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: 1/1/2024 to 12/31/2024
Date of report: 6/2/2025
Annual Meeting Dates: 4/1/2025 to 4/2/2025, held in Champaign, IL

Participants from NCERA-217: ***In-person***: Ehsan Ghane, Michigan State University; Jane Frankenberger, Purdue University; Sushant Mehan, South Dakota State University; Tyler Groh, Penn State University; Jeppe Kjaersgaard, Minnesota Department of Agriculture; Kelly Nelson, University of Missouri; Laura Christianson, University of Illinois; Steven Hall, University of Wisconsin; Jeff Strock, University of Minnesota; Vinayak Shedekar, Ohio State University; Eileen Kladivko, Purdue University; Matt Helmers, Iowa State University; Gary Sands, University of Minnesota; Lindsay Pease, University of Minnesota. ***Attending online:*** Xinhua Jia, North Dakota State University; Luciano Alves de Oliveira, University of Illinois

Brief Summary of the Annual Meeting
The annual meeting of NCERA-217 was held during the annual Conservation Drainage Network (CDN) conference. The CDN is made up of people from academia, industry, state and federal agencies, and NGOs. NCERA-217 members had a key role in forming the CDN and continue to lead the group forward into the future. The 2024 CDN Annual Conference had 97 in-person participants and 27 virtual, including the 16 people who attended the NCERA-217 business meeting. The NCERA-217 business meeting was held at 7:30AM on April 2nd 2025. Those in attendance are listed in the bold section above. Administrative Advisor Kanwar opened the meeting with a comment on the NCERA-217 group and how well everyone is doing at identifying opportunities such as greenhouse gas emissions related to conservation drainage and recycling water and building teams to acquire funding to develop meaningful resources. Kanwar went on to say that the midterm review of the current project is 2026 and that members should consider applying for a new engagement and excellence award. The meeting progressed into discussions on the previous year's monthly research discussions, lead by Frankenberger. These monthly discussion meetings will likely continue into this coming year since NCERA-217 members find value in them. There was then a brief discussion on the accomplishments of the NCERA-217 group over the past year in order to determine what will be submitted in the annual report. Kladivko nominated Sands for Vice-Chair with a second from Nelson. The group voted unanimously for Sands to serve as the 2025-2026 Vice-Chair and the 2026-2027 Chair of NCERA-217. Lastly, the group voted to have the annual CDN and NCERA-217 meetings in Michigan in 2026 and Iowa in 2027.

Accomplishments:

Short-term outcomes

Members of NCERA-217 continue to lead the Conservation Drainage Network (CDN) in 2024. The CDN's focus is to advance tile drainage practices and enhancements while ensuring that environmental impacts are minimized. The partners that make CDN come from around the nation and have the following accomplishments:

Annual Meeting: With the help of partners from federal, state, and local agencies, the drainage industry, NGOs, and other private sector individuals focused on drainage, the members of NCERA-217 planned and held the 2025 Conservation Drainage Network Meeting (https://conservationdrainage.net/meetings-and-events/2025-cdn-annual-meeting/). The 2025 meeting had a total of 97 in-person and 27 virtual participants. This event consisted of panel discussions, presentations, time for brainstorming and thinking critically about the future of conservation drainage, and also in-person training for drainage practitioners. Topics covered included state and federal support for conservation drainage practices, scaling successful practice implementation, identifying key benefits of conservation drainage beyond yield and water quality, state-wide drainage reports from NCERA-217 participants, current research projects on drainage water recycling, saturated buffers, bioreactors, and controlled drainage, and state nutrient reduction strategies updates. The final day of the Conservation Drainage Network Meeting included a field trip to tour some of the drainage research sites at the University of Illinois to promote the exchange of information as well as brainstorm potential future collaborations.

Leading the Conservation Drainage Network: NCERA-217 members have recently been the leading members of the Conservation Drainage Network Organizing Committee. This committee consists of 11 members from industry, non-profits, state agencies, and committee chairs. In addition, there are four federal agency advisors. Further, NCERA-217 members maintain the CDN website (https://conservationdrainage.net/), the mailing list, and lead many of the CDN internal committees (Annual Meeting, Education and Extension, and Research Summary Committees). Through these committees, NCERA-217 members help advance conservation drainage by 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 continued success of the Conservation Drainage network is an outcome and a huge accomplishment for the NCERA-217 group.

Outputs

NCERA-217 members authored **34 peer-reviewed journal articles** and **5 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.

Ehsan Ghane and Mohamed Youssef developed a saturated buffer design and evaluation tool, funded by a USDA-NRCS Conservation Innovation Grant. This new tool supports both the design of a new system and evaluation of an existing system. An in-person workshop held at the Conservation Drainage Workshop Annual Meeting in Illinois trained 23 participants. Based on the post-workshop survey, 17 out of 18 respondents (94%) said that they plan on using the tool at their workplace, and 94% also stated that their knowledge increased moderately or a great deal. One workshop participant wrote, "The tool is very fascinating! I believe the application will greatly benefit the industry as whole. I look for to it going live for public use."

The research of NCERA-217 members was highlighted during two sessions at the 2024 ASA, CSSA, SSSA International Annual Meeting in San Antonio, Texas. Stephen Hall delivered an invited presentation at the ASA Environmental Quality Section Megaposium on the ongoing work by NCERA-217 members (Steven Hall, Laura Christianson, Jane Frankenberger, Tyler Groh, and Morgan Davis) to summarize the potential for conservation drainage practices to contribute to climate change mitigation. NCERA-217 members Lindsay Pease and Laura Christianson shared research outcomes of the NRCS-funded project

"Innovating through Barriers for Bioreactors and Saturated Buffers" during a special research session dedicated to this topic.

NCERA-217 members organized and delivered a mini-symposium at the 2024 Conservation Drainage Network meeting in Columbus, Ohio on Conservation Drainage and Climate Smart Agriculture. This 1.5-hour session included eight presentations on assessing the climate impacts of agriculture, competing hypotheses on drainage and soil carbon, Introduction to dissolved gases and indirect emissions, and presentation on the expected impacts of five conservation drainage practices. The presentation was developed into a paper submitted to Journal of Environmental Quality, and is online at https://conservationdrainage.net/GHG/. The group also sent comments to the USDA NRCS on the climate impacts of these practices for use in updating the Climate-Smart Agriculture and Forestry Mitigation Activities List.

NCERA217 members from three states (IA, MN, SD) planned and conducted the 23rd annual Drainage Research Forum, hosted by Iowa State University Extension, in Ames, IA. The event drew around 75 participants from a 5-state area, comprising many representatives from the drainage stakeholder community, such as engineering consultants, agency conservation staff, agricultural consultants, Extension professionals, and students. The network of research and Extension specialists sustained and strengthened through NCERA-217, continues to enrich this annual event by contributing topics and expertise to the program.

Impacts

NCERA-217 members contributed to the 2025 revision of the American Society of Agricultural and Biological Engineers (ASABE) Soil and Water Terminology Standard S526.5 MAR2025ED. This standard helps the engineering profession to use precise terms and definitions, which strengthens the quality of technical communication. Numerous terms in the standard that relate to drainage, including a new definition for “conservation drainage”, will be used in revising ASABE drainage-related standards to reflect updated practices.

Research by NCERA-217 members contributed to a modification of the NRCS Conservation Practice Standard 605, “Saturated Buffer”. The “General Criteria Applicable to All Purposes” section was modified to allow nitrate removal optimization in vegetated buffer zone sizing and design flow capacity. The optimization of nitrate removal was added to allow NRCS to use the Saturated Buffer Tool (SBTool). NCERA-217 members delivered drainage workshops in Michigan, Ohio, Iowa, and Wisconsin. In these workshops, members taught drainage design and concepts to improve crop production and protect water quality. Total number of attendees included over 100 participants. Participants at these workshops represented 4 states and one province of Canada. Based on the Michigan one-year follow-up survey, respondents said that they earned an average $10/acre increased income because of the workshop they participated a year ago. Participants from the one-year follow-up survey from Michigan wrote, "As a landowner, it gave me the tools to improve my existing drainage system", and "We do smaller tile project and repairs. The course has enabled me to do a better job planning and getting those areas corrected".