

WATER RESOURCES

IMPACT

July 2016 | Volume 18 | Number 4



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& RECYCLING**

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AWRA

AMERICAN WATER RESOURCES ASSOCIATION



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Effects of climate variability and increasing populations have thrust water reuse into the spotlight as a critical solution to minimize long-term risks to water supplies. Yet, of the 12 billion gallons per day of clean water produced in the U.S., only a fraction of that is now being reused.

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As we enter the 21st century, water supplies face new and complex challenges that will require new approaches and tools. Utilities need to find the right balance in assessing these factors in order to provide a resilient, reliable and affordable water supply to customers.

By Katie Henderson

15 Potable Reuse Practice – State of the Industry

The new U.S. Environmental Protection Agency (EPA) supplement to its 2012 Guidelines for Water Reuse, Potable Reuse – State of the Industry, due for release this year, provides the latest updates on tools and research along with case studies to facilitate further development of water reuse.

By Michelle Schutz

18 Getting the Public on Board with Your Potable Water Reuse Plan

Approaching water reuse initiatives without public engagement as a priority can be disastrous. Public acceptance of direct potable reuse is one of the primary challenges facing this source of water supply. Implementing best practices and understanding the psychology of the “yuck” factor is key.

By Lisa Beutler

About this issue

Issue theme: Water Reuse in an Era of Integrated Water Management

Associate Editor: Lisa Beutler, MWH (now a part of Stantec)

Water planners and managers have long understood the necessity to add water reuse to an integrated water management portfolio. This issue presents a snapshot of the latest research and developments in this effort. Kati Bell, Robert Angelotti and Denise Funk describe the demand and unused potential for water reuse to augment surface water supplies. Offering case studies from Florida, Texas and Georgia, they discuss the underlying water quality and regulatory factors that support or inhibit success. As they point out, reuse projects have been operating for over 40 years and the technology is only improving, yet even greater gains will be possible once on-going regulatory concerns are resolved. Then, Katie Henderson provides an overview of Water Research Foundation projects to develop the knowledge and tools water supply planners need to evaluate future water supply requirements and support more integrated,



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resilient and reliable water supplies. One aspect of the research is to evaluate how new water supplies from nontraditional sources, including reuse strategies beyond wastewater effluent (such as graywater and stormwater), can be aligned with land use planning and be protective of public and environmental health.

Readers are then offered a sneak peek of the soon-to-be-released U.S. EPA supplement to the 2012 Water Use Guidelines, titled Potable Reuse – State of the Industry. Michelle Schutz explains that the update provides state and local authorities with a framework for implementation of potable reuse projects by reporting on practices that have been implemented to date and offers a list of document highlights.

Finally, Getting the Public on Board with Your Potable Water Reuse Plan offers the whys and hows of gaining community acceptance for potable reuse projects. In addition to a Top Ten best practices list, resources for building a communications and engagement plan are provided along tips from psychologists on how to overcome public resistance.

Ensure the Future of Water



Martha Narvaez,
President, AWRA
president@awra.org

MY HUSBAND AND I recently met with a financial advisor. Our take-home message was the importance of strategically investing in the unexpected (life insurance) and the long-term (retirement). A large part of me wasn't the least bit excited about this approach. Investing in the unexpected and long-term, I don't reap any real benefit in the here and now, yet I have to pay for it. Meanwhile, the logical part of my brain realized this strategy is essential. Once I came to terms with this approach I began to realize how similar my personal situation is to investing in water resources.

As water resource professionals, like financial planners, we understand how important it is to invest in the unexpected threats and the long-term health of water resources. If we strategically invest, we can minimize the unexpected—main breaks, lead contamination, algae outbreaks, flooding and the list goes on. Long-term investments, such as reuse and recycling, maintenance, research, education, infrastructure improvements, pollution reduction and water storage and security, are another critical piece of the water resources investment strategy. Water resource professionals understand the importance of this investment strategy, yet there is often a lack of public support for investing in water resources. Those investments may not be appealing because, like life insurance and retirement investments, they don't always provide an immediate and tangible benefit. Yet without these water resource investments—as with personal investments—our future is in jeopardy.

Water reuse and recycling is a great example of investing in our future. Long ago, recycling

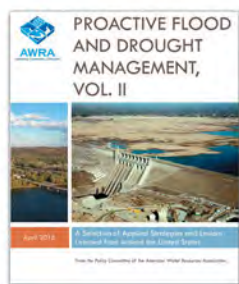
was complicated, confusing and not something that the average citizen did. Today, we commonly have recycling bins in our homes, work spaces and lining the streets. Recycling has become second nature to many and has become the law in many places. It is in our best interest, and in the interest of our water resource investment strategy, to continue this trend and to make water reuse and recycling as simple as recycling glass bottles and aluminum cans. Investment in this long-term strategy is critical to the health of water resources.

As you read this issue on water reuse and recycling, challenge yourself to think of innovative ways we can reduce the unexpected and invest in the long-term health of water resources. We need to put our heads together and challenge ourselves to find innovative and new ways to ensure the future of water resources. Now is a great time to be in the water resources field. It's exciting. It's challenging. Collectively we have great ideas and the expertise. It's all about clean water. But clean water for our future means strategic investment now.

Please consider sharing your ideas with our water resources community on [Conversations.awra.org](https://www.conversations.awra.org). This is a member benefit that provides a platform for water resources knowledge to be shared, enhanced and searched. It is the new home for all of AWRA's online conversations and provides an immediate connection to more than 2,200 of your AWRA colleagues.

I also hope many of you will join us in July for AWRA's Summer Specialty Conference on GIS and Water Resources, and Orlando in November for AWRA's Annual Conference, so that we can continue this discussion. ■

“Now is a great time to be in the water resources field. It's exciting. It's challenging. Collectively we have great ideas and the expertise. It's all about clean water.”



AWRA Policy Committee Releases Volume II of Proactive Flood and Drought Management Report

Lisa Engelman, chair of AWRA's Policy Committee

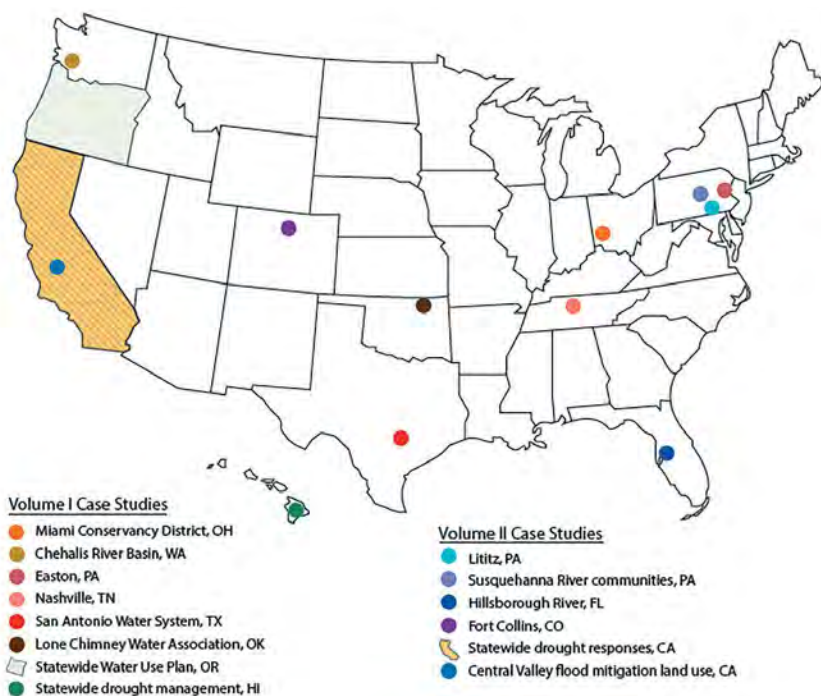


Figure ES1: Geographic distribution of cases selected for these reports.

THE AWRA POLICY Committee recently released “Proactive Flood and Drought Management, Volume II: A Selection of Applied Strategies and Lessons Learned from Around the United States,” edited by L. Donald Duke. This volume continues the work begun in the original report published by AWRA in 2013, adding six case studies and two overview essays to the original volume’s eight case studies.

The purpose of the two reports is to provide a better understanding of problems posed by floods and droughts and the emerging policy responses for better addressing these critical issues, with special focus on Integrated Water Resources Management (IWRM) as a way

of better achieving more robust solutions. IWRM – defined by AWRA in 2011 as “the coordinated planning, development, protection, and management of water, land and related resources in a manner that fosters sustainable economic activity, improves or sustains environmental quality, ensures public health and safety and provides for the sustainability of communities and ecosystems” – is increasingly being recognized as the preferred approach for addressing complex water resources issues.

The various institutions charged with addressing flood and drought mitigation tend to focus on their own missions and resist compromising those missions in

the name of integration. Integrating means giving up authority and sometimes giving up aspects of missions that have served constituencies for decades. This leads to sometimes intractable, bitter differences among those institutions. It is rare to see discussion of how to operate successfully within this structure.

These particular case studies were selected to illustrate a range of circumstances, geographic conditions and strategies, as well as examine the scope and impact of issues of flooding and droughts, and various policy interventions to address these impacts. The report identifies lessons learned, successes being achieved, ongoing challenges and opportunities for further improvement.

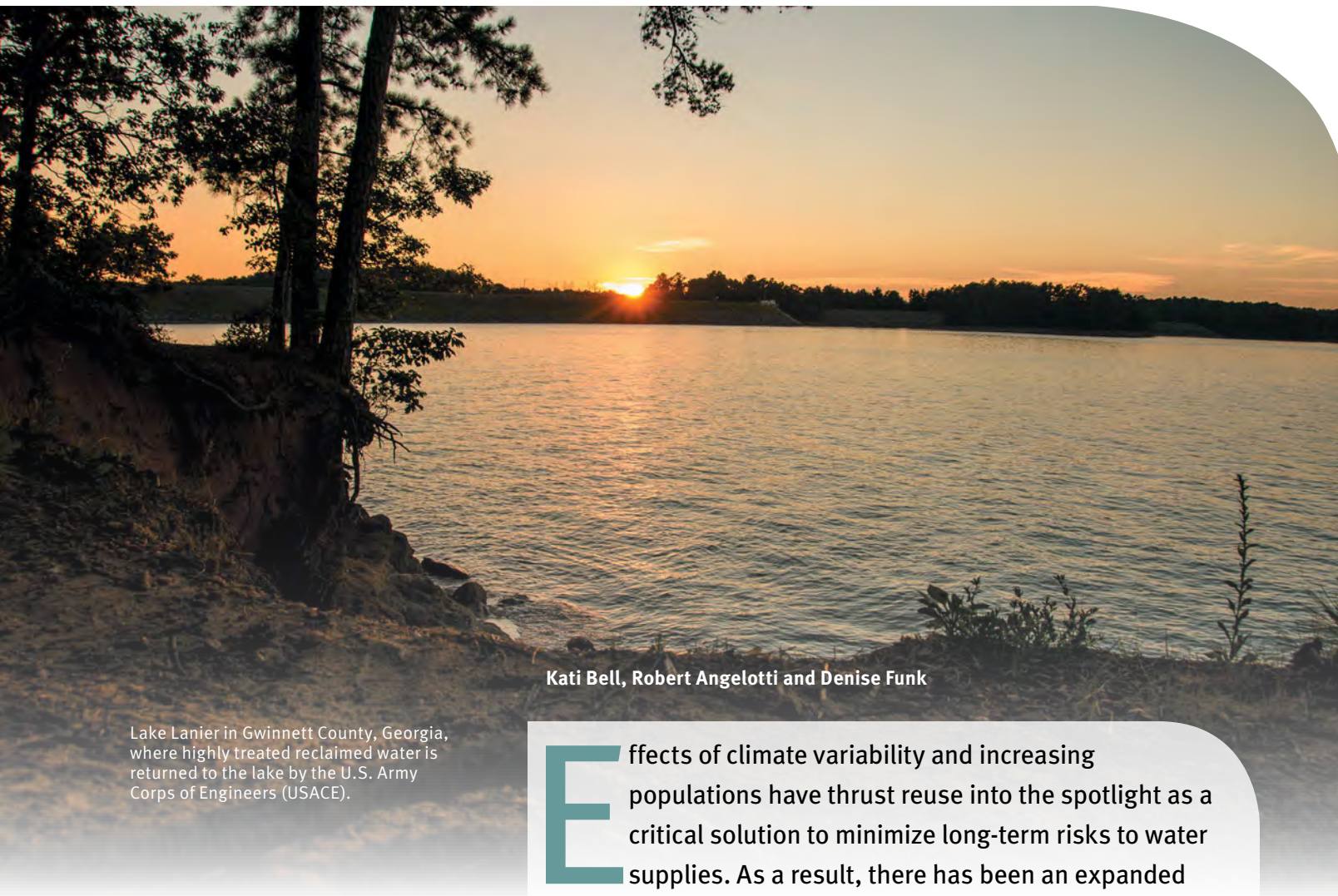
The cases in the two Volumes allow us to make some observations of lessons learned that may help inform the national dialogue about how to promote meaningful, effective, proactive management to mitigate the consequences of high flows and low flows on our streams, rivers and coastal zones. There are several key take home ideas highlighted in Lessons Learned in the concluding section of Volume II.

The AWRA Policy Committee has begun a Volume III, with a broader focus on drought management strategies and expanding to include some international perspectives.

Both volumes of the Proactive Flood and Drought Report can be downloaded from the AWRA website (www.awra.org). AWRA members also have access to four webinars (three based on Volume I and one based on Volume II) that may be accessed by logging in to the AWRA website. ■

Lisa Engelman can be reached at engelman_lisa@bah.com.

Reclaimed Water Quality Considerations for Surface Water Augmentation of Potable Water Supplies



Kati Bell, Robert Angelotti and Denise Funk

Lake Lanier in Gwinnett County, Georgia, where highly treated reclaimed water is returned to the lake by the U.S. Army Corps of Engineers (USACE).

Effects of climate variability and increasing populations have thrust reuse into the spotlight as a critical solution to minimize long-term risks to water supplies. As a result, there has been an expanded use of reclaimed water to extend water resources for communities. However, the amount of water reused can still be improved by adopting new, higher quality uses. As much as 12 billion gallons per day (bgd) of the 32 bgd of clean water produced in the United States could be beneficially reused (NRC, 2012). This estimate suggests more than a third of that clean water is available, yet only a fraction (7 - 8% of the total available volume) is now being reused (EPA, 2012).

Potable Reuse of Water: A View from Arizona

Susanna Eden, Sharon B. Megdal and Jean McLain

The potable reuse of water—the introduction of highly treated wastewater that meets or exceeds drinking water standards into the potable water system—is receiving increased attention as growing population and finite resources spur water managers to augment water supplies. Downstream water users have been drinking upstream wastewater for millennia; for example, Arizona’s Colorado River water users, including customers of the Central Arizona Project, receive treated wastewater from Las Vegas, NV. But the intentional reuse by one community of its own wastewater is new, an approach made possible by advanced treatment technologies that are capable of producing water purer than any found in nature.

In addition to the “de facto” reuse of wastewater by downstream users (described above), there are two types of potable reuse: Indirect Potable Reuse (IPR) and Direct Potable Reuse (DPR). The difference between the two is the use of an environmental buffer such as an aquifer or reservoir in IPR and the absence of such a buffer in DPR. For reasons related to regulatory permitting and public acceptance, IPR is now more common in the United States than DPR. Both forms of treatment employ a multiple barrier approach in which multiple advanced treatment technologies are combined to

reliably reduce a large suite of contaminants to vanishingly low levels, providing resilience, redundancy and robustness for a safe and sustainable water supply.

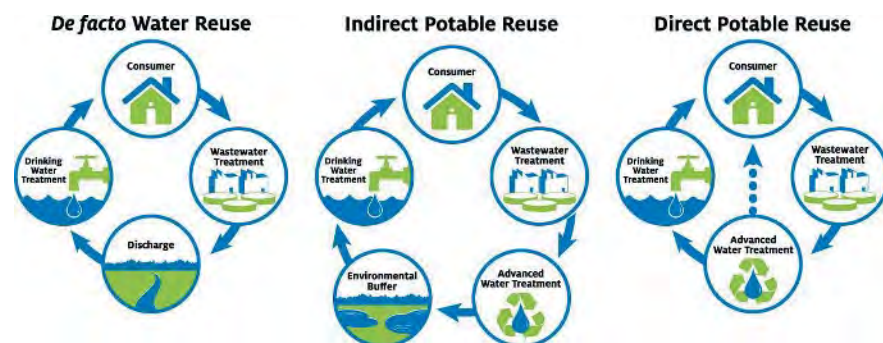
The multiple treatment processes often include microfiltration, reverse osmosis and advanced oxidation with ultra violet radiation. Other technologies, such as membrane bioreactors and granular activated carbon, can also be used in an advanced treatment train. The specific choice and order of processes depend on local factors, including regulations, unique

site challenges, specific contaminants, and available technologies.

Decisions on treatment train can be dependent on source water quality. While reverse osmosis (RO) is typically used in potable reuse of high-salinity water, alternatives may be employed if salinity is not a problem. RO is energy intensive and expensive, but currently it is the only treatment method available to remove salts. Desalination through RO produces brine, a waste stream that poses a problem in places like land-locked Arizona, where the current interpretation of aquifer protection regulations prohibits deep-well injection for brine disposal. Minimizing brine and finding safe disposal methods is an area of active research; one promising avenue is use of the brine to water salt-tolerant plants.

At this time, most recycled water in Arizona goes to non-potable uses, such as irrigation and industrial cooling. Cities like Tucson and Flagstaff have invested in distribution systems to deliver recycled wastewater to non-potable users. In the Phoenix area, approximately 22 percent of the more than 300,000 acre-feet of wastewater generated annually is delivered to the Palo Verde Nuclear Generating Station, 55 miles west of Phoenix, for use in the cooling towers, and an additional 22 percent goes to irrigation. These uses can be expected to continue; however, communities may find potable reuse more efficient than maintaining separate distribution systems.

The Scottsdale, Arizona, advanced water treatment system provides both potable and non-potable supplies. The Scottsdale Water Campus has been operating since 1998 and has undergone three expansions and upgrades since then, the most recent in 2013. Golf courses in Scottsdale receive recycled water when irrigation needs are high. When the non-potable demand is lower, recycled water is recharged through vadose zone wells to replenish the city’s groundwater supply. At the forefront of



Integrating Water Management and Water Supply Diversification

Katie Henderson

Over the last 150 years, breakthroughs in science and engineering – along with significant federal investment – helped create an era of high quality, cheap and abundant drinking water across North America. In his book, *The Big Thirst*, Charles Fishman called it “The Golden Age of Water.” Planning and developing new water supplies typically involved investing in large, centralized infrastructure.

Potable Reuse Practice – State of the Industry



Michelle Schutz, EPA

A supplement to the U.S. Environmental Protection Agency (EPA) 2012 Guidelines for Water Reuse is in the works. Currently in draft form, the document, called Potable Reuse – State of the Industry is scheduled for release this year (2016). Covering both indirect and direct potable reuse, the document is directed towards regulatory agencies developing or revising potable reuse standards and the planners and evaluators of design, operation of potable water reclamation facilities. It may also be useful to potable reuse consumers seeking a better understanding of potable reuse. Topics include state regulatory frameworks, opportunities, challenges and trends, and potable reuse applications, treatment technologies, research results, and case studies.

The 2012 Guidelines for Water Reuse provided comprehensive, up-to-date water reuse guidelines in support of regulations and guidelines developed by states, tribes and other authorities. This document met a critical need by providing a compendium of the state of the practice of water reuse and helped to inform state and local regulations and guidelines by providing technical information and outlining key implementation considerations for a broad range of reuse applications.

In the past four years, there have been an increased interest and application of potable reuse projects throughout the country. A growing number of communities are considering and implementing potable reuse to

Getting the Public on Board with Your Potable Water Reuse Plan

Lisa Beutler



Advances in technology coupled with western drought and the increasing importance of integrated water management portfolios have created a new momentum for implementing new potable reuse projects. This water source is especially valuable for supplementing drinking water supplies in water-scarce regions.



A New Way Forward in the Framework for Regulation of Toxic and Hazardous Substances to Protect Water Resources and the Environment

Eric J. Fitch



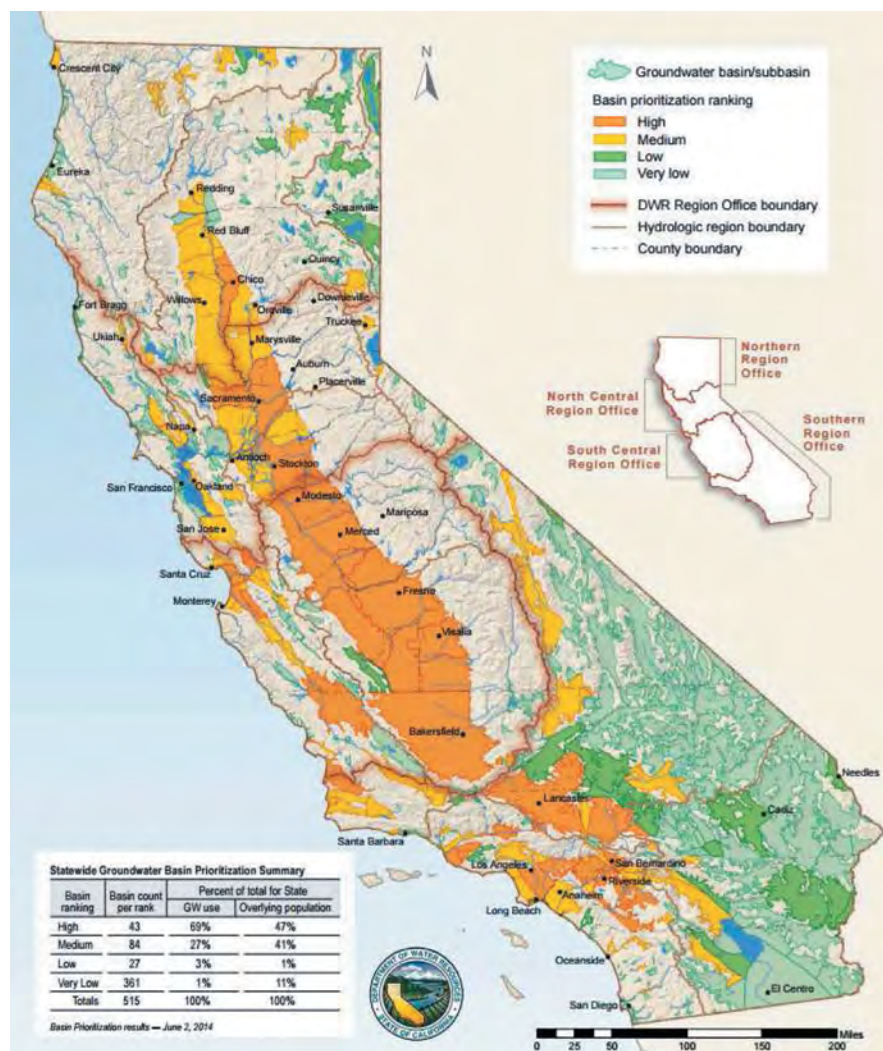
THIS COLUMN HAS somewhat of a reputation for being a Jeremiad – a lamentation, a complaint – laced with humor and sarcasm. If that is your hope for this one, well let's warn you first that this is going to be different. It is going to explain something that Congress is debating that has that potential to accomplish great good – if only one remembers that the perfect is often the enemy of the good.

Environmental Policy 101: once one gets past the overarching themes of U.S.

national policy toward the environment embodied in NEPA (the National Environmental Policy Act), much of the protection and restoration of water and environmental quality takes place under the authority of six laws. The first three laws are referred to by some as Environmental Media Acts, i.e. acts to control or eliminate discharge of pollutants – conventional and toxic – into an environmental medium: water, air, soil and groundwater. The “Big

California's Effort to Save its Aquifers Before the Well Runs Dry

Tanner Ketellapper



SGMA Groundwater Basin Prioritization.

AQUIFERS IN CALIFORNIA supply over a third of the state's water use and are a vital resource for many sectors of the economy. Although surface water supplies in California have been regulated for over a century, groundwater use across most of the state was historically unregulated, allowing landowners to pump large volumes of water with little consideration to the impact on neighboring wells or water levels in the underlying aquifer. Due to excessive groundwater pumping and lack of regulation, groundwater levels

have declined rapidly in many regions and led to sustainability concerns. For example, in some parts of the San Joaquin Valley, an area dominated by irrigated agriculture, groundwater levels have fallen by as much as 100 feet relative to historic levels. In 2014, the California state legislature took a major step towards reducing groundwater overdraft by passing the Sustainable Groundwater Management Act (SGMA). For the first time in California's history, the act established a framework for monitoring

and regulating groundwater use throughout the entire state.

The SGMA aims to regulate groundwater at the local level with management policies that reflect each groundwater basin's unique hydrologic and economic characteristics and challenges. The act established boundaries for 515 groundwater basins and classified each basin as very low, low, medium or high priority based on groundwater reliance, water demand, irrigated acres and other factors. In addition, the act outlines a process for appointing a responsible agency within each basin to develop and implement a sustainability plan to reduce groundwater overdraft. If agencies with a basin are unable or unwilling to develop a sustainability plan, the Department of Water Resources will intervene and implement a plan. Medium and high priority basins identified as critically over-drafted face the strictest regulation and must be managed under sustainability plans by January 31, 2020. Local agencies have discretion in developing their sustainability plans and policies to limit groundwater overdraft.

Many of the regions identified as medium and high priority are within the Central Valley, where agriculture is the largest economic driver. Some agricultural producers worry that the new regulations could limit their access to groundwater and threaten their crops and livelihood, particularly during dry years when surface water supplies are less available. Ultimately however, regulation and sustainable groundwater management is necessary to prevent depletion of the resource and ensure groundwater supplies are available in the future to support agriculture and other water uses. By implementing groundwater management policies at the local level, the SGMA hopes to account for each basin's unique characteristics and lessen the impact of regulation on local water users. ■

Tanner Ketellapper can be reached at tanner@waterexchange.com.



Florida State Section Updates

OUR MARCH MEETING was well attended, with 60 attendees at the Steinhatchee Landing Resort Conference Center. Many thanks to Carol Hinton (UFTREEO), Brian McDonald (Water and Air) and John Good (SRWMD) for chairing. One of the great things about AWRA is that it often takes us to the unique and off-the-beaten-path places in Florida. Steinhatchee certainly fits the bill.

Our May 20 meeting in Safety Harbor, FL, featured presentations on regional water resource management on topics including springs, climate change, sustainability, water quality challenges, state water policy updates and water reuse, with experts from the SWFWMD, FDEP and local Tampa Bay municipalities presenting. This meeting was co-sponsored by Region IV of the Florida Section American Water Works Association, with which AWRA shares the common interest of providing technical outreach for all Florida water resources professionals.

Our Annual Meeting is August 4-5 in Key Largo. Garrett Wallace worked diligently to obtain commitments from all five water management district executive directors to participate in the Water Management District Executive Director Round Table. This is a major accomplishment and we want to express our appreciation and gratitude to Garrett. We look forward to seeing you there!

Delaware State Section to Host 2016 Mid-Atlantic Conference

THE DELAWARE SECTION of AWRA is hosting the 2016 Mid-Atlantic Conference on September 15-16, located at the Chase Center on the Riverfront in Wilmington. This year's theme of "Solving Tomorrow's Water Resource Challenges Today" will open conversations about modernizing and protecting our infrastructure, planning for resilient water resource systems, measuring effectiveness of water resource projects, and much more!

Keynote speakers will include Mr. Dennis Doll, chairman, president and CEO of Middlesex Water, who will be sharing his perspectives on water supply management in the context of the Flint Michigan water crisis; and Mr. Christopher Crockett, P.E., Ph.D., Deputy Commissioner of Philadelphia Water Department, who



will be talking about the Green Cities Clean Waters Program, the green infrastructure component of Philadelphia's CSO long term control plan.

The Conference is also hosting the "Celebrate in the First State" Dinner Banquet that will be held on Thursday night at Timothy's Riverfront Grill on the banks of the historic Christina River. If you are interested in registering, becoming a sponsor/exhibitor, or want more information, please visit www.mac2016.wildapricot.org.



33rd Annual Montana AWRA Conference

NEARLY 180 SCIENTISTS, natural resource managers, academics, students and guests will meet at the Fairmont Hot Springs Resort for the 33rd Annual Montana AWRA Conference. The theme of this year's Conference is *Water Quality & Quantity in a Changing Climate*. The keynote speakers will include Dr. Shemin Ge, 2016 GSA Birdsall-Dreiss Lecturer with the University of Colorado-Boulder; Dr. Kelsey Jencso and Nick Silverman with the Montana Climate Office of the University of Montana; and Martha Narvaez, National AWRA President and with the University of Delaware's Water Resources Center. A pre-conference field trip and 5K Hydrophile fun walk/run will be held in the area on Wednesday, October 12. Please join us! More information can be found here: www.montanaawra.org/conference





AWRA National Board member Lisa Beutler and J. Paul Riley, AWRA national past president (1985), catch up on the latest during the Utah State Section Annual Conference.

National AWRA President Martha Corozzi (row 2, fourth from left) poses with other AWRA Spring Specialty conference field trip participants, as they wait to board the Alaska Railroad to travel from Fairbanks to Anchorage. The conference was held in Anchorage, AK, April 25-27, 2016.



Washington AWRA (AWRA-WA) State Section's 2016 Annual State Conference

THE WASHINGTON SECTION of the American Water Resources Association is holding its 2016 Annual State Conference on October 26, 2016 at the Seattle Mountaineers Event Center in Seattle. The topic for this year's event, Rural Domestic and Municipal Water Supply, transpires from the recent changes in the legal landscape in the state. Court rulings have significantly altered how the state of

Washington must manage water, including rural domestic (permit-exempt) uses. The conference will involve in-depth discussions of recent legal cases and water management challenges, and will delve into potential policy choices and solutions in light of this altered environment.

Our annual conferences have consistently gained popularity over the years, and earned our organization a

reputation for approaching the most timely water-related issues in the state from diverse viewpoints. These provide great opportunities to share information, find resources, and network with colleagues from around the region.

For more information and updates, visit the conference page on our website: www.waawra.org/2016-State-Conference. ■

AWRA Webinar | July 13, 2016 | 1:00pm EDT

The Flint Water Crisis

In April of 2014, the city of Flint, MI, switched from purchasing water from Detroit to treating the Flint River for potable water. Flint residents immediately noticed issues with their water; however, they were repeatedly told by government officials that their water was safe to drink. Flint resident LeeAnne Walters contacted Marc Edwards and his team at Virginia Tech in late July 2015. The Flint Water Study Team was officially launched in August 2015.

This presentation will provide an overview of the Virginia Tech Flint Water Study team's efforts combining ethics engineering, citizen science, laboratory experiments, investigative science and social media to confirm the high lead levels in Flint's water.

Presenters: William Rhodes, Min Tang, Christina Devine
Members of the Flint Water Study team at Virginia Tech

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AWRA's 2015 Annual Water Resources Conference **Student Presenter Competition**

CONGRATULATIONS TO THE Student Presenter Competition winners of AWRA's 2015 Annual Water Resources Conference held during the conference in Denver, CO, Nov. 16-19.

Thanks to Leonard Rice Engineers of Denver, CO, which contributed money for the awards for this competition. Their donation allowed us to award a first prize and a runner-up for the oral and for the poster session. A total of 47 students participated throughout the 83 oral sessions, as well as the poster session. Conference attendees were given the opportunity to judge the students during their scheduled session. The following criteria were used for all competitors:

- Efficient use of allotted presentation time or poster space.
- Quality of responses to audience questions in oral or at poster sessions.

- Effective integration of audio-visual materials.
- Perceived preparedness.
- Logic and understandability of material (problem, methods, results, conclusions).
- Adequate description of context for material – conveyed purpose of paper, identified relevant literatures, etc.
- Overall style and presence; effective communicator – enthusiasm or persuasiveness
- Suitability for AWRA/professional audience.
- Significance and originality of the material presented.

Everyone did a terrific job, which made it a difficult decision, however, the following individuals were selected as the outstanding winners:



First Prize Oral Student Presenter: Isabella Bergonzoli, Washington University, St. Louis, MO
"The Behavioral Economics of a Private Well Water Community in the Face of an Unexplained Cancer Scare"
 (co-author: T. E. Thornton)

Isabella Bergonzoli Jaramillo is currently pursuing a Bachelor of Arts & Sciences from Washington University in St. Louis. She was born in Medellin, Colombia and grew up near the sunny beaches of West Palm Beach, Florida. When she was a freshman in high school, her ecology class traveled to a neighboring area, the Acreage, to run tests on private well water. At the time, she didn't understand how anthropogenic and naturally occurring carcinogens were affecting the drinking water. This inquiry led to a small project that would later become her research. Along with her mentor, Dr. Teresa Thornton, she devised a survey that measured homeowner behavior and distributed it to the Acreage's local high school. Isabella gathered data for

three consecutive years and reached out to schools in a similar area that were believed to have contaminated private well water. Her passion for economics, law and public policy prompted Isabella to take a behavioral economic approach on her research. She has been involved with AWRA since 2012, when she attended her first Annual AWRA Conference as a poster presenter at the age of 15. Isabella has since attended several local conferences and four Annual AWRA Conferences. At the most recent conference she was awarded for her talk! At Washington University in St. Louis, she hopes to finish her research and graduate with a degree in Economics. Isabella's goals are to attend law school and push for mandatory testing laws.



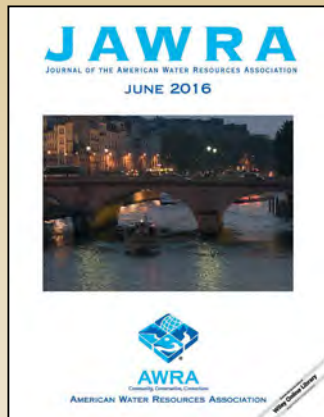
Second Prize Oral Student Presenter: Sara Porterfield, Colorado University, Boulder, CO
"The Paradox of Place: Finding the Colorado at Home and Abroad"

Sara Porterfield's love of the Colorado River led her to her current life as a doctoral candidate at the University of Colorado at Boulder, where she studies the environmental history of the American West and the Colorado River Basin. Her dissertation looks at the

Colorado's ties to rivers around the world through water development and recreation, which she uses as an excuse to go rafting on the Green, Yampa and Colorado rivers. Sara also works as a water educator, bringing the history of Western water use to diverse audiences in order to show how the past use of our water shapes the way we value and manage it today and in the future. Her work has been published on *The Dirtbag Diaries* podcast, in *COLUMBIA: The Magazine of Northwest History*, *The Canyon Country Zephyr*, the *Willamette Week*, *Annals of Wyoming*, and *H-Net Reviews: H-Environment*.

Highlights of the JAWRA Technical Papers

Volume 52, Issue 3, June 2016



- Mogollon *et al.* examined trends in flooding and stream flashiness in North Carolina and Virginia streams and assessed the influence of land cover and flow-regulated features on these endpoints.
- Christensen *et al.* evaluated flow-nutrient relationships between lakes in Voyageurs National Park, Minnesota.
- Rahm *et al.* investigated nitrate in-stream processing in headwater stream reaches downstream of wastewater treatment plant outfalls during low flow periods.
- Milman and Polsky identified the mechanisms by which state-level policies influence local-level outdoor watering restriction implementation.
- Zhang *et al.* investigated vertical stratification water temperature, dissolved oxygen and pH in recycling irrigation reservoirs.
- Salo *et al.* used well-established accuracy metrics to evaluate eight methods commonly used to map riparian zones in a semi-arid, mountainous watershed.
- Daggupati *et al.* used a SWAT model for the entire Missouri River Basin to simulate crop and water yields at a fine-scale resolution.
- Ator and Garcia developed an approach to take advantage of previously calibrated SPARROW models to improve understanding of contaminant fate and transport from uplands to streams and applied the approach to examine nitrogen in the Chesapeake Bay watershed.
- Lane and D'Amico used geospatial analysis to estimate geographically isolated wetlands across the conterminous United States.
- Yarnell *et al.* defined a methodology by which spring flow regimes in California regulated rivers can be modeled from quantifiable characteristics of spring snowmelt recessions in unregulated rivers.
- Steel *et al.* used a spatially and temporally dense temperature dataset to generate temperature metrics representing popular summary measures (*e.g.*, minimum, mean, or maximum temperature) and wavelet variances in the Snoqualmie River network. ■

2016 IMPACT Editorial Calendar

JANUARY 2016

Hydrophilanthropy

MARCH 2016

Drought, Response, Adaptation and Long Term Planning in a Changing Environment

MAY 2016

National Hydrography Dataset (NHD)

JULY 2016

Water Reuse and Recycling: Once Is Not Enough

SEPTEMBER 2016

The Top Ten Water Issues for America's Leaders

NOVEMBER 2016

Florida's Springs: Iconic Resources in Recovery

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members-only communities | discussions | libraries | member directory

Conversations.awra.org is the new home for AWRA's online conversations.

A place where AWRA members can learn, share and collaborate on the issues facing them every day.

As water resources managers, you know that only a portion of "knowledge" exists in newsletters, manuals, white papers, and within your own discipline. A vast amount of important information exists within the heads of your colleagues from other disciplines. This makes other AWRA members your greatest asset. Conversations.awra.org communities provide a platform for this wealth of knowledge to be shared, enhanced and searched.

Using Conversations.awra.org is as easy as logging in and joining each of the communities that you would like to be involved with. Each member already has a customizable profile, so take five minutes and follow the instructions below to start making connections!

How to Get Started

Log in at Conversations.awra.org

Your username and password are the same as what you use for the www.awra.org website. If you're not sure what your login information is, click on the 'I forgot my username or password' link and follow the prompts.

***Important:** When you log in for the first time, please be sure to read over the E-Group Rules and click on the 'I Accept' box at the bottom of the E-Group Rules & Etiquette page. You will need to accept these rules before continuing to Conversations.awra.org.

Complete Your Profile

Your colleagues will want to know a little bit about you. Complete your profile by importing information from LinkedIn or enter your information on the profile page.

***Important:** Basic contact and employment information is automatically populated onto your online Community profile from the **Members Only** section of the AWRA website. Updating your information there will also trigger the update of that info on your Community profile page.

Post a Message

Have a question? Your colleagues can help! Hover over the "Participate" tab on the menu bar and click on "Post a Message".

Need Assistance?

If you need additional guidance, email christine@awra.org

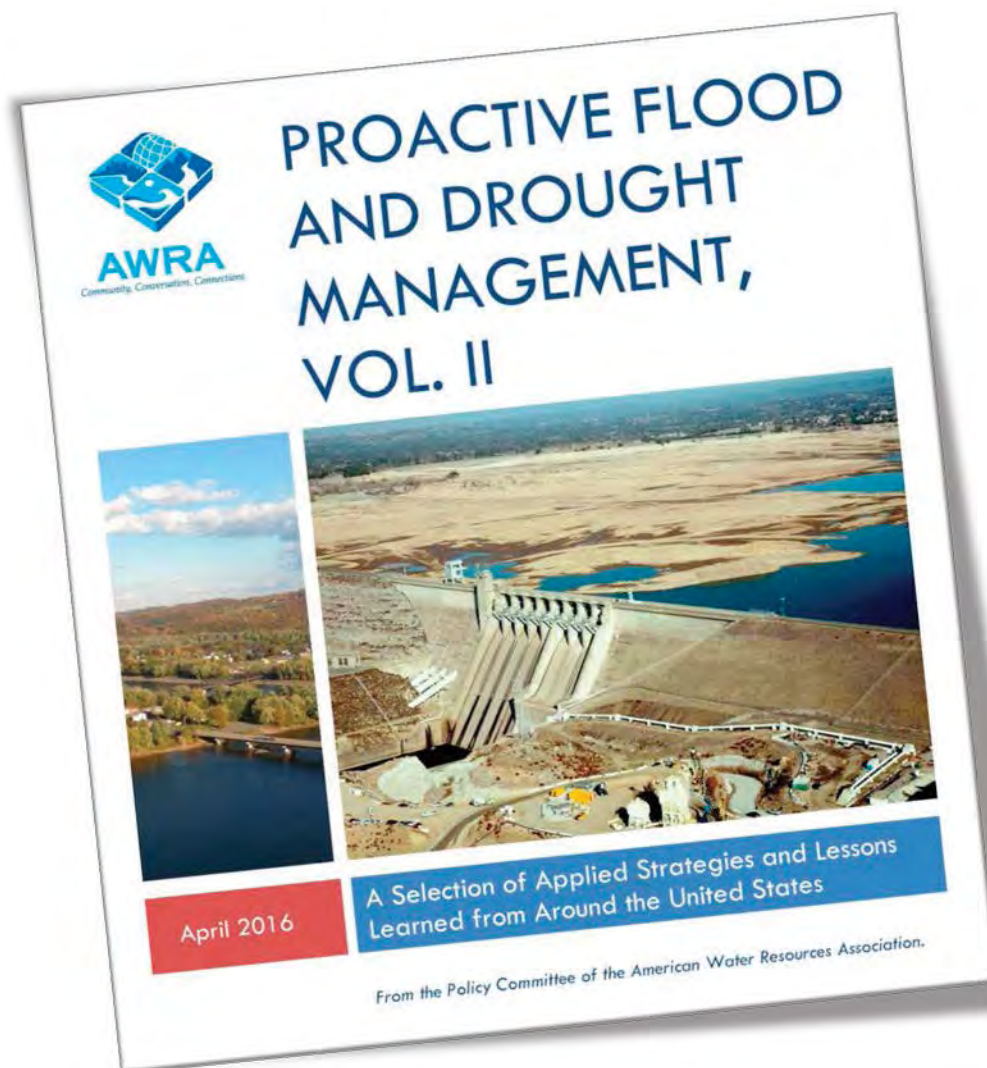
Review Your Email Settings

All members are auto-subscribed to the **AWRA Member Forum** and you will start to receive emails containing new discussion posts as members start participating.

To update your email preferences:

- Visit the "Settings" page under the "My Profile" tab in the menu bar. You can choose from the following options:
 - *Real Time:* You will receive an email each time a new message is posted.
 - *Daily Digest:* You will receive one email each day containing all of the previous day's messages.
 - *No Email:* This means that you won't receive any emails in your inbox. You will need to log in to Conversations.awra.org to view and reply to discussion posts
- Please make sure that your email address is accurate or you will not be able to receive any discussion posts.

Tip: To make sure that you always receive emails from Conversations.awra.org, please be sure to add "DoNotReply@ConnectedCommunity.org" to your email safe list.



AWRA Announces

FLOOD & DROUGHT MANAGEMENT, VOL.II

Volume II of the AWRA Policy Committee's report, adds six case studies and two overview essays to the previous volume's eight case studies. Selected to illustrate a wide range of circumstances, geographic conditions and strategies; these case studies and analyses are intended to provide a better understanding of current flood and drought management strategies. Based on these case studies, the AWRA Policy Committee lists several specific lessons learned regarding design and implementation of proactive flood and drought management efforts.

FOR A LIMITED TIME, AWRA IS OFFERING FREE DOWNLOAD OF BOTH VOLUMES!



For more information visit
www.awra.org

Want to get there faster? Scan the QR code.

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VOLUMES TODAY!**