Center for Watershed Science and Education

Waubee Lake, Oconto County (Photo credit: Ryan Haney)

Annual Report 2016-2017

UW Extension
University of Wisconsin–Extension

College of Natural Resources
University of Wisconsin-Stevens Point

About the Center

The Center for Watershed Science and Education is a partnership between the UW-Stevens Point College of Natural Resources and UW–Extension. In the spirit of the Wisconsin Idea, the Center works to:

- *Support watershed stewardship*
- *Assist citizens with lake, river and drinking water quality problems*
- *Promote management strategies for water resource protection*
- *Provide water quality assessment and support*
- *Prepare students for careers as water resource professionals*

The Center works in every corner of Wisconsin, with concerned citizens, lake and stream associations, stewardship organizations, county conservation and Extension offices, and state and federal agencies. Housed in the Center is the Water and Environmental Analysis Laboratory (WEAL), a state-of-the-art facility that performs dozens of different analyses on water and other environmental media. Center staff includes three UW-Extension specialists, five project and technical staff, five environmental chemists, and two support staff. Fifteen or more students are typically employed as laboratory or project assistants.

Center for Watershed Science and Education

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Key Programs

Drinking Water Safety and Groundwater Education

The safety of drinking water for Wisconsin's families is a vital health concern. The Center's WEAL facility tested the well water of over 3,200 Wisconsin residents this past year. Analyses were performed for coliform bacteria, nitrate, chloride, metals and sometimes pesticides. Eleven percent of the wells tested had drinking water that exceeded standards for nitrate, the most common health-related contaminant found in Wisconsin groundwater. Twenty-five percent contained detectable levels of diaminochlorotriazine (DACT), a breakdown component of the pesticide atrazine. Additionally, 19% were found to contain coliform bacteria. Lab staff counseled homeowners on interpreting their test results, well disinfection, and ways to make their water supplies safe.

Community-based drinking water education programs reached over 1,000 well users in 10 counties (Calumet, Dodge, Green, Green Lake, Iowa, Kewaunee, Sauk, Sheboygan, Taylor, and Trempealeau). These programs enlisted the help of local agencies and tested water at the scale of one or two townships. Homeowners submitted samples from their wells and received results along with interpretive assistance. Additional interpretive materials were provided at educational sessions for the participants.

The safety of drinking water for Wisconsin's families is a vital health concern.

Water samples are not only analyzed in the lab! In June, Center staff operated a convenient nitrate screening booth at the Midwest Renewable Energy Fair (theenergyfair.org). Attendees brought well water samples to be analyzed for nitrate on the spot. The booth also made an appearance at Wisconsin Farm Technology Days event in Kewaunee County in July. Between these two events, 400 people were counseled on water quality concerns, and almost 150 samples were analyzed.

Groundwater models are essential teaching tools for incorporating groundwater education into an instructor's curriculum. Annual workshops are offered by the Center, in partnership with WDNR and WGNHS, to provide K-12 teachers with instruction on using a sand-tank groundwater model. This past year, thirty-eight teachers and other educators participated in three one-day workshops. Teacher reports indicate that more than 1,900 students participated in school-based groundwater activities following the workshops. The models are assembled by and purchased from the UW-Stevens Point Student Chapter of the American Water Resources Association.

Chippewa County Groundwater Quality Inventory

Chippewa County partnered with the Center to conduct a groundwater study of 744 private wells. The goal was to resample as many wells as possible from the County's 1985 and 2007 studies in order to identify changes in groundwater quality. The Center successfully resampled 510 wells from the 2007 set, and 185 wells that participated in both prior studies. The new data collected, combined with previous data, will allow a detailed investigation into whether groundwater quality has changed over time.

The new data expanded on previous studies by examining nearly twenty different chemical parameters in addition to nitrate. Sixty wells were selected to also test for pesticides, pharmaceuticals and personal care products. These results were compared to percent agricultural land and density of septic systems near the wells to understand the source of any nitrate contamination.

This study resulted in an impressive data set, which Chippewa County will be able to use to identify areas where groundwater quality concerns exist, understand the extent to which groundwater quality has changed, inform groundwater management decisions, and focus outreach efforts to rural well owners.

The study also provided two undergraduate students, Brewster Johnson and Sean Piette, with opportunities to use and improve their skills as they assisted with water sampling, database management and spatial analysis.

As of Summer 2017, groundwater inventory studies are underway in Portage County, Waupaca County, and the Town of Saratoga, Wisconsin, providing valuable experiences to additional student interns.

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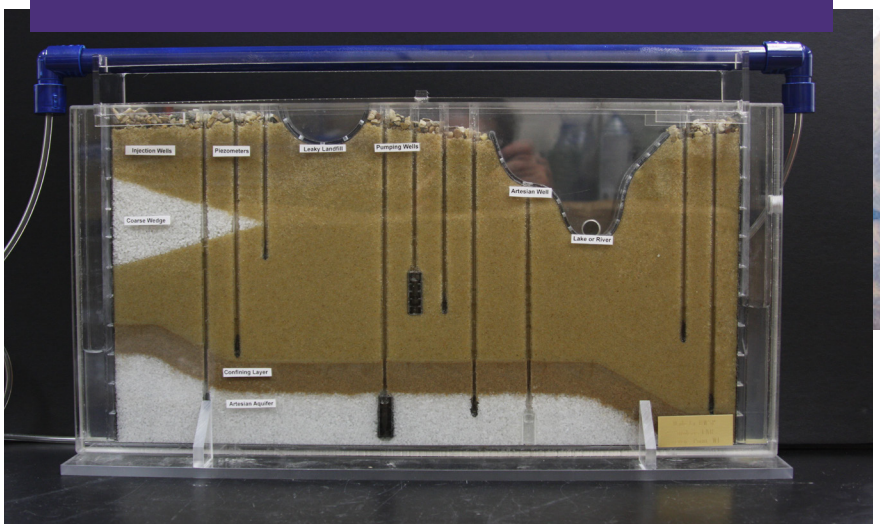
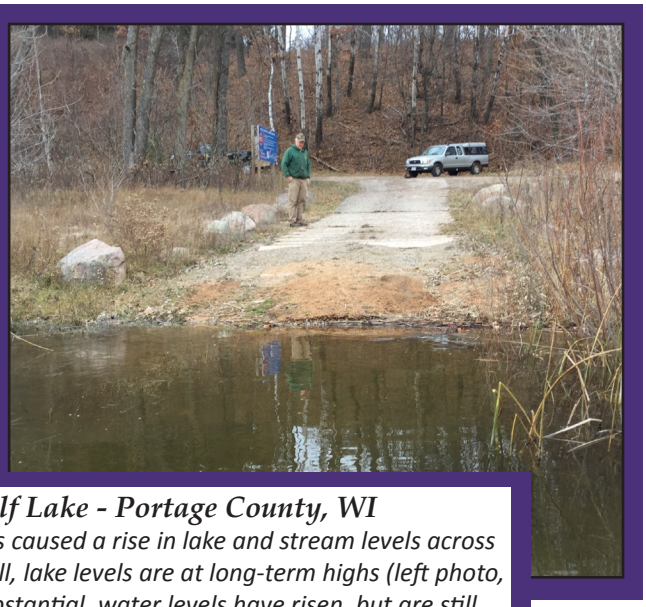


Groundwater education specialist Kevin Masarik demonstrates how to use a sand-tank groundwater model (model shown on left). The models are assembled by and purchased from the UW-Stevens Point Student Chapter of the American Water Resource Association.

Understanding Groundwater Pumping Impacts

Groundwater pumping remained in the forefront of water issues and legislative actions in 2016-2017. Lake and river stewardship groups, industry, and municipal and county officials created heavy demand for outreach programming, which sometimes resulted in semi-weekly presentations. In addition, legislative staff requested scientific information to inform their deliberative processes. There is also an increasing need for enhanced monitoring to understand groundwater pumping impacts. Center staff continue to work closely with agencies and citizen monitoring volunteers.



A Deeper Look: Sunset Lake and Wolf Lake - Portage County, WI

Historically high precipitation in the last three years has caused a rise in lake and stream levels across central Wisconsin. Where pumping drawdowns are small, lake levels are at long-term highs (left photo, Sunset Lake boat landing). Where drawdowns are substantial, water levels have risen, but are still below average levels (right photo, Wolf Lake boat landing, where water levels are below the long-term average, indicated by Portage County Parks Director Gary Speckmann).

Volunteer Streamflow Monitoring

Since 1972, the Center has promoted and supported citizen science programs such as the Volunteer Streamflow Monitoring Program. Launched in 2013, this program is a collaboration with county conservation offices and the WDNR. It provides citizen volunteers with the tools they need to collect valuable streamflow data. Formal, hands-on training sessions empower volunteers to accurately measure flow using professional-grade equipment. To date, nearly 40 volunteers and county conservation staff have been trained to gather streamflow data. This unique program monitors more than eighty stream sites across six counties on a monthly basis.

Center staff members also provide ongoing technical support and quality control tests to maintain the integrity of the data being collected. Data are uploaded to the WDNR's Surface Water Integrated Monitoring System (SWIMS) database for archiving.

This volunteer program is unique to the state of Wisconsin, and may be the only program of its kind in the nation.

Center staff member Jessica Haucke (front right) demonstrates how to conduct a streamflow measurement to a group of volunteers.

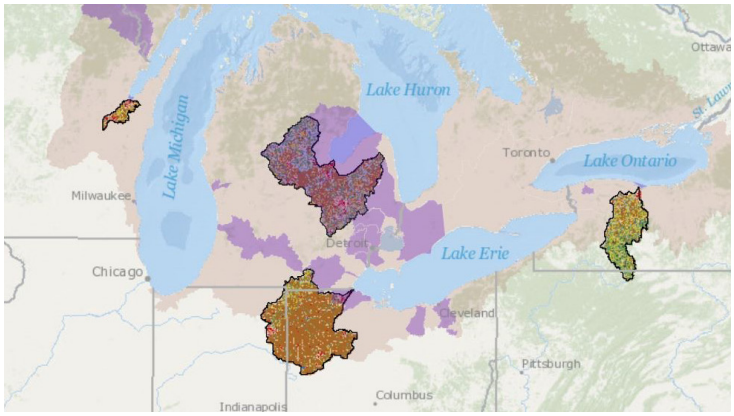
WEAL Key in USGS Great Lakes Initiative

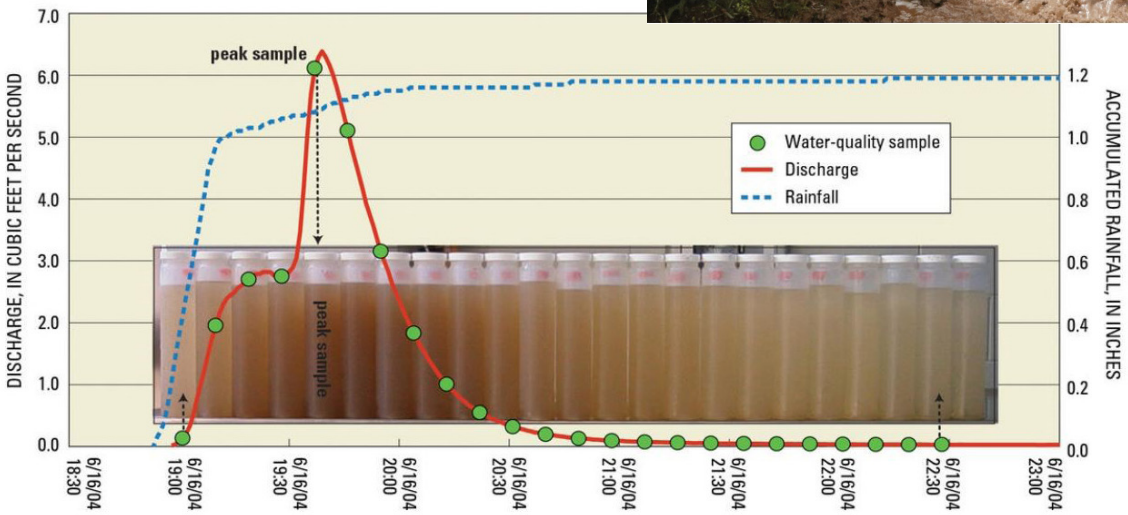
Thousands of runoff samples from across the Great Lake states arrive at the WEAL every year. Collected after snowmelt and heavy rainfalls, these samples are analyzed as part of the USGS Great Lakes Restoration Initiative. This collaboration between the WEAL and the USGS has been in place since 2010.

The Initiative was launched in 2010 to protect and restore the largest system of fresh surface water in the world. The Great Lakes contain 20% of the Earth's fresh surface water, providing drinking water to over 40 million people, while supporting recreation, fishing, and industrial uses valued at billions of dollars in economic benefit to the region.

Water quality in the Great Lakes basin has become more impaired in recent decades, with high-profile problems including blue-green algae blooms in Lake Erie and Green Bay. Algae blooms are the result of excessive nutrients running off of lands and urban areas into the lakes. The samples arriving to the WEAL are runoff collected in automated farm field stations. The samples inform USGS about pollutant loads coming from various practices, and where improvements are needed.

The WEAL–USGS partnership works because of the WEAL's capacity to provide high quality analytical work and its ability to mobilize to meet demands during periods of high runoff. Undergraduate students employed by the WEAL are trained by and work under the guidance of professional staff who directly oversee their work. Students leave UWSP with resumes that highlight their experience with real-world problems.





This image shows an example hydrograph showing how the discharge, or volume of water passing through a streamgauge (red line), changes as the result of accumulating rainfall (blue dotted line). The bottles shown are the water-quality samples collected at each time point (green circles), showing the discharge response and variability in sediment and nutrient concentrations of water samples collected during an edge-of-field runoff event.

Top: *Priority watershed study sites in the Great Lakes Restoration Initiative project*

Middle: *Spring runoff at a USGS automated sampling station at an edge-of-field site*

Lake Management Planning

Since 2002, Center staff members have provided structure and support to help Wisconsin counties and lake stewards enhance their understandings of local lakes, and take steps to protect and improve them.

2016 saw the beginning of a multi-year collaborative project with Oconto County, citizen groups, UW-Extension, and WDNR. Comprehensive lake management plans for all 60 lakes in the county with public access will be developed or updated. The process starts with a two-year baseline lake study measuring water quality, shoreland health, aquatic plant communities, watershed land use and community opinions. The study results are then used during a series of public meetings to aid in the development of the lake management plan. Lake studies began in Summer 2016 on the first nine lakes. Studies on six more lakes began in Summer 2017, and additional lakes will be added to the project each year. The lake management plans will be used as guides to inform management decisions based on current data and community goals.

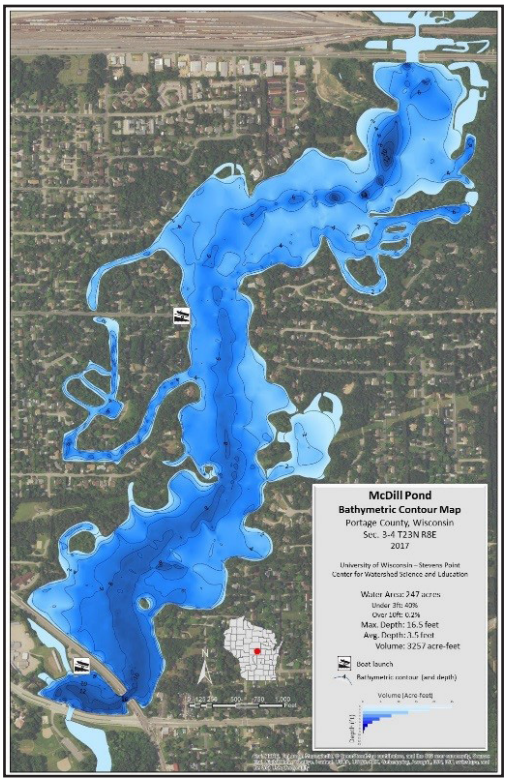
"Oconto County depends on tourism, and before 2015 had no real information on the state of our lakes," said Ken Dolata, Oconto County Conservationist. "This study will give us baseline data of our lakes, and also educate personnel and County Board Supervisors as to how the public values these lakes– helping steer us in the proper direction in our planning. The process so far has been instrumental in connecting lake property owners with the Land Conservation Division, and has already generated great interest in restoring and protecting the lakes."

A similar collaborative project involving Columbia County, the City of Portage and WDNR began in 2017. A lake management plan is being developed for the prized Silver Lake. A two-year lake study will be followed by a series of public meetings where local citizens will create a vision for Silver Lake and identify the steps needed to realize their goals.

The Center now has the ability to create bathymetric maps for lakes, a particularly useful tool for modeling lake phosphorus or oxygen content, or when chemical application or dredging is being considered as part of a lake management plan.

A highlight of the Oconto County Lakes Project is the introduction of "Meet Your Scientist" events, where lake stewards can meet with professionals to exchange information about the lakes and build capacity for future project efforts.

Approximately 60 lake management plans will be developed or updated by citizens, with technical guidance provided by professionals and scientists in the Oconto County Lakes Project.



Bathymetric maps can prove useful for lake management purposes. The 247-acre McDill Pond was mapped in spring 2017, following a year- long drawdown of the lake to compact sediments and control Eurasian water-milfoil.

Recognitions of Excellence

University Scholar Award

George Kraft, Professor and Director of the Center, was the recipient of the University Scholar Award in 2017. Outstanding faculty and staff members were recognized by the University of Wisconsin-Stevens Point for their work during the 2016-2017 academic year.

Byron Shaw Scholarship

Andrew Wick, undergraduate intern with the WEAL, received the Byron Shaw Water Resources Scholarship in 2017. "[The Center] taught me so much about research techniques and water research," said Wick, "This experience will help me to think critically in future jobs."

Saying Farewell

Retirees this year included Dave Mechenich and Lynn Rasmussen. We also said farewell to our metals chemist, Eric Frank. They will be missed!

Dave Mechenich

Lynn Rasmussen

Eric Frank

New Faces in the Center

The Center welcomes Juli Bowling, Mike Mechenich and Kari Plautz to the team! Juli Bowling is our new metals chemist, Mike Mechenich joins us as our data manager, and Kari Plautz was hired as a program assistant.

Juli Bowling

Mike Mechenich

Kari Plautz

Pointers Going Forward

Congratulations to all FIVE of our graduating interns who obtained employment immediately upon graduating!

(Turn the page to learn more about student-centered excellence within the Center.)

Contributing to Student Success

Students leave UWSP with resumes that highlight their experience with real-world problems.

The Center hires students and provides them with experience and employment in the water resources field. The Center employed undergraduate students to work side-by-side with staff and community members on a variety of projects. This past year, student staff were involved in field work, laboratory duties, research projects and presentations, and data assessment.

Center and WEAL staff also engages with students in a number of UWSP courses, such as Advanced Techniques for Environmental Analysis (Water 492/692) to promote a scientific assessment of polluted environments using state-of-the-art methods and instrumentation. In addition, Center/WEAL staff offers laboratory tours and analyses for a number of classes taught in fisheries, water resources, soils, waste management, and chemistry.

The WEAL provided 20 students with paid internships last year. Students receive training and supervision from professional environmental chemists in a WDNR-certified lab.

Gaining Experience

WEAL intern Robby Abrahamian had the opportunity to assist with the Center's nitrate screening booth at this year's Midwest Renewable Energy Fair in Custer, Wisconsin. Attendees could bring a sample of their well-water and student interns could analyze them for nitrate on the spot.

Conducting Research

Amy Nitka and Paul McGinley received a $28,773 UW System grant from the Groundwater Research Advisory Council (GRAC) to investigate the impact of nitrate-nitrogen contamination on uranium concentrations in Wisconsin groundwater. Through this project, undergraduate students Andrew Wick and Nick Salewski gained valuable experience collecting soil and water samples and preparing them for analysis.

Building Connections

The Center hired two undergraduate students for the Chippewa County Groundwater Quality Inventory Project. Students Brewster Johnson and Sean Piette had the opportunity to assist with water sampling, database management and spatial analysis. “This internship has already begun to help shape my unique career path ," said Johnson. "And I made some life-long connections while doing so.”

Making an Impact

Undergraduate student Cayla Cavey is one of several students employed by the Center who are involved in the USGS Great Lake Restoration Initiative (GLRI) Project. Students are trained to process runoff samples the lab receives from the USGS, under the guidance of professional staff who directly oversee their work.

"My favorite part of this job is definitely the greater picture, knowing that the work we do here at the lab has eventual impacts on the Great Lakes region or just water quality in general," said Cavey.

Communications

In the past year, Center staff worked to update and maintain the Center for Watershed Science and Education website. The site has 13,400+ visitors each month with over 29,000 unique page views. Currently, there are over 70 reports available for download and viewing. The Center's social media presence has grown as well, with nearly 350 page likes on Facebook. Center staff also manage the Portage County Lakes Facebook page and email list-serve, helping the Center to connect with hundreds of citizens and provide updates on lake planning, volunteer opportunities, events and other relevant lake and river information.

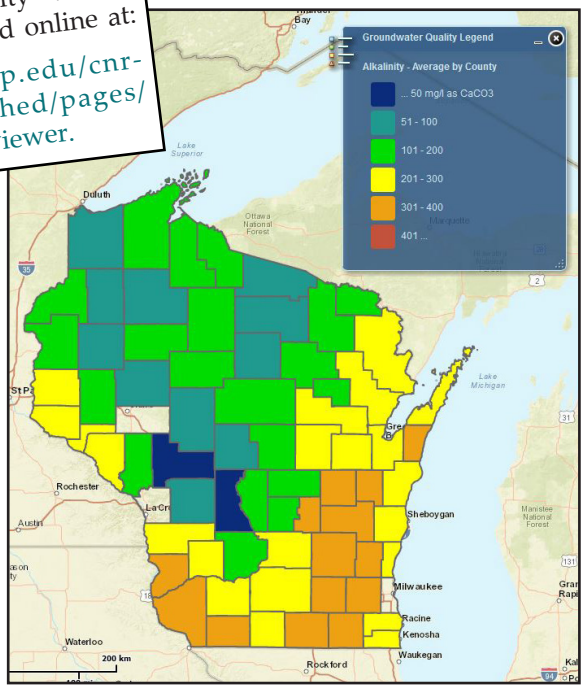
Over twenty scientific papers, posters, and reports were prepared by staff members, who also delivered more than 100 presentations for various groups, meetings, and conferences. George Kraft and Kevin Masarik presented at the International Groundwater Conference in Burlington, California.

The Wisconsin Well Water Quality Viewer

The Wisconsin Well Water Quality Viewer is the most-often accessed resource on the Center's website, with over 11,000 visitors this past year. The Viewer is used by citizens seeking information about local groundwater quality and by professionals or local leaders looking for data related to their specific communities or stakeholders. Maps and tables generated from the viewer are used by state agencies (e.g. Wisconsin Department of Health Services, Wisconsin Department of Natural Resources), county governments and other organizations.

Recently the Viewer was updated to include more recent data through 2016. In addition, data from the La Crosse County Health Department and the Eau Claire County Health Department have been integrated, providing more detailed coverage across the state.

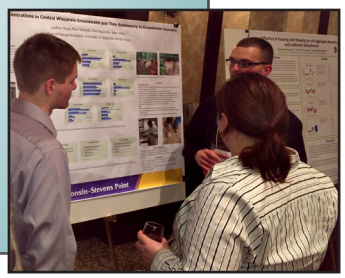
The Wisconsin Well Water Quality Viewer can be found online at: www.uwsp.edu/cnr-ap/watershed/pages/wellwaterviewer.



Student Research and Scholarship

Many students have opportunities to work with Center/WEAL staff advisors to conduct research for presentations for events such as the CNR Research Symposium, American Water Resources Association (AWRA) Conference, and Wisconsin Lakes Convention. These opportunities help students improve their public speaking and research skills while receiving helpful feedback from judges, faculty and professionals in their field.

- Andrew Wick and Nick Salewski - *"Uranium Concentrations in Central Wisconsin Groundwater and Their Relationship to Groundwater Chemistry"* (Presented at the 2017 CNR Research Symposium and AWRA Conference)
- Brewster Johnson and Sean Piette - *"Using Nitrate Source Analysis to Understand Groundwater Quality in Chippewa County"* (Co-authored poster presented at AWRA)



Scientific Papers and Reports

Amato M.S., Shaw B.R., Olson E., Turyk N., Genskow K., Moore C.F. 2016. **The Challenge of Motivated Cognition in Promoting Lake Health Among Shoreline Property Owners: Biased Estimation of Personal Environmental Impact.** Lake Reserve Manage. 32:386–391.

Bradbury, K.R., G.J. Kraft, J. Drought, M.N. Fienen, R.J. Hunt, D.J. Hart. 2017. **Groundwater Quantity Fundamentals in Wisconsin's Central Sands Region.** Prepared for the Wisconsin Food, Land, and Water Project Groundwater Quantity Working Group of the Wisconsin Land and Water Initiative.

Brodzeller, J. and P. McGinley. 2016. **A CE-QUAL-W2 Model for Dissolved Oxygen in the Big Eau Pleine Reservoir, Wisconsin to Understand and Manage Winter Anoxia.** Report from the Center for Watershed Science and Education, UW-Stevens Point. 59 pp.

Haucke J., Clancy K., Kraft G.J. 2016. **Tools to Estimate Groundwater Levels in the Presence of Changes of Precipitation and Pumping.** Journal of Water Resource and Protection, 8 (12): 1053-1077, http://www.scirp.org/journal/PaperInformation.aspx?PaperID=71722

Kraft, G.J., D.J. Mechenich, and J. Haucke. 2016. **Information Support for Groundwater Management in the Wisconsin Central Sands, 2013-2015.** Report to the Wisconsin Department of Natural Resources. Center for Watershed Science and Education, University of Wisconsin – Stevens Point / Extension. http://www.uwsp.edu/cnr-ap/watershed/Documents/kraft_cs_2013_2015.pdf

Masarik, K.C. (2016) **Design of a Field-Scale Approach for Evaluating Nitrogen Management Practices Impacts to Groundwater.** Report in partial fulfillment of DNR Project #15_BMP_01.

McGinley, P.M., K.C. Masarik, M.B. Gotkowitz, D.J. Mechenich. 2016. **Impact of Anthropogenic Geochemical Change and Aquifer Geology on Groundwater Phosphorus Concentrations**. Applied Geochemistry 72:1-9, http://dx.doi.org/10.1016/j.apgeochem.2016.05.020.

McGinley, P.M., W.M. DeVita and A.L. Nitka. 2016. **Evaluating Chemical Tracers in Suburban Groundwater as Indicators of Nitrate-Nitrogen Sources.** Final Report to the Wisconsin Department of Natural Resources. 48 pp.

Nocco, M., C. Kucharik, G.J. Kraft, and S. Loheide. In review. **Drivers of Recharge from Irrigated Cropping Systems in the Wisconsin Central Sands.** Submitted to Vadose Zone Journal.

Turyk, Nancy. 2017. **Watershed Plan for Fish Creek, Town of Gibraltar, Door County.** Final plan to town of Gibraltar and WDNR.

Turyk, Nancy. 2016. **Lake Wausau Shoreland Survey, Marathon County, WI.** Report to Lake Wausau and WDNR.

Turyk, N. and R. Haney. 2016. **Lake Management Plans for 13 Lakes in Waushara County.** Final plans to Waushara County and the WDNR.

Posters and Presentations for Professional Scientific Conferences

Arnold, C. and P. McGinley. 2017. **The "Other Side" of Wetland Treatment: Phosphorus Storage.** Poster presented at the Science Conference of the Wisconsin Wetlands Association.

Kraft, G.J. and D.J. Mechenich. 2016. **Irrigation Impacts in the Northern Great Lake States.** Invited presentation at the Toward Sustainable Groundwater in Agriculture - and International Conference Linking Science and Policy. University of California Davis and Water Education Foundation. San Francisco, CA.

Kraft, George. Sep. 2016. **Impact of Groundwater Extraction on Groundwater and Surface Water Hydrology. HalfMoon Education Seminar.** Madison, WI.

Masarik, Kevin. June 28-30, 2016. **Investigating Spatial and Temporal Variability in Wisconsin's Groundwater.** Oral Presentation at the International Groundwater Conference: Toward Sustainable Groundwater in Agriculture. Burlingham, CA.

Masarik, Kevin. May 23-26, 2017. **What Wisconsin has Learned from Over 25 Years of Well Water Testing and Outreach Education.** Private Well Water Conference. Champaign, IL.

Masarik, K., A. Nitka, D. Masterpole, B. Johnson, S. Piette. March 9-10, 2017. **An Overview of the 2016 Chippewa County Groundwater Quality Inventory.** Published abstract and poster presentation at the American Water Resources Association Wisconsin Section Annual Meeting. Elkhart Lake, WI.

Nitka, A., K. Masarik, D. Masterpole, B. Johnson, S. Piette. March 9-10, 2017. **Using Nitrate Source Analysis to Understand Groundwater Quality in Chippewa County.** Published abstract and poster presentation at the American Water Resources Association Wisconsin Section Annual Meeting. Elkhart Lake, WI.

Salewski, N., A. Wick, A. Nitka, P. McGinley. March 9-10, 2017. **Uranium Concentrations in Central Wisconsin Groundwater and Their Relationship to Groundwater Chemistry.** Published abstract and poster presentation at the American Water Resources Association Wisconsin Section Annual Meeting. Elkhart Lake, WI.

Notes

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