


WRC awards four grants in 2007 competition



The Water Resources Center is happy to announce the selection of four research projects for funding in the 2007 WRC competitive grant program. The projects include tracking triclosan in Mississippi River sediment, a study on the role of local stakeholders in water resource management, the influence of drainage on carbon cycling in agricultural areas, and using fermentation for contaminant remediation. Funding is provided by the national Water Resources Research Institute program of the USDI-USGS and the WRC.

Triclosan and triclosan—derived dioxins in the Mississippi River Sediment

Triclosan is a common antimicrobial used in liquid hand soaps and similar products. Due to the popularity of these products, it is expected that triclosan is prevalent in wastewater treatment

effluent released into the environment. The chemical processes undergone by this triclosan during wastewater treatment and subsequent release are of significant importance, as they may result in increased toxicity of the compound in natural waters.

Previous research conducted by Kris McNeill (Chemistry) and Bill Arnold (Civil Engineering) has shown that sunlight transforms triclosan into a member of the dioxin family. When triclosan is chlorinated in wastewater treatment facilities and then released into sunlit waters, it may form more toxic, highly chlorinated dioxins. In this project, the team hopes to discover, by analysis of sediment cores taken down river from the St. Paul wastewater treatment facility, whether wastewater treatment practices contribute significantly to the formation of toxic triclosan-specific dioxins.



Photo by Brent Datzell

Experimental drainage field plot and instrumentation at the Southern Research and Outreach Center, Waseca. Experimental drainage plots will be set up at this site to study cycling of carbon in agricultural systems. For more about this project, turn to page 3.

The results of this study will allow for a more comprehensive analysis of the effects of triclosan in the environment.

The role of local stakeholders in water resources management: characteriza-

Grants, continued on page 3

In this Issue

- 2 Director's Desk
- 3 Sterner to NSF
- 4 LiDAR
- 5 Great Lakes Research
- 6 Community News
- 7 Upcoming Events

WRC welcomes new Co-Director from MPCA



Faye Sleeper was named the new WRC Co-Director in April of 2007.

Faye Sleeper joins the Water Resources Center staff with 17 years experience in water quality programs at the Minnesota Pollution Control Agency (MPCA). For the last 8 years, she managed the MPCA's watershed program, which includes non-point source activities and impaired waters activities. The watershed programs partner with other governmental

organizations at the federal, state and local levels, and with academic institutions, advocacy groups and local partners by providing financial and technical assistance. The impaired waters program developed into one of the MPCA's fastest growing and highest priority programs during the last 6 years.

"Faye's extensive experience with watershed programs will improve the WRC's ability to respond to research and education needs concerning impaired waters," said Jim Anderson, WRC Co-Director.

Faye's environmental career was preceded by a 13-year career in social services, working with several adult and adolescent populations.

Around the State

Clean Water Legacy update

by Faye Sleeper, WRC Co-Director

The 2007 State Legislature passed two years of funding to continue implementation of the Clean Water Legacy Act (CWLA), passed in the 2006 legislative session. The funding is provided to five state agencies to administer, with the majority of funds being passed through to local implementers. The package fully funds the monitoring and assessment activities and total maximum daily load studies (TMDL) as envisioned by the G-16 stakeholder group, who crafted the CWLA and developed its initial funding platform. This year's legislature allocated approximately \$14.9 million for monitoring and assessment, \$20.6 million for TMDL development, and \$18.5 million for non-point source protection and restoration. Point-source restoration activities will likely be included in a bonding bill.

The funds for monitoring and assessment and TMDLs are administered by the Minnesota Pollution Control Agency (MPCA) and Minnesota Department of Natural Resources (DNR). The non-point restoration funds are administered by four agencies. The Board of Water and Soil Resources administers the majority of the funds through its existing restoration programs as well as a small portion for reporting and evaluation. The Minnesota Department of Agriculture and the Public Facilities Authority received the remaining non-point source restoration funds, which will be passed through local units of government for existing activities.

Permanent funding for CWLA programs was included in discussion about dedicated funding through a constitutional amendment. However, the constitutional amendment and other forms of permanent funding were not attained this year.

The CWLA, as passed in 2006, included the establishment of the Clean Water Council (CWC). The CWC has been meeting monthly since March 2007 and has focused on understanding the issues and the work that lie ahead of them.

From the Director's Desk

As I write, the fire crews are working to contain the fire in the Boundary Waters Canoe Area. Many of us in natural resources and environmental work have mixed emotions, as we know that fire is important to the regeneration of forests, yet there are losses of cabins and facilities that impact people's livelihoods and hold many memories.



My first month at the Water Resources Center has been a bit like a particular boundary waters experience that I expect many of you have also had.

I have entered a lake that I have paddled many times, yet I had always crossed the lake from the other direction. This time I have entered from the portage that was always my "take out" point, and now I traverse the lake in the opposite direction. I know that the water body and landforms are basically the same, yet they seem very different because I have a fresh, new vantage point.

Likewise, joining the Water Resources Center after working on water quality issues for over 17 years at the Minnesota Pollution Control Agency has given me a fresh perspective. We work on many of the same issues; we just approach them from a different vantage point. People and organizations benefit from new perspectives, so I am excited to have this opportunity.

Most of us in water resources tracked the funding for Clean Water Legacy this year, recognizing that we are seeing a new interest in protecting and restoring Minnesota's water resources. The legislature passed a bill that adds significant funds for Clean Water Legacy for the next two years (see article to left), yet as of the date this is written, permanent funding has not yet been secured. We are still waiting to see how the constitutional amendment for permanent funding fares. Many of you watched other bills that may impact both policy and funding for other water resource issues. While we want to breathe a sigh of relief as the end of session draws near, we need to stay vigilant of Congress' work on the federal budget and its impact on water resources. And work will begin soon on next year's state legislative session.

In the midst of this, it is important to take time to renew oneself in between the busy times. Over the summer for many of you this may include enjoying the water resources we work so hard to protect, such as sitting in a boat or on a dock with a fishing rod in your hands, swimming with your children or grandchildren, paddling and portaging in the Boundary Waters Canoe Area, or avoiding the water hazard on a golf course. Meanwhile, I will use the summer to learn to navigate familiar waters from a new direction.

A handwritten signature in cursive script that reads "Faye E. Sleeper".

Faye Sleeper, WRC Co-Director

In the next couple of months they will identify their focus for the next year. The University of Minnesota is represented by Deborah Swackhamer, Interim Director of the Institute on the Environment.

The Water Resources Center continues to work with the various state agencies through participation in advisory committees, research on different aspects of impaired waters, and through its edu-

cation and outreach activities.

For more information about the CWLA and its programs, visit www.leg.state.mn.us/leg/legis.asp and type "Clean Water Legacy Act" in the "Search Legislature" bar at the top right-hand corner of your screen.

WRS faculty accepts 2-year term as NSF director

In Washington D.C., the National Science Foundation (NSF) Directorate for Biological Sciences has appointed Water Resources Science faculty member Dr. Robert Sterner as its new director of the Division of Environmental Biology for a two-year term. Sterner is currently a professor in the University's Department of

Ecology, Evolution and Behavior.

"We are extremely pleased to welcome Bob Sterner," said Dr. James Collins, NSF assistant director for biological sciences. "His accomplishments and long-standing interest in environmental biology and evolutionary and ecological processes will serve NSF, the Biological Sciences Directorate, and the Division of Environmental Biology well."

Sterner is an ecologist and limnologist. His research involves studies of ecological stoichiometry: understanding the biological and chemical links among elements in ecosystems. By considering the processes that result in the patterns of elements in nature, ecological stoichiometry demonstrates how this chemical variation influences the distribution, abundance and interactions of species.

Sterner has served on the board of the American Society of Limnology and Oceanography and is chair of the 2008 Gordon Conference on Metabolic Ecology. He is currently an associate editor of the journal *Ecology*. A widely-published scientist, Sterner has authored more than 60 peer-reviewed articles and co-authored *Ecological Stoichiometry: The Biology of Elements from Molecules to the*

Biosphere. At the University of Minnesota he has taught courses in aquatic biology and general biology.

Previous academic and professional positions include appointments as a faculty member at the University of Texas at Arlington, and postdoctoral research at the Max Planck Institute in Germany. He received his doctorate in ecology from the University of Minnesota and a bachelor's degree in biology from the University of Illinois.

NSF's Division of Environmental Biology supports basic research and education in ecology and evolutionary biology in such areas as biodiversity, molecular genetic and genomic evolution, population dynamics, ecosystem processes, conservation biology, restoration ecology and the ecological effects of global climate change. Among its programs are those on long-term ecological research, the ecology of infectious diseases, and assembling the tree of life.

Sterner's appointment will take him to Washington D.C.; he will not be teaching during this time. He will return throughout his term to check on his research.

Adapted from NSF press release, May 31, 2007



Photo by Tim Rummelhoff

Sterner has been a faculty member at the University of Minnesota since 1994, and was a student here from 1980–86.

Grants, continued from page 1

tion and diffusion of Minnesota Lake Improvement Districts

More than ever before, Minnesota waters are being subjected to human development, recreation, and pollution. According to the Minnesota Pollution Control Agency, there are 1013 impaired lakes, a number that has increased by nearly 100 since 2004. Despite advances in water policy, Minnesota lakes are more contaminated than ever before.

Dennis Becker (Forest Resources) is leading a project to assess the role of stakeholder-driven Lake Improvement Districts (LIDs) in Minnesota water resource management. In doing so, Becker hopes to answer such questions as "How do LIDs contribute to the enhancement of water resources in the State of Minnesota?" and "How can LIDs make local citizens accountable for solutions to local water quality problems," and "How can LIDs contribute to statewide management objectives?"

The unveiling of specific LID accomplishments, along with the perspective of local, county and state participants regarding the program, may aid state lawmakers in enhancing the means for citizens to tackle issues of impaired water quality in their own backyards.

The influence of drainage on biogeochemical cycling of carbon in agricultural ecosystems

It is well known that agricultural land use is an important source of sediment and nutrient loading to local streams and rivers. A constituent of such loading, dissolved organic matter (DOM), can provide crucial information about local aquatic ecosystems, water quality and nutrient transport, and regional/global biogeochemical cycles. However, the specific dynamics of DOM transport in such landscapes is not well understood.

Jennifer King (Soil, Water, and Climate), Brent Dalzell (Large Lakes Obser-

vatory), Jaques Finlay (Ecology, Evolution, and Behavior), David Mulla (Soil, Water and Climate), and Gary Sands (Bio-products/Biosystems Engineering) are conducting a study that will investigate how subsurface drainage practices influence carbon export and cycling. Centered at the U of M's Southern Research and Outreach Center in Waseca, this research will yield valuable about drainage practices that may improve the water quality of local and regional water bodies.

A unique aspect of this research is that its findings will be incorporated into University graduate and undergraduate coursework such as Biogeochemical Processes, and Soil Conservation and Water Quality Impacts, taught by faculty participating in the project. Also, the study will provide undergraduate and graduate students of King, Finlay, Mulla, and Sands

Grants, continued on page 8

Governor's Council considers LiDAR technology

by Les Everett, Water Resources Center

Water quality and hydrology research and planning are increasingly dependent on high resolution digital elevation data. These are high resolution digital topographic maps used to model water flow through watersheds under different climatic and land-use scenarios. Applications include predicting and measuring soil erosion from fields and stream banks, preparing flood risk maps, siting wetlands for water storage and nutrient removal, watershed mapping, soil mapping, forest cover mapping, and many other applications in agriculture, transportation, and natural resource management.

The Minnesota High Resolution Digital Elevation Model (DEM) working group of the Governor's Council on Geographic Information is developing a legislative proposal to finance a high resolution DEM for the state of Minnesota. They have begun by identifying the need for and value of this type of information. The

proposed elevation model would be accurate to within +/- 15 centimeters, at a 95% confidence rate. This data is capable of generating 2-foot contours. While there are a few alternatives for collecting this type of data, the working group are focusing specifically on LiDAR (Light Detection and Ranging) technology, which has been used successfully in some Minnesota counties already.

Because of technological advances, the cost is now less than 20% of what it was six years ago, inducing several states, including Iowa, to contract for statewide coverage. The working group is preparing the proposal for the next legislative session. The Elevation Committee of the Governor's Council is co-chaired by Ron Wencil of the USGS and David Claypool, Ramsey County Surveyor. The working group for the proposal is headed by Tim Loesch, DNR and includes Les Everett, UM Water Resources Center.

Swackhamer receives environmental health award

Deb Swackhamer has been selected as the 2006 winner of the Harvey G. Rodgers Environmental Health Leadership Award, given by the Minnesota Public Health Association (MPHA). It is named for Harvey G. Rodgers who served for 34 years with Minnesota Department of Health until his retirement in 1961. This award honors "an individual who, through years of dedication, distinguished service and technical contribution has promoted the public's health through preservation of the environment. She received the award during the MPHA's annual meeting, held at St. John's University on June 14, 2007.

WRS alumnus spotlight: David Thoma in the parks

Dr. David Thoma, a graduate of the Water Resources Science program recently visited the campus and gave a seminar covering two topics: "Water Quality in National Parks on the Colorado Plateau" and "Use of Satellite-based Remote Sensing for Soil Moisture Characterization." While in Minnesota, Thoma was a USDA-National Needs Fellow, graduating from the WRS program in 2003. His dissertation research with Dr. Satish Gupta dealt with management impacts and remote sensing applica-



Dr. David Thoma

tions for water quality assessment. Specifically, he characterized tillage system impacts on water quality, crop residue cover from Landsat imagery, and river bank erosion with airborne LiDAR. After graduation, David accepted a post-doctoral position with the USDA-ARS Southwest Watershed Research Center in Tucson. His research with Dr. M. Susan Moran involved testing methods to derive soil moisture maps from radar satellite data. Currently, David is the hydrologist for the Northern Colorado Plateau (NCPN) Inventory and Monitoring Program of the National Park Service. The NCPN network of 16 National Parks includes among others Arches, Bryce Canyon, Canyonlands and Zion in Southern Utah. His primary duties

involve developing and implementing long-term monitoring plans for aquatic habitat and water quality. He works closely with USGS and state water quality specialists as well as with park hydrologists and resource managers to track status and trends in important indicators of ecosystem health. David is duty stationed at Bryce Canyon, but frequently travels to other parks on the Colorado Plateau. He is a native of Arkansas and received his B.S. degree from the University of Arkansas and Masters Degree from Montana State University at Bozeman. In between his degrees he worked on the soil survey of Yellowstone National Park for five years. He loves the outdoors, and in 2005 he climbed Mt. McKinley, the highest peak in North America.

NRRI receives \$1 million to monitor deeper into the Great Lakes

Algae research will tell of water quality changes over decades

by June Kalestad, Natural Resources Research Institute, University of Minnesota Duluth

Scientist Amy Kireta should be enjoying the cruise—satellite television, high-speed internet, three delicious meals prepared daily, exercise room—not a bad gig for a researcher on a month-long sampling expedition this spring in the heart of the Great Lakes. Unfortunately, there's no escaping sea-sickness and storms.

Kireta, phytoplankton specialist from the University of Minnesota Duluth's Natural Resources Research Institute (NRRI), worked this spring aboard the Environmental Protection Agency's research vessel, Lake Guardian. The collected single-celled phytoplankton (algae) and zooplankton (microscopic animals) are going to supply reams of information about changes taking place in the waters of the Great Lakes. So at all hours of the day and night, sea sick or not, the scientists get a 15-minute warning to don steel-toed shoes, life vest and hard hat before reaching their next sampling station.

NRRI received a \$1 million grant from the Environmental Protection Agency to play a significant role in collecting water quality data from the Great Lakes. Kireta and lead scientist Euan Reavie will use the algae to provide long-term information on the impacts of invasive species,



Photo courtesy of NRRI

Amy Kireta and EPA Chief Scientist Glenn Warren send the sampler off the side of the Lake Guardian. The sampling equipment is a SeaBird 911 CTD (conductivity, temperature, depth) with a Rosette water sampler, sensor pump, fluorometer, transmissometer, altimeter, PAR (phyto-synthetically active radiation), pH, and dissolved oxygen, with GPS interface.

excessive nutrients, and possibly, climate change in the lakes. The five-year project will investigate how these lowest links on the food chain are faring in the face of human disturbance. Reavie and Kireta will gather, identify, sort, and count thousands of species of microscopic algae.

"Algae are a critical piece of the Great Lakes food web and can track the impacts humans have had—and will have—on fisheries and the lake ecosystem," Reavie explained.

Algae were used as indicators of the Great Lakes coastal zones during NRRI's recent Great Lakes Environmental Indicators project, but sampling in open water is fundamentally unique—the water moves mightily

and the impacts are more diffused. Unlike localized coastal disturbances, results in the open water track whole-lake impacts.

Kireta uses a rosette sampler (see photo) to collect phytoplankton samples from the surface down to 65 feet below. The open waters and 6-to-10 foot waves could be a challenge, but the Lake Guardian and their tools are built for the task. And, Kireta added, "We have an experienced captain who keeps us pointed in the best direction and over the correct GPS point."

Once the samples are in the lab, the microscopic work begins. The soft algae are analyzed separately from the diatoms which have cell walls made of biogenic glass. This is followed by seemingly endless data compilation and analysis. The data are transformed into answers for critical ecological questions, like "How have we impacted the quality of the Great Lakes?" and "What does the future of the food chain look like?"

This research is part of a vast, multi-disciplinary team of scientists, government officials and public representatives whose goal is the protection and restoration of the largest single source of fresh water in the world.

The EPA Great Lakes National Program Office's Biological Open Water Surveillance Program has been conducting monitoring of the Great Lakes since 1983. It is intended to fulfill the provisions of the Great Lakes Water Quality Agreement of the International Joint Commission to evaluate water quality trends over time and identify emerging problems in the ecosystem, among other things.

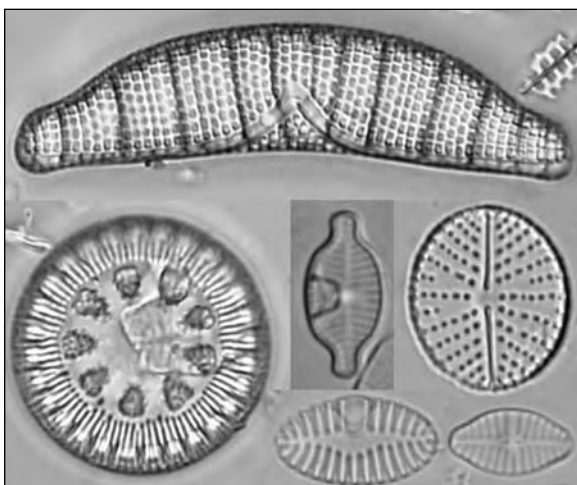


Photo courtesy of NRRI

A collage of diatom species from lakes Michigan, Superior and Huron.

U of M Water Community News

NRRI director receives Biennial Award for Great Lakes Science

Many rivers and some of the largest lakes in the world lie along, or flow across, the border between the United States and Canada. The International Joint Commission is an independent bi-national organization established by the Boundary Waters Treaty of 1909. Its purpose is to help prevent and resolve disputes relating to the use and quality of boundary waters and to advise Canada and the U.S. on related questions.

This important commission has awarded the Biennial Award for Great Lakes Science to NRRI Center Director Jerry Niemi for his leadership on the Great Lakes Environmental Indicators project.

This award was established in 2002 to publicly recognize the importance of science and engineering in the management of the Great Lakes. It recognizes Niemi as an outstanding scientist whose research has had a positive influence on environmental quality and the health of the Great Lakes basin ecosystem.

"Dr. Niemi's leadership in facilitating collaboration among Great Lakes researchers and his visionary research on indicators will enhance our understanding of the environmental health of the Great Lakes for years to come," said Dennis L. Schornack, U.S. co-chair of the IJC.

Jim Anderson (WRC and Soil, Water, and Climate) and **Mike Sadowsky** (Soil, Water, and Climate) received a grant from the Minnesota Department of Agriculture for a project titled "Development of a DNA Marker Gene System for *E. coli* from Cows, Pigs, and Turkeys, and Use of Small Watersheds to Monitor Bacteria Loadings, and Effects of Mitigation Practices."

Bill Arnold and **Tim LaPara** (Civil Engineering) were awarded a grant from the Legislative-Citizen Commission on Minnesota Resources to study pharmaceutical and microbiological pollution in Minnesota this July.

Stephen Bortone (Minnesota Sea Grant) was invited to present a lecture titled "Monitoring and Assessment of Artificial Reef Effectiveness" at the International Centre for Advanced Mediterranean Agronomic Studies, Mediterranean Agronomic Institute of Zaragoza, Spain. Bortone also served on the workshop discussion panel.

Emi Ito (Earth Science and Geology/Geophysics) has been appointed to a 4-year term on the steering committee of the British Ocean Sediment Core research facility, part of the UK national deep sea core repository.

Joseph A Magner (Forest Resources) presented a paper entitled "Contributions of Organic Matter and Suspended Sediment to Turbidity: Muddying TMDLs in the Blue Earth River Basin" at the American Institute of Hydrology meeting in Reno, Nevada, in April. The paper was authored by **Christian Lenhart** (Forest Resources), **Kenneth N. Brooks** (Forest Resources), **Daniel Henely** (CFANS), and Magner.

Research conducted by **Mike Sadowsky** and **Satoshi Ishii** (Soil, Water, and Climate) concerning potentially dangerous bacteria in proximity to high use freshwater was recently featured in MSNBC and Medical News Today. These articles are available online at: www.msnbc.msn.com/id/19053410/ and www.medicalnewstoday.com/medicalnews.php?newsid=72434.

Heiko Schoenfuss (Saint Cloud State University) was featured in the June 4th Edition of *Newsweek* magazine for his research on emerging alkylphenols in Minnesota rivers. This research was funded in part by the Water Resources WRCI competitive grants program.

University of Minnesota Extension recently filled two positions. **John Bilotta** will be managing the Non-point Education for Municipal Officials (NEMO) Program in the Twin Cities and Greater Minnesota. **Shane Missaghi** will be assisting cities and watershed districts and organizations by providing

education and disseminating research results about stormwater management, including use of stormwater best management practices (BMPs).

Josef Werne (UMD Chemistry and Biochemistry) has been elected Associate Director of Graduate Studies for the Water Resources Science Graduate Program in Duluth. Werne is an associate professor of chemistry and a member of the Large Lakes Observatory. His 3-year term will begin fall semester, 2007.

Jeffrey Werner (WRS Alumnus) received an honorable mention for the Universities Council on Water Resources (UCOWR) Ph.D. Dissertation Award in Natural Science & Engineering. Werner was advised by **Bill Arnold** (Civil Engineering), and **Kris McNeill** (Chemistry).

University of Minnesota Water Resources Science Program Degree Recipients

Millicent Mrema received her M.S. in February 2007. Her plan B paper was titled "Spatial temporal analysis of causes and impacts of changes in stream flow in the Kihansi catchment." Mrema was advised by **Frances Homans** (Applied Economics).

Ole Olmanson received his M.S. in February 2007. His thesis was titled "Improving the accuracy and field practicality of a short-time domain reflectometry sensor." Olmanson was advised by **Tyson Ochsner** (Soil, Water, and Climate).

Valerie Were received her M.S. in March 2007. Her thesis was titled "Monitoring non-point source pollution using the reference condition approach: A case-study from the Minnesota River Basin." Were was advised by **Jim Perry** (Fisheries, Wildlife, and Conservation Biology).

Upcoming Events

Save the Date!

The Minnesota Water 2007 and Annual Water Resources Joint Conference will be held October 23–24, 2007. The Conference will be held at the Earle Brown Heritage Center in Brooklyn Center, MN. Two day-long workshops will be offered on October 22, in conjunction with the conference.

Technical Service Provider training will be provided in November for the RUSLE2 and Land Treatment components of CNMPs (Comprehensive Nutrient Management Plans) and Conservation Planning. All training will be held at Cabelas in Owatonna, MN. More information and registration is available at tsp.umn.edu/.

July 23–26, 2007. **2007 UCOWR/NIWR Conference: Hazards in Water Resources.** Boise, Idaho. For registration information, visit <http://www.ucowr.siu.edu/>.

July 31, 2007. **Midwest Strip-Tillage Expo 2007.** Hawkeye Community College, Waterloo, Iowa. Manufacturers, researchers and farmers will demonstrate equipment for strip-tillage and associated operations, and will present the latest information on strip-tillage related topics, including equipment selection, fertility management, and guidance technology. For more information, visit <http://wrc.umn.edu/outreach/striptillageexpo/midwest/>.

August 12–18, 2007. **30th Congress of the International Association of Theoretical and Applied Limnology.** Montreal, Quebec. For registration and program information, visit <http://www.sil2007.org/>.

August 14, 2007. **Northern Strip-Tillage Expo.** Fergus Falls, Minnesota. For more information, visit <http://wrc.umn.edu/outreach/striptillageexpo/minndak/>.

September 5–6, 2007. **2007 Clean Water Partnership Summit.**

Cincinnati, Ohio. This conference will focus on innovation in water research and development in the areas of drinking water, homeland security, sustainability, and ecosystems. Visit <http://etprogram.org/summit07> for more information about this event.

October 16, 2007. **The Nineteenth Annual St. Croix River Research Rendezvous.** Since 1989, the St. Croix River Research Rendezvous has been a significant forum for the presentation and discussion of scientific investigations centered on the watershed of the St. Croix River. The event will be held at the Warner Nature Center, and is sponsored by the St. Croix Watershed Research Station. For more information, please visit www.smm.org/scwrs/programs/rendezvous/.

October 29–31, 2007. **Making a Great Lake Superior 2007.** Duluth Entertainment and Convention Center, Duluth, Minnesota. This conference will gather researchers, land and resource managers, educators and basin residents

to participate in interdisciplinary discussions about the most important issues facing Lake Superior. For more information, visit <http://www.seagrants.umn.edu/superior2007/>.

November 8, 2007. **Understanding RUSLE2 Soil Loss Model.** This hands-on class introduces the RUSLE2 soil loss model, how it works and the data necessary to run the program. Participants are required to bring a laptop computer and load the software.

November 9, 2007. **Upland Land Treatment Evaluation.** In this day-long on-farm and classroom training USDA-NRCS instructors will walk a farm with class participants to explain how to evaluate the need for ephemeral, gully, sheet and rill erosion, and sediment control. Selection of conservation practice alternatives that fit the farm's landscape and producer's management system and objectives will be covered. Emphasis will be placed on protecting the soil and water resources on fields receiving nutrient applications.

November 29, 2007. **Advanced RUSLE2.** This hands-on class builds on the information provided in the introductory class, to provide more information on using RUSLE2 for soil erosion prediction. It will cover more information about building and using crop rotations, the tillage operations available for use in the program, how to choose an appropriate yield, and appropriate uses for the model. Participants will use RUSLE2 on their laptops in class exercises.

Minnegram is published quarterly by The University of Minnesota Water Resources Center

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Publications and Resources

Conservation Tillage Systems for Corn Following Soybeans, BU-08483. University of Minnesota Extension, authored by Jodi DeJong-Hughes and Jeff Vetsch. The publication presents results of on-farm yield trials conducted across southern Minnesota and provides management tips for conservation tillage. The on-farm research was conducted by Regional and Local Extension Educators and staff of Monsanto Corporation working with cooperating farmers over

a two-year period. The research and publication were funded under an EPA 319 grant administered by MPCA and managed by Les Everett of the Water Resources Center. This publication is available on the UM Extension web site at www.extension.umn.edu/distribution/cropsystems/DC8483/.

Minnesota Watershed District Guidebook. Minnesota Board of Water and Soil Resources (BWSR), and the

Minnesota Association of Watershed Districts. April 2007. The Board of Water and Soil Resources and the Minnesota Association of Watershed Districts has prepared this handbook to provide information about watershed districts and to highlight the important work that is being done by each district. This publication is available in PDF format online at www.bwsr.state.mn.us/publications/Wdguidebkforweb.pdf.

Grants, continued from page 3

sampling and data analysis opportunities in both field and laboratory settings.

Enhanced contaminant remediation: fermentation as a method to enhance dissolution of hydrophobic compounds

Regulators are increasingly concerned about the contamination of Minnesota groundwater supplies. The Minnesota Environmental Protection Agency has listed 4675 sites in its inventory of groundwa-

ter contamination, a number that is not expected to decrease. Because nearly 80 percent of Minnesota uses groundwater for drinking water, mitigation of contamination is of vital interest.

Paige Novak (Civil Engineering) will investigate whether this mitigation can be achieved by encouraging ambient microorganisms to ferment contaminants into innocuous byproducts. This microbial stimulation may be promoted by adding degradable carbon sources,

like sugars, to contaminated groundwater environments. Unlike existing methods of remediation, Novak's technique can be conducted without extraction of groundwater, saving time and money.

Novak hopes that this method will be an expedient, cost-effective way to bring contaminated groundwater sites into compliance with state advisory standards.