

2004 YEAR IN Review

ROBERT B. ANNIS WATER RESOURCES INSTITUTE

Dr. Alan Steinman,
Director of the
Robert B. Annis
Water Resources
Institute

Every year at this time, I get the chance to review what we've done over the past year and see if we've achieved the goals that we set for ourselves. I'm always amazed how quickly that time goes. As with everything you feel passionate about, there is never enough time in the day or resources available to complete all that could and should be done.

Yet, I look over this past year with a sense of satisfaction. Whereas our first two years at the Lake Michigan Center were characterized by transition and change, this past year was one of stability and maturity. Our four new staff scientists have filled critical niches here at the Institute. The energy and expertise they bring to the team has helped create a new level of synergy and collaboration.

AWRI staff members have always worked well together. Now, with such a diverse group of professionals, each bringing a different perspective and set of skills to the table, we are able to do much more. With a multidisciplinary approach combining ecology, microbiology, chemistry, hydrology, geography, education, and outreach, we are able to look at problems within the environment in a more comprehensive, far-reaching way.

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AWRI staff
performing fish
studies.



GRAND VALLEY
STATE UNIVERSITY



"With nearly 200 miles of Lake Michigan shoreline and countless lakes, rivers and streams within my district,

protecting our water resources remains one of my top priorities. The Annis Water Resources Institute serves an important role in connecting with local communities and helping them to manage a number of important environmental matters. The research it provides on a variety of issues contributes enormously to what makes this state great."

Congressman Pete Hoekstra



"For many years, the Annis Water Resources Institute and its dedicated, talented staff have reached

out to the community and provided stakeholders, decision makers, and residents with the tools, research, and expertise needed to protect and preserve their water resources and quality of life. The Institute is an integral part of the Grand Valley State University community and plays a very important role in fulfilling our mission."

GVSU President Mark Murray

Integrating research, education, and outreach to enhance and preserve freshwater resources



**Graduate student
Aaron Parker**

Aaron majored in natural resources management at Grand Valley and earned his undergraduate degree

in 2003. Now, he's pursuing a masters degree in biology at GVSU, hoping to land a career in fish research. He is now a graduate research assistant at AWRI.

"I love being outdoors, which is one of the reasons why working with the Institute is so great," says Aaron, who is studying adaptive radiation of yellow perch in coastal wetlands and the Great Lakes under Don Uzarski. "I chose Grand Valley to pursue a masters because scientists here are involved in cutting-edge issues. They have integrity and are well respected in the field. The relatively low cost of the graduate program was a plus too. It's a great education for less money than other universities."



**Graduate student
Dana VanHaitma**

Dana received her bachelor's degree in Biology from Central Michigan University in 2003. Since graduation, she has

worked in the AWRI Information Services Center and is a full-time graduate student. Dana has an AWRI assistantship and hopes to complete the requirements for her masters degree in biology from GVSU in summer 2005.

According to Dana, "I wanted to come to GVSU because the Lake Michigan Center is a wonderful location for aquatic science." Her masters research, directed by Carl Ruetz, involves yellow perch and it includes energy content analysis of prey species, evaluation of perch diet, and predator-prey experiments in the AWRI mesocosm facility. "There are so many people willing to help at AWRI," says Dana. "It is an open and friendly environment in which to complete my studies." Dana hopes to pursue a career in environmental science that combines field and laboratory work.

Continued from front

The wealth of data we collect and analyze does not just sit on the shelf. Through our programs, we reach out to the community with in-depth analysis and practical tools and applications. When you're talking about complicated environmental issues that have ramifications in the political and economic arenas, being able to provide a broad, comprehensive framework is absolutely critical to finding workable solutions.

While our mission—"integrate research, education, and outreach to enhance and preserve freshwater resources"—defines who we are, it also issues a worthy challenge. With limited available resources, the job of implementing that mission is not easy but never has it been more important. Here in west Michigan and even the world over, our quality of life is defined by the quality of our natural resources. Whatever we can do now to protect and preserve them will help secure the future.

Institute Highlights for 2004

- AWRI has already benefitted from the new masters program in biology the University instituted in 2003. New graduate students have contributed in several different ways to the work AWRI does (see sidebar).
- The Lake Michigan Center hosted over 115 events in 2004.
- AWRI staff members were asked to provide expert testimony in environmental matters before state and federal governments. Al Steinman testified before the Subcommittee on Water Resources and Environment in the U.S. Congress. Don Uzarski and Al Steinman both testified before the Committee on Natural Resources in the Michigan State Senate.
- AWRI will receive \$125,000 over the next five years from the R.B. Annis Educational Foundation for an endowment to help support the Institute's K-12 outreach program.
- Staff met in March for a retreat to discuss topics such as AWRI's role in Muskegon, reputation and credibility, collaboration, long-term funding, academics, expanding technology, and marketing.
- AWRI received a 2004 Public Health Partnership Award from the Michigan Association for Local Public Health for our collaborative efforts with local health departments.
- AWRI received a \$500,000 grant from the federal government for facility upgrades, educational opportunities, and research programs.

Focusing On:

Collaboration

Since its inception, the Annis Water Resources Institute has placed a high priority on collaboration, acknowledging that the resources and talents of many different people working together will result in better outcomes and more options for preserving and protecting our vital water resources. Principal investigators, graduate students, interns, administrative staff, technicians, science instructors, vessel and maintenance personnel, research associates, and research assistants all contribute to the collaborations within the AWRI.

In this issue of *Year in Review*, we will look at the different ways that we collaborate—both internally within the Institute and externally with other universities, government agencies, nongovernment organizations, funders, and community groups.

Muskegon Lake Monitoring: Ongoing Study Builds Data (internal collaboration example)

Listed as an Area of Concern (AOC) in the Great Lakes Water Quality Agreement, Muskegon Lake became the focus of an ongoing, Institute-wide monitoring program in 2003. The program is designed to collect and analyze data essential to assessing the overall health of the lake. In its second year, the program has continued to record the lake's ecological conditions, providing baseline information needed to help identify trends and possible remedial efforts.

This work is supported, in part, by the Muskegon Lake Research Endowment Fund. Generous donations from lead contributors Dr. William G. Jackson, the Muskegon Sportfishing Association, and concerned citizens and companies throughout the region have helped build this fund.

Drs. Alan Steinman, Bopaiah Biddanda, Carl Ruetz, and Rick Rediske with technical support from Lori Nemeth, Mary Ogdahl, and Scott Kendall, have collected data on vegetation, nutrients, bacteria, chemicals, plankton, invertebrates, and fish in the lake. This year, the team was able to map the Muskegon Lake bottom and nearshore Lake Michigan using the University of Michigan's submersible. The remotely operated equipment allows scientists to record the nature of the lake's bottom and its inhabitants via an underwater camera and other sample collection features.



Top: Muskegon Lake shoreline. Bottom: AWRI technician measures river metabolism.

Last year, AWRI sampled the fish community primarily through specialized fyke nets, set up to trap fish, which then could be identified and counted. This year in addition to the nets, researchers used electrofishing to capture fish. Working at night in a specially rigged boat (courtesy of the University of Michigan), the team discharged a small electrical current into the water to temporarily stun fish, which then could be identified and counted before being released back into the lake. This harmless method of capture provides a bigger and better picture of the different fish species within the lake.

The Information Services Center (ISC), directed by John Koches, has mapped all sample stations and created a Web site that links these stations to the results of water quality analysis for each station. The Web site will serve as an important resource for stakeholders, decision-makers, and anyone in the Muskegon Lake community interested in viewing the data generated.



Hardened shoreline on Muskegon Lake.

Funding received from the Environmental Committee of the Community Foundation for Muskegon County allowed AWRI staff to conduct a “hardened shoreline” inventory around Muskegon Lake—an assessment of physical structures that commercial and residential landowners have used to protect their property, including sea walls, rip rap, and other non-natural materials. The inventory characterizes and measures the extent of these structures and compares them to shoreline left in its natural state. It will help determine if these structures limit the natural habitats that are needed to sustain indigenous sport fisheries and other important aquatic systems.

**Muskegon River Watershed:
Knowledge of Fish Habitats Will
Help Develop Model
(collaborations with other
universities and a federal agency)**

Stretching over several counties, the Muskegon River is home to hundreds of native fish and aquatic wildlife, who depend on a delicate balance for survival. As more and more of its shoreline becomes developed, that balance could be upset, creating irrevocable changes in the character of the river and its fish population.

AWRI has begun a three-year study with researchers from Michigan State University, University of Michigan, Michigan Department of Natural Resources, and National Oceanic and Atmospheric Administration (NOAA) to assess the fisheries of the lower Muskegon River in relation to habitat and human activities. The project is funded by the Great Lakes Fisheries Trust.

Dr. Don Uzarski is looking at the macroinvertebrate community at four sites in the Muskegon wetland complex while Dr. Steinman’s lab, led by aquatic biologist Mary Ogdahl, is evaluating algal production at 16 sites in the Muskegon River and its tributaries. Data generated from these studies will provide important information on food availability for fish in the system. The overall goal is to develop a model for fish populations and their critical habitats, which will help officials better understand and manage river and coastal habitats.

**Mecosta County Goundwater: Baseline Study Provides
More Accurate Picture
(internal collaboration and collaboration with a state agency)**

AWRI is in the second and final year of its project “Environmental Analysis of Well Water in Mecosta County: a Comprehensive and Integrated Approach.” This project was funded by the Ice Mountain Stewardship Fund of the Fremont Area Community Foundation.

This past summer, AWRI researchers and staff collected and analyzed additional groundwater well samples to supplement the 50 samples completed during the project’s first year. Dr. Steinman and Dr. Rediske are conducting an environmental analysis on the samples, including water quality parameters of pH, alkalinity, major nutrients, cations, and anions, as well as testing for coliform bacteria. Dr. Biddanda is examining the relationship between dissolved organic carbon in the ground water and total bacterial



**Dr. Bopi Biddanda
measuring carbon
in water samples.**

abundance. Throughout the project, the ISC has converted the data into a Geographic Information System (GIS) database, along with other environmental information such as hydrology, soils, topography, land use and cover. Dr. Xuefeng (Michael) Chu will develop a conceptual groundwater model for the Muskegon River watershed area within Mecosta County.

At the project's completion, AWRI will conduct a "hands-on" workshop for stakeholders and partners to review the compiled data. The current and comprehensive information generated by the study will provide a more accurate picture of the condition of well water, which will help the Mecosta County Local Health Department protect public groundwater resources.

Fenske Landfill: Research Results Indicate Better Options for Leachate (collaboration with GVSU main campus)

In cooperation with the Michigan Department of Environmental Quality and DLZ Engineering in Lansing, Michigan, Dr. Neil MacDonald from GVSU's biology department and AWRI's Dr. Rediske have investigated possible options for dealing with landfill leachate, a substance resulting from trapped water that "percolates" through waste material. Currently, the leachate is hauled to wastewater treatment facilities for disposal—an expensive process. The MDEQ is looking for better options for disposing of the leachate—without causing harm to the environment.

This past year, the team has conducted tests to determine if there are any hazardous effects when leachate is applied directly to vegetation used to cover the landfill. The project investigated the irrigation of leachate on test plots at the Fenske Landfill and evaluated the impacts related to potential groundwater and soil contamination, the uptake of contaminants by plants, and the effects on plant growth. Initial test results look promising. They did not indicate adverse environmental impact. In fact, applying leachate can have positive outcomes because it can be used as a reliable water and nutrient source, especially during times of drought. The team will continue its study to assess possible long-term trends.

This project, which uses the combined expertise of researchers from AWRI and GVSU, is a great example of how good science can be translated into a real world, practical application, providing a sensible, low-cost option that may save Michigan taxpayers thousands of dollars.



Tests for *E. Coli* help make beaches safe.

Beach Monitoring: Rapid *E. Coli* Testing Gives Immediate Results (collaboration with a state agency)

Another good example of a project having real world application is one that AWRI scientists undertook with local health departments. Because water recreation plays such an important role in west Michigan's economy, the quality of water in Lake Michigan and inland lake beaches has become a top priority for health officials. Lakeside parks with beaches must comply with health regulations and compliance standards, especially when it comes to *E. coli*, a harmful bacterium that may cause sickness.

This past summer, AWRI collected samples at more than 50 sites in state and county parks within Muskegon County and analyzed them using a rapid ATP screening test and the Colilert system that identifies *E. coli* by fluorescence. The testing procedure allows scientists to quickly analyze samples for the presence of *E. coli*. With rapid results, health officials can then determine whether or not to close the beach. Traditional methods involving standard plate counts require 24 hours before results are available.



Water samples being collected on the *Jackson*.

For its work in this critical public health issue, AWRI received a 2004 Public Health Partnership Award from the Michigan Association for Local Public Health.

The *Angus* and *Jackson*: Vessel Program Serves As Essential Resource for Educators, Community Groups, and Scientists

For years, the vessels of AWRI—the *D.J. Angus* and *W.G. Jackson*—have offered educators, community groups, and scientists an invaluable tool for learning about our resources and conducting vital research. The program, directed by Dr. Janet Vaill, represents collaboration at its best.

Several K-12 schools integrate the vessel program into their regular curricula, giving students a refreshing change from classroom learning. Years later, many of these students still fondly remember the unique, hands-on experience, increasing their awareness and interest in protecting water resources. On a college level, GVSU biology, geology, and education professors take advantage of this resource and include it in their classes.

Since 1998, the *Jackson* has made an annual summer tour of Lake Michigan, docking at ports of call to give onboard tours and sharing important information about Lake Michigan with area residents. In conjunction with the U.S. EPA Lake Michigan Forum, the *Making Lake Michigan Great* tour has reached 28 ports of call in Michigan, Illinois, Indiana, and Wisconsin.

Because the vessels can be expensive to operate and maintain, support from individuals and groups are an integral part of what makes this program a success. A donation from Dr. William Jackson provided resources needed to convert both vessels to run on biodiesel fuel, a nontoxic, biodegradable energy source that is less harmful to the environment than regular diesel fuel. Funding from endowments and other sources enables AWRI to keep this important resource available to all.



Top: *Making Lake Michigan Great* tour "celebrates" White Lake. Bottom: Educators view the bottom of Muskegon Lake via a remotely operated submersible.

AWRI Highlights

Ecological Research Group

AWRI plays an important role in assessing the condition of our natural environment. Scientists and research technicians gather samples and conduct sophisticated analysis in our research laboratories. This information provides the foundation that helps us make decisions about living responsibly within our environment. For more information about the Institute's research projects, contact the individual researchers using e-mail addresses below or call AWRI at (616) 331-3749.

Ecological Research Group Highlights

Dr. Bopaiah Biddanda (biddandb@gvsu.edu):

- Continued long-term collaborative work on pelagic metabolism in Lake Michigan with scientists using NOAA ship time. Results will be presented at the International Association of Great Lakes Research meeting in 2005.
- Continued exploration of a submerged sinkhole ecosystem in Lake Huron and surveyed it using the University of Michigan's remotely operated submersible. Preliminary results show evidence of chemosynthesis by microorganisms at the submerged vent ecosystem. Funded by NOAA.
- Continued the Mecosta County groundwater study. Funded by the Fremont Area Community Foundation.
- Participated in AWRI's long-term study of Muskegon Lake. Mapped Muskegon Lake floor and nearshore Lake Michigan using U of M's submersible. Funded by the Muskegon Lake Research Endowment Fund.
- Studied the fate of land carbon in streams and lakes of west Michigan. A student project found that sunlight and microbes together consume the bulk of terrestrially derived carbon during its journey to the lake. Funded by NASA-MSGC.
- Member of GVSU's College of Liberal Arts and Sciences Dean Search Committee and CLAS Staff Advisory Council. Supervisor of Water Quality Event for Science Olympiad. Member of the editorial board for the *Journal of Plankton Research*.



Gail Smythe prepares samples for analysis.

Dr. Michael Chu (chux@gvsu.edu):

- Developed Windows-based hydrologic and environmental modeling software, which has been used by a number of students, professors, and researchers from ten countries.
- Set up a hydrologic monitoring system in Little Black Creek to collect and process stream flow data. Focused on hydrologic and environmental modeling, including watershed characterization, surface runoff simulation, and metal and sediment transport modeling.
- Continued the Mecosta groundwater project for aquifer analysis and groundwater mapping.

Dr. Mark Luttenton (luttentm@gvsu.edu):

- Conducted biological monitoring and assessment of the Henry's Fork River, Idaho. Funded by Henry's Ford Foundation.
- Prepared a preliminary evaluation of the impact of zebra mussels on primary production in Croton Pond.
- Studied survival of two hatchery strains of brown trout in the Rogue River (collaboration with Dr. Alex Nikitin, GVSU).
- Conducted a White Lake nutrient loading study.
- Member of the Masters degree committee at the University of West Indies.

Dr. Rick Rediske (rediske@gvsu.edu):

- Conducted PCB congeners analysis of fish and invertebrates samples to help calibrate the development of a model simulating the relationship between diet and growth of Lake Michigan whitefish. This project is a partnership with NOAA and USGS.
- Investigated the nature, extent, and environmental effects of sediment contamination in the Mona Lake watershed. Funded by U.S. EPA and Mott Foundation.

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- Continued monitoring program for *E. coli* concentrations at Lake Michigan beaches with the Muskegon County Health Department and MDEQ. Funded by Muskegon Co. Health Dept.
- Continued work on nutrient loading in the Muskegon River watershed (collaboration with Dr. Mike Wiley, Univ. of MI). Funded by Great Lakes Fishery Trust.
- Served as chair for the Muskegon Lake Public Advisory Council, formed to look at possible ways to help delist the lake as an Area of Concern.
- Member of MDEQ Environmental Monitoring Advisory Board and MDEQ Analytical Detection Limit Evaluation Board.

Dr. Carl Ruetz (ruetzc@gvsu.edu):

- Continued long-term monitoring of fish populations in Muskegon Lake.
- Collected data and analysis on the distribution of the round goby in coastal habitats of Lake Michigan in collaboration with Dr. Uzarski. Funded by Great Lakes Coastal Program, USFWS.
- Continued studying fish population dynamics in the Florida everglades.
- Member of the Research/Scholarship Committee, Science and Mathematics Cluster, College of Liberal Arts and Sciences.

Dr. Alan Steinman (steinmaa@gvsu.edu):

- Conducted an internal phosphorus loading study in Spring Lake. Year 2. Funded by Spring Lake – lake board.
- Directed the Muskegon Lake long-term monitoring program. Funded by Muskegon Lake Research Endowment Fund.

**Dr. Steinman
testifying in
Washington,
D.C.**



- Explored the role of internal vs. external phosphorus loading in Mona Lake. Funded by MDEQ.
- Studied algal metabolism in lower Muskegon River. Funded by Great Lakes Fishery Trust.
- Appointed to: Michigan Groundwater Advisory Council, US EPA's Science Advisory Board to review draft report on the environment, Minnesota Sea Grant's Advisory Board, Board of Directors of Land Conservancy of West Michigan.
- Testified before the Subcommittee on Water Resources and Environment in the U.S. Congress and Michigan Senate's Committee on Natural Resources.
- Associate Editor of *Journal of the North American Benthological Society* and *The Scientific World Journal*.

Dr. Don Uzarski (uzarskid@gvsu.edu):

- Completed a project on monitoring and evaluating coastal habitats and wetlands fragmentation for potential restoration activities. Funded by MDEQ.
- Continued testing variability and usefulness of SOLEC indicators in wetlands of Lakes Huron and Michigan. Funded by U.S. EPA.
- Investigated the extent and ecological effects of sediment contamination in the Little Black Creek watershed with hydrological model for cadmium transport.
- Assessed a Muskegon River wetland for fish habitat and food sources. Funded by Great Lakes Fishery Trust.
- Member of Project Management Team of the Great Lakes Coastal Wetlands Consortium.

Peer-Reviewed Publications:

- Biddanda, B.A.** 2004. Techniques for study of carbon flow through bacteria in pelagic food webs. In (D. V. Subba Rao, ed) "Pelagic Ecology Methods." A. A. Balkema Publishers, Tokyo. Pages 208-219.
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- Biddanda, B.A.** 2004. Book review of "UV Effects in Aquatic Organisms and Ecosystems." (Edited by E.W. Helbling and H. Zagarase; Published by The Royal society of Chemistry, 2003). *Journal of Plankton Research* 26: 255-256.
- Madenjian, C.P., D.V. O'Conner, S.M. Chernyak, **R.R. Rediske**, and **J.P. O'Keefe**. 2004. Evaluation of a chinook salmon (*Oncorhynchus tshawytscha*) bioenergetics model. *Canadian Journal of Fisheries and Aquatic Sciences* 61: 627-635.



ISC staff collaborating on a project.

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- Chick, J.H., C.R. Ruetz, and J.C. Trexler. 2004. Spatial scale and abundance patterns of large fish communities in freshwater marshes of the Florida everglades. *Wetlands* 24(3): 652-664.
- Steinman, A.D. and M. Oggdahl. 2004. An innovative funding mechanism for the Muskegon Lake AOC. *Journal of Great Lakes Research* 30:341-343.
- Kranz, R., S.P. Gasteyer, T. Heintz, R. Shafer, and A.D. Steinman. 2004. Conceptual foundations for the sustainable water resources roundtable. *Water Resources Update* 127:11-19.
- Steinman, A.D., M. Luttenton, and K.E. Havens. 2004. Sustainability of surface and subsurface water resources: Studies from Florida and Michigan, U.S.A. *Water Resources Update* 127:100-107.
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- Uzarski, D.G., C.A. Stricker, T.M. Burton, D.K. King, and A.D. Steinman. 2004. The importance of hyperheic sediment respiration in several mid-order Michigan streams. *Hydrobiologia* 518:47-57.
- Uzarski, D.G., T.M. Burton and J.A. Genet. 2004. Validation and performance of an invertebrate index of biotic integrity for Lakes Huron and Michigan fringing wetlands during a period of lake level decline. *Aquatic Ecosystem Health & Management* 7(2):269-288.
- Burton, T.M., D.G. Uzarski and J.A. Genet. 2004. Invertebrate habitat use in relation to fetch and plant zonation in northern Lake Huron coastal wetlands. *Aquatic Ecosystem Health & Management*. 7(2):249-267.
- Jude, D. J., D. Albert, D.G. Uzarski, and J. Brazner. 2004 (in press). Lake Michigan's Coastal Wetlands: Distribution, Biological Components and Threats. "The State of Lake Michigan." M. Munawar and T. Edsall (Eds). *Ecovision World Monograph Series, Aquatic Ecosystem Health and Management Society*.

Information Services Center

The Information Services Center (ISC) collects and analyzes data from environmental research projects, condenses these data into useful information, and then offers the information to those who make decisions about managing our natural resources. For more information about the ISC's projects, contact John Koches at (616) 331-3792 or kochesj@gvsu.edu.

Information Services Center Highlights

- Continued work on numerous projects in the **Rogue River Watershed**. This year's accomplishments include improvements to one road-stream crossing and the installation of a boardwalk at a DNR fishing site. A total of seven best management practices (BMPs) have been implemented including four road/stream crossing improvement projects, the reestablishment of a vegetative buffer, one stream bank stabilization project, and the boardwalk. Project funded by the MDEQ Nonpoint Source Programs.
- Completed a three-year project to update, examine, and forecast **land use and cover conditions within the Muskegon River Watershed**. Products include a map atlas for the 113 townships in the watershed containing information about surface geology, topography, presettlement landscape, and 1978/98 land use and cover conditions. Another popular product is the handbook titled *Local Tools for Lasting*

Boardwalk in the Rogue river watershed.





Example of a road-stream crossing inventory.

Change. More information about the project with access to aerial photographs and detailed analysis is available on the project Web site at www.gvsu.edu/wri/isc/sustain. Project funded by The Wege Foundation with assistance from the Fremont Area Community Foundation.

- Completed work on the **Lower Grand River Watershed Project** including the development of new tools and guidelines aimed at helping local governments and area stakeholders to perform detailed analysis and plan development for smaller subwatersheds. Project products include a detailed Watershed Management Plan for the Sand Creek Watershed and a comprehensive website located at www.gvsu.edu/wri/isc/lowgrand. Project funded by the MDEQ Nonpoint Source Programs.

Dr. Michael Chu and Brian Hanson measure flow in Tamarack Creek.



- Continued analysis of groundwater aquifers in Mecosta County, a project funded by the Ice Mountain Stewardship Fund administered by the Fremont Area Community Foundation. A comprehensive Geographic Information System was developed, including a digital elevation model, updated 1998 land use and cover, and the identification of unconfined and confined groundwater well locations to be included in a conceptual model of groundwater hydrology.
- Continued development of a Watershed Interactive Map Viewer. This work was accomplished as a result of several ISC projects including the Muskegon River Watershed Mega Model Project and the Lower Grand River Watershed Project. Users of the system can access detailed information and map products for various watersheds using their own internet browser at <http://148.61.56.211/website/WITproject/viewer.htm>.
- Started work on the Muskegon River Watershed Transition/Implementation Grant. This two-year project allows the update of the existing Muskegon River Watershed Management Plan, provides education to area residents and decision-makers, and implements best management practices at high priority sites. The BMPs to be implemented include providing permanent conservation easements on vegetative filter strips established on agricultural lands and installing a rain garden/infiltration basin as a demonstration project.

ISC Collaborative Projects/Partners:

- Grand Valley Metropolitan Council
- GVSU's Geographic Information Systems (GIS)
- Muskegon Area-wide Plan Steering Committee
- Muskegon Conservation District
- Muskegon Farmland and Open Space Workgroup
- Muskegon River Watershed Assembly
- Muskegon River Watershed Assembly's Data Repository Committee
- Lake Michigan Federation
- Land Conservancy of West Michigan
- Regional Environmental Planning Agency
- Regional Geographic Information System
- Rogue River Watershed Council
- Sand Creek Watershed Partners
- Timberland RC&D
- Trout Unlimited
- West Michigan Environmental Action Council (WMEAC)
- West Michigan GIS Users Group
- West Michigan Shoreline Regional Development Commission
- White River Watershed Partnership

Outreach and Education Initiatives

AWRI outreach initiatives offer unique learning opportunities on the GVSU vessels and in the classroom that create awareness of, and appreciation for, our natural resources. Emphasis is on programs for pre-college students, teachers, and the general public. For more information about programs and learning opportunities, contact **Janet Vail** at (616) 331-3048 or vailj@gvsu.edu.

Outreach and Education Initiatives Highlights

- In 2004, the *D.J. Angus* and the *W.G. Jackson* research vessels provided educational opportunities for over 5,000 people.
- The **Making Lake Michigan Great Tour 2004**, funded by the U.S. EPA Great Lakes National Program Office, brought the *W.G. Jackson* vessel to Manistique, Pentwater, Green Bay, and White Lake.
- Twenty-four teachers were added to the **GLOBE network** through training at the Lake Michigan Center. Training partners were the Michigan Environmental Council and the Regional Math and Science Center, with funding by the Dart Foundation. GLOBE is supported by NASA. A GLOBE scientist came to GVSU to present special GLOBE training on surface temperature.
- Funding from the Michigan Space Consortium made it possible for AWRI to serve as an effective GLOBE partner and to conduct classroom activities in the LMC's R.B. Annis Educational Classroom. About

AWRI instructor Gus Unsel instructing students at the Lake Michigan Center.



Students in the R.B. Annis Educational Foundation classroom.

1,000 students and their teachers were reached by classroom activities and AWRI staff visits to schools.

- AWRI received funding from Nestle Waters to facilitate **Michigan Project WET water festivals**. Two festivals were held reaching nearly 500 students with hands-on water education activities.
- Dr. Janet Vail is completing the **air quality curriculum** for the Clean Michigan Initiative Environmental Education Curriculum Project. AWRI is also assisting with the water quality curriculum for that project.
- A three-day **watershed workshop for teachers** was held at the Lake Michigan Center in cooperation with Michigan Technological University and the Grand Rapids Area Pre-College Engineering Program. Another workshop for teachers focused on the Lower Grand River Watershed.
- AWRI worked with Indiana Dunes National Lakeshore and other partners to present the week-long **Great Lakes Institute** onboard the U.S. EPA *Lake Guardian* vessel.
- Funding for five years was received for the establishment of the **R.B. Annis Educational Foundation Outreach Program Endowment**. The endowment will be used to support projects to benefit K-12 students served by AWRI.
- Dr. Vail serves as co-chair of the U.S. EPA Lake Michigan Forum and is an appointed member of the MDEQ Environmental Advisory Council. She is secretary of the West Michigan Chapter of the Air & Waste Management Association and a member of the West Michigan Clean Air Coalition and the Muskegon County Environmental Coordinating Council. University service includes being a member of the GVSU Grant Leadership Advisory Team.



The R.B. Annis Water Resources Institute:

- conducts research and collects data on the natural resources in our region
- shares information with the community about our environment
- collaborates with other organizations to discuss ideas and find solutions to problems
- offers hands-on learning experiences aboard research vessels and in the classroom
- helps business, industry, and communities implement environmentally-safe practices
- addresses issues that will affect our community in the future
- provides GVSU students with the opportunity to apply their classroom learning and be part of a research team
- collaborates with GVSU professors and others on research projects
- offers graduate courses at its Lake Michigan Center

If you would like more information about AWRI's programs, please call us at (616) 331-3749 or (231) 728-3601, fax us at (616) 331-3864, contact us through the internet at www.gvsu.edu/wri/, or write us at Annis Water Resources Institute, Lake Michigan Center, 740 W. Shoreline Dr., Muskegon MI 49441.

2004 AWRI Staff

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Leslie De Vries, Science Instructor
Candi Goldman, Science Instructor
James Muller, Science Instructor
Roger Sharp, Science Instructor
Gus Unsel III, Science Instructor
Chuck Vanderlaan, Science Instructor

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Ronald Brown, Captain
Robert Burns, Captain
William Frost, Deckhand
Roger Hillstead, Maintenance
Augie Kotlewski, Deckhand
Douglas Maas, Mechanical Engineer
Brad Nieboer, Marine Electrician
Robert Pennell, Deckhand
Marc Porter, Deckhand
Jim Winks, Captain and Deckhand

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Michael Rediske, Technical Call-in
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Adam Bosch, Technical Call-in
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Interns: Sarah Barnhard, Robert Barrett, Brad Robinson

Herbert VanderMey Intern: Matt Breen



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