ARIZONA WATER RESOURCE
The Water Resources Research Center Quarterly Newsletter

Volume 23 Number 3 Summer 2015

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Publications

The Water Resources Research Center produces research reports, outreach materials, and regular publications, including the Weekly Wave e-news digest, the quarterly Arizona Water Resource newsletter and the Arroyo, an annual publication focusing on a single water topic of timely concern in Arizona. **Sign up online to receive WRRC newsletters, event updates and more at: wrrc.arizona.edu/subscribe**.

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Judges taste beer made with 30% recycled wastewater in the 2014 Pure Water Brew Challenge; in 2015 they will judge home-brews made with 100% recycled wastewater. Source: Clean Water Services

Contest Inspires Home-brewers to Make Beer from Wastewater

by Nejlah Hummer, Montgomery & Associates Summer Writing Intern at the WRRC

The phrase "toilet to tap" has taken on a whole new meaning in Oregon. Oregon Brew Crew (OBC), the state's oldest home beer-brewing club, has formed an unlikely partnership with Clean Water Services, a water resources management utility that runs 4 wastewater treatment plants in the Portland area. Together they are turning recycled wastewater into beer. The duo is sponsoring the second annual Pure Water Brew Sustainable Beer Challenge, an event that breaks new ground by requiring contestants to use recycled wastewater as the base for their home-brews.

The water used for the "sewage brewage" is sourced from the Tualatin River directly downstream from one of Clean Water Services' wastewater treatment plants. After being extracted from the river, the wastewater is treated using a 3-step advanced treatment process, which includes ultrafiltration, reverse osmosis, and advanced oxidation, or UV light treatment. The end result is crisp, ultra-purified water that has a distilled-like quality. This is an exciting prospect

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New Report Moves Discussion of Colorado River Basin Supply and Demand Forward

by Marie-Blanche Roudaut, WRRC Graduate Outreach Assistant

In June, the US Bureau of Reclamation released a report that laid out potential approaches to closing the water supply-demand gap identified in its landmark Colorado River Basin Water Supply and Demand Study (Basin Study 2012). The product of 18 months of meetings and study by stakeholder working groups, the *Moving Forward, Phase One* report, contains the results of research and discussion on next steps. The report's extensive list of recommendations highlights the many varied options that exist.

The 2012 Basin Study was the most comprehensive to date and was conducted in partnership with the seven Colorado River Basin States and in collaboration with a wide range of stakeholders. The report looked at supply and demand projections

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Colorado River Basin. Source: *Moving Forward: Phase 1 Report.*

from 2012 through 2060. An unprecedented attempt at bringing together a wide variety of participants from the Basin, this study was the largest scenario-planning project ever to be conducted by the Bureau of Reclamation. The Basin Study incorporated scenarios from both experts and stakeholders, creating a collaborative model that made it easier to find common ground to address shared challenges.

The Basin Study indicates that, in the coming decades, significant shortfalls between projected water supplies and demands will seriously affect the agricultural, municipal, energy, and environmental sectors, unless a wide range of solutions are applied to mitigate these shortfalls.

Prompted by the findings of the Colorado River Basin Study, Reclamation initiated, in May 2013, the Moving Forward effort in collaboration with federal, state, and tribal entities, conservation organizations, and other Basin stakeholders. The Moving Forward effort was designed to build on and pursue next steps identified in the Basin Study. The ultimate goal was to identify a variety of water savings and management approaches to address projected water supply and demand gaps. These approaches needed to have broad-based support, provide a wide-range of benefits to water users, and enhance the health of the Basin's watersheds.

The Moving Forward effort continues the collaborative and inclusive approach of the initial study. It is organized into three multi-stakeholder workgroups. The three workgroups include 1)Municipal and Industrial (M&I) Water Conservation and Reuse; 2) Agricultural Water Conservation, Productivity, and Transfers; and 3) Environmental and Recreational Flows. A multi-stakeholder Coordination Team, consisting of representatives from the Bureau of Reclamation and the Basin States, guides and reviews the work prepared by the workgroups.

Phase 1 of Moving Forward was funded by the Bureau of Reclamation and the Basin States and the resulting report documents the outcomes of Phase 1. Chapters were contributed by each multi-stakeholder workgroup. During the 18 month period needed to complete Phase 1, the workgroups met regularly to prepare their chapters, which were subsequently reviewed by the Coordination Team. The overall goal of Phase 1 was for each workgroup to identify opportunities and potential actions their sectors could take to solve the challenges highlighted in the original Basin Study. This process was based on data collection, case studies, and evaluation of successes and challenges of existing programs. Potential actions selected by the workgroups include expanding M&I water conservation and reuse, facilitating future agricultural water saving and productivity enhancements, and providing environmental and recreational benefits within the Basin.

Opportunities exist to increase water conservation and reuse, and in many cases, methods are already being implemented. Opportunities will vary depending on many factors, including the extent to which measures have already been implemented, the cost of specific conservations measures, the cost of existing and new water supplies, the degree of public acceptance, and the laws and regulations. The three workgroups recognized that although many opportunities exist to enhance water use efficiency, greater efficiency may become more difficult and costly to implement in the future. In addition, the Colorado River Basin represents a very diverse region; solutions are often site-specific and depend on local conditions. Despite this diversity, the workgroups identified several commonalities among the sets of potential future actions and they highlighted these for each sector.

All three workgroups stressed the importance of seeking out continuous and sustainable sources of funding. Funding is needed not only to accomplish the programs' goals, but also to meet the substantial needs for infrastructure improvements, such as improved conveyance and distribution infrastructure, reduced operation and maintenance costs, replacement of aging and inefficient infrastructure, and expansion of reuse.

Another commonality identified by the three workgroups was the importance of cross-program coordination and information exchange among the three sectors. Coordination was considered essential because of the complexities associated with balancing competing needs of water deliveries for M&I, agricultural purposes, hydropower generation, and environmental protection. Coordinated planning and implementation enables multipurpose solutions and can lead to more management flexibility to develop win-win strategies across sectors.

A third common thread among the three workgroups was the importance of scientific research, data management, monitoring, and quantifying benefits and trade-offs. They underlined the need for program reporting in order to evaluate cost effectiveness. They also identified facilitating information sharing as an important step.

The final recommendation by the workgroups was to expand outreach programs and partnerships. They noted that projects benefit from improved stakeholder involvement and commitment, and broad support facilitates action.

Phase 2 of the Moving Forward effort begins in 2015 with the identification and implementation of proposed pilot projects using the same collaborative and inclusive approach.

The full Phase 1 report is available at http://www.usbr.gov/lc/region/programs/crbstudy/MovingForward/Phase1Report.html.

City of Phoenix Joins Forest Protection Program

The City of Phoenix entered into a three-year partnership with the National Forest Foundation (NFF) to improve forest health and water quality in the Salt and Verde watersheds. The City is investing $200,000 in a program developed by the NFF and Salt River Project called the Northern Arizona Forest Fund, which focuses on the Nation Forests in northern Arizona where most of the surface water supplies to the greater Phoenix area originate. The program involves local governments, businesses, and nonprofits in projects to reduce wildfire risk, improve streams and wetlands, enhance wildlife habitat, and generally help improve and protect watershed health. The Northern Arizona Forest Fund's first two projects are already underway (see AWR Winter 2015), and in 2016, the program will implement six high priority projects on all five National Forests in northern Arizona – the Apache-Sitgreaves, Coconino, Kaibab, Prescott, and Tonto National Forests.

Desalination Technology Innovation for the Developing World Is Topic of International Competition

Massachusetts Institute of Technology (MIT)/Jain Irrigation Systems, University of Texas at El Paso (UTEP) Center for Inland Desalination System, and Green Desal were top winners of the Desal Prize, a competition that challenged worldwide innovators to create cost-effective, energy efficient, and environmentally sustainable desalination technologies. The goal is to provide potable water for humans and water for crops in developing countries. The competition received 68 applications from 29 countries. The top three teams shared grant funds totaling $400,000 to be used to implement pilot projects with small-holder rural farmers in a USAID mission region. First Place MIT and Jain Irrigation Systems designed a photovoltaic-powered electrodialysis reversal (EDR) system designed for low energy consumption. In second place, UTEP Center for Inland Desalination System designed a Zero Discharge Desalination system that reduces water waste. Green Desal, an international team, received an honorable mention for a high-percent recovery system that integrates proven technologies. The Bureau of Reclamation hosted the international competition at the Brackish Groundwater National Desalination Research Facility in Alamogordo, NM.

Final Clean Water Rule Released by EPA and Army

On May 26, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers released the final Clean Water Rule, which is intended to protect U.S. streams and wetlands from pollution and degradation. The rule defines the waters protected under the Clean Water Act with the goal of making permitting less costly, easier, and faster for businesses and industry. Determining jurisdiction for the purpose of Clean Water Act enforcement was confusing, complex, and time-consuming since Supreme Court decisions in 2001 and 2006, and as a result, the EPA and the Army Corps of Engineers received requests from members of Congress, state and local officials, industry, agriculture, environmental groups, scientists, and the public for a rule that provides clarity. In developing the rule, the agencies held more than 400 meetings with stakeholders across the country and reviewed over one million public comments. According to the EPA, the Clean Water Rule only protects the types of waters that have historically been covered under the Clean Water Act. It scales back regulation of ditches, does not apply to groundwater or shallow subsurface flows, and does not create any new agricultural permitting requirements. Despite efforts to address concerns expressed after the publication of the proposed rule that it expanded Clean Water Act jurisdiction, there continues to be opposition to implementation. Opposition has inspired actions in the U.S. Congress to prevent the rule from taking effect.

National Environmental Award Goes to Tucson's AOP Treatment Facility

Tucson Water's Advance Oxidation Process (AOP) Water Treatment Facility was awarded the 2015 Grand Prize in Design from the American Academy of Environmental Engineers and Scientists (AAEES). The prize identifies Tucson's facility as among the best environmental projects and programs. The facility uses AOP technology to treat groundwater contaminated with 1,4-dioxane, which was used by aircraft manufacturing companies in the Tucson airport area from the 1940s to the 1970s. The process combines ultraviolet light with hydrogen peroxide to purify up to eight million gallons of water a day.

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Arizona Water Resource is published quarterly by the University of Arizona Water Resources Research Center. AWR accepts news, announcements, and other information from all organizations.

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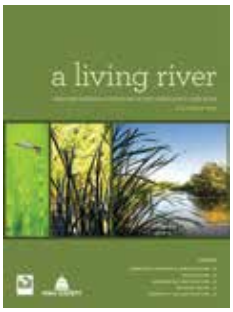
Resources

A Living River: Charting Wetland Conditions of the Lower Santa Cruz River. 2014 Water Year



Sonoran Institute
June 2105

This second assessment of wetland conditions along the Lower Santa Cruz River provides a summary of the initial improvements after the upgrade of the two wastewater reclamation facilities that release effluent into the river. The report highlights improved aquatic habitat, improved water clarity, and increased infiltration along the stretch of the river from Tucson to Marana, AZ. *A Living River* for water year 2014 can be downloaded from http://www.sonoraninstitute.org/where-we-work/southwest/santa-cruz-river/879-living-river-2014.html. *A Living River 2013 Water Year* is also available online.

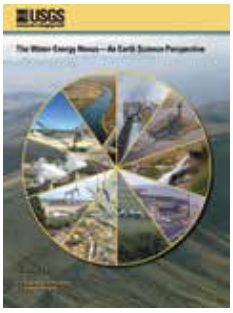
Enhanced Interactive Climate Map

U.S. Department of Agriculture Natural Resources Conservation Service, National Water and Climate Center

The National Water and Climate Center, a program of the USDA Natural Resources Conservation Service, has released a new version of its interactive map. The new version lets users view current climatic conditions, such as precipitation, snow water equivalent, and streamflow volume. The map also displays current and historical conditions for snow depth and reservoir storage. When a user clicks on a map site, the station information and summary statistics pop up. The map also provides access to reports and site pages. The interactive map can be accessed through http://www.wcc.nrcs.usda.gov/.

The Water-Energy Nexus—An Earth Science Perspective

By Richard W. Healy, William M. Alley, Mark A. Engle, Peter B. McMahon, and Jerad D. Bales



U.S. Geological Survey Circular 1407
2015

The USGS has assembled a review of the complex ways in which water and energy are interconnected in the report, *The Water-Energy Nexus—An Earth Science Perspective*. This document describes the earth science data collection and research used to develop current understanding of the water-energy nexus. Water availability and use are closely connected with energy development and use. Water cannot be delivered to homes, businesses, and industries without energy, and most forms of energy development require large amounts of water. Understanding this nexus can be improved by enhanced data collection and research. The document analyzes and discusses a broad range of relevant earth science issues, including freshwater availability, water use, and ecosystems health. It contains assessments of saline water resources and of fossil-fuel, uranium, and geothermal resources. In addition there are discussions of subsurface injection of wastewater and carbon dioxide and related induced seismicity; climate change and its effect on water availability and energy production; by products and waste streams of energy development; emerging energy-development technologies; and energy for water treatment and delivery. Circular 1407 can be downloaded from http://pubs.usgs.gov/circ/1407/.

Maps of Lake Powell

National Aeronautics and Space Administration (NASA) Earth Observatory

The NASA Earth Observatory has developed a series of maps showing the water level in Lake Powell from 1999 to 2015. The map sequence can be viewed at http://earthobservatory.nasa.gov/Features/WorldOfChange/lake_powell.php?src=eoa-features.

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Residential Water Prices in U.S. Continue to Increase

Water prices across the country increased again in 2015. Each year since 2010, Circle of Blue, an online scientific media outlet, surveys the 20 largest U.S. cities and 10 regionally representative cities to gather data on prices for water. In 2015 they found that the monthly water bill for a family of four using 100 gallons per person per day had increased 41 percent on average. Compared to a rise of just 1.8 percent in the Consumer Price Index, water prices increased an average of 6 percent in the 12 months before March 2015. A graphic illustrating water prices across the country is available from Circle of Blue at http://www.circleofblue.org/waternews/wp-content/uploads/2015/04/WaterPricing2015graphs.pdf.

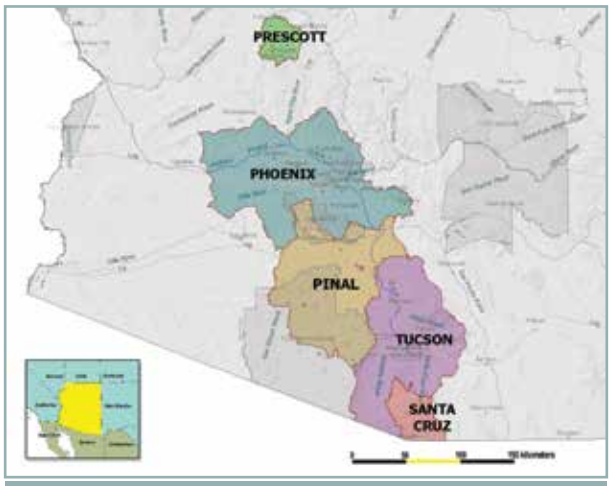
Collaboration is Key for Innovative Water Management Tool

by Joseph Olsen, General Manager, Metro Water District

Numerous news articles, both local and national, have been written about the Cities of Phoenix and Tucson entering into an agreement for Phoenix to store a share of its Central Arizona Project (CAP) water at Tucson's underground recharge facilities in preparation for projected municipal and industrial (M&I) shortages of CAP water. This concept known as Inter-Active Management Area (AMA) Firming was proclaimed as innovative water management. U.S. Senator Jeff Flake even lauded Inter-AMA firming in an op-ed piece by touting its creativity that benefits both the Phoenix and Tucson communities. (Arizona Daily Star, March 23, 2015).

However, the full story was not in the media reports. While it is noteworthy that Arizona's two largest municipalities are working together on water planning during a statewide drought, the real story of Inter-AMA firming is about creativity and collaboration, two critical components for managing water in Arizona ahead of potential supply shortages.

The concept of Inter-AMA firming began with the questions, "How will the Arizona Water Banking Authority (AWBA) remedy the projected shortfall in meeting its M&I firming goal for the Tucson area?" and "How can the Phoenix area utilize the growing accumulation of Maricopa County water storage tax funds after AWBA meets the Phoenix AMA M&I firming goal?"



Active Management Areas.
Source: Arizona Department of Water Resources

Metro Water District, a regional water entity in Southern Arizona, and Tucson Water collaborated with Phoenix and the Arizona Municipal Water Users Association (AMWUA), representing Maricopa County's ten largest municipalities, to develop a concept in which AWBA would store water in Tucson on behalf of the Phoenix area. By doing this, more M&I water would be firmed in the Tucson area while also providing a benefit to Phoenix M&I users. During severe future shortages, CAP water could be delivered directly to the Phoenix area, which needs wet water delivered to its surface water treatment plants, and the water stored by AWBA could then be recovered to meet Tucson area's needs.

Initial discussions acknowledged the benefits of using funds from the Phoenix area to purchase water for Inter-AMA firming, however due to growing demands, AWBA would have less and less access to excess CAP water, with virtually no access during shortages. Therefore, efforts were also directed to individual water providers with CAP M&I water allocations.

For Inter-AMA Firming to be realized, CAP users in the Phoenix and Tucson areas had to support it. AMWUA and the Southern Arizona Water Users Association (SAWUA), which comprises Tucson's 15 largest water providers, agricultural water users, and reclamation departments, jointly concurred that Inter-AMA Firming would significantly help Arizona deal with future Colorado River shortages to CAP M&I users. SAWUA and AMWUA agreed that a pilot phase was important to refine the mechanics of Inter-AMA firming. Specifically, Phoenix area municipal water providers would store some of their unused CAP M&I water at Tucson area recharge facilities where the water can be recovered and used in Southern Arizona during a shortage in exchange for the Phoenix providers receiving the same amount of CAP water delivered from Tucson providers. This ensures that each region has water during a shortage through a partnership that maximizes existing resources and infrastructure.

After M&I CAP users in Pima and Maricopa Counties supported the concept, further collaboration was needed. SAWUA and AMWUA sent a joint letter of support to the Arizona Department of Water Resources, AWBA, and CAP to begin to address regulatory and operational concerns. These entities have been supportive of Inter-AMA Firming and expressed a willingness to make the concept work.

This support led to Metro Water, Tucson and Phoenix's governing bodies approving agreements to initiate pilot projects in 2015. Under the pilot, Phoenix has ordered 150 acre-feet of its CAP allocation to be delivered and recharged at Metro's Avra Valley Recharge Project (AVRP) in 2015. In October 2016, Metro will place an order for its 2017 CAP water and have 150 acre-feet of that CAP water delivered to Phoenix as recovered water. Metro will then recover the 150 acre-feet that had been stored at AVRP and Metro's order of CAP water will remain whole. Phoenix is also in the process of performing a similar pilot project with Tucson Water for 850 acre-feet of CAP water.

If the pilots are successful, Inter-AMA firming could expand among water providers with CAP M&I water subcontracts as well as AWBA. The intent is that Phoenix area water providers would help expand Tucson area recharge facilities and have a larger portion of their otherwise unused CAP water stored in the Tucson area to firm their CAP allocations, thus providing more certainty for when shortage impacts their M&I CAP supplies in the future.

The collaborative process used to develop Inter-AMA Firming will become more essential if Arizona is to continue proactively addressing water challenges. Working together creatively generates the most beneficial solutions and is imperative for Arizona's water future.

Student Spotlight

Elia Tapia, Arid Land Resource Sciences

Elia Tapia is a first-year Ph.D. student in the Arid Lands Resource Sciences Graduate Interdisciplinary Program. She completed her Bachelor's degree in Geology at the University of Sonora (UNISON). While attending UNISON, she had the opportunity to participate in the Exchanging Cities Water and Infrastructure Program (ExCit) which awarded her a one-year exchange scholarship at Michigan Technological University. In Michigan, she worked as a research assistant at the Natural Hazards Mitigation in Pacific Latin America Program, and was able to travel to Guatemala to determine sulfur dioxide emissions from Pacaya and Santiaguito volcanoes by using a ground-based ultraviolet (UV) spectrometer (FLYSPEC).

She went on to complete a Master of Science Degree in Geology and Hydrology, graduating Summa Cum Laude. Her background in geological sciences and hydrology led her to develop a thesis project entitled "Climate Change Scenarios for the Rio Yaqui Basin and Their Impact on the Valle del Yaqui Aquifer, in Sonora, Mexico."

As a researcher in the Geology Department at UNISON, she worked on several projects from the National Water Commission in Mexico (CONAGUA). Among the most beneficial learning experiences for her career were: "The National Program for Drought Prevention;" "Water Resources Availability Assessment" for over 55 aquifers in the states of Sonora and Chihuahua; and "Artificial Recharge Studies" for three over exploited aquifers in Sonora, Mexico. She also worked as an adjunct professor for the same institution, teaching Geologic Data Analysis, Earth Systems, and Natural Hazards classes.

In 2012, Elia started working in the binational Transboundary Aquifer Assessment Program (TAAP) for Santa Cruz and San Pedro aquifers as part of the Mexican research team group. Her work involved binational meetings held with US representatives and contributing research organizations to establish the basis of a unified report that would cover information from both sides of the border. While working in the TAAP project, she had the opportunity to learn about the research work that is being undertaken at the University of Arizona, especially within the Arid Lands Resource Sciences program (ALRS) and the Water Resources Research Center (WRRC).

Elia decided to continue her research work through the ALRS program, emphasizing projects related to groundwater assessment that could lead to improved decision-making to mitigate water scarcity. She is particularly interested in groundwater assessment and management strategies in transboundary settings, and research using remote sensing and GIS tools along with effective stakeholder engagement methodologies.

As a University of Arizona student and a Graduate Assistant at the WRRC, Elia has been building upon the efforts of the TAAP project, but this time as part of the American research group and with the guidance of Dr. Sharon B. Megdal, Director of the WRRC. This year, Elia joined the Water RAPIDS team at the WRRC and started working with the Desert Landscape Conservation Cooperative (LCC), an international, public-private partnership that collectively influences landscape conservation in the Mojave, Sonoran and Chihuahuan deserts, both in the United States and Mexico.

Elia and her husband have traveled through different countries around the world, and with their baby daughter Emma, they manage to balance their studies, careers and family life.

Ethiopian Summer Internship Engages WRRC Graduate Research Assistant

Water Resources Research Center (WRRC) Graduate Research Assistant, Reshet S. Gebremariam, is participating in a summer internship on climate change adaptation in Ethiopia (East Africa) with the United Nations Development Program - Global Environment Facility (UNDP-GEF). The Global Environment Facility was established as a pilot program of the World Bank to assist in the protection of the global environment and to promote environmental sustainable development. As a GEF Implementing Agency, UNDP-GEF offers countries highly specialized technical services for eligibility assessment, programme/project formulation, mobilization of required co-financing, project implementation oversight, results management and evaluation, performance-based payments and knowledge management.

At the UNDP, under the supervision of Regional Technical Advisor Benjamin Laroquette, Gebremariam supports UNDP-GEF's work on integrated climate change strategies, climate resilient livelihoods, and climate information and early warning systems. She undertakes research in support of programmes and projects developed by the UNDP-GEF team including editing, translation, formatting work, and review of documents. She also assists with annual project reviews including compiling critical information on project results and impacts. At the end of the internship, Gebremariam hopes to better understand the impacts of climate change on vulnerable communities, particularly women and youth in developing countries, and how communities can better adapt to changing climatic conditions through livelihood diversification and improved land, water, and resource management.

At the WRRC, under the supervision of Director Sharon B. Megdal and Assistant Director Susanna Eden, Gebremariam works on various outreach projects and assists the staff with special tasks. She is in her second year of the Master of Science in *Water, Society, and Policy* at the University of Arizona and expects to graduate in the Fall of 2015.

Details Matter

by Sharon B. Megdal

The two big water stories of the western United States and perhaps the nation are California's water crisis and the potential for a shortage declaration on the Colorado River. Both are manifestations of drought conditions, as California has experienced a multi-year drought in its critical watersheds and the Colorado River Basin is in its 15th year of drought. The implications for the two states are different thus far. While California is experiencing a widespread water crisis, Arizona is not. California has only recently enacted groundwater management legislation. Arizona has managed groundwater in designated Active Management Areas (AMAs) since 1980. The Arizona Water Banking Authority has been storing water underground for almost 20 years in preparation for potential shortages. California does not have such extensive groundwater storage.

Many point to Arizona's groundwater management and water storage as evidence of sound water management and good planning. As I respond to inquiries about Arizona water management practices, I try to include details that are important to understanding both the strengths and the limitations of Arizona practices. I would like to use this column to discuss just a few of the details I think are necessary to developing a complete picture of the state's water situation.

My first example is the Arizona Assured Water Supply (AWS) Rules for the AMAs, a foundational element of groundwater management. The AWS Rules, which require demonstration of a 100-year water supply for new subdivisions, are complex and vary across Arizona's five AMAs. A detail not often mentioned is that, per the AWS Rules, the demonstration of 100-year physical availability of water may depend on water pumping to a depth of 1,000 feet below land surface. The Arizona Department of Water Resources (ADWR) examines carefully the hydrological studies related to physical water availability and performs very strict accounting of groundwater use, recharge, and replenishment. Yet some potential for localized aquifer draw-down remains. Though this matter is well-recognized by the water community and has been the subject of discussion and policy proposals, it is as yet not fully resolved.

My second example refers to another complex component of the AWS Rules, namely provisions related to meeting the rules' requirement that water use be consistent with the AMA management goal through membership in the Central Arizona Groundwater Replenishment District (CAGRD). Pursuant to 1993 state legislation, the CAGRD operates in Maricopa, Pinal, and Pima counties and is governed by the Central Arizona Project (CAP) Board, on which I sit as an elected member representing Pima County. The CAGRD is required to replenish for its members what is reported as excess groundwater pumping under the AWS Rules. CAGRD membership is voluntary; many have availed themselves of the opportunity to join in order to develop. The CAGRD is statutorily required to develop a Plan of Operation every 10 years. The plan submitted to ADWR in December 2014 is awaiting approval. The details I want to mention here relate to CAGRD membership and costs. The CAGRD must accept members that qualify pursuant to statute, regardless of the gap between water supplies secured by the CAGRD and projected replenishment obligations. The Plan of Operation identifies water supplies that are potentially available for meeting the projected replenishment obligation. These supplies may turn out to be very expensive. CAGRD plans and activities are not commonly on the radar screen of the water customer affected by the costs of replenishment. For some customers, CAGRD charges show up only annually as an assessment on the property owner's property tax bill. All involved need to receive detailed information on what the framework for membership, operations, and assessment of charges means for current and future CAGRD members and customers.

My third example of the importance of details relates to the pertinent date for an official declaration of shortage conditions for the Colorado River. Guidelines adopted by the U.S. Secretary of Interior specify the first curtailment to Colorado Water deliveries when Lake Mead's water level is projected to be "at or below elevation 1,075 feet and at or above 1,050". For CAP, the associated cutback will be 320,000 acre feet (an acre foot is 325,851 gallons of water). This amounts to just over 20 percent of CAP's annual entitlement of 1.5 million acre feet. Per the priorities established for CAP water deliveries, a cutback this significant will have impacts, particularly to central Arizona agriculture, CAGRD replenishment, and water storage by the Arizona Water Banking Authority. Communications regarding shortage typically mention these impacts, along with reporting that deliveries to Municipal & Industrial Priority or Indian subcontractors will not be affected. The relative security of water deliveries to these customers is extremely important to communicate. In addition, I would like to note this important detail: there will be an impact on cost for those who do receive CAP water as CAP's fixed costs are spread over fewer units of water sold. The exact impact to the residential water customer will depend on the utility serving that customer. The good news for the short-term is that, even though Lake Mead's water level fell below 1,075 this June, precipitation in the Colorado watershed during May makes it very unlikely that a shortage will be declared for 2016. Another detail: the declaration depends on the water level projected for January 1, 2016 by the U.S. Bureau of Reclamation in August, 2015. A similar schedule for shortage determination pertains to future years. While it does seem that we can breathe a sigh of relief in the very short-term, a shortage declaration remains probable in the next few years.

More information about these important matters can be found on many web sites, most specifically those of ADWR, CAP, and the U.S. Bureau of Reclamation.

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Address Service Requested

Beer continued from page 1

for home-brewers, who see the ultra-pure, recycled water as a blank slate full of possibilities. OBC member Jeremie Landers told the *Oregonian*, "In this case, the water we'll be using is cleaner than tap water you'd ever find anywhere. The purity level is incredible."

Despite the fact that Clean Water Services' recycled water exceeds Oregon's drinking water purity standards, getting approval to use it for the beer competition was challenging. Current Oregon regulations only allow recycled wastewater to be used for irrigation and wetland recharge, but not for drinking purposes. In April, the state's Department of Environmental Quality granted Clean Water Services and OBC special permission to serve the beer at events only, but not to sell it in bars.

While there are clear benefits to using the highly-purified water from a brewer's standpoint, the true purpose of the contest is to raise awareness about the issue of water scarcity and to help change the public's negative perception about drinking recycled wastewater. Art Larrance, Oregon's godfather of craft brewing and the inspiration for the project, told Clean Water Services, "Some of us have these perceived notions in our mind about where this water has been before. And so if we can brew beer and drink this water, that's gonna give people a strong inclination of maybe using this water for other purposes." Clean Water Services spokesman Mark Jockers hopes that this competition will be the first step in expanding the use of recycled wastewater for drinking purposes in Oregon. In an interview with Oregon Public Radio, Jockers said, "What we're really trying to do here is start a conversation about the nature of water, and there's no better way to start a conversation than over a beer."

Clean Water Services will distribute 300 gallons of purified recycled wastewater to approximately 25 OBC home-brewers on June 26th. The second annual Pure Water Brew Sustainable Beer Challenge will take place at the end of August, and the winners will take their prize kegs to the Water Environment Federation Technical Exhibition and Conference in Chicago later this year.