

Water Resources Center

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Minnegram Summer 2019

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[MN water conference committee members look back while planning for the future](#)

The Minnesota Water Resources Conference brings back its mix of water research, policy and practice to the St. Paul RiverCentre October 15-16, 2019. In keynote talks and breakout sessions, attendees learn about strides in current research and application of research on the landscape. Keynote speakers this year are University of Minnesota president Joan Gabel, NPR meteorologist Paul Huttner and UMN faculty Don Wyse and Nick Jordan who will speak jointly about the Forever Green Initiative.

The annual conference is the result of eleven months of planning meetings, during which committee members assess the pros and cons of past conferences, review hundreds of abstracts for break out and poster sessions and choose keynote speakers for the upcoming conference.

Minnegram asked committee members Karen Jensen and Mark Brigham for their thoughts about the conference, its value to attendees and memorable moments.

[Nutrient removal in modular bioreactors](#)

by Jeff Strock, Professor, Soil, Water, and Climate

Field experiments were conducted at the University of Minnesota Southwest Research and Outreach Center (SWROC) in Lamberton, Minnesota to experimentally assess the impact of a novel two phase bioreactor design for removing N and P from agricultural subsurface drainage water. Modular bioreactors were constructed using mixed woodchips plus corn cobs for facilitating denitrification plus either crushed concrete, steel slag or limestone fragments for P sorption. Experimental bioreactors were installed adjacent to an existing drainage ditch/waterway.

[Farmers demo conservation practices to preserve soil for future generations](#)

by Anna Cates, State Soil Health Specialist

In the shade a big cottonwood in Becker County, thousands of dragonflies buzzed around the 40 people passing around handfuls of soil. "Feel how much lighter that one is? That's where I've been doing no-till since 1990," Mike Kucera explained. The USDA-NRCS Agronomist brought soil up from his home farm in Lincoln to show the gradient from a dense, compacted roadway to porous, root-filled healthy soil. The difference is stark: a preserved chunk of the healthy soil weighs ~60% of the compacted one.

[Field Work podcast features Extension educators Brad Carlson and Jodi DeJong-Hughes](#)

by Brad Carlson, UMN Extension Professor

American Public Media/National Public Radio has launched a podcast series directed towards farmers called Field Work. The series focuses on topics related to environmental stewardship and sustainability. Extension Educators Brad Carlson and Jodi DeJong-Hughes from the Water Resources team were each featured in recent episodes. DeJong-Hughes was on one of the first episodes and discussed practicing reduced tillage and some of her work and research in that area.

[QSTP completes analysis of CEC concentrations within on-site septic systems at MNDOT rest areas](#)

by Jack Distel, Sara Heger, Sondra Larson, Dan Wheeler and Jessica Doro

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[Watershed Specialist Training: Is It for You?](#)

by Karen Terry, UMN Extension, Associate Professor

What does it take to be a strong and effective watershed manager? Obviously it requires a solid understanding of the science of water, such as the basic water cycle (hydrology), nutrient cycling (chemistry), limnology, best management practices to address issues (management techniques), geology, soils, and geography/cartography. But to be a good watershed manager requires a broader suite of skills because it's not enough to understand the natural resources side of the equation: a good manager must also understand the human side of the equation and how the two realms intersect.

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Summer 2019 Director's Corner

The last few months have provided us with a fitting example of the water challenges that we have across the state. In [May](#), most of southern Minnesota had above normal rainfall, with some areas exceeding long-term averages by up to five inches. In [June](#), much of the state swung the other direction, although the southeast continued to be an outlier with more than six inches of rain above normal. These variations led to significant impacts for our agricultural producers: this year, the state's [corn planting](#) finished mid-June, almost a full two weeks later than normal. Currently, less than 60 percent of the corn crop is rated good or excellent, compared to an average of more than 80 percent for this time of year. Rainfall taxed our towns and cities, as well. On [July 8-9](#), a storm in northwestern Minnesota resulted in record or near record rainfall for many communities, including Georgetown (4.47 inches), Hallock (3.58 inches), and Thief River Falls (2.31 inches).

Work at the Water Resources Center and with our partners are finding a range of options for dealing with this new normal. In this Minnogram issue, Jeff Strock [reports](#) on how combining bioreactors and using novel "ingredients" can reduce nutrients from agricultural drainage water. Brad Carlson [describes](#) how he and Jodi DeJong-Hughes, two recent additions to the WRC team, were featured in recent episodes of Fieldwork, a new podcast focused on agriculture, environmental stewardship, and sustainability. The Minnesota Office of Soil Health has been busy, and Anna Cates [highlights](#) farm demonstrations teaching the principles of soil health to employees from local soil and water conservation districts.

In addition to research, outreach, and engagement, the WRC helps Minnesotans address new water challenges through partnership and collaboration. As I write this, we have just finished hosting our colleagues from the Iowa Water Center, and we are discussing how to leverage our comparative advantage to better meet the needs of our stakeholders across the state and region. Another important collaboration is the [Onsite Sewage Treatment Program's work with MNDot to analyze rest stop septic wastewater](#) to determine the presence and effects of chemicals of emerging concern. Karen Terry describes how the [WRC's Watershed Specialist Training](#) helps early-career watershed managers build both technical expertise and develop relationships among their peers to support their work into the future. Finally, we are preparing for the [2019 Minnesota Water Resources Conference](#), a two-day event October 15-16 both presenting the results of previous collaborations and serving as a gathering to spark new ones.

We hope to see you there!



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Farmers demo conservation practices to preserve soil for future generations

By Anna Cates, State Soil Health Specialist

In the shade a big cottonwood in Becker County, thousands of dragonflies buzzed around the 40 people passing around handfuls of soil.

“Feel how much lighter that one is? That’s where I’ve been doing no-till since 1979,” Mike Kucera explained. The USDA-NRCS Agronomist brought soil up from his home farm in Lincoln to show the gradient from a dense, compacted roadway to porous, root-filled healthy soil. The difference is stark: a preserved chunk of the healthy soil weighs ~60% of the compacted one.



Kristin Brennan, NRCS’ assistant state soil scientist and soil health specialist, is among others leading a series of summer soil health trainings over a two-week period in four regions of Minnesota.

Photo credit: BWSR

Mike, along with the Minnesota NRCS and the Minnesota Office for Soil Health, used hands-on demonstrations to teach soil health to employees of local Soil and Water Conservation Districts and NRCS at four locations around Minnesota in June. Participants spent one day learning classroom material, and a second day out in the field, applying what they learned to a farmer’s land. The farmers shared their management practices and answered questions about what it was like to be farming differently from their neighbors.

Trainees compared physical, biological and chemical properties at two contrasting locations. Healthy soil had more earthworms, faster infiltration, more residue cover, and faster nutrient cycling. Faster nutrient cycling means that less soil nitrate is available to be washed away with heavy rains, which have hit everywhere in the state this year. Faster infiltration means that water is stored in the soil profile, instead of washing soil and associated

phosphorus away. Agricultural lands cover about 27 million acres of the state, and managing soil health by reducing tillage and incorporating cover crops into agricultural lands are integral pieces of the state Nutrient Reduction Strategy.

From Marshall to Mora, trainees talked about how difficult it is for producers to make such drastic changes in their systems. Bruce, the farmer with the dragonflies said his father had to die before he could reduce tillage. But now, he would never go back. Bruce’s cousin is starting to try some no-till because he knows Bruce won’t rent him the land when he retires unless he keeps up the healthy soil Bruce has built. Trainees were encouraged by the slow trickle of new faces who ask about cost-share programs for soil health practices around the state. The training gave them new ways to show farmers how their soil had changed with new management.

Bruce’s grandparents lived on the hill with the dragonflies with no running water until 1965. Their house is gone, but the land continues to support his family. By building up his soil, he’s hoping to keep it around for a few more generations.



Rodney Aaron, a Brooklyn Center-based NRCS civil engineer and technician, and Tessa Zee, the Sauk River watershed conservation planner based at the Stearns County Soil and Water Conservation District office, examined a sample during field training outside Mora, MN.

Photo credit: BWSR

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MN water conference committee members look back while planning for the future

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The annual conference is the result of eleven months of planning meetings, during which committee members assess the pros and cons of past conferences, review hundreds of abstracts for break out and poster sessions and choose keynote speakers for the upcoming conference.

Minnegram asked committee members Karen Jensen and Mark Brigham for their thoughts about the conference, its value to attendees and memorable moments.

What do you hope attendees gain from the conference?

Mark: A useful take away that is new and applies to their work--either information or a methodological approach. And pride in being part of a truly great community of water-resources professionals in Minnesota.

Karen: New technical information, of course. I also hope attendees can expand their professional networks, meeting new colleagues who will bring energy and inspiration to their day-to-day work.

What benefits and /or challenges did you see resulting from the 2005 [merger of the Minnesota Waters Conference and the Water Resources Conference](#)?

Karen: I clearly see the benefits. The merger brought together the disciplines of water resources engineering and water resources sciences, creating a unified, but yet diverse audience: a good mix for innovation and learning. The field of water resources management has become less “siloeed” over time: practitioners need to understand multiple aspects of the field (both science and engineering) to truly become accomplished.

Mark: One challenge is ensuring that there are consistently tracks that professional engineers find useful and relevant to their work. We have some consulting engineers on the planning committee and that needs to continue because it's critical to ensuring that their perspectives help shape the conference.

It's wonderful that the conference has grown to be so successful. Can you point to some concrete outcomes of the conference? Policies enacted, resource management changes, or devices put onto the landscape that were introduced at the conference?

Mark: The 2014 special session Sulfate, Mercury, and Wild Rice was an excellent roll-out of research that supported development of the update to Minnesota's water-quality standard for sulfate in waters that support wild rice.

Karen: I'll throw out the example of green-infrastructure stormwater management. Years ago, I heard presentations at the conference about the emerging field of “stormwater infiltration” to manage runoff. Within a couple of years, infiltration had grown into “low impact development”, and now that field has grown into green-infrastructure stormwater management. The entire arc of this crucial field of water management was exhibited by presentations at the conference over two decades.

What are your most memorable moments from the conference over the years?

Mark: Ray Archuletta's plenary presentation from the 2018 conference was outstanding, inspiring, and had broad societal relevance.

Karen: Hands down, Governor Dayton's appearance and Water Resources Professionals Week proclamation presentation. The Governor was amazed at the conference attendance numbers and how many professionals were working to protect Minnesota's waters.

Also, moment Jeff and I accepted the proclamation from Governor Dayton remains a highlight of my career.

What is your favorite part of the conference?

Mark: I always enjoy reconnecting with my fellow graduate students from about thirty years ago. We all took different paths, but it's great to see the different ways we continue to contribute and do interesting work. And I equally enjoy reconnecting with the many friends and colleagues I've made in Minnesota's water resources community since graduate school. Hallway chatter and the poster / social hour sessions are invaluable.

Karen: The energy in the room in the first moments on the first day; I love looking around at the attendees and see all the new faces, particularly of students and young professionals – the appearance of the next generation who will take on the mantle of caring for Minnesota's waters. And I especially love to see how many young women are present – this is such a change over when I joined the water resources profession, and it delights me to no end.



The Minnesota Water Resources Conference is sponsored by the Water Resources Center and the College of Continuing and Professional Studies. The conference is co-sponsored the Department of Civil, Environmental, and Geo- Engineering, College of Science and Engineering, University of Minnesota Minnesota Section, American Society of Civil Engineers Minnesota Sea Grant College Program, University of Minnesota and the Natural Resources Research Institute, University of Minnesota.

[View the history of the conference through archived programs and abstracts](#)

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Nutrient removal in modular bioreactors

by Jeff Strock, Andry Ranaivoson, Gary Feyereisen, Kurt Spokas, David Mulla and Marta Roser

Ditches convey surface runoff water and subsurface tile drainage from artificially drained agricultural lands and are important to the agricultural economy of Minnesota and other Midwestern states. However, traditional methods of surface and subsurface drainage often result in degraded water quality. There has been increased interest in developing Best Management Practices (BMPs) for mitigating the effects of subsurface drainage. Ideally, a successful BMP would mitigate the negative impact of subsurface drainage while limiting its negative consequences on crop production practices and crops. A potentially successful BMP would be the



Aerial photo of the cube bioreactors. Each treatment is repeated in each block of three cubes. Each cube can nominally contain 1,000 liters of water.

design of a bioreactor which can mitigate both nitrogen (N) and phosphorus (P) efficiently under a wide range of flow and environmental conditions. Additionally, the bioreactor would be easily accessible for replacing and recycling the P sorbing and N denitrifying constituents. The effectiveness of a novel bioreactor design that could be placed into or adjacent to agricultural drainage ditches for the removal of N and P was the primary focus of this study.

Field experiments were conducted at the University of Minnesota Southwest Research and Outreach Center (SWROC) in Lamberton, Minnesota to experimentally assess the impact of a novel two phase bioreactor design for removing N and P from agricultural subsurface drainage water. Modular bioreactors were constructed using mixed woodchips plus corn cobs for facilitating denitrification plus either crushed concrete, steel slag or limestone fragments for P sorption. Experimental bioreactors were installed adjacent to an existing drainage ditch/waterway.

Nitrate removal was tied to the retention time in the bioreactor coupled with the addition of acetate. Longer retention time resulted in a greater removal of nutrients however, acetate improved nitrogen removal efficiency. Results also indicate that reduced conditions within the bioreactors but only consistently when acetate was added to the subsurface drainage water. All three P sorbing materials performed adequately for removing P from drainage water. Toward the end of the field experiment, as temperatures decreased, the P removal efficiency of the materials declined. During this time some of the materials acted as a source of P rather than a sink for P removal.

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Field Work podcast features Extension educators Brad Carlson and DeJong-Hughes

By Brad Carlson

American Public Media/National Public Radio has launched a podcast series directed towards farmers called [Field Work](#).

The series focuses on topics related to environmental stewardship and sustainability.

Extension Educators Brad Carlson and Jodi DeJong-Hughes from the Water Resources team were each featured in recent episodes. DeJong-Hughes was on one of the first episodes and discussed practicing reduced tillage and some of her work and research in that area. A range of topics were covered including soil health, reducing erosion and compaction.

Carlson's episode came out just after Memorial Day and discussed nitrogen management and the connection with water quality. Some of the basic principles of how nitrogen behaves in the environment, and how and why to make management decisions based on site characteristics and the climate were covered. Brad was accompanied by farmer Mark Bauer, the two have had a working relationship for over 20 years. Together Mark and Brad talked about fertility management on Mark's farm and how it is possible to use practices that maximize profit while minimizing impact on the environment.

The podcast series is the brainchild of Annie Baxter from American Public Media and is an outgrowth of her work with Minnesota Public Radio's *The Water Main*. The hosts of the podcast are Zach Johnson, who has become a YouTube sensation as *The Millennial Farmer*, and Mitchel Hora, who farms and consults on the topic of soil health. Johnson is from the Alexandria, MN area, and Hora is from Southeast Iowa. The [Field Work](#) series is available for download from National Public Radio's web site, as well as other places that host podcasts such as Stitcher and iTunes. [Longer, unedited versions with video](#) are available on YouTube.



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OSTP completes analysis of CEC concentrations within on-site septic systems at MNDOT rest areas

by Jack Distel, Sara Heger, Sondra Larson, Dan Wheeler and Jessica Doro

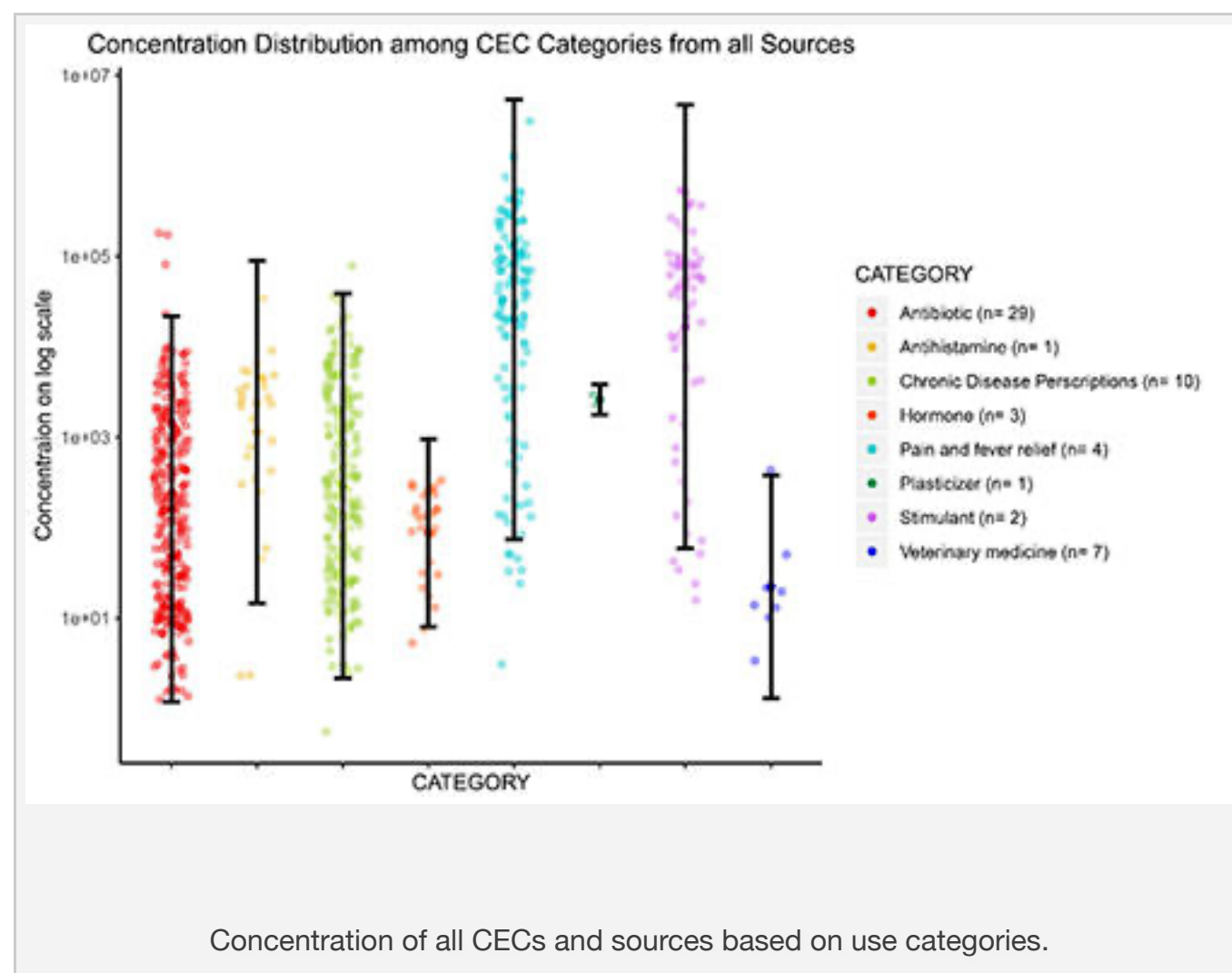
An analysis of contaminants of emerging concern (CEC) within on-site treatment of human waste identified the prepotency of such systems to process CECs or transport them into the environment. The systems sampled ranged from trench, at-grade, and mound septic tanks among five respective sites and one septage land application site. All septic systems treated public rest stops managed by the Minnesota Department of Transportation (MNDOT). Septage was sourced from a variety of public facilities and private businesses. Public restrooms are heavily used and thus provide a good representation people's CEC use and environmental impact, compared to a single-family home system. Researcher chose a diverse distribution of individual CECs and treatment technologies. Examples of CECs chosen include antibiotics, chronic disease prescriptions, veterinary medicine, stimulants, hormones, antihistamines, pain and fever relief prescriptions, and a plasticizer.

On-site treatment of human waste greatly affects how CEC finds its way into the environment. How on-site treatment systems handle influent CECs is important for future system design and use. The sampling methods of this analysis allowed a comparison of CEC concentrations from a system's influent sewage/septage to those found in the treatment area soil and then the groundwater. All CECs were analyzed following standardized laboratory procedures. General waste water characteristics (e.g. biological oxygen demand and total phosphorus) were also sampled and compared at all sites.

There were 58 individual CECs tested, split among two main groups



Example of sampling site. The monitoring well is down gradient from septic mound with poles marking locations for soil



Concentration of all CECs and sources based on use categories.

based on criteria of laboratory analytics. Among the 58 CECs, 13 were not found in any samples. Sewage samples, across all treatment types, had the highest prevalence of CEC occurrence. Groundwater had the second most CEC occurrences. Soil had the fewest CECs detected. The occurrence pattern was similar to the distribution of concentrations. Sewage and groundwater CEC concentration, in milligrams per liter, were similar. Soil was at an order of magnitude lower. This trend represents the potential ability for soil to either bind or breakdown CECs to a point of non-detection. Furthermore, it illuminates the ability of CECs to be

hydraulically transported through a system and into the environment with minimal depletions in concentration.

Due to the potential risk posed by CECs in the environment, it is imperative to understand the abilities of on-site treatment systems to effectively process CECs. This analysis, on the occurrence and concentrations of CECs within on-site treatment of human waste, builds a foundation of observations that can be used to prompt further studies.

In conclusion, here are the main take-aways of this study:

- On-site sewage treatment practices tend show promising removal rates of CECs
- No treatment type seemed to be more or less adequate at processing CECs
- Within soils, CECs did not seem to occur prevalently or at large concentrations
- Concentrations and occurrences of CECs in groundwater were not uncommon and were reflective of the CECs within the respective sewage influent

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Watershed Specialist Training: Is It for You?

By Karen Terry

What does it take to be a strong and effective watershed manager? Obviously it requires a solid understanding of the science of water, such as the basic water cycle (hydrology), nutrient cycling (chemistry), limnology, best management practices to address issues (management techniques), geology, soils, and geography/cartography. But to be a good watershed manager requires a broader suite of skills because it's not enough to understand the natural resources side of the equation: a good manager must also understand the human side of the equation and how the two realms intersect.

The Watershed Specialist Training is a semester-long online course offered fall and spring by the University of Minnesota's Water Resources Center and Extension. It is designed for early-career watershed managers. Typical participants range from Soil and Water Conservation District staff to graduate students to state agency staff to watershed district board members. The course consists of weekly readings and resources, group discussions about the weekly content, webinars featuring content experts, and assignments to build skills and assess learning. A key component of the course is the richness of the discussion between the participants. Most assignments have a requirement of reading and commenting on others' assignments, which fosters critical thinking as well as challenging them to write responses in a clear, professional, helpful way. Previous participants say they value learning how to be more deliberate in water resource management activities such as engaging stakeholders, planning communications, and weighing potential implementation projects.

The course is divided into nine modules:

1. Introduction and Networking (1 week): becoming familiar with course expectations, the online course platform (Canvas) and getting to know one another.
2. Water Institutions and Policy (1 week): exploring what authority lies where.
3. Watershed Science for Managers (2 weeks): strengthening our understanding of how water moves across the landscape and how our land use decisions affect that. This is a review for many of the participants, but it generates good discussion and challenges them to raise their understanding to a level at which they are comfortable explaining the complex concepts to others.
4. Civic Engagement and Water Resources (2 weeks): learning and practicing skills to authentically engage stakeholders in discussing, planning, and implementing land use practices. This module is often eye-opening for participants as they explore the differences between public participation and actively fostering civic engagement. This includes doing thorough stakeholder analysis and identifying appropriate levels of engagement and activities to engage.
5. Communication (1 week): learning and practicing skills to effectively communicate the desired messages. This is an important subset of the skills needed for good civic engagement. Participants are required to create a communication plan and outreach items, such as a PowerPoint presentation and media release, to practice effectively reaching a targeted audience.
6. Assess, Monitor, and Evaluate (2 weeks): using the "Discovery Cycle" – an iterative process for designing and implementing assessment, monitoring, and evaluation for clean water programs – participants conduct an information gap analysis as the foundation for designing assessment or monitoring plans.
7. Selecting Implementation Activities (2 weeks): developing a strategy to select sound implementation activities. This includes creating SMART goals, listing and evaluating potential activities (structural and non-structural) and the corresponding cost-benefit analyses, prioritizing activities, and making final decisions about which activities to implement.
8. Project and Program Implementation (2 weeks): using the skills and tools learned in the previous modules to develop a rigorous project or program plan.
9. Tie-up (1 week): wrapping up the course by asking each participant to review their own learning and create a professional development plan for continued learning.



Are you interested in learning more about the course for yourself or your staff? Check out the website (<https://wst.umn.edu/>) or contact instructors Karen Terry (kterry@umn.edu) or Ann Lewandowski (alewand@umn.edu). The fall session will start right after Labor Day; class size is limited to 22 participants so reserve your seat early!

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Summer 2019 Community News

[WRC to host UCOWR/NIWR 2020 Conference in Minneapolis, MN](#)

The Universities Council on Water Resources (UCOWR) and the National Institutes for Water Resources (NIWR) will host their joint, annual conference Water. Place. People.

June 9-11, 2020

[Conference organizers are accepting calls for special sessions.](#)

Bill Arnold (Department of Civil, Environmental, and Geo- Engineering, WRS faculty) gave a CSE public lecture: *Stuck in the Muck: Our Household Chemical Footprint Revealed in Sediment Cores*, highlighting the presence of household chemicals in the environment and the potential long-term impacts on aquatic systems. Arnold was also the keynote speaker at the spring meeting of the Minnesota Chromatography Forum, May 7-9, 2019, Minneapolis, MN.

Jeff Havig (Earth Sciences, WRS faculty) joined collaborators from the University of Auckland, New Zealand, and the University of New South Wales, Australia, for a sampling expedition to study hot springs in the Taupu Volcanic Zone on the North Island of New Zealand.

Ingrid Schneider (Forest Resources, WRS faculty) presented posters at the National Outdoor Recreation Conference in Rapid City, SD May 6-9, 2019: *Differentiating displacement: Visitor's onsite & intended actions* and *Optimizing social media platform engagement among visitors* with student Elena Tsakakis. Schneider is continuing her work on the St Croix National Scenic Riverway with visitor observations and surveys to understand Riverway visitor behaviors to improve visitor experiences and inform management decisions.

Brandy Toner (Soil, Water and Climate, WRS faculty) was awarded promotion to professor at the spring meeting of the Board of Regents.

The Minnesota Department of Agriculture awarded a contract to the Minnesota Office for Soil Health staff to develop a Minnesota Cover Crop Guide. This project expands existing cover crop information by focusing on Minnesota research and summarizing guidance for Minnesota conditions. The guide will explore impacts of cover crop adoption, and management challenges such as selecting cover crop species, establishing and terminating covers, and managing weeds and nutrients in rotations that include cover crops. Approaches to each of these issues vary with the species, soil and landscape characteristics, and farm operation. The initial web version of the guide is expected in spring of 2020, with new information added as it becomes available.



OSTP's Sara Heger explains the basics of septic system management at a recent homeowner training class.

The UMN Onsite Sewage Treatment Program (OSTP) received a second round of funding through a grant from the Minnesota Department of Health to offer educational homeowner septic classes in 2019 and 2020 across Minnesota. Classes cover septic system and well function maintenance. The class provides basic information on chemicals of emerging concern (CEC) including pharmaceuticals and personal care products (PPCP) and the potential impact on septic systems and groundwater. The UMN collaborates with local programs including counties, wastewater management districts, homeowner associations, or other similar organization who host and marketing the homeowner classes.

[Training program information](#) or contact Sara Heger at sheger@umn.edu/612-625-7243

OSTP and the North Central Region Water Network received the [UCOWR](#) Education and Public Service award at the UCOWR annual meeting in Snowbird, UT June 11-13, 2019. The award recognizes educational institutions, individuals, groups, or agencies that have made significant contributions to increase public awareness of water resources development, use, or management covering any one or a combination of the natural, biological, and social sciences.

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Summer 2019 Student News



Brian Bohman presented *Evaluation of Variable Rate Nitrogen and Reduced Irrigation Management on Nitrate Leaching for Potato*, at the Potato Association of America Conference, July 2019. Bohman is advised by **David Mulla** and **Carl Rosen**.



Adam Frankiewicz presented a poster entitled: *Developing an Updated and Educational Key for Sphaeriidae clam of the Great Lakes Region* at the International Association for Great Lakes Research (IAGLR) 2019 Conference in Brockport, NY in June, 2019. Frankiewicz is advised by **Valerie Brady** and **John Pastor**.



Adelle Keppers presented a poster entitled: *Characterization of Antibiotic Resistant Genes in Cities' Upper Sewer System in Western Lake Superior* at the AEESP Conference in Arizona, May 2019. Keppers is advised by **Chanlan Chun**.

Vadym Ianaiev presented a poster entitled: *Beyond the Nearshore Shunt: Quagga mussels boost benthic-pelagic nutrient exchanges in Lake Michigan-Huron* at the International Association for Great Lakes Research Conference. (IAGLR) June 2019 in Brockport, NY. Ianaiev is advised by **Sergei Katsev**.

Kaela Natwora, presented a poster entitled: *Is Diazotrophy Important in the Great Lakes: Quantifying who and how much* at the International Association for Great Lakes Research (IAGLR) 2019 Conference in Brockport, NY in June, 2019. Natwora is advised by **Cody Sheik**.

New Faculty:

Vasudha Sharma - Assistant Extension Professor and Irrigation/Water Quality Specialist in the Departments of Soil, Water, and Climate and Bioproducts and Biosystems Engineering.

The Water Resources Center is a unit of the [College of Food, Agricultural and Natural Resource Sciences](#) and [University of Minnesota Extension](#).

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Summer 2019 Resources and Publications

[*Arsenic concentrations after drinking water well installation: Time-varying effects on arsenic mobilization*](#)

Erickson, M.L., H.F. Malenda, E.C. Berquist and J.D. Ayotte

Science of the Total Environment, August 2019

Chronic exposure to geogenic arsenic via drinking water is a worldwide health concern. However, effects of well installation and operation on arsenic concentrations and mobilization are not well understood. This knowledge gap impacts both reliable detection of arsenic in drinking water and effective public health recommendations to reduce exposure to arsenic. This study examines changes in arsenic and redox geochemistry over one year following installation of 254 new domestic water wells in three regions of the north-central USA that commonly have elevated arsenic concentrations.

[*A harmonized image processing workflow using Sentinel-2/MSI and Landsat-8/OLI for mapping water clarity in optically variable lake systems*](#)

Page, B.P., L.G. Olmanson and D.R. Mishra

Remote Sensing of Environment, September 2019

This study demonstrates the applicability of harmonizing Sentinel-2 MultiSpectral Imager (MSI) and Landsat-8 Operational Land Imager (OLI) satellite imagery products to enable the monitoring of inland lake water clarity in the Google Earth Engine (GEE) environment.

[*The Effect of Goldfish \(Carassius auratus\) on Water Quality in Horse Stock Tanks*](#)

Catalano, D.N., H.J. Bradley, S. Missaghi, M.R. Hathaway and K. L. Martinson

ScienceDirect, August 2019

Goldfish (*Carassius auratus*) have been reported as a method to keep water tanks clean; however, little information exists on this approach. The objectives were to evaluate the efficacy of goldfish on maintaining water quality in tanks and to evaluate the frequency that this method is used.

[*Climatic Controls on Landscape Dissection and Network Structure in the Absence of Vegetation*](#)

Hooshyar, M., A. Singh, D. Wang and E. Fofoula-Georgiou

Geophysical Research Letters, March 2019

Drainage networks emerge due to the movement of sediment driven by climatic and tectonic forcings. Previous observations revealed the dependence of drainage density (Dd) on climatic factors such as mean annual precipitation (MAP). Specifically, it has been observed in intermediate climate (~175 mm < MAP < 700 mm) that Dd decreases with increasing MAP. This declining trend has been argued to be attributed to biotic activity, that is, the dominance of vegetation growth over runoff erosive force.

[*Effect of dissolved iron on CDOM and other optical properties for dissolved organic matter in lakes and rivers of the Upper Great Lakes states*](#)

Brezonik, P.L., J.C. Finlay and R.M. Hozalski

UMN Data Repository, 2019

These files contain the raw field and lab data collected during sampling of lakes and a few rivers in 2014-2016 to evaluate the importance of dissolved iron concentrations in affecting apparent levels of colored dissolved organic matter (CDOM), as measured spectrophotometrically by light absorption coefficient at 440 nm, a(440), with additional sampling in 2018 for more specific purposes.

[*Visitor preferences at Osceola Landing on the St Croix National Scenic Riverway*](#)

Schneider, I.E and E. Tsakakis, 2019

Prepared for the National Park Service

In response to managerial concerns and increased visitor presence along the St. Croix National Scenic Riverway (SACN), systematic visitor observation occurred 2017 at three landings: Osceola, Earl and Whispering Pines (Schneider et al. 2018). Following the observational phase, Riverway personnel requested a survey to evaluate visitor experiences with attention to maintaining scenic Riverway qualities, assessing quality visitor experiences, and improving safety.

[*Snow algae drive productivity and weathering at volcanic rock-hosted glaciers*](#)

Havig, J.R. and T.L. Hamilton

ScienceDirect, February 2019

Earth has experienced periodic local to global glaciation for nearly 3 billion years, providing supra- and subglacial environments for colonization by microbial communities. A number of studies have reported on the role of microbial communities in glacial ecosystems including their influence on element cycling and weathering, but there is a paucity data on volcanic rock-hosted glacial ecosystems.

[*Hypolith photosynthesis in Hydrothermal Areas and Implications for Cryptic Oxygen Oases on Archean Continental Surfaces*](#)

Havig, J.R. and T.L. Hamilton

Frontiers in Earth Science, February 2019

Here, we explore phototrophic communities in both hypolithic and hot spring environments in Yellowstone National Park as potential analogs to Archean continental surfaces. Hypolithic communities in geothermal settings were similar in both composition and carbon uptake rates to proximal hot spring communities.

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Summer 2019 Upcoming Events

[Water Resources Institute Stormwater Operations and Maintenance Conference](#)

August 4-7, 2019
Minneapolis, MN

[Aqua Chautauqua: Otter Tail River Watershed](#)

August 15, 2019
Dunton Locks County Park

Detroit Lakes MN

[Minnesota Water Resources Conference](#)

October 15-16, 2019
St. Paul, MN

[Conservation Tillage Conference](#)

December 17-18, 2019
Holiday Inn St. Cloud

[2020 Minnesota Climate Adaptation Conference](#)

January 22, 2020
Continuing Education Center
St. Paul Campus

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Summer 2019 CrossCurrents - links to other water-based websites



Minnesota USGS Water Science Center

[Your source for water-resource information collected and interpreted by the U.S. Geological Survey in Minnesota.](#)



Minnesota Sea Grant

[Promotes the best and most current science regarding Lake Superior and inland lakes to resource users, managers, and policy-makers](#)



Natural Resources Research Institute Center for Water and the Environment

[Find out how the Center promotes private sector development, while protecting Minnesota's environment.](#)

Extension Water Resources

[Learn more about Extension stormwater, watershed and shoreland education programs, as well as NEMO \(Nonpoint Education for Municipal Officials.\)](#)

Minnesota Water Research Digital Library

[MNWRL is a growing, searchable inventory of current Minnesota-focused publications on all types of water research topics, including peer-reviewed and non-peer-reviewed literature](#)

Minnesota Pollution Control Agency's [Waterfront Bulletin](#)

This monthly bulletin features updates on impaired waters, watershed project funding, and activities related to water restoration and protection throughout Minnesota.

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