



2012 Annual Conference Abstract Book



**Choosing
Conservation:
Considering Ecology, Economics, and Ethics**

67th International Annual Conference

Ft. Worth, TX [July 22-25, 2012] www.swcs.org/12AC

67th SWCS International Annual Conference Abstract Book

Table of Contents

Conference Schedule in Brief	2
SWCS Board of Directors, Officers, Program Committee & Staff	3
Conference Sponsors	4
Soil Quality and ECO Farming Workshop	5
Presentation Schedules	6
Symposia Sessions Summary	12
Symposia Session Descriptions & Abstracts	13
Oral Presentation Abstracts	36
Poster Presentation List.....	104
Poster Presentation Abstracts.....	106

Index Note: In lieu of attempting to predict what keywords are of interest to you, we have made the text of the pdf version of this document fully text searchable. Please use the find function to search the electronic version for the words or phrases you are seeking.

Conference Schedule in Brief

Sunday, July 22

8:00 AM	Soil Quality and ECO Farming Workshop	Elm Fork I & II
8:30 AM	Science and Policy Committee Meeting.....	Treaty Oak
Noon	House of Delegates, State of Society Address & Regional Roundtable Meetings	Trinity Ballroom
1:30 PM	*LiDAR Workshop.....	Bur Oak
1:30 PM	*Conservation Leadership Workshop.....	Post Oak
1:30 PM	JSWC Editorial Board	Treaty Oak
1:30 PM	Student Member Forum	Red Oak
4:00 PM	Chapter Leader 101	Post Oak
4:00 PM	Berg & Society Fellows Forum	Trinity Ballroom
6:00 PM	New Members/First Timers Orientation	Elm Fork I & II
6:30 PM	Welcome Reception at BRIT.....	Load at Trinity Ballroom Doors

Monday, July 23

8:30 AM	Opening Plenary & Pritchard Lecture	Brazos I/II
10:00 AM	Morning Break: Exhibit Hall and Poster Presentations Open	Rio Grande
10:30 AM	Concurrent Sessions	See Schedule (Page 27)
Noon	Lunch Break.....	On your own
Noon	*International Committee Meeting.....	Worthington Room
1:30 PM	Concurrent Sessions	See Schedule (Page 28)
2:00 PM	ARCSE Board Meeting.....	Treaty Oak
3:00 PM	Afternoon Break.....	Rio Grande
3:30 PM	Concurrent Sessions	See Schedule (Page 29)
5:00 PM	Poster and Exhibitor Reception in Exhibit Hall	Rio Grande
7:30 PM	Greenfire: Aldo Leopold and a Land Ethic for our Time (Movie)	Brazos I & II

Tuesday, July 24

7:30 AM	Special Topic Breakfast - NIFA-CEAP	Pecos I
7:30 AM	Special Topic Breakfast - NASS	Bur Oak
8:00 AM	Tuesday Plenary	Brazos I/II
10:00 AM	Morning Break in Exhibit Hall.....	Rio Grande
10:30 AM	Concurrent Sessions	See Schedule (Page 30)
Noon	*Awards Luncheon.....	Hacienda
Noon	Lunch Break.....	On your own
1:30 PM	Concurrent Sessions	See Schedule (Page 31)
3:30 PM	Concurrent Sessions	See Schedule (Page 32)
5:15 PM	SWCS Annual Conference Program Committee.....	Treaty Oak

Wednesday, July 25

7:30 AM	*Tour #2 - Burgundy Beef and Sunset Winery.....	Gather in Trinity Ballroom Lobby
	*Tour #4 - Fort Worth Nature Center (A&B) and Stockyards	
8:00 AM	*Tour #1 - Botanical Research Institute of Texas and Fort Worth Botanic Garden	
	*Tour #3 - Bear Creek Ranch (Dixon Water Foundation)	

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

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- Craig Allen, University of Nebraska-Lincoln
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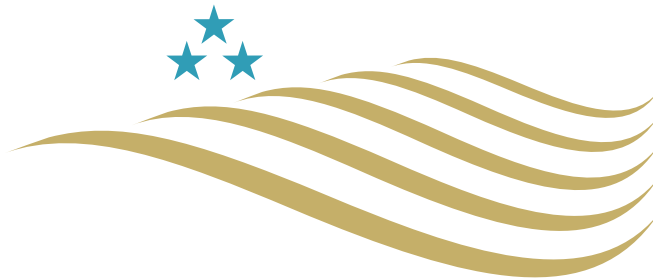
Mark your calendar:
July 21-24, 2013
Reno, Nevada
Peppermill

Conference Sponsors

The Soil and Water Conservation Society is pleased to recognize our 2012 Conference Sponsors.



The
Fertilizer Institute
Nourish, Replenish, Grow



**National
Farmers
Union**

UNITED TO GROW FAMILY AGRICULTURE



Popcorn and soda for the Monday evening screening of GreenFire generously provided by the Sand County Foundation.

A cash bar will be available.



Green fire

ALDO LEOPOLD AND
A LAND ETHIC FOR OUR TIME

Soil Quality and ECO Farming Workshop:

A systems approach to enhance agro-ecosystem services

Presented at the 67th International Annual Conference
Soil and Water Conservation Society
Ft. Worth, Texas

Agenda

- 8:00 Climate and Carbon effects on Soil and Water Quality: rethinking tillage in the 21st Century.
- Randall Reeder, Ext. Ag. Engineer (retired), Ohio State University
 - Rafiq Islam, Soil Scientist, The Ohio State University
- 8:45 ECO Farming and agro-ecosystem services
- Jim Hoorman, Extension Educator, The Ohio State University
- 9:30 Break
- 9:45 The Systems Approach to No-till (including strip-till)
- Paul Jasa, Extension Ag. Engineer, University of Nebraska
 - Jodi DeJong-Hughes, Extension Educator, University of Minnesota
- 11:15 Cover crops and below-ground soil health
- Dave Brandt, President, Ohio No-Till Council
 - Rafiq Islam, Soil Scientist, Ohio State University
- 12:00 Lunch
- 1:15 No-till: Continuous NT impact on soil and water quality
- Don Reicosky, Soil Scientist (retired), USDA-ARS, Morris, MN
- 2:15 Soil quality tests and demonstrations
- Rafiq Islam, Soil Scientist, The Ohio State University
 - Jim Hoorman, Extension Educator, The Ohio State University
- 3:40 Evaluation
- 3:45 Adjourn

This workshop is a dual-purpose educational program: (1) A Train-the-Trainer program, mainly for educators and agency people who want to teach soil quality management to farmers and others; and (2) An educational workshop for crop consultants, farmers and anyone else who wants to learn more in-depth about agricultural soil quality and how to improve it. It is supported by a grant from the USDA North Central Region Sustainable Agriculture Research and Education program (SARE).

The workshop will include: Soil quality and health; 21st century agriculture; Continuous no-till; Systems approach to no-till, including strip-till in cold climates; Cover crops; Soil quality test kit demo; and ECO farming.

ECO Farming is a concept that leads to enhanced ecosystem services. ECO means: E = Exclusive Long-term No-till (a system that minimally disturbs the soil only for planting and fertilizer application.) C = Continuous Cover means keeping a living and growing crop on the soil during the entire year. O = Operational practices that improve soil and water quality, increase carbon sequestration and improve farm economics.

Abstract Book - 67th International SWCS Annual Conference
Conference Presentation Schedule

Monday	10:30 a.m.	10:50 a.m.	11:10 a.m.	11:30 a.m.
Brazos I & II Symposium	Conservation Technology Innovations: New Options for the Future - Gregorio Cruz, USDA-NRCS			
Pecos I Symposium	Conservation Effects Assessment Project: Accomplishments from USDA-ARS Benchmark Watersheds - Mark Walbridge, USDA-ARS			
Pecos II Symposium	Lessons from Monitoring and Measurement of Water Quality Projects in Midwestern Agriculture Watersheds - Jimmy Daukas, American Farmland Trust			
Bur Oak Modeling & Tools	CIG Presentation: Application of NutrientNet in Chesapeake Bay Watershed as powered by Nutrient Tracking Tool <i>Ali Saleh, Tarleton State University</i>	Assessment of Riparian Buffers as an Alternative Conservation Practice using the USDA AnnAG-NPS Watershed Pollutant Loading Model <i>Ronald Bingner, USDA-ARS-NSL</i>	Adaptive hydrologic enforcement of LiDAR-based Digital Elevation Models <i>Brian Gelder, Iowa State University</i>	Modeling the effects of conservation tillage on hydrology and nutrient transport in a Canadian Prairie watershed under frozen soil condition. <i>Wanhong Yang, University of Guelph</i> Originally: Yongbo Liu
Post Oak Outreach/Education	The Impact of Nutrient Management Planning in Arkansas <i>Mike Daniels, University of Arkansas</i>	Evaluation of Agricultural Irrigation Efficiency and State Water Policy in Arkansas <i>Kuatbay Bektemirov, University of Arkansas</i>	Emergency Conservation recovery in the New Madrid Floodway <i>David Speidel, USDA NRCS</i>	Watershed Based Program Design and Implementation <i>Jacqui Laporte, Ontario Ministry of Agriculture, Food and Rural Affairs</i>
West Fork I & II Water	The Lake Macatawa Water Quality Project. <i>Dan Callam, Hope College</i> Originally: Graham Peaslee	Retrospective analysis of periodically-collected suspended-sediment data in the United States <i>Casey Lee, U.S. Geological Survey</i>	A GIS index approach to prioritize water quality monitoring of CAFOs in North Carolina <i>Jay Christensen, US EPA, National Exposure Research Laboratory</i>	Large-Scale Restoration of Disturbed Wetlands on Florida Agricultural Lands <i>Mitchell Griffin, CH2M HILL</i>
Central Symposium	Food Security: Conservation, Inputs and Technology - Jorge Delgado, USDA-ARS-SPNR			
Elm Fork I & II Soil	Vertical Tillage Effects on Corn Yield, Disease and Pathogens, and Soil Properties <i>DeAnn Presley, Kansas State University</i>	Wind Erosion of Organic Soils <i>Ted M Zobeck, USDA-ARS</i>	Regional Assessment of Short-term Impacts of Corn Stover Removal for Bioenergy on Soil Quality and Crop Production <i>DeAnn Presley, Kansas State University</i>	Estimation of soil water evaporative loss after tillage operation using stable isotope technique <i>Mutiu Busari, University</i>

Abstract Book - 67th International SWCS Annual Conference

Monday	1:30 p.m.	1:50 p.m.	2:10 p.m.	2:30 p.m.
Brazos I & II	No Presentations Scheduled			
Pecos I Symposium	Conservation Effects Assessment Project: Accomplishments from USDA-ARS Benchmark Watersheds PART II - Mark Walbridge, USDA-ARS			
Pecos II Symposium	MRBI Symposium - Mike Daniels, University of Arkansas			
Bur Oak Water	The use of models to manage for water availability and nutrient transport in an agricultural landscape <i>Jeannie Barlow, U.S. Geological Survey</i>	Agronomic, Economic and Institutional Factors Influencing Spatial Variability of Water Use in the Irrigation District 014-Rio Colorado, Mexico <i>Yamilett Carrillo, University of Arizona</i>	Estimating Flood Damages Averted from NRCS Watershed Projects <i>Noel Gollehon, Natural Resources Conservation Service, USDA</i>	Water As A Crop Helping Land-owners Find Value Meeting Society's Water Resource Needs. <i>Alex Echols, Sand County Foundation</i> Originally: Steven Parrett
Post Oak Conservation Economics	Assessing the Economic Impact of New Water Quality Regulations <i>Brad Barbeau, CSU Monterey Bay School of Business</i>	The Value of Environmental Benefits from NRCS WRP easements. <i>David Buland, USDA NRCS</i> Originally: Felix Spinelli	Use of the Discount Rate in Conservation Programs and Projects: <i>Mark Xu, NRCS, USDA NRCS</i>	Sell Versus Burn Crop Residue Management Decisions Using Economic Analysis For Arkansas Wheat-Soybean Double Crop Production Systems <i>C. Robert Stark, University of Arkansas at Monticello School of Agriculture</i>
West Fork I & II Symposium	Deep and Silent Waters: Challenges in Aquifer Sustainability - Jean Steiner, USDA-ARS			
Central Symposium	Pollinator Conservation Grows Up: Lessons Learned from the Field (CIG Session) - Cheryl Simmons, USDA-NRCS			
Elm Fork I & II Conservation Policy	Learning from NIFA-CEAP: Changing Conservation Programming <i>Deanna Osmond, NC State University</i>	Evaluating the Environmental Benefits of Rangeland Conservation Practices <i>Kenneth Spaeth, USDA-NRCS</i>	Toward Integrated Wetland Conservation: A Diagnostic Framework <i>Kyle Magyera, Wisconsin Wetlands Association</i>	Conservation of Mangrove ecosystems: Global assessment of climatic impacts, <i>Keith Toffling, University of Massachusetts</i> Originally: Tim Randhir

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Monday	3:30 p.m.	3:50 p.m.	4:10 p.m.	4:30 p.m.
Brazos I & II Symposium	Ecological Farming: A systematic approach to increasing ecological services and economic profit - James Hoorman, Ohio State University Extension			
Pecos I Symposium	Conservation Effects Assessment Project: Accomplishments from USDA-ARS Benchmark Watersheds PART III - Mark Walbridge, USDA-ARS			
Pecos II Symposium	Discovery Farms: Monitoring Runoff from Real, Working Farms - Mike Daniels, University of Arkansas			
Bur Oak Symposium	International Grassroots Conservation Success Stories - Theo Dillaha, SWCS International Committee			
Post Oak Water Quality & Agriculture	Using conservation tillage to increase yield and water use efficiency of corn and cotton under deficit irrigation <i>R.Louis Baumhardt, USDA Agricultural Research Service</i>	Potential for Improving Agriculture's Water Use Efficiency in Northwest Mexico: The Mexicali Agricultural Valley <i>Yamilett Carrillo, University of Arizona</i>	Assessing the effects of nutrient enrichment on agricultural stream ecology: Regional implications for nutrient criteria development <i>Jeff Frey, U.S. Geological Survey</i>	Effects of retired lands on water quality in southern Minnesota agricultural watersheds <i>Jeff Frey, U.S Geological Survey</i>
West Fork I & II Symposium	Deep and Silent Waters: Challenges in Aquifer Sustainability PART II - Jean Steiner, USDA-ARS			
Central Modeling & Tools	A New Framework to Incorporate Agronomic Systems into Ecological Site Descriptions <i>Susan Andrews, Natural Resources Conservation Service</i>	Effect of Topographic Characteristics on Compound Topographic Index for Identification of Gully Channel Initiation Locations. <i>Ron Bingner, USDA-ARS-National Sedimentation Laboratory Originally: Henrique Momm</i>	Rapid Response to Historic Drought Impacts on the National Forests and Grasslands in Texas <i>Kathleen Ward, USDA-FS-National Forests and Grasslands in Texas</i>	Developing a Comprehensive National Conservation Cost Database <i>Mark Xu, NRCS, USDA</i>
Elm Fork I & II Conservation Policy	Systems Approach To Reduce Nitrogen Loss <i>Alex Echols, Sand County Foundation</i>	Climate Change, Natural Resource Concerns in Malawi, Africa <i>John Kluthe, USDA-NRCS</i>	Water Conservation: A Stakeholder Approach to Implementing Statewide Initiatives <i>Vanessa Escobar, Texas Water Development Board</i>	Economic Implications of Deed Restrictions on NRCS Conservation Easements <i>Janet Perry, USDA NRCS NHQ</i> Originally: Felix Spinelli

Abstract Book - 67th International SWCS Annual Conference

Tuesday	10:30 a.m.	10:50 a.m.	11:10 a.m.	11:30 a.m.
Pecos I Symposium	2012 Farm Bill Implications for Conservation - Jimmy Daukas, American Farmland Trust			
Red Oak	No Presentations Scheduled			
Bur Oak Symposium	Choosing the Best Survey Tool GPS, Optical, or MGIS - Micah Bench, Trimble Navigation, LTD			
Post Oak Urban	Land use pattern and stream flows in urbanizing watersheds. <i>Paul Ekness, University of Massachusetts</i> Originally: Timothy Randhir	Development of an Urban Eco-system along Eight Miles of the San Antonio River <i>Jacque Thomas, Jacobs Engineering Group</i>	Engineering a "Natural" Solution to an Unnatural Challenge, Shoreline Stabilization and Beautification on Town Lake Trail, Austin <i>Heather Harris, CH2M HILL</i>	Erosion control through the vetiver system in urban settings in Central Africa <i>Yves-Dady Botula, University of Kinshasa DR Congo / Ghent University Belgium</i>
West Fork I & II Symposium	Streamlining Conservation Delivery - Cheryl Simmons, NRCS			
Central Symposium	Advances and Challenges in Monitoring Water at the Field Edge: Methods and Case Studies - Mark Tomer, USDA/ARS			
Elm Fork I Symposium	Expanding Support Creation of the first Friends of a Soil and Water Conservation District - Dale Threatt-Taylor, Wake Soil and Water Conservation District			
Elm Fork II Economics, Ecology & Ethics	Bennett, Leopold and the Shadow of James Madison <i>Alex Echols, Sand County Foundation</i>	A Brief Survey of Ethical Arguments for Soil Conservation <i>Thomas Sauer, USDA-ARS</i>	Soil microbial communities and enzyme activities in soils during historically extreme drought conditions in the USA <i>Veronica Acosta Martinez, USDA-ARS</i>	Economic and Biophysical Impacts of Land Management Practices in Southern Manitoba <i>Mohammad Khakbazan, Agriculture and Agri-Food Canada</i>

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Tuesday	1:30 p.m.	1:50 p.m.	2:10 p.m.	2:30 p.m.
Pecos I Symposium	Conclusions and Conservation Benefits from the Nation Cropland Assessment - Arnold King, Texas AgriLife Research			
Red Oak	No Presentations Scheduled			
Bur Oak Adaptive Management	Effect of pinyon and juniper slash on sediment production following a prescribed cut-and-limb treatment in central Nevada <i>Sarah Noelle, The University of Arizona</i>	CIG Presentation: Targeting conservation practices through watershed modeling informed by farmer interviews <i>Margaret Kalcic, Purdue University</i>	Sustainable Cropping Systems Using Cover Crops, Native Species Field Borders and Riparian Buffers for Environmental Quality <i>Clark Gantzer, University of Missouri</i>	Strategies Targeting American Agricultural Resources Sustainability: A 6-State Study of Energy Coupled with Resource Management <i>Martha Zwonitzer, Iowa Soybean Association</i>
Post Oak Symposium	Phyto-Aquatic Nutrient Recycling (CIG Session) - H. Tony Hartmann, Great Lakes Ag Energy			
West Fork I & II Symposium	BMP's in the Chesapeake Bay; what is really there? - Bob Ensor, Howard Soil Conservation District			
Central Symposium	Advances and Challenges in Monitoring Water at the Field Edge: Methods and Case Studies PART II - Mark Tomer, USDA/ARS			
Elm Fork I Symposium	Toward guidelines for model calibration and validation? - Claire Baffaut, USDA-ARS-CSWQRU			
Elm Fork II Water	Complexity of Agricultural and Human Interactions on Water Quality and Quantity in the Mississippi Delta <i>Richard Coupe, U.S. Geological Survey</i>	The Effects of 2011 Ohio and Mississippi River Valley Flooding on Cairo, Illinois Area <i>Kenneth Olson, University of Illinois</i>	The effects of groundwater withdrawals from the Mississippi River Valley alluvial aquifer on surface water quality in northwestern Mississippi <i>Heather Welch, US Geological Survey</i>	Iowa Daily Erosion Project <i>Brian Gelder, Iowa State University</i>

Abstract Book - 67th International SWCS Annual Conference

Tuesday	3:30 p.m.	3:50 p.m.	4:10 p.m.	4:30 p.m.
Pecos I Symposium	Spinoff Technologies from the CEAP National Cropland Assessment - Arnold King, Texas AgriLife Research			
Red Oak Soil	Examining plant nutrient recovery efficiencies in the United States, 1996-2010 <i>Wen-Yuan Huang, Economic Research Service, U.S. Department of Agriculture</i>	NuGIS: a Nutrient Use Geographic Information System for the U.S. <i>Paul Fixen, IPNI</i>	Assessment of Polluting Potential of Major soil types within Lake Huron tributaries <i>Ross Wilson, Ausable Bayfield Conservation Authority</i>	The Impact of 2011 Induced Levee Breaches on Agricultural Lands of Mississippi River Valley <i>Kenneth Olson, University of Illinois, NRES</i>
Bur Oak Adaptive Management	Management Of Drainage Waters: New Practice Standards <i>Alex Echols, Sand County Foundation</i>	A basis for decision making on soil conservation in Prince Edward Island PEI, Canada: Considering the evidence <i>Linnell Edwards, Agriculture and Agri-Food Canada</i>	Adaptive management of ecosystem services in Orinoco Watershed: A regional Assessment. <i>Luisa Galindo, University of Massachusetts Originally: Timothy Randhir</i>	Nutrients management in the Danube River Basin <i>Mihaela Popovici, International Commission for the Protection of Danube River ICPDR</i>
Post Oak Symposium	Embracing Conservation Practices as a Producer A Panel Discussion - Gretchen Kamps, University of Wisconsin-Platteville Pioneer Farm			
West Fork I & II Symposium	Addressing the Adoption Challenge (CIG Session) - Thomas Green, Agflex, Inc.			
Central Symposium	Advances and Challenges in Monitoring Water at the Field Edge: Methods and Case Studies PART III Page 37 - Mark Tomer, USDA/ARS			
Elm Fork I Symposium	Toward guidelines for model calibration and validation? PART II - Claire Baffaut, USDA-ARS-CSWQRU			
Elm Fork II Water Quality & Agriculture	Paired Watershed Studies in the Jordan Lake Watershed: A Regulated System in North Carolina <i>Deanna Osmond, NC State University</i>	Management of creek pastures to protect and improve water quality <i>Kevin Wagner, Texas A&M University, Texas Water Resources Institute</i>	The NRCS/USACE Partnership Handbook: A Field Guide to Working Together Toward Shared Goals <i>Cynthia Wood, U.S. Army Corps of Engineers</i>	Physicochemical Properties of Soils and some Water Sources on the Western Flank of Mount Cameroon <i>Norbert Fomenky, University of Buea Originally: Aaon Tening</i>

Symposia Sessions Summary		
Title & Organizer	Day/Time	Location
2012 Farm Bill Implications for Conservation Jimmy Daukas, American Farmland Trust	Tuesday, 10:30 – Noon	Pecos I
Addressing the Adoption Challenge (CIG Session) Thomas Green, Agflex, Inc.	Tuesday, 3:30 – 5:00 p.m.	West Fork I/II
Advances and Challenges in Monitoring Water at the Field Edge: Methods and Case Studies Mark Tomer, USDA/ARS	Tuesday, 10:30 a.m. – 5:00 p.m.	Central
BMP's in the Chesapeake Bay; what is really there? Bob Ensor, Howard Soil Conservation District	Tuesday, 1:30 – 3:00 p.m.	West Fork I/II
Choosing the Best Survey Tool GPS, Optical, or MGIS Micah Bench, Trimble Navigation, LTD	Tuesday, 10:30 – Noon	Bur Oak
Conclusions and Conservation Benefits from the Nation Cropland Assessment Arnold King, Texas AgriLife Research	Tuesday, 1:30 – 3:00 p.m.	Pecos I
Conservation Effects Assessment Project: Accomplishments from USDA-ARS Benchmark Watersheds Mark Walbridge, USDA-ARS	Monday, 10:30 a.m. – 5:00 p.m.	Pecos I
Conservation Technology Innovations: New Options for the Future Gregorio Cruz, USDA-NRCS	Monday, 10:30 a.m. - Noon	Brazos I & II
Deep and Silent Waters: Challenges in Aquifer Sustainability Jean Steiner, USDA-ARS	Monday, 1:30 – 5:00 p.m.	West Fork I/II
Discovery Farms: Monitoring Runoff from Real, Working Farms Mike Daniels, University of Arkansas	Monday, 3:30 – 5:00 p.m.	Pecos II
Ecological Farming: A systematic approach to increasing ecological services and economic profit James Hoorman, Ohio State University Extension	Monday, 3:30 – 5:00 p.m.	Brazos I/II
Embracing Conservation Practices as a Producer: A Panel Discussion Gretchen Kamps, University of Wisconsin-Platteville Pioneer Farm	Tuesday, 3:30 – 5:00 p.m.	Post Oak
Expanding Support Creation of the first Friends of a Soil and Water Conservation District Dale Threatt-Taylor, Wake Soil and Water Conservation District	Tuesday, 10:30 – Noon	Elm Fork I
Food Security: Conservation, Inputs and Technology Jorge Delgado, USDA-ARS-SPNR	Monday, 10:30 a.m. – Noon	Central
International Grassroots Conservation Success Stories Theo Dillaha, SWCS International Committee	Monday, 3:30 – 5:00 p.m.	Bur Oak
Lessons from Monitoring and Measurement of Water Quality Projects in Midwestern Agriculture Watersheds Jimmy Daukas, American Farmland Trust	Monday, 10:30 a.m. – Noon	Pecos II
MRBI Symposium Mike Daniels, University of Arkansas	Monday, 1:30 – 3:00 p.m.	Pecos II
Phyto-Aquatic Nutrient Recycling (CIG Session) H. Tony Hartmann, Great Lakes Ag Energy	Tuesday, 1:30 – 3:00 p.m.	Post Oak
Pollinator Conservation Grows Up: Lessons Learned from the Field (CIG Session) Cheryl Simmons, USDA-NRCS	Monday, 1:30 – 3:00 p.m.	Central
Spinoff Technologies from the CEAP National Cropland Assessment Arnold King, Texas AgriLife Research	Tuesday, 3:30 – 5:00 p.m.	Pecos I
Streamlining Conservation Delivery Cheryl Simmons, NRCS	Tuesday, 10:30 – Noon	West Fork I/II
Toward guidelines for model calibration and validation? Claire Baffaut, USDA-ARS-CSWQRU	Tuesday, 1:30 – 5:00 p.m.	Elm Fork I

Symposium Session Descriptions and Agendas

2012 Farm Bill Implications for Conservation

Jimmy Daukas, American Farmland Trust

Tuesday, 10:30 – Noon

Pecos I

The Farm Bill is the single most important piece of legislation affecting conservation. The 2012 Farm Bill is being debated under the pressure of severe budget cuts and increasing demands on producers to improve environmental quality. The early glimpse of a Farm Bill that the Agriculture Committees sent to the Super Committee showed significant, even dramatic changes in conservation programs as well as safety net programs. All have important implications for conservation on the ground and in the fields. Panelists will present the latest information on the status of the Farm Bill, potential impacts on conservation, review changes and new programs, and next steps.

Panelists:

- Mitch Hunter, American Farmland Trust
- John Peterson, Soil and Water Conservation Society
- Jimmy Daukas, American Farmland Trust (Moderator)

Addressing the Adoption Challenge

Thomas Green, Agflex, Inc.

Tuesday, 3:30 – 5:00 p.m.

West Fork I/II

(CIG Session)

Four recent Conservation Effects Assessment Program (CEAP) reports show unmet challenges in adoption of proven best management practices (BMPs). For example, the Great Lakes Basin CEAP indicates a significant opportunity for increased conservation, with 47% of cropland acres in need of additional nutrient management and approximately 19% at a critical need level. More than 20 studies point to fear of income loss as a barrier to farmer adoption. Tactics to address this economic risk include technical support, education, cost-shares and incentive payments, community-based programs, performance guarantees and on-field comparison trials.

This symposium will look into several programs that incorporate a combination of the tactics above in order to best adapt to the needs of both the producer and the watershed. Programs presenting include:

- 1) **BMP CHALLENGE**, an opportunity to test state-recommended nutrient management and tillage practices with a risk-free guarantee that covers any net returns loss due to the BMP
- 2) **Minnesota Department of Agriculture Nutrient Management Initiative**, an in-field evaluation focused on helping farmers fine-tune their nutrient application rates by comparing to either a higher or lower application rate
- 3) **Great Lakes Protection Fund**, agricultural retailer projects in the Sandusky River watershed that use SWAT based analysis to target acres for developing conservation plans
- 4) **Wisconsin Buffer Initiative**, a collaborative effort to identify specific areas to implement riparian buffers within a larger conservation system in order to increase efficiency and effectiveness.

Presenters:

1. Brian Brandt - American Farmland Trust
2. Brian Williams, MDA Nutrient Management Initiative
3. Thomas Green, IPM Institute of North America
4. Peter Nowak, Professor, Emeritus, for Environmental Studies at the University of Wisconsin-Madison Nelson Institute

ABSTRACTS

1. Brian Brandt - American Farmland Trust

The BMP CHALLENGE expanded in the past ten years to assist farmers in implementing more than 16,000 acres of nutrient and tillage BMPs, reducing nitrogen applications by over 430,000 lbs., sediment loading by 3800 tons and phosphorus by 5000 lbs. The grower works with a crop adviser to develop a nutrient or tillage management plan. The grower applies their conventional practice to a check-strip, and the BMP to the balance of the field. At harvest, the grower compares the yields, and the BMP CHALLENGE calculates a net returns analysis accounting for any cost input savings. In the event of an income loss, the grower receives full reimbursement. Recent developments include trials in precision agriculture, planned nitrogen reduction (intentionally applying less than university-recommended rates of fertilizer), high-value crops and liquid manure.

2. Brian Williams, MDA Nutrient Management Initiative
Minnesota farmers have participated in the Nutrient Management Initiative (NMI) evaluation program for the past 6 years at over 170 locations. Participating farmers work with a certified crop adviser and set up test comparisons on their own farm. The focus of the program is to help farmers to fine-tune their nutrient application rates with either a higher or lower application rate comparison and evaluate their economic outcomes. Upon completion of the program the farmer and certified crop adviser receive an economic analysis based on the farmer's actual nutrient costs, and yields from replicated strips using a yearly average corn price. Participating farmers receive funding to reimburse them for the certified crop adviser's fees and the time spent on the project.

3. Thomas Green, IPM Institute of North America

The projects with the Great Lakes Protection Fund in the Sandusky River watershed benefit from collaborations with agricultural retailers that have already built relationships and meet regularly with the producers in the area. The projects focus on the agricultural input infrastructure as a primary influencer of practices and product use, and emphasizes the significance of providing long-term solutions for undertreated acres.

4. Peter Nowak, Professor, Emeritus, for Environmental Studies at the University of Wisconsin-Madison Nelson Institute
"Barriers to Conservation Adoption in Agriculture," a 1992 article in the Journal of Soil and Water Conservation list 16 reasons why farmers are either unwilling or unable to adopt conservation practices. It was pointed out in the article that many of these reasons were beyond the control of the farmer. The complexity of this situation has only increased in the intervening twenty years as international markets, advances in technology, and demographic changes, among other factors, has made this a challenging issue. A summary overview of these major factors will be followed by some suggestions on how assessments and intervention strategies need to be designed to address this challenge.

Advances and Challenges in Monitoring Water at the Field Edge: Methods and Case Studies

Mark Tomer, USDA/ARS

**Tuesday, 10:30 a.m. – 5:00 p.m. -- 3 sessions
Central**

The aim of this session is to share lessons learned from experience and new technologies that are being developed that can assist conservationists who are interested in monitoring water quantity and quality at the field edge. New initiatives including NRCS's Mississippi River Basin Initiative are encouraging field scale monitoring efforts to better understand effects of conservation practices on water quality at the field scale. There is also cost sharing being made available to producers through special practice 799 under interim standards. However, monitoring is expensive and edge of field monitoring presents many challenges due to the ephemeral and rapid responses in flows that occur at this scale compared to stream monitoring. Snowmelt is an additional challenge in Northern climates, especially when a significant snowpack partially melts and refreezes on a diurnal basis. Against these challenges, there is need to use consistent methods to allow comparison among sites and practices where landowners agree that data collected on their property can be shared.

This session will summarize efforts that university and government scientists are undertaking to address the challenges involved with edge of field monitoring. These efforts include case studies, development of new monitoring methods, statistical analysis of data, assessment of practices, and development of guidelines to locate and install gauging and sampling equipment.

Session 1

1. Andrew Sharpley, University of Arkansas
2. Daren Harmel; USDA-ARS
3. Doug Smith, USDA-ARS
4. Mark Tomer, USDA-ARS

Session 2

1. Dennis Busch, University of Wisconsin-Platteville
2. Philip Parker, University of Wisconsin-Platteville
3. Kevin King, USDA-ARS
4. Mike Daniels; University of Arkansas

Session 3

1. Jacqui Laporte, Ontario Ministry of Agriculture, Food and Rural Affairs
2. Merrin Macrae, University of Waterloo
3. Tom Prout, Ausable Bayfield Conservation Authority

ABSTRACTS

Edge-of-field Monitoring in the Context of Watershed Management

Andrew Sharpley, University of Arkansas

Edge-of-field monitoring has provided invaluable information on factors influencing nutrient and sediment runoff from agricultural land. This has included establishing the relative importance of surface runoff and tile flow on watershed export; of soil phosphorus (P), added P and hydrology on P runoff; and of land management on nutrient runoff. Edge-of-field monitoring has also contributed greatly to our understanding of how conservation or best management practices (BMPs) can decrease nutrient and sediment runoff and their respective reduction efficiencies. However, there has been less success in translating this information to effective watershed mitigation strategies, which has been due in part to the site specificity of BMP effectiveness, the legacy of past management, and fluvial processes. The recently established NRCS monitoring conservation practice (CP 799) will help provide targeted information on edge-of-field nutrient loss over a wide range of settings and locations. Even so, in-stream processes that act as sinks and sources of nutrients downstream of edge-of-field inputs must be accounted for when developing future watershed remediation strategies. Further, inadvertently increasing field to stream connectivity with certain BMPs, should be considered when scaling up from edge-of-field to watershed functioning.

Increasing Data Quality and Reducing Uncertainty in Edge-of-Field Runoff Monitoring

Daren Harmel, USDA-ARS

Kevin King, Doug Smith

For many years, the uncertainty in measured water quality data introduced by sample preservation and laboratory analysis procedures has been relatively well understood. This superior understanding, relative to other uncertainty sources such as sample collection and data management, logically resulted in a vast majority of QA/QC attention being focused on sample preservation and laboratory analysis in typical water monitoring projects. In contrast, research related to water quality data collection has only recently provided similar understanding of sampling methods and the resulting uncertainties. In light of this recent research, QA/QC methods and priorities should be refined to minimize uncertainty from water quality data collection. Much of this recent research, specifically that of Harmel et al. (2006, 2009), focused on small watershed and edge-of-field data collection. Typical uncertainty estimates ($\pm\%$) reported in this work, ranged from approximately 5-25% for streamflow, 5-35% for sample collection, 2-25% for sample preservation/storage, and 3-25% for laboratory analysis, although much higher uncertainties were observed for poor monitoring conditions and limited QA/QC. Data processing and management typically contributed < 5% uncertainty but occasionally introduced 10-100%. These analyses showed that considerable uncertainty can be introduced by each procedural category; therefore, QA/QC

should appropriately address each category. Similarly, QA/QC protocols should require uncertainty estimation to provide important data "quality" information to field staff, decision-makers, modelers, and regulators. If implemented, these QA/QC refinements will improve the "quality" and value of runoff water quality data.

Keywords: water quality, measurement, uncertainty, nonpoint source

Separating Surface and Subsurface Pathways Transporting N and P from Fields

Douglas R. Smith, USDA-ARS

Nutrient losses from agriculture have led to Harmful Algal Blooms in lakes, reservoirs and estuaries. It is well known that nitrogen (N) is lost through both surface and subsurface flowpaths. Traditionally, phosphorus (P) has been thought to be lost mostly through surface runoff processes, and that the majority of that loss was associated with either erosion or direct loss of fertilizer or manure to surface runoff water. Upon further review, subsurface transport of P is an important contributor to the overall P loss budget. The objectives of this presentation will be to assess surface and subsurface losses of N and P, as only through a more thorough understanding of these processes can we begin to address minimizing the risks of nutrient loss from these pathways. In the St. Joseph River Watershed in northeast Indiana, surface and subsurface runoff are being monitored from four fields ranging from 2.2 to 4.5 ha. In these fields, >60% of the N is typically lost through subsurface flowpaths, unless >75% of the discharge occurs through surface runoff. While partitioning of DRP and TP between surface and subsurface flow are correlated with the partitioning of discharge, the range in values is much greater than what was observed for N. In general, approximately 50% of the SP or TP loads are lost through subsurface tile, but this can vary based on the cropping system attributes. The importance of subsurface losses of P need to be recognized so treatment technologies can be identified to minimize downstream P loading.

Keywords: phosphorus, nitrogen, runoff, tile flow,

Runoff and Phosphorus Loads from Two Iowa Fields with and without Applied Manure, 2000-2011

Mark Tomer, USDA-ARS

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Kevin Cole, USDA-ARS, kevin.j.cole@ars.usda.gov; Jerry

Hatfield, USDA-ARS, jerry.hatfield@ars.usda.gov

Understanding the dynamics of field-edge runoff water quality and responses to changes in management practices and climate through monitoring will probably require decadal-duration data sets. This study compared runoff volumes and phosphorus loads from two fields in central Iowa, where the glacial landscape is dominated by the Clarion-Nicollete-Webster soil association. Both fields were in corn-soybean rotation but only one received swine manure, which was applied following soybean harvest to meet the following corn crop's N requirement. Runoff flumes (H-type) were installed

along grassed waterways prior to the 2000 growing season; runoff samples were collected on a flow-interval basis using and analyzed for total P. Monitoring continued through 2010, providing eleven years of data. Results are only for rainfall-runoff events because sites were remote and consistent snowmelt monitoring was not feasible. Results provided data on 119 events from the manured site, and 94 events at the non-manured site, with 74 events common to both sites. Discharge through the monitoring flumes occurred on average less than 116 hours per year, but half the total discharge observed in the entire 11 years occurred during a total 48 hours of storm flow. This result emphasizes the challenge of monitoring ephemeral flows. Functions that described runoff fraction (the fraction of rainfall that was converted to runoff) as a function of storm size were virtually identical at the two sites. Average annual runoff was greater from the non-manured site (54 mm yr⁻¹) than the manured site (37 mm yr⁻¹), however, P loads were greater from the manured site 1.4 vs 1.1 kg P ha⁻¹yr⁻¹. The difference is small, especially given soils in the non-manured field app

Keywords: Edge-of-field monitoring, phosphorus, runoff, manure application

Installing Robust yet Lower Cost Gauging Stations Dennis Busch; UW Platteville

Through the NRCS Interim Conservation Practice Standard Code 799 Monitoring and Evaluation, producers have access to funding for a variety of monitoring activities, including edge-of-field runoff monitoring. The interim NRCS standard provides challenges and opportunities for edge-of-field surface-water runoff monitoring. The primary challenge is purchasing, installing, and operating a surface-water gauging station within the cost-share limitations, not enough support is available given the cost of current monitoring techniques. However, the University of Wisconsin-Platteville Pioneer Farm, in collaboration with other scientists, has developed low-cost monitoring techniques that may fulfill the monitoring needs of the interim standard. These methods are currently being evaluated at sites in three states. Equipment cost reductions have been created by engineering equipment for a single use (quantifying edge-of-field pollutant loads), and by sacrificing some accuracy in order to reduce installation, operation, and maintenance costs.

The following innovative components for edge-of-field monitoring activities will be described and discussed. These components are designed to improve performance and simplify operation and maintenance of gauging stations.

1. HXL-Flume. This new flume designed and tested at Pioneer Farm will reduce installation and maintenance costs.
2. Plug-And-Play Components. Operational costs will be reduced because station components are designed to be "plug-and-play" compatible. Each component has a unique plug for a unique receptacle- eliminating difficult wiring connections and greatly reducing technical training and skill required for gauge operation.

An Evaluation of Lower Cost Discharge Measurement and Sampling Methodologies Phillip Parker; UW Platteville

It is difficult, if not impossible, to accurately pre-program automated samplers so that both small and large events are sampled adequately. What often occurs is insufficient samples are collected during small runoff events, and sampler capacity is exceeded during large runoff events. A need exists for runoff estimation devices that can predict the volume of runoff within 10 - 20% of the actual discharge at a lower cost than the state-of-the-art methods.

Results of a study to evaluate four alternative lower cost methodologies are presented. The first alternative system (Two-Part Flow Weight Composite Sampler) uses an automated sampler that is capable of collecting samples based on two flow intervals simultaneously. This allows one sampler to be set to two flow-weight compositing intervals- one interval for small events and one for large events. The second system (Single-Stage Siphon Sampler) includes single-stage siphon samplers installed at multiple flume depths in association with an integrated stage sensor-datalogger. Accuracy measurements are reported as relative percent accuracy and are calculated as a difference from results determined by our current system (referred to as EPA method). The third system is the Crown Divisor Sampler, which captures a set fraction of the runoff discharge using triangular-shaped openings in a "crown" that is placed on top of a standard 5-gallon pail. The fourth system is the Multi-Orifice Sampler that is affixed to the side of an H-flume.

Experimental results indicate that the 2-Part Flow Weight Composite Sampler was able to adequately sample both large and small events. The nitrogen and phosphorus loads produced by replicate samplers were precise and strongly correlated to EPA

Edge-of-Field Phosphorus Transport in Surface and Sub-surface Drainage Kevin King, USDA-ARS Norm Fausey, USDA-ARS

Nutrient enrichment from agricultural sources is the primary water quality concern facing many local, state, and national entities throughout the world. Excess phosphorus has lead to eutrophic conditions in many freshwater lakes and streams. Similarly, excess nitrogen from Midwestern agriculture continues to feed the hypoxic zone in the Gulf of Mexico. The two primary pathways for nutrients to enter surface waters are through surface runoff and subsurface (tile) discharge. Twenty-five percent of all the farmland in the US and Canada would not be farmable without some form of subsurface drainage. In the Midwest, 37% of cropland acres are artificially drained. Partitioning water movement and any associated agri-chemicals through surface and subsurface pathways is critical for understanding the controlling process and targeting and identifying best management practices. Through the Mississippi River Basin Initiative we have

launched a study to quantify the edge-of-field hydrologic and water quality impacts of cover crop implementation. To date, ten edge-of-field surface discharge stations have been installed across a gradient of soil test phosphorus levels. At four of these ten sites, subsurface tile drainage data is also collected. Here we provide an update and preliminary data from that study. The presentation will include concentrations and loading from event based data.

Keywords: phosphorus, edge-of-field, tile, runoff

Validating and Demonstrating Best Management Practices to improve water quality on Ontario Farms

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The sciences of agronomics, hydrogeology, soils, social behaviour, economics and environment join together to evolve robust water quality solutions to complex biophysical and temporal farm production systems. Best Management Practices are not stagnant so there is a constant need to feed progressive ideas to innovative farm managers who tweak small plot and laboratory research into farm scale practical husbandry. It is through the collaborate efforts of scientists, agronomists and farmers that real understanding of how to implement actions that improve water quality can be made.

Projects that validate and demonstrate best management practices are in place across the province of Ontario. These projects investigate solutions to regulatory, production, economic and environmental obstacles. As information becomes available this science is used to support policy, programs and practices for the support of agriculture production systems that protect water quality.

Keywords: best management practices, verification, water quality

Quantifying year round runoff and water quality in surface and subsurface runoff in tile drained agricultural fields in Southern Ontario

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Agricultural watersheds have long been identified as a source of phosphorus (P) to surface water bodies. There is uncertainty regarding the relative contributions of surface runoff (overland flow) and runoff through drainage tiles to the export of both particulate (PP) and dissolved (DP) forms of P from fields. Much of the existing scientific research done on these topics has been conducted in warmer climates, primarily during the growing season. It is unclear if the P export patterns observed in these studies hold true in Canadian (Ontario) climates, 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. A set of new projects has been initiated with the objective of quantifying year-round runoff and water quality from no-till agricultural fields in Southern Ontario. Sub-objectives 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. Preliminary results demonstrate that hydrologic events trigger a rapid increase in P concentrations in drainage tile effluent although P concentrations in drainage tiles are lower than P concentrations in overland flow during the same periods. The effects of season, event type, antecedent moisture conditions and tillage type on the magnitude and speciation (dissolved, particulate) of P fluxes are discussed.

Keywords: water quality monitoring, phosphorus, tile drainage

Evaluating Rural Best Management Practices at the Site and Watershed Scales in Huron County

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Mari Veliz, Ausable Bayfield Conservation Authority, RR 3 Exeter, ON N0M 2G0, mveliz@abca.on.ca

The South-East shore of Lake Huron provides many residents of Ontario with drinking water and swimming, boating and fishing recreational opportunities. However, nutrient, particularly phosphorus, sediment and bacterial impacts from adjacent rural watersheds can sometimes limit both the human uses and the ecological integrity of the shores of Lake Huron. Expanded from previous community watershed stewardship efforts, the Crops and Creeks, Watershed Based Best Management Practices Evaluation (WBBE, Huron) project is evaluating economic decision making and the environmental effects of multiple best management practices (BMPs) in small watersheds.

In small watersheds near Bayfield, Ontario (75 km² area with 22 small streams), 35 BMPs were undertaken in 2008 and 2009. To meet the project objectives, farmers in pilot watersheds have been encouraged to adopt additional BMPs and to provide data on inputs/outputs of crop and livestock production system and BMP related costs and benefits. Information collected from the landowners regarding the costs and benefits of the BMPs will provide some insights to the economic decisions that are made at the farm-scale that

influence interest in BMPs. We have also established test plots of erosion control structures, cover crops, conservation tillage and reduced nitrogen application to improve predictability of existing watershed hydrological models.

The land management information, combined with water quantity and quality monitoring, and improved predictive modeling will evaluate efficacy of the BMPs at the watershed scale. Preliminary results will be highlighted in comparison to existing watershed scale evaluation projects being conducted in North America.

Keywords: watershed, best management practices, water quality monitoring

BMP's in the Chesapeake Bay; what is really there?

Bob Ensor, Howard Soil Conservation District

Tuesday, 1:30 – 3:00 p.m.

West Fork I/II

EPA has long contended that agriculture is a major contributor to the decline of the water quality in the Chesapeake Bay. The agricultural sector has long contended that there are many more Best Management Practices on the ground than are being credited. The presenters embarked on a fact finding mission to determine the truth, through a project funded by the National Association of Conservation Districts and then through a project funded by Howard County Maryland. The objective of the NACD project was to seek agreement among the six Bay watershed states on a common data collection protocol that would feed consistent information on non-cost shared, farmer funded practices to the Chesapeake Bay Model.

The objective of the Howard County project was to collect all BMP data on properties in the Agricultural Preservation Program, which would be entered into the Bay Model. This project included determining if an individual farm could meet the TMDL and have N and P tradable credits.

Results in the Howard County project show:

- many farmer-funded practices have not been reported;
- farms can meet the TMDL and have excess N and P credits;
- the potential benefits and costs of completing inventories of BMP's on watershed agricultural farms
- if replicated in the six bay states, it could significantly impact agriculture's TMDL load allocation and policy decisions.

These results have ramifications far beyond the Chesapeake Bay setting precedence for TMDL activities nationwide.

Presenters:

- Bob Ensor, District Manager, Howard Soil Conservation District
- Dana York, President, Green Earth Connection.

Choosing the Best Survey Tool GPS, Optical, or MGIS

Micah Bench, Trimble Navigation, LTD

Tuesday, 10:30 – Noon

Bur Oak

There are many survey tools available to Civil Engineers to include survey GPS, optical, lasers, mapping tools and more. Which tool from the survey tool chest is best for the application and job at hand to best fulfill the customers' requests? Field to Finish using Integrated Survey Solutions

This session will consist of collecting combined GNSS and optical data, as well as integrating imaging data collected simultaneously using integrated workflows. Users will gain experience utilizing field procedures to collect data on the State Plane Coordinate System using an integrated survey process that combines real-time GNSS and robotic surveying operations. Survey data will be collected using one data collector, one job and one coordinate system. Survey field data will be collected using enhanced workflows that increase productivity through new field collection methods in a true multitasking environment. Imagery will be collected from both the data collector camera and the robotic total station camera to provide enriched survey data information to the office technicians as well as to final deliverables. The field workflows will incorporate the use of sharing data (near Real-time) from the field to the office and back to the field from the office. Sharing all survey data collected in the field with the office as well as sending updated project data to the field will enhance productivity, communications and collaboration efforts for all your projects. Survey data will then be transferred to office software for viewing, quality control, and reporting. The data will be viewed in both 2D and 3D views, viewed with data overlays on captured images, processing feature codes including linework and symbology, export survey data to Google Earth.

Presenters:

- Sean Chard, Trimble Navigation
- Gretchen Hartley, Trimble Navigation

Conclusions and Conservation Benefits from the Nation Cropland Assessment

Arnold King, Texas AgriLife Research

Tuesday, 1:30 – 3:00 p.m.

Pecos I

The CEAP National Cropland Assessment was designed to quantify the environmental effects of conservation practices applied to cropland fields of the United States. The CEAP team completed the study using the APEX model and detailed cropland management information gathered by on-site interviews with a representative sample of farmers throughout the Nation. The APEX output data represents the edge of field losses of sediment, nutrients, and pesticides. The APEX data was then integrated into the SWAT/HUMUS model to assess water quality effects in each 2 digit watershed which included all major river systems in the United States.

The symposium focuses on edge of field conservation practice effects assessed by the APEX model and off-site water quality impacts assessed by the SWAT/HUMUS model. The impacts are based on sediment, nutrients, and pesticide loads expected to be delivered at the outlet of each watershed assessed by the study. Lessons Learned on data input requirements, model calibration and "what we would do differently" will be discussed. An open discussion period will follow the formal presentations

The symposium will follow this outline:

Moderator: Arnold King, Texas AgriLife Research, Temple, Texas

1. Edge of Field losses of Sediments, Nutrients, and Pesticides by Lee Norfleet, NRCS, Temple, Texas
2. Water Quality Effects of Sediments, Nutrients, and Pesticides by Jeff Arnold, ARS, Temple, Texas
3. Cropland Treatment Needs - Cost Optimization Software by Jay Atwood, NRCS, Temple, Texas
4. Lessons Learned and What We Would Do Differently by Lee Norfleet, NRCS, Temple, Texas

Conservation Effects Assessment Project: Accomplishments from USDA-ARS Benchmark Watersheds

Mark Walbridge, USDA-ARS

Monday, 10:30 a.m. – 5:00 p.m. -- 3 sessions
Pecos I

The symposium “Conservation Effects Assessment Project: Accomplishments from USDA-ARS Benchmark Watersheds” will illustrate the opportunities for ARS research accomplishments to support conservation policy. Specifically, their long-term databases provide scientific bases for regional assessment outcomes, their site-specific research improves watershed model structure, and their multi-scale research affords opportunities to evaluate the success of conservation practice implementation and targeting. The strength of the ARS network, representing a number of different soil, climate, and cropping systems, helps reduce uncertainty in documentation of conservation program success. This overview outlines the project, lists a few earlier accomplishments, and introduces the symposium, which will highlight major recent accomplishments in a number of fields. The symposium will communicate information on conservation practice efficacy and targeting to NRCS conservationists and LGU extension agents.

Session 1

- 10:30p CEAP ARS Watershed Assessment Study – Overview
John Sadler, USDA-ARS
- 10:40p Conservation Program Effects on Soil Quality
Doug Karlen, USDA-ARS
- 11:00p Factors Impacting Mitigation of Pesticide Runoff and Leaching
Tom Potter, USDA-ARS
- 11:20p Efficacy of Edge-of-Field Conservation Practices
Matt Moore, USDA-ARS
- 11:40p Tools to Improve Practice Placement Efficacy
Mark Tomer, USDA-ARS

Session 2

- 1:30p Implementation of Nutrient Reduction Measures
Ray Bryant, USDA-ARS
- 1:50p SWAT, ANNAGNPS, and APEX Modeling
Advancements
Jeff Arnold, USDA-ARS
- 2:10p Impact of Weather and Climate Scenarios on
Assessment Outcomes
Jurgen Garbrecht, USDA-ARS
- 2:30p Association between conservation practices and
ecology
Richard Lizotte, USDA-ARS

Session 3

- 3:30p Fine Sediment Sources on CEAP Watersheds
Roger Kuhnle, USDA-ARS
- 3:50p Impacts of conservation practice placement within a
watershed: Case study in tile drained systems
Tom Moorman, USDA-ARS
- 4:10p Panel Discussion: NRCS and Extension Service
Feedback on Information Needs
 - Lisa Duriancik, NRCS
 - Wayne Honeycutt, NRCS
 - Deanna Osmond, NCSU Ext
 - Jim Gulliford, SWCS
 - Shanon Phillips, Oklahoma Cons. Commission
 - Moderator: Roberta Parry, EPA

ABSTRACTS

Cropland CEAP Soil Quality Assessment Update

Doug Karlen, USDA-ARS

Diane Stott, USDA-ARS National Soil Erosion Research Lab

One goal for the USDA cropland Conservation Effects Assessment Project (CEAP) was to assess the effects of various conservation practices on soil quality, which is a proactive process for quantifying the long-term impact of crop and soil management practices within agricultural watersheds. Our objectives were to quantify several soil quality indicators, including soil organic carbon (SOC) content, and determine if the Soil Management Assessment Framework (SMAF) could help detect long-term effects of various conservation practices. Near-surface soil

samples (0 to 5 cm) were collected from all 14 Cropland CEAP watersheds, two NRCS Special Emphasis watersheds, and an organic transition farm in New Hampshire. Soil organic carbon (SOC), bulk density (Db), water-filled pore space (WFPS), electrical conductivity (EC), microbial biomass carbon (MBC), potentially mineralizable C and N, pH, P, K, Ca, Mg, Cu, Fe, Mn, and Zn were measured and the data are being evaluated using the SMAF. The South Fork watershed assessment in central Iowa, conducted on a field-by-field basis, helped identify potential soil-based causes for poor canopy development. This presentation will provide a preliminary review of the preliminary results from several of the watersheds and discuss their relationship to the conservation practices being used at those sites.

Keywords: Soil quality assessment, Soil Management Assessment Framework (SMAF), Soil analyses

Non-point source pesticide pollution in CEAP watersheds - controlling factors and mitigation strategies

Tom Potter, USDA-ARS

For more than 70 years, crop production in the USA has depended heavily on synthetic chemical pesticides for weed, insect, and disease management. These products continue to be critical components of pest management programs that sustain food and fiber production and protect public health, homes and property and their intensive use is anticipated into the foreseeable future. However, decades of pesticide usage in the USA has resulted in contamination of water resources to levels that may be harmful to humans and aquatic ecosystems. Currently there is substantial emphasis on development of products that reduce human and ecological risks of pesticide use. While progress has been made, it is clear that crop protection with pesticides will continue to threaten water quality. This has sustained a need for understanding factors controlling pesticide movement in agricultural landscapes and for mitigation strategies that reduce and limit pesticide transport from farm fields to streams, rivers, and groundwater. In this presentation we will highlight work in ARS CEAP Benchmark watersheds that have delineated and quantified the factors controlling hydrologic transport pathways and demonstrate efficacy of management practices at field, farm, and watershed scales that serve to minimize off-site transport.

Keywords: pesticides, watersheds, mitigation, conservation, fate, transport

Efficacy of edge-of-field conservation practices from ARS-CEAP watersheds

Matt Moore, USDA-ARS

A number of edge-of-field conservation practices are available to landowners to help mitigate against the deleterious effects of agricultural runoff. Many of these practices (e.g. constructed wetlands, riparian buffers, grassed waterways, and drainage

ditches) incorporate vegetation as a critical component assisting in reduction of contaminants. This presentation will review different edge-of-field conservation practices currently being assessed among the ARS-CEAP watersheds. These practices include, but are not limited to, riparian buffers, vegetated buffer strips, constructed wetlands, and drainage ditches. Discussion will also include current modeling efforts (e.g. REMM - Riparian Ecosystem Management Model) to assess buffer effectiveness. Emphasis will be placed on water quality impacts of these edge-of-field practices at both the field and watershed scales.

Keywords: wetlands, riparian buffers, ditches, modeling

Tools to Improve the Placement of Conservation Practices in Watersheds

Mark Tomer, USDA-ARS

Tamie Veith, USDA-ARS, tamie.veith@ars.usda.gov; Claire Baffaut, USDA-ARS, claire.baffaut@ars.usda.gov; Greg McCarty, USDA-ARS; greg.mccarty@ars.usda.gov

Conservation programs can become costly and ineffective if implemented based solely on voluntary landowner participation rather than on implementing BMPs where reduction potentials are greatest and their impacts most cost-effective. Studies have long reported that the successes of nonpoint source pollution control efforts depend upon the ability to properly identify, target, and remediate critical source areas of pollution. This presentation will provide an update on technologies that can help prioritize which conservation practices should be most effective for improving water quality in watersheds and where they should be placed to provide that benefit with maximum effectiveness. Simulation models, remote sensing data, and terrain analyses comprise a variety of new approaches for watershed-scale conservation planning and assessment. These technologies cross scales from identifying zones with fields to broad changes across the watershed and often include additional benefits such as increasing ecosystem services or decreasing farmer costs. Integration of these hydrologic and topographic approaches with the response of the whole farm system can lead to a collaborative and integrated framework that promotes successful and effective water quality control at the watershed level.

Keywords: Conservation effects assessment, precision conservation, watershed analysis, water quality

Development and Adoption of Measures to Prevent Off-site Nutrient Transfers

Ray Bryant, USDA-ARS

Ray Bryant¹, Peter Kleinman¹, Dan Jaynes², Gary Feyereisen³ and Jim Ippolito⁴

¹ USDA-ARS, Pasture Systems and Watershed Management Research Unit, University Park, PA 16802

² USDA-ARS, Agroecosystems Management Research Unit, Ames, IA, 50011

3 USDA-ARS, Soil and Water Management Research Unit, St. Paul MN 55108

4 USDA-ARS, Northwest Irrigation and Soils Research Laboratory, Kimberly, ID 83341

While the Conservation Effects Assessment Project (CEAP) has primarily focused on quantifying the benefits of existing conservation practices, CEAP has also contributed to the development of new measures that prevent off-site transfer of nutrients from farms to water bodies. We review case-studies demonstrating the role of CEAP-related research leading to the adoption of some of these nutrient reduction measures. In support of the Conservation Reserve Enhancement Program, a behavioral study of in-stream defecation by pastured cattle aided in gaining acceptance of stream bank fencing by farmers and program managers in the New York City watershed. Acceptance of bioreactors in the Mississippi drainage basin stems from studies that first tested reactor media, then evaluated deployment methods, and finally examined site-specific performance. Analogous development of gypsum reactors to bind phosphorus in the Mid-Atlantic region has reached the stage of on-farm trials, with USEPA already identifying these filters as “next generation” measures for the Chesapeake Bay. By documenting reductions in nutrient losses in runoff, leaching, and volatilization, farmers are being provided with data to inform their choice between multiple styles of commercially available manure injectors. New research supported by the city of Boise, Idaho in the Snake River watershed shows the potential for water treatment residuals to enrich phosphorus binding capacity of engineered wetlands. Clearly, CEAP objectives go beyond quantifying the benefits of past conservation efforts and include the introduction of the conservation measures of the future.

SWAT, AnnAGNPS, and APEX Modeling Advancements

Jeffrey G. Arnold, USDA-ARS Temple, TX

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Field and watershed scale models are important decision support tools used in determining the impact of USDA conservation policies on water, sediment, nutrient and pesticide loadings to water bodies in the joint NRCS/ARS CEAP National Cropland Assessment. Model validation is essential for acceptance and scientific credibility of the assessment and to ensure realistic results. Data and research results from the ARS

Benchmark Watersheds were used to validate, enhance, and estimate uncertainties of the models. These models include the SWAT river basin, the AnnAGNPS watershed, and the APEX field and watershed models. Examples of benchmark watersheds and resulting model enhancements include: 1) Walnut Creek (IA) - tile flow and nitrates, pothole storage; 2) Leon and Bosque River (TX) - dairy waste management and phosphorus cycling; 3) Washita River (OK) - flood control structures and rangeland runoff; 4) Goodwin Creek (MS) - ephemeral gully and stream bank erosion; 4) Beasley Lake (MS) - nutrient management; 5) Little River (GA) - riparian zone processes and high baseflow conditions; 6) Town Brook and Manhantango (NY & PA) - BMP placement and variable source area hydrology; 7) Choptank (MD) - use of NEXRAD in SWAT and riparian processes; 8) Mark Twain and Goodwater Creek (MO) - claypan soil, pesticide fate, and identification of critical areas; and 9) St. Joseph and Big Walnut Creek (IN & OH) - tile flow and nitrates, nitrogen balance and management, pesticide fate and transport. These efforts provided confidence in CEAP conservation policy through the data and scientific understanding obtained from model validation, improved process components/algorithms, and impact of conservation practices as documented in over 60 peer reviewed journal articles.

Keywords: hydrologic models, water quality, conservation effects assessment

Impact of Weather and Climate Scenarios on Assessment Outcomes

Jurgen Garbrecht, USDA Agricultural Research Service

Hillslope runoff, soil erosion, stream flow, and channel sediment transport form a chain of linked processes that drain watersheds of excess rainfall and carry eroded soil and sediments downstream. At the top of this chain of processes is rainfall without which there would be no runoff, soil or fluvial erosion, or sediment transport. Thus, watershed drainage and sediment processes are functionally related, directly or indirectly, to rainfall and, by extension, to changes in weather and climate. This contribution reviews simple functional relationships that link rainfall to hillslope runoff and soil erosion, and to channel flow and sediment transport and yield. Based on these semi-quantitative and empirical relationships, the extent of potential impacts due to changes in weather and climate on drainage and sediment processes are inferred. Findings of selected investigations are used to illustrate what might happen under hypothetical scenarios of weather and climate variations. Selected investigations include the non-linear watershed runoff response to rainfall in the Central Great Plains; the effectiveness of conservation practices under a changing climate in a central Oklahoma watershed; the linkage between climate change, agricultural practices, soil water, and flow in southern Corn Belt watersheds; changes in curve number over time on a Coshocton, Ohio, watershed; bank erosion during major flooding in Iowa during summer 2008 and river corridor management to mitigate trends of increasing sediment movement under an intensified climate regime; and, the implications of

changes in upstream runoff and sediment yield for watershed sediment yield in northern Mississippi watersheds.

Keywords: climate variability, surface runoff, sediment yield, soil conservation

Associations Between Conservation Practices and Ecological Responses of Agricultural Streams and Lakes

Richard Lizotte, USDA-ARS

The Conservation Effects Assessment Program (CEAP) Watershed Assessment Study goals are to quantify the environmental benefits of conservation practices at the watershed scale. Currently, a critical knowledge gap exists in linking conservation practices and their ecological effects on aquatic ecosystems since few studies have examined these relationships at the watershed scale. The objective of our presentation is to synthesize existing research results across three CEAP riverine watersheds and one lacustrine watershed that are currently conducting ecological assessments of conservation practices. Assessments of fish-habitat relationships within channelized agricultural headwater streams in Cedar Creek and Upper Big Walnut Creek watersheds showed that conservation practices that only alter nutrient and pesticide concentrations have little or no effect on fish communities within channelized agricultural headwater streams. Studies on Little River watershed showed that riparian buffers could contribute to naturally low stream dissolved oxygen levels because of allochthonous organic matter input from leaf litter and other detritus while riparian forest shade limits periphyton algae production, decreasing inputs of autochthonous organic matter. Beasley Lake watershed showed conservation practices affected lake water phytoplankton algae (chlorophyll a) concentrations indirectly with increases in summer chlorophyll a due to decreases in TSS and changes in nutrient levels and N:P ratios after implementation. Ecological assessments from CEAP studies suggest that: 1) conservation practices that do not alter in-stream habitat quality will have a limited effect on fishes within channelized agricultural headwater streams; and 2) edge-of-field conservation practices alters physicochemical variables affecting algae production within riverine and lacustrine watersheds. Keywords: CEAP, Fish, Organic Matter, Algae, Habitat, Nutrients

Fine Sediment Sources on CEAP Watersheds

Roger Kuhnle, USDA-ARS, NSL

Christopher Wilson, University of Iowa; Bob Lerch, USDA-Agricultural Research Service; Seth Dabney, USDA-Agricultural Research Service

Information on the sources of sediments from watersheds is critical for the placement and design of effective conservation measures. Effective conservation measures are necessary to assure long-term productivity and minimize downstream impacts from excess sedimentation. The activities of naturally

occurring radionuclides, ^7Be and ^{210}Pb , in source sediments and the sediment transported in the channels of watersheds during runoff events, have yielded information on the relative sources of channel and land surface derived sediment that is finer than 0.062 mm in diameter through a simple two end-member mixing model. These source determinations have been accomplished for individual runoff events in eight CEAP watersheds and results suggest that eroded surface soils were more prevalent in the suspended load early in a runoff event, but channel contributions dominated the suspended load at later stages. The method proved useful for multiple sites due to a constant proportion of the atmospheric deliveries of the two radionuclides globally. In addition, a four-year study in two Missouri CEAP watersheds, using the erosion pin method, showed that streambanks contributed 87% of the annual in-stream sediment and 23% of the annual nitrogen transported from the watersheds. Adjacent land use and stream order were also shown to be non-significant factors affecting bank erosion. These studies demonstrate that improved management of riparian areas to decrease streambank erosion would result in significant water quality improvement in the streams of many agricultural watersheds.

Keywords: Benchmark watershed, CEAP, sediment sources

Effectiveness of conservation practices within watersheds: Case study in tile-drained systems

Thomas Moorman, USDA-ARS, Ames, IA

Douglas Smith, USDA-ARS, West Lafayette, IN, Douglas.R.Smith@ARS.USDA.GOV; Kevin King, USDA-ARS, Columbus OH, kevin.king@ars.usda.gov; Rob Malone, USDA-ARS, Ames, IA, rob.malone@ars.usda.gov

The effectiveness of conservation practices are governed in part by the spatial and temporal patterns of water flow as runoff and subsurface (tile) drainage. The variability in patterns of nitrate loss were examined using data from different sized catchments with four CEAP watersheds located in central Iowa, northern Indiana and central Ohio. Bioreactors, drainage water management, cover crops, no-tillage, conservation cropping systems, grassed waterways, blind inlets (aka French drains) and ditch management are practices that reduce nitrate and phosphorus through plant uptake, denitrification, sedimentation or soil adsorption. We assess the likely effectiveness of these practices given the constraints on hydrologic residence time imposed by terrain, seasonal precipitation patterns, and storm event effects on hydrology for these watersheds.

Keywords: watersheds, conservation practices, drainage, nitrate, phosphorus

Conservation Technology Innovations: New Options for the Future

Gregorio Cruz, USDA-NRCS

Monday, 10:30 a.m. - Noon

Brazos I/II

(CIG Session)

A component of the Environmental Quality Incentives Program, the Conservation Innovation Grants (CIG) is a competitive grant program intended to stimulate the development and adoption of innovative conservation approaches and technologies. CIG enables Natural Resources Conservation Service (NRCS) to work with Federally recognized Indian tribes, State or local unit of government, non-governmental organizations, or individuals to accelerate technology transfer and adoption of promising technologies and approaches to address some of the Nation's most pressing natural resource concerns.

Since 2004, NRCS has funded projects addressing different resource concerns such as energy, water quality, soil quality, wildlife, forestry, and more. Integration of new technologies and approaches is an important element of the CIG program and a NRCS goal. As a method to provide an opportunity to learn about ways to accelerate conservation practice adoption, improve natural resource management, share innovative conservation projects and the learn about the CIG program, NRCS and CIG participants will present grant examples and results during the symposium.

10:30 a.m. Cheryl Simmons, Moderator Welcome

10:35 a.m. Lillian Woods, Team Leader/National Technology Support Coordinator

10:45 a.m. Gregorio Cruz, Conservation Innovation Grants Program Manager

11:20 a.m. Mace Vaughan, Pollinator Specialist, Xerces Society
Noon End Session

CIG-related presentations and sessions offered at the conference are tagged in this agenda and on the schedule grid as ***CIG Session, CIG Poster, or CIG Presentation.***

Deep and Silent Waters: Challenges in Aquifer Sustainability

Jean Steiner, USDA-ARS

Monday, 1:30 – 5:00 p.m. -- 2 sessions

West Fork I/II

There are numerous challenges to address ecological, economic, and ethical considerations of aquifer sustainability in face of growing populations and climate change. In this symposium we will feature case studies of integrated research focused on aquifer sustainability that will highlight new tools and the role of data and equity in bringing people to the table to tackle multiple and conflicting interests. The symposium is intended to advance science and policy discussions relating to groundwater resources and sustainability.

Session 1:

- Opening: Dr. Dan R. Upchurch, USDA-ARS
- Valuing Aquifers: Challenges on the Road Toward Sustainability
Jean Steiner, USDA-ARS, El Reno, OK
- Ogallala Aquifer Use, Sustainability, and a New Paradigm for the Texas High Plains
Terry A. Howell, USDA-ARS, Bushland, TX
- Enhancing Groundwater Sustainability: Policy and management alternatives for the Calera aquifer, Zacatecas, Mexico
Francisco Mojarro, Universidad Autonoma de Zacatecas

Session 2:

- Poster Session with Symposium Posters (In Exhibit Hall)
 41. ASCE-EWRI Standardized Reference ET Equation based Bushland Reference ET Calculator.
Prasanna H. Gowda, Jerry Ennis, Terry A. Howell, Thomas H. Marek, and Dana O. Porter, USDA-ARS and Texas AgriLife
 42. Quantitative and qualitative analysis of groundwater in Aguanaval and Chupaderos aquifers (MEXICO).
Hugo J  nez Ferreira, Carlos Bautista-Capetillo, Francisco Mojarro, Universidad Aut  noma de Zacatecas
 43. Variations in precipitation between 1970 and 2009 in the Canadian River watershed in New Mexico and Texas: Implications regarding the use of Lake Meredith and the Ogallala Aquifer as water supplies.
David Brauer, USDA-ARS, Bushland, TX
 44. SPELLmap: An Application For Handling Large Georeferenced Hydrological Datasets
J.A. Guzman, D.N. Moriasi, P.J. Starks, J.L. Steiner, and P.H. Gowda, USDA-ARS, El Reno, OK, and Bushland, TX
- Assessment tools: Linkages of atmospheric-surface-subsurface water assessment
Daniel N. Moriasi, USDA-ARS
- Sustainability on the Border: Water, Climate, and Social Change in a Fragile Landscape
W.L. Hargrove University of Texas, El Paso
- Panel on Research and Policy Needs
Dan R. Upchurch, USDA-ARS (Moderator)

ABSTRACTS

Ogallala Aquifer Use , Sustainability, and a New Paradigm for the Texas High Plains

Terry A. Howell*, David. K. Brauer*, Robert E. DeOtte, Jr. , and Bobby A. Stewart , *USDA-ARS, Bushland, Texas; West Texas A&M University

Unquestionably the Ogallala Aquifer has sustained economic development in the western U.S. Great Plains as the world's largest fresh water aquifer. However, its depletion and minimal recharge in most areas is recognized worldwide as a looming water resource issue for regional agriculture, municipal, and industrial uses. It may be the most studied and debated groundwater resource in the U.S. At current use rates, it is not a sustainable water resource for this critical area of the U.S. and particularly Texas. The State of Texas has enacted recent legislation to clarify the State's legal status on groundwater; however, the regulation, conservation, and desired future conditions are largely dictated by local groundwater districts under State authorization. Within the past year, these legally empowered bodies have enacted many types of policies and restrictions to attempt to meet their desired future local goals that meet State dictates to meet the current and water demands and to prolong the aquifer life. We will describe the historical uses, institutional policies historically and current proposals and the paradigm changes anticipated to meet desired future aquifer conditions.

A Modeling Approach to Evaluating the Impact of Changing Irrigation and Cropping Systems on the Reduction of Groundwater Depletion in the Calera Watershed, Zacatecas Mexico

F. Mojarro Davila,* D. N. Moriasi, J. R. Avila Carrasco, G. Prasanna, C. Bautista-Capetillo, F. G. Echavarría-Chairez, J.C. Garbrecht, J. L. Steiner, T. Howell, E. Kanemasu, J. A. Versa, K. Wagner, and J. Hernandez

Groundwater is the main source of water in the semi-arid Calera watershed, located in Zacatecas State, Mexico. Due to increasing population, industrial growth, and increased irrigation, groundwater extraction exceeds recharge rates, so evaluation of new policy, technology, and management options is needed. In the Calera watershed area the native flora has been in decline for decades. In this study, the Soil and Water Assessment Tool (SWAT), an extensively used hydrologic model was calibrated and used as a tool to evaluate irrigation, land use and management systems to determine

practical scenarios which may guide policy planning and lead to management plans to minimize groundwater depletion rates. A biomass and water balance approach, which has potential for calibration of hydrologic models in ungauged or data-scarce watersheds in many parts of the world, was used. The model reproduced crop biomass, ET, and deep aquifer recharge rates reasonably well. The main scenarios simulated included the conversion to more efficient irrigation systems, conversion of low water requirement crops like canola, and rainfed beans and corn crops to native grasses. Overall, the best combined scenario results showed a maximum of 26% reduction in groundwater depletion rates, which is about half of the 50% target reduction depletion rates by 2021, proposed by the Federal government. It is clear that the solution to arrive at a sustainable exploitation of the Calera aquifer will require more than switching to better irrigation systems, crops with lower water requirements (canola), and range land restoration.

Assessment tools: Linkages of atmospheric-surface-subsurface water assessment

Daniel N. Moriasi, Jorge A. Guzman, Prasanna H. Gowda, Jean L. Steiner, Jeff G. Arnold, and Raghavan Srinivasan

Groundwater consists of approximately 30% of the earth's fresh water while surface water consists of about 1%. Groundwater uses include drinking, irrigation agriculture, and industrial production. The main problems associated with groundwater are overdraft and pollution from manufactured compounds and nitrates. The interaction of groundwater contamination with surface waters is analyzed by use of hydrology transport models. However, commonly available and extensively used models have serious limitations. For example, the Soil and Water Assessment Tool (SWAT) provides relatively accurate estimates of the surface water budget if accurate ET data are provided for calibration, but such ET data have been difficult to obtain, particularly at watershed scales. Additionally, while SWAT simulates subsurface flow to the stream network and recharge to deeper layers, it does not simulate subsurface flow in adequate detail to evaluate impacts of surface land use and management on groundwater quantity and quality outcomes. MODFLOW, a groundwater model developed by the USGS, does not account for processes that occur on the surface and in the root zone, and so is not responsive to impacts of land use and management. Recently, a remote sensing-based energy balance ET algorithms (EB_ET) that provide spatially variable ET data was developed, which provides an opportunity to calibrate or substitute for

ET estimates in SWAT. This study seeks to sequentially couple EB_ET, SWAT, and MODFLOW to account for all major hydrologic processes above, on, and below the land surface. This effort would improve the capacity to comprehensively address water resource issues worldwide.

Sustainability on the Border: Water, Climate, and Social Change in a Fragile Landscape
W.L. Hargrove and D. M. Borrok, The University of Texas at El Paso

Surface flow in the Rio Grande River is dwindling due to drought and increased demand. Groundwater pumping, which is largely un-regulated, is being used in its place and exerting an enormous strain on the region's stored water capital. Thus, achieving a sustainable water supply requires balancing the groundwater budget over long time periods. The goals of our project are 1) To evaluate the future resiliency of regional groundwater capital in the face of projected changes in demand and climate; and 2) To assess opportunities for transformability of the groundwater budget through changing policy and technology. A bi-national, interdisciplinary team of researchers from border region institutions has been assembled to address this problem. Our approach incorporates systems analysis, complexity science, and the use of integrative modeling tools such as scenario planning. Using this holistic approach we will combine disparate component models (e.g., hydrological, chemical, climate, land-cover/ecosystem change, agricultural, snowmelt, economic, demographic, etc.) across disciplines and at different scales of time and space. We will explore the linkages and feedbacks among these component models in response to plausible scenarios of change in the driving forces of climate and demand. Scenarios will be informed through interaction with a stakeholder panel of public and regulatory personnel. We anticipate that our work will not only provide a framework for water sustainability decision making for our bi-national region, but will serve as a model for rivers in bioclimatically similar regions in the U.S. and globally.

Discovery Farms: Monitoring Runoff from Real, Working Farms

Mike Daniels, University of Arkansas

Monday, 3:30 – 5:30 p.m.
Pecos II

The Discovery Farms Program began in Wisconsin to fill the purpose of engaging producers in the identification and if necessary the reduction of nutrient and sediment losses from a variety of agriculture farming systems by collecting runoff data from real, working farms. The program is founded on the belief that farmers who are engaged, educated and empowered with actual on-farm information will use the data to address water quality concerns. The concept has demonstrated the success of this approach and has now spread to three other states: Arkansas, Minnesota and North Dakota and is gaining interest around the country from producers and their commodity organizations.

This symposium will share experiences, successes, the principals of operation and key tasks needed to develop and implement Discovery Farms programs from each of the four states. Among the four states, edge of field and feedlot monitoring is being conducted for a diverse set of agricultural production systems ranging from livestock operations in Wisconsin, livestock and cash grain farms in Minnesota, beef cattle and row crop farms in North Dakota to poultry, livestock, rice and cotton farms in Arkansas. The purpose of the symposium is two-fold: 1) to provide guidance and advice to help other States develop plans and partnerships with stakeholder groups to build Discovery Farms programs in their respective States, and 2) review edge of field monitoring options for NRCS practice 799 to help consultants, extension personnel, NRCS and State Agency representatives become familiar with the science and proper monitoring techniques. Edge-of-field monitoring is now approved by NRCS as a standard practice (Standard 799) eligible for cost-share for producers interested in quantifying sediment and nutrient losses from their operations.

Session Speakers:

- Dennis Frame & Dennis Busch - University of Wisconsin-Platteville
- Warren Formo, Minnesota Agricultural Water Resource Center
- Ron Wiederholt, North Dakota State University
- Mike Daniels & Andrew Sharpley, University of Arkansas
- Robert Kroger, Mississippi State University

ABSTRACTS

The Wisconsin UW - Discovery Farms Program: What went right and what went wrong.

Dennis Frame and Eric Cooley

University of Wisconsin - Extension, Discovery Farms Program, 40195 Winsand Drive, Pigeon Falls, WI 54760

Development and implementation of on-farm, systems research has recently received increasing attention. However, for those considering the initiation of farming systems research, there are many aspects to consider including how to develop the program, how to accomplish goals, and who to involve. The specific details of data collection methodology, farm selection, farmer cooperation with environmental and profitability analyses, and forthright communication of research results are critical to the success of the projects. There is a special need for on-farm systems research that addresses an array of environmental issues, particularly the effects of management practices on off-farm water quality (both surface and groundwater) and the relationship with on-farm profitability and increased labor needs to implement solutions. The environmental issues facing agricultural producers and taxpayers are far too great to postpone needed on-farm environmental research. To meet these challenges, some states have developed a network of "Discovery Farms" representing the variety of viable agricultural enterprises currently operating in differing soil and physiographic settings around each individual state.

The Discovery Farms Program could be the responsibility of several different types of organizations including land grant universities and agricultural non-government organizations. The critical directive is that the leading organization must be committed to:

- A producer led initiative,
- Open and unbiased data collection,
- Systems-based research,
- Collecting water quality, agronomic and meteorological data to identify environmental issues prior to making recommendations for changes in management practices,
- Working with farmers and their advisors on developing and implementing practices that protect the environment.

North Dakota Discovery Farms: Strengthening the Relationship Between Profitable Farm Production and the Environment

Ron Wiederholt, North Dakota State University

North Dakota has focused much of its surface water quality improvement efforts on decreasing the negative risks associated with livestock manure runoff. With the assistance of significant cost share dollars, producers have implemented best management practices (bmp's) to comply with regulations and improve livestock facility runoff management. Unfortunately, water quality regulations and bmp's are rarely supported by hard scientific data. Thus, a grassroots team of affected individuals designed and implemented a

statewide intensive runoff water monitoring project, modeled after a similar Wisconsin program. The purpose is to gather missing data and better understand the true impacts of farmstead runoff. A basic tenet of the project design is that producers are expected to be the innovators, addressing any issues identified through water quality monitoring. Three operations volunteered to allow monitoring of either edge-of-feedlot runoff or tile drainage at the sub-watershed scale. They have used the early results of the project to help with bmp implementation that will continue to be monitored for success. Project results will also be used by other producers, water quality practitioners, regulators and policymakers. The program is a cooperative effort involving North Dakota State University, the North Dakota Department of Health and U.S. Geological Survey.

Keywords: conservation, water quality, runoff

The Arkansas Discovery Farm Program: Engaging stakeholders in Environmental and Natural Resource Solutions

Mike Daniels¹ and Andrew Sharpley²

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Arkansas agriculture faces several critical environmental and natural resource issues ranging from excess nutrient concerns associated with poultry production in Northwest Arkansas to critical groundwater decline and sediment loss issues associated row crop production in the Mississippi Delta region of Eastern Arkansas. To help engage and empower stakeholders to address these critical resource issues, we implemented the Arkansas Discovery Farm Program, which we modeled after a similar effort in Wisconsin. The program includes a stakeholder advisory committee consisting of representatives from farm and producers organizations and from the Nature Conservancy. We also utilize a technical advisory committee that consists of representatives from local, state and federal conservation and environmental agencies. In partnership with these committees, we are monitoring water use and runoff water quality for nutrients and sediments from the edge-of-fields on six farms in Arkansas and evaluating potential improvement strategies if needed. These include: 1) a poultry operation in Northwest Arkansas where we are monitoring runoff from around production houses, 2) a beef cattle operation in Central Arkansas, 3) a rice-soybean-corn operation in Stuttgart where we are evaluating water management and irrigation strategies, 4) a rice-soybean operation in Northeastern Arkansas and 5) a cotton operation in Southeastern Arkansas where we will investigate the use of cover crops to reduce erosion and suppress herbicide-resistant pigweed.

REACH: Mississippi's working lands conservation, and stewardship program

Robert Kröger¹ and J. Dan Prevost²

¹ Department of Wildlife, Fisheries and Aquaculture, Mississippi State University, Box 9690, Mississippi State, MS, 39762

² Delta F.A.R.M., PO BOX 276, Stoneville, MS, 38776

REACH (Research and Education to Advance Conservation and Habitat) will be a state-wide, producer driven, "hands-on" delivery vehicle, that will provide coordination and support for documenting the benefits of conservation efforts to natural resources and agriculture on specific farms. REACH will provide scientifically defensible information to support efforts that meet the resource needs of landowners and producers while increasing awareness of sustainable conservation in production agriculture. The REACH program goal is create a network of cooperative farms in Mississippi with variable agricultural practices to illustrate the success of conservation practice implementation on landscape stewardship while encouraging profitable and sustainable production systems. Objectives of the REACH program include: 1) quantifying and documenting resource benefits through science, to provide sound justification for federal investments in conservation; 2) will further efforts in Mississippi that support the health of Mississippi's water resources, both inland and downstream to the Gulf of Mexico; and 3) assist in implementing from a research, education and outreach standpoint, existing efforts of nutrient reduction at both regional and state levels. REACH is a collaborative led effort between Mississippi State University extension service, Mississippi Agriculture Forest Experiment Station (MAFES), Forest and Wildlife Research Center (FWRC), Delta F.A.R.M. (farmers advocating resource management), supporting and cooperating state and federal agencies and farmers of Mississippi.

Ecological Farming: A systematic approach to increasing ecological services and economic profit

James Hoorman, Ohio State University Extension

Monday, 3:30 – 5:00 p.m.

Brazos I/II

ECO Farming or ecological farming and ranching is a new concept that employs all our current knowledge and technology about conservation best management practices that increase carbon sequestration and improve the environment. ECO Farming stands for E=Exclusive Long-term No-till or a no-till system that does not disturb the soil. Exclusive Long-term No-till increases carbon sequestration and allows the soil ecology to recover. C = Continuous Living Cover means keeping a living and growing crop or cover crop on the soil during the entire year. A continuous living cover impacts soil ecology, nutrient recycling, soil compaction, hydrologic water movement and management, and global climate change. O= Operational technologies used on the farm or ranch to improve the soil environment. Operational technologies may include integrated pest management (IPM), genetic manipulation, crop rotations, biological controls, controlled traffic, water table drainage management (where applicable), and other best management practices. Farmers and ranchers who have adopted this approach are reporting 50-70% reductions in commercial fertilizer and herbicides while increasing crop yields and profits. ECO Farming is a systems approach that closely mimics Mother Nature and natural forces in the environment that improve ecological services while keeping agricultural profitable.

This session will include visual soil demonstrations on soil quality and soil health, presentations on soil ecology and nutrient recycling, biology of soil compaction and water dynamics, cover crop economics, and using sustainable crop rotations and cover crops including legumes to provide homegrown nitrogen. The ECO farming or ecological farming and ranching concept will be introduced, demonstrated, and applied using real life examples.

Presenters:

- Defining Eco Farming: James J. Hoorman (45 minutes)
- Practical applications: David Brandt (30 minutes)
- Q&A Period and Future Direction Both (15 minutes)

Embracing Conservation Practices as a Producer: A Panel Discussion

Gretchen Kamps, University of Wisconsin-Platteville Pioneer Farm

**Tuesday, 3:30 – 5:00 p.m.
Post Oak**

Each day a producer makes many decisions that have potential to affect conservation, but how much thought is put into conservation when those decisions are made? With commodity and land prices sustaining high values, producers are making production decisions to determine how to generate the most revenue on their farms, and for some, the value of conservation practices is overlooked. Join three Southwestern Wisconsin farmers for this symposium focusing on the economics and ethics of conservation in place on their farms. Each of the farmers will share how their animal and cropping enterprises are managed to protect natural resources and why conservation is viewed as a value-added practice on their farms.

They will share ideas of things that have been done on their farms to balance livestock, crops and the environment. They will also discuss what they think needs to happen in order to encourage small, limited resource farms to address environmental concerns. Government sponsored conservation programs with an economic incentive are enticing, but many farmers want to address conservation with an affordable and common-sense approach where they can, that is within their budgets and timetables. Listen as these producers share their successes and failures in conservation practices and bring your own success and failure examples along to share during the open discussion.

This symposium will be an outstanding opportunity to learn directly from the producer and participate in a dialogue about livestock, crops, and conservation practices, how they affect the environment and how commodity prices influence farm enterprise decisions.

Featuring three southwestern Wisconsin producers:

- Josh Kamps
- Richard Gorder
- Mark Riechers.

Expanding Support Creation of the first Friends of a Soil and Water Conservation District

Dale Threatt-Taylor, Wake Soil and Water Conservation District
**Tuesday, 10:30 – Noon
Elm Fork I**

Citizens in Wake County, North Carolina have created the first Friends organization for a Soil and Water Conservation District in the nation. This non-profit organization will leverage economic support and increase the ability of the Wake Soil and Water Conservation District (Wake District) to achieve its conservation goals. The Friends of the Wake Soil and Water Conservation District (Friends of the District) provides community based support for the local soil and water conservation district. The goal of the organization is to increase awareness of the Wake District, provide a voice for needed resources and support from county leadership.

To support the ecological efforts of the Wake District, the Friends of the District realized that the challenges of limited resources and a SWCD's traditional operating methods needed to be addressed. To protect the natural resources in Wake County the Friends of the District was formed to allow for flexibility and innovation in every possible funding and outreach opportunity. The problems the Wake District face are not unique and are very common across the nation. How we have chosen to handle current issues will inspire other organizations.

Rather than an advocacy "club", the Friends of the District work to increase the District's range of awareness to the citizens of Wake County. They understand the need to sustain our watersheds, promote clean water, and conservation work.

Panelists:

- JB Martin, State Conservationist, North Carolina, USDA-NRCS
- Shawn Springer, SWCS North Carolina Hugh Hammond Bennett Chapter
- Dale Threatt-Taylor, Wake Soil and Water Conservation District (Moderator)

Food Security: Conservation, Inputs and Technology

Jorge Delgado, USDA-ARS-SPNR

Monday, 10:30 a.m. – Noon

Central

This is the 13th Annual SWCS-SSSA Joint Symposium, which is being held at the 2012 SWCS and SSSA annual meetings.

This joint symposium will be titled “Food Security: Conservation, Inputs and Technology.” This is a topic of great importance and interest to both societies. It is very clear from recent publications that food security is not likely to be achieved without choosing conservation, and that the topics of ecology, economics and ethics are important for achieving sustainable food security. This joint symposium will continue with the tradition of cooperation between the two societies and will help to create opportunities to disseminate this cutting-edge information to members of both societies. It will also help to “jumpstart” a conversation about why choosing conservation is important for economics, global sustainability, and food security, at both societies. The farm bill is an important activity that is related to these topics, and the presentation about the 2012 Farm Bill and its relationship to the topic of food security will be timely and in sync with the goals of the program. The SWCS and SSSA have always been at the forefront of conservation and soil science, and this year’s topic connects with current global issues related to soil and water conservation and global sustainability.

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|--------------|--|
| 1:30-1:35 pm | Introductory Remarks
Moderator: <i>Jorge A. Delgado</i> , USDA-ARS, Fort Collins, CO 80526 |
| 1:35-1:55 pm | Potential to Develop Crops to Contribute to Food Security, Conservation and Sustainable Systems
<i>Dr. Junping Chen</i>
USDA-ARS Molecular Biologist (Plants), Lubbock, TX |
| 1:55-2:15 pm | Soil Management for Food Security
<i>Drs. Tom E. Schumacher¹, Sharon K. Papiernik² and David Lobb³</i>
¹ Professor, Plant Science Dept., South Dakota State University; ² Supervisory Soil Scientist, USDA-ARS; ³ Faculty, Department of Soil Science, University of Manitoba |
| 2:15-2:35 pm | Economics, Soil and Water Conservation and Food Security
<i>Dr. John Westra</i>
Associate Professor, Department of Agricultural Economics and Agribusiness, Louisiana State University |
| 2:35-2:55 pm | Farm Bill 2012: Conservation, Food Security, and Technology
<i>Dr. C. Wayne Honeycutt</i>
USDA-NRCS Deputy Chief for Science and Technology |
| 2:55-3:00 pm | Discussion / Adjourn |

International Grassroots Conservation Success Stories

Theo Dillaha, SWCS International Committee

Monday, 3:30 – 5:00 p.m.

Bur Oak

This session will explore the characteristics of successful grassroots conservation efforts around the world. Each presentation will address the following topics:

1. Overview of the particular grassroots conservation program
2. How the program works,
3. Conservation benefits/impacts,
4. Role of government support in program success (financial, etc.),
5. Challenges encountered and how they were addressed,
6. Recommended practices for successful grassroots conservation programs

The session will conclude with a 30-min roundtable discussion and question and answer session on the characteristics of successful grassroots conservation programs.

Presentations (15 minutes each including 2-3 minutes for individual questions):

- Grassroots Conservation in the Congo Region
Speaker: Alain Ndona, University of Kinshasa, Democratic Republic of Congo
- Grass Roots Conservation in Lantapan, Philippines
Speaker: Manuel Reyes, Department of Natural Resources and Environmental Design, North Carolina Agricultural and Technical State University. Greensboro; and Theo Dillaha, Biological Systems Engineering Department, Virginia Tech, Blacksburg
- Grassroots Conservation in Nigeria: Role and Challenges of the National FADAMA Project
Speaker: Mutiu Busari Ph.D., Department of Soil Science & Land Management, University of Agriculture, Abeokuta, Nigeria
- Opportunities of Conservation Agriculture-based Resources Conserving Practices to Build Resilience Against Drought and Soil Degradation in Northern Ethiopia
Speaker: Yves-Dady Botula Manyala, MSc., Department of Natural Resources Management, Faculty of Agronomy, University of Kinshasa and Ph.D. Student, Department of Soil Management, Ghent University, Belgium

Lessons from Monitoring and Measurement of Water Quality Projects in Midwestern Agriculture Watersheds

Jimmy Daukas, American Farmland Trust

Monday, 10:30 a.m. – Noon

Pecos II

According to the U.S. Geological Survey, upper Midwest watersheds contribute the highest nutrient loads that can cause low-oxygen dead zones in the Gulf of Mexico. Reducing nutrient runoff is challenging in these states in part because of high nitrogen-dependent corn production and the prevalence of shallow-tiled fields that quickly drain water from beneath the soil surface. Advanced nutrient management and other buffer-type practices could reduce the leakage and runoff of nutrients from fields. Better monitoring and measurement of project activities designed to accelerate adoption of conservation practices is critical to success.

The Leadership for Midwestern Agricultural Watersheds is an effort of a number of partners of watershed-scale projects to advance toward success in improving water quality in the context of a healthy farm economy, through communications among watershed project leaders-sharing approaches, lessons learned, and results. Participants are drawn from projects in Wisconsin, Minnesota, Iowa and Illinois. Partners identified improving understanding of the most cost-effective ways of measuring progress made and results achieved by watershed-scale nutrient management projects as an important priority.

Monitoring and measurement is taking place at various levels within the watershed, e.g., the edge of field, in-stream, and watershed. Projects are gathering baseline data in different ways, e.g., inventory of practices, benchmarking, geo-spatial databases. Some projects also are securing social information and indicators through surveys and interviews to understand attitudes and measure changes in perspectives.

Panelists will present on their project's approach to environmental monitoring, baseline data and the use of social information. Panelists also will present recommendations on ways to address challenges and improve measurement. Better understanding of the impact of projects and the integration of social and environmental measurement has implications for improving future conservation policy, how conservation decisions are made, cost efficiency of conservation expenditures.

Panelists:

- Mike Baise, American Farmland Trust;
- Joseph Britt, Sand County Foundation;
- Todd Sutphin, Iowa Soybean Association;
- David De Gues, The Nature Conservancy

MRBI Symposium

Mike Daniels, University of Arkansas

Monday, 1:30 – 3:00 p.m.

Pecos II

The MRBI: Sharing Experiences and Successes

The Mississippi Healthy River Basin Initiative was launched in 2010 in twelve states to address excess nutrient delivery to the Gulf of Mexico. This financial assistance program is authorized to spend \$80 million and is independent of the farm bill. It offers some new and innovative concepts for conservation programming including partnerships, monitoring and assessment.

Panelists:

- Mike Sullivan, State Conservationist – Arkansas NRCS.
- Jennifer Heglund, USDA-NRCS
- Andrew Wargo, Desha County Conservation District and Charles Glover, Poinsett County Conservation District
- Dr. Michele Reba, USDA-ARS, Jonesboro, Arkansas

Phyto-Aquatic Nutrient Recycling

H. Tony Hartmann, Great Lakes Ag Energy

Tuesday, 1:30 – 3:00 p.m.

Post Oak

(CIG Session)

Great Lakes Ag Energy (GLAE) & Resource Engineering Associates (REA) introduce their Phyto-Aquatic Nutrient Recycling (PANR) system. The technology integrates aqua-cultural algal wastewater treatment, aka High Rate Algae Pond (HRAP) systems, with anaerobic digesters and other practical wastewater bio-treatment technologies. The PANR System combines advances in algae bioreactors and other harvestable water features, with retention ponds and engineered or natural wetland habitat, to sequester and recycle nutrients on-site. This in turn, enables broader use of digester technology, distributed energy generation & energy efficiency, and improves wastewater and non-point source cleanup, handling, and grey water recovery.

H. Tony Hartmann (CEO, GLAE) will provide background and give an overview of the CIG project (2010-2012). John Hackney (CTO, GLAE) will describe the algal and harvestable components of the PANR System, including greenhouse functions, outdoor algal troughs and harvestable bog. Carl Chenoweth, (Senior Engineer - P.E., REA) will describe planning, permitting, engineering, comprehensive nutrient management plan integration, construction of the retention pond(s) and engineered wetlands. All will be available for Q & A, including a discussion of conventional systems, and a comparison, including economic analysis.

Presenters:

1. H. Tony Hartmann, CEO, Great Lakes Ag Energy
2. John Hackney, CTO, Great Lakes Ag Energy
3. Carl Chenoweth, P.E., Resource Engineering Associates

Pollinator Conservation Grows Up: Lessons Learned from the Field

Cheryl Simmons, USDA-NRCS

Monday, 1:30 – 3:00 p.m.

Central

(CIG Session)

In 2008, through an NRCS Conservation Innovation Grant, the Xerces Society launched a series of on-farm pilot projects to restore pollinator habitat on farms from Maine to Florida to California. This presentation follows those case studies-from initial landowner meetings-to mass seeding native wildflowers-to the ongoing management of maturing habitat.

Lessons learned include some of the human barriers to conservation adoption, the economic costs and benefits of habitat restoration, and novel approaches to establishing forb-rich landscapes. Through these lessons, the Xerces Society and agency partners have been able to refine the process of pollinator habitat conservation. The results are increasingly successful project implementation, greater motivation by farmers to take action, and a growing understanding that pollinator conservation can enhance other ecosystem services, such as supporting other beneficial insects for pest control services ("conservation biological control").

New technology, including a Pollinator Habitat Assessment Tool for in-field decision-making by conservation planners, and region-specific habitat restoration guidelines will also be introduced as part of the presentation.

Presenters:

- Eric Mader, The Xerces Society for Invertebrate Conservation
- Mace Vaughan, The Xerces Society for Invertebrate Conservation

Spinoff Technologies from the CEAP National Cropland Assessment

Arnold King, Texas AgriLife Research

Tuesday, 3:30 – 5:00 p.m.

Pecos I

The CEAP National Cropland Assessment was one of the most complex computer simulation studies ever conducted by USDA. The National assessment required massive amounts of data and computing power to study the environmental effects that conservation practices had on soil and water quality. As a result of this undertaking, there are several spinoff technology developments that will be beneficial to society.

This symposium will focus on four spinoff technologies that resulted from the work required to complete the National Cropland Assessment. They are:

1. A field office planning tool based on APEX as a simulator
2. An assessment and potential development of a P index procedure based on digitized CEAP data
3. Using CEAP data to assess the effects of optional uses of cropland coming out of CRP contracts
4. A World Resource Institute (WRI) project on alternative strategies for Nutrient Trading

An open discussion will follow the formal presentations

The symposium will follow this outline:

- Moderator: Susan Wang, Texas AgriLife Research, Temple, Texas
- 1st presentation: A field Office Planning Tool by Evelyn Steglich
- 2nd Presentation: Using CEAP Results to evaluate USDA's Phos. Index by David Moffitt
- 3rd Presentation: CRP Lands - Optional Land Uses by Richard Iovanna
- 4th Presentation: Economics and Alternatives related to Nutrient Trading by Michelle Perez

Streamlining Conservation Delivery

Cheryl Simmons, NRCS

Tuesday, 10:30 – Noon

West Fork I/II

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 clients identify conservation objectives, inventory resource concerns and opportunities, analyze alternatives, and formulate treatments through conservation planning is unique. 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 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 delivering conservation assistance. Aligning NRCS' business systems with its mission, strategic plan, and business model is critical to agency's success.

The NRCS Client Gateway, using geospatial tools to support participation in programs, a revised resource concern list and more will be covered in this symposium.

Presenters/Authors:

1. Conservation Delivery Streamlining Initiative - Establishing a Business Model for Future Conservation Assistance
Lane Price, CDSI-NRCS, Kristie McKinley, CDSI-NRCS, Russ Hatz, NTS-NRCS, Anthony Burns, NTS-NRCS, Cheryl Simmons, NTS-NRCS
2. Client Gateway - Assisting NRCS customers through the internet.
Tim Carney, CDSI-NRCS
3. Financial Assistance Ranking Model - Integrating GIS into everyday business
Kristie McKinley, CDSI-NRCS

Toward guidelines for model calibration and validation?

Claire Baffaut, USDA-ARS-CSWQRU

Tuesday, 1:30 – 5:00 p.m.

2 sessions

Elm Fork I

Multi-objective decision-making requires assessment and predictive tools such as simulation models, which can be used to evaluate trade-offs and incorporate economics and ecology. However, models can be effective only if their results are meaningful, which requires that they are correctly calibrated and validated.

This symposium follows the SWCS 2011 modeling summit, which led to a recommendation to “develop a set of best practices during parameterization, calibration, and validation in order to obtain a model that produces correct outputs and is not over parameterized”. Similar discussions among members of the American Society of Agricultural and Biological Engineers have led to an effort to develop model calibration and validation guidelines. Toward this goal, technical papers have been written and are being reviewed that summarize the current calibration and validation procedures recommended by model developers or expert users for 32 models. Following publication of these papers, discussions will take place to develop the guidelines. This symposium represents one of these discussions and will include:

1. Individual presentations of the recommendations provided for the models most interesting to the SWCS audience (WEPP, RHEM, SWAT, APEX, HSPF, AnnAG-NPS, DRAINMOD, etc).
2. Presentation of a draft synthesis of the 32 papers for discussion.
3. Discussion on the following topics:
 - What form could calibration/validation guidelines take?
 - Should other literature be included?
 - What needs to be included?

This symposium will be most useful to model practitioners interested in calibration/validation procedures and to resource managers who need to understand how to ensure meaningful results.

Presenters, Part 1:

- Mariano Hernandez, USDA-ARS
- Wayne Skaggs, North Carolina State University
- Rob Malone, USDA-ARS
- Claire Baffaut, USDA, ARS

Presenters, Part 2:

- Daniel Moriasi, USDA-ARS
- Discussion period

Oral Presentation Abstracts

Acosta
Tuesday, 11:10 a.m.
Room: Elm Fork II

Soil microbial communities and enzyme activities in soils during historically extreme drought conditions in the USA

Presenter: Veronica Acosta Martinez, USDA-ARS

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Abstract:

The Southern High Plains region of Texas experienced a significant reduction in 2011 crop production due a record drought as it experienced the hottest summer since 1911 (> 48 days of temperatures above 37.7oC and only 37.8 mm precipitation). Soil microbial communities and their associated enzymatic capacity are key drivers in soil ecosystem functioning, however, little is known about the effects of extreme weather on the microbial composition and functional capacity of soil. Therefore, we sampled a sandy soil (65% of sand) and a clay loam (38% of clay,) at 0-10 cm under a management history of monoculture (continuous cotton) or rotation (cotton-sorghum). Pyrosequencing was utilized to characterize bacterial and fungal diversity and enzyme activities important for C, N, P and S cycling were determined as indicators of biogeochemical cycling. Distance-based Redundancy Analysis (dbRDA) of pyrosequencing data demonstrated distinct microbial communities according to rotation and monoculture management history, regardless of the soil type. Thus, the microbiome continued to be a fingerprint of management despite extreme drought conditions. Enzyme activities were higher (>1.5X) compared to previous samplings (except for arylsulfatase and α -glucosaminidase), indicating that soil colloids were essential for protecting the extracellular enzymes that can maintain the metabolic functioning of soil. High functional redundancy may explain the ability of these systems to resist short-term extreme drought conditions. However, global climate predictions of extended high temperatures and heavy precipitation events, may result in adverse effects on soil quality due to depletion of soil organic matter reserves and reduced ecosystem resistance and resiliency.

Keywords: soil quality, soil conservation, microbial diversity, pyrosequencing, microbial communities, Ogallala aquifer, drought

Andrews
Monday, 3:30 p.m.
Room: Central

A New Framework to Incorporate Agronomic Systems into Ecological Site Descriptions

Presenter: Susan Andrews, Natural Resources Conservation Service

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Abstract:

A new framework is proposed that will help achieve conservation objectives for ecological sites under agronomic uses by: (1) optimizing management, based on land potential, (2) promoting development of innovative management systems, (3) supporting identification of high priority research needs, (4) improving efficiency of conservation planning, (5) increasing certainty of conservation outcomes, (6) providing flexibility to promote innovative management systems, (7) encouraging private and public investments, and (8) increasing accountability to the public, OMB and Congress. Within the framework, called the Land Optimization and Analysis Model (LOAM), reference conditions are defined for each agroecological site, which is a distinctive kind of land based on reoccurring soil, landform, geological, and climatic characteristics that differs from other kinds of land in its potential to support distinctive ranges of soil functions (as indicated by soil properties) and their responses to natural and human-caused disturbance. The framework will facilitate the collection, interpretation and application of information on current status (condition) of land relative to two reference conditions: (a) ecological potential, the maximum potential for a site with little or no human intervention (as reflected in the status of soil functions) and (b) attainable potential for an agricultural product group such as grains or forage, assuming current technology, market and regulatory conditions but differing management practices. Implementation of the framework will immediately increase usefulness of existing data by managers and provide a roadmap for long-term future data collection.

Keywords: ecological site, conservation planning tool, soil function

Assessing the Economic Impact of New Water Quality Regulations

Presenter: Brad Barbeau, CSU Monterey Bay School of Business

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Kay Mercer, M.S., PCA, KMI, Inc.

Abstract:

In California, there is increasing pressure to implement non point source regulations to protect water quality. For example, the Porter Cologne Act, the state “clean water act”, imposes more stringent requirements for irrigated and grazing agriculture than the U.S. Clean Water Act. New environmental regulations aimed at achieving goals of healthy ecosystems carry with them economic costs. The difficulty of assessing the magnitude and the locus of economic impact is an important consideration in the process of regulatory decision making. Several California studies have utilized different approaches to measure the economic impact of proposed agricultural water quality regulations, with varying degrees of success. For example, the Central Valley Regional Water Quality control board estimated the costs of management practice implementation for the proposed Long Term Irrigated Lands Program to be between \$216 and \$1,321 million per year. Other Regional Water Quality Control Boards and private agricultural interests have conducted additional economic analyses of proposed regional regulations which have consisted of varying subsets of the cost categories listed above. Not surprisingly, each analysis has produced a different and partial economic assessment which cannot be compared with or added to other regional assessments. No standard exists for defining a “complete” economic impact analysis. In addition, defining categories of costs would allow for comparing patterns of costs across different proposed regulations. In this presentation, we will review several economic analyses and propose a standardized methodology and terminology that can be applied to assessing the true economic impact of proposed regulation.

Keywords: economics, economics of regulation, regulation

Barlow
Monday, 1:30 p.m.
Room: Bur Oak

The use of models to manage for water availability and nutrient transport in an agricultural landscape

Presenter: Jeannie Barlow, U.S. Geological Survey

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Abstract:

The recent development of two models by the U.S. Geological Survey, the SPATIally Referenced Regression On Watershed attributes (SPARROW) model and the Mississippi Embayment Regional Aquifer Study (MERAS) groundwater model, are useful tools for understanding and managing nutrients and water availability in the Mississippi Embayment. SPARROW models, recently developed to estimate nutrient inputs from streams in the South-Central United States that drain to the Gulf of Mexico, have helped identify watersheds that contribute large amounts of nutrients to the Gulf and corresponding sources of nutrients, thereby providing greater understanding of how to target future management activities. The MERAS model, a regional groundwater flow model encompassing all fresh water aquifers within the Mississippi Embayment, has recently been used to assist water managers with applying groundwater conservation measures in the Mississippi Delta, an area of intense agriculture production, which relies heavily on groundwater for irrigation. Mathematical models, such as SPARROW and MERAS, simulate many components of the hydrologic system, each of which can be adjusted independently allowing for a more holistic understanding of how individual processes affect the hydrologic system as a whole. Additionally, the development of these two models has helped identify the types of data that are most relevant and useful to collect, leading to optimized monitoring programs, which in turn, produce models that are more effective decision support tools.

Keywords: models, water availability, water quality, agriculture

Baumhardt
Monday, 3:30 p.m.
Room: Post Oak

Using conservation tillage to increase yield and water use efficiency of corn and cotton under deficit irrigation

Presenter: R.Louis Baumhardt, USDA Agricultural Research Service

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Abstract:

Southern High Plains producers supplement the erratic growing season rainfall with irrigation using ground water from the Ogallala Aquifer. Increased pumping costs and declining well capacities in this region require improved precipitation capture and crop water use efficiency to maintain production stability and profitability. Separate blocks of corn (*Zea mays* L.) and cotton (*Gossypium hirsutum* L.) were grown in rotation with wheat (*Triticum aestivum* L.) and intervening fallow to store precipitation in a disk, sweep, and no till Pullman soil (fine, mixed, superactive, thermic Torrertic Paleustoll) at the USDA-ARS Conservation and Production Research Laboratory, Bushland, TX. Summer crops were irrigated by lateral move mid-elevation sprinklers in blocks receiving ~ 25 or 50 mm every 10-14 days, which correspond to limited, but common, well pumping capacities for the region. Crop water use was estimated from a soil water balance of measured precipitation, irrigation, and soil water content and evaluated in relation to crop growth and yield. Residue retaining no-till reduced evaporation and increased the soil water stored during fallow from 40 mm to 80 mm compared with sweep and disk tillage. Cumulative ET increased with increasing irrigation, but residue retaining sweep and no-till practices did not affect ET compared with disk tillage. Compared with disk tillage, no-till corn and cotton yields increased 80% and 50% under irrigation of ~2.5 mm d⁻¹. At the higher ~5.0 mm d⁻¹ irrigation rate no-till yields increased 25% and 40%. We conclude that residue reduced growing season evaporation, which increased water use efficiency and crop yields.

Keywords: no-tillage, Ogallala Aquifer, mulching, water conservation

Evaluation of Agricultural Irrigation Efficiency and State Water Policy in Arkansas

Presenter: Kuatbay Bektemirov, University of Arkansas

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Abstract:

Generally, agriculture is the largest user of water resources. Arkansas' agriculture is irrigated mainly with groundwater, and there is a growing challenge to the availability of water in some parts of the state. This paper will examine the irrigation water use in Arkansas through the lenses of the common-pool resource theory, and explore opportunities for developing policy measures to prevent the "Tragedy of Commons" scenario. The study draws on secondary sources, including the literature on common-pool resources and irrigation management, as well as available socioeconomic information in the state. Using FRIS data set drawn from three national samples of irrigators taken in 1998, 2003, and 2008, the study will estimate the changes in water application rates and irrigated acreage in response to the federal EQIP payments and state water policies. The study will analyze the factors that drive the demand for water to irrigate crop production in Arkansas. Preliminary analysis indicates that, between 1990 and 2007, the national average irrigation application rate decreased to 88%, but in Arkansas it stood at the level of 1990, while the state's irrigated acreage increased by 18% in 2007. Small changes in irrigation water use may have large implications for water availability for other uses within the State. The paper offers policy recommendations that will enable water users to benefit from increased water efficiency, and encourage farmers to employ better irrigation technologies and conservation practices in Arkansas. Ethical issues raised by water allocation decisions, including stakeholder input and conflict resolution, will also be discussed.

Keywords: Agriculture Policy, Economics, Irrigation Efficiency, Conservation, Groundwater, State Water Policy, Water Resource Management, Institutions

Bingner
Monday, 10:50 a.m.
Room: Bur Oak

Assessment of Riparian Buffers as an Alternative Conservation Practice using the USDA AnnAGNPS Watershed Pollutant Loading Model

Presenter: Ronald Bingner, USDA-ARS-NSL

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Abstract:

Riparian buffers can be an effective management practice used to reduce sediment and chemical pollutant loads from agricultural fields to downstream water bodies. The capability of buffers to reduce pollutants depends on factors such as buffer width, vegetation type and cover, soil properties, topographic characteristics, and management practices. Watershed technology designed to evaluate pollutant loadings from buffers has been developed and evaluated at field-scale levels, but watershed-scale riparian buffer assessments are limited both in monitored and simulated conditions. The integration of field-scale buffer pollutant loading models with watershed-scale modeling tools can provide a more accurate and practical approach for decision-making on where to apply riparian buffer conservation management practices. In this study, the USDA Annualized Agricultural Nonpoint Source (AnnAGNPS) pollution model was enhanced by the development of a riparian buffer component. AnnAGNPS was developed to perform watershed-scale evaluations of conservation and management practices implemented to control pollutant loads from different sources. Standard databases containing topographic characteristics, management practices, vegetation information, and soil properties were integrated with a simplified version of the Vegetative Filter Strip Model (VFSMOD). The AnnAGNPS riparian buffer component was evaluated within selected watersheds to assess the effectiveness of buffers in reducing the watershed's total pollutant load. Watershed-modeling technology can provide critical capabilities to action agencies, such as the USDA-NRCS, on identifying critical locations of pollutant sources allowing for targeted mitigation/conservation efforts.

Keywords: Watershed Models, Riparian Buffers, Conservation Practices, Pollutant Loads

Effect of Topographic Characteristics on Compound Topographic Index for Identification of Gully Channel Initiation Locations.

Presenter: Ron Bingner, USDA-ARS-National Sedimentation Laboratory Originally: Henrique Momm

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Abstract:

Sediment loads from gully erosion can be a significant sediment source within watersheds, resulting in major contributions to water quality problems, to reduction of crop productivity, and to damaging downstream ecosystems. Areas containing a high probability of gully formation in agricultural watersheds are often evaluated by spatially deriving stream power estimates from topographic information by combining local slope, upstream drainage area, and planform curvature into a compound topographic index (CTI). The ability to use CTI in identifying zones prone to gully formation is affected by field topographic characteristics and resolution of the DEM. Evaluation of CTI values, using simulated catchments, provided a mechanism to assess the individual effect of relief variance, overall catchment slope, and raster grid cell size. Results indicate that CTI values are linearly influenced by changes in relief variance and overall slope, while variations in raster grid cell size caused a non-linear variation (reverse power shape) in the average 0.1% highest CTI values, in addition to changes in cumulative distribution shape. Standardizing CTI values (CTIn) produced merged cumulative distribution curves when varying overall slope, terrain relief variance, and to a lesser degree, DEM resolution. Similar results were found when evaluating critical CTIn values for three measured catchments. Standardization of CTI cumulative distributions improved comparisons between different sites with distinct drainage area sizes and topographic characteristics, providing a possible alternative for investigations of large watersheds with more than one topographic face.

Keywords: ephemeral gully erosion, unit stream power, compound topographic index, DEM resolution

Erosion control through the vetiver system in urban settings in Central Africa

Presenter: Yves-Dady Botula, University of Kinshasa DR Congo / Ghent University Belgium

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Abstract:

One of the major problems in capital cities of DR Congo (Kinshasa) and Republic of Congo (Brazzaville) is soil erosion. Huge ravines, up to 100 meters deep developed readily due to land clearing and uncontrolled urban development. Conventional engineering structures showed their limitations in terms of time, money and efficiency to circumvent erosions. They are very expensive to implement and to maintain and are themselves prone to seepage erosion. To face the huge number of ravines which threaten the major cities of the two Congos, more sustainable and low-cost alternatives techniques to control soil erosion are highly needed. A first experience in a peri-urban setting called Kikwit in DR Congo proved the efficiency of the vetiver system as a biological measure for erosion control. Introduced by the World Bank in the 1980's, this environmental system is based on a unique plant called the vetiver. When planted in the form of narrow self-sustaining hedgerow, the vetiver system has proved to deal with common, unresolved environmental issues related to soil and water in developing countries. This system was able to rehabilitate and stabilize ravines in Kikwit. These encouraging results monitored during four years led to a second experience in urban settings. Conventional engineering techniques and the vetiver system were combined as an alternative to better control ravines in Brazzaville. The results on various sites after three years are greatly promising. Therefore, more experimentation need to be conducted to comfort these results and to vulgarize this technique in other urban and peri-urban settings.

Keywords: soil conservation, erosion control, vetiver system, urban settings, Central Africa

The Value of Environmental Benefits from NRCS WRP easements.

Presenter: David Buland, USDA NRCS Originally: Felix Spinelli

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Greg Kidd, NRCS

Abstract:

The Natural Resources Conservation Service (NRCS) has converted and placed easements on over 1.8 million acres of former wetland areas back to wetlands through the Wetlands Reserve Program (WRP) since the program's inception in 1991. Although past benefit-cost analyses (BCAs) required by the Office of Management and Budget (OMB) has shown that these WRP 30-year and permanent easements provide valuable environmental services to the public, recent developments may provide a more systematic, scientific approach to estimate their expected environmental benefits. These developments include recent research reports, such as those related to the NRCS' Conservation Effects Assessment Project (CEAP) and greater accessibility of regional program data on wetland types and their functions under easement. Both serve as the basis for this study's estimate of their expected physical effects of WRP restoration and easement efforts. This paper first describes the physical effects possibly being produced by WRP easements as found in past and recent studies on a regional basis. A simple comparison of these qualitative outcomes with program acreage and past NRCS program costs is made and provides the basis of an initial macro-assessment of the costs and benefits associated with these outcomes. Short of definitive environmental outcome measures (such as a composite environmental benefit index on each easement), these per acre physical effects, costs, and benefits comparisons can be viewed as the lower bound of the value associated with WRP easements. Regional comparisons should provide a better understanding of the existing WRP easements and the trade-offs in terms of environmental benefits and costs of different WRP easement policy strategies across regions and program goals in terms of addressing selected resource concerns.

Keywords: conservation easements, WRP, benefit estimation

Estimation of soil water evaporative loss after tillage operation using stable isotope technique*Presenter: Mutiu Busari, University***Corresponding Author:**

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Abstract:

This study was carried out in 2009 to determine the effect of tillage on evaporative loss of water from the soil. Zero tillage (ZT) and conventional tillage (CT) were used. Monthly rain water was collected while soil suction tubes were installed for soil water collection at the depths 0.15, 0.50 and 1.0 m by pumping the soil water with a peristaltic pump. Soil water evaporation was estimated using stable isotopes of water. The mean isotopic contents of the site precipitation were -2.96‰ (oxygen-18) and -13.76‰ (deuterium) and were highly depleted compared with -1.15‰ (oxygen-18) and -0.75‰ (deuterium) for the soil water at 0.15 m. Though, there was a strong linear relationship ($R^2 = 0.97$) between oxygen-18 and deuterium of rain and soil water, surface samples under CT were located farther from the local meteoric water line at the upper end of the regression line. This indicates more evaporative loss of water under CT compared with ZT. Soil water stable isotopes were more enriched near the surface under CT and down the profile under ZT suggesting occurrence of more evaporation and infiltration under CT and ZT, respectively. Deuterium excess ranged between 4.93 to 11.61‰ under ZT and -2.32 to 11.66‰ under CT implying more isotopic fractionations due to CT compared with ZT. The annual evaporation estimated using vapour diffusion equation ranged from 46-70 mm year⁻¹ under ZT and 54-84 mm year⁻¹ under CT. Therefore, to reduce soil water loss, adoption of conservation tillage practices such as zero tillage is encouraged.

Keywords: Deuterium excess, evaporative loss, isotopic fractionation, stable isotope

Callam
Monday, 10:30 a.m.
Room: West Fork I & II

The Lake Macatawa Water Quality Project.

Presenter: Dan Callam, Hope College Originally: Graham Peaslee

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Abstract:

The Lake Macatawa watershed in western Michigan suffers from extensive and historically pervasive non-point-source nutrient pollution and excess sedimentation (primarily from agricultural land in the headwaters of the watershed). More recent microbial contamination issues have also occurred regularly in Lake Macatawa as well. In an effort to address these water quality issues, a unique combination of partnering organizations collaborated on a multi-year water quality study. The partners include a local metropolitan planning organization, a non-profit outdoor education organization, and an undergraduate research institution. A relatively low-cost sediment monitoring program has been adapted from the literature and used to collect and quantify sediment loading from eight of the nine major sub-watersheds that contribute to Lake Macatawa. The collected sediment has also been analyzed by a novel combination of eight different analytical techniques in order to develop unique sediment “fingerprints” that can help to identify the relative origin of the sediment within the watershed. Finally, a microbial source tracking study was performed to identify the origin of the fecal coliform indicator species found in Lake Macatawa, using DNA identification of *Bacteroides* to pinpoint the origin of the microbial contamination. Preliminary results from all three water quality measurements will be presented, together with an overview of how the project was designed, funded and conducted.

Keywords: non-point-source pollution, sedimentation, water quality measurements, sediment fingerprinting, microbial source tracking

Carrillo
Monday, 1:50 p.m.
Room: Bur Oak

Agronomic, Economic and Institutional Factors Influencing Spatial Variability of Water Use in the Irrigation District 014-Rio Colorado, Mexico

Presenter: Yamilett Carrillo, University of Arizona

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Jeffrey Silvertooth, University of Arizona

Abstract:

As agriculture consumes about 70% of the world's freshwater withdrawals, farmers are expected to carry more of the burden of water conservation. Cultivating at the southern end of the Colorado River's drought-stricken watershed, Mexican farmers face a future of water shortages. In order to identify feasible water conservation strategies in Mexico's 5th largest Irrigation District (DR014-Rio Colorado), we need to evaluate what institutional and environmental variables influence water use. We acquired information on farmers' water use and their opinions on water conservation barriers thru a district-wide survey applied to 521 farmers. We analyzed the spatial variability of water use by adding the database of farmers' responses to a geographic information system.

Parcels in the aquifer withdrawal region use more water than farmers dependent on Colorado River flows delivered to Mexico; farmers on the edges of the district are not choosing to use less water, but less water is available for them to use. Limitations to improve water use efficiency at the parcel level are: a) the limited allowance in the US-Mexico Water Treaty to adapt scheduled deliveries to Mexico, b) the uncertainty perceived by farmers regarding the availability of water when their crops need it, and c) the lack of precise measurement of the water delivered to the parcels. The lack of technical knowledge and low profitability of traditional crops make implementing irrigation technology for water conservation cost-prohibitive for most farmers. Not surprising, a high majority of small-scale farmers are now choosing to rent their water rights (estimated at 70%/year).

Keywords: Water conservation, Colorado River, Mexicali Agricultural Valley, farmers' survey, spatial variability of water use

Potential for Improving Agriculture's Water Use Efficiency in Northwest Mexico: The Mexicali Agricultural Valley

Presenter: Yamilett Carrillo, University of Arizona

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Jeffrey Silvertooth, University of Arizona

Abstract:

The over-allocated, fully-diverted, drought-stricken Colorado River is one of the most important rivers in North America. As shortages will affect users in the United States and Mexico, water managers encourage higher rates of water use efficiency (WUE). Mexico's entitlement is about 9% of allocated Colorado River flows and farmers own most of these water rights (88%).

In this paper we evaluate the potential for increasing WUE at the parcel level in Mexico's Irrigation District 014-Rio Colorado. The specific objectives are to determine: 1) to what extent are farmers applying more water than needed during irrigations and 2) which areas of the irrigation district may have a higher potential for farmers to achieve higher WUE rates, considering local agronomic and socio-economic conditions. A geographic information system was developed to analyze how the basic soil and water characteristics prevalent in this irrigation district help determine the areas more suitable for farmers to decrease the amount of water applied per hectare and spatially analyze farmers' responses in a district-wide survey. The three main crops grown are wheat, cotton and alfalfa, the average water volume applied per hectare was 10,496 m³/yr, and gravity dominates as irrigation technique. Increasing WUE is not as feasible in all areas within the Mexicali Agricultural Valley as 22% of Mexicali's croplands are salt-affected soils and 19% are sodic soils. Here, small-scale farmers perceived only two options: continue irrigating their parcels in the "low-frequency, high-volume, total-area" mode to keep soil productivity or rent/sell their water rights.

Keywords: Water conservation in agriculture, Colorado River, salt-affected soils, farmers' survey, spatial modelling of water use

Christensen

Monday, 11:10 a.m.

Room: West Fork I & II

A GIS index approach to prioritize water quality monitoring of CAFOs in North Carolina

Presenter: Jay Christensen, US EPA, National Exposure Research Laboratory

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Abstract:

Poor management of confined animal feeding operation (CAFO) effluent can contribute to nonpoint source (NPS) nutrient pollution. In North Carolina, swine production has been implicated in the eutrophication of the state's rivers and estuaries. To mitigate nutrient pollution, CAFOs often use riparian buffers, yet buffer effectiveness for nutrient removal is variable. Landscape position, surface and groundwater flows, and soil variation all influence removal. Due to the diffuse nature of NPS nutrient pollution and the variability of the landscape, determining where CAFO-related water quality issues may arise is problematic. In this work, I present a relative index of potential CAFO pollution in the Cape Fear, NC watershed. First, the index considers animal numbers and the potential amount of effluent produced. Second, it considers the soils and slopes of application fields to assess vulnerability to erosion and leaching. Finally, it considers the spatial context of the application fields in relationship to buffers and adjacent streams. A GIS model spatially connects the application fields via flowpaths to riparian buffers of varying efficiency and determines the amount of effective buffer. The components of the index are summarized within small catchments and combined into the final relative index. State and federal regulators can use the resulting index values to prioritize water quality monitoring across the watershed. Although the model still needs to be validated through field monitoring, it provides an approach that could be useful to target monitoring toward catchments with a high risk of CAFO NPS pollution.

Keywords: CAFOs, swine, nutrients, flowpath analysis, Cape Fear

Coupe
Tuesday, 1:30 p.m.
Room: Elm Fork II

Complexity of Agricultural and Human Interactions on Water Quality and Quantity in the Mississippi Delta

Presenter: Richard Coupe, U.S. Geological Survey

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Abstract:

Scientific evidence shows that the long-term cumulative degradation of the environment due to the current agricultural paradigm is inconsistent with the goals of sustainable agriculture. Three examples are presented where agricultural management decisions, made at three different levels (local, regional, and global) adversely affect water quality and quantity in unintended ways in the Delta of northwestern Mississippi. First, the lack of regulation of groundwater use for irrigation has caused declines in groundwater levels which have resulted in loss of baseflow to streams and threatens future water supply. In the second example, Federal policy, which subsidizes corn for use in biofuel generation, has encouraged many farmers to switch from cotton to corn production. Compared to cotton, corn needs more inputs of nutrients and more water. The third example is the wholesale adoption of a system for weed control that relies on a single mode of action. This system promised many benefits such as fewer applications of herbicides, improved water quality, and less toxicity. Many of the promised benefits were met early on, but eventually the system has led to multiple applications of herbicides, degradation of water resources, and a weed control system near collapse due to widespread resistance. Although these examples are specific to the Mississippi Delta, analogous situations are replicated throughout the world and point to the need for change in how we grow our food, fuel, and fiber, manage our soil and water resources, and prepare for the future.

Keywords: water quality, water quantity, Mississippi, biofuels, weed control

Daniels
Monday, 10:30 a.m.
Room: Post Oak

The Impact of Nutrient Management Planning in Arkansas

Presenter: Mike Daniels, University of Arkansas

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Andrew Sharpley and Karl VanDevender, University of Arkansas; Adrian Baber and Patrick Fisk, Arkansas Natural Resources Commission, and Debbie Moreland, Arkansas Association of Conservation Districts

Abstract:

In 2003, the State of Arkansas enacted nutrient management laws that require livestock producers to obtain a nutrient management plan written by a State-certified nutrient management planner before they can apply nutrients to agricultural lands within defined nutrient sensitive watersheds. The University of Arkansas in partnership with the Arkansas Natural Resources Commission and the Arkansas Association of Conservation Districts to develop a certification training program to train and certify nutrient management planners. To date over 200 plan writers have been trained and plans have been written in nutrient surplus watershed lying in thirteen Northwest Arkansas Counties. The impact of this conservation program will be presented.

Keywords: nutrient management, water quality, education, outreach

Echols
Monday, 2:30 p.m.
Room: Bur Oak

Water As A Crop Helping Landowners Find Value Meeting Society's Water Resource Needs.

Presenter: Alex Echols, Sand County Foundation Originally: Steven Parrett

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Additional Authors:

Alex Echols, Sand County Foundation

Abstract:

Since an estimated 80% of the annual precipitation in the continental United States falls on private land - where intensive use has altered watershed functions including water storage, filtration, and delivery - promoting and enabling voluntary, incentive-based, improved water stewardship on working landscapes is a critical means to increase water resource security for the future.

Sand County Foundation, working with local and national partners, has begun to design, pilot, evaluate, and communicate about the potential of landowner led solutions to improve the quality and quantity of local water resources. Water As A Crop[®] can play a leading role in addressing the country's future water resource needs by empowering landowners with knowledge, tools, inspiration, and incentives to become skilled water stewards who produce more reliable, cleaner water.

This presentation will describe the first Water As A Crop[®] demonstration project, located in the Trinity River Basin south of Fort Worth. Now in its third year of development, this unique partnership between major urban water users, conservation groups, and landowners is testing the social, economic and environmental outcomes of this approach inspired by Aldo Leopold. Sand County Foundation will learn from this initial effort and apply these findings to future demonstration sites.

Keywords: Leopold, Water, Crop, Landowner, Demonstration

Bennett, Leopold and the Shadow of James Madison

Presenter: Alex Echols, Sand County Foundation

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N/A

Abstract:

Hugh Bennett was influenced early in his career by the soil erosion he documented when he led the soil survey for Louisa County, VA. Likewise, Aldo Leopold documented the loss of productive soils in Wisconsin and elsewhere. These two men inspired a nation to understand that healthy soils and human opportunity are inseparable. Likewise, James Madison, who was regarded by his peers as the “Leading farmer in America” and enshrined in the Constitution and Bill of Rights many of the principles that inspired Bennett and Leopold.

Bennett and Madison walked the same ground in central Virginia. They both observed the devastation to the land and the people dependent upon it when destructive practices were used. In his 1818 address as President of the Albemarle County Agriculture Society Madison called for the adoption of conservation practices to protect agricultural productivity, the bounty of nature and economic opportunity. Madison linked the rights and responsibilities of land ownership

These three men had a profound effect on conservation. This presentation traces the thread of individual responsibility for land health that runs through the U.S. Constitution and the way that these three men, each in his own way, promoted idea that conservation rights and responsibilities are two sides of the same coin.

Keywords: Agriculture, Conservation Policy, History

Systems Approach To Reduce Nitrogen Loss

Presenter: Alex Echols, Sand County Foundation

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Abstract:

USDA's Conservation Effects Assessment Program documents that reducing the loss of nitrogen from agriculture to our nation's waters is one of the key conservation challenges we face today. To be cost effective and protect both the economic viability of farm operations and the capacity to expand food production we need more effective conservation strategies. With potential declining conservation funding, a systemic approach that assesses which management practices at which specific locations will have the greatest conservation return on investment is essential if we are to meet this challenge.

This principle has been adopted as part of the updated Nutrient Management Practice (590) of the Natural Resource Conservation Service, and will be included in the upcoming standard for Management of Drainage Waters. It also needs to be applied to other conservation programs and sanctioned by ecosystem service markets to bring capital investments into agricultural conservation.

This paper describes Sand County Foundation's experiences of implementing specific practices in three states to assess their acceptance by farmers, environmental outcomes, costs and ultimately conservation return on investment. Additionally, we will describe a potential model in which ecosystem service buyers from outside the agricultural sector can adopt similar principles.

Keywords: Water, Farm Economics, Conservation Policy

Management Of Drainage Waters: New Practice Standards

Presenter: Alex Echols, Sand County Foundation

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Abstract:

Agricultural drainage waters are one of the most important vectors moving nutrients from the field where they are essential to production to our waters where they become an environmental liability. Inadequate attention to this vector has been given in the past to address water quality and other environmental issues. Managing drainage waters is also one of the most cost effective strategies to reduce nutrient loss (nitrogen in particular.)

To overcome this shortfall the Natural Resources Conservation Service (NRCS) has worked with a series of agricultural, conservation and industry partners to develop a new set of practice standards to place an emphasis on managing drainage waters in locations where those practices are cost effective.

This set of practices will be integrated into a systems approach to nutrient management being adopted by NRCS. The specifics of how the program will operate, incentives to landowners, targets for implementation and evaluation criteria will be presented in this forum.

Keywords: Water, Nutrients, Drainage, Wetlands

Edwards
Tuesday, 3:50 p.m.
Room: Bur Oak

A basis for decision making on soil conservation in Prince Edward Island PEI, Canada: Considering the evidence

Presenter: Linnell Edwards, Agriculture and Agri-Food Canada

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Abstract:

This presentation will seek to address the specific concerns for PEI implicit in the guidance questions posed by SWCS's Program Committee pertaining to how conservation decisions are made when uncertainty is high; and how uncertainty affects conservation choices. The answers may be based on (a) scientific evidence generated through local research, and (b) the provincial Agricultural Crop Rotation Act of 2002. The former basis involves several laboratory, small-plot, and commercial-field experiments conducted by the author under simulated or natural precipitation where it was shown that winter rye (the most adapted winter cover) reduced cool-season sediment mass and runoff volume by an average of 50% and 80%, respectively. Similar amplitudes were shown for straw mulching. The latter basis, the Rotation Act, aimed squarely at conserving soil under potato production where customary husbandry is intensive and destructive to the soil, averaging 30 t/ha/yr for the cool period alone while exceeding 100 t in the worst cases. This Act, which subtly dictates farmer choices and has a punitive component, was mostly hortative and specified that rotations be not-less-than three years, whilst recommending agronomic measures to minimize soil physical degradation. The value and urgency of the Act can best be seen through the economic importance of the potato crop which accounts for 50% of total farm receipts and occupies a commensurate amount of land, over 60% of which is on sloping terrain without any cool-season cover.

Keywords: Cool-period erosion, potato rotation policy

Land use pattern and stream flows in urbanizing watersheds.

Presenter: Paul Ekness, University of Massachusetts Originally: Timothy Randhir

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Abstract:

Urbanization can significantly impact water flows in watershed systems by changing stream flow dynamics. There is limited information on how changes in urbanization patterns affect water flows at a landscape scale. This information is important to develop landscape conservation strategies in urbanizing watersheds. This study evaluates the hydrologic impacts of land use patterns in 37 watersheds of varying sizes throughout Massachusetts. Hydrologic data is compiled from USGS gauging stations at the outlet of each watershed from 1970 to 2010. Spatial landuse data for 1973, 1985, 1999 and 2005 is used to generate a long term time series of landuse change within each watershed. Landuse patterns within each watershed in each time period are quantified using spatial statistics (FRAGSTAT). Metrics on fragmentation, patch density, number of patches, edge density clumps and open space are determined. Hydrologic variables for each watershed are determined and include baseflow, magnitude and duration of maxima and minima daily, weekly, and monthly hydrologic cycles. Temporal land use trends show an increase in fragmentation with increases in edge densities, which lowered daily and weekly minima of stream flow. The peak flow generally decreased over the study period and had significant effects on the base flows in the higher order streams. Landscape pattern has significant implications on excess and deficit water conditions in water bodies. Managing future urban patterns can minimize the impacts of landuse on stream flows. Understanding the relationship of landuse patterns on stream flow is critical in managing floods and low flows in watershed systems.

Keywords: Land use pattern, urbanization, stream flow, watershed

Water Conservation: A Stakeholder Approach to Implementing Statewide Initiatives

Presenter: Vanessa Escobar, Texas Water Development Board

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Holly Vierk, Texas Water Development Board, Public Awareness Coordinator

Abstract:

Water conservation is critical to the future economic and environmental viability of Texas. By 2060, more than 46 million people are expected to call Texas home. Increasing population, demand on water supplies, and frequency of drought allows us to recognize the vital role of conservation in meeting the future water needs of Texas. Recognizing the importance of conservation in meeting our future demand, the Texas Legislature directed the formation of the Water Conservation Advisory Council. The Council is a formal stakeholder group designed to provide the Governor, the Legislature, state agencies, and political subdivisions, with the resource of a select council with expertise in water conservation. The Council is directed to address several charges and to report to state leadership before every legislative session. In Texas there are a variety of water user groups, each with their own perspectives and needs to consider when planning for the state's long-term water supply needs. It is for that reason that a stakeholder approach is utilized in planning and evaluating water conservation initiatives on a statewide level. The Council has focused on three core elements for achieving success in water conservation and has identified a number of key findings and recommendations for advancing water conservation in Texas. This presentation will provide an overview of the Council and its role in the state's water conservation efforts. The presentation will discuss how the council was established, the council's activities and accomplishments, lessons learned and future efforts.

Keywords: Water Conservation, Programs, Policy

Fixen
Tuesday, 3:50 p.m.
Room: Red Oak

NuGIS: a Nutrient Use Geographic Information System for the U.S.

Presenter: Paul Fixen, IPNI

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Abstract:

A property fundamental to the sustainability of any cropping system is the balance between nutrients imported to the system and those being removed. The resulting balance is an indicator of the likely direction of temporal soil fertility change and the potential for nutrient loss to air and water. At a farm or field scale, nutrient balance can guide changes in practices, and when combined with other indicators, serve as a measure of progress in meeting nutrient stewardship goals. Aggregate data at a watershed or state level can guide nutrient management and conservation education and serve as factual input into environmental policy development. NuGIS (Nutrient Use Geographic Information System) is a nutrient balance model that predicts partial nutrient balance and nutrient removal to use ratios for the U.S. at county, state, and watershed scales. Harvest removals of N, P and K are estimated from USDA-NASS crop production data and the latest crop removal coefficients based on an on-going national project focused on developing a spatial database of measured coefficients. Fertilizer use and recoverable manure nutrients are estimated from AAP-FCO fertilizer sales data and Agricultural Census information for the five Census years from 1987 through 2007 with annual estimates since 2007 available in the near future. Balance estimates and the component data layers can be viewed via a web-based interactive graphical interface or exported in tabular form. The analysis reveals areas of both highly positive and highly negative nutrient balances. NuGIS can be accessed by logging in at <http://nugis.ipni.net>.

Keywords: nutrient balance, nutrient removal, nutrient use, nutrient use efficiency

Physicochemical Properties of Soils and some Water Sources on the Western Flank of Mount Cameroon

Presenter: Norbert Fomenky, University of Buea Originally: Aaon Tening

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Abstract:

One of the areas of increasing human activities is the western flank of Mount Cameroon. These activities with natural processes alter the properties of soils and water which affect the health of plants, animals and humans. This work was therefore, aimed at investigating some physicochemical properties of soils and some water sources on the western flank of Mount Cameroon. Soil and water samples were collected in February 2010 and analysed for their physicochemical properties using standard methods. The soils were generally acidic with 60% of them being loam and 40% clay-loam. Most of the physicochemical properties of the water analysed were within acceptable limits of World Health Organisation. There was an indication of increasing nitrate levels from some of the water sources. The average nitrate concentrations were 0.31, 0.68 and 1.94 mg/L in streams, springs and wells, respectively. An insignificant ($p > 0.05$) but positive correlation was observed between nitrate and altitude. Sulphate showed a negative significant relation with altitude ($P < 0.05$). There were significant positive relationships ($p < 0.05$ and $p < 0.01$) between total nitrogen and altitude and carbon and altitude, respectively. Exchangeable magnesium and exchangeable calcium showed significant negative correlations ($p < 0.05$ and $p < 0.01$, respectively) with altitude. Among the natural sources of pollution identified are weathering, erosion and sea water intrusions. The anthropogenic ones included waste from homes, laundry, fertilizers, sewage and factories.

Keywords: Soil, water, altitude, human activities, mount Cameroon

Frey
Monday, 4:10 p.m.
Room: Post Oak

Assessing the effects of nutrient enrichment on agricultural stream ecology: Regional implications for nutrient criteria development

Presenter: Jeff Frey, U.S. Geological Survey

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Abstract:

Agricultural streams have some of the highest nutrient (nitrogen and phosphorus) concentrations in the United States, and in many areas greatly exceed background concentrations. The U.S. Geological Survey's National Water-Quality Assessment Program conducted a study between 2003-2009 within eight agricultural settings across the United States to improve the understanding of how nutrients influence biological communities and how these interactions are modified by stream habitat, land use, and geographic location in agricultural ecosystems. Sites were selected to maximize the nutrient gradient within each of the study areas. The Agricultural Intensity Index, which is based upon nutrient inputs, amount of agriculture in watershed, and percent of riparian in agriculture was developed to help explain nutrient concentrations in streams and to help rank watersheds without stream nutrient data. Many agricultural streams have been modified such that water flows faster downstream, reducing the ability of the stream to filter nutrients from the water. This results in greater amounts of nitrogen and phosphorus transported to receiving waters including coastal systems. In some systems macrophytes were as important as benthic algae in the overall production of aquatic vegetation. Additionally, in some systems the potential accumulation and storage of nitrate in shallow aquifers could be discharged to streams long after improvements are made at the land surface, which has important implications for environmental managers. Biological condition of algal and invertebrate communities decreases as stream nutrient concentration and agricultural intensity increases, although responses vary regionally. Regardless of nutrient conditions, physical habitat often has the strongest influence on biological condition.

Keywords: nutrient enrichment, biological response

Frey
Monday, 4:30 p.m.
Room: Post Oak

Effects of retired lands on water quality in southern Minnesota agricultural watersheds

Presenter: Jeff Frey, U.S Geological Survey

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Abstract:

Nutrient enrichment, primarily by phosphorus and nitrogen, is commonly associated with water quality impacts of agricultural land use. In the 1990s, agricultural best management practices, including retired lands, were intensively implemented in order to reduce runoff and sediment loads from fields into streams. Retired lands are those taken out of production either permanently or for an extended period of time through federal and local conservation programs such as the Conservation Reserve Program, Reserve Conservation Easement Program, and the Conservation Reserve Enhancement Program. A recent study by the U.S. Geological Survey in the Minnesota River basin found significant decreases in nitrogen and sediment but not phosphorus as area of retired lands increased. Additionally, stream health improved as documented by several biological metrics. A three year study began in 2011 of small (about 5 mi²) paired basins, with and without retired riparian lands, in southern Minnesota streams to determine if the source of phosphorus is from field or retired land soils or from stream channels. Samples of field and riparian soil, suspended sediment, and stream water were sampled for nutrients, trace elements, and organic content in the fall 2011 in order to quantify the abundance and source of nutrients. Aquatic species were sampled in order to get an initial understanding of diversity, organism health, and trophic resources. This study will evaluate whether increases in retired riparian land abundance result in improved biological community structure, improved food-chain length, and improved organism health through influences on water quality, sediment sources and characteristics, and habitat.

Keywords: nutrient enrichment, biological response, retired lands, BMPs

Adaptive management of ecosystem services in Orinoco Watershed: A regional Assessment.

Presenting Author: Luisa Galindo, University of Massachusetts

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Abstract:

Ecosystem services provided by watershed systems sustain economic and ecological processes. Assessing these services at spatial extents is important for developing adaptive management strategies for conservation. Orinoco basin originates from the Andes and flows into the Atlantic and passes to Colombia and Venezuela. It is one of the most biologically and hydrologically diverse areas of the world. This study aims to assess spatial distribution of ecologic services in the watershed for developing adaptive management strategies. Geographic Information Systems is used to process land use, soils, climate, vegetation biomass, biodiversity, and administrative variables in the watershed. Runoff is estimated using soil drainage classes, land use, and precipitation. Precipitation distribution is interpolated using spline methods. Sediment loading is assessed using RUSLE to study implications of water quality. Habitat and sequestration services are assessed using spatial distribution of the total biomass and biodiversity. An ecosystem service index is developed and is used in assessing the implications of land use change and climate change using a scenario analysis. General observation is that ecosystem services vary over space and have cumulative benefits at watershed scale. Adaptation strategies should thus focus on site-specific conservation while account for watershed-wide enhancement of ecosystem services. The results will benefit the society in developing new methods and baseline assessments in sustaining ecosystem services of watershed systems. The methods are transferable to other watersheds for developing adaptive management plans for watershed systems.

Keywords: Ecosystem services, watersheds, adaptive management, conservation

Sustainable Cropping Systems Using Cover Crops, Native Species Field Borders and Riparian Buffers for Environmental Quality

Presenter: Clark Gantzer, University of Missouri

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Abstract:

This presentation will focus on the application of sustainable management practices for no-till cultivation using cover crops, native species field borders, and fast growing woody species integrated in vegetative strips and riparian buffers. An ongoing field project at the Bradford Research and Extension Center near Columbia, MO will be highlighted. We will present information on annual cover crops usage for row-crop rotations that emphasize the contribution of biologically-fixed nitrogen, weed growth suppression, carbon sequestration, and soil health. We will discuss use of cover crops alone and in mixes either over-seeded in standing corn and soybeans or drilled after harvest and then followed by an annual grain crop. We will also present options for enhancing riparian buffers and field borders for wildlife and a haven for beneficial insects, using native forbs and shrubs with the fast growing woody species (willow and cottonwood) that will enhance water quality, wildlife habitat, and thus promote native beneficial pollinator species. Presentation of current on-farm success stories from Missouri producers using these techniques will be discussed. The organization, presentation, and outcomes of field days and workshops for farmers, landowners, and educators to encourage adaption of these methods will be discussed. Farmers must produce more food and fuel, but do it sustainably, and these practices will enable farmers to do so while making choices that improve water, soil, and air quality, and provide wildlife habitat.

Keywords: soil and water conservation, cover crops, riparian buffers, field borders, on-farm success stories

Adaptive hydrologic enforcement of LiDAR-based Digital Elevation Models

Presenter: Brian Gelder, Iowa State University

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Abstract:

The use of high resolution topographic surveys often present problems in hydrologic and hydraulic simulations. High frequency features, such as roads, bridges, and trees, are not captured by lower resolution surveys but create obstructions to flow in high resolution surveys. Typical flow enforcement algorithms, such as filling all values to an overflow point, removes flow detail in the filled areas and manual methods of flow enforcement return more realistic results, however they are extremely time consuming. To overcome these difficulties we propose an automated hydrologic enforcement algorithm that connects areas of channelized flow and replaces elevations in the DEM as appropriate.

The proposed method consists of four main procedures: initial DEM cleaning and pit filling, initial flow forcing by hole punching, channel enforcement, and channel cutting. Initial DEM cleaning removes one cell sinks (i.e. "pit filling") and it can also remove the deepest elevation value in each watershed and replace it with the second deepest value in areas of poor quality data. Initial flow forcing aggregates water flow into watersheds that are deeper than a pre-selected criteria by filling so all watersheds have defined shape characteristics. Channel enforcement removes the obstructions that necessitated the fill operation in the previous step in areas where channelized flow is likely. Channel cutting involves identifying areas where flow and watershed characteristics indicate that a downstream connection is likely and searching for an acceptable connection location. After a connection location has been found the least cost connection path is enforced in the DEM using the elevation of the upstream location.

Keywords: LiDAR, hydrology

Iowa Daily Erosion Project

Presenter: Brian Gelder, Iowa State University

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Abstract:

The Iowa Daily Erosion Project (IDEP) is an ongoing modeling effort that provides estimates of hillslope runoff, erosion, and soil moisture at the township level (~100 km²) on agricultural areas throughout the state of Iowa every morning. It currently utilizes 15-20 year old USDA Natural Resources Inventory (NRI) crop rotation survey data and real time weather and remotely sensed rainfall to drive the Water Erosion Prediction Project model. In response to continued interest we are updating IDEP to version 2.0 which will include increased spatial resolution weather data, complex hillslopes with variable soil properties, remotely sensed management data, and increased spatial resolution of runoff and erosion estimates while maintaining a near-real-time (ca. 6 hour) operation schedule. We will discuss the methods being used to identify the 1,000,000 modeled hillslopes across the state and estimate annual hillslope management practices. We will also discuss plans for adding watershed modeling capabilities to IDEP.

Keywords: LiDAR, hydrology

Estimating Flood Damages Averted from NRCS Watershed Projects

Presenter: Noel Gollehon, Natural Resources Conservation Service, USDA

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Abstract:

Even though NRCS's Watershed Program is currently not funded, over the multi-decade operation of the program many hundreds of structures were installed and watershed improvements made. This legacy of flood control, water supply, recreation, and habitat benefits continues because the structures and practices are in place. This presentation presents an historical description of the watershed program and then develops preliminary monetary estimates of the flood damages averted as a result of the existing NRCS watershed projects during the 2011 storm events of Hurricane Irene and Tropical Storm Lee. The analysis uses the actual storm event frequencies and converts the average annual flood control benefits to the damages averted from the two 2011 storms. Results are presented in aggregate, by storm, and by state.

Keywords: economic benefits estimation, flood control benefits, NRCS watershed projects, Hurricane Irene, Tropical Storm Lee

Large-Scale Restoration of Disturbed Wetlands on Florida Agricultural Lands

Presenter: Mitchell Griffin, CH2M HILL

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Abstract:

Many natural wetlands have been extensively modified over the years by ditching, diking, or grading to create agricultural land suitable for pasture, grazing, or other intensive uses. Government agencies are purchasing these lands for conservation purposes with the intent to restore the natural functions to the properties. These restorations may include both community modification and limited and construction to undo previous modifications. The goal of the typical wetland restoration project is to restore the hydrology and ecology of the site using the least amount of design, management, and long-term operational support to achieve the greatest possibility of restoring natural wetland communities with minimal or no adverse affects to onsite resources or to offsite properties. Often, restoring native vegetation and invasive species control will not be successful unless the hydrology of the wetlands is addressed first.

For the past 6 years, the authors have been providing engineering services to the USDA-NRCS to restore properties enrolled in the Wetland Reserve Program (WRP). To date, CH2M HILL has worked on 22 projects/farms addressing restoration on over 25,000 acres. Projects have ranged in size from 37 to about 2,900 acres in area. Restoration projects require a multidisciplinary approach to evaluate the soils, existing vegetation and cultural resources, surveying, and evaluating local and maybe regional hydrology. The presentation will describe how these projects are evaluated (scope, tools, and methods) and the type of activities implemented to restore the hydrologic regime in disturbed wetlands.

Keywords: hydrology, hydroperiod, construction, WRP, restoration

Harris
Tuesday, 11:10 a.m.
Room: Post Oak

Engineering a “Natural” Solution to an Unnatural Challenge, Shoreline Stabilization and Beautification on Town Lake Trail, Austin

Presenter: Heather Harris, CH2M HILL

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Abstract:

The Shoal Creek watershed spans the entire City of Austin, with a drainage area of approximately 13 square miles. The “lower” portion of Shoal Creek is within an area of active redevelopment in downtown Austin. Planned projects include a new Central Library, which will create a “prominent civic landmark and destination along Shoal Creek.” Thus, the City of Austin is using this opportunity to transform Shoal Creek into a “signature urban green space.” One such project involves shoreline improvements for the Lady Bird Lake Peninsula at the mouth of Shoal Creek, an area that is part of the heavily populated Town Lake Trail. The peninsula is a manmade feature that has shown significant erosion over the past several years, resulting in poor riparian integrity and a risk to the popular hike and bike trail. Further, there is concrete riprap on the northern side of the peninsula that has been undermined, is aesthetically undesirable and prevents any vegetative growth in that area. Planned improvements include improving the human experience along the peninsula through native vegetation and trail enhancements and stabilizing approximately 500 feet of shoreline using a variety of methods. Because the space is a city park, the resulting project must be integrated with desired public uses and is informed by an organized stakeholder group. The presentation will summarize the process used by the project team to develop a design that provides an engineered solution to the challenges mentioned, while maintaining a natural aesthetic and desirable experience for the trail users.

Keywords: stream stabilization, erosion, H/H

Huang
Tuesday, 3:30 p.m.
Room: Red Oak

Examining plant nutrient recovery efficiencies in the United States, 1996-2010

Presenter: Wen-Yuan Huang, Economic Research Service, U.S. Department of Agriculture

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Abstract:

Properly applying nitrogen, phosphate, and potash is essential for managing soil resource for sustainable agricultural production. Nitrogen and phosphate, if over applied, can harm the environment, through leaching into ground water and runoff into surface water. If under applied, nitrogen, phosphate and potash will be mined from the soil for crop use. Continuously mining soil nutrients from soil can degrade soil and reduce soil productivity. Excess nutrient applied and excess nutrient mined should be avoided in managing soil resource for a sustainable crop production. This paper assesses the trends of nutrient use efficiency in production of corn, cotton, winter wheat, and soybeans in the U.S. from year 1996 to year 2010. Nutrient recovery efficiency is used for the assessment. It is the ratio of the amount of nutrient in crop harvested and removed from the field over the amount of nutrient applied for that crop production. If ratio is less (greater) than 1, excess (mining) nutrient occurs. Nutrient recovery efficiencies under following three groups of planted acres are presented: (1) all planted acres, (2) planted acres receiving nutrients, and (3) planted acres receiving excess nutrients. Trends of recovery efficiencies, percents of planted acres with excess nutrients applied and nutrients mined, and the amounts of excess nutrients applied and the nutrients mined in those three groups will be compared and discussed. Implication on need to adjust nutrient management practices for a more sustainable crop production will be addressed. Available data from USDA's ARMS surveys will be used for the analysis.

Keywords: Plant nutrients, recovery efficiency, excess nutrient applied and mined

Targeting conservation practices through watershed modeling informed by farmer interviews

Presenter: Margaret Kalcic, Purdue University

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Abstract:

Watershed models are commonly used to target conservation efforts for water quality protection. Yet these models may fail to produce usable solutions due to shortcomings in both modeling and policy frameworks. This work utilizes an adaptive optimization approach based on farmer interviews to increase the usability and subsequent adoption of targeting scenarios. The Soil and Water Assessment Tool (SWAT) is used for watershed modeling and targeting of conservation practices in west central Indiana. Farmer interviews reveal the locations of current conservation efforts and management practices, as well as farmer opinions on and preferences for future conservation. Current farmer practices inform the management practices and assumptions underlying the SWAT model of the study area, while farmer conservation preferences constrain the targeting scenarios to those most feasible in the study area. We expect to find that farmer interviews (1) allow for more realistic assumptions of current land management, (2) alter the set of conservation practices used in the targeting scenarios, (3) result in greater cost for a certain water quality benefit because of constraints placed by farmer preferences, and (4) increase usability and likelihood of adoption of the targeting approach.

Keywords: Targeting, conservation practices, stakeholder involvement, farmer interviews, SWAT, water quality

Economic and Biophysical Impacts of Land Management Practices in Southern Manitoba

Presenter: Mohammad Khakbazan, Agriculture and Agri-Food Canada

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Abstract:

As part of the Canadian Watershed Evaluation of Beneficial Management Practices (WEBs), a model, in a Stella modelling framework, was developed to estimate crop production economics and effects on soil characteristics under three different tillage regimes. The model quantified economic and biophysical impacts of land management practices for three crop rotations under three tillage systems, conventional (CT), minimum (MT) and zero (ZT), at the watershed scale and was calibrated against an economic assessment of land management data collected in the South Tobacco Creek (STC) watershed in southern Manitoba over a 20 year period. The model results generally show no significant differences between tillage systems in terms of total production costs for typical rotations in southern Manitoba, however, MT produced more favorable economic results than CT or ZT. The model will estimate the economic benefits of each tillage regime, monitoring changes in soil characteristics, such as solum depth and soil organic matter, and tracking CO₂ emissions due to decomposition of crop stubble and mineralization of soil organic matter. By applying calibrated water quality experimental results from the watershed to the model through the use of a tillage index- precipitation function, value will be placed upon modelled loss of nitrogen and phosphorus. An overall sense of the net benefit to water quality and to the producer will be incorporated into the model to help with policy development in encouraging uptake of conservation practices.

Keywords: Watershed, tillage, cost, benefit, soil characteristics, water quality

Kluthe
Monday, 3:50 p.m.
Room: Elm Fork I & II

Climate Change, Natural Resource Concerns in Malawi, Africa

Presenter: John Kluthe, USDA-NRCS

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Abstract:

3/13/2012 (Revision to original submission)

Neither Kluthe nor any applicant was selected by the Department of State to serve as the Embassy Science Fellow, Malawi, Africa, 2012. Therefore Kluthe's presentation will focus on the current challenges and difficulties with natural resources that Malawi faces. He will cite research and current reports on the status of progress and the need for further action.

The combination of Malawi's reliance on rain-watered agriculture, it's large, poor population and its strong need for natural resources for day to day living make this nation acutely vulnerable to climate change.

The combination of national policy and immediate need for these resources contribute to deforestation. Several steps must be taken to reverse the cycle of production methods that decrease OM and increase compaction. These efforts will in turn allow better water infiltration, increased vegetation, and higher resistance to changes in climate.

The plan will consider all dimensions of the growing canopy as potential areas to absorb and hold carbon. The Fellow will strongly look to agroforestry practices that intentionally combine crops or livestock with trees to address the need for increased carbon storage and other natural resource benefits. The Fellow will also focus on political and policy considerations that could be used to enhance the goal of increased carbon storage.

Kluthe earned a Master of Science in Forestry at the Univ of Missouri; conducted research on agroforestry; and earned a BS in agronomy from Missouri State Univ. Kluthe presented at the 8th Association for Temperate Agroforestry Conference in Corvallis, OR 2003. Kluthe serves as VP for Razorback Chapter SWCS and member of the SWCS Professional Development Committee. Kluthe is currently participating in a Tri-State Leadership Development Program.

Keywords:

Laporte
Monday, 11:30 a.m.
Room: Post Oak

Watershed Based Program Design and Implementation

Presenter: Jacqui Laporte, Ontario Ministry of Agriculture, Food and Rural Affairs

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Abstract:

Lake Huron is the second largest Great Lake by surface area and third largest freshwater lake in the world. The Southeast Shore has been named a priority area for action under the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem. A Canadian Framework for Community Action sets out the guiding principles of building capacity, supporting community involvement, taking action, and measuring success. Key watersheds on the Southeast Shore have been identified as priorities for immediate action. Canada and Ontario, in partnership with local municipal governments, health units, conservation authorities and environmental organizations, are working to develop and implement recommendations for actions to deal with water quality issues, including nuisance algae and beaches posted as being unsafe for swimming. Strategies include the development and implementation of watershed management plans, including targeted actions, monitoring and research needs, for each priority area. Local agencies are evaluating the effectiveness of best management practices within the priority watersheds, and assessing their environmental and economic costs and benefits. This project is unique in its governance structure - recognizing the geographic challenge of a large, international watershed, a complex set of environmental challenges constantly influenced by economic forces and climate change, and a finite amount of money and resources to fix it. The project structure also recognizes the importance of collection of existing national and international data, awareness of future trends, partnerships among agencies with sometimes conflicting mandates, and the value of research in providing the best possible advice to stakeholders.

Keywords: lake, nutrient loading, agriculture, outreach, education, best management practices

Retrospective analysis of periodically-collected suspended-sediment data in the United States

Presenter: Casey Lee, U.S. Geological Survey

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Douglas Glysson, USGS

Abstract:

Much of the historical and ongoing suspended-sediment data has been collected using different sampling, processing, and analytical methodologies. These inconsistencies have limited the ability to understand factors affecting suspended sediment transport at regional and national scales. Prior to sediment assessments planned in the third cycle of the U.S. Geological Survey National Water Quality Assessment (NAWQA), a retrospective analysis is being performed on the approximately 4,000 gaged sites with periodically-collected sediment data to (1) determine how sediment data vary with respect to sampling and analytical methods, (2) understand how biases/uncertainty associated with different methods affect computations of sediment concentration and flux, (3) identify which sites and what data should be used to estimate sediment flux and characterize trends, and (4) characterize how environmental setting and human activities have affected sediment transport across the United States. The primary product of this effort is a web-accessible, interactive, map-interface for sediment and sediment-associated data, including interpreted information on suspended-sediment loads and trends. This presentation will present preliminary results regarding the spatial and temporal distribution of suspended-sediment data across the United States.

Keywords: sediment, retrospective analysis

Toward Integrated Wetland Conservation: A Diagnostic Framework

Presenter: Kyle Magyera, Wisconsin Wetlands Association

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Abstract:

Integrated environmental management and related approaches have been widely endorsed for emphasizing interconnections between water, land, and related resources and placing them within a broader social and institutional context. Yet there has been limited application of those approaches to wetland conservation. This presentation introduces an integrated wetland conservation (IWC) framework for analyzing and identifying opportunities for integration within state (subnational) wetland programs. The IWC framework was developed through a literature review focusing on wetland protection, restoration, and management as well as integrated approaches to environmental management and planning. Utility of the IWC framework was tested through a case study of the state wetland program for Wisconsin. The Wisconsin case study was facilitated by semi-structured interviews with key informants from local, state, and federal agencies, universities, and nongovernmental organizations. Results of applying the IWC framework in Wisconsin suggest that limited integration currently exists, although the state program has opportunities to improve IWC by increasing watershed-scale planning and strengthening mechanisms for interaction and coordination between stakeholders. Diagnosing integration in Wisconsin's wetland program was found to be significantly aided by the IWC framework, suggesting that the IWC framework may help others in evaluating if integration exists and understanding how it might be achieved to produce more efficient and effective wetland program outcomes.

Keywords: wetland, governance, watershed, integration, IWRM

Effect of pinyon and juniper slash on sediment production following a prescribed cut-and-limb treatment in central Nevada

Presenter: Sarah Noelle, The University of Arizona

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Abstract:

Single leaf pinyon pine and Utah juniper expansion throughout the western United States has caused a decline in understory vegetation diversity and abundance, loss of wildlife habitat, changes in surface hydrology, and an increased potential for soil erosion. Treatment of pinyon-juniper (PJ) encroached rangelands to improve ecological function is becoming a high priority for land managers. However, knowledge of the effects of PJ treatment on hydrologic processes is limited, thus research is required to assist in developing appropriate management prescriptions to improve hydrologic function. To investigate the impact of PJ treatment on surface hydrology, we conducted a study to determine the effect of interspace slash presence on sediment yield. The study was located on a 4.5ha southwest-facing pinyon-juniper encroached hillside in the Desatoya Mountains of central Nevada. The research followed a prescribed cut-and-limb treatment that occurred in 2009. Small plot rainfall simulation was utilized in order to determine sediment production within 28 plots, 14 with slash and 14 without. Simulated rainfall was applied at an 8.6cmh⁻¹ rate representative of the 100-year storm return interval for short duration, high intensity summer storms for the area. Analysis of variance was used to test for differences in sediment yield between treatments and results indicate that sediment production was significantly reduced by slash presence ($p = <0.0001$). This study suggested that PJ treatments that promote slash ground cover could be important for reducing soil erosion from degraded pinyon-juniper encroached rangelands.

Keywords:

The Effects of 2011 Ohio and Mississippi River Valley Flooding on Cairo, Illinois Area

Presenter: Kenneth Olson, University of Illinois

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Abstract:

The purposeful opening of the New Madrid Floodway in May 2011 reduced the flooding and immense pressure caused by the rain-swollen, fast moving Ohio and Mississippi Rivers on towns like Metropolis (IL), Paducah (KY) and Cape Girardeau (MO) as well as reduced the pressure on the seawall and levee system at Cairo, Illinois. The peak flow and flood levels at most levees on the lower Mississippi River and along the way to the Gulf of Mexico were lowered by a meter. There were no levees across from Cairo on the Kentucky side of the Ohio River. Consequently, these undeveloped bottomlands and the floodplain experienced minimal land degradation despite temporarily storing a portion of the floodwaters which they gradually released as the in-flowing water pressure subsided. The extensive loss of Mississippi River bottomlands to agriculture and urban development has limited the natural capacity of alluvial bottomlands to manage flooding in main river channels. Without natural wetland buffers, like the bottomlands, floodwater will push against concrete and levees. It appears the Corps of Engineers' induced breach the Birds Point levee (MO) and the passing of floodwaters through the New Madrid Floodway dropped the flood level at Cairo by 0.9 m (3 ft) in 48 hrs which reduced the water pressures on seawall and levee system. There was no loss of life or property in Cairo, Future City or Urbandale, IL since the levee and seawall system held back the record high floodwaters of the Ohio and Mississippi Rivers for many weeks.

Keywords: Cairo, Illinois, Ohio River Flooding, Kentucky bottomlands, sea wall, levee, flooding

Olson
Tuesday, 4:30 p.m.
Room: Red Oak

The Impact of 2011 Induced Levee Breaches on Agricultural Lands of Mississippi River Valley

Presenter: Kenneth Olson, University of Illinois, NRES

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Lois Wright Morton, Iowa State University

Abstract:

The decision to blow-up the Birds Point fuse plugs and frontline levees had significant consequences for rural Missouri landowners, farmers and residents in the New Madrid Floodway. When the Corps of Engineers were given permission to open the Floodway, the Mississippi River was 1.2 m (4 ft) higher than planned for and the initial additional force and depth of floodwater caused more damage to buildings and more deep land scouring than was predicted. Impacts included the loss of the 2011 wheat crop and crop production loss from perhaps 8,094 to 12,146 ha (20,000 to 30,000 ac) of poorly drained clayey soils, which were not re-planted in 2011. Most of the 53,824 ha (133,000 ac) farmland in Floodway dried out sufficiently to permit soybean planting in June or fall planting of wheat. Reclamation efforts by the Corps of Engineers have removed much of the thick sand deposits with the sand used to patch the frontline and fuse plug levees between Birds Point, MO and New Madrid, MO or to partially fill in the crater lakes and adjacent gullies. Most of the drainage and road ditches which were filled with sediment were cleaned out by excavators prior to October of 2011 and proper drainage restored. Even if the hundreds of hectares (acres) of gully fields located 8 kilometers from the levee breaches are reclaimed, these soils are likely to have lower productivity. The reclamation effort could restore some of the permanently lost cropland in crater lakes and sand delta and/or create additional wetlands and wildlife habitat adjacent to the patched levees.

Keywords: Mississippi River flooding, New Madrid floodway, gully fields, crater lakes, crop loss

Paired Watershed Studies in the Jordan Lake Watershed: A Regulated System in North Carolina

Presenter: Deanna Osmond, NC State University

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Abstract:

In 2008, multiple sectors (urban, agriculture, point sources) were regulated to reduce nitrogen and phosphorus loading in to Jordan Lake - a drinking water resource for over 200,000 in the towns of Cary and Apex, NC. Agriculture is expected to reduce its loads by the required amount (35-8% N and 5% P); however, a land use study conducted in 2006 by Osmond shows that producers under apply nutrients, erosion is low and many streams are buffered. To determine the actual loss of nutrient and sediments from agriculture, two paired watershed studies were established in 2006 to monitor total suspended sediments, total phosphorus, total nitrogen, nitrate nitrogen and fecal coliform from a pasture pair and a cropped pair. Headwater streams were selected to ensure maximum land use for the type of agricultural system we were monitoring. During this initial phase we have been able to show good hydrologic relations between the pairs and calculate pollutant losses. The cropland systems have lower phosphorus and sediment losses. Starting late 2012, one pasture and one crop watershed became treatment watersheds. We will show the pre-conservation practice water quality data as well as 6 months of post-conservation practice information.

Keywords: paired watersheds, conservation practices, water quality

Learning from NIFA-CEAP: Changing Conservation Programming

Presenter: Deanna Osmond, NC State University

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Abstract:

Conservation practices are being scrutinized by multiple agencies, especially the Office of Management and Budget, as to their effectiveness. The USDA funded the Conservation Effects Assessment Project (CEAP) to provide scientifically credible information on conservation practice effectiveness. The National Institute of Food and Agriculture (NIFA) in association with the Natural Resources Conservation Service funded 13 watershed-scale projects to determine the effectiveness of conservation practices relative to timing, location, and socioeconomic factors. The 13 NIFA-CEAP projects finished in 2011 and a synthesis to develop lessons learned was finalized in 2012. This paper will focus on policy issues that surround the synthesized findings from NIFA CEAP Watershed relative to the reevaluation of agricultural policy and approaches for improved performance and outcomes of conservation practices.

Keywords: conservation practices, conservation programs, water qulaity

Economic Implications of Deed Restrictions on NRCS Conservation Easements

Presenter: Janet Perry, USDA NRCS NHQ Originally: Felix Spinelli

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Elizabeth Crane-Wexler

Abstract:

Strategic placement of conservation easements has proven to be an important instrument in the conservationist's tool kit. For example, restored wetlands can play a huge part in improvement of water quantity and quality issues, wildlife habitat and an assortment of other resource concerns in many areas. The Natural Resources Conservation Service (NRCS) has converted over 1.8 million acres of former wetland areas back to wetlands through the Wetlands Reserve Program (WRP) as well as involved in the placement of easements on land enrolled in the Grassland Reserve Program (GRP); in the Farm and Ranch Lands Protection Program (FRPP); in the Healthy Forest Reserve Program (HFRP); and in the Emergency Watershed Program (EWP) and the wetland conservation/mitigation authority provided under 7 CFR, Part 650 (Protection of Wetlands). Although these programs' objectives differ, landowners enrolling in them expect some form of compensation from USDA and its' partners for foregone income associated with restrictions on the use of land placed under easements. This paper examines some of the legal and economic factors that easement purchasers, such as NRCS, consider when selecting and making financial commitments related to their easement programs, such as the expected desired environmental outcomes, the easement's location, program goals, etc. Also, this paper compares some key legal characteristics between the GRP and WRP easement programs that directly affect the landowners' decision to enroll their land parcels. This paper should provide a better understanding of these factors considered by easement purchasers, landowners. The public should gain a greater appreciation of role of easements in conservation efforts.

Keywords: conservation easements, WRP, GRP, legal, economic aspects

Nutrients management in the Danube River Basin

Presenter: Mihaela Popovici, International Commission for the Protection of Danube River ICPDR

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Abstract:

The Danube is the second longest European river, binding together diverse ecosystems and more countries (19) than any other river in the world. The sustainable and equitable management of the Danube River basin for municipal, agricultural, and industrial uses, as well as the conservation and restoration of ecosystems and the management of those water resources requires international coordination and cooperation, successful institutional arrangements, and economic and social consideration. The Danube Convention represents the legal as well as political framework for transboundary water management, supported by a solid scientific understanding of the most significant water managements issues.

The Danube RBM Plan required under the EU Water Framework Directive (WFD) had involved the identification of the specific water quality problems that exist and listed the measures that are required to address those problems. Of importance is the continued reduction in organic and nutrient pollution loads throughout the basin principally through the building of waste water treatment systems. The planned measures will considerably reduce nitrogen and phosphorus emissions to water but fall significantly short of the stated target of 1960s levels regarding inputs to the Black Sea and, crucially, the WFD 2015 requirements.

For assessing the effects of measures to reduce nutrient pollution by 2015, the MONERIS model (Modelling Nutrients in the River Systems) has been applied. MONERIS, as both a scientific and management tool in nutrient management compares the calculated nutrient input with the observed nutrient loads in the rivers and allows improving the knowledge, the understanding of processes and quantification of the successes.

Keywords: nutrients, Danube, agriculture

Vertical Tillage Effects on Corn Yield, Disease and Pathogens, and Soil Properties

Presenter: DeAnn Presley, Kansas State University

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Abstract:

In the Midwest there has been an increase the number of vertical tillage (VT) implements sold and a large push in marketing these newer implements to producers. Vertical tillage is defined as shallow tillage, usually in the top 5 to 7.5 cm of the soil and results in no horizontal disturbance of the soil. The objective was to determine the short-term (one growing season) effects of a vertical-tillage operation on seedling emergence, crop growth and development, yield, residue decomposition, disease incidence and severity, quantification of pathogen propagules in soil and crop residue, and effects on the near-surface soil physical properties. The study was conducted during the 2010 growing season at four locations throughout Kansas and compared vertical tillage against the producer's current practice of no-till (NT) or strip tillage (ST). In NE Kansas, VT was compared to NT and conventional disk. Bulk density at a depth of 0-5cm under the NT conditions had a value of 0.95 g/cm³, while it dropped off to 0.78 and 0.80 g/cm³ in the VT and disk treatments respectively. Under NT conditions the infiltration rate (0.84 mm/hr) was significantly lower than VT (2.12 mm/hr) and conventional disk (1.29 mm/hr). Disease severity (lesions per plant) was higher in NT (71.8) than in the VT (46.3) and disk (42.8) treatments, which might be attributed to the higher residue cover in the no-till (60.2%), compared to the VT (40.8%) and disk (35.6%) treatments.

Keywords: vertical tillage, corn, soil physical properties, plant pathology

Presley
Monday, 11:10 a.m.
Room: Elm Fork I & II

Regional Assessment of Short-term Impacts of Corn Stover Removal for Bioenergy on Soil Quality and Crop Production

Presenter: DeAnn Presley, Kansas State University

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Abstract:

While the U.S. agricultural sector is in a prime position to provide crop residues such as corn (*Zea mays* L.) stover as feedstock for large-scale bioenergy production, excessive removal of corn stover from agricultural fields has the potential to increase soil erosion, degrade soil properties, and impact crop yields. This project assesses the effects of multiple rates of corn stover removal on runoff and erosion and changes in soil physical properties and corn yields on a regional scale across three soils at Colby, Hugoton, and Ottawa in Kansas, USA. The soils were Ulysses silt loam (Fine-silty, mixed, superactive, mesic Aridic Haplustolls) at Colby, Hugoton loam (Fine-silty, mixed, superactive, mesic Aridic Argiustolls) at Hugoton, and Woodson silt loam (Fine, smectitic, thermic Abruptic Argiaquolls) at Ottawa, all with slopes $\leq 1\%$. Five stover treatments that consisted of removing 0, 25, 50, 75, and 100% of stover after harvest from no-till and strip-till continuous corn plots were studied. Simulated rainfall was applied in spring 2010 at rates representing 5 yr return intervals at each site and included a dry and wet run. At Colby, 25% stover removal caused runoff to occur 16 min sooner than no removal. Stover removal affected runoff amount at Colby and Hugoton, but not at Ottawa. Complete stover removal increased sediment loss at Colby and Hugoton, while 50% removal increased sediment loss at Ottawa. Sediment-carbon (C) loss increased with complete removal at Hugoton and with 50% removal at Ottawa. Mean weight diameter (MWD) decreased with stover removal $\geq 75\%$ on all soils. At Ottawa, 75% stover removal reduced soil C in the top 5 cm by 1.57 Mg ha⁻¹. Further monitoring of long term removal impacts is warranted.

Keywords: Bioenergy, residue, soil

Saleh
Monday, 10:30 a.m.
Room: Bur Oak

Application of NutrientNet in Chesapeake Bay Watershed as powered by Nutrient Tracking Tool

Presenter: Ali Saleh, Tarleton State University

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Abstract:

NutrientNet (NN) is a water quality trading platform that allows prospective buyers and sellers of nutrient credits to evaluate their options and execute a trade. Credits generated by sellers through implementation of prescribed conservation practices are calculated and certified in the NN interface through the program's linkage to Nutrient Tracking Tool (NTT), a nutrient calculation tool, and its interface with a programming platform that allows for certification of the credits prior to trading. Integration of NTT into NN allows users of NN to calculate nutrient credits that would be associated with a wide variety of conservation practices. NTT in turn estimates the nutrient and sediment credits it generates through its linkage to the Agricultural Policy Environmental eXtender (APEX), a field scale model. Practices that can be evaluated in NN through NTT include nutrient management, irrigation, grazing alternatives, alternative crop rotations, filter and buffer strips, and alternative tillage options, among others. After NTT simulations the NN trading platform presents estimates of per acre nitrogen, phosphorus, and sediment losses, flow, and crop yield to the user and advises the user as to whether they have met baseline nutrient levels and are ready to trade any additional credits generated, or have yet to meet baseline and need to implement additional conservation options before they are qualified to generate a credit for trading. The NN platform has been tested in Maryland and is scheduled to be introduced in other states within the Chesapeake Bay watershed in the new future.

Keywords: NutrientNet, Nutrient Tracking Tool, Water quality, Trading, Best Management Practices

A Brief Survey of Ethical Arguments for Soil Conservation

Presenter: Thomas Sauer, USDA-ARS

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Abstract:

In developing soil conservation policy, economic considerations are frequently the focal point of the justification for public investment on private land. The underlying assumption is that soil itself has no intrinsic value, that it's only worth is in producing a product or providing a service. Soil stewardship also falls outside most environmental ethics arguments as ethical treatment is generally only afforded to living things (primarily only higher animals). Aldo Leopold's views that culminated in *The Land Ethic* represent a sharp contrast with the common thought of his day and even ours. Leopold was influenced by the writings of an eccentric Russian mystic named P.D. Ouspensky. Ouspensky's book *Tertium Organum* proposed "A living and rational universe", a concept followed on by Rene Dubos in *The God Within* and ultimately James Lovelock with *The Gaia Hypothesis*. These writers all supported a profound, holistic view of the earth and universe as opposed to a utilitarian, reductionist view of strict separation between living and inanimate components with limited interaction among them. Within this holistic world view everything is connected and distinctions between "living" and "nonliving" or the comparative value of entities are much less clear or important. Initiatives targeting an improvement in the national commitment to soil conservation should include a greater emphasis on developing the values behind individuals' commitment to land stewardship. This strategy was succinctly articulated in an article in *Science* in 1967 by Lynn White Jr., which became a key contribution to the still-developing field of environmental ethics.

Keywords: soil stewardship, environmental ethics,

Evaluating the Environmental Benefits of Rangeland Conservation Practices

Presenter: Kenneth Spaeth, USDA-NRCS

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Mark Wertz, Leonard Jolley

Abstract:

A new U.S. Department of Agriculture report evaluates federal rangeland management practices using a comprehensive review of the scientific literature on specific practices.

The recently released Rangeland Conservation Effects Assessment Project (CEAP) report, Conservation Benefits of Rangeland Practices: Assessment, Recommendations, and Knowledge Gaps, shows that the USDA Natural Resources Conservation Service (NRCS) approach to rangeland conservation planning is sound. The synthesis also identifies critical knowledge gaps in rangeland science and sets a precedent for formalized partnerships among scientists, land managers, conservation specialists, and policymakers. These partnerships can help NRCS provide the most up-to-date science-based information for rangeland conservation.

The report is the product of a rigorous external review by 40 rangeland scientists of published peer-reviewed scientific literature related to rangeland conservation practices. NRCS commissioned the report to evaluate its current efforts helping ranchers implement conservation practices and to help guide future efforts.

The scientific review team focused on seven core rangeland conservation practices: prescribed grazing, prescribed burning, brush management, range planting, riparian management, wildlife habitat management, and invasive plant species management. They also examined two cross-cutting issues: a landscape approach to rangeland conservation and a social and economic assessment of rangeland conservation. The 429-page report finds that NRCS rangeland practice standards are in concordance with the most current science. But it also identifies the need to appraise the overall net benefits of rangeland conservation practices-benefits beyond market values related to food and fiber production.

Keywords: Rangeland CEAP conservation practices

Emergency Conservation recovery in the New Madrid Floodway

Presenter: David Speidel, USDA NRCS

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Abstract:

Study of the New Madrid Floodway emergency conservation program operation provides a valuable case study. Outreach was needed to reach landowners and community leaders after the 2011 Mississippi flood. The effectiveness of USDA's interagency county emergency boards to reach seven Drainage and Levee Districts and hundreds of landowners in the floodway validates the local based programs approach. Understanding the value of local based programs is the critical lesson to take away for natural resource managers. The objective of assessing the deep sediment damage to fields and drains in first 60 days resulted in repair funding for individual fields in 2011 and \$34 million for group projects in 2012. The New Madrid 133,000 acre Floodway is part of the Mississippi River flood protection system. It is designed to relieve pressure on the principle downstream levees during extreme flood events that could jeopardize 2.2 million acres of Delta cropland and numerous urban areas. The floodway was used in May 2011 to relieve the pressure on the other levees. Local USDA managers were charged to assist producers and Drainage/Levee Districts with the recovery of the prime farmlands damaged by gullies created from the high velocity flows and restoring cropland's lost productivity from sand and sediment deposits. The prior solid relationships developed between the local County Boards, Drainage/Levee Districts, the Soil and Water Conservation Boards and USDA officials ensured rapid implementation of damage assessments and requests for assistance from individual farmers to reclaim land, restore crop production and mitigate soil degradation.

Keywords: Floodway, emergency conservation, levees, partnerships, urban, prime farmland, Delta,

Presenter: C. Robert Stark, University of Arkansas at Monticello School of Agriculture

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Crop residue management decisions in southern soybean production systems include more alternatives than nationwide. One alternative with major conservation implications is residue burning, a choice typically not considered in upper-Midwestern states. Burning releases valuable carbon from plant material into the atmosphere contributing to greenhouse gas levels. Recent forage shortages from unfavorable weather in Texas have created new crop residue market possibilities and should be considered in management decisions. Recent grain market prices have reached historical highs. Combining these factors suggests that conservation minded Southern producers should reexamine crop residue management decisions using extended economic analyses. This study considers crop residue choices on Arkansas doublecrop soybean production systems and extends research to incorporate more recent grain market prices, new crop residue marketing opportunities, and production input price adjustments. Small-plot research conducted in 2004-2006 at an Arkansas agricultural experiment station was originally analyzed by Verkler et al., 2009 to estimate economic returns as affected by residue and water management practices. Plot research data was generated from a long-term agronomic study first initiated in 2001 and still being maintained. Grain prices for this new inquiry are calculated from NASS state daily grain reports, input prices from current university extension service crop enterprise budgets, and crop residue market prices from county extension agriculture agent interviews. Crop residue management choices, especially burn/sell alternatives, will be reanalyzed under current price, market, and practice options to determine economic impacts.

Page 91

Development of an Urban Ecosystem along Eight Miles of the San Antonio River

Presenter: Jacque Thomas, Jacobs Engineering Group

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Abstract:

The Mission Reach is located 1 mile downstream of the well-known (ultra-urban) San Antonio Riverwalk, and includes 8 miles of urban stream just below the outlet of the main flood tunnel. The San Antonio Channel Improvement Project, authorized in 1954, converted the Mission Reach from an unruly stream into a large grass-lined ditch. The Water Resources Act of 2000 expanded the purpose of the San Antonio flood channel to include environmental restoration and recreation as project purposes.

Aquatic ecosystem functions are being restored through modifications to channel morphology, and riparian ecosystem functions are being restored through the establishment of native herbaceous and woody species. A pilot channel (with pool-riffle complexes, meanders, and glides) provides for stability of the sediment transport regime and diversity of aquatic habitat. Adjacent quiescent pools and backwater zones complement the riverine environment. Approximately 330 acres of riparian woodland habitat will be established with the planting of over 20,000 native trees grown from seed.

The funding for this ecosystem restoration project was leveraged through the provision of multiple community benefits, including:

- 13 miles of trail system, vista points, and shade/picnic structures;
- Connection to San Antonio's history and heritage-four historic missions which were constructed along the river during the Spanish colonization;
- Increase in adjacent property values in an area perceived by the broader community as neglected/blighted;
- Increase in economic development and tourism.

Upon completion, the Mission Reach Ecosystem Restoration project will be the centerpiece of the largest urban park in the United States.

Keywords: ecosystem restoration, urban, economic redevelopment, community participation

Conservation of Mangrove ecosystems: Global assessment of climatic impacts,

Presenter: Keith Toffling, University of Massachusetts Originally: Tim Randhir

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Abstract:

Mangrove wetland systems are vital part of sustainable coastal zones and provide multiple ecosystem services to coastal regions. These ecosystems have high ecological productivity, sustain shorelines, and buffer inland areas during natural disasters. In spite of this, these ecosystems are threatened by land use and climatic changes that reduce their spatial extent and functions. This study aims to study the impacts of climatic change on distribution of three major Mangrove species. A Geographic Information System is used to process land scape, distribution, and climatic information at a global scale. A spatial model of habitat suitability is used to quantify impacts of climatic change on distribution of each species. Climate change estimates from Hadcm3 RCM predictions are used in modeling impacts on habitat suitability. Statistical analysis is used to study functional relationship of each species to climatic change. The results indicate that the vulnerability distribution depends on the type of species and geography. In addition, mangroves in some tropical countries are more vulnerable than others depending on local changes in temperature and precipitation regimes. A spatially targeted, conservation strategy for protecting these wetland systems can be used to protect these vital ecosystems. Climatic change can have a significant effect on the distribution of these ecosystems, requiring landscape policies to protect and increase their adaptability to stressors. The results will be useful to nations that depend on the ecosystem services of Mangrove ecosystems for economic and ecological sustainability. The spatial assessment opens opportunities to identify hotspots where conservation efforts could be targeted.

Keywords: Mangrove ecosystems, wetlands, climatic change, spatial policy

Management of creek pastures to protect and improve water quality

Presenter: Kevin Wagner, Texas A&M University, Texas Water Resources Institute

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Abstract:

Runoff of *E. coli* and other fecal indicator bacteria from grazing lands has been identified as a significant source of bacterial contamination in need of reductions to improve water quality. Management of creek pastures and implementation of best management practices to address these bacterial issues is critical to the success of watershed restoration efforts. The impacts of grazing management and providing off-stream watering facilities in creek pastures were evaluated to assess their effectiveness for reducing *E. coli* loading. Study results showed that rotational grazing, if timed appropriately, was a very effective practice for reducing *E. coli* runoff. Further, the impact of grazing timing was more significant than the impact of grazing pressure or stocking rate. As a result of these findings, it is recommended that, where feasible, creek pastures and other hydrologically connected pastures be grazed during periods when runoff is less likely and that upland sites be grazed during rainy seasons when runoff is more likely to occur.

The study also found that when off-stream water was provided, the amount of time cattle spent in the creek was reduced 43%. Despite this significant reduction in the amount of time cattle spent in the creek, this study was not able to document statistically significant *E. coli* loading reductions as a result of providing alternative water. Regardless, providing off-stream water in creek pastures is a recommended practice for improving water quality by reducing the amount of time cattle spend in the creek.

Keywords: Water quality, *E. coli*, grazing, cattle, runoff, alternative water

Ward
Monday, 4:10 p.m.
Room: Central

Rapid Response to Historic Drought Impacts on the National Forests and Grasslands in Texas

Presenter: Kathleen Ward, USDA-FS-National Forests and Grasslands in Texas

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Abstract:

In 2011 the worst drought in the history of the state of Texas ravaged crops, trees, livestock and wildlife and contributed to devastating wildfires and dramatic drops in groundwater levels. The U.S. Forest Service (USFS) manages 675,000 acres of public land in Texas. Thousands upon thousands of trees died on USFS lands because of the extreme drought conditions and a coincident explosion of Ips bark beetle attacks on stressed trees. The dead and dying trees created a major public safety hazard, added tons of fuel to the parched forest, and created new challenges for wildfire control and smoke management. The extreme drought incident stimulated a time-critical call to action across USFS lands in the state. A rapid response plan was initiated by the agency in order to quantify the extent of drought-impacted area and to determine where the impacts were the most severe. The first phase of the plan was to collect data in the field using handheld GPS units. The second phase was to collect data overhead using aerial sketchmapping and digital photography over the hardest hit areas. The third phase was the generation of a forest-wide remotely sensed change detection product that detailed pre- and post-drought vegetation condition. The three-phase process provided critical information at several scales for timely and in depth analyses by soil, water, wildlife, fisheries, botany, fire, silviculture and planning specialists on how best to protect and restore drought-impacted natural resources on USFS lands.

Keywords: groundwater, fuel loading, wildfire, bark beetle, restoration

Welch
Tuesday, 2:10 p.m.
Room: Elm Fork II

The effects of groundwater withdrawals from the Mississippi River Valley alluvial aquifer on surface water quality in northwestern Mississippi

Presenter: Heather Welch, US Geological Survey

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Abstract:

Phosphorus yields from the Mississippi River Basin (MRB) contribute to the formation of a zone of hypoxia in the Gulf of Mexico each spring and summer. Streams located in northwestern Mississippi, an area referred to locally as the Delta, have been identified as yielding some of the highest amounts of phosphorus in the MRB, although the application of phosphorus fertilizer to agricultural fields is low. Because groundwater from the Mississippi River Valley alluvial (MRVA) aquifer contributes the majority of streamflow via return flow during the irrigation season and is also a contributor to baseflow, the high phosphorus yields from the Delta might be attributed to the alluvial aquifer. Water from the alluvial aquifer has been shown by a number of studies conducted by the U.S. Geological Survey to have unexpectedly high concentrations of dissolved phosphorus, concentrations range from 0.06 to 1.2 milligrams per liter. An estimate of the amount of phosphorus applied to a rice field by groundwater irrigation from the alluvial aquifer is approximately equivalent to the annual flux of phosphorus from the Delta, indicating that groundwater may be the primary source of phosphorus to Delta streams.

Keywords: phosphorus, groundwater, water quality

Assessment of Polluting Potential of Major soil types within Lake Huron tributaries

Presenter: Ross Wilson, Ausable Bayfield Conservation Authority

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Abstract:

High nutrient levels in Lake Huron nearshore waters can result in shoreline algal blooms. Ontario's Huron County has thriving agricultural production on lands drained by tributaries with outlets at the Lake Huron coast. Beach recreational value and aquatic ecosystem function are considerations in programs striving to aid farmers in applying Best Management Practices (BMP) aimed at minimizing soil and nutrient loss. Three small coastal watersheds were selected to monitor the effectiveness of agricultural BMPs on farmland under cash crop production in reducing sediment and nutrient loading into the small tributaries (gullies) draining this region. These gullies cross six significantly different, major soil types. Each soil type features different textures, slopes and aerial extents which are unlikely to contribute equally to sediment and nutrient release. A Spring 2011 high-resolution Light Detection and Ranging (LiDAR) flight mission produced a data cloud from which digital elevation model (DEM) products were developed. A Fall 2011 field soil classification campaign examined selected soil pedons at various landscape positions for all six major soil types. On-going laboratory work will assess the "phosphorus sensitivity" of these soils for nutrient release to these gullies. Concurrent soil erosion and run-off modelling will examine sediment release contributions from these soil landscapes. These results all add value to soil map renewal as well as provide detailed local soil knowledge for selection of on-farm BMP implementation. Locations within each soil type may be identified where implemented BMPs will be most effective at reducing nutrient and sediment loss.

Keywords: agricultural BMP, soil type, sediment and nutrient release

The NRCS/USACE Partnership Handbook: A Field Guide to Working Together Toward Shared Goals

Presenter: Cynthia Wood, U.S. Army Corps of Engineers

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Anna Bramblett, USDA-NRCS, National Water Management Center

Abstract:

In May 2011, Natural Resources Conservation Service (NRCS) and U.S. Army Corps of Engineers (USACE) renewed the NRCS/USACE National Partnership Agreement. The overall goal of the Partnership is to “promote a long term working relationship to improve management of water and related natural resources under the missions and authorities of NRCS and USACE.” Areas of cooperation include watershed planning, wetland creation, restoration, and enhancement, (including coastal restoration), natural disaster recovery and restoration, water quality improvements, water supply development, and water management. The Agreement also promotes coordination between NRCS’s Swampbuster and USACE’s Regulatory Programs and coordination of programs and activities that promote wise use of floodplains.

As part of a collaborative effort, a partnership handbook has been developed. The NRCS/USACE Partnership Handbook: A Field Guide to Working Together Toward Shared Goals is designed to stimulate and facilitate active cooperation and collaboration between the two agencies. The handbook contains basic information about each agency’s missions, programs, capabilities, and modes of operation. Identifying and understanding each others’ mutual interests can lead to developing shared goals and leveraging resources to implement joint solutions. Case studies and examples are included to illustrate what has worked in the past and where further collaboration and problem solving is needed to reach better results in the future. Often the differences in agencies’ business practices can act as barriers to collaborative efforts. This handbook identifies common problems in the collaborative effort and suggests ways to minimize and even eliminate those barriers.

Keywords: Collaboration, water resource and management, education

Use of the Discount Rate in Conservation Programs and Projects:

Presenter: Mark Xu, NRCS, USDA NRCS

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Abstract:

Discount rates in economic analyses play a critical role in determining the viability of resource and environmental programs and projects. NRCS analysts constantly use discount rates for regulatory analysis, allocation of public funds to conservation programs and projects, and provide advises to farmers on conservation projects. The decision on choosing an appropriate discount rate for conservation economic analysis such as benefit and cost analysis is complex given the many economic factors affecting discount rate. Some discount rate uses are also governed by Federal regulations. Currently, there are several inconsistencies within the Agency about the proper use of discount rate, potentially leading to incompliance with Federal regulations, misallocations of Federal funds, and inaccurate or inappropriate guidance to farmers.

This paper reviews the economic theory underlining discount rate, Federal regulations on discount rate, and their application to discount rate used by NRCS analysts. The paper provides clarifications on and offers recommendations to several concerns raised by NRCS economists related to the appropriate use of discount rate: (1) the correct interpretation of Federal regulations about discount rates for regulatory analysis, and discount rates for non-regulatory analysis for both water resource and non-water resource, as well as the policy and legal issues related to Federal regulations for discount rate that are applicable to conservation analysis, (2) whether to use social discount rate or private discount rate for farm-level or site-specific analyses, (3) whether to use nominal or real discount rates, and (4) whether to use a project specific rate or an average rate.

Keywords: Discount rate, NRCS, conservation economic analysis, regulatory analysis, benefit and cost analysis

Developing a Comprehensive National Conservation Cost Database

Presenter: Mark Xu, NRCS, USDA

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Abstract:

NRCS has a history of developing excellent programs for providing conservation data, including the traditional National Resources Inventory (NRI) Program, and the more recent Conservation Effects Assessment Project (CEAP). Conservation planning for efficient allocation of public funds and economic evaluation of individual conservation projects demand high quality conservation cost data. High quality cost data is critical for achieving maximum conservation cost efficiencies through targeting or market-based approaches. Diverse sources for conservation cost data vary in accuracy, consistency, and availability, and often do not meet the current and likely future demands for conservation planning and evaluation. NRCS is working on developing a comprehensive national conservation cost database (NCCD) that covers all conservation practices in all geographic regions in the US. The database should substantially improve the accuracy, consistency, and efficiency in getting and using conservation cost data for economic analysis of conservation programs and projects. This paper discusses the issues related to the development of the NCCD that include the following:

- Principals and methods for developing components in the NCCD.

- Principals and methods for developing component costs in the NCCD.

- The initial NRCS effort, which occurred in 2010, for developing 505 cost components in 12 regions that cover 48 continental States.

- On-going efforts for the development of the NCCD.

- Potential future actions for the development of the NCCD.

- Potential applications of the NCCD.

Keywords: National conservation cost database, conservation planning and evaluation, conservation cost efficiency

Yang
Monday, 11:30 a.m.
Room: Bur Oak

Modeling the effects of conservation tillage on hydrology and nutrient transport in a Canadian Prairie watershed under frozen soil condition.

Presenter: Wanhong Yang, University of Guelph Originally: Yongbo Liu

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Wanhong Yang, University of Guelph, Canada

Abstract:

The 75-km² South Tobacco Creek (STC) watershed in southern Manitoba has been one of the study sites in the Watershed Evaluation of BMPs (WEBs) project in Canada since 2004. In the STC watershed, a long-term paired experiments of conventional and conservation tillage revealed that phosphorous, particularly dissolved phosphorous loads have increased significantly after conservation tillage, while sediment and nitrogen loads from the conservation tillage field showed an obvious reduction. In this study, we adapted the SWAT model into Canadian Prairie conditions by developing an algorithm to account for snow redistribution among different Hydrologic Response Units (HRUs) and an algorithm to characterize the effect of frozen soil on surface runoff, sediment, and nutrient cycle at HRU level. The adapted model was applied to the STC watershed in which snowmelt runoff is the dominant source of stream flow and water quality constituents, and is affected heavily by the freeze-thaw conditions. The adapted model was calibrated and validated using the flow, sediment, and water quality data collected at the conventional and conservation tillage field stations as well as the main stream stations. Better SWAT model performance has been achieved compared to the modelling result without improved snow redistribution and frozen soil algorithms. Finally the model was used to assess various conservation tillage distribution scenarios. It is found that the adapted model can better characterize the snowmelt hydrologic processes in the STC watershed, and is capable of evaluating the effects of conservation tillage on hydrology and water quality in the Canadian Prairie watersheds.

Keywords: Conservation tillage, frozen soil, WEBs, Canada

Wind Erosion of Organic Soils

Presenter: Ted M Zobeck, USDA-ARS

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Abstract:

Organic soils (Histosols) cover an estimated 21 million ha in forty states in the USA. These soils are typically associated with intense cultivation which can raise their wind erosion risk when loose and dry, yet little is known about how soil properties affect soil loss by wind erosion. In this study, we used a field wind tunnel to measure soil loss from a range of organic soils and quantify the influence of soil properties. A field wind tunnel was used to generate suspended sediment from agricultural surfaces for soils ranging from 13% to 67% organic matter content. The wind erodible fraction (<0.9 mm) and dry mechanical stability, as measured using a rotary sieve, ranged from 36% to 74% and 73% to 94%, respectively. Dust emissions and saltation were measured using a vertical slot sampler and suspended dust was collected using a Grimm optical particle size analyzer. Particle density of the saltation-sized material (>106 microns) varied with organic matter (OM) content and ranged from 2.41 to 1.61 g cm⁻³. The lowest OM soils produced the highest dust concentrations. The soil with the lowest non-erodible proportion (26%) had distinctly higher dust emissions compared with the other soils (non-erodible fraction $>49\%$). The dust emissions from the four high OM soils ($>25\%$) were not significantly increased by the introduction of abrader. Variations in dust emissions can be linked to soil properties. Estimates of field dust emissions were closely related to organic matter content, a measure of soil stability, and soil density.

Keywords: wind erosion, dust emissions, organic soils

Zwonitzer
Tuesday, 2:30 p.m.
Room: Bur Oak

Strategies Targeting American Agricultural Resources Sustainability: A 6-State Study of Energy Coupled with Resource Management

Presenter: Martha Zwonitzer, Iowa Soybean Association

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Abstract:

The objective of this research is to improve producer profitability and provide necessary data addressing on-farm resource management and sustainability by engaging 615 producers across six states in a scientifically valid field of study of current production practices, documenting and analyzing cropping attribute energy use, other input use, and management practices, and evaluating agronomic, economic, and environmental results. The project engages a statistically significant number (600-plus) of mainstream soybean producers and 20 crop consultants from six states (Ohio, Indiana, Illinois, Iowa, Kentucky, and South Dakota) in a farmer-led, scientifically valid field study of current soybean production practices, documenting and analyzing energy use, other input use, and management practices, and evaluating agronomic, economic, and environmental results. Results from this research show the aggregated energy inputs across the entire project, state-by-state and provides energy case studies that can be used in the adaptive management process on individual farms to address sustainability and resource concerns.

Keywords: Energy, RMS, Adaptive Management, Planning, Sustainability

Poster Presentations

Adaptive Management of Conservation Efforts

1. NRCS Remote Sensing Labs Utilization of Aerial Photography in Support of Stewardship Land Monitoring
Adam Durham, USDA-NRCS
2. Sustainable ranch management: Integrating resource monitoring and business planning
Kristie Maczko, Sustainable Rangelands Roundtable, University of Wyoming

Agricultural and Conservation Economics

3. Values and the Agricultural Landscape
Pike Brown, Ph.D., Landcare Research, New Zealand

Biodiversity Conservation and Management

4. Geospatial Analysis of Flood Plain Land Use and Riparian Vegetation Pattern in the Tuolumne Watershed, San Joaquin Valley, California
Augustine Awunudiogba, California State University Stanislaus
5. Pyrosequencing Reveals Bacteria Carried in Different Wind Eroded Sediments
Dr. Terrence G. Gardner, USDA-ARS/ Alabama A&M University
6. Virginia Quail Management Assistance Program Facilitating Diverse Habitat Development
Robert Glennon, Virginia Tech
7. **CIG Poster:** Increasing the Availability of Local Ecotype Milkweed (*Asclepias* spp.) Seed for Monarch Butterfly Habitat Conservation
Eric Mader, The Xerces Society for Invertebrate Conservation
8. **CIG Poster:** Promoting Agricultural Sustainability through Beneficial Insect Hedgerows: Restoring Pollination and Pest Control Services on Farms in California's Central Valley, Phase II
Mace Vaughan, The Xerces Society for Invertebrate Conservation

Conservation Models, Tools and Technologies

9. Potentials of Aerial Cropping For Rehabilitation of Degraded Land In South Western Nigeria
Aruleba Joseph Olusegun, Ekiti State University, Nigeria
10. Potential Use of a New NLEAP-GIS Tool to determine and reduce Nitrate Losses from the Arkansas Delta
Theodis Bunch, USDA/NRCS
11. A New Nitrogen Index to Assess Sustainability of Cropping Systems of Andean Regions of South America
Jorge A. Delgado¹ USDA-ARS, Soil Plant Nutrient Research Unit, Fort Collins, CO 80526
12. Phytoremediation Database: A tool to assist in remediation and rehabilitation of contaminated sites
Joel Douglas, USDA-NRCS
13. Evaluating the utility of sediment retention structure dredge and dairy manure compost as a restoration strategy for highly degraded rangelands in Central Texas
William Fox, Texas AgriLife Research, Texas A&M University System
14. GeoObserver - A Tool for Streamlining Geospatial Data Management
Paul Fukuhara, USDA NRCS NGMC
15. **CIG Poster:** Integrating No-Till Cropping, Manure and Cover Crops with Manure Slurry Seeding
Tim Harrigan, Michigan State University
16. NRCS Imagery Support for Conservation Planning
Tony Kimmel, NRCS-National Geospatial Management Center
17. Using Multi-frequency Reservoir Survey Techniques to Refine Watershed Conservation Strategy
Jason McAlister - Blackland Research Center
18. **CIG Poster:** Monitoring Edge-of-Field Surface-Water Runoff: a Three-State Pilot Project to Promote and Evaluate a Simple, Inexpensive, and Reliable Gauge
Randy Mentz, University of Wisconsin-Platteville Pioneer Farm
19. NRCS National Elevation Program support Conservation Planning & Design
Steve Nechero, USDA-NRCS-NGMC
20. Rural Stormwater Management Model - Southeast Shores of Lake Huron, Ontario, Canada
Tom Prout, General Manager and Secretary Treasurer, Ausable Bayfield Conservation Authority ABCA
21. Differentiating Tillage Practices Using Landsat -5 TM Data
Sonisa Sharma, University of Nebraska-Lincoln

- 22. **CIG Poster:** Development and Testing of Pollinator Habitat Enhancement Specifications for Six Regions of the U.S
Eric Mader, The Xerces Society for Invertebrate Conservation
- 23. Using Rare Earth Element (REE) Tracers to Identify Preferential Micro-Sites of Post-Fire Aeolian Erosion
R. Scott Van Pelt, USDA-ARS
- 24. Assessment of Sampling Methods for Carbon Credit Monitoring
Sumit Sharma, Oklahoma State University
- 25. Nitrous oxide emissions as a function of N application to bioenergy feedstocks
Tracy M. Wilson, Oklahoma State University

Outreach, Education and Community Engagement

- 26. Arkansas Discovery Farms: Row Crop Production
Pearl Daniel, University of Arkansas
- 27. Enabling locals in Sierra Leone, Africa to Attain a Healthy Future Through Sustaining Long-Term Water Quality
Liberty Galvin, Oklahoma State University

Soil Resource Assessment and Management

- 28. Soil Carbon Accumulation After Short-term Use of Rye as a Winter Cover Crop
Francisco Arriaga, University of Wisconsin
- 29. Soil Compaction Under Dual-Purpose Winter Wheat
Alexandra Cumbie, Oklahoma State University
- 30. Sustainable Nutrient Management of In-field Livestock Wintering Systems
Dennis Haak, Agriculture and Agri-Food Canada
- 31. Evidence towards sediment accumulation characteristics of slotted pipes as best management practices on agricultural landscapes
Robert Kroger, Mississippi State University
- 32. Soil Aggregation and Glomalin in a Soil Quality Management Study in a Cold, Semi-arid Region
Kris Nichols, USDA-ARS
- 33. High-resolution soil erosion modelling with a LiDAR-derived DEM for a small Lake Huron coastal watershed in Ontario
Peter Nowell, University of Guelph
- 34. Effect of Agronomic Practices on Soil Microbial Biomass and Cumulative Greenhouse Gas Emissions from Bioenergy Sorghum Production
Joseph Storlien, Texas A&M University

Water Resource Assessment and Management

- 35. A River Runs Thru It... the North Canadian River Watershed Traveling Educator Workshop
Karla Beatty and Debi Carnott, Oklahoma Conservation Commission
- 36. Sediment Loading Measurements in the Lake Macatawa Watershed
Daniel J. Callam, Hope College
- 37. Monitoring Water Wells in Middle Tennessee with Down Well Camera
Sam O. Dennis, Tennessee State University
- 38. Water table response to precipitation events based on depth to groundwater and vegetation
Birl Lowery, University of Wisconsin-Madison
- 39. Evaluation of perennial warm-season grasses production for forage and biofuel in Washington
Romulus Okwany, Washington State University
- 40. The NRCS/USACE Partnership Handbook: A Field Guide to Working Together Toward Shared Goals
Cynthia Wood, Institute for Water Resources, U.S. Army Corps of Engineers

Sustainable Aquifer Symposium Posters

- 41. ASCE-EWRI Standardized Reference ET Equation based Bushland Reference ET Calculator.
Prasanna H. Gowda, Jerry Ennis, Terry A. Howell, Thomas H. Marek, and Dana O. Porter, USDA-ARS and Texas AgriLife
- 42. Quantitative and qualitative analysis of groundwater in Aguanaval and Chupaderos aquifers (MEXICO)
Hugo Junez-Ferreira, UAZ; Carlos Bautista-Capetillo, UAZ; Francisco Mojarro, UAZ
- 43. SPELLmap: An Application Tool For Handling Large Georeferenced Hydrological Datasets
Jorge A. Guzman, ARS-USDA Grazinglands Research Laboratory
- 44. Variations in precipitation between 1970 and 2009 in the Canadian River watershed in New Mexico and Texas: Implications regarding the use of Lake Meredith and the Ogallala Aquifer as water supplies
David Brauer, CPRL-ARS-USDA

Poster Presentation Abstracts

Arriaga

Poster Number: 28

Soil Carbon Accumulation After Short-term Use of Rye as a Winter Cover Crop

Presenter: Francisco Arriaga, University of Wisconsin

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Abstract:

The use of winter cover crops has been proposed to protect and enhance soil resources. Cereal rye (*Secale cereale* L.) can be an effective cover crop since it can produce large amounts of biomass in certain climates. However, short-term benefits of cover crop use on soil carbon accumulation are not well known. A study was established to investigate the short-term impact of a rye winter cover crop on soil carbon accumulation. Different soil carbon fractions were compared between three cover crop treatments (no cover, residue retained and residue removed). These three cover treatments were selected to help distinguish carbon contributions to the soil from above- and below-ground cover crop biomass. After two years of establishment, organic carbon and particulate organic matter concentrations were significantly greater with the use of a cover. The above-ground biomass portion of the cover crop contributed significant amounts of carbon to the soil when compared to the below-ground portion (residue removed) and no cover. Soil carbon stratification ratios indicate that both above- and below-ground portions of the cover crop have a positive impact on soil quality when compared to no cover crop use. Short-term use of high-residue winter cover crops can improve soil carbon sequestration and overall soil quality, but long-term use is still recognized as being more beneficial.

Keywords: cover crop, carbon, biomass harvest, bioenergy, soil quality

Potentials of Aerial Cropping For Rehabilitation of Degraded Land In South Western Nigeria

Presenter: Aruleba Joseph Olusegun, Ekiti State University, Nigeria

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Abstract:

Aerial cropping is a traditional soil and water conservation technique that involves the use of naturally and planted trees and shrubs. The potential for rehabilitation of degraded land was evaluated on an Alfisol and Ultisols located in the savannah and forest agro ecological zones of south western Nigeria. To investigate the potentials of Aerial cropping for degradation rehabilitation, soil Physical, chemical and biological properties were examined on soils under aerial cropping for five years and non aerial cropping plots adjacent to each other, both under maize/cassava intercrops. Soil samples were collected at 5 different depths of 0 - 10, 10 - 20, 20 - 30 and 40 - 50cm at both Aerial and no Aerial cropping sites for study. Result of this study revealed considerable changes and improvements that had occur in aerial cropping plots in comparison with the non aerial cropping plots with regard to the environmental parameters. Infiltration rates were significantly high in aerial cropping Alfisol and Ultisols. Aggregate stability was significantly low in the non Aerial plot. A considerable increase in carbon formation of up to 60% was observed with the aerial cropping plots. There was an increase in bulk density with soils of ordinary plot. Moisture content and yield of crops were significantly higher in the aerial cropping plots. Aerial cropping prevents erosion, maintains soil cover, increases organic matter, fix atmospheric N, conserves soil water, reduces soil losses and binds the soil particles together. This system considerably improves the degraded soil and enabled the sustainable productivity of the soil of the study site.

Keywords: Aerial cropping, Land Degradation, Rehabilitation, Sustainability and Conservation.

Avwunudiogba
Poster Number: 4

Geospatial Analysis of Flood Plain Land Use and Riparian Vegetation Pattern in the Tuolumne Watershed, San Joaquin Valley, California

Presenter: Augustine Avwunudiogba, California State University Stanislaus

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Abstract:

Floodplain features such as the riparian vegetation perform important geomorphic and hydrological functions including river bank stabilization and erosion control, sediment transport and deposition, pollution control, and maintenance of stream water quality. Monitoring of riparian vegetation and land use pattern is important in developing mitigation measures and designing appropriate watershed management programs that seek to balance human needs with ecosystem services provided by the rivers flood plain particularly in highly modified watersheds such as those in the San Joaquin Valley. This study examines the spatial pattern of riparian vegetation and land use within the flood plain of the Tuolumne watershed over the last several decades.

The spatial extent of the floodplain was delineated based on topographic criteria derived from digital elevation model (DEM) supplemented by interpretation of high resolution, digital Orthophoto, field survey and mapping of flood plain features such as paleochannels, oxbow lakes, and natural levees. Historical land use and riparian vegetation within the delineated flood plain was compiled from historical/ archival aerial photographs while Landsat-TM satellite imagery were acquired from USGS-EROS data center and classified to generate the current pattern of land use and riparian vegetation using a combination of unsupervised and supervised approaches.

The result shows the floodplain is dominated by agriculture and urban land use which has exerted significant impact on the riparian zone and the spatial extent of the riparian vegetation in the watershed. Declining trends in the spatial extent and the proportion of the valley reach that was occupied by riparian was observed.

Keywords: Riparian Vegetation, Tuolumne Watershed, Floodplain, San Joaquin Valley, California

A River Runs Thru It... the North Canadian River Watershed Traveling Educator Workshop

Presenter: Karla Beatty and Debi Carnott, Oklahoma Conservation Commission

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Abstract:

The North Canadian River Watershed Traveling Educator Workshop was a project designed to train educators within the North Canadian River Watershed on the importance of the watershed, a major drinking water source for the Oklahoma City metro area. The goal of the workshop was to instill a sense of stewardship and personal ownership in the watershed by creating a greater awareness of how individual actions and choices impact the overall water quality and quantity of the North Canadian River. The workshop provided participants the skills, materials and confidence to incorporate watershed education into their classrooms. The project was a 3-day traveling workshop on June 14-16, 2011. Fifteen educators traveled from the Oklahoma City metro area to Beaver, Oklahoma and back, following the course of the river. Participants received professional instruction in watershed education, watershed curriculum and other educational materials as well as 36 hours of professional development credit. After the workshop, participants had a better understanding of the North Canadian River Watershed and its importance as a major drinking water source for the Oklahoma City metro area. They learned what private landowners upstream are doing to help improve and protect the water quality of the river. These educators in turn were able to educate their students about the importance of watershed stewardship and ways that they can help protect their own drinking water source.

Responses from a 6-month post-workshop evaluation are being compiled and information from the evaluations will be included in the poster.

Keywords:

Variations in precipitation between 1970 and 2009 in the Canadian River watershed in New Mexico and Texas: Implications regarding the use of Lake Meredith and the Ogallala Aquifer as water supplies

Presenter: David Brauer, CPRL-ARS-USDA

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Abstract:

Extensive development of the Canadian River in New Mexico and Texas occurred in the 20th century to provide water for irrigation, industrial and municipal uses and recreation. These developments have not alleviated water supply deficiencies in the region. We conducted a series of studies examining water trends within the entire watershed upstream of Lake Meredith in Texas. This study focused on variations in precipitation parameters (annual rainfall, rainfall volume per event, etc.) within the watershed between 1970 and 2010. Annual rainfall from 36 weather stations located in or adjacent to the watershed had a mean annual rainfall from 2001-2010 that was 25mm less the mean from 1971-2000. Contour maps were constructed for the mean annual rainfall for the periods of 1971-2000 and 2001-2010, and then a difference map of the two periods. The difference map indicated that more than 80% of the surface area of the watershed received less annual precipitation during the 2001-2010 period than the long-term 1971-2000 period. There was no difference in the percentage of rain events that produced more than 12.5 mm of precipitation during 1971-2000 and 2001-2010 time periods. Results of ArcSWAT simulations supported the hypothesis that the observed decreases in annual rainfall during the 2001-2010 time period were sufficient to account for the observed decrease in storage of Lake Meredith. Uncertainties regarding the ability of Lake Meredith to supply water for industrial and municipal uses, water suppliers are seeking alternative sources including Ogallala Aquifer, increasing demands on a finite water resource.

Keywords: aquifer sustainability, surface water, water supply

Values and the Agricultural Landscape

Presenter: Pike Brown, Ph.D., Landcare Research, New Zealand

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Abstract:

New Zealand's landscape has undergone profound changes since the arrival of Māori settlers around 1300: Tussock grassland took over after fires destroyed scrub and beech forests, and European settlers introduced exotic grasses, flowering plants, and trees that supplanted the native vegetation. Economic activities such as livestock farming; wheat, barley, and wine production; and mining have further altered the landscape. Over the last 20 years, however, dairy conversion has become the predominant land change, and the sector has become the focus of New Zealand's economy, responsible for 30% of the country's exports. Periodic surveys suggest that New Zealanders are increasingly concerned about the changes to the visual landscape resulting from intensified dairying, including irrigated pastures in traditionally dry areas, the removal of 0.5 million metres of shelterbelts, and dairy cows being held in more confined paddocks than dry stock. A comprehensive survey was undertaken to better understand which aspects of the landscape are important to New Zealanders and what solutions may mitigate residents' unfavorable impressions of dairying. Solutions focus especially on shelterbelts, including those comprising native trees with high biodiversity values. Specifically, we adapted visual assessment study methodologies from urban studies to critically analyse various mitigation strategies using a cross-classified random effects model. This approach facilitates studying the different landscape images while accounting for differences in preferences and outlook among survey respondents. In addition to quantifying specific mitigation strategies, we demonstrate diverging urban-rural preferences for the rural landscape.

Keywords: trees, visual assessment study, rural landscape

Bunch

Poster Number: 10

Potential Use of a New NLEAP-GIS Tool to determine and reduce Nitrate Losses from the Arkansas Delta

Presenter: Theodis Bunch, USDA/NRCS

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Abstract:

A 2011 report by the USDA found that only one third of U.S. cropland is meeting the criteria for best management practices (BMPs) for application rate, time of application, and method of application of nitrogen. If BMPs are not used, the potential for nitrogen losses to the environment increases. Nitrate leaching losses have been correlated with impacts to groundwater and the hypoxia problem in the Gulf of Mexico. Various reports have noted that although nitrate leaching losses from the Midwest are a major contributor to the outflux of nitrate from the Mississippi River watershed, the Arkansas Delta nonetheless contributes a significant amount. A 2012 study conducted by the University of Arkansas and USDA used the Nitrogen Loss and Environmental Assessment Package with GIS capabilities (NLEAP-GIS) 4.2, which was released in 2010, and found that with BMPs potential nitrate leaching losses from the Arkansas Delta can be minimized. The model is now available in a new version written in the programming language Java[®]. This version is more powerful, has a more user-friendly interface, and looks visually similar to Google Earth[®]. Analysis of spatial and temporal variability of these leaching losses on selected farm areas for different counties using the new model will be presented. The model showed that BMPs can reduce nitrate leaching losses and significantly reduce emissions of N₂O in the region, providing opportunities for nitrogen trading in water and air markets, and can potentially contribute to a lower outflux of nitrate from the Arkansas Delta.

Keywords: Arkansas Delta, BMPs, NLEAP-GIS, nitrate leaching, N₂O, nitrogen trading, NTT, water quality

Sediment Loading Measurements in the Lake Macatawa Watershed

Presenter: Daniel J. Callam, Hope College

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Abstract:

The Lake Macatawa watershed in western Michigan suffers from extensive and historically pervasive non-point-source nutrient pollution and excess sedimentation (primarily from agricultural land in the headwaters of the watershed). An earlier TMDL study identified that more than 90% of the phosphorus entering Lake Macatawa is inorganic phosphate attached to sediment particles. Thus, identifying the source and measuring the amount of sediment entering the lake has become a high-priority research topic in the effort to improve water quality. A relatively low-cost sediment monitoring program has been adapted from the literature and 129 sediment samplers were constructed and placed throughout the watershed to collect and quantify sediment loading from eight of the nine major sub-watersheds that contribute to Lake Macatawa. This multi-year sampling program continues through a second sampling season this year and preliminary results from both seasons will be presented. These sediment samplers collect sediment only during flood stage on the tributaries entering the lake, when most of the sediment transports during rain events and provide vital “ground-truth” measurements of various sediment loading models developed for this watershed. The collected sediment has also been analyzed by a novel combination of eight different analytical techniques in order to develop unique sediment “fingerprints” that can help to identify the relative origin of the sediment within the watershed. An overview of the analytical methods developed and their relative importance in determining sediment source locations will be presented as well.

Keywords: Sedimentation, sediment loading, sediment fingerprinting, water quality measurements

Soil Compaction Under Dual-Purpose Winter Wheat

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Abstract:

The dual-purpose use of winter wheat (*Triticum aestivum* L.) as forage for beef cattle is a common practice throughout the Southern Plains. In areas such as the North Canadian River watershed, where dual-purpose wheat is the dominant cropland management system, the adoption of no-till has been limited due to concerns about soil compaction. This study was conducted to evaluate compaction in no-till wheat under dual-purpose (winter grazing and grain harvest) and graze-out management scenarios on different soil types. Grazing treatments were established in the fall of 2011 by placing exclosures at three locations on a Cyril fine sandy loam (course-loamy, mixed superactive, thermic Cumulic Haplustoll), a Dale silt loam (fine-silty, mixed, superactive, thermic Pachic Haplustoll), and a Bethany silt loam (fine, mixed, superactive, thermic Pachic Paleustoll). Exclosure treatments were used to simulate grain-only, dual-purpose, and graze-out management, and were arranged in a randomized complete block with three replications. Soil cores (0-10, 10-20, 20-30, and 30-45cm) will be collected from all exclosures and replicated graze-out plots after cattle are removed from all fields in June. Soils will be analyzed for bulk density, moisture, and penetration resistance. Residue cover will be determined and surface (0-20cm) structure will be visually evaluated. Data collected from this study will provide an assessment of the extent of compaction resulting from dual-purpose and graze-out wheat management. This research will demonstrate the impacts of grazing in no-till wheat to allow producers to make decisions about grazing intensity based on soil type differences and their susceptibility to compaction from grazing.

Keywords: winter wheat, dual-purpose, graze-out, grain only, soil compaction

Arkansas Discovery Farms: Row Crop Production

Presenter: Pearl Daniel, University of Arkansas

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Abstract:

The Arkansas Discovery Farms is a program geared toward monitoring and evaluating water quality of runoff from various agricultural production systems. The program assesses the need for Best Management Practices related to water conservation, as well as reduction of nutrient and sediment loss. In eastern Arkansas, two row-crop production systems are being monitored. The Cherry Valley location consists of a soybean-wheat-rice rotation across two farms. One farm utilizes conventional tillage and a groundwater source, whereas the other practices conservation tillage and uses a combination of surface water sources and wells. In Stuttgart, the 1,500 acre farm features a rice-soybean-corn rotation. This farm utilizes only surface water and collects all runoff into an irrigation reservoir via a tail-water recovery system. Water use and quality is being monitored on four fields including rice grown on zero-grade, unleveled ground (control), and rice and corn grown on precision-leveled fields. It is the goal of the Arkansas Discovery Farms Program to bridge a knowledge gap among farmers, natural resource managers, and other partners about the environmental benefits and effects of agriculture on water quality. In the process of water quality monitoring, the Discovery Farm Program helps farmers to evaluate what is occurring on their land and why. Through this education, understanding can be obtained. A major part of the Discovery Farm Program is spreading awareness and knowledge of these topics. The program shares its goals and progress with other natural resource professionals, organizations, and the public through attendance in informational meetings, field days, newsletters, and websites.

Keywords: monitoring, row crop, rice, BMP

Delgado

Poster Number: 11

A New Nitrogen Index to Assess Sustainability of Cropping Systems of Andean Regions of South America

Presenter: Jorge A. Delgado, USDA-ARS, Soil Plant Nutrient Research Unit

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Abstract:

Population growth, impacts from a changing climate, and other challenges highlight the need to conserve soil and water quality so that maximization of crop yields to feed the expanding world population can be achieved and sustained into future generations. The Andean regions of South America are predominantly risky landscapes that have high slopes susceptible to erosion, especially after harvesting crops that leave low amounts of crop residue such as potatoes, and/or removing the straw from grain systems following cultivation of these landscapes. Tools that can be used by technical personnel who work with local farmers on these agricultural systems are needed to enhance communication with farmers and local communities in Andean regions and increase conservation. A new Nitrogen Index available in the English and Spanish languages, in metric and English units, and with a Soil Sustainability Index, was developed and evaluated for these regions by comparing results from the tool with research data. This Index is being used as an educational tool at the Universidad Estatal de Bolívar in Guaranda, Ecuador, and is helping its users assess the effects of management practices on the sustainability of cropping systems in their region. Preliminary results from evaluation of the new Nitrogen Index and its Soil Sustainability Index for these high-risk cropping system-landscape combinations of South America will be presented. These preliminary results suggest potential exists to use the tool to help assess effects of management practices on the sustainability of systems and on nitrogen use efficiencies in Andean regions of South America.

Keywords: Bolivia, Ecuador, Nitrogen Index, soil quality, sustainability, water quality

Monitoring Water Wells in Middle Tennessee with Down Well Camera

Presenter: Sam O. Dennis, Tennessee State University

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Abstract:

Groundwater can be vulnerable to contamination especially in karst terrain and in unconfined sand aquifers. These geological characteristics are prevalent in Middle and West Tennessee. The geology of Middle Tennessee is limestone rocks that tend to weather into terrains referred to as karst. Karst is characterized by sinkholes, disappearing streams and caves that could serve as conduits to contaminants because of their rapid groundwater flow especially in recharge conditions such as rain storm events. The protection of groundwater and surface water from contamination continues to pose a major challenge; because it impacts source water quality. Recent advances in down-well cameras use fiber optics technology to provide digital video images to gain better understanding of water wells. One of the goals of this study was to capture film footage of wells in Middle Tennessee counties. The data shows no evidence of leaks through the casing or casing joints in the wells monitored. However, visual evidence of extensive fractures and dissolution channels within the sedimentary rock aquifer was noted during the video inspections of the open bore-hole. Therefore, it would be rational to assume that the potential for seeping contaminants exists. Evidence in the video indicated a biologically active ground water, or other chemotropic matter dissolved from soil minerals. Live fish and a live spider were observed in one of the wells. Thus, it can be deduced that both wells could test positive for a variety of bacteria and chemicals which may not be safe for drinking purposes without treatment.

Keywords: ground water, water well, contamination, downwell camera, karst

Phytoremediation Database: A tool to assist in remediation and rehabilitation of contaminated sites

Presenter: Joel Douglas, USDA-NRCS

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Abstract:

Using plants to sequester, assimilate or degrade inorganic or organic contaminants in soils, sediments, surface water, and ground water is referred to as phytoremediation. Kansas State University, through an agreement with the USDA-Natural Resources Conservation Service National Plants Data Center developed a phytoremediation database to assist conservationists, land managers, landowners and revegetation specialists in remediation and rehabilitation of contaminated sites. The database is a compilation of literature references from over a thousand publications on the use of vegetation for phytoremediation and over twenty five case studies describing full-scale phytoremediation in practice. The database serves the following three purposes: i) it has a three-way linkage between species used for phytoremediation, contaminants being remediated, and research studies investigating phytoremediation; ii) it classifies studies based on phytoremediation mechanisms, study characteristics, and successfulness of the plant species used to remediate the contaminant; and iii) identifies case studies where phytoremediation has been successfully employed in full scale remediation projects. The database is organized so that one can systematically sort and search the above information from multiple publications based on contaminants, phytoremediation mechanisms, species, media, study type, or combination of two or more of these subject matters. Retrieval of information is facilitated with graphical user interface which allows for navigation and search of phytoremediation information contained in the database.

Keywords: phytoremediation

NRCS Remote Sensing Labs Utilization of Aerial Photography in Support of Stewardship Land Monitoring

Presenter: Adam Durham, USDA-NRCS

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Abstract:

The Remote Sensing Labs (RSLs) support the NRCS mission by producing high quality, nationally consistent, and scientifically defensible products used to carry out the stewardship land monitoring requirements. In the past, the NRCS monitored stewardship land on-site throughout the United States. Currently, the RSLs stretch the capabilities of agency field staffs by providing aerial high resolution (nominal one foot) processed imagery in the form of mosaics. These mosaics support programs such as the Wetland Reserve Program, Grassland Reserve Program, as well as many others. Remote sensing provides several benefits:

- Aiding field staffs in determining where to allocate resources such as people, time, money, and equipment.
- Allowing areas to be observed where physical access is limited.
- Being faster, less expensive, and more accurate.

Before the mosaics are used for monitoring, each individual image within a mosaic must be orthorectified. Orthorectification is the process of accurately registering imagery to ground coordinates and geometrically correcting the images to remove distortions that occur during image capture. Beginning in FY 2013 the RSLs will be responsible for performing stewardship land monitoring in support of NRCS field offices. This transition to remote monitoring will serve to alleviate the large burden of on-site monitoring of all stewardship land. Remote monitoring will be performed using a thin-client web-based application, GeoObserver. It allows for on-screen digitizing, delineation of observations and it's tied to a national easement database. This poster illustrates how the RSLs persistently use new technologies to facilitate efficient stewardship land monitoring.

Keywords: remote sensing, aerial photography, stewardship land, monitoring, NRCS, orthorectification, GeoObserver

Evaluating the utility of sediment retention structure dredge and dairy manure compost as a restoration strategy for highly degraded rangelands in Central Texas

Presenter: William Fox, Texas AgriLife Research, Texas A&M University System

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Abstract:

Accelerated soil loss from rangeland ecosystems can impact watershed function and processes (Ludwig et al., 2005), both at the site of loss (uplands) and downstream. This two tiered impact has both biophysical and socio-economic implications causing challenges to restoration (Fox et al., 2009). Sustainable land management and onsite conservation provides one action addressing soil erosion issues, but are there possibilities of turning the negative impacts of previous events into a “win” for the overall watershed? We evaluated the potential for using materials collected from sediment control structures, amended with dairy manure compost, to quantify variables of species germination, establishment and production as a possible restoration strategy for highly degraded systems. Objectives of the study were 1) evaluate species establishment in dredged lake sediment with varying levels of dairy compost amendments, and 2) evaluate biomass, above/below ground, production of commonly used species for revegetation in central Texas. Initial results indicate the potential for utilizing dairy manure compost as an amendment to reconstitute lake sediments that have been deposited into sediment retention ponds. The strategy of land applying these unconsolidated sediments back onto highly eroded landscapes would provide a win-win scenario for rehabilitating drastically disturbed rangelands through 1) removal of the sediments from the structures; thus extending the lifespan and increasing their value over time as a sink of sediment loads, and 2) the approach could produce a tremendous amount of materials that could be applied onto highly eroded landscapes in an effort to add to restoration capabilities.

Keywords: Rangeland Restoration, sediment retention structure dredge, dairy manure compost, species evaluation

GeoObserver - A Tool for Streamlining Geospatial Data Management

Presenter: Paul Fukuhara, USDA NRCS NGMC

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Abstract:

With the development of enterprise geospatial web applications being used in NRCS, there is a need to streamline the management of authoritative geospatial data sets being used for agency programs. There was a desire to not depend on heavy desktop clients and local data sets but rather consider a web based application for streamlining the viewing, managing, and analysis of centralized authoritative geospatial data. GeoObserver is implemented using COTS geospatial tools and web mapping technologies and is also being customized for specific agency needs such as easement and dam monitoring.

GeoObserver Features:

- Streamlines local geospatial data management by utilizing web based data storage and access
- Allows navigation by spatial features or attribute fields
- Supports side by side visual comparisons of multiple years of the same data/images
- Supports the QA/QC of existing geospatial data to produce nationally consistent geospatial data
- Supports verification and updating of spatial features and tabular attributes
- Supports spatial and tabular summarization and reporting
- Supports spatial and attribute querying
- Supports web based geoprocessing functions and models
- Configurable for specific program and project views

GeoObserver Uses:

- Streamlining of geospatial data management
- Visualization and mashups of national geospatial data sets
- Review of geospatial data for nation

Keywords: data management, web appication, web tools, silverlight, enterprise, authoritative, streamlining

Enabling locals in Sierra Leone, Africa to Attain a Healthy Future Through Sustaining Long-Term Water Quality

Presenter: Liberty Galvin, Oklahoma State University

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Oklahoma State University study abroad program under Mike Dicks, michael.dicks@okstate.edu, associated with the Wes Watkins program for International Trade and Development

Abstract:

In developing countries, water-related illnesses cause 80% of deaths and diseases. In these areas wells are dug to meet immediate needs and are not maintained for long-term viability. During the winter of 2011 a group of Oklahoma State University students traveled to Sierra Leone, Africa to work with Njala University students to initiate a pilot project to build several bio-sand water filters. These water filters are modeled after the CAWST manual (Centre for Affordable Water and Sanitation Technology) and demonstrate the age-old technology of sand filtration. These water filters are easily constructed and maintained. The filters are designed to have a concrete container, gravel on the inside near the outlet pipe, and sand as the majority of the filter's inner purifying component. These filters are 99.9% effective at removing harmful bacteria with proper maintenance and monitoring. A survey of four available water sources surrounding Njala was performed using Cholilertâ„¢ coliform detector tests. The results showed that they all contained some amount of bacterial coliform indicating they should not be used for drinking water. The team successfully built and installed two water filters near Njala. The filters were placed at primary schools to encourage young children to attend school and to help safeguard the filters for long-term viability. One additional filter container was created and will be installed exclusively by the Njala students. All materials and tools were purchased inside the country to guarantee recreation of the filters. The filters are easily duplicated in third world countries and with proper education and training these could create a solution to their need for potable water.

Keywords: Bio-sand water filters, open-surface site, fecal chloroform test

Presenter: Dr. Terrence G. Gardner, USDA-ARS/ Alabama A&M University

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Little is known about the microbial communities carried in wind-eroded sediments from various soil types and land management systems. A novel technique, pyrosequencing, promises to expand our understanding of the vast microbial diversity of soils and eroded sediments as it can sequence between 10-100 times more DNA fragments than previous techniques providing enhanced exploration into what microbes are being lost from soil due to wind erosion. Our study evaluated the bacterial diversity of coarse sized fractions of wind-eroded sediment as well as dust collected from three different organic-rich soils in Michigan using a portable field windtunnel. Our findings suggested: 1 Bacteria carried in the coarser sediment and dust were effective fingerprints of the soil source, although their distribution (predominance) may vary depending on the soil characteristics as certain bacteria may possibly be more protected in soil surfaces than others; 2 Coarser wind-eroded sediment showed higher bacterial diversity than fine dust and; 3 Certain bacteria were more predominant in fine dust (Bacteroidetes, Chloroflexi and Firmicutes) than coarse sediment (Proteobacteria and Acidobacteria, revealing different locations and niches of bacteria in soil, which depending on wind erosion processes, can have important implications on the soil sustainability and functioning. Infrared spectroscopy showed that wind erosion preferentially removes particular kinds of C from the soil that are lost via fine dusts. Our study provides evidence that eroded sediments remove the active labile organic soil particulates containing key microorganisms involved in soil biogeochemical processes, which can have a negative impact on the quality/function of the parent soil.

Keywords: Wind erosion; Dust emissions; Microbial diversity; Soil functioning; Pyrosequencing; Fugitive Dust

Virginia Quail Management Assistance Program Facilitating Diverse Habitat Development

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Abstract:

Conservation partners in Virginia are assisting landowners with wildlife habitat development through the Commonwealth's Quail Management Assistance Program (QMAP). The Commonwealth initiated the QMAP to provide technical assistance to participants in implementing the Virginia Best Management Practices (BMPs) for Wildlife and the USDA Farm Bill Programs. The BMPs provide incentives to landowners to establish field borders, leave fields idle, and convert non-native forages to native grasses and forbs. The BMPs are targeted in selected soil and water conservation districts (SWCD) throughout the state where the greatest potential exists to create early successional habitat. Five biologists, funded by the Virginia Department of Game and Inland Fisheries and the USDA, Natural Resources Conservation Service and employed by Virginia Tech University, assist landowners develop and implement habitat management plans. The biologists also assist with Farm Bill implementation. The QMAP was responsible for habitat development and management on 81,972 acres in 2011. QMAP contributes to the citizens of the Commonwealth by restoring early successional habitat for those declining species of wildlife that depend on it. The conservation partnership that implements QMAP is unique in that it takes advantage of existing administrative strengths in the SWCDs and Virginia Tech to administer the BMP program and employ the biologists without creating new bureaucratic infrastructure. The technical practices that are the BMPs develop critically needed early successional habitat without the extensive paperwork of USDA programs or costly seedings or plantings. The poster will illustrate how the QMAP program implements the BMPs and assists landowners.

Keywords: Virginia Quail Management Assistance Program, Farm Bill

SPELLmap: An Application Tool For Handling Large Georeferenced Hydrological Datasets

Presenter: Jorge A. Guzman, ARS-USDA Grazinglands Research Laboratory

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Abstract:

Lack of data management tools is one of the major limitations to effectively evaluate and use available atmospheric, surface, and subsurface datasets representing hydrological spatial-temporal variability. Data commonly used in research and released to the public through data repositories entail enormous human effort and funding at the network operation and data handling to assure good data quality. Ultimately these data are used for project-specific purposes, which require additional preparation, formatting, filtering, aggregation, segregation, and visualization that demand a large amount of time and computational resources, not to mention the added risk of incorporating unexpected errors. A georeferenced dataset application, SPELLmap, was developed using DELPHI to rapidly manipulate, visualize, and support cross-variable analyses of large static (grids and site-specific time series) and dynamic (variable geographical position within a specific area) datasets commonly found in complex systems. The Little Washita experimental watershed climate datasets (ARS-USDA MICRONET) with more than 500 million observations were used to assess the application capabilities and performance as well as evaluate quality of these data. In addition, SPELLmap was used to develop input files for a coupled SWAT-MODFLOW model in the Rush Spring aquifer, Oklahoma. A brief description of SPELLmap and its application capabilities will be presented. Once released to the public, SPELLmap will aid users to perform rapid multi-variable data analyses, manipulation to assess data quality and consistency, provide data preparation for modeling purposes, and evaluate hydrological spatial-temporal variability contained within their datasets.

Keywords: Data management tools, ARS MICRONET, SPELLmap, Hydrological Modeling

Sustainable Nutrient Management of In-field Livestock Wintering Systems

Presenter: Dennis Haak, Agriculture and Agri-Food Canada

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Abstract:

An increasing number of producers on the Canadian prairies are feeding or grazing their livestock in a field setting rather than a confined corral during the winter season. In-field winter feeding systems, such as swath and bale grazing, involve lower costs associated with reduced manure and feed handling. Technologies such as mobile electric fencing, winterized watering systems, and portable windbreaks help to maintain livestock health and productivity.

In-field wintering feed systems provide increased soil fertility and increased plant growth by greatly reducing ammonia volatilization losses, which are common with confined feeding systems. However, there is a risk of increased loss of nutrients by surface water runoff, particularly during spring snowmelt. Sustainable management of nutrients involves both appropriate site selection and ongoing site management.

The Agri-Environment Services Branch (AESB) of Agriculture and Agri-Food Canada (AAFC) has initiated a number of monitoring, technology transfer and applied research projects to facilitate improved nutrient management of in-field livestock winter feeding systems. The Farm Environment Management Survey is being used to monitor adoption trends. Technology transfer projects include a recent publication, a winter site risk assessment tool, and a nutrient loading calculator. Research initiatives include long term monitoring of soil nutrients and forage/crop response following a high nutrient load feeding event with bale grazing. AESB is also providing support to a number of multi agency research projects aimed at measuring and understanding nutrient losses from in-field winter feeding sites.

Keywords: livestock winter feeding, nutrient management, bale grazing, swath grazing, soil productivity, nutrient runoff

CIG Poster: Integrating No-Till Cropping, Manure and Cover Crops with Manure Slurry Seeding

Presenter: Tim Harrigan, Michigan State University

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Abstract:

A new and innovative process-manure slurry seeding-that integrates no-till cropping, manure application and the seeding of cover crops in one efficient operation has been developed at Michigan State University. Low-disturbance aeration tillage creates an absorptive surface in untilled ground that prevents overland flow and soil erosion by fracturing the soil, increasing surface roughness, improving infiltration, and conserving crop residues. In one pass, cover crop seed that has been mixed with liquid manure in the spreader tank is delivered through drop-tubes to fractured and loosened soil behind each set of aeration tines. A cover crop soon emerges, capturing nutrients and forming a vegetative barrier to overland flow. Biomass yields of oil seed radish, annual ryegrass, cereal rye, oats, wheat and several forages sown as a cover crop in corn silage or wheat stubble were equal to or greater than drilled seedings. This new process is an environmentally sensitive option for integrating manure and cover crops in no-till cropping systems. This new process alleviates seedbed compaction; reduces erosion by increasing surface roughness, improving water infiltration and conserving crop residues; improves nutrient cycling; and mitigates contaminant loss to the environment. Slurry seeding provides fuel savings (more than 2 gal per acre) and labor savings (more than 0.35 hr per acre) compared to typical tillage and seeding practices. Slurry seeding is transferable to most areas where cover crops are grown and is ideally suited to the Upper Midwest where livestock-based cropping systems predominate.

Keywords: low-disturbance tillage, aeration tillage, cover crops, manure, slurry seeding

Quantitative and qualitative analysis of groundwater in Aguanaval and Chupaderos aquifers (MEXICO)

Presenter: Hugo Junez-Ferreira, UAZ; Carlos Bautista-Capetillo, UAZ; Francisco Mojarro, UAZ

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Abstract:

Quantitative and qualitative groundwater evaluation is fundamental for proper planning of water resources by policy/decision makers; it is essential to providing clean drinking water and water for irrigation and industrial use to spur economic development while ensuring a clean environment. Therefore, it is necessary to understand the spatial and temporal water level behavior in conjunction with the processes that control the transport, hydrodynamic dispersion and chemical and biological reactions affecting contaminant concentrations in the subsurface. This paper presents a summary of geological and hydrodynamic performance studies for Aguanaval and Chupaderos aquifers, both surrounding Calera aquifer. Databases of historical groundwater level provided by the National Water Commission (CONAGUA) were employed to determine temporal trends of water level and values were projected for years 2010, 2030 and 2050. Potential recharge sites were also identified. The water quality analysis in each aquifer included a review of studies carried out by CONAGUA and was completed by obtaining, through geostatistics, spatial distributions for alkalinity, bicarbonate, calcium, carbonate, chloride, electrical conductivity, magnesium, pH, sodium, sulfate, temperature and total dissolved solids (TDS), employing databases generated in recent sampling campaigns. This analysis provided additional elements to help understand the functioning of groundwater in studied aquifers. Finally, results were compared with permissible values established in the Mexican Official Norm NOM-127-SSA1-1994, "Environmental health, water for use and human consumption - quality permissible limits and treatments that must be applied for drinkable water".

Keywords: groundwater, planning, policy/decision makers

NRCS Imagery Support for Conservation Planning

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Abstract:

The National Geospatial Management Center (NGMC) provides high resolution Orthoimagery to support the Natural Resources Conservation Service (NRCS) conservation planning, natural resource inventories, engineering, remote sensing business activities, and web services. Orthoimagery is an authoritative data layer for all NRCS conservation assistance activities.

Conservation Applications: The (NRCS) uses a variety of Orthoimagery datasets that meet agency program business requirements. NGMC identifies Orthoimagery as "Essential" to support conservation assistance processes. Orthoimagery serves an important base layer for NRCS GIS applications. Orthoimagery effectively supports NRCS conservation planning, engineering applications, soil survey inventories, the Web Soil Survey, natural resources inventories, easements monitoring and compliance. NGMC acquires Orthoimagery assets such as seamless one meter resolution NAIP, for the US lower 48 states. Sub-meter resolution Satellite based Orthoimagery (DigitalGlobe-QuickBird-2/WorldView-2, GeoEye-GeoEye-1) is available for Alaska, Hawaii, Guam, Pacific Basin, Puerto Rico, and the Virgin Islands. NGMC maintains Orthoimagery to support web services for engineering and dam sites, hydrologic and vegetation studies, and the Natural Resource Inventory (NRI). NGMC manages and serves updated Orthoimagery to support continuous remote sensing disaster response activities and web services (Department of Homeland Security for Emergency Support Functions) in states along the Atlantic coast, Gulf coast, and Pacific coastal areas. Conclusion: The NGMC is committed to providing NRCS imagery needs by acquiring Orthoimagery that supports NRCS essential conservation activities and geospatial business requirements.

Keywords: National Geospatial Management Center

Evidence towards sediment accumulation characteristics of slotted pipes as best management practices on agricultural landscapes

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Abstract:

The Mississippi River Healthy Basins Initiative calls for best management practices that actively avoid, control and trap non-point source pollutants such as sediments and nutrients. Typical edge-of-field practices of forested riparian buffers, filter strips, and grass buffers control and trap sheet flow surface runoff. Slotted pipes are drainage water management structures that theoretically slow runoff velocities, detain a variable pool of water, and encourage sedimentation. The objective of this study was to document sediment accumulation behind four newly installed slotted pipes in the Mississippi Alluvial Valley. Furthermore, geometry of installation and sediment samples will provide sediment volumes and phosphorus loads retained on agricultural landscapes as a result of slotted pipes. There were no significant differences in sediment accumulation rates (mm/day) between the four pipes ($H=2.611$; $p=0.625$) over 635d. Observed curvi-linear trend ($r^2=0.76$) in accumulation and the Von Bertalanffy non-linear model in sediment accumulation through time for all four sites, highlights highest sediment accumulation occurs at approximately 235d following installation. A Mann Whitney U test shows highly significant differences in sediment accumulation between T0-235 (1.5mm/day) and T235-624 (-0.0357 mm/day). Average sediment volumes and phosphorus loads retained will be calculated. Results will document performance measures of slotted pipes for sediment accumulation and phosphorus load reduction per pipe. Furthermore, estimates of time that maximize sediment accumulation ($t=235d$) provide a defined management protocol that could maximize sediment and nutrient reductions of slotted pipes as edge-of-field management practices.

Keywords: best management practices, sediment, pipe,

Water table response to precipitation events based on depth to groundwater and vegetation

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Abstract:

The water table elevation in monitoring wells at the Hancock Agricultural Research Station, Hancock, Wisconsin dropped about two meters over the period from 2002 to 2011. This water table decline was also reflected in lake levels as several lakes in the Wisconsin Central Sand Plain (WCSP) suffered from low water levels. The objective of this research was to quantify interactions between vegetation (irrigated agricultural crops, prairie, and forest) and groundwater recharge in the WCSP. Groundwater monitoring equipment was installed at eight sites to assess water table elevation, soil water content, and precipitation at 15-minute intervals under different vegetation. Data showed that the water table responded to precipitation events differently based on the position in the groundwatershed and depth to the water table. Monitoring sites in the groundwatershed's discharge area responded quickly to precipitation events and the amount of rise of the water table increased linearly with precipitation. Interception of precipitation by plant canopy and decaying vegetative material on the soil surface in forest and prairie environments of the discharge area decreased groundwater rise as it responded to precipitation relative to agricultural fields. While agricultural crops used groundwater through irrigation, natural vegetation relied on water stored in the sandy soils and the shallow water table (1.5 to 3 m) for daily transpiration needs. Where groundwater was further from the surface, responses to precipitation events were buffered by the greater depth (5 to 7 m) of soil above the water table.

Keywords: groundwater, irrigation, prairie, forest, soil water

Sustainable ranch management: Integrating resource monitoring and business planning

Presenter: Kristie Maczko, Sustainable Rangelands Roundtable, University of Wyoming

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Abstract:

Maintaining successful ranch operations benefits not only ranchers, but also the well-being of rangeland-dependent communities and open space conservation efforts. To address these priorities, the Sustainable Rangelands Roundtable, the Wyoming Business Council, Wyoming State Grazing Board, University of Wyoming extension, the Noble Foundation, Grazing Lands Conservation Initiative, USDA Forest Service Rocky Mountain Research Station, Natural Resources Conservation Service, and several ranchers developed a process to integrate ranch monitoring with business planning. The assessment framework contains 17 indicators for monitoring ecological, economic and social sustainability. Indicators are attributes that can be directly measured and assessed to detect changes and trends. SRR ranch assessment indicators address: soil stability and bare ground; availability of surface water and water volume; species composition of plant communities, invasive species, fire, and riparian areas; wildlife populations, domestic meat produced and harvestable material production; profit from livestock production and products produced, as well as visitor use information for recreational enterprises; technical assistance and continuing education received, and protection of special values. Monitoring resource conditions, wildlife, livestock production, and associated economics to align business plan goals with rangeland resource capacities can improve viability and sustainability of family ranches. Specific procedures and expected outcomes of the SRR ranch sustainability assessment monitoring and business planning process are detailed in a guidebook linked at <http://sustainable-rangelands.org/ranchassessment/guidebook.pdf>.

Keywords: resource monitoring, business planning, ranch management, sustainable rangelands

CIG Poster: Increasing the Availability of Local Ecotype Milkweed (*Asclepias* spp.) Seed for Monarch Butterfly Habitat Conservation

Presenter: Eric Mader, The Xerces Society for Invertebrate Conservation

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Abstract:

Milkweeds (*Asclepias* spp.) are the obligate host plants of monarch butterfly (*Danaus plexippus*) caterpillars. The loss of milkweed from across the monarch's breeding range is considered a significant factor in the declining monarch numbers recorded at overwintering sites in Mexico and on the California coast. To offset the loss and degradation of monarch breeding habitat, the North American Monarch Conservation Plan recommends planting regionally appropriate native milkweed species. However, commercial sources of native milkweed seed are scarce, especially across the southern tier of the United States, limiting opportunities to include milkweeds in large-scale regional restoration efforts. Through a national USDA-NRCS Conservation Innovation Grant, the Xerces Society is offering technical support and funding to native seed producers as a way to incentivize the production of local ecotype milkweed seed. Initial results have been highly successful with over 100 pounds of seed produced in partnership with native seed producers in Texas, Idaho, and California, and new seed production fields currently being established in Florida, New Mexico, and Arizona. Initial seed harvests have already been distributed to landowners and conservation groups for restoration efforts in California, and replicated efforts are now underway in other regions. Concurrently, Xerces is developing propagation guidelines for select milkweed species and promoting the benefits of milkweeds for native bees and other wildlife. This approach of incentivizing native seed production and building new markets for native plant materials provides a successful model for increasing native plant conservation.

Keywords: Pollinators, Biodiversity, CIG

Using Multi-frequency Reservoir Survey Techniques to Refine Watershed Conservation Strategy

Presenter: Jason McAlister - Blackland Research Center

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Abstract:

Multi--frequency reservoir survey techniques offer the means by which watershed conservationists may verify historic sediment delivery estimates, identify critical areas, and assess implementation strategies. To demonstrate application of this technology and value of its derivatives, a multi-year, multi-frequency acoustic survey of Granger Lake was undertaken. Objectives of the study were to use existing data and standard bathymetric and sub-bottom survey techniques to verify assumptions of original reservoir capacity, examine the general accuracy of previously derived sedimentation rate, document conservation implementation effectiveness, and identify critical areas for future conservation strategy. Sediment profiling results indicate pre-impoundment reservoir design estimates were overstated, thus skewing historic sediment delivery estimates. Insights from this research highlight the importance of sub-bottom profiling as a validation tool in the pre-planning phase, and its utility with regard to targeted implementation and follow-up assessment.

Keywords: conservation, assess, multi--frequency, reservoir, sub-bottom, sediment

CIG Poster: Monitoring Edge-of-Field Surface-Water Runoff: a Three-State Pilot Project to Promote and Evaluate a Simple, Inexpensive, and Reliable Gauge

Presenter: Randy Mentz, University of Wisconsin-Platteville Pioneer Farm

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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. This project will evaluate a prototype gauge that was designed to reduce equipment, installation, and operational 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. The control structure, a new, low-profile flume developed by Pioneer Farm Research staff, will be installed below-grade with an approach section, where feasible. This combination will reduce hydraulic head pressures upstream of the station, eliminating the need for tall wingwalls and long earthen berms. A hydronic heat system mounted under the steel approach and flume will provide the operator with a quick and easy way to remove ice in the winter, saving hours of labor. A number of other cost saving measures and design features will be detailed in this presentation.

Twenty-four prototype gauges will be installed, operated, and evaluated in Wisconsin, Minnesota, and Iowa. 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.

Keywords: edge-of-field, runoff, nonpoint, prototype, low cost, tier 1

Nechero

Poster Number: 19

NRCS National Elevation Program support Conservation Planning & Design

Presenter: Steve Nechero, USDA-NRCS-NGMC

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Abstract:

NRCS National Elevation Program is acquiring high resolution elevation data using Light Detection and Ranging (LiDAR) technology to create digital elevation models, hillshades, slope and contour map and data products to support NRCS Conservation Planning and Design activities. The National Geospatial Management Center is developing web based elevation derivatives for NRCS tools for the Conservation Delivery Streamlining Initiative (CDSI) and the Engineering Field Tools (EFT). The goal to to create elevation map and data products that are plug and play for state and field office users.

Keywords: Conservation Delivery Steamlining Initiative, Engineering Field Tools, Elevation, LiDAR

Soil Aggregation and Glomalin in a Soil Quality Management Study in a Cold, Semi-arid Region

Presenter: Kris Nichols, USDA-ARS

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Abstract:

Global food insecurity and rapidly diminishing water, soil, and energy resources are putting pressure on agroecosystems to efficiently produce more food while maintaining or enhancing natural resources. The field study here was established in 1993 on a research farm near the Northern Great Plains Research Laboratory (NGPRL) in Mandan, ND. The study's objective was to evaluate the impacts of cropping sequences and tillage systems (minimum and no-till) on biomass production, precipitation use efficiency, and soil properties. In 2006, surface (0-15 cm) soil samples were collected from the continuous spring wheat with residue removed (CSW-), CSW plus residue (CSW+), SW-chemical fallow (SW-F), and SW-safflower-rye (SW-S-R) treatments under both types of tillage. Dry aggregate size distribution (DASD), water-stable aggregation (WSA), and glomalin production (BRSP) were measured. Glomalin is a glycoprotein produced by arbuscular mycorrhizal (AM) fungi which correlates with soil aggregation in many soils and may be an indicator of AM activity. The hypotheses were: 1. treatments under no-till (NT) would have higher amounts of macroaggregates (≥ 0.25 mm), levels of WSA, and BRSP; and 2. treatments with a fallow period would have lower values. Macroaggregate concentration was higher under NT than minimum till. A whole soil stability index calculated from DASD and WSA was higher under continuous cropping (i.e. CSW and SW-S-R) than under SW-F, and glomalin was highest in the 1-2 mm aggregates. The results indicate that in a cold, semi-arid region, NT and continuous cropping improve soil aggregation and potentially mycorrhizal activity.

Keywords: no-till, cropping systems, soil quality, arbuscular mycorrhizal fungi, glomalin, water-stable aggregation

High-resolution soil erosion modelling with a LiDAR-derived DEM for a small Lake Huron coastal watershed in Ontario

Presenter: Peter Nowell, University of Guelph

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Abstract:

The geospatial version of the Water Erosion Prediction Project (WEPP) model, GeoWEPP (Renschler et al., 2002), was used to assess relative soil erosion intensity, at the within-field scale, across a small agriculturally-dominated subwatershed on Ontario's Lake Huron coast. The Ridgeway Drain of Huron County drains approximately 938 Ha. Cropped fields account for about 754 Ha. Field-specific agricultural land management information from the Ontario Agricultural Resource Inventory (AgRI) was used. A three-year corn-bean-grain crop rotation occurs most commonly. Soybeans or varieties of edible beans are planted "bean years" while grain crop choices for "grain years" include Winter Wheat, Spring Wheat and occasionally other cereals. Some farmers omit grain or plant successive corn crops in their rotation schemes. Study area tillage systems include conventional ploughing after grain and no-till bean and grain crops. A high-resolution (vertical accuracy of 10cm) Light Detection and Ranging (LiDAR) mission was flown in late Spring 2011. Post-processing of these data cloud was accomplished with the Whitebox GAT (V. 1.0.7; John Lindsay, University of Guelph, Centre for Hydrogeomatics) and Variogram Estimation and Spatial Prediction plus Error (VESPER V. 1.62; Minasny et al., 2005) kriging software products. A number of DEM products, including a hydro-enforced 5m X 5m DEM, were produced. Climate data for a 30 year time horizon was compiled. GeoWEPP erosion model results are presented as raster maps. Within-field variations were noted as well as significant differences between the cropped fields.

Keywords: Soil erosion model, GeoWEPP, LiDAR-based DEM, agriculturally-dominated Lake Huron coastal watershed

Okwany

Poster Number: 39

Evaluation of perennial warm-season grasses production for forage and biofuel in Washington

Presenter: Romulus Okwany, Washington State University

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Abstract:

The need to complement the fossil fuel energy with renewable energy sources has pushed to the front research on various sources for such energy. Cellulosic bio-oil has seen significant success in the mid-west with corn as the main biomass material. In Washington State the production of corn for biofuel is not exactly welcome due to the high input demand that it requires and low IWUE. Perennial warm-season grasses have thus received significant interest given their potential for lower water demand and high biomass output in marginal lands. Their promotion is also boosted by their secondary use as forage material. We present the results of a three year study that evaluated field scale production yield potential, water use, and water use efficiency of several annual warm-season grasses and their comparison to corn and sweet sorghum. The results show significant potential to promote the development of these perennial grasses outside their traditional Midwest growing regions to the Pacific Northwest.

Keywords: renewable energy, cellulosic, perennial grasses

Prout

Poster Number: 20

Rural Stormwater Management Model - Southeast Shores of Lake Huron, Ontario, Canada

Presenter: Tom Prout, Ausable Bayfield Conservation Authority ABCA

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Abstract:

Understanding and reducing the impacts of stormwater runoff in rural Ontario requires a truly rural model. That's why conservation groups, agencies, and landowners along Lake Huron's southeast shores, in a rural part of Ontario stretching from Sarnia to Tobermory, are working together to create a rural stormwater management model. A model like this has not been created before. It will fill a gap in understanding impacts to the nearshore water quality of Lake Huron and make it possible to implement improved strategic actions that protect water quality. This new technology will then be shared with others. Stewardship funding is limited. It needs to be invested strategically with the best and most detailed information possible. This new rural model, with funding support from the Province of Ontario's Showcasing Water Innovation Program, will help find ways to undertake projects where they will have the greatest benefit to conserve soil and protect water. The Ontario Ministry of the Environment announced, on December 20, 2011, a Showcasing Water Innovation Program grant of \$700,000 towards this new, and truly rural, water-quality initiative. Additional financial support and in-kind contributions will come from other funding partners. The project will lead to increased environmental expertise in rural Ontario and that expertise can be exported provincially, nationally, and internationally. Ausable Bayfield Conservation Authority (ABCA) will lead the Rural Stormwater Management Model project in partnership with Maitland Valley, St. Clair Region, Sauguen Valley, and Grey-Sauble conservation authorities and other partners including the Healthy Lake Huron: Clean Water, Clean Beaches (Lake Huron Southeast Shores)

Keywords: rural stormwater management model, Lake Huron, Ontario, Canada, South East Shores, Clean Water, Clean Beaches, Ausable Bayfield Conservation Authority, ABCA, runoff, landowners, projects

Differentiating Tillage Practices Using Landsat -5 TM Data

Presenter: Sonisa Sharma, University of Nebraska-Lincoln

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Abstract:

Tillage management practices are one of the core components of crop simulation, agro-hydrological, and ecological models that play decisive role in decision-making in agriculture at multiple geographic scales. A major advantage of remote sensing data acquisition techniques over conventional field reconnaissance studies is that they provide fast, low-cost assessment of tillage practices at multiple spatio-temporal scales. The objectives of this study is to classify tillage and no-tillage cropping system using Landsat (L5) reflectance bands. Landsat image path 29 and row 32 for April images of 2004, 2005, 2006 and 2007 will be used in this study. Field subsets for each L5 image (14 till and 17 no-till) will be created within ERDAS Imagine. Field reflectance will be calculated by averaging all the pixel reflectance values within each field within ERDAS Imagine. Quadratic Discriminant Analysis will be used to classify fields of known tillage (till and no-till) in SAS software. Cross Validation (Leave -out field) will be used for corroboration. All seven bands will be used in the analysis. In 1997, Landsat TM based models were able to classify 93 % of tillage attributes when they were tested with independent data from 27 fields in Ohio. Landsat -5 based models appears to classify tillage practices accurately and may help to improve the applicability of several existing agricultural and environmental models.

Keywords: tillage, reflectance, classification

CIG Poster: Development and Testing of Pollinator Habitat Enhancement Specifications for Six Regions of the U.S

Presenter: Eric Mader, The Xerces Society for Invertebrate Conservation

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Abstract:

The inclusion of pollinator conservation as a priority in Farm Bill conservation programs presents a new implementation challenge for agency staff across the United States. While restoration ecologists have refined the process of native plant establishment for many diverse biomes, the creation and long-term management of high-density native wildflower plantings represents a new frontier in habitat restoration. The ability of such plantings to persist over time, the availability and affordability of seed, appropriate planting technology, and the integration of such habitat into working farm systems, all present barriers to adoption. Through a national NRCS Conservation Innovation Grant, the Xerces Society and partner-scientists conducted field trials to test and document the establishment process for wildflower plantings in New England, Florida, California, the Pacific Northwest, the Upper Midwest, and the Mid-Atlantic. This effort resulted in on-the-ground projects being implemented in 10 states in partnership with berry producers, tree fruit orchards, vegetable row crops, the native seed industry, and NRCS Plant Materials Centers.

As a direct outcome, Xerces and the NRCS have developed new habitat creation job sheets for farms as diverse as California avocado orchards and Massachusetts cranberry bogs. These job sheets (and corresponding real world case studies) are the most comprehensive effort yet to provide pollinator conservation guidance for farm planners across the U.S.

Keywords: Pollinators, Biodiversity, CIG

Effect of Agronomic Practices on Soil Microbial Biomass and Cumulative Greenhouse Gas Emissions from Bioenergy Sorghum Production

Presenter: Joseph Storlien, Texas A&M University

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Abstract:

Renewed interest in biofuel production has been enhanced by goals of reducing dependence on foreign oil, while potentially mitigating greenhouse gas (GHG) emissions. Bioenergy sorghum is one source of biomass feedstock which is being examined in Texas and throughout the southern U.S. Soil and crop management practices associated with production of bioenergy sorghum can influence soil biological activity, direct emissions of GHGs, and overall soil health. The aim of this study was to understand the effects of crop rotation (corn-sorghum vs. sorghum-sorghum), N fertilization (0 vs. 280 kg N ha⁻¹), and residue management (0 vs. 50% crop biomass return) on soil microbial biomass (SMB) carbon (C) and nitrogen (N) pools and cumulative GHG (CO₂-C & N₂O-N) emissions in a bioenergy sorghum cropping system in central Texas. Since June of 2010, field measurements of GHG fluxes have been collected from a bioenergy sorghum cropping system near College Station, Texas. Soil samples were collected from the site after crop harvest, in November 2011, for analysis of SMB C and N.

Preliminary results suggested that residue return promoted greater nutrient cycling and overall soil health, indicated by increased SMB C and N and greater losses of CO₂-C in 2010, but not in 2011. Crop rotation significantly impacted SMB C and cumulative losses of CO₂-C in both 2010 and 2011. Further investigation will identify the ideal combination of nitrogen fertilization rate, residue return, and crop rotation that reduces GHG emissions and sustains microbial activity while maintaining optimal biofuel crop production.

Keywords: bioenergy, microbial biomass, greenhouse gas, soil carbon

Using Rare Earth Element (REE) Tracers to Identify Preferential Micro-Sites of Post-Fire Aeolian Erosion

Presenter: R. Scott Van Pelt, USDA-ARS

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Abstract:

Plant communities in desert environments are spatially anisotropic. Nutrient islands develop below shrub canopies and in the bases of bunch grasses that enhance plant growth and reinforce the spatial anisotropy. Catastrophic disturbance that removes the vegetation such as fire or drought can result in the release of the trapped sediment which becomes redistributed over the landscape by wind and water. We applied Rare Earth Element (REE) tracers to different landscape positions of an anisotropic Northern Chihuahuan Desert ecosystem at the Sevilleta National Wildlife Refuge in central New Mexico in an effort to study this process. The results indicated that in desert grassland, a disproportionate amount of the post-fire sediment is entrained from areas under grass clumps and in grassland-shrubland ecotones, the soil under shrubs is the primary source of entrained sediment. The bare surfaces between vegetation produced the least sediment. REEs appear to be a powerful tool for investigating spatial patterns of aeolian processes.

Keywords: wind erosion, sediment source, nutrient islands, fire effects, Rare Earth Element

Vaughan
Poster Number: 8

CIG Poster: Promoting Agricultural Sustainability through Beneficial Insect Hedgerows: Restoring Pollination and Pest Control Services on Farms in California's Central Valley, Phase II

Presenter: Mace Vaughan, The Xerces Society for Invertebrate Conservation

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Abstract:

Between 2006 and 2009, the Xerces Society and the University of California launched an effort to research and test hedgerow creation strategies for California farms that benefit pollinating insects. During the first phase of this project, through a NRCS Conservation Innovation Grant, we compared weedy crop field borders with native shrub hedgerows in California's Central Valley for their suitability in supporting pollinators. Based upon the initial project findings, we extended that work in 2009 (Phase II) to examine the benefits of hedgerows for other types of beneficial insects—specifically predators and parasitoids of crop pests.

The results of both research components demonstrate a clear finding: native plant hedgerows attracted more beneficial than pest insects, while weedy areas showed the opposite trend, attracting significantly more pest than beneficial insects. We conclude that replacing weedy areas at field crop edges with managed native plant hedgerows will sustain or increase beneficial rather than pest insects on farms.

Since one of the barriers to hedgerow adoption by farmers is the concern that they will increase pest insect populations, this project is providing crucial new evidence to help alleviate that concern. To share these findings more widely with farmer-audiences and the agencies that support them we have developed new hedgerow design and management guidelines that are actively being integrated into a nationwide outreach campaign.

Keywords: Pollinators, Biodiversity, CIG

Warren

Poster Number: 24

Assessment of Sampling Methods for Carbon Credit Monitoring

Presenter: Sumit Sharma, Oklahoma State University

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Abstract:

Carbon sequestration is helpful in overcoming increasing levels of atmospheric CO₂ and has opened both global and local carbon markets for carbon trading. In the United States, Oklahoma is the first state to initiate a statewide carbon program which is currently developing and testing carbon offset verification protocols. Agriculture can be an effective source for carbon sequestration by adopting no-till practices or establishing permanent grasses. A pilot project is currently underway to evaluate verification protocols for no-till and grassland establishment. As a part of the pilot project, this study will assess sampling methods for C monitoring. Soil samples were taken from 48 fields in Oklahoma to a depth of 30cm using a 27.5cm push probe, 39.8cm hydraulic probe and a 48cm slide hammer probe. The samples are divided into 0-10, 10-20 and 20-30cm segments. Soil samples are analyzed for moisture, bulk density, total C, pH and inorganic C when the pH is above 7.2. Preliminary results show that the bulk density measured from the slide hammer is significantly higher than that measured by other methods. Variability in bulk density is higher for the push probe and slide hammer probe compared to the hydraulic probe. The data collected in this project will be used to determine the number of samples required to monitor carbon sequestration in cropland under contract for carbon credits in Western OK. This will provide the Oklahoma Carbon Program with methodologies needed to incorporate soil sampling into the current verification process.

Keywords: Carbon sequestration, No-till, Cropland

Nitrous oxide emissions as a function of N application to bioenergy feedstocks

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Abstract:

The sustainability of any cellulosic bioenergy feedstock production system is in part a function of its ability to decrease net greenhouse gas emissions into the atmosphere compared to the combustion of fossil fuels. Nitrous oxide emissions can be a significant component of the total greenhouse gas budget for a bioenergy feedstock production system. Few studies have evaluated N₂O emissions from forage sorghum grown for cellulosic bioenergy and no research has been conducted to evaluate this important component of the production system in Oklahoma. The objective of this study was to evaluate the response in N₂O emissions to a range of N rates applied to forage sorghum, switchgrass and mixed grasses. This study was initiated at Stillwater, Oklahoma in spring 2010, when forage sorghum (ES 5200, Ceres Inc), switchgrass and mixed native grasses were planted. Nitrous oxide emissions were measured using a vented chamber technique. These measurements were collected weekly until side-dress fertilizer application. Emissions were then measured daily after fertilization for 5 days and then every other day for an additional 5 days at which time sample frequency became weekly for the duration of the growing season. This data will be useful in developing a greenhouse gas lifecycle analysis for forage sorghum, switchgrass and mixed grasses in the Central Great Plains.

Keywords: Nitrous oxide, emissions, bioenergy

The NRCS/USACE Partnership Handbook: A Field Guide to Working Together Toward Shared Goals

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Abstract:

In May 2011, Natural Resources Conservation Service (NRCS) and U.S. Army Corps of Engineers (USACE) renewed the NRCS/USACE National Partnership Agreement. The overall goal of the Partnership is to “promote a long term working relationship to improve management of water and related natural resources under the missions and authorities of NRCS and USACE.” Areas of cooperation include watershed planning, wetland creation, restoration, and enhancement, (including coastal restoration), natural disaster recovery and restoration, water quality improvements, water supply development, and water management. The Agreement also promotes coordination between NRCS’s Swampbuster and USACE’s Regulatory Programs and coordination of programs and activities that promote wise use of floodplains.

As part of a collaborative effort, a partnership handbook has been developed. The NRCS/USACE Partnership Handbook: A Field Guide to Working Together Toward Shared Goals is designed to stimulate and facilitate active cooperation and collaboration between the two agencies. The handbook contains basic information about each agency’s missions, programs, capabilities, and modes of operation. Identifying and understanding each others’ mutual interests can lead to developing shared goals and leveraging resources to implement joint solutions. Case studies and examples are included to illustrate what has worked in the past and where further collaboration and problem solving is needed to reach better results in the future. Often the differences in agencies’ business practices can act as barriers to collaborative efforts. This handbook identifies common problems in the collaborative effort and suggests ways to minimize and even eliminate those barriers.

Keywords: Collaboration, Water Resource and Management, Education

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