Wisconsin Ground Water Association Newsletter

INSIDE THIS ISSUE:

President's Message

As I set here on a crisp November morning writing the final President's Message for my term in that office, I'd like to ramble reflectively on what we've accomplished over the past year, and where we are now headed as an organization.

Last winter, we amended and updated our bylaws so that, among other things, we now have much more flexibility in appointing At-Large Members to the Board of Directors.

We've gone electronic, not only with the excellent *WGWA Newsletter*, and the *WGWA Note* e-mail series, but even with things like our election. The WGWA web site has been modified accordingly.

This fall we took a deep breath, and, with the Wisconsin Chapter of AIPG, put on a two-day field trip to the Northwoods, to look at mining issues. The trip cost—with lodging, approaching $200—had us justifiably concerned as perhaps being a bit pricey for the membership. I am delighted to report, however, that our concern seems to have been unfounded. The three dozen folks who participated (the second highest number ever) were very happy with the trip, convinced that the value received was well worth the investment. "If you build it, they will come" seems to apply as well to a quality field trip as it does to baseball diamonds in Iowa cornfields! For next year, we and AIPG are talking to the Minnesota Ground Water Association about putting on a joint two-day field trip to the SW Wisconsin, SE Minnesota driftless area, to focus on the many fascinating karst features there. It promises to be at least as wonderful as was the Northwoods tour!

We shifted our schedule around so that our annual meeting is now in the spring, and the field trip in the fall. This was done to facilitate our combining

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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 winter newsletter is February 16, 2003.

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meetings with other organizations. We are trying to cut down on the number of excellent, but conflicting, organizational meetings out there that we'd all like to attend. In March, we combined forces with the Wisconsin Chapter of AWRA, and that worked quite well. Unfortunately, AWRA decided to go its own way next year, so instead, we are teaming with three other Wisconsin water-oriented organizations—the River Alliance of Wisconsin, the Wisconsin Wetlands Association, and the Wisconsin Lakes Association—to put on a combined effort, which we are calling "Where the Waters Meet," to be held in Green Bay on Thursday, April 10, 2003. WGWA President-Elect Margy Blanchard and I have been, and will continue to be, involved in the planning for that effort. You will shortly be receiving information concerning that conference and will, I believe, be impressed with the breadth and depth of the effort. To say this conference is going to be interdisciplinary would be an understatement. You won't ever have seen anything like it, I guarantee!

The day before the "Where the Waters Meet" conference, also in Green Bay at the same location, WGWA, itself, will have a meeting where the papers given will focus strictly on ground water issues. We will soon be sending out a formal "Call for Papers" for that meeting. In an effort to boost participation and interest, we will be offering substantial cash awards to the best student papers and poster sessions (including separate awards for undergraduate and graduate presenters).

And that brings us to WGWA's growing interest in resurrecting our educational support function. You have seen that we are restarting the WGWA Education Committee, and are recruiting volunteers for that effort. We have members who are interested in supporting and liaisoning with our colleges and universities that have ground water programs, and other members who are interested in spending time and effort working with the K-12 system. All who are interested in participating—which, by the way, involves deciding *what* it is that we can do!— are encouraged to come aboard, and join the effort!

We've also become an Affiliate of the Groundwater Guardian (GG) Program, and are looking for more volunteers to jump aboard that effort. The function of our committee will be to liaison with, and find ways to support, the eight local Wisconsin Groundwater Guardian organizations, in addition, perhaps, to providing support to eh folks at the Groundwater Center at UW Stevens Point which assist in coordinating the Wisconsin GG Groups. The GG groups spend considerable time focusing on K-12 issues, as well as adult education and awareness issues.

We have more than mere human resources to plug into these efforts, too. I'm talking funding. For example, just in terms of dues, WGWA currently collects in excess of $10,000 per year. The annual conference we hold, the field trips we put on...all are fee-based and self-supporting. The hard copy version of the *WGWA Newsletter* used to be a major expense item for us, but now that we've gone electronic, the bulk of that cost has disappeared. Your Board of Directors has, therefore, determined that the thing to do with our financial resources is to put our money where our mouth is, by trying to find ways to effectively give back to the systems that nurtured us all. By doing so, we have the best chance of elevating general public awareness of the many ground water issues which seem to do nothing but grow more important to our citizenry as the years and decades roll by. The bottom line is, that if you volunteer to work on these committees, you will actually have some resources with which to work with, in order to accomplish your mission!

I suppose this all sounds rather nebulous, and, for that reason, may seem to smack of "pie in the sky." Nor does it evoke the sort of selfish pocketbook concerns in us, that, for example, things related to the PECFA program, have mobilized us into taking collective action in the past. Still, the education and public awareness mission related to ground water issues is important—in my view, *orders of magnitude* more important that PECFA ever was!

Call it sustainability, or whatever other label you want to put on it. But the groundwater resource is finite. The Waters of Wisconsin (WOW) effort is moving forward, to try to address the many long-

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term water issues that face us. If we—arguably the single largest group of ground water resource management professionals in Wisconsin—fail to show up and do what might reasonably be expected to be our professional duty, then...well, I shudder to think what might happen!

I'll conclude by thanking a few folks. First, thanks to Kristen Gunderson of Earth Tech, who has graced WGWA with her presence for four years as our Secretary. Thanks to Jeff Hosler of J. L. Hosler and Associates, who has ably served as an At-Large Board member. Thanks to Joan Viney of MWH, who has stepped in and done yoeperson work on the WGWA web site, and who, as the new publisher, single handedly reinvented the *WGWA Newsletter* in electronic form. And, last, but certainly not least, thanks to Margy Blanchard, who saved this organization's bacon last year by agreeing to run for a second term as WGWA President. Margy and I have worked together on professional organizational matters since the early days of the old AERC organization, way back in 1994. I can tell you, from personal experience, good things always seem to happen whenever she's involved... and that ain't no coincidence!

It's been an honor and a joy to be your President this past year. In one capacity or another, I hope to be able to play a role in WGWA for many years to come! Thanks again for affording me the opportunity!

- Boyd Possin - WGWA President

WGWA Board Meeting Minutes

Tuesday, June 4, 2002
Conference Call

Persons present: Margy Blanchard*, Boyd Possin*, Kristen Gunderson*, Marilyn Weiss*, Joan Viney*, Tom Riewe*, Kevin Olson*, Jeff Hossler* (* via phone)

A. Call to order about 6:00 pm. No additional agenda items were noted.

B. Last meeting minutes - E-mailed out to everyone after the last meeting at the Spring Conference (March) and Margy moved to approve the minutes, Marilyn seconded, passed 4-0.

C. Treasurer's Report – $14,670.96 in account as of June 4, 2002. WGWA is now tax-exempt in the State of Wisconsin for sales tax since we are an education organization. Contact Marilyn if you make purchases and need the number. We also have a credit card for WGWA use, make sure to get purchase documentation to Marilyn to track purchases. $8,175 in dues received so far this year and there have been a few small expenditures this year.

D. Membership Report – As of June 4, 2002 - 315 members are currently paid up for 2002. 29 members are listed on the roster that were paid in 2001. Marilyn is working on cleaning up the database. There are 39 brand-new members, 3 student members, and 28 companies with 182 individuals in the corporate membership.

E. Old Business

AWRA Relationship Breakdown – Boyd and Margy explained what has been going on since the joint conference in March. AWRA has decided to have their own conference next year and not pursue a joint meeting due to concerns with their tax issues/status and that they viewed their group as an overall water resources group and didn't want to just focus on groundwater.

2. Election of 2003 Officers – Need to recruit candates for Secretary and President-elect. Boyd asked the At-Large Board Members to form an informal committee to recruit candidates to try and come up with some names prior to the next Board Meeting. Marilyn will send out a list of the people that indicated interest in being more involved in WGWA on their membership forms.

3. Regional Meetings – How to invigorate them? Discussion of how to get better attendance, social vs. informational/ presentation meetings, frequencies, and timing of meetings. Will come back to this topic at the next meeting.

4. Relationship with AIPG – Margy stated that WGWA and AIPG Boards have met twice since December. The two groups are planning a joint field trip in the fall of 2002 and the two boards will continue to meet periodically. The next meeting is planned for June 26 in Madison – contact Margy if you are interested in attending.

5. Progress Report on Fall Field Trip – September 27-28. September 27 meet in Rhinelander and take a coach bus around noon to the Crandon Mine, visit the mine and stop at a rock outcrop along the way, and then on to the core shack to check out the mine cores. Dinner at the Holiday Acres is planned for Friday night. A group of rooms has been reserved for our group at Holiday Acres. Saturday concludes with a stop at an old abandoned copper mine in-

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cluding an official miner pasty lunch. Registration materials will be coming out soon. Cost is estimated to be about $110 per person ($75 for students/children) plus lodging costs (estimated to be about $80 per room, regardless of number of people in the room). There will also be options for Friday only, Saturday only, and Friday dinner.

6. On-line version of *WGWA Newsletter* – Group commented to Joan (the Webmaster) that things looked and worked well. Only concern was getting back on schedule with issuing the newsletters – only 1 has been "published" in 2002. Spring issue should be out very soon, summer issue should be closer to on time.

F. New Business

1. Do we need/want to assign individual member IDs and passwords for on-line access to the *WGWA Newsletter*? – Concern is that people may not become members if they can now get the newsletter for free online. There would be an expense and great hassle to issue individual IDs and passwords. The Board decided to leave the password situation as is, and the issue may be revisited if membership levels decline over time.

2. New spring conference alignment with Wisconsin Association of Lakes, Wisconsin Wetlands Association, and the River Alliance of Wisconsin – Boyd contacted some of these groups after the AWRA relationship broke down. All the groups were considering combining meetings in April 2003 in Green Bay to avoid competition between the groups for conference attendance. There will be a planning meeting in late June to discuss plans including a joint plenary session and each of the groups having individual meetings as well. There will be one fee and people are free to attend whatever sessions they wish to attend. There will also be a push to get student (both graduate and undergrad) papers and posters presented at the conference. Need to reconvene the education committee to explore policy, awards, options, feasibility, and communications. Margy will be the board representative on the committee and Marilyn will send out the list of the members that indicated interest in education to Margy.

3. Possible alignment with the Wisconsin Groundwater Guardians? – Boyd discussed a recent meeting he had at UW-Stevens Point during a campus visit where the Wisconsin Groundwater Guardians group became part of the discussion. There are currently 7 local groups in the state. The focus of the groups is educating the public (primarily the young public) about groundwater issues. Boyd contacted their national office about WGWA becoming a Groundwater Guardian group. Boyd will send out some additional information about the group and the board will discuss this further at an upcoming meeting.

Next Board Meeting – tentatively Tuesday, August 20 at 6:00pm.

Meeting adjourned about 7:50pm.

Tuesday, August 20, 6:00 PM
Teleconference Call

A. Meeting called to order at 6:05 PM - Boyd, Margy, Marilyn, Kevin, Tom present; Kristen, Jeff absent)

B. Minutes of last meeting were adopted.

C. Treasurer's Report (Marilyn) - Currently have total of $15,116.71 in bank.

D. Membership Report (Marilyn) - 323 members, 3 more than last time.

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E. Old Business

1. Election of 2003 Officers - Report from Members-At-Large Elections Subcommittee on progress in identifying candidates. Brian Hahn for secretary. Several other names were mentioned for at-large positions, or for positions in future years, but, so far, no candidates for President-Elect have been found

2. Regional meetings - how to invigorate them? (Regional Coordinators/All) Need to put something in *WGWA Newsletter* and add encouragement to *WGWA Notes*.

3. Progress report on fall field trip (Kevin/ Boyd) - So far have less than 20 signed up, but this is expected. Most will be last minute. Still, decided to scale back to just one bus.
4. Progress Report on April 2003 Conference (Margy) - Have had two meetings. Last one on August 1. Meeting on August 10. WGWA meeting on April 9. Have tentative agenda--meeting starts at 9am, introduced by WAL president. Then maybe Nina Bradley doing a reading. Introduction--Steve Born. Then Jim Peterson will do hydrologic budget/water cycle. Then voices for water--people from each sponsoring organization. Two questions to be posed to each group--i.e., what are you biggest problems and biggest successes? Then lunch--with topic tables. In afternoon two one and a half hour period, with a total of four concurrent sessions. (copy in notes from meeting)

Next planning meeting is Sept. 11 from noon till 4:30.

Let's crank up an education committee. Also look for an outside speaker that we would pay for.

F. New Business

1. Groundwater Guardian Affiliate Status - reviewed draft ROAs (result-oriented activities). They were approved. Motion passed to get application done by 8-31.

2. April 2003 Groundwater Festival (Boyd) - Described festival—being put on by UW Stevens Point. Noth for public and K-12. Needs about $5,000 in contributions to go over the top on funding. Boyd suggested that WGWA, along with AIPG, consider funding most, if not all, of that balance.

3. WGWA position on supporting draft Groundwater Summit document - Discussed and agreed not to support document. Problem is that document fails even to address ther lack of vision and control in state government that failed to recognize the conditions that led to the PECFA spending travesty, even though it was happening in plain sight!

Meeting adjourned at 7:55 PM.

Monday, October 28, 2002 Conference Call

Persons present: Margy Blanchard*, Boyd Possin*, Kristen Gunderson*, Marilyn Weiss*, Tom Riewe*, Kevin Olson*, Brian Hahn*, Mark Strobel* (* via phone)

A. Call to order about 6:00 pm. No additional agenda items were noted.

B Last meeting minutes (August 20)- E-mailed out to everyone by Boyd today and Margy moved to approve the minutes, Marilyn seconded, passed 4-0. Boyd noted that the names of potential candidates for office were removed.

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C. Treasurer's Report – $16,006.06 in account as of October 28, 2002. We made a small profit on the field trip.

D. Membership Report – As of October 28, 2002 - 323 members are currently paid up for 2002.

E. Old Business

1 Election of 2003 Officers – Have 2 candidates for Secretary (Brian Hahn and Janis Kesy) but none for President-Elect. Need to determine if there are any potential candidates by Thanksgiving. Boyd offered up the possibility of him running again similar to what Margy did the previous year. Final decisions will be made by e-mail. Balloting by fax/mail/email will have the ballots out by December 2 and returned by December 16 if we follow last year's model. There will also be an At-Large Board Member position to be filled. Boyd moved to accept the nominations for Secretary and that he would run for President if no one else stepped forward. Margy seconded, passed 4-0.

2. Report on Fall Field Trip – Toured Nicolet Minerals Visitor Center, core shed, and the proposed mine site. Stopped by Northern Lake Service for a tour of their lab. Also stopped at an outcrop of pillow basalts near Rhinelander. Bruce Brown and Tom Hooyer gave after dinner presentations on Precambrian and Pleistocene geology of northern Wisconsin & Upper Michigan. The second day included a hike at Bond Falls and a trip into the Caledonia Mine complete with a pasty lunch. A total of 30 people attended both days and an additional 9 people were able to come up for 1 day. There will be a write-up and photos from the trip in the next newsletter and more about the trip on the website.

3. Progress Report April 2003 Conference – The WGWA conference will be Wednesday, April 9. Thursday, April 10 will be "Where the Waters Meet" a co-sponsored event with WGWA, Wisconsin Association of Lakes, Wisconsin Wetlands, and Wisconsin River Alliance amongst others. A topic for the WGWA portion (Wednesday) that has been suggested is pharmaceuticals in groundwater. Margy is looking for suggestions for speakers. Another potential topic could be the technical side of water supply issues/aquifer storage in Brown County. We need to issue a call for papers and give notice that there are awards for the top papers. We could also have a poster session. Margy will draft a call for papers and work on getting some speakers lined up. Deadline for abstracts will be February 7, 2003. Eight prizes - $500 for best grad and undergrad presentation and posters (4 total) and $250 for second in each category for runner-up (4 total). Boyd moved, Kristen seconded. Passed 4-0.

4. Report on Waters of Wisconsin Forum - Held last week Monday and Tuesday – over 600 people attended – and there were less than 20 consultants. There were a lot of DNR and academic types. There were comments made that the conference that this was just the beginning of the effort and that the work will be portrayed to the Legislature as a consensus of water professionals. Brian commented that the WOW effort is receiving a lot of bad press in Central Wisconsin. Margy commented that the conference had an emotional slant to the issues that is not normally associated with scientific conferences.

F. New Business

1. 2003 Membership Drive – Need to get more students and academic types. We should include a membership form with the

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call for papers. Marilyn suggested simplifying the corporate membership to if a company has 6 or members, that the fee is $25 per person (some companies have 7 or more members).

2. Groundwater Guardian Affiliate Committee – Identified about 3 people willing to help with this project. Focus will be on K-12 education on groundwater issues. Boyd turned out application so we will be official for next year.

3. Education Committee – Would like to have members of the committee serve as liaisons with the different campuses. Boyd also suggested maybe developing a student affiliate of the WGWA. WGWA could offer to do brown bag talks at the campuses. Should also look at inviting students to give talks at the area meetings.

4. April 2003 Groundwater Festival – Part of the Groundwater Guardian program based at UW-SP. It will be a 2-day festival. 1 day for K-12 (focusing on 5th graders) and 1 day open to the public. This will hopefully become an annual event and will move around to different locations throughout the state. Boyd proposed that WGWA donate money for the event. Margy moved to donate $2,000 to the Groundwater Festival for the April 2003 event, Boyd seconded. Passed 4-0.

G. Next Board Meeting – tentatively sometime in late January for the turnover in the officers and firm up conference plans (sessions, abstracts, etc.).

Meeting adjourned about 7:55pm.

Today, we have the same amount of water as we did when the earth was formed.

MODEL SPEAK

Particle-Tracking Methods and Limitations

A. Introduction

With the development of more powerful computers and modeling software, the desire for calculating and visualizing two- and three-dimensional ground-water flow (vector) fields for problem analysis has grown exponentially. As a result, particle-tracking methods (also commonly called paithline analyses) were developed to aid the understanding and displaying of large- and small-scale hydraulic structures in the vector field. This article presents some fundamentals and techniques in particle tracking and highlights a number of the method's limitations.

B. What is Particle Tracking?

A numerical ground-water flow model is used to solve for an array of hydraulic heads that conform to the inner and/or outer boundaries of the model domain and the model input values for the region's hydraulic characteristics (such as, aquifer hydraulic conductivity, recharge, fully penetrating streams). For finite- difference or finite-element models, the resultant head field is structured around an orthogonal or curvilinear grid, respectively. However, the analytic element method eliminates the need to discretize (grid) the flow field.

Particle-tracking methods utilize the resultant head solution to calculate ground-water velocities (vectors) across the flow domain. The field lines of a velocity vector field are called streamlines. Pathlines are trajectories of individual particles released in the flow field. For steady-state flow (flow field does not change over time), streamlines and pathlines are coincident; in a time-dependent (transient) flow field they are not. Therefore, particle-tracking models track the movement of ground water or the equivalent of a set of distinctive, tiny particles injected into the flow field. The visualization of particle motion (sometimes using real-time animation) is perhaps the most realistic representation of ground-water flow rate and direction.

C. What Are Particle-tracking Methods Used For and How?

Two of the more important uses for applying pathline analysis are for problems pertaining to evaluation of the zone of contribution for ground-water supply wells and contaminant transport. In source water protection, reverse and forward particle-tracking methods are used. Forward particle tracking involves the tracking of particles in the direction of ground-water flow and can be used to determine the ground-water source areas for a pumping well or whether a well might be contaminated by a particular contaminant source.

Reverse particle tracking involves tracking particles in the direction opposite to ground-water flow. Since ground water flows toward a pumping well, reverse tracking is used when particles are released around the circumference of a well. For example, in source water protection, the final locations of particles placed about the well after five years would determine the boundary of the well's five-year capture zone. Reverse particle tracking eliminates the trial and error associated with forward particle tracking by eliminating areas of the flow field from which ground water would not migrate to the well. However, forward tracking can be useful for ensuring that an adequate number of particles are used in the delineation of contributing areas for a water supply well (Barlow, 1994). Particle-tracking simulation results for well protection are sometimes verified by comparing calculated ground-water ages with ages determined from tracer analysis of ground water for the pumping well(s).

Particle tracking is also an important tool for analyzing numerical model designs and simulations. As stated in Anderson and Woessner (1992), particle-tracking analyses are useful for examining the effects of different model boundary conditions that might not be identified by examining head distribution alone, for evaluating more clearly the location

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of recharge and discharge areas, and for assessing the effects of partially penetrating wells and streams.

D. Limitations in Applying and Displaying Particle-tracking Results

The calculated velocity field is dependent on the head solution. It follows then that an inaccurate simulation or representation of the flow field will lead to an inaccurate representation of particle flow paths as well as any predictions based on those analyses. Therefore, one important consideration in producing accurate particle tracks is making sure that there is proper resolution in the head field. For model designs based on a grid configuration, the distance between adjacent nodes determines the solution resolution. By increasing the grid resolution (such as, using variable spacing to decrease the size and increase the number of grid cells), the number of calculated heads and velocities in the flow domain are proportionally increased. Finer nodal spacing should be used where greater importance is placed on particle-tracking analyses, such as 1) areas surrounding a pumping well(s) where steeper gradients are present or in areas where natural hydraulic gradients are greater; 2) areas where spatial changes in hydraulic conductivity or transmissivity are present; 3) next to modeled surface-water bodies if water budgets or ground-water/surface-water interactions are a focus of the study; and 4) areas adjacent to and surrounding simulated hydraulic control designs to evaluate their performance.

There are two conceptual issues to keep in mind when using a coarse grid for particle-tracking analysis. First, a simulated pumping well is sometimes called a weak sink when the well's discharge does not create inward hydraulic gradients across all sides of its resident cell. This is in contrast to a strong sink, where a well's discharge is sufficiently strong to capture ground water from all sides. According to Zheng and others (1995), in the case of a weak sink in particle tracking, the fate of a particle entering the cell is indeterminate using common particle-tracking solutions because there is nothing in the calculation to indicate whether the particle should be captured or exit the cell across an outflow side (when in fact it might eventually be captured by the well). Finer grid spacing would result in a refinement of the velocity field calculated from hydraulic heads. Subsequently, particle paths would be better refined so that all particles that should be captured by the pumping cell are and can be distinguished from particles bypassing the cell. Second, in many instances model layers are designed to represent distinct hydrogeologic units that vary in thickness across the model area. Particle-tracking errors can also be introduced when varying the vertical dimension of a cell in a particular model layer (often called grid distortion) because tracking solutions are based on a rigid orthogonal grid. In summary, these particle-tracking constraints suggest that, when possible, finer grid spacing with uniform model layer thicknesses should be used when performing pathline analyses unless numerical solutions are used to overcome these constraints.

For many unconfined flow systems, particle tracking based on the use of two-dimensional models needs to be carefully considered for calculating accurate particle travel times and time-related capture zones. As stated by Barlow (1994), the size of the land area contributing water to wells can easily be under-predicted due to a two-dimensional model's inability to represent shallow, partially penetrating wells or vertically heterogeneous and anisotropic aquifer units.

Particle tracking applies to advective transport only and does not account for contaminant dispersion (unlike random walk methods) or diffusion. As an example, contamination located outside a pumping well's source area that is defined by particle tracking may potentially impact the well. However, the simulation of pure advective flow is a good first estimate of contaminant movement in an aquifer and is a common conservative approach for modeling mass transport under the assumption that most of the contaminant plume spread is caused by aquifer heterogeneities. Where it is desired to show the effects of sorption in a particle-tracking simulation,

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retardation can be simulated indirectly through changes in the value for aquifer porosity. Increasing effective porosity will result in a lower simulated ground-water flow velocity, which is similar to the effect one would expect for a contaminant that was prevented (via sorption) from traveling at the same velocity of ground water.

There are other limitations that are important from a research standpoint with respect to using particle-tracking methods for contaminant studies. These involve the communication and interaction between particles (all particles are tracked on their own), the effects of particle size changes and recirculation through time, and the computational inefficiency when using constant time step algorithms in a varied velocity field (Wen and others, 1996). However, these limitations in current particle-tracking methods may not be particularly significant for the degree of accuracy usually accepted in hydrogeologic studies.

E. Final Comments

The development of modeling and processing methods to trace and visualize the flow paths of ground water has significantly improved the ability to evaluate contributing areas for water-supply wells, the movement of subsurface contaminants, and the design of engineered ground-water remediation systems. Although pathline analysis is an important aspect of numerical ground-water flow studies, predictions based on particle-tracking methods are still subject to the same unmeasured variability and uncertainty in aquifer media and its structure that is inherent to flow modeling. Therefore, it is important to evaluate the widest range of plausible solutions and consider uncertainty as a property of the model input data.

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WGWA/AIPG Fall 2002 Field Trip

Mining in the Northwoods – The Old and the New

Submitted by Kevin Olson, Photographs Courtesy of Jill Possin, Boyd Possin and Mari Vice

The 2002 AIPG/WGWA fall field trip was a huge success. About 40 of us spent September 27 and 28 traveling around the northwoods learning first-hand about the mineral resources in the Precambrian rocks and the challenges, past and present, that face those who would extract those resources.

Our first stop was Nicolet Mineral's Visitor Center in Crandon. Steve Kircher (Nicolet Minerals) and Steve Donahue (Foth and Van Dyke) gave us their insider's point of view on the background and status of the permitting process for the Crandon Mine, an overview of the extraction and milling process for the zinc, copper, lead, silver and gold that comprises the Crandon ore deposit, and a description of proposed treatment and disposal methods for the mine tailings and waste water.

Stop #2 was at the proposed mine site. What better backdrop for Steve Donahue to lay out the proposed mine development? Steve went through a series of figures showing the ore body, proposed mine works, tailings management plans, wastewater management plans and groundwater protection plans. He described the various types of wetlands at the site, and the potential threats to each from the mine operations based on their groundwater modeling.

Mal Gross of Northern Lake Service (NLS) provided refreshments and a tour of the NLS laboratory facility at Stop #3.

Bruce Brown (WGNHS) and Jeff Lynott (ECCI) described the pillow structures in the basalt outcrops at Monico (Stop #4).

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The final stop for Day #1 was at Nicolet Mineral's core shed in Rhinelander, where 40 miles of rock core are stored. Jeff Lynott arranged in advance for some of the more interesting core to be laid out for our review.

Bruce Brown (WGNHS) provided the after dinner entertainment, an overview of the Precambrian geology of northern Wisconsin and the Upper Peninsula, complete with slides, commentary and interesting anecdotes from his 30+ years of professional experience. Tom Hooyer (WGNHS), a Pleistocene geologist, and Jeff Lynott chipped in with some additional observations.

Day #2 started with a brief stop on the mighty Wisconsin River (barely a stream) near the Wisconsin-Michigan border and a second stop at the beautiful Bond Falls where most of us stretched our legs with a short hike around the Falls.

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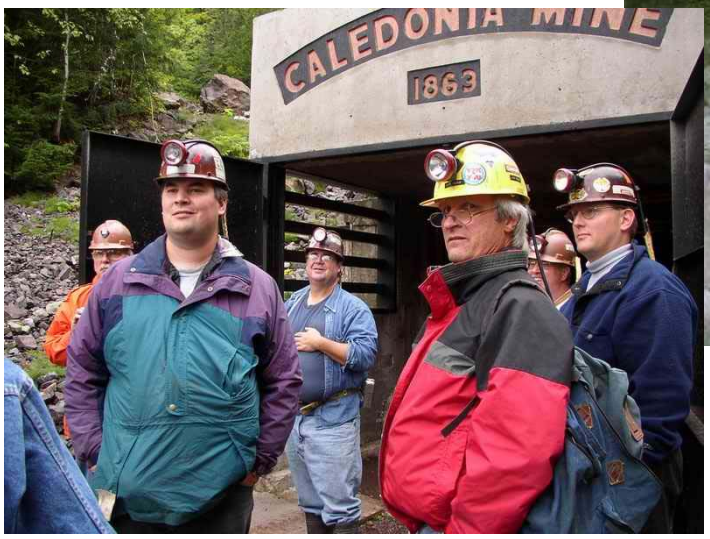
From there, we continued our journey north to the Caledonia Mine at Mass City, Michigan. The Caledonia Mine is an active, operating, underground copper mine. Its main product nowadays is collector-quality mineral specimens. The owner, Richard Whiteman, gave us a brief talk on the history of the mine and a safety lesson, after which we donned miners' lamps and hardhats to do some prospecting of our own.

Special thanks go to Boyd Possin for the many long hours he put into making this a most enjoyable and educational field trip.



Wayne's Web World

Transboundary Aquifers

Transboundary aquifers are probably not a subject many of us have had to address in our careers. Commonly, boundary issues for us usually involve the migration of organic chemicals in ground water across property lines. However, the competition for ground-water resources that cross an international boundary contributed to the armed conflict between Syria and Israel in 1967, known as the Six-Day War.

Conflicts over ground-water resources have occurred throughout the world. The Guarani Aquifer is shared by Brazil, Uruguay, Paraguay and Argentina (Figure 1). The affected countries have undertaken cooperative study of this aquifer system. The Global Environment Facility (GEF) Programme, which is part of the United Nations Development Programme, has funded several studies of the Guarani Aquifer, including isotope studies and a feasibility study of geothermal development.

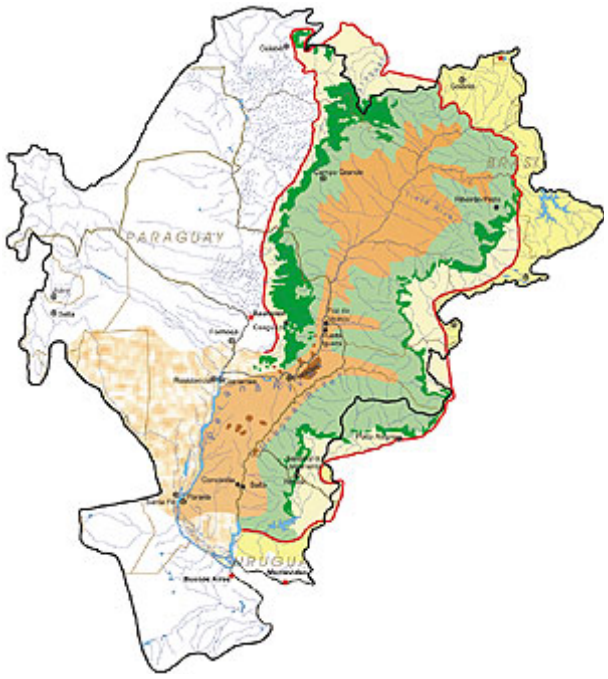


Figure 1: Isotopic tools are helping four South American countries get a handle on sustainable management of the giant Guarani aquifer. The Guarani watershed is depicted above (Source: International Atomic Energy Agency, http://www.iaea.or.at/)

The United Nations Educational, Scientific and Cultural Organization (UNESCO) website focuses special attention on aquifers with no appreciable modern recharge (sometimes known as "fossil" aquifers) but are an important water resource in arid regions. Some of these aquifers are transboundary such as the Nubian Sandstone aquifer between Chad, Egypt Libya and Sudan, or the Qa-Disi aquifer between Jordan and Saudi Arabia. These large aquifer systems transcend and are disconnected from surface-water drainage basins. As such they do not conform with the definition given in the United Nations Convention - the "common terminus" criterion that is assumed to apply to both surface and ground-water systems. Therefore it is not clear in international law what rules would apply to such aquifers. For instance, does the lack of recharge of an aquifer make any difference in the regulation of development and control of pollution of such aquifers? Are there any instances of co-operative arrangements surrounding "fossil" aquifers where depletion or pollution of the ground-water reserve is an issue?

So where can you learn more about transboundary aquifers and the issues associated with them? Well, a few of the websites that discuss transboundary aquifers in more detail include:

International Water Law Project
http://internationalwaterlaw.org/

The International Water Law website addresses international law that applies to all water resources; so much of its content is focused on surface water. However, it does contain the entire document on the management of transboundary aquifers that was developed by UNESCO and the International Association of Hydrologists (IAH) in 2001.

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International Association of Hydrologists – Transboundary Aquifer Resource Management
http://www.iah.org/News/2001/016.html

The International Association of Hydrologists (IAH) is very active in the issues surrounding transboundary aquifers. The IAH website contains a newsletter with the acronym TARM – Transboundary Aquifer Resource Management.

United Nations Educational, Scientific and Cultural Organization
http://www.unesco.org/water/

The UNESCO website devoted to news, programs and policy concerning all water resources. Many of the international agreements concern the sharing of rivers or other surface-water bodies. However, the UNESCO website does provide several documents on Internationally Shared Aquifer Resources Management (ISARM).

There is also a discussion thread on transboundary aquifers that has been running since 3 June 2002. The link to the discussion thread can be found at (http://www.worldwaterforum.org/for/en/fshow.695).

And, as special bonus, a Glossary of Hydrology is available as a link. The link to the water glossary is http://www.cig.ensmp.fr/~hubert/glu/aglo.htm.

University of New Mexico – Water Resources Research Institute
http://wrri.nmsu.edu/

Not surprisingly, this website is focused on the competition for water resources in the southwestern United States and Mexico. As such, it includes entire report on transboundary aquifers of southwestern New Mexico (http://wrri.nmsu.edu/publish/otherrpt/swnm/downl.html).

Transboundary Freshwater Dispute Database
http://www.transboundarywaters.orst.edu/

Maintained by Oregon State University, the purpose of this organization is to aid in the assessment of the process of water conflict prevention and resolution. The database is searchable by state, water-resource use, basin or date. It includes a summary of agreements and full texts of treaties.

by: ***Wayne Hutchinson***
Delta Environmental Consultants

Calendar of Events

What: Milwaukee Phytotechnologies Workshop
When: November 19-21, 2002
Where: Hyatt Regency 333 W. Kilbourn, Milwaukee WI 53203
Cost: Course fee is $250, $100 for non-profits, no cost to government regulators; room rates at Hyatt available at $89+tax
Contact: Chris Rog, Sand Creek Consultants, 715-365-1818, www.sand-creek.com)

What: WGWA Southern Area Meeting - Open Discussion
When: Monday, December 2, 2002, 7:00 to 8:30 AM
Where: Sunprint Cafe, 704 South Whitney Way, Madison
Cost: Free (you pay for your own food)
Contact: John Tweddale, BT^2, Inc., 608-224-2830, 608-224-2839 (fax), jtweddale@bt2inc.com

What: 1st Annual Wisconsin Groundwater Festival. Groundwater, surface water, energy and humans-what's the connection? The Wisconsin Groundwater Festival will be a fun-packed two-day event offering hands-on activities, presentations, and exhibit booths on May 9th and 10th, 2003 at the University of Wisconsin-Stevens Point. Friday will be a "School Day" for Wisconsin 5th and 6th grade students and their teachers from 9am-3:30pm. (Pre-registration required.) Saturday will be open to the general public from 10am-4pm.
When: May 9 and 10, 2003
Where: UW-Stevens Point
Cost: Free
Contact: Denise Kilkenny-Tittle at 715-346-2722 or gwguardian@uwsp.edu

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.