Engaging Residents in Water Conservation Practices

ASU
Sustainable Cities Network
Arizona State University

Project Cities

A Fall 2019
Collaborative Project with
Arizona State University's
Project Cities & the
City of Peoria

PEORIA ARIZONA

ACKNOWLEDGMENTS

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To access the original student reports, additional materials, and resources, visit:

links.asu.edu/PCPeoriaWaterConservation19F

ABOUT PROJECT CITIES

The ASU Project Cities program uses an innovative, new approach to traditional university-community partnerships. Through a curated relationship over the course of an academic year, selected Community Partners work with Project Cities faculty and students to co-create strategies for better environmental, economic, and social balance in the places we call home. Students from multiple disciplines research difficult challenges chosen by the city and propose innovative sustainable solutions in consultation with city staff. This is a win-win partnership, which also allows students to reinforce classroom learning and practice professional skills in a real-world client-based project. Project Cities is a member of Educational Partnerships for Innovation in Communities Network (EPIC-N), a growing coalition of more than 35 educational institutions partnering with local government agencies across the United States and around the world.

ABOUT SUSTAINABLE CITIES NETWORK

Project Cities is a program of ASU's Sustainable Cities Network. This network was founded in 2008 to support communities in sharing knowledge and coordinating efforts to understand and solve sustainability problems. It is designed to foster partnerships, identify best practices, provide training and information, and connect ASU's research to front-line challenges facing local communities. Network members come from Arizona cities, towns, counties, and Native American communities, and cover a broad range of professional disciplines. Together, these members work to create a more sustainable region and state. In 2012, the network was awarded the Pacific Southwest Region's 2012 Green Government Award by the U.S. EPA for its efforts. For more information, visit *sustainablecities.asu.edu.*

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ASU Sustainable Cities Network
Arizona State University

Project Cities

Sustainability Through Local Action

projectcities.asu.edu

ABOUT PEORIA

Ranked as the No. 1 place to live in Arizona by Money Magazine and the only Arizona city named as one of the best cities in the U.S. by Yahoo! Finance, the city of Peoria is currently home to more than 171,000 residents. The city enjoys a reputation as a family-oriented, active community with an exceptional quality of life. Peoria entertainment and recreational amenities include popular attractions such as Lake Pleasant, a large network of trails and open space, community parks, recreation centers, community theater, libraries, pools, and the spring training home for the San Diego Padres and the Seattle Mariners.

The city has demonstrated a strong commitment to sustainability, as evidenced by its directive to incorporate LEED building design standards, a council-adopted Sustainability Action Plan, and a dedicated full-time staff person to manage and coordinate organization-wide sustainability initiatives.

PEORIA TEAM

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Peoria is the place
World class ▪ Sustainable ▪ Future Ready

peoriaaz.gov

June 4, 2020

Dear Peoria community members,

It is with tremendous gratitude and excitement that we bring to your attention the results of the first year of our partnership with ASU's Project Cities program. This collaboration provided the opportunity to move beyond traditional resources, and explore all that is possible by working alongside faculty and students across several academic programs.

Project Cities is one of several partnerships we enjoy with ASU, and part of our ongoing strategy to learn from innovative community leaders as we address the complex challenges and opportunities we face as a fast-growing community. With a modest investment in this program, we received extensive research, creative recommendations, diverse perspectives, and innovative deliverables that take several key initiatives to the next level for us.

These include our efforts around water conservation, transit, placemaking, smart cities, and the possibilities around our Skunk Creek corridor near the P83 Entertainment District. Many of these efforts entailed public participation, and you may have participated by speaking to students at one of several Peoria events they attended, or by sharing your personal insight through a survey. By engaging students and faculty on these subjects, we have advanced our understanding and positions on each topic much more quickly than we could have without their assistance.

The project results provided us with invaluable insights into many of our most important opportunities and we are proud to see the students' deliverables advancing. We hold our partnership with ASU and Project Cities in high esteem and look forward to continuing this work on additional projects in the coming year.

Sincerely,

Cathy Carlat, Mayor

Jeff Tyne, City Manager

Peoria, Arizona

Rio Vista Recreation Center

Demographics

total population: **172,259**

median age: **39.5**

highly skilled and educated workforce of 85,252

11,997 veterans live in Peoria

73% of residents are homeowners

median property value: **$230,400**

31% of residents hold a Bachelor's degree or higher

median household income: **$73,039**

Schools

#3 of 131 Best School Districts for Athletes in Arizona

#5 of 40 Best School Districts in Phoenix Metro Area

#7 of 130 Best School Districts in Arizona

The Peoria Unified School District is one of the largest employers in the West Valley. The district consistently receives high ratings and offers signature programs such as the Career and Technical Education programs.

Peoria is also home to Huntington University, a liberal arts college offering digital media education in animation, broadcasting, film, graphic design and other digital media arts.

Leading industries

Peoria, Arizona is not just a scenic suburb of Phoenix, but also a thriving economic development hub with an educated workforce and high-end residential living. There are 22,470 employers and more than 75,000 people employed within Peoria. Leading industries include health care and social assistance, retail trade, and finance and insurance. Highest-paying industries include utilities, manufacturing and public administration. Beyond these industries, Peoria works actively to attract businesses from aerospace and defense, film and digital media, technology and innovation, hospitality and tourism, and research and development. Peoria is the place for business owners, developers and investors.

Health Care & Social Work
10,905 employees

Retail Trade
10,628 employees

$
Finance & Insurance
6,574 employees

History

Founded in 1886 by Midwestern settlers, Peoria is nestled in the Salt River Valley and extends North into the foothills around Lake Pleasant. Beginning as a small agricultural town, the economy received a major boost when a railroad spur line was built along Grand Avenue. The construction of the Roosevelt Dam in 1910 secured a reliable water supply, attracting more settlers to the area and business endeavors to the town center. Peoria's economy continued to have an agricultural focus for decades. Continually growing, Peoria assumed city status in 1971 with a population of 4,792. It has since grown into a city with a population over 172,000, and is renowned for its high quality of life and recreational amenities.

Sustainability

Peoria has demonstrated leadership in municipal sustainability efforts through a wide range of actions. Listed below are some of the City's sustainability accomplishments.

- Incorporation of LEED building design standards

- Appointment of a full-time city staff member who manages and coordinates sustainability initiatives

- Sustainable urban planning practices including open space planning and water management principles

- Sustain and Gain: Facebook page and brochures keep residents up to date on city sustainability efforts and ways to get involved

- Water Conservation Program: free public classes, public outreach at city events, and water rebate incentives for residents

- Council-adopted Sustainability Action Plan: this strategic planning document, in its second iteration, ensures city departments are developing sustainability-oriented goals, tracking success metrics, and encouraging cross-communication in the preparation of Sustainability Update presentations made to the Peoria City Council on an annual basis

- Sustainable University: courses and workshops to empower residents to make small changes that make Peoria a better place to live. Topics covered include residential solar, gardening, composting and recycling

Awards and recognition

- Received three Crescordia awards by Arizona Forward at the annual Environmental Excellence Awards in 2016

- 12th City for Green Space in the U.S. in 2019 *(Wallethub)*

- Top 15 Safest Cities in the U.S. 2017-2019 *(Wallethub)*

- 6th Wealthiest ZIP Code in 2020 *(Phoenix Business Journal)*

- Top 50 Hottest Hoods in 2018 *(Phoenix Business Journal)*

- 10th Best City to Raise a Family in 2018 *(Wallethub)*

- Top 100 Golf Course in U.S. 2017-2019 *(Golf Digest)*

Lake Pleasant

Timeline

1886	1889	1919	1954	1971	1977	1986	1994	2007	2012	2017	2020

1886 — Peoria founded by William J. Murphy

1889 — First school district formed

1919 — Chamber of Commerce organized

1954 — Peoria incorporated

1971 — Assumed city status with a population of 4,792

1977 — Brewers spring training begins at Greenway Sports Complex

1986 — Centennial celebration

1994 — Peoria Sports Complex opened

2007 — Theater for the Performing Arts and Rio Vista Recreation Center opened

2012 — 20-year extension spring training agreement with San Diego Padres and Seattle Mariners

2017 — Selected as site of new $70M health clinic for Maricopa County Integrated Health System

2020

Livability

Peoria is renowned as a great place to raise a family and start a career. A plethora of local amenities and attractions contribute to Peoria's livability. Beyond the tourist attractions of Spring Training and Lake Pleasant, the City offers many community facilities and recreational opportunities for all ages and interests such as an extensive public park system and annual community events. Peoria's dedication toward livability is also evident in the City's latest General Plan which addresses sustainable water use, housing, public services and more.

Ranked as the No. 1 place to live in Arizona and one of the best cities in the United States.

-Money Magazine and Yahoo! Finance

Peoria Sports Complex

Peoria strives to uphold these six major livability priorities in order to maintain an exceptional quality of life for its citizens.

- Arts, Cultural and Recreational Enrichment
- Economic Prosperity
- Smart Growth
- Superior Public Services
- Healthy Neighborhoods
- Integrated Transportation

Community facilities

- Peoria Community Center
- Rio Vista Recreation Center
- Peoria Sports Complex
- Peoria Center for the Performing Arts
- 36 neighborhood parks
- 2 libraries
- 3 swimming pools
- 6 golf courses
- 9 lighted multi-purpose ball fields
- 15 tennis courts

Lake Pleasant

Urban ecology, ecotourism and recreation

Peoria is surrounded by the natural beauty of the Sonoran Desert and is home to Lake Pleasant, a 23,000-acre park and major recreational asset to the North Valley. The transient Agua Fria River and New River flow through Peoria, as do a multitude of washes and creeks. Most notable perhaps is Skunk Creek — known for the recreational trails running alongside it — which forges a connection between Peoria and Glendale. Northern Peoria is home to beautiful mountains and buttes including Sunrise Mountain, Calderwood Butte and Cholla Mountain.

Boasting over 300 days of sunshine annually, Peoria's ecotourism opportunities are a steady industry for residents and visitors. The City features over 60 miles of trails for walking, biking and horseback riding, as well as 570 total acres of accessible park land.

Lake Pleasant Regional Park contains a full-service marina, providing opportunities for water-oriented recreation such as kayaking, water skiing and even scuba diving. Visitors can also go horseback riding, take gliding lessons, hike, camp and more.

Skunk Creek

Pleasant Harbor

MAP OF PEORIA & GREATER PHOENIX, ARIZONA

★ Peoria City Hall

Ψ ASU campus

Peoria

Phoenix

Scottsdale

Glendale

Mesa

Apache Junction

Tempe

Gilbert

Chandler

N

The following report summarizes and draws highlights from work and research conducted by students in COM 414/CMN 598 Crisis Communication, for the Fall 2019 partnership between ASU's Project Cities and the City of Peoria.

To access the original student reports, additional materials, and resources, visit:

links.asu.edu/PCPeoriaWaterConservation19F

ASU Sustainable Cities Network
Arizona State University

Project Cities

Sustainability through **local action**

EXECUTIVE SUMMARY

Unlike many other communities in Arizona, the City of Peoria has groundwater bodies within its borders and adjacent. Lake Pleasant is a recreational asset to the North Valley, and both the Agua Fria and New River flow through the city. Peoria's primary water sources, Central Arizona Project (CAP) and Salt River Project (SRP) water, are delivered via a long canal network that channels the water across hundreds of miles to serve the entire Phoenix Metro Area. Peoria's other primary water sources are groundwater and reclaimed water. While Peoria's water future is secure under normal circumstances, the state is in a sustained two-decade-long drought, and climate change threatens to increase drought severity in the future. As a leader in the realm of sustainable water management and conservation practices, Peoria staff and leadership seek to take action today, in order to prevent more serious consequences in the future.

The City of Peoria created a Water Conservation and Shortage Response Plan (Drought Management Plan) in 2017 to mitigate water challenges and prepare for the possibility of more prolonged and persistent drought scenarios. Peoria's plan uses a tiered system, linked to the water level at Lake Meade, which feeds the CAP system.

Education and outreach are central to the plan, and the city will need to use different kinds of messaging in the different stages of the plan, but water conservation is complex, and the direct impacts of residential water use are not immediately felt by the people who use it. Therefore, communication needs to be strategic and on-message for the city to effectively inform the public about conservation needs and practices, while also motivating compliance through reasoning, incentives, and appeals to common goals.

Through Peoria's partnership with ASU Project Cities, students from the New College's School of Social and Behavioral Sciences engaged with city staff to develop messaging strategies and sample content for the Drought Management Plan. Students split into 6 teams, each given the same task: to develop a messaging campaign that would educate residents about water conservation and change residents' usage patterns. Residents, or households, were identified as the campaigns' primary audience, with the students also including recommendations for targeting different types of stakeholders, such as businesses.

The student teams first researched Peoria's demographics and character, current water conservation messaging strategies in use by the city, and best practices from other communities and academic literature. Equipped with this research, the students developed 6 unique water conservation communication campaigns, with three messaging levels: awareness, education, and crisis communications. Each student team also generated a unifying "visualization" for their campaign that encapsulates the value of water conservation and signifies concrete steps residents need to adapt.

These visualizations and attitudes about general water conservation were field-tested in pilot studies that involved convenience sampling and open-ended and closed-ended survey questions of Maricopa County residents. Analysis of the field test data revealed four key takeaways that were then incorporated into the specific recommendations for message content and dissemination:

1. Set the affective tone
2. Keep it simple
3. "Push" messages, rather than relying on residents to seek them out
4. Be aware that pro-conservation attitudes do not predict reported conservation behavior

Effective strategies for water conservation messaging allow for continued growth, expansion of ecotourism opportunities, and resilient communities. Recommendations were informed by academic research, literature reviews, and comparative analysis of communication strategies in other states. Students produced a report on messaging strategies designed to increase residents' water-saving behaviors that are consistent with the city's drought alert stages found on page 22 of this report. To push risk communication and the upgraded shortage response plan out to the public, students developed a campaign strategy with visualizations and levels of potential involvement from citizens and city leadership (all five proposed student campaigns are profiled on pp. 35-47 of this report). The students' campaign visuals and engagement strategies were pilot tested to determine the effectiveness of their recommendations and evaluate the change in respondents' perception of water conservation.

GOALS & RECOMMENDATIONS

The goal of this project was to help Peoria leverage water conservation campaigns and messaging strategies to enable public engagement to prepare for drought alert messages at different stages as seen on page 22.

Figure 1 *Director of Communications, Jennifer Stein, and Water Services Director, Cape Powers, present the City of Peoria's drought management planning efforts to students during the 2019 Fall Semester Kickoff.*

Figure 2 *Students present engagement strategies at the 2019 Fall End-of-semester Showcase.*

RECOMMENDATIONS FOR WATER CONSERVATION CAMPAIGN MESSAGING

Water conservation campaign messaging recommendations

Incorporate elements of the proposed water conservation campaigns detailed in this report (pp. 35-47).

Deliver a messaging campaign with three tiered stages, based on severity: 1) awareness, 2) education & adaptation, and 3) crisis communication (pp. 35-36, 50-54).

Teach and habituate water conservation behaviors among residents and businesses by increasing awareness of existing programs and plans in Peoria (pp. 31-32).

Continue to develop educational messaging strategies and involvement practices that encourage behavior change in residents' daily life and foster a desire to conserve water actively (pp. 22-23, 35-36).

Choose a simple visualization and concise messaging that conveys an affective tone and sense of urgency (pp. 35-37, 49).

Deploy messaging across a variety of media types, such as flyers in utility bills, social media campaigns, and specialized features and events (pp. 35-36, 50-54).

Share infographics that represent alert systems in local media coverage and social media campaigns (pp. 52-53).

Plan Level 3 "crisis" communication ahead of time, with specific instructions for residents, in case a formal water emergency is declared in the future. Prepare for emergencies in advance by tying messaging to specific "trigger" metrics for Peoria's water supply (p. 54).

Consider Peoria residents' needs for feedback mechanisms that notify them of their conservation progress in their households and as an individual (pp. 49, 54).

FACULTY
MAJIA NADESAN

COM 414/CMN 598: CRISIS COMMUNICATION
THE NEW COLLEGE OF INTERDISCIPLINARY ARTS AND SCIENCES

Messaging Campaigns to Encourage Behavioral Change

An exploration of academic literature on risk communication and field tests of specific messaging strategies

ACKNOWLEDGMENTS

INTRODUCTION

Arizona is rated one of the least sustainable states in the country. The state is often characterized as the poster child for unsustainable development (Robbins, 2019). The water crisis is a critical issue that needs to be managed and communicated to the public through a strategic messaging plan to bring awareness and persuade citizens to take action.

Arizona obtains water from four categories of supply sources: Colorado River water, surface water other than from the Colorado River, groundwater, and reclaimed water ("Securing Arizona's Water Future," n.d.). A close look at each of these reveals significant concern. First, "surface water from lakes, rivers, and streams is Arizona's major renewable resource." However, because of the dry climate, the available amount of surface water can fluctuate from one year to one season and one town to the next ("Securing Arizona's Water Future," n.d.). Second, approximately a quarter of Arizona's water comes from the Colorado River, and this river is running exceptionally low (Schultz, 2014). Third, there is groundwater that lies beneath the earth in reservoirs called aquifers ("Securing Arizona's Water Future," n.d.). The concern with these aquifers is that water is being pumped at a speed far faster than can be replenished, creating a deficit ("Securing Arizona's Water Future," n.d.). Fourth, reclaimed water is treatable wastewater, but it can only be used for agriculture, golf courses, parks, industrial cooling, and maintenance of wildlife areas ("Securing Arizona's Water Future," n.d.). Anticipating supply is challenging, but growing population demand and future droughts seem inescapable.

Figure 3 *A typical urban canal distributing water across Scottsdale, Arizona*

So, what does this mean for the City of Peoria? According to Cape Powers, Director of Water Services Administration for the city, "if the current, severe drought continues, Central Arizona Project (CAP) water deliveries will be impacted." Powers warns, "this could result in a decrease of CAP water supplies, less water available for recharge, and even more emphasis on conservation, and implementation of Peoria's Drought Management Plan" (Powers, 2019). City leadership have spent years creating a variety of water resources, yet they need to continue to make long-term commitments to sustainable water practices and position Peoria as a leader in water conservation.

Figure 4 *Peoria Water Services Director, Cape Powers, presents information on Arizona water usage to students at the 2019 Fall Semester Kickoff.*

Enacting the Drought Management Plan would include restrictions and prohibitions on water use, and potential rate increases on water. When it comes to city functionality, this would mean reduced water for parks, landscapes, and ornamental fountains. For residents, there would be no winter seeding of lawns, new sod applications, or the ability to wash cars as water restrictions constrain household supply available for these types of activities. Businesses would also face water limits, impacting employees, patrons, and business operations. Refer to Table 1 on page 22 for a more comprehensive understanding of cuts planned for municipal, residential, and non-residential entities. To avoid more drastic measures, the City of Peoria must plan on residents using less water now. **This need for water conservation requires the city to develop a strategy and communication plan that informs and educates Peoria residents consistent with the city's drought alert stages.**

RESEARCH METHODS

Students first met with city staff to understand their perspective and priorities at the Project Cities Fall Kickoff event on September 11, 2019. Following this initial meeting, students conducted a literature review of concepts from academia and private practice regarding behavioral change messaging and public intervention strategies. Additionally, the students reviewed Peoria's shortage response plan and familiarized themselves with existing messaging around water conservation.

Figure 5 *Director of Communications, Jennifer Stein, answers student questions during the Water Conservation Breakout Session of the 2019 Fall Semester Kickoff.*

Equipped with this knowledge, the students then separated into 6 groups, each tasked with developing an individual messaging campaign intended to increase water conservation behaviors by City of Peoria residents. The campaigns use a 3-level, tiered messaging approach: awareness, education and adaptation, and crisis communication. Teams began by drafting an initial visual element to guide their messaging campaigns, then built persuasive messaging strategies to accompany their image. Messaging was designed to be suitable for different mediums, to be actionable, and to be sufficiently persuasive to result in behavior change.

The messaging campaigns were then field tested by asking survey respondents for input on the campaigns, and some additional information about their personal values and behaviors. After analyzing their responses and drawing inferences, each team consulted with a graphic designer (arranged by Project Cities) to refine their visuals and work iteratively with the designers, ultimately creating a final image to accompany each of the six messaging campaigns.

Review of Peoria's 2017 Drought Management Plan

City of Peoria drought alert stages			
Stage 1 *Water Watch Alert*	*Stage 2* *Water Alert*	*Stage 3* *Water Warning*	*Stage 4* *Water Emergency*
Invoked when **possibility** exists that the City of Peoria will not be able to meet water demands of customers Purpose of raising consciousness and voluntary reduction measures City municipal departments lead by example Public outreach messaging to ensure understanding of deficiency and need for compliance	Declared when deliveries to CAP or SRP are reduced by 10 percent **and probability** the City of Peoria will not be able to meet the water demands of customers Monitor supply availability daily and recommend supply augmentation and demand reduction Drought team will meet to determine reduction strategies The City will increase monitoring to locate and enforce water waste codes	Declared when deliveries to CAP or SRP are reduced by **more** than 10 percent and City of Peoria **will not be able to meet** water demands of customers Implementation of supply augmentation and demand reduction strategies from Stage 2 City increases educational outreach to the public Drought code enforcement	Involves a **major failure** of any supply, treatment or distribution infrastructure whether temporary or permanent in the water distribution system of CAP, SRP or City of Peoria *Water System Emergency Response Plan* used to manage failures of City of Peoria systems City Council and the public will be given notice

Table 1 *City of Peoria drought alert stages*

The City of Peoria has an established plan for actual water conservation (see Table 2), but has not yet developed a campaign for changing beliefs about water availability, attitudes about the value of water, and resident conservation behavior. With these concerns at the forefront, ASU students were tasked with creating effective messaging strategies to reshape the way Peoria residents think about and use water. They aimed to develop options for educating and encouraging compliance with mandatory water cutbacks should the city face significant reductions in the water supply. As Peoria residents take responsibility, conserve water, and use it more efficiently, the result will be long-term water use reductions, which will secure water for future needs and generations to come.

City of Peoria drought response options menu				
Response options	*Stage 1*	*Stage 2*	*Stage 3*	*Stage 4*
Municipal				
Public information and awareness campaign.	Initiate	Expand	Intensify	Intensify
Educate staff on indoor and outdoor water saving techniques.	X	X	X	X
Reduce or eliminate irrigation for parks and landscaping.	Reduce	Reduce	Reduce	Eliminate
Turn off ornamental fountains.	X	X	X	X
Conduct indoor water audits.			X	X
Limit or prohibit washing of fleet vehicles.		Limit	Prohibit	Prohibit
Limit hydrant flushing for non-water quality issues.		Limit	Limit	N/A
Limit use of water for fire training.		Limit	Limit	N/A
Eliminate all fire hydrant uses except those required for safety.				X
Residential				
Educate residents on indoor and outdoor water saving techniques.	Initiate	Expand	Intensify	Intensify
Promote conservation with respect to operation and maintenance of swimming pools.	X	X	X	X
Turn off ornamental fountains.		X	X	X
Enforce restrictions on spraying of impervious surfaces.		X	X	X
Limit or prohibit overseeding for winter lawn.		Limit	Prohibit	Prohibit
Limit maximum number of watering days per week and the duration of watering.		3 days/week	2 days/week	Prohibit
Enforce landscape watering restrictions.		X	X	X
Limit or prohibit installation of new sod, seeding, and/or other landscaping.			Limit	Prohibit
Prohibit vehicle washing.			Prohibit	Prohibit
Non-residential				
Educate the general public on indoor and outdoor water saving techniques.	Initiate	Expand	Intensify	Intensify
Turn off indoor and outdoor ornamental fountains.		X	X	X
Promote indoor and outdoor water audits.		Promote	Promote	Promote
Promote conservation with respect to operation and maintenance of swimming pools.		X	X	X
Promote and/or enforce serving water in restaurants only upon request.		X	X	X
Promote and/or enforce reduction in frequency of linen and towel washing in hotels.		X	X	X
Limit or prohibit overseeding for winter lawn.		Limit	Prohibit	Prohibit
Establish policy guidelines and/or limitations for new sod installation.		X	X	X
Limit maximum number of watering days per week and the duration of watering.		3 days/week	2 days/week	No turf irrigation
Enforce landscape watering restrictions.		X	X	X
Limit or prohibit dealership washing of vehicles.		X	Limit	Prohibit
Limit/prohibit commercial car washes.		No waste	Limit	Prohibit
Prohibit and/or enforce use of construction water.		Enforce permits	Enforce permits	Prohibit

Table 2 *Connecting potential policy options with stages of urgency will help guide Peoria leadership in the future*

Problem statement

Arizona faces long-term water resource management issues. Arizona cities must prepare for water conservation, given the uncertainty of future water supplies. As with all Arizona cities, the City of Peoria faces water resource issues and must anticipate and plan for scenarios where water availability is limited. The challenge for the City of Peoria is to develop and disseminate a comprehensive water conservation campaign that informs the public about water resource availability that prepares them for enforced conservation and motivates them to adopt water conservation habits willingly.

Accordingly, the proposed City of Peoria Water Conservation Campaign aims to change beliefs about the "taken-for-grantedness" of water, encourage new valuation of water conservation, promote water conservation habits, and build educational awareness around the City of Peoria Drought Management Plan. The proposed project deliverables include:

- Produce a report on messaging strategies designed to increase residents' water-saving behaviors

- Produce a report on the strategic recommendations for rolling out the Water Shortage Response Plan

- Conduct scenario planning with recommendations for messaging regarding enforced conservation

- Pilot test educational campaign messaging with the general public using netnography

- Field test education campaign messaging with the general public

--- *Editor's Note* ---

Netnography is a specific set of online research practices related to data collection, analysis, research ethics, and representation, rooted in participant observation.

Literature review

In order to meet the challenges associated with changing beliefs, values, and habits about water conservation, the class began with background research. Students investigated the nature of the problem, audience characteristics, and regional and national best practices in water conservation, as identified in academic research and professional water conservation policies, programs, and practices. The class also investigated the forms of communication most likely to change behavior.

The type of communication deployed in the water campaign is risk communication. The National Research Council on Risk Perception and Communication (1989) defined risk communication as "The interactive process of exchanging information and opinion among individuals, groups, and institutions. It involves multiple messages of the nature of risk and other messages, not strictly about risk, that expresses concerns, opinions or reactions to risk messages and to legal and institutional arrangements of risk management." Effective risk communication is necessarily grounded in understanding existing barriers to achieving general purposes, which might include audience beliefs and values about water conservation as well as lack of familiarity or access to water conservation practices. According to Lundgren & McMakin (2019), effective risk communication must be dialogic and relational, and, therefore, must engage audiences and allow for transactional communication. Lack of engagement by the audience in conservation messaging erodes support for conservation behavior.

Researching water conservation

To be able to change water conservation habits, we must also change mindsets and beliefs about water. One framework for promoting water-saving practices is the "Behavior Change Wheel" by Michie et al. (2001), which identifies three requirements for behavior change: Capability, Opportunity, and Motivation. Where Capability is the psychological and physical ability of an individual to engage in a particular activity, Opportunity is defined as the components outside the individual which encourage them to act and Motivation is a process of the brain that directs behavior like goals and habits. It helps organize different practices into categories and helps decision-makers understand behaviors and design tasks suitable for behavior change.

Another group of researchers (Addo, Thoms, & Parsons, 2018) looked at how this model could provide insight into water conservation behavior and thus formulate interventions and actions based upon it. Their task was to show that this was a viable measurement tool for predicting public conservation behavior. The researchers found that opportunity was the best predictor of water conservation behavior followed by motivation and then capability.

To understand the barriers toward water conservation, Gregory and Leo (2003) measured attitudes in Australia with regards to water conservation, examining influential factors including reasoned influence (e.g., cognitive processes), unreasonable influence (e.g., habits), and situational influence (e.g., size of family and income). It is interesting to note that those who had attitudes of conservation still had medium-to-high water bills; some factors for this phenomenon were the size of family and a "full nest" of children who lived with the parents. Retired couples who had "empty nests" received lower water bills. This may indicate total water consumption is more likely to be driven by type of user than attitudes toward conservation. Researchers concluded that the most viable way to change habits was through reasoned influences and involvement. **When the public was made to feel part of important decisions, they tended to be more involved in conservation.** Habits need to be formed through water conservation campaigning to convert mere awareness into active conservation.

Research on effective water conservation risk communication is relatively limited. However, VanDyke and King (2018) evaluated the risk communication of officials managing Texas groundwater using the CAUSE model of communication, which aims to foster Confidence, Awareness, Understanding, Satisfaction, and to motivate Enactment. The CAUSE model is a problem-solving approach to risk communication. The program instilled confidence through transparency, built credibility by letting the public know conservation rules were based on science and research, and created a network with opinion leaders to help them spread the word. Opinion leaders were found to be especially important in legitimizing and disseminating water conservation messages.

Editor's Note

Opinion leaders are often organically determined, arising in communities based on their ethos, expertise, or prestige. They might be a parent, religious leader, or other prominent community member.

To improve understanding, water authorities hosted information sessions online, used mass media and held periodic public meetings, many of which were mandatory. They found that placing constituents under watering restrictions (e.g., only watering your yard on certain days) during drought, along with financial incentives, were the best motivators for solution enactment. A challenge mentioned in the research was the difficulty in the retention of conservation behavior when the crisis was not immediate. Constituents having difficulty retaining information about water conservation is a similar challenge for Arizona.

Drawing on research by Bishop (2003), Tiger (2014) recommends eight communication strategies that are relevant for enhancing conservation behavior through message content and design:

1. Communicate authentically
2. Partner with the media
3. Be relevant
4. Communicate succinctly
5. Engage citizens and customers
6. Work through stakeholders
7. Consider timing
8. Maintain ongoing dialogue

City of Peoria demographics

Having learned about the importance of reasoned influence, involvement, and relational interactivity in producing effective risk communication, students turned to the unique characteristics of City of Peoria residents, as well as their understanding, affinity, and familiarity with the city's current water conservation messaging. Effective conservation communication is clear, transparent, and motivates behavior modification. The rationale for conservation must be clear and compelling. Efforts by the City of Peoria officials must consider these factors when designing messages to be successful.

According to the US Census Bureau (2018), Peoria is listed as the 9th largest city in Arizona, with an estimated population of 172,259. Data retrieved from the US Census Bureau (2017) states that Peoria's population is 51.98 percent (83,745), female and 48.11 percent (77,638) male. Of the total population, 121,411 are adults, and 25,764 of those adults are senior citizens. The median age is 39.5 years old, 37.7 years old for males, and 40.8 years old for females. Residents under the age of 18 make up 24.8 percent of the population, and individuals under the age of 5 make up 6.6 percent of the population (US Census Bureau, 2018).

Figure 6 *City of Peoria population by sex, U.S. Census Bureau, 2018*

Figure 7 *City of Peoria age group distribution, U.S. Census Bureau, 2018*

Examining the city's population by race, most residents are Caucasian;
approximately 73.5 percent or roughly 137,004 residents (US Census
Bureau, 2018). Hispanics make up about 3.5 percent of the population
or roughly 5,696 residents (US Census Bureau, 2018). Black or African
American residents make up about 3.2 percent of the population or
5,106 residents (US Census Bureau, 2018). The Asian population
consists of 6,177 people making up 3.8 percent of the overall population.
American Indian or Alaska Natives make up 0.07 percent of the
population, with a total of 1,062 people (US Census Bureau, 2018).
Native Hawaiian and other Pacific Islanders make up 0.2 percent of the
population, consisting of 336 people (US Census Bureau, 2018). Those
with two or more races make up 3.7 percent of the population, with
5,972 people (US Census Bureau, 2018).

Figure 8 *City of Peoria by race/ethnicity, U.S. Census Bureau, 2018*

The next set of demographics analyzed were: average household income,
poverty rates, homeownership, property values, family size, unemployment
rates, and the highest level of education completed. The median household
income is approximately $69,589. The percentage of individuals living in
poverty is 8.2 percent (US Census Bureau, 2018). On average, 72 percent
of residents own their homes (US Census Bureau, 2018). The median
property value is $230,400 (Ballotpedia, n.d.). The average household
size is 2.79, and the average family size is 3.39 (US Census Bureau,
2018). Peoria has a 59.9 percent employment rate and a 6.1 percent
unemployment rate. The most common jobs are: Office & Administrative
Support Occupations (11,624), Sales & Related Occupations (9,798) and
Management Occupations (8,696) (DataUSA, 2019).

Approximately 92.70 percent of residents over the age of 25, graduated from high school (US Census Bureau, 2018). Approximately 27.19 percent of Peoria residents said they have some college education (Peoria, Arizona, Population, 2018). Additionally, 31.10 percent of residents 25 years or older have a bachelor's degree or higher (US Census Bureau, 2018). The percentage of individuals with a graduate degree is 10.72 (Peoria, Arizona, Population, 2018). In addition to these findings, it was determined that 86.4 percent of households in Peoria have broadband internet access (US Census Bureau, 2018).

Figure 9 City of Peoria education levels of residents over the age of 25, U.S. Census Bureau, 2018

To determine the primary values and beliefs of the residents of Peoria, voting trends and religious beliefs were examined. Voting patterns from 2000-2016 for Arizona reflected the majority of local elections were won by Republican Party candidates (Politics & Voting in Peoria, Arizona, 2018). Arizona voter registration statistics for July 2019, suggest that 34.79 percent of its inhabitants are Republican, while the percentage of state voters supporting the Democrat Party was 31.03 percent. Independent parties represent 33.17 percent of registered state voters. Peoria is reportedly leaning liberal compared to the conservative state climate, with the Federal Election Committee reporting more individual contributions toward Democratic and progressive campaigns from 2015-2018, compared to Republican and conservative campaigns ("Politics and Voting").

Figure 10 Political affiliations of registered voters in Peoria, Politics and Voting, 2018

Another aspect analyzed was religious affiliation. Overall, research from the Pew Research Center suggests that more than 60 percent of adults in Arizona believe in some form of God, with the predominant religion being Christianity. Also, 51 percent of adults report that faith is essential to them, and 55 percent state that they pray at least once a day (Religion in America, 2018). Peoria has a variety of churches, which include: Christian, Baptist, Lutheran, Presbyterian, and Catholic faiths. According to the literature, until recently, conservation efforts and environmental issues were seen as secular movements. But change has begun within religious populations, to frame conservation efforts as a response to moral and spiritual crises (Harris, 2016). Still, Arizona, in general, tends to be more religious than secular. Religious preferences for Peoria residents also align with the state in general.

In reviewing the demographics of Peoria, the analysis reveals a higher Caucasian population that is older and more educated than the state's population in general, enjoying a slightly higher income level, with high access to technology and the internet as compared to many other areas in the state. Peoria residents also enjoy higher homeownership and relatively low unemployment rates. Although the city is leaning democratic, it still has a mostly conservative population that aligns closely with the state's overall political attitudes and voting trends.

Peoria's existing water conservation messaging

To create effective communication that changes beliefs, values, and behaviors, it is vital to assess the scope and impact of existing messages promoted by the City of Peoria about the water crisis and prevention tactics to local city residents. This research also focuses on water conservation messaging from other states to understand how they communicate about their water resources, on a broader scale. Evaluating existing communication will provide a baseline for where the City of Peoria stands in providing effective messaging and identify what areas require adjustments. This message evaluation strategy will indicate the purpose, objectives, strengths, and weaknesses of current communication and identify strategies for effective water conservation messaging needed in Peoria.

The City of Peoria's website is one of many public information sources. As an official website, this medium can be a leading information channel for residents to obtain information and potentially provide feedback and questions about water conservation campaigns. Water is currently highlighted as an individual page on the City of Peoria website **(www.peoriaaz.gov/government/departments/water-services)**.

Under "Water Conservation," the site provides links to the official Water Conservation Plan and to existing water conservation messaging **(www.peoriaaz.gov/government/departments/water- services/ water-conservation)**, including Xeriscape, Water Use It Wisely **(wateruseitwisely.com)**, and AMWUA, Arizona Municipal Water Users Association. Peoria runs multiple social media accounts such as Twitter, Instagram, and Facebook. The main social media accounts include the city-affiliated one, Peoria Police, and Peoria Fire. These accounts are fairly active but geared more towards providing entertaining information rather than water crisis information. The police and fire accounts typically report about crime, emergencies, and current news. The city-based account does balance between news and family-fun posts. All three accounts have a substantial number of followers, ranging in the high thousands (City of Peoria, AZ, 2013).

One of the particularly relevant messages promoted by the City of Peoria is the Sustain and Gain 2019 Brochure (Figure 11). The Sustain and Gain booklet is an annual city publication targeting Peoria residents. The purpose of the booklet is to provide sustainability information, tips, programs, and resources. Parallel to sustainability, the publication includes two and a half pages of water conservation tips, a breakdown of a resident's water bill, and water conservation rebates for homeowners, such as Xeriscape. The second communication from the city is the Water Use It Wisely campaign. Designed to help citizens implement new ways to save water in their homes and community, the campaign provides suggestions to encourage new habits that will save water. These tips promote a sustainable lifestyle that will reduce water consumption. The content of "Sustain and Gain" and "Water Use it Wisely" can be incorporated into the proposed campaign, during the Awareness and Education phases.

For improvement, the students noted there are no visualizations of water risk across these existing campaign messages, and the public is not provided a compelling rationale for conservation. Peoria's current water conservation messaging lacks an explanation as to "why" consumers should reduce their water usage. The City of Peoria does not share details or reports about the risk of depleting water sources or reasons behind why people should conserve their water, aside from saving money. Although communicating tips for conserving water campaigns is a viable strategy, the challenge of actually persuading the audience to take action remains, especially if the purpose of conservation remains limited and ambiguous. In sum, the Peoria community does not fully comprehend the importance of water conservation; residents and businesses are ill-prepared for a water shortage.

What is xeriscape?

Xeriscape is the environmental design of residential and park land to reduce water use with colorful, drought-tolerant, low-water-use plants to provide attractive, shaded landscapes. Xeriscape conversion allows you to eliminate grass and develop a landscape that fits the desert environment.

Scorpion Weed (phacelia)
Low and spreading shrub. Mature size 1-1/2' tall. Green-gray leaves with orange-scarlet tubular flowers.

Sea Purslane (sesuvium verrucosum)
Fast growing shrub from Brazil. Mature size 30' tall x 10' wide. Purplish leaves with small blue or white flowers.

Canary Island Date Palm (phoenix canariensis)
Moderate growing succulent with a mature size 5' tall x 3' wide. Blue-green fronds with sharp orange-red tips.

For a full list of drought-resistant plants, visit www.amwua.org/plants.

Peoria Reporter

A major monsoon roars through the Valley. Trees blow over, potholes form and streets flood. Who do you call for help? No one. Pull out your phone and download the Peoria Reporter app. With a few intuitive clicks, you can report all of these issues and so much more - weeds, cracks, leaks, graffiti and code compliance issues. There is no need to search the web for phone numbers, just click and send. The app has a list of department phone numbers. To download, visit your phone's app store and search Peoria Reporter.

See it! Snap it! Send it!

Save Water, Save Money!

Water usage can easily be reduced at every home or business. The city of Peoria offers helpful rebates that can make you more water efficient and save you money!

RESIDENTIAL PROPERTY SAVINGS
Smart irrigation controller, up to $250
High-efficiency toilet, up to $100
Xeriscape conversion, up to $1,650
New home xeriscape, up to $150

NONRESIDENTIAL SAVINGS
Smart irrigation controller, up to $250
High-efficiency toilet, up to $100
Xeriscape conversion, up to $1,650

Since 2003, residents using the xeriscape rebate had more than 1 million square feet of grass removed and saved more than 10 million gallons of water. **Just think how much water you could save!**

Act now! Only a limited number of rebates are available each year.

Download an application today at www.peoriaaz.gov/rebates.
For more information, call 623.773.7861.

LANDSCAPE WATER GUIDELINES

How Much & How Often
Water to the outer edge of the plant's canopy and to the depth indicated. Watering frequency will vary depending on season, plant type, weather and soil.

		Spring (Mar-May)	Summer (May-Oct)	Fall (Oct-Dec)	Winter (Dec-Mar)	Water this Deeply (Typical Root Depth)
Trees	Desert adapted	14-30 days	7-21 days	14-30 days	30-60 days	24-36 inches
	High-water use	7-12 days	7-10 days	7-12 days	14-30 days	24-36 inches
Shrubs	Desert adapted	14-30 days	7-21 days	14-30 days	30-45 days	18-24 inches
	High-water use	7-10 days	5-7 days	7-10 days	10-45 days	18-24 inches
Groundcovers & Vines	Desert adapted	14-30 days	7-21 days	14-30 days	21-45 days	8-12 inches
	High-water use	7-10 days	2-5 days	7-10 days	10-14 days	8-12 inches
Cacti & Succulents		21-45 days	14-30 days	21-45 days	if needed	8-12 inches
Annuals		3-7 days	2-5 days	3-7 days	5-10 days	8-12 inches
Warm Season Grass		4-14 days	3-6 days	6-21 days	15-30 days	6-10 inches
Cool Season Grass		3-7 days	none	3-10 days	7-14 days	6-10 inches

These guidelines are for established plants (1 year for shrubs, 3 years for trees.) Additional water is needed for new plantings or unusually hot or dry weather. Less water is needed during cool or rainy weather. Drip run times are typically 2 hours or more for each watering.

On the very first Earth Day, 20 million people gathered in the streets of America. An environmental movement was born as a result.

15 Ways to Ditch Plastic*

Roughly 9.1 **BILLION** tons of plastic have been produced since the 1950s, and most of that plastic will remain in the environment for hundreds of thousands of years. When plastics finally begin to decompose, they release toxic chemicals into the soil and water.

1. Carry your lunch in glass or metal containers.
2. Use a stainless steel water bottle.
3. Use paper bags or no bags for produce at the grocery store.
4. Swap plastic wrap for natural beeswax wrap.
5. Instead of buying individually wrapped bars, buy trail mix or granola in bulk.
6. Use your own silverware for lunch or when ordering takeout.
7. Buy toilet paper wrapped in paper.
8. Choose bar soap instead of liquid.
9. Use a bamboo toothbrush.
10. Put homemade cleaning solutions in reusable metal spray bottles.
11. Give your pets cloth toys instead of plastic ones.
12. Choose detergent in cardboard boxes.
13. Bring a reusable tote bag whenever you shop.
14. Buy milk or juice in glass bottles.
15. Use a reusable glass or metal straw.

Summer Energy Savings*

Heat waves and long summer days mean staying indoors longer, running air conditioning more often, watering plants more, and washing more clothes like bathing suits and beach towels. This equates to higher overall energy use.

- **Raise the temperature on your thermostat,** ideally 75 degrees while you are at home and 78 degrees or higher when you are not at home.
- **Use fans to cool your home.** Fans cool down a room, while they are in use, by four degrees.
- **Hang curtains to reduce the heat from sunlight** coming through windows.
- **Clean your air filter regularly** to avoid overworking the cooling system.
- **Heat your food in the microwave.** Using the oven can raise the kitchen's temperature by 10 degrees.
- **Clean behind your dryer** to maintain the efficiency.
- Skip the dryer and **hang your clothes** in the garage or outside to dry.
- **Switch to LED bulbs,** They use 75% less energy and last 50 times longer than traditional bulbs.
- **Seal cracks and openings** with caulk or weather-stripping.
- **Turn down your water heater temperature** as it accounts for 18% of the energy consumed in the home.

GET THE FACTS!

what's in your water?

2018 Water Quality Report

Download the latest report at www.peoriaaz.gov/waterreports.

Did You Know?

Broken drip emitters result in millions of gallons of wasted water a year. A study by Arizona State University found that just two broken emitters are estimated to waste more than **100 gallons of water per hour.**

Typical Water Use per Person Each Day

- Eating, Cooking, Drinking 4%
- Showers and Baths 12%
- Toilets 13%
- Household Cleaning (Clothes, dishwasher, faucets) 16%
- Outdoors (Landscaping, pools, leaks, etc.) 55%

Fix Drip Line Leaks with a Goof Plug

Move drip emitters to your tree's dripline and install a goof plug into the old hole.

Drip Line — Water here — Water here
Standard 1/4" hole plug
Plug for holes larger than 1/4"
Click!
HOSE

Investigate leaks at SmartHomeWaterGuide.com

Let's make fats, oils & grease in the drain EXTINCT!

JURASSIC SINK

Oilisaurus Rex
Fattiplodicus
Greasidon

Follow these simple tips to help prevent sewer backups.

- Pour cooled fats, oils and grease into a covered, disposable container and save it for the next HHW event. Do not pour them down sink drains or toilets.
- Soak up spilled oils and grease with an absorbent material, such as paper towels or kitty litter, then discard into trash.
- Use sink strainers to catch any remaining food waste while washing dishes, then discard into trash.

Not All Drains Are the Same

Wastewater (Sanitary Sewer) System: Domestic wastewater (such as water from sinks, toilets, washers, etc.) from homes and businesses is collected in sewers and travel via underground pipes to a wastewater treatment plant where the water is treated and cleaned.

Stormwater System (Storm Drain): Rainwater and excess irrigation water travels in gutters, catch basins, underground pipes, retention basins, grass or concrete channels, and washes. The water flows to waterways without receiving any treatment. The city's primary discharge locations are the Agua Fria River, New River, ADOT drainage channels, community retention basins and parks. As the runoff flows, it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality. Everything dumped or drained into the stormwater system pollutes the environment.

Do Your Duty!
Pick Up Your Dog's Poo

Besides being gross, pet waste can contain:
- E. Coli
- Toxoplasma gondii
- Roundworm
- Tapeworm

It can contaminate stormwater and enter our water supply, causing health problems, especially for the immune-compromised and pregnant women.

Things You Can Do to Prevent Stormwater Runoff Pollution

10

- Use fertilizers sparingly and sweep up driveways, sidewalks and gutters.
- Never dump anything down storm drains or in streams.
- Add vegetation or gravel to bare spots in your lawn.
- Compost your yard waste.
- Use least toxic pesticides, follow labels, and learn how to prevent pest problems.
- Pick up after your pet.
- Direct downspouts away from paved surfaces; consider a rain garden to capture runoff.
- Take your car to the car wash instead of washing it in the driveway.
- Check your car for leaks and recycle your motor oil.
- Have your septic tank pumped and system inspected regularly.

Bottled Water vs. Tap Water

- The average price of a gallon of bottled water is $1.22.
- Only about 20% of the bottles are recycled. Most go to a landfill. They take 450 years to break down.
- Many bottled water companies labeling their product as "purified" or "natural spring water" have confessed to filling their products with simple tap water.

- The water that comes out of every resident's household plumbing only costs approximately 1/2¢ per gallon!
- In most blind taste tests, tap water easily holds its own against bottled waters, even the pricey ones.
- By law, municipal water systems must report their water source and composition...bottled water doesn't.

Figure 11 *Existing water conservation messaging from City of Peoria's 2020 Sustain and Gain program*

Benchmarks & best practices in water conservation

To further understand the City of Peoria's effectiveness in communicating the city's worsening water crisis, national and regional benchmarks were examined. The City of Fresno and the state of Minnesota emphasize that water is a necessity and scarce resource in their communication; this is something Peoria did not do explicitly. To gain insight into how other cities in the Phoenix area are handling water conservation messages, students evaluated the City of Scottsdale's water conservation communication. The primary medium the City of Scottsdale uses to advertise water conservation is on its Water Resource website. The main messaging strategy deployed by this website is informational. The target audience is adults who are actively searching for ways to conserve water. The Peoria website may entice the elderly community because it is simple and clear to use. The educational section offers free brochures that target general adult, as well as youth audiences. It is encouraged that schools order brochures in bulk for their classrooms (Water Resources, 2019). There are also free interactive presentations offered for grade 2 through grade 6 (Water Resources, 2019). The City of Scottsdale provides the presentation material.

Figure 12 *City of Scottsdale Water Resources page, showing links to free educational tools, retrieved Fall 2019*

The presentations target not only children and students but teachers and parents as well. The website lacked a hard-driving persuasive model. Instead, they offered applicable tips to reduce water usage and ways to get a rebate for additional conservation efforts (Water Resource, 2019). The downside of this website is there is no urgency to conserve, nor is there any way to find the information other than actively seeking it out.

CAMPAIGN DEVELOPMENT AND TESTING

Review and reflection of the background information collected on the nature of the problem, the characteristics of the audience, and the existing messaging and programs around water conservation, point to key features that are necessary for success and opportunities that can be leveraged and challenged. **Key features of a successful campaign include clarity, transparency, and accessibility.** Opportunities exist for leveraging existing message content from other cities and water conservation campaigns, such as Water Use it Wisely. Opportunities also exist for leveraging social media with the existing City of Peoria water app, for more targeted and "push-oriented" communication to Peoria residents. Key challenges include lack of urgency connected to water conservation, lack of understanding of the problem, and city residents' unfamiliarity with city planning. In response, the students propose a multi-level campaign (Figure 13) that coincides with the current conservation system outlined in Table 2 (see page 23).

Messaging level 1: Awareness
▪ Response option stages 1-2
▪ Introduction to campaign with visualization, which will frame subsequent messaging and target beliefs and values
▪ Water Conservation Competition, aimed at inculcating conservation behavior
Messaging level 2: Education and adaptation
▪ Response option stage 3
▪ Education on trigger system
▪ Social media campaign aimed at behavior change
▪ Establish Citizens Advisor Council
Messaging level 3: Crisis communication
▪ Response option stage 4
▪ Crisis communication by city authorities
▪ More specific and targeted communication with resources

Figure 13 *Proposed water conservation campaign for the City of Peoria, from original student work*

The proposed multi-layered campaign is designed to coincide with the requirements of each level of the City's drought alert system, with **Level 1 "Awareness,"** aimed at changing beliefs and values about water conservation, briefly introducing the drought alert system, and inculcating water conservation habits.

Level 2 "Education and Adaptation," is aimed at educating residents and businesses on the specific requirements and effects of the drought alert system (see Table 2), supplemented with a social media campaign that targets desired and undesired resource utilization. For example, Level 2 communication might use targeted social media to deliver weekly tips in water conservation utilizing an app that is promoted in Level 1 communication. Rolling out the app in this stage is critical as it will teach residents how to quantify their water use and conserve as needed. Level 2 communication should be dialogic, involving opportunities for residents to ask questions and express concerns. Bishop (2003) recommended a "representative advisory committee" for listening and understanding concerns. This committee would become critical for leading and adjudicating water allocation, and conservation concerns should a drought emergency (Drought Alert Stage 4) be called.

Level 3 "Crisis Communication," will incorporate formal messaging from city officials reported in mainstream media, in addition to city websites and mailers, announcing a water state of emergency. Students strongly recommend that "emergency" language be used by the Peoria Mayor, Office of Communications and Director of Water Services, to thoroughly explain the requirements of water conservation by city officials, should alert Level 4 – the Water Emergency - be triggered.

Local media should be brought in to explain the city's Drought Contingency Plan and to reiterate the message objective of Level 3 communication – requiring an immediate change in conservation behavior. Messaging must be specific and concrete with ample opportunities for residents to reach out to the city for practical help and financial support should sudden water rate increases impact them. Students strongly recommend the city anticipate and prepare for subsidies or exemptions for low-income residents who might be unable to pay for any sudden water rate increases. The City should consider carefully how the use of rate increases will impact its most economically vulnerable citizens. The proposed Citizens Advisory Council will need to be involved in decision making and serve as a forum for raising issues or concerns.

The class focused on the messaging for Levels 1 and 2 by developing visualizations and water conservation engagement strategies that could be launched during the Level 1 Awareness Stage. The aim would be to introduce the campaign, unifying messages across levels, and cultivate positive affect towards the goal of water conservation. Students developed the following visualizations and water conservation engagement strategies, each of which was pilot tested:

- **Water Is campaign** - Visualization and Hashtag: Beulah, Kevin, & Wayne

- **Lasting Legacy campaign** - Visualization and Hashtag: Alyssa A., Miko, Samuel, Lisette

- **Save a Rose campaign** – Visualization: Brenda, Harry, Daniel, Mia & Jennifer

- **Conserve Water, Conserve Life campaign** – Visualization and Hashtag: Denise, Michael, Darrith, and Matthew

- **Water Conservation Competition** - Engagement Strategy: Alyssa M. and Austin

- **S.T.E.P.S. Program:** Darrnell, Mei, Traivon

Pilot tests
Each of these awareness strategies was field-tested in a series of eight small pilot tests. All of the pilot tests relied on convenience and snowball sampling techniques to generate respondents. The developed questionnaires evaluated respondents' perceptions of water conservation more generally, as well as the campaign visualization and engagement strategy, more specifically. All pilot tests were conducted in Maricopa County, AZ, between October 7, 2019, and November 7, 2019. Although some of the pilot tests were conducted directly in Peoria, others were conducted in sister cities, such as Glendale, AZ, that are geographically adjacent to the city and are demographically similar in make-up and awareness about water conservation.

Lasting Legacy Water Drop campaign

The Lasting Legacy visualization promotes a legacy built by the present generation for future generations on how to exercise wisdom in water sustainability. This visualization includes children to promote the idea that this action would not only affect living adults, but generations to come. The water drop and landscape symbolize how vital water is to Arizona desert inhabitants. Several pilot tests were developed to target participants with Peoria demographics, at which point the same survey instrument was administered. See Appendix B on page 63 for specific details.

Three pilot tests were deployed to test the Lasting Legacy visualization. One pilot test was deployed on Facebook, two pilot tests were conducted at a business, and a final pilot-test leveraged Halloween to reach respondents in the Peoria ZIP Code, 85381. The participants, representing convenience samples of Maricopa County residents, were asked to rate their belief of the following statements as strongly disagree, disagree, neutral, agree, or strongly agree:

- This image clearly represents a water conservation campaign

- This image persuades the audience on the value of water conservation

- The "Lasting Legacy" slogan sparks curiosity to learn more about the campaign

- The image effectively visualizes the theme of the campaign

The combined quantitative and qualitative data generated from these pilot tests yielded pro-sustainability sentiment but low awareness about specific conservation habits and little motivation to seek out relevant conservation information. Respondents expressed positive attitudes about conservation but revealed a lack of urgency encoded in the visualization.

Following the design consultation with ASU Knowledge Enterprise graphic design staff, it was determined the initial student campaign visualization successfully exhibited the core messaging students wanted to display. Therefore, the Lasting Legacy campaign's initial design was promoted to the students' final design, resulting in only one graphic for this particular campaign.

Figure 14 "Lasting Legacy" final student visualization

Water Is campaign

The "Water is" campaign is designed to foster audience involvement and is well-adapted for social media sharing. A pilot-test was developed to assess the appeal of the message and the urgency of its conservation messaging. Thirty people were shown the images of the "Water is" campaign and were asked their opinions using an open-ended questionnaire. See Appendix A on page 60 for details. Most of the questions were open-ended to understand people's views better. The sample group was a cross-section of patrons from Faith Bible Church in Glendale, Arizona, with 43 percent of respondents being City of Peoria residents. More generally, respondents' age and education closely represented the City of Peoria demographics.

Respondents were told that the visualization and pilot tests were part of a class project to analyze the campaign and that their answers would be anonymous, in hopes that more honest opinions would surface. Feedback was analyzed in terms of themes. When asked whether the message had a negative or positive effect, the majority said that it had a positive effect, although, two respondents answered that the messaging was not clear, and one respondent was neutral. The people who thought the message was positive were asked to elaborate further, and many of the answers fell into four themes:

- Messaging was simple

- Messaging was clear and to the point

- Messaging language was appealing

- Messaging addressed a pressing problem here in the desert

Among those who thought the messaging had a negative connotation, their reasons included:

- Messaging was worrisome

- Messaging did not show urgency

It is interesting to note the stark opposites in the accounts given for the negative responses.

Finally, the participants were asked what one word they would use to describe water; **"Water is [fill in the blank]."** The answers showed that the participants placed a significant value on water. The most popular answers were that water is a precious commodity, necessary, and essential. When asked if people would like to participate in events with regards to this campaign, it is interesting to note that though the majority saw the messaging as positive, they were still unwilling to participate. For those who were willing, they said that they'd like tips on how they can save more water at home.

Figure 15 "Water is..." preliminary student visualization

Figure 16 *"Water is..." final visualization designs created in consultation with ASU Knowledge Enterprise graphic design staff*

Save a Rose campaign

The Save a Rose visualization leveraged symbolism, the rose, already officially linked to the City of Peoria. There was a total of three pilot tests conducted to assess this visualization. In the first pilot test, nine individuals were interviewed either in person, via telephone or email. For the interviews conducted in person or by phone, notes were taken summarizing the respondent's answers. For interviews conducted via email, respondents were sent open-ended questions soliciting responses. For the second and third pilot tests, individuals were targeted and interviewed at a local doctor's office and coffee shop in the City of Peoria.

These two studies used a Likert scale in which participants were asked four questions about water conservation and the visualization presented. Participants were asked to rate their responses between 1 and 5, with 1 being very unfamiliar or very unlikely and 5 being very familiar or very likely. Questions were asked verbally, and the visualization was shown using a picture of the drawn-out design on a tablet.

Overall, this portion of the study showed that most participants are relatively familiar with the importance of water conservation. They understand that conserving water is necessary, especially in the state of Arizona. It is clear to them that water is scarce, and steps need to be taken to conserve water. Analysis of responses revealed that our visual was not as effective as students had hoped it would be because respondents felt the rose was poorly chosen and did not reflect conservation. Respondents were not aware that the rose represented the City of Peoria. More positively, the majority of respondents indicated they were willing to take steps presented, to conserve water. This means that specific water conservation steps need to be "pushed" out to residents more concretely.

Figure 17 *"Save a Rose" preliminary student visualization*

Figure 18 *"Save a Drop" final visualization design created in consultation with ASU Knowledge Enterprise graphic design staff*

Conserve Water, Conserve Life campaign

The "Conserve Water, Conserve Life" visualization was generated to highlight the importance of water and make the audience aware of its power of water and to value it more directly, as opposed to seeing conservation merely as a means for saving money. In the visualization, it was critical to include a web link that directs residents to a page that has water conservation information so they can have a better understanding of it and to promote sustainable behavior. The webpage should include water conservation goals, the nature of the water crisis, actions that the audience can take to save water, contact points, possible negative local impacts if water conservation efforts are not successful, and other helpful resources. Adding a web link personalizes messages to Peoria residents on a background of the visualization, a photo of the Arizona desert.

This visualization was pilot tested using a nine-question survey using the free online tool called Survey Monkey (surveymonkey.com). See Appendix D on page 73 for details. The questions asked were a mix of both open-ended and close-ended and provided quantitative and qualitative results. Questions were developed to understand the participants' opinion on the visualization, the participants' likelihood of visiting the City of Peoria's website to learn more about water conservation, and the participants' current level of concern about their available water supply.

The link to the survey was shared amongst the four group members. The survey was then disseminated online to the group members' social media accounts, including Facebook, Snapchat, and Instagram, for 72 hours. In the online posts, a brief description of the Water Conservation Project was given along with the purpose of this survey and the survey link. The research group decided to target the online community since it would be the most efficient way of obtaining data. This information was also shared in a City of Peoria Facebook group to collect data from actual Peoria residents.

Figure 19 *"Conserve Water, Conserve Life"*
preliminary iteration created in consultation with
ASU Knowledge Enterprise graphic design staff

Figure 20 *"Conserve Water, Conserve Life"*
final design created in consultation with ASU
Knowledge Enterprise graphic design staff

S.T.E.P.S Program – practicing water conservation through an application

The City of Peoria already has a simple water conservation app that allows residents to report water leaks. A water conservation app that provides updates on water use educates residents on water conservation behaviors and helps them identify water waste through the S.T.E.P.S program, would be invaluable. Creating an app is an effective way to educate and inspire specific conservation behaviors.

A questionnaire using SurveyMonkey was deployed to test the S.T.E.P.S. application for water conservation.

A recurring theme showed up in response to the question, "When people get involved in trying to solve environmental problems, how often do you think they make things better?"

The majority of the audience chose the answer, "Once in a while," which was approximately 35 percent.

The second leading answer, however, was a tie between "About half the time" and "Most of the time," which was approximately 28 percent.

The results indicate a lack of confidence within the community to better the environment.

Another recurring theme derived from the question, "How willing are you to change your lifestyle to reduce the damage you cause to the environment?" The most common answer was "Extremely willing," which was approximately 54 percent. The second leading answer was "Very willing," which was approximately 36 percent.

These results indicate a lack of confidence in the success of conservation efforts but a personal willingness to conserve. A water conservation app can bridge the gap.

Figure 21 S.T.E.P.S. Program student developed infographic

Figure 22 S.T.E.P.S. mobile application mockup created in consultation with ASU Knowledge Enterprise graphic design staff

Water competition engagement strategy – Level 1 strategy

Persuasion is increased under conditions of direct involvement. Residents need to be educated on best-water conservation practices and must be motivated to deploy them. Accordingly, a friendly competitive strategy was designed to teach residents how to save water and to motivate direct participation. This engagement strategy is appropriate for Level One, the Awareness Stage. The competition would aim to see which subdivisions in Peoria could use the least amount of water during a single month; the winners (residents in that subdivision) would receive 15 percent off their next water bill.

The competition strategy was tested through a pilot study using convenience samples. The data was collected by interview and through a qualitative questionnaire that was deployed on October 28th and 29th of 2019. The questions were:

- Do you currently try to save water?

- Would you participate in a water conservation competition against other neighborhoods?

- Do you relate to the images on the visualization, and does this campaign make you think of water differently than what you did before?

The sample population consisted of seven adults; the youngest interviewed was 26 years old and the oldest 83, with the other interviewees being between 39 and 45. This sample was representative of the residents in Peoria because the average age of a Peoria resident is 39.5 years old. Results indicated that **respondents could see themselves participating in the beginning but did not think the competition would sustain over the long term.** Most said they would participate if it meant they could get a discount on their bill, while others said conservation tips should be added. Overall, people aren't actively thinking about saving water, but this campaign would get them motivated to adopt new conservation behaviors.

A meta-analysis of results from water conservation visualizations and strategies

A meta-analysis of aggregate data was conducted after collecting and analyzing the specific results from the pilot-testing of campaign visualizations and involvement strategies. The inductive and emergent meta-analysis yielded four overarching themes:

Theme 1 - Setting the affective tone

The meta-analysis reveals a recurring challenge in setting the affective tone for imagery and language and involvement tactics, of the Level 1 Awareness Stage. All of the visualizations developed generated positive responses – respondents "liked" the visualizations – but felt they did not convey the urgency of limited water resources. All of the visualizations lacked urgency, but **a sense of urgency could be communicated through simple adjustments in the imagery** (e.g., changing the color from blue to yellow or orange).

Theme 2 – Keep it simple and clean

Meta-analysis revealed respondents were drawn to simple, clean, and memorable messaging. Too much information and graphic complexity were detrimental.

Theme 3 - Social desirability but lack of drive

Meta-analysis also revealed that although respondents across pilot tests reported pro-conservation values and attitudes, few expressed willingness to seek out advice and implement it in their daily lives. For example, in the 'Water is' survey, 90 percent of the respondents said that the message was clear and interesting, but when asked if they would like to be involved in such a project, the majority said no. The most common reason for this response was that they had other commitments.

Theme 4 - Pushing messages

Meta-analysis revealed respondents prefer to have conservation messages "pushed" out consistently. Finding messaging strategies that push residents will be critical for campaign success. For example, the existing City of Peoria digital water app could be altered to promote weekly water conservation tips and alert households to significant changes in their water use. It could also be used to praise conservation, and signal or warn residents of increased consumption that could be caused by water leaks or other controllable circumstances.

Recommendations

Based on our multi-layered analysis and pilot tests, we propose a longitudinal campaign that begins by building awareness for the need to conserve water and moves to pushing out specific conservation messages targeted at changing behavior. Students developed seven different visualizations for building awareness and integrating messaging across the entire campaign. These messages were pilot tested using a variety of methodologies in the Peoria geographic area, leading to refinements in visualization strategies and message dissemination plans and practices. See Figure 13 on page 35.

The proposed City of Peoria Water Conservation Campaign would consist of three levels or stages, with messaging and dissemination strategies adapted for the unique needs of each.

Level 1 is the Awareness Stage with messages aimed at changing beliefs about the long-term availability of water, increasing the valuation of water conservation, and changing attitudes about actual water conservation practices. Awareness Level 1 messaging should include a visualization that represents the campaign that will be replicated in subsequent levels of more targeted messaging. The class developed four images and two involvement strategies for use by the city.
Level 1 messaging includes a City of Peoria "Competition for Water Conservation" and a proposed City of Peoria Water Day, scheduled on World Water Day, usually held in March. Most critically, it includes the development and promotion of the City of Peoria water conservation app – S.T.E.P.S.

Dissemination of Level One Awareness Stage messages should deploy a variety of communication media, ranging across flyers in bills, social media campaigns, and specialized events (e.g., Competition for Water Conservation and World Water Day) as itemized below. Given the importance of opinion leaders and influencers, we strongly recommend incorporating testimonials from recognizable community leaders, celebrities, and others of note and encouraging them to use social media to disseminate awareness messaging. We believe that children should be primary targets, although programs for their involvement were not developed by students, given the stipulated focus on adults.

Level 1 - Awareness Stage messages, strategies, and disseminations	
Flyers	Flyer in billing launching campaign, emphasizing visualization, identifying purpose, and introducing the City of Peoria Water Alert System.
Special events	Water Conservation Competition City of Peoria Celebration of World Water Day School-based water conservation education and valuation
Social media	All the campaigns students have come up with are easily disseminated social media. Each campaign has a hashtag (e.g., #wateris). Finding celebrities and local opinion leaders and influencers to promote the campaign across social media is critical to success.
Stickers	Incorporate campaign stickers with visualization for cars and water bottles.
HOA	Peoria has a prominent Homeowner Association (HOA). Through their HOA, they have regular meetings to provide a place for discussion for the community. Students would like to connect with a couple of these associations and discuss with them ways to educate and motivate their homeowners about water conservation. One method would be to provide HOA leaders with blue flags, possibly with the Peoria logo, to award neighbors who are actively conserving water. This may encourage others to follow suit to receive the flag on their lawn and feel included. Working with HOAs will provide a sense of accountability for the neighborhoods and hopefully inspire other homeowners as well.

Table 3 *Level one awareness stage messages, strategies, and disseminations*

Editor's Note

There are many HOAs throughout Peoria, especially in the newer areas, making HOAs an effective way of reaching out to the community. HOA leadership can act as a local liaison by disseminating messages in their communications with members. Local solutions for communities without HOAs should also be developed. The key is to find ways to disseminate information locally, and provide opportunities for feedback from those localities, back into more centralized decision making at the city level.

Level 2 Messaging and Dissemination Stage in the proposed multi-level campaign pushes out specific messages about the water alert system and water conservation tips. The content of Level 2 messages will include the selected visualization and will focus on educating and incentivizing specific conservation behaviors and preparing audiences for water rules and rationing that will be enacted if a water alert or water emergency is called. We propose that infographics be developed to represent the alert system on flyers, in local media coverage, and social media campaigns.

Infographics are recommended to educate residents about the alert system and water conservation plan and to clarify particular and concrete actions residents can apply to initiate water conservation. Figures 23 and 24 feature an initial and refined concept for a sample infographic that could educate residents about the source of their water and the way the City of Peoria Water Alert system works.

Figure 23 Educational water source graphic, initial concept

Figure 24 Finalized water source graphic, illustrating aquifer depletion, created in consultation with ASU Knowledge Enterprise graphic design staff

Level 2 - Messaging and Dissemination Stage outreach	
Flyers	Flyer in billing launching campaign explaining the City of Peoria Water Alert system, detailing the necessity of enforced conservation should alert system be activated, and identifying consequences for non-compliance. It is critically important to provide resources and contact information anticipating resident needs (e.g., concerns about costs) and enabling residents to reach out should they have questions.
Special events	"A Day without Water" Initiative. On this day, we will encourage residents to refrain from water use; government employees will be required to participate, excluding drinking water. This initiative may seem harsh, but it reminds citizens how fortunate they are to live with water. Water from the Colorado River is diminishing and "A Day Without Water" Initiative will encourage the public to be conscious about how much water they consume. Water Conservation Training Day at City Hall Water Conservation Training Days with local retailers, such as Home Depot, Lowes, and Ace Hardware School based water conservation education and valuation
Social media	Social media should include visualization and be aimed at disseminating specific strategies. For Level 2 the aim will be to direct people to more information curated by the water department and to encourage and inform citizens on how they can be a part of the change. Now is the time to start making informational YouTube videos on concrete water conservation habits that can be shared across various social media platforms. Existing City of Peoria water app should be used to push out water-saving tips and alert heavy users and encourage conservation habits.
HOA	Outreach to HOA board members to mobilize residents to conserve water and to identify water use that can be cut in common areas.
Citizens Advisor Council	Must represent the diversity of Peoria residents. The committee should be created before level 4 is enacted (i.e., Water Emergency).

Table 4 *Level two awareness messages, strategies, and disseminations*

Level 3 Messaging and Dissemination Strategies should be labeled "Crisis Communication," corresponding with a formal Water Emergency. Specific instructions are required at this stage. Messaging should reiterate resources and contacts already shared in Level 2 Risk Communication. The message dissemination strategies are uniquely adapted to the urgency of the crisis communication situation, with emphasis on the role of key Peoria officials, in making televised media appearances and collaborating with local print media to formally announce mandatory conservation actions required by residents and businesses.

Level 3 messages will contain specific instructions on cutbacks and rationale for the city of Peoria's water crisis. These messages will include precise step-by-step instructions on water conservation practices, such as helping family and friends understand the current circumstance, tips on reducing water usage in one's household, and in turn, the neighborhood.

These messages will have the highest level of urgency and come with a list of precautions and necessary steps for water rationing and conservation. Penalties for those who do not comply with conservation regulations should also be included in Level 3 messaging. There also needs to be resources, or the ability to acquire resources for those in need, with messaging detailing the importance of rationing. All these messages must be strategically worded, and the city would need to tread cautiously so that they do not cause panic or ensue chaos. The messages need to explain the reasons for the shortages while highlighting how to conserve and ration. Lastly, the city needs to consider its residents' needs for feedback mechanisms.

CONCLUSION

The visualizations developed and tested by this course and the communication campaign benefited from the expert review provided by City of Peoria officials and consultation with digital media experts from the ASU Knowledge Enterprise (KE)'s Marketing and Communications department, allowing for still more message development. The class is grateful for the support and assistance of Ana Hernandez, Patrick Cheung, Travis Buckner, and Jason Franz, with a special appreciation for Ms. Hernandez's conceptual artistry.

Figure 25 *Compiled final campaign visualizations*

Feedback from ASU digital experts reinforced the importance of developing a sense of urgency. This feedback echoed the results from the pilot tests. However, the class found it challenging to create visual images that simultaneously elevated the symbolic significance of water (thereby re-valuing it) and the urgency of potential drought. Fear appeals lose impact over time so the class wanted to inspire, rather than alarm, but realized that without urgency, there would be little motivation for adapting conservation habits.

The class learned quite a bit about the importance of honing visual signification from KE involvement. The non-verbal aspects of messaging, such as the importance of color, font, and visual imagery, were stressed in ways that extended student thinking regarding their impact in shaping audience interpretations.

Feedback from city officials focused on aligning the alert system with the communication campaign and considering more fully how campaign communications from the city would incorporate established media. Each of these recommendations promoted reflection. Aligning the City of Peoria's Drought Alert Stages and the proposed communication campaign levels would enhance overall clarity for those involved in producing the campaign and those receiving it. The lack of alignment in alert and messaging strategies afflicts the entire system as CAP's alert system does not map directly onto Arizona cities' drought alert systems.

Students' proposed communication campaign levels – Awareness, Education, and Crisis Communications – maps the city's Drought Alert Stages 1 and 2 primarily into the "Awareness" level of the campaign with spillover into "Education." The unresolved question that arises from this disconnect is whether the communication campaign should introduce another level. This issue of alignment requires further consideration and will be the focus of a Spring 2020 applied project to field test proposed messaging.

Final feedback from city officials included concern about the class's general lack of consideration for collaboration with mainstream news and other established media. The class is made up of "digital natives" that prioritized using social media and engagement strategies, especially the competition and water conservation app, over more traditional approaches to disseminating messages. Yet, the established media do have a significant role to play across messaging levels in highlighting conservation successes and failures in Awareness and Education messaging, and in legitimizing and explaining Crisis Communications should a water emergency be called.

Additionally, the class felt that opinion leaders were critical in building residents' sense of identification with the campaign. Both glamorous and mundane opinion leaders alike, could be highlighted by local media, inspiring narratives of successful conservation, framed by the legitimacy still-offered by mainstream print and television media. This project is ongoing as messages will be field-tested in the spring, and these unresolved issues revisited. Students learned so much from the experience and remain grateful to ASU Project Cities and the City of Peoria in making this collaboration so successful.

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To access the original student reports, additional materials, and resources, visit:

links.asu.edu/PCPeoriaWaterConservation19F

APPENDIX A: WATER IS CAMPAIGN

Figure 26 *"Water is..." preliminary student visualization*

Figure 27 *"Water is..." final visualization designs created in consultation with ASU Knowledge Enterprise graphic design staff*

The "Water is" campaign is designed to foster audience involvement and is well-adapted for social media sharing. A pilot-test was developed to assess the appeal of the message and the urgency of its conservation messaging. Thirty people were shown the images of the "Water is" campaign and were asked their opinions using an open-ended questionnaire. Most of the questions were open-ended to better understand people's views. The sample group was a cross-section of patrons from Faith Bible Church in Glendale, Arizona, with 43 percent of respondents being City of Peoria residents. More generally, respondents' age and education closely represented the City of Peoria demographics.

─────── *Editor's Note* ───────

Glendale and Peoria share a long border, and their respective residents frequently cross between communities for daily needs, and share some water management infrastructure, demonstrating the unique cross-sectional nature of water scarcity challenges.

Respondents were told that the visualization and pilot tests were part of a class project to analyze the campaign and that their answers would be anonymous, in hopes that more honest opinions would surface. The questions were as follows:

1. Are you a citizen of Peoria?
2. Does the visualization convey the message clearly or not? Why?
3. Would you be interested in being part of this campaign?
4. If yes, what are some of the ways you'd like to be involved?
5. If no, what could be a reason holding you back?
6. Does the message have a positive or negative connotation? Why?
7. Fill in the blank: Water is____

Feedback was analyzed in terms of themes. When asked whether the message had a negative or positive effect, the majority said that it had a positive effect, although two respondents answered that the messaging was not clear and one responder was neutral. The people who thought the message was positive were asked to further elaborate and many of the answers fell into four categories:

- Messaging was simple

- Messaging was clear and to the point

- Messaging language was appealing

- Messaging addressed a pressing problem here in the desert

Among those who thought that the messaging had a negative connotation, reasons included:

- Messaging was worrisome

- Messaging did not show urgency

It is interesting to note stark opposites in the accounts given for the negative responses.

Finally, the participants were asked what one word they would use to describe water; **"Water is [line here]."** The answers showed that participants have placed a significant value on water. **The most popular answers were that water is a precious commodity, necessary, and essential.** We asked the last question based on research regarding engagement.

Survey responses: "Water is _____."	
Response	*Number of people*
Finite	3
Limited	1
Life	8
In everything	1
A gift from God	1
Invaluable	1
Necessary to live	5
Essential	2
Refreshing	2
A requirement	1
In short supply	1
Precious	4

Table 5 *Write-in responses to the survey question, "Water is____."*

When asked if people would like to participate in events with regards to this campaign, it is interesting to note that even though the majority saw the messaging as positive, they were still unwilling to participate. For those who were willing to participate, they said they would like tips on how they can save more water at home.

APPENDIX B: LASTING LEGACY CAMPAIGN

Figure 28 *"Lasting Legacy" final student visualization*

The Lasting Legacy visualization promotes a legacy built by the present generation for future generations on how to exercise wisdom in water sustainability. This visualization includes children to promote the idea that this action would not only affect adults but generations to come. The water drop and landscape symbolize how vital water is to Phoenix desert inhabitants. Several pilot tests were developed that targeted participants who match the demographics of Peoria, using the same survey instrument to ensure the message would accurately predict how the residents of Peoria would perceive the message:

- This image clearly represents a water conservation campaign

- This image persuades the audience on the value of water conservation

- The "Lasting Legacy" slogan sparks curiosity to learn more about the campaign

- The image effectively visualizes the theme of the campaign

The participants were asked to rate their belief of the statements either as strongly disagree, disagree, neutral, agree, or strongly agree. One pilot test was deployed on Facebook, two pilot tests were conducted at a place of business, and a final pilot-test leveraged Halloween to reach respondents in the Peoria zip code 85381 while passing out candy. Tables 6 through 9 detail the participant responses for each location.

Lasting Legacy survey responses collected via Facebook					
Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
This image clearly represents a water conservation campaign.	0	1	2	5	2
This image persuades the audience on the value of water conservation.	0	3	4	3	0
The "Lasting Legacy" slogan sparks curiosity to learn more about the campaign.	0	0	0	7	3
The image effectively visualizes the theme of the campaign.	0	3	0	6	1

Table 6 "Lasting Legacy" survey responses collected via Facebook (n=10)

Lasting Legacy survey responses collected via a place of business					
Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
This image clearly represents a water conservation campaign.	0	1	2	6	2
This image persuades the audience on the value of water conservation.	0	3	4	3	0
The "Lasting Legacy" slogan sparks curiosity to learn more about the campaign.	0	0	0	7	3
The image effectively visualizes the theme of the campaign.	0	3	0	6	1

Table 7 "Lasting Legacy" survey responses collected via place of business (n=11)

Lasting Legacy survey responses collected at a work event					
Statement	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
This image clearly represents a water conservation campaign.	0	1	1	0	2
This image persuades the audience on the value of water conservation.	0	2	1	1	0
The "Lasting Legacy" slogan sparks curiosity to learn more about the campaign.	1	1	0	0	2
The image effectively visualizes the theme of the campaign.	0	0	2	0	2

Table 8 *"Lasting Legacy" survey responses collected at a work event (n=4)*

Lasting Legacy survey responses collected in Peoria during Halloween					
Statement	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
This image clearly represents a water conservation campaign.	0	2	5	5	0
This image persuades the audience on the value of water conservation.	0	4	5	3	0
The "Lasting Legacy" slogan sparks curiosity to learn more about the campaign.	0	0	4	4	4
The image effectively visualizes the theme of the campaign.	0	3	6	3	0

Table 9 *"Lasting Legacy" survey responses collected while passing out candy on Halloween in Peoria zip code 85381 (n=12)*

Aggregating the data generated across the surveys yielded the following results shown in Figure 29.

29A *"This image clearly represents a water conservation campaign."*

29B *"This image persuades the audience on the value of water conservation."*

29C *"The 'Lasting Legacy' slogan sparks curiosity to learn more about the campaign."*

29D *"The image effectively visualizes the theme of the campaign."*

Figure 29 *Aggregated Lasting Legacy visual campaign survey data*

Students created a normal frequency distribution chart to show the frequency between people who strongly disagree to strongly agree. Strongly disagree would be considered a 1.00, disagree would fall into 2.00, and so forth until we reach strongly agree in which would result in a 5.00. We found that there is a higher frequency of people aligning with our image and overall campaign.

Response	Frequency
5.00	21
4.50	19
4.00	14
3.50	5
3.00	4
2.50	1
2.00	0
1.50	0
1.00	0

Figure 30 *Frequency distribution of Lasting Legacy survey responses*

APPENDIX C: SAVE A ROSE CAMPAIGN

Figure 31 *"Save a Rose" preliminary student visualization*

Figure 32 *"Save a Drop" final visualization design created in consultation with ASU Knowledge Enterprise graphic design staff*

The Save a Rose visualization leveraged symbolism; the rose, already officially linked to the City of Peoria. There was a total of three pilot tests conducted to assess this visualization. In the first pilot test, nine individuals were interviewed either in person, via telephone or email. For the interviews conducted in person or by phone, notes were taken by the interviewers, summarizing the respondent's answers. For interviews conducted via email, respondents were sent the open-ended questions, and they responded via email with their answers. For the second and third pilot tests, individuals were targeted to be interviewed at a local doctor's office and a coffee shop; these two studies used the same survey instrument.

Pilot Test 1: Nine individuals (convenience sample) were interviewed either in person, via telephone or email. For the interviews conducted in person or by phone, notes were taken by the interviewers, summarizing the respondent's answers. For the interviews conducted via email, respondents were sent the open-ended questions, and they responded via email with their answers. Participants were asked open-ended questions to allow them to answer the questions, in a descriptive manner freely.

The following questions were used in our pilot test, their numbers correspond to the answers in Tables 9A and 9B:

1. What are your initial reactions to this visualization?
2. What does water conservation mean to you?
3. What do you know about water conservation in AZ?
4. If you were exposed to this visualization in a water campaign, what questions would you have?

The participants' responses were then coded as either positive or negative. If the respondent provided feedback regarding the visual message using words and phrases that showed a positive attitude towards the visual image, then these answers were coded as positive. If they responded with confusion and used words or phrases that showed they were not fond of the visual image, then their responses were coded as negative.

For the questions regarding water conservation, if the respondents used words or phrases that showed they were aware of the importance of water, shortage of water, and what water conservation was, then these answers were coded as positive. On the other hand, if the answers had words or phrases that showed a lack of understanding of the importance of water, the water crisis, and what water conservation is, then these answers were coded as negative.

Save a Rose write-in survey responses	
Participant 1 **(47, Male, No children, college degree, City of Peoria resident)**	1. After careful observation, I can see the message of visual aid. 2. Water conservation should be everyone's business. 3. Being in desert, water is essential to our survival. 4. What is the other water conservation doing the city planning to have?
Participant 2 **(44, Female, No children, college degree, City of Peoria resident)**	1. Visual message seems easy to understand 2. Water conservation is vital to our city as we are noticing water shortage in our neighboring cities/states. 3. All I know is that water is sacred, especially in AZ. 4. How do we know that our water conservation efforts impact our city?
Participant 3 **(12, Female, No children, City of Peoria resident)**	1. Like the rose image in the visual aid. 2. I did now know about this until you shared it with me. 3. Nothing 4. Does this mean, I have to take shorter showers?
Participant 4 (18, Male, No Children)	1. It is straight to the point. 2. Water conservation means to me that we should save water for when we have droughts, we still have access to water. 3. I do not know anything. It is a desert, however. 4. What is the biggest use of water in households and job use in the city?
Participant 5 (52, Female, Two Children, high school degree, college degree- BA)	1. It is nice and clean. You know where it is for (Watering can say Peoria). 2. Water is a precious resource. And we have to conserve it, because we need it to survive. 3. I know that people will not use lawns as they use too much water. 4. How are you going to save the water?
Participant 6 (53, Male, Two Children, high school degree)	1. Refreshing. 2. Water conservation means to me, ways to conserve water or different ways to conserve water to be able to water plants. 3. I do not really know. 4. How does the city plan on conserving water? How do you get more roses to grow in your city?

Table 10A *Save a Rose write-in survey responses (n=9)*

Save a Rose write-in survey responses (continued)

Participant 7 (29, Female, college degree-B.A., AZ Native, Latino, no kids)	1. Initial response to the graphic imagine is confusion. I didn't know roses are an Arizona native plant. I felt like using water even for plants that are not natural grown in a desert environment do use the city water. So, my confusion is the city of Peoria not only wasting water on everything on the water bucket but also on plants implanted in the area? 2. I believe water conservation is important due to the water usage from a growing population. Eventually, supply will not meet the demand. Preventive measures should take place so the water supply doesn't become scarce for usage. 3. With the growing population in the Phoenix (valley) area, I would assess the AZ water supply is not the best. 4. What other actions are currently being done to address the water supply? What are some of the conservative measures that the city of Peoria and the rest of AZ can implement? Currently, how much water supply deficit is AZ facing? Why is water wasted on items listed in the bucket?
Participant 8 (29, Female, Some college education, AZ Native, Latino, 2 kids)	1. I thought that the flower was pretty, but that roses are not so common around this area. The depiction of saving water in one place to use it in another place is a great way to make a person conscientious about their own usage. 2. Water conservation means using water wisely and not wasting it or letting it run just because. In the shower, open the faucet only when you are about to go in and don't let it run. Limiting the number of baths a person takes, etc. 3. I know it important to conserve water here in AZ because we get it from far away and is recycled after we use it, but it takes time for it to go through the process. I don't know what the state expects from people exactly or if they have specific measures to do so. 4. If I saw this picture in a water campaign my only concern would be the rose. If we are trying to conserve water why not use a plant that is more commonly seen in Arizona. A rose requires extra care and water. It's a funny observation, but that would go through my mind if I saw it.
Participant 9, (Male, 40, college degree-M.A., AZ Native, no kids)	1. Rose doesn't belong, it's unnatural in a desert setting. 2. Using water in a smart way. 3. Knows about CAP, Colorado River supplying some of our water supply, but believes there to be an "abundance" amount of water for the near future. Believes that in order to help water conservation efforts commercial businesses need to cut down on their water usage, example would be their use of lots of water for plant growth not common in a desert state. Water conservation messaging in AZ has been ineffective. 4. Why the rose? And the message of the image appears to be that water is life

Table 10B Save a Rose write-in survey responses (n=9)

Pilot Test 2: The first set of interviews were conducted in the office of an ear nose & throat specialist, over the course of eight hours (7:30am-4:00pm). While the study was voluntary, participants were selected based on the city demographic they listed. The cities included in this study were: Peoria, Surprise, Glendale and El Mirage. Given the small number of participants, it was determined that using neighboring cities for data collection might be beneficial.

The second set of interviews were conducted at Dutch Bros. coffee shop located at the Westgate Entertainment District in Glendale, over the course of 2 hours (6-8 pm). This study was voluntary, and participants were selected based on their city demographic as well. A total of 25 participants were questioned; 14 females and 11 males.

Using a Likert-Scale, participants were asked four questions about water conservation and the visualization presented. Participants were asked to rate their responses from 1 to 5, with 1 being very unfamiliar/very unlikely and 5 being very familiar/very likely. Figure 33 shows an example of the Likert-Scale.

The following questions were asked:

- How knowledgeable would you say that you are about water conservation?

- How memorable is this design or how likely are you to remember this design?

- How difficult would incorporating any of the 3 activities listed on the water can be, into your daily routine, for you?

- What is the most memorable aspect about this design?

1	2	3	4	5
Very unfamiliar	Somewhat unsure	Somewhat familiar	Familiar	Very familiar

Figure 33 Example of a likert-scale similar to what survey respondents saw during pilot test 2

APPENDIX D: CONSERVE WATER, CONSERVE LIFE CAMPAIGN

Figure 34 "Conserve Water, Conserve Life" preliminary iteration created in consultation with ASU Knowledge Enterprise graphic design staff

Figure 35 "Conserve Water, Conserve Life" final design created in consultation with ASU Knowledge Enterprise graphic design staff

The "Conserve Water, Conserve Life" visualization, was generated to highlight the importance of water, make the audience aware of the power of water, and value water more directly, as opposed to seeing conservation merely as a means for saving money. In the visualization, it was critical to include a web link that directs residents to a page that has water conservation information so they can better understand water conservation and promote sustainable behavior. The webpage should include: water conservation goals, nature of the water crisis, actions that the audience can take to save water, contact points, possible negative local impacts if water conservation efforts are not successful, and other helpful information (Lundgren, & McMakin, 2019). Adding the web link personalizes the message to City of Peoria residents with the background of the visualization; a photo of the Arizona desert. To take action, residents must become aware and educated on the initial problem.

This visualization was pilot tested using a nine-question survey through the free online tool surveymonkey.com. The questions asked were a mix of both open-ended and close-ended and provided quantitative and qualitative results. Six out of the nine questions were in regards to the participants' demographics and consisted of the following questions:

1. What is your age? (Under 18, 18 - 24, 25 - 34, 35 - 44, 45 - 54, 55 - 54, or 65+)

2. What is your gender? (Male, Female, or Other - Please Specify)

3. Please describe your race/ethnicity. (Asian, American Indian/Alaskan Native, African- American/Black, Hispanic/Latino, Native Hawaiian/Other Pacific Islander, White, or Other - Please Specify)

4. In what city do you live? (Avondale, Glendale, Happy Valley, Peoria, Phoenix, Scottsdale, Surprise, Tempe, or Other - Please Specify)

5. What is the highest level of education you have completed? (High School Diploma/GED, Some College, Undergraduate Degree, Graduate Degree, Doctorate/Professional Degree, or Other - Please Specify)

6. What is your household's estimated COMBINED income for 2018? - Income BEFORE taxes (Less than $20k, $20k - $34.9k, $35k - $49.9k, $50k - $74.9k, $75k - $99.9k, $100k - $149.9k, or $150k or more)

Additionally, the following questions were asked to understand the participants' opinion on the ad developed by our group: the participants' likelihood of visiting the City of Peoria's website to learn more about water conservation, and the participants' current level of concern about available water supply:

7. How well does the ad communicate the need to conserve water (the image of the ad is shown above)? Suggested edits or feedback? (Extremely Well, Very Well, Somewhat Well, Not So Well, or Not at All Well)

8. How likely are you to visit PeoriaWater.org to learn more about water conservation? (Extremely Likely, Very Likely, Somewhat Likely, Not So Likely, or Not Likely at All)

9. How concerned are you about your available water supply? (Extremely Concerned, Very Concerned, Moderately Concerned, Slightly Concerned, or Not at All Concerned)

The link to the survey was shared amongst the four group members. The survey was then primarily disseminated online to the group members' social media accounts, including Facebook, Snapchat, and Instagram, for 72 hours. In the online posts, a brief description of the Water Conservation Project, the purpose behind this survey, and the survey link were included. The research group decided to target the online community as most efficient way of obtaining data. The data was also shared in a City of Peoria Facebook group to collect data from actual residents from the city.

	Q9: EXTREMELY CONCERNED	Q9: VERY CONCERNED	Q9: MODERATELY CONCERNED	Q9: SLIGHTLY CONCERNED	Q9: NOT AT ALL CONCERNED	TOTAL
Under 18	0.00% 0	0.00% 0	0.00% 0	0.00% 0	100.00% 1	1.49% 1
18-24	26.67% 4	6.67% 1	60.00% 9	6.67% 1	0.00% 0	22.39% 15
25-34	40.00% 12	26.67% 8	26.67% 8	6.67% 2	0.00% 0	44.78% 30
35-44	33.33% 3	11.11% 1	44.44% 4	11.11% 1	0.00% 0	13.43% 9
45-54	0.00% 0	20.00% 1	40.00% 2	40.00% 2	0.00% 0	7.46% 5
55-64	14.29% 1	57.14% 4	14.29% 1	0.00% 0	14.29% 1	10.45% 7
65+	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0
Total Respondents	20	15	24	6	2	67

Figure 36 "Conserve Water, Conserve Life" survey responses, specifically juxtaposing the opinion questions with age demographics

37A Age group under 18 water conservation concern levels (n=1)

37B Age group 18-24 water conservation concern levels (n=15)

37C *Age group 25-34 water conservation concern levels (n=30)*

37D *Age group 35-44 water conservation concern levels (n=9)*

37E *Age group 45-54 water conservation concern levels (n=5)*

37F *Age group 55-64 water conservation concern levels (n=7)*

Figure 37 *Reported respondent level of concern for water conservation, categorized by age group (n=67)*

APPENDIX E: WATER CONSERVATION COMPETITION AND ENGAGEMENT STRATEGY

This pilot study was designed to test the water conservation competition planned for Level 1 Awareness. The pilot study was conducted through interviews that used a qualitative questionnaire. The questionnaire asked open-ended questions. The questions included: do you currently try to save water, would you participate in a water conservation competition against other neighborhoods, do you relate to the images on the visualization, and does this campaign make you think of water differently than what you did before. These questions were chosen because the group wanted to get an idea about participant's current views on saving water, if a competition would be something people would actually do, and if the visualization would be effective in making the message personal to the audience.

The group members gathered participants with a convenience sample; one group member is a resident of Peoria and was able to question their neighbors. Of the participants, two lived in an adjacent city, Glendale, and were selected to see if other cities would be interested in doing a competition or something of the like. The participants ranged from age 26 to 83 years old, with most participants between the ages of 39 and 45. This group had two members and one asked the questions on October 28, 2019 and the other on October 29, 2019.

Results showed the competition wouldn't be something that would last. The campaign would likely gain attention in the beginning because it's different, but people would forget it as time passed on. However, it was found that incentives would be a major factor to elicit participant engagement. It was common for participants to say they did not think about water conservation on a daily basis. A competition was said to be a reminder to save water.

APPENDIX F: MODELING CONSERVATION STRATEGY THROUGH A S.T.E.P.S. PROGRAM

Group 6 focused on a Water Conservation App engagement strategy. The app would allow residents to track their water use and make comparisons with past use and perhaps even community norms. The STEPS conceptualization is designed to help people improve their water conservation by systematically surveying and analyzing water use. The STEPS Water Conservation App would be rolled out as part of Level 1 and 2 messaging.

In order to test the appeal of the STEPS app, the group developed a questionnaire that was disseminated using SurveyMonkey to collect feedback. The questionnaire also asked respondents to evaluate a graphic that could potentially be adapted to representing the City of Peoria's water alert system in level 2 educational messaging.

Although only 13 responses were generated, the respondents were all from Maricopa County and self-identified across a range of cultural identifiers including White, Black, Hispanic, Asian, and other. One of the benefits of a diverse sample is minimizing bias. The data generated from respondents were revealing when analyzed for recurring themes.

Interview Questions
- What is your gender?
- What is your age?
- Are you: (reference to race)?
- What city do you currently live in?
- What is the highest level of education you have completed?
- From a glance, explain what initially captures your attention?
- When people get involved in trying to solve environmental problems, how often do you think they make things better?
- How willing are you to change your lifestyle to reduce the damage you cause the environment?

Figure 38 *S.T.E.P.S. Program student developed infographic*

Figure 39 *S.T.E.P.S. mobile application mockup created in consultation with ASU Knowledge Enterprise graphic design staff*

Results

The results point to several component themes across respondents' answers. An overarching theme shows that there is willingness to change behavior or get involved. From our interview question, people understand that water scarcity is an important factor of everyday living and building a sustainable life for themselves and their communities. The results showed that individuals are doubtful of each other when it comes to saving the environment, but, most individuals said they were willing to change their lifestyle to better the environment.

Outcome 1

The feedback from the audience revealed recurring themes that indicate current perspectives on environmental concern. In addition, the responses based on the visuals showcased a trend. The recurring theme and trend help confirm the positions of individuals on water conservation. Scattered responses were also taken into consideration because it can expose ambiguity which affects data or differences among individuals that reflect the understandings or misunderstandings of water conservation.

One of the recurring themes showed up in the question, "When people get involved in trying to solve environmental problems, how often do you think they make things better?" The majority of the audience chose the answer, "Once in a while" which was approximately 35 percent. The second leading answer, however, was a tie between "About half the time" and "Most of the time" which was approximately 28 percent. The results indicate a lack of confidence within the community to better the environment. Another recurring theme derived from the question, "How willing are you to change your lifestyle to reduce the damage you cause to the environment?" The most common answer was, "Extremely willing" which was approximately 54 percent. The second leading answer was, "Very willing" which was approximately 36 percent. The results indicate that there is a lot of confidence within individuals to help the environment.

Outcome 2

A common trend can be found within the responses about the infographic. The question presented about the infographic was, "From a glance, explain what initially captures your attention?" Four individuals mentioned, "Every drop counts." This question was asked to test the effectiveness of the infographic. The trend in respondents' answers reinforces the importance of clear and easy-to-read communication. Messages should be honest, informative and have some sort of urgency.