

# Minnesota Ground Water Association

www.mgwa.org

## Newsletter

March 2015  
Volume 34, Number 1

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MGWA President  
Lanya Ross

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### President's Letter

Spring is coming, and my friends and family talk in relief about winter's end. I protest, hoping for more snow. This is, after all, the source of our water. Am I alone, or do the rest of you groundwater professionals also yearn for a big snowpack to recharge the year? Maybe I'm just a sucker for the rush of a big March snowmelt; it reminds me of why I chose my profession, way back as a six-year old, watching runoff carve canyons into the sand driveway on the farm. It matches the feeling of gearing up for field work, and we are gearing up for a lot this year. Everyone I talk to is working with some combination of new people, new professional requirements, and new projects.

The MGWA Board is a micro-example of this. Our new Treasurer, Emily Berquist, and President-Elect, Ole Olmanson, are adding new energy and ideas to our organization. One project we are tackling this year is the new continuing education requirement of a minimum of two professional development hours in professional ethics to renew your license in 2016. Another project is our second white paper, which we look forward to announcing at our Spring Conference. This is a big year for our conferences.

For our Fall Conference, we have the honor of co-hosting the International Multidisciplinary Conference on Sinkholes and the Engineering

and Environmental Impacts of Karst—more commonly known as The Sinkhole Conference—which will be held in Rochester during the week of October 5–9, 2015. The conference includes technical papers presented in three days of plenary sessions, field trips, and short courses. To learn more, visit our website or that of our co-host, the National Cave and Karst Research Institute.

Coming up first, though, is our Spring Conference. I've gotten some laughs about my title: "*Pickles, Beer and Cloud Computing: The Case for Sustainable Groundwater*". A slate of fantastic speakers will showcase some great examples of Minnesota's approach to sustainable groundwater management. We have a much talked about goal in Minnesota: that sustainable groundwater use does not harm ecosystems, degrade water quality, or compromise the ability of future generations to meet their own needs. What exactly does "sustainable" mean for daily decision making in your business? How do you make the Minnesota State Fair pickle sustainably? How do you sustainably capture the flavor of Minnesota in a local beer? What are the limits that shape our answer to these questions? How do you analyze the huge quantities of information needed to answer these questions?

So here's hoping for a good snowpack, good recharge, and a year full of good work.

### Dr. Fletcher Driscoll Retires

Until recently, Dr. Fletcher Driscoll, resident near and sailor on White Bear Lake, was a Principal in the firm of Fletcher Driscoll & Associates. He received a B.A. in Geology from Carleton College, Northfield, Minnesota and a Ph.D. in Hydrogeology from the University of Minnesota in Minneapolis. He has specialized in water supply, design and construction of water and monitoring wells and the occurrence, fate and transport of contaminants in groundwater. Over a twenty year period Driscoll instructed in over five hundred continuing education programs for scientists, engineers and lawyers. He first testified as an expert regarding groundwater contamination in 1971. Since then he has been deposed more than 75 times and



given testimony at numerous trials, mediations, arbitrations and hearings. Driscoll served as principal author and editor of *Groundwater and Wells, 2nd Edition*. More than 150,000 copies of this text are in print. At the request of — continued on page 3

## MGWA MEMBER NEWS

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### Newsletter Deadlines

Issue	Due to Editor
June '15	05/01/2015
September '15	08/01/2015
December '15	11/06/2015
March '16	02/05/2016

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### Nic Borchardt Promoted at DNR

Nic Borchardt accepted a position as a drilling coordinator in the Water Monitoring and Surveys unit of the MNDNR. In his new position Nic will assist with the expansion of the DNR's out-state groundwater monitoring network. Nic previously worked as a Field Hydrogeologist with the County Geologic Atlas group in the DNR. Prior to joining the DNR he completed his undergraduate work at the University of Wisconsin Eau Claire, mud logged in Texas, and earned his Master's degree at the University of Minnesota.



Nic Borchardt in the 'field'.

### Jon Pollock Joins Xcel Energy

Jon Pollock, a former MGWA Board Member, recently joined Xcel Energy as an environmental analyst working on internal regulatory compliance issues. Jon is a Professional Geologist with over 25 years of experience including work as a regulator, contractor, and consultant. He has worked on various types of investigation and corrective action projects, as well as regulatory compliance issues and emergency response (both as an environmental consultant and firefighter). Jon has worked with Xcel in the past on various projects and is now excited to be a part of Xcel. He will be working out of the Marquette Plaza office in Minneapolis.



Jon Pollock

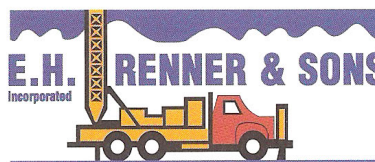


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## MGWA MEMBER NEWS, cont.

### Dr. Fletcher Driscoll retires, cont.

the President he served on the National Drinking Water Advisory Council from 1981-1983. Driscoll was elected a Fellow of the Geological Society of America in 1995, and is a Life Member of the American Geophysical Union, the American Water Works Association and the National Ground Water Association.

*When we at the MGWA newsletter learned of Dr. Driscoll's plans to retire, we asked him to reflect on his long and successful career in the groundwater profession. He was kind enough to reply, as were two of his long-time colleagues Rhea Lowell and Susan Mullin. Here is what they had to tell us.*

#### MGWA Editors

"Thank you for the invitation to comment on my retirement. I have had the good fortune to work during a time (1969-2014) when all areas of hydrogeology exploded, especially the multiple aspects of groundwater science. The term, hydrogeology, had a broader definition in the 1960s and early 70s than it has today. I was trained, for example, in all of the general fields of hydrogeology including the study of limnology, fluvial hydrology, meteoric water, and glaciers, as well as groundwater. The academic and research experiences I received at the University and my previous 10-year experience in a water-related business proved to be enormously helpful in my later teaching, business, consulting and expert witness work. I cannot over-emphasize the value of my comprehensive training in all aspects of hydrogeology because solving so many groundwater challenges hinged on knowledge of how water exists and moves in other environments on or above the earth's surface.

Although I was fortunate to be professionally active at a time when groundwater supply, treatment and contamination were major issues, the future employment opportunities look just as bright to me in these areas, both here in the United States and throughout the world. What has changed during my professional lifetime is the huge expansion of employment opportunities for groundwater scientists in business, academia, engineering and in government at the federal, state, county and city levels. Similarly, business and engineering opportunities have also greatly expanded. Even in the area of groundwater contamination, remedial work will continue for decades at many sites. Furthermore, ever more stringent limits on contaminant concentrations will provide many new challenges for development of enhanced groundwater treatment and remediation technologies. Thus, all aspects of groundwater-related science and en-

gineering will continue to create employment opportunities, but the demands on scientists to perform their work more effectively will also increase.

Based on extensive expert witness work it is apparent that many (if not most) groundwater contaminant investigations lacked focus in terms of meeting client remedial, regulatory and legal needs. This opinion is based on review of thousands of documents related to the various cases. Blame for the lack of appropriate strategic plans can be shared by the consultants, government, and the clients themselves. Many of the consultant errors occurred years ago because of an unfamiliarity with the behavior of contaminants in the groundwater environment. Also, water supply litigation has occurred because of mistakes in interpreting how the aquifer would react under pumping conditions. Many of the consultant shortcomings have occurred at the office level because of the way the scientists prepared the scope of their investigations and the interpretation of the data. It is evident that we as groundwater scientists must work together more effectively on behalf of our clients.

Here are some suggestions for improving the quality of our professional work:

- ◆ Develop working relationships with people who have greater skills and experience than you have, either in your own office or elsewhere. Make one or more of them part of every project team by giving them enough billable hours to (at least) help develop project strategies, verify the accuracy of the conclusions reached based on data and review rigorously the project reports. Learn to take criticism with grace and thanks.
- ◆ Either before or during your scientific work develop skills to solve the problems or needs you identify in your investigations. In other words learn to design and build groundwater remedial systems, design and test water and monitoring wells, and design treatment systems for water supply work. Developing skills in engineering will make you so much more valuable to your client, even if you or your own firm will not do the engineering work. Other areas that will become increasingly important will be toxicology, biological science, and civil engineering (roads, bridges, building foundations). Although it would be ideal to double major, it is not necessary to obtain a degree in engineering or other fields, but only to learn how to perform certain tasks related to your investigation results.

— continued on page 5

## 2015 MGWA Board

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## The primary objectives of the MGWA are:

- ◆ Promote and encourage scientific and public policy aspects of groundwater as an information provider;
- ◆ Protect public health and safety through continuing education for groundwater professionals;
- ◆ Establish a common forum for scientists, engineers, planners, educators, attorneys, and other persons concerned with groundwater;
- ◆ Educate the general public regarding groundwater resources; and
- ◆ Disseminate information on groundwater.

## MGWA's Corporate Members

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## Abbreviations and Acronyms

- ◆ ASTM – American Society for Testing and Materials
- ◆ DNR – Minnesota Department of Natural Resources
- ◆ MDA – Minnesota Department of Agriculture
- ◆ MDH – Minnesota Department of Health
- ◆ MGS – Minnesota Geological Survey
- ◆ MPCA – Minnesota Pollution Control Agency
- ◆ USEPA or EPA – United States Environmental Protection Agency
- ◆ USGS – United States Geological Survey

## MGWA MEMBER NEWS

### Greg Brick joins DNR



Greg Brick, Ph.D., was hired in December 2014 as a Research Analysis Specialist at the DNR, Ecological and Water Resources Division, for the LCCMR-funded State-wide Spring Inventory.

He became interested in springs while mapping the springs of the Twin Cities as an undergraduate, for which he received the Minneapolis Park Board's "Volunteer of the Year" Award in 1993. In the March 1997 MGWA Newsletter, he published his study of Twin Cities springs. A long-time member of the MGWA, he contributed the "Groundwater History" column over several years.

Greg was employed as a Hydrogeologist at several environmental consulting firms and taught Geology at several local colleges, most recently, Metro State University.

*Greg Brick "interviewing" the spring in Lanesboro Park with a YSI meter.*

### BJ Bonin Joins DNR

William "BJ" Bonin is a new hire in the DNR's Groundwater Technical Unit. After 10 years in consulting and another 9 years in utility construction and design, BJ will be working on well and borehole construction and aquifer testing projects in the Twin Cities Metro area.

BJ grew up in the northern part of Twin Cities Metro area and received his Bachelor's degree



in Geology and Space Studies (1994) from Bemidji State University in Bemidji, MN. He attended graduate school in economic geology at Oregon State University and petrology at the University of Tennessee before completing a Master's degree in Infrastructure Systems Engineering from the University of Minnesota in 2005.

BJ has worked as a drafter and surveyor for multiple municipalities and as a consultant doing well design, engineering geology, and mineral exploration. He is also a songwriter and musician with his current band Demolition Means Progress.

### White Paper Initiative –

**First White Paper – update** – work continues on the preparation of the white paper on Manganese in Minnesota Groundwaters by our volunteer members on the Work Group. The report is expected to be finished and available to MGWA members and the general public this summer.

**Second White Paper – NEW TOPIC!** The White Paper Committee has selected our next topic from the suggested topics submitted by our MGWA members. The title is:

#### *Minnesota's Groundwater Education Gap:*

#### *Preparing Students to Effectively Manage our Groundwater Resources in the Future*

and it is intended to evaluate the gaps in Minnesota's K-12 and post-secondary curricula to meet the long-term needs of students to: 1) be informed citizens when making groundwater management decisions and/or: 2) have the skills necessary to be competitive when applying for entry-level positions as groundwater professionals. The scoping document describing this topic more fully is available on the MGWA website at [www.mgwa.org/whitepapers.php](http://www.mgwa.org/whitepapers.php). We invite you to **VOLUNTEER FOR THE EDUCATION GAP WORK GROUP** by filling out the participation form at [www.mgwa.org/whitepapers\\_participation.php](http://www.mgwa.org/whitepapers_participation.php) and submit it to [office@mgwa.org](mailto:office@mgwa.org) by May 31st. If you have any questions, please contact Bruce Olsen ([sawdust2013@gmail.com](mailto:sawdust2013@gmail.com)).

Thank you for participating and helping the MGWA address our groundwater issues!

—White Paper Committee (Kelton Barr, Mark Collins, Bruce Olsen, Jeff Stoner)

MGWA Newsletter March 2015

### Dr. Fletcher Driscoll retires, cont.

- ◆ Develop a special skill that few other scientists can match such as knowing how to drill wells from practical experience, testing in a chemical lab, working on a geo-technical rig testing soils or understanding in depth the regulatory or legal requirements affecting your client at complicated sites.
- ◆ Seek out opportunities to speak at groundwater meetings on a topic where you have special expertise or write peer-reviewed papers for groundwater journals.
- ◆ Continue to upgrade your skills and experience so you can take on challenges other colleagues cannot.

Developing ways to enhance the quality of your work by working with talented professional and learning additional skills not directly associated with your primary academic training will increase your value to clients. Acquiring these skills will give you an ‘edge’ in selling yourself and creating employment security in your career. You will become your own profit center.”

*Fletcher Driscoll, February 24, 2015*

“When Fletcher “retired” in 1999, we formed a small company to finish off a few projects. We did not expect the business to grow as it did! I am very thankful for the opportunity I had to work with Fletcher for 15 years past his original retirement. It made a tremendous difference in my life: allowing me to work on professionally challenging and interesting projects and spend more time with my children. Fletcher was masterful at bringing out the best in each member of our company, while also encouraging our outside interests. We worked very hard when it was necessary and took time off when the work was slim, following the natural ebb and flow of the consulting business. Here are just a few of the things I have learned from Fletcher:

- ◆ Care about your clients, including the pressures they face in their work **and** in their life. Help them succeed.
- ◆ Care about your co-workers. Ask for extraordinary effort from the entire team, and be generous with your thanks and praise. Celebrate your successes.
- ◆ Do good work. Don’t just present the data. Tell a story that people actually will read and include the best graphics you can manage.
- ◆ Never say no. Look for the exciting possibilities in every new opportunity.

Fletcher is a consummate salesman and successfully grew our company because he cared about our clients and he believed in our ability to help them succeed. Many of us who are scientists have a lot to learn from Fletcher about the “people” side of our business.”

*Susan Mullin, February 23, 2015*

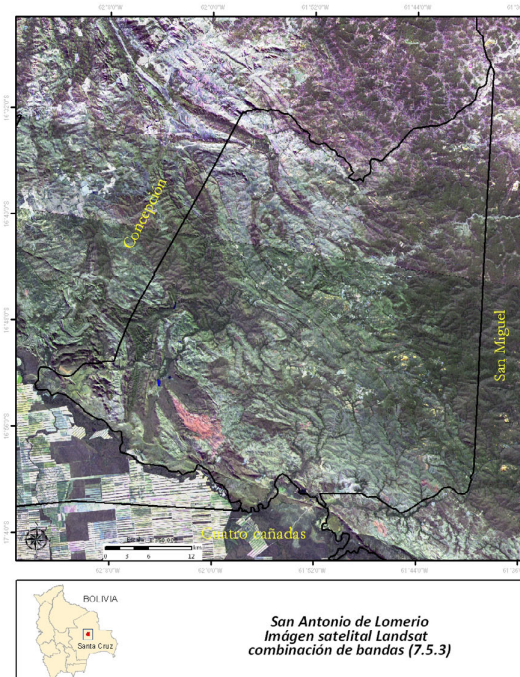
“I have had the privilege of working with Fletcher for more than 20 years. I could not have asked for a better mentor, teacher, role model and friend. His sincere interest in expanding and promoting the skills of each team member to improve the product for the client is unparalleled and always resulted in a win for all involved.”

*Rhea Lowell, February 14, 2015*

### Back to Bolivia, 2014

*by Jeff Green*

Last April I had the opportunity to return to Bolivia to do more water development work with Latcom (Latcom.org), a small U.S. mission agency. As on previous trips, I flew from Minneapolis to Santa Cruz, Bolivia by way of Miami and La Paz, Bolivia. On my previous trips, I went from Santa Cruz west into the foothills of the Andes Mountains.



*Photo 1. Lomerio, location and satellite image*

The focus of this trip, however, was an area called the Lomerio (Photo 1). Located north of Santa Cruz, it is a very interesting area with a lot of water issues. The Lomerio is the home of the Chiquitano indigenous people and is an area of tropical dry forest on low mountains (Photo 2). It rains heavily about half of the



*Photo 2. Lomerio, tropical dry forest on low mountains*

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### Bolivian water supply, cont.

year. There is a dry season of 3-4 months where rainfall is light and sporadic. The bedrock is igneous and metamorphic rock of the Brazilian Shield. It is analogous to the Canadian Shield in northern Minnesota. The hard crystalline rock only yields water in fractured areas; those areas are intermittent and not evident on the surface. Unlike northern Minnesota, the area was not glaciated during the Pleistocene, so there is very little depth of unconsolidated material over the bedrock. When you combine very limited bedrock groundwater resources with minimal unconsolidated material cover and an extended dry season, it is easy to see why water is a big issue in the Lomerio. We were in the Lomerio at the request of a group called REDES, an organization of evangelical churches in a number of the Lomerio communities. One of the things they want to do is help their communities get clean water.

Both prior to heading out to the Lomerio and after we returned from the Lomerio to Santa Cruz, we spent time meeting with various people from agencies and NGOs who work on water issues in the area. PROASU was of particular interest. They are a well-drilling group that is part of the state of Santa Cruz government. After a previous meeting when I was in Bolivia in 2012 they asked me to come back and help them to try to better understand the hydrology of the landscape in the Lomerio. They have drilled a number of wells in the area but quite a few of them ended up being dry holes. They do keep records of their wells and they took the time to photocopy all of their records for the Lomerio. We are still working on compiling those data and getting them into an electronic format.

Our base in the Lomerio was the small village of Puquio. I had been there briefly in 2012 and had seen their water supply. They use a small spring that flows during the wet season and have a well drilled by PROASU. The spring water runs on the surface and is laden with bacteria. The well water has fluoride levels that are double the drinking water standards. Our team drank bottled water. The spring water at Puquio was an odd, milky white color (Photo 3). The water chemistry of the spring and the bedrock well are very different. Calvin Alexander, emeritus University of Minnesota Earth Science Professor, commented that he had never seen water with chemistry like that spring.

We traveled to several other communities around Puquio to begin the investigation of the area's water supplies. A couple of them also had springs; their water was that same milky white. In talking with the local people, that is how spring water looks in

the Lomerio. We saw a number of wells in the area, some were productive and some were not. The productive wells are equipped



Photo 3. Spring water at Puquio



Photo 4. Well with hand pump

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#### Tom Wardell

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**Bolivian water supply, cont.**

with hand pumps (Photo 4) and, based on local information and the PROASU records, supply 10-30 gallons per minute. There simply is not a lot of water in the crystalline bedrock.

We also looked at several other options for water supply. One was “atajados”, or dams which impound surface runoff during the wet season and store it for use during the dry season. Several towns are planning on using those for water supply, because they have so much difficulty finding adequate groundwater supplies. On an individual level, several groups have been installing rainwater catchment tanks in the Lomerio on various buildings. Those can work well, but there needs to be a provision made for directing the first rainfall to waste. The first water collected has a high load of debris and detritus from the roof that you really want to keep out of your water supply.

We did come up with some plans for improving the water supply at Puquio. They include fencing off the area we believe is one of the sources of recharge water for the spring. The cows and pigs that use it for a drinking water source can be directed to another *atajado* nearby. We also are working on putting in a shallow, large diameter well to capture the spring water below the surface, which should be cleaner than the surface source. Our hope is that PROASU will be able to do the well installation. The simplest solution to the high fluoride levels in the bedrock well is to blend that water with the spring water from the shallow well we hope to install.

Going forward, I plan to return to Bolivia, though it will not be this year. We are working on getting the PROASU well data into a spreadsheet which we can then use to make a shapefile. From that, we can make a .kmz file which can be loaded into Google Earth or Bing maps. Both of those have high-quality aerial imagery which seems to show some amount of geologic structure in the area. By overlaying the well locations and yield information we may be able to learn more about the patterns of water-yielding areas. Wheaton College Geology Department staff are also assisting with this GIS work and they might send a student down to do geophysical explorations as well.

Lastly, I made a contact with a Bolivian hydrogeologist while I was there. Directed by a Bolivian acquaintance to a government office that deals with groundwater, we met Monica Ximena, who works for the state of Santa Cruz. When I asked her if she was a hydrogeologist, she replied “yes I am”. When I said “I am, too” her response was “really?”! It turns out that there are very few hydrogeologists there (and this is a city of 2 million people). We have been e-mailing regularly as she frequently seeks input on things she is dealing with. She also has offered to assist us in our work in the Lomerio.

If you are interested in learning more about this work, please do not hesitate to contact me at [jgreen8083@gmail.com](mailto:jgreen8083@gmail.com). I am particularly interested to hear from anyone who has experience with groundwater occurrence in the Canadian Shield or Brazilian Shield. If you want to see what the area looks like, you can go to Google Earth or Bing Maps and search for San Antonio de Lomerio, Santa Cruz, Bolivia. That will give you a view of this area: a place that is calling me back.

**Quinquennial MGWA Member Survey**

In 2010 the MGWA leadership initiated a survey of the membership, reporting the findings in several articles in 2011. The findings were quite enlightening, defining for the first time several demographics of our membership. Thinking that a similar survey should be done every five years (*i.e.*, quinquennially), we are initiating another Member Survey this year.

All of our members will be receiving an email invitation in April with a link to an electronic survey. We urge you all to take the ten minutes or so to fill it out. Rest assured, it will be completely anonymous. Our last survey was taken by over half of our members, making it statistically relevant. The results will again be summarized in subsequent articles in the MGWA Newsletter.

PLEASE FILL OUT THE SURVEY WHEN YOU RECEIVE IT – THANK YOU!



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### The Minnesota Geological Survey has Moved

by Harvey Thorleifson, MGS Director

Things are changing at Minnesota Geological Survey (MGS). Most important, several new members of staff have joined in recent months, including Quaternary, Paleozoic, and Precambrian geologists.



### County Geologic Atlases Initiated for St. Louis and Lake Counties

by Dale Setterholm, MGS Associate Director, and Mark Jirsa, MGS Project Manager

The County Geologic Atlas Program, a cooperative effort of the Minnesota Geological Survey and the DNR Division of Ecological and Water Resources, has initiated projects in St. Louis and Lake Counties. The comprehensive geologic and hydrologic mapping and associated databases of atlases are intended to support management of water and mineral resources.

Fortunately, geologic maps for many parts of these counties have been published (figure on page 9). Detailed bedrock geologic maps (quadrangle scale) have been published for the area along the Lake Superior shoreline from Duluth to Grand Marais, and surficial geologic maps were created for a few of these quadrangles at the Duluth end of the shore. Reconnaissance-scale (1:100,000 and 1:200,000) bedrock geologic maps exist for all of Lake County and the northern half of St. Louis County. The glacial materials of the Arrowhead Region are largely unmapped, with the exception of work completed by MGS on the Mesabi Range and the North Shore, and other maps created mostly by graduate students.

These counties have geologic and cultural characteristics that present challenges to our typical atlas methods and this will affect the format and resolution of the products. Most of the bedrock of this region is composed of igneous and metamorphic rocks which host and convey water only through fractures in the rock. Those fractures are difficult to map and their hydrologic performance is probably best determined by pumping tests and other investigations beyond the scope of an atlas. On a gross scale the topography of the bedrock surface is likely a strong influence on groundwater flow, and we will map this as accurately as the data allow.

The MGS team, now more than 40 people, is more focused than ever on groundwater-related information products that are supported by strategic research. In particular, of course, I am referring to the County Geologic Atlas program, carried out in close coordination with partners, that is now the core of the MGS role.

In addition to the ongoing contributions of more experienced staff, the role of new staff, development of new partnerships, increased focus on groundwater, and greatly accelerated production of County Atlases, the big thing on the MGS radar recently has been a move – one block north – to a whole new building.

Since the 1980s, MGS had been occupying a University building at 2642 University Avenue West. It gradually became partially vacant, in need of repair, and in demand for train-station-related development. So, MGS moved, with most of the moving taking place just before and just after the MLK weekend in January.

The Survey can now be found at 2609 West Territorial Road, St Paul MN 55114. While Berry runs north from the old Survey building, beside KSTP, MGS is slightly east of Berry, on the north side of Territorial, at the intersection with Westgate. The Survey is at the corner, in a red-trimmed building. Topographic map and MGS publication sales continue to be available. Ample free parking is available at the front door. Please visit! A full staff directory with telephone and email information is available from our web site [www.mnngs.umn.edu](http://www.mnngs.umn.edu).

The glacial materials vary greatly in thickness and character and the resolution at which we can map them in three dimensions will be strongly affected by data distribution. To address these challenges, we recently completed a 1-year pilot study of small areas within the two counties to identify which mapping techniques are appropriate and what effort is required.

These are very large counties with relatively low population density, a limited road network, and areas where motorized activities are not allowed. Relatively fewer well construction records are available, and they are very unevenly distributed. Similarly, exploration drilling records are very dense, but only in limited areas. A geologic investigation typically compensates for sparse data by increasing drilling and geophysical surveys. The limited access will make these investigations more difficult. The rocky nature of the glacial deposits also limits the utility of our Giddings soil probe. We will compensate with excavations, and a larger Rotasonic drilling program. We expect that the uneven distribution of data will result in uneven resolution of our mapping. As a result, we may produce detailed inset maps for areas of greater data density.

Our work will progress in a sequence of subproject areas, with new areas starting before the prior area is completed. We intend to release digital products immediately following completion of each subproject area. This will allow users to get data as quickly as possible. Work is underway for the first subproject area, referred to here as the Central Arrowhead area. When all subprojects are complete we will compile comprehensive atlases for each county.

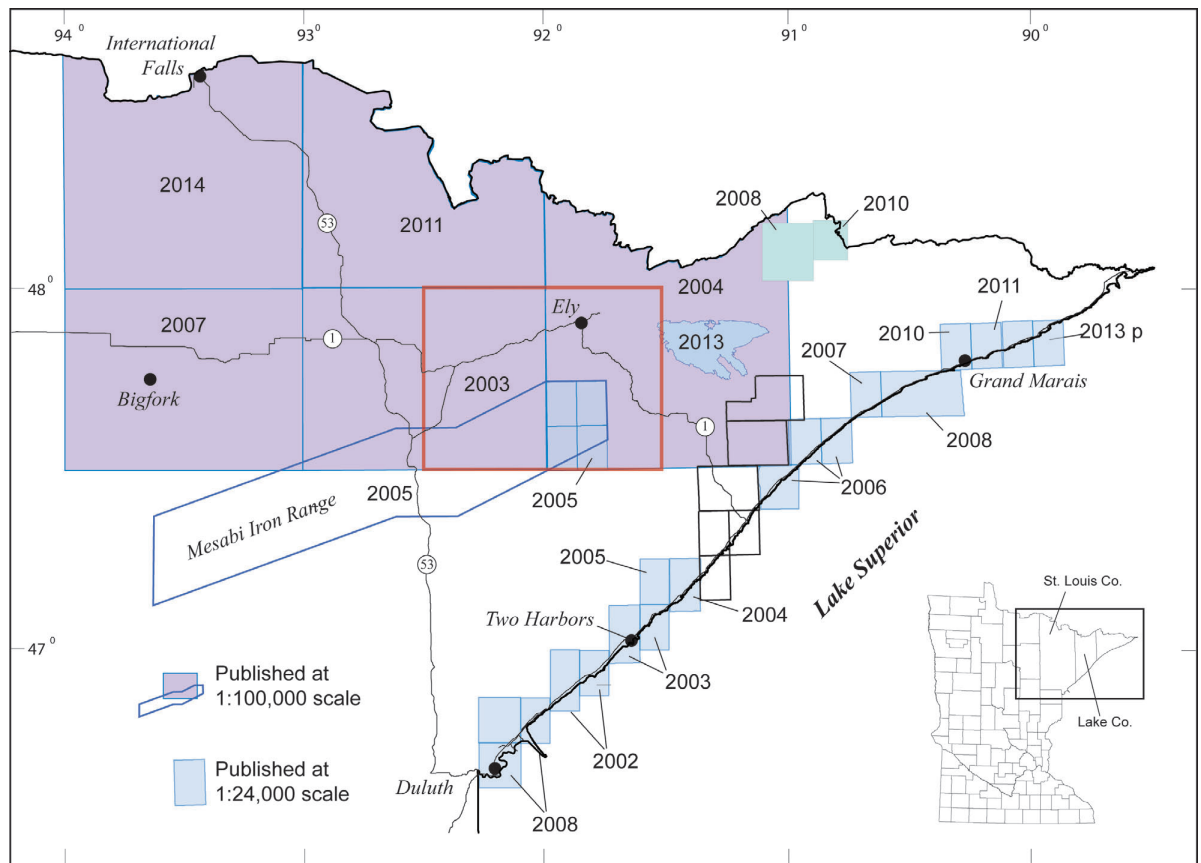
— continued on page 9



## AGENCY NEWS, cont.

### County Geologic Atlases Initiated for St. Louis and Lake Counties, cont.

Figure — Recently published geologic maps of the Arrowhead area. Most portray bedrock geology; the exceptions are maps of the Mesabi Iron Range and several quadrangles near Duluth that include both bedrock and Quaternary geology. Red outline is the Central Arrowhead subproject area where the first stage of county atlas mapping is currently underway. (from Plate 6, Figure 5).





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## Hydrogeochemical Study of Groundwater Controls on Sulfate and Wild Rice

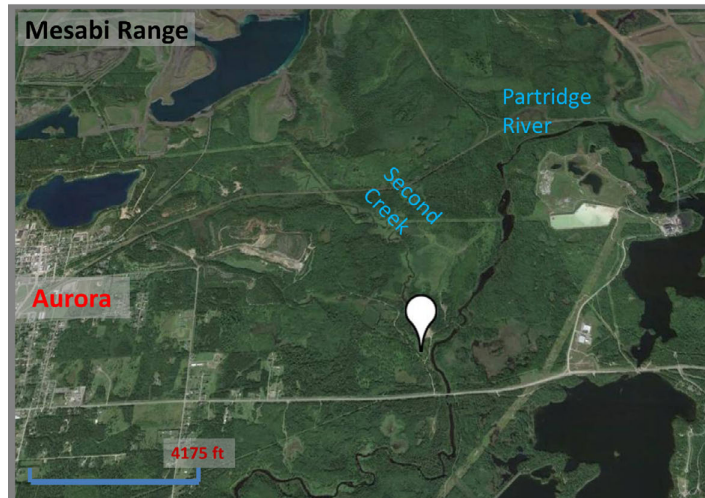
by Crystal Ng, Assistant Professor of Hydrogeology, Department of Earth Sciences, University of Minnesota – Twin Cities

Minnesota has a unique 10 mg/L sulfate regulation aimed at protecting wild rice lakes and streams. This standard has been the center of much attention in recent years, which has prompted a study by the Minnesota Pollution Control Agency (MPCA) to clarify a connection between sulfate and wild rice. Their report presented lab and field data supporting a wild rice vulnerability when elevated levels of sulfate converts to sulfide in the porewater of lake and stream beds [MPCA, 2014]. The study further found this effect to attenuate where high iron concentrations precipitate out sulfide onto sediments. The relationship among sulfate, sulfide, and iron were statistically found with an extensive survey of 119 sites in surface water bodies throughout the state. However, questions remain about the hydrological and geochemical processes that control actual levels of iron and sulfide observed. For example, it is unclear why many high sulfate concentration stream sites in the study did not exhibit low iron levels and sparse wild rice growth.

The MPCA study primarily examined surface water and shallow porewater chemistry – an obvious focus for a surface water quality regulation affecting an aquatic plant. Our new hydrogeology research group at the University of Minnesota is beginning an investigation into the role of hydrological fluxes in driving sulfate impacts on wild rice waters. Recognizing the inseparability of groundwater and surface water, we are testing one particular hypothesis that some sites may have groundwater boundary conditions that are just as important as (or more so than) surface water contributions to stream bed porewater and wild rice growth.

We are conducting an in-depth look at Second Creek in St. Louis County (Figure), one of the sulfate-impacted streams observed to support plentiful wild rice in the MPCA's study. This summer, masters student Amanda Yourd will be collecting physical and chemical groundwater measurements, both deeper within the stream bed and laterally adjacent to the stream, to augment existing surface and shallow porewater chemistry observations. With a process-oriented goal to our study, she will integrate the different data using a hydrogeochemical model that represents water fluxes and geochemical reactions. Because of complicated groundwater-surface water interactions, the porewater chemistry at the Second Creek site is likely affected by hyporheic flow paths below the stream, variable fluxes through the adjacent wetlands, and managed surface water releases upstream by industry. Probing these complex dynamics will require multiple measurement techniques and the aid of a computer model. We anticipate that our results will not only help address questions about the wild rice and the sulfate standard in Minnesota, but it will also provide insights into hydrogeological intricacies that impact water quality and ecology.

MPCA (2014), Analysis of the wild rice standard study: Draft for scientific peer review. Minnesota Pollution Control Agency. June 9, 2014. wq-s6-42z available at: [www.pca.state.mn.us/index.php/water/water-permits-and-rules/water-rulemaking/sulfate-standard-and-wild-rice/scientific-peer-review.html](http://www.pca.state.mn.us/index.php/water/water-permits-and-rules/water-rulemaking/sulfate-standard-and-wild-rice/scientific-peer-review.html)



(Figure) Location of the University of Minnesota Hydrogeochemical Study Investigating the Tie Between Sulfate and Wild Rice.

## The Minnesota Department of Agriculture's Township Testing Program – 2013 Initial Results Summary

By Kim Kaiser, Minnesota Department of Agriculture

### Introduction

The Minnesota Department of Agriculture (MDA) recently updated the Nitrogen Fertilizer Management Plan (NFMP). The NFMP is the state's blueprint for prevention or minimization of the impacts of nitrogen fertilizer on groundwater. One of the goals of the NFMP is to minimize or mitigate the source of pollution from nitrogen fertilizer. Updating the NFMP provides an opportunity to restructure the State's strategies for reducing nitrate contamination of water resources, with more specific, localized accountability for nitrate contamination associated with row crop agricultural production.

To effectively manage nitrate contamination of water resources, it is appropriate to focus on areas of greatest risk. Nitrate testing of private wells is one of the most direct methods for identifying areas and wells at greatest risk. For this, the MDA has developed the Township Testing Program (TTP). In the TTP, the MDA works with local partners such as counties and Soil and Water Conservation Districts (SWCDs) to coordinate private well nitrate testing in vulnerable townships using Clean Water Funds.

Twenty-two townships from four counties participated in the first pilot projects for the township testing program in 2013. Benton, Dakota, Morrison, and Wadena Counties were chosen for pilot projects based on past nitrate results, vulnerable geology, row crop production and local partnerships.

### Background

Nitrate is a naturally occurring, water soluble molecule that is made up of nitrogen and oxygen. Although nitrate occurs naturally, it can also originate from man-made sources such as

— continued on page 11

## MDA Township Testing Program, cont.

fertilizer, animal manure and human waste. Nitrate is a concern because it can have a negative effect on human health at elevated levels. The U.S. Environmental Protection Agency (USEPA) has established a drinking water Maximum Contaminant Level (MCL) of 10 mg/L for nitrate as nitrogen (U.S. EPA, 2009) in municipal water systems. The Minnesota Department of Health (MDH) has also established a Health Risk Limit (HRL) of 10 mg/L for private drinking water wells in Minnesota.

In 1993, the MDA began to offer free walk-in style nitrate clinics where homeowners could have water from their private wells tested. Since then, the MDA and local partners have tested over 60,000 wells and provided educational materials to thousands of Minnesota families. This information is extremely useful for the homeowner and provides some basic knowledge of where nitrate hotspots found; but lacked the scientific rigor to use the results for uses beyond educational outreach. The MDA continues to help local partners with nitrate testing clinics by providing nitrate testing equipment and supplies for use at county offices or events.

The MDA has also been working closely with other agencies on developing regional private well nitrate networks. Homeowners collect their own water sample and send it by mail to be tested by a laboratory or a county representative using MDA equipment at no cost to the homeowner. Homeowner volunteers are the cornerstone of the private well networks. This method has been developed from years of collaboration with other state and local agencies through pilot projects testing different methods of collection and sample delivery.

Building on the success of the past nitrate monitoring work, the MDA piloted a Township Testing Program to determine current nitrate concentrations in private wells on a township scale at a high density. Clean Water funds are used by counties and Soil and Water Conservation Districts (SWCDs) with MDA guidance to gather additional data on nitrate contamination from private wells. Sampling multiple wells in a township allows high nitrate areas to be identified and targeted practices implemented in these regions.

The MDA has identified townships throughout the state that are vulnerable to groundwater contamination and have significant row crop production. Private well sampling is focused in these vulnerable areas.

## Goal and Objectives

The immediate goal of the pilot projects was to develop a methodology to characterize current nitrate conditions in groundwater from private wells on a township scale. This was accomplished through unique partnerships between the MDA, the Wadena Soil and Water Conservation District (SWCD), Morrison SWCD, Benton SWCD and Dakota County.

### Objectives:

1. Determine current nitrate concentrations in private wells in targeted townships.
2. Educate the well owners on the nitrate concentrations in their wells.
3. Assist counties in fulfilling their county water plans with regard to nitrate; and
4. Develop a methodology to support decision making under the Nitrogen Fertilizer Management Plan.

## Methods

In order to effectively target response strategies, it is necessary to identify areas of concern. Areas of concern tend to be fairly localized and need to have some definable boundaries, for purposes of the township testing and the NFMP, townships were selected. Factors such as aquifer vulnerability, row crop production and previous high nitrate results were used to prioritize townships for testing in 2013. MDA selected townships with the following criteria: at least 30 percent of the area characterized with vulnerable groundwater and at least 20 percent of the area in row crop production (Figure 1). The map in figure 1 served as a starting point for planning sample locations and was modified based on local expertise from the County or Soil and Water Conservation Districts.

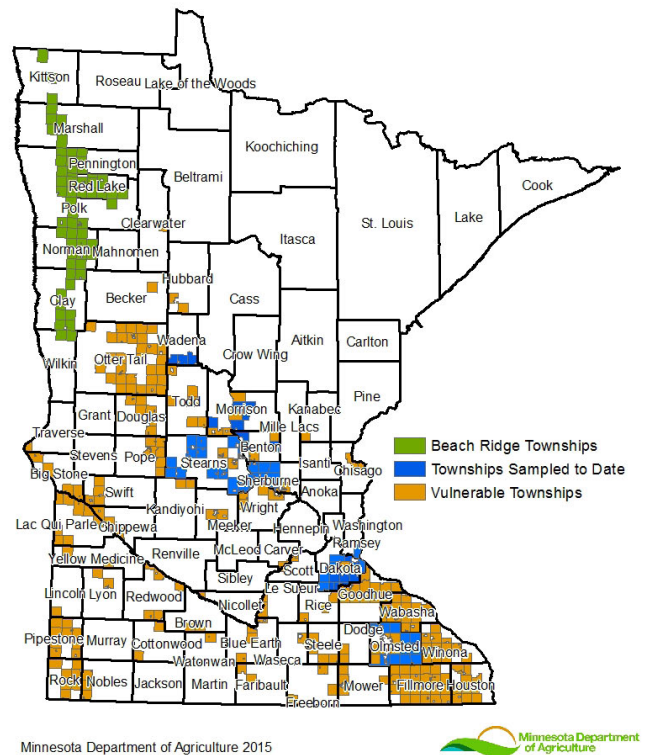


Figure 1. Vulnerable townships and townships sampled to date.

Of special consideration is the Beach Ridge Townships in the Red River Valley which pose some striking differences than other areas of the state. Unlike the Central Sands region where the sands are used for row crop production, the Beach Ridge sand is not heavily used because of the higher amounts of gravel in the deposit. So, in a township that has 20 percent row crops, they are likely being grown in the opposite part of the township than where the groundwater is vulnerable. There is also little evidence of elevated nitrate based on nitrate testing done when new wells are constructed. In these townships MDA will conduct additional work to evaluate the cropping history and the potential risk to groundwater from the use of nitrogen fertilizer.

Using Clean Water Funds, MDA was able to provide the counties with funding to offer nitrate testing to all households in the selected townships. This work is accomplished by working with

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## MDA Township Testing Program, cont.

either a county environmental program or Soil and Water District. Once agreements are in place outreach and testing can be finished very quickly, usually within six months. Overall project coordination is done by the county including public outreach and working with a state certified lab to run the nitrate analysis on homeowner collected samples. The county also contacts local government units such as township board members to inform them of the township testing program.

Developing the well owner list was a major task for these projects and was done by the counties using a combination of parcel data, building values, and septic records or well records as indicators of whether a well was on the property. Once the homeowner list was compiled by the counties, a certified lab sent the well owners a water sample kit, including a voluntary survey about their well, sample bottle, sample instructions, a participation letter and a pre-paid mailer at no cost to the homeowner. The well owner collected the water sample, completed the survey and returned the water sample to the lab. Results from individual wells are sent directly to the well owner (homeowner), along with a letter explaining the results.

Initial statistical summaries are performed on results from all well types with the exception of hand-dug wells, which are excluded. This initial summary may not represent ambient groundwater conditions because of potential point sources such as septic systems. However this unscrubbed information does represent what people are using for domestic purposes. Homeowners with nitrate detections in their water sample will also be offered a pesticide sample. In townships with greater than 10 percent of the wells over the HRL, homeowners with high nitrate results (greater than or equal to 5 mg/L) will be offered a follow-up sample by trained staff. During the follow-up sampling the well information, land use and potential nitrate source information will be verified. Homeowners with nitrate detections in their water sample will also be offered a pesticide sample.

## Results

In 2013, approximately 1,964 wells were tested in the 22 townships. On average, 30 percent of homeowners in these townships responded to the nitrate test kit. The results of the township nitrate sampling are displayed in Figure 2 as the percentage of wells over the HRL of 10 mg/L nitrate-N. The summary statistics for 1901 wells are presented in Table 1, which includes all of the well types except those of known hand dug construction. Sample results with ambiguous address locations were also left out of the summary statistics table.

Results from these pilot townships indicate that overall 384 wells (20 percent) were over the HRL of 10 mg/L nitrate-N. In 18 townships, 10 percent or more of the wells had nitrate greater than 10 mg/L. Marshan Township in Dakota County had one of the highest percentages of wells over the HRL (52 percent) with a median value of 10.7 mg/L. Agram Township in Morrison County also had a severely elevated percentage of wells over the HRL (52 percent) with a median value of 10.2 mg/L. However, Agram Township has a significantly higher rate of wells over the HRL than the other Central Sands townships.

These pilot township results contrast findings from the Central Sands network (MDA 2012) and a 2010 USGS report on nitrate concentrations in private wells in glacial aquifer systems in which less than five percent of sampled private wells had nitrate concentrations greater than 10 mg/L (Warner and Arnold, 2010).

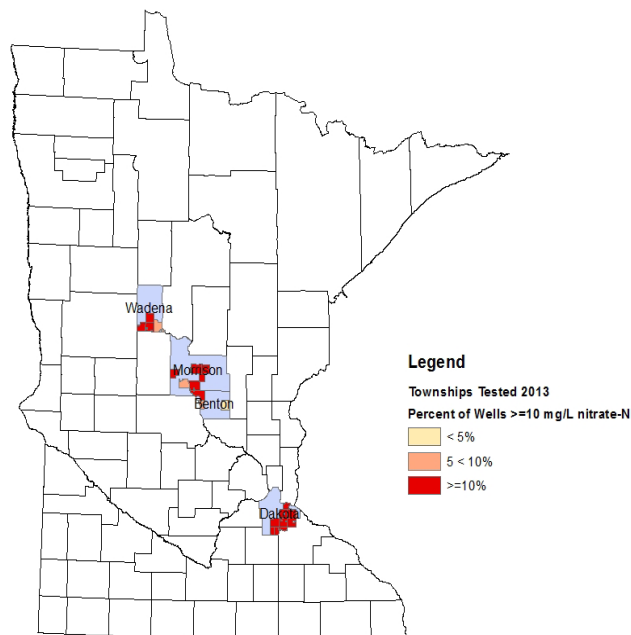


Figure 2. 2013 Summary of wells over the HRL for nitrate-N.

The differences in the study findings are likely due to differences in sampling design and density. The township testing program is specifically looking in areas where there is likely to be elevated nitrate, while the other two studies (Warner and Arnold, 2010 and MDA 2012) are designed to look at larger regional concentrations and trends. Both studies indicate that nitrate concentrations can vary considerably over short distances.

## Survey Results

The well owner survey, sent out with the sampling kit, provided additional information about private wells that were sampled. The survey included questions about the well construction, depth and age, and nearby land use. The survey information provided by well owners will be summarized in the initial individual county reports. As summary reports become available they will be posted at the following website:

[www.mda.state.mn.us/protecting/cleanwaterfund/gwdwprotection/townshiptesting.aspx](http://www.mda.state.mn.us/protecting/cleanwaterfund/gwdwprotection/townshiptesting.aspx)

## Summary

Results for these 22 townships indicate that 384 wells (20 percent) were greater than or equal to the HRL of 10 mg/L. Based on these pilot townships, using the ratios of aquifer (groundwater) vulnerability and row crop production as indicators for elevated nitrate in private wells may be a useful tool in prioritizing nitrate sampling in the future.

Future work includes the following: 1) using trained staff to resample wells over 5 mg/L, with homeowner consent; 2) performing well site visits, when possible, to rule out obvious well construction issues and point sources of nitrate, such as septic systems, livestock, etc.; 3) developing additional tools or methods in order to rule out these obvious point sources; and 4) increasing efforts to obtain well log information for participating wells so

— continued on page 13

## MDA Township Testing Program, cont.

that nitrate results, the aquifer designation and well construction can be compared in a more comprehensive fashion. Homeowners with nitrate detections in their water sample will also be offered a pesticide sample at no cost to the homeowner.

Each county participating in the township testing will have a summary report with more details and will be posted on-line as they become available. An additional 36 townships were sampled in 2014 and those results will be available in 2015. MDA plans to offer nitrate tests to approximately 56,000 well owners between 2015 and 2021 using Clean Water Funds.

Results from the township testing will help guide the type of response necessary to address nitrate in groundwater through the Nitrogen Fertilizer Management Plan.

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Table 1. 2013 township testing summary statistics.

County	Township	Number of Wells <sup>1</sup>	Values					Nitrate-N Range		
			Min	Max	Mean	Median	90th Percentile	<3 mg/L	3<10 mg/L	≥10 mg/L
			Nitrate as Nitrogen mg/L or parts per million (ppm)					Percent		
Benton	Langola	101	<DL2	37.5	4.4	0.1	17.6	65%	20%	16%
Benton	Maywood	66	<DL2	10.7	0.8	<0.03	2.9	91%	8%	2%
Benton	Watab	321	<DL2	40.9	3.5	0.6	8.2	67%	25%	9%
Dakota	Castle Rock	100	<DL3	59.8	3.9	<DL3	13.1	65%	21%	14%
Dakota	Douglas	63	<DL3	68.6	8.2	3.1	21.7	48%	17%	35%
Dakota	Hampton	79	<DL3	28.9	5.8	2.0	15.9	54%	16%	29%
Dakota	Marshan	112	<DL3	32.7	10.1	10.7	22.5	35%	13%	52%
Dakota	Nininger	83	<DL3	29.8	7.7	4.9	21.4	45%	19%	36%
Dakota	Randolph	54	<DL3	18.7	2.9	<DL3	11.1	72%	17%	11%
Dakota	Sciota	27	<DL3	21.2	3.3	<DL3	15.8	78%	7%	15%
Dakota	Vermillion	77	<DL3	27.1	7.8	8.5	19.1	38%	19%	43%
Dakota	Waterford	37	<DL3	33.2	5.3	0.3	13.3	59%	16%	24%
Morrison	Agram	109	<DL2	40.8	9.8	10.2	20.5	33%	15%	52%
Morrison	Belle Prairie	98	<DL2	39	4.5	0.1	14.7	66%	16%	17%
Morrison	Bellevue	133	<DL2	43.7	3.7	<DL2	12.5	80%	8%	11%
Morrison	Buh	49	<DL2	31.2	2.9	<DL2	12.9	80%	8%	12%
Morrison	Culdrum	57	<DL2	28.2	2.7	<DL2	11.9	81%	7%	12%
Morrison	Swan River	65	<DL2	40.9	3.1	<DL2	9.4	74%	17%	9%
Wadena	Aldrich	33	<DL2	32.4	4.9	<DL2	21.6	67%	15%	18%
Wadena	Thomastown	110	<DL2	21.2	1.4	<DL2	7.7	86%	10%	4%
Wadena	Wadena	95	<DL2	31.3	4.4	0.8	14.5	71%	11%	19%
Wadena	Wing River	32	<DL2	23.4	3.5	<DL2	12.7	69%	19%	13%
<b>Total</b>		<b>1901</b>								

<sup>1</sup>Does not include wells of known hand-dug construction or wells with ambiguous address locations.

2DL stands for Detection Limit which is 0.03 mg/L

3DL stands for Detection Limit which is 0.023 mg/L

# Mapped Paleozoic Karst Springsheds in Southeast Minnesota

Jeffrey A. Green, MN DNR Ecological and Water Resources, and E. Calvin Alexander, Jr., University of Minnesota Earth Science.

Map to accompany the LCCMR report, September 2014: *Springshed Assessment Methods for Paleozoic Bedrock Springs of Southeastern Minnesota*

Project Title: Trout Stream Springshed Mapping in Southeast Minnesota, Phase III

Legal Citation: M.L. 2011, First Special Session, Chp. 2, Art. 3, Sec. 2, Subd. 05b1

## Introduction

This article is an abridged version of the text from the map found at [files.dnr.state.mn.us/waters/groundwater\\_section/mapping/springshed/springshed\\_map.pdf](http://files.dnr.state.mn.us/waters/groundwater_section/mapping/springshed/springshed_map.pdf). It displays mapped springsheds as of June 2014 in the Paleozoic karst bedrock of southeast Minnesota. It also incorporates work done as part of the Fillmore County Geologic Atlas (Alexander and others, 1996, Plate 9). A thumbnail of the complete map is displayed in Figure 1.

## Regional Geology and Stratigraphy

The flat-lying Paleozoic sedimentary bedrock of southeastern Minnesota is Cambrian to Devonian in age (505 to 350 million years ago) (Mossler, 2008) and was deposited as a series of shallow, fluctuating seas advanced and retreated across what is now southeastern Minnesota. The Cambrian-age rocks are primarily sandstone, siltstone and shale while the Ordovician and Devonian rocks are primarily carbonate (limestone and dolostone) and shale.

Rock layers that serve as the source of water for the many springs found in southeast Minnesota are highlighted on the map and stratigraphic column. The Decorah Shale is a regional aquitard and is the boundary between the Galena limestone karst system and the Prairie du Chien karst system. Many springs discharge from the lower Galena because the water cannot move through the relatively impervious, underlying shale. The St. Lawrence Formation (green on the map) is an important regional bedrock unit from which many springs discharge and where disappearing streams (stream sinks) contribute water to springs (Green and others, 2012).

These rock units are covered by varying thicknesses of unconsolidated sediments. Areas with less than 50 feet of sediment cover have been the focus of springshed mapping efforts because sinkholes and disappearing streams are primarily found in those areas. Those features are not common where the cover is thicker than 50 feet (brown areas on the map), typically in three settings: isolated areas in the bluffland regions, along the alluvium deposits of the major rivers, and under deep glacial deposits to the west.

## Methods

The surface-water springsheds were identified by analyzing LiDAR digital elevation models or topographic maps. The groundwater springsheds in southeastern Minnesota were mapped

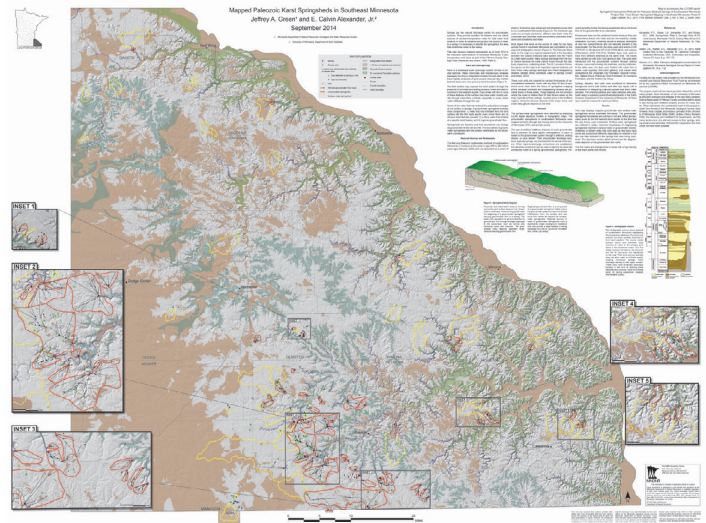


Figure 1. Mapped Paleozoic Karst Springsheds in Southeast Minnesota.

primarily through dye tracing done by the University of Minnesota, DNR, and private cavers. The use of artificial additives (tracers) to track groundwater flow is common for karst aquifer investigations. A tracer is added to the groundwater system through a sinkhole, sinking stream, or cave stream. Then groundwater discharge locations, typically springs, are monitored for the arrival of the tracers. When input-to-discharge connections are established, the identified connection can be used to identify the area that contributes water to a spring (groundwater springshed). Frequent sampling during the tracing experiment allows groundwater travel time to be calculated.

Fluorescent dyes are the preferred tracers because they are conservative (travel with water and are non-reactive), readily obtainable, non-toxic, relatively simple to analyze, detectable at very low concentrations and not naturally present in the groundwater. For this study, the dyes used were eosine (CAS 17372-87-1), Rhodamine WT (CAS 37299-86-8), and uranine C/fluorescein (CAS 518-47-8). Multiple dyes were used to trace from different sinkholes at the same time. The traces were carried out with 200–1200 grams of dye. The dyes were introduced into the groundwater systems through sinking streams, snow melt running into sinkholes, and dry sinkholes. In the latter case, the dyes were flushed with water from a tanker truck (typically 500–2000 gallons). Dye traces were conducted in the Lithograph City Formation, Spillville Formation, Galena Group, Prairie du Chien Formation, St. Lawrence Formation, and the Tunnel City Group. Springs, streams, and wells were monitored to determine background levels both before and after dye inputs with a combination of integrating charcoal packets and direct water samples. The charcoal packets and water samples were analyzed using a scanning spectrofluorophotometer in the Earth Sciences Department of the University of Minnesota. All three dyes could be measured in parts per billion.

For more details on the methods used, see: *Springshed Assessment Methods for Paleozoic Bedrock Springs of Southeastern Minnesota*, [files.dnr.state.mn.us/waters/groundwater\\_section/mapping/springshed/springshed\\_assessment\\_protocols.pdf](http://files.dnr.state.mn.us/waters/groundwater_section/mapping/springshed/springshed_assessment_protocols.pdf)

## Results

You will find the map with the results at the following location: [http://files.dnr.state.mn.us/waters/groundwater\\_section/mapping/springshed/springshed\\_map.pdf](http://files.dnr.state.mn.us/waters/groundwater_section/mapping/springshed/springshed_map.pdf)

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## Mapped Springsheds in Southeast Minnesota, cont.

The map displays mapped groundwater and surface-water springsheds across southeast Minnesota. The groundwater springshed boundaries reflect groundwater levels in the first bedrock karst aquifer at the time that the dye traces were conducted. Common boundaries of neighboring springsheds represent surface-water or groundwater divides. Sinkholes or stream sinks that were used as dye-trace input points are symbolized differently depending on whether or not dye was later detected in the springs that were being monitored. The dye-trace vectors are the diagrammatic depiction of the groundwater flow route. The five insets are enlargements of areas with a high density of dye trace points and vectors.

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### Acknowledgements

Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR).

## New USGS Reports Describe Groundwater Vulnerability to Contamination

One in every five samples of groundwater used as a source for drinking contains at least one contaminant at a level of concern for human health, according to a new U.S. Geological Survey report.

About 115 million people—more than one-third of the Nation's population—rely on groundwater for drinking water, and the need for high-quality drinking-water supplies is becoming more urgent as the Nation's population grows.

USGS scientists assessed water quality in source (untreated) water from 6,600 wells in regionally extensive aquifers that supply most of the groundwater pumped for the Nation's drinking water, irrigation, and other uses. The new USGS reports highlight how geology, hydrology, geochemistry, and chemical use affect the concentrations of individual contaminants in groundwater.

The USGS report is available on-line at <http://pubs.usgs.gov/circ/1360/>.

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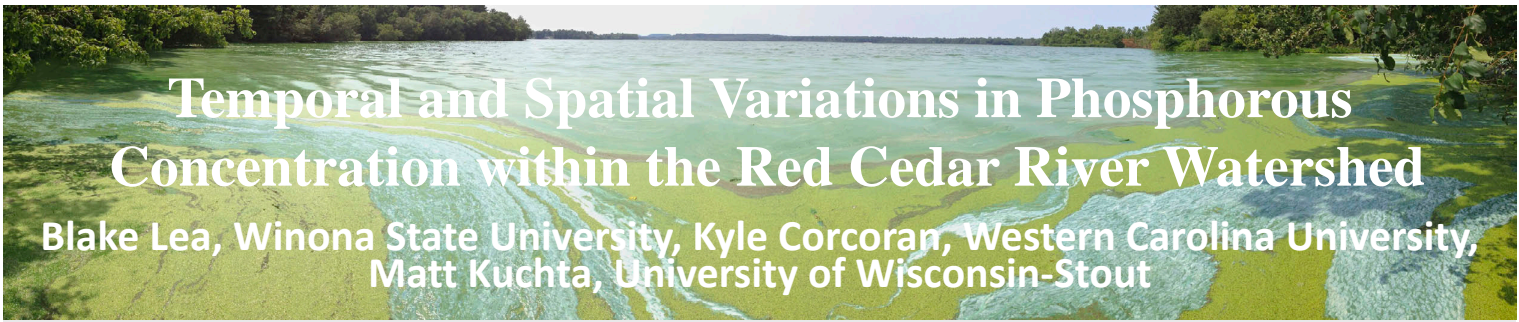
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# Temporal and Spatial Variations in Phosphorous Concentration within the Red Cedar River Watershed

Blake Lea, Winona State University, Kyle Corcoran, Western Carolina University, Matt Kuchta, University of Wisconsin-Stout

## Introduction:

Phosphorus is one of the key nutrients in sustaining healthy plant growth; however, if too much phosphorus is present within the a water system, it can lead to massive algal blooms. Excessive algal growth can release toxins and deplete dissolved oxygen concentrations as the algae decays. This leads to poor water quality, as seen in the lower Red Cedar River Watershed.

Previous research in the Red Cedar watershed has not investigated the background contribution of phosphorus from groundwater sources compared to surface water. Our research explores and identifies groundwater and surface water interactions.

## Phosphorus Concentration in Groundwater Samples

Date of Analysis	Geologic Formation	SRP (mg/L)	TP (mg/L)	SRP (mg/L)	TP (mg/L)
7/30/2014	Eau Claire FM	0.103	0.164	0.118	0.188
7/30/2014	Brachiopod Shell Layer	0.259	0.414	0.715	1.146
7/30/2014	Lone Rock	0.003	0.003	0.047	0.074
7/30/2014	Upper Mt Simon	0.781	1.252	0.867	1.391
7/30/2014	Rainwater	0	0.000	0.01	0.014
7/30/2014	Upper Mt. Simon Priority RD	0.309	0.495	0.638	1.024

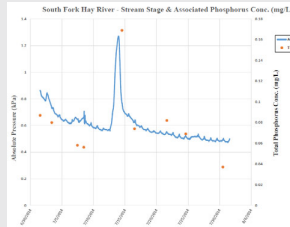
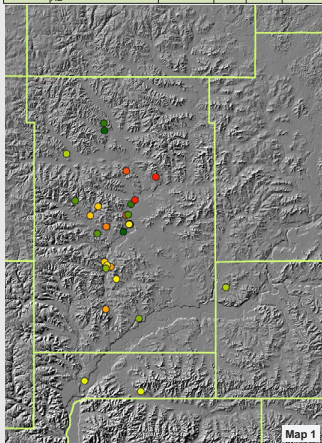


Figure 1

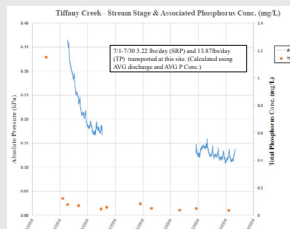


Figure 2

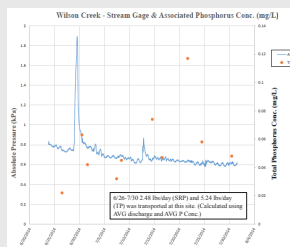


Figure 3

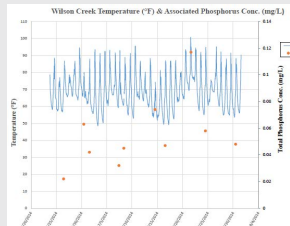
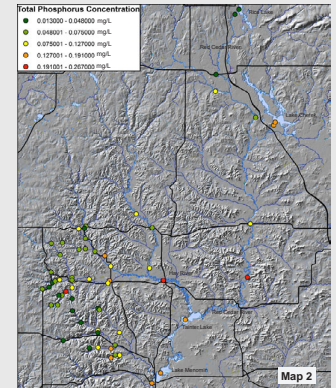


Figure 4

## Phosphorus Concentration in Surface Water Samples



## Conclusion:

Land use practices affect when phosphorus is transported downstream. In the Wilson Creek watershed the highest concentrations of soluble reactive phosphorus (SRP) and total phosphorus (TP) were observed downstream of sites where cattle were pastured, with the highest TP concentrations on the hottest days.

In the South Fork Hay River and Tiffany Creek watersheds the highest concentrations of SRP and TP were associated with large precipitation events. Rainfall events can cause sheet, rill, and gully erosion, which are able to transport phosphorus that is attached to sediment particles. Rain events also lead to increased discharge in streams, which can move phosphorus attached to sediment in the streambed, stream banks, and in larger events, even the floodplain.

We found elevated SRP and TP concentrations in some groundwater samples. A potential groundwater phosphorus source is located near the contact between the Mt. Simon and Eau Claire formations, which contain abundant phosphatic brachiopod shells. The widespread distribution of these bedrock units suggests background TP and SRP testing and sourcing should be done in order to best estimate total maximum daily phosphorus loads from individual streams.



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## MGWA BOARD MINUTES

### Minnesota Ground Water Association Board Meeting Minutes

#### Meeting Date: December 3, 2014

Location: Fresh Grounds Café, 1362 West 7th Street, St. Paul, MN.  
Attendance: Eric Mohring, President; Lanya Ross, President-Elect; Bob Tipping, Past President; Audrey Van Cleve, Treasurer; Avery Cota-Guertin, Secretary; Sean Hunt, WRI; Tedd Ronning, Newsletter Editor.

Past Minutes: Approved.  
Treasury: Van Cleve provided the Board with copies of the financial report. Total income for the period of January 1, 2014 - December 2, 2014 is \$100,501; total assets as of December 2, 2014 are \$132,422. Net income is \$40,102. The 2014 Fall Conference brought in a net income of \$19,750.

Newsletter: The newsletter was submitted to WRI last week.  
Web Page: The 2014 Fall Conference materials including presentations, audio files, pictures, and agenda were posted to the web page.

WRI Report: WRI will work on membership renewals and officer ballots. Ronning will send Hunt information for officer ballots.

Old Business: 2014 Fall Conference. The Board discussed feedback received from the 2014 Fall Conference attendees. The Board revisited the possibility of including an ethics component in future conferences to satisfy professional licensure requirements. 2015 Sinkhole Conference. Ross reported that several conference calls have taken place since the last board meeting. The deadline has passed for submission of abstract papers to be published in the proceedings. Ross and Barr are continuing work to solicit abstracts for talks and posters from local professionals; these abstracts may not be published in the conference proceedings. The Board discussed an appropriate timeline by which to have session topics available to members such that members have sufficient time to submit papers and abstracts before the March 2015 deadline. The Board discussed the possibility of extending Van Cleve's authority to write checks on behalf of MGWA through the Sinkhole Conference; this could be in addition to the authority of the acting Treasurer. White Paper Topics. The Board discussed the status of the Manganese White Paper topic. MGWA Foundation. The Board will schedule a joint meeting with the MGWA Foundation Board in early 2015. 2015 Officer Candidates. The President-Elect and Treasurer candidates will be presented in the upcoming newsletter and on the officer ballot. The Board discussed providing new officers with introductions to google drive.

#### Meeting Date: January 7, 2015

Location: Fresh Grounds Café, 1362 West 7th Street, St. Paul, MN  
Attendance: Lanya Ross, MGWA President; Eric Mohring, MGWA Past President; Ole Olmanson, MGWA President-Elect; Emily Berquist, MGWA Treasurer; Avery Cota-Guertin, MGWA Secretary; Tedd Ronning, Newsletter Editor; Scott Alexander, MGWAF President; Amanda Strommer, MGWAF Secretary (by phone); Cathy Valis-Horns, MGWAF Director; Stuart Grubb, MGWAF Director; Sean Hunt, WRI; Jeanette Leete, WRI; Kelton Barr; Bob Tipping; Audrey Van Cleve.

Past Minutes: Welcome and Introductions: Approved.

New Business: The meeting attendees provided introductions and descriptions of roles and responsibilities with the MGWA Board and MGWA Foundation. MGWA/MGWAF items. Ross outlined some concerns that the MGWA Board has for the MGWAF with regard to scheduled regular MGWAF meetings, vacant MGWAF roles, and pending grant requests. Alexander agreed getting back into a regular meeting schedule will address the present concerns. Strommer expressed an interest in being more involved with MGWAF and serving as Secretary. Leete suggested that we call a vote today to have Cota-Guertin to serve as acting MGWAF Secretary to sign a resolution document to separate restricted money into another account. In his new role as a MGWAF member, Mohring motions that Cota-Guertin serve as acting MGWAF Secretary to sign the resolution document to separate restricted funds and after Strommer will serve as MGWAF Secretary. Motion prevails. Mohring motions to open a Hiway Credit Union account to separate restricted funds. Motion prevails. The MGWA Board and MGWAF discussed resolutions to the Children's Water Festival and Brown/Nicollet pending grant requests. The Children's Water Festival requested \$1000; previously the Children's Water Festival was granted \$2000. Representing MGWAF, Mohring motions to grant the Children's Water Festival \$2000, to be paid retroactively. Motion prevails. Mohring motions to meet the grant request for the Brown/Nicollet Water Festival with \$1000. Motion prevails. The Board and MGWAF brainstorm a plan for MGWAF to efficiently manage fundraising efforts and scholarships. Barr suggested a formally established

### MGWA 2015 Membership Dues

Professional Rate:	\$35
Full-time Student Rate:	\$15
Newsletter (printed and mailed) Directory	\$20
	\$7

Membership dues rates were revised at the October 1, 2010 meeting of the MGWA Board. They remain unchanged.

## MGWA BOARD MINUTES, cont.

### Minnesota Ground Water Association Board Meeting Minutes, cont.

committee to sit under the MGWAF to keep items such as developing and maintaining relationships with exhibitors running to raise money for scholarships. Tipping volunteered to assist with maintaining exhibitor relationships and solicit exhibitors for future conferences. Tipping suggested that MGWA members might also be interested in assisting with these efforts. Tipping volunteered to be a member of the exhibitor/conference committee and suggested at least two other people volunteer. Alexander will set up a meeting in January to discuss the details of starting a conference committee and scholarships. Hunt will send MGWA members an email to advertise for scholarships. Strommer will send a follow-up email to schools after the holiday break to remind of scholarship opportunities.

The Board received a request from the University of Minnesota for a letter of support for a manganese-related research project. The Board discussed the possibility of providing a letter of recommendation. The letter is not intended to be an endorsement of a specific project or researcher; instead, it more broadly supports efforts to improve knowledge about the topic which is in line with the White Paper Initiative. Barr suggested that the Board develop a policy for endorsements or letters of support from requesters. Mohring motions to sign the letter of support for the University of Minnesota request. Motion prevails.

MGWA items. MGWA Board meetings will continue on the first Wednesday of every month in 2015 at 11:30am.

MGWA moved the Google drive demo agenda item to the next board meeting.

Ross gave the board an update on the new ethics requirement for the professional licensure. The ethics requirement is a two hour course every two years. Ross is in contact with the Board and AIPG; discussed a possible partnership to address this issue. Ross suggested reminding MGWA members and conference attendees at the Spring Conference of the new ethics requirement. Grubb discussed an ethics course in which he participated and recommended that people look into a business school for fulfilling ethics requirement for professional licensure. Alexander mentioned that the University of Minnesota has an online ethics course, as another possibility.

Old Business:

2015 Spring Conference. Ross presented a draft conference title to the Board; "Pickles, Beer, and Cloud Computing – The Case for Groundwater Sustainability".  
2015 Sinkhole Conference. The Board discussed a desire to have a local presence at the Sinkhole Conference. The Board discussed putting out a call for abstract papers and establish people to review these abstract papers. Barr explained that in the past the abstracts and proceedings were peer reviewed and published. Barr suggested that additional abstract papers may be submitted to the conference but will not likely be included in the proceedings. A committee to review abstracts is needed along with people to co-chair sessions. Hunt described the process for submitting white papers topics on the website. The deadline for submitting abstract papers will be in May. The abstract paper deadline and submittal procedure will be in the next newsletter and announced at the Spring Conference. Ronning will talk with the editorial staff to see if there is interest in assisting with the review of abstract papers. Barr will send an email request to Ronning outlining the details of reviewing abstract papers.  
White Paper development. One new topic was submitted.

Treasury:

Berquist provided the Board with copies of the financial report. Total income for the period of January 1, 2014 - December 31, 2014 is \$101,006; total assets as of December 31, 2014 are \$123,633. Net income is \$39,445. The board decided to have check signing authority granted to Berquist and Leete.

Newsletter:

December newsletter was distributed.

Web Page:

The 2014 Fall Conference materials including presentations, audio files, pictures, and agenda were posted to the web page.

WRI Report:

Membership renewals and officer ballots went out to MGWA members. Hunt provided the Board with membership reports. WRI emailed members requesting White Paper topics. Employment opportunities also sent out through MGWA. WRI reported that MGWA has filed the 2013 form 990T.

### Meeting Date: February 4, 2015

Location:

Fresh Grounds Café, 1362 West 7th Street, St. Paul, MN

Attendance:

Lanya Ross, MGWA President; Eric Mohring, MGWA Past President; Ole Olmanson, MGWA President-Elect; Emily Berquist, MGWA Treasurer; Tedd Ronning, Newsletter Editor; Sean Hunt, WRI; Jeanette Leete, WRI; Kelton Barr  
Approved as amended.

Past Minutes:

Treasury:

Berquist provided the Board with copies of the financial report. Total income for the period of January 1, 2015- January 31, 2015 is \$9286; total assets as of January 31, 2015 are \$115,775. Net income for the period of January 1, 2015- January 31, 2015 is \$6072.

Newsletter:

Ronning reported that there was nothing to report. But then proceeded to report that the backlog is small, and encouraged the board to let people who might want to

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## MGWA BOARD MINUTES, cont.

### Minnesota Ground Water Association Board Meeting Minutes, cont.

	submit something know.
Web Page	Hunt followed suit by reporting that there was not much to report on the web site itself.
WRI Report	Hunt then reported that emails have gone out about the White Paper Initiative and membership renewals. They are working on returned mail. Leete is working on sales and use tax.
MGWA Foundation	Hunt reported that a check was sent to the Metro Children's Water Festival for their 2014 request, and that they followed up immediately with a request for 2015. A check was also sent for the Brown-Nicollet-Cottonwood Children's Water Festival. Leete reported that all the paperwork is done for the transfer of funds to the Hiway Federal Credit Union. Mohring made the following motion: Provide \$1,000 directly to NCKRI for another scholarship to the sinkhole conference; give the MGWA Foundation \$2,000 for the Metro Children's Water Festival; hold 15,000 in reserve (to Affinity Plus) for Sinkhole Conference contingencies; and put \$5,000 in the HO Pfannkuch Fund. Motion seconded and carried.
Old Business:	Cathy Villas-Horns is still receiving applications for student scholarships. <u>2015 Spring Conference</u> . Ross presented the working plan for the spring conference "Pickles, Beer, and Cloud Computing: The Case for Sustainable Ground Water." We need to formalize the poster presentation. Need to mail out brochure by March 1. <u>2015 Sinkhole Conference</u> . Barr reported that we have 3-4 abstract editors for the "abstract only" talks. The abstract solicitation will be on the website. Jeff Broberg will lead a 2nd field trip – a ½ day trip on Friday and has provided a description. <u>White Paper</u> : Barr reported that we have a new topic idea submitted by Bruce Olsen: "Minnesota's Ground Water Education Gap". The board supported this idea. Another idea was submitted that will likely be a newsletter article.
New Business	<u>Member Survey</u> : Ross suggested a repeat member survey. <u>AIPG News</u> : Barr reported that the MN Chapter of AIPG has new website, and have revived the newsletter with Jane Willard as as editor. There is a new student chapter at Saint Thomas. <u>Ethics Training</u> : deferred

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