

New TMDL Rule: Improving the effectiveness of an old tool

by Stefanie Miklovic

On July 11, EPA Administrator Carol M. Browner signed a new rule intended to clarify and strengthen the Total Maximum Daily Loads (TMDLs) program for improving water quality. "More than 90 percent of all Americans live within 10 miles of a polluted body of water," said Browner. "This program is designed to

"A significant change is that it moved the implementing process into the TMDL process."

-Howard Markus, MPCA

control the greatest remaining threat to America's waters—polluted runoff." EPA delayed the date the rule becomes effective to October 2001, as requested by Congress, to allow ample time for Congressional review.

In the beginning

TMDLs, or "pollution budgets," were mandated in 1972 by Section 303 of the Clean Water Act (CWA) as a tool for identifying and regulating sources of pollution to the nation's water bodies. EPA first issued regulations governing the establishment of TMDLs and identification of impaired waterbodies in 1985 and then revised them in 1992. The 1992 regulations required states to identify all water bodies in the state in which technology-based effluent regulations were not stringent enough to attain state-set water quality standards. Water bodies were ranked by their use and severity of pollution, and then studied to identify all sources of pollution (both point and non-point) and to establish

TMDLs that would reduce the pollution to meet water quality standards. Both TMDLs and lists of impaired waters were submitted to EPA for review every two years. If EPA disapproved of the TMDL or the list, then EPA was required to establish a new TMDL or list. States could then use the TMDLs to allocate pollution among sources, more specifically to determine allowable pollution discharges through the National Pollutant Discharge Elimination System (NPDES) program, and to develop voluntary and incentive-based programs for reducing non-regulated pollution loads.

By 1996, adequate progress toward improved water quality had not been made, leading EPA to establish a Federal Advisory Committee (FAC) to evaluate the TMDL program. This committee, composed of 20 members with interests ranging from the environment and agriculture to state and local issues, spent two years developing recommendations to enhance the program's effectiveness in improving the nation's water quality.

What lies ahead

EPA considered the FAC's recommendations and then announced the proposed rule in August 1999. The purpose of the ruling is to provide a framework through which EPA, states, and other interested parties can work collaboratively to achieve water quality goals. The new TMDL rule builds upon the old rule by strengthening its requirements through better definitions, and it introduces new requirements aimed at increasing the effectiveness of the overall process, as well as expediting

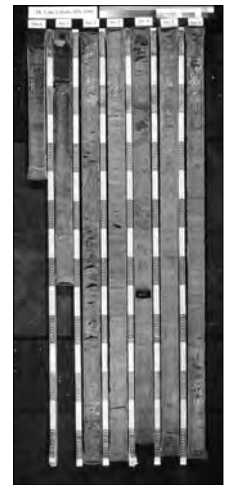
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Facility to protect lake cores for future research

Lacustrine sediment cores collected today will now be more accessible to scientists of the future, thanks to the new National Lacustrine Core Repository (LacCore) at the U of MN hosted by the Limnological Research Center (LRC) and the Large Lakes Observatory (LLO). This core facility, sponsored by the National Science Foundation (NSF), is modeled after existing ocean core facilities which house thousands of meters of marine sediment cores.

"The idea is to allow for cost-efficient, multiple uses of cores," said Doug Schnurrenberger, LRC Core Facility Scientist and new LacCore curator. "Scientists now can collect [lacustrine] cores with the knowledge that

Core facility continued on page 3



Example of core sections collected from Lake LaSalle, MN

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Around the state

WATER RESOURCES UPDATES

State-wide plan addresses NPS pollution

Seventeen technical committees comprising representatives from federal, state, local, and private organizations have been busy drafting Minnesota's 2000 Nonpoint Source Management Program Plan (NSMPP), which sets out a statewide approach for addressing major water quality problems from nonpoint source (NPS) pollution. If approved by the US Environmental Protection Agency, the five-year plan will ensure that the current annual funding level of \$6 million dollars will continue to come from federal Clean

Water Act Section 319 NPS funds to the State of Minnesota.

The purpose of the NSMPP is to determine five-year goals for addressing NPS water pollution in each of Minnesota's water resources and develop a comprehensive list of recommended action steps to be carried out during the five-year window. Only activities listed in the NSMPP are eligible for 319 funds. The plan will also provide a tool for the Project Coordination Team, a team of 20 state, federal and local representatives that oversees the planning process, to determine 319 grant awards.

Public review of Minnesota's 2000 NSMPP will begin in November 2000. The draft NSMPP will then be posted on MPCA's web site and distributed to Basin Planning Committees throughout the State. For more information, contact MPCA's Coordinator of Minnesota's 2000 NSMPP, David L. Johnson, at (651) 296-6041 or by E-mail: david.l.johnson@pca.state.mn.us.

Program to help livestock producers meet feedlot permitting rules

The Water Resources Center and University of Minnesota Extension Service were awarded a Clean Water Act Section 319 grant to develop and implement an educational program to teach livestock producers about meeting new state feedlot rules. The rules, published in September 2000 and administered by the Minnesota Pollution Control Agency (MPCA), include requirements for feedlot registration, permitting, and operation. Almost all feedlots in the state are affected by the new rules.

Six regional training workshops for cooperating agency staff, Extension staff, and county feedlot officers will be held in

September for the purpose of preparing staff to present county information sessions to livestock owners, agricultural professionals, and other interested parties. These county-based educational workshops will begin in October and run through March 2001. A second set of regional and county meetings will be held in 2001, focusing on manure and nutrient management plans and other operational concerns. Producer-oriented packets containing manure and nutrient management manuals, workbooks and background information will be distributed for use in the county education programs.

The Minnesota Department of Agriculture, the MPCA, the Board of Water and Soil Resources, and the USDA Natural Resources Conservation Service are participating in the education program, ensuring that producers hear a unified message about how to meet feedlot requirements. This same group of organizations has also been cooperating with UM Extension in nutrient management education related to the federal Environmental Quality Incentive Program since 1997.

Scientists map deepest hole in Lake Superior

In July, Large Lakes Observatory (LLO) graduate student Deb Rausch and faculty members Nigel Watrus and Tom Johnson mapped the deepest hole in Lake Superior using the state-of-the-art multi-beam sonar system on the R/V Blue Heron research vessel. The researchers found that the deepest site in the lake (390 meters) is not a quiet environment. Widespread erosion of the lake floor was discovered, testifying to the occasional passage of "deep water storms." The cause, frequency, and duration of such storms is yet unknown.

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people in the future will use them.”

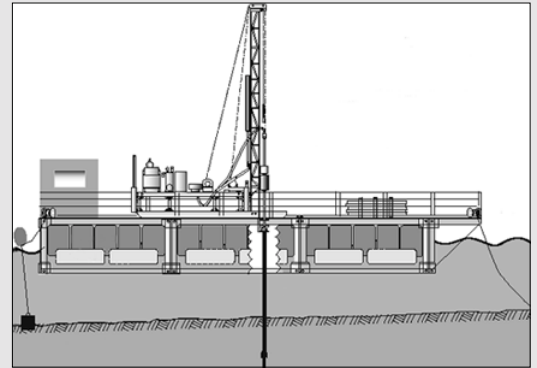
Ocean repositories that properly preserve and archive marine cores have existed for decades. The need for a similar lacustrine repository had not previously been recognized because most researchers have worked independently on cores, looking at only one or two aspects of each core collected, and because technology for drilling hundreds of meters of cores had not yet been developed, limiting most research to cores less than 30 meters in length.

“In the last 10 years, more and more of us have started to work collaboratively,” remarked Emi Ito, acting director of the LRC and new LacCore director. “In my case, in any given project, I routinely work with specialists in diatom, pollen, ostracode, charcoal, isotopes and trace elements, and with a hydrogeologist. So, coordination during sediment subsampling has become much more important.” The driving force that made immediate construction of the facility necessary, however, was the establishment of the Global Lakes Drilling Initiative (see inset). This initiative will involve the collection of hundreds of meters of core, samples that must be properly preserved. In May 1999, Ito, Kerry Kelts (former director of the LRC), Tom Johnson (director of the Large Lakes Observatory, UMD), and Schnurrenberger were awarded an \$832,276 grant from NSF-Earth Systems History to develop a prototype facility capable of storing 9300 sections of core (1.5 m each), and to establish an organizational infrastructure, database, and protocol for the facility.

“For [the repository] to be successful,” Schnurrenberger explained, “both the cores and previous data collected on the cores must be made available to scientists.” Core data published in national archives will be entered into a database and then published on the web. Researchers will have access to both cores and data after a moratorium period, which will allow for the completion of the initial study. LacCore will be run by LRC staff, but all procedures will be

New drilling system eases process for obtaining long lake cores

How do scientists acquire long sediment cores from modern lakes? Until recently, the answer has been through the use of grounded drilling rigs. These permanent structures can be costly to construct and operate, can limit the total number of cores collected at a site, and can limit the areas where long cores can be collected. Kerry Kelts, former director of the U of MN Limnological Research Center (LRC), the University of Arizona, and Drilling, Observation and Sampling of the Earth’s Continental Crust, Inc. (DOSECC), recently designed and constructed a drill rig and modular barge



General configuration of the GLAD800 drilling system, consisting of a drilling rig and barge.

system (GLAD800 drilling system) to alleviate these problems. The new system can easily be disassembled, reassembled, and expanded, allowing a **GLAD800** con't on page 6

determined by an NSF External Advisory Group composed of scientists from around the country who represent various earth system history interests.

What will the repository do for the paleolimnology field? “When the initial core descriptions are being done on these long cores, the researchers are likely to be all there pitching in and looking at the cores. When scientists with different expertise are looking at the core and discussing what they intend to analyze, new insights are likely to be gained,” explained Ito. “Because the metadata for each core will be publicly accessible, scientists who are not members of the original research team will be able to access the material. This does not mean that it has been impossible to do so, but rather that there will be material that can be sampled by another investigator at a later date.” Such a system will not only allow future studies to build upon previous work, but will also allow research to develop on lakes that become inaccessible in the future due to political unrest or cost.

Construction of the new prototype facility, a prefabricated cold room located at the LRC’s Field Equipment Storage

Facility, is scheduled for completion at the end of September. If NSF approves the prototype facility after three years, construction of a larger facility with capacity for 100,000+ core sections will be pursued.

Ito hopes eventually to see the construction of an underground repository adjacent to the LRC core lab, which is located six floors underground in the Civil Engineering building on the East Bank campus. An underground facility would present an ideal location for archiving cores since the natural insulating effect of the ground would reduce the amount of energy needed to keep the cold room at 4° C, and would prevent the cores from freezing, which is the greatest danger to core preservation. Close proximity of such a facility to the state-of-the-art LRC core lab would also increase the number of visiting scientists to the lab. “The opportunity to interact with different scientists will be very good, not just for our students but for the faculty and research associates as well,” said Ito. For more information, contact Doug Schnurrenberger at 612-626-7889 or by E-mail at laccore@tc.umn.edu.

A comparison of new and old TMDL regulations

<i>New Rule (scheduled to become effective October 1, 2001)</i>	<i>Old Rule</i>
TMDL Implementation Plans TMDLs must include an implementation plan that defines specific steps to be taken to restore polluted waters on a specific schedule.	TMDLs did not require implementation plans.
New Commitments to Reducing Nonpoint Pollution Implementation plans must provide a demonstration, or "reasonable assurance," that measures to reduce pollution from nonpoint sources will be implemented.	Specific commitments or demonstrations for implementation were not required.
Schedules for Attaining Water Quality Standards Implementation plans must identify a date by which the state expects that water quality standards will be attained. This date must reflect a goal of meeting water quality standards within 10 years of establishment of the TMDL (when practicable).	Plans did not address schedules for attainment of water quality standards.
Schedules for Developing TMDLs States must develop TMDLs as expeditiously as practicable, but not later than 10 years after July 10, 2000 or 10 years after the date of listing for waters listed after that date. If this schedule is not practicable in a given state, an extension up to 5 years may be granted.	States had to set priorities and identify TMDLs that they expect to develop over the next two years.
Schedules for Implementing Pollution Control Measures Require that a schedule provide for implementing controls within 5 years when practicable.	Schedules for implementing nonpoint source controls were not addressed.
EPA Backstop of TMDLs EPA must develop TMDLs when EPA disapproves of a submitted TMDL, or when a state fails to make substantial progress under an approved schedule. EPA must complete a TMDL within 2 years after state failure, with an opportunity for up to a 2-year extension if the Administrator determines there is a compelling need for more time. EPA will give public notice of any such extensions.	EPA developed a TMDL only when a TMDL submitted to EPA was disapproved.
Comprehensive Listing of Polluted Waters A comprehensive listing of a state's polluted waters, including waters needing TMDLs, waters impaired by pollution, polluted waters with completed TMDLs, and polluted waters where existing controls will meet water quality standards before the next list is submitted (i.e., within 4 years) is required.	Lists included only waters impaired by pollutants and those still needing a TMDL.
Priority for Drinking Water and Threatened/Endangered Species States must identify and give high priority to waters where the problem pollutant is causing, or threatens to cause a drinking water system to violate a drinking water standard or where the waterbody supports threatened or endangered species, unless the state explains why a different priority is appropriate.	Drinking water problems and threatened or endangered species were not addressed.
EPA Backstop of State Lists of Polluted Waters and Schedules EPA must establish lists of polluted waters and schedules for TMDL development if EPA disapproves a submitted list/schedule and when a state does not submit a list/schedule by April 1, 2002 and every 4 years thereafter.	EPA established a list of polluted waters when a state list submitted to EPA was disapproved.
Expanded Public Involvement States must provide the public with notice and an opportunity for review and comment on lists of polluted waters (including methodologies) and modifications to these lists; also requires notice and opportunity for comment on TMDLs.	States provided notice on TMDLs in accordance with states procedures; EPA provided notice when EPA established lists and TMDLs.
Improved Water Quality Information and Greater Consistency of Data States must develop a methodology for assessing the health of waters and listing polluted waters including involvement of public and EPA. States are given the flexibility to combine two existing reports of polluted waters [under sections 305(b) and 303(d) of the Clean Water Act] if they wish to do so.	Information concerning methods was among other documentation to be submitted.
New EPA Authority for Permit Issuance in Waters with TMDLs EPA can object to and reissue expired state NPDES permits for waters not meeting water quality standards.	EPA had no procedural mechanism to assure that expired NPDES permits that needed to be reissued in order to implement a TMDL were reissued.

—Excerpted in part from testimony given by J. Charles Fox, Assistant Administrator for Water, US EPA, before the subcommittee on Oversight, Investigations, and Emergency Management; committee on Transportation and Infrastructure, US House of Representatives on July 27, 2000.

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improvements made in water quality. "A significant change [to the new rule] is that it moved the implementing process into the TMDL process," said Howard Markus, Minnesota Pollution Control Agency (MPCA). "It also greatly increased the requirements for public participation."

Under the new rule, TMDL reduction plans will include: a methodology for assessing the health of polluted waters, a comprehensive list of all the state's water bodies that are found to be impaired by pollution, an implementation plan defining specific steps for restoring each polluted water body, and schedules for developing the lists and TMDLs, and for obtaining water quality standards for each water body. Results of each step in the TMDL process must undergo public review and EPA approval. The rule also requires that measures to reduce pollution must target both point and non-point source pollution, and that first priority be given to waters used for drinking water or supporting threatened or endangered species. If the states do not complete the tasks adequately or within the scheduled time, EPA must perform the task within an allotted amount of time (see page 4 for a comparison of the old and new rules).

Since the proposed rule was announced, opposition by members of Congress, agricultural interests, forestry, environmental groups, and other interested parties has grown. Some critics have questioned whether EPA is focusing too much effort on the TMDLs and ignoring other CWA programs aimed at improving water quality, or whether they are trying to supersede state authority. Others have expressed concern over definitions of terms such as "loading" and "pollutant," and whether required tasks are realistic in terms of available technology, time, and resources.

Over 34,000 comments from a 150-day public review period were considered for the new ruling, as well as input from state and local agencies and organizations, and groups from business, industry, agriculture, and forestry interests. Revisions made to the ruling give states more

flexibility in implementing the TMDL program and remove provisions that would have required new permits for forestry, livestock, and aquaculture operations (which are regulated by the CWA's NPDES program).

What the ruling means to Minnesota

The first impaired waters list for Minnesota was submitted to EPA in 1998, and contained 130 water bodies. MPCA is currently working to develop TMDLs for all 130 water bodies. Although implementation plans are not yet required as part of the TMDL process, several of the water bodies already have implementation plans in process, due to work done in cooperation with local groups and other agencies.

How will the new ruling affect Minnesota? "I believe the main change will be to upgrade the implementation planning for each completed TMDL reduction budget plan," said Markus. He explained that plans will now be more detailed, contain more defined schedules, and face more rigorous scrutiny.

"The only way this rule will be effective is through local initiatives," commented Markus. Markus noted that although the rule calls for measures to be taken toward mitigating non-point source pollution, neither state nor federal agencies have the authority to regulate activities that lead to such pollution. Measures taken will thus consist of education and pollution reduction incentives. "When people come to understand that these problems are real and that they are part of the problem, they will come to care about cleaning up their resource. People do care about having a clean environment. When we [MPCA] make a good case [that a problem exists], people will want to work on these problems."

The rule has been upgraded to "major rule" status, allowing Congress ample time to review it. It is scheduled to become effective October 1, 2001, meaning effects of the rule are not likely to be seen until 2002, when the states must submit their next list. To view the final rule, visit <http://www.epa.gov/owow/tmdl/finalrule/finalrule.pdf>.

Water Resources Science graduate awarded fellowship

Brent Dalzell, Water Resources Science graduate, was recently awarded a USDA National Needs Fellowship to pursue a Ph.D. degree in Earth and



Atmospheric Science from Purdue University. This three-year fellowship will allow Dalzell to study the role of wetland and ripar-

ian systems on water quality, stream geomorphology, and aquatic biota.

Dalzell recently completed his Master's degree in Water Resources Science, working under advisers Prasanna Gowda and Dave Mulla, Department of Soil, Water, and Climate. His research focused on using an integrated spatial-process model to simulate and evaluate non-point source pollution in the lower Minnesota River Basin. Dalzell plans to continue working with hydrological modeling at Purdue, but will turn his attention towards coupling wetland and agricultural models to determine the influence of wetland type, size, and spatial patterning on water quantity and quality from agricultural watersheds.

"I'm excited about the fellowship," said Dalzell, "because it opens the door to opportunities that I hadn't previously considered. It forced me to consider things that I had taken for granted such as the benefits of attending a different institution and the opportunity to expand my research."

Dalzell received one of two prestigious National Needs Fellowship awards granted by Purdue. USDA sponsors these awards, which are delivered through university programs throughout the U.S.



Minnesota Water Community News

Ira Adelman (Fisheries and Wildlife), **Deborah Swackhamer** (Environmental and Occupational Health), **Peter Sorensen**, and **Heiko Schoenfuss** (Fisheries and Wildlife), will serve as PIs on a new grant entitled, "Assessing the Validity of Vitellogenin as a Biomarker of Endocrine Disruption in Populations of Fish." Their project won funding through a national competition by the National Sea Grant Program of NOAA. **Adelman** has also been elected future President of the American Fisheries Society. He will be second vice president this year, progressing in three years to become President.

Deborah Swackhamer has been promoted to Full Professor in the School of Public Health, and has also been appointed by the International Joint Commission of the Great Lakes to a three-year term on their Scientific Advisory Board. In June, **Swackhamer** and **Thomas Jabusch** (Water Resources Science) attended the Gordon Research Conference on Environmental Sciences: Water, held at Holderness School in New Hampshire. **Jabusch** presented a poster entitled, "Predicting bioaccumulation of organic chemicals in phytoplankton: measurement and evaluation of octanol/water and lipid/water partitioning coefficients."

Doug Ricketts, Tom Johnson, and Kate Whittaker (Large Lakes Observatory) conducted field work on Lake Issyk Kul in Kyrgystan in August. Issyk Kul is the eleventh largest lake in the world, and is situated next to the beautiful Tien Shan Mountains near the Chinese border. The group will be mapping the lake floor and collecting sediment cores for paleoclimate research. NSF provided the funds for the project.

Kathy Draeger (Water Resource

Science) attended the 10th World Water Congress in Melbourne, Australia, in March and presented a paper entitled "Evaluation of Watershed Organizations and Indicators of Effectiveness in Addressing Water Quality Issues" at Watershed 2000 in Vancouver, BC in July.

John Kingston (NRRI/Ely Field Station) presented "A morphological evaluation and taxonomic transfer of *Fragilaria polygonata cleve-euler*" at the 16th International Diatom Symposium in Athens and the Aegean Islands, Greece, in August.

Tim LaPara has joined the environmental engineering science faculty in the Department of Civil Engineering. He received his Ph.D. from Purdue University, where he also spent the past year as a postdoctoral fellow. His area of specialization is environmental microbiology, including the application of molecular biology tools in environmental engineering.

Lorin Hatch, previously a postdoctoral research associate in the WRC, has been appointed as an interim assistant professor in the Department of Forest Resources for the coming year. He replaces **Jim Perry** who was appointed Interim Head of the Department of Fisheries & Wildlife.

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single rig unit to collect long lacustrine cores from lakes around the world.

The GLAD800 drilling system, constructed by DOSECC through funding by the International Continental Drilling Program (ICDP), uses wire-line technology from the mining industry to obtain long cores. The rig is composed of a modified Christensen CS 1500 diamond coring rig supported by a barge. The de-

sign of the system allows it to be deployed in up to 200 m of water, and to collect 6.2 cm diameter cores up to a depth of 800 m (water + sediment). The design also allows the drill to be operated from different floatation systems or to be used on land as a typical diamond core rig.

Testing of the rig began in August on the Great Salt Lake in Utah. DOSECC drill operators will collect a total of 1200 m of cores (ranging from 50 m to 700 m in depth) from eight locations on the lake and then hand them over to a team of scientists including Kelts and Doug Schnurrenburger (LacCore curator and LRC scientist), to be prepared for shipping to the new National Lacustrine Core Repository (LacCore) at the University of Minnesota. Analysis and archiving of the cores, funded by NSF, will occur at the LRC core lab and the new repository (see article on page 1).

Cores collected from the Great Salt Lake Drilling Project will later be used for paleolimnological research ranging from local concerns such as neotectonic events in the Great Salt to global concerns such as climate change. To identify long-term records of climate change, the cores can be compared to ocean and ice cores, as well as other lake cores. "We've been limited by technology to the past 20,000-30,000 years," said Schnurrenburger. "This new system will now allow us to extend the paleoclimate records back into the past millions of years."

Once testing is completed, the GLAD800 drilling system will be made available to researchers in a wide spectrum of disciplines from around the world whose research is approved by NSF and ICDP. UMD Large Lakes Observatory director Tom Johnson is scheduled to be the next researcher to use the rig for his study of Lake Malawi in Africa in 2002.



Upcoming Events

33rd Annual Water Resources Conference

On October 30, the Minnesota Section of the American Society of Civil Engineers and the U of MN College of Continuing Education will sponsor the 33rd annual Water Resources Conference held on U of MN's St. Paul campus. The topic for this year's conference is non-point source pollution (NPS), more specifically hypoxia and the role TMDLs play in alleviating the effects of NPS pollution. Other topics such as restoration, water quality, and long-term water quality monitoring will also be examined.

Aspecial workshop, entitled "Using Natural Resources Conservation Service (NRCS)-Based Methods for the Design of Detention and Retention Basins," will also be held on October 31 for engineers responsible for the design and review of detention basins based on NRCS methodology. The program will provide practical information and cost-effective ways to design detention and retention facilities.

For more information on either the conference or the workshop, contact Bev Ringsak at (612) 624-3720 or E-mail: bringsak@cce.umn.edu.

September 27. **Metro Children's Water Festival.** MN State Fairgrounds, St. Paul, MN. Approximately 1200 fifth-grade students from the Twin Cities will learn about surface water, nonpoint source pollution, safe drinking water, wetlands, fish, macroinvertebrates, and other water-related topics. Contact Barb Liukkonen at (612) 625-9256 for more information.

September 28-30. **The Bonds Between**

Women & Water. Duluth, MN. This interdisciplinary conference will bring together scholars, artists, policy makers, and members of the community to explore the multiple and diverse ways women and water are connected. Visit http://www.d.umn.edu/women_water for more information.

October 17-19. **45th Annual Midwest Ground Water Conference.** Columbus, OH. The conference provides an opportunity for hydrogeologists, geologists, engineers, students and others studying ground water resources in their respective states to meet and exchange ideas, discuss mutual problems affecting the Midwest, and summarize results of field and laboratory studies. Contact Mike Hallfrisch, Ohio DNR, Division of Water at (614) 265-6745 or E-mail: mike.hallfrisch@dnr.state.oh.us.

October 19. **Bell Live!** Minneapolis, MN. Live satellite broadcasts from the North Shore offer a behind-the-scenes glimpse of science in action as researchers and students explore the great lake. Learn about lake effects, water quality, exotic species, and human impact in this ecosystem. For more information, call (612) 624-9050.

November 4-5. **A Superior Chattaqua.** Two Harbors, MN. This purpose of this workshop, sponsored by the University of Minnesota's Large Lakes Observatory, is to allow Lake Superior researchers the opportunity to share new ideas, formulate initial questions, and establish new collaborations with other members of the Lake Superior research community. Contact Elise Ralph at eralph@d.umn.edu for more information.

November 13-15. **Asking the Right Questions: Evaluating the Impact of Groundwater Education.** Nebraska

City, NE. This conference of the Groundwater Foundation will discuss effective strategies for evaluating the impact of groundwater education and other natural resource programs. For more information, contact Cindy Kreifels at (800) 858-4844 or E-mail: cindy@groundwater.org.

November 14-16. **Environmental Permitting Symposium II.** Chicago, IL. This international symposium will provide a technical forum for environmental professionals to share experiences and knowledge concerning permitting activities for sources of air and water pollutants and waste facilities and to discuss legal and regulatory requirements. Visit <http://www.awma.org/awma/confs/descriptions/permit2.htm> for more information.

December 3-6. **62nd Midwest Fish and Wildlife Conference.** Minneapolis, MN. This conference is the largest gathering of fish and wildlife professionals in the Midwest. Visit the conference website at <http://midwest2000.fws.gov> for more information.

December 5-6. **Environmental Strategies for Aquaculture Symposium.** Minneapolis, MN. This symposium, held in conjunction with the Midwest Fish and Wildlife Conference, will provide environmental regulators and groups with an opportunity to learn more about aquaculture, which includes both private and government-run facilities, in the North Central Region. It will also provide a forum where governmental regulators and environmental groups can express their specific concerns regarding the impacts of aquaculture on the environment. For more information, visit <http://midwest2000.fws.gov>, or contact Ron Kinnunen at (906) 228-4830 or E-mail: kinnunen@msue.msu.edu.



New Publications

Minnesota Environment 2000. MPCA. 2000. This report presents a snapshot of Minnesota's environment in both the past and present. It also looks at the environmental challenges faced both statewide and in geographic regions across the state. Available at <http://www.pca.state.mn.us/about/pubs/mnreport/index.html>

Rivers: Ribbons of Life. Arrowhead Water Quality Team. This 22-minute video describes the value of riparian zones and how they can be protected. Available on loan from county extension offices and water plan coordinators in Minnesota, and from UWEX basin educators in Wisconsin. For ordering information, call 800-876-8636.

Significant Floods in the United States During the 20th Century - USGS Measures a Century of Floods. USGS. 2000. This fact sheet lists 32 of the most significant floods in the United States during the 20th century and provides internet sites for acquiring near-real-

time streamflow data and other pertinent flood information. Visit <http://ks.water.usgs.gov/Kansas/pubs/factsheets/fs.024-00.html>.

Effect of Stream Channel Size on the Delivery of Nitrogen to the Gulf of Mexico. USGS. 2000. This study reveals evidence supporting the theory that nitrogen pollution is naturally removed from water much more rapidly in small stream than in large rivers. The report is available at <http://water.usgs.gov/nawqa/sparrow/nature/nature.html>.

BEACH Watch Survey Report. US EPA. 2000. This report contains data from the third annual National Health Protection Survey of Beaches, conducted for the 1999 swimming season. Available at <http://www.epa.gov/ost/beaches/2000update/>.

Putting the Pieces Together: State Nonpoint Source Enforceable Mechanisms in Context. Environmental Law Institute. 2000. This document

contains a set of 8 case studies designed to assess how enforceable mechanisms are used in practice. Visit <http://www.eli.org/bookstore/rri Statenonpointsourceenfmec00.htm> for more information.

The Quality of our Nation's Waters. US EPA. 2000. This brochure summarizes the National Water Quality Inventory: 1998 Report to Congress document. Available at <http://www.epa.gov/305b/98report/98brochure.pdf>.

Liquid Assets 2000: America's Water Resources at a Turning Point. US EPA. 2000. This report explores the current condition of the nation's water resources and demonstrates the link between clean water and a strong economy by focusing on specific businesses and activities that rely on clean water. Available at <http://www.epa.gov/ow/liquidassets/index.html>.

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