Wisconsin Ground Water Association Newsletter

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President's Message

As we begin 2002, we find that four familiar faces are gone from the WGWA leadership:

- Last year's Past President, Bruce Hensel of NRT Consultants, has retired to the glow of being a regular ol' environmental consultant. After three years of yeoman service to the organization, he deserves it! Fortunately for all of us, Bruce continues to work on a document that will describe the history of WGWA, and we're all looking forward to seeing that. Thanks, Bruce!

- Gone, too, from the Board is Lori Rosemore of Ayres Associates, who has been our Treasurer. She, too, will resume consulting full time. Well, not entirely...she is going to keep a hand in WGWA as a member of Wayne Hutchinson's Newsletter Committee. Thanks, Lori!

- The term of At-Large Board Member Madeline Gotkowitz has expired. Madeline will fully concentrate on her duties as WGNHS, not the least of which is fighting the battle against arsenic in Wisconsin's groundwater. Thanks, Madeline!

- Finally, Deb Kerr of URS has stepped down both as the WGWA web site administrator, and the publisher of the hard copy newsletter. She created the web site, and has been taking the newsletter articles from Wayne Hutchinson, and banging them together, along with advertisements, into Microsoft Publisher for at least the last decade! But Deb isn't going away either—she'll trek on as a member of Wayne's newsletter committee. Thanks, Deb!

Also, then, as we begin 2002, four new faces—well, three new faces, actually—join the board.

- This year, Margy Blanchard should have ascended to the Position of Past President. And she has, but because we could not get anyone to run for President Elect last November, Margy, being the good scout she is, volunteered to run again. Not surprisingly, she won--unanimously (i.e., there were no write-in votes)!

- Brand new to the organization is our newly elected Treasurer, Marilyn Weiss, from the Wisconsin Air National Guard in Madison. The Treasurer's job, frankly, is probably the busiest, most time-consuming of all the Board positions, and we are fortunate to have her.

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The newsletter is published four times per year. If you have any suggestions or submissions, please contact us at: Wisconsin Ground Water Association, c/o Marilyn Weiss, WGWA Treasurer, P.O. Box 8593, Madison, Wisconsin 53708-8593. Email: wgwainfo@wgwa.org; Web site: http://www.wgwa.org. The deadline for submissions to the spring newsletter is May 17, 2002. The summer newsletter deadline is July 1, 2002.

PRESIDENT'S MESSAGE
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- We've also got new At-Large Board member, Tom Riewe of DNR in Madison. We are fortunate to have Tom on the Board. A long time WGWA member, Tom, in a sense, replaces Madeline in that he, too, is one of the state's recognized experts on arsenic problems in groundwater.

- Finally, the dual position of web site administrator and newsletter publisher has been taken over by Joan Viney, who is a colleague of Margy's at MWH in Madison. Joan will not only take over the web site, she also is publishing the new electronic version of the newsletter, in the inaugural issue of which you are reading this message. She already has put her own "look" on the web page. If you haven's visited http://www.wgwa.org/ lately, do so! (I love that animated header on each page!)

So what should WGWA want to accomplish in 2002 and beyond? A major concern of the WGWA leadership is the fact that it is so very difficult to get professionals to step up and play a role in the leadership of this organization. There's just no excuse for Margy having had to run again. Frankly, it's embarrassing. Alas, however, WGWA is not alone in this leadership malaise. Talking to colleagues in other related organizations—e.g., AIPG and AWRA—we find that they have leadership vacuums, too.

I've a theory about this, and here it is: the ground-water profession has, over the past twenty years, become splintered into at least two sectors, which have all but lost sight of each other. One sector is that which is most familiar to WGWA members--environmental remediation. The other, most familiar to members of, for example, AWRA, is water-resources management, having to do with water supply and ground-water/surface-water relationships. That the two sectors have lost track of each other is evident in the membership of AWRA *vs* the membership of WGWA--there's practically no crossover. A year ago, I attended the March 2001 annual AWRA meeting in Green Lake. It was an absolutely wonderful conference, with tons of fascinating papers on various aspects of ground-water research. Approximately 150 professionals and students were present. But how many of the attendees, do you suppose were environmental consultants? I counted a grand total of five!

The problem with a rift like this, is that it causes specialization to such a degree that all of us begin to lose sight of why it is that we elected to become water-resources professionals in the first place. If we begin to lose sight of the "why" in what it is that we do, then what it is that we do begins to seem rather like a job than it does a career. In my book, non-professionals have jobs. Professionals have careers.

In a small effort to begin closing this rift, WGWA and AWRA have elected to merge their annual meeting this year (and, we hope, every year from now on). By the time you read this, the annual meeting either will be imminent, or will already have happened. If it's imminent, and you haven't planned on attending, then please change your mind! If it's already happened, then I hope those of you who attended thought the experience to be worth repeating every year. If the meeting had shortcomings, then, instead of complaining about it or deciding never to go again, ask how you can get involved in the planning of the next to make it better!

Another thing this year will be an increased WGWA emphasis on interacting with the Wisconsin university community. In the last newsletter, I started a column called "Campus Snapshot" in which I described the ground-water program at UW-Eau Claire. WGWA had never been particularly close to the universities in this state, and that's a shame! We're going to change that. I'm sorry there's no Campus Snapshot in this newsletter—that's because I personally am laid up right now for health reasons, and can't get out and about. But I'll be back in the groove before the next issue of the newsletter. As we get around to the various campuses in the state, I think you'll be impressed with the breadth and depth of hydrogeologic research and training that is ongoing.

With the Wisconsin AIPG chapter, we are going to take the afternoon of Earth Day, April 22, to put up a display in the Capitol Rotunda in Madison to show legislators and their staff what the important ground-water and geological issues are these days. If any of you would like to participate in this, we'd love to have you! Let me know.

Finally, because the conference has been moved to March, we are going to move the annual WGWA field trip from the spring to the very late summer. We've already picked a tentative date—Friday, September 13. We plan to put on the field trip with the AIPG folks, and if they accept our invitation, the AWRA folks. All we need now is a theme and a place(s) to visit! Ideas, anyone?

As you can see, we've got a lot on our plate, but, somehow, in and amongst our day jobs, we'll find a way to get it done. If you want to join us in these efforts, c'mon in! The water's fine!

Boyd Possin, P.G.
President

In a one-hundred year period, a water molecule spends 98 years in the ocean, 20 months as ice, about 2 weeks in rivers and lakes and less than 1 week in the atmosphere.

Association Activities in the Midwestern States

In the Spring 2001 WGWA Newsletter, Wayne's Web World provided useful information on other State ground-water associations and provided links to their web sites. This column will provide you with updates on ground-water association activities within Wisconsin, Illinois, Minnesota, Iowa and Michigan. If you know of other associations or activities that could be added to this column in future issues, please contact Lori Rosemore.

Minnesota Ground Water Association
(http://www.mgwa.org/)

Effective Drilling and Well Techniques in Minnesota
April 23, 2002, 8 am – 5 pm
Johnson Screens
1950 Old Hwy 8 NW
New Brighton, MN

MGWA's Spring 2002 Conference, *Effective Drilling and Well Techniques in Minnesota*, is an outdoor action conference demonstrating several drilling techniques, such as cable tool, rotosonic, large diameter rotary, directional, hollow stem auger, and direct push. Sampling, laboratory and investigation techniques will also be discussed. The keynote speaker, Mr. John Schneiders of Water Systems Engineering, Inc. and NGWA's McEllhiney distinguished lecturer, will speak on the *Chemical Rehabilitation of Wells.* This conference meets the criteria for continuing education for Professional Geologists as specified by the MN Board of AELSLAGID, and approved for continuing education credits for Minnesota Well License Renewals by the MN Department of Health.

For additional information and registration materials, visit the MGWA web site. For information about conference content and logistics, contact: Robert Caho (763)479-3121, rwc_bc@yahoo.com. For information about conference registration, contact:
WRI (651)276-8208, office@mgwa.org.

Illinois Groundwater Association
(http://www.iga.uiuc.edu/)

The next IGA meeting will be held on April 24, 2002 in DeKalb at Northern Illinois University. Preparations are reportedly underway. For updates or further information, visit IGA's web site.

Iowa Groundwater Association
(http://www.igwa.org/)

Although there were no upcoming IGWA meetings posted on the IGWA website, IGWA announced the Iowa Children's Water Festival has been scheduled for May 2002. IGWA helps sponsor this festival both monetarily and through hours of volunteer time by its members. The festival structure, content, and target audience (fifth-grade students) are reportedly patterned after the successful Nebraska Children's Groundwater Festival. Additional information is available on the IGWA website.

Michigan Ground Water Association

(http://www.michigangroundwater.com/)

Michigan Ground Water Association Convention

March 11-12, 2002

Lansing, Michigan

Please see the web site for additional information on educational programs and speakers.

WGWA Board Meeting, Thursday, January 17, 2002 (Conference Call)

Persons present: Margy Blanchard*, Boyd Possin*, Kristen Gunderson*, Lori Rosemore*, Marilyn Weiss*, Joan Viney*, Tom Riewe*, Wayne Hutchinson* (* via phone)

Call to order about 6:05 pm.

A. Last meeting minutes - E-mailed out to everyone after the last meeting (November) and were approved via e-mail for inclusion in the next newsletter.

B Treasurer's Report – Transition to new treasurer (Lori to Marilyn) - $11,010.11 in account as of December 31, 2001. Recent expenditures include newsletter expenses, website maintenance, WoW meetings, and expenses for the upcoming spring meeting. $160 in membership fees has been received since the last meeting.

C Membership Report – As of January 17, 2002 - 310 members are currently paid up. 28 brand new members joined in 2001. We need to update the mailing address for WGWA membership to the new treasurer – will set up a P.O. Box in Madison. Also need to take care of getting Marilyn and Boyd as new signatories for the account.

D Old Business

1. Communication with WGWA Members – How are we doing?
   a. Newsletter production - Results of member survey showed about 2/3 of respondents in favor of going to electronic newsletter, 1/6 wanted to stay with the hardcopy, and 1/6 did not have a preference. About 60-70 people responded. Wayne (Newsletter editor) commented that the Illinois Groundwater Association and the National Ground Water Association have both gone electronic. Pagination and production would be much simpler and cheaper with an electronic newsletter, there is the possibility for color graphics, and distribution would be faster – no lag time at the printer and in the mail. We could e-mail an announcement and a link via WGWA Notes announcing that the newsletter is available on the website and hard copies of the newsletters could be send out to members if requested. There will be a notice on the membership renewal, in a WGWA Note, and in the fall newsletter about the change. Advertising could continue on the margins and could contain links. Margy moved that starting with the winter newsletter that the newsletter will go electronic, with hard copies made available upon request. Marilyn seconded. The vote passed 4-0.
   b. Maintaining WGWA Web Site – Web maintenance will now be performed by Joan Viney for $400 a quarter. That will include both standard maintenance and electronic posting of the newsletter. Margy motioned for the expenditure, Boyd seconded, vote passed 4-0.
2. Election of 2002 Officers – Confirmation by Board of fall balloting. Marilyn Weiss, new treasurer. Margy Blanchard new President elect.
3. At-large Board Members – Madeline Gotkowitz's term has expired, Boyd moved to appoint Tom Riewe to the board as an at-large board member. He is currently a hydrogeologist with the WDNR. Margy seconded. Appointment passed 4-0.
4. Joint spring meeting with AWRA – March 7 & 8 – Margy and Boyd attended a planning meeting last week in the Dells. Meeting would also include separate WGWA and AWRA meetings at the beginning of the 2-day conference. Included in the $85 pre-registration fee ($35 students) are Thursday lunch and dinner, breaks both days, and a $2 membership fee for AWRA. Flier is being finalized for the conference. An announcement will go out as a WGWA Note and mailed out to the membership.
   a. Registration forms for WGWA membership available to attendees at the conference.
   b. Career session – Friday afternoon – need speakers – from state agencies, academia, and consultants (engineers and geologists). Will have a panel discussion and networking discussions. Margy will be working on this portion – please let her know of any suggestions for speakers.
   c. Vendor display – vendor fees will be used to pay for the career session lunch. Margy and Boyd will contact the vendors. Let them know if you have any suggestions or contacts that may be interested in having a booth/table. We may have difficulties since FET is at the same time.

E New Business

1. Semi-annual meetings with AIPG – Boyd and Margy met with AIPG board members in December. They are interested in doing joint activities in the future such as a fall field trip. Will start by having joint board meetings every six months (next meeting May 15). Boyd has reserved the balcony at the Capital on Earth Day, Monday April 22, for Geologists Day at Capitol with AIPG. Need to discuss what we are actually going to do on that day. The 2 boards need to get together to work on this (ad-hoc committee?).
2. Changes to Bylaws – Boyd has been soliciting input from previous past presidents and board members via e-mail. Boyd mailed out a marked up version of the bylaws to the board prior to the meeting; some changes are editorial, others are substantive changes. A discussion of the proposed changes, including redefining existing positions, term limits and lengths, and election of officers. Final proposed changes will be sent out via a WGWA Note for review by the membership. 10% of the membership will have to

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sign a petition (could be via fax) agreeing with the changes before the proposed changed can be put to a vote to the membership. A majority of the votes cast must be in favor of the changes before the revised bylaws will take effect. Boyd will send out a new markup of the bylaws based on the discussion to the board for final approval before sending the bylaws out to the membership. Margy moved to accept the proposed changes pending review of the final changes. Marilyn seconded. Vote passed 4-0. Goal is to have this done by the conference in March.

F Next Board Meeting – try to have it at the March conference. Exact timing to be determined. Contact Boyd with schedules.

G Meeting adjourned about 8:40pm.

Respectfully submitted,

Kristen Gunderson
Secretary

The Joint WGWA/AWRA Meeting Was a Great Success!

On March 7th and 8th, 2002, nearly 170 water-resource professionals gathered for a terrific conference at the Chula Vista Resort in Wisconsin Dells.

Before the conference began, both organizations held business meetings. Your WGWA Board of Directors formally adopted the change to the WGWA Bylaws, after determining that, of the more than 60 votes cast by WGWA members, no one was opposed to the rule change.

New board members—Treasurer Marilyn Weiss and At-Large member Tom Riewe—were introduced.

The Board announced its intent to conduct an Autumn Field Trip, and is exploring the possibility of a two-day affair "up north" to explore what's happening at the Crandon mine. Assuming we go ahead with this, it surely will be in the tradition of all past WGWA field trips, that is, informative and fun—for the whole family!

At the AWRA business meeting, bylaw changes were also discussed, but not finalized. Elections were held for officer positions in that organization. A fellow many of you know—

Seated: Boyd Possin (President), Margy Blanchard (President-Elect), Kevin Olson (At Large Member)
Standing: Kristen Gunderson (Secretary), Marilyn Weiss, Tom Riewe (At Large Board Member)

Rick Stoll of the Green Bay DNR office—was affirmed as the new President-Elect.

The meeting then proceeded with a plenary session at which sustainability issues were discussed. Water of Wisconsin (WoW) representative Curt Meine discussed the status of the WoW effort. Prof. John Magnuson of UW-Madison discussed sustainability in terms of climate changes. And WGWA President Boyd Possin urged participants not to forget that, in order for sustainability to be a viable issue, the human element cannot be ignored.

The remainder of the conference then consisted of dozens of oral presentations and poster sessions presented in concurrent sessions. They were a wonderful way to recharge the old hydrologic batteries!

On the evening of the 7th, we were treated to an after-dinner lecture and slide presentation by Paul Herr of Nature Safaris, who gave us all an amusing "tour" through the Devils Lake area—certainly not the usual discussion of this area which is so near and dear to the hearts of so many Wisconsin water professionals! And, after dinner, the conference's most profound discussions were held—where else?—but in the Chula Vista's very spacious and accommodating bar! Talk about recharging the batteries!

The next day consisted of more excellent papers, and wound up with a student workshop, attended by most of the 40 students who had attended the conference. A panel of water-resource professionals from widely varying backgrounds gave the students a view of their own worlds, how they got to where they are, and, in general, passed on to the rapt audience their various interpretations of the meaning of life!

And next year? It's a bit early to say, but it might well end up that the next joint conference will be, like the WGWA Field Trip, held "up north," possibly in Minocqua, and probably in the last week in February.

by Boyd Possin
ECCI

Wayne's Web World

"Research Labs and 'Think Tanks'"

In our never-ending quest for answers to the myriad of questions that arise regarding ground water, we may find that some of the more obscure websites hold the key. Many websites were developed to serve as clearinghouses for ground-water information. Specific ground-water issues are summarized on page after page on your computer screen.

Many of the Research Labs and 'Think Tanks' were formed to address needs other than ground water. For instance, the mission of the research laboratories operated by the United States Department of Energy was to develop more effective and smaller nuclear weapons, or peaceful uses of nuclear energy. With the end of the Cold War, these laboratories had to scramble to develop a "new reason for being." Ironically, and much to our benefit, many of the laboratories were reborn as environmental laboratories.

The missions of overseas laboratories reflect the topics and development strategies of their respective countries. Some portray a generalist approach to the environment, while others focus on agricultural questions and still others summarize activities, production and research in petroleum.

On a country-by-country basis, the features on the websites for sixteen research labs or "think tanks" are as follows:

Australia:

CRC for Waste Management and Pollution Control
http://www.crcwmpc.com.au/

Australia's national center for waste management and pollution control focuses on four areas of research – wastewater treatment and reuse, solid-waste management, contaminated site remediation and hazardous-waste management, and waste minimization and cleaner production.

The website contains numerous summaries of research projects. A few full research papers are available as Adobe pdf files.

Canada:

Alberta Research Council
http://www.arc.ab.ca/

Founded in 1921 as a provincial research council, it is now a wholly owned subsidiary of the Alberta Science and Research Authority. It's core research and development areas include agriculture, energy, forestry, environment, heath, and manufacturing.

Under "site map/search" webpage issues of ARC's newsletter (R & D Bulletin) and annual reports are available.

Environmental Technology Centre
http://www.etcentre.org/

Established in 1970s to focus on developing science and technology for environmental protection. Focus of research is on Air, Water and Nature (remedial technologies and oil-spill clean-up). Website contains a bibliography of papers published by ETC staff

National Water Research Institute
http://www.cciw.ca/nwri/nwri.html

This is Canada's largest fresh-water research organization. No downloadable files, but it does contain lists of research papers published by Institute staff since 1997.

India:

Water Centre for Technology – Eastern Region
http://www.wtcer.stpbh.soft.net

This website is focused mostly on agricultural issues. Listings of projects and publications on watershed management and ground-water monitoring network design are included, but there are no downloadable files.

Mexico:

Instituto Mexicano del Petroleo (Mexican Institute of Petroleum)
http://www.imp.mx

As the title strongly suggests, this site is maintained by Mexico's petroleum industry. Of interest to WGWA members are the descriptions of research projects on fractured and solution-channel characterization, and bioremediation. Unfortunately, you'll need to practice your Spanish because there are no English documents and no English mirror site. And finally, there are no downloadable files.

United States:

Ames Laboratory
http://www.ameslab.gov/

Established in 1947 at Iowa State University by the Atomic Energy Commission, it was originally charged with developing methods to produce high-purity uranium metal. Cur-

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rently its main research topics include solar power and remote-controlled analysis of hazardous waste.

Under "Research Programs" the Environment tab contains a page devoted to Expedited Site Characterization. Unfortunately, though the page lists numerous publications by Lab staff, none are downloadable files.

Argonne National Laboratory
http://www.anl.gov/

Argonne National Laboratory, located west of Chicago, had its origins in the atomic bomb program of World War II. In 1946 it was charged with developing peaceful uses for atomic energy and became the United States first national laboratory.

Programs now include high-energy physics, energy and environmental management. Several pages contained detailed descriptions of research and publications authored by laboratory researchers, though very few publications are downloadable.

Southwest Research Institute
http://www.swri.org/

The Southwest Research Institute is a quasi-governmental research laboratory with eleven divisions focused on petroleum, space, computers and the Center Nuclear Waste Regulatory Analysis (CNWRA). The CNWRA was established in 1987 as a federally funded research and development center sponsored by the Nuclear Regulatory Commission to resolve technical and regulatory issues related to a geologic repository for high level nuclear waste.

Detailed studies of proposed Yucca Mountain nuclear waste repository are included at this website. Within the CNWRA are the Geology and Geophysics Program and the Geohydrology and Geochemistry Program. Unfortunately, there are no downloadable files.

The "Lighter Side" page contains explanations of many everyday physics questions.

Battelle
http://www.battelle.org/

Battelle is a quasi-governmental research laboratory started in 1929. It is based in Columbus, Ohio and focuses on research in agriculture, automotive research, healthcare, national security, transportation, space technology, energy and environmental.

On-line newsletters, in pdf format, include Environmental Updates and Environmental Forensics. Environmental Management articles are available in pdf format.

Brookhaven National Laboratory
http://www.bnl.gov/world/

Established in 1947, this United States Department of Energy lab focuses on nuclear and high-energy physics. The Environmental Services Division posts a few reports; most interesting is site ground-water monitoring report that includes a full evaluation of low-flow purging technique for sampling

Idaho National Engineering and Environmental Laboratory
http://www.inel.gov/

Started operation in 1949 as the National Reactor Testing Station. The first use of nuclear fission to produce a usable quantity of electricity occurred at INEEL in 1951.

INEEL has been named the United States Department of Energy's lead laboratory for Environmental Management, including Environmental Restoration, Waste Management, Spent Nuclear Fuel, and High-Level Waste.

Click on the Site Index (http://siteindex.inel.gov/) for complete listing of pertinent topics. Various newsletters and site-specific regulatory documents are available for download under Public Documents, including some brief synopses of research projects on the Snake River Plain Aquifer under Subsurface Topics, which is a selection under Publications Index.

Lawrence Livermore National Laboratory
http://www.llnl.gov/

The University of California Radiation Laboratory opened in 1952 on a one-square-mile parcel at the site of a former World War II Naval Training Facility. Its first mission was to design nuclear weapons.

Select "Research Areas" under "Science & Technology" (http://www.llnl.gov/llnl/04science/research.html). Then under the "Environmental Science" section you can find LLNL's groundbreaking report on the risk, or lack thereof, from petroleum releases. This report is subtly entitled "Recommendations to Improve the Cleanup Process for California's Leaking Underground Fuel Tanks" is cataloged as UCRL-AR-121762.

Publications concerning investigations of the proposed nuclear waste disposal facility at Yucca Mountain may be found under the "Hydrology and Subsurface Transport" subsection, which is part of the "Geology and Geophysics" sec-

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tion. The "Geology and Applied Geophysics" section also contains full reports on using various surface and borehole geophysical techniques, as well as their extensive four-volume report on the "Dynamic Underground Stripping Technology for Groundwater Cleanup" which possibly represents the most studied gasoline spill in history (http://geosciences.llnl.gov/envtech/dynstrip/index.html).

The "Engineering" section contains a report on using ground-penetrating imaging radar (GPIR) to test the structural integrity of bridges (http://www-eng.llnl.gov/documents/em/gpir.html). Be aware that some of the direct links to the cited reports do not work, so be prepared to use the on-line "Search" capability to locate the active link.

Under the "Environmental Technology" Research Area, links to papers are available on dehalogenation of chlorinated hydrocarbons, vapor extraction, oxidation of organic wastes, and electromagnetic induction for subsurface imaging.

Los Alamos National Laboratory
http://www.lanl.gov/worldview/

Los Alamos National Laboratory was founded during World War II to develop weapons based upon advanced concepts and new discoveries. In 1943, LANL was charged with developing an atomic bomb.

Obviously its mission has changed so select "Science and Technology" and then choose the "Earth & Environmental Sciences (EES)" organization and click on "GO" to access a site that contains extensive listing of engineering, scientific, and environmental reports concerning the Yucca Mountain site (http://www.ymp.gov/). Chose "Technical Library" from list of icons that appear on the left side of your screen.

National Risk Management and Research Laboratory – Ada, Oklahoma
http://www.epa.gov/ada/

Started as the Robert S. Kerr Research Center in 1966 as a U. S. Public Health Service laboratory, operation was transferred to the U. S. Department of the Interior to provide technical assistance and conduct research regarding water-pollution problems in Arkansas, Louisiana, New Mexico, Oklahoma and Texas.

In 1970, it became one of fifteen research laboratories administered by the newly created United States Environmental Protection Agency. In 1995 it became part of the National Risk Management and Research Laboratory headquartered in Cincinnati, Ohio.

It is now known as the Subsurface Remediation and Protection Division and includes an extensive collection of downloadable publications. Just click on the "Publications" icon for access to dozens of publications. Nearly two dozen public-domain software packages are available for download by clicking the "Software" icon. An extensive list of active links to other ground-water and remediation websites is available by clicking the "Links" icon

RAND Institute
http://www.rand.org/

Founded in 1946 by the U. S. Air Force (then the Army Air Forces) to develop aircraft, rockets and satellites. It was the first organization dubbed a "think tank." Today it has research programs in child policy, civil and criminal justice, education, environment and energy, health, international policy, labor markets, methodology, national security, population and regional studies, science and technology, social welfare and transportation.

The website includes numerous policy documents, many downloadable as pdf files, on the topics listed above.

The Ground-water Source: Notes from the Supply Side

Ground-water Awareness -- Is It Time to Put Our Money Where Our Mouth Is?

As I write this, ground-water awareness week (March 17th to 23rd) is less than a month away. Anyone who has been paying attention lately would know that ground-water awareness is on the rise both locally and nationally. WGWA is holding a joint meeting with the AWRA on March 7th and 8th called "Sustainability of Wisconsin's Water Resources." Last fall, The University of Wisconsin's Water Resources Institute held the "Ground Water Summit" to establish the need for future ground-water research and regulation. Also last fall, the Colorado Ground Water Association held a conference on the limited ground-water resources in the Denver Basin and Front Range called "Troubled Waters." In 2000, the Illinois State Water Survey held a conference on the tightening water supply in northeastern Illinois called "Will the Well Run Dry?." These conferences all serve to draw attention to the narrowing margin between available supply and rising demand for water resources in many parts of the country.

New England and the Mid-Atlantic States are in extreme drought conditions with many states imposing limitations on ground-water and surface-water withdrawal. The southeast has been in the throes a drought for several years. A few states, such as Florida, just recently received enough precipitation to recharge aquifers, but demand is still rising fast and several cities are building desalination plants to bridge the gap. Other states, such as Georgia, are still experiencing a severe drought. The Pacific Northwest is still picking up the economic and political pieces of the problems created when the US Fish and Wildlife Service restricted use of water on the Klamath River system to protect fish habitat, shutting down agriculture on tens of thousands of acres of land.

And of course, there's the arid southwest where tales of wrangling over water rights are the stuff that books and Hollywood movies are made of. California has used more than its allotment of Colorado River water for years and is now being forced to cut back to stay within its limits. Southern California is looking to develop large well fields in the Mojave Desert to make up some of the lost water. Las Vegas, which is projected to grow 5.8% this year, will fully utilize its Colorado River allotment in 2006 and has enough surplus river water stored in an aquifer to meet demands until about 2016. The local water authority has been looking at developing well fields in mountain valleys 50 to 100 miles away to obtain future supplies. Nye County, just north of Las Vegas, has filed a water-rights claim to the only unclaimed water in southern Nevada, the water under the Nevada Test Site. The Nevada Test Site was the home of underground nuclear testing and is immediately adjacent to the proposed high-level nuclear waste repository at Yucca Mountain. The filing is part of a classic water rights political battle intended to force the federal government to acquire Colorado River rights and pipe the water 70 miles up hill to retirement communities and ranchers in Nye County.

To be sure, we are not running out of water. I've read estimates that we have lost no more than 0.5% of the water that was originally formed on the planet over 4 billion years ago. However, the water is not always available where we need it, when we need it. The actions required to transfer or store large quantities of water typically have environmental, political and economic implications that generate heated controversy and long court battles.

Given the high profile of ground water and water supply on the national political scene, its only natural that our investment in water research and sound data collection are increasing to meet the needs. Unfortunately, this is not the case. Anyone who has tried to get a complete set of stream gauge records for a given stream, or historic water-quality or water-level data for a given aquifer, knows that the current system of monitoring and archiving water data is woefully inadequate.

In spite of the outdated system of water-data collection, the need for more and better water data is not being taken seriously by our elected officials. The proposed 2003 federal budget targets the USGS for a reduction of $46 million. More significantly, most of these cuts ($33.8 million) are focused on water-related programs. These include; zeroing out the $6 million budget for the Water Resources Research Institute (which provides money directly to states on a matching basis for local ground-water research), $22 million cut from Hydrological Monitor Assessment and Research (which conducts regional ground-water research and monitoring), and $5.8 million from the National Water-Quality Assessment program (which collects and disseminates water-quality data to regulatory agencies and water policy makers).

Last year, the 2002 federal budget proposed a reduction in the USGS budget of $89 million, again, mostly focused on water programs. I had conversations with high level USGS staff that indicated that a staff reduction of as much as 20% with drastic reductions in water research and monitoring would have been needed to meet the budget cuts. The NGWA and a few other groups lobbied hard in support of the USGS and got the full budget restored and an increase of $20 million. This effort required a substantial commitment of resources on behalf of the NGWA. A similar effort will be required this year.

While the USGS has stepped on a few toes in the private sector in the past, the contributions of the agency in the field of water management cannot be overstated. The USGS plays a critical role in providing the science and base line data needed to effectively manage both our ground-water and sur-

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The Ground-water Source
(Continued from page 9)

face-water resources. The USGS is unique in their approach of conducting regional analysis of our water resources. No other entity can provide the depth of research and technical expertise on regional and national water issues. The data they collect provides the critical input needed to identify trends in water quantity and quality to make wise management decisions and form effective regulation. By their status as a scientific organization, the USGS provides information that is uniquely unbiased and reliable. Any actions that reduce the efforts of the USGS on water related issues would create a large hole in our understanding of our water resources, a hole that cannot be filled effectively by state or local agencies alone.

If you believe that we need better data on water quality and quantity, data that are freely available from an unbiased source, please be willing to help. If you are a member of NGWA, you will be receiving a request through the NGWA e-zine to contact your congressmen expressing your concern about the proposed cuts. If you are not a member of the NGWA, please consider acting on your own behalf. Please make the time to write, call or e-mail your congressmen.

After last year's effort, I was surprised at how effective calls from informed constituents can be. Given that most elected officials don't fully understand all the provisions of the bills on which they vote, they are very likely to support an issue in which someone (their constituents) has expressed an interest. Conversely, they are equally likely to cut something that no one seems to think is important. I recently had the opportunity to speak with Dr. Charles Groat, the director of the USGS. He was very much aware of NGWA's efforts to support the USGS. In his opinion, the support from the NGWA and its members had a big influence on their budget, much more so than anything they could do themselves. We will all need to pitch in if we are to get next year's budget restored and prevent the USGS from being a target in future years.

I firmly believe that how well we manage our water resources will determine much of the economic and environmental well being of our state and of our country. To do this, we will need sound, reliable, unbiased data on the current state of our resources. Its too late to go back and get the data we should have collected in the past, we will have to make due with what we have. However, it is not too late to start collecting the data we will need in the future. The full value of the data may not be known for decades, but the cost of not collecting the data will be far higher. Please be aware of what is happening and be willing to support the future of ground-water management.

by John Jansen
Aquifer Science and Technology

Here is another view of the wonderful turnout at the Joint WGWA/AWRA Meeting

A Short, Personal History of the Science of Groundwater Flow

Did any of you who are NGWA members happen to catch the autobiographical sketch in the current issue of the *Journal of Ground Water* by Josef Toth? For me, not only was there considerable excitement engendered by the opportunity to see something almost casually written by this hydrogeological giant, but also it caused memories to flood back to me from my introductory hydrogeology class, Hydrogeology 463, at UW-Madison, in the fall of 1970(!). My professor, Dave Stephenson, knew how to put things into a nutshell—of course, back then, hydrogeology was still an acorn, and not the oak it has grown into today!

"Folks," he said, "here's what you need to know about hydrogeology...

"1856: Henry Darcy invents Darcy's Law (v = ki/n), showing that water flows from areas of high head to areas of low head.

"1940: M. King Hubbert theorized that groundwater follows vertically curved flow paths, flowing downward under the upland recharge areas, and then upward beneath flowing streams in discharge areas.

"1963: Josef Toth mathematically demonstrated that such flows can, and do, occur in layers, as shallow, intermediate, and deep groundwater flow systems.

"1966-1968: Al Freeze and Paul Witherspoon produced a series of three papers showing more completely the mathematics of groundwater flow, and noted that flow through and between strata of differing hydraulic conductivities refracts much as does a beam of light streaming through glasses of differing indices of refraction."

(Continued on page 11)

History of Groundwater Flow
(Continued from page 10)

Somehow, Dave managed to stretch that into an entire semester!

Later benchmarks:

1971: Prickett and Longquist invent PLASM, the first groundwater flow model. I, still hung up back there on "v = ki/n," missed the boat!

1979: Freeze and Cherry publish the first authoritative text, *Groundwater*, pulling together all of this history and information for the first time between hard covers—but from my point of view, nine years late!!!

1979 - Present: Yada, yada...RCRA...yada, yada... Superfund...yada, yada...LUST...yada, yada...Brownfields... yada, yada...

Did I forget anything? Nope...I think that about sums up where your president is coming from;-)

by Boyd N. Possin, P.G.
President - WGWA

MODEL SPEAK .....Spatial and Temporal Scales

I. Introduction

Two major aspects of ground-water/surface-water flow modeling studies are the definition of spatial and temporal scales for simulating the aquifer/watershed and any associated subsystems. These scales are largely dependent on the hydraulic nature and dynamics of the surface or subsurface regime that is modeled as well as the study objectives. At some point during the study, the modeler must address the issue of how to convey and incorporate information produced at one scale into a model designed at another scale. This article will present some basic principles regarding conceptualization and mathematical representation of spatial and temporal scales in hydrologic modeling with some tips to provide better representation of these scales.

II. Description of Modeling Scales

Spatial Scaling

Spatial scaling refers to the physical setting or dimensions on which the hydrologic processes are occurring. Spatial scales that are commonly studied with ground-water models can range from a few meters (for example, in the vicinity of a pumping well or the ground-water/surface-water interface) to hundreds of kilometers (for example, a ground-water basin). Hydrologic models (for instance, ground-water flow, river/stream/canal flow, overland flow, infiltration, and evapotranspiration) can be divided into four scales: macroscale, mesoscale or regional, sub-regional, and local or field-scale. Macroscale models typically cover large portions of the earth and, in addition to hydrologic responses, are often used for "big picture" ecosystem responses such as climate simulations. Regional models generally cover portions of a state/province or states/provinces and are often used for the design or evaluation of long-term water-resource plans, or to evaluate the hydrology of an extended aquifer system. Sub-regional models cover watershed or basin areas and are often used for designing water use and management structures such as well fields, canals, or levees, or evaluating total maximum daily loads. Field-scale models cover sub-catchment areas and are often used to predict the impact of water management plans on flooding and runoff at the local scale, or the effects of individual pumping wells.

One of the major reasons for using a large-scale ground-water or hydrologic model is to determine the ground-water, surface-water, and/or chemical flux into or out of a given region. This process of dealing with various spatial scales is often referred to as telescopic mesh refinement (TMR; Ward and others, 1987) where a regional (coarse-grid) model provides the boundary conditions (such as, hydraulic or chemical flux) for a more refined (smaller grid spacing) model or nest of models that define the area of interest. As stated by Hunt and others (1998), the TMR approach allows for a lower level of complexity on the larger scale model so that greater project time and budget can be focused where it is needed on the site scale model. However, a modeler may sometimes rush into the design of a large, complex model without considering the benefits of TMR to avoid data management for multiple models, or to avoid determining the appropriate size of the large and site-scale models or the number of nested models required.

Spatial scaling and its associated mathematical formulation for a finite-difference or finite-element model is represented by the spacing of the nodal array, which define the cell grid in either a block-centered (nodes comprise the centers of cell) or mesh-centered (nodes comprise the corners of cell) approach, or the size and shape of elements. The nodal cells or elements might be one-, two-, or three-dimensional in nature. Spatial scaling in finite-difference modeling is fairly rigid when compared to the greater flexibility allowed by the finite-element method. However, each modeling approach has its advantages and disadvantages.

In finite-difference modeling, the application of variable-grid spacing is the most common method for refining the solution (using smaller cell dimensions) where greater accuracy is desired. A rule of thumb for finite-difference modeling is to increase the spacing from one node to the next by a factor of 1½ or 2. However, one disadvantage of this procedure becomes apparent when the decreasing nodal cell spacing is carried out to the boundaries of the model, where it is most likely not needed. Those exterior nodal cells (if active) also require the same type of model information as interior cells, information that may not be available outside the area of interest.

As stated by Anderson and Woessner (1992), finite elements can be sized (such as, optional use of triangles, rectangles, and quadrilaterals) and located to better approximate irregularly shaped boundaries than standard finite differences, and are more capable of handling model features such fault zones, point sources and sinks, seepage faces, and moving water tables than finite differences. However, finite elements require more data input, and may be more difficult to understand and program for the inexperienced user. The analytic element method (AEM) of modeling solves the problem of physical scaling because the discretization of the flow domain by grid or elemental networks is not required. The AEM uses an infinite aquifer assumption; therefore, the model scale does not need to be specified prior to model construction (Hunt and others, 1998).

Nature exhibits a tremendous amount of spatial variability over a range of different scales. Two important ground-water-modeling parameters that immediately come to mind in this regard are recharge and hydraulic conductivity. An important aspect of the scaling problem relates to the difference between the scale at which processes are mathematically de-

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scribed and the scale at which field measurements are obtained. Model calibration and uncertainties are compounded when a modeler extrapolates a field-scale measurement, such as hydraulic conductivity from a slug test to a greater scale such as a 10-acre industrial site. Based on past experience, it is indeed unfortunate that the two most-altered parameters in the quest for model calibration and the two parameters most sensitive to change, are the parameters that have the greatest uncertainty with respect to their distribution and range in magnitude. With this in mind, you can understand how spatial scaling with model grids inherently homogenizes the hydraulic characteristics of the aquifer.

Temporal Scaling

Temporal scaling refers to two main categories: steady state and time-variant or transient state. Hydrogeologic processes can be highly variable in time as well as space. There are seasonal fluctuations in ground-water levels from recharge, stream bank storage, and agricultural irrigation and drainage. Diurnal fluctuations in ground-water levels are caused by atmospheric and tidal effects, recharge, evapotranspiration, and plant consumption. Activities such as pumping can have a strong, initial, temporal effect on ground water but then the effect stabilizes after time.

In steady-state flow modeling, the hydraulic head solution is independent of time. However, in pathline analyses, the velocity of a particular particle in a steady-state flow regime may vary with time due to the particle's change in location (Zheng and Bennett, 1995). When running transient ground-water flow models, the total simulation time is divided into stress periods, which are, in turn, divided into time steps. A steady-state condition is assumed for a particular temporal effect if a representative average can be made of the effect, if the effect is too small to include in the analysis, and/or if the effect is not noticed because the analysis period is too short.

III. Some Techniques and Pitfalls in Model Scaling

Spatial Scaling

Many ground-water-modeling projects require different spatial resolutions to evaluate field data and make predictions on aquifer system behavior. Greater resolution is often required in the vicinity of pumping wells, surface-water bodies, ground-water drainage schemes, and ground-water injection/infiltration scenarios where greater curvature in the water-table or potentiometric surface might be expected to occur. Finer spatial resolution may also be required to account for variability in hydrostratigraphy (horizontally and/or vertically) or, if known, ground-water recharge or discharge rates.

As stated by Zheng (1994), there are a variety of situations where a given discretization scheme is adequate for a satisfactory flow solution, but can lead to significant particle tracking errors. For example, the accuracy of particle tracking can be improved by refining the discretization of the flow field around sinks (such as, pumping wells). A simulated well within a nodal cell in a coarse model grid can be a weak sink that does not discharge at a rate to capture ground-water flow entering the cell. However, finer discretization can turn a weak sink into a strong sink. A recent procedure, called nested rediscretization (Spitz and others, 2001), has been developed for MODFLOW/MODPATH to refine the model grid at a pumping well by creating a submodel (separate MODFLOW simulation) at the well cell, which is repeatedly done (successive rediscretizations) until the simulated well becomes a strong sink.

As stated by Zheng and Bennett (1995), spatial discretization requirements for solute-transport modeling are usually more stringent than for flow modeling. Where advection dominates, the accuracy of a transport solution is dependent on how well the flow field is represented. By increasing the grid resolution, the number of calculated velocities in the flow domain are proportionally increased. As an additional result, the processes of dispersion, sorption, and chemical reaction (where utilized) are better represented. One criterion for transport simulation, the Peclet number (which is the ratio of cell size to dispersivity in a particular direction), can be rather strict and require small nodal spacings if flow velocity is large or dispersivity is small.

Temporal Scaling

Surface-water modelers often use relatively short time steps or stress periods (days or less) compared to ground-water modelers (who typically use time periods of months or years) because surface water commonly reacts to stresses much faster than ground water. This is a reason why surface-water modelers sometimes overlook the ground-water component. The disparate time scales are difficult to resolve when simulating surface-water and ground-water behavior and create challenges to the modeler when integrating both hydraulic regimes in a model.

For accurate ground-water flow modeling solutions, a ratio of 1.2 to 1.5 is typically used for successive time steps with a minimum of five time steps for a stress period where there are no changes in stress or boundary conditions (de Marsily, 1986). Time step design is typically handled by program interface software (such as, Groundwater Vistas). However, it is good modeling practice to test the effects of time discretization so that the largest time step change that does not significantly change the solution can be used for model runs (Anderson and Woessner, 1992). A new set of time steps (such as, stress period) is usually warranted whenever there

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Model Speak
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are changes in parameters such as pumping, recharge, and/or river stage.

Simulation of solute transport, unlike flow simulation, is almost always transient in nature (Zheng and Bennett, 1995). That is, chemical concentration should be considered a function of time, even when the governing flow field is steady state. Solute transport simulations generally require smaller time steps than flow simulations because of certain solution criteria (such as, Courant number) and stability criteria associated with explicit solution schemes in finite-difference or finite-element methods. The Courant number is the number of cells (or fraction of a cell) that a solute particle is advected in one time step. The stability criteria for a transport solution are a function of dispersivity; smaller time steps may be needed for large dispersivity values.

IV. Final Comments

As stated by Anderson and Woessner (1992), the design of spatial and temporal scales can greatly influence the numerical solution. Ideally, it is desirable to use small nodal spacing and small time steps so that the numerical representation better approximates the partial differential equation. In the end, the essential scaling problem is distinguishing correctly between parameters that can or can not be considered generally constant or at least constant across discrete dimensions (van der Heijde and others, 1988).

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The editorial board is soliciting WGWA and non-WGWA members to provide modeling articles and reviews for Model Speak. To submit articles or provide suggestions for articles you would like to see, please contact Deborah Kerr (deb_kerr@urscorp.com*) at URS Corporation (262-782-7281).*

Basin Partnerships – Combining Resources on Ground-water Concerns

Background

An extensive statewide push for partnership approach to natural resource concerns occurred after reorganization of the Wisconsin Department of Natural Resources (WDNR). In 1998, the WDNR, University of Wisconsin Extension (UWEX) and the Rock River Coalition (a basin-wide non-profit organization) combined efforts to develop a Rock River Basin partnership approach. In the Rock River Basin the method was to 'Toss a Wide Net' both in determining critical issues as well as in team membership. They began by surveying more than 1600 people regarding their major basin natural resource concerns. This was followed by the Rock River Basin Forum: Partnerships for the Future', where 180 people further refined the concerns. Six Rock River Coalition issue teams were organized to continue the discussion and to develop and implement action plans. One of these issue teams is the Ground-water Issue Team.

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Basin Partnerships
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Rock River Basin Ground-water Issue Team 1998 - 2001
The Rock river Coalition (RRC) Ground-water Issue Team started with fourteen members including state and regional WDNR staff, Farm Bureau representative, county UWEX agent, a Wisconsin Geological and Natural History Survey (WGNHS) specialist, a business representative and Department of Agricultural, Trade and Consumer Protection (DATCP) staff. As a team, a number of concerns were recognized but decided to: 1) Determine the most significant ground-water contaminants in the basin, 2) Encourage proper sealing of unused abandoned wells and 3) Educate basin farmers regarding potential contamination risks in the basin.

As a result, the team hosted three well abandonment demonstrations resulting in the sealing of a number of wells with bentonite. The RRC was able to hire a consultant who used the nationally recognized Farm*A*Syst program, with farmers to assess areas of potential contamination to ground water. Twenty nine farmers have completed the assessment; the RRC has funds to perform another 43 assessments. It's been a challenge to find participants due to confidentiality concerns. The RRC guarantees that results will not be identified by name and will only be released in summary format, but the concern remains.

Determining the most significant contaminants proved more complex than the team's resources or abilities. However, they were able to pull together a resource list of ground-water data sources. This information will soon be listed on the UWEX Rock River website: http://clean-water.uwex.edu/rockriver. Printed materials listed in the resource guide will be available at the UWEX Rock River Basin Educator's office in Jefferson. Citizens, health departments and others will thus have a handy location to find available data.

The shallow limestone geology in parts of the basin is of particular concern for ground-water contamination. The team completed a display and brochure on this 'Karst' topography to explain why it's a concern and what people can do. The brochure and display, originally developed for Farm Progress Days, is now being used statewide.

RRC Ground-water Issue Team 2002
With the original projects nearing conclusion, the team decided to invite new members and take a fresh look at ground-water concerns in the basin. In January 2002, fourteen people brainstormed concerns. The initial results included:

1. The impact of ground-water quality and quantity on surface water. The changing rate of infiltration and ground-water removal and their impact on baseflow in springs and streams.
2. Education of policy makers and politicians on vulnerability of ground-water systems.
3. Building a constituency for ground water (similar to lake associations and river groups).

Some of the specific concerns and suggestions related to these three issues included recent arsenic findings in Walworth County, the loss of monitoring wells, the lack of information on the link between ground-water and surface-water pollution (especially phosphorus), and the desire to encourage Ground-water Guardian groups.

The team continues to look for new members to help develop and implement an action plan for these and other issues. If interested you may contact Suzanne Wade, UWEX Rock River Basin Educator at 920/674-7295 or suzanne.wade@ces.uwex.edu.

The Rock River Basin is the land area that drains to the Rock River. The basin covers more than 3,770 square miles. It stretches from the Theresa and Horicon marshes in the north to Beloit on the south; on the western border it includes most of Madison and the Yahara lakes, on the east is Oconomowoc with its own cluster of lakes. The basin is home to rich farmlands, thriving industries, and flourishing communities, both large and small.

The Rock River Coalition
The Rock River Coalition (RRC) is a private nonprofit organization composed of citizens, agencies, businesses and organizations dedicated to preserving and promoting the economic, cultural and environmental resources of the basin. A major emphasis of the coalition is to develop partnerships from diverse groups that work on significant issues for basin citizens.

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Basin Partnerships
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Rock River Watershed Partnership

The Rock River Basin is home to another group that has been investigating the possibility of using nutrient trading as one method of meeting surface-water quality goals. After three years only two trades for phosphorus between point sources (wastewater treatment plants) and farmers are likely to happen. However, ground-water professionals may be interested in one hotly debated conclusion of the Stream Quality Study by Dr. Ken Potter of the University of Wisconsin. One of the study's conclusions was that tiled fields were better for stream quality, since erosion and phosphorus runoff did not occur at the same rate as untiled fields.

An extensive computer model, the Soil and Water Assessment Tool or SWAT, was performed on the basin for the RRWP by Earth Tech, Inc. One of the complicating factors to the model was correctly determining ground-water interactions; therefore a baseflow separation model was developed. The model showed some vast differences, but on average 60 to 80% of surface water came from baseflow or ground water. Pheasant Branch in Middleton to the west of Madison showed a significant difference with only 48% of its water from baseflow. The reason appears to be the withdrawal of significant amounts of water from the aquifer underlying Pheasant Branch by the City of Madison. Research on the system shows that instead of ground water feeding Lake Mendota, in some areas Lake Mendota's water is feeding aquifers near the lake. The entire study can be accessed (without most maps) at the UWEX Rock River Basin website.

Other Basin Efforts
Four years ago the WDNR contracted with the UWEX to establish Educators for Natural Resources in many of Wisconsin's River Basins. Currently 15 Basin Educators work on natural resources issues in 23 river basins.
The most active basin ground-water programs other than the Rock River are in the Central Sands area and Door County. To locate the Basin Educator in your area go to http://cleanwater.uwex.edu/basins/meeteds.html.

Suzanne Wade
University of Wisconsin – Extension

Rock River Coalition Groundwater Issue Team January 8, 2002 Meeting Minutes

Present: Chris Mechenich, UWEX Groundwater Center; Madeline Gotkowitz, Wisconsin Geologic and Natural history Survey; Ed Morse, Wisconsin Rural Water Association; Ruth Johnson, DNR; Mark Krumenacher, GZA GeoEnvironmental, Inc; Dave Neuendorf, Dodge County UWEX; Laurie Lambert, Dane County LCD; Paula Allen, DATCP; Dave Johnson, DNR; Celeste Moen; Jim Congdon, DNR; Tom Koch, RMT, Inc; Tim Banwell, Rock County Health Department

Next Meeting: February 19, 2002 UWEX Jefferson County, 864 Collins Road, Jefferson. Agenda to refine the priorities and begin to look at action planning on the top priorities. (Contact Suzanne Wade for directions)

Minutes:
Following introductions, Chris Mechenich, UWEX Groundwater Center provided information on the offerings of the center. She also provided information on the new Groundwater Guardian program. Any community (defined broadly) working in partnership on groundwater education and protection may be eligible to be listed as a Groundwater Guardian. Our issue team could apply, or we could encourage other communities to become one.

Madeline Gotkowitz presented research on arsenic in groundwater. Walworth County, in particular, has a number of wells that have tested very high. She is looking for support and assistance to continue well monitoring and educational programs in Walworth or other areas.

Next the team brainstormed issues and concerns regarding groundwater in the Rock River Basin. Below is the list, rearranged in order of the number (#) of votes each received. The highest number possible is 13. Those not receiving any votes are listed in the order they were presented during brainstorming. People phrased their concerns in many different styles, I've tried to rewrite some of them as problems. More editing will be needed.

Rock River Basin Groundwater Issues and Concerns – in priority order

1. The impact of groundwater quality and quantity on surface water. The changing rate of infiltration and groundwater removal impacts on baseflow in springs and streams. Surface water quality can be impacted by groundwater such as phosphorus, et al. But we don't know since data is not available, more studies needed. #11

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Rock River Coalition Groundwater Issue Team

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2. Education of policy makers and politicians on vulnerability of groundwater systems. #10

3. Build constituency for groundwater (similar to lake associations and river groups) #9

4. Motivate homeowners to sample their water for their own health. #4

5. Educate farmers, farm groups, homebuilders and developers. #3

6. Groundwater monitoring needs to be part of land and water resource management plans, monitoring needed to meet smart growth requirements: We have lost sampling points for groundwater levels that help us keep track of groundwater depletion, drought: Possible solution, volunteer groundwater monitoring (15 + 18 +26). #3

7. Outreach to business community regarding groundwater concerns. #3

8. Impact of septic systems, manure storage and land spreading regarding antibiotics, and growth hormones. #3

9. Survey policy makers regarding attitudes and concerns and opinions on groundwater. #2

10. Lack of information on local groundwater hydrology: recharge areas etc.: Groundwater flow map with community, geology and municipal overlays. #2

11. Impacts of intense animal operations, land spreading of manure on groundwater. #2

12. Using data to effect policy. #2

13. Lack of guidelines for groundwater protection in smart growth planning. #2

14. Not enough local information on use of fertilizers and pesticide: Rural and urban. #1

15. Need more coordination and sharing of data collection. #1

16. Collect private well sampling do we need to target areas where are they, what should we sample for. #1

17. Recognition of what data is already available in various sources especially at the DNR. #1

18. Need town based sampling – arsenic, nitrate and bacteria. #1

19. Need wellhead protection – property owner education. #1

20. Water quantity baseline acquisition.

21. What to do with data, help homeowners figure out what they can do – especially referring to arsenic.

22. How can we get people to use groundwater overlays that have been prepared?

23. Karst reporting and inventory

24. Identify and protect recharge areas.

25. Closure of underground storage tanks by natural attenuation – overall impact.

26. High capacity wells survey of violations need for follow-up.

27. Trade associations to internally regulate.

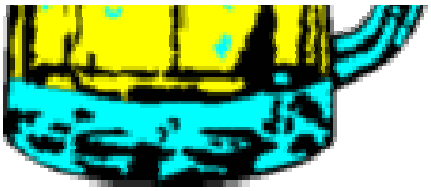
28. Educate and promote CREP especially buffers around sinkholes and fractures.

29. Well abandonment, small business, maintenance – public service announcement.

30. School education.

31. Increase infiltration esp. urban: use techniques such as rain gardens.

It takes 1,500 gallons of water to produce 1 barrel (36 standard U.S. gallons) of beer.



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We are looking for coordinators in many of the following areas. If you are interested, please contact Boyd Possin.

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(LaCrosse, Black River Falls, Eau Claire, Chippewa Falls, surrounding area)
Position Open.

Southern Area
(Madison and surrounding area)
John Tweddale
BT^2
Phone: 608-224-2830 and 608-224-2839
jtweddale@bt2inc.com

(Continued on page 19)

North Central Area
(Stevens Point, Wisconsin Rapids, Wausau, Rhinelander, surrounding area)

Tod Roush
Maxim Technologies
Phone: 715.845.4100; Fax: 715.842.0381
troush@maximusa.com

Mark Strobel
Earth Tech, Inc.
Phone: 715-342-3022; Fax: 715-341-7390
mark_strobel@earthtech.com

Northeast Area
(Green Bay, Appleton, Oshkosh, Fond du Lac, surrounding area)
Position Open.

Southeast Area
(Milwaukee, Sheboygan, Racine, Kenosha, surrounding area)

Scott Brockway
Tetra Tech EM
Phone: 262.821.5894 X232; Fax: 262.821.5946
brockws@ttemi.com

Judy Fassbender
Applied Environmental Solutions, Inc.
Phone: 414-507-5571; Fax: 262.560.1963
gofish@globaldialog.com

Join the Wisconsin Ground Water Association Today!

Please take a few moments and become a member of WGWA. Annual dues are $15 for students, $30 for individuals, and $150 for corporate members, and are payable to WGWA. Corporate memberships allow companies to register six members at a discounted rate.

For new members, just complete the following form and send to: Wisconsin Ground Water Association, Attn: Marilyn Weiss, WGWA Treasurer, P.O. Box 8593, Madison, WI 53708-8593.

INDIVIDUAL MEMBERSHIP: **Regular Member:** o **$30** **Student Member:** o **$15**

Name:_____ Firm:_____

Position:_____

Mailing Address:_____

_____ __ __ __ __ __ – __ __ __ __

City State ZIP Code (9 digits)

Telephone Number: (_____)_____ Fax: (_____)_____

E-mail: _____

Are you interested in participating in any WGWA Committees?

o Newsletter o Membership o Web Site

o Legislation o Program & Education

o Special Interests: _____

o Please check if you do not wish to be listed in a WGWA membership directory.

CORPORATE MEMBERSHIP: o **$150**

Firm:_____

Mailing Address:_____

_____ __ __ __ __ __ – __ __ __ __

City State ZIP Code (9 digits)

Telephone Number: (_____)_____ Fax: (_____)_____

E-mail: _____

Corporate Members:

1)_____

2)_____

3)_____

4)_____

5)_____

6)_____

o Please check if your company does not wish to be listed in a WGWA membership directory.