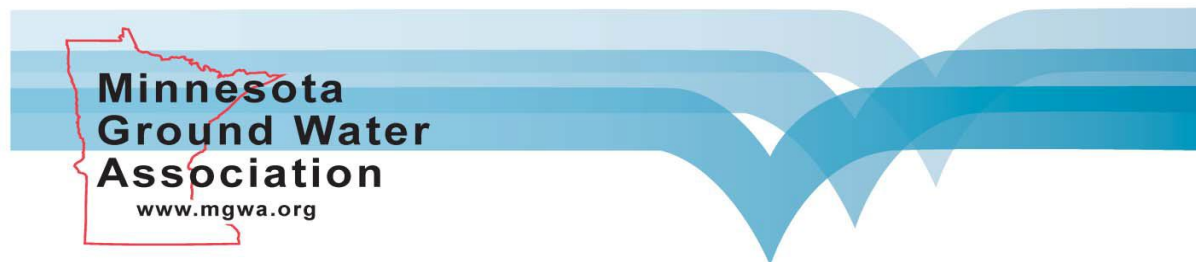


Minnesota's Groundwater Education Gap: *Preparing Students to Effectively Manage Our Groundwater Resources in the Future*

MGWA Second White Paper Work Group:

Dr. Randal Barnes, Ellen Considine, Jeff Stoner,
Rachel Beise, Gilbert Gabanski, Cathy Udem,
Jonathon Carter, Bruce Olsen, Karen Voz



Objectives

- **Identify knowledge about Groundwater that high school graduates need to be informed adults**
- **Identify gaps in K-12 education**
- **Identify gaps in postsecondary curriculum and graduation requirements**
- **Discuss alternatives for closing these gaps**

Approach

Given that the MGWA scoping document ID'd broad range of objectives,

Workgroup chose to focus on:

- 1. K-12 (public long term)**
- 2. Postsecondary**
- 3. Statewide education strategies**

Two Online Surveys

Obtain information not available from experts or existing reports

- **Survey 1 - What questions does public commonly ask about GW?**
- **Survey 2 – What training and skills do employers want for entry-level jobs?**

Questions Public Commonly Ask:

Is my well water safe to drink?



For what contaminants should I test my well?

Questions Public Commonly Ask:

Where does my drinking water come from?



How does groundwater become contaminated?

Questions Public Commonly Ask:



Are our aquifers being over pumped?

Will we have enough groundwater for future generations?

Questions From Interviews:

Who provides GW expertise for teachers?



What teaching resources are available?



What statewide strategies and partnerships address GW education?

Questions About Postsecondary:

How do Minnesota schools compare to those in surrounding States?



Do undergraduate degree requirements reflect employer hiring?

K-12 Example Findings (2 of 8)

- **No statewide requirement or incentive for students to understand aspects about groundwater beyond the hydrologic cycle in order to graduate from high school.**
- **Expanding student understanding about groundwater in Minnesota schools must be integrated with state education standards and benchmarks defined in state statute.**
 - (**Challenges** for teachers/school boards to meet standards/benchmarks + achievement testing goals)

K-12 Implications and Opportunities

Example:

- **Revisions to Minnesota academic standards for science scheduled for 2017-2018 school year could narrow gaps in groundwater knowledge**

Postsecondary **Example Findings** (2 of 5)

- **MGWA survey** of public sector and private sector employers = **no formal mechanism to communicate to Minnesota's postsecondary institutions** the knowledge, skills, and experience they require of candidates for entry-level groundwater jobs.
- **3 of 12 Minnesota colleges and universities selected** for review **offer coursework relating to GW beyond the introductory level.**

Postsecondary Implications and Opportunities

Examples:

- **Employer Interest to improve communication regarding the hiring requirements** for entry-level professional-groundwater position may ultimately improve the likelihood that postsecondary students in Minnesota will be better qualified to fill in-state job openings.
- **MGWA, with other professional organizations, has opportunity to improve communication** between employers and postsecondary institutions to help reduce hiring problems.

Statewide Strategy **Example Finding** (1 of 5)

- **Planning strategies with water-resources education** documented by several organizations **in the public sector and private sector, but** either **limited detail about GW education or focus on target groups.**

Statewide Strategy Implications and Opportunities

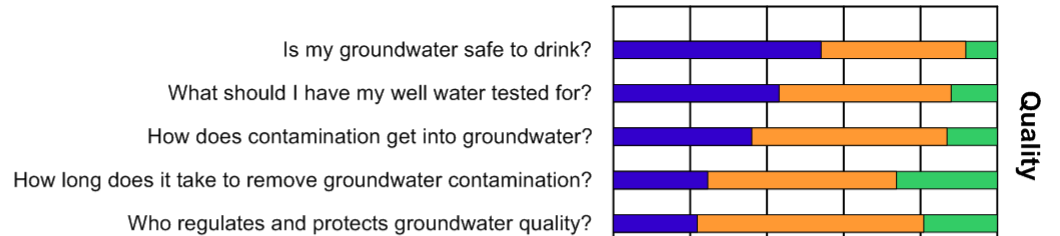
Examples:

- **MGWA has opportunity to assist** with developing a statewide strategy for improving groundwater education **that builds upon previous efforts and the experience gained by attempting to implement them.**
- **Contact with other professional groups identified potential collaborators for MGWA to partner with and increase the base of support for closing GW education gaps.**

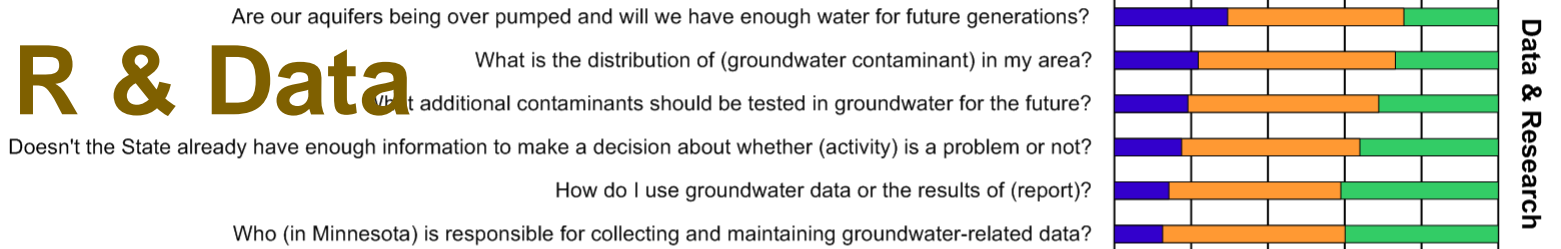
MGWA Survey-Common Qs from Public

Quality

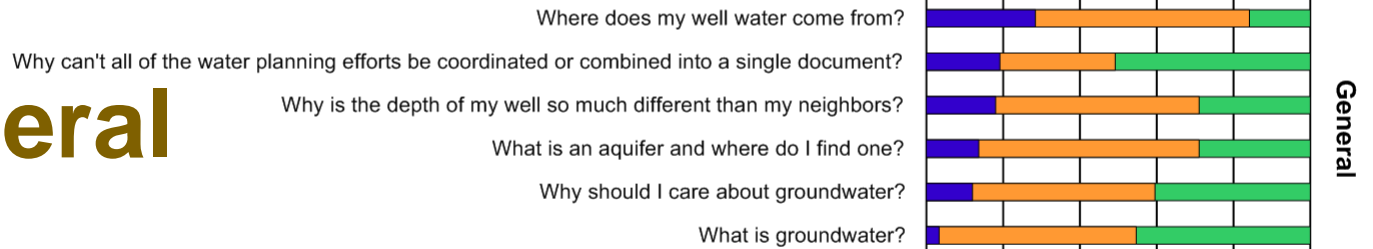
Frequently Sometimes Never



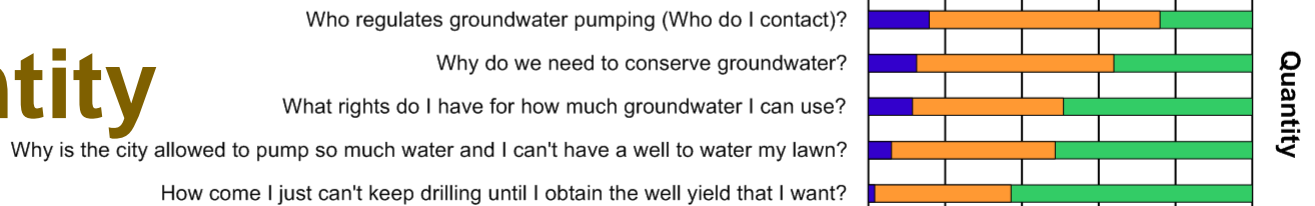
R & Data



General



Quantity



0% 20% 40% 60% 80% 100%

Go Readme

Paper: 23 pp. with 39 pp. of data and analysis in Appendices.

Publish on MGWA Web site, December 2016

White Paper Contacts

(questions/discussion for one year):

- **Cathy Udem**
- **Gilbert Gabanski**

Acknowledgments

White Paper Committee Liaisons:

Kelton Barr and Mark Collins

Other contributors:

Terry Doud	E-STEM Program, Heritage School Dakota County
Dr. Fred Finley	STEM Education Center University of Minnesota
Darrell Gerber	Freshwater Society
Benji Kohn	Trout in the Classroom, Trout Unlimited
Janine Kohn	Project WET, Minnesota Department of Natural Resources
John Olson	Science Specialist, Minnesota Department of Education
Doug Paulson	STEM Specialist, Minnesota Department of Education
Stew Thornley	Drinking Water Academy, Minnesota Department of Health

MGWA (You): For completing the [surveys](#) on employment characteristics, commonly asked questions from the public, and employer needs for entry-level GW positions.



One More Pitch



Potential Action Items for MGWA? (handout)

1. **Reactivate MGWA Groundwater Education Committee**
2. **Participate in public process as Minnesota Department of Education revises the Minnesota Academic Standards for science in 2017-2018**
3. **Establish a work group to develop classroom lessons including GW principles or management to help K-12 students**
4. **Ask MGWA volunteers to work with teacher groups and other professional organizations to identify a mechanism for accessing groundwater-related teaching resources**
5. **Approach other professional geoscience and engineering organizations for interest in developing mechanisms for employers to communicate their hiring requirements to postsecondary institutions**
6. **Host a forum to discuss a statewide strategy**

Questions?



And now for something completely
different...

An Update on the Newest
White Paper
**Drain Tiles and
Groundwater Resources**
Understanding the relations

Minnesota Ground Water Association

Fall Meeting

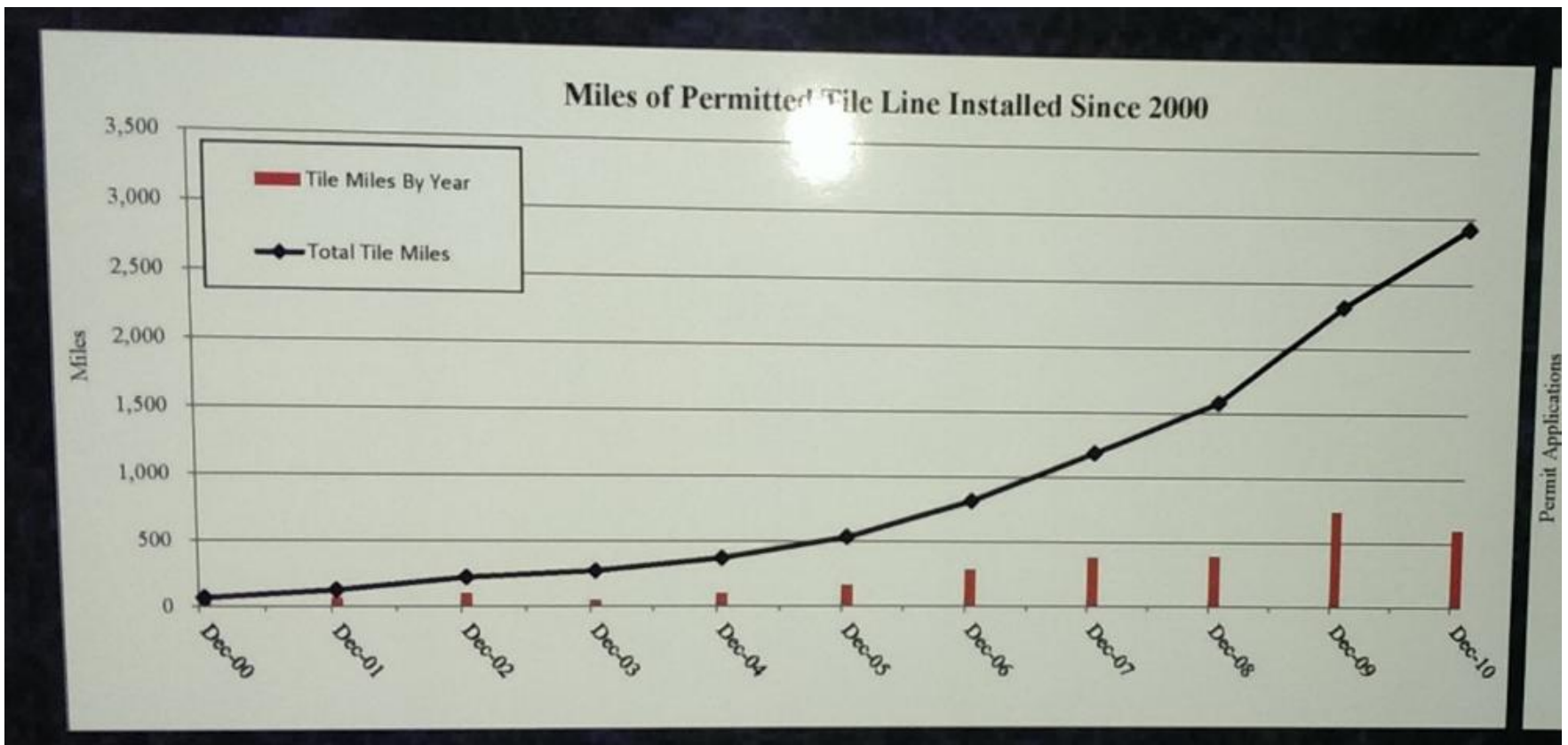
November 16, 2016

University of Minnesota, St. Paul

Progress as of November

- 1) Diverse and talented workgroup has been meeting since late Summer
- 2) Following the MGWA Board's guidance
- 3) Meeting with experts in the field
- 4) Outlining and Scheduling the business of writing the White Paper
- 5) Will update progress at Spring meeting

Bois De Sioux Watershed



Buffer on Right, None on Left



Got to Love Soil Scientists



Questions or Comments about the Workgroup?

White Paper Committee Liaison:

Andrew Streit

andrew.streit@state.mn.us

218 302-6617



As we look into the future...

A person is silhouetted against a vibrant sunset sky. The sun is low on the horizon, creating a bright glow and lens flare effects. The sky is filled with soft, golden clouds. The person stands on a dark, silhouetted horizon line, looking out over the landscape.

**NEW
TOPICS**

WHAT NEW TOPICS WILL BE SUBMITTED?

*We need your ideas for
the next topic for a
white paper*



**Minnesota Ground Water Association
White Paper Topic
Nomination Form**

[the submission should be no longer than 2 pages in length]

White Paper Topic:

Problem Statement:

Briefly describe the topic in the context of potential impact(s) on Minnesota's groundwater resources and on its users. Describe the urgency of this topic from a MGWA perspective—why now?

Background and Technical Content:

Briefly outline relevant historical, conceptual and/or technical background as needed to understand the value of preparing the proposed white paper.

Arguments for Selection of this Topic:

Consider describing

- o Implication(s) for Minnesota groundwater resources.
- o How the resulting white paper might advance recognition of the issue.
- o Who would benefit?

Name(s) of the person(s) submitting this topic:

Contact number or e-mail address where a MGWA representative may contact you:

Would you be willing to serve on a work group if the topic is selected?

Evaluation Criteria:

The range of topics is wide open, but may be evaluated using initial criteria that include:

- **Consistency with several objectives of the MGWA, for enhancing:**
 - o Protection and conservation of Minnesota groundwater
 - o Future economically and environmentally sustainable uses and management
 - o Increased public awareness of and education about groundwater issues
 - o Water policy and regulation;
- **Geographic area involved:** having statewide or regional impact will receive a higher priority than one that is locally or community focused;
- **Time frame:** a potential adverse impact on Minnesota's groundwater resources within a time frame of three decades or less will receive a higher priority than one that is likely to take longer;
- **Nature of groundwater impacts:** impacts on both the quantity and quality of Minnesota's groundwater resources will receive a higher priority than one that may impact only one of these characteristics;
- **Surface-water connection:** topics involving groundwater and interconnected surface water resources will receive a higher priority than one that may impact only groundwater;
- **Human health impacts:** potential adverse impacts on people's health will receive a higher priority than one that does not.



...JUST SEND IT IN!

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White Papers

The Minnesota Ground Water Association (MGWA) is undertaking the preparation of white papers addressing a number of issues concerning ground water. The white papers are prepared by the ground water professionals of the MGWA and are available to anyone interested in neutral, science-based information on these topics.

What is a "White Paper"?

MGWA defines a white paper as an article that gives an unbiased treatment of a topic for informational and educational purposes. A white paper will positively influence future quantity or quality of groundwater resources, interrelated resources, and their use. A white paper presents the technical aspects for the evaluation form, but includes references to sources of more detailed information.

New White Paper Topics

Completed White Papers

01 - Manganese in Minnesota's Groundwater

White Papers in Preparation

The following topics are currently under preparation:

02 - Minnesota's Groundwater Education Guide

03 - Drain Tiles and Groundwater Resource

Participation

Survey

 MGWA

Minnesota Ground Water Association White Paper Topic Nomination Form

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Submit your topic ideas

EARLY and OFTEN

Deadline in January, 2017

***And thanks for keeping MGWA
engaged in our state's
discussions of groundwater!***