

June 1998

University Lake Core Facility is one of a kind

It's amazing how much one can learn from mud. It's a well-kept secret for most of us, but for researchers at the University of Minnesota's Limnological Research Center Core Facility, lake sediments reveal the climate, hydrology and ecology of ancient landscapes. LRC Core Facility Director, Kerry Kelts, passionately describes lake sediments as "the history pages of past global climate change." As lake sediments accrue over time, their physical, geological, chemical and biological components reflect the prevailing conditions of the surrounding environment at the time of deposition, much like tree rings reflect the occurrence of fires, drought and disease. The LRC Core Facility, which encourages the study of lake, wetland, and bog cores, was born in 1991 when Kelts came to the University and is the only one of its kind in the country. Researchers from around the world come to work in this open laboratory that serves as an international role model for interdisciplinary training and research on global change and regional environmental dynamics.

Limnology is a global science, and lakes are like small oceans, very complex systems. The Core Facility uses this notion to take an ocean science systems approach to paleolimnology rather than a disciplinary approach. The facility provides, in one lab, all the basic technologies needed for complete initial core studies, like those on an ocean drilling vessel. Research at the LRC Core Facility covers a wide variety of subjects under the broad umbrella of paleolimnology. Although much research focuses on paleoclimate problems, cores are used for a variety of other scientific inquiries, especially those requiring time-based studies such as pollution, history, evolution, agriculture, human disturbance, and fires. Basic core analyses include physical parameters such as particle size, organic matter content, and water content as well as detailed documentation of the sedimentary matrix. These parameters are then used to assess general patterns in the cores in preparation for more complex analyses.

The 4000-square-foot lab includes 37 independent equipment stations and operates not as a segmented facility but as a single integrated instrument. The lab is open to any qualifying scientist or graduate student for only a small user fee. "Often individual instruments are available in individual faculty labs, but accessible through mutual interest. Here all equipment is accessible and individuals use the lab to serve their own purposes; they do not need to be in collaboration with me," said Kelts. The result is a cost-efficient lab that provides a pool of collective expertise. In May, Tom Johnson of the Large Lakes Observatory in Duluth joined colleagues from around the world to do an intensive week's work on sediment cores collected in March 1998 from Lake Malawi in Africa. Such short but intense "core parties" foster interdisciplinary interactions that Kelts says are a major goal for the facility.

To operate a facility such as this requires a substantial amount of supervision. The scientist in charge of such responsibilities is Dr. Douglas Schnurrenberger, a newly appointed core facility scientist who began work June 1, 1998. "He is not only a first-class scientist in charge of managing the facility, but a partner in core analytical training and expertise," stated Kelts.

Minnesota Water '98 Frames New Challenges for Drinking Water

Over 300 people attended "Protecting Minnesota's Water Supplies," the sixth biennial Minnesota Water '98 conference sponsored by the Minnesota Water Resources Center. Speakers representing federal, state and local government agencies and non-government organizations came together in Minneapolis for the 2-day conference held on May 5-6.

Plenary speakers addressed a broad spectrum of topics from assessments of Minnesota's drinking water to infrastructure issues and problems with disinfection by-products, while issues such as chemical contaminants, disaster prediction, advances in treatment technology, and rural water systems were discussed in the 16 break-out sessions. Surface water protection, hydrologic studies and groundwater characterization pervaded the 43 presentations displayed during the two poster sessions.

Anne Barry, commissioner of the Minnesota Department of Health (MDH), gave a favorable assessment of Minnesota's drinking water in the first plenary session. Quoting a new MDH report on the state of Minnesota's drinking water supplies, Barry reported that more than 85% of the 9,000 public and 750 municipal wells in Minnesota have no problems with contamination. She continued to say that during the floods of 1997 and this year's tornadoes, the drinking water supplies in the

affected areas remained virtually unscathed. The relatively low incidence of contamination and the resilience of the drinking water distribution systems during catastrophic events is testimony to the effectiveness of Minnesota's water treatment, the dedication of water utility employees, and the high quality of Minnesota's water infrastructure, said Barry.

Barry highlighted public complacency regarding drinking water as a major challenge to maintaining high drinking water standards. With emerging problems such as cryptosporidium and chlorination by-products, Barry stressed that Minnesota needs to remain vigilant in its efforts to ensure safe drinking water. However, Barry warned against the dangers of an alarmist approach when addressing new problems in drinking water.

Agreeing that neither a complacent nor an alarmist approach will ensure the safety of drinking water, plenary speaker Eric Olson, an attorney for the Natural Resource Defense Council in Washington, D.C., stressed the need for continued investment in water quality.

Olson explained that a common ground between the two extremes must be found in order to tackle future challenges of drinking water. "We are entering a new era of water treatment, and nothing is driving this change as much as emerging microbial pathogens and disinfection by-products," he said. Olson commended Minnesota and the other communities around the United States who have invested the money to maintain and upgrade their drinking water facilities. However, he was quick to point out that many communities in the United States have not made these efforts. "Several communities are living off the investments made by their grandparents in the earlier part of the century when water treatment was first initialized in this country."

On a similar note, plenary speaker Phil Singer, a professor at the University of North Carolina, cast these new threats in an optimistic light by saying that they can be eliminated or severely reduced by integrating new technologies into water facilities.

Integrating these new technologies will not be an inexpensive task, as Olson pointed out. "The changes required to upgrade or renovate treatment facilities will not come cheap to Americans. It will take a significant investment." He quoted an EPA report that said, "It is estimated to take at least \$130 billion in capital investment over the next 10 to 20 years to bring America's drinking water facilities into the new millennium". To raise and spend this amount of money will require the support of the general public, and the only way to do that is to make sure that the public is informed about drinking water issues, Olson said.

Disinfection By-products (DBPs)

Issues surrounding disinfection-by products received considerable attention in the plenary talks, as well as in several break-out sessions. With the vast majority of water-treatment facilities using chlorination, by-products of chlorination are ubiquitous in drinking water.

Chlorine has been used for drinking water disinfection since the turn of the century. It wasn't until the 1970s that it was discovered that chlorine reacts with natural organic material (NOM) to form substances such as trihalogenated methanes (THMs) and haloacetic acids (HAAs), which are believed to be carcinogens. Quoting an EPA report about recent studies that link increases in colon, bladder, and rectal cancers to certain chlorination by-products, Olson talked about the mounting evidence indicating the potential health risks of disinfection by-products. According to the report, an estimated 9,000 people die each year from cancer believed to be caused by disinfection by-products. "That is more than twice the number of people who die in fires each year. This is not an insignificant number, if these estimates are anywhere near accurate," said Olson. While epidemiological studies like these are the first of their kind, they raise questions about the safety of our current methods of disinfection.

The growing concern over disinfection by-products also raised questions about current drinking water standards. It was pointed out that current EPA drinking water standards are based either on the average values of repeated testing or on occurrence data (data based on how often a contaminant occurs in nature) rather than on the health risks associated with the by-product. Olson amplified this point by referring to the recent studies conducted in California and New Jersey that suggest that consuming water containing even a small amount of disinfection by-products, lower than the legal limit allows, may significantly increase the incidence of spontaneous abortions and birth defects.

In addition to the issues concerning the basis of contaminant standards, the methodology used to establish these standards also met serious criticism at the conference. Both Olson and Singer pointed out that current drinking water standards are not established for the most vulnerable populations (infants, pregnant women, and the elderly) but are based on a 70 kilogram adult.

With an ever-increasing focus on the control of drinking water disinfection by-products, alternative disinfection practices received ample attention at the conference. Two break-out

sessions addressed advances in treatment technologies. Raymond Hozalski , a professor from the University of Minnesota, talked about both the advantages and disadvantages of the most promising alternative, ozone disinfection.

Ground Water Protection

Although groundwater protection received little attention in the plenary sessions, a poster session and several break-out sessions focused specifically on these issues. As the demand for water supplies increase, groundwater is being used more readily as an alternative or supplement to existing surface water supplies. Speakers addressed the notion that long-term reliability of groundwater requires a full understanding of the groundwater regime, the use of correct and appropriate technology for location and abstraction, and reliable maintenance procedures.

Tuesday's luncheon speaker, Kevin McCormack of the Environmental Protection Agency, described the importance of the Well Head Protection Program, a preventive program aimed at keeping containments from entering public water supplies, in ensuring safe drinking water. Gary Oberts from Metropolitan Council and Eric Mohring of the Minnesota Board of Water and Soil Resources chaired a break-out session focusing on the issues of groundwater in the Twin Cities Metropolitan Area.

Privatization

Bill Kellogg, of Camp, Dresser, & McKee, Inc., and Marty Jessen of U.S. Filter, Inc., led a panel discussion on privatization. Privatization of water facilities in the United States is one of the fastest growing businesses in the environmental sector, in part because it can increase overall efficiency in some cases. Several local water utility managers from across Minnesota spoke in the break-out sessions about the challenges they face due to privatization and the methods they are employing to increase efficiency within their facilities.

University Research Important to EQIP Success

Minnesota farmers and landowners are teaming-up with locally-led conservation efforts to improve the natural resources of their farms and surrounding areas thanks to the Environmental Quality Incentives Program (EQIP), a federally-funded program to promote volunteer stewardship on the farm.

Each landowner in the program first meets with a consultant to develop a comprehensive conservation plan. Then, through cost sharing and incentive payments, farmers work with local groups to implement the conservation plan over a 5- to 10-year period.

Critical to the success of EQIP is the input of quality research-based information concerning the impacts of various management practices on natural resources. Researchers at the University of Minnesota have been investigating these impacts for years, and through the University of Minnesota Extension, this expertise is reaching landowners in the EQIP program.

As the new EQIP Extension Educator for Southeast Minnesota, Kevin Blanchet coordinates activities between Extension and other agencies on general EQIP education in such areas as crop nutrients, pest control, grazing and tillage management. Blanchet also develops model management plans that farmers and their consultants can use or review when creating farm-specific plans. In addition, he provides educational assistance and support for local citizen conservation groups.

As Blanchet sees it, a lot is riding on the success of EQIP. Failing to achieve results with incentive-based programs like EQIP, says Blanchet, will mean a stronger regulatory approach to addressing environmental problems in agriculture in the future.

Civic Organizing*

The concept of "civic organizing" is based on five core values. These are a belief in human capacity, belief in democracy, belief in active citizenship, belief in political competence, and a belief in institutional efficacy (see sidebar article). A new joint project between the Met Council, the University of Minnesota Extension Service, the Minnesota River Basin – Joint Powers Board, and county partners in the Lower Minnesota River Watershed is using this conceptual framework in an attempt to create a watershed-wide problem-solving approach to the issue of water quality in the Minnesota River.

The thrust of this two-year project is to build on existing technical work pertaining to water quality in this watershed. The way this will be done is by first building a base of practitioners willing to incorporate the principles of civic organizing and active citizenship into their work. These practitioners will include both technical experts as well as leaders from other major sectors of the watershed community (i.e. faith, education, civic organizations, private business, government).

Step One in building this base will begin in June when a small group of individuals representing technical and community perspectives gather to discuss civic organizing and active citizenship principles, the implications these have for their work, and places in their work where they might thoughtfully and purposefully integrate these concepts. At a later date (likely September) these individuals will present on their successes (and failures) with this effort. A variety of people from throughout the basin will be invited to that gathering. This process of recruitment, commitment to action, sharing and learning will be repeated as part of the overall project cycle. Upon conclusion of the two-year project the goal is to have a base of practitioners large enough to sustain the civic organizing and active citizenship efforts and carry them back to the various places in which citizens of the watershed spend their time.

Hired to work with this project is Mr. Roger Reinert. Roger has been an Extension Educator for the past three years. Activities relating to his current position include chairing Extension's Leadership and Citizenship Education Specialization and being a member of the Active Citizenship Initiative leadership team.

***Civic Organizing Framework. Peg Michels, Civic Organizing, Inc. and Tony Massengale, Center for Civic Capacity Building.**

The Five Core Values of Civic Organizing*

- **Belief in Human Capacity**
A belief in the people: That every individual has the capacity to grow, to produce, to be ethical and to be a co-creator in the world.
- **Belief in Democracy**
A belief in democracy as the best form for human governance. Democracy is rule by the people. It requires a belief that people have the capacity to discern, to produce and deploy resources, and to create rules that honor the tension between the parts and the whole.
- **Belief in Active Citizenship**
A belief in the role of the citizen as a governing member rather than a citizen as legal status. In a democracy, citizens are obligated to contribute to the well-being of the whole. As a result of their contributions, citizens also share in the benefits society has to offer. Individuals learn and practice active citizenship in institutions of family, faith, community, work, learning, and governance.
- **Belief in Political Competence**
Politics is the work of the citizen. In order to fulfill the obligation to govern, everyone must develop the political competence needed to take effective action.
- **Belief in Institutional Efficacy**
Institutions in a democracy are accountable for meeting the human need for family, faith, work, community, learning, and self-governance. When those needs are not being met through existing institutions, citizens are obligated to provide leadership for institutional transformation.

***Civic Organizing Framework. Peg Michels, Civic Organizing, Inc. and Tony Massengale, Center for Civic Capacity Building.**

Omnibus bill toughens feedlot regulations

PCA, BWSR, and DNR water-resources projects find needed dollars

After a tough fight over new feedlot regulations, the 1998-99 Omnibus Bill for environmental and agricultural spending was passed by both houses last month.

The new legislation contains several new feedlot regulations as well as extensive modifications of existing rules. Among the new provisions is a prohibition against issuing feedlot permits for the construction of open-air, earthen or flexible membrane-lined swine waste lagoons.

Under the new legislation, applicant experience will be critical to obtaining a permit. Even if proposed feedlots comply with new standards, the PCA can refuse a permit if the applicant is found to lack the experience needed to operate the facility in compliance with current regulations.

The bill also requires increased public involvement when the PCA conducts feedlot inventories or issues general National Pollutant Discharge Elimination System (NPDES) permits.

Total appropriations under the bill for the FY 98-99 biennium are \$17.24 million. The PCA will receive \$1.39 million for a variety of projects. These include several water-related efforts such as county feedlot grants, fish research, continued investigation of amphibian deformities and federal clean water programming.

Department of Natural Resources (DNR) appropriations total \$10.99 million for the biennium and include funds for the establishment of a whitewater kayaking, rafting and canoeing recreation area on the Mississippi near St. Anthony Falls.

The Board of Water and Soil Resources (BWSR) will receive a total of \$1.4 million under the new bill, including funding for the Quad Lakes restoration, dairy water quality grants and consolidation of existing shoreland and lake-related guidebooks.

Excerpted in part from the Senate Briefly, April 15, 1998.

Floodplain conservation approved for the Minnesota River

Minnesota Governor Arne Carlson's goal to have a fishable and swimmable Minnesota River by the year 2002 came a step closer when the Clinton administration approved the Conservation Reserve Enhancement Program (CREP) last month. The program will combine federal and state easement dollars to retire 190,000 acres of chronically flood-prone land along the Minnesota River. Eligible farmers will be paid approximately \$1,000 an acre to remove their land permanently from corn and soybean production, and their land will remain as private property. In the eyes of U.S. agriculture secretary Dan Glickman, who agreed to the federal participation, the program is a win-win situation for all parties involved from the federal government to the farmers.

Excerpted in part from Mississippi Monitor, March, 1998

Find Great Lakes temperature information with CoastWatch

Great Lakes surface water temperature information is just a few clicks of a mouse away. It's at the Sea Grant CoastWatch site on the World Wide Web: www.coastwatch.msu.edu.

The CoastWatch site shows temperatures in easy-to-understand graphic images of all the Great Lakes—Superior, Michigan, Huron, Erie and Ontario. It captures daily National Oceanic and Atmospheric Administration satellite transmissions and presents the most current information in the form of contour lines, called isotherms, on five lake-wide, 16 regional, and 42 port maps.

This information is important to anglers and commercial fishing operations for predicting where fish are likely to congregate, and to educators and students for limnology and map studies.

For more information, contact Gunderson at (218) 726-8715 or jgunderson@extension.umn.edu.

Experts implicate drainage in nitrate loading

In a recent technical forum on drainage, University of Minnesota and State researchers concluded that artificial drainage is increasing nitrate loads to streams. The event, which took place at the Minnesota Water '98 conference, was the third such forum since the floods of '97 sparked renewed interest in the effects of drainage on watershed hydrology and stream ecology. Nitrate loading is of particular concern because of its role in producing hypoxia in the Gulf of Mexico.

University professor Gyles Randall reported on studies conducted at the Southern Experimental Station in Waseca that illustrate the effects of cropping system and fertilizer application rate on nutrient loads. His data clearly showed that fields planted in row crops produced higher nitrate losses than fields supporting perennial vegetation. Increasing fertilizer application rate also resulted in higher nutrient losses in the experimental plots. While timing of application had a small effect on nitrate loss, tillage method did not seem to have any effect on nutrient fluxes from the farm fields.

Paul Wotzka, MPCA, discussed a recent study of a tile-drained corn-soybean field in Nicollet, MN, and drew similar conclusions regarding the effects of tile drainage on nitrate loading. Although nitrate concentrations did not increase with increasing flows, Wazeka found that the hydrology of the drained system was extremely flashy and resulted in rapid transport of nitrate off the field and into open ditches.

University professor E. Calvin Alexander discussed the effects of surface tile inlets on the hydrology and nutrient regime of drained fields. He explained that tile inlets are extremely effective at transporting water off the soil surface and that they speed up an already fast system. According to Alexander, the surface tile inlets reduce recharge to local groundwater systems and water lost to evapotranspiration. This water is delivered instead to surface waters.

Participants also discussed pros and cons of several ideas for mitigating the effects of tile drainage on nutrient loading. These included engineered drainage systems that can store water and reverse flow back onto the field in times of drought, and storage structures to facilitate denitrification and settling. While many who attended were optimistic at the notion of an engineering solution to the drainage-related nutrient problems, several participants pointed out that most options would force farmers to take significant amounts of land out of production.

U holds second technical Forum on drainage

A second technical forum on drainage was held at the University of Minnesota's St. Paul Student Center on December 16, 1997. Participants included personnel from federal, state and local agencies as well faculty members and graduate students from the University of Minnesota.

The technical forum had six technical presentations. Joe Magner of the Minnesota Pollution Control Agency summarized possible geomorphic impacts of increased flow. He reported that changes in channel width, slope, sinuosity and other characteristics should be expected with possible changes in flow rates from drainage activities.

Both Luther Aadland of the Minnesota Department of Natural Resources and E. Calvin Alexander revisited the issue of climatic vs. human influence in causing major flood events. While recognizing the importance of climatic factors, Aadland concluded that, for the Red River of the North, other factors such as drainage, channelization, and conversion to row-crop agriculture play a role in peak flows and that wetland and stream protection and restoration are viable means of moderating flood flows. Alexander, speaking about the Minnesota River Basin, concluded that the most important factor for floods is precipitation, but that row crop agriculture and drainage play a secondary role.

Randal Barnes of the University of Minnesota discussed process-based modeling and statistical analysis, highlighting the strengths and limitations of these two approaches.

Steve Taff of the University of Minnesota discussed the social dynamics of drainage. He proposed that drainage policy is a social science question and consequently managing drainage is really about managing people.

After considerable discussion, it was decided that at least two additional forums are needed to discuss the implication of drainage on water quality and on biotic communities.

Shoreland volunteers make a difference

Anyone who believes that volunteerism can't make a real difference should talk with the members of the Minnesota Shoreland Volunteer Program. Over the last few years, the group boasts an impressive résumé of accomplishments including sparking a \$100,000 shoreland revegetation demonstration and research project, increasing lake association membership by 200%, completing a comprehensive septic system survey and arranging for a co-op to mix fertilizers specially formulated for specific shoreland areas.

The Shoreland Volunteer Program, which was developed by the University of Minnesota Extension Service and is coordinated locally, brings people with expertise in managing shoreland together with the people who want that expertise—shoreland property owners. Over 250 volunteers have participated in the program in 18 Minnesota counties in the past 3 years.

The main purpose of the Shoreland Volunteer Program is to provide people with the knowledge, resources and motivation to become better shoreland stewards and to provide leadership for community stewardship efforts. "There is so much talk about the cumulative negative impacts of shoreowners." said Barbara Luikkonen, a water resources educator for the Water Resources Center. "The Shoreland Program shows that there can be cumulative positive impacts as well."

By providing accurate, research-based information and demonstrating ways to share that information, the Shoreland Volunteer Program gives property owners the tools to make a difference in the quality of their lakes and rivers. By making local contacts, initiating activities, and establishing a network to answer questions and provide information and assistance, trained volunteers become resources for their neighbors. And some of these neighbors even become volunteers themselves.

Volunteers complete a one-day training workshop, planned by a local committee that includes members from local government, Extension, state agencies and nearby lake associations. The format and content of each workshop is tailored to accommodate local needs, interests, and concerns, but all workshops include some basic information on limnology, aquatic vegetation, on-site wastewater treatment, communication, and what is expected of volunteers.

Following the workshop, volunteers commit a certain number of hours to shoreland stewardship activities. Surveys compiled by Extension suggest that most volunteers follow through on the action plans they develop at the workshops. Volunteers may work with youth, present programs to their lake association or other civic groups, speak out at county or township board meetings, distribute educational materials, write newsletter or newspaper articles, or simply talk with friends and neighbors about how they can better protect water quality.

In Sherburne, Stearns and Wright counties, a core of Shoreland Volunteers serve as a steering committee and contribute to a quarterly newsletter distributed by Extension. Other volunteers have begun shoreline revegetation projects or have simply stopped mowing their lawn right to the water's edge, allowing native vegetation to flourish, reducing erosion and filtering runoff. Some Shoreland Volunteers have initiated or revitalized water quality monitoring on their lake.

The Shoreland Volunteer program began in Itasca and Aitkin counties in 1994, when lake association members were interested in a program to help them become more involved in protecting water quality. From there, the Shoreland Volunteer Program has spread to much of east-central Minnesota: there are trained volunteers in Aitkin, Carlton, Chisago, Cook, Hennepin, Isanti, Itasca, Kanabec, Lake, LeSueur, Mille Lacs, Pine, Rice, St. Louis, Sherburne, Stearns, Waseca, and Wright counties.

The program is still relatively new, and will continue to evolve as it is adopted and adapted across the state. A guidebook that describes the program more fully is available from the University of Minnesota Water Resources Center (612-625-2282).

Exotic fish identification cards available for Great Lakes Anglers

The University of Minnesota Sea Grant Program recently reprinted two popular wallet-sized cards to aid anglers in identifying two exotic fish found in the Great Lakes, the round goby and the Eurasian ruffe. The cards explain why these fish are considered a problem, describe how to identify them, and explain what anglers should do if they find them.

Because regulations vary, each version contains a slightly different message regarding possession or transport of these exotic fish. Cards will be distributed through bait shops, marinas, public events, associations, environmental education organizations, and natural resource management offices. Single cards are free.

Individuals or organizations wishing to obtain cards should contact their state Sea Grant office, or their state or provincial natural resource management agency. For more information, or free cards, contact Jensen at (218) 726-8712, or by e-mail at djensen1@d.umn.edu.