70TH ANNUAL

SOIL AND WATER CONSERVATION SOCIETY CONFERENCE

COMING HOME TO CONSERVATION

PUTTING SCIENCE INTO PRACTICE

FINAL PROGRAM

PRESENTED BY THE

SOIL AND WATER CONSERVATION SOCIETY

JULY 26–29, 2015
SHERATON GREENSBORO AT FOUR SEASONS
GREENSBORO, NC

the good growth plan

Agriculture already uses 70% of the world's fresh water. And many countries are facing severe shortages. A rising global population and changing rainfall patterns mean we must make the most of this precious resource. As one of the world's leading agricultural companies, Syngenta is helping farmers to grow more while also conserving water. As part of The Good Growth Plan, we are committed to improving the average productivity of the world's major crops by 20% without using more water, land or inputs. And we are ready to work with growers, governments, NGOs and all who share this agenda. Please follow our progress at www.goodgrowthplan.com

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Conference Schedule in Brief

Sunday

11:00 a.m. Registration Opens
Registration Desk

12:00 p.m. House of Delegates, State of Society Address, Leadership Development Training, and Regional Roundtable Meetings
Victoria A

1:00 p.m. *COMET-Farm: Agriculture and Forestry Carbon and Greenhouse Gas Accounting at Your Fingertips
Sandpiper

1:30 p.m. *Nitrogen Tools Workshop
Tanglewood

2:00 p.m. *Tips for Successful Grant Writing
Tidewater A

3:30 p.m. Fellows Forum
Victoria A

4:30 p.m. Student Networking Session
Grandover East

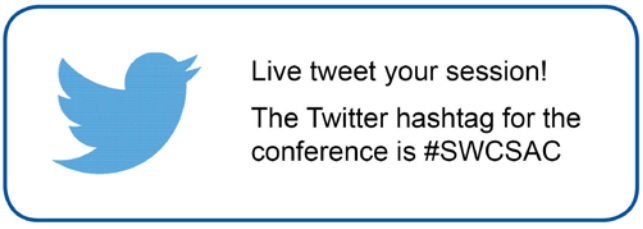
5:30 p.m. International Committee Meeting
Links

5:30 p.m. JSWC Editorial Board Meeting
Edgewood

5:30 p.m. New Members/First-Timers Orientation
Victoria B

6:30 p.m. Welcome Reception
3rd Floor Pre-Function Space

**Additional fees apply*



Monday

6:45 a.m. Registration Opens
Registration Desk

7:15 a.m. Morning Coffee and Soil Health Partnership Farmer Panel
Guilford F/G

8:30 a.m. Opening Welcome and Pritchard Lecture
Guilford F/G

10:00 a.m. Morning Break: Exhibit Hall and Poster Presentations Open
Imperial A/B/C/D

10:30 a.m. Concurrent Sessions
See page 22

10:30 a.m. CIG Showcase and Posters
Augusta/Tidewater

12:00 p.m. Lunch Break
On your own

12:00 p.m. ARCSE Lunch and Annual Business Meeting
Grandover West

12:30 p.m. Science and Policy Committee Meeting
Oak A

1:30 p.m. Concurrent Sessions
See page 23

1:30 p.m. CIG Showcase and Posters
Augusta/Tidewater

3:00 p.m. ARCSE Board Meeting
Grandover West

3:00 p.m. Afternoon Break with Exhibitors
Imperial A/B/C/D

3:30 p.m. Concurrent Sessions
See page 24

3:30 p.m. CIG Showcase and Posters
Augusta/Tidewater

5:30 p.m. Exhibitor and Poster Reception in Exhibit Hall
Imperial A/B/C/D

7:00 p.m. Silent Auction Ends
Imperial A/B/C/D

7:30 p.m. Hugh Hammond Bennett Chapter Game Night and Live Auction
Colony A

Tuesday

7:00 a.m. Professional Development Committee Meeting
Oak A

7:30 a.m. Registration Opens
Registration Desk

7:30 a.m. Morning Coffee - sponsored by Envirocert International, Inc, and Light Breakfast
Guilford Foyer

8:00 a.m. Tuesday Plenary
Guilford F/G

10:00 a.m. Morning Break in Exhibit Hall
Imperial A/B/C/D

10:30 a.m. Concurrent Sessions
See page 33

10:30 a.m. 2015 USDA-NIFA NIWQP and ARFI Annual Project Director's Meeting
Victoria A

12:00 p.m. *Awards Luncheon
Guilford D

12:00 p.m. Lunch Break
On your own

1:30 p.m. Concurrent Sessions
See page 34

1:30 p.m. 2015 USDA-NIFA NIWQP and ARFI Annual Project Director's Meeting
Victoria A

1:30 p.m. ARS-WAS Cropland CEAP Annual Meeting
Colony B

3:30 p.m. Concurrent Sessions
See page 35

3:30 p.m. 2015 USDA-NIFA NIWQP and ARFI Annual Project Director's Meeting
Victoria A

3:30 p.m. ARS-WAS Cropland CEAP Annual Meeting
Colony B

5:00 p.m. Focus Group for Recipients of USDA-NIFA Funding During 2001-2013
Meadowbrook

5:15 p.m. SWCS Annual Conference Program Committee
Oak A

6:00 p.m. Hugh Hammond Bennett Chapter Memory Lane Event
Colony A

** Additional fees apply*

Wednesday

7:00 a.m. *CEAP Calhoun Critical Zone Observatory Tour

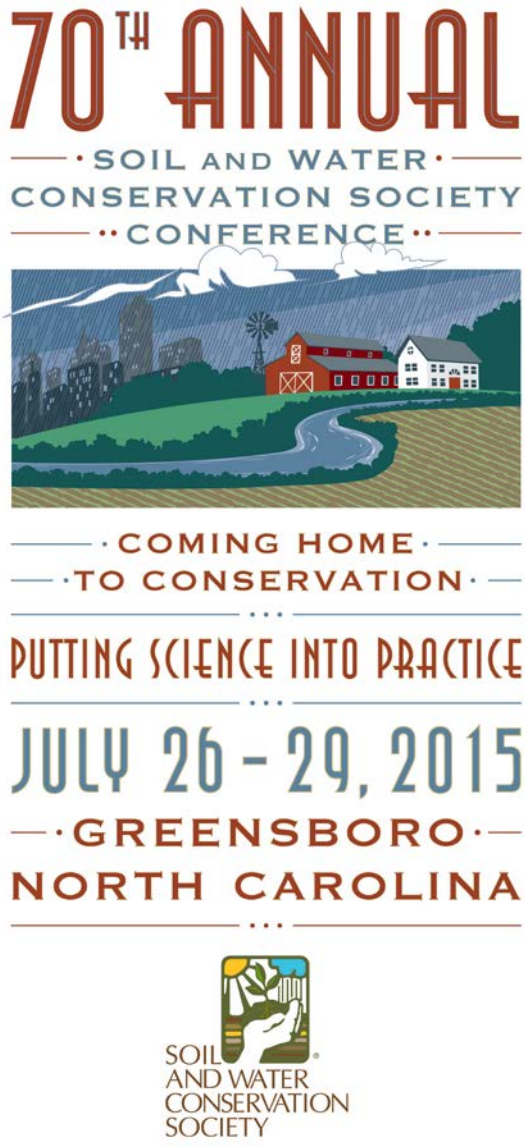
7:00 a.m. *North Carolina State University Lake Wheeler Field Laboratory and Syngenta Tour

8:00 a.m. *Soil Health Farm Tour

8:00 a.m. *North Carolina Viticulture Research and Raylen Vineyards and Winery Tour

8:30 a.m. USDA-NIFA NIWQP and ARFI Annual Project Director's Meeting – Day 2
Victoria A

**Additional fees apply*



Program Committee Chair Message

This is the third time I have had the pleasure of serving as program planning chair of the SWCS Annual Conference. Each time I am humbled by the generosity of talent and time from those who submit presentations and programming, and those who serve to review submissions and support authors in becoming accepted. Thank you to all who have served in these capacities. The content of this conference is excellent because of you.

The 70th anniversary program includes many topics of continued importance to conservation professionals; it also includes an overarching theme of "Putting Science into Practice." The program planning committee hopes that this theme will remind us all of the value of discovery and its role in implementing evidence-based conservation on the landscape. The professional diversity of SWCS membership and guests at this conference create the perfect atmosphere in which to share ideas and make connections between science and practice.

For the 2016 conference, program planning will be led by Deanna Osmond (chair) and supported by DeAnn Presley (co-chair). SWCS and this conference will benefit greatly from their expertise and enthusiasm.

Finally, I would be remiss if I didn't mention that all of us are participating in the 70th Anniversary Conference in the home state of Hugh Hammond Bennett. Welcome to North Carolina and welcome home to conservation!

Tommy Bass, Program Planning Chair
Montana State University

Hugh Hammond Bennett Chapter Welcome

Welcome to the Home of Conservation

To every friend of soils, water quality, and conservation work, from lands far and near, this is our year to celebrate! We are so excited to have you join us IN the state where soil conservation began, DURING the International Year of Soils, and WITH the most welcoming folks around.

We want all soil conservationists to feel right at home here in North Carolina. After all, this is the birthplace of the Father of Soil Conservation, Hugh Hammond Bennett. If you have any questions about North Carolina, the SWCS Hugh Hammond Bennet Chapter (HHB), or the location and home site of Hugh Hammond Bennett, just ask a local chapter member (look for volunteers wearing tan vests). We simply LOVE to talk about our legacy and our state.

North Carolina is a fabulous state, and we hope you will return on many occasions. There are many facts that you may or may not know about North Carolina.

You may already know that Mount Mitchell is the highest peak in the eastern United States or that North Carolina ranks number one in production of tobacco and sweet potatoes. Looking at a map, you may guess that there are more than 300 miles of shoreline on North Carolina's coast, more than any other state on the East Coast. We are number one in solar power for the southern states, and number four nationwide. The coastal city of Wilmington is known as Hollywood East, and many movies and TV shows were filmed in North Carolina, including *Iron Man 3, The Last of the Mohicans, Dirty Dancing,* and *Homeland*.

There are 10 million people who call North Carolina home. These rural and urban citizens help support our strongly balanced economy of agriculture and business. North Carolina State University and North Carolina A&T provide an excellent foundation for our conservation, forestry, and agricultural studies. Duke University is a leader in graduate school research covering environmental management and natural resources.

Western North Carolina includes Great Smoky Mountains National Park and the Blue Ridge Parkway, two of the most-visited attractions in the National Park System. If you go east, visit Cape Hatteras, which was America's first national seashore. Don't forget to see the wild horses on Shackleford Banks near Morehead City and Atlantic Beach. North Carolina is also home to four national forests and more than 40 state parks where you can camp, kayak, hike, fish, picnic, and more.

You may not, however, know that more species of salamanders live in the North Carolina mountains than any other place in the world. In addition, the Great Smoky Mountains boast more than 1,400 varieties of flowering plants and 100 species of trees (more species of trees than in the whole of Europe). By the way, North Carolina is the birthplace of Forest Conservation in America. In 1898, Carl Schenck started the first school of forestry, the Biltmore Forest School near Asheville. The Venus Fly Trap is only found in a 50-mile radius from Wilmington. The Uwarrhie Mountains are the oldest mountain range in North America, and Transylvania County has more waterfalls than any county east of the Mississippi. Also—a bit more important to some of us—North Carolina has 448 soils series, and Cecil is our official state soil.

I hope you enjoy your time here in North Carolina. Members of the Hugh Hammond Bennett Chapter are here to welcome and assist you with a successful, fun, and educational conference visit. I invite you to find me at this historic 70th Annual SWCS International Conference and say hello. I want to meet everyone from soils near and far.

Dale Threatt-Taylor, President
Hugh Hammond Bennett Chapter

2015 SWCS Conference Volunteers

Thank you to all who assisted in planning the 70th SWCS International Annual Conference!

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Leadership Development Liaison

John Kluthe, USDA-NRCS
Professional Development Liaison

Deanna Osmond, North Carolina State University
Co-Chair

Chrissy Rhodes, SWCS
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Kim Johnson-Smith, SWCS
SWCS Operations and Programs

Jeffrey Strock, University of Minnesota
SSSA S06 Liaison

Mark Weltz, USDA-ARS
USDA-ARS Grazinglands CEAP Liaison

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Dale Threatt-Taylor
SWCS HHB Chapter President

Jim Canterberry
HHB Historical Collector

Pat Harris
Games Night Coordinator

Teresa Hice
Silent Auction Coordinator

Gail Hughes
Tour Coordinator

Shawn Springer
Volunteer Coordinator

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Craig Allen, University of Nebraska-Lincoln
Adaptive Management of Conservation Efforts

Philip Buchanan, USDA-NRCS
Conservation Economics and Policy

Deborah Cavanagh-Grant, University of Illinois-Extension
Conservation in Nontraditional Agriculture

Katie Flahive, EPA
Water Resource Assessment and Management

Janet Perry, USDA-NRCS

DeAnn Presley, Kansas State University
Soil Health Resources, Indicators, Assessment, and Management

Linda Prokopy, Purdue University
Social Sciences Informing Conservation

Mark Risse, University of Georgia-Athens
Outreach, Education, and Community Engagement

Cheryl Simmons, USDA-NRCS
Conservation Models, Tools, and Technologies

Conference Registration & Facility Information

The Soil and Water Conservation Society registration desk is located on the 1st floor, outside the Imperial Ballroom. SWCS staff members will be on site to assist you.

REGISTRATION HOURS

Sunday 11:00 a.m. – 6:30 p.m.
Monday 6:45 a.m. – 5:30 p.m.
Tuesday 7:30 a.m. – 5:00 p.m.

TICKETS AND PASSES

The conference registration fee covers one participant. All registered attendees will receive a registration packet, which contains a formal name badge and tickets for purchased events.

Your name badge acts as your admission ticket to educational sessions (including the plenary sessions), exhibits, posters, and special events. Please be sure your name badge is worn at all times in the conference area. For your safety, it is recommended that you do not wear your name badge outside the conference area. Please note that tickets will be collected for all ticketed events.

Formal name badges are not provided for guests. Additional tickets for guests to attend the Welcome Reception on Sunday evening, the Exhibit and Poster Reception on Monday evening, educational tours, or the Awards Luncheon may be purchased at the Registration Desk and are subject to availability.

Please Note: No refunds will be given for conference registrations, workshops, tours, meal functions, or activities. Registration personnel will not exchange tickets. SWCS reserves the right to cancel events/activities without prior notice.

LOST AND FOUND

Check with the hotel registration desk or at the SWCS registration desk.

MEDICAL SERVICES

For medical emergencies, dial "0" from any house phone or room phone.

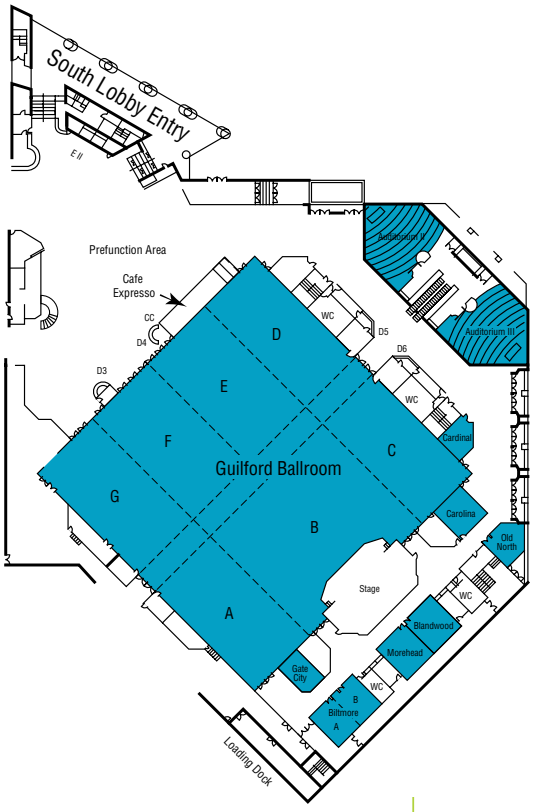
CEUS

SWCS has worked to secure continuing education credits (CEUs) from various certifying organizations. Certified, licensed, or professional engineers (PE), agronomists (CPAg), soil scientists and classifiers (CPSS and CPSC), crop advisors (CCA), crop consultants (CPCC), foresters, range managers (CPRM), grassland professionals (CGP), professionals in erosion and sediment control (CPESC) and storm water quality (CPSWQ), and other professional conservationists may be able to obtain CEUs.

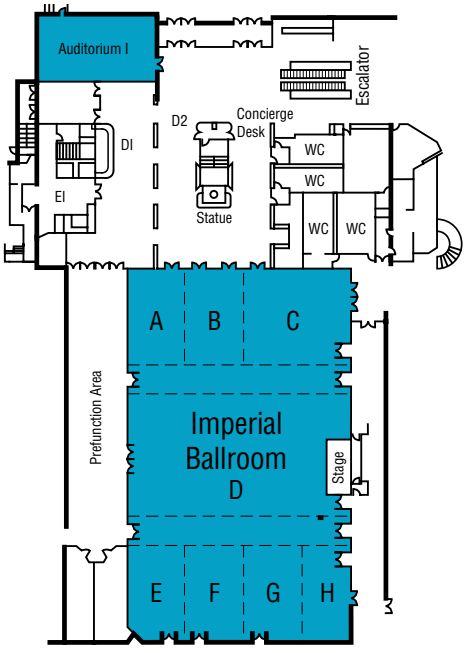
Please pick up a CEU tracking/sign in sheet at the registration desk and have each room moderator sign the sheet as appropriate. Return the form to registration at the end of the conference, and we will submit it on your behalf.

Sheraton Greensboro at Four Seasons
Meeting Space Map

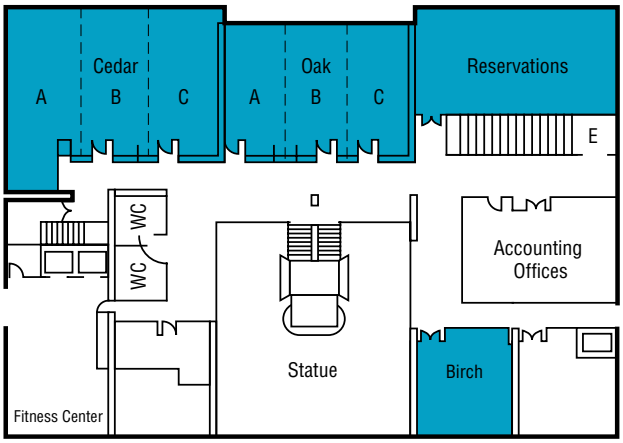
First Floor Guilford Ballroom



First Floor Imperial Ballroom

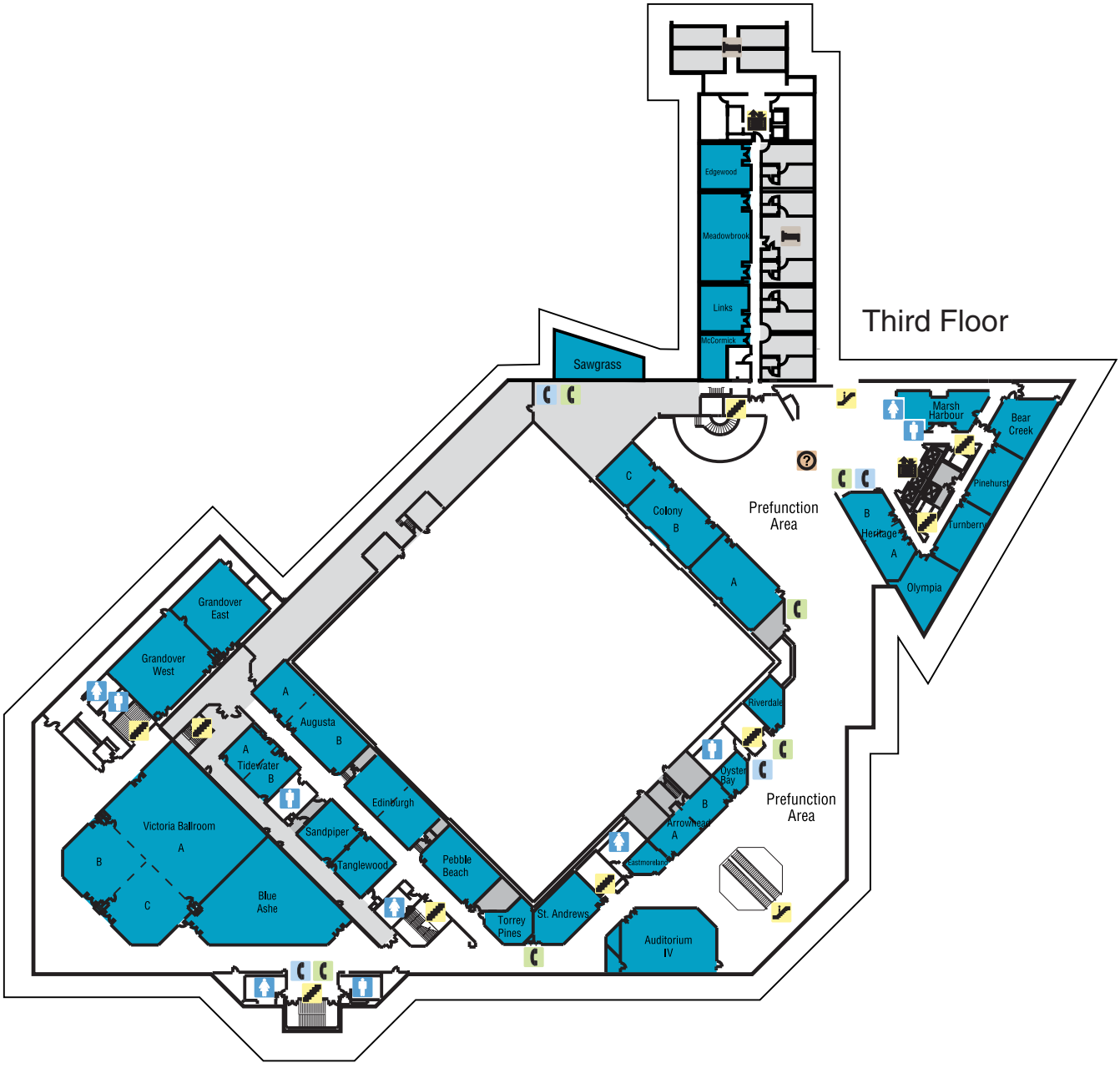


Second Floor Meeting Rooms



Sheraton Greensboro at Four Seasons
Meeting Space Map

THIRD FLOOR
MEETING
ROOMS
PREFUNCTION
VICTORIA WING



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	2012 – 2015
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SWCS Corporate Members

SWCS is pleased to have the following organizations as corporate members and partners in the effort to advance natural resource conservation and environmental sustainability.

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Agri Drain Corporation

Hickenbottom Inc.
Look for the bright orange inlet - Hickenbottom's Trademark

Dow AgroSciences

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Conservation Technology Information Center

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Watershed Materials

White River Irrigation District

The Nature Conservancy
Saving the last great places on earth

Ecosystem Services Exchange
Valuing Conservation

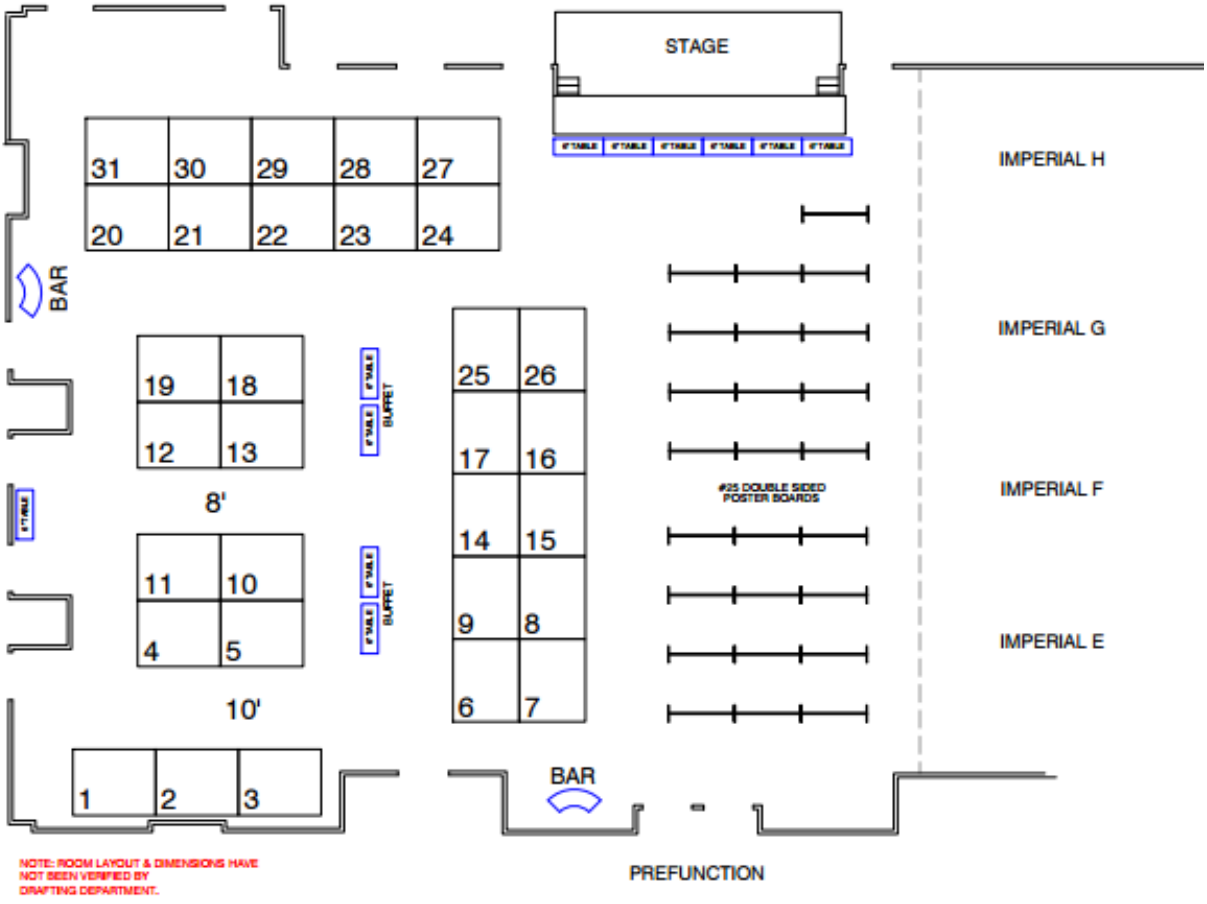
Are you interested in having your organization recognized for its dedication to natural resources protection and sustainability? Contact Chrissy Rhodes at 515-289-2331 x 114 or email corporate.info@swcs.org to discuss all of the benefits of becoming an SWCS corporate member.

Conference Exhibitors

Booth #	Exhibitor	Contacts/Representative
1	US Environmental Protection Agency – water.epa.gov	Katie Flahive
2	Watershed Materials, LLC – www.maddogfoambridges.com	Carl Hamman & Garrett Rhyne
3	Agren – www.agrentools.com	Tom Buman
4 & 5	Soil Health Partnership – www.soilhealthpartnership.org	Nick Goeser
6	American Farmland Trust – www.farmland.org	Mike Baise & Jen Filipiak
7	Syngenta – www.syngenta.com	Ann Bryan & Jill Wheeler
8	La Crosse Seed – www.laxseed.com	Chris McCracken
9	EnviroCert International, Inc. – www.envirocertintl.org	Rob Vanscoy & Sandy Gibbs
10	USDA-NRCS: Celebrating the International Year of Soils – www.nrcs.usda.gov	Amy Overstreet & David Smith
11	USDA-NRCS – www.nrcs.usda.gov	Ron Nichols & Peg Reese
12	National Association of Conservation Districts (NACD) – www.nacdnet.org	Bill Berry & Rich Duesterhaus
13	AMS Inc. – www.ams-samplers.com	Hari Anestos
14	Southern SARE – www.southernsare.org	Candace Pollock
15	USDA-NASS – www.nass.usda.gov	Dee Webb
16	Voss Signs – www.vosssigns.com	Tom Tenerovicz
17	XYLEM / YSI – www.ysi.com	Scott Kindelberger
18	Truax Company, Inc. – www.truaxcomp.com	Michael Hall
19	USDA-NRCS-CNTSC – www.nrcs.usda.gov	Cheryl Simmons
20	USGS South Atlantic Water Science Center – www.usgs.gov/water/southatlantic	Chad Wagner
21	Great Plains Mfg., Inc. – www.greatplainsag.com	John Parker
22	Ward Labs Inc. – www.wardlab.com	Lance Gunderson
23	Crop Health Labs – www.crophealthlabs.com	Michelle Gregg
24	Agri Drain Corporation – www.agridrain.com	Jeff Harris & Charlie Shafer
25	Verdesian Life Sciences – www.vlsci.com	Dave Schwartz & Larry Shivers
26	Dow AgroSciences – www.dowagro.com	Tony Weiss
27	National Center for Appropriate Technology (NCAT) – www.ncat.org/www.attra.org	Chris Lent
28	COMET-Farm – www.comet-farm.com	Mark Easter & Matthew Stermer
29	Ernst Conservation Seeds – www.ernstseed.com	Greg Kedzierski
30	Eijkelkamp – www.eijkelkamp.com	Troy Chipps & Rob Stolsz

Exhibit Hall Layout

Sheraton Greensboro at Four Seasons, Imperial Ballroom A,B,C, and D



Poster Presentations

ADAPTIVE MANAGEMENT OF CONSERVATION EFFORTS

1. Adaptive Management of Young Longleaf Pine Stands in Southeastern Virginia

2. Adaptive Nitrogen Management for Corn, Sorghum, and Wheat in the Coastal Plain of North Carolina

3. Arkansas Discovery Farms: Increasing Water Sustainability with Irrigation

4. Bridging the Gap between University Science and Local Policy to Achieve Nutrient Loss Reduction: The Role University Centers Can Play

5. Future Directions of Usable Science for Rangeland Sustainability

6. Grass and Agroforestry Buffer Influence on Spatial Differences of Selected Soil Quality Parameters

7. Improving Irrigation Efficiency in Soybeans with Pipe Planner Design and a Surge Valve

8. Phosphorus Recovery Prior to Land Application of Biosolids Using the "Quick Wash" Process Developed by USDA

9. Several Years Application of Some Amendments on Soil Physical Properties of a Light-Textured Soil

10. Yields of No-till Irrigated Continuous Corn Can Be Increased with Controlled-Release Fertilizer

CONSERVATION ECONOMICS AND POLICY

11. Market-Based Solutions in Conservation

CONSERVATION MODELS, TOOLS, AND TECHNOLOGIES

12. Assessing Agroforestry Greenhouse Gas Emissions and Sequestration with COMET-Farm

13. Assessing Cropland Greenhouse Gas Emissions Using COMET-Farm

14. Assessing Livestock Greenhouse Gas Emissions with COMET-Farm

15. Considerations and Resources on Feed and Animal Management to Reduce Greenhouse Gas Emissions and Improve Business Value for Dairy Farms in the United States

16. Dryland Cropping Systems for the Central High Plains of North America

17. Geospatial Products for Conservation and Monitoring of Tree Resources in Agroecosystems

18. The Application and Use of Unmanned Aerial Systems in Precision Agriculture

OUTREACH, EDUCATION, AND COMMUNITY ENGAGEMENT

19. Facilitating Community-Based Conservation Initiatives in Chesapeake Bay, Morgantown, and Berks County, Pennsylvania

20. Private and Public Sector Conservation Collaboration Engages Plain Sect Farmers to Improve Soil and Stream Health in the Lancaster County, Pennsylvania, Drainage Area to the Chesapeake Bay

21. Small Scale Agriculture—FAS and NRCS International Program

22. Soil and Water Science Curriculum for Informal Youth Education

23. Texas Watershed Steward Program

SOCIAL SCIENCES INFORMING CONSERVATION

24. Improving Food Security through Soil Conservation for Smallholder Farmers in Rural El Salvador

25. Useful to Usable (U2U): Transforming Climate Information into Usable Tools to Support Midwestern Agricultural Production

SOIL RESOURCE ASSESSMENT AND MANAGEMENT

26. Assessing and Demonstrating Soil Restoration Practices on Disturbed Land in New Jersey's Coastal Plain

27. COMET-Farm, a Modeling and Measuring Tool for Greenhouse Gases (GHG) that Can Target Soil Health

28. Efforts to Improve Soil Restoration Requirements on Disturbed Land in New Jersey

29. Incorporating Multiple Ecosystem Services into the Design of Low Impact Development Strategies

30. Influence of Agroforestry Buffers and Row Crop Management on Soil Hydraulic Properties

31. Long-Term Soil and Crop Management Effects on Soil Physical Properties Related to Soil Erodibility

32. Nitrogen Rate and N Loss-Prevention Additive Effects on Corn and Wheat Yields in North Carolina

33. Water Infiltration in Claypan Soils Influenced by Agroforestry and Grass Buffers for Row Crop Management Systems

WATER RESOURCE ASSESSMENT AND MANAGEMENT

34. Arkansas Discovery Farms: Monitoring Nutrient Loss in Runoff From Soybean Fields

35. Collaborative Opportunities for Watershed Protection and Flood Prevention through USDA's Regional Conservation Partnership Program

36. Monitoring Nutrient Runoff from Cotton on the Arkansas Cotton Discovery Farm

37. Optimal Allocation of Agricultural Water Use in the Humid Southeastern US Using Hydro-Economic Modeling

38. Prediction of Drawdown around a Radical Collector Well

39. The Effects of Land Use Changes and Climate Variability on Reservoir Sedimentation for the Little Washita River Experimentation Watershed

40. Treatment of BPA Contaminated Stormwater with Manganese Oxide-Coated Sand

41. Water Vulnerability to Diffuse Pollution from Agriculture: A Case Study in Lincolnshire County, UK

42. Watershed Planning in Texas

PRECISION CONSERVATION

43. Nutrient Dynamics in Root Zone of Soil Water Retention Technology

44. Subsurface Application of Poultry Litter to Improve Air and Water Quality

WATER SCIENCE IN THE PUBLIC INTEREST

45. Balancing River Flow and Associated Ecological and Cultural Needs at the Chattahoochee River National Recreation Area

46. Climate Variability and Change with Elevation in Kenya, East Africa

47. Water for the Seasons: Evaluating the Feasibility of Domestic and International Implementation

Sunday, July 26 Schedule & Events

Schedule

11:00 a.m.	Registration Opens *Registration Desk*
12:00 p.m.	State of Society Address, House of Delegates, Leadership Development Training, and Regional Roundtable Meetings *Victoria A*
1:00 p.m.	*COMET-Farm: Agriculture and Forestry Carbon and Greenhouse Gas Accounting at Your Fingertips *Sandpiper*
1:30 p.m.	*Nitrogen Tools Workshop *Tanglewood*
2:00 p.m.	*Tips for Successful Grant Writing *Tidewater A*
3:30 p.m.	Fellows Forum *Victoria A*
4:30 p.m.	Student Networking Session *Grandover East*
5:30 p.m.	International Committee Meeting *Links*
5:30 p.m.	JSWC Editorial Board Meeting *Edgewood*
5:30 p.m.	New Members/First Timers Orientation *Victoria B*
6:30 p.m.	Welcome Reception *3rd Floor Pre-Function Space*

**Additional fees apply*

Events

STATE OF THE SOCIETY, HOUSE OF DELEGATES, LEADERSHIP DEVELOPMENT TRAINING, AND REGIONAL ROUNDTABLE MEETINGS

12:00 p.m. – 3:00 p.m., *Victoria A*

The annual SWCS meeting will include President Mark Berkland's State of the Society address, the Annual Report from Executive Director Jim Gulliford, and the House of Delegates session. Immediately following the House of Delegates, the Leadership Development Committee would like to invite all guests to participate in an interactive leadership training:

Leadership Development Training: Discover the Branding Power of ONE – *Ron Nichols, USDA-NRCS*

Learn how personal branding power can be put to use at home, on the job, in the community, and more importantly for **SWCS chapters!** In this fun, interactive workshop you'll discover the amazing power of a single voice; how to assess personal brand attributes; how to define and live personal brand legacy; and how to become a "brand warrior" (for any cause). Participants will learn why every person in the organization is a reflection of their brand and how to ensure each team member's projects deliver the organization's brand value. Recruiting new members to the Society and potential board members to the local chapter are just two of the many tools participants will gain from this training.

Following the leadership training, chapters will have the opportunity to discuss information within small groups.

WORKSHOP: COMET-FARM: AGRICULTURAL AND FORESTRY CARBON AND GREENHOUSE GAS ACCOUNTING AT YOUR FINGERTIPS

1:00 p.m. – 5:00 p.m., *Sandpiper*

Instructors: *Matthew Stermer, Colorado State University; Mark Easter, Colorado State University; Kevin Brown, Colorado State University*

COMET-Farm is the practical, web-based application of the USDA entity-level methods for greenhouse gas inventories. Workshop attendees will receive hands-on instruction on greenhouse gas accounting at the field, parcel, farm, and ranch scale. Attendees will learn how to use and apply the COMET-Farm tool to calculate the entity-level greenhouse balance of farm, ranch, agroforestry, and forestry operations, and will complete conservation scenario analyses. The workshop will focus on how the COMET-Farm tool was developed, practical examples of crop, livestock, agroforestry, and forestry scenarios, and how to interpret and report greenhouse gas inventories.

WORKSHOP: NITROGEN TOOLS

1:30 p.m. – 5:00 p.m., *Tanglewood*

Instructor: *Jorge A. Delgado, USDA-ARS*

The Nitrogen Tools workshop will provide training on the Nitrogen Index for Windows XP and Windows 7. Attendees of the workshop will receive handouts to follow along with the presenter's examples. Workshop participants will gain hands-on experience using these tools (the Nitrogen Index, Phosphorus Index, and N_2O Index), which can be used by Technical Service Providers (TSP), conservationists, nutrient managers, and others. The ultimate goal is to improve nitrogen use efficiency at the farm level to maintain yields,

increase economic returns for farmers, and minimize nitrogen losses to the environment.

WORKSHOP: TIPS FOR SUCCESSFUL GRANT WRITING

2:00 p.m. – 4:30 p.m., *Tidewater A*

Instructors: *Denis Ebodaghe, USDA-NIFA; James Hill, Sustainable Agriculture Research and Education Program (SARE)*

Advance planning and preparation are the keys to successful grant writing. In this interactive workshop, presenters will demonstrate how goals and objectives, when well-articulated, can result in successful receiving funding for a project. This workshop will touch on tools needed to submit a grant that accurately addresses key areas such as evaluation criteria, qualifications and experience to carry out project work, funding to conduct project work, evaluation of project work, project sustainability beyond the expiration of the grant, and electronic submission. By the conclusion of this workshop, attendees will have the opportunity to prepare and critique examples of short grant proposal submissions.

FELLOWS FORUM

3:30 p.m. – 5:30 p.m., *Victoria A*

You are in Jordan Lake Watershed: Regulation, Agriculture, Water Quality, and Trading

Presenters: *Rich Gannon, North Carolina Department of Environment and Natural Resources; Deanna Osmond, Dan Line, and Caela O'Connell, North Carolina State University; Mazkak Arabi and Dana Hoag, Colorado State University*

Jordan Lake provides drinking water for close to 250,000 people in Cary and Apex, North Carolina, and is considered nutrient sensitive. As a result of excess nutrients in the lake and algae blooms, regulations were developed with stakeholders and implemented to reduce nitrogen by 0% to 35% and phosphorus by 0% to 5% from all contributing sources—point, agriculture, and urban. Results from a USDA National Institute of Food and Agriculture–funded, integrated agricultural water quality project will be presented. Topics include the watershed regulatory structure, agricultural conservation practice effectiveness, water quality modeling and monitoring analysis, economic feasibility of nutrient trading between agricultural land and urban nonpoint sources, farmer willingness to trade, and the importance of multidisciplinary research and extension in addressing complex water quality issues.

STUDENT NETWORKING SESSION

4:30 p.m. – 6:30 p.m., *Grandover East*

SWCS student colleagues are invited to join the SWCS Professional Development Committee, along with a variety of conservation industry professionals and guests from various conservation disciplines, for an interactive discussion about planning for a career in environmental conservation. Students will gain advice on how to match education to the needs of the industry and learn successful practices for employment after graduation. Attendees will also engage in professional networking and more. Attendance is encouraged for student members and professionals wishing to connect with students.

NEW MEMBERS/FIRST-TIMERS ORIENTATION

5:30 p.m. – 6:30 p.m., *Victoria B*

New members and conference first-timers will have the opportunity to network with one another and discuss the conference with a few experienced SWCS Board members, who will share tips for navigating the agenda, connecting with fellow conservationists, and making the most out of time spent at conference. Participants are encouraged to use this time to ask questions about membership benefits and the services offered by the society.

SPECIAL 70TH ANNIVERSARY WELCOME RECEPTION

6:30 p.m. – 8:30 p.m., *3rd Floor Pre-Function Space*

Prepare to attend this special kick-off event to celebrate the conference's return to Hugh Hammond Bennett's home state. As part of this interactive reception, participants will have the opportunity to paint with soils, enjoy local music, play conservation trivia games, or just mingle and socialize among historic photos covering 70 years of conservation.

Look for North Carolina's SWCS Hugh Hammond Bennett Chapter members at the reception and receive a special conference souvenir! Light hors d'oeuvres with a Southern flare will be served along with a cash bar. While at the reception, be sure to sign the large commemorative canvas to document your travel "Home to Conservation." **A ticket for this event is included with full conference registration.** Additional tickets for guests may be purchased online in advance or at the registration table if available.

Monday, July 27 Schedule & Events

Schedule

6:45 a.m. Registration Opens
Registration Desk

7:15 a.m. Morning Coffee and Soil Health Partnership Farmers Panel
Guilford F/G

8:30 a.m. Opening Welcome and Pritchard Lecture
Guilford F/G

10:00 a.m. Morning Break: Exhibit Hall and Poster Presentations Open
Imperial A/B/C/D

10:30 a.m. Concurrent Sessions
See page 22

10:30 a.m. CIG Showcase and Posters
Augusta/Tidewater

12:00 p.m. Lunch Break
On your own

12:00 p.m. ARCSE Lunch and Annual Business Meeting
Grandover West

12:30 p.m. Science and Policy Committee Meeting
Oak A

1:30 p.m. Concurrent Sessions
See page 23

1:30 p.m. CIG Showcase and Posters
Augusta/Tidewater

3:00 p.m. ARCSE Board Meeting
Grandover West

3:00 p.m. Afternoon Break with Exhibitors
Imperial A/B/C/D

3:30 p.m. Concurrent Sessions
See page 24

3:30 p.m. CIG Showcase and Posters
Augusta/Tidewater

5:30 p.m. Exhibitor and Poster Reception in Exhibit Hall
Imperial A/B/C/D

7:30 p.m. Silent Auction Ends
Imperial A/B/C/D

7:30 p.m. Hugh Hammond Bennett Chapter Game Night and Live Auction
Colony A

Events

SOIL HEALTH PARTNERSHIP FARMER PANEL SESSION

7:30 a.m. – 8:15 a.m., *Guilford F/G*

Moderator: *Nicholas Goeser, National Corn Growers Association*

This session will feature three farmers who will discuss the ways they are evaluating and adopting the latest conservation technologies on their farms as part of the Soil Health Partnership (SHP) Demonstration Network. The SHP Partnership Demonstration Network farmers evaluate advanced agronomic systems techniques to improve soil health and economic profitability, serve as peer-to-peer farmer mentors for those interested in adopting sustainable cropping system practices, and host hands-on communication events and field days to highlight the latest integrated agronomic technologies. In this session, the farmers will also talk about their experiences within the network and with these agronomic technologies.

2015 PRITCHARD LECTURE

Soil: The Forgotten Piece of the Water-Energy-Food Nexus

8:30 a.m. – 10:00 a.m., *Guilford F/G*

Presenter: *Jerry Hatfield, USDA-ARS*

Soil is often overlooked as a critical part of the foundation for providing the food, feed, fiber, and water resources for humankind. Soil degradation continues to be an unspoken problem because current agricultural systems often don't address the long-term implications of the increasingly reduced capacity of our soils to function. Improving soils will not solve all of our global issues, but it will lessen the instability in food production, improve our environmental resilience in a changing climate, and increase diversity across the landscape. In 2015, the International Year of the Soils, these challenges provide an incentive for us to understand the true value of soil and promote soils as a critical natural resource.

Jerry L. Hatfield is the laboratory director of the USDA-ARS National Laboratory for Agriculture and the Environment and Director of the Midwest Climate Hub in Ames, Iowa. His personal research focuses on quantifying the interactions among the components of the soil-plant-atmosphere system to quantify resilience of cropping systems to climate change. He represents agriculture on the National Climate Assessment, as a member of the Intergovernmental Panel on Climate Change (IPCC) process that received the 2007 Nobel Peace Prize, and on an IPCC Special report on the Effects of Climate Extremes. He is a Fellow of the American Society of Agronomy, Crop Science Society of America and Soil Science Society of America. He is also Past-President of the American Society of Agronomy and member of the American Meteorological Society, American Geophysical Union, and Soil and Water Conservation Society. He is the recipient of numerous awards and was elected to the ARS Hall of Fame in 2014 for his research contributions to agriculture and environment quality. He is the author or coauthor of 417 refereed publications and the editor of 16 monographs.

CONSERVATION INNOVATION GRANTS (CIG) SHOWCASE AND POSTER SESSION*

10:30 a.m. – 5:00 p.m., *Tidewater/Augusta*

The USDA Natural Resources Conservation Service (NRCS), in conjunction with SWCS, will again host the Conservation Innovation Grants (CIG) Showcase at the SWCS Annual Conference. The showcase presents the opportunity to learn about cutting-edge conservation projects from across the United States. As a method to provide an opportunity to learn about ways to accelerate conservation practice adoption, improve natural resource management, share innovative conservation projects, and the learn about the CIG program, NRCS and CIG participants will present grant examples and results during the symposium.

This symposium will run from 10:30 a.m. - 5:00 p.m. on Monday, July 27. The final 90-minute CIG Showcase session will be held in the CIG Poster display area following a 30-minute refreshment break held in the same room. CIG posters will remain on display throughout the session. The purpose of this session is to facilitate interaction between current and future CIG Participants, NRCS technical specialists and managers, and other SWCS conference attendees.

**This session will run in conjunction with the SWCS conference concurrent sessions.*

EXHIBITOR AND POSTER RECEPTION

5:30 p.m. – 7:30 p.m., *Imperial A/B/C/D*

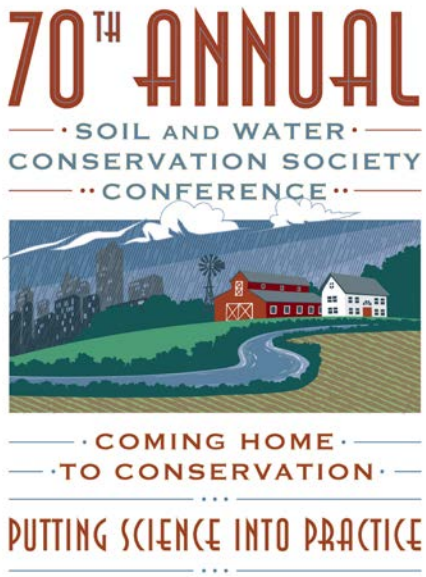
This reception is an opportunity to visit with authors presenting posters; make connections with potential business associates; reconnect with colleagues; and meet vendors showcasing their newest technology, programs, and products. Light hors d'oeuvres will be served along with a cash bar. A ticket for this event is included with full conference registration. Additional tickets for guests may be purchased at the registration desk for $25/person.

HUGH HAMMOND BENNETT CHAPTER GAME NIGHT AND LIVE AUCTION

7:30 p.m. – 9:30 p.m., *Colony A*

Everyone is invited to bring their fun caps to this educational social competition hosted by the Hugh Hammond Bennett Chapter. This Showdown Tournament will allow participants to represent their SWCS chapter, state, territory, or country.

There is no fee to attend, and the entire family is invited to participate in the fun!



70th SWCS International Annual Conference At-A-Glance

	Monday, July 27, 2015			
6:45AM - 5:30PM	**Conference Registration Desk Open**			**Registration Desk 1**
7:15AM - 8:15AM	**Morning Coffee and Soil Health Partnership Farmer Panel -** *sponsored by Soil Health Partnership and Monsanto*			**Guilford F/G**
8:30AM - 9:15AM	**Opening Remarks:** *Jim Gulliford, Soil and Water Conservation Society; Commissioner Steve Troxler, North Carolina Department of Agriculture and Consumer Services; Chief Jason Weller, USDA-NRCS*			
9:15AM - 10:00AM	**Pritchard Lecture: International Year of the Soil -** *Jerry Hatfield, USDA-ARS* *Sponsored by Syngenta*			**Guilford F/G**
10:00AM - 10:30AM	**Refreshment Break with Exhibitors -** *sponsored by American Farmland Trust*			**Imperial A/B/C/D**
10:30AM - 12:00PM	**Symposia Sessions**			
Guilford F *Conservation Models/Tools/Technologies*	Sod-Based Rotation: A Best Management Practice for Soil and Water Sustainability - *Sheeja George, University of Florida*			
Auditorium 1 *Soil Health*	Soil Health Demonstrations in Cropland and Pasture Land Use - *Steve Woodruff, USDA-NRCS*			
Imperial E *Special Symposium*	Special Symposium: Agriculture Irrigation and Precision Technologies to Reduce Water Use - *George Vellidis, University of Georgia*			
Imperial F *Water Science in the Public Interest*	NOAA's National Sea Grant College Program: Engaging Diverse Audiences for Building Resilient Communities - *Sarah Bowman, NOAA*			
	Oral Presentations			
	10:30AM	**10:50AM**	**11:10AM**	**11:30AM**
Imperial G *Adaptive Management*	Soil Health, Resilience, and Climate Change *Bill Berry, NACD*	Water Quality Success Stories Due to Conservation Targeting *Michelle Perez, World Resources Institute*	Water Management in Saudi Arabia Using Deficit Irrigation Strategy *Abdulrasoul Alomran, King Saud University*	Implementation of a Progressive Manure Application Risk Management (ARM) System to Reduce Agricultural Runoff and Leaching Events *Nichole Embertson, Whatcom Conservation District*
Imperial H *Conservation Models/Tools/Techniques*	Managing Denitrification Woodchip Bioreactors for Maximum Nitrate Removal and Minimum Carbon Expended *Keegan Kult, Iowa Soybean Association*	A Protocol for Continuous Improvement Plans to Enhance Water Quality Protection *Tom Simpson, Simpson*	Early Season Rainfall for Quantifying Agronomic Risk in Nitrogen Management *Peter Kyevryga, Iowa Soybean Association*	Sensitivity and Stability of Iowa Daily Erosion Project 2 to Variable Landscape and Rainfall Intensity *Richard Cruse, Iowa State University*
Oak B/C *Outreach/Education/ Community Engagement*	Creating a Clean Water Future *Leslie Gahagan, City of Foley, Alabama*	Implementing Watershed Conservation Goals in an Agricultural Landscape through Innovative Partnerships, Education, and Community Engagement in the Mackinaw River Watershed, Illinois *Krista Kirkham, The Nature Conservancy*	I Heart Soil: Dr. Dirt and the International Year of Soil *Clay Robinson, ACSESS*	Continuing Education for Certified Professionals *Clay Robinson, ACSESS*
Cedar A/B *Water Resources*	Water Use and Economic Impacts of Furrow Irrigation Initiation Delays in Mid-South Soybean Production Systems *C. Robert Stark, University of Arkansas*	Evaluation Effects of Magnetized Saline Water on Seed Germination and Seedling Growth of Bean (*Phaseolus vulgaris*) *Fateme Aghamir, Tarbiat Modares University*	National 303(d) Vision: A State Perspective *Jeff Berckes, Iowa DNR*	
12:00PM - 1:30PM	**Lunch on Your Own**			

1:30PM - 3:00PM	Monday, July 27, 2015 - Symposia Sessions			
Guilford F *Conservation Economics and Policy*	Documenting the Economic Benefits of Soil Health Management for Farmers - *Sarah Mine, Datu Research*			
Auditorium 1 *Outreach/Education/ Community Engagement*	International Year of Soils - *Debbie Anderson, USDA-NRCS*			
Imperial E *Soil Health*	Long-Term Agricultural Research: A Means to Achieve Resilient Agricultural Production for the 21st Century and Beyond - *Jeffrey Strock, University of Minnesota*			
	Oral Presentations			**See Below**
	1:30PM	**1:50PM**	**2:10PM**	**2:30PM**
Imperial F *Water Science in the Public Interest*	Defining and Analyzing Agricultural Production Systems to Determine the Capacity to Make Soil and Nutrient Management Improvements in the Canadian Lake Erie Basin *Pamela Joosse, Agriculture and Agrifood Canada*	A Collaborative Modeling Approach to Assess Resiliency of Snow-Fed Arid Land River Systems: Results from an Organizational Survey of Water Managers *Loretta Singletary, University of Nevada, Reno*		
Imperial G *Conservation Economics and Policy*	Economic and Spatial Assessment of Crop Irrigation in the Arkansas Delta *Kuatbay Bektemirov, University of Arkansas*	Payments for Hydrologic Environmental Services and Environmental Perceptions of Forest Landowners of the Iztaccihuatl – Popocatepetl Region in the State of Puebla, Mexico *Angel Bustamante Gonzalez, Colegio de Postgraduados*	Households' Adoption of Drought Tolerant Plants: An Adaptation to Climate Change? *Laura McCann, University of Missouri*	Systematic Analyses of Erosion, Water Quality and Air Quality by12 KM Grid for the US *Verel Benson, Benson Consulting*
Imperial H *Soil Health*	Using Soil Respiration Tests to Measure Plant Available Nitrogen in Cover Cropped Soils: Demonstrations, Research, and Outreach in South Carolina *Chanda Cooper, Richland SWCD*	Evolution of Soil Surveys: From County Datasets to a Regional Approach *Debbie Anderson, USDA-NRCS*	Soil and Crop Management Influences on Soil Physical Quality of Sanborn Field *Evren Cetin, University of Missouri*	Nuts and Bolts of Crop Rotation Planning: Finding the Data Necessary to Make Informed Decisions *Jeremy Bunch, Shepherd's Grain*
Oak B/C *Social Sciences*	Cultural Capital and Nutrient Reduction *Cornelia Flora, Kansas State University*	A Synthesis of the NIFA Water Portfolio: Early Lessons and Future Directions *Linda Prokopy, Purdue University*	Iowa Farmers' Willingness to Take Action in Support of Nutrient Reduction Strategy Goals *J. Arbuckle, Iowa State University*	
Cedar A/B *Water Resources*	Treating Subsurface Drainage Discharges with Denitrifying Bioreactors *Larry Geohring, Cornell University*	Discharge and Suspended Sediment Patterns in a Small Mountainous Watershed with Widely Distributed Stony Soils *Zhihua Shi, Institute of Soil and Water Conservation*	The Central Mississippi River Basin LTAR Site Infrastructure *Edward Sadler, USDA-ARS*	Water Quality Performance of Wetlands Receiving Nonpoint Source Nitrogen Loads and Potential of Targeted Wetland Restoration to Reduce Nitrogen Loads in Iowa *William Crumpton, Iowa State University*
3:00PM - 3:30PM	**Refreshment Break with Exhibitors**			**Imperial A/B/C/D**

3:30PM - 5:00PM	Monday, July 27, 2015 - Symposia Sessions			
Guilford F *Water Science in the Public Interest*	Detection, Monitoring, Prediction, and Prevention of Harmful Algal Blooms (HABs) - *Sarah Bowman, NOAA*			
Auditorium I *Conservation in Nontraditional Agriculture*	Demonstrating and Disseminating the Best Practices and Technologies for Watershed Rehabilitation to Help Rural Farmers: A Case Study in Pakistan - *Cheryl Simmons, USDA-NRCS*			
Imperial E *Soil Health*	Long-Term Agricultural Research: A Means to Achieve Resilient Agricultural Production for the 21st Century and Beyond - *Jeffrey Strock, University of Minnesota*			
	Oral Presentations			**See Below**
	3:30PM	**3:50PM**	**4:10PM**	**4:30PM**
Imperial F *Adaptive Management*	Diffuse Water Pollution from Agriculture and Mitigation Measures: A Case Study in Lincolnshire, UK *Gueorgui Anguelov, University of Lincoln*	From Field to Stream: Measuring Sediment and Nutrient Losses to Demonstrate the Need for Sub-Watershed Scale Conservation Planning *Kevin Kuehner, Minnesota Department of Agriculture*	Balancing Food Safety and Sustainability: Co-Management for Conservation and Production Goals in Fresh Produce Systems *Mary Bianchi, UC Cooperative Extension*	Responses and Attitudes Toward Soil and Water Conservation Needs and Potential Climate Change Scenarios by Farmers in Dry Land Areas of the Inland Pacific Northwest *Robert Mahler, University of Idaho*
Imperial G *Conservation Economics and Policy*	Western Arkansas Woodland Restoration Project (WAWRP) *John Kluthe, USDA-NRCS*	Experimental Validation and Regulatory Application of USLE/RUSLE in Uruguay *Mario Perez-Bidegain, Fac de Agronomia*	Soil Quality and Profitability Effects of Conventional and Conservation Irrigated Potato Rotation Systems in Western Canada *Mohammad Khakbazan, Agriculture and Agri-Food Canada*	Mitigation of Eutrophication in River Basins, Lakes, and Coastal Waters Requires an Integrated and Adaptive Approach: Experiences from the Netherlands *Joachim Rozemeijer, Deltares*
Imperial H *Conservation Models/Tools/Technologies*	Assessing the Greenhouse Gas Balance of Farming and Ranching Practices with COMET-Farm *Mark Easter, Colorado State University*	Conservation Modeling and Verification in Agriculture Operations *Bethany Reinholtz, GDS Associates, Inc .*	Quantifying the Greenhouse Gas Benefits of Agricultural Conservation and Management *Marlen Eve, USDA*	Vegetated Treatment Area Effectiveness at Reducing Nutrient Runoff from Small Swine Facilities in Central Texas *Kori Higgs, USDA-ARS*
Oak B/C *Outreach/Education/ Community Engagement*	NACD Soil Health Team and National Outreach *Bill Berry, NACD*	Ag/Climate Decision Support Tools for Farmers and Ag Advisors: The Products, Outreach, and Evaluation *Vikram Koundinya, University of Wisconsin*	Building Capacity to Educate Private Water Supply Users: Virginia Master Well Owner Network and Virginia Household Water Quality Program *Erin Ling, Virginia Tech*	
Cedar A/B *Water Resources*	Using the Vetiver Grass Technology (VGT) to Protect Shorelines from Siltation and Other Potential Pollutants *Mohammad Golabi, University of Guam*	A Framework for Setting Realistic Expectations for Water Quality Improvements Based on Changes in Agricultural Activities *Paul Capel, US Geological Survey*	A Study of Ecosystem Services Provided by a Stormwater Retrofit System on a Public School Campus in Orange County, North Carolina *Eric McDuffie, Orange County Schools*	Water Quality Monitoring in the Jersey Valley Watershed *Callie Herron, UW-Discovery Farms*

Monday, July 27 Symposia Sessions

SOD-BASED ROTATION: A BEST MANAGEMENT PRACTICE FOR SOIL AND WATER SUSTAINABILITY

10:30 a.m. – 12:00 p.m., *Guilford F*

Moderator: *Sheeja George, University of Florida*

Sod-based rotation (SBR) is an economically and environmentally sustainable agricultural practice that has been demonstrated at experimental and commercial farms in the southeastern United States, consistently displaying increased crop yields with reduced irrigation demand, reduced fertilizer and pesticide use, increased soil health, and reduced energy consumption. It is a practice incorporating at least two years of perennial grass followed by cash crops. Benefits of this system have been documented widely in a bahiagrass–bahiagrass–peanut–cotton rotation, with promising research on bahiagrass–bahiagrass–soybean–corn rotations and vegetable production following bahiagrass, indicating the potential range of its applicability. The theory behind SBR is that high biomass inputs of the perennial grass combined with minimal tillage and cover cropping increase organic matter in the soil, which has important consequences to soil and water management. Integrating cattle into SBR has demonstrated a model for improved economic returns and efficient use of nutrient and water resources. Our modeling studies indicate that a nonirrigated SBR system has significant advantage over irrigated conventional rotation systems by reducing irrigation costs while maintaining comparable or better yields. Economic models developed from research efforts to date have combined savings due to reduced water demand in addition to other production management savings. These models indicate that a 200-acre farm can increase its net profit from less than $50,000 per year under traditional row crop rotations to over $90,000 per year under SBR. This effort, now in its 15th year, continues to be an outstanding example of increasing productivity using minimal resources, with water savings being central to the system. The talks in this symposium will provide an in-depth overview of SBR, past and current research, and future direction focusing on strategies integrating science and policy for increased adoption.

Presentation 1: Integrating Perennial Grass and Livestock into Row Crop Production – *Jim Marois, University of Florida*

Presentation 2: Effects of Water Savings Due to Implementation of a Sod-Based Crop Rotation System on Reservoir Elevations and River Flows – *Steve Leitman, University of Florida*

Presentation 3: Soil Health in a Sod-Based Crop Rotation System – *Sheeja George, University of Florida*

SOIL HEALTH DEMONSTRATIONS IN CROPLAND AND PASTURE LAND USE

10:30 a.m. – 12:00 p.m., *Auditorium 1*

Moderator: *Steve Woodruff, USDA-NRCS*

Soil health can be defined as the capacity of the soil to function. Soil is a vital living ecosystem that sustains plants, animals, and humans. To meet the projected needs of the world's burgeoning population—and to do so in a sustainable way—it is critical that we focus on ensuring the health and productivity of our soil.

Attendees to this session will observe and learn the importance of the four core principals of soil heath through interactive demonstrations and discussion. Instructors will walk the participants outside to see a rainfall simulator, slake test, and other demonstrations. While the rainfall simulator is running, instructors will discuss the significance of the water cycle, nutrient and mineral cycles, energy flow, and soil life. Through observation of test results for the same soil types with different management systems, attendees will see the impacts of agricultural practices on both cropland and pasture lands. Closing discussion will focus on the ways soil health principals can be used to restore health to working lands and can lead to systemic, continental-scale improvements in water, air, wildlife—all while enhancing long-term agricultural productivity.

SPECIAL SYMPOSIUM

AGRICULTURE IRRIGATION AND PRECISION TECHNOLOGIES TO REDUCE WATER USE

10:30 a.m. – 12:00 p.m., *Imperial E*

Moderator: *George Vellidis, University of Georgia*

Water is arguably the most important input to agricultural crop production. With increasing demands for water and greater frequency of droughts, managing water inputs will be exceedingly important. This symposium will focus on irrigation technologies to reduce water use and improve irrigation efficiency.

Presentation 1: Hydrogel and Compost on the Photosynthetic Activity and Production of Maize (*Zea mays* L.) Grown for Forage – *Aurelio Pedroza-Sandoval, Universidad Autónoma Chapingo*

Presentation 2: Precision Irrigation Management Based on Crop Canopy Temperature – *Saleh Taghvaeian, Oklahoma State University*

Presentation 3: Long-Term Water Conservation Technology that Doubles Production and Preserves Ground Water – *Alvin Smucker, Michigan State University*

Presentation 4: University of Georgia Smart Sensor Array (UGA SSA) for Scheduling Irrigation – *George Vellidis, University of Georgia*

NOAA'S NATIONAL SEA GRANT COLLEGE PROGRAM: ENGAGING DIVERSE AUDIENCES FOR BUILDING RESILIENT COMMUNITIES

10:30 a.m. – 12:00 p.m., *Imperial F*

Moderator: *Sarah Bowman, NOAA*

NOAA's National Sea Grant College Program (Sea Grant) is a federal-state partnership of 33 university-based programs in every coastal and Great Lakes state and US territory. Sea Grant programs support community adaptation research and outreach projects intended to help build resilience to natural hazards, including severe weather, increased shoreline erosion, sea level rise and Great Lakes water level changes, and other impacts of a changing climate. Many coastal areas are in need of plans to mitigate these coastal hazards, which provides Sea Grant programs the opportunity to build relationships between key decision-makers, citizens, practitioners, and experts in the field. The incorporation of diverse audiences within a community strengthens the initial stages of a collective planning process and guides subsequent local and state response to our changing coasts. The speakers will share useful tactics for effectively engaging a diverse audience of community leaders, stakeholders, and citizens, and highlight common pitfalls to avoid. This will be followed by a facilitated discussion, which will engage the audience to explore additional best practices, challenges, and perhaps solutions for effective community engagement on resilience and climate adaptation processes. Join Sea Grant specialists to examine ways to overcome obstacles encountered along the way to preparing communities for a changing future.

Presentation 1: Planning for Sea Level Rise in Georgia – *Mark Risse, Georgia Sea Grant, University of Georgia*

Presentation 2: Implementing Comprehensive Community Flood Resilience Planning in Hyde County, North Carolina – *Jessica C. Whitehead, North Carolina Sea Grant*

Presentation 3: Building Adaptive Capacity and Resilience through Local Conservation Collaboration – *Clara Rubin, University of Rhode Island*

DOCUMENTING THE ECONOMIC BENEFITS OF SOIL HEALTH MANAGEMENT FOR FARMERS

1:30 p.m. – 5:00 p.m., *Guilford F*

Presenters: *Rich Duesterhaus, National Association of Conservation Districts; Nicholas Goeser, Soil Health Partnership; Sarah Mine, Datu Research; Neil Conklin, Soil Renaissance; Deborah Atwood, AGree*

Soil health management provides wide-reaching economic and environmental benefits, but for adoption of practices like no-till, cover cropping, and crop rotations to increase, a fair share of these benefits must accrue to farmers. Currently, there is a lack of data on the economic returns of soil health management practices for producers.

A number of collaborative efforts to fill this data gap—via demonstration farms, case study research, and data integration and analysis—are currently underway. This symposium session will bring together major players to assess the current state of prominent, nationwide efforts. The National Corn Growers Association (NCGA)'s Soil Health Partnership is identifying, testing, and measuring management practices that improve soil health and benefit farmers' bottom lines over a five-year time series. The National Association of Conservation Districts and global consulting firm Datu Research are exploring which soil health management practices work under various conditions, and what impact they have on producers' net revenues. The Soil Renaissance, an initiative of the Farm Foundation, NFP, and the Samuel Roberts Noble Foundation, is evaluating measurement tools and working to quantify the effects of soil health on economic risks and returns. To make efficient use of existing data, food and agricultural policy group AGree is engaging with the USDA in an effort to integrate and analyze existing data within USDA on conservation practices, yield, variability, soil health, and other key indicators.

Leaders of these efforts will share methodological approaches and preliminary findings, and identify emerging gaps. What do early findings tell us about the economic benefits for farmers? What questions do we expect to have answered by the time these efforts are completed, and where will more work be needed? How can we best "divide and conquer" the remaining work to get high-quality information in farmers' hands as soon as possible?

INTERNATIONAL YEAR OF THE SOILS

1:30 p.m. – 3:00 p.m., *Auditorium 1*

Moderator: *Debbie Anderson, USDA-NRCS*

Presentation 1: Overview of International Year of Soils – *David Smith, USDA-NRCS*

This symposium will celebrate the 2015 International Year of Soils through presentations highlighting the importance of soils and how soils impact our everyday lives internationally.

Presentation 2: Global Soils Partnership – *Jon Hempel, USDA-NRCS*

The Global Soil Partnership was developed in response to the renewed recognition of the central role of soil resources as a basis for food security, climate change adaptation and mitigation, sustaining biodiversity, and bioenergy production, along with provisioning of other key ecosystem services.

Presentation 3: Improving Soil Fertility and Soil Health in Pakistan through Demonstration and Dissemination of Best Management Practices for Farmers – *Otto Gonzalez, Foreign Agricultural Service*

Examples of impacts will be featured through presentations on current international collaborative projects and activities. Participants will also learn about demonstrations and tests on research and extension plots in Pakistan of best management practices of maintaining or building soil organic matter and improving soil health to result in improved soil moisture conservation, soil fertility, and reduced dependence on chemical fertilizer.

Presentation 4: Latin America Soil Science Collaboration – *Thomas Reinsch, USDA-NRCS*

USDA-NRCS has collaborated with the Latin America Soil Science Society through participation in workshops, conferences, and publications. Collaboration has resulted in sharing new technologies, data, information, and strengthened capacity. This collaboration has favorably impacted shared resource concerns along the common boundary of Mexico and the United States.

Presentation 5: International Soils Judging Contest: Changes to Soils Curriculum – *Maxine Levin, USDA-NRCS*

A new generation of students are experiencing the International Soils Judging Contest activities. Opportunities of changes to the soils curriculum will be considered.

LONG-TERM AGRICULTURE RESEARCH: A MEANS TO ACHIEVE RESILIENT AGRICULTURE PRODUCTION FOR THE 21ST CENTURY AND BEYOND

1:30 p.m. – 5:00 p.m., *Imperial E*

Moderator: *Jeffrey Strock, University of Minnesota*

The topic of the 16th Annual SWCS-SSSA Joint Symposium is resilient long-term agricultural production. Contemporary scientific and societal concerns of climate change; extreme weather variability; environmental quality (air and water); biodiversity; ecosystem services; and profitable, sustainable, and resilient food, feed, fiber, and energy production systems make such a symposium timely. This symposium will explore how new technologies and innovative means of improving crop production systems are being used or should be used in long-term agricultural research to meet future food, feed, fiber, and energy needs. This symposium will explore how systems science can provide sound solutions and multiple options for decision making by producers and those involved in agribusiness and conservation professions. Invited presentations will include an overview of contemporary long-term agricultural research and visions of future long-term agricultural research. A series of presentations will synthesize long-term agricultural research on discipline specific topics including soil fertility, soil water, tillage, cropping systems, weeds, diseases, and insects. This joint symposium will continue the tradition of cooperation between the two societies and will help create opportunities to disseminate information regarding solutions to new opportunities in soil and water management and conservation.

Presentation 1: The Oldest Continuous Cotton Experiments in the World – *Charles Mitchell, Auburn University*

Presentation 2: Long-Term Research on Nutrient Management of California Irrigated Cropping Systems: Russell Ranch Sustainable Agricultural Facility – *Kate Scow, University of California*

Presentation 3: Weed Management and Climate Change: Monitor, Measure, Manage – *Lewis Ziska, USDA-ARS*

Presentation 4: Nearly 20 Years of Bt Hybrids: What Have We Learned and Where Do We Go from Here? – *Mike Gray, University of Illinois*

Presentation 5: Long-Term Agricultural Research: Plant Diseases – *Tim Paulitz, Washington State University*

Presentation 6: Agronomic, Economic, and Environmental Performance Characteristics of Conventional and More Diverse Cropping Systems in the US Corn Belt – *Matt Liebman, Iowa State University*

Presentation 7: Long-Term Research: Soil and Water Availability – *Clark Gantzer, University of Missouri*

DETECTION, MONITORING, PREDICTION, AND PREVENTION OF HARMFUL ALGAL BLOOMS (HABS)

3:30 p.m. – 5:00 p.m., *Guliford F*

Moderator: *Sarah Bowman, NOAA*

NOAA's National Sea Grant College Program (Sea Grant) is a federal-state partnership of 33 university-based programs in every coastal and Great Lakes state and US territory. Sea Grant

programs support efforts to detect, understand, and reduce the occurrence of harmful algal blooms (HABs). HABs can cause taste and odor problems in drinking waters, pollute beaches with scums, reduce oxygen levels for fish and other animals, and cause processing problems for public water supplies. For example, during August of 2014 over 400,000 residents in Toledo, Ohio, were banned from using their water because a massive bloom in Lake Erie washed into their drinking water intake. HABs have been known to produce a wide array of neurotoxins, liver toxins, cell toxins, and skin irritants. Though HABs are natural, their occurrence has increased since the mid-1990s. Malfunctioning septic systems, products with phosphates like dishwasher detergent, and runoff from urban and agricultural lands are thought to contribute to more frequent HABs. Sea Grant-funded research helps to forecast how factors like river runoff, nutrient loads, and molecular indicators influence HABs and toxin production. Sea Grant's education and extension efforts empower elected officials, beach managers, pet owners, the media, and the public to make informed, data-driven decisions regarding HAB management and health protection of coastal inhabitants. Additionally, several Sea Grant programs work with citizen scientists to monitor local waters for the presence of HABs. Continued efforts to improve detection, monitoring, prediction, and prevention of HABs is vital to coastal economies and communities.

Presentation 1: Harmful Algal Bloom Research, Response, Outreach, and Management through the South Carolina Sea Grant Consortium – *Dianne I. Greenfield, Belle W. Baruch Institute of Marine and Coastal Sciences*

Presentation 2: Harmful Algal Blooms in the Gulf of Mexico – *Emily A. Smith, NOAA*

Presentation 3: Harmful Algal Blooms in the Great Lakes: How Do We Solve the Problem – *Jeffrey M. Reutter, Ohio Sea Grant and Stone Lab, The Ohio State University*

DEMONSTRATING AND DISSEMINATING THE BEST PRACTICES AND TECHNOLOGIES FOR WATERSHED REHABILITATION TO HELP RURAL FARMERS: A CASE STUDY IN PAKISTAN

3:30 p.m. – 5:00 p.m., *Auditorium 1*

Moderator: *Cheryl Simmons, USDA-NRCS*

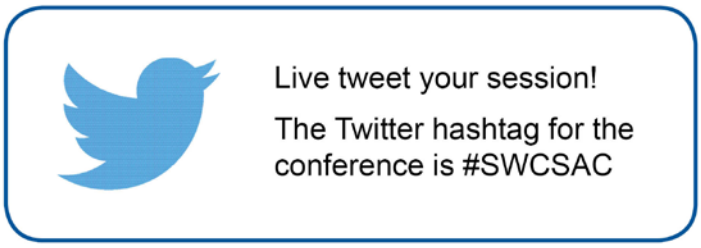
This symposium highlights work of USDA-NRCS and USDA-Foreign Agriculture Service (FAS) in collaboration with an international partner, the International Center for Agricultural Research in the Dry Areas (ICARDA), and 10 Pakistani agricultural institutions to establish 46 demonstration sites, develop extension materials, and provide training on service provision as well the use of digital technology to deliver extension messaging to thousands of farmers.

Presentation 1: An Approach for Providing USDA Technical Expertise to Support US Foreign Policy Objectives – *Otto Gonzalez, USDA-FAS*

Presentation 2: Demonstrating and Disseminating Agriculture Practices in Pakistan – *Matt Stellbauer, USDA-FAS*

Presentation 3: Collaborating with International and Local Organizations to Improve Soil Health and Soil Fertility – *Thomas Reinsch, USDA-NRCS*

Presentation 4: Consider Gender in Sustainable Agriculture Outreach – *Cheryl Simmons, USDA-NRCS*



A PROJECT TO MAKE AGRICULTURE MORE PRODUCTIVE AND SUSTAINABLE THROUGH

IMPROVED SOIL HEALTH

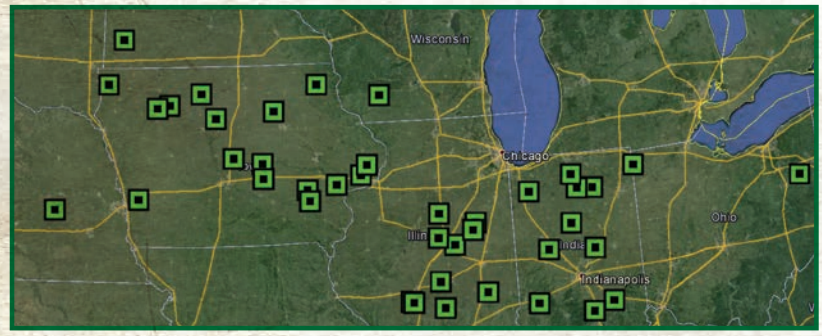
SOIL HEALTH PARTNERSHIP

LET'S UNLOCK THE POTENTIAL THAT'S RIGHT UNDER OUR FEET.

Ask anyone in agriculture and they'll tell you: healthy soils sustain higher yields. Just as important, if less apparent, is the crucial role soil health can play in protecting water quality and other aspects of good environmental stewardship. However, while our industry has seen massive leaps in innovation in seed technology, equipment design and precision planting strategies, we haven't seen a concentrated effort to aggregate and measure the beneficial effects of innovative soil management strategies. Until now.

HOW DOES THE SOIL HEALTH PARTNERSHIP DEFINE SOIL HEALTH?

We believe soil health is the continued capacity of a soil to function as a vital living ecosystem that sustains plants, animals and humans.



2014 SHP DEMONSTRATION FARM LOCATIONS

The Soil Health Partnership is building a network to evaluate soil health impacts on crop yields, farm economics, and environmental outcomes.

An NCGA Initiative

NCGA

Initial Support From

Monsanto and
The Walton Family Foundation

With Technical Support From

The Nature Conservancy

For more information about this initiative please visit SoilHealthPartnership.org

Tuesday, July 28 Schedule & Events

Schedule

7:00 a.m. Professional Development Committee Meeting
Oak A

7:30 a.m. Registration Opens
Registration Desk

7:30 a.m. Morning Coffee - sponsored by Envirocert International, Inc, and Light Breakfast
Guilford Foyer

8:00 a.m. Tuesday Plenary
Guilford F/G

10:00 a.m. Morning Break in Exhibit Hall
Imperial A/B/C/D

10:30 a.m. Concurrent Sessions
See page 33

10:30 a.m. 2015 USDA-NIFA NIWQP and ARFI Annual Project Director's Meeting
Victoria A

12:00 p.m. *Awards Luncheon
Guilford D

12:00 p.m. Lunch Break
On your own

1:30 p.m. Concurrent Sessions
See page 34

1:30 p.m. 2015 USDA-NIFA NIWQP and ARFI Annual Project Director's Meeting
Victoria A

1:30 p.m. ARS-WAS Cropland CEAP Annual Meeting
Colony B

3:30 p.m. Concurrent Sessions
See page 35

3:30 p.m. 2015 USDA-NIFA NIWQP and ARFI Annual Project Director's Meeting
Victoria A

3:30 p.m. ARS-WAS Cropland CEAP Annual Meeting
Colony B

5:00 p.m. Focus Group for Recipients of USDA-NIFA Funding During 2001-2013
Meadowbrook

5:15 p.m. SWCS Annual Conference Program Committee
Oak A

6:00 p.m. Hugh Hammond Bennett Chapter Memory Lane Event
Colony A

** Additional fees apply*

Events

A LOOK AT PRECISION CONSERVATION: PUTTING SCIENCE INTO PRACTICE

8:00 a.m. – 10:00 a.m., *Guilford F/G*

Presenters: *David Muth, AgSolver, Inc; Mark Tomer, USDA ARS; Linda Prokopy, Purdue University*

Moderator: *Deanna Osmond, North Carolina State University*

David Muth is the Senior Vice President of Analytics at AgSolver, Inc. Prior to cofounding AgSolver in 2013, Muth led a research team at the Idaho National Laboratory, working on bioenergy feedstock production and logistics analysis. He led the development of open-source environmental process modeling tools to support the design and assessment of bioenergy landscapes. These open-source tools are used by the US Department of Energy and its research partners to design sustainable and economically viable bioenergy feedstock production systems. Muth was raised on a farm in north-central Iowa and applies his practical experience with agribusiness

Tuesday, July 28 Schedule & Events

CONTINUED

decision making to identify innovative data management and simulation approaches that increase profitability, reduce risk, and improve environmental performance in production agriculture. He received his PhD in mechanical engineering from Iowa State University in 2012.

Linda Prokopy collaborates extensively with scientists across Purdue University and co-leads a regional project to develop social indicators to measure the effectiveness of projects that try to minimize nonpoint source pollution. She conducts social evaluations of watershed projects in Indiana and also has a number of competitive grants that use social indicators to improve the outcomes of water projects. Natural resources in Indiana and elsewhere are increasingly threatened by human pressures such as land use change, climate change, and water pollution. Prokopy's research, teaching, and engagement cumulatively address these human threats with a particular focus on understanding how to encourage more people to become engaged in environmentally friendly behaviors. She uses both qualitative and quantitative methods in her research and frequently uses techniques such as surveys, interviews, and focus groups.

Mark Tomer is a research soil scientist with the National Laboratory for Agriculture and the Environment (NLAE) of the USDA's Agricultural Research Service (ARS) in Ames, Iowa. His background includes a BS in forestry from the University of Montana, an MS in soil physics from Montana State University, and a PhD in soil and water resources from the University of Minnesota. Prior to joining ARS in the year 2000, Tomer gained research and technology transfer experience working on agricultural salinity in eastern Montana and on municipal wastewater irrigation in forest plantations in New Zealand. Tomer is currently the lead scientist for watershed research at NLAE, and he has served on ARS's Leadership Team for the Croplands Conservation Effects Assessment Project (CEAP).

2015 USDA-NIFA NIWQP AND ARFI ANNUAL PROJECT DIRECTOR'S MEETING*

10:30 a.m. – 5:30 p.m., *Victoria A*

The USDA National Institute of Food and Agriculture (NIFA) and the Soil and Water Conservation Society will host the 2015 USDA-NIFA NIWQP and AFRI Annual Project Director's Meeting. The meeting will feature awardees from the National Integrated Water Quality (NIWQP, FY 2010-2014), the Agricultural and Food Research Initiative (AFRI), Water for Agriculture (FY 2014) and Foundational (FY 2011 and 2013) programs. The group will share the learned concepts, innovative methodologies and project successes through oral presentations and posters sessions. The meeting will allow the opportunity to enhance communication and interaction between NIFA program staff and awardees. In turn, NIFA staff will benefit by identifying success stories and impacts resulting from sponsored research in these programs.

*This session will run in conjunction with the SWCS Conference concurrent sessions.

ARS-WAS CROPLAND CEAP ANNUAL MEETING*

10:30 a.m. – 5:00 p.m., *Colony B*

Participants will hear updates from ARS and NRCS headquarters and participate in round robin reports from the ARS watersheds.

*This session will run in conjunction with the SWCS Conference concurrent sessions.

FOCUS GROUP FOR RECIPIENTS OF USDA-NIFA FUNDING DURING 2001-2013

5:00 p.m. – 7:00 p.m., *Meadowbrook*

Did you receive USDA-NIFA funding during 2001-2013 for a project that included a water component? Mike O'Neill (University of Connecticut) and Linda Prokopy (Purdue University) are evaluating the 2001-2013 NIFA Water Portfolio to understand project successes in promoting solutions to water problems in agricultural, rural, and urban watersheds. Many project directors have been contacted to provide input through an online survey, but we would also like to invite you to attend this focus group being held in conjunction with the SWCS Annual Conference.

HUGH HAMMOND BENNETT CHAPTER MEMORY LANE EVENT

6:00 p.m. – 8:00 p.m., *Colony A*

Attend the final evening gathering and enjoy local music and pictures from the past. Share your special moments at the conference and say goodbye to fellow attendees and new friends. Collect contact information from peers and fellow professionals to stay in touch until next year. HHB Chapter members will be present to answer any questions about your travels through North Carolina or about Wednesday's tours. This informal event is free to any conference participants who wish to attend.

	Tuesday, July 28, 2015			
7:30AM - 5:00PM	**Registration Desk Open**			**Registration Desk 1**
7:30AM - 9:00AM	**Morning Coffee -** *sponsored by Envirocert International, Inc,* **and Light Breakfast**			**Guilford Foyer**
8:00AM - 10:00AM	**Plenary Session: A Look at Precision Conservation: Putting Science into Practice -** *David Muth, AgSolver, Inc; Linda Prokopy, Purdue University; Mark Tomer, USDA-ARS* **Moderator:** *Deanna Osmond, North Carolina State University*			**Guilford F/G**
10:00AM - 10:30AM	**Refreshment Break with Exhibitors**			**Imperial A/B/C/D**
10:30AM - 12:00PM	**Symposia Sessions**			
Guilford F *Precision Conservation*	Engaging Farmers in Watershed Planning through Precision Conservation: Midwestern Case Studies Utilizing the Agricultural Conservation Planning Framework - *Mark Tomer, USDA-ARS*			
Auditorium I *Soil Health*	Economics of Soil Health Practices - *Lynn Knight, USDA-NRCS*			
Imperial E *Water Science in the Public Interest*	Syngenta Crop Protection's Watershed Monitoring and Stewardship Program - *Clint Truman, Syngenta*			
	Oral Presentations			
	10:30AM	**10:50AM**	**11:10AM**	**11:30AM**
Imperial F *Conservation in Nontraditional Agriculture*	Conservation Practices Used in the Tropical Climates of the Pacific Basin *Bernadette Luncsford, USDA-NRCS*	Support People, the Planet and Increase Profit through Using Organic Soil Conservation Practices *Ib Hagsten, International Organic Inspectors Association*	Incorporating Bioenergy in Sustainable Landscape Designs: A Discussion of Bioenergy's Potential Role in Conservation from Two DOE Workshops *Maria Negri, Argonne National Laboratory*	On-Farm Soil Quality Testing in Organic and Conventional Peach Orchard Systems *Esther Thomsen, Utah State University*
Imperial G *Conservation Models/Tools/Techniques*	Shooting a Moving Target: A Dissolved Phosphorus Problem Paradigm *Rem Confesor, Heidelberg University*	The Role of Unmanned Aircraft Systems in Natural Resource Management *Michael Hutt, Cherokee Nation Technologies*		
Imperial H *Outreach/Education/ Community Engagement*	Repeated Survey of Public Attitudes Following an Extended Period of Exceptional Drought in Texas *Diane Boellstorff, Texas A&M AgriLife Extension System*	Texas Well Owner Network: Protecting Groundwater Resources and Human Health *Drew Gholson, Texas A&M AgriLife Extension System*	The Evolution of a Local Soil and Water Conservation District: From Traditional Technical Assistance and Program Funding to Environmental Regulatory Enforcement *Danon Lawson, Gaston National Resources Department*	Assessing and Building Local Watershed Steward Capacity via the North Carolina Watershed Stewardship Network *Christy Perrin, Water Resources Research Institute*
Oak B/C *Water Resources*	Improving Watershed Planning Using Bacterial Source Tracking *Kevin Wagner, Texas Water Resources Institute*	Strategic and Prioritized Implementation of Conservation and Compliance for Improved Water Quality and Aquatic Life Habitat *Kevin Fenn, Oregon Department of Agriculture*	1890s Land Grant Universities Water Center: Its Activities Past and Present *Asmare Atalay, Virginia State University*	
Cedar A/B *Social Sciences*	I Just Call It Practical Economics – Survival Economics: Understanding Nutrient Management for Improved Conservation *Hanna Rosman, Iowa State University*	Power of Peers: The Effectiveness of Farmer Networks *Aaron Pape, Purdue University*	Estimation of the Crop-Tillage Choices with Aggregate Data: An Application to Modeling Conservation Tillage Frequency *Lyubov Kurkalova, North Carolina State University*	Engaging Missed Demographics in Conservation Changes: Women Farmland Owners and Wetlands in Iowa *Angie Carter, Iowa State University*
12:00PM - 1:30PM	**Awards Luncheon (must have ticket)**			**Guilford D**

1:30PM - 3:00PM	Tuesday, July 28, 2015 - Symposia Sessions			
Guilford F *Social Sciences*	Engaging Non-Operator Women Farmland Owners in Agricultural Conservation - *Jennifer Filipiak, American Farmland Trust*			
Auditorium I *Conservation Models/Tools/Technologies*	Haiti Soil Survey and Natural Resources Conservation Initiative - *Charles Kome, USDA-NRCS*			
	Oral Presentations			
	1:30PM	**1:50PM**	**2:10PM**	**2:30PM**
Imperial E *Conservation Models/Tools/Techniques*	Image Processing and GIS Techniques for Assessing Agroforestry Practices *Dacia Meneguzzo, US Forest Service*	Evaluation of GIS-Based Erosion-Deposition Modeling for Land Management at Military Installations *Helena Mitasova, North Carolina State University*	An Assessment of the Regional Effects of Agricultural Conservation Practices on Nutrient Transport in the Upper Mississippi River Basin *Ana Maria Garcia, USGS*	
Imperial F *Water Science in the Public Interest*	Impact of Levee Breaches, Flooding, and Land Scouring on Soil Productivity *Kenneth Olson, University of Illinois*	Water Quality Monitoring in Bayou Chene and Lacassine Bayou in Louisiana *Durga Poudel, University of Louisiana at Lafayette*	Weak Links in Communication Contribute to Harmful Algal Blooms in Lake Erie *Laura Johnson, Heidelberg University*	Assessing the Impact of Farm Management on Water Quality: Can Science Really Change Public Perceptions *Andrew Sharpley, University of Arkansas*
Imperial G *Precision Conservation*	Using Novel Geospatial Tools and Approaches for Identifying Critical Nutrient Source Areas for Implementing Best Management Practices in the Grand River Watershed, Ontario, Canada *Louise Heyming, Grand River Conservation*	Livestock Trail Erosion: Some Treatment Options *Dennis Schrodt, USDA-NRCS*	Irrigating Sweet Corn with Drip Irrigation to Conserve Water Resources *Gary Hawkins, University of Georgia*	EphGEE: Ephemeral Gully Erosion Estimator *Seth Dabney, USDA-ARS*
Imperial H *Soil Health*	Scientific Basis for Soil Health *Charles Honeycutt, USDA-NRCS*	Cover Crop Decision Making: New Tools and Technology for 2015 and Beyond *Scott Wohltman, La Crosse Seed*	Soil Organic Carbon Simulation by Using the APEX Model for Organic and Chemical Management under Conservation and Conventional Tillage Systems *Kieu Le, North Carolina A&T State University*	
Oak B/C *Soil Health*	Influence of Biochar and Diversified Cropping Systems on Soil Physical and Chemical Properties *Deborah Aller, Iowa State University*	Soil Quality Assessment in Urban Gardening: Trace Metals and Phosphorus *Tolessa Deksissa, University of the District of Columbia*	Soil Conservation and Greenhouse Gas Emissions: The Role of Reduced Tillage and Organic Agriculture in Soil Nitrous Oxide Production *Sean Bloszies, North Carolina State University*	
Cedar A/B *Conservation Models/Tools/Technologies*	Improving Construction Site Stormwater Quality *Richard McLaughlin, North Carolina State University*	Using Tillage to Improve Post-Construction Soil Infiltration *Richard McLaughlin, North Carolina State University*	Particulate Phosphorus Removal in Piedmont Stormwater: A Mechanistic Model Based on Continuous Particle Size Distribution, Implications for BMPs *Mark River, Duke University*	Impact of Cropping Practice on Soil Potassium Supply *Marko Davinic, Western Ag Innovations*
3:00PM - 3:30PM	**Refreshment Break**			**Imperial Ballroom Foyer**

3:30PM - 5:00PM	Tuesday, July 28, 2015 - Symposia Sessions			
Guilford F *Outreach/Education/ Community Engagement*	Communicating the Hope in Healthy Soil: A Behind the Scenes Look at an International Award-Winning Campaign - *Ron Nichols, USDA-NRCS*			
Imperial E *Soil Health*	Soil Health On the Ground: Opportunities and Challenges in Fostering Practice Adoption - *Rebecca Power, University of Wisconsin-Extension*			
	Oral Presentations			
	3:30PM	**3:50PM**	**4:10PM**	**4:30PM**
Imperial F *Precision Conservation*	Pinpointing the Most Erosive Areas within A Field: Precision Conservation Intersects with Precision Agriculture *Tom Buman, Agren*	Targeting Critical Ephemeral Gully Erosion Sites in a Watershed *Tom Buman, Agren*	Irrigation Scheduling and Outreach to Protect Groundwater Quality in Central Minnesota *Luke Stuewe, Minnesota Department of Agriculture*	
Imperial G *Water Resources*	Restoring Hydrological Function on Landscapes through the Removal of Western Juniper *Thomas Esgate, Pit Resource Conservation District*	Agricultural Water as a Potential Source of Bacterial Contamination to Fresh Produce: A Rainfall Simulation Study *Fawzy Hashem, University of Maryland Eastern Shore*	The Perfect Storm: Nitrate Concentrations in the Midwest in a Wet Year Following the Drought of 2012 *Jeffrey Frey, USGS*	Improved Bioreactor Management through Monitoring of Potential Contaminants *Keegan Kult, Iowa Soybean Association*
Imperial H *Adaptive Management*	Conservation Agriculture with High Tunnels *Manuel R. Reyes, North Carolina A&T State University*	Assessing the Groundwater Resources and Estimating Future Demand for Irrigation in Three Districts of Nepal *Romulus Okwany, International Water Management Institute*		
Oak B/C *Soil Health*	Measuring Land and Other Capital Inputs *Thomas Reinsch, USDA-NRCS*	Introducing the New NRCS Soil Health Division *Diane Stott, USDA-NRCS*	Rangeland Soil Health *Diane Stott, USDA-NRCS*	
Cedar A/B *Conservation Economics and Policy*	US Agricultural Water Conservation, Emerging Demands, and the Challenge for a Sustainable Future *Glenn Schaible, EPA*	Options to Address Nutrient Pollution from Agricultural Drainage *Jan Goldman Carter, National Wildlife Federation*	Factors Affecting Adoption of Stormwater Management Practices by Homeowners: Rain Gardens and Rain Barrels *Dong Won Shin, University of Missouri*	

Tuesday, July 28 Symposia Sessions

ENGAGING FARMERS IN WATERSHED PLANNING THROUGH PRECISION CONSERVATION: MIDWESTERN CASE STUDIES UTILIZING THE AGRICULTURAL CONSERVATION PLANNING FRAMEWORK

10:30 a.m. – 12:00 p.m., *Guilford F*

Moderators: *Linda Prokopy, Purdue University; Mark Tomer, USDA-ARS*

Watersheds have become a focus of our efforts to improve the environmental performance of agriculture, particularly at the smaller (HUC12) scale. A set of precision conservation planning tools has been developed to help facilitate a "watershed approach" to conservation planning through a participatory process involving landowners. The approach emphasizes the need to improve soil health across a watershed, and provides multiple options to place a variety of structural and vegetative practices to control, trap, and treat water flows within and below fields in locations suited to each type of practice. The Agricultural Conservation Planning Framework (ACPF) comprises a set of ArcTools that can identify multiple options for site-specific placement of conservation practices throughout a watershed based on landscape (hydrologic) and soil criteria, which allows local farm producers the discretion to select preferred practices and locations. The ACPF tools have been applied in HUC12 watersheds in four states. This session will highlight case studies and summarize the responses of farm producers to watershed-specific information and illustrate the flexibility of planning approaches and options that can be provided at the watershed scale using these precision conservation GIS tools. Representatives from six watersheds and four states (Indiana, Minnesota, Iowa, and Illinois) will be included in the panel. The 90-minute session is formatted to include an 8 to 10 minute presentation for each watershed followed by a facilitated 30-minute panel discussion.

Presentation 1: Watershed Planning Approach in Two Northern Indiana Watersheds – *Jill Reinhart, USDA-NRCS*

Presentation 2: Application of the ACPF to the Upper Silver Creek Watershed – *John Sloan, Great Rivers Research and Education Center*

Presentation 3: Watershed Planning Approach in Beaver Creek, Iowa – *Adam Kiel, Iowa Soybean Association*

Presentation 4: Watershed Planning Approach in Dobbins Creek, Minnesota – *Joe Magner, University of Minnesota*

Presentation 5: Use of the ACPR in Subwatersheds of the Le Seuer River, Minnesota – *Jessica Nelson, Minnesota State University*

Presentation 6: From Field to Stream: Advancing Conservation Planning and Delivery in Minnesota's Root River – *Kevin Kuehner, Minnesota Department of Agriculture*

ECONOMICS OF SOIL HEALTH PRACTICES

10:30 a.m. – 12:00 p.m., *Auditorium 1*

Moderator: *Lynn Knight, USDA-ARS*

As conservation tillage, cover crops, and other soil health-related practices gain attention and focus, questions are moving from the agronomic to the economic. Understanding how producers are making decisions to adopt these practices can help target assistance that promotes future implementation.

We propose to discuss three topic areas: analysis of historic use of conservation tillage using ARMS data; costs and benefits of adopting viable soil health conservation systems in the southeastern United States; and the Cover Crop Economic Decision Support Tool.

The ARMS conservation tillage study is the first to use data on tillage history as well as current tillage practices to distinguish farms that use no-till continuously from those that alternate no-till with other tillage practices. Revealed preference data is used in an ordered logit regression analysis to determine the effect of land characteristics, climate, farm characteristics, and producer demographics on producer choice among tillage regimes. Our primary objective is to develop a richer understanding of producer no-till adoption decisions.

In the Southeast, conservation systems are a viable production option for producers to positively impact soil health. Current ARS research explores the costs and benefits of adopting a conservation system by producers in the Southeast.

The Cover Crop Economic Decision Support Tool helps address some of the economic and financial questions that arise. It is an Excel-based, partial budgeting tool that has been developed to assist landowners, producers, and planners make informed decisions regarding those questions. The tool highlights a producer's changes in operating costs and benefits over both the short term and long term, assessing both profitability and affordability.

Presentation 1: Modeling No-Tillage Adoption by Corn and Soybean Producers: Insights into Sustained Adoption – *Roger Claassen, USDA*

Presentation 2: Economics of Conservation Systems Research in Southeastern United States – *Leah M. Duzy, USDA-ARS*

Presentation 3: Cover Crop Economic Decision Support Tool – *Lauren Cartwright, USDA-NRCS*

SYNGENTA CROP PROTECTION'S WATERSHED MONITORING AND STEWARDSHIP PROGRAM

10:30 a.m. – 12:00 p.m., *Imperial E*

Moderator: *Clint Truman, Syngenta*

The Atrazine Ecological Monitoring Program (AEMP) focuses on soil and water resource assessment, atrazine fate and transport, nitrate-nitrogen and sediment transport, and stewardship within vulnerable watersheds in major corn and sorghum producing States. A goal of the AEMP is to protect invertebrates, fish and amphibians, and their habitat and food sources from the direct effects of sediment and runoff transported agrichemicals. Hydrology (rainfall, stream flow), land use (farming practices, agrichemical use), and selected water quality parameters associated with AEMP watersheds have been monitored for multiple years to assess if, and if so, then the magnitude and duration in which streams exceed interim water quality triggers. Field and watershed monitoring data also help guide stewardship programs through best management practice (BMP, cultural and structural practices) implementation. This symposium will have sections on (1) AEMP overview (2004-Present), which will briefly describe the history of the monitoring program, site selection process, study design, and highlight monitoring results from the last five years; (2) stewardship and education outreach and agricultural community engagement activities, which will include utilizing remotely sensed, fly-over data coupled with grower survey data to quantify structural and cultural BMP adoption; (3) modeling tools to accurately represent existing long-term watershed monitoring data; and (4) model output evaluation to address watershed-wide BMP implementation (adoption and effectiveness).

ENGAGING NON-OPERATOR WOMEN FARMLAND OWNERS IN AGRICULTURAL CONSERVATION

1:30 p.m. – 3:00 p.m., *Guilford F*

Presenters: *Jennifer Filipiak, American Farmland Trust; Jill Reinhart, USDA-NRCS; Peggy Petrzelka, Utah State University; Jean Eells, E Resources Group; Jim Baird, American Farmland Trust*

Outreach to women, particularly non-operating landowners (NOLs) could open up thousands of acres with high potential conservation benefits. These lands could respond well to additional conservation treatments and have the greatest potential for losses of sediment and nutrients. According to the USDA Agricultural Census, NOLs control just under 40% of US agricultural land, yet we know very little about this group of landowners, given the most recent national data was collected in 1999. More recent data collected by state agencies and researchers working in limited geographical areas is suggestive but insufficient. Yet while data lags, projections estimate up to 70% of US farmland will change hands in the next 20 years, with up to 75% of this transferring to women. Surveys indicate that women tend to place a high priority on conservation and soil health and other

conservation practices. However, they are underrepresented in conservation programs. USDA views women as an important, but underserved, target audience.

Participants in this symposium will learn about a unique, successful new model for engaging women farmland owners in conservation called "Women Caring for the Land." We'll explore the science behind the efficacy of this model from perspectives of practitioners, researchers, and agency staff. In dialogue with presenters, attendees will gain a fuller understanding of how to engage this new demographic in conservation programs and offer their own experience to identify the opportunities and impediments to incorporating this new tool into the existing conservation toolbox.

HAITI SOIL SURVEY AND NATURAL RESOURCES CONSERVATION INITIATIVE

1:30 p.m. – 5:00 p.m., *Auditorium 1*

Moderator: *Charles Kome, USDA-NRCS*

Following the 2010 earthquake in Haiti, President Obama directed US government agencies to contribute toward the recovery effort and a sustainable future for Haiti. Funded by the US Agency for International Development, under the flagship Feed the Future initiative, the USDA-NRCS World Soil Resources, in collaboration with the Haiti Ministry of Agriculture (MARNDR), the Haiti School of Agriculture, and the nongovernmental organization WINNER, completed a detailed soil survey (1:24000) for a 3,000 ha pilot area in the Cul de Sac plain. The main goal of the symposium is to highlight some of the major achievements and challenges faced during the project. The impacts of the project on (1) capacity building for Haiti to expand the soil survey beyond the pilot area and (2) soil resources assessment at government and local levels will be discussed. The current status of soil resources from the soil survey perspective and possible future conservation practices to restore and sustain soil health and productivity will also be discussed, including perspectives from Haitian specialists collaborating in the project.

COMMUNICATING THE HOPE IN HEALTHY SOIL: A BEHIND THE SCENES LOOK AT AN INTERNATIONAL AWARD-WINNING CAMPAIGN

3:30 p.m. – 5:00 p.m., *Guilford F*

Presenters: *Ron Nichols, USDA-NRCS; J. Gordon Arbuckle Jr., Iowa State University*

How do you take a subject like soil health, make it accessible and create a campaign that your target audience can really "dig?" The answer: the old fashioned way—with solid research, focused planning, creative execution, and frequent evaluation. Though the subject matter may seem dry to some audiences, improving the health of our soil may be the single most important environmental endeavor of our time.

Ron Nichols, the architect of "Unlock the Secrets in the Soil," will take you behind the scenes of the international award-winning awareness and education campaign to show you how it was done on a shoestring budget. Within just the first two years of the campaign, earned media placement and stakeholder ad buys promoting the campaign are estimated to be valued at more than $6 million. An estimated three-fold increase in soil health system adoption (to 10 million acres) has occurred since the campaign's inception.

Importantly, awareness and understanding of the basics and benefits of soil health appear to be increasing in America's heartland. J. Gordon Arbuckle, associate professor in the Department of Sociology at Iowa State University has been examining attitudes, perceptions, and behavior regarding agricultural conservation among Iowa's farmers and landowners for years. His most recent Iowa Farm and Rural Life Poll focused on understanding farmer perspectives on soil health. Arbuckle will present the results of that poll, his analysis, and other trends and observations during this symposium.

SOIL HEALTH ON THE GROUND: OPPORTUNITIES AND CHALLENGES IN FOSTERING PRACTICE ADOPTION

3:30 p.m. – 5:00 p.m., *Imperial E*

Moderator: *Rebecca Power, University of Wisconsin-Extension*

This symposium will feature four panelists experienced in soil health management and communication/education. An NRCS resource conservationist will describe NRCS's approach to soil health awareness; a university soil scientist will discuss the strengths and potential pitfalls of communicating about soil health and practices that promote soil health; and Nancy DeLong, DuPont Pioneer, will talk about the value of soil health training as way for Pioneer to improve productivity and add value for their customers. DeLong and Kevin Erb, University of Wisconsin-Extension, will present the results of a blended (on-line and in-field) soil health pilot training program and lessons for training farm advisors.

Wednesday, July 29 Schedule & Events

Schedule

7:00 a.m. *CEAP Calhoun Critical Zone Observatory Tour

7:00 a.m. *North Carolina State University Lake Wheeler Field Laboratory and Syngenta Tour

8:00 a.m. *Soil Health Farm Tour

8:00 a.m. *North Carolina Viticulture Research and Raylen Vineyards and Winery Tour

8:30 a.m. USDA-NIFA NIWQP and ARFI Annual Project Director's Meeting – Day 2
Victoria A

**Additional fees apply*

OUTDOOR CLASSROOM/EDUCATIONAL TOURS

All participants should meet at the **front entrance of the hotel** at least 15 minutes prior to the departure times listed above.

Buses will leave on time. Please be ready to board the bus 15 minutes before your tour departs. Refunds will not be issued if you miss the bus.

Events

CEAP CALHOUN CRITICAL ZONE OBSERVATORY TOUR

7:00 a.m. – 7:30 p.m.

The tour of the Calhoun Critical Zone Observatory, located near Union, South Carolina, has stops focusing on Hardwood Natural System reference areas, the Human-Natural System interactions, the Tyger River (which drains to the Atlantic via Charleston Harbor), Calhoun's 60-year Soil-Ecosystem Experiments, and Re-instrumentation of Calhoun's 68-year old Experimental Watersheds. Lunch will be at the Rose Hill Plantation State Park and Historic Site, which was the home of Secessionist Governor William Henry Gist. Dinner will be delivered to the tour upon departure to be eaten on the bus while returning to Greensboro. Bottled water will be available on the bus, but you are encouraged to bring your own water bottle along. Meals are provided through the registration fee.

NORTH CAROLINA STATE UNIVERSITY LAKE WHEELER FIELD LABORATORY AND SYNGENTA TOUR

7:00 a.m. – 4:00 p.m.

This 1,800 acre research and teaching farm hosts a wide range of agricultural operations typical of the Piedmont. For the last 15 years, it has also been the site of the Sediment and Erosion Control Research and Education Facility (SECREF), which combines research, undergraduate teaching, and workshop demonstrations of construction site stormwater management. The tour will also include a visit to the extensive on-site waste (septic systems) demonstration area, where numerous standard, innovative, and experimental systems are assembled above-ground to allow installers to view them and understand how they function. The second portion of this tour includes a visit to the Syngenta RTP Innovation Center, a 50 acre campus established in 1984, which currently houses more than 400 employees focused on improving crops including corn, soybeans, sugar cane, rice, cereals, vegetables, and sunflowers. The Advanced Crop Lab has an acre of greenhouse space, which can simulate 40 different growth environments to accelerate the research and discovery process, while still attaining the equivalent of a Gold LEED certification. **Lunch will be provided for participants of this tour.**

Save on taxi fare! This shuttle will make a stop at Raleigh-Durham International Airport on its way to the Syngenta facility (approximately 12:45 p.m.). If you would like to be dropped off at the airport, please bring your luggage with you on the tour. Secure storage will be available on the shuttle. **Please note, those choosing to depart from the airport will miss the Syngenta portion of this tour.**

SOIL HEALTH FARM TOUR

8:00 a.m. – 4:15 p.m.

The Soil Health Tour will visit three different farms, allowing participants to see how farmers are following soil health planning principles and the related dramatic impacts to their soils and farm operations.

- The Don and Curtis York Farm has incorporated the use of multispecies cover crops into their grazing system along with high density rotation grazing. By using a diverse mix of summer annuals, the Yorks have been able to provide high quality forage in a time of the year that most pastures in North Carolina go dormant.
- North Carolina A&T State Research Farm has been using no-till and cover crops for the past 10 years, turning rundown fields into highly productive soil ecosystems. Innovative ideas like the terminating a cover crop with a roller crimper while planting along with nitrogen-producing legumes make the farm a valuable educational resource.
- The Ray Styer Farm has been practicing basic soil

health management for the past 40 years. Management activities include multispecies cover crops, no-till, and strip cropping. Ray Styer's 50 head cattle feeder operation provides enough manure to cover half the acreage each year. His soils have been used in countless soil health demonstrations around the country, including before both Senate and House agriculture committees, representatives, and other government agencies.

A box lunch will be provided for participants of this tour.

NORTH CAROLINA VITICULTURE RESEARCH AND RAYLEN VINEYARDS AND WINERY

8:00 a.m. – 1:30 p.m.

North Carolina is home to more than 100 wineries, a number that has more than quadrupled since 2001. The industry has two focuses—native muscadine grapes and European-style vinifera grapes. Commonly planted vinifera grape varieties include Cabernet Sauvignon, Cabernet Franc, Merlot, Syrah, Chardonnay, and Viognier. RayLen vineyards is one of North Carolina's largest vinifera vineyards and is also home to cooperative research conducted by North Carolina State University's soil science, horticulture, and plant pathology departments. The tour will allow participants to sample from scenic RayLen Vineyards and Winery as they learn about research supporting North Carolina's viticulture industry.

Lunch will not be provided for participants of this tour.

Save on taxi fare! This shuttle will make a stop at the Piedmont Triad International Airport on its way back to the hotel. If you would like to be dropped off at the airport, please bring your luggage with you on the tour. Secure storage will be available on the shuttle.

2015 USDA-NIFA NIWQP AND ARFI ANNUAL PROJECT DIRECTOR'S MEETING – DAY 2

8:30 a.m. – 4:30 p.m., *Victoria A*

The USDA National Institute of Food and Agriculture (NIFA) and the Soil and Water Conservation Society will host the 2015 USDA NIFA NIWQP and AFRI Annual Project Director's Meeting. The meeting will feature awardees from the National Integrated Water Quality (NIWQP, FY 2010-2014), the Agricultural and Food Research Initiative (AFRI), Water for Agriculture (FY 2014) and Foundational (FY 2011 and 2013) programs. The group will share the learned concepts, innovative methodologies and project successes through oral presentations and posters sessions. The meeting will allow the opportunity to enhance communication and interaction between NIFA program staff and awardees. In turn, NIFA staff will benefit by identifying success stories and impacts resulting from sponsored research in these programs.

Save the Date

Come and Share Your Knowledge to Advance the Future of Our Soil and Water Resources in **Louisville, Kentucky**, for the **71st SWCS International Annual Conference** on **July 24-27, 2016,** at the **Galt House Hotel**.

SWCS Conference Sites & Presidents

1946 Chicago, IL, Ralph H. Musser
1947 Omaha, NE, Ralph H. Musser
1948 Cincinnati, OH, T.S. Buie
1949 St. Louis, MO, Lloyd E. Partain
1950 Detroit, MI, Firman E. Bear
1951 Memphis, TN, Morris E. Fonda
1952 Buffalo, NY, Morris E. Fonda
1953 Colorado Springs, CO, H.H. Bennett
1954 Jacksonville, FL, R.Y. Bailey
1955 Green Lake, WI, Austin L. Patrick
1956 Tulsa, OK, Edward H. Graham
1957 Pacific Grove, CA, J.S. Russell
1958 Asheville, NC, Russell G. Hill
1959 Rapid City, SD, Alvin C. Watson
1960 Guelph, ON, Elmer L. Sauer
1961 Lafayette, IN, Walter C. Gumbel
1962 Washington, DC, Roy D. Hockensmith
1963 Logan, UT, George M. Browning
1964 Jackson, MS, Herbert A. Hopper
1965 Philadelphia, PA, Minott Silliman, Jr.
1966 Albuquerque, NM, John R. J. Bradshaw
1967 Des Moines, IA, Cecil W. Chapman
1968 Athens, GA, Frank H. Mendell
1969 Fort Collins, CO, Ray Hunter
1970 Toronto, ON, Robert W. Eikleberry
1971 Columbus, OH, Einer L. Roget
1972 Portland, OR, J.R. Johnston
1973 Hot Springs, AR, A.B. Linford
1974 Syracuse, NY, William L. Vaught
1975 San Antonio, TX, Frank W. Schaller
1976 Minneapolis, MN, Chester E. Evans
1977 Richmond, VA, J. Vernon Martin
1978 Denver, CO, Arthur D. Latornell
1979 Ottawa, ON, William Moldenhauer
1980 Dearborn, MI, Gerald R. Calhoun
1981 Spokane, WA, Jesse L. Hicks
1982 New Orleans, LA, Robert C. Baum
1983 Hartford, CT, Chris J. Johannsen
1984 Oklahoma City, OK, Floyd E. Heft
1985 St. Louis, MO, Roland R. Willis
1986 Winston-Salem, NC, Joe D. Nichols
1987 Billings, MT, Maurice G. Cook
1988 Columbus, OH, Donald Van Meter
1989 Edmonton, AB, David R. Cressman
1990 Salt Lake City, UT, Richard Duesterhaus
1991 Lexington, KY, Richard Duesterhaus
1992 Baltimore, MD, Ronald J. Hicks
1993 Fort Worth, TX, Ronald J. Hicks
1994 Norfolk, VA, Calvin J. Perkins
1995 Des Moines, IA, Gary Steinhardt
1996 Keystone Resort, CO, John A. Knapp
1997 Toronto, ON, Aniko Szojka-Parnell
1998 San Diego, CA, Aniko Szojka-Parnell
1999 Biloxi, MS, Dennis Pate
2000 St. Louis, MO, Dennis Pate
2001 Myrtle Beach, SC, Dana Chapman
2002 Indianapolis, IN, Bob Eddleman
2003 Spokane, WA, Myron Senechal
2004 St. Paul, MN, Deborah Cavanaugh-Grant
2005 Rochester, NY, Jean Steiner
2006 Keystone, CO, Jean Steiner
2007 Tampa, FL, Theo Dillaha
2008 Tucson, AZ, Peggie James
2009 Dearborn, MI, Peggie James
2010 St. Louis, MO, Gary Steinhardt
2011 Washington, DC, Bill Boyer
2012 Fort Worth, TX, BIll Boyer
2013 Reno, NV, Dan Towery
2014 Chicago, IL, Dan Towery
2015 Greensboro, NC, Mark Berkland
2016 Louisville, KY, Mark Berkland

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