Poster Presentations

Sunday, July 18 — 6:30 p.m. — Archview and Gateway Ballrooms

The posters below were presented at the 65th SWCS International Conference in St. Louis, Missouri, on July 18-21, 2010. Abstract and author contact information is with each abstract.

Adaptive Management of Conservation Efforts

1. Enhancing ecosystem services by sod-based rotations and crop-livestock integration
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2. Water Quality Impacts of Shifting towards a Corn Dominated Agricultural Watershed
   Peter Beeson, USDA ARS HRLS
3. Reducing Hay Feeding on the Southern Coastal Plain
   Dennis Chessman, USDA-NRCS
4. Living Snow Fence Payment Calculator: Research and Assess the Farmer and MN-DOT Economic and Environmental Costs and Benefits of Living Snow Fences including carbon impacts
   Diomy Zamora, University of Minnesota Extension
5. Ecosystem Services of Narrow Base Terraces: Part 3 of 3 Agricultural and Landscape Modeling
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6. Inundation influences on bioavailable phosphorus in restored wetland sediments
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Conservation and Environmental Policy and Program Design

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   Coreen H. Cockerill, Wilmington College
8. Implementing Conservation Policy: How Important Is the Agency in Determining Policy Outputs?
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   Thomas A. Green, IPM Institute of North America Inc.
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13. Ecosystem Services of Narrow Base Terraces: Part 1 of 3 Surface-Water Quality
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14. Switchgrass and Pecan Biochar Amendments to a Sandy Coastal Soil
    Warren J Busscher, USDA-ARS, Florence, SC

15. New Tools to Assess Risk of Nitrogen Loss to the Environment
    Jorge A. Delgado, USDA-ARS Soil Plant Nutrient Research Unit
16. Herbicide Transport to Surface Runoff on Claypan Soils: Scaling from Plots to Fields
    Fessehaie Ghidey, USDA-ARS
17. Utilizing Mobile Computing Technologies and GIS for Monitoring the Biological Recovery of Streams Remediated for Acid Mine Drainage
    Nicholas B Grant, Office of Surface Mining Reclamation and Enforcement (OSM)
18. Ecosystem Services of Narrow Base Terraces: Part 2 of 3, Biodiversity
    Jeff Huebschman, UW-Platteville Pioneer Farm
19. Improving Decision Making Related to Performance and Sustainable Management of Conservation Buffers
    Benjamin W. Koziol, Stone Environmental
20. Evaluating Practices to Mitigate Nutrient Transport in a Tile-drained Subwatershed of the Mackinaw River, Illinois
    Maria Lemke, The Nature Conservancy
21. Vegetated Agricultural Drainage Ditches: A New Conservation Practice Utilizing Current Landscape Features
    Matthew T. Moore, USDA-ARS
22. A Web Based System For Providing Ranchers With Financial And Conservation Risk Management Tools
    Will Shaw, Center for Natural Resource Information Technology
23. Near-real time prediction of wildfire risk on grazing lands with the Burning Risk Advisory Support System (BRASS)
    Will Shaw, Center for Natural Resource Information Technology
24. The Challenges of Implementing Conservation Tillage and Cover Crops in Clay Soils
    Gretchen Sassenrath, USDA-ARS
25. SSURGO Vector-to-Raster Conversion Increases Data Utility and Processing Efficiency
    Ryan Williams, USDA ERS

Fish, Wildlife, and Biodiversity Conservation

26. Toxicity of Silicon Carbide Nanowires to Sediment-Dwelling Invertebrates in Water or Sediment Exposures
    Joseph Mwangi, University of Missouri
27. Performance of Warm Season Grass in Riparian Zones
    Martin van der Grinten, USDA-NRCS-Big Flats Plant Materials Center

Soil Resource Assessment

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    J. Jeffery Goebel, USDA NRCS
29. Emiquon nutrient dynamics: an examination of wetland and former wetland soils following 80+ years of agriculture
    A. Puanani Borges, Biology Department, Bradley University
30. A Rapid, Cost-Effective, And Greener FDA Method For Soil Quality Analysis
    Anna Eynard, South Dakota State University

31. Use of Models in Assessing the Impact of Cropping System, Land Types and Suitability on Land Degradation in SouthWestern Nigeria
    Dr. Aruleba Joseph Olusegun. University of Ado Ekiti. Nigeria
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    Daniel Wallace, USDA NRCS GA State Resource Inventory Coordinator

Soil Resource Management and Conservation

33. Conservation Tillage Improves Soil Physical Properties on Different Landscape Positions of a Coastal Plain Soil
    Francisco J. Arriaga, USDA-Agricultural Research Service
34. Remediation of Urban and Industrial Soils Contaminated with Pesticides by Supercritical Extraction
    Teresa Castelo-Grande, Departamento de Engenharia QuÃmica, Faculdade de Engenharia da Universidade do Porto
35. Canadian Agri-Environmental Indicators for Nitrogen
    Reinder De Jong, Eastern Cereal and Oilseed Research Centre, AAFC, Ottawa
36. Optimum planting date for rye cover crop in Massachusetts: a spatial analysis
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37. Root Mass of Tillage Radish Grown on a Hardpan Soil
    Phil Bauer USDA - ARS
38. Alternative Management Practices For Small Organic Farms
    Faustin Iyamuremye, ENTSC, faustin.iyamuremye@gnb.usda.gov
39. Assessing Rangeland Ecosystem Goods and Services
    Kristie Maczko, Sustainable Rangelands Roundtable
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    Dr. Jean Steiner, Laboratory Director, USDA-ARS Grazinglands Research Laboratory, El Reno, OK
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    Paul Salon, USDA-NRCS
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    Tom E. Schumacher, South Dakota State University

Water Resources and Management

44. Removing of Arsenic from Water by a Magnetic Stabilized Bed
    Paulo A Augusto, Departamento de Engenharia QuÃmica, Faculdade de Engenharia da Universidade do Porto
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    Kundan Dhakal, University of Nebraska-Lincoln
46. The Economics of Culvert Replacement: Fish Passage in Eastern Maine
    John Long, USDA-NRCS
47. Pumping Plant Efficiency Testing in Louisiana
    Brandon Samson, Louisiana NRCS

48. Identifying Source-Pathways of Multiple Contaminants During a Rainfall-Runoff Event in a Tile-Drained Agricultural Watershed
Mark Tomer, USDA-ARS

49. Simulation of nitrate leaching from a potato production system in Prince Edward Island, Canada: model calibration and verification
Yefang Jiang, Prince Edward Island Department of Environment, Energy and Forestry, Canada

50. An Evaluation of GIS Methodologies for Improving P-Index Measurement in the Illinois Watershed
Cara Hastings, University of Arkansas at Monticello

51. Soil Water Chemistry during Conversion of Marginal Land to Biomass Crop Production in the Lower Mississippi Alluvial Valley
Hal O. Liechty, School of Forest Resources, University of Arkansas at Monticello

52. Assessing Surface Water Availability in the Santa Cruz Watershed
Wenming Nie, USEPA, ORD, NERL-ESD-Landscape Ecology Branch

Conservation Innovation Grant Program (CIG)

53. Eco Apple: Developing Markets for Northeast Apple Growers using Advanced IPM
Thomas A. Green, IPM Institute of North America Inc.

54. PRiME (Pesticide Risk Mitigation Engine): A New Online Pesticide Evaluation Tool for Agriculture
Thomas A. Green, IPM Institute of North America Inc.

55. Southeast MN 2-Stage Ditch
Richard Biske, The Nature Conservancy

56. Staking Terraces Online: A Terrace Layout Program
Melissa Bay, University of Missouri

57. Managing Claypan Soils: Annual Grain Crops vs. Perennial Switchgrass
Gregory W. Landers, University of Missouri

58. Innovative Approach for Restoring Native Grasslands, Wildlife and Other Natural Resources
Jim Willis, Wildlife Habitat Federation

59. In a market-based crop rotation, teff will maximize the use of soil moisture and increase the annual income for dry land farmers in Kansas
Josh Coltrain, Solomon Valley RC&D Area, Inc.

60. Vegetation and Soil Moisture Monitoring of Landscape Scale Western Juniper (Juniperus occidentalis) Treatments
Thomas Esgate, Cooperative Sagebrush Initiative

61. The Nutrient Trading Tool (NTT)
Ali Saleh, Texas Institute for Applied Environmental Research (TIAER), Tarleton State University

62. The Effect of Anaerobically Digested Dairy Effluent and Method of Application on Yield and Nitrogen Uptake of Grass
Elizabeth Whitefield, Washington State University

63. Hedgeapple Biotech
Alan Gravett MD MPH

Poster Presentation Abstracts

Find authors/presentations using the search function above.

1

Enhancing ecosystem services by sod-based rotations and crop-livestock integration

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Research is in the 9th year at the University of Florida's North Florida Research and Education Center in Quincy to evaluate the impact of sod-based rotation under conservation tillage on cotton and peanut and cotton yield and quality. Perennial grass such as Bahia (Paspalum notatum Flugge) in rotation with cotton and peanut has shown positive impact on crop yields and economics. It also has positive effect on pest/disease reduction as compared to conventional rotations. Irrigated peanut in sod-based rotation yielded higher than the one in conventional cotton-cotton-peanut rotation; under no irrigation, both cotton and peanut had higher yields. Therefore, especially under no irrigation, sod-based system mitigated water stress improving yield and water-use efficiency. The sod-based rotation gives benefits above conservation tillage; crop/sod-livestock integration seeks to close nutrient cycling within the system, improve soil microbial activity, and increase soil organic matter through carbon sequestration. While preliminary data on the success of such systems in supporting some ecosystem services has been fairly documented, the mechanisms generating these benefits within the systems require more attention in order to clearly identify the value of these services. The impact of conservation tillage under both conventional and sod-based rotations on ecosystem services will be discussed. Relationships between management practices and provisional/regulating/supportive services these diversified systems provide will be emphasized.

2

Water Quality Impacts of Shifting towards a Corn Dominated Agricultural Watershed

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The South Fork of the Iowa River covers about 780 square kilometers (193,000 ac) and is one of 15 benchmark watersheds of the USDA Conservation Effects Assessment Project (CEAP). The watershed is dominated by potholes and artificial subsurface tile drainage needed to drain the hydric soils which cover 54% of the watershed. The South Fork watershed is 85% agricultural land with mainly either corn (Zea mays L.) or soybean [Glycine max L. (Merr.)]. The water quality has been impacted negatively by two recent changes, (1) the expansion of corn production and (2) the shift from soybean rotation to continuous corn. This shift towards corn cultivation is a result of the recent emphasis on renewable biofuels, in particular ethanol. In 2000, the entire watershed was 44% corn and 41% soybean, since then the disparity has grown and the maximum difference is seen in 2007 when the watershed was 59% corn and 21%

soybean. This study uses SWAT/APEX to track changes in water quality due to expansion of corn production and the increased fertilizer applications resulting from continuous corn practices. Furthermore, some areas could see a switch to total corn production to meet federal ethanol production goals. This scenario was also simulated to show the impacts to water quality from large-scale expansion of corn cultivation.

3

Reducing Hay Feeding on the Southern Coastal Plain

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Feed costs are the single greatest expense incurred by livestock producers. In October 2007, a long-term demonstration project was begun on approximately 18 ha of diverse forages at the Jimmy Carter Plant Materials Center (JCPMC), Americus, GA. The primary goal is to demonstrate the potential for year-round grazing on the southern Coastal Plain. The grazing area of diverse forages is divided into seven pastures with permanent fence which are further divided with poly-wire. Twenty-two Angus beef cows have been on the system since March 2008, and two 100 percent calf crops have been produced. Calf average daily gain was approximately 1 kg during the first year, and 1.3 kg during the second. Cow body condition score has never been below 4 at any time during the demonstration. Forage availability is closely monitored and the herd moved as needed. Stockpiling of bermudagrass and tall fescue, and improved utilization of cool-season annuals by increasing stocking density should reduce hay feeding to less than 45 days during the winter of 2009. Crude protein has ranged from 9 to 23 percent, and digestible organic matter from 63 to 70 percent. Although we are less than 2 years into the project, it appears that hay feeding by the average cow-calf producer in the Coastal Plain can be significantly reduced by making relatively minor adjustments to their grazing system.

4

Living Snow Fence Payment Calculator: Research and Assess the Farmer and MN-DOT Economic and Environmental Costs and Benefits of Living Snow Fences including carbon impacts

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Eco-system services can include many land practices that protect/enhance natural resources or benefit the community. Identifying what types of incentives landowners are willing to accept to adopt eco-system land practices is critical to the establishment and the acceptance of these services.

Blowing and drifting snow on Minnesota's roadways is a transportation efficiency and safety concern. Establishing standing corn rows and living snow fences improves driver visibility, road surface conditions, and has the potential to lower costs of road maintenance as well as accidents attributed to blowing and drifting snow. An added benefit includes sequestering carbon while avoiding the carbon emissions of snow removal operations.

In recent years the Minnesota Department of Transportation (Mn/DOT) has paid farmers to leave standing corn rows to protect identified snow problem roadways. They have paid farmers $1.50 per bushel above market rate. This payment may not be sufficient incentive for leaving standing corn rows.

This project will: 1) develop a calculator to estimate payments for farmers that will include consideration of safety and snow removal cost savings; 2) estimate potential income from carbon payments; 3) working closely with Mn/DOT engineers and plow operators, estimate the safety and snow removal costs and carbon emissions avoided by Mn/DOT through establishing living snow fences; and 4) evaluate farmers' willingness to establish living snow fences and identify farmers/landowners constraints to adoption. This data will be provided to Mn/DOT to assist them in their decision making related to their Living Snow Fence Program.

5

Ecosystem Services of Narrow Base Terraces: Part 3 of 3 Agricultural and Landscape Modeling

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Narrow based terraces are permanently vegetated earthen berms constructed perpendicular to the slope to prevent rapid runoff of rainfall and control erosion of topsoil. Unfortunately, spacing between terraces is fixed, and as a result, terraces installed twenty years ago are not compatible with today's larger farming implements.

The University of Wisconsin Platteville's Pioneer Farm is quantifying multiple ecosystem services provided by narrow-based terraces and exploring alternative conservation practices to decide the future of these terraces on the farm. This project is multidisciplinary and includes: surface-water monitoring, surface and groundwater modeling, and surveys of nesting birds, small mammals, and vegetation. Here we present the results of groundwater and agricultural modeling.

Agricultural management practices can have a significant impact on runoff, erosion and sediment load as well as crop yield and nutrient loads. The choice of which management practices to use may be influenced by the need to maintain good water quality. Given the potential non-linearity of the effects of management practices it may be difficult to determine which practices to use. Precision agricultural modeling can provide great benefits to understand the effects of management practice. The Precision Agricultural Landscape Modeling System (PALMS) was calibrated a field on Pioneer Farm by manipulating hydrological parameters and validated against the observed data on the adjacent field, using the calibrated parameters. PALMS was then used to simulate the effects of changing a number of practices such as conservation practice, tillage, vegetation type and manure and fertilizer application. The effects were indeed non-linear and depended also upon antecedent and meteorological conditions. The results showed that while conservation practices often reduced runoff and erosion at higher rainfall intensities, they sometimes increased them at lower intensities.

6

Inundation influences on bioavailable phosphorus in restored wetland sediments

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Agricultural surface runoff carries high nutrient loads to downstream receiving waters contributing to eutrophication. Used as part of best management practice efforts, restored

wetlands can intercept non-point source nutrient pollutants before entering downstream aquatic systems. Due to the lack of information documenting sedimentary sorption and desorption of phosphorus during typical inundation cycles in primary aquatic systems associated with agriculture of the Lower Mississippi Alluvial Valley, this study seeks to quantify field sediment capacity to mitigate phosphorus. A restored wetland cell in Coldwater, Mississippi was subjected to increased agricultural runoff through a simulated storm event. Water extractable phosphorus (Pw), was monitored during the storm event as well as following the experiment in an inflow to outflow stratified manner. Preliminary data shows significant relationships between inundation and the amount of Pw desorbed from drainage sediments. Pw concentrations, at the most inundated site, significantly decreased over a 6 hour period (700m from inlet; r2=0.744; p=0.02). In contrast, the least inundated site (often dry) had a slight increase in Pw concentrations with time (100m from inlet; r2=0.11; p=0.45). Post manipulated flow (24h-5 months) sediment sampling show similar patterns of Pw concentration availability. This research puts forward preliminary data on how inundation with increased hydraulic residence time, in drainage systems associated with agriculture, can decrease the total bioavailable phosphorus in drainage sediments. This decrease in bioavailable phosphorus, with time, could reduce equilibrium phosphorus concentration and thus create drainage sediments acting as phosphorus sinks at lower water column phosphorus concentrations.

7

Using the Vested Interest Perspective to Examine Public Involvement in Watershed Management: An Exploratory Factor Analysis

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Advancements in technology and improvements in information dissemination related to natural resource management have led to increased public involvement in management practices. A new awareness of the need to involve the public in resource management at an ecosystem level is evident in the current literature. Although many researchers have studied the role of vested interest as it applies to public involvement in resource management, few have examined the dimensionality of the vested interest concept. This study sought to identify latent measures of vested interest using exploratory factor analysis.

A survey of 1190 residents of the Muskingum Watershed Conservancy District (MWCD) in Ohio was used to examine public interest in watershed management planning activities. Participants were asked to respond to questions designed to measure public attitudes towards MWCD practices, frequency of resource use, and awareness of watershed development planning activities. A theoretical model representative of the vested interest perspective was constructed using elements of risk perception and social exchange theories. Three latent constructs that relate to vested interest - (1) perceptions related to support or success of management efforts; (2) use of facilities or dependency on land within the conservation district; and (3) willingness to pay for services - were extracted using factor analysis.

Results suggest there may be utility in applying a path model that incorporates a multi-dimensional vested interest variable. By incorporating more-diverse measures of the vested interest perspective, future researchers should gain a better understanding of how the vested interest perspective functions within the predictive model for public participation.

8

Implementing Conservation Policy: How Important Is the Agency in Determining Policy Outputs?

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Water pollution policy has increasingly come to focus on nonpoint source (NPS) pollution in the United States following the success of point source regulation. Agriculture is the largest source of NPS water pollutants and is a target of public pollution policy and considerable academic research. Literature assessing the implementation of existing agricultural NPS programs is scarce. This research seeks to document the implementation of the Environmental Quality Incentives Program (EQIP) and generates an understanding of how Congressional legislation is translated to program form and the factors that affect this process. In-depth interviews with Indiana's Natural Resource Conservation Service (NRCS) staff were used to investigate the implementation process. Conclusions from the interviews highlight ways in which Congressional intent is interpreted at the state level and how state-level needs and concerns influence policy implementation. These findings serve as preliminary evidence for a nationwide survey of NRCS staff that will be conducted in Fall 2010. Findings from the overall study will provide evidence to inform how future Congressional directives are translated to the program level.

9

North Central NRCS & IPM Working Group: Grower Incentives for IPM

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The North Central NRCS & IPM Working Group: Grower Incentives for IPM is a partnership between National Resources Conservation Services (NRCS) personnel and Integrated Pest Management (IPM) specialists representing all North Central states. The group's goal is to increase adoption of IPM through participation in conservation programs administered by NRCS. Working group members convene via monthly conference calls to identify high priority challenges faced by NRCS, IPM specialists and growers. Accordingly, the group organizes activities and develops tools and resources to overcome these challenges.

Since 2006, the working group has developed/adapted essential resources such as IPM elements and guidelines for fruit and field crops specific to the North Central region, a guide to creating IPM elements and guidelines and a training session to assist NRCS in writing effective pest management plans for the Environmental Quality Incentives Program (EQIP). Additionally, North Central states such as Ohio have effectively utilized mini-grants from the working group to work with state NRCS personnel to introduce cost-share rates for growers in categories such as general vegetable IPM, sweet corn IPM, tree fruit IPM and strawberry IPM.

In 2010, the working group plans to expand their efforts to a national scale, collaborating with IPM Centers, NRCS and other regional working group to assist all growers desiring to adopt IPM through NRCS programs such as EQIP, Conservation Activity Plans and the Conservation Stewardship Program.

10

Using NRCS Practice Standards to Crosswalk to Organic

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Organic farmers face the same resource concerns as non-organic farmers. Heavy reliance on tillage leads to loss of organic matter, soil erosion, and poor soil quality. The 2008 Farm Bill includes provisions supporting transition to organic agriculture and tailoring conservation activities to organic production. Organic farming is finding its place in USDA programs administered by the Natural Resources Conservation Service (NRCS). NRCS assistance for organic farming is increasing, giving conservation planners an opportunity to promote the Agency's resource protection objectives to this new audience. Training to increase their ability to provide competent technical assistance to organic farmers is needed.

NRCS assistance to the organic community is based on its conservation planning process to identify conservation practices that solve resource concerns at the field level. An emphasis on integrating conservation activities with the National Organic Program (NOP) rules raises two questions that conservation planners face as they provide assistance to organic farmers:

1. What are the differences between a specific NRCS practice standard and its related NOP standard?
2. How are NRCS practice standards used to assist growers that are already in or transitioning to organic production?

Conservation practice comparison sheets answer these questions by directly comparing the NRCS and NOP standards. They provide examples to show how NRCS practice standards can work in harmony with organic certification, while achieving NRCS resource protection goals. These comparison sheets are used for field staff training on crop rotation, cover crops, and nutrient and pest management to help farmers crosswalk to organic production.

11

Factors Affecting the Testing of Manure Transported Off the Farm

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Manure testing allows farmers to apply the appropriate amount of nutrients for crop growth and also reduces water pollution caused by excess nutrients. The adoption of manure testing for manure that is applied on other farms has not been examined in the literature.

A survey of 3000 Iowa and Missouri farmers with animal feeding operations was conducted in the spring of 2006. Respondents who answered yes to the question of whether they provided manure to other farm operations or individuals in the past two years comprised the subset for this study. The
dependent variable was whether either they or the farmer receiving the manure tested it for nutrient
content before applying it.

Those with off-farm income levels of $0-$9,999 and $25,000-$49,000 were significantly less likely to test manure than the base category of no off-farm income. Those with education of less than high school level were more likely to test manure than the base category of high school degree which is contrary to expectations. Having a contract regarding manure transfers, the buyer paying for the manure, and longer distance between the farms were found to have a positive and significant influence on manure testing. Manure from farmers who only had liquid manure was more likely to be tested than from those who had solid manure, which may be due to the variability in water content of liquid manure.

12

A GIS Based Decision Support Tool for Assessing Carbon Sequestration and Other Ecosystem Services

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A GIS web server decision support tool has been developed for the Southwest Regional Carbon Sequestration Partnership that allows of assessment of carbon sequestration and other ecosystem services associated with implementation of a carbon sequestration management programs. The tool makes use of a GIS interface to allow users to select an area of interest for examining carbon sequestration management alternatives in a spatially explicit manner. The Agricultural Policy Environmental eXtender (APEX) model is used as the core engine for assessing carbon sequestration, erosion, plant growth, and water quality on agricultural lands. SSURGO and STATSGO data are used to parameterize soil information. Weather data for the model can be generated or extracted from interpolated daily climate data provided by NOAA for the period of 1948 to present. Users are allowed to select baseline management practices and alternatives for carbon sequestration. The tool contains a routine for delineating land surfaces into sub-watersheds based on slope position and elevation that allows sub-watersheds to be delineated within the field of interest by the user. The inclusion of this routine will allow a more refined representation of water movement and management in the area of interest, thus allowing the user to define carbon management practices based on slope position. The tool also contains routines for mapping output, data visualization, and reporting in a spatially coherent manner and provides a framework for quantifying carbon sequestration and other ecosystem services that can be used by landholders, aggregators, service agencies (NRCS), and policy makers.

13

Ecosystem Services of Narrow Base Terraces: Part 1 of 3 Surface-Water Quality

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Narrow base terraces are permanently vegetated earthen berms constructed perpendicular to the slope to prevent rapid runoff of rainfall and control erosion of topsoil. Unfortunately, spacing between terraces is fixed, and as a result, terraces installed twenty years ago are not compatible with today's larger farming implements.
The University of Wisconsin Platteville's Pioneer Farm is quantifying multiple ecosystem services provided by narrow-based terraces and exploring alternative conservation practices to decide the future of these terraces on the farm. This project is multidisciplinary and includes: surface-water monitoring, surface and groundwater modeling, and surveys of nesting birds, small mammals, and vegetation. Here we present the results of surface-water monitoring efforts. Surface-water runoff gauging stations were installed at Pioneer Farm in cooperation with the United States Geological Survey to monitor quality and quantity of runoff from five agricultural basins where narrow base terraces are installed. Runoff was sampled year-round over a five year period. Samples were analyzed for the following: total solids, total suspended solids, nitrate

+ nitrite N, ammonium, total keldahl nitrogen, total phosphorus- dissolved filtered, and total phosphorus- unfiltered.
Results indicate that narrow base terraces as part of our overall conservation program resulted in low nutrient and sediment yields. For example, annual yields ranged from 63 to 1,700 kg ha-1 for total solids, 1.7 to 10.4 kg ha-1 for total nitrogen, and 0.9 to 2.8 kg ha-1 for total phosphorus. Statistical analyses indicate that basins are calibrated and will be useful for evaluating conservation alternatives to narrow base terraces using a paired-basin approach.

14

Switchgrass and Pecan Biochar Amendments to a Sandy Coastal Soil

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Sandy soils of the wet, warm SE Coastal Plain have poor physical characteristics and low carbon contents. To improve soil properties, we added switchgrass (Panicum virgatum) and non-activated pecan (Carya illinoinensis) biochar. Switchgrass was ground to a fine powder and added to soil at rates of 0 or 20 ppm; soil was the Ap horizon of a Norfolk loamy sand, a thermic Typic Kandiudult. Biochar was developed by pyrolyzing ground pecan shells at 1300Â°F. Biochar had 88% C, 0.4% N (C:N ratio 220:1); 58% of its C resided in recalcitrant polymerized aromatic ring structures. Biochar was added to switchgrass treatments at rates of 0, 5, 10 or 20 ppm. Treatments were incubated in 1.7 lbs of soil in PVC columns for 70 days at 10% (w w-1) water content. Both biochar and switchgrass amendments decreased soil penetration resistance and improved water retention. They also affected aggregation, infiltration, and water holding capacity; but results were mixed. Switchgrass and non-activated biochar amendments can be used to improve soil physical characteristics; switchgrass amendments were not expected to last more than a year while the recalcitrant biochar should last much longer.

15

New Tools to Assess Risk of Nitrogen Loss to the Environment

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Many scientific reports on agricultural nutrient management have shown that excessive nitrogen inputs can lead to increases in nitrogen losses to the environment. Better nitrogen management has been identified as a potential approach to reducing the risk of nitrogen movement from the field to the environment. New, robust nitrogen tools that can be used in the nutrient conservation planning process were developed by ARS in cooperation with NRCS and other cooperators. These tools can quickly generate a field-scale analysis using information that can easily be obtained during a farm visit. The new Tier One 2010 Nitrogen Index and Tier Two Nitrogen Environmental Losses Analyses Package (NLEAP-GIS) have recently been developed. These tools will be available for download from the internet in 2010. The results from a upcoming book titled Advances in Nitrogen Management for Water Quality, describing how these tools can be used to assess nitrogen risk, will be presented in this paper. Additionally, a nitrogen risk assessment showing results from analyses of nitrogen management from the Northeast, Midwest, Mississippi Delta, the irrigated West, and Pacific Northwest, will also be presented. These results and analyses show that these new tools can potentially be used to assess the risk of nitrogen loss across these regions and provide information that can help nutrient managers increase nitrogen use efficiencies and improve nitrogen management.

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Herbicide Transport to Surface Runoff on Claypan Soils: Scaling from Plots to Fields

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The offsite movement of herbicides into streams and lakes is a serious non-point source pollution problem. Claypan soils, which have a significant runoff potential because of low permeability, are especially susceptible to soil and herbicide losses. Previous plot scale (0.92 ac) monitoring showed that herbicide losses from a corn-soybean rotation under a no-till tillage system without any incorporation were higher than from a mulch tillage system with incorporation. Exponential models that calculate average event herbicide concentrations as a function of application rate, runoff volume, days after application, and cumulative temperature had been developed using plot scale data. Model proportionality coefficients for the no-till system were four to five times higher than for the mulch-till system. The objective of this study was to extend these results to the field scale. Two fields (85 and 19 ac) were instrumented during 1997-2001, and runoff and associated herbicide losses were measured during each runoff event. The applicability of the exponential model was tested at the field scale. The models developed at plot scale performed well in calculating atrazine concentrations at field scale, as indicated by r2 and the Nash-Sutcliffe efficiency greater than 0.7 and 0.64, respectively. These findings indicate that the results obtained on replicated plots can be extended to the field scale. They confirm that, on claypan soils, not incorporating herbicides, as would be done in a no-till system, leads to significantly higher herbicide losses. The challenge is to find a management system that keeps herbicides in the soil when no-till is employed.

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Utilizing Mobile Computing Technologies and GIS for Monitoring the Biological Recovery of Streams Remediated for Acid Mine Drainage

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Mobile computing technologies when used in conjunction with global positioning systems (GPS) and Geographic Information System (GIS) applications have been shown to greatly increase the efficiency, accuracy, and productivity of field data collection. Comprehensive stream assessment requires various types of data. Combined with habitat assessments, hydrological investigations, and knowledge of land use, aquatic macroinvertebrate surveys provide a comprehensive diagnostic assessment of impacts affecting biological health in aquatic systems. This poster presentation will address lessons learned by Office of Surface Mining (OSM) personnel while utilizing various mobile computing devices and GIS software to collect and analyze comprehensive stream assessment data.

Several aquatic bioassessments were conducted to assess changes in the biotic integrity of streams impacted by acid mine drainage (AMD) which have undergone remediation by the installation of passive treatment systems. Mobile computing devices and GIS software were used to record and organize water quality data, physical stream characteristics, and initial biotic factors as well as delineate stream reaches and AMD sources. Photographs of stream reaches were taken using an imbedded digital camera which instantly linked images to their corresponding GIS feature simplifying the ability for future habitat assessment review. ESRI

ArcGIS Quick Forms were produced to increase data collection efficiency. Data was instantly stored into GIS formats simplifying analyzes in and out of the field. With adequate preparation, the GIS and mobile computing tools used for these projects proved extremely useful for accurate and efficient data collection, as well as saving valuable field navigation time.

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Ecosystem Services of Narrow Base Terraces: Part 2 of 3, Biodiversity

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Narrow base terraces are permanently vegetated earthen berms constructed perpendicular to the slope to prevent rapid runoff of rainfall and control erosion of topsoil. Unfortunately, spacing between terraces is fixed, and as a result, terraces installed twenty years ago are not compatible with today's larger farming implements.

The University of Wisconsin Platteville's Pioneer Farm is quantifying multiple ecosystem services provided by narrow-based terraces and exploring alternative conservation practices to decide the future of these terraces on the farm. This project is multidisciplinary and includes: surface-water monitoring, surface and groundwater modeling, and surveys of nesting birds, small mammals, and vegetation. Here we present the results of biological surveys.

Terraces were surveyed to determine species and abundance of birds using terrace habitat and specifically, whether nests within terraces resulted in successfully fledged young. Species and abundance of small mammals utilizing terraces was determined through mark-and-recapture trapping. Terrace vegetation was also sampled to determine species composition and both percent cover and vertical density.

Preliminary evidence indicates that terraces function as reproductive sinks due to the low number of nests that successfully fledge young. Species richness and diversity measures of birds using the terraces are low in comparison to native grassland habitats within the same geographic area. In contrast, species richness of small mammals on these terraces is comparable to native grassland habitats, although species diversity is lower. Species richness and diversity of terrace vegetation was also low and not comparable to native habitats. Additional findings will be presented to supplement these preliminary data.

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Improving Decision Making Related to Performance and Sustainable Management of Conservation Buffers

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Use of conservation buffers in agriculture has been promoted to reduce nutrient, sediment, and pesticide load to receiving water bodies. Much research has been devoted to the absolute mitigation efficiency resulting from conservation buffers. From the literature, the current scientific consensus is that conservation buffers may significantly reduce deleterious impacts to surface water from production agriculture. With the combined benefits to surface and groundwater quality, promoting the establishment and maintenance of conservation buffers is

important to the health of agricultural ecosystems. This research applies a probabilistic ecosystem service framework and tool for evaluating the economic potential of conservation buffers under varying ecological models, economic markets, and incentive programs in a model agricultural system. Using a combination of physical and economic models based on first principles, primary physical and economic processes are simulated inside a Bayesian network. The ecosystem service potential of a conservation buffer (evaluated in dollars) is presented as a distribution incorporating the marginal and joint probability distributions of the submodels. Components of the model include: carbon sequestration, nutrient load reduction, programmatic incentives, and productivity fluxes. Valuing ecosystem services as net cost/profit for a land manager, optimization of component submodels identifies potential economically sustainable equilibrium. In addition, economic endpoints can be evaluated under multiple combinations of ecological and economic process parameters.

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Evaluating Practices to Mitigate Nutrient Transport in a Tile-drained Subwatershed of the Mackinaw River, Illinois

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We evaluated effectiveness of outreach on implementation of best management practices (BMPs) and water quality improvement in experimental versus reference subwatersheds (4,000 ha) of the Mackinaw River. Land use was >80% row crop agriculture with extensive subsurface tile drainage. Outreach significantly increased implementation rates of grassed waterways, stream buffers, and strip-tillage throughout the experimental subwatershed. Seven years of monitoring revealed no significant changes in nutrients, total suspended solids, or hydrologic variables. Results suggest that the BMPs implemented during this study were bypassed by subsurface drainage tiles. We are currently testing the effectiveness of intercepting tile water using wetlands to reduce nutrient exports. Specific questions include: (1) watershed to wetland area ratio needed for wetlands to effectively retain tile water and reduce nutrients, and (2) optimum placement of wetlands on the landscape. We constructed 3 experimental wetland systems, each with 3 consecutive wetland cells that represent a wetland to watershed ratio of 3%, 6% and 9% per wetland system. Monitors measure water volume and nutrients as tile water moves through the wetland systems. Preliminary results suggest that wetland to watershed ratios of 3%, 6% and 9% will remove 18%, 34%, and 43% of nitrate nitrogen, respectively, and 43%, 55%, and 56% of orthophosphorus, respectively. Illinois State Water Survey is developing a hydrologic model to target where conservation practices will be most effective in the watershed. We will begin testing this model in our paired watershed sites in 2010. Additionally, we will coordinate teams of local farmers to assist in outreach efforts.

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Vegetated Agricultural Drainage Ditches: A New Conservation Practice Utilizing Current Landscape Features

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Historically, agricultural drainage ditches were viewed primarily as conduits to transport excess water from the production landscape. Vegetation in ditches was often burned or physically removed, serving no apparent useful function. Since 1998, extensive research has been conducted on the ability of vegetated agricultural drainage ditches to reduce pesticide transport to aquatic receiving systems. More recent research has focused on nutrient abatement in these unique landscape features. In field experiments, between 61-87% of measured pesticide residue was present in ditch plant species as opposed to being in the water or sediment. Additional studies in California determined a vegetated ditch was three times more efficient at mitigation of diazinon runoff than was an unvegetated ditch. Vegetated ditches also demonstrated 44-57% reduction in nutrient load transport over an intensive 2 year study in north Mississippi. The value and importance of maintaining ditch vegetation has been amply demonstrated. Culmination of these research projects has led to the development of Conservation Practice 607A (Vegetated Agricultural Drainage Ditch) currently used in California and Mississippi as Environmental Quality Incentive Program (EQIP) approved conservation practices. Challenging economic times will cause farmers and landowners to continue to look toward inexpensive, yet environmentally successful conservation management practices such as vegetated drainage ditches.

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A Web Based System For Providing Ranchers With Financial And Conservation Risk Management Tools

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Drought represents one of the greatest risks facing ranchers and resource managers of livestock. The objective of the Forage Risk Assessment Management System (FRAMS) project was to develop and evaluate the use of a web-based decision support system to assist producers in the complex decision making process pertaining to retaining or destocking livestock. FRAMS is an integrated online tool which combines ranch specific plant communities, soils, and weather data with livestock information, market conditions, and ranch level enterprise budgets. It incorporates several monitoring tools, including the Phytomass Growth Simulator (PHYGROW), Nutritional Balance Analyzer (NUTBAL), Near Infrared Reflectance Spectroscopy (NIRS) fecal sample analysis, an economic analysis sell/feed trade off tool, and a reproductive pregnancy rate calculator.

After an initial ranch visit and training session, participating ranchers can access the FRAMS website 24/7 to assess performance of free-grazing animals and forage conditions, explore keep and feed options versus destocking, and update ranch specific data such as precipitation and herd structure. Surveys from FRAMS participants indicated 92% of users accessed the system once a month or more. 85% believed that FRAMS impacted their knowledge base concerning livestock management practices during drought. If available at no cost or as a cost-share, 64% would consider using FRAMS on a regular basis. Based on these findings, FRAMS was extended through 2010 and expanded to include 30 ranches in seven states. In conclusion, FRAMS appears to be a viable drought decision support tool for livestock managers.

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Near-real time prediction of wildfire risk on grazing lands with the Burning Risk Advisory Support System (BRASS)

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The risk of wildfire on grasslands is directly related to the state and condition of current weather and vegetation variables within an ecosystem. The Burning Risk Advisory Support System (BRASS) is a decision support tool designed to provide land managers the ability to assess fuel and weather information in near-real time to aid in prescribed and wildfire management on grazing lands. The BRASS system is composed of two primary components: the Phytomass growth simulator (PHYGROW), and the burning risk model PHYRESIM, developed using the BEHAVE fire system tools.

Initially developed for the Livestock Early Warning System (LEWS) in Africa, the PHYGROW model "grows" the herbaceous vegetation (fuel) used to drive the PHYRESIM model daily. In addition, it provides estimates of current live herbaceous/live wood moisture, standing crop, and live wood production. By combining outputs from PHYGROW with NOAA daily weather data, PHYRESIM is able to construct a 7-day forecast of local burning conditions updated at 6 hour intervals.
Although based on established equations from the BEHAVE model, validation tests are currently being planned on Fort Hood, Texas, and the Apache-Sitgreaves National Forest, Arizona to observe how the daily custom fuels models from PHYGROW perform compared to actual burning conditions.
Understanding the risk of wildfire in a region can help managers coordinate objectives to mitigate the threat of wildfire on land and water resources, while also giving local leadership the tools to direct resources to problem areas. The BRASS system has the potential to provide essential data to managers.

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The Challenges of Implementing Conservation Tillage and Cover Crops in Clay Soils

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Conservation practices, such as reduced tillage and cover crops, can improve soil quality and increase soil moisture for crop production. Benefits to production, soil quality, and water conservation have been observed especially in areas with rapidly draining soils. While historically enjoying high rainfall levels, increasing use of irrigation over the past 10 years has resulted in declines in aquifer levels in the Mississippi Delta. We are interested in management practices that conserve soil moisture for crop growth during dry periods, improve soil quality, and potentially reduce the need for irrigation on the alluvial soils of the Mississippi Delta. We examined the impacts of tillage (subsoiling) and cover crop (winter wheat or rye) on soil moisture, electrical conductivity, and soil nutrients. Final yield and cotton fiber quality were determined for each production system and used to determine economic return. Irrigation improved yield in only one of the three years. The conservation production system showed the greatest response to water during this dry year. Cover crops had only a slight impact on SCI. While the conservation system showed a positive SCI, the improvement would only result in a $2.32 per acre per year payment. Conservation practices had inconsistent impacts on improving yield. However, excessive soil moisture during a wet spring interfered with good seed bed preparation and planting in plots with cover crops, resulting in poor plant stand and lower yield. Incentive payments to farmers to encourage use of conservation practices need to be examined for applicability to Delta soils and environment.

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SSURGO Vector-to-Raster Conversion Increases Data Utility and Processing Efficiency

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The SSURGO database, providing detailed soil attributes for the U.S., is widely used as an input to economic models designed to address national agriculture policy needs. SSURGO data are queried in a GIS environment at the full spatial extent to evaluate results for national-level policy questions. The native SSURGO format is vector (polygons), and although available as a seamless file, it consists of over 35 million polygons, presenting a challenge for GIS functional

expressions. A conversion of the SSURGO spatial data, from vector to raster (grid), was carried out to allow for the generation of national-level results in a GIS environment, in addition to regional analyses.
The raster-formatted SSURGO allows for substantial increases in processing efficiency, greatly improving ERS ability to integrate SSURGO data into economic models. Display speed is greatly improved allowing for national maps to be designed for individual soil properties, such as the National Crop Commodity Productivity Index (NCCPI) data. The SSURGO raster data have provided critical inputs to economic analyses that examine farmer behavior while controlling for variation in natural resource endowments. For example, measures of land productivity are used to help understand the factors driving the conversion of grassland to cropland.
The SSURGO raster has a 30-meter ground resolution, at the same spatial extent and resolution as the National Land Cover Database (NLCD), for the option of restricting coverage only to agricultural areas. The data are projected to an equal-area coordinate system to allow for area measurements. The dataset represents 98.7% of the map units from the vector SSURGO data, and covers approximately 99% of NLCD 2001 cropland, pasture and hay.

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Toxicity of Silicon Carbide Nanowires to Sediment-Dwelling Invertebrates in Water or Sediment Exposures

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Silicon carbide nanowires (SiC) in aquatic environment would likely accumulate in sediment. Tests assessed toxicity of sonicated or non-sonicated SiC in water for 48 h and to sonicated SiC in whole-sediment for 10 d. Also 96 h tests were done with midge, mussels, and oligochaetes exposed to sonicated SiC in water. Mean 48-h survival of amphipods exposed to non-sonicated SiC (83%) was not significantly different from the control (90%). Mean 48-h survival of amphipods exposed to sonicated SiC (0 and 15%) was significantly different from the control survival (90 and 98%). No mortality was observed in tests with midge, mussels, or oligochaetes . Amphipods mean 10-d survival (80%) with sonicated SiC mixed in the sediment or layered on the sediment surface was not significantly different from the survival in control (88 and 93%). The biomass of amphipods exposed to sonicated SiC mixed in the sediment was reduced significantly relative to the control. Amphipods biomass was even more pronounced with SiC layered on the sediment surface. The SiC were observed on the surfaces of test organisms and in their digestive tract, indicating that physical smothering of respirator surfaces or blockage of the digestive tract may contribute to the toxicity of amphipods in water or sediment exposures.

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Performance of Warm Season Grass in Riparian Zones

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Native warm season grasses are a potentially important component of riparian buffers. There is a need to determine the suitability of selected warm season grass species for use in riparian buffers where occasional flooding can occur. In a previous greenhouse pot experiment,

potential candidates of warm season grasses were identified for their ability to extend their roots into saturated soil. To verify the results, this study was conducted in actual field locations in New York, Pennsylvania and Maryland with high soil water tables or periodic flooding. Nine warm season grass cultivars of the following species were included in this study: big bluestem, switchgrass, indiangrass, prairie cordgrass, and eastern gamagrass. Each plot consisted of three rows planted on 30 cm centers of individual plants started in the greenhouse with the rows perpendicular to the stream bed. Survival, growth, vegetative vigor and yields were evaluated for three years of the study. The nine cultivars were averaged across the four locations and ranked. 'Red River' prairie cordgrass, 'Meadowcrest' eastern gamagrass, 'Hightide' switchgrass and 'Shelter' switchgrass consistently performed the best for survival, vigor and biomass production. 'Suther' big bluestem and 'Osage' indiangrass were intermediate, while 'Niagara' big bluestem, 'Suther' indiangrass and 'Bonilla' big bluestem were consistently the lowest ranked cultivars. Flooding tolerance determined in the greenhouse study did a reasonably good job in predicting performance under riparian conditions in the field. However, enough difference existed between the greenhouse and field results to recommend the need to verify results with field studies before recommending cultivars for use in riparian zones.

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Assessing Ecosystem Services Using the National Resources Inventory (NRI)

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Findings from the 2007 National Resources Inventory (NRI) are now available for the conterminous 48 States to help improve understanding of natural resource status, conditions, and trends on the Nation's non-Federal land. Conducted by the USDA Natural Resources Conservation Service in cooperation with the Iowa State University Center for Survey Statistics and Methodology, the NRI is a statistical survey whose primary purpose is to support agricultural and environmental policy development and program implementation. The NRI provides nationally consistent statistical data that support analysis of resource trends on rural and developed land over all regions of the United States since 1982. It provides information for addressing a broad range of natural resource issues, including land use and development, soil erosion, and wetlands. Linkages to NRCS soils data provide a unique capability for spatial as well as temporal analyses.

Data from the 2007 NRI show trends in land use, including use and extent of agricultural land and development of rural non-Federal land. The data show the dynamics of land-use change within agricultural uses and between agricultural and nonagricultural uses. Also presented are trends in soil erosion both by water (sheet and rill erosion) and wind, including erosion in relation to soil loss tolerance (T), as well as trends in the extent of wetlands.

NRI data show not only the current condition of natural resources on agricultural landscapes but also changes over time and place. These data are thus valuable sources of information that can help describe current and historical conditions and recent (25-year) trends in changes to, and assess ecosystem services provided by, agricultural landscapes.

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Emiquon nutrient dynamics: an examination of wetland and former wetland soils following 80+ years of agriculture

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Soil C content and nutrient dynamics are important factors to developing plant communities and can be altered by moisture regimes. This study examines C dynamics at Emiquon, a large-scale wetland restoration project along a major river system following soybean/corn cultivation for 80+ years. At Emiquon are two former wetlands of differing ages (50 and 1,000+ years) prior to cultivation. As a comparison, wetland and agriculture sites of similar soil types to Emiquon were examined. Composite cores from 0-10, 10-25, and 25-50 cm depths were taken, analyzed for bulk density, total and resistant carbon and nitrogen, and incubated for nitrogen turnover for 30, 60, and 120 days. Organic C, total C and N content, and C:N ratio differed between sites. All were lowest in agriculture, followed by the younger then older former wetland, and greatest in current wetland soils. This was observed at all depths and when summed to 50 cm. Resistant C and N followed this trend except at 10-25 cm where RC was highest in agriculture followed by the younger former wetland. Nitrogen mineralization, nitrification and percent nitrification were significantly higher in former wetland soils following 60 and 120 days. After 120 days, N mineralization in the younger former wetland was significantly greater than the older former wetland with the reverse for nitrification and percent nitrification. Results suggest that nutrient content and nitrogen turnover currently differ between former wetland sites and among land-uses. Further investigation is needed to evaluate whether differences are associated with soil type, topography or moisture.

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A Rapid, Cost-Effective, And Greener FDA Method For Soil Quality Analysis

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The total microbial activity of soils provides a general estimate of soil organic matter turnover. Fluorescein diacetate (FDA) hydrolysis is a relatively simple method of evaluating enzyme activity associated with soil organic matter decomposition. Current FDA methods use relatively large volumes of either acetone or chloroform-methanol to terminate the hydrolysis at a specific time. These procedures produce significant quantities of hazardous waste. Our objective was to minimize the quantity of hazardous waste while reducing cost. Soils representing a wide range of fluorescein absorbance values were evaluated in a series of experiments involving selected mixtures of chloroform and methanol. A chloroform-methanol mixture was added to terminate the reaction since in soils with low microbial activity a decrease in fluorescein absorbance may occur when acetone is used. However FDA still needs to be dissolved in a small amount of acetone. In the reported modified FDA assay the amount of acetone was reduced by more than 80 percent compared to other published methods. Only 0.1 mL of chloroform per g of soil

without any addition of methanol appeared to be enough to stop the hydrolysis of FDA instead of 7.5 mL of chloroform-methanol (2:1 v/v) per 1 g of soil as in previous chloroform-methanol methods. The proposed method reduces hazardous waste and cost for estimating total soil microbial activity while allowing measurements of low activity soils.

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Use of Models in Assessing the Impact of Cropping System, Land Types and Suitability on Land Degradation in SouthWestern Nigeria

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Two sites (Apomu and Alabata) measuring 10 ha and representing rainforest and savannah agro-ecological zones, respectively in South Western Nigeria were chosen to evaluate the influences of cropping system, suitability and land types on the degree of land degradation. Multiple linear step-wise forward elimination regression was use to measure the interrelationships of the land parameters measured. The result using the model Y = 0.99 - 0.21CS + 0.10LT + 0.36S showed that for Apomu, the cropping system contributed 30% to the degradation as indicated by bulk density. Organic matter, conductivity and land suitability contributed more than 15% in terms of bulk density and permeability while land type contributed 17.5 and 2% of the degradation due to permeability and organic matter respectively. At Alabata, the model that best describes the relationships is Y = 0.17 + 0.09CS + 0.23LT + 0.31S. Cropping system contributed 10-12% degradation while land type contributed between 6.5 - 17.3% due to organic matter content, ESP, exchangeable K and bulk density. Land degradation models were also developed for each nutrient based on the cropping system, suitability and topographic land types. Appropriate cropping system for defined soil / land types to minimise land degradation were recommended.
Keywords: land degradation, cropping system, land type, model and suitability

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Soil Change Comparison Study Integrated with Ecological Site Inventory in Southern Coastal Plain Longleaf

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In Calendar Year 2010, Georgia will complete a comparison study using the procedures of the 2008 publication Soil Change Guide: Procedures for Soil Survey and Resource Inventory, Version 1.1. Work will be performed in conjunction with Ecological Site Inventory on Southern Coastal Plain (MLRA133A) Longleaf Pine/Wiregrass plant communities. The reference state for this proposed Ecological Site Description (ESD) is an open savannah-like landscape with a very diverse understory of herbaceous and grass plants. Frequent fire was the controlling factor in historical times. The comparison will be between forest and pasture land uses on longleaf/wiregrass ecological sites occurring on Tifton soil series of capability class I or IIe. This work builds on experience in developing an ESD for Atlantic Coast Flatwoods (MLRA153A) Longleaf communities. Integrating ESD's and soil comparison studies is a current issue in future directions of NRCS inventory work. The proposed poster will discuss the experience of this integration and lessons learned from doing so.

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Conservation Tillage Improves Soil Physical Properties on Different Landscape Positions of a Coastal Plain Soil

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Changes in soil physical properties due to landscape position can considerably affect crop management strategies and environmental impacts. Better understanding of the spatial variability of soil physical properties, and its relationship with different soil management strategies, can help in developing improved management strategies. In order to have a better understanding of these relationships on a Coastal Plain soil, a study was established to determine the effect of management practices and landscape variability on soil physical properties (infiltration, aggregate stability and total C) of a 9 ha (22 acre) field located in Central Alabama. Three zones were identified in the field (summit, backslope and accumulation) using elevation, electrical conductivity and traditional soil survey data. Conventional tillage, with (CTM) and without manure (CT), was compared to conservation tillage, with (RTM) and without manure (RT), on a corn (Zea mays L.)-cotton (Gossypium hirsutum L.) rotation. In general, infiltration, aggregate stability and C content were lower with CT. Manure application increased (P â‰¤ 0.01) C content 62% when applied to CT, and 39% when applied to RT. Infiltration was greatest on the summit [14.5 cm/h (5.7 in/h)], followed by backslope and accumulation zones [8.6 and 7.1 cm/h (3.4 and 2.8 in/h), respectively]. No significant difference was found for aggregate stability (P = 0.69) and soil carbon (P = 0.39) between zones. Six years of conservation tillage improved infiltration and increased soil C content, however manure has only increased soil C content of this Costal Plain soil.

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Remediation of Urban and Industrial Soils Contaminated with Pesticides by Supercritical Extraction

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The main goal of this work is to carry out a study on the applicability of the technique of extraction with supercritical carbon dioxide to the removal of pesticides from contaminated soils and also to conclude about its ability to process ordinary urban soils that may be contaminated in the future. The existing contaminated soils come from a soil yard of a company, presenting non-negligible levels of atrazine, DDT, and some traces of other contaminants.
In order to optimize the procedure and to be aware of the remediation efficiency of the process, we have performed some preliminary experiments. These experiments consisted in the preparation of solid matrices of sand of different granulometries, which was impregnated with atrazine and submitted to a batch process of extraction with supercritical carbon dioxide. The experiments were carried out at 40ÂºC and 21,5 MPa, being the extraction time of two hours. The extracts and feeds content were analysed by High Performance Liquid Chromatography (HPLC), which was implemented for the two solvents used: methanol and acetonitrile. The main conclusion that can be withdrawn from this preliminary experimental work, independently of its preliminary character, is that extraction with supercritical carbon dioxide is an effective technique for the decontamination of soils with pesticides, having attained a recovery of atrazine between 96 and 98.8 %.
We have also adapted our system in a way to be able to work in a semi-continuous mode and are currently applying into real contaminated soil samples of the company yard and of pesticide impregnated soil matrices from an urban area.

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Canadian Agri-Environmental Indicators for Nitrogen

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With increasing amounts of nitrogen (N) being added to farmland, there are concerns regarding its possible negative impact on the environment. An optimal balance between N requirements for production versus efficient N use is required, so as to minimize N losses from the agricultural system.
The Residual Soil Nitrogen (RSN) Indicator and the Indicator Risk Of Water Contamination by Nitrogen (IROWC-N) were developed to identify agronomic regions which are at risk to N leaching from 1981 to 2006. RSN is the amount of nitrate nitrogen that remains in the soil at the end of the growing season, whereas IROWC-N is an indicator which links RSN to climatic and soil conditions to assess the likelihood of N moving through the soil and out of the agricultural system. The IROWC-N results are assessed in terms of both the nitrate N lost via leaching and the N concentration in the leached water.
The Canadian average RSN estimates increased gradually from 9.3 to 17.7 kg N ha-1 during the 1981 to 2006 period, with an exceptional peak (25.0 kg N ha-1) in 2001. The average amount of N lost in Canada ranged from 2.1 to 2.6 kg N ha-1 from 1981 to 2006. During the same period, estimates of N concentration in the drainage water increased from 2.2 to 5.3 mg N L-1. The national aggregated IROWC-N index, which represents the proportion of farmland in various risk classes, was low, increasing linearly from 6.7 to 10.6.

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Optimum planting date for rye cover crop in Massachusetts: a spatial analysis

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Delay in planting cover crops can dramatically reduce nitrogen (N) uptake and recovery. Evaluating the loss of N accumulation is critical to the farmer who has to decide the planting date based on completion of corn harvest, suitable weather conditions and time availability for fall manure application. The objective is to determine N accumulation by a rye cover crop based on planting date throughout the state. Field experiments were conducted during 2004 and 2008. Rye cover crop was planted in 6 planting dates in fall from late August to early October at weekly intervals. Rye biomass and total nitrogen was measured several times from planting date to the end of the year and in spring. Weather data and cover crop sampling data were used to develop a model for estimating biomass and N accumulation from growing degree days (GDD). Using a non linear model based on elevation and long term weather data from 14 weather stations, total accumulated GDD and then biomass production and N accumulation were calculated for all locations in the state. This was repeated for each planting date from August 25 to the end of the year. This spatial model is a powerful tool for evaluating the effect of the rye planting date on rye growth and N accumulation. Cover crop growth and N accumulation was reduced exponentially as farmers delay planting date. Using this spatial model an optimum planting date can be estimated based on farmers' preferences and practical limitations in the region.

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Root Mass of Tillage Radish Grown on a Hardpan Soil

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Soil compaction is a major resource concern in coastal plain soils where the hardpan can develop annually due to the sand particles re-consolidation after heavy rainfalls and by vehicular traffic. Farmers are using subsoiler shanks every spring to alleviate soil compaction and to eliminate the hardpan that restricts root growth and water infiltration. Disturbing the soil too often with tillage implements will reduce soil quality and contributes more greenhouse gas emission to the atmosphere.
On other soils, tillage radishes have been proposed to alleviate soil compaction without disturbing the soil profile. These radishes are planted after the main crop harvest as cover crops, and will grow 8" - 14" deep into the soil and have 1" - 2 " diameter roots.
Test plots were established in late September of 2009 at the Pee Dee Research Center at

Florence, SC to explore the capabilities of these radishes to penetrate the root inhibiting hardpans of coastal plain soils. Treatments in the study were radishes planted with and without paratill subsoiling. Radishes were planted in 7.5" wide rows with a grain drill. Data collection included root biomass and length at approximately 60, 90, 120, and 150 days after planting. Results of this study will help determine whether using Tillage radishes instead of tillage implements can improve soil quality, reduce fuel use, and increase profitability of crop production in South Carolina.

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Alternative Management Practices For Small Organic Farms

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The 2007 census figures reveal the trend towards more small and very large farms and fewer mid-sized operations. Management techniques and other high input strategies to improve soil quality and crop yield on large farms may not be suitable and profitable on those small farms. Among alternative techniques, intercropping and agroforestry have been shown to enhance soil quality and crop production on small farm in the tropics.

Intercropping, which is the simultaneous cultivation of more than one crop on the same piece of land offers many advantages especially to organic and urban farming in terms of resource use, erosion reduction, weed and pests/diseases management, yield, and diversification of agroecosystem. Land equivalent ratios greater than one, which corresponds to overyield often observed with intercropped plants is a well-documented benefit, likely due to the better use of available resources such as moisture and nutrients.

Agroforestry or voluntarily growing trees/shrubs with crops in mix is also commonly practiced in tropical regions especially on highly sloped land, and it has been of great interest in USA during the recent decades. Agroforestry affects soil quality through its capacity to modify biophysical and biochemical properties of the soil. Agroforestry improves soil organic matter quantity and quality, soil structure, porosity, water retention, and nutrient cycling.

The effect of these two agricultural techniques will be reviewed in relation to soil quality, agronomic characteristics, and crop yield based on the results obtained in US and other countries. We will assess successful adoption of those practices in US.

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Assessing Rangeland Ecosystem Goods and Services

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Sustainable Rangelands Roundtable (SRR) workshops related to rangeland ecosystem goods and services captured stakeholder perspectives, developed categorization frameworks, and incorporated rangeland ecosystem goods, services, and core processes into SRR's Integrated Social, Economic, and Ecological Conceptual (ISEEC) Framework for Considering Rangeland Sustainability. While rangeland amenity values matter to some individuals, profit potential may motivate others to engage in conservation of rangeland ecosystem goods and services. Participants developed an applied evaluation method suitable for use by ranchers, field staff, and land managers who seek to consider the income potential of rangeland ecosystem goods and services.

The ISEEC Framework developed by SRR was applied to the Texas Leon River Restoration Project to illustrate the utility of the framework to address multiple desired uses -- traditional ranching operations, national security military uses, and critical species habitat requirements. Monitoring is foundational to successful rangeland management for ecosystem goods and services. Baseline data is needed to detect changes in the ecosystem that may be due to management actions, disturbances, or longer term processes like climate change. Social and economic systems also must be monitored to fully assess sustainability. SRR's ecological, social and economic indicator set for rangeland inventory, monitoring, and assessment is applicable at multiple spatial scales. Workshop participants used the concept of adaptive management illustrates how such information can enter the policy cycle. Better information leads to better decisions, culminating in sustainable management of rangeland ecosystem goods and services to satisfy wants of current populations while also conserving the nation's rangelands for future generations.

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Farm-Level Economic Impact Of No-Till Farming In Western Oklahoma

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No-till has been shown to improve soil conditions and water quality, as compared to conventional tillage methods. However, studies of the relative economic impacts of no-till farming have generally been inconclusive. To help farmers make informed decisions about tillage alternatives, information about the farm-level economic impacts of tillage alternatives, is needed. Farm survey data from the Fort Cobb Reservoir watershed (FCRW) in southwestern Oklahoma was used to evaluate economic impacts of no-till farming as compared to current practices. The Farm-level Economic Model (FEM), an annual economic simulation model, was used to simulate the impacts of the alternative tillage practices on farm profits under various diesel price and winter wheat yield scenarios. The results indicate that if wheat yields remain unchanged when farmers switch to no-till, no-till would be more profitable than conventional tillage or the current mix of tillage practices in the watershed. Only if wheat yields decline significantly (10% or greater), would no-till be less profitable than conventional tillage or the

status quo, even at reasonably high fuel prices. No-till also performs better relative to other tillage practices as fuel prices increase. For each $1/gallon increase in the price of diesel fuel, no-till farm profits improve by roughly $1/acre relative to conventional tillage. In general, if farmers switching to no-till manage their operations carefully and maintain crop yields, they are likely to come out ahead financially.

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Assessment of Grassland Management Methods for Balancing Soil C Sequestration With Native Grass Biomass Production

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Grassland management (annual spring burning, late summer haying, and no management) and grass species composition (cool season, warm season, and cool+warm season mixtures) has important independent and interactive effects on biomass production and soil C sequestration in soil previously row-cropped then converted to perennial native grasses. During the last 2 yr of the 9-yr experiment, shoot biomass from the burn (2730 kg ha-1) and mow (3421 kg ha-1) canopy management treatments were less than no management (4655 kg ha-1). Burn treatment biomass contained 1189 kg C ha-1, mow contained 1433 kg C ha-1, while no management contained 2014 kg C ha-1. Soil C sequestration was independent of grass species composition. Soil C sequestration rates, which increased in strong linear fashion after initial grass establishment, were 387, 503, and 711 kg C ha-1 yr-1 for burn, mow, and no management treatments, respectively. Thus, the choice of grassland management methods when converting cropland to grassland should be based upon consideration of grass biomass utilization as well as soil C sequestration. No canopy management would be recommended if the primary goal was to increase soil C sequestration. If the goal was to use harvested grass biomass as a feedstock, an annual late-summer haying treatment could be recommended with the understanding that this would be less efficient at increasing the soil C sequestration rate. A spring burn treatment would be recommended if the goals were restoring or maintaining dominance of C4 warm season grasses in mixed grasslands while only slowly increasing soil C sequestration.

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Yield and Time of Harvest of Tall Wheatgrass for Biomass Energy in New York

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The use of perennial grass for energy production is a sustainable alternative to annual crops and provides many ecosystems services. Two tall wheatgrass studies were established on 9/4/07 in Corning, NY on a Unadilla silt loam soil and evaluated in 2008 and 2009. A cultivar yield trial was conducted with tall wheatgrass varieties; 'Alkar', 'Jose', 'Largo' and 'Szarvasi-1', intermediate wheatgrass 9051920 and 'Bellevue' and 'Chiefton' reed canarygrass. The grasses were managed under a two cut harvest regime, and fertilized twice per year with 74 kg/N/ha. The second study evaluated first cutting dates with two varieties of tall wheatgrass 'Alkar' and 'Szarvasi-1', fertilized once per year with 84 kg/N/ha. The cutting dates started on 7/3 and continued

approximately once a week for four weeks. Chemical analysis for fiber, ash and minerals was conducted in 2009. In the cultivar yield study the wheatgrass yields were comparable to the reed canarygrass, with average yields of both grasses for both years of 11.2 Mg/ha (5.0 t/a). In the tall wheat grass time of cutting trial 85% of the total yield was obtained from the single cut system in the last week of July with an overall average yield for both years of 9.9 Mg/ha (4.4 t/a). The late July cutting date is compatible with ground nesting bird management and occurs at a time with easier drying and harvesting. The chemical analysis showed trends of decreasing K (1.0%), CL (.15%) and Ash (3.4%) with later cutting dates indicating potential as a biomass energy crop.

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Soil Quality Changes After Topsoil Addition To Eroded Land

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Soil-landscape rehabilitation within eroded fields can be accomplished by moving topsoil from depositional to eroded landscape positions. The purpose is to improve soil quality and productivity of the upper root zone in eroded areas of the field. Changes in soil quality may be estimated through changes in structural stability, soil organic matter turnover, and hydraulic properties. Our objective was to evaluate the effect of topsoil addition as a soil-landscape rehabilitation method on selected soil quality indicators. An on-farm study was established in 2007 with six blocks located within eroded positions and three blocks within depositional positions. Each block included an undisturbed control compared to addition plots within the eroded positions and to removal plots in the depositional positions. Crops were soybean in 2008 and spring wheat in 2009. Soil sampling was conducted in the spring of each year. In 2008 and 2009 measurements were made of wet aggregate stability, soil organic matter, particulate organic matter, total soil microbial activity, and aggregate wettability. Soil quality data will be related to crop performance.

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Removing of Arsenic from Water by a Magnetic Stabilized Bed

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In this paper we present a short overview of the methods used for the removal or reduction of arsenic content in water, either used concerning industries or human populations. These methods include precipitation-coagulation processes, membrane separation, ion exchange, and adsorption processes. For each one of these methods its advantages and disadvantages are listed, as well as their efficiencies.

We also present the preliminary results of the application of a new method to achieve the removal or reduction of arsenic. This method represents an innovative alternative presenting important advantages over the remaining methods, and his based on a Magnetic Stabilized Bed (MSB) that acts as a new system to achieve the solid-liquid contact. We describe its operation principles, standing out also its main characteristics and properties that make it a clear advantage in arsenic removal.

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Relationship of Precipitation and Crop Planting Dates to Stream-Measured Atrazine Levels in the NE-KS Blue River Basin Watershed.

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Atrazine is one of the most commonly used herbicides in the United States. Its contamination of surface and groundwater has brought extensive public scrutiny. The Big Blue River Basin in Nebraska and Kansas has frequently had atrazine concentrations that exceed the EPA Total Maximum Daily Load (TMDL) of 3 ppb. Between 1997 and 2004 Kansas State University led a project that measured temporal and spatial patterns of pesticides in the Blue River Basin. The objective of this research is to explore the relationship between planting dates, rainfall, and atrazine levels measured at gauging stations in the Blue River Basin from 1997 through 2004. Daily crop-planted acres by date and county were obtained from the USDA Risk Management Agency (RMA) and serially complete precipitation data sets were obtained from the High Plains Regional Climate Center (Lincoln, NE). The percentage of crop-planted area by date was calculated from RMA data. Preliminary analysis of these data for 2002-2004 showed that maximum loads of atrazine appeared between mid-May and early June, which coincides with RMA sorghum planting dates. Applications of atrazine in corn and sorghum often coincide with major rainfall events that result in high runoff scenarios.

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The Economics of Culvert Replacement: Fish Passage in Eastern Maine

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The Natural Resources Conservation Service (NRCS) is working with Project SHARE (Salmon Habitat and River Enhancement) in eastern Maine to restore fish passage and reduce stream habitat degradation from poorly-designed stream crossings. Project SHARE is a non-profit

organization of landowners, government, business, and watershed councils focused on recovery of endangered Atlantic salmon in Maine.
This partnership is removing undersized and hung culverts (culverts hanging above the water level) on logging roads and replacing them with arch culverts. These projects benefit aquatic organisms by removing barriers to migration upstream and downstream, and restoring stream flows to natural width and flow conditions. To date, 21 of the 44 planned arch culverts have been installed, opening up 51 miles of stream habitat to Atlantic salmon.
Arch culverts have high up-front installation costs, ranging in the tens of thousands of dollars. A landowner thinking about replacing a smaller round culvert with a properly-sized arch culvert should weigh this up-front, one-time cost against the future periodic maintenance and replacement costs of keeping the smaller, non-stream or non-fish friendly culverts in place.
This poster displays the results of an economic analysis that compared the long-term costs of continually replacing undersized culverts versus installing a properly sized arch culvert, using actual data from four sites that the partnership completed. Graphs are used to visually show the trade-offs in costs between arch and round culverts. All four sites showed lower average annual costs for the landowner for the arch culvert alternative.

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Pumping Plant Efficiency Testing in Louisiana

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With the cost of fuel and energy on the rise, testing the operational efficiency of pumping plants and irrigation systems will provide recommendations for energy conservation, reduced fuel consumption, and more efficient production of irrigation water.
The Natural Resources Conservation Service (NRCS), in partnership with Louisiana State University AgCenter, is now offering a new tool to landowners which is designed to help find ways to increase efficiency of irrigation systems. The NRCS Pumping Plant and Irrigation System Efficiency Evaluation Unit is a mobile unit that can be driven on-site to test irrigation systems, providing producers with data to help them achieve maximum overall efficiency for water production and energy conservation.
The on-site unit is equipped to take measurements that are used to evaluate energy input and output of the pumping plant to determine overall system efficiency. Efficiency information can be provided to the landowner to assist them in improving efficiency, potentially saving energy and reducing the cost per unit of irrigation water pumped. Information provided by the on-site unit on the actual pumping rate will allow the landowner to more effectively manage the application of the irrigation water. In addition, based on the measurements provided by the on-site unit, NRCS can provide recommendations to producers regarding the optimum speed for power plant operation to ensure efficient fuel consumption. Thus far, 13 diesel, four horizontal electric, five submersible, two re-lift, one variable frequency drive, and one natural gas units have been tested.

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Identifying Source-Pathways of Multiple Contaminants During a Rainfall-Runoff Event in a Tile-Drained Agricultural Watershed

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Agricultural water quality is influenced by contaminant-transport pathways unique to each watershed. We hypothesized that better information on contaminant transport pathways can inform how conservation efficacy could be improved. This study determined dynamics of nitrate-N, total P, E. coli, and sediment during a runoff event in Tipton Creek, Iowa. The watershed's uplands have extensive tile drainage, which discharges through an alluvial valley. A September 2006 storm yielded 5.8 mm discharge during the ensuing seven days, monitored at the outlet (49,000 ac), two upstream tile-drainage outfalls (4584 ac), and a runoff flume draining 26 ac in the lower valley. Tile and outlet nitrate-N loads were similar, verifying tiles dominate nitrate delivery. Hydrograph separations indicated 13% of tile discharge was from surface inlets draining depressions. On a unit-area basis, tile discharge delivered P and E. coli loads that were about half and 30% of the outlet's, respectively. Rapid, synchronous timing showed surface inlets an important upland source for both contaminants. Flume results indicated surface runoff also sourced TP and E. coli loads, but not dominantly. At the outlet, sediment, P, and E. coli showed synchrony. Activities of 7Be and 210Pb showed channel sediments sourced 78% of sediment contributions. Each contaminant showed a unique aspect of source, pathways, and/or timing, necessitating separate mitigation strategies. Given context of a late summer storm and mature crops, results inform on conservation efficacy in the watershed. To comprehensively address water quality, the suite of practices currently encouraged could be complemented by buffering tile intakes and stabilizing streambanks.

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Simulation of nitrate leaching from a potato production system in Prince Edward Island, Canada: model calibration and verification

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Nitrate contamination of groundwater is of increasing concern in Prince Edward Island (PEI), Canada. The contamination has been associated primarily with intensive potato production. LEACHN was employed to simulate nitrate leaching from a representative potato production system in PEI. The model was calibrated to data from a tile drain leaching experiment of potato grown in rotation with barley conducted in PEI during 1988-1992. The model was verified against an independent data set from an experiment conducted to evaluate the impacts of two typical N rates for potato grown in rotation with barley and red clover on nitrate loss on the same site during 2006-2008. The model respected the timing of groundwater recharge and annual recharge rates very well and failed to reproduce the outflow spikes in the tile drain. The rate constants of N transformation compared similar to those in the literature. LEACHN predicted nitrate concentrations in the tile-drain effluent very well in both calibration and verification cases. Both measurements and simulations showed that nitrate leaching occurred primarily during a period between crop harvest and planting of the subsequent crop with leached nitrate concentrations peaking shortly after crop harvest, and declining throughout the following winter and early spring. Modeling showed that nitrate leaching is a function of soil,

meteorology and crop management practices; N input and N uptake efficiency and associated harvest index significantly influenced the magnitude of nitrate leaching. The model predictions on soil nitrate contents were subject to relatively large errors possibly because the measurements reflected the high spatial heterogeneity of soil properties and management, while the one-dimensional model represented the specified properties and management only. The modeling exercises suggested LEACHN could be used to predict nitrate leaching from similar potato cropping systems in PEI if properly calibrated and verified.

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An Evaluation of GIS Methodologies for Improving P-Index Measurement in the Illinois Watershed

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Phosphorus (P) from agricultural runoff can contribute to accelerated freshwater eutrophication. In Arkansas a phosphorus index (P-Index) is used in nutrient management planning to assess the risk of offsite transport of phosphorus from fields. The P-Index has three components: source factors (i.e. soil P and amount, type, and timing of manure added), transport processes (i.e. runoff, erosion, and proximity to streams), and a best management practice multiplier. The focus of this study is to evaluate different methodologies used to measure several factors within the transport component of the index and to assess if Geographic Information System (GIS) methodologies could be used to derive transport factor values. The Illinois River Watershed of Northwest Arkansas is the study site and is ideal for two main reasons: 1) the watershed is home to a thriving poultry industry and a large number of producers annually have management plans written and 2) current GIS data is available at many scales for the watershed. Slope information from field work, from soil series, and from Digital Elevation Model's (DEM's) will be used to calculate transport factor values and subsequently compared. Performing such calculations and comparisons are important for increasing the efficiency of P-Index risk assessment, establishing consistent methodology, validating soil series information typically used by plan writers, testing the overall sensitivity of the index to slope information, and assessing the methods currently used for calculating the transport component of the Index.

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Soil Water Chemistry during Conversion of Marginal Land to Biomass Crop Production in the Lower Mississippi Alluvial Valley

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Marginal agricultural land in the Lower Mississippi Alluvial Valley (LMAV) could be an attractive location for growing biomass feedstocks for bioenergy production. Much of this marginal land has low economic returns from traditional agricultural crops due to late season flooding or low fertility. Cellulosic biomass crops such as switchgrass or cottonwood trees, which are adapted to these conditions, would likely grow well on these marginal lands. As part of a larger project

which is evaluating the productivity of these crops as well as various agroforest cropping systems, we are quantifying to what degree carbon and nitrogen is retained by the cottonwood and switchgrass cropping systems. In one facet of this evaluation, we are monitoring soil water chemistry during the conversion of these agricultural lands to the cottonwood and switchgrass. Soil water samples are collected at a depth of 30 cm using tension lysimeters in fields with normal agricultural crop rotations (soybean-sweet sorgham) as well as a portion of these fields that were planted to cottonwood and switchgrass. We are analyzing these samples for pH, NO3-N, NH4-N, Total N, Total P, and PO4-P. Monitoring was initiated at the end of the first growing season following establishment at three locations within the LMAV. Chemistry of the samples collected during the first six months of the study will be summarized and compared among the different crops.

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Assessing Surface Water Availability in the Santa Cruz Watershed

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The Southwest Ecosystem Service Project (SwESP) is one of five place-based studies in the U.S. Environmental Protection Agency's Ecosystem Services Research Program (ESRP). The goal of the SwESP is to identify, locate, and inventory ecosystem services. Initial research efforts are focused on the Santa Cruz River watershed (Arizona, USA and Sonora, Mexico). Given the growing demand for water and the likely decreasing precipitation due to climate change, water availability has become a dominant issue in semi-arid ecosystems. Quantifying the amount of available water for human and ecosystem is very challenging due to its complexity. In this study, surface and groundwater models will be explored to simulate surface runoff processes, recharge to subsurface storages, and engineering alterations. This paper reports on our review and application of existing hydrological models and modeling frameworks including the Automated Geospatial Watershed Assessment Tool (AGWA) and groundwater models.

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Eco Apple: Developing Markets for Northeast Apple Growers using Advanced IPM

Thomas A. Green, IPM Institute of North America Inc.

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PRiME (Pesticide Risk Mitigation Engine): A New Online Pesticide Evaluation Tool for Agriculture

Thomas A. Green, IPM Institute of North America Inc.

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Southeast MN 2-Stage Ditch

Richard Biske, The Nature Conservancy

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Providing Carbon Credit Incentives for the Adoption of Lagoon Covers on Hog Farms in North Carolina and Dairies in New York
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Staking Terraces Online: A Terrace Layout Program
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