source water pollution (nitrogen (N), phosphorus, and sediment) associated with organic and conventional vegetable farming systems under different tillage practices. In our research, we evaluate surface water (nutrients, carbon and sediment) and potential groundwater quality (N) from organic and conventional systems for sweet corn. The experimental plots have been used long-term (> 17 years) and provided valuable insights into different tillage and management systems. Besides comparing water quality data, we evaluate soil organic matter and different fractions of organic matter, cover crop biomass and N, crop yield, N uptake, and N use efficiency of the different treatments. The Agricultural Policy Environmental Extender (APEX) model has been used to model the two systems to help quantify losses. We will only be presenting the water quality, carbon, and yield data at this presentation. Yield is 3-times greater for the conventional management system relative to organic management due mostly to weed pressures but also because there was less available N in the organic system. There is greater microbial biomass in the organic management/conservation tillage system; the other systems are similar to each other, except the chemical plow, which is the lowest. Although there are differences in soil bulk density between treatments (lower in organic than conventional management), there was no relationship between yield and greater bulk densities. Plowed systems, particularly chemical plow treatments, lost the highest quantities of total carbon through surface runoff as compared to no-till treatments. When considering both yield, and nutrient and carbon losses, the most environmentally sustainable system is conventional management/ conservation tillage.

Subject Areas: Water Resources Assessment and Management

*denotes primary author

Creating Climate-Smart Ag Landscapes through Agroforestry

Authors: Gary Bentrup*, U.S. Forest Service; Michele Schoeneberger, USDA FS/NRCS National Agroforestry Center; Henry deGooijer, Agriculture and Agri-Food Canada – Agroforestry Development Centre; Raju Soolanayakanahally, Agriculture and Agri-Food Canada – Agroforestry Development Centre; Tom Sauer, USDA ARS – National Laboratory for Agriculture and the Environment; Jim Brandle, University of Nebraska-Lincoln; Xinhua Zhou, University of Kansas –Kansas City ; Dean Current, University of Minnesota - Center for Natural Resources & Agricultural Management

Abstract: Agricultural lands are being pressed to provide increasing environmental and economic services while at the same time their capacity to provide these services is being challenged under a highly dynamic climate, changing markets, and evolving environmental conditions. For example, the rising frequency of floods and droughts is making risk and adaptive management difficult to achieve in annual-only systems. Addressing these challenges requires a comprehensive approach to creating multifunctional landscapes that provide adaptive management options to these cumulative pressures. Agroforestry, the intentional integration of trees and/or shrubs into crop and animal production systems, is one adaptive management tool for building more resilient landscapes. These diversified systems support sustainable production of food, feed, fiber, and energy while improving wildlife habitat and soil, water and air quality. Agroforestry promotes resiliency by 1) modifying microclimate to manage production, 2) increasing landscape connectivity to facilitate species migration, 3) creating biodiversity refugia, and 4) diversifying income streams; all working to confer greater ecological and economic resiliency to agricultural lands under an uncertain and shifting climate. Additionally, it can mitigate greenhouse gases (GHGs) by 1) sequestering carbon, 2) decreasing emissions of GHGs via energy savings and reduced fertilizer and fuel use, and 3) being integrated into renewable bioenergy production. In this presentation, we offer an overview of the evidence illustrating these benefits and describe specific ways that agroforestry can be used to create adaptive and resilient landscapes that achieve landowner and societal goals.

Subject Areas: Adaptive Management of Conservation Efforts; Conservation Models, Tools, and Technologies

*denotes primary author

Databases and Tools to Enable Watershed-Scale Conservation Planning within a Regional Context

Authors: Mark Tomer*, USDA/ARS; David James, USDA/ARS; Sarah Porter, USDA/ARS; Brian Gelder, Iowa St. Univ.; Kathleen Boomer, The Nature Conservancy; Eileen McLellan, Environmental Defense Fund; Nathan Torbick, AGS; Linda Prokopy, Purdue Univ.

Abstract: Agricultural water quality is a thorny problem because the water bodies of inherent public focus are belied by the diversity of landscapes where the problem must be solved using conservation practices. We propose that translating resource planning information from field to watershed scales can show the problem tractable and help us manage water quality for continual improvement. A spatial framework that enables conservation planning in fields and watersheds across Illinois, Iowa and southern Minnesota was developed at the HUC-12 watershed scale, based on agricultural field boundaries. Annual crop cover data then provided spatial data on crop rotations on a field-by-field basis. Soils attributes commonly used in watershed studies were extracted from the NRCS soil survey database for access within this framework. The data provide a base for watershed assessment, and a spatial reference for precision conservation planning tools that employ LiDAR topographic data. Pre-processing LiDAR data for hydrologic routing challenges implementation at an operational scale, but progress is being made. Using a set of test watersheds, GIS-based tools are being developed to target specific conservation practices according to physically based but flexible criteria. The tools can be adjusted to surface or sub-surface drained landscapes, and practices implemented in fields, at field edges, and in riparian zones are included. A conceptual matrix to delineate riparian zone management opportunities is part of the toolset development. We seek to enable conservation planners to work with landowners and farming communities using precision conservation tools, to identify preferred practices and evaluate their possible distributions in a variety of conservation planning scenarios. We intend to test whether provision of precise but flexible spatial information on conservation opportunities can guide conservation planning, implementation, and monitoring in watersheds.

Subject Areas: Conservation Models, Tools, and Technologies; Outreach, Education and Community Engagement; Soil Resources Assessment and Management; Water Resources Assessment and Management

*denotes primary author

Denitrifying bioreactors: Opportunities and challenges for managing offsite nitrogen losses

Authors: Arthur Gold*, University of Rhode Island; Louis Schipper, University of Waikato; Kelly Addy, University of Rhode Island

Abstract: In watersheds that deliver elevated levels of agricultural nitrogen (N), denitrifying bioreactors – often simple trenches filled with a solid carbon (C) substrate – hold great promise for reducing edge-of-field N losses through denitrification. Denitrification beds – lined containers filled with a particulate C – are used to treat nitrate-rich discharges from conveyance systems, e.g., tile drainage or effluents, and also have been tested in stream beds. Denitrification walls – trenches filled with particulate C placed perpendicular to groundwater flow – are passive systems that treat non-point discharges of nitrate-rich groundwater before it reaches surface water or tile drains. These systems have largely been developed in the temperate zone for high-input, high-production croplands and nitrified waste streams. A wide range of nitrate removal rates (0.014 to 22 g N m^{-3} d^{-1}) have been reported in field-based bioreactor studies generally reflecting differences in C substrates, hydrologic setting, temperature, seasonal/site variation in N loading and hydraulic residence time. Through a synthesis of available literature, we will discuss the controlling factors of denitrification in denitrifying bioreactors, longevity of treatment, design options, as well as hydrologic considerations and isotopic approaches for siting these systems. Environmental trade-offs and costs are also valuable considerations. Our project is creating a network of researchers and stakeholders to help foster the coordination of standards in evaluating the design and strategic placement of new systems and to advance the adoption of denitrifying bioreactors.

Subject Areas: Water Resources Assessment and Management

*denotes primary author

Effect of Land Use on Soil Aggregate Stability under Slash and Burn Cultivation

Authors: Dr. Augustine Avwunudiogba*, California State University

Abstract: Soil aggregate stability (SAS) is an important soil physical property that influences hillslope hydrological processes such as infiltration, runoff, and erosion. A change of land use from forest to agriculture may lead to the destruction of soil aggregates, formation of surface seal, reduced infiltration, and increase potential for runoff and erosion on hillslopes. This study investigates the effect of land use associated with slash and burn cultivation on SAS in a small mountainous watershed in eastern Mexico. Top (0- 15 cm) soil samples were collected from cultivated, fallow, mango, shaded coffee, pasture, and forest plots and subjected to laboratory analysis. The samples were analyzed for texture (percent sand, silt, and clay) using the hydrometer method, organic matter (OM) using loss on ignition, bulk density (BD) by the core method, while total porosity (TP) was determined from the value of BD, and percentage of water stable aggregates (WSA) using wet sieving method. The percentage of WSA > 0.25 mm varied according to the land use. The mean value of the percent WSA >0.25 mm were 52.0, 66.2, 77.9, 85.6, 91.5, and 87.1 for cultivated, fallow, pasture, mango, shaded coffee, and forest plots respectively. With the exception of shaded coffee plots, the mean value of percentage WSA >0.25 mm was highest in forest plots and lowest in cultivated plots. The result of multiple regression analysis between percentage of WSA >0.25 mm and the other soil properties indicates that OM, clay, and silt were the most important properties accounting for the variability in the observed percentage of WSA. The result suggests that the conversion of natural forest to slash and burn cultivation may lead to degradation of WSA in the study site. Cultural practices promoting increase and retention of OM in the top soil in the study site is necessary to minimize the breakdown of WSA and reduce potential runoff and erosion from cultivated plots.

Subject Areas: Soil Resources Assessment and Management; Adaptive Management of Conservation Efforts; Agricultural and Conservation Economics; Conservation and Environmental Policy and Program Design

*denotes primary author

Effects of Repeated Burning on Soil Nitrogen and Cheatgrass (*Bromus tectorum*) Biomass and Reproduction

Authors: Rachel Jones*, University of Nevada, Reno; Jeanne Chambers, U.S. Forest Service; Dale Johnson; David Board, U.S. Forest Service; Robert Blank, Agricultural Research Service

Abstract: Restoration of rangelands dominated by cheatgrass, an invasive annual grass, depends on controlling cheatgrass while providing conditions for native species establishment. Cheatgrass growth and reproduction is responsive to available soil nitrogen (N) and decreasing soil N may reduce cheatgrass competitiveness. Fire volatilizes some N, but can result in an immediate increase in NH_4 and longer-term increase in NO_3. Higher N availability increases cheatgrass growth and N content and, consequently, N loss when cheatgrass is repeatedly burned. We asked if repeated burning would deplete soil available N and thus reduce cheatgrass N content, growth and reproduction. We used a factorial experiment in two sites in Nevada. Factors included two litter treatments (removed and intact) and four burn treatments (unburned, burned only, burned and seeded with cheatgrass, and burned and seeded with annual wheat). We burned in fall 2008-2011 and then seeded. The litter treatment was conducted in the first year only. Soils (0-5 cm) and vegetation were sampled in 2008-2012 during peak biomass and before and after burns. Analyses were conducted with mixed model ANOVAs. Soil mineral N increased from 2008-2010 but decreased in 2011. Cheatgrass N increased from 2008-2009 but decreased in 2010-2011 and was lowest in wheat plots. Cheatgrass density increased from 2008-2011, except in wheat plots. Cheatgrass biomass and reproduction increased in all four years in control plots. In burned plots, biomass and reproduction increased from 2008-2010 then declined in 2011. Plots seeded with wheat responded more quickly to burning, likely due to competition with cheatgrass. Less litter following burns resulted in lower cheatgrass cover and biomass, possibly indicating feedback between cheatgrass and litter. Our research indicates that repeated burning may be a useful tool in restoration of cheatgrass-dominated sites, especially if accompanied by seeding with a strong competitor like wheat.

Subject Areas: None of the above

*denotes primary author

Enhancing Ecosystem Services: Designing for Multifunctionality

Authors: Gary Bentrup*, U.S. Forest Service; Mike Dosskey, U.S. Forest Service; Gary Wells, USDA Natural Resources Conservation Service (retired); Doug Wallace, USDA Natural Resources Conservation Service (retired)

Abstract: Maximizing a single ecosystem service, such as crop production, has often come at the expense of other ecosystem services including abundant wildlife and clean water. It has also increased the vulnerability of farms to weather extremes and variable markets and calls into question the long-term viability of this approach to land management. To minimize environmental and economic tradeoffs in farmed landscapes, we must be more deliberate in managing them for multiple ecosystem services. Enhancement of ecosystem services is frequently accomplished by using methods developed and promoted by the USDA Natural Resources Conservation Service (NRCS). This approach has worked well over past decades to reduce soil erosion while sustaining high levels of agricultural production. As conservationists strive to bolster additional ecosystem services, however, some limitations of the NRCS methods begin to emerge. We suggest that a landscape ecological design approach can enhance the cost-effectiveness of NRCS practices by: (1) designing each installation for optimum combinations of services; (2) targeting locations and emphasizing design features that produce disproportionately greater benefits and synergies; (3) avoiding locations and minimizing design features that produce conflict, cancelling effects, or negative consequences; and (4) tailoring the design from location to location depending on resource needs, site capabilities, and landowner preferences. A subset of 11 NRCS conservation practices commonly called vegetative buffers is used to illustrate how an ecological design process might work.

Subject Areas: Adaptive Management of Conservation Efforts

*denotes primary author

Factors Affecting Adoption of Nitrogen Management Technologies

Authors: Catharine Weber, Univ. of Missouri; Laura McCann*, Univ. of Missouri

Abstract: From 1972 to 2001, the amount of nitrogen fertilizer increased about 45% in U.S agriculture, with corn being the most nitrogen-demanding crop (Martin, et al., 2006). Nitrogen losses can result in surface and groundwater contamination, hypoxic dead zones, and health problems. However, proper timing and quantity of application can minimize nitrogen losses and decrease cost. The USDA Agricultural Resource Management Survey (ARMS) 2010 Corn Production Practices and Costs dataset will be used to model adoption of two technologies; nitrogen inhibitors (NIs) and plant tissue testing. NIs consist of enzymes that block the conversion of ammonium to nitrate; delaying the conversion helps prolong nitrogen in the root zone (Nelson & Huber, 1992), which is beneficial during flooding events. Plant tissue testing can increase yield by quantifying fertilizer uptake and determining plant health by measuring total elemental content (Ludwig, 1997). It can also be used to analyze the effects of drought stress (Verslues, et al., 2006). Of the 2,600 farmers surveyed, approximately 9% used NIs and 3% performed a plant tissue test. A logistic regression model was used to analyze each technology. Initial logistic models show basing N rate on a consultant recommendation is positive and significant (at the 10% level) for both technologies. For NI adoption, both ln(fertilizer per acre) and purchasing seed with insecticide or fungicide pretreatment were positive and significant (5%), while age was negative and significant (5%). No till, government conservation payments, and education level were positive and significant (1%) for plant tissue testing. Our results show that adoption of these technologies may be increased by educational efforts aimed at industry professionals. The low adoption rate for plant tissue testing, and the positive effect of government programs, indicates that significant barriers to voluntary adoption may exist.

Subject Areas: Agricultural and Conservation Economics; Conservation and Environmental Policy and Program Design

*denotes primary author

Fate and Transport of Trenbolone Acetate Metabolites in Rangeland Runoff

Authors: Gerrad Jones*, University of Nevada, Reno; Edward Kolodziej, University of Nevada, Reno

Abstract: US beef cattle are implanted with over 4500 kg/yr of the synthetic anabolic growth promoter, trenbolone acetate (TBA). At least 8% (380 kg/yr) of the implant dose is excreted in cattle manure as hormonally active steroid metabolites, which are potent endocrine disruptors that can reduce aquatic vertebrate fecundity at low concentrations (~10 ng/L). The endocrine disruption potential is greatest downstream of agricultural lands, where runoff concentrations of 350 ng/L have been reported. Therefore, characterizing the environmental risk of TBA metabolite exposure is critical. Our objectives were to identify dominant steroid fate and transport mechanisms and strategies to minimize steroid transport in grazing rangelands. We evaluated leaching rates and overland transport in both irrigation and rainfall scenarios using microcosms and/or plot scale vegetated buffer strips. Using GC/MS/MS analysis, we also evaluated steroid attenuation by quantifying concentration decreases in these studies. The data indicate that agricultural stormwater management is necessary for minimizing the risk of steroid transport from rangelands. Approximately 100% more steroids were leached during rainfall than irrigation, which resulted from two factors. First, leaching rates are a function of the manure/water interfacial area, which was greater in rainfall events. Second, rain dislodged more solids, which likely correspond to higher steroid transport. On vegetated buffer strips, steroid attenuation ranged from 60-90% and depended on the applied concentration. Future experiments will characterize the specific vegetated buffer strip removal mechanisms (sorption to soil or grass, etc.). The results of this study are important by identifying when the risk of steroid transport is the greatest. A combination of filter strips and filter berms, which allow lateral movement of water through soil but retain solids, can be used to attenuate steroids both on and off of rangelands during rainfall events.

Subject Areas: None of the above

*denotes primary author

Feasibility of Soil Carbon Monitoring for Carbon Credits

Authors: Sumit Sharma, Oklahoma State University; Jason Warren*, OSU; Alex Cumbie, Oklahoma State University; Tracy Wilson, Oklahoma State University

Abstract: In general, there is a high level of uncertainty around the rate of soil carbon sequestration that occurs after the conversion of cultivated cropland to no-till management or permanent grass. This uncertainty results in a high level of uncertainty with respect to the quality and therefore value of carbon credits generated through the adoption of these management practices. In fact, soil carbon sequestration protocols generally use estimates based on limited data collected from scientific literature or models that have not been fully validated. Therefore, in order to strengthen the quality and therefore value of carbon credits from soil carbon sequestration, various sampling protocols have been proposed. Yet, none have been tested to determine their feasibility. In 2010, a sampling protocol was developed for the Oklahoma Carbon program and then evaluated to determine the impact of probe selection, soil type, and land management on soil carbon stocks and variability. Conservation district personnel were then trained to collect samples and asked for feedback on the time required to collect samples, ease with which the task was completed and observations regarding the quality of soil samples collected. This information was used to determine costs and personnel requirements to complete the protocol. This presentation will provide a summary of analytical findings as well as an assessment of the feasibly of this protocol to be implemented for carbon credit monitoring.

Subject Areas: None of the above

*denotes primary author

Greater Quantities of Grain, Cellulosic Biomass and Vegetables are Produced with Less Water and Lower Nutrient Leaching On Highly Permeable Marginal Soils

Authors: Alvin Smucker*, Michigan State University; Kurt Thelen, Michigan State University; Mathieu Ngouajio, Michigan State University; Ron Goldy, Michigan State University

Abstract: High quality water, the world's most finite critical resource, ensures economic, environmental, political and social stability. A new soil water conservation technology retains more water in plant root zones. Excessive infiltration and redistribution of water within highly permeable soils are well known. To avoid past agroecological errors during the conversion of marginal sandy soils into viable cellulosic biomass production systems, subsurface water saving membranes can be coupled with prescription-based best water management practices that promote sustainable agricultural production. Soil scientists and engineers at Michigan State University developed and field-tested a patented membrane installation device (MID) to install water saving membranes at multiple soil depths in large lysimeters and field test sites. This new subsurface water retention technology (SWRT) dramatically reduces irrigation requirements retaining at least 200% more soil water in the plant root zone. Water saving membranes dramatically reduce drought stress events as long as two weeks even during the driest years. Prescription irrigation and fertilization of sands is now a possibility with SWRT water saving membranes that increase corn production by 135% (213 bu/a) and 174% (268 bu/a) of corn grain by irrigated corn planted at 30 and 15 inch row spacings. This technology offers extraordinary boosts in crop yields by increasing shoot to root ratios, retaining more soil nutrients, improving plant water use efficiency, increasing soil C sequestration and protecting ground water quality. SWRT membranes can be used to convert at least 400 million acres of highly permeable sandy soils in the USA into green fields of accelerated food and cellulosic biomass production providing food and energy needs for the rapidly expanding population.

Subject Areas: None of the above

*denotes primary author

Groundwater Hydrology and Producer Water Use: An Integrated Hydro-Economic Model

Authors: Ye Wang, Texas Tech University; Chenggang Wang*, Texas Tech University; Zhuping Sheng, Texas A&M AgriLife Research and Extension; Yi Liu, Texas A&M AgriLife Research and Extension; James Bordovsky, ; Jeff Johnson, Texas Tech University; Eduardo Segarra, Texas Tech University

Abstract: In Texas High Plains, agricultural irrigation accounts for over 90% of groundwater pumping from the Ogallala Aquifer, and this groundwater resource is being rapidly depleted. To extend the life of the aquifer, the State of Texas requires that local groundwater management districts define Desired Future Conditions (DFC) for groundwater availability, and develop their own management plans to achieve the DFCs. Evaluating alternative DFC-based management plans requires accurate predictions of future aquifer conditions. One of the many challenges facing groundwater policy analysts is to model the complex interactions between water-user behavior and aquifer conditions. Groundwater Availability Model (GAM), the hydrologic model currently used for simulating future aquifer by Texas Water Development Board, does not explicitly account for the changes of producers' water use behavior in response to changes in aquifer conditions. This paper aims to integrate an econometric model of groundwater demand into GAM in order to achieve more precise predictions of future groundwater conditions for management plan evaluation. Our groundwater demand estimation is based on historic cropping and hydrologic data, taking into account economic factors such as crop price and irrigation equipment costs. We test whether the incorporation of the econometrically estimated water demand will improve the prediction power of GAM. The results and the experience learned from this project will improve the methodology for predicting future groundwater conditions and develop better management plans to preserve the nation's precious water resources.

Subject Areas: Agricultural and Conservation Economics

*denotes primary author

Hydrological response of intensive forest management system in tropical rain forest

Authors: Hatma Suryatmojo*, Kyoto University; Yosuke Yamakawa, Kyoto University; Masamitsu Fujimoto, Ritsumeikan University; Ken'ichirou Kosugi, Kyoto University; Takahisa Mizuyama, Kyoto University

Abstract: A tool to manage tropical rainforests in Indonesia is an intensive forest management system (IFMS), characterized by selective timber harvesting and intensive line planting to enrich the standing stock. A study was conducted in the Bukit Baka Experimental Catchments, Central Kalimantan, Indonesia. This study evaluated the impact of IFMS phase on runoff and suspended sediment yield (SSY) compared to a natural forest condition, using a paired catchment method. Runoff and SSY were investigated in three small catchments, a natural forest (catchment A), an IFMS with intensive strip-line planting (catchment B) and an IFMS with intensive contour-line planting (catchment C). The results showed that implementation of IFMS has a significant effect on catchment hydrology particularly in runoff and SSY. There was a significant difference in runoff and SSY among different IFMS phases and between catchment B and C. This study demonstrated that direct runoff, peak discharge and SSY increased dramatically during all phases of IFMS. The highest levels of runoff and SSY generally come from catchment B. Intensive contour-line planting has proven effective to control the direct runoff and also to significantly reduce the SSY, compared to intensive strip-line planting. The result proved that reducing canopy cover and surface disturbances from logging roads, selective logging, and line planting without considering the catchment slope significantly affected both runoff and SSY. Forest management practices should consider and attempt to minimize disturbances in each IFMS phase in order to control runoff and sediment yield. Proper protection of the forest floor with strict control over the logging activities, combined with intensive contour-line planting would also contribute to reduce impact of logging, and help to meet a sustainable forest management goal.

Subject Areas: Soil Resources Assessment and Management; Adaptive Management of Conservation Efforts; Conservation and Environmental Policy and Program Design; Water Resources Assessment and Management

*denotes primary author

Impact of Conservation Practices on Soil Health

Authors: Zahangir Kabir*, USDA-NRCS; dennis Chessman, USDA-NRCS; Kay JoyBarge, USDA-NRCS

Abstract: Excessive tillage and land fallowing during winter can contribute to soil degradation and environmental pollution. Fall tillage and leaving the land fallow during winter disrupts the soil ecosystem, reducing macro and micro organism populations. Consequently, the benefits that healthy soils provide such as enhanced nutrient cycling and improved water infiltration and holding capacity are diminished. In addition, concerns over environmental deterioration through the transport of sediments, nutrients, and pesticides from farmland to surface waters have encouraged adoption of conservation practices such as cover crops in winter and conservation tillage in spring. Conservation practices may improve soil physical properties at the macroscopic level, thereby affecting soil chemical and biological properties at the microscopic level. Conservation practices and their potential contribution to the soil biota and soil health will be discussed.

Subject Areas: Biodiversity Conservation and Management; Adaptive Management of Conservation Efforts; Soil Resources Assessment and Management

*denotes primary author

Iowa Soybean Association Cooperative Conservation for Watershed Health - CIG Project Results

Authors: Todd Sutphin*, Iowa Soybean Association; Heath Ellison, Iowa Soybean Association; Roger Wolf, Iowa Soybean Association

Abstract: The Iowa Soybean Association implemented a USDA-NRCS Conservation Innovation Grant from 2008 thru 2012. This project strove to improve watershed health in Iowa by developing, testing, and implementing a cooperative conservation system focused on water quality with linkages to soil, atmosphere, and energy. To achieve this goal five HUC12 watersheds were chosen in the Boone and Raccoon River basins in which to focus efforts. Within each watershed a watershed management plan was developed which then guided the development of resource management systems for participating farmers. A number of supporting activities were completed during this process including water monitoring, RASCAL assessments of the streams, a sociological survey, soil loss and phosphorus risk analysis, in field performance evaluation, agronomist training, and attribute analysis. The combination of planning and assessment at the field, farm, and watershed scale successfully demonstrated a framework for watershed improvement. This presentation will provide a summary of activities, results, and outcomes of the project.

Subject Areas: Water Resources Assessment and Management; Adaptive Management of Conservation Efforts; Soil Resources Assessment and Management; CIG (Conservation Innovation Grant) Related Project

*denotes primary author

Kansas extension education program on poultry litter utilization and storage site selection to minimize impacts on water quality

Authors: Peter Tomlinson*, Kansas State University; Herschel George, Kansas State University

Abstract: Increasing environmental regulations on the land application of poultry litter in Missouri, Arkansas and Oklahoma has resulted in an influx of poultry litter into Southeast Kansas and concern about potential impacts on water quality. In the spring of 2012, the Kansas Department of Agriculture, Division of Conservation (KDA-DC), Kansas Department of Health and Environment (KDHE) and the Kansas Water Office explored possible regulatory options. In response to possible regulations, Kansas Farm Bureau (KFB) and other agricultural producer organizations in Kansas, requested that a voluntary, non-regulatory approach that promoted best management practices (BMPs) and producer education be implemented. Financial resources were made available through KDA-DC, KDHE and the natural resources conservation service (NRCS) to encourage producers to implement best management practices for poultry litter storage and nutrient management planning. Concurrently, Kansas State Research and Extension (KSRE) worked to develop educational programing on poultry litter and a storage site evaluation tool. The poultry litter educational programing addresses the basic composition, fertilizer value, and BMPs that minimize the risk of nutrient runoff and odor from the storage and land application. The site evaluation tool provides producers with a metric to evaluate the suitability of potential infield storage sites and takes into consideration site conditions such as proximity and slope to water ways, soil type, size and type of buffer and distance to neighboring homes and wells. The initial education program was presented at a Kansas Farm Bureau sponsor meeting in November of 2012. The partnership between Kansas Farm Bureau, State agencies, NRCS and KSRE is continuing to work together to develop additional educational tools and publications. The expected outcomes are increased producer awareness about the utilization of poultry litter and BMPs that protect water quality.

Subject Areas: Outreach, Education and Community Engagement; Conservation and Environmental Policy and Program Design; Conservation Models, Tools, and Technologies

*denotes primary author

Late Summer Native Plant Establishment

Authors: Debra Turrieta*, DriWater

Abstract: The purpose of this informal study was to answer several questions. When is the best time of year to plant for both optimum survival rates and minimal water use? Can a time-release water gel (TRWG) provide enough moisture to establish a plant with reduced costs and less maintenance than hand watering? Is there substantial difference in the growth of a plant (both root mass and upper body growth) when established using a time-release water gel with the micronutrient zinc and glacial acetic acid (IAA), over hand watered plants. When plants feed, or photosynthesize, they grow and increase their carbohydrate storage (energy). If plants are given adequate time and moisture to grow and develop roots prior to the dormant season, it is assumed that the roots have more capacity to increase carbohydrate storage. By having this "food" available when spring comes the plants have a head start to better uptake spring moisture and nutrients making plants stronger for the coming growing season. With today's unstable climates spring may be the only time that plants have to develop and strengthen before possible summer drought, so the extra push the plants have received from carbohydrate reserves the better prepared they are to handle dryer climatic conditions. Our findings showed that late summer planting allow sufficient photosynthesis resulting in ample carbohydrate storage for spring plant growth. That the addition of zinc and glacial acetic acid contributes to the production of essential growth over potable water with no nutrients. That using TRWG-Z significantly lowers water use while efficiently establishing plants. The initial study show August plants with a 139% average increase in root mass, and a 68% increase in upper plant growth for plants established with TRWG-Z over hand-watered plants.

Subject Areas: Conservation Models, Tools, and Technologies; Adaptive Management of Conservation Efforts; Agricultural and Conservation Economics; Water Resources Assessment and Management

*denotes primary author

Leadership for Midwestern Watersheds, Insights from MRBI Watershed Managers

Authors: Michael Baise*, American Farmland Trust; Ann Sorensen, American Farmland Trust; Joe Britt, Sand County Foundation

Abstract: The third Leadership for Midwestern Watersheds meeting focused on engaging farmers and targeting conservation practices in, and scaling up lessons learned from, watershed projects. Forty-four participants registered, primarily from Iowa, Minnesota, Wisconsin, Indiana and Illinois; 13 were attending for the first time. Sand County Foundation, American Farmland Trust, Iowa Soybean Association, The Nature Conservancy and the Great Lakes Regional Water Program sponsor LMW meetings to encourage the exchange of information and improve the overall performance of watershed projects in the Midwest, including projects that are part of the USDA NRCS Mississippi River Basin Initiative (MRBI). New for this meeting was a pre-workshop survey, providing direction for the discussions. For engaging farmers, survey respondents were interested in quantifying the benefits for farmers and facilitating farmer leadership. Their most frequent stories of success involved one-on-one outreach and persuading farmers to allow runoff from their land to be monitored. The greatest challenges were changing the perceptions held by farmers and building trust. For targeting, respondents most frequently mentioned prioritizing field sites, effectively using data, the focus of the target and the importance of monitoring. Sixty-five percent of respondents had identified critical sites within their project watershed based on either pollutant loss/reduction or location/position. For scaling up, respondents mentioned developing databases, establishing partnerships, individual versus holistic planning and sharing information. To inform federal and state water quality regulation, programs and policies, they mentioned showing data, sharing success stories and collecting data.

Subject Areas: Water Resources Assessment and Management; Adaptive Management of Conservation Efforts; Outreach, Education and Community Engagement; Soil Resources Assessment and Management

*denotes primary author

Local Cooperation through Climate Change Data Visualization

Authors: Leigh Bernacchi*, University of Idaho; J.D. Wulfhorst, University of Idaho

Abstract: Data visualization techniques have employed downscaling in order to make local effects more clear and to ground perceptions of climate change in more localized phenomena. Local knowledge shared throughout the community in a variety of media has been shown to improve public participation in natural resource management and planning. For this paper, we analyze sociological survey data in visualization strategies for cooperative adaptation to wheat production amidst climate change scenarios. Results are based on surveys administered to 2000 Inland Pacific Northwest wheat producers with more than 50 acres of production in wheat. We collected baseline agronomic data as well as responses to hypothetical climate change scenarios and information sources. These data will be integrated with agro-ecological zones, and subsequently shared with respondents and other local community members through web, public meeting and print interfaces. The visualization techniques to illustrate the results to various audiences include mapping, modeling and downscaled data. The discussion is focused on user-focused and data-rich interface components; specialized rhetoric for each user; and the ways in which tools can be implemented into cooperative management strategies. Visualization strategies may enable community members to empathize and to innovate problem-solving scenarios in the context of large-scale, long-term issues like climate change. Use of visualization techniques in this type of research analysis may generate social learning and more coordinated collective action parallel to the larger landscape scale.

Subject Areas: Outreach, Education and Community Engagement; Adaptive Management of Conservation Efforts; Conservation Models, Tools, and Technologies; NIFA-related Presentation

*denotes primary author

Microbial biomass determinations and some microbial quality indicators for improving soil sustainability

Authors: Stella Asuming-Brempong*, University of Ghana, Legon.

Abstract: Microbial biomass carbon was determined for soils of Typic paleustult and Quazisament (USDA, 1980) by the chloroform fumigation incubation and the substrate induced respiration methods. Microbial biomass carbon was determined by chloroform fumigation method (CFM) following the method of Jenkinson and Powlson (1976) whilst the method of Anderson and Domsch (1976) with some modification was used to determine the substrate induced respiration (SIR). The objective of the study was to assess some microbial parameters that influenced the sustainability of the soil. Microbial biomass carbon by CFM ranged from 161.9-296.0 ug CO_2-C/g soil for both soils. Biomass determined by SIR for both soils also ranged from 195-300 ug CO_2-C/g soil. The proportion of microbial biomass carbon in total soil organic carbon i.e. the microbial quotient gave insight into the capability of the soil to support microbial growth.The metabolic quotient (qCO_2) showed the efficiency by which soil microorganisms used C-resources in the soil and stressed soil (Quazisament) had high qCO_2 values. The microbial and the metabolic quotients indicate the soils vulnerability to disturbance. The amount of carbon sequestered in the soils significantly influenced the proteobacteria ($p < 0.001$) and actinomycetes populations ($p < 0.028$). Thus, soils with high carbon storage showed high proteobacteria population and vice versa but the actinomycete population showed no particular trend with soil carbon. Also, the distribution of the major microbial grouping of microorganisms in soil was influenced by carbon stored in soil. Generally, microbial biomass decreased with soil depth. A significant correlation of 0.86 was obtained between the basal respiration and available P. The basal respiration and the organic carbon content of the Typic paleustult (Adenta series) were higher than that of the Haatso series (Quazisament) suggesting that the Adenta series had a higher fertility status than Haatso series.

Subject Areas: Biodiversity Conservation and Management; Outreach, Education and Community Engagement; Soil Resources Assessment and Management

*denotes primary author

Midwest Cover Crops Council: A Regional Collaboration that Works

Authors: Dean Baas, Michigan State University Extension*; Dale Mutch, Michigan State University Extension

Abstract: Cover crops provide a variety of ecosystem services including erosion protection, soil building, nitrogen sourcing and scavenging, and weed, disease and pest management. Widespread cover crop adoption and usage by farmers has been hampered in part due to the lack of knowledge of cover crop alternatives, understanding of cover crop agronomic and environmental functions, insight into economic and agronomic risks and accessibility to specific cover crop application information. In 2006 40 participants from the Midwest, including 5 farmers, met to discuss how to better collaborate and share information on cover crop use. Since that initial meeting and with support from the Great Lakes Regional Water Program, the W.K. Kellogg Foundation, an NRCS Conservation Innovation Grant and many other organizations, the Midwest Cover Crops Council (MCCC) has sought to achieve their aim of broad adoption of cover crops by farmers, by building a vital and effective regional collaboration of a diverse group from academia, production agriculture, non-governmental organizations, commodity interests, private sector, and federal and state agencies. The MCCC has become a leading source for Midwest cover crop information through its website, listserv, decision tools, field guide and annual meetings. By 2013 attendance at the MCCC annual meeting had grown to over 270. As a loose collaboration of cover crop colleagues, the evolution of the MCCC as an organization, the development of its products and its regional impact will be discussed. Why the MCCC has been successful and what has not worked as well under this structure will also be explored.

Subject Area: Water Resources Research and Outreach in the Upper Midwest

*denotes primary author

Modeling Grazing Impacts on Soil Erosion with the WEPP Model

Authors: William Elliot*, Rocky Mtn Res Station; Hussin Alshantiri, Washington State University; Linda Hardesty, Washington State University; Emily Bruner, Rocky Mtn Research Station; Joan Wu, Washington State University

Abstract: In the Asotin Creek, Washington, Rangeland CEAP Project, watershed health is dependent on ground cover provided by rangeland plant communities. Grazing can alter the plant community composition, the canopy cover and the ground cover, thereby affecting runoff and erosion rates. Grazing may be by domestic sheep or cattle, following predetermined grazing schedules to maximize biomass utilization whilst minimizing adverse impacts; or by wildlife, like deer, elk, and wild sheep, where there is little control. The Water Erosion Prediction Project (WEPP) model has the ability to describe plant communities as well as grazing schedules. This capability of WEPP, however, has not been tested to evaluate its utility to aid in grazing management. Therefore a study was carried out to determine how to best describe rangeland plant communities in the WEPP management file common in the Asotin Creek Watershed. Both grazed and ungrazed plant communities were modeled. Once the current vegetation and grazing conditions were satisfactorily modeled, a sensitivity analysis was carried out to determine how changing the livestock grazing management could impact rangeland erosion. It was found that the current practices of grazing cattle during the spring season had minimal impact on runoff and erosion. Neither doubling nor halving the spring grazing period showed any measurable change in runoff and erosion. Reducing the year round elk population, however, did decrease rangeland erosion rates in the analysis.

Subject Areas: None of the above

*denotes primary author

Modeling the Impacts of Conservation Practices on Streamflow and Erosion in a Salmon-Bearing Rangeland Watershed: Asotin Creek, Washington

Authors: Hakjun Rhee*, Washington State University; William Elliot, Rocky Mtn Res Station; Joan Wu, Washington State University; Shuhui Dun, Washington State University; Linda Hardesty, Washington State University

Abstract: Asotin Creek is a tributary to the Snake River in the Columbia River Basin, draining 323 square miles of Asotin and Garfield Countries in the State of Washington. Elevations range from 760 to 6,200 ft, and annual precipitation from 12 to 45 inches. Livestock grazing in the watershed began in the early 1800s, and pasture and rangelands are the primary land use, utilizing 43 percent of the area. The creek itself provides a seasonal habitat for native salmonids listed under the Endangered Species Act, resulting in a number of conservation practices. Many habitat enhancement projects have been implemented in the watershed since 1996, with a focus on water quality and riparian function. Improved practices include riparian fencing, alternative water development, tree planting, and installation of sediment ponds. Understanding the impacts of these conservation practices on water resources will contribute to restoration and conservation of watershed health in Asotin Creek. The Water Erosion Prediction Project (WEPP) model was applied to the upper drainage (104 square miles) in Asotin Creek upstream from a streamflow gaging station (USGS 13334450). The WEPP model is a process-based, continuous-simulation, hydrology and erosion prediction model built on the fundamentals of hydrology, plant science, hydraulics, and erosion mechanics. The model was run using the available weather station data (USDA NRCS SNOTEL and NOAA). The results are compared to streamflow data from the USGS gaging station. The current conservation practices are evaluated with respect to streamflow and sediment prediction. Based on the evaluation results, the WEPP appears to do a reasonable job of modeling a rangeland watershed, and to be able to describe rangeland conservation practices with respect to streamflow and erosion.

Subject Areas: None of the above

*denotes primary author

Passive treatments of polyacrylamide on turbid stormwater: ditch application followed by modified settling basin design

Authors: Jihoon Kang*, NC State University; Scott King, ; Richard McLaughlin, North Carolina State University

Abstract: Regulations on construction site runoff will likely lead to adoption of improved sediment erosion control practices, including the application of polyacrylamide (PAM) to enhance turbidity reduction. In this study, we evaluated the turbidity reduction by employing a range of passive PAM treatments in wattles and jute mattings installed in an experimental ditch followed by a settling basin. The PAM treatments employed in the ditch were 1) wattles alone (no PAM), 2) wattles + solid PAM block, 3) wattles + granular PAM on weirs only, 4) wattles + jute under the wattles and PAM on the jute only, 5) wattles + jute under the wattles (no PAM), 6) wattles + jute under the wattles with PAM on the weirs only. For each test, three series of wattles were installed in the ditch lined with a plastic ground cloth. Three consecutive stormwater flows were introduced to the ditch for 28 minutes per storm with sediments added at 5000 mg L^{-1}, and the ditch effluents were routed to a settling basin. For selected treatments (1 and 3), we evaluated the effects of the settling basin geometry in turbidity reduction: 1) standard 2:1 (length:width), 2) horizontal 1:2, and 3) ramp design having a slope toward basin outlet in the standard basin. Our results showed that PAM treatments resulted in turbidity reduction up to 66% at the ditch outlet and up to 87% in the basin outlet relative to influent turbidity (≈ 300 NTU). Placing jute matting under wattles resulted in significantly greater turbidity reduction when granular PAM was applied to the wattle weirs or jute matting, as compared to the PAM applied to the wattle weirs only without placing jute matting. The turbidity reduction by solid PAM blocks was not as effective as the granular PAM. When PAM was introduced in the ditch, all of three basin geometries were equally effective in reducing turbidity up to 93%. Field evaluation is in progress and our results will contribute to the better understanding of passive treatments of PAM.

Subject Areas: Conservation in Urban Settings; Adaptive Management of Conservation Efforts; Soil Resources Assessment and Management; Water Resources Assessment and Management

*denotes primary author

Perennial grass dominance: creating a resilient community in an exotic annual invaded rangeland

Authors: Dan Harmon*, USDA ARS; Charlie Clements, USDA ARS

Abstract: Millions of hectares of western rangelands are invaded by cheatgrass (*Bromus tectorum*). It has created an immense fire threat to public and private lands from salt desert to pine communities. With this increasing invasion, it has become alarmingly important to rehabilitate the landscape. This requires controlling cheatgrass, and more importantly facilitating the development of a functioning resilient plant community. No specific guidelines are followed to achieve this. Various interest groups from wildlife managers, ranchers, environmentalists and academics differ on how to protect these landscapes. We believe establishing a long-lived perennial grass is the best means to allow succession to develop a resilient shrub/bunchgrass community. We have formulated a plan based on decades of rangeland restoration research. While it is a work in progress, it provides the greatest chance for success in 30 cm or less precipitation zones of northern Nevada. The concepts are based on successional theory and agronomic principles. We identify the differences of the threat (cheatgrass) and the resistance (perennial grasses) in regards to seed banks, germination, establishment and competition. We will discuss a step by step process to efficiently restore succession to invaded habitats and the research behind each decision. We believe that plant material testing is keystone to the process of managing rangelands, as each seeded species has a different inherent potential to successfully compete with and suppress cheatgrass. Suppressing cheatgrass densities and decreasing fire threat is the first step towards a functioning rangeland. We also recognize the importance of site potential variances and the difficulties of landscape scale management. Implementing an integrated approach using grazing management, herbicide and mechanical control and fall seeding efforts with the most effective seeded species, can protect and restore the landscape from cheatgrass dominance.

Subject Areas: Adaptive Management of Conservation Efforts; Biodiversity Conservation and Management; Conservation Models, Tools, and Technologies

*denotes primary author

Post-fire Land Restoration, Weed Management, and Soil Biology in Northern Nevada

Authors: Julie Etra*, WBS Inc.

Abstract: Open space in northern Nevada is subject to frequent intense fires. This phenomenon continues the cycle of invasive weed establishment and persistence, damages the soil ecosystem, contributes to soil erosion, and limits the re-establishment of sustainable native plant communities. In 2009, Washoe County Department of Regional Parks and Open Space received funding through the American Recovery & Reinvestment Act for restoration of fire-impacted non-federally owned properties. As part of the restoration work, Western Botanical Services Inc. (WBS) in conjunction with the County and the USDA, Reno, NV, assisted with design and oversight of the installation of a 2.5-acre test plot in Peavine Canyon, April 2011. The purpose of the plots was to test the efficacy of coated seed to enhance germination and plant establishment accompanied with herbicides to control weeds. The site included 48 plots, all pre-treated in the winter of 2011 mechanically and chemically (glyphosate) to control Bromus tectorum. Treatments were repeated four times each in a random block design using two species of grasses (one per plot) and six treatments: 1.Control; 2. Control with imazapic; 3. Activated charcoal imazapic; 4. Activated charcoal coating, AM mycorrhiza, imazapic; 5. Activated charcoal coating, Azospirillum brasilense, imazapic; 6. Charcoal, mycorrhiza, bacteria, imazapic. Preliminary monitoring in 2011 and 2012 included reconnaissance and cover analysis. No new germination was noted from the species seeded in 2011. There was a marked increase in plant growth and diversity from remnant plants released from weed competition in comparison to the surrounding untreated area, observed both in 2011 and 2012 with over fifteen (15) native and adapted species identified including species of shrubs, grasses, and forbs. WBS will conduct detailed analysis of all 48 plots for vegetation, soils, roots, and plant tissue, in an attempt to evaluate effect of inoculants, in the early spring of 2013.

Subject Areas: None of the above

*denotes primary author

Potential for perennial crops for bioenergy production: results of a survey in an Iowa watershed

Authors: Sarah Varble*, Southern Illinois University; Silvia Secchi, Southern Illinois University; Dale Varble, Indiana State University

Abstract: Growing crops for biofuels is not a new idea, however, growing and harvesting dedicated perennial crops for biomass energy production (either liquid fuels or electricity generation) is an approach that has not yet been widely adopted for a variety of reasons, including reluctance of farmers. Dedicated perennials can potentially provide a reliable income source to farmers and protect the environment by improving water quality. Such crop production systems increase the sustainability and resilience of an agro-ecological system by spreading the financial and production risks that farmers endure from monoculture production, increasing biodiversity, and decreasing the damage done to highly erodible land. Through the analysis of the results of a survey completed by farmers in the Clear Creek watershed in rural Iowa, this paper will examine which factors are significant predictors in the interest of local farmers in producing dedicated perennial crops for biomass energy production. Variables include acres farmed, age of farmer, farm characteristics, profitability, knowledge of biomass crops, and government policies. A regression will be used to determine the significance of these variables on: 1.) interest in producing, and 2.) the number of acres the farmer would be interested in putting into production of switchgrass. The results can help establish policies that could influence farmers to move to from annual crops to production of biomass energy perennial crops, and thus would increase the resilience of the entire system. The results are especially relevant in Iowa, where the survey was performed, because farming practices are particularly intensive in the state, and the agricultural sector has the potential to move from a contributor to climate change and associated extreme events into a sector that contributes to climate change mitigation via reduction in energy-intensive input uses, production of renewable fuels, and sequestration of carbon in the soils.

Subject Areas: Conservation and Environmental Policy and Program Design; Conservation Models, Tools, and Technologies; Outreach, Education and Community Engagement; Water Resources Assessment and Management

*denotes primary author

Potential Water Benefits of On-Farm Storage Systems

Authors: Mary Love Tagert*, Mississippi State University; Joel Paz, Mississippi State University; Elizabeth McCraven, Mississippi State University; Richard Kirmeyer, Mississippi State University; Jonathan Pote, Mississippi State University

Abstract: The Mississippi River Basin contains over 60% of the harvested cropland in the United States, and the Mississippi and Atchafalaya Rivers contribute more than three-fourths of the total nutrient load to the Gulf. Since the 1970's, groundwater levels in the Mississippi Alluvial Aquifer have decreased at a rate of approximately 100,000 acre-feet per year due to increased irrigated acres. Today, there are roughly 18,000 permitted irrigation wells dependent on water from the Mississippi Alluvial Aquifer. Adequate supply of good quality water is important to sustaining agriculture, the primary industry in the economically depressed Mississippi Delta. Due to concerns over groundwater declines and increasing fuel costs to run irrigation pumps, farmers have begun implementing irrigation conservation measures, such as creating on farm storage areas to capture irrigation and surface water runoff from the field for later use. These systems offer farmers the dual benefit of providing water for irrigation and also capturing nutrient rich tailwater for on farm reuse. This project includes monitoring of two on farm water storage areas in the Porter Bayou Watershed, Mississippi and has four main objectives: a) determine the downstream nitrogen and phosphorous concentrations of effluent from water storage systems, b) quantify the effects of water storage systems on downstream flow levels through a watershed, c) increase the adoption of on-site water storage technology and dissemination of potential benefits, and d) enhance the science education of middle and high school students by promoting the benefits of water conservation and environmental stewardship. Data collection began in February 2012, with water samples collected for analysis every three weeks throughout the growing season. Effluent nitrate and phosphorus levels were significantly lower than the inlet levels at both on farm storage systems.

Subject Areas: NIFA-related Presentation; Conservation Models, Tools, and Technologies; Outreach, Education and Community Engagement; Water Resources Assessment and Management

*denotes primary author

Protecting the San Francisco River through the Promotion of Community Stewardship in Clifton, Arizona

Authors: Berenise Rivera*, University of Arizona; Channah Rock, University of Arizona

Abstract: Fecal contamination of surface water can result from several sources ranging from human sewage, agricultural or livestock operations runoff, and local wildlife. The Arizona Department of Environmental Quality (ADEQ), is a regulatory agency that maintains a 303d list of locations that do not meet clean water regulatory standards. As of 2008, ADEQ listed 17 impaired watersheds throughout the state of Arizona on the 303d list due to *E. coli* presence higher than the US EPA set standards. The Gila River is listed on the 303d list and it is comprised of the Upper Gila River Watershed from Coolidge Dam to the Arizona-New Mexico border and covers about 6,000 square miles. The Gila Watershed, 17 percent is privately owned and the remainder is under the stewardship of state, federal and tribal governments. The objective of this study is to evaluate community perception on water quality of the San Francisco River in Clifton, Arizona, composed of about 56% Hispanic population. Preliminary survey results on water quality of the San Francisco River (SFR) showed 48% of people surveyed think the SFR has poor water quality for swimming. Also, the majority of respondents were concerned with poor water quality and their health. Sixty percent of people get information from the newspaper, factsheets or brochures and 52% of people get information from conversations with others. This presentation will describe the use of information such as fact sheets/brochures on water quality and human health and a one-day workshop on basic microbiology; and the impact in community stewardship leading to behavior change. The data from this study will be used as a tool to improve community outreach and implement Best Managements Practices (BMPs) to improve water quality and protect public health.

Subject Areas: Outreach, Education and Community Engagement; Conservation in Urban Settings

*denotes primary author

Redox-Specific Biodegradation of Trenbolone Acetate Metabolites

Authors: Emily Cole*, University of Nevada, Reno; Edward Kolodziej, University of Nevada, Reno; Samantha McBride, University of Nevada, Reno

Abstract: Reclaimed agricultural water used in crop irrigation, runoff from animal agriculture operations such as concentrated animal feeding operations (CAFOs), and even sewage treatment effluent potentially contain high levels of steroidal hormones and associated degradates administered as growth-promoters to beef cattle. These synthetic growth promoters and their metabolites (SGPMs) can be released into the aquatic environment and can impact ecosystem health. The available research on the environmental fate of these compounds and their transformation mechanisms is currently incomplete. To evaluate the impact of reduction oxidation state and to elucidate transformation pathways, microcosm studies investigated the fate of 17α-trenbolone, 17β-trenbolone, and trendione – the primary metabolites of trenbolone acetate – in biologically active systems. Using titanium (III) citrate, dithiothreitol, and L-cysteine, microcosms were poised at aerobic, suboxic, anoxic, and anaerobic redox states for 17α-trenbolone, 17β-trenbolone, and trendione, and GC/MS/MS analysis was used to measure steroid loss as a function of time. To investigate the formation of transformation products, high resolution LC/MS/MS was employed to estimate proposed degradation pathways. Results indicate that aerobic biodegradation yields half-lives of approximately 3 and 5 days for 17β-trenbolone and trendione respectively, and that lowering the redox potential of the system increases steroid half-lives. Furthermore, preliminary transformation pathway estimations imply that trendione may be a critical intermediate in the degradation of both 17α- and 17β-trenbolone. Outcomes of this study will improve treatment strategies for all types of water that contain steroids and will improve environmental risk assessment concerning the impact of SPGMs on aquatic organisms.

Subject Areas: None of the above

*denotes primary author

Reducing Nitrate Loads from Tile-Drained Cropland: Options and Outlook

Author: Jane Frankenberger, Purdue University*

Abstract: Recent research in the Midwest has developed and tested a number of ways that cropping systems and drainage systems can be altered to reduce nitrate loads while maintaining high agricultural productivity. This talk will discuss the ten strategies that have been identified as the most promising, and how both the hydrology and nitrogen cycle may need to be changed. Costs, relative benefits, and the state of our knowledge will be discussed for each, as well as the outlook for achieving load reduction through their use.

Subject Area: Water Resources Research and Outreach in the Upper Midwest

*denotes primary author

Rehabilitation of Cheatgrass Infested Rangelands

Authors: Charlie Clements, USDA ARS; Dan Harmon*, USDA ARS; Robert Blank, USDA-ARS

Abstract: The introduction and subsequent invasion of cheatgrass (*Bromus tectorum*) has altered native plant communities and the wildlife species that depend on these communities. Cheatgrass has truncated secondary succession by outcompeting native plant species for limited resources, thus building persistent seed banks to take advantage of conditions that occur in arid environments. The presence of cheatgrass has increased the chance, rate, spread and season of wildfires. The establishment of long-lived perennial grasses is the key at suppressing cheatgrass densities and fuel loads. The use of natural and prescribed fires in big sagebrush (*Artemisia tridentata*) communities can open a window for successful rehabilitation efforts as these fires burn hot enough for a long enough period of time to kill the majority of cheatgrass in the seed bank. On the other hand, a wildfire in a cheatgrass dominanted community burns so fast that live seeds are numerous in the seed bank as well as on the surface. The decrease in available nitrogen also limits cheatgrass germination the 1st fall and spring following the wildfire, therefor decreasing the competition that desirable seeded species will face the following spring. If you miss seeding the 1st fall following a big sagebrush wildfire, the window drastically closes and any success is very limited. Mechanical and herbicide treatments are also tools that can be used in decreasing cheatgrass seed bank densities. This paper presents clear examples of methodologies at decreasing cheatgrass densities and fuel loads as well as plant material testing plots that report those species that showed the best performance and ability to compete with and suppress cheatgrass.

Subject Areas: None of the above

*denotes primary author

Resiliency of Conservation Buffers to Floods and Drought in Iowa and Illinois

Authors: Jeff Jensen*, Trees Forever; Debbie Fluegel, Trees Forever

Abstract: Conservation buffers provide multiple benefits that enhance the resiliency of agroecosystem landscapes while reducing sedimentation and nutrient loading. They also face multiple threats. From economic pressures to management issues, removal and conversion to row-crop production is a real concern that could negate all the positive ecosystem services buffers provide. Landowner surveys conducted in 2008 & 2013 from current buffer participants are used to determine the resiliency of buffers to the flooding of 2008 and the drought of 2012. In addition, information was solicited as to the intent and reasoning of landowners deciding whether to keep a buffer in place versus converting to row-crops. Survey results from landowners in 2008 show that 96% report the buffer was effective in controlling erosion & protecting water quality and 95% replied the buffer functioned as hoped. Tree loss & damage as well as soil erosion was higher for newly established sites compared to more established sites. Finally, 86% of landowners with a CRP buffer replied they would leave them in place. Surveys administered in 2013 are expected to yield similar results for buffer resiliency; however, given the rise in commodity prices, we would expect a lower percentage of landowners keeping buffers in CRP. Conservation buffers work and provide many ecosystem services to society. Removal or conversion to row-crops is a concern that threatens to reduce ecosystem services and potentially add to the problem of non-point source nutrient loading and sedimentation. At a time when focused attention and effort is taking place throughout the entire Mississippi River Basin to reduce nutrient loading to the Gulf of Mexico, we can't afford to lose any ground and must continue progress towards meeting water quality goals.

Subject Areas: Water Resources Assessment and Management; Conservation Models, Tools, and Technologies; Outreach, Education and Community Engagement; Soil Resources Assessment and Management

*denotes primary author

Restoration of 2011 Flood Damaged Birds Point - New Madrid Floodway

Authors: Kenneth Olson*, Univ. of IL, NRES; Lois Morton, Iowa State University

Abstract: During the spring 2011 flooding along the Mississippi River, the strong current and sweep of water through the Birds Point, Missouri levee breach in May 2011 created a hundred hectares (hundreds of acres) of deep gullies, scoured hundreds of hectares (hundreds of acres) of land, eroded tons of soil, filled ditches with sediment which blocked drainage, created sand deltas and damaged irrigation equipment, farm buildings and homes. Reclamation and restoration of these agricultural lands following the U.S. Army Corps of Engineers (USACE) opening of the New Madrid Floodway to relieve flood pressure on the levee system from the Mississippi River has been time consuming and costly to individual landowners and public tax dollars. The USACE approach to managing the 2011 flood illustrates both success and failure of resilience-based landscape management in the Mississippi River Valley. While levees were rebuilt, ditches cleared of sediment, and many lands in the Floodway restored by November 2012, soil productivity and growing conditions continue to challenge the farmers of this historically highly productive region.

Subject Areas: Adaptive Management of Conservation Efforts

*denotes primary author

Restoration of the Hayman Burn Area: a multi-modal analysis on the convergence of ecological science and social values in post-fire restoration

Authors: Andrea Hassler*, Rocky Mountain Field Institute

Abstract: This research investigates the convergence of ecological science and social values in post-fire restoration. The 2002 Hayman wildfire was the largest to date in Colorado, consuming 138,000+ acres of public and private land. The area burned mixed-severity adjacent to the densely populated Front Range and consumed large tracts of land surrounding the state's largest municipal drinking supplies. With limited funding, the USFS has partnered with multiple private and non-profit organizations to complete restoration treatments. Continued restoration has been taking place through innovative and experimental design to recover key ecosystem services of the Pike National Forest. Interviews with key stakeholders and in-field observation is coupled with GIS remote sensing analysis of land cover change to explore the evolution of post-fire restoration and present tools for best practices moving forward. Research was completed after the 2012 Waldo Canyon fire which was the state's most destructive to date. Many of the innovative treatments used in the Hayman by non-profit partners a decade after the fire have been implemented immediately in the Waldo burn area. The ways in which restoration has taken form in the Hayman burn area, and subsequently in the Waldo Canyon burn area, reflects key values that people have for the watershed and presents an example to recover ecological integrity in the most extreme cases. This study serves to gain a deeper understanding of our relationship with our forests, soils and watersheds.

Subject Areas: Adaptive Management of Conservation Efforts; Conservation Models, Tools, and Technologies; Soil Resources Assessment and Management; Water Resources Assessment and Management

*denotes primary author

State Certainty Programs for Landowners and Producers

Authors: William Berry*, NACD; Richard Duesterhaus, NACD

Abstract: This presentation summarizes research by the National Association of Conservation Districts on state-based certainty programs for agricultural producers. While they vary from state to state, the programs generally seek to improve water quality and provide agricultural producers and landowners some degree of regulatory certainty for adopting best-management practices in their operations. Certainty programs have enrolled thousands of agricultural producers in several states. NACD's research reviewed several of these programs and found similarities and differences among them. Programs are voluntary. They rely on scientifically sound practices and systems that are scientifically sound to achieve verifiable water quality gains. They provide confidentiality to producers butrequire verification to provide assurance that producers have taken necessary steps to achieve goals. Programs offer incentives for participation, including enhanced federal Environmental Quality Incentives Program (EQIP) cost-sharing or points and state or local practice incentives. Some programs have market components, such as affinity labeling. Other states are in the process of developing certainty programs, making NACD's research timely and worth sharing.

Subject Areas: Conservation and Environmental Policy and Program Design; Agricultural and Conservation Economics; Conservation Models, Tools, and Technologies; Outreach, Education and Community Engagement

*denotes primary author

Statistical model equivalency to predict fecal indicator bacteria densities enumerated by QPCR- and culture-based methods

Authors: Raul Gonzalez, UNC Chapel Hill; Rachel Noble*, UNC Chapel Hill

Abstract: As a result of the BEACH Act, the USEPA was required to publish new or revised criteria based on new studies. This led to the 2012 recreational water quality criteria (RWQC) recommendations for protecting public health in marine and fresh waters that are designated for recreation. The new RWQC document places increased emphasis on decreasing the time between sample collection and public advisories, primarily by approving enterococci quantitative PCR (QPCR) as an alternative, more rapid method and advocating the use of predictive models. Using QPCR for recreational water monitoring minimizes processing time, with results typically available in 4 hours. In addition, predictive models can completely eliminate delay between sample collection and results by providing real-time estimates of fecal indicator bacteria (FIB). The objective of this work was to examine the relationship between QPCR- and culture-based real-time predictions of ENT in North Carolina estuaries, a location where monitoring agencies have expressed interest in these real-time methods. Specifically, ENT QPCR and culture models were compared with respect to correlations with environmental variables, model variable selection, and model performance in management decisions. Our results indicate that equivalency was found between predictor models created from densities of both QPCR- and culture-based models. Besides a significant correlation between the 2 analytical methods ($r = 0.60$, $p < 0.0001$), similar significant correlations with antecedent rain, climate, and environmental variables were seen across analytical methods. Both QPCR and culture-based models selected similar predictor variables (QPCR-based adjusted R^2=0.90; culture-based adjusted R^2=0.89). Overall, for both analytical method based models, the percent correct in management decisions were 96% and 90% for ENT QPCR and culture thresholds. Future work to validate the models across other mid-Atlantic estuaries will be vital.

Subject Areas: Water Resources Assessment and Management; NIFA-related Presentation

*denotes primary author

Stormwater Management Education in Nebraska: Integrating Extension, Teaching, and Research

Authors: David Shelton*, University of Nebraska; Kelly Feehan, University of Nebraska; Steven Rodie, University of Nebraska; Thomas Franti, University of Nebraska; Katie Pekarek, University of Nebraska; Bobbi Holm, University of Nebraska

Abstract: Stormwater management is a concern for communities with populations of over 10,000 largely because of mandates to reduce stormwater runoff volumes and associated pollutants. A University of Nebraska-Lincoln Stormwater Work Group was organized in 2006 to develop educational programs and materials to address stormwater management through green infrastructure and other BMPs. A USDA-NIFA grant titled "Improving and Conserving Water Resources through Stormwater Management Education for Community Decision Makers of Today and Tomorrow" was received in 2009 which further supported and greatly expanded work group efforts. This, coupled with support from numerous Nebraska communities, has successfully blended extension programming with university teaching and research. This synergy has helped communities more effectively manage stormwater quantity and quality while building a knowledge-base that will continue to support future initiatives and programs. Extension programs have included: presentations for design professionals, stormwater program managers, Master Gardeners, and homeowners; all-day rain garden workshops/installations; green infrastructure practice tours; rain barrel construction workshops; web-based resources; an interactive rain garden model; youth activities; and publications. Research projects are generating information on rain garden hydrologic and plant growth attributes. Academic programs in both landscape architecture and landscape horticulture are expanding curriculum in green infrastructure, low impact development, and stormwater BMP design and construction. Efforts have culminated in new course lectures as well as studio design projects that have addressed real-world client issues. Fundamentals of the strong integration of extension, teaching, and research; the multi-faceted products that have broadened the scope of urban-focused extension stormwater programming; and selected programming impacts will be illustrated and discussed.

Subject Areas: Outreach, Education and Community Engagement; Conservation in Urban Settings; Water Resources Assessment and Management; NIFA-related Presentation

*denotes primary author

Strategies for Expanding the 4R Initiative: A Survey of Agricultural Retailers and Conservation Districts

Authors: Doug Lawrence*, Blackwoods Group LLC; Richard Duesterhaus, NACD; Lara Moody, Stewardship Programs, TFI; Kelsey Swango, NCFC; Jeff Sands, ARA; Frank Clearfield, Blackwoods Group LLC

Abstract: One of the more visible challenges facing agriculture is the management of nutrients. Two key groups associated with helping farmers make nutrient stewardship decisions are local fertilizer retailers and local Soil and Water Conservation Districts. Unfortunately, there is little information about the farmer-fertilizer retailer-conservationist relationship. To gain a better understanding of this relationship, which is essential to fostering enduring progress using the voluntary nutrient stewardship approach, The Fertilizer Institute, National Council of Farmer Cooperatives, Agricultural Retailers Association, National Association of Conservation Districts, and the American Society of Agronomy – Certified Crop Advisors surveyed field-level employees of conservation districts, commercial fertilizer companies, and farmer cooperatives about their views on nutrient stewardship. The primary purpose of the survey was to identify strategies to help farmers improve their adoption of "4R" nutrient stewardship practices, which focuses on applying nutrients at the Right time, the Right place, the Right rate, and from the Right source. The survey also asked respondents for their perceptions of the environmental and economic impacts of nutrient stewardship practices as well as information about perceived farmer attitudes toward the adoption of 4R nutrient stewardship. The results of the survey are being used to develop strategies to improve partnerships related to 4R nutrient stewardship adoption as well as out-reach and educational materials that can be used by others.

Subject Areas: Outreach, Education and Community Engagement; Adaptive Management of Conservation Efforts

*denotes primary author

Surfactant-Facilitated Transport of *Cryptosporidium parvum* in Soil

Authors: Christophe Darnault*, Rensselaer Polytechnic Institute; Astrid Jacobson, Utah State University; David Powelson, Utah State University; Philippe Baveye, Rensselaer Polytechnic Institute

Abstract: The presence of the parasitic protozoan *Cryptosporidium parvum* in watersheds is inevitable due to agricultural activities and wildlife. Understanding the fate and transport of *C. parvum* oocysts in the environment is critical for the protection of public health and drinking water sources. To better understand the mechanisms by which *C. parvum* oocysts move through soils and contaminate water resources, we study their mobility under conditions representative of real-world scenarios, where both *C. parvum* and chemicals that affect their fate are present in soils. Surfactants occur widely in soils due to agricultural practices such as wastewater irrigation and application of pesticides or soil wetting agents. They affect water tension and, consequently soil infiltration processes and the air-water interfaces in soil pores where *C. parvum* oocysts may be retained. We investigate the surfactant-facilitated transport of *C. parvum* in agricultural soils from Illinois and Utah under unsaturated flow conditions. Our research examines the sorption and desorption of *C. parvum* oocysts onto soil particles in the presence of natural and industrial surfactant solutions, and the mobility of *C. parvum* oocysts in the presence of surfactants in structured and non-structured (packed) soil columns. We find that the presence of the surfactant accelerates the transport of the oocysts through preferential flow paths. On the other hand, when connected macropores are not present in the soils, the presence of the surfactant retards the transport of the oocysts through the soil matrix by straining oocyst-surfactant-Ca flocs.

Subject Areas: NIFA-related Presentation; Soil Resources Assessment and Management; Water Resources Assessment and Management

*denotes primary author

Tamarisk Removal for Conservation of Cultural Resources

Authors: Beverly Harry*, Pyramid Lake Paiute Tribe

Abstract: The 906 acres below Marble Bluff Dam (MBD) is an important spawning area to the endangered cui-ui (*Chasmistes cujus*). During the spawning season, cuiui begin congregating near the delta of Pyramid Lake and use a 3-mile stretch of river to lay their eggs or resumed their journey to MBD where they would be passed above the dam to the river to select their spawning gravels. Since the construction of MBD, this area has been imperiled by decreased water flows to Pyramid Lake, compounded by increased sedimentation during high flows, and further degraded by salt cedar and other undesirable noxious weeds that are presently established on terraces and river banks. Further, a fishway was also constructed which only has been modestly successful in assisting cuiui spawning movement. In 2012, approximately 10% of the spawning cuiui population used the fishway while 90% chose the river to make their ascent. In 2009, the Environmental Department of the Tribe began exploring habitat restoration alternatives to assist in maximizing riparian health. Sections of the river were treated repeatedly against tall whitetop and purple loosestrife. It was also determined that the tamarisk leaf beetle (Diorhabda spp.) , introduced in 2005, was making progress on defoliating tamarisk trees. The tamarisk is well-known for establishing successfully in altered flow regimes and can impact water resources, plant diversity, and wildlife habitat. This invited the opportunity for the Tribe to begin managing and treating tamarisks to reduce water intake and replace with more desirable native plants and trees.

Subject Areas: Water Resources Assessment and Management

*denotes primary author

Targeting Forest Management through Fire and Erosion Modeling

Authors: William Elliot*, Rocky Mtn Res Station; Mary Ellen Miller, Mich Tech Research Inst

Abstract: Forests deliver a number of ecosystem services including clean water. When forests are disturbed by wildfire, the timing, quantity and quality of runoff are altered. A modeling study was carried out in the 5500 km^2 (2000 mi^2) Mokelumne Watershed in Sierra Nevada Mountains in California to determine the risk of wildfire, and the potential sediment delivery from wildfire for approximately 6-ha (14-acre) hillslope polygons within the basin following wildfire. Wildfire severity was estimated with the FLAMMAP prediction tool based on current vegetation condition. From the FLAMMAP model results, the fire intensity was estimated by the predicted flame length for each pixel and averaged for each hillslope polygon. Sediment delivery was then estimated from each polygon using a modified batching version of the GeoWEPP model. For the GeoWEPP runs, fire intensity and prefire fuel condition were used to estimate fire severity. Fire severity and soil properties from the STATSGO database were used to build WEPP soil files. Topography was determined from a 30-m DEM. Following the initial WEPP run, polygons generating the greatest amount of sediment or were critical for reducing fire spread were "treated" by reducing the amount of fuel available for a wildfire. The fire and erosion models were run a second time to see if the treatment resulted in a reduced fire intensity, and hence a reduced erosion rate. The erosion associated with fuel treatment was also estimated to allow managers to evaluate if there was a net reduction in sediment delivery due to treatment. Polygons showing the greatest net decrease in sediment delivery from treatment could then be prioritized for fuel reduction activities. From the results of these model runs, an economic value can be put on delivered sediment. If there are cost savings by reducing sediment delivery, those savings may be available to carry out the fuel treatments.

Subject Areas: Adaptive Management of Conservation Efforts; Conservation Models, Tools, and Technologies; Soil Resources Assessment and Management; Water Resources Assessment and Management

*denotes primary author

The Conservation Reserve Program Readiness Initiative - Training Impacts and Resources

Authors: Rebecca Power, University of Wisconsin-Extension, Madison*; Kevin Erb, University of Wisconsin-Extension, Green Bay

Abstract: Since 1985, the Conservation Reserve Program (CRP) has offered landowners an economical and ecologically sound alternative to planting traditional crops in environmentally sensitive areas. In 2012 and 2013, record numbers of contracts and acres were up for re-enrollment, creating a significant potential strain on the conservation workforce. The Natural Resources Conservation Service (NRCS) recognized the need for additional professionals to assist landowners with developing CRP plans and others aspects of the CRP workload. Under guidance from the Conservation Professional Training Program, a national team of Extension staff, NRCS and FSA staff, and representatives from NRCS partner agencies and organizations have collaborated to develop a multi-faceted Conservation Reserve Program Readiness Initiative to help meet CRP needs. This presentation will highlight impacts of the training program and new online trainings available as a result of the project.

Subject Area: Water Resources Research and Outreach in the Upper Midwest

*denotes primary author

The cost of cleaner water: Linking farmer incentives to conservation outcomes

Authors: Lorine Giangola*, University of Colorado at Boulder

Abstract: This project addresses two policy-relevant questions that natural resource managers and conservation professionals have raised repeatedly: How much will it cost to increase the adoption of agricultural conservation practices over large areas? And, how much will it cost to achieve a particular water quality outcome at the watershed scale? This research focuses on the Le Sueur River watershed (LRW), an agricultural watershed in southern Minnesota. High levels of turbidity, attributed to both geological conditions and agricultural activity, have impaired water quality in the basin, making the LRW a disproportionate contributor of total suspended solids (TSS) to the Minnesota River, which in turn contributes disproportionately to TSS loads in the Upper Mississippi River basin. A mail survey of farmers in the LRW (response rate 34%) proposed a conservation reverse auction scenario to gather least-cost incentives data. Farmers submitted willingness-to-accept bids to adopt four sediment and nutrient conservation practices on their land: no-till, conservation cover, riparian buffers, and grassed waterways. Farmers' bids and farm size data were used to build conservation supply curves, which tell us the cost of putting a certain number of acres under each practice. Using these curves, we can link cost data to expected water quality outcomes modeled with the Soil and Water Assessment Tool (SWAT). SWAT, previously calibrated for the LRW, modeled water quality improvements under various conservation scenarios; the conservation supply curves tell us how much it will cost to implement those conservation scenarios. This interdisciplinary approach allows us to link incentives costs to conservation outcomes and to estimate the cost of achieving water quality improvements in the LRW.

Subject Areas: Conservation Models, Tools, and Technologies; Agricultural and Conservation Economics; Conservation and Environmental Policy and Program Design; Water Resources Assessment and Management

*denotes primary author

The Role of Watershed Management Groups and Key Stakeholders in the Resilience and Sustainability of a Rural Iowa Watershed

Authors: Sarah Varble*, Southern Illinois University; Silvia Secchi, Southern Illinois University

Abstract: The combination of local farming practices (i.e. tiling, channelization) and global climate change has led to an increase in not only the severity, but also the frequency of extreme weather events in the Midwest, including droughts and floods. These can result in severe damage to watersheds, ecosystems, and communities. Watershed management groups and government agencies can help deter the damage done by these events by developing plans, building resources, and providing knowledge networks in order to increase economic and environmental health. When these groups work with communities, resilience and adaptive capacity increase. However, for societies to possess adaptive capacity, the members of the society and governing agencies and organizations must first realize a threat exists and have the willingness and capacity to change. This paper examines the role of watershed management groups and policy forming institutions in the Iowa-Cedar watershed. Interviews and a web-based survey of the members of the groups will assess their perceptions of risks from weather events, sustainability, and resources. We will also examine the perceived need for change in this rural environment in order to increase sustainability, resilience and adaptive capacity from the point of view of local key stakeholders. Policies, social networks, and leadership of the groups will be studied to determine whether watershed management group participants think these are adequate. This study will help determine the factors that need to be addressed by governing agencies and resource management groups in order to withstand more extreme events associated with climate change and enhance adaptive capacity and resilience in the face of these emerging threats.

Subject Areas: Outreach, Education and Community Engagement; Conservation and Environmental Policy and Program Design; Water Resources Assessment and Management

*denotes primary author

The Use of Biochar on Low Organic Matter Soils

Authors: Duane Friend*, University of Illinois

Abstract: Biochar is a by-product of low oxygen combustion of bioenergy feed stocks. This type of low oxygen combustion, called pyrolosis, is used in the production of bio-oil and syngas. Amending poor soils with biochar has been done in many locations around the world. The most well known uses of biochar are the Dark Earths (Terra Preta) of Amazonian South America. Studies in poor tropical soils have shown substantial increases in crop yields when biochar was applied. How would biochar affect low organic matter soils in Illinois? To answer this question, a 2-year field study using biochar on three low organic matter soils was initiated in 2012. The study was funded by an Illinois Department of Agricultural Sustainable Ag Grant. Sites in Mason county, Cass County, and Calhoun county are being used. The sites are areas where soil organic matter is low (0.5 to 2%). Rates of 0, 10, and 20 tons per acre of biochar were applied in replicated plots, and planted to corn. Biochar from wood pellets were used in this study. Normal fertilizer and herbicides were employed. Soil tests were conducted before biochar application, and at the end of crop season. Yields were examined as well. First year yield results were highly variable, partially due to the abnormally dry and hot conditions experienced in 2012. Before and after soil tests did show an increase in soil organic matter where biochar was applied, but CEC values were also variable. Plans for 2013 are to again plant corn into these plots, but no additional biochar applications will be made. Soil tests and yield will again be used to examine potential changes as the biochar ages. Soil tests from spring 2013 will be available by the time of this conference. It is hoped final results will indicate that biochar will improve soil quality in low organic matter soils.

Subject Areas: Adaptive Management of Conservation Efforts; Soil Resources Assessment and Management

*denotes primary author

Use of Drought Indicators in Decision-Making process of Drought Management

Authors: Ekaterina Altman*, University of South Carolina

Abstract: Drought is a complex phenomenon with devastating effects on soil and water resources. It is hard to measure and evaluate drought due to its variations in temporal and spatial magnitude. Previous researches determine that different indicators are inconsistent in detecting drought and sometimes show opposite results. The uncertainty between indicators is high, but management is possible, as South Carolina drought management program shows. For three decades SC has a proactive drought management program to monitor and mitigate drought. The SC Drought Response Committee (DRC) evaluates climatic data and multiple drought indices to declare drought alert phases that trigger drought policy implementation. This research takes a closer look at the work of the DRC in the complex decision-making process. The purpose of this research is to investigate drought indicators and DRC management process to evaluate state drought alert phases in detecting drought onset, duration, severity and recovery. The research demonstrates a method to assess relationships among seven drought indicators and the DRC alert phases for five SC counties on a monthly scale for a period of nine years. The preliminary analysis is focused on ability of indicators to detect the state's last two major droughts for a period of 2000-2008. The drought indices and the DRC alert phases were generally inconsistent with each other. However, there is a close resemblance between the DRC alert phases with the U.S. Drought Monitor (DM) outputs. These results can be explained with the fact that both the DRC and the DM use an integrated approach and rely on analyses of several key indices and ancillary indicators. This research aims to benefit a decision-making process for drought, water, and soil managers, government officials, and stakeholders as it informs drought assessment through the use of drought indicators in drought mitigation and management.

Subject Areas: None of the above

*denotes primary author

Using GIS and Field Assessments to Compare Kansas Riparian Woodlands

Authors: Charles Barden*, Kansas State University; William Beck, Kansas Forest Service; Dalila Maradiaga, Kansas State University; Jeff Neel, Blue Earth Consulting

Abstract: This study compared riparian forests within three lake watersheds in Northeast Kansas. Using a combination of GIS, remote sensing, and on-the-ground forest assessment and inventory plots, riparian forests in the three study watersheds were categorized into three condition classes, based on parameters adapted from the Stream Visual Assessment Protocol and the Proper Functioning Condition systems. Functioning condition class was assigned by examining the ratio of forest width (from top bank) to stream active channel width (ACW), and percent forest canopy coverage within the riparian area. Forest stand data and qualitative riparian area observations (e.g., invasive species presence, management evidence) were also collected from on-the-ground inventory plots within each watershed. Data and observations were used to validate GIS / remote sensing data, as well as provide guidance for future direction of voluntary forestry programs and technical assistance aimed at achieving the greatest water quality impact for the three lakes. Riparian areas without forest cover were classified as areas "In need of riparian forest establishment", and were found to be most prevalent within Centralia (76.4% of total riparian area), yet represented only 32.2%, and 16.4% of the total riparian area within Atchison and Banner, respectively. In general, riparian forests within all three watersheds exhibited a lack of sustainable forest management. Considering sedimentation rates, Banner exhibits a surprisingly high rate, despite having a grassland-dominated watershed. However, field observations made during riparian forest assessments indicated that Banner had the highest incidence of grazed riparian woodlands, with 72% of the tracts surveyed showing evidence of cattle use, whereas Atchison and Centralia had cattle impacting only 25% and 21% of the tracts visited, respectively.

Subject Areas: Water Resources Assessment and Management; Biodiversity Conservation and Management; Conservation Models, Tools, and Technologies

*denotes primary author

Using Vetiver Grass Technology for preventing sedimentation at the shorelines of Guam

Authors: Mohammad Golabi*, University of Guam

Abstract: The paradise island of Guam relies heavily upon its beaches, clean water and coral to draw tourists to its shores. Given the lack of appropriate infrastructure, the need for low-cost, innovative methods for protecting the shorelines, coral and marine organisms threatened by sedimentation and other pollutants are an urgent undertaking for Guam. Preventing shoreline erosion is important to ensuring the survival of the economic sustainability of the island by attracting the island's tourists. Wave action and upland storm water run-off are the main causes of erosion and sedimentation, hence decreasing marine water quality and coral reef health. Engineering controls (i.e., check dams) to protect the shorelines are costly and can delay implementation of best management practices. Alternatively, Vetiver grass technology (VGT) is an inexpensive and effective measure for controlling erosion and trapping sediments in storm water run-off, thus improving water quality in streams and shorelines. Vetiver seedlings grow into a dense, bunch-type grass with extraordinary physiological and morphological attributes in both soil and water. The grass has stiff stems up to 8 feet tall when fully mature, an extremely strong root system, is able to trap sediment, withstand high wave action, and high storm water flow. Vetiver also has nitrogen-fixing mycorhiza with ability to absorb high concentrations of nutrients and agrochemicals. These attributes make VGT highly suitable for protecting shorelines from sedimentation and pollutants (i.e., N, P) while being an ideal plant for terrestrial and aquatic environments. In contrast with conventional engineering structures, efficiency of VGT improves with time as vegetative cover matures. Results from our experiment using VGT showed when properly implemented it provides an effective, low cost means for reducing pollutants and mitigating sedimentation near shorelines and ocean waters; it is virtually a maintenance free green technology.

Subject Areas: Water Resources Assessment and Management; Conservation in Urban Settings; Conservation Models, Tools, and Technologies

*denotes primary author

Using LiDAR Elevation Data to Advance Local Conservation Work

Authors: Ann Lewandowski, University of Minnesota*; Leslie Everett, University of Minnesota

Abstract: Minnesota recently completed delivery of a publicly available statewide LiDAR dataset of high-resolution elevation information. The data is profoundly changing how districts, counties and other local organizations do conservation work. It can be used in local offices – before going out to the field -- to define small (field-scale) catchments, to predict potential sites of gully erosion to help target conservation practices, for wetland mapping or identifying potential wetland restoration sites, in making preliminary engineering designs such as for sediment control basins, and can even help with preliminary mapping of forest types and characteristics. At this presentation, learn examples of how LiDAR data is being used to improve work effectiveness and efficiency; the process and partners involved in acquiring the Minnesota data; features and limitations of the data; hardware, software and training required to take advantage of the data; and online training resources available through the University of Minnesota and the State of Minnesota.

Subject Area: Water Resources Research and Outreach in the Upper Midwest

*denotes primary author

Wheat and radish companion planting for forage and grain in both single- and dual-purpose wheat in Kansas

Authors: DeAnn Presley*, Kansas State University

Abstract: Kansas wheat producers are approaching extension seeking research-based information on cover crops, including the potential advantages of companion planting radishes with wheat i.e., growing radishes simultaneously with the wheat in the fall as a companion crop. Also, producers are searching for data on the benefits of grazing wheat in a dual-purpose wheat system, in which cattle graze on the wheat biomass and the wheat is also harvested for grain. Seven replicated field trials were planted in fall 2011 and 2012 containing radishes co-planted with wheat at a rate of 3 lbs/ac of tillage radish seed. When planted in September in a dual-purpose wheat scenario (grazing plus grain), the radishes were able to emerge and grow a large amount of aboveground biomass before the first hard frost. If the field was planted in October in a grain only scenario, the radishes emerged but produced almost zero biomass. There was no significant effect by radishes on the yield. Grazing caused a significant increase in grain yield both years at all sites evaluated. The outcome of our work is that wheat producers will be equipped to make better decisions about implementing these practices in their operations.

Subject Areas: Soil Resources Assessment and Management; Outreach, Education and Community Engagement

*denotes primary author

Poster Presentations

Adaptive Management of Conservation Efforts

1. Facilitating Perennial Grass Establishment using Herbicide to Control Cheatgrass and Promote Resilient Landscapes
   Charlie Clements, USDA ARS
2. Windbreaks and Waterbreaks: Putting the Brakes on Extreme Weather Impacts on Ag Lands
   Gary Bentrup, U.S. Forest Service
3. Nutrient and Water Management: Their Important Relationship and Challenges to Implementation
   Dennis Chessman, USDA NRCS

Agricultural and Conservation Economics

4. *Economic Performance of a Corn Belt Grass Farm*
   David Archer, USDA ARS NGPRL

Biodiversity Conservation and Management

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   David Wooster, Oregon State University
6. Thoughts of Soil and Water Conservation Design for Tourism Highway in Mountain Area Based on the Landscape Function
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Conservation Models, Tools, and Technologies

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   Dave Goorahoo, CSU Fresno
8. Improving Watershed Resiliency through a New Rural Stormwater Management Model in a Rural Area Along Lake Huron
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9. The Wall - GTC Hatch to Bonaire TL #7
   Susan Avent, Georgia Transmission Corporation
10. Operationalizing Tillage Mapping Technologies
    Nathan Torbick, AGS
11. Validation of DNDC Model for Estimation of Nitrous Oxide Emissions from Agricultural Soils
    Navreet Kaur Mahal, CSU Fresno
12. Airjection Irrigation as a Management Strategy for Optimizing Water Use Efficiency and Improving Soil Quality
    Dave Goorahoo, CSU-Fresno

Outreach, Education, and Community Engagement

13. Reducing Bacteria with Best Management Practices for Livestock: Development of the Lone Star Healthy Streams Program
    Jennifer Peterson, Texas A&M AgriLife Extension

Soil Resource Assessment and Management

14. Biogeochemistry of a Soil Catena in the Eastern Sierra Nevada Range, NV
    Robert Blank, USDA ARS
15. Assessment of Soil Sediments and Salinity Status of Wetland Landscape Affected by Climate Change in South-Western Nigeria
    Joseph Aruleba, Ekiti State University
16. Biogeochemistry of Hydrothermally and Adjacent Non-Altered Soils
    Robert Blank, USDA ARS
17. Nitrogen Slow-Release and Stabilizer Products for Grain Sorghum Production
    Mark McFarland, Texas A&M AgriLife Extension
18. Assessment and Management of a Degraded Utilisol for Fruit Crops Production in South Southern Nigeria
    Omoyeni Opeyemi, Ekiti State University
19. Using Rare Earth Elements (REE) to Determine Wind-Driven Soil Dispersion from a Point Source
    R. Scott Van Pelt, USDA ARS
20. Incorporating Water Repellent Soils into Post Fire Erosion Predictions - A Case Study
    Nathan Gardiner, Texas A&M University
21. Soil Carbon and Nitrogen Dynamics after Six Years of Cover Crop Use
    Francisco Arriaga, University of Wisconsin-Madison

Water Resource Assessment and Management

22. Optimizing Water Use Efficiency of Tomato under Subsurface Irrigation with ET model
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24. The Tribal Approach to Understanding Non-Point Source Pollution in Nevada
    Olin Anderson, Pyramid Lake Paiute Tribe
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    Patrick Hunt, USDA ARS
26. Effects of Tillage Practices on Annual Runoff and Phosphorus Export through Drainage Tiles and Surface Runoff in Ontario, Canada
    Merrin Macrae, University of Waterloo
27. The National Water Quality Initiative
    Erika Larsen, USEPA
28. The Implementation of the New Kentucky Nitrogen and Phosphorus Index to Reduce Agricultural Nonpoint Source Pollution
    Tibor Horvath, USDA NRCS
29. What Happens When Snow Melts? Winter Phosphorus Export from Cropland in Southwest Wisconsin
    Randy Mentz, University of Wisconsin-Platteville

Conservation Innovation Grant (CIG) Related Project

30. Mapping Rice Paddy and Winter Waterfowl Hydroperiod in the USA with Multiscale Satellite Imagery
    Nathan Torbick, AGS
31. Demonstration of Winter Cover Crops and Evaluation of their Environmental Effectiveness on Improving Water Quality on a Working Demonstration Farm in the Mackinaw River Watershed, Illinois
    Krista Kirkham, The Nature Conservancy
32. Integrating Soil, Crop and Pest Monitoring Using Spatial Technology on Arkansas Cotton Farms to Achieve Nutrient Loss Reduction
    Tina Gray Teague, Arkansas State University
33. Affordable Edge-of-Field Monitoring: A Three-State Project to Promote and Evaluate a Simple, Inexpensive, and Reliable Gauge
    Ben Brown, University of Wisconsin-Platteville

Adaptive and Mitigation Planning for Drought

34. Effects of Corn Stover Removal on Yields in a Notill Management System
    Gary Varvel, USDA ARS
35. Drought Survival and Perennial Grass Success in the Face of Cheatgrass Invasion: Germination, Emergence, Seedling Die-off and Reproduction
    Dan Harmon, USDA ARS
36. International Cooperation for Climate Change Mitigation and Adaptation Using Conservation Agriculture in North America
    Jorge Delgado, USDA ARS
37. Membrane Installation Approaches for Increasing Soil Water Holding Capacity in Highly Permeable Soils
    Alvin Smucker, Michigan State University
38. Nitrous Oxide Emissions from Winter Wheat during Drought
    Tracy Wilson, Oklahoma State University
39. Identification of Hydrologic Drought Triggers from Hydro-climatic Predictor Variables
    Meenu Ramadas, Purdue University

Invasive Plant Species

40. An Integrated Weed Management Approach to Saltcedar Control: Controversies and the Definition of Success
    Charlie Clements, USDA ARS
41. Influence of Bromus tectorum Invasion on Soil Properties in Northern Nevada
    Robert Blank, USDA ARS
42. Forecasting Bromus Tectorum and Fire Threat: Site Soil Type versus Population Traits
    Dan Harmon, USDA ARS

Rangeland Conservation and Grazinglands CEAP

43. Evaluating Conservation Practices and Plant Material on Cheatgrass Invaded Landscapes: A 10 Year Case Study
    Charlie Clements, USDA ARS

44. Chemistry of Through-fall and Stem-flow Leachate Following Rainfall Simulation over Pinyon and Juniper
Robert Blank, USDA ARS
45. Effectiveness of Conservation Management for Decreasing Soil Loss in Runoff from Cattle Pastures
Daniel Pote, USDA ARS
46. Comparison of a Multi Cone vs. Single Cone Penetrometer as Tools to Assess Grazing Compaction
Alex Cumbie, Oklahoma State University
47. Assessing the Effectiveness of Conservation Practices on a Working Ranch in Southeastern Arizona using the Rangeland Hydrology Erosion Model (RHEM)
Morgan Ross, University of Arizona
48. Spatial Scale of Drought in a Meso-Scale Southwestern Watershed
Haiyan Wei, University of Arizona

Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

49. Advancing the Adoption and Strategic Placement of Artificial Nitrogen Sinks
Aruthur Gold, University of Rhode Island
50. Hydrologic Simulation of Drought in the Upper Colorado River Basin
Clyde Munster, Texas A&M University
51. Stormwater Management Education in Nebraska: Integrating Extension, Teaching, and Research
David Shelton, University of Nebraska
52. Factors Affecting Adoption of Nutrient Management Practices by Farmers and Homeowners
Laura McCann, University of Missouri
53. *Soil Water Repellency, Water Flux and Water Content in Soil of Three Ecosystems in the Lower Wisconsin River Valley*
Birl Lowery, University of Wisconsin-Madison
54. Good farmers in the U.S. Cornbelt
Jean McGuire, Iowa State University
55. Watershed Diagnostics for Improved Adoption Of Management Practices: Integrating Biophysical And Social Factors
Paul Leisnham, University of Maryland
56. Water Quality Performance of Wetlands Receiving Nonpoint Source Loads: Nitrate Removal Efficiency and Mass Load Reductions Using Targeted Wetland Restorations
William Crumpton, Iowa State University
57. Potential Impact of Targeted Wetland Restoration on Nitrate Loads to Mississippi River Subbasins: Performance Forecast Modeling of Loads and Load Reductions
William Crumpton, Iowa State University
58. Monitoring of On-Farm Water Storage Systems in Porter Bayou Watershed, Mississippi
Joel Paz, Mississippi State University
59. Long-Term Agro-ecosystem Research in the Upper Mississippi River Basin, Dennis Busch, UW-Platteville
60. Showing (Stream) Signs of Concern
Tom Buman, Agren
61. Social Capacity, Landscape-level Conservation and the Demonstration Watershed Approach: Case Studies in the Upper-Midwestern United States,
Nicholas Babin, Purdue University
62. Water Quality and Ecosystem Services from Landscape Best Management Practices that Enhance Vegetation in Urbanizing Watersheds
Jules Bruck, University of Delaware
63. Online Tool to Help Farmers Reduce Phosphorus and Sediment Loading in Owasco Lake, New York
J Archibald, Cornell University
64. Water Sustainability in Desert Agriculture: Enhancing Relationships and Global Competency of Graduate Students and Faculty through Collaboration with Israel
Sharon Walker, UC Riverside
65. A Management Tool for Small Community Onsite Wastewater Treatment Systems: The Community System Owner's Guide
Sara Heger, University of Minnesota
66. Developing Tools to Attenuate Emerging Contaminants in Onsite Wastewater Treatment Systems: Project Update
Gurpal Toor, University of Florida
67. The Great Lakes Regional Water Program: Impacts and Next Steps
Rebecca Power, University of Wisconsin Extension
68. Analysis of Conservation Practice Effectiveness and Producer Adoption Behavior in the Lake Jordan Watershed (North Carolina)
Deanna Osmond, North Carolina State University

69. Urban Forestry: Using I TREE at Kent State University – Service Learning Course 2012
    Dave Ward, Envirocert
70. Analysis of Endocrine Disrupting Compound Uptake in Fruit and Vegetables
    Patrick Wilson, University of Florida/IFAS
71. An Integrated Approach to Precision Conservation Planning In The South Fork Watershed
    Jon Witter, Ohio State University
72. An Integrated Approach to Foster Science-Based Management Of Agricultural Drainage Channels In The Western Lake Erie Basin
    Jon Witter, Ohio State University
73. Study of the Uptake of PPCPs into Greenhouse Vegetables Grown Under Moisture Stress Conditions
    Philip Moravick, University of Hawaii at Manoa
74. Microbial and Nitrogen Loads in Streams of Urbanizing Watersheds Impacted by Varying Densities of On-site Wastewater Treatment Systems
    Mussie Habteselassie, University of Georgia
75. Prototype Mobile Irrigation Water Management System on eRAMS/CSIP
    Allan Andales, Colorado State University
76. Improving Understanding of Ephemeral Gully Sediment and Nutrient Sources on Cultivated Fields
    Aleksey Sheshukov, Kansas State University
77. Smart Irrigation: Smartphone technology for Managing Urban and Agricultural Irrigation
    Kelly Morgan, University of Florida
78. Water Quality Best Management Practices in the Judith River Watershed
    Stephanie Ewing, Montana State University
79. AFRI Project, Year 3: Implementation of a High-Resolution Drought Monitoring Product
    Brent McRoberts, Texas A&M University
80. An Integrated Approach to Precision Conservation Planning in the South Fork Watershed
    Richard Cruse, Iowa Water Center

Poster Presentation Abstracts

1. Facilitating Perennial grass establishment using herbicide to control cheatgrass and promote resilient landscapes

Authors: Charlie Clements*, USDA ARS; Dan Harmon, USDA ARS

Abstract: The introduction and subsequent invasion of Cheatgrass (*Bromus tectorum*) onto Intermountain rangelands has resulted in increased frequencies of wildfires and severely altered native plant communities. These destructive wildfires have negatively impacted wildlife and grazing resources. The ability of resource managers to have tools available to them to control such aggressive weeds as cheatgrass is instrumental in the success of rehabilitation and restoration efforts. The objective of this study was to test the effectiveness of herbicides [Imazapic (Plateau), Rimsulfuron (Matrix), Sulfometuron Methyl (Landmark)] on controlling cheatgrass and allowing for the establishment of seeded species. Twelve plots, 25m x 50m, were established in fall 2010 and treated with 1) Imazapic at 0.42kg/ha, 2) Rimsulfuron at 0.28kg/ha, and 3) Sulfometuron Methyl at 0.12kg/ha rates and replicated 3 times in a randomized block design. Treated plots were fallowed for one year and seeded to Siberian wheatgrass (Agropyron fragilla ssp. sibiricum) at 7 lbs/ac rate. Siberian was chosen because of the low precipitation (15.75cm/year). Sulfometuron Methyl yielded the highest control (98.7%) (cheatgrass pre-herbicide: 265/m^2 vs. post-herbicide: 4/m^2) followed by Imazapic, (95.6%) and Rimsulfuron (91.9%). Control plots averaged 419 cheatgrass plants/m^2, well above our recommended < less than 100/m^2 density requirement for perennial establishment. Established perennial grass seedling density varied by treatment (Sulfometuron Methyl: 69/m^2, Imazapic: 44/m^2, Rimsulfuron: 16/m^2 and Control: 1.1/ft^2). Even with the expected seedling die-off before full adult establishment (2-3 years), Sulfometuron Methyl and Imazapic treated plots should result in sufficient (~10 plants/m^2) perennial grass to suppress cheatgrass densities in the near future.

Subject Areas: Adaptive Management of Conservation Efforts; Conservation Models, Tools, and Technologies; CEAP-related Presentation

*denotes primary author

2. Windbreaks and Waterbreaks: Putting the Brakes on Extreme Weather Impacts on Ag Lands

Authors: Gary Bentrup*, U.S. Forest Service; Michele Schoeneberger, USDA FS/NRCS National Agroforestry Center

Abstract: Extreme weather events are creating environmental problems, accelerating erosion rates, and threatening agricultural production. The implementation of sound conservation practices will be critical for creating climate resilient farms and landscapes. Tree-based conservation practices are particularly valuable because they can minimize flood and drought impacts while producing other services that landowners' value. Windbreaks are a time-tested strategy for conserving soil moisture and reducing soil erosion during droughts but can be managed to deliver a broader suite of ecosystem services. Through innovative design and plant selection, windbreaks can provide services such as habitat for beneficial insects, biomass feedstock, aesthetic enhancement, and edible food products. Waterbreaks offer a novel approach for addressing the surge in flooding intensity and frequency by providing a series of strategically placed buffers in the floodplain to reduce the impacts of flood events. During nonflooded conditions, waterbreaks can provide wildlife corridors between upland and riparian areas and improve water quality by trapping sediment and filtering runoff, while providing alternative income through hunting fees and harvesting products such as timber, nuts, and other nontimber forest products. In this presentation, we illustrate how these tree-based practices can be used to create climate resilient landscapes that offer multiple ecosystem services.

Subject Areas: Adaptive Management of Conservation Efforts

*denotes primary author

3. Nutrient and water management: their important relationship and challenges to implementation

Authors: Dennis Chessman*, USDA-NRCS; Dan Johnson, USDA-NRCS; Karen Lowell, USDA-NRCS

Abstract: Although the role of water and nutrients for crop growth is obvious to most farmers, how to efficiently and economically manage these critical inputs together is not always as apparent. In the western United States, crop irrigation accounts for significant use of a fresh water supply that in the future may become increasingly limited. Improved irrigation management using existing tools can reduce agriculture's water demand. Similarly, nutrient management that more precisely matches nutrient application and nutrient demand allows more efficient use of fertilizer, energy and cost savings, and reduced adverse off-site impacts of nutrients moving to ground or surface water. In irrigated systems, efficient nutrient management requires consideration of the role of irrigation water in nutrient movement. Applying the right amount of water, where and when it is needed is an essential consideration to ensure that nutrients likewise are present in the right amounts where and when they are needed. Methods for improving the management of water and plant nutrients concurrently in response to changes in evapotranspiration and soil moisture throughout the growing season will be presented.

Subject Areas: Adaptive Management of Conservation Efforts; Outreach, Education and Community Engagement; Soil Resources Assessment and Management; Water Resources Assessment and Management Agriculture and Conservation Economics

*denotes primary author

4. Economic Performance of a Corn Belt Grass Farm

Authors: David Archer*, USDA-ARS-NGPRL; Carter Johnson, South Dakota State University; Cody Zilverberg, South Dakota State University; Craig Novotny, South Dakota State University; Tom Schumacher, South Dakota State University (retired); Arvid Boe, South Dakota State University; Scott Kronberg, USDA-ARS-NGPRL

Abstract: Highly productive lands tend to be utilized for crop production, since crop production is thought to generate the highest economic returns. This often leads to cropland being the dominant land use in highly productive landscapes. This is the case in areas of the western Corn Belt where most native tallgrass prairie have been converted to corn and soybean production. However, little information exists on the economic performance of grasslands relative to crop production in these landscapes, since these lands were converted to crop production long ago. The EcoSun Prairie Farm in eastern South Dakota was established in 2008, restoring a corn-soybean farm to native prairie plants to demonstrate the economic potential for a tallgrass prairie farm. The Prairie Farm includes 210 ha (518 ac) of crop land and former Conservation Reserve Program land that was restored to native plants over time, including monoculture and mixed species plantings used for seed, grazing, and hay production. This analysis documents the economic performance of the Prairie Farm over the first five years for the portions of the farm that were not in annual crop production each year. Gross income and net returns have increased each year. Early income was predominantly from seed production. Hay production was added in 2010, and cattle were added in 2011. By 2012, nearly equal amounts of gross income were generated from grass seed, hay, and livestock. Grass seed has been the most profitable enterprise. Gross income in 2012 was nearly $140,000, with net return of $60,000, excluding land costs and labor, and some of the restored land is not yet producing income. While this is less than the income that could have been generated by renting the land out for crop production, this restoration occurred at a time when crop prices and crop land rents rapidly escalated. Grassland restoration could be of interest to a landowner who values grasslands or if crop prices and crop land profitability decline.

Subject Areas: Agricultural and Conservation Economics; Biodiversity Conservation and Management

*denotes primary author

5. Effects of Climate Change and Agricultural Intensification on Ecosystem Services in Riparian Areas and Streams in Eastern Oregon

Authors: David Wooster, Oregon State University; Sandra DeBano*, Oregon State University; Laura McMullen, ICF International

Abstract: Climate change and agricultural intensification are predicted to have strong effects on ecosystem services associated with riparian areas and streams in the next century. We used a multidisciplinary approach to examine how these phenomena will impact ecological functions associated with riparian areas and streams in eastern Oregon. We focused on serveral functions particularly valued by humans - steelhead (*Oncorhyncus mykiss*) production, water quality, pollination services, and potential pest control services. We examined these questions using a combination of empirical and theoretical studies. Water quality, pollinators, and natural enemies of crop pests were examined by sampling intermittent and perennial streams and riparian areas for two years. The impacts of climate change and agricultural intensification on steelhead production were investigated using a spatially explicity model. While some ecological functions were strongly impacted by these phenomena (e.g., pollination, steelhead habitat), others were not (e.g., macroinvertebrate production). The results of our work suggest that climate change and agricultural intensificaiton have different effects on ecosystem services associated with these streams and riparian areas.

Subject Areas: Biodiversity Conservation and Management

*denotes primary author

6. Thoughts of soil and water conservation design for tourism highway in mountain area based on the landscape function

Authors: Zongwei Chen (CATS)

Abstract: As the particular nature and function of mountainous tourist road, soil and water conservation construction on them should take the safety of main project, ecological restoration and landscaping needs into account. Take tourism highway from ShennongjiaMuyuping to Xingshan County Zhaojun Bridge in Hubei Province of China as an example, this paper divided the highway into three landscape characteristic zones, three landscape transition zones and eight landscape characteristic spots based on different characteristics of natural, humanity to keep the beauty and harmony of local landscapy . Then, develop the soil and water conservation designs respectively in line with the highway zonation. In this methold, soil and water conservation is in close connection with landscape construction, improving the eco-efficiency, landscape and social benefit significantly. This artical can provide reference for other soil and water conservation construction on tourist highway

Subject Areas: Adaptive Management of Conservation Efforts; Conservation Models, Tools, and Technologies

*denotes primary author

7. Agronomic Water Use Efficiency of Fresh Market Tomatoes Exposed to Elevated Carbon Dioxide

Authors: Florence Sharma*, CSU Fresno; Bardia Dehghanmanshadi, CSU-Fresno; Dave Goorahoo, CSU-Fresno

Abstract: Steady increases in atmospheric carbon dioxide (CO_2) have been attributed to global warming and climate variability. These environmental changes may have negative effects on available water sources to irrigate agricultural lands. Water use efficiency (WUE) can be a valuable indicator to evaluate water management in crops production. Agronomist may be primarily concerned with harvestable yield in relation to irrigation applied, or may relate yield to total water input during the season, including rainfall which is definition of agronomic WUE. The goal of this project was to evaluate agronomic WUE of tomato under elevated CO_2. During two growing seasons, tomatoes were grown on a sandy loam soil within sixteen open-top chambers (15ft W x 5ft L x 10ft H) at the California State University-Fresno farm. Half of the chambers received ambient air and the other half were subjected to elevated CO_2. For the CO_2 enriched plots, mean daily CO_2 levels within the crop canopy was around 600 ppm during the 8 hours of application, whereas concentrations in the ambient plots averaged around 390 ppm. Subsurface drip irrigation was used to apply water at rates equivalent to 100% ET and 80% ET based on California Irrigation Management Information System (CIMIS) data. Soil moisture sensors were installed to monitor irrigation rates for all treatments. In 2011, there was no significant different among four treatment in WUE. However in 2012, WUE was higher under elevated CO_2 and irrigation regimes did not have significant effect on WUE.

Subject Areas: Conservation Models, Tools, and Technologies

*denotes primary author

8. Improving watershed resiliency through a new rural stormwater management model in a rural area along Lake Huron

Authors: Tom Prout*, Ausable Bayfield Conservation; Alec Scott, Ausable Bayfield Conservation Authority (ABCA)

Abstract: Advanced computer modelling to manage stormwater in urban areas is now common but software and modelling to understand how stormwater runoff acts in rural areas, and how it can best be managed, is needed for those who work in soil and water conservation. An integrated watershed partnership of government, environment, health, and landowners along the southeast shores of Lake Huron, in Canada, has completed the first year of a project to develop this model. The consulting team assisting with the model is also a cooperative effort of consultants in both Ontario and Minnesota. The pending model is to be used with PCSWMM software which is compatible with SWMM software used by the United States Environmental Protection Agency. The scientific outcomes of this project will include better data through the installation of five new monitoring stations, increased understanding of rural flow systems, and more systematic understanding of the impacts of best management practices - determining which projects work best in which areas and at what scale. The project will benefit society by making it possible for stewardship professionals, working with landowners, to identify and implement the most effective projects to reduce impacts on lakes and rivers, reduce health risks, and reduce storm runoff and soil erosion. The project shows a collaborative integrated watershed management model in action through the pooling of resources and the sharing of information.

Subject Areas: Conservation Models, Tools, and Technologies; Adaptive Management of Conservation Efforts; Conservation and Environmental Policy and Program Design; Water Resources Assessment and Management

*denotes primary author

9. The Wall - GTC Hatch to Bonaire TL #7

Authors: SUSAN AVENT*, GEORGIA TRANSMISSION CORP; Lorna Campbell, Campbell Environmental, Inc.

Abstract: Georgia Transmission Corporation, an electric power company, owns a 500 kV transmission line that crosses the Altamaha River near Plant Hatch, a generation facility. The Altamaha River is a large Coastal Plain river with a wide channel and floodplain. Over time, the river had meandered approximately 300 feet toward Structure #7. The top of the riverbank was less than 40 feet from the footing with Structure #7 in danger of being compromised. Project alternatives included relocation of Structure #7 or riverbank stabilization leaving Structure #7 in place. Relocation was complicated by an adjacent transmission line and would require the replacement or relocation of multiple structures on both transmission lines. Environmental factors included wetlands and protected aquatic species as well as existing gas lines in the vicinity. Ultimately, the least environmentally damaging practicable alternative was to stabilize the riverbank using a linear articulated block grout filled fabric revetment (Fabriform™). Coordination/permitting with resource agencies was required prior to construction. Timing was critical for construction to be completed during low water. An abandoned logging road was improved for access by utilizing nonwoven geo-textile fabric and rolled Tensar Triad Geo-Grid™ topped with rock. The strength eliminated the need to disturb the soil by grubbing. Along the riverbank, the pillow design of the Fabriform™ revetment allowed the material to adjust to grade changes because it is cast in place. Scuba divers filled holes with #57 stone and grout to ensure a 2:1 slope. For final stabilization, a mix of temporary and native grass species from the area was seeded. FlexTerra™ spray on erosion control fabric was used to ensure the soil and seed were held in place and to minimize erosion during the germination period.

Subject Areas: Conservation Models, Tools, and Technologies; Adaptive Management of Conservation Efforts

*denotes primary author

10. Operationalizing tillage mapping technologies

Authors: Nathan Torbick*, AGS; Steve Hagen, AGS

Abstract: A wide range of agricultural management practices are being implemented on the millions of acres of row crops. Decisions regarding the implementation of tillage practices in these agricultural areas have a significant effect on soil erosion, surface temperature and albedo, water quality and TMDL, rural livelihoods, and carbon sequestration and offset protocol. However, currently there is no systematic and cost-effective method for documenting tillage practices across the landscape. To address this innovation gap we developed an Operational Tillage Information System (OpTIS). OpTIS integrates multiple satellite platforms to create tillage information products at multiple scales. The ability of readily available satellite sensors (Landsat, AWiFS, IKONOS and MODIS) to map tillage practices and winter cover crops was assessed across six diverse watersheds in the Mississippi and Great Lakes basins. A Classification And Regression Tree (CART) based on crop indices was found to be the most effective technique for mapping tillage classes (traditional, no-till, mulch) and winter cover crops with 85% overall accuracy. Moderate scale imagery was found to have moderately strong (R^2=0.6) relationships between our operational Crop Residue Cover (CRC) index and ground truth residue cover measurements. OpTIS products are available in an interactive web-GIS framework to our end users for visualizing and downloading tillage information for their watershed. The system is scalable to any region, easily transferable, and provides end-users with unique access to customizable geospatial tillage information products over the web.

Subject Areas: Conservation Models, Tools, and Technologies

*denotes primary author

11. Validation of DNDC model for estimation of nitrous oxide emissions from agricultural soils

Authors: Navreet Kaur Mahal*, CSU Fresno; Dave Goorahoo, CSU- Fresno; Florence Sharma, CSU Fresno; Janet Robles, CSU Fresno

Abstract: The effects of the anthropogenic increase in atmospheric greenhouse gases (GHGs) concentration on climate change are beyond dispute. Of the three biogenic GHGs (i.e., carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O)), N_2O is considered to be the most potent. It has been estimated that in California, agricultural soils accounts for 64% of the total N_2O emissions. The various factors affecting N_2O emissions have been well documented and more recently models have been developed to estimate direct N_2O emissions from agriculture and then identify and evaluate the potential of management practices to mitigate these emissions. However, there is a lack of field data to calibrate and validate these models specifically for crops grown under different management systems in the San Joaquin Valley. The overall goal of this study is to calibrate the crop sub model, validate the Denitrification-Decomposition (DNDC) model for cotton cropping systems in California. The specific objectives are to determine N_2O fluxes for cotton fertilized with Urea Ammonium Nitrate (UAN 32) combined with a nitrification and urease inhibitor. During this phase, flux chamber measurements were conducted using an Environmental Protection Agency (EPA) approved methodology to collect air samples (ppm data) which were ultimately analyzed using a Gas Chromatograph (G.C.). Data related to soil factors (soil moisture, temperature, C:N, pH, Bulk density, Eh, saturation), crop factors (maximum height, yield, Leaf Area Index, C:N of roots, shoots and fruits and plant biomass)and climatic factors (minimum and maximum temperature, precipitation and solar radiation) have been collected during this 2011 growing season. In the next phase, this data will be used for the calibration and validation of DNDC model. This will help in making decisions to optimize environmentally safe and economic use of fertilizers without affecting crop production while meeting new regulations.

Subject Areas: Conservation Models, Tools, and Technologies; Soil Resources Assessment and Management

*denotes primary author

12. Airjection Irrigation as a Management Strategy for Optimizing Water Use Efficiency and Improving Soil Quality

Authors: Dave Goorahoo*, CSU- Fresno; Florence Sharma, CSU Fresno; Navreet Kaur Mahal, CSU Fresno; David Zoldoske, CIT- CA State Univ- Fresno

Abstract: Injection of air into the root zone environment has shown to enhanced crop productivity. However, the cost of an air-only injection system separate from the irrigation system had previously remained cost-prohibitive. With the acceptance of subsurface drip irrigation (SDI) by commercial growers, implementation of an AirJection® Irrigation system has become economically feasible. In studies conducted to date through the Center for Irrigation Technology (CIT), we have observed increases as much as 33% in bell pepper count, and a 39% increase in bell pepper weight for aerated plots versus the plots receiving only water. On average, AirJection® Irrigation has resulted in a13-18% yield increase in fresh market tomatoes, cantaloupes, honeydews, broccoli, strawberries and sweet corn. Similar results have been obtained by a research group at Queensland University in Australia. Our work with organic farming systems indicated that AirJection® Irrigation also positively affected photosynthetic and soil respiration rates, stomatal conductance, leaf scale water use efficiency, plant tissue nitrate concentrations, and shoot and root biomass. In our most recent research, we are evaluating the impact of AirJection® Irrigation on tomatoes grown in salt affected heavy clay soils in the western San Joaquin Valley (SJV). Soil salinity measurements using the electromagnetic induction technique at the beginning and the end of the growing season along with soil samples, are currently being analyzed taken before and after the cropping season, will be used to assess impact of the SDI-air treatment on soil salinity and soil fertility. Yield and quality indices based on size, external appearances and firmness, soluble solids will also be compared between the tomatoes irrigated with the aerated water and those receiving only water (control).

Subject Areas: Conservation Models, Tools, and Technologies

*denotes primary author

13. Reducing Bacteria with Best Management Practices for Livestock: Development of the Lone Star Healthy Streams Program

Authors: Jennifer Peterson*, Texas A&M AgriLife Extension; Larry Redmon, Texas A&M AgriLife Extension Service; Kevin Wagner, Texas Water Resources Institute

Abstract: Excessive levels of fecal indicator bacteria (e.g. *E. coli*) remain a major cause of water quality impairment throughout Texas. Although watersheds can be affected by microbial pollution from a wide variety of sources, livestock are increasingly under scrutiny. In order to alleviate this, preclude potential regulatory implications, and most importantly, protect human health, progressive implementation of best management practices (BMPs) is needed. To achieve this, significant resources are required to educate landowners and livestock producers on bacteria impairments, their causes, and most importantly, BMPs that can be implemented to reduce bacterial contamination. The Lone Star Healthy Streams (LSHS) program was specifically designed and developed to provide this information to landowners to address bacterial contamination from beef cattle, dairy cattle, horse operations, poultry operations, and feral hogs. Furthermore, a better understanding of the BMP adoption behavior of Texas livestock producers and landowners is needed to enable state water quality and natural resource agencies to better design practices and programs that encourage and secure participation, facilitate sustained adoption of practices, and meet water quality goals in the most cost effective manner. This poster presentation will detail the development of the LSHS educational program as well as the evaluation component that seeks to assess potential barriers that exist in the adoption and implementation of BMPs by Texas livestock producers and landowners.

Subject Areas: Outreach, Education and Community Engagement; Conservation and Environmental Policy and Program Design; Water Resources Assessment and Management
Soil Resources Assessment and Management

*denotes primary author

14. Biogeochemistry of a Soil Catena in the Eastern Sierra Nevada Range, NV

Authors: Robert Blank*, USDA-ARS; Dale Johnson, ; Tye Morgan, ; Patrick Freeze, ; Rachel Jones, University of Nevada, Reno; Rebecca Lawrence, ; Ann Lue, ; Lauren Roaldson, ; Jake Steinman, Casandra Woodward,

Abstract: As a field/lab project, students in the Soil Biogeochemistry class of the University of Nevada, Reno described and characterized five pedons at Little Valley, NV, at the eastern edge of the Sierra Nevada. Developed largely from granite, the catena encompassed five pedons, which from high to low elevation, included a Lithic Psamment, a Typic Psamment, a Haploxerept, a Haploxeroll, and an Argiaquoll. Overall, total nitrogen, mineral nitrogen, organic carbon, and solution-phase cations and anions were generally greatest in O horizons relative to underlying mineral horizons. Net 30-day nitrogen mineralization potentials were very low or negative for the first four pedons in the catena, but considerably higher in pedon 5, and are predictable based and carbon to nitrogen ratios. For pedons 1-3, Bray-extractable phosphorus significantly correlated with citrate-dithionite extractable iron (R^2=0.86); but not so for pedons 4 and 5. Lower Bray-extractable P and lack of correlation with citrate-dithionite iron in pedons 4 and 5 may be due to a greater proportion of ecosystem phosphorus in vegetation, which at these sites, is dominated by grasses and sedges. Characterizing and understanding the pedogenesis of this and other catenas could be used as a baseline for assessing the effects of management decisions, fire, and climate-change.

Subject Areas: Soil Resources Assessment and Management; Outreach, Education and Community Engagement

*denotes primary author

15. Assessment of Soil Sediments and Salinity Status of Wetland Landscape as Affected by Climate Change in South-Western Nigeria

Authors: Joseph Aruleba*, Ekiti State University; Samuel Ajayi, Ekiti State University

Abstract: The effect of climate change on soil sediments and salinity status presents a significant threat to a wide range and distribution of native plants and animals in Nigeria. Assessment of the status and management action is often required to mitigate the effects of soil sediments and salinity and ensure biodiversity conservation. Soil samples from five wetlands were subjected to routine chemical analysis and the parameters related to soil salinity: exchangeable cations, total dissolved solids (TDS), sodium absorption ratio (SAR), magnesium adsorption ratio (MAR), residual sodium carbonate (RSC), and phosphate, nitrate and sulphate contents determined. The soils had mean pH of 5.2 and TDS range of 125-247mg/l. All the salt index values were positive except in locations C. Mean SAR, and MAR were generally moderate to very high while phosphate, sulphate and nitrate contents were more than the tolerable limits. Exchangeable sodium percentage (ESP) estimated from the SAR was high in all sites. The salt index was high and ranged from 20.06-30.03. Salinity and luxury consumption of the concentrated nutrients make the soils unsafe for agricultural production as a result of the direct toxic effects on both plants and animals with threats to human health and loss of biodiversity. The study identified the sources of the high salt content to climate change characterized by erosion, flooding, increase temperature, decrease precipitation etc. Management practices recommended for soil sediment control and salinity mitigation include leaching of the soil with good quality water, phyto-remediation, avoidance deep tillage, use of organic residues, planting of tolerant crops etc. Keywords: Wetland, Salinity, Climate Change, Sediment control, Mitigation and Assessment

Subject Areas: Soil Resources Assessment and Management; Adaptive Management of Conservation Efforts; Biodiversity Conservation and Management; Conservation and Environmental Policy and Program Design

*denotes primary author

16. Biogeochemistry of Hydrothermally and Adjacent Non-Altered Soils

Authors: Robert Blank*, USDA-ARS; Dale Johnson, ; Tye Morgan, ; Kelli Belmont, ; Shannon Lencioni, ; Chris Pearson,

Abstract: As a field/lab project, students in the Soil Biogeochemistry class of the University of Nevada, Reno described and characterized seven pedons, developed in hydrothermally and adjacent non-hydrothermally altered andesitic parent material near Reno, NV. Hydrothermally altered soils had considerably lower values, relative to adjacent soil, including: pH's, bray-extractable phosphorus, soil-solution phosphorus, cation exchange capacity, exchangeable calcium and magnesium, and net 30-day nitrogen mineralization potentials. Coarse-fragments content, DTPA-extractable iron, and soil-solution sulfate were much higher on hydrothermally altered soils. These studies have utility in enhancing students understanding of soil biogeochemistry, but may also elucidate reasons rare endemic plants, such as Eriogonum robustum, occupy these hydrothermally altered soils.

Subject Areas: Soil Resources Assessment and Management

*denotes primary author

17. Nitrogen Slow-Release and Stabilizer Products for Grain Sorghum Production

Authors: Mark McFarland*, Texas A&M AgriLife Extension ; Dennis Coker, Texas A&M AgriLife Extension; Dennis Pietsch, Texas A&M AgriLife Research; Tony Provin, Texas A&M AgriLife Extension; Russell Sutton, Texas A&M AgriLife Research

Abstract: Nitrogen contamination of surface and groundwater resources is a major issue for agriculture. Grain sorghum is a rotational crop that can be used to recover residual N in the soil. Use of slow-release N fertilizers to supplement soil N could improve N use efficiency in grain sorghum and thus reduce total N rates and potential N losses to water resources. Field studies were initiated at three locations in the Central Texas Blackland Region with moderate N levels as determined by measurement of residual soil nitrate to a depth of 48 inches. Fertility treatments were rates of 0, 30, 60, 90 and 120 pounds of N per acre surface applied as liquid urea ammonium nitrate (UAN) alone or in combination with a urease-nitrification inhibitor injected below the soil surface. Additional treatments included surface-band application at planting or stage two of 30, 60, and 90 pounds per acre of granular urea and two slow-release N sources. Experimental units were arranged in a randomized complete block design and replicated five times. Total N in uppermost-expanded leaves, total N uptake in biomass, and grain were measured. Grain yield was not affected by use of slow-release products or addition of N stabilizers when compared to standard N sources.

Subject Areas: Soil Resources Assessment and Management; Water Resources Assessment and Management

*denotes primary author

18. Assessment and Management of a Degraded Utilisol for Fruit Crops Production in South Southern Nigeria

Authors: Omoyeni Opeyemi*, Ekiti State University; Joseph Aruleba, Ekiti State University; Vincent Aduramigba,

Abstract: Soil conservation sustainability is favored when the characteristics of the soil adequately match the requirement of the crop to be grown on a particular soil, therefore the suitability assessment of a soil is of paramount for a specific crop in any location.About 60ha farm of an ultisol in Southern Nigeria was suitability evaluated for fruit crop production on nearly flat to flat land with agro-ecological features adequate for most tropical fruit crops. Soil constraints are topsoil coarse texture, poor structure, extreme acidity, low basic caution content and CEC. Current soil chemical properties are the most critical soil fertility limitations in which Pedons 1 and 3 are respectively moderately suitable [S2f] and marginally suitable [S3f] for citrus, pineapple, plantain/banana while Pedon 4 is not suitable [NSf]. For mango, pear, guava and indigenous tree fruits, Pedons 2 and 4 are moderately suitable [S2f] and marginally suitable [S3f] respectively. Only pawpaw has climatic limitations. For marginally suitable [S3c, S3cf] and not suitable [NScf] pedons to be higly suitable or match the crop requirements in the study area, mulching and manuring to maintain soil organic matter at high levels should optimize soil reaction and so make liming unnecessary for citrus, guava, mango and pawpaw. Split application of appropriate N, K and Mg fertilizers and complementary manure – fertilizer use are recommendations for attaining potential suitability rating in the site. Keywords: Ultisols, Suitability, Evaluation, Fruits, Citrus, Suitable, Not suitable.

Subject Areas: Soil Resources Assessment and Management; Adaptive Management of Conservation Efforts; Biodiversity Conservation and Management; Conservation and Environmental Policy and Program Design

*denotes primary author

19. Using Rare Earth Elements (REE) to Determine Wind-Driven Soil Dispersion from a Point Source

Authors: R. Scott Van Pelt*, USDA-ARS; Melanie Barnes, Texas Tech University; John Strack, USDA-ARS

Abstract: Although erosion of soil by water is a predictably directional process, the erosion of soil by wind is determined by wind direction on an event-wise basis. The wind-driven dispersal patterns of chemical constituents including natural soil components and anthropogenic contaminants are not well understood. We applied a solution of $Er(NO_3)3$ to a 5 m2 (1.26 m radius) circle of soil in the center of a 50 m radius bare flat area of a field. The application resulted in a three order of magnitude increase in Er soil concentration in the application area. We employed a total of 30 BSNE sampler masts at 5, 20, and 50 m radii to determine horizontal mass flux and sediment Er concentrations on a weekly basis from February to June of 2011. Although Er tagged sediment was collected in every BSNE sampler mast during the course of the study, over 67% of the tagged sediment was driven beyond the eastern boundary of the field, indicating the dominant directions of sediment transport.

Subject Areas: Soil Resources Assessment and Management; Conservation Models, Tools, and Technologies

*denotes primary author

20. Incorporating Water Repellent Soils into Post Fire Erosion Predictions - A Case Study

Authors: Nathan Gardiner*, Texas A&M University; Bruce Herbert, Texas A&M University

Abstract: The development of water repellent soils is a common by-product of wildfires. Identifying areas of high erosion risk and accurately predicting overall erosion are key variables relating to revegetation and allocation of often scarce recovery resources. Yet, there is currently no standard practice for incorporating the development of water repellency or other fire induced property shifts into soil erosion prediction models. Following a 2011 wildfire near Bastrop Texas erosion predictions were generated by combining post fire vegetation maps, remote sensing fire intensity data, field measurement of post fire soil water repellency, and laboratory measurements of soil property shifts in a GIS-based RUSLE. The model results were validated qualitatively through field observations and photography. By incorporating vegetative cover the model presented here proved to be much better at predicting areas of high erosion than erosion predictions generated by Texas Forest Service immediately after the fire. Incorporating soil water repellency generally produced improved erosion predictions, but the relative importance on soil water repellency in erosion predictions proved to be rather small. Field observations indicated that small scale variations in topography were a far better predictor of erosion than soil water repellency or related soil property shifts.

Subject Areas: Soil Resources Assessment and Management; Adaptive Management of Conservation Efforts; Conservation Models, Tools, and Technologies

*denotes primary author

21. Soil carbon and nitrogen dynamics after six years of cover crop use

Authors: Francisco Arriaga*, Univ. of Wisconsin-Madison; Spyridon Mourtzinis, Auburn University; Kipling Balkcom, USDA-ARS

Abstract: The use of winter cover crops has many benefits. Among these is the increase in soil carbon accumulation. However, soil carbon and nitrogen dynamics, which influences microbial activity and nitrogen availability to plants, can be affected with cover crop use. A laboratory incubation study was conducted with soil collected from a field experiment that was established six years prior with the goal of examining the impact of rye (Secale cereale) as a winter cover crop. Treatments included: 1) rye retained in the field, 2) rye harvested in the spring, and 3) no cover control. Soil was incubated for 0, 30 and 60 days in a controlled environment. Respiration was measured with a sodium hydroxide trap and inorganic nitrogen with a colorimetric procedure after a potassium chloride extraction. Preliminary results indicate that soil carbon accumulation increased with the use of rye as a cover crop, even if it was harvested. Additionally, nitrogen availability was enhanced with cover crop use. Findings from this work highlight the importance and benefits of using a winter cover crop in agricultural fields.

Subject Areas: Soil Resources Assessment and Management; Conservation Models, Tools, and Technologies; Water Resource Assessment and Management

*denotes primary author

22. Optimizing Water Use Efficiency of Tomato Under Subsurface Irrigation with ET model

Authors: Bardia Dehghanmanshadi*, CSU-Fresno; Florence Sharma, CSU Fresno; Dave Goorahoo, CSU-Fresno; Touyee Thao,

Abstract: Agriculture is a major user of ground and surface water in the United States. However, with the increasing demand for water due to population growth and environmental issues as well as uncertainty linked with climate change, water allocation to the agriculture sector may be declining in the future. One approach is to imorove agricultural water use efficiency and optimizing estimation of crop water requirements to adapt evapotranspiration (ET) models. These models can be used to calculate crop water requirements in order to effectively schedule irrigation, by multiplying reference evapotranspiration (ETo) with coefficients specific to a particular crop (Kc). Coefficients have been calculated for many crops but were developed under very specific management practices that are not always applicable to current agriculture practices and irrigation management in California. Additionally, Kc is not available for many crops. Thus, the objective of our study was to develop new Kc for processing tomatoes grown under sub-surface drip irrigation. The Kc was obtained through lysimeter studies conducted during two growing seasons in Five Points, CA. Daily measurements of crop ET and ETo were collected to estimate these Kc. Weekly measurements of crop ground cover were also performed to derive relationships between Kc and fractional cover. The Kc reached a maximum value of 1.2 at mid-season and started decreasing about 3 weeks later. Collected data demonstrated that coefficients obtained at peak season were relatively higher than those generally reported for tomatoes. Results also showed good correlation between fractional cover and Kc ($r^2 = 0.91$). The Kc increased curve linearly until canopy reached about 75% of fractional cover. The results are important to schedule effective irrigation cycles and optimize the crop water use efficiency.

Subject Areas: Water Resources Assessment and Management; Conservation Models, Tools, and Technologies

*denotes primary author

23. Community Education for Watershed Management

Authors: Sydonia Manibusan*, University of Guam; Mohammad Golabi, University of Guam

Abstract: Accelerated sedimentation caused by human activity such as off-road vehicle use, burning, development on unprotected upland areas, and clear cutting have a strong impact on watershed dynamics on Guam. When soil is disturbed sediment is deposited onto the reef, which is smothered by sediment, killing organisms, and making them uninhabitable. Changing this activity requires education of the public on natural resources and encouraging efforts to reduce negative human impacts and promote actions to improve the island environment. This includes providing information about island watersheds and their issues. As such, we have developed a small scale, topographical model of the island of Guam in which the landscape of southern and northern Guam is presented at the local university campus (UOG). The model is surrounded by a moat representing the ocean and is equipped with rainfall simulators of local and island-wide rainfall with controlled time lapse simulating rainfall patterns. Toy sized off-road vehicles are introduced to areas where unprotected soil is disturbed and susceptible to erosion and sedimentation. Areas of the model are burned to represent the impacts of fire on erosion and sedimentation. Runoff in the model carries sediment to the surrounding ocean creating murky water to illustrate the immediate impact of disturbances (i.e. off-roading and burning) on the watershed and ocean. Vetiver grass (Vetiveria zizanoides) was used on the model to illustrate an erosion control method and minimize sedimentation. This model is used for public demonstration at the university during fairs and field trips for students and island residents to simulate concepts discussed in the classroom and literature. Through direct visual representation of human activities on watershed and reef systems the public, especially the youth, can be made aware of their impact on the environment and make educated decisions to minimize erosion causing activities such as off-roading and fires.

Subject Areas: Water Resources Assessment and Management; Outreach, Education and Community Engagement; Soil Resources Assessment and Management

*denotes primary author

24. The Tribal Approach to Understanding Non-Point Source Pollution in Nevada

Authors: Olin Anderson*, Pyramid Lake Paiute Tribe

Abstract: The Pyramid Lake Paiute Tribe is an early implementer of non-point source (NPS) pollution reduction, having adopted a NPS Assessment and Management Plan in 1994. The plan had objectives to reduce nutrients and other pollutants to the large desert terminus lake that gives the tribe its name. While many successes have been gained in terms of water quality and restoration of the populations of two species of listed fish, NPS pollution remains a problem on the Pyramid Lake reservation. This poster will present several years of research and two decades of water quality monitoring. It will also feature a photographic essay of current NPS issues and corresponding BMPs at Pyramid Lake, along the Truckee River, and in nearby snow-fed creeks and ephemeral streams. In the spring of 2013, the Tribe conducted a fresh look at NPS pollution in an Assessment Report, completed as a result of support from the U.S. Environmental Protection Agency. This poster will summarize the findings and outline the new and engaging way to involve the tribal community so they may better understand their own watershed, and their personal contributions to preserving and restoring water quality.

Subject Areas: Water Resources Assessment and Management; Adaptive Management of Conservation Efforts; Biodiversity Conservation and Management; Outreach, Education and Community Engagement

*denotes primary author

25. Denitrification in manure impacted riparian buffers of the South Atlantic Coastal Plain

Authors: Patrick Hunt*, USDA-ARS

Abstract: Riparian buffers within the South Atlantic Coastal Plain (SCP) perform the important ecosystem function of filtering nutrient runoff. Relative to nitrogen, their removal of nitrate via denitrification improves surface and groundwater quality. Yet, when denitrification is incomplete, there is the potential for emissions of the greenhouse gas nitrous oxide. A study was implemented along manure impacted riparian buffers of the SCP. These included crop production and pasture fields receiving poultry, swine, or beef manure. There were five points sampled along a topographic gradient (field to wetland) on each buffer. Emissions of nitrous oxide were sampled using static gas chambers with subsequent gas chromatographic analyses. The nitrous oxide emissions were below 5.0 mg N_2O m^{-2} d^{-1}. Soil samples from the surface (upper 10cm) were also analyzed for denitrification enzyme activity (DEA). The DEA values were < 800 µg N_2O kg^{-1} hr^{-1}. These values are consistent with significant denitrification without extraordinarily high emission.

Subject Areas: Water Resources Assessment and Management; Soil Resources Assessment and Management

*denotes primary author

26. Effects of tillage practices on annual runoff and phosphorus export through drainage tiles and surface runoff in Ontario, Canada

Authors: Merrin Macrae*, University of Waterloo; Richard Brunke, Ontario Ministry of Food, Agriculture and Rural Affairs; Michael English, Wilfrid Laurier University; Vito Lam, University of Waterloo; Kevin McKague, Ontario Ministry of Food, Agriculture and Rural Affairs; Ivan O'Halloran, University of Guelph; Gilian Opolko, Wilfrid Laurier University; Chris Van Esbroeck, University of Waterloo; Yutao Wang, University of Guelph

Abstract: There is uncertainty regarding the relative contributions of surface runoff and runoff through drainage tiles to the export of particulate (PP) and dissolved (DP) forms of P. There is also uncertainty regarding whether management practices such as tillage affect the partitioning of runoff and P export via these pathways. Recent scientific evidence suggests that no-till fields, which reduce erosion from the soil surface, may increase losses of dissolved P in tile drain effluent. This has not yet been proven for Canadian (Ontario) climates and soil types, where most annual runoff occurs outside of the growing season and a significant portion of annual runoff and nutrient losses occur during the spring freshet. The objectives of this research are to provide estimates of annual runoff and P export rates in drainage tiles and overland flow from sites in Ontario. Sub-objectives of these studies include determining the effects of tillage practices on P export and the relative contributions of surface runoff and tile drainage to field scale biogeochemical losses. Six sites across Southern Ontario have been instrumented with runoff monitoring equipment, automated water samplers and meteorological stations to collect high-frequency data year-round. Results demonstrate that hydrologic events trigger a rapid increase in P concentrations in drainage tile effluent, although this does not occur for very small events. Within a field, P concentrations and runoff are greater in tiles found at the downslope end of fields, but do not appear to be affected by tillage practices at our sites. Phosphorus concentrations are much greater in overland flow than in tile drain effluent; however, overland flow occurs during less than 20% of hydrologic events per year. The effects of season, event type, antecedent moisture conditions and tillage type on the magnitude and speciation (dissolved, particulate) of P fluxes are discussed.

Subject Areas: Water Resources Assessment and Management; Soil Resources Assessment and Management

*denotes primary author

27. The National Water Quality Initiative

Authors: Erika Larsen*, USEPA; Katie Flahive, USEPA; Karma Anderson, USDA

Abstract: In 2012, the United States Department of Agriculture (USDA) launched a National Water Quality Initiative (NWQI). The Natural Resources Conservation Service (NRCS) is collaborating with the Environmental Protection Agency (EPA) and state water quality agencies to reduce non-point sources of nutrients, sediment, and pathogens related to agriculture in small priority watersheds in each state. These priority watersheds are selected by NRCS State Conservationists in consultation with state water quality agencies and NRCS State Technical Committees. One to three priority watersheds were initially selected in each State. NWQI provides a means to accelerate voluntary, private lands conservation investments to improve water quality and to focus water quality monitoring and assessment funds where they are most needed. The NWQI assists producers with addressing water quality resource concerns related to high priority waters in the following categories: 1) Impaired- watershed documented as impaired and identified on 303(d) list, a list of waters not meeting, or not expected to meet applicable water quality standards, 2) Threatened- watershed documenting an impairment but does not have a Total Maximum Daily Load (TMDL) Implementation plan and is non on the 303(d) list, 3)TMDLs- a watershed that has been on 303(d) list of impaired waters but may have been removed because there is a TMDL, and 4) Critical- watersheds upstream of an impaired segment and is a significant contributing source of the downstream impairment for a stream in one or more the categories above. USDA is designating approximately five percent of EQIP financial assistance to targeted agricultural conservation practice implementation in NWQI watersheds. NRCS has dedicated funding for Edge-of-Field monitoring of conservation systems in NWQI watersheds. State agencies will use 319 or other funds to track progress through in-stream and watershed level water quality monitoring in one watershed per state.

Subject Areas: Water Resources Assessment and Management; Adaptive Management of Conservation Efforts

*denotes primary author

28. The Implementation of the New Kentucky Nitrogen and Phosphorus Index to Reduce Agricultural Nonpoint Source Pollution

Authors: Tibor Horvath*, USDA NRCS; Jorge Delgado, USDA-ARS; Carl Bolster, USDA ARS

Abstract: A new study released in September 2011 by the USDA found that all of three best management practices (BMPs) for nitrogen in terms of application rate, time, and method, are done for only about a third of U.S. cropland (http://www.ers.usda.gov/Publications/ERR127/). Without BMPs, the potential for nitrogen losses and negative environmental impacts such as contaminated groundwater increases (e.g., http://groundwaternitrate.ucdavis.edu/). It is important to apply BMPs to reduce nitrogen losses, and the USDA recently published an article about new nitrogen tools that can help their users assess the effects of BMPs (http://www.ars.usda.gov/is/AR/archive/sep11/nitrogen0911.htm). Another nutrient related to water quality is phosphorus, and the Phosphorous Index is another tool that can be used to assess the risk of losses for this nutrient (Sharpley et al. 2003). One tool that can help assess the risk of nitrogen losses to the environment is the new Nitrogen Index, which was just revised and released in 2012 for laptop and desktop computers (http://ars.usda.gov/npa/spnr/nitrogentools). This tool was also released in 2012 as the first nitrogen loss risk assessment tool for mobile phones (the Nitrogen Index smart phone application, or "app"). The Nitrogen Index application was developed for Android™ devices and can be downloaded for free at the Google Play™ website (https://play.google.com) using the search term, 'Nitrogen Index'. In order to facilitate the assessment of the risk of the losses of nitrogen and phosphorus to the environment we recently developed a new cutting-edge prototype of the Nitrogen and Phosphorus Index for the state of Kentucky. This tool was transferred to USDA-NRCS Kentucky in December 2012.

Subject Areas: Water Resources Assessment and Management; Adaptive Management of Conservation Efforts

*denotes primary author

29. What Happens When Snow Melts? Winter Phosphorus Export from Cropland in Southwest Wisconsin

Authors: Randy Mentz*, Univ of Wisconsin-Platteville; Mike Penn, Univ of Wisconsin-Platteville; Paul McGinley, Univ of Wisconsin-Stevens Point; Dennis Busch, UW-Platteville; Andrew Cartmill, UW-Platteville

Abstract: Winter precipitation and snowmelt runoff are important sources of agricultural phosphorus (P) loss. Edge-of-field instrumentation was installed at multiple locations to measure winter runoff (quality and quantity) at Pioneer Farm, University of Wisconsin-Platteville, in 2002. Pioneer Farm is a 430-acre mixed-livestock farm, with 75% under row-crop production in a corn and alfalfa rotation. Edge-of-field runoff monitoring indicated that approximately half of annual runoff occurs in winter. Sediment loss was generally low. Although higher P losses were measured over the study period, mean losses over time were well under the 6 lb/acre benchmark of the Wisconsin Phosphorus Index. Phosphorus losses varied between fields and years. The majority of the P lost was in dissolved form, which is readily available to aquatic plants. In summary, snowmelt runoff has the potential to convey large dissolved P export pulses to rivers and lakes at the critical period of increased plant and algal growth prior to the recreational season.

Subject Areas: Water Resources Assessment and Management; Conservation Models, Tools, and Technologies; Conservation Innovation Grant (CIG) Related Projects

*denotes primary author

30. Mapping rice paddy and winter waterfowl hydroperiod in the USA with multiscale satellite imagery

Authors: Nathan Torbick*, AGS

Abstract: Flooding of rice paddies and wetland habitat in the Sacramento Valley, California and mid-south (USA) is complex involving agricultural production, conservation, water demands, and public health. Paddies can undergo flooding for multiple reasons including crop decomposition and soil preparation, greenhouse gas emissions management, and promotion of migratory waterfowl habitat. For these reasons the mapping of rice and wetland habitat flood conditions is needed to help guide decision making. In this research application we assess the ability of Landsat, MODIS, and PALSAR to characterize rice paddy and wetland habitat flood patterns across rice in the USA. We compare the use of multi-temporal PALSAR dual-pol (HH, HV), fine-beam strips, Landsat TM and ETM+, and MODIS to characterize paddy hydroperiod (flood length and frequency) across rice paddies and wetland habitat. A series of systematic classifications were executed using the imagery to determine the strengths and limitations of the remotely sensed data. Fallow rice fields that were flooded presented the most challenging class to accurately map in an operational context. The results show more than 400,000 acres of rice paddies underwent winter flooding across California with one third of paddies receiving repeated maintenance applications throughout the winter season. With the growing availability of SAR and optical sensors, accurate mapping of wetland and rice flooding regimes across the USA is feasible.

Subject Areas: CIG (Conservation Innovation Grant) Related Project

*denotes primary author

31. Demonstration of winter cover crops and evaluation of their environmental effectiveness on improving water quality on a working Demonstration Farm in the Mackinaw River watershed, Illinois

Authors: Krista Kirkham*, The Nature Conservancy; Maria Lemke, The Nature Conservancy; Kent Bohnhoff, Natural Resources Conservation Service; Shalamar Armstrong, Illinois State University; Mike Wallace, University of Illinois; David Kovacic, University of Illinois

Abstract: The use of cover crops on agricultural lands has been identified as an important management practice with potential to improve water quality by reducing nitrogen leaching and sediment transport. With 80% of land use in Illinois designated as farmland, it is an ideal landscape to promote cover cropping to address local and national water quality concerns. However, few (16%) farmers use cover crops in IL, partly due to concerns regarding potential short time frames between planting and spring removal. Our goals are to demonstrate the value and usability of cover cropping to IL farmers and to measure environmental efficacy of cover crops at reducing nitrogen export from tile-drained lands. The project site is a research and demonstration farm in Lexington, IL, where 6 years of research has been conducted on the effectiveness of constructed wetlands at reducing nutrient runoff from tiles. Since 2005, the farm has hosted dozens of tours and been the focus of local, state, and national presentations and media outlets. Research at this site has shown that wetland to watershed ratios of 3% to 9% remove 19-47% of nitrate nitrogen and 49-58% of orthophosphorus loadings exported by tiles. The East and West were used as treatment and reference sites for our cover crop study. Cover crops were planted on 18 acres that drain into the East wetland in 2011 (cereal rye and radish) and 2012 (annual rye grass). To measure the effectiveness of cover crops in reducing nutrient runoff and improving soil quality, samples were collected at tile outlets and field transect sites (soil temperature, soil nutrients, cover crop production) for the treatment and reference fields. Dry soil conditions yielded low cover results thus far; however, soil sampling after 1 year of cover crops indicated significantly higher extractable phosphorus values in cover crop soils compared to control, while soil nitrate values are significantly lower in cover crop soils compared to control.

Subject Areas: CIG (Conservation Innovation Grant) Related Project; Outreach, Education and Community Engagement; Water Resources Assessment and Management

*denotes primary author

32. Integrating Soil, Crop and Pest Monitoring Using Spatial Technology on Arkansas Cotton Farms to Achieve Nutrient Loss Reduction

Authors: Tina Gray Teague*, Ark State Univ -U Ark Exp Sta; Erin Kelly, Arkansas State University - UA Division of Agriculture; Michele Reba, USDA-ARS-Watershed Physical Processes Research Unit; Calvin Shumway, Arkansas State University - UA Division of Agriculture; Jennifer Bouldin, Arkansas State University - UA Division of Agriculture; Keith Morris, Arkansas State University; Leo Espinoza, University of Arkansas Division of Agriculture, Cooperative Extension Service

Abstract: This poster summarizes the first year of a two-year CIG funded project focused on encouraging Midsouth cotton producers to expand adoption of nutrient management practices to increase fertilizer use efficiency and reduce nutrient yield from their farms. Conservation practices include use of spatial technology in an adaptive nutrient management approach that will ultimately employ site specific fertilization based on directed soil sampling and zone management. Our assumption is that if there is increased fertilizer use efficiency from adopting site specific nutrient management, this also will lead to reduced nutrient yield from the land. Wheat cover crops are included and considered a critical management practice in improving water and soil conservation efforts. Also included are crop monitoring with COTMAN for decision-making on crop protection from insect pests and irrigation timing. Three cooperating producers selected the paired fields on each farm in 2011. Fields had been precision leveled and had a single outlet structure for automated samplers and sensors for water quality assessments. Fields were classified into management zones based on soil electrical conductivity (EC) properties collected from measurements using a dual depth Veris® 3150 Soil Surveyor. The results from 2012 were encouraging as differences in crop and pests among management zones were observed. Plants growing in coarse sand and clay textured soil had slower nodal development, fewer nodes and earlier maturity than plants in other management zones. Yields were lower in those zones. Cover crops did not impact yield but did affect insect pests; cover crops reduced risk from early season thrips. We have assembled an exceptional team for this project. With the help of our cooperating producers and crop advisers, we are using on-farm measurements to document progress our US cotton producers are making toward more sustainable cotton systems.

Subject Areas: CIG (Conservation Innovation Grant) Related Project; Adaptive Management of Conservation Efforts; Soil Resources Assessment and Management; Water Resources Assessment and Management

*denotes primary author

33. Affordable Edge-of-Field Monitoring: A Three-State Project to Promote and Evaluate a Simple, Inexpensive, and Reliable Gauge

Authors: Ben Brown*, Univ of Wisconsin-Platteville; Randy Mentz, Univ of Wisconsin-Platteville; Dennis Busch, UW-Platteville; Mark Tomer, USDA/ARS; Adam Birr, Minnesota Department of Agriculture

Abstract: Edge-of-field runoff monitoring provides high-quality, valuable data to producers, researchers, and government agencies; however, collecting this data can require significant investments in equipment and labor. There is a need for more cost-effective surface-water monitoring solutions, especially among conservation-oriented organizations with limited budgets. The objective of this project is to field-test a prototype gauge designed to reduce costs while adding features that improve functionality. Cost savings are achieved by simplifying station operation, substituting expensive multipurpose components with inexpensive, low-cost components, and using methods that reduce labor input. A new, low-profile flume is installed below-grade where feasible. This will reduce ponding and hydraulic head pressure upstream of the station, eliminating the need for tall wingwalls and long earthen berms. A hydronic heat system is integrated into the flume and will provide the means to quickly remove ice when prepping a station for runoff. Intial performance results indicate that the prototype system will provide an effective alternative to other accepted methods that are more costly. Funding is being provided by a NRCS Conservation Innovation Grant, the Iowa Soybean Association, the Minnesota Department of Agriculture, Hewitt Creek Watershed Improvement Association, UW-Platteville Pioneer Farm, Minnesota Nature Conservancy, Fillmore SWCD, and Goodhue County SWCD.

Subject Areas: CIG (Conservation Innovation Grant) Related Project; Water Resources Assessment and Management

*denotes primary author

34. Effects of Corn Stover Removal on Yields in a Notill Management System

Authors: Gary Varvel*, USDA-ARS; Ken Vogel, USDA-ARS; Rob Mitchell, USDA-ARS; Ron Follett, USDA-ARS

Abstract: Crop residues such as corn stover are viewed as an abundant and inexpensive source of biomass that can be removed from fields to produce bioenergy. Assumptions include that with minimum or no-tillage farming methods, there will be no deleterious production or environmental effects. A long-term field study was established in eastern Nebraska using no-till corn on a non-irrigated site, marginal for row-crop production. Our objective was to determine corn stover removal effects on corn grain and stover yields. Corn, under no-tillmanagement was grown at three N fertilizer levels. Results from the study, which has been conducted since 2001 (a period including several drought years), will be presented.

Subject Area: Adaptation and Mitigation Planning for Drought

*denotes primary author

35. Drought Survival and Perennial Grass Success in the Face of Cheatgrass Invasion: Germination, Emergence, Seedling Die-off and Reproduction

Authors: Dan Harmon*, USDA ARS; Charlie Clements, USDA ARS

Abstract: Cheatgrass (*Bromus tectorum*) dominance and competitiveness is often attributed to early (Fall) germination. We hypothesize that cheatgrass germinates earlier compared to 3 common restoration perennial grasses ('Hycrest' crested wheatgrass *Agropyron desertorum* x critatum, squirreltail *Elymus elymoides*, bluebunch wheatgrass *Psuedorogenaria spicata*). We however also hypothesize that germination is not the limiting factor but rather seedling desiccation. Using field soil (15ft^3 box), 4 species (Cheatgrass, 'Hycrest' crested wheatgrass, squirreltail and bluebunch wheatgrass) were seeded into 4 soil types (12 soil boxes). In total, 120 seed caches (25 seeds/cache) were buried for each species. Every two weeks (Nov-April) germination, emergence and seedling survival were observed and soil temperature and moisture percent were monitored. Precipitation events provided the only water. Cheatgrass germinated first at colder temperatures (Feb, low -3C:high 3C) compared to perennials (March, low 1C:high 4C). By March 1st (7% soil moisture) the percent of total seeds germinated was Cheatgrass 46%, Bluebunch 27%, 'Hycrest' 19% and squirreltail 17%. The percent of 120 caches exhibiting germination was similar between species (Cheatgrass 71%, Bluebunch 71%, 'Hycrest' 62% and squirreltail 62%). By April 10th (3% soil moisture) the native grasses lost 10% of recruitment at emergence (percent of caches emerged: Cheatgrass 69%, Bluebunch 64%, 'Hycrest' 63% and squirreltail 53%). By July 20th soil moisture was 2% and seedling die-off was drastic (percent surviving plants: Cheatgrass 32%, Bluebunch 10%, 'Hycrest' 22% and squirreltail 11%). Reproduction comparisons are disparate (Total number of 120 caches that flowered: Cheatgrass 35, Bluebunch 0, 'Hycrest' 5 and squirreltail 0). Based on the results, our hypotheses are supported. Drought was the greatest cause of failure. Thus drought tolerance should be paramount in restoration plant material decisions and research.

Subject Area: Adaptation and Mitigation Planning for Drought

*denotes primary author

36. Evaluating the efficiency of different drought indices in the city of Shiraz and choosing the most appropriate one

Authors: Foad Foolad*, UNL; Fatemeh Saadat Hosseini,

Abstract: Drought is a repetitive climate aspect and in a general term it can be said that drought is reduction in precipitation and lack of water supply. Since Iran is located in a dry and semi arid region it has experienced drought in recent years. Multiple and pervasive droughts in recent years has been in such a way that drought has become a normal climate phenomena in Iran. So forecasting and analyzing drought is the most important coping strategy, and it can reduce damages caused by drought. Considering the specific location of the Fars province, investigating drought effects and finding the most appropriate drought monitoring index would be of a great help to manage drought in the region. In this regard, the goal of this study is to study features of precipitation in the city of Shiraz and investigating the performance of different drought indices in the Shiraz region and choosing the most appropriate index by using Spearman rank correlation coefficient. For this purpose, Z-Score index, standardized precipitation index (SPI), deciles of precipitation index (DPI), percent of normal precipitation index (PNPI) and rainfall anomaly index (RAI) were studied and in order to choose the most appropriate index, correlation rate among drought indices ranks and precipitation changes in the statistical period of the studied region, was calculated using Spearman rank correlation coefficient and it became clear that DPI index is able to evaluate droughts in the region more efficiently. Key words: Drought, Drought indices, Shiraz, Spearman rank correlation coefficient.

Subject Area: Adaptation and Mitigation Planning for Drought

*denotes primary author

37. International Cooperation for Climate Change Mitigation and Adaptation Using Conservation Agriculture in North America

Authors: Jorge Delgado*, USDA-ARS; Uriel Figueroa Viramontes, INIFAP, La Laguna, Matamoros, Coahuila, Mexico; Daniel Lapidus, USDA-FAS, Washington D.C. ; Jorge Etchevers, Colegio de Postgraduados, Chapingo/Montecillo, Mexico; Alejandro Camalich , SAGARPA, Mexico City, México; Adriana Otero, USDA-FAS, Mexico City D.F., Mexico; Adam Branson, USDA-FAS, Mexico City D.F., Mexico

Abstract: Recent reports suggest climate change will impact agricultural systems, impacts that could threaten food and national security, especially via extreme events (e.g., the 2012 drought) that could reduce field-level grain production (Lal et al. 2012). Projections for the western U.S. and northern Mexico suggest increased drought in some areas, which will further stress systems already stressed by lower availability of water. Delgado et al. (2011) reported that applying good policies and practices for air, soil, and water conservation will be necessary for mitigation of and adaptation to climate change. Research has shown that Conservation Agriculture (CA) for climate change adaptation must be implemented if we are to increase productivity and the potential to achieve food security under climate change. The U.S. and Mexico are cooperating in a new, joint program to expand the implementation of CA for climate change adaptation across Mexico. The program will also cover the use of tools to aid communication between extension and farmers. The Mexico Nitrogen (N) Index has been used in Mexico to assess the risk of N losses. Similar indexes are also being used in different regions of the U.S. by NRCS and others to assess management and risk of N and phosphorus (P) losses. As part of this cooperation, a new, improved version of the Mexico N Index will be developed to include: i) an N_2O index; ii) a sustainability index; iii) capability of making nitrogen fertilizer recommendations; and iv) a P index. A prototype of the new Mexico N Index will be presented. Preliminary results from evaluation of this index suggests it can help assess the effects of management practices on nitrogen use efficiency and sustainability, as well as make recommendations for N inputs in agricultural systems. They also suggest that this index could help enhance communication between technical personnel and farmers across Mexico, and increase application of CA for climate change adaptation.

Subject Area: Adaptation and Mitigation Planning for Drought

*denotes primary author

38. Membrane Installation Approaches for Increasing Soil Water Holding Capacity in Highly Permeable Soils

Authors: Alvin Smucker*, Michigan State University; Ted Zobeck, USDA-ARS; R. Scott Van Pelt, USDA-ARS; John Burnham, Burnham Soi and Water Management

Abstract: Irrigation water sources face declines and greater demands by competing municipal, industrial, or commercial interests. Droughts, increasing commodity prices, shortages of high producing agricultural lands for both food and cellulosic biomass, increasing nitrogen fertilizer costs combined with growing global food and energy demands require the commercialization of new sustainable technologies that provide essential soil, water and nutrient conservation while expanding crop production. Researchers at Michigan State University and the Texas High Plains USDA have successfully installed and field tested novel installations of water saving membranes that reduce deep leaching similar to natural Bt horizons in soil profiles. Soil water retention technology (SWRT) membranes are long-term sustainable improvements that double soil water holding capacity in the root zones of medium and coarse textured sands. Strategically placed soil water retention membranes enhance crop productivity by significantly reducing plant drought and supplemental irrigation frequency with resultant 174% and 145% increases in the yields of corn and cucumber. Water saving membranes uniformly retain and re-distribute soil water via natural capillary distributions to plant roots, supplying water to plants in a manner that greatly improves water use efficiency in highly permeable soils. Greater soil water retention reduces plant root competition for plant photoassimilates augmenting aboveground plant biomass and grain yields. Video and graphic descriptions will demonstrate installation of highly functional water conservation practices for permeable soils across the USA and globally.

Subject Area: Adaptation and Mitigation Planning for Drought

*denotes primary author

39. Nitrous Oxide Emissions from Winter Wheat during drought

Authors: Tracy Wilson*, Oklahoma State University; Jason Warren, OSU; Bill Raun, Oklahoma State University

Abstract: Nitrous oxide (N_2O) is an extremely potent greenhouse gas (GHG), 310 times more potent than carbon dioxide (CO_2) and is currently the number one ozone depleting GHG. Global climate change is driving a need to understand N_2O emissions from cropping systems and methods of reducing the emissions. In 2011, vented gas collection chambers were installed in a long-term winter wheat fertility trial in Stillwater, OK. Emissions of N_2O were monitored from 4 nitrogen fertilization rates, 0, 40, 80 and 120 lbs N/ac (120 lb rate was split applied) for 7 days following N application then once weekly for the remainder of the year. Data collection continued for 2012 and will occur through 2013. The data from 2011 and 2012 will allow producers and policy makers to be aware of N_2O emissions that will occur even during drought.

Subject Area: Adaptation and Mitigation Planning for Drought

*denotes primary author

40. Identification of Hydrologic Drought Triggers from Hydro-climatic Predictor Variables

Authors: Meenu Ramadas, Purdue University; Rajib Maity, Purdue University; Indrajeet Chaubey*, Purdue; Carol Song, Purdue University; Dev Niyogi, Purdue University; KrishnaKumar Nedunuri, Central State University; Rao Govindaraju, Purdue University

Abstract: In this study, we describe a method for identification of triggers for streamflow-related droughts by utilizing statistical methods that identify patterns in various hydro-climatic variables that result in low streamflow values. From a host of probable input variables, Principal Component Analysis is utilized for predictor selection. The joint dependence between the first few principal components (that explain over 95% of the variability in the predictor set) and streamflows is computed by a scale-free measure of association using asymmetric Archimedean copulas over two study watersheds in Indiana, USA. This dependence is suitably inverted to find expected values and ranges of predictor hydro-climatic variables for different streamflow quantiles. This information is translated to drought triggers for one-month lead time over the study areas. Results show that this methodology yielded good results for capturing the joint dependence behaviors for low flows leading to a promising method for trigger development for droughts at short lead times.

Subject Area: Adaptation and Mitigation Planning for Drought

*denotes primary author

41. An Integrated Weed Management Approach to Saltcedar Control: Controversies and the Definition of Success

Authors: Charlie Clements*, USDA ARS; Dan Harmon, USDA ARS

Abstract: Saltcedar (*Tamarix ramosissima*),is a small exotic tree that has invaded more than 1.9 million hectares in the western United States. The USDA-Agricultural Research Service has investigated potential bio control insects since the 1970's. In 2001 a leaf beetle (*Diorhabda elongata*) was released at 3 sites in northern Nevada. It established at 2 sites (Lovelock and Shurz). From 2000-2011 we monitored 100 trees at each site to record the effect of the beetle on salt cedar defoliation, death and the understory plant community. Measurements were taken annually (May 2001-2011). Death from defoliation was predicted to occur within 3-5 years (communication ARS bio control entomologists). Maximum defoliation (96-100% of tree) occurred to 54% of trees at Lovelock (2004) and 18% of trees at Shurz (2007). At Lovelock Saltgrass (*Distichlis spicata*) cover increased (2001: 9.26% vs. 2011:50%) and tall whitetop (*Lepidium latifolium*) decreased (2001:12.68% vs. 2011:0%) with defoliation. At Shurz understory cover fluctuated annually (2.99% to 0.01%, mostly *Bromus tectorum*). Our monitoring indicates a diverse and productive plant community is not released by the defoliation process. What further blurs the evaluation of control success is the controversy of "actual" tree death. A defoliated tree has tremendous potential to re-grow. Our observations found that regrowth is stimulated by dead stem removal, a necessity to perform any further management practices (e.g. revegetation seeding) (removal conducted by Lovelock landowners frustrated by the lack of plant community improvement provided by beetle defoliation). After clearing above ground salt cedar biomass, virtually all root crowns re-sprouted, leading to the requirement of herbicide control. In 2011 we began herbicide experimental trials at Lovelock to control the remaining saltcedar. Initial results indicate herbicide control without understory loss (salt grass, creeping rye) is difficult however achievable.

Subject Areas: None of the above

*denotes primary author

42. Forecasting *Bromus Tectorum* and Fire Threat: Site Soil Type versus Population Traits

Authors: Dan Harmon*, USDA ARS; Charlie Clements, USDA ARS

Abstract: Cheatgrass (*Bromus tectorum*) is the most successful exotic species and greatest threat to the Intermountain west. It provides the fuel by which fire destroys large native habitats. Its success lies in the ability to build large persistent (>1 year) seed banks and an adaptive plastic nature. Plasticity of germination timing (Oct-June) and biomass do not halter seed production. It rarely desiccates before reproduction. In a drought, lack of germination has little negative effect due to the seed bank. In 2009 we began monitoring 15 cheatgrass populations. Five habitats were chosen (1:big sagebrush understory, 2:post burn, 3:silt salt desert, 4:sand salt desert, 5: pine forest)with 3 replicate sites for each. Habitats were discerned by soil types (nitrogen and water capacity). Based on field observations and a controlled greenhouse experiment using field soils, germination, biomass, and seed bank are all affected by soil type. Flowering was determined by parent seed. One population however (5: pine forest) had a heritable larger biomass (increased fire threat) (Population 5: 0.76g vs. Populations 1-4: 0.56g per plant) and delayed flowering (73 days vs. 32 days). Silty salt desert sites had the only summer (June) germination observed. We theorize the matrix potential of fine soils as a factor. Sandy salt desert populations lacked establishment during a drought year and had the smallest average seed bank (sand:7, silt:11, understory:15, pine forest:18, post burn:26 seeds/ft2). Sagebrush understory soils were the most productive, resulting in a larger biomass (fire threat) and seed production (Understory soil: 1.14g biomass/0.84g seed vs. 4 other soil types: 0.45g biomass/0.30g seed per plant). Reoccurring cheatgrass fires lead to restoration failure. Our research helps define the threat of cheatgrass based on soil type to improve the efficacy and predictability of restoration efforts so that prioritization of fire prevention and land management can occur.

Subject Areas: None of the above

*denotes primary author

43. Influence of *Bromus tectorum* invasion on Soil Properties in Northern Nevada

Authors: Robert Blank*, USDA-ARS; Tye Morgan, ; Kelli Belmont,

Abstract: In the last 50 years, the exotic annual grass, *Bromus tectorum*, has come to dominate rangelands over northern Nevada. Long-term occupation of soil by *B. tectorum* has the potential to alter soil processes particularly carbon and nitrogen cycles. Using a paired design, we compared surface soil properties (0-5, 5-10 cm) between cheatgrass invaded and nearby similar soil occupied by native vegetation for 9 sites in the northern Nevada. Response variables quantified included: total C and N, mineral N, labile C, and soil-solution anions. Pooled over site and depth, soils invaded by *B. tectorum* had significantly greater total C (1.78 vs. 0.93%), total N (0.145 vs. 0.080%), labile C (551 vs. 348 mg kg^{-1}), and solution phase ortho-P (71.6 vs. 36.5 µmol L^{-1}). Mineral N was much higher in soil beneath *B. tectorum* than soil beneath native vegetation (0.64 vs. 0.36 mmol kg^{-1}), but statistically similar. These data indicated the invasion by *B. tectorum* affects soil C and N cycles relative to native plant communities. Higher levels of labile C in invaded sites suggest faster turnover of C. These data were collected during a below average precipitation year and the study will be duplicated in a more normal year.

Subject Areas: None of the above

*denotes primary author

44. Evaluating Conservation Practices and Plant Material on Cheatgrass Invaded Landscapes: A 10 Year Case Study

Authors: Charlie Clements*, USDA ARS; Dan Harmon, USDA ARS

Abstract: Cheatgrass (*Bromus tectorum*), is an exotic and invasive annual grass that has spread across millions of hectares of Wyoming big sagebrush (*Artemisia tridentata* ssp. wyomingensis)/ bunchgrass rangelands throughout the Intermountain west. Cheatgrass provides an early maturing, fine textured fuel that increases the chance, rate, spread of wildfires. In 2000, at Orovada, Nevada, we began a conservation experiment involving herbicide application, plant material seeding and cheatgrass suppression monitoring. Because of cheatgrass densities (4,900/m^2) herbicide control ('Oust' .10 g/ha) was required prior to seeding efforts (>100 plants per m2 requires control treatment). Sixteen species (8 grasses, 4 shrubs and 4 forbs) were drill seeded and evaluated in regards to germination, emergence, establishment and cheatgrass suppression. Monitoring was conducted for 10 years. Post herbicide control cheatgrass plot densities averaged 9.24/m^2. Initially, 'Hycrest' crested wheatgrass (*Agropyron cristatum* x), 'Sherman' big bluegrass (*Poa ampla*) and bluebunch wheatgrass (*Psuedorogenaria spicata*) had the highest seedling density (2001: 16.5/m^2, 8.6/m^2, 4.6/m^2). Seedling density and mortality was monitored seasonally (2011-2010). In 2010, 'Hycrest' and 'Sherman' had the highest persistent densities (4.6/m^2 and 3.6/m^2). Both species were resilient to cheatgrass invasion and suppressed cheatgrass densities compared to control plots (cheatgrass density- 'Hycrest' plot:4.6/m^2, Sherman plot:3.6/m^2, control plot: 817.4/m^2). Other grass species that did not suppress cheatgrass below the 100 plants/m^2 conservation requirement were bluebunch wheatgrass (204/m^2) and squirreltail (*Elymus elymoides*)(301.62/m^2). Understanding the inherent potential of seed species to establish, persist and suppress cheatgrass is critical in evaluating conservation practices that attempt to reverse the tide of cheatgrass dominance, wildfires, and loss of critical wildlife habitats and grazing resources

Subject Area: Rangeland Conservation and Grazinglands CEAP

*denotes primary author

45. Chemistry of Through-fall and Stem-flow Leachate Following Rainfall Simulation over Pinyon and Juniper

Authors: Robert Blank*, USDA-ARS; Sam Lossing, Smith Creek Ranch; Mark Weltz, USDA-ARS; Tamzen Sringham; Shauna Uselman, USDA-ARS

Abstract: We hypothesized that leachate from pinyon and juniper canopies, following rainfall events, may contribute sizable levels of solutes and C to the soil surface. We quantified solutes and dissolved carbon in stem-flow (SF) and through-fall (TF) following replicated rainfall simulation events in a pinyon/juniper woodland of the Desatoya Range of Nevada. Except for nitrate and ortho-P, solute concentrations were affected by a significant tree species (pinyon, juniper) by collection location (SF, TF) interaction. Nitrate concentrations were significantly higher in leachate from juniper (95.0 µmol L^{-1}) than pinyon (29.2 µmol L^{-1}). SF leachate had significantly more ortho-P (18.9 µmol L^{-1}) than TF leachate (8.3 µmol L-1). In general, SF leachate contained greater concentrations of Ca^{+2} and Mg^{+2} (only for juniper), and SO_4^{-2}, K^{+} that TF leachate. Juniper trees were a considerable source of Ca^{+2} (SP=1.27, TF=0.21 mmol L^{-1}) and Mg^{+2} (SF=1120. TF=58 µmol L^{-1}); whereas pinyon trees were a sink or minor source of Ca^{+2} (SF=-0.028, TF=0.027 mmol L^{-1}) and Mg^{+2} (SF=-41, TF=5 µmol L^{-1}). For individual collection sites, dissolved C was higher in juniper leachate (SF=349, TF=87 mg C L^{-1}) than pinyon leachate (SF=124. TF=47mg C L^{-1}). These data support the hypothesis. Differences in solute concentration and dissolved C between pinyon and juniper may, overtime, affect soil properties and microbial activity.

Subject Area: Rangeland Conservation and Grazinglands CEAP

*denotes primary author

46. Effectiveness of Conservation Management for Decreasing Soil Loss in Runoff from Cattle Pastures

Authors: Daniel Pote*, USDA-ARS; Philip Moore, USDA-ARS; David Brauer, USDA-ARS

Abstract: Conservation efforts to decrease soil erosion and nutrient losses in storm runoff from pastures have focused primarily on diminishing soil surface damage caused by intensive livestock hoof action and on finding better methods for applying the nutrients necessary to sustain adequate forage production. Best management practices (BMPs) recommended to help address these problems include rotational grazing systems, exclusion zones, grass buffers, and riparian buffers; but the long-term effectiveness of these techniques has not been adequately assessed. To help fill this knowledge gap at the field scale, a USDA-ARS research team initiated a 15-year study in 2003 using 15 constructed watersheds at the Dale Bumpers Small Farms Research Center in Booneville, AR. Each 0.14-ha (0.35-acre) watershed was isolated by earthen berms topped with barbed wire fencing, and the downslope end was narrowed to direct all runoff through a fiberglass flume equipped with a pressure transducer and automatic water sampler for measuring runoff. All watersheds were hayed the first year while background data were being collected. During years 2-7, broiler litter was applied annually at 5.6 Mg/ha (2.5 t/a), and the following five watershed management strategies (each randomly replicated three times) were evaluated: hayed, continuously grazed, rotationally grazed, rotationally grazed with a nutrient-application buffer, and rotationally grazed with a fenced riparian buffer. Comparing results from grazed watersheds to those managed as hay fields showed that continuous grazing increased watershed soil loss by 200%, while rotational grazing with a fenced riparian buffer increased soil loss by only 40%. Successful completion of the research will provide NRCS field offices with tools they need to accurately identify the most effective and sustainable management practices for decreasing soil, water, and nutrient losses from livestock grazing systems.

Subject Area: Rangeland Conservation and Grazinglands CEAP

*denotes primary author

47. Comparison of a Multi Cone vs. Single Cone Penetrometer as Tools to Assess Grazing Compaction

Authors: Alex Cumbie, Oklahoma State University; Jason Warren*, OSU; Sumit Sharma, Oklahoma State University; Tracy Wilson, Oklahoma State University

Abstract: Producers concerns about compaction from grazing of no-till cropland in the Southern Plains results in significant resistance to the adoption of no-till in the region. Grazing alters the surface of a no-till soil in a number of ways. It reduces residue cover, which may promote the formation of crusts. Hoof action during wet conditions can cause irregularities in the soil surface that may result in non-uniform seed depth at planting of the following crop. And of course grazing can cause compaction of the soil surface. Compaction is generally evaluated using measures of bulk density or penetration resistance with a single cone penetrometer. The purpose of this study was to compare the cone index values collected using a single cone penetrometer to those collected using a penetrometer having 5 cones push into the soil surface simultaneously. Data was collected from cooperator fields managed as dual purpose no-till wheat. The use of a multi cone penetrometer may reduce data collection time and reduce variability that is often observed with a single cone system.

Subject Area: Rangeland Conservation and Grazinglands CEAP

*denotes primary author

48. Assessing the effectiveness of conservation practices on a working ranch in southeastern Arizona using the Rangeland Hydrology Erosion Model (RHEM).

Authors: Morgan Ross*, University of Arizona; Shea Burns, Agricultural Research Service ; David Guertin, University of Arizona; Mitchel Mcclaran, University of Arizona; Phil Heilman, Agricultural Research Service

Abstract: The Automated Geospatial Watershed Assessment tool (AGWA) was used to apply the Rangeland Hydrology Erosion Model (RHEM) on a working ranch to assess the effects of a suite of conservation practices. The ranch typically supports 100 head of cattle, and is located in southeastern Arizona along the San Francisco River (SFR), a major tributary to the Gila River (GR). The SFR was historically the only available water for the cattle. The SFR and GR are currently listed by the Arizona Department of Environmental Quality (ADEQ) as impaired for sediment and *E. coli* (a bacterial water quality standard), and the ranch was considered to be in poor rangeland health, especially along the SFR. The ranch received grants from ADEQ, Arizona Water Protection Fund, Natural Resource Conservation Service (NRCS), and U.S. Fish and Wildlife Service to install wells to provide water for cattle in the uplands away from the SFR, fence off the SFR riparian area, and restore riparian vegetation. The RHEM/AGWA tool was used to assess the potential effectiveness of the conservation practices on sediment yield to the SFR. Vegetation characteristics were sampled across the ranch using the NRCS Natural Resource Inventory procedures to determine the range of expected vegetation conditions (Poor – Excellent) and to parameterize RHEM. Five management scenarios were evaluated with RHEM/AGWA: Historic, New, No Grazing, Increase Grazing Intensity and Additional Riparian Buffers along tributary streams across the ranch. Vegetation condition (Poor – Excellent) was modeled based on distance to water (SFR and the new wells), slope gradient, and livestock exclusion. Results indicate that the New management scenario decreased sediment yield by 7% and the No Grazing management scenario decreased sediment yield by over 100% compared to the Historic management. The study provides a framework for representing the effects of conservation practices on erosion and sediment yields using the RHEM/AGWA tool.

Subject Area: Rangeland Conservation and Grazinglands CEAP

*denotes primary author

49. Spatial Scale of Drought in a Meso-Scale Southwestern Watershed

Authors: Haiyan Wei*, University of Arizona; Mitchel Mcclaran, University of Arizona

Abstract: Large and intense droughts raise concerns about appropriate management responses, but equally intense droughts may occur at smaller spatial scales, even when large droughts don't occur. We compare the spatial scale of drought between summer and winter seasons, and whether those patterns changed after the recent dry period began in 1996. We use two measures of dryness, Standardized Precipitation Index (SPI) and Palmer Drought Severity Index (PDSI) because the later includes temperature and soil water holding capacity (SWC). We define drought as the lowest 20th percentile (driest 15 y) in the 73 y record (1940-2012); summer is Jun-Sep and winter is Dec-Mar; and the data represent the 225 km^2 Santa Rita Experimental Range in southern Arizona, using monthly records from 22 gauges, temperature from PRISM, and SWC from a NRCS soil survey. SPI and PDSI were estimated separately for one hundred 2.25 km^2 cells using an interpolated precipitation and area-weighted SWC. We compare the frequency of small (22.5-45 km^2) versus medium (45-135 km^2) drought patches (contiguous cells). Patch size was greater using PDSI than SPI, and small drought more frequent than medium drought using SPI but less frequent using PDSI. Including the spatially uniform values of temperature in PDSI increased the continuity of drought cells. Small patches were more frequent in summer than winter (4 vs. 1% of years) using SPI, but less likely using PDSI (5 vs. 8%). Small droughts only occurred when the full-scale (225 km^2) was not in drought. Medium patches were more frequent in summer than winter (15 v 5%) using SPI, but less likely using PDSI (5 vs. 1%). More than 75% of medium patches occurred when the full-scale area was not in drought. Since 1996, patch size increased using SPI and PDSI, and the summer patches increased more than winter. Knowing that small areas of drought occur even when large areas are not in drought will help design pasture size, herd movement, and drought detection efforts.

Subject Area: Rangeland Conservation and Grazinglands CEAP; Water Resources Research, Education, and Outreach (NIFA Land Grand/Sea Grant 406 NRI)

*denotes primary author

50. Advancing the adoption and strategic placement of artificial nitrogen sinks

Authors: Arthur Gold*, University of Rhode Island; Kelly Addy, University of Rhode Island; Mark David, University of Illinois; Louis Schipper, University of Waikato; Brian Needelman, University of Maryland; Jill Raval, University of Rhode Island; Elissa Monahan, University of Rhode Island

Abstract: In watersheds that deliver elevated levels of agricultural nitrogen (N), constructed wetlands and denitrifying bioreactors hold great promise to sustain agricultural productivity while also protecting water quality. These "artificial N sink" systems are positioned to intercept drainage waters or N-rich groundwater and promote denitrification, the conversion of nitrate to N gases. Some of these practices are eligible for USDA EQIP support, but widespread adoption is stymied by critical knowledge gaps, including the seasonal performance of different designs in different settings, longevity of treatment and lack of design criteria. Our integrated research, extension and education project seeks to advance the adoption and strategic placement of appropriate artificial N sink designs. This poster will focus on our extension activities. Our efforts are informed by advisory teams of technical and implementation experts as well as by ongoing assessment of training and informational needs of our stakeholders. We surveyed stakeholders in May and October of 2012 and found that the preferred media to obtain information is websites. We have developed a website – www.artificialnsinks.org – to be the conduit of information to farmers, farm advisors, agencies, and educators. Sections of the website include a Frequently Asked Questions page to provide background information. We also developed a georeferenced International Atlas; by clicking on individual sites on the map, users can view contact information, read case studies, and link to additional resources. We are also building sections of the website for webcasts, fact sheets, course curriculum, technical summaries, geospatial and soil survey interpretation for particular locations for siting, and guidance documents. Immediate outcomes of our project will include increased stakeholder knowledge of the utility and placement of artificial N sinks as well as an increased ability to map specific locations suitable for these systems.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

51. Hydrologic simulation of drought in the Upper Colorado River Basin

Authors: Clyde Munster*, Texas A&M; Rachel McDaniel, Texas A&M; John Nielsen-Gammon, Texas A&M University; Tom Cothren, Texas A&M

Abstract: The Soil Water Assessment Tool (SWAT) hydrology model was calibrated and validated for drought conditions in the Upper Colorado River basin in Texas. The SWAT model was then coupled with a probabilistic meteorological weather forecast program that provided precipitation and air temperature inputs to the SWAT model. This NOAA ensemble forecast system accurately forecast meteorological conditions during periods of drought two weeks in advance for the Upper Colorado River basin. These inputs allowed the SWAT model to forecast hydrologic conditions in the Upper Colorado River basin two weeks in advance. Output from the SWAT model included; stream flows, soil moisture, evapotranspiration, groundwater levels, reservoir levels, and crop production.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

52. Stormwater Management Education in Nebraska: Integrating Extension, Teaching, and Research

Authors: David Shelton*, University of Nebraska; Kelly Feehan, University of Nebraska; Steven Rodie, University of Nebraska; Thomas Franti, University of Nebraska; Katie Pekarek, University of Nebraska; Bobbi Holm, University of Nebraska

Abstract: Stormwater management is a concern for communities with populations of over 10,000 largely because of mandates to reduce stormwater runoff volumes and associated pollutants. A University of Nebraska-Lincoln Stormwater Work Group was organized in 2006 to develop educational programs and materials to address stormwater management through green infrastructure and other BMPs. A USDA-NIFA grant titled "Improving and Conserving Water Resources through Stormwater Management Education for Community Decision Makers of Today and Tomorrow" was received in 2009 which further supported and greatly expanded work group efforts. This, coupled with support from numerous Nebraska communities, has successfully blended extension programming with university teaching and research. This synergy has helped communities more effectively manage stormwater quantity and quality while building a knowledge-base that will continue to support future initiatives and programs. Extension programs have included: presentations for design professionals, stormwater program managers, Master Gardeners, and homeowners; all-day rain garden workshops/installations; green infrastructure practice tours; rain barrel construction workshops; web-based resources; an interactive rain garden model; youth activities; and publications. Research projects are generating information on rain garden hydrologic and plant growth attributes. Academic programs in both landscape architecture and landscape horticulture are expanding curriculum in green infrastructure, low impact development, and stormwater BMP design and construction. Efforts have culminated in new course lectures as well as studio design projects that have addressed real-world client issues. Fundamentals of the strong integration of extension, teaching, and research; the multi-faceted products that have broadened the scope of urban-focused extension stormwater programming; and selected programming impacts will be illustrated and discussed.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

53. Factors Affecting Adoption of Nutrient Management Practices by Farmers and Homeowners

Authors: Laura McCann*, Univ. of Missouri; Robert Broz, University of Mo Extension

Abstract: Addressing water pollution from farms and lawns will require voluntary adoption of nutrient management strategies. Research on factors affecting adoption of some best management practices (BMPs) by farmers exists, but less research has been conducted on factors affecting adoption of BMPs by homeowners. Also, little information exists on the value of manure and compost as a substitute for commercial fertilizer. The overall objective is to use our research results to improve the design of policies, practices, and educational programs to promote voluntary adoption of environmentally sound practices and thus improve water quality. Specific objectives include: 1) Determine factors affecting adoption by corn farmers of plant tissue testing and nitrogen inhibitors using an existing USDA dataset, 2) Use the dataset to examine regional variation in manure and compost markets, 3) Determine factors affecting homeowner adoption of nutrient and stormwater management practices in the Hinkson Creek Watershed based on a mail survey, 4) Train new researchers in techniques relating to adoption and survey methods, 5) Incorporate on-going research results in the watershed into an existing hydrologic modeling course, 6) Create a course to give journalism students experience designing a media campaign to change homeowner behavior, 7) Collaborate with city and county officials to improve programs to increase homeowner adoption of nutrient and stormwater management practices, including development of a web “app” on fertilizer, and 8) Disseminate results on manure and compost markets by developing materials for the Livestock and Poultry Environmental Learning Center.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

54. Soil Water Repellency, Water Flux and Water Content in Soil of Three Ecosystems in the Lower Wisconsin River Valley

Authors: Birl Lowery*, Univ. of Wiscoonsin-Madison; Mario Flores-Mangual, Univ. of Puerto Rico, Mayaguez; James Bockheim, Univ. of Wisconsin-Madison

Abstract: Soil water repellency is a characteristic of some soils, especially when they become extremely dry; this drying triggers the hydrophobicity which can affect infiltration, soil water content, and even groundwater recharge. Vegetation type can also influence soil hydrophobicity. The objectives of this study were to: (1) determine water repellency of a sandy soil under three vegetation types, prairie, red pine plantation, and mixed vegetations; (2) determine the effects of the vegetation types on soil water content; and (3) explore if soil applied surfactant will reduce soil water repellency. The study was conducted on Sparta sand. Soil water content was monitored using time domain reflectometry probes. Soil samples were taken (0 to 70 cm) and analyzed using water drop penetration time (WDPT) and soil wetted area (SWA) methods. Soil hydrophobicity was greater in soil from the pine plantation when compared to the prairie and mixed vegetation. Water repellency as determined by WDPT method extended to deeper depths in the pine (35 cm) than in the prairie and the mixed vegetations (15 cm). The SWA under the pine plantation was significantly ($\alpha = 0.05$) less than under the prairie at 10- to 60-cm depths, and at the 10- to 50-cm depth for the mixed vegetations, suggesting possible differences in water repellency in the pine plantation at depths that the WDPT did not show. The difference in soil water repellency among vegetation types could be attributed to differences in the types of organic C. On the average soil water content was less in the pine than the other vegetation types. There was increased soil water storage in the prairie following of surfactant application, but not in other vegetation types.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

55. Good farmers in the U.S. Cornbelt

Authors: Jean McGuire*, Iowa State University; Lois Morton, Iowa State University

Abstract: Row crop production in the US Midwest is viewed as responsible for a myriad of water pollution issues within the Mississippi River basin and downstream locations such as the Gulf of Mexico. Currently a voluntary approach is being used to induce farmers to make changes in their production practices to reduce the migration of soil and crop inputs from cropland to ground and surface water enabling the transport of these pollutants to larger water bodies. Many attempts have been made to better understand how farmers can be motivated to adopt sustainable farm management practices to reduce or eliminate the flow of these pollutants from farmland. One concept, "the good farmer," is being studied in Europe, Australia and the United States as a framework to understand how farmers see themselves and the practice of agriculture. Scientists are using social psychological identity theory to better comprehend how farmers view themselves in regards to farm decisions and practices. A better understanding of farmers' views of themselves and the practice of agriculture offer opportunities to develop soil conservation and water quality improvement programs that farmers are more likely to adopt thereby increasing the sustainability of such programs. This poster provides the results of recent surveys of Iowa farmers and U.S. Cornbelt farmers on how they define "a good farmer."

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

56. Watershed Diagnostics For Improved Adoption Of Management Practices: Integrating Biophysical And Social Factors

Authors: Paul Leisnham*, University of Maryland; Hubert Montas, University of Maryland; Adel Shirmohammadi, University of Maryland; Thomas Hutson, University of Maryland; David Lansing, University of Maryland Baltimore County

Abstract: The goal of this proposal is to support the adoption and maintenance of targeted Best Management Practices (BMPs) for polluted areas by developing new GIS-based assistive tools that integrate biophysical and social factors. We will achieve this through a multi-level and collaborative combination of three objectives. 1. Social science research and education evaluating the attitudes and behaviors of agricultural producers and broader watershed citizens related to water quality and BMP adoption. 2. Biophysical research on a Diagnostic Decision Support System (DDSS) that includes an adoption behavior sub-model to strengthen the technical abilities of State and Federal partners to precisely target effective BMPs. 3. Extension and education of stakeholders in ecologically oriented water-quality assessment and management, environmental stewardship, and DDSS application. Extension will use findings from social research to develop and improve effective outreach strategies. The selected watershed for this study is the Choptank Basin, which is agricultural, impaired, and drains directly into the Chesapeake Bay. It has been the focus of considerable biophysical data collection and water protection efforts, which this study will leverage to develop a next-generation adaptive environmental management tool. This project involves close partnerships with State and Federal agencies, and they have already participated in developing the objectives. Agency partners will help us engage agricultural producers and broader community citizens.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

57. Water Quality Performance of Wetlands Receiving Nonpoint Source Loads: Nitrate Removal Efficiency and Mass Load Reductions Using Targeted Wetland Restorations

Authors: William Crumpton*, Iowa State University; Greg Stenback, Iowa State University

Abstract: Wetland restoration is a promising strategy for reducing surface water contamination in agricultural watersheds and in particular for reducing nitrate loads to the Mississippi River and its tributaries. However, adequate performance data are available for a relatively small number of systems receiving nonpoint source loads, and there is considerable variability in performance among wetlands. In order to better characterize nitrogen removal by wetlands receiving nonpoint source loads, we measured the nitrogen removal performance of wetlands receiving a wide range of hydraulic and nutrient loads. The wetlands were monitored as an integral part of the Iowa Conservation Reserve Enhancement Program (CREP) and were selected to provide a broad spectrum of major external forcing functions affecting wetland performance: hydraulic loading rate, residence time, nitrate concentration, and nitrate loading rate. Our objectives were to evaluate the effectiveness of the wetlands in reducing agricultural nitrate and total nitrogen loads and to identify primary factors controlling wetland performance. All of the wetlands monitored were effective in reducing nitrate and total N loads. Nitrate removal efficiency (expressed as annual percent mass removal) ranged from less than 10% to over 90% and was primarily a function of hydraulic loading rate (HLR) and temperature. Mass nitrate removal ranged from 200 to over 2000 kg N ha^{-1} $year^{-1}$ and was primarily a function of HLR, temperature, and nitrate concentration. Although we observed very high nitrate removal rates, performance measures (K and K20) were near the median reported for nitrate treatment wetlands and these high removal rates would be predicted based on the hydraulic and nitrogen loading rates of the monitored systems. Results demonstrate that wetlands can be effective sinks for nonpoint source nitrate loads across a wide range of conditions and that their performance is consistent with that of treatment wetlands.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

58. Potential Impact of Targeted Wetland Restoration on Nitrate Loads to Mississippi River Subbasins: Performance Forecast Modeling of Loads and Load Reductions

Authors: William Crumpton*, Iowa State University; Greg Stenback, Iowa State University; David Green, Iowa State University; Bradley Miller, Michigan State Univesity

Abstract: Non-point source nitrogen loads to surface waters in the Midwest Corn Belt are among the highest in the Mississippi River Basin, and are suspected as a primary source of nitrate contributing to hypoxia in the Gulf of Mexico. Nitrate is transported from cropland primarily via subsurface drainage, especially in extensively tile drained areas like the Corn Belt. As a result, grass buffer strips, woody riparian buffers, and many other practices suited to surface runoff have little opportunity to intercept nitrate loads in these areas. However, wetlands sited to intercept tile drainage have the potential to significantly reduce nitrate loads, and this approach is particularly promising for heavily tile drained areas like the Corn Belt. A performance forecast modeling approach is used to estimate the total nitrate reduction that could be achieved using wetlands as nitrogen sinks in tile-drained regions across the upper Midwest. Not only does the extent of tile drainage vary but also the efficacy of wetlands for nitrogen reduction varies across the region. This is because several primary determinants of wetland performance vary longitudinally across the upper Midwest, including volume and timing of “runoff”, nitrate concentration, and temperature. Our analyses suggest these factors would result in an order of magnitude range in mass nitrate removal per acre of wetland restored for different areas of the upper Midwest. The model was used to estimate the nitrate reduction that could be achieved using targeted wetland restoration in tile-drained regions of the upper Mississippi River (UMR) and Ohio River basins.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

59. Monitoring of On-Farm Water Storage Systems in Porter Bayou Watershed, Mississippi

Authors: Joel Paz*, Mississippi State University; Mary Love Tagert, Mississippi State University; Elizabeth McCraven, Mississippi State University; Richard Kirmeyer, Mississippi State University; Jonathan Pote, Mississippi State University

Abstract: Farmers in the Mississippi Delta region are faced with two major issues with regard to sustainably managing agroecosystems, namely, declining groundwater levels in the Mississippi Delta Shallow Alluvial Aquifer and nutrient loads into the Mississippi River and the Gulf of Mexico. On-farm water storage (OFWS) systems, which include a tailwater recovery canal and storage pond, offer farmers the benefits of providing irrigation water and capturing nutrient-rich tailwater from irrigated fields. The placement of these systems throughout a watershed can be better targeted if we can quantify the downstream nutrient reduction and water quantity effects of the technology. The objectives of this project are to estimate the amount of tailwater runoff that could be reused for irrigation and to examine the changes in nitrogen and phosphorus levels of effluent from OFWS systems. Monitoring of two OFWS systems, one on Metcalf Farm and one on Pitts Farm, in Porter Bayou watershed, Mississippi commenced in February 2012. The amount of water from OFWS systems used for irrigation was recorded throughout the 2012 growing season. Water samples from different points within the OFWS were collected every three weeks and analyzed for several water quality parameters. A total of 183.51 acre-feet of water from OFWS was used to irrigate corn and soybean grown on the 158-acre Pitts Farm, which translates to a savings of approximately 60 million gallons of water that were not pumped from the aquifer for irrigation. Effluent water from OFWS systems on Metcalf and Pitts farms had significantly lower nitrate and phosphorus levels compared to water that entered the systems.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

60. Long-Term Agro-ecosystem Research in the Upper Mississippi River Basin

Authors: Dennis Busch*, UW-Platteville; John Baker, USDA-ARS, Soil and Water Research Unit, St. Paul, MN; Gary Feyereisen, USDA-ARS, Soil and Water Management Research Unit, St. Paul, MN; Donita Cartmill, UW-Platteville; Andrew Cartmill, UW-Platteville

Abstract: The over-arching challenge facing agricultural production is one of demand for increased production framed within long-term resilience and sustainability. Understanding the long-term fluxes of nutrient, water, and carbon within an agro-ecosystem is fundamental in ensuring our long-term sustainable future. The goal of this proposed research is to reduce scientific uncertainty and understand how an agro-ecosystem will respond to change in land use, management practice, and climate change drivers, and develop meaningful, integrated, economic, social, and institutional instruments for the implementation of long term improved land and water resource use at the catchment, regional, and continental scale. The goal will be accomplished through our participation in the United States Department of Agriculture (USDA) Agricultural Research Service (ARS) Long Term Agro-ecosystem Research (LTAR) network. The initial network includes 10 nodes strategically located across the USA, one of which is the Upper Mississippi River Basin (UMRB), a collaboration of four sites. This LTAR partnership will utilize previously established and other long-term studies at these locations in Wisconsin, Minnesota, and Iowa to provide new insights on agricultural sustainability and productivity in the Upper Mississippi River Basin (UMRB).

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

61. Showing (Stream) Signs of Concern

Authors: Tom Buman*, Agren

Abstract: People have the most concern with the natural resources that they are: 1. Closest to….. 2. Identify with….. 3. Grew up and interacted in….. As conservation professionals we need ways to increase the status of natural resources in the world of public opinion. Public relations firms have countless ways to get a message into the minds of the public. But a major feature is all of them is: REPETITION. The Soil and Water Conservation Districts (SWCD) in Carroll County Iowa has developed an outreach project that provides that repetition message 24 hours a day, 7 days a week. The project is simply the addition of stream identification signs at both sides of a bridge along a creek, stream, or river. Adding stream signs gives that stream a unique identity. It is named and labeled, and therefore takes on an additional intrinsic value. By showing the stream has value, it then has importance that is worthy of personal and community concern. By “leveraging” dollars, the costs were spread widely. In Carroll County, the SWCD will put in $900 total for three phases of installation. The total material cost of the 68 signs installed on 34 bridges is $8,156, with an total project cost of $16,312. The SWCD share of the total project is only 5.3%. But it was critical that the SWCD take the lead. Neighbors, landowners, and people up and downstream of the bridge are interested in seeing the stream named and marked. Collectively, they put the pieces together and recognize their watershed, and what other streams merge into rivers and larger watersheds. Concern for streams starts at the local level.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

62. Social Capacity, Landscape-level Conservation and the Demonstration Watershed Approach: Case Studies in the Upper-Midwestern United States

Authors: Nicholas Babin*, Purdue University; Linda Prokopy, Purdue University; Nathan Mullendore, Purdue University

Abstract: Sites for landscape-level water quality improvement projects are often chosen based on "worst-first" criteria. However, when watersheds are prioritized for initiatives solely based on their level of physical impairment, the watershed's social capacity to support and adopt the particular suite of proposed strategies and practices is often ignored. This has been shown to lead to the dedication of large amounts of resources to watersheds that can only hope to produce minimal results, while more "recoverable" watersheds are overlooked. Less explored has been the topic of what criteria make for a watershed with high social capacity and the role of these criteria in selecting "demonstration" watersheds where novel practices can be piloted. This paper presents the results of one such approach. Key criteria employed to identify high social capacity for adoption of new landscape-level conservation practices are discussed. A comparative case-study of three "demonstration" watersheds in Iowa, Minnesota and Indiana "ground truths" these criteria as well as offers insights on opportunities and barriers for adoption of these emerging practices.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

63. Water quality and ecosystem services from landscape best management practices that enhance vegetation in urbanizing watersheds.

Authors: Shreeram Inamdar*, University of Delaware; Jules Bruck, U. Delaware; Doug Tallamy, U. Delaware; Sue Barton, U. Delaware; Joshua Duke, U. Delaware

Abstract: Landscapes in urban and suburban watersheds have increasingly become less diverse with adoption of a paradigm that replaces native plant communities with vast expanses of intensively-managed turf accentuated with non-native ornamentals. Such an intensive-management approach has not only degraded ecological health and integrity but also adversely impacted water quality and ecosystem services in urban landscapes. Here, we measure how greater vegetation diversity vis-à-vis a monoculture of intensively managed turf landscapes can influence – water quality, carbon sequestration, food-web complexity, pollination services, and pest-control benefits. In addition, we quantify the costs associated with such landscapes and through "demonstration gardens" highlight the value and approaches for enhancing biodiversity to homeowners and landscape professionals. To accomplish these tasks we have implemented six treatment watersheds – one in turf/lawn, two forested sites, one "urban", one meadow watershed, and one watershed with mixed landuse including a golf course. Water quality at the outlet of these watersheds has been assessed continuously using manual "grab" runoff sampling and automated YSI water quality sensors. Carbon sequestration has been measured for plant biomass along three 100 m transects in each of the two replicates for three treatments. Pest control services were compared in each treatment by sweeping vegetation in a standardized way along three transects in each of two replicates. Pollination services were compared across treatments indirectly by quantifying potential breeding sites in each habitat type. In 2012 we worked to install a demonstration garden at a residential subdivision - Applecross in Wilmington, DE. We created an informational handout Livable Ecosystems: A Model for Suburbia, and a website (http://sites.udel.edu/sld/) to offer additional information about our project progress.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

64. Online tool to help farmers reduce phosphorus and sediment loading in Owasco Lake, New York

Authors: J Archibald*, Cornell University; Todd Walter, Cornell University

Abstract: Owasco Lake Watershed is a 200 square-mile watershed in the Finger Lakes region of New York State dominated by dairy agriculture. The lake has problems with phosphorus (P) and sediment loading, primarily in the southern and Dutch Hollow tributaries of the lake, causing eutrophication and threatening the water supply of the surrounding municipalities. To address this problem, we have developed a real-time online mapping tool to highlight areas of the landscape that are predicted to generate runoff and potentially contribute nonpoint source contaminants to receiving waters. Activities, such as spreading manure or fertilizer, are discourages in these areas when runoff is likely to occur. We are currently in the process of identifying farmers to use the tool and give feedback about its usefulness in farm management. Further work will focus on measuring the water quality downstream of participating farmers and to determine the effectiveness of avoiding the runoff generating areas in controlling pollutant loading downstream. Stakeholder feedback will guide further development of the tool, both in terms of improving accuracy and developing the best user-interface to aid in decision-making.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

65. Water Sustainability in Desert Agriculture: Enhancing relationships and global competency of graduate students and faculty through collaboration with Israel

Authors: Sharon Walker*, UC Riverside; Moshe Herzberg, Ben Gurion University

Abstract: Through the USDA International Science and Education Program we are working to establish an international, interdisciplinary research and educational collaboration leading to innovative approaches for management of water for agricultural uses, essential both in Israel and the US. The effort is linking faculty and graduate students at the University of California, Riverside (UCR) and Ben Gurion University of the Negev (BGU) in Israel through the following mechanisms: 1) hands-on experience and exposure for students and faculty to Israel's water management and agricultural research and practices through short visits (faculty) and extended stays (students); 2) sharing curricular materials for undergraduate and graduate course development to enhance the international content of existing courses at both UCR and BGU; and 3) dissemination of information to assist US scholars in becoming acquainted scientifically and culturally with Israeli water management and research, particularly as it affects sustainable agriculture in desert regions. It is the goal of this project to result in a more informed scientific and engineering community at UCR, BGU, and beyond, but also lead to international relationship building and ongoing collaboration extending far beyond the grant period. A synopsis of the program activities will be shared in an effort to facilitate and assist others in developing similar programs and educational framework.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

66. A Management Tool for Small Community Onsite Wastewater Treatment Systems: The Community System Owner's Guide

Authors: Sara Heger*, University of Minnesota

Abstract: With over 25% of America's population being served by septic systems, the need for proper management is a key issue to accelerate adoption of current technologies and improve existing onsite wastewater treatment systems. This project is developing a wastewater decision-making tool for consumers and will transform rural wastewater management by creating the Community System Owner's Guide (CSOG) tool. The University of Minnesota's Onsite Sewage Treatment Program and its national partners are addressing the increased need for education and resource development resulting from EPA's "Voluntary National Guidelines for Management of Onsite and Clustered Wastewater Treatment Systems" (2003). Partnerships in Arizona, Iowa, Michigan, Minnesota, and North Carolina, along with the US EPA, are working together on this project to delivers a nationally relevant and locally customizable interface tool to facilitate the development of CSOGs. This project is bridging the gap between septic system professionals, regulators, and owners through the availability of sound management guidance from the system owner's perspective. This project's primary deliverable is a web-interface that empowers any consultant, engineer, septic professional, facilitator, or even an educated community member to become a CSOG developer and produce an expert-driven and locally-customized manual that outlines the management responsibilities, activities, and frequencies for any cluster soil-based wastewater treatment system in America.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

67. Developing Tools to Attenuate Emerging Contaminants in Onsite Wastewater Treatment Systems: Project Update

Authors: Gurpal Toor*, University of Florida; Yun-Ya Yang, University of Florida; Patrick Wilson, University of Florida/IFAS

Abstract: Contamination of groundwater from domestic wastewater-born trace organic compounds (TOrC) is an increasing concern. The overall goal of this project is to develop tools to attenuate TOrC from onsite wastewater treatment systems (OWTS) to protect drinking water supplies of rural populations. This presentation will discuss the findings of our ongoing research, for which we constructed three OWTS (1/3 of a household OWTS) that were 6-m long and 0.6-m wide: drip dispersal, gravel trench, and advanced system (with aerobic (lingo-cellulosic) and anaerobic (sulfur) medias). Each OWTS received 120 L of septic tank effluent (STE) per day (equivalent to maximum allowable rate of 3 L/ft^2/day). Soil-water samples were collected from the vadose zone using suction cup lysimeters and groundwater samples were collected using piezometers. Twelve selected TOrC (acetaminophen, bisphenol-A, caffeine, carbamazepine, 17β-estradiol, estrone, ethynylestradiol, ibuprofen, sucralose, sulfamethoxazole, salicylic acid, and triclosan) in STE, soil-water, and groundwater were analyzed by solid-phase extraction and liquid chromatography-tandem mass spectrometry (LC-MS/MS). Eleven of twelve compounds analyzed were detected in at least one STE and soil-water sample at concentrations in the low ng/L to low µg/L. No TOrC were detected in groundwater after seven-months of STE disposal in the mounds. As many TOrC are highly reactive (e.g., sorption and degradation), it may take time for these compounds to appear in the groundwater plumes of our OWTS. For our ongoing work to elucidate the mass balance and pathways of TOrC attenuation in drainfield of OWTS, three small mounds were also constructed and instrumented with multi-probe moisture, temperature, and EC sensors. Laboratory and field research is ongoing; the results of which will help contribute to our understanding of fate and transport of TOrC in OWTS and ways to protect groundwater from TOrC contamination.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

68. The Great Lakes Regional Water Program: Impacts and Next Steps

Authors: Rebecca Power*, University of Wisconsin-Extens; Thomas Blewett, University of Wisconsin-Extension; Joseph Bonnell; Richard Cooke, University of Illinois; Jane Frankenberger, Purdue University; Jenna Klink, University of Wisconsin-Extension; Faye Sleeper; Lois Wolfson, University of Minnesota

Abstract: The Great Lakes Regional Water Program is a partnership between the National Institute of Food and Agriculture National Water Program and the University of Illinois, Purdue University, Michigan State University, the University of Minnesota, the Ohio State University, and the University of Wisconsin. Since 2000, our primary goal has been to increase the impact of water research, campus-based education, and outreach programs initiated by the land grant universities and our federal, state, and local partners through development and implementation of collaborative initiatives that address national priority issues. Our poster highlights impacts from three multi-state initiatives: the Midwest Cover Crop Council; Building Regional Capacity to Implement the Two-Stage Ditch Design Concept; and Coordinating Climate Outreach in Urbanizing Areas. We also describe next steps for Extension-led multi-state research and outreach in the Upper Midwest.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

69. Analysis of Conservation Practice Effectiveness and Producer Adoption Behavior in the Lake Jordan Watershed (North Carolina)

Authors: Deanna Osmond*, NC State Universiity; Dana Hoag; Caela O'Connell; Daniel Line; Mazdak Arabi

Abstract: The goal of Analysis of Conservation Practice Effectiveness and Producer Adoption Behavior in the Lake Jordan Watershed (North Carolina) is to add to the conservation effects knowledge base of watershed-scale impacts of conservation practices on water resources and producer behavior. The research objectives are focused on: 1) identifying water quality effects of conservation practices at a watershed scale through water quality monitoring, 2) a better understanding of farmer/rancher and hobby farmer decision making relative to nutrient management and conservation practice adoption through key informant interviews, 3) use of water quality models to assess benefits from historical implementation and projected implementation of conservation practices, and 4) use of water quality models tied to economic models that will analyze tradeoffs for point to nonpoint source nutrient trades and nonpoint (agriculture) to nonpoint (urban) trades. Over the past two years we have completed the key informant survey of land owners to determine their understanding and use of conservation practices and water quality trading beliefs, conducted water quality monitoring relative to implemented pasture conservation practices, and provided an initial basis to water quality trading. Results from the survey, water quality monitoring, and modeling will be presented.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

70. Urban Forestry: Using I TREE at Kent State University – Service Learning Course 2012

Authors: Danny Ross*, Kent State University; Student Authors: Cassandra Clevenger, Stephanie Deibel, Dale Dunford, David Fristik, Anthony Gravino, Joshua Grund, Daniel Himes, Douglas Klingenberg, Rachel Kohnke, Mitch Myers, Gregory Orr, Joseph Quesenberry & Rebecca Stanoszek Advisors: Dan Ross, Adjunct Professor, Departments of Geography and Biology, Kent State University; Heather White, Manager, University Facilities Management, Kent State University; Jason Knowles, Private Urban Forester, Owner Knowles Municipal Forestry

Abstract: Kent State University has been recognized for their outstanding Urban Forest on Campus. It was time to update the inventory of the trees and look at collecting more detailed information such as – safety, health of the trees, water quality and environmental data. The US Forest Service has developed a computer program to develop this data called I TREE. Kent State wanted to use this program. Since SERVICE LEARNING COURSES (providing students with REAL LIFE EDUCATIONAL EXPERIENCES) is a major outreach at Kent State University, a joint effort was started in the Fall of 2012 between the Department of Biology and the University Facilities Management of Kent State. An Urban Forestry Course was offered to the students to collect the data to update the TREE INVENTORY, and convert the data to be used in the I TREE PROGRAM. This poster paper will show how the students used Mobile Mapper GPS units to collect the data, detailed listing of the data collected, and also review the technical data produced from the I TREE software. Plans are to continue this course for years to come until the whole Urban Forest at Kent State University has been inventoried. This poster paper will also review some improvements and other technical data that could be added to the I TREE PROGRAM – such as – Urban Wildlife Habitat; Air Pollution Control; Aesthetics, etc..

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

71. Analysis of Endocrine Disrupting Compound Uptake in Fruit and Vegetables

Authors: Patrick Wilson*, University of Florida/IFAS; Jian Lu, University of Florida/IFAS; Peter Stoffella, University of Florida/IFAS

Abstract: Bisphenol A (BPA), alkylphenols (APs), synthetic estrogen 17-α-ethynylestradiol (17α-EE2), and natural estrogens including estrone (E1), β-estradiol (E2), and estriol (E3) have attracted public attention because of their potential negative effects on human health and wide occurrence in the environment and foodstuffs. The focus of this research was to develop reliable methods for analyzing these typical endocrine disrupting chemicals (EDCs) in vegetables and fruits using gas chromatography with mass spectrometry detection, and to investigate the bioaccumulation of typical endocrine in vegetables and fruits. An isotope dilution method was developed for monitoring the potential bioaccumulation of typical EDCs in vegetables and fruit. Derivatised extracts of 4-n-NP, BPA, E2, and E1 were analyzed by gas chromatography with mass spectrometry in selected ion storage (SIS) mode or tandem mass spectrometry (MS/MS) mode. The methods developed in this project were published in the Journal of Chromatography A (1258:128-135), and the Journal of Agriculture and Food Chemistry (in press). Lettuce and tomato plants were grown hydroponically in solutions spiked with the target endocrine disrupting chemicals in order to evaluate their potential uptake and accumulation in edible tissues. In addition, plants were also grown in non-spiked media and the target EDCs (NP, BPA, and E2) were applied to the foliage in water simulating overhead irrigation with reclaimed water. Results indicate that all three compounds can accumulate in lettuce, but uptake was more efficient for the foliar exposure treatment. Significant accumulation in tomato fruit was also observed. A field investigation also indicated that BPA, NP, E1 and E2 can be taken up by citrus trees and transported to the fruit. The bioaccumulation of EDCs in vegetables and fruit irrigated with water containing environmentally relevant concentrations indicates a potential exposure pathway for EDCs.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

72. An Integrated Approach To Precision Conservation Planning In The South Fork Watershed

Authors: Richard Cruse*, Iowa Water Center; Thomas Paulsen, Iowa State University; Seth Dabney, USDA-ARS; Elena Polush, Ball State University; Jamie Ridgely, Agren; Karl Gesch, Iowa State University; Tom Buman, Agren

Abstract: An integrated approach to precision conservation planning in the South Fork watershed has been designed to spatially quantify and strategically control sediment loss in the South Fork of the Iowa River. The project fully integrates research, education, and extension to reduce the water quality impacts associated with ephemeral gully erosion, an issue that has recently garnered increased attention among stakeholders. New, high-resolution, distributed erosion modeling, combined with easy-to-use and accurate conservation planning tools, open tremendous possibilities to practically implement the concepts of precision conservation. The activities, which will begin in the spring of 2013, seek to validate this technology with in-field measurements, demonstrate the application of these tools to target BMPs at a field-scale across an entire watershed, engage agricultural landowners in implementation of these practices, and educate students and watershed stakeholders on erosion sources and control. Project objectives include: 1) Validate predictions of a recently developed ephemeral gully calculator on 24 field-scale watersheds in central Iowa. 2) Compare predicted ephemeral gully channel locations and properties with ground-truth observations obtained using survey and photogrammetric techniques. 3) Work with ag educators to develop instructional units to educate high-school FFA students on types of water erosion, erosion control practices, and the water quality benefits associated with precision conservation. 4) Utilize precision conservation planning technologies to target and fully-plan BMPs for ephemeral gully control across the watershed. 5) Direct market plans for ephemeral gully control practices to landowners of high-priority sites. 6) Engage watershed stakeholders in identifying areas of ephemeral gully erosion and planning and installing appropriate best management practices.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

73. An Integrated Approach To Foster Science-Based Management Of Agricultural Drainage Channels In The Western Lake Erie Basin

Authors: Jon Witter*, The Ohio State University; Paula Mouser, The Ohio State University; Tomas Koontz, The Ohio State University; Rafiq Islam, The Ohio State University; Andy Ward, The Ohio State University; Stephanie Jolliff, Ridgemont Local High School; Carrie Vollmer-Sanders, The Nature Conservancy

Abstract: The Western Lake Erie Basin (WLEB) is one of the most highly productive and intensively farmed regions in the world. Drainage practices, including channelization, facilitate reliable and economic production of agricultural commodities, but are widely regarded as a primary source of water quality impairment driving nutrient and sediment export to its receiving waterbody, Lake Erie. A growing body of scientific literature suggests that agricultural drainage channels may act as sources or sinks of pollutants which can be affected by management regimes. Members of the project team have developed alternative drainage channel designs over the past decade that have been shown to have water quality benefits; however, these alternative practices are not regularly considered in channel management and decision-making processes. The long-term goal of this integrated research, education, and extension project is to inform and facilitate science-based management of agricultural drainage channels to protect and enhance water quality, while meeting drainage needs essential for agricultural production. This goal will be accomplished through a) further quantification of the water quality benefits of alternative channel designs, b) identification of factors that affect adoption, c) development of roadmap for targeted implementation, and d) improved stakeholder knowledge. To address these objectives we will undertake a series of field experiments to assess water quality benefits in the WLEB; use that knowledge to interact with stakeholders to promote acceptance; and, disseminate findings broadly to landowners, conservation professionals, policy makers, and students.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

74. Study of the Uptake of PPCPs into Greenhouse Vegetables Grown Under Moisture Stress Conditions

Authors: Philip Moravcik*, University of Hawaii at Manoa; Clinton Williams, USDA Arid Lands Agricultural Research Center, Maricopa, AZ; Chittaranjan Ray, University of Hawaii; Sergio Santiago Melendez, University of Hawaii; Deborah Roll, USDA Arid Lands Agricultural Research Center, Maricopa, AZ; Allan Knopf, USDA Arid Lands Agricultural Research Center, Maricopa, AZ

Abstract: Recycled wastewater is increasingly used for agricultural irrigation, especially in water-limited areas of the US. There is growing concern about microcontaminants in this water since many treatment plants are not designed to remove discarded PPCPs added to municipal sewage. These chemicals are often found in the recycled water supply and may pose a potential health hazard to consumers of raw food crops irrigated with it. We are investigating the uptake of PPCPs into an array of fresh vegetables grown in greenhouses in Hawaii and Arizona, using three moisture stress levels similar to those found in agricultural areas. The chemicals have been added to the irrigation water at concentrations found in global water sources, and at incrementally higher amounts to monitor the uptake vs. concentration and stress levels seen during a typical growing period. Solvent extraction of freeze-dried edible plant parts by either traditional or ASE methods, and cleanup using a SPE cartridge, yields extracts that are suitable for mass analysis using LCMS/MS ion monitoring. Preliminary data suggests that the plant varieties chosen are capable of drug uptake. There is increasing media attention given to PPCPs, antibiotics, and illegal drugs appearing in the nation's water supply. We believe the results from this research project will contribute to the growing body of data that suggests plants are capable of absorbing harmful chemicals from the environment, and provide a better understanding of the uptake process. These studies will aid agriculturalists using recycled water to minimize the uptake of PPCPs and provide a safer food supply.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

75. Microbial and Nitrogen Loads in Streams of Urbanizing Watersheds Impacted by Varying Densities of On-site Wastewater Treatment Systems

Authors: Mussie Habteselassie*, University of Georgia; David Radcliffe, University of Georgia; John Clarke, United State Geological Survey; Qingguo Huang, University of Georgia; Mark Risse, UGA

Abstract: The impact of Onsite Wastewater Treatments Systems (OWTS) on water quality has not been elucidated to allow inclusion in land use planning projects. Currently, OWTS are blamed for poor water quality and considered consumptive water use. The overall project goal is determine the impact of OWTS on water quality in urbanizing watersheds of Ocmulgee and Oconee River basins in Georgia and promote behaviors and technologies that increase the effectiveness of OWTS. Our study area includes 24 well characterized watersheds with high and low density OWTS in the Metropolitan Atlanta area. The selected watersheds are common in the Southern Piedmont region. The watersheds are monitored and water samples are collected several times a year under base- and storm-flow conditions. Water samples are analyzed for fecal indicator bacteria (total coliform, *E. coli* and *enterococci*), different nitrogen forms (total Kjeldhal N, ammonium, nitrate), chloride (Cl-) and steroidal hormones (estrone-E1, estradiol-E2 and estriol-E3). Portions of the water samples are filtered using bacteria and viruses specific filters for source-tracking analysis. In this meeting, we will be reporting results from 2011 and 2012 sampling events. Contaminant loads for fecal indicator bacteria, nitrogen forms and hormones will be reported.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

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76. Prototype Mobile Irrigation Water Management System on eRAMS/CSIP

Authors: Allan Andales*, Colorado State University; Mazdak Arabi, ; Troy Bauder, Colorado State University

Abstract: Improved irrigation water management (IWM) in approximately 54.9 million acres of irrigated farm land in the U.S. can play a key role in water conservation, prevention of water pollution, and enhanced crop productivity. A prototype cloud-based IWM tool was developed for Colorado. The tool is hosted on the cloud-based eRAMS geographical information system with online services implemented on the Cloud Services Innovation Platform (CSIP). The tool gives irrigators near-real-time estimates of daily soil water content of individual fields and recommends irrigation water amounts and timings based on short-term National Weather Service forecasts. The tool accesses weather data from the Colorado Agricultural Meteorological Network (CoAgMet), which provides daily rainfall and estimates of crop consumptive water use at around 65 locations across Colorado. It provides enhanced graphing capabilities to view charts of CoAgMet weather data, as well as charts of the field water balance. The tool can also be used to view soil maps of user-specified fields, via online access to the USDA-Soil Survey Geographic (SSURGO) Database. Apps for handheld devices such as smart phones or tablets are currently being developed to display essential IWM information and synchronize with the tool on eRAMS/CSIP. The mobile IWM system will be tested in two major irrigated river basins in Colorado where actual water savings from the use of the mobile IWM system will be measured and documented.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

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77. Improving Understanding of Ephemeral Gully Sediment and Nutrient Sources on Cultivated Fields

Authors: Aleksey Sheshukov*, Kansas State University; Kyle Douglas-Mankin, Kansas State University; Timothy Keane, Kansas State University; Nathan Nelson, Kansas State University; Philip Barnes, Kansas State University; Ronald Graber, Kansas State University

Abstract: Improved understanding of watershed sources and rates of sediment and nutrients, particularly contribution of ephemeral gullies (EG), is needed to restore water quality in the U.S. Surface erosion from ephemeral gullies in cultivated fields contributes a substantial fraction of annual upland sediment, and does so disproportionally relative to other sources during high-flow events, thus investigation of gully formation and progression is highly important. Erosion from EGs mixes surface with subsurface soil within a field and therefore changes the dynamics of phosphorous, sorption, and impacts phosphorous runoff concentrations from a field. Four fields in the Little Ark River Watershed in Central Kansas were selected for monitoring, two fields in no-till and two fields in convention tillage. A baseline geomorphological assessment of six EGs in the four monitored fields were conducted and major properties were recorded and analyzed. Four geomorphological models and a simplified process-based model were evaluated to predict an occurence, field location and topographic features of EGs. The geomorphological models relied on a concept of topographic index threshold and utilize a slope, upstream drainage area, and planform curvature. The simplistic physically-based model was based on a turbulent overland flow equation and a critical shear stress equation. The resuting model yielded a condition for the critical drainage area threshold being a function of runoff excess rate, roughness coefficient, among other topographic features. The analysis showed that the process-based EG model slightly over-predicted EG topographic properties compared to the observed data, while the accuracy of the geomorphological models depended on the selected threshold values. For all models, the finer detail field assessment was found to be necessary to decrease uncertainty in EG prediction.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

78. Smart Irrigation: Smartphone technology for managing urban and agricultural irrigation

Authors: Kelly Morgan*, University of Florida; Kati Migliaccio, University of Florida; George Vellidis, University of Georgia; Clyde Fraisse, University of Florida

Abstract: Agriculture irrigation studies in the southeastern states have shown significant water savings with improved irrigation methods. Published works by three of the project principles have shown water conservation for urban, fruit, and row crop irrigation in Florida and Georgia. A common aspect the irrigation research described is for producers to use better methods in estimating crop water needs. Irrigation Scheduler tools have been developed by this group to estimate evapotranspiration from real-time data and are available at the Florida Automated Weather Network (FAWN) web site. Water savings of approximately 20% have been documented by using these tools. Economic savings would be approximately $80 per ha per year. The Smartphone applications developed by this project will expand on this effort by using real-time water balance approaches, such as measurement of rain and estimation of ET. These concepts are exploited in development of Smartphone irrigation apps to provide real-time and forecasting information that can be used for more efficient irrigation and water conservation. With the increasing price of fuel and potential restrictions on agriculture irrigation water, these apps will be useful for the sustainability of the agriculture community by providing them with at-their-fingertips knowledge for improved irrigation (and water conservation) and potential financial savings through lower fuel costs (less pump time). It is anticipated that using the apps for better irrigation will also reduce nutrient leaching, creating an additional benefit for the grower. Smartphone apps have been developed for citrus and strawberries with urban and cotton to be developed in 2013. The citrus and strawberry apps will be evaluated by growers in 2013. In-service training events for extension agents and specialists, stakeholder training events and a dedicated web site will further validate and advertise the Smartphone apps.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

79. Water quality best management practices in the Judith River watershed

Authors: Stephanie Ewing*, Montana State University; Douglas Jackson-Smith, Utah State University; Clain Jones, Montana State University; Adam Sigler, Montana State University; Gary Weissmann,

Abstract: In the Judith River watershed, Montana, groundwater nitrate concentrations often exceed drinking water standards, yet adoption rates of water quality best management practices (BMPs) by local producers are low. We have undertaken a participatory approach that engages producers and stakeholders in an integrated research, extension and education project. In Year 1 of this project, we completed a grower survey, initiated field activities, engaged in active conversation with participants and stakeholders, and presented results of our work at four national and international meetings, as well as locally. Our initial grower survey (59.2% response rate) characterized management practices currently in use, perceptions of effectiveness and practicality, and land use history. We reviewed and validated the findings together with other research results through presentations with our Producer Research Advisory Group and Advisory Council. Selection of BMPs for field testing was based on ongoing discussion with the AC/PRAG, and survey results. Six ~80-acre fields across three landforms are being managed to compare three potential BMPs for reducing nitrate leaching. We collected and analyzed soil cores and biomass; excavated, described and sampled soil pits; and instrumented select soils with moisture and temperature sensors, and lysimeters. We installed and sampled 18 groundwater wells in two fields on landforms with contrasting groundwater regimes. Groundwater flow modeling was initiated, and surface water and groundwater were sampled during 16 sampling trips. Team members were actively involved in outreach, discussing the project in local radio and newspaper stories, and at the Central Agricultural Research Center Field Day, attended by over 100 community members.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

80. AFRI Project, Year 3: Implementation of a High-Resolution Drought Monitoring Product

Authors: Brent McRoberts*, Texas A&M University; John Nielsen-Gammon, Texas A&M University; Ryan Boyles, North Carolina State University; Rebecca Cumbie, North Carolina State University; Dev Niyogi, Purdue University

Abstract: The prototype, high-resolution product developed for drought monitoring in Texas over the first two years of this project was expanded to provide spatial coverage to the central and eastern United States during 2012. The expansion was accompanied by the creation of a web interface to access real-time drought information and continued interaction with stakeholders to ensure the usefulness of the products generated. The drought products use radar-based precipitation estimates for real-time hydrologic information. However, much of the central and eastern United States is contaminated by biased estimates that deteriorate the quality of the drought products. The led to the development of a bias correction step which seeks to minimize systematic biases in the radar precipitation estimates. The correction algorithm uses in situ precipitation measurements to generate a statistical model that spatially characterizes existing biases, which can be used to correct the radar-based precipitation estimates. Further refinement of the bias correction step includes testing factors that can cause range-dependent biases and the seasonality of these factors.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

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NIFA Special Symposium: Speed Science Abstracts

Understanding the Importance of Local Citizens in Watershed Management

Authors: Robert Broz*, University of Mo Extension; Dan Downing, University of Mo Extension

Abstract: For the past eight years EPA has encouraged the development of nine element watershed management plans. These plans include topics for identifying causes of pollution, describing management measures and areas of concern, developing an information/education component, and developing a schedule for implementation. These areas require not only the science base for determining pollution sources and possible mitigation strategies but incorporates the needs and abilities of local citizens to design and implement a series of management practices to improve water quality and get areas taken off the 303 (d) list. A statewide educational training was offered on watershed management planning. The training was divided into two tracks – one on what needs to be included in the nine elements and where to find much of the available information, and the second component was on the human dimension component that discussed volunteerism, keeping volunteers active and excited, and the role of local citizens in planning, writing and implementing a plan of action that would reduce, control or eliminate the sources of pollution. The assumption was that science based management practices to reduce pollutant loading would be accepted without question and would be the key to a successful plan to mitigate pollutants. The human element of watershed planning was considered the easier component and would require little time and effort. Results showed that even the best science for selecting practices did not facilitate success in pollution mitigation. The human element needed significant establishment for long term success in watershed protection. The science was recognized as important but did not facilitate adaption and acceptance. Surveys and evaluations of watershed groups demonstrate the importance of local involvement and culture when developing successful plans.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Statistical model equivalency to predict fecal indicator bacteria densities enumerated by QPCR- and culture-based methods

Authors: Raul Gonzalez, UNC Chapel Hill; Rachel Noble*, UNC Chapel Hill

Abstract: As a result of the BEACH Act, the USEPA was required to publish new or revised criteria based on new studies. This led to the 2012 recreational water quality criteria (RWQC) recommendations for protecting public health in marine and fresh waters that are designated for recreation. The new RWQC document places increased emphasis on decreasing the time between sample collection and public advisories, primarily by approving enterococci quantitative PCR (QPCR) as an alternative, more rapid method and advocating the use of predictive models. Using QPCR for recreational water monitoring minimizes processing time, with results typically available in 4 hours. In addition, predictive models can completely eliminate delay between sample collection and results by providing real-time estimates of fecal indicator bacteria (FIB). The objective of this work was to examine the relationship between QPCR- and culture-based real-time predictions of ENT in North Carolina estuaries, a location where monitoring agencies have expressed interest in these real-time methods. Specifically, ENT QPCR and culture models were compared with respect to correlations with environmental variables, model variable selection, and model performance in management decisions. Our results indicate that equivalency was found between predictor models created from densities of both QPCR- and culture-based models. Besides a significant correlation between the 2 analytical methods ($r = 0.60$, $p < 0.0001$), similar significant correlations with antecedent rain, climate, and environmental variables were seen across analytical methods. Both QPCR and culture-based models selected similar predictor variables (QPCR-based adjusted $R^2 = 0.90$; culture-based adjusted $R^2 = 0.89$). Overall, for both analytical method based models, the percent correct in management decisions were 96% and 90% for ENT QPCR and culture thresholds. Future work to validate the models across other mid-Atlantic estuaries will be vital.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

4-H Stream Teams Pilot Program: Creating Local Watershed Connections, Prompting Community Service, Increasing Water Literacy in Youth and Expanding Statewide Outreach.

Authors: Sanford Smith*, Penn State Cooperative Extension; Jennifer Fetter, Penn State

Abstract: In 2010, youth in one central Pennsylvania watershed were invited to be part of an innovative pilot program to learn about water in their community, and how their lives are interconnected to it. This is the mission of 4-H Stream Teams piloted in the Conewago Creek Watershed. This watershed is also where partners from several universities, government agencies, and non-profits have come together to see what a collaborative effort, the Conewago Creek Initiative, can do to restore a small watershed and improve water quality entering the Chesapeake Bay. Funding from a USDA-NIFA Integrated Water Quality Program Grant allowed youth to be included in this collaborative effort through 4-H Stream Teams. This program has three main components: 1) a hands-on water-education curriculum including water conservation, water science, and water quality issues 2) a small watershed focus where youth can build personal connections and 3) a community service mission based in that small watershed. In the pilot, 66 dedicated volunteers have reached over 2,800 youth through 4-H Stream Team groups and activities. Youth have demonstrated knowledge gain in water topics and their watershed boundaries and increased participation in service projects that directly benefit the watershed. Now in Year 3, 4-H Stream Teams is also being launched outside of the Conewago pilot region, throughout Pennsylvania. New volunteers, 77 adults from across the state, have been trained through four sequential and interactive webinars. These volunteers are now identifying youth and small watersheds for new 4-H Stream Teams in their communities. Also, 89 youth water educators from the Mid-Atlantic Region came together in Sept. 2012 for the first Dive Deeper Summit, in Harrisburg, PA. This was an opportunity to share best practices from the 4-H Stream Teams program and other local and state efforts, enhance networking, and encourage collaboration among educators who value science-based youth water education.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Accumulation of Antimicrobials and Antimicrobial Resistant Salmonella infantis in Lettuce at the Production Stage

Authors: Xu Li*, University of Nebraska-Lincoln; Yuping Zhang; J. Brett Sallach; Shannon Bartelt-Hunt; Daniel Snow, ; Laurie Hodges,

Abstract: Treated wastewater effluent becomes an important irrigation water source. However, the trace levels of antimicrobials and human pathogens, some of which are antimicrobial resistant, in the wastewater may accumulate in soil and in food crop. Compared to surface contamination, which may be eliminated through washing, the accumulation of antimicrobials and human pathogens inside food crops that are often eaten raw is particularly threatening. The objective of this study is to investigate the internal accumulation of antimicrobials and Salmonella infantis in lettuce after wastewater effluents containing these contaminants are used as irrigation water. In the past year, the project has made the following progress. A comparative study was performed to determine efficiencies for the extraction of antimicrobials from a lettuce matrix. Four methods; freeze and thaw, maceration, ultrasonication, and microwave assisted solvent extraction were tested on lettuce samples spiked with known quantities of four antibiotics (oxytetracycline, sulfamethoxazole, lincomycin, and ciprofloxacin). Ultrasonication was determined to be the preferred method due to its consistent recovery and low detection limits. In addition, the effects of drought on Salmonella uptake were investigated. A 5-day drought stress was exerted to lettuce before permanent wilting occurred. With 10^8 CFU/mL Salmonella in irrigation water, 30 out of 72 non-stressed plants and 40 out of 72 drought-stressed plants were positive for Salmonella. The number of Salmonella in non-stressed lettuce was up to 1.1×10^3 CFU/g fresh weight, while that in drought stressed lettuce was up to 6.1×10^3 CFU/g fresh weight ($p = 0.0597$).

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Achieving the Desired Future Conditions for Groundwater Availability: An Integrated Hydro-Economic Modeling Framework

Authors: Chenggang Wang*, Texas Tech University; Zhuping Sheng, Texas A&M AgriLife Research and Extension; Ye Wang, Texas Tech University; Yi Liu, Texas A&M AgriLife Research and Extension; James Bordovsky; Jeff Johnson, Texas Tech University; Eduardo Segarra, Texas Tech University

Abstract: In Texas High Plains, agricultural irrigation accounts for over 90% of groundwater pumping from the Ogallala Aquifer, and this groundwater resource is being rapidly depleted. To extend the life of the aquifer, the State of Texas requires that local groundwater management districts define Desired Future Conditions (DFC) for groundwater availability, and develop their own management plans to achieve the DFCs. Evaluating alternative DFC-based management plans requires accurate predictions of future aquifer conditions. One of the many challenges facing groundwater policy analysts is to model the complex interactions between water-user behavior and aquifer conditions. Groundwater Availability Model (GAM), the hydrologic model currently used for simulating future aquifer by Texas Water Development Board, does not explicitly account for the changes of producers' water use behavior in response to changes in aquifer conditions. This project aims to integrate an econometric model of groundwater demand into GAM in order to achieve more precise predictions of future groundwater conditions for management plan evaluation. Our groundwater demand estimation is based on historic cropping and hydrologic data, taking into account economic factors such as crop price and irrigation equipment costs. We test whether the incorporation of the econometrically estimated water demand will improve the prediction power of GAM. The results and the experience learned from this project will improve the methodology for predicting future groundwater conditions and develop better management plans to preserve the nation's precious water resource.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Addressing Water for Agriculture in the Colorado River Basin

Authors: Reagan Waskom*, Colorado Water Institute; MaryLou Smith, Colorado Water Institute; Pete Taylor, Colorado State University; Julie Kallenberger, Colorado Water Institute; Faith Sternlieb, Colorado Water Institute; Melinda Laituri, Colorado State University; Sharon Megdal, Water Resources Research Center, University of Arizona; Sam Fernald, New Mexico Water Resources Reearch Institute; Dave Kreamer, University of Nevada, Las Vegas; Mac McKee, Utah Center for Water Resources Research; Ginger Paige, University of Wyoming; Doug Parker, California Institute for Water Resources, University of California

Abstract: The Colorado Water Institute at Colorado State University spearheaded a USDA-NIFA funded regional planning grant focused on understanding agriculture water challenges in the Colorado River Basin (CRB). Carried out in partnership with the seven CRB land-grant universities (Colorado State University, University of Arizona, University of California, University of Nevada, New Mexico State University, Utah State University, and University of Wyoming), the Planning Grant Team studied: 1) What farmers, ranchers, and water managers are thinking about the current and future status of their agricultural water, what pressures they are facing, and how they are dealing with these pressures. 2) Farmers and ranchers' beliefs towards the permanent and temporary transfer of water out of agriculture, the role of storage, and how to best work with other stakeholders to address the challenges associated with limited water supplies. 3) Agricultural water users' preferences for meeting future water demands, changes in water law and policy they think are needed, and how land-grant universities can best assist with the challenges they are facing, or will be facing with regard to their agricultural water. This presentation will briefly report on results from our in-depth exploratory interviews, a survey of agricultural water users throughout the CRB, and the development of geospatial layers for multi-level, multi-purpose agricultural water governance.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Bioaccumulation of Emerging Contaminants in Edible Crops: Greenhouse Studies

Authors: Christopher Higgins*, Colorado School of Mines

Abstract: Anthropogenic organic contaminants present in wastewater which may persist through treatment processes pose a complex and relevant issue when treated wastewater, or reclaimed water, becomes a viable and important agricultural resource. The vast range of types of chemical contaminants resulting from human use includes pharmaceuticals, flame retardants, corrosion inhibitors, surfactants, plasticizers, and many others. The presence of many of these, including perfluoroalkyl acids (PFAAs) in reclaimed water has been well documented. Previous studies have documented the potential for contaminant bioaccumulation in plants, particularly perfluorooctane sulfonate (PFOS), perfluorooctanoate (PFOA), some pharmaceuticals, surfactants and antimicrobials into foodcrops. In this study, foodcrops relevant to reclaimed water crop irrigation, namely lettuce and strawberries, were grown in controlled greenhouse conditions and irrigated with reclaimed water that had been fortified with differing levels of pharmaceuticals, personal care products, and PFAAs. Accumulation in edible and non-edible portions of the foodcrops was generally dose-dependent. In addition, chemical accumulation was consistent with the higher bioaccumulation potential of smaller molecules.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Differential Evolution's application to estimation of soil water retention parameters

Authors: Zhonghui Ou*, Fujan Normal Uni.

Abstract: Because of water resource deficiency and irrigation cost, botanist, agriculturists and farmers want to accurately know the water flow in soil and water uptake by root, which is formulated by the soil water retention curve (SWRC). Previous research on SWRC shown by literatures ignored the textural difference and the sampling analysis of soil, and it is necessary to develop new optimization and statistics methods. Differential Evolution (DE) is introduced to predict the SWRC parameters and it is configured for the reliability and efficiency with the whole database UNSODA. The main investigated dataset is 235 samples from the lab_drying_h-t table and the numerical testing shows the data resource is reliable and steady. Some specific statistical computations are designed to investigate the convergence speed and fitness precision of DE, comparison between different experimental measurements of hydraulic data, parametric characteristics (e.g. conductivity and permeability) of different textural groups, etc. The statistical results on UNSODA show DE has higher performance in parameter fitness and time saving than some previous optimization methods. Water demand and supply can be generally estimated from the conductivity and permeability of soil, root uptake, local climate, etc. Therefore SWRC is significant for automatic irrigation, plant growth and harvest.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Enabling The Flow Of Ecosystem Services From Agriculture To Improve Puerto Rico's Water Quality And Mitigate Global Climate Change

Authors: Jonathan Winsten*, Winrock International; Walter Silva Araya, University of Puerto Rico; Luis Perez Alegria, University of Puerto Rico

Abstract: Agriculture is an important contributor of nutrients and sediments to ground and surface water, as well as nitrous oxide (N_2O) to the atmosphere. However, maintaining viable farms is also crucial to our nation's food security and rural economic health. Therefore, it is essential that we develop ways to reward farmers for innovative and cost-effective actions to improve water quality and mitigate global climate change. Our project is working with two intensive farming operations on Puerto Rico's south coast. On one farm, we are focusing on plantain production, which is widespread crop throughout Puerto Rico and has great importance for the agricultural economy of the island. On the second farm, we are focusing on papaya production, which uses intensive tillage and nutrient management and is rapidly increasing in acres planted. Two prominent simulation models are being applied to estimate nutrient and GHG emissions from these production systems. Comprehensive measurements of phosphorus, nitrogen and N_2O losses are being taken throughout the production cycle of each crop and on a variety of soil types. The measurement data will be used to calibrate and validate each model, which can then be used to analyze scenarios of alternative management practices and serve as a serve as the basis of a quantification methodology for reduced nutrient and GHG emissions. Through scientific quantification of environmental outcomes, producers can be given flexibility and incentivized, through markets and/or policy, to take the most cost-effective actions for their specific fields to address water quality and climate change simultaneously. This project builds on a recommendation created by farmers, scientists, and agency staff in Puerto Rico for inducing cost-effective environmental performance on farms. The long-term outcomes of this project are expected to include cost-effective reductions in nutrient loads and GHG emissions from agricultural land in Puerto Rico.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Enhancing Water Quality in Tennessee's Oostanuala Watershed: An Integrated Approach Towards Understanding Adoption and Efficacy of Best Management Practices for Livestock Operations

Authors: Forbes Walker*, University of Tennessee

Abstract: The Oostanaula Creek (HUC TN06020002083) is an agricultural watershed in eastern Tennessee, typical of the Ridge-and-Valley region occupying much of the eastern United. The issues facing this watershed are common throughout the ridge and valley region (urbanization, water quality degradation, etc.). Segments of Oostanaula Creek are listed as impaired due to pathogens (*E. coli*), nutrients (phosphorus) and loss of biological integrity due to siltation from pasture grazing systems. We have been using the best available science to identify sources of water quality degradation and to encourage agricultural producers and other stakeholders to adopt cost-effective best management practices (BMPs) to reduce pathogen loading into the watershed. We have also conducted a watershed-wide education program to inform farmers, youth and adult residents about the importance of maintaining and improving water quality. Bi-weekly water quality analyses have been performed at 10 locations in the Oostanaula watershed. The results of this work have shown that while a significant portion of the *E. coli* contamination is from cattle sources, sediment contamination is not only from pasture runoff. Best management practice (BMP) implementation in the upper reaches may be more effective in reducing contamination than in the lower reaches but upstream agricultural BMPs alone will not reduce all sediment loads in the watershed. We have assessed the willingness of livestock producers to adopt different BMPs. Beef cattle owners were willing to implement management activities that improved pasture productivity. This would appear to be a win-win BMP strategy for beef cattle owners wishing to enhance animal productivity and improve water quality. We are trying to develop microbial source tracking assays to discriminate between dairy and pastured beef fecal waste. Although several candidates were found, none of the phylotypes were completely exclusive and present in only dairy or beef manure.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Environmental Fate and Transport of Steroid Hormones and Veterinary Antibiotics Derived from Animal Farms

Authors: WEI ZHENG*, University of Illinois (UIUC); Michael Machesky, University of Illinois at Urbana-Champaign

Abstract: The widespread occurrence of pharmaceuticals and steroid hormones in the water bodies has been recognized as an emerging environmental issue. Land application of concentrated animal feeding operation (CAFO) waste has been identified to be a major source discharging these emerging contaminants to soils. In this study, four tasks were accomplished. First, robust methods were developed to analyze commonly-occurring estrogenic hormones and veterinary antibiotics in a variety of samples at trace levels. Second, the degradation kinetics and mechanisms of selected steroid estrogens in aqueous solutions blended with CAFO wastewater under aerobic and anaerobic conditions were investigated. A racemization reaction between estradiol isomers via estrone was observed in the CAFO wastewater under anaerobic conditions. Also, anaerobic degradation rates of these steroid estrogens were significantly lower than their aerobic degradation rates. These results suggest that anaerobic conditions greatly slow down the breakdown of these contaminants, possibly leading to their accumulation in the anoxic environment over time. Third, a soil column experiment showed that manure-borne colloids may facilitate the transport of the antibiotic florfenicol in soil and enhance its leaching to groundwater. A two-site nonequilibrium adsorption contaminant transport model was developed to fit the facilitated-transport process. A sorption experiment showed that the sorption capacities of florfenicol in soils amended with CAFO wastewater were less than those in non-amended soils, which further confirms that colloid-facilitated transport of the antibiotic occurs in the presence of manure. Fourth, a field monitoring study revealed that several estrogens and their conjugates were frequently detected in the soil and groundwater surrounding fields receiving CAFO wastes. The information from this study is very useful for assessing the potential environmental risk associated with CAFO waste land application.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Fate and Transport Mechanisms of 17Beta-Estradiol and its Conjugates

Authors: Frank Casey*, North Dakota State Univ.

Abstract: In 2012, experiments were conducted to determine how dissolve organic carbon (DOC) and colloidal organic carbon (COC) derived from soil and manure affect the fate and transport of 17ß-estradiol (E2). Radiolabelled (14C)-E2 was filtered with pure water and different combinations of soil and manure derived COC/DOC solutions. Observations indicated DOC affected the solubility of E2, and that E2 can associate with the COC fractions of manure and soil, which can increase the mobility of E2 in water moving in the environment (e.g. field runoff, subsurface transport). Additionally, models were developed to help identify and potentially predict the fate and transport of the sulfate and glucuronide conjugates of E2. Between 60% and 90% of all estrogens excreted from farm animals are in the forms of conjugates. Experimental observations from soil batch experiments were used to develop fate and transport models of E2-S and E2-G and their metabolites. The model was solved numerically and applied inversely to the experimental observations using a global optimization method to quantify the sorption and transformation parameters of E2-S and E2-G and their metabolites. Finally, field observations have continued on a field where subsurface agriculture drainage is installed and where manure has been applied. Other field observations of the E2 in the floodwaters were made.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Fate of Antibiotics in Poultry Litter Before and After Application to Grasslands

Authors: Ching-Hua Huang*, Georgia Institute of Technolog; Miguel Cabrera, University of Georgia; Spyros Pavlostathis, Georgia Institute of Technology; Aaron Thompson, University of Georgia; Peizhe Sun, Georgia Institute of Technology; Sarah Doydora, University of Georgia

Abstract: Persistent antibiotics in poultry litter (PL) may contaminate soil and water when the litter is applied to pastures as fertilizer. This project investigates mobilization of antibiotics from PL and the fate of these contaminants in the soil-water environment through a combination of laboratory and field studies. The project includes four specific objectives to: 1) investigate the sorption/desorption of antibiotics in PL and in litter-amended soils and evaluate the impact of aluminum sulfate amendment; 2) investigate the degradation of antibiotics during litter stacking and evaluate the impact of aluminum sulfate amendment; 3) investigate the biotic and abiotic transformation of antibiotics under conditions relevant in water-litter-soil environments; and 4) investigate the transport of antibiotics in runoff after litter application and evaluate the impact of aluminum sulfate amendment. This project will lead to a better understanding of the environmental fate and transport of antibiotics from PL land applications and the impact of litter management. The results will be useful for the farmers, poultry industry, and environmental scientists for the development of litter management strategies to mitigate potential adverse effects associated with antibiotic contaminants.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Geospatial Training for Water Resource Professionals in the Land Grant System

Authors: Chester Arnold*, University of Connecticut ; David Dickson, University of Connecticut; Arthur Gold, University of Rhode Island

Abstract: Geospatial technologies, including Global Positioning Systems (GPS), Geographic Information Systems (GIS), and new GIS/internet "fusion" technologies, have tremendous potential for furthering the work of university professionals working in the water quality field. The University of Connecticut Center for Land Use Education and Research, in collaboration with the University of Rhode Island Extension Water Program, is entering the final year of its NIFA Water Program project to provide geospatial training to researchers and educators within the USDA Land Grant university system. The focus of the training has been primarily on the fusion technologies that allow researchers, educators and extension faculty to create maps and share information over the internet with their peers and target audiences, without any formal knowledge of GIS or other desktop geospatial technologies. For the first two years the emphasis has been on using Google Maps to create "mashup" web maps, but this technology is evolving so rapidly that the focus for the past two years has been on an alternative web mapping application called ArcGIS Online. Workshops have been held at National NIFA Water Program Conferences, regional workshops hosted by NIFA Water Program Regional Programs, and at other conferences as requested. The objectives and methods of these workshops will be shared, as will the response of the trainees. Examples of online maps created by Water Program participants following their training will be reviewed, and a discussion held on the current and future uses of this technology.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Heartland Water Quality Coordination Initiative

Authors: Lois Morton*, Iowa State University

Abstract: The mission of the Heartland Water Quality Initiative over the past 12 years has been to promote integrated responses to current and emerging water-related issues in Iowa, Kansas, Missouri and Nebraska. Faculty and staff from state and tribal land grant institutions built networks, developed capacity and applied science-based information in partnership with EPA Region 7 and other federal, state and local government officials, NGOs, and agricultural industry groups to develop sustainable systems to improve water quality. This work has: increased focus on environmental issues in university extension Plans of Work; expanded recognition and use of land-grant university resources by agency partners, including regional and national EPA; added opportunities for young investigators, graduate students and minority institutions to participate in water resources research, publication and programming; provided new research initiatives in the social sciences; reduced duplication of programs within the region and increased partnerships with land-grant programs outside of the region; amplified the multi-state dialog on water issues by communities, legislators and the private sector; and increased staff support and leveraging of additional grants for water resources research and extension.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Hydrologic simulation of drought in the Upper Colorado River Basin

Authors: Clyde Munster*, Texas A&M; Rachel McDaniel, Texas A&M; John Nielsen-Gammon, Texas A&M University; Tom Cothren, Texas A&M

Abstract: The Soil Water Assessment Tool (SWAT) hydrology model was calibrated and validated for drought conditions in the Upper Colorado River basin in Texas. The SWAT model was then coupled with a probabilistic meteorological weather forecast program that provided precipitation and air temperature inputs to the SWAT model. This NOAA ensemble forecast system accurately forecast meteorological conditions during periods of drought two weeks in advance for the Upper Colorado River basin. These inputs allowed the SWAT model to forecast hydrologic conditions in the Upper Colorado River basin two weeks in advance. Output from the SWAT model included; stream flows, soil moisture, evapotranspiration, groundwater levels, reservoir levels, and crop production.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Integrating remote sensing of evapotranspiration with surface and groundwater information to target potential water conservation projects in watersheds

Authors: Daniel Howes*, Cal Poly State Univ.

Abstract: On-farm losses (runoff and deep percolation) can be a significant source of non-point source contamination in agricultural, rural, and urbanizing watersheds. In most cases, these losses can be attributed to improper irrigation scheduling and low system distribution uniformity. Since both can have negative impacts on a number of factors, it is likely that growers having one or more of these items may not know where problems exist. The amount of agricultural fields within a watershed can number in the hundreds or thousands. This, combined with limited resources at a watershed manager's disposal, creates the need for a procedure to target areas with high potential for water quality improvement through irrigation system and management modifications. The framework developed in this project will focus on techniques to determine where on-farm losses are most likely occurring within a watershed. Understanding the spatial relationship between applied water and actual evapotranspiration over a watershed is a critical piece of this framework. The objectives of the project are to integrate research, extension, and education to: 1) Develop a framework for targeting high priority areas on a watershed scale using remote sensing to compute actual crop evapotranspiration and groundwater and surface water information to applied irrigation water. 2) Research on-farm irrigation practices and irrigation system performance in areas identified as high priority and low priority to confirm that irrigation system and operational modifications can demonstrate conservation and improved quality of water resources on a watershed scale.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Linking Surface Hydrology with Subsurface Restrictive Layers to Develop the Fertilizer Forecaster for Pennsylvania

Authors: Patrick Drohan*, Penn State University; Lauren Vitko, Penn State University; Anthony Buda, USDA-ARS; Peter Kleinman, USDA-ARS; Doug Beegle, Penn State University; Doug Miller, Penn State University; Paul Knight, Penn State University; Henry Lin, Penn State University

Abstract: Restrictive layers impede the movement of water via generation of saturated conditions, which in turn increases runoff of agricultural nutrients. The USDA Soil Survey provides scale-dependent information on the presence of restrictive layers (and drainage class), but its resolution is not fine enough to delineate regions prone to saturation at the field-scale. In this study, we used ground-penetrating radar (GPR) to generate a model of restrictive layer (fragipan subsoil horizon) extent and depth in a portion (approximately a third) of the 39.5-ha-FD-36 watershed, within the Mahantango creek watershed, east-central Pennsylvania. GPR transects (10-15 m apart) were run and fragipan presence determined via soil pits. Data from ground-penetrating radar, in conjunction with field verification via soil pits, were used to build a model of horizon extent and depth. Model results were compared to the extent mapped in an order 1 soil survey of the watershed. On the south slope of the watershed, fragipan extent determined via GPR was comparable to that shown in the soil survey. On the north slope, however, fragipan identification via GPR over-predicted fragipan extent relative to the soil survey. It is presumed that bedrock was interpreted as a fragipan in the radar profile for regions of the north slope; the reason for this may have to do with the high soil moisture status during data collection. In the future, more soil data will be used to confirm or improve the viability of the model. Further, the role of soil moisture conditions (and a perched water table) on fragipan identification via GPR will be investigated.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Northeast States and Caribbean Islands Regional Water Program Summary

Authors: Arthur Gold*, University of Rhode Island; Alyson McCann, University of Rhode Island

Abstract: The Northeast States and Caribbean Islands Regional Water Program emerged from the combined research, education, and Extension strengths of the regions' ten Land Grant Universities (LGUs) and incorporated key stakeholders and partners into a framework to advance the protection and improvement of water quality. Our program was based on the premise that the infusion of knowledge and the adoption of best management practices (BMPs) within agricultural, rural, and urbanizing communities would improve the efficiency and effectiveness of water quality protection and improvements. Our long term goal was to strengthen the research, teaching and Extension capacity of the LGUs to deliver outcome-based water programs that would serve to educate, empower, and engage agricultural producers, residents, and communities throughout the region to steward their local water resources. The heart of this regional effort centered around 8 Focus Areas. These Focus Areas tailored the national themes to the strengths of the region's Land Grant Universities' research, education, and Extension programs and captured the enthusiasm of our partners and stakeholders. The 8 Focus Areas included: 1. Volunteer Water Quality Monitoring & Watershed Assessment 2. New England NEMO 3. Sustainable Landscaping 4. Drinking Water and Private Wells 5. Water Quality and Production Agriculture 6. Small Farms Initiative 7. New England On-Site Wastewater Training Center 8. The Islands Initiative This presentation will highlight the accomplishments of this regional effort.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Protection of Water Resources through a Sustainable Organic Water Quality Detection Technique

Authors: Taha Marhaba*, New Jersey Institute of Tech

Abstract: Sustainable technologies and strategies are needed the development and application of rapid, efficient techniques for detecting water quality problems and pollution sources. In addition, uniform applications of analytical parameters are needed to spatially and temporally monitor water quality for sustainable management of water resources and allocations to all stakeholders. Natural organic matter (NOM) in the environment today does not only come from humic sources, but also from non-humic or synthetic sources. The typical total organic carbon (TOC) analysis has been typically used as an aggregate measure of NOM in water. NOM from surface water sources were isolated and fractionated by resin adsorption techniques into hydrophobic acid, hydrophobic neutral, hydrophobic base, hydrophilic acid, hydrophilic neutral and hydrophilic base. The Spectral Fluorescent Signatures (SFS) technique through a database of spectral characteristics specific to each fraction was developed for the identification of the six NOM fractions. Among the main advantages of the technique are high sensitivity and rapid identification. The potential use of the SFS technique for the rapid spatial and temporal qualitative and quantitative identification of the NOM fractions, including the problematic ones, such as precursors to trihalomethanes (THMs) formation following chlorination of water is presented. In addition the application of the technique for point/non-point source water assessment, impact on water quality and optimization of water treatment for the overall reduction of unnecessary residuals is presented.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Public actions taken to address water quality and quantity issues in the northwestern USA since 2002

Authors: Robert Mahler*, University of Idaho

Abstract: The purpose of this paper is to document voluntary actions the general public has taken to address water quality and quantity concerns in the northwestern USA over the last 10 years. These actions have been attributed primarily to educational outreach efforts targeted at the general public by the five land grant universities in the region Northwest Indian College, Oregon State University, University of Alaska, University of Idaho, Washington State University). This effort was supported by USDA-NIFA. Data were collected using mail-based surveys conducted at five-year intervals in 2002, 2007 and 2012. Each survey contained between 45 and 60 questions and was mailed to 2,200 randomly chosen residents of Alaska, Idaho, Oregon and Washington. Return rates in excess of 50% were received for each survey ensuring that the results are statistically valid. The 2002 survey results were used as base line data. More than 85% of the region's adults have made lifestyle changes to address water quantity issues. For instance, since 2002, 64% have installed at least one water-saving appliance in their home, 58% report that they have reduced water use in their yards, 57% have reduced water use in their home, and 40% have reduced the amount of water used washing their cars. Conversely, only 14% have not made voluntary changes to address the amount of water used. Almost 82% of adults have acted to improve water quality. Voluntary water quality actions taken since 2002 include: changed the disposal of household wastes (61%), reduced the use of fertilizers and pesticides in homes (26%) and yards (54%), and changed the disposal of used motor oil (36%). Less than 19% of adults have not voluntarily addressed water quality issues in their homes. This study demonstrates that education to cause positive voluntary actions is very effective and may work better than the regulatory approach in this region of the USA.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Social pressure, perceived risk, and motivation to protect local streams

Authors: Robyn Wilson*, The Ohio State University; Kristina Slagle, The Ohio State University

Abstract: Previous research demonstrates that an individual is motivated to seek out information about a hazard when they feel that there is a gap in the information they need to take appropriate action. This gap typically increases when an individual perceives the risks as high and feels social pressure to know more about the hazard. Ultimately, the degree to which someone systematically seeks out information about a risk, the more likely they are to develop stable beliefs about the hazard, and the more likely they are to engage in risk reducing behavior over time. The study reported here is the final phase of a NIFA funded National Integrated Water Quality project focusing on residents of urbanizing watersheds and the factors influencing their stream-related beliefs and behaviors with the goal of improving communication about local streams. We conducted a watershed-scale survey to test a model of decision making that explains both what motivates individuals to seek out and carefully process information about local streams, as well as how this information behavior influences relevant attitudes and household behaviors (e.g., switching to non-toxic household cleaners). Our findings indicate that systematic information seeking occurs as a result of social pressure, while systematic processing occurs when one values the environment, or when perceived personal risk is high for those with low environmental values. More systematic seeking and processing does lead to stronger and more positive attitudes toward taking action, and greater intentions to act. The results indicate that increasing social dialogue about local stream health could be a relevant motivator of information seeking, while those who do not have a strong environmental ethic need information about the perceived likelihood of personal consequences resulting from degraded local streams.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Stormwater Management Education in Nebraska: Integrating Extension, Teaching, and Research

Authors: David Shelton*, University of Nebraska; Kelly Feehan, University of Nebraska; Steven Rodie, University of Nebraska; Thomas Franti, University of Nebraska; Katie Pekarek, University of Nebraska; Bobbi Holm, University of Nebraska

Abstract: Stormwater management is a concern for communities with populations of over 10,000 largely because of mandates to reduce stormwater runoff volumes and associated pollutants. A University of Nebraska-Lincoln Stormwater Work Group was organized in 2006 to develop educational programs and materials to address stormwater management through green infrastructure and other BMPs. A USDA-NIFA grant titled "Improving and Conserving Water Resources through Stormwater Management Education for Community Decision Makers of Today and Tomorrow" was received in 2009 which further supported and greatly expanded work group efforts. This, coupled with support from numerous Nebraska communities, has successfully blended extension programming with university teaching and research. This synergy has helped communities more effectively manage stormwater quantity and quality while building a knowledge-base that will continue to support future initiatives and programs. Extension programs have included: presentations for design professionals, stormwater program managers, Master Gardeners, and homeowners; all-day rain garden workshops/installations; green infrastructure practice tours; rain barrel construction workshops; web-based resources; an interactive rain garden model; youth activities; and publications. Research projects are generating information on rain garden hydrologic and plant growth attributes. Academic programs in both landscape architecture and landscape horticulture are expanding curriculum in green infrastructure, low impact development, and stormwater BMP design and construction. Efforts have culminated in new course lectures as well as studio design projects that have addressed real-world client issues. Fundamentals of the strong integration of extension, teaching, and research; the multi-faceted products that have broadened the scope of urban-focused extension stormwater programming; and selected programming impacts will be illustrated and discussed.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Surfactant-Facilitated Transport of *Cryptosporidium parvum* in Soil

Authors: Christophe Darnault*, Rensselaer Polytechnic Institute; Astrid Jacobson, Utah State University; David Powelson, Utah State University; Philippe Baveye, Rensselaer Polytechnic Institute

Abstract: The presence of the parasitic protozoan *Cryptosporidium parvum* in watersheds is inevitable due to agricultural activities and wildlife. Understanding the fate and transport of *C. parvum* oocysts in the environment is critical for the protection of public health and drinking water sources. To better understand the mechanisms by which *C. parvum* oocysts move through soils and contaminate water resources, we study their mobility under conditions representative of real-world scenarios, where both *C. parvum* and chemicals that affect their fate are present in soils. Surfactants occur widely in soils due to agricultural practices such as wastewater irrigation and application of pesticides or soil wetting agents. They affect water tension and, consequently soil infiltration processes and the air-water interfaces in soil pores where *C. parvum* oocysts may be retained. We investigate the surfactant-facilitated transport of *C. parvum* in agricultural soils from Illinois and Utah under unsaturated flow conditions. Our research examines the sorption and desorption of *C. parvum* oocysts onto soil particles in the presence of natural and industrial surfactant solutions, and the mobility of *C. parvum* oocysts in the presence of surfactants in structured and non-structured (packed) soil columns. We find that the presence of the surfactant accelerates the transport of the oocysts through preferential flow paths. On the other hand, when connected macropores are not present in the soils, the presence of the surfactant retards the transport of the oocysts through the soil matrix by straining oocyst-surfactant-Ca flocs.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

The Extension Volunteer Monitoring Network: Supporting Volunteer Water Quality Monitoring Efforts Throughout the USA

Authors: Linda Green, University of Rhode Island; Kristine Stepenuck, Unviserity of Wisconsin Extension; Elizabeth Herron, University of Rhode Island; Frank Finley, Salish-Kootenai College; Ken Genskow, University of Wisconsin; Arthur Gold*, University of Rhode Island

Abstract: The USDA NIFA Cooperative Extension-based Volunteer Monitoring Water Resource Project has been active since 2000. Our goal was to increase the vigor, vitality and viability of volunteer monitoring and citizen science programs. We have created a comprehensive support system for volunteer water quality monitoring & citizen science efforts across the country, known as the Extension Volunteer Monitoring Network. We developed the "Guide for Growing Volunteer Water Quality Monitoring Programs" as the centerpiece for our efforts, which can be found on-line at http://www.usawaterquality.org/volunteer. This Guide provides succinct, comprehensive and timely information distilled from successful programs across the country, packaged as a suite of factsheet learning modules, some of which have been accompanied by state, regional and national workshops. Modules exist to help programs get started, design a monitoring strategy, train effectively, build and maintain credibility, manage volunteers, plan a data management system, make effective presentations, fund-raise and evaluate their efforts. Designed for "one-stop-shopping", the modules highlight techniques of successful programs and link to a multitude of available resources. Recently we have engaged in a nationwide assessment of the status and needs of volunteer monitoring programs. This talk will provide an overview of the Project emphasizing recent outputs, the Guide for Growing Programs, the Extension Volunteer Monitoring Network, and additional resources on our virtual hub.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

The Role of Biotransformation, Photolysis, and Mineral Interactions on the Environmental Fate on Synthetic Growth Promoters Used in Animal Agriculture

Authors: Edward Kolodziej*, University of Nevada, Reno; Eric Marchand, University of Nevada, Reno; David Cwiertny, ; Emily Cole, University of Nevada, Reno; Shen Qu, University of Iowa

Abstract: To investigate the environmental fate of synthetic growth promoters used in animal agriculture, a series of biotransformation, photo-transformation, and sorption studies were conducted. Results from phototransformation studies are suggesting that initial phototransformation rates of trenbolone metabolites are rapid, forming a range of more polar steroids (mono-, di-, and tri- hydroxy species) as products. Alteration of the conjugated pi bond system suggests that these photoproducts do not absorb in the solar spectrum, implying increased environmental persistence of photoproducts in irradiated surface waters. NMR analysis has identified the major photoproducts of trenbolone metabolites, and accurate mass LC-MS/MS analysis suggests that at least some of these photoproducts are stereoisomers or structural analogs of trenbolone metabolites, indicating conservation of the steroid structure through phototransformations. Most interestingly, photoproduct transformation pathways are reversible, suggesting that parent trenbolone metabolites can be regenerated from photoproducts in some cases. Similar to phototransformation, closely related biotransformation products are also observed to form from parent trenbolone metabolites in biologically active systems. These findings have a number of implications for the environmental fate of trenbolone metabolites. For example, the observations of product-to parent reversion, conservation of steroidal structure through environmental transformation processes, and likely biological activity of transformation products all suggest that the potential environmental risk of trenbolone is currently underestimated. The relevant timescales, product distributions and ecosystem health implications for each of these processes will be discussed along with implications for management of synthetic growth promoters in receiving waters.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Uptake, translocation and bioaccumulation of PPCPs in vegetables

Authors: Jay Gan*, University of California; Sherry Wu, ; Jeremy Conkle, ; Laurel Dodgen,

Abstract: Treated wastewater is increasingly used to irrigate agricultural crops in different parts of the world. A threshold concern for this reuse, however, is the potential accumulation of trace contaminants such as pharmaceuticals and personal care products (PPCPs) into food produce such as vegetables. It is especially important to identify those PPCPs that have a high potential for plant uptake and translocation. In this study, we grew lettuce, spinach, cucumber and pepper in solutions containing 19 PPCPs at 0.5 or 5 µg/L, and analyzed for their tissue levels in roots and leaves using freeze-drying, sonication for extraction and LC-MS/MS for detection. Triclocarban, fluoxetine, triclosan, and diazepam showed the highest accumulation in roots, and the accumulation was positively related to Kow. However, fluoxetine, diuron, and carbamazepine exhibited the highest translocation to leaves. Therefore, while hydrophobicity propelled root accumulation, hydrophilicity appeared to control in-plant translocation. Carbamazepine was also detected in vegetables irrigated with treated wastewater under field conditions.

Subject Area: Water Resources Research, Education, and Outreach (NIFA Land Grant/Sea Grant 406 and NRI)

*denotes primary author

Use of Vegetative Filter Strips on Surface Irrigated Fields and Development of a Decision-Support Tool to Optimize Water Quality Benefits

Authors: Jeffrey Ullman*, University of Florida; Rafael Muñoz-Carpena, University of Florida; Gregory Kiker, University of Florida; Vicki McCrackn, Washington State University; William Pan, Washington State University; Brian Bodah, Washington State University; Oscar Perez-Ovilla , University of Florida; Miguel Campo-Bescos, University of Florida

Abstract: The goal of this study was to examine vegetative filter strips (VFS) as a best management practice (BMP) along surface irrigated fields and to develop a decision-support tool to evaluate VFS implementation to optimize water quality benefits. VFS plots of varying vegetation type and length were established at the end of crop fields using furrow (rill) irrigation in the highly irrigated Yakima River Basin in Washington. The potential removal efficiency for sediment (total suspended solids; TSS) and nutrients (N, P) from irrigation return flows was quantified. VFSMOD, a VFS hydrologic model, was used to simulate water and pollutant reduction effectiveness for a range of irrigation return flows as a function of soil type, crop type, filter vegetation type, management scenarios and various filter lengths. Results were summarized in removal response curves (e.g., contaminant reduction vs. filter strip characteristics) for TSS, N and P to evaluate targeted filter strip design. Socio-economic data was collected through focus groups, agency cooperation and production cost analysis. The physicochemical and socio-economic results were used to develop a decision-making tool (QnD:VFS) to integrate and visualize alternative, spatially-explicit, water management strategies. The QnDTM program incorporates multi-criteria decision analysis (MCDA), management, economic and socio-political issues in a user-friendly scenario framework. QnD links spatial components within GIS files to the abiotic (e.g., climate), biotic and chemical/contaminant interactions, allowing for hydrologic modeling at the watershed-scale. The QnD:VFSMOD platform can then be used to evaluate potential water quality benefits achieved through VFS implementation at various locations in the watershed in the context of socio-economic determinants (e.g., grower incentives and motivations). This decision-support tool can thus help target resources for natural resource conservation and optimize water quality benefits.

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*denotes primary author