

North Dakota Water Resources Research Institute

North Dakota State University
University of North Dakota



Website: www.ce.ndsu.nodak.edu/wrri

January 2002

From the Director

Welcome to the 2002-issue of the Institute newsletter. The purpose here is to give you a brief look at the water research and other activities of the Institute. I encourage you to consult the Institute website, www.ce.ndsu.nodak.edu/wrri, for details.



Dr. Gregory McCarthy, the previous Director, recently assumed charge as the Associate Vice President for Interdisciplinary Research, NDSU, after more than ten years of distinguished service to the Institute. Effective October 1, 2001, I was appointed the Director of the ND Water Resources Research Institute. My job as the Director of the Institute adds to my current responsibilities as the Chair of the NDSU Department of Civil Engineering and Construction. I hope my several years of teaching and research experience in the area of hydrology and water resources along with my appreciation and respect for its interdisciplinary nature will help me direct the Institute program successfully.

As in the past few years, again this year, we decided to continue to meet the mission of the Institute by dedicating most of our Federal allotment funds toward competitive graduate student research fellowships, each of which is also a research project that will result in a masters thesis or doctoral dissertation. The faculty advisors find matching or co-funding for the research through the university, or grants from local, county, state or federal agencies, foundations, or industry. If you have a water research proposal in mind, give me or a faculty at NDSU or UND a call to discuss collaboration. The funds you already have may be leveraged by coupling them with a fellowship to a graduate student supported by the Institute.

The Institute acknowledges the support of the Dean of the College of Engineering and Architecture, Dr. Otto Helweg, whose specialty is also water resources systems and engineering. The offices of the Institute has been moved to the Civil Engineering department in the Civil and Industrial Engineering building on the North Dakota State University campus. Marcia Pepper and Kristin Ferris from the Dean's office will assist the director with Institute finances, communications and information transfer.

The Institute will operate with the continuing help of the State Advisory Committee consisting of three members representing the three principal agencies dealing with water issues – State Water Commission, State Health Department, and the USGS - and a Technical Advisory Committee consisting of faculty from NDSU and UND. Though the Institute has no state appropriated support, the North Dakota State University and the University of North Dakota administrations consider the Institute's activities important and are supportive of its efforts and the Institute is thankful for that.

The North Dakota Water Resources Research Institute is located in the NDSU Department of Civil Engineering and Construction. We can be reached at Box 5285, University Station, Fargo, North Dakota 58105-5285 or at (701) 231-7244.

G. Padmanabhan, Director
Chair and Professor, Department of Civil Engineering and Construction

Highlights of Research of 2001 Institute Fellows



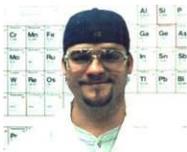
Eric Dodds received his M.S. in Environmental Engineering at NDSU. His advisor was Wei Lin, Assistant Professor of Civil Engineering. Release of heavy metals from mining products and processes can create significant environmental damages to receiving water bodies. In his study of metal removal by constructed wetlands using batch removal experiments with peat and Cu and Ni, Eric found that metal removal increases with pH, but temperature was determined to be insignificant for Cu and Ni removal from single metal solutions. Metal removal at higher pH was influenced by metal insolubility.



Stuart Hurley received his M.S. in Environmental Engineering at NDSU. His advisor was Wei Lin, Assistant Professor of Civil Engineering. In his investigation of ozone consumption rates and by-product formation Stuart found ozone consumption was much faster at elevated temperatures in the summer, resulting in a higher ozone demand for disinfection. Aldehydes were found to be the major ozonation by-products, and their concentration increased with ozone dose.



Anthony Miller received his M.S. in Zoology at NDSU. His advisor was Malcolm Butler, Professor of Zoology. In his study of the characteristics and influences of upland tree harvesting on the water quality of northern forested wetlands, Tony found the physical processes such as length of wetland hydroperiod and the abundance of organic carbon govern invertebrate community dynamics. Upland tree removal lengthens hydroperiod, increases primary productivity in seasonal forest wetlands, and causes alterations in invertebrate community dynamics by making wetlands more visible to colonizing predatory invertebrates.



Paul Skubinna has submitted his thesis for review with plans to graduate in 2002-summer with an M.S. degree in Geology at UND. His advisor is Scott Korom, Assistant Professor of Geological Engineering. In modeling the hydrogeochemistry of denitrification in in-situ mesocosms in the Elk Valley aquifer, he uses groundwater quality analyses and PHREEQC-2, an aqueous geochemical model provided by the USGS, to study a denitrification tracer test at the Elk Valley Aquifer field site and to provide insights into associated geochemical reactions.



Kyle Zimmer completed his Ph.D dissertation in May 2001 at NDSU. His advisor was Malcolm Butler, Professor of Zoology. Kyle's work on the effects of fathead minnows and drainage history on prairie wetland ecosystems demonstrated that the presence of fathead minnows is an important determinant of ecosystem structure in prairie wetlands, and that restored wetlands are very similar to non-drained analogs. Not only were these patterns consistent in five years of data collected from over 20 wetlands, but Kyle was able to demonstrate unequivocally that minnows actually cause observed differences between minnow-supporting and fish-free wetlands such as higher turbidity and lower invertebrate diversity and abundance.



Andrea Arruda is nearing completion of her doctoral dissertation at NDSU. Her advisor is Andres Campiglia, Assistant Professor of Chemistry. The methodology developed by Andrea and her advisor provides rapid and selective analysis of total or specific compound identification at parts-per-billion to parts-per-trillion levels. The screening method can determine total PCB and PCDF in water sample and tell before hand whether the sample merits detailed chromatographic analysis. They also investigated Laser-Excited Time-Resolved Spectrometry (LETFS) with fiber optic probes to analyze PCB and PCDF in aqueous samples and overcome the lack of selectivity from the room temperature phosphorimetry (RTP) method.



Melissa Meyer is working on her Ph.D research at UND. Her advisor is Anthony Borgerding, Assistant Professor of Chemistry. Using the high speed gas chromatography (extraction/HSGC) system, extraction, separation, and detection of low ppb concentrations of nonpolar analytes was possible in less than 1 minute. Preliminary results for the iron trap mass spectrometry (extraction/ITMS) system suggest that extraction and detection of polar and nonpolar analytes in the low ppm concentration range is possible in 1-2 minutes. Future work on the extraction/ITMS system will involve splitting the extraction gas flow to the ITMS. This will allow higher total flow rates without further taxing the MS, and improve vacuum conditions.

2002 Graduate Research Fellows Announced

Seven 2002-Graduate Research Fellowships were approved for award by the State Advisory Committee. One doctoral candidate, Megan Jaskowiak (Ph. D.program, Botany, NDSU; advisor.Marvin Fawley,Botany, NDSU) had her fellowship renewed. The following are the new fellowships awarded:

- **Rahul Bajpai** (M.S. program, Environmental Engineering, NDSU). **Comparative Analysis of Fargo and Moorhead Ozonation Systems**; advisor, Wei Lin, Civil Engineering, NDSU.
 - **Katy Kumar** (M.S. program, Environmental Engineering, NDSU). **Analysis and reduction of the Phosphorus in the wastewater of Cargill Inc. North American Corn Milling Industry**; advisor, Wei Lin, Civil Engineering, NDSU.
 - **Fred Ossman** (Ph.D. program, Zoology, NDSU). **Northern Forest Wetlands: Characteristics and Influences on Invertebrate and Amphibian Community Structure**; advisor, Malcolm Butler, Zoology, NDSU.
 - **Anthony Pothoff** (M.S. program, Zoology, NDSU). **Evaluation of walleye to suppress fathead minnow populations in Type IV & V wetlands**; advisor, Malcolm Butler, Zoology, NDSU.
 - **Unal Kizil** (Ph.D. program, **Agricultural and Bio-system Engineering, NDSU**). **Feedlot Runoff and Manure Management Modeling**; advisor, James Lindley, Agricultural and Bio-systems Engineering, NDSU.
 - **Shannon Torrence** (M.S. program, Zoology, NDSU). **Variables Influencing Habitat Use by Diving Waterbirds Foraging in the Prairie Pothole Region**; advisor, Malcolm Butler, Zoology, NDSU.
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Impact of Lake Ashtabula on Sheyenne River algal communities



Megan Jaskowiak will continue her Ph.D. botany research at NDSU on the impact of Lake Ashtabula on Sheyenne River algal communities. Working with Marvin Fawley, Professor of Botany, and Research Associate Karen Phillips, Megan will continue studies of the river's periphyton, and examine the effects of man-made Lake Ashtabula on those flora. For the past three years the periphyton communities in the Sheyenne river have been studied. This research provided not only baseline data for the Devils Lake outlet project, but also an opportunity to examine the ecology of algal communities in the river. Further studies are needed to prove that these specimens are new species. An appropriate Latin epitaph will be determined and a species description (including Latin diagnosis) will be written. The steps completed in the species description will follow the nomenclature rules adopted by the international botanical congress (1994). The knowledge gained from this ecological research will contribute to both regional water quality studies and diatom ecology overall.



Rochelle Nustad, Institute Fellow
collecting samples from a wetland



Eric Dodds, Institute Fellow
working on a constructed wetland

National Competitive Grant Program

The Announcement/Request for Proposals for the Fiscal Year 2002 National Competitive Grant Program authorized by section 104(g) of the Water Resources Research Act of 1984, as amended, may be obtained either at https://Engineering.Purdue.edu/WRRRC/NIWR/competitive_grants/104G_RFP/ or by going to <http://www.niwr.org/NIWR/> and then clicking on National Competitive Grants Program -104G. The Announcement is being distributed only through that site. Applications will only be accepted electronically via the Internet at <http://www.niwr.org/NIWR>. Applications must be filed by 5:00 PM, EST, March 15, 2002 and must be approved by the Institute or Center through which they were submitted by 5:00 PM, EST, March 22, 2002.

New Handbook

A new handbook titled "Handbook of Water Use and Conservation" by noted conservation expert Amy Vickers is recently published by WaterPlow Press. The 464-page book describes water use characteristics, water audit steps, and over 100 efficiency measures for homes, landscapes, industries, businesses and farms. The book offers many case studies and benefit-cost comparison of efficiency measures. The book is available through www.waterplowpress.com or www.amazon.com.

North Dakota Water Resources Research Institute

The Institute was founded in 1965 by authority of Congress as one of the 54 Institutes throughout the nation and is administered through the United States Geological Survey. The NDWRRI receives funding through section 104 of the *Water Resources Research Act of 1984* and it applies its Federal allotment funds to research that fosters: (A) the entry of new research scientists into the water resources field, (B) training and education of future water resources scientists, engineers, and technicians; (C) the preliminary exploration of new ideas that address water problems or expand understanding of water and water-related phenomena; and (D) the dissemination of research results to water managers and the public.

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