

2024

YEAR IN REVIEW





There is no shortage of challenges when it comes to water in Arizona – the shrinking Colorado River, groundwater depletion and water contamination are just a few. Simultaneously, there are innovative solutions being developed, tested and implemented every day.

We in the Arizona Water Innovation Initiative (AWII) are doing our part to develop innovative solutions to water challenges across the state with our five strategic priorities, as well as several cross-cutting programs. In the process, we've learned that innovation comes in many forms.

There is wide agreement, for example, that groundwater supply and quality are priority issues for the state of Arizona. Working across fields and sectors, AWII experts are innovating a multi-pronged, whole-of-program approach.

For example, AWII's Impact Water - Arizona program is co-developing, in partnership with a large array of collaborators, a series of locally driven groundwater workshops in rural communities, innovating an approach to community engagement on challenging issues that is widely applicable.

Researchers with the Advanced Water Observatory and Decision Support System are developing a statewide groundwater assessment that will help residents and decision-makers to better visualize the groundwater picture across the state.

In addition, Global Center for Water Technology researchers are spearheading work in collaboration with the Arizona Department of Water Quality to

address issues that affect groundwater quality, such as PFAS, with innovative new technologies. These novel approaches are spurring further work in Arizona's water sector leading to patents and tech start-ups.

Water policy experts with the Kyl Center for Water Policy are addressing gaps in current groundwater management areas, including highlighting the need to recharge aquifers near the same place where groundwater is withdrawn to prevent negative impacts such as subsidence.

Finally, the Arizona Water for All program is working to ensure that these innovations are available to and implemented for all Arizonans, including its most water-insecure communities.

Combined, the Arizona Water Innovation Initiative strategic priorities provide a holistic approach to many of Arizona's most pressing water challenges. By combining innovation, research, collaboration and practical solutions, AWII is creating solutions to Arizona's complex water challenges.


Dave White

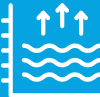
Principal Investigator, Arizona Water Innovation Initiative
Julie Ann Wrigley Global Futures Laboratory®


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Impact *at a glance*

2,062

Students engaged

143

Engagement events conducted



71

Projects supported

15,795

Partners and residents engaged



15

Arizona state agencies engaged

47

Research and development personnel employed



36

Arizona industry partners engaged

2

Global Center for Water Technology testbeds launched

Focused on industrial water vapor recovery research and rural water technology research.

25

Rural and tribal community engagement events



9

Patents developed

21

Tools and products developed

5

Spin-off companies in development

7

Certificates and courses for workforce development

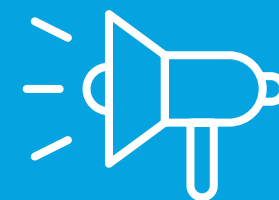
These courses address community-specific needs and equip individuals with the skills needed for water management and research.

1,600

Local, national, international media stories

10.74 B

Unique media readership



\$20M

Ad spend equivalency



What people *are saying*

“ To protect our water supply for future generations and support our growing economy, we need long-term solutions. ASU’s Arizona Water Innovation Initiative is leading the development of cutting-edge approaches to water management so we can get the most out of every drop. Working with public, private and nonprofit partners, AWII supports solutions like Advanced Water Purification, groundwater management and resilient infrastructure—and informs the work of policymakers like me.”

Congressman Greg Stanton, Arizona’s 4th District

“ At the Arizona Department of Environmental Quality, we work to ensure all Arizona residents have access to clean and safe drinking water. We strive to support small community water systems in particular in complying with both the federal Safe Drinking Water Act and Clean Water Act. Our partners with the Arizona Water Innovation Initiative are supporting that important work with innovative solutions related to key issues including Advanced Water Purification, cesspool remediation and PFAS removal.”

Karen Peters, Arizona Department of Environmental Quality Deputy Director

“ The Arizona State Land Department is committed to water efficiency on all state lands. With limited staff to address water issues, we are partnering with the Arizona Water Innovation Initiative to better understand our water uses and improve water efficiency in ways that benefit both trust beneficiaries and the state.”

Robyn Sahid, Commissioner, Arizona State Land Department

STRATEGIC PRIORITY 1



Improving water efficiency and quality with technology



“ Addressing Arizona’s water challenges is a top priority for Governor Katie Hobbs. We recognize the importance of water security for Arizona’s economic future and are well positioned to tackle critical water issues. We have made immense progress on issues including the Colorado River, and there are many innovative solutions on the horizon for rural groundwater, water quality and more. The Arizona Water Innovation Initiative is a key partner in securing a thriving future for the state.”

Patrick Adams

Senior Advisor for Water Policy to Arizona Governor Katie Hobbs

The Global Center for Water Technology is addressing the water quantity and quality concerns of current and future Arizona water users by rapidly developing, commercializing and deploying advanced technologies for water augmentation, conservation, treatment and reuse. Working with industrial, municipal, agricultural, tribal and international partners, the center links world-class researchers and students with companies to support energy production, microchip manufacturing, information technology, industrial cooling, agriculture, tourism and other industries. The team is advancing innovative technologies that are enhancing water quality while generating an additional 250,000 acre-feet per year of sustainable water annually within a decade. They additionally worked with the Arizona Department of Environmental Quality on the development of the Arizona Advanced Water Purification program, significantly increasing the state’s water security.



Water treatment plant. Photo by Faith Kearns.

State and university partnership develops innovative PFAS treatment options

The recent announcement of a new federal rule aimed at reducing PFAS (per- and polyfluoroalkyl substances) in drinking water gives water utilities a few years for implementation. In Arizona, the state Department of Environmental Quality (ADEQ) will be responsible for ensuring the new regulatory standards are met.

While meeting this latest standard may sound straightforward, questions remain about the best treatment options for removing PFAS from drinking water.

That's where Treavor Boyer comes in. Boyer, a professor of environmental engineering in ASU's School of Sustainable Engineering and the Built Environment whose research focuses on water quality and treatment, is working with ADEQ to provide technical

advice on PFAS treatment options with support from AWII and the Global Center for Water Technology.

"PFAS is really the top contaminant we are facing in the environment right now," says Boyer. "I tell students who are getting ready to graduate that if they go into water or wastewater, they're going to be working on PFAS for a long time because the more we look for it, the more we find it in both groundwater and surface water."

There are currently two primary methods used to remove PFAS from drinking water: activated carbon adsorption and ion exchange resin. While activated carbon is more commonly used, ion exchange resin may be more useful in some circumstances, especially as more detailed research and guidance develops.

One of the main challenges with PFAS treatment is that no matter the treatment, when PFAS are removed, they

“Every public drinking water system, regardless of size, is unique and deserves a custom PFAS solution.”



end up concentrated on the carbon or resin surface that then needs to be disposed of or treated as well.

"You can use ion exchange resin to effectively remove PFAS from water," says Boyer, "but the big questions and uncertainties surround the fact that the resin is then typically regenerated. This is different from activated carbon, which is taken off site and reactivated or disposed of."

Regeneration involves exposing the PFAS-laden resin to a chemical solution that removes the PFAS and allows for reuse of the resin, which creates a relatively smaller volume waste stream to manage.

"Water utility personnel are used to regenerating ion exchange resin after it is used for removal of nitrate or calcium hardness," says Boyer, "but PFAS regeneration is more complex and may involve a different set of chemicals than they might usually have on hand."

To address the questions that ADEQ has about regenerating the resin, Boyer says that researchers in his lab are completing a review of very recent literature "because PFAS is a topic that evolves on a weekly timescale." They'll then move on to an experimental plan, and then experimental work, focused on regeneration specific to water conditions in Arizona.

In the end, they will provide ADEQ with guidance on ion resin exchange regeneration for PFAS removal that includes a cost analysis and other considerations for utilities.

"With something as complex as PFAS, regulators know that there's not going to be one way," says Boyer. "I give ADEQ a lot of credit for working ahead so that when there are these multiple ways forward, they have enough internal resources to make decisions and provide guidance."

Boyer's collaborators at ADEQ agree.

"Through our state-wide testing program, ADEQ saw that even isolated rural water systems are not spared from PFAS contamination," says Jasmina Markovski, senior engineer with ADEQ. "Every public drinking water system, regardless of size, is unique and deserves a custom PFAS solution. While tempting, 'plug-and-play' solutions directly off the shelf are usually not the most effective treatment choice because they do not consider a system's specifics."

“That's where this collaboration between ASU and ADEQ is valuable. We are testing innovative, Arizona-specific PFAS treatment approaches and providing science-based testing protocols to assess performance potential for different systems with different goals,” continues Markovski. “We are lucky to have a local university that is a national leader when it comes to PFAS research to support ADEQ in bridging science with application.”

PFAS is only one set of what are called “emerging contaminants” that will need to be addressed over time. “There is a lot of innovative research happening when it comes to water contaminants,” says Boyer, “but putting the research into practice really requires partnerships with regulators and utilities, so we are glad to be working with ADEQ from the start to provide support for this complex process.”

The Global Center for Water Technology will be collaborating on an additional several projects co-developed with ADEQ to address water quality concerns including quantity challenges for on-site drinking and septic systems, industrial waste impacts on ground and surface waters and long-term disposal options for salty brines that could increase access for expanded use of brackish groundwaters or reduce costs of wastewater desalination and potable reuse. — Faith Kearns

STRATEGIC PRIORITY 1



Driving tech innovation in Arizona's water sector

What do point-of-use water filters, destruction of forever chemicals, hydrogen, wastewater reuse, atmospheric water harvesting and water sterilization have in common? They are all areas where researchers are pursuing technology innovation to improve Arizona's water outlook, as well as support job growth and the state's economic future.

The water technology innovation space is a small but growing one, says Adam Gushgari, whose role with AWII and the Global Center for Water Technology is to support researchers in commercializing promising water technologies.

"Arizona has a very up and coming tech sector, but we really haven't nailed down what the primary tech driver is in this region," Gushgari says. "Water makes a lot of sense with climate change and greater water

use for a lot of commercial industrial applications, including AI. We have an incredible opportunity sitting in front of us."

Gushgari is a civil and environmental engineer who received both his undergraduate and doctoral degrees at ASU, close to where he was raised. Before entering his doctoral program, he had a life-changing experience.

"I had a friend overdose on what we believe was heroin adulterated with fentanyl. It was the second person I'd known in my adult life who died from an opioid overdose," says Gushgari. "She was on the road to recovery and had been clean for about six months when she overdosed."

That tragic event happened as Gushgari was re-evaluating his career path. He met with ASU professor Rolf Halden and they discussed the emerging field of wastewater epidemiology and its potential use for monitoring opioid levels and the presence of fentanyl in



STRATEGIC PRIORITY 1



to about \$300 million. By 2022, that number was up to \$1.6 billion," Gushgari says. "The largest investment areas have been water treatment, followed by water monitoring and then water management. That means there's an opportunity for university startup companies, especially those whose business plans require external funding to capitalize on an opportunity."

However, for researchers interested in commercializing their work, there is no playbook and the process is not necessarily straightforward, says Gushgari.

"Anytime I talk with a researcher who wants to start a company, I ask them what they want out of it. It's important to understand your own personal drive," says Gushgari. "The answer doesn't matter as much as being truly introspective, because if you're not true to yourself, you're going to burn out."

For academics, Gushgari stresses the importance of moving quickly.

"From my experience with university-focused startups, we often miss the time for market entry," Gushgari says. "There's this idea that we have to have perfect technology or we just need a couple more improvements. When we do that, we are chasing perfection, which is not obtainable. If you see an opportunity, the time to start pursuing that is yesterday."

Given the tailored approach that has to be taken for each startup effort in Arizona's water technology innovation sector, it can be hard to know what success might look like. However, Gushgari is clear.

"It's really about growth," says Gushgari. "Patents, startup companies, bringing in corporate investment, all of these efforts support job creation and economic growth. If we're not successful in that, in my mind then we're too early. This is a sector that's going to grow a hundred percent, so we just have to time it right." — Faith Kearns

a community. Soon after, Gushgari entered a doctoral program with Halden to start research in the field.

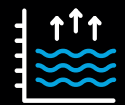
"There were very few academic institutions doing wastewater epidemiology at the time and no for-profit companies. We became the first researchers to publish the positive detection of fentanyl in U.S. wastewaters," says Gushgari. "At the same time, we spun out our own startup company, AquaVitas, and saw some mild successes in the first few years. What really catalyzed our work was the SARS-CoV-2 pandemic when the Centers for Disease Control came out and said this is valuable for disease detection."

With that successful experience under his belt, Gushgari joined the Arizona Water Innovation Initiative. He now supports water researchers in pursuing their own entrepreneurial visions.

"One core ethos of the research and development side of the university is driving innovation in our communities. Where business comes into play is when it is time to translate innovative ideas into the routine, so to speak," says Gushgari. "When we have something that has a clear public benefit and demonstrated applicability within a target market, there is an opportunity for commercialization."

Gushgari says that the water technology startup space has seen increased venture capital investment, which provides some indicator of potential growth in the field.

"Venture capitalists do a lot of research. Prior to 2015, there was relatively little venture capital funding in water tech innovation. But starting in 2017, it went up



Revolutionizing water measurement, modeling and prediction

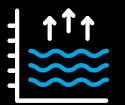


“We’re very focused on incorporating the best available climate science and hydrological observations and operations into our plans for use of water supplies. So the partnership with ASU is very beneficial. This is a group that we can meet with in person to talk about ideas or science concepts.”

Nolie Templeton

Planning Analyst, Colorado River Programs, CAP

The Advanced Water Observatory and Decision Support System (AWODSS) is revolutionizing water measurement, modeling and prediction and providing data necessary to identify critical risks, vulnerabilities and capabilities in hydrologic systems. The observatory is deploying state-of-the-art technology to fully map, monitor and model all of Arizona’s water supplies. This investment is enabling ASU to partner with federal and state agencies, local water management agencies, research institutions and the private sector to increase the capacity for informed decision-making, enhance water security and reduce risks of future water shortages. The team has developed a pilot Arizona Water Observatory in partnership with the Lincoln Institute for Land Policy that will lead to water savings through more efficient water management.



Heavy equipment used to do forest treatment and thinning work. Photo by Wren Raming.

Forest thinning to provide downstream water benefits

Following a wildfire in the state’s watersheds, rainfall washes ash and debris into rivers and the reservoirs that provide water to the Valley. When a large amount of debris fills the reservoirs, it reduces the capacity for water storage and can damage water infrastructure such as dams and water treatment plants.

In a pilot program, Arizona State University and Salt River Project (SRP) are investigating whether forest thinning will increase water supplies, in addition to reducing wildfire risk and protecting important infrastructure. The project is focused on a 3,400-acre area in the Kaibab National Forest.

The research team developed a cutting-edge modeling technique for estimating water benefits derived from forest thinning and restoration.

The scientists created a high-resolution map of the watershed — one that accounts for trees along with their height, size and species using light detection and ranging (LiDAR) surveys and high-resolution imagery of the land. The LiDAR, combined with other image data, generated a precise, three-dimensional surface of the watershed.

Professor Enrique Vivoni, director of the Center for Hydrologic Innovations at ASU, along with graduate students and postdoctoral scholars from the center, combined the LiDAR results with other publicly available datasets to create a new model of a thinning project area. This research is part of the Arizona Water Innovation Initiative — a statewide project led by the Julie Ann Wrigley Global Futures Laboratory® in collaboration with Ira A. Fulton Schools of Engineering.



The results of recent tree thinning efforts -- aimed at restoring the forest to a density that can withstand occasional low to medium intensity fires -- in the Baker Butte area near Payson. Photo by Wren Flaming.

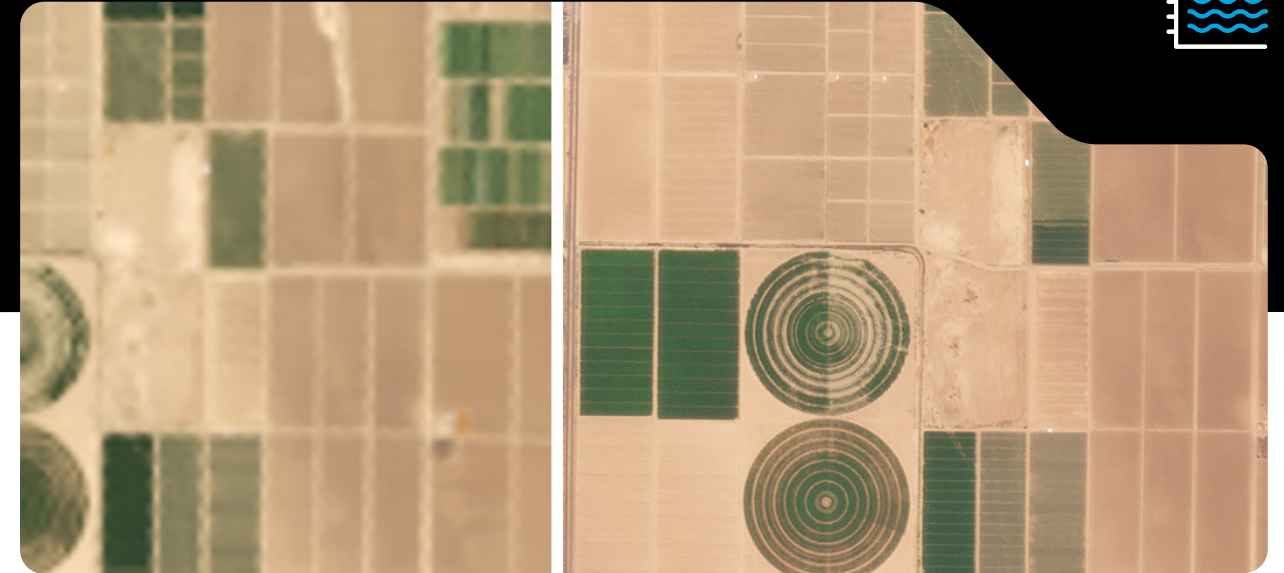
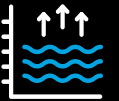
"Arizona is at a crossroads in terms of our water supply portfolio. Applied innovation projects, such as this effort in forest health and water resilience, translate research into actions for the benefit of our renewable water supplies. Not only does our work with SRP set the stage for regional impacts, but it is also a successful model for how universities can collaborate effectively with water agencies and utilities," said Vivoni.

The pilot program determined that forest thinning on approximately five square miles of land in the Kaibab National Forest would generate approximately 230 acre-feet, or nearly 75 million gallons of water during the first year. One acre-foot of water can provide water for three Arizona families for one year.

“The SRP-ASU innovative water model is applying research to real-world projects to help us understand the watershed benefits of forest thinning. This collaboration has proven to be invaluable as we continue to find ways to ensure water reliability during a record drought and shortages of other sources of water such as the Colorado River,” said Elvy Barton, SRP Manager of Water and Forest Sustainability.

SRP manages the water supply for much of the Valley — most of which comes from more than eight million acres of land in northern Arizona. Snowfall and rain provide the water that travels through the watershed into its reservoirs, which is then delivered to 2.5 million homes and businesses in the Phoenix Metropolitan area.

In addition to the pilot study, ASU and SRP are modeling forest thinning projects in the East Verde River and East Clear Creek watersheds, which provide water to Payson and are areas at high risk for catastrophic wildfire. — Sandra Leander



Croplands in Pinal County, Arizona as imaged by LandSat at 30-meter resolution (left) and Planet at three-meter resolution (right). Both images were taken in August 2023.

New partnership to quickly detect water supply and demand changes

Think of Arizona's biggest water issues and three immediately come to mind: the Colorado River, high country snowpack and groundwater. Although each topic presents its own unique set of challenges, improving measurement and monitoring in these critical arenas can help managers to quickly and accurately respond to changes in water supply and demand.

A new partnership between Planet, a satellite imaging company, and AWII is supporting researchers in assessing and monitoring water supply and demand at higher resolution in both time and space than ever before.

Enrique Vivoni, director of the Center for Hydrologic Innovations and professor of hydrosystems engineering, explains that the resolution of Planet's satellite-based products is a game changer. The partnership with Planet also allows ASU researchers to develop new algorithms that can be used to inform decision-making by water agencies and managers.

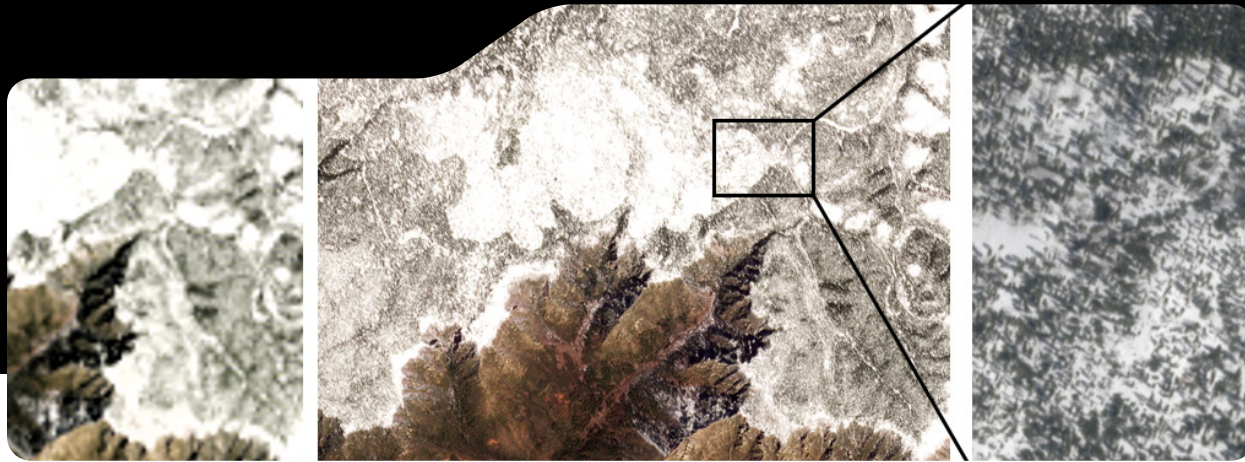
For example, long-term drought in the Colorado River Basin led to the declaration of water shortages that have in turn reduced water deliveries to the Central Arizona Project (CAP). Vivoni, who is also a pillar leader for AWII, and his team are conducting a retrospective study with high-resolution Planet data that will provide a new view of how water policy triggers in the Basin impacted crop production and agribusiness in Arizona.

"Frequently captured, high-resolution images provide a unique and detailed understanding of the intricate, dynamic changes occurring across crops over time," says Shraddha Sharma, a graduate student researcher on the project.

Understanding how drought shortages impacted crop production is critical for agricultural production, water security and economic development.

"We're curious what these policy changes did to farmers' decisions about the type of crop they farmed, how many acres they had that particular year and whether there is a differential response," says Vivoni.

STRATEGIC PRIORITY 2



Baker Butte on the Mogollon Rim in March 2024. From left to right, images compare snowpack as seen by 30-meter resolution LandSat with three-meter PlanetScope, as well as the capability of the half-meter resolution SkySat which allows researchers to see individual trees and snow beneath forest canopies in many locations. Planet at three-meter resolution (right). Both images were taken in August 2023.

With supply reductions from the Colorado River system, the need for a reliable water supply from the Salt and Verde River watershed to support the Phoenix metropolitan area is paramount. The Salt River Project has a robust approach to managing this system. However, management challenges remain due to variable snowpack dynamics.

“Over 80 percent of the streamflow from the Salt and Verde Rivers originates from snowmelt, making accurate snowpack mapping important for predicting water supply,” says Zhaocheng Wang, a postdoctoral scholar and principal investigator on the project. “The three-meter resolution data provided by Planet allows us to map the snowpack extent within the watershed, which can help the utility determine the snowpack level and predict streamflow volume.”

Similarly, groundwater supplies are being tested not only in Arizona but around the world. In Arizona, groundwater makes up 40% of the state’s overall water supplies. However, measuring and monitoring this crucial resource can be particularly challenging because it is found beneath land surfaces, which is where satellite-based data comes in.

Jay Famiglietti, Global Futures Professor and science director for AWII, is using Planet’s soil moisture products to enhance NASA’s GRACE-based groundwater storage estimates.

“The high-resolution soil moisture data will add important spatial information to the more coarse resolution GRACE data, so that we can produce one-

kilometer maps of groundwater storage changes for all of Arizona,” says Famiglietti. “This is a process that will help us to get to the spatial and temporal scales at which water decisions are actually made.”

The researchers hope that the Planet partnership leads to products that are new and innovative that can then be adopted back by the company. Vivoni is particularly excited about creating dashboards – online visualization platforms – with this kind of high-resolution data.

“Within AWII, we’re creating an online water observatory that aides decision makers so they can say ‘this is how our watersheds, groundwater systems and forested areas have been behaving in the last three months,’ and they have a better understanding of the context for the decisions that need to be made today.”

Vivoni says it is by design that he works with decision makers and managers at state agencies and utilities from the beginning of his projects; doing so leads to an end product that’s most closely tied to their needs.

“It’s very easy for technologists, engineers and scientists to take on a project and go away for two or three years and then come back and say, ‘look what I solved.’ And suddenly what was solved has no relevance to the initial question that was posed because there was no interaction along the way. We’re trying to break that mold by interacting early and often with the people who are using our research results.” — Faith Kearns

STRATEGIC PRIORITY 3



Measurably advancing water security in Arizona’s most water-insecure households



The Arizona Water for All program works with Arizona’s most water-insecure households and communities to improve water security and engagement in water decision-making with synergistic, innovative social infrastructure and engineered solutions. To achieve water security, Arizona Water for All is working to promote empowerment for next-generation water leaders with the Water Leadership Institute and increase participation in community water decision-making and the Arizona Water for All Network, as well as deploy proven water security solutions such as fit-to-purpose technologies and advance measurement and monitoring of household water insecurity.

“Water for People is excited to be developing and pushing forward a new domestic WASH – or water, sanitation and hygiene – program that will work toward closing the access gap that affects millions of people throughout the U.S. We are excited to be collaborating with Arizona Water for All as we examine the work already taking place on the ground throughout Arizona and collectively move to accomplish our shared goals and priorities.”

Chris Friemund
US Program Manager for Water for People

“EDF is honored to be collaborating with Arizona Water for All and Rural Community Assistance Corporation to implement the Water Leadership Institute in Arizona. Our partnership will allow us to shape a meaningful program to bring together youth from communities disproportionately impacted by water issues, sharing with them information and tools to lead, bring about positive change and shape the future of water in their communities.”

Mariana Rivera-Torres
Manager of Climate Resilient Water Systems,
Environmental Defense Fund



Groundbreaking partnership addressing water insecurity in Arizona

A team spearheaded by Amber Wutich, lead for the Arizona Water for All (AW4A) pillar of AWII, is making strides to support water-insecure communities and households in Arizona.

“The media keeps insisting that Phoenix is the most unsustainable city in the U.S., but the reality is that, at ASU, we’re leading the way in developing innovative engineering and social infrastructures to help humans survive and thrive in the face of water scarcity, excess heat and other climate stressors,” Wutich says.

Wutich and her team are combining social infrastructure with physical infrastructure and creating community partnerships to address water insecurity in Arizona. Initially formed to advance water security in communities along the U.S.-Mexico border, Wutich’s team

has expanded to design innovative approaches to holistically address water insecurity across Arizona.

In November, Wutich and AW4A announced two new first-of-their-kind partnerships with Northern Arizona University (NAU) and the University of Arizona (U of A) that will support water-insecure communities across the state.

“When we work with the University of Arizona, we can partner with border communities in Arizona’s Sonoran desert. And when we work with Northern University Arizona, we can partner with Navajo, Hopi and other Indigenous nations in the high desert mountains,” Wutich explains.

The growing AW4A network is a first of its kind in Arizona, bringing together communities across the state to address water insecurity at a broad level.

Lucero Radonic, an associate professor at NAU’s Department of Anthropology and School of Earth and

“Partnering with our sister universities...is essential because it helps us bring the strengths of working with different peoples and ecologies.”

Sustainability, will be leading research in Coconino County at the Water, Society and Policy Lab.

Her goal is to continue to train the next generation of researchers on how to engage with diverse community actors and institutions for the advancement of water security.

“In the lab, we think about water security, both at the household level — do you have enough reliable quality water to drink? — and at the landscape level — do we actually have healthy river systems and water-conscious land-use planning?” Radonic explains.

She is currently working to identify trends in experiences of water hauling in rural, unincorporated communities, which she describes as a “widely unexplored area.” Radonic is looking to establish new partnerships under AW4A to collaborate with water experts asking similar questions, particularly on Navajo and Hopi tribal lands. Her research will also support Wutich’s research in communities along the U.S.-Mexico border.

“I think it’s important to recognize that the experiences around water hauling here are super diverse. Even within the Coconino Plateau where we are located,” Radonic says. “The reasons behind different groups’ water-hauling experiences are equally diverse and always tied to histories of land and water development.”

For southern Arizonans, water security is an ever-present discussion, according to Megan Carney, the director of the U of A’s Center for Regional Food Studies.

“Living in the desert, in an arid climate, and with the future of water feeling precarious makes water a very precious resource. With the state of Arizona producing many different agricultural commodities that are really water intensive, people are constantly worrying about water access, long-term availability and the cost of water, which is increasing,” Carney says.

The U of A’s partnership with AW4A will enable Carney to continue her community-based collaborative research into perceptions of food and water insecurity in Arizona’s Sonoran Desert. With a well-known lack of infrastructure and access to services throughout much of Arizona’s borderlands, Carney hopes her research will result in increased local participation in water-related decision-making.

“We will be hosting a series of community dialogues with residents to convene folks around questions of water insecurity, how they experience it in their daily lives, how they navigate it, and the ways that we might be able to increase both their knowledge of, and participation in, decision-making around water and other resources in this part of the state,” Carney says.

“Partnering with our sister universities, Northern Arizona University and the University of Arizona, is essential because it helps us bring the strengths of working with different peoples and ecologies,” Wutich says. “It’s an honor to work together across our beautiful, diverse state to improve people’s water and lives.” — *O’Hara Shipe*



Selso Villegas teaches participants about the challenges and opportunities of water leadership at the San Xavier District

Empowering water leadership in southern Arizona

Arizona Water for All, in partnership with the Rural Community Assistance Corporation and Environmental Defense Fund, piloted a Water Leadership Institute (WLI) in both South Tucson and Nogales to increase empowerment and engagement in water decision-making among Arizona's most water-insecure communities.

From September to December of 2024, 50 people from across southern Arizona gathered for four sessions designed to equip each participant with the skills, knowledge and network needed to meaningfully engage in water issues in their community.

Water issues in Arizona are varied and range from groundwater depletion and pollution to droughts and seasonal flooding, so proposed management strategies must be equally flexible and community-informed. The WLI created a space for seasoned local leaders, like Cesar Lopez, Selso Villegas and Meghan Smart, to share their first-hand insight into building water solutions in their communities.

Cesar Lopez is the director of SEEDS Farm, an organization in Nogales that is using culturally-based, traditional practices to expand local organic food production and cultivate leadership skills in young people. He worked closely with Arizona Water for All — a pillar of the Arizona Water Innovation Initiative — to build the WLI curriculum and hosted the inaugural session of the institute on the farm itself.

During his tour of the farm, he detailed the farm's soil restoration practices and displayed the water harvesting techniques including rain catchment implemented on-site — an example of practical, sustainable solutions in a region where every drop counts. Lopez is one of many local leaders the WLI convened to share regional knowledge and experience, showing students that there is no one "right" way to be a leader, and myriad perspectives and skills make up the leadership table.

Meghan Smart, senior scientist with the Arizona Department of Environmental Quality (ADEQ), joined the WLI as another guest speaker to share the power of citizen science with participants as a way to enact meaningful change in water and the environment. Smart is a biologist by training, and developed Arizona Water



Water Leadership Institute participants in Nogales, Arizona celebrate graduation



Water Leadership Institute Graduates in South Tucson, Arizona

Watch, an ADEQ community science program that allows anyone across the state with access to a smartphone to upload data relating to water quality in real time.

Arizona's vast terrain and expansive waterways make it especially challenging for state officials to monitor changes in environmental conditions, so ADEQ has been leveraging the power of community science to understand local conditions and send out resources like clean-up supplies when appropriate. Smart emphasized the importance of each individual contribution because without the thousands of volunteers who have contributed to Arizona Water Watch to date, ADEQ would not have as comprehensive an understanding of the health and safety of Arizona's waterways.

Another guest facilitator, Selso Villegas, executive director of the Water Resources Department of the Tohono O'odham Nation, joined the WLI to share an Indigenous perspective on water leadership. His decade-spanning career as a hydrologist and advocate for Indigenous self-determination in water makes him an invaluable resource to up-and-coming water leaders.

During an incredibly special tour of the San Xavier District's Wa:k Hikdan project, an area of the Santa Cruz River that has been restored with riparian vegetation and flowing water, Villegas led participants through a timeline of the setbacks and successes that made the

restoration project possible. This offered participants a firsthand account of the potential for creating restored riparian habitats as emerging water leaders.

On graduation day, participants gathered to reflect on everything they had learned and witnessed over the course of the past months, and to boldly share their own leadership stories with their cohort. Each student stood and spoke about their journey to leadership, and reflected on how they would participate in water stewardship moving forward.

According to evaluation data collected by surveying participants, 90% of participants reported that they felt motivated to organize and advocate for their communities, and 85% of participants reported being interested in pursuing a career related to water, climate or the environment.

As ASU researchers and engineers pursue advanced water solutions in Arizona, it's vital to adapt management and mitigation strategies to fit the diverse needs and priorities of communities across the state. By convening and listening to community leaders with regional expertise, and encouraging young people to pursue a seat at the decision-making table, we can start to build an Arizona with a secure water future for us all. — Daniela Sherrill and Vanessa Fajardo



Catalyzing community understanding, engagement and capacity



“Our team’s continuous work in the water education space with partners like CAP, Watershed Management, AZ Project WET, EcoRise and ASU’s Impact Water - Arizona team keep us informed on the latest efforts.”

Amy Liu Flores

Program Manager,
Sustainability Teachers’ Academies

Impact Water - Arizona is fostering community awareness and involvement to tackle water challenges and propel solutions in the state. By collaborating across diverse expertise and resources, this program is sparking knowledge, inspiring engagement and instigating transformative change for a more secure and resilient water supply. The team’s work led to the creation of the Sulphur Springs Water Alliance, strengthening community understanding and advocacy for groundwater management. The workshop provided credible data and strategies, laying the groundwork for an engaged coalition.



Anne Riechman facilitates a community group project planning session on day two of the workshop. Photo courtesy of the Project Cities team.

Empowering rural communities to engage in water decision-making

A sustainable and resilient water future in Arizona invites local, place-based solutions that are community-driven and collectively crafted to meet the needs of every resident. Community members having a seat at the table is especially critical in rural areas, where residents feel the impacts of water management decisions differently than in urban areas.

The increasing stress on water resources in Arizona has prompted residents in rural communities, such as the Verde Valley in northern Arizona, to be more involved in the decision-making process for ensuring a safe and secure water supply.

Simultaneously, Julia Davis, the program manager of ASU Project Cities, a signature program with the Sustainable Cities Network (SCN) that works to connect Arizona communities with ASU students and resources to co-create strategies that address local sustainability challenges, has noticed an increased interest from rural communities to partner with the university, especially on topics like water management.

When Davis came across a funding opportunity from Impact Water - Arizona, an AWII pillar, the Project Cities team saw an opportunity for a university-community engagement event that would also allow the team to develop a framework for inclusive water decision-making in rural areas of the state.

The proposed project in the Verde Valley offered Impact Water – Arizona and AWII an opportunity to support an inclusive collaboration between multiple Arizona communities and the university, centered around the place-based knowledge of local residents and a shared motivation to address water challenges.

With the goal of uplifting diverse voices in rural and small Arizona communities, Project Cities expanded their ongoing partnership with the Town of Clarkdale to invite an intergenerational group of local community members, city leadership, water management practitioners and others from Clarkdale, Camp Verde and Cottonwood to participate in a Verde Valley Water Workshop.



A community group presents their project ideas to the rest of the workshop participants. Photo courtesy of the Project Cities team.

Typically, a local municipality — most often urban — approaches Project Cities with an idea for a student project. Which means residents haven't been directly involved in project planning, until now.

Susan Craig, the director for Impact Water - Arizona, was excited to support this work to develop an inclusive convening, as well as an updated model for community engagement that would allow knowledge to be translated into action through community-led student projects.

"Impact Water – Arizona champions community-driven solutions, emphasizing inclusive engagement and diverse community collaboration for sustainable water management," says Craig. "Recognizing the invaluable insights of local communities, this approach tailors solutions to address regional water challenges."

After receiving the grant award, and almost a year of planning, the Project Cities team facilitated a two-day workshop this spring. The workshop brought together a group of close to 40 community members, including municipal leaders, K-12 educators, local youths, older adults, NGOs and others to share information and resources, expand communication networks and brainstorm collaborative community-driven projects.

Empowering youth voices was also a priority for Project Cities, especially since youth are rarely involved in the decision-making process. Anne Reichman, the director of SCN, shares why it is so important to have youth representation at the table "Those are your future residents, your business owners, your

families, as well as your industries and your businesses, because everybody needs to have a say in the future."

The first day of the workshop, hosted at the Clark Memorial Clubhouse in Clarkdale, was aimed at creating a shared language around water. On the second day, workshop attendees gathered at the Camp Verde Community Library. By the end of that day, the community groups had developed several project ideas, which Project Cities has now matched with ASU courses that will start in the fall.

Students will work with the Clarkdale community, part of an ongoing commitment to the town, to expand water education signage at a local park. Another class will develop a visualization of the town water report card to improve how they communicate technical information. In Camp Verde, students will develop a peer community assessment and analysis of their local water conservation activities.

Just as these projects required a diverse group of residents to create them, they'll also engage a broad range of students from across the university, including through courses in technology communications, data visualization and public affairs.

Innovative, community-driven solutions are essential for sustainable water management, which invites a thoughtful and inclusive approach to involve local community members in the decision-making process. Programs like Project Cities and Impact Water – Arizona exhibit a commitment to serving rural residents of the state through their ongoing dedication to creating collaborative spaces that support innovative approaches to water management. — *Laura Randall*



UX masters student Mayank Muthyala and Dr. Claire Lauer testing the AZ Waterbot at the Water Awareness Month Festival, April 2024.

Questions about water in Arizona? An innovative new chatbot is here to help

From water quality to water supply, Arizona residents have many water-related questions that can sometimes be hard to find answers to. Starting today, a new Arizona-specific water chatbot is on the scene to help.

Developed by ASU researchers and supported by the AWII Impact Water - Arizona program, the Arizona Water Chatbot, or AZ Waterbot, is a tool that provides highly curated information in response to user-generated questions about Arizona water. The bot is designed to preserve the complexity of water information while providing a conversational interface for users.

Stephen Carradini, an associate professor of technical communication at ASU, focuses his

research on emerging technologies. In particular, he investigates the ethics of technologies and how people integrate the latest technologies into businesses, workplaces, the public sphere and society at large.

Over the years, he has researched new technologies as they arise, including social media, smart phones and crowdfunding. Carradini has recently turned his attention to artificial intelligence and delved into tool development.

That means that when Claire Lauer, user experience lead for AWII, approached Carradini with an idea for a chatbot focused on responding to the questions that Arizonans have about water, he was ready to build it. But, first, he had to answer the question "why a chatbot?" for himself.

“Water information needs to be distributed to Arizona residents in any way that it can...If a chatbot helps, I thought, then maybe that’s a thing we should be doing.”

Carradini says when he first started the project in 2023, the novelty of a chatbot was appealing and something he hoped would help to spur interest in water issues.

“Water information needs to be distributed to Arizona residents in any way that it can,” says Carradini. “If a chatbot helps, I thought, then maybe that’s a thing we should be doing.”

In addition, the AZ Waterbot fit in with another interest of Carradini’s — applying the ASU Charter in his own work.

“This is the most direct way yet that I’ve been able to apply what I really care about and try to really make a difference in people’s lives,” says Carradini. “It’s a way to take responsibility for ongoing issues in the community.”

To build the chatbot, Carradini and his small team of student researchers first had to choose a large language model. They then got to work training it and guiding it to the best and most trustworthy information sources.

“We had to start by ensuring that harmful information is blocked from results. Then we moved on to training the chatbot on the information that we want it to use,” says Carradini. “We used a process called retrieval augmented generation to gather priority data that we wanted to supply, then decompiled the documents into a vector database. When people ask a question, it goes to those sources first.”

Carradini notes that there is a trade-off between the time spent developing the chatbot and the accuracy of information that it provides. In this case, he says that he and his team worked hard on accuracy.

“We wanted to spend extra time making sure the AZ Waterbot didn’t give wrong answers. We put in safety checks and managed data,” says Carradini. “Our bot

has the benefit of being scoped down to just water, but it also has the extra challenge of trying to do that for a public audience.”

The Arizona Water Chatbot is intended to answer both the common questions water experts anticipate, as well as those they might not even realize people have.

“Residents can get answers to questions about where our water comes from and how we make it safe to drink,” says Claire Lauer, “but also about whether we will run out of water, how it is distributed equitably and why our water tastes the way it does.”

“An important piece of this project is that the chatbot both answers questions and helps us gather data so we can provide more customized information and resources based on what people are concerned about or need to know more about,” says Susan Craig, Impact Water director. “As part of AWII’s goal of providing trustworthy water information, I am particularly happy that the chatbot includes links for more information, next steps and information sources.”

Looking toward the future, Carradini says that additions to the chatbot will include Spanish-language resources, both from existing documents as well as translations that the team is developing. The team is also developing a voice to text feature that will allow people to verbally ask their questions to the chatbot.

“I really see the AZ Waterbot as a support to everything else that’s happening in the water information ecosystem,” says Carradini. “We are essentially a feedback gathering mechanism as well as an information providing mechanism. We are really looking forward to supporting that broader water information ecosystem as we go.” — *Faith Kearns*

STRATEGIC PRIORITY 5



Building consensus on sound water stewardship



The Kyl Center for Water Policy at the Morrison Institute for Public Policy at Arizona State University is a non-partisan, non-profit think tank that promotes research, analysis, collaboration and open dialogue to ensure sound water stewardship for Arizona and the West. The Kyl Center’s work advances innovative and cooperative solutions to Arizona’s crucial water management challenges from an interdisciplinary perspective. In 2024, the team supported the implementation of a groundbreaking new policy, the Alternative Designation of 100-year Assured Water Supply, efforts to secure water rights for tribal nations and development of a long-term strategy for the Colorado River.

“The priorities for the Arizona Department of Water Resources range from groundwater to the Colorado River and from tribal water settlements to protecting our last free-flowing rivers. Collaborating with the Arizona Water Innovation Initiative allows us to leverage our resources to address these critical issues.”

Tom Buschatzke

Director, Arizona Department of Water Resources

STRATEGIC PRIORITY 5



The Granite Reef Underground Storage Project. The project is a partnership between Phoenix and five other regional municipalities. Photo by ©Ted Wood/Central Arizona Project via The Water Desk.

Matching groundwater withdrawal and recharge locations in the Valley of the Sun

The Phoenix metropolitan area hides a valuable source of water underground — a large and ancient aquifer. As is true for many arid areas around the world, this groundwater provides tremendous benefits, including stability in times when surface water supplies are reduced.

While generally well managed under Arizona's 1980 Groundwater Management Act, decades on, the aquifer is facing new challenges.

The Kyl Center for Water Policy at ASU's Morrison Institute, an AWII pillar, recently released a report examining groundwater sustainability in the greater Phoenix area.

"We have a solid groundwater management framework and are doing well when it comes to

the amount of water withdrawn and recharged," says Kathryn Sorensen, director of research at the Kyl Center and lead author of the report, "but there is a mismatch between where we are withdrawing groundwater and where we are putting it back through recharge and replenishment. This can lead to areas of aquifer compaction and land subsidence, permanently reducing the ability to recharge groundwater in the future."

The report explains that the discrepancy between groundwater withdrawal and recharge locations can largely be attributed to workarounds with the state's Assured Water Supply program that allow entities to pump groundwater in one area of the aquifer and recharge it in another. The locations might be nearly 100 miles apart.

"The Assured Water Supply rules, created as a result of the 1980 Groundwater Management Act, were extraordinarily

“The cost of delaying investments in the infrastructure that can address groundwater decline is the irreparable loss of aquifer capacity.”

controversial because they entailed enormous investment in renewable water supplies," says Sorensen. "There was a lot of pushback, mostly from developers, but also from some cities really struggling with the expense, and so a couple of workarounds were developed."

For example, developers, cities, private water companies and others are allowed to pump groundwater if they can demonstrate there is one hundred years of groundwater physically available below their community. They are obligated to recharge that water afterward, but there is no requirement that recharge take place near where the groundwater was pumped.

"In some ways that approach makes sense," says Sorensen, an economist who also spent many years as a practitioner with the city of Mesa and then the city of Phoenix directing their water and wastewater utilities. "It is much less expensive to rely on groundwater wells and recharge than it is to build a surface water treatment plant."

"Wells can be drilled right next to where you need the water, which also minimizes the need for transmission mains and other expensive infrastructure," she continues. "If you're pumping in the same area you are recharging, it is not necessarily a problem, but that is not what we are doing."

The solution, Sorensen explains, is to uphold and improve the investments that the state has already made in groundwater management. That has been challenging because passing the Groundwater Management Act alone was a huge accomplishment. While the Act has been adjusted over the years, the changes that remain to be made will likely be much harder and more expensive to achieve.

"There are trade-offs between short-term economic gains and long-term regional stability," says Sorensen, "and those trade-offs make it politically difficult to enhance groundwater management."



The shortage declaration on the Colorado River means that protecting Phoenix's groundwater resources is even more important. Central Arizona has long relied on water from the river to recharge its aquifer, but with supplies cut by roughly half, sustainable groundwater management is even more critical.

The report puts forth several more specific recommendations to improve groundwater sustainability in the Phoenix area, including requiring recharge to occur within the same area as pumping, increasing groundwater withdrawal fees and discontinuing new groundwater pumping permits.

"We need to up our game when it comes to protecting our groundwater," says Sorensen. "The cost of delaying investments in the infrastructure that can address groundwater decline is the irreparable loss of aquifer capacity. That becomes a disadvantage to future generations. Even for solely economic reasons, it's imperative that our groundwater supplies are secure."

Groundwater sustainability is an issue not just in the metro Phoenix area, but across the state.

"The work that Jay Famiglietti and other researchers with AWII are involved in is extremely helpful in identifying areas of groundwater overdraft and quantifying the impacts of excessive pumping," says Sarah Porter, director of the Kyl Center for Water Policy. "We are putting forward an 'all hands on deck' approach, and that's exactly what the state needs right now." — Faith Kearns



Tribal water policy

Gaps in water policies have historically left tribal communities with limited access to clean water and infrastructure, a situation that Cora Tso is working to correct.

Tso, a senior research fellow with the Kyl Center for Water Policy at Arizona State University's Morrison Institute, an AWII pillar, is particularly well-suited to address tribal water policy issues as both a lawyer specializing in Indian and water law and an enrolled member of the Navajo Nation.

"My reverence for water definitely stems from growing up in a traditional Navajo home and understanding the importance of water in our

daily lives and who we are as people," she says. "Taking care of the land and water are cultural values that I was born and raised with that help guide me in life."

Tso is now working with Arizona tribes, as well as with state and federal agencies and other key communities, including ASU's tribal partnership program, to develop collaborative water solutions and policy recommendations.

"Earlier this year, the Navajo Nation, the Hopi Tribe and the San Juan Southern Paiute Tribe approved the proposed Northeastern Arizona Indian Water Rights Settlement Agreement (NAIWRSA). If implemented, this agreement would settle the three Tribal nations' water rights claims to the Colorado River, the Little Colorado



Cora Tso (middle) speaks on a panel about the Arizona Water Innovation Initiative at a 2024 World Water Day event hosted by Julie Ann Wrigley Global Futures Laboratory at ASU. Photo by Katelyn Reinhart.

River and groundwater resources in northeastern Arizona," says Tso. "This agreement also includes 36 additional parties, including the state of Arizona, the United States, other municipalities in northeastern Arizona, state agencies and private users within the area."

Tso says that this settlement is historic because it enhances water access for thousands of residents in northeastern Arizona, and it also contributes to closing the water access gap that these Tribal communities have faced for decades and continue to face.

"The settlement is a comprehensive strategy to achieve 'wet water' access for these communities," says Tso. "What's unique about a settlement is that it goes beyond what some call 'paper water' — meaning legally settled or decreed rights — and adds to that with agreements for funding and infrastructure projects to actually get these communities access to their water."

Tso recently created an explainer on NAIWRSA, as well as hosted a related webinar. She is also working on an explainer on the Yavapai-Apache Nation (YAN) settlement that is also with Congress.

"With this settlement, the YAN water rights claims would be fully resolved with regards to the Verde River, as well as other sources of water, including the Little Colorado River as well as some Colorado River

water," says Tso. "This would also be a comprehensive settlement and includes not only the resolution of their water rights, but also projects that would be funded by the federal government to import water from already established reservoirs and help proactively manage the pumping of groundwater within the Verde Valley."

The feedback on this work has been positive so far.

"We've heard that the Navajo Nation water team has found the resource helpful and appreciated that the university has highlighted this important settlement for their communities in northeastern Arizona," says Tso. "We also heard that people appreciated the diversity of perspectives with the webinar we organized on the explainer. We were intentional about inviting the Tribal nations involved to participate and that we were highlighting the benefits for non-Tribal communities like the city of Flagstaff."

Tso says that ASU is a phenomenal place to highlight this work for tribal communities.

"It's important to me to be in a space where we can present the history and current impact that tribes have on Arizona water policy and tell the story from our perspective," says Tso. "Over the long term, I would like to have played a big part in changing the narrative related to tribal water rights." — Faith Kearns



Convenings

The Arizona Water Innovation Initiative serves as neutral ground for many convenings related to challenging water conversations in Arizona.



Fourth generation grower Ed Curry describes one of his pumps.

Supporting rural communities to protect their groundwater

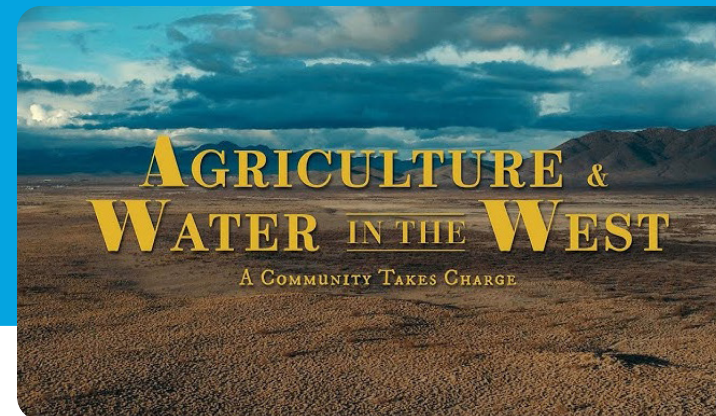
Over 40 years ago, Arizona took an important step toward long-term water security with the Groundwater Management Act. The Act focused on the state's most populous areas, leaving rural groundwater largely unmanaged.

Today, however, protecting rural groundwater is one of Arizona's top priorities, and one of its thorniest challenges.

The film "Agriculture and Water in the West: A Community Takes Charge", developed by the Babbitt Center for Land and Water Policy and the Lincoln Institute of Land Policy in partnership with AWII's Impact Water-Arizona program, documents the work of one community to collaboratively address its groundwater issues after years of conflict.

Using a workshop that came about through an extensive planning process with this Cochise County community as a jumping off point, the film provides insight into the groundwater challenges and potential solutions rural communities across the state are contending with. It also highlights the deep relationship people have with water.

Throughout the film, Sulphur Springs Valley residents refer to their wells as if they are beloved family members. Fifth-generation rancher Tina Thompson speaks of the hand-dug well that allowed her family to establish their ranch. Fourth-generation grower Ed Curry describes one of his pumps as tired; it's been slowing down after 50-60 years of service.



Scan here to watch the film

This close relationship with their wells makes sense. Ray Quay, a researcher with the Decision Center for a Desert City at ASU, says in the film, "Farming really didn't become prevalent here until the invention of the groundwater pump."

While some critique using scarce water to grow crops, the film, which was directed by Sean Ender, owner of Peak to Creek Films, addresses the issue head-on.

"We farm in the desert, not in spite of the desert, but because of the desert. I think a lot of people have this idea of 'why are you wasting water on agriculture in the desert' and it's really the opposite," says Paul Brierley, head of Arizona's Department of Agriculture. "This is where water is going to be as highly productive as anywhere."

Due in large part to that productivity, alongside a strong attachment to its culture and rich farming history, residents in the Sulphur Springs Valley are united in their desire to protect their groundwater, but have been divided on exactly how to do so. Susan Craig, director of Impact Water - Arizona, notes that the format of the workshop allowed the community to come together in a neutral space and listen to each other.

"This is a community that has been in deep conflict over water issues for a very long time," says Ryan Maye Handy with the Lincoln Institute for Land Policy in one scene, "and they didn't let that stop them from getting together, talking intimately about some of the least comfortable and maybe scariest topics they face every day."

Even the presence of cameras didn't seem to deter open and honest conversations. Those conversations led to some surprising moments.

"One of the principles of one of the largest industrial agricultural operations stood at one of the white boards and said to me 'we're simply going to have to

use less water,'" says Mark Spencer, a Valley resident, in the film. "To hear that was really encouraging."

"It's been fun to watch neighbors that were pitted against each other to come together in one room," says Curry in one scene. "I went from not helping at all to being on the Governor's Water Council and honored to be there and honored to be a part of the solution instead of part of the problem."

The workshop was so successful that the group established a formal alliance to continue their work together. "At the time this was filmed, the Sulphur Springs Water Alliance was still in the process of establishing itself and hiring a coordinator. They now have subcommittees, and a vision and mission," says Craig.

The film is already reaching well beyond the participants.

“ The closing statement about the need to understand uncertainty at a practical level and translating it into actionable steps really resonated with me,” Patty Emmert with Local First Arizona reflects. **“I agree that the heightened levels of division we experience in various areas stem from the increased uncertainty we face daily. This highlights the importance of pausing, embracing difficult discussions and seeking consensus-based solutions.”**

From the Governor's office to the state legislature to rural residents, it is clear that addressing groundwater challenges is a priority for Arizona. Craig says that the ultimate hope is that this film will inspire other communities to take action on rural groundwater protection, and she has plans for more workshops in the coming year in collaboration with the University of Arizona and the Babbitt Center.

"It was a huge success to have a community come together and work to find common ground," says Craig, "and we are going to carry that success forward into new places facing related water challenges." — Faith Kearns



Scaling Water Resilience and Stewardship

In September, ASU and SRP held a co-organized event: Scaling Water Resilience and Stewardship. The event was by invitation and led by Enrique Vivoni and Kelly Barr at ASU and Elvy Barton at SRP through AWII and the Center for Hydrologic Innovations.

The gathering brought together academics from Arizona's state universities; government agencies including the U.S. Department of Agriculture, Arizona Forestry and Fire Management, Arizona Game and Fish; nonprofits including the Bonneville Environmental Foundation, Blue Forest and the National Forest Foundation; and companies including Apple, Intel, Planet, Swire Coca-Cola and PepsiCo, among others.

Participants shared information on water stewardship efforts and techniques for scaling, expanding and applying water stewardship plans, particularly in relation to forest management and wildfire hazard reduction and its impacts on water supply. The event was well received, with participants expressing excitement and interest in continuing to work together.

Key outcomes included bringing together diverse stakeholders to coalesce around shared water stewardship goals, attracting attention and potential investments for expanding water stewardship efforts in Arizona's forests, and providing valuable training and networking and workforce development opportunities for university students and researchers.

The meeting also resulted in plans for a science working group to further study the connections between forest management and water supply, as well as the potential for entrepreneurial activities to aid agencies and corporations in quantifying the water benefits of forest management.

“This is a long-term collaboration between ASU and the Salt River Project that is yielding applied innovations that are being translated into real-world use cases,” says Vivoni. “The various contributions from the event showed that water-positive outcomes are possible from forest treatments. We are also helping to train the next-generation workforce in the emerging area of water valuation of land restoration projects.”



ASU students visit Verde Valley

Students in Professor Kathryn Lambrecht's Fundamentals of Technical Communication course visited the Town of Clarkdale in September to meet with the town manager and learn about the town's community context and history. The students are collaborating with the town on a project to create water education signage for its Selna Mongini Park.

In addition, for Daniel Schugurensky's Public Affairs Capstone course project, "Exploring Challenges and Opportunities for Water Conservation and Stormwater Management in the Verde Valley Watershed," two capstone students visited the town of Camp Verde. The group started the day off at Hauser Farms, met with the library manager to discuss education and community engagement, talked with a local rancher, and ended the day with a visit to the stormwater office and a tour of the wastewater treatment plant.

These projects are a collaboration with Project Cities and Impact Water - Arizona.



Water Innovation Technology Showcase a success

The first-ever Water Innovation Technology Showcase, co-hosted by the Global Center for Water Technology (one of the AWII pillars) and the Southwest Sustainability Innovation Engine, exceeded all expectations. With over 100 registered attendees and 20 companies presenting groundbreaking solutions, the event showcased innovative advancements in water management and sustainability.

Representatives from industry, government and academia gathered from across the nation to explore how these technologies could be integrated into their communities to enhance both ongoing and planned water conservation efforts. The event facilitated meaningful discussions and fostered opportunities for collaboration, providing a vital platform for water stakeholders to connect and share ideas. Additionally, it yielded valuable insights for refining future showcases and events, ensuring they address critical gaps in water-focused business and innovation ecosystems.

Women leading Phoenix's water sector

The Empowering Currents: Women Leading the Phoenix Water Sector event celebrated the contributions and leadership of women in the water sector, showcasing their pivotal roles in shaping the future of Phoenix's water management and sustainability.

Our esteemed panelists, composed of leaders and trailblazers from various facets of the water industry, shared their insights, experiences and strategies for success.

“My number one takeaway from the Nogales event is that people want to be involved in creating the solutions to the problems that they’re witnessing.”



The bilingual Community Water Forum in Nogales, Arizona.

Arizona Water for All Network launch

In July, the Arizona Water for All (AW4A) team held their first official event, a bilingual Community Water Forum in Nogales, Arizona, in collaboration with Border Community Alliance and Water for People. The event was focused on facilitating conversations on important water issues between historically underrepresented residents and government officials, including the mayor of Nogales and representatives from the U.S. Consulate.

“I am really proud of the way the Nogales meeting turned out. We provided time for people to talk about their most pressing water concerns as well as their ideal water future,” says Daniela Sherrill, community research lead for AW4A. “I don’t think we offer enough spaces for people to listen to each other and voice their worries and the solutions they would like to see.”

The AW4A team has established a partner network lead at both the University of Arizona and Northern Arizona University to round out geographic representation across the state and to ensure that local needs are being met. They are also partnering with a variety of groups with on-the-ground connections in water-insecure communities throughout Arizona.

“My number one takeaway from the Nogales event is that people want to be involved in creating the solutions to the problems that they’re witnessing,” says Sherrill. “Unfortunately, they have been made to feel like they can’t be involved or don’t have the resources. People feel this deep connection with their communities and they want to have a functioning place to live, which of course includes access to safe and affordable water. We are here to support those goals.”



Organizers Enrique Vivoni (ASU) and Mike Hulst (AHS) with poster award winner Karem Abdelmohsen

ASU Flow 2024

ASU Flow 2024 was held in October at the SRP PERA Club in Tempe. During the event, ASU students and researchers had the opportunity to meet practitioners from the private sector, nonprofit organizations and government agencies.

Enrique Vivoni, along with Mike Hulst, president of the Phoenix chapter, welcomed participants and introduced our keynote speaker, Leslie Meyers, associate general manager and chief water resources and services executive of Salt River Project.

Graduate students and researchers put together an exciting poster session with 22 contributions, including two posters placed near the SRP CrossCut Canal, highlighting recent work on estimating evaporation from canals and climatic and water cycle dynamics in urban land covers.

This was followed by five nicely executed lightning talks, informing around 110 participants about applied innovation projects and other efforts addressing water resilience and cutting-edge research from both ASU and the U of A.

ASU Flow is here to stay, and AHS and CHI look forward to working with partners in 2025.

The best presenters received awards during an exquisite networking dinner with water practitioners joining from over 20 companies and agencies, along with ASU faculty, students and postdocs.



The summit gathered a diverse range of experts, including water researchers, start-up entities, larger companies and other participants in atmospheric water harvesting, to discuss the broad ranges of uses in this technology, ranging from drinking water to industrial water usage. Photo courtesy Global Futures Laboratory

First atmospheric water harvesting technology event

As questions about water resources and access continue to build in the Southwest, some experts are turning to an unlikely place for solutions: our atmosphere. Atmospheric water harvesting (AWH), a method of water collection that draws water from humidity in the air, offers a new pathway for water security.

Experts with a focus in areas including engineering, hydrology, material science and thermodynamics gathered at Arizona State University in early 2024 for the Atmospheric Water Harvesting Summit. Paul Westerhoff, lead for the Global Center for Water Technology, an AWII pillar, moderated the event. He says that while AWH technology has gathered interest from industries like health care, home appliances, semiconductor manufacturing, military and data centers, it is an underutilized area for progress.

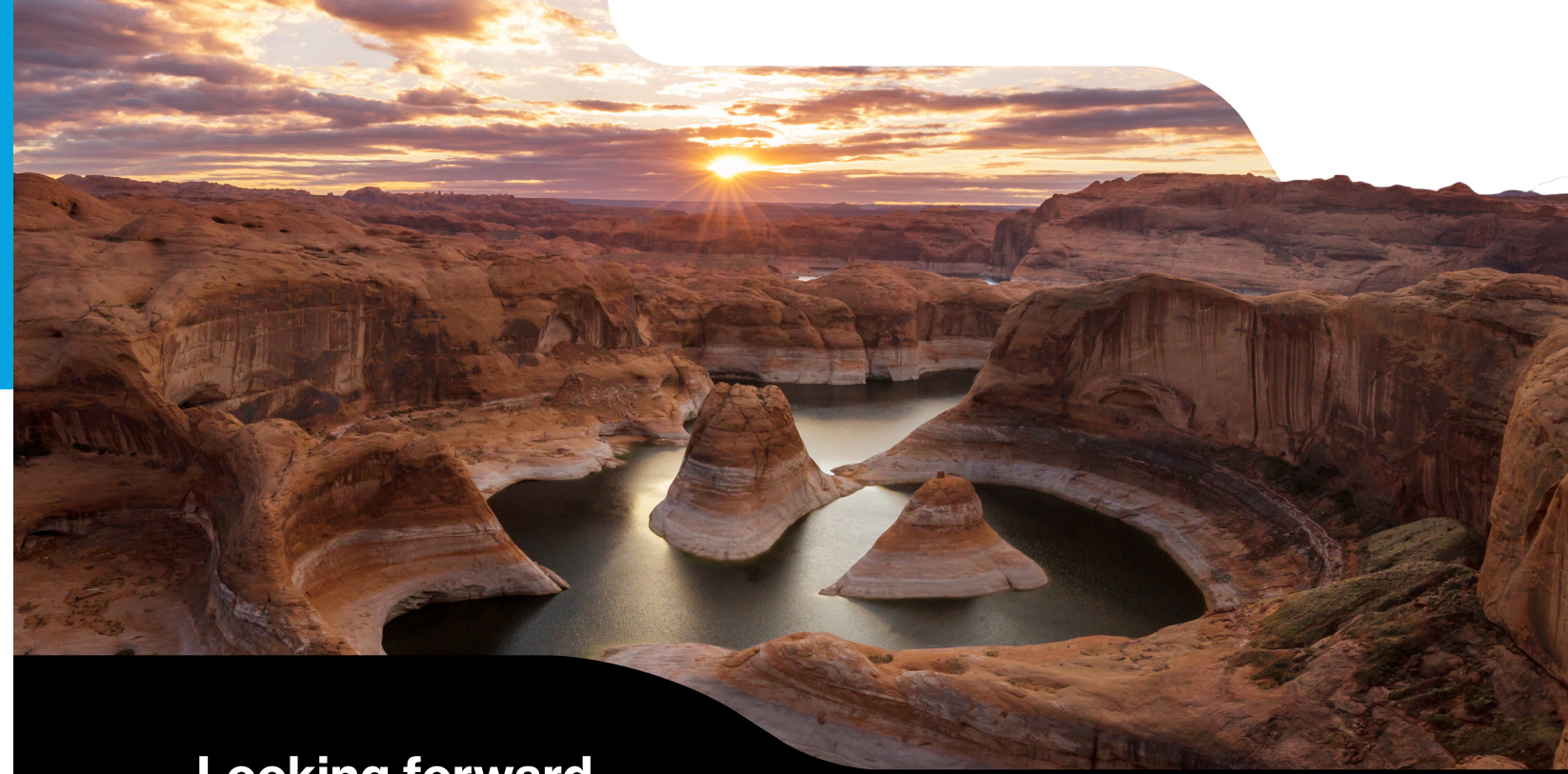
“This has been the first international AWH summit — at the very least the first one of this scale — and this is an area that could really benefit from dedicated attention,” says Westerhoff. “Water is a human right. The question is: How can we get water in the right place at the right time, with the right quality? This is where atmospheric water capture technology can really shine.”

The summit gathered water researchers, start-up entities, larger companies and other participants in AWH. This diverse range of experts discussed the broad range of uses for this technology, from drinking water to industrial water usage.

The summit featured experts in areas of material science and processing, in addition to in-practice methods of atmospheric water harvesting. Participants included representatives from groups such as Intel, PepsiCo, international universities and the Defense Advanced Research Projects Agency.

The summit concluded with a wrap up of action items, and the promise of continued conversations. Westerhoff said the summit was a move in the right direction toward a more sustainable water future.

“There is immense opportunity for atmospheric water capture across all sectors,” says Westerhoff. “As we continue to navigate water scarcity issues in Arizona, the greater Southwest and then around the world, more conversations will need to happen. This gathering has been an important start.” — *Katelyn Reinhart*



Looking forward

In 2025, two issues are likely to continue to rise to the top of Arizonans' water concerns: rural groundwater and the Colorado River. The Arizona Water Innovation Initiative is dedicated to continuing to address both challenges alongside our state, local and community partners.

When it comes to groundwater, we are working across all of our strategic priority areas to drive innovative technical, policy and community-led solutions to help ensure that rural areas of the state are not left behind. For example, researchers with the Advanced Water Observatory and Decision Support System are developing high-resolution maps of groundwater depths across the state while the Impact Water - Arizona team engages with local communities to empower water decision-making. At the same time, the Global Center for Water Technology experts are addressing groundwater quality issues while the KyI Center for Water Policy supports the development of pragmatic groundwater management policies.

In addition, we are excited to continue supporting projects that enhance water resilience, such as empowering Arizona residents with tools for water conservation and

showcasing cutting-edge technologies like advanced water purification systems. These efforts will help Arizona better respond to shifting needs and ensure sustainable water use for generations to come.

In the coming year, AWII remains committed to addressing the state's water challenges and ensuring a sustainable water future through strategic initiatives and meaningful partnerships. Collaborating with universities, research institutions and local communities will create more comprehensive, impactful solutions. As AWII continues to shape the future of Arizona's water landscape, our collective efforts will contribute to a more water-secure and sustainable state.

To stay informed about AWII's activities and access trusted water information, please visit our website at azwaterinnovation.asu.edu, subscribe to our blog, or attend one of our upcoming events. We look forward to working together to secure a thriving, water-resilient future for Arizona.



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