

Water Resources Center

UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

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The Water Resources Center is affiliated with the College of Food, Agricultural and Natural Resource Sciences and University of Minnesota Extension.

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WRC awards three grants in 2011 competition

The Water Resources Center awarded funding to three research projects in 2011. The projects study a variety of pollutants in water bodies, including fecal indicators in sand and sediment, arsenic sources in glacial aquifers and in well water, and sulfates in the sediment of the St. Louis River Estuary.

Stratigraphic distribution and mineralogical sources of arsenic to Minnesota glacial aquifers

This research identifies the stratigraphic and mineralogical sources of arsenic in groundwater in west-central and south-central Minnesota. Principal Investigator (PI) Brandy Toner (SWC, UM) and co-PI Ed Nater (SWC, UM) intend to generate new geochemical information on the speciation of arsenic in glacial deposits using X-ray absorption spectroscopy and sequential extractions. This information will be integrated with existing hydrogeology and stratigraphy databases to determine the distribution

of arsenic species in geologic formations. Results will be reported to Minnesota state agencies with drinking water quality mandates. Toner and Nater believe that research outcomes are sorely needed and have implications beyond the health of Minnesotans, as arsenic-contaminated water impacts communities around the world.



Photo credit: Brandy Toner

Graduate student Sarah Nicolas subsamples archived cores for arsenic research at the Department of Natural Resources facility in Hibbing, Minnesota.

Grant awards, continued on page 2

Water Sustainability Framework delivers a comprehensive plan for Minnesota's water future

Although Minnesota is known for its abundance of water, perhaps the state hasn't been diligent enough in managing it. Deborah Swackhamer, co-director of the University of Minnesota's Water Resources Center (WRC), compares Minnesota's current water management strategy to managing a checking account—without knowing your balance.

Now, Swackhamer hopes that will change. After Minnesotans passed a constitutional amendment dedicating a percentage of sales tax to fund the environment for 25 years, Minnesota's Legislature asked the WRC to create a comprehensive plan for making water-related investments toward the goal of sustainability.

As project leader of the Minnesota Wa-

ter Sustainability Framework, Swackhamer oversaw eight technical work teams representing a range of expertise, a governing council, a recommendation-reviewing synthesis team and a citizen stakeholder advisory committee. The resulting 150-page report addresses a range of water-related issues including drinking water quality, agricultural and industrial water use, ecological needs, invasive species and Minnesota's water infrastructure system—all within the context of changing climate, demographics and land use and development.

In short, the Framework, delivered to the Legislature January 15, 2011, identifies the most pressing issues that must be addressed to achieve sustainable water use, offers strategies for what should be done, and provides recommendations for how to meet these challenges. Swackhamer hopes to see the Legislature and Executive agencies take action on some of the essential recommendations this session, including: beginning studies needed to determine our water balance, and revise water withdrawal permitting processes; require

Framework delivery, continued on page 5



Simon, Sam and I loaded the van with water sampling equipment and we anticipated a long afternoon of testing Minneapolis lakes and rivers for their first science fair project. The cold November winds were blowing, so we bundled up, and Simon's mom provided a thermos of hot cocoa. Over the next five hours we collected samples and measurements at five lakes and at the Minnesota River at Fort Snelling State Park. I was thrilled to help them with their project as a way to share my own passion for clean water and pass on lessons about human impact on our water resources.

This issue of the *Minnegram* highlights the work of individuals and groups whose projects focus on engaging others in the environment. Carolyn Sampson does this through her work as an Environmental Manager for General Mills, an extension of her own personal conservation interest. Sampson was one of many contributors to the Minnesota Water Sustainability Framework, which you can also read about in this issue. The Framework is a forward-looking document that invites Minnesotans to work on water resources issues now, to benefit future generations.

We celebrate the many years that Heinz Stefan has devoted to researching and teaching about water resources at the University of Minnesota's St. Anthony Falls Laboratory. Please consider attending the international symposium honoring Heinz on May 12, 2011.

The WRC has funded three research projects, each important to human health as well as the aquatic environment. These researchers study the water environment so that we can develop better policies and improve management of our water resources. Likewise, we highlight one of our key training programs, the Wetland Delineator Certification program.

Back to Simon and Sam. They completed their research, report, and poster without much further help from me. They placed 3rd at the science fair, an honor well beyond their hopes as they began their assignment. I wonder if I didn't learn more than they did in this project. I have a clearer appreciation of my civic responsibility to interact on a regular basis with friends and neighbors to protect our environment. Engagement can be a one-minute conversation about where the muddy water in a puddle goes, to working on a science fair project, and more. My secret hope is that Simon will choose to sample water in Lake Vermillion near his family's cabin in July for this year's project and include me. Since he now knows the protocol, perhaps he will hire me to paddle the canoe and pour the lemonade!

WRC co-director

Arsenic concentrations in domestic well water throughout large regions of Minnesota exceed the public drinking water standard of 10 $\mu\text{g}/\text{L}$ set by the U.S. EPA in 2001, following a review of evidence for increased risk of cancer with consumption of drinking water below $\mu\text{g}/\text{As}/\text{L}$. The scale of the problem is illustrated by the results of the Minnesota Arsenic Study. Fifty percent of the 869 domestic wells tested in west-central Minnesota had arsenic concentrations greater than 10 $\mu\text{g}/\text{L}$, which poses a serious and widespread public health concern. In response to these challenges, the Minnesota well code now requires that each of the estimated 8,000–12,000 new potable water supply wells be tested for arsenic. While these tests provide families with important information about drinking water quality, the information comes only after the well has been drilled. "While arsenic removal systems can be purchased by individuals, they are expensive, require maintenance and do not provide alarms for high arsenic concentrations or system failure. The intent of our research is to help Minnesotans to place their wells where the probability of safe water is greatest," said Toner.

Persistence of the fecal indicator *Bacteroides* in sand and sediment

Bacteroides is a commensal gut bacterium often used to determine levels of fecal contamination in recreational waters. PI Mike Sadowsky (SWC, UMD) and co-PI Randall Hicks (Biology, UMD) will measure the spatial distribution of human-specific *Bacteroides* and its persistence and growth in sand and sediment. Sadowsky and Hicks have three objectives for their research: determine the seasonal distribution of *Bacteroides* in sand and sediment on a beach with continuous sewage effluent inputs, examine effects of temperature and moisture on *Bacteroides* persistence in sand and sediment, and assess the degree of *Bacteroides* growth in sediment and its persistence relative to key bacterial pathogens and indicator organisms, namely, *E. coli* and *Enterococcus*. The broad goal of this research is to assess the validity of *Bacteroides* as a fecal indicator bacterium in Minnesota waters.

The role of sulfate reduction in sediment of the St. Louis River Estuary: Phase II

Nathan Johnson's (CE, UMD) objective is to determine if sulfate is the limiting factor in the production of methyl mercury in the sediments of the St. Louis River Estuary. Proposals to begin non-ferrous mining on the Mesabi iron range in the upper reaches of the St. Louis River watershed have drawn attention to a variety of environmental concerns including the potential mobilization of sulfate. The transformation of mercury to the toxic methyl mercury form is known to be integrally tied to sulfate reduction in many environments. Although substantial contributions of sulfate from mining-influenced tributaries have been observed, Johnson says little is known about the role sulfate plays in mercury-related processes downstream. The Estuary is a popular sport fishing destination with restrictions on fish consumption due to mercury levels in the fish. Johnson will employ physical and mathematical modeling of the biogeochemical processes influencing mercury in sediments. The results will help determine the influence of increased sulfate loads on methyl mercury production and accumulation in fish tissue in the St. Louis River Harbor.

General Mill's Carolyn Sampson views Water Framework's recommendations as simplifying water-related compliance for industry

by Nina Shepherd

Carolyn Sampson, an environmental manager for the Innovation, Technology and Quality Division at General Mills, was a member of the Minnesota Water Sustainability Framework project's synthesis team.

While Sampson was recruited for her technical expertise, the team has also benefitted from her personal interests. She's a dedicated conservationist and outdoorswoman, and has chaired and served as a long-time member of the Boundary Waters Wilderness Board.

Her employer's commitment to sustainability and environmental improvement is impressive, too.

Since 2006, General Mills has reduced its water usage rate by nine percent—nearly twice the company's five-percent goal.

And General Mills has set even more ambitious sustainability goals for the future. The company has pledged to reduce its water usage, energy usage and greenhouse gas emission rate by 20 percent by 2015, and to trim its solid waste generation rate by 50 percent by then.

An important part of Sampson's work at General Mills involves overseeing water-related compliance and regulatory requirements for the company's three main research and development facilities.

The largest facility, located near its corporate headquarters in Golden Valley, operates three wells and has an industrial waste discharge permit. Each year, the regulatory reporting portion of her work requires Sampson to submit multiple hard copies of reports or applications—all containing similar information—to multiple agencies, including the Metropolitan Council, Minnesota Department of Natural Resources, City of Golden Valley, and Minnesota Department of Health.

While Sampson sees great value in tracking

and reporting, she finds the current process is cumbersome and a little confounding.

"In business, productivity is everything," she says. "My time and that of others

could be much better spent solving technical problems—or better yet, creating and implementing new methods of sustainability."

Not only is the reporting process onerous, says Sampson, but there's currently no statewide, water-related database that allows companies to easily track trends, model performance, or plan for the future.

"It's a simple technological issue. The state lacks an integrated and accessible data manage-

ment system for water quantity and quality that allows for electronic reporting and permitting, as well as forecasting," she says.

As a solution, Sampson supports the Framework's recommendations for a Web-based water reporting and permitting database. Such a system would not only make it more efficient for industry to file reports, but could help businesses and communities plan for the future.

"Once you populate a database, it could be used for a variety of purposes, from running reports to tracking trends and characteristics," says Sampson. Electronic tracking of permitting and withdrawals would also help managers of natural resources line up water withdrawals with resources to better protect ecosystems, as well as Minnesota's long-term water budget.

Sampson believes that implementation of the recommendation will give clear signals to industry that the state encourages careful planning and sustainable practices. "Ambiguity is the toughest thing to plan for," she says. "The Framework's recommendations to create a comprehensive, Web-based system would result in regulatory stability and help industry better forecast and plan."



General Mills Environmental Manager Carolyn Sampson supports the Minnesota Water Framework's recommendations for a web-based water reporting and permitting database.

Legislative Update

As sessions begin, state, federal budget balancing news grim

It is too early to predict the final outcome of the FY2012 University budget. The UM has requested \$642.2M for each of the next two years, up from \$623.4M and \$591.1M in FY2010 and FY2011, respectively. The legislature has asked the UM to consider its response to a 15–20 percent cut. The Governor's proposed budget has \$635.6M per year for the UM for the next two years. These reductions include reduced funds to the agricultural and extension services, and thus may impact the WRC. The bottom line will not be determined until mid-May, and thus budget planning at the University includes a variety of scenarios.

The US Congress is in an unusual position, busy with both FY2011 and FY2012 budgets. The House passed a Continuing Resolution (CR) in early February that funds the government through the rest of the fiscal year and cuts approximately \$60B from this year's budget; however, this did not pass the Senate. To avoid a government shutdown, Congress and the President agreed to a CR to fund the government until March 18. The House CR with \$60B in cuts did *not* cut the Water Resources Research Institute (WRRI) program funds, hopefully indicating broad support for the program in Congress. The current CR does not touch the WRRI program; we remain optimistic that whatever bill funds the FY2011 budget will include funds for the WRRI program for the rest of the year. The bad news is that the President's FY2012 budget does not include funding for the WRRI program. This situation has occurred off-and-on over time, under both Republican and Democratic administrations, and Congress has always restored funding. We are disappointed that we are in a situation requiring Congressional action to restore funding. As an authorized program, WRRI is not an earmark, but we need to work hard to highlight our importance to our states to garner Congressional support. Although Congress is holding hearings on the various parts of the FY2012 budget, there will likely be little movement on passing a budget until the FY2011 budget is finalized. We continue working with Congressional leaders to reauthorize the Water Resources Research Act, which includes authorization of our appropriation.

Research *Revisited*

University research and instructional expertise marks the difference in WRC's Wetlands Delineator Certification Program

Knowing the difference between Canada goldenrod (*Solidago canadensis*) and Giant goldenrod (*Solidago gigantea*) can make the difference between a wetland and an upland. It's also a skill that can save companies and municipalities valuable time and critical resources.

But plant identification is one of only hundreds of skills offered by experts in the growing field of professional wetland delineation. Whether a project involves building hospitals or homes, assessing wetland easements or wetland monitoring, wetland delineators are increasingly called upon for their expertise in low-lying areas and bodies of water.

Now in its fifth training season and sixth year of certification, the Water Resources Center's Wetland Delineator Certification Program (WDCP) delivers cutting-edge training to environmental experts in private companies and municipal organizations. The program stands out for its instructional staff that includes the region's top wetland, soil and water experts and year-long access to expertise. Although not required by the State of Minnesota, wetland delineator certification adds credibility and customer confidence to a variety of wetland-related professions by formally recognizing the training and expertise that goes into wetland delineation.

"Wetland delineation is a growing and emerging field," says Dan Wheeler, a research fellow in the UM Department of Soil, Water, and Climate and WRC, and co-coordinator of the WDCP. "Because of the constant evolution in our understanding of wetlands, certified wetland delineators are taught how to apply this information to their wetland assessments. Participants in our program are assured regular updates on changes in wetland delineation via continuing education requirements."

WDCP boasts an award-winning team of faculty and staff, many of whom have contributed to such benchmark publications as the Minnesota Delineation Manual and

as substance, WDCP instructors aim to make learning fun, easy and memorable through hands-on training in the classroom and in the field.

"Our program stands out among the competition for its instructional base –our instructors are the very same experts the state turns to for help in drafting delineation standards and in conducting the most complicated delineations throughout the Upper Midwest," says Wheeler.

Upon completion of any WDCP courses, participants will be able to confidently assess if an area satisfies vegetation, soil, or hydrological requirements or indicators, understand the biological, chemical, and physical features at work in wetlands, and confidently and accurately determine the boundaries of wetlands.

WDCP's basic five-day training course, covering the fundamentals of wetland delineation, is offered at least two times each summer. For those seeking re-certification, new courses on a variety of industry-related subjects are added every year, and these count toward continuing education credits. WDCP courses are continually being evaluated by the participants themselves to ensure the program meets not just certification goals, but the needs of individuals in the field. For details, visit: www.mnwetlands.umn.edu.



Photo credit: Elizabeth Wells

Wetland delineation students learn how to profile soil. When profiling soil, students must describe soil colors, distinguish soil horizons, and differentiate among loamy, clay, and sandy textures.

Delineation Guidance Manual for Minnesota and Wisconsin, as well as to hundreds of local, state, and federally-sponsored wetland research projects and authoritative publications on plants, soils, and hydrology. WDCP instructors hail from a variety of university departments, as well as from the Minnesota Board of Water and Soil Resources and other agencies.

In addition to their academic accomplishments, WDCP instructors have worked shoulder-to-shoulder with industry and government professionals, including generous support from the Minnesota Board of Water and Soil Resources, and performed thousands of delineations and consulted on numerous high-profile enforcement cases. And because style can be as important



Photo credit: Elizabeth Wells

Students in the Wetland Delineation Hydric Soils class fan out to test soil for a variety of wetland soil indicators in a field near Detroit Lakes, Minnesota.

Heinz Stefan's legacy: building bridges across academic, engineering, and regulatory disciplines to protect the environment

Retiring UM civil engineering professor Heinz Stefan is an integral part of Saint Anthony Falls Laboratory (SAFL), much like the river that runs through it. "He's the grandfather of SAFL," says Ben Erickson, assistant scientist at the lab. Indeed, for many of the associate directors, researchers, and professors at the lab, Stefan has been advisor, teacher, or mentor. "Education is in my heart,"

Stefan says. He also co-advised several students in the Water Resources Science program, including Filiz Dadasser Celik, 2009 winner of the outstanding Ph.D. dissertation award from the Universities Council on Water Resources.

As a student in Germany considering his future vocation, Stefan focused on what he could observe, rather than choosing more abstract studies. "I'm attracted to things you can see, things you can think

about visually, and things that relate to people, to community, with everyday significance. To me, water is very concrete," says Stefan. After earning a civil engineering degree in Germany, Stefan concluded that he was more interested in water itself than in designing bridges. He earned a then-rare hydraulic engineering degree in France, before accepting a post-doctoral position from Dr. Lorenz Straub, the founder and director of SAFL. He spent the years 1963–1965 at SAFL before returning to Europe and

"working his heart out" at the Berlin Water Resources Institute as chief engineer and lecturer. In 1967, SAFL's director, Ed Silberman, offered him a faculty position at the lab. He has been there ever since.

When asked to define his success, Stefan points to SAFL's tackling environmental issues, breaking down barriers between



Photo credit: Bonnie Jean Mackey

About Stefan's impact on his work, current research associate William Herb says, "As I transitioned from a mechanical engineering background, Heinz taught me that to model natural systems, you need to pick your battles – choose the most important processes, develop simple models for them, and get your hands on as much field data as you can to verify that you made the right choices."

various disciplines, integrating water use and moving engineering projects forward, while at the same time protecting the aquatic environment. Stefan has seen firsthand how damaging engineering activity can be to the environment. He grew up on the Main River in Germany, one of the major tributaries of the Rhine. In his early twenties, when work began on the river to create a more navigable waterway for shipping from the North Sea to the Black Sea, Stefan worked summers on the project as an

engineering intern. "I could see the river being transformed into a canal, with the backwaters and wetlands eliminated, along with the habitat for birds and fish. The wildlife was suffering, and it touched me."

Gradually, he moved from integrating water conveyance and hydro-power into surrounding environments, to water quality. Controlling thermal pollution at Minnesota's coal and nuclear power plants was a major project for Stefan and other researchers at SAFL. Discharged warm water from these plants was potentially detrimental to fish and other animals; researchers determined how to safely discharge water back into the river with minimal impact on fish and other wildlife. "We succeeded quite well with thermal pollution at these sites, with no problems for decades," says Stefan. Currently, he is studying road salt: how much is used on Minnesota roads, when it is applied, and most importantly, where the salt eventually goes. Much washed-away salt goes first into our streams and lakes and then the groundwater. Over time, if road salt use lessens, the lakes could clean themselves. Stefan's concern is that the state's groundwater could be more permanently affected. Clearly, this is another public question that requires multiple entities talking to each other about environmental issues and solutions. Stefan hopes the SAFL's interdisciplinary programs will continue to set the example of how to solve problems. "We have become a very interdisciplinary outfit. I hope I had a little bit to do with that."

The civil engineering department will honor Stefan with an international symposium May 12, 2011, at SAFL. For more information, visit: www.safl.umn.edu/.

Framework delivery, continued from page 1

implementation of pollutant load reduction plans by all sources, including currently unregulated sources; address contaminants of emerging concern; integrate water and land planning at the watershed scale; and review environmental and energy policies

for consistency with sustainability principles.

"The Framework's recommendations offer Minnesotans a chance to lead the nation in long-term, forward-thinking management

of our water resources," says Swackhamer. "Even more importantly, implementation of the recommendations will assure the people of the state that our water resources will be here for generations to come."

Community News

Lakeside Stormwater Reduction Project partners **Valerie Brady** (WRS graduate faculty, NRRI, Minnesota Sea Grant), **Jesse Schomberg** (Minnesota Sea Grant), and **Karlynn Eckman** (WRC), presented a poster at the Minnesota Waters Conference, October 19–20, 2010 on preliminary results from the Duluth Knowledge, Attitude and Practices (KAP) study.

Karlynn Eckman (WRC) presented “Evaluating Outcomes of Water Resources Projects on Target Audiences,” at the metro-area Watershed Partners meeting, October 13, 2010, at the Capitol Region Watershed District. **Eckman** also presented “Lessons from Turtle Lake: Engaging Shoreland Property Owners in Native Buffers,” at the Midwest Fish and Wildlife Conference in Minneapolis, MN, December 13, 2010.

Emi Ito (WRS graduate faculty, Geology and Geophysics) participated in the Dead Sea Deep Drilling Project as a member of the principal investigators team in November and December 2010. She spent about a week each time on the drill rig mounted on a barge, as the scientist-in-charge during twelve-hour night shifts. The drilling project, some ten years in the making, is being conducted by investigators from Israel, the United States, Germany, Japan, Switzerland, and Norway. Steve Goldstein of Columbia University and **Ito** are co-PIs of the NSF proposal, which in part funds the drilling project.

John Gulliver (WRS faculty, CE) and **Julian Marshall** (CE) have developed a new Peace Corps Master’s International

Program for students concentrating in Environmental Engineering or Water Resources Engineering within the Department of Civil Engineering. The program has two components. Students will spend two consecutive semesters at the University of Minnesota prior to entering the Peace Corps. The curriculum covers environmental engineering and water resources engineering courses aimed at understanding and improving conditions globally, including in developing countries. Students will then spend two consecutive years in the Peace Corps. Upon returning to Minnesota, students will receive their Master’s International M.S. degree from the Department of Civil Engineering and the College of Science and Engineering.

Erika Rivers (2009 Conservation Biology Ph.D. graduate) was appointed Assistant Commissioner for Outreach and Community Service at the Minnesota Department of Natural Resources, February 2011. Previously, Rivers oversaw the Vermillion State Park master planning process and was project lead on the LCCMR-funded Native Shoreline Buffer Incentives project.

Deb Swackhamer (WRC-co-director) testified to the Minnesota House Environment and Energy Committee on January 5, 2011 and to a joint hearing of the Minnesota Senate Environment Committee and Agricultural Committee on February 8, 2011 on the Minnesota Water Sustainability Framework. She was a keynote speaker and presented the Framework to the League of Women Voters, Minnetonka chapter,

January 22, the annual Drainage and Wetland Conference, February 7, the annual meeting of the MPCA Water and Watersheds group, February 9, the MPCA Citizens Board February 22, the annual meeting of the Minnesota Association of Conservation Professionals February 25, the annual Erosion Control Conference, March 3. She also conducted briefings of the Framework with commissioners of MPCA, DNR, MDH, and MDA and with staff of most of the Minnesota Congressional delegation. **Swackhamer** attended and served as chair of the annual National Institutes of Water Resources (NIWR) Conference in Washington, D.C. February 13–16, 2011. She is the President of NIWR this year. **Swackhamer** attended the fourth of five meetings planned for reviewing the USGS NAWQA program for the National Research Council of the National Academy of Sciences in Washington, D.C. February 1–2, 2011.

The 4th Annual Minnesota Wetlands Conference, “Wetland Science: The Next Generation,” was held January 19, 2011, on the UM St. Paul campus. **Faye Sleeper**, co-director of the WRC welcomed over two hundred conference attendees. Speakers at the conference included state and federal agency employees, UM faculty, private consultants and a lawyer specializing in wetland-related legal implications. The conference was sponsored by the Minnesota Wetland Delineator Certification Program, MN Wetland Professionals Association, and the UM Water Resources Center.

Minnegram

Minnegram is sponsored by the University of Minnesota College of Food, Agricultural and Natural Resource Sciences, University of Minnesota Extension, the USGS-USDI National Institutes for Water Resources, and the Agricultural Experiment Station. It is published quarterly by the University of Minnesota Water Resources Center; all opinions expressed within are representative of the respective authors and do not necessarily reflect the views of the supporting entities.

Directors: Faye E. Sleeper, Deborah L. Swackhamer

Editor: Christine Hansen

Submissions: Minnegram welcomes articles, community news, news stories, photos, and other materials for publication.

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Eric Ahlstrom received his M.S. in November 2010. His thesis title was "Toward Setting Realistic Expectations for Agricultural Management Practices Based on Water Flow Paths and Lag Times." Ahlstrom was advised by **Paul Capel**.

Beth Bernhardt received her M.S. in December 2010. Her thesis title was "Validation of the MBT-CBT Paleotemperature Proxy: Effects of Environmental and Seasonal Variability in Soils and Lacustrine Sediments." Bernhardt was advised by **Josef Werne**.

Victoria Chraibi, a Fulbright Canada alumna, has received a 2010–2011 Fulbright Canada–RBC EcoLeadership grant. The program provides small grants to Fulbrighters who engage in environmental action in their host or home community. In close cooperation with the Great Lakes Aquarium and the DNR MinnAqua program, the grant will be used to help fund a workshop series to train local K–12 teachers in current water issues. In each of the eight workshops, teachers will be introduced to a topic, meet a local researcher, learn about their current research in the Great Lakes region, discuss how to incorporate the topic and environmental stewardship into their class curriculum, and receive free course materials and teaching kits. The workshop series runs February through August 2011.

Yi-Wen Chiu received her Ph.D. in October 2010. Her dissertation was titled: "Assessing Future Water Availability and Water Use Impacts in Minnesota Using a Geospatial System Dynamic Model." Chiu was advised by **Sangwon Suh** and **John Nieber**.

Allison Gamble received her Ph.D. in October 2010. Her dissertation was titled "Energy Flow and Ecological Connections in the Nearshore and Offshore Areas of Lake Superior." Gamble was advised by **Thomas Hrabik**.

Ajay Jones received his M.S. in September 2010. His thesis was titled "Effects of Repeated Early Season Herbicide Treatments of Curlyleaf Pondweed on Native Macrophyte Assemblages in Minnesota Lakes." Jones was advised by **Raymond Newman**.

Megan Kelly received her M.S. in December 2010. Her thesis title was: "Direct and

Indirect Photolysis of Two Phytoestrogens, Genistein and Daidzein." Kelly was advised by **William Arnold**.

Paul Peterson received his M.S. in December 2010. His thesis title was "Using Urban Forestry Practices to Reduce Stormwater Runoff." His advisors were **Ken Brooks** and **Bruce Wilson**.

Elaine Ruzycki received her M.S. in December 2010. Her thesis title was "Estimating Sediment, Nutrient, and Mercury Loads from Four Western Lake Superior Watersheds Using Continuous In-stream Turbidity Monitoring." Ruzycki was advised by **Richard Axler** and **George Host**.

Bryan Tolcser received his M.S. in December 2010. His thesis was titled "Remote Mapping and Classification of Wetlands Using Decision Trees." Tolcser was advised by **Joe Knight** and **Marvin Bauer**.

Tsz Ki Martin Tsui received his Ph.D. in December 2010. His dissertation title was "Mercury Bioaccumulation and Methylation in Stream Ecosystems." Tsui was advised by **Jacques Finlay**.

Jacqueline Welch presented "Comparing Planktonic Bacterial Communities in Ship Ballast Water and the Duluth-Superior Harbor," at the American Society of Limnology & Oceanography (ASLO) Aquatic Sciences Meeting, San Juan, Puerto Rico, February 13–18, 2011. Welch is advised by **Randall Hicks**.

Melissa Wilson presented "Aerially Seeding Winter Rye Into Standing Corn in Minnesota: Successes and Failures," at the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (ASA-CSSA-SSA) International Meetings, Long Beach, CA, October 31–November 3, 2010. Wilson is advised by **John Baker** and **Deborah Allen**.

Martijn Woltering presented "Vertical and Temporal Variability of *Crenarchaeota* in Lake Superior and Implications for the Application of the TEX86 Temperature Proxy," at the American Geophysical Union Fall Meeting, in San Francisco, CA, December 13–17, 2010. Woltering is advised by **Josef Werne**.

May 6, 2011

Water and Agriculture in the 21st Century

*North Star Ballroom
St. Paul Student Center*

The "Solution-Driven Science" symposia highlight topics that are relevant to everyone's future. The symposia are supported by and reflect the strategic initiatives of the College of Food, Agricultural and Natural Resource Sciences. For information call: 612-625-7061

May 12, 2011

The Future of Environmental Hydraulics: A symposium to honor the career of Heinz G. Stefan

St. Anthony Falls Laboratory

International scholars in environmental hydraulics will present their research in the field and its relationship to Stefan's research. For more information, visit: <http://www.safl.umn.edu/>.

May 30–June 3, 2011

IAGLR 54th Conference on Great Lakes Research

Duluth, MN

Hosted by the University of Minnesota Duluth. For more information, visit: www.iaglr.org/conference/.

October 18-19, 2011

Minnesota Water Resources Conference

RiverCentre, Saint Paul, MN

The Minnesota Water Resources Conference presents innovative and practical water resource engineering solutions, management techniques and current research about Minnesota's water resources. **Please note that abstracts are due by April 15, 2011. Instructions and a link to the submission page are available at the WRC website: wrc.umn.edu.**

Publications & Resources

The Proceedings of the XV International Symposium on Chironomidae i. ISBN # 978-0-615-41254-2 October, 2010 385 pp.

Symposium proceeding consists of thirty-six papers presented during the XV International Symposium on Chironomidae at the University of Minnesota, 2003. To purchase: shop-secure.extension.umn.edu/PublicationDetail.aspx?ID=2057

Toccalino, Patricia L. and Hopple, Jessica A., 2011, *Quality of Water from Public-Supply Wells in the United States, 1993-2007, Overview of Major Findings* U. S. G. S. Circular 1346, 58 p. In this study, chemical water-quality conditions were assessed in source groundwater from 932 public-supply wells and in source and finished water from a subset of 94 wells.

Minnesota Water Sustainability Framework, a plan for clean, abundant water for today and generations to come, requested by and delivered to the Minnesota State Legislature, January 15, 2011. Deborah Swackhamer, project lead. Find it at: wrc.umn.edu

Garcia-Reyero, N., C.M. Lavelle, B.L. Escalon, D.

Martinovi, K.J. Kroll, P.W. Sorensen, and N.D. Denslow, N.D. 2011. *Behavioral and genomic impacts of a wastewater effluent on the fathead minnow*. Aquatic Toxicology 101: 38-48.

Lavelle, C.A. and P.W. Sorensen. 2011. *Behavioral responses of adult male and female fathead minnows to a model estrogenic effluent and its effects on exposure regime and reproductive success*. Aquatic Toxicology 101: 521-528.

Sabo, J.L., J.C. Finlay, T. Kennedy, and D.M. Post. 2010. *The Role of Discharge Variation in Scaling of Drainage Area and Food Chain Length in Rivers*. Science 330:965-967 DOI: 10.1126/science.1196005

The 2011 National Institutes for Water Resources Executive Summary is now available. For more information, visit NIWR's new website at <http://niwr.net/>.

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