Celebrating, Educating, Connecting
2015 Groundwater Foundation National Conference
by Jennifer Wemhoff, The Groundwater Foundation

Throughout this year of celebrating The Groundwater Foundation’s 30th anniversary, we’ve been fixated on the number 30. The 2015 National Conference was held October 20-22, 2015 in Lincoln, Nebraska and culminated this celebration. In one last tribute to 30, here are 30 amazing things that happened at The Groundwater Foundation’s 2015 National Conference:

1. Our groundwater family expanded to include everyone at the conference. New friends were made, and old friends reconnected.

2. Susan Seacrest returned, and proved that her energy and passion for groundwater are ageless. As she said in her Sparkplug Breakfast remarks, “Coming back to groundwater is like coming home!”

3. Seacrest was also honored with the Maurice Kremer Groundwater Achievement Award in recognition of her work in founding The Groundwater Foundation.

4. Mogens Bay, Chairman and CEO of Valmont Industries talked about the relationship between advanced irrigation technology and the world’s food security.

5. Lincoln had gorgeous weather the week of the conference. October weather in Nebraska can be unpredictable!

6. We celebrated the awesomeness of Groundwater Guardians and Green Sites as they mingled with conference participants during lunch. Catherine Chertudi, Boise, Idaho Groundwater Guardian team, talked about inspiration.

7. Snippets of classic 80s music by Aha and Simple Minds bookended the 30th anniversary celebratory dinner. “Take on Me” and “Don’t You (Forget About Me)” and were both released in 1985, as part of a look back to the year The Groundwater Foundation began.

8. Lincoln-area Girl Scouts demonstrated fun, hands-on groundwater education activities at the Soak It All Up workshop. Frannie the Fish tells the story of water quality and wildlife, and Awesome Aquifers illustrates groundwater concepts in a mini groundwater model.

9. We honored Nebraska groundwater legend Wayne Madsen. Wayne’s son, Monty and his wife, Erlene, made a generous contribution in Wayne’s name to The Groundwater Foundation endowment to ensure groundwater education for the next 30 years and beyond.

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NASA Confirms Evidence of Liquid Water on Mars

Recent findings from NASA's Mars Reconnaissance Orbiter (MRO) provide the strongest evidence yet that liquid water flows intermittently on present-day Mars.

Using an imaging spectrometer on MRO, researchers detected signatures of hydrated minerals on slopes where mysterious streaks are seen on the Red Planet. These darkish streaks appear as seasonal features, often have been described as possibly related to liquid water. The new findings of hydrated salts on the slopes point to what that relationship may be to these dark features. The hydrated salts would lower the freezing point of a liquid brine, just as salt on roads here on Earth causes ice and snow to melt more rapidly. Scientists say it's likely a shallow subsurface flow, with enough water wicking to the surface to explain the darkening.

"We found the hydrated salts only when the seasonal features were widest, which suggests that either the dark streaks themselves or a process that forms them is the source of the hydration. In either case, the detection of hydrated salts on these slopes means that water plays a vital role in the formation of these streaks," said Lujendra Ojha of the Georgia Institute of Technology (Georgia Tech) in Atlanta, lead author of a report on these findings published Sept. 28 by Nature Geoscience. Ojha first noticed these puzzling features as a University of Arizona undergraduate student in 2010, using images from the MRO's High Resolution Imaging Science Experiment (HiRISE). HiRISE observations now have documented RSL at dozens of sites on Mars. The new study pairs HiRISE observations with mineral mapping by MRO's Compact Reconnaissance Imaging Spectrometer for Mars (CRISM).

The spectrometer observations show signatures of hydrated salts at multiple RSL locations, but only when the dark features were relatively wide. When the researchers looked at the same locations and RSL weren't as extensive, they detected no hydrated salt.

Ojha and his co-authors interpret the spectral signatures as caused by hydrated minerals called perchlorates. The hydrated salts most consistent with the chemical signatures are likely a mixture of magnesium perchlorate, magnesium chloride and sodium perchlorate. Some perchlorates have been shown to keep liquids from freezing even when conditions are as cold as minus 94 degrees Fahrenheit (minus 23 Celsius), On Earth, naturally produced perchlorates are concentrated in deserts, and some types of perchlorates can be used as rocket propellant.

Perchlorates have previously been seen on Mars. NASA's Phoenix lander and Curiosity rover both found them in the planet's soil, and some scientists believe that the Viking missions in the 1970s measured signatures of these salts. However, this study of RSL detected perchlorates, now in hydrated form, in different areas than those explored by the landers. This also is the first time perchlorates have been identified from orbit.

MRO has been examining Mars since 2006 with its six science instruments.

"The ability of MRO to observe for multiple Mars years with a payload able to see the fine detail of these features has enabled findings such as these: first identifying the puzzling seasonal streaks and now making a big step towards explaining what they are," said Rich Zurek, MRO project scientist at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California.

For Ojha, the new findings are more proof that the mysterious lines he first saw darkening Martian slopes five years ago are, indeed, present-day water.

"When most people talk about water on Mars, they're usually talking about ancient water or frozen water," he said. "Now we know there's more to the story. This is the first spectral detection that unambiguously supports our liquid water-formation hypotheses for RSL."

The discovery is the latest of many breakthroughs by NASA's Mars missions.

"It took multiple spacecraft over several years to solve this mystery, and now we know there is liquid water on the surface of this cold, desert planet,"
Using Bacteria to Remove Nitrogen from Groundwater

USGS scientists have conducted the first-ever field measurements of anammox activity in groundwater, demonstrating that nitrogen removal from groundwater can occur through the action of naturally occurring bacteria. This research was conducted in collaboration with partners from the Virginia Institute of Marine Science and the University of Connecticut.

Anammox, shorthand for anaerobic ammonium oxidation, is a process carried out by naturally occurring bacteria that can simultaneously remove ammonium and reduce nitrogen gases, combining the two to produce harmless nitrogen gas.

Over the past 100 years, humans have drastically altered the global nitrogen budget by fixing nitrogen gas from air to produce fertilizer in the form of ammonium and nitrate. Nitrate and ammonium are now prevalent fixed nitrogen contaminants that may be found in surface water and groundwater worldwide. Until fixed nitrogen is converted back to nitrogen gas, it remains as a potential water contaminant. Anammox and denitrification are the only two processes that can remove excess fixed nitrogen by chemically changing it back to nitrogen gas.

“Virtually all terrestrial and aquatic environments now contain extra fixed nitrogen from human activities, including groundwater, the planet’s primary freshwater resource,” said Richard Smith, a USGS research hydrologist and lead author of the investigation.

The detailed findings of the investigation were recently published in *Environmental Science and Technology*.

The paper documents the competition between anammox and denitrification for nitrogen oxides and explores the effect of altered organic carbon concentrations on that competition. The results of this study indicate that anammox does occur in groundwater, that it can be an important mechanism for fixed nitrogen removal, and that it should be included when interpreting subsurface geochemistry and constructing groundwater nitrogen budgets.

Co-authors on the study include USGS scientist J.K. Böhlke; Bongkeun Song from the Virginia Institute of Marine Science; and Craig Tobias from the University of Connecticut, Department of Marine Science. The National Science Foundation provided additional research support.

Projects to Research the Impact of Drought on Water Quality

The U.S. Environmental Protection Agency (EPA) awarded $4 million to four institutions to conduct research to combat the effects of drought and extreme events on water quality on watersheds and drinking water utilities.

“Anammox bacteria can supply its own organic carbon by fixing carbon dioxide,” Smith continued, “naturally occurring anammox bacteria are ideally suited for life in groundwater, where they could potentially be important for fixed nitrogen removal. While practical applications are still in the distant future, this process could be particularly important where groundwater is discharging to surface waters and coastal environments.”

Working at a carefully monitored USGS groundwater study site at Cape Cod, Massachusetts, the research team found that anammox was active in the subsurface in a variety of geochemical conditions, even where groundwater ammonium concentrations were low. The rates of activity were relatively low, but anammox could potentially affect inorganic nitrogen concentrations in situations where groundwater residence times are sufficiently long.

The U.S. Environmental Protection Agency released the following statement: “It seems that the more we study Mars, the more we learn how life could be supported and where there are resources to support life in the future.”
10. Post-conference tour participants learned about Lincoln’s saline wetlands, the remains of a large salt basin. They also helped reintroduce endangered species Salt Creek Tiger Beetle larvae back into Salt Creek.

11. The future is now – Back to the Future Day was October 21, 2015. While we don’t have flying card or self-drying clothes (yet), we have helicopters that can “drill” virtual test holes, we have satellites that use gravity to track groundwater storage, and other amazing technologies that help us protect and conserve groundwater.

12. The Groundwater Foundation Board of Directors held a strategic planning session with staff in conjunction with the conference. Every board member was in attendance, and a vision for the future of The Groundwater Foundation began to take shape.

13. H₂O Heroes workshop participants took part in a wide-ranging discussion about challenges and successes in addressing specific groundwater concerns in their communities.

14. Connections were made by conference participants, finding common ground, common challenges, and learning from each other’s experiences.

15. None of the computers, projectors, or other associated technologies had major malfunctions.

16. Groundwater was launched into orbit, hearing from Jay Famiglietti of NASA and UC-Irvine about how NASA is using the power of satellites to track the changes in groundwater storage.

17. The California drought was discussed with optimism for the future, in terms of groundwater management, public awareness, and behavior change.

18. Exhibits provided additional learning and networking around pharmaceutical disposal, irrigation technology, outreach and partnerships, contaminant management, and more.

19. Laughs and guffaws punctuated the dinner presentation of John Heaston from Field to Market. Heaston gave a humorous take on water resource management.

20. All Groundwater Foundation staff members were able to attend, and conference attendees got to meet each member of our team – Communications Manager Jennifer Wemhoff, Executive Vice President Cindy Kreifels, Financial Services Accountant Doug Sams, Database Manager Lori Davison, President Jane Griffin, Program Managers Jessica Wheeler and Anthony Lowndes.

21. Israel’s system of water management was presented as a case study by Naty Barak of Netafim.

22. Groundwater myths were debunked by William Alley of the National Ground Water Association, while talking about the challenges in effectively communicating groundwater science with the public.

23. Attendees went home with real-world tools and new ideas to help protect groundwater in their communities. Expert speakers shared their knowledge and experience on topics from groundwater protection through the lens of economic development.
private well testing barriers, effective partnerships, and climate change.

24. Pre-conference tour participants saw major urban redevelopment areas on the east and west ends of Lincoln's downtown areas. The West Haymarket area transformed blighted floodplain into an entertainment district. East Downtown features Union Plaza, an urban park designed and inspired by water and flood control.

25. Jim Goeke and Karen Amen wrapped up the conference by asking attendees about their takeaways and what they planned to do when they returned to their communities.

26. We were catapulted 30 years into the future by University of Nebraska students Kate Boone and William Avery, who shared how their interest in water wasn’t piqued until college, because water wasn’t talked about in high school other than its properties and molecules. Groundwater Foundation President Jane Griffin shared tools and resources that can help fill these gaps in groundwater education.

27. We ate. A lot. And enjoyed each others’ company.

28. Educators received Awesome Aquifer Kits to take back to their classrooms as part of the Wellspring of Water Activities and Soak it All Up workshops. The kits, along with computer groundwater modeling software and educational mobile apps, were demonstrated to help educators replicate the activities in their classrooms.

29. The common passion of groundwater protection united people from different backgrounds, with different interests and experiences.

30. We all were recharged to protect groundwater in our communities!

A compilation of all presentations and exhibit descriptions is available on The Groundwater Foundation’s website: www.groundwater.org/conference.html.

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Mapping the Earth’s Groundwater

New Study Looks at the Globe’s Total Supply of Groundwater

roundwater: it’s one of the planet’s most precious natural resources. It ranges in age from months to millions of years old. There’s increasing global demand to know how much we have and how long before it’s tapped out.

For the first time since a calculation of the global volume of groundwater was attempted in the 1970s, an international group of hydrologists has produced the first data-driven estimate of the Earth’s total supply of groundwater. The study was published in *Nature Geoscience* by Dr. Tom Gleeson of the University of Victoria with co-authors at the University of Texas at Austin, the University of Calgary, and the University of Göttingen.

The bigger part of the study is the “modern” groundwater story. The report shows that less than six percent of groundwater in the upper two kilometres of the Earth’s landmass is renewable within a human lifetime.

“This has never been known before,” says Gleeson. “We already know that water levels in lots of aquifers are dropping. We’re using our groundwater resources too fast—faster than they’re being renewed.”

With the growing global demand for water, this study provides important information to water managers and policy developers as well as scientists from fields such as hydrology, atmospheric science, geochemistry and oceanography to better manage groundwater resources in a sustainable way, he says.

Using multiple datasets (including data from close to a million watersheds), and more than 40,000 groundwater models, the study estimates a total volume of nearly 23 million cubic kilometres of total groundwater of which 0.35 million cubic kilometres is younger than 50 years old.

Why is it important to differentiate old from modern groundwater? Young and old groundwater are fundamentally different in how they interact with the rest of the water and climate cycles. Old groundwater is found deeper and is often used as a water resource for agriculture and industry. Sometimes it contains arsenic or uranium and is often more salty than ocean water. In some areas, the briny water is so old, isolated and stagnant it should be thought of as non-renewable, says Gleeson.

The volume of modern groundwater dwarfs all other components of the active water cycle and is a more renewable resource but, because it’s closer to surface water and is faster-moving than old groundwater, it’s also more vulnerable to climate change and contamination by human activities.

The study’s maps show most modern groundwater in tropical and mountain regions. Some of the largest deposits are in the Amazon Basin, the Congo, Indonesia, and in North and Central America running along the Rockies and the western cordillera to the tip of South America. High northern latitudes are excluded from the data because satellite data doesn’t accurately cover these latitudes. Regardless, this area is largely under permafrost with little groundwater. The least amount of modern groundwater is not surprisingly in more arid regions such as the Sahara.

“Intuitively, we expect drier areas to have less modern groundwater and more humid areas to have more, but before this study, all we had was intuition. Now, we have a quantitative estimate that we compared to geochemical observations.” says Dr. Kevin Befus, who conducted the groundwater simulations as part of his doctoral research at the University of Texas and is now a post-doctoral fellow at the United States Geological Survey.

The next step in painting a full picture of how quickly we’re depleting both old and modern groundwater is to analyze volumes of groundwater in relation to how much is being used and depleted.

“Since we now know how much groundwater is being depleted and how much there is, we will be able to estimate how long until we run out,” says Gleeson. To do this, he will be leading a further study using a global scale model.

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Mr. Groundwater
Wayne Madsen Leaves Legacy
By Lee Orton, Nebraska Well Drillers Association

Wayne Madsen was a career water well pump installation professional, having assumed the ownership of a business established by his father in Trenton, Nebraska. Madsen's Well Service was known throughout his service region as an operation which would get the work done professionally and promptly.

Madsen was elected to the Board of Directors of the Nebraska Well Drillers Association in the early 1980s, rising to become its President in 1990. In that role, Madsen championed the adoption of the laws providing for the licensing of the professional water well industry, the development of formal state water well construction standards, and the advancement of the professions by requiring continuing professional education to retain professional licensing.

Following his President's tenure, Madsen became the Chairperson of the Well Drillers Association Public Education and Public Affairs Committees. In that capacity he, along with his wife, Jean, participated in dozens of public and community education events, from The Groundwater Foundation's Children's Festivals, to adult education forums sponsored by his Association Committees and by the Cooperative Extension at the University of Nebraska.

He contributed to the creation of “Wally Water” and “Wanda Water” and frequently donned those costumes with Jean, marching in parades and appearing at fairs or home shows to attract not only the children's, but the parents' attention to learning about groundwater.

Madsen chaired Groundwater Day at the Capitol in Nebraska, which saw dozens of groundwater professionals working with the Legislators to increase understanding of groundwater for decision makers.

Madsen worked tirelessly on Groundwater Foundation events developed to educate others about groundwater. He served for a number of years on planning and advisory committees for the Foundation and provided significant volunteer time in the implementation of those programs.

Wayne Madsen was without doubt Mr. Groundwater in Nebraska. Everyone who knew him respected his integrity and his tenacity in the delivery of his education efforts for the cause of groundwater management and wise use. He was recognized by The Groundwater Foundation with its prestigious Kremer Award in 2000 and by his fellow groundwater professionals in 2001 with the first Wayne Madsen Award for Community Service. The Madsen Award continues to be awarded to recognize other Nebraskans who have delivered community services for groundwater.

In 2014, following the death of both Wayne and his wife Jean, Wayne's son, Monty, and his wife, Erlene, contributed $50,000 to establish a Groundwater Foundation Endowment Fund in memory of Wayne and all he stood for in groundwater conservation, management and education. A fitting tribute to his legacy! For more information about the Fund, contact Jane Griffin (402-434-2740 ext. 102 or jgriffin@groundwater.org).

Hear colleagues talk about the respect they had for Wayne, and his lasting legacy on groundwater protection and education: www.youtube.com/watch?v=5x0Fi6AmeG8.

Internship Changing Behavior
By Melissa Allen, Groundwater Foundation Intern

I, my name is Melissa Allen, and I'm the intern here at The Groundwater Foundation. I began this internship with a two-month project of organizing and digitizing the photo archive, which stored an abundance of photos of almost every program, tour, festival and conference since the organization's founding in 1985.

Through this first project, I acquainted myself with the history and people of The Groundwater Foundation. Through the Groundwater Guardian community networks, Groundwater University, the Children's Groundwater Festivals – and the list goes on – individuals and communities across the country have worked together to educate the public about the importance of groundwater and its conservation.

The fact is, our environment is rapidly changing, and our uses and needs of water are changing along with it. Linking individuals and communities together to engage in water education is vital for its care and conservation. I'm excited to be involved with an organization that is working at the forefront of this issue. For myself, I have not always been the most water-conscious person. In fact, I fancy myself as a hot-and-long shower enthusiast.

But since joining The Groundwater Foundation as the intern, I have learned so much about the necessity of water for communities of all shapes and sizes. I've noticed changes in my own daily behavior that has lessened my water use based off of all that I'm learning here at the Foundation. As I learn more, I become more and more excited to help in the environmental education of my own community to keep our water flowing healthy and strong for generations to come.
To Flush or Not To Flush?
Disposable Wipes and Septic Systems

With the help of well-crafted advertising, disposable wet wipes—a product once used mainly for wiping baby bottoms—are now increasingly being used on adult bottoms. Although they are frequently labeled as “flushable,” the problems adult wet wipes have created for municipal sewer systems are well documented. Their increasing presence in sewers has created a major surge in clogged lines and sewage pumps for municipal wastewater utilities. The effect of flushed wipes on septic systems has received less attention, but problems are also being widely reported.

Disposable wet wipes are one of many types of nonwoven fabrics, manufactured by entangling fibers in a sheet or web structure, and bonding them mechanically, chemically, or thermally. The fibers are not knitted or woven as conventional fabrics are. Nonwoven fabrics have many uses, of which wipes are just one. There are also many different types of wipes including baby wipes, personal hygiene wipes, cosmetic removal wipes, and household cleaning wipes for many types of surfaces. Besides disposability, one of their attributes is their durability—compared to paper products they are less likely to fall apart when being used. This durability, however, can create problems after disposal.

But the label says I can flush them

Things get confusing for homeowners because some wipes are labeled as flushable and some aren’t—baby wipes and surface cleaning wipes, for example, were never intended to be flushed. However, for those wipes that claim to be “flushable” or “septic safe,” it is debatable to what extent that is true.

INDA, the Association of the Nonwoven Fabrics Industry publishes the document, “Guidelines for Assessing the Flushability of Disposable Nonwoven Products,” which provides the criteria that may be used to identify wipes that can be labeled as flushable. The guidelines use seven different tests to determine the compatibility of wipes with both sewers and septic systems. The guidelines have been subject to criticism, however. They only apply to INDA members and even for INDA members they are voluntary. As a result, there is no assurance for consumers that a product labeled as being flushable was tested using the INDA criteria.

Also, many wastewater officials feel the guidelines are not sufficiently rigorous. Analysis of clogs of sewers and sewage pumps show that the materials causing clogs are usually a mixture of different types of wipes—both flushable and non-flushable—plus other items such as paper hand towels and feminine hygiene products. However, these analyses also show that wipes, including those labeled as flushable, do not break up after flushing as often advertised, but tend to stay in one piece.

The Federal Trade Commission (FTC) agrees that the claim of flushability for some wipes has not been adequately proven. Under a settlement with the FTC, Nice-Pak Products, Inc., a manufacturer of wet wipes, agreed in May 2015 to stop advertising their wipes as flushable and septic safe until those claims could be substantiated. The FTC decided the tests that Nice-Pak used to determine flushability did not reflect real-world sewer and septic system conditions. Nice-Pak markets their wipes under in-store brand names at Costco, CVS, and Target, and other retailers.

The effects of flushed wipes on septic systems is not as well documented as they are for sewer systems. However, septic tank pumpers and service providers report problems as well. Wipes tend to clump into masses that can block the line to the tank or block the tank inlet. This can potentially result in wastewater backing up into the house—something no homeowner wants to deal with.

Wipes can also clog the vacuum hose that service providers use to pump the tank. Removing clogs, whether they are in the tank or the vacuum hose, makes routine servicing of septic tanks take longer. Longer service times means greater costs for the pumper—costs that naturally get passed on to the homeowner.

Service providers also report problems with wipes clogging septic tank outlets and effluent filters. Because the primary function of the tank is to allow solids to settle to the bottom, clogging of the outlet end of the tank calls into question just how well wipes settle in an actual septic system environment rather than in an artificial testing environment.

People who service advanced onsite wastewater treatment systems also report problems with wipes. These include clogging of pumps, wipes that wrap around and cling to moving parts, and wipes that get deposited on the top of media filters, which affects how wastewater is distributed through the treatment medium.

A septic system, whether it is a conventional or an advanced treatment system, represents a significant investment for a homeowner. It is in the homeowner’s interest to prevent any conditions from occurring that might cause the system to malfunction. Manufacturers of wipes, with prodding from the wastewater industry, have been working to make wipes that are intended to be flushable more flushable and to more clearly label wipes that are not intended to be flushed. For homeowners, however, the safest, easiest course of action is to keep all wipes out the wastewater system—whether it is a septic system or a sewer system—by disposing of them with their regular solid waste.

What to flush

Your toilet may seem like a convenient way to get rid of certain unwanted items—you flush it and they disappear. However, toilets are only intended to get rid of three basic items: poop, pee, and toilet paper (and on occasion—puke). Everything else you might be tempted to flush should usually be bagged and disposed of with your regular garbage.

What not to flush

- wet wipes of all types
- disposable diapers
- facial tissue or paper hand towels
- tampons/applicators/sanitary pads
- hair
- dental floss
- incontinence pads
- condoms
- bandages
- disposable toilet brush heads
- cigarette butts
- bandages
- kitty litter
- unwanted medications

Information provided by the National Environmental Services Center. Visit www.nesc.wvu.edu.
Susan Seacrest, who began The Groundwater Foundation out of her kitchen in 1985 and grew it to a nationally-recognized voice for groundwater education and citizen involvement, has been selected as the 2015 recipient of the Maurice Kremer Groundwater Achievement Award.

Seacrest was presented the award as part of The Groundwater Foundation’s 2015 National Conference, held October 20-22, 2015 in Lincoln, Nebraska. The Kremer Award was established in 1985 to recognize Nebraskans who have made a substantive contribution to the conservation and protection of Nebraska’s groundwater.

“Each year it is a great honor to present the Maurice Kremer award,” said Groundwater Foundation President Jane Griffin. “This year it is even more special to award it to Susan Seacrest, founder and first president of the Groundwater Foundation. Susan has had an enormous impact on groundwater awareness, protection and conservation for 30 years, and her impact will continue for many more decades.”

Seacrest founded The Groundwater Foundation in 1985 and served as its President until retiring in 2007. During her tenure at the Foundation, she developed programs such as the Children’s Groundwater Festival and community recognition for groundwater protection, Groundwater Guardian.

“The selection of Susan Seacrest as the recipient of the 2015 Maurice Kremer Groundwater Achievement Award recognizes Susan’s tremendous contributions to the conservation and protection of Nebraska’s groundwater resources,” said selection committee member Don Kraus of the Central Nebraska Public Power and Irrigation District in Holdrege, Nebraska. “As the founder of The Groundwater Foundation, her efforts to educate and motivate the public have inspired action to ensure sustainable, clean groundwater supplies across the state, the nation and the world.”

As a result of her work on behalf of groundwater, Seacrest was featured as a Hero for the Planet by Time magazine, and awarded the John Wesley Powell Award from the U.S. Geological Survey and The Heinz Environmental Award from The Heinz Family Philanthropies.

In 2008, Seacrest continued her educational career at North Star High School in Lincoln, Nebraska, where she focused on working with Lincoln’s immigrant and refugee families. Seacrest retired from the Lincoln Public Schools in 2014, and was part of the planning committee for the National Science Olympiad Tournament held at the University of Nebraska in May 2015.

“Susan’s initial conception for The Groundwater Foundation was that the basis for its educational programs was to be sound science,” said selection committee member Bob Kuzelka. “This information base made the Foundation a greater scientific organization than many of its educational and scientific peers.”

“She would be the last to say it, but truthfully there is no recipient more appropriate than Susan to receive the award the year of The Groundwater Foundation’s 30th anniversary!” Griffin said.

Jim Goeke, selection committee member, echoed these thoughts. “Susan Seacrest is the quintessential recipient of the Kremer Award. Were it not for her creative genius, energy, and vision, there would be no Groundwater Foundation. It is entirely appropriate to recognize her on the 30th anniversary of the organization she founded with its highest award.”
Dear Friends of Groundwater,

It’s been 30 years – can you believe it? Thirty years ago The Groundwater Foundation was in its infancy, embarking on its mission to inspire groundwater protection. Many things have changed in the past 30 years, but one has not:

**Groundwater is a precious and threatened resource.**

The demands on and threats to groundwater are ever-increasing; without substantial changes, it is predicted that by 2050 there will be a 40% deficit in meeting the global demand for water.

This is where **YOU** come in to play.

Support from **YOU** is vital to the fulfillment of our mission at The Groundwater Foundation – to educate people and inspire action to ensure sustainable, clean groundwater for future generations – and has been for the past 30 years. Membership dollars create educational opportunities and tools for youth, individuals, and communities. Membership dollars inspire budding engineers or scientists to pursue a career in water. Membership dollars foster environmental stewards, now and for the future.

**YOU** can be the one to transform the life of a student, like a nine-year old girl who attended a groundwater summer camp a few years ago. She showed up the first day of camp and told us she didn’t like nature, and her mother had made her attend. As the week went on, she became more engaged and involved. By the last day, she was thoroughly enjoying herself. We were thrilled at her transformation, but didn’t understand the full impact until the next summer, when she returned and brought friends to “the best camp ever.”

**YOU** can empower communities, like a Groundwater Guardian that was dealing with high nitrates and a contentious relationship with ag producers in the wellhead protection area. The local water superintendent spearheaded a Groundwater Guardian team, using the framework of the program to involve several farmers and citizens, and mend the relationship. He said, “We have actually seen a slight decrease in nitrate levels. This is great for our system but best of all the relationship with the farmers is much better – they actually wave or speak to me when I run across them in public. We also understand each other’s concerns better. All this has been possible because we started the Groundwater Guardian team.”

Our work isn’t done. Our mission is still being fulfilled, and I invite **YOU** to be part of it by becoming a member. **YOU** can help make it happen. Thirty years in and it’s just the beginning – let’s get started!

Sincerely,

Jane Griffin, Groundwater Foundation President

P.S. You can join online right now - [www.groundwater.org/action/member.html](http://www.groundwater.org/action/member.html).