

Report for 2001MI3001B: Natural Resources Integrated Information System

- Other Publications:

- Wolfson, LW, D. Mokma, G. Schultink, and E. Dersch. In Press. Development of a Wetland Information System for Assessing Wetland Functions. Lakes and Reservoirs: Research and Management.
- Witter, Scott G., Ruth Kline-Robach, D.L. Long, Jon Bartholic and Fred Poston. 2001. MSU-WATER: A New Way of Addressing Water Quality Challenges. Water Resource Update, The Universities Council on Water Resources.
- Mokma, D., G. Schultink, E. Dersch, and L. Wolfson. 2000. Methods and Guidelines for Local Wetland Protection and Related Land Use Planning. Special SAPMINAR Report, Michigan Agricultural Experiment Station, Michigan State University, East Lansing, MI. 16pp.
- Brown, E., A. Peterson, R. Kline-Robach, K. Smith, and L. Wolfson. 2000. Developing a Watershed Management Plan for Water Quality: An Introductory Guide. Institute of Water Research, Michigan State University, East Lansing, MI. 52 pp.
- Wandell, H. and L. Wolfson. 2000. A Citizens Guide for the Identification, Mapping, and Management of the Common Rooted Aquatic Plants of Michigan Lakes. WQ 55. Michigan State University Extension, East Lansing, MI. 90 pp.
- Hart, S, M. Klepinger, H. Wandell, D. Garling, and L. Wolfson. 2000. Integrated Pest Management for Nuisance Exotics In Michigan Inland Lakes. WQ 56. Michigan State University Extension, East Lansing, MI. 28 pp.
- Wolfson, L. and M. Higgins. 2000. Aquatic Ecosystems, Unit 8, in Module 1: Virtual Watershed Program in Watershed Management. (www.h2oshed1.vu.msu.edu) Michigan State University, East Lansing, MI.
- Wolfson, L. 2000. Prioritizing Pollutants, Sources, and Causes, Unit 6 in Module 2: Building and Implementing Watershed Management Plans. (www.h2oshed2.vu.msu.edu). Michigan State University, East Lansing, MI.
- Schultink, Ger, R. Moore, L. Wolfson, J. Dischinger-Smedes. 2000. Guidelines for Wetland Identification and Evaluation: Needs and Opportunities for Local Protection. Agricultural Experiment Station, Research Report No. 572. Michigan State University, East Lansing, MI.
- DIttri, F.M. 1999. Environmental Contamination and the Information Highway. In: Integrated Environmental Management: Development Information and Education in the Asian Pacific Region, Ann Arbor Press, Chelsea, MI, pp. 211-222.
- DIttri, F.M. 1999. What Education and Information Systems Can Do To Help Solve Environmental Problems: A Summary. In: Integrated Environmental Management: Development Information and Education in the Asian Pacific Region, Ann Arbor Press, Chelsea, MI pp. 271-277.
- Shi, Y, A.M. Shortridge, and J.F. Bartholic. 2002. Grid computing for real time distributed collaborative geoprocessing. Advances in Spatial Data Handling: 10th International Symposium on Spatial Data, Springer Verlag; ISBN: 3540438025; Bk&Cd-Rom edition
- Kerr, J., Da Ouyang, and Jon Bartholic, 2002. Targeting Watershed Interventions for Reduction of Nonpoint Source Pollution. Journal of Soil and Water Conservation. (In review).

**MICHIGAN INSTITUTE OF WATER RESEARCH
ANNUAL TECHNICAL REPORT -- FY 2001**

Research Program – Basic Project Information

Research Synopsis – 2001MI3001B

Title: Natural Resources Integrated Information System

Project Number: 01

Start Date: 03/01/00 **End Date:** 02/28/01

Funding Source: 104B

Congressional District: 8

Research Category: Water Quality Management

Focus Category #1: M&P; **#2:** WQL; **#3:** MOD

Lead Institute: Michigan Institute of Water Research

Descriptors: Data Analysis, Data Storage and Retrieval, Information Dissemination, System Analysis, Geographic Information Systems, Water Quality Management, Watershed Management

Primary PI: Jon F. Bartholic, Institute of Water Research, Michigan State University

Other PIs: No Other PIs

Introduction

The Institute of Water Research (IWR) at Michigan State University (MSU) provides timely information for addressing contemporary land and water resource issues through coordinated multidisciplinary efforts using advanced information and networking systems. The IWR endeavors to strengthen MSU's efforts in nontraditional education, outreach, and interdisciplinary studies utilizing available advanced technology, and partnerships with local, state, regional, and federal organizations and individuals. Activities include coordinating education and training programs on surface and ground water protection, land use and watershed management, and many others. An extended introduction can be found in our FY99 Annual Technical Report. We also encourage you to access our web site which offers a more comprehensive resource on IWR activities, goals, and accomplishments; www.iwr.msu.edu.

Area of Relevant Research

Numerous federal and state agencies are increasing their emphasis on examining water problems from the watershed perspective. The watershed perspective is being emphasized in the reauthorization of the Clean Water Act, the new Farm Bill as well as several other pieces of legislation. Because of our Institute's long term position relative to national and state water programs, we function as a coordinator to assist with linkages, support education, research, and outreach with and among agencies in the broad water arena. Accordingly, we are in a unique position to facilitate watershed policy, planning, and management with a multi-disciplinary perspective. Our proposed effort includes three major thrusts. The first is the enhancement of integrated watershed systems that can be used for analysis of various management options. The second is extended education where the internet and advanced computer systems in addition to traditional conferences and workshops are used to extend new knowledge to agencies, organizations, and local level watershed and land use groups. The third involves developing a networking infrastructure to facilitate cooperation among partners such as the USDA, Natural

Resource Conservation Service, USEPA, and state Departments of Natural Resources, Environmental Quality, and Agriculture, as well as township associations and county organizations.

Results and Benefits

We will promote the dissemination and application of results through the thrusts of extended education, networking, and strong partnerships with other organizations. Thus, an excellent opportunity exists to disseminate and assure application of knowledge. Consistent with a watershed approach, emphasis will be placed on assisting individuals in understanding the interactions of human land use practices and activities on surface and groundwater. This will be accomplished by working with local professionals, practitioners, consultants, and in educating local decision makers about watershed functions and related policy options for the facilitation of water quality protection. The extensive use of extended education over the internet using hypertext techniques will greatly facilitate the effectiveness of wide dissemination throughout the state and region relative to watershed education and applicable policies. Further, many of these modules and approaches can be used nation-wide.

Nature, Scope, and Objectives

Goal

Develop an information exchange integrated support system for watershed studies with emphasis on land use and resource stewardship. The system will support research, studies by faculty and graduate students in several departments, and planning and management by local, county, state, and federal agencies.

Objectives

1. Integrate concepts and activities in watershed systems and extended education through a networking infrastructure of organizations and digital communication pathways with integrated distributed data sources and partners.
2. A computer/network based Natural Resources Integrated Information System (NRIIS) will be developed with graphical interface and search mechanisms to access models, data, information, and GIS/graphic tools.
3. Graduate students will use the system a) to facilitate their research, b) see how their study is part of a larger system, and c) gain experience with NRIIS and its power for enhancing research, technology, and information transfer and communication for informed natural resource policy, planning, and management decisions.

Principle Findings and Significance

The Institute recently developed an interactive watershed information system that can be used over the Internet. This web site provides several layers of data that can be integrated or viewed separately. The system, "Understanding Your Watershed: An Interactive Mapping Program to Explore Michigan Watersheds," is designed for use as a convenient and versatile tool that provides access to data sets, maps, and reports. Lakes, rivers, and streams; drainage patterns; wetlands; topographic contour lines; roads and highways; and digital orthophotography are some of the data layers that are available through this system. Through the use of this innovative tool,

planners will have unique opportunities to visualize and understand the complexity of land-water interrelationships critical to the development of effective watershed plans. Watershed planners will have the ability to identify and prioritize critical areas that pose risks for erosion or nutrient loading to surface waters. This key part of the watershed planning process will be more firmly based on scientific data and information. This interactive geographical information system (GIS) can be used as a complement to Developing a Watershed Plan for a Water Quality Introductory Guide to address many of the steps described in the Guide.



Over the past few years, IWR has conducted research in water quality/nonpoint source pollution (NPS), particularly in the areas of soil erosion, sediment transport and nutrient loading, and assessing Best Management Practices (BMPs) using computer models. Watershed Information System, soil erosion assessment tool and watershed spatial database have been developed to facilitate land use and watershed planning, and expedite the process of decision making. The widely accepted erosion model Revised Universal Soil Loss Equation (RUSLE) has been computerized and the RUSLE Online website has been completely redesigned to provide the full functionality of soil erosion assessment. Watershed Information System provides watershed planners and others not only data, but information on farmlands, elevation, wetlands, streams and potential risk areas to assist in prioritizing their resources and make informed decisions. Our efforts have also involved building watershed spatial database which includes digital soils, digital elevation model (DEM), digital aerial photographs, 8- and 14-digit watershed boundaries, water bodies, wetlands, and other watershed related datasets.

In the research on targeting watershed interventions for reduction of nonpoint source pollution, we used the soil erosion model RUSLE to estimate soil erosion and sediment and phosphorous loading under alternative conservation practices and targeting approaches in Michigan's Stony Creek watershed. Using an erosion/sediment delivery model, analyzes likely erosion levels under alternative targeting options. The model focuses on the impact of altering the quarter mile we buffer treatment zone. Digital soils and digital elevation model (DEM) data are used in this study. Simulations have been conducted to evaluate the effects of crop rotations, tillage practices, slopes and the width of filter strips on sediment and phosphorus loadings. The analysis shows that promoting the use of no-till and targeting steeper areas within the riparian corridor can bring the greatest reduction in sedimentation and phosphorous loads.

The RUSLE Online website provides a user-friendly interface and free access to soil conservationists, agricultural extension personnel and others for quick assessment of soil erosion. Users can easily choose their county, soils, crops, tillage practices and other field information to estimate the soil loss for multi-year planning. The program has been used by USDA-NRCS county agents, MSU Extension personnel, and online virtual university courses and others. IWR has also developed an EZ-Mapper bundled with digital soils data to help farmers, certified crop consultants and others to more effectively work on Comprehensive Nutrient Management Planning (CNMP). This program eliminates the hassle and time-consuming process to create a

farmstead map. IWR has also provided training to interested parties. In cooperation with the USDA-NRCS, IWR has also evaluated the Windows Pesticide Screening Tool, or Win-PST, in Michigan counties. Risk maps have been generated for St. Joseph County and used by local extension personnel and crop consultants.

IMPACT: 2002/01 TO 2002/12

Development of the user-friendly RUSLE Online has greatly enhanced the efficiency of soil erosion assessment process. It can now be used for multi-year crop planning in minimizing soil erosion. Watershed Information System can turn spatial data into helpful information in assisting decision-making. Study on targeting watershed interventions for reduction of nonpoint source pollution will help local and federal governments to prioritize their funding for areas that have most environmental benefit. Pesticide risk maps can guide farmers for pesticide applications and in choosing alternatives and implementing best management practices to minimize pollution in potentially high-risk areas.

STUDENT SUPPORT

Category	Section 104 Base Grant	Competitive Awards	NIWR Internship	All Other	Total
Undergrad				6	6
Masters	1			10	11
PhD	1			4	5
Post Doc					0
Totals	2			20	22

NOTABLE AWARDS AND ACHIEVEMENTS

Laura Bruhn’s Master Student (Best Graduate Paper Award)
 Michigan State University’s Virtual Watershed Program:
 Development and Delivery of an Internet-Based Academic Credit or Professional Certificate Program in Watershed Management
 Environmental Practice Journal of the National Association of Environmental Professionals
 The Evergreen State College, Olympia, WA 98505

The University’s efforts in protection the groundwater supply that serves 50,000 people daily were recognized by the MDEQ in a Wellhead Protection Program recognition ceremony in 2002. Also in 2002, MSU became the first University in the U.S. to be recognized as a Groundwater Guardian Community by the Groundwater Foundation, a nonprofit organization that promotes proactive groundwater protection activities.

PUBLICATIONS

Wolfson, LW, D. Mokma, G. Schultink, and E. Dersch. In Press. Development of a Wetland Information System for Assessing Wetland Functions. Lakes and Reservoirs: Research and Management.

Witter, Scott G., Ruth Kline-Robach, D.L. Long, Jon Bartholic and Fred Poston. 2001. MSU-WATER: A New Way of Addressing Water Quality Challenges. *Water Resource Update*, The Universities Council on Water Resources.

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D'Itri, F.M. 1999. Environmental Contamination and the Information Highway. In: *Integrated Environmental Management: Development Information and Education in the Asian Pacific Region*, Ann Arbor Press, Chelsea, MI, pp. 211-222.

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Shi, Y, A.M. Shortridge, and J.F. Bartholic. 2002. "Grid computing for real time distributed collaborative geoprocessing." *Advances in Spatial Data Handling: 10th International Symposium on Spatial Data*, Springer Verlag; ISBN: 3540438025; Bk&Cd-Rom edition

Kerr, J., Da Ouyang, and Jon Bartholic, 2002. Targeting Watershed Interventions for Reduction of Nonpoint Source Pollution. *Journal of Soil and Water Conservation*. (In review).