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G E M E X T R A

SUPPLEMENT TO THE WATER RESOURCES REVIEW

FROM THE GEM PROGRAM MANAGER

Long-time readers of the **Water Resources Review** will remember when the Water Resources Institute (WRI) was selected in November 1988 by The W.K. Kellogg Foundation as a Regional Center for its Groundwater Education in Michigan (GEM) Program. WRI has completed the first two years of its work for the Foundation and is now in its third and final year.

WRI has been able to accomplish much in its first two years with GEM. This "Special Edition" of the **Water Resources Review** highlights our accomplishments to date and sets the stage for next year's activities and beyond. The article which appears on this same page touches upon how WRI has organized its GEM Program. It also identifies the accomplishments realized during Program Year II. The next article introduces the reader to our goals for the last scheduled program year. The concluding article looks at what the WRI has achieved as a result of GEM activities, and what lies ahead beyond Program Year III.

John K. Koches
GEM Program Manager

GROUNDWATER EDUCATION IN MICHIGAN

WRI CONCLUDES ITS SECOND YEAR AS A REGIONAL CENTER FOR GEM

Over the last two years, the WRI has made significant progress toward achieving its GEM Program goals. The work program is divided into four "Areas of Emphasis," which follows the originally conceived proposal to The W.K. Kellogg Foundation. Each area of emphasis has associated with it a corresponding goal (See below).

GEM Goals by Area of Emphasis

Information Networking:

- Goal #1 -To increase groundwater understanding by serving as a regional "hub" in a state-wide groundwater communication network.

Groundwater Research:

- Goal #2 - To protect and enhance groundwater quality.

Community Out-Reach:

- Goal #3 - To cooperate with and assist all GEM and other groundwater projects.

K-12 Education:

- Goal #4 - To develop and promote groundwater education.

Networking

Networking activities associated with this goal include an annual conference, a newsletter, and communications between and among all groundwater projects.

The WRI sponsored its Second Annual Groundwater Conference on October 9, 1990. It involved presentations from more than a dozen speakers, and attracted over 100 participants.

The **Water Resources Review** has evolved as a direct consequence of the GEM Program and has become a powerful information tool for the Institute. The **Review** has a new editor and its production has become an integral responsibility of all WRI staff and Research Associates. The mailing list has grown to more than 1,600 individuals and represents public and governmental officials, schools and universities, interest groups, media representatives, private consultants, business and industry, and numerous Foundations.

Groundwater Research

Groundwater Research Projects include the establishment of a Geographic Information System (GIS), geologic studies to determine aquifer recharge/discharge areas and aquifer vulnerability, and chemical studies to identify areas of groundwater contamination.

The WRI has created and currently manages a Well-Log Data Base which includes more than 13,000 wells in Ottawa, Muskegon,

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and Kent Counties. The Institute has already delivered its data base for Ottawa and Muskegon Counties to the Geologic Survey Division of the Department of Natural Resources. Information for these two counties has been incorporated into the State-Wide Groundwater Data Base System. Delivery of Kent County information is expected within the next few months. The MDNR uses this information for assessment, internal assistance within the department, and technical assistance outside the agency.

The WRI Well-Log Data Base has been used in the detailed investigation of groundwater resources at the local level. This includes the cities of Whitehall, Montague, and Grant, and the Townships of Allendale, Caledonia, Casnovia, Crockery, Grand Haven, Robinson, and Tyrone.

The WRI has also compiled a data base that catalogs groundwater chemistry. The Well-Chem Data Base includes information provided by the Ottawa, Muskegon, and Kent County Health Departments. This information includes more than 20,000 records that identify seven chemical constituents of local groundwater resources including iron, sodium, nitrate-nitrogen, hardness, conductivity, chloride, and fluoride.

The Institute has published a report summarizing the chemical information gathered for Ottawa County (WRI Report #CR-89-1). Similar publications for the Kent and Muskegon County Well-Chem Data Bases will also be produced.

(See below for an up-to-date listing of Reports, Map Sets, and Software Products resulting from the WRI GEM Program Year II.)

Reports

-*The Contamination of Groundwater in West Michigan with Nitrate and Herbicide*, February 1990. (MR-90-3)

- *The Use of Pattern Recognition To Study Groundwater Chemistry*, November 1990. (TM-90-6)

by Edward Baum, Ph.D., WRI Research Associate and Professor of Chemistry.

-*Draft Report, Muskegon County Groundwater Data Base*, August 1990.

Map Sets

-*Map Set For The Cities Of Montague And Whitehall, Muskegon County, Michigan*

-*Map Set For The City Of Grant, Newaygo County, Michigan*

-*Map Set For Allendale Township, Ottawa County, Michigan*

-*Map Set For Caledonia Township, Kent County, Michigan*

-*Map Set For Casnovia Township, Muskegon County, Michigan*

-*Map Set For Crockery Township, Ottawa County, Michigan*

-*Map Set For Robinson and Grand Haven Townships, Ottawa County, Michigan*

-*Map Set For Tyrone Township, Kent County, Michigan*

Software

-*The Groundwater Primer*,

-*The Thirsty Wizard*,

by Melvin Northup, Ph.D., WRI Research Associate and Professor of Natural Resources Management. (Interactive Computer Program/Learning Tool)

-*WELLTEST/WELLCONV* (Error checking software for WELL- LOG Data Base and use in SURFER, GEOBASE, CONDOR, AND AUTOCAD.)

-*DMA Conversion Software*, (Software used to convert DMA ASCII files into a compressed format for use on DOS computers.)

-*MIRIS/WELLKEY Utilities* These Utilities include the following modules:

- *ELEVTEST* - Checks WELLKEY elevation against DMA elevations.
- *MIRIS* - Converts MIRIS.arc files into Surfer border files.
- *MACRO* - Assembles county-wide data base from individual township data.

by Kevin Cole, Ph.D., WRI Research Associate and Assistant Professor of Geology.

Community Out-Reach

Community Out-Reach projects include the organization of groundwater workshops and training sessions, and providing technical assistance for government officials, planners, and policy makers. As a Regional Center for GEM, the WRI also serves as a repository for groundwater information.

WRI sponsored an important workshop late last March titled, *The Fundamentals of GIS*. The workshop was presented by Dr. David P. Lusch of the Center for Remote Sensing at Michigan State University. It served to acquaint local officials with the techniques and useful applications associated with Geographic Information Systems (GIS).

The WRI Human and Natural Resources Information System (HUNRIS) continues to grow and has become an important component of WRI activities. This sys-

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tem now includes the Groundwater Data Base, specific GIS applications, and several on-line information systems including the United States Environmental Protection Agency's Information Storage and Retrieval System known as STORET. STORET access is being provided through collaboration with the Michigan Department of Natural Resources.

Also included under HUNRIS is the WRI Reference Library. This library has grown from an idea to a resource with more than 500 individual entries.

K-12 Education

WRI's K-12 education projects include the testing of groundwater curriculum and the organization of teacher workshops on groundwater education. WRI has been particularly interested in the development of Interactive Computer Programs for classroom use.

WRI staff has made several GEM presentations at area schools. More importantly, the WRI has been able to give support to other GEM projects which are directly involved in actual classroom presentations of groundwater principles.

Dr. Melvin Northup, WRI Research Associate and Professor of Natural Resources Management, developed WRI's first computer interactive learning tools during Program Year I. His first program was called "The Groundwater Education Wizard" (GEWIZ). This program has been distributed to approximately 60 area educators, planners, and policy makers.

As a result of surveys and interviews, Dr. Northup has further enhanced his software products. This has lead to the creation of two more computer programs, "The Groundwater Primer" and the "The Thirsty Wizard." The Groundwater Primer acquaints the student with basic groundwater principles, concentrating on word definitions. The Thirsty Wizard is a computer word game similar to "Hangman".

WRI continues in its development of innovative learning tools. These include a coloring book, card games, and the further enhancement of existing Interactive Computer Programs.

TOMORROW'S GEM PROGRAM AT WRI

WRI is in the third year of its GEM Program, planning numerous innovative activities including the completion of projects already begun.

The WRI will take considerable time this year evaluating its GEM Program. Surveys will be distributed to those individuals and agencies in which the WRI has networked, as well as targeting the general public to test their appreciation and understanding of groundwater problems and protection issues.

The Third Annual Groundwater Conference is scheduled for October 8, 1991, and will again be hosted at the L.V. Eberhard Center in Grand Rapids, Michigan. While the agenda for this event is still being considered, the use of case studies to focus broad areas of groundwater interests is expected.

The WRI will continue to distribute the **Water Resources Review**, highlighting the WRI GEM Program as a featured article. The WRI will also continue in its development of HUNRIS and associated Geographic Information Systems (GIS). Staff will conduct additional analytical studies of groundwater chemistry in an attempt to further identify specific geographic areas with water quality problems.

The Institute has initiated a special project to assess the potential impacts of Act 307 sites of environmental contamination. It is developing methods to understand existing groundwater problems, and using this knowledge to avoid future problems.

Several groundwater workshops are proposed for this final year. This includes workshops to further acquaint local officials with WRI's GIS capabilities. Other workshops include the exchange of information about Non-Point Source Pollution/Stormwater Management and Risk Assessment Models.

Several local units of government have requested WRI assistance to incorporate environmental constraint analysis as part of their zoning ordinances and master plans. The WRI will devote considerable attention to the implementation of "special projects" in the next year.

Last year's out-reach efforts saw WRI's participation in various fairs and festivals throughout the summer months. While this activity requires considerable preparation and extra effort, it was considered a major educational success.

WRI's K-12 education activities will include Teacher Workshops as well as the further development of Interactive Computer Programs, games, and models. The WRI will work closely with the Ottawa County Soil and Water Conservation District and the Tri-County Forestry Council as they each develop education tools and programs.

BEYOND YEAR THREE

The GEM Program has enhanced the Water Resources Institute at Grand Valley State University in many ways. Since receiving its Kellogg award, Grand Valley State University has continued to show its support for the Institute and has invested in its longevity. The University has initiated a $5.1 million Advancement Campaign specifically for WRI. It is also completing the construction of a 5,100 square foot office and laboratory facility to house the WRI for the next four to five years.

GEM activities have also been integrated into other WRI programs, including the Grand River Watershed Program and the Waste Reduction and Management Program. These new WRI initiatives include the protection of groundwater resources as a part of their goals.

The Human and Natural Resources Information System (HUNRIS) is an important product of the GEM Program. The information gathered by WRI researchers is being utilized by local and state government officials, universities, planners, consultants, the general public, and many others. The skills and knowledge developed as a result of the GEM Program will remain intact and available through WRI staff and faculty.

ACKNOWLEDGEMENTS

While it is virtually impossible to list all those individuals, groups, and agencies which have assisted WRI in its GEM Program, staff and faculty would like to acknowledge this cooperation.

The Water Resources Institute GEM Program would not have been able to accomplish a fraction of what it has without the support of key people at several institutions. This includes first The W.K. Kellogg Foundation and the Institute of Water Research at Michigan State University (MSU). This also includes the other GEM projects and Regional Centers. A special thank you goes to the MSU Center for Remote Sensing. Staff from the Michigan Department of Natural Resources Lansing and the Grand Rapids District Office have been an enormous help. Perhaps most important is the help and interest expressed by local officials and agencies active in our three county region. This includes the local Health Departments, local Soil Conservation Districts, and the Michigan State Cooperative Extension Service. And last, we should not forget the many individuals and citizen groups whose interest and dedication help to spur our activity.

A sincere thanks to all who have taken the time to help and get involved.

Water Resources Review Extra

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