

Governor appoints new leaders to state environmental agencies

Governor Tim Pawlenty has appointed new leaders to several of Minnesota's environmental agencies: the Minnesota Department of Health, the Minnesota Department of Natural Resources, the Minnesota Pollution Control Agency, and the Metropolitan Council, a regional agency with an environmental branch. No change has been made at the Minnesota Department of Agriculture or the Minnesota Board of Water and Soil Resources.

These leadership positions play important policy-making roles in state water management activities and the ways the agencies interact with the University of Minnesota and environmental organizations across the state.

Dianne Mandernach was appointed



Dianne Mandernach

Minnesota Commissioner of Health on February 3, 2003. The Minnesota Department of Health is the state's lead public health agency and operates programs in disease prevention and control and health

promotion, as well as programs in well management, source water protection, and safe drinking water. Mandernach served as CEO at Mercy Hospital and Health Care Center in Moose Lake, Minnesota, for nine years before being appointed commissioner. She had previously held positions at Mercy Hospital as director of human resources and as associate administrator.

Gene Merriam was appointed commissioner of the Minnesota Department of Natural Resources on January 17, 2003. The Department of Natural Resources



Gene Merriam

works with citizens to protect and manage the state's natural resources as well as to provide outdoor recreation opportunities. Prior to being named commissioner, Merriam was vice president, chief financial officer and treasurer for ECM Publishers for six years. Before that he served as a state senator from Coon Rapids for 22 years. During his legislative career, he chaired the Senate Agriculture and Natural Resources Committee, the Senate Finance Committee, and the Legislative Commission on Minnesota Resources.

Sheryl Corrigan was named commissioner of the Minnesota



Sheryl Corrigan

Pollution Control Agency on December 16, 2002. The Pollution Control Agency works to protect Minnesota's environment through monitoring environmental quality and enforcing environmental regulations. Corrigan's most recent position was as an environmental health and safety manager at 3M. From 1990 to 1993, she served as an environmental planner for the Metropolitan Council and was heavily involved in the research of water supply, wetland preservation and environmental policy. Corrigan was instrumental in developing a long-term water supply plan for the metropolitan area.

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WRC co-director named NAWT Man of the Year



Jim Anderson, co-director of the Water Resources Center, received the 2002-2003 "Man of the Year" award from the National Association of Wastewater Transporters (NAWT) at the 23rd Annual Pumper and Cleaner Environmental Expo held February 19 in Nashville, Tennessee. The award is presented by NAWT board representative Tim Frank of Tim Frank Septic Inc., Huntsburg, Ohio.

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From the Director's Desk



Being green

It's not easy being green. So sang Kermit the Frog over a generation ago. He was singing about the difficulty of being different, which indeed can be burdensome. Today, it's still not easy

being green, but the phrase has a different meaning now that "green" is associated with environmentalism. It does seem difficult to be optimistic about where we are headed environmentally. Almost weekly, we hear about funding cuts in environmental programs or changes in long-standing federal environmental regulations. The changes usually are advertised as "just removing the inflexibility or needless bureaucracy of old regulations," but many believe that the changes represent a significant loosening of the laws and regulations that have been responsible for much of the improvement in environmental quality that has occurred over the past 20-30 years. In fact, with the war in Iraq, terrorist threats, a weak stock market, shaky economy, huge state (and federal) deficits, and major cuts to state and University budgets, it is difficult to be optimistic about much of anything these days, and it is easy to feel blue.

However, America didn't become the great and powerful nation it is by its citizens wringing their hands and saying "woe is me." Now is not the time for us to lose faith in the prospects for a better tomorrow. Our governor is fond of saying that difficult times present opportunities. Whether one agrees with his prescriptions for meeting those difficulties or

not, his basic assertion is correct. We need to take heart and work to see that the change produced by these opportunities becomes positive.

I would like to mention four recent developments related to environmental issues that are encouraging in these otherwise stormy times. First, the U.S. EPA announced it was re-instituting its STAR Fellowship program for graduate students in environmentally related disciplines. It had abruptly terminated that popular program in 2002 but now will renew it with \$10 million in funding. Second, the U.S. Senate voted recently against drilling for oil in the Arctic National Wildlife Reserve. Granted, the vote was close (52-48; kudos to Minnesota's two senators for voting against the drilling), and pressure to approve drilling will continue as long as we equate improvements in quality of life with ever-increasing consumption of fossil fuel energy. Third, Congress recently passed, and the President signed legislation to double the National Science Foundation's budget over the next five years, and the NSF has expressed a strong interest in expanding its research programs in the environmental sciences and engineering. The Foundation recently issued a ten-year prospectus for environmental programs, and a review of the document makes for interesting reading. Finally, it is encouraging to note a recent EPA report that levels of contaminants in the Great Lakes continue to decline, evidence that our past commitment to environmental improvement has not been without consequence. Look around and see if you can find any encouraging "green" news; it beats being blue.

Pat

Patrick Brezonik, WRC co-director

Around the State



WATER RESOURCES UPDATES

Feedlot rule revision unlikely to affect Minnesota livestock producers

by Les Everett, Program Coordinator, WRC

In December 2002, The U.S. Environmental Protection Agency published revised rules for National Pollution Discharge Elimination System (NPDES) permits for Confined Animal Feeding Operations (CAFOs). The revisions

change the way that large CAFOs are defined, expand record-keeping and other requirements, and also place regulations on smaller lots that discharge pollutants to waters of the United States. The revised rules can be found at <http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm>.

The revision is projected to bring the nationwide number of CAFOs with NPDES permits up from 4,500 in 2002 (600 in Minnesota) to 15,500 by 2006. States are required to adopt and implement the rules within one year if state rules need modification, or within two years if a change in state legislation is required.

The Minnesota Pollution Control Agency, which implements feedlot rules in Minnesota, is studying the new federal rules to determine whether adjustments might be required in state rules or

legislation. Because the new requirements are less stringent than many had expected and closely approximate the CAFO permitting requirements already in place in Minnesota, the number of NPDES permits in Minnesota is not likely to change significantly. In effect, under the revision, other states will be required to improve to Minnesota's standard. That was welcome news for Minnesota livestock producers, who compete in a national market.

The NPDES permitting revision included the following changes:

- Large CAFOs are no longer defined by animal type equivalencies expressed in "animal units," but by threshold numbers of each animal type.
- Some previously excluded animal types are now included.

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University of Minnesota to host symposium on environmental assessment methods

The symposium "Frontiers in Assessment Methods for the Environment" (FAME) will be held August 10–13, 2003, on the University of Minnesota Minneapolis campus. The symposium is sponsored by the Association of Environmental Engineering Science Professors (AEESP) with financial support from the National Science Foundation.

FAME will bring together scientists and engineers from many disciplines responsible for the groundbreaking technological advances being made in environmental measurement systems and assessment methods. These advances promise to revolutionize the ways scientists and engineers study and solve complicated environmental pollution problems. Advances include an impressive array of new *in situ* instruments and profilers, chemical and biological sensors, new modeling techniques to simulate physical, chemical, and biological processes in complex systems, and continuing improvements in the computer systems and informatics needed to take advantage of the large databases (terabytes) generated by the new technologies.

Symposium participants will have an opportunity to learn about several proposed NSF funding initiatives for highly instrumented and networked environmental field research facilities, such as CLEANER (Collaborative Large-scale Engineering Analysis Network for Environmental Research) that build on and are a natural outgrowth of these technological advances.

A faculty group primarily from the Department of Civil Engineering is organizing the symposium, and the Water Resources Center is providing logistic services. For more information or to register for the event, please visit the symposium Web site: <http://wrc.coafes.umn.edu/FAME/>.

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Peter Bell

Peter Bell was appointed chair of the Metropolitan Council on January 9, 2002. The Council, in partnership with local governments in the seven-county area, conducts long-range planning to promote orderly, environmentally sound and cost-effective growth. Bell is a member of the University of Minnesota Board of Regents and served on the transition teams for both Governor Ventura and Governor Pawlenty. Prior to his appointment as chair, Bell was executive vice president for publishing and educational services at Hazelden, an internationally renowned nonprofit organization providing alcohol and drug-abuse services. From 1994 to 1999 he served as executive vice president for corporate community relations for TCF Bank, Minneapolis.

Gene Hugoson was reappointed commissioner of the Minnesota Department of Agriculture on December 27, 2002. Hugoson was first appointed Agriculture Commissioner in July 1995 by Governor Carlson, and was reappointed



Gene Hugoson

Hugoson has served as a member and is now chairman of the state's Environmental Quality Board, and is president-elect of the National Association of State Departments of Agriculture.



Ron Harnack

The Executive Director of the Minnesota Board of Water and Soil Resources (BWSR) is a leadership position that is not automatically subject to reappointment when a new administration takes office. Ron Harnack has served as the executive director of BWSR since 1991. From 1970 to 1991, Harnack worked for the Minnesota Department of Natural Resources, Division of Waters, in various technical, supervisory and administrative positions at the region and central office.

VSMP publishes stream monitoring guide

The Volunteer Stream Monitoring Partnership (VSMP) has published a 100-page guide to volunteer stream monitoring for volunteers and volunteer leaders.

The *Guide to Volunteer Stream Monitoring*, compiled and edited by Mary Gullickson and Barb Liukkonen of the Water Resources Center, is designed to describe monitoring activities at three levels: an introductory level (Frog), an intermediate level (Stonefly), and a master level (Kingfisher). These levels and their accompanying activity sheets are color-coded for easy use. Within each level, activities are further subdivided into three categories of monitoring purpose: Awareness & Education, Continuous Record, and Problem

Investigation. Volunteers can choose monitoring activities that suit both their level of experience and their purpose for monitoring.

The Guide contains a Monitoring Matrix so that readers can see easily the activities in the document, as well as the appropriate experience level and monitoring purpose for each activity. Activities range from measuring stream water levels (an introductory Frog-level activity) to event-based sampling for nutrients or bacteria (a master Kingfisher-level activity).

Copies of the Guide are available from VSMP for \$10 (includes shipping and handling). To order, contact Mary Gullickson at 612-625-6781 or gulli021@umn.edu.

Workshops offered to improve shoreland management

In their natural state, Minnesota's shorelines are diverse and sensitive areas that help protect water quality and provide critical habitat for many species of plants and animals. The University of Minnesota Extension Service Shoreland Education Program provides workshops on shoreland management on a regular basis throughout Minnesota. Locations and dates for upcoming workshops are listed below.

The Shoreland Education Program also provides information, practical experience, and resources for people interested in practicing or promoting shoreland stewardship.

For a Shoreland Education Program brochure, workshop registration form, and workshop schedule visit the Extension Water Quality web site: <http://www.extension.umn.edu/water/shore>. Or contact Tracy Thomas at 612-625-2282.



Shoreland Volunteer Workshops:

Grand Rapids, Friday and Saturday, April 25–26

Park Rapids, Friday and Saturday, May 2–3

Shoreland Revegetation Workshops:

Northwest Minnesota–Mentor
April 8 and June 3

West Central Minnesota–Spicer
April 5, May 17, and June 14

Southeast Minnesota–Kasota
May 14, June 5, and September 4

Central Minnesota–Crosslake
May 16, June 5, and June 13 or June 27

Aquatic Plant Identification Workshops:

East-Central Minnesota–Rush City
Friday and Saturday, July 11–12

Central Minnesota–Crosslake
Thursday and Friday, July 17–18

West-Central Minnesota–Ortonville
Saturday, July 19

Minnesota Environmental Partnership launches legislative water initiative

by Kevin Proescholdt, Outreach Coordinator, Volunteer Stream Monitoring Partnership and WRC

The Minnesota Environmental Partnership (MEP), a coalition of 80 nonprofit environmental organizations, launched its “Protect Our Water” legislative initiative on January 14th at the 7th annual MEP Legislative Forum, which drew more than 50 members of the Minnesota Legislature. Between 400 and 500 people attended the event and heard presentations from House Speaker Steve Sviggum (R-Kenyon) and other policy makers. Senate Majority Leader John Hottinger (DFL-St. Peter) spoke on “Protecting Our Environment in an Era of Budget Deficits.”

MEP’s 2003 Protect Our Water legislative campaign is part of a broader, four-year Healthy Waters initiative. Healthy Waters is a commitment by MEP to change and enact policies to protect and restore Minnesota’s waters through legislative initiatives, public education, and outreach efforts.

The Protect Our Water package consists of three issues. The first issue concerns reducing phosphorus in Minnesota waters and includes protecting last year’s phosphorus-free lawn fertilizer bill from amendments or repeal and eliminating phosphorus found in dishwasher detergents sold in the state.

The second MEP issue deals with septic systems (ISTS, or Individual Sewage Treatment Systems). An estimated one-third of Minnesota’s 536,000 ISTS are improperly designed or maintained, and an estimated additional 64,000 are classified by the Minnesota Pollution Control Agency as “imminent threats to public health and safety.” MEP’s legislation would require counties to identify failing systems and those considered to be “imminent threats.” It would also require that septic systems be inspected and upgraded to code before property sales. This work would be funded with a previously unused

provision of the Environmental Trust Fund.

The third issue in MEP’s legislative package deals with funding for environmental protection, both short-term increases in user fees and long-term dedication of increased public funding. MEP specifically supports the \$1 million recommendation from the Legislative Commission on Minnesota Resources (LCMR) for citizen and agency water quality testing, and funds for the Minnesota Pollution Control Agency’s water quality monitoring and management programs that have been submitted to the governor as part of the 2003 budget.

The three issues comprising the Protect Our Water initiative, as well as more than 30 environmental topics that may see action at the Legislature this session, are described in detail in a 58-page “Minnesota Environmental Briefing Book” compiled by the Minnesota Environmental Partnership. For more information about the Protect Our Water campaign or to request a copy of the “Minnesota Environmental Briefing Book” for the 2003 Legislative Session, contact the Minnesota Environmental Partnership at 651-290-0154 or via email at info@mepartnership.org, or visit the organization’s Web site at: www.MEPpartnership.org.

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- Record keeping requirements are expanded, and an annual report is required.
- Manure must be sampled for nutrient content every year.
- States are required to establish technical standards to minimize phosphorus transport from manure applications where field-specific assessments indicate potential phosphorus loss problems.
- Setback distances for manure application are specified; however, Minnesota setbacks and restrictions will likely be considered equivalent and continue to be the standard.

Watershed district survey finds homeowners care about runoff

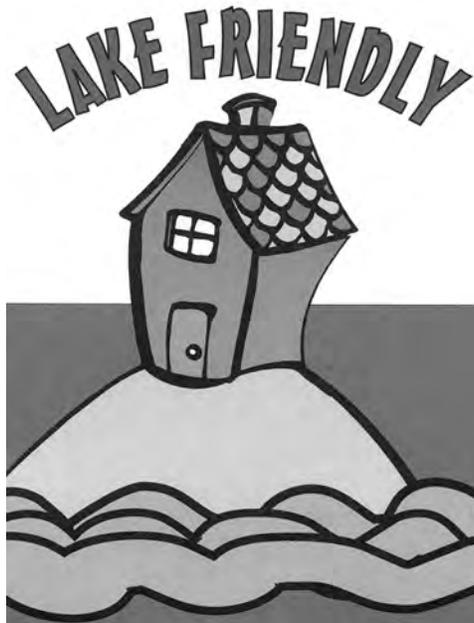
by Barb Liukkonen, Water Resources Education Coordinator

How much do homeowners understand about the water that runs off their property? How much do they care?

In a survey conducted last summer as part of a cooperative project between Prior Lake Spring Lake Watershed District (PLSLWD) and the WRC, it became apparent that homeowners understand quite a bit about the need to reduce runoff from their lots and that they care significantly about protecting water quality in nearby lakes and streams. Many property owners were ready to take action to protect water resources, but didn't know what to do.

Lynn Cyrus, PLSLWD intern, conducted runoff audits with 50 property owners to identify areas in which they could change practices to reduce the volume of water and pollutant load from their homes, yards, gardens, and impervious surfaces. Many of the property owners lived on Prior or Spring lakes and the remainder lived in neighborhoods that drain to the lakes, but are not immediately adjacent to it.

Following the survey, PLSLWD recommended practices that property owners could adopt to reduce runoff.



This graphic is used by the Prior Lake-Spring Lake Watershed District in their Lake Friendly project. The project involves a visit to homeowners' property by a water resources professional who helps homeowners review their yard care practices and their properties' drainage patterns. After completing a Lake Friendly checklist, practices such as changing fertilizer use, redirecting drainage, establishing buffers, changing chemical storage practices, and implementing yard waste may be recommended to the homeowner.

Many of the suggestions were simple and inexpensive, such as changing their lawn mowing habits, diverting drain spout water away from impervious surfaces, or watering differently. Everyone who completed the audit was given a \$100 certificate to help them implement the more complex or expensive recommendations. So far, 19 homeowners have redeemed their certificates, with the most common purchases being native plants and copies of the book *Lakescaping for Wildlife and Water Quality*. Other popular choices have included rain barrels, consultations from landscape ecologists, lawn aerator rentals, the DNR "Restore Your Shore" CD, and zero-phosphorus boat soap.

The project was funded by Metropolitan Council through the MEP program and by the Prior Lake Spring Lake Watershed District. During the upcoming months, Lynn will follow up with homeowners to determine which practices have been implemented and how homeowner awareness and attitudes have shifted as a result of the project. A final report will be completed in 2003.

Water Resources 2003 Grant Program funds continuing projects

Three research projects that began in March 2002 are continuing in the WRC's 2003 external grant program, which began March 1. Funding for the projects is provided by the Water Resources Research Institute program of the USGS, and the Center for Agricultural Impacts on Water Quality, a WRC program supported by the College of Agricultural, Food and Environmental Sciences. The continuing projects are: *Characterization of nitrifying bacterial populations in wastewater treatment bioreactors*, Tim LaPara, Department of Civil Engineering; *Effect of riparian forest harvest on instream habitat and fish and invertebrate communities*, Ray Newman, Bruce Vondracek, and Jim Perry, Department of Fisheries, Wildlife and Conservation Biology; and *Biodiversity in urban ponds and lakes: human effects on plankton populations*, Bob Sterner, Department of Ecology, Evolution and Behavior. For descriptions of these projects,

see the March 2002 issue of *Minnegram* or visit the Water Resources Center Website at <http://wrc.coafes.umn.edu/>.

An additional project submitted to the 2002 competition is being funded in the FY 2003 program. Mindy Erickson, Water Resources Science Ph.D. candidate, and her advisor, Randal Barnes (Civil Engineering), are investigators on the project *Arsenic in Minnesota groundwater and its impact on the drinking water supply*. This project is investigating arsenic in Minnesota and identifying potential geochemical causes of elevated arsenic levels. Research results will be used to develop new regulations and guidelines related to well construction and drinking water testing in high-arsenic areas.

Reports from the WRC's 2002 research activities were published recently and are available on the Web at <http://wrc.coafes.umn.edu/pubs/tech147/index.html>.



U of M Water Community News

John S. Adams, (Geography), completed a 3-year term as a member of the NRC Committee on the Restoration of the Greater Everglades Ecosystem (CROGEE). **Patrick Brezonik** (WRC and Civil Engineering) continues as a member of CROGEE.

Patrick Brezonik was a co-organizer of an ASLO workshop on new research directions in limnology December 1–4 in Boulder, Colorado. The workshop was funded by the NSF's GeoSciences Directorate. Professors **Tom Johnson** and **Elise Ralph** (LLO, Duluth) and **Miki Hondzo** (Civil Engineering) were participants in the workshop.

Ken Brooks (Forest Resources), **Hans Gregersen** (Emeritus, Forest Resources), Peter Ffolliott, and Leonard DeBano published the third edition of *Hydrology and the Management of Watersheds* in January 2003.

In January 2003, Ph.D. student **Melinda (Mindy) Erickson** (Water Resources Science) was awarded the Albert Howard Fellowship for graduate students in the arts, science, and engineering. Mindy's advisor is **Randal Barnes** (Civil Engineering), and her Ph.D. research concerns arsenic in ground-water used for drinking water supplies in Minnesota.

Les Everett (WRC) was awarded the Education Award from The Minnesota Chapter of the Soil and Water Conservation Society at their annual meeting in Morton on March 7. Everett was cited for his efforts in organizing interagency education projects.

Neal Hines (Civil Engineering) received a student travel award from the American Society of Limnology and Oceanography to present a talk on elemental mercury dynamics in northern Minnesota at the February 2003 meeting in Salt Lake City.

Keith Lodge (Chemical Engineering, UMD) published research on the organic-carbon normalized partition coefficient for dioxin in *Advances in Environmental Science*. Lodge and co-authors also published research on predicting total PAH concentrations in contaminated sediments in *Environmental Monitoring & Assessment*.

Jim Perry (Fisheries, Wildlife, and Conservation Biology) was elected a Fellow of the American Institute of Fisheries Research Biologists.

Carrie Reinhart (WRS) won the Carolyn Crosby Fellowship, which provides a summer fellowship plus a grant for continuing Ph.D. research. Carrie's advisor is **Susan Galatowitsch** (Horticulture), and her Ph.D. research is on invasive plants and wetland restoration.

Doug Schnurrenberger (Geology and Geophysics and curator of the National Lacustrine Core Repository) will travel to Iceland in early spring to study the history of glacial advance and retreat. This expedition is the second GLAD200 (Global LAkes Drilling to 200 meters) project.

The Department of Geography has hired paleolimnologist **Bryan Shuman** as an assistant professor. Shuman will join the Limnological Research Center and Quaternary Paleoecology community and work closely with faculty, staff and students in the Core Lab.

In November **Steve Sternberg** (Chemical Engineering, UMD) visited the Desert Research Institute in Las Vegas, Nevada and gave an invited presentation on mixing behavior in heterogeneous porous media. In December, Sternberg presented a talk on dispersion measurements in porous media at the American Geophysical Union International Meeting in San Francisco.

WRC research on satellite assessment of Minnesota lake water quality conducted by **Patrick Brezonik**, **Marv Bauer** (Forest Resources), and **Leif Olmanson** (WRC), was featured in the Minneapolis Star Tribune newspaper in January. The story was also picked up by the Associated Press and featured by KARE 11-TV and The Duluth News Tribune.

December 2002

University of Minnesota Water Resources Science Program Degree Recipients

Stanley Asah received a M.S. in December 2002. Advised by **Jim Perry** (Fisheries, Wildlife, and Conservation Biology), Asah's thesis was titled "The stoichiometry of detrital processing and detritivore food quality preferences in a cold spring stream."

Meghan Elizabeth Brown received a M.S. in December 2002. The title of her Plan B paper was "A 2001 survey of crustacean zooplankton in the western arm of Lake Superior." Brown's advisor was **Donn Branstrator** (Biology, UMD).

Leah Class received a M.S. in December 2002. Advised by **Jim Perry**, Class's Plan B paper was titled "Towards watershed development: Two case studies of soil erosion and participatory development in north-west India."

Heather Hendrixson received a M.S. in December 2002. Her thesis was titled "Stoichiometry of freshwater fish in relation to allometry and phylogeny, and the role of skeleton in fish stoichiometry." Hendrixson's advisor was **Robert Sterner** (Ecology, Evolution, and Behavior).



Upcoming Events

April 15-17, 2003. Indianapolis, IN. **Great Lakes Commission Semiannual Meeting.** This year's theme is "Restore the Greatness!" Policy makers and opinion leaders from the binational Great Lakes-St. Lawrence region will address public policy issues with implications for the region's environmental health, economic prosperity, and quality of life. For more information contact: Mike Donahue, mdonahue@glc.org or see www.glc.org/meeting.

April 23-24. Moorhead, MN. **First International Water Conference: "Water, Science, and Decision-making."** Plenary speakers and concurrent sessions will address water management issues in the Red River Basin such as flood damage reduction and mitigation and natural resource protection and development. For more information see www.tri-college.org/watershed/conference.htm.

May 1-4. Minneapolis, MN. **American Wetlands Campaign Biennial Conference.** The purpose of the conference is to educate and inspire people to initiate and sustain on-the-ground wetland conservation and education projects. This year's conference will include three tracks: education and outreach, wetland science, and wetland conservation policy. The conference will also include sessions

related to the 2003 American Wetlands Campaign theme—Bogs, Playas, Pools: Protect America's Unique Wetlands. For more information contact Leah Miller at (301) 548-0150 x219 or visit www.iwla.org/SOS/awm/conference/index.htm.

May 11-14. Kansas City, MO. **Agricultural Hydrology and Water Quality.** The American Water Resources Association's 2003 spring specialty conference is a forum for all participants in the agricultural water resources community and provides the opportunity for discussion of multidisciplinary aspects of agricultural hydrology and water quality. The conference will discuss ongoing research efforts, agricultural practices and management systems, policy development, and legislative efforts nationally and internationally. Contact Ramesh Kanwar at (515) 294-1434 or see www.awra.org/meetings/Kansas2003/.

May 19-22, 2003. Minneapolis, Minnesota. **Organic Geochemical Stratigraphy Short Course.** With the support of the University's Quaternary Paleoecology (QP) minor program, the Limnological Research Center will present a spring short course focusing on cutting-edge and classical organic geochemical techniques and their utility in the interpretation of

lacustrine paleorecords. The course features four external speakers, Stefano Bernasconi (ETH-Zürich), Simon Brassell (University of Indiana), Katherine Freeman (Penn State), and Peter Leavitt (University of Regina), and will be moderated by Josef Werne (Large Lakes Observatory, UM-Duluth). The course is free and noncredit. For more information or to register, please contact Michele Brusegard at (612) 624-4514 or bruse002@umn.edu.

June 16-18, 2003. Grand Traverse Bay, MI. **The Second Annual Invasive Species Field Course.** The Inland Seas Education Association (ISEA) has developed the Invasive Species Field Course to teach educators and environmental professionals about invasive species in the Great Lakes Region, and to prepare them to effectively teach their students, colleagues and volunteers about invasive species. The Field Course will provide a unique combination of professional seminars on shore and hands-on field sampling aboard ISEA's 77'schooner "Inland Seas." Course participants will interact with a faculty of scientists, regulators, mariners and educators with a common interest in this critical issue. For more information see www.GreatLakesEducation.org.

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Publications and Resources



Advances in water resources research: Project summaries for 2002. University of Minnesota Water Resources Center. 2003. This report summarizes activities in the Water Resources Center's research program during calendar year 2002. This publication is available at <http://wrc.coafes.umn.edu/pubs/tech147/>, or contact Tracy Thomas at thoma032@umn.edu.

Hydrogeology of the Paleozoic bedrock in southeastern Minnesota. Minnesota Geological Survey. 2003. This publication characterizes the hydrogeologic attributes of the Paleozoic strata and constructs a hydrogeologic framework for southeastern Minnesota (including the Twin Cities) that supports more effective ground-water management strategies and improves our ability to predict aquifer productivity and contaminant transport paths. It can be purchased from the MGS Map and Publication Sales Office, 262 University Ave, St. Paul, MN 55114, and can be

downloaded from <http://www.geo.umn.edu/mgs/rptlist.html#RI> (click on 61).

Nutrient and suspended-sediment concentrations and loads, and benthic-invertebrate data for tributaries to the St. Croix River, Wisconsin and Minnesota, 1997-99. U.S. Geological Survey. Revised and reprinted, 2003. This revised report replaces the original, which had incorrect labeling of annual versus daily loads and yields in some of the text, tables, and figures. Copies may be purchased from the U.S. Geological Survey, Branch of Information Services, Box 25286, Denver, CO 80225-0286. Orders must include check or money order payable to the U.S. Department of the Interior—U.S. Geological Survey. Specify report number WRIR 01-4162.

OpenLot Agreement: A flexible approach to correcting runoff problems. Minnesota Pollution Control Agency and

University of Minnesota Water Resources Center. 2003. This pamphlet, the product of a 319 grant, details the Open Lot Agreement, a flexible, phased-improvement option for reducing runoff pollution on feedlots of fewer than 300 animal units. It is available online at <http://www.pca.state.mn.us/hot/feedlots.html>, or in hard copy from David Wall, MPCA, david.wall@pca.state.mn.us.

Validating N rates for corn on farm fields in southern Minnesota. University of Minnesota Extension Service. 2003. This publication describes the results of 29 site-years of research on farm fields in southern Minnesota to find the best rate of N to apply for corn after soybeans. Copies of this publication (number BU-07936-S 2003) can be ordered from the University of Minnesota Extension Service Distribution Center, 405 Coffey Hall, 1420 Eckles Ave, St. Paul, MN 55108-6068, or email order@extension.umn.edu.