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JOVE Activities Take Off

In 1991, the National Aeronautics and Space Administration, (NASA), chose GVSU to participate in its (JOVE), JOint VEnture, program. This nationwide program is designed to increase university participation in science-related research and provide outreach to students as a means of increasing the number of science and mathematics graduates. Over the past year, several interesting research projects with potential applications to WRI research have taken off and outreach activities have developed.

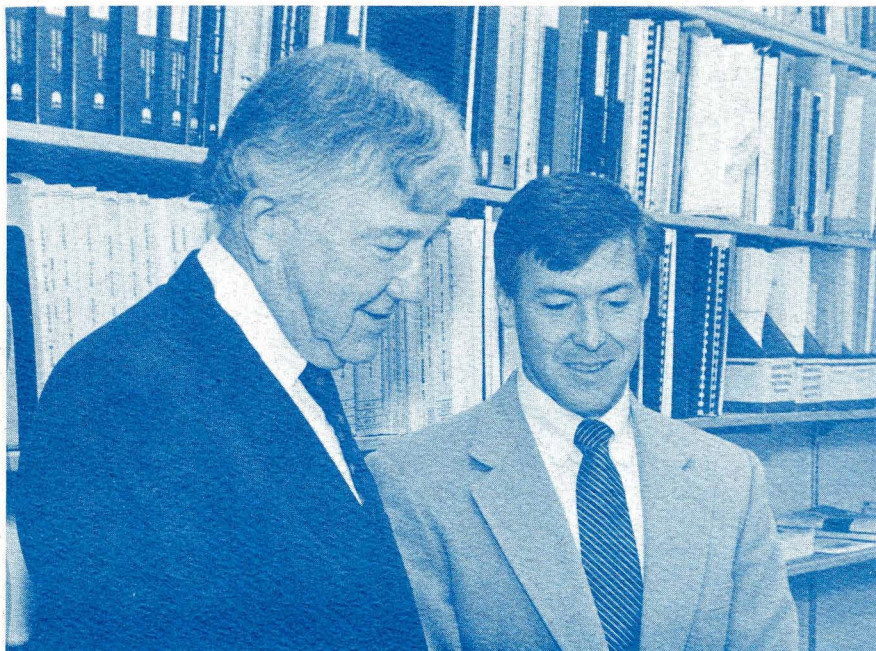
Research Activities

Three GVSU faculty members are conducting research under the NASA/JOVE program. Dr. Kevin Cole, WRI Faculty Associate and Assistant Professor of Geology, is

(See page 3)

Table of Contents

- JOVE Activities Take Off
- "ON-GUARD!" Nominated for Award
- From The Director
- Lewis Reference Room Unveiled
- WRI Receives Westerman Foundation Grant
- Stormwater Committee Makes Difference
- Grand River Workshop Increases Awareness
- Citizens Monitor Water Quality
- WRI Investigates Wetlands
- One Too Many Copies?
- WRI Publications Available



GVSU President Arend D. Lubbers (left) and Brian Lewis (right) of Lewis Publishers, Inc. examine materials donated to the Water Resources Institute at the Lewis Reference Room dedication ceremony. See story on page 2.

"ON-GUARD!" Computer Program Nominated for National Award

"On-Guard!", an interactive, user-friendly pollution prevention computer program has been nominated by the U.S. Environmental Protection Agency in Region 5 for a National Pollution Prevention Award. The program was developed through the Waste Reduction and Management Program (WRAMP) of the Water Resources Institute and Guardsman Products of Grand Rapids. The "On-Guard!" program contains a series of questions, helpful hints and animation regarding pollution prevention organized in specific modules applicable to the paint manufacturing industry.

At a meeting of the WRAMP Industrial Advisory Board, Robert Ripley, Vice President of Corporate Environmental and Technical Affairs of Guardsman Products, Inc.,

viewed a demonstration of the WRAMP automotive repair shops computer program and envisioned a similar product being developed relating to the paint manufacturing industry. Such a program would have application beyond the West Michigan Area through Mr. Ripley's involvement with the National Paint & Coatings Association, comprised of more than 700 member companies.

What resulted from Robert Ripley's initial idea was a five month partnership between Guardsman Products and the Waste Reduction and Management Program to make this idea a reality. In September, 1991, a joint committee of Robert Ripley, Bruce Katje and Gary MacLean from Guardsman Products and Tom Kimball, Janet Vail and Dr. Ronald Ward from the Water

(See page 4)

From the Director

Our **WATER RESOURCES REVIEW**, like most newsletters, is intended to communicate our Institute's activities and related matters. Thus, we typically include articles highlighting events and topics. This issue deviates from that normal pattern only in that this column makes two requests that I hope you will honor.

First, you will find a tear-out postage-paid **1992 GRAND RIVER WATERSHED SURVEY** insert. Please note that the survey is very brief--only five questions for your response. However, the information that we are seeking is very important in guiding our Grand River Watershed Program and possibly other similar initiatives to protect and improve our water resources. I hope that you will take a few minutes to complete and return the survey. We are relying on your assistance and will share a summary of your responses in our next issue.

My second request relates to the **ONE TOO MANY COPIES** column on page 7. We want to communicate with all interested parties but we do not wish to burden anyone with multiple or unwanted copies. Thus, we would welcome any new names that you might suggest for addition to our mailing list. Conversely, if for some reason you receive more than one copy of this publication, or if you wish to be deleted from our mailing list, we would appreciate hearing from you either by phone or mail.

As always, I appreciate all of your cooperation and assistance. Please do not hesitate to contact me if you have any questions on either of the above matters.

Ronald W. Ward
Director
Water Resources Institute

WRI Receives Grant From The Samuel L. Westerman Foundation

The Water Resources Institute was recently awarded a \$9,000 grant from The Samuel L. Westerman Foundation of Grand Haven, MI. The grant will be used to further investigate heavy metal contamination in the lower Grand River wetlands and bayous.

In 1990, WRI initiated research on the lower Grand River and found that heavy metals are accumulating in these regions producing conditions which may be detrimental to human health, health of the ecosystem and decrease recreational use. The Westerman grant will enable WRI to continue with research in these areas.

Specific research initiatives include: determining the availability of metals to organisms, including fish, benthic invertebrates, plants and wildlife; modeling the transport, deposition, and resuspension of metals in the bayous and wetlands; and estimating the risks posed by heavy metals to recreational values and public health. Dr. Patrick Thorpe, WRI Researcher and GVSU Assistant Professor of Biology, anticipates that this study "will provide insight into the effects of heavy metals on ecosystem health."

Lewis Reference Room is Unveiled

April 14, 1992 marked the unveiling of the Lewis Reference Room located in the Water Resources Institute Building on Grand Valley State University's Allendale campus. The room has been dedicated in memory of Edward E. Lewis, founder of Lewis Publishers, Inc., the leading publisher of environmental books.

Brian Lewis, a 1984 Grand Valley State University Seidman School of Business graduate and son of Edward E. Lewis, has generously offered to provide all Lewis Publishers, Inc. titles to the Water Resources Institute as a gift. WRI has already received over 100 titles covering topics such as fish toxicity, waste management, wetlands and groundwater contamination. "The new Lewis titles enable me to be more productive and efficient because more information is readily available," comments Ramon David, laboratory manager at the Water Resources Institute.

Based out of Chelsea, MI, Lewis Publishers, Inc. was founded in 1980 by Edward E. Lewis and is a division of CRC Press, Inc. Since 1984, Brian Lewis has directed much of the company's energies toward agricultural and environmental publications. "We are the biggest environmental publisher in the world and in essentially two years, we will be the largest agricultural publisher," comments Lewis.

In addition to Lewis publications, the Lewis Reference Room also contains hundreds of additional books, journals and videos which cover a variety of science and environmental topics. The Reference Room is available to the public by appointment. If you would like more information on the Lewis Reference Room, please contact Stacey Tabor at (616) 895-3749.

studying the hydrogeological applications of remote sensing. Dr. Ross Reynolds, WRI Faculty Associate and Assistant Professor of Physics, is researching protein crystallography. Dr. William Chren, WRI Faculty Associate and Assistant Professor of Engineering, is involved in satellite development and design.

Dr. Kevin Cole is currently researching the use of microwave remote sensing in determining soil moisture. Traditionally, remote sensing has been used to determine types of vegetation, canopy cover and height and other surface characteristics. "I am looking at eliminating the effects of vegetation, eliminating the effects of hill slope, eliminating everything except the effect of moisture in the soil," remarks Cole.

Cole uses microwave remote sensing which makes use of synthetic aperture radar to obtain radar holograms of Earth's surface. Cole is using these radar images to calibrate a terrain modelling program, FLOW, which he developed to determine slope aspect, flow accumulation, drainage network, watershed boundaries and ultimately, soil moisture. The information will enable Cole to determine when and where farmers need to irrigate and predict crop yield based on moisture balance. "I can tell the farmer that his crops are not getting enough water in this field or he is over irrigating in that field," adds Cole.

Dr. Ross Reynolds' research involves the determination of protein structure through use of x-ray crystallography. Currently, Reynolds is examining the structure of cytochrome C5, a protein structure used in the respiration cycle of living organisms. "The precise determination of their atomic structure is essential for a full understanding of the details of electron transport as carried out by these proteins," according to Reynolds.

Reynolds' research includes growing crystals in the microgravity of space to obtain better ordered



Doug Kindschi (right), Dean of Math and Science at GVSU, watches as Jim Jipping (left), Chair of the Space Education Council, zealously demonstrates how to make a comet at a Space Education Council Meeting.

crystals which are more useful in research. There are several benefits to growing crystals in space including, lack of density gradients and minimized crystal sedimentation.

Dr. William Chren's research efforts are directed toward the design and development of satellites. Chren is involved in developing a two-dimensional prototype of ESTAR (Electronically Scanned Thinned Array Radiometer), a passive synthetic-aperture radiometer used to sense soil moisture and ocean salinity from space. Chren's research goal "is to explore architectural alternatives in the design and implementation of four parts of the DDS (digital data subsystem of ESTAR)."

Outreach Activities

In 1991, GVSU formed the NASA Space Education Council under the JOVE program to provide outreach to schools throughout western Michigan. The Council is composed of area teachers, parents and GVSU faculty and staff. The Council's primary goals are to promote awareness about space science and create more interest in the math and sciences among stu-

dents of all ages. To accomplish these goals, the Council is working toward improving the teaching of science. "Many teachers are afraid to teach science...We want to show these teachers how to do science," comments Carla Gyzm, Council participant.

To improve the teaching of science, the Council is organizing a Summer Teacher Workshop. The workshop is targeted for summer 1993 with a proposed emphasis on using thematic approaches to teaching science in elementary and secondary schools. Jim Jipping, Chair of the Space Education Council and teacher at Holland Christian High School, comments, "We (the Council) have come a long way in developing our ideas...I am very excited about the direction we are taking."

The Space Education Council meets once a month at the Water Resources Institute on GVSU's Allendale campus. If you would like more information on the Council, please contact Jim Jipping at (616) 396-1477. If you would like more information on the next meeting, please contact Mary Albrecht at (616) 895-2261.

Stormwater Committee Looking to Make a Difference



The Stormwater Committee, a citizen's group formed under the Grand River Watershed Program, has been meeting regularly to discuss problems associated with stormwater runoff, such as, soil erosion and sedimentation. The Committee is composed of area engineers, developers, lawyers, concerned citizens and WRI faculty and staff.

Committee participants are looking to do more than discuss stormwater issues amongst themselves, they would like to share their expertise with municipalities, State government officials, contractors and the community. To accomplish this goal, the Committee has formed three task forces to examine the Committee's potential of becoming a stormwater planning agency, to examine local ordinances and help develop new legislation, and to coordinate a stream restoration project.

The stream restoration task force has proposed an interesting project for York Creek using a watershed approach. Pete DeRitter and Ruth Wildbahn of the Coalition for Grand River Preservation are coordinating the project and "would like to restore York Creek so that it will once again be able to maintain brook trout populations."

York Creek is a tributary of the Grand River with a 3-square mile watershed extending into Alpine Township, Plainfield Township and the City of Walker. Rapid urbanization and land use practices in the watershed have lead to the degradation of the creek. Specifically, soil erosion and sedimentation are seen as the major contributors to the decline in water quality.

The task force is in the process of developing a watershed management plan incorporating land use mapping, photo documentation, water quality testing, stormwater management, bank stabilization, and soil erosion control. DeRitter adds, "Residents need to be involved in the process to assure long term success."

If you would like more information on the Stormwater Committee or would like to attend the next meeting, please contact Stacey Tabor at (616) 895-3749.

"ON-GUARD!" ...Continued from Page 1

Resources Institute began a series of meetings to develop the computer program "On-Guard!".

The Guardsman team provided text and "real world" advice for the program while the WRI team translated the information into an interactive computer program. The text was written primarily by Bruce Katje of Guardsman and Tom Kimball of WRI developed the program and graphics. Besides ideas from Guardsman, the committee used ideas from the EPA Guides to Pollution Prevention: The Paint Manufacturing Industry and information submitted for the National Paint and Coatings Pollution Prevention awards.

In January, 1992 the program was presented to the quality committee at Guardsman and to the Guardsman environmental managers from across the country for their review and comments. Four members of the "On-Guard!" team went to the National Paint & Coatings Association (NPCA) headquarters in Washington, D.C. to demonstrate the computer program. The NPCA was asked to review the program and discussions are underway about distribution of the program to the NPCA membership.

In order for pollution prevention to become a reality in American industry, there must be awareness of this concept throughout a company from the individual hourly worker to the chief executive officer. "On-Guard!" appeals to employees at all levels in a company and delivers pollution prevention tips in a unique way. Plans are underway to adapt this program for other industries. Contact Janet Vail of the Water Resources Institute at (616) 895-3749 for further information on computer applications for pollution prevention.

Grand River Workshop Increases Awareness

On May 5, the Water Resources Institute hosted a Grand River Workshop at The L.V. Eberhard Center in downtown Grand Rapids to promote and celebrate community involvement in the preservation of the Grand River. The event featured hands-on exhibits by the Kent County Health Department, Ottawa Soil and Water Conservation District, the Center for Environmental Study, the Michigan Trails Girl Scout Council, the Water Resources Institute and several other groups.

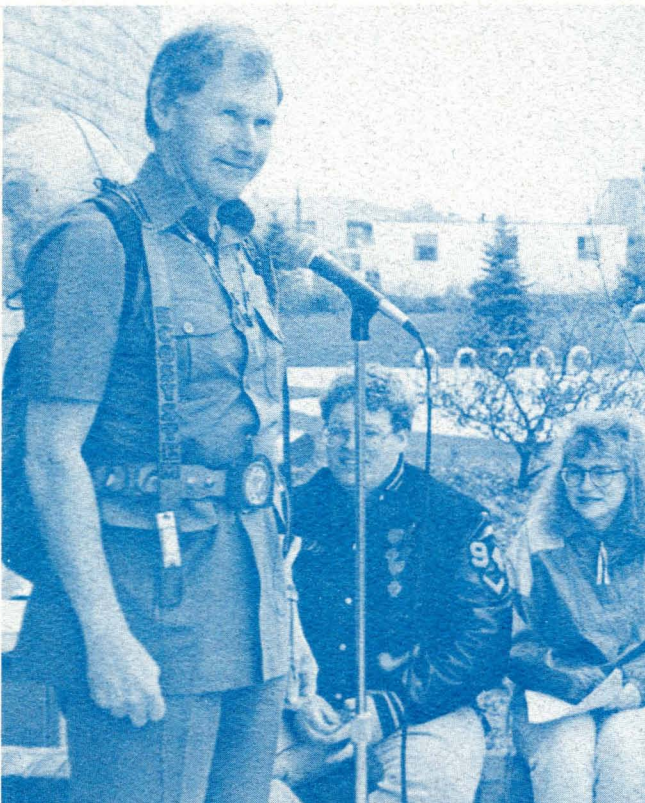
In addition to the exhibits, well known limnologist, Dr. Jack Vallentyne (Johnny Biosphere) thrilled the audience with a discussion on the importance of preserving and protecting our natural resources. Vallentyne is author of a book entitled, "The Algal Bowl: Lakes and Man" and in the 1970's, played a prominent role in reducing levels of phosphate in laundry detergents.

Many environmentally concerned student groups throughout the Grand River Watershed are doing their part in preventing pollution. To recognize these groups, the Water Resources Institute, with the support of The Grand Rapids Foundation, sponsored the Grand River Watershed Pollution Prevention Awards. Award recipients were honored at the Grand River Workshop.

In the senior high division, the winner was YIKES! (Young Idealistic Kids with Environmental Sensitivity) for their successful Christmas tree recycling program. Over



Governor Engler and Dr. Ron Ward, WRI Director, discuss water quality issues at the Grand River Workshop.



Guest speaker Dr. Jack Vallentyne (left), Johnny Biosphere, stressed the importance of modifying our actions in order to protect our environment.

6000 trees were collected in 1991 and turned into organic mulch. YIKES! is sponsored by the West Michigan Environmental Action Council (WMEAC).

Hayes Middle School in Grand Ledge was honored for their school recycling program (styrofoam, aluminum cans, paper) which was instrumental in instituting district-wide recycling programs. Hayes Middle School was also commended for tree planting on Earth Day, school clean-ups, and awareness programs.

Recycling at Holton Elementary School focuses on paper, plastics, styrofoam, and tin. Students keep track of the number of trees saved through paper recycling. At a rate of 17 trees per ton of paper, they have saved 26 trees so far.

Since 1990, the students at Ottawa Area Center have been in charge of a recycling program for ten items - styrofoam, copy paper, tin, glass, plastic, newspaper, and brown bags. This program is special in that the severely mentally impaired students at Ottawa Area Center are learning skills that will someday allow them to handle a job involving sorting recyclable materials.

C. Christopher Worfel from The Grand Rapids Foundation wrapped up the evening event with a statement concerning The Foundation's longtime commitment to the preservation and protection of the Grand River.

Citizens Volunteer to Monitor Water Quality

In the United States there are thousands of volunteer groups forming to help keep an eye on the nation's lakes, rivers, streams and estuaries. During the Third National Citizens' Volunteer Water Monitoring Conference this spring in Annapolis, MD, representatives from over a hundred volunteer programs in over 30 states gathered to discuss forming partnerships with governments, schools, businesses and environmental organizations to implement and maintain successful volunteer monitoring programs.

ACTIVITIES ACROSS THE NATION

Volunteer monitoring of the environment is not a new idea. In the 1700's, England protected its salmon and trout streams through citizen monitors known as "Riverkeepers" and the U.S. National Weather Service has used volunteers to record weather for over 100 years.

Today, programs across the nation vary from a few volunteers to highly organized volunteer networks with interests ranging from environmental education to enforcement and compliance monitoring. Some programs, such as Project RiverWatch in New York, depend solely on private donations whereas most programs, such as the Minnesota Clean Rivers Project, depend heavily on state and federal funding:

Data collected by volunteer groups is often used by state governments for establishing baseline and long-term water quality trends, water quality status reports and nonpoint source assessments. Data collected under the Texas Adopt-A-Beach Program were instrumental in the ratification of MARPOL Annex V, legislation which prohibits ocean dumping of plastics worldwide.

Data can also be used at the local government level. "The City of Austin, Texas passed a ban on



Students picking up trash at a Water Resources Institute sponsored stream clean up along the banks of the Grand River.

phosphates due in part to data collected through our monitoring activities," says Chani Gilfeather, a L. Banes High School student volunteering under the Colorado River Watch Network.

ACTIVITIES IN THE GRAND RIVER WATERSHED

There has been a recent surge of organized volunteer monitoring activities in the Grand River watershed. Through coordination with the West Michigan Environmental Action Council (WMEAC), a Grand River Citizens Watershed Council has formed with representatives from the seven major tributaries along the Grand River: the Thornapple, Looking Glass, Portage, Maple, Rouge, Flat and Red Cedar Rivers as well as representatives from the Coalition for Grand River Preservation, Caretakers of the Grand and Interconnections. According to Ruth Wildbahn, President of the Coalition for Grand River Preservation, the Council's "big concerns are better land use, stormwater runoff, bank stabilization and red flagging pollution hot spots."

Through activities such as tree plantings, stream bank cleanups and visual assessments of rivers, these groups have had a strong impact on their communities. "I see a lot of interest from citizens. In the last five years citizens have become much more aware of water quality issues. People want to make a difference," adds Wildbahn. Currently, Council activities do not include routine water quality testing but it is a project which they hope to implement basinwide.

Other area volunteer monitoring activities include the Stream Team Program, funded through The Grand Rapids Foundation, and WMEAC's Adopt-A-Stream Program. The Water Resources Institute has worked with the Michigan Youth Corps and Grand Valley State University students in streambank cleanups and river assessments. WRI was also a sponsor of the Grand River Expedition '90, a 13 day canoe trip down the length of the Grand River aimed at promoting stewardship and awareness of our natural resources.

If you would like more information on any of these activities, please contact Stacey Tabor at (616) 895-3749.

WRI Continues to Investigate Wetlands in the Grand River Watershed

Wetlands continue to be the topic of much discussion throughout the United States. Since 1950, estimated wetland losses in the lower 48 states vary regionally from 3.2 percent to 14.1 percent. In 1991, the U.S. Department of the Interior estimated that wetland losses continue to occur at the rate of 200,000 to 300,000 acres each year. Current wetland losses in Michigan are approximately 6,500 acres per year.

Wetlands play a significant role in the ecology of the Grand River watershed serving a number of valuable and productive functions, including: providing food, cover, and reproductive habitat for fish and wildlife, influencing river drainage, flushing characteristics, current, and sedimentation patterns, storing storm and floodwaters, regulating water quality variables and providing recreation, education and research opportunities.

As part of its Grand River Watershed Program*, the Water Resources

Institute has committed itself to wetlands research. Research topics include larval fish survival, comprehensive wetland surveys/inventories and sediment contamination and toxicity.

Since 1990, Dr. Mark Luttenon, WRI Researcher and Assistant Professor of Biology, has examined the importance of Grand River wetlands, particularly Bruce Bayou, Stearns Bayou, Indian Channel and Dermo Bayou, to the survival of larval fish populations. Luttenon notes that, "many larval fish are poor swimmers so they must avoid current, and they are very vulnerable to predation." Analyses show wetlands offer protection from swift currents found in the main channel, provide cover from predators and sufficient amounts of food for growth and survival.

Frederick Bevis, WRI Researcher and Associate Professor of Biology, has been working on wetland surveys to determine total wetland losses, characterize the surface hydrology, identify hydric

soils and define vegetation community types in Pottawattomie, Bruce and Lloyd Bayous and the Indian Channel wetlands. According to research by Bevis, wetland losses in the lower Grand River watershed are astounding. In the past 60 years, Stearns Bayou has lost over 79 percent and Harbor Island has lost over 89 percent.

Dr. Patrick Thorpe, WRI Researcher and Assistant Professor of Biology, has examined the presence of heavy metals in the sediments of western Michigan bayous since 1990. Findings indicate that there are relatively high levels of metals in these regions. Nine metals were examined including: cadmium, lead, nickel, chromium, arsenic, copper, iron, manganese and zinc. During the summer of 1992, Dr. Thorpe will be researching the bioavailability and bioaccumulation of these metals in the ecosystem.

* Principal funding provided by The Grand Rapids Foundation.

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Publications Available Through the Water Resources Institute:

- Documentation for "On-Guard!" Program #CR-92-1
- Documentation for Hazardous Waste Reduction Checklist for Automotive Repair Shops #CR-91-13
- Software for Waste Reduction, Waste Management, and Regulatory Compliance #CR-91-12
- Model of the Project to Improve Science Education (PRISE) Course Development Process #MR-92-1
- Call or write the WRI office for more information.