



Grand Canyon Skywalk at Eagle Point.  
Photo: pixabay.com

# ARIZONA WATER RESOURCE

## The Water Resources Research Center Quarterly Newsletter

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### Bill Introduced to Settle Hualapai Water Rights

by Jake Golden, WRRC Student Research Assistant

Standing above the Grand Canyon on the Hualapai Tribe's "Skywalk" brings a new perspective to the canyon's magnificence. The Hualapai Tribe or the "People of the Tall Pines," is committed to developing economic opportunities for its people in northwestern Arizona and, to do this, the Tribe needs a secure water supply. Arizona is home to 22 federally recognized tribes, of which 14 tribes have some sort of resolved water rights settlements. Settlement of Indian water rights claims is a high priority for the state.

Over the past six years, the Hualapai Tribe has been engaged in negotiations for the settlement of its water rights. The latest development in this process is Senate Bill 1770, commonly known as the "Hualapai Tribe Water Rights Settlement Act of 2017", which was introduced in early September by Senators Jeff Flake and John McCain during the 115th Congress. S. 1770 is considered the second phase of the Hualapai water settlement. In 2014, negotiations resulted in the Bill Williams River Settlement Act, which resolved tribal claims to water in the Bill Williams River basin and resolved issues relating to the Freepoint Minerals Corporation/Planet Ranch dispute. It was signed by President Obama and became law in December 2014.

This act was challenged by Mohave County but was unanimously upheld by the Arizona Supreme Court and validated by the Congressional Research Service during 2015.

S. 1770 attempts to accomplish the same ends as Senate Bill 3300, which failed to make any headway in 2016. Like the previous version, S. 1770 calls for 4,000 acre-feet of Colorado River water to be re-allocated to the Hualapai Tribe by the Central Arizona Project from the 67,300 acre-feet of water set aside for tribal water settlements under the 2004 Arizona Water Settlements Act. The bill specifies that the Hualapai Tribe is entitled to use groundwater and surface water within the reservation boundaries and is obligated to store 1,115 acre-feet per year of its 4,000 CAP entitlement to protect against reduced deliveries due to water shortages on the Colorado River.

The bill also proposes funding the construction of a pipeline, the Hualapai Water Project, from Diamond Creek to Peach Springs and then to Grand Canyon West. The pipeline would have the capacity to deliver a minimum of 3,414 acre-feet of water per year. It would be entirely within Hualapai lands, and the tribe would have to pay the CAP's pumping and energy charges if they choose to have the water delivered through

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Feature

CAP infrastructure. Funding for operations, maintenance, and replacement for water services is included.

With respect to S. 3300, the Department of the Interior released a statement outlining potential problems. The federal appropriation for the settlement was \$173.5 million. Over three-fourths of this funding was to cover the construction costs of the Hualapai Water Project, including the pumping plants and water treatment plants. A \$32 million Hualapai OM&R Trust Account was to be created for the tribe's use to maintain the new project, and \$7 million was allocated to cover intermittent costs and technical training.

The Interior statement noted that the costs are too high for the small amount of water to be delivered under the proposed settlement. It raised concerns about the inclusion of OM&R costs, believing that this represents a double charge that will set a precedent for future settlements involving CAP water. Finally, Interior was also concerned with the particularly broad waiver of sovereign immunity by the tribe and the inability for the tribe or the United States to object to any groundwater usage outside the reservation boundaries.

These concerns are likely to arise again as S. 1770 makes its way through the legislative process. Regardless, the parties will be working toward a quick resolution through negotiation rather than litigation. 🇺🇸

## Feature

### Archaeological Discoveries Reveal Value of Santa Cruz River in Prehistory

by Sam Potteiger, WRRC Student Outreach Assistant

When people think of Tucson, Arizona, they typically think of our scorching hot summers or the highly-regarded University of Arizona. However, Tucson can also be associated with a rich history dating back to the earliest Southwest Paleoindians. In fact, the Santa Cruz River Valley is one of North America's longest inhabited regions. The earliest evidence of human occupation dates back 12,000 years, prior to the existence of the Clovis peoples. The Clovis culture is generally regarded by archaeologists to be the ancestors of most Native American tribes. Around 4,000 prehistoric sites have been identified in the Santa Cruz watershed and exciting new discoveries continue to be made. These discoveries could potentially alter how archaeologists view the technological progression of the region's earliest inhabitants.

The Tucson area is known to have been an important agricultural hub for ancient Native American tribes, and the Santa Cruz River floodplain contains the earliest recorded instances of irrigation in the Southwest. Evidence suggests that it was farmed extensively in the Early Agricultural Period, roughly 2,000 - 3,000 years ago.

Nearly two years ago, construction began to connect West Sunset Road with I-10 and North Silverbell Road. A worker excavating at the site of a planned bridge made an astounding discovery. As Patrick McNamara described in the Tucson Daily Star, the excavator, Dan Arnit, gently scratched away at the dirt, revealing what looked to him to be a heel. He slowly uncovered the rest of the print to reveal the toes and eventually a set of human footprints. The prints belonged to ancient farmers who had tended to fields along the Santa



Dan Arnit shows the ancient exposed crop field and accompanying footprints. (Doug Gann, Archaeology Southwest)

Cruz River, which is thought to have existed up to a mile away from its current location. The rest of the site was excavated to reveal an ancient agricultural field with multiple sets of footprints, field boundaries, planting pits, and irrigation canals.

According to McNamara, these findings were more than just a glimpse into history for Jason Bahe, Pima County Department of Transportation project manager. For Native Americans, the site represents a medium to establish a relationship with their ancestry. Bahe, of Navajo descent, brought his daughter to the site, which provides a 3,000-year-old snapshot of the life of these early farmers. The discovery made there is the earliest evidence of the use of irrigation in the Santa Cruz Valley.

Sunset Road acts as a lens into a transitional period for the Santa Cruz peoples. During this period, societies moved towards larger permanent settlements and increased prosperity. At settlements along the Santa Cruz River, people grew corn, squash, and beans to supplement existing hunting and trapping. Eventually, multiple family groups began to settle together. Populations boomed, and settlements



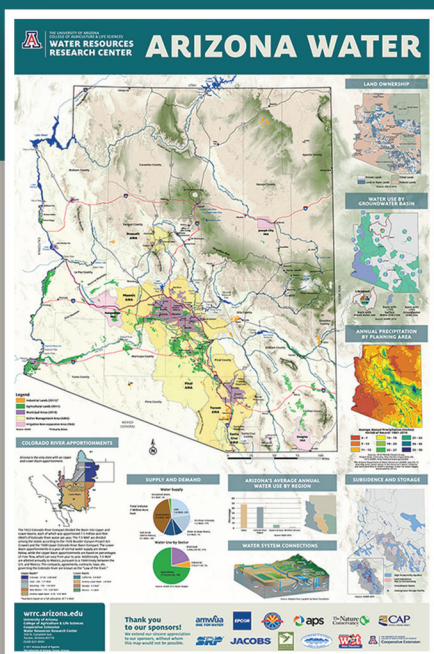
expanded into villages and harnessed resources from a greater area. Other aspects of culture advanced as a result of this expanded wealth. At the site at Sunset Road, the technological advances of the early Santa Cruz societies can be seen. There is evidence of trade with neighboring tribes and even with peoples as far as Mesoamerica. Scholars have posited that as culture flourished and the Early Agricultural Period came to a close, distinct identities began to appear among the Paleoindians. Archaeologists point to this time as the moment when a culture formed that could distinctly be labeled Hohokam. The Hohokam method of irrigation was unparalleled anywhere else in the Southwest. The canals the Paleoindians and early Hohokam built in the Santa Cruz Valley prefigured the complex networks that the Hohokam built in Central Arizona nearly 2,000 years later.

The Hohokam canals built in the Mesa area as long ago as 600 CE are still considered engineering marvels. The irrigation system is simple, but the true marvel of its creation is its monumental scale. The trenches were dug 12 feet deep and diverted water from the Salt and Gila Rivers. The main channels, which drew water directly from the river, were wide at their mouths and tapered as secondary branches drew water from the main channel. By reducing the channel size as the flow decreased, the Hohokam were able to sustain a steady flow rate throughout the different branches of the system. The steady flow rates ensured that the irrigation system would function correctly. If the flows were too fast, sediment would be brought into the trenches and hinder flow. Water that was too slow might not reach the fields at the ends of the branching canals. By meticulously crafting their canals, the Hohokam were able to support an estimated population of 80,000 through the irrigation of more than 100,000 acres of land between 1,100 CE and 1,450 CE. The much earlier sites on the Santa Cruz River indicate that the Hohokam had perfected their irrigation techniques over the course of several millennia.

Archaeological discoveries provide evidence that the Santa Cruz River acted as the heart of all life in the Tucson area for thousands of years. In historic times, Europeans encountered Native American societies built around the bounty the river provided, although by that time the ancient irrigation canals had long since been abandoned and lost under layers of sediment. Father Eusebio Kino, a Spanish missionary, was the first European to set foot into the Santa Cruz Valley. He founded Mission San José de Tumacácori in 1691, and over the course of the next century, the Spanish established other missions in the region where orchards and gardens were irrigated by diverting water from the river.

At the time of American settlement in the 19th Century, the river still had a beneficent aspect. Julius Froebel, German journalist and world-traveler, was astounded by the natural beauty of the river during his visit in the mid-1800s. "The banks of the river, and the valley itself, are covered with poplars and willows, ash trees and plantains, oaks and walnut trees." Froebel was enchanted by the stark contrast between the bountiful river valley and the harsh surrounding desert. The meadows and grasses of the river valley also supported a diverse range of wildlife. Gold-hungry settlers rushing to California mentioned catching turkeys and hunting pronghorn along the riverbanks.

The history of the Santa Cruz River describes a river of plenty. For early inhabitants, it was the source of life in an otherwise challenging environment. The Hohokam constructed sophisticated canal systems to divert its water and support a thriving community. Long after the times of the Hohokam, European settlers saw how the river breathed life into the desert. Although the river may not flow in Tucson anymore, discoveries like those made at Sunset Road act as reminders of the Santa Cruz as a living river. 🌱



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# News Briefs

## SRP Reservoirs Rebound after Wet Winter

Healthy winter snow and rain in Arizona helped fill Salt River Project (SRP) reservoirs in Central Arizona. This winter broke a six-year streak of lower than average runoff. As Jeffrey P. Lane reported in August, all reservoirs on the Salt River except Roosevelt Lake were full in early spring. Reservoirs on the Verde River reached capacity in February, so that it was necessary to spill water and continue the releases through late spring. With a total of about 970,440 acre-feet of runoff, the SRP system recovered from 49 percent of capacity last year to 68 percent of capacity as of August 23, 2017. Current reservoir levels can be found online through the SRP website at <http://data.hydrometdataservice.info/dwr/report.aspx?dt=10/3/2017>.

## New SRP Website Offers Watershed Information

Anyone thinking of taking advantage of recreational opportunities in the Salt and Verde River watershed can now check out hydrologic and meteorological conditions on the Salt River Project's new website: WatershedConnection.com. The site replaces and expands a previous information source, WatershedMonitor.com, creating a user-oriented portal for learning about the watershed and SRP's role in its protection and management.

## Large Study Finds Plastic in Drinking Water Worldwide

Plastic is used in practically all aspects of life and now it has been found in drinking water. Orb Media and a researcher with the University of Minnesota School of Public Health, conducted a massive study, collecting samples from five



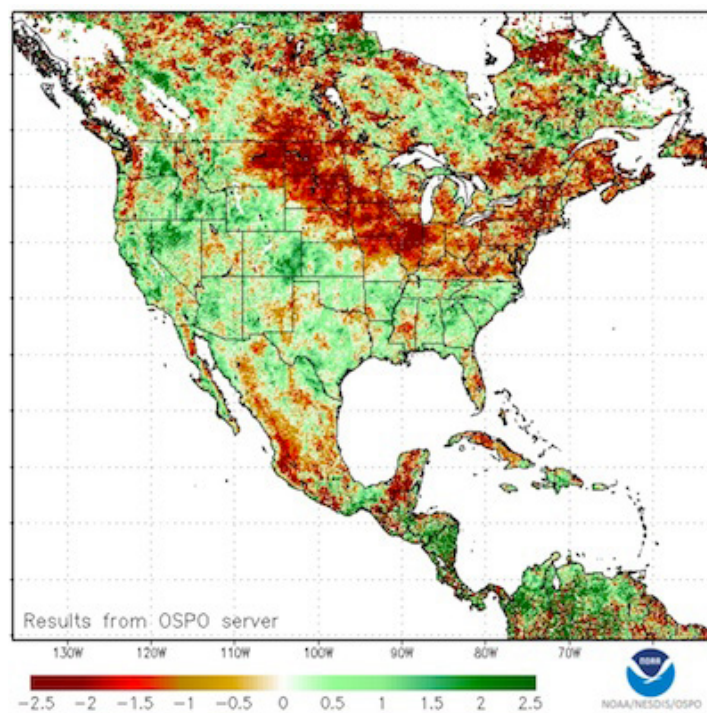
Photo: WRRRC

different continents, and found that more than 80 percent of the samples contained plastic fibers. In the United States, that percentage was more than 90 percent, on par with Beirut, Lebanon. These plastic microfibers come from a variety of sources, including clothing, paints, and dust from tires. The fibers find their way into water sources and eventually come out the tap in drinking water. What's more, the microfibers find their way into food as well through irrigation and then

moving up the food chain. Is this a concern? Apparently, this is an unanswered question. According to Orb Media, plastic microfibers are known to absorb chemicals from their environment. When the body attempts to digest these materials, these chemicals are released into the body. In addition, plastic microfiber can break down into particles so small that they can move through the intestinal wall. Upgrading water treatment to nanofiltration or reverse osmosis could prevent plastic microfibers from entering drinking water, but this is an expensive option. Orb Media has posted a report of their research at [https://orbmedia.org/stories/Invisibles\\_plastics/multimedia](https://orbmedia.org/stories/Invisibles_plastics/multimedia), where they advocate for reducing the use of plastics and recycling those plastic items we do use.

## Flash Drought Prediction Enhanced and Expanded

The rapidly developing drought in the upper Midwest this summer called attention to improving drought prediction capabilities. A satellite data based tool has proven useful in predicting "flash droughts", those periods of abnormally low precipitation and high temperature that lead to a rapid



decrease in soil moisture. The tool, Evaporative Stress Index (ESI), became operational in 2016. Christopher Hain, the project leader, worked with a multi-agency team beginning in 2008, which included the U.S. Department of Agriculture, National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, and others. ESI has detected indicators of drought much earlier than conventional monitors, and it excels at recognizing and predicting flash droughts. It has already proven its usefulness to farmers and ranchers in the United States. Based on assessment of ESI's



functionality, the development team is expanding ESI to global datasets for use worldwide. Most effective when used in conjunction with other information sources, its unique utility is its ability to reduce the lag times of other monitors. One route to the ESI is through <https://www.climate.gov/maps-data/dataset/evaporative-stress-index-maps-0>.

## Binational Cooperation Yields Agreement on Colorado River

As September came to a close, the International Boundary and Water Commission convened representatives of the United States and Mexico for the ceremonial signing of Minute 323 to the 1944 Water Treaty between the nations. Minute 323 extends the provisions of Minute 319, which was signed in 2012 and set to expire at the end of 2017. It retains the previously agreed upon annual increases and annual cutbacks in water allocation to Mexico based


also extends provisions of Minute 242, which deals with salinity control measures for water delivered to Mexico. To deal with the variability of flows arriving in Mexico, a pilot program and operational review will be undertaken at Morelos Dam, which should lead to less variability in daily flow.

Regarding the environment, provisions of Minute 319 are extended and augmented. River water, in the amount of 210,000 acre-feet, was pledged for environmental purposes, one-third each from Mexico and the United States and one-third from a binational coalition of NGOs. In addition, funds will be provided: \$9 million for research and monitoring and \$9 million for restoration projects. The U.S. commitment of 70,000 acre-feet will be met with water conserved with the \$31.5 million the United States will invest in water conservation projects in Mexico. Additional water conserved through these projects will be allocated to Mexico, except



Photo: Arizona Department of Water Resources

upon water levels in Lake Mead. In addition, it adopts a Binational Water Scarcity Contingency plan, which depends on achievement of the water saving described in the Lower Basin Drought Contingency Plan and lays out the terms of Mexico's participation. It also continues Mexico's option to defer delivery and store portions of its Colorado River water entitlement in Lake Mead and establishes a revolving account and Intentionally Created Mexican Allocation. Minute 323

for amounts reserved for the system, benefiting all users, and for the United States. New water source projects, such as desalination and treated effluent reuse, are included along with conservation projects for long-term protection of Colorado River flows. Binational working groups defined by Minute 323 will be active for the duration of the agreement—through 2026—investigating and monitoring implementation. 

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ROCKY MOUNTAIN SOUTHWEST CHAPTER

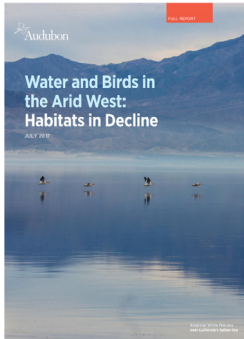
## BEYOND THE MIRAGE DOCUMENTARY WINS REGIONAL EMMY

Beyond the Mirage, The Future of Water in the West, received an Emmy from the National Academy of Arts & Sciences Rocky Mountain Southwest Chapter for Best Topical Documentary. The film was the work of Cody Sheehy of the UA College of Agriculture and Life Sciences (CALs) with the collaboration and support of CALs, the Water Resources Research Center, and Arizona Public Media.

## Water and Birds in the Arid West: Habitats in Decline

Chad Wilsey, Taylor Lotem, Nicole Michel, Karyn Stockdale

National Audubon Society, July 2017

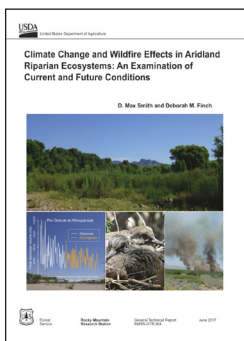


As part of its Western Water Initiative, the National Audubon Society released a report, *Water and Birds in the Arid Southwest: Habitats in Decline*, which focuses on the Colorado River Basin and inland western saline lakes. The report assesses the impacts to key western bird species and their environments of the anticipated effects of climate change and water availability. Acting as a springboard for conservation actions, the report hopes to foster water management practices that take into account the surrounding ecosystem impacts. [https://www.audubon.org/sites/default/files/wbaw\\_report\\_5july17\\_updated\\_final.pdf](https://www.audubon.org/sites/default/files/wbaw_report_5july17_updated_final.pdf)

## Climate Change and Wildfire Effects to Aridland Riparian Ecosystems: An Examination of Current and Future Conditions

D. Max Smith, Deborah M. Finch

U.S. Department of Agriculture, U.S. Forest Service, Rocky Mountain Research Station, 2017.



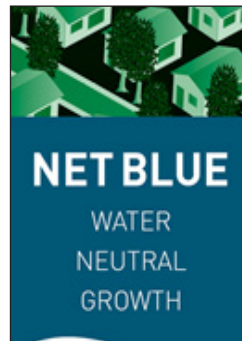
In partnership with the U.S. Department of Agriculture, the U.S. Forest Service has published, *Climate Change and Wildfire Effects to Aridland Riparian Ecosystems: An Examination of Current and Future Conditions*, a study reviewing the ecohydrology of southwestern streams, particularly sites along the Middle Rio Grande, to describe the impacts of wildfires on plant communities and riparian-nesting birds. The study begins with a comparison of the ecohydrology

among sites in the Colorado River and Rio Grande Basins to illustrate differences in streams. Next, the authors share their results from the Middle Rio Grande in New Mexico about the impacts to riparian recovery from the wildfires in 2011. Based on an examination of plant density and diversity in the area from Los Lunas to south of the Sevilleta fire, the study concludes that cottonwood forests are in decline. This change in composition will negatively affect the nesting-birds of the Middle Rio Grande, but further study is needed to better predict the quality of their habitat. Study outputs provide valuable

information for setting standards for surface flows that ensure these ecosystems can remain healthy. The full report, RMRS-GTR-364, is only available online through Treesearch at [www.treesearch.fs.fed.us/pubs/54331](http://www.treesearch.fs.fed.us/pubs/54331).

## Net Blue Water Neutral Growth

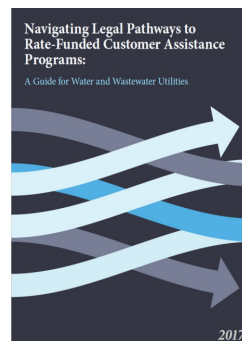
Alliance for Water Efficiency, The River Network, and the Environment Law Institute



The Alliance for Water Efficiency partnered with the River Network and the Environmental Law Institute to create a model ordinance for communities to use in projecting and offsetting water demands of new developments. Such ordinances are intended to ensure that growth has a neutral impact on service area water demand. Users are able to access and amend the model ordinance based on local conditions. The model ordinance is free to use, user-friendly, and open source. <http://www.allianceforwaterefficiency.org/net-blue-landing-page.aspx>.

## Navigating Legal Pathways to Rate-Funded Customer Assistance Programs

University of North Carolina at Chapel Hill Environmental Finance Center, July 2017



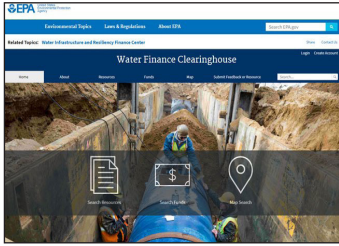
The University of North Carolina Environmental Finance Center released a report, *Navigating Legal Pathways to Rate-Funded Customer Assistance Programs*, on the financial burdens placed on low-income customers resulting from high water and wastewater rates. Utility rate hikes usually accompany infrastructure upgrades and may be needed to offset low per capita use. UNC provides profiles for each of the 50 states and

describes the challenges to making customer assistance programs (CAPs) feasible and legally achievable. For Arizona, the report covers both commission-regulated (private) and noncommission-regulated (public) utilities. State statutes and policies mandate just and reasonable rates and prohibit any unfair advantage to any person, which may prevent utilities from offering lower rates to low income customers. However, Arizona offers a state-level bill assistance program based on income. The report also notes that Pima County offers a bill discount program, known as the Sewer Outreach Subsidy Program, to customers based on income. The report is available at <https://efc.sog.unc.edu/sites/www.unc.edu/files/Pathways%20to%20Rate-Funded%20CAPs.pdf>.



## Water Finance Clearinghouse

U.S. Environmental Protection Agency, Office of Water, Office of Wastewater Management, 2017.

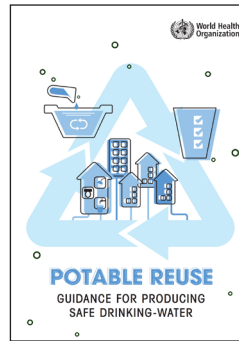


The U.S. Environmental Protection Agency (EPA) recently introduced the Water Finance Clearinghouse, developed by the Water Infrastructure and Resiliency Finance Center. The Clearinghouse offers


communities access to resources and funding opportunities through its online databases. Resources such as, case studies, reports, webinars, and presentations are available for communities to use when they are contemplating or making financing decisions about water infrastructure projects. The Clearinghouse “map” feature allows users to easily select a state, territory, or EPA Region for access to geographically relevant information. The portal was launched as an effort to create an all-inclusive database for community water finance needs. The Clearinghouse is updated on rolling basis and new resources and funding options can be submitted by becoming a Clearinghouse Contributor. To visit the Clearinghouse, go to <https://ofmpub.epa.gov/apex/wfc/f?p=165:1:::>

## Potable Reuse: Guidance for Producing Safe Drinking Water

World Health Organization, 2017.



The latest release by the World Health Organization (WHO), Potable Reuse: Guidance for Producing Safe Drinking Water, builds upon previous WHO reports on potable reuse and safe drinking water quality in an effort to provide guidance for water suppliers, water managers, and those with an interest in potable reuse. Readers should be aware; however, that the report assumes that they are familiar with the safe drinking water framework. The report aims to provide information on potable reuse and its performance in current reuse schemes. WHO highlights case studies of potable reuse projects, either indirect or direct, intended to help fulfill identified water needs. Overall, the report provides an overview for those interested in adopting a potable reuse scheme. The report is available at [http://www.who.int/water\\_sanitation\\_health/publications/potable-reuse-guidelines/en/](http://www.who.int/water_sanitation_health/publications/potable-reuse-guidelines/en/)




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# Public Policy Review

Photos, clockwise from top left: View of reception area for Cutting-Edge Solutions to Wicked Water Problems conference; Conference co-chairs Dror Avisar and Sharon B. Megdal; Sorek Desalination Plant field trip participants; Panel at Sept. 12 WATEC conference; Central Arizona Project Board members Jennifer Brown and Mark Taylor with Sharon B. Megdal.

Photographers: Gefen Ronen Eliraz, Jennifer Brown, and Michelle Baruch

## Comparing Experiences and Lessons Learned: The September 2017 International Conference on Cutting-Edge Solutions to Wicked Water Problems

by Sharon B. Megdal

My work focuses on water policy and management. For over a decade, I have been comparing the policies and management approaches of Israel with those of Arizona and the Colorado River Basin. This multi-faceted effort has involved several visits to Israel, where I have studied their management strategies and often speak about our region's water matters. Water recharge and banking, transboundary water and wastewater, groundwater management and governance, and conservation are among the issues compared. This calendar year started with a new opportunity, namely to co-chair a water conference co-convoked by a U.S. organization, the American Water Resources Association (AWRA), and the Water Research Center at Tel Aviv University (TAU). On September 10-11, 2017, the conference "Cutting-Edge Solutions to Wicked Water Problems" was held at Tel Aviv University's beautiful Porter School of Environmental Studies building. Professor Dror Avisar, Water Research Center Director, served as conference co-chair. It was great to work with Professor Avisar, whom I did not meet in person until the day before the conference!

Wicked water problems are difficult to formulate and solve. (See <https://wrrc.arizona.edu/wicked-water-problems>.) Some examples are overuse or over-allocation of surface water and groundwater, impacts of long-term drought or changing

climate, the imbalance between growing demands for water relative to supplies, and transboundary water and wastewater challenges, including pollution. Different regions face different problems, but the pathways to solutions often have common or similar elements. Israel is well known for its leadership in deployment of desalination technology, drip irrigation, and water reclamation, which has enabled it to address the scarcity of natural freshwater resources. While Israeli water management has influenced the work of others across the globe, we must acknowledge that institutional and governance factors, along with those related to geographic and physical variables, will shape the policies we see implemented. The key thrust of the conference was to discuss the pathways to solutions so to learn from each other's experiences and/or research. The active sharing and learning occurred through conference keynote addresses, technical presentations, field trips, and meals and hallway conversation. And learn we did!

In addition to speakers and attendees from the U.S. and Israel, experts from Mexico, the United Kingdom, and Hong Kong participated. The opening keynote speakers set the stage. Felicia Marcus, Chair of the California State Water Resources Control Board, emphasized the need to look at the whole of the problem(s), including difficult-to-predict game-changing influences, such as those associated with climate. Scale is important to consider: the population of California is more than four times that of Israel and the economy of this single state in the U.S. would rank about sixth among countries world-wide. Starting with a bit of humor, she invoked Godzilla in her first slide to evoke the horror of the wicked water problems situation. She emphasized that California's Water Action Plan includes a mix of approaches. Her presentation underscored a concern water managers often speak to, namely that it will take a crisis to spur actions that many have known were advisable, but difficult to implement, due to political and cost considerations. In California, the worst drought in



modern times served as the wake-up call and led to adoption of conservation mandates and groundwater management legislation. She emphasized the need to recognize the sometimes harsh realities and take bold actions.

Professor Eilon Adar of the Zuckerberg Institute for Water Resources at Ben Gurion University of the Negev provided an overview of how Israel has addressed the wicked problem of water scarcity. Often during the conference the saying “necessity is the mother of invention” came to mind. In Israel, the scarcity of naturally occurring usable water relative to demand made “bridging over the water shortage” the primary water management goal. Key strategies included: improving water utilization efficiency for irrigation and other water applications; conservation; water reuse; and management of water quantity and quality. “New” usable water was created through treating and reclaiming wastewater and desalinating seawater and brackish groundwater. Like California, responding to crisis has figured into the timing of Israel’s water management actions. Drought conditions during the early part of this century resulted in changing agricultural water allocations and water pricing, which led to a renewed look at seawater desalination and the current situation where the quantity of desalinated water exceeds 70 percent of the quantity for municipal use. Key take-away messages were that water has economic value and its management needs care and attention through a holistic and coordinated approach.

Remarks on “Immigration and the Water Crisis” by TAU Vice Rector Professor Eyal Zisser helped provide a regional geopolitical backdrop to the discussions. Conference attendees received the most up-to-date information on the Red Sea-Dead Sea Project (Project) by Oded Fixler, Senior Deputy Director General, Israel Ministry of Regional Cooperation. He serves as the Israeli lead for the Joint Advisory Board with Jordan for the Project. His address covered the details of this cutting-edge and complex program to address partially the water scarcity challenges faced by (1) Jordan, whose significant water demands occur in the northern part of the country, (2) a key agricultural area in the south of Israel, and (3) the West Bank. A 2013 Memorandum of Understanding signed by Israel, Jordan, and the Palestinian Authority enabled the parties to move forward with what may be the first phase of a much larger effort to desalinate Red Sea water. The Project involves building a plant in Jordan. Some of the desalinated water will be sold to Israel. Israel in turn will provide water from the Sea of Galilee in the North to Jordan. The Project includes delivery of water to the Palestinian Authority for the West Bank, further demonstrating its regional importance. Also incorporated are energy features and the pumping the seawater desalination plant’s brine discharge to the Dead Sea to offset some of the decline in Dead Sea water levels – another truly wicked water problem of the region.

Field trips were offered to the IDE’s Sorek Desalination Plant, the largest reverse osmosis desalination facility in the world,

and to Netafim’s drip irrigation manufacturing facility at Kibbutz Hatzerim in the Negev Desert, where participants learned about the technology in drip emitters and life on a kibbutz. In addition, those who did not participate in the field trip to Sorek were able to take a virtual tour of the Sea of Galilee (Lake Kinneret), conducted by Dr. Doron Markel, Unit Head for Monitoring and Management of Lake Kinneret and Its Watershed. This was followed by a screening I hosted of the award-winning documentary *Beyond the Mirage*, which connects some of the wicked water problems of the lower Colorado River Basin and Arizona to Israeli water management. (See <http://beyondthemirage.org/>.)

Two tracks of technical presentations on wicked problems as well as strategies to address them featured experts representing academic institutions, government water agencies, the private sector, and non-governmental organizations. Low Jordan River and Colorado River flows, low inflows into the Sea of Galilee and Lake Mead, transboundary wastewater and associated pollution problems, water banking programs, water quality monitoring, water use efficiency, and water treatment were just some of the topics covered. For a more complete overview of the topics, along with contact information for the lead presenters, please consult the final program. (<http://awra.org/meetings/Israel2017/> and <http://watec-israel.com/preview-program/>.)

It is hard to convey the excitement associated with the conference in words. This was the first visit to Israel for many participants, some of whom were joined by family members. Several combined the conference experience with other exploration of this small country. For me and others, this conference was followed by participation in the biennial international WATEC conference and expo (<http://watec-israel.com/>), where discussion of wicked water problems carried over into the panel on water scarcity and abundance. See <https://wrrc.arizona.edu/panel-remarks-watec> for a summary of my panel comments.

I am grateful for the many positive comments I received before, during, and after the conference. Organizing a conference always takes a lot of work, and co-chairing an international conference was something new for me. It involved dealing with many issues that either do not arise or arise less frequently when chairing a domestic conference, whether local or national. While it did not involve too many sleepless nights for me, it did involve many early mornings of calls and emails working across the 10-hour time difference. I wish to offer my most sincere thanks to all those who helped make this conference successful. In addition to the speakers, I wish to shout out special thanks to Ken Reid and staff at AWRA, Dror Avisar and his colleagues at Tel Aviv University, and conference collaborators Netafim, IDE Technologies, Tel Aviv University, International Arid Lands Consortium, WATEC, and, last but not least, the University of Arizona Water Resources Research Center! 🌍



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