

Water Resources Center

Minnegram Spring 2018

Director's Corner

[a message from Director Jeff Peterson \(https://www.wrc.umn.edu/spring-2018-directors-corner\)](https://www.wrc.umn.edu/spring-2018-directors-corner)

Features

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By Seth Thompson, Water Resources Science PhD student

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river basin. The consequences of nitrogen runoff are becoming more well-known—algal blooms and the Dead Zone in the Gulf of Mexico are now part of the popular lexicon. In fact, USA Today, has run articles on both topics—the latest of which focuses on a scientific study describing how long term changes in agricultural practices will be necessary to bring the Dead Zone into compliance—and even then, it would take many years for all the excess nitrogen currently in the system to work its way out.

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by Sam Bauer, Associate UMN Extension Professor

Water use in the home landscape is a hot topic- even in Minnesota. In the Twin Cities, on average three times more water is used during the summer than in the winter and much of this water is used outdoors. As urbanization increases and we continue to experience more extreme heat and drought, greater pressure is placed on our water resources. If you own an irrigation system or water your lawn with portable sprinklers, reduce your overall water use by implementing the following water-saving tips.

<https://www.wrc.umn.edu/waterconf> News

[Minnesota Water Resources Conference call for abstracts \(https://ccaps.umn.edu/minnesota-water-resources-conference/call-abstracts\)](https://ccaps.umn.edu/minnesota-water-resources-conference/call-abstracts)

Deadline May 4, 2018

[Spring 2018 Community News \(https://www.wrc.umn.edu/minnegram-spring2018\)](https://www.wrc.umn.edu/minnegram-spring2018)

[Spring 2018 Student News \(https://www.wrc.umn.edu/student-news\)](https://www.wrc.umn.edu/student-news)

[Spring 2018 Resources and Publications \(https://www.wrc.umn.edu/minnegram\)](https://www.wrc.umn.edu/minnegram)

[Spring 2018 Upcoming Events \(https://www.wrc.umn.edu/upcomingevents\)](https://www.wrc.umn.edu/upcomingevents)

[Spring 2018 CrossCurrents-Links to other water-based websites \(https://www.wrc.umn.edu/links\)](https://www.wrc.umn.edu/links)

- [Confluence \(/publications/confluence-0\)](/publications/confluence-0)
- ▼ [Minnegram \(/publications/minnegram\)](/publications/minnegram)
 - [Minnegram Fall 2016 \(/publications/minnegram/fall2016minnegram\)](/publications/minnegram/fall2016minnegram)
 - [Minnegram Fall 2017 \(/publications/minnegram/minnegramfall2017\)](/publications/minnegram/minnegramfall2017)
 - [Minnegram Spring 2016 \(/publications/minnegram/minnegram-spring-2016\)](/publications/minnegram/minnegram-spring-2016)
 - [Minnegram Spring 2018 \(/publications/minnegram/spring-2018\)](/publications/minnegram/spring-2018)
 - [Minnegram Summer 2016 \(/publications/minnegram/minnegram-summer-2016\)](/publications/minnegram/minnegram-summer-2016)
 - [Minnegram Summer 2017 \(/publications/minnegram/summer-2017-minnegram\)](/publications/minnegram/summer-2017-minnegram)

- [minnegram winter 2016 \(/publications/minnegram/minnegramwinter2016\)](/publications/minnegram/minnegramwinter2016)
- [Minnegram Winter 2017 \(/publications/minnegram/minnegram-winter-2017\)](/publications/minnegram/minnegram-winter-2017)
- [Minnegram Winter 2018 \(/publications/minnegram/winter2018minnegram\)](/publications/minnegram/winter2018minnegram)
- [WRC publications \(/publications/wrc-pubs\)](/publications/wrc-pubs)
- [UM Digital Conservancy \(archive\) \(http://conservancy.umn.edu/handle/11299/91180\)](http://conservancy.umn.edu/handle/11299/91180)

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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Water Resources Center

Spring 2018 Director's Corner

Warm spring greetings from the WRC staff. In this time of new growth and beginnings, we are pleased to bring you several articles about recent developments in the WRC as well as seasonal water management topics.

We welcomed Joel Larson as our associate director in January. You can find out more about Joel and his take on his new job in an [interview \(/www.wrc.umn.edu/jlarson\)](/www.wrc.umn.edu/jlarson) with Minnegram editor Chris Hansen. More recently, we welcomed [Ben Page \(/www.wrc.umn.edu/minnegram-spring2018\)](/www.wrc.umn.edu/minnegram-spring2018) as the latest addition to our research staff. Ben is a remote sensing specialist and will be working on a major enhancement of the [Minnesota Lake Browser \(https://water.rs.umn.edu/\)](https://water.rs.umn.edu/).

One of the WRC's core missions is to convene events that connect frontier knowledge from multiple fields. This year, we hosted the first ever [Water Resources Assembly and Research Symposium \(/www.wrc.umn.edu/symposium\)](/www.wrc.umn.edu/symposium), which brought the University of Minnesota water community together to discuss emerging science topics. One focus area of the event was the growing potential for collaboration at the interface of data and water sciences. The event also launched another speaker series, the [Headwaters Lectures \(/www.wrc.umn.edu/news-events/headwaters-lecture\)](/www.wrc.umn.edu/news-events/headwaters-lecture), which will continue as stand-alone seminars featuring internationally known researchers throughout the year.

Speaking of convening events, save the dates for the 2018 Minnesota Water Resources Conference: October 16-17 at the RiverCentre in St. Paul. The call for abstracts is already out, with submissions due on May 4. Visit the [conference website \(https://ccaps.umn.edu/minnesota-water-resources-conference\)](https://ccaps.umn.edu/minnesota-water-resources-conference) to submit an abstract, register as an exhibitor, or nominate a distinguished colleague for the Dave Ford Award.

The next few months are a period when a large share of the annual nutrients losses from cropland work their way into surface waters, contributing to the hypoxic zone in the Gulf of Mexico and more localized harmful algal blooms (HABs). Lucy Levers [summarizes some of the ongoing research \(//www.wrc.umn.edu/covercrops\)](http://www.wrc.umn.edu/covercrops) on continuous living cover cropping systems to reduce nutrient losses. An active group of researchers in Minnesota is contributing to the science based management of HABs. A workshop on March 29 highlights some of this recent work, and you can learn much more about HABs at the [Extension webpage \(http://www.extension.umn.edu/environment/water/conservation/algae/\)](http://www.extension.umn.edu/environment/water/conservation/algae/) curated by Shahram Missaghi.

Other feature articles give you tips for [reducing outdoor water use \(//www.wrc.umn.edu/waterlawns\)](http://www.wrc.umn.edu/waterlawns) in the summer months and fills you in on a program [where WRS graduate students teach and interact \(//www.wrc.umn.edu/insci-ed-out\)](http://www.wrc.umn.edu/insci-ed-out) with elementary and middle school science students.

Best wishes for a warm and productive spring.

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InSciEd Out brings student-driven inquiry to local classrooms

By Seth Thompson, Water Resources Science PhD student

Students across the Twin Cities metropolitan area are getting the opportunity to ask and answer their own scientific questions thanks to the Integrated Science Education and Outreach (InSciEd Out) program. An evidence-based elementary and middle school program, InSciEd Out empowers young learners to investigate society's most pressing health issues so they can ignite measurable and sustainable changes in the health and wellness of their families and communities. Through a partnership between the College of Biological Science and the Mayo Clinic, InSciEd Out now reaches over 3,000 students from 6 partner schools in the Twin Cities.

Water Resources Science faculty Jim Cotner and PhD student Seth Thompson have worked to develop a water-centric curriculum for the InSciEd Out program that engages students through a focus on the link between water quality and human health. Through strong teach-scientist partnerships, elementary and middle school students perform experiments to better understand how contemporary water issues such as eutrophication or contaminants of emerging concern in local water bodies can impact their health. Ultimately, students are empowered to do real science, using the support of Cotner and Thompson to push their questions towards true novelty.

"The types of questions young students come up with are truly amazing," says Thompson. "Working with these students challenges me to think of my own research questions in a new way. They aren't afraid to challenge me to explain why I am interested in a question or why they should care about it. That constant challenge has forced me to think more deeply about the scientific questions I am asking as a researcher."

Through a process known as "student extensions," InSciEd Out students work with a scientist partner to develop and perform impactful experiments. For example, 8th grade students at one partner school recently completed a project to examine the impact of soil texture on the transport of surface water contaminants into groundwater. These students will be presenting their work at a year-end research symposium to be held at the University of Minnesota on April 16th.

This emphasis on engaging students in relevant science has paid off. As Kristen Dirksen, a 5th grade teacher at an InSciEd Out partner school puts it, "I have found that the connections with the scientists really brings out even more scientific reasoning in my students. The students are excited to share their knowledge with others, especially their community. There is so much pride in my students when they present their work to the community. They see their value and realize that their science has an impact on others. It's truly an amazing experience."

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For more information about the InSciEd Out program for to learn about opportunities for involvement, contact Seth Thompson at thom2587@umn.edu (<mailto:thom2587@umn.edu>).

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UMN alumnus Joel Larson at home in new role as WRC associate director

New WRC Associate Director Joel Larson is not missing his east coast office commute. As the acting Director for the Southeast Climate Hub and living just outside DC, Joel and his wife Amelia counted commuting time to daycare and the office as family time, as they were rarely home during waking hours.

Born in Kansas, raised in Des Moines, Joel left Iowa in high school to attend a two year international school program in New Mexico, one of 10 campuses around the world that recruited 25% of the student body from the host country and rest of the students from abroad. After this taste of internationalism, Joel enrolled at Macalester College in St. Paul, which attracts a number of international students. He never did take an International studies course; a required freshman geography class grabbed his imagination, and he was hooked.

It was the relationships between the landscape and people that interested him. For example, how water policy in the western US historically focused on “beneficial uses” such as drinking water and irrigation, which continues to drive the complex interactions between legal, political, ecological, and socioeconomic environments. Understanding and responding to those relationships is challenging, but he embraced it as part of his work at the Bureau of Land Management and the Southwest Climate Hub. “I try to make the science accessible and policy options acceptable to the range of stakeholders in the agricultural, forestry and rural communities as they make decisions about water management and conservation planning,” said Joel.

Learning how policy is created at the local, state and federal levels drew him to the graduate program at the

University of Minnesota's Humphrey School of Public Affairs, where base skills such as leadership and management are taught to be applied in any technical field. Joel has taken the analytical and “soft skills”—those tools and techniques that promote a positive work environment—and used them to facilitate an environment where teams and individuals not only get their work done but also thrive. His broader understanding of technical subjects enables him to help his teams effectively do their work.

On the job at the Water Resources Center, Joel looks forward to working in a more hands-on environment, where the effects of programs and policies put in place are more visible as all of the players work together for a common goal. At the national level, it was difficult to see the cause and effect of his work, but not impossible. After arriving in Minnesota, Joel was reading a Board of Water and Soil Resources (BWSR) publication that included five principles for the upcoming work. They were the same principles that his office in DC had written three years before to help the agriculture and forest industries respond to climate change. “Here was proof that the work I had done on the federal level did in fact make a difference to the people on the ground, in the trenches,” said Joel.

His new work commute? A walk through tranquil St. Anthony Park. Quality family time? Spent at home with Amelia, two-year-old Soren and Alice, the family's lab/shepherd mix. Total relaxation? Not quite. More like happy anticipation. A new little Larson arrives in March.

“We all work, live, and play in an environment of some kind: urban, rural, or in between. I hope to build relationships between individuals and communities by highlighting the role that water plays in connecting all of us.”

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Water resources symposium seeks to increase public visibility of UMN water research

“Without water, there is no life.” With those words, Al Levine welcomed the attendees of the [Water Resources Assembly and Research Symposium](http://www.wrc.umn.edu/news-events/assembly-research-symposium).

Levine, the University's Vice-President for Research, shared that he realized that the visibility of the water research community was an issue when a University president asked him who was doing water research at the University. Organizers of the symposium hope that events like this will raise the water research community's profile within the University through cooperation with its colleges and units.

The rest of the morning saw two panels of researchers and [Water Resources Science \(https://wrs.umn.edu\)](https://wrs.umn.edu) students give their thoughts about the perception of water at the University of Minnesota and what the future may hold for water research. Writers, students, researchers, and center directors pointed to storytelling, core science, water body restoration, and citizen science involvement as part of bringing water to the forefront of work being done at the University as well as in society.

Vipin Kumar, a professor in the Department of Computer Science and Engineering, presented the inaugural [Headwaters Lecture \(http://www.wrc.umn.edu/news-events/headwaters-lecture\)](http://www.wrc.umn.edu/news-events/headwaters-lecture), "Big Data in Water: Opportunities and Challenges for Machine Learning," which addressed how machine learning can play a role in promoting water science. The goal of the new Headwaters Lecture series is to bring internationally known scholars to discuss frontier research issues with the University water community.

The afternoon session focused on shaping a new Digital Water initiative. The [Water Resources Center \(http://www.wrc.umn.edu/home\)](http://www.wrc.umn.edu/home) and [Minnesota Supercomputing Institute \(https://www.msi.umn.edu/\)](https://www.msi.umn.edu/) seek to invest in new resources to support data-enabled water research. The new resources will be driven by community input and may include staff, specialized software, training opportunities, or computing infrastructure. To begin the afternoon session, a series of lightning talks highlighted current examples of data-driven water research including the use of sensors, the role of socioeconomic data and spatial data mining, that is, the process of discovering interesting and previously unknown, but potentially useful patterns from spatial databases. Input to shape the Digital Water initiative was obtained from small group discussions and a survey distributed before the symposium. A poster session and reception concluded the afternoon.

Jeff Peterson, Director of the Water Resources Center said that the daylong event "illustrated that we have a diverse, engaged, and capable water resources community at the University of Minnesota. Bringing all these experts together helps to advance our collective understanding and identify new ways of tackling pressing water resources needs."

The event was sponsored by the College of Food, Agricultural, and Natural Resource Sciences and the Water Resources Center, with assistance from the Minnesota Supercomputing Institute and the Water Resources Science graduate program.

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Finding solutions: cover crops

by Lucia Levers, Water Resources Center Research Associate

Nitrogen pollution. The term is inextricably linked with growing corn: here in Minnesota, and all along the Mississippi river basin. The consequences of nitrogen runoff are becoming more well-known—algal blooms and the Dead Zone in the

Gulf of Mexico are now part of the popular lexicon. In fact, *USA Today*, has run articles on both topics—the latest of which (<https://www.usatoday.com/story/tech/science/2018/03/26/gulf-mexico-dead-zone-persist-decades/459335002/>) focuses on a [scientific study \(http://science.sciencemag.org/content/early/2018/03/21/science.aar4462?utm_source=SciPak%20%28updated%206/30/2017%29&utm_campaign=9e5ed08838-EMAIL_CAMPAIGN_2018_03_16&utm_medium=email&utm_term=0_10c5e799a3-9e5ed08838-126527301\)](http://science.sciencemag.org/content/early/2018/03/21/science.aar4462?utm_source=SciPak%20%28updated%206/30/2017%29&utm_campaign=9e5ed08838-EMAIL_CAMPAIGN_2018_03_16&utm_medium=email&utm_term=0_10c5e799a3-9e5ed08838-126527301) describing how long term changes in agricultural practices will be necessary to bring the Dead Zone into compliance—and even then, it would take many years for all the excess nitrogen currently in the system to work its way out.

But, there is no need to let tears “runoff”: community members, agriculturists, and researchers are working on ways to reduce agricultural nitrogen pollution, without severely impacting the agricultural industry.

Here at the Water Resources Center, we are looking at cover crops to do just that.

To understand why cover crops are a way to combat nitrogen, one must understand a bit about how a typical corn field contributes to nitrogen pollution. Corn is harvested in the fall, nitrogen fertilizer is applied for next year’s young plants, then the fields lay bare until spring planting. Nitrogen pollution leaches out the system over the winter and into our waterways. By planting a cover crop after the corn harvest, nitrogen is effectively stored in a plant over winter. This reduces nitrogen pollution, but also has a number of other benefits such as decreasing erosion and sedimentation, and increasing biodiversity, soil organic matter, and biological activity.

Sounds fantastic, but unfortunately, as pointed out in this [Star Tribune \(http://www.startribune.com/cover-crops-provide-benefits-but-are-a-tricky-proposition-for-minnesota-farmers/352456631/\)](http://www.startribune.com/cover-crops-provide-benefits-but-are-a-tricky-proposition-for-minnesota-farmers/352456631/) article, cover

crops are not free for the farmer. And while they may reduce fertilizer needed, providing a monetary benefit, the rest of their budgetary effects are costs.

Since providing environmental benefits help everyone, including the creatures of the Gulf of Mexico, here at the WRC we have been researching subsidies to encourage cover crop adoption. A subsidy program would help alleviate any cost concerns that corn farmers may have. With the [Minnesota Board of Water and Soil Resources \(http://www.bwsr.state.mn.us/index.html\)](http://www.bwsr.state.mn.us/index.html), we collected data from farmers to assess the types and amounts of subsidies that would spur cover crop adoption. Not all land, nor farmers are alike, so it is important to discover both where cover crops would be most effective, and with whom. Additionally, as discussed in the previous [Minnegram \(//www.wrc.umn.edu/infewsgrant-0\)](http://www.wrc.umn.edu/infewsgrant-0), we continue to work with other University of Minnesota researchers to answer questions about cover crop species, methods, and effectiveness.

These programs may become particularly important with nitrogen fertilizer application limitations, as outlined by Governor Dayton's [plan \(https://www.mprnews.org/story/2018/03/07/mn-moves-to-eliminate-nitrates-in-groundwater-environmentalists-wait-wonder\)](https://www.mprnews.org/story/2018/03/07/mn-moves-to-eliminate-nitrates-in-groundwater-environmentalists-wait-wonder), expected to be finalized this December.

If you are interested in learning more about cover crops, and their cousins, alternative perennial crops, please visit [Forever Green Initiative \(https://www.forevergreen.umn.edu/\)](https://www.forevergreen.umn.edu/) and the [UMN Extension \(https://www.extension.umn.edu/agriculture/soils/cover-crops/\)](https://www.extension.umn.edu/agriculture/soils/cover-crops/).

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Water-saving strategies for home lawns

by Sam Bauer, Associate UMN Extension Professor

Water use in the home landscape is a hot topic- even in Minnesota. In the Twin Cities, on average three times more water is used during the summer than in the winter and much of this water is used outdoors. As urbanization increases and we continue to experience more extreme heat and drought, greater pressure is placed on our water resources. If you own an irrigation system or water your lawn with portable sprinklers, reduce your overall water use by implementing the following water-saving tips.

Pay attention to the weather

During a Minnesota summer, we may see heavy periods of rainfall followed by extended drought. Homeowners with lawns should adjust irrigation practices accordingly. This means no longer relying on the “set it and forget it” irrigation schedule that is often programmed into automatic systems. Operating irrigation controllers in manual mode is one way to solve this issue: turn the controller on only when your lawn shows signs of drought.

Select lawn grasses that use less water and can tolerate drought

Whether you are establishing a new lawn or renovating an existing lawn, choice of grass species will impact irrigation requirements. Traditional grass species for Minnesota include Kentucky bluegrass, perennial ryegrass, fine fescue, and tall fescue. Fescue species offer the best drought tolerance. Fine fescues simply use less water, and tall fescue has a deep root system able to access more moisture.

Adjust irrigation programs to conserve water

To encourage rooting and drought tolerance, lawns should be irrigated infrequently (one time or less per week) with a sufficient volume of water to wet soils to a depth of six inches, assuming no rainfall has occurred. Depending on your soil type, your lawn may only need as little as a half-inch of water. Set irrigation programs to water during the morning hours. Watering during the heat of the day reduces the amount of water absorbed by the soil and made available to plants.

Audit your irrigation system

Auditing your irrigation system is a good step toward water conservation. Irrigation contractors will perform this service for you if you contract with them.

There are three basic steps:

1. Check system components including sprinklers, valves and controllers.
2. Conduct a performance test.
3. Program the controller.

For more information on conducting an irrigation audit, see [Auditing home lawn irrigation systems \(http://www.extension.umn.edu/garden/turfgrass/watering/auditing-irrigation/\)](http://www.extension.umn.edu/garden/turfgrass/watering/auditing-irrigation/).

Implement water saving technologies

Rain sensors connected to irrigation controllers are common water-saving devices. Over the past decade, “smart” irrigation controllers, soil moisture sensors and more efficient sprinklers have also been developed. Smart irrigation controllers save water by automatically adjusting irrigation programs based on water use estimates or stored historical data. Additionally, inexpensive (\$150 or less) soil moisture sensors can be purchased and embedded in the lawn. These sensors will not allow an irrigation system to run if soil moisture levels are adequate. Many municipalities offer rebates (as much as \$250) for installing these smart irrigation devices on your home irrigation system.

Improve soils and lawn quality through good maintenance

Lawn care practices have a direct impact on irrigation requirements. High mowing heights (3 inches or greater) and proper fertilizer use will improve lawn quality and reduce irrigation requirements. Aeration of a lawn followed by top-dressing with quality compost can lessen compaction and add organic matter to soil. This will improve water infiltration in heavy soils as well as increase moisture-holding capacity of sandy soils that drain rapidly.

Recycle water when possible

Recycling water for irrigation requires proper design of water storage and separate to supply the water to irrigation sprinklers. Professional contractors who have expertise in this area have designed these systems for large commercial buildings and sports complexes. For homeowners, rain barrels can be purchased from local municipalities and companies for the purpose of reusing rain water to irrigate landscape plants.

Change expectations

Consider changing your lawn expectations to allow for temporary discoloration during drought periods. It is very rare to have extended droughts that completely compromise the integrity of a lawn.

Design landscapes for water conservation

Choose plants that are well-suited to your site including drought-tolerant plants for dry areas. Mulch garden beds to retain soil moisture and reduce weeds. Retain water on-site using rain barrels, raingardens, and planted slopes.



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Water Resources Conference Call for Abstracts

- **Abstract Deadline:** The abstract deadline has passed. Accepted presenters will be notified in July
 - **Abstract formats:** 20-minute oral presentation or poster
 - **Special Session:** The deadline for submitting special sessions has passed. Selected sessions will be contacted in April to discuss next steps.
-
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Abstract Requirements

- Objectives and results of the research, policy, implementation plan, or project
- Engineering approaches or techniques of project implementation
- Brief summary of methodologies used in the study or project
- Results of the project and expected completion date

Topics of Interest

- Agricultural Water Issues
- Aquatic Biota
- Climate Change
- Contamination/Remediation
- Contaminants of Emerging Concern
- Drinking Water/Water Supply
- Education and Citizen Involvement
- Emerging Issues
- Engineering Solutions and Applications
- GIS/LiDAR

- Green Infrastructure
- Groundwater
- Hydrology
- Innovative Technologies
- Invasive Species
- Lakes
- Low Impact Development
- Mining
- Monitoring
- Nutrients
- Policy
- Rivers, Streams, and Floodplains
- Standards and Management
- Stormwater
- Social Science/Human Dimensions
- Wastewater
- Water Resource Sustainability
- Water Reuse
- Wetlands

NOTE: All accepted concurrent session and poster presenters and co-presenters are required to register and pay registration fees in order to present at the conference.

612-301-2448 | #mnwrc18 | ccapsconf3@umn.edu

- [Twitter](#)

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Current as of July 17, 2018

Water Resources Center

Spring 2018 Community News

John Bilotta (UMN Extension, Sea Grant) is working with Sea Grant colleagues to draft a ten year vision on Sea Grant efforts in community flooding. He hosted a workshop February 2018 in Miami, Florida and will synthesize the information and draft the ten year vision by August 2018.

Melinda Erickson (WRS faculty, Department of Bioproducts and Biosystems Engineering & U.S. Geological Survey) has a new adjunct appointment in the Department of Soil, Water, and Climate. Erickson's work was highlighted in the "Lake Superior Project" series produced by WTIP North Shore Community Radio. The January 2018 feature "Arsenic in our groundwater?" is available as an audio archive on the [WTIP website](http://www.wtip.org/lspjproject-arsenic-our-groundwater-0) (<http://www.wtip.org/lspjproject-arsenic-our-groundwater-0>).

John Gulliver (WRS faculty, CE) and **John Nieber** (WRS faculty, BBE) received a grant from the Minnesota Local Road Research Board for their project Design and Construction of Infiltration Facilities. The grant is funded July 2018 through June 2021.

WRS faculty **Crystal Ng** (Earth Sciences) and **Byron Steinman** (Earth and Environmental Sciences) have been named McKnight Land-Grant Professors. Ng investigates sulfur cycling in wetlands, social-biophysical perspectives on wild rice aquatic habitats, sources and consequences of arsenic contamination, and eco-hydrological modeling. Steinman is principally focused on improving methods for identifying climate signals in observational data and refining interpretations of paleoclimate records. The McKnight Land-Grant Professorship Program advances the careers of new assistant professors at a crucial point in their professional lives.

Ben Page joined the Water Resources Center as a research fellow in April 2018. Page is a remote sensing specialist and will work with Leif Olmanson (Remote Sensing and Geospatial Analysis Laboratory) and David Porter (Minnesota Supercomputing Institute=MSI) on WRC-housed grant projects related to remote sensing and mapping of lake water quality. These projects will contribute to the emerging Digital Water Initiative, a joint effort of the WRC and MSI.

Tony Runkel (WRS faculty, Minnesota Geological Survey and Department of Earth Sciences) and colleagues are combining borehole instrumentation and testing with mapping of fractures in the Platteville Formation to improve our understanding of flow. Understanding this common but poorly understood phenomena is essential to effective ground water management. The project is funded by the Environment and Natural Resource Trust Fund as recommended by the Legislative and Citizen Commission on Minnesota Resources.

Karen Terry (UMN Extension Water Resources Team), Toby Spanier (UMN Extension), the Heron Lake Watershed District and the Minnesota Pollution Control Agency conducted an educational meeting at Key Largo near Slayton, MN February 12, 2018. for Minnesota small towns experiencing failing sewer and water infrastructure. Attendees

included city and county representatives as well state and federal officials. Terry provided information about water, watersheds, stormwater, and practices to slow runoff. Other topics addressed were watershed restoration, community water infrastructure needs and funding for education and and water utility upgrades.

Bob Tipping (WRS faculty, Minnesota Geological Survey) and colleagues are investigating the role of geologic setting in the variation of temperature in trout streams. Distributed temperature sensing (DTS) is measured with fiber optic cable laid over 1 to 2 km stream reaches, and the findings are compared with geologic conditions and trout populations to better understand critical habitat for native brook trout- the most temperature sensitive population of these streams. The project is funded by the Environment and Natural Resource Trust Fund as recommended by the Legislative and Citizen Commission on Minnesota Resources.

The Water Resources Center is a unit of the
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and Natural Resource Sciences and University of
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Water Resources Center

Spring 2018 Student News

The Water Resources Science program welcomes new faculty: **Peter Calow**, UMN, Humphrey School of Public Affairs, **Laure Charleux**, UMD, Department of Geography, Urban, Environmental & Sustainability Studies, **Afton Clarke-Sather**, UMD, Department of Geography, Urban, Environmental & Sustainability Studies, **Xue Feng**, UMN, Department of Civil, Environmental and Geo-Engineering, **Christopher Filstrup**, UMD, Large Lakes Observatory and Minnesota Sea Grant, **Jeff Havig**, UMN, Department of Earth Sciences, and **Allen Mensinger**, UMD, Department of Biology.

Anna Baker presented a poster *The influence of erosional hotspots on watershed-scale phosphorus dynamics in intensively managed agricultural landscape* at the American Geophysical Union Fall Meeting in New Orleans, LA on December 11-15, 2017. Baker is advised by **Jacques Finlay** and **Karen Gran**.

Nathaniel Baeumler presented a poster *Climate and Land Use Change Impacts on Nitrogen Concentrations and Nitrogen Loads in the Minnesota River* at the Soil Science Society of America's annual meeting in Tampa, FL on October 22-25, 2017. Baeumler is advised by **Satish Gupta**.

Brian Bohman presented two talks: *Comparison of Strategies to Monitor and Measure Nitrate Leaching Under Irrigated Potato Production Grown on Sandy Soils in North Central USA* and *Adaptive Nitrogen and Irrigation Management Strategies Improve Agronomic and Environmental Outcomes from Potato Production* at the Soil Science Society of America's annual meeting in Tampa, Florida on October 22-25, 2017. Bohman is advised by **David Mulla** and **Carl Rosen**.

Erik Bye presented a poster *Chemical characterization of soil organic matter in a Chesapeake Bay salt marsh: analyzing microbial and vegetation inputs to SOM* the American Geophysical Union Fall Meeting in New Orleans, LA December 11-15, 2017. Bye is advised by **Kathryn Schreiner**.

Moji Fakhraee presented a poster *Sediment Sulfur Isotopes Reflect Seawater Oxygen Rise in Neoproterozoic* at the American Geophysical Union Fall Meeting in New Orleans, LA on December 11-15, 2017. Fakhraee is advised by **Sergei Katsev**.

Erik Hendrickson received his MS winter 2018. His thesis was titled: *Microplastics in the surface water and sediments of western Lake Superior as determined via microscopy, Pyr-GC/MS, and FTIR*. Hendrickson was advised by **Elizabeth Austin-Minor**.

Sophie Lafond-Hudson presented a poster *Exploring the roles of iron and carbon in controlling sulfide toxicity in multi-year wild rice mesocosms* at the Society of Environmental Toxicology and Chemistry Meeting in Minneapolis on November 13-16, 2017. Lafond-Hudson is advised by **Nathan Johnson**.

Timothy Martin received his MS winter 2018. His thesis was titled: *Comparing estimates of fishing effort and lake choice derived from aerial creel surveys and smartphone application data in Ontario, Canada*. Martin was advised by **Paul Venturelli**.

Jane Mazack received her PhD winter 2018. Her dissertation was titled: *Winter invertebrate dynamics in groundwater-fed streams in southeastern Minnesota, USA*. Mazack was advised by **Len Ferrington** and **Bruce Vondracek**.

Marissa Shepherd received her MS winter 2018. Shepherd was advised by **Paige Novak**.

Amber White presented a poster *Assessing internal loading of methylmercury in a sulfate impacted freshwater coastal estuary through extensive field study* at the Society of Environmental Toxicology and Chemistry Meeting in Minneapolis on November 13-16, 2017. White is advised by **Nathan Johnson**.

Kari Wolf received her MS winter 2018. Her thesis was titled: *Climate and Land Use Change Impacts on N-Loads in Iowa Rivers and Remediation of Tile Water with an Anion-Exchange Resin*. Wolf was advised by **Satish Gupta**.

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Water Resources Center

Spring 2018 Resources and Publications

[Estimating the Leaf Area Index of Crops through the Evaluation of 3D Models](#)

https://www.researchgate.net/profile/Dimitrios_Zermas/publication

[/321816478_Estimating_the_Leaf_Area_Index_of_crops_through_the_evaluation_of_3D_models/links/5a4b92faaca2729b7c880d3b/Estimating-the-Leaf-Area-Index-of-crops-through-the-evaluation-of-3D-models.pdf](https://www.researchgate.net/profile/Dimitrios_Zermas/publication/321816478_Estimating_the_Leaf_Area_Index_of_crops_through_the_evaluation_of_3D_models/links/5a4b92faaca2729b7c880d3b/Estimating-the-Leaf-Area-Index-of-crops-through-the-evaluation-of-3D-models.pdf)

Zermas, D., V. Morellas, D. Mulla and N. Papanikolopoulos

Financial and social elements of modern societies are closely connected to the cultivation of corn. Due to the massive production of corn, deficiencies during the cultivation process directly translate to major financial losses. The early detection and treatment of crops deficiencies is thus a task of great significance.

[Global, Regional, and Megacity Trends in the Highest Temperature of the Year: Diagnostics and Evidence for Accelerating Trends](http://onlinelibrary.wiley.com/doi/10.1002/2017EF000709/full)

Papalexiou, S.M., A. AghaKouchak, K.E. Trenberth and Efi Foufoula-Georgiou - Earth's Future

Trends in short-lived high-temperature extremes record a different dimension of change than the extensively studied annual and seasonal mean daily temperatures. They also have important socioeconomic, environmental, and human health implications. Here, we present analysis of the highest temperature of the year for approximately 9000 stations globally, focusing on quantifying spatially explicit exceedance probabilities during the recent 50- and 30-year periods.

[Sedimentary sulfur isotopes and Neoproterozoic ocean oxygenation](http://advances.sciencemag.org/content/4/1/e1701835)

Fakraee, M., S.A. Crowe and S. Katsev - Science Advances, 2018

Abrupt disappearance of mass-independent fractionation of sulfur isotopes (MIF-S) from the geologic record and an apparent ingrowth in seawater sulfate around 2.45 billion years ago (Ga) signal the first large-scale oxygenation of the atmosphere [the Great Oxygenation Event(GOE)].

[Compositions and Methods for C. Difficile Treatment](https://patentscope.wipo.int/search)

[/en/detail.jsf?docId=WO2018006088\)](#)

Hamilton, M.J., A. Khoruts, M.J Sadowsky and C.M. Staley - US Patent App. 15/258,821, 2018

The present disclosure provides compositions and methods for treating *Clostridium difficile* infection (CDI) including primary and recurrent CDI. In particular, the compositions and methods described herein are capable of achieving a CDI clearance rate of at least 80% through a single oral dose of a pharmaceutical composition comprising a freeze-dried fecal microbiota preparation.

[Monitoring and Maintenance of Phosphate Adsorbing Filters \(https://ascelibrary.org/doi/full/10.1061/%28ASCE%29EE.1943-7870.0001296?src=recsys&\)](https://ascelibrary.org/doi/full/10.1061/%28ASCE%29EE.1943-7870.0001296?src=recsys&)

Erickson, A.J., P.T. Weiss and J.S. Gulliver- *Journal of Environmental Engineering*

Field installations of two iron-enhanced sand filters (IESFs), designed to remove phosphate and particulates from stormwater runoff, were monitored and maintained for 1–3 years. One application, a traditional IESF in an agricultural watershed, retained over 64% of the influent phosphate load, whereas the second, a pond perimeter IESF in a developing suburban watershed, retained 26%.

[How or when samples are collected affects measured arsenic concentration in new drinking water wells \(https://onlinelibrary.wiley.com/doi/full/10.1111/gwat.12643\)](https://onlinelibrary.wiley.com/doi/full/10.1111/gwat.12643)

Erickson, M.L., H. F. Malenda and E. C. Berquist - *Groundwater* DOI:10.1111/gwat.12643

Since 2008, Minnesota well code has required testing water from new wells for arsenic. Sample collection protocols are not specified in the well code, so among 180 well drillers there is variability in sampling methods, including sample collection point and sample collection timing.

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Water Resources Center

Spring 2018 Upcoming Events

[The Environmental and Water Resources Engineering Institute of the American Society of Civil Engineers \(https://www.ewricongress.org/\)](https://www.ewricongress.org/)

Minneapolis, MN

May 20-25, 2018

[Minnesota Water Resources Conference](https://ccaps.umn.edu/minnesota-water-resources-conference) (<https://ccaps.umn.edu/minnesota-water-resources-conference>)

October 16–17, 2018

Saint Paul RiverCentre

[Climate Adaptation Conference](http://www.wrc.umn.edu/news-events/climateadaptationconference) (<http://www.wrc.umn.edu/news-events/climateadaptationconference>)

November 14, 2018

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Water Resources Center

Winter 2018 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. \(http://mn.water.usgs.gov/\)](#)

Minnesota Sea Grant

[Promotes the best and most current science regarding Lake Superior and inland lakes to resource users, managers, and policy-makers \(http://www.seagrants.umn.edu/\)](#)

Natural Resources Research Institute Center for Water and the Environment

[Find out how the Center promotes private sector development, while protecting Minnesota's environment. \(http://www.nrri.umn.edu/cwe/default.htm\)](http://www.nrri.umn.edu/cwe/default.htm)

Extension Water Resources

[Learn more about Extension stormwater, watershed and shoreland education programs, as well as NEMO \(Nonpoint Education for Municipal Officials.\) \(http://www.extension.umn.edu/environment/water/\)](http://www.extension.umn.edu/environment/water/)

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 \(https://water-research-library.mda.state.mn.us/pages/application/publicRecordSearch.xhtml\)](https://water-research-library.mda.state.mn.us/pages/application/publicRecordSearch.xhtml)

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

<http://www.pca.state.mn.us/index.php/water/water-publications/waterfront-bulletin.html#current-issue>) 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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