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Water Resources Year in Review - Winter 2000

Annis Water Resource Institute

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2000 YEAR IN Review

ROBERT B. ANNIS WATER RESOURCES INSTITUTE

from
Ron Ward,
Director of the
Robert B. Annis
Water Resources
Institute

The construction of our new Grand Valley State University Lake Michigan Center in Muskegon has taken center stage this year, and its opening next June invites new and exciting opportunities for the Annis Water Resources Institute (AWRI). A brief review of the development of the Institute will help to explain what has brought us to our current position and to understand what lies ahead.

GVSU established the Annis Water Resources Institute in 1986 to conduct research and to apply the results of that research to protect and improve one of Michigan's most precious resources—its waters. The Institute's Groundwater Education in Michigan Program, funded by the W. K. Kellogg Foundation, and its Grand River Watershed Program, funded by the Grand Rapids Foundation, were the first major initiatives of the Institute. Since then the Institute's work has been expanded to dozens of streams, river systems, lakes, and groundwater problems. It has also expanded in scope to include issues such as land use, pollution prevention, and air quality, making AWRI a more comprehensive environmental organization.

The Institute has fulfilled the expectations of the university, the area community, and the state. We have demonstrated competency, achieved

success, and gained credibility. The impact of our projects has grown beyond the state of Michigan. Yet our mission remains the same—to conduct environmental research and transfer those findings to decisionmakers and the general public.

The perspective of Institute activities has not changed through the years; however, its facilities, personnel, and reputation have increased greatly. This development of AWRI has led GVSU to expand our mission to include an

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GRAND VALLEY
STATE UNIVERSITY

The Annis Water Resources Institute:

- conducts innovative research and collects vital data on the impact our lifestyle has on our natural resources
- shares information about our environment with the community
- collaborates with other organizations to discuss ideas and find solutions to problems
- offers hands-on learning experiences aboard research vessels
- helps business, industry, and communities implement environmentally-safe practices
- confronts 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
- assists GVSU professors in their research.



Ongoing construction

To preserve, protect and improve our natural resources

Environmental Research Group

In our research laboratories, AWRI conducts sophisticated environmental analyses and assessments. This information is the foundation that helps us make decisions about living responsibly within our environment.

"The data we are able to extract from thorough testing procedures provides vital input in decisions that affect our choices and our quality of life."



An Interview with Dr. Richard Rediske, Senior Program Manager

You recently finished a sediment study on Manistee Lake. What did you discover?

Our research indicated that the sediments of the lake were adversely impacted by salt brine, oil contamination, and contaminated groundwater from paper mill waste treatment lagoons.

Some of this contamination is still current, but most is historic, meaning greater than 10 years old. There are four salt extraction companies, a foundry, and a papermill currently on the lake. The paper mill waste treatment lagoon has been closed, however historic groundwater still enters the lake. The impacts from oil contamination and brine appear to affect aquatic life the most.

You also conducted tests on Muskegon Lake. Those tests will continue next year, but what have you found so far?

Based on initial results, we found heavy metals and organic chemicals at the Division Street Stormwater Outfall,

the old coal gas production facility, and the area near the old Lakey Foundry. These areas of sediment contamination may cause harm to bottom dwelling organisms.

We also found high levels of coal tar related chemicals in what appears to be a small area. These materials are known carcinogens and are toxic to aquatic life.

The State will determine if the high levels require a clean-up. Certainly developers will have to address this problem if they plan to dredge the lake and build marinas.

Next year, we will be looking at the distribution of the aquatic insects at the bottom. We want to determine if there is any correlation between the type and number of organisms and the chemical contamination.

We're also looking at the deposition pattern of heavy metals to see if it's changed—if it's gone down in recent years or if it's still as high as it was years ago. They've stopped discharging heavy metals through surface water into the lake, however the metals are in the sediment which can be moved by currents, then transported and deposited into the lake. We're trying to find out how much is being currently transported. If there's a lot of deposition going on, you might want to go back to the source and take the metals out. If it's buried under clean sediment, then you'd probably want to leave it there.

The data we collect will help decision-makers prioritize areas for remediation and restoration.



This year you completed a habitat survey of the lower Muskegon River watershed. How has it changed since 1978?

We noted a significant change in wetland vegetation in the areas between the Causeway and Mill Iron Road in the past 20 years. About half of the wetland vegetation changed to species more tolerant of high water levels. Near US 31, shrub and emergent vegetation like cattails replaced what used to be wetland forest.

Basically what's been happening is this area is now more prone to flooding. Excessive sediment deposition and restrictions in the water course from the highway crossing allow water to pool and cause flooding.

The change affects not only the landscape but the wildlife as well, attracting more species suited to the wetter environment and eliminating those that are not. Change of that magnitude results in a loss of diversity.

You do quite a bit of work with benthic macroinvertebrates. What are these organisms and why are they so important in your research?

We use benthic macroinvertebrates in almost all of our work. They are insects that live on the bottom of lakes and streams, and are very sensitive to changes in the sedimentation. They are also the basis of the food web for fish, so changes in their population can have a great effect on other species.

We measure chemicals and sedimentation, however we determine their effects by the way it's reflected in the invertebrate communities. Changes in number and in species give us a good idea of overall impact.

In our work over the past few years, we have seen the diversity of insects improving in lakes but not in streams. Cleaning up the effluents discharged into lakes has helped significantly. We must now focus on the streams and try to reduce excess sedimentation caused by water run-off and development.

2000 Group Highlights

- Finalized a report of sediment on Manistee Lake, a project funded by the U.S. Environmental Protection Agency (U.S. EPA).
- Completed the first year of a two-year sediment contamination and aquatic insect investigation of Muskegon Lake, funded by the U.S. EPA's Great Lakes National Program Office.
- Completed a habitat survey of the lower Muskegon River documenting the vegetative changes from the mid 70's to now. A CD Rom of the results is available. This project was funded by the Community Foundation for Muskegon County through the Great Lakes Community Foundation Environmental Collaborative.
- Continued to perform analyses of groundwater from two contaminated sites to determine if natural biodegradation is occurring. Results have shown that indicator chemicals are present which means hazardous chemicals in the environment are degrading naturally. Decision-makers are using the results to develop a closure plan, leaving some of the areas to degrade naturally while removing areas so high that they are toxic to bacteria.
- Made presentations on the Agricultural Water Quality Index (AWQI) at conferences in Missouri and Ohio, sponsored by the American Farm Bureau Foundation. The AWQI was developed to help agricultural producers determine the condition of their streams and what effect farming practices have on water quality.
- Worked in collaboration with the Michigan Department of Environmental Quality (MDEQ) and Horizon Environmental to examine how adding chlorine affects the performance of the Lakeview Airport Treatment Lagoons. Excessive biological growth limits the effectiveness of the treatment system in summer months. Since results of the chlorine addition experiments were encouraging, officials are evaluating the feasibility of adding chlorine to boost performance.
- Assisted three faculty members in their independent research projects related to water quality issues by providing lab space, equipment, and technical assistance. We also worked with three students on research for classes they need to complete their degrees.

Information Services Center



The Information Services Center (ISC) collects and analyzes data from environmental research projects, condenses this data into useful information, and then offers the information to those who make critical decisions about managing our natural resources.

“Through several different projects, the ISC has been able to develop tools and methods for capturing information on water quality and land use issues. These tools are valuable in solving not only environmental problems but also help shed light on socio-economic concerns as well.”

An Interview with John Koches, Senior Program Manager

Michigan is known for its great fishing streams. How has development jeopardized one of our state’s natural treasures?

Streams such as the Rogue River are renown for their trout population. Trout survival depends on cold water, and cold-water fisheries are most susceptible to housing and urban development.

Impervious surface areas—rooftops, sidewalks, roads—intercept stormwater that would normally be absorbed by the ground, taking days, weeks, if not months before finding its way to a nearby stream. In the process, the water cools down and enters the stream slowly.

But in developed areas, rain water flows over these hard surfaces and gets conveyed through pipes sometimes directly into the stream, increasing the temperature, the velocity, and the amount of water. Runoff often warms up streams, erodes banks, creates excess sedimentation which fills in cobble, destroying spawning habitat and food sources.

Protecting cold water fisheries like the Rogue River is very important and can be difficult, especially if the river flows over a wide area. That’s when collaboration and cooperation with decision-makers and stakeholders become essential.

One of the outcomes of the Rogue River project is establishment of a watershed council responsible for implementing management practices. Why is this significant?

The key to long term and successful watershed management is giving ownership to people at the local level. The council is represented by stakeholders—those with vested interests in protecting the watershed. They would be most likely to influence property owners because they own property within the watershed as well. It’s more of a shepherding instead of a regulatory approach to water quality management.

This group can also consider other issues not addressed in the watershed management plan, which focuses mostly on nonpoint source pollution. They can look at biodiversity, social and economic issues, habitat—all of which potentially affect water quality.

Do any other similar groups exist for other watersheds?

The Muskegon River Watershed Assembly works on a similar principle—give ownership at the local level. The Rogue River watershed is a fairly small



system, the Muskegon River watershed is about 2,300 square miles and covers about a dozen counties. The challenge becomes, how do you manage a watershed so large? It's critical to have some sort of system of governance.

Will AWRI become involved with longterm management projects?

Our watershed projects are specifically designed so that at some point the implementation process is turned over to a responsible party or parties. Because that process may require 20 years or more of effort, we feel it's important to help facilitate and encourage the formation and organization of these partnerships, since they are so critical to longterm management.

We will always be involved in finding partners who will assume longterm responsibility for implementing best management practices, yet our main focus will continue to be on collecting and analyzing data, creating tools, providing training, offering recommendations, and working with others to come up with solutions.

Location of the Rogue River Watershed



2000 Group Highlights

- Completed the watershed management plan for the Rogue River watershed and submitted a proposal for implementation of best management practices. The project is funded by U.S. EPA and administered by the Michigan Department of Environmental Quality.
- Helped establish a watershed council in partnership with Grand Valley Metro Council and West Michigan Trout Limited. This entity is responsible for long-term management of the Rogue River Watershed.
- Began work on the Muskegon River Watershed Project. This project is funded by the U.S. EPA and administered by the Michigan Department of Environmental Quality.
- Began an initiative which will allow the Kent County Stormwater Task Force to explore administrative options for stormwater management. Funding provided by the U.S. EPA as authorized by Section 319 of the Clean Water Act.
- Completed the sixth year of the Gypsy Moth Suppression Program, affecting 5 counties in Michigan.
- Collaborated with GVSU Economic Professor Paul Thorsnes to develop a marketable development rights model with funding from the Michigan Great Lakes Protection Fund.
- Completed inventory of impervious surfaces for Cannon Township as part of stormwater ordinance development.
- Finished a Road/Stream Crossing Inventory consisting of 706 sites in Ionia County. Funding was provided through the 1998 Michigan Transportation Enhancement Program.
- Completed the third year of the Source Water Assessment Program for a 16 county region in west Michigan with funding provided by the Michigan Department of Environmental Quality.
- Continued work for the Pierce Cedar Creek Institute identifying ecosystem indicators that will help determine future land use decisions. Funding provided by the Willard G. Pierce and Jessie M. Pierce Foundation.
- Generated a comprehensive map atlas which documents land changes since 1978 for the Newaygo County Land Use project. Funded by the Fremont Area Foundation through the Great Lakes Community Foundation Environmental Collaborative.

Outreach Initiatives

AWRI outreach initiatives keep the community informed about environmental concerns and offer unique learning opportunities which create awareness of and appreciation for our natural resources.

“One of the most important things we do is to create connections between individuals and groups.”



An Interview with Dr. Janet Vail, Senior Program Manager

The W.G. Jackson completed its third year touring Lake Michigan. How many ports of call did you visit and why is this tour important?

This past year, we again partnered with the U.S. Environmental Protection Agency Lake Michigan Forum to sponsor the *Making Lake Michigan Great 2000 Tour*. This time, the *W.G. Jackson* research and education vessel visited nine ports of call on Lake Michigan with new stops in Pentwater, Manistee, Ludington, Sheboygan, and Saugatuck.

This tour was important because we could showcase the Lakewide Management Plan that was recently completed. The Great Lakes Quality Agreement with Canada mandates that every lake has to have a plan. The plan was put together by the U.S.

Environmental Protection Agency, state and federal agencies, and tribes.

Even though our purpose remains the same, the tour itself is different because each port has a different menu of events. Our program is customized to meet local needs. For example, in Waukegon area residents were concerned about sediments in their harbor so there were experts onboard to address that issue.

The tours help us develop a comprehensive and consolidated plan of action for protecting Lake Michigan by making connections throughout the Lake Michigan basin. Plans are already under way for next year's tour that will culminate in the *Lake Michigan: State of the Lake 2001 Conference* in November.

AWRI conducted its second GLOBE teacher training workshop. How was this year different than last?

What made this year's GLOBE workshop possible was a massive effort on the part of many partners. The Michigan Environmental Council helped arrange it, and it was the first time we worked with trainers from Michigan State University and Murphy Elementary School who helped guide teams of teachers through GLOBE protocols. The Regional Math and Science Center helped coordinate workshop logistics. The teams of teachers came from Kent, Ottawa, and Muskegon counties.

What is Project WET and what is AWRI's role?

Project WET is one of the premier environmental education programs in the nation. AWRI has been designated the



Michigan Coordinator for the national program.

The core of the program is a curriculum and activity guide for students in grades K through 12. It is a collection of water-related, fun, hands-on, and easy-to-use activities. We offer workshops for teachers so they are trained to implement Project WET activities.

We also sponsored the first Project WET Water Festival here at Heritage Landing on September 22. There were festivals that day in all 50 states. We wanted to model for teachers how to do the Project WET activities and get students connected with the whole theme of water. What better place to do that than at Heritage Landing in the rain? They certainly got the idea of water cycles. Teachers and students both went away really excited.

Why is it important that AWRI offer an educational outreach program?

AWRI's mission centers on applied research and application, so education naturally becomes a very important part of our overall efforts. Helping people understand their environment—both young and old alike—makes an impact. People become better stewards when they learn more about their world and how to take care of it.



2000 Group Highlights

- Completed a third successful year of the *Making Lake Michigan Great* tour during which the *W.G. Jackson* traveled to 9 ports of call on Lake Michigan. The purpose of the project was to spread the word about the U.S. EPA Lakewide Management Plan for Lake Michigan. More than 1,500 people turned out for the events.
- Concluded another year during which more than 8,500 people participated in activities aboard the research vessels, the *D.J. Angus* and the *W.G. Jackson*.
- Published a new vessel activities guide for elementary and middle school teachers.
- Coordinated Michigan Project WET (Water Education for Teachers) training workshops. WET is a national, interdisciplinary water education program originally developed in 1984.
- Held the first Michigan Project WET Water Festival September 22 at Heritage Landing in Muskegon. Over 750 students from area schools attended.
- Conducted a Global Learning and Observations to Benefit the Environment (GLOBE) training workshop for 33 educators at GVSU Allendale campus and the AWRI Muskegon Field Station. GLOBE is an international environmental monitoring program which links scientists and students from around the world. Funding provided by the Dart Foundation, Frey Foundation, Wege Foundation, and the Michigan Space Grant Consortium.
- Held the first "Summer Science Adventure Day Camp" at the Muskegon AWRI field station and "Outside Water Science Camp" in Zeeland. Campers went onsite to study and explore natural habitats.

emphasis on the entire Lake Michigan basin. This new emphasis gave rise to the Lake Michigan Center (LMC) now under construction. The Center will provide more than a home for the Annis Water Resources Institute and its existing programs. It will be a focal point for all organizations and individuals interested in Lake Michigan and the Great Lakes in general; a place where scientists, policy makers, citizen groups, regulators, and the general public can meet and exchange information and ideas. The Center will provide offices, classrooms, conference facilities, research labs, computer labs, boat docks, and storage facilities to support those activities.

The LMC will provide a new home, appropriately located on Muskegon Lake with easy access to Lake Michigan, for the Annis Water Resources Institute. The Institute will continue its existing programs, partnerships, and collaborations, but the Center will provide new opportunities for AWRI to develop programming and collaborations to meet its mission. The community in which we work will be enlarged, but our mission to conduct environmental research and deliver the findings of that work to protect and improve our environment will remain the same.

Please circle June 21, 2001 on your calendar. I look forward to introducing you all to the new GVSU Lake Michigan Center that will be dedicated on that date.

The R. B. Annis Water Resources Institute works closely with GVSU professors researching our environment. The following professors received AWRI Faculty Research Awards:

Miles Hacker

Professor and Chair of Biomedical and Health Sciences

Project title: Evaluation of the Cytotoxic and Mutagenic Potential of Chemicals Made by Blue Green Algae

Mark Luttenton

Associate Professor of Biology

Project title: Muskegon River Invertebrate Communities and the Potential Effects of Zebra Muscles on Invertebrates Below Croton Dam.

Neil MacDonald

Associate Professor of Biology

Project title: Water Quality Monitoring in the Pigeon River Watershed

Faculty Collaborators:

John Gabrosek, Assistant Professor of Math and Statistics; **Carol Griffin**,

Assistant Professor of Biology; **Mark Luttenton**, Associate Professor of Biology; **Shaily Menon**, Assistant Professor of Biology; **Paul Stevenson**, Assistant Professor of Math and Statistics; **Paul Thorsnes**, Assistant Professor of Economics

AWRI provides opportunities for students to pursue their interests in our environment. The following students received AWRI internships during 2000:

D. J. Angus-Sciencetech Educational Foundation Interns:

Sarah Allarding
Srinivasan Prasanna
Amy Taylor

VanderMey Intern:

Michael Sherer

Ford Motor Company Interns:

Megan Clos
Ann Hammond
Kristen Rench
Michael Russ

2000 Staff/Administrative:

Tonya Cnossen
Renee Kemp
Roxana Taylor
Ron Ward, Director

Information Services Center:

Jean Conzelmann
Mia DeBruyne
Rod Denning
Joan Gibson
Sarah Hypio
John Koches, Senior Program Manager
Nichol Stout
Kurt Thompson

Outreach Initiatives:

Jeffery Auch
Thomas Baar
Richard Behm
Ronald Brown
Robert Burns
Bonnie Cowles
Leslie DeVries
Ronald Dykstra
Anthony Fiore, Jr.
John Gort
Roger Hillstead
Douglas Maas
Daniel McCormick
Robert Pennell
Roger Tharp
Gus Unseld III
Janet Vail, Senior Program Manager
Chuck Vanderlaan
Melissa Welsh
Elizabeth Wilgenburg

Environmental Research Group:

James Bigelow
Betty Doyle
David Nash
Richard Rediske, Senior Program Manager
Cynthia Thompson

Student Assistants:

Sarah Allarding
Eric Andrews
Jessica Blunt
Michael Buth
Megan Clos
Jean Conzelmann
Nathan Dunn
Rebecca Gannon
Betsy Grannis
Ann Hammond
Stephanie Hansen
Mitchell Koetje
Yashica Lockett
Michelle McQuiston
Christa Miller
Srinivasan Prasanna
Kristen Rench
Michael Russ
Brett Shelagowski
Michael Sherer
Gains Spohn
Pete Stevens
Amy Taylor
Brenda Tinsley
Bruce VanDenBosch
Michael VanOoteghem
Jessica Weerstra
Kris Williams



If you would like more information about AWRI's programs, please call us at (616) 895-3749, fax us at (616) 895-3864, contact us through the Internet at <http://www4.gvsu.edu/wri/>, or write us at R.B. Annis Water Resources Institute, Grand Valley State University, One Campus Drive, Allendale, MI 49401.