

the **AQUIFER**

Volume 27

Number 2

Fall 2012

©

A PUBLICATION OF THE GROUNDWATER FOUNDATION



This Heat Has Got Right Out of Hand **It's a Cruel Summer** **What Does the Record Heat and Drought of 2012 Mean?**

By Jennifer Wemhoff, The Groundwater Foundation

Oh Bananarama, how right you are. Even though the song “Cruel Summer” was released in 1983, it seems a fitting anthem for the summer that was 2012.

Yes, we're finally into Fall. Yes, the record heat has passed. Yes, it's easy to forget those days upon days of more than 100 degrees when the air is crisp and the sun is shining in a brilliant blue sky. But the bright sun shines a spotlight on all the reminders here and across the U.S. that the drought is far from over and we're not out of the woods yet – dry riverbeds, dead trees, shriveled crops, wildfire remnants, and brown lawns.

Is it the heat?

The National Oceanic and Atmospheric Administration (NOAA) reported that Summer 2012 was the third hottest summer on record for the continental U.S. July 2012 was the single hottest month on record and August was the fourth warmest. Globally, sea ice levels were the all-time lowest on record for August.

Heat indices regularly topped 100 degrees (F) throughout the summer. Coupled with dry conditions and strong winds, the

Summer of 2012 was ripe for wildfires. Over seven million acres were burned from June to August in over 22,000 fires.

Is it the drought?

The Palmer Drought Index indicates that 55.1% of the Lower 48 was in moderate to extreme drought, with 39% experiencing severe to extreme drought. NOAA reports that Nebraska's summer precipitation was almost six inches below average, and Wyoming's more than two inches below, making 2012 the driest summer on record in both states. In addition, summer precipitation levels in Missouri, Illinois, Iowa, South Dakota, and New Mexico were among their ten driest.

In The Groundwater Foundation's hometown of Lincoln, Nebraska, summer was one of water-use restrictions. In August, mandatory restrictions were in effect, limiting outdoor watering to certain days of the week, and making violations a ticketable misdemeanor offense. The Lincoln Police Department issued 400 tickets for watering violations.

Public Safety Directory and former Lincoln Police Chief Tom

Casady shared some humorous explanations, taken from police reports, that officers received when issuing watering violations, including:

It's her husband's fault: “As I issued her the citation she angrily said it should be her husband getting the ticket since he was the one who turned on the water.”

No warning? “She was not happy to receive an official citation as she had heard that people were receiving warnings and no one had come to ‘warn’ her about violating the watering restrictions.”

Rumor has it. “She said she had heard ‘rumors’ about watering restrictions in the city, but had not made an attempt to learn the specifics.”

Unaware part one: “Owner was contacted and she stated she did not know we were in a drought and that there was a water restriction in place. I advised her that we have been in this emergency water restriction for almost a month now and that information was being given through numerous news outlets.

Cruel Summer, continued on page 3 ►

INSIDE

2

Groundwater Shorts

4

Brown or Green

5

USGS Details

Climate Change

6

Source Water

Monitoring and

Hydraulic Fracturing

7

Women in Water

8

Williamson to

Receive Kremer

Award

9

Groundwater

Foundation News



Mission of The Groundwater Foundation:

To educate people and inspire action to ensure sustainable, clean groundwater for future generations.

Groundwater Shorts

The Price of Water

Which is vital to life – water or expensive perfume? Water, of course. So it would stand to reason that water would be more expensive; the reality is that water is cheap. Most of us in the U.S. don't even realize how inexpensive the water we get from our taps is.

Let's compare the cost of tap water in the United States to many other commonly-used consumer goods:

Product	Average Price <i>\$/Gallon</i>
Tap water	\$0.0048
Coca-Cola ®	\$3.00
Gasoline	\$4.00
Tide® laundry detergent	\$8.50
Imported beer	\$12.00
Evian® bottled water	\$25.00
Starbucks® latte	\$22.00
Pepto-Bismol®	\$65.00
Vicks Formula 44D® cough syrup	\$100.00
American whiskey	\$150.00
Visine® eye drops	\$750.00
Revlon® nail enamel	\$1,000.00
Good French wine	\$1,000.00
Chanel® No. 5 perfume	\$45,000.00

Source: Journal AWWA, May 2012

Water is the cheapest – yet the most valuable and critical to our lives – item on the list. It's almost 10 million times cheaper than Chanel® No. 5 perfume!

Public tap water in the U.S. is a great bargain, and one whose value is unfortunately overlooked. 💧

This issue of *The Aquifer* is proudly sponsored by:



Share your water protection or conservation message with *Aquifer* readers!
Visit http://www.groundwater.org/au/docs/aquifer_sponsorship.pdf or contact
The Groundwater Foundation at 1-800-858-4844 to find out how.

Call for Applications 2013 Presidential Innovation Award for Environmental Educators

Applications are now being accepted for the 2013 Presidential Innovation Award for Environmental Educators. The award recognizes outstanding kindergarten through grade 12 teachers who employ innovative approaches to environmental education and use the environment as a context for learning for their students. Up to two teachers from each of EPA's 10 regions, from different states, will be selected to receive this award. The White House Council on Environmental Quality, in partnership with the U.S. Environmental Protection Agency administers this award to nationally honor, support and encourage educators who incorporate environmental education in their classrooms and teaching methods.

Winning educators will receive a commemorative plaque and an award of

\$2,000 to be used to further the recipient's professional development in environmental education. In addition, the educator's local education agency will also receive an award of \$2,000 to fund environmental educational activities and programs of the teacher.

Applicants will be judged by their responses to each of these six factors: innovative approaches to teaching, demonstrated student achievement, serving the underserved student population, extending environmental education into the community, demonstrating leadership in the field of environmental education, and integrating environmental education into broader curriculum.

The deadline for applications is January 31, 2013. For more information on how to apply and other award information, please visit <http://www.epa.gov/education/teacheraward/>. 💧

She stated she did not know there was a restriction and suggested that the city find another way to inform its citizens of it.”

Don't tell my wife! “He said an officer could stop by after that time to issue the citation and said the officer could call first to see if he was home. I asked def. if his wife would be home prior to his return because she could be issued the citation instead of him. Def. said he is the one who set the controller for the sprinkler system in error. He also said that he would rather be shot than have to deal with his wife getting the citation.”

Perhaps the most troubling to me is this explanation: “As I issued his citation he stated that he will be watering his backyard everyday because he has a tall privacy fence and no one will be able to see that he is watering.”

It's not about getting caught and evading the ticket. People clearly still don't understand or appreciate the value of water in their lives, even when it's on the news, in the papers, on signs around town, or in the form of a police officer at the door.

Worst summer ever?

Though the heat and drought of 2012 was and is severe, the impact is not as extensive as that experienced in the Dust Bowl years of the 1930s. The duration of the Dust Bowl era was eight years; in those eight years, 3.5 million people in the Great Plains region fled their homes and farms due to the drought. Over 20 million hectares (49 million acres or 77,000 square miles) of farmland were left unusable each year.

Currently, the USDA predicts the lowest corn yield per acre since 1995, with 80% of the agricultural land in the U.S. affected by the drought. This, and the drought as a whole, could have an impact on food prices beginning this fall, with price

impacts for beef, pork, poultry and dairy.

Many farmers in 2012 have a distinct advantage over those in the 1930s – irrigation. Center pivot irrigation changed the modern face of agriculture and has helped feed the world, while enabling producers to be efficient in their water use. As pointed out in *The Groundwater Foundation's Rainmakers: A Photographic Story of Center Pivots*, center pivot technology is powerful, but its true impact depends on the human steward operating it rather than the machine itself.

What does it mean?

NOAA projects that heat waves like those of this past summer may become more common and last longer in the next few decades, so it's likely that there are more like this past summer to be dealt with.

So what does this all mean?

It means there's still work to be done. There are still people who don't understand the value of water, that it's a finite resource, and a precious commodity.

It means that now is the perfect opportunity to plan for the future, and a future of drought. Science continues to innovate and find ways to do more with less water, and we as consumers of that water need to not only support these efforts but do the same in our own lives, in ways large and small. Whether it means giving up on a lush green lawn in the middle of a historic drought or farmers continuing to innovate with center pivots and other technology, we all need to look at ways we can survive the cruel summer – now and in the future. 💧

Palmer Drought Severity Index August, 2012

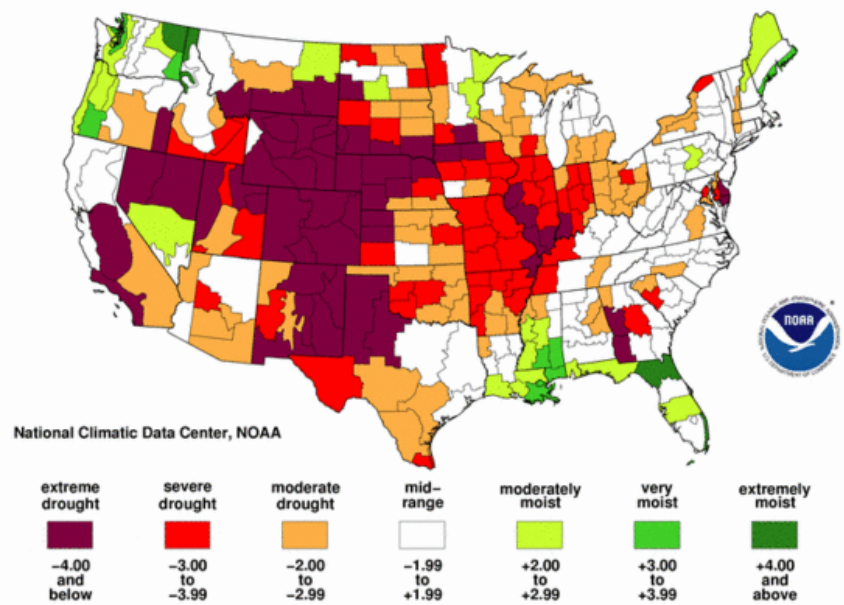


Image source: <http://www1.ncdc.noaa.gov/pub/data/cmb/drought/historical-palmer/201208-pdsi.gif>

References

- Botelho, Greg. “By the numbers: Today's drought vs. the Dust Bowl era.” CNN. com. Retrieved October 4, 2012 from <http://www.cnn.com/2012/09/15/us/drought-by-the-numbers/index.html>.
- Casady, Tom. “Explanations abound.” The Director's Desk Blog. Retrieved October 4 from <http://lpd304.blogspot.com/2012/08/explanations-abound.html>.
- Cruel Summer (song). 2012. Wikipedia, The Free Encyclopedia. Retrieved on October 3 from [http://en.wikipedia.org/wiki/Cruel_Summer_\(song\)](http://en.wikipedia.org/wiki/Cruel_Summer_(song)).
- Lindsey, Rebecca. “With rising greenhouse gases, U.S. heat waves to become more common & longer lasting.” ClimateWatch. Published online August 2012. Retrieved October 3 from <http://www.climatewatch.noaa.gov/article/2012/with-rising-greenhouse-gases-u-s-heat-waves-to-become-more-common-longer-lasting>.

NOAA National Climatic Data Center, State of the Climate: National Overview for August 2012, published online September 2012, retrieved on October 3, 2012 from <http://www.ncdc.noaa.gov/sotc/national/2012/8>.

NOAA National Climatic Data Center, State of the Climate: Wildfires August 2012, published online September 2012, retrieved on October 3, 2012 from <http://www.ncdc.noaa.gov/sotc/fire/2012/8>.

Osborne, Susan. “Summer 2012 Recap.” ClimateWatch. Published online September 2012. Retrieved on October 3, 2012 from <http://www.climatewatch.noaa.gov/article/2012/summer-2012-recap>.

The Groundwater Foundation, 2005. *Rainmakers: A Photographic Story of Center Pivots*.

U.S. Drought 2012: Farm and Food Impacts. 2012. USDA Economic Research Service. Retrieved on October 3, 2012 from <http://www.ers.usda.gov/newsroom/us-drought-2012-farm-and-food-impacts.aspx>.

Brown or Green

What does it mean for your septic system performance?

by Brad D. Lee, Water Quality Extension Specialist, University of Kentucky Department of Plant and Soil Sciences and Gregg C. Munshaw, Extension Specialist, University of Kentucky Department of Plant and Soil Sciences

Many homeowners notice color differences in the turfgrass over their septic system soil treatment area. Most often, homeowners observe green or brown stripes in their turfgrass relative to the surrounding lawn. This discoloration is worth keeping an eye on because turfgrass color is often an early sign that serious problems are about to occur.

Brown Turfgrass over the Trenches

In warmer months or during dry periods, turfgrass over subsurface soil treatment areas can turn brown and appear burned. This condition is due to the lack of water-holding capacity in soil above the absorption field trenches or beds.

Water is required by turfgrasses for chemical reactions, evaporative cooling, transportation of nutrients and organic compounds throughout the plant, and maintenance of turgidity (leaves springing back after being stepped on). In an ideal situation, open spaces in the soil would be half full of water and half full of air (approximately 25% of total soil volume is water). When the percentage of available soil water decreases, the turfgrass plant runs into problems. Prolonged water stress will initially reduce turfgrass growth. The turf will usually lose its luster and it will not spring back after being walked on. As drought stress continues, plant cells will increase solute levels in an attempt to maintain turgidity. Further drought stress will usually result in either drought avoidance or drought escape. Drought avoidance can be defined as

maintaining function (usually at a reduced level) by adapting the physical features of the plant to either save or locate more water. Examples of drought avoidance include leaf rolling to reduce water loss or increased root length to find more water. Drought escape in turfgrasses is usually defined as drought dormancy. During drought dormancy the plant will basically shut itself down until environmental conditions improve. Although there is some overlap between the two categories, commonly used turfgrasses can mostly be classified as either one or the other.

Kentucky bluegrass exhibits drought dormancy while tall fescue, bermudagrass, zoysiagrass, and perennial ryegrass are classified more often as drought avoiders. Grasses that are drought avoiders will usually remain somewhat green during the drought period but if the drought is severe enough they will not be able to recover. Grasses that exhibit drought dormancy will be straw brown and look dead during the drought but will almost always recover fully once the drought has ended. Drought tolerance varies across species but can even vary widely within a species. Initial turfgrass selection should always consider drought tolerance as part of the criterion.

What Can You Do?

Brown turfgrass over the septic system is merely an aesthetic problem. No action is required by the homeowner. Your septic system is probably functioning as designed. The problem is transient, and your lawn should recover fully by October when the temperatures cool and it rains. You should

not water your lawn above the absorption trenches because the additional water can reduce the effectiveness of the soil treatment area and may eventually lead to soil treatment area failure.

Soil Absorption Field Maintenance

To properly maintain your septic system's soil treatment area:

- Avoid vehicular traffic and construction activities in the soil treatment area. (Rule of thumb: Nothing larger than a riding lawn mower should be on top of your septic system)
- Divert runoff water from your lawn, roof, and basement drains away from the soil absorption field.
- Do not plant trees or shrubs in or adjacent to the soil absorption field.

Green Turfgrass over the Trenches

When a septic system soil treatment area overloads hydraulically, the trenches are filled with wastewater. Hydraulic overloading occurs when the soil surrounding the trenches cannot absorb and disperse high wastewater flows produced by the home. When the soil cannot absorb and disperse all the wastewater, the trench fills like a bathtub. The nutrient-rich wastewater moves through the soil pores above the trenches to the surface, resulting in lush green turfgrass over the absorption field. In dry months, the green stripes over the trenches offer a stark contrast to the grass between the trenches.

Wet Soils and Turfgrasses

As bad as dry soils are for turfgrasses, wet soils can be just as bad. Oxygen in the soil is required for root growth. When oxygen levels become low, roots become shorter and shorter. Short roots in a scenario such as this aren't a concern for water uptake, but access to some nutrients in the soil may be limited. If the load to the septic system is decreased and water levels decrease, the short turfgrass roots can be of great concern depending on the dryness of the year. Although rooting is an important part of wet soils, other factors can be of concern as well. Wet soils can result in increased thatch production due to reduced populations of soil microbes to break down dead plant parts. Increased thatch layers can lead to scalping when mowing. Thatch can also lead to raised crowns

Drought rankings of commonly used turfgrasses

Very good – bermudagrass
Good – zoysiagrass
Medium – tall fescue
Poor – Kentucky bluegrass
Very poor – perennial ryegrass

and root systems growing in the thatch layer. Exposed crowns and roots can lead to severe heat stress during the hottest times of the year. Thatch is also known to be a favorable medium for the survival of turf disease causing pathogens. When high pathogen populations are coupled with succulent and weak turfgrass, the result is often diseased turf.

If you have properly maintained your septic system over its lifetime and you observe green stripes over the soil

absorption field during extended dry periods, decrease the load on the system by:

- Installing aerators on faucets and showerheads to decrease flow
- Replacing older appliances such as toilets, clothes washers, and dishwashers with newer, water-saving units
- Reducing lengthy showers

- Washing your clothes at a laundromat
- Decreasing the number of washing cycles

If you decrease water use but green turfgrass stripes persist for a few months, contact your county health department for additional advice. These health professionals will have a list of septic system professionals in your area who can assist in troubleshooting

your problem. Possible solutions include adjusting flows in your septic system distribution box or adding additional trenches to an undersized septic system.

Remember: A properly functioning septic system relies on the soil's ability to absorb wastewater. A septic system owner's primary responsibility is to protect human health and the environment. Modifying the system to be aesthetically pleasing is secondary. 💧

For more information

Visit the Home and Environment web page at <http://www.ca.uky.edu/enri/henv/>.

Reprinted from the University of Kentucky Cooperative Extension.

USGS Details Climate Change

Effects on Water Availability in 14 Local Basins Nationwide

Climate change projections indicate a steady increase in temperature progressing through the 21st century, generally resulting in snowpack reductions, changes to the timing of snowmelt, altered streamflows, and reductions in soil moisture, all of which could affect water management, agriculture, recreation, hazard mitigation, and ecosystems across the nation. Despite some widespread similarities in climate change trends, climate change will affect specific water basins in the U.S. differently, based on the particular hydrologic and geologic conditions in that area.

New USGS modeling studies project changes in water availability due to climate change at the local level. So far, the USGS has applied these models to 14 basins:

- Sprague River Basin, Oregon
- Sagehen Creek Basin, California
- Feather River Basin, California
- Naches River Basin, Washington
- Yampa River Basin, Colorado

- East River Basin, Colorado
- Black Earth Creek Basin, Wisconsin
- Flint River Basin, Georgia
- Pomperaug River Watershed, Connecticut
- Clear Creek Basin, Iowa
- Cathance Stream Basin, Maine
- Trout Lake Basin, Wisconsin
- Starkweather Coulee Basin, North Dakota
- South Fork of the Flathead River, Montana

"The advantage of these studies is that they demonstrate that there is not just one hydrological response to climate change: the predictions account for essential local factors that will govern the timing, severity, and type of impact, whether it be water shortage, drought, or flood," said USGS Director Marcia McNutt. "This is exactly the sort of information communities need to know now, because we are unlikely to see a 'water-as-usual' future."

These local projections are based on General Circulation Models (GCM) that predict how climate change will affect temperature, precipitation, and

emissions for large regional areas. The USGS's Precipitation Runoff Modeling System (PRMS) applies information from the downscaled GCM projections to local watersheds, where impacts of climate change on water availability will depend on local conditions.

These local-scale hydrologic projections will allow managers to plan for changes in water resources that are specific to their area.

For example, the USGS models project that changes to snow pack in the Sprague River Basin in Oregon could cause annual peak streamflows to occur earlier in the spring as overall basin storage decreases, which may force managers to modify storage operation and reprioritize water deliveries for environmental and human needs. Reduced snowpack in headwaters of the Colorado River could affect the amount and timing of streamflow to the Colorado River and also impact important recreation areas. Portions of

Maine may see higher streamflows which could affect populations of endangered Atlantic salmon. Areas of the already drought-stressed Flint River Basin, one of Atlanta's primary drinking water supplies, are projected to become even drier.

"This is exactly the sort of information communities need to know now, because we are unlikely to see a 'water-as-usual' future."

The results for each basin present a complex story due to uncertainty associated with the future climate projections and their effect on

the hydrological response of the different geographical regions of the nation.

Detailed information about watershed responses to climate change can be found at <http://pubs.usgs.gov/sir/2011/5077/>. Additionally, a collection of USGS studies that contributed to these basin-wide analyses was published in the journal *Earth Interactions*.

The downscaled GCM models are obtained from the World Climate Research Programme's Coupled Model Intercomparison Project phase

Source Water Monitoring and Hydraulic Fracturing

Testing Helps Water Operators and Well Owners Understand Water Quality

To extract natural gas from geologic deposits a process called hydraulic fracturing or “fracking” is used. This process uses a large volume of water and added chemicals that are injected into the gas well under high pressure to create cracks, seams, and fissures in the deep rock layers within which the gas is trapped. The newly created fissures allow the gas to be extracted more freely and efficiently.

When the frac fluid returns to the surface it is referred to as return or flowback fluid and should be considered industrial wastewater. The flowback wastewater typically has a very different chemical composition than the frac mixture that went down the well. This is because frac fluid often mixes with deep geologic groundwater, referred to as “formation water” or “natural brine,” that has a high concentration of dissolved substances. In many cases the flowback wastewater is considerably saltier than seawater. The composition of flowback wastewater is variable depending on the makeup of the frac fluid and the local geology. In the Marcellus Shale region of Pennsylvania and West Virginia, the flowback wastewater shows highly elevated concentrations of total dissolved solids (TDS), barium, iron, sodium, chloride, bromide, and dissolved organic carbon. Other potential contaminants include volatile organic compounds (VOCs), dissolved methane, oil and grease, and radionuclides.

Testing Is a Must

When private well owners or public water systems have source water—either groundwater or surface water—close to a drilling operation they worry about what could happen and want to stay vigilant to protect themselves and their communities. One way to stay on top of the situation is to have the source water tested before drilling starts thereby establishing a baseline. After the drilling and hydraulic fracturing starts, conduct water tests at regular intervals (at least every six months) for several years after the drilling stops.

One common contaminant of flowback wastewater that is of particular concern to drinking water plant operators is bromide. While bromide is not considered to be a direct health risk, when it is present in chlorinated water it reacts to form bromine. Bromine, the elemental form of bromide, belongs to the same group of elements (the halogens) as chlorine, and has similar properties, including some disinfection capability. However, just as chlorine can react to form disinfection by-products (DBPs) in the presence of organic matter, so can bromine. The presence of bromide in the source water can lead to the formation of a wide array of DBPs that are a mixture of chlorinated and brominated compounds.

This can create a problem for drinking water operators because one resulting bromine compound, hypobromous acid, has been found to react much more readily with organic matter than its chlorinated counterpart, hypochlorous acid. This means that the resulting DBPs may be more highly brominated than

might be expected given the initial concentration of bromide in the source water. Further, because bromine/bromide is heavier than chlorine/chloride, the more heavily brominated the DBPs become, the more likely the water system is to find itself in violation of DBP drinking water standards.

Because of the extremely high concentration of dissolved solids in flowback wastewater, frequent monitoring for TDS is important. Fortunately, TDS can be monitored easily with a meter. The dissolved solids are primarily in ionic form and carry a slight electrical charge.

Electrical conductivity meter readings are a good approximation of TDS. Water systems with well drilling occurring within their source water area may want to consider the installation of continuous reading conductivity meters in their source water as an early warning system for possible wastewater spills.

Drinking water systems and private well and spring owners should know and have an established baseline or history of the characteristic chemical concentrations of their drinking water source. Any significant changes to their baseline indicators should be viewed as a potential sign that their systems are being influenced by external factors and should trigger additional investigations.

For More Information

The National Environmental Services Center has two articles related to water and shale gas extraction. The first, “Communities, Water Sources and Potential Impacts of Shale Gas Development,” is available at

www.nesc.wvu.edu/waterwedrink while the second, Tech Brief: Oil and Gas Extraction and Source Water Protection may be downloaded from www.nesc.wvu.edu/pdf/DW/publications/ontap/tech_brief/TB54_OilGasExtraction.pdf.

References

- Baker, Lewis. 2011. “Part I: Impacts to Drinking Water Supplies from Hydraulic Fracturing.” Webinar presentation (July 26), National Rural Water Association.
- Center for Rural Pennsylvania. 2011. The Impact of Marcellus Gas Drilling on Rural Drinking Water Supplies. (October). Accessed at: www.rural.palegislatore.us/documents/reports/Marcellus_and_drinking_water_2011_rev.pdf
- Fallon, Sandra. 2011. “Communities, Water Sources and Potential Impacts of Shale Gas Development,” The Water We Drink: Free Articles for Your Publication, available at www.nesc.wvu.edu/waterwedrink.
- Mylykangas, Tiaa. 2004. Prevention of Bromine-Containing Disinfection By-Products During Drinking Water Treatment. Finland National Public Health Institute. (February). Accessed at: www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_a/2004a3.pdf
- U.S. House of Representatives, Committee on Energy and Commerce. 2011. Chemicals Used In Hydraulic Fracturing. Washington DC: U.S. House of Representatives. ♦
- Reprinted from OnTap, Volume 12, Issue 2, Fall/Winter 2012. OnTap is published by the National Environmental Services Center. Visit www.nesc.wvu.edu.*

Women in Water

By Christine Spitzley, Greater Lansing Area Groundwater Guardian Team

Eighty-five percent of American Water Works Association (AWWA) members are men. Discouraged by these numbers and concerned about what it means for the future of the industry, Michigan Section AWWA members and co-chairs of the Management and Administrative Practices (MAAP) Committee, Jaime Halm and Christine Spitzley, decided to formally reach out to other Michigan women in the industry.

With the support and vision of the MAAP Committee and the Michigan Section Board of Trustees, they began by hosting a Women's Networking Event at the Michigan Section AWWA Conference in 2009. The premise of the event was simple, bring together women, make connections and offer the support of the Michigan Section. What began as a casual breakfast in 2009 has evolved into a networked group of women who believe in what they do and want other women to explore the potential of a career in the water industry.

At the 2010 Michigan Section AWWA Conference, Gina Wommack, Vice President at CH2M Hill, shared the specific steps her company has taken to include, mentor and encourage

women. Her presentation sparked additional conversations throughout that conference about the evolving roles of women in the work place especially as it relates to the water industry.

Based on these discussions, in 2011 Halm and Spitzley secured funding from the Michigan Section and collaborated with Dr. Stephen Gasteyer at Michigan State University to survey members of the Michigan Section in order to obtain some baseline information about the feelings, attitudes and realities women face in the water industry in Michigan.

The resulting study is titled "Gender and Workforce Issues in the Water Industry: Some Preliminary Insights from Michigan." Dr. Gasteyer first shared the concept and initial findings of the study at the 3rd Annual Women's Networking Event in September, 2011. He also presented his study at the American Water Works Association Conference in Dallas, Texas in June 2012.

On September 11, 2012, the 4th Annual Women's Networking Event took place at the Michigan Section's Annual Conference. Halm and Spitzley reviewed the study and proposed three ideas for discussion: a mentor program, the creation of profiles

of women in the water industry and the issue of diversity. With the use of an instant data collection system similar to that used on "Who Wants to be a Millionaire," they were able to pose questions and receive real time, anonymous answers from participants.


Halm and Spitzley first proposed the idea of an informal mentor program coordinated by the Michigan Section. The support for the idea was overwhelmingly positive. There was strong interest from women who were willing to serve as mentors as well as those who would be interested in having a mentor. Interestingly, women at all stages in their careers felt they would benefit from a mentor relationship.

The second idea, to create a set of profiles of women in the water industry in various roles, was also supported. The majority of women present were willing to share their story and promote profiles through various networks. The goal of developing the profiles is to put faces and stories to the many disciplines that make up the water industry.

The third discussion was about the issue of diversity. What is diversity? What does it look like? Is it the role of associations like AWWA to provide education

and training or is that the role of employers? It was noted that those in the private sector were much more likely to have gone through mandated diversity training while it is optional for those in the public sector. The opinions and beliefs shared on this topic varied greatly. While no consensus was reached, it did provide some initial feedback on the topic.

The next steps for this group include the launch of the mentor program, publishing profiles of women in the water industry and continuing the dialogue about diversity. In addition, the MAAP Committee is exploring ways to improve the support of all water industry professionals by their employers, to bring more women into the field, and encourage veterans to consider the water industry as their next career.

For additional information about the work of the Michigan Section MAAP Committee, please contact Jaime Halm, Lab Manager, Wyoming, MI at Halmj@wyomingmi.gov or Christine Spitzley, Senior Environmental Programs Planner, at Tri-County Regional Planning Commission at cspitzley@mitrcpc.org. 


Climate Change, *continued from page 5*

3 multi-model dataset archive. The USGS PRMS models were developed as part of the USGS National Research Program (NRP) in cooperation with USGS Water Science Centers. The NRP develops new information, theories, and techniques to anticipate, understand, and

solve problems facing resources managers and is a national leader in understanding the effects of climate change on water resources.

These USGS models are just one of several tools developed and used by agencies within the Department of the Interior to

study potential impacts from climate change and to provide tools to resource managers to adapt to those changes. For example, the Bureau of Reclamation recently unveiled a user-friendly tool for calculating future streamflow and water supplies at 195 sites in the

western United States to help increase accessibility of science-based information and ease understanding of how climate variations will impact water availability for local communities. Find more information at http://gis.usbr.gov/Streamflow_Projections/. 

Williamson to Receive Kremer Award

Longtime Groundwater Foundation Board Member Earns Groundwater Achievement Honor

Dayle Williamson, Greater Nebraska District Manager for United States Senator Ben Nelson and Groundwater Foundation Board member for 20 years, has been selected to receive the 2012 Maurice Kremer Groundwater Achievement Award.

The award was named for Maurice Kremer, who spent 20 years in the Nebraska Legislature where he was best known for his contributions toward protecting the state's water resources. In honor of his work, the award was established in 1985 to recognize Nebraskans who have made a substantive contribution to the conservation and protection of Nebraska's groundwater.

"I always had the highest respect for this great gentleman," said Williamson about Kremer. "Maurice Kremer was dubbed as 'Mr. Water' with great respect for all of the work he did during the 70s when many new state and federal environmental laws went into effect."

Williamson worked with Senator Kremer for many years as Director of the Natural Resources Commission. "As a farmer and irrigator, [Kremer] came to the Legislature with a great recognition of the value of groundwater," said Williamson. "He had lived through the drought and depression of the 1930s and remembered crops withering each and every year in Hamilton County. As well drilling techniques and pumps improved, he gained firsthand knowledge of the value of groundwater on his farm."

"Dayle Williamson is a worthy recipient of this award," said Groundwater Foundation President Jane Griffin. Williamson joined Senator Nelson's staff in 2001 and has focused on agriculture and military support.

Prior to that time he had a long career in State Government, beginning in 1958. He later served as Executive Secretary of the Nebraska Soil and Water Conservation Commission during the development of "Nebraska's State Water Plan" in the early 1970s. After reorganization to the Natural Resources Commission, Williamson served several Governors as an agency director for a period of 30 years.

Selection Committee member Don Kraus points to Williamson's accomplishments for Nebraska's water resources as Director of the Nebraska Natural Resources Commission. "Dayle worked with producers for common sense approaches to Federal programs that would affect Nebraska resource management. Dayle also helped to guide many of the Commission studies on natural resource management that provided guidance for future water legislation."

Williamson began his agricultural career with the University of Nebraska Agricultural Extension Service as a county agent. After graduating from the University of Nebraska, he spent two years in the U.S. Army, and spent the next 30 years in his military career as a member of the Nebraska Army National Guard, reaching the rank of Brigadier General before retiring.

"I have worked with Dayle since 1969 in my days in the Nebraska State Office of Planning and Programming. Through the years I have never ceased to be amazed by his never ending enthusiasm and optimism," said selection committee member Bob Kuzelka.

Williamson will be presented with the award at the Nebraska Water Resources Association and Nebraska State Irrigation Association Conference on

November 19, 2012 in Kearney, Nebraska.

The Kremer Award is chosen by a selection committee appointed by The Groundwater Foundation Board of Directors. Selection committee members include: Don Kraus, Central Nebraska Public Power and Irrigation District; Jim Goeke, University of Nebraska

Conservation and Survey Division; Bob Kuzelka, University of Nebraska School of Natural Resources; and, Jane Griffin, The Groundwater Foundation.

For more information about the Kremer Award and past winners, please visit <http://www.groundwater.org/aw/kremerbiographies.html>. ♦



Dayle Williamson

PAST KREMER RECIPIENTS

2011 Lee Orton • 2010 Michael Jess • 2009 Vance Anderson
• 2008 Ann Bleed • 2007 Jim Cook • 2006 Senator Ed Schrock
• 2005 Roger Patterson • 2004 Darrell Watts • 2003 Chris Beutler • 2002 Eugene Haarberg • 2001 Jim Goeke • 2000 Wayne Madsen • 1999 Richard Harnsberger • 1998 Les Sheffield • 1997 Robert B. Daugherty • 1996 Frank A. Smith
• 1995 Fred Salmon and Family • 1994 Virginia Smith • 1993 Robert B. Crosby • 1992 Ted Filipi • 1991 Ralph Marlette
• 1990 Warren Fairchild • 1989 Val Kuska • 1988 Eugene Reed • 1987 Maurice Kremer • 1986 Vincent Dreeszen



Make an Impact – Become a Member

How can you make an impact? By becoming a Groundwater Foundation member today and ensuring that people learn about and know how to protect groundwater for future generations. You can help make it happen, simply by taking a few minutes and joining.

The Groundwater Foundation's programs and projects work with youth, communities, businesses, and individuals to help educate people about and protect the resource that over half of us rely on for drinking water and that helps to grow our food - groundwater!

The support of our members makes these efforts possible. Members benefit by:

- Staying up-to-date on groundwater issues.
- Connecting with others who understand the importance of groundwater.
- Learning what you can do to protect groundwater.
- Earning a discount on Groundwater Catalog products and Groundwater Foundation event registrations.

Become a member today! Join online at www.groundwater.org/au/membership.html or by calling 1-800-858-4844. 💧

Project Seeks to Bridge the Gap

A project funded by the Nebraska Environmental Trust is working across Nebraska to help bridge the gap between understanding our actions and their impact on water quality.

The "Bridging the Gap in Source Water Protection" project began earlier this year and will help foster groundwater protection and conservation actions in Nebraska homeowners and create awareness of best management practices by showcasing efforts with proven environmental benefits and provide homeowners with tools to replicate these practices.

By working with proactive communities, businesses, and other sites, the GF has worked to incorporate educational activities into existing events and showcase positive efforts.

The Groundwater Foundation participated in a variety of events across Nebraska as part of this project, including the Earth Day Celebration at the Lincoln Children's Zoo,

Outdoor Discovery Days at Platte River State Park, a workshop for teachers at the Lake McConaughy Visitor's Center near Ogallala, two lunch and learn sessions at Assurity Life Insurance in Lincoln, the Water Quality Open golf tournament at Quarry Oaks Golf Course near Louisville, the Harvest Festival in Gothenburg, and many more. Event participants learned about the value of water to plants through the Growing with Groundwater activity and built their own mini-terrarium, made groundwater protection bracelets to help remind them of different activities they can do in their homes to protect and conserve groundwater, and answered trivia questions about groundwater, recycling, and green practices.

The Bridging the Gap project will continue into 2013 and 2014. Information, downloadable handouts, webinars, and other resources will be posted to the Foundation's website as part of the Bridging the Gap project at www.groundwater.org. 💧

Need an Activity Idea?

Shop the Groundwater Catalog for great hands-on, brains-on activities for the classroom and beyond!

Making Discoveries

What is an aquifer? How does groundwater get contaminated? Find the answers to these questions and others in *Making Discoveries*. This activity guide helps you teach others about groundwater, surface water, wetlands, and pollution through entertaining, hands-on experiments and activities. *Making Discoveries* is perfect for planning a Water Awareness Day, water

festival, or teaching a classroom about groundwater contamination.

Making a Bigger Splash

Featuring effective water education and festival activities, *Making a Bigger Splash* will become a favorite addition to your festival library. All of the activities in this collection are fun, hands-on, brains-on ways to teach important water concepts. The book is full of great ways to add fresh elements to already established events, first time festivals, and classrooms.

Circles of Fun

Teach audiences of all ages to appreciate water use and food production with fun hands-on activities included in the book on CD-Rom. Activities cover the history of irrigation, modern water saving techniques currently being used on farms, irrigation-related vocabulary terms and definitions, full color photographs of irrigation methods, games, puzzles, answer keys, and more.

Build a working model of a center pivot from a drinking straw, experiment with spray bottles to discover the value of different sprinkler patterns, and make original artwork with irrigation equipment are just a few of the activities you can teach with this instructional guide.

Activities have been correlated to National Education Standards and cover multiple disciplines including science, visual arts, technology, geography, history, mathematics, and more. Formatted as Adobe® PDF, the activity instructions, handouts, and visual aids are ready to be printed in the quantity required by your educational needs.

Find these products and more in our online shop at <http://www.groundwater.org/shop/default.asp>. 💧



▲ Participants at Bridging the Gap project events at WaterFest (top) and the Lincoln Children's Zoo build mini terrariums as they learn about groundwater-friendly practices being implemented at sites across Nebraska.



Board of Directors:

Warren Arganbright
Chair

Jay Beaumont
Vice Chair

Lori Davison
Secretary

James Burks
Treasurer

Andy Belanger
Ann Bleed
Jane Griffin
Cindy Kreifels
Cathy Lotzer
Chandler Mazour
E. Robert Meaney
Stephen Mossman
Lee Orton
Steve Seglin

**Technical
Advisory Committee:**

Michael Allen
Angela Amack
Marge Cook
Hyder Houston
Bob Kuzelka
Pat Mangan
Mike Shulters

The Aquifer

Fall 2012
Volume 27, Number 2

The Aquifer is published
quarterly by:

The Groundwater Foundation
P.O. Box 22558
Lincoln, NE 68542-2558
Phone: 402-434-2740
E-mail: info@groundwater.org
Web: www.groundwater.org

The Groundwater Foundation is a nonprofit educational foundation dedicated to educating the public about the conservation and protection of groundwater.

© 2012 The Groundwater Foundation. All rights reserved. Reproduction of material permitted with full attribution to copyright owner.

The Aquifer is a registered trademark of The Groundwater Foundation and is published quarterly. The views expressed in articles appearing in *The Aquifer* are those of the authors and do not necessarily represent the view of The Groundwater Foundation, individual members, or its Board of Directors.

Aquifer Staff:

Editor:
Jennifer Wemhoff
jwemhoff@groundwater.org

Design & Illustration:
Carla Otrebosky

Editorial Contributors:
Cindy Kreifels
Jane Griffin

♻️ Please consider the environment before printing.

**Follow The Groundwater
Foundation Online!**

We're on Facebook,
Twitter and YouTube



Membership, Materials and Publications Order Form

ITEM	PRICE	QTY	AMOUNT
Groundwater Foundation Memberships			
Ripple Creator	\$35-\$74		
Big Splash Supporter.....	\$150-\$249		
Groundwater Defender.....	\$500-\$999		
<input type="checkbox"/> New Membership <input type="checkbox"/> Renewal Your contribution as a Groundwater Foundation member helps support the Foundation's educational programs. You will also receive <i>The Aquifer</i> , a 10% discount on all Foundation Catalog products, and reduced registration fees to all Groundwater Foundation events. Visit www.groundwater.org for more information.			
Awesome Aquifer Kit Build your own working aquifer model! Includes instructions for six advanced groundwater demonstrations.	\$34.95 10 or more at \$32.95		
Circles of Fun Teach audiences of all ages to appreciate water use and food production with fun hands-on activities. CD-ROM.	\$19.95		
Making A Bigger Splash: A Collection of Water Education and Festival Ideas Hands-on activities, games and science experiments.	\$16.45		
Rainmakers: A Photographic Story of Center Pivots Center pivots are used world-wide to bring food to our tables, over 100 intriguing photos enable readers to view the beauty and marvel of this unique technology. Great gift idea.	\$24.95		
NAME _____ ORGANIZATION _____ ADDRESS _____ CITY _____ STATE _____ ZIP _____ DAYTIME PHONE _____ EMAIL ADDRESS _____		Subtotal: <i>Groundwater Foundation members, don't forget to subtract 10% from the subtotal for your member discount. Sorry, discount cannot be used on Foundation memberships (new or renewal).</i>	
PLEASE CHARGE MY: <input type="checkbox"/> VISA <input type="checkbox"/> MASTERCARD CARD # _____ EXPIRES _____ 3-DIGIT SECURITY CODE / SIGNATURE OF CARDHOLDER _____		Shipping Charge: <i>See table below at left. *Please call 402-434-2740 for orders totaling \$200 or more, for orders shipped outside of the United States, or for special rush options.</i>	
ENCLOSED, PLEASE FIND: <input type="checkbox"/> CHECK <input type="checkbox"/> MONEY ORDER		Sales Tax: <i>Nebraska residents only: please include appropriate sales tax for your area. Do not add sales tax to membership dues.</i>	
Total Amount Enclosed:			

Send completed order form and payment to:
The Groundwater Foundation,
P.O. Box 22558, Lincoln, NE 68542-2558

Shipping Charge Table*

Total Price of Items	Shipping Charge
\$0.00 - 14.99	\$10.79
15.00 - 29.99	13.72
30.00 - 49.99	15.88
50.00 - 74.99	18.35
75.00 - 99.99	20.20
100.00 - 149.99	22.36
150.00 - 199.99	24.82