

NC Regional Multistate Project/Committee Annual Report

Project/Activity Number: NCERA-217

Project/Activity Title: Drainage design and management practices to improve water quality

Period Covered: 1/1/2023 to 12/31/2023

Date of report: 6/2/2024

Annual Meeting Dates: 4/3/2024 to 4/4/2024, held in Westerville, Ohio

Participants from NCERA-217: *In-person*: Abigail Tomasek, Oregon State University; Laura Christianson, University of Minnesota; Jane Frankenberger, Purdue University; Eileen Kladvko, Purdue University; Ehsan Ghane, Michigan State University; Lindsay Pease, University of Minnesota; Jeppe Kjaersgaard, University of Minnesota; John McMaine, South Dakota State University, Steven Hall, University of Wisconsin; Mallika Nocco, University of Wisconsin; Sushant Mehan, South Dakota State University; Tyler Groh, Penn State University; Zach Easton, Virginia Tech; Ramesh Kanwar, Iowa State University; Vinayak Shedekar, Ohio State University; Xinhua Jia, North Dakota State University. ***Attending on-line*:** Kelly Nelson, University of Missouri; Gary Hawkins, University of Georgia. Matt Helmers, Iowa State University, Luciano Alves de Oliveira, University of Illinois

Brief Summary of the Annual Meeting

The annual meeting was held in conjunction with the Conservation Drainage Network, a broad-based group that NCERA-217 had a key role in forming and which NCERA-217 members continue to lead. The 2024 Conservation Drainage Network Annual Meeting had 170 participants and is described in more detail under “Accomplishments” in this report. The NCERA-217 business meeting was held at 7 am April 4 with 20 people in attendance, listed at the top of this document. Administrative Advisor Kanwar informed attendees that the new proposal was approved with excellent reviews, and will begin October 2024. He suggested strategies for interacting with drainage partners and those who focus on sustainability. Tyler Groh of Penn State was nominated to become Vice-Chair and voted in unanimously. Group impacts were discussed, along with suggestions for improving future documentation. The group decided that the 2025 meeting will be held in Illinois.

Accomplishments:

Short-term outcomes

NCERA-217 members led the success of the **Conservation Drainage Network**, a national partnership that works to improve drainage practices to reduce adverse environmental impacts while meeting future crop production needs. The CDN Organizing Committee consists of 11 members representing industry, non-profits, state agencies, and committee chairs, as well as four federal agency advisors. NCERA-217 members maintained the website (<https://conservationdrainage.net/>) and mailing list, as well as leading several of the committees. These committees support the Network accomplishing its mission of advancing conservation drainage including conducting and summarizing research, sharing information about industry innovations, advising conservation practice standard development, informing policy making, coordinating education and outreach activities, and driving implementation. The successful Conservation Drainage Network is a major outcomes of NCERA-217.

Annual Meeting: NCERA-217 members joined with partners from the federal, state, and local agencies as well as the drainage industry and other private sector, to plan and hold the 2024 Conservation Drainage Network Annual Meeting. The meeting brought together 148 participants in person and 22

online, including 19 students, many of whom presented posters at an evening session. Speakers included NRCS Regional Conservationist Kasey Taylor, as well as speakers from the Ohio Department of Agriculture, Advanced Drainage Systems, USEPA, and numerous other agencies and companies that play an important role in advancing conservation drainage. Two field trips took participants to informative drainage sites around Ohio. Feedback showed that 87% of respondents rated how much they learned at the meeting as high or very high. Many participants described how they plan to use the information, with several listing specific practices they will use or promote as a result of what they learned, as well as sharing information with others in their agency. The networking was rated as useful or very useful to 92% of respondents, and several wrote about new contacts they had made and projects they began planning.

Outputs

NCERA-217 members authored **32 peer-reviewed journal articles** and **11 peer-reviewed Extension publications** on topics related to agricultural drainage and its impacts on crop yield, water quality, and related research. These are listed in the separate Publications document.

In 2023, a total of 19 webinars related to drainage and drainage water quality topics as part of the Iowa Learning Farms Conservation webinar series. There have been 4944 combined live and archived views of these webinars.

NCERA-217 members developed a modular drainage curriculum called “Filling the Pipeline: Agricultural Drainage Education to Meet 21st Century Water Management Needs” (<https://transformingdrainage.org/drainage-course/>) to educate students or professionals to meet the growing need for next-generation drainage strategies. The 14 learning modules were developed by a team of drainage researchers and educators led by Jane Frankenberger and Laura Christianson. They will enable students at any university to benefit from leading-edge drainage knowledge sought by employers. They can also be used by drainage professionals, to gain a deeper understanding of drainage principles, to update their design methods, and to learn to plan the newer conservation drainage practices.

The three-day Michigan drainage workshop led by Ehsan Ghane had attendees from other states in the region including Ohio, Wisconsin, and Missouri. Based on the survey after the workshop, 77% of respondents said that they plan on changing their operation because of the workshop, and 95% said the “workshop increased their knowledge a great deal.” The profitability impact of the drainage workshop was also estimated through the survey, with 100% of respondents saying that they expect to gain an average \$16/ac increased income because of the skills learned at the workshop.

A new Landscape and Drainage Water Management web-site was initiated in Missouri: <https://extension.missouri.edu/programs/landscape-and-drainage-water-management>

Activities

In Georgia, Gary Hawkins provided drainage presentations to 50 county extension agents so they are better informed as to how to assist homeowners. Drainage was part of three presentations which focused on water quality and covered both homeowner and agricultural participants, with 105 persons in attendance. He conducted multiple (12) on-site visits with Extension Agents to look at and provide recommendations for drainage in both homeowner and agricultural locations.

In Iowa, Matt Helmers continued to provide timely presentations on the Iowa Nutrient Reduction Strategy and drainage water quality practices. Weekly webinars were implemented with the Iowa Learning Farms. There were 19 webinars in 2023 that touched on drainage and drainage water quality. From these there have been 4944 combined live and archived views. The audience for this multi-state and actually international. As part of one of the Iowa Learning Farms programs they are providing edge of field practice referrals to the Iowa Department of Agriculture and Land Stewardship, and in the past three years have provided 337 referrals.

Impacts

In Missouri, improved drainage water management (DWM) has increased corn and soybean yields over 20%, while subirrigation systems have increased crop yields up to 40%. DWM has reduced nutrient losses in drainage water flow or gaseous loss up to 80%. Kelly Nelson's drainage water management program utilizes integrated systems including subsurface tile drainage, cover crops, conservation practices, and new technology to enhance nutrient use efficiency and increase food production.

The Virginia Dept of Environmental Quality (VDEQ) has proposed as many as 100 legacy N remediating bioreactors to be installed in an effort to meet their TMDL requirements, in part based on Zach Easton's work monitoring bioreactors. Virginia has also recently approved a \$5,000,000 a pay-for-performance pilot program, a direct result of data his group has provided, to spur innovation in non-point source programs, bioreactors are assumed to be a natural fit for pay-for-performance programs because of the ease with which N reductions can be quantified.

NCERA-217 participants from Iowa, Illinois, Indiana and Minnesota supported the inclusion of conservation drainage in their State Nutrient Reduction Strategies. They are working with their state agency staff and researchers at other universities and USDA-ARS within the state, and also meet together as the Midwest Nutrient Effectiveness discussion group, to quantify nutrient reductions. The impact is that the State Nutrient Reduction Strategies will have a stronger science base for selection of the most effective conservation practices in drained landscapes, which is expected to lead to improved nutrient reductions in surface water. These efforts have elevated the visibility of conservation drainage with state and federal agencies, who now regularly consider conservation drainage practices to address nutrient concerns.

In Iowa, continued drainage water quality monitoring at five drainage water quality research facilities across Iowa has advanced our understanding of the role that the 4Rs of Nitrogen Management play in nitrate-N reduction. Researchers have found that split application of nitrogen has the potential to reduce nitrate-N losses based on six years of study at the Northwest Research Farm. Also, they found that even with no nitrogen application they only reduce nitrate concentration and loss by about 40%.

Iowa is also expanding work on drainage water recycling, monitoring the crop production and water quality at three sites in 2023. The site near Story City, IA that has had supplemental irrigation from drainage water recycling since 2016 showed that the supplemental irrigation increased corn yield by 43 bu/acre on average in the years when supplemental irrigation was used.