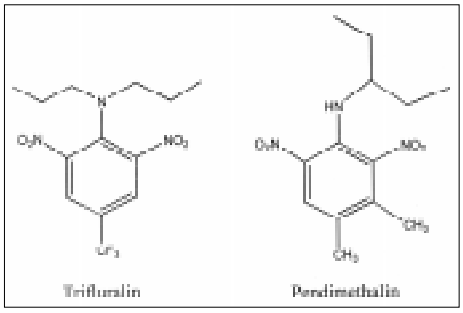
Four University grants awarded by the WRC

by Stefanie Miklovic

Four new research projects were selected for funding in the 2000 grant competition sponsored by the Water Resources Center (WRC). The four studies address issues of current concern in Minnesota: control of nitrogen and phosphorus fluxes from agricultural watersheds, quality of drinking water, and remediation of degraded waters. Funding for the projects is provided by the Water Resources Research Institutes program of the USGS, and the Center for Agricultural Impacts on Water Quality, a program of the College of Agricultural, Food, and Environmental Sciences.

Investigation of the abiotic reduction of the herbicides trifluralin and pendimethalin

Trifluralin and pendimethalin are dinitroaniline herbicides commonly used in Minnesota for agricultural purposes. As a result, low concentrations of both herbicides have been detected as



contaminants in groundwater, surface water, and air. The EPA classifies them as persistent-bioaccumulative toxins, but their environmental impact and potential threat to public health are not well understood. To investigate their fate in groundwater, William Arnold, assistant professor, Department of Civil Engineering, was awarded a grant to evaluate the potential role of abiotic reduction as a sink for these compounds under a variety of groundwater conditions. He also will identify transformation products resulting from such reactions so that potential environmental and human health effects of these compounds on the environment can be better understood.

Runoff water quality and crop responses to variable manure application rates

Incorrectly applied manure can lead to water quality problems such as reduced oxygen levels and high levels of fecal coliform bacteria. Studies have shown that applying manure at rates based on the

WRC Grants continued on page 5

The WRC finds a home

In February, the Water Resources Center moved to 173 McNeal Hall, 1985 Buford Avenue, St. Paul, MN 55108. Our phone and fax numbers remain the same (phone: 612/624-9282 and fax: 612/625-1263). Stop in and see our new facilities!

Looking Back; Planning Ahead

Minnesota Water 2000

The seventh biennial *Minnesota Water* conference, entitled "A Watershed Year: Looking back; planning ahead," will be held April 25-26 at the Minneapolis Convention Center. Sessions will focus on assessing the status of Minnesota's water resources as we enter the next century, reviewing what we've learned over the past 100 years, and integrating science, policy, management, education, and economics to explore the future of our water resources.

Plenary sessions will feature topics such as trends in water use, quality and management, and concurrent sessions will present more specific topics such as new tools for monitoring and case studies of present water issues. Other presentations will describe new findings and international perspectives in water resources.

For a summary conference program, see page 3.

In This Issue

Around the state

WATER RESOURCES UPDATES

LiMNology conference explores new technologies

The second annual LiMNology symposium took place in Siren, Wisconsin, on February 19-20. LiMNology, composed of limnological researchers from around the state, was created to provide an interdisciplinary environment for limnologists to study the struture and function of inland waters in a local and global context. The two-day retreat, entitled "LiMNology Science 2001: New Technologies," involved presentations describing how new technologies are advancing and aiding limnological research. Some of the new technologies discussed were high frequency sonar to map plankton distributions, real-time, web-accessed water quality data, stable isotopes, Landsat imagery, and the use of microstructure probes to measure turbulence.

The group also discussed goals and future activities for LiMNology, and agreed to continue community-building through retreats and seminars and through the development of connections with agencies working in the aquatic sciences. Proposed future activities include: (1) submitting a proposal to the National Science Foundation's (NSF) Integrative Graduate Education and Research Training (IGERT) program to support graduate student stipends and enhance their educational experience, and (2) investigating the prospects for becoming part of the National Ecological Observatory Network (NEON), a new NSF initiative that funds large infrastructure projects. For more information about LiMNology, visit the website: http://www.limnology.umn.edu.

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Water Resources Annual Conference Call for Abstracts

The Planning Committee for the 33rd Annual Minnesota Water Resources Conference is seeking topics and abstracts for presentation at the October 30, 2000 conference. This conference is attended by water resource professionals from both the government and private sector. Topics sought for this conference include: methods and design of bioengineering, Phase II of the NPDES stormwater regulations, methods for reducing runoff volumes, land use impacts on water quality, Best Management Practices (BMPs) to improve water quality, and wetland alterations and their impacts downstream. Brief abstracts should be submitted by March 17, 2000 to Bev Ringsak at 352 Classroom Office Building, 1994 Buford Avenue, St. Paul, MN 55108. For more information, contact Bev Ringsak at (612) 624-3720.

Minnesota Sea Grant College Program biennial request for proposals

The University of Minnesota Sea Grant College Program is soliciting proposals for coastal and Great Lakes research for the program period of February 1, 2001 through January 31, 2003. Proposals for research concerning improved understanding, use, and management of Great Lakes resources, particularly related to coastal Lake Superior and the adjacent region, will be considered. Proposals dealing with regional and national coastal problems, including biotechnology, coastal engineering, and coastal hazards, also are encouraged. University faculty are encouraged to develop collaborative relationships with other academic institutions within and outside of Minnesota, resource management agencies, and industries when developing their proposals, but principal investigators must be affiliated with an academic institution in Minnesota.

A letter of intent, including a brief abstract of the proposal containing a problem statement, objectives, approach, time frame, and tentative budget, must be submitted to the Minnesota Sea Grant office by March 17, 2000. Full proposals are due at Minnesota Sea Grant on or before May 1, 2000.

Full proposal preparation guidelines are available on the Minnesota Sea Grant Web site (www.d.umn.edu/seagr). For more information,contact Judy Zomerfelt at Minnesota Sea Grant, (218) 726-8106, or by e-mail: jzomerfe@d.umn.edu.

Looking Back; Planning *Ahead*

Minnesota Water 2000

April 25-26, 2000
Minneapolis Convention Center

Tuesday, April 25

Plenary Sessions I and II (8:55 - 12:15)

Minnesota's Water Unification Plan
Governor Ventura (invited)

National Trends in Water Quality, Policy, and Management
Robert Hirsch, USGS

Changes in Water Use in Minnesota
John Linc Stine, MDNR

Trends in Surface and Ground Water Quality and Quantity in Minnesota
Michael Sandusky, MPCA

Water Resource Management in Minnesota: Past Successes and Future Challenges
Gene Hugoson, Commissioner, MDA

Luncheon/Speaker (12:15 - 1:30)

Where Art & Science Meet - Engaging the Public in Water Resources
Betsy Damon, Keepers of the Waters

Concurrent Sessions I and II (1:30 - 5:00)

1A Water Supply and Wastewater Issues
1B Toxic Substances
1C Lake Pepin
1D New Tools for Monitoring and Modeling
2A Watershed Management: Policy and Economics
2B The Changing Face of Agriculture
2C Groundwater Investigations
2D Case Studies in Remediation

Wednesday, April 26

Plenary Sessions (8:30 - 9:45)

Evolution of Water Policy and Management in Minnesota
Ron Nargang, The Nature Conservancy

A Historical Look at Water Resources Science in Minnesota
Pat Brezonik, Water Resources Center

Panel (10:15 - 11:30)

How to respond to the challenges of future water resource management

Education
Jim Perry, Interim Head, University of Minnesota, Deptartment of Fisheries and Wildlife

State Legislation and Policy
Steve Morse, Minnesota Department of Natural Resources (invited)

Involving Citizens in Decision-Making
Peter Bachman, MN Center for Environmental Advocacy (invited)

Lunch/Poster session (11:30 - 1:00)

Concurrent sessions on issues (1:00 - 3:20)

A Drainage Issues in Water Management
B Rivers and Streams
C Lakes and Wetlands
D Ecological Indicators

For registration materials and more information about the conference, visit **http://wrc.coafes.umn.edu/water2000/.** The registration fee is $95 when postmarked before April 7; late registration is $110. One-day registration is $60, and student registration is $55 including luncheon ($30 without). Both must be postmarked before April 7.

Water on the Web:

Integrating real-time data with educational curricula through the internet

"Surfing the net" has a new meaning for students involved in a state-of-the-art, Internet-based water quality monitoring project. Water on the Web (WOW) allows high school and college students to monitor several Minnesota lakes and a major tributary to Lake Superior over the Internet and integrate the results with geographic information systems (GIS), data visualization, and in-depth educational materials.

WOW is a cooperative effort involving the University of Minnesota-Duluth Education Department, the Natural Resources Research Institute, Minnesota Sea Grant, and Apprise Technologies, Inc., and is funded through the National Science Foundation. WOW teaches students the fundamentals of science based on real-time data; trains teachers in advanced technology, including GIS, remote sensing, instrumentation, and use of the Internet; and improves communication and cooperation among local industry, agencies, and educational institutions. The goal is to help equip students with real-world skills they can use in college and beyond.

WOW is based on a new sampling device called Remote Underwater Sampling Station (RUSS), developed by Apprise Technologies in Duluth. It contains a solar-powered, on-board computer that is operated by remote control through cellular phone transmission. A leveling device attached to a multiprobe sensor moves up and down the water column measuring temperature, dissolved oxygen, pH, conductivity, and turbidity at depths up to 100 meters. The RUSS units typically are programmed to collect 1-meter-interval profiles at approximately 4-6 hour intervals seven days per week, but they may be programmed for additional event-specific sampling relevant to the time scale of nonpoint source pollution, such as continuous monitoring at a single depth before, during, and after a storm.

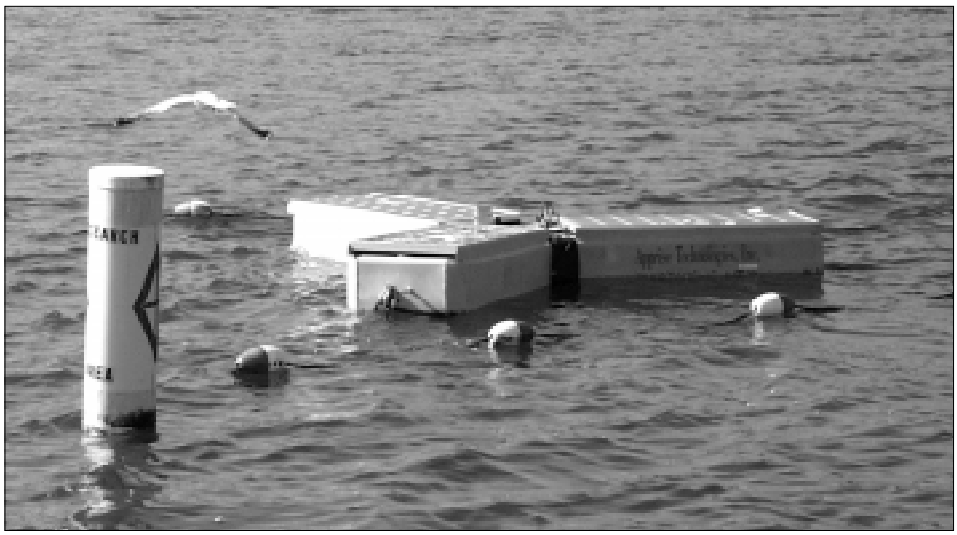

Photo courtesy of Apprise Technologies, Inc.

A Remote Underwater Sampling Station (RUSS) on Lake Independence.

Numerical data as well as interactive data visualization tools are available on-line, allowing students to investigate a lake's water quality by designing experiments and sampling programs and conducting interactive inquiries of lakes and watersheds. RUSS data also will be helpful to water resource managers because it can provide intensive data during critical time periods (storms and mixing). So far, RUSS units have been placed in Ice Lake (Grand Rapids), Grindstone Lake (near Sandstone/Hinkley), Lake Independence (near Minnetonka), and at two contrasting sites in Lake Minnetonka: hypereutrophic, intermittently-mixed Halsted Bay and well-stratified West Upper Lake where water quality is better. A unit intended for the St. Louis River will be installed early in 2000.

At lakes Minnetonka and Independence, NRRI and Sea Grant researchers are using RUSS in collaboration with the Hennepin Parks Department and the Minnehaha Creek Watershed District as part of a new study called LAKE ACCESS: Making Water Quality Data Real and Relevant for Minnesotans. The study is funded by EPA's Environmental Monitoring for Public Access and Community Tracking (EMPACT) program. This two-year project will provide near real-time and historic data, as well as interpretive information on lake water quality, to citizens and decision-makers. Data collected by three RUSS units will also be available through touch-screen computer kiosks located in local visitor centers and the Minnesota Science Museum. The project will provide a mechanism for public feedback into the local government decision-making process by giving them information relevant to their quality of life and increasing their understanding of factors affecting water quality in Minnesota's lakes.

For more information, visit the WOW website at http://wow.nrri.umn.edu, the LAKE ACCESS site at http://www.nrri.umn.edu/empact, or contact Bruce Munson, Minnesota Sea Grant and Department of Education, at (218) 726-6324, or George Host, Natural Resources Research Institute, at (218) 720-4279.

Article modified from a previous note in EPA's Nonpoint Source News - Notes Issure #59, November 99.

Water Resources Science student awarded Knauss Fellowship

The National Sea Grant College Program awarded the prestigious Dean John A. Knauss Marine Policy Fellowship to Jonathan Pundsack, a graduate student in the Water Resources Science program at the University of Minnesota-Duluth. This fellowship, named after a former director of the National Oceanic and Atmospheric Administration (NOAA), allows Pundsack to spend the next year working with NOAA's Office of Global Programs in Silver Spring, Maryland.


Johnathan Pundsack

"I recommended Jonathan for this competitive position without hesitation," said Carl Richards, director of Minnesota Sea Grant. "His personality and interest in combining policy and research in the field of public health are ideally suited to the Knauss Fellowship." Minnesota Sea Grant is helping to support Pundsack during his fellowship.

Each year, NOAA offers approximately 30 Knauss Fellowships. The program was established in 1979 to provide an educational experience to students interested in marine or Great Lakes resources and in the national policy decisions affecting those resources. The program matches graduate students with hosts in the legislative branch, executive branch, or appropriate associations located in the Washington, D.C. area for one year.

Pundsack investigated the ability of alternative wastewater treatment systems to remove pathogens; he studied at the University of Minnesota-Duluth under the guidance of Richard Axler of the Natural Resources Research Institute and Professor Randall Hicks of the

Knauss Award continued on page 7

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crop requirement for nitrogen can improve infiltration and reduce runoff. Applying manure at phosphorus-based rates, which are lower than nitrogen-based rates, may improve water quality, but has yet to be investigated. Neil Hanson, assistant professor, Department of Soil, Water, and Climate; and Sagal Goyal, professor, Department of Veterinary Diagnostic Medicine, were awarded a grant to evaluate the effects of applying manure at various phosphorus-based rates on soil hydraulic properties, the loss of nutrients in surface runoff, the presence of pathogens in runoff water, and crop production.

A novel *in situ* technology for the treatment of groundwater contaminated with agriculturally-derived nitrate

Nitrate contamination of groundwater, which may result from the improper use of heavy fertilizers, is a significant problem in the Midwest. Several treatment options are available to remove nitrate from contaminated drinking water supplies, but current options are expensive or create additional water quality problems. *In situ* autotrophic denitrification is a process that can selectively remove nitrate within the aquifer. Its use, however, has been hampered by the inability to transfer H_2 gas into an aquifer efficiently. Paige Novak, assistant professor, and Michael Semmens, professor, Department of Civil Engineering, were awarded a grant to study the effectiveness of using hollow fiber membranes to add H_2 gas to an aquifer to promote *in situ* denitrification.

Evaluation of bank erosion inputs to the Blue Earth River with airborne laser scanner

Development of effective pollution management practices requires knowing what pollution sources are the largest contributors. Sediment and nutrient pollution in the Minnesota River result from a variety of sources, including upland erosion from agricultural areas and stream bank collapse. The relative contributions from these sources, however, are not well understood. Satish Gupta, professor, Department of Soil, Water, and Climate; Marvin Bauer, professor, Department of Forest Resources; and David Thoma, Ph.D. student, Water Resources Science, have been awarded a grant to determine how accurately airborne scanning laser altimetry can measure stream bank mass failure rates and phosphorus inputs on the Blue Earth River, a tributary to the Minnesota River. If results are favorable, this technology will be an important tool for resource managers to determine which projects have the greatest potential for pollution abatement and to assess the effectiveness of current control efforts.


Stream bank erosion on the Blue Earth River.

Minnesota Water Community News

Carol Johnston (Natural Resources Research Institute) was recently appointed to the National Research Council's (NRC) Committee on Mitigating Wetland Losses. The Committee will review options for mitigating wetlands loss through restoration, enhancement, and creation, and will prepare a report in 2001. Johnston previously served on NRC Committees for Watershed Management and Characterization of Wetlands.

Susan Galatowitsch (Horticulture) recently traveled with a Nature Conservancy of Minnesota expedition to the Peten region of northern Guatemala. The purpose of the expedition was to investigate the potential for a professional exchange program for purposes such as conducting flora and fauna surveys of the newly established Sierra Lacondon National Park. The landscape is karst-limestone geology, resulting in spring-fed, forested wetlands. Park officials suspect that the hydrology and aquatic biology of the region is unique, but neither has been explored.

Ray Newman (Fisheries and Wildlife) presented "Ruffe: A problem or just a pest?" at the 10th International Aquatic Nuisance Species and Zebra Mussel Conference, held in Toronto, Ontario, in February. His talk described the results of a project that investigated the effects ruffe have on perch and bethnic communities in Lake Superior.

Jim Perry (Forest Resources) has recently accepted the position of Interim Head of the Department of Fisheries and Wildlife. He replaces **Ira Adelman**, who is stepping down after serving 18 years as department head.

U of M researchers assist Nepal with conservation efforts

Seven University of Minnesota faculty recently traveled to Nepal to learn about the biophysical, social and political opportunities within the Narayani River Basin. The goal was to develop a cooperative effort with Nepalese colleagues, resulting in effective conservation for the Narayani ecosystem. This river basin is important to Nepal for its rich biodiversity and abundant resources. Increasing stress from growing urban centers, agricultural runoff, and land use changes within the watershed has created concern from the Nepalese government over the river's water quality and vegetation. As a result of this concern, the Nepalese Ministry of Forestry sought the expertise of University of Minnesota researchers, Ira Adelman, Bruce Vondracek and Andrew Simons (Fisheries and Wildlife), Teri Allendorf and Dave Smith (Fisheries and Wildlife and Conservation Biology), Jim Perry (Forest Resources and Fisheries and Wildlife), and Deborah Swackhamer (Environmental and Occupational Health). While in Nepal, the group spoke with officials from the Nepalese Ministry of Forestry, and Nepalese Ministry of National Parks and Wildlife Conservation, representatives from the King Mahendra Trust for Nature, the United States Agency for International Development, and the World Wildlife Federation as well as leaders of Nepalese communities to understand what opportunities and priorities existed in the region for conservation of the Narayani ecosystem. Jim Perry's comment on return from the trip was "Colleagues in Nepal are very excited about the opportunity for long term interaction with the University and see many possibilities for research, graduate education and improved management of biodiversity."

Bruce Vondracek and Teri Allendorf tour the Royal Chitwan Park with a colleague from the Nepalese Ministry of National Parks and Wildlife Conservation.

Since their return, the group has begun developing a proposal, "Biodiversity in the Narayani Ecosystem: Conservation through Participation," to be submitted to the Global Environment Facility, which is implemented in Nepal by the United Nations Development Program (UNDP). The GEF, composed of donor agencies from numerous countries, funds projects addressing global problems such as climate change and the loss of biodiversity. Through a collaborative effort with the Nepalese ministries, the King Mahendra Trust for Nature, and Nepalese communities, the group hopes to obtain a better understanding of the Narayani ecosystem and assist in the development and implementation of sustainable management programs.

Nepal continued on page 8

Upcoming Events

March - June. **Shoreland Design** and **Planting Techniques Workshops.** Fourteen one-day workshops will be sponsored by Extension in northeast and east central Minnesota. These advanced, hands-on workshops will create a local network of trained individuals who can help with shoreland restoration. For more information about dates and locations, contact Mary Blickenderfer, Extension Shoreland Specialist, at (218) 327-4616.

April - October. **Landscaping for Wildlife and Water Quality Workshops**. Fifteen workshops designed to help shoreland owners understand and adopt landscaping concepts will be offered across the state, through a partnership led by the DNR and funded through an LCMR grant. For more information about dates and locations, contact Lori Naumann at (651) 296-6157.

April 12. **Carbon Cycling in the Ocean**. University of Minnesota. Rob Benner from the University of South Carolina will present this seminar. For more information, contact Jim Cotner at (612) 625-1706 or E-mail: cotne002@tc.umn.edu.

April 9-12. **Gulf of Mexico Symposium 2000**. Mobile, AL. This symposium will bring together scientists, citizens, educators, government representatives and students to share and discuss critical issues and challenges concerning the Gulf of Mexico. For more information, contact Lisa Adams at (334) 621-1541 or E-mail: acf@the gulf.net.

April 13-14. **Third Annual Conference on Great Lakes' Law, Science & Policy**. Toledo, OH. A look at contaminated sediments from both a legal and a scientific perspective. This program will invite experts from both the United States and Canada to discuss, from technical and legal frameworks, the causes, prevention and remediation of contaminated sediments. For more information, contact Gary Overmier at (419) 530-4179 or E-mail: govermi@pop3.utoledo.edu.

April 16-19. **3rd International Conference on Modeling Groundwater Flow**. Brainerd, MN. The subject of this conference is the analytic element in groundwater modeling. For more information, contact Josh Curlee at (612) 625-5522, or visit the conference website at http://www.ce.umn.edu/AEMGroundwater/aemcontent.html

April 25-26. **Minnesota Water 2000–A Watershed Year: Looking Back; Planning Ahead.** Minneapolis, MN. This conference will focus on the status of Minnesota's ground and surface waters as we begin the millenium. For further information, visit http://wrc.coafes.umn.edu/water2000/, or contact Tracy Thomas at (612) 625-2282 or E-mail: thoma032@tc.umn.edu.

May 3-5. **Bridging the River**. St. Paul, MN. This conference will focus on bridging communication between communities along the Upper Mississippi. For more information, contact George Orning at (612) 625-0081 or E-mail: ornin002@tc.umn.edu.

June 5-9. **Fluvial Geomorphology and Stream Restoration Workshop.** Whitewater River, MN. This workshop on fluvial geomorphology and stream restoration techniques, offered by the Minnesota Chapter of the American Fisheries Society, will combine classroom lectures and field exercises to teach stream typing and its applications as well as fundamental river restoration techniques. A tour of the recent restoration work on the Whitewater River in southeastern Minnesota will be offered to demonstrate various techniques. For more information, contact Karen Terry at 218/739-7449 or E-mail: klterry@prtel.com.

June 5-9. **American Society of Limnology and Oceanography: 2000 Aquatic Sciences Meeting.** Copenhagen, Denmark. This conference will demonstrate that aquatic sciences cross many boundaries and not only those we traditionally identify, such as sediment-water and water-air interfaces. For more information, contact ASLO 2000 co-chairs, Bo Riemann at E-mail: bri@dmn.dk, or Morten Sondergarr at E-mail: flabms@inct.uni2.dk.

Knauss Award con't from page 5

Department of Biology.

Pundsack moved to Washington, D.C., in February and began studying the socio-economic effects of seasonal climate change. During his year at the Office of Global Programs, he will examine the broad-scale impacts of climate on such things as precipitation, disease outbreaks, natural disasters, and agriculture.

"Probably one of the most exciting aspects of the fellowship is the opportunity for me to integrate my scientific training with public policy," said Pundsack. Pundsack was impressed that roughly half of the 400 former Knauss Fellows still work on water-related issues in or near Washington, D.C.

Excerpt from MN Sea Grant News Release

New Publications

Minnesota Rivers. The Water Resources Center. 1999. This primer describes how rivers function and provides more detailed information on such topics as how Minnesota rivers are managed and monitored. To obtain a copy, contact the WRC at (612) 624-9282.

Distribution of major herbicides in ground water of the United States. J.E. Barbash, G.P. Thelin, D.W. Kolpin, R.J. Gilliom. 1999. This report examines the occurrence of selected herbicides and their degredates in ground water based on results from investigations of the USGS National Water-Quality Assessment Program and the Midwest Pesticide Study. Available on the web at http://water.wr.usgs.gov/pnsp/rep/wrir984245/.

Waters to the Sea: Rivers of the Upper Minnesota. 2000. Center for Global Environmental Education. This CD-rom explores rivers of the upper Mississippi region from the Ice Age to the present. Three historic guides lead journeys that investigate impacts of human activities on rivers of the prairies, deciduous forests, and pinelands. Fun multimedia activities connect environmental history, hydrology, ecology, and water quality. For more information, visit http://cgee.hamline.edu.

Sustainability of ground-water resources. W.M. Alley, T.E. Reilly, O.L. Franke. 1999. This report describes the hydrologic, geologic, and ecological factors influencing the sustainability of ground-water resources. Available from the USGS at (800) 275-8747 or on the web at http://water.usgs.gov/pubs/circ/circ1186/.

Protocol for developing nutrient TMDLs. 1999. The EPA has published this TMDL technical guidance document to help professionals involved in TMDL development. Comments and suggestions from readers are encouraged. Available from EPA at (513) 489-8190 or on the web at http://www.epa.gov/owow/tmdl/techsupp.html.

Getting in step guidebook. The Council of State Governments. 1999. This three part guide is geared at helping professionals develop and implement an effective watershed outreach plan. Available at (800) 521-3042.

Nepal con't from page 6

Conservation of the Narayani River ecosystem will require a continuing effort by the Nepalese government and communities. This work in the Narayani is just the next step in a long road for faculty like Dave Smith and Francie Cuthbert (Fisheries and Wildlife); Dave has worked in Nepal for 23 years. For others in the group, this is a new experience. The University of Minnesota researchers plan to begin this new project in Summer 2001 and remain involved at least five years, working toward a series of locally and nationally sustainable practices.

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